Main-Index

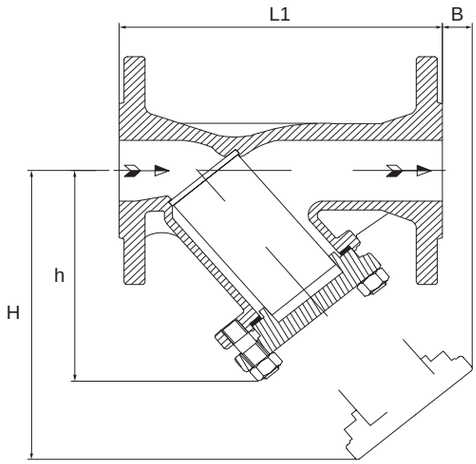
back to start page

All measurements and weights are approximate figures.
Illustrations are not bindig. Alteration rights reserved.

open printversion

Strainer with flange connection
GGG 40.3, PN 16

Strainer with flange connection,
for water, steam and heat transfer oil
Filter screen: made of alloy steel wire,
if desired with supporting basket
(from DN 200 onwards standard equipment)
and/or fein screen (mesh size 0,25 mm)
Body: GGG 40.3, PN 16
Flanges acc. to DIN 2533



Order text:
Strainer GGG 40.3, PN 16, DN . .
filter screen made of alloy steel,
Flanges acc. to DIN
List-No. 150 4 . .

Max. operating pressure:

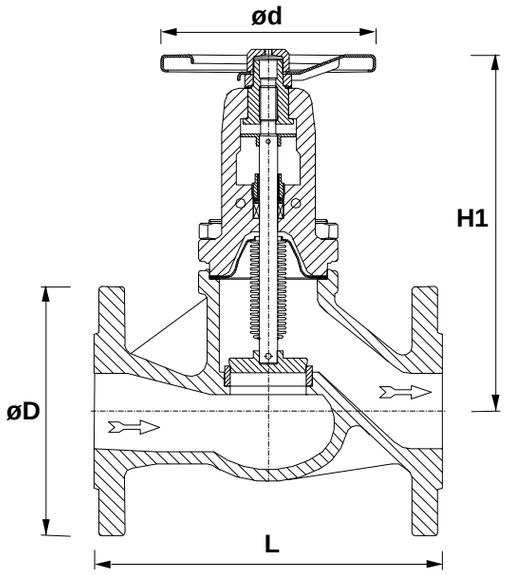
by:	120	200	250	300	350	°C
PN 16	16	13	13	13	10	bar

DN	List-No.	Weight	Immersion lenght	Height opened		Measure	Screen	Wire gauge x mesh size
		kg	L	h	H	B	∅ x height	
15	150 400	3,5	130	90	135	10	23 x 57	0,5 x 1
20	150 401	4	150	100	150	10	28 x 69	0,5 x 1
25	150 402	5,5	160	115	180	25	36 x 83	0,5 x 1
32	150 403	7	180	125	205	35	42 x 99	0,5 x 1
40	150.404	9	200	150	235	45	50 x 115	0,5 x 1
50	150 405	12	230	160	250	45	61,5 x 120	0,5 x 1
65	150 406	16	290	180	285	25	78,5 x 135	0,63x1,25
80	150 408	21	310	215	330	40	89,5 x 150	0,63x1,25
100	150 410	28	350	235	365	55	109,5 x 170	1,0 x 1,6
125	150 412	41	400	275	425	65	137,5 x 200	1,0 x 1,6
150	150 415	58	480	305	480	50	160 x 225	1,0 x 1,6
200	150 420	115	600	390	610	80	210 x 285	1,0 x 1,6

open printversion

Manual operated stop valve in two way form with bellow sealing, PN 16/25 Form A

Valve body: two way form
for heat transfer oil, water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: stainless steel bellow
and safety stuffing box
Internal parts: stainless steel
Plug with marginal seat
Non-rising handwheel
Position indicator, locking device and
lubricating nipple as standard



Accessories, special types**:**
Regulating plug (appendix ...d)
Plug with soft seal, temp. max. 200 °C, (appendix ...w)
Hood valve design acc. to DIN EN 12828 (appendix ...k)
Limit switch
Travel limiter

Material/nominal pressure:

EN-GJL-250	(GG-25)	PN 16	DN 15-300	List-No.: 246 **3**..a.
EN-GJS-400-18-LT	(GGG-40.3)	PN 16	DN 15-350	List-No.: 246 **4**..a.
EN-GJS-400-18-LT	(GGG-40.3)	PN 25	DN 15-150	List-No.: 246 **5**..a.

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...120	150	200	250	300	350	°C
EN-GJL-250	PN 16	16	14,4	12,8	11,2	9,6	---	bar
EN-GJS-400-18-LT	PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
EN-GJS-400-18-LT	PN 25	25	24,3	23,0	21,8	20,0	17,5	bar

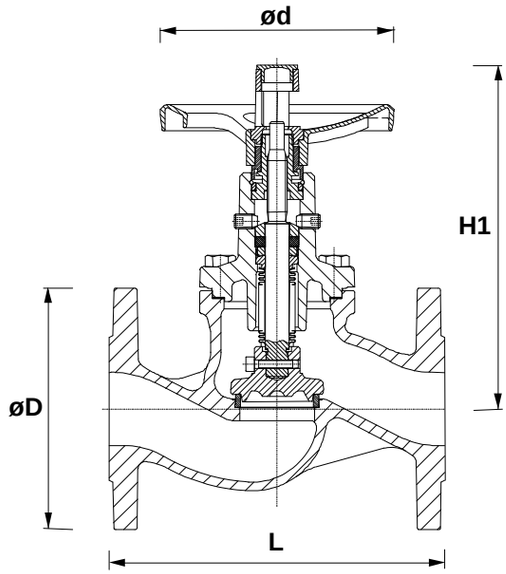
Order text:
Manual stop valve, material . . ., PN . ., DN . .
in two way form with bellow sealing
List-No. 246 . . . a ., accessories . . .

DN	List-No.	Kvs m³/h		Stroke mm	Weight kg	Length L	Height H	Handwheel Ød	Flange ØD	
		Stop	Regulating						PN16	PN25
15	246 .00a.	5,3	3,8	6	3,7	130	205	125	95	95
20	246 .01a.	7,2	4,3	6	4,5	150	205	125	105	105
25	246 .02a.	12,0	7,8	8	5,6	160	210	125	115	115
32	246 .03a.	16,0	9,0	8	6,9	180	210	125	140	140
40	246 .04a.	28,5	22,0	13	8,9	200	225	150	150	150
50	246 .05a.	43,0	30,0	13	11,0	230	230	150	165	165
65	246 .06a.	75,0	55,0	16	15,3	290	245	175	185	185
80	246 .08a.	105,0	85,0	20	21,1	310	265	175	200	200
100	246 .10a.	170,0	125,0	25	32,4	350	365	300	220	235
125	246 .12a.	270,0	225,0	32	51,6	400	395	300	250	270
150	246 .15a.	405,0	350,0	40	74,0	480	430	400	285	300
200	246 .20a.	725,0	570,0	50	140,0	600	550	520	340	---
250	246 .25a.	1145,0	945,0	70	240,0	730	720	520	405	---
300	246 .30a.	1635,0	1635,0	80	265,0	850	775	520	460	---
350	246 .35a.	2220,0	2220,0	90	360,0	980	975	640	520	---

open printversion

Manual operated stop valve in two way form with bellow sealing, PN 16/25 Form B

Valve body: two way form
for heat transfer oil, water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: stainless steel bellow
and safety stuffing box
Internal parts: stainless steel
DN 15-100: throttling plug
DN > 100: shut-off plug
Non-rising handwheel
Position indicator, locking device and
travel limiter as standard



Accessories, special types**:**
Throttling plug from DN 125 (appendix ...d)
Plug with soft seal, temp. max. 200 °C, (appendix ...w)
Hood valve design acc. to DIN EN 12828 (appendix ...k)

Material/nominal pressure:

EN-GJL-250	(GG-25)	PN 16	DN 15-300	List-No.: 246 **3**...
EN-GJS-400-18-LT	(GGG-40.3)	PN 16	DN 15-350	List-No.: 246 **4**...
EN-GJS-400-18-LT	(GGG-40.3)	PN 25	DN 15-150	List-No.: 246 **5**...

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...120	150	200	250	300	350	°C
EN-GJL-250	PN 16	16	14,4	12,8	11,2	9,6	---	bar
EN-GJS-400-18-LT	PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
EN-GJS-400-18-LT	PN 25	25	24,3	23,0	21,8	20,0	17,5	bar

Order text:
Manual stop valve, material . . ., PN . ., DN . .
in two way form with bellow sealing
List-No. 246 . . . ., accessories . . .

DN	List-No.	Kvs m³/h		Stroke kg		Length L	Height H	Handwheel Ød	Flange ØD	
		Stop-	Throttling-	PN16	PN25				PN16	PN25
15	246 .00.		4,8		3	130	211	125	95	95
20	246 .01.		8,3		4	150	214	125	105	105
25	246 .02.		11,9		5	160	220	125	115	115
32	246 .03.		19,9		8	180	238	125	140	140
40	246 .04.		27,1		9	200	243	125	150	150
50	246 .05.		43,3		11	230	266	160	165	165
65	246 .06.		75,1		17	290	290	160	185	185
80	246 .08.		116,7	21	29	310	324	200	200	200
100	246 .10.		172,3	31	40	350	348	200	220	235
125	246 .12.	270,0	171,5	51	65	400	460	250	250	270
150	246 .15.	393,0	204,0	69	89	480	479	250	285	300
200	246 .20.	657,0	457,0	139	---	600	570	400	340	---
250	246 .25.	1035,0	714,0	239	---	730	606	400	405	---
300	246 .30.	1466,0	1028,0	343	---	850	660	400	460	---
350	246 .35.	1466,0	1028,0	390	---	980	660	400	520	---

open printversion

Manual operated control valve in three way form with PTFE-V-ring sealing, DN15-150 EN-GJS-400-18-LT, PN 16 / 25

Body: EN-GJS-400-18-LT three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: manual operated

Accessories, special types**:**
Limit switches (on request)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Manual operated control valve, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
List-No.: PN16: 2631 **4** . . , PN25: 2631 **5** . .
Accessories . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

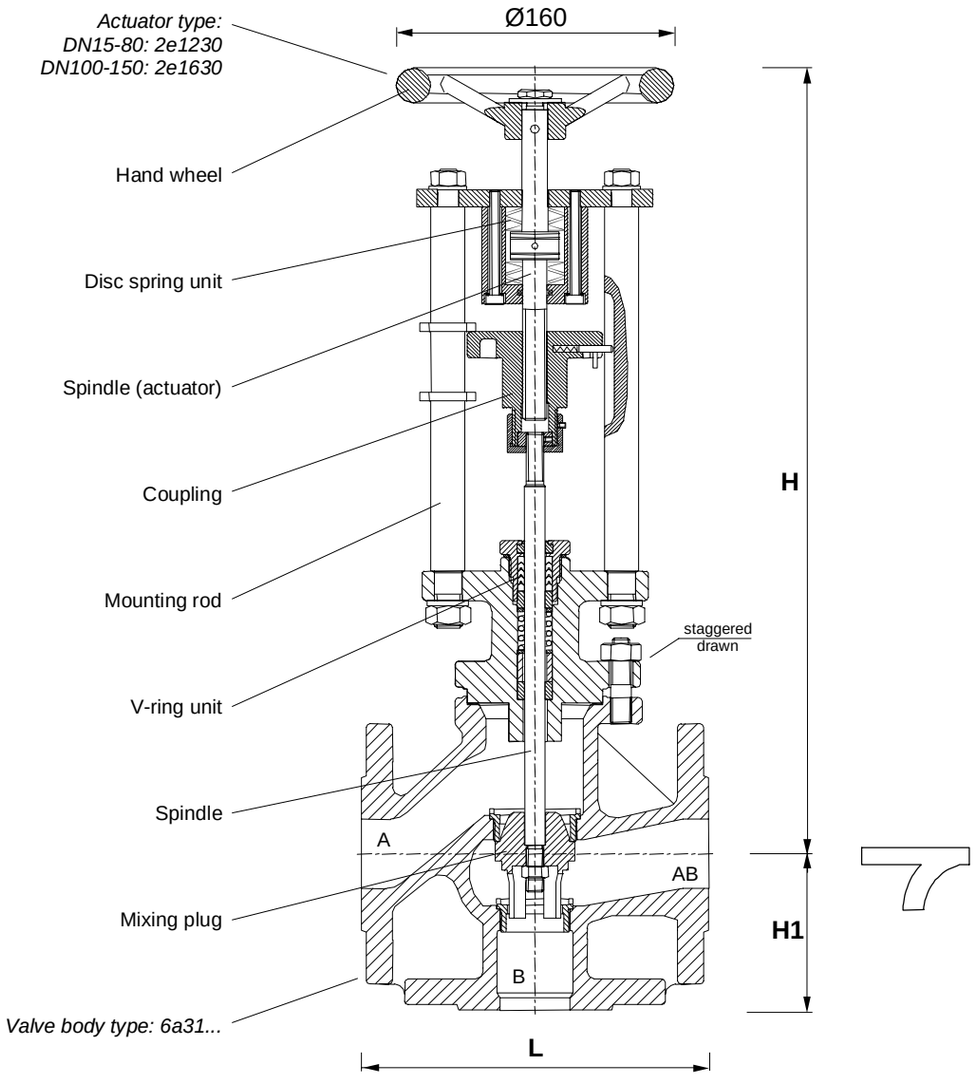
by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	List-No. PN 16	List-No. PN 25	Kvs m³/h	Stroke mm
15	2631 400	2631 500	4	20
20	2631 401	2631 501	6,3	20
25	2631 402	2631 502	10	20
32	2631 403	2631 503	16	20
40	2631 404	2631 504	25	20
50	2631 405	2631 505	40	20
65	2631 406	2631 506	63	30
80	2631 408	2631 508	100	30
100	2631 410	2631 510	160	30
125	2631 412	2631 512	230	35
150	2631 415	2631 515	330	38

Bigger DN and two way form on request

open printversion



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	416	430	424	431	436	438	481	482	489	645	660
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	13	14	15	17	19	22	38	43	56	111	132

open printversion

Manual operated control valve in three way form with bellow sealing, DN15-150 EN-GJS-400-18-LT, PN 16 / 25

Body: EN-GJS-400-18-LT three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: manual operated

Accessories, special types**:**
Limit switches (on request)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Manual operated control valve, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
List-No.: PN16: 2661 **4** . . , PN25: 2661 **5** . .
Accessories . . .

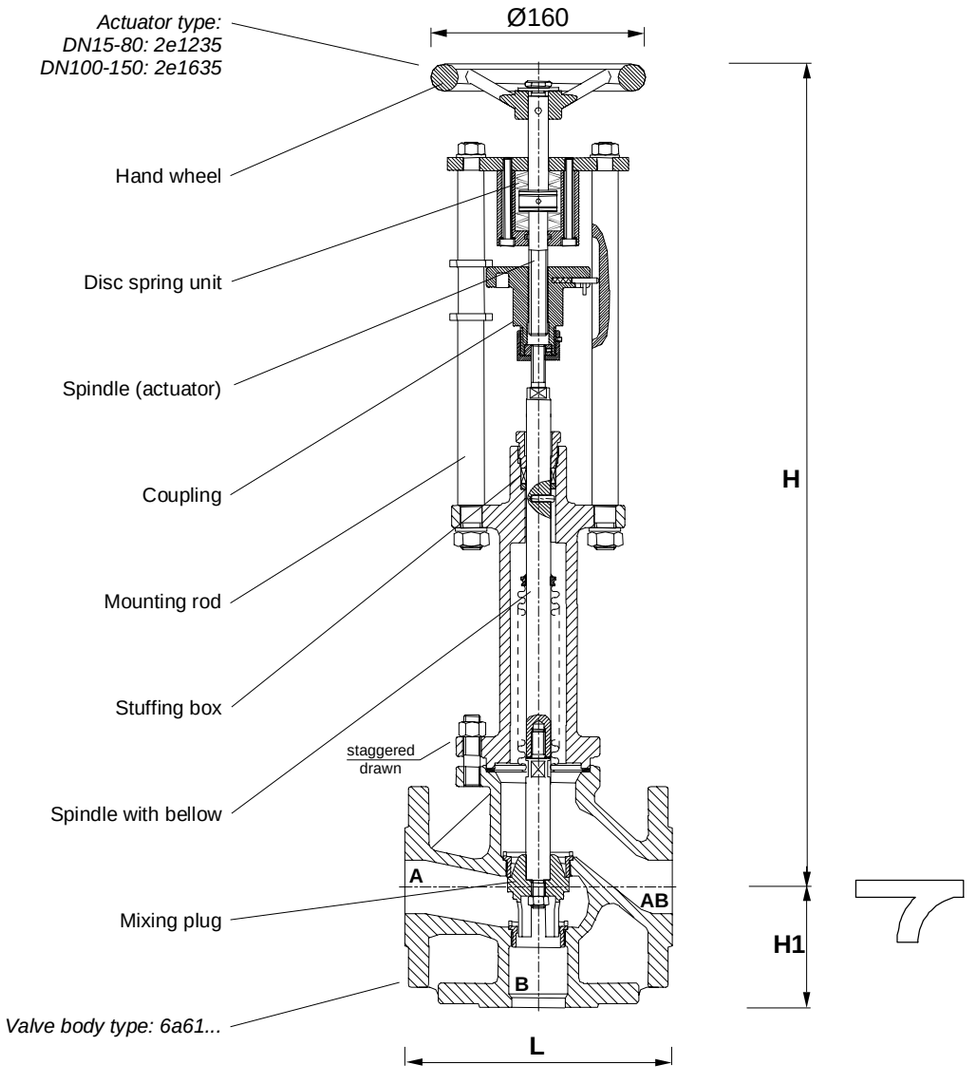
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

DN	List-No. PN 16	List-No. PN 25	Kvs m³/h	Stroke mm
15	2661 400	2661 500	4	20
20	2661 401	2661 501	6,3	20
25	2661 402	2661 502	10	20
32	2661 403	2661 503	16	20
40	2661 404	2661 504	25	20
50	2661 405	2661 505	40	20
65	2661 406	2661 506	63	30
80	2661 408	2661 508	100	30
100	2661 410	2661 510	160	30
125	2661 412	2661 512	230	35
150	2661 415		330	38

Bigger DN and two way form on request

open printversion



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	590	605	599	606	611	616	743	744	751	855	870
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	13	14	15	18	19	22	41	46	59	113	134

open printversion

Pneumatic control valve in two way form, PN 16/25/40, EN-GJS-400-18-LT / GP240GH+N
Spindle sealing with PTFE-V-ring unit

DN 15-50	1-5kN- actuator	321..._1
DN 65-100	1-5kN- actuator	321…_2
DN 50-100	10kN- actuator	321...Se
DN 65-150	14/20kN- actuator	321...Sg/i
DN 200	14/24kN- actuator	321 4/520Sg/k

Pneumatic control valve in three way form, PN 16/25, EN-GJS-400-18-LT
Spindle sealing with PTFE-V-ring unit

DN 15-150	1-5kN- actuator, with mixing plug	331 4/5...
DN 50-150	14kN- actuator, with mixing plug	331 4/5…Sg
DN 200	14kN- actuator, with mixing plug	331 4/520Sg
DN 32-150	1-5kN- actuator, with diverting plug	332 4/5...
DN 50-150	14kN- actuator, with diverting plug	332 4/5...Sg
DN 200	12-18kN- actuator, with diverting plug	332 4/520Sf/g/h

Pneumatic control valve in two way form, PN 16/25/40, EN-GJS-400-18-LT / GP240GH+N
Spindle sealing with bellow

DN 15-150	1-5kN- actuator	351...
DN 50-100	10kN- actuator	351...Se
DN 65-150	14kN- actuator	351...Sg
DN 200	14/25kN- actuator	351 420Sg/k

Pneumatic control valve in three way form, PN 16/25, EN-GJS-400-18-LT
Spindle sealing with bellow

DN 15-150	1-5kN- actuator, with mixing plug	361 4/5...
DN 200	14kN- actuator, with mixing plug	361 420Sg
DN 15-100	1-5kN- actuator, with mixing plug, with weld-on ends	361 4/5...fs
DN 32-150	1-5kN- actuator, with diverting plug	362 4/5...
DN 200	12-18kN- actuator, with diverting plug	362 420Sf/g/h

Pneumatic control valve PN16, bronze CC491K (Rg5) ..... 381...
in three or two way form with thread connectors

Accessories:

Electro-pneumatic (E/P) converter	39036..
Pneumatic (P/P) positioner	3905...
Electro-pneumatic (E/P) positioner	3908...
Pneumatic accessories	393/4...
Limit switches	39e...
Manual operating device	39h...

Pneumatic actuators:

Pneumatic actuator type 3f1 Thrust 1-5 kN, diaphragm area 250 cm²	3f1...

Operating instructions: see group 0

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN15-50 PN 16 / 25 / 40

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 400°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 50:1
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway "
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 2,4 bar, ...d: 4,4 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

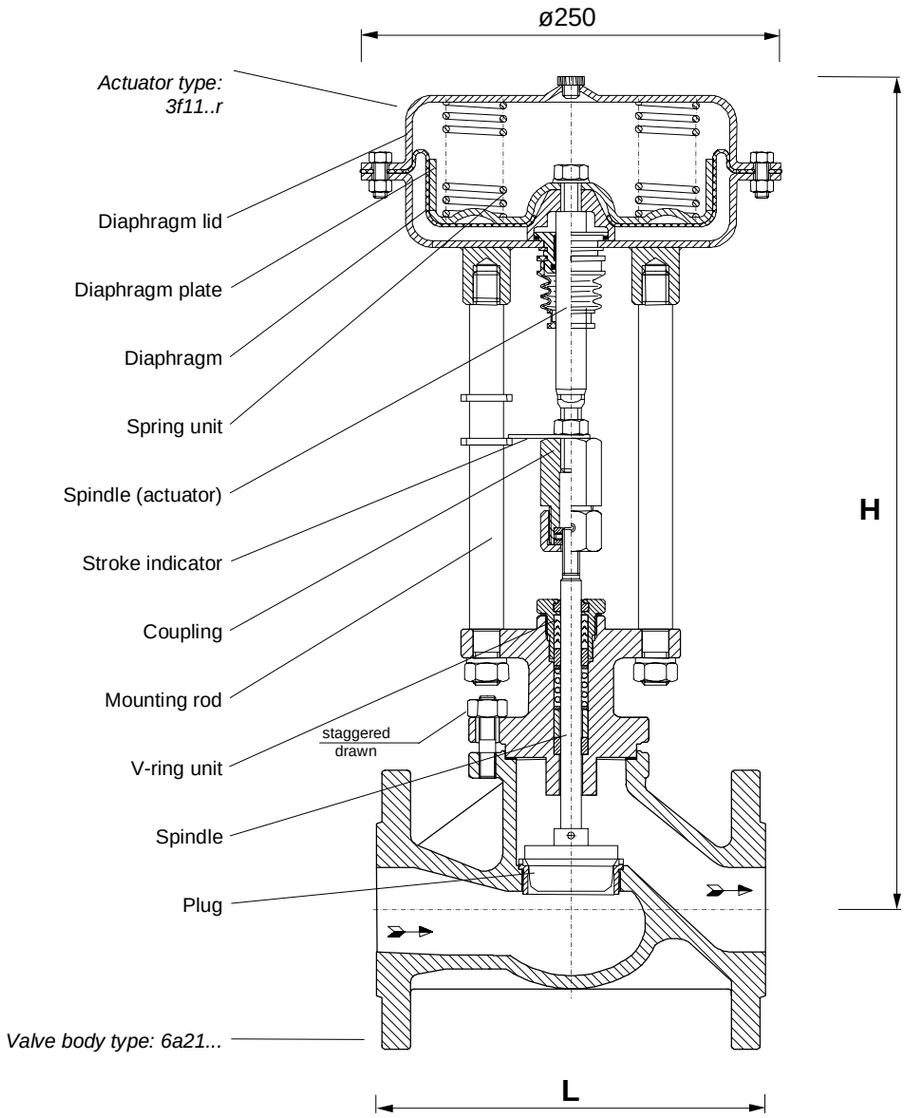
Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes (opens) straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 321 **4** . . , PN25: 321 **5** . . , PN40: 321 **7** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:		-10...50	100	150	200	250	300	350	400	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	bar

* = *max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for control signal... 0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	321 400.	321 500.	321 700.	4,0	20	17,9	40,0	
	321 450.	321 550.	321 750.	2,5	20	17,9	40,0	
	321 470.	321 570.	321 770.	1,6	20	17,9	40,0	
20	321 401.	321 501.	321 701.	6,3	20	17,9	40,0	
	321 451.	321 551.	321 751.	4,0	20	17,9	40,0	
	321 471.	321 571.	321 771.	2,5	20	17,9	40,0	
25	321 402.	321 502.	321 702.	10	20	11,1	37,3	
	321 452.	321 552.	321 752.	6,3	20	17,9	40,0	
	321 472.	321 572.	321 772.	4,0	20	17,9	40,0	
32	321 403.	321 503.	321 703.	16	20	6,3	22,8	40,0
	321 453.	321 553.	321 753.	10	20	11,1	37,3	40,0
	321 473.	321 573.	321 773.	6,3	20	17,9	40,0	40,0
40	321 404.	321 504.	321 704.	25	20	3,6	14,4	32,4
	321 454.	321 554.	321 754.	16	20	6,3	22,8	40,0
	321 474.	321 574.	321 774.	10	20	11,1	37,3	40,0
50	321 405.	321 505.	321 705.	40	20	1,9	8,9	20,7
	321 455.	321 555.	321 755.	25	20	3,6	14,4	32,4
	321 475.	321 575.	321 775.	16	20	6,3	22,8	40,0



DN	15	20	25	32	40	50
Height H	460	474	468	474	480	482
Length L	130	150	160	180	200	230
Weight kg	17	18	19	20	21	23

INDEX

1
2
3
4
5
6
7
8
9
0

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN65-100 PN 16 / 25 / 40

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 400°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway "
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 2,4 bar, ...d: 4,4 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

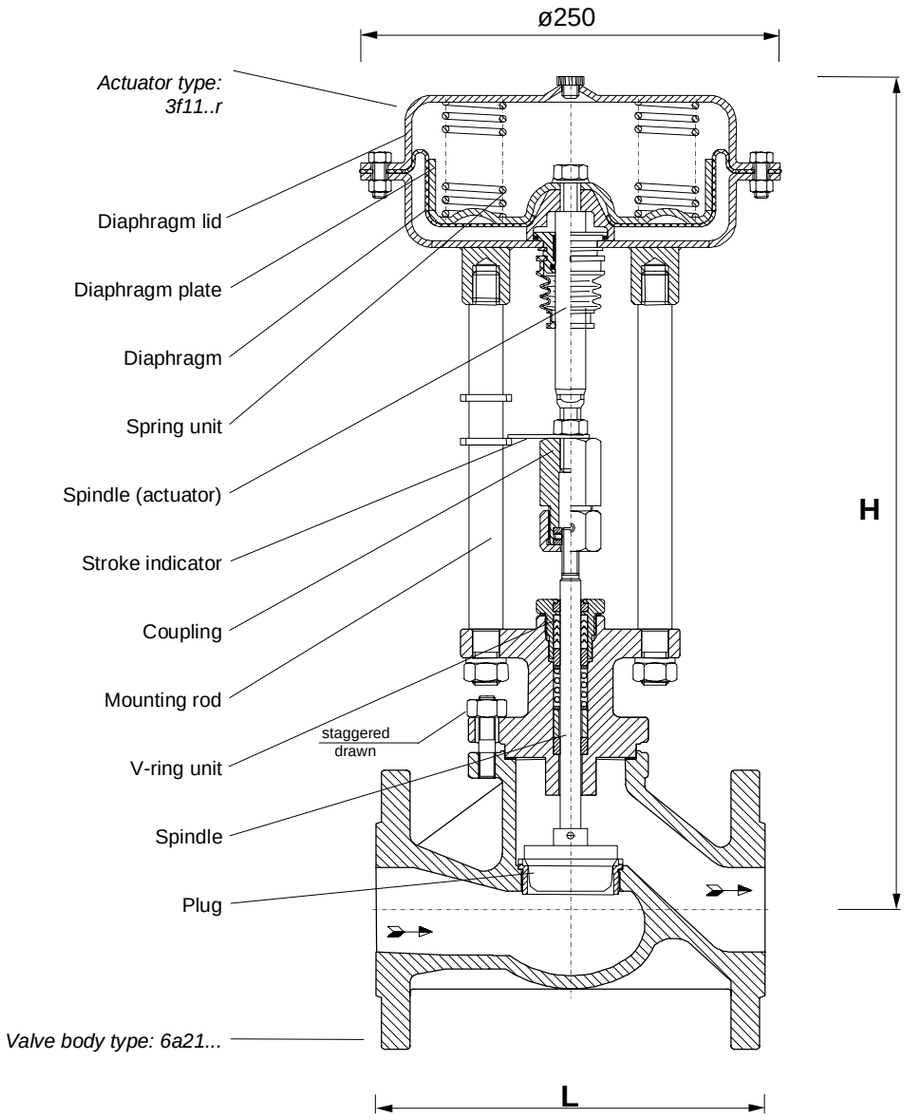
Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes (opens) straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 321 **4** . . , PN25: 321 **5** . . , PN40: 321 **7** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:		-10...50	100	150	200	250	300	350	400	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for control signal... 0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
65	321 406.	321 506.	321 706.	63	30	0,6	4,8	11,9
	321 456.	321 556.	321 756.	40	20	1,9	8,9	20,7
	321 476.	321 576.	321 776.	25	20	3,6	14,4	25,0
80	321 408.	321 508.	321 708.	100	30		3,0	7,7
	321 458.	321 558.	321 758.	63	20	0,6	4,8	11,9
	321 478.	321 578.	321 778.	40	20	1,9	8,9	20,7
100	321 410.	321 510.	321 710.	160	30		1,7	4,7
	321 460.	321 560.	321 760.	100	30		3,0	11,9
	321 480.	321 580.	321 780.	63	22	0,6	4,8	11,9



DN	65	80	100
Height H	525	526	533
Length L	290	310	350
Weight kg	38	41	51

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN50-100 PN 16 / 25 / 40, with 10kN actuator

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 400°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 400 cm², ø310 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway "
Air connection: G1/4"
Operating pressure: 4,4...5,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

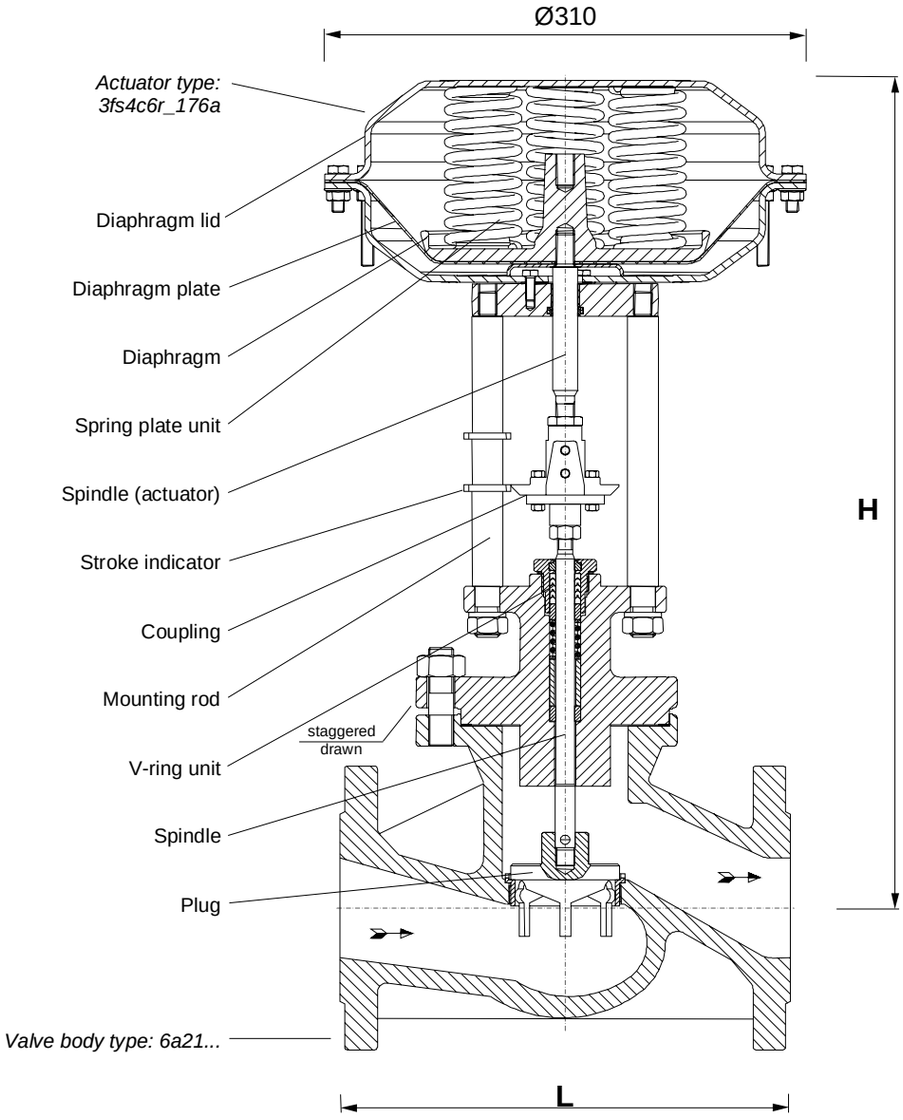
Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 321 **4** . . Se, PN25: 321 **5** . . Se, PN40: 321 **7** . . Se
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:		-10...50	100	150	200	250	300	350	400	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) type ...Se
50	321 405Se	321 505Se	321 705Se	40	20	40,0
	321 455Se	321 555Se	321 755Se	25	20	40,0
	321 475Se	321 575Se	321 775Se	16	20	40,0
65	321 406Se	321 506Se	321 706Se	63	30	26,1
	321 456Se	321 556Se	321 756Se	40	20	40,0
	321 476Se	321 576Se	321 776Se	25	20	40,0
80	321 408Se	321 508Se	321 708Se	100	30	17,2
	321 458Se	321 558Se	321 758Se	63	20	26,1
	321 478Se	321 578Se	321 778Se	40	20	40,0
100	321 410Se	321 510Se	321 710Se	160	30	10,9
	321 460Se	321 560Se	321 760Se	100	30	26,1
	321 480Se	321 580Se	321 780Se	63	22	26,1



DN	50	65	80	100
Height H	528	571	572	579
Length L	230	290	310	350
Weight kg	29	47	51	61

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN65-150 PN 16 / 25 / 40, with 14/20kN actuator

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 400°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 800 cm², ø420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway "
Air connection: G1/4"
Operating pressure: 3,7…6,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

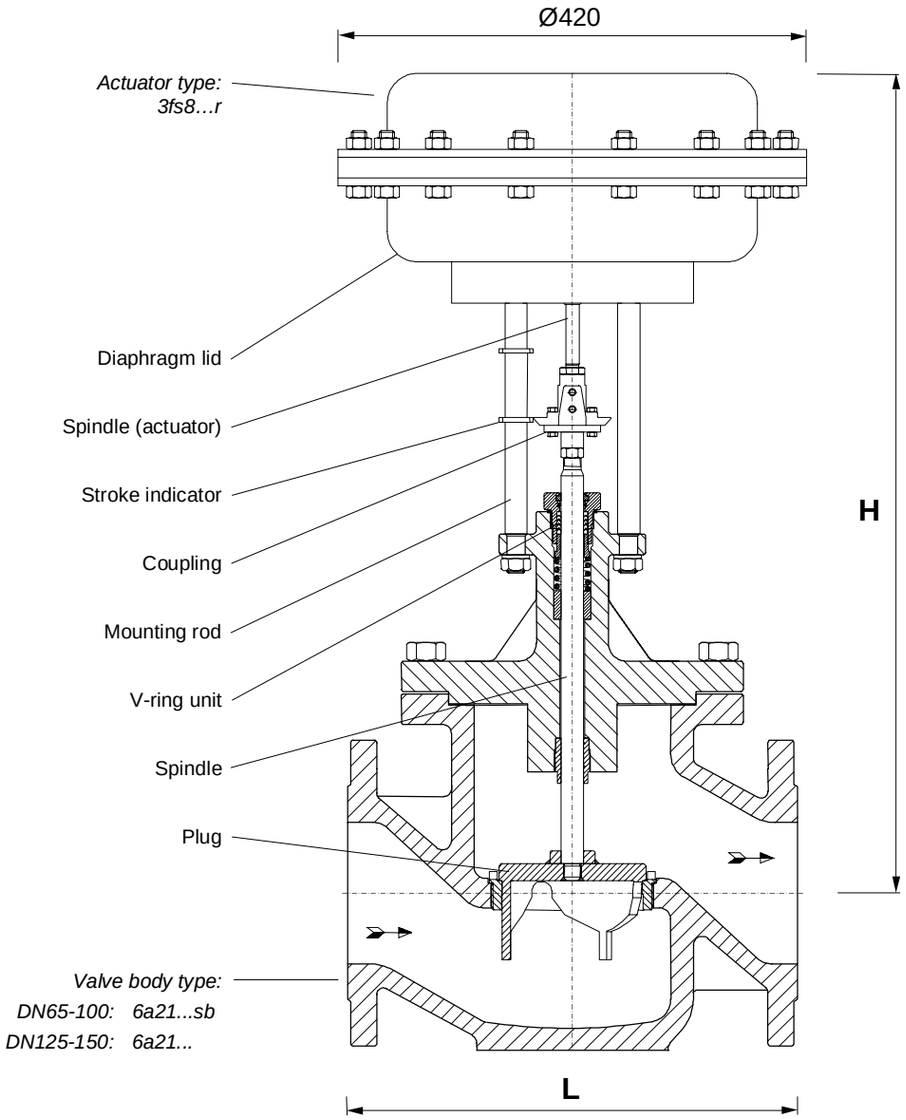
Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 321 **4** . . S . . ., PN25: 321 **5** . . S . . ., PN40: 321 **7** . . S . . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:		-10...50	100	150	200	250	300	350	400	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN16	PN25	PN40	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) type ...Sg	type ...Si
65	321 406S.	321 506S.	321 706S.	63	30	38,0	40,0
80	321 408S.	321 508S.	321 708S.	100	30	24,7	39,0
100	321 410S.	321 510S.	321 710S.	160	30	16,0	25,0
	321 460S.	321 560S.	321 760S.	100	30	38,0	40,0
125	321 412S.	321512S.		230	60	10,0	14,7
	321 412S._140a	321 512S._140a		140	35	16,0	25,0
	321 412S._100a	321 512S._100a		100	35	24,7	36,1
150	321 415S.	321 515S.		330	60	6,8	10,1
	321 415S._250a	321 515S._250a		250	50	10,0	14,7
	321 415S._150a	321 515S._150a		150	35	16,0	25,0



DN	65	80	100	125	150
Height H	677	678	685	763	778
Length L	290	310	350	400	480
Weight kg	87	90	100	137	157

Pneumatic control valve in two way form with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16/25

Body: EN-GJS-400-18-LT (GGG-40.3), two way form
for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway
Air connection: G 1/4",
Operating pressure: 5,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 630
Spindle sealing with PTFE-V-ring unit
Spring closes straightway
Control signal . . . – . . . bar, closing pressure . . bar
List-No. 321 . 20 S . , accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

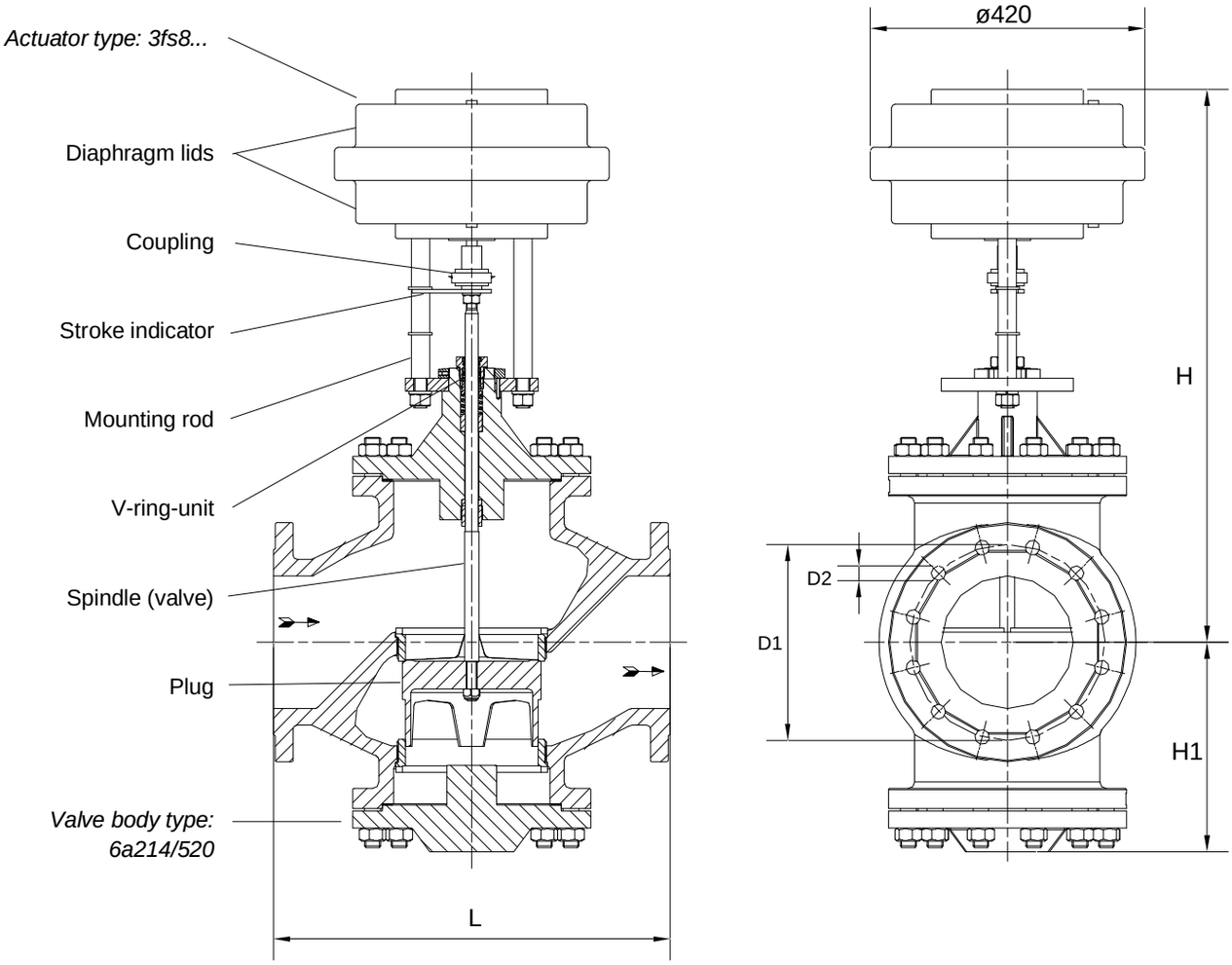
by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure**** (bar) for control signal...	
	PN 16	PN 25	m³/h	mm	1,9...4,9 bar	2,1…5,1bar
200	321420Sg	321520Sg	630	60	3,7	
200	321420Sk	321520Sk	630	60		6,8

*** higher closing pressures on request*

open printversion



Dimensions

DN	200
Height H	835
Length H1	315
Length L	600
Weight kg	315

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

open printversion

Pneumatic control valve in three way form with PTFE-V-ring sealing, DN15-150 EN-GJS-400-18-LT, PN 16 / 25

Body: EN-GJS-400-18-LT three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway A-AB"
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes (opens) straightway A-AB
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 331 **4** . . . , PN25: 331 **5** . . .
Accessories: . . .

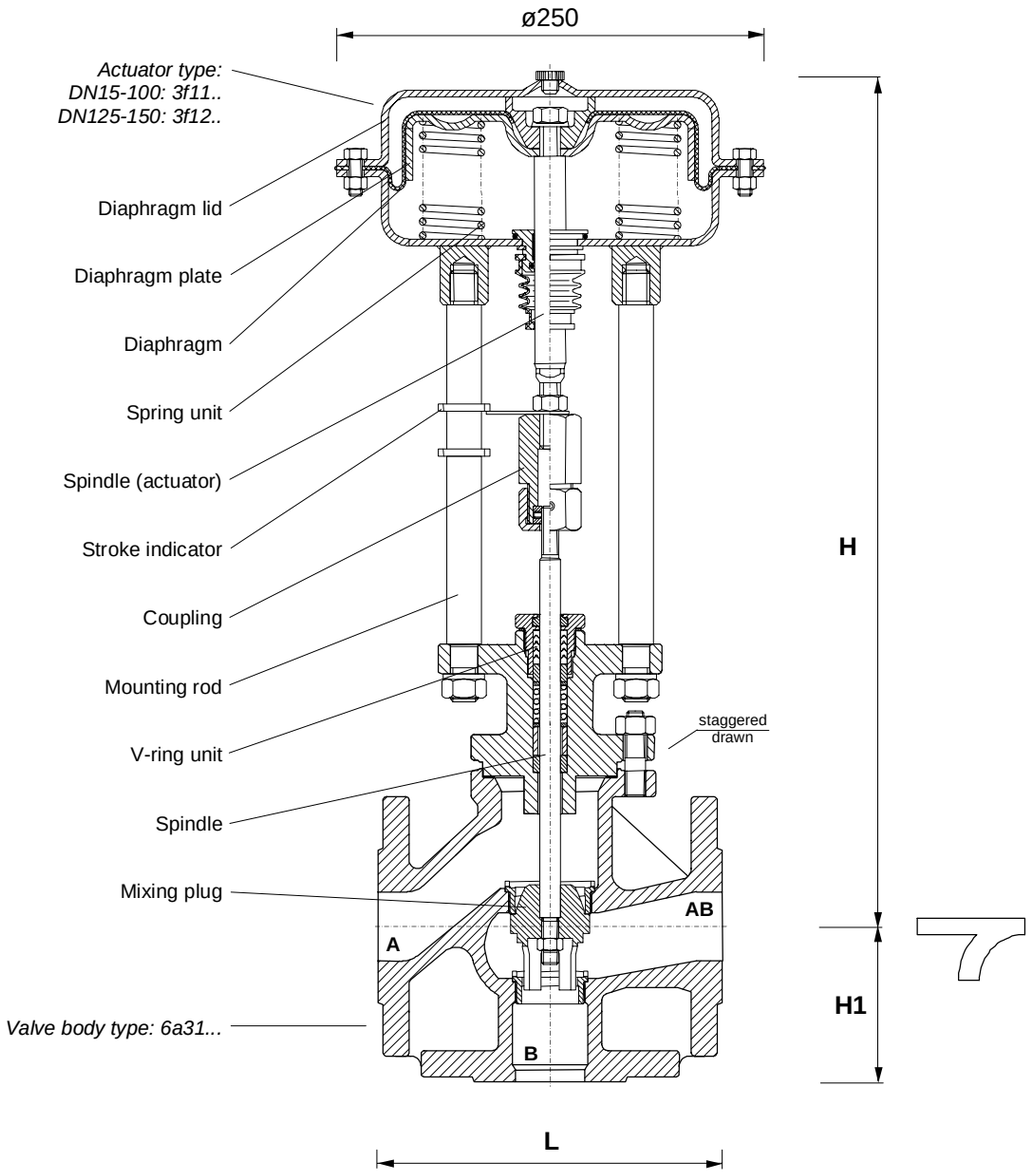
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure*** (bar) for control signal...		
	PN16	PN25	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	331 400.	331 500.	4	20	17,9	25,0	
20	331 401.	331 501.	6,3	20	17,9	25,0	
25	331 402.	331 502.	10	20	11,1	25,0	
32	331 403.	331 503.	16	20	6,3	22,8	25,0
40	331 404.	331 504.	25	20	3,6	14,4	25,0
50	331 405.	331 505.	40	20	1,9	8,9	20,7
65	331 406.	331 506.	63	30	0,6	4,8	11,9
80	331 408.	331 508.	100	30		3,0	7,7
100	331 410.	331 510.	160	30		1,7	4,7
125	331 412.	331 512.	230	35		0,7	2,5
150	331 415.	331 515.	330	38			1,6

** = higher closing pressures and DN>200 on request, DN200: see page 3314/520Sg*



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	458	472	466	473	480	483	525	526	533	685	700
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	17	18	19	22	23	26	42	47	61	115	137

INDEX

1
2
3
4
5
6
7
8
9
0

Pneumatic control valve in three way form with PTFE-V-ring sealing, DN50-150 EN-GJS-400-18-LT, PN 16 / 25 with 14kN actuator

Body: EN-GJS-400-18-LT three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway A-AB
Air connection: G1/4"
Operating pressure: 3,8-5,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes straightway A-AB
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 331 **4** . . . Sg, PN25: 331 **5** . . . Sg
Accessories: . . .

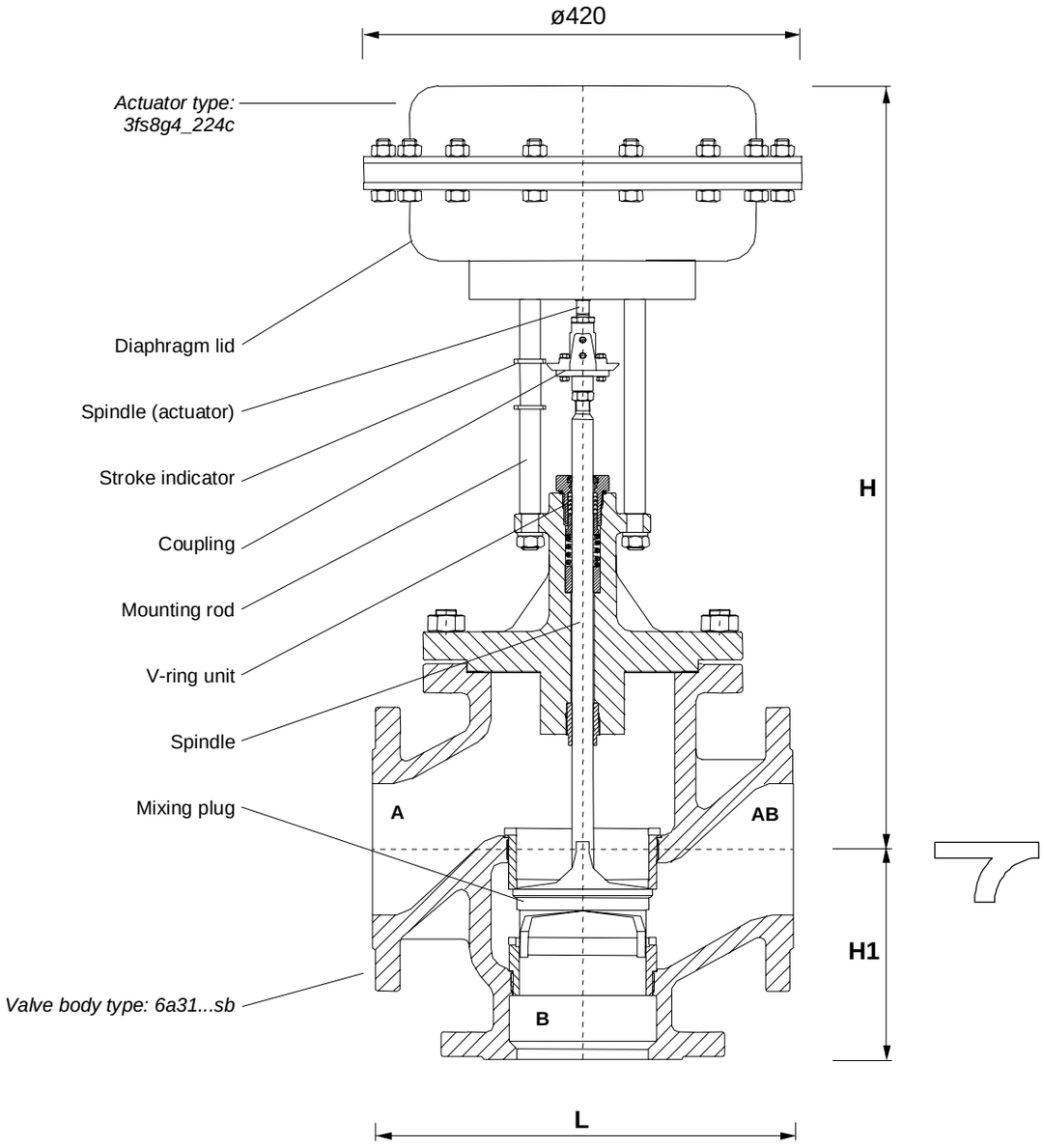
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN 16	PN25	**Kvs** m³/h	**Stroke** mm	**Closing pressure**** (bar) type ...Sg
50	331 405Sg	331 505Sg	40	20	25,0
65	331 406Sg	331 506Sg	63	30	25,0
80	331 408Sg	331 508Sg	100	30	24,7
100	331 410Sg	331 510Sg	160	30	15,8
125	331 412Sg	331 512Sg	230	35	10,0
150	331 415Sg	331 515Sg	330	38	6,8

*** = higher closing pressures and DN>200 on request, DN200: see page 3314/520Sg*



DN	50	65	80	100	125	150
Height H	610	653	654	661	763	778
Stud length H1	100	120	130	150	200	210
Length L	230	290	310	350	400	480
Weight kg	62	79	81	94	150	170

Pneumatic control valve in three way form with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16/25

INDEX

1
2
3
4
5
6
7
8
9
0

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with mixing plug, for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway A-AB"
Air connection: G 1/4",
Operating pressure: 6,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with mixing plug
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 630
Spindle sealing with PTFE-V-ring unit
Spring closes straightway A-AB
Control signal 1,2 – 4,9 bar, closing pressure 2,0 bar
List-No. 331 . . . Sg, accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

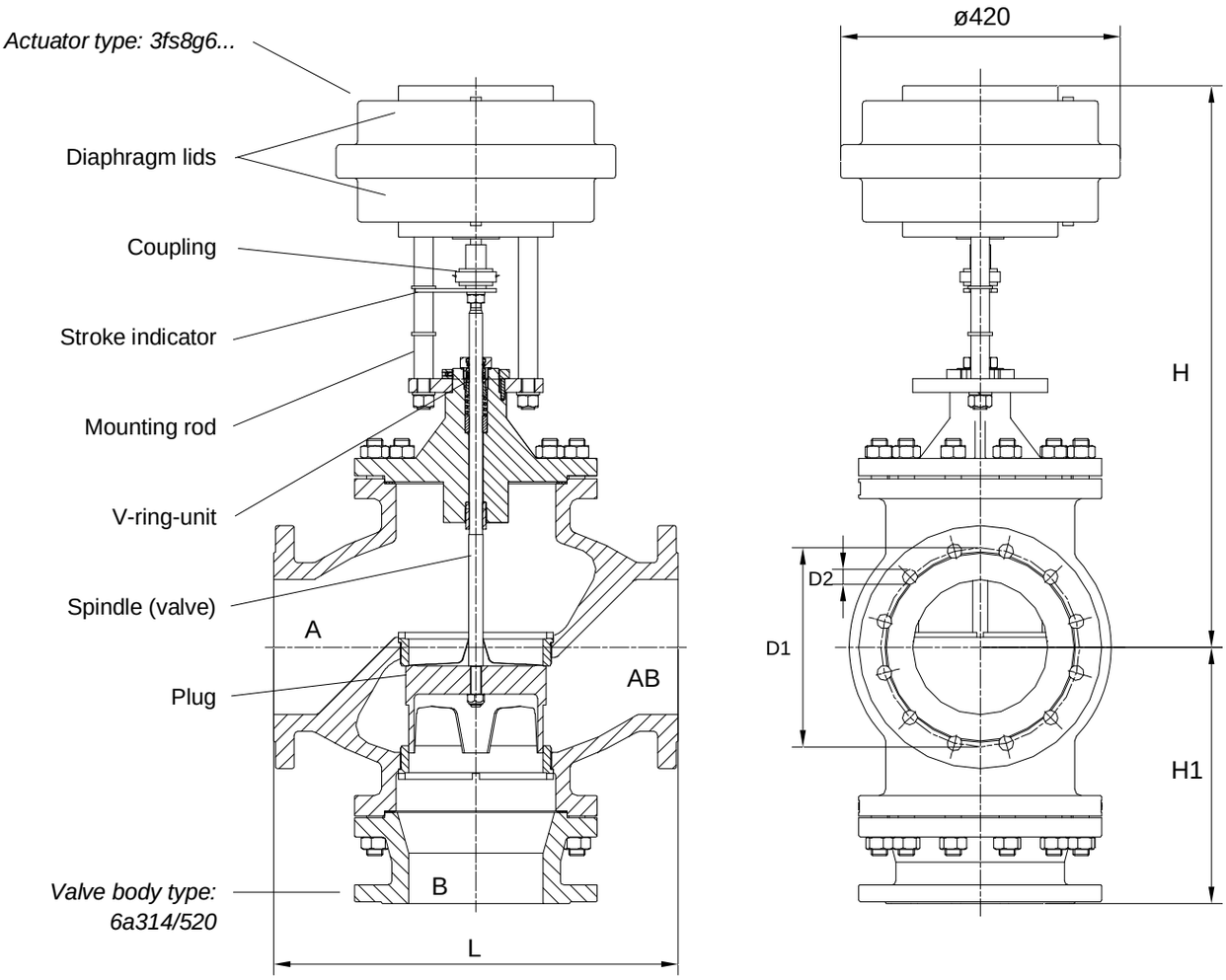
by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure*** (bar) for control signal...
	PN 16	PN 25	m³/h	mm	1,9...4,9 bar
200	331420Sg	331520Sg	630	60	2,0

** higher closing pressures on request*

open printversion



Dimensions

DN	200
Height H	835
Stud length H1	380
Length L	600
Weight kg	315

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

open printversion

Pneumatic control valve for diverting function three way form with PTFE-V-ring sealing, DN15-150 EN-GJS-400-18-LT, PN 16 / 25

Body: EN-GJS-400-18-LT three way form
Version with diverting plug, for water and steam
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway AB-A"
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with diverting plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes (opens) straightway AB-A
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 332 **4** . . . , PN25: 332 **5** . . .
Accessories: . . .

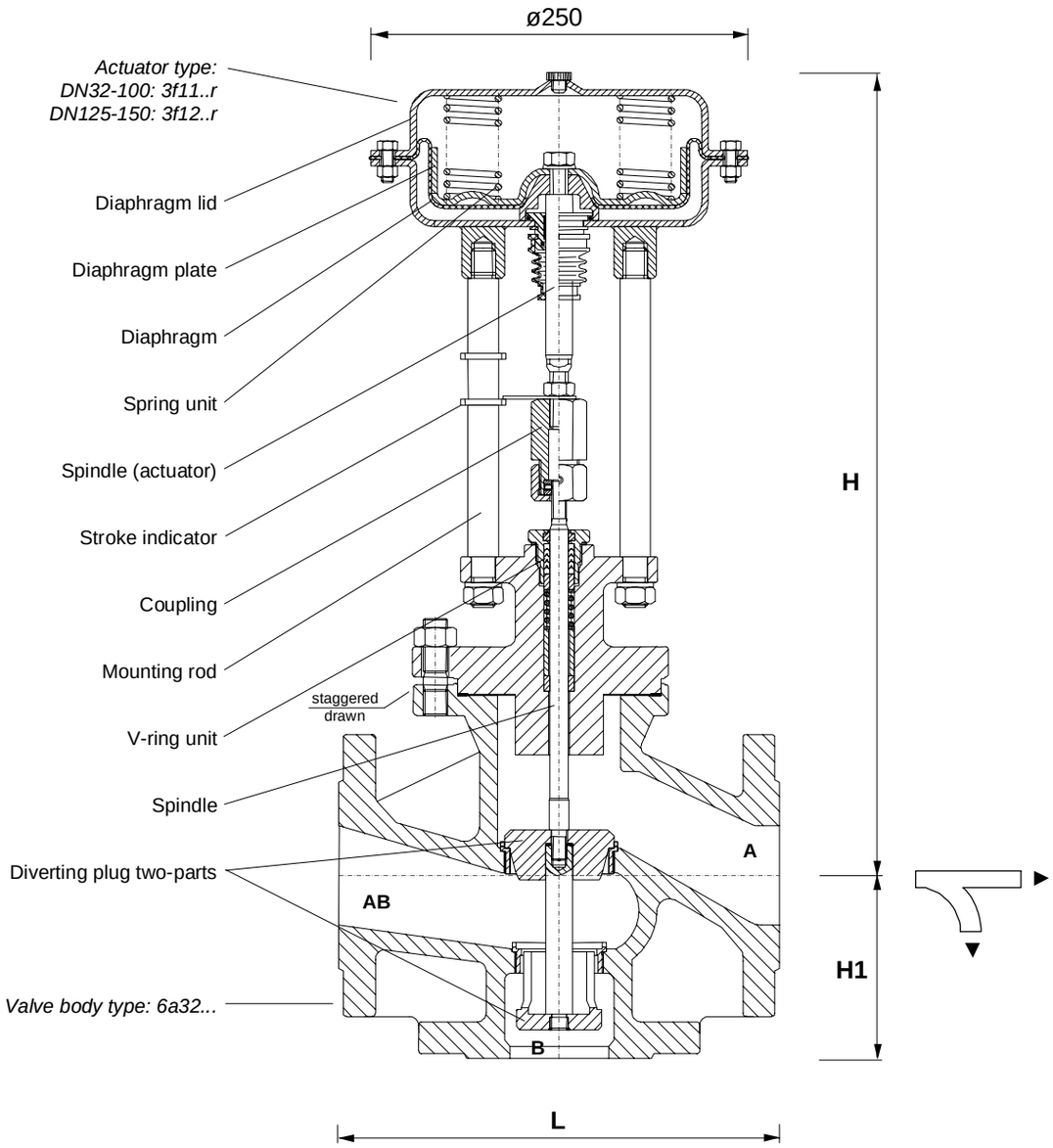
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure*** (bar) for control signal...		
	PN16	PN25	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
32	332 403.	332 503.	12	20	6,3	22,8	25,0
40	332 404.	332 504.	20	20	3,6	14,4	25,0
50	332 405.	332 505.	27	20	1,9	8,9	20,7
65	332 406.	332 506.	50	20	0,6	4,8	11,9
80	332 408.	332 508.	83	30		3,0	7,7
100	332 410.	332 510.	123	30		1,7	4,7
125	332 412.	332 512.	190	35		1,7	4,7
150	332 415.	332 515.	250	35		1,0	3,1

** = higher closing pressures and DN>200 on request, DN200: see page 3324/520Sf/g/h*



DN	32	40	50	65	80	100	125	150
Height H	473	480	483	525	526	533	685	700
Stud length H1	80	90	100	120	130	150	200	210
Length L	180	200	230	290	310	350	400	480
Weight kg	22	23	26	42	45	58	115	135

Pneumatic control valve for diverting function three way form with PTFE-V-ring sealing, DN50-150 EN-GJS-400-18-LT, PN 16 / 25, with 14kN actuator

Body: EN-GJS-400-18-LT three way form
Version with diverting plug, for water and steam
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway A-AB
Air connection: G1/4"
Operating pressure: 3,8-5,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with diverting plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Spring closes straightway AB-A
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 332 **4** . . . Sg, PN25: 332 **5** . . . Sg
Accessories: . . .

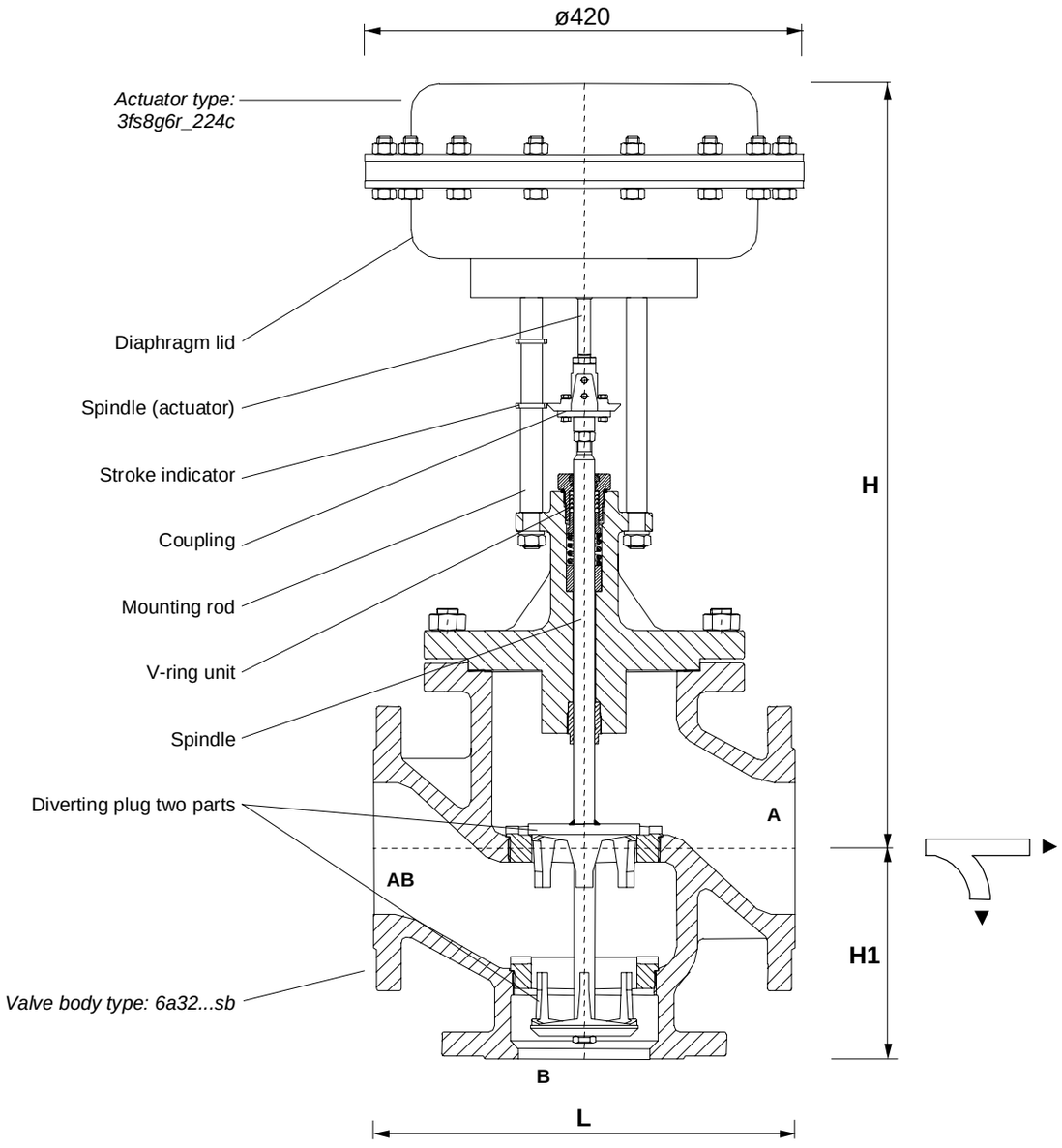
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.** PN 16	PN25	**Kvs** m³/h	**Stroke** mm	**Closing pressure**** (bar) type ...Sg
50	332 405Sg	332 505Sg	27	20	25,0
65	332 406Sg	332 506Sg	50	30	25,0
80	332 408Sg	332 508Sg	83	30	24,7
100	332 410Sg	332 510Sg	123	30	15,8
125	332 412Sg	332 512Sg	190	35	15,8
150	332 415Sg	332 515Sg	250	35	10,8

*** = higher closing pressures and DN>200 on request, DN200: see page 3324/520Sf/g/h*



DN	50	65	80	100	125	150
Height H	610	653	654	661	763	778
Stud length H1	100	120	130	150	200	210
Length L	230	290	310	350	400	480
Weight kg	62	79	81	94	150	170

Pneumatic control valve for diverting function 332 4/5 20Sf/g/h E with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16/25, with 12-18kN actuator

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version with diverting plug, for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: diaphragm area: 800 cm², ∅ = 420 mm
type ...h: 1730 cm², ∅ = 600 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway AB-A
Air connection: G 1/4", type ...h: G 3/4"
Operating pressure: 6,0 bar, type ...h: 3 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with diverting plug
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 470
Spindle sealing with PTFE-V-ring unit
Spring closes straightway AB-A
Control signal . . . – . . . bar, closing pressure . . . bar
List-No. 332 . 20 S . , accessories: . . .

Pressure-Temperature ratings acc. to DIN EN 1092-2:

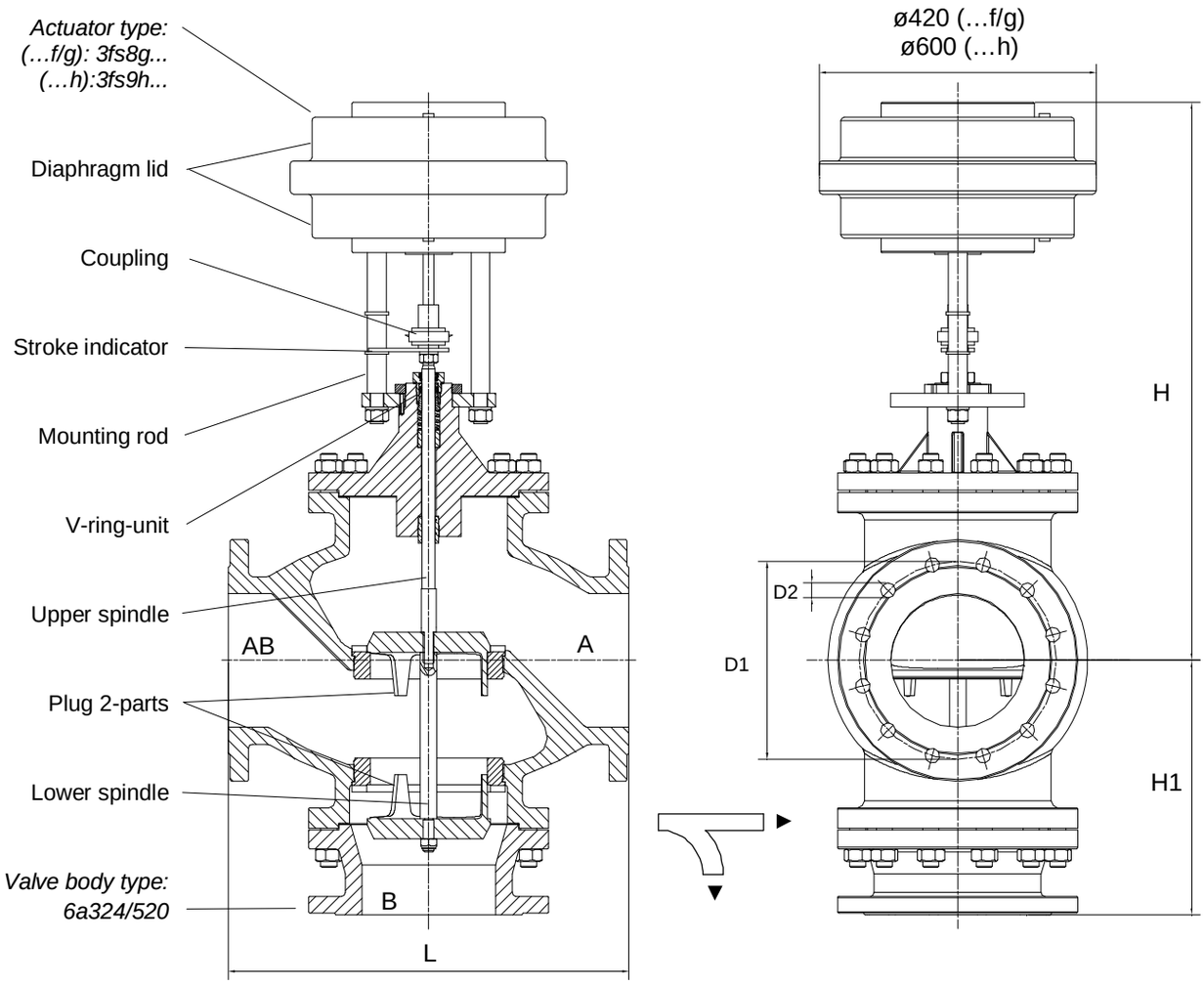
by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure**** (bar) for control signal...		
	PN 16	PN 25	m³/h	mm	1,5...4,5 bar	2,1...4,1 bar	0,9...2,0 bar
200	332420S**f**	332520S**f**	470	50	4,0		
200	332420S**g**	332520S**g**	470	50		4,9	
200	332420S**h**	332520S**h**	470	50			6,5

*** higher closing pressures on request*

open printversion



Dimensions

DN	200
Height H (…f/g)	835
Height H (…h)	1200
Stud length H1	380
Length L	600
Weight kg (…f/g)	315
Weight kg (…h)	400

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

open printversion

Pneumatic control valve in two way form with bellow sealing, DN15-150 PN 16 / 25 / 40(25)

INDEX

1
2
3
4
5
6
7
8
9
0

Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway "
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 2,4 bar, ...d: 4,4 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes (opens) straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 351 **4** . . , PN25: 351 **5** . . , PN40(25): 351 **6** . .
Accessories: . . .

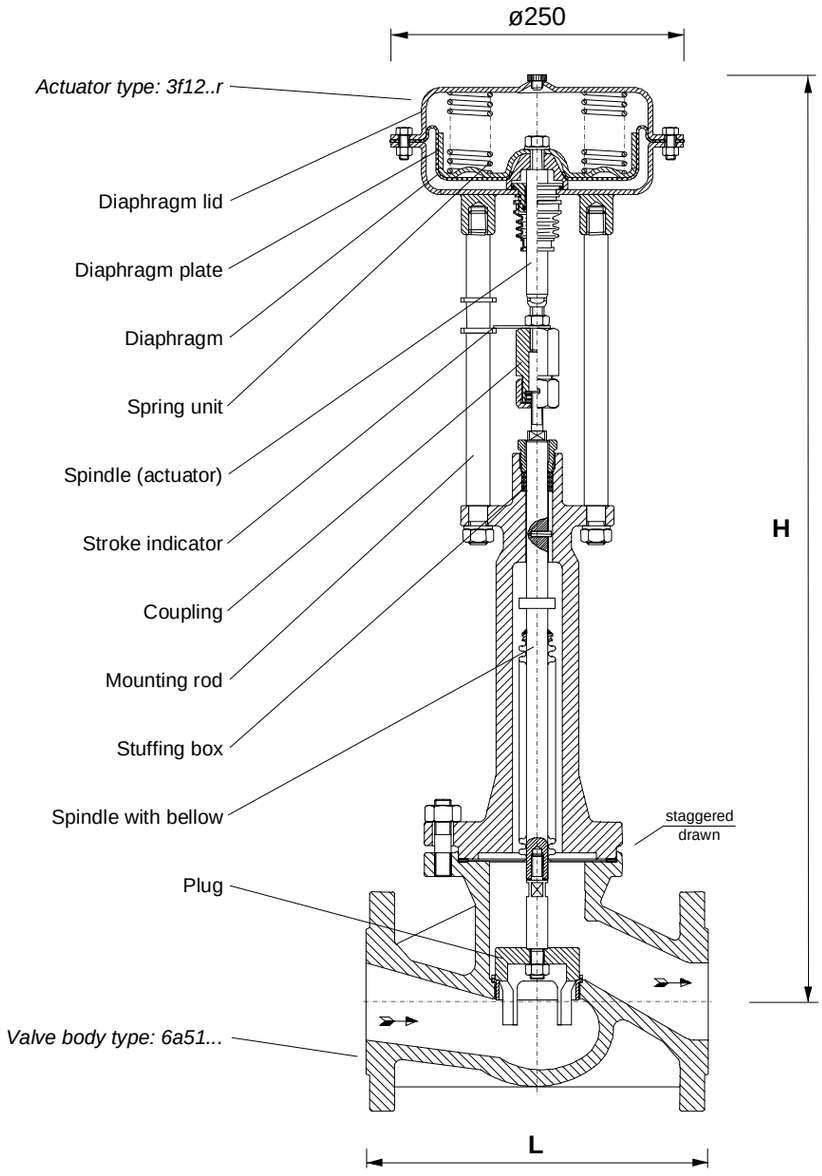
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	400	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40(25)*	GP240GH+N	25	25	25	25	25	25	24	21	bar

** = acc. to KFM norm*

DN	**List-No.** PN16	PN25	PN40(25)	**Kvs** m³/h	**Hub** mm	**Closing pressure**** (bar) for control signal... 0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	351 400.	351 500.	351 600.	4,0	20	17,9	25,0	
20	351 401.	351 501.	351 601.	6,3	20	17,9	25,0	
25	351 402.	351 502.	351 602.	10	20	11,1	25,0	
32	351 403.	351 503.	351 603.	16	20	6,3	22,8	25,0
40	351 404.	351 504.	351 604.	25	20	3,6	14,4	25,0
50	351 405.	351 505.	351 605.	40	20	1,9	8,9	20,7
65	351 406.	351 506.	351 606.	63	30	0,6	4,8	11,9
80	351 408.	351 508.	351 608.	100	30		3,0	7,7
100	351 410.	351 510.	351 610.	160	30		1,7	4,7
125	351 412d	351 512d		230	40			2,5
150	351 415d			330	40			1,6

*** = higher closing pressures see pages 351Se / 351Sg, DN200: see page 351420Sg/k, DN>200 on request*



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	633	647	641	648	653	656	785	786	793	896	912
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	19	20	21	22	24	26	45	49	59	106	126

Pneumatic control valve in two way form with bellow sealing, DN50-100 PN 16 / 25 / 40(25), with 10kN actuator

Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 400 cm², ø310 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway "
Air connection: G1/4"
Operating pressure: 4,4…5,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 351 **4** . . Se, PN25: 351 **5** . . Se, PN40(25): 351 **6** . . Se
Accessories: . . .

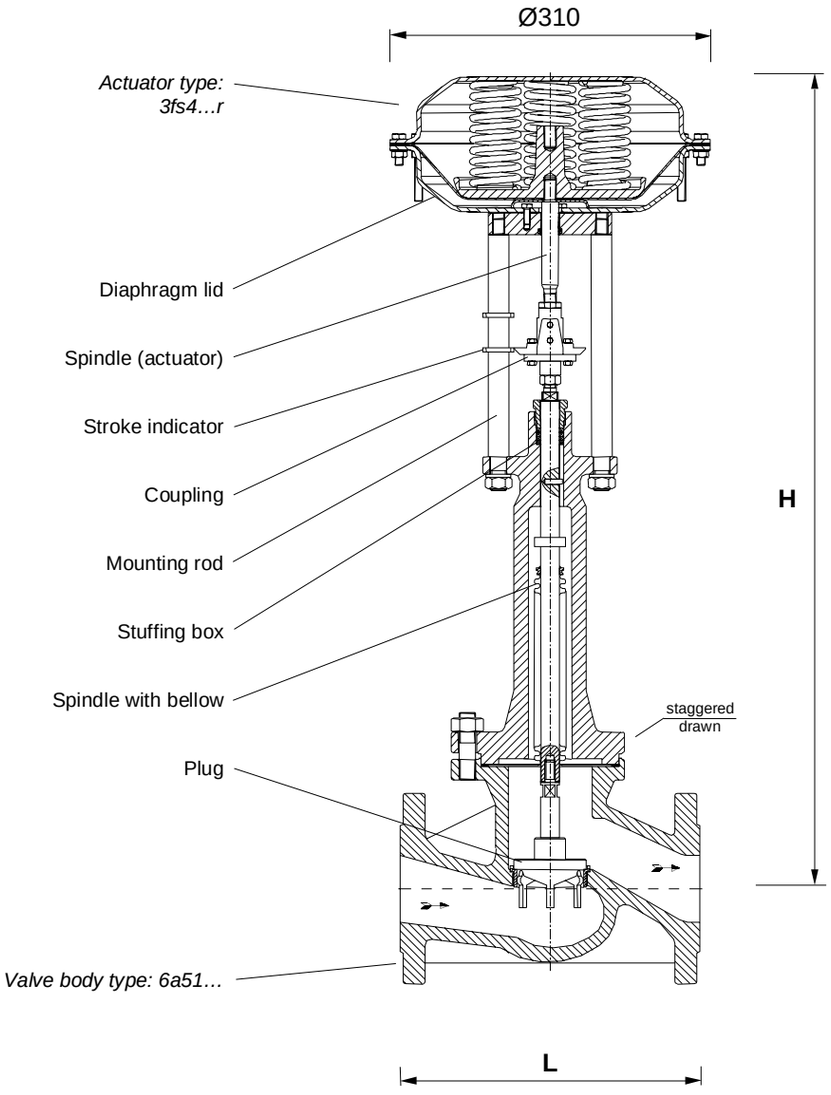
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	400	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40(25)*	GP240GH+N	25	25	25	25	25	25	24	21	bar

** = acc. to KFM norm*

DN	**List-No.** PN16	PN25	PN40(25)	**Kvs** m³/h	**Stroke** mm	**Closing pressure**** (bar) type ...Se
50	351 405Se	351 505Se	351 605Se	40	20	25,0
	351 455Se	351 555Se	351 655Se	25	20	25,0
	351 475Se	351 575Se	351 675Se	16	20	25,0
65	351 406Se	351 506Se	351 606Se	63	30	25,0
	351 456Se	351 556Se	351 656Se	40	20	25,0
	351 476Se	351 576Se	351 676Se	25	20	25,0
80	351 408Se	351 508Se	351 608Se	100	30	17,2
	351 458Se	351 558Se	351 658Se	63	20	25,0
	351 478Se	351 578Se	351 678Se	40	20	25,0
100	351 410Se	351 510Se	351 610Se	160	30	10,9
	351 460Se	351 560Se	351 660Se	100	30	25,0
	351 480Se	351 580Se	351 680Se	63	22	25,0

*** = higher closing pressures and DN125-150 see page 351Sg, DN200: see page 351420Sg/k, DN>200 on request*



DN	50	65	80	100
Height H	690	819	820	830
Length L	230	290	310	350
Weight kg	28	46	50	60

Pneumatic control valve in two way form with bellow sealing, DN65-150 PN 16 / 25 / 40(25), with 14kN actuator

Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 800 cm², ø420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway "
Air connection: G1/4"
Operating pressure: 3,7...4,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes straightway
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 351 **4** . . Sg . . ., PN25: 351 **5** . . Sg . . ., PN40(25): 351 **6** . . Sg . . .
Accessories: . . .

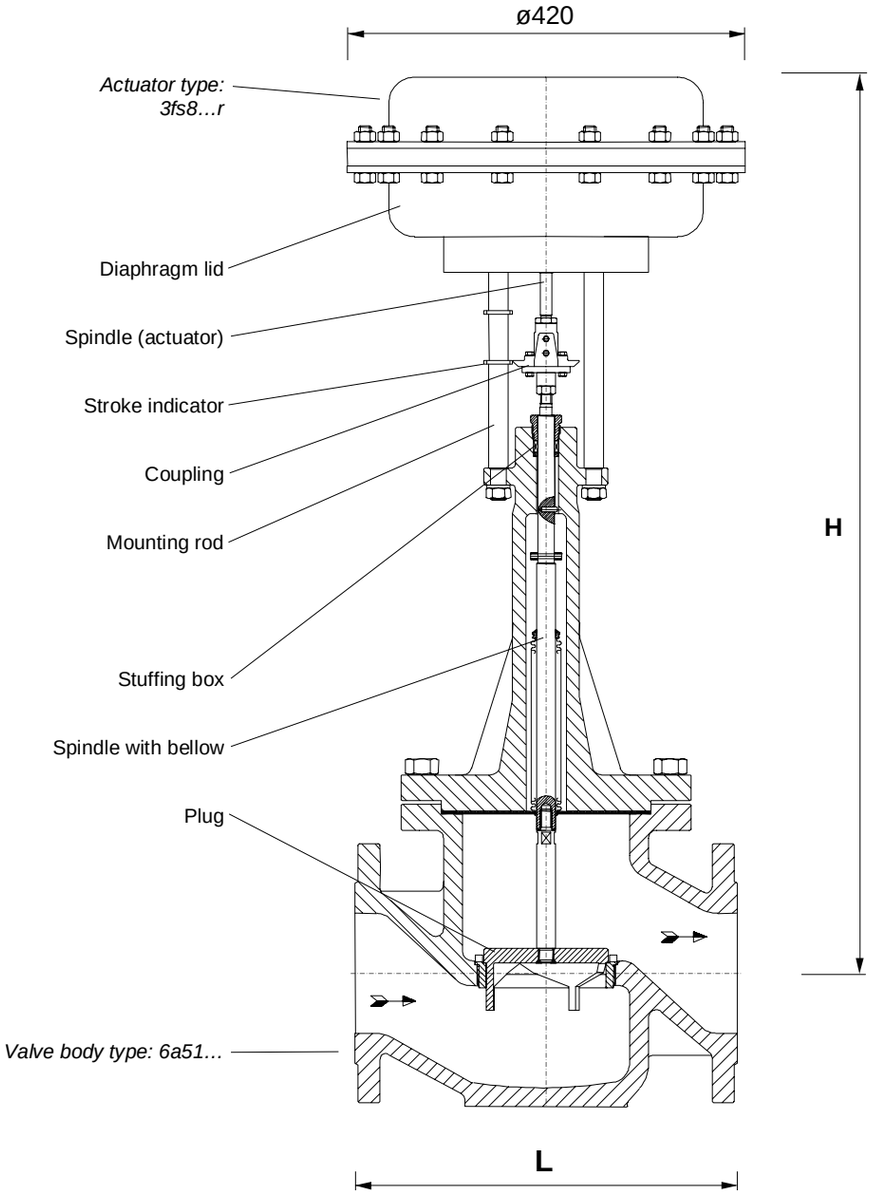
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	400	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40(25)*	GP240GH+N	25	25	25	25	25	25	24	21	bar

** = acc. to KFM norm*

DN	**List-No.** PN16	PN25	PN40(25)	**Kvs** m³/h	**Stroke** mm	**Closing pressure**** (bar) type ...Sg
65	351 406Sg	351 506Sg	351 606Sg	63	30	25,0
80	351 408Sg	351 508Sg	351 608Sg	100	30	24,7
100	351 410Sg	351 510Sg	351 610Sg	160	30	16,0
	351 460Sg	351 560Sg	351 660Sg	100	30	25,0
125	351 412Sg	351512Sg		230	40	10,0
	351 412Sg_140a	351 512Sg_140a		140	30	16,0
	351 412Sg_100a	351 512Sg_100a		100	30	24,7
150	351 415Sg			330	40	6,8
	351 415Sg_250a			250	40	10,0
	351 415Sg_150a			150	30	16,0

*** = DN200: see page 351420Sg/k, DN>200 on request*



DN	65	80	100	125	150
Height H	865	866	875	975	990
Length L	290	310	350	400	480
Weight kg	81	85	95	141	161

Pneumatic control valve in two way form with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16

Body: EN-GJS-400-18-LT (GGG-40.3), two way form
for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway
Air connection: G 1/4",
Operating pressure: 5,5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in two way form
EN-GJS-400-18-LT (GGG-40.3), PN 16, DN200, Kvs 630
Spindle sealing with bellow
Spring closes straightway
Control signal . . . – . . . bar, closing pressure . . bar
List-No. 351 420 S . , accessories: . . .

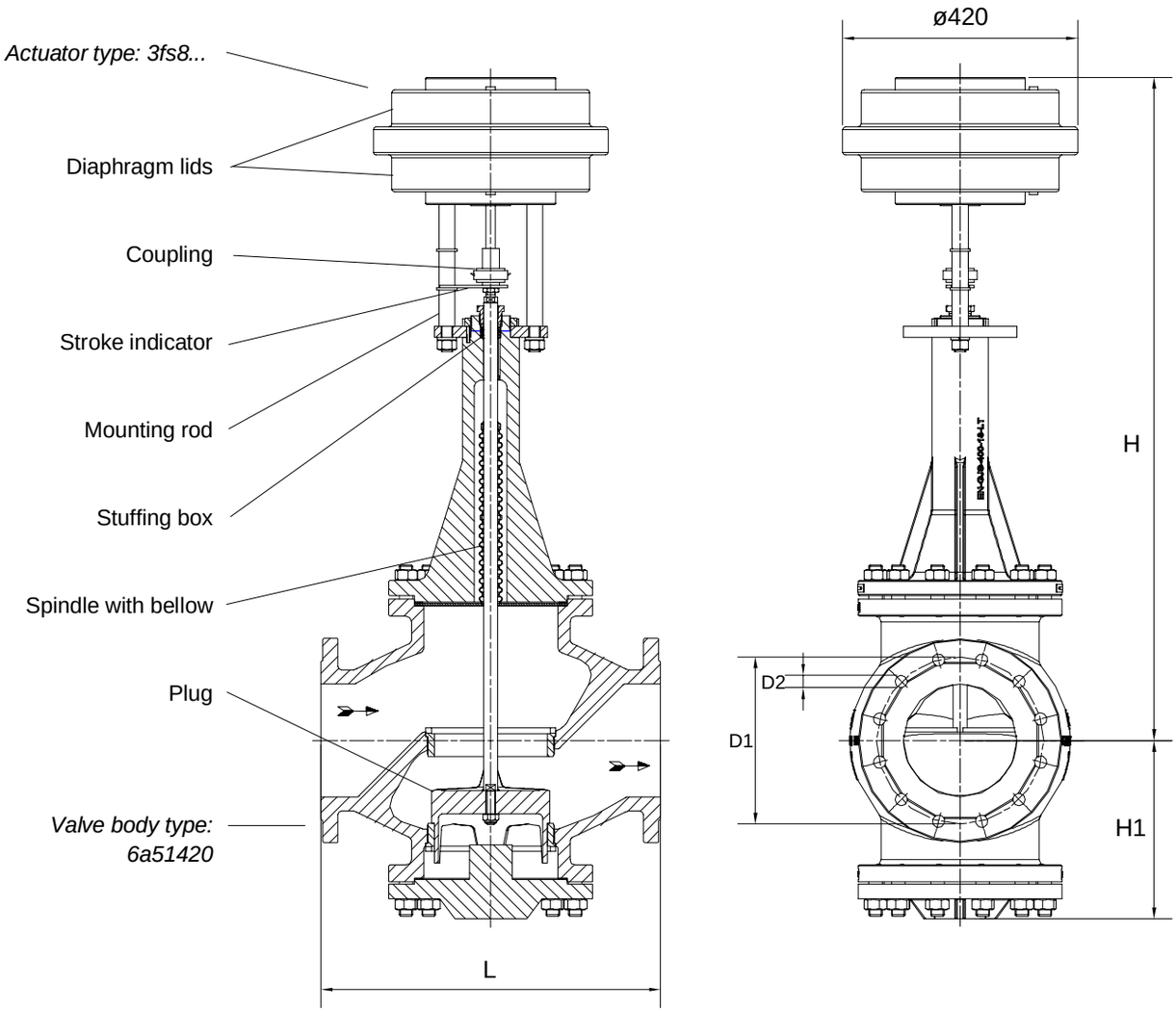
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	**List-No.** PN 16	**Kvs** m³/h	**Stroke** mm	**Closing pressure*** (bar) for control signal... 1,9...4,9 bar	2,1…5,1 bar
200	351 420Sg	630	60	3,7	
200	351 420Sk	630	60		6,8

** higher closing pressure on request*

open printversion



Dimensions

DN	200
Height H (mm)	1180
Length H1 (mm)	315
Length L (mm)	600
Weight (kg)	345

Flange connections acc. to DIN EN 1092-2

PN	D1 (mm)	D2 (mm)	Quantity of screws	Thread
16	295	22	12	M20

open printversion

Pneumatic control valve in three way form with bellow sealing, DN15-150 EN-GJS-400-18-LT, PN 16 / 25

Body: EN-GJS-400-18-LT three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway A-AB"
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

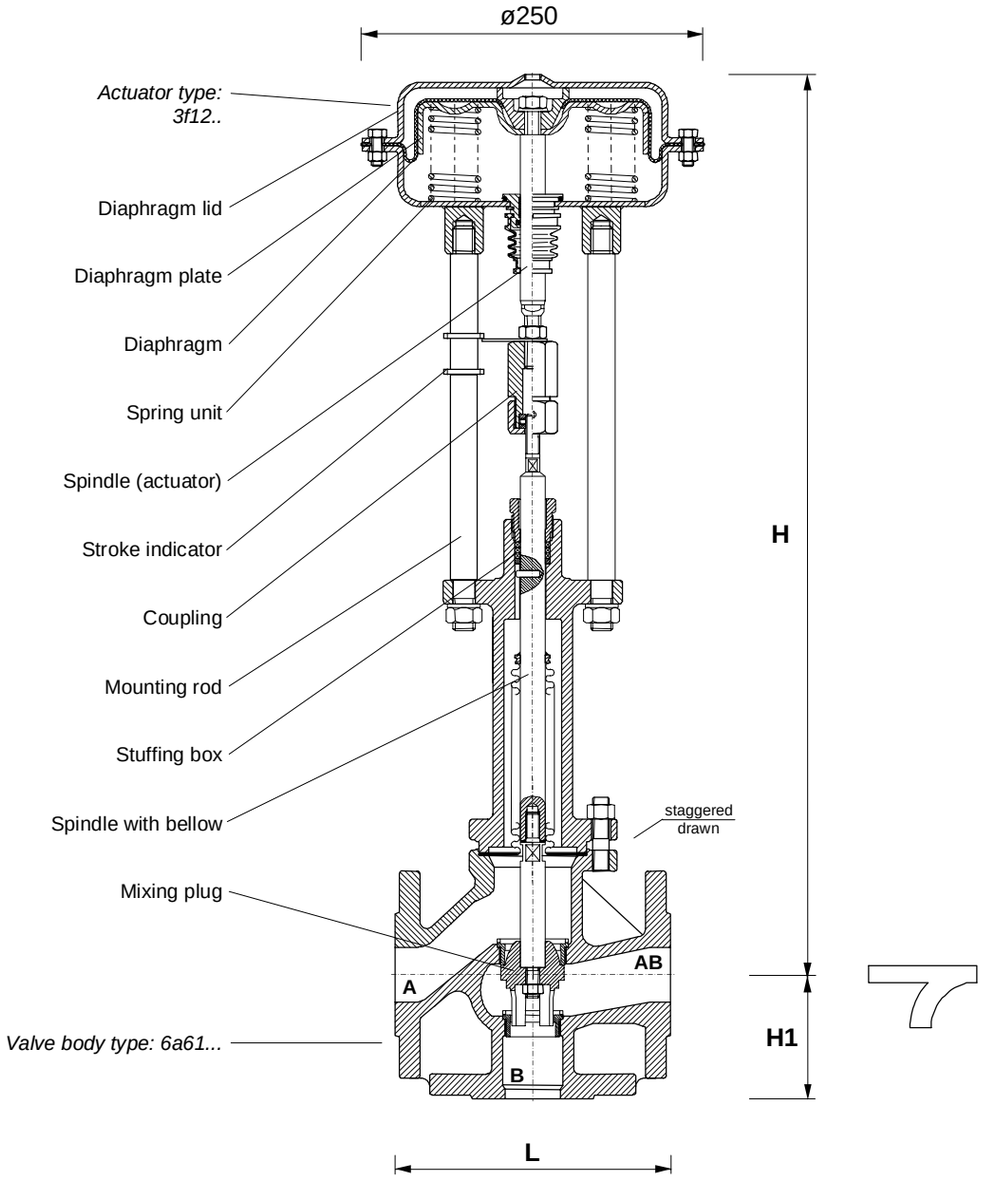
Order text:
Pneumatic control valve in three way form, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes (opens) straightway A-AB
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 361 **4** . . . , PN25: 361 **5** . . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure*** (bar) for control signal...		
	PN16	PN25	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	361 400.	361 500.	4	20	17,9	25,0	
20	361 401.	361 501.	6,3	20	17,9	25,0	
25	361 402.	361 502.	10	20	11,1	25,0	
32	361 403.	361 503.	16	20	6,3	22,8	25,0
40	361 404.	361 504.	25	20	3,6	14,4	25,0
50	361 405.	361 505.	40	20	1,9	8,9	20,7
65	361 406.	361 506.	63	30	0,6	4,8	11,9
80	361 408.	361 508.	100	30		3,0	7,7
100	361 410.	361 510.	160	30		1,7	4,7
125	361 412.	361 512.	230	35		0,7	2,5
150	361 415.		330	38			1,6

** = higher closing pressures and DN>200 on request, DN200: see page 361420Sg*



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	633	647	641	648	653	656	785	786	793	896	912
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	18	19	20	23	24	28	46	50	64	118	140

Pneumatic control valve in three way form with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with mixing plug, for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: diaphragm area: 800 cm², ∅ = 420 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway A-AB"
Air connection: G 1/4",
Operating pressure: 6,0 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with mixing plug
EN-GJS-400-18-LT (GGG-40.3), PN 16, DN200, Kvs 630
Spindle sealing with bellow
Spring closes straightway A-AB
Control signal 1,2 – 4,9 bar, closing pressure 2,0 bar
List-No. 361 420 Sg, accessories: . . .

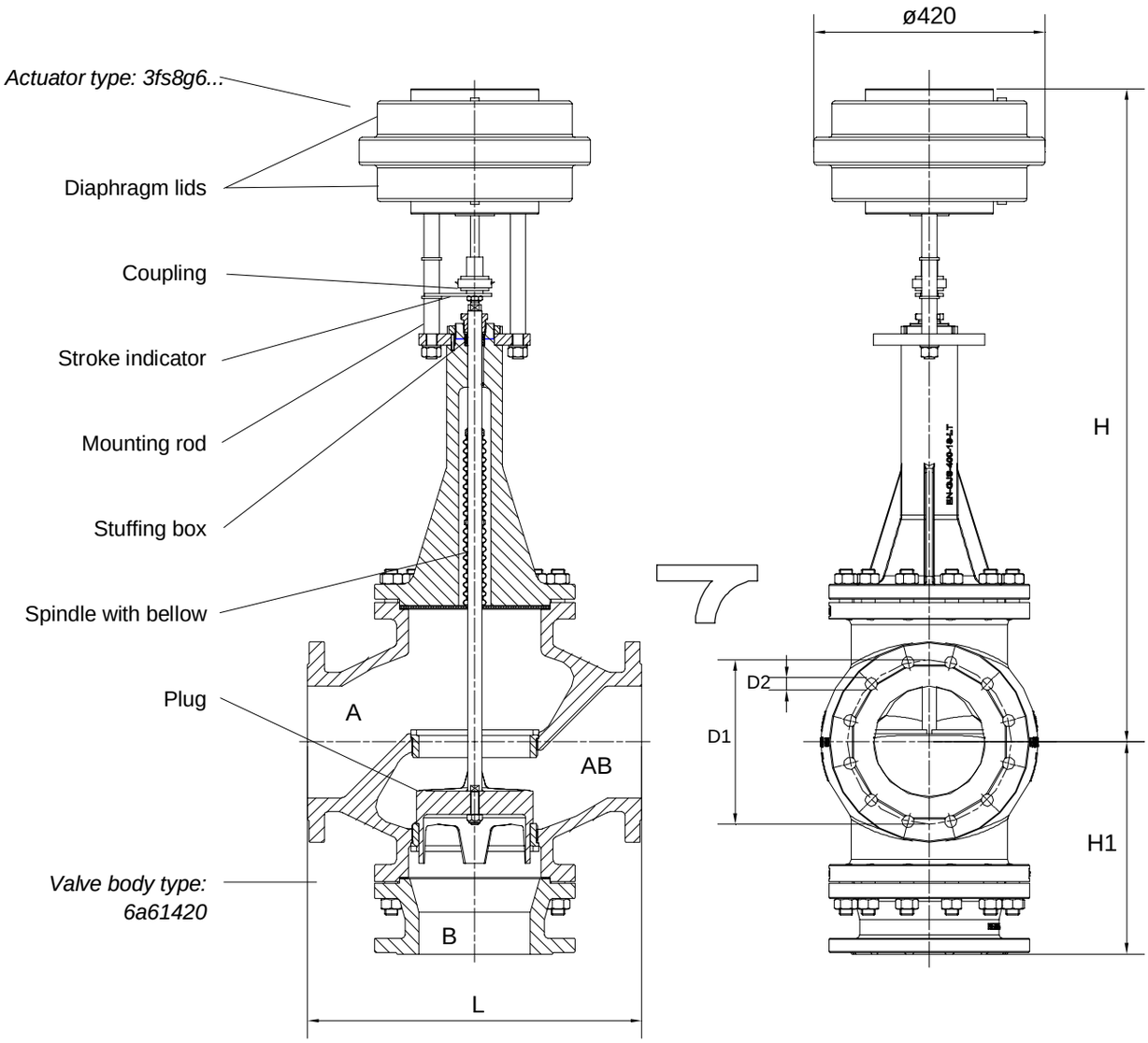
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	**List-No.** PN 16	**Kvs** m³/h	**Stroke** mm	**Closing pressure*** (bar) for control signal... 1,9...4,9 bar
200	361 420Sg	630	60	2,0

** higher closing pressures on request*

open printversion



Dimensions

DN	200
Height H (mm)	1180
Stud length H1 (mm)	380
Length L (mm)	600
Weight (kg)	360

Flange connections acc. to DIN EN 1092-2

PN	D1 (mm)	D2 (mm)	Quantity of screws	Thread
16	295	22	12	M20

open printversion

Pneumatic control valve in three way form with bellow sealing, type with weld-on ends EN-GJS-400-18-LT, PN 16 / 25, DN15-150

Body: EN-GJS-400-18-LT three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Valve body special type:
Weld-on ends similar to DIN EN 12627
(On request with welded pipe section)

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway A-AB"
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other Kvs- values (on request)

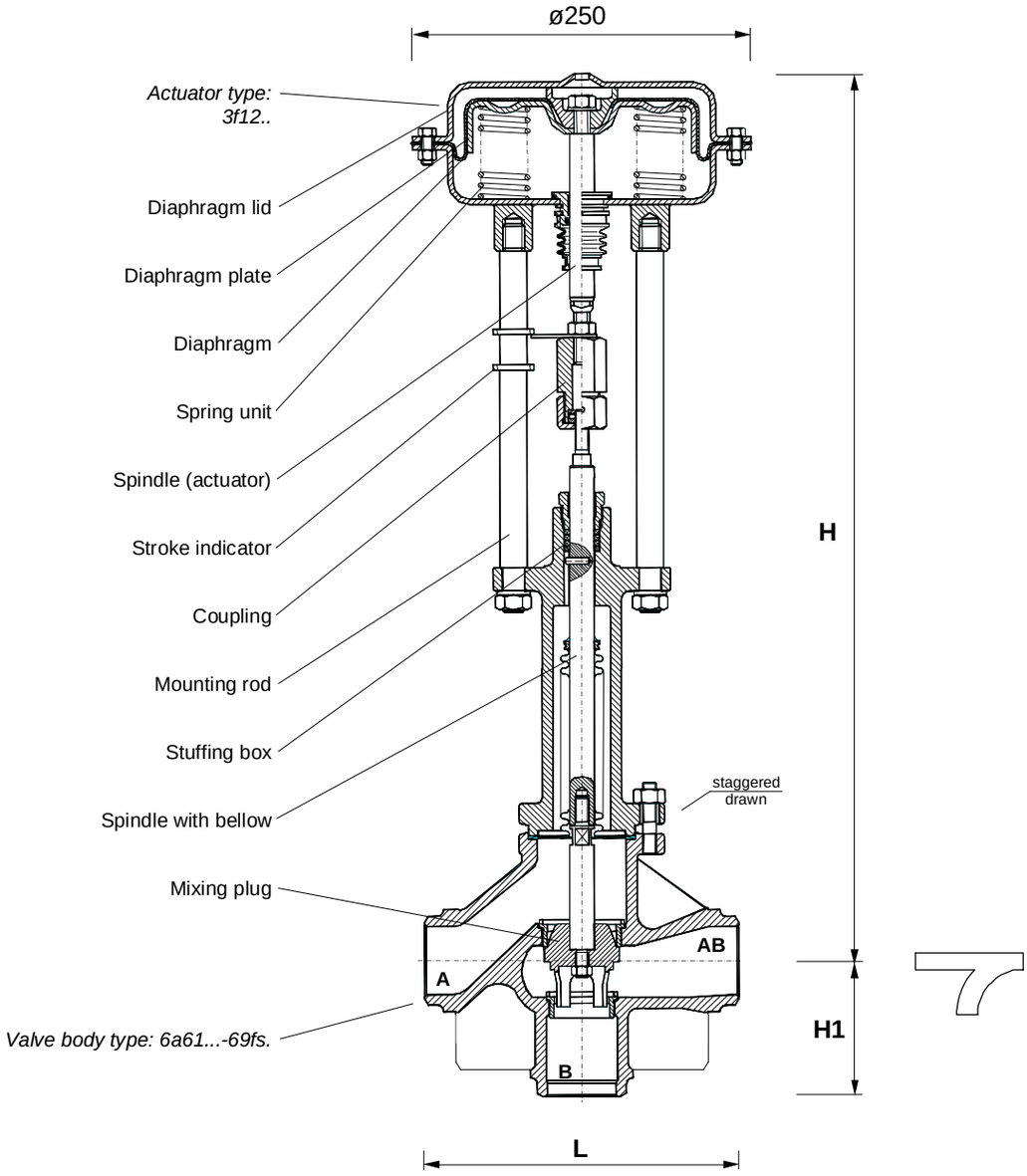
Order text:
Pneumatic control valve in three way form, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Type with weld-on ends
Spindle sealing with bellow
Spring closes (opens) straightway A-AB
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 361 **4** . . . -69fs ., PN25: 361 **5** . . . -69fs .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

DN	**List-No.** PN16	PN25	**Kvs** m³/h	**Stroke** mm	**Closing pressure*** (bar) for control signal... 0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
15	361 400.-69fsa	361 500.-69fsa	4	20	17,9	25,0	
20	361 401.-69fsa	361 501.-69fsa	6,3	20	17,9	25,0	
25	361 402.-69fsa	361 502.-69fsa	10	20	11,1	25,0	
32	361 403.69fsa	361 503.-69fsa	16	20	6,3	22,8	25,0
40	361 404.-69fsa	361 504.-69fsa	25	20	3,6	14,4	25,0
50	361 405.-69fsb	361 505.-69fsb	40	20	1,9	8,9	20,7
65	361 406.-69fsb	361 506.-69fsb	63	30	0,6	4,8	11,9
80	361 408.-69fsb	361 508.-69fsb	100	30		3,0	7,7
100	361 410.-69fsb	361 510.-69fsb	160	30		1,7	4,7
125	361 412.-69fsc	361 512.-69fsc	230	35		0,7	2,5
150	361 415.-69fsc		330	38			1,6

** = higher closing pressures on request*



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	633	647	641	648	653	656	785	786	793	896	912
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	17	18	19	21	23	27	45	48	62	115	137

Pneumatic control valve for diverting function three way form with bellow sealing, DN15-150 EN-GJS-400-18-LT, PN 16 / 25

Body: EN-GJS-400-18-LT three way form
Version with diverting plug, for heat transfer oil
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway AB-A"
Air connection: G1/4"
Operating pressure: standard type: 1,6 bar
other types: ...c: 3 bar, ...d: 6 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

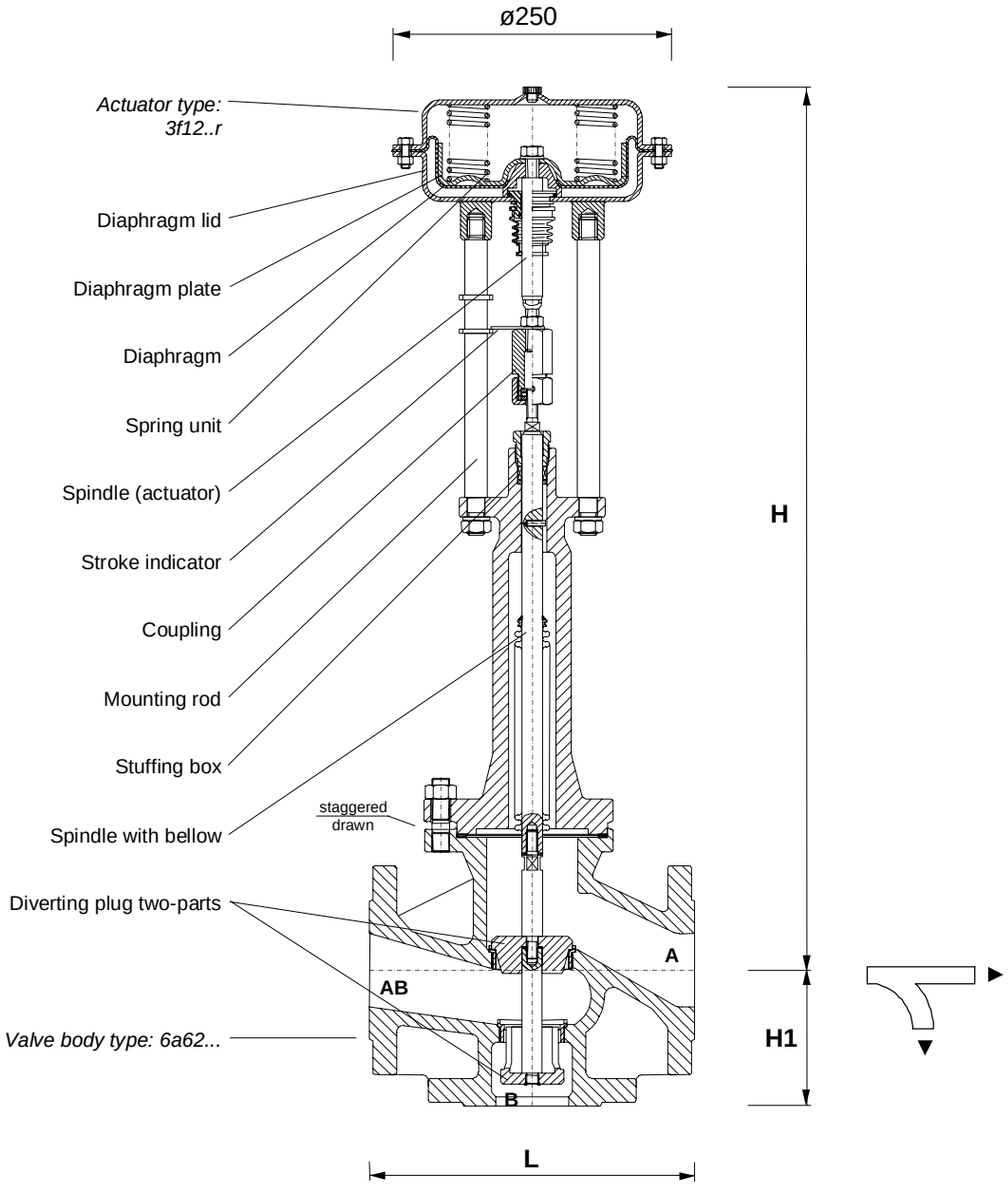
Order text:
Pneumatic control valve in three way form, with diverting plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Spring closes (opens) straightway AB-A
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: PN16: 362 **4** . . . , PN25: 362 **5** . . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

DN	**List-No.**		**Kvs**	**Stroke**	**Closing pressure*** (bar) for control signal...		
	PN16	PN25	m³/h	mm	0,4...1,2bar: standard	1,0...2,0bar: type ...c	2,0...4,0bar: type ...d
32	362 403.	362 503.	12	20	6,3	22,8	25,0
40	362 404.	362 504.	20	20	3,6	14,4	25,0
50	362 405.	362 505.	27	20	1,9	8,9	20,7
65	362 406.	362 506.	50	30	0,6	4,8	11,9
80	362 408.	362 508.	83	30		3,0	7,7
100	362 410.	362 510.	123	30		1,7	4,7
125	362 412.	362 512.	190	35		1,7	4,7
150	362 415.		250	35		1,0	3,1

** = higher closing pressures and DN>200 on request, DN200: see page 362420Sg*



DN	32	40	50	65	80	100	125	150
Height H	648	653	656	785	786	793	896	912
Stud length H1	80	90	100	120	130	150	200	210
Length L	180	200	230	290	310	350	400	480
Weight kg	24	25	28	45	49	62	118	138

INDEX

1
2
3
4
5
6
7
8
9
0

Pneumatic control valve for diverting function with bellow sealing, DN200
EN-GJS-400-18-LT (GGG-40.3), PN 16, with 12-18kN actuator

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with diverting plug, for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: diaphragm area: 800 cm², ∅ = 420 mm
type ...h: 1730 cm², ∅ = 600 mm
Control signal / closing pressure: see table
Operating mode: "Spring closes straightway AB-A"
Air connection: G 1/4", type ...h: G 3/4"
Operating pressure: 6,0 bar, type ...h: 3 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (on request)
Inductive limit switches (on request)
Manual operating device (on request)
Other kvs- values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Pneumatic control valve in three way form, with diverting plug
EN-GJS-400-18-LT (GGG-40.3), PN 16, DN200, Kvs 470
Spindle sealing with bellow
Spring closes straightway AB-A
Control signal . . . – . . . bar, closing pressure . . . bar
List-No. 362 420 S . , accessories: . . .

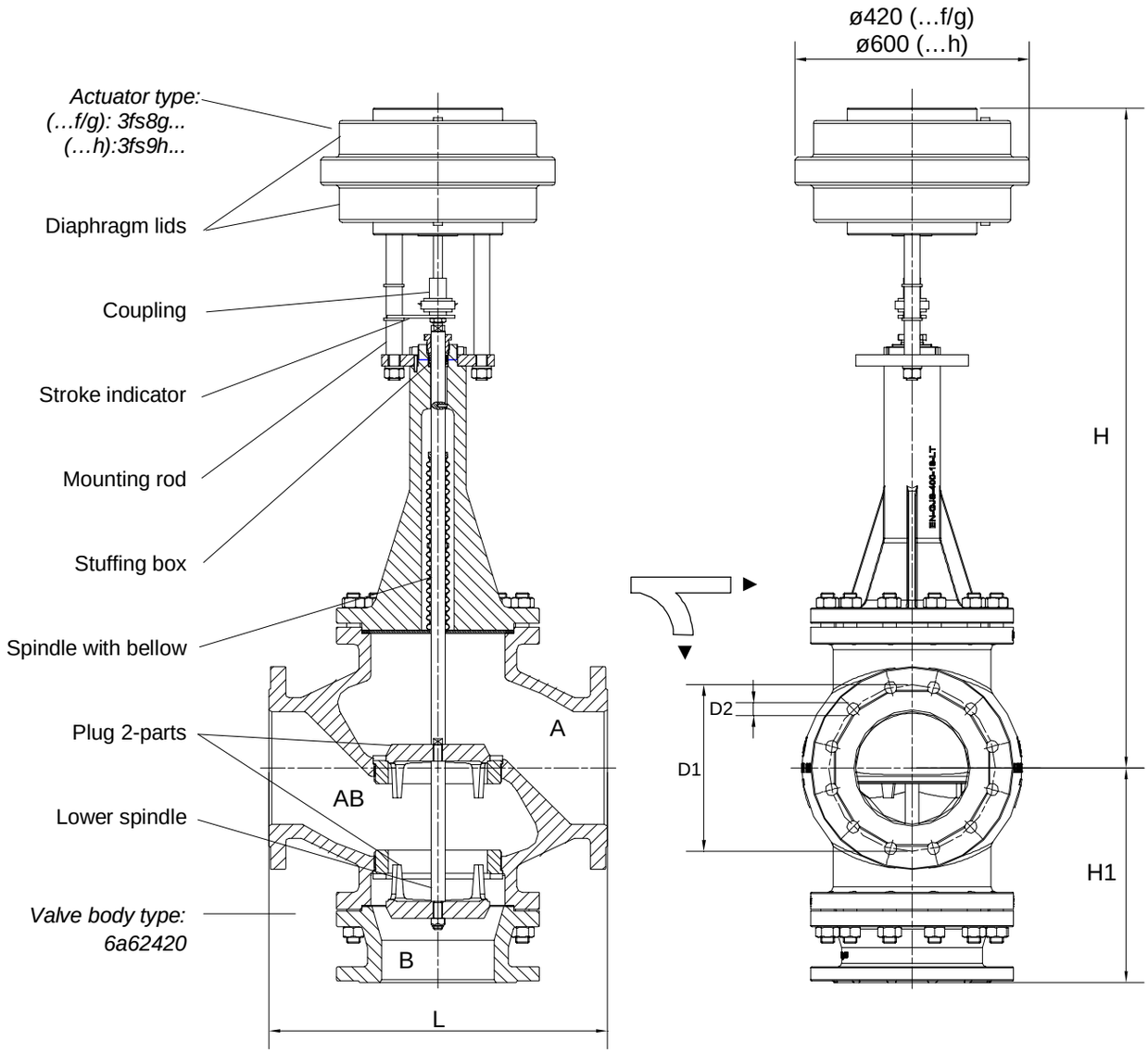
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	**List-No.** PN 16	**Kvs** m³/h	**Stroke** mm	**Closing pressure*** (bar) for control signal... 1,5...4,5 bar	2,1...4,1 bar	0,9...2,0 bar
200	362420S**f**	470	50	4,0		
200	362420S**g**	470	50		4,9	
200	362420S**h**	470	50			6,5

** higher closing pressures on request*

open printversion



Dimensions

DN	200
Height H (...f/g)	1180
Height H (…h)	1545
Stud length H1	380
Length L	600
Weight kg (…f/g)	360
Weight kg (…h)	445

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20

open printversion

Pneumatic control valve in two or three way form with internal thread connectors Bronze CC491K (Rg5), PN 16, DN1/2”-2”

INDEX
1
2
3
4
5
6
7
8
9
0

Body: Bronze CC491K (Rg5)
for water 0...130°C
Internal thread connectors: acc. to DIN
including cap nut and connecting part
of galvanized malleable cast iron
optionally of bronze

Pressure range:	PN16
Spindle sealing:	EPDM-O-ring
Plug:	brass CW614N
Spindle:	stainless steel 1.4122
Flow characteristic:	A-AB equal percentage
	B-AB linear
Positioning ratio:	DN15: 50:1
	DN20-50 100:1

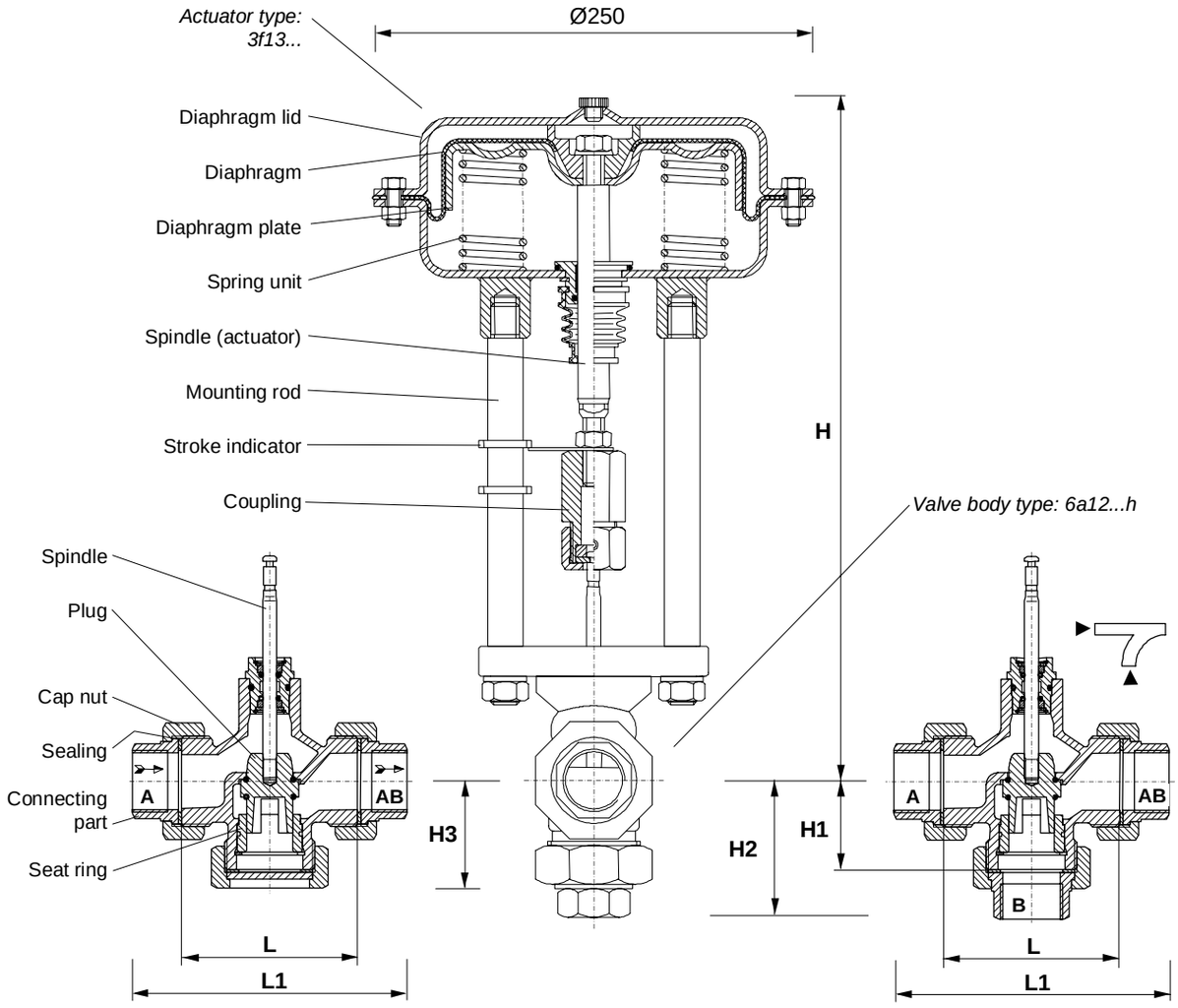
Leakage: EN1349 – seat leakage VI G 1 (tight sealing)

Actuator: diaphragm area 250 cm², ø250 mm
Control signal / closing pressure: see table
Operating mode (reversible):
"Spring closes straightway A-AB“
Air connection: G1/4“
Operating pressure: standard type: 1,4 bar
other types: ...c: 2,8 bar, ...d: 5 bar

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)
Other Kvs- values (on request)

Order text:
Pneumatic control valve in two way form / three way form
Bronze CC491K (Rg5) PN16, DN . ., Kvs . . .
Spindle sealing with O-ring
Spring closes (opens) straightway A-AB
Control signal . . . - . . . bar, closing pressure . . . bar
List-No.: two way form: 381 **2** . . . , three way form: 381 **3** . . .
Accessories: . . .

DN	**List-No.** 2-way	3-way	**Kvs** m³/h	**Stroke** mm	**Closing pressure** (bar) for control signal... 0,4...1,0bar: standard	1,0...1,8bar: type ...c	1,8...3,2bar: type ...d
1/2"	3812 100	3813 100	4	12	16,0		
3/4"	3812 101	3813 101	6,3	12	16,0		
1"	3812 102.	3813 102.	10	14	11,0	16,0	
1 1/4"	3812 103.	3813 103.	16	14	6,3	16,0	
1 1/2"	3812 104.	3813 104.	25	14	3,6	16,0	
2"	3812 105.	3813 105.	40	14	2,0	8,9	16,0



Two way form

Three way form

DN	1/2“	3/4“	1“	1 1/4"	1 1/2"	2“
Height H	370	373	376	385	388	388
Length L	62	75	80	120	130	150
Length ~L1	114	127	138	184	198	222
Stud length H1	40	41	45	55	60	65
Stud length ~H2	66	67	74	89	94	101
Stud length ~H3	48	53	57	68	73	78
Weight kg	11,0	11,5	11,8	12,5	13,1	14,7

INDEX
1
2
3
4
5
6
7
8
9
0

INDEX

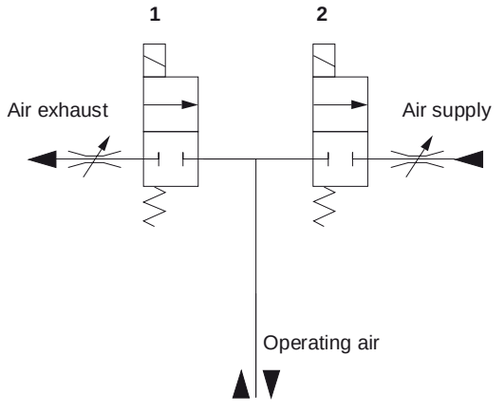
1
2
3
4
5
6
7
8
9
0

Technical data:

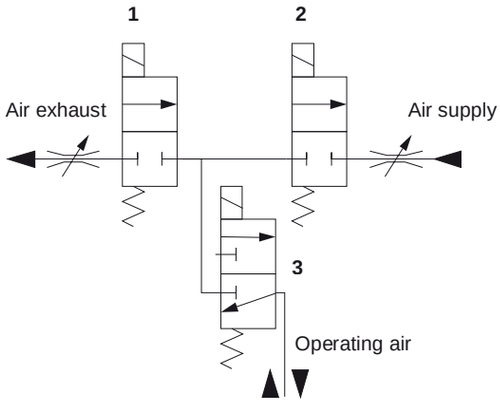
Input signal:	3-point-step signal
Supply:	230V / 50Hz, alternatively: 24V / 50Hz, 24V DC
Electrical connection:	Connector acc. to DIN EN 175301-803-C
Connecting cable:	ø4,5-6 mm / max. 0,75 mm²
Compressed air supply:	Class 3 acc. to ISO 8573-1
Air pressure:	1,4...6 bar (20...90 psi)
Output signal:	0...100% air pressure
Air connection:	G 1/4"
Protecting class:	IP65 acc. to DIN EN 60529

Function:

The electro-pneumatic converter is a connecting element between controller and pneumatic control valve.
It creates a control signal from "+"- or "-" impulse of 3-point-step controller and from available compressed air.
Voltage application on exhaust solenoid valve 1 effects de-aeration of the pneumatic actuator, voltage application on supply solenoid valve 2 effects aeration of the pneumatic actuator. For proper functioning of converter with quick-exhaust function, it is necessary to apply voltage also on solenoid valve 3. Voltage interruption on this valve activates the quick-exhaust function: de-aerating of the pneumatic actuator.
The pneumatic output signal depends on the supply air pressure and must not be higher than the maximum permissible pressure of the actuator. The flow rate of the supply and exhaust air can be modified with throttling valves, therefore it is possible to adjust the positioning time of the pneumatic actuator if necessary.



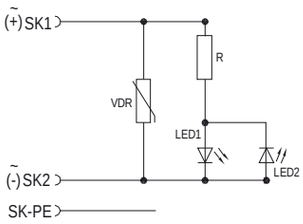
Type 390 360.*
without quick-exhaust function



Type 390 365.*
with quick-exhaust function

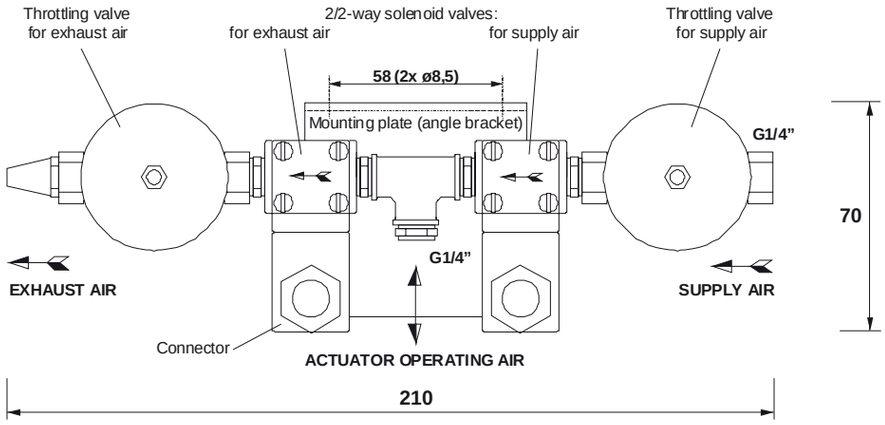
** = All solenoid valves are shown currentless*

Electrical wiring - connector:

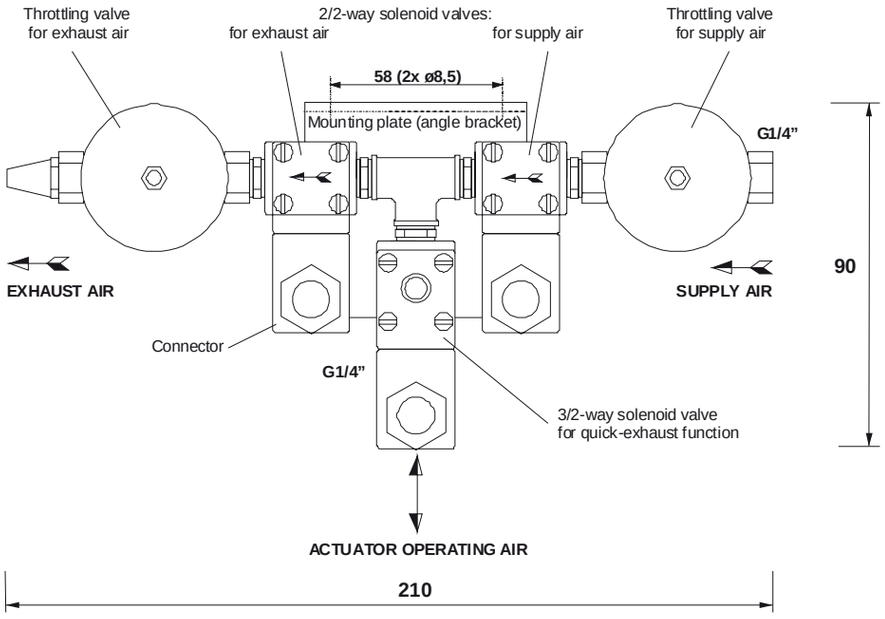


Types overview:**		**List– No.**
230V / 50 Hz	without quick-exhaust function	**390 360**
24 V / 50 Hz	without quick-exhaust function	**390 3602**
24V DC	without quick-exhaust function	**390 3608**
230V / 50 Hz	with quick-exhaust function	**390 365**
24 V / 50 Hz	with quick-exhaust function	**390 3652**
24V DC	with quick-exhaust function	**390 3658**

*** Ex-type of solenoid valves on request*



Type 390360. without quick-exhaust function



Type 390365. with quick-exhaust function

Foxboro SRP981

Function:

The positioner is mounted on pneumatic control valves and is used to assign the valve position to the control signal.
The positioner compares the pneumatic control signal of a control system to the stroke of the control valve and issues a signal pressure for the pneumatic actuator.
The stroke is measured by the pick-up lever connected to a measuring spring installed in the positioner and the downstream pneumatic control system. When a system deviation occurs, the actuator is either vented or filled with air.
The minimum and the maximum of the input signal correspond to the end positions of the valve.
If necessary, the signal pressure change can be slowed down by a volume restriction.

Technical data:

Input signal:	0,2...1,0 bar (3...15 psi), 0,2...0,6 bar and 0,6...1,0 bar
Air supply:	Acc. to ISO 8573-1: - Maximum particle size and density: class 2 - Oil contents: class 3 - Pressure dew point: class 3 or at least 10 K below ambient temperature
Air supply pressure:	1,4...6 bar (20...90 psi)
Output signal:	0...100% air supply pressure
Characteristic:	Linear
Air connection:	G 1/4" acc. to ISO 228
Operating direction:	Reversible *Factory setting: direct (increasing input => increasing output)*
Max. ambient temperature:	-40 ... 80 °C
Protection class:	IP54 (IP 65 on request)
Weight:	ca. 1,1 kg

Type:	**List– No.**
Foxboro SRP981:	**390 546**

Foxboro SRI990

Samson 3725

Function:

The positioner is mounted on pneumatic control valves and is used to assign the valve position to the control signal.
The positioner compares the electric control signal of a control system to the stroke of the control valve and issues a signal pressure for the pneumatic actuator.
The stroke is measured by the pick-up lever connected to a sensor installed in the positioner and the downstream electronics.
When a system deviation occurs, the actuator is either vented or filled with air.
The minimum and the maximum of the input signal correspond to the end positions of the valve.
If necessary, the signal pressure change can be slowed down by a volume restriction.

Technical data:

Input signal:	4...20 mA, 4...12 mA and 12...20 mA, two-wire system with reverse polarity protection
Air supply:	Acc. to ISO 8573-1: - Maximum particle size and density: class 2 for SRI990, class 4 for 3725 - Oil contents: class 3 - Pressure dew point: class 3 or at least 10 K below ambient temperature
Air supply pressure:	1,4...6 bar (20...90 psi)
Output signal:	0...100% air supply pressure
Characteristic:	Linear
Air connection:	G 1/4" acc. to ISO 228
Operating direction:	Reversible *Factory setting: direct (increasing input => increasing output)*

Type:	**390846x (Foxboro SRI990)**	**390841a. (Samson 3725)**
Max. ambient temperature:	-40 ... 80 °C	-20 ... 80 °C
Protection class:	IP 65	IP 66
Explosion protection:	II 2 G EEx ia IIC T6 (Standard)	II 2 G Ex ia IIC T4 (Option)
Weight:	ca. 1,7 kg	ca. 1,0 kg

Types*:	**List– No.**
Foxboro SRI990 standard Ex-version:	**390 846x**
Samson 3725 standard version:	**390 841a**
Samson 3725 Ex-version:	**390 841ax**

*** On request:**
- *Accessories (for instance output signal 4...20 mA, inductive limit switches, pressure gauge)*
- *Special design (for instance other protection class, stainless steel housing, version for oxygen)*
- *Positioner from other producer (for instance ABB, Flowserve, Siemens)*
- *Positioner for other communications (for instance HART, PROFIBUS)*

Accessories for operating air
3/2-ways solenoid valve, throttling valve, maintenance unit

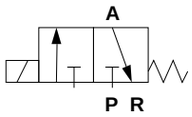
INDEX

1
2
3
4
5
6
7
8
9
0

3/2-ways solenoid valve for operating air

Material:	Brass, spool from polyamide
Nominal diameter:	2mm
Operating pressure:	0…10 bar
Voltage:	230V 50/60Hz, alternatively: 115V/50...60Hz (appendix …1) 24V/50...60Hz (appendix …2) 24VDC (appendix …8)
Ambient temp.:	-10° ... +55°C
Connections:	P = Air supply A = Actuator R = Deaeration
Operating mode:	De-energized P-A closed, A-R open (A deaerated)
El. connection:	Cable plug
Protection class:	IP65 with cable plug
Weight:	Ca. 0,5 kg
Listen-Nr.:	**393300..**

393300..

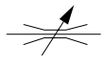


Special types:

Ex-protection:	II 2G Ex eb mb IIC T4 Gb, II 2D Ex mb tb IIIC T130 ºC Db with terminal box or with cast-on cable
List-No.:	**3933xc..**

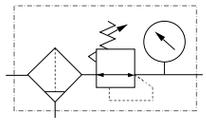
Throttling valve

Material:	Brass
Connection:	Both sides R 1/4“ female thread
Weight:	Ca. 0,1 kg
List-No.:	**394800..**



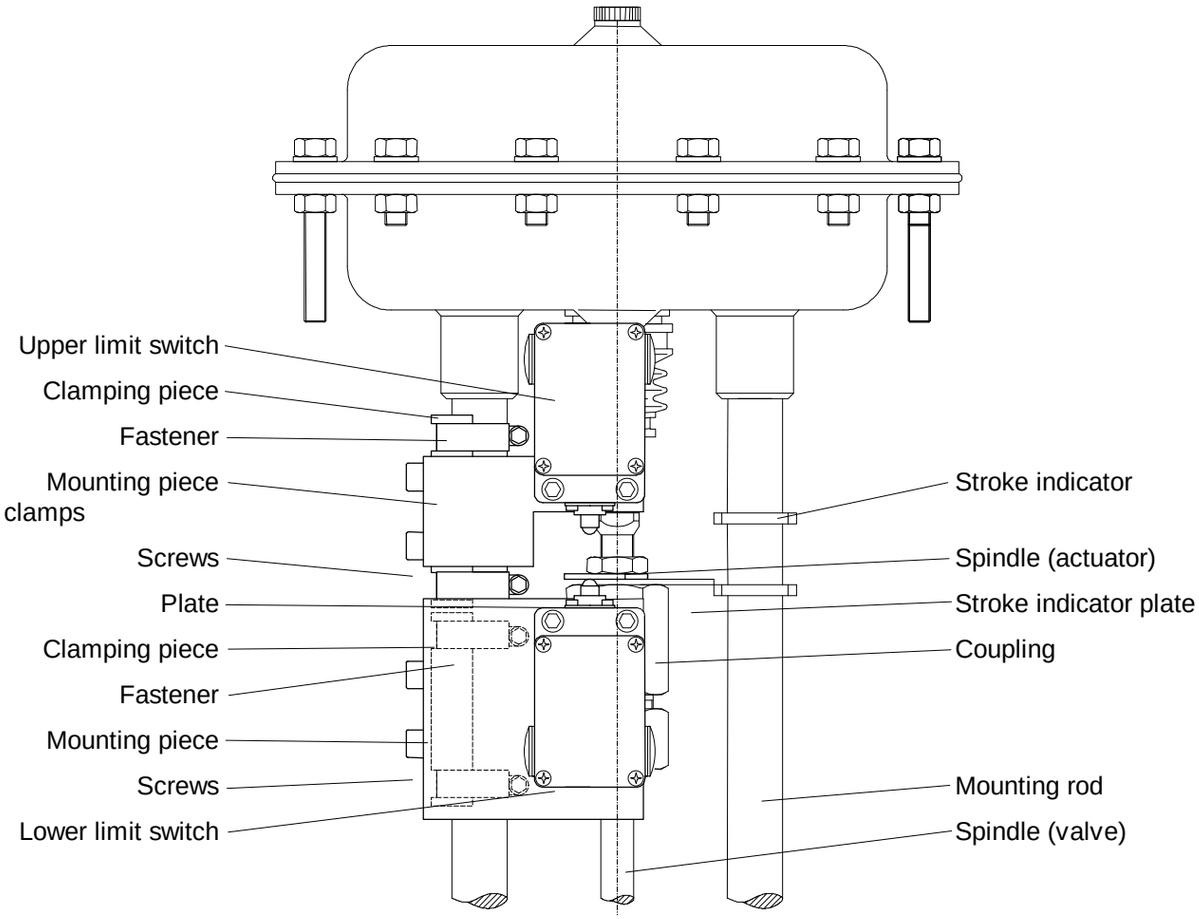
Maintenance unit

Input pressure:	Max. 10 bar
Output pressure:	Adjustable to 10…80% of the input pressure
Connection:	Both sides R 1/4" female thread
Weight:	Ca. 0,5 kg



List-No.:	**394150**	With manometer for output pressure 0…2,5 bar
	394151	With manometer for output pressure 0…6,0 bar
	394152	With manometer for output pressure 0…10,0 bar
	394159	Accessory: mounting angle

Pneumatic actuators type 3f1... can be equipped with an additional limit switch with positive break normally closed contact, for valve position „up" and / or „down".



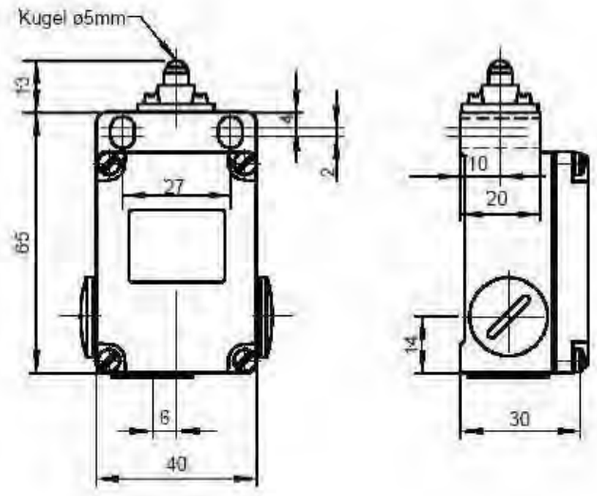
Limit switch (see also next page):

Switching system:	Snap action, positive break normally closed contact
Switching element:	1 opener / 1 closing contact
Electrical loading:	6A / 400V AC (AC-13)
Minimum load:	10mA / 24V
Protection class:	IP 65

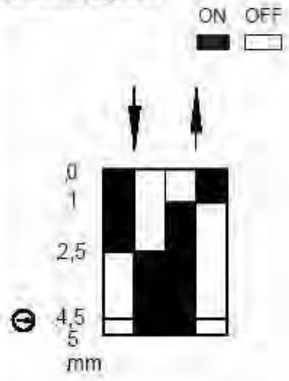
Type summary:	**List-No.**
1 additional upper limit switch for valve position „up"	**39eo**
1 additional lower limit switch for valve position „down"	**39eu**
2 additional limit switches for valve positions “up” and „down"	**39ev**

open printversion

Dimensional drawing



Switching path



Circuit diagramm

Technical Data:

Regulations:	IEC 947-5-1/EN 60947-5-1
Housing:	GD-AL alloy, colour painted
Type of protection:	IP 65 as per EN 60529/DIN VDE 0470-1
Contakt material:	Fine silver
Switching element:	1 normally closed 1 normally open
Switching system:	snap action , positive break normally closed contact
Temperature range:	- 20° C to + 80° C
Mounting connection:	Screw connection, self lifting clamp
Actuation:	ball plunger
Mounting:	Designed for M5
Fixing spacing:	27 mm
Cable inlet:	3 x M16x1,5
Electrical construction:	IEC 947-5-1, electrically isolated switching inserts
Electrical loading:	400 V AC 6 A (AC-13)
Minimum load:	24 V 10 mA
Short circuit protection:	6 A (slow blow)
Mechanical operating life:	>1 million switching cycles
Switching frequency:	max. 3600 switching cycles / h

Specifications:

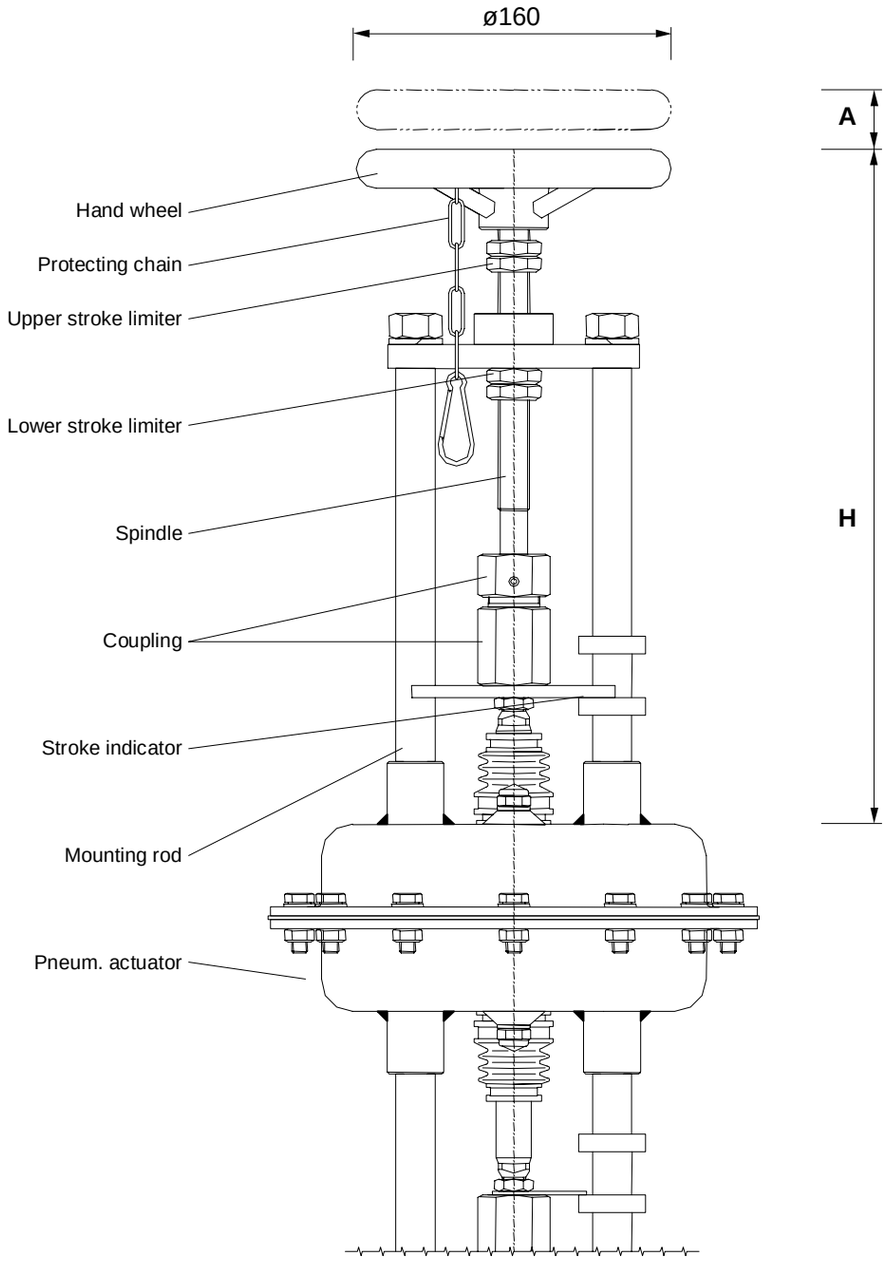
- plastic cover

Fitting instructions:

When used as a safety switch (positive break of the normally closed contacts) ensure a plunger stroke of at least 4,5 mm and that the switch is fitted and secured so that it is not possible to move the switch when actuating !

Part No.: 45.1.01.0.01

open printversion



Summary of types:

Manual operating device for actuator with operating mode **Spring moves spindle downwards** (upper spring)

List.-No.	Hub mm	H mm	A mm
39h20o	20	300	41
39h30o	30	300	61
39h35o	35	300	71
39h40o	40	300	81

Manual operating device for actuator with operating mode **Spring moves spindle upwards** (lower spring)

List.-No.	Hub mm	H mm	A mm
39h20u	20	340	21
39h30u	30	340	31
39h35u	35	340	36
39h40u	40	340	41

The manual operating device can be delivered only assembled to the actuator, later assembly on an actuator without the manual operating device is not possible.

Technical data

Diaphragm area:	250 cm²
Diameter:	250 mm
Control pressure:	max. 6 bar
Thread connection:	G1/4“
Stroke:	15, 20, 30, 35, 40 mm
Spindle sealing:	O-Ring, maintenance free
Operating mode:	Spring moves spindle upwards / downwards (reversible)
Rods distance:	100 mm
Connection to valve spindle:	coupling ring ø20 x 10 mm with thread M10 or M12
Max. ambient temperature:	-20°…110°C
Weight:	9 kg

Accessories, special types**:**
I/P-Positioner, control signal 4...20 mA (see page 390 8)
P/P-Positioner, control signal 0,2...1,0 bar (see page 390 5)
Electro-pneum. transformer (see page 390 3)
Solenoid valve for operating air (see page 393)
Limit switches (see page 39e)
Inductive limit switches (on request)
Manual operating device (see page 39h)

Order text:
Pneumatic actuator
Spring moves spindle upwards / downwards
Control signal . . . - . . . bar for stroke . . . mm
Mounting rod length . . . mm
List-No. 3f1 . . .

Stroke	**Spring range (bar)**				
mm	0,4…1,2	1,0…2,0	2,0…4,0	0,9…2,2	1,8…4,4
15	X	X	X	-	-
20	X	X	X	-	-
30	X	X	X	-	-
35	-	X	X	-	-
40	-	-	-	X	X

Summary of types:

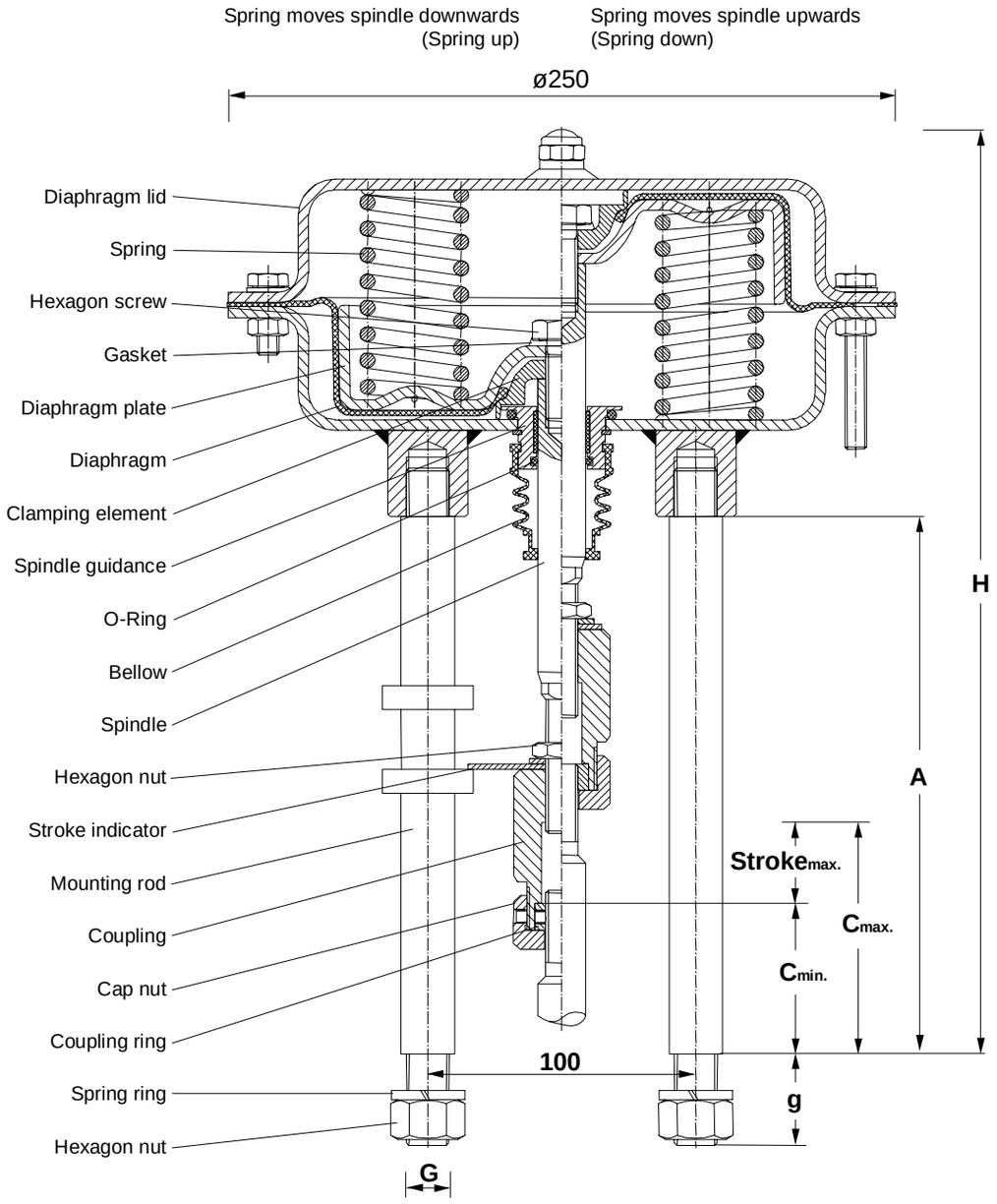
3f1 **x** **x** **x** **x**

Mounting rod length
0 = 200 mm
1 = 180 mm
2 = 230 mm

Spring range
b = 0,4…1,2 bar
c = 1,0…2,0 bar
d = 2,0…4,0 bar

Stroke
1 = 15 mm
2 = 20 mm
3 = 30 mm
4 = 35-40 mm

Reverse operating mode
r = Spring moves spindle downwards



A* mm	Cmin. mm	Cmax. mm	H mm	G mm	g mm
180	29	65	325	M12	24
200	49	85	345	M16	32
230	86	122	375	M16	32

** = Other mounting rod lengths on request*

Motor control valve in two way form, PN 16/25/40, EN-GJS-400-18-LT / GP240GH+N
Spindle sealing with PTFE-V-ring unit

DN 15-50	2-5,5kN- actuator	421..._1
DN 65-150	2-5,5kN- actuator	421..._2
DN 50-150	8-15kN- actuator	421...He/f/h
DN 80-150	20/25kN- actuator	421...Hi/k
DN 200	12-25kN- actuator	421 4/520Hf/h/i/k

Motor control valve in three way form, PN 16/25, EN-GJS-400-18-LT
Spindle sealing with PTFE-V-ring unit

DN 15-150	2-5,5kN- actuator, with mixing plug	431 4/5...
DN 50-150	8-15kN- actuator, with mixing plug	431 4/5...He/f/h
DN 200	12/15kN- actuator, with mixing plug	431 4/520Hf/h
DN 32-150	2-5,5kN- actuator, with diverting plug	432 4/5...
DN 50-150	8-15kN- actuator, with diverting plug	432 4/5...He/f/h
DN 200	12-25kN- actuator, with diverting plug	432 4/520Hf/h/i/k

Motor control valve in two way form, PN 16/25/40, EN-GJS-400-18- LT / GP240GH+N
Spindle sealing with bellow

DN 15-150	2-5,5kN- actuator	451...
DN 50-150	8-15kN- actuator	451...He/f/h
DN 200	12-25kN- actuator	451 420Hf/h/i/k

Motor control valve in three way form, PN 16/25, EN-GJS-400-18-LT
Spindle sealing with bellow

DN 15-150	2-5,5kN- actuator, with mixing plug	461 4/5...
DN 15-100	2-5,5kN- actuator, with mixing plug, with weld-on ends	461 4/5…-69fs
DN 200	12/15kN- actuator, with mixing plug	461 420Hf/h
DN 32-150	2-5,5kN- actuator, with diverting plug	462 4/5...
DN 200	12-25kN- actuator, with diverting plug	462 420Hf/h/i/k

Motor control valve PN16 bronze CC491K (Rg5) in three or two way form with thread connectors ..... 481...

Accessories:

Additional load dependent limit switches	49ev
Potentiometer	49f...
Process controller integrated into actuator	49r...
Digital positioner integrated into actuator	49sr7...
Additional travel dependent limit switch	49w.

Electrical actuators:

Electrical actuator type 4e1 ..... 4e1…
Thrust 1,5-5,5 kN

Electrical, explosion proof actuator type 4ex ..... 4ex...
PTB-certified in accordance to ATEX directive 94/9/EG
for zone 1, 2, 21, 22, Thrust 0,5-10 kN
alternatively suitable for most KFM control valve types

*Other types of actuators, for instance **AUMA** or **SCHIEBEL** products, are alternatively suitable for most KFM-control valve types (on request)*

Operating instructions: see group 0

Motor control valve in two way form with PTFE-V-ring sealing, DN15-50 PN 16 / 25 / 40

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 400°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 50:1
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 421 **4** . . , PN25: 421 **5** . . , PN40: 421 **7** . .
Accessories: . . .

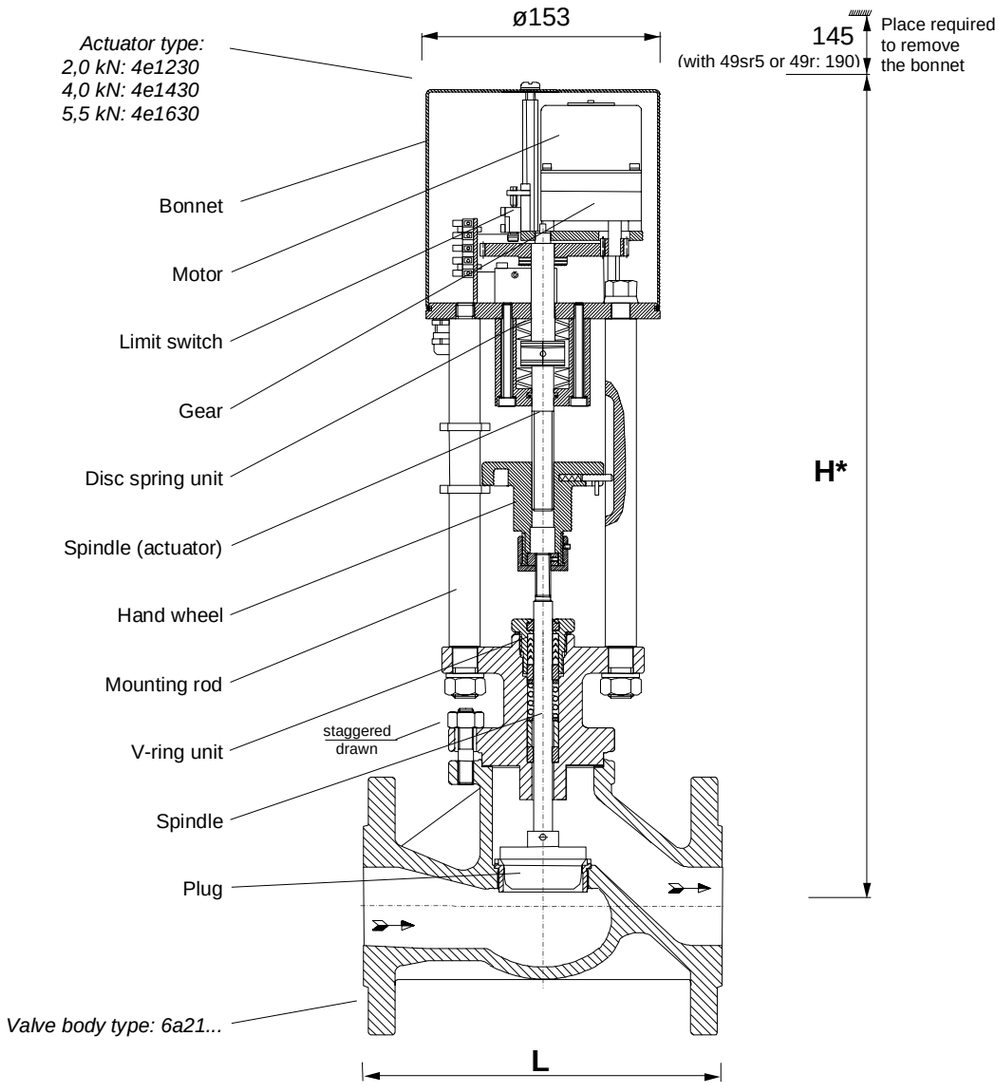
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:		-10...50	100	150	200	250	300	350	400	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**			**Kvs**	**Stroke**	**Pos. time**	**Closing pressure** (bar)		
	PN16	PN25	PN40	m³/h	mm	sec	2000N	4000N	5500N
15	421 400	421 500	421 700	4	20	66	40,0		
	421 450	421 550	421 750	2,5	20	66	40,0		
	421 470	421 570	421 770	1,6	20	66	40,0		
20	421 401	421 501	421 701	6,3	20	66	40,0		
	421 451	421 551	421 751	4,0	20	66	40,0		
	421 471	421 571	421 771	2,5	20	66	40,0		
25	421 402.	421 502.	421 702.	10	20	66	28,5	40,0	
	421 452	421 552	421 752	6,3	20	66	40,0		
	421 472	421 572	421 772	4,0	20	66	40,0		
32	421 403.	421503.	421 703.	16	20	66	17,3	39,3	40,0
	421 453.	421 553.	421 753.	10	20	66	28,5	40,0	
	421 473	421 573	421 773	6,3	20	66	40,0		
40	421 404.	421 504.	421 704.	25	20	66	10,8	25,,2	36,0
	421 454.	421 554.	421 754.	16	20	66	17,3	39,3	40,0
	421 474	421 574.	421 774.	10	20	66	28,5	40,0	
50	421 405.	421 505.	421 705.	40	20	66	6,6	16,0	23,0
	421 455.	421 555.	421 755.	25	20	66	10,8	25,2	36,0
	421 475.	421 575.	421 775.	16	20	66	17,3	39,3	40,0

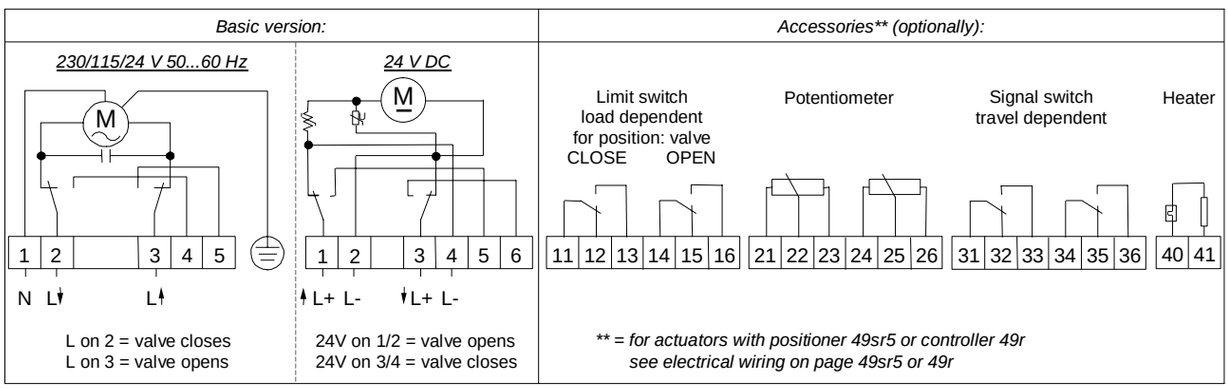
Motor control valve in two way form with PTFE-V-ring sealing, DN15-50 PN 16 / 25 / 40



DN	15	20	25	32	40	50
Height H*	491	505	499	506	511	513
Length L	130	150	160	180	200	230
Weight kg	14	15	16	18	19	21

** = add. 45mm for actuators with positioner 49sr5 or controller 49r*

Electrical wiring:



Motor control valve in two way form with PTFE-V-ring sealing, DN65-150 PN 16 / 25 / 40

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 400°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner for max. 40mm stroke (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 421 **4** . . , PN25: 421 **5** . . , PN40: 421 **7** . .
Accessories: . . .

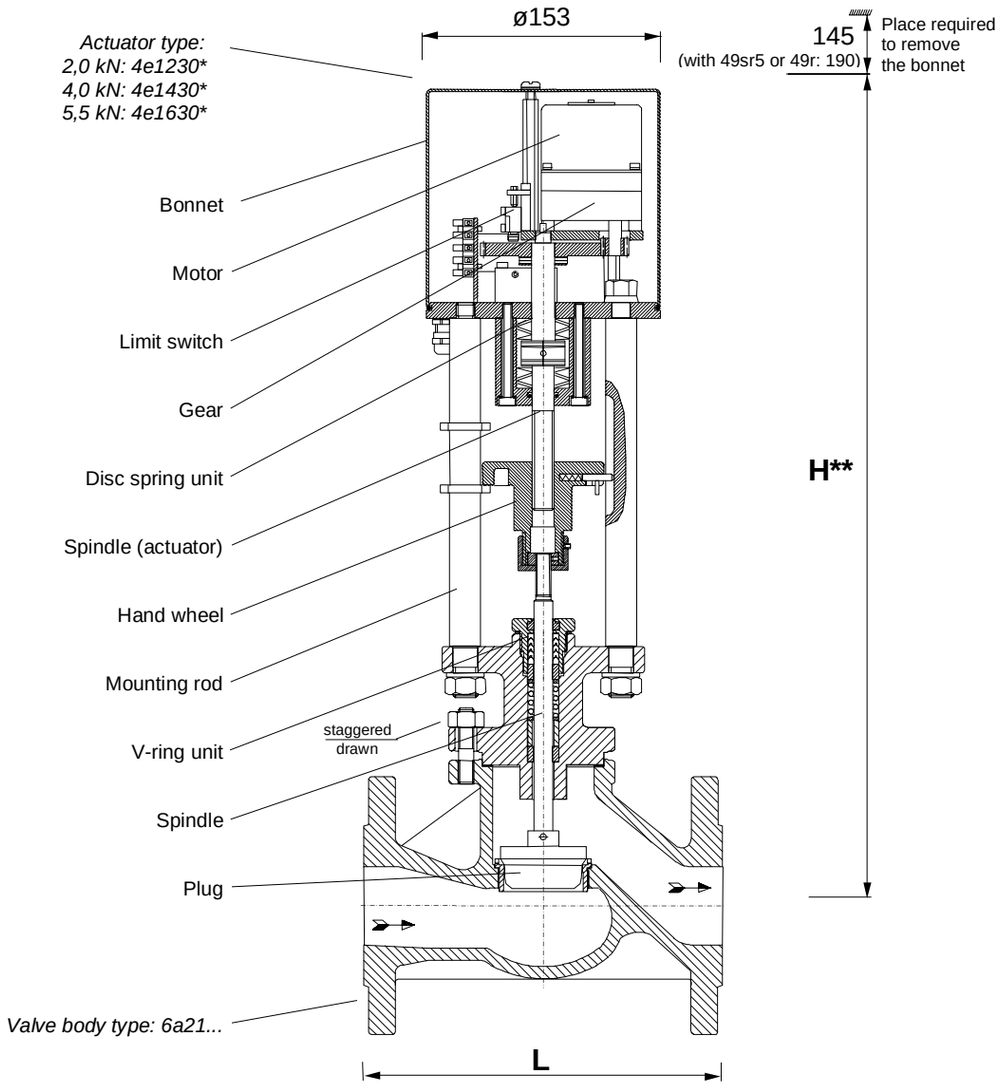
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:		-10...50	100	150	200	250	300	350	400	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**			**Kvs**	**Stroke**	**Pos. time**	**Closing pressure** (bar)		
	PN16	PN25	PN40	m³/h	mm	sec	2000N	4000N	5500N
65	421 406.	421 506.	421 706.	63	30	99	3,4	9,1	13,4
	421 456.	421 556.	421 756.	40	20	66	6,6	16,0	23,1
	421 476.	421 576.	421 776.	25	20	66	10,8	25,2	36,0
80	421 408.	421 508.	421 708.	100	30	99	2,0	5,8	8,6
	421 458.	421 558.	421 758.	63	20	66	3,4	9,1	13,4
	421 478.	421 578.	421 778.	40	20	66	6,6	16,0	23,1
100	421 410.	421 510.	421 710.	160	30	99	1,1	3,5	5,4
	421 460.	421 560.	421 760.	100	30	99	3,4	9,1	13,4
	421 480.	421 580.	421 780.	63	22	73	3,4	9,1	13,4
125	421 412.	421512.		230	60	198	0,5	2,1	3,3
	421 412_140a.	421 512_140a.		140	35	116	1,1	3,5	5,4
	421 412_100a.	421 512_100a		100	35	116	2,0	5,8	8,6
150	421 415.	421 515.		330	60	198	-	1,3	2,1
	421 415_250a.	421 515_250a.		250	50	165	0,5	2,1	3,3
	421 415_150a	421 515_150a.		150	35	116	1,1	3,5	5,4

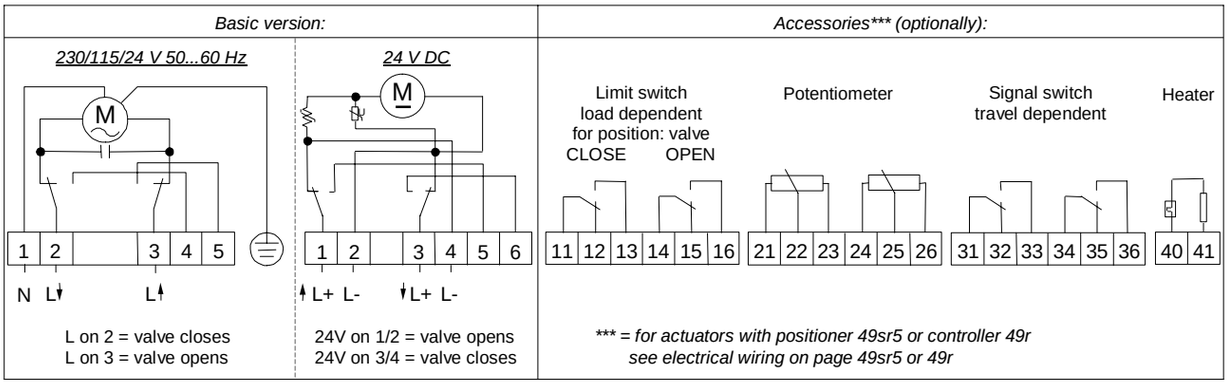
Motor control valve in two way form with PTFE-V-ring sealing, DN65-150 PN 16 / 25 / 40



DN	65	80	100	125	150
Height H**	556	557	564	760	775
Length L	290	310	350	400	480
Weight kg	35	37	48	101	121

** = only for stroke up to 40mm; actuators for stroke 50-60mm: 4e1266 (2kN) , 4e1466 (4kN) and 4e1666 (5,5kN)*
*** = add. 45mm for actuators with positioner 49sr5 or controller 49r*

Electrical wiring:



open printversion

Motor control valve in two way form with PTFE-V-ring sealing, DN50-150 PN 16 / 25 / 40, with 8-15kN actuator

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 400°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 8 kN / 34 VA (appendix ...e)
12 kN / 34 VA (appendix ...f)
15 kN / 50 VA (appendix ...h)
Power supply: 230V / 50Hz
Alternatively: 230V / 60Hz (appendix ...e6/f6/h6)
Other voltages: 115V 50/60Hz, 24V 50/60Hz,
24V DC, 400V 3Ph. on request
Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 421 **4** . . H ., PN25: 421 **5** . . H ., PN40: 421 **7** . . H .
Accessories: . . .

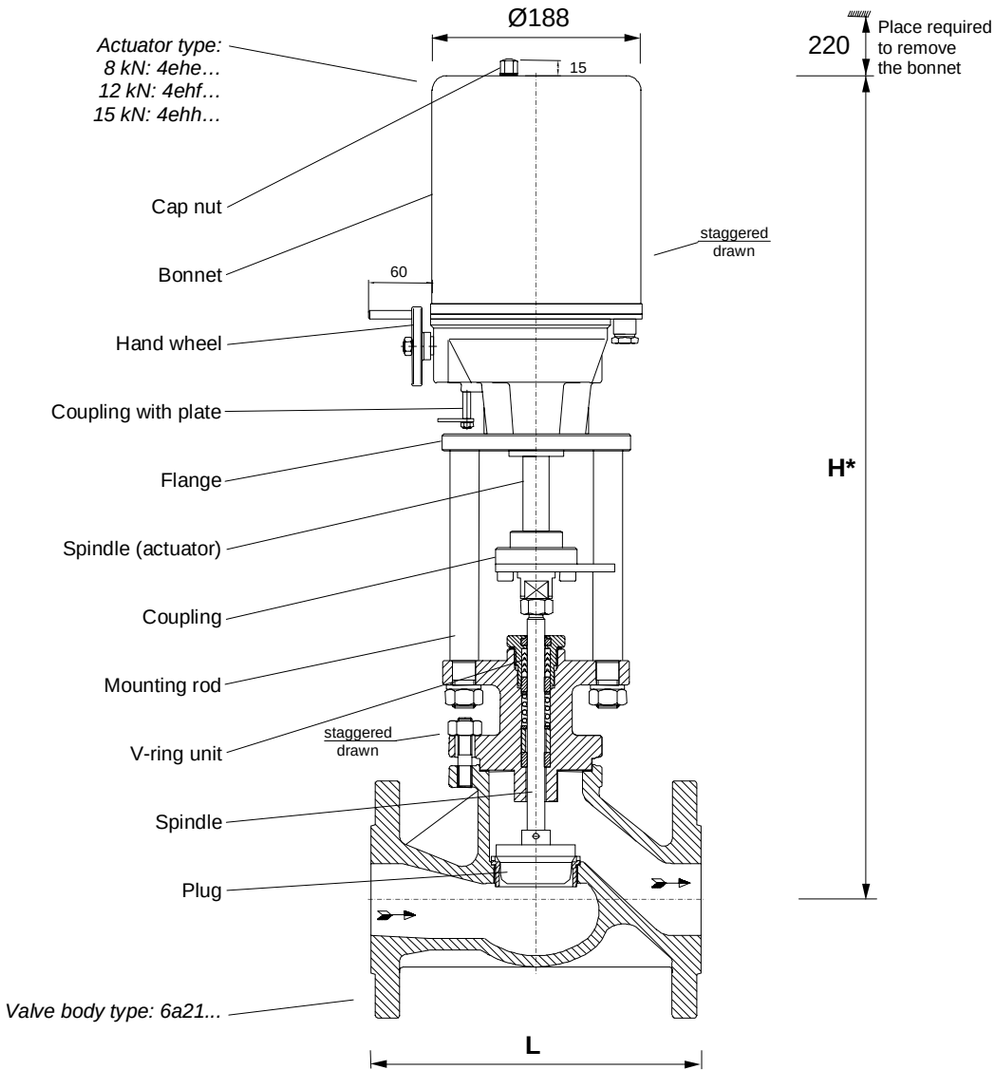
Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:		-10...50	100	150	200	250	300	350	400	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**			**Kvs**	**Stroke**	**Pos. time**	**Closing pressure** (bar)		
	PN16	PN25	PN40	m³/h	mm	sec	8kN	12kN	15kN
50	421 405H.	421 505H.	421 705H.	40	20	48	34,8	40,0	
	421 455He	421 555He	421 755He	25	20	48	40,0		
	421 475He	421 575He	421 775He	16	20	48	40,0		
65	421 406H.	421 506H.	421 706H.	63	30	72	20,4	31,8	40,0
	421 456H.	421 556H.	421 756H.	40	20	48	34,8	40,0	
	421 476He	421 576He	421 776He	25	20	48	40,0		
80	421 408H.	421 508H.	421 708H.	100	30	72	13,4	21,0	26,6
	421 458H.	421 558H.	421 758H.	63	20	48	20,4	31,8	40,0
	421 478H.	421 578H.	421 778H.	40	20	48	34,8	40,0	
100	421 410H.	421 510H.	421 710H.	160	30	72	8,4	13,3	17,0
	421 460H.	421 560H.	421 760H.	100	30	72	20,4	31,8	40,0
	421 480H.	421 580H.	421 780H.	63	22	53	20,4	31,8	40,0
125	421 412H.	421 512H.		230	60	72	5,2	8,4	10,8
	421 412H._140a	421 512H._140a		140	35	42	8,4	13,3	17,0
	421 412H._100a	421 512H._100a		100	35	42	13,4	21,0	26,6
150	421 415H.	421 515H.		330	60	72	3,5	5,7	7,4
	421 415H._250a	421 515H._250a		250	50	60	5,2	8,4	10,8
	421 415H._150a	421 515H._150a		160	35	42	8,4	13,3	17,0

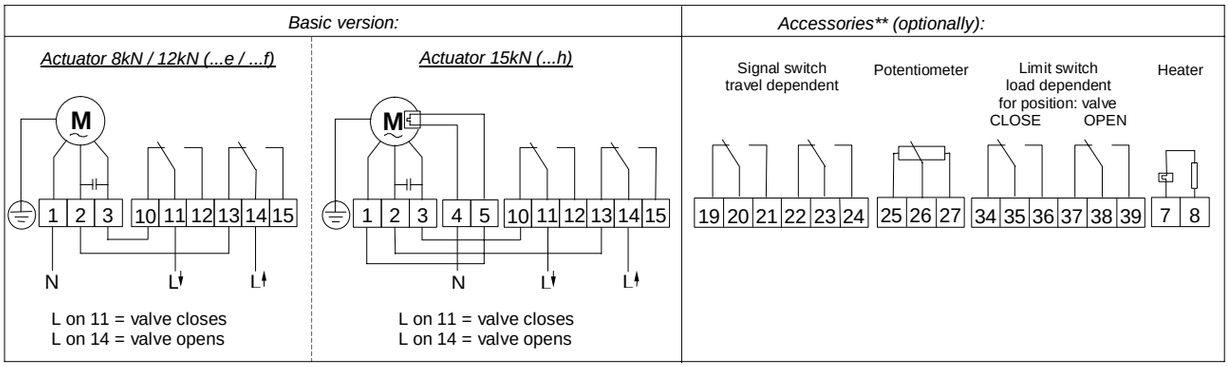
INDEX
1
2
3
4
5
6
7
8
9
0



DN	50	65	80	100	125	150
Height H*	625	668	669	676	834	849
Length L	230	290	310	350	400	480
Weight kg	25	39	42	52	104	124

** = additional 20mm for 15kN actuator and 25mm for version with positioner*

Electrical wiring *230 /115 /24 V 50/60 Hz*:**



*** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in two way form with PTFE-V-ring sealing, DN80-150 PN 16 / 25 / 40, with 20-25kN actuator

INDEX

1
2
3
4
5
6
7
8
9
0

Body: two way form, for water and steam
Pressure range: PN16, PN25, PN40
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 400°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	20 kN / 218 VA (appendix ...i)
	25 kN / 218 VA (appendix ...k)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...i6/k6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced Kvs- values (on request)
Soft sealing for max. 200°C (on request)
Perforated plug (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

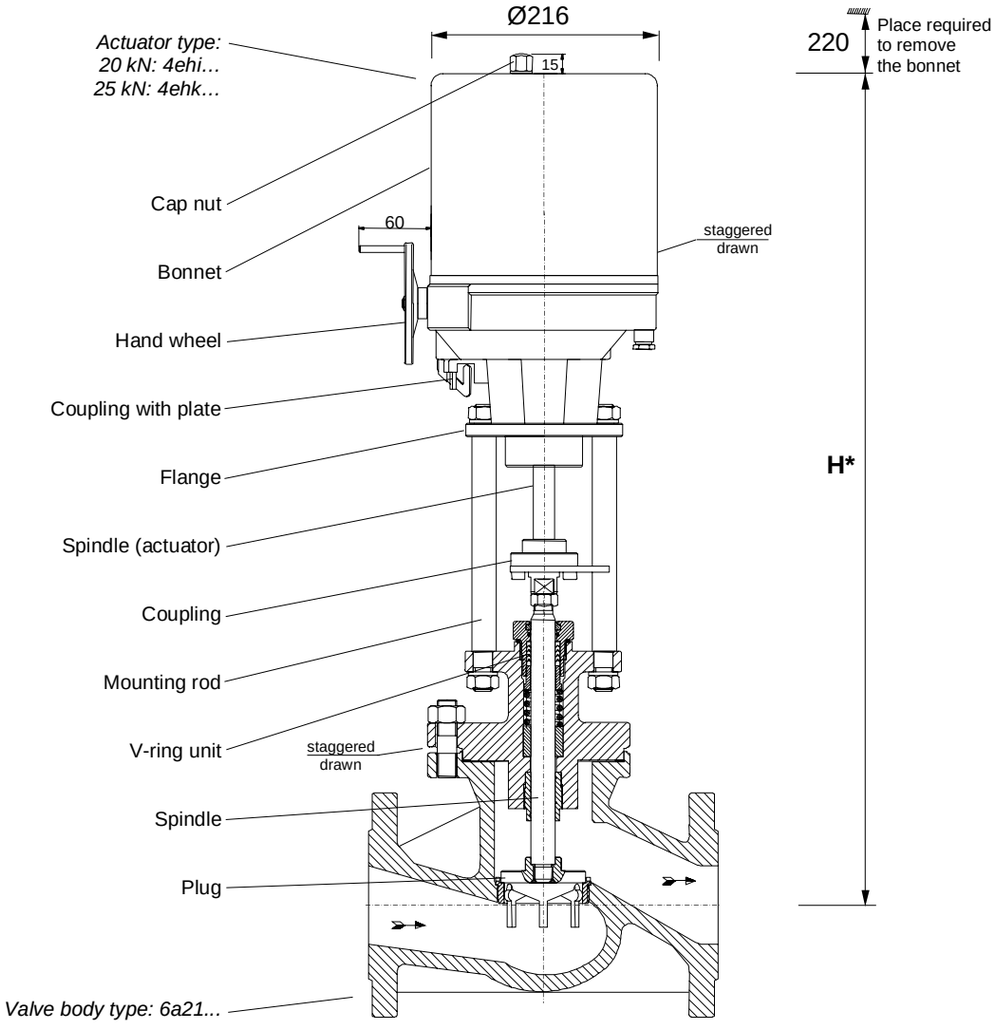
Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 421 **4** . . H ., PN25: 421 **5** . . H ., PN40: 421 **7** . . H .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-1/2:

by:		-10...50	100	150	200	250	300	350	400	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40	GP240GH+N	40	37,3	34,7	30,2	28,4	25,8	24	23,1	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

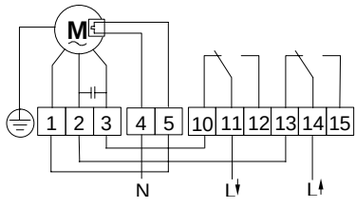
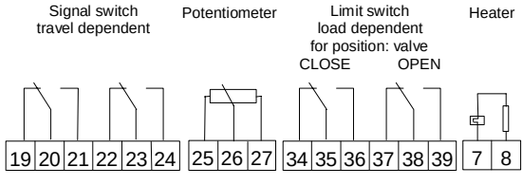
DN	List-No.			Kvs	Stroke	Pos. time	Closing pressure (bar)	
	PN16	PN25	PN40	m³/h	mm	sec	20kN	25kN
80	421 408H.	421 508H.	421 708H.	100	30	36	36,1	40,0
100	421 410H.	421 510H.	421 710H.	160	30	36	23,1	29,2
125	421 412H.	421 512H.		230	60	72	14,7	18,7
	421 412H._140a	421 512H._140a		140	35	42	23,1	29,2
	421 412H._100a	421 512H._100a		100	35	42	36,1	40,0
150	421 415H.	421 515H.		330	60	72	10,1	12,9
	421 415H._250a	421 515H._250a		250	50	60	14,7	18,7
	421 415H._150a	421 515H._150a		160	35	42	23,1	29,2



DN	80	100	125	150
Height H*	762	769	934	949
Length L	310	350	400	480
Weight kg	47	57	109	119

** = additional 40mm for version with positioner*

Electrical wiring *230 /115 /24 V 50/60 Hz*:**

Basic version:	*Accessories** (optionally):*
	

L on 11 = valve closes
L on 14 = valve opens

*** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in two way form with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16 / 25

Body: EN-GJS-400-18-LT (GGG-40.3), two way form
for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: with integrated manual emergency operation
and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
	20 kN / 206 W (appendix …i)
	25 kN / 206 W (appendix …k)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6/…i6/…k6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 630
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No. 421 . 20 H . , accessories . . .

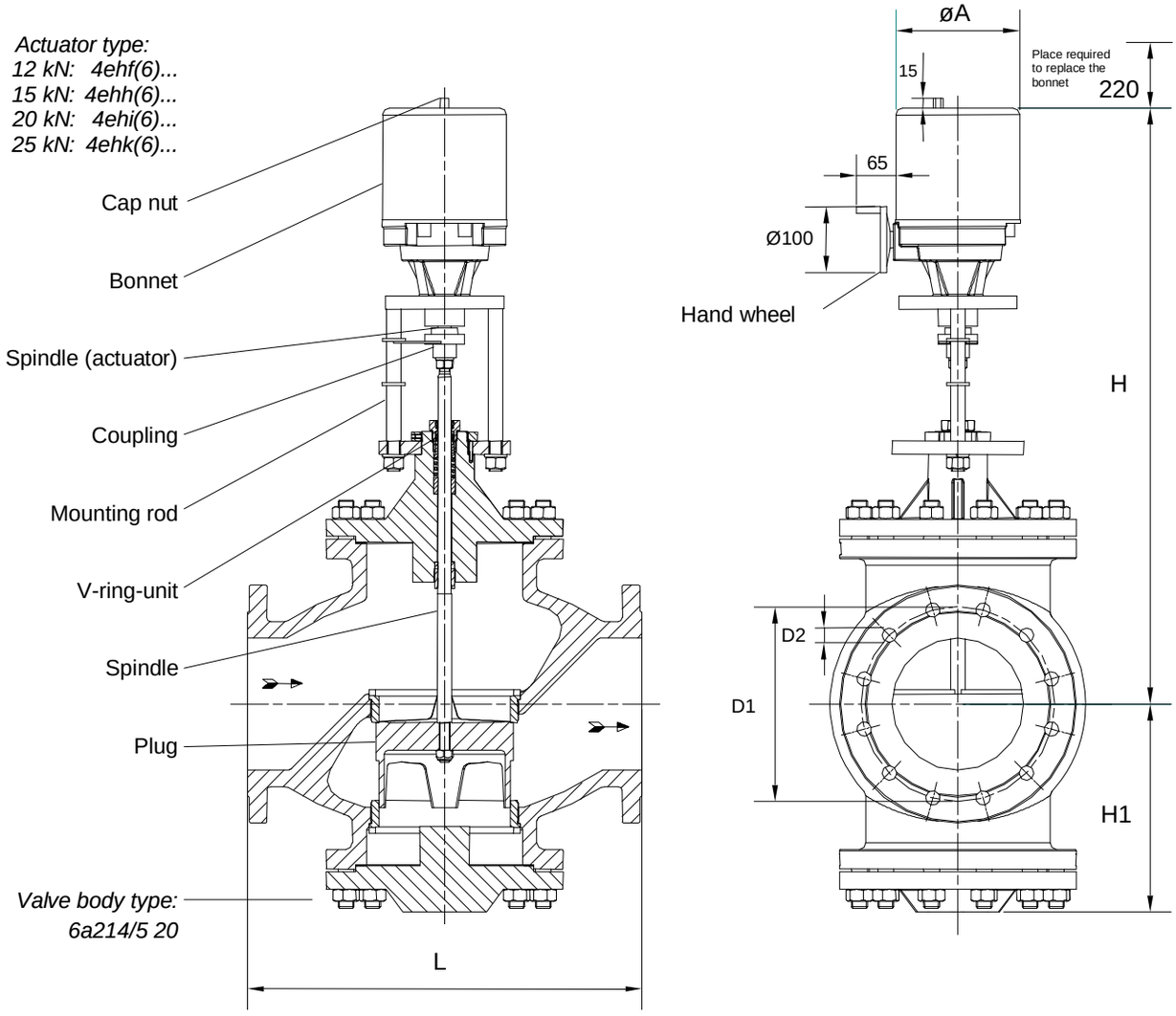
Pressure-Temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	List-No.		Kvs	Stroke	Pos. time	Closing pressure** (bar)			
	PN 16	PN 25	m³/h	mm	sec	12 kN	15kN	20kN	25kN
200	421 420Hf	421 520Hf	630	60	72	3,1			
200	421 420Hh	421 520Hh	630	60	90		4,0		
200	421 420Hi	421 520Hi	630	60	72			5,6	
200	421 420Hk	421 520Hk	630	60	72				7,1

** *higher closing pressures on request*



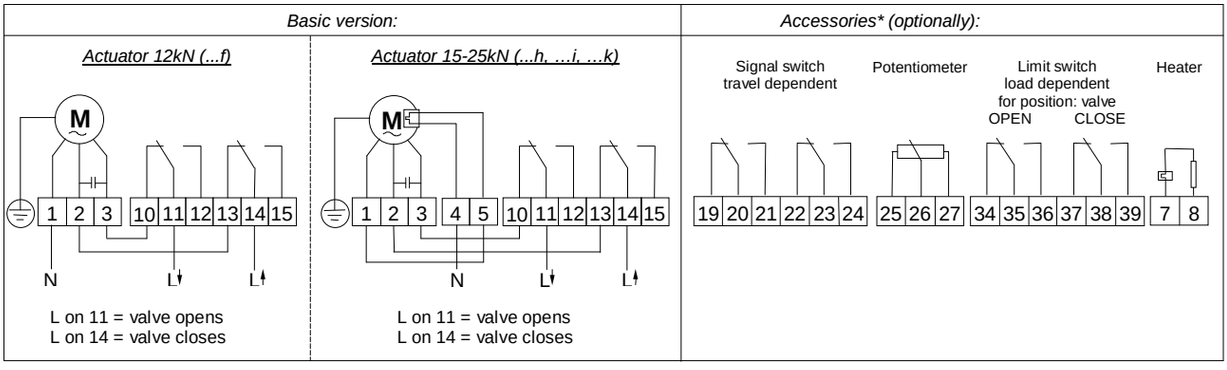
Dimensions

DN 200	12-15kN (...f/...h)	20-25kN (...i/...k)
Height H	905	980
Length H1	315	315
Length L	600	600
Weight kg	280	285
Diameter A	188	216

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

Electrical wiring *230 /115 /24 V 50/60 Hz*:*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in three way form with PTFE-V-ring sealing, DN15-150 EN-GJS-400-18-LT, PN 16 / 25

INDEX

1
2
3
4
5
6
7
8
9
0

Body: EN-GJS-400-18-LT three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 431 **4** . . , PN25: 431 **5** . .
Accessories: . . .

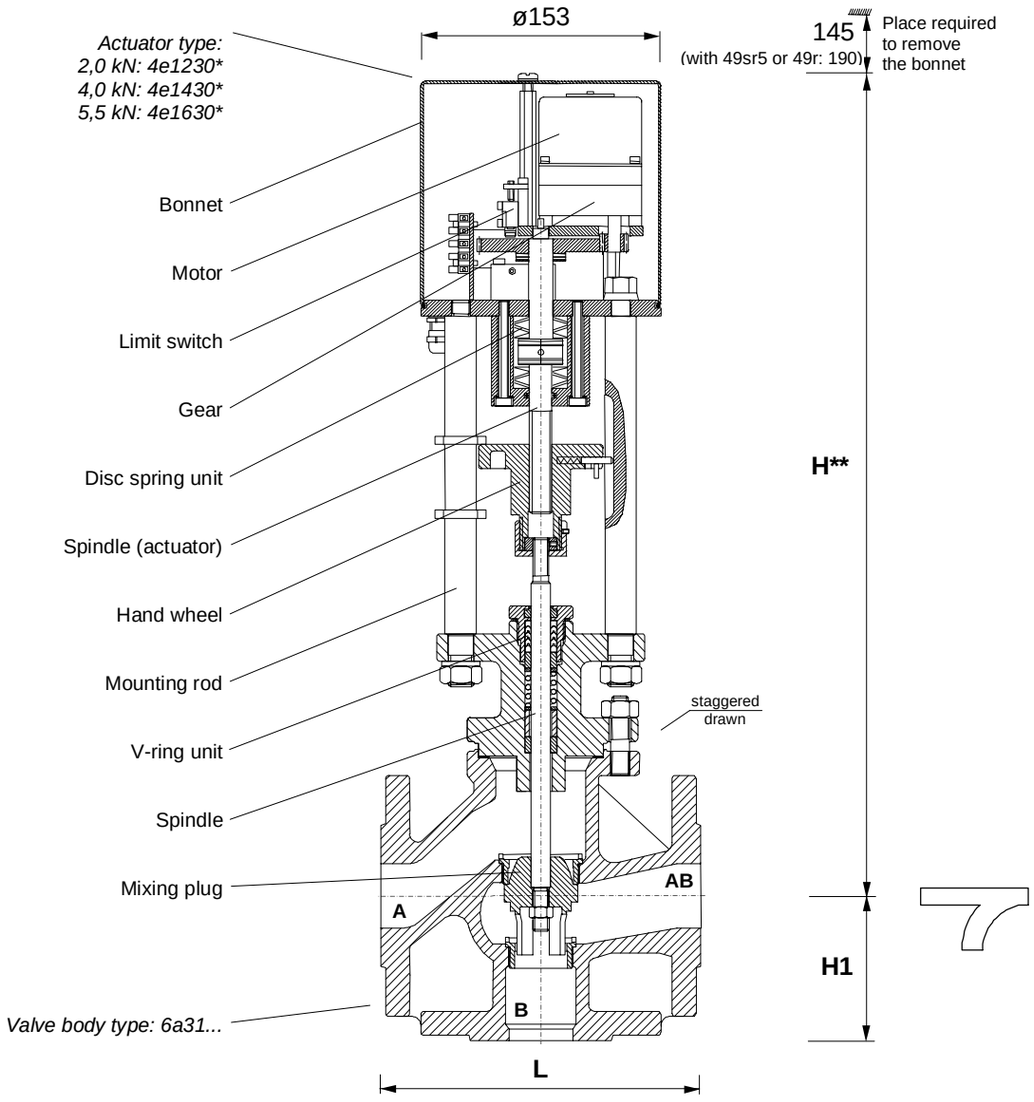
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN 16	PN 25	m³/h	mm	sec	2000N	4000N	5500N
15	431 400	431 500	4	20	66	25,0		
20	431 401	431 501	6,3	20	66	25,0		
25	431 402	431 502	10	20	66	25,0		
32	431 403.	431 503.	16	20	66	17,3	25,0	
40	431 404.	431 504.	25	20	66	10,8	25,0	
50	431 405.	431 505.	40	20	66	6,6	16,0	23,0
65	431 406.	431 506.	63	30	100	3,4	9,1	13,3
80	431 408.	431 508.	100	30	100	2,0	5,8	8,6
100	431 410.	431 510.	160	30	100	1,1	3,5	5,4
125	431 412.	431 512.	230	35	116		2,1	3,3
150	431 415.	431 515.	330	38	126		1,3	2,1

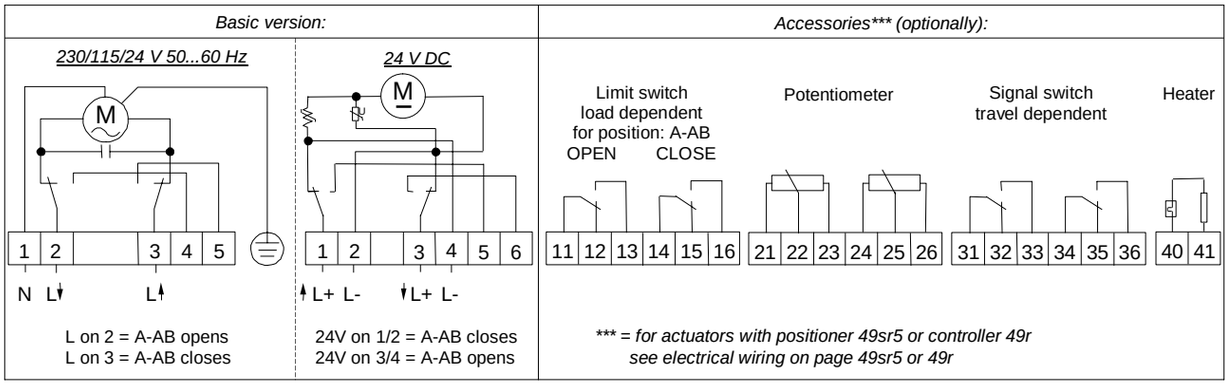
*** = higher closing pressures see page 4314/5He/f/h, DN200 see page 4314/520Hf/h, bigger DN on request*



DN	15	20	25	32	40	50	65	80	100	125	150
Height H**	491	505	499	506	511	513	556	557	564	720	735
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	15	16	17	20	21	24	40	45	58	113	134

** = only for DN 15-100; actuators for DN 125-150: 4e1435 (4kN) and 4e1635 (5,5kN)*
*** = add. 45mm for actuators with positioner 49sr5 or controller 49r*

Electrical wiring:



Motor control valve in three way form with PTFE-V-ring sealing, DN50-150 EN-GJS-400-18-LT, PN 16 / 25, with 8-15kN actuator

Body: EN-GJS-400-18-LT LT three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 8 kN / 34 VA (appendix ...e)
12 kN / 34 VA (appendix ...f)
15 kN / 50 VA (appendix ...h)
Power supply: 230V / 50Hz
Alternatively: 230V / 60Hz (appendix ...e6/f6/h6)
Special voltages: 115V 50/60Hz, 24V 50/60Hz
24V DC, 400V 3Ph. on request
Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 431 **4** . . H ., PN25: 431 **5** . . H .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

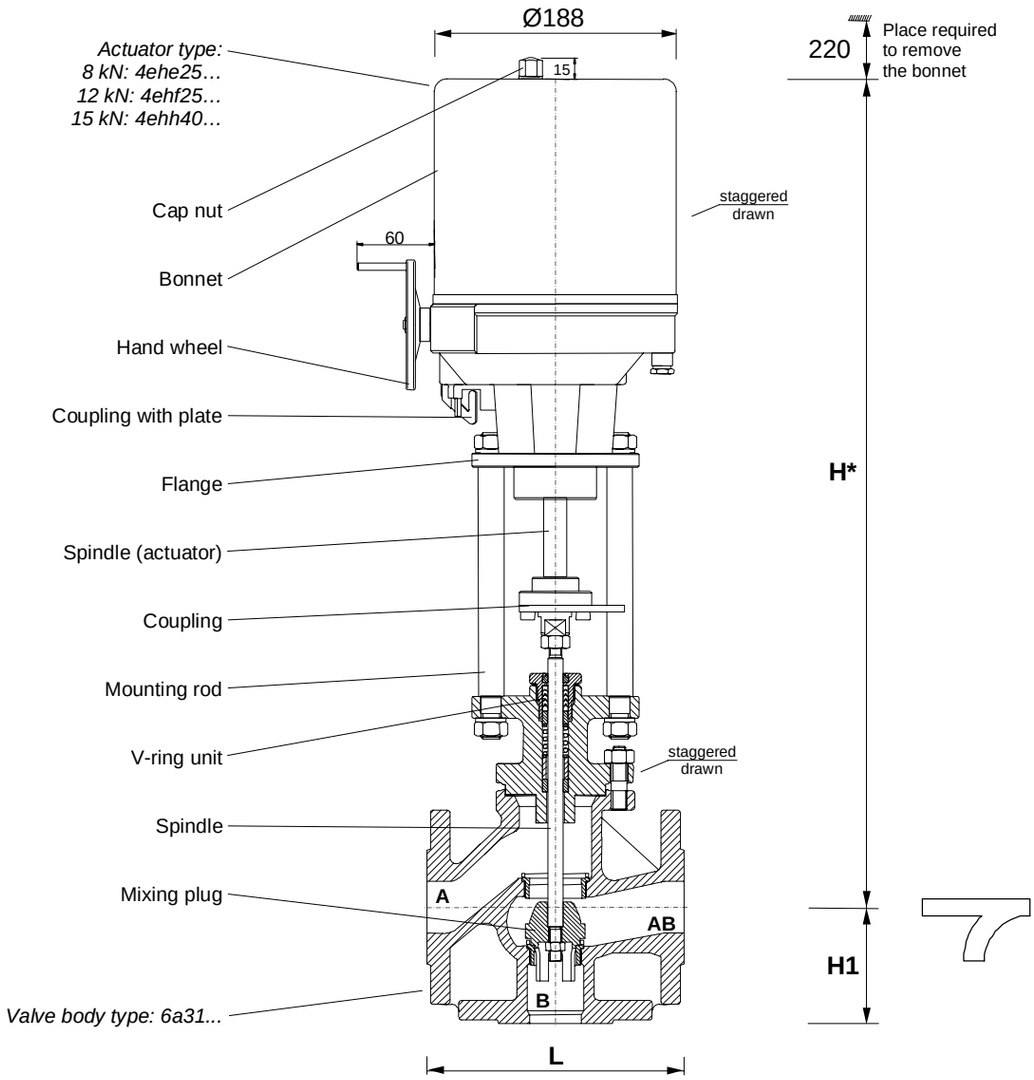
by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN 16	PN 25	m³/h	mm	sec	8kN	12kN	15kN
50	431 405He	431 505He	40	20	48	25,0		
65	431 406H.	431 506H.	63	30	72	20,4	25,0	
80	431 408H.	431 508H.	100	30	72	13,4	21,0	25,0
100	431 410H.	431 510H.	160	30	72	8,4	13,3	17,0
125	431 412H.	431 512H.	230	35	84	5,2	8,4	10,8
150	431 415H.	431 515H.	330	38	92	3,5	5,7	7,4

*** = DN200 see page 4314/520Hf/h, higher closing pressures and bigger DN on request*

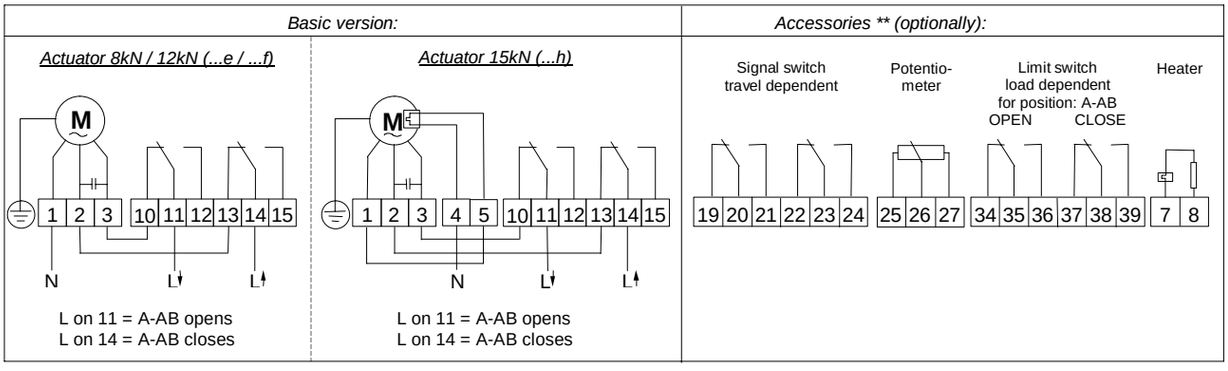
INDEX
1
2
3
4
5
6
7
8
9
0



DN	50	65	80	100	125	150
Height H*	708	751	752	760	861	876
Stud length H1	100	120	130	150	200	210
Length L	230	290	310	350	400	480
Weight kg	28	45	49	62	117	138

** = additional 20mm for 15kN actuator and 25mm for version with positioner*

Electrical wiring *230 /115 /24 V 50/60 Hz*:**



*** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in three way form with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16 / 25

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with mixing plug, for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: with integrated manual emergency operation and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 630
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No. 431 . . . H . , accessories . . .

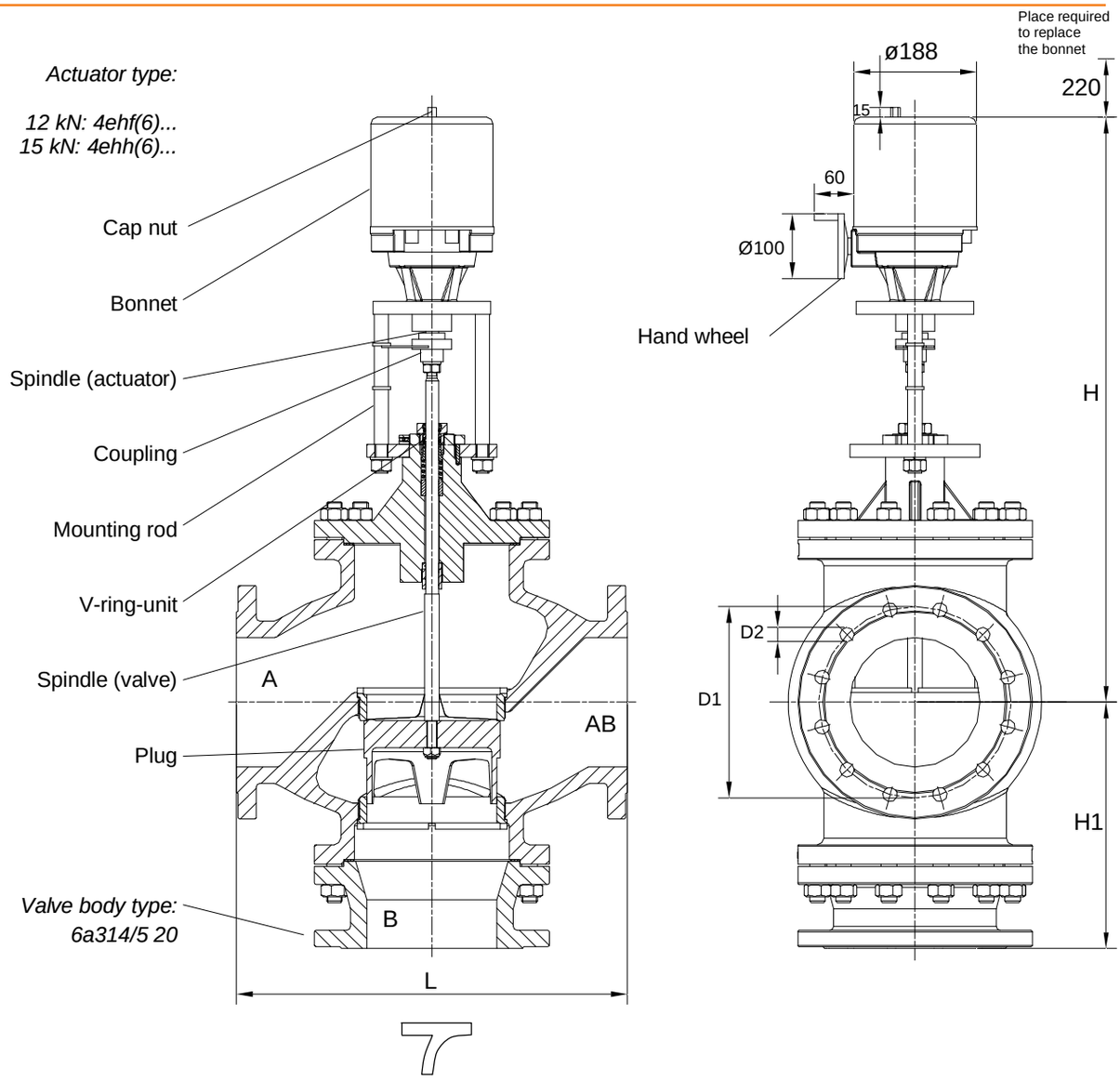
Pressure-Temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. time**	**Closing pressure*** (bar)	
	PN 16	PN 25	m³/h	mm	sec	12 kN	15kN
200	431 420Hf	431 520Hf	630	60	72	3,1	
200	431 420Hh	431 520Hh	630	60	90		4,0

** higher closing pressures on request*



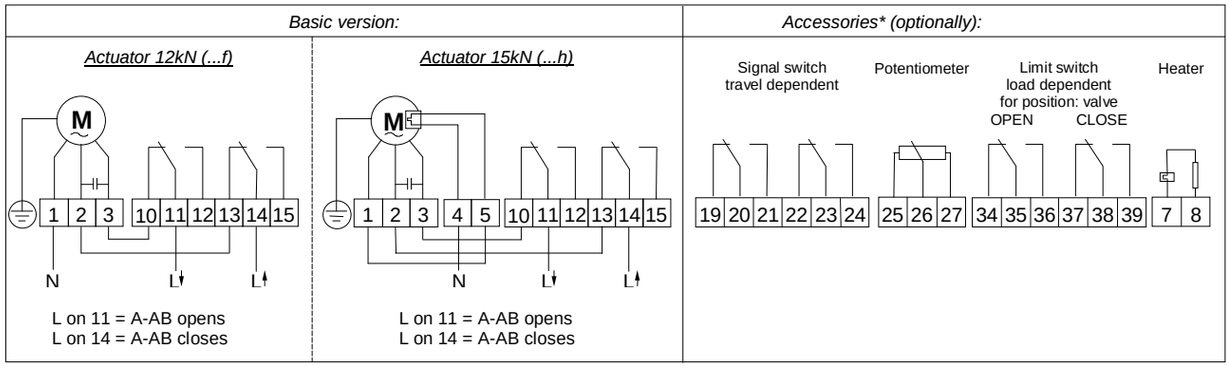
Dimensions

DN	200
Height H	905
Stud length H1	380
Length L	600
Weight kg	280

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

Electrical wiring *230 /115 /24 V 50/60 Hz*:*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Body: EN-GJS-400-18-LT three way form
Version with diverting plug, for water and steam
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with diverting plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 432 **4** . . , PN25: 432 **5** . .
Accessories: . . .

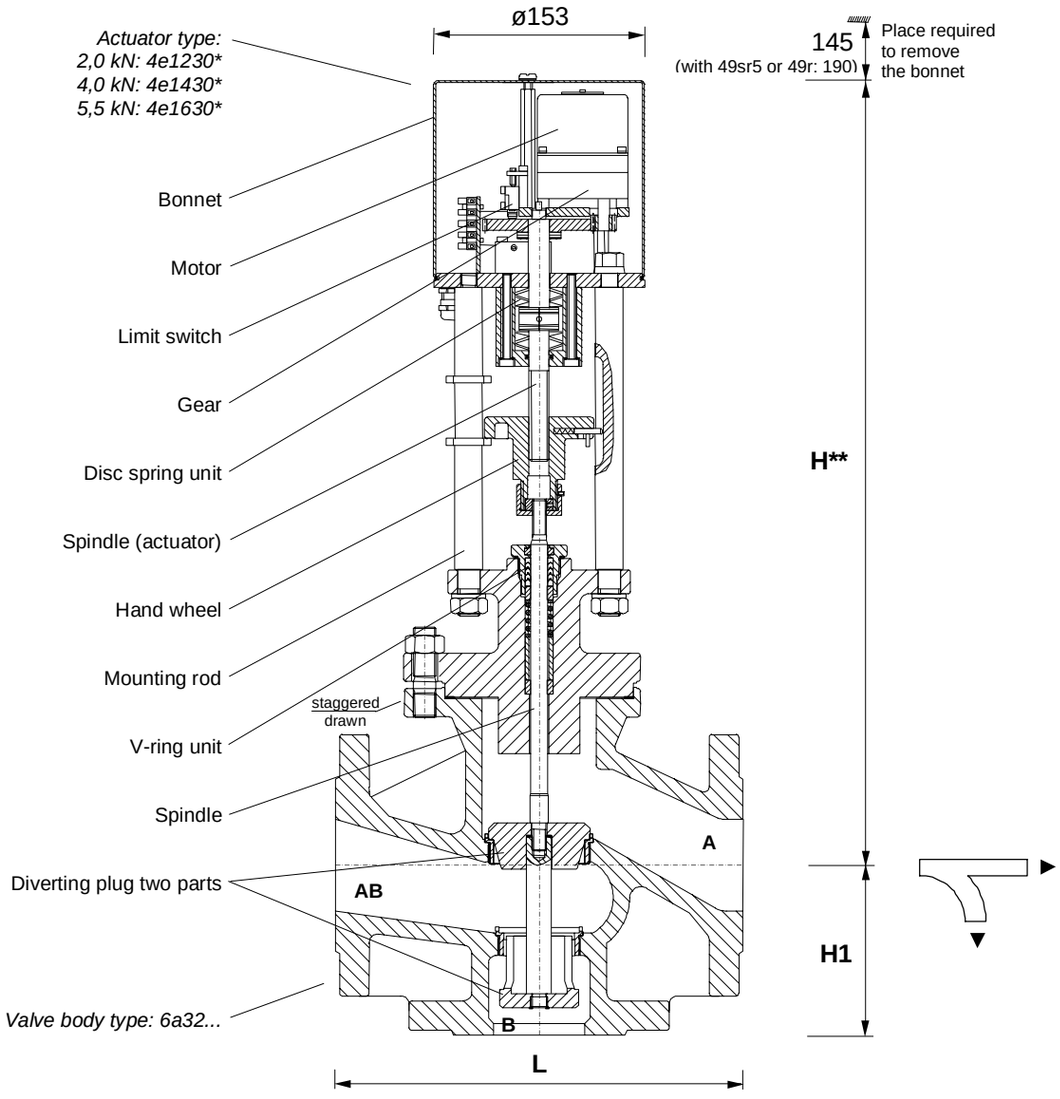
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN 16	PN 25	m³/h	mm	sec	2000N	4000N	5500N
32	432 403.	432 503.	12	20	66	17,3	25,0	
40	432 404.	432 504.	20	20	66	10,8	25,0	
50	432 405.	432 505.	27	20	66	6,6	16,0	23,0
65	432 406.	432 506.	50	30	99	3,4	9,1	13,3
80	432 408.	432 508.	83	30	99	2,0	5,8	8,6
100	432 410.	432 510.	123	30	99	1,1	3,5	5,4
125	432 412.	432 512.	190	35	116		3,5	5,4
150	432 415.	432 515.	250	35	116		2,3	3,6

*** = higher closing pressures see page 4324/5He/f/h, DN200 see page 4324/520Hf/h/i/k, bigger DN on request*



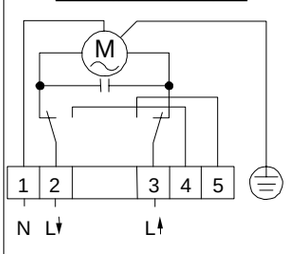
DN	32	40	50	65	80	100	125	150
Height H**	506	511	513	556	557	564	720	735
Stud length H1	80	90	100	120	130	150	200	210
Length L	180	200	230	290	310	350	400	480
Weight kg	20	21	24	39	43	56	112	133

** = only for DN 32-100; actuators for DN 125-150: 4e1435 (4kN) and 4e1635 (5,5kN)*
*** = add. 45mm for actuators with positioner 49sr5 or controller 49r*

Electrical wiring:

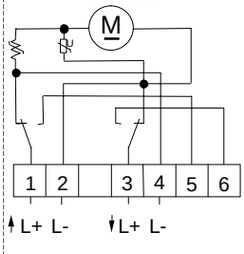
Basic version:

230/115/24 V 50...60 Hz



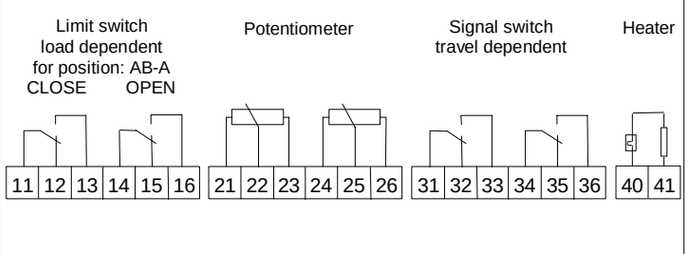
L on 2 = AB-A closes
L on 3 = AB-A opens

24 V DC



24V on 1/2 = AB-A opens
24V on 3/4 = AB-A closes

*Accessories*** (optionally):*



**** = for actuators with positioner 49sr5 or controller 49r*
see electrical wiring on page 49sr5 or 49r

Body: EN-GJS-400-18-LT three way form
Version with diverting plug, for water and steam
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 8 kN / 34 VA (appendix ...e)
12 kN / 34 VA (appendix ...f)
15 kN / 50 VA (appendix ...h)
Power supply: 230V / 50Hz
Alternatively: 230V / 60Hz (appendix ...e6/f6/h6)
Special voltages: 115V 50/60Hz, 24V 50/60Hz
24V DC, 400V 3Ph. on request
Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with diverting plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 432 **4** . . H ., PN25: 432 **5** . . H .
Accessories: . . .

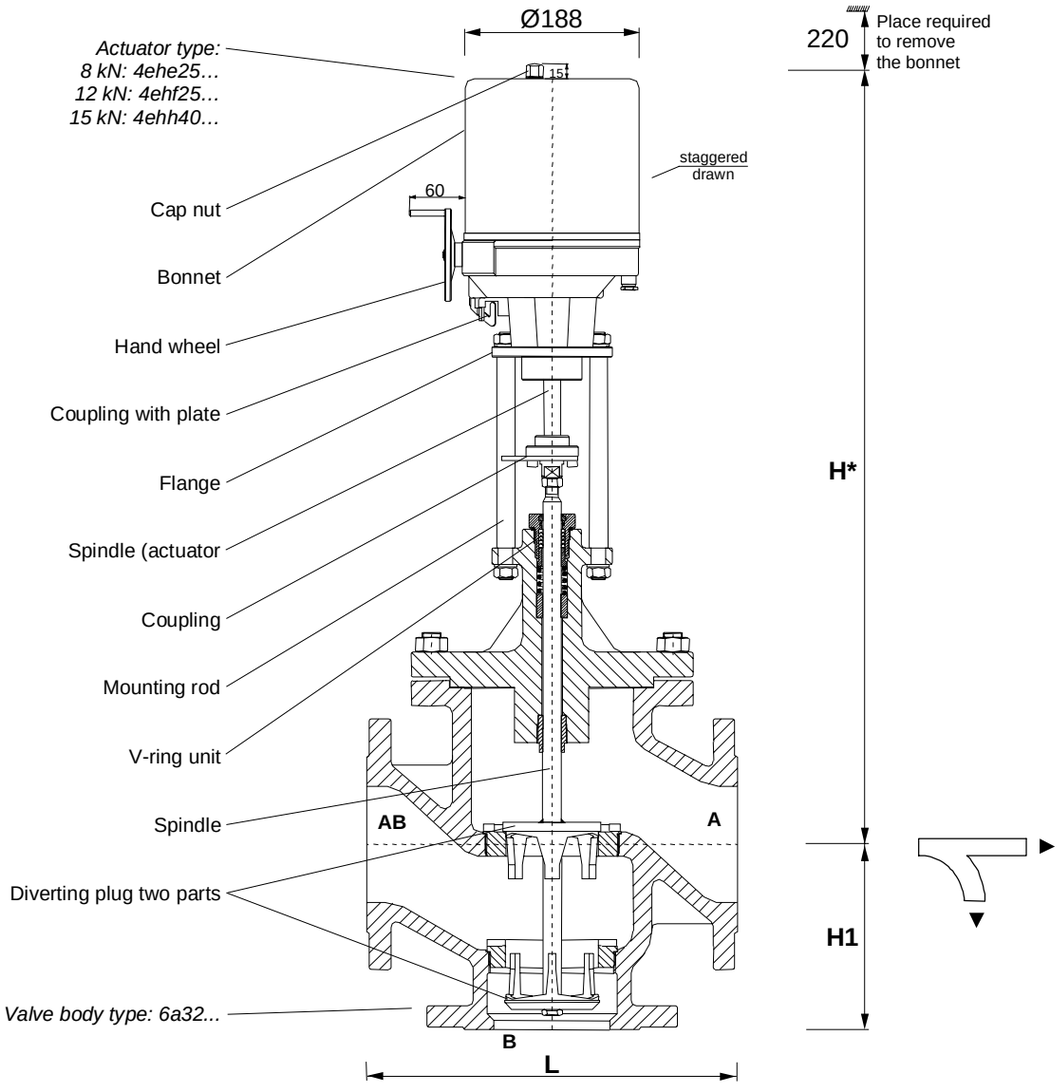
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)		
	PN 16	PN 25	m³/h	mm	sec	8kN	12kN	15kN
50	432 405He	432 505He	27	20	48	25,0		
65	432 406H.	432 506H.	50	30	72	20,4	25,0	
80	432 408H.	432 508H.	83	30	72	13,4	21,0	25,0
100	432 410H.	432 510H.	123	30	72	8,4	13,3	17,0
125	432 412H.	432 512H.	190	35	84	8,4	13,3	17,0
150	432 415H.	432 515H.	250	35	84	5,7	9,1	11,7

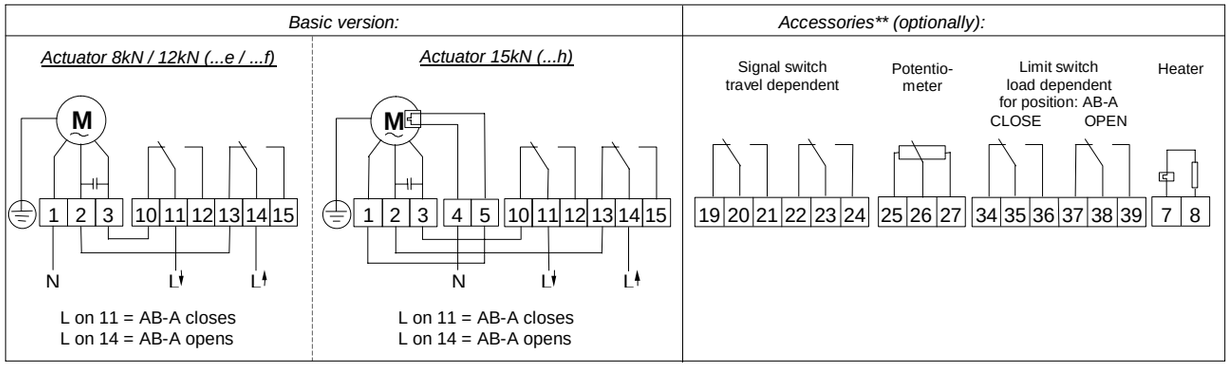
*** = DN200 see page 4324/520He/f/h/i/k, higher closing pressures and bigger DN on request*



DN	50	65	80	100	125	150
Height H*	708	751	752	760	861	876
Stud length H1	100	120	130	150	200	210
Length L	230	290	310	350	400	480
Weight kg	28	45	49	62	117	138

** = additional 20mm for 15kN actuator and 25mm for version with positioner*

Electrical wiring *230 /115 /24 V 50/60 Hz*:**



*** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve for diverting function with PTFE-V-ring sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16 / 25

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version with diverting plug, for water and steam
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: with integrated manual emergency operation and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
	20 kN / 206 W (appendix ...i)
	25 kN / 206 W (appendix …k)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6/…i6/…k6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with diverting plug
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN200, Kvs 470
Spindle sealing with PTFE-V-ring unit
Power supply . . ., closing pressure . . . bar
List-No. 432 . . . H . , accessories . . .

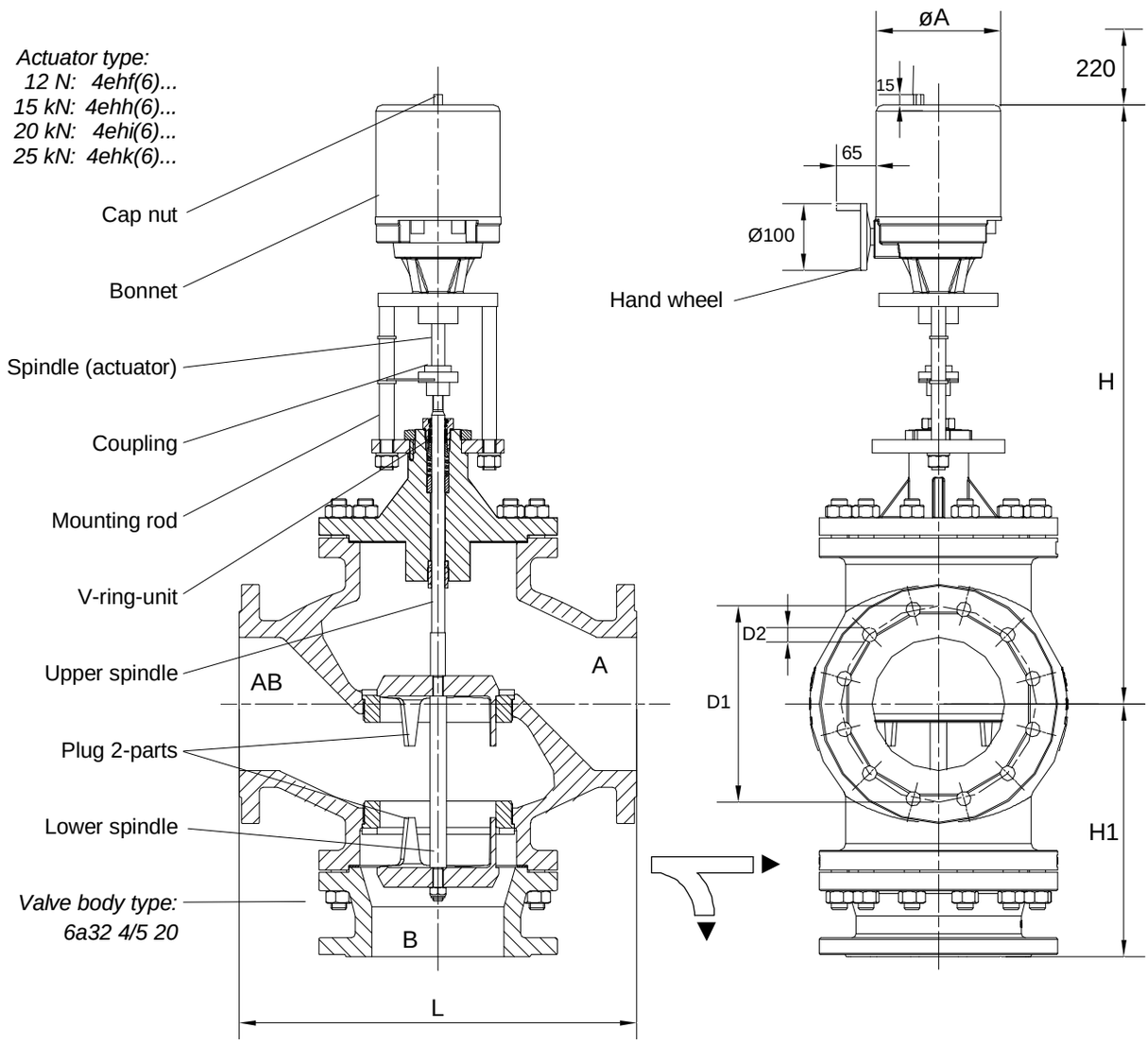
Pressure-Temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C*
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

* = max. 250°C for spindle sealing with PTFE-V-ring unit

DN	**List-No.**		**Kvs**	**Stroke**	**Pos. time**	**Closing pressure**** (bar)			
	PN 16	PN 25	m³/h	mm	sec	12 kN	15kN	20kN	25kN
200	432 420Hf	432 520Hf	470	50	60	4,1			
200	432 420Hh	432 520Hh	470	50	75		5,3		
200	432 420Hi	432 520Hi	470	50	60			7,4	
200	432 420Hk	432 520Hk	470	50	60				9,4

*** higher closing pressures on request*



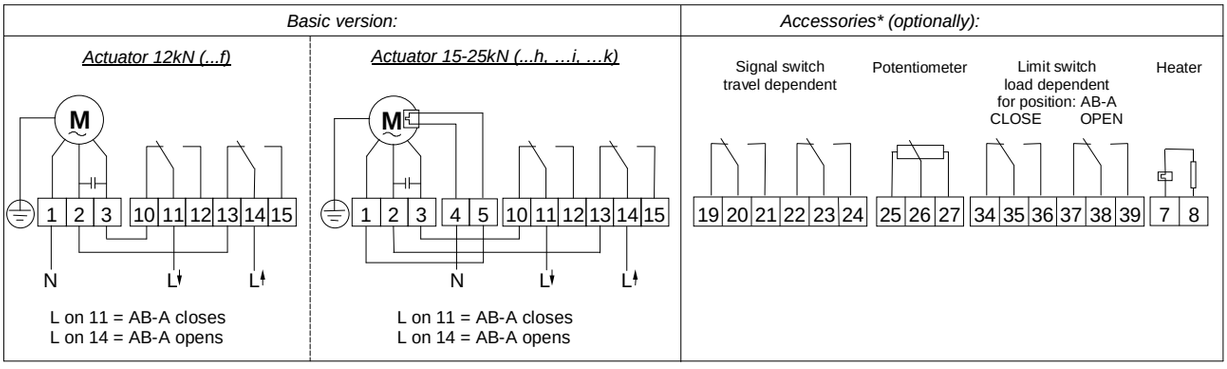
Dimensions

DN 200	12-15kN (...f/...h)	20-25kN (...i/...k)
Height H	905	980
Length H1	380	380
Length L	600	600
Weight kg	280	285
Diameter A	188	216

Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20
25	310	26	12	M24

Electrical wiring *230 /115 /24 V 50/60 Hz*:*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve in two way form with bellow sealing, DN15-150 PN 16 / 25 / 40(25)

Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 2000 N
Power input: 12 VA
Alternatively: 4000 N / 28 VA (appendix ...c)
5500 N / 28 VA (appendix ...d)
Power supply: 230V/50...60Hz
Optionally: 115V/50...60Hz, 24V/50...60Hz, 24VDC
Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 451 **4** . . , PN25: 451 **5** . . , PN40(25): 451 **6** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

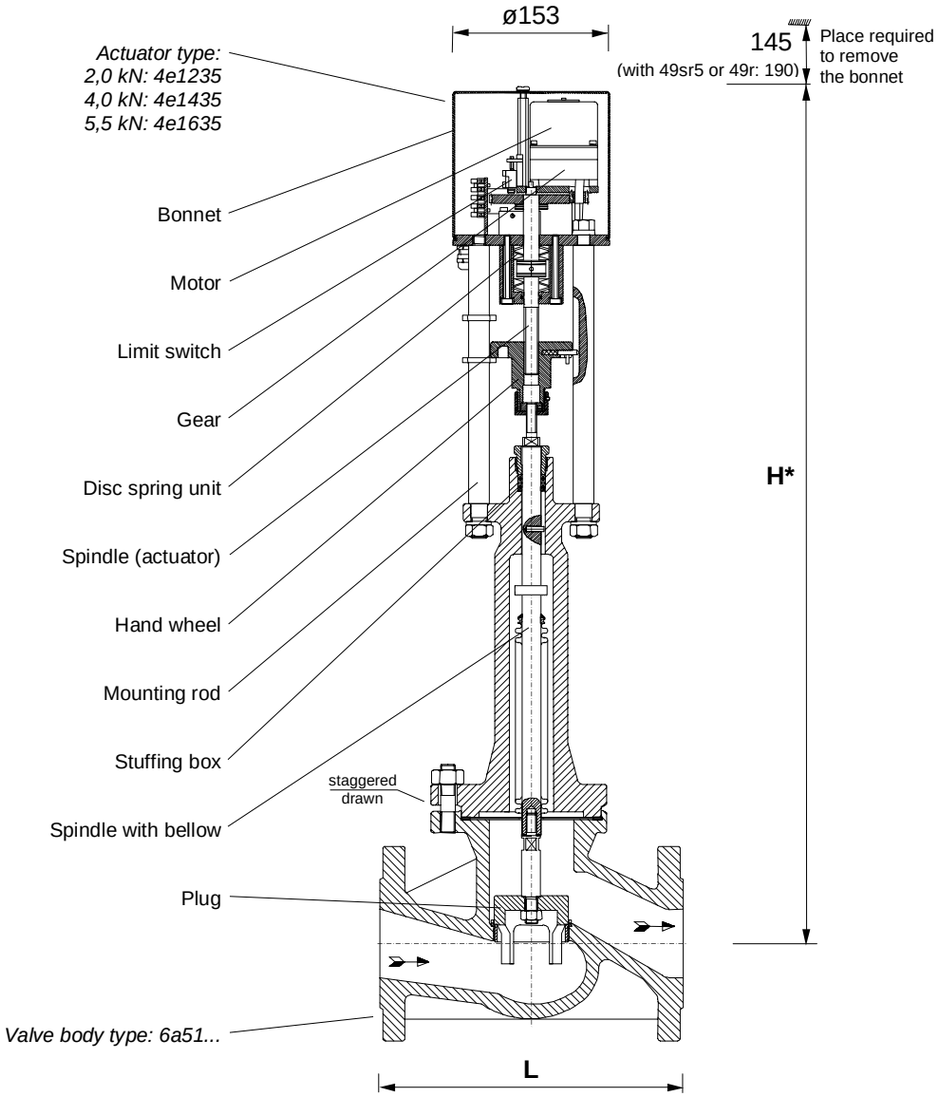
by:		-10...50	100	150	200	250	300	350	400	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40(25)*	GP240GH+N	25	25	25	25	25	25	24	21	bar

** = acc. to KFM norm*

DN	**List-No.** PN16	PN25	PN40(25)	**Kvs** m³/h	**Stroke** mm	**Pos. time** sec	**Closing pressure**** (bar) 2000N	4000N	5500
15	451 400	451 500	451 600	4,0	20	66	25,0		
20	451 401	451 501	451 601	6,3	20	66	25,0		
25	451 402	451 502	451 602	10	20	66	25,0		
32	451 403.	451 503.	451 603.	16	20	66	17,3	25,0	
40	451 404.	451 504.	451 604.	25	20	66	10,8	25,0	
50	451 405.	451 505.	451 605.	40	20	66	6,6	16,0	23,0
65	451 406.	451 506.	451 606.	63	30	99	3,4	9,1	13,3
80	451 408.	451 508.	451 608.	100	30	99	2,0	5,8	8,6
100	451 410.	451 510.	451 610.	160	30	99	1,1	3,5	5,4
125	451 412.	451 512.		230	40	132	0,5	2,1	3,3
150	451 415.			330	40	132		1,3	2,1

*** = higher closing pressures see page 451He/f/h, DN200: see page 451420Hf/h/i/k, DN>200 on request*

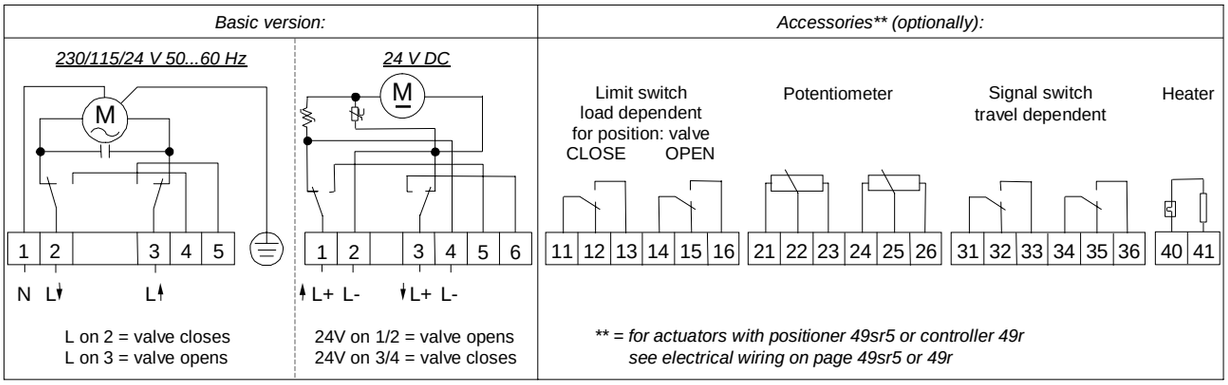
INDEX
1
2
3
4
5
6
7
8
9
0



DN	15	20	25	32	40	50	65	80	100	125	150
Height H*	661	675	669	676	681	683	813	814	821	924	940
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	17	18	19	20	22	24	43	47	57	104	124

** = add. 45mm for actuators with positioner 49sr5 or controller 49r*

Electrical wiring:



Motor control valve in two way form with bellow sealing, DN50-150 PN 16 / 25 / 40(25), with 8-15kN actuator

Body: two way form, for heat transfer oil
Pressure range: body PN16, PN25, PN40
bellow PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-1/2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches
Thrust: 8 kN / 34 VA (appendix ...e)
12 kN / 34 VA (appendix ...f)
15 kN / 50 VA (appendix ...h)
Power supply: 230V / 50Hz
Alternatively: 230V / 60Hz (appendix ...e6/f6/h6)
Special voltages: 115V 50/60Hz, 24V 50/60Hz
24V DC, 400V 3Ph. on request
Motor rating standard acc. to DIN EN 60034-1: S4-30%ED - 600c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other reduced kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
Material . . ., PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 451 **4** . . H ., PN25: 451 **5** . . H ., PN40(25): 451 **6** . . H .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

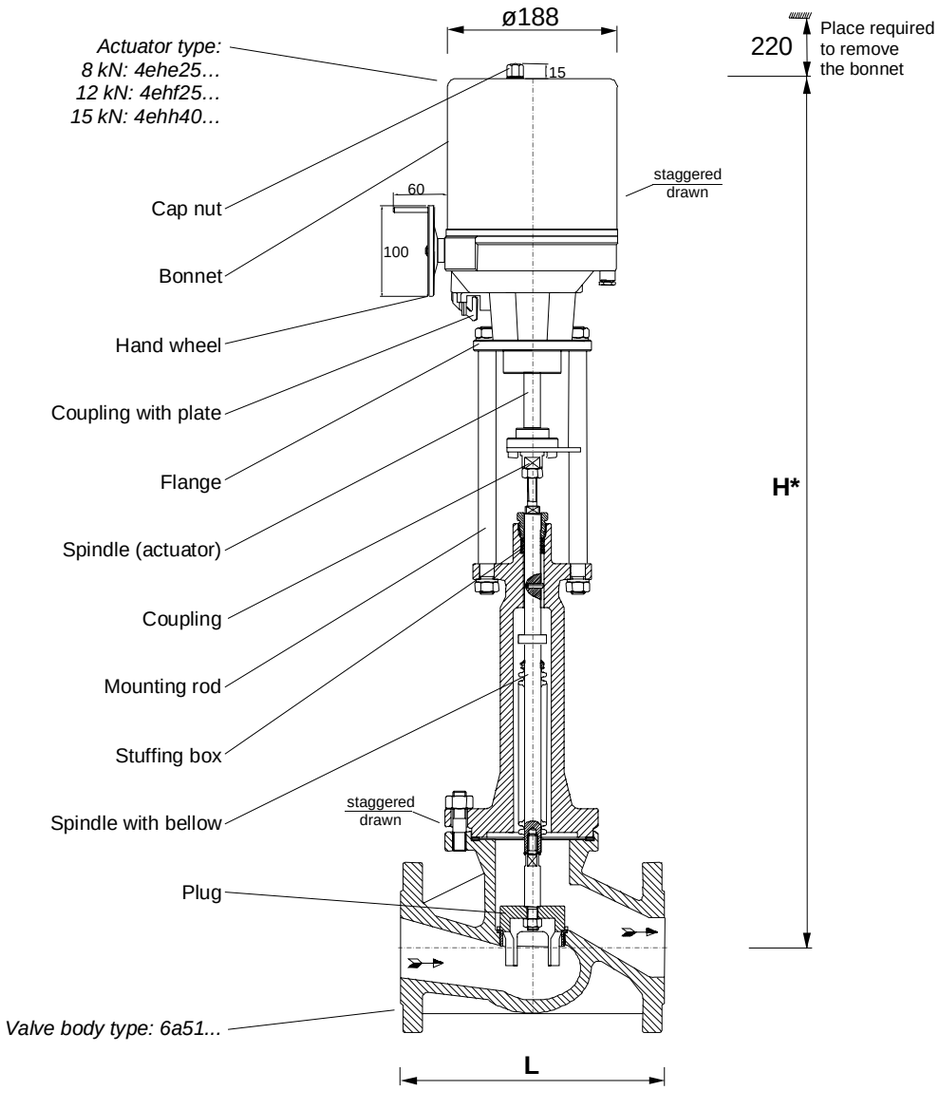
by:		-10...50	100	150	200	250	300	350	400	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	-	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	-	bar
PN40(25)*	GP240GH+N	25	25	25	25	25	25	24	21	bar

** = acc. to KFM norm*

DN	List-No. PN16	PN25	PN40(25)	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure** (bar) 8kN	12kN	15kN
50	451 405He	451 505He	451 605He	40	20	48	25,0		
65	451 406H.	451 506H.	451 606H.	63	30	72	20,4	25,0	
	451 456H.	451 556H.	451 656H.	40	20	48	25,0		
80	451 408H.	451 508H.	451 608H.	100	30	72	13,4	21,0	25,0
	451 458H.	451 558H.	451 658H.	63	20	48	20,4	25,0	
	451 478H.	451 578H.	451 678H.	40	20	48	25,0		
100	451 410H.	451 510H.	451 610H.	160	30	72	8,4	13,3	17,0
	451 460H.	451 560H.	451 660H.	100	30	72	20,4	25,0	
	451 480H.	451 580H.	451 680H.	63	22	53	20,4	25,0	
125	451 412H.	451 512H.		230	40	96	5,2	8,4	10,8
	451 412H._140a	451 512H._140a		140	30	72	8,4	13,3	17,0
	451 412H._100a	451 512H._100a		100	30	72	13,4	21,0	25,0
150	451 415H.			330	40	96	3,5	5,7	7,4
	451 415H._250a			250	40	96	5,2	8,4	10,8
	451 415H._150a			160	30	72	8,4	13,3	17,0

*** = higher closing pressures on request, DN200: see page 451420Hf/h/i/k, DN>200 on request*

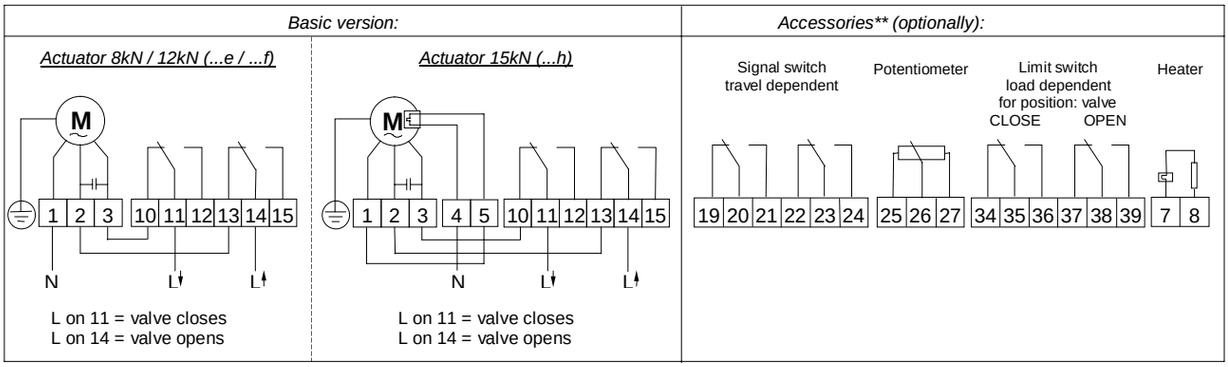
INDEX
1
2
3
4
5
6
7
8
9
0



DN	50	65	80	100	125	150
Height H*	793	923	924	931	1033	1048
Length L	230	290	310	350	400	480
Weight kg	22	39	46	56	103	123

** = additional 20mm for 15kN actuator and 25mm for version with positioner*

Electrical wiring *230 /115 /24 V 50/60 Hz*:**



*** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

INDEX

1 2 3 4 5 6 7 8 9 0

Body: EN-GJS-400-18-LT (GGG-40.3), two way form
for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: with integrated manual emergency operation
and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
	20 kN / 206 W (appendix …i)
	25 kN / 206 W (appendix …k)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6/…i6/…k6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in two way form
EN-GJS-400-18-LT (GGG-40.3), PN16, DN200, Kvs 630
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No. 451 420 H . , accessories . . .

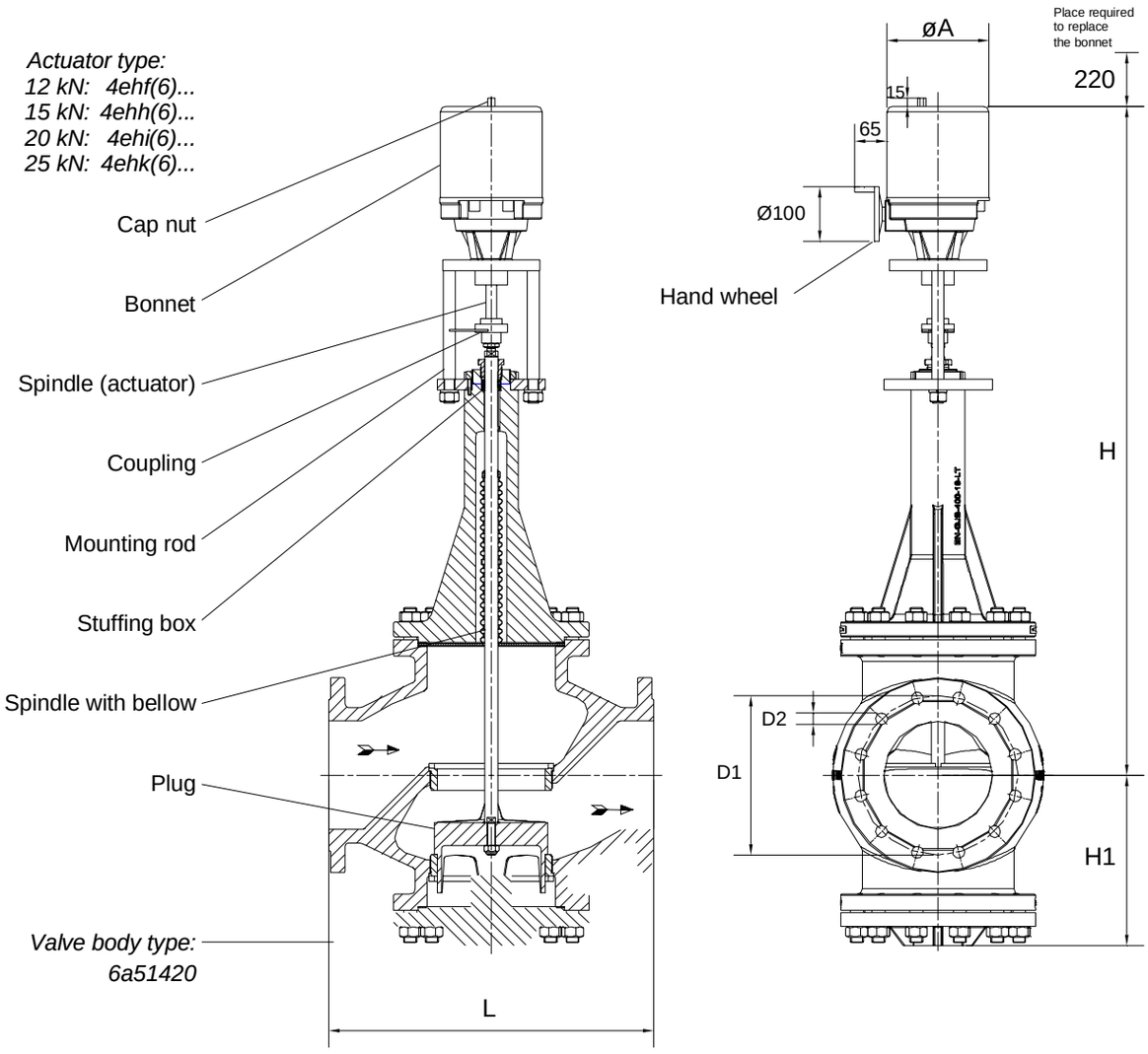
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	**List-No.** PN 16	**Kvs** m³/h	**Stroke** mm	**Pos. time** sec	**Closing pressure*** (bar) 12 kN	15kN	20kN	25kN
200	451 420Hf	630	60	72	3,1			
200	451 420Hh	630	60	90		4,0		
200	451 420Hi	630	60	72			5,6	
200	451 420Hk	630	60	72				7,1

** higher closing pressure on request*

open printversion



Dimensions

DN 200	12-15kN (...f/...h)	20-25kN (...i/...k)
Height H	1240	1315
Length H1	315	315
Length L	600	600
Weight kg	310	315
Diameter A	188	216

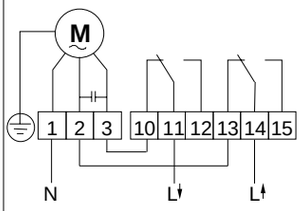
Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20

Electrical wiring *230 /115 /24 V 50/60 Hz*:*

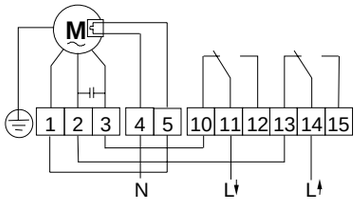
Basic version:

Actuator 12kN (...f)



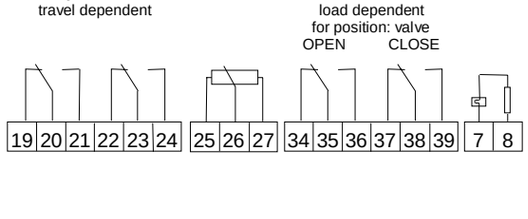
L on 11 = valve opens
L on 14 = valve closes

Actuator 15-25kN (...h, ...i, ...k)



L on 11 = valve opens
L on 14 = valve closes

Accessories (optionally):*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

open printversion

Motor control valve in three way form with bellow sealing, DN15-150 EN-GJS-400-18-LT, PN 16 / 25

Body: EN-GJS-400-18-LT three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 461 **4** . . , PN25: 461 **5** . .
Accessories: . . .

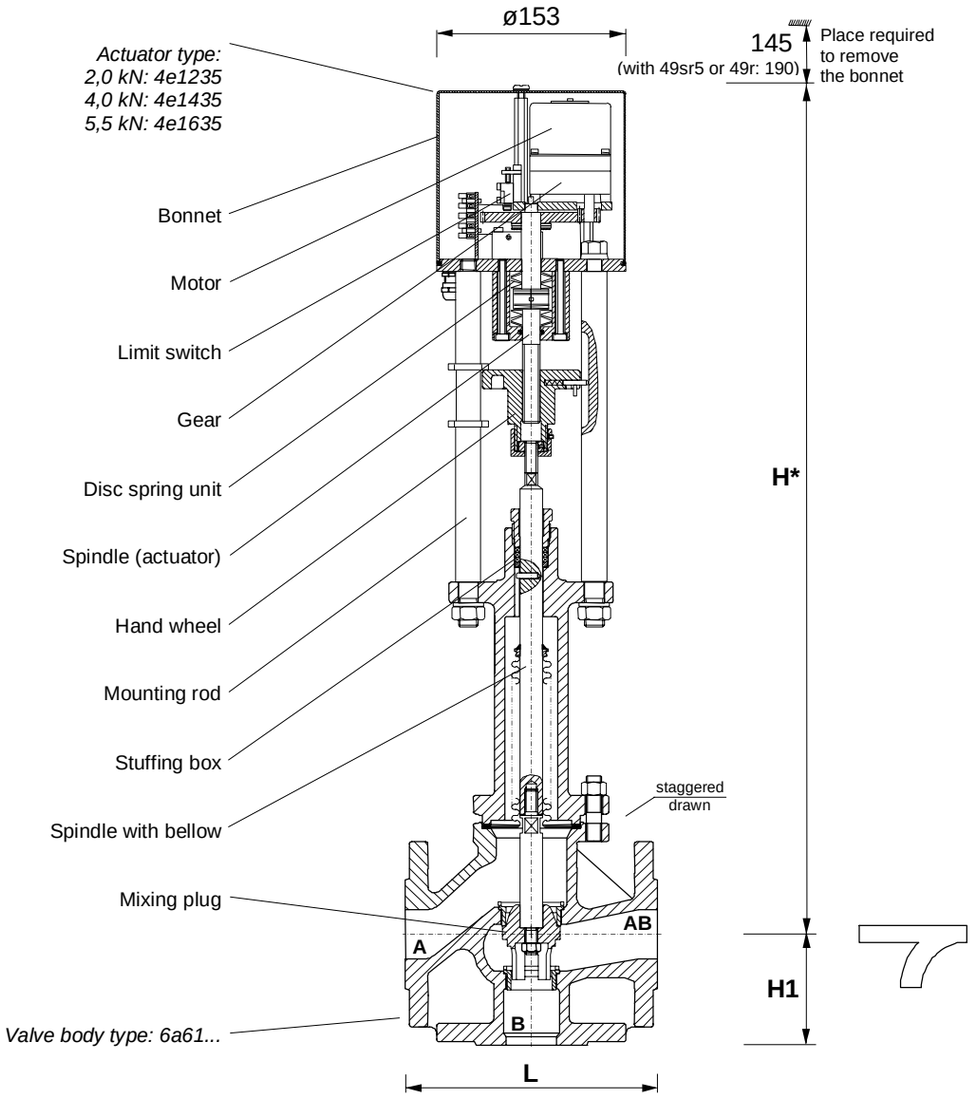
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

DN	List-No. PN 16	List-No. PN 25	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure* (bar) 2000N	4000N	5500N
15	461 400	461 500	4	20	66	25,0		
20	461 401	461 501	6,3	20	66	25,0		
25	461 402	461 502	10	20	66	25,0		
32	461 403.	461 503.	16	20	66	17,3	25,0	
40	461 404.	461 504.	25	20	66	10,8	25,0	
50	461 405.	461 505.	40	20	66	6,6	16,0	23,0
65	461 406.	461 506.	63	30	99	3,4	9,1	13,3
80	461 408.	461 508.	100	30	99	2,0	5,8	8,6
100	461 410.	461 510.	160	30	99	1,1	3,5	5,4
125	461 412.	461 512.	230	35	116		2,1	3,3
150	461 415.		330	38	126		1,3	2,1

** = higher closing pressures on request, DN200: see page 461420Hf/h/i/k, DN>200 on request*

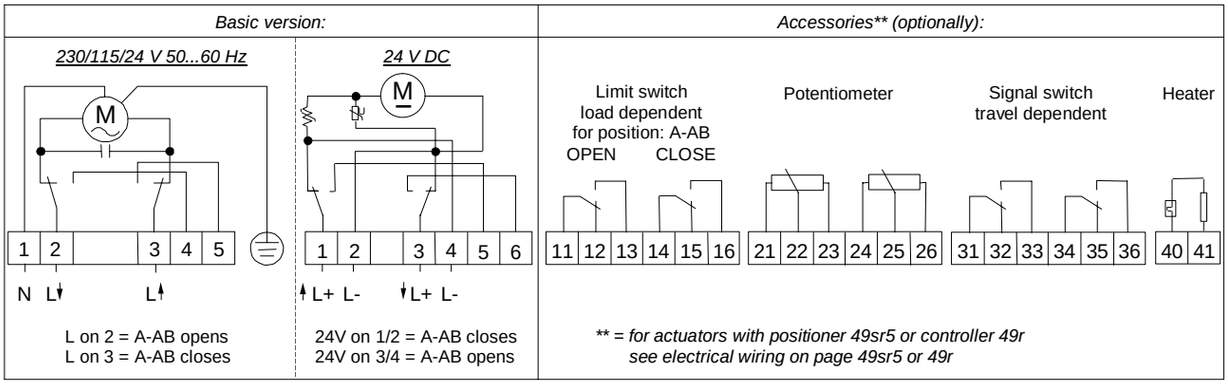
Motor control valve in three way form with bellow sealing, DN15-150 EN-GJS-400-18-LT, PN 16 / 25



DN	15	20	25	32	40	50	65	80	100	125	150
Height H*	661	675	669	676	681	683	813	814	821	924	940
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	16	17	18	21	22	25	44	48	62	116	137

** = add. 45mm for actuators with positioner 49sr5 or controller 49r*

Electrical wiring:



INDEX
1
2
3
4
5
6
7
8
9
0

Motor control valve in three way form with bellow sealing, type with weld-on ends EN-GJS-400-18-LT, PN 16 / 25, DN15-150

Body: EN-GJS-400-18-LT three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Valve body special type:
Weld-on ends similar to DIN EN 12627
(On request with welded pipe section)

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)

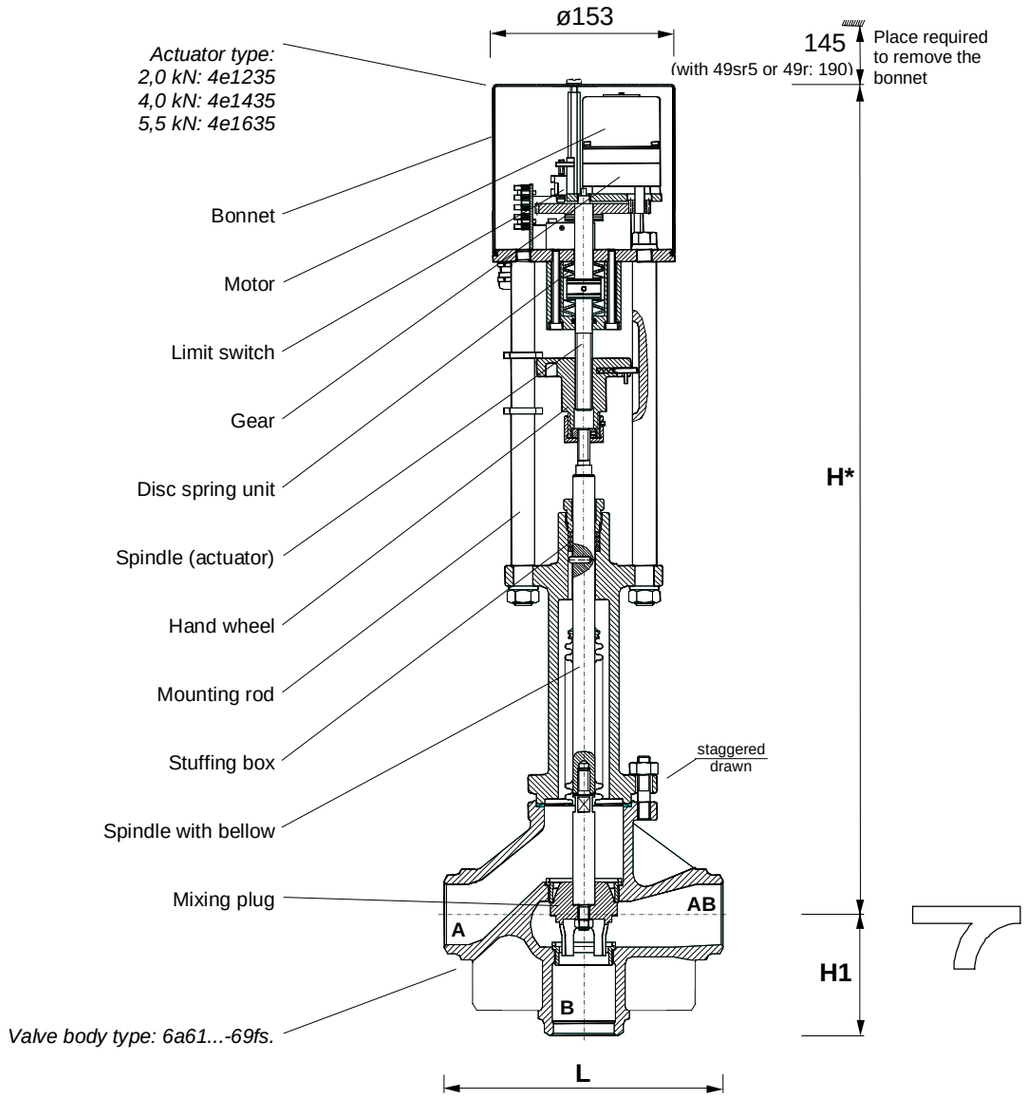
Order text:
Motor control valve in three way form, with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Type with weld-on ends
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 461 **4** . . -69fs ., PN25: 461 **5** . . -69fs .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

DN	List-No. PN 16	List-No. PN 25	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure* (bar) 2000N	4000N	5500N
15	461 400-69fsa	461 500-69fsa	4	20	66	25,0		
20	461 401-69fsa	461 501-69fsa	6,3	20	66	25,0		
25	461 402-69fsa	461 502-69fsa	10	20	66	25,0		
32	461 403.-69fsa	461 503.-69fsa	16	20	66	17,3	25,0	
40	461 404.-69fsa	461 504.-69fsa	25	20	66	10,8	25,0	
50	461 405.-69fsb	461 505.-69fsb	40	20	66	6,6	16,0	23,0
65	461 406.-69fsb	461 506.-69fsb	63	30	99	3,4	9,1	13,3
80	461 408.-69fsb	461 508.-69fsb	100	30	99	2,0	5,8	8,6
100	461 410.-69fsb	461 510.-69fsb	160	30	99	1,1	3,5	5,4
125	461 412.-69fsc	461 512.-69fsc	230	35	116		2,1	3,3
150	461 415.-69fsc		330	38	126		1,3	2,1

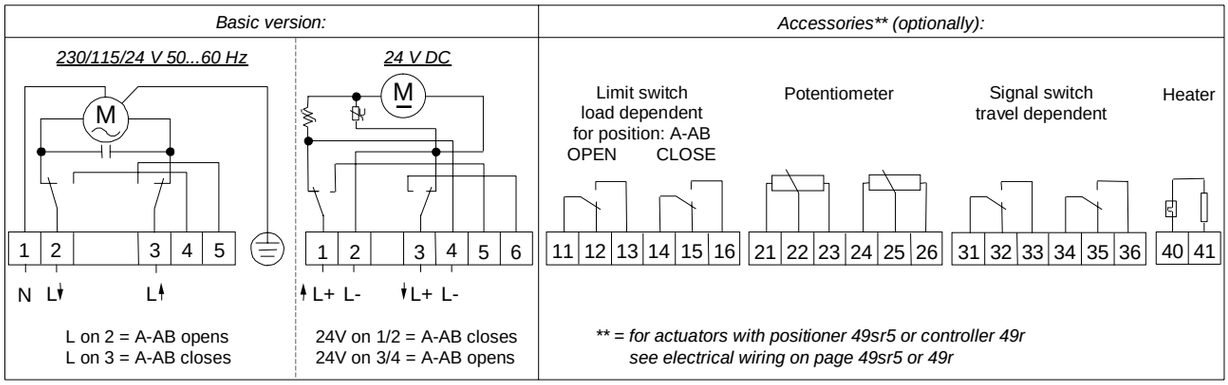
** = higher closing pressures and bigger DN on request*



DN	15	20	25	32	40	50	65	80	100	125	150
Height H*	661	675	669	676	681	683	813	814	821	924	940
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Weight kg	15	16	17	20	21	24	42	46	60	113	134

** = add. 45mm for actuators with positioner 49sr5 or controller 49r*

Electrical wiring:



INDEX
1
2
3
4
5
6
7
8
9
0

Motor control valve in three way form with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with mixing plug, for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: with integrated manual emergency operation
and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with mixing plug
EN-GJS-400-18-LT (GGG-40.3), PN16, DN200, Kvs 630
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No. 461 420H . , accessories . . .

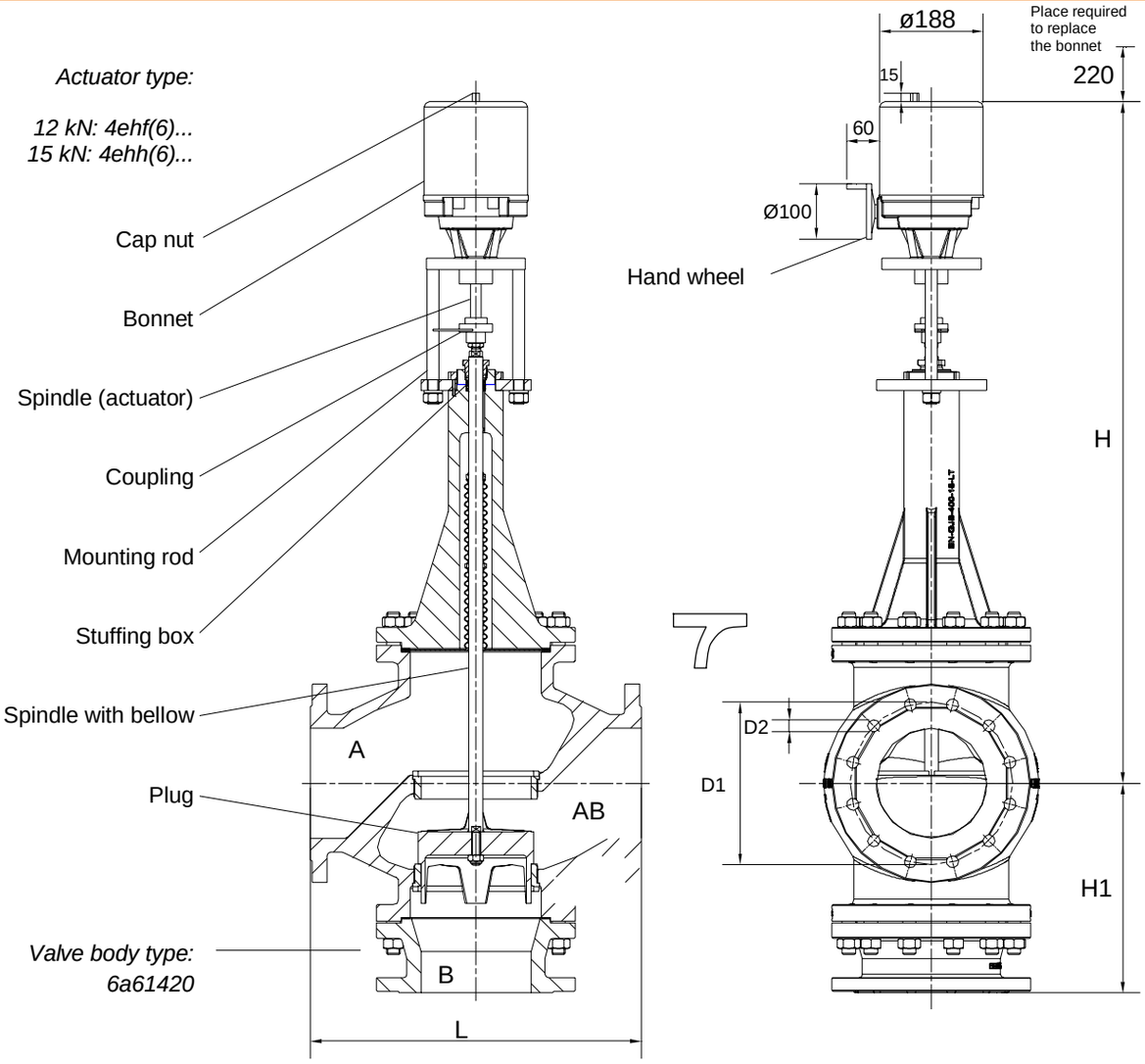
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	List-No. PN 16	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure* (bar) 12 kN	15kN
200	461 420Hf	630	60	72	3,1	
200	461 420Hh	630	60	90		4,0

** higher closing pressure on request*

open printversion



Dimensions

DN	200
Height H	1240
Stud length H1	380
Length L	600
Weight kg	325

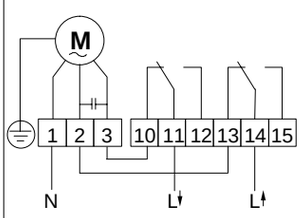
Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20

Electrical wiring *230 /115 /24 V 50/60 Hz:**

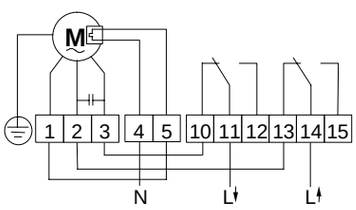
Basic version:

Actuator 12kN (...f)



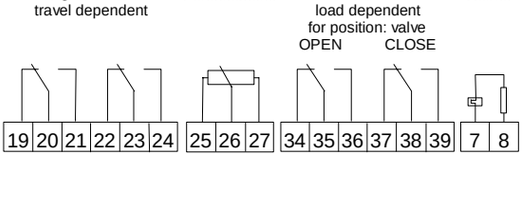
L on 11 = A-AB opens
L on 14 = A-AB closes

Actuator 15kN (...h)



L on 11 = A-AB opens
L on 14 = A-AB closes

Accessories (optionally):*



open printversion

** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

Motor control valve for diverting function three way form with bellow sealing, DN32-150 EN-GJS-400-18-LT, PN 16 / 25

Body: EN-GJS-400-18-LT three way form
Version with diverting plug, for heat transfer oil
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
	5500 N / 28 VA (appendix ...d)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

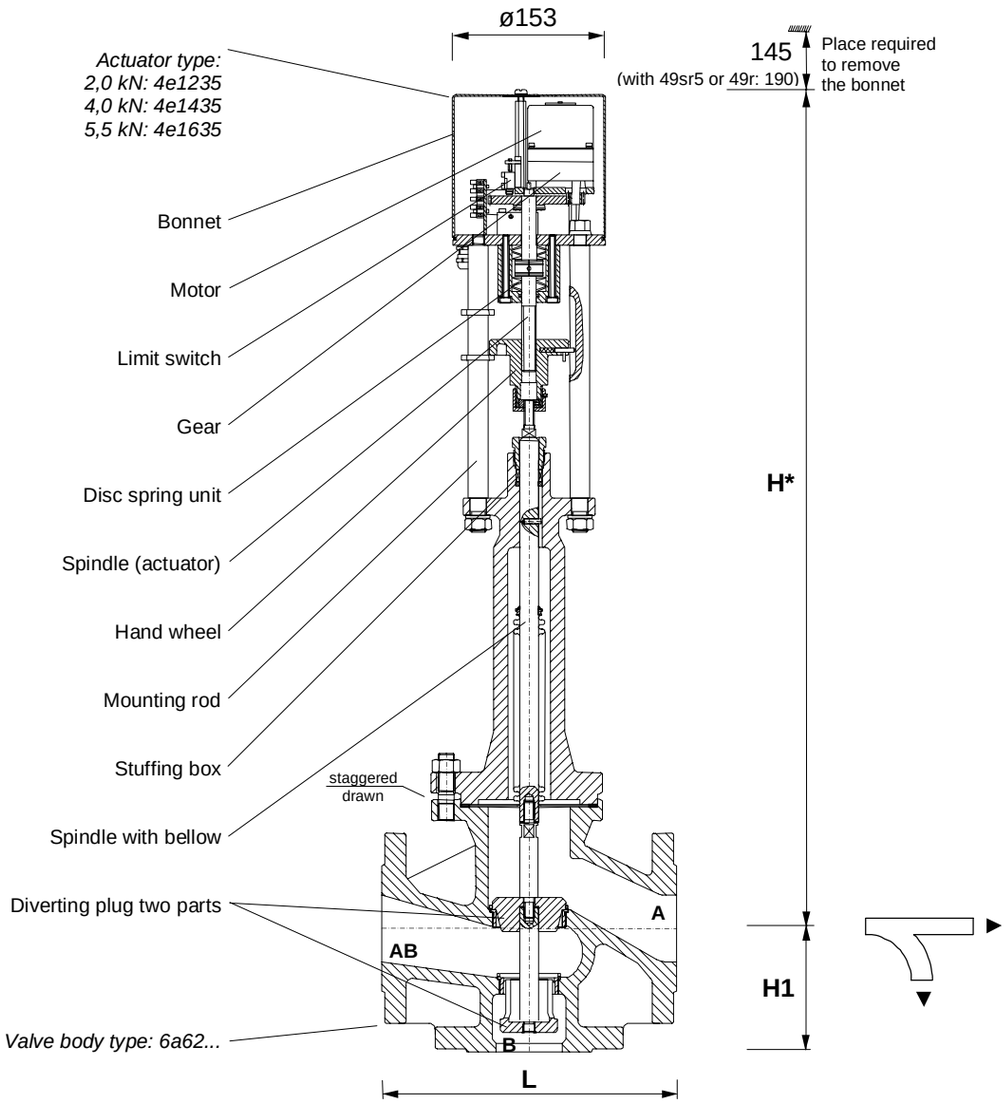
Order text:
Motor control valve in three way form, with diverting plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No.: PN16: 462 **4** . . , PN25: 462 **5** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

DN	List-No.		Kvs	Stroke	Pos. time	Closing pressure* (bar)		
	PN 16	PN 25	m³/h	mm	sec	2000N	4000N	5500N
32	462 403.	462 503.	12	20	66	17,3	25,0	
40	462 404.	462 504.	20	20	66	10,8	25,0	
50	462 405.	462 505.	27	20	66	6,6	16,0	23,0
65	462 406.	462 506.	50	30	99	3,4	9,1	13,3
80	462 408.	462 508.	83	30	99	2,0	5,8	8,6
100	462 410.	462 510.	123	30	99	1,1	3,5	5,4
125	462 412.	462 512.	190	35	116		3,5	5,4
150	462 415.		250	35	116		2,3	3,6

** = higher closing pressures see page 4624/5He/f/h, DN200: see page 462420Hf/h/i/k, DN>200 on request*



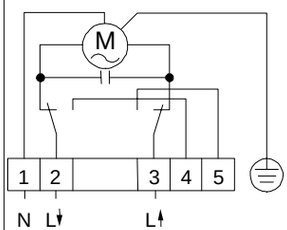
DN	32	40	50	65	80	100	125	150
Height H*	676	681	683	813	814	821	924	940
Stud length H1	80	90	100	120	130	150	200	210
Length L	180	200	230	290	310	350	400	480
Weight kg	22	23	26	43	47	59	115	135

** = add. 45mm for actuators with positioner 49sr5 or controller 49r*

Electrical wiring:

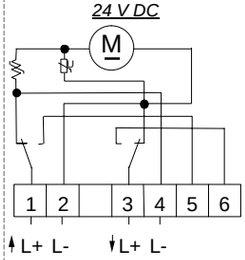
Basic version:

230/115/24 V 50...60 Hz



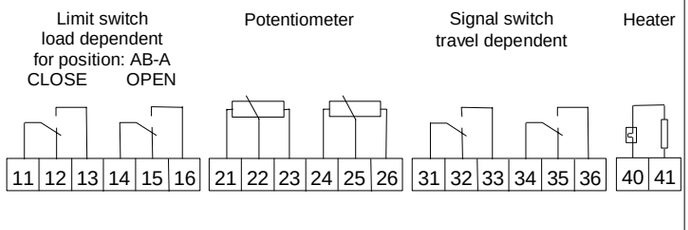
L on 2 = AB-A closes
L on 3 = AB-A opens

24 V DC



24V on 1/2 = AB-A opens
24V on 3/4 = AB-A closes

*Accessories** (optionally):*



*** = for actuators with positioner 49sr5 or controller 49r see electrical wiring on page 49sr5 or 49r*

Motor control valve for diverting function with bellow sealing, DN200 EN-GJS-400-18-LT (GGG-40.3), PN 16

Body: EN-GJS-400-18-LT (GGG-40.3), three way form
Version: with diverting plug, for heat transfer oil
Pressure range: PN 16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: four wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: 30:1
Leakage: < 0,01% Kvs

Actuator: with integrated manual emergency operation
and load dependent limit switches

Thrust:	12 kN / 152 W (appendix ...f)
	15 kN / 152 W (appendix ...h)
	20 kN / 206 W (appendix …i)
	25 kN / 206 W (appendix …k)
Power supply:	230V / 50Hz
Alternatively:	230V / 60Hz (appendix ...f6/...h6/…i6/…k6)
Other voltages:	115V 50/60Hz, 24V 50/60Hz,
	24V DC, 400V 3Ph. on request

Motor rating standard acc. to DIN EN 60034-1: S4 – 30% – 600 c/h
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent
Add. signal switches travel dependent
Feedback potentiometer
Integrated positioner
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Other kvs - values (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Motor control valve in three way form, with diverting plug
EN-GJS-400-18-LT (GGG-40.3), PN16, DN200, Kvs 470
Spindle sealing with bellow
Power supply . . ., closing pressure . . . bar
List-No. 462 420H . , accessories . . .

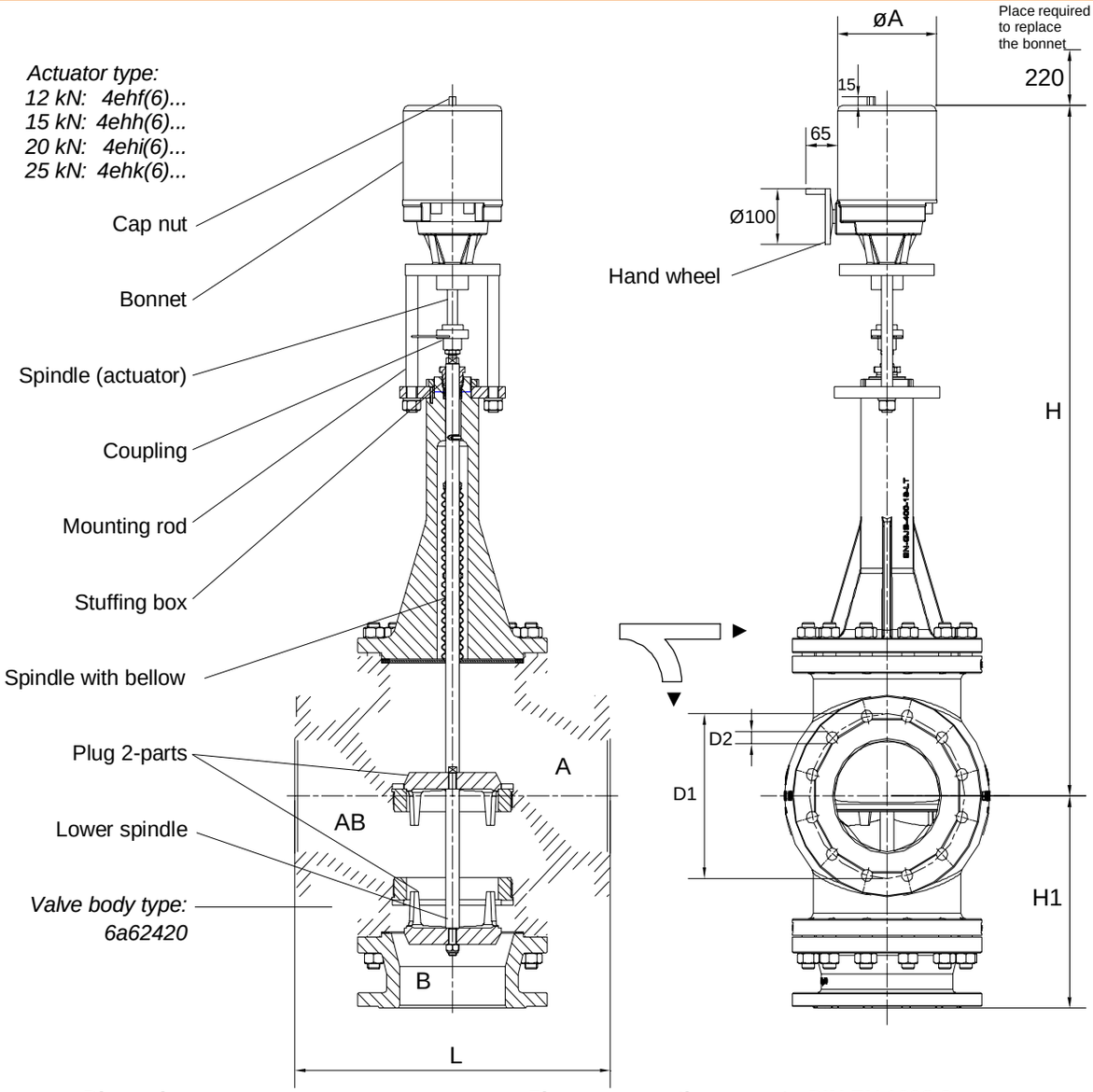
Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10…120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	List-No. PN 16	Kvs m³/h	Stroke mm	Pos. time sec	Closing pressure* (bar) 12 kN	15kN	20kN	25kN
200	462 420Hf	470	50	60	4,1			
200	462 420Hh	470	50	75		5,3		
200	462 420Hi	470	50	60			7,4	
200	462 420Hk	470	50	60				9,4

open printversion

** higher closing pressure on request*



Dimensions

DN 200	12-15kN (...f/...h)	20-25kN (...i/...k)
Height H	1240	1315
Length H1	380	380
Length L	600	600
Weight kg	325	330
Diameter A	188	216

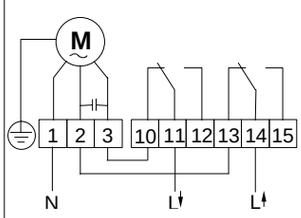
Flange connections acc. to DIN EN 1092-2

PN	D1	D2	Quantity of screws	Thread
16	295	22	12	M20

Electrical wiring *230 /115 /24 V 50/60 Hz*:*

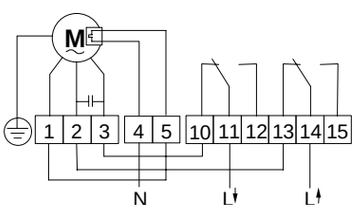
Basic version:

Actuator 12kN (...f)



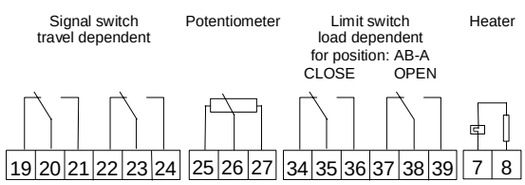
L on 11 = AB-A closes
L on 14 = AB-A opens

Actuator 15-25kN (...h, …i, …k)



L on 11 = AB-A closes
L on 14 = AB-A opens

Accessories (optionally):*



** = for other voltages / accessories see wiring diagrams in operating instruction 4eh80_b.*

INDEX
1 2 3 4 5 6 7 8 9 0

Motor control valve in two or three way form with internal thread connectors Bronze CC491K (Rg5), PN 16, DN1/2”-2”

Body: Bronze CC491K (Rg5)
for water 0...130°C
Internal thread connectors: acc. to DIN
including cap nut and connecting part
of galvanized malleable cast iron
optionally of bronze

Pressure range:	PN16
Spindle sealing:	EPDM-O-ring
Plug:	brass CW614N
Spindle:	stainless steel 1.4122
Flow characteristic:	A-AB equal percentage
	B-AB linear
Positioning ratio:	DN15: 50:1
	DN20-50: 100:1

Leakage: EN1349 – seat leakage VI G 1 (tight sealing)

Actuator: with manual emergency operation
and load dependent limit switches

Thrust:	2000 N
Power input:	12 VA
Alternatively:	4000 N / 28 VA (appendix ...c)
Power supply:	230V/50...60Hz
Optionally:	115V/50...60Hz, 24V/50...60Hz, 24VDC

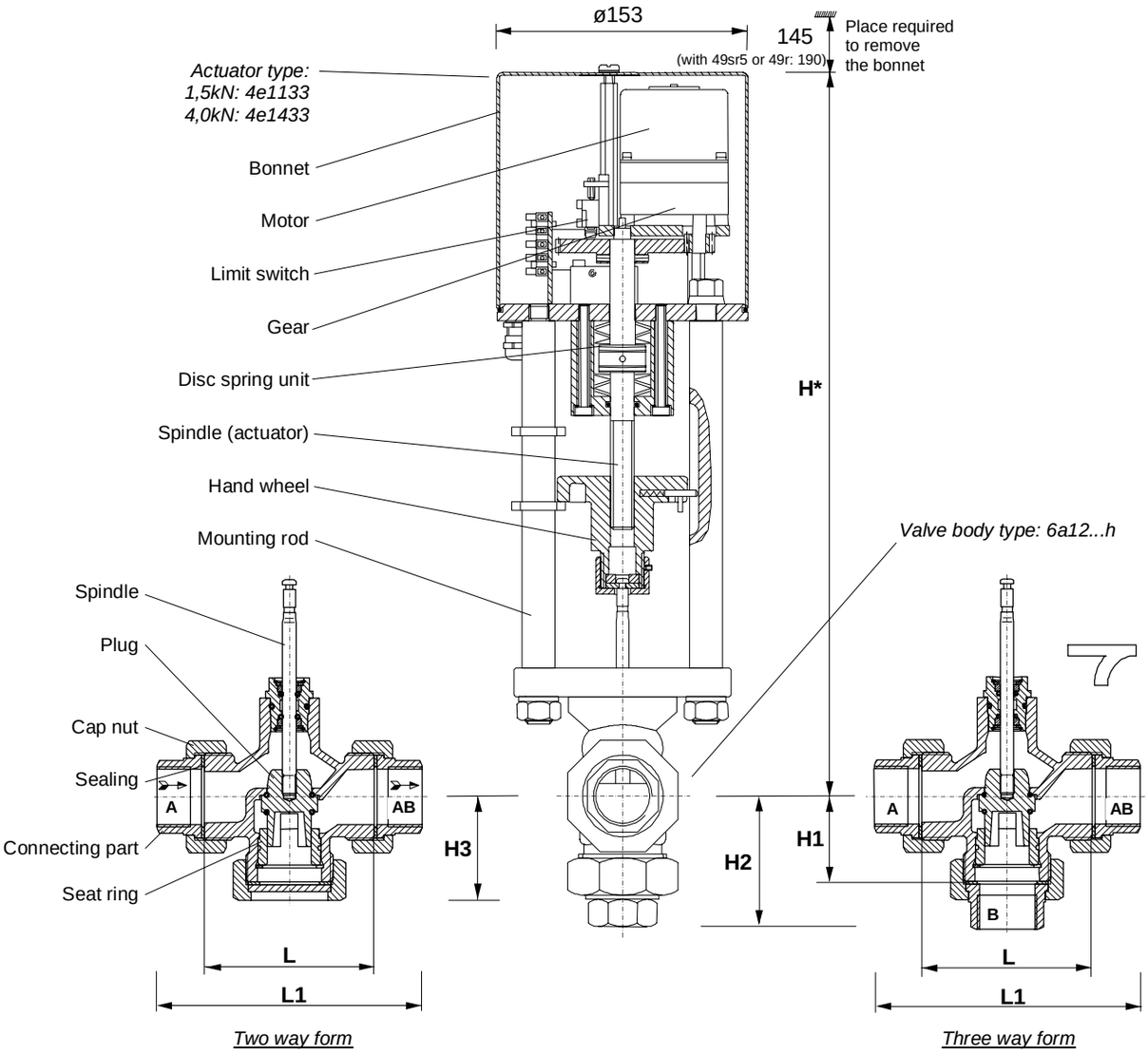
Motor rating standard acc. to DIN EN 60034-1: S1 – 100%
Protection class acc. to DIN EN 60529: IP65

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent (see page 49w)
Feedback potentiometer (see page 49f)
Integrated positioner (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V
Actuator heater (on request)
Other positioning speed (on request)
Reduced Kvs- values (on request)

Order text:
Motor control valve in two way / three way form
Bronze CC491K, PN 16, DN . ., Kvs . . .
Spindle sealing with O-Ring
Power supply . . ., closing pressure . . . bar
List-No.: two way form: 481 **2** . . . , three way form: 481 **3** . . .
Accessories: . . .

DN	**List-No.** 2-way	3-way	**Kvs** m³/h	**Stroke** mm	**Pos. time** sec	**Closing pressure** (bar) 1500N	4000N
1/2"	4812 100	4813 100	4	12	40	16,0	
3/4"	4812 101	4813 101	6,3	12	40	16,0	
1"	4812 102	4813 102	10	14	47	16,0	
1 1/4"	4812 103.	4813 103.	16	14	47	11,8	16,0
1 1/2"	4812 104.	4813 104.	25	14	47	7,2	16,0
2"	4812 105.	4813 105.	40	14	47	4,2	16,0

Motor control valve in two or three way form with internal thread connectors Bronze CC491K (Rg5), PN 16, DN1/2”-2”



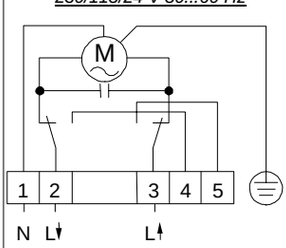
DN	1/2”	3/4”	1”	1 1/4”	1 1/2”	2”
Height H *	390	393	396	405	408	408
Length L	62	75	80	120	130	150
Length ~L1	114	127	138	184	198	222
Stud length H1	40	41	45	55	60	65
Stud length ~H2	66	67	74	89	94	101
Stud length ~H3	48	53	57	68	73	78
Weight kg	7,7	8,2	8,5	9,2	9,8	11,4

** = add. 45mm for actuators with positioner 49sr5 or controller 49r*

Electrical wiring:

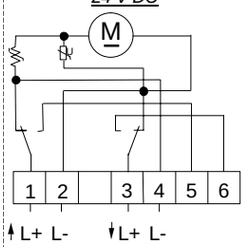
Basic version:

230/115/24 V 50...60 Hz



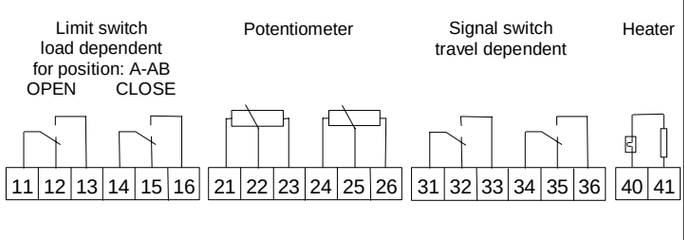
L on 2 = A-AB opens
L on 3 = A-AB closes

24 V DC



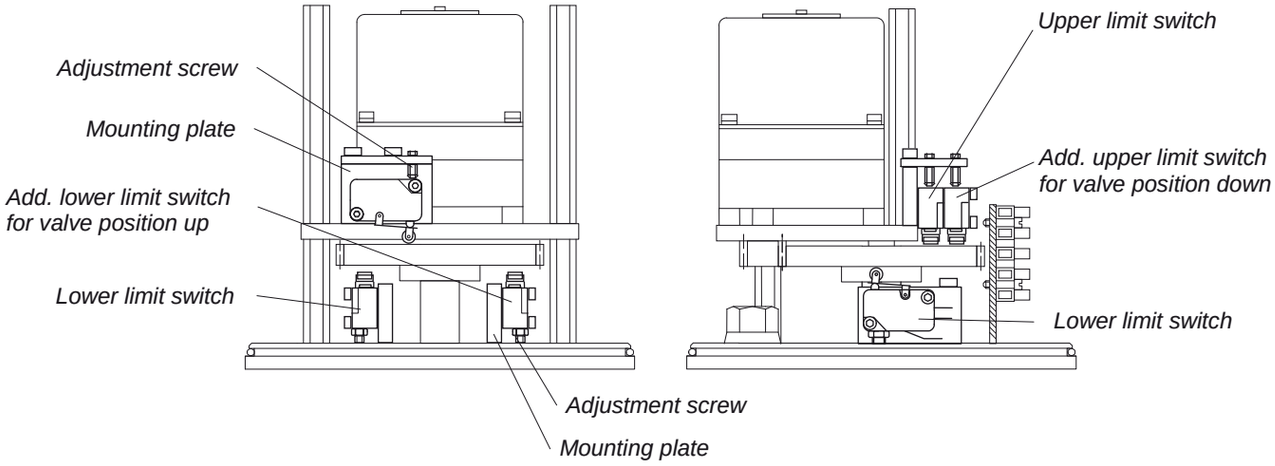
24V on 1/2 = A-AB closes
24V on 3/4 = A-AB opens

*Accessories*** (optionally):*

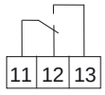


**** = for actuators with positioner 49sr5 or controller 49r*
see electrical wiring on page 49sr5 or 49r

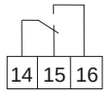
Electric actuators type 4e1 can be equipped with an additional load dependent limit switch for valve position up and down. The zero-potential change-over switches have a contact rating of 250V / 2A.



Additional Terminals:



Switch for valve position down



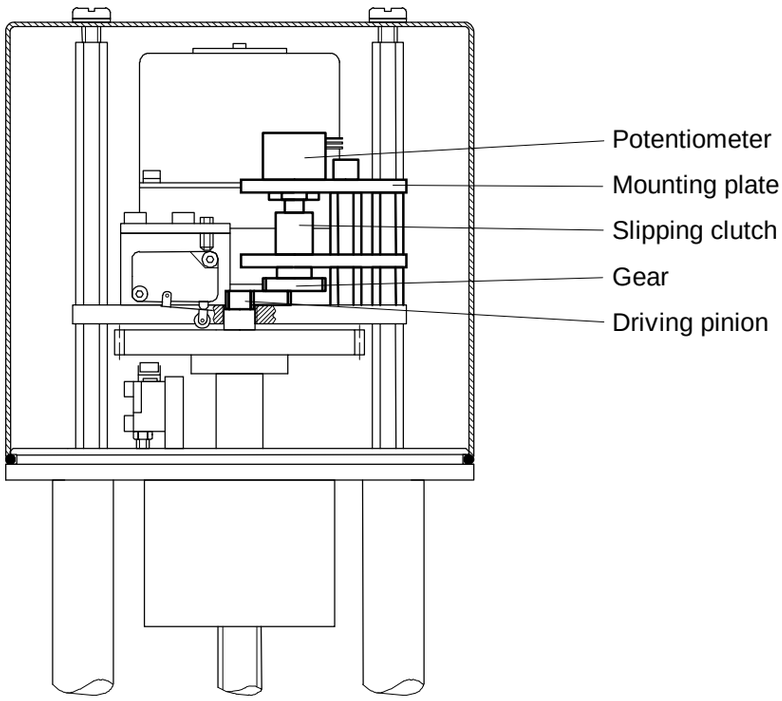
Switch for valve position up

open printversion

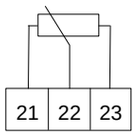
Electric actuators type 4e1… can be equipped with a potentiometer for position feedback.

The potentiometer is connected to the actuator by a slipping clutch. This effects an auto-adjustment after each manual operation and prevents damages by exceeding of the end position.

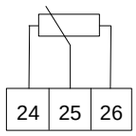
Attention! The potentiometer has to be readjusted after each manual operation with hand wheel. To readjust the potentiometer, the actuator has to be driven electrically in both end positions.



Additional terminals:



Potentiometer 1



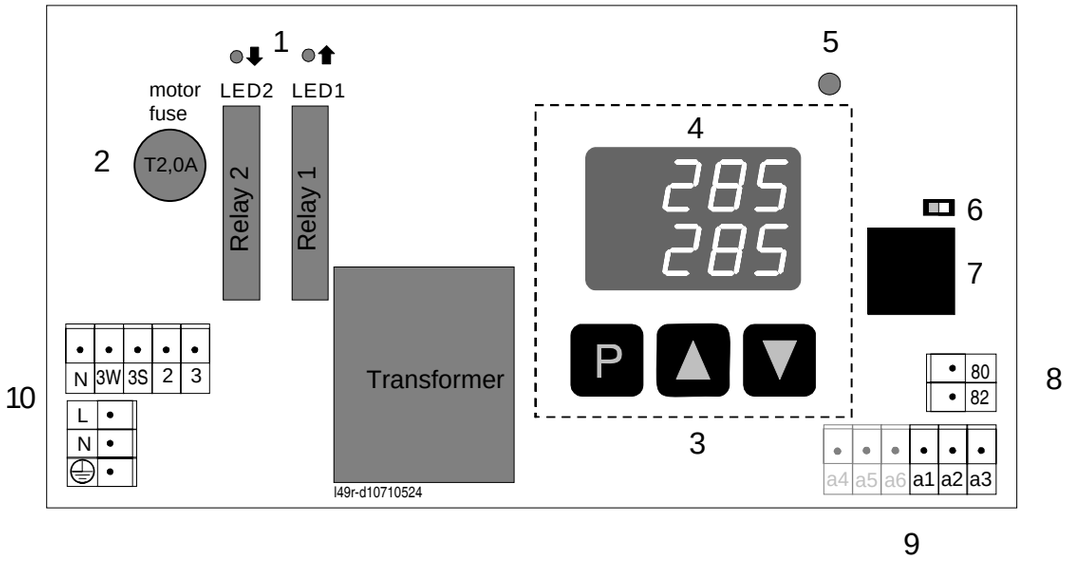
Potentiometer 2

Type summary:

49f	**x**	**x**	**x**	
			2	Double potentiometer
		1		100 Ohm
		2		200 Ohm
		5		500 Ohm
		0		1000 Ohm *
	1			Stroke 15 mm
	2			Stroke 20 mm
	3			Stroke 30/35 mm
	4			Stroke 40 mm

** default value: standard potentiometer 1000 Ohm*

open printversion



1 LEDs for displaying the relay function
2 Fuse for drive motor
3 Operating keys for set values and parameters
4 Digital displays for actual value and second display value (if active)
5 Status LED
6 Switch for connection of interface / external display and operating unit
7 Connection for interface or external operating unit
8 Connector plug for signal output
9 Connector plug for measuring inputs
10 Connector plug for mains voltage and actuator

Description

The KFM 49r is a series of microcomputer-based industrial regulators intended for mounting directly into actuator drives. The entire control loop is very compact once the sensor has been connected.

All versions can conveniently be operated, parameterised and configured through the interface. Depending on the version, an operating and display unit or a potentiometer is included for specifying the set value and adjusting the parameters.

Alternatively it is possible to connect a mobile display and operating unit instead of the interface adapter. The switch above the connector must be moved to the appropriate position for this purpose.

Type summary	**Li.no.**
Basic version for external operation (operating unit or PC)	**49r700**
Basic version with operating and display unit	**49r70d**
Basic version with potentiometer operation	**49r70p**
Additional fittings:	
With additional, freely configurable switch contact	**49r71**...
With signal output 0/4...20mA / 0/2...10V	**49r7..o.**
With RS485 interface, KFM 2.0 protocol	**49r7...s**
With Profibus DP interface	**49r7...p**
Mobile display and operating unit	**49sr59z**
Measuring inputs	**type suffix**
Pt100 DIN, 0...400°C	**none**
standard signal 0(4)...20mA, 0(2)...10V	**…e.**
Optional: additional input for position feedback	

open printversion

Technical data:

Input*:	0 / 4...20 mA or 0 / 2...10 V Pt 100 DIN Remote resistance sensor 0 ... 100 - 1000 Ohm Other values optional
Output*:	3 relays, 230V max. 2 A 0 / 4...20mA for signal output, 500 Ohm load
Status indicator:	1 status LED for normal operation and fault (flashing) 2 LEDs for function display relay 1 and 2
Optional interfaces:	RS 485 / KFM 2.0 protocol, Profibus DP, others **= depending on the particular model*

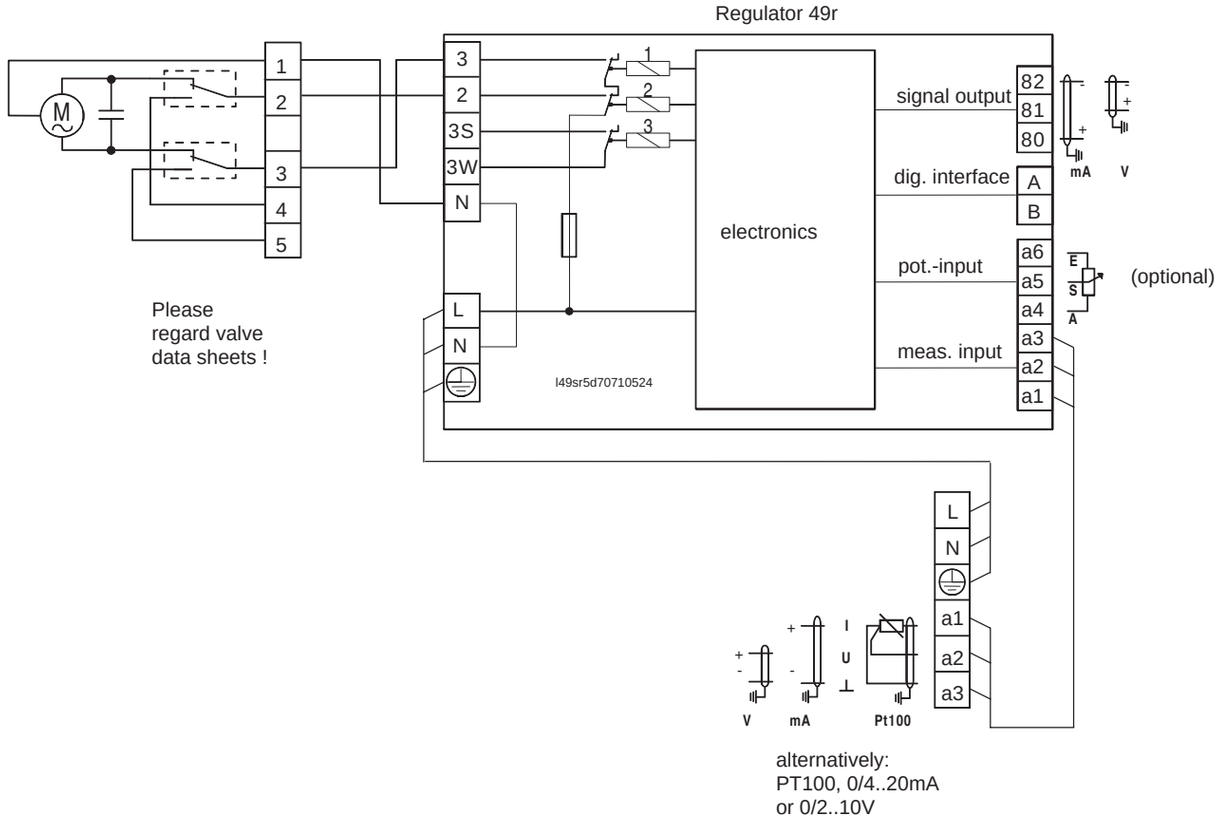
Other operating data:

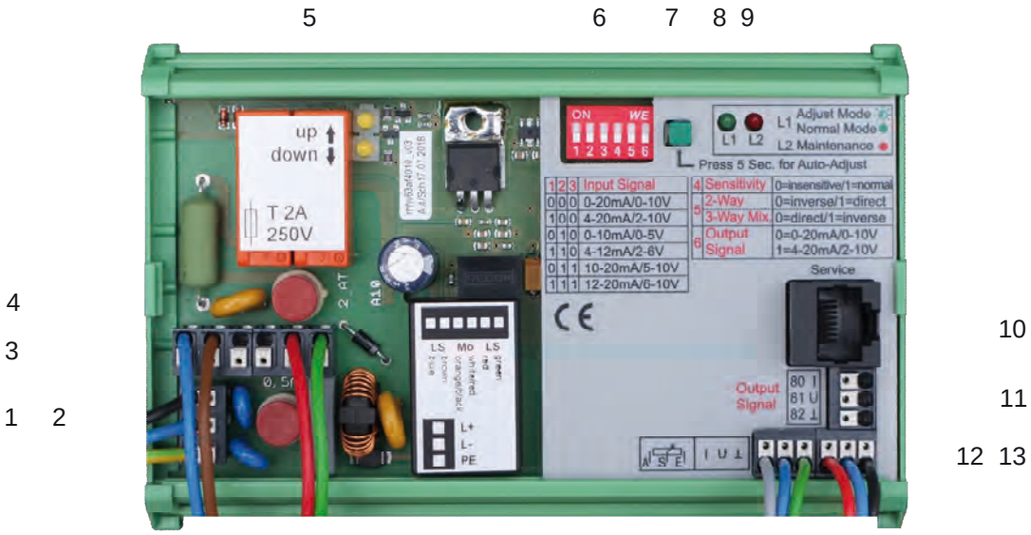
Mains connection:	230V +/- 10 %,48...62Hz,approx.3VA alt.115 V,other voltages by request
Permissible ambient temp.:	0...60°C, nominal temperature 20 °C
Climatic resistance:	Relative humidity <= 75 % annual average without condensation,
Interference emission/immunity:	In accordance with EN 61326, industrial requirements

Characteristic values *(depending on type and version):*
Set in parameter level. Factory preset if desired.

Proportional range Xp:	0,1...999,9 %
Integral action time Tn:	0.0...999.9 min
Derivative action time Tv:	0.0...99.9 min
Response sensitivity Xsh:	0,1...1,0 %
Motor run time Tm:	6...600 sec
Characteristic curve change.:	direct / inverse
Switching point diff.SA (add.contact):	0..100.0 K
Switching difference Sd:	0.1...100.0 K

Connection and block diagram: Variant showing maximum configuration; some connections may not be available, depending on the version. The actual connection diagram (as supplied) is shown on the respective device.





1 connection mains voltage*
2 fuses for electronics
3 connection limit switch and drive motor*
4 fuse for drive motor
5 relays with status LEDs
6 coding switch for input and output section, direction of action and sensitivity
7 button for start of automatic travel adjustment
8 status LED
9 maintenance LED
10 connection for service interface, external operating unit
11 connection signal output
12 connection feedback potentiometer*
13 connection drive signal*
* =internal wiring

Description

The positioner turns an incoming drive signal into the correct drive position by comparing the signal with the position feedback of a potentiometer which is installed in the drive and adjusting the drive with the up and down relays. There is a signal for travel feedback 0/4..20 mA / 0/2..10 V by default. Optionally, an additional contact relative to the actuator position is possible, e.g. to limit the valve stroke to a min. or max. opening degree. The device is integrated in the drive free of maintenance or operation. All important basic settings for direction of action and sensitivity are specified by way of the coding switches. Communication with leading systems is also possible via bus adapter, e.g. for Profinet KFM item nr. 99spne.., for data acquisition or remote maintenance purposes as well as for the execution of digital positioning commands.

The commission (if necessary, please refer page 3) consists merely of a check of the settings and a single operation of the calibration key. After this a LED will show if the automatic adjustment of the final positions is finished. Subsequently the device is ready for use.

Predictive Maintenance:
For predictive maintenance of the actuator, a signal is output by LED if the previous use of relays (switching operations) or of the spring assembly (approach of the end positions) requires a check of the drive.
The wear status of the actuator can be read with the PC software PKS at any time, as well as the history of setpoint, actual value and potentiometer setting which are saved in the integrated datalogger.

Type list	**Li.Nr.**
Basic model	**49sr7**
Extras:	
Special voltage (1=115 V AC, 2=24V AC, 8=24V DC), others on request	**49sr7_ ..**
Additional contact (Relays, potential free NO contact 250V, 2A)	**49sr7..1**
Mobile operating unit	**49sr79z**

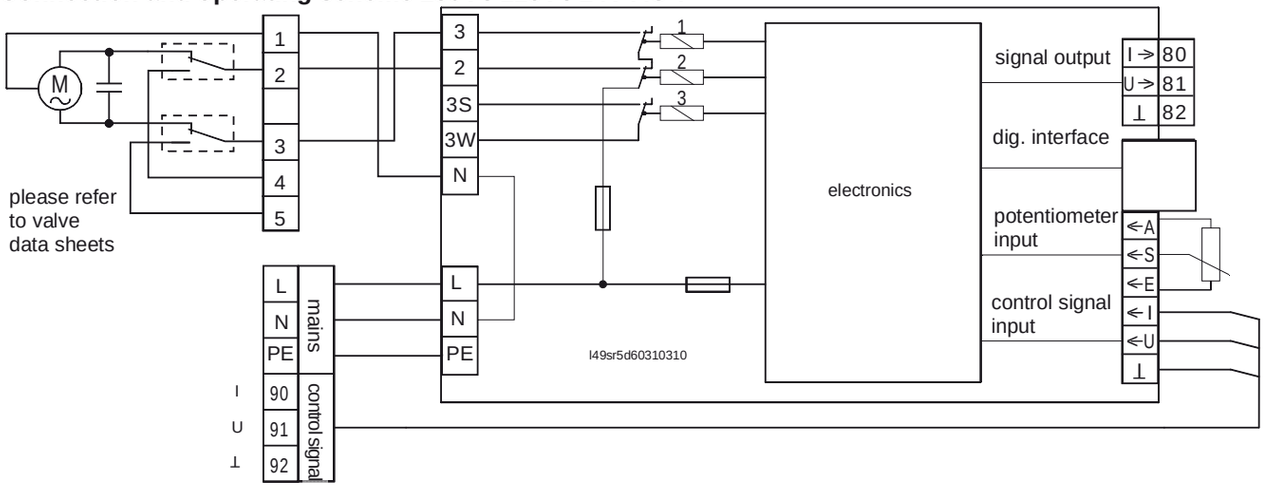
INDEX

1
2
3
4
5
6
7
8
9
0

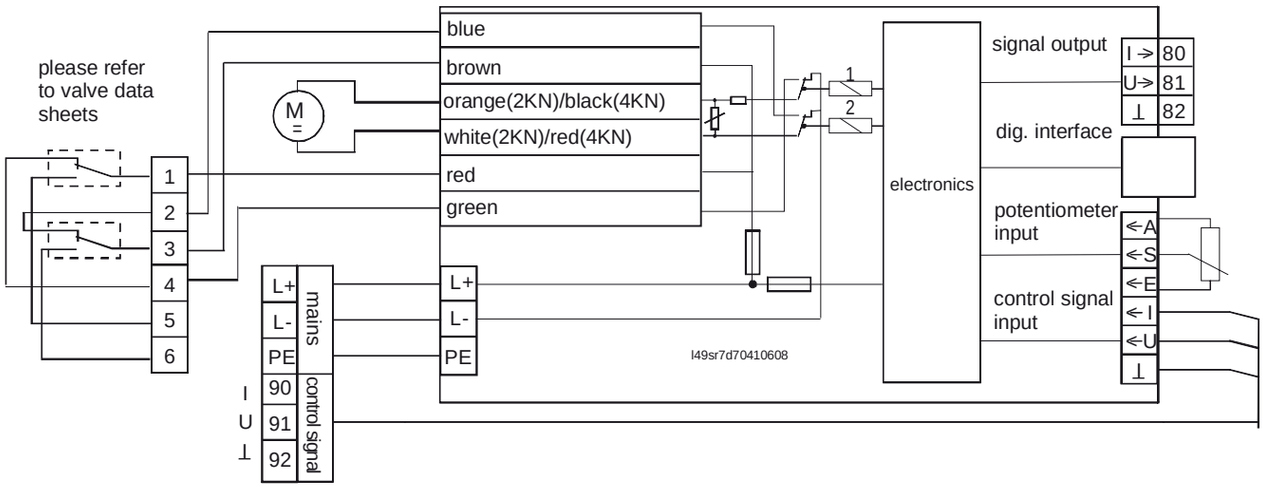
Technical data:

Input (adjustable):	0...20mA / 0...10V 4...20mA / 2...10V 0...10mA / 0...5V 4...12mA / 2...6V 10...20mA / 5...10V 12...20mA / 6...10V
Response sensitivity:	switchable normal / reduced
Output:	up to 4 relays, max. 250V , 2 A 0/4...20mA for position feedback, load < 500 Ohm, 0/2...10 V, load > 500 Ohm
Direction of action:	adjustable: *direct*: increasing input signal opens (straight) passage *inverse*: increasing input signal closes (straight) passage
Operating display:	2 status LEDs for adjustment, normal operation, error and maintenance 2 (3) LEDs for function display relays 1 and 2 (3)
Mains connection:	230V +/- 10 %, 48...62Hz, approx. 3VA alternative 115V/24V AC or 24V DC, other voltages on request
Interface:	service interface KFM 2.0 RJ45 (socket)
Allowed ambient temperature:	0...60°C, nominal temperature 20°C

Connection and operating scheme 230V / 115V / 24V AC*: positioner 49sr7



Connection and operating scheme 24V DC*: positioner 49sr78

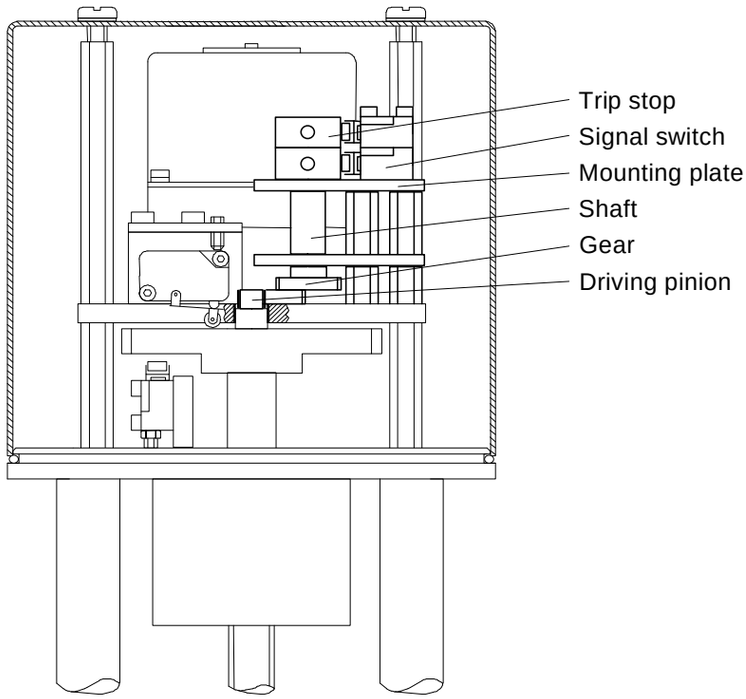


* maximum version, some connections may not exist depending on version. Decisive for the delivered version is the connection diagram on the device.
Hint: Control signals must be shielded, maximum cable length 30 meters.

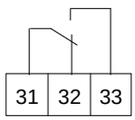
open printversion

Electric actuators type 4e1... can be equipped with 1 or 2 additional travel dependent switches.
The zero-potential change over switches have a contact rating of 250V / 2A (ohmic load).

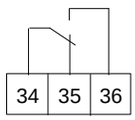
Attention! The signal switches have to be readjusted after each manual operation with hand wheel.



Additional terminals:



Signal switch 1



Signal switch 2

Type summary:

49w x x

2 2 travel dependent signal switches

1 Stroke 15 mm
2 Stroke 20 mm
3 Stroke 30/35 mm
4 Stroke 40 mm

open printversion

Technical data:

Thrust:	1500 N / 2000 N / 4000 N / 5500 N
Power input:	12 VA / 12 VA / 26 VA / 26 VA
Stroke:	41 mm
alternatively:	51 und 65 mm (on request)
Limit switches:	1 changeover switch for each end position load dependent, rating 250V / 2A
Positioning time:	3,3 s/mm
alternatively:	2,2 s/mm (option 49t12)
Controlling:	with 3-point step controller
alternatively:	4...20 mA / 0...10 V (option 49sr..)
Power supply:	230V / 50...60Hz
alternatively:	115V / 50...60Hz (option 49u1) 24V / 50...60Hz (option 49u2) 24V DC (option 49u8)
Protection class:	IP 65
Manual emergency operation:	with hand wheel
Mounting position:	any, avoid hanging position (damaging possible by effluent media)
Max. ambient temperature	-15...60° C
Weight:	7 kg

Accessories, special types**:**
Add. limit switches load dependent (see page 49e)
Add. signal switches travel dependent for max. 40mm stroke (see page 49w)
Feedback potentiometer for max. 40mm stroke (see page 49f)
Integrated positioner for max. 40mm stroke (see page 49sr)
Integrated process controller (see page 49r)
Feedback signal 4-20mA / 0-10V for max. 40mm stroke
Actuator heater (on request)
Other positioning speed (on request)

Order text:
Electrical actuator for stroke . . . mm, thrust . . . N
Power supply . . ., positioning time . . . s/mm
Mounting rods . . . mm
List-No. 4e1 . . .
Accessories: . . .

Type summary:

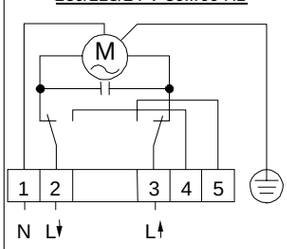
Mounting rod length: (mm) *		195	200		218		231		250		295
Stroke (mm)		41	41	51	41	51	41	51	41	51	65
Thrust (N)	1500	4e1133	-	-	-	-	-	-	-	-	-
	2000	-	4e1230	4e1250	4e1231	4e1251	4e1232	4e1252	4e1235	4e1255	-
	4000	4e1433	4e1430	4e1450	4e1431	4e1451	4e1432	4e1452	4e1435	4e1455	4e1466
	5500	-	4e1630	4e1650	4e1631	4e1651	4e1632	4e1652	4e1635	4e1655	4e1666

** = other mounting rod lengths on request*

Electrical wiring:

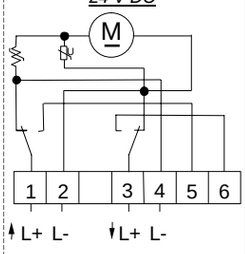
Basic version:

230/115/24 V 50...60 Hz



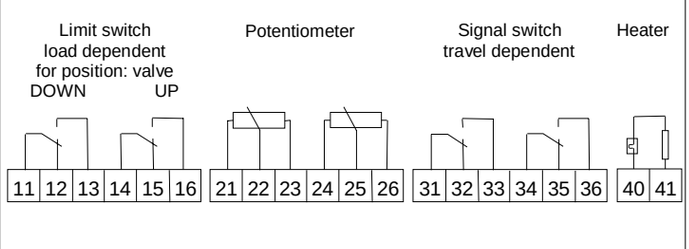
L on 2 = stroke downwards
L on 3 = stroke upwards

24 V DC



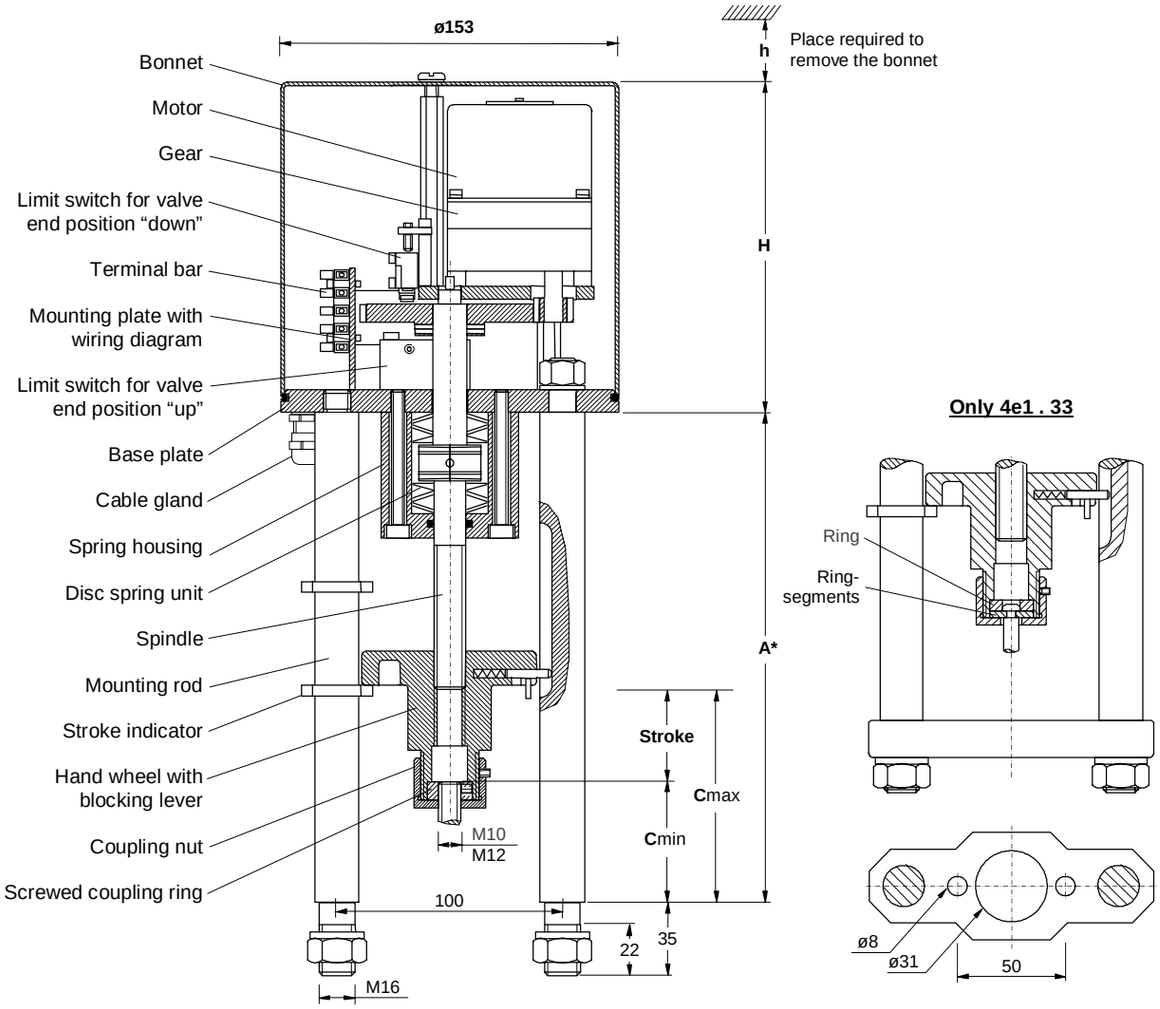
24V on 1/2 = stroke upwards
24V on 3/4 = stroke downwards

*Accessories** (optionally):*



*** = for actuators with positioner 49sr5 or controller 49r*
see electrical wiring on page 49sr5 or 49r

open printversion



Type	A* mm	Stroke max. mm	Cmin mm	Cmax mm	H mm		h mm	
					without 49r…/49sr	with 49r…/49sr	without 49r…/49sr	with 49r…/49sr
4e1 . 33	195	41	40	81	146	191	145	190
4e1 . 30	200	41	45	86				
4e1 . 31	218	41	63	104				
4e1 . 51	218	51	37	88				
4e1 . 32	231	41	76	117				
4e1 . 52	231	51	50	101				
4e1 . 35	250	41	95	136				
4e1 . 55	250	51	69	120				
4e1 . 66	295	65	96	161				

** = other mounting rod lengths on request*

Electrical, explosion proof actuator type 4ex.. (ExRun),
alternatively suitable for most KFM-control valve types (appendix ...X.)

PTB-certified in accordance to ATEX directive 94/9/EC
For all types of gas, mixtures, vapours and dust for use in zone 1, 2, 21, 22
With manual emergency operation and load dependent limit switches

Protection class:	II2(1)G Ex de [ia] IIC T6/T5, II2(1)D Ex td [iaD] A21 IP66 T80°C
Control mode:	OPEN/CLOSE, 3-point, optionally 4-20mA / 0-10V
Supply voltage:	24 ... 240V AC/DC, +/- 10%, self adjustable
Frequency:	50 ... 60Hz +/- 20%
Thrust (selectable):	0,5 / 1,0 kN (4exa...) 2,5 / 5,0 kN (4exb...) 7,5 / 10,0 kN (4exc...)
Positioning time (selectable):	2 / 3 / 6 / 9 / 12 s/mm (4exa… and 4exb…) 4 / 6 / 9 / 12 / 15 s/mm (4exc...)
IP-Protection EN 60529:	IP66
Motor rating standard: EN 60034-1	S3 - 50%ED – max. 300 c/h
Stroke (adjustable):	5 ... 60mm
Ambient temperature:	-20 ... +40°C at T6 / -20 ... +50°C at T5
Integrated heater:	standard

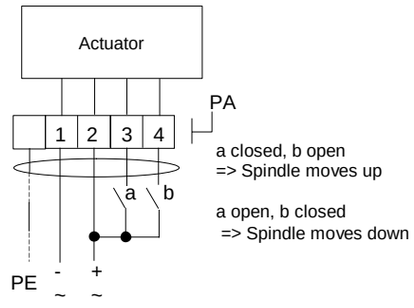
Accessories, special types**:**
2 add. signal switches, adjustable (49xw2)
Integrated positioner 4-20mA / 0-10V (49xsr)
Feedback signal 4-20mA / 0-10V (49xsrü)

Order text:
Electrical, explosion proof actuator, thrust . . .,
Mounting rod length . . ., coupling M. ., accessories . . .
List-No. 4ex . . .

Electrical wiring:

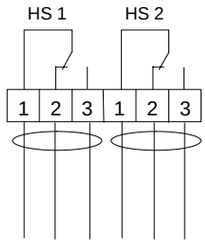
Basic version:

24 ... 240 VAC/DC



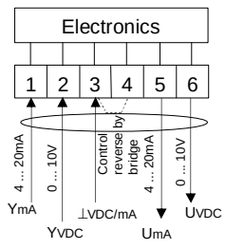
Accessories(optionally):

Add. signal switches
49xw2

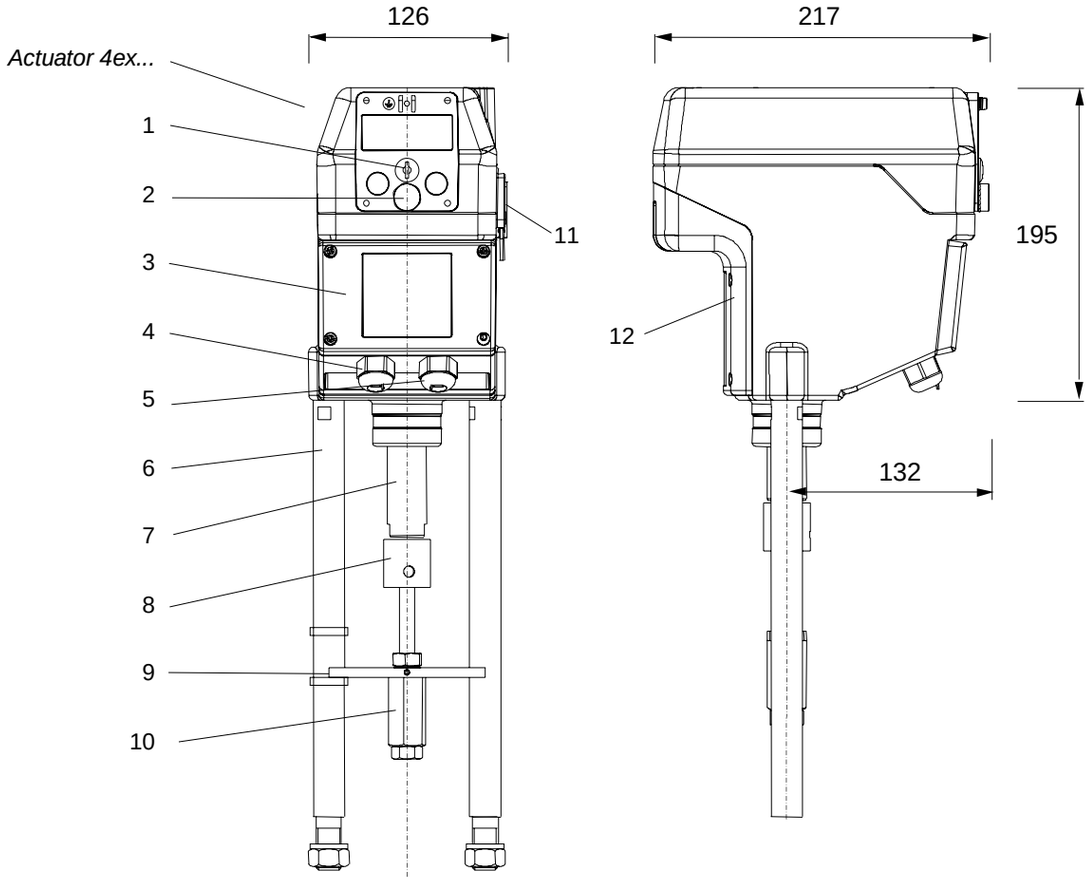


Positioner 4-20mA / 0-10V
49xsr

Feedback signal 4-20mA / 0-10V
49xsrü



open printversion



1	Switch for force and positioning time adjustment (behind blanking plug)
2	Button for automatic stroke adjustment and LED operating display (behind blanking plug)
3	Junction box
4	Cable screw connection (control signal, feedback signal, potentiometer, button)
5	Cable screw connection (supply voltage, control)
6	Mounting rod, mounting rod length depending on the valve type
7	Actuator spindle
8	Coupling nut
9	Stroke indicator
10	Coupling, thread depending on the valve type
11	Switch for manual operation
12	Cover for gear (stroke adjustment)

open printversion

Emergency stop or outlet valves see group 6

Motor control valve in three way form with PTFE-V-ring sealing, PN 16 / 25, DN15-100 EN-GJS-400-18-LT, with 2,8kN actuator with emergency close function

Body: EN-GJS-400-18-LT three way form
for water and steam, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: spring-loaded PTFE-V-ring unit
for media temperatures up to 250°C
Alternatively: graphite-packing
for media temperatures up to 350°C
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Electro-hydraulic actuator: with emergency close function
(straightway A-AB closed by power failure)
and integrated manual emergency function
Thrust: 2800 N
Power input: DN15...50: 17VA
DN65...100: 28VA
Power supply: 230V/50...60Hz
Alternatively: 24V AC (only with positioner 59sr)
for input 0…10V or 4…20mA)
Protection class acc. to DIN EN 60529: IP54

Function:
In normal operation the electric pump generates pressure on the piston and moves the valve spindle (stroke) and simultaneously the return spring (preloading) downwards. In emergency (by power failure) the solenoid valve opens the pressure container and the return spring moves the piston and the valve spindle upwards and closes the straightway of the valve.

Accessories, special types**:**
Add. signal switches (59e)
Feedback potentiometer (59f)
Integrated positioner (59sr)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Electro-hydr. control valve in three way form with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with PTFE-V-ring unit
Power supply . . ., with emergency close function, closing pressure . . . bar
List-No.: PN16: 531 **4** . . , PN25: 531 **5** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

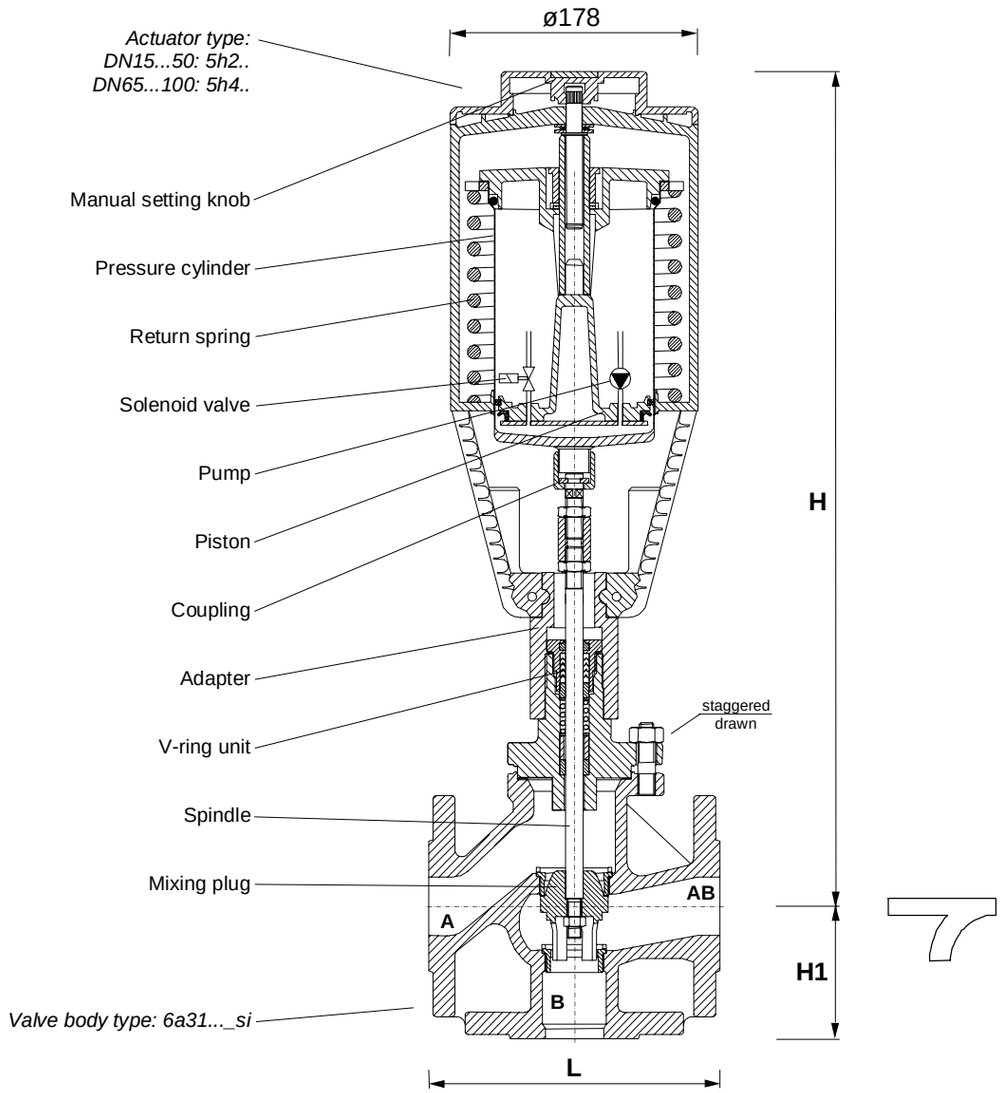
by:		-10...50	100	150	200	250	300	350	°C*
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

** = max. 250°C for spindle sealing with PTFE-V-ring unit*

DN**	List-No.		Kvs	Stroke	Pos. time	Emergency close time		Closing pressure
						230V	24V+59sr	2800N
	PN 16	PN 25	m³/h	mm	sec	sec	sec	bar
15	531 400	531 500	4,0	20	120	10	10	25,0
20	531 401	531 501	6,3	20	120	10	10	25,0
25	531 402	531 502	10	20	120	10	10	25,0
32	531 403	531 503	16	20	120	10	10	25,0
40	531 404	531 504	25	20	120	10	10	16,5
50	531 405	531 505	40	20	120	10	10	10,4
65	531 406	531 506	63	30	90	18	20	5,7
80	531 408	531 508	100	30	90	18	20	3,5
100	531 410	531 510	160	30	90	18	20	2,1

*** = bigger DN on request*

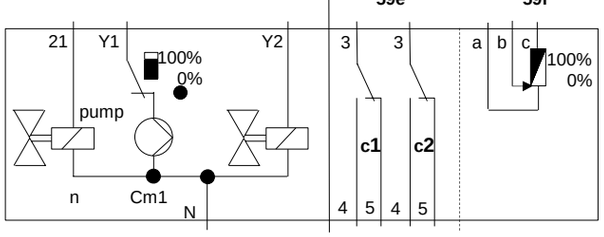
open printversion



DN	15	20	25	32	40	50	65	80	100
Height H	555	569	563	570	575	578	621	622	629
Stud length H1	65	70	75	80	90	100	120	130	150
Length L	130	150	160	180	200	230	290	310	350
Weight kg	16	18	19	21	22	26	43	48	61

Electrical wiring:

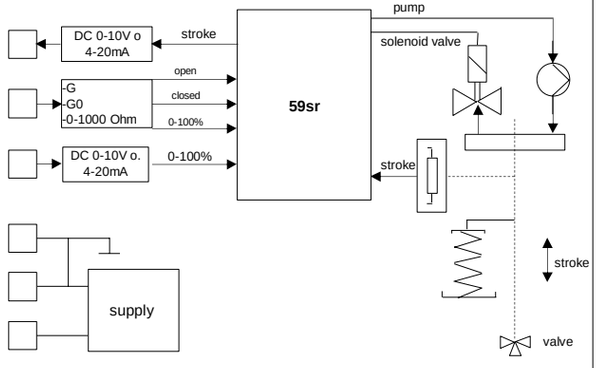
optionally:



Cm1	Limit switch	Y1	Straightway A-AB opens
n	Solenoid valve	Y2	Straightway A-AB closes
c1, c2	Signal switch	N	Neutral conductor
a,b,c	Potentiometer	21*	Voltage*

*= - *Voltage has to be always connected here*
- *Disconnection/power failure activates emergency close function (A-AB closed)*

24V AC with positioner 59sr..., 0-10V / 4-20mA:



U	Position feedback signal	G0	Power supply 24V AC
Z	Override control		System neutral (SN)
Y	Control signal	G	Power supply 24V AC
M	Measuring neutral		System potential

Motor control valve in three way form with bellow sealing, PN 16 / 25, DN15-100 EN-GJS-400-18-LT, with 2,8kN actuator with emergency close function

Body: EN-GJS-400-18-LT three way form
for heat transfer oil, as mixing valve
(diverted purpose restricted, see page 038 990)
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: linear
Positioning ratio: : 30:1 (up to 50:1)
Leakage: < 0,01% Kvs

Electro-hydraulic actuator: with emergency close function
(straightway A-AB closed by power failure)
and integrated manual emergency function

Thrust:	2800 N	
Power input:	DN15...50:	17VA
	DN65...100:	28VA
Power supply:	230V/50...60Hz	
Alternatively:	24V AC (only with positioner 59sr)	
	for input 0…10V or 4…20mA)	

Protection class acc. to DIN EN 60529: IP54

Function:
In normal operation the electric pump generates pressure on the piston and moves the valve spindle (stroke) and simultaneously the return spring (preloading) downwards. In emergency (by power failure) the solenoid valve opens the pressure container and the return spring moves the piston and the valve spindle upwards and closes the straightway of the valve.

Accessories, special types**:**
Add. signal switches (59e)
Feedback potentiometer (59f)
Integrated positioner (59sr)
Reduced Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Electro-hydr. control valve in three way form with mixing plug
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Power supply . . ., with emergency close function, closing pressure . . . bar
List-No.: PN16: 561 **4** . . , PN25: 561 **5** . .
Accessories: . . .

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

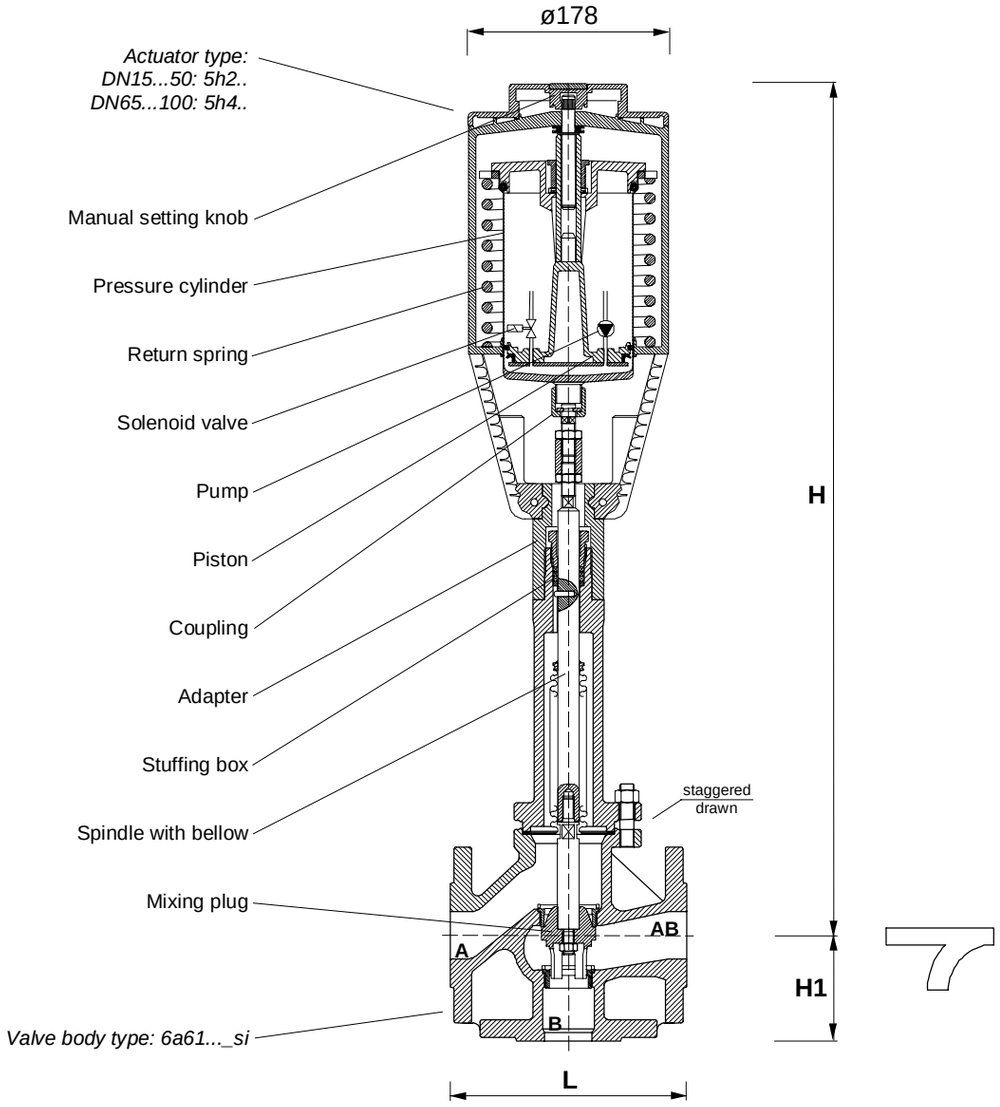
DN*	List-No.		Kvs	Stroke	Pos. time	Emergency close time		Closing pressure
						230V	24V+59sr	2800N
	PN 16	PN 25	m³/h	mm	sec	sec	sec	bar
15	561 400	561 500	4,0	20	120	10	10	25,0
20	561 401	561 501	6,3	20	120	10	10	25,0
25	561 402	561 502	10	20	120	10	10	25,0
32	561 403	561 503	16	20	120	10	10	25,0
40	561 404	561 504	25	20	120	10	10	16,5
50	561 405	561 505	40	20	120	10	10	10,4
65	561 406	561 506	63	30	90	18	20	5,7
80	561 408	561 508	100	30	90	18	20	3,5
100	561 410	561 510	160	30	90	18	20	2,1

** = bigger DN on request*

open printversion

INDEX

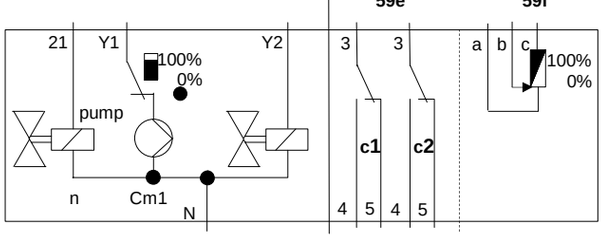
1 2 3 4 5 6 7 8 9 0



DN	15	20	25	32	40	50	65	80	100
Height H	714	728	722	729	734	737	867	868	875
Stud length H1	65	70	75	80	90	100	120	130	150
Length L	130	150	160	180	200	230	290	310	350
Weght kg	17	18	19	22	23	26	47	51	64

Electrical wiring:

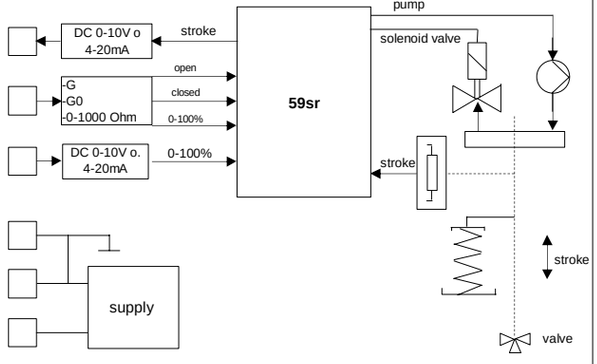
optionally:



Cm1	Limit switch	Y1	Straightway A-AB opens
n	Solenoid valve	Y2	Straightway A-AB closes
c1, c2	Signal switch	N	Neutral conductor
a,b,c	Potentiometer	21*	Voltage*

*= - *Voltage has to be always connected here*
- *Disconnection/power failure activates emergency close function (A-AB closed)*

24V AC with positioner 59sr…, 0-10V / 4-20mA:



U	Position feedback signal	G0	Power supply 24V AC
Z	Override control		System neutral (SN)
Y	Control signal	G	Power supply 24V AC
M	Measuring neutral		System potential

open printversion

Control valves with emergency functions see group 5

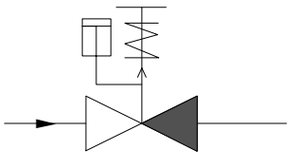
INDEX
1
2
3
4
5
6
7
8
9
0

Quick opening valve in two way form with bellow sealing EN-GJS-400-18-LT (GGG-40.3), PN 16 / 25

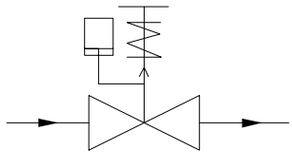
Body: EN-GJS-400-18-LT (GGG-40.3), two way form
for heat transfer oil
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Leakage: < 0,01% Kvs

Function:

Operating state



State after the release



The quick opening valve is a two way valve complete with mechanical actuator. In operation, the valve cone is in the lower end position (see diagram above), the straightway is closed (leakage < 0.01% kvs). This is achieved manually. The clamp lever included in the supply is used to move the toggle clamp downwards until it clicks into place (via the knee point). In so doing, the restoring spring is pre-tensioned. The switch signals that the valve has reached its end position (see below for switch data, other types of switches on request).
The opening trip is undertaken by connecting a pneumatic or hydraulic pulse (3 bar) to the cylinder. The cylinder piston forces the toggle clamp lever out of the clicked-in position; the restoring spring moves the valve cone into the upper end position. The straightway is opened (see diagram above).

Under tension, the tripping zone of the toggle clamp is to be kept clear of access by using suitable protection devices or barriers (risk of injury from the lever kicking back)

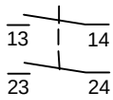
Accessories, special types**:**
Add. limit switches (on request)
Manual release (on request)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Quick opening valve in two way form
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
List-No. 6051 . . . , accessories: . . .

Switch data:

Switching element:	2 normally open contacts
Switching system:	slow action
Electrical loading:	400 VAC, 6 A, (AC15)
	250 VDC, 0,27 A, (DC-13)
Minimum loading:	24 V, 10 mA
Protection class:	IP 67 acc. to EN 60529
Temp. range:	-20 °C to 80 °C

Circuit diagramm:

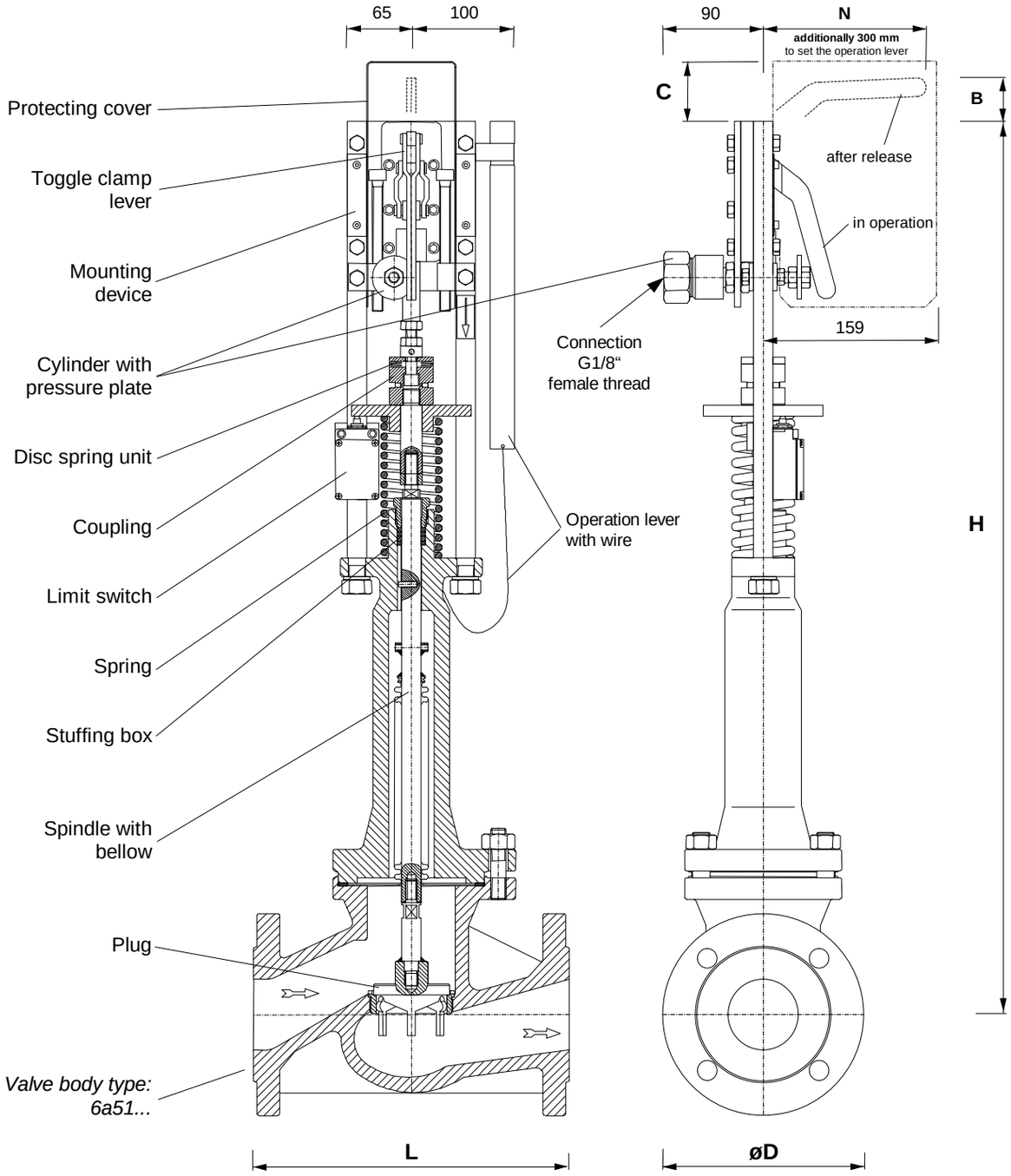


Pressure-temperature ratings acc. to DIN EN 1092-2:

by:	-10...120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

DN	List-No. PN 16	List-No. PN 25	Kvs m³/h	Stroke mm	Max. pressures differential bar	Max. pressures working bar (g)
15	6051 400	6051 500	4,0	20	25,0	25,0
20	6051 401	6051 501	6,3	20	25,0	25,0
25	6051 402	6051 502	10	20	25,0	25,0
32	6051 403	6051 503	16	20	16,0	25,0
40	6051 404	6051 504	25	20	11,0	17,0
50	6051 405	6051 505	40	20	7,0	8,0
65	6051 406	6051 506	63	30	5,0	6,0
80	6051 408	6051 508	100	30	3,0	4,0
100	6051 410	6051 510	160	30	2,0	3,0
125	6051 412	6051 512	230	40	1,0	2,0
150	6051 415		330	40	0,7	1,7

open printversion



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	666	680	674	681	686	689	819	819	827	929	944
Length L	130	150	160	180	200	230	290	310	350	400	480
Flange øD	95	105	115	140	150	165	185	200	235	270	300
B	25	25	25	25	25	25	55	55	55	110	110
C	55	55	55	55	55	55	96	96	96	96	96
N	155	155	155	155	155	155	150	150	150	135	135
Weight kg	16	17	18	19	21	23	40	43	53	105	115

INDEX

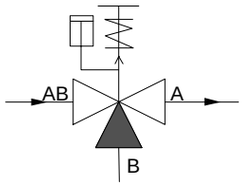
1 2 3 4 5 6 7 8 9 0

Quick change-over valve in three way form with bellow sealing EN-GJS-400-18-LT (GGG-40.3), PN 16 / 25

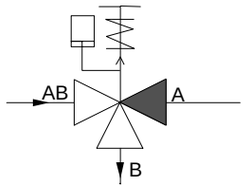
Body: EN-GJS-400-18-LT (GGG-40.3), three way form
for heat transfer oil
Pressure range: PN 16, PN 25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Leakage: < 0,01% Kvs

Function:

Operating state



State after the release



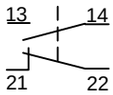
The quick change-over valve is a 3-way valve complete with mechanical actuator. In operation, the valve cone is in the lower end position (see diagram above), the straightway AB-A is opened and the bypass AB-B is closed (leakage < 0.01% kvs). This is achieved manually. The clamp lever included in the supply is used to move the toggle clamp downwards until it clicks into place (via the knee point). In so doing, the restoring spring is pretensioned. The switch signals that the valve has reached its end position (see below for switch data, other types of switches on request).
The change-over trip is undertaken by connecting a pneumatic or hydraulic pulse (3 bar) to the cylinder. The cylinder piston forces the toggle clamp lever out of the clicked-in position; the restoring spring moves the valve cone into the upper end position. The straightway AB-A is closed (leakage < 0.01% kvs) and the bypass AB-B is opened (see diagram above).
The valve can also be used as a 2-way quick stop valve, if the bypass B is closed with a blind flange.

Under tension, the tripping zone of the toggle clamp is to be kept clear of access by using suitable protection devices or barriers (risk of injury from the lever kicking back)

Accessories, special types**:**
Add. limit switches (on request)
Manual release device (on request)
Other Kvs- values (on request)
Weld-on ends (on request)
Flange drillings acc. to ANSI / JIS (on request)

Order text:
Quick change-over valve in 3-way form
EN-GJS-400-18-LT (GGG-40.3), PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
List-No. 6061 . . . , accessories: . . .

Switch data:

Switching element:	1 normally closed / 1 normally open contacts, positive break normally closed contact
Switching system:	Snap action
Electrical loading:	400 VAC, 6 A, (AC13)
Minimum loading:	24 V, 10 mA
Protection class:	IP 65 acc. to EN 60529
Temp. range:	-20 °C to 80 °C
Circuit diagramm:	

Pressure-temperature ratings acc. to DIN EN 1092-2:

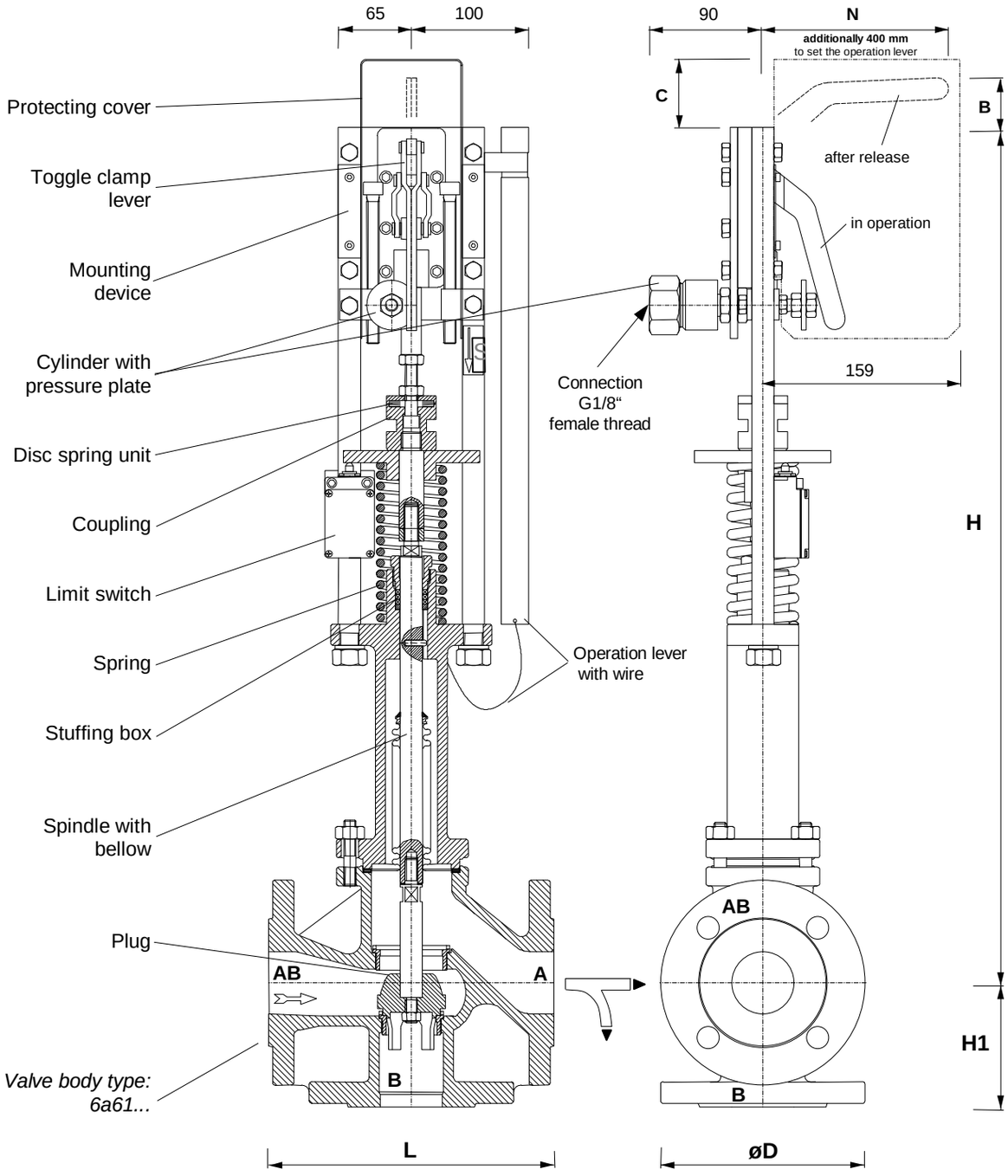
by:	-10...120	150	200	250	300	350	°C
PN 16	16	15,5	14,7	13,9	12,8	11,2	bar
PN 25	25	24,3	23	21,8	20	17,5	bar

DN	List-No. PN 16	List-No. PN 25	Kvs m³/h	Stroke mm	Max. pressures differential bar	Max. pressures working bar (g)
15	6061 400	6061 500	4,0	20	25,0	25,0
20	6061 401	6061 501	6,3	20	25,0	25,0
25	6061 402	6061 502	10	20	25,0	25,0
32	6061 403	6061 503	16	20	16,0	26,0
40	6061 404	6061 504	25	20	11,0	17,0
50	6061 405	6061 505	40	20	7,0	8,0
65	6061 406	6061 506	63	30	5,0	6,0
80	6061 408	6061 508	100	30	3,0	4,0
100	6061 410	6061 510	160	30	2,0	3,0
125	6061 412	6061 512	230	35	1,0	2,0
150	6061 415		330	38	0,7	1,7

INDEX
1
2
3
4
5
6
7
8
9
0

open printversion

Quick change-over valve in three way form with bellow sealing
EN-GJS-400-18-LT (GGG-40.3), PN 16/25



DN	15	20	25	32	40	50	65	80	100	125	150
Height H	666	680	674	681	686	689	819	819	827	929	944
Stud length H1	65	70	75	80	90	100	120	130	150	200	210
Length L	130	150	160	180	200	230	290	310	350	400	480
Flange øD	95	105	115	140	150	165	185	200	235	270	300
B	25	25	25	25	25	25	55	55	55	85	105
C	55	55	55	55	55	55	96	96	96	96	96
N	155	155	155	155	155	155	150	150	150	145	130
Weight kg	18	19	20	22	24	27	46	50	63	118	139

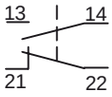
INDEX
1 2 3 4 5 6 7 8 9 0

Emergency stop valve with bellow sealing, DN20-80 EN-GJS-400-18-LT, PN 16

Body: EN-GJS-400-18-LT two way form
for heat transfer oil
Pressure range: PN16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: stainless steel bellow
and safety stuffing box
Internal parts: stainless steel

Quick closing device : acc. to DIN 4754
for shut off by emergency
and simultaneous disconnecting of burner
by electrical signal contact
Operated by release cord (supplied by customer)

Limit switch:

Switching element:	1 normally open / 1 normally closed contact
Switching system:	snap action, positive break, normally closed contact
Contact material:	fine silver
Temperature range:	-20°C to +80°C
Electrical loading:	400V AC, 6A (AC-13)
Minimum loading:	24V AC/DC, 10mA
Short circuit protection:	6A (slow blow)
Electrical construction:	IEC 947-5-1, electrically isolated switching inserts
Cable inlet:	3x M16x1,5
Protection class:	IP65 acc. to EN 60529 / DIN VDE 0470-1
Housing:	GD-Al alloy, painted
Electrical wiring:	

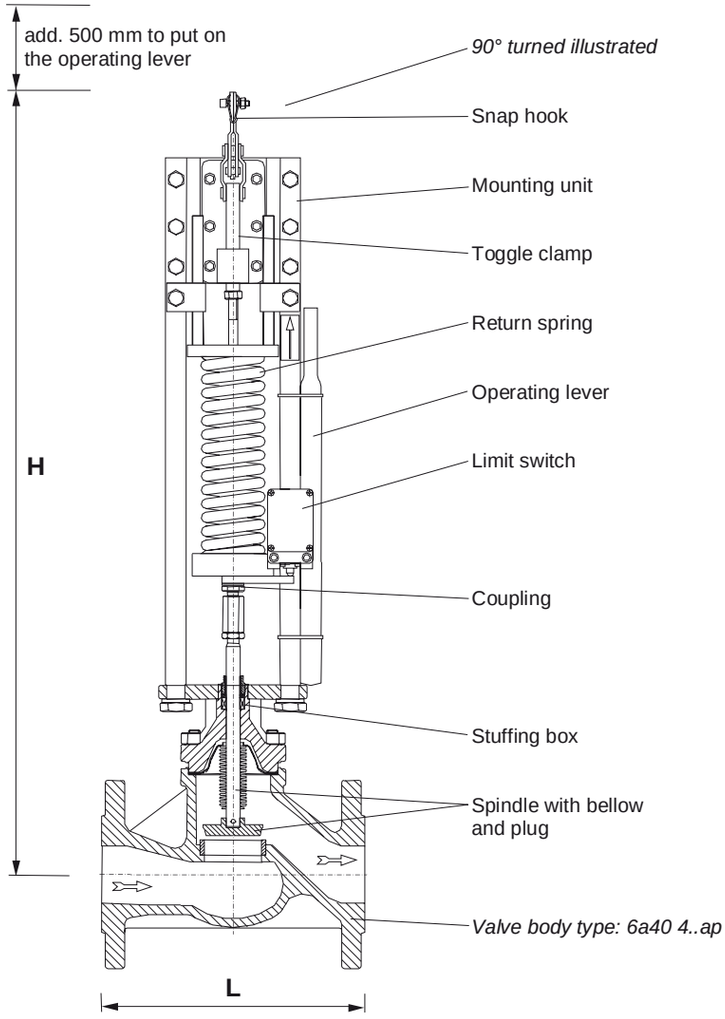
Order text:
Emergency stop valve
EN-GJS-400-18-LT, PN 16, DN . .
List-No. 640 4 . . sav

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	List-No.	Kvs m³/h	Stroke mm
20	640 401sav	7,2	6
25	640 402sav	12,0	8
32	640 403sav	16,0	8
40	640 404sav	28,5	13
50	640 405sav	43,0	13
65	640 406sav	75,0	16
80	640 408sav	105,0	20

open printversion



Emergency stop valve

Shown in operating state

DN	20	25	32	40	50	65	80
Height H*	710	715	720	735	740	755	775
Length L	150	160	180	200	230	290	310
Weight kg	11	12	14	16	18	22	28

** = add. 500mm to put on the operating lever*

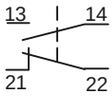
open printversion

Emergency outlet valve with bellow sealing, DN20-80 EN-GJS-400-18-LT, PN 16

Body: EN-GJS-400-18-LT two way form
for heat transfer oil
Pressure range: PN16
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: stainless steel bellow
and safety stuffing box
Internal parts: stainless steel

Quick opening device :
for discharge by emergency
with simultaneous disconnecting possibility
by electrical signal contact
Operated by release cord (supplied by customer)

Limit switch:

Switching element:	1 normally open / 1 normally closed contact
Switching system:	snap action, positive break, normally closed contact
Contact material:	fine silver
Temperature range:	-20°C to +80°C
Electrical loading:	400V AC, 6A (AC-13)
Minimum loading:	24V AC/DC, 10mA
Short circuit protection:	6A (slow blow)
Electrical construction:	IEC 947-5-1, electrically isolated switching inserts
Cable inlet:	3x M16x1,5
Protection class:	IP65 acc. to EN 60529 / DIN VDE 0470-1
Housing:	GD-Al alloy, painted
Electrical wiring:	

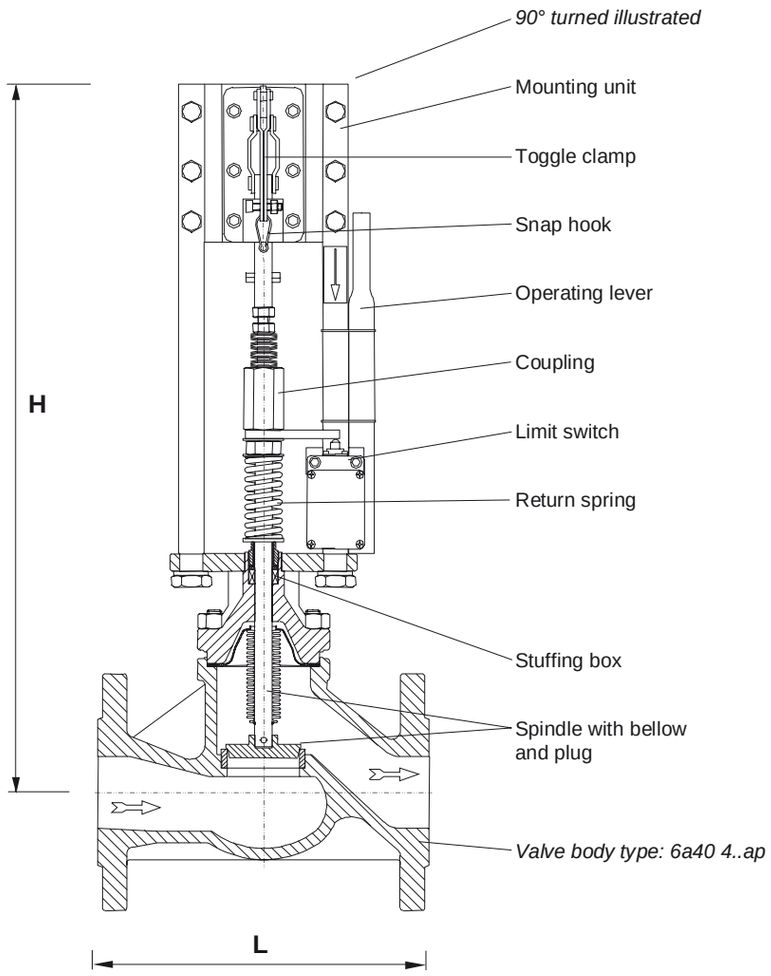
Order text:
Emergency outlet valve
EN-GJS-400-18-LT, PN 16, DN . .
List-No. 640 4 . . oa

Pressure-temperature ratings acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar

DN	List-No.	Kvs m³/h	Stroke mm
20	640 401oa	7,2	6
25	640 402oa	12,0	8
32	640 403oa	16,0	8
40	640 404oa	28,5	13
50	640 405oa	43,0	13
65	640 406oa	75,0	16
80	640 408oa	105,0	20

open printversion



Emergency outlet valve

Shown in operating state

DN	20	25	32	40	50	65	80
Height H	420	425	430	445	450	465	485
Length L	150	160	180	200	230	290	310
Weight kg	9	10	11	13	15	20	25

open printversion

Overflow valve in two way form with bellow sealing, DN25-80 EN-GJS-400-18-LT, PN 16 / 25

Body: EN-GJS-400-18-LT two way form
for heat transfer oil
Pressure range: PN16, PN25
Immersion length acc. to DIN EN 558, basic series 1
Flanges acc. to DIN EN 1092-2 type 21
Spindle sealing: double wall bellow
and safety stuffing box
Internal parts: stainless steel, replaceable seat rings
Flow characteristic: equal percentage (partially modified)

Function:
The valve opens the straightway against outside spring when the differential pressure on the valve plug is rising.
Response pressure: adjustable 1...4 bar with a wrench (width across flats 17 mm)

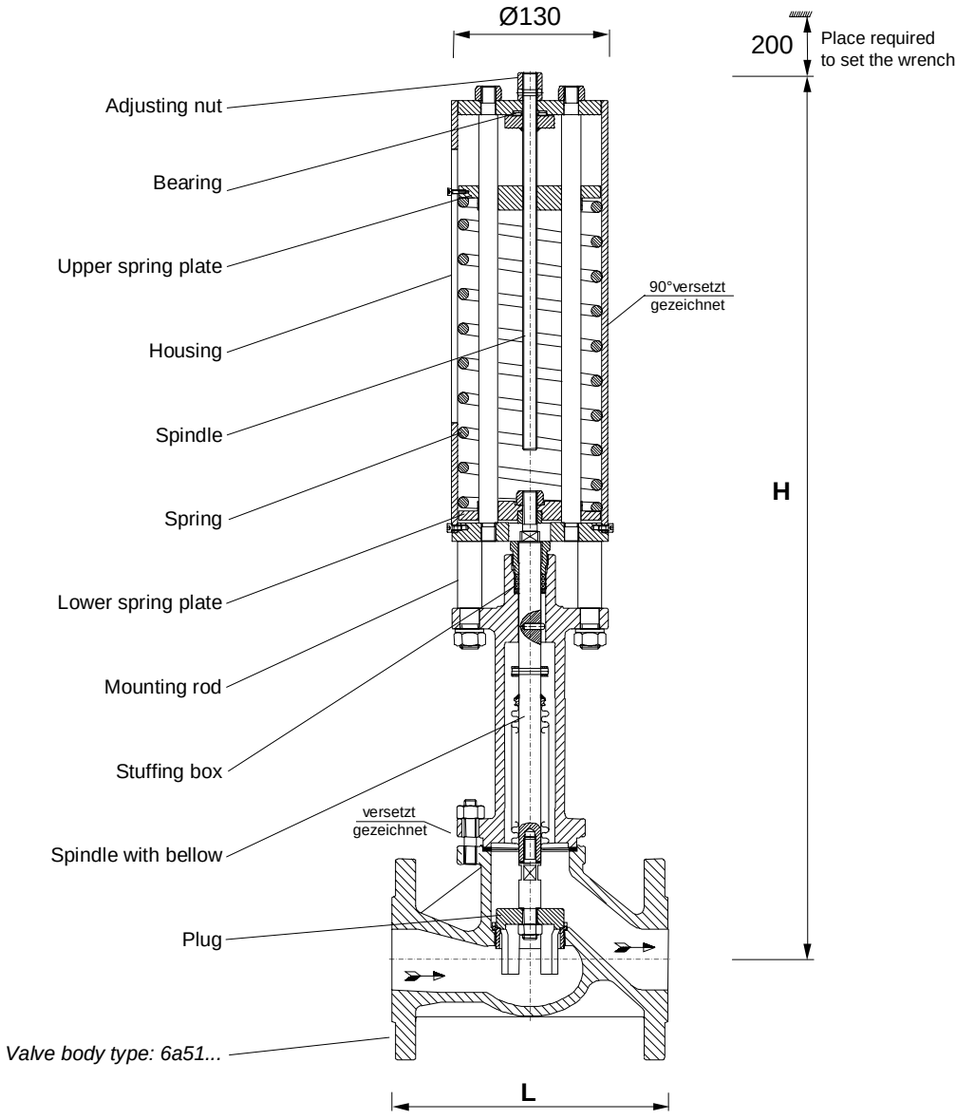
Order text:
Overflow valve in two way form
EN-GJS-400-18-LT, PN . ., DN . ., Kvs . . .
Spindle sealing with bellow
Adjustable overflow pressure 1…4 bar
List-No. 651 . . .

Pressure-temperature rating acc. to DIN EN 1092-2:

by:		-10...50	100	150	200	250	300	350	°C
PN16	EN-GJS-400-18-LT	16	16	15,5	14,7	13,9	12,8	11,2	bar
PN25	EN-GJS-400-18-LT	25	25	24,3	23	21,8	20	17,5	bar

DN	List-No.		Kvs	Stroke
	PN 16	PN 25	m³/h	mm
25	651 402	651 502	10	20
32	651 403	651 503	16	20
40	651 404	651 504	25	20
50	651 405	651 505	40	20
65	651 406	651 506	63	30
80	651 408	651 508	100	30

open printversion



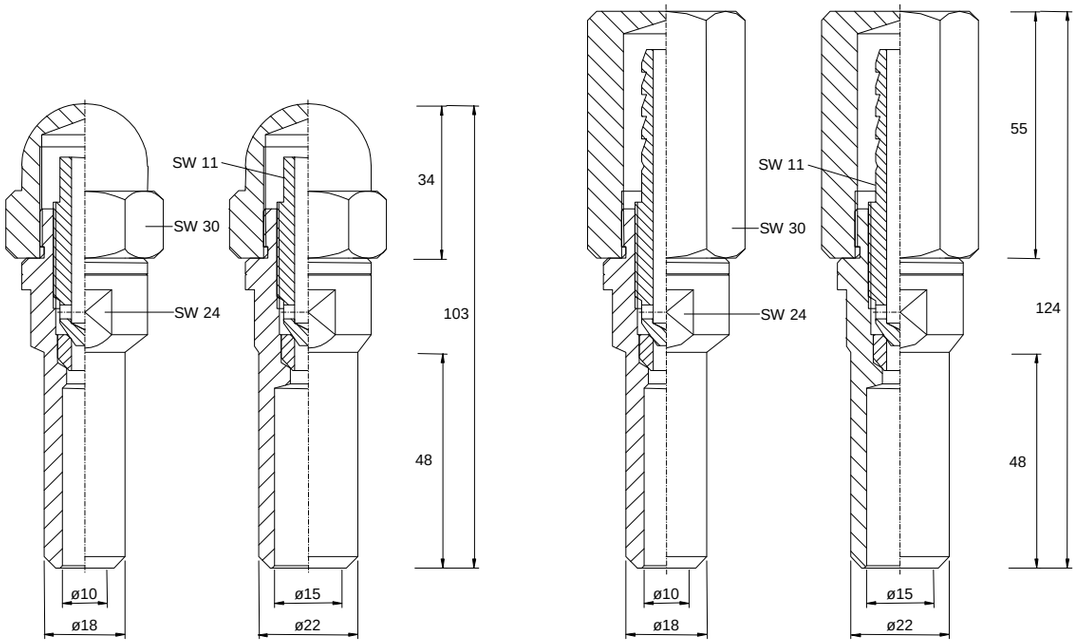
DN	25	32	40	50	65	80
Height H	721	728	732	735	920	921
Length L	160	180	200	230	290	310
Weight kg	15	17	18	21	37	40

open printversion

Air vent valve for heat transfer oil, P250GH (C22.8), PN25

INDEX

1 2 3 4 5 6 7 8 9 0



List-No.: **691 511c** **691 512c** **691 521c** **691 522c**

Technical data:

Body:	P250GH (C22.8)
Seat and plug:	Stainless steel
Locking cap:	Steel, galvanized; SW 30
Pressure range:	PN 25
Nominal diameter:	DN 10, DN 15
Connection:	Weld-on ends
Operation:	Square shaft SW 11
Weight:	0,3 kg (69151.) 0,4 kg (69152.)

Pressure-temperature ratings:

by:	-10…100	150	200	250	300	350	°C
PN 25	25	22	19	18	16	15	bar

Type summary:

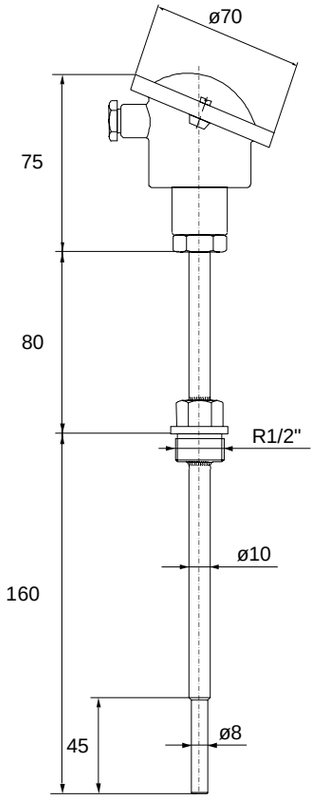
List-No.	DN	tube nozzle
691511c	10	no
691512c	15	no
691521c	10	yes
691522c	15	yes

open printversion

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0



Screw-in resistance thermometer with terminal head, measuring resistance 1x PT100 fixed built-in
alternatively: replaceable

Technical data:

Sensor:

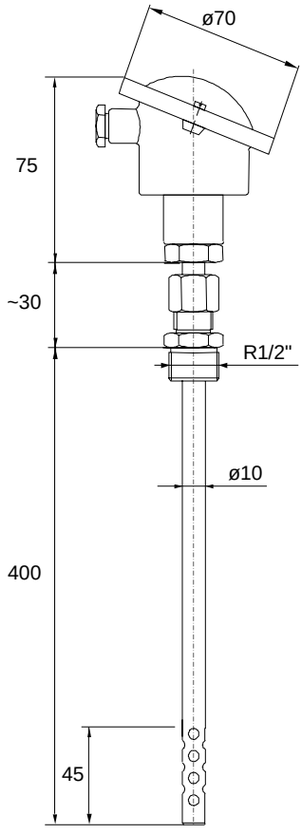
Terminal head:	Form B, aluminium diecast
Max. ambient temperature:	100°C
Max. media temperature:	400°C
Upper tube:	ø10 x 80 mm
Connection:	R 1/2"
Material of sensor tube:	1.4541
Installation length:	160 mm

Measuring resistance:	**List-No.:**	**Reaction times** (water 0,4 m/s)**:** *t05 in s*	*t09 in s*
Fixed built-in	713411	12	40
Replaceable	713411a	15	50

Order text:

Resistance thermometer 1xPT100 DIN
with terminal head form B
installation length 160mm
measuring resistance fixed built-in / replaceable
List-No. 713411 .

open printversion



Screw-in resistance thermometer with terminal head and movable screw joint, measuring resistance 1x PT100 fixed built-in.

Technical data:

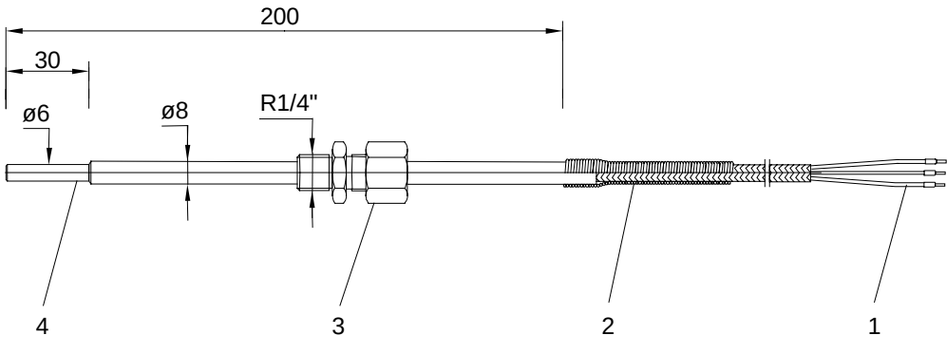
Sensor:

Terminal head:	Form B, aluminium diecast
Max. ambient temperature:	100°C
Max. media temperature:	400°C
Upper tube:	ø10 mm
Connection screw joint:	movable
Connection:	R 1/2"
Material of sensor tube:	1.4541
Installation length:	400 mm, 45 mm perforated
Reaction times (air 1 m/s):	t05 = 50 s t09 = 150 s

Order text:

Resistance thermometer 1xPT100 DIN
with terminal head form B
installation length 400mm
measuring resistance fixed built-in
List-No. 713514

open printversion



1. Cable terminal
2. Protective spring
3. Screw joint
4. Protective tube

Resistance thermometer, 3-wire-type with slidable screw joint and 3 m fixed PTFE measuring cable with alloy steel schielding and protective spring, wires with cable terminals.

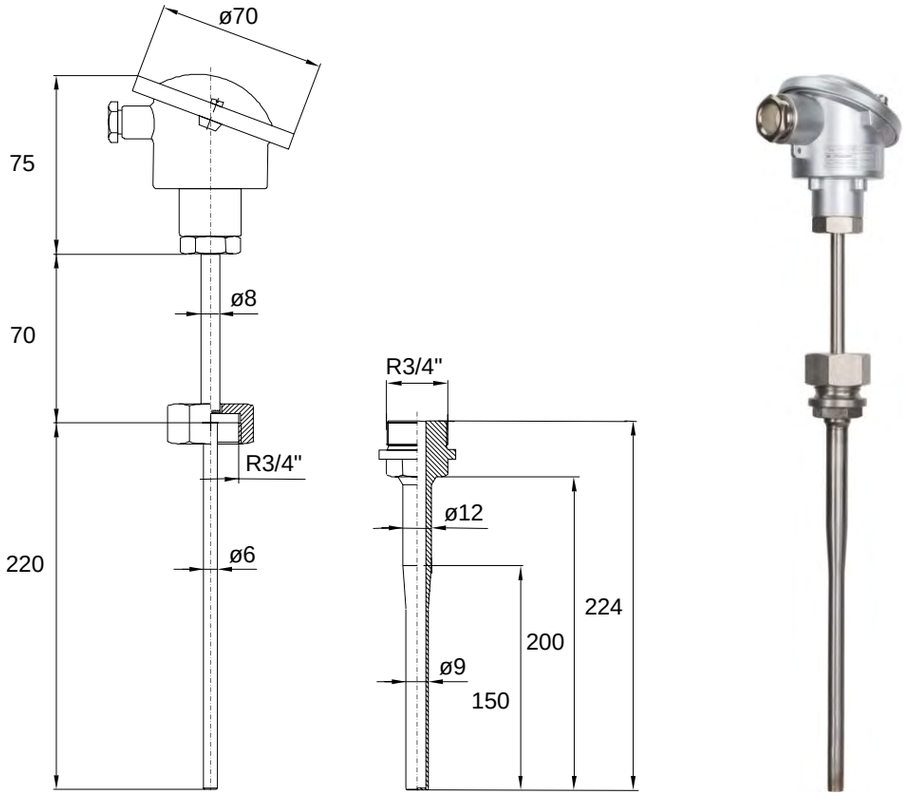
Technical Data:

Measuring jaw:	1 x Pt100 DIN, poured in, vibration safe
Transmit times (air 1 m/s	t_{05} = 50 s $_{09}$ = 150 s
Protective tube:	VA, 200 x 8 mm / measuring tip 30 x 6 mm
Cable:	3 m PTFE measuring cable for max. 280°C
Protective spring:	VA, 40 mm
Screw joint:	R 1/4"

Order text:

Resistance thermometer 1 x PT100 DIN
with 3m fixed PTFE measuring cable,
three-wire-type,
VA-protective tube 200 x 8 mm / 30 x 6 mm,
slidable screw joint R 1/4"
List-No.: 714 400p3

open printversion



Screw-in resistance thermometer with additional immersion shell. Component tested for heat transfer oil installations acc. to DIN 4754

Technical data:

Sensor:

Terminal head:	form B, aluminium diecast
Max. ambient temperature:	100°C
Max. media temperature:	400°C
Upper tube:	ø8 mm
Connection:	Cap nut R 3/4"
Sensor tube:	1.4541, 220 x ø6 mm
Reaction times (water 0,4 m/s):	t05 = 40 s t09 = 120 s

Immersion shell:

Material:	St 35.8
Installation length:	200 mm
Max. media temperature:	400°C

Types overview:	**List-No.:**
Resistance thermometer **1**x PT100 DIN incl. immersion shell of St 35.8	715712
Resistance thermometer **2**x PT100 DIN incl. immersion shell of St 35.8	715722

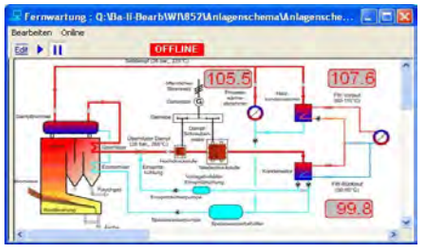
open printversion

Programmable logic control

Switching and monitoring devices

Accessories

Programmable functional units KFM 802.



Visualisation of custom specific installation- and process schemes with KFM PCS

General:

KFM 802.. is a modular expandable compact- control for medium size control tasks in housing for DIN rail mounting. Required hardware can easily be added to the programmable logic control as an assembly modul.

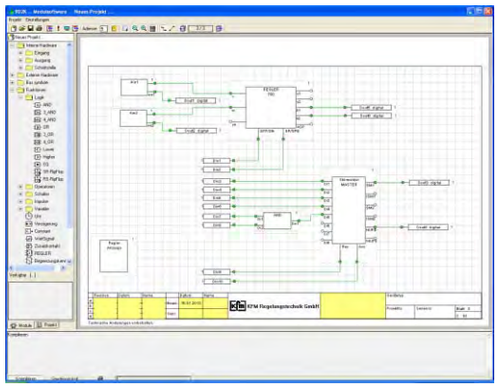
The special advantage of this series lies in the fact that there is no specific programming knowledge required. Configuration, operating, and visualisation take place with PC / IPC using the supplied software.

The devices are optionally put together and programmed ready for operation according to the customers´ needs.

Graphical programming software for easy configuration:

The KFM module software provides the creation, visualization and parameterization by graphical elements of projects based on the device series 803..

Possible range of functions (extract):
Impulse-, switching-, logic or control functions, also custom specific, operators, interface functions, real time clock.



Module overview

Basic modules:

802620	CPU- module

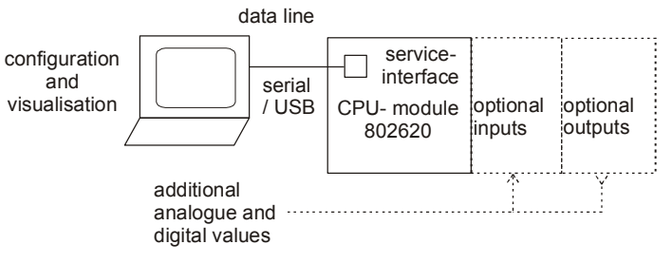
Power supply modules:

802500	Power supply module 100-230V AC
802508	Power supply module 24V AC or DC

Additional modules:

802220	Module with 2 analogue inputs Pt100 / stand. signal, range 0..400 / adjustable
802280	same as 802220, but range -200..+800 / adjustable
8023801	Module with 8 binary inputs 230VAC,1 relay contact (pot. free changeover)
8023881	Module with 8 binary inputs 24VDC,1 relay contact (pot. free changeover)
802750	Module with 5 relay outputs (changeover, max. 250V 2A)

Flow chart:



open printversion

Interfaces:
1 x service interface KFM 2.0 (TTL), CPU-module 802620 only

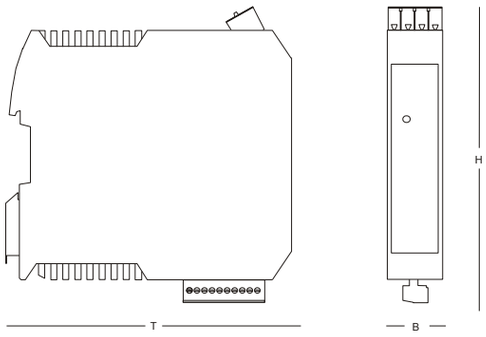
Technical data:

Mains connection:	100..250 VAC, about 12 VA, alternatively 24VDC, about 12 VA
optional: bin. inputs:	230 VAC, about 2 mA, alternatively 24VDC, about 2 mA
optional: anal. inputs:	Pt100/ standard signal, range 0..400 resp. -200..+800°C / adj.
optional: relay output:	230 V / max. 2 A
optional: anal. output:	0/4…20 mA, 0/2…10V (load <= 500Ω)

Other operating data:

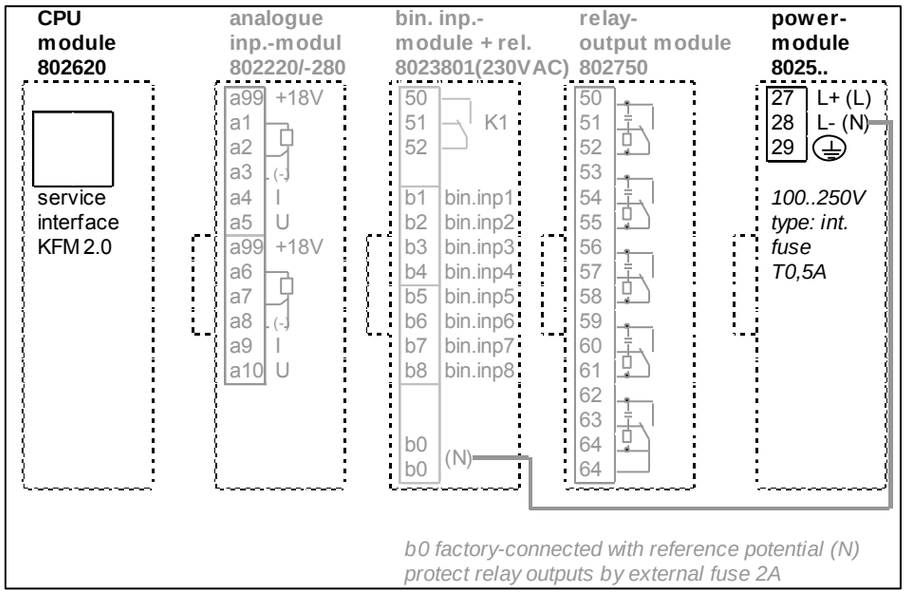
Housing:	for fastening to 35mm mounting rail
Installation orientation:	vertical, unlocking tab downwards
Type of protection:	IP20
Perm. ambient temperature:	0...60°C,
Nominal temperature:	20°C
Climatic category :	Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC:	refer to EN 61326

Installation dimensions (each module)



H= 124mm, B = 22,5mm, T = 116mm

Wiring diagram: (Example, valid for each delivered device is the wiring diagram on its casing only.)



open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

programmable logic control KFM 803

Hardware-expansion modules 852..,

General:

KFM 803 is a compact- control with integrated, arbitrary expandable hardware, for medium size control tasks.

The special advantage of this series lies in the fact that there is no specific programming knowledge required. The graphical programming software provides the creation of applications in a quick and easy way. Furthermore, operating and visualization is integrated in the the device- version 803, so that separate operating- and display units are unnecessarry. Optionally with touch operation.

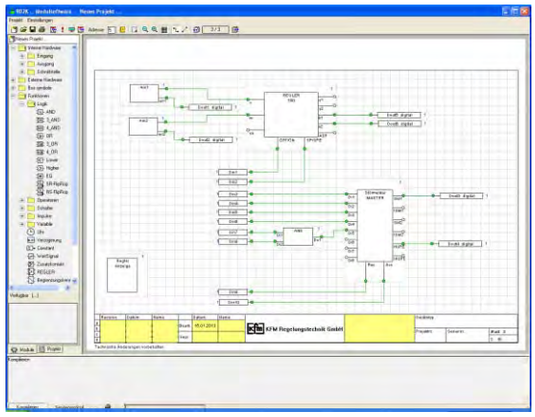
The housing in control panel format 96x96mm contains a variety of possible analogue and binary in- and outputs and other additional functions. There are several interface- adapters for the communication with control systems available. The display is switchable from the normal view (values, status) to pages for data logger, binary message lists, history or further, custom specific pages as well as ready to use elements and bitmaps.

The devices are optionally programmed ready for operation according to the customers´ needs.

Graphical programming software for easy configuration:

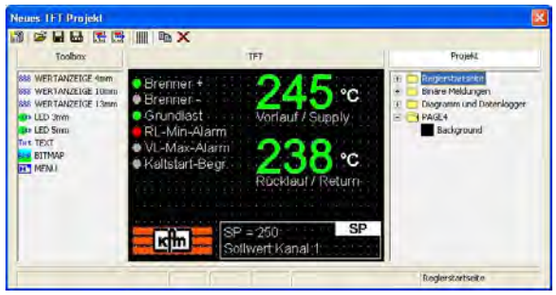
The KFM module software provides the creation, visualization and parameterization by graphical elements of projects based on the series 803..

Possible range of functions (extract):
Impulse-, switching-, logic or control functions, also custom specific, operators, interface functions, real time clock.

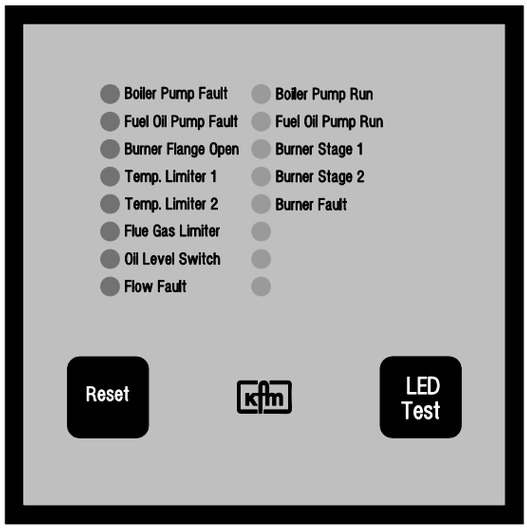


Configuration of the controller display:

The factory- preadjusted display pages of the TFT-display can be optionally freely designed. Process indicated diagrams and custom specific logos can be uploaded as a bitmap file easily.



open printversion



General description:

Compact unit in the 96 x 96 mm switch panel format for operating and fault messages in control and monitoring systems.

Faults are displayed by red LEDs on the front panel, operations are displayed by green LEDs. (Optional colours can be supplied).

Operating displays are triggered by contact inputs and have a mere display function.
In addition, fault messages entail an internal, automatically interlocking alarm circuit (relay k1).

The 'reset' - button releasing the alarm locking situation is mounted on the front panel, together with a lamp-test button. One further optional button can be provided.

The legend film is behind the front film and can be accessed following the removal of the front frame. Legends can either be produced by the supplier according to instructions, or by the user on a laser printer or copier.

Types (Examples):

821 0016a	16 operation displays
821 0808a	8 malfunction warnings, 8 operation displays
821 1006a	10 malfunction warnings, 6 operation displays
821 1600a	16 malfunction warnings
...e	Option first- value message

Additional devices:

Type addition **"i."**	all malfunction indication inputs with inverted function for message chains
Type addition **".z"**	all malfunction indication inputs with 5 sec time delay
821 9s	Interface

open printversion

Malfunction alarm display with single inputs
Type KFM 821

Functions:
Operating displays have a mere display function. Their display is by green LEDs (optional colours can be supplied).

Fault messages are grouped as a multi-input fault warning message by relay k1. When a fault has occurred on one of these inputs, the collective relay is switched off, the attendant red LED flashes. Once the *Reset button* on the front is actuated, the fault warning LED has steady light now. *Following* the remedy of the malfunction, the fault warning LED extinguishes and the collective relay is switched on again automatically.

Normal logic: In the event of further faults occurring in addition to existing faults, the LEDs of all faults that have already been acknowledged will have steady light, whilst the LEDs of the messages that have not yet been acknowledged will flash. The collective relay is switched on for a short time (about 2 sec.) additionally.

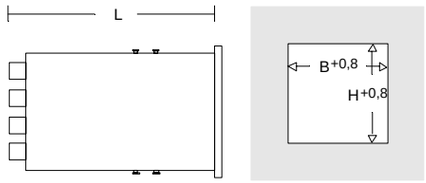
Option “first-value message” (type add-on ...e): In the event of a further fault occurring in addition to an existing, not yet acknowledged fault, the LED of the new fault message will have steady light, whilst the LED of the first fault message will continue to flash.

The button "LED test" is intended for a light diode function check.

Technical data:

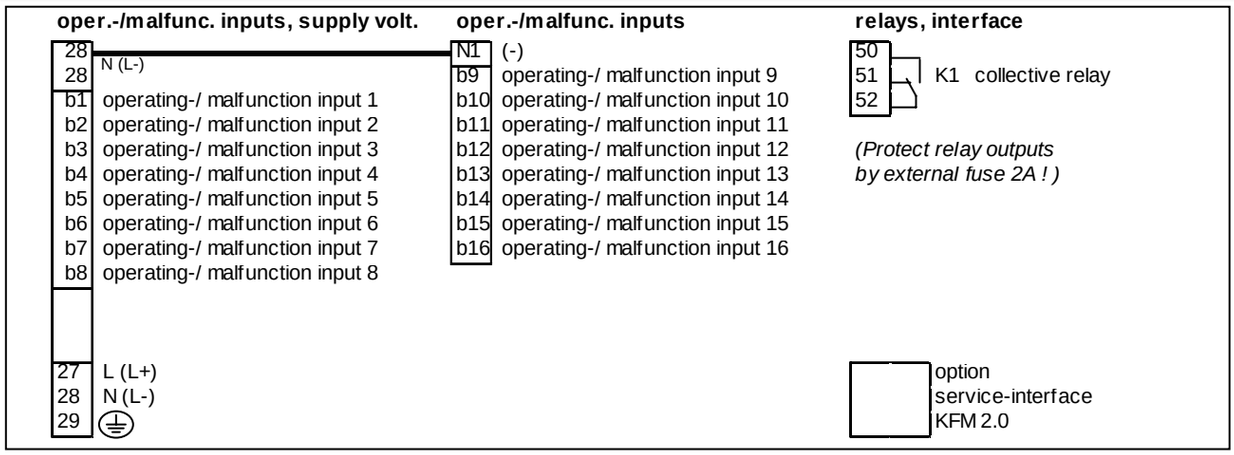
Operating- and fault- Display Inputs :	230 V, 48...62 Hz
Input current :	2 mA
Supply voltage :	230 V, approx. 3.5 VA
Relay outputs :	potential free change-over contacts for max.230 V / 2 A
Type of protection acc. DIN 40050 :	IP 54 (terminals IP 20)
Permissible ambient temperature :	0...60°C, nominal temperature: 20°C
Service position :	optional
Permissible relative humidity :	75 % average annual value (group F DIN 40040), without dew formation

Installation dimensions:



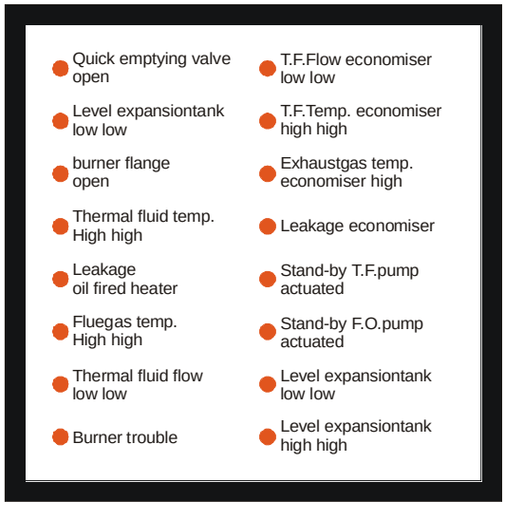
L = 150 mm, B = 92 mm, H = 92 mm

Connecting diagram:
(Example: 821 0808a, depending on sub type there may be some additional details or some details are missing ; valid for each version is the wiring diagram on its casing only.)



open printversion

INDEX
1
2
3
4
5
6
7
8
9
0



General description:
Compact device in 96x96 mm switch panel format for operating and malfunction indication in control and monitoring equipment.

Red LED's are used to indicate malfunctions, yellow for pre-alarms and green for operating indications on the front plate (other colours are possible as options).

Operating indications are controlled by contact inputs, and have a pure display function;
In addition, pre-alarms are switched to a collective relay.
Malfunction indications also initiate an internal, self-latching alarm circuit, switched to a collective relay.
Furthermore an additional relay exists for new value messages.

All operating functions are routed on terminals. The functions "Reset" and "LEDTest" are available by connecting external keys. This allows for each operating function also to be executed on multiple devices by a common key.

The labeling is done by the manufacturer with adhesive labels, according to customised specifications using a template file.

Type summary:

Type	Malfunction indications	Pre-alarms	Operating indications	Collective relay	Collective relay pre-alarms	New value relay	Keys
822 004.na	0	0	4x4	0	0	0	1
822 040.na	0	4x4	0	0	1	0	2
822 103.na	1x4	0	3x4	1	0	1	2
822 202.na	2x4	0	2x4	1	0	1	2
822 211.na	2x4	1x4	1x4	1	1	1	2
822 301.na	3x4	0	1x4	1	0	1	2
822 400.na	4x4	0	0	1	0	1	2
822 000_.....na	*	*	*	1	0	1	2

* = Freely selectable segmentation by two up to maximum 16 operating and malfunction indications (e.g. 822 000_**0214**.na = 2 malfunction indications, 14 operating indications)

model designation voltage (seventh position, e.g. 822 202**8**na**)**

0	230V AC supply voltage, operating / malfunction and external key inputs
8	24V DC supply voltage, operating / malfunction and external key inputs
type addition **".z"**	all malfunction indication inputs with 5 sec time delay
type addition **".i"**	all malfunction indication inputs with inverted logic (failsafe)

Supplementary equipment:

829s	Serial interface according to the KFM protocol 2.0 (service interface, e.g. permits connection of PROFIBUS-DP adapter 99spde.. for transmission of single indications)

open printversion

INDEX
1 2 3 4 5 6 7 8 9 0

Functions:
Depending on type there are operating, pre-alarm and malfunction-displays and -functions existing.

Operating displays have a mere display function. Their display is by green LEDs (optional colours can be supplied).

When a pre-alarm is registered at one of the *pre-alarm* inputs, the pre-alarm collective relay K3 (depending on type) operates and the associated yellow LED flashes.

After the external *reset* key is pressed, the pre-alarm LED now has steady light.

After the pre-alarm has been corrected the pre-alarm collective relay is reset, i.e. it drops out again and the pre-alarm LED goes out.

When a malfunction is registered at one of the *malfunction* inputs, the malfunction collective relay K1 operates and the associated red LED flashes. Additionally the new value relay operates for 3 sec.

After the external *reset* key is pressed, the malfunction LED now has steady light.

After the fault has been corrected the malfunction collective relay is reset, i.e. it drops out again and the malfunction LED goes out.

If another malfunction, in addition to the existing malfunction, occurs, the LED for the malfunction input that has now become active flashes and the new value relay operates for 3 sec.

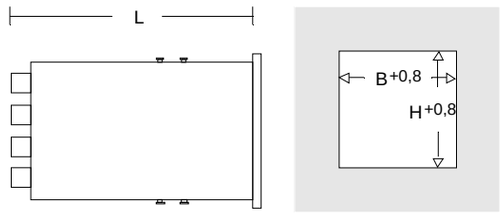
Option "Time delay" (type add-on z): The malfunction signal is only evaluated if it continues for a minimum of 5 seconds. This allows short and intermittent disturbances to be suppressed.

The function "LED-Test" serves to test the function of the light diodes.

Technical data:

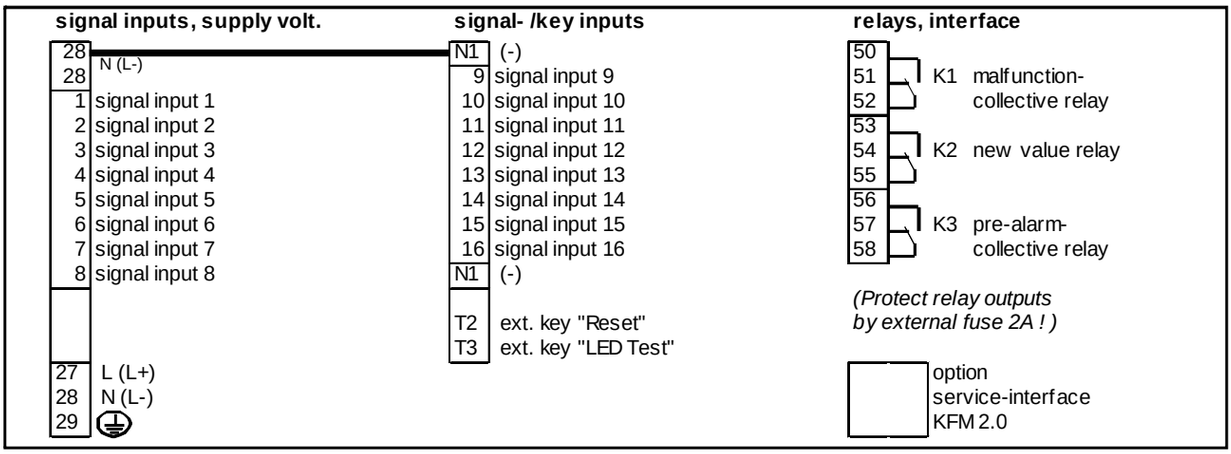
Signal inputs:	230 VAC / 24VDC, approx. 2 mA
ext. key inputs:	230 VAC / 24VDC, approx. 2 mA
Supply voltage:	230 VAC / 24VDC, approx. 3,5 VA
Relay outputs:	230 V / max. 2 A
Protective system EN 60529:	IP54 (terminals IP20)
Permissible ambient temp.:	0...60°C, rated temp. 20°C
Service position :	optional
Relative humidity:	<= 75 % yearly average, no condensation
Climatic category:	KWF to EN 60529
EMC:	referring to EN 61326

Installation dimensions:



Form 96x96: L=150mm, B=92mm, H=92mm

Connection diagram: (example)

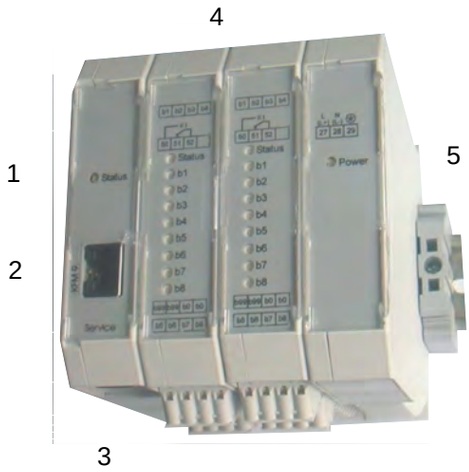


open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

1 Status-LED (CPU-module)
2 RJ-45 connector for KFM controller 902 / 93
3 Configuration interface (service) for PC connection
4 Binary input modules with relay
5 Power-LED (power supply module)



General description:

Compact device for operating and malfunction indication in control and monitoring equipment. In conjunction with KFM-controller 902 / 903 / 93.. operating and malfunction messages can additionally be displayed in plain text-messages on the controller. A message list shows the resp. texts for all activated binary inputs in the order of their occurrence. Additionally, a history can be displayed depending on the version. The messages can be assigned to relays for collective or first-value message optionally.

The device is modular in structure for mounting on DIN rail. It consists of a CPU- and a power-module and, depending on the number of required binary hardware inputs, of one ore more input modules, each with 8 binary inputs and one relay contact implemented as potential-free changeover contact.

The configuration of the inputs, the assignment to the collective relay and the entry of the texts can easily be modificated by WinPKS-PC-software.

Types:

CPU-modules:

826260	CPU-module with interface for plain text-messages
826264	CPU module with interfaces for plain text-messages on devices 902/93 (LC-display) and for the connection of a bus adapter or additional device, for example, profibus or external setpoint.
826265	CPU module with interfaces for plain text-messages and history on devices 903/93 (TFT-display) and for the connection of a bus adapter or additional device, for example, profibus or external setpoint.

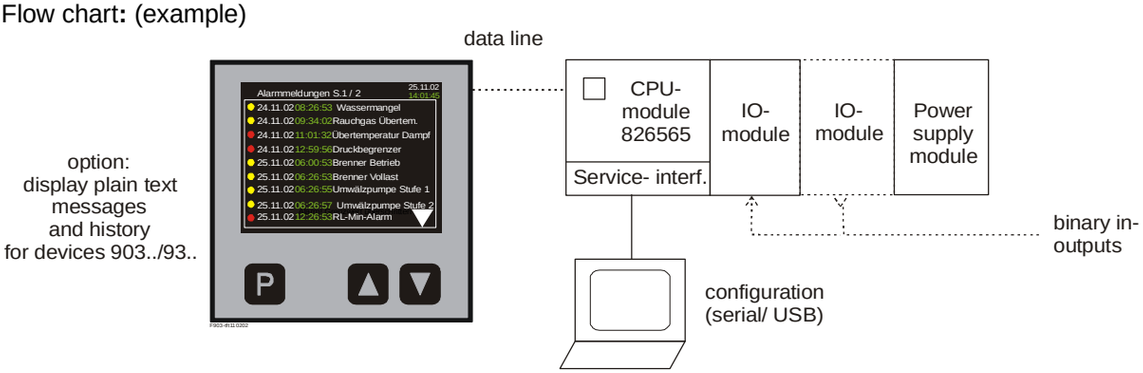
Binary in- output modules:

826230	Module with 8 binary inputs 230VAC,1 relay contact (pot.free changeover)
826238	Module with 8 binary inputs 24VDC,1 relay contact (pot.free changeover)

Power supply modules:

826250	Power supply module 100-230V AC
826258	Power supply module 24V AC or DC

Flow chart**:** (example)



open printversion

Technical data:

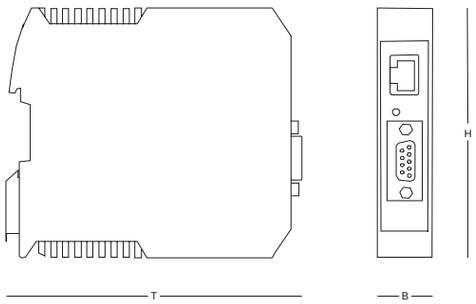
Operating- / malfunction inputs*:	230 VAC, about 2 mA, alternatively 24VDC, about 2 mA
Button inputs*:	230 VAC, about 2 mA, alternatively 24VDC, about 2 mA
Mains connection:	100..250 VAC, about 12 VA, alternatively 24VDC, about 12 VA
Relay output :	230 V / max. 2 A

* = Depending on different wire connention to the terminals, the use of external voltage alternatively to potential-free change-over switches is possible.

Other operating data:

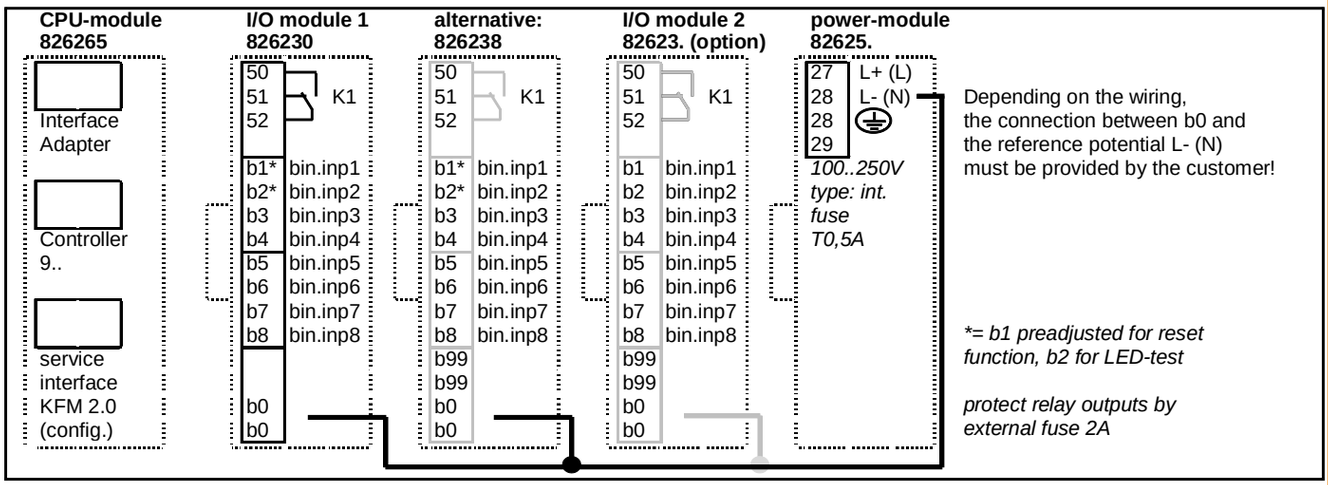
Housing:	for fastening to 35mm mounting rail
Installation orientation:	vertical, unlocking tab downwards
Type of protection:	IP20
Perm. ambient temperature:	0...60°C,
Nominal temperature:	20°C
Climatic category :	Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC:	refer to EN 61326

Installation dimensions (each module)

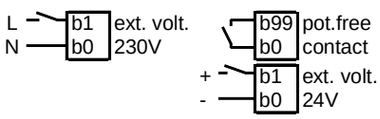


H= 99mm, B = 22,5mm, T = 116mm

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only.)

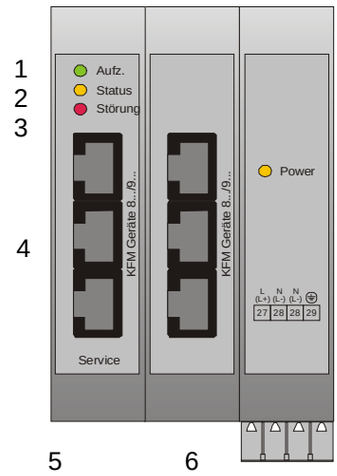


Wiring, example inp. 1:



open printversion

1 Green LED for indication data recording
2 Yellow LED for operation mode indication
3 Red LED for malfunction indication
4 Interfaces for KFM devices
5 Own Service interface
6 Optional interface module



General description:
The KFM 834 data logger product line is used for the continuous recording and storage of operational data of KFM devices like controllers KFM 9.., malfunction alarm displays / alarm panels KFM 82 via a serial interface. Additional analogue and digital data can be handled optionally.

The devices are modular in structure, for mounting on DIN rail. The hardware basic version consists of the CPU-module 834100. and a power-module 85250. and includes 3 interfaces for connection of up to 3 KFM devices. Optional equipment: interface modules for further devices.

The Windows programs DCSLOG for reading the stored data by PC (locally or via modem) and LOGSET for changing the logger parameters are included in delivery. The adapters Type KFM 99szks2 / 4 / u have to be used for the logger`s service interface.

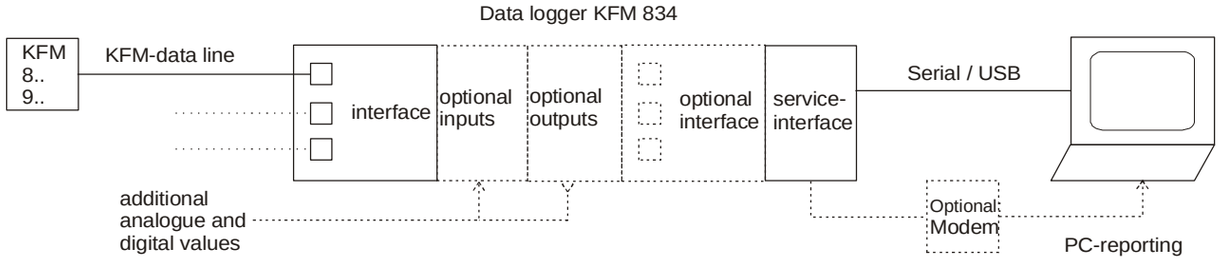
In maximum 24 analogue tracks are available.The recording period is limited by the memory capacity, the number of activated tracks and the recording cycle (example: with 4 analogue tracks and a recording cycle of 2 minutes the recording period will be about 18 days).

A ring buffer effects continuously the overwriting of the oldest stored data when the max. memory capacity is reached.Optionally an alarm contact can signalise the achievement of a certain memory utilisation ratio.

The devices are modular in structure, consisting of functional- and power supply module, alternatively type version .._i can directly be used with the power supply of already existing KFM-assemblies, e.g. series 8…

Optional equipment: Input modules for analogue and binary input for direct recording, independent from connected KFM-devices, as well as signalising modules with relay outputs (pot. free change-over contacts).

Flow chart:



Type summary:
CPU-module:

834100	Basic model
834130	Basic model, additional interfaces expandable via bus plug

Device variants (last number)

.i	Functional module for connecting power supply of already existing KFM-assemblies *(type 834100 only)*

Power supply module:

852500	Power supply module 100-250V AC
852508	Power supply module 24V AC / DC

Interface module (optional):

834030	3 x KFM interfaces for connection, connection to CPU-module via bus plug

Interfaces:
3 x KFM-devices, (optionally expandable via interface module) baudrate 9600,19200 and 38400 bit/s, connection via enclosed connecting cable.

1 x service, transfer rate 38400 bit/s for operation, data transfer and configuration.
Connection via external interface adapter for RS232, RS485 or USB (KFM-Type 99szks2 / 4 / u) resp. without access to stored data for Profibus (KFM-type 99spde.) or Modbus (KFM-type 99sm.).

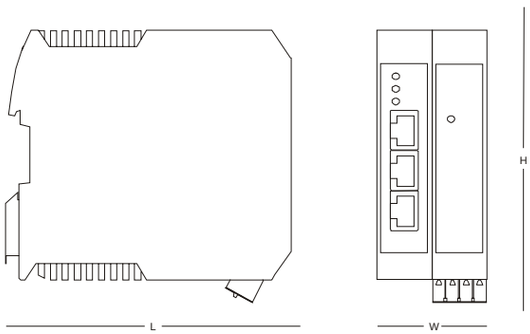
Technical data:

Power supply:	100..250 VAC, approx. 12 VA, alternative 24V AC / DC, approx. 12 VA
optionally: binary inputs:	230 VAC, approx. 2 mA, alternative 24VDC, approx. 2 mA
optionally: relay outputs :	230 V / max. 2 A

Other data:

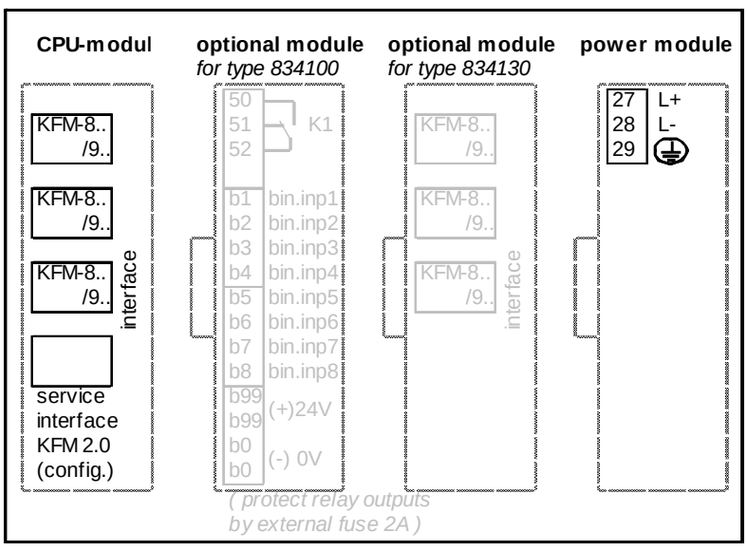
Housing:	For DIN rail
Installation orientation:	vertically, locking tab points downward
Type of protection acc. EN60529:	IP20
Permissible ambient temperature:	0...60°C,
Nominal temperature:	20°C
Relative humidity:	<= 75 % yearly average (according to EN60529), no condensation
EMC:	according to EN 61326

Dimensions (hardware basic version)

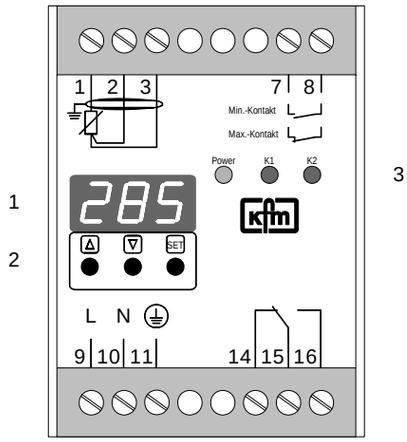


H= 124mm, W = 45mm, L = 116mm

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only.)



1 Digital display of setpoint value
2 Pushbuttons for adjusting the setpoint values
3 LEDs for operating and error indication



General:

Type 842 is a temperature switch with digital display of setpoint value and a configurable contact-function.

The Pt100 measurement input is of the 3-conductor type, so that compensation is automatically provided for cable resistances and ex-barrier units, as an alternative depending on the type there is a standard signal measuring input 0(4)-20mA and 0(2)-10V available.

Depending on the wiring of the binary input the device operates as a min. or max. contact.

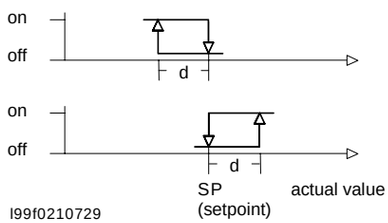
Types:	type suffix
Basic type, measuring input PT100 (0 –400°C)	without
Measuring input standard signal 0(4)..20mA, 0(2)..10V	..e

Function:

After the mains voltage has been switched on, the operating indicator and also LED K1, depending on the actual value, and the setpoint value lights up. Depending on the wiring of the binary input the characteristic of the relay can be inverse or direct, in every case the relay is released if the determined setpoint value has been reached. The relay is switched on again upon exceeding the hysteresis each.

Min. contact: (Terminals 7 and 8 not connected)
Relay K1 switches on if the actual value is lower than the setpoint (minus the hysteresis)

Max. contact: (Terminals 7 and 8 connected)
Relais K1 switches on if the actual value is higher than the setpoint (plus the hysteresis)



Actual value display:

The actual value is displayed as long as the the arrow up key is pressed.

Adjusting the setpoint value:

The mode in which the setpoint value is adjusted is activated by pressing the "SET" button, the displayed value flashes. The new setpoint value can now be adjusted using the arrow keys. The setting mode is deactivated by pressing the "SET" button again. The displayed value ceases to flash, and the adjusted value is adopted as the new set value.

Fault:

The relay is switched off if there is a fault at the measurement input. Then the display shows "---" in the actual value display mode.

Adjusting the parameters:

The mode in which the first parameter switching hysteresis "d" can be configured is entered by holding the "SET" button for 5 seconds. The display shows the short name "d" in the first position and the currently adjusted value flashing in the second and third position. The desired new value can now be adjusted using the arrow keys. By pressing the "SET" button again the adjusted value is adopted as the new switching hysteresis and, depending on the type, the mode in which the next parameter can be configured is entered. At the last parameter the device reverts to its normal operation status display after pressing the "SET" button again.

Settings in detail:
(existence depends on version and type):

Polling:press and hold the SET-button for >5 sec,
release after the display reacts.

		Factory setting:	*Notes:*
d	Hysteresis (switching difference on/off)	*8 (Type: ..e: 0,5)*	___
n	Number of decimal places of the display "-1 / 0 / 1" * (If "-1" is configured each parameter L / H is automatically multiplied by 10 for the actual value display!)	*1*	___
L / H	start / end of display range (dep. on the number of dec. places) *	*0.0 / 8.0*	___
A	Input type: "i0: 0-20mA / i4: 4- 20mA / u0: 0-10V / u2: 2...10V" * (note different terminals for I/U!)	*4...20 mA*	___

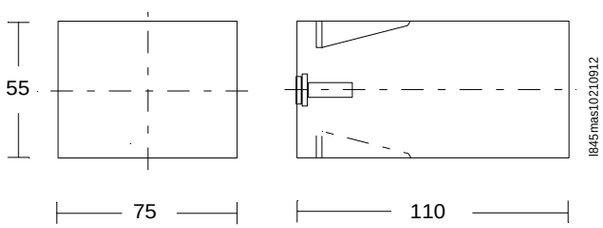
** only with input voltage / current*

***return** to operating mode*:
briefly press the SET-*button*

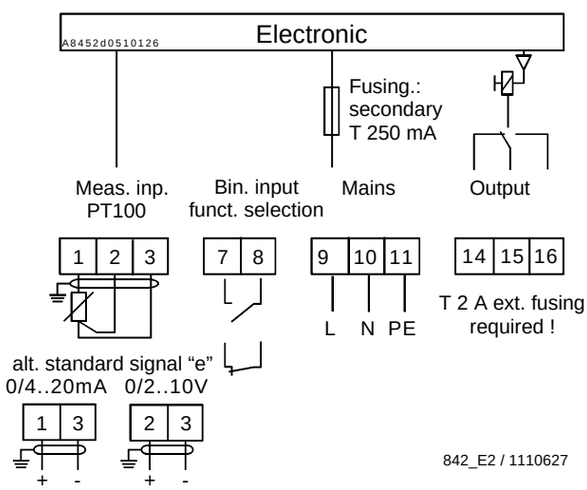
Characteristic values:

Analogue input:	1 x Pt 100 DIN, three-wire techniques, standard signal alternatively
Measuring range	0 ... 400 °C resp. adjustable
Adjusting the setpoint values:	Using recessed push-buttons
Output:	1 relay, max 250 V 2 A
Switching hysteresis:	adjustable, 1 .. 99 K
Housing:	For fastening to 35 mm mounting rail, or for screw fastening
Mains connection:	230VAC + 10 % / - 15 %, 48...62Hz
alternatively:	115 VAC, 48 VAC, 24 VAC
Power consumption:	Approx. 4 VA
Fusing:	Secondary side, T 250 mA
Type of protection acc. EN 60529:	IP 20
Permissible ambient temperature:	0...60°C
Nominal temperature:	20°C
Storage and transport temperature:	-20 ... + 80 °C
Climatic resistance:	Relative humidity <= 75 % annual average without condensation
Electromagnetic compatibility:	In accordance with EN 61326, industrial requirements
Installation orientation:	optional

Installation dimensions:



Connection diagram:



INDEX

1
2
3
4
5
6
7
8
9
0

1 Digital display of set value
2 Pushbuttons for adjusting the set values recessed and sealable
3 Internal reset pushbutton
4 LEDs for operating and error displays
5 Function check button

DIN assembly tests:

STB 1146 S	ref. DIN EN 14597
SIL2	ref. IEC 61508
CE 0045	ref. rule 97/23/EG, modul B and D

General:
Two-channel self-monitoring safety temperature limiter, constructed to meet the requirements for increased safety (DIN EN 14597, SIL 2).

The electrical safety circuit is switched off, i.e. opened, if the set value is exceeded or if there is a fault at the measurement input or in the device. A fault signal is also provided at the terminals. The limiter can only be unlatched manually after the fault has been rectified.

The Pt100 measurement input is of the 3-conductor type, so that compensation is automatically provided for cable resistances and intermediate explosion arresters.

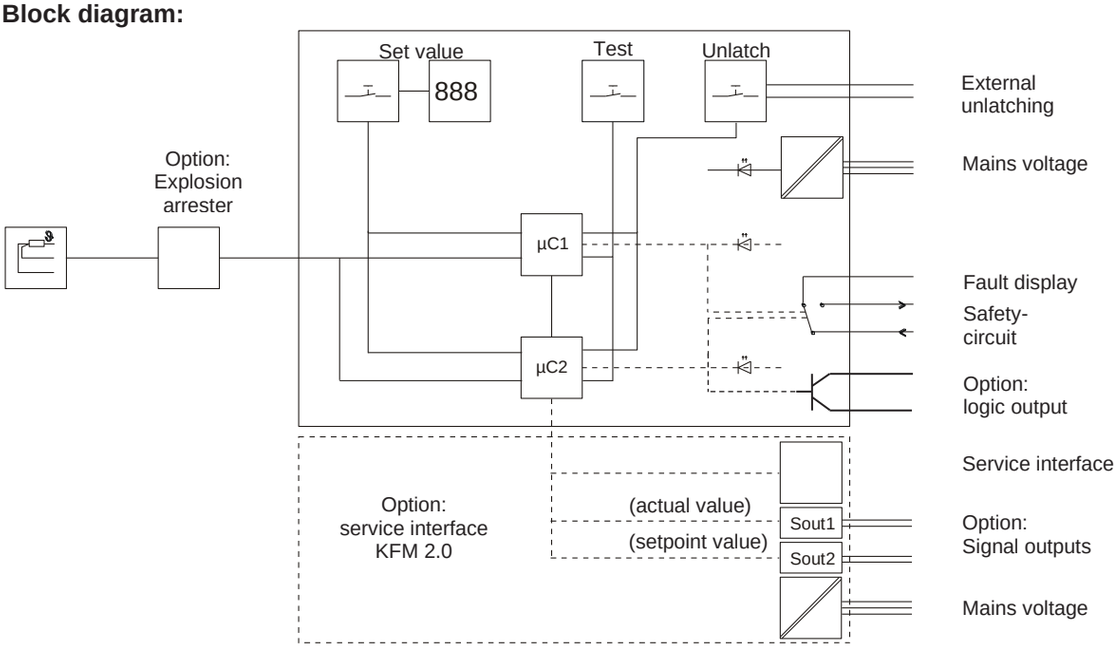
The device includes test buttons with which the specified annual function checks can be carried out very conveniently, without having to disturb the connected cables.

Actual- and setpoint value as well as the status of the relays can be transmitted by using the optional service interface (extra module), actual- and setpoint value can additionally be transmitted by optional signal outputs. In conjunction with external adapters also with Profibus, Modbus, Ethernet etc.

Models:

845 210	Model without display
845 220	Model with display
845 2.1	Model with additional logic output
845 2….-849s	Model with service interface, protocol KFM 2.0
845 2….-849og2	Model with 2 signal outputs 4..20mA
845 2….-849sog2	Model with service interface and 2 signal outputs 4..20mA
Suffix (also extra module)	without: 230V AC, 01 = 115V AC, 02 = 24V AC, 08 = 24V DC

Block diagram:



open printversion

INDEX

1 2 3 4 5 6 7 8 9 0

Acceptable sensors:
All temperature sensors demonstrably according to DIN EN 14597 are acceptable. Please observe the specifications about type, application range, installation conditions and time constant in the VDTÜV datasheet.

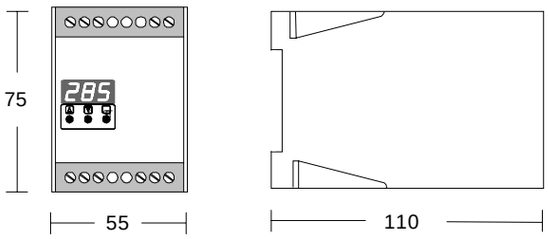
Type	Operating medium	Maximum switching point	Protection tube
713 4..	Liquids	400 °C	Without immersion sleeve
713 5..	Air and exhaust fumes	400 °C	Without immersion sleeve
715..	Liquids	400 °C	Only use protection tube supplied

Characteristic values:

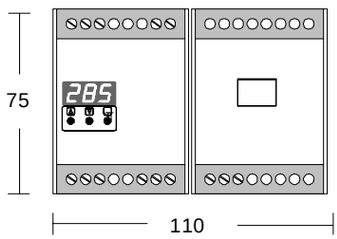
Input / Measuring range:	1 x Pt 100 DIN / -200 ... + 600 °C, others optional
Set value adjustable range:	*Note: Observe the sensor's switching point!* Type 845 210: -200 °C (+10K) ... 600 °C (-10K) Type 845 220: -99 ... 600 °C
Adjusting the set values:	Using recessed, sealable push-button
Output:	2 relays, max. 250 V 2 A*, Option: 1xLogic (open coll. max 24VDC/100mA) status display ch. 1 Option: 2 cont. outputs 4...20mA (Load<=500Ω) for actual-/ setpoint value
Switching hysteresis:	8 K +/- 1K, other values available on request (expressed as appendix to type identifier in plain text, e.g. 845 220 4K)
Process safety time (PST):	10 seconds
Housing:	For fastening to 35 mm mounting rail, or for screw fastening
Mains connection:	230VAC + 10 % / - 15 %, 48...62Hz, alt. 115 VAC, 24 VAC, 24VDC
Power consumption:	Approx. 4 VA
Fusing:	Secondary side, T 250 mA
Type of protection acc. EN 60529:	IP 20, for mounting within a housing offering at least IP 40
Permissible ambient temperature:	0...60°C, Nominal temperature: 20°C
Storage and transport temperature:	-20 ... +80 °C
Climatic resistance:	Relative humidity <= 75 % annual average without condensation
Electromagnetic compatibility:	In accordance with EN 61326, industrial requirements
Installation orientation:	optional
Data transfer rate:	9600Bit/s

Installation dimensions:

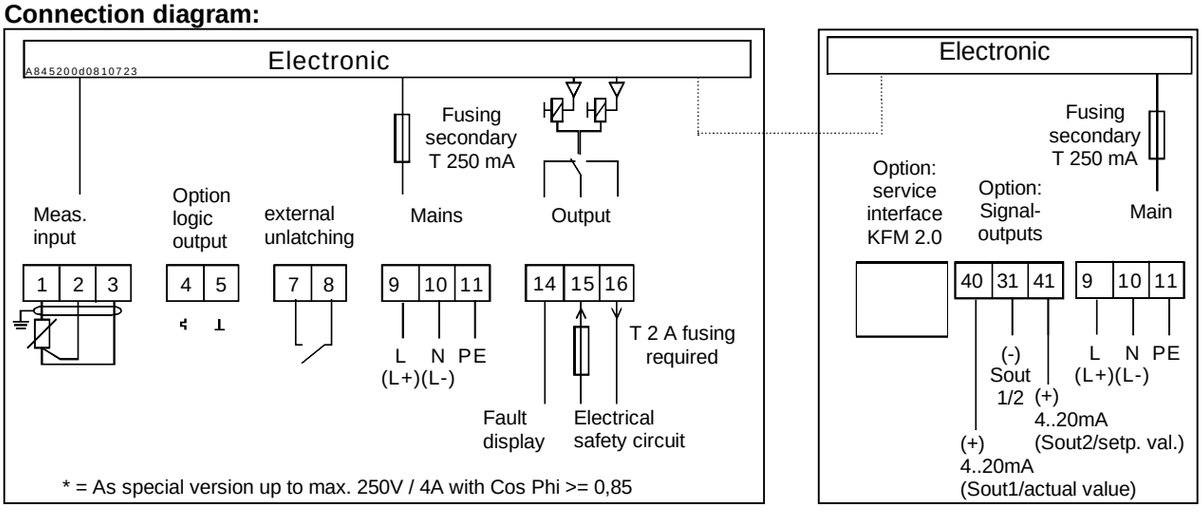
Only safety temperature limiter:



Safety temperature limiter incl. service interface / signal outputs



Connection diagram:

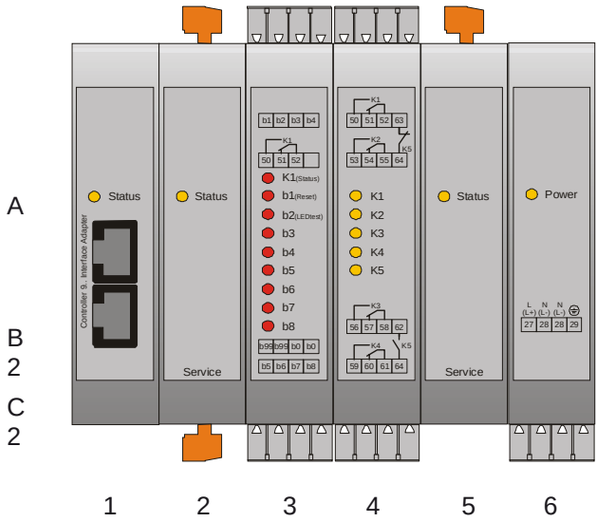


open printversion

INDEX

A Status-LED (depending on the module)
B Connection interface for
KFM controller 903 / 93
C Interface, only KFM-service
(analogue input module)

1 Hardware expansion adapter (852610)
2 Analogue input module (8522..)
3 Binary input module with relay cont. (8523..)
4 Relay output module (8527..)
5 Analogue output module (8528..)
6 Power supply module (8525..)



General description:

The modular hardware expansion modules are used to enlarge the built-in hardware of KFM-devices by adding additional in- and outputs.
For connection to external KFM-devices, e.g. controller series 903K or devices equipped with interface 99s610, module-sided the module 852610 is necessary, which connects all further modules. Optionally, a field bus adapter can be connected to the CPU module (interface “interface adapter”).
Alternatively, expansion modules can be connected to independent DIN rail modules directly, e.g. module 852620 (only for data acquisition), data logger 834.. or modular malfunction alarm display 826..

Module overview:

CPU- modules:

852610	Hardware expansion adapter for KFM-controller
852620	Independent module for data acquisition
852621	Freely configurable data processing module

Power supply modules:

852500	Power supply module 100-230V AC
852508	Power supply module 24V AC or DC

Analogue modules:

852220	Module with 2 analogue inputs Pt100 / stand. signal, range 0..400 / adjustable
852280	same as 852220, but range -200..+800 / adjustable
85228e4m8	Module with 4 anal. inputs stand. signal 0/4..20mA, range adj., connection M8 sockets
852820	Module with 2 analogue outputs 0/4...20mA

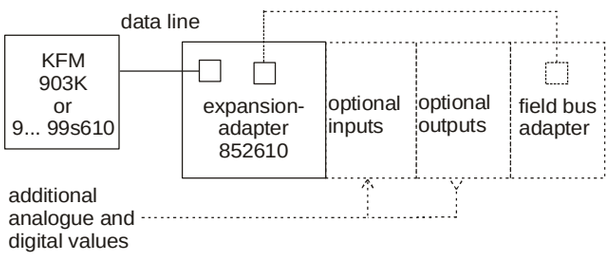
Digital modules:

8523801	Module with 8 binary inputs 230VAC,1 relay contact (pot. free changeover)
8523881	Module with 8 binary inputs 24VDC,1 relay contact (pot. free changeover)
852750	Module with 5 relay outputs (changeover, max. 250V 2A)

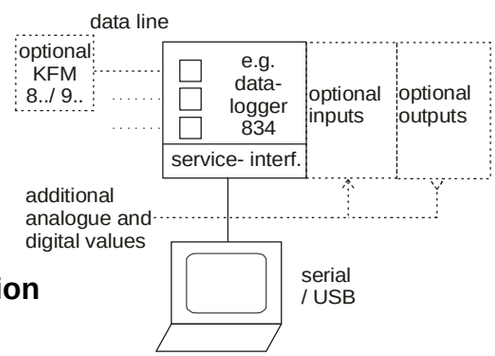
Device variants (last number):

.0i1	Single-sided connection for internal bus connection only

Flowchart: with Hardware expansion adapter



with independent functional module



open printversion

INDEX

1 2 3 4 5 6 7 8 9 0

Interfaces:
1 x KFM-device 903K or 9.. 99s610 (only hardware expansion adapter 852610), connection via the supplied cable, 1x interface adapter

Only 8522..: 1 x TTL, protocol KFM 2.0, only for KFM- service

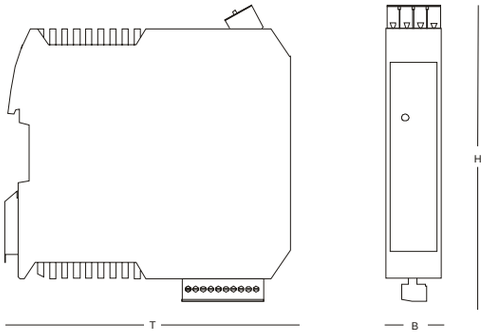
Technical data:

Mains connection:	100..250 VAC, about 12 VA, alternatively 24VDC, about 12 VA
optional: bin. inputs:	230 VAC, about 2 mA, alternatively 24VDC, about 2 mA
optional: anal. inputs:	• Pt100/ standard signal, range 0..400 resp. -200..+800°C / adj. • Potentiometer 0…100/1000Ω / standard signal, range adjustable
optional: relay output:	230 V / max. 2 A
optional: anal. output:	0/4..20mA (load<=500Ω) as control or signal output

Other operating data:

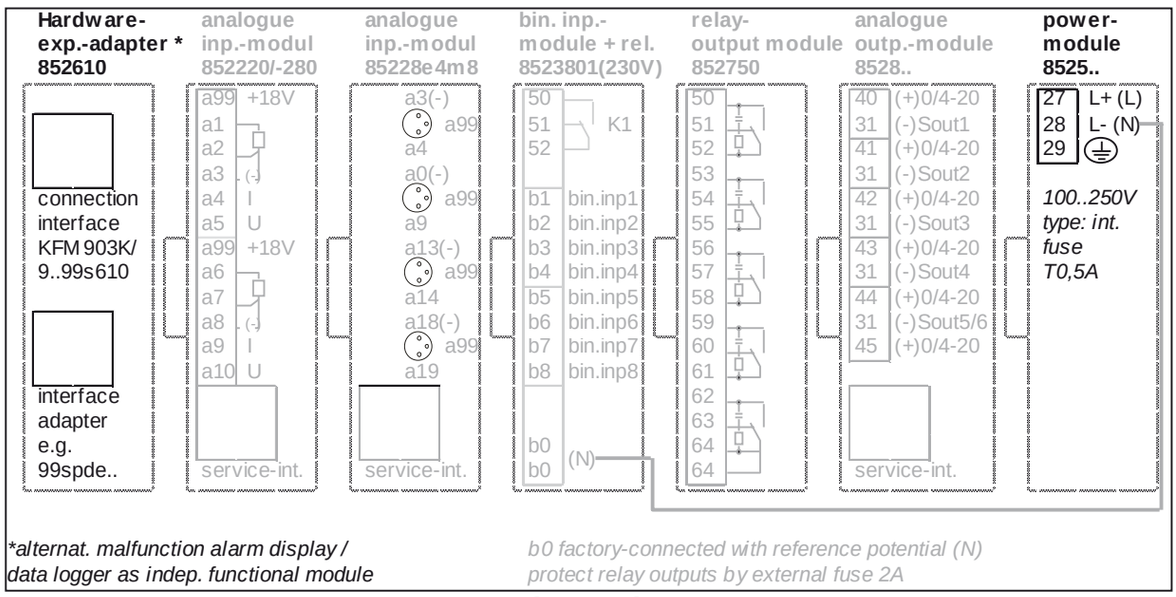
Housing:	for fastening to 35mm mounting rail
Installation orientation:	vertical, unlocking tab downwards
Type of protection:	IP20
Perm. ambient temperature:	0...60°C,
Nominal temperature:	20°C
Climatic category :	Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC:	refer to EN 61326

Installation dimensions (each module)

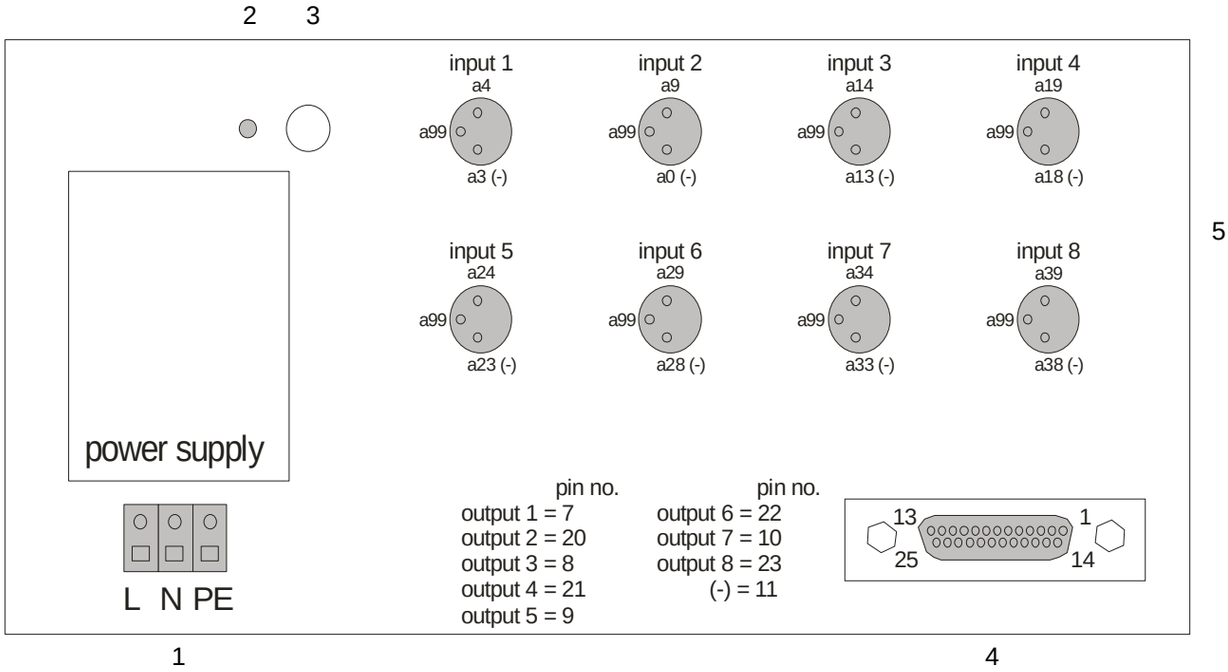


H= 124mm, B = 22,5mm, T = 116mm

Wiring diagram: (Example, valid for each delivered device is the wiring diagram on its casing only.)



open printversion



1 power supply terminals
2 power LED
3 fuse (T 0,2 A)
4 outputs D-Sub 25 socket (0..5V)
5 inputs 8 x M8 sockets (4..20mA)

General

The electronic measuring transducer 899.. converts incoming signals linear from 4..20 mA to 0..5 V output signals. A maximum of 8 channels is available. The signal can be connected active or passive (supply by circuit board) depending on the wiring. Signal lines must be laid with shielded cables. To avoid cross interference, do not lay close to live components or lines. Lay the shield to ground potential on one end.

The connection of the 4-20mA input signals is made by eight M8 sockets, the 0..5 V output signals are available on a D-Sub 25 socket.

The operational readiness is displayed by a green led if the power supply is connected.

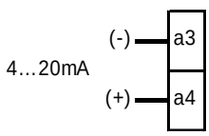
The device is working without any user intervention, it is intended for mounting on standard rails.

Tecnical data:

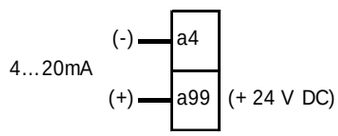
Input:	8 x 4...20mA, active or passive signal alternatively
Output:	8 x 0...5V, load > 500 Ohm (filter 100Ω/10nF)
Power supply:	100..250 VAC, about 15VA
Permissible ambient temperature:	0...60°C, nominal temperature 20°C

Connections, examples apply to input 1:

A) external supply



B) supply by circuit board



open printversion

Industrial controller with descriptive text display (format 96x96)

Industrial controller with LED display (segment display)

Custom specific industrial controller

Function extensions

Additional equipments and digital communication – see Page 2 –

Operating instructions – see group 0 -

INDEX

Additional equipments

Software

Digital communication

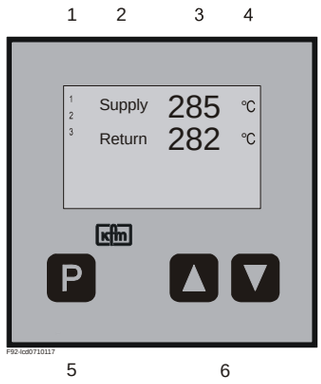
Touch operation

Seite 1

open printversion

Industry Controller, Function extensions – see Page 1 –

INDEX



1 LCD display for relay function
2 Descriptive text for displayed values
3 Digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

certifications: DIN, GL, BV

General:
KFM 902 is an industrial microcomputer-based controller series in control panel format 96 x 96 mm with a performance range of up to 8 relay outputs, various signal inputs and outputs as well as numerous possible optional extras. Communication with control systems is also possible.

All relay contacts are implemented as potential-free changeover contacts. Normally, the N.O. contacts of all relays are internally permanently wired with RC elements. Optionally, the RC elements for relays K1…K3 are led on terminals for the selective connection (N.O. contact factory-connected). The scope of delivery includes plugable terminal blocks.

The transflective LCD indication with white background lighting is easy to read in both light and dark environments. In operating mode up to 4 values (actual values, setpoint values, control settings, ..) can be displayed including freely adjustable description text and unit of display. Additional displays for operating and malfunction messages, including the corresponding hardware or custom display masks are optionally available.

Stage controllers and three-point step controllers with auxiliary contact (e.g. burner controller) are fitted as standard with a 2nd measuring input, continuous controllers have an extended measuring input range.

Types *(depending on configuration):*	*Type*
Indicator	9020..
Single-stage controller	9021..
Two-stage controller	9022..
Three-point controller	9023..
Positioner / follow-up controller	9024..
Two-point PID controller	9025..
Three-point PID controller	9026..
Three-point step controller	9027..
Continuous controller	9028..
Continuous controller with 2 outputs	9029..

Sub-types:	*suffix*
Basic function	00
Basic function + 1..8 additional contacts	01..08
Basic function double, triple, quadruple	20,30,40
Logic output 0/24V max 40mA	..L

Function extensions:(*)	
Difference controller	991d
Limitation controller	991g
Cascade controller	991k
Program controller	991p
Ramp setpoint	991r
Malfunction modul	991s
Stage controller	991t

Additional devices:(*)	
Additional analog inputs	(99) a.
External setpoint incl. switching	(99) bwa.
Second setpoint incl. switching	(99) bwz.
Binary inputs for special functions	(99) b..
Further additional contacts	(99) f
Analog signal outputs	(99) o.
Interface by external module for Profibus, Modbus, Ethernet, ..	(99) s..

*See also data sheets 99.. !

Measuring inputs:	Type suffix
(max. 4, depending on version)	
Pt100/standard signal, 0...400°C/adj.	without (or 0)
Pt100/standard signal, -200...+800°C/adj.	99mb14b
Thermal element NiCr-Ni (K)0...1200°C	
Fe-CuNi (J)0... 900°C, PtRh-Pt (S)0...1700°C	qt
Remote resistance transmitter 0…100/1000Ω	qw

Feature for meas. input 2 with equipment external setpoint: Standard signal configurable to ext. setpoint value, the Pt100 input is extra usable

Ranges:
Pt 100: 0..400°C (switching controllers), -200..+800°C (continuous controllers), switchable to °F,
standard signal: Display adjustable -999 to 9999, setpoint range can be limited via menu

Binary inputs:
Max. 20 inputs, alt. for potential-free contacts or for ext. voltage 0 / 24V, for status messages (can optionally be saved) or control functions.

Displays:
Max. 4-four-digit value displays with selectable decimal point, each including adjustable descriptive text and unit of display, optional add. message texts, custom display masks, up to 8 displays for relay functions.

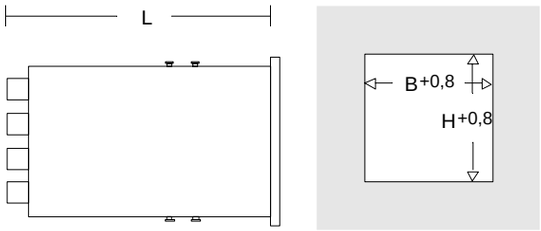
Outputs:
Up to 8 relays as setting outputs or additional contacts, with potential-free changeover contacts, switching power 250V 2A incl. spark extinction (on the N.O. contact)
up to 6 continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω), as setting or signal output
up to 3 logic outputs 0/24V max. 40 mA, alternatively 16 outputs open collector, max 24 V / 100 mA

open printversion

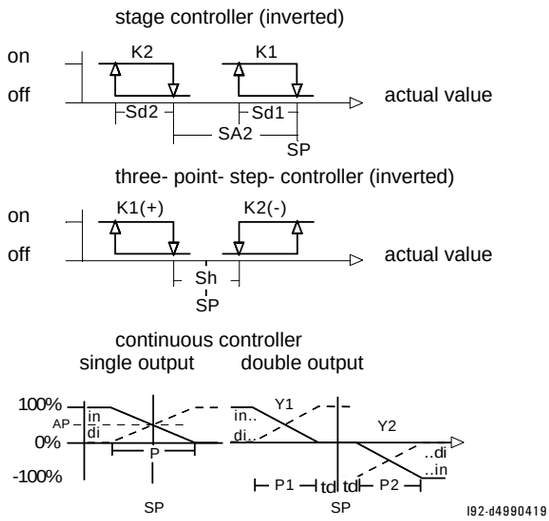
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, code locked,
pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

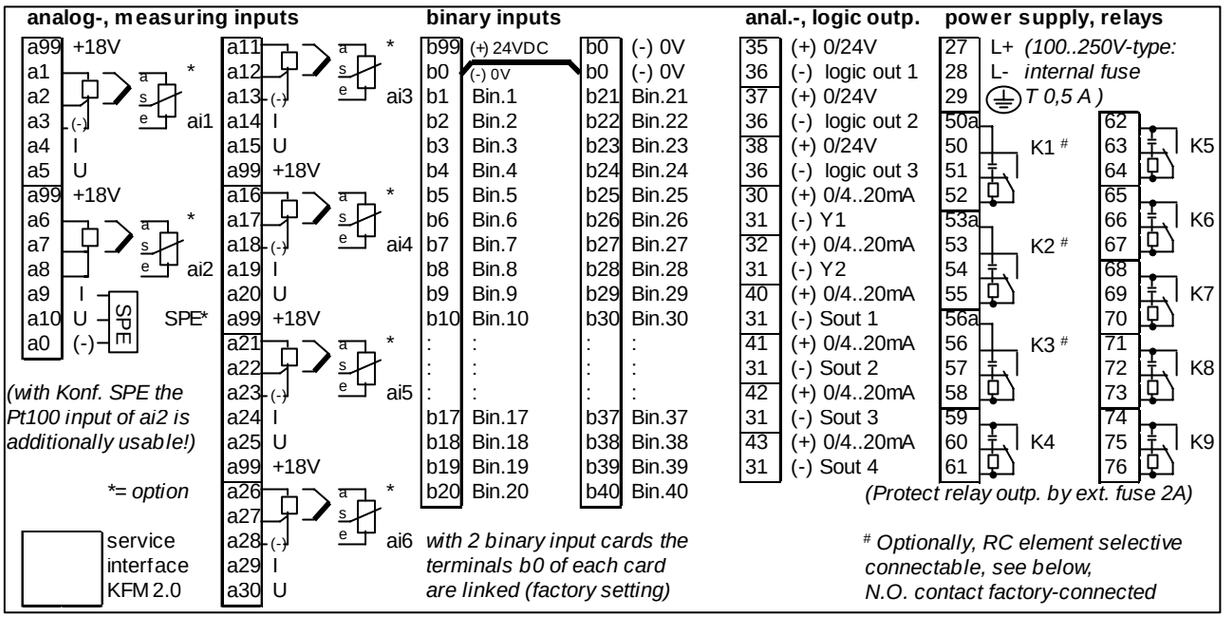


Form 96x96: L=150mm, B=92mm, H=92mm

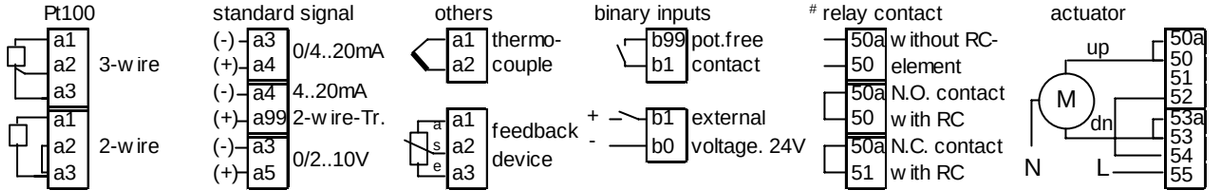


Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

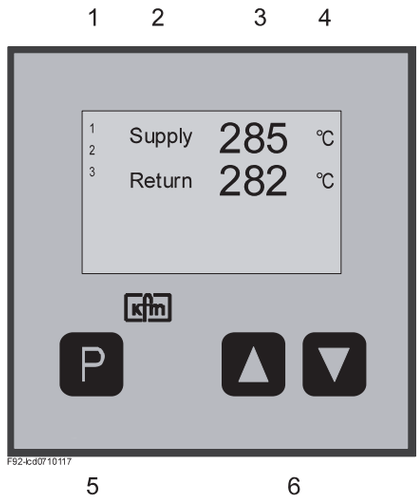
Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)



Wiring, examples for input 1 and output 1 respectively:



open printversion



1 LCD display for relay function
2 Descriptive text for displayed values
3 Digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

General:

With remote devices 902A50 controller types 902 / 93 can be remotely operated, i.e. all operations can take place at the controller as well as at the remote control device resp. all indications are visible on both.

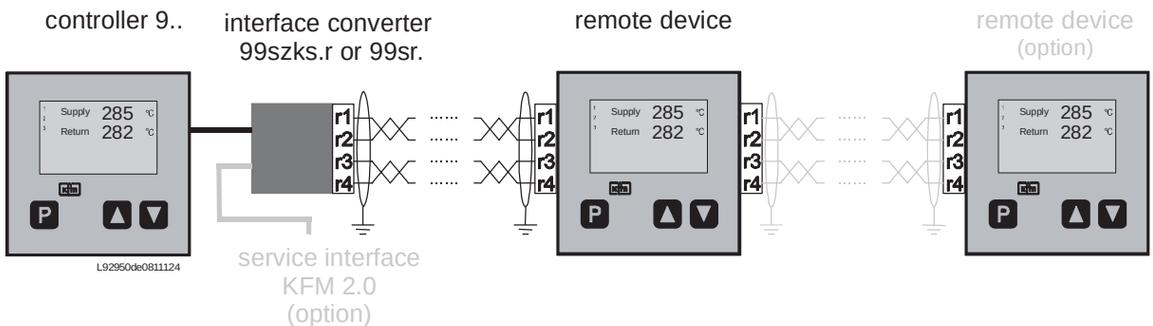
In the attempt of simultaneous operation the device which was operated first has priority. At this device the operation can be continued normally, at the other device the operation is blocked. But at any time on the displays of both devices identical contents are indicated. After the used menu level of the prior device has been left, operation is possible at both devices.

Depending on type, keys can be integrated in the remote device or routed to the terminals for connecting external keys.

The connection to the controller type 902 / 93 is realised by a patch cable and the interface adapter 99szks.r (small housing) or 99sr. (housing for mounting on DIN rail).The remote device is connected to the output terminals of the interface adapter (max. distance 1000m). Optionally, the service interface of the controller is available on the interface converter 99szks1r resp. 99sr1.

Types	**List No.:**
Remote device standard version, power supply 100...250V AC	**902A500**
Remote device standard version, power supply 24V DC	**902A508**
Interface converter for mounting on DIN rail, incl. (without) service interface	**99sr1 (99sr0)**
Interface converter small housing, incl. (without) service interface	**99szks1r (99szks0r)**

Connections: (Example)



Hint: *Interface circuits* must be laid with **shielded** and **twisted** cables. To avoid cross interference, do not lay close to components or lines through which current is flowing. Lay the shield to ground potential on both ends.

INDEX

1 2 3 4 5 6 7 8 9 0

Hints for setup-level: The setup-level is entirely for the *configuration of the remote device* and is only used exceptionally for adjustment of contrast and brightness of the background illumination, resp. for the configuration of different bus addresses when using two remote devices. The control of the connected controller in the operating mode is possible automatically after leaving the setup-level.

Press and hold the P - button, switch on power supply

A frame with the description „SETUP“ shows the activated setup-level.
Release P - button,

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed: Press the ▼...▲ buttons

Settings in detail:
(existence depends on version and type):

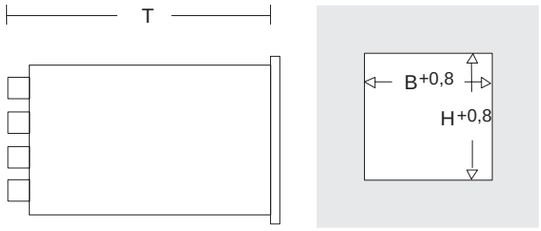
		Factory setting*:*	Notes
Adr	bus address (0...1)	0	___
CRST	Contrast setting for display remote device (0 ... 20)	10	___
BRIG	Brightness adjustment for display remote device (0 ... 20)	10	___

return *to operating mode:*
briefly press the P- button

Error messages:

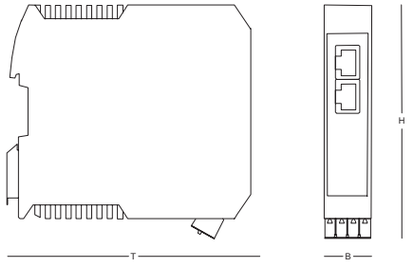
OFFLINE	Fault on remote interfaces, data link interrupted Check the patch cable and the interface converter 99s.. connection as well as the controller 9.. power supply.

Technical data / Installation dimensions 902A50.:
Housing: for panel mounting, 96x96mm
Power supply:24 VDC,alt. 100..250VAC,app. 2 VA
Protect. system (DIN EN 60529):
IP 54 (terminals IP 20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: relative humidity <= 75 %
yearly
average, no condensation
EMC: refer to EN 61326
Serial interface: RS 422, max. length 1000m

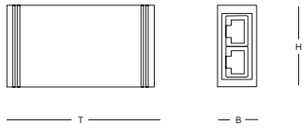


Form 96x96: H=92mm, B=92mm, T=150mm

Installation dimensions interface converter 99sr. / 99szks.r :



H= 110mm, B = 22,5mm, T = 116mm



H= 42mm, B = 20mm, T = 76mm

Wiring diagrams:

902A50.

bin. Inputs

b0	(-) 0V
b1	P-key*
b2	
b3	^ key*
b4	v key*

remote interfaces

r1	RS422,
r2	from interface
r3	converter
r4	99szks.r / 99sr.

r1*	
r2*	to further
r3*	remote
r4*	devices

power supply

27	L+
28	L-
29	⏚

fuse: T0,2A

*= depending on type

99sr. / 99szks.r

remote interfaces

r1	
r2	to remote dev.
r3	902A50.
r4	

to controller 9..

configuration-interface (PC)*

*= depend. on type

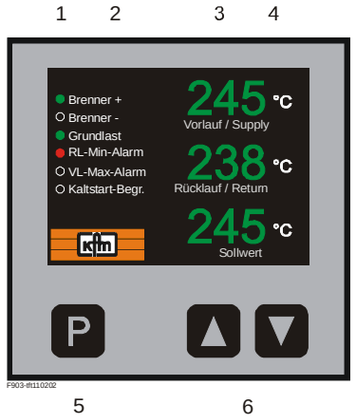
open printversion

(Examples, valid for each device is the wiring diagram on its casing only)

INDEX

1 Display for relay function
2 Descriptive text for relay functions
3 Descriptive texts and digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

certifications: DIN, GL, BV



General:
KFM 903 is an industrial microcomputer-based controller series in control panel format 96 x 96 mm with a performance range of up to 9 relay outputs, various signal inputs and outputs as well as numerous possible optional extras. Communication with control systems is also possible.

All relay contacts are implemented as potential-free changeover contacts. Normally, the N.O. contacts of all relays are internally permanently wired with RC elements. Optionally, the RC elements for relays K1…K7 are led on terminals for the selective connection (N.O. contact factory-connected). The scope of delivery includes plugable terminal blocks.

The transmissive colour TFT indication is easy to read in both light and dark environments.

Parameter set, TFT- configuration, data logger recordings and fault history can be transferred by means of conventional USB stick. Irrespective from that, the continuous logger data is automatically saved on a regular basis if the USB stick is inserted.

Stage- and three-point step controllers with auxiliary contact (e.g. burner contr.) are fitted as standard with a 2nd measuring input. Additional contacts can be switched time dependent using the integrated real time clock.

Types *(depending on configuration):*	*Type*
Text-indicator	903000
Indicator	90301.
Single-stage controller	9031..
Two-stage controller	9032..
Three-point controller	9033..
Positioner / follow-up controller	9034..
Two-point PID controller	9035..
Three-point PID controller	9036..
Three-point step controller	9037..
Continuous controller	9038..
Continuous controller with 2 outputs	9039..

Sub-types:	*suffix*
Basic function	00
Basic function + 1..8 additional contacts	01..08
Basic function double, triple, quadruple	20,30,40
Logic output 0/24V max 40mA	..L

Function extensions:(*)	
Difference controller	991d
Limitation controller	991g
Cascade controller	991k
Program controller	991p
Ramp setpoint	991r
Malfunction modul	991s
Stage controller	991t

Additional devices:(*)	
Additional analog inputs	(99) a.
External setpoint incl. switching	(99) bwa.
Second setpoint incl. switching	(99) bwz.
Binary inputs for special functions	(99) b..
Further additional contacts	(99) f
Analog signal outputs	(99) o.
ext. module f.Profibus,Modbus,Ethernet..	(99) s..

Measuring inputs:

(max. 8, depending on version)	*Type suffix*
Pt100/standard signal, -200...+800°C/adj.	without (or 0)
Thermal element NiCr-Ni (K)0...1200°C	
Fe-CuNi (J)0... 900°C, PtRh-Pt (S)0...1700°C	qt
Remote resistance transmitter 0…100/1000Ω	qw

Feature for meas. input 2 with equipment external setpoint: Standard signal configurable to ext. setpoint value, the Pt100 input is extra usable

Ranges:
Pt 100: -200..+800°C, switchable to °F,
standard signal: Display adjustable -999 to 9999,
setpoint range can be limited via menu

Binary inputs:
Max. 20 inputs, alt. for potential-free contacts or for ext. voltage 0 / 24V, for status messages (can optionally be saved) or control functions.

Displays:
Max. 4-four-digit value displays with selectable decimal point, each including adjustable descriptive text and unit of display, optional add. message texts with time stamp, custom display masks also with real-time graphical representation, up to 9 displays for relay functions incl. freely adjustable description texts.

Outputs:
Up to 9 relays as setting outputs or additional contacts, with potential-free changeover contacts, switching power 250V 2A incl. spark extinction (on the N.O. contact)
up to 6 continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω), as setting or signal output
up to 3 logic outputs 0/24V max. 40 mA, alternatively 16 outputs open collector, max 24 V / 100 mA

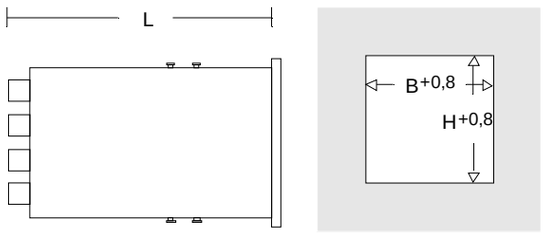
open printversion

*See also data sheets 99.. !

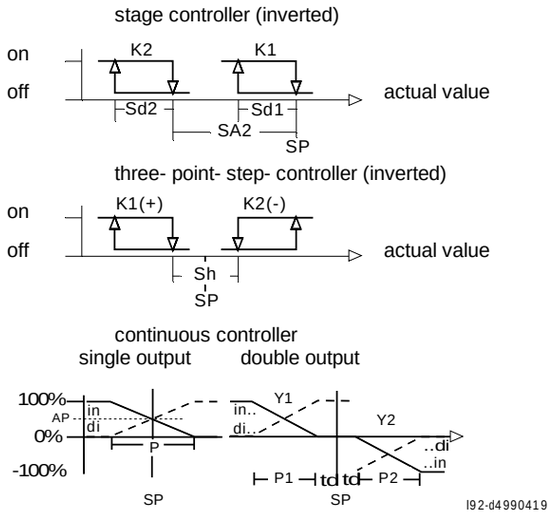
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, code locked,
pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input or time dependent, switching function adjustable

Installation dimensions:

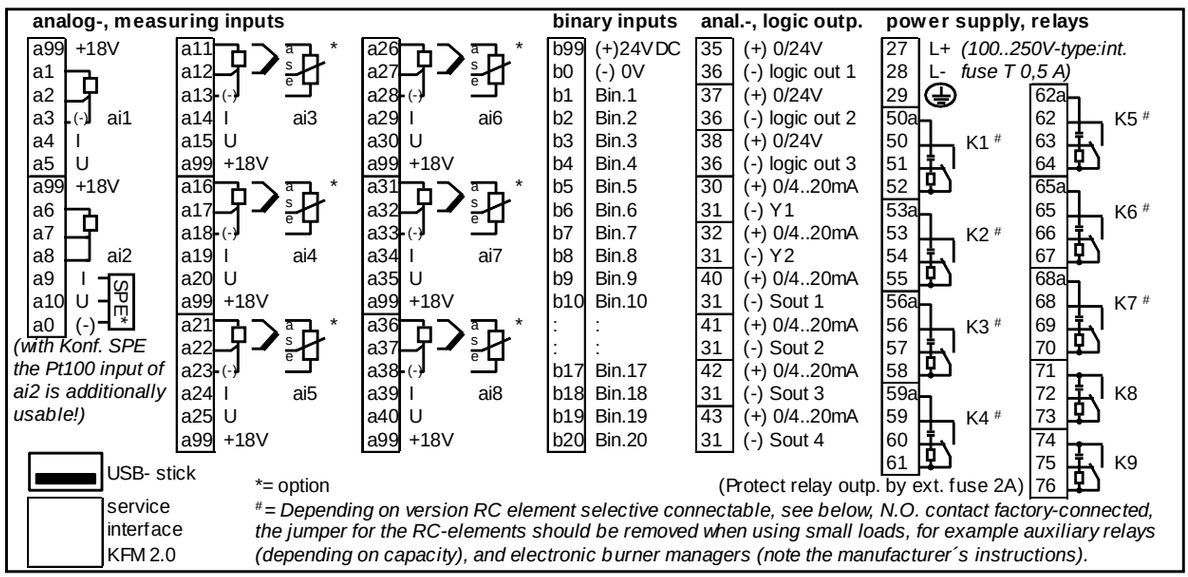


Form 96x96: L=150mm, B=92mm, H=92mm

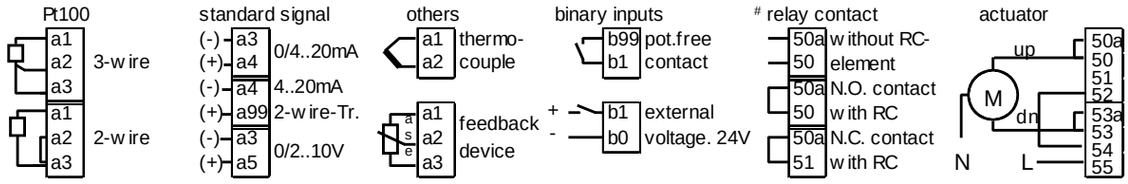


Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529: IP54 (terminals IP20)
Permissible ambient temperature: 0...60 °C
Nominal temperature: 20 °C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)

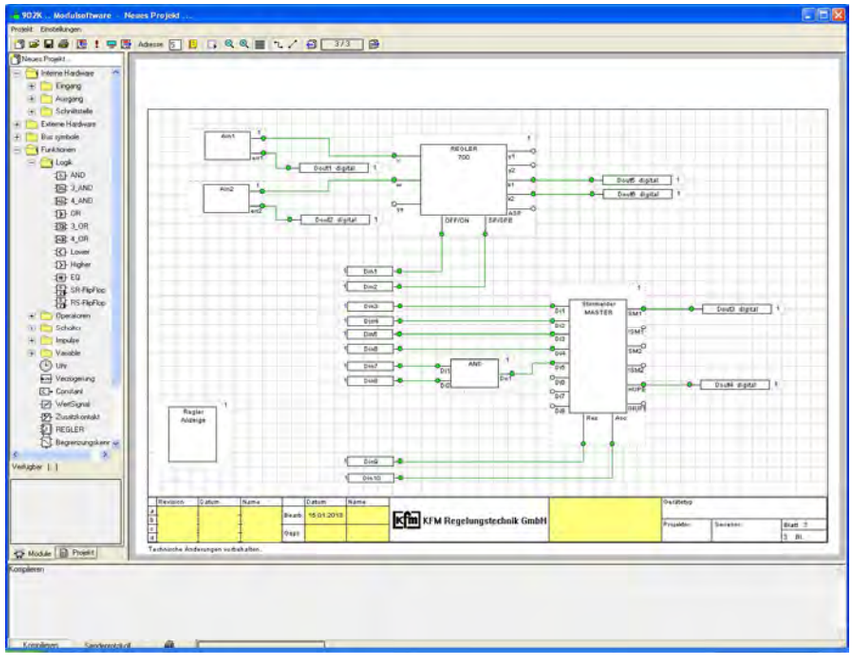


Wiring, examples for input 1 and output 1 respectively:



INDEX

1
2
3
4
5
6
7
8
9
0



General:

Controllers of the series 903 can be delivered with the type extension K in a freely programmable version and then available functional packages can be added arbitrary within the hardware, using a graphical workspace, so that a separate control system is often not necessary.

The belonging module software 99pkm provides beside ready to use controller modules a large number of control functions and logical operations compact within the individual device, furthermore expansion modules can be added to it by using an optional interface.

Alternatively, the delivery can be done unprogrammed with hardware in various types. In this case the programming is provided by the customer or at extra cost by the factory.

Normally, the RC element for the relays can be connected selectively, see table for types with permanently connected RC element.

Hardware- types (*unprogrammed*)**:**

Type	Measuring inputs	Binary inputs	Analogue outputs	Relays
903K2223	2	2	2	3
903K2C46	2	12	4	6
903K5807	5	8	0	7
903K5826	5	8	2	6
903K5K28	5	20	2	8[#]
903K8223	8	2	2	3

Hardware- expansion modules: see sheet 852..

[#] = In part, RC element permanently connected

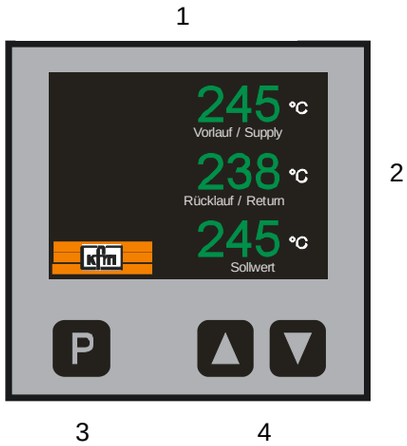
versions 903K.. (type suffix)

Meas. input * potentiometer: _*w,
Analogue output * voltage: _*u
* = Number in case of several in- and outputs

Special versions depending from quantities possible.

open printversion

1 Colour display
2 Displays for setpoint value and actual value (option)
3 Key for setpoint- and parameter mode
4 Setpoint adjustment



General:
The units in 96 x 96 panel mounting format are based on the KFM 903 industrial control unit series and allow external setting of one to four setpoints or continuous control outputs and up to 4 three-level signals. Upper and lower limits can be assigned to the setting ranges.

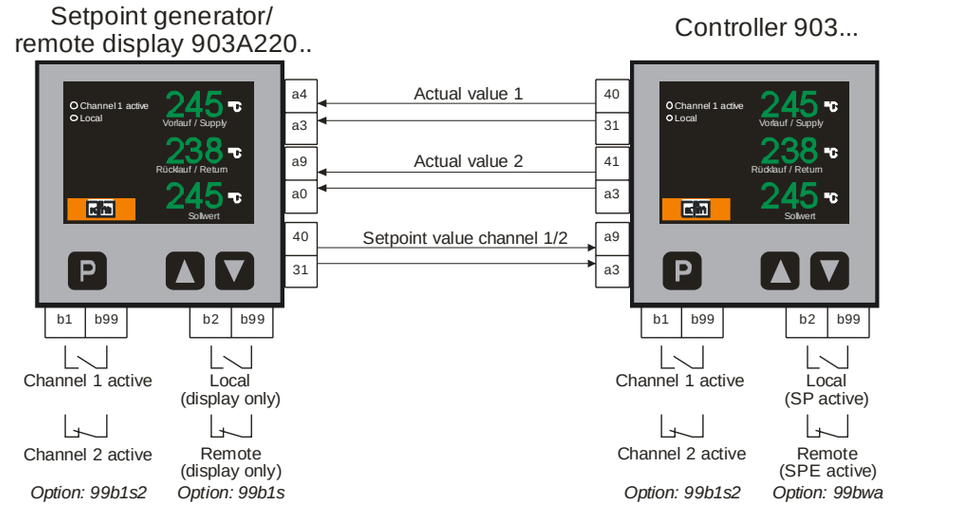
The adjusted setpoint– or control value is shown on the graphical display in the operating status. Depending on the equipment, further displays can be present, for example for actual value remote display.

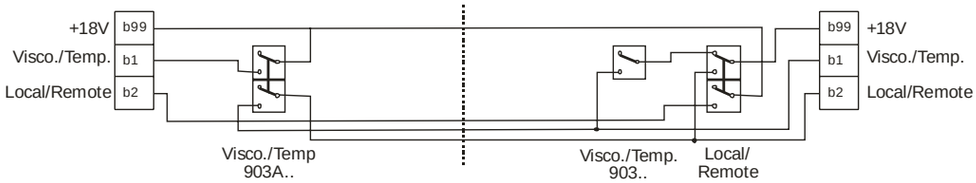
Accessories from the KFM 903 product range are available as an option.

Types:	*Type*
Setpoint generator	903A200
Setpoint generator double	903A220
Option: 1 x actual value – remote display incl. measuring input Pt100 / stand. signal	99axq
ditto, but double	99axqq
binary input for alternating activation of 2 channels	99b1s2

See data sheet 903 for device variants and accessories

Wiring:
Example, connections between **generator** 903A220-99axqq-b1s2-b1s and **controller** 903..-99bwa-og2-..

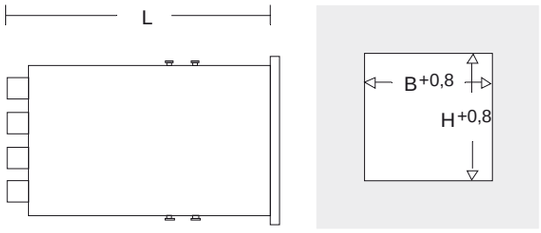




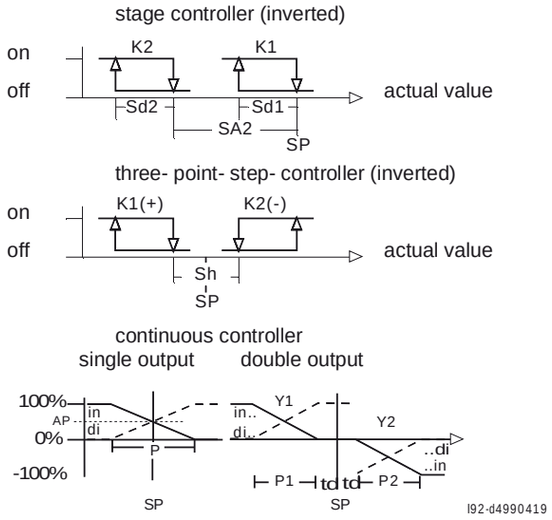
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, code locked,
pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input or time dependent, switching function adjustable

Installation dimensions:

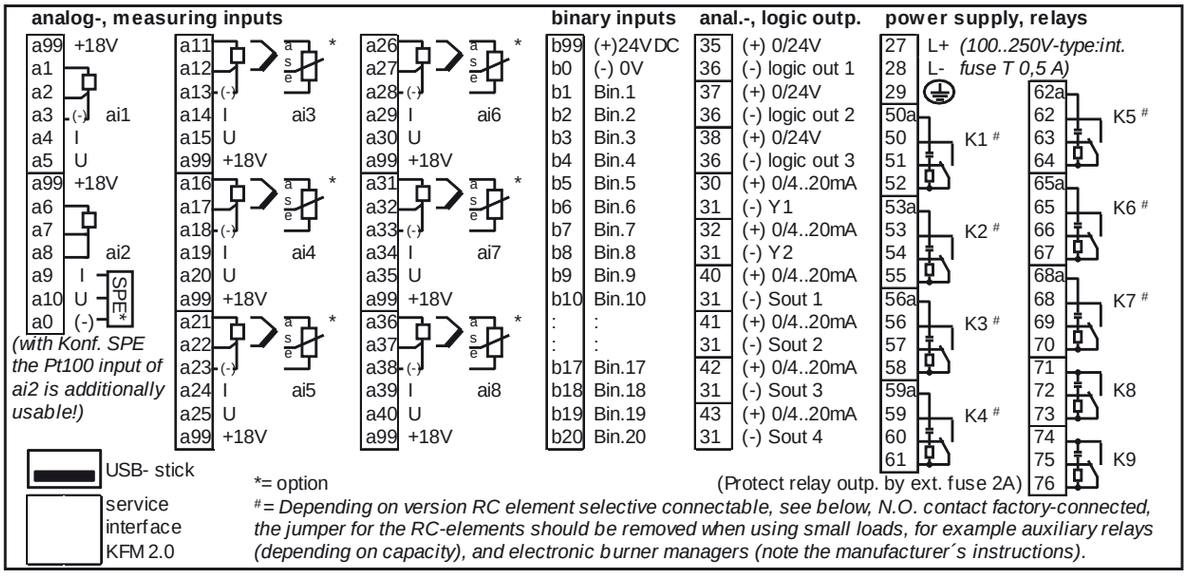


Form 96x96: L=150mm, B=92mm, H=92mm

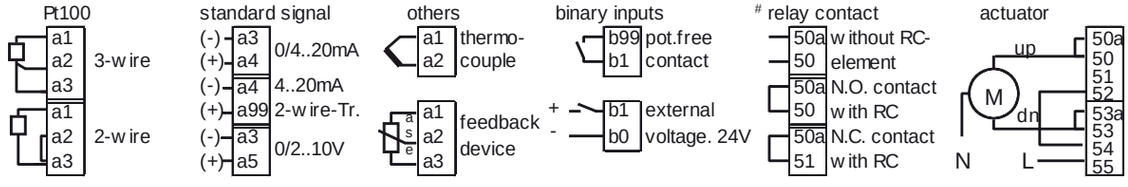


Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529: IP54 (terminals IP20)
Permissible ambient temperature: 0...60 °C
Nominal temperature: 20 °C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)



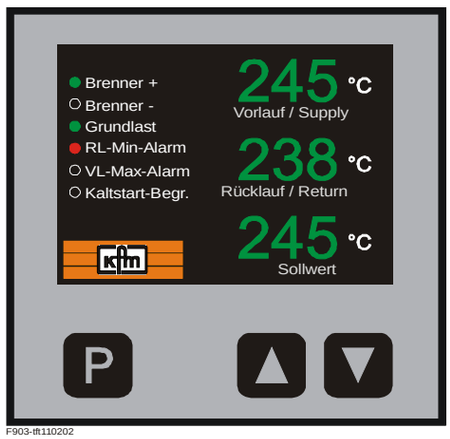
Wiring, examples for input 1 and output 1 respectively:



INDEX

1 2 3 4 5 6 7 8 9 0

1 2 3 4



5 6

1 Display for relay function
2 Descriptive text for relay function
3 Digital values and descriptive text displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

General:

With remote devices 903A50 controller types 903 / 93 with option 99sre can be remotely operated, i.e. all operations can take place at the controller as well as at the remote control device resp. all indications are visible on both.

In the attempt of simultaneous operation the device which was operated first has priority. At this device the operation can be continued normally, at the other device the operation is blocked. But at any time on the displays of both devices identical contents are indicated. After the used menu level of the prior device has been left, operation is possible at both devices.

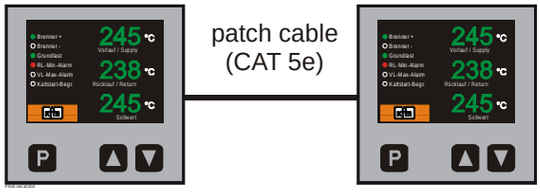
Depending on type, keys can be integrated in the remote device or routed to the terminals for connecting external keys.

The connection to the controller with option 99sre is realised by a patch cable. The remote device can be connected in a maximum distance up to 100 m.

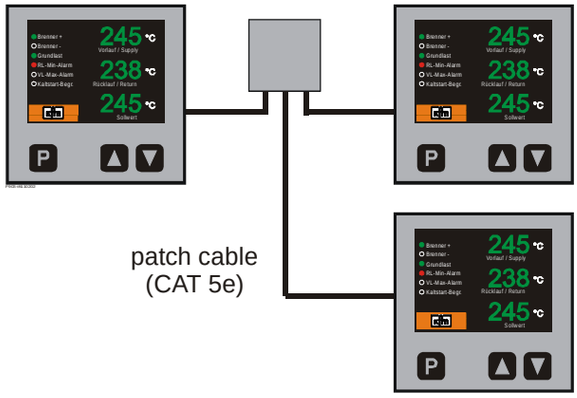
Types	**Li.No.**
Remote device standard version, power supply 100...250V AC	**903A500**
Remote device standard version, power supply 24V DC	**903A508**

Flow chart: *(Examples, single remote device / two remote devices connected via a switch.)*

controller 9..sre — patch cable (CAT 5e) — remote device



controller 9..sre — switch — remote device; patch cable (CAT 5e)



Note: Interface connections must be laid out with shielded and twisted cables of category 5 or better (CAT5e)!

open printversion

INDEX
1 2 3 4 5 6 7 8 9 0

Hints for setup-level: The setup-level is entirely for the *configuration of the remote device* and is only used exceptionally for adjustment of contrast and brightness of the background illumination, resp. for the configuration of different bus addresses when using two remote devices. The control of the connected controller in the operating mode is possible automatically after leaving the setup-level.

Press and hold the P - button, switch on power supply

A frame with the description „SETUP“ shows the activated setup-level.
Release P - button,

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed: Press the ▼...▲ button

Settings in detail:
(existence depends on version and type):

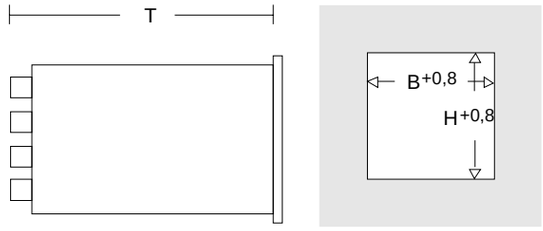
		Factory setting*:*	Notes
Adr	bus address (0...10)	5	___
BRIG	Brightness adjustment for display remote device (0 ... 100)	50	___

return *to operating mode:*
briefly press the P - button

Error messages:

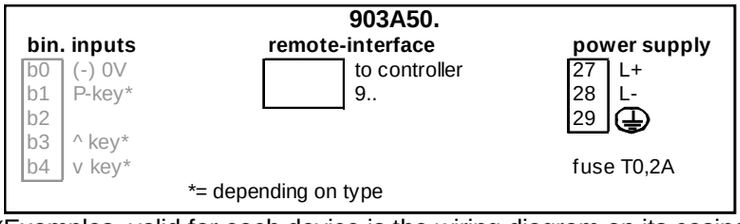
OFFLINE	Fault on remote interfaces, data link interrupted. Check the patch cable and the controller 9.. power supply.

Technical data / Installation dimensions 903A50.:
Housing: for panel mounting, 96x96mm
Power supply:24 VDC,alt. 100..250VAC,app. 2 VA
Protect. system (DIN EN 60529):
IP 54 (terminals IP 20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: relative humidity <= 75 % yearly average, no condensation
EMC: refer to EN 61326
Interface: Ethernet 10Base-T or 100Base-TX (autom. baudrate detect.), max. length 100 m



H=92mm, B=92mm, T=150mm alternative 70mm

Wiring diagrams:



(Examples, valid for each device is the wiring diagram on its casing only

1 Digital display actual value
2 2nd digital display (if active)
3 LED-display relay function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)

Certifications: DIN, BV, DNV, GL

Brief description:

KFM 92 is a microprocessor based industry controller series in panel mounting- format 96 x 96 mm. Design and operating elements are especially devised for easy and convenient handling and operation. An assembly system renders possible the simple basic version as well as a plurality of variants with up to 8 relays, several digital and analog out- and inputs and other additional devices. All relay contacts are implemented as potential-free changeover contacts. Normally, the N.O. contacts of all relays are internally permanently wired with RC elements. Optionally, the RC elements for relays K1…K3 are led on terminals for the selective connection (N.O. contact factory-connected). The scope of delivery includes plugable terminal blocks.

Types:

(depending on configuration):*	*type:*
indicator	9201.
one stage controller	9210.
two stage controller	9220.
heating / cooling controller	9230.
positioner / follow-up controller	9240.
two- point- PID controller	9250.
three- point- PID controller	9260.
three- point- step controller	9270.
continuous controller	9280.
continuous controller, 2 outputs	9281.

Sub-types:

	suffix (*)
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: logic output	..L

function extensions

	suffix (*)
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices:

	(*)
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
interface Profibus, Interbus S, other	(99) sp/si.

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 92700-99aw-ogx-rü. For more information see corresponding data sheets.

Inputs:

max. 4 measuring inputs, acc. to sub-type*:*	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.
combined input Pt100 / standard signal	q.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 4000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 8 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

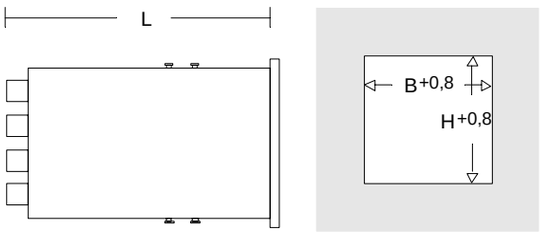
Outputs:

up to 8 relays with potential free change over switch, as control outputs or as additional contacts, capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

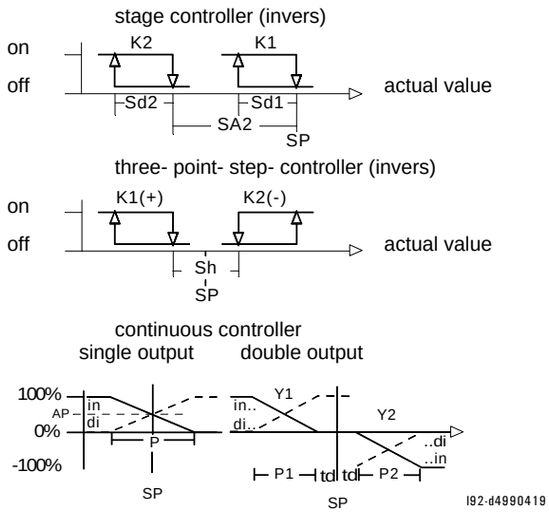
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

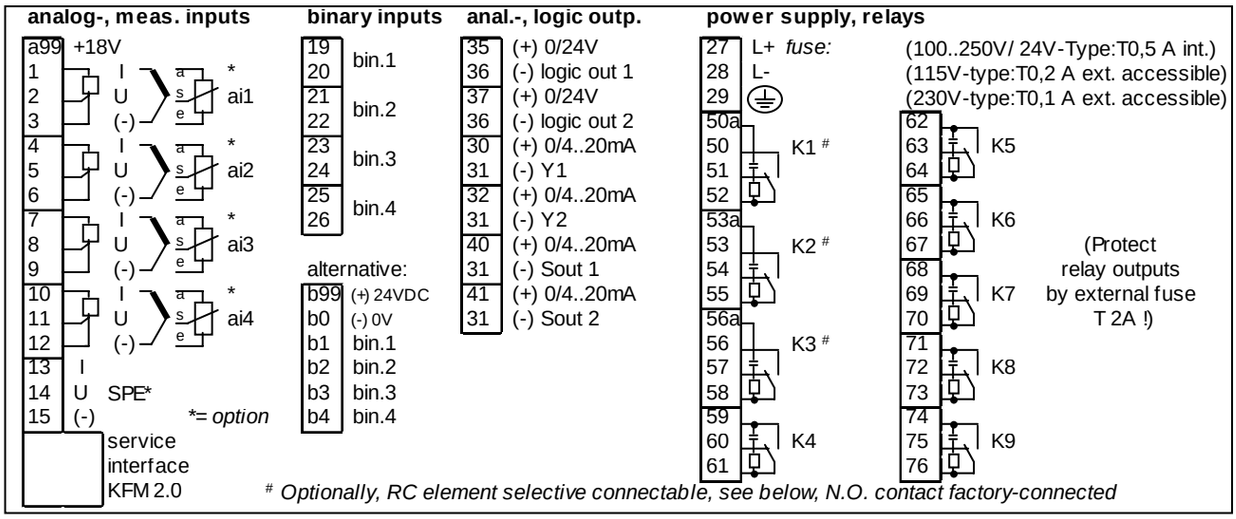


Form 96x96: L=150mm, B=92mm, H=92mm
Form 72x144: L=170mm, B=68mm, H=139mm

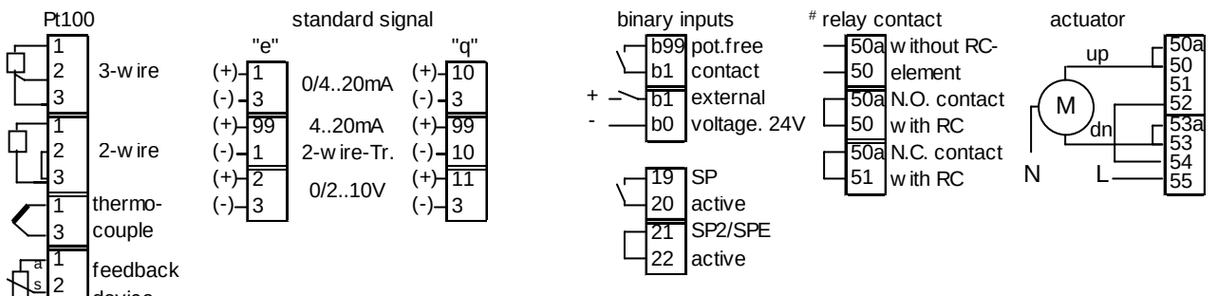


Other data:
Housing for panel mounting, 96 x 96 mm (type 92.., 93..) or 72 x 144 mm (type 94)
Power supply: 100-250VAC, 24VAC/DC(appr. 14 VA) alternative 230VAC, 115 VAC, 48...62Hz
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC: refer to EN 61326

Wiring diagram: valid for each delivered controller is the wiring diagram on its casing only)



Wiring, examples for input 1 and output 1 respectively:



open printversion

1 Digital display actual value (depending on type)
2 Digital display setpoint
3 Key for setpoint and parameter mode
4 Setpoint adjustment
5 Parameter mode lock switch (back face)

General:

The units in 96 x 96 panel mounting format are based on the KFM 92 industrial control unit series and allow external setting of one to three setpoints or continuous control outputs and up to 4 three-level signals. Upper and lower limits can be assigned to the setting ranges.

The unit has a dual display. In operating mode, the target value or control output is displayed in the lower row. The upper row can optionally be used for the remote display of the actual value.

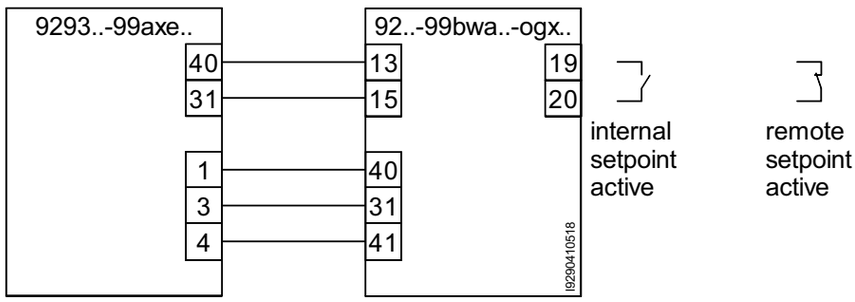
Accessories from the KFM 92 product range are available as an option.

Types:	*Type*
Setpoint generator	9293.
Setpoint generator with actual value remote display (Pt100 / standardised signal)	9293.0 / e
Actuator (three-point step)	9297.
Actuator (continuous)	9298.
Actuator (continuous, 2 outputs)	9299.

See data sheet 9200 for device variants and accessories

Wiring:

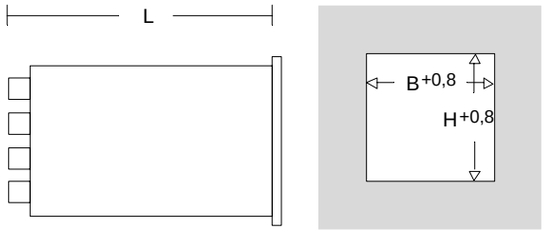
Example:Connections between **remote control unit** 92930e-99axe.. and **controller** 92..-99bwa-ogx-..



open printversion

Characteristics:
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
(parameters depending on sub type:)
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Installation dimensions:

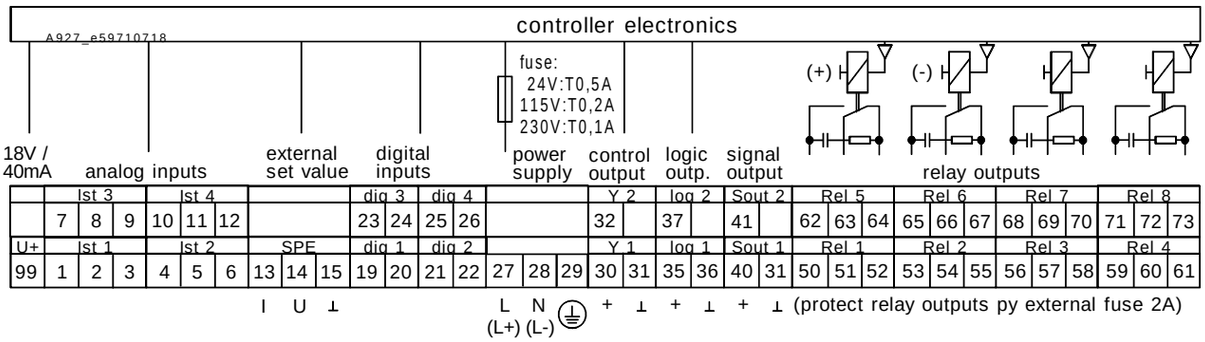


Form 96x96: L=150mm, W=92mm, H=92mm
Form 72x144: L=170mm, W=168mm, H=139mm

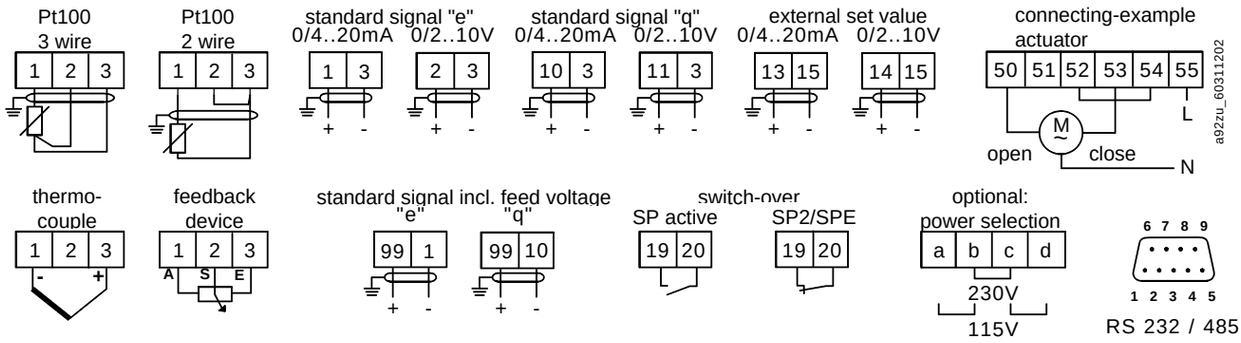
Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Other data:
Housing for panel mounting, 96 x 96 mm (type 92.., 93..) or 72 x 144 mm (type 94)
Power supply: 230VAC +/- 10 %, 48...62Hz
alternative 115 VAC, 48 VAC, 24 VAC, 24 VDC
Power consumption: approx. 14 VA
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KUF to DIN 40050
Relative humidity <= 75 % yearly average, no condensation
EMC: refer to EN 50081-2 and EN 50082-2

Wiring diagram: (Example, depending on sub type some details can be missed valid for each delivered controller is the wiring diagram on its casing only)



wiring examples (for input 1 each)

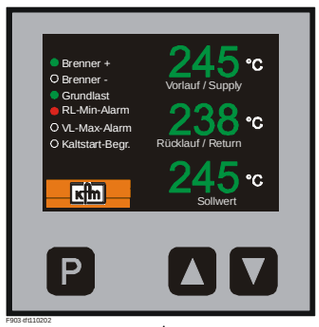


open printversion

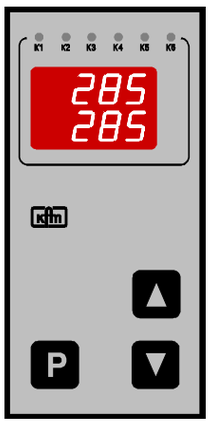
INDEX

General:
A consistently modular hardware- und software design philosophy enables ready to use, preadjusted to customer specification functional sets and modular expandable assemblies with graphical user interface for every application; also several control functions at the same time and/or alternate switchable.
The entire range of services offered by series *8../9..* in accordance to the respective data sheets is for functioning available.

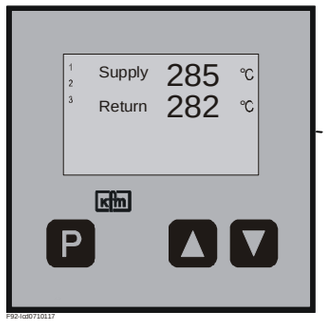
Series 903..
TFT-display



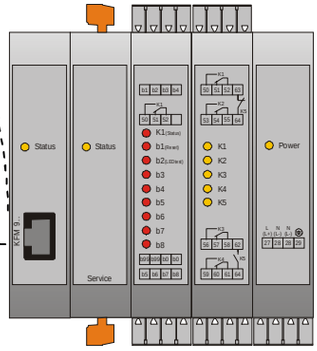
Series *94..*
(72x144mm)



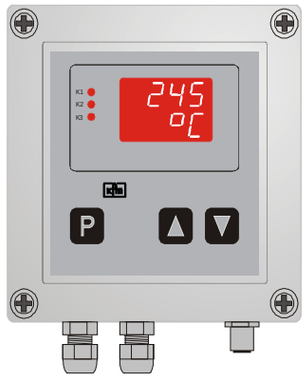
Series *902..* LCD-display



Series *852..*
functional modules

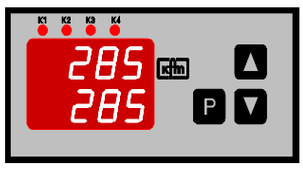


Series *92..*
7-segment
display



Series *96..*
for valve
attachment or
wall mounting
(130x130mm)
alternative TFT
or LCD display

Series *91..*
(48x96mm)



Options:
Additional switching contacts and measuring inputs, modular expansion units, set value lowering at night or external set value incl. switching, gradient, cascade, program function, step controller, digital interfaces, remote control, malfunction alarm- and operating devices with time stamp (real time clock), wall mounting

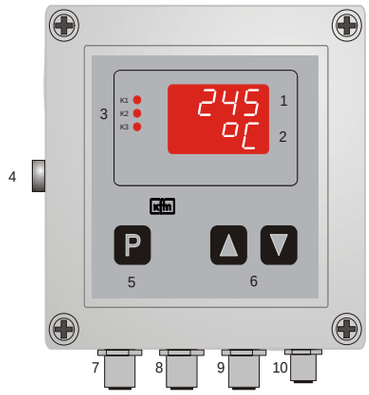
Let us know what we can do for you – our suggested solution is free-of-charge and without any obligation!

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

1 Digital display actual value
2 2nd digital display (if active)
3 LED-display relay function
4 Fuse relays (T 2A)
5 Key for setpoint and parameter mode
6 Setpoint adjustment
7 Terminals power supply
8 Terminals relay outputs
9 Service interface
10 Terminals measuring input



General:
KFM 96 is an industry controller series in valve attachment- resp. wall mounting- format 130 x 130 with a performance range of up to 4 relay outputs, various signal inputs and outputs as well as numerous possible optional extras.

Depending on the model the relays are carried out as potential-free changeover contacts or minus- priority circuit. Normally, the N.O. contacts of all relays are internally permanently wired with RC elements.

Optionally the connection of the service interface and the communication with the master system is realised with a M12 plug- and screw connector, the USB connection is made with the adapter cable 99szksm.

The display is available with LED (7- segment), transflective LCD with white backlight lighting and transmissive coloured TFT.

Types (*depending on configuration*)**:**	*type*
one stage controller	96..1..
two stage controller	96..2..
heating / cooling controller	96..3..
positioner / follow-up controller	96..4..
two- point- PID controller	96..5..
three- point- PID controller	96..6..
three- point- step controller	96..7..
continuous controller	96..8..
continuous controller, 2 outputs	96..9..

Display:	*3.- 4. suffix*
LED	..01.
LCD	..02.
TFT	..03.

Sub types:	*6.-7. suffix*
basic function	00.
basic function + 1..4 additional contacts	01..04.
2 x basic function	20.

Function extensions:	
Difference controller	991d
Limitation controller	991g
Cascade controller	991k
Program controller	991p
Ramp setpoint	991r
Malfunction module	991s
Stage controller	991t

Additional devices:(see also data sheet 99..!)	
Additional analog inputs	(99) a.
External setpoint incl. switching	(99) bwa.
Second setpoint incl. switching	(99) bwz.
Binary inputs for special functions	(99) b..
Further additional contacts	(99) f
Analog signal outputs	(99) o.
Interface by external module for Profibus, Modbus, Ethernet, ..	(99) s..

Measuring inputs(*max. 2,dep. on vers.*)**:**	*Type suffix*
Pt100/standard signal, 0..400°C/adj.	without or 0
Pt100/ standard signal, -200..+800°C/ adj.	99mb14b
Remote resistor transmitter 0...100/1000Ω	qw

Ranges:
Pt 100: -200..+800°C, switchable to °F,
standard signal: Display adjustable -999 to 9999,
setpoint range can be limited via menu

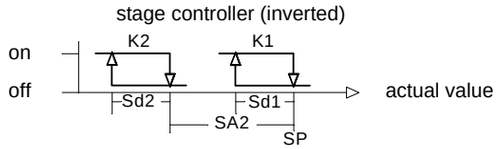
Displays:
Max. 2 / 4* four-digit value displays with selectable decimal point, (each including adjustable descriptive text and unit of display, optional add. message texts) *
also custom display masks,
up to 4 displays for relay functions
** LCD and TFT only*

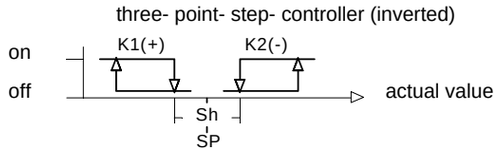
Outputs:
Up to 4 relays as setting outputs or additional contacts, with potential-free changeover contacts, switching power 250V 2A incl. spark extinction (on the N.O. contact)
alt. up to 2 continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω), as setting or signal output

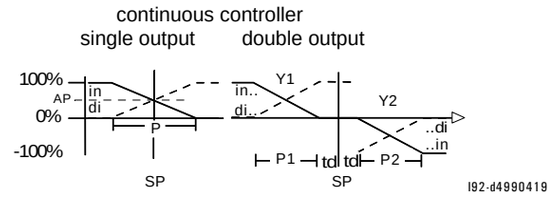
Example valve attachment:

Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, code locked,
pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

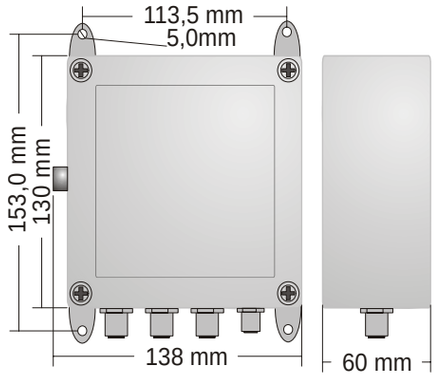
Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable





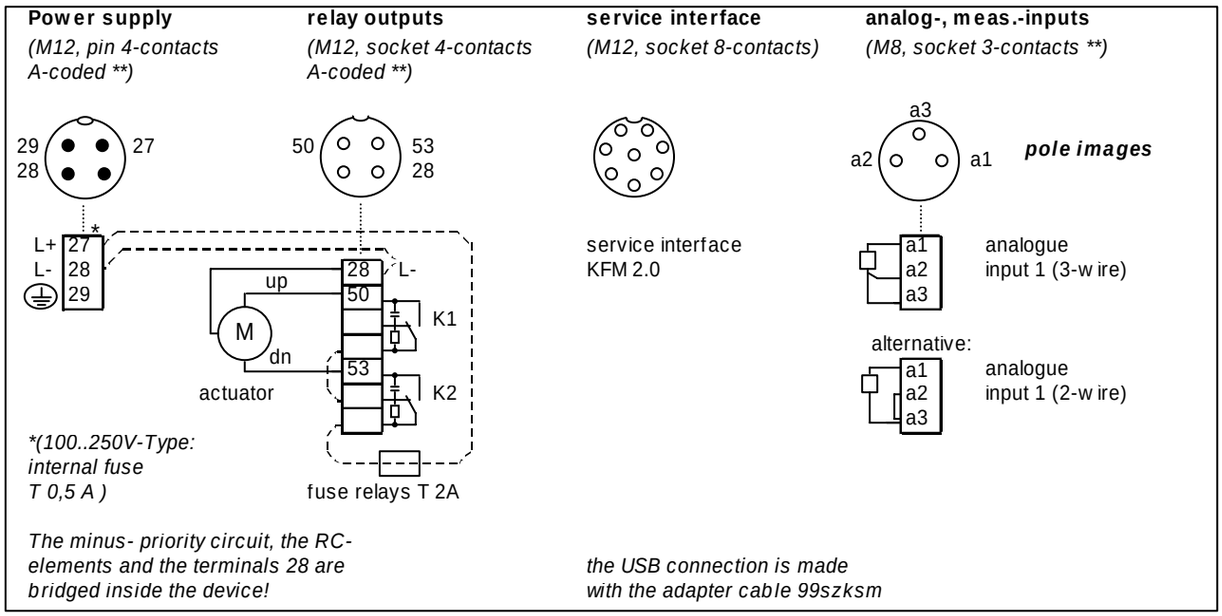


Installation dimensions:



Other data:
Housing for panel mounting, 96 x 96 mm
mounting direction: optional
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529: IP65
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)



** *Corresponding connection cable can be supplied on request.*

open printversion

Function extension for calculating the *difference* between two actual values.
(Differential value = actual value 1.. – actual value 2..).
The calculated difference is displayed and made available both as a controlled variable and a reference for additional contacts or signal outputs (CH 0 / Ist0).

All controllers of the KFM 902 / 93 type series can be operated with this additional function as a differential value controller. An additional measuring input is included with this function extension.

Versions:	**Li.-No.**
	991d*

Order text: Function extension: Difference controller
incl. add. measuring input Pt100/standard signal
range depending on type 0..400°C,
-200..+800°C resp. adjustable
calculation of the difference X1-X2
for display and further measured value processing

(*possible measuring inputs and list end no. refer to sheet 902)

Operation (special features)**:**

Operating status:

Besides the indication of the difference value the display lines are also configurable to the actual values 1 and 2

Settings:

The differential value is displayed in the parameter levels, in as much as it is relevant for settings and displays, additionally as channel (CH) 0:

Parameter level 2:

0bLo/0bHi Start / end of range for calculated difference

(if the difference goes under / exceeds the range limits: Error message Err0)

0nSt In as much as this function is provided: Setting the number of places after the decimal point of the differential value display

Supplement to error messages:

Err 0 Differential calculation error.
Causes: Error at measuring input 1 or 2, or the difference has gone under or exceeded the range limits (0bLo / 0bHi).

Optional equipment:
Auxiliary control circuit with limiting function

The limiting function for the type series 902 / 93 consists of an additional control circuit with its own measuring input and its own settings (CH2), intervening in the output of the main control circuit. The function mode (min. or max. limitation, effective direction) can be set per menu.

Function:

In the case of 3-point step controllers the relay of one control direction (depending on the presetting) is locked and the relay of the other control direction is activated in increments as soon as the set limit value is exceeded or undergone. This causes the current position of the actuator to be maintained or adjusted so that the limit value is maintained.

In the case of continuous action controllers the higher or lower current control signal, depending on the presetting, is selected from the two control circuits and switched to the output. In this way the control signal of the auxiliary control circuit is given priority as soon as the set limit value is no longer maintained.

Versions:	**List No.:**
auxiliary control circuit with limiting function incl. additional universal input Pt100 or standard signal range depending on type 0..400°C or –200..+800°C resp. adjustable	991g*
version with limitation function only for the second output	991g2*

* alternatively other measuring inputs (type accessories such as main type Pg. 902)

Operation (supplement):

Actual value display:

Short-term display in the bottom display by actuating the ▲-key,
continuous display can be configured in the parameter level 2

Setpoint value setting:

Actuate the P-key until "**2SP**" appears,
set the desired value using the arrow keys.

Parameter level1 :

After calling up the parameter level select **CH 2**.
Call up and set the parameters in succession as for CH1.
*Attention: Do not change the setting of parameter **CH 1** for the main control circuit!*

Configuration level:		*Factory setting*
2out	effective auxiliary control circuit direction direct / inverse (di / in)	in
out	min. / max. limiting function (Lo / Hi)	Lo

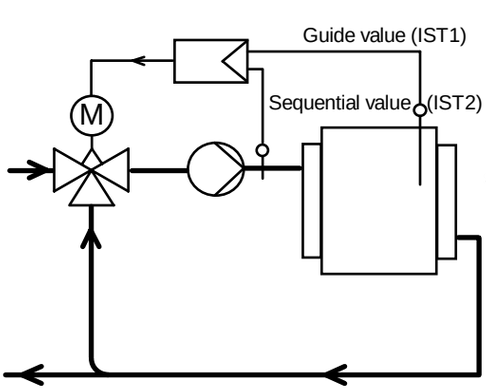
open printversion

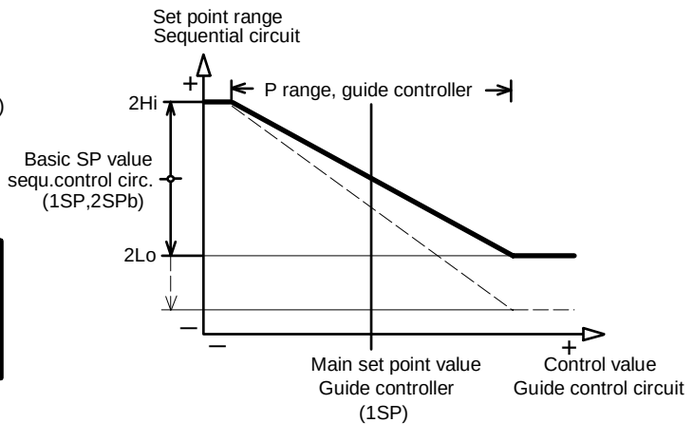
Function:

For cascade controllers, the basic unit of the standard version serves as a sequential controller, acting on the control output. The function extension consists of an additional guide control circuit with its own measuring input, the output of which acts on the set point value of the sequential controller. A deviation between set point and actual value of the guide control circuit (e.g. product temperature) increases or decreases the basic set point value of the sequential control circuit (e.g. supply temperature or combustion chamber temperature) within an adjustable range.

In the basic version 991k, only the set point value for the guide control circuit is set. It also serves as basic set point value for the sequential circuit. In version 991kb the possible change of the set point value is limited by the adjusted minimum and maximum absolute values. In version 991ku the guide controller set point value and sequential controller basic set point value are set independently from each other.

Version 991kdt provides a so called dt-control, to monitor the difference between the guide- and sequential actual value. Upon exceeding the adjusted difference value will influence the cascade to reduce the difference below the adjusted value.





Control behaviour, equipment:

Sequential controller:	as desired, depending on the selected basic version
Guide controller:	PI (PID), with especially modified integral action

Versions:	**List No.:**
Standard version	991k..
the same, with limitable sequential setpoint value range	991kb.
Standard version, with dt-control	991k..dt
the same, difference value heating / cooling separately adjustable	991k..dt2
separate set point values	991ku..
Guide control circuit can be switched off permanently by menu (sequential controller measuring input actual value 3)	991k..(3)m

Addition for measuring input of guide controller, if different from sequential controller:

Pt100 DIN, 0...400°C	..0 or without
Pt100 DIN, 0...100°C	..1
Thermal element NiCr-Ni (Typ K)0...1200°C	..n
Thermal element Fe-CuNi (Typ J)0... 900°C	..f
Thermal element PtRh-Pt (Typ S)0...1700°C	..p
Rheostatic teletransmitter 0...100/1000Ω	..w
Standard signal 0(4)...20mA, 0(2)...10V	..e
Combined input PT100 DIN, -200..800°C or standard signal	..q
Actual value transferred by digital interface in place of measuring input	..x

open printversion

Characteristic features of cascade controller

Guide value = Input IST1 (Terminal 1-3 / a1-a5)*
alternative: by digital interface
Sequential value = Input IST2 (Terminal 4-6 / a6-a8)*
alternative: Input IST3 (Terminal 7-9 / a11-a15)*

Set point value setting:

1SP Guide controller set point value, also basic set point value for sequential controller (except for type 991ku)
2SP Display: current sequential controller set point value = total of basic set point value and guide controller influence

Parameter level 1 (supplement):

		Factory setting:	*Notes:*
CH	Channel selection of guide controller / sequential controller = CH1 / CH2		
FUE	Only CH2: temporarily switch off guide controller influence (only for optimization) or permanently (An = on, Aus = off)	An	___
2SPb	Basic set point value for sequential controller (only for type 99ku)	0	___

Parameter level 2 (supplement):

2Lo / 2Hl	admissible maximum difference of the sequential controller set point value	-50/50	___
2FLo / 2FHl	minimum / maximum limit of sequential controller set point value	#/#	___
dt	Difference value between guide - and sequential actual value (0 ... #) Adjustment 0 will cause the deactivation of the function (type 991kdt only) (#= controller range)	0	___
dt1/2	the same, difference value for heating / cooling separately adjustable	0/0	___

Configuration level (supplement):

1 ib	Integration range of the guide controller: 0...100% of the proportional band	*100*	___

Commissioning

Prior to optimizing the control behaviour, correct the factory set set point value range limitations of the sequential circuit, if necessary. The admissible range of the sequential circuit set point value is dependent upon various factors (e.g. maximum heating surface temperature, design of the heating surfaces, etc.) and should be individually set for each machine system. The values "2Lo" for the bottom and "2Hi" for the upper limit are set in parameter level 2 as a *difference* to the basic set point (also refer to the function diagram). The factory setting for thermostats is -50K / +50 K, for controllers with signal input 0.0. In version 991kb is to adjust additional an upper and lower absolute limit value.

Once the sequential control circuit limit values are set, optimize the sequential control circuit *without* influence on the guide control circuit. For this purpose, switch off the guide controller function (parameter level 2: CH2, FUE AUS). Now undertake the standard optimization of the control parameters.

Subsequently, switch on the guide controller function again and optimize the parameter for the guide control circuit, taking into consideration that the guide control circuit often reacts more sluggish than the sequential circuit. Therefore, it can usually be operated as proportional action controller *without* integral action (value for I at 0.0) or with a relatively long integral action time (several minutes). As an option, the integration range may be limited with parameter ib.

Deviating reaction to error messages:

At Err 1 the guide controller element does not function,
the sequential controller element continues to operate as standard controller with the set set point value.

At Err 2* the configurated safety circuit reacts (Factory setting: relay off or control signal on 0)

* depending on version

open printversion

Function:

Enter a series of set point values and allocated times in the parameter level, which are invoked in succession after a program start has been triggered. The controller operates in standard operation on the basis of the set basic set point value prior to a start and following a program sequence.

The program function is activated in the parameter level, by entering the desired program steps into ”Pr-S”. The program function is shut off with adjustment Pr-S = 0, also the respective menu positions are suppressed. The adjusted number of steps applies uniformly for all existent programs. If fewer steps are required in the individual program than preset under Pr-S, they can be suppressed by setting a set point value as precedent and a time of ”0”.

Enter the programs as steps with consecutive numbers, always consisting of a target set point value SP.. and the attendant time t.. If a direct switch-over (*jump*) to the next set point value is desired, t.. is set to ”0”. If a value of >0 is set for t.., the change to the attendant target set point value takes place within this time in form of a *Ramp.* If a set point value is to be kept unchanged for a specific amount of time, set the subsequent SP.. to the same value, the attendant time t.. serves as *holding time* .

Shall the program run several times, enter the desired number of program cycles into ”P-CY”. Factory setting is 1. A continuous reapeating program cycle is selected by adjustment P-CY = 0.

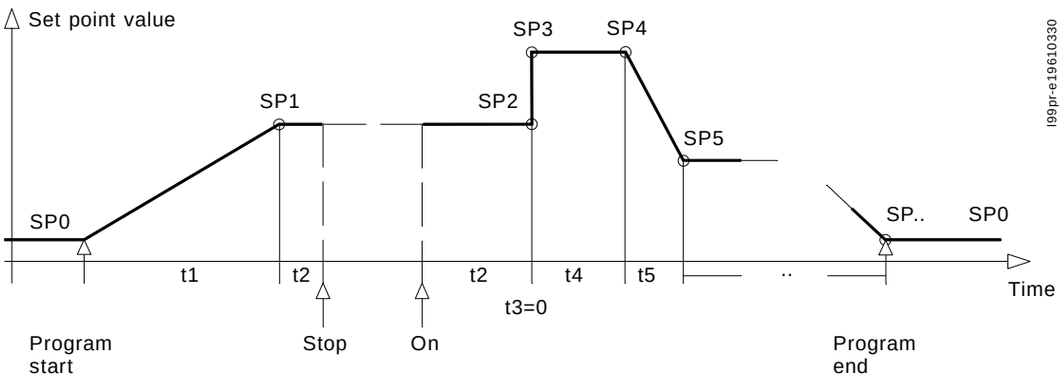
integrated set point monitoring:

Constant monitoring takes place during the program sequence, to check whether the actual value follows the current set point value. The program sequence is stopped as soon and as long as the difference set as admissible is exceeded:

With a *ramp*, the further increase or decrease of the set point value is stopped. With *holding times* the specified time increases accordingly. With a *jump* the next time segment does not start till afterwards.

special feature for switching contacts
The available switching contacts of the controller can switch optionally in relation to the program status (SP0) or individual program steps (SP1…SP20).

Program sequence (example)



Versions:	**List No.:**
1 program, max. 20 steps, 1 control input	991p1
4 programs, max. 20 steps, 1 control input	991p4
8 programs, max. 10 steps, 1 control input	991p8
optional:	
as mentioned above, but with 3 additional control inputs for the start of each program P-nr.1…4	991p4b3

open printversion

Special features of the program controllers:

Operation (supplement):

The *bottom display* continuously shows the current (ramp) set point value influence SP..
(Factory setting, other displays can be configurated)

Actuate the P key *(continuous):*

only when the program is running:

SP.. Display of the current (ramp) set point value influence SP..

only when program is OFF:

SP 0 Basic set point value, display and adjustment possibility via the ▲…▼ keys

P-nr Display of the current program No.,
.. only when program is OFF: program selection via the ▲…▼ keys

P-CY* Number of program cycles, factory setting: 1
continuous program cycle is caused by adjustment 0

Pro Display of the current operating condition:
..
AN: program is running
Stop: program has stopped
AUS: program has been completed or aborted, basic set point value is active

Switch-over possibilities from the displayed operating condition by means of the ▲ key (continuous):
AN: start program or continue stopped program
Stop: stop the running program and continue at this point later
AUS: abort running program and continue with the basic set point value (SP0)

Note:The "ON" function may also be triggered by briefly closing the control input (sensor or wiping contact).

program overview 1/2 (only LCD- / TFT- types)
display of the actual program data (number, status, active cycle*, active segment,
actual program setpoint, segment time and proportional total time) at an overview page

program overview 2/2 (only LCD- / TFT- types)
simplified graphic display of the program data, current time as dotted cursor

press the P key again*: return to operating condition.*

Parameter level 2 (supplement): Factory setting:

Pr-S Select the number of program steps/time segments 10/20
uniformly for *all* programs, 1...10/20, depending on the design

P-nr Select the program number (1...4/8, depending on the design)

t'.1 Enter the holding or ramp time (0.0...999.9 min), in which the 1
subsequent (target) program set point value SP.1 is to be reached.

SP.1 Enter the 1st (target) program set point value
(see program example) 0

t..,SP.. Continuously enter times and set point values for further
program steps by actuating the P key.

Return to the operating condition after the last setting.
Next program: invoke parameter level 2 again.

Configuration level (supplement):

d SP Set point value monitoring: admissible deviation
between set point and actual value (K or value) 5.0

only for devices equipped with additional contacts:

REL. switching function additional contact (relay no..): "Pr E / Pr A " Pr E
(Pr E: program status or program step active = relay on, otherwise off;
Pr A: program status or program step active = relay off, otherwise on)

REL. assignment to individual program steps "SP1…SP20", or program status "SP0" SP0

* = only available if equipped

open printversion

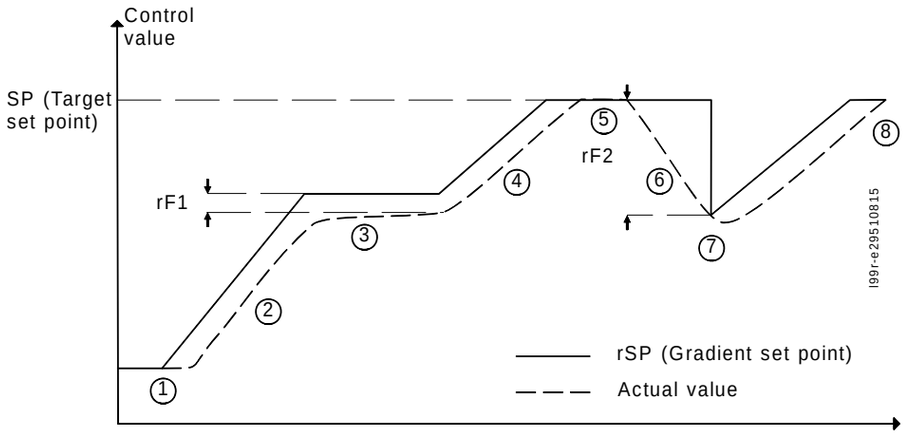
Function:

The set point value “SP” set at the controller serves as the target set point value. Once the controller has been switched on, the starting point of the ramp set point value “rSP” is set to the available actual value. Subsequently, the default set point value increases or decreases by the set gradient.

A synchronously running monitoring function causes the ramp set point value to be stopped as soon and as long as the actual value does not follow the default set point value at the set max. distance ("rF1").

The additional function "ramp set point value" switches off as soon as the target set point value is reached, however, it remains in readiness and starts again each time the set point value setting is changed or when the actual value is changed by more than the admissible difference ("rF2").

Operating phases of the ramp function (example)



1. Ramp set point value is set to actual value
2. Set point value increases at set gradient
3. Set point value does not continue to increase as the actual value does not follow
4. Set point value increases again, as actual value has dropped below the max. difference "rF1"
5. Actual value has reached the target set point value, ramp function is switched off
6. Possible malfunction: actual value drops by more than the admissible "rF2"
7. Ramp function is activated, ramp set point value is set to momentary actual value
8. Target set point value is reached again, ramp function is switched off.

Versions:	**List No.:**
Standard version	991r.
Alternative versions	
Separate adjustment for increasing and decreasing gradients	991rhk
bin. input to control the ramp set point value (ramp active, if input bridged)	991rb1
Possible additional functions	
Additional contact, related to the gradient-status	99fr
binary input for extern stop of ramp function	99b1s14

Peculiarities of controllers with ramp set point value

Operation:

Parameter level 2 (supplement):

ZBR Time base of the ramp in unit per minute “min“ or unit per hour “std“, factory setting: min.

Gr Increase (gradient) of the ramp set point value in K or value (0.0...100.0) per minute or hour (Setting 0.0 = ramp function switched off), factory setting: 0.0

dSPL Additional possibility when display is switched over: "r SP" => display of momentary ramp set point value

*Only version **991rhk:***

Gr1 Setting for **increasing** gradient in K resp. value (0.0...100.0) per minute or hour

Gr2 Setting for **decreasing** gradient in K resp. value (0.0...100.0) per minute or hour

Configuration level (supplement):

rF1 "Waiting window": maximum deviation of the ramp set point value from the actual value, as stopping influence on the set point change. Factory setting : 2.0

rF2 "Start window": minimum deviation of actual value / standard set point value for renewed start of the ramp function. Factory setting: 10.0

Function extension: Status and error messages

Controllers from the 902 / 93 series with LCD can receive status and error messages by means of supplementary internal or external binary inputs and display them in plain text in the lower two display lines. The texts associated with the currently activated binary inputs are displayed chronologically in a message list. The messages can also be optionally assigned to relays as collective or new value messages.

Function:

By means of the corresponding activation of a binary input, the associated message text is displayed in the third display line. Depending on the message logic that has been set, a flashing circle symbol appears before the text line (new value). The message can be confirmed by means of binary input 1 (reset). This is indicated by the permanent display of the symbol before the message. Following deactivation of the binary input, the associated text and, if applicable, the additional symbol are removed from the display.

Through various terminal connections it is possible to activate the binary inputs by means of external voltages or also by means of floating contacts.

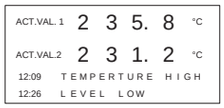
The functions of the binary inputs can be set (direct or inverted) and they can each be provided with a separate time delay. In addition each input can be assigned to a collective relay. The requisite contact output is provided by means of the configuration of the additionally existing supplementary contact. Depending on type a further configurable supplementary contact is available for announcing new values, e.g. by means of a buzzer or a new value pulse. This contact is always activated (single 3 sec. pulse or permanent) when a new message appears. After confirming with reset, the contact is reset.

The display texts can be edited simply using the KFM PKS PC software.

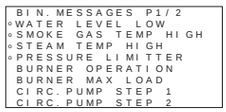
Versions:	**List no.:**
16 Binary inputs for status and error messages with plain text display incl. 2 freely configurable relays	991s16
20 Binary inputs for status and error messages with plain text display incl. 2 freely configurable relays	991s20
24 Binary inputs for status and error messages with plain text display incl. 2 freely configurable relays	991s24
Possibility of indication of status and error messages from external binary input and relay modules in clear text, connection at the service interface	991sw

Special features of controllers with status and error messages:

Operation (extension):



If the binary inputs are activated, the associated texts can be displayed in the two lower 3 mm display lines. The corresponding value displays are hidden during this time.



Message list: *Briefly* press the ▲ - button (*do not* hold)
The display now shows a list of message texts for all activated binary inputs in the order of their occurrence. Additionally, messages which are configured to the collective relay are marked with a circle symbol. This flashes until the message has been confirmed by means of binary input 1.

Parameter level 2 (extension):		Factory setting	Notes
DSPT	Indication of status and error messages (TXT = indication of the texts in display lines 3 / 4 and in the message list, TXTL = indication of the texts in the message list only, AUS = no indication of texts	TXT	___

Configuration level (extension, with internal binary inputs only**):**		Factory setting	Notes
bin. input	Sub-menu for binary input configurations Calling: press the P - button and *hold it* > 5 sec		
BIN*	Direction of control action binary input* direct / inverse (di/in)	di	___
BIN*	Assignment of collective relay: Stat=none, SREL= collective relay	stat	___
BIN*	Switch-on delay (0…300 sec)	0	___
	*= Number of the binary input		

Additional function selection options for supplementary contacts:

SR A	Collective message function, relay is de-energised if there is an error message.
SR E	Collective message function, relay is energised if there is an error message.
NW A	New value message, relay is de-energised if a new error message appears that has not yet been confirmed with reset.
NW E	New value message, relay is energised if a new error message appears that has not yet been confirmed with reset.
IP A	New value pulse, relay is de-energised for 3 sec if a new error message appears.
IP E	New value pulse, relay is energised for 3 sec if a new error message appears.
SRIA	Collective message function with new value pulse, relay is de-energised if there is an error message. If a further (new) error message appears, the relay is energised for 3 sec.
SRIE	Collective message function with new value pulse, relay is energised if there is an error message. If a further (new) error message appears, the relay is de-energised for 3 sec.

Error messages (extension):

Err 62	Connection fault to external hardware Please check cable wiring and external hardware !

open printversion

Function:

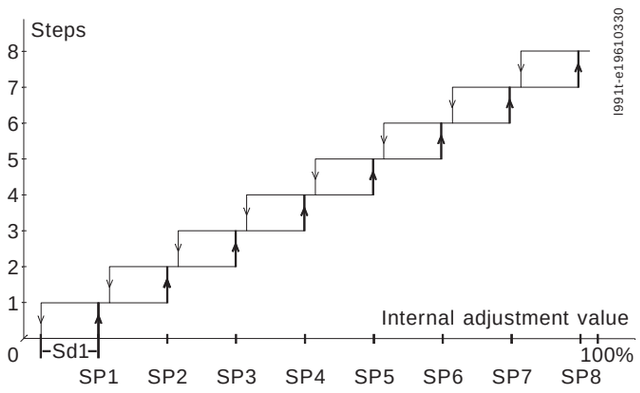
Completion of a continuous PID controller with subsequently arranged switching steps, optionally installed in the controller or in external accessory units. In principle, the operation, handling and optimization of the continuous controller remain unchanged, However, the continuous control signal is not led to the outside but immediately converted internally to an appropriate number of switched on relay switching steps, based on the actuating variable 0...100%.

In the factory setting, the switching points of the steps are evenly distributed throughout the entire adjustment range, however they may be changed as desired. An installed switch-on delay prevents simultaneous switch on of all steps and thus load jumps in the supply mains. It is set jointly for all steps.

All relays are potential free change over contacts, a spark quenching unit is installed for the normally open contacts. Relays which are not needed may be switched off through switch point >100%. Recommended supplement for heater controls: accessory equipment 99ax to display the return flow temperature.

The first step may be configured as switching output if desired. This causes an adaption of the power jumps between two steps and thus an almost infinitely variable behaviour.

Example of 8 steps



Versions:	**List No.:**
Internal controller switching steps: (maximum 8 (92..) or 6 (94../ 95..) steps)	991t..
Switching steps in external accessory units: (4,6 or 8 each, max 20 steps total) comprising of:	
- Controller connection for accessory units	91tw
- Accessory unit:	
for switchboard installation 96x96mm	991tz2..
for switchboard installation 72x144mm	991tz4..
as 19"- insert	991tz5..
for standard rail installation	991tz6..
Option:	
First step cycling, relay version	..t
ditto, logical output	..tL

open printversion

Special features of step controllers

Factory setting

Configuration level (supplement):

tE	Switch-on delay per step 1...60sec	5sec
SP..	Switch-on points for step 1...8, based on output 0...100% (or deactivation with setting 101%)	see table
Sd..	Switching differences %	see table

optional:

rel	Switching behaviour of first step: St (normal step) / CY" (cycling*)	St
cy"	Cycle for cycle behaviour (2...120 sec)	20 sec

Settings SP.., Sd..
in %, based on internal control signal 0...100%

	SP1	**SP2**	**SP3**	**SP4**	**SP5**	**SP6**	**SP7**	**SP8**	**Sd..**
for switching behaviour St= normal									
3 Steps	34	66	97						31
4 Steps	27	50	74	97					24
5 Steps	21	40	59	78	97				18
6 Steps	17	33	49	65	81	97			14
7 Steps	16	30	43	57	70	84	97		11
8 Steps	13	25	37	49	61	73	85	97	10
for switching behaviour CY= step1 cycling									
3 Steps		34	66						0.1
4 Steps		27	50	74					0.1
5 Steps		21	40	59	78				0.1
6 Steps		17	33	49	65	81			0.1
7 Steps		16	30	43	57	70	84		0.1
8 Steps		13	25	37	49	61	73	85	0.1

open printversion

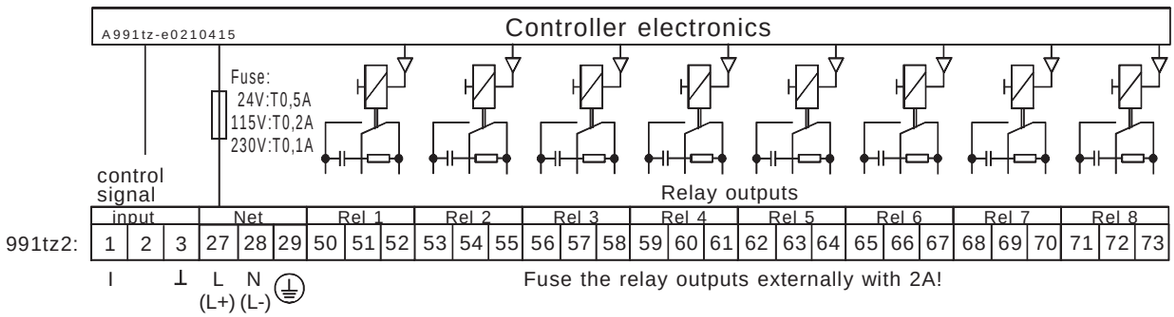
Method of operation:

The relay extension units are triggered by controllers of the series 9.. with the option 991tw, using a special direct current signal. The setting of all parameters (switching distance, switching difference, switching delay, etc.) is performed in the setting controller.

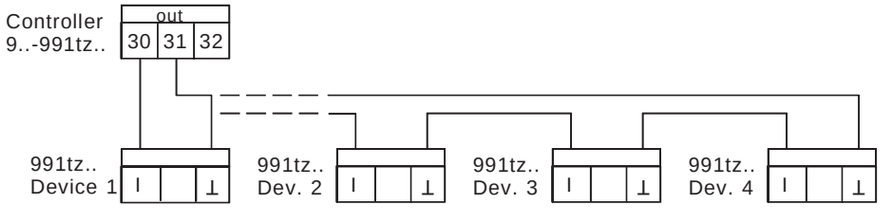
Technical data:

List no.	991tz2	991tz4	991tz5	991tz6
Housing	for panel mounting 96x96	for panel mounting 72x144	for 19" mounting	for norm rail or screw connections (H:75,W:100,D:110)
Output	8 relays max. 250V, 2A	6 relays max. 250V, 2A	6 relays max. 250V, 2A	5 relays max. 250V, 2A
max. number of cascaded devices	2	3	3	4*

Connection:

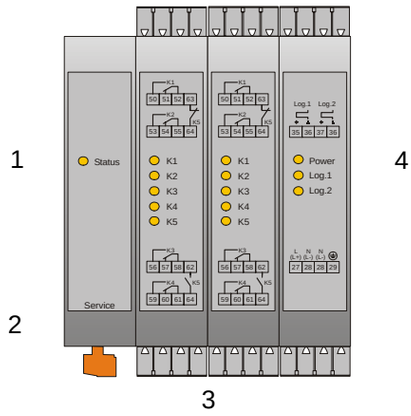


Connection of multiple devices (cascading) to the controller output out1 (terminal 30 / 31)



open printversion

1 Status-LED (CPU-module)
2 Service interface for configuration (PC)
3 Relay modules
4 Power-LED (power supply module)



Brief description:
Continuous controllers from the series 9 can be complemented with subsequently arranged switching steps by the modular step controller 991tz86e. Actuation is performed using the continuous control signal. The configuration of all parameters (setpoint distance, hysteresis, switch-on delay etc.) is done in the CPU-module of the modular step controller by the KFM-PC- software PKS. The modular step controller consists of one CPU- and power supply module each as well as one ore more relay modules with 5 relays each, depending on the number of required switching steps. The step controller can be complemented with 4 relay modules to a maximum of 20 relays. All relays are potential free change over contacts.

In the factory setting, depending on the number of relay modules, the switching points of the steps are evenly distributed throughout the entire control range, however they may be changed as desired. An installed switch-on delay prevents simultaneous switch on of all steps and thus load jumps in the supply mains. It is set jointly for all steps.

Relays which are not needed may be switched off by setting the switch point >100%. The first step may be configured as a cyclic switching output if desired. In parallel, depending on the version, there is a cyclic switching output available for driving a semi conductor switch. This causes an adaption of the power jumps between two steps and thus an almost infinitely variable behaviour.

Version for automatic change-over of the steps
Every change in the output steps causes an automatic change-over of the active steps by activating the next higher output step for power increase and deactivating the lowest output step for power decrease. This forces an approximately even use of all steps including the connected load.

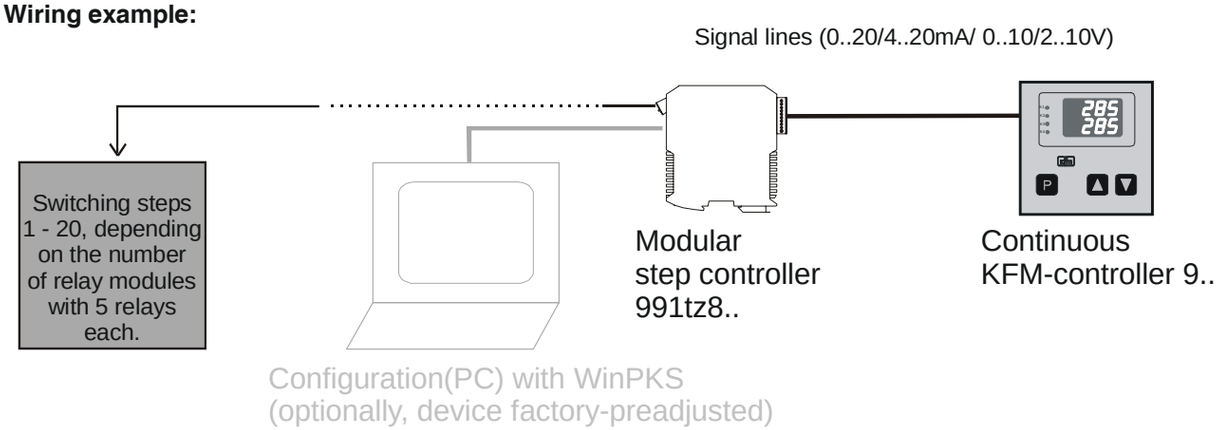
Type summary:

991tz86(e.)	CPU- module (with standard signal 0(4)...20mA, 0(2)...10V measuring input)
991tz870	Relay module with 5 relays
991tz850	Power supply module 100-250 VAC
991tz858	Power supply module 24 V AC/ DC

Device versions:

..L	Switching output 0/24V max. 40 mA
...z	Automatic change-over of the steps

Wiring example:



INDEX
1
2
3
4
5
6
7
8
9
0

INDEX

1 2 3 4 5 6 7 8 9 0

Error messages:

The status LED of the resp. module signalises the operating state:

CPU- module:

yellow permanent:	Normal operation
yellow flashing:	*Only with configuration 4..20mA/ 2..10V:* Measurement line error analogue input
red permanent:	The detected module is unsuitable -> Check the type name of the module, (see type summary)
red flashing:	Communication error between one or more other modules -> Check proper position of the connections beetwen the individual modules

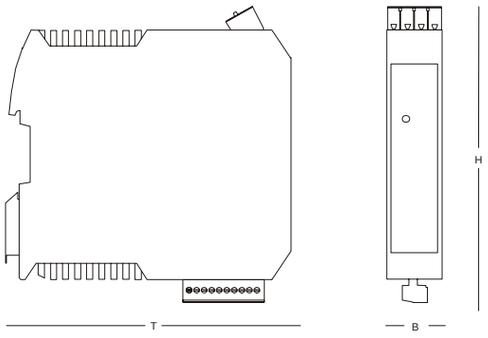
Relay module:

yellow permanent:	Relay actuated, switched on or switched off depending on the configuration
red flashing:	Communication error to the CPU -> Check proper position of the connections beetwen the individual modules

Power supply module:

yellow permanent:	Supply voltage on, normal operation
red flashing:	Communication error to the CPU -> Check proper position of the connections beetwen the individual modules

Installation dimensions (each module):

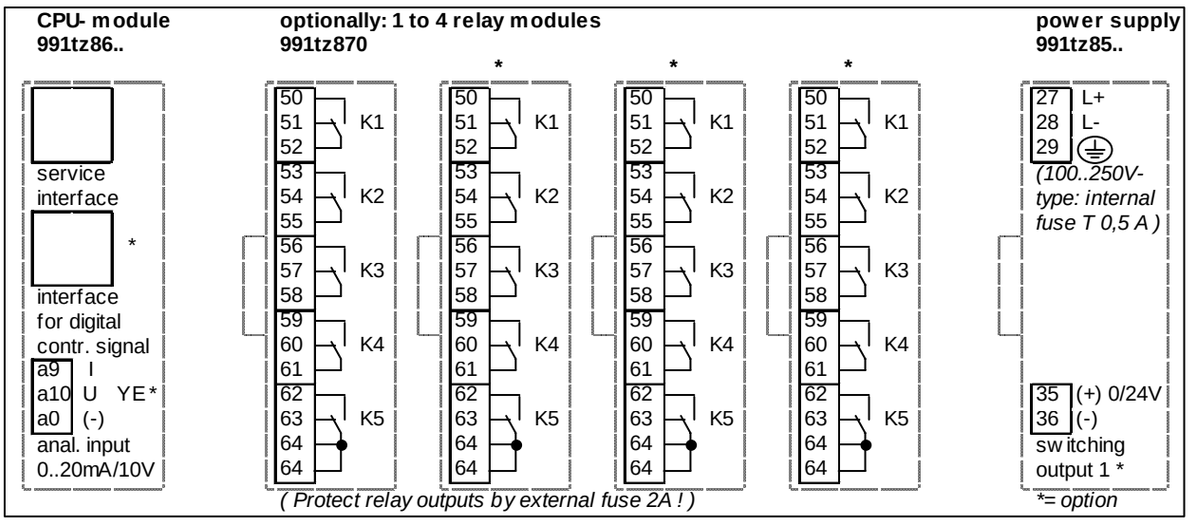


H= 124mm, B = 22,5mm, T = 116mm

Technical data:

Power supply: 100..250VAC, about 12VA,
alternative 24V DC/ AC, about 12VA
Relay output: 230 V / max. 2 A
Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Relative humidity <= 75 % yearly average,
(KWF to EN 60529) no condensation
EMC: referring to EN 61326

Connection diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)



open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Method of operation:

The functional extension for continuous PID controllers consists of a following electrical output for the operation of motors, control valves or other electrical actuators. The operation, control and optimisation of the continuous controller remain, in principle, unchanged.

The continuous control signal is converted via the relay outputs K1 (open) and K2 (closed) directly into a corresponding setting of the connected actuator (see the controller data sheet for the circuit diagram). At the same time, the usual continuous output is omitted (with the exception of Type 991uy).

In addition to the two additional relays, the necessary supplementary item, 99axr, the input for the position feed back, is also supplied. A feedback potentiometer for indication of the position must be present on the actuator that is being driven.

The expansion to version 2 consists of an additional input and an output for a second actuator, whose position is compared with the first and made to follow it.

The functional extension for a three-step controller allows a second actuator to be operated in parallel. The position is continuously compared with that of the first actuator, and made to follow it. In addition to the two additional relays, the two necessary items of supplementary equipment, 99axr, inputs for the position feed back, are also supplied. Feedback potentiometers for indication of the position must be present at both the actuators that are being driven.

Models:	**List no.:**
Position controller instead of continuous output	991u
Position controller in addition to continuous output	991uy
Double position controllers instead of continuous output	991u2
Position controller for continuous heating/cooling controller (9281.):	
- instead of 1st output (heating output)	991uh
- instead of 2nd output (cooling output)	991uk
Second (relay) position output for switching controllers	991uww

Operation (extension):

Parameter level:		Factory setting
SA..	Dead band relay no. to guidance signal (as a % of the regulating distance)	0.0
Sd..	Switching difference relay no. (as a % of the regulating distance)	0.5

Configuration level:

FG. A..E Remote comparison, see data sheet 99axr or reverse side

open printversion

Controllers of series 92/93 (903/93) may be equipped with up to 4 (8) analog inputs per unit in addition to the measuring inputs available as standard. They may be used to display additional measuring values or as reference value for installed additional contacts.

Series 92/93 only:
The display is continuously switched over to additional inputs by actuating the ▲ key. In addition, the bottom display shows the brief designation of the attendant measuring input. The display automatically switches back to the standard operating condition 30 seconds after the last key was pressed. Furthermore, input 2 may be configured as a second display in addition to the controller actual value.

For series 903/93 only:
Factory adjusted, the values of input 1 to 8 are shown with plain text indication.

For temperature sensor inputs, °C or °F may be selected as display unit, for standard signal inputs, a scaling between -999 and +4000 (series 92/93) respectively -999 and +9999 (series 903/93) may be infinitely set.

Measuring input:	**List-No.:**	**Measuring/display range**
Series 92/93 only:		
Resistance thermometer:		
Pt100 DIN	99ax	0...400 °C
Thermal elements:		
NiCrNi (Typ K)	99axn	0...1200 °C
FeCuNi (Typ J)	99axf	0...900 °C
PtRhPt (Typ S)	99axp	0..1700 °C
Standard signal:		
0(4)...20 mA or 0(2)...10 VDC alternatively connectable incl. voltage supply	99axe	adjustable
Rheostatic teletransmitter:		
0...100 to 0...1000 Ω	99axr	adjustable
For series 903/93 only:		
Resistance thermometer / Standard signal:		
Pt100 DIN (PT1000 DIN) switchable 0(4)...20 mA or 0(2)...10 VDC alternatively connectable incl. voltage supply	99axq(c)	-200...800 °C / adjustable
Thermal elements / Standard signal:		
Thermal element switchable 0(4)...20 mA or 0(2)...10 VDC alternatively connectable incl. voltage supply	99axqt	NiCrNi (Typ K) 0...1200 °C / FeCuNi (Typ J) 0...900 °C / PtRhPt (Typ S) 0..1700 °C / adjustable

Additional terminals:

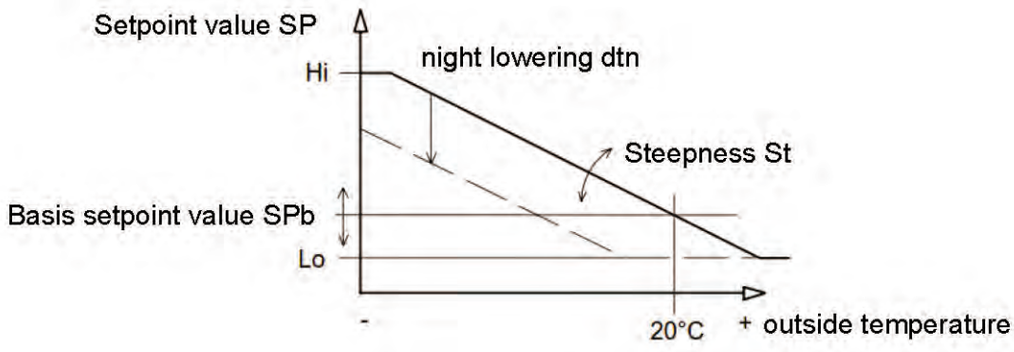
Series 92/93: see sheet 9200 wiring diagram, analogue inputs ai1 to ai4
Series 903/93: see sheet 903 wiring diagram, analogue inputs ai1 to ai8
Terminal numbers according to number of existing, or required analogue inputs

open printversion

INDEX

1 2 3 4 5 6 7 8 9 0

This accessory equipment measures the outside temperature und calculates each corresponding setpoint value “SP”, for example for the supply temperature of a heating circuit in consideration of the adjusted basis setpoint value “SPb” (correlated to +20°C outside temperature) and the adjusted steepness “St”, in accordance to the below diagram.
Optionally, lowering the temperature at night “dtn” is activated by closing a binary input (for example external switch clock).



Type summary: **List.-no.:**

For outside temperature measurement with Pt 100 DIN, range preadjusted -30...+70°C:	99axa
Type as above, but with option for lowering the temperature at night:	99axan

Operation (in addition):

Operating status:

For series 92/93 only:
Display line 1 shows the actual value of the supply temperature (measuring input 1)
Display line 2 shows the actual value of the outside temperature (measuring input 2)
The actual calculated setpoint value is displayed by brief pressing the P-button.
(Depending on type, further displays or switch over to further values)

For series 903/93 only:
Factory adjusted the values of input 1 (supply) and 2 (outside temperature) as well as the actual setpoint value are displayed with plain text indication.

Parameter level 1:		factory adjustment:	notes:
SPb	Basis setpoint value with outside temp. +20°C, range 0...400°C	20	_____
St	Steepness, range 0,1...5,0 K/K	1,0	_____
dtn	Lowering the temperature at night, range 0...400 K	0	_____

Parameter level 2:

Lo/Hi	Limitation of the calculated setpoint value, Upper- / lower limit	relating to meas. range	_____

Corresponding terminals (example):

Terminal- no.:		**Connection of:**
For series 92/93 only:		
1 / 2 / 3	analogue input 1 (PT100)	regulating variable, for example supply
4 / 5 / 6	analogue input 2 (PT100)	outside temperature
19 / 20	binary input 1	for example external switch clock
For series 903/93 only:		
a1 / a2 / a3	analogue input 1 (PT100)	influenceable regulating variable
a6 / a7 / a8	analogue input 2 (PT100)	changeable reference variable
b99 / b1	binary input 1	for example external switch clock

open printversion

Supplementary equipment for series 9..
Maximum/minimum selection from 2 measurement inputs

On devices with an additional measurement input (input 2), this supplementary equipment permits a maximum or minimum selection from the inputs 1 or 2. The values indicated by the two inputs are continuously compared, and only that input with the larger (or smaller) value is used as the regulating magnitude.

Ordering text: Supplementary equipment:
Minimum-maximum selection between 2 measurement inputs
Li. – no. 99ax1ma

Additional information for the operating instructions:

In the normal operating mode, the *upper* display indicates the **active** actual value.
The *lower* display remains empty, or, according to the version and the setting, indicates the (active) set value or the manipulated variable.

If the ▲ - button is pressed the *upper* display shows the value for input 1 and
the *lower* display shows the value for input 2.

Different reactions to error messages:

An error in one of the two measurement inputs is indicated by an “Err” in the display.

By pressing the ▲ - button it is possible to determine whether the error occurred at input 1, input 2, or at both inputs.

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Used in conjunction with controllers with three-point step output, this option allows position indication of the accessed actuator equipped with a feedback potentiometer.

A program for convenient automatic adaptation of the display 0...100% to the electrical values of the respectively available feedback potentiometer in the configuration level, is included:

Operation:
After checking or correcting the actuating time "Y" actuate the P-key, possible several times,
until **"FG A"** appears in the display.
Start compensation by *pressing the P-key for a prolonged time (longer than 5 sec.),*
until a flashing **"0"** appears in the bottom display.
(*Press the P-key briefly to skip compensation.)*
Relay 2 ("-") switches ON, actuator moves to starting/closed position,
Relay 2 switches OFF, **"0"** changes to steady display

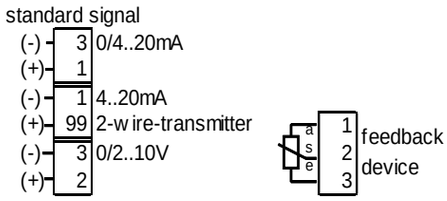
After checking the mechanically correct position, acknowledge the default value 0% with the P-key,
"**FG E**" appearing in the top display for final value compensation,
a flashing **"100"** appears in the bottom display
Relay 1 ("+") switches ON, actuator moves to end/open position,
Relay 1 switches OFF, "**100**" changes to steady display

After checking the mechanically correct position, confirm the default value 100% with the P-key
(subsequently, the system switches to the next configuration)

The program also checks whether the output has really caused an alteration of the position of the actuator and the potentiometer:
If identical values are measured at the start and the end, the error message "Err 300" appears.

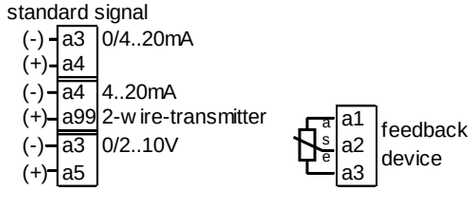
Measuring input:	**List No.:**	**Measuring/display range**
Teletransmitter 0...100 to 0...1000 Ω	99axr	0...100.0 %
Standard signal 0(4)...20mA, 0(2)...10V	99axe	0...100,0 %

Wiring: Examples, each for input 1 ***,** valid for each delivered controller is the wiring diagram on its casing only



* Terminal No. per number of existing and/or required inputs:
1st analog input: Terminal 1/2/3
2nd analog input: Terminal 4/5/6
3rd analog input: Terminal 7/8/9
4th analog input: Terminal 10/11/12

alternative:



* Terminal No. per number of existing and/or required inputs:
1st analog input: Kl. a1/a2/a3/a4/a5
2nd analog input: Kl. a6/a7/a8/a9/a10/a0
3rd analog input: Kl. a11/a12/a13/a14/a15
4th analog input: Kl. a16/a17/a18/a19/a20

open printversion

additional device for standard signal input: alteration rate limitation

The adjustment *d* helps to avoid overshoots due to violent corrective actions,
f.e.in steam contol circuits.

The additional adjustment *db* allows to restrict this influence to a part of the
input range.

Example:
The signal input range is 0 to 20 bar, with a setpoint value of 10 bar the damping shall be limited to the range from 5 to 15 bar.

The adjustement for the parameter *db (%) is derived as follows:
The damping shall be effiective within 5 to 15 bar.
This means a damping range of 10 bar, referring to the measuring range of 20 bar it is 50 %.

Order text: Additional device:
input signal alteration rate limitation
List No. 99azd*

Adjustment:
(in supplement to configuration level):

***d"** permissible speed of corrective action, % per second
(no function: adjust 0.0)
factory setting: 0.0

***db** influenced part (%) of input range
(no range restriction: adjust 100)
factory setting: 100

* = no. of measuring input

Option to cascade function 991.. activation by digital input

This option allows to activate the cascade function 991k by digital inputs (f.e. terminal 19 / 20 = digital input 1).

Contact closed: the cascade function is active. All influences to the setpoint value (f.e.external setpoint value, second setpoint value) refer to the guide controller.

Contact open: the cascade function is off. Only the sequential controller is active. All influences to the setpoint value (f.e.external setpoint value, second setpoint value) refer to the sequential controller.

Type summary:	**List No.:**
switchable with separate sequential controller setpoint	99b1s8
as stated above, but with takeover of the guide controller setpoint	99b1s8fsp

Type 991b1s8fsp: The sequential controller part continues to operate with the guide controller setpoint in case of Err 1 or disabled guide controller.

Attention:
To avoid cross interference all low voltage measuring lines and pilot wires must be encased in a shielded cable (the shielding must be earthed one-sided) and avoid the neighbourhood of heavy current lines.

Controller series 9.. can acquire status messages by using internal binary inputs and provide them via service interface for further processing, for example with interface adapter 99spde.. for Profibus.

The binary inputs can be accessed with parameter code "1002". *For the structure of the parameter see page 6 of the manual 99s_BE.*

With series 903... messages can be additionally displayed as LED symbol and in plain text on the TFT display, the LEDs and message texts can be easily edited by the KFM-PC Software PKS.

With series 92.. and 902.. messages are displayed in the setpoint level by parameter "bin" resp. "BIN.EING.“.

Depending on the sub type, the use of external voltage 0 / 24VDC alternatively to potential-free change-over switches is possible.

Types:

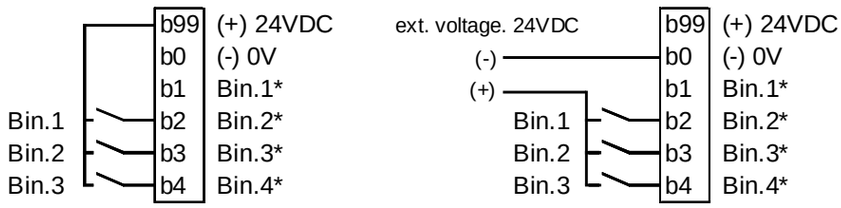
99b2s: 2 binary inputs incl. software for acquiring and processing of status messages

99b3s: 3 binary inputs incl. software for acquiring and processing of status messages

99b4s: 4 binary inputs incl. software for acquiring and processing of status messages

Additional connection terminals:

Example for type 99b3s, valid for each delivered controller is the wiring diagram on its casing only.



Remarks: *To avoid cross interference use shielded cable only for the low voltage signal leads, the shielding must be earthed one-sided.*

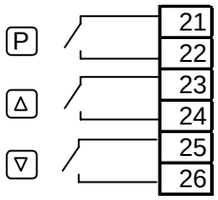
Avoid to cross with load wires.

** Appropriated digital inputs depend on additional functions, respectively on already used binary inputs.*

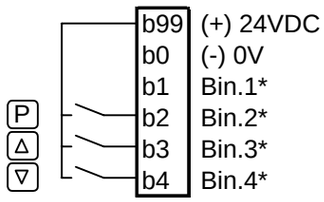
Controllers of the series 9.. can be equipped with terminals for external keyboards.
Depending on sub type, the use of external voltage 0 / 24V alternatively to potential-free change-over switches is possible.

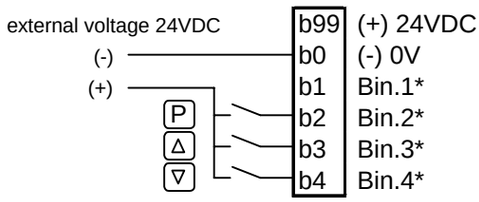
Wiring diagram:

(Examples, depending on sub type, some details can be missed. Valid for each delivered controller is the wiring diagram on its casing only)



alternative:





Remarks: *To avoid cross interference use shielded cable only for the low voltage signal leads, the shielding must be earthed one-sided.*

Avoid to cross with load wires.

** Appropriated digital inputs depend on additional functions, respectively on already used binary inputs.*

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

This function expansion makes it possible to switch over control units of series 9.. from the internal equipment set point value to an externally specified setpoint value, as desired.

The analog input for processing the external setpoint value signal is identified on the connection terminals with the designation SPE, as well as the optional connection type of voltage (U) or direct current (I).

The voltage or current range may be configured to 0 or 2...10 V or 0 or 4...20 mA. Furthermore, the setpoint range allocated to the signal range is freely adjustable. The function of the value is selectable by menu as absolute (abs) adding (add) or subtracting (sub).

Depending on type, switch-over from the internal to the external setpoint value takes place through a binary control input (potential free contact, alternative: external voltage 24 VDC) or is to select, additionally with the type extension "..mb", by menu adjustment in the setpoint level (SP-F: choice SP = internal or SPE = external setpoint). Only for type extension "..mb" : The configuration of the external setpoint for series 902.. takes place in the configuration level using SPEF (resp. SP-F for type 9..) by selecting BIN = activation by bin. input or MENU (resp. SP-L for type 9..) = activation by menu adjustment in the setpoint level.

In the operating level, the incoming external setpoint value signal is displayed under the designation “SPE” after the setpoint value “SP”, once the P key is actuated again. In addition, it can be recognized whether this is currently effective, depending on the switch setting: The respective active value SP or SPE appears in normal indication, the inactive value is flashing.

Providing the setpoint value in the operating level is displayed in the bottom display, this display automatically switches over to the external setpoint value, i.e. as soon as it has been activated it displays the current effective setpoint value.

Types	**List No.**
Activation with control input for potential free contact*	99bwa
Switch-over with menu function or potential free contact*	99bwamb

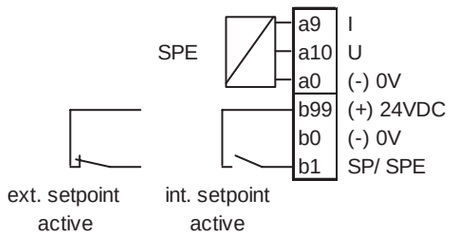
*Depending on sub type, the use of external voltage 0 / 24VDC alternatively to potential-free change-over switches is possible.

Order text:

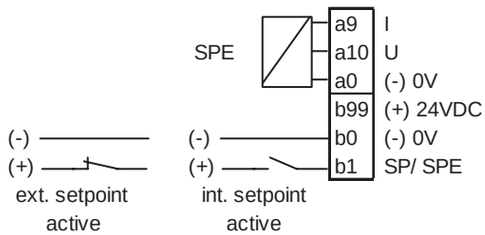
Accessory equipment:
Function expansion for external setpoint value
with additional analog input 0/4...20mA o. 0/2...10V
Types... List No.....

Additional connection terminals: Examples, valid for each delivered controller is the wiring diagram on its casing only.

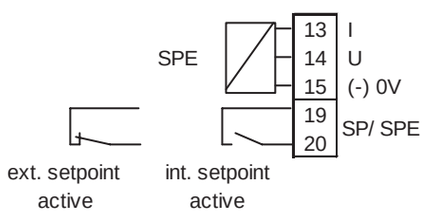
potential free contact



external voltage 24 VDC



alternative:



open printversion

Accessory equipment 9..
additional set point value permitting switch-over

This function expansion for control units of series 9.. makes it possible to enter one or several additional set point values in the operating level as an optional alternative to the main set point value SP.

Switch-over from the main set point value to a different set point value takes place through the allocated binary control input (potential free contact, alternative: external voltage 24 VDC). Only one contact may be switched at a time.

Providing the set point value in the operating level is displayed in the bottom display, this display automatically switches over to the external set point value, i.e. as soon as it has been activated it displays the current effective set point value.

In the operating level, the additional set point value is displayed and set under the designation “SP2” / ”SP3” for example, after the main set point value “SP”, once the P key is actuated again. In addition, it can be recognized which set point value is currently effective: The respective active value SP or SP_ appears in the normal display, the inactive value only flashing.

Types:	**Li.-No.**
- Switch over to other set point values by potential free binary control input[#]	99bwz*

[#] = Depending on sub type, the use of external voltage 0 / 24VDC alternatively to potential-free change-over switches is possible. (series 92..: sub type “u“)

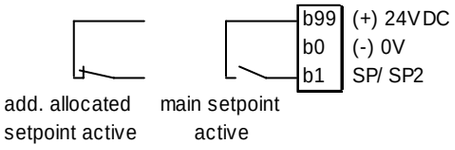
Order text:

Accessory equipment:
Function expansion for switching over
to additional set point values incl.
attendant binary control inputs
Li.-No. 99bwz*: Control input for potential free contact

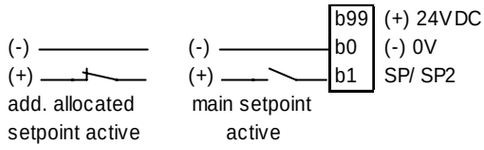
* = Number of additional set point values

Wiring diagram: Example, each for 99bwz1, valid for each delivered controller is the wiring diagram on its casing only.

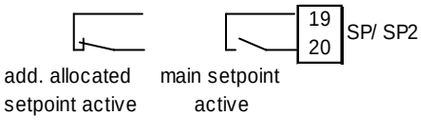
potential free contact



external voltage 24 VDC



alternative:



open printversion

INDEX

The control function can be stopped with an external contact via a digital input.

Open contact: Normal control function
Contact closed: Stopped control function

Alternative: reverse operation -u

Execution:	**List No.**
Control stop, (switching output: relay *off*, continuous output: corrective signal set to the last value), *manual function* active	99bxh
for three-point step controllers:	
Control stop, all relays off *	99bx70
Control stop, relay K2 (-) actuated *	99bx72
for continuous controllers:	
Control stop, corrective signal *0%* *	99bx80
Control stop, corrective signal *0% with open contact* **	99bx80us
for continuous controllers with 2 corrective signal outputs:	
Control stop, output 1 = 0%, output 2 not affected *	99bx81
Control stop, output 1 = not affected, output 2 = 0% *	99bx82
Control stop, output 1 = 100% (20mA), output 2 not affected *	99bx83
Control stop (series 90..), output 1 and output 2 = 0% *	99bx90y
Control stop (series 90..), output 1 = 0%, output 2 not affected **	99bx91s
Control stop (series 90..), output 2 = 0%, output 1 not affected **	99bx92s

* manual function *can* be called

** After reactivation of the binary input the output signal is rising to the calculated control value with an adjust. gradient one time. -s

for ramp setpoint controllers:
additional: ramp setpoint reset -r

for additional switching contacts:			
Automatic function contact 1-4 stop, concerning relays off			99bxf1
Automatic function contact 2-4 stop, concerning relays off			99bxf2

Other executions upon request

99bx…s only:

Configuration level 1 (extension) *if existing*:		*factory setting:*	*notes:*
1/2tY	permissible rate of change for the control output (1/2) per second (0…100% of signal range) no limitation: adjust 0	1.7	___

Connection:
Refer to the wiring diagram contained in the general controller description Pg. 90../92.. resp. manual 90../92..

open printversion

Special function:
Limitation of a continuous action control output

INDEX

Description:

The control output of continuous action controllers can be limited to a settable value by way of a binary input or a relay linkage.

Adjustement of the desired maximum value of the control variable:

Series 92/ 902:	Configuration level	Parameter "YHi"
Series 903:	Parameter level 2	Parameter "LHi"

Versions:	**List No.**
Limitation by way of binary output	99bybb
Limitation by linking an auxiliary contact K1. The switching point is set as usual for K1; all standard function and allocation selection possibilities of the auxiliary contact are retained.	99bybf

By allocation of another measuring input it is also possible to trigger the limitation by conditions outside the control circuit (return temperature, other measuring value).

Alternative in each case: reverse action	.....u

open printversion

additional device for continous controllers series 9..: speed limitation of corrective action

This alternation helps to avoid overshoots due to violent corrective actions, f.e.in steam control circuits.

Order text: Additional device:
speed limitation of corrective action
List No. 99byd.

Adjustment:
(in supplement to configuration level):

tY permissible speed of corrective action, % per second
(no function: adjust 0.0)

factory setting: 0.0 %/sec

Versions	**List- No.:**
Standard version	99byd
Special version:	
Speed limitation of the *decreasing* corrective action, *increasing* corrective action unaffected	99byd1

open printversion

In the *double* continuous controllers of the 9… series, this additional equipment is used to select, according to the setting, either the largest (maximum selection) or the smallest (minimum selection) of the two internal actuating signals, and to make it available at only *one* output present in hardware as a 0/4…20 mA signal.

Ordering text:

Additional equipment for continuous controllers:
Selection function for maximum or minimum selection of the internal actuating signal of a double continuous controller and connection to the position output.
List no.: 99bym

Operation:

Configuration levels (extension):

		Factory setting:	*Notes:*
1out	Position output characteristic curve control loop 1 direct / inverse "di / in"	in	
2out	Position output characteristic curve control loop 2 direct / inverse "di / in"	in	
out	Position output signal "0-20 / 4-20" mA	4-20	-------
out	Operation of the "Lo / Hi" selection	Lo	-------

The control loop selection facility consists of an additional binary input in order to activate one or the other of two control loops.

According to the state of the binary input, the first (binary input unconnected) or the second (binary input bridged) control loop is activated. The output of the inactive control loop is set to 0%.

Further options (available on request):

- The signal selection function also includes an additional input for an external actuating signal.
- Additional minimum / maximum – selection switching

Ordering text: Supplementary equipment:
Signal selection function for continuous 2-channel controllers
Li.-no. 99byu2

Operation (extension):

Display of the actual value:

Temporary indication in the lower display by pressing the ▲ button,
permanent display can be configured in parameter level 2

Configuration levels (extension):		Factory setting
out	Min.- / Max. selection function (Lo / Hi)	Lo

open printversion

INDEX

1 2 3 4 5 6 7 8 **9** 0

Controller from series 9.. can capture impulse counter- signals using internal binary inputs and provide for example the actual volume per hour or the added up total quantity for displaying and further processing. Depending on version the impulse counter- signals can be used for flow control, dosage or for pump-protection respectively control.

The total quantity of each impulse input is saved every 6 minutes independently of the power supply and can be reset or adjusted if required. It can be selected between division and multiplication depending on the size of the factor. The displayed value is a result of the quantity and an adjustable correction factor.

Furthermore, with *version 99cb2d* can be switched over from either impulse input 1 or the difference between impulse input 1 - 2 using an additional internal binary input.

The usage of external voltage 0 / 24 V DC is possible alternatively to a potential free contact. The maximum frequency of the impulse inputs is 3,2 kHz.

Versions:

99cb: 1 binary input incl. software for the capturing of impulse counter- signals and the calculation of actual volume per hour or the added up total quantity

99cb2d: 2 binary inputs incl. software for the capturing of impulse counter- signals and the calculation of actual volume per hour or the added up total quantity, either impulse input 1 or the difference between impulse input 1 - 2

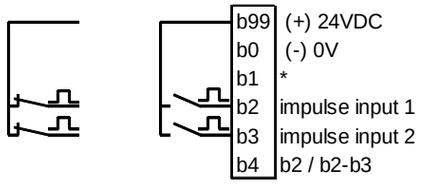
Settings in detail: *(existence depends on version and type):*

Setpoint value setting (supplement):		**Factory setting**	**Notes**
Faktor	correction factor	1,000	___
Parameter level 1 (supplement):			
***NKS_o1**	Number of decimal places output 1 " added up total quantity " (0...3)	0	___
***NKS_o2**	Number of decimal places output 2 " actual volume per hour " (0...3)	0	___
Configuration level (supplement):			
***fakt**	Factor (didi/ dimu/ mudi / mumu)*(**di**vision resp. **mu**ltiplication)*	mumu	___
***tf_o1**	Time factor output 1 " added up total quantity " (0,001...9999)	1,000	___
***tf_o2**	Time factor output 2 " actual volume per hour " (0,001...9999)	1,000	___
***SetC_sm**	Set Counter (0...99 999 999)*(max. 8 significant places)*	0	___

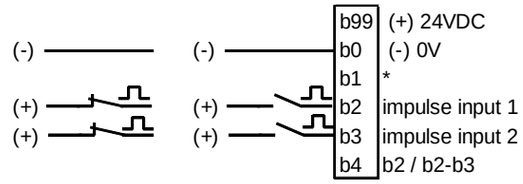
** Number of the impulse input*

Wiring diagram: Example ..cb2d, valid for each device is the the wiring diagram on its casing only .

potential free contact



external voltage 24 VDC

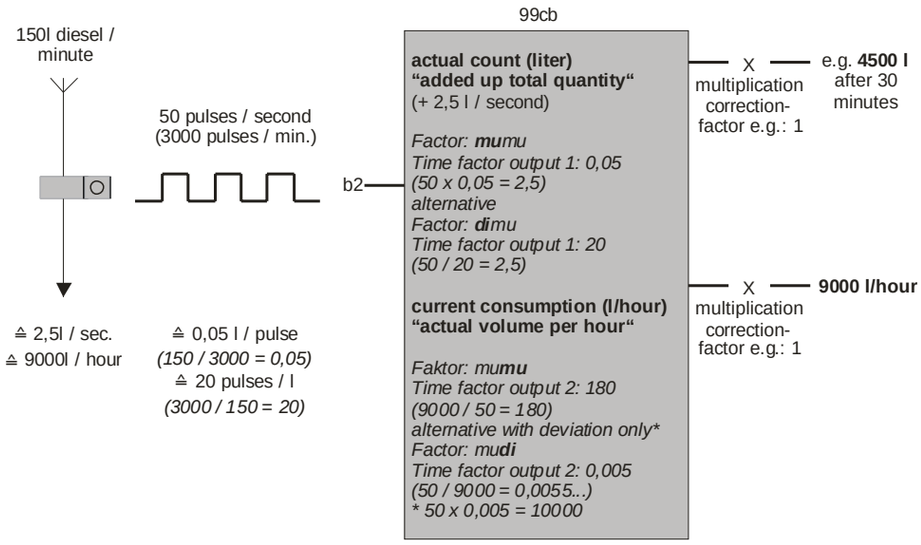


* = other

open printversion

Example: version 99cb, counter module for diesel fuel

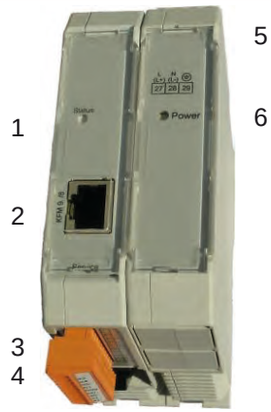
Counter module characteristics:
20 pulses / liter



1
2
3
4
5
6
7
8
9
0

open printversion

INDEX



1 Status-LED
2 RJ-45 connector KFM controller
3 Terminals signal outputs / binary- and analogue inputs
4 Service interface for configuration (PC)
5 Terminals supply voltage
6 Power-LED

Brief description:
With the intelligent accessory device 99e, for mounting on DIN rail, controllers of series 9.. can be equipped with an input for external setpoint and additional signal outputs later on. The external setpoint is activated by a binary input. The requested transmission data e.g. actual value, setpoint or regulating variable as well as the range and type of the in- / outputs are configurable. So the accessory device 99e can be used additionally or alternatively to the use of bus- systems, e.g. PROFIBUS.

The communication between the accessory device and the service interface of the KFM controller takes place by a patch cable (2m), which is delivered with each accessory device. Connection faults are recorded in the fault memory for diagnostic purposes. The devices are modular in structure, consisting of functional- and power supply module, alternatively type version ..i can directly be used with the power supply of already existing KFM-assemblies, e.g. series 8…

Type summary:
Functional module for connecting power supply modules:

99ebwogg	Accessory device for external setpoint and 2 signal outputs

power supply module:

99e500	Power supply module 100-250V AC
99e508	Power supply module 24V AC or DC

Functional module for connecting power supply of already existing KFM-assemblies:

99ebwoggi	Accessory device for external setpoint and 2 signal outputs 0/4...20mA

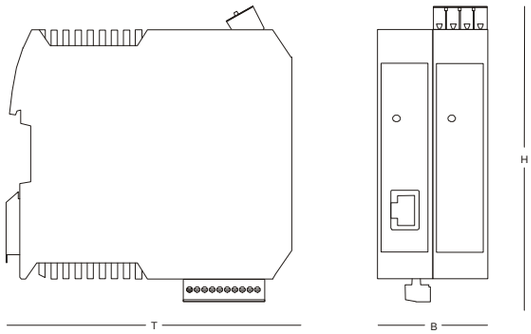
Adjustments: (existence depends on version and type)
The accessory device 99e is delivered preadjusted. In case of changes, the preadjustments can easily be modificated by a configuration program in the PKS PC software (from version 1.9L) via the service interface

write: (to the KFM controller)		*factory setting*	*notes*
Data word 1	Bus- setpoint 1(1060 ref. to protocol KFM 2.0)	1060	___
Only if a KFM controller series 92 is connected:			
Data word 1	(Internal)- setpoint 1(1100 ref. to protocol KFM 2.0) *Note: The internal setpoint of the controller will be overwritten if the binary input is activated.*	1100	___
read: (from the KFM controller)			
Data word 2	Actual value 1(1010 " " ")	1010	___
Data word 3	Actual value 2(1011 " " ")	1011	___
	for further parameter codes refer to manual 99s		
1ELO/1EHI	for external setpoint: start / end of setpoint range	0 / 400	___
1SLO/1SHI	for information signal output 1: start / end of range	0 / 400	___
2SLO/2SHI	for information signal output 2: start / end of range	0 / 400	___
AIN1	Input type for input no.1: “0..20/4..20(mA)/0..10/2..10(V)/ AUS=OFF" (note different terminals for I/U!)	4-20	___
Sou1	Type of information output signal 1:"0..20/4..20(mA*)0..10/2..10(V*)"	4-20 / 2-10	___
Sou2	Type of information output signal 2:"0..20/4..20(mA*)0..10/2..10(V*)"	4-20 / 2-10	___
Adr	bus address KFM controller 9.. * = depending on version	5	___

Commissioning:
Connect the patch cable (2m) with the service interface of the (9..) KFM-controller. The power-LED on the power supply module signalises the operating voltage, the status-LED on the functional module the operating status:

yellow permanent:	Normal operation
yellow flashing:	Communication error between KFM-controller and accessory device 99e.. Hint: All analogue outputs are set to the start of range, the fault memory will be increased by 1.
red flashing:	Measurement line error analogue inputs accessory device 99e.. Hint: All transmission values to the KFM-controller are set to the start of range.
red yellow flashing:	Communication error KFM- controller and measurement line error. Hint: All analogue outputs and transmission values are set to the start of range, the fault memory will be increased by 1.
red permanent:	Internal error *Switch off power supply for a short time. If, after this time, the LED still lights contact KFM or remit the device for repair.*

Installation dimensions:

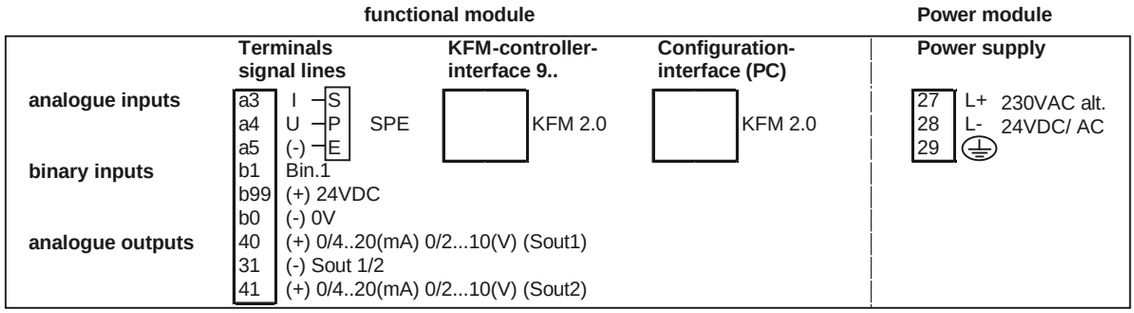


H= 124mm, B = 45mm, T = 116mm

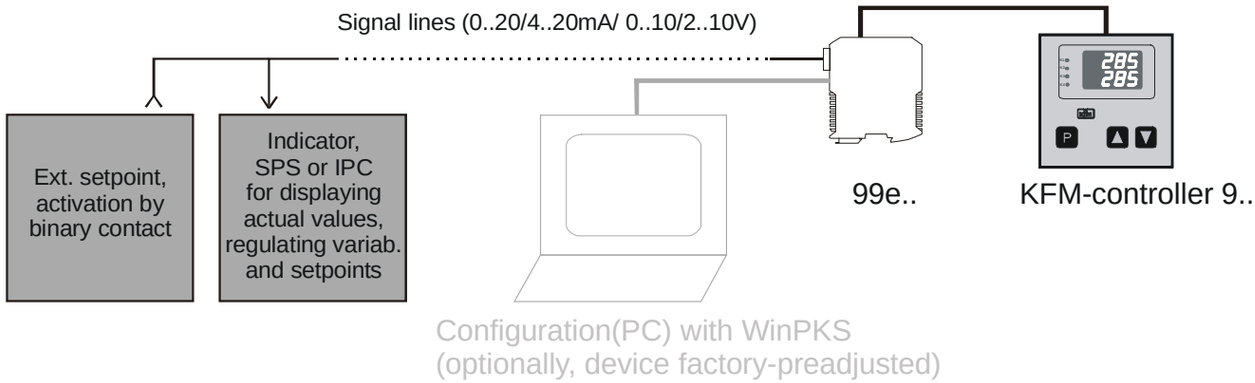
Technical data:

Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 230V AC, about 12 VA
altern. 24V DC/ AC, about 12 VA
Outputs: 1(2) continuous outputs 0/4…20mA
alternative 0/2…10V (load >= 500 Ω)

Connection diagram:



Wiring example:



Additional switching contacts are avaiable type dependent, up to 8 relays per controller.

1. Adjustments on *parameter* level, seperately per each contact:

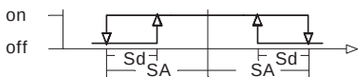
SP.. **S**witching **p**oint for independent additional contacts with own set value (type dependent).
SA.. **S**witching interval for following additional contacts, given as range (**a**bsolute value) above or below the set value of the controller.
(SA or SP alternatively, depending on the selected control function)

Sd.. **S**witching **d**ifference (hysteresis), dead zone between activating and deactivating switching function. (To the deactivating switching point it is necessary to take an adequate deviation (concerning the adjusted switching point) into account)

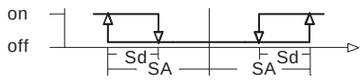
2. Selectable **switching functions** on *configuration* level, seperately per each contact:
(type dependent**)**

a) *following* contacts:

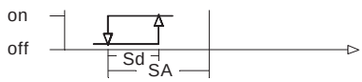
LC A Switching point on both sides of the set value (**L**imit **c**omparator). Relay drops out in case of rising deviation (**A**us)



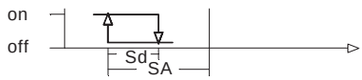
LC E Switching point on both sides of the set value (**L**imit **c**omparator). Relay cuts in in case of rising deviation (**E**in)



Su A Switching point below the set value. Relay drops out in case of decr. act. value (**A**us)



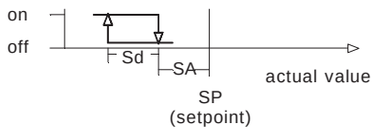
Su E Switching point below the set value. Relay cuts in in case of decr. actual value (**E**in)



So A Switching point above the set value. Relay drops out in case of rising act. value (**A**us)

So E Switching point above the set value. Relay cuts in in case of rising actual value (**E**in)

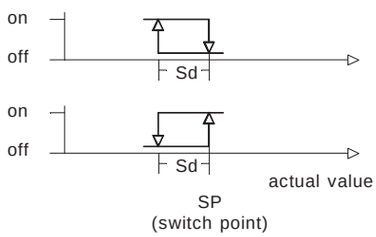
St A Heating stage below the set value. Relay drops out in case of rising act. value (**A**us)



b) *independent* contacts :

US A Relay drops out in case of rising actual value (**A**us)

US E Relay cuts in in case of rising actual value(**E**in)



3. further adjustments on configuration level:

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH.. assigned measuring input/ actual value (**ch**annel) no. .. for independent contacts or assigned control loop for following contacts

SI E "Safety" shut down (in case of measuring line fault): Relay **on**
SI A "Safety" shut down (in case of measuring line fault): Relay **off**

open printversion

Additional contact with special function: switchable common output for 2 control channels

Additional device (only) for dual controller:
series 92.. type: 927030..(three-point-step) and 928030..(continuous) resp.
series 902../903.. type: 902(3)72..(three-point-step) and 902(3)82..(continuous)

In devaition to the normal device (1 output for each control loop) there is only one output (type three-point-step: relay K1 + K2 or continuous: control output Y1) for both control loops.

Depending on the switching state of the additional contact (type three-point-step: relay 3 or continuous: relay 1) the control channel 1 or the control channel 2 is connected to the output.

additional contact switched off: control channel 1 is connected to the output
additional contact switched on: control channel 2 is connected to the output

Besides the switching state of the additional contact the LED (type three-point-step: LED3 or continuous: LED1) gives the additional information of the active control channel.

The adjustments and the other functions of the additional contact are equal to the normal device.

Type:	**List - No.**
1 common output, switchable to control loop 1 or 2	99f1u
option: the setpoint of the 1st control channel(1 SP) can be adjusted at the configuration-level (for this setpoint the setpoint limitations 1 Lo/Hi are dropped)	99f1u2

open printversion

This function expansion is designed to transmit actual values, set point values, additional correcting variables, etc. as standard signals from series 92/93/94/95 control units to display units, PLC or IPC.

The current or voltage range can be configured at 0...20mA, 4...20 mA, 0 ...10V or 2...10 V.
The signal range can be set as minimum and maximum value.

Designs:	**Type**
Output signal 0/4...20mA	99og.
Output signal 0/2...10 V	99ok.
As alternative:	
Actual value	x
2 actual values	xx
Set point value	....w
Actual value + set point value	....xw
dc decoupled (isolated), suffix:	.....t / tt

Additional designs available upon request

Order text:

Accessory equipment:
1(2) analog signal output(s) ...(mA,V)
for ... (value) and ...-(value)
Adjustable range
Li. No. 99o.....

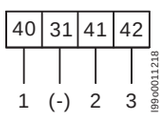
Operation:

Parameter level 2 (supplement):		*Factory setting*
(1)S Lo	Beginning of range setting (display value)	*(same as controller)*
(1)S Hi	End of range setting (display value)	*(same as controller)*

Configuration level (supplement):

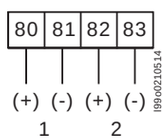
Sout **Sou1(2)**	Assignment of information signal (value): Ist1 = Act.1/ Ist2 = Act.2/ Setp. = SP/ control output =Y	*Ist 1*
Sout **Sou1(2)**	Selection of information signal (type): 0-20 / 4-20 mA or 0-10 / 2-10 V	*4-20*

Additional connecting terminals:



1 = Signal output 1
2 = Signal output 2
3 = Signal output 3
(-) = common reference potential

isolated design:



1 = Signal output 1
2 = Signal output 2

Hint: The signal output1 is also galvanic isolated from output 2

open printversion

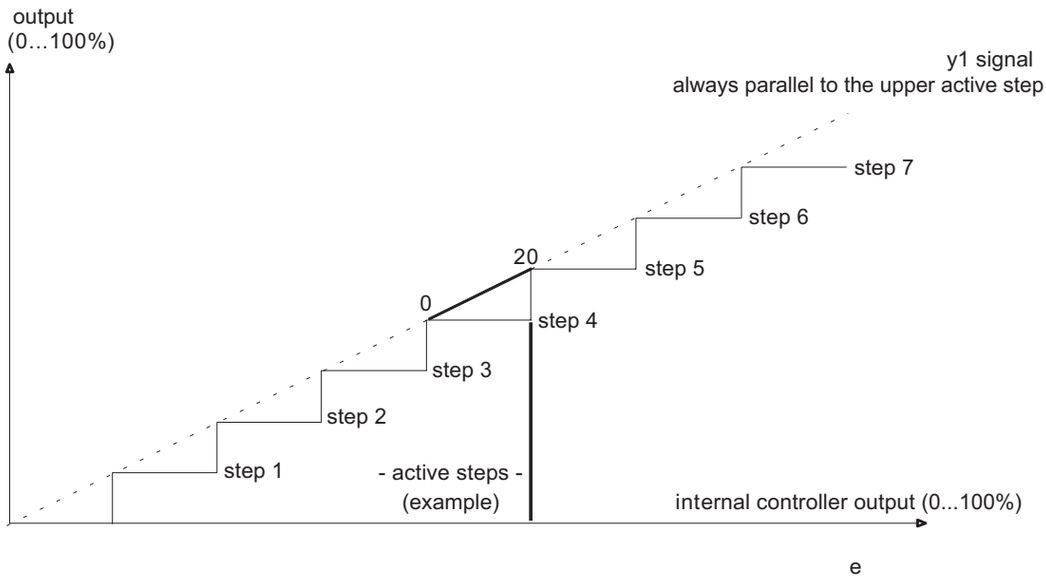
Function :

Additional analog signal output 0(4)...20 mA, or logic output for step controller Type 92D.. (or 92800-99st..) to compensate the power steps between the heating steps.

The signal range is always parallel to the upper active steps: it starts with the switch-on point of the step at 0% output signal and ends at 100% output signal immediately before the switch-on point of the next step.

In conjunction with a thyristor actuator that complements the normal step switch and takes effect on the remaining heating steps, a quasi continuous control of the total performance is guaranteed.

	Type
analog output	99ogy
logic output	99ogyL



Setting Possibilities:
(Configuration level; supplement):

tE	Switch-on delay time 1...60 sec. (for all steps)	- Standard setting: 5.0 sec.
tP	Time delay (switch interrupt) for the y1-output, when switching to the next step.	- Standard setting: 0.0 sec.
SP..	Switch-on points (e.g. 1...7 relays), relative to 0..100% of the controller output (or: deactivation of steps not needed: Value > 100%)	- Standard setting: - 12.5;25;37,5;50;62,5;75,87.5 - (4 relays: 20, 40, 60, 80)
Sd..	Switch difference of the steps (e.g. 1...7)	- Standard setting: 0.1

open printversion

INDEX

Controllers series 9.. with this accessory equipment can be switched over to another parameter set. The switch over takes place by the assigned binary control input (potential free contact, alternative external voltage 24 VDC).

Depending on type, both parameter sets include the control parameters and additionally one setpoint value as well as control- and configuration parameters for an additional contact.

Types	**List No.:**
switchable 2. parameter set control parameter	99p2
switchable 2. parameter set control parameter, add. setpoint value and function add. contact K3	99p2k3

Setpoint value level (addition):

SP 1* Setpoint value 1. parameter set
SP 2* Setpoint value 2. parameter set

Parameter level (addition):

P1 Proportional range, 1. parameter set
I1 Integral action time, 1. parameter set
d1 Rate time, 1. parameter set
Sh1 Response sensitivity, 1. parameter set
P2 Proportional range, 2. parameter set
I2 Integral action time, 2. parameter set
d2 Rate time, 2. parameter set
Sh2 Response sensitivity, 2. parameter set

SA 3* Setpoint distance for trailing contact, 1. parameter set
SP 3* Setpoint value independent additional contact, 1. parameter set
Sd 3* Hysteresis additional contact, 1. parameter set

SA 4* Setpoint distance for trailing contact, 2. parameter set
SP 4* Setpoint value independent additional contact, 2. parameter set
Sd 4* Hysteresis additional contact, 2. parameter set

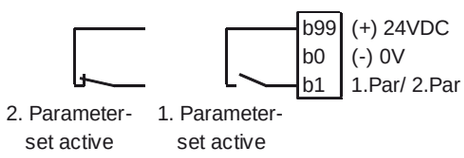
Configuration level (addition):

reL3* Function mode, assigned actual value and fail-safe position add. contact, 1. parameter set
reL4* Function mode, assigned actual value and fail-safe position add. contact, 2. parameter set

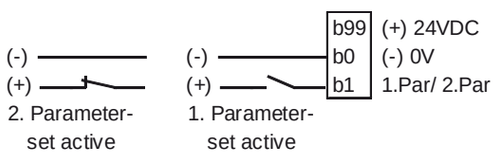
* = type 99p2k3 only

Wiring diagram: Example, in each case for 99p2.., valid for each delivered controller is the wiring diagram on its casing only.

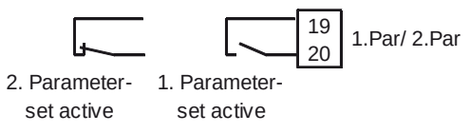
Potential free contact



external voltage 24 VDC



alternative:



open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

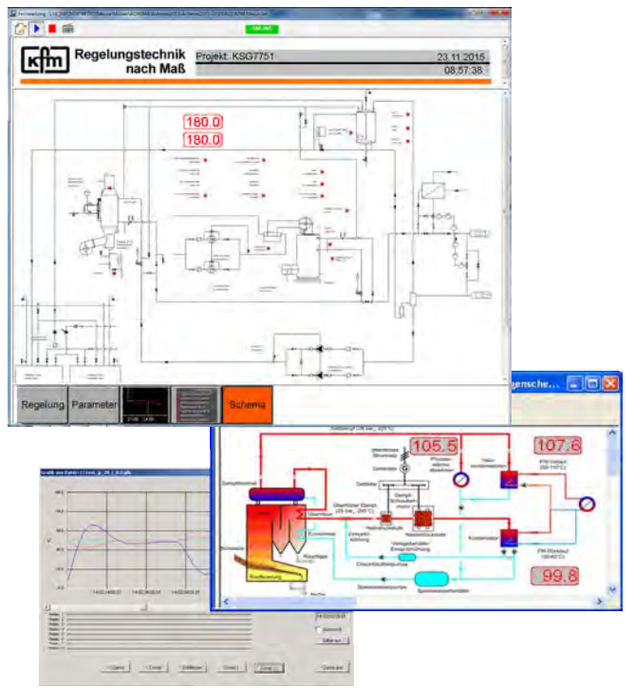
General:

The interface- software KFM- PCS offers process- visualization of custom specific system schemes and flow charts. The operation and visualization takes place by PC or industrial- PC. The creation of projects with graphical design tools and the operation are distinguished by simple handling. All devices equipped with service- interface KFM 2.0 can be integrated for data supply.

Operating and visualization for real- time operation (online):

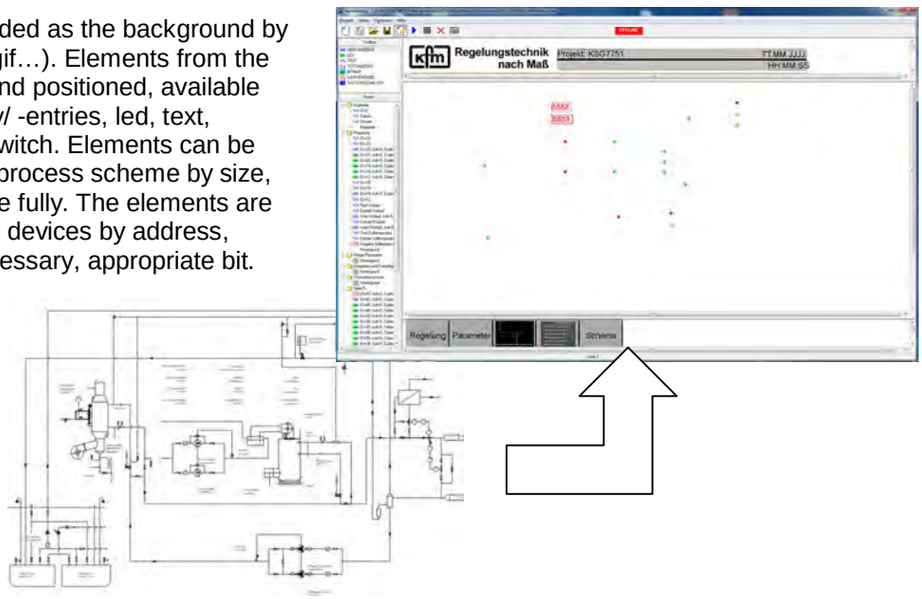
All inserted elements, e.g. value displays, value entries or leds, are communicating according to their configuration with the desired device. In addition to the dynamic display of system variables and –conditions the control of the process by the system operator takes place using the buttons push- button/ switch and value entries.

The data- transfer of complete parameter blocks, the graphical representation (line recorder) and data recording (data logger) as well as the display of operating- and malfunction history are possible.

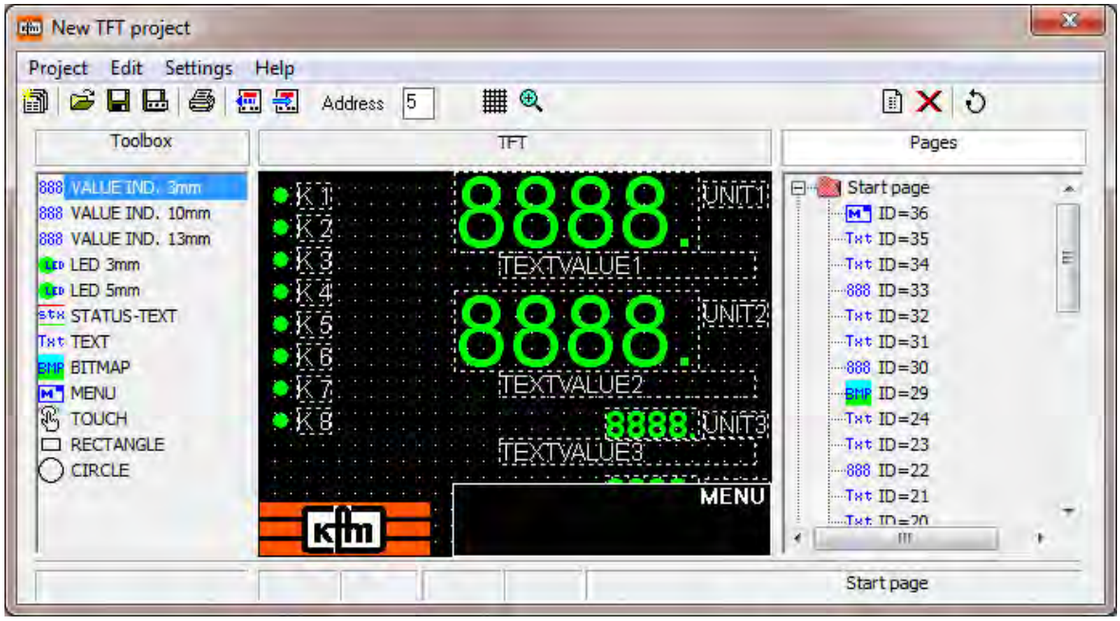


Creation of projects (offline):

The system scheme is loaded as the background by a bitmap file (.bmp/ .jpg/ .gif…). Elements from the tool box are moved over and positioned, available elements are value display/ -entries, led, text, bitmap and push button/ switch. Elements can be adapted to the respective process scheme by size, color, transparency or state fully. The elements are assigned to the connected devices by address, parameter code and if necessary, appropriate bit.



open printversion



TFT- displays from KFM- series 803 and 903 can be changed or completely new designed with this program.

Every retrievable value in the device can be placed at any position and designed freely across the individual pages. In addition, there are texts and graphical symbols in various form and color. It is also possible to import whole bitmap-, JPEG-, PNG- or GIF-files, for example company logos or pictures.

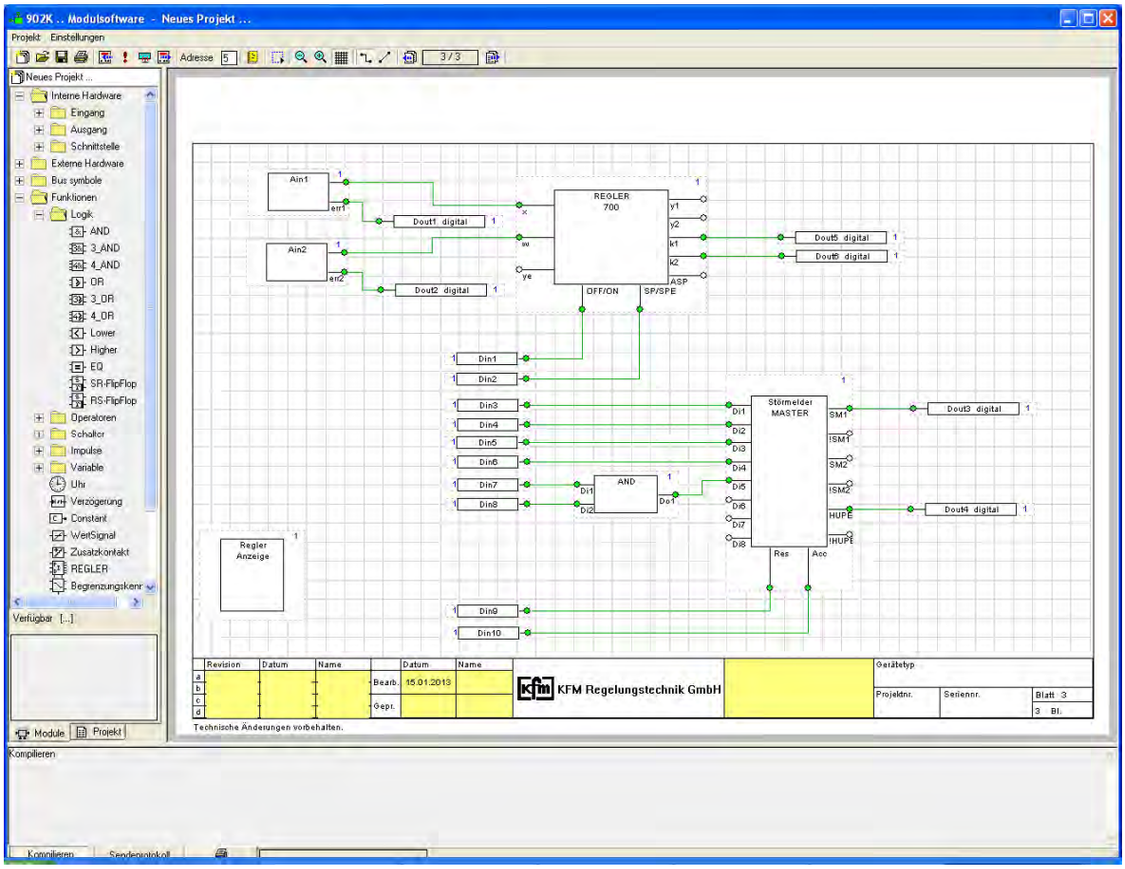
Beside the start page and the existing logger- and binary message page a maximum of 5 free pages can be set additionally, to which can be page turned at the device. Also, pages can be deleted again and changed in their order.

The configuration can be saved as a file, that is easily taken over to devices of the same kind later or serve as a basis for customization for different devices.

Hint:

Alternatively, individual configurations can be supplied ex work at extra cost.

open printversion



General:

Controllers of the series 903 can be delivered with the type extension K in a freely programmable version and then available functional packages can be added arbitrary within the hardware, using a graphical workspace, so that a separate control system is often not necessary.

The module software 99pkm provides beside ready to use controller modules a large number of control functions and logical operations compact within the individual device, furthermore expansion modules can be added to it by using an optional interface.

Alternatively, the delivery can be done unprogrammed with hardware in various types. In this case the programming is provided by the customer or at extra cost by the factory.

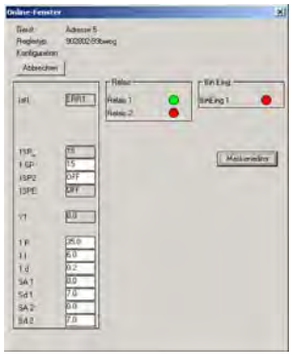
open printversion

INDEX
1
2
3
4
5
6
7
8
9
0

The interface software KFM – PKS offers different function areas, which can be optionally and independently used. The software is distinguished by simple handling.

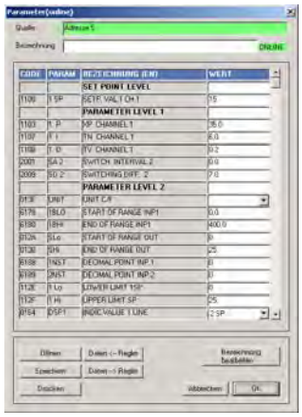
1. Online remote operation

On starting, the program automatically searches for any connected controllers. A window then appears, displaying the actual value, set value and parameters of the first controller found. Settings with a white background can be changed; changes have immediate effect in the controller. If more than one controller is connected (RS485 only), the required controller can be selected via a menu.



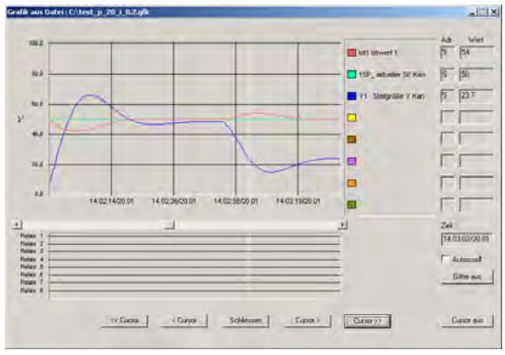
2. Data transfer

Optionally also the complete parameter block of the selected controller can be read out, edited, displayed as a table and printed out.
It is also possible to save the complete parameter setting as a file. Equally, parameter sets that have already been saved can be loaded into the controller.



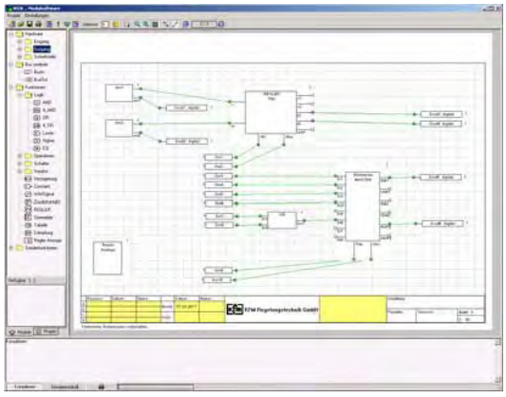
3. Graphical Display (Line Recorder)

The data arriving from the controller can be displayed as a continuous diagram. Recordings made previously can also be recalled and displayed.



4. Data Recording (Logger)

Up to eight types of data arriving from the controller can be stored continuously in a file. This file can later either be recalled and displayed as a graph, or can be used by other programs.



5. Module software (only from WinPKS ver.2.0 or later)

The KFM module software provides the creation, visualization and parameterization by graphical elements of projects based on the controller series 902K..

open printversion

General information:

Serial interfaces enable digital communication with computers or higher ranking control systems.
An RS 232 (optional USB) interface permits connection of one controller per computer interface. The RS485 interfaces enables the connection of max. 32 participants in one data bus. Here, the controllers must be set to different addresses for differentiation.(Controller configuration level). Further Interfaces upon request.

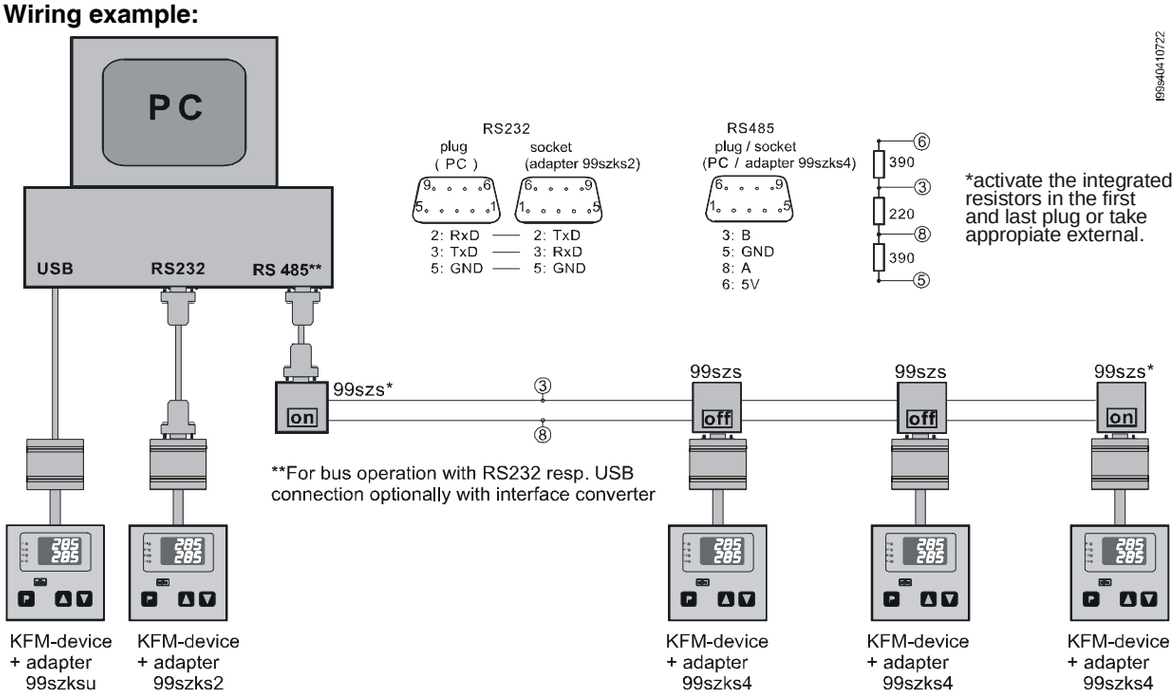
Technical data:

Interface:	direct connection - RS232, USB	bus connection - RS485
Connection:	serial, asynchronous 2 wire (+GND)	serial, asynchronous 2 wire (+GND)
Transfer medium:	twisted and screened cable	twisted and screened cable
Bus line length:	-	1000m
Branch connection length:	15m	2m
Max. number of controllers:	1	31
Transmission direction:	-	data flow control
Transfer rate:	9600, 19200, 38400 Bit / s	9600, 19200, 38400 Bit / s

Connection lines:

Cable junction for KFM devices is done by adapters which are linked to the service interface.
By direct connection: 99szks2(RS232), alternatively 99szksu(USB)
By bus connection: 99szks4(RS485)
To establish the bus connection, providing that there is no interface RS485 on PC resp. at the PLC existing, an interface converter RS232 resp. USB to RS485 is necessary.
Use screened lines to connect the interfaces (e.g. KFM 99szl.).
Place the screening on the controller earthing terminal.
Connect the RS485 line at the beginning (PC or interface converter) and the end (last controller) with d- sub - plugs with integrated resistors (f.e. type 99szs) or appropriate external resistors.

Wiring example:

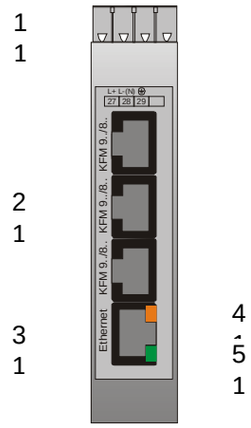


open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

1 Power supply 24V DC
2 RJ-45 interface connector for KFM device 8.. / 9.. (number depending on type)
3 RJ-45 interface connector to the ethernet
4 Status-LED activity (*orange =half-duplex or green =full-duplex*)
5 Status-LED active connection (*orange =10Mbps or green =100Mbps*)



Serial interfaces enable digital communication with computers or higher ranking control systems. Communication takes place serially.

KFM-controllers are accessible, by using their service interface and this adapter, also for ethernet respectively internet.

In terms of PC facilities, the IP address of the adapter is assigned to the connection settings of the KFM software directly, for example PCS for process visualisation.

Types:

99se18.	Adapter for communication with one KFM device 8../ 9.., power supply 24V DC
99se38.	Adapter for communication with three KFM devices 8../ 9.., power supply 24V DC

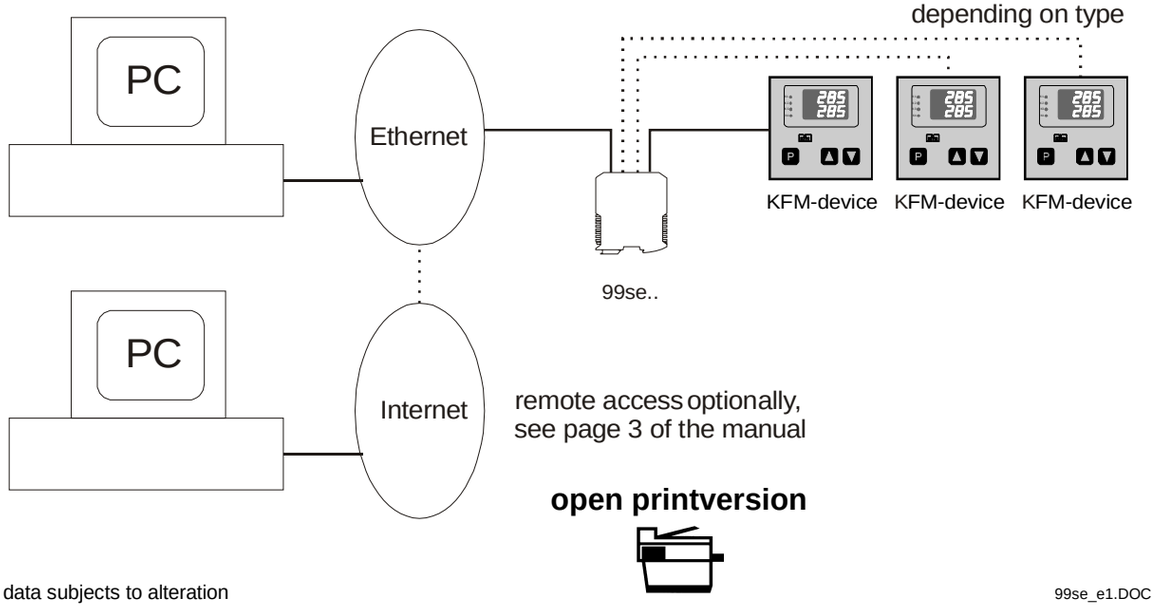
type additions optionally

..v	Encryption AES (Rijndael) 256 bit
.0	Functional module without power supply terminals for conn. power supply modules 99e500
.0i	Functional module for connecting power supply of already existing KFM-assemblies

power supply module

99e500	Power supply module 100-250V AC

Wiring example:



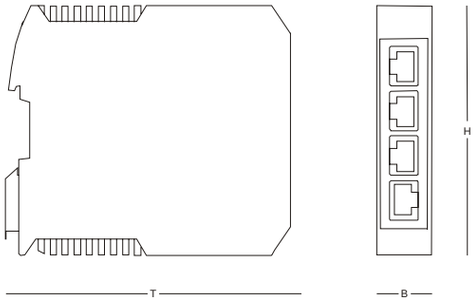
Technical Data:

Protocol:	TCP/IP, UDP/IP, ARP, ICMP, SNMP, TFTP, Telnet, DHCP, BOOTP, HTTP and AutoIP
Interface:	Ethernet 10base-t or 100base-tx (automatic baud rate detection)
Plug connections:	RJ45
Max. number of devices:	32
Administration:	SNMP, telnet, serial, internal web server and windows®-based software for configuration and administration
Baud rate:	9600 bit / s ,19200 bit / s and 38400 bit / s
Compatibility:	Ethernet: version 2.0/IEEE 802.3
Encryption:	Password blocking, optionally AES (Rijndael) 128-,192-,or 256- bit

Other operating data:

Power supply :	24V DC, about 100mA; alternative 100-250V AC, about 12 VA (with power supply module 99e500 only)
Housing:	for fastening to 35mm mounting rail
Installation orientation:	vertical, unlocking tab downwards
Type of protection:	IP20
Perm. ambient temperature:	0...60°C,
Nominal temperature:	20°C
Climatic category :	Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC:	refer to EN 61326

Installation dimensions (each module)



H= 99mm, B = 22,5mm, T = 116mm

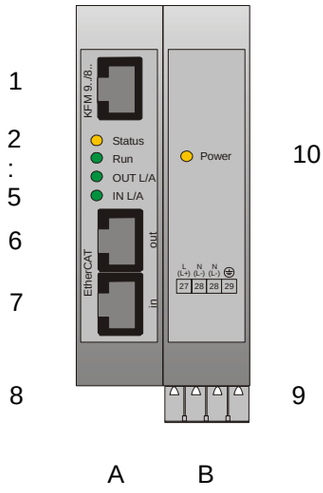
open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

1 RJ-45 connector KFM-device
2 Status LED KFM-device
3 Run LED
4 LED connection state output
5 LED connection state input
6 RJ-45 connector EtherCAT output
7 RJ-45 connector EtherCAT input
8 Configuration interface (service) for PC-connection
9 Terminals supply voltage
10 Power LED

A EtherCAT adapter (99sec..)
B Power supply module* (99e5..)
*Existing, depending on the equipment



General:
The connection of KFM-devices to the EtherCAT fieldbus is realized by the intelligent bus adapter 99sec.., wich is configured to the address of the connected device and the requested transmission data e.g. actual value, setpoint and status word. The EtherCAT- addresses are determined automatically by the master device during network initialization.

The EtherCAT interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).

The EtherCAT-connection is carried out as a standard-ethernet-interface (100base-TX or 100base-FX; baudrate: 100 MBit/s) in accordance with IEEE 802.3, the EtherCAT-adapter is inserted directly into the bus line at the in- and output side by the appropriate RJ-45 connectors.

The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. 255 devices could be installed. Data modules for floating point operation are available for the data transmission. Two error bits make it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory.

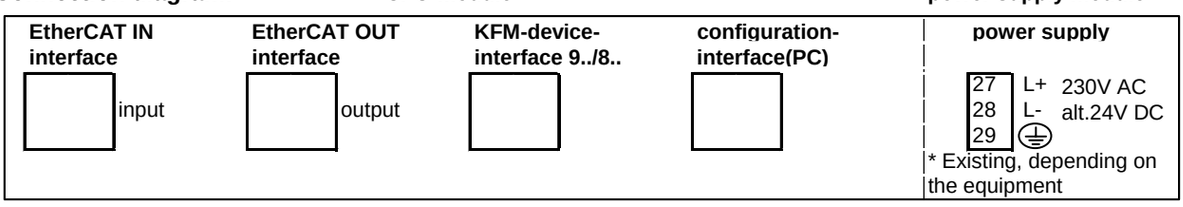
Types:
Functional module without mains supply for connection with power supply modules:
99sec120 Adapter for 12 EtherCAT values

Power supply module:
99e500 Power supply module 100-250V AC
99e508 Power supply module 24V AC or DC

Functional module for connection with power supply within already existing KFM-assemblies:
99sec120i Adapter for 12 EtherCAT values

Adjustments:
The PROFIBUS adapter is delivered preadjusted. In case of changes, the preadjustments can easily be modificated by a configuration program (WinPKS-PC-software, from version 2.15) using the configuration interface.

Connection diagram: **CPU-module** **power supply module ***



open printversion

INDEX

1 2 3 4 5 6 7 8 9 0

Commissioning:

Connect the supplied patch cable (1,5m) with the service- interface of the KFM device and the RJ-45 connector “KFM 9../8..“ of the EtherCAT-adapter and connect the RJ-45 connector “ECAT IN“ to the EtherCAT bus. Further optional EtherCAT-adapters can be connected using the RJ-45 connector “ECAT OUT“.

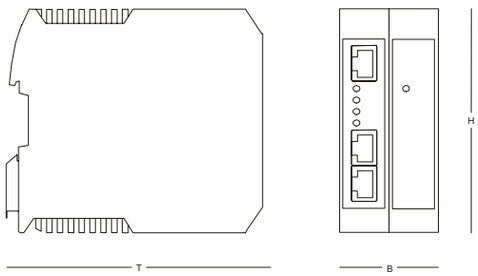
The LEDs on the front signalize the operating conditions :

LED	display	signification
EtherCAT-adapter, status KFM- device	yellow permanent	*Normal operation*
	yellow flashing	*Communication error* between KFM-device and EtherCAT-adapter Hint: all transmitted values of the respective device are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
	red flash./ perm.	*Fault* on loading the parameter, remit device for repair.
EtherCAT-adapter, Run-LED	off	*Initialization condition*, nor mailbox-communication neither process data-communication possible
	green fast flashing	*Pre-operational condition*, mailbox-communication but no process data-communication possible
	green slow flashing	*Safe-operational condition*, mailbox- and process data-communication possible, but outputs remain in a safe condition
	green permanent	*Operational condition*, mailbox- and process data-comunication possible
EtherCAT-adapter, Out L/A-LED	off	*No connection* to the subsequent EtherCAT-module
	green permanent	*Connection* to the subsequent EtherCAT-module
	green flashing	*Communication* with the subsequent EtherCAT-module
EtherCAT-adapter, IN L/A-LED	off	*No connection* to the foregoing EtherCAT-module / master Hint: all transmitted values of the respective device are set to “0“, the respective fault memory will be increased by 1.
	green permanent	*Connection* to the foregoing EtherCAT-module / Master
	green flashing	*Communication* with the foregoing EtherCAT-module / Master
Power supply module, Power LED	yellow permanent	*Voltage supply* connected to the power supply module

Technical data:

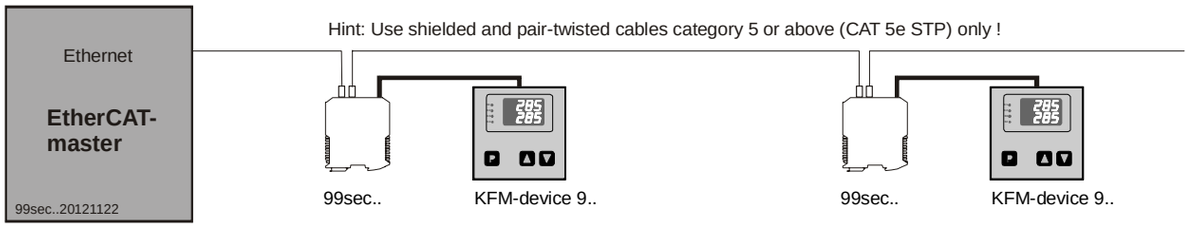
Housing: for fastening to 35mm mounting rail Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 230V AC, about 12 VA
altern. 24V DC, about 12 VA

Installation dimensions:



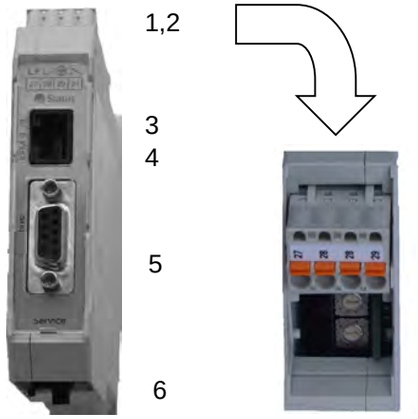
H= 99mm, B = 45mm, T = 116mm

Wiring example:



INDEX

1 Terminals supply voltage
2 Coding switches address adjustment
3 Status-LED
4 RJ-45 connector KFM device
5 9-pole D-SUB plug Modbus- RTU
6 Configuration interface (service) for PC connection



Brief description:
The connection of KFM devices to the MODBUS- RTU is realised by the external bus adapter 99sm.. which is configured to the requested transmission data e.g. actual value and setpoint. The MODBUS interface is able to replace separate wiring of external analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).
The MODBUS interface is carried out as RS232-, RS485- or RS422- bus interface. The adapter has to be connected directly to the bus wiring using the 9-pole D-SUB plug.
Suitable resistors (e.g. in the connector plugs) must be present at the beginning and at the end of the bus line for communication via data bus. Shielded and twisted cables must be used. Lay the shield to ground potential. The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. For each segment 32 devices could be installed, with a repeater up to 99. The bus adapter provides the MODBUS-functions 01/05 (read single bit), 03 / 04 (read input register) and 16 (write multiple register). Analogue values are transmitted as 2 x 16 bit floating point numbers, binary values as 1 bit or 2 byte-word (16 bit, if necessary a multiple of it). The function of the adapter can be supervised by a fault bit. Additionally connection faults are recorded in the fault memory for diagnostic purposes.

Types:

fifth and sixth position		*seventh position*	
99sm04.	Adapter for 4 MODBUS values, power supply 24V DC	99sm..2	for RS 232 interface
99sm12.	Adapter for 12 MODBUS values, power supply 24V DC	99sm..4	for RS 485 interface
99sm28.	Adapter for 28 MODBUS values, power supply 24V DC	99sm..6	for RS 422 interface

device variants (last number):

.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies

Power supply module:

99e500	Power supply module 100-250 V AC

Adjustments:
The MODBUS adapter is delivered preadjusted. In case of changes, the preadjustments can easily be modificated by a configuration program in the WinPKS PC software via the service interface.

	designation	*KFM parameter*	*MODBUS-register#*	*factory setting read / write*
Data word 1	Control word 1	1004	10 (“Dec“)	write
Data word 2	Bus setpoint 1	1060	20 (“Dec“)	write
Data word 3	Actual value 1	1010	30 (“Dec“)	read
Data word 4	Actual value 2*	1011	40 (“Dec“)	read
	* = *depending on type* # =*memory area in the modbus master*			
	for further parameter codes according to protocol *KFM 2.0 refer to manual 99sm.*			
Bus monitor	Monitor check time (0..100 sec), period within which a bus request shall take place, otherwise LED signals a failure. *Hint: Bus monitor is deactivated by setting 0*			5
Delay time	Delay time (0..250ms) for a modbus-adapter reply			0
Baudrate	Modbus baudrate (9600/19200/38400)			9600
Parity, Stopbits	Modbus parity (None/Even/Odd), number of stopbits (1, 2)			none, 2 stop
Bus address	0..99, **Coding switch**, available after removing the covering			5

Hint: In case of multiple bus participants different addresses are to be adjusted !

open printversion

1 2 3 4 5 6 7 8 9 0

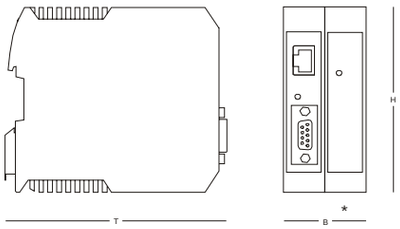
Commissioning:

Set the desired modbus-address by use of the coding switch. Connect Modbus with 9-pole D-SUB connector and patch wire (1,5m) with service interface of the KFM device.
Use of the supply voltage on the Modbus interface only for terminating resistors.

The LED on the front signalises the operating status:

yellow permanent:	Normal operation
yellow flashing:	Communication error between KFM device and MODBUS adapter Hint: all transmitted values of the respective device are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
red flashing:	Communication error MODBUS, MODBUS not active, the respective fault memory will be increased by 1.
red yellow flashing:	Communication error MODBUS and KFM device, each fault memory will be increased by 1.

Installation dimensions:



H= 99mm, * Version without or with power supply module: B = 22,5mm or 45mm, T = 116mm

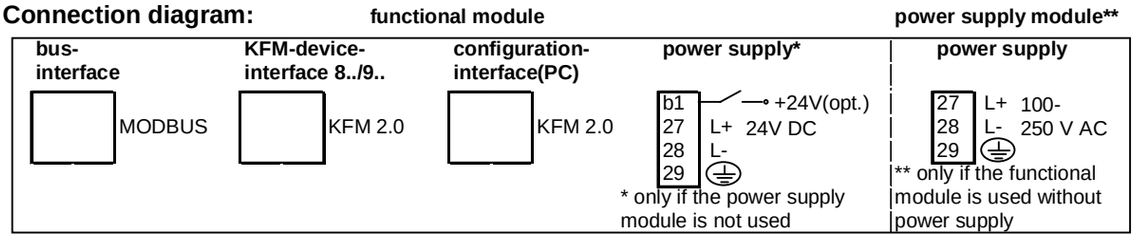
Technical data:

Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 24V DC, about 100 mA

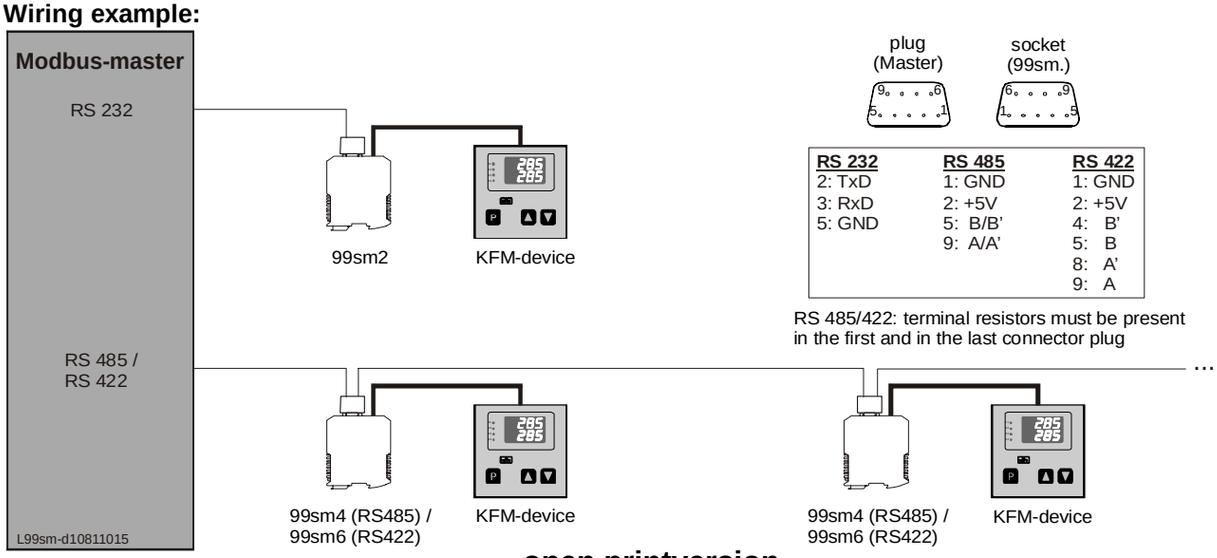
Technical data:

Modbus-interface:	RS232	RS485	RS422
Connection (serial):	asynch.,2-wire (+GND)	asynchronous, 2-wire	asynchronous, 4-wire
Cable lenght	15m	1000m	1000m
Max. number of devices:	1	31	31

Connection diagram:

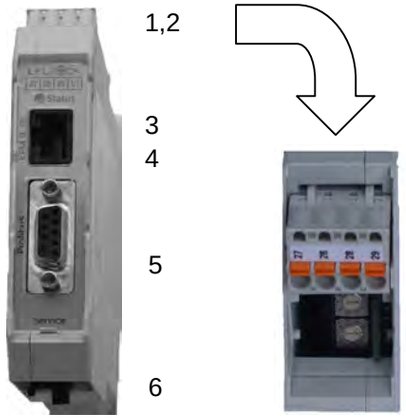


Wiring example:



open printversion

1 Terminals supply voltage
2 Coding switches address adjustment
3 Status-LED
4 RJ-45 connector KFM device
5 9-pole D-SUB plug PROFIBUS
4 Configuration interface (service) for PC connection



General description:
The connection of KFM devices to the PROFIBUS DP is realised by the external bus adapter 99spde, which is configured to the requested transmission data e.g. actual value, setpoint. The PROFIBUS interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits). The PROFIBUS-DP interface is carried out as RS 485 bus interface referring to EN50170. The PROFIBUS adapter has to be connected via a 9-pole D-SUB plug directly to the bus wiring. The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. For each segment 32 devices could be installed, with a repeater up to 99. For the data transmission data modules for fixed and floating point operation are available. The baudrate is detected automatically up to 12 Mbaud. Further Information refer to the GSD file in the appendix.
An error bit makes it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory.

Types:

99spde04.	Adapter for 4 PROFIBUS values, power supply 24V DC
99spde12.	Adapter for 12 PROFIBUS values, power supply 24V DC
99spde28.	Adapter for 28 PROFIBUS values, power supply 24V DC

Device variants (last number):

.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies
..0b	Functional module with binary input 24V DC; terminal open: normal function / read and write possible, terminal closed: read only

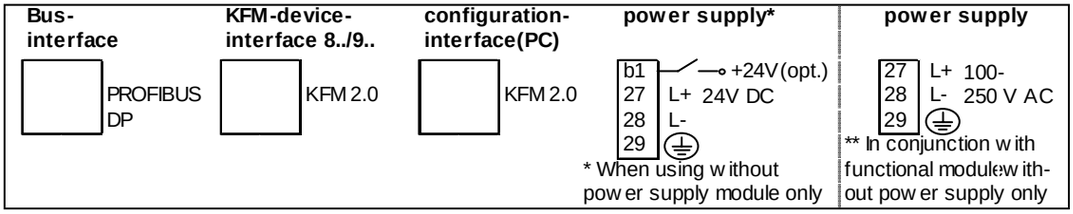
Power supply module:

99e500	Power supply module 100-250 V AC

Adjustments:
The PROFIBUS adapter is delivered preadjusted. In case of changes, the preadjustments except from the bus address, can easily be modified by a configuration program (WinPKS PC Software from version 1.9L).

		factory setting
Data word 1	Bus setpoint 1 (1060 ref. to protocoll KFM 2.0)	Bus setpoint 1
Data word 2	Actual value 1 (1010 " " ")	Actual value 1
Data word 3	Actual value 2* (1011 " " ")	
Data word 4	Control signal* (1020 " " ")	
	for further parameter codes refer to page 5 and 6	
	** = depending on type*	
Bus address	0..99, Coding switch, available after removing the covering below the power supply terminals *Hint: In case of multiple bus participants different addresses have to be adjusted !*	5

connection diagram:



open printversion

Installation note:

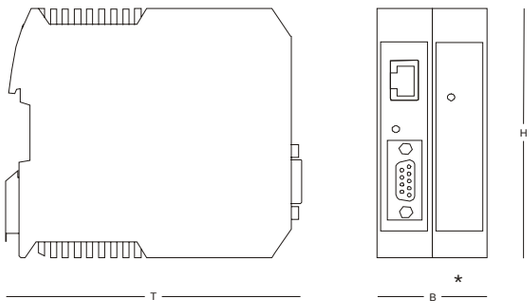
The modules must be locked on the designated mounting rail one after the other and then **pushed together**. The plug connectors connect the individual modules. Before removal, the modules must be **shifted apart** one after the other.

Commissioning:

Set the desired double-digit profibus-address by use of the two coding switches (available after removing the covering below the power supply terminals). Different addresses have to be configured on multiple adapters. Connect Profibus with 9-pole D-SUB connector and patch wire (1,5m) with service interface of the KFM device.The LED on the front signalises the operating status:

yellow permanent:	Normal operation
yellow flashing:	Communication error between KFM device and PROFIBUS-DP adapter Hint: all transmitted values are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
red flashing:	Communication error PROFIBUS DP, PROFIBUS DP not active Hint: all transmitted values are set to “0“, the respective fault memory will be increased by 1.
red yellow flashing:	Communication error PROFIBUS DP and KFM device Hint: all transmitted values are set to “0“, each fault memory will be increased by 1.

Installation dimensions:

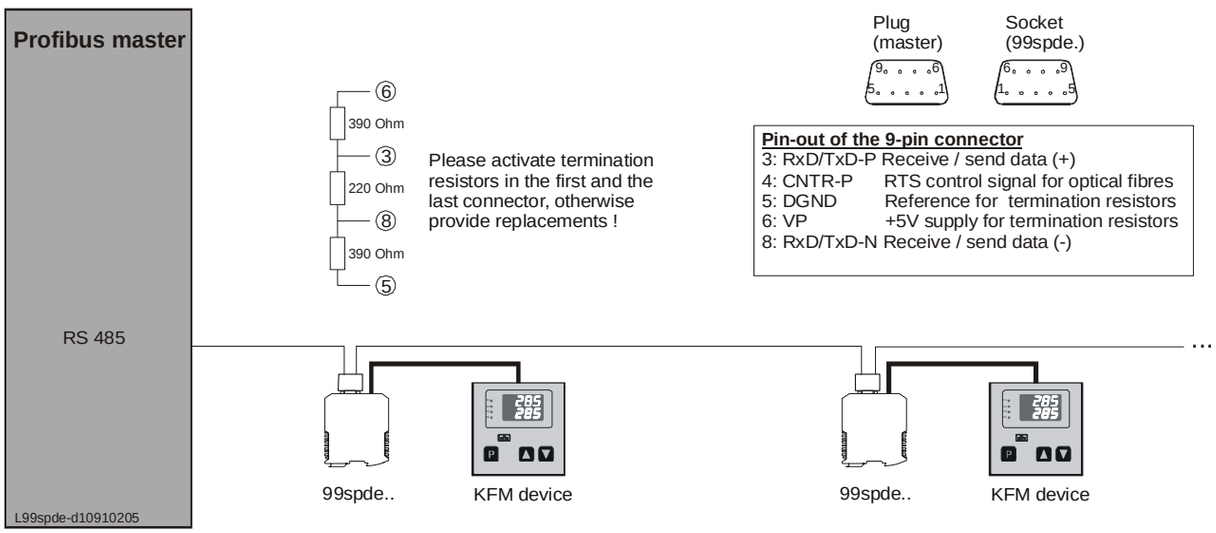


H= 99mm,
* version with or witout power supply module:
B = 22,5mm or 45mm, T = 116mm

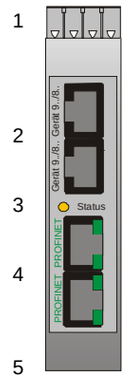
Technical data:

Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 24V DC, about 100 mA,
alternative 100-250V AC, about 12 VA

Wiring example:



1 Terminals power supply voltage *
2 RJ-45 device- connectors series 9../8..*
3 Status LED bus adapter
4 RJ-45 connector PROFINET
5 Configuration interface (service) for PC connection
* = Depending on version



General description:
The PROFINET interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).

The connection of devices series 9../8..* to the PROFINET-IO is realised by the intelligent bus adapter 99spne... The bus adapter is configured to the addresses of the connected devices and the requested transmission data e.g. actual value, setpoint and status word. The communication between the adapter and the service interface of the device / devices* takes place by a patch cable(1,5m), which is delivered with each adapter.

The PROFINET -connection is carried out as a standard-ethernet-interface (10 Base-T / 100 Base-TX; Baudrate: 10/100 MBit/s) in accordance with IEEE 802.3 and is inserted directly into the bus line at the in- and output side by the appropriate RJ-45 connectors.

Data modules for floating point operation are available for the data transmission, GSDML- files in the XML-format are enclosed. Error bits make it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory.
* Depending on version

Types:

99spne05d.	Adapter for 5 PROFINET values, pow. supply 24VDC, two device connectors for series 9../8..
99spne12.	Adapter for 12 PROFINET values, pow. supply 24VDC, one device connector for series 9..
99spne28.	Adapter for 28 PROFINET values, pow. supply 24VDC, one device connector for series 9..

Device variants (last number):

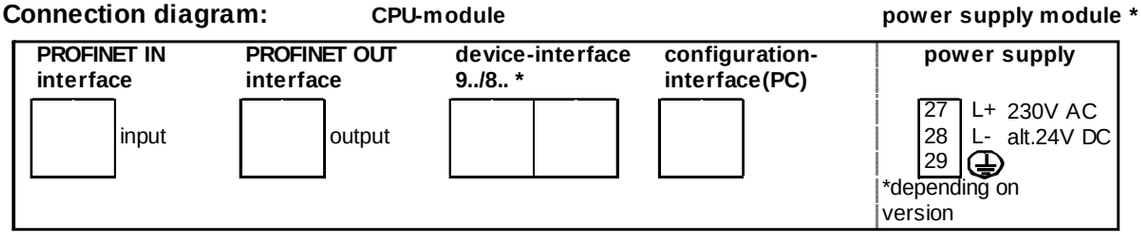
.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies

Power supply module:

99e500	Power supply module 100-250V AC

Adjustments:
The PROFINET adapter is delivered preadjusted (IP-address: 192.168.1.254). Normally, the IP-address is managed dynamically by the Profinet-master. However, in case of changes to the IP-address or the transfer data between the adapter and the device 9../8.., the preadjustments can easily be modificated by a configuration program (WinPKS-PC-software, from version 2.01.39) using the configuration interface.

Connection diagram:



open printversion

Commissioning:

Connect the enclosed patch cable (1,5m) with the service- interface of the device series 9../8.. and the RJ-45 connector “9../8..“ of the bus adapter. The profinet connection takes place in- and optional output sided arbitrary at the ethernet- connectors.

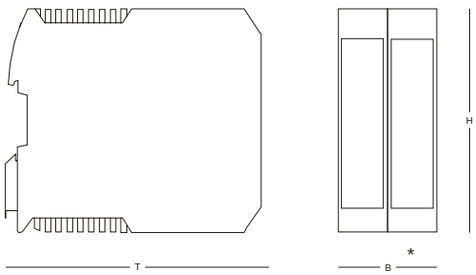
The LEDs on the front signalise the operating status:

LED	**display**	**meaning**
PROFINET-adapter, LED "status"	yellow permanent	*Normal operation*
	yellow flashing	*Communication error* between device 9../8.. and bus adapter
	red flashing	*Communication error* between bus adapter and profinet
	red yellow flashing	*Communication error* between device 9../8.. and bus adapter as well as between bus adapter and profinet
	red permanent	*Fault* when loading the parameter, send the device for repair
Power supply module, power LED	yellow permanent	*Power supply connected to the power supply module*

Technical data:

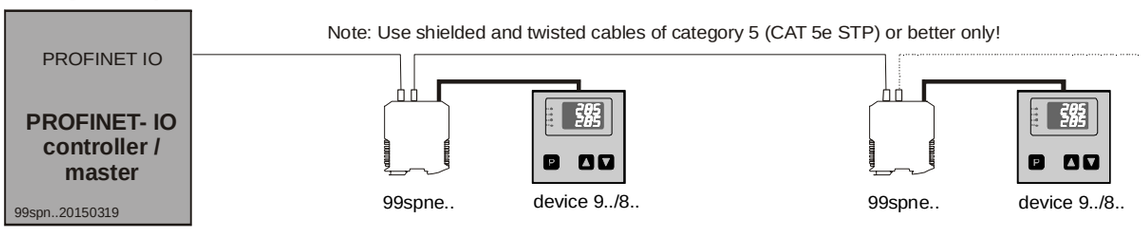
Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply:, 24V DC about 12 VA,
alternative 100-250V AC, about 12 VA

Installation dimensions:



H= 99mm, * Version without or with power supply module: B = 22,5mm or 45mm, T = 116mm

Wiring example:



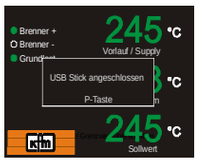
903 / 93 series devices fitted with the USB-Host can read in and out the parameter set, TFT configuration and, depending on version, the complete configuration by means of conventional USB stick. Moreover, again depending on version, data logger recordings and fault history can be read out.
Irrespective of the above selectable functions, the continuous logger data is automatically saved on a regular basis if the USB stick is inserted.

The data are prepared and processed by the PC with the KFM parametering software PKS in the respective function areas; data logger recordings can be imported and visualised in Excel by means of csv- file.

The stick is inserted from outside into the USB-Host port at the rear.

Without connected USB stick the menu with the functions for data transfer are hidden; they appear once the connection with the USB stick has been successfully established. During a file transfer the progress is shown by means of a progress bar; successful file transfer is acknowledged with a message.

Operating state: USB- connection:



In its operating state the prefect connection of an inserted USB stick is indicated by the message "USB stick connected".

P - briefly press the key to acknowledge the message. Data transfer functions are now available in the parameter level 1**.**

Parameter level 1:

USB stick Menu (only) if fitted with USB-Host and inserted USB stick:
Data transfer functions
The desired function is marked in blue with the ▼...▲ keys,
to acknowledge input briefly press the P key

"**Only load parameters**", "**Load TFT project**",
"**Load complete configuration**"
*Parameter set, TFT project or the complete configuration is transferred from the USB stick to the device; mark desired file and acknowledge with P -key.**

"**Only save parameters**", "**Save TFT project**", "**Save complete configuration", Save logger data"**
Parameter set, TFT project or the complete configuration or the fault history as well as the logger data are transferred from the device to the USB stick.

"Abort" to leave the menu or "**Remove USB"** in order to securely interrupt the connection to the USB stick

** Submenu "Parameter file": Depending on file type and in consideration to the instructions on the standard path (see next section) existing data can be selected on the USB stick.*

Instructions on standard path:
Parameter set, TFT project and the complete configuration must be saved on the USB stick in accordance to the following standard path:

- **Parameter set:** \Fbnr\PARAM*.pks
  Example: \21728034\PARAM*.pks
- **TFT projekt:** \Fbnr\TFT*.tft
  Example: \21728034\TFT*.tft
- **Configuration:** \Fbnr\CONFIG*.kfg
  Example: \21728034\CONFIG*.kfg

"Fbnr": Serial number in accordance to the type plate (example: R217 28 034).

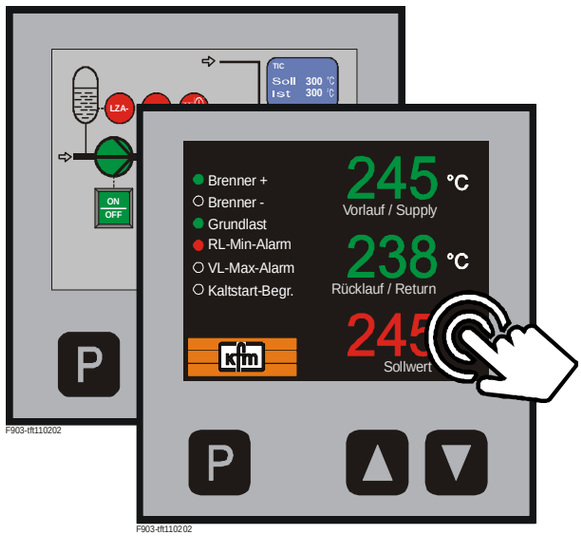
Instructions regarding parameter set and configuration:
Depending on the configuration, it may be that the parameter set must also be read in or out after configuration when transferring the current parameters (after exchange of configuration only).

Instructions to the file name on file read out:
The file is automatically named and saved into standard path on the USB stick in accordance with year, month, day and a sequential number. Example: A parameter file is saved on 22 March 2015 on the USB stick as "15032200.pks".
Exception: Automatically saved logger data are named according to year and calendar week.
Example; A logger recording within the 22 calendar week 2017 is named "2017_W22.csv".

Supported USB sticks
The USB-Host function works fine with most commercial USB sticks. Even though, the perfect connection is only assured when using USB sticks that have been obtained from KFM or approved by KFM.
Tested, for example: USB Xmore GXQC8A0116R

Attention:

- *In order to avoid data loss, the USB stick must not be removed during reading in and out!*
- *Before removing the USB stick, the connection to the USB stick must have been securely interrupted!*
- *The USB stick serves for Setup and is otherwise to be removed. Exception: Long-term logger recordings for diagnosis purposes (> 5 days).*
- *The controller is deactivated during file loading and may need to be automatically restarted after end of transfer!*
- *The service port of the controller is deactivated during file saving.*



General

Controller series 903.. may be delivered with touch- function by the accessory equipment 99t, then they can be operated intuitively by touching the screen within the capability of the TFT-configuration

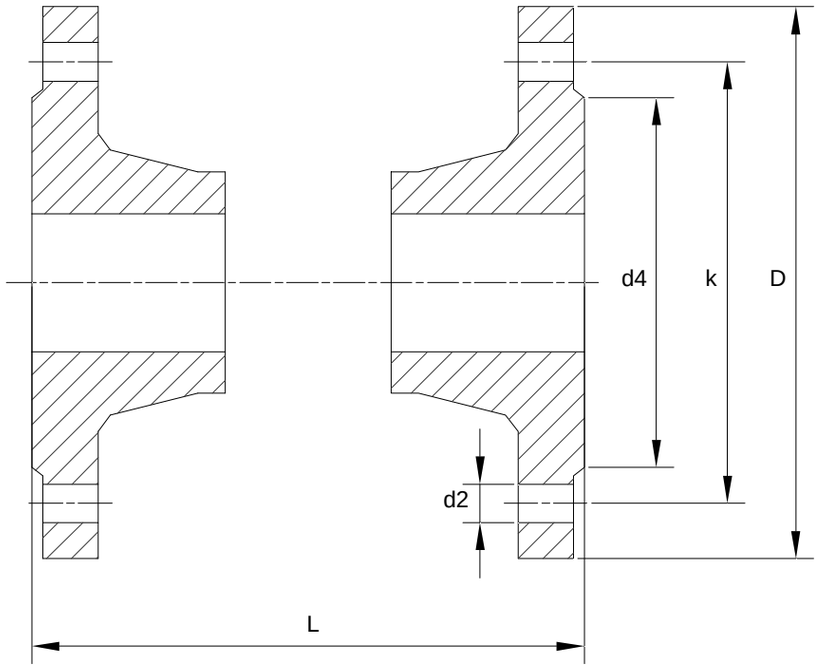
In the standard version, setpoint values can be set easily just touching the corresponding actual value. Furthermore, page change, switch- / button functions or entering values can be configured using the appropriate touch- elements respectively adjustments. The P-, arrow up and arrow down button are present as mechanical buttons additionally.

The capacitive touch- function ensures wear- free and precise operating and provides real multi-touch.

The operation of custom specific small and medium sized system schemes and flow charts becomes possible with the touch function. The creation of visualization- projects with graphical design tools in the PKD- PC software is distinguished by simple handling.

See sheet 99PKD for more details regarding the software

Versions	**List-No.:**
Controller display with additional touch- function	99t



Flange connections* according to DIN EN 1092-1/2

	Nominal pressure PN16						Nominal pressure PN25						Nominal pressure PN40					
				Screws						Screws						Screws		
DN	D	d4	k	No.	M..	d2	D	d4	k	No.	M..	d2	D	d4	k	No.	M..	d2
15													95	45	65	4	M12	14
20													105	58	75	4	M12	14
25			see PN40						see PN40				115	68	85	4	M12	14
32													140	78	100	4	M16	18
40													150	88	110	4	M16	18
50													165	102	125	4	M16	18
65	185	122	145	4	M16	18							185	122	145	8	M16	18
80			see PN40										200	138	160	8	M16	18
100	220	158	180	8	M16	18							235	162	190	8	M20	22
125	250	188	210	8	M16	18							270	188	220	8	M24	26
150	285	212	240	8	M20	22							300	218	250	8	M24	26
200	340	268	295	12	M20	22	360	278	310	12	M24	26	375	285	320	12	M27	30

Immersion length* according to DIN EN 558, basic series 1

DN	15	20	25	32	40	50	65	80	100	125	150	200
L	130	150	160	180	200	230	290	310	350	400	480	600
Tol.	± 2	± 2	± 2	± 2	± 2	± 2	± 3	± 3	± 3	±3	± 3	± 4

*dimensions in millimeter

open printversion

Connections* for flanges drilled to ANSI / JIS

	ANSI 150lbs					JIS 10K					JIS 16K				
				Holes					Holes					Holes	
DN	D	d4	k	No.	d2	D	d4	k	No.	d2	D	d4	k	No.	d2
15	95	45	60	4	16						95	45	70	4	15
20	105	58	70	4	16	see JIS 16K					105	58	75	4	15
25	115	68	79	4	16						115	68	90	4	19
32	140	78	89	4	16						140	78	100	4	19
40	150	88	98,6	4	16						150	88	105	4	19
50	165	102	120,6	4	19	165	102	120	4	19	165	102	120	8	19
65	185	122	139,7	4	19	185	122	140	4	19	185	122	140	8	19
80	200	138	152,4	4	19	200	138	150	8	19	200	138	160	8	23
100	235	162	190,5	8	19	235	162	175	8	19	235	162	185	8	23
125	270	188	216	8	22	270	188	210	8	23	270	188	225	8	25
150	300	218	241,3	8	22	300	218	240	8	23	300	218	260	12	25
200	360	278	298,5	8	22	360	278	290	12	23	360	278	305	12	25

*dimensions in millimeter

Pressure-Temperature-Rating

		Max. working gauge pressure in bar at temperature °C acc. To DIN EN 1092-2						
		-10...120	150	200	250	300	350	
EN-GJL-250 (GG-25)	PN16	16	14,4	12,8	11,2	9,6		
EN-GJS-400-18-LT (GGG-40.3)	PN16	16	15,5	14,7	13,9	12,8	11,2	
	PN25	25	24,3	23	21,8	20	17,5	

		Max. working gauge pressure in bar at temperature °C acc. To DIN EN 1092-1							
		-10…50	100	150	200	250	300	350	400
GP240GH+N (GS-C25N)	PN16	16	14,9	13,9	12,4	11,4	10,3	9,6	9,2
	PN25	25	23,3	21,7	19,4	17,8	16,1	15,0	14,4
	PN40	40	37,3	34,7	30,2	28,4	25,8	24	23,1
GX5CrNiMo19-11-2 (1.4408)	PN16	16	14,9	13,5	12,4	11,7	11	10,7	10,2
	PN25	25	23,3	21,1	19,4	18,3	17,2	16,7	16
	PN40	40	37,3	33,8	31,1	29,3	27,6	26,7	25,6

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Installation:

Attention: *- Installation, operation and maintenance should be done only by qualified personnel.*
- Disconnect pressure air supply before working on the valve and make sure, that it is impossible to connect it unintentionally (injury hazard)
- It is not permitted to work on the valve body and to exchange the actuator as long as the valve is subjected to pressure and temperature.
- Crushing and injury hazard because of moving parts
- Observe corresponding operating manuals for installed accessories

The mounting site should be easily accessible and have sufficient clearance for maintenance and for removing the actuator. Ensure that the pipe line axes are flush and connection flanges are parallel. Provide suitable measures to absorb possible tensile and pressure forces. The valve must not serve as a fixed point.
It must be carried by the piping.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position should be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing). Observe a 10 x DN spacing to flanges, elbows, etc., to avoid an impaired valve function.

Remove flange covers before the installation. Use suitable handling and lifting equipment for installing the valve (see corresponding data sheet for the weights).

Regard the permitted max. operating pressure and temperature as described in the corresponding valve data sheet. Observe the ambient temperature limits (-20...+60°C), if necessary, provide a drive heater at lower temperatures and for higher temperatures insulate the pipeline, provide conductive plates or cooling possibilities.

Retighten the screws of all flange connections (also cover and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

Pneumatic connection:

The air supply pressure has to be set according to instruction on the nameplate by means of a reducing unit. For protection of actuators, the reducing unit should be combined with filter unit.

The pneumatic supply tube has to be connected to the free thread connection on the pressure side of the actuator. The thread connection on the opposite spring side of the actuator is protected with the sealing and vent cap. The cap must not be removed, the vent hole must not be closed.

By operating mode "spring closes", the pneumatic connections are situated by three way valves with mixing plug on the upper side of the actuator, by two way valves and by three way valves with diverting plug on the lower side of the actuator.
This is reverse by operating mode "spring opens".

The proper mounting side for pneumatic connection can be controlled with stroke indicator:
position without air supply up: pneumatic connection up,
position without air supply down: pneumatic connection down

Maintance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also cover and connection piece flanges), the valve cone should be located in the centre.

Attention: **-** *Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean it in order to protect stuffing boxes and PTFE-V-rings against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with PTFE-V-rings or bellows.

Undertake maintenance on the actuator in accordance with the corresponding information in the separate operating instructions.

INDEX

1
2
3
4
5
6
7
8
9
0

Disassembly of actuator:

- Move actuator with actuating pressure into the middle of the stroke
- Loosen headless setscrew in the cap nut (21)
- Secure coupling (20) position (width across flats 32), unscrew** cap nut (21)
- Unscrew nut (23)
- Remove actuator from valve
- Let off actuating pressure

Assembly of actuator:

- Position actuator onto valve, tighten nut (23)
- Move actuator into middle of stroke with actuating pressure
- Secure coupling (20) position (width across flats 32)
- Tighten cap nut (21) and headless setscrew
- Move valve into end positions, if necessary, and adjust clamping rings towards position indicator (17)

** ***Note:*** *Ensure that the position of coupling (20), indicating plate (19) and fastening nut (18) is not altered, otherwise the starting point of the actuator will require resetting.*

Setting the starting point

Ensure that the actuator is readily assembled on the valve before setting.
Release lock nut (18) (see fig. 1) on the actuator spindle (16) and screw slightly in the direction of the actuator. Temporarily remove the indicating plate (19) located beneath.

Set the desired starting pressure for the actuator on the control air reducing unit. If the access is performed via a positioner, set it to the maximum actuating pressure by the appropriate input signal.

Screw coupling (20) onto the actuator spindle (16) until the valve spindle is just in the CLOSED position or starts moving in the OPEN direction.

If the coupling cannot be adjusted sufficiently on the drive spindle, first of all adjust the coupling ring (22) by approx. 5 mm. It is accessible after the cap nut (21) has been screwed off the coupling (20) and can be turned slightly up or down on the spindle.

First of all loosen the headless setscrews of the position securing element on the coupling ring and cap nut. After completing the measure, ensure that all parts are restored to their original status.

Subsequently, reattach indicating plate (19), secure with lock nut (18) and restore to the normal operating status on the pressure reducing unit or positioner.

Exchanging the diaphragms

- Dismantle actuator from valve - as described above
- Unscrew coupling (20) and nut (18) from the drive spindle (16)
- Remove nuts and screws (5) and diaphragm lid (1)

Attention: *All actuators contain two long screws. Ensure that these screws are loosened last and uniformly on both sides to reduce the spring pretension / preloading.*
Non-observance of this information entails risk of injury !

- Remove springs (2) and spindle-diaphragm-diaphragm plate unit
- Secure spindle (16) position (width over flats 13) and screw off screw (4) together with retaining ring
- Remove clamping element (3) and diaphragm (8), insert new diaphragm (8) and clamping element (3)
- Replace retaining ring, insert screw (4) and tighten against the spindle (16)
- Insert springs (2) and spindle-diaphragm-diaphragm plate unit, ensuring at the same time that the springs are correctly positioned in the diaphragm plate (6) and the diaphragm is aligned in relation to the screw holes
- Put diaphragm lid (1) in place and align, insert screws (5) commencing with the two long screws and tighten in a cross pattern with the nuts
- Screw coupling (20) and nut (18) onto the actuator spindle (16), insert indicating plate (19)
- Mount actuator onto valve - as described above
- Set the starting point - as described above

open printversion

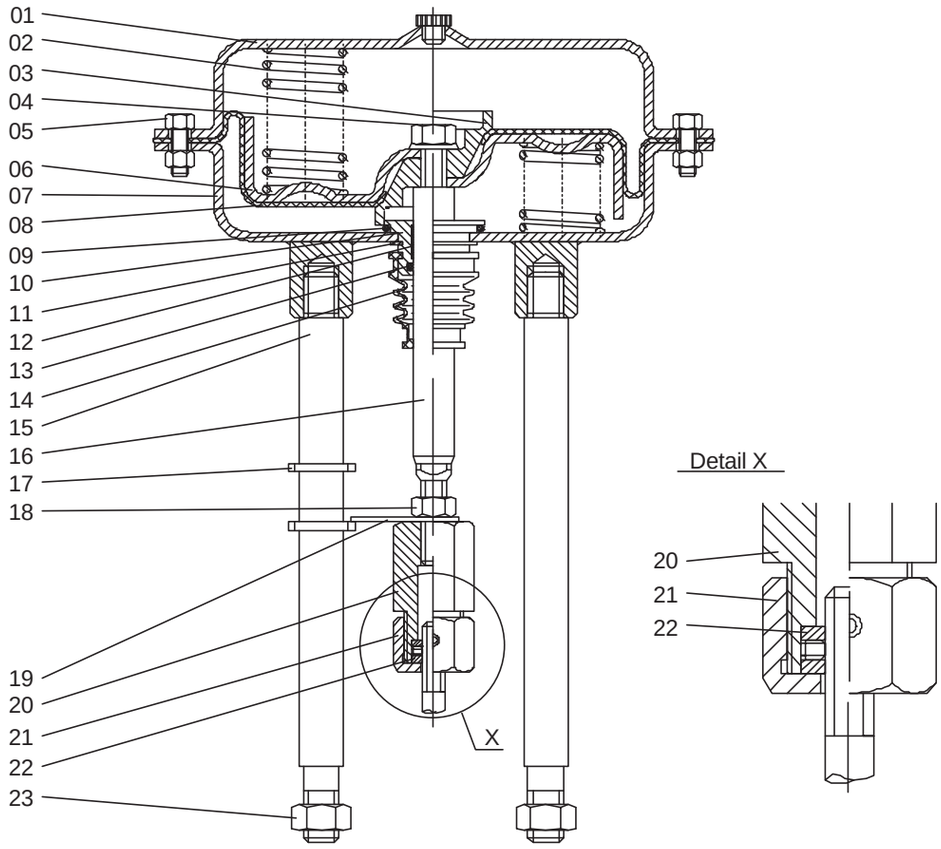


Fig. 1

No.	Designation	Part-No.
01	Diaphragm lid	f5h
02	Spring	f5f ***
03	Clamping element	f3ks
04	Screw M12 with retaining ring	e8av1230+f8ds12
05	Screw M8 with Nut	f8av0825+f8mv08
06	Diaphragm plate	f5mt
07	Diaphragm housing	f5b
08	Diaphragm	f5m
09	O-ring	f5o38x4
10	Spindle guidance	f3sd
11	Seeger-ring	f5sr31
12	Guiding tape	f9fb
13	O-ring	f5o18x3
14	Bellow	f5gf
15	Mounting rod	f3s200
16	Spindle	f3s12
17	Stroke indikators	e5ak
18	Nut M12	f8mv12f
19	Indicating plate	f3ab
20	Coupling	f3k60
21	Cap nut	f3um3/4
22	Coupling ring with headless setscrew	e3sr10 ****
23	Nut M16 with spring ring	e8mv16+e8fv16

*** = Stroke and control pressure dependent
**** = Only for valve spindle with thread M10

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Function:

The electro-pneumatic converter is a connecting element between controller and pneumatic control valve.
It creates a control signal from "+"- or "-" impulse of 3-point-step controller and from available compressed air.
Voltage application on exhaust solenoid valve 1 (see drawings on pages 2-3) effects de-aeration of the pneumatic actuator, voltage application on supply solenoid valve 2 effects aeration of the pneumatic actuator.
For proper functioning of converter with quick-exhaust function, it is necessary to apply voltage also on solenoid valve 3.
Voltage interruption on this valve activates the quick-exhaust function: de-aerating of the pneumatic actuator.
The pneumatic output signal depends on the supply air pressure and must not be higher than the maximum permissible pressure of the actuator. The flow rate of the supply and exhaust air can be modified with throttling valves, therefore it is possible to adjust the positioning time of the pneumatic actuator if necessary.

Installation and wiring:

Attention:

- Installation, operation and maintenance should be done only by qualified personnel.
- Disconnect pressure air supply before working on the valve and make sure, that it is impossible to connect it unintentionally (injury hazard)
- Crushing and injury hazard because of moving parts
- Observe corresponding operating manuals for actuator

- Fasten E/P converter with two M8 screws on the actuator cover
  (use convenient adapter if necessary)
- Connect operating air output with pneumatic actuator input using hose or tube
- Connect supply air from the pneumatic maintenance unit to converter input
- Check tightness of all pneumatic connections
- Connect converter electrically with the 3-point-step controller
  Observe applicable accident prevention and safety regulations for electrical equipment!

  Additional for E/P converter with quick-exhaust function (type 390365.):
- Apply voltage from the safety chain on the 3/2-way exhaust solenoid valve 3

Initiation:

- Adjust pressure of the supply air on the pneumatic maintenance unit according to the required air pressure for the pneumatic actuator

  ***Hint**: Operation with too high air pressure causes reduction of the control quality*
- Generate „+“ or „-“ impulse from the controller by changing of the set point and check the function of the control valve
- Adjust the operating time of the control valve with throttling valves for air supply and air exhaust.
  Clockwise turning of the handwheel: longer operating time
  Anticlockwise turning of the handwheel: shorter operating time
  The operating time by permanent „+“ or „-“ signal should be about 20-30 s (factory setting)
- Dismount the handwheels of the throttling valves to avoid undesirable alterations of the adjustment, if necessary

  Additional for E/P converter with quick-exhaust function (type 390365.):
- Check the voltage on the 3/2-way exhaust solenoid valve
  (there is no control function possible without voltage application on this valve)

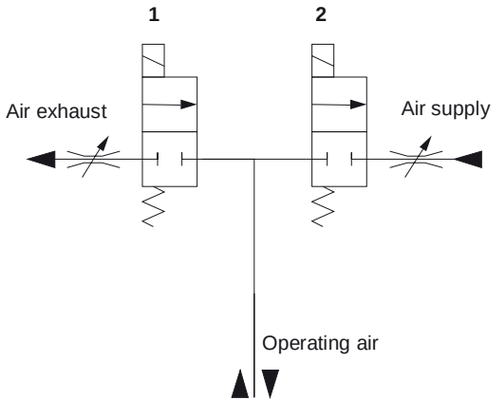
open printversion

INDEX

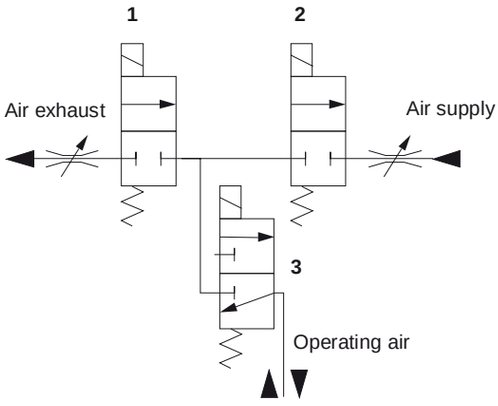
1 2 3 4 5 6 7 8 9 0

Technical data:

Input signal:	3-point-step signal
Supply:	230V / 50Hz, alternatively: 24V / 50Hz, 24V DC
Electrical connection:	Connector acc. to DIN EN 175301-803, Form A
Connecting cable:	ø4,5-6 mm / max. 0,75 mm²
Compressed air supply:	Class 3 acc. to ISO 8573-1
Air pressure:	1,4...6 bar (20...90 psi)
Output signal:	0...100% air pressure
Air connection:	G 1/4"
Protecting class:	IP65 acc. to DIN EN 60529



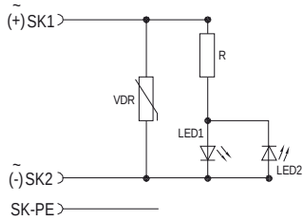
Type 390 360.*
without quick-exhaust function



Type 390 365.*
with quick-exhaust function

** = All solenoid valves are shown currentless*

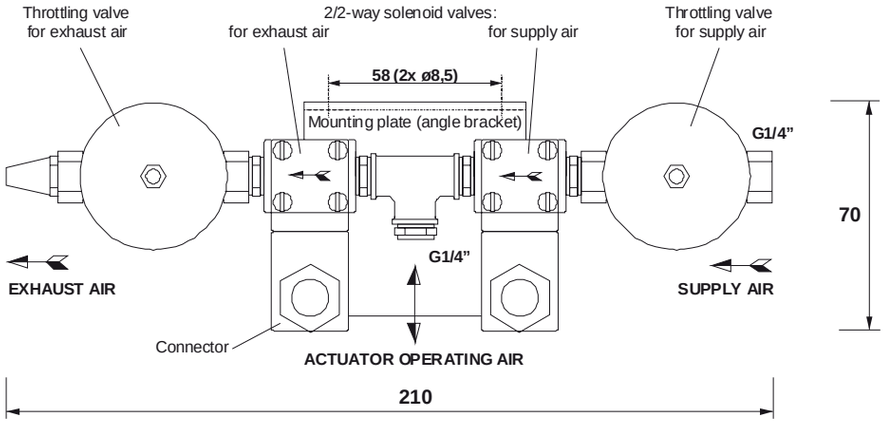
Electrical wiring - connector:



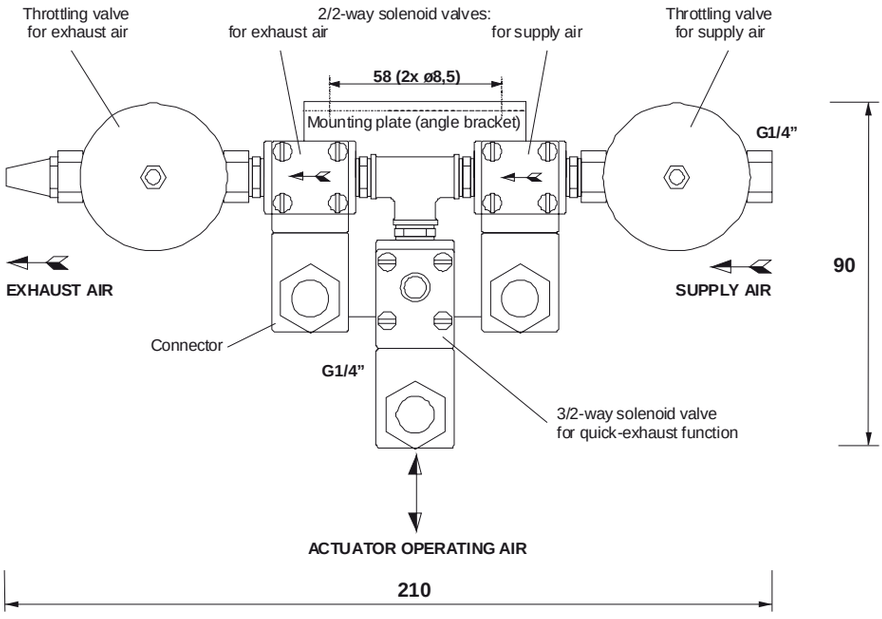
Types overview:**		**List– No.**
230V / 50 Hz	without quick-exhaust function	**390 360**
24 V / 50 Hz	without quick-exhaust function	**390 3602**
24V DC	without quick-exhaust function	**390 3608**
230V / 50 Hz	with quick-exhaust function	**390 365**
24 V / 50 Hz	with quick-exhaust function	**390 3652**
24V DC	with quick-exhaust function	**390 3658**

*** Ex-type of solenoid valves on request*

open printversion



Type 390360. without quick-exhaust function



Type 390365. with quick-exhaust function

INDEX

1
2
3
4
5
6
7
8
9
0

MOUNTING AND OPERATING INSTRUCTIONS

EB 8394 EN

Translation of original instructions

Series 3725

Type 3725 Electropneumatic Positioner

Firmware version 1.12

CE Ex certified

Edition June 2014

open printversion

Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

➔ For the safe and proper use of these instructions, read them carefully and keep them for later reference.

➔ If you have any questions about these instructions, contact SAMSON's After-sales Service Department (aftersalesservice@samson.de).

The mounting and operating instructions for the devices are included in the scope of delivery. The latest documentation is available on our website at ***www.samson.de > Service & Support > Downloads > Documentation***.

Definition of signal words

⚠ DANGER

Hazardous situations which, if not avoided, will result in death or serious injury

⚠ WARNING

Hazardous situations which, if not avoided, could result in death or serious injury

NOTICE

Property damage message or malfunction

Note

Additional information

Tip

Recommended action

Firmware revisions	
1.02 (old)	**1.03** (new)
	Internal revisions
1.03 (old)	**1.10** (new)
	Setting of the travel in steps of 0.5 mm (P4 parameter code)
	Monitoring of the end stops only during initialization and in manual mode
	To suppress common-mode interference on the signal lines, the D component of the positioner is switched off when the actuator is at a standstill.
1.10 (old)	**1.11** (new)
	Internal revisions
1.11 (old)	**1.12** (current version)
	Internal revisions

1 Safety instructions and measures

Intended use

The SAMSON Type 3725 Positioner is mounted on pneumatic control valves and is used to assign the valve position to the control signal. The device is designed to operate under exactly defined conditions (e.g. operating pressure, temperature). Therefore, operators must ensure that the positioner is only used in applications where the operating conditions correspond to the technical data. In case operators intend to use the positioner in other applications or conditions than specified, contact SAMSON.

SAMSON does not assume any liability for damage resulting from the failure to use the device for its intended purpose or for damage caused by external forces or any other external factors.

➔ Refer to the technical data for limits and fields of application as well as possible uses.

Reasonably foreseeable misuse

The Type 3725 Positioner is ***not*** suitable for the following applications:

– Use outside the limits defined during sizing and in the technical data

Furthermore, the following activities do not comply with the intended use:

– Use of non-original spare parts

– Performing maintenance activities not specified by SAMSON

Qualifications of operating personnel

The positioner must be mounted, started up, and serviced by fully trained and qualified personnel only; the accepted industry codes and practices are to be observed. According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible hazards due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

Explosion-protected versions of this device are to be operated only by personnel who has undergone special training or instructions or who is authorized to work on explosion-protected devices in hazardous areas.

Personal protective equipment

No personal protective equipment is required for the direct handling of the positioner. Work on the control valve may be necessary when mounting or removing the positioner.

➔ Observe the requirements for personal protective equipment specified in the valve documentation.

➔ Check with the plant operator for details on further protective equipment.

Revisions and other modifications

Revisions, conversions or other modifications to the product are not authorized by SAMSON. They are performed at the user's own risk and may lead to safety hazards, for example. Furthermore, the product may no longer meet the requirements for its intended use.

Safety features

Upon failure of the air supply or electric signal, the positioner vents the actuator, causing valve to move to the fail-safe position determined by the actuator.

Warning against residual hazards

The positioner has direct influence on the control valve. To avoid personal injury or property damage, plant operators and operating personnel must prevent hazards that could be caused in the control valve by the process medium, the operating pressure, the signal pressure or by moving parts by taking appropriate precautions. They must observe all hazard statements, warning and caution notes in these mounting and operating instructions, especially for installation, start-up, and service work.

If inadmissible motions or forces are produced in the pneumatic actuator as a result of the supply pressure level, it must be restricted using a suitable supply pressure reducing station.

Responsibilities of the operator

The operator is responsible for proper operation and compliance with the safety regulations. Operators are obliged to provide these mounting and operating instructions to the operating personnel and to instruct them in proper operation. Furthermore, the operator must ensure that operating personnel or third persons are not exposed to any danger.

Responsibilities of operating personnel

Operating personnel must read and understand these mounting and operating instructions as well as the specified hazard statements, warning and caution notes. Furthermore, the operating personnel must be familiar with the applicable health, safety and accident prevention regulations and comply with them.

Servicing explosion-protected devices

If a part of the device on which the explosion protection is based needs to be serviced, the device must not be put back into operation until a qualified inspector has assessed it according to explosion protection requirements, has issued an inspection certificate, or given the device a mark of conformity. Inspection by a qualified inspector is not required if the manufacturer performs a routine test on the device before putting it back into operation. Document the passing of the routine test by attaching a mark of conformity to the device. Replace explosion-protected components only with original, routine-tested components by the manufacturer.

Devices that have already been operated outside hazardous areas and are intended for future use inside hazardous areas must comply with the safety requirements placed on serviced devices. Before being operated inside hazardous areas, test the devices according to the specifications for servicing explosion-protected devices.

Maintenance, calibration, and work on equipment

➔ Only use intrinsically safe current/voltage calibrators and measuring instruments for interconnection with intrinsically safe circuits to check or calibrate the equipment inside or outside hazardous areas.

➔ Observe the maximum permissible values specified in the certificates for intrinsically safe circuits.

Referenced standards and regulations

Devices with a CE marking fulfill the requirements of the Directives 2014/34/EU and 2014/30/EU. The declaration of conformity is included at the end of these instructions.

Referenced documentation

The following documents apply in addition to these mounting and operating instructions:

– The mounting and operating instructions of the components on which the positioner is mounted (valve, actuator, valve accessories, etc.).

1.1 Notes on possible severe personal injury

⚠ DANGER

Risk of the formation of an explosive atmosphere.

Incorrect installation, operation, or maintenance of the positioner in potentially explosive atmospheres may lead to ignition of the atmosphere and cause death.

➔ The following regulations apply to installation in hazardous areas: EN 60079-14 (VDE 0165, Part 1).

➔ Installation, operation, or maintenance of the positioner must only performed by personnel who has undergone special training or instructions or who is authorized to work on explosion-protected devices in hazardous areas.

1.2 Notes on possible personal injury

⚠ WARNING

Risk of personal injury due to moving parts on the valve.

During initialization of the positioner and during operation, the actuator stem moves through its entire travel range. Injury to hands or fingers is possible if they are inserted into the valve.

➔ During initialization, do not insert hands or fingers into the valve yoke and do not touch any moving valve parts.

1.3 Notes on possible property damage

NOTICE

Risk of damage to the positioner due to incorrect mounting position.

➔ Do not mount the positioner with the back of the device/vent opening facing upward.

➔ Do not seal the vent opening when the device is installed on site.

Risk of malfunction due to incorrect sequence during start-up.

The positioner can only work properly if the mounting and start-up are performed in the prescribed sequence.

➔ Perform mounting and start-up as described in section 5 in page 26.

An incorrect electric signal will damage the positioner.

A current source must be used to provide the electrical power for the positioner.

➔ Only use a current source and never a voltage source.

Incorrect assignment of the terminals will damage the positioner and will lead to malfunction.

For the positioner to function properly, the prescribed terminal assignment must be observed.

➔ Connect the electrical wiring to the positioner according to the prescribed terminal assignment.

Malfunction due to initialization not yet completed.

The initialization causes the positioner to be adapted to the mounting situation. After initialization is completed, the positioner is ready to use.

➔ Initialize the positioner on the first start-up.

➔ Re-initialize positioner after changing the mounting position.

Risk of positioner damage due to incorrect grounding of the electric welding equipment.

➔ Do not ground electric welding equipment near to the positioner.

Incorrect cleaning will damage the window.

The window is made of Makrolon® and will be damaged when cleaned with abrasive cleaning agents or agents containing solvents.

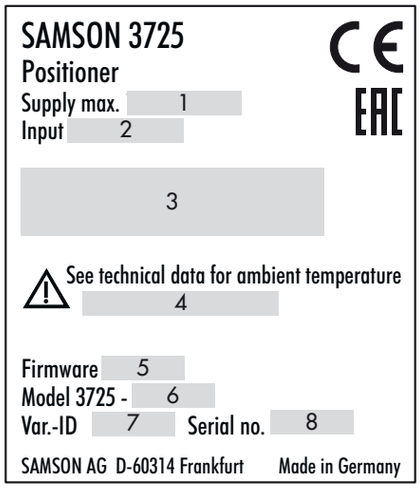
➔ Do not rub the window dry.

➔ Do not use any cleaning agents containing chlorine or alcohol or abrasive cleaning agents.

➔ Use a non-abrasive, soft cloth for cleaning.

2 Markings on the device

2.1 Nameplate



1 Max. supply pressure
2 Signal range
3 Type of protection for explosion-protected devices
4 Temperature limits in the test certificates for the explosion-protected devices
5 Firmware version
6 Model no.
7 Configuration ID
8 Serial number

2.2 Article code

Positioner	Type 3725-	x	x	x	0	0	0	0	x	0	0
With LCD and autotune, 4 to 20 mA reference variable											
Explosion protection [1]											
Without		0	0	0							
Intrinsic safety: **ATEX**		1	1	0	0						
Intrinsic safety: **STCC**		1	1	0	0						
Intrinsic safety: **CSA c/us**		1	3	0	0						
Intrinsic safety: **GOST**		1	1	3	0						
Shipbuilding certificate											
Without									0		
Bureau Veritas certification									1		

[1] See Table 1 for details on explosion protection certificates.

Table 1: *Summary of explosion protection certificates*

Type	Certification			Type of protection
3725-1100	**STCC**	On request		
	EC type examination certificate	Number Date	PTB 11 ATEX 2020 X 2011-08-25	II 2 G Ex ia IIC T4
3725-113	EAC Ex	Number Date Valid until	RU C-DE.GB08.B.00697 2014-12-15 2019-12-14	1Ex ia IIC T4 Gb X
3725-130	**CSA c/us**	Number Date	2703735 X 2014-06-03	Ex ia IIC T4; Class I, Zone 0, AEx ia IIC T4; Class I, Div. 1, Groups A, B, C, D

3 Design and principle of operation

The Type 3725 Electropneumatic Positioner is mounted on pneumatic control valves and is used to assign the valve position (controlled variable x) to the control signal (reference variable w). The positioner compares the electric control signal of a control system to the travel or opening angle of the control valve and issues a signal pressure (output variable y) for the pneumatic actuator.

The positioner mainly consists of the following components (see Fig. 1):

- Magnetoresistive sensor (2)
- Analog i/p converter (6) with a downstream air capacity booster (7)
- Electronics unit with microcontroller (4)

The travel or opening angle is measured by the pick-up lever, non-contact magnetoresistive sensor and downstream electronics.

The pick-up lever is connected to a magnet inside the device. The motion of the pick-up lever causes the direction of the magnetic field to change. This change is sensed by the sensor. The electronics unit determines the current position of the actuator stem or opening angle from this information.

The position of the actuator stem or opening angle is transmitted to the microcontroller (3) over the A/D converter (4). The PD control algorithm in the microprocessor compares this actual position to the 4 to 20 mA control signal after it has been converted by the A/D converter (3). In case of a system deviation, the activation of the i/p module (6) is changed so that the actuator of the valve (1) is pressurized or vented accordingly over the downstream booster (7). The supply air is supplied to the booster and the pressure regulator (8).

The output signal pressure supplied by the booster can be limited to 2.3 bar by software.

The volume restriction Q (10) is used to optimize the positioner by adapting it to the actuator.

Tight-closing function

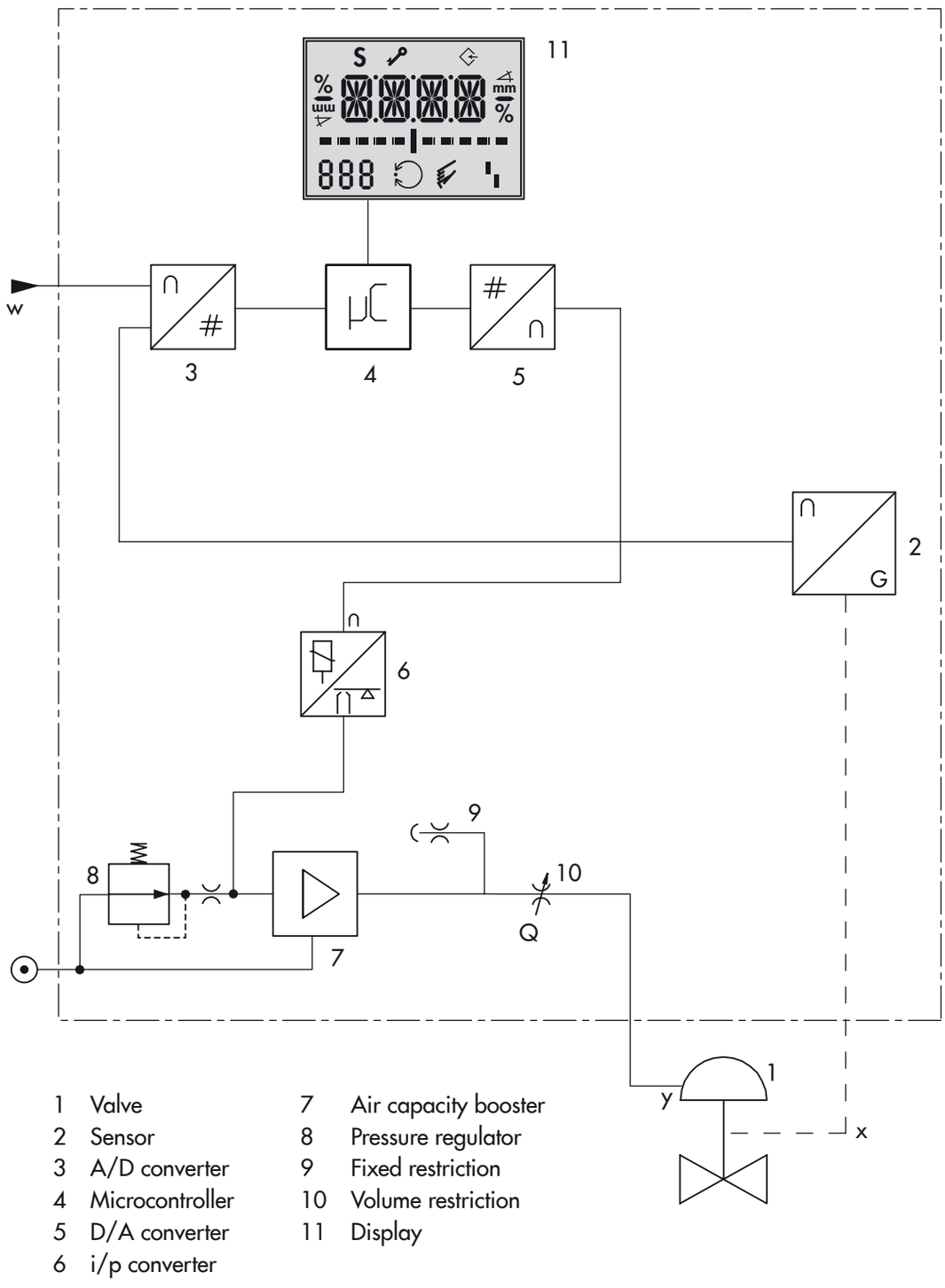
The pneumatic actuator is completely filled with air or vented as soon as the reference variable falls below 1 % or exceeds 99 % (see end positions set in P10 and P11 parameter codes).

3.1 Mounting versions

The Type 3725 Positioner is suitable for the following types of attachment:

- Direct attachment to SAMSON Type 3277 and Type 2780-2 Actuators
- Attachment to actuators according to IEC 60534-6 (NAMUR)
- Attachment to Type 3372 Actuator (Series V2001 Valves)
- Attachment to rotary actuators according to VDI/VDE 3845

➔ Refer to section 5.2 onwards for a description of the types of attachment.



1 Valve
2 Sensor
3 A/D converter
4 Microcontroller
5 D/A converter
6 i/p converter
7 Air capacity booster
8 Pressure regulator
9 Fixed restriction
10 Volume restriction
11 Display

Fig. 1: *Circuit diagram*

3.2 Accessories and mounting parts

Table 2: Direct attachment to Type 3277-5 and Type 2780-2 Actuators (see section 5.2)		Order no.
Mounting parts		
For actuators up to 120 cm²		1402-0239
Accessories for actuator		
Switchover plate for Type 3277-5xxxxxx.01 Actuator		1400-6822
Connecting plate for additional attachment of, e.g. a solenoid valve: G ⅛		1400-6823
Accessories for positioner		
Connecting plate (6)	G ¼	1402-0235
	¼ NPT	1402-0236
Pressure gauge bracket (7)	G ¼	1402-0237
	¼ NPT	1402-0238
Pressure gauge bracket for combination with Type 4708-55 Supply Pressure Regulator		1402-1515
Pressure gauge mounting kit (8) up to max. 6 bar (output/supply)	Stainless steel/brass	1402-0938
	Stainless steel/ stainless steel	1402-0939

Table 3: Direct attachment to Type 3277 (section 5.2.2)		Order no.
Mounting parts		
Actuators 240, 350, 355, 700 cm²		1402-0240
Accessories		
Connection block with seals and screw	G ¼	1402-0241
	¼ NPT	1402-0242
Pressure gauge mounting kit up to max. 6 bar (output/supply)	Stainless steel/brass	1402-0938
	Stainless steel/ stainless steel	1402-0939

Table 4: Pipe connections for Type 3277 (direct attachment)

Pipe connection	Actuator size	Material	Connection	Order no.
Piping with screw fittings – for fail-safe action "actuator stem retracts" – with air purging of the top diaphragm chamber	175 cm²	Steel	G ¼ / G ⅜	1402-0930
			¼ NPT/ ⅜ NPT	1402-0958
		Stainless steel	G ¼ / G ⅜	1402-0950
			¼ NPT/ ⅜ NPT	1402-0964
	240 cm²	Steel	G ¼ / G ⅜	1402-0927
			¼ NPT/ ⅜ NPT	1402-0959
		Stainless steel	G ¼ / G ⅜	1402-0951
			¼ NPT/ ⅜ NPT	1402-0965
	350 cm²	Steel	G ¼ / G ⅜	1402-0928
			¼ NPT/ ⅜ NPT	1402-0960
		Stainless steel	G ¼ / G ⅜	1402-0952
			¼ NPT/ ⅜ NPT	1402-0966
	355 cm²	Steel	G ¼ / G ⅜	1402-0956
			¼ NPT/ ⅜ NPT	1402-0961
		Stainless steel	G ¼ / G ⅜	1402-0953
			¼ NPT/ ⅜ NPT	1402-0967
	700 cm²	Steel	G ¼ / G ⅜	1402-0929
			¼ NPT/ ⅜ NPT	1402-0962
		Stainless steel	G ¼ / G ⅜	1402-0954
			¼ NPT/ ⅜ NPT	1402-0968
	750 cm²	Steel	G ¼ / G ⅜	1402-0957
			¼ NPT/ ⅜ NPT	1402-0963
		Stainless steel	G ¼ / G ⅜	1402-0955
			¼ NPT/ ⅜ NPT	1402-0969

Table 5: Attachment to NAMUR rib or attachment to rod-type yokes according to IEC 60534-6 (section 5.3)		Order no.
5 to 50 mm travel, lever already on positioner		
For actuators		1402-0330
Actuators from other manufacturers and Type 3271 with 120 to 700 cm² effective areas		
Accessories		
Connecting plate	G ¼	1402-0235
	¼ NPT	1402-0236
Pressure gauge bracket	G ¼	1402-0237
	¼ NPT	1402-0238
Pressure gauge mounting kit up to max. 6 bar (output/supply)	Stainless steel/brass	1402-0938
	Stainless steel/st.steel	1402-0939

Table 6: Attachment to rotary actuators (section 5.5)		Order no.
Light version		
VDI/VDE 3845 (September 2010), level 1 [1], AA1 size		1402-0243
VDI/VDE 3845 (September 2010), level 2 [1], AA2 size		1402-0244
VETEC Type S160 Actuator or SAMSON Type 3278 Rotary Actuator (160 cm²)		1402-0294
VETEC Type S320		1402-0295
Heavy-duty version		
VDI/VDE 3845 (September 2010), level 1 [1], AA1 to AA4 size		1402-1097
VDI/VDE 3845 (September 2010), level 2 [1]		1402-1099
VETEC Type S160/R		1402-1098
Accessories		
Connecting plate	G ¼	1402-0235
	¼ NPT	1402-0236
Pressure gauge bracket	G ¼	1402-0237
	¼ NPT	1402-0238
Pressure gauge mounting kit up to max. 6 bar (output/supply)	Stainless steel/brass	1402-0938
	Stainless steel/st. steel	1402-0939
Connecting plate for Type 3710 Reversing Amplifier		1402-0512

[1] See page 24 for details.

Table 7: General accessories	Order no.
Cable gland M20x1.5	
Black plastic	8808-1011
Blue plastic	8808-1012
Nickel-plated brass	1890-4875
Stainless steel 1.4305	8808-0160
Adapter M20x1.5 to ½ NPT	
Powder-coated aluminum	0310-2149
Stainless steel	1400-7114
Brief instructions inside cover	
German	0190-6173
English	0190-6174

3.3 Travel tables

Note

*The **M** lever is included in the scope of delivery.*

Direct attachment to Type 3277-5 and Type 3277 Actuators

Actuator size [cm²]	Rated travel [mm]	Adjustment range at positioner			Required lever	Assigned pin position
		Min.	Travel	Max.		
120	7.5	5.0 mm	to	16.0 mm	M	25
120/240/350	15	7.0 mm	to	22.0 mm	M	35
355/700	30	10.0 mm	to	32.0 mm	M	50

Direct attachment to Type 2780-2 Actuator

Actuator size [cm²]	Rated travel [mm]	Adjustment range at positioner			Required lever	Assigned pin position
		Min.	Travel	Max.		
120	6/12	5.0 mm	to	16.0 mm	M	25
120	15	7.0 mm	to	22.0 mm	M	35

Attachment according to IEC 60534-6 (NAMUR)

SAMSON Type 3271 Actuator		Travel of other valves		Required lever	Assigned pin position
Size [cm²]	Rated travel [mm]	Min.	Max.		
120	7.5	5.0 mm	16.0/25.0[1] mm	M	25
120/240/350	15	7.0 mm	22.0/35.0[1] mm	M	35
700	7.5				
700/355	15/30	10.0 mm	32.0/50.0[1] mm	M	50

[1] When 'MAX' is selected as the nominal range (P4 code, see page 68)

Attachment to rotary actuators according to VDI/VDE 3845

Rotary actuators			Required lever	Assigned pin position
Min.	Opening angle	Max.		
24°	to	100°	M	90°

3.4 Technical data

Type 3725 Positioner			
Travel (adjustable)	Direct attachment to Type 3277: Direct attachment to Type 2780-2: Attachment to Type 3372 Actuator: Attachment according to IEC 60534-6 (NAMUR): Attachment to rotary actuators:	5 to 30 mm 6/12/15 mm 15/30 mm 5 to 50 mm 24 to 100°	
Reference variable w (reverse polarity protection) Static destruction limit	4 to 20 mA signal range · Two-wire device Split-range operation 4 to 11.9 mA and 12.1 to 20 mA ±33 V		
Minimum current	3.8 mA		
Load impedance	Max. 6.3 V (corresponds to 315 Ω at 20 mA)		
Supply air Air quality acc. to ISO 8573-1	Supply air: 1.4 to 7 bar (20 to 105 psi) Max. particle size and density: Class 4 · Oil content: Class 3 · Pressure dew point: Class 3 or at least 10 K below the lowest ambient temperature to be expected		
Signal pressure (output)	0 bar up to the supply pressure · Can be limited to approx. 2.3 bar by software		
Characteristic	3 characteristics for globe valves · 9 characteristics for rotary valves		
Hysteresis	≤ 0.3 %		
Sensitivity	≤ 0.1 %		
Transit time	Only for actuators with initialization time > 0.5 s [1]		
Direction of action	w/x reversible		
Air consumption	≤ 100 l_n/h with a supply pressure up to 6 bar and a signal pressure of 0.6 bar		
Air output capacity To fill actuator with air To vent actuator	 At Δp 6 bar: 8.5 m_n^3/h At Δp 6 bar: 14.0 m_n^3/h	 At Δp = 1.4 bar: 3.0 m_n^3/h, At Δp = 1.4 bar: 4.5 m_n^3/h,	 K_{Vmax}(20 °C) = 0.09 K_{Vmax}(20 °C) = 0.15
Permissible ambient temperature	−20 to +80 °C −25 to +80 °C with metal cable gland The limits in the test certificates additionally apply for explosion-protected versions		

[1] For faster actuators, a volume restriction must be used. Otherwise, the initialization cannot be performed successfully.

Safety		
Influences	Temperature: Effect of vibration: Supply air:	≤ 0.15 %/10 K ≤ 0.25 % up to 2000 Hz and 4 g according to IEC 770 None
Electromagnetic compatibility	Complying with EN 61000-6-2, EN 61000-6-3 and NAMUR Recommendation NE 21	
Explosion protection [1]	Intrinsic safety: **ATEX, STCC, CSA, GOST**	
Degree of protection	IP 66	
Compliance	CE · EAC	
Materials		
Housing	Polyphthalamide (PPA)	
Cover	Polycarbonate (PC) [2]	
External parts	Stainless steel 1.4571 and 1.4301	
Cable gland	M20x1.5, black polyamide (PA)	
Vent plugs	High-density polyethylene (PE-HD)	
Weight	**Approx. 0.5 kg**	

1) See Table 1on page 13 for details on explosion protection certificates.
2) Makrolon®

3.5 Dimensions in mm

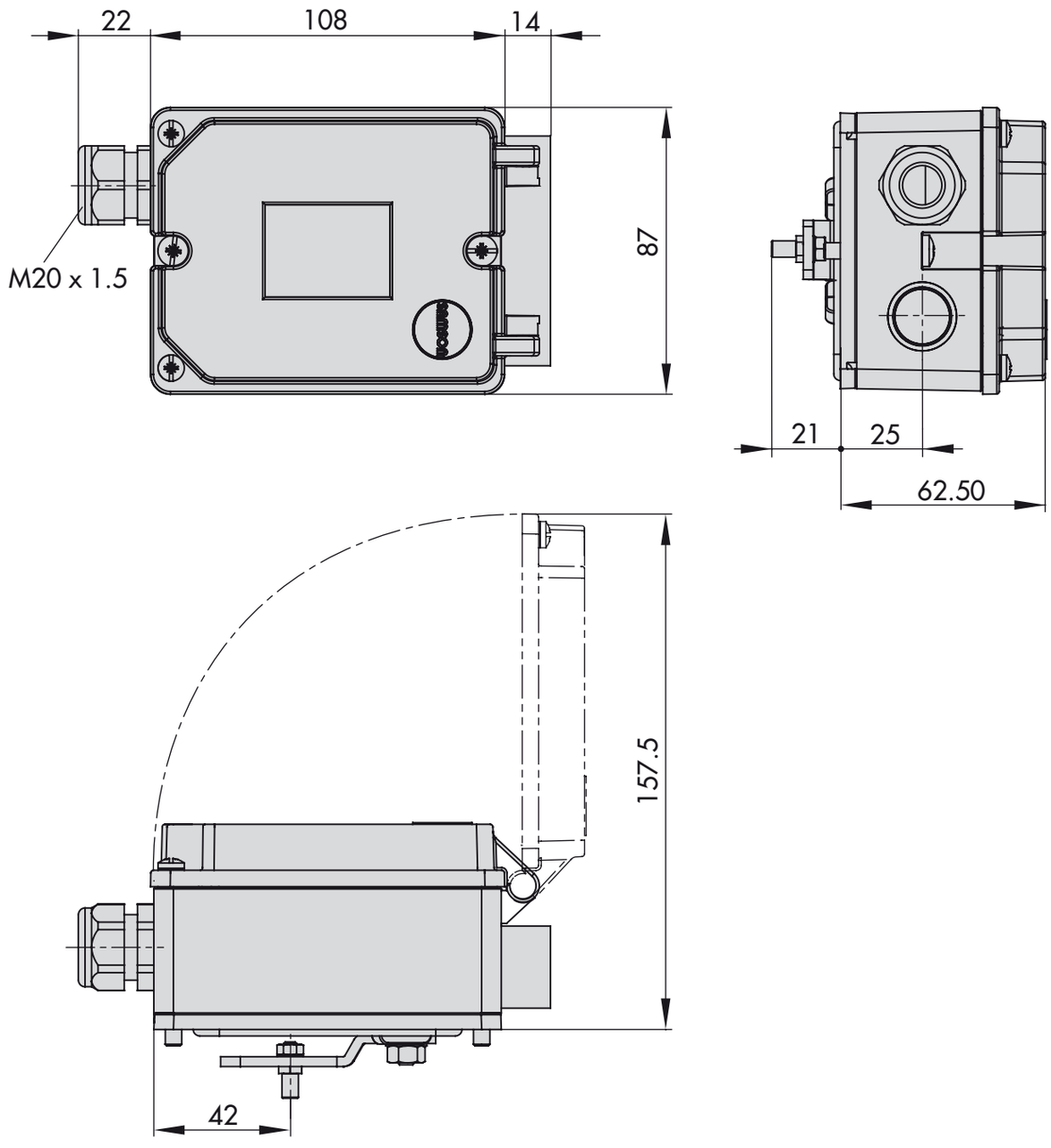


Fig. 2: *Dimensional drawings for Type 3725 Positioner*

3.5 Dimensions in mm

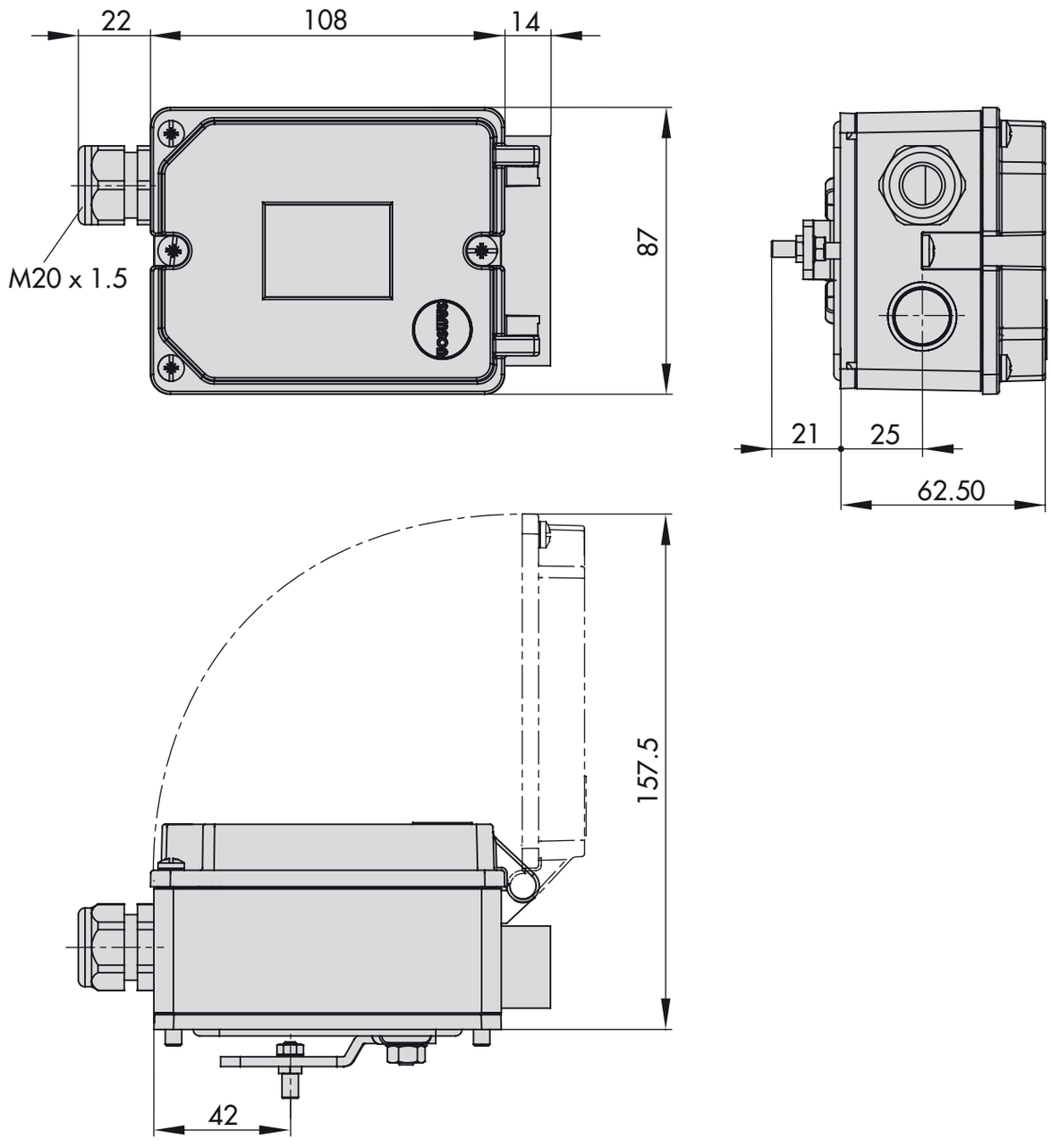
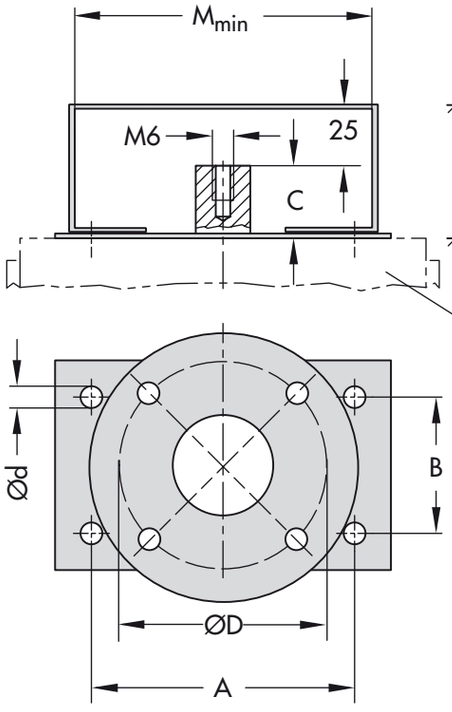


Fig. 2: *Dimensional drawings for Type 3725 Positioner*

Fixing levels according to VDI/VDE 3845 (September 2010)



Dimensions in mm

Size	A	B	C	Ød	M_{min}	ØD [1]
AA0	50	25	15	5.5 for M5	66	50
AA1	80	30	20	5.5 for M5	96	50
AA2	80	30	30	5.5 for M5	96	50
AA3	130	30	30	5.5 for M5	146	50
AA4	130	30	50	5.5 for M5	146	50
AA5	200	50	80	6.5 for M6	220	50

1) Flange type F05 acc. to DIN EN ISO 5211

4 Measures for preparation

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Compare the shipment received against the delivery note.
2. Check the shipment for transportation damage. Report any transportation damage.

4.1 Unpacking

NOTICE

Risk of positioner damage due to foreign particles entering it.
Do not remove the packaging and protective film/protective caps until immediately before mounting and start-up.

1. Remove the packaging from the positioner.
2. Dispose of the packaging in accordance with the valid regulations.

4.2 Transporting and lifting

4.2.1 Transporting

– Protect the positioner against external influences (e.g. impact).
– Protect the positioner against moisture and dirt.
– Observe transport temperature depending on the permissible ambient temperature (see technical data in section 3.4).

4.2.2 Lifting

Due to the low service weight, lifting equipment is not required to lift the positioner.

4.3 Storage

NOTICE

Risk of positioner damage due to improper storage.
– Observe storage instructions.
– Avoid long storage times.
– Contact SAMSON in case of different storage conditions or long storage periods.

Storage instructions

– Protect the positioner against external influences (e.g. impact, shocks, vibration).
– Do not damage the corrosion protection (coating).
– Protect the positioner against moisture and dirt. In damp spaces, prevent condensation. If necessary, use a drying agent or heating.
– Observe storage temperature depending on the permissible ambient temperature (see technical data in section 3.4).
– Store positioner with closed cover.
– Seal pneumatic and electrical connections.

5 Mounting and start-up

NOTICE

Risk of malfunction due to incorrect sequence of mounting, installation, and start-up.
Observe the prescribed sequence.

➔ Sequence to be kept on mounting, installing, and starting up the positioner:

1. **Remove the protective caps from the pneumatic connections.**
2. **Mount the positioner on the valve.**
➔ Section 5.2 onwards
3. **Perform pneumatic installation.**
➔ Section 5.6 onwards
4. **Perform electrical installation.**
➔ Section 5.8 onwards
5. **Perform the settings.**
➔ Section 7 onwards

The following applies when mounting the positioner:

➔ **Do not mount the positioner with the vent opening (Fig. 4) facing upward.**

➔ **Do not seal the vent opening.**

5.1 Lever and pin position

The positioner is adapted to the actuator and to the rated travel by the lever on the back of the positioner and the pin inserted into the lever.

The travel tables on page 20 show the assignment between the required lever and pin position.

The positioner is equipped with the **M** lever (pin position **35**) as standard (see Fig. 3).

Removing the lever and changing the pin position:

NOTICE

Incorrect removal of the lever will damage the positioner.
Only remove the lever when it is positioned at the bottom mechanical stop.

1. Move the lever to the bottom mechanical stop (see Fig. 4) and hold it in place. Undo and remove the nut using a wrench (width across flats SW 10).
2. Remove the lever from the shaft.
3. Insert pin in position as listed in the travel table.
4. Fasten the lever.

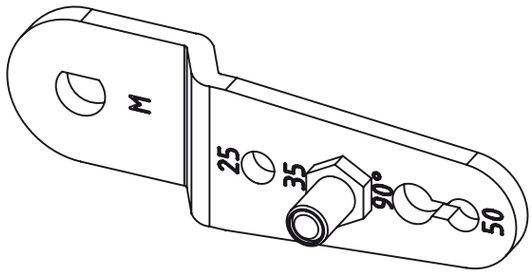


Fig. 3: *M lever with pin position 35*

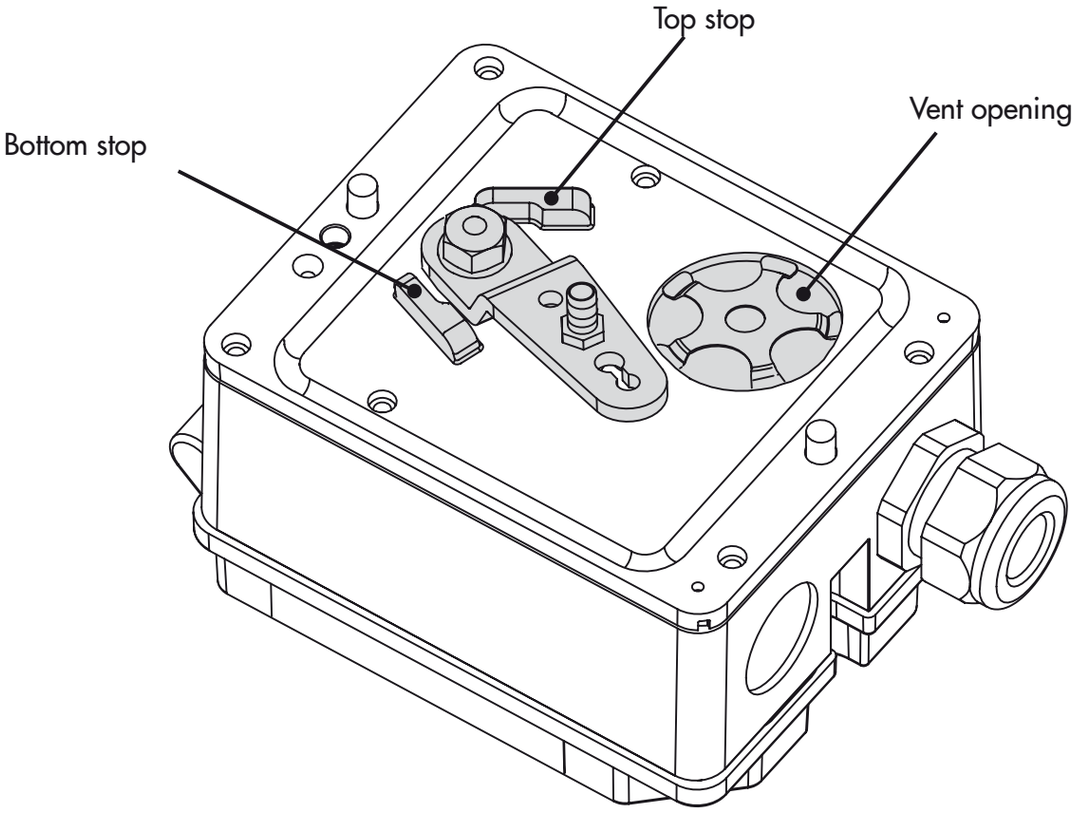


Fig. 4: *Mechanical stops and vent opening*

5.2 Direct attachment

5.2.1 Type 3277-5 and Type 2780-2 Actuators

➔ Required mounting parts and accessories: Table 2 on page 16.

➔ Observe travel tables on page 20.

Actuator with 120 cm² diaphragm area

Depending on the type of positioner attachment, the signal pressure is routed either left or right of the yoke through a hole to the actuator diaphragm.

➔ Depending on the fail-safe action of the actuator "actuator stem extends" or "actuator stem retracts", first attach the switchover plate (9) to the actuator yoke (while aligning it with the corresponding symbol for left or right attachment according to the marking, see Fig. 6).

1. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges on the positioner, making sure the two seals (6.1) are seated properly.
2. Screw the screw plug (4) on the back of the positioner into the hole below it (park position) (see Fig. 8) and seal the signal pressure output on the connecting plate (6) or on the pressure gauge bracket (7) with the stopper (5) included in the accessories.
3. Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.
4. **15 mm travel:** Keep the follower pin (2) on the M lever (1) on the back of the positioner in the pin position 35 (delivered state). **7.5 mm travel:** Remove the follower pin (2) from the pin position 35, reposition it in the hole for pin position 25 and screw tight.
5. Insert formed seal (15) into the groove of the positioner housing.
6. Place positioner on the actuator in such a manner that the follower pin (2) rests on top of the follower clamp (3). While doing this, press on the ribbed area shown in Fig. 5 to lock the pick-up lever in the top position. The lever (1) must rest on the follower clamp with spring force.

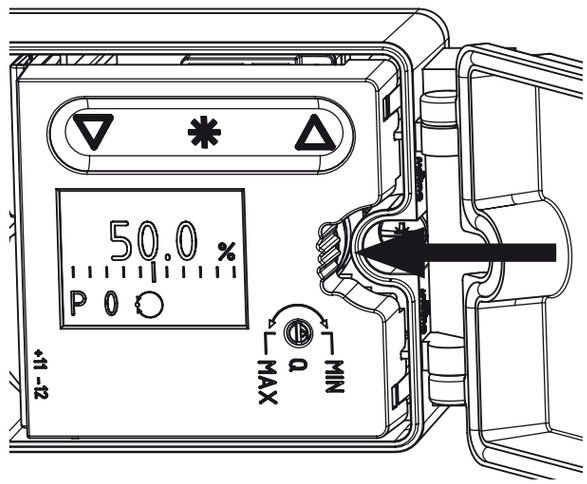


Fig. 5: *Locking the pick-up lever in position*

7. Mount the positioner on the actuator using the two fixing screws.

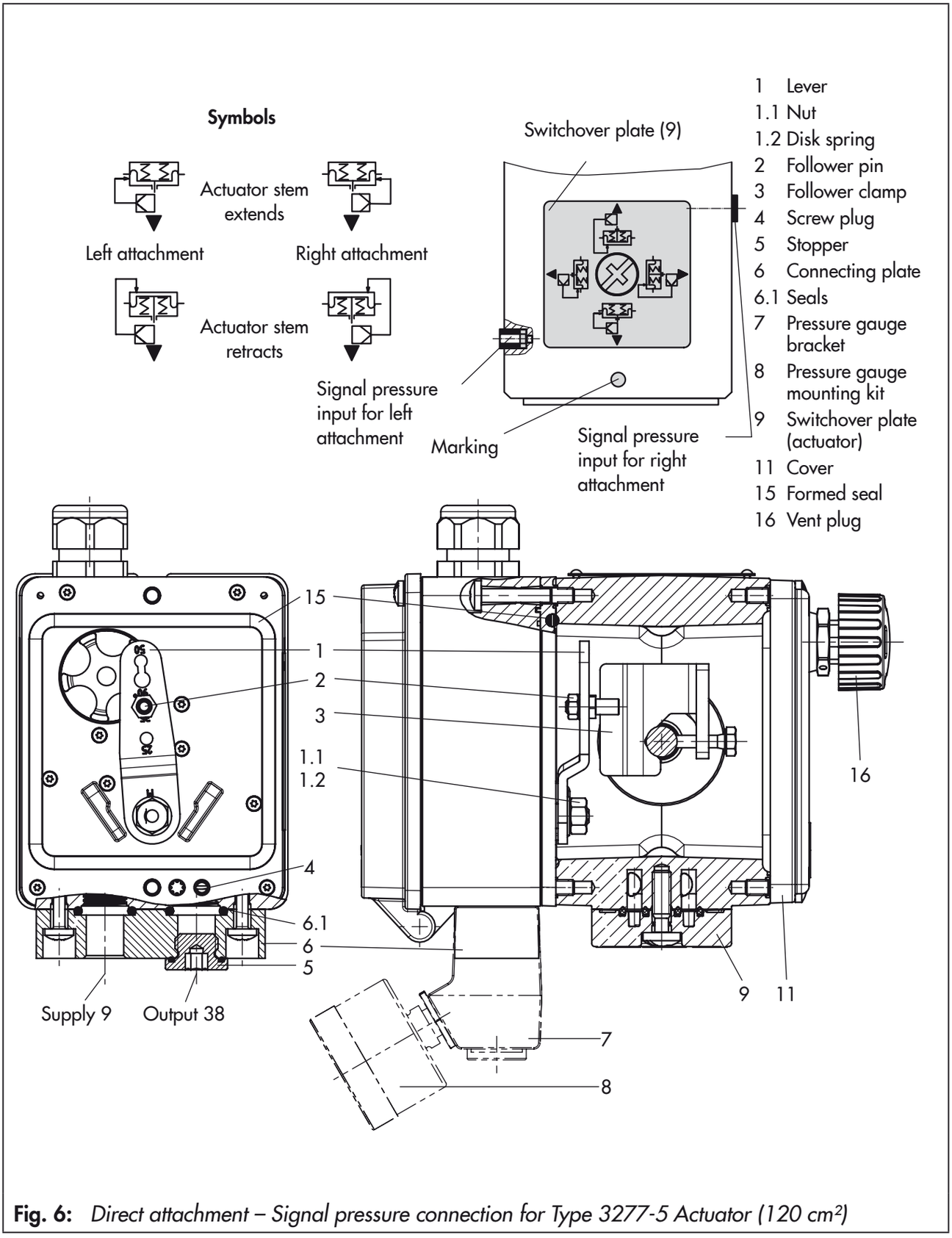


Fig. 6: *Direct attachment – Signal pressure connection for Type 3277-5 Actuator (120 cm²)*

8. Mount cover (11) on the other side. Make sure that the vent plug is located at the bottom when the control valve is installed to allow any condensed water that collects to drain off (Fig. 7).

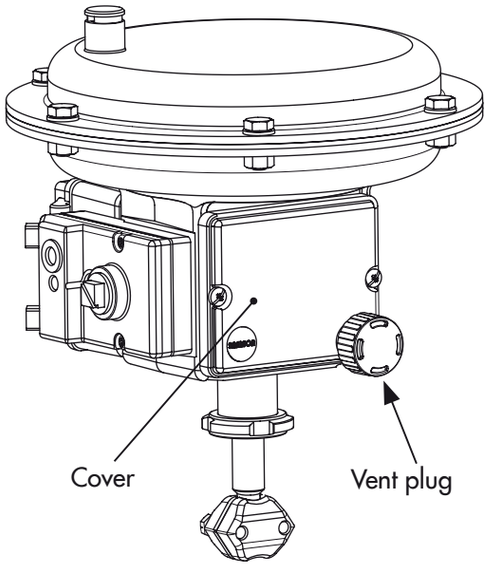


Fig. 7: *Cover with vent plug when the valve is installed*

Additional solenoid valve

If a solenoid valve is additionally mounted onto the actuator, the signal pressure port at the back of the positioner must be sealed (see Fig. 8). To do this, unscrew the screw plug located in the middle hole (screw plug in park position) and screw it into the signal pressure port to seal it.

In this case, route the signal pressure from the signal pressure output to the actuator over the connecting plate (6) or pressure gauge bracket (7). The connecting plate (accessories for the actuator) replaces the switchover plate (9).

i ***Note***

The switchover plate and connecting plate are accessories for the actuator (120 cm²). They are listed in section 3.2 on page 16.

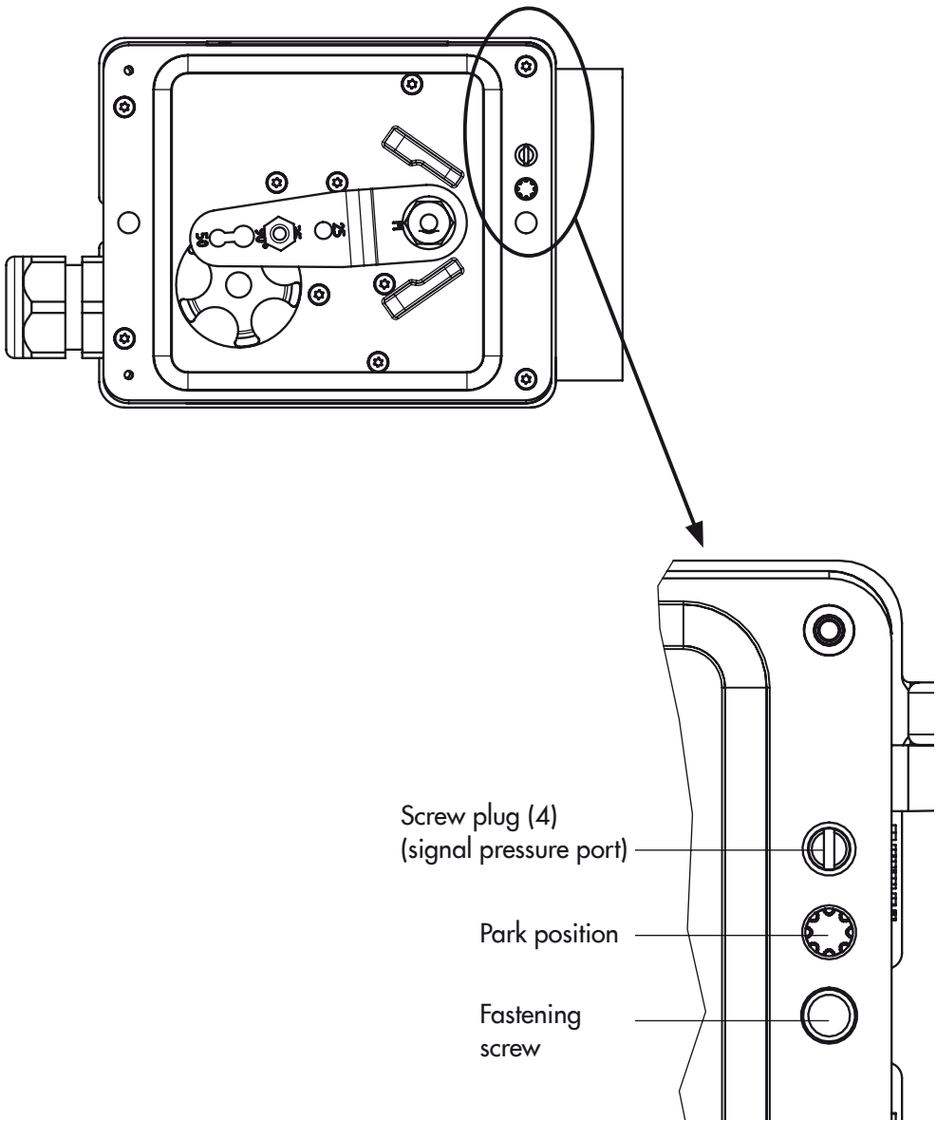


Fig. 8: *Signal pressure port and park position for screw plug*

5.2.2 Type 3277 Actuator

➔ Required mounting parts and accessories: Table 3 on page 16.

➔ Observe travel tables on page 20.

Actuators with 240 to 700 cm² effective areas

The positioner can be mounted either on the left or right side of the yoke. The signal pressure is routed to the actuator over the connection block (12), for actuators with fail-safe action "actuator stem extends" internally through a hole in the valve yoke and for "actuator stem retracts" through an external pipe.

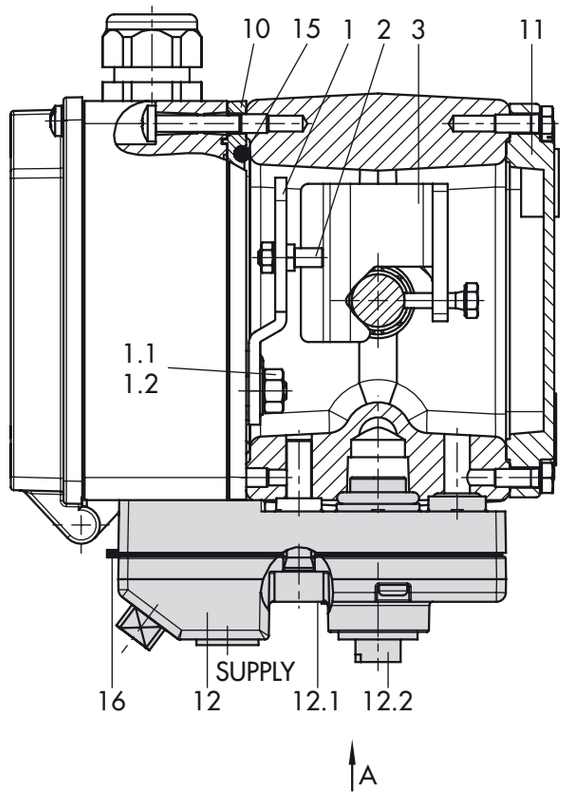
Place follower clamp (3) on the actuator stem, align it and screw tight so that the mounting screw is located in the groove of the actuator stem.

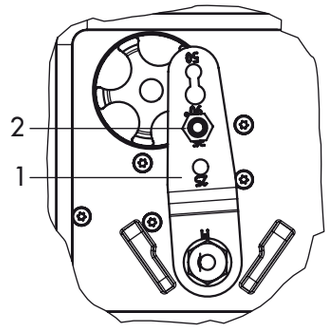
1. For actuators 240 and 350 cm² with 15 mm travel, keep the pin (2) in pin position 35.

   For actuators with 355 or 700 cm², remove the pin (2) on M lever (1) on the back of the positioner from pin position 35, reposition it in the hole for pin position 50 and fasten tight.
2. Insert formed seal (15) in the groove of the positioner housing.
3. Place positioner on the actuator in such a manner that the pin (2) rests on top of the follower clamp (3).
4. While doing this, press on the ribbed area to lock the lever in the top position (see Fig. 5).

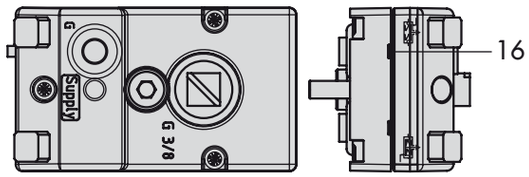
   The lever (1) must rest on the follower clamp with spring force.
   Fasten the positioner on the actuator using the two fixing screws.
5. Make sure that the tip of the gasket (16) projecting from the side of the connection block is positioned to match the actuator symbol for the actuator's fail-safe action "actuator stem extends" or "actuator stem retracts". If this is not the case, unscrew the three fastening screws and lift off the cover. Turn the gasket (16) by 180° and re-insert it.
6. Place the connection block (12) with the associated seals against the positioner and the actuator yoke and fasten using the screw (12.1).
7. For actuators with fail-safe action "actuator stem retracts", additionally remove the stopper (12.2) and mount the external signal pressure pipe.
8. Mount cover (11) on the other side.
   Make sure that the vent plug is located at the bottom when the control valve is installed to allow any condensed water that collects to drain off (see Fig. 7 on page 30).

Type 3277 Actuator with Type 3725 Positioner (direct attachment)





View A



1	M lever
1.1	Nut
1.2	Disk spring
2	Follower pin
3	Follower clamp
11	Cover
12	Connection block
12.1	Screw
12.2	Stopper or connection for external piping
15	Formed seal
16	Gasket

Fig. 9: *Direct attachment · Signal pressure connection for Type 3277 Actuator with 240 to 700 cm²*

5.3 Attachment according to IEC 60534-6

The positioner is attached to the control valve using a NAMUR bracket (10).

➔ Required mounting parts and accessories: Table 5 on page 18.

➔ Observe travel tables on page 20.

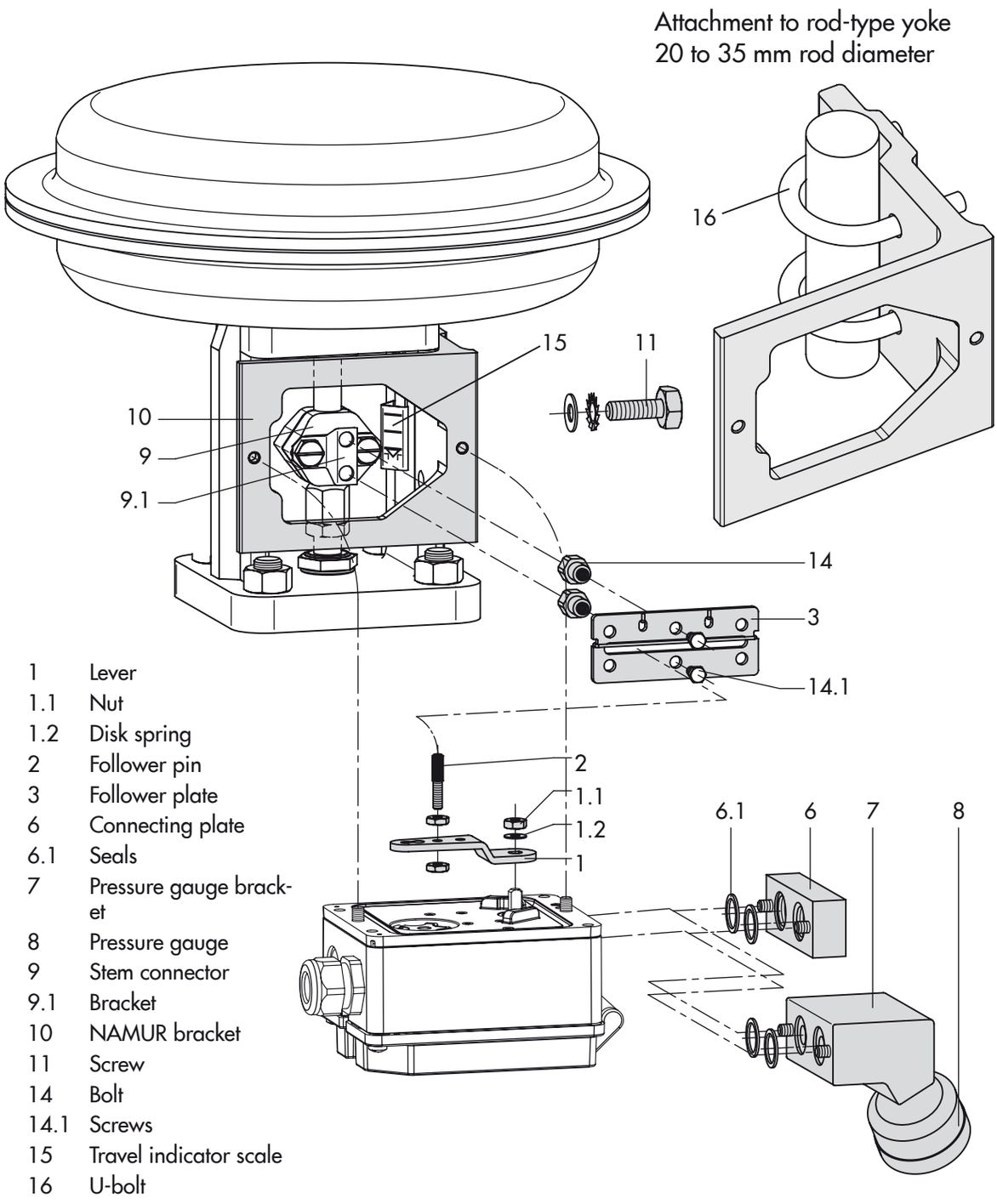
1. Screw the two bolts (14) to the bracket (9.1) of the stem connector (9), place the follower plate (3) on top and use the screws (14.1) for fastening.
2. Fasten the NAMUR bracket (10) to the control valve.

– For valve with NAMUR rib: Fasten the NAMUR bracket (10) using the M8 screw (11) and toothed lock washer directly to the yoke hole.

– For valves with rod-type yoke: Place the two U-bolts (16) around the stem. Position the NAMUR bracket (10) and fasten it using the nuts, washers and toothed lock washers.

3. Align the NAMUR bracket (10) so that its mounting holes are approximately in line to the middle of the travel scale indicator (15) (the slot of the follower plate must be centrally aligned with the NAMUR bracket at mid valve travel).
4. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges (8) on the positioner, making sure the two seals (6.1) are seated properly.
5. Place positioner on the NAMUR bracket in such a manner that the pin (2) rests in the slot of the follower plate (3). Adjust the lever (1) correspondingly.

   Fasten the positioner to the NAMUR bracket using its two mounting screws.



1	Lever
1.1	Nut
1.2	Disk spring
2	Follower pin
3	Follower plate
6	Connecting plate
6.1	Seals
7	Pressure gauge bracket
8	Pressure gauge
9	Stem connector
9.1	Bracket
10	NAMUR bracket
11	Screw
14	Bolt
14.1	Screws
15	Travel indicator scale
16	U-bolt

Fig. 10: *Attachment according to IEC 60534-6*

5.4 Attachment to Type 3372 Actuator (V2001)

The Type 3725 Positioner is already included in the scope of delivery for Series V2001 Valves (Fig. 11).

The attachment is briefly described below to allow conversion work to be performed.

Actuator with 120/350 cm², stem extends

The signal pressure is routed through the corresponding port in the support element to the actuator diaphragm.

➔ Thread the screw plug on the positioner into the hole below (park position) (see Fig. 8 on page 31).

Actuator with 120/350 cm², stem retracts

The signal pressure is routed through piping at the side of the support element to the actuator diaphragm.

Attachment including solenoid valve

The signal pressure is routed from the output port of the positioner to the solenoid valve and through a corresponding hole in the support element to the actuator diaphragm.

Type 3372 Actuator,
version with 120 cm²

Type 3372 Actuator,
version with 350 cm²

Fig. 11: *Mounting on Type 3372 Actuator*

5.5 Attachment to rotary actuators

The positioner is mounted to the rotary actuator using a mounting bracket.

➔ Required mounting parts and accessories: Table 6 on page 18.

➔ Before attaching the positioner onto the SAMSON Type 3278 Rotary Actuator (160 cm²) or VETEC Type S160 Actuator, first mount the adapter (13) to the free end of the shaft end using four screws (10, 1).

1. Place follower clamp (3) on the slotted actuator shaft or adapter (13).
2. Place coupling wheel (4) with flat side facing the actuator on the follower clamp (3). Refer to Fig. 12 to align slot so that it matches the direction of rotation when the valve is in its closed position.
3. Fasten the coupling wheel (4) and follower clamp (3) tightly onto the actuator shaft using screw (4.1) and disk spring (4.2).
4. Mount connecting plate (6) or pressure gauge bracket (7) with pressure gauges (8) on the positioner, making sure the two seals are seated properly.
5. Fasten the mounting bracket (10) to the actuator using four screws (10.1).
6. Unscrew the standard follower pin (2) from the positioner's M lever (1). Use the metal follower pin (Ø 5 mm) included in the mounting kit and screw tight into the hole for pin position 90°.
7. Place positioner on the mounting bracket (10) and fasten tight. Taking the actuator's direction of rotation into account, adjust lever (1) so that it engages in the slot of the coupling wheel (4) with its follower pin (Fig. 13).

➔ The lever (1) must be parallel to the long side of the positioner when the actuator is at half its angle of rotation.

8. Stick the scale plate on the coupling wheel (4) so that the arrow tip indicates the closed position and it can be easily read when the valve is installed.

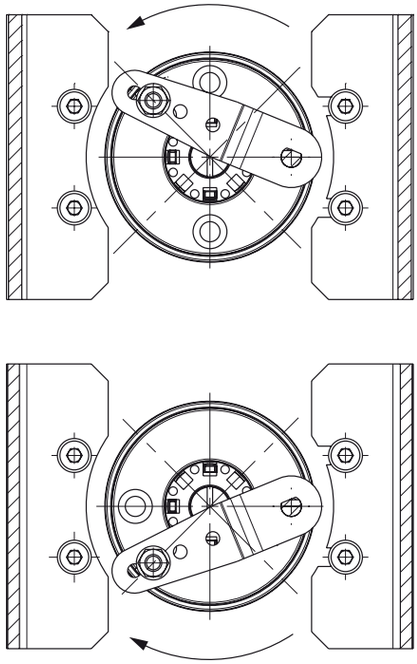
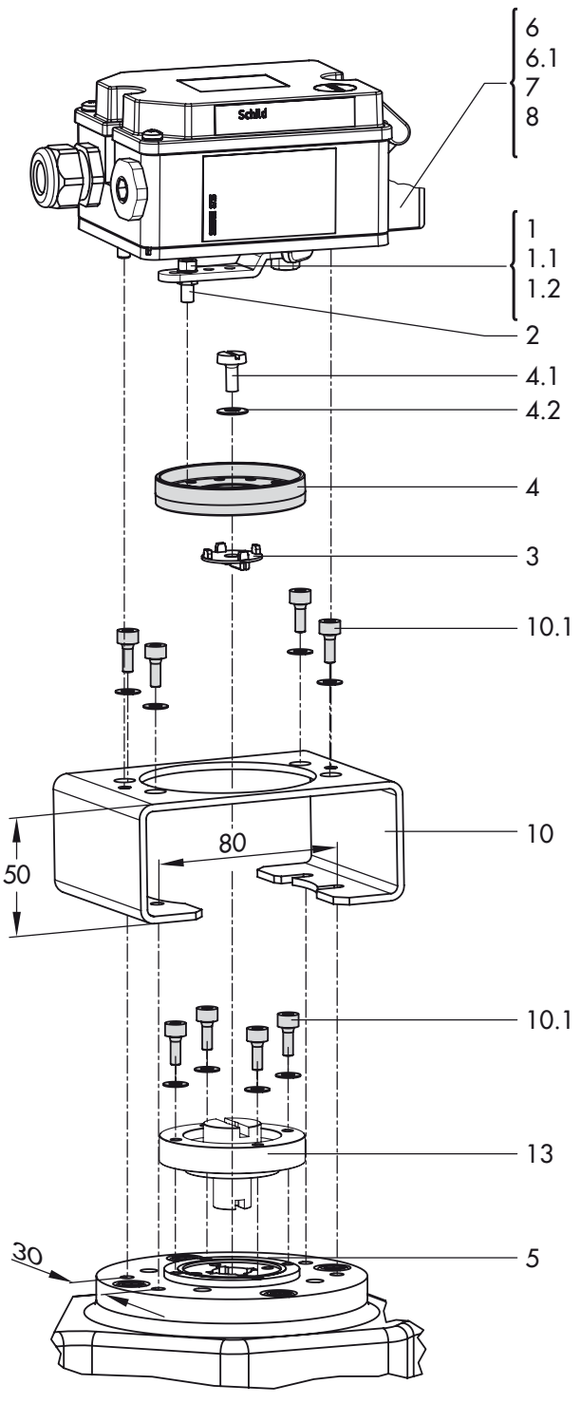
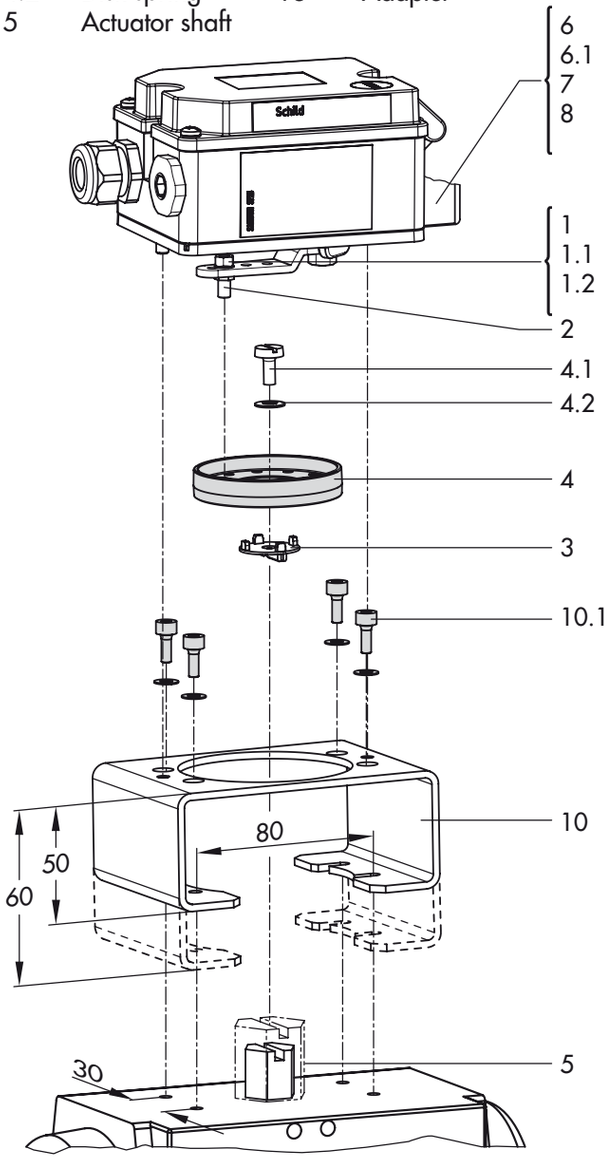


Fig. 12: *Direction of rotation*



Attachment to SAMSON Type 3278 Rotary Actuator (160 cm²) or VETEC Type S160 Actuator

1	Lever	6	Connecting plate
1.1	Nut	6.1	Seals
1.2	Disk spring	7	Pressure gauge bracket
2	Follower pin	8	Pressure gauge mounting kit
3	Follower clamp		
4	Coupling wheel	10	Mounting bracket
4.1	Screw	10.1	Screws
4.2	Disk spring	13	Adapter
5	Actuator shaft		



Attachment according to VDI/ VDE 3845, level 1

Fig. 13: *Attachment to rotary actuators*

5.5.1 Heavy-duty version

➔ Required mounting parts and accessories: Table 6 on page 18.

Prepare actuator and mount possibly required adapter supplied by the actuator manufacturer.

1. Mount the housing (10) onto the rotary actuator. In case of VDI/VDE attachment, place spacers (11) underneath, if necessary.
2. For **SAMSON Type 3278** and **VETEC S160 Rotary Actuators**, screw the adapter (5) onto the free end of the shaft or place adapter (5.1) onto the shaft of the **VETEC R Actuator**. Place adapter (3) onto **Type 3278, VETEC S160 and VETEC R** Actuators. For **VDI/VDE version**, this step depends on the actuator size.
3. Stick adhesive label (4.3) onto the coupling in such a manner that the yellow part of the sticker is visible in the window of the housing when the valve is OPEN. Adhesive labels with explanatory symbols are enclosed and can be stuck on the enclosure, if required.
4. Fasten coupling wheel (4) on the slotted actuator shaft or adapter (3) using screw (4.1) and disk spring (4.2).
5. Unscrew the standard follower pin (2) from the positioner's M lever (1). Attach the follower pin (Ø5 mm) included in the mounting kit to pin position 90°.
6. Mount connecting plate (6) for required G ¼ connecting thread or pressure gauge bracket (7) with pressure gauges on the positioner, making sure the two seals (6.1) are seated properly. Double-acting springless rotary actuators require the use of a reversing amplifier on the connection side of the positioner housing (refer to section 5.5.2).
7. For actuators with a volume of less than 300 cm³, fit the restriction (order no. 1400-6964) into the signal pressure output of the positioner (or the output of the pressure gauge bracket or connecting plate).
8. Fasten the positioner onto the adapter plate (12).
9. Place the positioner together with the adapter plate on the housing (10) and screw it tight. Taking the actuator's direction of rotation into account, adjust lever (1) so that it engages in the correct slot with its follower pin (Fig. 14).

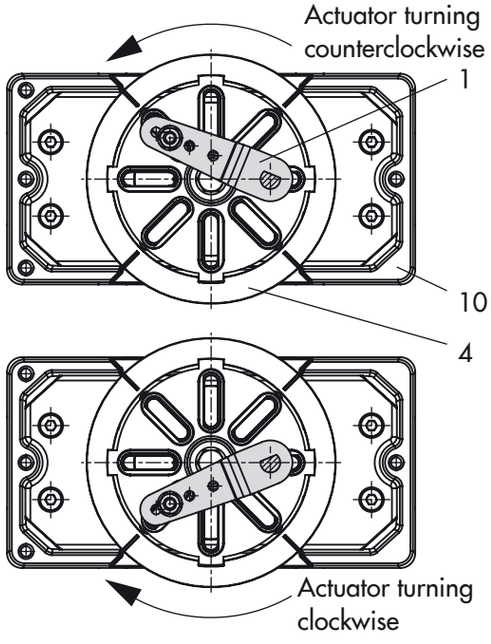


Fig. 14: *Direction of rotation*

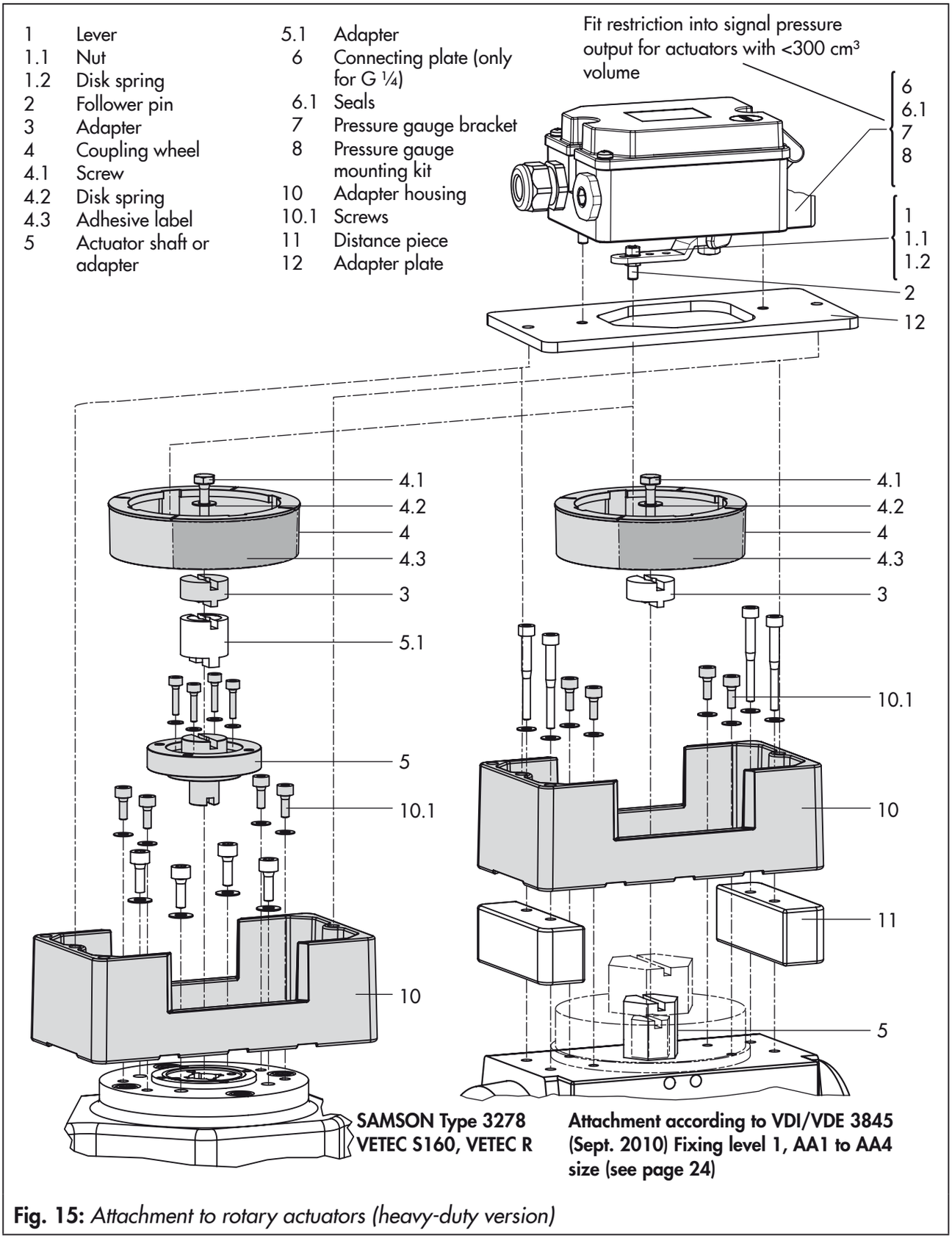


Fig. 15: *Attachment to rotary actuators (heavy-duty version)*

5.5.2 Mounting the Type 3710 Reversing Amplifier

When a Type 3710 Reversing Amplifier is used, a connecting plate is placed between the positioner and reversing amplifier. The reversing amplifier is fastened together with the connecting plate to the positioner using screws (Fig. 16).

i Note

The screws supplied with the connecting plate have a TORX PLUS® profile (size 25 IP) and must be tightened using a suitable tool.

Details on the Type 3710 Reversing Amplifier: Mounting and Operating Instructions
▶ EB 8392

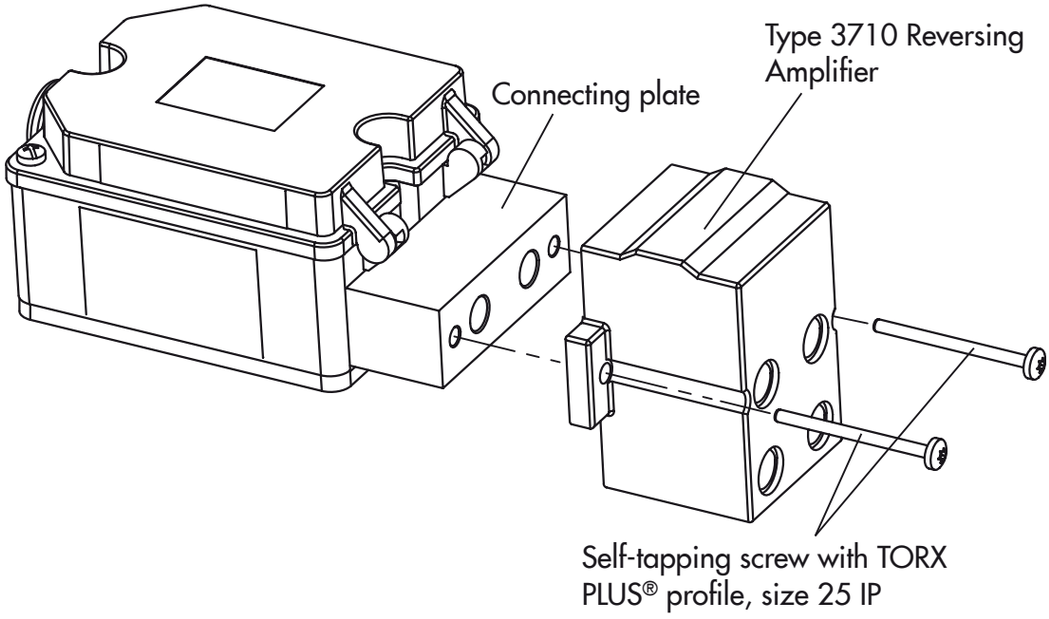


Fig. 16: *Mounting the Type 3710 Reversing Amplifier*

5.6 Pneumatic connections

⚠ WARNING

Risk of injury by possible movement of the actuator stem after connecting the signal pressure.
Do not touch or block the actuator stem.

NOTICE

Incorrect connection of the supply air will damage the positioner and will lead to malfunction.
– *Screw the screw fittings into the connecting plate, pressure gauge mounting block or connection block from the accessories.*
– *Keep the length of the line as short as possible to avoid delays in control signal transmission.*

The pneumatic connections are optionally designed as a bore with ¼ NPT or G ¼ thread. The customary fittings for metal and copper pipes or plastic hoses can be used.

NOTICE

Risk of malfunction due to failure to comply with required air quality.
Only use supply air that is dry and free of oil and dust.
Read the maintenance instructions for upstream pressure reducing stations.
Blow through all air pipes and hoses thoroughly before connecting them.

5.7 Connecting the supply air

NOTICE

Risk of malfunction due to incorrect sequence of mounting, installation, and start-up.
Keep the following sequence.
1. *Remove the protective caps from the pneumatic connections.*
2. *Mount the positioner on the valve.*
3. *Connect the supply air.*
4. *Connect the electrical power.*
5. *Perform the start-up settings.*

5.7.1 Signal pressure connection

The signal pressure connection depends on how the positioner is mounted onto the actuator:

Type 3277 Actuator

➔ The signal pressure connection is fixed when the positioner is directly attached to the Type 3277 Actuator.

Attachment according to IEC 60534-6 (NAMUR)

➔ For attachment according to IEC 60534-6 (NAMUR), the signal pressure can be routed to either the top or bottom diaphragm chamber of the actuator, depending on the actuator's fail-safe action "actuator stem extends" or "actuator stem retracts".

Rotary actuators (heavy-duty version)

➔ For rotary actuators, the manufacturer's specifications for connection apply.

Tip

To monitor the supply air and signal pressure, we recommend mounting pressure gauges (see accessories in section Table 6).

Mounting the pressure gauges:

➔ See sections 5.3 and Fig. 10

5.7.2 Supply pressure

The required supply air pressure depends on the bench range and the actuator's direction of action (fail-safe action). The bench range is written on the nameplate either as the spring range or signal pressure range. The operating direction is marked **FA** or **FE**, or by a symbol.

Fail-close or ATO (air to open):
Actuator stem extends

Fail-open or ATC (air to close):
Actuator stem retracts

Supply pressure for fail-close valves (for globe and angle valves):

➔ Required supply pressure = Upper bench range value + 0.2 bar, minimum 1.4 bar.

Supply pressure for fail-open valves (for globe and angle valves):

➔ For tight-closing valves, the maximum signal pressure pst_{max} is roughly estimated as follows:

$$pst_{max} = F + \frac{d^2 \cdot \pi \cdot \Delta p}{4 \cdot A} \text{ [bar]}$$

d = Seat diameter [cm]
Δp = Differential pressure across the valve [bar]
A = Actuator area [cm²]
F = Upper bench range value [bar]

If there are no specifications, calculate as follows:

➔ Required supply pressure = Upper bench range value + 1 bar

Note

The signal pressure at the output (38) of the positioner can be restricted to approx. 2.3 bar by setting P9 parameter code to ON.

5.8 Electrical connections

⚠ DANGER

Risk of the formation of an explosive atmosphere.

For installation in hazardous areas, observe the relevant standards that apply in the country of use.

Standard applicable in Germany: EN 60079-14: 2008 (VDE 0165, Part 1) Explosive Atmospheres – Electrical Installations Design, Selection and Erection.

⚠ WARNING

Incorrect electrical connection will render the explosion protection unsafe.

– Adhere to the terminal assignment.

– Do not undo the enameled screws in or on the housing.

– Do not exceed the maximum permissible values specified in the EC type examination certificates when interconnecting intrinsically safe electrical equipment (U_i or U_0, I_i or I_0, P_i or P_0, C_i or C_0 and L_i or L_0).

Selecting cables and wires

➔ **Observe clause 12 of EN 60079-14 (VDE 0165, Part 1) for installation of the intrinsically safe circuits.**

➔ Clause 12.2.2.7 applies when running multi-core cables and wires with more than one intrinsically safe circuit.

➔ **Radial thickness of the insulation** of a conductor for common insulating materials (e.g. polyethylene): **minimum 0.2 mm**.

➔ **Diameter of an individual wire** in a fine-stranded conductor: **minimum 0.1 mm.**

➔ Strip **8 mm** insulation off the wire ends.

➔ Protect the conductor ends against splicing, e.g. by using wire-end ferrules.

➔ Cable glands available:
See Table 7 on page 19

Equipment for use in zone 2/zone 22

In equipment operated according to type of protection Ex nA II (non-sparking equipment) according to EN 60079-15: 2003:

➔ Circuits may be connected, interrupted, or switched while energized only during installation, maintenance, or repair.

Equipment connected to energy-limited circuits with type of protection Ex nL (energy-limited equipment) according to EN 60079-15: 2003:

➔ Equipment may be switched under normal operating conditions.

The maximum permissible values specified in the statement of conformity and its addenda apply when interconnecting the equipment with energy-limited circuits in type of protection Ex nL IIC.

5.8.1 Electric power supply

➔ Only use a current source and never a voltage source!

➔ Keep the reference variable within the static destruction limit of ±33 V.

5.8.2 Cable entry

The M20x1.5 cable gland is designed for a clamping range of 6 to 12 mm.

The cage clamp terminals hold wire cross-sections of 0.2 to 1.5 mm².

➔ To unlock the cage clamp terminals: place a slotted screwdriver on the plastic part (Fig. 17) and lightly push it into the terminal block.

➔ Insert or remove the wire **without force**.

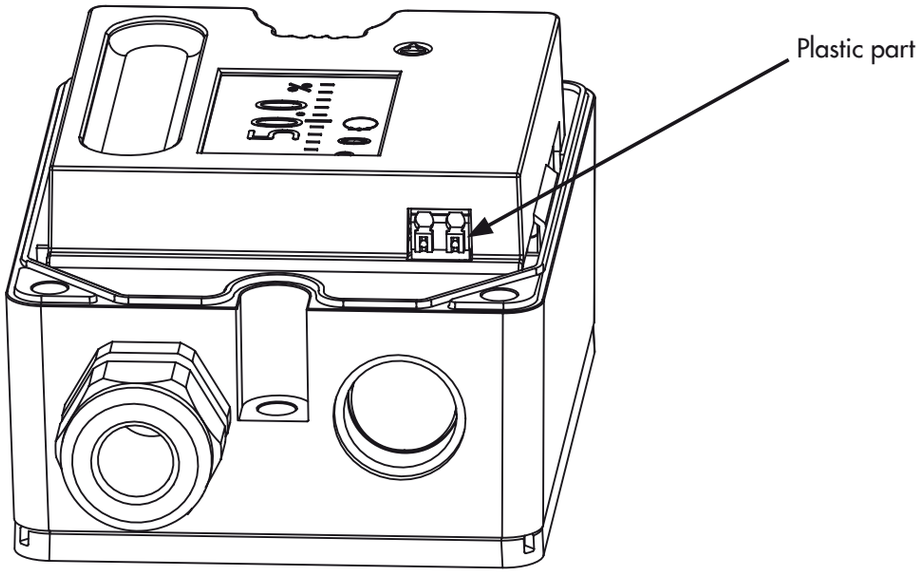
5.8.3 Connecting the electrical power

NOTICE

Risk of malfunction due to incorrect sequence of mounting, installation, and start-up.
Keep the following sequence.

1. *Remove the protective caps from the pneumatic connections.*
2. *Mount the positioner on the valve.*
3. *Connect the supply air.*
4. *Connect the electrical power.*
5. *Perform the start-up settings.*

➔ Connect the electrical power (mA signal) as shown in Fig. 17.



Terminal assignment for mA control signal:

+11	-12

Fig. 17: *Electrical connections*

6 Operation

6.1 Operating controls

Three capacitive keys are used to operate the positioner and allow the user to navigate within the menu on the display (Fig. 18). Additionally, the volume restriction allows the air output capacity to be adapted to the size of the actuator.

6.1.1 Capacitive keys

△: ***Up***

✳***: Confirm***

▽: ***Down***

Touch △ or ▽ key to select a parameter code (***P0*** to ***P20***). Then touch ✳ key to confirm the selected code.

To save changes to parameters in a non-volatile memory, proceed as follows:

➔ After changing parameters, press △ or ▽ to change to Code ***P0*** or

➔ wait three minutes until the display returns automatically to ***P0***.

---

i ***Note***

– *The ⟐ icon on the display indicates that the changed parameter settings have not yet been saved in the non-volatile memory.*
– *The selected parameter code remains active until you change the setting or exit the parameter code.*
– *After changing settings in **P2**, **P4** and **P8** parameter codes, the positioner must be re-initialized.*

6.1.2 Volume restriction Q

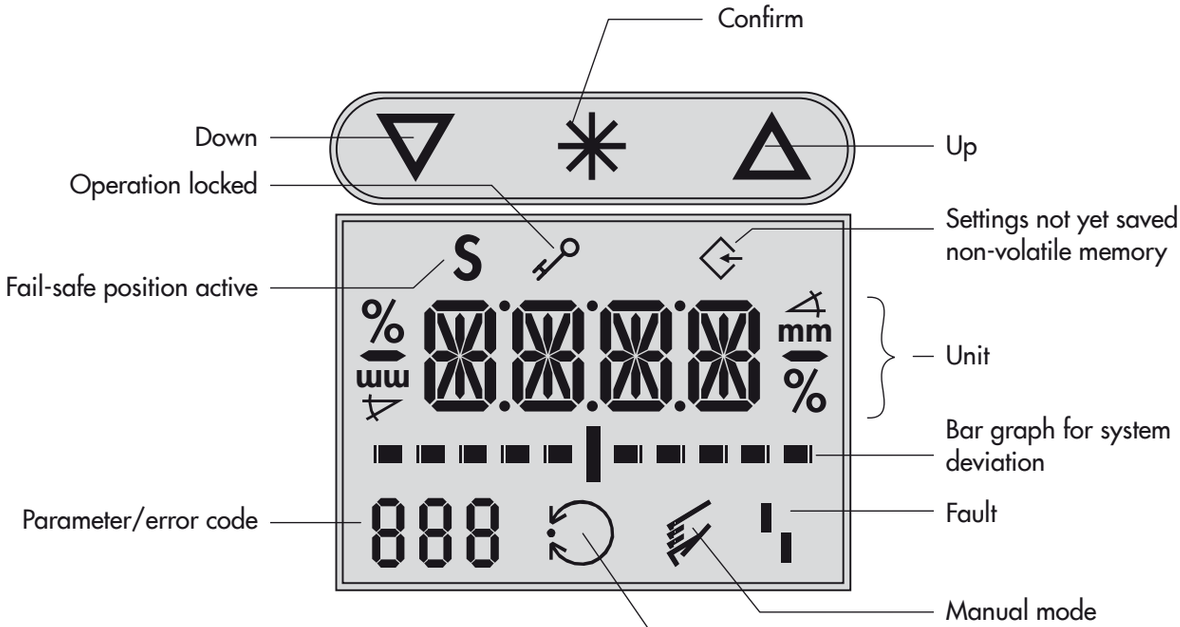
The volume restriction serves to adapt the air output capacity to the size of the actuator. Two fixed settings are possible (refer to section 7.3).

6.1.3 Display

Icons which are assigned to certain codes and functions are indicated on the display (Fig. 18). The bar elements indicate the system deviation that depends on the sign (+/–) and the value. One bar element appears per 1 % system deviation.

If the positioner has not yet been initialized, the lever position in degrees in relation to the mid-axis is indicated. One bar element corresponds to approximately a 7° angle of rotation.

If the fault indication icon is displayed, press △ or ▽ until ***ERR*** is displayed to view the ***E0*** to ***E15*** error codes (see section 9.2).



Reading	Meaning
ESC	Stop
Err	Malfunction
LOW	w too low
MAN	Manual mode
MAX	Maximum range
RST	Reset
INIT	Initialization
ON/OFF	Activated/deactivated
ZERO	Zero calibration

Fig. 18: *Display with all readings*

7 Operating the positioner

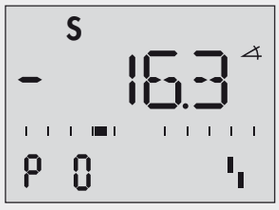
Before start-up, mount the positioner following the sequence described in section 5. Apply the electric reference variable to start up the positioner. Refer to section 5.8.3.

i ***Note***

– ***LOW*** *on the display indicates that the reference variable is lower than 3.8 mA.*
– *The positioner is ready for operation with its default settings for most applications.*
– *After connecting the electrical signal, the positioner performs a calibration of the capacitive keys which takes approx. three seconds. During this time, do not touch the key panel. Otherwise, the keys will not work properly. Disconnect and reconnect the electrical signal to restart the calibration of keys.*

Reading after connecting the power supply

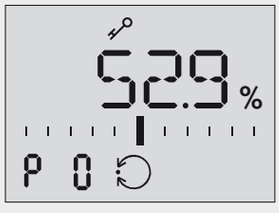
Reading when the positioner has **not** yet been initialized



*Code **P0** is displayed. The fault indication icon and **S** (fail-safe position) appear on the display.*

The reading indicates the lever position in degrees in relation to the mid-axis.

Reading when the positioner has been initialized:



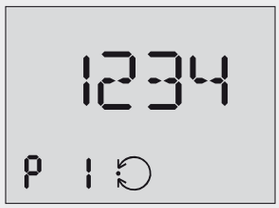
Code P0 is displayed. The positioner is in closed-loop operation indicated by the closed-loop operation icon.

The indicated value corresponds to the control position in %.

Details on initialization of the positioner: section 7.8.

7.1 Adapting the display

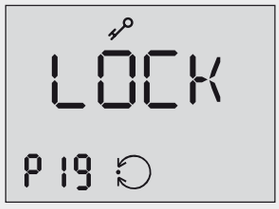
The display reading direction can be rotated by 180°. If the displayed data appear upside down, proceed as follows:



1. *Touch △ or ▽ until Code **P1** appears.*
2. *Press ✳ to confirm the selected code. **P1** blinks.*
3. *Touch △ or ▽ until the display is set in the desired direction.*
4. *Press ✳ to confirm display direction.*

7.2 Enabling configuration to change parameters

Before changing parameter settings in an initialized positioner, configuration must be enabled first by selecting Code ***P19***:



LOCK *and the key icon indicate that the configuration is locked. Deactivate locking as follows:*

1. *Touch △ or ▽ until Code **P19** appears.*
2. *Press ✳ to confirm the selected code. **P19** blinks.*
3. *Touch △ or ▽ until **OPEN** is displayed.*
4. *Press ✳ to enable configuration.*

i ***Note***

If no settings are entered within three minutes, the enabled configuration function becomes invalid.

7.3 Adjusting the volume restriction Q

The volume restriction Q (see Fig. 19) serves to adapt the air output capacity to the size of the actuator:

Actuators with a **transit time < 1 s**, e.g. linear actuators with an effective area smaller than 240 cm², require a restricted air flow rate.

➔ Setting to MIN

Actuators with a **transit time ≥ 1 s** do not require the air flow rate to be restricted.

➔ Setting to MAX

Additional points that apply concerning the volume restriction:

➔ Intermediate settings are not permitted.

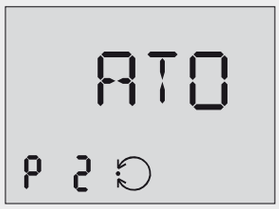
➔ Re-initialize positioner after changing the volume restriction setting.

Fig. 19: *Volume restriction Q (MAX/MIN setting)*

7.4 Entering the air action

– ATO (air to open) applies to a valve opening as the signal pressure increases.
– ATC (air to close) applies to a valve closing as the signal pressure increases.

The signal pressure is the pneumatic pressure at the output of the positioner applied to the actuator.



Default air action: ***ATO***

Change the air action (enable configuration as described in section 7.2):

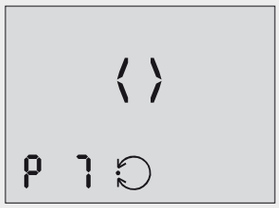
1. *Touch △ or ▽ until Code* ***P2*** *appears.*
2. *Press ✳ to confirm selected code.* ***P2*** *blinks.*
3. *Touch △ or ▽ until the required air action appears.*
4. *Press ✳ to confirm setting.*

i ***Note***

The changed air action first becomes effective after the positioner has been re-initialized.

7.5 Entering the direction of action

The direction of action (***P7***) is set to increasing/increasing (>>) by default, i.e. when the positioner is initialized, ***0 %*** is displayed when the valve is closed and ***100 %*** when the valve is fully open. If necessary, the direction of action can be changed (enable configuration as described in section 7.2):



Changing the direction of action to increasing/decreasing:

1. *Touch △ or ▽ until Code* ***P7*** *appears.*
2. *Press ✳ to confirm selected code.* ***P7*** *blinks.*
3. *Touch △ or ▽ until* ***<>*** *appears.*
4. *Press ✳ to confirm setting.*

The following correlation applies:

Valve	CLOSED	OPEN
Display	0 %	100 %
Direction of action increasing/increasing (>>)	4 mA	20 mA
Direction of action increasing/decreasing (<>)	20 mA	4 mA

7.6 Limiting the signal pressure

If the maximum actuator force is too high for the valve used, the signal pressure limit can be activated in Code ***P9***. The pressure is then limited to approx. 2.3 bar.

Activate the signal pressure limitation (enable configuration as described in section 7.2):

1. *Touch △ or ▽ until Code **P9** appears.*
2. *Press ✳ to confirm selected code. **P9** blinks.*
3. *Touch △ or ▽ until **ON** appears.*
4. *Press ✳ to confirm setting.*

7.7 Setting other parameters

The following table lists all the parameter codes and their default settings. Proceed as described previously to change parameters.

More details concerning the parameter codes can be found in section 11.2.

Parameter codes [default settings]			
P0	Status indication	P10	End position w < [ON]
P1	Reading direction	P11	End position w > [OFF]
P2 [1)]	ATO/ATC [ATO]	P14	Display of reference variable w
P3 [1)]	Pin position [35]	P15	INIT Start initialization
P4 [1)]	Nominal range [MAX]	P16	ZERO Start zero calibration
P5	Characteristic [0]	P17	MAN Manual mode
P6	Reference variable [4 to 20 mA]	P18	RST Reset
P7	w/x direction of action [>>]	P19	Enable configuration
P8 [1)]	Gain Kp [50]	P20	Firmware version
P9	Pressure limitation 2.3 bar [OFF]		

1) Positioner needs to be re-initialized after changing the parameter setting

7.8 Initialization

During initialization the positioner adapts itself optimally to the friction conditions and the signal pressure required by the control valve.

⚠ WARNING

Risk of injury due to the actuator stem extending or retracting.
Do not touch or block the actuator stem.

NOTICE

The process is disturbed by the movement of the actuator stem.
Do not initialize the positioner while the process is running and only after isolating the plant by closing the shut-off valves.

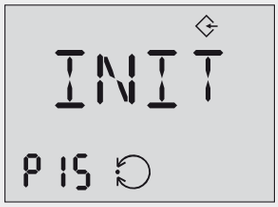
The type and extent of self-adaptation depends on the preset parameters. ***MAX*** applies as the default setting for the nominal range (Code ***P4***). During the initialization process, the positioner determines the total travel range or rotational range of the valve (from the CLOSED position to the opposite end position).

Alternatively, a different travel can be selected in Code **P4** (see code list in section 11.2).

i ***Note***

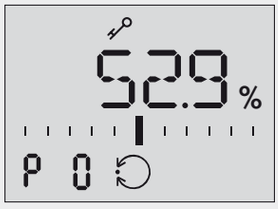
*The travel set in Code **P4** is only limited during initialization. However, it might be exceeded in closed-loop control when the control signal is higher than 20 mA.*

Start initialization (enable configuration as described in section 7.2).



1. *Touch △ or ▽ until Code **P15** appears.*
2. *Press ✳ and hold for six seconds. 6...5...4...3...2...1 is counted down on the display.*

*The initialization starts and **INIT** blinks. The time required for the initialization procedure depends on the actuator transit time and can take a few minutes.*



Initialization successfully completed. The positioner is in closed-loop operation indicated by the ↻ closed-loop operation icon.

The indicated value corresponds to the control position in %.

Configuration is locked indicated by the key icon.

The fault indication icon ▚ appears when the initialization fails.

7.8.1 Canceling initialization

The initialization can be canceled:

1. During initialization touch ✳: ***ESC*** blinks on the display.
2. Press ✳ to confirm: Initialization is canceled.

i ***Note***

This code must be confirmed by pressing ✳. Otherwise, the code remains active.

Initial state 1:
*The positioner is **not** initialized.*
The positioner goes to the fail-safe position after the initialization process has been canceled.

Initial state 2:
The positioner is initialized.
On canceling a new initialization process, the positioner returns to closed-loop operation. The settings of the previous initialization are used.

A new initialization can be started directly afterwards.

7.9 Zero calibration

In case of inconsistencies in the closing position of the valve, e.g. with soft-seated plugs, it might be necessary to recalibrate zero over Code ***P16*** (enable configuration as described in section 7.2).

Start the zero calibration by activating Code ***P16*** as follows:

1. *Touch △ or ▽ until Code **P16** appears.*
2. *Press ✳ and hold for six seconds. 6...5...4...3...2...1 is counted down on the display.*

*Zero calibration starts, **ZERO** blinks on the display.*

The time required for the initialization procedure depends on the actuator transit time and can take a few minutes.

The positioner moves the control valve to the CLOSED position and recalibrates the internal electric zero point.

When the zero calibration has been successfully completed, the positioner changes to closed-loop operation.

7.9.1 Canceling zero calibration

Zero calibration can be canceled:

1. During zero calibration touch ✳: ***ESC*** blinks on the display.
2. Press ✳ to confirm: Zero calibration is canceled.

i ***Note***

This code must be confirmed by pressing ✳. Otherwise, the code remains active.

The positioner changes to closed-loop operation without performing a zero calibration. A new zero calibration can be started directly afterwards.

7.10 Manual mode

The valve position can be moved as follows using the ***Manual mode*** function:

Enable configuration as described in section 7.2.

1. *Touch △ or ▽ until Code **P17** appears.*
2. *Press ✳ and hold for six seconds. **6-5-4-3-2-1-** is counted down on the display and **P17** blinks.*

   The manual set point is indicated on the display of an initialized positioner.

   The lever position in degrees in relation to the longitudinal axis is indicated on the display of a positioner that has not been initialized.
3. *Touch △ or ▽ to change the manual set point.*

Initialized positioner

The manual mode starts using the last set point used in closed-loop operation, ensuring a bumpless changeover.

The bar elements on the display indicate the system deviation between the manual set point and set point used for closed-loop control while manually moving the valve in Code ***P17***.

The manual set point is adjusted in steps of 0.1 %. You can move the valve controlled within its range.

Positioner that has not been initialized

Touch △ or ▽ for a long time to move the valve manually.

The valve is only moved in one direction uncontrolled. The bar elements on the display indicate the change in direction.

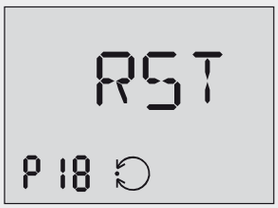
Touch ✳ to deactivate manual mode.

i Note

*The Manual mode function can only be exited as described or by interrupting the electrical supply (cold start). The positioner does **not** automatically exit this function and return to the display showing the status indication.*

7.11 Reset

A reset causes an initialization to be undone and all parameters settings are reset to the default settings (see code list in section 11.2).



Enable configuration as described in section 7.2.

1. *Touch △ or ▽ until Code **P18** appears.*
2. *Press ✳ and hold for six seconds. 6...5...4...3...2...1 is counted down on the display.*

***RST** blinks while ✳ is pressed. As soon as the key is released, the reset process is completed and the display returns to status indication **(P0)**.*

i Note

*The ! fault indication icon is displayed after a reset since the positioner needs to be re-initialized. The error code **E2** is also activated (see section 9.2).*

8 Servicing

Note

The positioner was checked by SAMSON before it left the factory.

– The product warranty becomes void if service or repair work not described in these instructions is performed without prior agreement by SAMSON's After-sales Service department.

– Only use original spare parts by SAMSON, which comply with the original specifications.

The Type 3725 Positioner requires no maintenance. There are filters with a 100 µm mesh size in the pneumatic connections for supply and output which can be removed and cleaned, if required.

➔ Observe the maintenance instructions of any upstream supply air pressure reducing stations.

8.1 Cleaning the window in the cover

NOTICE

Incorrect cleaning will damage the window. The window is made of Makrolon® and will be damaged when cleaned with abrasive cleaning agents or agents containing solvents.

– Do not rub the window dry.

– Do not use any cleaning agents containing chlorine or alcohol or abrasive cleaning agents.

– Use a non-abrasive, soft cloth for cleaning.

8.2 Preparation for return shipment

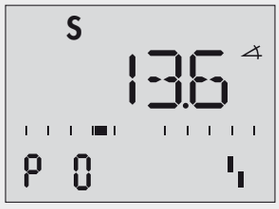
Proceed as follows to return valves to SAMSON:

1. Put the control valve out of operation. See associated valve documentation.
2. Remove the positioner (see section 10.2).
3. Send the positioner to your nearest SAMSON subsidiary. SAMSON subsidiaries are listed on our website at ▶ www.samson.de > Contact.

9 Malfunctions

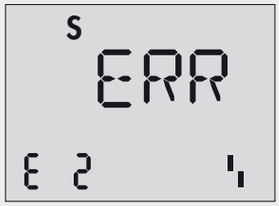
In case of a fault, the fault indication icon is displayed. Switch past Code ***P0*** or ***P20*** to display the respective error code ***E0*** to ***E15*** together with ***ERR*** appear on the display. Refer to the error code list in section 9.2 for the cause of the errors and the recommended action.

Example:
If, for instance, a travel has been entered in Code ***P4*** (nominal range) which is larger than the maximum valve travel possible, the initialization process would be interrupted (***E2*** error code) because the rated travel would not have been reached (***E6*** error code). The valve moves to the fail-safe position (***S*** indicated on the display).

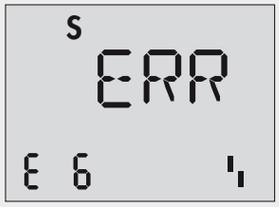


Display of the fault indication:

- *Fault indication icon appears.*
- *Valve moves to fail-safe position (S indicated on the display).*



E2 *error code: Initialization canceled.*

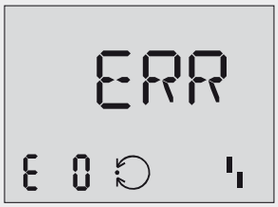


E6 *error code: Rated travel not achieved.*

The nominal range (Code P4) must be changed and the positioner re-initialized to remedy this problem.

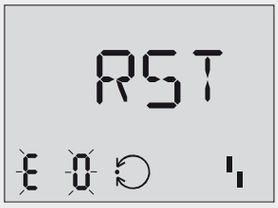
9.1 Resetting error codes

The E0 and E8 error codes can be reset as follows:



1. *Touch △ or ▽ to select the error code.*

2. *Touch ✳ to confirm the error code.* ***ESC*** *is displayed and the error code blinks.*



3. *Touch △ or ▽ until* ***RST*** *appears.*
4. *Press ✳ to reset the error.*

   The reset procedure can be canceled by touching ✳ when ***ESC*** *appears.*

9.2 Error codes

The errors listed in the following table are assigned to error classes:

Error class 1: No operation possible

Error class 2: Manual operation only possible

Error class 3: Manual operation and closed-loop control possible

Contact SAMSON's After-sales Service department for malfunctions not listed in the table (see section 11.1).

Code	Description		Class
E0	**Zero error** (operational error)	Only with tight-closing function ***P10*** (end position w < set to ON). The zero point has shifted by more than 5 % compared to initialization. The error may arise when the valve seat trim is worn.	3
	Recommended action	Check valve and positioner attachment. If the positioner is mounted correctly, perform a zero calibration over Code ***P16*** (see section7.9). **Error code can be reset (see section 9.1).**	
E1	**Displayed and INIT values are not identical** (operational error)	Adjusted and displayed valves are not identical to the INIT values as the parameters were changed after initialization.	3
	Recommended action	Reset parameters or perform initialization.	
E2	**Positioner has not been initialized**	Malfunction or parameter change requiring the positioner to be re-initialized.	2
	Recommended action	Set parameters and initialize the positioner over Code ***P15***.	
E3	**K_P setting** (initialization error)	Positioner hunts. Volume restriction set incorrectly, too much gain.	2
	Recommended action	Check the volume restriction setting as described in section 7.3. Limit gain K_P in Code ***P8***. Re-initialize the positioner.	
E4	**Transit time too short** (initialization error)	The transit times of the actuator determined during initialization are so short (below 0.5 second) that optimal positioner tuning is not possible.	2
	Recommended action	Check the volume restriction setting as described in section 7.3. Re-initialize the positioner.	

E5	**Standstill detection is not possible** (initialization error)	Supply pressure varies. Mounting incorrect.	2
	Recommended action	Check supply air and positioner mounting. Re-initialize the positioner.	
E6	**Travel is not achieved during initialization** (initialization error)	Supply pressure is too low, actuator leaks, incorrect travel adjusted or pressure limit function activated. When MAX is selected for ***P4*** code (nominal range): the measuring span of the lever is too small (incorrect lever, incorrect pin position). Initialization is canceled when the angle of rotation of the positioner shaft is smaller than 11°.	2
	Recommended action	Check supply air, positioner mounting, lever, pin position, and setting. Re-initialize the positioner.	
E7	**Actuator does not move** (initialization error)	No supply air, mounting blocked.	2
	Recommended action	Check supply air, positioner mounting and mA input signal. Re-initialize the positioner.	
E8	**Travel signal at lower/ upper limit**	Wrong pin position, wrong lever, wrong attachment direction when NAMUR attachment is used.	1
	Recommended action	Reset error code (see section 9.1). Check positioner mounting and re-initialize the positioner.	
E9 to **E15**	**Device error (internal)**	Return positioner to SAMSON AG for repair.	1/3

9.3 Emergency action

Upon failure of the air supply or electric signal, the positioner vents the actuator, causing valve to move to the fail-safe position determined by the actuator.

The plant operator is responsible for emergency action to be taken in the plant.

Tip

Emergency action in the event of valve failure is described in the associated valve documentation.

10 Decommissioning and disassembly

⚠ DANGER

Risk of fatal injury due to ineffective explosion protection.

The explosion protection becomes ineffective when the positioner cover is opened.
The following regulations apply to installation in hazardous areas: EN 60079-14 (VDE 0165, Part 1).

❗ NOTICE

The process is disturbed by interrupting closed-loop control.
Do not mount or service the positioner while the process is running and only after isolating the plant by closing the shut-off valves.

10.1 Decommissioning

To decommission the positioner before removing it, proceed as follows:

1. Disconnect and lock the air supply and signal pressure.
2. Open the positioner cover and disconnect the wires for the control signal.

10.2 Removing the positioner

1. Disconnect the wires for the control signal from the positioner.
2. Disconnect the lines for supply air and signal pressure (not required for direct attachment using a connection block).
3. To remove the positioner, loosen the three fastening screws on the positioner.

10.3 Disposal

➔ Observe local, national, and international refuse regulations.

➔ Do not dispose of components, lubricants, and hazardous substances together with your other household waste.

11 Annex

11.1 After-sales service

Contact SAMSON's After-sales Service department for support concerning service or repair work or when malfunctions or defects arise.

E-mail

You can reach the After-sales Service Department at aftersalesservice@samson.

Addresses of SAMSON AG and its subsidiaries

The addresses of SAMSON AG, its subsidiaries, representatives, and service facilities worldwide can be found on the SAMSON website, in all SAMSON product catalogs or on the back of these Mounting and Operating Instructions.

Required specifications

Please submit the following details:

- Order number and position number in the order
- Type, serial number, firmware version, device version

11.2 Code list

11.2.1 Parameter codes

Code	Display, values [default setting]	Description
Note: Codes marked by an asterisk (*) indicate that the positioner needs to be re-initialized afterwards		
P0	**Status reading with basic information**	The reading indicates the valve position or angle of rotation in % when the positioner is initialized. On touching ✳ when the positioner is not initialized, the position of the lever in relation to the mid-axis is displayed.
P1	**Reading direction**	The reading direction of the display is turned by 180°.
P2*	**ATO/ATC** [ATO]	Parameter to adapt the positioner to how the valve functions: ATO: Air to open (valve CLOSED in fail-safe position), ATC. Air to close (valve OPEN in fail-safe position)
P3*	**Pin position** 17/25/[35]/50/90°	Insert follower pin in the proper position depending on the valve travel/opening angle (select according to travel tables on page 20).
P4*	**Nominal range [MAX]** Values with default setting [35]: e.g. 7.5/8.92/10.6/12.6/15.0/17.8/21.2 mm	**Firmware 1.03 and lower:** The possible adjustment range can be selected in stages depending on the selected pin position: ***17*** From 3.75 to 10.6 mm ***25*** From 5.3 to 15.0 mm ***35*** From 7.5 to 21.2 mm ***50*** From 10.6 to 30.0 mm For ***90°***: Maximum range only, if ***P3*** = 90° ***MAX:*** Maximum possible travel
	Nominal range [MAX]	**Firmware 1.10 and higher:** The possible adjustment range can be selected in steps of 0.5 mm depending on the selected pin position: ***17*** From 3.5 to 11.0 mm, alternatively ***MAX*** (up to 18.0 mm) ***25*** From 5.0 to 16.0 mm, alternatively ***MAX*** (up to 25.0 mm) ***35*** From 7.0 to 22.0 mm, alternatively ***MAX*** (up to 35.0 mm) ***50*** From 10.0 to 32.0 mm, alternatively ***MAX*** (up to 50.0 mm) For ***90°***: Maximum range only, if ***P3*** = 90° ***MAX:*** Maximum possible travel

P5	**Characteristic** 0 to 8 [0]	Select characteristic: 0, 1, 2 for globe valves, 0 to 8 with rotary actuators (P3 = 90°) 0 Linear 1 Equal percentage 2 Reverse equal percentage 3 SAMSON butterfly valve, linear 4 SAMSON butterfly valve, equal percentage 5 VETEC rotary plug valve, linear 6 VETEC rotary plug valve, equal percentage 7 Segmented ball valve, linear 8 Segmented ball valve, equal percentage
P6	**Reference variable** [4 to 20 mA] SRLO/SRHI	For split-range operation: **SRLO**: low range 4 to 11.9 mA **SRHI**: high range 12.1 to 20 mA
P7	**w/x** [>>]/<>	Direction of action of the reference variable w to the travel/rotational angle x (increasing/increasing or increasing/decreasing)
P8*	**Gain K_p** 30/[50]	On initializing the positioner, the gain is set to the selected value. If the positioner hunts, the K_p value can be reduced.
P9	**Pressure limitation** ON/[OFF]	The signal pressure can take on the same pressure as the supply air at the maximum [**OFF**] or, in the case that the maximum actuator force can damage the valve, the pressure is limited to approx. 2.3 bar.
P10	**End position w <** [ON]/OFF	Lower tight-closing function: If ***w*** reaches up to 1 % towards the final value that causes the valve to close, the actuator is immediately completely vented (with **ATO** - air to open) or filled with air (with **ATC** - air to close).
P11	**End position w >** ON/[OFF]	Upper tight-closing function: If ***w*** reaches up to 99 % towards the final value that causes the valve to open, the actuator is immediately completely filled with air (with **ATO** - air to open) or vented (with **ATC** - air to close).
P14	**Info w** Initialized	Indicates the internally adjusted set point in the positioner (adjusted set point in 0 to 100 % according to the settings in ***P6*** and ***P7***). Touch ✳ to display external set point (applied set point in 0 to 100 % according to the 4-20 mA signal).
	Not initialized	Displays external set point in 0 to 100 % according to the 4-20 mA signal.

P15	**Start initialization**	Press ✳ button to cancel the initialization process. As a result, the valve moves to the fail-safe position. After a power supply failure during initialization, the positioner starts with the values of the last initialization (if available).
P16	**Start zero calibration**	The zero calibration process can be interrupted by touching ✳. The control valve returns to closed-loop operation. ***Note:*** *A zero calibration cannot be started when* ***E1*** *error code exists.* After a power supply failure during zero calibration, the positioner starts with the settings from the last zero calibration.
P17	**Manual mode**	Press △ or ▽ to enter the set point.
P18	**Reset**	Parameters are reset to their default setting. The positioner can only return to closed-loop operation after it has been re-initialized.
P19	**Enable configuration** [LOCK]/OPEN	Enable configuration to change parameter settings. This function is automatically canceled when none of the keys are touched within three minutes.
P20	**Firmware version**	Installed firmware version is displayed. Touch ✳ to display the last four digits of the serial number.

SMART IN FLOW CONTROL

SAMSON

EU Konformitätserklärung / EU Declaration of Conformity

Für das folgende Produkt / For the following product

Elektropneumatischer Stellungsregler / Electropneumatic Positioner

Typ / Type 3725

wird die Konformität mit den nachfolgenden EU-Richtlinien bestätigt / signifies compliance with the following EU Directives:

EMC 2004/108/EC (bis/to 2016-04-19) EMC 2014/30/EU (ab/from 2016-04-20)	EN 61000-6-2:2005, EN 61000-6-3:2010, EN 61326-1:2006

Hersteller / Manufacturer:

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3
D-60314 Frankfurt am Main
Deutschland/Germany

Frankfurt, 2016-04-06

i.V. Gert Nahler

Gert Nahler
Zentralabteilungsleiter/Head of Department
Entwicklung Automation und Integrationstechnologien/
Development Automation and Integration Technologies

ppa. Scherer

ppa. Günther Scherer
Qualitätssicherung/Quality Managment

SMART IN FLOW CONTROL

SAMSON

EU Konformitätserklärung / EU Declaration of Conformity

Für das folgende Produkt / For the following product

Elektropneumatischer Stellungsregler / Electropneumatic Positioner

Typ / Type 3725-1100..

entsprechend der EG-Baumusterprüfbescheingung PTB 11 ATEX 2020 X ausgestellt von der/ according to the EU Type Examination PTB 11 ATEX 2020 X issued by

Physikalisch Technische Bundesanstalt
Bundesallee 100
D-38116 Braunschweig
Benannte Stelle/ Notified Body 0102

wird die Konformität mit den nachfolgenden EU-Richtlinien bestätigt / signifies compliance with the following EU Directives:

EMC 2004/108/EC (bis/to 2016-04-19) EMC 2014/30/EU (ab/from 2016-04-20)	EN 61000-6-2:2005, EN 61000-6-3:2010, EN 61326-1:2006
Explosion Protection 94/9/EC (bis/to 2016-04-19) Explosion Protection 2014/34/EU (ab/from 2016-04-20)	EN 60079-0:2009, EN 60079-11:2012

Hersteller / Manufacturer:

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3
D-60314 Frankfurt am Main
Deutschland/Germany

Frankfurt, 2016-04-06

i.V. Gert Nahler

Gert Nahler
Zentralabteilungsleiter/Head of Department
Entwicklung Automation und Integrationstechnologien/
Development Automation and Integration Technologies

ppa. Scherer

ppa. Günther Scherer
Qualitätssicherung/Quality Managment

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3 60314 Frankfurt am Main
Telefon: 069 4009-0 · Telefax: 069 4009-1507
E-Mail: samson@samson.de
Revison 05

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

EC-TYPE-EXAMINATION CERTIFICATE

(Translation)

(1)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:

PTB 11 ATEX 2020 X

(4) Equipment: e/p-positioner, type 3725-1100..

(5) Manufacturer: SAMSON AG Mess- und Regeltechnik

(6) Address: Weismüllerstr. 3, 60314 Frankfurt, Germany

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential assessment and test report PTB Ex 11-21059.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2009 **EN 60079-11:2007**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

Ex II 2 G Ex ia IIC T4

Zertifizierungssektor Explosionsschutz
On behalf of PTB:

Braunschweig, August 25, 2011

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

sheet 1/3

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(13) # SCHEDULE

(14) **EC-TYPE-EXAMINATION CERTIFICATE PTB 11 ATEX 2020 X**

(15) Description of equipment

The e/p-positioner, type 3725-1100.. is a single-acting positioner intended for the installation onto pneumatic lift drives and slewing-motion actuators. It is used for the assignment of a valve position to an actuating signal. Non-flammable media serve as pneumatic auxiliary power.
The e/p-positioner, type 3725-1100.. is a passive two-terminal network which may be connected to all certified intrinsically safe circuits provided that the permissible maximum values for U_i, I_i and P_i are not exceeded.
The equipment is installed inside the hazardous area.
The permissible ambient temperature range is -25 °C ... 80 °C.

Electrical data

Signal circuit (terminals 11/12) ..... type of protection Intrinsic Safety Ex ia IIC only for connection to a certified intrinsically safe circuit

Maximum values:

U_i = 28 V
I_i = 115 mA
P_i = 1 W

C_i = 8.3 nF
L_i negligibly low

(16) Assessment and test report PTB Ex 11-21059

(17) Special conditions for safe use

The manufacturer documentation and the operating instructions manual shall include all required information to restrict the risc of electrostatic charge to a minimum. A warning label shall be affixed to the equipment.

sheet 2/3

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 11 ATEX 2020 X

(18) Essential health and safety requirements

met by compliance with the standards mentioned above

Zertifizierungssektor Explosionsschutz
On behalf of PTB:

Braunschweig, August 25, 2011

Dr.-Ing. U. Johannsmeyer
Direktor und Professor

VDE Prüf- und Zertifizierungsinstitut

VDE

VDE Prüf- und Zertifizierungsinstitut GmbH • Merianstraße 28 • D-63069 Offenbach

Samson AG
Mess- und Regeltechnik
Herrn Tomislav Varga
Weismüllerstraße 3
60314 Frankfurt

90 Jahre VDE

Offenbach, 2011-05-11

Ihr Zeichen	Ihr Schreiben	Unser Zeichen - bitte angeben	Ansprechpartner
Tomislav Varga	2010-12-14	479000-9010-0001/144591 FG34/bhl-wah	Herr Biehl Tel (069) 83 06-249 Fax (069) 83 06-716 gerhard.biehl@vde.com

PRÜFBERICHT
zur Information des Auftraggebers

Test Report for the Information of the applicant

Schutzartprüfung an SAMSON Stellungsregler

Typ 3725

dieser Prüfbericht enthält das Ergebnis einer einmaligen Untersuchung an dem zur Prüfung vorgelegten Erzeugnis. Ein Muster dieses Erzeugnisses wurde geprüft, um die Übereinstimmung mit den nachfolgend aufgeführten Normen bzw. Abschnitten von Normen festzustellen.
Die Prüfung wurde durchgeführt von 2011-01-10 bis 2011-05-09.

This test report contains the result of a singular investigation carried out on the product submitted. A sample of this product was tested to found the accordance with the thereafter listed standards or clauses of standards resp. The testing was carried out from 2011-01-10 to 2011-05-09.

Der Prüfbericht berechtigt Sie nicht zur Benutzung eines Zertifizierungszeichens des VDE und berücksichtigt ausschließlich die Anforderungen der unten genannten Regelwerke.

The test report does not entitle for the use of a VDE Certification Mark and considers solely the requirements of the specifications mentioned below.

Wenn gegenüber Dritten auf diesen Prüfbericht Bezug genommen wird, muss dieser Prüfbericht in voller Länge an gleicher Stelle verfügbar gemacht werden.

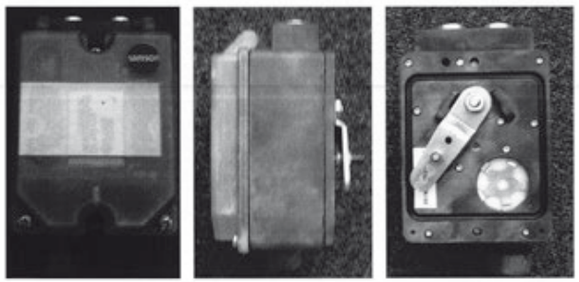
Whenever reference is made to this test report towards third party, this test report shall be made available on the very spot in full length.

1 Aufgabe

An dem unter Punkt 2 bezeichneten Prüfmuster wurde eine Prüfung auf Einhaltung der Schutzart IP66 durchgeführt.

2 Prüfmuster

SAMSON Stellungsregler, Typ 3725



3 Beurteilungsgrundlage

DIN EN 60529 (VDE 0470 Teil 1):2000-09
Schutzarten durch Gehäuse (IP- Code)
Deutsche Fassung EN 60529:1991 + A1:2000

Geschäftsführer
Dipl.-Ing./Dipl.-Kfm. Wilfried Jäger
Merianstrasse 28
D-63069 Offenbach
Tel.: +49 (0) 69 83 06-0
Fax: +49 (0) 69 83 06-555
E-mail: vde-institut@vde.com

Gerichtsstand:
Offenbach am Main
HRB 43618
USt.-IdNr.: DE261922990
Steuer-Nr.: 04425092566

Bankkonto
Commerzbank AG
BLZ 500 800 00
Kto.Nr.: 198 027 000
S.W.I.F.T.-Code:
DRES DE FF XXX
IBAN

Nach dem Geräte- und Produktsicherheitsgesetz (GPSG) benannte Stelle für technische Arbeitsmittel und Verbraucherprodukte. Nach der EMV-Richtlinie 2004/108/EG benannte Stelle für elektromagn. Verträglichkeit (EMV) von Geräten. Von Akkreditierungsstellen im DAR nach DIN EN ISO/IEC 17020, 17021, 17025 und DIN EN 45011 akkreditiert. Akkreditiert durch: IEC – Internationale Elektrotechnische Kommission – IECEE/CB, IECQ und CENELEC – Europ. Komitee für elektrotechn.

VDE

Seite 3 - 11.05.2011 Unser Zeichen: 479000-9010-0001/144591
FG34/bhl-wah

4 Durchführung der Prüfung

Die Staubprüfung erfolgte mit Absaugung gemäß Kategorie 1 über die Kabelverschraubung. Der Unterdruck betrug 2 kPa; die Prüfzeit 8 Stunden.

5 Prüfergebnis

Für das unter 2 beschriebene Prüfmuster wurde folgendes Ergebnis erzielt:

- Schutz gegen den Zugang zu gefährlichen Teilen und gegen feste Fremdkörper nach DIN EN 60529/ VDE 0470 Teil 1:2000-09	**IP6X**	**erfüllt**
- Schutz gegen das Eindringen von Wasser nach DIN EN 60529/ VDE 0470 Teil 1:2000-09	**IPX6**	**erfüllt**

Das Gehäuse des SAMSON Stellungsreglers erfüllt in der vorgestellten Ausführung die Anforderungen an die Schutzart IP66.

Während der Prüfung drang weder Staub noch Wasser in das Gehäuse des Stellungsreglers ein.

VDE Prüf- und Zertifizierungsinstitut GmbH
Fachgebiet FG34

i. A. i. A.

Installation Manual for Apparatus certified by CSA for use in Hazardous Locations

Electrical rating of Intrinsically Safe Apparatus for installation in Hazardous Locations

Table 1: Maximum values

Signal Circuit / Circuit No. 1		
Connection to terminals +11 / -12		
Type of protection:		Intrinsically Safe, AEx ia, Nonincendive
Rated current:		4 mA to 20 mA
Maximum values	V_{max} / U_i	28 V
	I_{max} / I_i	115 mA
	P_i	1 W
	C_i	8.3 nF
	L_i	negligible
Software Limit Switches / Circuit No. 2 and 3		
Connection to terminals +41 / -42 *and* +51 / -52		
Type of protection:		Intrinsically Safe, AEx ia, Nonincendive
Rated values:		For connection to NAMUR switching amplifier acc. to IEC 60947-5-6
Maximum values	V_{max} / U_i	20 V
	I_{max} / I_i	60 mA
	P_i	250 mW
	C_i	negligible
	L_i	negligible

Note: Entity / Nonincendive Wiring Parameters must meet the following requirements:

U_0 **or** $V_{OC} \leq U_i$ **or** V_{max} / I_0 **or** $I_{SC} \leq I_i$ **or** I_{max} / $P_0 \leq P_i$ **or** P_{max}

C_a **or** $C_O \geq C_i + C_{Cable}$ / L_a **or** $L_O \geq L_i + L_{Cable}$

The correlation between Temperature Class and permissible ambient temperature range is shown in Table 2.

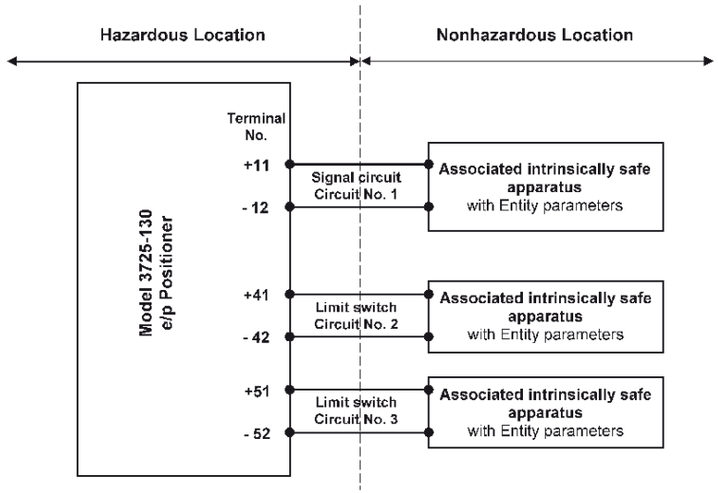
Table 2:

Temperature Class	Permissible ambient temperature T_a
T4	-25 °C ≤ T_a ≤ + 80 °C

Intrinsically Safe when installed as specified in manufacturer´s Installation Manual.

CSA – certified for Hazardous Locations

Ex ia IIC T4, Class I, Zone 0
AEx ia IIC T4, Class I, Zone 0
Class I, Division 1, Groups A, B, C, D
IP66



Notes:

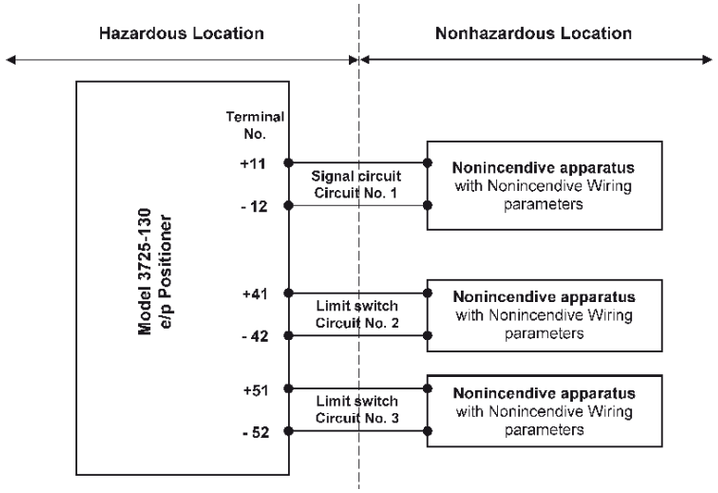
1. The apparatus may be installed in intrinsically safe circuits only when used in conjunction with certified intrinsically safe associated apparatus. For maximum values see Table 1 on page 1.
2. For the interconnection of intrinsically safe and associated intrinsically safe apparatus not specifically examined in combination as a system, the Entity Parameters must meet following requirements:

V_{OC} or U_0	≤	U_i or V_{max}
I_{SC} or I_0	≤	I_i or I_{max}
P_0	≤	P_i or P_{max}
C_a or C_O	≥	$C_i + C_{Cable}$
L_a or L_O	≥	$L_i + L_{Cable}$

3. The installation must be in accordance with Canadian Electrical Code C.E.C. Part 1.
4. The installation must be in accordance with the National Electrical Code NFPA 70 and ANSI/ISA RP 12.06.01.
5. Due to the high surface resistance avoid electrostatic charging of the enclosure when mounting and servicing the apparatus in hazardous areas.
6. Use only supply wires suitable for 5 °C above surrounding temperature.

CSA – certified for Hazardous Locations

Class I, Division 2, Groups A, B, C, D
IP66



Notes:

1. The apparatus may be installed in nonincendive wiring circuits only when used in conjunction with certified nonincendive associated apparatus. For maximum values see Table 1 on Page 1.
2. For the interconnection of nonincendive and associated nonincendive apparatus not specifically examined in combination as a system, the Nonincedive Wiring parameters must meet following requirements:

   V_{OC} or U_0 ≤ U_i or V_{max}
   I_{SC} or I_0 ≤ I_i or I_{max}
   P_0 ≤ P_i or P_{max}
   C_a or C_O ≥ C_i + C_{Cable}
   L_a or L_O ≥ L_i + L_{Cable}
3. The installation must be in accordance with Canadian Electrical Code C.E.C. Part 1.
4. The installation must be in accordance with the National Electrical Code NFPA 70 and ANSI/ISA RP 12.06.01.
5. Due to the non-metallic enclosure make sure to install and service the device:
   - in such a way that electrostatic charging cannot take place,
   - in such a way that the enclosure is protected from mechanical impact.
6. Use only supply wires suitable for 5 °C above surrounding temperature.
7. Any hazard that could be caused in the valve by the process medium, the signal pressure or by moving parts are to be prevented by means of the appropriate measures.

EB 8394 EN

INDEX

1

2

3

4

5

6

7

8

9

0

open printversion

SAMSON AKTIENGESELLSCHAFT
Weismüllerstraße 3 · 60314 Frankfurt am Main, Germany
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
samson@samson.de · www.samson.de

2019-02-27 · English

SRI990 Analog Positioner
SRI990-T Electrical Position Transmitter

The analog Positioner **SRI990** with analog input 4 to 20 mA is designed to operate pneumatic valve actuators. It offers easy adjustment by means of switches and potentiometers. The modular structure of the POSYS positioner series enables conversion from an analog to a “intelligent” positioner by easy exchanging the electronics.
In version “Electrical Position Transmitter” **SRI990-T** the device includes the option Position Transmitter but no controller and no pneumatic components. The positon of actuator is given as 4-20 mA output signal.

FEATURES

- Configuration by means of switches and potentiometers
- Load 300 Ω
- Low air consumption
- Stroke 8 to 260 mm (0.3 to 10.2 inches)
- Angle range up to 95 degree
- Supply air pressure up to 6 bar (90 psig), with spool valve up to 7 bar (105 psig)
- Single acting or double acting
- Mechanical travel indicator
- Position transmitter 4 - 20 mA as option
- Attachment to stroke actuators directly or according to IEC 534 part 6 (NAMUR)
- Attachment to rotary actuators according to VDI/VDE 3845
- Protection class IP 65 (IP 66 on request) and NEMA 4X
- Explosion protection:
  II 2 G EEx ia IIC T6 according to ATEX
  or “Intrinsic Safety” according to FM

Additional equipment (compatible with SRD991):

- Integrated inductive limit switches, independent of device electronics

Accessories (compatible with SRD991):

- Gauge attachment for supply air and outputs
- Booster relay
- SRI990 can be upgraded to a SRD991 by exchange of the electronic motherboard

Repair and maintenance operations must be carried out by qualified personnel!

open printversion

FOXBORO ECKARDT

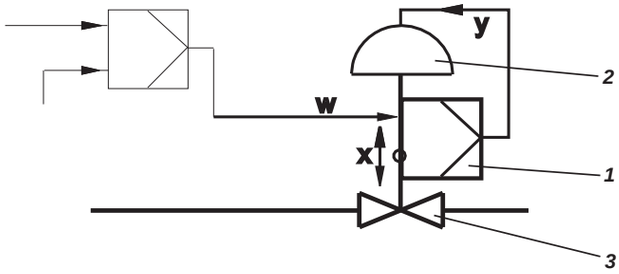
TABLE OF CONTENTS

open printversion

1 METHOD OF OPERATION

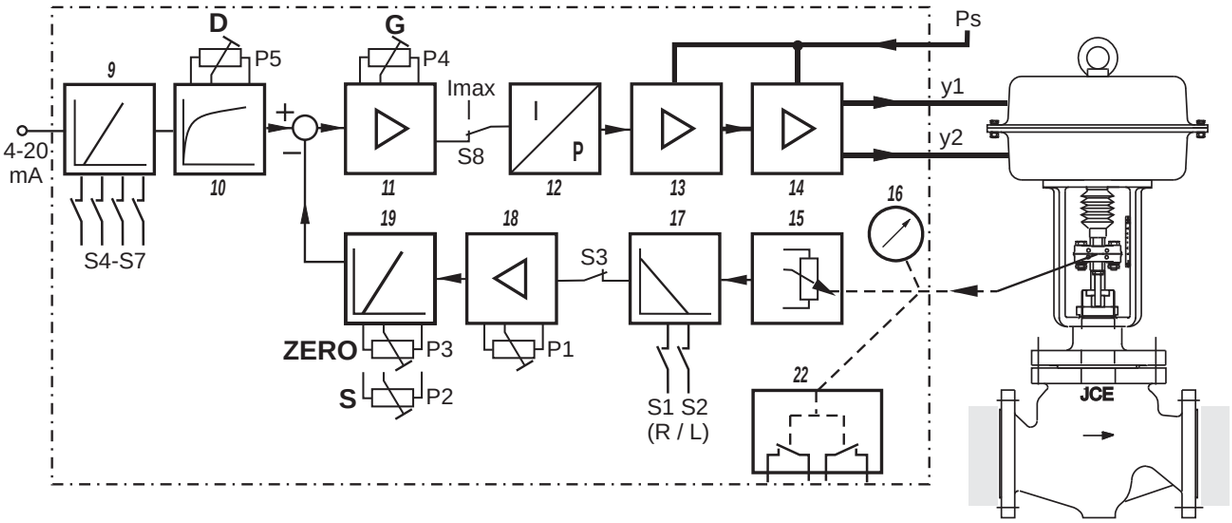
1.1 General

The intelligent positioner SRI990 ***1*** and the pneumatic actuator ***2*** form a control loop with the setpoint value w (from master controller or control system), the output pressure y and the position x of the actuator on valve ***3***.
The positioner can be attached to both linear actuators and rotary actuators.
Actuators with spring force are controlled by a single acting positioner. Actuators without a spring force are controlled by a double acting positioner. The positioner can be operated by means of switches and potentiometers.



For the supply air, we recommend the FOXBORO ECKARDT FRS923 filter regulator.

1.2 Block diagram



1.3 Operation

The supply of the electronics unit is diverted from the current signal 4 to 20 mA at the input.

The current value is measured and is suited in input circuit ***9*** to the desired input range (control action or split range) via switches S4 - S7. In circuit ***10*** the signal is provided with an adjustable time constant setable via potentiometer P5.

The resulting internal signal is guided to the analog control circuit ***11*** , the gain of which is adjustable via potentiometer P4. The output of the control circuit drives the electromechanic converter (IP module) ***12*** , which controls the analog single acting or double acting pneumatic amplifier ***14*** through the preampifier ***13***. The output of the amplifier ***14*** is the output pressure y (y_1,y_2) to the actuator. The pneumatic amplifiers are supplied with supply air ***Ps*** 1.4 to 6 bar (20 to 90 psig).

The position x of the actuator is measured by the position sensor (conductive plastic potentiometer) ***15*** . The desired direction of rotation is set in ***17*** via switches S1 and S2. The SPAN is suited to the stroke / rotation angle range via potentiometer P2, while ZERO is set in ***19*** via potentiometer P3. With switch S3, potentiometer P1 provides an internal zero adjustment in ***18***, carried out by the manufacturer (service function). The resulting feedback signal is guided to control circuit ***11*** .

The IP module receives its maximum drive current via switch S8, enabling checking of the function of the pneumatic unit.

The position x of the actuator is independently displayed by the mechanical travel indicator ***16*** .

The mechanical limit switch ***22*** (optional) enables independent alarm signals.

1.4 Safety requirements

Accident prevention

This device complies with regulations for the prevention of accidents **Power-Driven Work Aids** (VGB 5) of 1st October 1985.

In option “limit switch” do not touch control vane during operation - danger of injuries!

Electrical safety

This instrument satisfies the conditions for safety class III, overvoltage category I according to EN 61010-1 or IEC1010-1.

Any work on electrical parts must be done by qualified personal.

The instrument must be used for its designated purpose and connected in accordance with its connection diagram (see pages 17 and 27).
Locally applicable installation regulations for electrical equipment must be observed, e.g. in the Federal Republic of Germany DIN VDE 0100 resp. DIN VDE 0800. The instrument contains no built-in fuses.

The instrument must be operated with safe, extra low voltage-SELV or SELV-E.

Safety precautions taken with the instrument may be rendered ineffective if the instrument is not operated in accord- ance with the Master Instructions.

Limitation of power supplies for fire protection must be observed in accordance with EN 61010-1, appendix F or IEC 1010-1.

Explosion protection

(Only if ordered)

Technical data for explosion protection see Product Specifications Sheet PSS EVE0107 A-(en).

For installations located in explosive atmospheres, all relevant national regulations and installation conditions must be observed, e.g. in the Federal Republic of Germany ElexV and DIN VDE 0165.

Attention:
When repairing explosion-protected equipment, observe the national regulations.

Repairs involving parts must be manufacturer’s original parts.

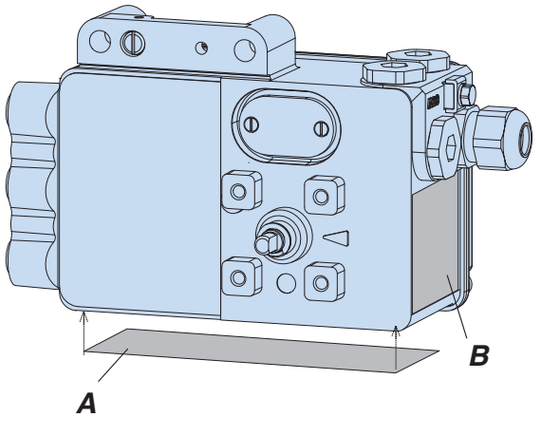
The following applies to the Federal Republic of Germany: Repairs involving parts required for explosion protection must either be carried out by the manufacturer or by authorized personnel and confirmed by certificate.

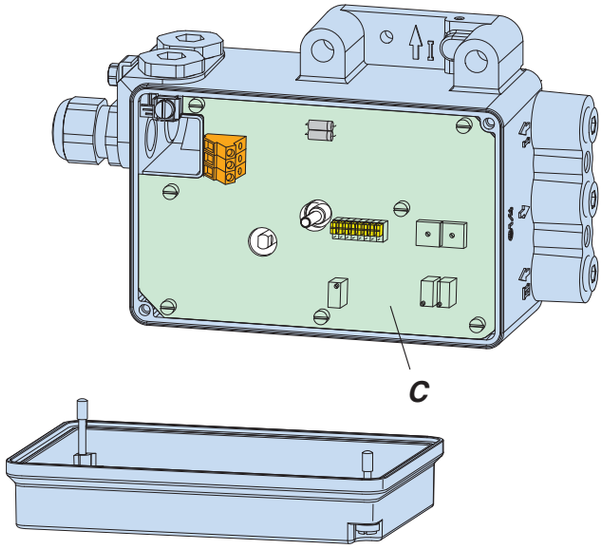
EMC and CE

For notes regarding Electromagnetic compatibility EMC and CE labels see Product Specifications Sheet PSS EVE0107 A-(en).

In order to ensure EMC protection, the electronic board must be screwed to the housing.

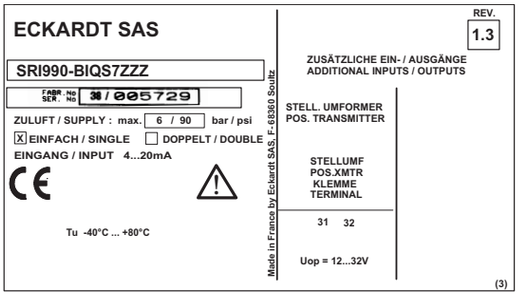
2 LABELS





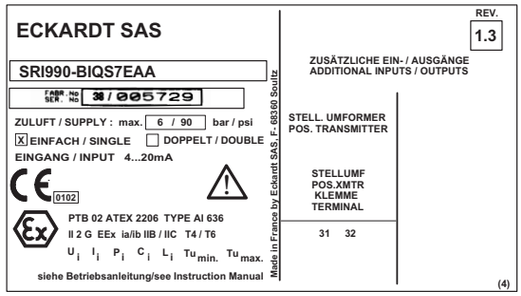
A Nameplate
B Additional label for options
C Imprinted references regarding settings

Nameplate *A* (Example)
Without Ex-protection

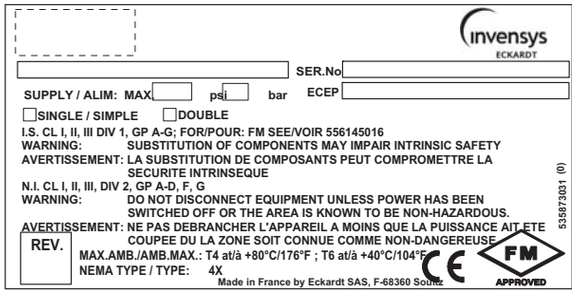


SRI990 [Device specification, Model Code]
SER.No [Serial number]
ECEP [Number for special engineered version]

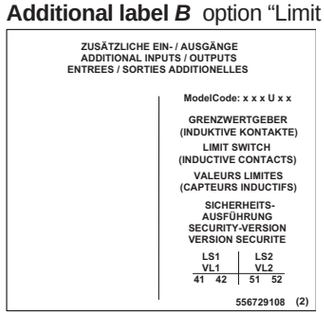
Nameplate *A* (Example)
Classified intr. safe by ATEX
Type of protection “EEx ia”



Additional label *A* FM (Example)



Additional label *B* option “Limit switches” (Example)

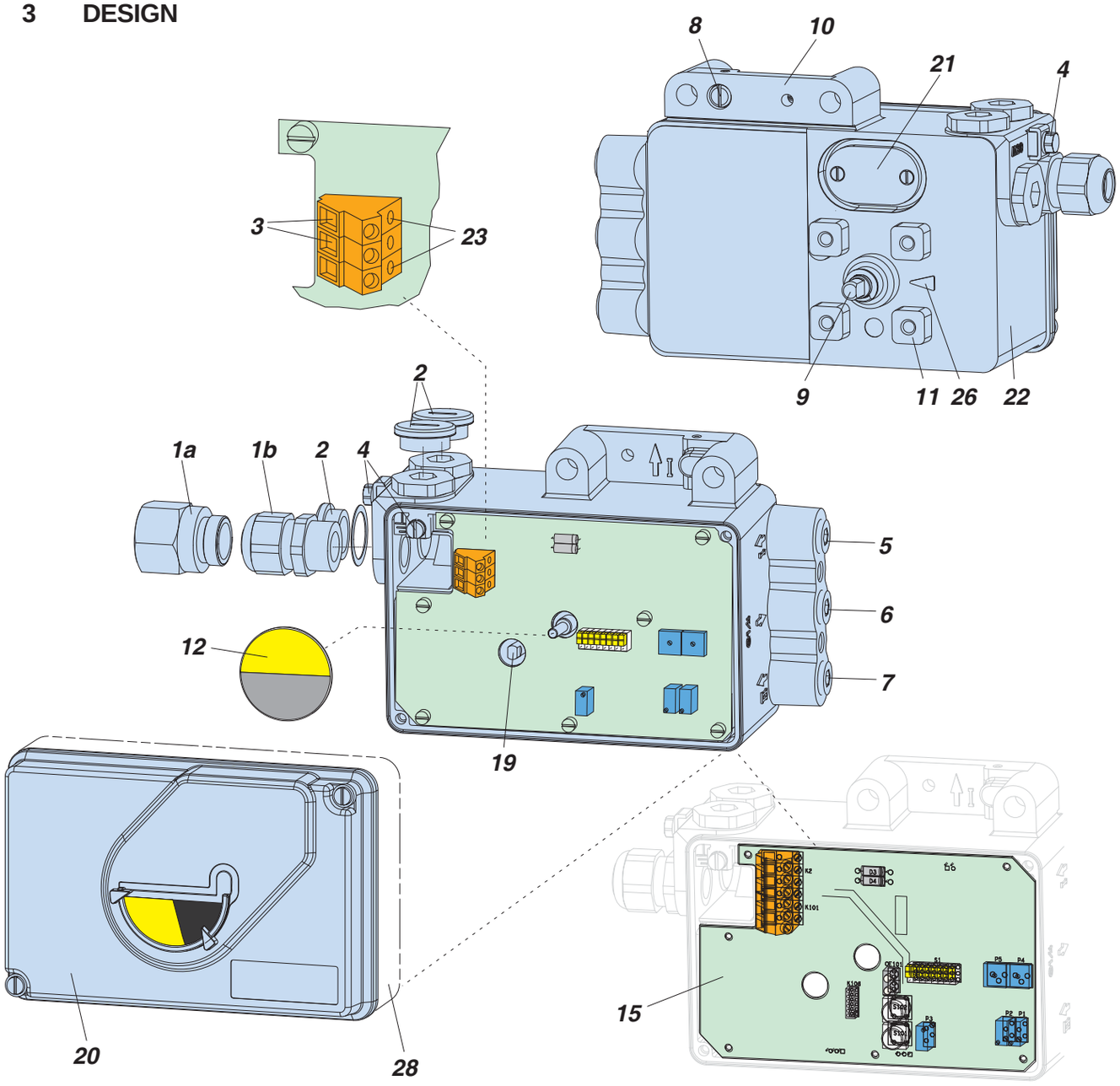


Measurement point label (Example)
Directly fixed or attached

XXX 09/16

open printversion

3 DESIGN

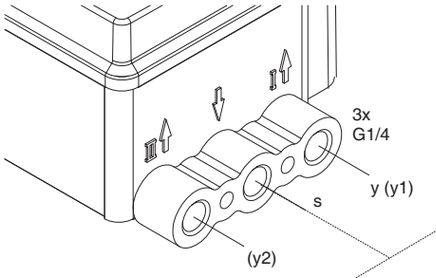


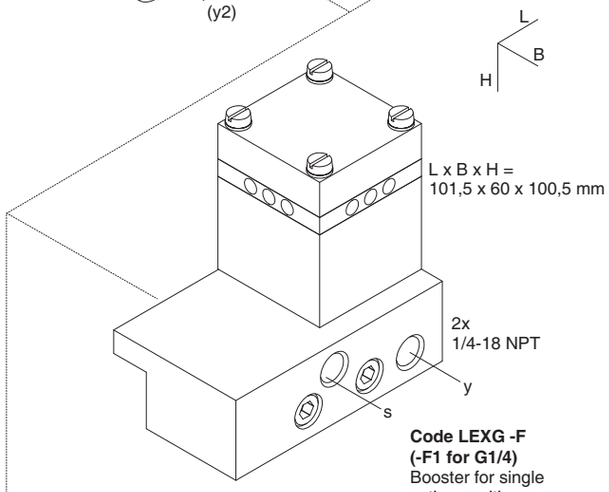
1a Adapter, eg. 1/2"-14NPT
1b Cable gland
2 Plug, interchangeable with Pos. ***1***
3 Screw terminals (11 + / 12 –) for input (w)
I– for current measurement (see also Item ***23***)
4 Ground connection
5 Female thread G 1/4 for output I (y / y1)
6 Female thread G 1/4 for air supply (s)
7 Female thread G 1/4 for output II (y2)
8 Direct attachment hole for output I (y1)
9 Feedback shaft
10 Connection manifold for attachment to stroke actuators
11 Connection base for attachment to rotary actuators
12 Travel indicator
15 Main board version “with Position Feedback”
19 Fixing shaft for limit switch
20 Cover with window to ***12***
21 Air vent, dust and water protected
22 Data label
23 Tip jacks for current measurement, ∅ 2 mm
(integrated in teminals)
26 Arrow is perpendicular to shaft ***9*** at angle 0 degree
27 Check valve (at type of protection NEMA 4X)
28 High cover with built-in limit switches

open printversion

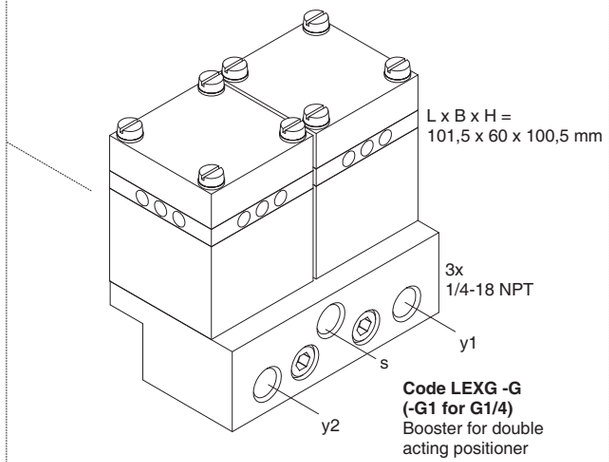
3.1 Pneumatic Accessories

When mounting, check the proper seating of the O-rings and bolt on the accessories with the two M8 bolts. Unused outputs are closed by means of plastic plugs.

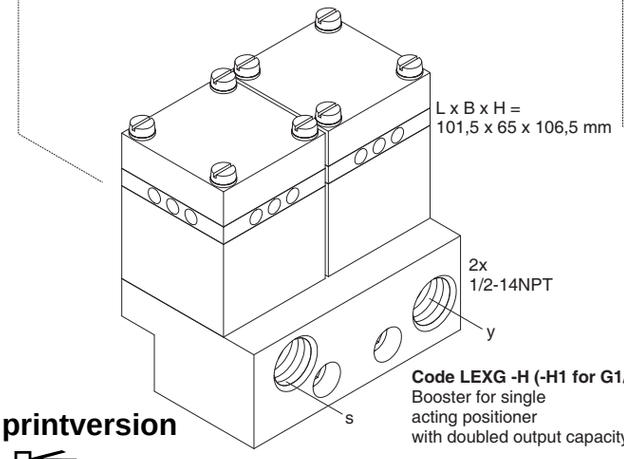




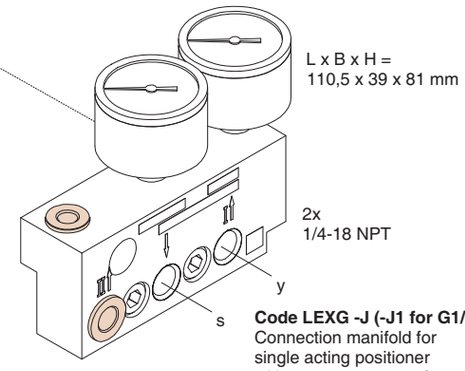
Code LEXG -F
(-F1 for G1/4)
Booster for single acting positioner



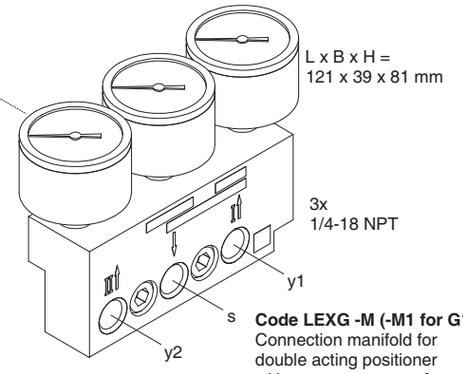
Code LEXG -G
(-G1 for G1/4)
Booster for double acting positioner



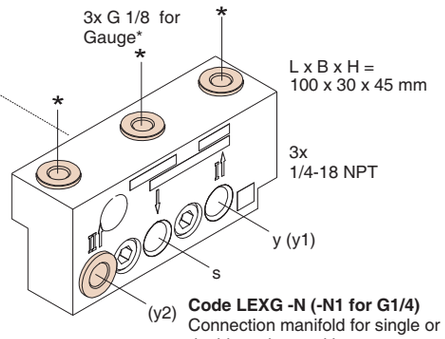
Code LEXG -H (-H1 for G1/4)
Booster for single acting positioner with doubled output capacity



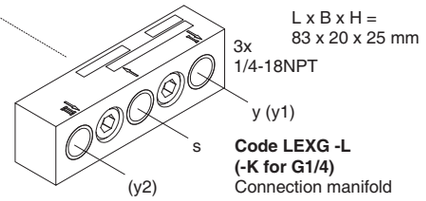
Code LEXG -J (-J1 for G1/4)
Connection manifold for single acting positioner with pressure gauges for supply air s and output y



Code LEXG -M (-M1 for G1/4)
Connection manifold for double acting positioner with pressure gauges for supply air s, outputs y1 and y2



Code LEXG -N (-N1 for G1/4)
Connection manifold for single or double acting positioner with threads G 1/8 for pressure gauges for supply air s, outputs y(y1) and (y2) (supplied without pressure gauges)



Code LEXG -L
(-K for G1/4)
Connection manifold

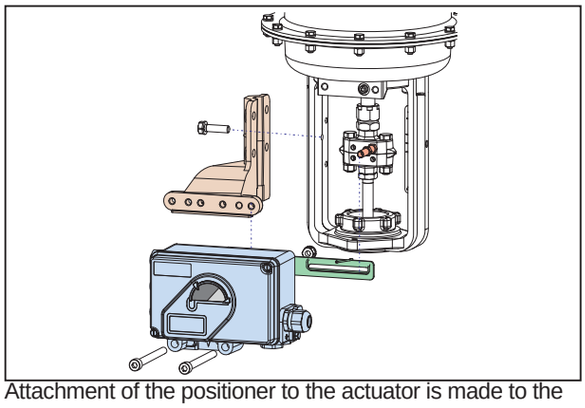
* Unused threads for pressure gauges are closed by means of lock screw Part No. 425 024 013.

open printversion

4 MOUNTING TO LINEAR ACTUTAORS

4.1 NAMUR Mounting - left hand -

Applicable to actuators with cast yoke or pillar yoke acc. to NAMUR (DIN IEC 534-6).
Mounting the positioner with pneumatic connections on the left side and electrical connections on the lower right side.



Attachment of the positioner to the actuator is made to the left using the mounting bracket and feedback lever for a NAMUR mount. Use:
attachment kit EBZG -H for a cast yoke, or
attachment kit EBZG -K for a pillar yoke.

- The side outputs I (or I and II, see page 6) are used. The rear output I is closed by means of a lock screw 522 588 013.

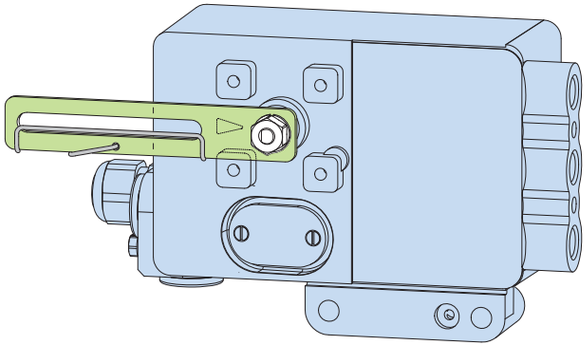
Pneumatic connections: Do not use Teflon tape for sealant. The fine fibres could disturb the function of the SRI990. Use only Loctite® #243 for sealant [1].

Screw-type glands for electrical connections are positioned on the lower or right side. Any unused threaded holes are closed by plugs.

If housing cover has an air vent, this air vent must face-down when mounted.

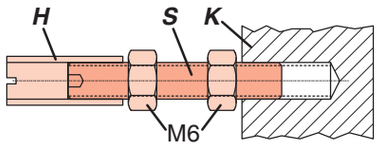
4.1.1 Preparation of the positioner

Rotate the shaft stub of shaft ***9*** so that the flat on the shaft stub is perpendicular to the arrow ***26*** on the housing (detail see page 13), at mid travel range. Fasten the feedback lever ***A*** to the shaft by means of spring washer and nut M8.



4.1.2 Preparation of the actuator

Screw the carrier bolt to the stem connector (see page 9) and lock it by means of a counter nut.
A carrier bolt with an adjustable length is used to be able to screw on various coupling pieces.



It consists of a stud ***S***, which is screwed into the coupling piece ***K*** (with 3 mm Allen key) and locked with a lock nut M6. The threaded sleeve ***H*** is screwed onto it and locked with a lock nut M6. Make sure that the bolt is adjusted to the right length!
Fasten the mounting bracket to the left side of the yoke.
For a cast yoke use a screw M8 x 30,
for a pillar yoke use two U-bolts and four nuts.

4.1.3 Mounting of the positioner

Fasten the positioner to the mounting bracket using two spring washers and two screws M8 x 80.
Note, the carrier bolt ***B*** is in the slot of the feedback lever ***A*** and the compensating spring ***F*** touches the carrier bolt.

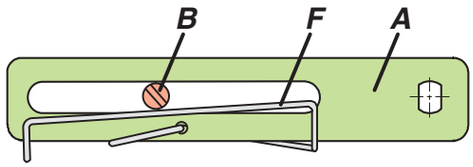


Fig.: Feedback lever

For optimum utilization of the positioner operating range, it is recommended that the arrangement is adjusted according to the following procedure before fixing. At an actuator position in the middle of travel range, the feedback lever position should be perpendicular to the actuator stem and the angle range should be between –10° ... +10° and –45° ... +45°.

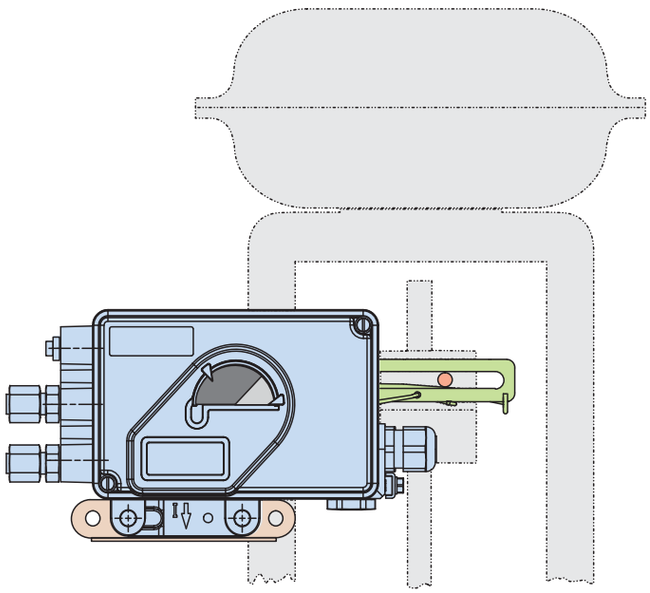
Fasten the positioner to the mounting bracket so that a suitable angle range is selected.

It is recommended that the pneumatic and electrical connections are made after adjusting the position.

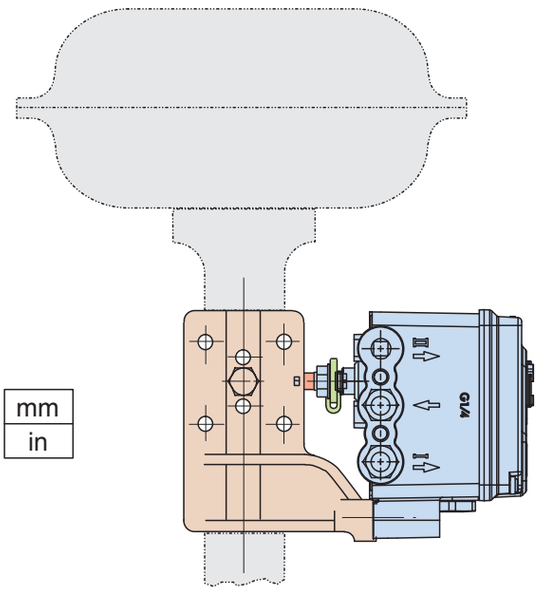
open printversion

1) Apply only to male thread

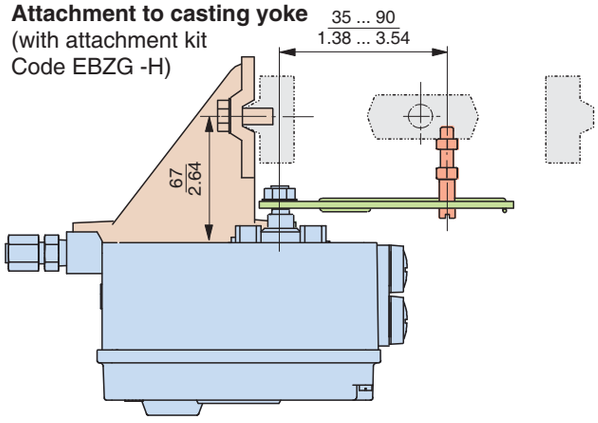
4.1.4 NAMUR Mounting Dimensions – left hand –



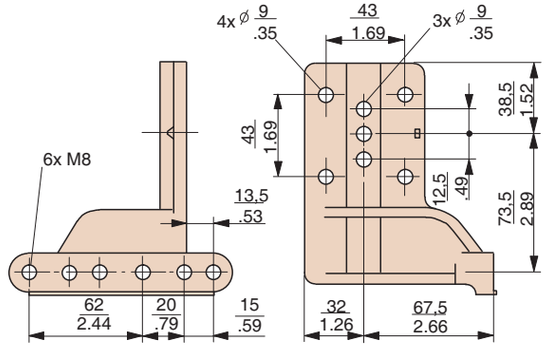
mm
in



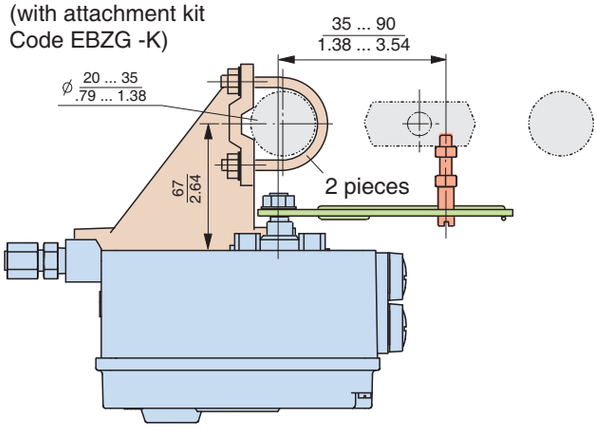
Attachment to casting yoke
(with attachment kit
Code EBZG -H)

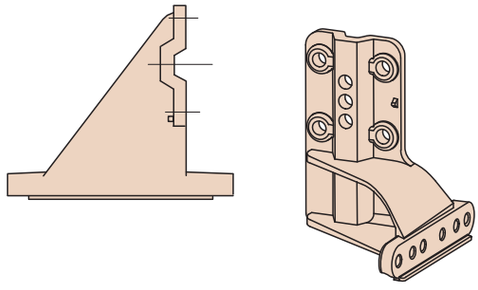


Mounting bracket

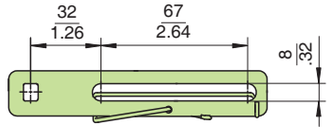


Attachment to pillar yoke
(with attachment kit
Code EBZG -K)

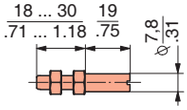




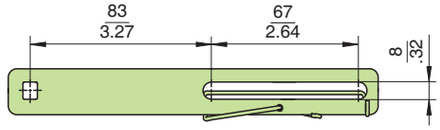
Feedback lever Code EBZG-A for 8..70 mm travel



Carrier bolt for connection to valve stem



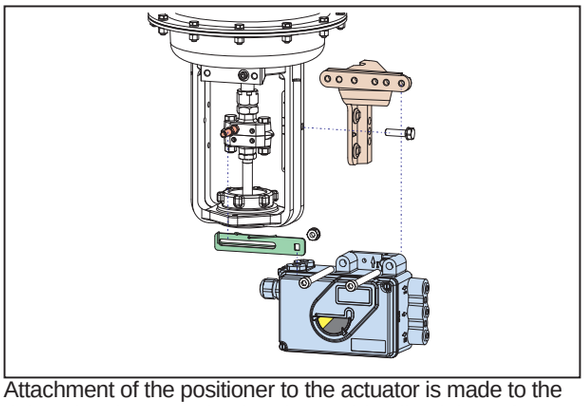
Feedback lever Code EBZG-B for 60..120 mm travel



open
printversion

4.2 NAMUR Mounting - right hand -

Right-hand mounting is done if for instance left-hand mounting is not possible for structural reasons. Applicable to actuators with cast yoke or pillar yoke acc. to NAMUR (DIN IEC 534-6).
Mounting the positioner with pneumatic connections on the right side and electrical connections on the left side.



Attachment of the positioner to the actuator is made to the right using the mounting bracket and feedback lever for a NAMUR mount. Use:
attachment kit EBZG -H for a cast yoke, or
attachment kit EBZG -K for a pillar yoke.

- The side outputs I (or I and II, see page 6) are used. The rear output I is closed by means of a lock screw 522 588 013.

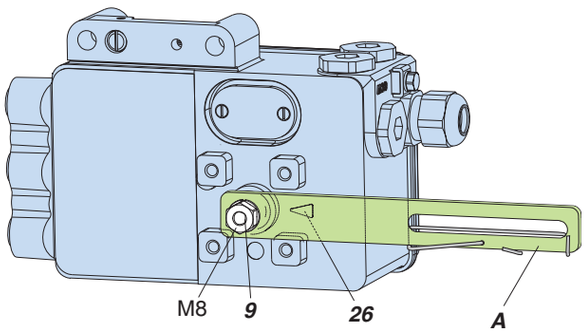
Pneumatic connections: Do not use Teflon tape for sealant. The fine fibres could disturb the function of the SRI990. Use only Loctite® #243 for sealant [1].

Screw-type glands for electrical connections are positioned on the left side. Any unused threaded holes are closed by plugs.

If housing cover has an air vent, this air vent must face-down when mounted.

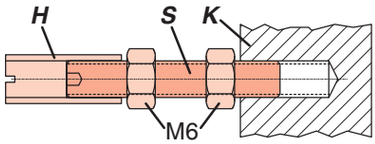
4.2.1 Preparation of the positioner

Rotate the shaft stub of shaft ***9*** so that the flat on the shaft stub is perpendicular to the arrow ***26*** on the housing (detail see page 13), at mid travel range. Fasten the feedback lever ***A*** to the shaft by means of spring washer and nut M8.



4.2.2 Preparation of the actuator

Screw the carrier bolt to the stem connector (see page 9) and lock it by means of a counter nut. A carrier bolt with an adjustable length is used to be able to screw on various coupling pieces.



It consists of a stud ***S***, which is screwed into the coupling piece ***K*** (with 3 mm Allen key) and locked with a lock nut M6. The threaded sleeve ***H*** is screwed onto it and locked with a lock nut M6. Make sure that the bolt is adjusted to the right length!
Fasten the mounting bracket to the left side of the yoke. For a cast yoke use a screw M8 x 30, for a pillar yoke use two U-bolts and four nuts.

4.1.3 Mounting of the positioner

Fasten the positioner to the mounting bracket using two spring washers and two screws M8 x 80.
Note, the carrier bolt ***B*** is in the slot of the feedback lever ***A*** and the compensating spring ***F*** touches the carrier bolt.

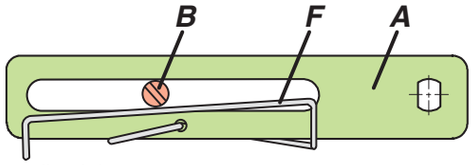


Fig.: Feedback lever

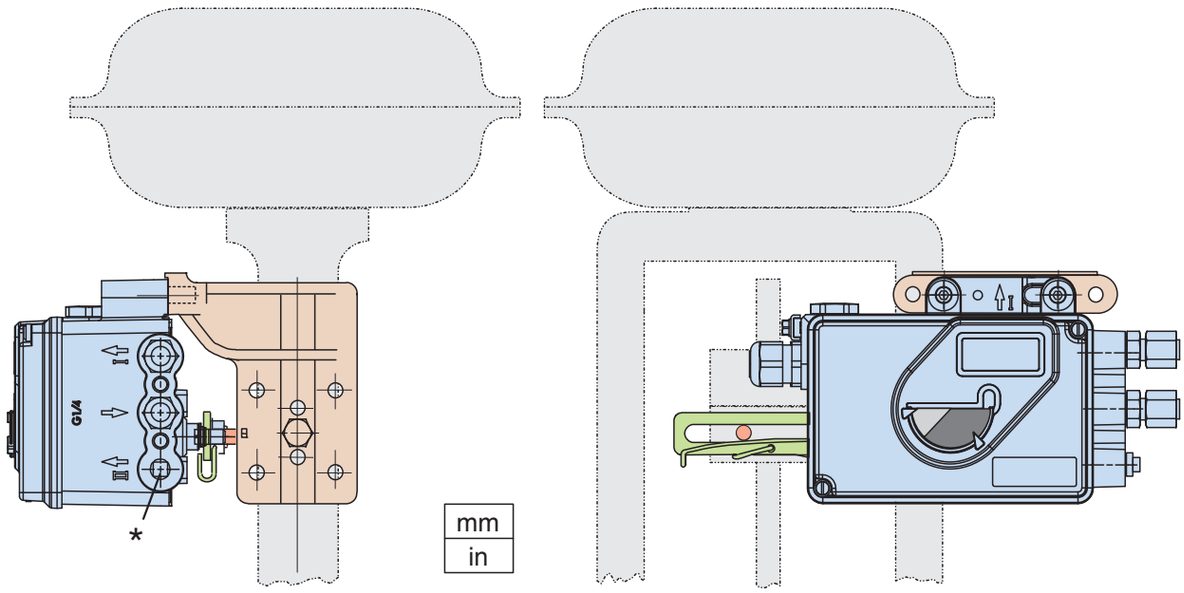
For optimum utilization of the positioner operating range, it is recommended that the arrangement is adjusted according to the following procedure before fixing. At an actuator position in the middle of travel range, the feedback lever position should be perpendicular to the actuator stem and the angle range should be between –10° ... +10° and –45° ... +45° .

Fasten the positioner to the mounting bracket so that a suitable angle range is selected.

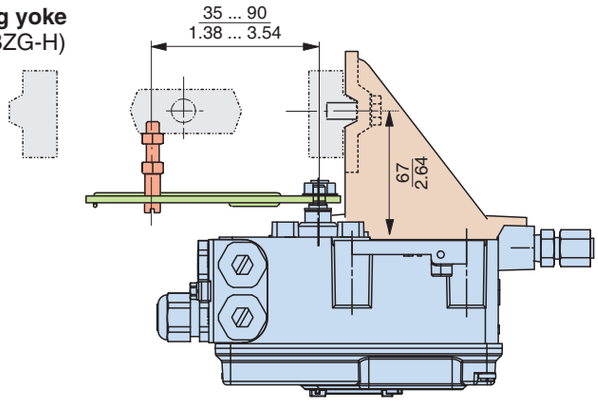
It is recommended that the pneumatic and electrical connections are made after adjusting the position.

1) Apply only to male thread

4.2.4 NAMUR Mounting Dimensions – right hand –

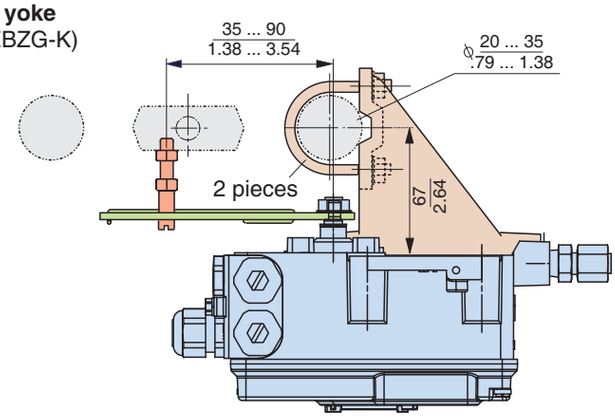


Attachment to casting yoke
(with attachment kit EBZG-H)



Mounting bracket, feedback lever and **carrier bolt** see page 9

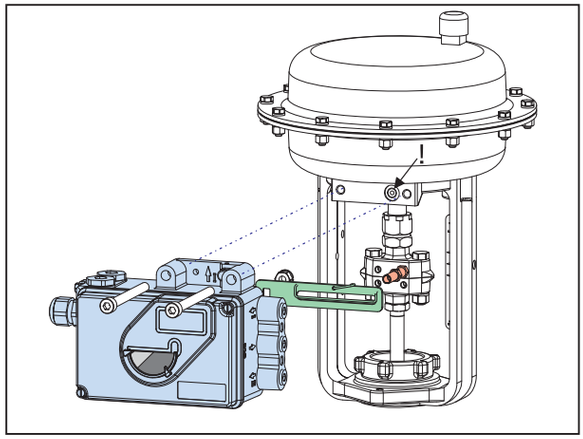
Attachment to pillar yoke
(with attachment kit EBZG-K)



open printversion

4.3 Direct Mounting

Actuators with appropriately prepared yoke (PA200, PA350) enable mounting of the SRI990 direcly to the actuator yoke.



The attachment of the positioner is accomplished by bolting it directly to the actuator yoke using the feedback lever for a direct mount (with attachment kit EBZG -D).

The rear output I and the side outputs I and II are used as follows (see page 6) :

- Actuator single acting, spring force closes:
  The rear output I is used (remove lock screw in hole ***D***).
  The side output I is closed by means of a lock screw 522 588 013.
- Actuator single acting, spring force opens:
  The side output I is used.
  The rear output I is closed by means of a lock screw.
- Actuator double acting:
  The rear output I and the side output II is used.
  The side output I is closed by means of a lock screw.

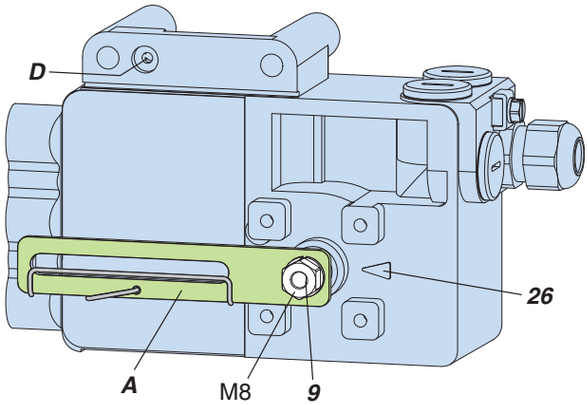
Pneumatic connections: Do not use Teflon tape for sealant. The fine fibres could disturb the function of the SRI990. Use only Loctite® #243 for sealant[1].

Screw-type glands for electrical connections are positioned on the side. Any idle female threads are closed by means of plugs.

If housing cover has an air vent, this air vent must face-down when mounted.

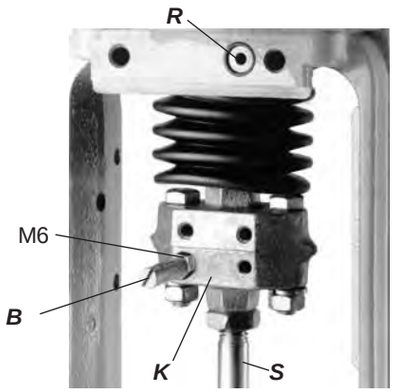
4.3.1 Preparation of the positioner

Rotate the shaft stub of shaft ***9*** so that the flat on the shaft stub is perpendicular to the arrow ***26*** on the housing (detail see page 13), at mid travel range. Fasten the feedback lever ***A*** to the shaft by means of spring washer and nut M8.



4.3.2 Preparation of the actuator

Screw in the carrier bolt ***B*** on the coupling piece ***K*** on the drive spindle ***S*** at the lower left and lock it by means of a nut M6.



4.3.3 Mounting of the positioner

Fasten the positioner to the upper part of the yoke using 2 spring washers and 2 screws M8 x 80, as shown above. The rear output I of positioner has contact to the air duct ***R*** in the yoke.
Attention: Note the correct position of the O-ring on the yoke for the rear connection I!

Note, the carrier bolt ***B*** is in the slot of the feedback lever ***A*** and the compensating spring ***F*** touches the carrier bolt.

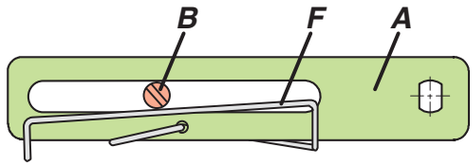
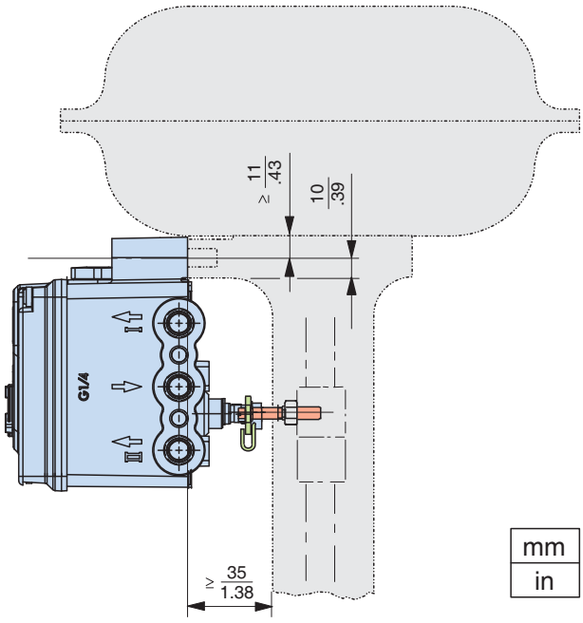


Fig.: Feedback lever

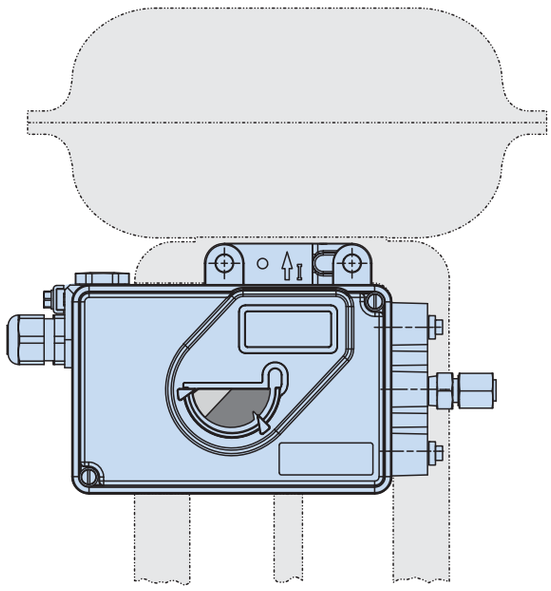
open printversion

1) Apply only to male thread.

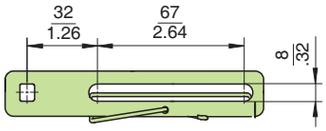
4.3.4 Mounting dimensions – direct mounting –



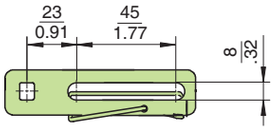
mm
in



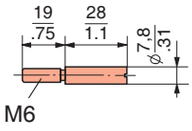
Feedback lever Code EBZG-A for 8..70 mm travel



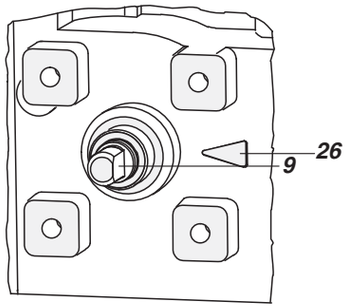
Feedback lever FoxPak/FoxTop in Code EBZG-E

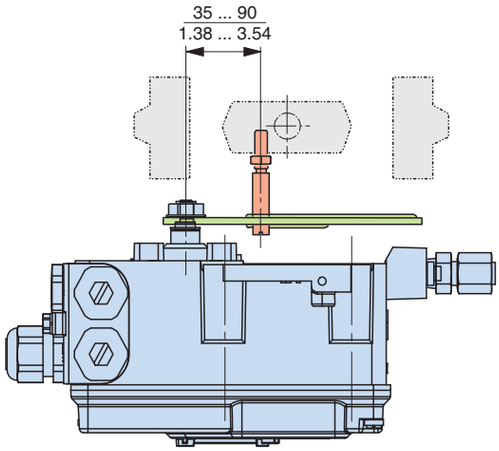


Carrier bolt for connection to valve stem

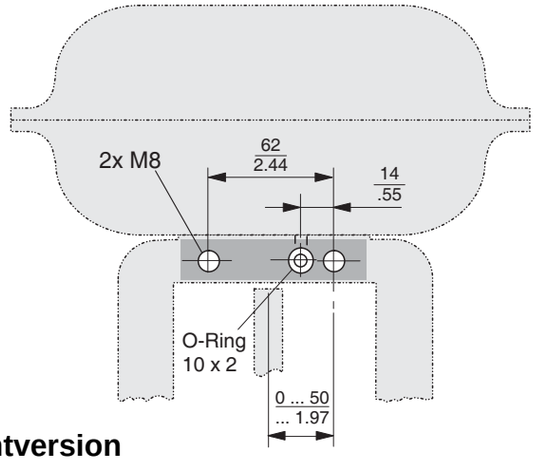


Detail: shaft stub ***9*** is perpendicular to the arrow ***26*** on the housing(at mid travel range)





Connection to yoke using the direct connection hole for rear output I (y/y1)

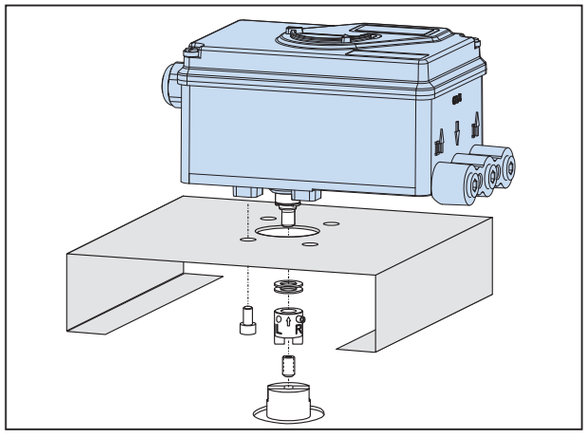


open printversion

5 MOUNTING TO ROTARY ACTUATORS

5.1 Type of mount

Applicable to rotary actuators that meet the VDI/VDE 3845 standard for mounting. Installation position of positioner: Mount the positioner so that the pneumatic connections are in the same direction as the longitudinal drive axis of the actuator as shown in the illustration below.



Attention: The feedback shaft ***9*** of the SRI has no mechanical stop, therefore may spin 360 degrees. The permissible rotation angle range is between +50 and –50 degrees around the arrow at the housing concerning the flat area of the feedback shaft (also see detail page 13 bottom). Since a rotary actuator has a rotary angle of about 90 degrees the mounting as described in the following must be carried out very precisely.

Attachment of the positioner to the actuator is made by using the rotary adaptor kit EBZG -R.

- Either the side outputs I (or I and II) are used and the rear output I is closed by means of the lock screw 522 588 013.

Pneumatic connections: Do not use Teflon tape for sealant. The fine fibres could disturb the function of the SRI. Use only Loctite® #243 for sealant [1].

Screw-type glands for electrical connections are used as needed. Any unused threaded holes are closed by plugs.

Caution! Prevent accumulation of water in the instrument in this mounting position by sealing cable entry against water. Provide a continuous supply of dry instrument air.

5.1.1 Preparation of positioner

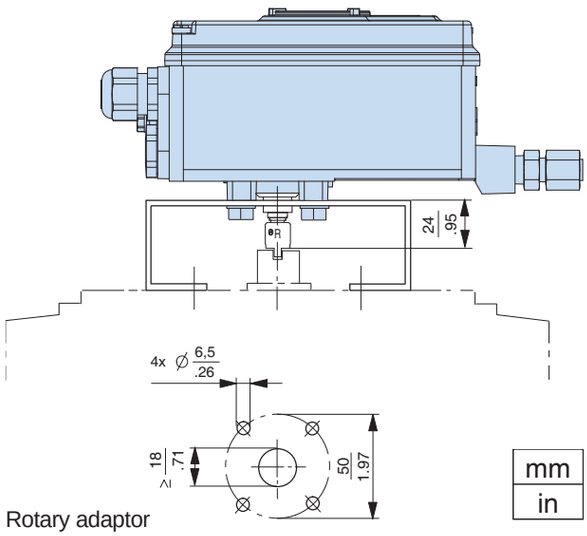
Valve must be in failsafe position[2] and the direction of rotation of the actuator drive shaft must be known. These items are extremely important for proper functioning. These items can be checked as follows in case they are not clear:

In the single-acting actuator the force of the installed spring closes. The pressureless actuator is in a failsafe position. Through manually feeding compressed air it can be seen whether the actuator drive shaft rotates to the left or to the right.

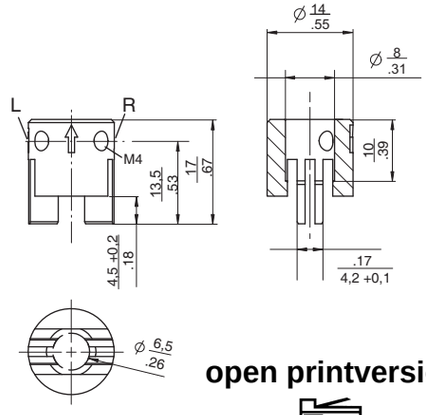
In the double-acting actuator (without spring reset) both air chambers are basically equal. Failsafe position can be either “open” or “close”. Therefore, indication of the fail- safe position has to be determined by engineering. Then the direction of rotation may be determined by manual feeding of compressed air.

Bolt ***2*** is screwed into actuator drive shaft ***1*** for subsequent centering of the rotary adaptor ***3*** . The attachment console is mounted to the stroke actuator (see illustration).

Attachment diagram for bracket



Rotary adaptor



1) Apply only to male thread.
2) Failsafe position: Defined position in case of failure of input signal

5.1.2 Preparation of the actuator

First the rotary adaptor is being prepared:

For attachment to a counter-clockwise or left turning actuator secure the stud screw ***4*** in the threaded hole "**L**" of the rotary adaptor; hole "R" remains open. See Fig. 27.

For attachment to a clockwise or right turning actuator secure the stud screw ***4*** in the threaded hole "**R**" of the rotary adaptor; hole "L" remains open. See Fig. 28.

Note: Studscrew should always be tightened into flat on feedback shaft(9).

Now place the rotary adaptor ***3*** with two washers ***5*** on the feedback shaft ***9*** of the positioner against the stop.
Note :Stud screw should always be tightened into flat on feedback shaft(***9***).

When the product temperature rises, the drive shaft ***1*** becomes longer. Therefore, the rotary adaptor ***3*** must be mounted so that approx. 1 mm (0.04 in.) of clearance results between the drive shaft ***1*** and the rotary adaptor ***3*** . This is achieved by placing an appropriate number of washers ***5*** on the feedback shaft stub ***9*** before attaching the rotary adaptor. Two washers should result in a clearance of 1 mm.
Now screw and tighten the bolt in the coupling against the flat part of the feedback shaft(do not screw against thread!).

Finally turn the feedback shaft in such a way that the arrow of the coupling points to the arrow of the SRI housing.
Beginning and end positions of the actuator drive shaft ***1*** and feedback shaft ***9*** are marked in figure 27 (left-rotating actuator) and in figure 28 (right-rotating actuator) by arrows for the respective direction of rotation.
The feedback shaft is now in the normal position corresponding to the failsafe position of the actuator.

5.1.3 Mounting of positioner

SRI and actuator are in failsafe position.
Attach the SRI on the console in such a way that the catch of coupling ***3*** is guided into the groove of shaft ***1***. Use bolt ***2*** to center and align the positioner to the actuator. Be careful not to shift shafts ***1*** and ***9*** and that both shafts are exactly flush.
Fasten the positioner to the bracket by means of 4 lock washers and 4 screws M6 x 12.

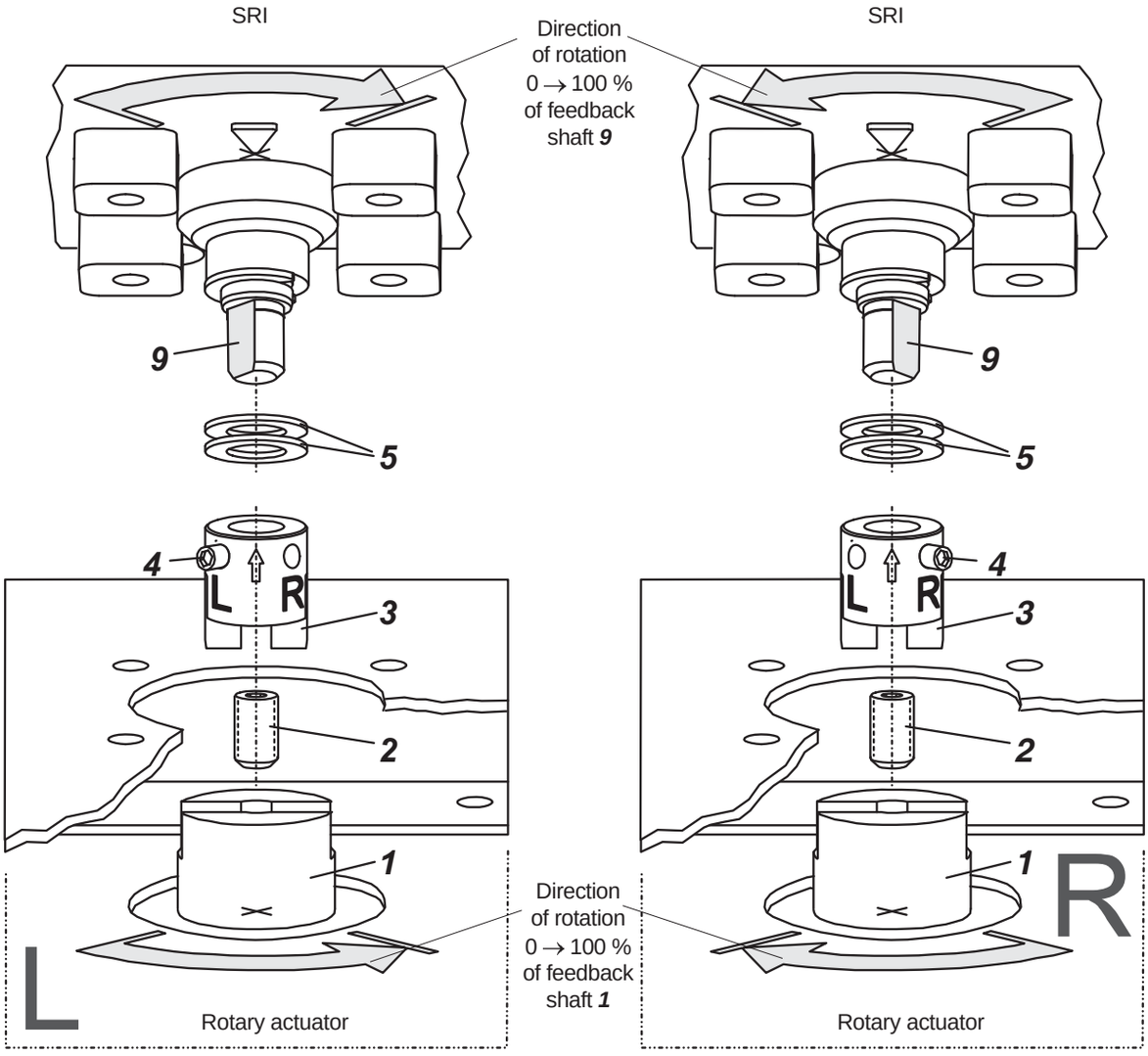
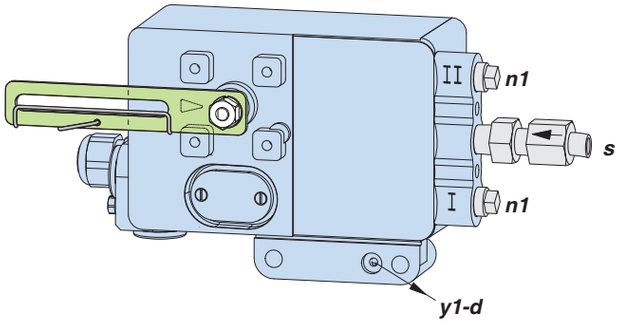
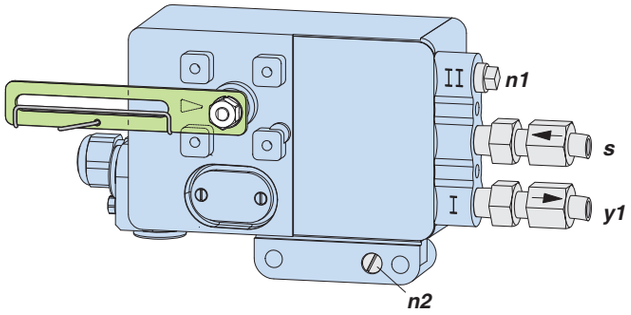


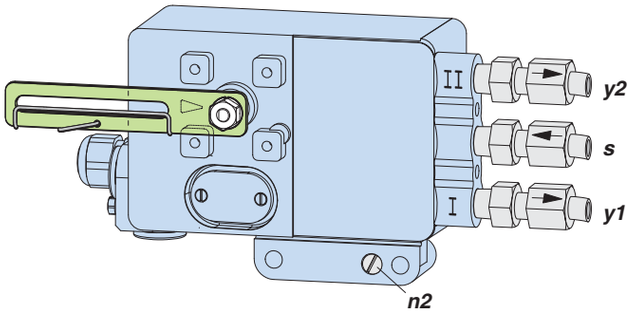
Figure 27: Mounting if actuator is rotating to the left

Figure 28: Mounting if actuator is rotating to the right

6 PNEUMATIC CONNECTIONS







Following alignment and mounting of the positioner to the valve, pneumatic tubing has to be provided.

The connection illustrations depend on the respective version.

Explanation of abbreviatons:

s Supply air

y1-d Output 1 for direct mounting, depressurized at currentless electronics. When using this output ***y1*** has to be closed by means of hex. screw.

y1 Output 1, depressurized at currentless electronics. When using this output, ***y1-d*** has to be closed by means of sealing screw and O-ring.

y2 Output 2 for double-acting actuator. Full pressure at currentless electronics. Closed at single-acting actuator.

n1 Hex. screw with NPT thread

n2 Sealing screw with O-ring

Air supply. . . . . according to ISO 8573-1
Solid particle size and density class 2
Oil rate . . . . . class 3
Pressure dew point 10 K under ambient temperature

7 ELECTRICAL CONNECTION

The safety requirements on page 4 must be observed!

Unused cable glands should be closed off.
Guide cable through gland ***1***. The gland is suitable for cable diameters of 6 to 12 mm (0.24 to 0.47 in). Observe the tightness of the cable entry.
Provide electrical connection of input line at screw terminals ***3*** marked 11+ and 12 – . The terminals are suitable for wire cross-sections of 0.3 to 2.5 mm^2 (22 -14 AWG).

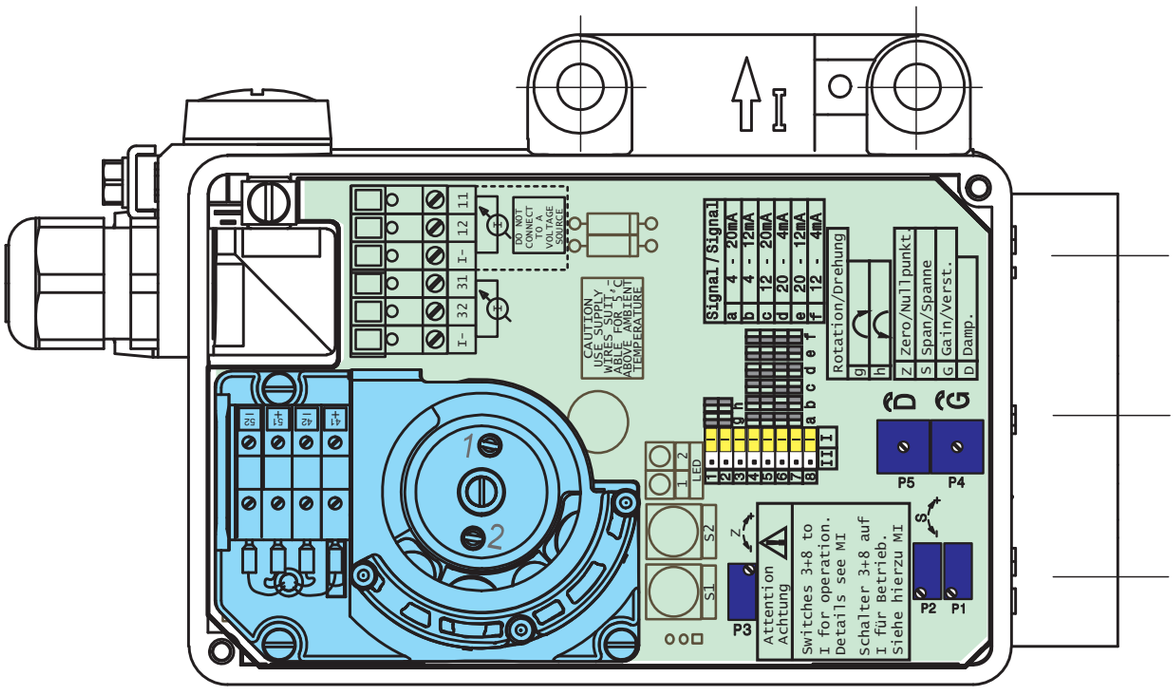
Note: When connecting shielded cable connect the cable shield only to the system! Do not connect the cable shield to the SRI !

Connection to terminals (pos. ***3+, 3–***):

11+ Input w+
12– Input w–
(Options see table below)

The input current can be measured at tip jacks 23+ and 23- (integrated in terminals, underneath the screws). The tip jacks fit plugs with a diameter of 2 mm (0.08 in)

In order to improve EMV protection by integration into local grounding the internal and external grounding conduct connection 4 is available.



11 +	Input W +
12 –	Input W –
Option Position Feedback + Alarm	
31 +	Position Feedback 4 - 20 mA (+)
32 –	Position Feedback 4 - 20 mA (–)

Optional equipment 'limit switch' (see terminals ***40***)

SRI990-xxxT, U via inductive sensor	
Mark	Signal
41 +	GW1
42 –	GW1
51 +	GW2
52 –	GW2

GW Binary output ext. supplied

open printversion

8 START-UP

8.1 General

First of all, the nameplate should be checked, especially with respect to references to Ex / non- Ex, input signal, single / double acting.

Before starting the positioner the SRI must be mounted to the actuator; and an input signal 4 to 20 mA or split range have must be available. The supply air connection must have sufficient capacity and pressure of 1.4 to 6 bar (20 to 90 psig) and should not exceed the maximum operating pressure of the actuator.

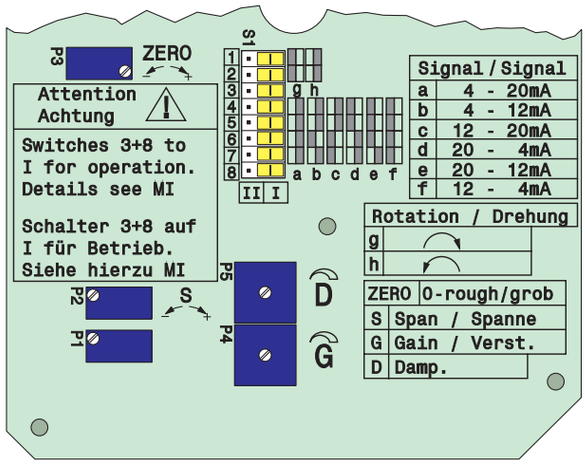
The SRI990 can be adjusted by means of switches and potentiometers when the housing cover is opened.

Attention: Configuration using switches and potentiometers may interfere with operation of the actual process! During configuration it is recommended that there is no flow through the valve.

At initial start-up various adjustments have to be set. The following procedure is recommended:

- Setting of direction of rotation of feedback lever (chapter 8.2)
- Setting of input signal range
  e.g. 4 to 20 mA or split range (chapter 8.3)
- Setting of gain (chapter 8.4)
- Setting of zero and span (chapter 8.5)
- Setting of damping (time constant, chapter 8.6)
- The position indicator ***12*** is attached to the desired position after selection of the transmission at indicator shaft (chapter 8.7)
- If housing cover has an air vent, this air vent must face-down when mounted. When attaching the housing cover make sure that the vent opening points toward the bottom.

Settings via switches and potentiometers
For the setting of the SRI990 and the adjustment of various parameters 8 dip switches and 5 potentiometers are available. See electronics imprint as follows:



The potentiometers are for the setting of:

- Zero point (ZERO): P3
- Span (S): P2
- Gain (G): P4
- Damping (D): P5
- Electronics alignment: P1 [1)]

Single-threaded potentiometers with limited rotation angle to set gain (G) and damping (D) are available, where the actual position is indicated by an arrow. To set zero point (ZERO), span (S) and the electronics alignment[1)] multiple-threaded potentiometers (approx. 30 rotations) without rotation limitation are used.

The switches are for the setting of:

- Direction of rotation of feedback lever (switches 1, 2)
- Electronics adjustment (switch 3) [1)]
- Signal range (switches 4, 5, 6 and 7)
- Pneumatic test (switch 8)

The switch numbers (1 through 8) are imprinted on the electronics. The possible switch position ("I" and "II") are imprinted below switch 8. The switch positions are defined as follows:

Switch Position "I": Switch Position "II":

Caution!
Switches 3 and 8 must be in position "I" during operation. Prior to resetting switches 1 to 8 it is recommended to shut-off the respective part of the installation since processes are activated influencing and disturbing the current process. Therefore, it is recommended that no medium flows through the valve during configuration.

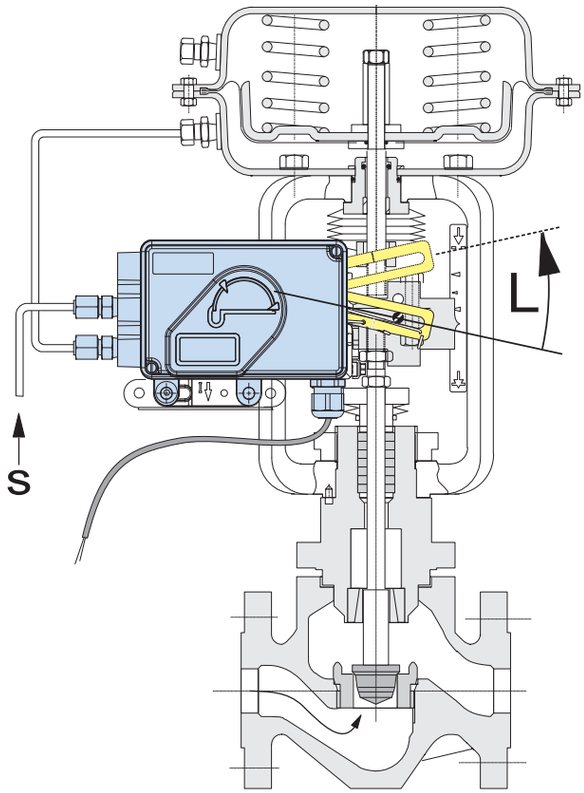
open printversion

1) Adjustment of electronic board (in workshop), see page 22)

8.2 Setting of direction of rotation of feedback shaft

If the actuator moves from starting to end position, the direction of rotation of the feedback shaft is to the right or left hand, depending on the mounting method of the positioner selected and on the configuration of the actuator (spring closes/ opens/ double-acting).
For proper functioning this direction of rotation must be set at positioner (via switches 1+2).

The direction of rotation is defined as direction of rotation of the feedback shaft from the starting to the end position looking at the positioner from the front. See following illustration (shown is: left hand mounting, spring closes, direction of rotation L).



Direction of rotation of feedback shaft of a single-acting **stroke actuator** with spring:

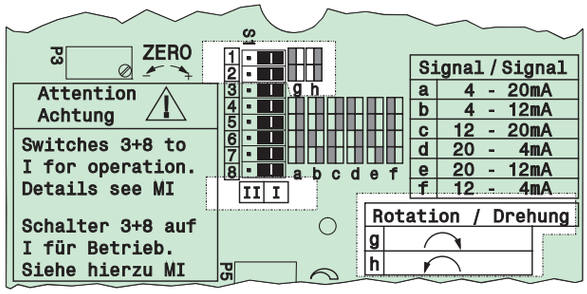
Left hand mounting, direct mounting	Spring in actuator	Right hand mounting
L	Spring closes	**R**
R	Spring opens	**L**

Direction of rotation of feedback shaft for a **rotary actuator**:

Actuator opens rotating to the left	Actuator opens rotating to the right
L	**R**

Direction of rotation of feedback shaft of the double-acting actuator is a. o. determined by the mounting side and the tubing of the pneumatic outputs to the actuator. It has to be considered that in a powerless SRI990 the output y1 will become pressureless and y2 contains air supply pressure.

The direction of rotation of the feedback shaft is set via switches 1+2; see the following illustration.



L: left-hand rotating feedback shaft switch 1+2 on “I”
R: right-hand rotating feedback shaftt: switch 1+2 on “II”

Remarks: If the direction of rotation is not in the right manner, the actuator moves to the end position with full force, and the positioner cannot be controlled.

open printversion

Definitions

Stroke, stroke range of the membrane actuator is defined for rotary actuator as **angle, angle rang**e..

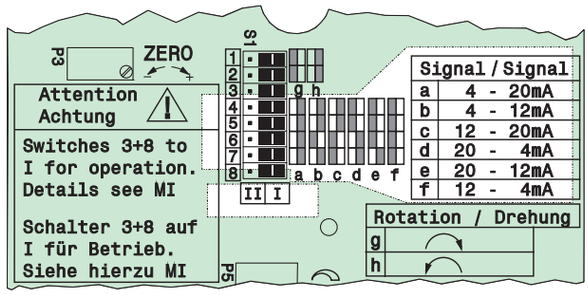
0 % position is the mechanical impact at actually closed valve (caution if using handwheel and mechanically adjustable stroke limitation!)

100 % position is the mechanical impact at actually open valve.

8.3 Setting of Input Signal Range

The following input signal ranges can be set for the SRI990 via switches 4 to 7:

0 %	100 %	item	S4	S5	S6	S7
4 mA	**20 mA**	**a**	**I**	**I**	**I**	**I**
4 mA	12 mA	b	I	I	II	I
12 mA	20 mA	c	I	I	II	II
20 mA	4 mA	d	II	II	I	I
20 mA	12 mA	e	II	II	II	I
12 mA	4 mA	f	II	II	II	II



The switch positions for the setting of various signal ranges are imprinted on the electronics. See illustration.

For 4 to 20mA the switches 4 to 7 are set to position “I” (as shown).
This concludes the setting of the input signal range!

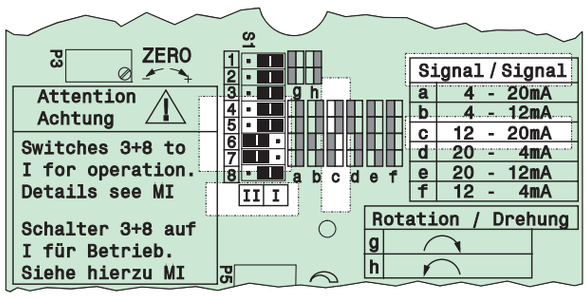
Split Range

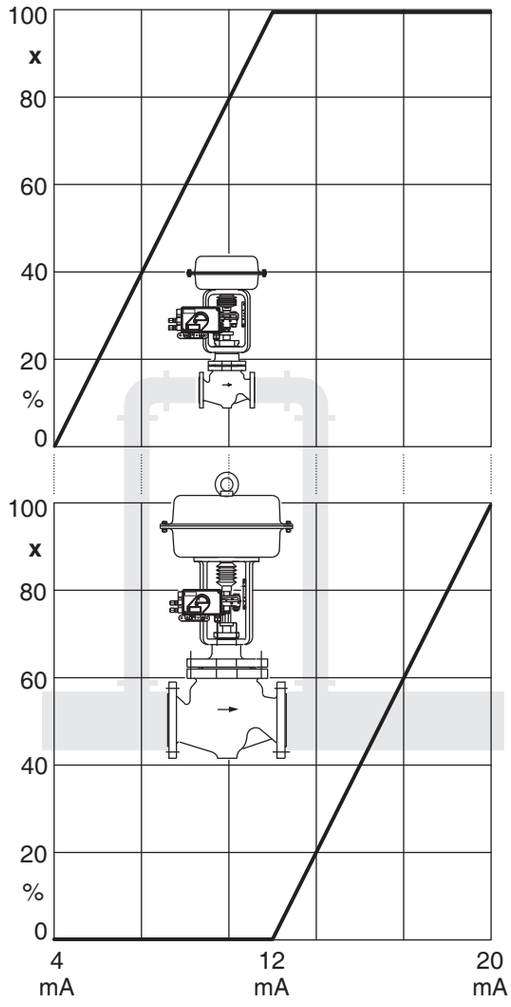
If several positioners are operated at one current loop in sequence with the standard signal 4 to 20 mA, individual valve positions may be allocated to each device, which also may overlap if necessary.

This function is useful if an additional control range is demanded which cannot be covered by one valve only. A valve of smaller nominal size can be applied to the smallest quantities; a parallel mounted valve of bigger no- minal size takes on the larger quantities.

Example: Setting the signal range to 12 to 20 mA
It is recommended to shut off current of the positioner prior to resetting of the input signal range (turn-off input signal). The switches 4 and 5 are set to position “I” and switches 6 and 7 to position “II”.

The individual switch positions are shown in the following illustration.





Split range, subdivision of input signal range
Example: At low current, only the smaller valve positions; from approx. 50 % the large valve is added

open printversion

8.4 Setting of gain (G)

The loop amplification of the positioner is set via potentiometer P4 for gain (G). The maximum possible gain is thereby determined by the stability behavior of the control loop. It is selected in such a way that the actuator no longer oscillates at constant given input value.

Rotation to the right P4: amplification is increased
Rotation to the left P4: amplification is reduced

If the positioner control loop oscillates, gain (G) must be reduced. It has to be considered that a change of gain changes the control deviation, therefore, requiring setting of the potentiometer for the position range (zero and span).

8.5 Setting of zero (ZERO) and span (S)

Following settings in chapters 8.2 through 6.4 at initial start-up setting of zero point (ZERO) and span (S) are performed as follows:

a) Enter starting value of command variable (beginning of stroke).
b) Turn potentiometer P3 for zero point (ZERO) until actuator just begins to move from its end position.

Rotation to the right P3: zero point is increased
Rotation to the left P3: zero point is reduced

c) Enter final value of variable (end of stroke)
d) Turn potentiometer P2 for span (S) until actuator exactly reaches its end position.

Rotation to the right P2: span is increased
Rotation to the left P2: span is reduced

These settings influence amplification, therefore adjusting in chapter 8.4 may become necessary.

8.6 Setting of damping (D)

Potentiometer P5 for damping (D) influences the dynamic behavior of the actuator at a discontinuous change of the input signal. The input signal is provided with an additional time constant for this purpose. The time constant is only noticeable in the position control loop if the time constant set via potentiometer is larger than the position time of the actuator.

Rotation to the right P5: damping is increased
Rotation to the left P5: damping is reduced

The effect of the positioning time may be checked by entering input signal jumps. The range limits and the gain are not influenced by a change.

8.7 Setting of the travel indicator

The mechanical travel indicator is coupled to the feedback shaft of the positioner by a gear. The gear has two selectable ratios 1 : 2 and 1 : 6. [1].

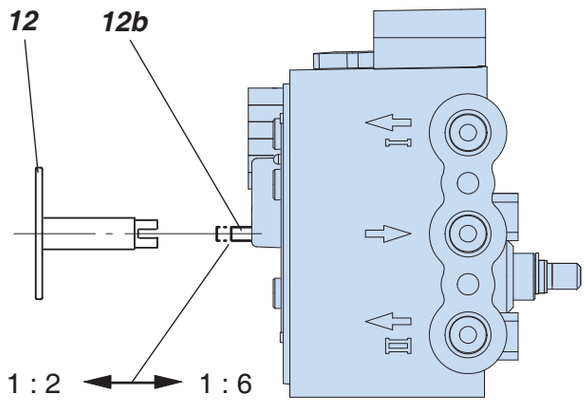
Selection of gear ratio:
For rotation angles of the feedback shaft less than 30° select a ratio 1 : 6. This gear selection amplifies the feedback shaft rotation angle six times and for example, a 20° angle is shown as 120°.

For rotation angles greater than 30 ° select a ratio of 1 : 2. This gear selection amplifies the shaft rotation angle by a factor of two and for example, a 45° angle is shown as 90°.

For rotary actuators the rotation angle is equal to the rotation angle of the actuator. Consequently, a 90° rotation angle will result in a 180° display angle for the 1 : 2 gear ratio.

For linear actuators the rotation angle is determined by travel span and feedback lever length. In this case, an exact 180° display angle can only be achieved for a 30° rotation angle using a 1 : 6 gear ratio. If any other rotation angle results, either the closed or full open positon can be set to be indicated at, for example 0° or 180°. However, if the closed position is chosen for display, then the full open display position angle is dependent on travel span, feedback lever length and gear ratio. If the full open position is chosen for display, then the closed positon angle becomes dependent.

Setting gear ratio:
Remove travel indicator ***12***. Pull out pin ***12b*** for a ratio 1 : 2 or push in the pin for a ratio 1 : 6. Use a smooth turning operation to free the gears and to set pin ***12b*** against the stop. See illustration.



Turn the travel indicator ***12*** to the desired position, put it on the gear shaft against the stop and pinch the wire ring for secure coupling.

open printversion

1) The values are rounded for making easier calculations. The exact ratios are 1 : 1.83 and 1 : 6.28 .

8.8 Start-Up of Position Transmitter (4-20 mA) for SRI990-xIQxxx

General

The electrical position transmitter is an accessory installed in the factory. It converts the stroke or rotary movement of an actuator into an electrical standard signal 4 to 20 mA. Attachment and start-up of the unit to the actuator must be performed according QG EVE0107 A. At 50% stroke, the control lever must be horizontal. The electronic connection of the position transmitter must be assured. Both LED's are then light up.

Adjusting the start of the measuring range (4 mA)

a) Move the actuator to the starting position.
b) Press push button S1 "Config output 4 mA" longer than 2 s. During this time LED 1 lights up. After 2 s both LEDs are light up again, the value for 4 mA is stored.

Adjusting the end of the measuring range (20 mA)

a) Move the actuator to the end position.
b) Press push button S2 "config output 20 mA" longer than 2 s. During this time LED 2 lights up. After 2 s both LEDs are light up again, the value for 20 mA is stored.

Random adjustment of the current values at the end points

a) Move the actuator to the end position, where you want to adjust the current.
b) Press both buttons simultaneously for about 2 s. Then both LED's are alternating flashing in a slow frequency.
c) With push button S2 "Config Output 4 mA" the output current value can be increased. Pressing the buttons for a short moment results in a small change and pressing the button for a longer time results in a fast mode for a bigger change. The value of the current can be freely decreased between about 3.3 and increased up to 22.5 mA.
d) Without any additional manipulations of the push button the new value is automatically saved. After a few seconds, the device returns into the normal operating mode, indicate by both LED's that are then light up again.

Trouble shooting of the position transmitter

The components of the position transmitter are under constant surveillance by the installed micro controller. Errors are detected and indicated when both LED's are off or both LED's are paralell flashing at a fast frequency.
In the event of fatal error, e.g. potentiometer not connected, an output current of more then 24 mA will be shown in addition to the error indication given by the LED'S(fast flashing).

In this case check the following:

a) if the potentiometer is correctly connected to the electronic board.
b) if the potentiometer is within its working span.

When both LED's are off, the supply voltage should be checked (minimum tension, polarity).

8.9 Basic adjustment of electronics

Attention: Service only

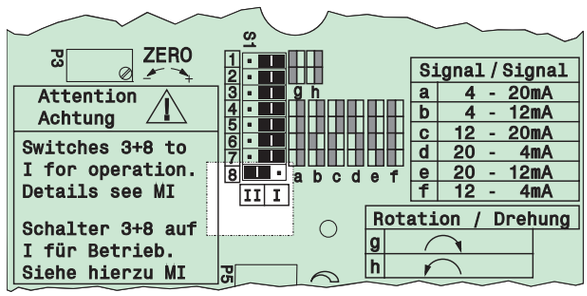
The electronics unit has been sufficiently factory-adjusted; an adjustment at delivery is not required. The potentiometer is secured by means of lacquer against unintentional operation.
In the event an adjustment of the electronics becomes necessary (e.g. following exchange of electronics) the procedure is as follows:

a) Enter input current 4 mA.
b) Switch S3 to “II”: positioner control loop is opened.
c) Turn potentiometer P1 until actuator just begins to move from its end position.
d) Return S3 to “I”.

8.10 Pneumatic test

Attention: Service only

To check the pneumatic parts of the positioner by directly applying current to the IP module (no control).
Procedure: Put switch 8 in position ”II” (see illustration).



Attention!
Resetting of switch 8 initiates actions influencing and possibly disturbing the current process! Therefore, no medium should flow through the valve during these settings.

Setting switch 8 to position “II” actuates a pneumatic test, checking the function of the positioners pneumatic system, including its control. If switch 8 is set from position “I” (condition of operation) to position “II”, the pressure in the actuator goes to nearly full air supply pressure. The actuator moves in the direction associated with maximum pressure.

If no reaction is shown, check:
- does air supply exist?
- is plug connected to IP module?
If these items are okay, possibly the electronics, or a pneumatic part, are defective. Exchange see page 24.

During operation switch 8 must be in position “I” at all times!

9 DECOMMISSIONING

Before decommissioning the unit, disconnect supply air and the electrical input signal.

10 DIAGNOSIS

Fault	Possible cause	Solution
Actuator does not react to existing input signal or to changes of input signal	Pneum. connections were interchanged	Check pneum. connections, see page 16
	Electric connections were interchanged	Check electric connections, see page 17
	Wrong setting of zero and span	Check, see page 21
	IP module or pneumatic part defective	Carry out Pneumatic Test, possibly change part, see page 25
	Direction of rotation interchanged	Change direction of rotation
Output pressure does not reach full capacity	Supply air capacity insufficient	Check air supply
	IP module defect	Carry out Pneumatic Test, possibly change module, see page 25
	Filter in air supply connection plugged	Exchange filter, see page 24
Actuator moves to end position	Positioner mounted on wrong side or switch1+2 set faulty (**R/L**)	Check mounting side as per table page 19
	Pneumatic test still active (switch 8 = “II”)	Return switch 8 to “I”, see page 22
	Pneumatic connections were interchanged (double-acting version)	Check connections, see page 16
Unstable behavior, position control circuit oscillates	Gain too high	Reduce gain, see page 21
	Friction on valve packing too great	Loosen packing gland slightly or replace
	Piston actuator: Friction at cylinder too great	Reduce gain, see page 21
Stroke range cannot be set	Positioner does not fully decompose pressure	Check air supply (max. 6 bar)
		Check gain, see page 21
		Carry out pneumatic test (switch 8 = “II”), see page 22
Pneumatic test is without effect	No air supply	Connect air supply
	No input signal	Connect input signal
	IP module is not connected, or IP module or a pneumatic part defective	Connect IP module, or exchange part (workshop)

11 MAINTENANCE

11.1 General

The positioner SRI990 requires little maintenance. When replacing components during repair work, the safety requirements on page 4 must be observed!

11.2 Supply filter replacement

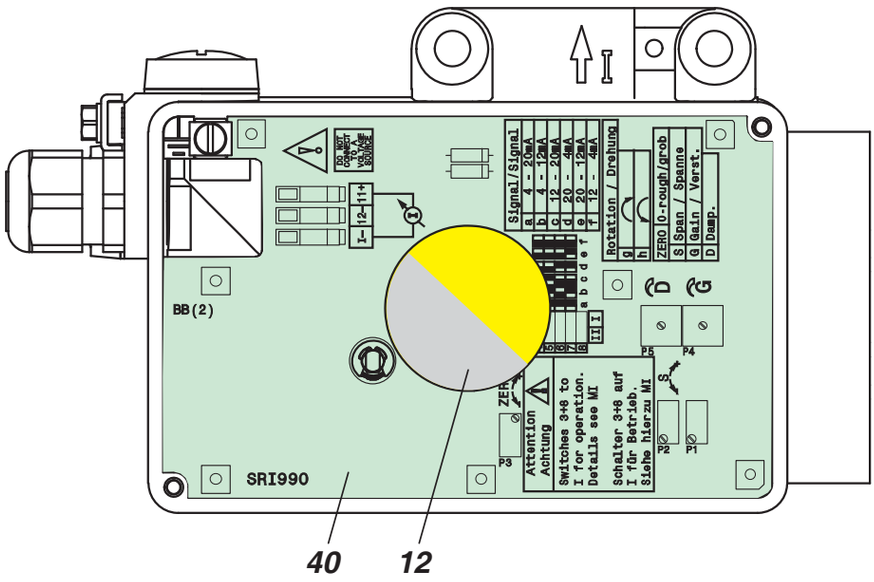
An obstructed supply filter can be replaced. Unscrew the air supply fitting, remove the filter and exchange the filter with a new one.

11.3 Removal of electronics unit

Pull off travel indicator ***12*** . To remove the electronics unit ***40***, loosen the 7 screws at front, see illustration below.

Lift off electronics unit vertically to top. Disconnect plugs ***41*** and ***42*** (see page 25) from the board. Do not use tools to remove plugs because components could be damaged. Tight-fitting plugs can be easily removed by tilting them diagonally inward before pulling them off.

Connect plugs ***41*** and ***42*** to the new electronics unit ***40*** and attach the new unit by using the 7 screws at front (attention with the cables).



11.3.1 Conversion of positioner

Positioners of the POSYS series consist of identical mechanical and pneumatic components and accessories. A conversion to either a “digital” or “intelligent” positioner is possible by simply exchanging the electronics unit.

Please refer you to TI EVE0102 U for an upgrade

11.4 Replacement of mechanical and pneumatic units

First remove the electronics unit ***40*** (see preceding page).

11.4.1 Amplifier replacement

Release the pneumatic amplifier ***43*** from the base plate and replace O-rings between the amplifier and base plate[1]. Use 3 O-rings for a single-acting amplifier and 5 O-rings for a double-acting amplifier. If replacing a single-acting amplifier with a double acting, remove sealing screw ***44*** before installation.

The air capacity throttle screws have to be released until the screw head is even with the amplifier surface (= no throttling).

11.4.2 Preamplifier replacement

Unscrew the preamplifier ***45*** from the base plate by removing screws ***46*** and ***47*** .

Replace 4 O-rings between preamplifier ***45*** and base plate[1] and install new preamplifier.

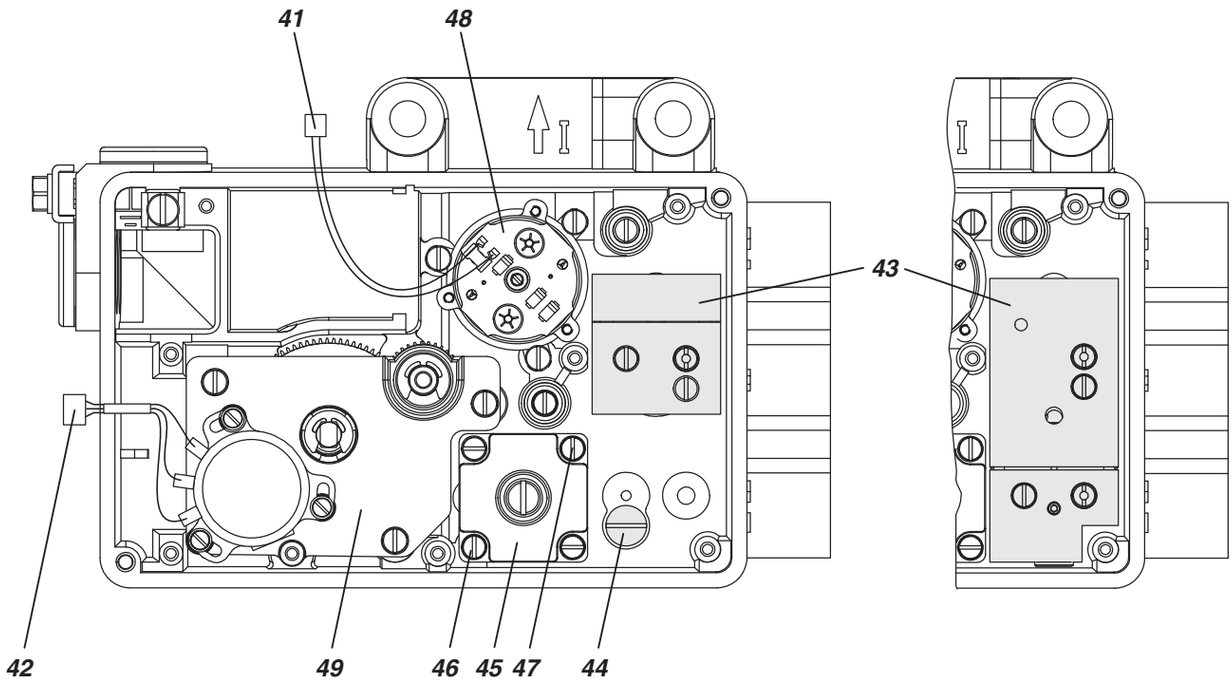
11.4.3 Replacement of IP module

Remove the IP module ***48*** from base plate and replace with new IP module. Replace the O-ring between IP module and base plate and install new IP module.

11.4.4 Replacement of Feedback unit

First remove feedback lever or rotary adapter from feedback shaft. Now remove retaining ring from feedback shaft ***9*** (see page 6). Remove screws and pull out complete unit ***49*** consisting of feedback shaft, gears and position sensor.

Insert new feedback unit ***49*** and secure with screws. Remember to replace the retaining ring at feedback shaft.



open printversion

1) The base plate consists of a manifold and air ducts. O-rings are required to guarantee sealing of the mounted elements.

12 OPTION “Limit switch”

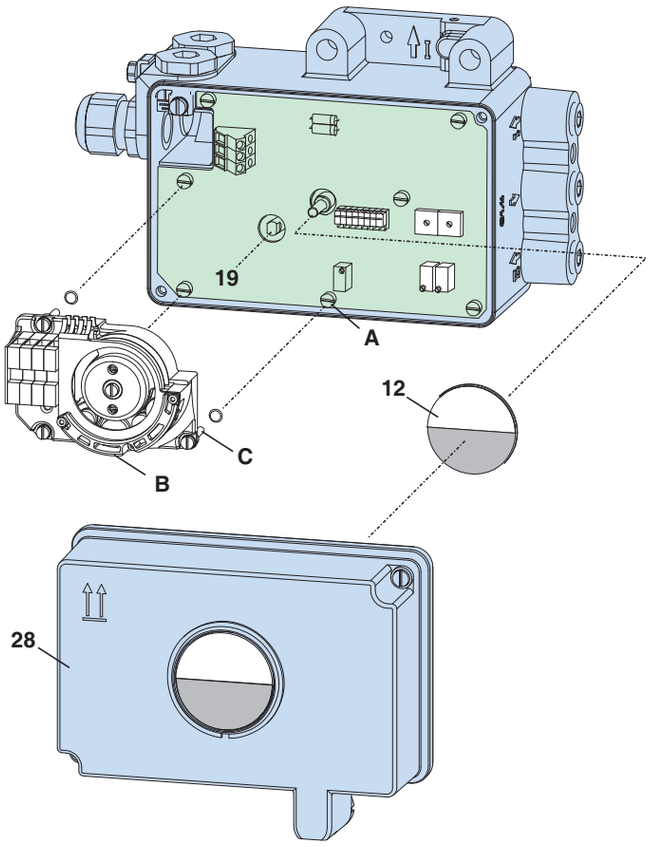
Remove three screws ***1*** including tooth lock washer from plastic cover.

Attach limit indicator ***2*** so that the flattened shaft end ***19*** contacts the groove of the limit indicator shaft in the positioner.

Attach limit indicator by means of three screws ***3*** and washers. The feedback shaft at back of positioner should easily be turnable, thereby also moving the vanes of the limit indicator. If this is not the case, loosen screws ***3*** and flush- align the shafts of positioner and limit switch (turn coupling shaft several times).

Replace short travel indicator **12** by long travel indicator.

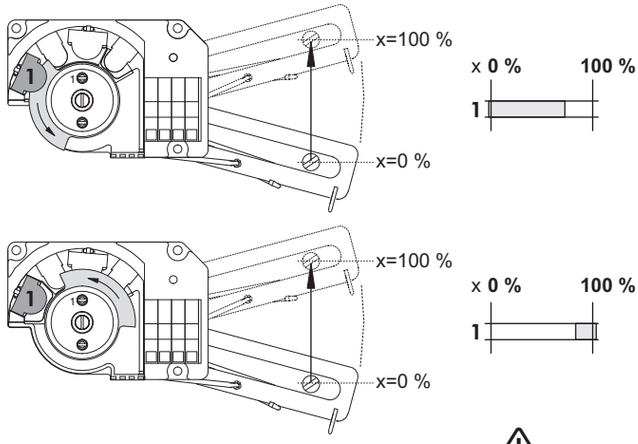
Screw high cover ***20*** (or standard cover with insert frame) on housing.



Switch functions
Feedback lever, feedback shaft and the control vanes are all connected to each other, without an intermediate transmission. The control vanes are therefore moving simultaneously with the same angle rate as the feedback lever. The length of the control vane corresponds with the swing angle of 120°.

Both control vanes are located on different planes. Each control vane can be seen independently from the other, because each has its own sensor.

By adjusting the screws (after loosening the center screw ***10***), the control vanes can be adjusted relative to the angle rate, so that e.g. one vane dives into and another dives out of the sensor (see illustration).

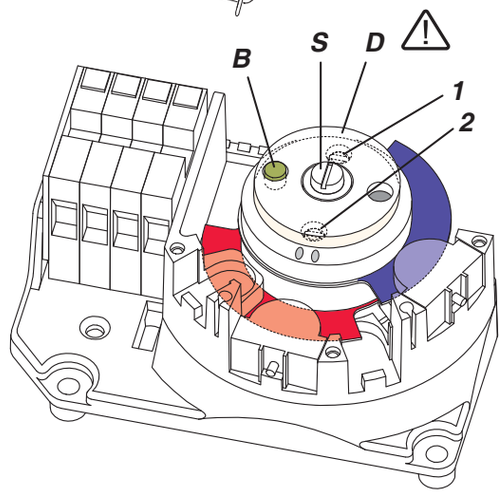


Setting limit switch trigger points
First loosen screw ***S*** until disc ***D*** is no longer blocked by bolt ***B*** . Then turn disc by 90°, until set screws ***1*** and ***2*** are accessible.

Set trigger point switch GW1:
Turn screw ***1*** at mark (•), until desired switch behavior is reached.
Set trigger point switch GW2:
Turn screw ***2*** at mark (• •), until desired switch behavior is reached.

To fix switch points turn disc again by 90°, until the bolt catches, then fasten tight the center screw ***S*** .

Do not touch control vanes during operation
danger of injuries!



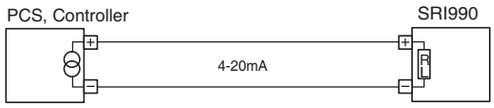
Levels of control vanes (illustration without cover)

13 SYSTEM CONFIGURATION

The safety requirements in page 4 must be observed!

13.1 Non-intrinsically safe operation

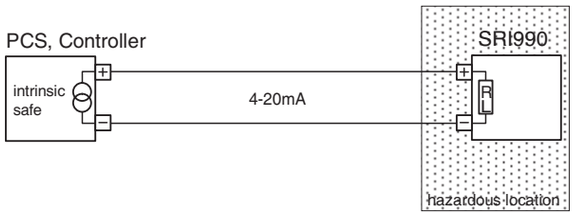
The SRI990 can be connected directly to the 4 to 20 mA output of the process control system or controller. Load RL approx. 300 Ohm.



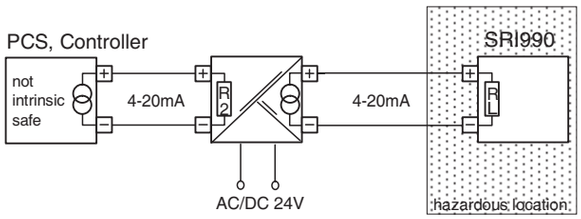
13.2 Intrinsically-safe operation

The SRI990 can be connected directly to an intrinsically safe 4 to 20 mA output of the process control system or controller. If no intrinsically safe output is available, a suitable buffer amplifier or safety barrier with an intrinsically safe output must be connected. During intrinsically safe operation the connection must be checked for conformance to intrinsic safety before commissioning.

Controller / process control system-output intrinsically safe:



Controller / process control system-output not intrinsically safe:



The following devices may be used:

Device	Input Load R2	Drives load at output	drives n *) SRI990
TV928	50 Ω	600 Ω	1 pc.
TV228	< 100 Ω	700 Ω	2 pcs.
II949	RL+200 Ω	580 Ω	1 pc.

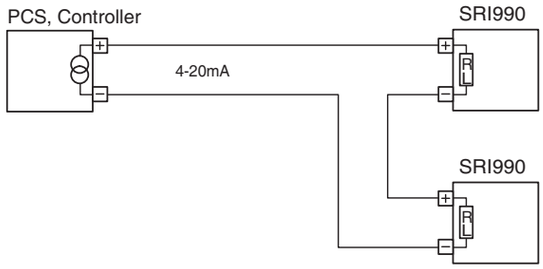
All components connected to the SRI990 in a hazardous location must be Ex-approved. The limits are not to be exceeded in any case. These limits are also valid for connection of other capacitances, inductances, voltages and currents. Additional options may have different limit values than the basic device. See Product Specification Sheet PSS EVE0107 A-(en) and/or Certificate of Conformity.

13.3 Split range

If several actuators are to be controlled from an identical conduct variable and carry out full stroke only in a certain portion of this conduct variable, an individual SRI990 is to be provided for each actuator the zero and span of which can be set to the respectively desired partial range of the conduct variable.

The positioners are electrically switched in series. It is important that the permissible load of the process control system or controller is not exceeded (RL of an SRI990 approx. 300 Ohm).
The output voltage (idle voltage) must be >8.5 V per connected positioner. The total line capacitance is not to exceed 1 µF.

Example: 2-fold split range

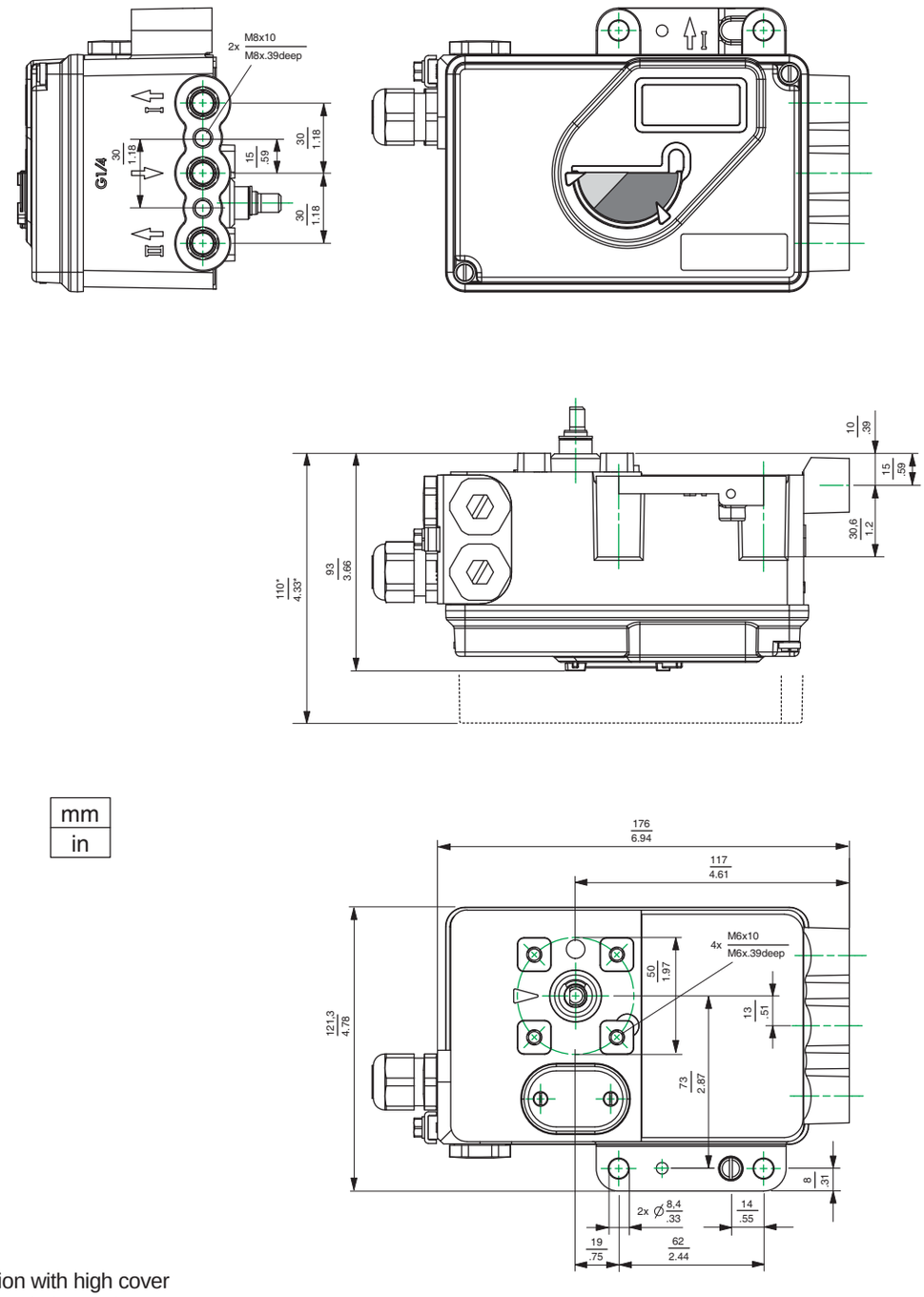


During intrinsically-safe operation identical conditions as described in chapter 13.2 are valid.

Setting of the positioners is described in page 20.

*) For split range

DIMENSIONS



*) Dimension with high cover at option “Limit switch”

FOXBORO ECKARDT GmbH
Postfach 50 03 47
D-70333 Stuttgart
Tel. # 49(0)711 502-0
Fax # 49(0)711 502-597
http://www.foxboro-eckardt.com

DOKT 536 022 046

Type 6014
Solenoid valve

3/2-Way Solenoid Valve

Voltage 12V or 24V
UL / UR valid with
class 2 power supply only

We reserve the right to make technical changes without notice.

Technische Änderungen vorbehalten.

Sous réserve de modifications techniques.

www.burkert.com

Operating Instructions 1104/17_EU-ml_00803455 / Original DE

Operating Instructions

Bedienungsanleitung
Manuel d'utilisation

MAN 1000010024 ML Version: I Status: RL (released | freigegeben) printed: 04.08.2011

1. OPERATING INSTRUCTIONS

The operating instructions describe the entire life cycle of the device. Keep these instructions in a location which is easily accessible to every user and make these instructions available to every new owner of the device.

The operating instructions contain important safety information!

Failure to observe these instructions may result in hazardous situations.

- The operating instructions must be read and understood.

2. SYMBOLS

The following symbols are used in these instructions.

DANGER!

Warns of an immediate danger!

- Failure to observe the warning may result in a fatal or serious injury.

WARNING!

Warns of a potentially dangerous situation!

- Failure to observe the warning may result in a serious or fatal injury.

CAUTION!

Warns of a possible danger!

- Failure to observe this warning may result in a medium or minor injury.

NOTE!

Warns of damage to property!

Important tips and recommendations.

→ designates a procedure which you must carry out.

open printversion

MAN 1000010024 ML Version: I Status: RL (released | freigegeben) printed: 04.08.2011

3. INTENDED USE

Incorrect use of the solenoid valve Type 6014 can be dangerous to people, nearby equipment and the environment.

- The device is designed for blocking, dosing, filling and venting neutral gaseous and liquid media.
- Use according to the permitted data, operating conditions and conditions of use specified in the contract documents and operating instructions. These are described in the chapter entitled *"7. Technical Data"*.
- The device may be used only in conjunction with third-party devices and components recommended and authorised by Bürkert.
- Correct transportation, correct storage and installation and careful use and maintenance are essential for reliable and problem-free operation.
- Use the device only as intended.

3.1. Restrictions

If exporting the system/device, observe any existing restrictions.

3.2. Approvals

The approval mark indicated on the Bürkert labels refers to the Bürkert products.

e 1
03 5791

Devices which must bear the type approval mark were approved at the Kraftfahrtbundesamt under the type approval number

e1*72/245*2006/96*5791*00

and are put into circulation with the indicated type approval mark. You can obtain an extract of the type approval from the address below.

Bürkert Werke GmbH
Zulassungsbeauftragter,
Christian-Bürkert-Str. 13-17,
D-74653 Ingelfingen

Further information on the approvals can be found in chapter *"7.1. Conformity"*.

3.3. Ex approval

The Ex approval is only valid if you use the modules and components authorized by Bürkert as described in these operating instructions.

You may use the electronic modules only in combination with the pneumatic valve types released by Bürkert, otherwise the Ex approval will be void!

If you make unauthorized changes to the system, the modules or components, the Ex approval will also be void.

3.4. Possible errors in use

- Do not supply the medium connectors of the system with aggressive or flammable mediums.
- Do not put any loads on the body (e.g. by placing objects on it or standing on it).
- Do not make any external modifications to the device bodies. Do not paint the body parts or screws.

4. BASIC SAFETY INSTRUCTIONS

These safety instructions do not make allowance for any

- contingencies and events which may arise during the installation, operation and maintenance of the devices.
- local safety regulations – the operator is responsible for observing these regulations, also with reference to the installation personnel.

⚠

Danger – high pressure!

- Before loosening the lines and valves, turn off the pressure and vent the lines.

Risk of electric shock!

- Before reaching into the system, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

Risk of burns/Risk of fire if used continuously through hot device surface!

- Keep the device away from highly flammable substances and media and do not touch with bare hands.

open printversion

General hazardous situations.

To prevent injury, ensure that:

- the system cannot be activated unintentionally.
- Installation and repair work may be carried out by authorized technicians only and with the appropriate tools.
- After an interruption in the power supply or pneumatic supply, ensure that the process is restarted in a defined or controlled manner.
- The device may be operated only when in perfect condition and in consideration of the operating instructions.
- The general rules of technology apply to application planning and operation of the device.

The solenoid valve Type 6014 was developed with due consideration given to the accepted safety rules and is state-of-the-art. However, dangers can still arise. Failure to observe this operating manual and its operating instructions as well as unauthorized tampering with the device release us from any liability and also invalidate the warranty covering the device and accessories!

4.1. Models with explosion protection

DANGER!

Danger of explosion!

Improper use in the potentially explosive area may result in an explosion.

- Also follow the specifications in the certificate of conformity.
- If models have ATEX approval, also follow the specifications in the ATEX instructions.

MAN 1000010024 ML Version: I Status: RL (released | freigegeben) printed: 04.08.2011

5. GENERAL INFORMATION

5.1. Contact address

Germany

Bürkert Fluid Control Systems
Sales Center
Chr.-Bürkert-Str. 13-17
D-74653 Ingelfingen
Tel.: +49 (0)7940 - 10 91 111
Fax: +49 (0)7940 - 10 91 448
E-mail: info@de.burkert.com

International

Contact addresses can be found on the final pages of the printed operating instructions.

And also on the internet at: www.burkert.com

5.2. Warranty

The warranty is only valid if the solenoid valve Type 6014 is used as authorized in accordance with the specified application conditions.

5.3. Information on the internet

The operating instructions and data sheets for Type 6014 can be found on the Internet at: www.burkert.com

6. SYSTEM DESCRIPTION

6.1. General description

The direct-acting solenoid valve Type 6014 is available in two designs.

Type 6014 is used for the blocking, dosing, filling and venting of neutral gaseous and liquid media, in particular for controlling single-acting pneumatic drives or technical vacuum. The modular designed valve can be installed individually or in a block on the multiple manifold.

Type 6014P is used as a special pilot valve for direct installation on the externally controlled pneumatic drives. It consists of the magnetic drive Type 6012 and a special connection body with hollow screw which can be connected directly to the control air connection of the drive. The valve features manual actuation as standard.

open printversion

MAN 1000010024 ML Version: I Status: RL (released | freigegeben) printed: 04.08.2011

7. TECHNICAL DATA

7.1. Conformity

In accordance with the EC Declaration of conformity, the solenoid valve Type 6014 is compliant with the EC Directives.

7.2. Standards

Conformity with the EC Directives is verified by the following standards.

EN 60079-0, EN 60079-7, EN 60079-18, EN 61241-0, EN 61241-1, EN 13463-1

7.3. Operating conditions

WARNING!

Heat sources and temperature fluctuations may cause malfunctions or leaks.

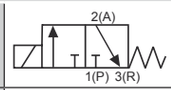
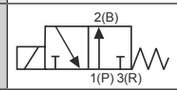
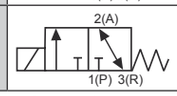
- If the device is used outdoors, do not expose it unprotected to the weather conditions.
- Avoid heat sources which may cause the allowable temperature range to be exceeded.

Ambient temperature:	-10 – +55 °C
Medium temperature:	
FKM	-10 – +100 °C (PA coil) -10 – +120 °C (Epoxid coil)
Media:	neutral gaseous and liquid media (e.g. compressed air, town gas, natural gas, water, hydraulic fluid, petrol, technical Vacuum), which do not attack body and sealing materials (see table of resistance)
Viscosity:	max. 21 mm²/s
Protection class:	IP65 in accordance with EN 60529 with cable plug

7.4. Mechanical data

Dimensions	See data sheet	
Body material	Type 6014:	Brass, Stainless steel 1.4305 Polyamide (PA, Flange)
	Type 6014P:	Brass, Polyamide (PA)
Hollow screw	Type 6014P:	Brass, nickel-plated Aluminium, anodized
Base plate	Type 6014P:	Aluminium, anodized IXEF
Sealing material	Type 6014:	FKM EPDM on request
	Type 6014P:	FKM

7.5. Fluidic data

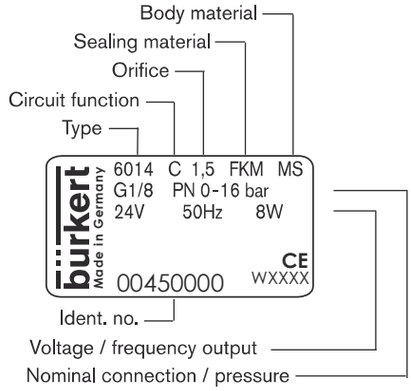
Circuit functions		
C (NC)		3/2-way valve, direct-acting, normal output A unloaded
D (NO)		3/2-way valve, direct-acting, normal output B pressurized
T		3/2-way valve, direct-acting, Universal valve

Tab. 1: Circuit functions

Pressure range	see type label	
Line connectors	Type 6014:	G1/8, G1/4, Flange
	Type 6014P:	G1/8, G1/4
	Hollow screw	G1/8, G1/4

Note the information specified on the type label for voltage, type of current, and pressure.

7.6. Type label (example)



7.7. Electrical data

Connections:	DIN EN 175301-803 Form A for cable plug Type 2508
Supply voltage:	24 V DC ± 10 % - max. residual ripple 10% 24 V / 50 Hz 230 V / 50 Hz
Voltage tolerance:	± 10%
Nominal output: Impulse version	8 W 7 W
Nominal operating mode:	100% continuous operation
for block installation	5 W continuous operation on request 8 W intermittent operation 60% (30 min)

Note the information specified on the type label for voltage, type of current, and pressure.

8. INSTALLATION

8.1. Safety instructions

DANGER!

Risk of injury from high pressure in the equipment!

- Before loosening the lines and valves, turn off the pressure and vent the lines.

Risk of injury due to electrical shock!

- Before reaching into the system, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

WARNING!

Risk of injury from improper installation!

- Installation may be carried out by authorized technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and an uncontrolled restart!

- Secure system from unintentional activation.
- Following installation, ensure a controlled restart.

MAN 1000010024 ML Version: I Status: RL (released | freigegeben) printed: 04.08.2011

8.2. Fluid installation

DANGER!

Risk of injury from high pressure in the equipment!

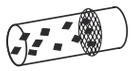
- Before loosening the lines and valves, turn off the pressure and vent the lines.

Installation position: any, actuator preferably upwards.

Procedure:

→ Before installation, clean any possible dirt off the pipelines and flange connections.

→ If required, install a dirt trap to prevent malfunctions.



Mesh size:
0.2 – 0.4 mm

Pay attention to the flow direction of the valve.
from 1(P) → 2(A) (CF C) or
from 1(P) → 2(B) (CF D)

Valve with threaded connection:

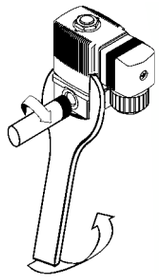
→ Use PTFE tape as sealing material

NOTE!

Caution risk of breakage!

- Do not use the coil as a lifting arm.

→ Hold the device with a suitable tool (Open-end wrench) on the body and screw into the pipeline.

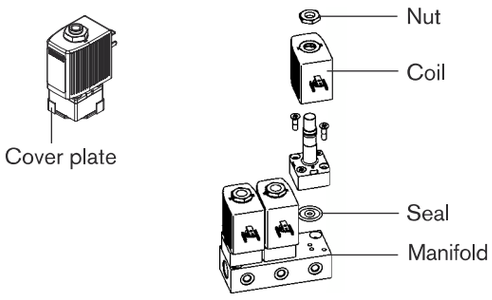


Valve with flanged connection:

→ Remove the cover plate.

→ Loosen the nut on the coil and remove coil.

open printversion



WARNING!

Danger – escaping medium!

Leaking connections if seals not seated properly, if manifold uneven or if surface quality of the manifold inadequate.

- Make certain the seals included with delivery are properly seated in the valve.
- Ensure that the manifold is even.
- Ensure that the surface quality of the manifold is adequate.

→ Insert the seal into the body.

→ Screw the body onto the manifold (Tightening torque: max. 1.5 Nm).

→ Attach the coil and screw on the nut (Tightening torque: max. 5 Nm).

8.3. Connection of the cable plug

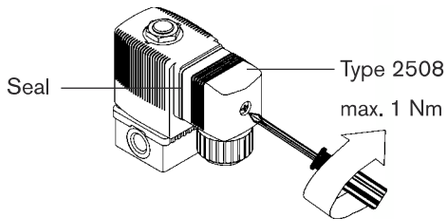
WARNING!

Risk of injury due to electrical shock!

- Before reaching into the system, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

If the protective conductor contact between the coil and body is missing, there is danger of electrical shock!

- Always connect protective conductor.
- Check electrical continuity between coil and body.

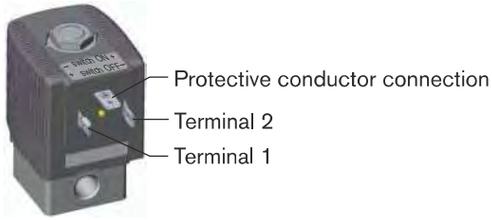


Note the voltage and current type as specified on the type label.

Control of pulse version

Correct polarity is essential to ensure that the device functions: Note identification on the upper side of the coil.

Pulse duration at least 50 ms.



Polarity	Specifications	Terminal connections
- Switch ON +	Valve (P seat) will be opened	(+) on terminal 2, (–) on terminal 1
+ Switch OFF -	Valve (P seat) will be closed	(+) on terminal 1, (–) on terminal 2

Tab. 2: Control of pulse version

Use only device socket without electrical wiring for pulse versions.

8.4. Rotation of coil

WARNING!

Risk of injury due to electrical shock!

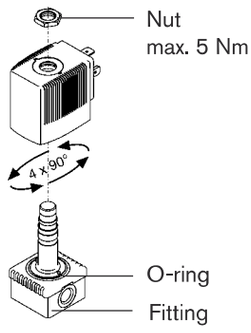
If the protective conductor contact between the coil and body is missing, there is danger of electrical shock!

- Check protective conductor contact after installing the coil.

Overheating, Risk of fire

Connection of the coil without pre-assembled valve will result in overheating and destroy the coil.

- Connect the coil with assembled fitting only.



The coil can be turned by 4 x 90° (for block installation only 2 x 180°).

→ Loosen nut

→ Turn coil

→ Tighten nut with suitable tool (Open-end wrench) (max. 5 Nm).

MAN 1000010024 ML Version: I Status: RL (released | freigegeben) printed: 04.08.2011

open printversion

9. MAINTENANCE, TROUBLESHOOTING

9.1. Safety instructions

DANGER!

Risk of injury from high pressure in the equipment!

- Before loosening the lines and valves, turn off the pressure and vent the lines.

Risk of injury due to electrical shock!

- Before reaching into the system, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

Risk of burns/Risk of fire if used continuously through hot device surface!

- Keep the device away from highly flammable substances and media and do not touch with bare hands.

WARNING!

Risk of injury from improper maintenance!

- Maintenance may be carried out by authorized technicians only and with the appropriate tools!

Risk of injury from unintentional activation of the system and an uncontrolled restart!

- Secure system from unintentional activation.
- Following maintenance, ensure a controlled restart.

9.2. Malfunctions

If malfunctions occur, check

→ the line connectors

→ the operating pressure

→ the supply voltage and valve control

If the valve still does not switch, please contact your Bürkert Service.

MAN 1000010024 ML Version: I Status: RL (released | freigegeben) printed: 04.08.2011

10. DISASSEMBLY

10.1. Safety instructions

DANGER!

Risk of injury from high pressure in the equipment!

- Before loosening the lines and valves, turn off the pressure and vent the lines.

Risk of injury due to electrical shock!

- Before reaching into the system, switch off the power supply and secure to prevent reactivation!
- Observe applicable accident prevention and safety regulations for electrical equipment!

WARNING!

Risk of injury from improper disassembly!

- Disassembly may be carried out by authorized technicians only and with the appropriate tools!

10.2. Disassembly

→ Turn off the pressure and vent the lines.

→ Switch off the power supply.

→ Loosen the cable plug.

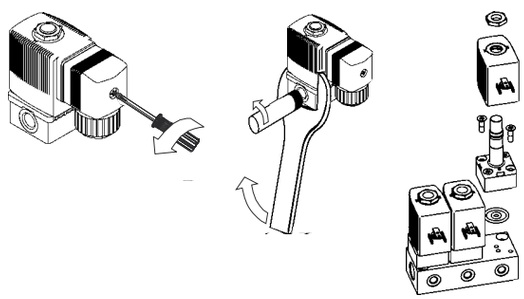
Valve with threaded connection:

→ Hold the device with a suitable tool (Open-end wrench) on the body and screw off the pipeline.

Valve with flanged connection:

→ Loosen the nut on the coil and remove coil.

→ Loosen the body from the manifold



open printversion

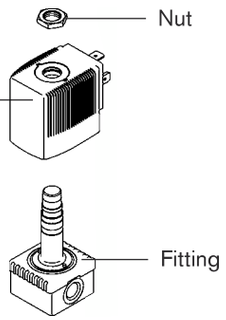
11. SPARE PARTS

CAUTION!

Risk of injury and/or damage by the use of incorrect parts!

Incorrect accessories and unsuitable spare parts may cause injuries and damage the device and the surrounding area.

- Use only original accessories and original spare parts from Bürkert.



Coil and fitting can be ordered complete by quoting the identification number of the device.

(see type label)

Wearing part set on request.

12. PACKAGING, TRANSPORT, STORAGE, DISPOSAL

NOTE!

Transport damages!

Inadequately protected equipment may be damaged during transport.

- During transportation protect the device against wet and dirt in shock-resistant packaging.
- Avoid exceeding or dropping below the allowable storage temperature.

Incorrect storage may damage the device.

- Store the device in a dry and dust-free location!
- Storage temperature: -40 - 80 °C.

Damage to the environment caused by device components contaminated with media.

- Observe applicable regulations on disposal and the environment.

MAN 1000010024 ML Version: I Status: RL (released | freigegeben) printed: 04.08.2011

INDEX

1
2
3
4
5
6
7
8
9
0

Please note:

Compressed air contains liquid and solid foreign particles that may have influence on the function of pneumatic control valves. A purification of the compressed air is an indispensable requirement.

Installation:

- Install maintenance unit into the horizontal air pipe with G 1/4"-screwed joint with straight up hand wheel
- Mind correct stream direction (arrows)
- Use PTFE-ribbon for tightening

Adjustment:

- Prior to operating the pressure reducer must be relieved by turning out the adjusting screw
- Turn the adjusting screw clockwise until the pressure gauge indicates the desired operating pressure

Remark: *The pressure reducer is equipped with a resetting control. The output pressure can be reduced by turning the adjusting screw without air consumption.*

Maintenance:

- Drain condensate daily
- Clean filter regularly:
  - Loosen screw connection
  - Remove container
  - Remove fastening nut from sinter filter
  - Take out filter
  - Clean filter in cleansing agent and dry well
  - Reinstall maintenance unit

Technical data:

Primary pressure:	max. 10 bar
Operating pressure:	adjustable 10...80% of the primary pressure
Pressure gauge range:	0...2,5 bar (type 394 150)
	0...6,0 bar (type 394 151)
	0...10,0 bar (type 394 152)
Filter pore size:	50...75 µm
Connection:	G 1/4" female thread
Operating temperature:	0...50°C

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Installation:

Warning: *- Installation, operation and maintenance should be done only by qualified personnel.*
- Disconnect supply voltage before working on the valve and make sure, that it is impossible to switch the power on unintentionally (death and injury hazards)
- It is not permitted to work on the valve body and to exchange the actuator as long as the valve is subjected to pressure and temperature.
- Crushing and injury hazard because of rotating and moving parts

The mounting site should be easily accessible and have sufficient clearance for maintenance and for removing the actuator. Ensure that the pipe line axes are flush and connection flanges are parallel. Provide suitable measures to absorb possible tensile and pressure forces. The valve must not serve as a fixed point.
It must be carried by the piping.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position should be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing). Observe a 10 x DN spacing to flanges, elbows, etc., to avoid an impaired valve function.

Remove flange covers before the installation. Use suitable handling and lifting equipment for installing the valve (see corresponding data sheet for the weights).

Regard the permitted max. operating pressure and temperature as described in the corresponding valve data sheet.

Observe the ambient temperature limits (-20...+60°C)

For higher temperatures insulate the pipeline, provide conductive plates or cooling possibilities.

When using valves outdoors, in environments with high temperature fluctuations or high humidity or by temperatures near or below the freezing point, we suggest a heating resistor be fitted to prevent the buildup of condensation within the enclosure.

If the valves are installed outdoors, check the correct assembly of the actuator hood, specially the gaskets.
By direct climatic influences an additional coverage or best-case a housing as protection for the actuator is necessary.

Retighten the screws of all flange connections (also cover and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

Electrical connection:

Check supply voltage according to the rating plate, loosen screws on the actuator hood and remove hood.

Route signal and control lines separately from high-voltage lines, if necessary, run in screened cables.
Insert cables (1.5 mm²) through a twisting sleeve or cable gland.

Perform electrical connection with the supply voltage switched off according to the connection diagram (observe VDE, EVU and regional electrical regulations).

In the event of deviations, the connecting diagram in the actuator hood has precedense.

Maintance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also cover and connection piece flanges), the valve cone should be located in the centre.

Warning: *- Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean it in order to protect stuffing boxes and PTFE-V-rings against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with PTFE-V-rings or bellows.

Undertake maintenance on the actuator in accordance with the corresponding information in the separate operating instructions.

open printversion

Attention:

- Adjustment of and work on the actuator may only be done by skilled labour
- Disconnect power supply before removing the cover
- Observe local instructions and terminal diagram

Actuator disassembly:

- disconnect supply
- loosen fixing screw (21) (see Fig.1)
- unscrew coupling nut (19)
- unscrew nuts (18)
- take off actuator from valve connection

Actuator assembly:

- lift actuator onto valve connection and secure nuts (18) (see Fig.1)
- tighten (19) coupling nut and fixing screw (21)
- connect lines acc.to wiring diagram
- if necessary, move actuator in both limit positions and adjust stroke indikators (17) on mounting rod

Maintenance: the spindle has to be kept cleen and lubricated, if necessary, lubricate the spindle with molykote including grease

Limit switches:

Attention! *The limit switches work load dependent and turn off automatically when the valve drives in end position, so that a readjustment, as for travel dependent limit switches, is not necessary and not allowed. Change of the factory adjustment endangers correct operation, no warranty will be given and no liability will be accepted in case of damage of the varnish sealing.*

If for extraordinary reasons, for instance by previous damages, a readjustment is exceptionally necessary, the actuator should preferably be sent in for new factory adjustment. Only if this is exceptionally not possible, a new coarse adjustment can be directly done, with our agreement and acc. to the following operating instruction.

Special information for actuators with integrated positioner:

No reaction of limit switch can occur when the positioner turns off the actuator to early, before the valve is in the end position. Don't readjust limit switch in this case, control at first adjustment of positioner and correct it if necessary.

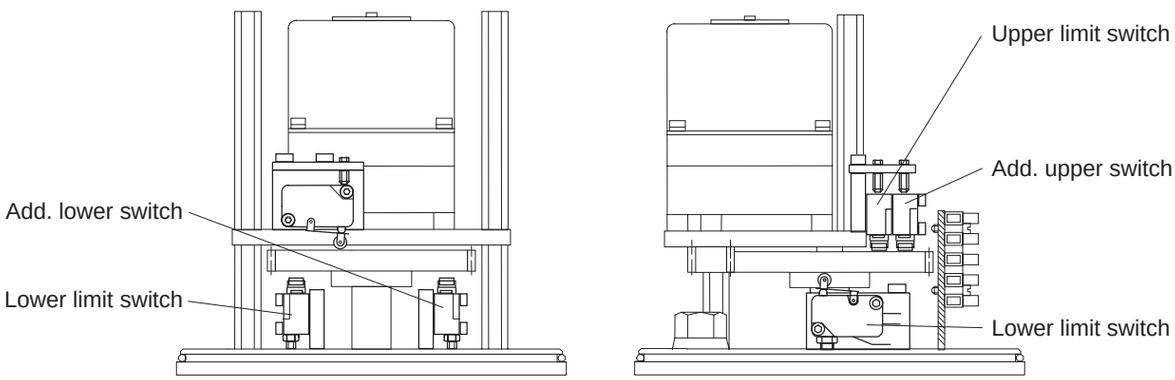


Fig.1

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

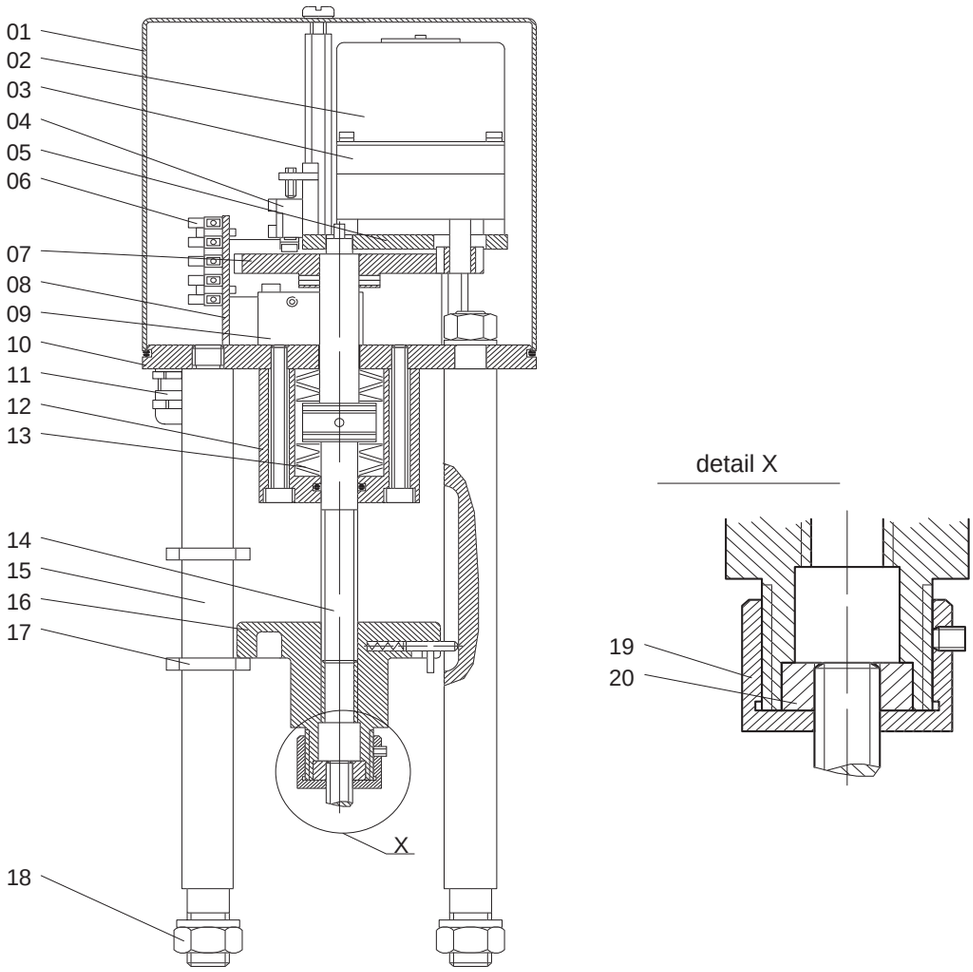


Fig.2

No.	Designation	Part-No.
01	Bonnet: 2kN / 4kN	e3h136 / e3h180
02	Motor 230V / 50/60Hz: 2kN / 4kN***	e2m220 / e2m220.4
02a	Capacitor: 2kN / 4kN	e2k033 / e2k068
03	Gear: pos. speed 3,3s/mm / pos. speed 2,2s/mm	e2g1875 / e2g1250
04	Limit switch for spindle position "down"	eheo
05	Mounting plate for motor	e3zp
06	Terminal bar	e6k12
07	Gear wheel	e3zr75
08	Mounting plate with wiring diagram	e3hb
09	Limit switch for spindle position "up"	eheu
10	Base plate	e3gp
11	Screw-type cable bushing PG11	e1kv11
12	Spring housing	e3fg
13	Set of disc springs	e5ft355+e5fs335
14	Spindle	e3s
15	Mounting rods	e3s... / e3s...n
16	Hand wheel with blocking lever	ehhr
17	Stroke indicator	e5ak
18	Hexagonal nut M16	e8mv16
19	Coupling nut	e5vk
20	Screw collar ring	e3sr...

*** = only for standard actuator: voltage 230V / 50/60Hz

open printversion

1 Fuses for drive motor
2 Relays with LED function indication (relay 3* without LED)
3 Coding switch for range settings, direction of control action and sensitivity
4 Push button for starting automatic regulating distance adjustment
5 Status-LED
6 Error-LED Profibus*
7 Coding switches bus address Profibus*
8 Connection for service interface, external display
9 Switch termination resistors Profibus*
10 Terminals for bus line Profibus*
11 Terminals for signal output
12 Terminals for feedback potentiometer and actuating signal (wired internally)
13 Terminals for mains voltage and actuating output for actuator (wired internally)

Description

The position controller converts an incoming actuating signal into the associated drive position by comparing the signal with the position feedback from a potentiometer built into the drive, and by setting the drive position via relays 1 and 2. An output signal 4..20 mA for position feedback is in the standard equipment. Optionally, an additional contact with regard to the actuator position is possible, for example for the limitation of the valve travel to a minimum or maximum opening degree.

The automatic and maintenance-free device is integrated into the actuator. All main basic parameters for range, operating direction and sensitivity are set via coding switches. Optionally, various interfaces to higher-level master computers or PLCs are available, both for data acquisition or remote maintenance purposes and for executing digital control commands.

The device is only accessible once the drive cover has been removed. Commissioning only consists of checking the settings and a single activation of the adjustment button; an LED indicates completion of the automatic adjustment to the end positions. The device is then ready for operation.

Type summary	**Li.no.**
Basic unit	**49sr5**
Additional fittings:	
Extra voltage (1=115V AC, 2=24V AC, 8=24V DC), others on request	**49sr5_ ..**
Position feedback output 0..10V instead of 4..20mA	**49sr5.k**
Interface RS485, protocol 2.0	**49sr5.s**
Profibus DP interface	**49sr5.sp**
Additional contact (potential free N.O. 250V, 2A)	**49sr5..1**
Mobile display and control unit	**49sr59z**

* = available depending on type

open printversion

Description

The option additional contact contains of an additional relay with a potential-free normally open contact. This can be used for minimum or maximum stroke limitation of the control valve or for signal purpuses. The operating direction and the switching point are adjustable, also preadjusted on custumer's demand.

Putting into operation

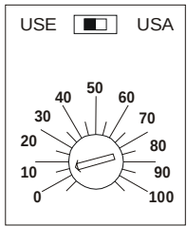
Before putting into operation the correct wiring and adjustments (see next chapter) are to be checked.

Hint: Before activating the automatic regulating distance adjustment the switching point of the additional contact is to be adjusted to 0% (US A) or 100% (US E). Otherwise the full regulating range cannot be driven!

Adjustments

Switching point:

adjustable to 0 ... 100 %,
referring to valve position

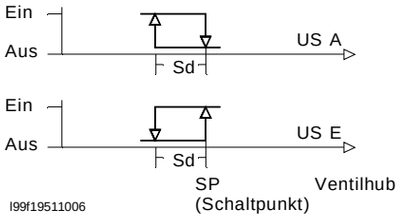


Operating direction:

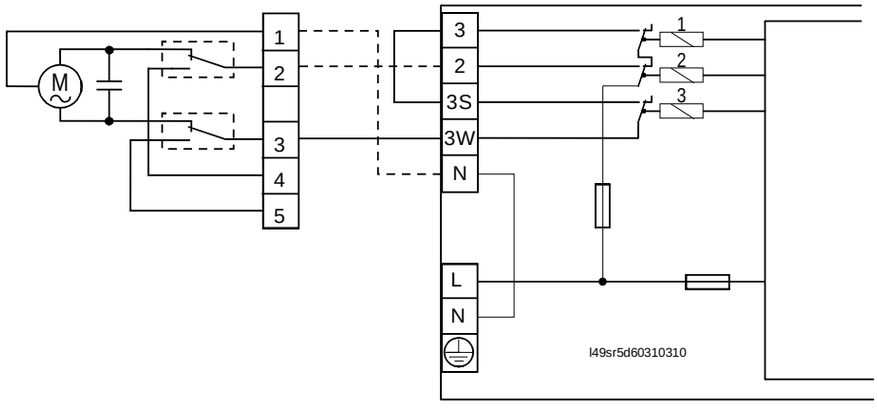
adjustable, alternatively:

US A: Relay switches off in case of rising valve stroke

US E: Relay switches on in case of rising valve stroke



Installation example for minimum stroke limitation with three-way-valves
(straight way is closed when the spindle is in the upper position)



INDEX
1
2
3
4
5
6
7
8
9
0

Commissioning

Prior to commissioning, the mechanical setting of the potentiometer in the drive should be checked and corrected if necessary!

During commissioning, first check the settings of the coding switches for input signal, operating range and signal flow direction.

Then press the push button for the automatic regulating distance adjustment for 5 seconds. The actuator then consecutively drives to both end positions, and the positioner adjusts itself automatically.
Two LEDs indicate the function of the relay.

During the adjustment, the status LED flashes every 3 seconds. As soon as the adjustment process is complete, the LED changes to continuous light, thus indicating normal operating status.

Rapid flashing (1 second cycle) indicates a fault at the measuring inputs (feedback / control signal). Details can be displayed via an additional display and control unit or read via an interface and external software, e.g. PKS.

Status indicator

Status LED:	
Continuous light	Normal function
Flashing, 3s	Adjustment process running
Flashing, 1s	Fault at the measuring inputs

Settings

Range:	*Position of coding switches 1 to 3:*
0...20mA / 0...10V	000
4...20mA / 2...10V*	100
0...10mA / 0...5V	010
4...12mA / 2...6V	110
10...20mA / 5...10V	011
12...20mA / 6...10V	111

Response sensitivity:	*Position of coding switch 4:*
normal*	1
reduced	0

Operating direction	Position of coding switch 5:
direct*	0 for three-way mixing valves (closed position upwards) 1 for straight-way valves resp. three-way diverting valves (closed position downwards)
inverse	1 for three-way mixing valves (closed position upwards) 0 for straight-way valves resp. three-way diverting valves (closed position downwards)

open printversion

direct: increasing input signal opens the straight way,
inverse: increasing input signal closes the straight way.

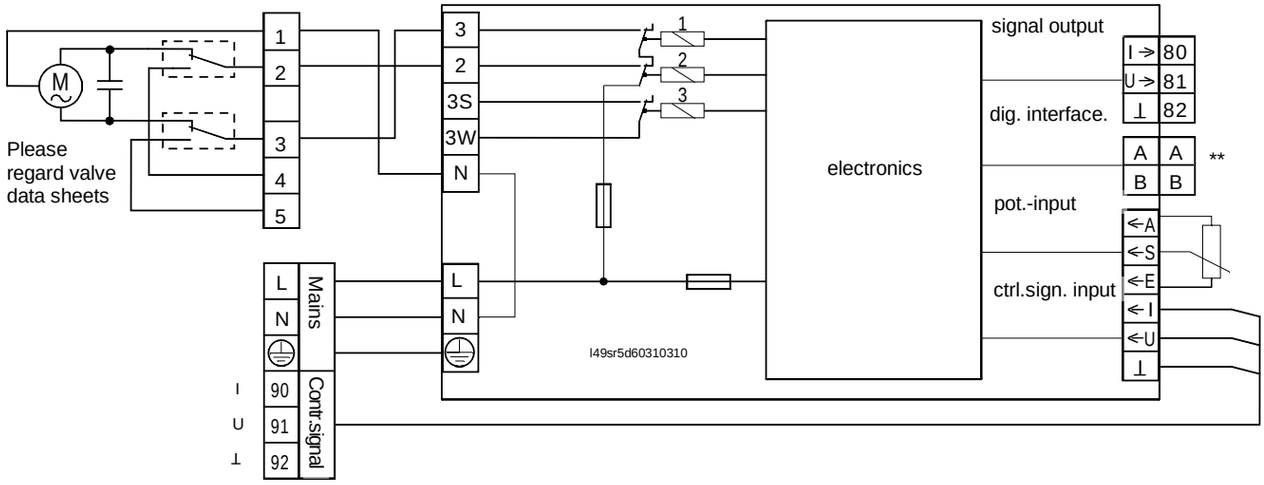
(= factory setting)*

INDEX

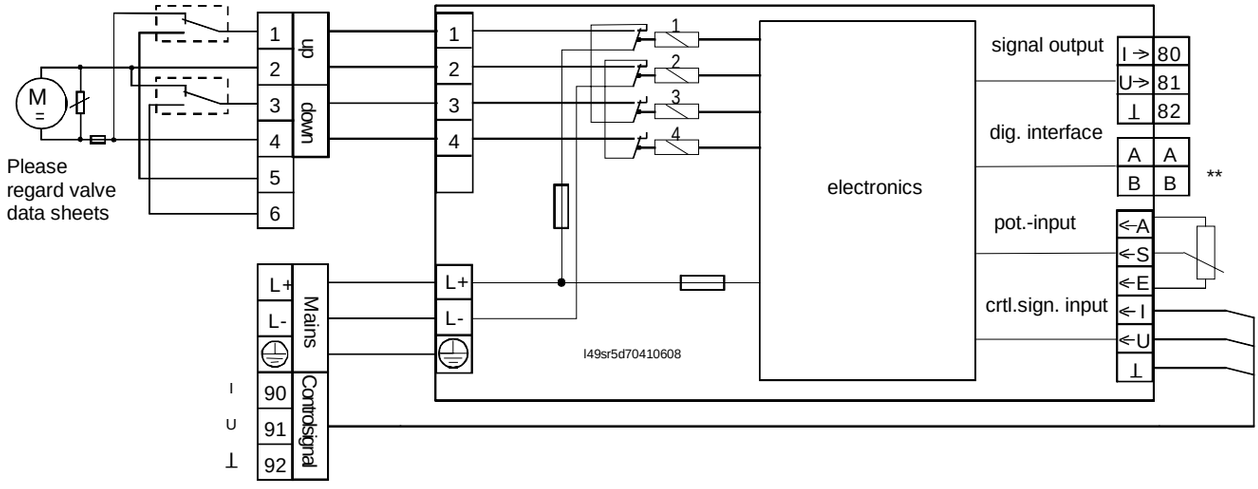
Technical data:

Input (adjustable):	0...20mA / 0...10V 4...20mA / 2...10V 0...10mA / 0...5V 4...12mA / 2...6V 10...20mA / 5...10V 12...20mA / 6...10V
Response sensitivity:	switchable normal / reduced
Output:	up to 4 relays, max. 250V, 2 A 4..20mA for position feedback, load imp. < = 500 Ohm, alt. 0..20mA optional 0 .. 10 V, load impedance > 500 Ohm, alt. 2..10V
Operating direction (adjustable):	direct: increasing input signal opens the straight way, inverse: increasing input signal closes the straight way
Status indicator:	1 status LED for adjustment procedure, normal operation, fault 2 LEDs for function display relay 1 and 2; 1 fail.- LED Profibus(opt.)
Mains connection:	230V +/- 10 %, 48...62Hz, approx. 3VA alternatively 115 V, other voltages on request
Optional interfaces:	RS 485 / 2.0 protocol, Profibus DP, others
Permissible ambient temp.:	0...60°C, nominal temperature: 20°C

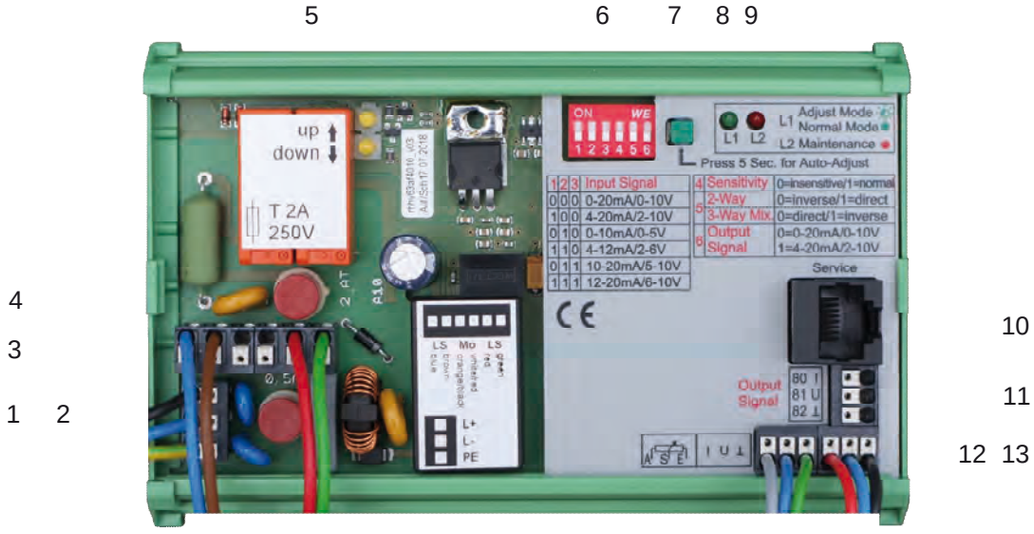
Internal function and connections 230V / 115V / 24V AC*: Positioner 49sr5



Internal function and connections 24V DC*: Positioner 49sr58



* Example, depending on sub type some details can be missed. The wiring diagram glued into the bonnet is only valid for each delivered controller.
** The shield must be connected positioner sided on a large contact area to the ground potential cable clamp.



1 connection mains voltage*
2 fuses for electronics
3 connection limit switch and drive motor*
4 fuse for drive motor
5 relays with status LEDs
6 coding switch for input and output section, direction of action and sensitivity
7 button for start of automatic travel adjustment
8 status LED
9 maintenance LED
10 connection for service interface, external operating unit
11 connection signal output
12 connection feedback potentiometer*
13 connection drive signal*
* =internal wiring

Description

The positioner turns an incoming drive signal into the correct drive position by comparing the signal with the position feedback of a potentiometer which is installed in the drive and adjusting the drive with the up and down relays. There is a signal for travel feedback 0/4..20 mA / 0/2..10 V by default. Optionally, an additional contact relative to the actuator position is possible, e.g. to limit the valve stroke to a min. or max. opening degree. The device is integrated in the drive free of maintenance or operation. All important basic settings for direction of action and sensitivity are specified by way of the coding switches. Communication with leading systems is also possible via bus adapter, e.g. for Profinet KFM item nr. 99spne.., for data acquisition or remote maintenance purposes as well as for the execution of digital positioning commands.

The commission (if necessary, please refer page 3) consists merely of a check of the settings and a single operation of the calibration key. After this a LED will show if the automatic adjustment of the final positions is finished. Subsequently the device is ready for use.

Predictive Maintenance:

For predictive maintenance of the actuator, a signal is output by LED if the previous use of relays (switching operations) or of the spring assembly (approach of the end positions) requires a check of the drive.
The wear status of the actuator can be read with the PC software PKS at any time, as well as the history of setpoint, actual value and potentiometer setting which are saved in the integrated datalogger.

Type list	**Li.Nr.**
Basic model	**49sr7**
Extras:	
Special voltage (1=115 V AC, 2=24V AC, 8=24V DC), others on request	**49sr7_ ..**
Additional contact (Relays, potential free NO contact 250V, 2A)	**49sr7..1**
Mobile operating unit	**49sr79z**

INDEX

1
2
3
4
5
6
7
8
9
0

Description

The version with additional contact contains an additional relay with potential free NO contact. This can be used to limit the valve stroke or as a signal contact. Direction of action and switching point are adjustable, optionally factory pre-set and wired.

Commissioning

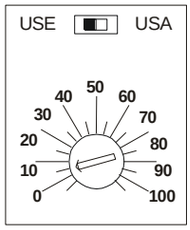
Before commissioning, the wiring (please refer below) as well as the required settings for direction of action and switching point have to be checked.

Hint: Before activating the automatic stroke compensation, set the switching point of the additional contact to 0% (US A) or 100% (US E), otherwise the full setting range will not be passed through!

Settings

Switching point:

Adjustable 0 ... 100 %,
referring to valve stroke

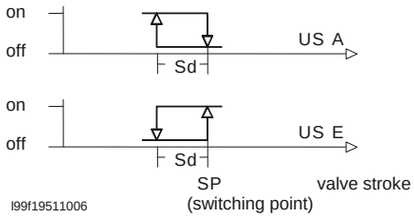


Direction of action:

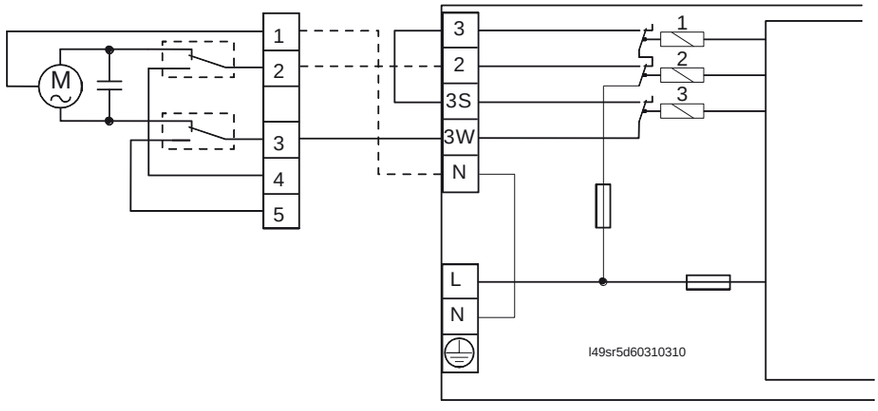
Adjustable, alternative:

US A: relay turns off while increasing valve stroke

US E: relay turns on while increasing valve stroke



Wiring example for minimal stroke limitation of three-way valves
(straight passage closes at spindle in upper end position)



Commissioning

Hint: Motor control valves with positioner are configured at factory (and adjusted to the travel) according to the order specifications before delivery. If the parameterization is not changed, a new automatic adjustment is not necessary.

Check mechanical setting of the potentiometers in drive before commissioning !

The settings of coding switches for input/output signal, operating range and direction of action have to be checked before commissioning.

Afterwards press the button for automatic travel adjustment for 5 seconds. The drive will go one after another to both end positions and sets itself up.
Two LEDs show the actual status of the relays.

The status LED flashes in 3-second intervals during the adjustment. As soon as the adjustment is completed, the LED lights up continuously.

Fast flashing (1 sec- intervals) signals an error at the measuring inputs (power / voltage).
Details can be shown by an additional operating device or via external KFM software e.g. PKS.

Operating program PKS
With the KFM software PKS it is possible to read out the wear status of the actuator (switching cycles of the relays, number of operations up to the end position) and the memory of the integrated datalogger (history of actual values, set values and potentiometer positions. The datalogger information can be saved as *.csv-file which is editable with e.g. Microsoft Excel.

Operating display

Status – LED (green):

Continuous	Normal operation
Flashing, 3s intervals	Adjustment in progress
Flashing, 1s intervals	Error at the measuring inputs

Maintenance – LED (red):

Continous	Due to the previous use of the relays (switching cycles) or of the spring assembly (approach of the end positions), a revision is recommended.

Settings

Input range:	*Position code switch 1 to 3:*
0...20mA / 0...10V	000
4...20mA / 2...10V*	100
0...10mA / 0...5V	010
4...12mA / 2...6V	110
10...20mA / 5...10V	011
12...20mA / 6...10V	111

Response sensitivity :	*Position code switch 4*:
normal*	1
insensitive	0

Direction of action:	*Position code switch 5*:
direct*	0 for three-way mixing valves (close- position above) 1 for straight way valves or three-way diverting valves (close- position below)
inverse	1 for three-way mixing valves (close- position above) 0 for straight way valves or three-way diverting valves (close- position below)

direct: increasing input signal opens (straight) passage
inverse: increasing input signal closes (straight) passage.

Output range:	*Position code switch 6*:
0...20mA / 0...10V	0
4...20mA / 2...10V*	1

* = *factory setting*

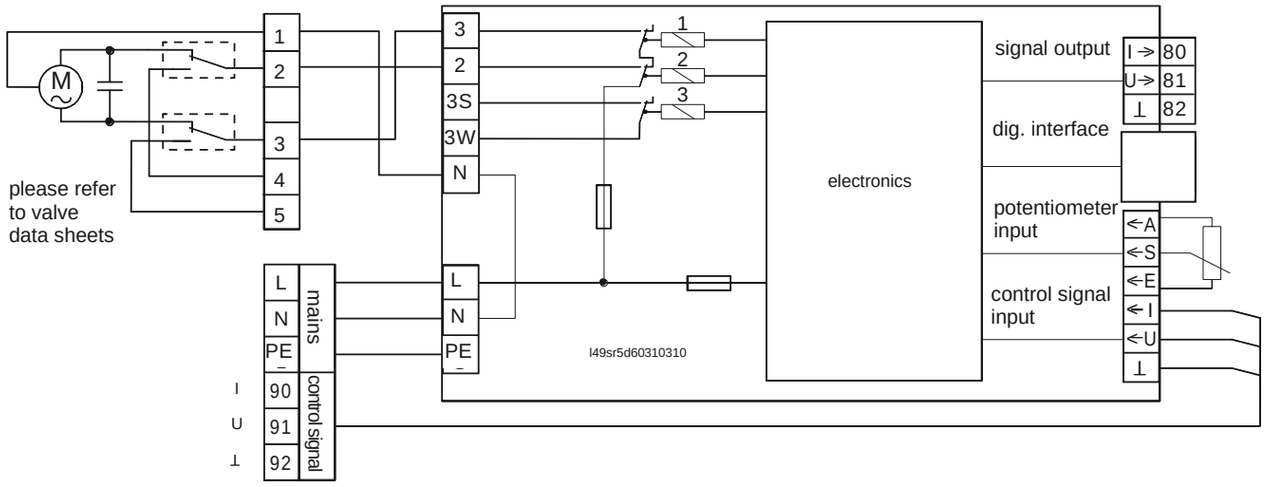
INDEX

1 2 3 4 5 6 7 8 9 0

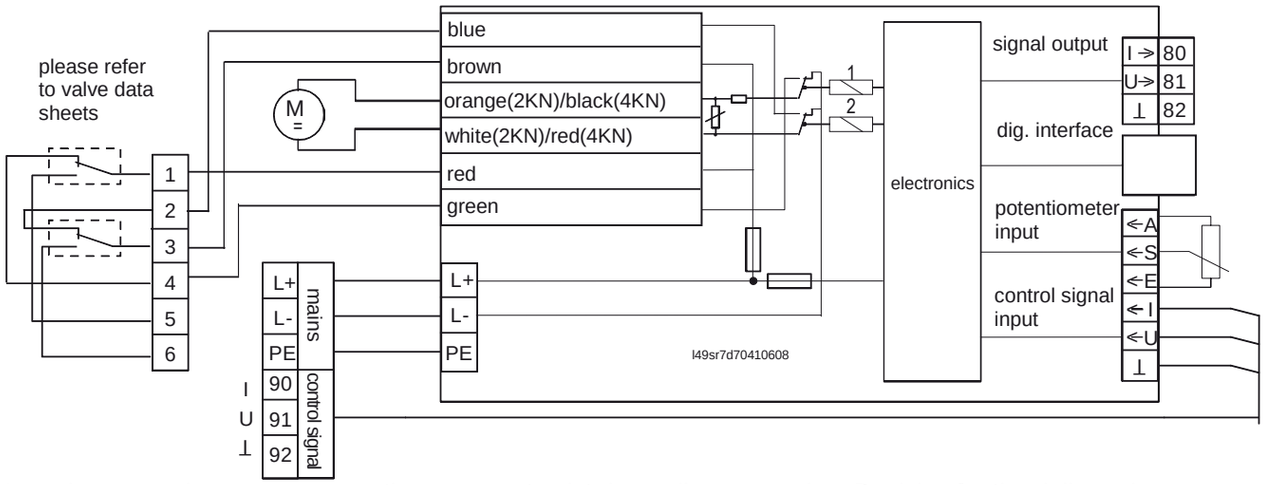
Technical data:

Input (adjustable):	0...20mA / 0...10V 4...20mA / 2...10V 0...10mA / 0...5V 4...12mA / 2...6V 10...20mA / 5...10V 12...20mA / 6...10V
Response sensitivity:	switchable normal / reduced
Output:	up to 4 relays, max. 250V , 2 A 0/4...20mA for position feedback, load < 500 Ohm, 0/2...10 V, load > 500 Ohm
Direction of action:	adjustable: *direct*: increasing input signal opens (straight) passage *inverse*: increasing input signal closes (straight) passage
Operating display:	2 status LEDs for adjustment, normal operation, error and maintenance 2 (3) LEDs for function display relays 1 and 2 (3)
Mains connection:	230V +/- 10 %, 48...62Hz, approx. 3VA alternative 115V/24V AC or 24V DC, other voltages on request
Interface:	service interface KFM 2.0 RJ45 (socket)
Allowed ambient temperature:	0...60°C, nominal temperature 20°C

Connection and operating scheme 230V / 115V / 24V AC*: positioner 49sr7



Connection and operating scheme 24V DC*: positioner 49sr78



* maximum version, some connections may not exist depending on version. Decisive for the delivered version is the connection diagram on the device.

Hint: Control signals must be shielded, maximum cable length 30 meters.

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Installation:

Attention!: - *Installation, operation and maintenance should be done only by qualified personnel.*
- *Release the operating mechanism before working on the valve.*
- *It is not permitted to work on the valve body and to exchange the operating mechanism as long as the valves are subjected to pressure and temperature.*

The mounting site should be easily accessible and have sufficient clearance for maintenance.
Ensure that the pipe line axes are flush and connection flanges are parallel.
Provide suitable measures to absorb possible tensile and pressure forces.
The valve must not serve as a fixed point. It must be carried by the piping.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale. If possible, provide a dirt trap in front of each control valve.

Installation position should be vertical to horizontal. Ensure that the installation direction is correct (directional arrows of the flow on the valve housing).

Regard the permitted max. operating pressure and temperatur as described in the corresponding valve specification sheet.

Retighten the screws of all flange connections (also lid and connection piece flanges) prior to commissioning/start-up and following initial heat-up.

For operating from a distance, a release cord (supplied by customer) should be fastened with the delivered spring hook on the toggle clamp lever.
Notice: The valves are delivered with unloaded spring, not ready for operation. For operation readiness after assembly, it is necessary to tighten the actuating spring as described below.

Operation:

Operation readiness: Hang out the spring hook with release cord and put the lengthening lever on the toggle clamp lever.

Push the toggle clamp lever acc. to tighten-direction arrow up to the snap point, to open the straightway (emergency stop valves) or to close the straightway (emergency outlet valves) and to tighten the actuating spring.

Attension: *Injury danger by emergency function release!*

Subsequent take off the lengthening lever and fasten the release cord with the delivered spring hook on the toggle clamp lever.

Emergency release: The actuating spring will open the straightway (emergency outlet valves) or close the straightway (emergency outlet valves) when the toggle clamp lever will be moved back from the snap point with the release cord.

After emergency release, it is necessary to tighten the actuating spring for operation readiness as described above.

Maintenance:

Following the initial temperature and pressure load, retighten the screws of all flange connections (also lid and connection piece flanges), the valve cone should be located in the centre.

Attention! *Never loosen the lid and flange screws as long as the fittings are subjected to pressure and temperature.*

Protect valve spindle against soiling, if necessary, clean and grease lightly in order to protect stuffing boxes and deflector hoods against increased wear.
Retighten stuffing box seals slightly in the event of leaks.
No further maintenance work is required for fittings with deflector hoods or bellows.

Occasionally lubricate the slide guide on the toggle clamp.

open printversion

Description

The valve has the job of ensuring that a minimum flow is maintained in a system even when all other routes are essentially closed. In normal operation it is closed, and only opens when the preset overflow pressure is exceeded.

The valve is a single-seating, two-way valve with spring loading. To the outside, the spindle is sealed by a stainless steel bellow that can absorb the full stroke. The cone is implemented as a control cone with a equal percentage characteristic. This avoids a sudden drop in the pressure when the valve opens.

Function:

Flow reaches the cone from underneath, and the overflow pressure, which depends on the tension set by the spring, pushes it upwards, so opening the passage.
The desired overflow pressure is adjusted by using a spanner to set the initial tension in the spring; it can be read from the scale on the side which covers a range from 1…4 bar (the factory setting is 2 bar).
The pressure setting is not an absolute value, but is the differential pressure between the inlet and outlet of the valve.

Assembly:

Attention:

- *Installation, operation and maintenance should be done only by qualified personnel.*
- *Release the regulating device before working on the valve.*
- *It is not permitted to work on the valve body and to exchange the regulating device as long as the valves are subjected to pressure and temperature.*

Installation position should be vertical (preferable) to horizontal.
Ensure that the installation direction is correct (directional arrows of the flow on the valve housing).
Regard the permitted max. operating pressure and temperatur as described in the corresponding valve specification sheet.
The mounting site should be easily accessible and have sufficient clearance for maintenance.
Ensure that the pipe line axes are flush and connection flanges are parallel. Provide suitable measures to absorb possible tensile and pressure forces. The valve must not serve as a fixed point.
It must be carried by the piping.

Clean pipelines thoroughly prior to installing the control valves in order to avoid damage through residual installation material, welding beads or forging scale.
If possible, provide a dirt trap in front of each control valve.

Retighten the screws of all flange connections (also lid and connection piece flanges) after initial heat-up and prior to commissioning / start-up.

Commissioning:

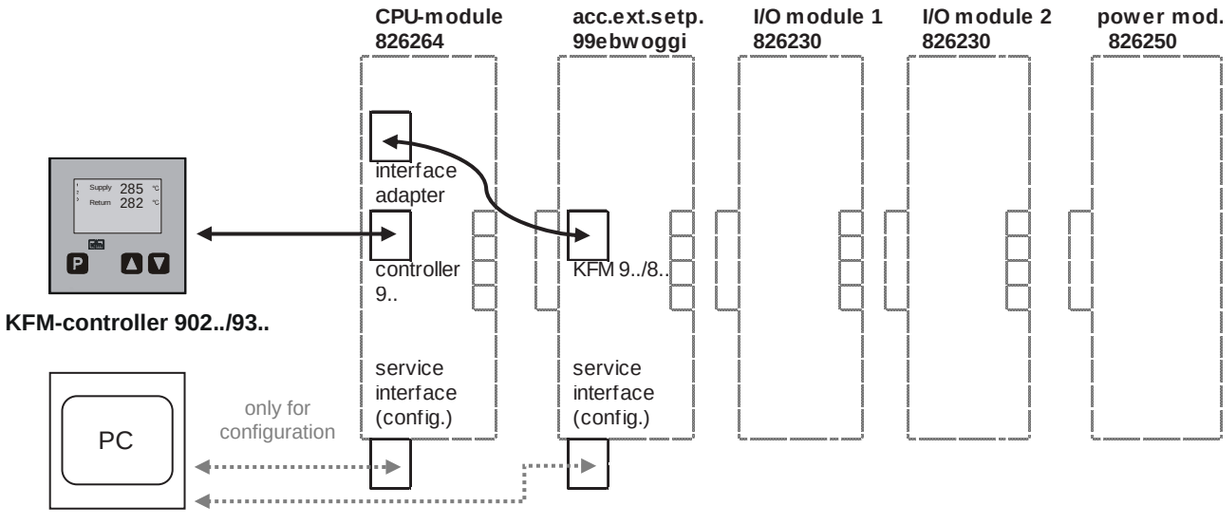
The valve was supplied with factory settings of either 2 bar or 1.5 bar. This setting must be checked in relation to the actual operating conditions found, and may need to be corrected.

The setting is changed using the adjusting screw. A size 17 spanner is required for this job. The adjusting screw causes the position of the upper spring plate to change, and so changes the initial spring tension. The setting can be read from the scale on the side (with a range from 1...4 bar). Turning to the left raises the trigger pressure, turning to the right lowers it.

The setting is correct when the valve is closed in normal operation (full rate of flow through the equipment), and only opens when the differential pressure exceeds the set value. If it is found that the factory setting is too low* (valve is continuously open), a higher value should be set. If the setting is too high (the valve either doesn't open, or opens too late as the differential pressure rises), a lower value must be set, although it must not be so low* that it remains open in normal operating conditions.
(* If the setting is too low, the flow can cause the cone to vibrate, and this can damage the valve!)

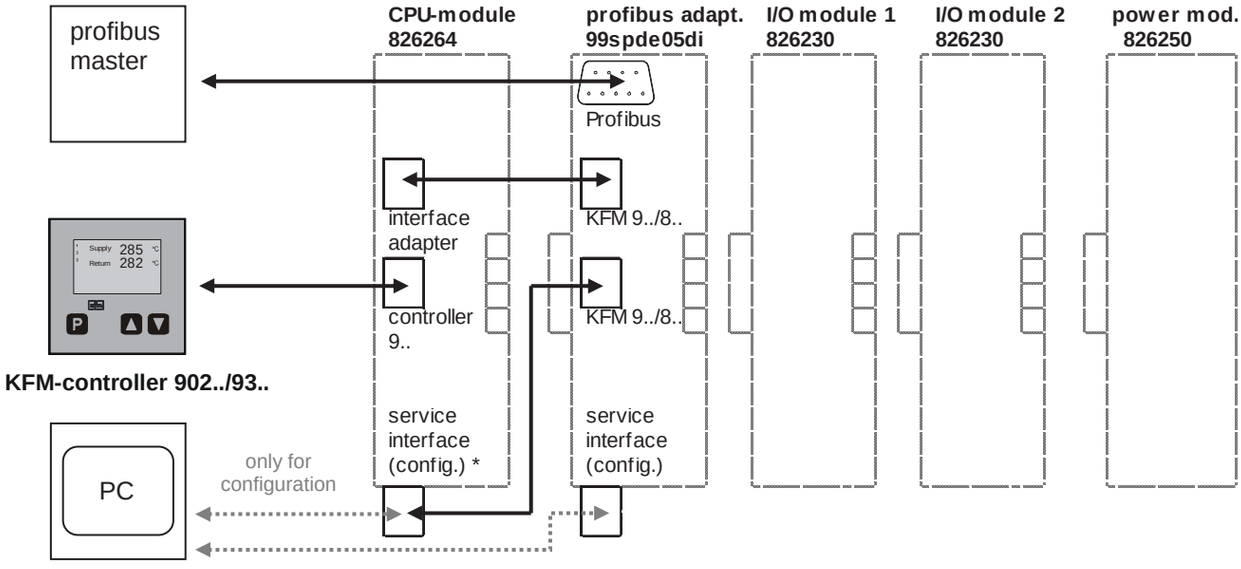
Example 1:

Fault detector (826624) with two I/O modules (826230) and plain text-messages on controller 902../93.., as well as accessory device for external setpoint and analogue signal outputs with power supply via internal bus connection (99ebwoggi).



Example 2:

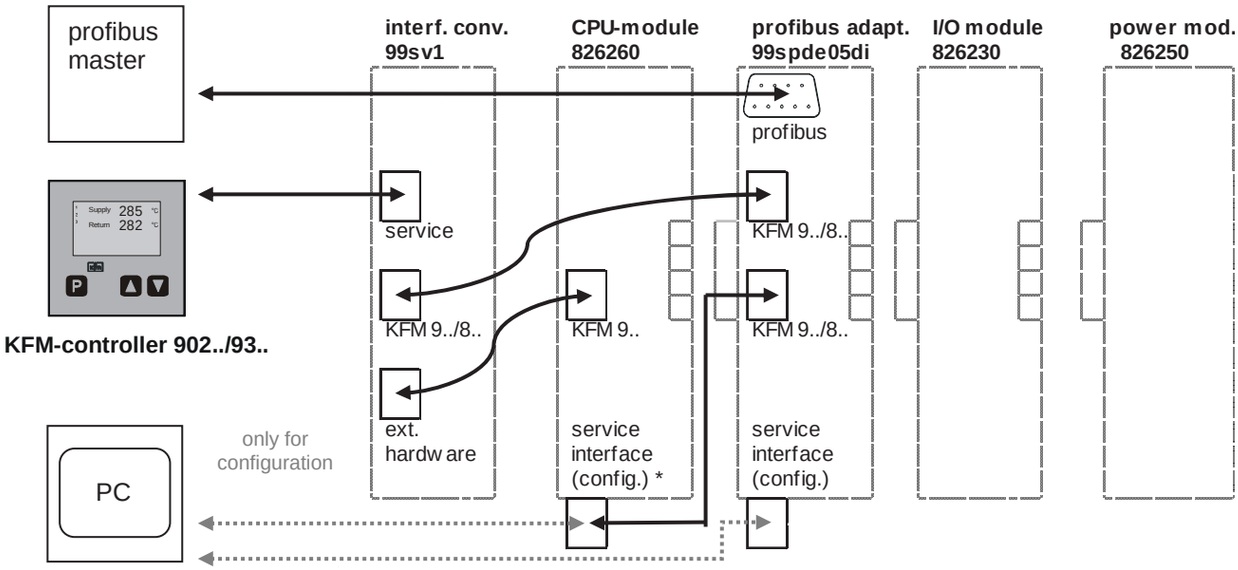
Identical as example 1- f**ault detector**, but instead of 99ebwoggi with profibus-adapter (99spde05di) for power supply via internal bus connection.



* The patch cable to the profibus adapter has to be removed prior configuration of the CPU-module.

Example 3:

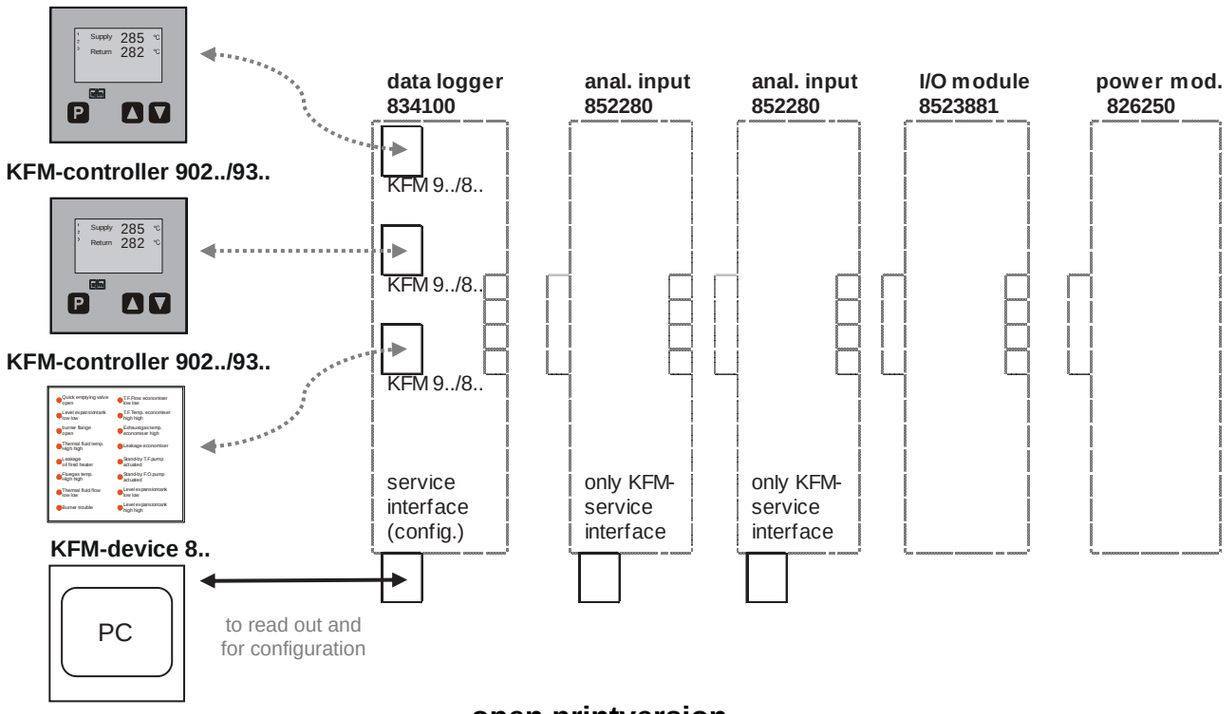
Identical as example 2- **fault detector** with profibus adapter, but with interface converter (99sv1) and simple CPU-module (826260).



* The patch cable to the profibus adapter has to be removed prior configuration of the CPU-module.

Example 4:

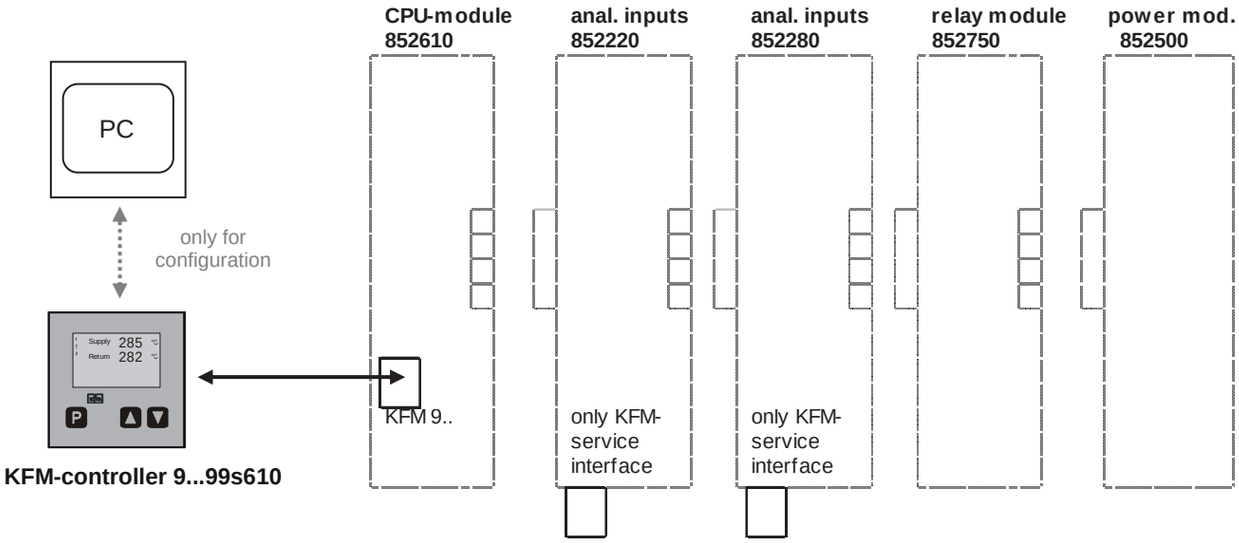
Data logger (834100) with two analogue input modules (852280) and one I/O module (8523881) for direct recording of analogue and binary data, independent from serial connected KFM-devices. In addition, data from 3 more KFM-devices can be recorded.



open printversion

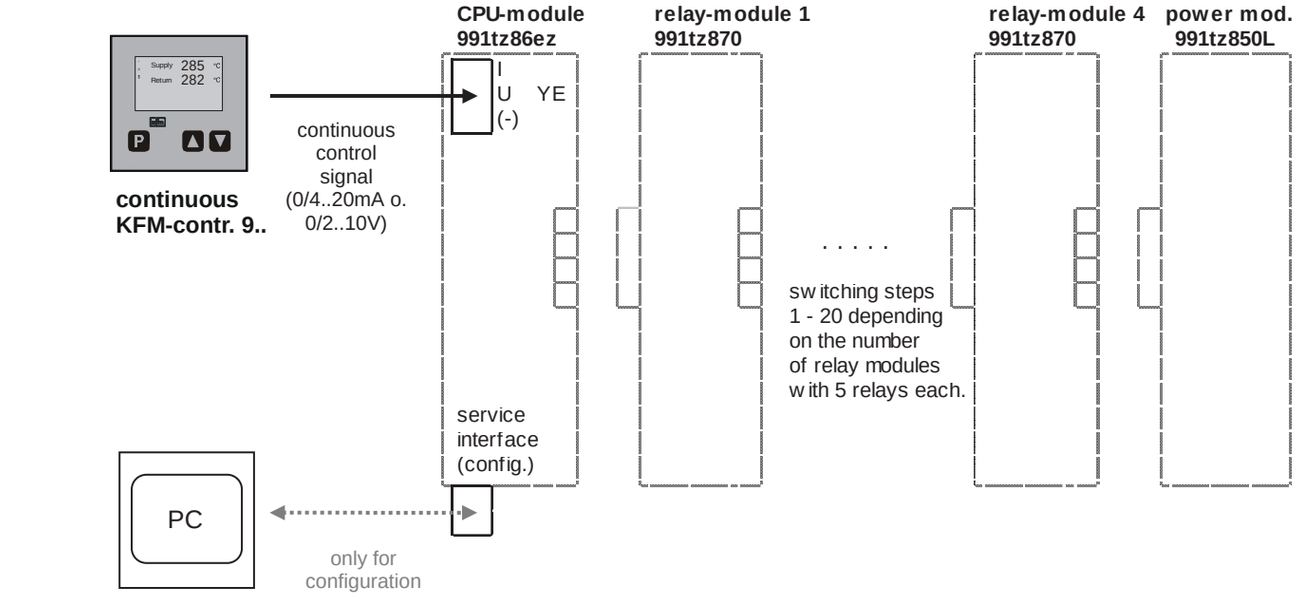
Example 5:

Modular **hardware-expansion modules** with hardware expansion adapter (852610) e.g. for additional analogue inputs (852220 / 852280) and relays (852750) etc., the optional hardware-expansion interface 99s610 is necessary at the controller-side.



Example 6:

Modular **step controller** with CPU-module (991tz86ez) and max. 4 relay modules (991tz870) with 5 relays each. Depending on the version, there is optionally a cyclic switching output on the power supply module (991tz850L) available.



open printversion

INDEX

1 Digital display of set value
2 Pushbuttons for adjusting the set values recessed and sealable
3 Internal reset pushbutton
4 LEDs for operating and error displays
5 Function check button

DIN assembly tests:

STB 1146 S	ref. DIN EN 14597
SIL2	ref. IEC 61508
CE 0045	ref. rule 97/23/EG, modul B and D

General:
Two-channel self-monitoring safety temperature limiter, constructed to meet the requirements for increased safety (DIN EN 14597, SIL 2).

The electrical safety circuit is switched off, i.e. opened, if the set value is exceeded or if there is a fault at the measurement input or in the device. A fault signal is also provided at the terminals. The limiter can only be unlatched manually after the fault has been rectified.

The Pt100 measurement input is of the 3-conductor type, so that compensation is automatically provided for cable resistances and intermediate explosion arresters.

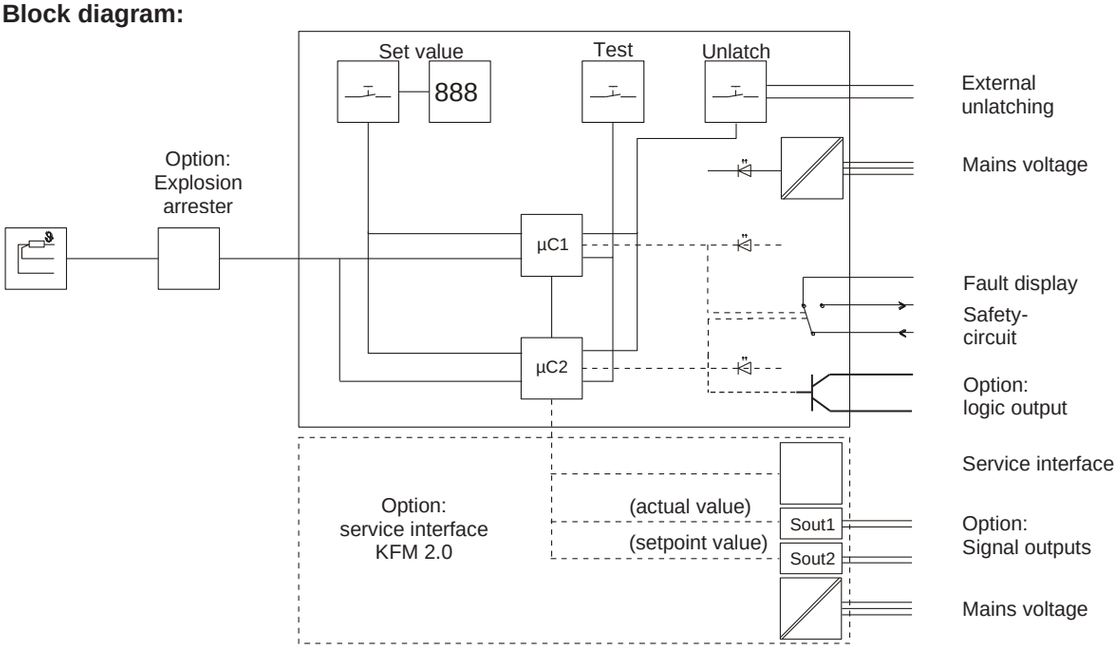
The device includes test buttons with which the specified annual function checks can be carried out very conveniently, without having to disturb the connected cables.

Actual- and setpoint value as well as the status of the relays can be transmitted by using the optional service interface (extra module), actual- and setpoint value can additionally be transmitted by optional signal outputs. In conjunction with external adapters also with Profibus, Modbus, Ethernet etc.

Models:

845 210	Model without display
845 220	Model with display
845 2.1	Model with additional logic output
845 2….-849s	Model with service interface, protocol KFM 2.0
845 2….-849og2	Model with 2 signal outputs 4..20mA
845 2….-849sog2	Model with service interface and 2 signal outputs 4..20mA
Suffix (also extra module)	without: 230V AC, 01 = 115V AC, 02 = 24V AC, 08 = 24V DC

Block diagram:



INDEX

1
2
3
4
5
6
7
8
9
0

Installation: Before installation inspect the controller for any visible signs of damage caused during transport.
Check power supply acc. to name plate.
Lock the housing with its tightening groove on the mounting rail.

Electrical wiring:
Connect up the device following the wiring diagram
- wire cross section max. 1,5 mm^2
- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.
- Exclude hazards due to live parts using an appropriate installation ,e.g. in a control cabinet, to protect against unintentional contact.

Putting into operation:
Switch on power supply. Depending on the setpoint, control lamps and the display will light up after a few seconds. If nothing happens: Switch off power supply, check electrical connections and other adjustments.

Maintenance:
All electronic devices in the product range of the manufacturer are virtually maintenance-free. Provided that the device is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. *In case of faults* repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance mark and remove the connected leads .

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Parameter settings: (*existing for model with signal outputs ..og2 only, resp. depending on type*)
The device is delivered preadjusted, the start / end of range (-200 / 600) and the setting (4-20) of the signal outputs are non-adjustable. In case of changes, the preadjustments can easily be modificated by a configuration program (WinPKS-PC-software, from version 2.39) using the configuration interface.

		factory setting	*notes*
Adr	Address KFM device 8..	5	___

Function:

After the mains voltage has been switched on, the operating indicator lights up. If the actual value is lower than the set value, both relays switch on, LEDs K1 and K2 light up, and the electrical output circuit is closed. If the actual value is higher than the set value, both relays are released and the LEDs go out. The electrical safety circuit is interrupted, and the normally closed contacts of the relays connect the voltage from terminal 16 to the fault signal output at terminal 14. Even if the actual value then falls again below the set value, or if the mains voltage is interrupted, the status remains unchanged. Only after the internal reset button, or an externally connected reset button, is pressed, and when the actual value is smaller than the set value (less the hysteresis), can the temperature limiter return to the operating state.

Adjusting the set values:

Type 845 210 (model without display of the set value):
Some appropriate means (a resistor decade box or similar simulator) is used to simulate the desired trigger temperature at the sensor input. This is entered as a new set value by pressing the "SET" button.
Note: Tolerance figures related to the components must be considered in relation to the set value range when using this version.

Type 845 220 (model with display of the set value):
The mode in which the set value is adjusted is activated by pressing the "SET" button, and the displayed value flashes. The new set value can now be adjusted using the arrow keys. The setting mode is deactivated by pressing the "SET" button again. The displayed value ceases to flash, and the adjusted value is adopted as the new set value.

For reasons of safety the set value should be adjusted on the Type 845 220 to a value 2K below the desired trigger value to allow for possible component tolerances. As an alternative, the determined trigger value can be noted on the safety label!

In accordance with DIN EN 14597, the set value must be secured against accidental or unauthorised modification. For this purpose, a safety label is applied over the "Set" button to seal it. In the case of devices of Type 845210 the set value must be recorded on the safety label.

Whenever the set value is adjusted, the function of the device is to be checked by simulating a corresponding temperature at the sensor input!

Function check:

In accordance with DIN EN 14597 the safety temperature limiter must be subjected to a function check once a year. To do this, the recessed test buttons are pressed in sequence, holding them down for about 3 seconds each. Pressing the first test button makes it possible to check that the associated relay releases, the corresponding LED goes out, the electrical safety circuit is interrupted and the external fault signal lamp lights up. The device must return to the normal condition by pressing the reset button. Both LEDs light up again, and the electrical safety circuit is closed. The second channel is then to be tested in the same way.

The annual function check specified by DIN EN 14597 is only carried out correctly if the two buttons are pressed independently, one after the other.

Faults:

There are a number of reasons why, after having been triggered in operation or after carrying out the function check, the device does not return again to the normal state despite the actual value being sufficiently low. The first step should be to check, e.g. by means of a resistance measurement, whether the sensor, including all the measurement cables, is OK.
Check also whether the actual value is indeed within the permissible measuring range. If the range is exceeded, the device switches off. When an attempt is made to reset the device, the relays close briefly but immediately open again, so that operation is not possible. Only when the actual value is within the acceptable range again is normal operation of the device possible following a reset.

If the possible sources of malfunction mentioned above had been ruled out, it can be assumed that there is an internal fault.
In that case, the device must be exchanged and returned to the factory for examination.

Acceptable sensors:
All temperature sensors demonstrably according to DIN EN 14597 are acceptable. Please observe the specifications about type, application range, installation conditions and time constant in the VDTÜV datasheet.

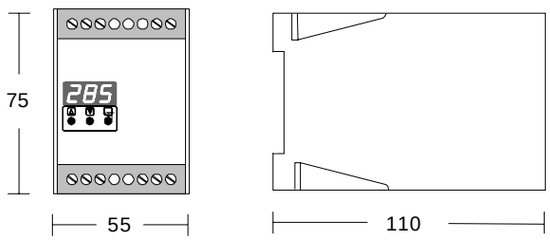
Type	Operating medium	Maximum switching point	Protection tube
713 4..	Liquids	400 °C	Without immersion sleeve
713 5..	Air and exhaust fumes	400 °C	Without immersion sleeve
715..	Liquids	400 °C	Only use protection tube supplied

Characteristic values:

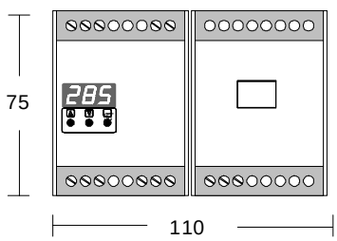
Input / Measuring range:	1 x Pt 100 DIN / -200 ... + 600 °C, others optional
Set value adjustable range:	*Note: Observe the sensor's switching point!* Type 845 210: -200 °C (+10K) ... 600 °C (-10K) Type 845 220: -99 ... 600 °C
Adjusting the set values:	Using recessed, sealable push-button
Output:	2 relays, max. 250 V 2 A*, Option: 1xLogic (open coll. max 24VDC/100mA) status display ch. 1 Option: 2 cont. outputs 4...20mA (Load<=500Ω) for actual-/ setpoint value
Switching hysteresis:	8 K +/- 1K, other values available on request (expressed as appendix to type identifier in plain text, e.g. 845 220 4K)
Process safety time (PST):	10 seconds
Housing:	For fastening to 35 mm mounting rail, or for screw fastening
Mains connection:	230VAC + 10 % / - 15 %, 48...62Hz, alt. 115 VAC, 24 VAC, 24VDC
Power consumption:	Approx. 4 VA
Fusing:	Secondary side, T 250 mA
Type of protection acc. EN 60529:	IP 20, for mounting within a housing offering at least IP 40
Permissible ambient temperature:	0...60°C, Nominal temperature: 20°C
Storage and transport temperature:	-20 ... +80 °C
Climatic resistance:	Relative humidity <= 75 % annual average without condensation
Electromagnetic compatibility:	In accordance with EN 61326, industrial requirements
Installation orientation:	optional
Data transfer rate:	9600Bit/s

Installation dimensions:

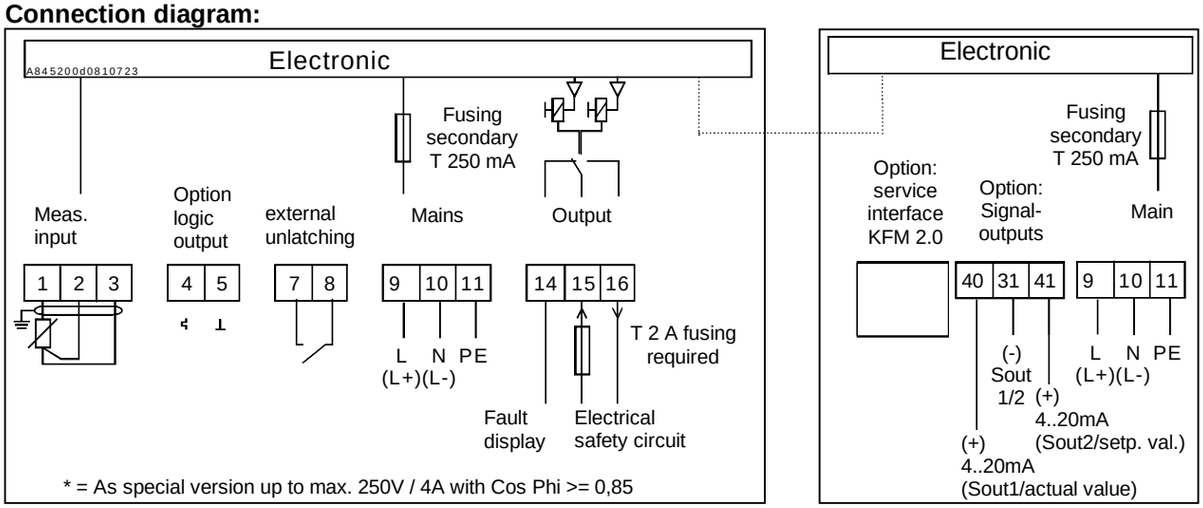
Only safety temperature limiter:



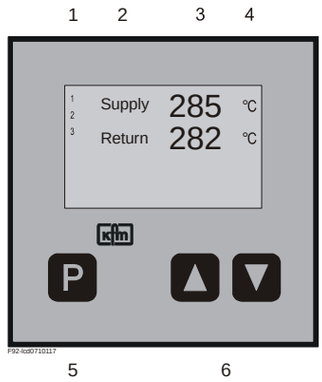
Safety temperature limiter incl. service interface / signal outputs



Connection diagram:



INDEX



1 LCD display for relay function
2 Descriptive text for displayed values
3 Digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

certifications: DIN, GL, BV

General:
KFM 902 is an industrial microcomputer-based controller series in control panel format 96 x 96 mm with a performance range of up to 8 relay outputs, various signal inputs and outputs as well as numerous possible optional extras. Communication with control systems is also possible.

All relay contacts are implemented as potential-free changeover contacts. Normally, the N.O. contacts of all relays are internally permanently wired with RC elements. Optionally, the RC elements for relays K1…K3 are led on terminals for the selective connection (N.O. contact factory-connected). The scope of delivery includes plugable terminal blocks.

The transflective LCD indication with white background lighting is easy to read in both light and dark environments. In operating mode up to 4 values (actual values, setpoint values, control settings, ..) can be displayed including freely adjustable description text and unit of display. Additional displays for operating and malfunction messages, including the corresponding hardware or custom display masks are optionally available.

Stage controllers and three-point step controllers with auxiliary contact (e.g. burner controller) are fitted as standard with a 2nd measuring input, continuous controllers have an extended measuring input range.

Types *(depending on configuration):*	*Type*
Indicator	9020..
Single-stage controller	9021..
Two-stage controller	9022..
Three-point controller	9023..
Positioner / follow-up controller	9024..
Two-point PID controller	9025..
Three-point PID controller	9026..
Three-point step controller	9027..
Continuous controller	9028..
Continuous controller with 2 outputs	9029..

Sub-types:	*suffix*
Basic function	00
Basic function + 1..8 additional contacts	01..08
Basic function double, triple, quadruple	20,30,40
Logic output 0/24V max 40mA	..L

Function extensions:(*)	
Difference controller	991d
Limitation controller	991g
Cascade controller	991k
Program controller	991p
Ramp setpoint	991r
Malfunction modul	991s
Stage controller	991t

Additional devices:(*)	
Additional analog inputs	(99) a.
External setpoint incl. switching	(99) bwa.
Second setpoint incl. switching	(99) bwz.
Binary inputs for special functions	(99) b..
Further additional contacts	(99) f
Analog signal outputs	(99) o.
Interface by external module for Profibus, Modbus, Ethernet, ..	(99) s..

*See also data sheets 99.. !

Measuring inputs: (max. 4, depending on version)	Type suffix
Pt100/standard signal, 0...400°C/adj.	without (or 0)
Pt100/standard signal, -200...+800°C/adj.	99mb14b
Thermal element NiCr-Ni (K)0...1200°C	
Fe-CuNi (J)0... 900°C, PtRh-Pt (S)0...1700°C	qt
Remote resistance transmitter 0…100/1000Ω	qw

Feature for meas. input 2 with equipment external setpoint: Standard signal configurable to ext. setpoint value, the Pt100 input is extra usable

Ranges:
Pt 100: 0..400°C (switching controllers), -200..+800°C (continuous controllers), switchable to °F,
standard signal: Display adjustable -999 to 9999, setpoint range can be limited via menu

Binary inputs:
Max. 20 inputs, alt. for potential-free contacts or for ext. voltage 0 / 24V, for status messages (can optionally be saved) or control functions.

Displays:
Max. 4-four-digit value displays with selectable decimal point, each including adjustable descriptive text and unit of display, optional add. message texts, custom display masks, up to 8 displays for relay functions.

Outputs:
Up to 8 relays as setting outputs or additional contacts, with potential-free changeover contacts, switching power 250V 2A incl. spark extinction (on the N.O. contact)
up to 6 continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω), as setting or signal output
up to 3 logic outputs 0/24V max. 40 mA, alternatively 16 outputs open collector, max 24 V / 100 mA

open printversion

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport.
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a *shielded cable* (the shielding must be earthed one-sided).
- The control leads must be *fused externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps (if available) will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse (if available) on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the product range of the manufacturer are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. *In case of faults* repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side,
loosen fastening devices and remove controller from the panel.

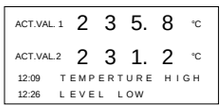
In case of remittance please give precise details of the fault to reduce time and cost of repair.

Error messages:

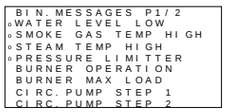
Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50 Err 52	Hardware error in program section Hardware error in data section no further operation possible, remit controller for repair
Err 58	Binary inputs out of function (status = 0), remit controller for repair
Err 59	Digital outputs out of function (switched off), remit controller for repair
Err 60	Relay outputs out of function (switched off), remit controller for repair
Err 61	Analogue outputs out of function (0 %), remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

Operating status:

Analog values: Depending on the configuration, up to three values in 10 mm size or two values in 10 mm and two values in 3 mm size can be displayed. A dedicated unit for each value can be configured if desired. The corresponding descriptive texts are changeable by means of the PKS PC software.
Depending on equipment, the status of the relays is shown at the left side of the display via the respective number (K) 1, 2, ..



In conjunction with the option of binary input messages, the corresponding texts are shown in the two lower 3 mm display lines if the binary inputs are activated. The corresponding value displays are hidden during this time.



Message list: *Briefly* press the ▲ - button (*do not* hold)
The display now shows a list of message texts for all activated binary inputs in the order of their occurrence. Additionally, messages which are configured to the collective relay are marked with a circle symbol. This flashes until the message has been confirmed by means of binary input 1.

Setpoint value setting:

Briefly press the P - button (*do not* hold)

A flashing frame with the description SP shows the activated setpoint level.
The *upper text display* shows the parameter name “SP=” and the adjusted value, the *lower text display* optionally shows a description text.

The displayed value can now be changed using the ▼ (smaller) and ▲ (larger) *buttons*.
A setpoint change is effective *immediately*, without any further operational steps.

‘Arrow’ button *acceleration effect:*
longer pressing *causes faster* changing.

return to operating mode:
briefly press the P - button (or automatic after > 30 sec)

optional:

***SPB** *Briefly* press the P - button again each time:
***SP** Bus setpoint, forced by an external bus adapter (e.g. 99spde..)
SP2 / 3 / .. setpoints of additional control loops (*=no)
SPE additional setpoints for the control loops
external setpoint (display only);
flashing description signifies for this version:
SP-F value is presently *not* active.
Switch over menu SP / SPE (only in case of adjustment SP-F=MENU (Conf-level))

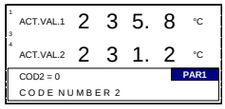
Manual operation: *(optional)*

Press and hold the ▼ -button, then additionally press the ▲ - button, then release both. (Option: *Switch on and off using the extra button* ↻*)*
(*For multi-channel controllers, first select the channel number CH.. using the* ▼...▲*. buttons and continue with the* P *-button, after which*:)

MAN. The *upper* text display shows “MAN. *", plus the setting variable, if it exists.
The control function is switched off.
Manual control is now possible using the ▼...▲. buttons
return to operating mode: *only* with P -button (or. ↻),
no automatic switching back from manual operation!

Optional: Start self-optimisation (see chapter Optimisation):
press the P -button >5 sec whilst in manual control function;
the lower display jumps to "-Ad-".
Abort: press the P -button again >5 sec

Access from the operating level



After *polling* (see instructions for level PARA 1 / 2), a flashing frame with the description PAR1 / PAR2 shows the activated parameter level.
The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed: Press the ▼...▲ buttons

Settings in detail:
(existence depends on version and type):

PARA 1

Polling: press and hold the P - button >5 sec,
release it after the display reacts.

		Factory setting	*Notes*
COD2	Code number 2 (password) for parameter levels (1…9999)	1	___
CH..	(only) for multi-channel controllers: Selection of desired channel (no.)		
P	Proportional range Xp (%) (for more details, see “Optimisation”)	25.0	___
I	Integral action time Tn (min) (for more details, see “Optimisation”)	7.0	___
D	Rate time Tv (min) (for more details, see “Optimisation”)	0.2	___
SH	Response sensitivity (“dead zone”) Xsh (%)	0.1	___
SA.	Setpoint distance (absolute) for following switching contact no.	5.0*	___
SP.	Independent setpoint for switching contact no.	0.0	___
SD.	Hysteresis (switching difference on/off) for switching contact no.	3.0	___
		(..201,701/SA3 :10.0)*	

***return** to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

PARA 2

Polling: *press and hold the P - button, additionally press the ▼ - button, hold* both buttons *for >5 sec, release them after the display reacts:*

COD2	Code number 2 (password) for parameter levels (1…9999)	1	___
Unit	Switches the unit of display (°C / °F)	C	___
***BLO/*BHI**	(only) for voltage / current input: start / end of display range	#	___
***ELO/*EHI**	(only) for external setpoint: start / end of setpoint range	#	___
***SLO/*SHI**	(only) for information signal output: start / end of range	#	___
NST	Number of decimal places of the display (0 / 1 / 2, depending on range)	0	___
***Lo / *HI**	Setpoint setting range, lower / upper limit	#	___
CRST	Contrast setting for display (0…20)	32	___
DSP1	Variable shown in first display line (10mm) (OFF / SP / Y / IST..)	IST1	___
DSP2	Variable shown in second display line (10mm) (OFF / SP / Y / IST..)	IST2	___
DSP3	Variable shown in third display line (10mm if DSP4=OFF, otherwise 3mm) (OFF / SP / Y / IST..)	SP	___
DSP4	Variable shown in fourth display line (3mm) (OFF / SP / Y / IST..)	OFF	___
	(SP = setpoint, Y=setting variable, Ist * = Actual value channel / measuring input*)		
EIN1..4	Unit of measurement for corresponding display line(°C / °F / % / bar / mbar / mPas / cSt / Kgm3 / mm / KPa / L / m3/h) Note: no conversion!	C	___
Text1/2/3/4	Desription text for corresponding display line1..4: choose from a predefined list (ACT.VAL..,SETPOINT, SUPPLY,RETURN), resp. 1 additionally editable text..*,changeable by PKS-software	1= ACT.VAL1 2= ACT.VAL1 3= SETPOINT	___ ___ ___

***return** to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = *longer* impulses, more sensitive reaction
higher value = *shorter* impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= *shorter* impulse gaps, faster balancing
higher value= *longer* impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller (if available) has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

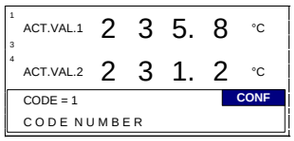
Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly



Access from the operating level

Polling: press and hold the P *- button, additionally press the* ▲ *- button, hold* both buttons *for >5 sec, release them after the display reacts:*
A flashing frame with the description CONF shows the activated parameter level. The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed:
Number values: Press the ▼...▲ buttons, text values:press the ▲ - button

Settings in detail:

	(existence depends on version and type):	*Factory setting*	*Notes*
CODE	Code number for configuration level (1…9999),	1	___
	Alternatively: Hold the P button for more than 10 sec after code entry:		
COD1	Possibility of setting the code number for the configuration level(option).	1	___
COD2	Possibility of setting the code number for the parameter levels(option).	1	___
LNG	Language selection of the menu text(Deutsch,English,User def, Off)	Deutsch	___
CONF	Selection of the configured controller function (*if existent*)		
	return to operating mode: *Briefly* press the P - button		
	or: **continue** to the following settings: press the P -button and *hold it* > 5 sec:		
	Note: when continuing after changing a function, the display first flashes for a few seconds, only then does the desired switching over or back take place		
SPEF	Configuration external/second setpoint “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “SP2” / “AUS”=OFF	MENU	___
AIN*	Input type for input no.*: "RTD / 0-20 / 4-20(mA) / 0-10 / 2-10(V) / AUS=OFF" (note different terminals for I/U!)**	*RTD*	___
IST*	Correction value for changing the controller display (+/-)	*0.0*	___
SP 2/E	Type of effect of second / external setpoint: "Add/ Sub/ AbS" (adding / subtracting / absolute value)	AbS	___
***YM**	Setting time of the controlled drive “6…600” (sec)	*60 sec*	___
***CY' '**	Switching frequency in two-point controllers: "2...120" (sec.)	*20 sec*	___
***OUT**	Setting output signal "0...20 / 4...20" (mA) /0...10 / 2...10 (V)“	*4...20 mA*	___
***OUT**	Setting output characteristic: direct / inverse "di / in"	*in*	___
	(with 2 outputs: "in in / in di / di in / di di")	*inin*	___
***td**	For 2 outputs: dead zone between outputs 1 and 2 “0…10%”	*0*	___
***AP**	Output signal working point (-100…+100)	*50*	___
FG A/E	Automatic adjustment of remote transmitter input (see extra sheet 99ar)		
Sou*	Assignment of inform. output signal(s)* (act. value/setp., setting var..)	*Ist1*	___
Sou*	Type of information output signal(s)* “0..20/4..20(mA)/0..10/2..10(V)” (* Sout= Signal 1; Sou2 = Signal 2)	*4...20 mA*	___
***Y_S**	Behaviour of the setting output in the event of measurement line error:		
	Relay position: "rel1 / rel2 / OFF"	*rel2(70.),rel1(20.)*	___
	Continuous output: "0...100" (%)	*0*	___
bin. Eing	Sub-menu for binary input configurations		
	Polling: press the P -button and *hold it* > 5 sec:		
BIN*	Direction of control action binary input* direct / inverse (di/in)	di	___
BIN*	Assignment of collective relay: Stat=none, SREL= collective relay	stat	___
BIN*	Switch-on delay (0…300 sec)	0	___
REL*	Function mode of additional contact (relay no.)	So*A(701),StA(201)*	___
REL*	Measuring input / control loop assigned to additional contact	*Ist 1*	___
REL*	Add. contact – relay pos. in event of meas. line error "SiE/SiA"(on/off)	*Si A*	___
Adr	if equipped with interface: bus address (number)	*5*	___
BAUD	if equipped with interface: baudrate (9600/19200/38400)	38400	___
	return to operating mode: briefly press the P - button *again*		

***** = ID number in case of several inputs / outputs or control loops.
******= Rtd input of ain2 is additionally usable if equipped with ext. setpoint and activation using SP-F.

INDEX
1 2 3 4 5 6 7 8 9 0

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

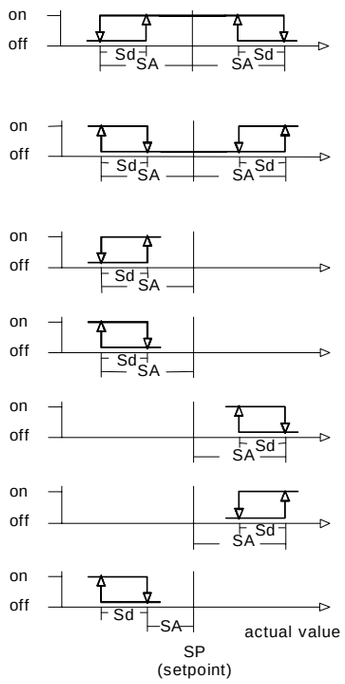
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

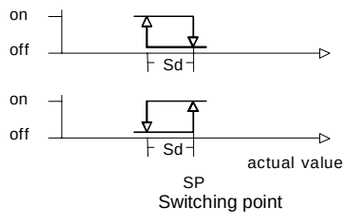
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

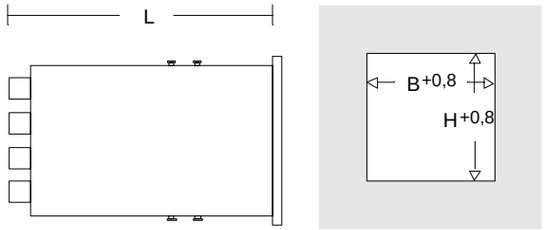
CH../.SP. (only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

"Safety" shut down (in case of measuring line fault):
SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

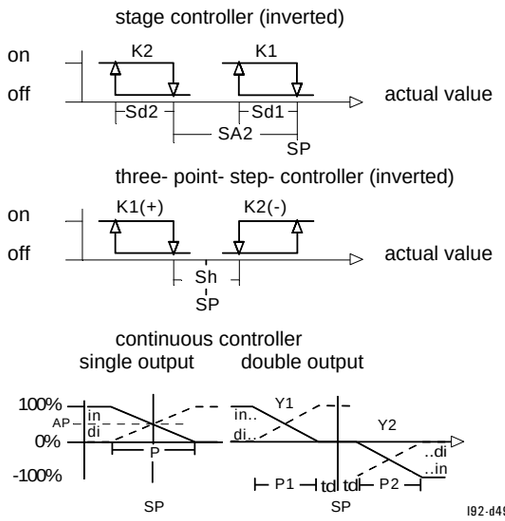
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, code locked,
pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

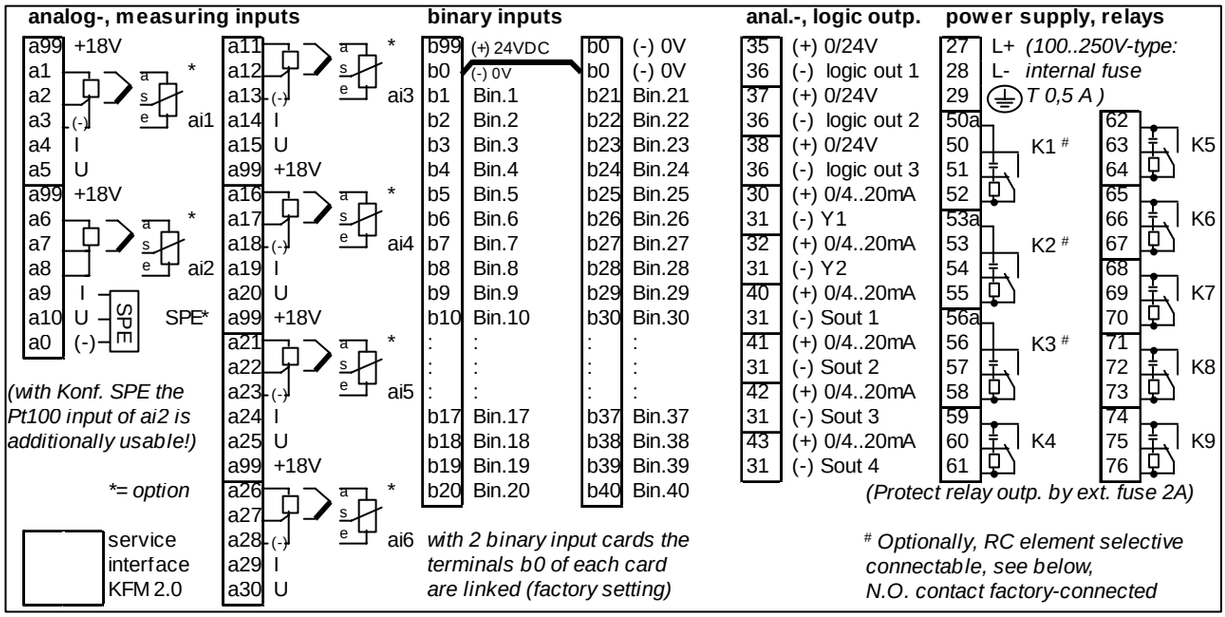


Form 96x96: L=150mm, B=92mm, H=92mm

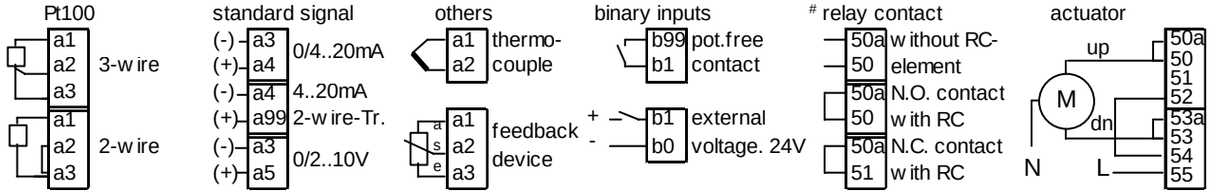


Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average,
no condensation
EMC: referring to EN 61326

Wiring diagram: (Example, valid for each delivered controller is the wiring diagram on its casing only)



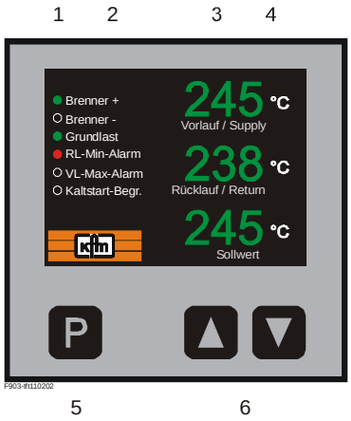
Wiring, examples for input 1 and output 1 respectively:



open printversion

1 Display for relay function
2 Descriptive text for relay functions
3 Descriptive texts and digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

certifications: DIN, GL, BV



General:
KFM 903 is an industrial microcomputer-based controller series in control panel format 96 x 96 mm with a performance range of up to 9 relay outputs (changeover), various signal inputs and outputs as well as numerous possible optional extras. Communication with control systems is also possible. Additional contacts can be switched time dependent using the integrated real time clock.

Controllers of the series 903 can be delivered with the type extension K in a freely programmable version and then available functional packages can be added arbitrary within the hardware, using a graphical workspace, so that a separate control system is often not necessary.

The belonging module software 99pkm provides beside ready to use controller modules a large number of control functions and logical operations compact within the individual device, furthermore expansion modules, an external malfunction alarm unit or a second freely programmable controller 903K can be added to it by using the standard interface.

Alternatively, the delivery can be done unprogrammed with hardware in various types. In this case the programming is provided by the customer or at extra cost by the factory.

The transmissive colour TFT indication is easy to read in both light and dark environments.

Parameter set, TFT- configuration, data logger recordings and fault history can be transferred by means of conventional USB stick. Irrespective from that, the continuous logger data is automatically saved on a regular basis if the USB stick is inserted..

The touch operation of the TFT- display is optionally available.

Depending on version, the industrial controller can configured and read out via USB stick.

INDEX

1
2
3
4
5
6
7
8
9
0

Content

REFERENCE!
This symbol refers to further information in other sections, chapters or other manuals.

open printversion

INDEX

1 2 3 4 5 6 7 8 9 0

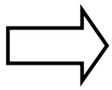
Types:

Types *(depending on configuration):*	*Type*
Text-indicator	903000
Indicator	90301.
Single-stage controller	9031..
Two-stage controller	9032..
Three-point controller	9033..
Positioner / follow-up controller	9034..
Two-point PID controller	9035..
Three-point PID controller	9036..
Three-point step controller	9037..
Continuous controller	9038..
Continuous controller with 2 outputs	9039..

Sub-types:	*suffix*
Basic function	00
Basic function + 1..8 add. contacts	01..08
Basic function double, triple, quadruple	20,30,40
Logic output 0/24V max 40mA	..L

Function extensions:(*)	
Difference controller	991d
Limitation controller	991g
Cascade controller	991k
Program controller	991p
Ramp setpoint	991r
Malfunction modul	991s
Stage controller	991t

Additional devices:(*)	
Additional analog inputs	(99) a.
External setpoint incl. switching	(99) bwa.
Second setpoint incl. switching	(99) bwz.
Binary inputs for special functions	(99) b..
Further additional contacts	(99) f
Analog signal outputs	(99) o.
external module for Profibus, Modbus, Ethernet..	(99) s..



* see also data sheets 99..

Measuring inputs:	*Type suffix*
(max. 8, depending on version)	
Pt100 / standard signal, -200...+800°C / adjustable	without (or 0)
Thermal element NiCr-Ni (K)0...1200°C Fe-CuNi (J)0... 900°C, PtRh-Pt (S)0...1700°C	qt
Remote resistance transmitter 0…100/1000Ω	qw

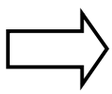
Feature for meas. input 2 with equipment external setpoint:
Standard signal configurable to ext. setpoint value, the Pt100 input is extra usable

Ranges:
Pt 100: -200..+800°C, switchable to °F,
standard signal: Display adjustable -999 to 9999,
setpoint range can be limited via menu

Binary inputs:
Max. 20 inputs, alt. for potential-free contacts or for ext. voltage 0 / 24V, for status messages (can optionally be saved) or control functions.

Displays:
Max. 4-four-digit value displays with selectable decimal point, each including adjustable descriptive text and unit of display, optional add. message texts with time stamp, custom display masks also with real-time graphical representation, up to 9 displays for relay functions incl. freely adjustable description texts.

Outputs:
Up to 9 relays as setting outputs or additional contacts, with potential-free changeover contacts, switching power 250V 2A
incl. spark extinction (on the N.O. contact)
up to 6 continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω), as setting or signal output
up to 3 logic outputs 0/24V max. 40 mA, alternatively 16 outputs open collector, max 24 V / 100 mA



External malfunction alarm display: see sheet 826..

INDEX

1
2
3
4
5
6
7
8
9
0

Intended use

The device is intended, in accordance to the technical data, for measuring- and control functions in industrial environments.
Any other use or usage beyond this scope is not considered as intended.
The device is constructed in accordance to the current standards and directives and complies with safety regulations.
Nevertheless, improper use can result in danger to life or property damages.
In order to avoid risks, the device must be used for the intended use in a proper safety condition and in compliance with the delivered technical documentation. Application- related dangers can occur also if the device is appropriate or intended used caused for example by missing safety devices or wrong adjustments.

Personnel qualification

This document includes all information necessary for the intended use of the device described therein.
It has been written exlusively for technically qualified personnel who have been specially trained with expertise in automation technology. Understanding these informations and the technically correct implementation of the delivered documentation are required for safe installation, commissioning as well as for safety during operation. Work on the device and the electrical wiring must only be carried out to the extent described by qualified personell.

Installation

Before installation: Inspect the controller for any visible signs of damage caused during transport.
Check power supply according to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical safety

- All electrical lines of the device must be disconnected during installation/dismantling, service- and repair work.
- Load circuits must be fused for the maximum load (see technical data).
- The device is not suitable for installation in areas with an explosion hazard.
- In addition to a faulty installation, also incorrectly (for example by self- adaption) or wrong set parameter values on the device could affect the correct process.
- Safety devices independently from the device should be provided always.
  The corresponding safety regulations must be observed.
- The operator must be electrostatic discharged (for example by touching a grounded metal object) before plugging or pulling of the connecting cables.
- During commissioning, the delivery defaults of the device can be different from the designated application. The plant constructor is generally responsible for commissioning.

Electrical wiring

- Plug bar on the back face of the controller; connect up the controller following the wiring diagram on the device.
- For connecting power supply phase wire and neutral wire must not be transposed.
- Wire cross section max. 1,5 mm^2
- Lay input-, output and supply cabling physically seperated and not parallel to one another.
- Use shielded and twisted cables for the measuring-, control- and interface circuits to avoid interferences; Ground the shield properly. Do not lay close to components or cables through which current is flowing.
- Do not loop through ground wires, but connect to a common grounding point in the control cabinet; furthermore, a professional potential equalization must be noted and the lines must be kept as short as possible.
- The DIN VDE 0100 “construction of low-voltage systems” respectively the appropriate country specific regulations (for example on basis of IEC 60364) must be followed for the wiring material, the installation and the electrical wiring.

Putting into operation

Switch on power supply. Digital display and control lamps (if available) will light up according to the setpoint after some seconds. Adjust set value and check other adjustments.

Maintenance

All electronic controllers in the product range of the manufacturer are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. In case of faults repair work by the customer should be restricted to the externally accessible leads, connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

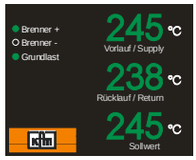
All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side,
loosen fastening devices and remove controller from the panel.

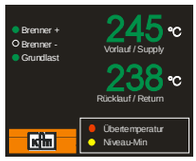
In case of remittance please give precise details of the fault to reduce time and cost of repair.

see chapter error messages on page 17

Operating status:



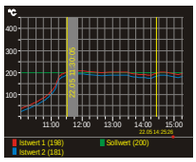
Analog values: Depending on the configuration, up to three values in 10 mm size or two values in 10 mm and two values in 3 mm size can be displayed. A dedicated unit for each value can be configured if desired. The corresponding descriptive texts are changeable by means of the PKS PC software.Depending on equipment, the status of the relays is shown at the left side of the display via a coloured circle icon.



In conjunction with the option of binary input messages, the corresponding texts are shown in the two lower 3 mm display lines if the binary inputs are activated. The corresponding value displays are hidden during this time.

Message list#: *Briefly* press the ▲ - button (*do not* hold)
The display now shows a list of message texts for all activated binary inputs in the order of their occurrence with date and time. Operating messages are displayed by a circle icon coloured green.Pre- alarm messages are displayed by a circle icon coloured yellow. Messages which are configured to the collective relay are marked with a circle icon coloured red. This flashes until the message has been confirmed by means of binary input 1 (reset).

History#: *Briefly* press the ▲ - button (*do not* hold)
As message list, but the display shows a list of optionally saved messages (max. 40, oldest one will be overwritten). Furthermore, gone pre- alarms and malfunction messages are marked with a yellow respectively with a red check mark.



Graphical representation#: - *Briefly* press the ▲ - button (*do not* hold)
Actual- and setpoint values of the controller are displayed as a continuous diagram. The actual recording cycle is signalised by an ongoing red dot. Vertical yellow lines with grey background for date and time represent recording interruptions.

optional: To switch on the cursor press P -button *briefly*:
The cursor is moved along the time axis with the ▼ (earlier) / ▲ (later)-*buttons*, the values of the cursor position are shown in accordance to the date and time.
- *briefly* press the P - button to switch off the cursor

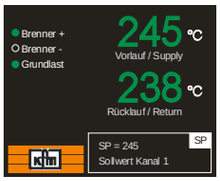
Custom specific representations#: briefly press the ▲ - button each (*do not* hold)

if existing

Note: The configuration of the graphical- and custom specific display is possible with the pc- software PKS only, see manual 99pks respectively chapter software on page 16.

Note: The parameters are shown partially, for full listing see sheet 99pkm_m (module overview).

Setpoint value setting:



- *Briefly* press the P - button (*do not* hold)
A flashing frame with the description SP shows the activated setpoint level and the parameter name “SP=”, the adjusted value as well as an description text optionally.

The displayed value can now be changed using the ▼ (lower) and ▲ (higher) *buttons*.

A setpoint change is effective *immediately*, without any further operational steps.

‘Arrow’ button *acceleration effect: longer* pressing *causes faster* changing.

***return** to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

optional:

***SPB**
Bus setpoint, forced by an external bus adapter (e.g. 99spde..)

***SP**
setpoints of additional control loops (*=no)

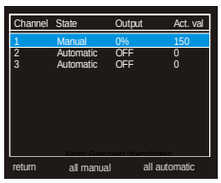
SP2 / 3 / ..
additional setpoints for the control loop

SPE
external setpoint (display only);
flashing description signifies: value is presently *not* active.

Briefly press the P - button again each time:

SP-F
Switch over menu SP / SPE
(only in case of adjustment SPEF=MENU (Conf-level))

Manual operation :
(if existing) :

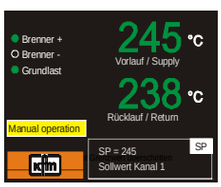


Press and hold the ▼ -button, then additionally press the ▲ - button, then release both. (Option: *Switch on and off using the extra button)*

A summary of the existing controller channels and their manual state is displayed.

The requested channel is marked blue using the ▼...▲ buttons,
press the P - button *briefly* to continue.
Then, select the status "manual" or "automatic" with the ▼...▲ buttons,
press the P - button *briefly* to continue.

The status "manual" provides now a manual control using the ▼...▲ buttons, the control function is deactivated.
The control function is activated in the status "automatic".
Press the P - button *briefly* to select a channel again.
Note: Marking "all manual" respectively "all automatic" and pressing the P - button briefly choose for all channels in common.



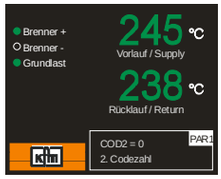
The corrective signal and the actual value are displayed for each channel.

return to operating mode: ***only*** with marking "return" and entering P - button *briefly* (respectively *), no* automatic switching back!
Note: The deactivated control function is signalised on the operation display by the display "Manual operation" on yellow background.

optional: Self- optimisation (see on page 11):
Marked channel P -button >5 sec: the display switches to "-Ad-

INDEX

Parameter level 1



Access from the operating level

After *polling* (see instructions for level PAR 1 / 2), a flashing frame with the description PAR1 / PAR2 shows the activated parameter level.

The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed: Press the ▼...▲ buttons

Settings in detail: *(existence depends on version and type):*

PAR1 Polling: press and hold the P - button >5 sec, release it after the display reacts.

Factory setting:

COD2 Code number 2 (password) for parameter levels (1...9999) 1

USB Stick Menu (only) with equipment USB-host and inserted USB stick: Functions for data transmission

The requested function is marked blue with the ▼...▲ buttons, briefly press the P -button to confirm

"**Load parameter only**", "**Load TFT-project**", "**Load complete configuration**"
Parameter set, TFT-project or the complete configuration will be transferred from the USB stick into the device, mark the desired file and confirm with the P -button.

"**Save parameter only**", "**Save TFT-project**", "**Save complete configuration**"
Parameter set, TFT-project or the complete configuration will be transferred from the device into the USB stick.

"**Cancel**" To exit the menu ⇨ See sheet 903susb for additional information

CH..	(only) for multi-channel controllers: Selection of desired channel (no.)	
P	Proportional range Xp (%) (for more details, see “Optimisation”)	25,0
I	Integral action time Tn (min) (for more details, see “Optimisation”)	7,0
D	Rate time Tv (min) (for more details, see “Optimisation”)	0,2
SH	Response sensitivity (“dead zone”) Xsh (%)	0,1
SA. (ZA.)**	Setpoint distance (absolute) for following switching contact no.	5,0*
SP.	Independent setpoint for switching contact no.	0,0
SD. (ZD.)**	Hysteresis (switching difference on/off) for switching contact no.	3,0
	Only with configuration time dependent additional contacts:	
tSt.	Start time for switching contact no.., (weekday, hour, minute)	daily/0/0
tL.	Switching time for switching contact no.., (days, hours, minutes)	0/0/0
		(..201,701/SA3 :10,0)*

**= Je nach Ausführung

return *to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

INDEX

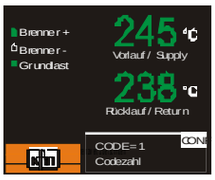
Parameter level 2

		Factory setting:
PAR2	Polling: *press and hold the* P *- button, additionally press the* ▼ *- button, hold* both buttons *for >5 sec, release them after the display reacts*.	
COD2	Code number 2 (password) for parameter levels (1...9999)	1
Time adj.	*Submenu* time adjustment, Polling: press and hold the P - button >5 sec.	
Date	Weekday, calendar day, month, year (actual selection marked white)	-
Time	Hour, minute, second (actual selection marked white)	-
Unit	Switches the unit of display (°C / °F), only temperature inputs	C
***BLO/*BHI**	(only) for voltage / current input: start / end of display range	#
***ELO/*EHI**	(only) for external setpoint: start / end of setpoint range	#
***SLO/*SHI**	(only) for information signal output: start / end of range	#
***NST**	Number of decimal places of the display (0 / 1 / 2, depending on range)	0
***Lo / *HI**	Setpoint setting range, lower / upper limit	#
BRGH	Brightness Display (30 ... 100)	50
DSP1/2/3/4	Variable shown in display line 1-4 (10mm) (OFF/SP/Y/IST*/text**/time**) Note: display line 1 to 3: 10mm, if DSP4 = "OFF" otherwise display line 1 and 2: 10mm, display line 3 and 4: 3mm (SP = setpoint,Y=setting var.,Ist*=actual value channel*/meas. input*)	1=IST1 2=IST2 3=SP 4=AUS
EIN1/2/3/4	Unit of measurement for display line 1-4 (°C/ °F/ %/ bar/ mbar/ mPas/ cSt/ Kgm3/ mm/ Kpa/ L/ m3/h/ " ") Note: no conversion!	°C/°C/°C
TEXT1/2/3/4	Desription text for corresponding display line1..4: choose from a predefined list: (ACT.VAL..,SETPOINT, SUPPLY,RETURN), resp. 1 additionally editable text.*,changeable by PKS-software	1= ACT.VAL 1 2= ACT.VAL 2 3=SETPOINT 4=OFF
DSPT	Configuration message text Txt (internal messages in lines 3 and 4, value indication is deactivated), Txtl (internal messages list only), Txi (external messages in lines 3 and 4, value indication is deactivated), Txil (external messages list only), OFF	OFF
Hist.	*Submenu* delete history, Polling: press and hold the P - button >5 sec.	
Del	Delete history (NO / YES)	NO

***return** to operating mode: briefly press the* P *- button*
(or automatic after > 30 sec)

***= ID number in case of several meas. inputs/ control loops. # = *corresp. range*
**= display line 4 only

Configuration level



Access from the operating level

Polling: press and hold the P *- button, additionally press the* ▲ *- button, hold* both buttons *for >5 sec, release them after the display reacts.*

A flashing frame with the description CONF shows the activated parameter level. The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed:
Number values: Press the ▼...▲ buttons, text values:press the ▲ - button

Settings in detail *(existence depends on version and type):*

		Factory setting
CODE	Code number for configuration level (1...9999), Alternatively: Hold the P button for more than 10 sec after code entry:	1
COD1	Possibility of setting the code number for the configuration level(option).	1
COD2	Possibility of setting the code number for the parameter levels(option).	1
LNG	Language selection of the menu texts (Deutsch,English,User def, Off)	*Deutsch*
CONF	Selection of the configured controller function (*if existent*)	

Note: when continuing after changing a function, the display first flashes for a few seconds, only then does the desired switching over or back take place

return to operating mode: *Briefly* press the P - button

or: **continue** to the following settings:
press the P -button and *hold it* > 5 sec

		Factory setting
SPEF	Configuration external setpoint: “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “AUS”=OFF	*AUS*
SP2F	Configuration second setpoint: “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “AUS”=OFF	*AUS*
SPBF	Configuration bus setpoint: ”BIN” (activation by a binary input) / “MENU” (activation in the setpoint level) / “BUS” (activation by a status bit via bus-interface adapter, such as 99spde)	*BUS*
SPOV	Take over external-/ bus setpoint value: “OVER” (the last valid external-/ bus setpoint value is taken over to the internal setpoint value) / “AUS”=OFF (setpoint value unaffected)	*AUS*
AIN*	Input type for input no.*: "RTD / 0-20 / 4-20(mA) / 0-10 / 2-10(V) / AUS=OFF" (note different terminals for I/U!)**	*RTD*
AiSP	Input type for input external setpoint: "0-20 / 4-20(mA) / 0-10 / 2-10(V)" (note different terminals for I/U!)	*4-20*
IST*	Correction value for changing the controller display (+/-)	*0.0*
SP 2/E	Type of effect of second / external setpoint: "Add/ Sub/ AbS" (adding / subtracting / absolute value)	AbS
***YM**	Setting time of the controlled drive “6…600” (sec)	*60 sec.*
***CY' '**	Switching frequency in two-point controllers: "2...120" (sec.)	*20 sec.*
***OUT**	Setting output signal "0...20 / 4...20" (mA) /0...10 / 2...10 (V)“	*4...20 mA*
***OUT**	Setting output characteristic: direct / inverse "di / in" (with 2 outputs: "in in / in di / di in / di di")	*in* *inin*
***td**	For 2 outputs: dead zone between outputs 1 and 2 “0…10%”	*0*
***AP**	Output signal working point (-100…+100)	*50*
FG A/E	⇨ Automatic adaption for position feedback input (see sheet 99ar)	
Sou*	Assignment of inform. output signal(s)* (act. value/setp., setting var..)	*Ist1*
Sou*	Type of information output signal(s)* “0..20/4..20(mA)/0..10/2..10(V)” (* Sout= signal 1; Sou2 = signal 2)	*4...20 mA*
***Y_S**	Behaviour of the setting output in the event of measurement line error:	
	Relay position: "rel1 / rel2 / OFF"	*rel2(70.),rel1(20.)*
	Continuous output: "0...100" (%)	*0*
bin. Eing	Sub-menu for binary input configurations Polling: press the P -button and *hold it* > 5 sec:	
BIN*	Direction of control action binary input* direct / inverse (di/in)	di
BIN*	Assignment of collective relay: Stat=none, SREL= collective relay	stat
BIN*	Switch-on delay (0...300 sec)	0
REL*	Function mode of additional contact (relay no.)	*SoA(701),StA(201)*
REL*	Measuring input / control loop assigned to additional contact	*Ist 1*
REL*	Add. contact – relay pos. in event of meas. line error "SiE/SiA"(on/off)	*Si A*
Adr	if equipped with interface: bus address (number)	*5*
BAUD	if equipped with interface: baudrate (9600/19200/38400)	*38400*

return to operating mode: briefly press the P - button *again*

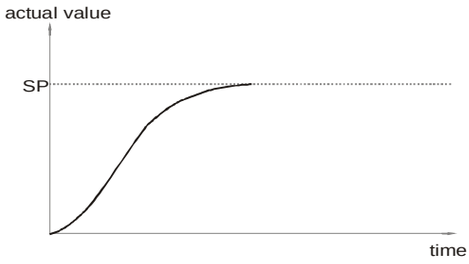
***** = ID number in case of several inputs / outputs or control loops.
******= Rtd input of ain2 is usable only if equipped with ext. setpoint and activation using SPEF.

manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information. The following informations are for help purpose only:

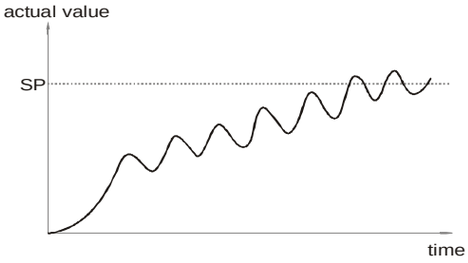
Optimal



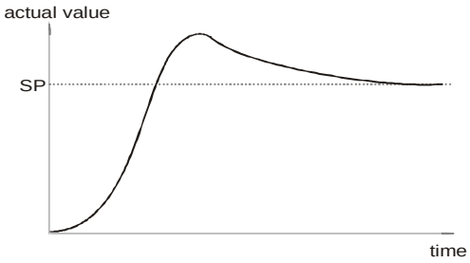
P = proportional band Xp (%):
lower value = *longer* impulses (three-point step control), more sensitive reaction,
higher value = *shorter* impulses (three-point step control), less sensitive reaction.

Examples:

- Oscillating temperature without distinct initial overshot: **P (Xp) too low**;



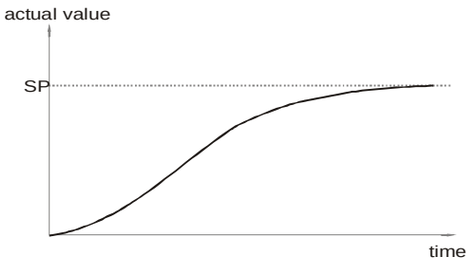
- The setpoint is reached very slowly after initial overshooting: **P (Xp) too high**.



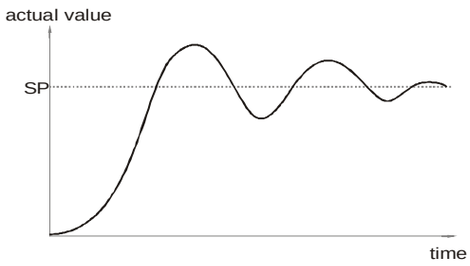
I = integral action time Tn (min):
lower value= *shorter* impulse gaps (three-point step control), faster balancing,
higher value= *longer* impulse gaps (three-point step control), slower balancing.

Examples:

- the set value is reached very slowly without overshooting: **I (Tn) too high**;



- high initial overshot followed by fading oscillation: **I (Tn) too low**.



D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

INDEX

1
2
3
4
5
6
7
8
9
0

Self-adaptation (optional)

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller (if available) has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first: Lower actual value adequately by manual operation (position of final control element) (quick circuits)or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min),then it increases the output signal about 10% or, in case of three- point- step controller operation,it triggers an output impulse with about 10% of the adjusted regulating time.The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation
(Display shows error code, ref.to chapter error messages on page 17)

Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for <u>trailing</u> contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off))

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

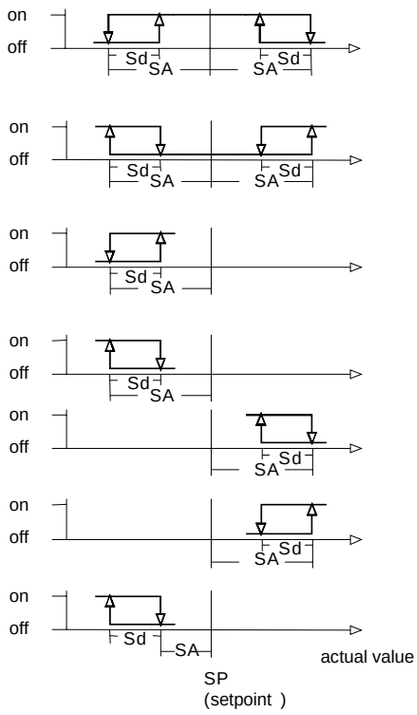
Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

St A Heating stage below setpoint. Relay drops out as actual value increases

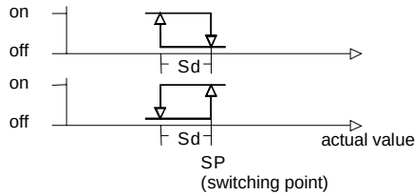
(**A**us = off)



Switching functions for <u>independent</u> contacts:

US A Relay drops out with increasing actual value (**A**us = off)

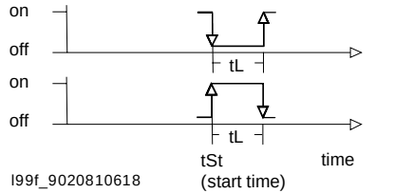
US E Relay picks up with increasing actual value (**E**in = on)



Switching functions for *<u>time dependent</u>* contacts*:*

RTCA time dependent switch-off contact(**A**us=off)

RTCE time dependent switch-on contact (**E**in= on)



See sheet 99rtc , among other things, examples for daily or weekly switching

In each case additional settings follow under "rEL." after the selection is acknowledged (P - key):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH./.SP. .(only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

Additional contact – special functions (depending on version)

Service function:

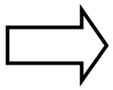
Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

Interface function:

BUS Bus function, relay is switched on/off depending on control via service- interface, for example using the profibus- adapter 99spde..



See manual 99sp.. for each adapter

Malfunction message function (when using the internal malfunction alarm display):

SR A /E Collective message function, relay is de-energised / energised if there is an alarm message.

NW A /E New value message, relay is de-energised / energised if a new alarm message appears that has not yet been confirmed with reset.

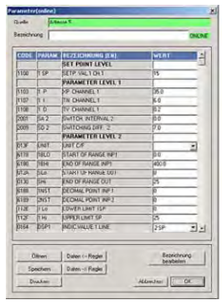
IP A /E New value pulse, relay is de-energised / energised for 3 sec if a new alarm message appears.

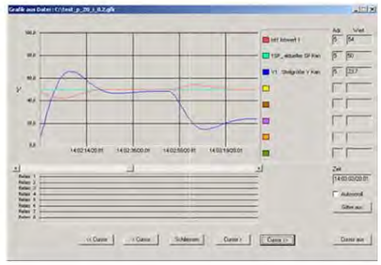
SRIA /E Collective message function with new value pulse, relay is de-energised / energised if there is an alarm message. If a further (new) alarm message appears, the relay is energised for 3 sec.

Software

PKS

- Data fransfer, editing and archiving of parameter sets
- Online remote operation
- Graphical display (line recorder)
- Data recording (logger)

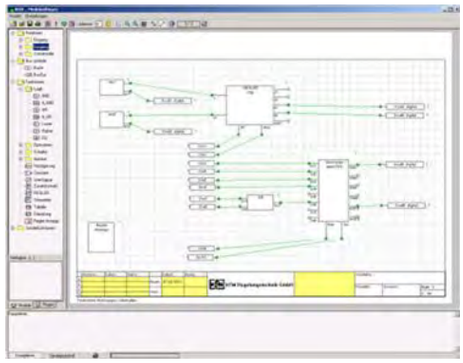




See sheet 99pks

PKM *(component of PKS)*

- Module software for graphical programming
- Regulation and control



See sheet 99pkm
See sheet 99pkm_m (module overview)

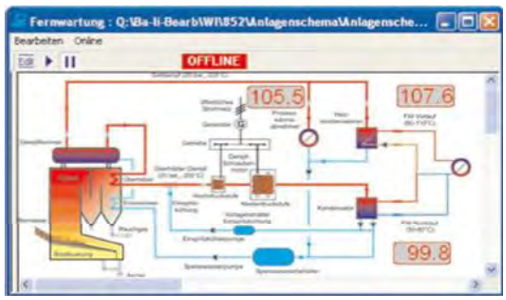
PKD *(component of PKS)*

- Configuration of the controller display
- Data logger, binary message lists and custom specific logos

See sheet 99pkd

PCS

- Visualization of custom specific system- and process schemes
- Remote maintenance



See sheet 99pcs

INDEX

Error messages

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50	Hardware error in program section
Err 52	Hardware error in data section no further operation possible, remit controller for repair
Err 58	Binary inputs out of function (status = 0), remit controller for repair
Err 59	Digital outputs out of function (switched off), remit controller for repair
Err 60	Relay outputs out of function (switched off), remit controller for repair
Err 61	Analogue outputs out of function (0 %), remit controller for repair
Err 63	Data connection to the hardware expansion modules interrupted, check cables

Error messages during self adaptation (see chapter self- adaption on page 13):

Err 202	Ambient conditions are not suitable for self adaptation; adjust parameters manually (see chapter manual optimization on page 12)
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

INDEX

1 2 3 4 5 6 7 8 9 0

Technical data
(depending on type and version)

Characteristics
Parameter-level, code locked.
pre adjusted on customer´s demand.

Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA(add. contacts):0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input or time dependent(daily-/ weekly switch. function), switching function adjustable

Measuring inputs:
Pt100/standard signal, -200..+800°C/adjust.

Thermal element * NiCr-Ni (K) 0..1200°C
Fe-CuNi (J) 0..900°C, PtRh-Pt (S) 0..1700°C

Remote resistance transmitter * 0...100/1000Ω
* = *option*

Ranges:
Pt 100: -200..+800°C, switchable to °F, standard signal: Display adjustable -999 to 9999, setpoint range can be limited via menu

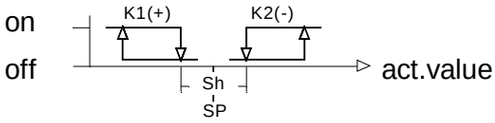
Binary inputs:
Alternative for potential-free contacts or for external voltage 0 / 24V

Outputs:
Relay with potential-free changeover contacts, switching power: 250V 2A incl. spark extinction (on the N.O. contact)

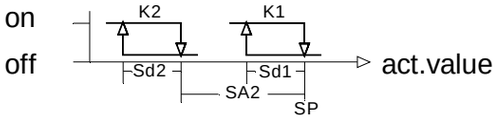
Continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω),

Logic outputs 0/24V max. 40 mA, alternatively outputs with open-collector,
max 24 V/100 mA

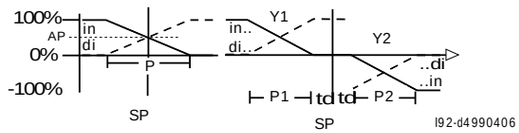
stage controller (inverted)



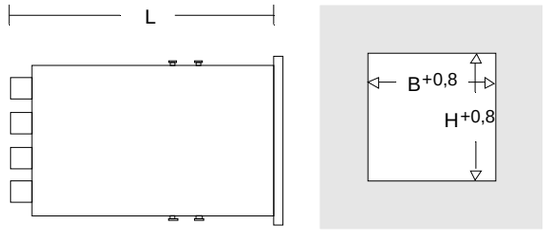
three- point step controller (inverted)



continuous controller
single output double output



Installation dimensions:



Form 96x96: L=150mm, B=92mm, H=92mm

Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529:
IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average, no condensation
EMC: referring to EN 61326

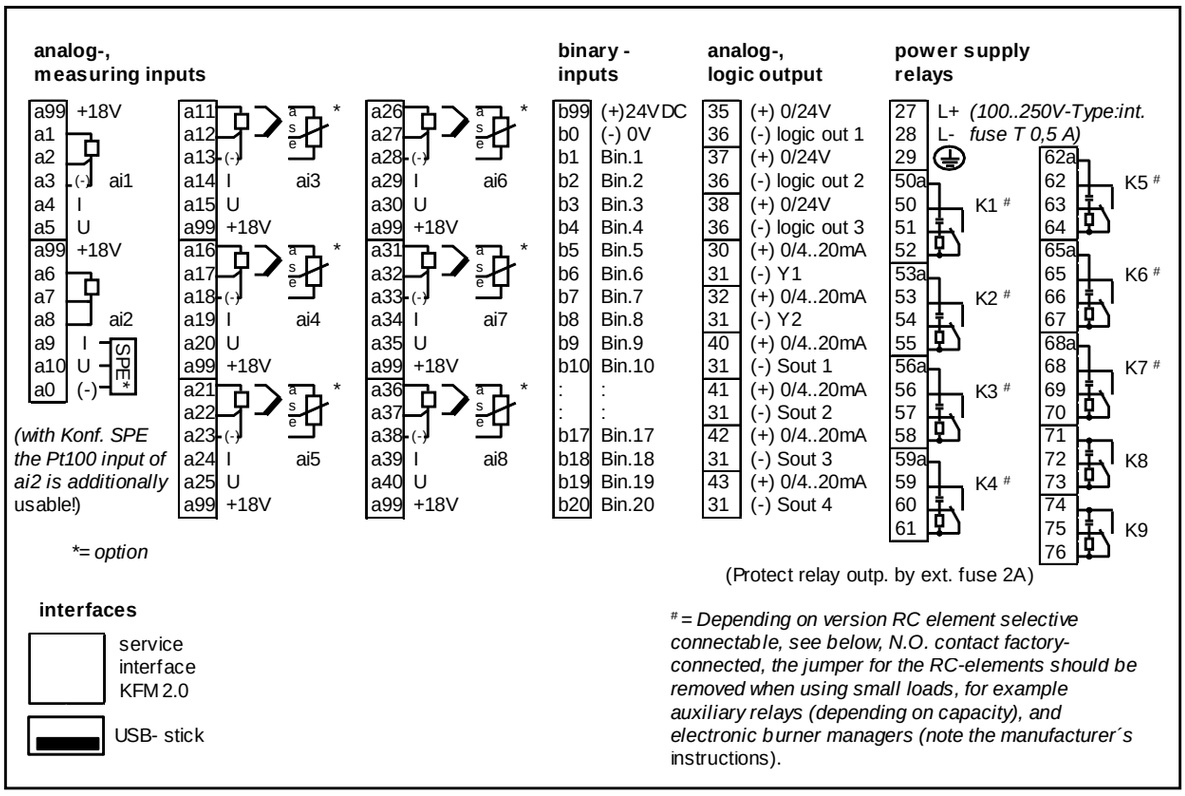
Interfaces:
Service interface KFM 2.0 RJ45 (socket)

USB- 2.0 Host plug type A (socket) für USB-memory stick, max. 100 mA

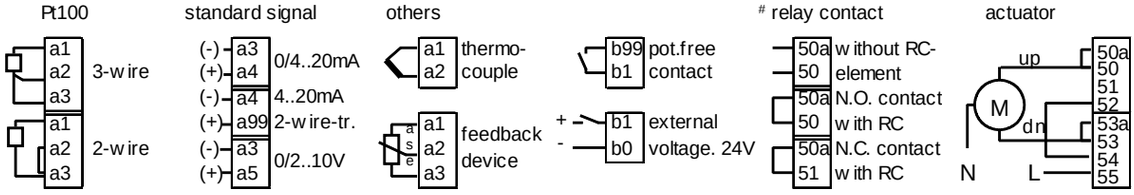
see sheet 99s for additionally information

Wiring diagram:

Example, valid for each delivered controller is the wiring diagram on its casing only



Wiring, examples for input 1 and output 1 respectively:



Regelungstechnik nach Maß

KFM-Regelungstechnik GmbH
Planckstraße 2
32052 Herford, Germany

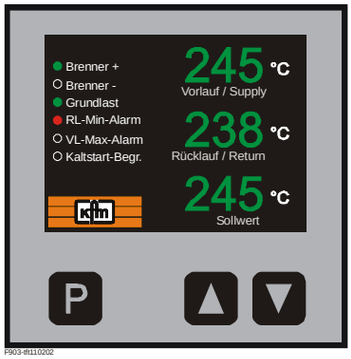
Internet: www.kfm-regelungstechnik.de
E-Mail: info@KFM-Regelungstechnik.de

Telefon: +49 (0) 52 21 / 77 08 - 0
Telefax: +49 (0) 52 21 / 77 08 - 43

INDEX

1 2 3 4 5 6 7 8 9 0

1 2 3 4



5 6

1 Display for relay function
2 Descriptive text for relay functions
3 Descriptive texts and digital value displays
4 Unit of display
5 Key for setpoint and parameter mode
6 Setpoint adjustment

certifications: DIN, GL, BV

General:
KFM 903 is an industrial microcomputer-based controller series in control panel format 96 x 96 mm with a performance range of up to 9 relay outputs, various signal inputs and outputs as well as numerous possible optional extras. Communication with control systems is also possible.

All relay contacts are implemented as potential-free changeover contacts. Normally, the N.O. contacts of all relays are internally permanently wired with RC elements. Optionally, the RC elements for relays K1…K7 are led on terminals for the selective connection (N.O. contact factory-connected). The scope of delivery includes plugable terminal blocks.

The transmissive colour TFT indication is easy to read in both light and dark environments.

Parameter set, TFT- configuration, data logger recordings and fault history can be transferred by means of conventional USB stick. Irrespective from that, the continuous logger data is automatically saved on a regular basis if the USB stick is inserted.

Stage- and three-point step controllers with auxiliary contact (e.g. burner contr.) are fitted as standard with a 2nd measuring input. Additional contacts can be switched time dependent using the integrated real time clock.

INDEX

1
2
3
4
5
6
7
8
9
0

Content

REFERENCE!
This symbol refers to further information in other sections, chapters or other manuals.

open printversion

INDEX

Hardware- types (unprogrammed)**:**

Type	Measuring inputs	Binary inputs	Analogue outputs	Relays
903K2223	2	2	2	3
903K2C46	2	12	4	6
903K5807	5	8	0	7
903K5826	5	8	2	6
903K5K28	5	20	2	8[#]
903K8223	8	2	2	3

[#] = Some relays with permanently connected RC element for spark suppression

Normally, the RC element is selectable connectable, see table for versions with permanently connected RC element.

versions 903K.. (type suffix)
Measuring inputs * for potentiometer: _*w,
Analogue outputs * voltage: _*u
* = Number in case of several in- and outputs

Special versions depending on quantities possible.

Hardware- expansion modules: see sheet 852..

External malfunction alarm display: see sheet 826..

INDEX

1
2
3
4
5
6
7
8
9
0

Intended use

The device is intended, in accordance to the technical data, for measuring- and control functions in industrial environments.
Any other use or usage beyond this scope is not considered as intended.
The device is constructed in accordance to the current standards and directives and complies with safety regulations.
Nevertheless, improper use can result in danger to life or property damages.
In order to avoid risks, the device must be used for the intended use in a proper safety condition and in compliance with the delivered technical documentation. Application- related dangers can occur also if the device is appropriate or intended used caused for example by missing safety devices or wrong adjustments.

Personnel qualification

This document includes all information necessary for the intended use of the device described therein.
It has been written exlusively for technically qualified personnel who have been specially trained with expertise in automation technology. Understanding these informations and the technically correct implementation of the delivered documentation are required for safe installation, commissioning as well as for safety during operation. Work on the device and the electrical wiring must only be carried out to the extent described by qualified personell.

Installation

Before installation: Inspect the controller for any visible signs of damage caused during transport.
Check power supply according to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical safety

- All electrical lines of the device must be disconnected during installation/dismantling, service- and repair work.
- Load circuits must be fused for the maximum load (see technical data).
- The device is not suitable for installation in areas with an explosion hazard.
- In addition to a faulty installation, also incorrectly (for example by self- adaption) or wrong set parameter values on the device could affect the correct process.
- Safety devices independently from the device should be provided always.
  The corresponding safety regulations must be observed.
- The operator must be electrostatic discharged (for example by touching a grounded metal object) before plugging or pulling of the connecting cables.
- During commissioning, the delivery defaults of the device can be different from the designated application. The plant constructor is generally responsible for commissioning.

Electrical wiring

- Plug bar on the back face of the controller; connect up the controller following the wiring diagram on the device.
- For connecting power supply phase wire and neutral wire must not be transposed.
- Wire cross section max. 1,5 mm^2
- Lay input-, output and supply cabling physically seperated and not parallel to one another.
- Use shielded and twisted cables for the measuring-, control- and interface circuits to avoid interferences; Ground the shield properly. Do not lay close to components or cables through which current is flowing.
- Do not loop through ground wires, but connect to a common grounding point in the control cabinet; furthermore, a professional potential equalization must be noted and the lines must be kept as short as possible.
- The DIN VDE 0100 “construction of low-voltage systems” respectively the appropriate country specific regulations (for example on basis of IEC 60364) must be followed for the wiring material, the installation and the electrical wiring.

Putting into operation

Switch on power supply. Digital display and control lamps (if available) will light up according to the setpoint after some seconds. Adjust set value and check other adjustments.

Maintenance

All electronic controllers in the product range of the manufacturer are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. In case of faults repair work by the customer should be restricted to the externally accessible leads, connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

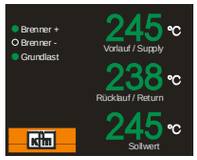
All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side,
loosen fastening devices and remove controller from the panel.

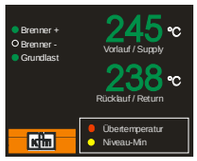
In case of remittance please give precise details of the fault to reduce time and cost of repair.

see chapter error messages on page 17

Operating status:



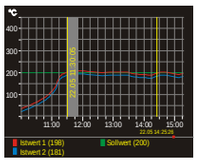
Analog values: Depending on the configuration, up to three values in 10 mm size or two values in 10 mm and two values in 3 mm size can be displayed. A dedicated unit for each value can be configured if desired. The corresponding descriptive texts are changeable by means of the PKS PC software.Depending on equipment, the status of the relays is shown at the left side of the display via a coloured circle icon.



In conjunction with the option of binary input messages, the corresponding texts are shown in the two lower 3 mm display lines if the binary inputs are activated. The corresponding value displays are hidden during this time.

Message list#: *Briefly* press the ▲ - button (*do not* hold)
The display now shows a list of message texts for all activated binary inputs in the order of their occurrence with date and time. Operating messages are displayed by a circle icon coloured green.Pre- alarm messages are displayed by a circle icon coloured yellow. Messages which are configured to the collective relay are marked with a circle icon coloured red. This flashes until the message has been confirmed by means of binary input 1 (reset).

History#: *Briefly* press the ▲ - button (*do not* hold)
As message list, but the display shows a list of optionally saved messages (max. 40, oldest one will be overwritten). Furthermore, gone pre- alarms and malfunction messages are marked with a yellow respectively with a red check mark.



Graphical representation#: - *Briefly* press the ▲ - button (*do not* hold)
Actual- and setpoint values of the controller are displayed as a continuous diagram. The actual recording cycle is signalised by an ongoing red dot. Vertical yellow lines with grey background for date and time represent recording interruptions.
optional: To switch on the cursor press P -button *briefly*:
The cursor is moved along the time axis with the ▼ (earlier) / ▲ (later)-*buttons*, the values of the cursor position are shown in accordance to the date and time.
- *briefly* press the P - button to switch off the cursor

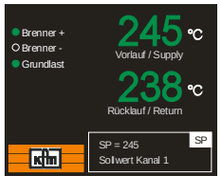
Custom specific representations#: briefly press the ▲ - button each (*do not* hold)

if existing

Note: The configuration of the graphical- and custom specific display is possible with the pc- software PKS only, see manual 99pks respectively chapter software on page 16.

Note: The parameters are shown partially, for full listing see sheet 99pkm_m (module overview).

Setpoint value setting:



- *Briefly* press the P - button (*do not* hold)
A flashing frame with the description SP shows the activated setpoint level and the parameter name “SP=”, the adjusted value as well as an description text optionally.

The displayed value can now be changed using the ▼ (lower) and ▲ (higher) *buttons*.

A setpoint change is effective *immediately*, without any further operational steps.

‘Arrow’ button *acceleration effect: longer* pressing *causes faster* changing.

***return** to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

optional:

***SPB**
Bus setpoint, forced by an external bus adapter (e.g. 99spde..)

***SP**
setpoints of additional control loops (*=no)

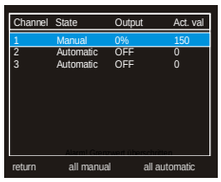
SP2 / 3 / ..
additional setpoints for the control loop

SPE
external setpoint (display only);
flashing description signifies: value is presently *not* active.

Briefly press the P - button again each time:

SP-F
Switch over menu SP / SPE
(only in case of adjustment SPEF=MENU (Conf-level))

Manual operation :
(if existing) :

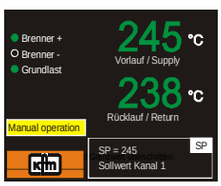


Press and hold the ▼ -button, then additionally press the ▲ - button, then release both. (Option: *Switch on and off using the extra button)*

A summary of the existing controller channels and their manual state is displayed.

The requested channel is marked blue using the ▼...▲ buttons,
press the P - button *briefly* to continue.
Then, select the status "manual" or "automatic" with the ▼...▲ buttons,
press the P - button *briefly* to continue.

The status "manual" provides now a manual control using the ▼...▲ buttons, the control function is deactivated.
The control function is activated in the status "automatic".
Press the P - button *briefly* to select a channel again.
Note: Marking "all manual" respectively "all automatic" and pressing the P - button briefly choose for all channels in common.



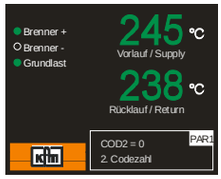
The corrective signal and the actual value are displayed for each channel.

return to operating mode: ***only*** with marking "return" and entering P - button *briefly* (respectively *), no* automatic switching back!
Note: The deactivated control function is signalised on the operation display by the display "Manual operation" on yellow background.

optional: Self- optimisation (see on page 11):
Marked channel P -button >5 sec: the display switches to "-Ad-

INDEX

Parameter level 1



Access from the operating level

After *polling* (see instructions for level PAR 1 / 2), a flashing frame with the description PAR1 / PAR2 shows the activated parameter level.

The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed: Press the ▼...▲ buttons

Settings in detail: *(existence depends on version and type):*

PAR1 Polling: press and hold the P - button >5 sec,
release it after the display reacts.

Factory setting:

COD2 Code number 2 (password) for parameter levels (1...9999) 1

USB Stick Menu (only) with equipment USB-host and inserted USB stick:
Functions for data transmission

The requested function is marked blue with the ▼...▲ buttons, briefly press the P -button to confirm

"**Load parameter only**", "**Load TFT-project**",
"**Load complete configuration**"
Parameter set, TFT-project or the complete configuration will be transferred from the USB stick into the device, mark the desired file and confirm with the P -button.

"**Save parameter only**", "**Save TFT-project**", "**Save complete configuration**"
Parameter set, TFT-project or the complete configuration will be transferred from the device into the USB stick.

"**Cancel**" To exit the menu ⇨ See sheet 903susb for additional information

CH..	(only) for multi-channel controllers: Selection of desired channel (no.)	
P	Proportional range Xp (%) (for more details, see “Optimisation”)	25,0
I	Integral action time Tn (min) (for more details, see “Optimisation”)	7,0
D	Rate time Tv (min) (for more details, see “Optimisation”)	0,2
SH	Response sensitivity (“dead zone”) Xsh (%)	0,1
SA. (ZA.)**	Setpoint distance (absolute) for following switching contact no.	5,0*
SP.	Independent setpoint for switching contact no.	0,0
SD. (ZD.)**	Hysteresis (switching difference on/off) for switching contact no.	3,0
	Only with configuration time dependent additional contacts:	
tSt.	Start time for switching contact no.., (weekday, hour, minute)	daily/0/0
tL.	Switching time for switching contact no.., (days, hours, minutes)	0/0/0
		(..201,701/SA3 :10,0)*

**= Je nach Ausführung

***return** to operating mode:*
briefly press the P - button (or automatic after > 30 sec)

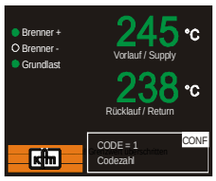
Parameter level 2

		Factory setting:
PAR2	Polling: *press and hold the* P *- button, additionally press the* ▼ *- button, hold* both buttons *for >5 sec, release them after the display reacts*.	
COD2	Code number 2 (password) for parameter levels (1...9999)	1
Time adj.	*Submenu* time adjustment, Polling: press and hold the P - button >5 sec.	
Date	Weekday, calendar day, month, year (actual selection marked white)	-
Time	Hour, minute, second (actual selection marked white)	-
Unit	Switches the unit of display (°C / °F), only temperature inputs	C
***BLO/*BHI**	(only) for voltage / current input: start / end of display range	#
***ELO/*EHI**	(only) for external setpoint: start / end of setpoint range	#
***SLO/*SHI**	(only) for information signal output: start / end of range	#
***NST**	Number of decimal places of the display (0 / 1 / 2, depending on range)	0
***Lo / *HI**	Setpoint setting range, lower / upper limit	#
BRGH	Brightness Display (30 ... 100)	50
DSP1/2/3/4	Variable shown in display line 1-4 (10mm) (OFF/SP/Y/IST*/text**/time**) Note: display line 1 to 3: 10mm, if DSP4 = "OFF" otherwise display line 1 and 2: 10mm, display line 3 and 4: 3mm (SP = setpoint,Y=setting var.,Ist*=actual value channel*/meas. input*)	1=IST1 2=IST2 3=SP 4=AUS
EIN1/2/3/4	Unit of measurement for display line 1-4 (°C/ °F/ %/ bar/ mbar/ mPas/ cSt/ Kgm3/ mm/ Kpa/ L/ m3/h/ " ") Note: no conversion!	°C/°C/°C
TEXT1/2/3/4	Desription text for corresponding display line1..4: choose from a predefined list: (ACT.VAL..,SETPOINT, SUPPLY,RETURN), resp. 1 additionally editable text.*,changeable by PKS-software	1= ACT.VAL 1 2= ACT.VAL 2 3=SETPOINT 4=OFF
DSPT	Configuration message text Txt (internal messages in lines 3 and 4, value indication is deactivated), Txtl (internal messages list only), Txi (external messages in lines 3 and 4, value indication is deactivated), Txil (external messages list only), OFF	OFF
Hist.	*Submenu* delete history, Polling: press and hold the P - button >5 sec.	
Del	Delete history (NO / YES)	NO

***return** to operating mode: briefly press the* P *- button*
(or automatic after > 30 sec)

***= ID number in case of several meas. inputs/ control loops. # = *corresp. range*
**= display line 4 only

Configuration level



Access from the operating level

Polling: press and hold the P *- button, additionally press the* ▲ *- button, hold* both buttons *for >5 sec, release them after the display reacts.*

A flashing frame with the description CONF shows the activated parameter level. The *upper text display* shows the first parameter name and the adjusted value, the *lower text display* optionally shows a description text.

continue to the next parameter and/or *confirm* entry:
briefly press each time the P - button

To *change* the setting displayed:
Number values: Press the ▼...▲ buttons, text values:press the ▲ - button

Settings in detail *(existence depends on version and type):*

		Factory setting
CODE	Code number for configuration level (1...9999), Alternatively: Hold the P button for more than 10 sec after code entry:	1
COD1	Possibility of setting the code number for the configuration level(option).	1
COD2	Possibility of setting the code number for the parameter levels(option).	1
LNG	Language selection of the menu texts (Deutsch,English,User def, Off)	*Deutsch*
CONF	Selection of the configured controller function (*if existent*)	

Note: when continuing after changing a function, the display first flashes for a few seconds, only then does the desired switching over or back take place

return to operating mode: *Briefly* press the P - button

or: **continue** to the following settings:
press the P -button and *hold it* > 5 sec

		Factory setting
SPEF	Configuration external setpoint: “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “AUS”=OFF	*AUS*
SP2F	Configuration second setpoint: “BIN” (activation by binary input) / “MENU” (activation from the setpoint level) / “AUS”=OFF	*AUS*
SPBF	Configuration bus setpoint: ”BIN” (activation by a binary input) / “MENU” (activation in the setpoint level) / “BUS” (activation by a status bit via bus-interface adapter, such as 99spde)	*BUS*
SPOV	Take over external-/ bus setpoint value: “OVER” (the last valid external-/ bus setpoint value is taken over to the internal setpoint value) / “AUS”=OFF (setpoint value unaffected)	*AUS*
AIN*	Input type for input no.*: "RTD / 0-20 / 4-20(mA) / 0-10 / 2-10(V) / AUS=OFF" (note different terminals for I/U!)**	*RTD*
AiSP	Input type for input external setpoint: "0-20 / 4-20(mA) / 0-10 / 2-10(V)" (note different terminals for I/U!)	*4-20*
IST*	Correction value for changing the controller display (+/-)	*0.0*
SP 2/E	Type of effect of second / external setpoint: "Add/ Sub/ AbS" (adding / subtracting / absolute value)	AbS
***YM**	Setting time of the controlled drive “6…600” (sec)	*60 sec.*
***CY' '**	Switching frequency in two-point controllers: "2...120" (sec.)	*20 sec.*
***OUT**	Setting output signal "0...20 / 4...20" (mA) /0...10 / 2...10 (V)“	*4...20 mA*
***OUT**	Setting output characteristic: direct / inverse "di / in" (with 2 outputs: "in in / in di / di in / di di")	*in* *inin*
***td**	For 2 outputs: dead zone between outputs 1 and 2 “0…10%”	*0*
***AP**	Output signal working point (-100…+100)	*50*
FG A/E	⇨ Automatic adaption for position feedback input (see sheet 99ar)	
Sou*	Assignment of inform. output signal(s)* (act. value/setp., setting var..)	*Ist1*
Sou*	Type of information output signal(s)* “0..20/4..20(mA)/0..10/2..10(V)” (* Sout= signal 1; Sou2 = signal 2)	*4...20 mA*
***Y_S**	Behaviour of the setting output in the event of measurement line error:	
	Relay position: "rel1 / rel2 / OFF"	*rel2(70.),rel1(20.)*
	Continuous output: "0...100" (%)	*0*
bin. Eing	Sub-menu for binary input configurations Polling: press the P -button and *hold it* > 5 sec:	
BIN*	Direction of control action binary input* direct / inverse (di/in)	di
BIN*	Assignment of collective relay: Stat=none, SREL= collective relay	stat
BIN*	Switch-on delay (0...300 sec)	0
REL*	Function mode of additional contact (relay no.)	*SoA(701),StA(201)*
REL*	Measuring input / control loop assigned to additional contact	*Ist 1*
REL*	Add. contact – relay pos. in event of meas. line error "SiE/SiA"(on/off)	*Si A*
Adr	if equipped with interface: bus address (number)	*5*
BAUD	if equipped with interface: baudrate (9600/19200/38400)	*38400*

return to operating mode: briefly press the P - button *again*

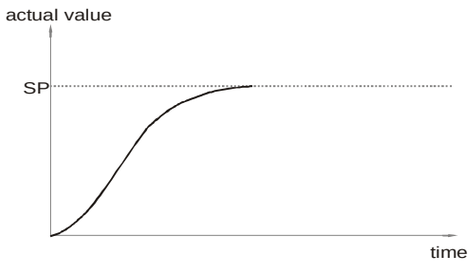
***** = ID number in case of several inputs / outputs or control loops.
******= Rtd input of ain2 is usable only if equipped with ext. setpoint and activation using SPEF.

manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information. The following informations are for help purpose only:

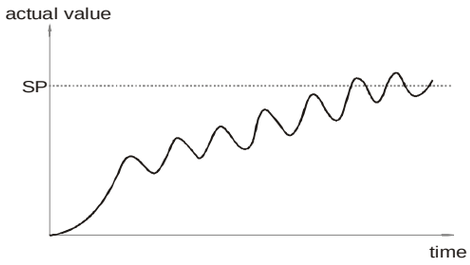
Optimal



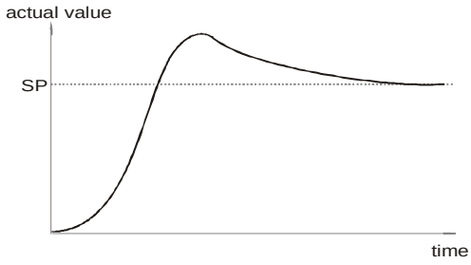
P = proportional band Xp (%):
lower value = *longer* impulses (three-point step control), more sensitive reaction,
higher value = *shorter* impulses (three-point step control), less sensitive reaction.

Examples:

- Oscillating temperature without distinct initial overshot: **P (Xp) too low**;



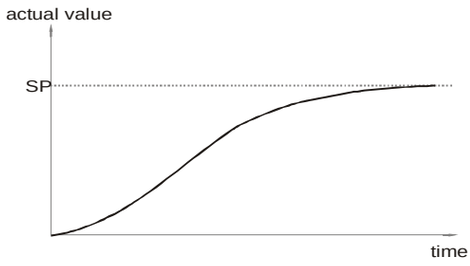
- The setpoint is reached very slowly after initial overshooting: **P (Xp) too high**.



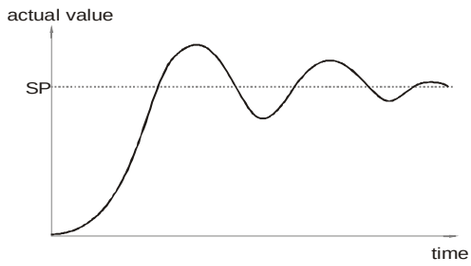
I = integral action time Tn (min):
lower value= *shorter* impulse gaps (three-point step control), faster balancing,
higher value= *longer* impulse gaps (three-point step control), slower balancing.

Examples:

- the set value is reached very slowly without overshooting: **I (Tn) too high**;



- high initial overshot followed by fading oscillation: **I (Tn) too low**.



D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

Self-adaptation (optional)

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller (if available) has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first: Lower actual value adequately by manual operation (position of final control element) (quick circuits)or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min),then it increases the output signal about 10% or, in case of three- point- step controller operation,it triggers an output impulse with about 10% of the adjusted regulating time.The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation
(Display shows error code, ref.to chapter error messages on page 17)

Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for <u>trailing</u> contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off))

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

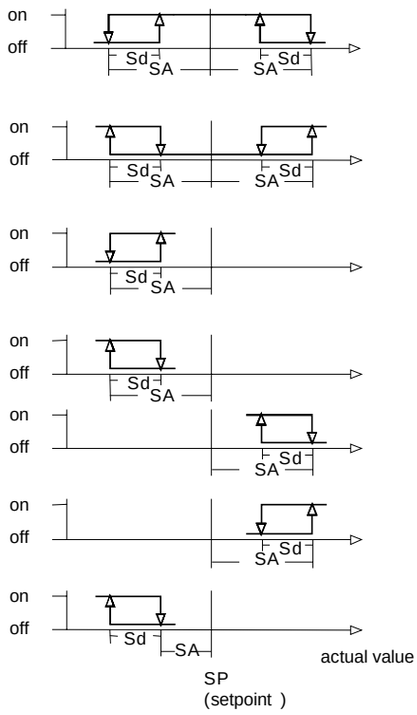
Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

St A Heating stage below setpoint. Relay drops out as actual value increases

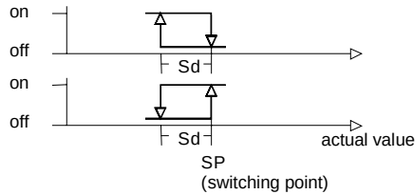
(**A**us = off)



Switching functions for <u>independent</u> contacts:

US A Relay drops out with increasing actual value (**A**us = off)

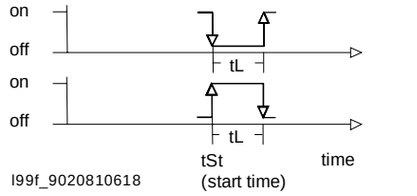
US E Relay picks up with increasing actual value (**E**in = on)



Switching functions for *<u>time dependent</u>* contacts*:*

RTCA time dependent switch-off contact(**A**us=off)

RTCE time dependent switch-on contact (**E**in= on)



See sheet 99rtc , among other things, examples for daily or weekly switching

In each case additional settings follow under "rEL." after the selection is acknowledged (P - key):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH./.SP. **.**(only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

INDEX

1
2
3
4
5
6
7
8
9
0

Additional contact – special functions (depending on version)

Service function:

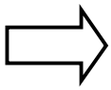
Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

Interface function:

BUS Bus function, relay is switched on/off depending on control via service- interface, for example using the profibus- adapter 99spde..



See manual 99sp.. for each adapter

Malfunction message function (when using the internal malfunction alarm display):

SR A /E Collective message function, relay is de-energised / energised if there is an alarm message.

NW A /E New value message, relay is de-energised / energised if a new alarm message appears that has not yet been confirmed with reset.

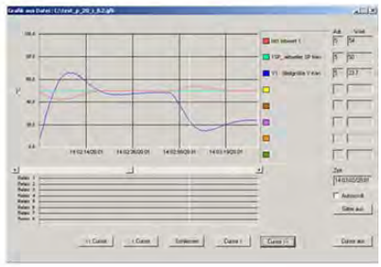
IP A /E New value pulse, relay is de-energised / energised for 3 sec if a new alarm message appears.

SRIA /E Collective message function with new value pulse, relay is de-energised / energised if there is an alarm message. If a further (new) alarm message appears, the relay is energised for 3 sec.

Software

PKS

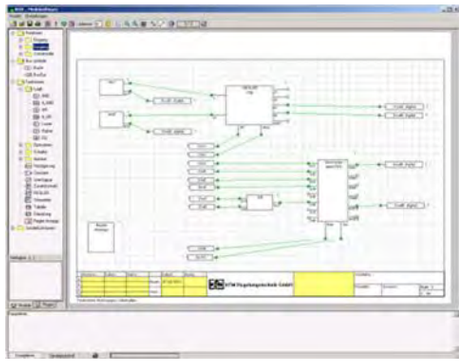
- Data fransfer, editing and archiving of parameter sets
- Online remote operation
- Graphical display (line recorder)
- Data recording (logger)



See sheet 99pks

PKM *(component of PKS)*

- Module software for graphical programming
- Regulation and control



See sheet 99pkm
See sheet 99pkm_m (module overview)

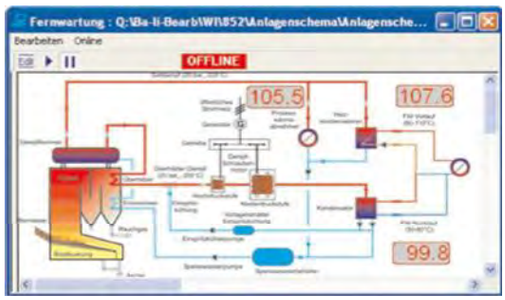
PKD *(component of PKS)*

- Configuration of the controller display
- Data logger, binary message lists and custom specific logos

See sheet 99pkd

PCS

- Visualization of custom specific system- and process schemes
- Remote maintenance



See sheet 99pcs

INDEX

Error messages

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50	Hardware error in program section
Err 52	Hardware error in data section no further operation possible, remit controller for repair
Err 58	Binary inputs out of function (status = 0), remit controller for repair
Err 59	Digital outputs out of function (switched off), remit controller for repair
Err 60	Relay outputs out of function (switched off), remit controller for repair
Err 61	Analogue outputs out of function (0 %), remit controller for repair
Err 63	Data connection to the hardware expansion modules interrupted, check cables

⇨ Error messages during self adaptation (see chapter self- adaption on page 13):

Err 202	Ambient conditions are not suitable for self adaptation; ⇨ adjust parameters manually (see chapter manual optimization on page 12)
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

INDEX

1 2 3 4 5 6 7 8 9 0

Technical data
(depending on type and version)

Characteristics
Parameter-level, code locked.
pre adjusted on customer´s demand.

Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA(add. contacts):0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input or time dependent(daily-/ weekly switch. function), switching function adjustable

Measuring inputs:
Pt100/standard signal, -200..+800°C/adjust.

Thermal element * NiCr-Ni (K) 0..1200°C
Fe-CuNi (J) 0..900°C, PtRh-Pt (S) 0..1700°C

Remote resistance transmitter * 0...100/1000Ω
* = *option*

Ranges:
Pt 100: -200..+800°C, switchable to °F, standard signal: Display adjustable -999 to 9999, setpoint range can be limited via menu

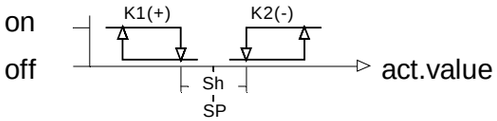
Binary inputs:
Alternative for potential-free contacts or for external voltage 0 / 24V

Outputs:
Relay with potential-free changeover contacts, switching power: 250V 2A incl. spark extinction (on the N.O. contact)

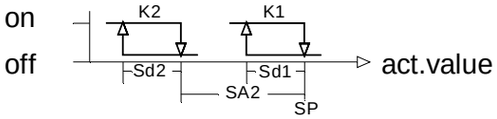
Continuous outputs 0/4...20mA, 0/2...10V (load <= 500 Ω),

Logic outputs 0/24V max. 40 mA, alternatively outputs with open-collector,
max 24 V/100 mA

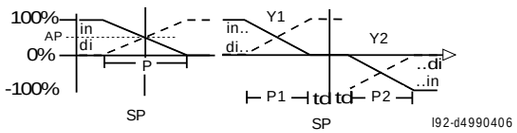
stage controller (inverted)



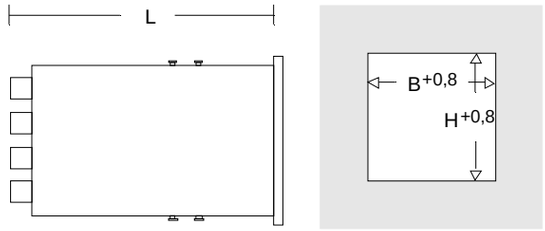
three- point step controller (inverted)



continuous controller
single output double output



Installation dimensions:



Form 96x96: L=150mm, B=92mm, H=92mm

Other data:
Housing for panel mounting, 96 x 96 mm
Power supply: 100..250 VAC, about 14 VA
alternative 24 V AC / DC
Protective system EN 60529:
IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: KWF to EN 60529
Relative humidity <= 75 % yearly average, no condensation
EMC: referring to EN 61326

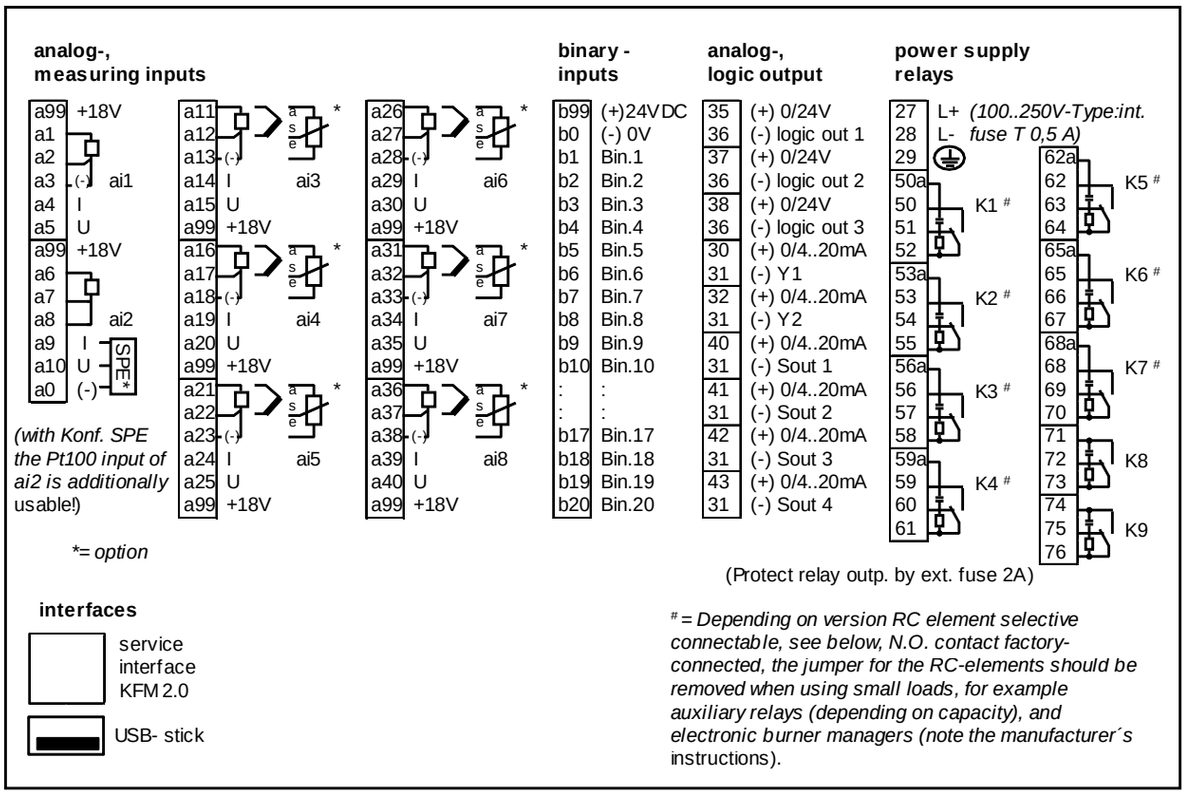
Interfaces:
Service interface KFM 2.0 RJ45 (socket)

USB- 2.0 Host plug type A (socket) für USB-memory stick, max. 100 mA

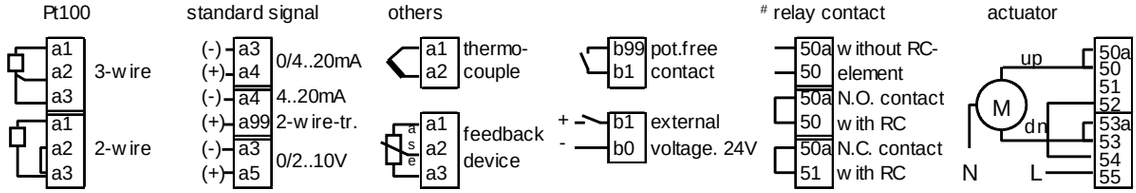
see sheet 99s for additionally information

Wiring diagram:

Example, valid for each delivered controller is the wiring diagram on its casing only



Wiring, examples for input 1 and output 1 respectively:



Regelungstechnik nach Maß

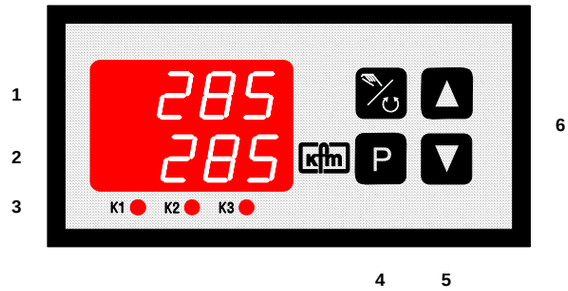
KFM-Regelungstechnik GmbH
Planckstraße 2
32052 Herford, Germany

Internet: www.kfm-regelungstechnik.de
E-Mail: info@KFM-Regelungstechnik.de

Telefon: +49 (0) 52 21 / 77 08 - 0
Telefax: +49 (0) 52 21 / 77 08 - 43

INDEX

1 Digital display actual value
2 2nd digital display (if aktive)
3 LED-display relais function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)



Brief description:

KFM 91 is a microprozessor based industry controller series in panel mounting- format 48 x 96 mm. Design and operating elements are especially devised for easy and convenient handling and operation.

An assembly system renders possible the simple basic version as well as a plurality of variants with up to 3 relays, several digital and analog out- and inputs and other additional devices.

Types:

(depending on configuration):	*type:*
indicator	9101.
one stage controller	9110.
two stage controller	9120.
heating / cooling controller	9130.
positioner / follow-up controller	9140.
two- point- PID controller	9150.
three- point- PID controller	9160.
three- point- step controller	9170.
continuous controller	9180.
setpoint generator	9193.

Sub-types:

	suffix (*)
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: logik output	..L

function extensions

	suffix (*)
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices*:

	(*)
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
other interfaces on demand	

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 91700-99bwa-ogx. For more information see corresponding data sheets.'

Inputs:

max. 2 measuring inputs, acc. to sub-type*:*	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 1000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 3 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

Outputs:

up to 3 relays with potential free change over switch, as control outputs or as additional contacts,
capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

INDEX

1
2
3
4
5
6
7
8
9
0

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the KFM range are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service.
In case of faults repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself. (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side, loosen fastening devices and remove controller from the panel.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Error messages:

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50 Err 52	Hardware error in program section Hardware error in data section no further operation possible, remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

Operating status:

The *upper display* shows the actual value (channel / measuring input 1),

the *lower display* remains empty or (depending on the version and settings) shows
- the attendant unit of measure (°C, °F, %...)
- an additional actual value, the setpoint value or the controller output value Y
- or the additional actual value only when the ▲ key is pressed.

Alternative type:
switch over the *upper* display to the several actual values by pressing the ▲ key,
the lower display shows the number of the attendant measuring input.

Setpoint value setting:

press P - key *shortly* (do *not* hold down)

The *upper display* shows the abbreviation of
the activated setpoint adjustment mode,
the *lower display* shows the adjusted value.

The indicated value can now be changed by the ▼ (lower) and ▲ (higher) -keys.
Each variation of the set value is *immediately* active, without any more operating steps.
The arrow keys have a built-in accelerator mode:
longer pressing causes faster alterations.

***Return** to operating level:*
Press P - key shortly (or automatically after 30 seconds without any key-action)

optional: Press P - key *shortly* again: *SP =set values of further control loops (*=no.) /
SP* =further set values of the control loop / SPE =external setpoint (display mode only);
flashing display signifies that the function is *not* active at the moment.

Manual operation: *(optional)*

Hold down ▼ - key and press ▲ - key, then release both keys.
(optional: switch on and off using separate - key)
(for multi-channel controllers first enter the channel number*,
and press P - key, then:)

The *lower diplay* shows "H *" and - if activated - the output position.
The *upper display* still shows the actual value. The automatic control is interrupted.

Manual control is now possible using the ▼...▲ - keys.

Return to operating level ***only*** by pressing the P - key (if present: the - key) **.**
(*no* automatic return from the manual mode)

optional: starting the self adaptation (ref. to chapter Optimization):
On manual operation level P - key >5 sec ;
the *lower display* indicates "-Ad-".
Cancel: P - key >5 sec again

Access from operating level.

Unlock the access first**:**
Turn the switch on the rear panel of the controller to position "**U**" = unlocked
(Lock access after the adjustments: Switch position to "L" = locked).

After the parameter level (refer to the instructions to each level) has been invoked, the first setting is shown and can be modified.

*It is **not** possible to invoke the parameter level when the switch is locked .*
In this case the display shows the abbreviation of the configured controller type.

Confirm the entry and / or **move on** to next parameter:
press the P -key *briefly*

Settings in detail:
(not available on all types)

Level 1: Invoke: Hold down the P - key for more than 5 sec. until the display changes

		factory setting:	*notes:*
CH	channel selection (no.) for multi-channel controller (only)		
***P**	proportional range Xp (%) (ref. to chapter "Optimization")	25,0	___
***I**	integral action time Tn (min) (ref. to chapter "Optimization")	7,0	___
***d**	rate time Tv (min) (ref. to chapter "Optimization")	0,2	___
***Sh**	sensitivity of response Xsh (%)	0,1	___
***SA..**	switching interval (absolut value) for following (additional) contact no...	5,0*	___
SP..	set point for independent additional contact no...	0,0	___
***Sd..**	switching difference for additional contact no...	3,0	___
		(*201,701/SA3:10,0)	

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

Level 2: Invoke: Hold down P - key and press ▼ - key,
hold down both keys for more than 5 sec. until display changes.

Unit	switch-over the displayunit (°C / °F)	C	___
***bLo/*bHI**	start / end of display range for voltage- / current -input (only)	#	___
***ELo/*EHI**	start / end of range for external setpoint (only), referring to signal	#	___
***SLo/*SHI**	start / end of range for signal output (only), referring to signal	#	___
nSt	modification of decimal point characters (0 / 1 / 2)	0	___
***Lo / *HI**	start / end of setpoint range (°C /°F or value)	#	___
dSPL	select display function for lower display (AUS / SP / Y / IST2)	AUS	___

(AUS = off, SP = setpoint, Y = output, Ist2 = actual value of channel / measuring input 2)

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

***** = channel no. in case of multiple measuring inputs or control loops. # = *acc. to range*

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = *longer* impulses, more sensitive reaction
higher value = *shorter* impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= *shorter* impulse gaps, faster balancing
higher value= *longer* impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Access from the operating level.
Unlock the access first: Turn the switch on the rear panel of the controller to position "**U**" (= unlocked). *It is **not** possible to configure the controller with **locked** switch.*
(Lock access after the adjustments: Switch position to "L"= locked)

Hold down the P - key and press the ▲ - key,
hold down both keys for more than 5 sec. until the display changes

Enter the code number (password) ▼...▲ (1...9999), factory setting: 1
move on to next input: *briefly* press P - key

Alternatively: Hold down key after entering code for more than 10 sec.
Possibility to modify code number (optional)

Select control function *(type dependent)*: the displayed ID number for the configured control function can be changed by pressing the ▲ - key.
(Example Type 930K31: choose (92..) 200, 201, 700, 701)

Return to operating level: *briefly* press the P - key
or
move on to following **adjustments**: hold down P - key for more than 5 sec.
Note: when switching is continued after a function has been changed, the display will first flash for several seconds, only then will the controller return to the selected level.

Configurations are displayed in succession (type and design dependent)
and can be changed: ▼...▲
(move on to next input: press P - key *shortly)*

		factory setting
Ist*	correction value to change the controller display (+ / -)	*0.0*
EinG	type of measuring input Pt 100 / DC-signal: "rtd / Iu"	*rtd*
Ain*	type of DC signal for input No.*:rtd/ 0/4-20mA/ 0/2...10V	*4...20 mA*
	(observe different terminal connection I/U)	*(91..:rtd)*
SP 2/E	kind of 2nd/ external setpoint: Add/ Sub/ AbS	AbS
	(adding / subtracting / absolute)	
***Y' '**	travel time of the actuator "6...600" (sec.)	*60 sec.*
***cy' '**	switching frequency for 2-point controllers: "2...120" (sec.)	*20 sec.*
***out**	adjusting kind of output signal "0...20/ 4...20(mA)/ 0...10/ 2..10(V)“	*4...20 mA*
***out**	adjusting output characteristics direct / inverted "di / in"	*in*
	(for 2 output signals:"in in / in di / di in / di di")	
***td**	for 2 output signals: deadpoint between output 1 and 2 "0...10%"	*0*
AP	correction of the output signal operation position	*50%*
FG A/E	automatical adjustment for teletransmitter input (ref. sheet 99ar)	
Sou*	adjusting type of information signal "0..20/4..20(mA)/0..10/2..10(V)"	*4...20 mA*
Sou*	adjusting kind of information signal "Ist/Soll.." (actual/ setp.value)	*4...20 mA*
	(*Sout= signal 1, Sou2= signal 2)	
***Y_S**	behaviour of the output in case of measuring line fault:	
	relay position:"rel1 / rel2 / AUS" (AUS = relays off)	*rel2(70.),rel1(20.)*
	continuous output position: "0...100" (%)	*0*
reL..	function selection for add. switching contacts :	
	add. contact 1 (relay-no.*)	*SoA(701),StA(201)*
	add. contact 2 (relay-no.*)	*Su A*
	select the corresponding measuring input / control circuit	*CH 1*
	relay condition in case of measuring line fault: "SiE/SiA"(on/off)	*Si A*
Adr	bus adress (adress no.) (for interface equipment only)	*5*

Return to operating level: *briefly* press the P - key again

***** = In case of multiple measuring inputs or control loops: relay- or channel number

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

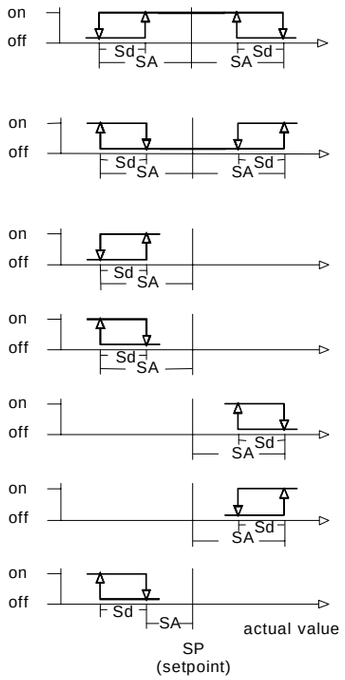
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

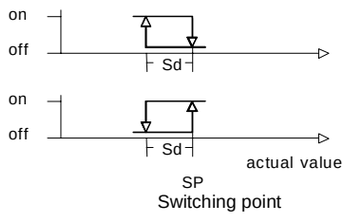
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Only for units with program option

Pr A Relay switched off (**a**us) during SP **pr**ogram level, otherwise switched on

Pr E Relay switched on (**e**in) during SP **pr**ogram level, otherwise switched off

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH../.SP. (only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

"Safety" shut down (in case of measuring line fault):

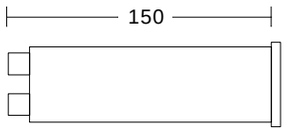
SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**

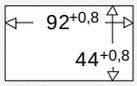
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

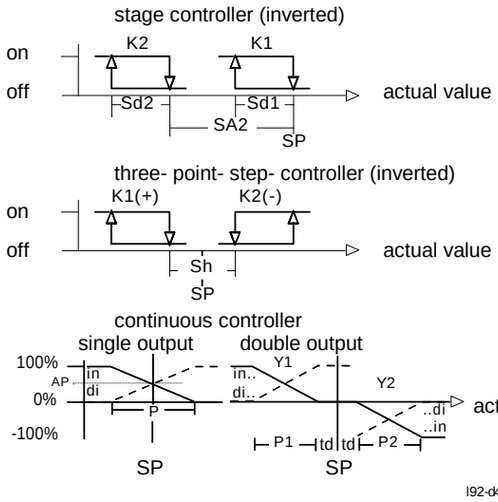
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

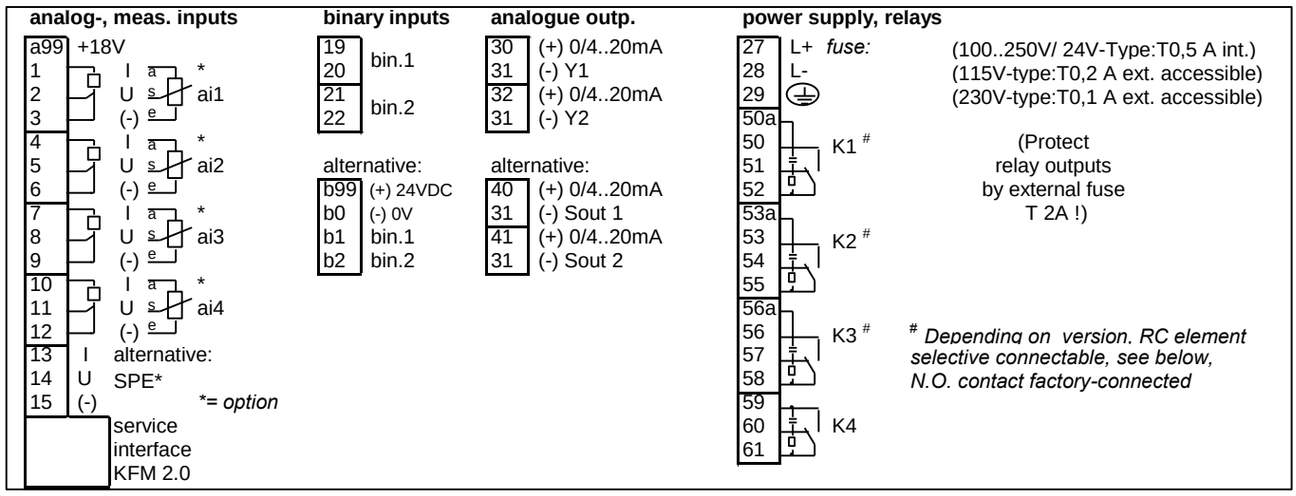




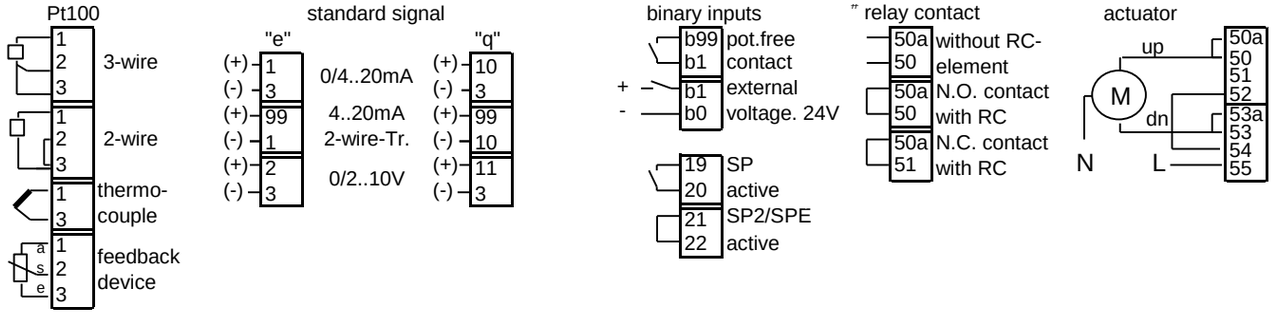


Other data:
Housing for panel mounting, 48 x 96 mm
Power supply: 230VAC +/- 10 %, 48...62Hz
alternative 115 VAC, 48 VAC, 24 VAC, 24 VDC
Power consumption: approx. 14 VA
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC: refer to EN 61326

Wiring diagram: valid for each delivered controller is the wiring diagram on its casing only)



Wiring, examples for input 1 and output 1 respectively:



open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

1 Digital display actual value
2 2nd digital display (if active)
3 LED-display relay function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)

Certifications: DIN, BV, DNV, GL

Brief description:

KFM 92 is a microprocessor based industry controller series in panel mounting- format 96 x 96 mm. Design and operating elements are especially devised for easy and convenient handling and operation. An assembly system renders possible the simple basic version as well as a plurality of variants with up to 8 relays, several digital and analog out- and inputs and other additional devices. All relay contacts are implemented as potential-free changeover contacts. Normally, the N.O. contacts of all relays are internally permanently wired with RC elements. Optionally, the RC elements for relays K1…K3 are led on terminals for the selective connection (N.O. contact factory-connected). The scope of delivery includes plugable terminal blocks.

Types:

(depending on configuration):*	*type:*
indicator	9201.
one stage controller	9210.
two stage controller	9220.
heating / cooling controller	9230.
positioner / follow-up controller	9240.
two- point- PID controller	9250.
three- point- PID controller	9260.
three- point- step controller	9270.
continuous controller	9280.
continuous controller, 2 outputs	9281.

Sub-types:	*suffix (*)*
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: logic output	..L

function extensions	*suffix (*)*
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices:	**(*)**
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
interface Profibus, Interbus S, other	(99) sp/si.

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 92700-99aw-ogx-rü. For more information see corresponding data sheets.

Inputs:

max. 4 measuring inputs, acc. to sub-type*:*	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.
combined input Pt100 / standard signal	q.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 4000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 8 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

Outputs:

up to 8 relays with potential free change over switch, as control outputs or as additional contacts,
capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport.
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps (if available) will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse (if available) on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the product range of the manufacturer are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service. *In case of faults* repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side,
loosen fastening devices and remove controller from the panel.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Error messages:

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50	Hardware error in program section
Err 52	Hardware error in data section no further operation possible, remit controller for repair
Err 58	Binary inputs out of function (status = 0), remit controller for repair
Err 59	Digital outputs out of function (switched off), remit controller for repair
Err 60	Relay outputs out of function (switched off), remit controller for repair
Err 61	Analogue outputs out of function (0 %), remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

Operating status:

The *upper display* shows the actual value (channel / measuring input 1),

the *lower display* remains empty or (depending on the version and settings) shows
- the attendant unit of measure (°C, °F, %...)
- an additional actual value, the setpoint value or the controller output value Y
- or the additional actual value only when the ▲ key is pressed.

Alternative type:
switch over the *upper* display to the several actual values by pressing the ▲ key,
the lower display shows the number of the attendant measuring input.

Setpoint value setting:

press P - key *shortly* (do *not* hold down)

The *upper display* shows the abbreviation of
the activated setpoint adjustment mode,
the *lower display* shows the adjusted value.

The indicated value can now be changed by the ▼ (lower) and ▲ (higher) -keys.
Each variation of the set value is *immediately* active, without any more operating steps.
The arrow keys have a built-in accelerator mode:
longer pressing causes faster alterations.

***Return** to operating level:*
Press P - key shortly (or automatically after 30 seconds without any key-action)

optional: Press P - key *shortly* again: *SP =set values of further control loops (*=no.) /
SP* =further set values of the control loop / SPE =external setpoint (display mode only);
flashing display signifies that the function is *not* active at the moment.

Manual operation: *(optional)*

Hold down ▼ - key and press ▲ - key, then release both keys.
(optional: switch on and off using separate – key)
(for multi-channel controllers first enter the channel number*,
and press P - key, then:)

The *lower diplay* shows "H *" and - if activated - the output position.
The *upper display* still shows the actual value. The automatic control is interrupted.

Manual control is now possible using the ▼...▲ - keys.

Return to operating level ***only*** by pressing the P - key (if present: the – key) **.**
(*no* automatic return from the manual mode)

optional: starting the self adaptation (ref. to chapter Optimization):
On manual operation level P - key >5 sec ;
the *lower display* indicates "-Ad-".
Cancel: P - key >5 sec again

Access from operating level.

Unlock the access first**:**
Turn the switch on the rear panel of the controller to position "**U**" = unlocked
(Lock access after the adjustments: Switch position to "L" = locked).

After the parameter level (refer to the instructions to each level) has been invoked, the first setting is shown and can be modified.

*It is **not** possible to invoke the parameter level when the switch is locked .*
In this case the display shows the abbreviation of the configured controller type.

Confirm the entry and / or **move on** to next parameter:
press the P -key *briefly*

Settings in detail:
(not available on all types)

Level 1: Invoke: Hold down the P - key for more than 5 sec. until the display changes

		factory setting:	*notes:*
CH	channel selection (no.) for multi-channel controller (only)		
***P**	proportional range Xp (%) (ref. to chapter "Optimization")	25,0	___
***I**	integral action time Tn (min) (ref. to chapter "Optimization")	7,0	___
***d**	rate time Tv (min) (ref. to chapter "Optimization")	0,2	___
***Sh**	sensitivity of response Xsh (%)	0,1	___
***SA..**	switching interval (absolut value) for following (additional) contact no...	5,0*	___
SP..	set point for independent additional contact no...	0,0	___
***Sd..**	switching difference for additional contact no...	3,0	___
		(*201,701/SA3:10,0)	

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

Level 2: Invoke: Hold down P - key and press ▼ - key,
hold down both keys for more than 5 sec. until display changes.

Unit	switch-over the displayunit (°C / °F)	C	___
***bLo/*bHI**	start / end of display range for voltage- / current -input (only)	#	___
***ELo/*EHI**	start / end of range for external setpoint (only), referring to signal	#	___
***SLo/*SHI**	start / end of range for signal output (only), referring to signal	#	___
nSt	modification of decimal point characters (0 / 1 / 2)	0	___
***Lo / *HI**	start / end of setpoint range (°C /°F or value)	#	___
dSPL	select display function for lower display (AUS / SP / Y / IST2)	AUS	___

(AUS = off, SP = setpoint, Y = output, Ist2 = actual value of channel / measuring input 2)

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

***** = channel no. in case of multiple measuring inputs or control loops. # = *acc. to range*

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = *longer* impulses, more sensitive reaction
higher value = *shorter* impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= *shorter* impulse gaps, faster balancing
higher value= *longer* impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller (if available) has to be unlocked: position "u")

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: "-Ad-",
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

Access from the operating level.
Unlock the access first: Turn the switch on the rear panel of the controller to position "**U**" (= unlocked). *It is **not** possible to configure the controller with **locked** switch.*
(Lock access after the adjustments: Switch position to "L"= locked)

Hold down the P - key and press the ▲ - key,
hold down both keys for more than 5 sec. until the display changes

Enter the code number (password) ▼...▲ (1...9999), factory setting: 1
move on to next input: *briefly* press P - key

Alternatively: Hold down key after entering code for more than 10 sec.
Possibility to modify code number (optional)

Select control function *(type dependent)*: the displayed ID number for the configured control function can be changed by pressing the ▲ - key.
(Example Type 930K31: choose (92..) 200, 201, 700, 701)

Return to operating level: *briefly* press the P - key
or
move on to following **adjustments**: hold down P - key for more than 5 sec.
Note: when switching is continued after a function has been changed, the display will first flash for several seconds, only then will the controller return to the selected level.

Configurations are displayed in succession (type and design dependent)
and can be changed: ▼...▲
(move on to next input: press P - key *shortly)*

		factory setting
Ist*	correction value to change the controller display (+ / -)	*0.0*
EinG	type of measuring input Pt 100 / DC-signal: "rtd / Iu"	*rtd*
Ain*	type of DC signal for input No.*:rtd/ 0/4-20mA/ 0/2...10V	*4...20 mA*
	(observe different terminal connection I/U)	*(91..:rtd)*
SP 2/E	kind of 2nd/ external setpoint: Add/ Sub/ AbS	AbS
	(adding / subtracting / absolute)	
***Y' '**	travel time of the actuator "6...600" (sec.)	*60 sec.*
***cy' '**	switching frequency for 2-point controllers: "2...120" (sec.)	*20 sec.*
***out**	adjusting kind of output signal "0...20/ 4...20(mA)/ 0...10/ 2..10(V)“	*4...20 mA*
***out**	adjusting output characteristics direct / inverted "di / in"	*in*
	(for 2 output signals:"in in / in di / di in / di di")	
***td**	for 2 output signals: dead center between output 1 and 2 "0...10%"	*0*
AP	correction of the output signal operating point	*50%*
FG A/E	automatical adjustment for teletransmitter input (ref. sheet 99ar)	
Sou*	adjusting kind of information signal "Ist/Soll.." (actual/ setp.value)	*Ist1*
Sou*	adjusting type of information signal "0..20/4..20(mA)/0..10/2..10(V)"	*4...20 mA*
	(*Sout= signal 1, Sou2= signal 2)	
***Y_S**	behaviour of the output in case of measuring line fault:	
	relay position:"rel1 / rel2 / AUS" (AUS = relays off)	*rel2(70.),rel1(20.)*
	continuous output position: "0...100" (%)	*0*
reL..	function selection for add. switching contacts :	
	add. contact 1 (relay-no.*)	*SoA(701),StA(201)*
	add. contact 2 (relay-no.*)	*Su A*
	select the corresponding measuring input / control circuit	*Ist1*
	relay condition in case of measuring line fault: "SiE/SiA"(on/off)	*Si A*
Adr	bus adress (adress no.) (for interface equipment only)	*5*

Return to operating level: *briefly* press the P - key again

***** = In case of multiple measuring inputs or control loops: relay- or channel number

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

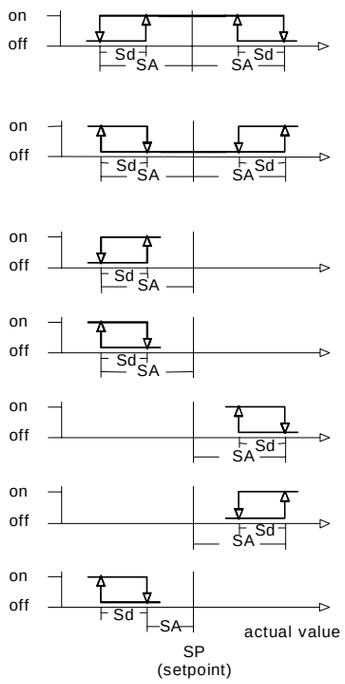
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

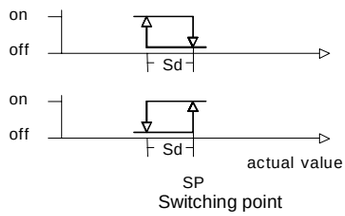
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH../.SP. (only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

"Safety" shut down (in case of measuring line fault):

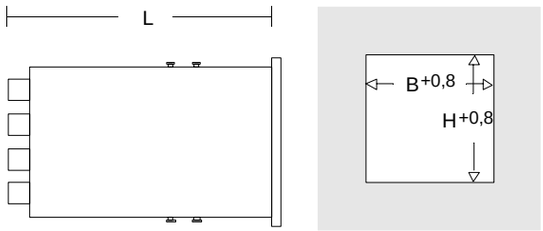
SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**

SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

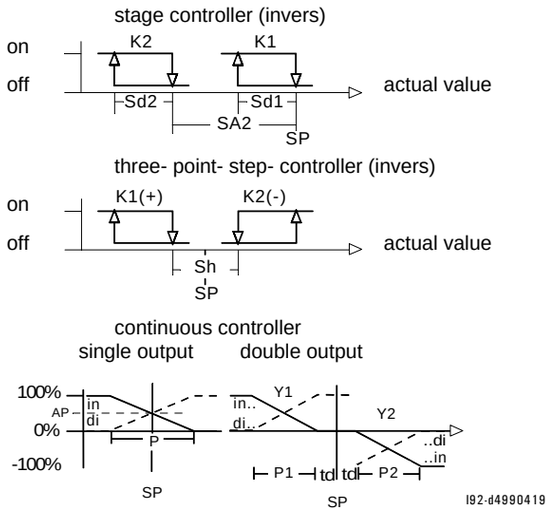
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

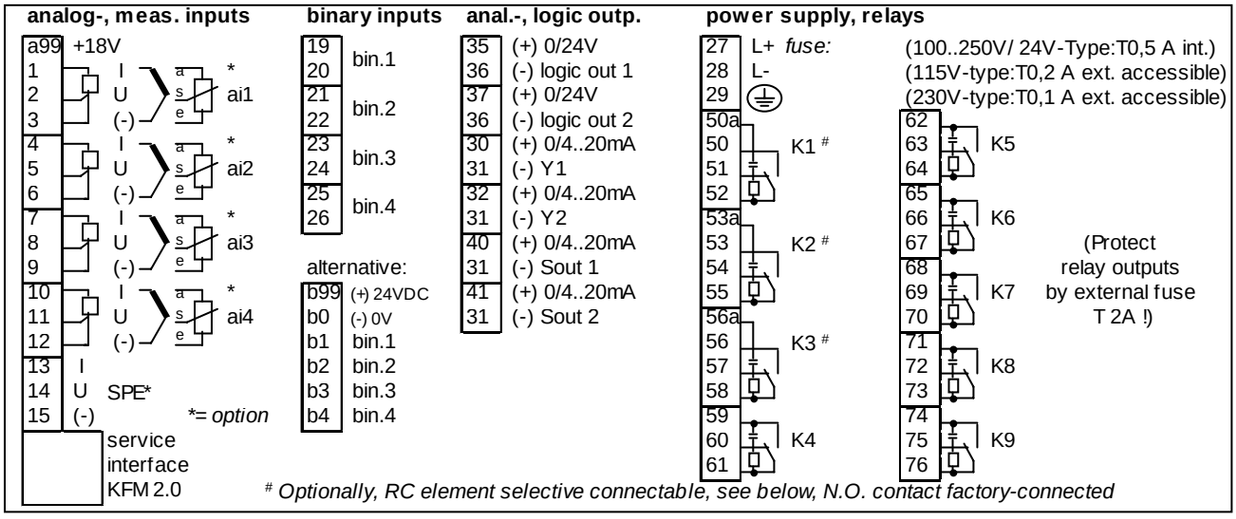


Form 96x96: L=150mm, B=92mm, H=92mm
Form 72x144: L=170mm, B=68mm, H=139mm

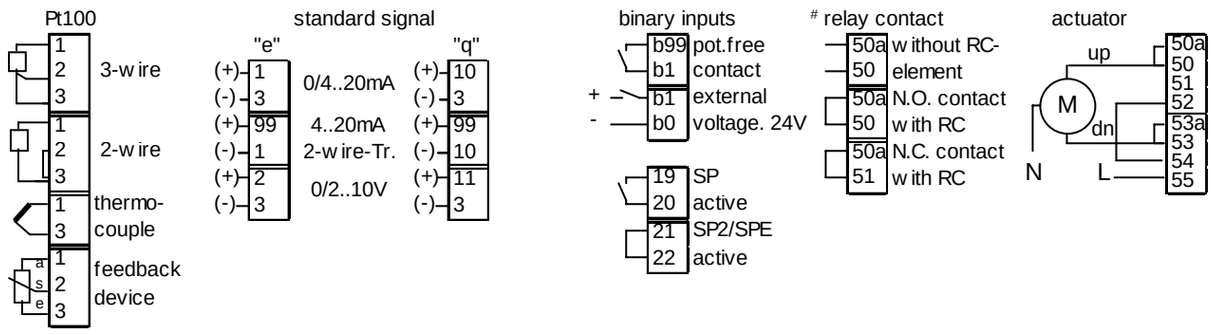


Other data:
Housing for panel mounting, 96 x 96 mm (type 92.., 93..) or 72 x 144 mm (type 94)
Power supply: 100-250VAC, 24VAC/DC(appr. 14 VA) alternative 230VAC, 115 VAC, 48...62Hz
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC: refer to EN 61326

Wiring diagram: valid for each delivered controller is the wiring diagram on its casing only)



Wiring, examples for input 1 and output 1 respectively:



open printversion

INDEX

1 2 3 4 5 6 7 8 9 0

1 Digital display actual value
2 2nd digital display (if aktive)
3 LED-display relais function
4 Key for setpoint and parameter mode
5 Setpoint adjustment
6 Parameter mode lock switch (back face)

Brief description:

KFM 94 is a microprozessor based industry controller series in panel mounting- format 72 x 144 mm. Design and operating elements are especially devised for easy and convenient handling and operation. An assembly system renders possible the simple basic version as well as a plurality of variants with up to 6 relays, several digital and analog out- and inputs and other additional devices.

Types: *(depending on configuration*):*	*type:*
indicator	9401.
one stage controller	9410.
two stage controller	9420.
heating / cooling controller	9430.
positioner / follow-up controller	9440.
two- point- PID controller	9450.
three- point- PID controller	9460.
three- point- step controller	9470.
continuous controller	9480.
continuous controller, 2 outputs	9481.

Sub-types:	*suffix (*)*
basic function	.0
basic function + 1 additional contact	.1
basic function + 2 additional contacts	.2
2 x basic function	.3
extension: (continuous) logic output	..L

Function extensions	*suffix (*)*
cascade controller	991k
program controller	991p
ramp set point value	991r
step controller	991t

Additional devices:	**(*)**
additional analog inputs	(99) a
external set value incl. switch-over	(99) bwa
second set value incl. switch-over	(99) bwz
binary input to switch special functions	(99) b..
additional switching contacts	(99) f..
analog signal outputs	(99) o.
serial interface RS 232/485	(99) s.
Interbus S interface	(99) si.

* In case of more than 1 extension there is at the data plate only once '99' , f.e. 92700-99aw-ogx-rü. For more information see corresponding data sheets.'

Inputs:

max. 4 measuring inputs, acc. to sub-type:	*type suffix*
Pt100 DIN, 0...400°C	none (or 0)
Pt100 DIN, 0...100°C	1.
thermo couple Ni Cr NI (type K)0...1200°C	n.
thermo couple Fe Cu NI (type J)0... 900°C	f.
thermo couple Pt Rh Pt (type S)0...1700°C	p.
feedback device 0...100 up to 1000 Ω	w.
standard signal 0(4)...20mA, 0(2)...10V	e.

Ranges:

Pt 100: 0...400°C, switchable to °F, optional: other ranges; for standard signal range adjustable -999 to 4000. Setpoint ranges can be limited by menu

Displays:

2 four- figured digital displays, decimal point adjustable, upper display: actual value, lower display: other selectable data,
up to 8 LEDs for relays function display.
Display of function:
Hold down the P-key for more than 5 sec
to get a short-cut message of the configured function on the display (=position 3-5 of list number)
(in case of locked parameter mode only).
Measuring line monitoring:
Display "Err 1...4" in case of measuring line fault and adjustable safety shut down of all outputs

Outputs:

up to 6 relays with potential free change over switch, as control outputs or as additional contacts,
capacity: 250V 2A,
incl. spark extinction (for normally open contacts)
1-2 continuous outputs 0/4...20mA, 0/2...10V as control or signal outputs(apparent ohmic load 500 Ω)

Installation:

Before installation inspect the controller for any visible signs of damage caused during transport
Check power supply acc. to name plate.
Push the housing from the front into the DIN- panel cut-out and secure from behind with the fastening devices supplied.

Electrical wiring:

Plug bar on the back face of the controller; connect up the controller at the rear following the wiring diagram; wire cross section max. 1,5 mm^2

- To avoid cross interference *all low voltage measuring lines and pilot wires* must be encased in a ***shielded cable*** (the shielding must be earthed one-sided).
- The control leads must be ***fused*** *externally* to protect the output relays.
- Phase wire and neutral wire must not be transposed.

Putting into operation:

Switch on power supply. Digital display and control lamps will light up according to the setpoint after some seconds. If nothing happens check the fine-wire fuse on the back panel of the controller and the electrical wiring. Adjust set value and check other adjustments.

Maintenance:

All electronic controllers in the KFM range are virtually maintenance-free. Provided that the controller is correctly installed and put into operation and is protected against mechanical damage and inadmissible operating conditions, it should give years of trouble-free service.
In case of faults repair work by the customer should be restricted to the externally accessible leads and connections and components the customer is expressly permitted to deal with himself. (bridge circuits, fuses).

All further work, especially on internal components will terminate warranty, makes subsequent inspection and fault repair more difficult and can cause considerable damage to the circuitry.

For repair remittance remove plug board with connected leads on the rear side, loosen fastening devices and remove controller from the panel.

In case of remittance please give precise details of the fault to reduce time and cost of repair.

Error messages:

Err 1...6	Fault on measuring input nr. ... check measuring lines for short circuit or breakage check measuring input by connecting a RTD
Err 55	Fault on loading the parameter; press any key, the controller starts in emergency operation mode, configuration of the parameters has to be checked
Err 50	Hardware error in program section
Err 52	Hardware error in data section no further operation possible, remit controller for repair
	Error messages during self adaptation:
Err 202	Ambient conditions are not suitable for self adaptation; adjust parameter manually
Err 205	routine exceeded the setpoint raise setpoint or lower actual value and start adaptation again
Err 206	Fault on measuring input during adaptation; check the wiring and start adaptation again

open printversion

INDEX

1
2
3
4
5
6
7
8
9
0

Operating status:

The *upper display* shows the actual value (channel / measuring input 1),

the *lower display* remains empty or (depending on the version and settings) shows
- the attendant unit of measure (°C, °F, %...)
- an additional actual value, the setpoint value or the controller output value Y
- or the additional actual value only when the ▲ key is pressed.

Alternative type:
switch over the *upper* display to the several actual values by pressing the ▲ key**,**
the lower display shows the number of the attendant measuring input.

Setpoint value setting:

press P - key *shortly* (do *not* hold down)

The *upper display* shows the abbreviation of
the activated setpoint adjustment mode,
the *lower display* shows the adjusted value.

The indicated value can now be changed by the ▼ (lower) and ▲ (higher) -keys.
Each variation of the set value is *immediately* active, without any more operating steps.
The arrow keys have a built-in accelerator mode:
longer pressing causes faster alterations.

***Return** to operating level:*
Press P - key shortly (or automatically after 30 seconds without any key-action)

optional: Press P - key *shortly* again: *SP =set values of further control loops (*=no.) /
SP* =further set values of the control loop / SPE =external setpoint (display mode only);
flashing display signifies that the function is *not* active at the moment.

Manual operation: *(optional)*

Hold down ▼ - key and press ▲ - key, then release both keys.

(optional: switch on and off using separate ⏻ - key)
(for multi-channel controllers first enter the channel number*,
and press P - key, then:)

The *lower diplay* shows „H *“ and - if activated - the output position.
The *upper display* still shows the actual value. The automatic control is interrupted.

Manual control is now possible using the ▼...▲ - keys.

Return to operating level ***only*** by pressing the P - key (if present: the ⏻ - key) **.**
(*no* automatic return from the manual mode)

optional: starting the self adaptation (ref. to chapter Optimization):
On manual operation level P - key >5 sec ;
the *lower display* indicates „-Ad-“.
Cancel: P - key >5 sec again

open printversion

INDEX

Access from operating level.

Unlock the access first**:**
Turn the switch on the rear panel of the controller to position „**U**“ = unlocked
(Lock access after the adjustments: Switch position to „L“ = locked).

After the parameter level (refer to the instructions to each level) has been invoked, the first setting is shown and can be modified.

*It is **not** possible to invoke the parameter level when the switch is locked .*
In this case the display shows the abbreviation of the configured controller type.

Confirm the entry and / or **move on** to next parameter:
press the P -key *briefly*

Settings in detail:
(not available on all types)

Level 1: Invoke: Hold down the P - key for more than 5 sec. until the display changes

		factory setting:	*notes:*
CH	channel selection (no.) for multi-channel controller (only)		
***P**	proportional range Xp (%) (ref. to chapter „Optimization“)	25,0	___
***I**	integral action time Tn (min) (ref. to chapter „Optimization“)	7,0	___
***d**	rate time Tv (min) (ref. to chapter „Optimization“)	0,2	___
***Sh**	sensitivity of response Xsh (%)	0,1	___
***SA..**	switching interval (absolut value) for following (additional) contact no...	5,0*	___
SP..	set point for independent additional contact no...	0,0	___
***Sd..**	switching difference for additional contact no...	3,0	___
		(*201,701/SA3:10,0)	

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

Level 2: Invoke: Hold down P - key and press ▼ - ke**y,**
hold down both keys for more than 5 sec. until display changes.

Unit	switch-over the displayunit (°C / °F)	C	___
***bLo/*bHI**	start / end of display range for voltage- / current -input (only)	#	___
***ELo/*EHI**	start / end of range for external setpoint (only), referring to signal	#	___
***SLo/*SHI**	start / end of range for signal output (only), referring to signal	#	___
nSt	modification of decimal point characters (0 / 1 / 2)	0	___
***Lo / *HI**	start / end of setpoint range (°C /°F or value)	#	___
dSPL	select display function for lower display (AUS / SP / Y / IST2)	AUS	___

(AUS = off, SP = setpoint, Y = output, Ist2 = actual value of channel / measuring input 2)

***Return** to operating status:*
Briefly press the P - key (or automatically after 30 sec.)

***** = channel no. in case of multiple measuring inputs or control loops. # = *acc. to range*

open printversion

INDEX
1
2
3
4
5
6
7
8
9
0

1. manual optimization

An optimum adaptation of the control parameters (P,I,D) is necessary in order to balance an appearing deviation as quickly, non-oscillating and exactly as possible, according to the given operating conditions.

Generally these adjustments require a lot of professional knowledge that cannot be replaced by this brief information.
The following informations are for help purpose only:

P = proportional band Xp (%):
lower value = *longer* impulses, more sensitive reaction
higher value = *shorter* impulses, less sensitive reaction
Examples: - Oscillating temperature without distinct initial overshot: Xp too low;
- The setpoint is reached very slowly after initial exceeding: Xp too high.

I = integral action time Tn (min):
lower value= *shorter* impulse gaps, faster balancing
higher value= *longer* impulse gaps, slower balancing
Examples: - the set value is reached very slowly without overshooting: Tn too high;
- high initial overshot followed by fading oscillation: Tn too low.

D = rate time Tv (min):
increases the controller reaction in case of fast actual value or setpoint alterations (adjust only if necessary). Higher values cause higher increase.

2. Self-adaptation

The self-adaptation is an automatic procedure that determines and self-adjusts the optimum control parameters Xp, Tn and Tv.

Operation, if contained in supply schedule:
(Parameter-safety-switch on the rear panel of the controller has to be unlocked: position „u“)

Check starting assumptions:
Actual value at least 20% below the adjusted set value,(e.g.:heating phase), otherwise first:
Lower actual value adequately by manual operation (position of final control element) (quick circuits) or increase setpoint adequately, if admissible. (faster procedure for slower circuits)

Call manual operation level: Press ▼ - key plus ▲ - key (optional: seperate key).
Check controller output: must not be higher than 85% , reduce if necessary.
Start self-adaptation: Hold down P - key for more than 5 sec. on manual operation level.
During operation the lower display shows: „-Ad-“,
the upper display still shows permanently the actual value.

Information about computer operation: First the self-adaptation program waits for stabilization of the actual value according to the given controller output (actual value alteration < 0,1% / min), then it increases the output signal about 10% or, in case of three- point- step controller operation, it triggers an output impulse with about 10% of the adjusted regulating time.
The optimum parameters are computed according to the unit- step response.

Cancel: Press P - key for more than 5 sec. = return to manual operation level

After successfully finishing the procedure the controller will return **automatically** to operating level.

Unsuccessful adaptation (Display shows error code, ref.to chapter error messages):
Press P - key again: Return to manual operation level
eliminate the indicated error
start adaptation again: P - key > 5 sec.
or return to operating level: P - key shortly

open printversion

Access from the operating level.
Unlock the access first: Turn the switch on the rear panel of the controller to position „**U**“ (= unlocked). *It is **not** possible to configure the controller with **locked** switch.*
(Lock access after the adjustments: Switch position to „L“= locked)

Hold down the P - key and press the ▲ - ke**y,**
hold down both keys for more than 5 sec. until the display changes

Enter the code number (password) ▼...▲ (1...9999), factory setting: **1**
move on to next input: *briefly* press P - ke**y**

Alternatively: Hold down key after entering code for more than 10 sec.
Possibility to modify code number (optional)

Select control function *(type dependent)*: the displayed ID number for the configured control function can be changed by pressing the ▲ - key.
(Example Type 930K31: choose (92..) 200, 201, 700, 701)

Return to operating level: *briefly* press the P - key
or
move on to following **adjustments**: hold down P - key for more than 5 sec.
Note: when switching is continued after a function has been changed, the display will first flash for several seconds, only then will the controller return to the selected level.

Configurations are displayed in succession (type and design dependent)
and can be changed: ▼...▲
(move on to next input: press P - key *shortly)*

		factory setting
Ist*	correction value to change the controller display (+ / -)	*0.0*
EinG	type of measuring input Pt 100 / DC-signal: „rtd / Iu“	*rtd*
Ain*	type of DC signal for input No.*:rtd/ 0/4-20mA/ 0/2...10V	*4...20 mA*
	(observe different terminal connection I/U)	*(91..:rtd)*
SP 2/E	kind of 2nd/ external setpoint: Add/ Sub/ AbS	AbS
	(adding / subtracting / absolute)	
***Y' '**	travel time of the actuator „6...600“ (sec.)	*60 sec.*
***cy' '**	switching frequency for 2-point controllers: „2...120“ (sec.)	*20 sec.*
***out**	adjusting kind of output signal „0...20/ 4...20(mA)/ 0...10/ 2..10(V)”	*4...20 mA*
***out**	adjusting output characteristics direct / inverted „di / in“	*in*
	(for 2 output signals:“in in / in di / di in / di di“)	
***td**	for 2 output signals: deadpoint between output 1 and 2 „0...10%“	*0*
AP	correction of the output signal operation position	*50%*
FG A/E	automatical adjustment for teletransmitter input (ref. sheet 99ar)	
Sou*	adjusting type of information signal „0..20/4..20(mA)/0..10/2..10(V)“	*4...20 mA*
Sou*	adjusting kind of information signal „Ist/Soll..“ (actual/ setp.value)	*4...20 mA*
	(*Sout= signal 1, Sou2= signal 2)	
***Y_S**	behaviour of the output in case of measuring line fault:	
	relay position:“rel1 / rel2 / AUS“ (AUS = relays off)	*rel2(70.),rel1(20.)*
	continuous output position: „0...100“ (%)	*0*
reL..	function selection for add. switching contacts :	
	add. contact 1 (relay-no.*)	*SoA(701),StA(201)*
	add. contact 2 (relay-no.*)	*Su A*
	select the corresponding measuring input / control circuit	*CH 1*
	relay condition in case of measuring line fault: „SiE/SiA“(on/off)	*Si A*
Adr	bus adress (adress no.) (for interface equipment only)	*5*

Return to operating level: *briefly* press the P - key again

***** = In case of multiple measuring inputs or control loops: relay- or channel number

open printversion

INDEX

Selectable switching functions (depending on version)**:**
For setting please refer to configuration level under „reL...“

Switching functions for trailing contacts:

LC A Break contact on either side of setpoint (**L**imit **c**omparator). Relay drops out as deviation increases (**A**us = off)

LC E Make contact on either side of setpoint (**L**imit **c**omparator). Relay picks up as deviation increases (**E**in = on)

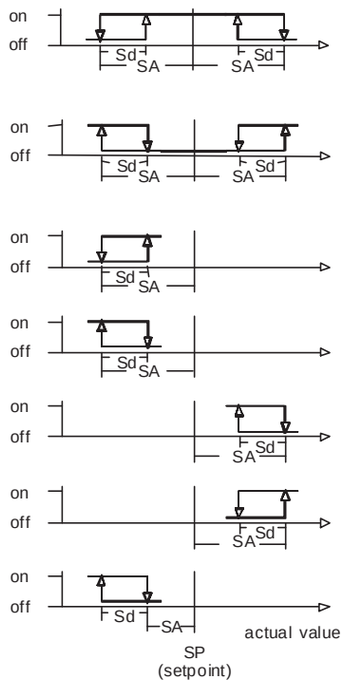
Su A Break contact below setpoint. Relay drops out as actual value decreases (**A**us = off)

Su E Make contact below setpoint. Relay picks up as actual value decreases (**E**in = on)

So A Break contact above setpoint. Relay drops out as actual value increases (**A**us = off)

So E Make contact above setpoint. Relay picks up as actual value increases (**E**in = on)

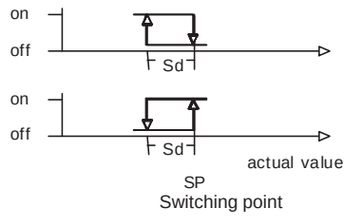
St A Heating stage below setpoint. Relay drops out actual value increases (**A**us = off)



Switching functions for independent contacts:

US A Relay drops out with increasing actual value (**A**us = off)

US E Relay picks up with increasing actual value (**E**in = on)



Service function:

Ein/Aus contact is constantly switched on (**Ein**) or off (**Aus**) respectively

Only for units with program option

Pr A Relay switched off (**a**us) during SP **pr**ogram level, otherwise switched on

Pr E Relay switched on (**e**in) during SP **pr**ogram level, otherwise switched off

Special function:

SF6 as SoA but switching point at setpoint, control output around SA below

In each case additional settings follow under "rEL." after the selection is acknowledged (P key) (depending on version):

Ist./ Y assigned value: actual value no. ... or Y (actuating signal)

CH../.SP. (only) for trailing contacts: assigned control circuit / channel (no.) or assigned setpoint (1SP., rSP, SP.1, ..)
for independent contacts: assignment of parameter input (channel no..)

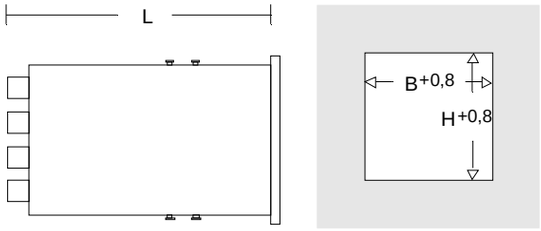
"Safety" shut down (in case of measuring line fault):
SI E Relay for "Safety" behaviour in event of measuring circuit error: relay **on**
SI A Relay for "Safety" behaviour in event of measuring circuit error: relay **off**

open printversion

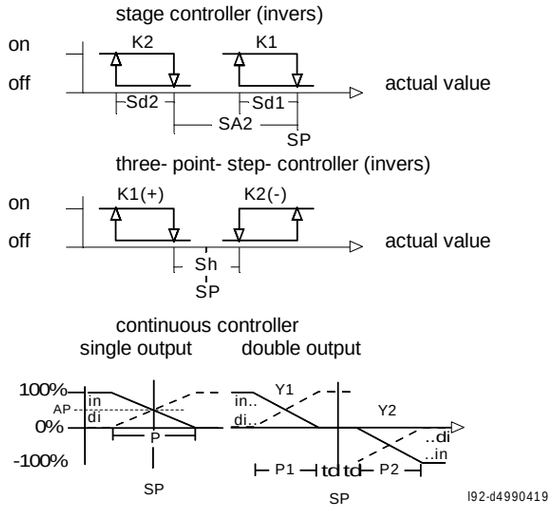
Characteristics: *(parameters dep. on sub type:)*
Adjustment on parameter level, with lock switch, pre adjusted on customer´s demand.
Proportional band Xp: 0,1...999,9 %
Integral action time Tn: 0,0...999,9 min
Rate time Tv: 0,0...99,9 min
Sensitivity of response Xsh: 0,1...1,0 %
Travel time of the actuator Tm: 6...600 sec
Switching frequency cy: 2...120 sec
Function characteristics: direct / inverted
Switching interval SA (add. contacts): 0..100,0 K
Switching difference Sd: 0,1...100,0 K

Additional contact functions:
As switching interval above and below setpoint or independent adjustable with own setpoint and measuring input, switching function adjustable (ref. to chapter additional switching contacts)

Installation dimensions:

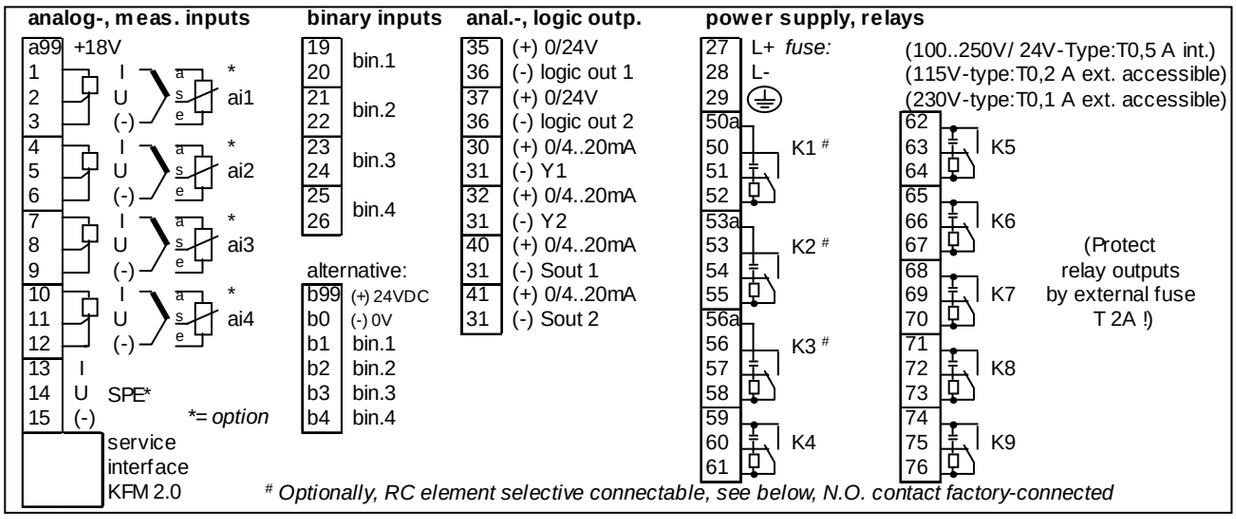


Form 96x96: L=150mm, B=92mm, H=92mm
Form 72x144: L=170mm, B=68mm, H=139mm

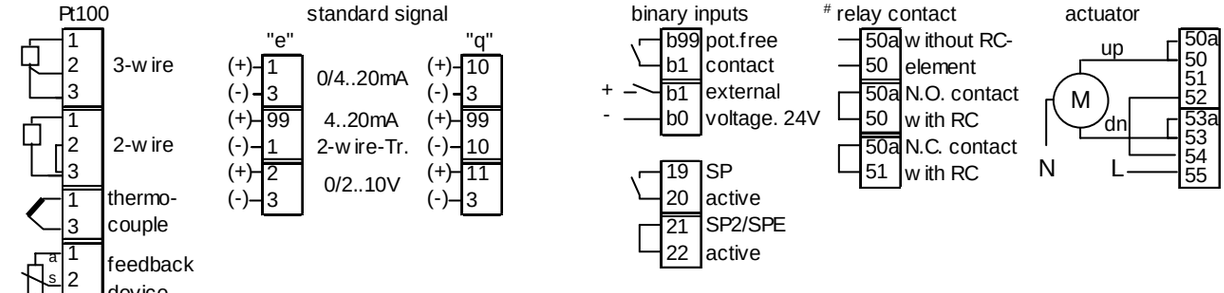


Other data:
Housing for panel mounting, 96 x 96 mm (type 92.., 93..) or 72 x 144 mm (type 94)
Power supply: 100-250VAC, 24VAC/DC(appr. 14 VA) alternative 230VAC, 115 VAC, 48...62Hz
Protective system DIN 40050: IP54 (terminals IP20)
Permissible ambient temperature: 0...60°C
Nominal temperature: 20°C
Climatic category: Relative humidity <= 75 % yearly average, no condensation, KWF to EN 60 529
EMC: refer to EN 61326

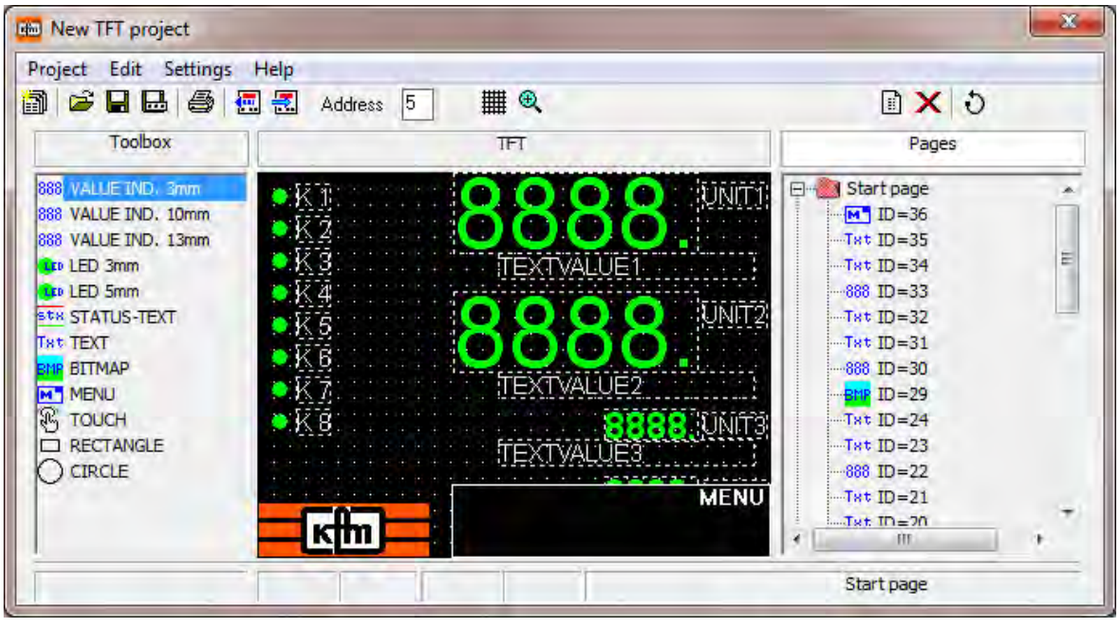
Wiring diagram: valid for each delivered controller is the wiring diagram on its casing only)



Wiring, examples for input 1 and output 1 respectively:



open printversion



TFT- displays from KFM- series 803 and 903 can be changed or completely new designed with this program.

Every retrievable value in the device can be placed at any position and designed freely across the individual pages. In addition, there are texts and graphical symbols in various form and color. It is also possible to import whole bitmap-, JPEG-, PNG- or GIF-files, for example company logos or pictures.

Beside the start page and the existing logger- and binary message page a maximum of 5 free pages can be set additionally, to which can be page turned at the device. Also, pages can be deleted again and changed in their order.

The configuration can be saved as a file, that is easily taken over to devices of the same kind later or serve as a basis for customization for different devices.

Hint:

Alternatively, individual configurations can be supplied ex work at extra cost.

INDEX

1
2
3
4
5
6
7
8
9
0

General:

A three- part editing window is opened with a central display field for the display to be processed, on the left there is a list (toolbox) with the available elements, which can be dragged into the display surface as well as a page index on the right side.

After starting the program, the display field and the page index are empty or show a preadjusted start file.

For communication the address Adresse 5 of the connected hardware must be entered in the toolbar. An automatic scan is started with the menu item „Settings“ -> „Find device address..“.

With the commands in the left area of the toolbar, a configuration (project) can be

- created new with the button “*new project*“
- opened from the PC hard disc by using the button “*open project*“
- or saved on the PC hard disc by using the button “*save project“ resp. “save as…*“ .

Furthermore, it is possible from a connected device to

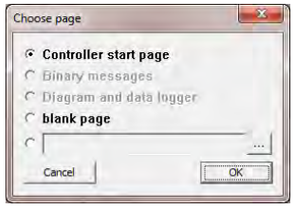
- read the TFT project from the device with the button “*receive project from controller*“ or
- to transfer the project into the device with the button “*send project to controller*“.

The start page of the project is shown on the display field at the program start. Optionally, it can be extended viewed or be equipped with a grid using the respective commands located in the central area of the toolbar.

The page index displays a list of all project pages in the order they can be switched forward at the device using the arrow up button. This order can be changed and pages can be inserted or deleted with the respective commands in the right area of the toolbar.

Note: Drag the selected page with the left mouse button pressed to the desired position to change the page order.

When a new page is added, a window appears, in which the type of the page can be set.



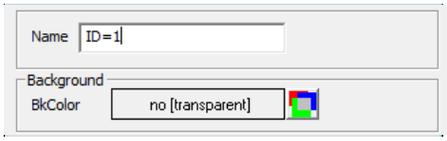
The design of the individual display pages is done with the elements from the toolbox (see page 3 - 4). A window appears with the symbol , where can be adjusted whether and after which time the display is switched back from the respective page to the controller start page.

The toolbox in the left area shows the different elements which can be dragged by the mouse to the desired position in the display. In the opposite, elements can be deleted with a double click on the right mouse button.

The xy- coordinates, the size and the name of the marked element is displayed at the bottom of the screen.

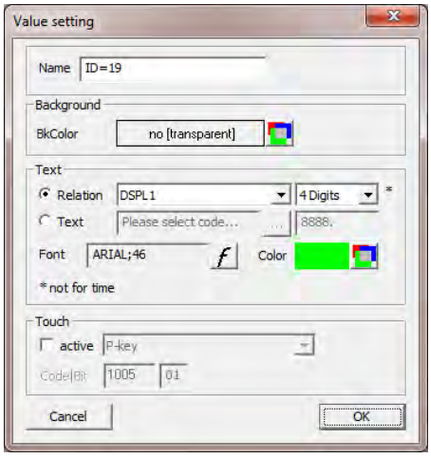
A double click of the right mouse button on the respective element opens a window, in which its necessary adjustments and assignments are made.

The description of the element within the project can be changed in the box “name” in the upper part of each setting window, the color behind the element can be changed in the field “background”.



Optionally, a touch element with a certain button function can be activated for devices with touch display in the lower part of the setting window.

The elements in detail:

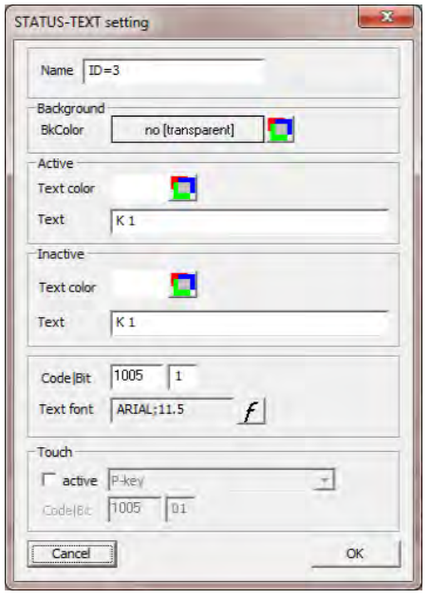


„VALUE SETTING*“:*

Controller parameter DSPL1/ 2/ 3/ 4 is choosable via dropdown- list for the value display using the box “Text → Relation“.

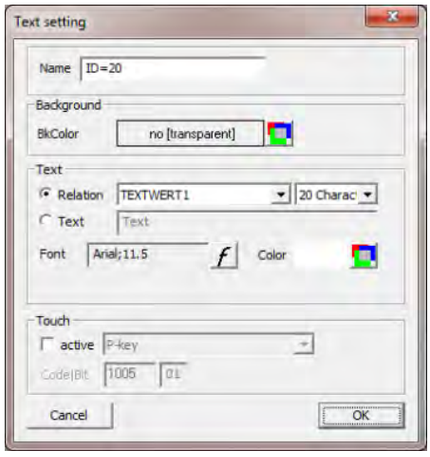
The parameter DSPL1/ 2/ 3/ 4 can be configured to setpoint- and actual values as well as correcting variables in accordance to the manual 903…

A parameter for the value display can be assigned permanently in the box “Text → Code“.



„LED“:

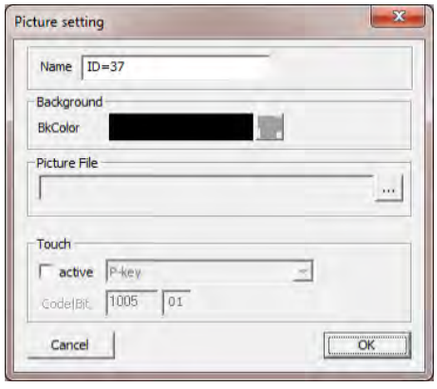
Code and bit selection, for example code 1005 and bit 1 for relay K1. The LED- and text color as well as the text in the box “active LED” and “inactive LED” is displayed at the controller in accordance with the status.



„TEXT“:

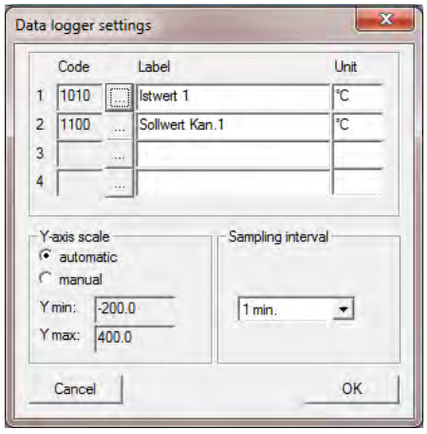
The descriptive text (controller parameter text1/2…) for the text display is choosable via dropdown list in the box “Text → Relation”. Alternatively, free texts can be set directly in the box
“Text → Text”.

The parameter Text1/2… can be configured at the controller from a list with fixed texts, for example: SETPOINT, ACT.VALUE or SUPPLY etc. and one freely editable text in accordance to the manual 903…



„PICTURE SETTING“:

A folder of a BMP-, JPEG-, PNG- oder GIF-file can be specified in the box “picture setting”.



„DATA LOGGER SETTINGS“:

The data logger settings are opened with a double click with the left mouse button on the page „diagramm and data logger“.

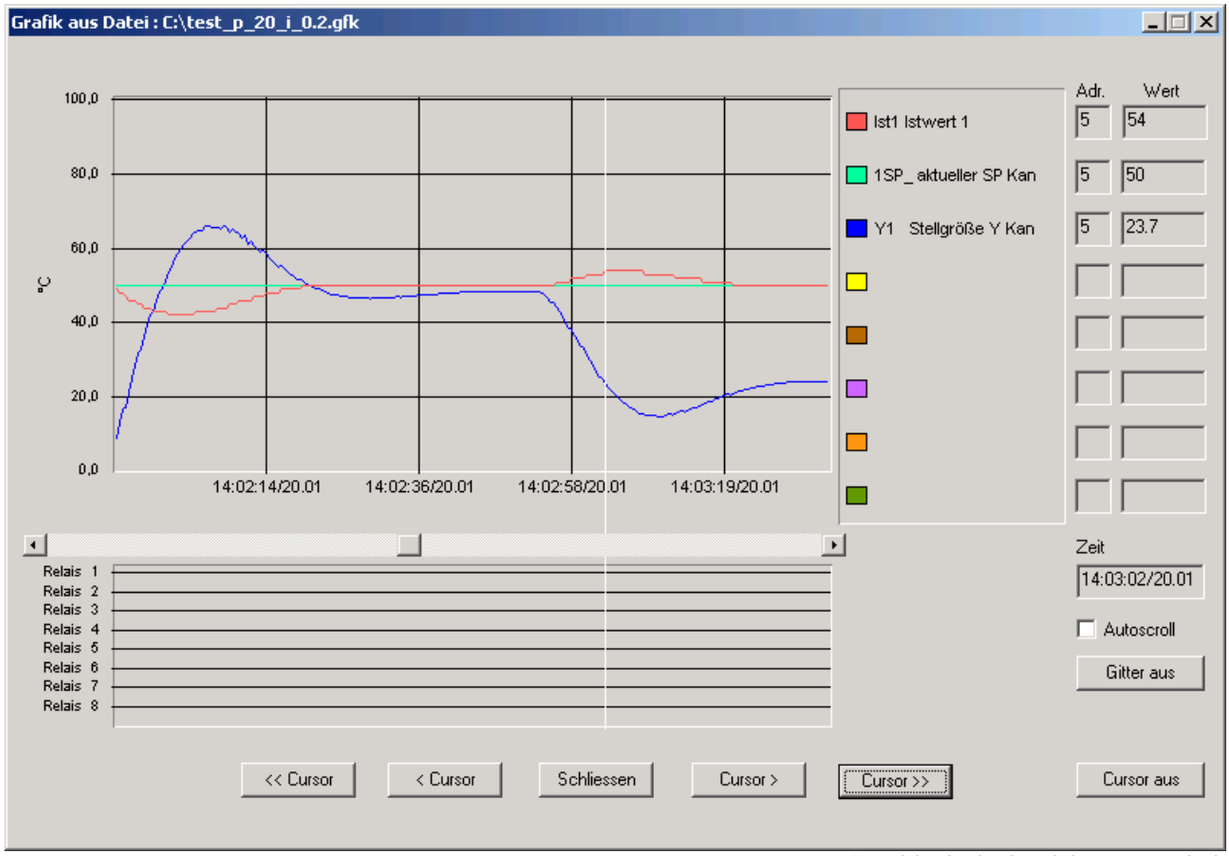
The parameter for the recording can be selected in the box “...“, the label and the unit are displayed permanently at the controller. Maximum 4 parameters are recorded.

The Y-axis sca le is done automatically or by means of a manual range specification.

The sampling interval for the recording can be adapted via dropdown list.

INDEX

1
2
3
4
5
6
7
8
9
0



Graphical Display (Line Recorder)

1. Displaying the current data

The data logger provides a graphical display of the controller data, which is simultaneously saved as a file in the PKS directory. The graphics factory setting shows both actual and set point values of a controller with the address 5. (Start: see 3.).

2. Displaying the saved data

A previously saved data recording is displayed on a diagram ("Data logger"->"Graphic from file" menu). Switching on the cursor mode enables numerical display of the individual data. (see 3.)

3. Starting the graphics/data logger

The data logger is activated and the progression over time of the parameters selected in the "Data logger" -> "Settings" menu is displayed on a diagram by selecting the "Data logger"->"Start" menu item.
The names of the channels displayed, the corresponding controller addresses and the currently transmitted values appear to the right of the graphics. The time is displayed below.

If the relay status of the controller is displayed (parameter 1005), the individual switch state of the relays is additionally displayed. At the same time the relay state is displayed to the right of the graphics as a bit sequence for the relays 8 to 1 (1: Relay ON, 0: Relay OFF).

If the "Autoscroll" in the graphics window is activated, then the graphics are automatically shifted to the left with each new sample, so that the current values can always be read-off on the right hand edge of the picture. The graphics remain still in case the Autoscroll function is deactivated and can be shifted manually with the scroll bar, in order to view the preceding time graph. However the graphics are updated continuously.
The grid can be hidden or shown with the "Grid OFF" or "Grid ON" button.

A graphics cursor can be switched on or off with the "Cursor On" or "Cursor Off" button. This can be moved along the time axis with the aid of the Cursor buttons. In cursor mode the current data is not displayed, but just the corresponding value of the cursor position is displayed to the right of the graph. The time displayed represents the sampling time for the cursor position.

The continuous recording can be paused with the "Data logger" -> "Stop" menu item. If the following request for saving the recorded data will be answered by "no", then the data will be overwritten when the data logger is restarted.

Regardless of the ongoing recording the Graphics screen can be exited with the "Close" button or <ESC>. Data will continue to be recorded in the background if the data logger is not stopped. It is possible to return to the continuous recording display at any time with the "Data logger" -> Actual graphic" menu item.

Notes for automatic data archiving:

The continuous recording data is sent to the "GRAFIK.GFK" file. This data is overwritten when the data logger is restarted.

In the case of permanent recording the "GRAFIK.GFK" file contains the record of the current week.
Automatic archiving takes place every Sunday after the first sampling which takes place after 6.00 am or after 7 days at the latest. The recorded file is saved and named with the days date.
Example: Recorded file "GRAFIK.GFK " is saved on the 18.12.2014 as "20141218.GFK".

The oldest data is deleted after the fourth sequential archiving, in order to limit the storage space. In order to save this data permanently it is necessary to store the required file in another directory beforehand or to rename it.
The file "GRAFIK.GFK" is located in the folder "Init" of the PKS installation directory, the file path can be seen from the menu item "About…" -> "About PKS".

4. Changing the defaults

The default graphic settings can be changed with the "Data logger"->"Settings" menu.

Another sampling time can be entered in minutes and seconds.

The scaling of the Y axis (temperature) in the graphics mode can be carried out manually or automatically. In the automatic setting, the scaling is automatically created in accordance to the smallest and largest recorded value. In the manual setting the values for the upper and lower limits can be entered.

A maximum of 8 channels can be recorded. The corresponding parameters of the connected controller are available by means of the button "…". Alternatively, parameters can be entered directly in the "Code" input boxes. The associated controller address for each parameter to be recorded is entered in the "Adr." box. The assignment and meaning of the parameter codes can be obtained from the 99s controller-interface operating instructions (example: parameter code 1010 = actual value 1).

Devices from 903K controller- series are configured and assigned to function packages ("projects") by a graphical user interface with 99pkm software. The program is protected with a password, the factory setting is 1. To prevent unauthorized use a new password can be assigned after entering the correct password. Projects can be created new with or without connected device or loaded from a device or a file for processing, saved as file or send to a device.

Circuit- workspace

A workspace for the circuit diagram appears on the right hand of the screen after the start of the program. The structure of the project is displayed on individual pages. The "page" area in the toolbar displays the number and description text of the active site, a list of all project pages and their description texts are opened by means of a mouse click on it. The description texts are automatically generated using the page headings. The fiels marked in yellow, located in the lower part of the circuit diagram page, are editable directly for processing comments. These are taken over to the table of contents automatically. The selection of another circuit diagram page is done by the drop down list or by page turning with the arrow buttons. The functions copy, paste, delete and the sort order for the circuit diagram pages are accessible via the adjacent edit- icons.

Modules

The left hand of the screen shows a selection list as folder structure, furthermore all kinds of functions in form of graphical elements. Is a device connected and activated or a project- file opened, the project scope existing in the device respectively loaded from the file is displayed only.
Without connected device the required hardware- components for the internal- and eventually external hardware can be inserted from a drop down list by double click on the left mouse button, hardware- components are being removed with double click on the right mouse button.

Located in the bottom part, the detail view "available" and the number of available identical modules (instances) of the actually selected module are shown. The circuit diagram and the help-text for the marked module are opened with the buttons "S" and "H". The module is inserted to the respective place into the circuit diagram page by dragging with the left mouse button pressed down, the instance is distinguishable by the blue number. Double click with the right mouse button on the module and confirmation with the button "Yes” deletes the module and the number of available intances is updated.

Module connections

Modules in the circuit diagram are linked together by a click with the right mouse button at junctures, double click with the right mouse button on a link deletes the connection.

Module parameter

Module parameters are editable in windows, opened with a double click with the left mouse button on each circuit diagram element. Adjustments are finished with the button "Apply". The windows contains also the buttons "Help", "Print" (for parameter set) and "circuit diagram" (if existing) to open the flow chart of the module. Flow charts and help texts are available in the pdf format. If not existing yet, the Adobe Reader has to be installed and the respective folder linked with the menu item "Settings" -> "path for documentations".

Controller display
The module "Controller display" has been already inserted into the circuit diagram and it is used for configuration of the visual controller display as well as the parameters in the operation levels. Double click with the left mouse button on the module "Controller display" opens the "Display-,operation menu selection".

TFT project: → see manual: "B 99pkd E"

Display- and operation menu selection:
All editable parameters of the modules used throughout the circuit diagram appear here. Next to the name of the module the descriptive text "value", the parameter name "dialogue" and the associated "level" is displayed respectively. By checkmark "adjustable in controller" the parameter is accessible for the operator on the controller in the displayed level. By checkmark "Display selection" the parameter is selectable in the controller menu for the value displays and can be preconfigured in the display selection "Display".

Display:
Parameters, units and texts that are choosable on the controller for indication can be preconfigured in the display selection "Display". By checkmark "adjustable in controller" the parameter is accessible for the operator on the controller in the displayed level. The description text with * for units and texts can be edited in the display selection directly.

Automatic conversion
Obsolete modules are listed in tabular form and can be automatically converted and replaced with the latest modules when opening configurations, the list can be printed optionally. The project is opened unchanged when canceling the automatic conversion. The rules and hints of the automatic conversion are displayed in detail prior.

Menu bar, toolbar

New, open or save file
A new project is created or a file loaded respectively saved with these icons.

Print
The entire or individual selected circuit diagram pages of the project can be printed with the print command. It can be determined by checkmark whether the print out takes place with or without title and contents. Furthermore, each parameter window contains a "print”- button to print out the respective parameter set.

Load configuration (project) from controller, send to controller compile
The compilation takes place automatically within every transmission of a project to a device. An event window appears during the transmission, with the respective button it can be switched between the result of the compilation and the transmission protocol; its content can be printed with the printer symbol. A separate compilation is necessary for testing only.

Diagnosis on/off,
Real-time monitoring can be started or stopped by this button if hardware is connected. The diagnosis allows to display a maximum of 20 analogue and digital values in real-time. Hold down "Ctrl" key plus double left mouse click on the desired output- juncture to add or delete real-time displays.

Address 

The address of the connected hardware has to be inserted here for communication.
An automatic scan is started with the menu item "Settings" -> "Find device address..".

Project translate 
The names of the modules can be switched over to different languages. The location for the translation text- file* "Text.txt" is visible in the menu item "Settings" -> "path for documentations", "translation text".
*= if existing

Select  on/off,
Allows to mark a circuit diagram area as a group by the mouse and furthermore opens more adjacent symbols to copy, cut, paste or delete  the marked area.

Extend, reduce, grid 
These symbols cause an extended or reduced view of the circuit diagram and the grid on or off as well as to snap modules on the grid. The grid can also be extended or reduced. Various types of grids can be selected with the menu item "Settings" -> "grid settings".

Representation of the connections 
This symbol cause a change to the representation of the connections into "simple line" or "angled line".

Pages
- see circuit diagram- workspace.

Menu/ Help
Here is the choice to display this manual or a detailed module overview and to start a demo-program.

INDEX

1
2
3
4
5
6
7
8
9
0

INDEX

Contents

open printversion

INDEX

1 2 3 4 5 6 7 8 9 0

Internal hardware (Interne Hardware)

Device identifier (Gerätekennung)

Device_identifier: (Gerätekennung:) (max. 10 available)

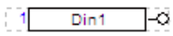
Function
The module provides the possibility to save an identifier in the device which is readable via the service interface.
See manual 99s for the parameter code.

Parameter

Text	(no control menu)	Text identifier (max. 10 character)

Input (Eingang)

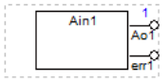
Din: (max. 32 available)



Function
The module provides at the output pin a real digital hardware input with a maximum frequency of 1 Hz.

Parameter
none

Ain: (max. 8 available)



Function
The module provides at the analogue output pin a real analogue hardware input. The resolution is normal or high resolution depending on the used hardware. The additional output pin err1 is set to 0 with a correct measuring value and set to 1 with a measuring fault.

Parameter

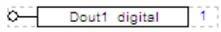
Ain.	(Configuration level)	Input type for input no.. (RTD/0-20mA/4-20mA/0-10V/2-10V) alternative (TH K/TH J/TH S/0-20mA/4-20mA/0-10V/2-10V)
IST.	(Configuration level)	Correction value for changing the measuring value (depending on range)
.Blo/.Bhi	(Parameter level 2)	Start / end of display range (standard signal -999...9999, others depending on range)
.NST	(Parameter level 2)	Number of decimal places (0/1/2 depending on range)
AiSP*	(Configuration level)	Input type for input no.2.2 (0-20mA/4-20mA/0-10V/2-10V)
Elo/Ehi*	(Parameter level 2)	Start / end of external set point range (-999...9999)

** = Special feature input 2 with configuration external set point: standard signal configurable for external set point, PT100 input additionally usable.*

INDEX

Output (Ausgang)

Dout: (max. 16 available)

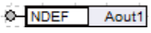


Function
The module provides a real digital hardware output. The signal connected to the input pin is emitted at the digital output depending on the configuration. 3 different PWM-modes are configurable in addition to the pure digital function.

Parameter

Typ	(Configuration level)	Output type (digital, PWM, PWM2s/10ms (cycle 2s, min. 10ms), PWM6s/20mS (cycle 6s, min. 20ms))
CY"	(Configuration level)	Cycle time (PWM) (2…120sec.)

Aout: (max. 5 available)



Function
The module provides a real analogue hardware output. The signal connected to the input pin is emitted at the analogue output with resolution in consideration of the signal range.

Parameter

.Sout	(Configuration level)	Signal assignment (Ist. SP., *extern: external signal at the input pin)
out...--Fkt	(Configuration level)	Setting output signal (0-20,4-20,20-0,20-4 (mA) also with absolute value for each setting (A...))
.SLo/.SHi	(Parameter level 2)	Start / end of signal output range (-999...9999)

1
2
3
4
5
6
7
8
9
0

Service interface (Service Schnittstelle)

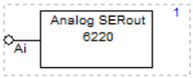
Analog_SERin: (max. 10 available)

Function
Via service-interface to code 6200...6209 transferred values are emitted at the output pin of the respective module. The valid signal range and the decimal place are adjustable. The lower range limit is emitted in case of range over- or under run. A monitoring time provides the verification of the interface function.

Parameter

Bslo/Bshi	(Parameter level 2)	Admissible signal range (-10000... + 10000)
sNST	(Parameter level 2)	Number of decimal places (0,1,2)
Ta``	(Parameter level 2)	Monitoring time (0…100 sec., 0=without, last value is on hold)

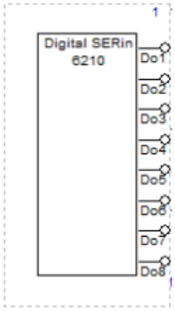
Analog_SERout: (max. 10 available)



Function
At the input pin attached signals are send via service- interface to code 6220...6229 and can be processed there for bus adapter, control system or for displaying at the TFT- front panel.

Parameter
None

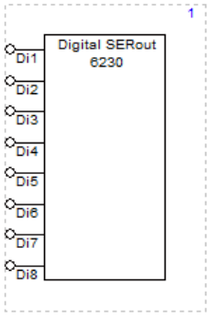
Digital_SERin: (max. 10 available)



Function
Via service-interface to code 6210...6219 transferred 8 bit-values are emitted as 0/1-signal at the output pins 1-8 of the respective module.
A monitoring time provides the verification of the interface function.

Parameter
Td`` (Parameter level 2) Monitoring time
(0...100 sec., 0= without, last value is on hold)

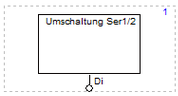
Digital_SERout: (max. 10 available)



Function
At the input pins 1-8 attached 0/1 signals are sent via service- interface to code 6230...6239 and can be processed there for bus adapter, control system or for displaying at the TFT- front panel as 8-bit values.

Parameter
None

Switchover_Ser1/2: (Umschaltung_Ser1/2:) (max. 1 available)



Function

The module provides a further second service interface in addition to the standard service interface. The interfaces can be used selectively via menu or control pin Di as well as parallel. The switched off service interface answers to requests with the sign "NAK" (hexadecimal "15") only.

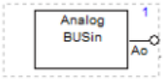
Parameter

Sio	(configuration level)	Selecting the interface (Sio1/ Sio2/ dual/ bin(ary input))

INDEX

Bus interface (Bus Schnittstelle)

Analog_BUSin: (max.10 available)

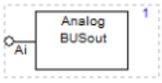


Function
Via bus-interface received analogue values are emitted at the output pin of the respective module. The valid signal range and the decimal place are adjustable. The lower range limit is emitted in case of range over- or under run. A monitoring time provides the verification of the interface function.

Parameter

Bblo/Bbhi	(Parameter level 2)	Admissible signal range (-10000... + 10000)
bNST	(Parameter level 2)	Number of decimal places (0,1,2)
bTa``	(Parameter level 2)	Monitoring time (0..100 sec., 0= without, last value is on hold)

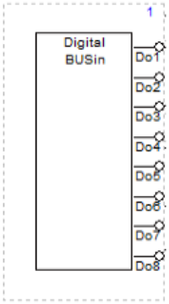
Analog_BUSout: (max. 10 available)



Function
At the input pin attached analogue output signals are sent via bus- interface and can be processed there for connected devices.

Parameter
None

Digital_BUSin: (max. 10 available)

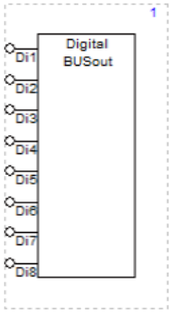


Function
Via bus-interface received 8-bit values are emitted as 0/1- signal at the output pins 1-8 of the respective module.
A monitoring time provides the verification of the interface function.

Parameter

bTd``	(Parameter level 2)	Monitoring time (0...100 sec., 0= without, last value is on hold)

Digital_BUSout: (max. 10 available)



Function
At the input pins 1-8 attached 0/1 signals are sent via bus- interface and can be processed there for connected devices.

Parameter
None

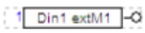
External hardware (Externe Hardware)

External module (Externes Modul) .. (max. 10 available)

The desired standard rail module can be selected from a list of available modules under external module and the containing hardware can be used individually in the configuration.
Available standard rail modules:
852220 (2x Ain)
852280 (2x Ain high resolution)
852750 (5x relays)
8523881 (8x Din,1x relay)
Following external hardware is available:

Input (Eingang)

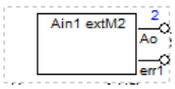
Din_extM: (max. 80 available)



Function
The module provides at the output pin a real digital input of an external hardware with a maximum frequency of 1 Hz.

Parameter
None

Ain_extM: (max. 20 available)



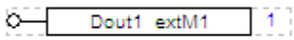
Function
The module provides at the analogue output pin a real analogue hardware input. The resolution is normal or high resolution depending on the used hardware. Each hardware module provides 2 analogue inputs with the same resolution. The additional output pin err1 is set to 0 with a correct measuring value and set to 1 with a measuring fault.

Parameter

AinM.....	(Configuration level)	Input type for input no.. (RTD/0-20mA/4-20mA/0-10V/2-10V)
ISTM.....	(Configuration level)	Correction value for changing the measuring value (-200..+800)
M.....Blo / Bhi	(Parameter level 2)	Start / end of display range (-200...+800)
M.....NST	(Parameter level 2)	Number of decimal places (0/1/2 depending on range)

Output (Ausgang)

Dout_extM: (max. 50 available)

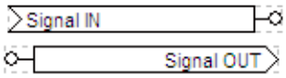


Function
The module provides a real digital hardware output. The signal connected to the input pin is emitted at the digital output depending on the configuration.

Parameter
None

Signal connection (Signalverbindung)

Signal_IN: / Signal_OUT: (max. 300 available each)

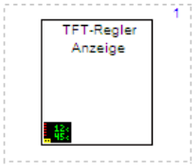


Function
Bus symbols are used for the textual labeling of signals and its easy usage on different points within a configuration. A differentiation is made between signal in- and signal out depending from the position of the signal pin.

Parameter
Beschriftung (no control menu) (freely adjustable)

Display/Anzeige

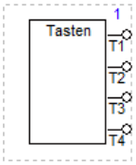
TFT-controller_display: (TFT-Regler_Anzeige:) (max.1 available)



Function
In this module, each parameter of the used modules can be individually selected whether it should appear in the device menu. Furthermore, it can be determined which values are available for displaying. Another part of the module is the workspace for graphical display layout with value displays, status messages, objects, texts and bitmaps.

Parameter
None

Buttons: (Tasten:) (max.1 available)



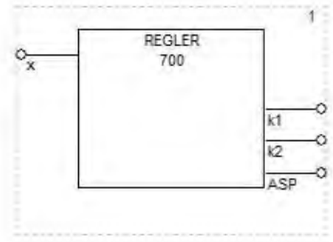
Function
The module provides at the output pins the real front buttons

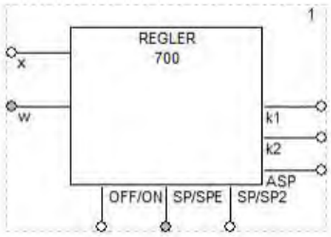
T1 = P-button
T2 = Special button (for example, manual operation / automatic mode or ON / OFF)
T3 = Arrow up button
T4 = Arrow down button

Parameter
None

Control functions (Regelfunktionen)

Controller: (Regler:) (max. 5 available)





Function
The module calculates a regulating variable, based on actual- and set point value, depending from control function, and puts it out on the respective output pins. The range of the actual value signal, which is connected at the input pin x, is recognized by the module automatically. The set point value SP is present internally, so in the simplest case the pin w is left unconnected. Continuous control signals are emitted on Y1 and/or Y2 depending on the configuration, switching ones on K1 and/or K2. Additionally, the active set point value is emitted on output pin ASP. Depending from control function, the basic- (standard) or extended control module can be selected by the option field.

With extended control module only (depending on control function):
The control pin Off/On is used to switch off and on the control function. The control outputs are switched off or set to 0% in off status.
When not in use, the pin must be connected with the constant 1.

Type 800 / 900 (continuous) only: If switching to a defined regulating variable is required during power up, the respective signal has to be connected to pin Ye, when not in use the constant 0.

With external set point value setting the desired signal must be connected to pin w. The switch over between internal and external set point takes place using the hardware pin SP/SPE or via controller menu depending from the parameter SPEF and the wiring of the control pin SP/SPE.

The same logic applies also for second set point SP2 and parameter SP2F. When not in use, the input pin SP/SP2 must be connected with the constant 0.

Type 400 (positioner) only: The alignment is started with a digital input pin, the active alignment is signalized on the digital output pin Abgl.

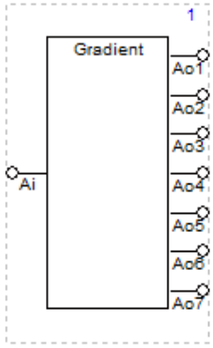
Parameter *(depending on function and option field only) /* ***Option field****: "basic(standard)" or "extended"*

Typ	(Configuration level)	Control function (200:2-stage, 300:3 point, 400:positioner, 500:2 point-PID,700:3 point-step, 800:continuous., 900: continuous with 2 outputs as sequence (H/C))
Lo/Hi	(Parameter level 2)	Set point setting range (-200..+800)
SP/SP2	(Setpoint level)	(internal resp. main-) set point, second set point (-200..+800)
SP-F	(Setpoint level)	Set point switch over menu (SP, SPE, SP2)
SPBf	(Setpoint level)	Switch over bus- setpoint (Off, Bus) (with adjustment menu)
ZBR	(Parameter level 2)	Time basis set point value gradient (min, hrs)
Gr1/Gr2	(Parameter level 2)	Set point value gradient for increasing/decreasing gradients (0-100)
SA2/SD1/2	(Parameter level 1)	Switching distance/ difference 2-stage controller (0,1..250/-200..800)
SA1/2/SD1/2	(Parameter level 1)	Switching distance/ difference 3 point-/ positioner (0,1..1000)
P/I/D/SH	(Parameter level 1)	Control parameter PID (0,1..999,9 / 0..999,9 / 0 .. 99,99) (SH: response sensitivity 3point-step (0,05..1,0))
SPEF/SP2F	(Configuration level)	Function external-/second set point (Off, Bin(ary inp.), menu)
SPBF	(Configuration level)	Function bus set point (Off, Bin(ary inp.), menu)
SPE	(Configuration level)	Type of effect external set point (abs(olut), add(ing), sub(tracting))
YM	(Configuration level)	Setting time of controlled drive (3point-step/posit. only) (6-600 sec)
Out	(Configuration level)	Setting output characteristic (in/di resp. combinations with type 900)
AP	(Configuration level)	Output signal operating point (-100...+100)
td	(Configuration level)	Dead zone between Y1 and Y2 (type 900 only)(0..10%)
Y_S	(Configuration level)	Behaviour of the setting output in the event of meas.- line error (Off / Rel1/ Rel2/ resp. -100..+100%)
rF1/rF2	(Configuration level)	Waiting- and re-start window for gradient (0,1..999,9)

Note: For this purpose see manual B903K for detailed explanations.

Function extension (Funktionserweiterung)

Gradient: (max. 10 available)



Function

The gradient is recalculated and emitted on pin Ao3 by sending a parameter set* (at least one (target-) set point value) to the gradient module. It is generated as quotient from the difference between the new send (target-) set point value and the actual set point value connected to input Ai divided by the actual ramp time. Further, the actual values for (elapsed) time (pin Ao1) and set point value (pin Ao2) as well as the associated saved values for (target-) time (pin Ao4), (target-) set point value (pin Ao5), tolerance (pin Ao6) and frequency (Pin Ao7) are available at the other outputs of the gradient module.

Instead of the actual (target-) set point value the calculated gradient and the actual target set point value can be sent to a subsequent arranged controller module.

Tolerance- and frequency value do not have any influence within the module.

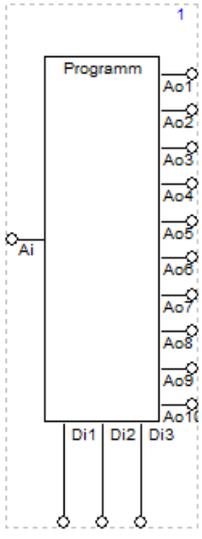
Note: An overarching strategy with external time- or set point value priority can be provided by analysing the actual ramp time and (target-) time respectively actual set point value and (target-) set point value for each actual segment

* = The calculation of the gradient is initiated by sending a (target-) set point value in the end or by confirmation of the (target-) set point value in the parameter level 2 using the p-button (also without changing the (target-) set point value).

Parameter

t'	(Parameter level 2)	Hold or ramp time, within the (target-) set point value is to be reached (hrs., min., sec.)
SP	(Parameter level 2)	(Target-) set point value (-999.0..+9999.0)
T	(Parameter level 2)	Tolerance value (-999.0..+9999.0)
F	(Parameter level 2)	Frequency value (0.0..+9999.0)

Program: (Programm:) (max. 4 available)



Function

The basis set point SP0 value is active before and after the program execution. Then it is also emitted at the output for the actual program set point value (pin Ao3), all other outputs emit 0.

The program execution is controlled by the control inputs Di1..3: The program is started (pin Di1), stopped (pin Di2) or canceled (pin Di3) with a single impulse at one of the inputs or by menu. The respective status (0=off, 1=on, 2 = stop) is emitted at the program- status output (pin Ao10).

Further, the actual values for cycle (pin Ao1), (elapsed) time of the actual segment (pin Ao2) and segment (pin Ao5) as well as the respective saved values for (target-) time (pin Ao6), (target-) set point value (pin Ao7), tolerance (pin Ao8) and frequency (pin Ao9) are provided at the remaining outputs.

Additionally, the quotient of the difference between the actual and the last (target-) program set point value divided by the actual program time is emitted as gradient at a separate output (pin Ao4). On program startup the basic set point value is used as the last (target-) program set point value for calculation. A 0 is emitted for the gradient if the last and the actual value are equal or the actual program time is 0.

The desired number of program cycles is adjusted using P-CY, whereby P-CY = 0 causes a continuous repeating program cycle.

Tolerance- and frequency value do not have any influence within the module.

The 4 possible instances can be operated subsequently or parallel. Thus, after the expiration of a program a second one can be started automatically.

Instead of the actual program set point value the calculated gradient and the actual target set point value can be sent to a subsequent control module.

Note: An overarching strategy with external time- or set point value priority can be provided by analysing the actual program time and (target-) program time respectively actual program set point value and (target-) program set point value for each actual segment.

integrated set point monitoring:

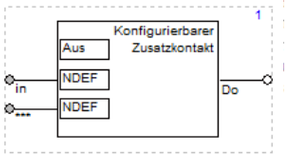
Constant monitoring takes place during the program sequence, to check whether the actual value (pin Ai) follows the current set point value. The program sequence is stopped as soon and as long as the difference set as admissible is exceeded:

With a *ramp*, the further increase or decrease of the set point value is stopped. With *holding times* the specified time increases accordingly. With a *jump* the next time segment does not start till afterwards.

Parameter

SP0	(Set point level)	Basic set point value, before and after program execution active (-200..+800)
P-Cy	(Set point level)	Number of program cycles (0..1000), 0 = continuous program cycle
Pro	(Set point level)	actual operating status (on / stop / off)
Pr-S	(Parameter level 2)	Number of program steps (0..10)
t‘.1.. .t‘.10	(Parameter level 2)	Holding or ramp time (hrs., min., sec.)
SP.1..SP1.10	(Parameter level 2)	(Target-) program set point value (-200..+800)
T.1 .. T.10	(Parameter level 2)	Tolerance value (-999.0..+9999.0)
F.1 .. F.10	(Parameter level 2)	Frequency value (-999.0..+9999.0)
dSP	(Configuration level)	Set point value monitoring,admissible deviation between set point value and actual value (0..200), the function is deactivated with adjustment 0

Configurable_additional_contact: (Konfigurierbarer_Zusatzkontakt:) (max. 10 available)



Function

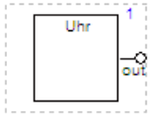
The module provides the entire function of a configurable additional contact. The output out is switching depending from actual- and set point value below, above or on both sides of the set point value or independently from it in accordance with the configuration. Special configurations are possible in conjunction with program-, ramp- and clock functions. For checking purposes, the contact can be configured to switch off or on. The adjustment bus is available for the connection of a bus adapter or a control system in conjunction with a hardware output. The digital output is switched on or off by setting or clearing the respective bit in the control word 1005.

Parameter

ZP.	(Parameter level1)	Switching difference resp. set point resp. switch on time (0...BHi)
ZD.	(Parameter level1)	Switching difference resp. switch on duration (0...BHi)
ZSK.	(Configuration level)	Switching functions (LCA, LCE, SuA, SuE, SoA, SoE, StA, USA, USE, RTCA, RTCE, PRA, PRE, BUS, SR A, SR E, NW A, NW E, IP A, IP E, SRIA, SRIE)
ZSK.	(Configuration level)	Assigned measuring input (Ist1..4, ALARM, PRE-ALARM, *extern: external signal at pin in)
ZSK.	(Configuration level)	Assigned set point/control loop (SP1..4, *extern: ext. Signal at pin ***)
ZSK.	(Configuration level)	Behaviour in case of measuring line fault (SiA,SiE)

Note: For this purpose see manual B903K for detailed explanations.
The configurable switching contact has to be used exclusively for new projects!

Clock: (Uhr:) (max. 1 available)



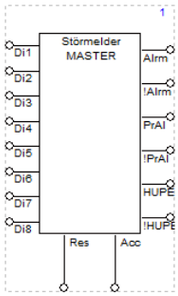
Function

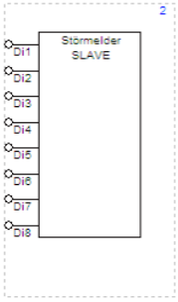
The module provides time- depending switching functions, for example for night or weekend temperature reduction, in conjunction with the respective configured additional contacts (see also configurable additional contacts).
The time of the device is displayed automatically at the module when a KFM device is connected. The time can be changed by menu and send to the device using the send-button.

Parameter

None

Malfuntion_alarm_display: (Störmelder:) (max. 1 Master + 9 Slave available)





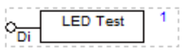
Function

Operating- and malfunction messages at the digital inputs Di1..Di8 from master- and slave modules are processed and outputted selective at the output pin Alrm or PrAl as collective message by the master module. Thereby, all alarm messages are put out on Alrm and all pre- alarm messages on PrAl. (Except imputs with parameter adjustement Di.Funktion=AloS "alarm without collective message" and Di.Funktion=PAoS "pre-alarm without collective message ").
The output Horn/ Hupe is used for new- value messages. !Alrm, !PrAl and !Hupe put out each signal in reversed form. A message- and history list incl. LED, plain text, date and time can be displayed on the display of the controller using the parameter DSPT (see controller display), operating messages are displayed green, pre-alarms yellow and alarms red. Messages are recorded selective in the history list, (max. 40, oldest value is overwritten), switched off malfunction messages are marked with a check. The direction of control can be configured direct or reverse and optionally a switch on delay for each input can be determined. A filled- in circle at the according input pin displays reverse action, a X displays a deactivated input pin. Messages and the horn/ Hupe can be reset resp. accepted by using the digital input reset (Res) and accept (Acc). When using additional contacts, those can be used as collective relay, new- value message, impulse relay or in combination (see additional contact parameter)

Parameter

Di.Dir	(Configuration level)	Direction of control (di/in/dis)
Di.Historie	(Configuration level)	Message recording (on, off)
Di.Funktion	(Configuration level)	Function collective relay (Alrm (alarm)/ AloR (alarm without reset)/ AloS (alarm without collective message)/ PrAl (pre-alarm)/ PAoR (pre-alarm without reset)/ PAoS (pre-alarm without collective message)/ STAT (none))
Di.Verzögerung	(Configuration level)	Switch on time delay (0...100 sec)
Accept function	(Configuration level)	Function alarm message / accept Horn-Hupe (on/ off)
Blinken	(Configuration level)	Function flashing alarm message (first value message-1Val/ new value message-NewV/ off)
StmTxt	(KFM-PC Software PKS)	message texts for active binary input, max. 40 characters

LED_Test: (max. 1 available)



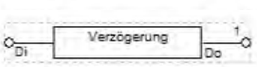
Function
The malfunction alarm display is complemented by the LED test function: All hardware input LEDs, if existing, lights when a 1 is connected to the input.

Parameter
None

INDEX

Signal manipulation (Signalbeeinflussung)

Delay: (Verzögerung:) (max. 10 available)



Function
The signal at the digital input Di is put out with an adjustable time delay to the digital output Do by the module. Positive adjustments cause a switch on delay, negative a switch off delay.

Parameter

DT	(Configuration level)	Time delay (sec.) (-9999...+9999)

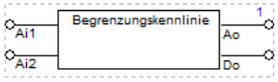
Signal_value: (WertSignal:) (max. 10 available)

Function
The input signal is converted to the output range 0…100 (normalized) in consideration of the WLo/WHi limits.

Parameter

Wlo/Whi	(Parameter level 2)	Start / end of display range (-9999...+9999)

Limitation characteristic (Begrenzungskennlinie:) (max. 10 available):

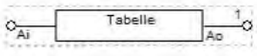


Function
The connected signal at input Ai1 (for example regulating variable) is limited, depending from a second value for example actual value, by adjustable key points and put out on output Ao. When the limiting function is active, the digital output Do is set to 1.

Parameter

tP1	(Configuration level)	Limiting point x-coordinate 1 referring to Ai2 (-999...9999)
yP1	(Configuration level)	Limiting point y-coordinate 1 referring to Ai1 (-100...+100)
tP2	(Configuration level)	Limiting point x-coordinate 2 referring to Ai2 (-999...9999)
yP2	(Configuration level)	Limiting point y-coordinate 2 referring to Ai1 (-100...+100)
BKtm	(Configuration level)	Direction of limiting characteristic (min/max-limiting)

Table: (Tabelle:) (max. 10 available)



Function
The analogue input value at Ai is compared with the X-values of 11 table-points by the module and the respective Y-value is put out at the output Ao. Intermediate values are interpolated, the lower- or higher range limit is emitted in case of range under- or overrun. The output range results from the minimum and maximum Y-value. The X-values must be entered in ascending order.

Parameter

TX./TY.	(Parameter level 2)	X-/Y-value for table points(-10000..+10000)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

Average (Mittelwert:) (max. 10 available)

Function
The arithmetic average is calculated continuously by the module from the analogue input values at Ai using the adjusted number of samples and the selected sampling time. The result is put out at the output Ao.

Parameter

Ta	(Configuration level)	Sampling time (0,2..10 seconds)
nMW	(Configuration level)	Number of samples (2..100)
Mnst	(Configuration level)	Number of decimal places of the output Ao (0..3)

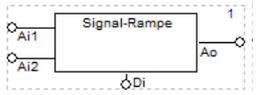
Damping: (Dämpfung:) (max.10 available)

Function
The alteration rate of the signal at Ai1 is limited by the module Damping (Dämpfung) and the limited signal is put out at Ao. The effective limiting range can be adjusted with the value which is connected to Ai2, also the alteration rate.

Parameter

db	(Configuration level)	Damping range which is effective in accordance with value at Ai2 (0..1000)
d``	(Configuration level)	Admissible alteration rate for the signal at Ai1(value\sec.) (0..1000)

Signal-ramp: (Signal-Rampe:) (max.10 available)

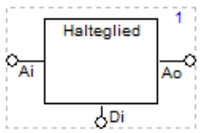


Function
The value of the offset- input Ai2 is put out by the module immediately at the analogue output Ao when a 0 is connected to the control input Di. After the change from 0 to 1 at the digital control pin Di, the value of the signal is put out at the output Ao starting from the value of the offset- input Ai2 with a freely adjustable gradient. After reaching the value of Ai1, its value is put out at Ao without delay while the digital control input is 1.

Parameter

GrSR	(Configuration level)	Gradient (value/sec.) (0...9999)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

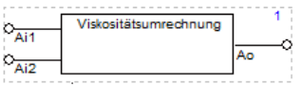
Hold_element: (Halteglied:) (max.10 available)



Function
The value of the offset- input (in) is put out by the module at the analogue output (out) while a 0 is connected at the digital control input pin. When the digital input pin is switched from 0 to 1, the actual connected value is put out until the digital control input is switched back again from 1 to 0.

Parameter
None

Viscosity_conversion: (Viskositätsumrechnung:) (max 10 available)



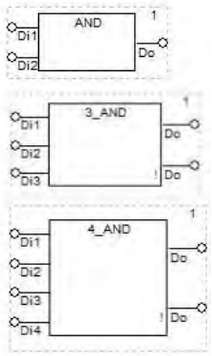
Function
The module calculates, with configuration of the parameter Unit to cSt, the kinematic viscosity and puts it out at the analogue output Ao. It is calculated in accordance to a stored formula from the dynamic viscosity at the analogue input Ai1 depending from the temperature at the analogue input Ai2 and the adjusted density for d15. With configuration of the parameter Unit to mPas, the dynamic viscosity at the analogue input Ai1 is put out at the analogue output Ao without calculation.

Parameter

d15	(Setpoint level)	Density at 15°C (500...1500)
Unit	(Parameter level 2)	Unit switch over (cSt/mPas)

Logic (Logik)

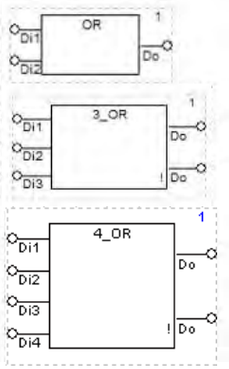
AND: / 3_AND: / 4_AND: (each max.10 available)



Function
The values at the digital inputs Di1 and following are linked with an AND- function by the module and the result is put out at the output pin Do. The direction of control is adjustable for each input individually direct or reverse. A filled in circle at the according input pin displays reverse action. The output pin !Do (if existing) puts out the signal from Do in reverse form.

Parameter
MaskAnd. (Configuration level) Direction of control Di. (di/in)

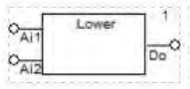
OR: / 3_OR: / 4_OR: (each max.10 available)



Function
The values at the digital inputs Di1 and following are linked with an OR- function by the module and the result is put out at the output pin Do. The direction of control is adjustable for each input individually direct or reverse. A filled in circle at the according input pin displays reverse action. The output pin !Do (if existing) puts out the signal from Do in reverse form.

Parameter
MaskOr. (Configuration level) Direction of control Di. (di/in)

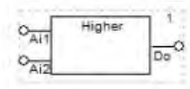
Lower: (max.10 available)



Function
The module compares the signals on both input pins Ai1 and Ai2. If Ai1 is lower than Ai2, a 1 is put out at the output pin Do, otherwise a 0.

Parameter
None

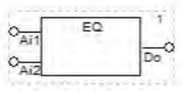
Higher: (max.10 available)



Function
The module compares the signals on both input pins Ai1 and Ai2. If Ai1 is higher than Ai2, a 1 is put out at the output pin Do, otherwise a 0.

Parameter
None

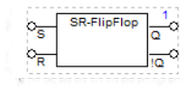
EQ: (max.10 available)



Function
The module compares the signals on both input pins Ai1 and Ai2. If Ai1 is equal to Ai2, a 1 is put out at the output pin Do, otherwise a 0.

Parameter
RNST (No control menu) Rounding (0-2,Nst)

SR-FlipFlop: (max.10 available)



Function
Due to a rising edge at the S-input (set) the output Q remains to 1 until it is reset by a rising edge at the R-input (reset). The S-input has priority while R and S are simultaneously set to 1.

Parameter
None

RS-FlipFlop: (max.10 available)

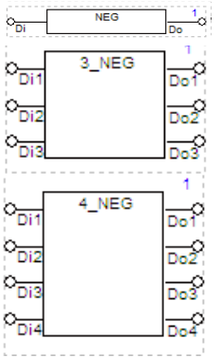
Function
Due to a rising edge at the S-input (set) the output Q remains to 1 until it is reset by a rising edge at the R-input (reset). The R-input has priority while R and S are simultaneously set to 1.

Parameter
None

INDEX

Operators (Operatoren)

NEG: / 3_NEG: / 4_NEG: (each max. 10 available)



Function
The reversed value of each according input pin is put out by the module at the digital output pin Do. and following.

Parameter

Maske NEG Eingang.	(no control menu)	Masking inputs (enbl/dis)

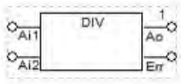
MUL: (max.10 available)

Function
The value from input Ai1 is multiplied with the value from input Ai2 and put out by the module at the output pin Ao. The range of the product is adjustable separately. With a result within the range, the additional digital output pin Err is set to 0, outside to 1.

Parameter

MBlo/MBHi	(no control menu)	Start / End product range (-9999999.00…99999999.00)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

DIV: (max.10 available)



Function
The value from input Ai1 is divided by the value from input Ai2 and put out by the module at the output pin Ao. The range of the quotient is adjustable separately. With a result within the range, the additional digital output pin Err is set to 0, outside to 1.

Parameter

dBlo/dBHi	(no control menu)	Start / End quotient range (-9999999.00…99999999.00)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

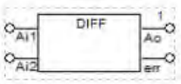
ADD: (max. 10 available)

Function
The value from input Ai1 is added to the value from input Ai2 and put out by the module at the output pin Ao. The range of the sum is adjustable separately. With a result within the range, the additional digital output pin Err is set to 0, outside to 1.

Parameter

ABlo/ABHi	(no control menu)	Start / End sum range (-9999999.00…99999999.00)
NSt	(no control menu)	Number of decimal places (0/1/2 depending on range)

DIFF: (max. 10 available)



Function
The value from input Ai1 is subtracted from the value from input Ai2 and put out by the module at the output pin Ao. The range of the difference is adjustable separately. With a result within the range, the additional digital output pin Err is set to 0, outside to 1.

Parameter

0Blo/0Bhi	(Parameter level 2)	Start / End difference range (-9999999.00…99999999.00)
NSt	(no control menu)	Number of decimal places (0/1/2 depending on range)

MAX: (max. 10 available)

Function
The higher one of both signals from the input pins Ai1 and Ai2 is put out at the analogue output pin Ao.

Parameter
None

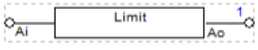
MIN: (max.10 available)

Function
The lower one of both signals from the input pins Ai1 and Ai2 is put out at the analogue output pin Ao.

Parameter

None

Limit: (max. 10 available)



Function
The signal from input pin Ai is limited in accordance to adjustable range limits and put out by the module to the output pin Ao.

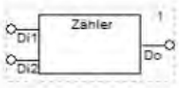
Parameter

LLo/LHi	(Parameter level 2)	Start / End of range (-999.0 ... +9999.00)

INDEX

Counter (Zähler)

Counter: (Zähler:) (max.10 available)

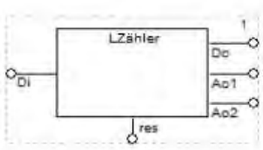


Function
The impulses (rising edge, max. 5 Hz) from the digital input Di1 are counted by the module and the count value is compared with a freely adjustable limit value. The digital output Do is set to 1 when the limit value is reached. The control input Di2 is used to reset the count value and the output Do.

Parameter

N	(Parameter level 2)	limit value (0...9999)

LCounter: (LZähler:) (max.10 available)



Function
The impulses (rising edge) from the digital input Di are counted and the count value is put out by the module to the analogue output Ao1. The value is saved independent from the power supply. The analogue output Ao2 (impulses per hour) is still without function. The output Do is set if the freely adjustable limit value is exceeded by the count value. The control input res is used to reset the count value and the output Do.

Parameter

LimLZ	(Parameter level 2)	limit value (0...9999)

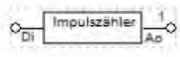
Operating_hours_counter: (Betriebsstundenzähler:) (max.10 available)

Function
The switched on time of a 1 signal from the digital input Di is counted by the module and the time value in hours is put out to the analogue output Ao. The value is saved independent from the power supply every 6 minutes. The parameter Set Counter is used to reset the value respectively to set a predetermined counter value in case of devices for replacement.

Parameter

SetC	(Configuration level)	Set Counter (0...99999.9)
NSt	(no control menu)	Number of decimal places (0/1/2 depending on range)

Impulse_counter: (Impulszähler:) (max.10 available)



Function
The impulses (max. 2500/sec.) from the digital input Di are counted and the count value is put out by the module to the analogue output Ao.

Parameter
None

Totaliser: (Summierer:) (max.10 available)

Function
An analogue value from the analogue input Ai per time unit / time factor (for example impulses per second) is summed up by the module. The count value is put out to the analogue output Ao1, that means the sum of the analogue values in time unit / time factor of the base value (for example litres per hour). The actual value of the "base time factor" (for example litres per hour) is put out to the analogue output Ao2. The calculation of the outputs can optionally be multiplied or divided. The value is saved independent from the power supply every 6 minutes. The parameter Set Counter is used to reset the value respectively to set a predetermined counter value in case of devices for replacement.

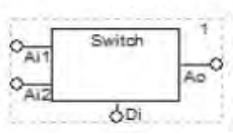
Parameter

Faktor	(Configuration level)	Factor (didi/dimu/mudi/mumu)
tf_o1	(Configuration level)	Output value 1 time factor (0,001...9999)
tf_o2	(Configuration level)	Output value 2 time factor (0,001...9999)
SetC_sm	(Configuration level)	Set Counter (0...99 999 999) (max. 8 significant digits)
NKS_o1	(Configuration level)	Output 1 decimal place (0...3)
NKS_o2	(Configuration level)	Output 2 decimal place (0...3)

INDEX

Switches (Schalter)

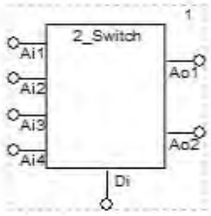
Switch: (max. 10 available)



Function
One of the signals from analogue inputs Ai1 and Ai2 is put out by the module to the analogue output Ao depending on the wiring of the digital input:
Di = 0: Ai1 is put out to Ao.
Di = 1: Ai2 is put out to Ao.

Parameter
None

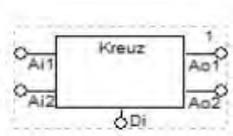
2_Switch: (max. 10 available)



Function
One of each signal from the analogue inputs Ai1 and Ai2 respectively Ai3 and Ai4 are put out to the analogue outputs Ao1 respectively Ao2 depending on the wiring of the digital input:
Di = 0: Ai1 is put out to Ao1 and Ai3 is put out to Ao2.
Di = 1: Ai2 is put out to Ao1 and Ai4 is put out to Ao2.

Parameter
none

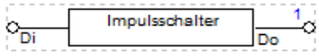
Cross_over: (Kreuz:) (max.10 available)



Function
The signals from the analogue inputs Ai1 and Ai2 are put out by the module to the analogue outputs Ao1 and Ao2 depending on the wiring of the digital input:
Di = 0: Ai1 is put out to Ao1 and Ai2 to Ao2.
Di = 1: Ai1 is put out to Ao2 and Ai2 to Ao1.

Parameter
none

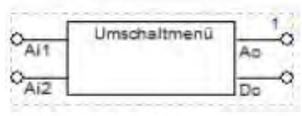
Impulse_switch: (Impulsschalter:) (max.10 available)



Function
The state of the output Do is changed by the module when the digital input Di is changed from 0 to 1. The state of the output Do is not saved when the power supply is switched off.

Parameter
None

Switch_over_menu: (Umschaltmenü:) (max.10 available)

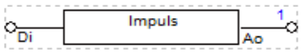


Function
The signals from the analogue inputs Ai1 and Ai2 are put out by the module to the analogue output Ao depending on the selection in the switch over menu. The digital output pin Do is set to 0 when Ai1 is selected and set to 1 when Ai2 is selected. The name and the description for the switch over menu as well as the designation for Ai1 and Ai2 are freely editable texts. The menu level, within the switch over menu should be listed, is freely selectable.

Parameter		
mname	(no control menu)	Designation for the menu
mdesc	(no control menu)	Description for the menu (displayed in addition to the designation)
mtext1	(no control menu)	Designation for Ai1
mtext2	(no control menu)	Designation for Ai2
mlevel	(no control menu)	Level within the menu is listed
mdset	(no control menu)	Preadjustment for input selection

Impulses (Impulse)

Impulse: (Impuls:) (max.10 available)

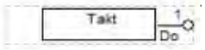


Function
An impulse with an adjustable length and amplitude is put out by the module to the output pin Ao with a rising edge from the input pin Di.

Parameter

DT	(Parameter level 2)	Impulse length (0...9999ms)
LEVEL	(Parameter level 2)	Impulse amplitude (0...9999)

Clock: (Takt:) (max.10 available)



Function
A cyclical clock signal with levels 0 and 1 is put out by the module to the output Do. The cycle duration is adjustable.

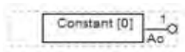
Parameter

T(ms)	(Configuration level)	Cycle duration (500...9999ms)

INDEX

Constant (Konstante)

Constant: (max.10 available)



Function
A constant value is put out by the module to the output.

Parameter

Constant	(Configuration level)	Constant value (-10000...+10000)
NSt	(Configuration level)	Number of decimal places (0/1/2 depending on range)

Adjustable_constant: (Einstellbare_Konstante:) (max.10 available)

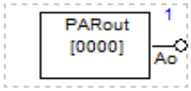
Function
A value is put out which is adjustable via menu in the set point level. The name and the description of the constant are freely editable texts.

Parameter

cname	(no control menu)	Designation for the constant in the menu
cdesc	(no control menu)	Description for the menu (displayed in addition to the designation)
cdset	(no control menu)	Constant pre-adjustment (value)
NSt	(sepoint level)	Number of decimal places (0/1/2 depending on range)

Parameter

PARout: (max.10 available)



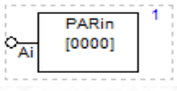
Function

In accordance to the entered controller- parameter code, the respective parameter is put out as analogue value in consideration of the decimal place to the output pin. So from nearly every module, any parameter can be read out and used in the configuration.

Parameter

Code	(no control menu)	valid parameter code in accordance to KFM 2.0 protocol

PARin: (max.10 available)



Function

The module reads the analogue value from Ai1 in consideration of the decimal place with a frequency of 1 Hz and writes the result into the parameter of the entered parameter code. In this way, values can be written to the parameter set of nearly every module.

Caution!

Write operations on EEPROM or flash-memory are done when using the module PARin. With constantly changing input values the limited number of memory- write cycles can be exceeded and result memory errors in case of power failure. Too frequently write operations should be avoided.

Parameter

Code	(no control menu)	valid parameter code in accordance to KFM 2.0 protocol

Comments (Kommentar)

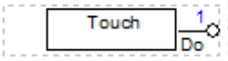
Comments: (Kommentar:) (max. 100 available)

Function
The module displays comments in the circuit diagram. The size of the comment window can be modified while the left mouse button is pressed down on the grey edge at the bottom right.

Parameter
None

Touch

Touch: (max. 10 available)



Function

The state of a touch- element (from the display) is put out in 0/1- signals by the module. It can be selected whether the element is used as button or switch.

Parameter

Typ Taste/ Schalter	(no control menu)	Function type of the display touch-element (butt/ swit)

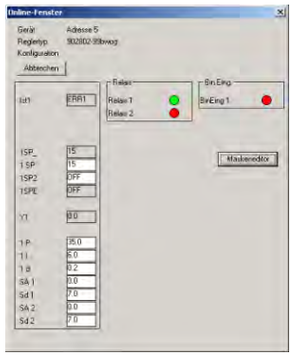
INDEX

1
2
3
4
5
6
7
8
9
0

The interface software KFM – PKS offers different function areas, which can be optionally and independently used. The software is distinguished by simple handling.

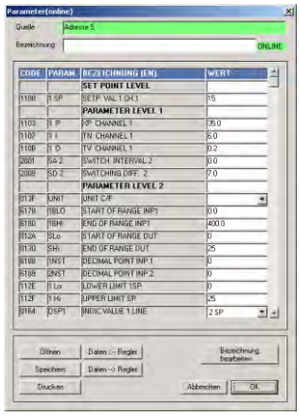
1. Online remote operation

On starting, the program automatically searches for any connected controllers. A window then appears, displaying the actual value, set value and parameters of the first controller found. Settings with a white background can be changed; changes have immediate effect in the controller. If more than one controller is connected (RS485 only), the required controller can be selected via a menu.



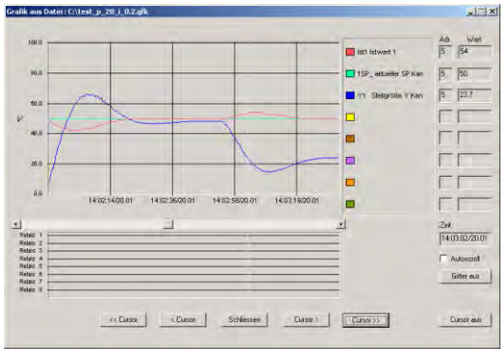
2. Data transfer

Optionally also the complete parameter block of the selected controller can be read out, edited, displayed as a table and printed out.
It is also possible to save the complete parameter setting as a file. Equally, parameter sets that have already been saved can be loaded into the controller.



3. Graphical Display (Line Recorder)

The data arriving from the controller can be displayed as a continuous diagram. Recordings made previously can also be recalled and displayed.

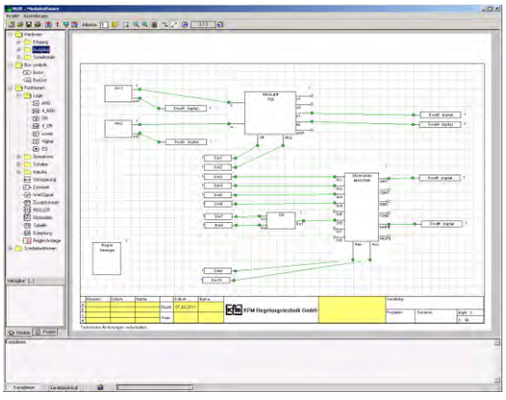


4. Data Recording (Logger)

Up to eight types of data arriving from the controller can be stored continuously in a file. This file can later either be recalled and displayed as a graph, or can be used by other programs.

5. Module software (optional)

The KFM module software provides the creation, visualization and parameterization by graphical elements of projects based on the controller series 902K..



Installation

- First end all applications which are running on the PC.
- Insert the PKS-CD in the CD drive and start the "Setup.exe" installation.
- A selection of german or english language for PKS is available.
- For installing and using of PKS agree to the liability exclusion.
- Select the destination folders of the hard disk drive into which the PKS files are to be installed in the following dialog. We recommend using the folders which are suggested.
- Apart from PKS it is possible to choose the TERMINAL program for modem configuration optionally.
- Then a link can be established with PKS in the Start menu as well as desktop icons.
- In addition to a summary of the chosen components the installation starts finally after clicking on the "Install" button.

Connection of the controller to a COM interface:
Connect the controller to the COM interface of the PC with the supplied RS232 or RS485 interface adapter. Ensure that the COM port is set accordingly after the PKS program start in the menu "options"->"settings".

Connection of the controller to a USB interface:
Connect the controller to the PC with the supplied USB interface adapter. The driver is installed automatically depending on the operating system, otherhwise manually: After you get the message "new hardware found", insert the included driver CD and launch the installation from the CD in the windows dialog. Following installation, the USB adapter appears in the windows system level as a further COM port. During driver installation the desired COM port is requested.
Ensure that the COM port of the USB adapter is set accordingly after the PKS program start in the menu "options"->"settings".

Connection of a device via Ethernet interface:
Connect the controller to the network interface of the PC with the supplied Ethernet interface adapter. Ensure that the COM- setting "Ethernet" and the IP-address of the Ethernet- interface adapter are set accordingly after the PKS program start in the menu "options"->"settings".
Further informations: → see manual: "B 99se E"

Information on uninstalling software

The interface software PKS and the software TERMINAL for modem configuration can be completely removed by execution of the program \uninst0000.exe wich is located in the PKS installation directory. If a link in the start menu has been created during the installation, it is possible to launch the "PKS,Terminal uninstall" from there.

Program operation

ADDRESS SEARCH window
Scanning for connected controllers is carried out once the program is started. The controller addresses are interrogated individually. As soon as a controller is found, the address appears black and the ONLINE window, respectively the configuration window in case of a bus adapter, is called up automatically.

Notes for working with several controllers:
If several controllers are operated simultaneously with PKS (only possible with the RS485 connection, suitable interface adapter necessary), the first controller found will be registered and it's data displayed in the ONLINE window. The address of this controller appears black in the ADDRESS SEARCH window.
The addresses of other controllers found are also displayed. All windows (apart from the ADDRESS SEARCH window) must be closed if another controller is to be selected. Afterwards the required address can be selected by clicking it in the ADDRESS SEARCH window. The ONLINE window of this controller opens automatically. Then handle the controller as described above.

ONLINE window
The ONLINE window shows actual values, setpoint values, switch states of the relays as well as the binary inputs and the most important parameters of the controller found. The data is updated continuously. Values can be changed in the input boxes (white). Changed values are sent immediately to the controller. The ONLINE window can be closed with <ESC> or by clicking the "close" button and reopened again with <F8> or the "Online"->"Online window" menu item.

Hint to mask editor
The display of the relays and the binary inputs in the ONLINE window can be inverted here and identifiers may be given to them (the inversion does not affect the actual switch state).
The mask setting and identifiers can be opened and saved manually with the "open and "save" buttons. If the "Open and save mask automatically" box is activated then the mask setting and identifiers will be saved and used automatically for the next operation with PKS.

Transfer of complete parameter data records

1. Reading out parameters
Alternatively to the ONLINE window the complete data record of the controller can be read out with the <F5> key or with the "File" -> "Data ← Controller" menu item. The parameters are displayed in the PARAMETER window and can be saved as a file or be printed ("File" menu). In addition a previously stored data record can be reloaded. In the PARAMETER window it is possible to add a comment in the form of a description of the controller to the file.

2. Parameter transmission
A changed or loaded data record can be transmitted to the controller by pressing the <F6> key or with the "File" -> "Data → Controller" menu item, changes have immediate effect if a controller is connected (display "online", green background).

*Note: Depending on the device, template files are optionally available for new data records without connected hardware, the files are saved in the PKS installation directory and can be used with the menu item "File"->"open" (file type: *.PKV).*

INDEX

1
2
3
4
5
6
7
8
9
0

Important: A previously stored and reloaded data record (display offline, red background) is only active after transmission to the controller.

WARNING: Incorrect changes of the data records may prevent the controller from working properly. It is therefore recommended to carry out modifications using professionally trained personnel.

Note only for LCD and TFT controller, for example 902../903../93.. or 824..
The descriptive texts for displayed values on the controller can be edited and archived with the menu item "edit label". Available descriptive texts are factory set in german and english language, they can be altered by using the buttons paste "DE" and paste "EN" (also with cyrillic characters). The desired descriptive texts can be activated after using the >OK<-button.

Options / Settings

The settings of the serial interface and the data transfer mode are carried out under the "Options" -> "Settings" menu. Password- protected menu items can be displayed by using the button "extended>>>".

Serial port

Enables the selection of the active interface of the controller / MODEM and the Baud Rate to be used, the IP- address and a port must be set for an Ethernet connection.

Besides a fixed selection of the Baud Rate of 9600, 19200 and 38400 the automatic Baud Rate detection can be selected. The automatic Baud Rate detection is recommended.

Data transfer mode (COM- interfaces only)

LOCAL:
The data is transferred by a controller connected directly to the serial interface.

REMOTE:
Transfer of the data from the controller to the PC is by means of remote data transfer/MODEM. Following the activation of the "REMOTE" option, the user is requested to enter a telephone number. Following confirmation, the PC MODEM tries to create a connection to the controller MODEM. This procedure can take around 30 seconds. If connection succeeds, the red "Offline" display of the dialog window changes to a green "Online" display. The telephone symbol in the background of the main window also changes from red to green. The connection remains active until the "Disconnect line" button is activated.

extended>>>

Allows to select additionally menu entries for displaying under the menu item "Extras". The selection is protected by passwords.

Extras / KFM-device programming (to display: "Options" -> "extended>>>")

KFM-device programming offers the possibillty for a device update with KFM provided software.

The device has to be connected to the PC and registered by address scanning in advance: choose the menu item "Extras" -> "Controller programming".

The device programming is protected by a password, the factory setting is 1.

To prevent unauthorized use a new password can be assigned after entering the correct password.

The COM port setting must be set accordingly and the respective file has to be selected to start the device programming.
You will be guided automatically through the rest of the proccess, a protocol shows the progress.

Extras / Accessory device for external setpoint and analogue signal outputs (99e..)

See instruction manual 99e.., e.g. for commissioning.

In case of a detected accessory device, (with or without connected controller to the accessory device) the respective configuration window opens automatically, it is manually available under the menu item "Extras" ->"99e..".

The configuration window shows the interface address of the controller which is connected to the accessory device. The configuration of the connected accessory device is being requested and displayed with the button read, the button send saves the actual configuration to the accessory device.

The corresponding parameters of the controller, which is connected to the accessory device, are available by means of the button "…", without connected controller there is a selection of the most common parameters available. Alternatively, parameters can be entered directly in the "Code" input boxes.

The buttons open and save allow to create archives and archived configurations can be reloaded.

Important: A previously stored and reloaded data record (display offline, red background) is only active after transmission to the accessory device.

Extras / Profibus-DP-adapter (99spde)
Extras / Modbus-adapter (99sm)

In case of a detected bus adapter, the respective configuration window opens automatically, it is manually available under the menu item "Extras" ->"99spde.. " for Profibus respectively Extras" ->"99sm.. " for Modbus.

The configuration window shows the bus address (configured at the bus adapter by a rotary encoding switch) as well as the interface address of the connected controller.
The configuration of the connected adapter is being requested and displayed with the button read, the button send saves the actual configuration to the adapter.

The corresponding parameters of the connected controller are available by means of the button "…". Alternatively, parameters can be entered directly in the "Code" input boxes.

Modify the parameter for reading from the controller or sending to the controller.

The buttons open and save allow to create archives and archived configurations can be reloaded.

See instruction manual interface 99spde, e.g. for organization of the profibus data modules and manual interface 99sm for the supported Modbus functions.

Notes for Modbus adapter 99sm
It is neccessary for the Modbus to select the data modules and the baudrate.

Optionally a latency period and a surveillance period for the bus can be entered, setting 0 deactivates the function.

Extras / read history or fault message

Recording times, message texts and the status of the operating- and fault messages are read out from connected KFM- malfunction alarm devices and displayed in a table view. The table can be saved and printed.

Extras / TFT display: → see manual: "B 99pkd E"
Extras / 903K module software: → see manual: "B 99pkm E"
Data logger: → see manual: "B 99pkl E"

Online / KFM Monitor

The values of any parameter from connected devices can be read or send with the KFM monitor. The communication is continuously displayed in a protocol and can be printed.

Note for the KFM Monitor:
The usage of the KFM- monitor is recommended to experienced users only! For the provided parameters see also manual 99s.

General information:

Serial interfaces enable digital communication with computers or higher ranking control systems.
An RS 232 (optional USB) interface permits connection of one controller per computer interface. The RS485 interfaces enable the connection of max. 32 participants in one data bus. Here, the controllers must be set to different addresses for differentiation.(Controller configuration level). Several Interfaces upon request.

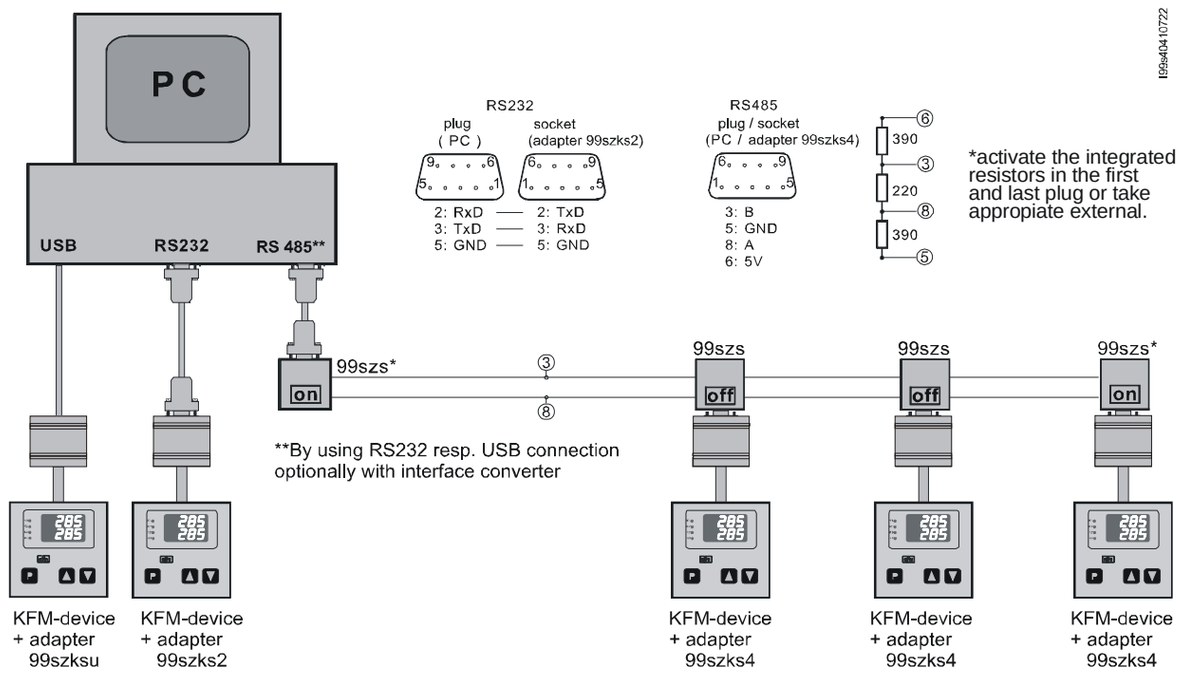
Technical data:

Interface:	direct connection - RS232, USB	bus connection - RS485
Connection:	serial, asynchronous 2 wire (+GND)	serial, asynchronous 2 wire (+GND)
Transfer medium:	twisted and screened cable	twisted and screened cable
Bus line length:	-	1000m
Branch connection length:	15m	2m
Max. number of controllers:	1	31
Transmission direction:	-	data flow control
Transfer rate:	9600, 19200, 38400 Bit / s	9600, 19200, 38400 Bit / s

Connection lines:

Cable junction for KFM devices is done by adapters which are linked to the service interface.
By direct connection: RS232(99szks2), alternatively USB(99szksu)
By bus connection: RS485(99szks4)
To establish the bus connection, providing that there is no interface RS485 on PC resp. at the PLC existing, an interface converter RS232 resp. USB to RS485 is necessary.
Use screened lines to connect the interfaces (e.g. KFM 99szl.).
Place the screening on the controller earthing terminal.
Connect the RS485 line at the beginning (PC or interface converter) and the end (last controller) with d- sub - plugs with integrated resistors (f.e. type 99szs) or appropriate external resistors.

Wiring example:



open printversion

INDEX
1
2
3
4
5
6
7
8
9
0

Transmission protocol:

Data is transmitted according to the KFM protocol 2.0 which is laid out in line with the ISO 1745.

Data format:

Each field of the data frame comprises a start bit, the 7 bit ASCII value,
a parity bit for even parity and a stop bit.
Transmission rate: 9600, 19200 or 38400 Bit/s (depending on type resp. setting).

Data frame (telegram) :

The data frame commences and ends with a control character (see table) and comprises of 2 bytes for the controller address (ADR) and 4 bytes for the parameter code (code) as well as up to 6 bytes for the number value, i.e.: number value on the left from the decimal point: up to 4 bytes; 1 byte for the decimal point, number value on the right of the decimal point: 1 byte.
1 byte = 1 digit or letter or control character = 1 ASCII value

Data integrity:

The data frames for parameter transmission are safeguarded with a "BCC" sign, i.e.the transmitted data is supplemented by a check sum consisting of the logic linking (EXOR) of all transmitted characters between STX (excl.) and ETX (incl.).
The controller acknowledges a successful transmission with "ACK". A faulty transmission is confirmed by "NAK".

Examples: The computer requests data

EOT	ADR	ADR	Code	Code	Code	Code	ENQ

the controller response:

STX	Code	Code	Code	Code	=	val.	val.	val.	val.	val.	ETX	BCC

The computer sends data. To this effect, the controller must be in operational state, because the simultaneous entry of data via interface and controller keyboard is inadmissible.

EOT	ADR	ADR	STX	Code	Code	Code	Code	=	val.	val.	val.	val.	val.	ETX	BCC

controllers response to a successful transmission: ACK

controllers response to a faulty transmission: NAK

Control characters:

control characters	value(HEX)	meaning
STX	02	start of text
ETX	03	end of text
EOT	04	end of transmission
ENQ	05	enquire
ACK	06	acknowledge
NAK	15	not acknowledge
=	3D	value allocation

Permitted characters for code and value:

ASCII-code	value (HEX)	description	ASCII-Zeichen	value(HEX)	description
"0"	30	zero	"9"	39	nine
"1"	31	one	"A"	41	ten (code)
"2"	32	two	"B"	42	eleven (code)
"3"	33	three	"C"	43	twelve (code)
"4"	34	four	"D"	44	thirteen (code)
"5"	35	five	"E"	45	fourteen (code)
"6"	36	six	"F"	46	fifteen (code)
"7"	37	seven	"."	2E	dec.point (value)
"8"	38	eight	"-"	2D	minus sign(val.)

open printversion

general information:

Only for older devices without online- functionality:
Transmission parameters are distinguished between online parameters and offline parameters, depending on their processing in the KFM – devices.
Online- parameters allow data transmission while the controller is in normal operating mode. In contrast, **offline**- parameters cannot be transmitted while the controller continues normal operation. So the controller has to be stopped by sending "10FE = 7708" (the display shows "ConF"). After the transmission the controller has to be switched-over to the normal operating mode by sending "10FF = 7708".

(The parameter code is exemplary for channel 1. For example: 113A = travel time of actuator channel 1. For the other channels change the number at the second place to the true channel number, for example 123A = travel time of actuator channel 2).
Parameters are available depending on type and design.

display	purpose	value range	CODE (HEX)	type
Operating indication:				
-	status- / control words 1..5 (word structure see page 6)		1001..05	online
IST1	actual value 1..6		1010..15	online*
ISTM1.1..10.2	actual value external modules 1..20		6250..64	online*
Y(1)..5	controller output channel 1..5	-100...100	1020..24	online*
Y	active controller output (e.g. 99g8.)	-100...100	102A	online*
D.W.	difference actual value 1 – actual value 2		1052	online*
M.W.	average actual value 1 / 2		1051	online*
Setpoint level:				
(1)SP	(internal) set point value channel 1	Lo...Hi *(see level 2)*	1(1)00	online
(1)SP2	second set point value channel 1	Lo...Hi *(see level 2)*	1(1)01	online
(1..5SP) (rSP)	active set point value channel 1..5, also active ramp- / program set point value		1030..34	online*
SP..	actual program step set point		3002	online*
SPB	bus setpoint	Lo...Hi *(see level 2)*	1060..64	online
SP-F	switch over SP/SPE	0 = SP, 1 = SPE	111C	online
2SP	current sequential controller set point value		103F	online*
P-CY	number of program cycles**	0...20	0148	online
“	number of program cycles module softw.**	0...1000	2650	online
A-CY	current program cycle module software**	0...1000	3003	online
Pro	actual program status	0=off,1=on,2=stop	3001	online
d15	density	500...1500	0152	offline
Parameter level 1:				
FUE	guide controller on/off	0=off,1=on	014D	online
(1)P(1)..4	proportional band XP1..4 channel 1	0.0...999.9	1(1)03..06	online
(1)I(1)..4	integral action time Tn1..4 channel 1	0.0...999.9	1(1)07..0A	online
(1)d(1)..4	derivative time Tv1..4 channel 1	0.0..99.9/0.00..99.99	1(1)0B..0E	online
(1)Sh	neutral zone Xsh channel 1	0.05...1,0	1(1)0F	online
(1)SA1..2	switching interval 1..2 channel 1	0...range(bLo/Hi) *(see*	1(1)13..14	online
(1)Sd1..2	switching difference 1..2 channel 1	0...range(bLo/Hi) *level 2)*	1(1)15..16	online
SA1..8	switching interval addit.contact 1..8	0.0...range	2000..07	online
Sd1..8	switching diff. addit.contact 1..8	0.1...range	2008..0F	online

* (parameter codes that can only be **send** by the controller)

** (transmission only with deactivated program function)

display	purpose	value range	CODE (HEX)	type
Parameter level 2:				
Unit	display unit °C / °F	0=°C, 1=°F	013F	offline
0bLo	min. val. range of actual val. 0 (diff/ aver.)	-999...bHi	1129	offline
UNIT	viscosity	0=cst, 1=cP	0151	offline
0bHi	max. val. range of actual val. 0 (diff/ aver.)	blo...4000	112A	offline
1..6bLo	min. value range input 1..6	-999...bHi	010C..11	offline
M1.1..10.2bLo	min. value range ext. modules input 1..20	-999...bHi	E4D0..E4	offline
1..6bHi	max. value range input 1..6	blo...4000	0112..17	offline
M1.1..10.2bHi	max. value range ext. modules input 1..20	blo...4000	E4E0..E4	offline
(1..3)SLo	min. value range signal output	-999...Shi	012A..2C	offline
(1..3)SHi	max. value range signal output	SLo...4000	0130..32	offline
0nst	decimal point actual value 0 (diff/ aver.)	0...2 (dep. on the range)	1128	offline
FLo	low limit set point value guide controller	0... Fhi	1130	online
FHi	high limit set point value guide controller	Flo...400	1131	online
1..6nst	decimal point input 1..6	0...2 (dep. on the range)	0118..1d	offline
M1.1..10.2nst	decimal point ext. modules input 1..20	0...2 (dep. on the range)	E550..64	offline
1 Lo	low limit set point value	-999...bHi	112E	offline
1 Hi	high limit set point value	blo...4000	112F	offline
DT	allowed deviation actual val.(dt control)	0...400	1146	offline
dSPL	lower display indication	0=OFF,1=SP, 2=rSP,3=Y,4=°C,5=°F, 6=bar,7=%,8=Ist1,9=Ist2...	0140	offline
DSP1..4	indication display line 1..4	0=OFF, 1=1 SP, 10=IST1, 11=IST2	0164..67	offline
EIN1..4	unit of measurement display line 1..4	3=m3_h, 4=C, 5=F, 6=%, 7=bar, 8=mbar, 9=mPas, 10=cSt,1=KGm3,12=mm	0168..6B	offline
Pr-S	number of program steps **	0...20	0149	offline
SP.1 .. 20	1...20. program setpoint val., program 1**	Lo...Hi	4101..14	online
H' 1.. 20	1...20. holding time, program 1**	0...6000	3101..14	online
Configuration level:				
ConF	type of controller		013C	offline
Cod1	code number	0...9999	0142	offline
Cod2	code 2..4	0...9999	0161..63	offline
LNG	language selection	0=DEUTSCH, 1=ENGLISH, 2=USER DEF, 3=OFF	8800	offline
Ist1..6	correction actual value 1..6	blo...bHi (+/-)	0124..29	offline
IstM1.1..10.2	correction actual value ext. modules 1..20	M.blo...M.bHi (+/-)	E4C0..D4	offline
Ain1..6	type of measuring input 1..6	0=4-20, 1=2-10, 2=0-20, 3=0-10, 5=rtd, 20=n100	011E..23	offline
AinM1.1..10.2	type of measuring input ext. modules 1..20	0=4-20, 1=2-10, 2=0-20, 3=0-10, 5=rtd, 20=n100	E4B0..C4	offline
SP-F	switch-over of the ext. setpoint via menu / bin. input (SP/SPE)	-2=AUS, -1=SPEB(bin.), 0=SPEM(menu), 1=SP2	014F	offline
YE	switch-over SPE / YE	0=SPE,1=YE	114E	offline
SPE	function of the ext. setpoint	2=AbS,3=Add,4=Sub	112D	offline

* (parameter codes that can only be **send** by the controller)

** (transmission only with deactivated program function)

open printversion

display	purpose	value range	CODE (HEX)	type
configuration level (continued):				
REL_	switch.behaviour of the first step,step contr.	0=stat, 1=rel	1144	offline
(1) Y"	travel time of actuator channel 1	6...600	1(1)3A	offline
(1) TE	switch-on delay per step, step controller	0...600	1(1)43	offline
Cy"	cycle time	2...120	013D	offline
(1) TP	pause time step controller	0...60	1(1)45	offline
(1)out	type of output signal 0 / 4...20mA	0=0-20,1=4-20	1(1)3B	offline
(1)out	output direction di / in	0=in(in),1=(in)di,2=diin,3=didi	1(1)3C	Offline
dSLo	valve drop. minimum	0...50	1122	offline
out	limitation selection (min / max)	0=Lo, 1=Hi	1127	offline
dSHi	valve drop. maximum	50...100	1123	offline
(1) ib	integration range limit channel 1	0...100	1(1)40	offline
(1)YLo	low limit control output	0...Yhi	1(1)38	offline
(1)YHI	limitation control output	-100...100	1(1)41	offline
(1)YHi	high limit control output	YLo...100	1(1)39	offline
(1) TY	control output slope	0...100	1(1)42	offline
(1) DB	damping range	0...100	1(1)25	offline
(1) D"	damping value	0...100	1(1)26	offline
Gr1..2	gradient 1..2	0...100	1132..33	offline
rF1..2	waiting window value 1..2	0.1...999.9	1134..35	offline
td	dead range	0.0...10.0	113D	offline
Sout(1..3)	signal output 0/4...20mA	0=0-20,1=4-20	0136..38	offline
Sou1..5	assignment signal output	11=Ist1, 12=Ist2, 21=SP	0155..5A	offline
(1)Y_S	output reaction at meas.fault (relais)	0=off,1=K1,2=K2	1(1)3E	offline
(1)Y_S	output reaction at meas.fault (Y)	YLo...YHi (continuous)	1(1)3F	offline
(1)YAP	operating point	YLO...Yhi	1(1)37	offline
YH	switch over control val. on / off	0=off,1=on	1148	offline
YH	external control value	0...100	1149	offline
d.SP	max. deviation actual value	0.1...200.0	0147	offline
t"	tolerance period act.value (ser. interface)	1...100	014E	offline
rEL1..8	function selection additional contact 1..8	0=LC A, 1=LC E, 2=Su A, 3=Su E, 4=So A, 5=So E, 6=St A, 7=US A, 8=US E, 11=OFF, 12=ON	2010..17	offline
rEL1..8	input selection additional contact 1..8	1...6=Ist1...6, 11=1Y...	2018..1F	offline
rEL1..8	channel / setpoint selection additional contact 1..8	1...4=1..4SP, 11=rSP...	2020..27	offline
rEL1..8	condition relay 1...8 for measuring line fault	0=SiA,1=SiE	2028..2F	offline
Adr	controller address	1...255	0141	offline
BAUD	baud rate (series 92..)	0=9600	2629	offline
	baud rate (series 902..)	0=9600, 1=19200, 2=38400	2629	offline

* (parameter codes that can only be **send** by the controller)

** (transmission only with deactivated program function)

open printversion

parameter for series 9..

read: (from KFM device)

status word 1 (8 Ascii-characters, code 1001)

char. 8	char. 7	char. 6	char. 5	char. 4	char. 3	char. 2	char. 1

Ascii- *character* 1..7: status measuring input 1 .. 7
0 = error-free measurement; 1 = fault at the resp. input

status word 2 (0 - 40 Ascii-characters depending on existing binary inputs, code 1002)

char. 40	char. 39	..	..	..	..	char. 2	char. 1

Ascii-character 1..40: status binary input 1 .. 40
0 = binary input deactivated; 1 = binary input activated

status word 3 (0 - 40 Ascii-characters depending on existing additional contacts, code 1005)

char. 40	char. 39	..	..	..	..	char. 2	char. 1

Ascii-character 1..40: status additional contact 1..40
0 = contact deactivated; 1 = contact activated

write: (to KFM device)

control word 1 (2 Ascii-characters, code 1004)

character 2				character 1			
bit 4	bit 3	bit 2	bit 1	bit 8	bit 7	bit 6	bit 5

bit 1 .. 4: control bus-setpoint 1 .. 4
0 = bus-setpoint deactivated, internal sepoint (SP) active
1 = bus-setpoint active (SPB)

control word 2 (10 Ascii-characters, code 1005)

character 10				..	..	..	..	character 1			
bit 40	bit 39	bit 38	bit 37	..	..	..	..	bit 4	bit 3	bit 2	bit 1

bit 1 .. 40: control additional contact 1 .. 40, if the contact is configured to “BUS“
0 = contact deactivated
1 = contact activated

parameter for malfunction indicator type 821, 822

CODE (HEX)	parameter*	range
100F	status word binary input 1-16	0, 1

Logical organization of the hexadecimal status word with the resp. LEDs:

figure 7				figure 6				figure 5				figure 4				figure 3				figure 2				figure 1				figure 0			
4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13

figure 7..4 = status LED 1 to 16 (0 = LED off, 1 = LED active)
figure 3..0 = flashing status LED 1 to 16 (0 = LED constantly on, 1 = LED flashing)

example: LEDs 1,6,8,11,16 active (0001 1010 0100 1000),
LEDs 6,8,16 flashing (0000 1010 0000 1000)
=> status word 1 = "1A48 0A08" (as ascii-character string)**

parameter for tableau type 8219sbtm

CODE (HEX)	parameter*	range
0901	status word binary input 1-16 of I/O-unit 1	0, 1
0902	status word binary input 1-16 of I/O-unit 2	0, 1
0903	status word binary input 1-16 of I/O-unit 3	0, 1
0904	status word binary input 1-16 of I/O-unit 4	0, 1

Logical organization of the hexadecimal status word 1-4 with the resp. LEDs:

addr	addr	,	figure 7				figure 6				figure 5				figure 4				figure 3				figure 2				figure 1				figure 0			
			4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13	4	3	2	1	8	7	6	5	12	11	10	9	16	15	14	13

addr — double-digit address of the resp. I/O-unit (e.g. malfunction indicator address 04)

, — separator (comma) between address and status word

figure 7..4 — status LED 1 to 16 (0 = LED off, 1 = LED active)
figure 3..0 — flashing status LED 1 to 16 (0 = LED constantly on, 1 = LED flashing)

example: LEDs 2,5,7,10,15 active (0010 0101 0010 0100),
LEDs 5,7,10 flashing (0000 0101 0010 0000)
=> status word 1 = "04, 2524 0520" (as ascii-character string)**

note: In case of an interruption between tableau and I/O-unit, the address 00 will be send.

* (Parameters are available depending on type and design.)

** Transmission as hexadecimal number, e.g. 1 (ASCII)= 31 (hex) , see also section "data format", page 2!

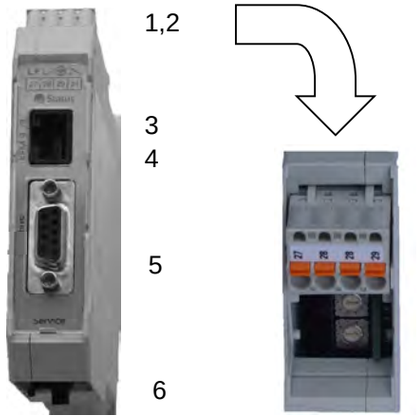
programming example in “C” (extract):

```
void send_data_frame( void)
{
int i;
char antwort=' ', z_buff[80];
unsigned char bcc;

printf( "\n\ndata ----> controller");
for ( i=0; i<=strlen( Ist); i++ )                    // send data - frame
    {
    if ( i==0 )
        {
        sende_byte( 0x04);                           // send 'EOT'
        sende_byte( adresse[0]);                     // send 1. adress-byte
        sende_byte( adresse[1]);                     // send 2. adress-byte
        sende_byte( 0x02);                           // send 'STX'
        sende_byte( code[0]);                        // send 1. code-byte
        bcc=code[0];
        sende_byte( code[1]);                        // send 2. code-byte
        bcc = bcc^code[1];
        sende_byte( code[2]);                        // send 3. code-byte
        bcc = bcc^code[2];
        sende_byte( code[3]);                        // send 4. code-byte
        bcc = bcc^code[3];
        sende_byte( EQL);                            // send '='
        bcc = bcc^EQL;
        }
    sende_byte( Ist[i]);                             // send data
    bcc = bcc^Ist[i];
    }//for
sende_byte( 0x03);                                   // send 'ETX'
bcc = bcc^0x03;
sende_byte( bcc & 0x00ff);                           // send BCC-byte

for ( i=1; i<=400; i++ )
    {
    if ( (inportb ( com+LSR) & 0x01) ) antwort=inportb( com+RBR);
    if ( antwort==NAK ) { printf( "\nOut of Range !"); break;}
    if ( antwort==ACK ) { printf( "\nOK !"); break; }
    delay( 1);
    }//for
if ( i==401 ) printf( "\nNo response !");
};
```

open printversion

INDEX

1 Terminals supply voltage
2 Coding switches address adjustment
3 Status-LED
4 RJ-45 connector KFM device
5 9-pole D-SUB plug Modbus- RTU
6 Configuration interface (service) for PC connection



Brief description:
The connection of KFM devices to the MODBUS- RTU is realised by the external bus adapter 99sm.. which is configured to the requested transmission data e.g. actual value and setpoint. The MODBUS interface is able to replace separate wiring of external analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).
The MODBUS interface is carried out as RS232-, RS485- or RS422- bus interface. The adapter has to be connected directly to the bus wiring using the 9-pole D-SUB plug.
Suitable resistors (e.g. in the connector plugs) must be present at the beginning and at the end of the bus line for communication via data bus. Shielded and twisted cables must be used. Lay the shield to ground potential. The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. For each segment 32 devices could be installed, with a repeater up to 99. The bus adapter provides the MODBUS-functions 01/05 (read single bit), 03 / 04 (read input register) and 16 (write multiple register). Analogue values are transmitted as 2 x 16 bit floating point numbers, binary values as 1 bit or 2 byte-word (16 bit, if necessary a multiple of it). The function of the adapter can be supervised by a fault bit. Additionally connection faults are recorded in the fault memory for diagnostic purposes.

Types:

fifth and sixth position		*seventh position*	
99sm04.	Adapter for 4 MODBUS values, power supply 24V DC	99sm..2	for RS 232 interface
99sm12.	Adapter for 12 MODBUS values, power supply 24V DC	99sm..4	for RS 485 interface
99sm28.	Adapter for 28 MODBUS values, power supply 24V DC	99sm..6	for RS 422 interface

device variants (last number):

.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies

Power supply module:

99e500	Power supply module 100-250 V AC

Adjustments:
The MODBUS adapter is delivered preadjusted. In case of changes, the preadjustments can easily be modificated by a configuration program in the WinPKS PC software via the service interface.

	designation	*KFM parameter*	*MODBUS-register#*	*factory setting read / write*
Data word 1	Control word 1	1004	10 (“Dec“)	write
Data word 2	Bus setpoint 1	1060	20 (“Dec“)	write
Data word 3	Actual value 1	1010	30 (“Dec“)	read
Data word 4	Actual value 2*	1011	40 (“Dec“)	read
	** = depending on type*		*# =memory area in the modbus master*	
	for further parameter codes according to protocol *KFM 2.0 refer to manual 99sm.*			
Bus monitor	Monitor check time (0..100 sec), period within which a bus request shall take place, otherwise LED signals a failure. *Hint: Bus monitor is deactivated by setting 0*			5
Delay time	Delay time (0..250ms) for a modbus-adapter reply			0
Baudrate	Modbus baudrate (9600/19200/38400)			9600
Parity, Stopbits	Modbus parity (None/Even/Odd), number of stopbits (1, 2)			none, 2 stop
Bus address	0..99, **Coding switch**, available after removing the covering			5
	Hint: In case of multiple bus participants different addresses are to be adjusted !			

open printversion

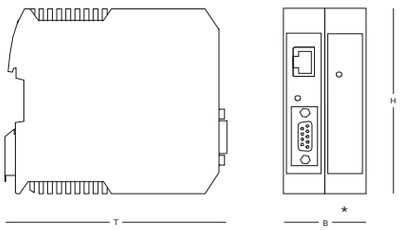
Commissioning:

Set the desired modbus-address by use of the coding switch. Connect Modbus with 9-pole D-SUB connector and patch wire (1,5m) with service interface of the KFM device.
Use of the supply voltage on the Modbus interface only for terminating resistors.

The LED on the front signalises the operating status:

yellow permanent:	Normal operation
yellow flashing:	Communication error between KFM device and MODBUS adapter Hint: all transmitted values of the respective device are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
red flashing:	Communication error MODBUS, MODBUS not active, the respective fault memory will be increased by 1.
red yellow flashing:	Communication error MODBUS and KFM device, each fault memory will be increased by 1.

Installation dimensions:



H= 99mm, * Version without or with power supply module: B = 22,5mm or 45mm, T = 116mm

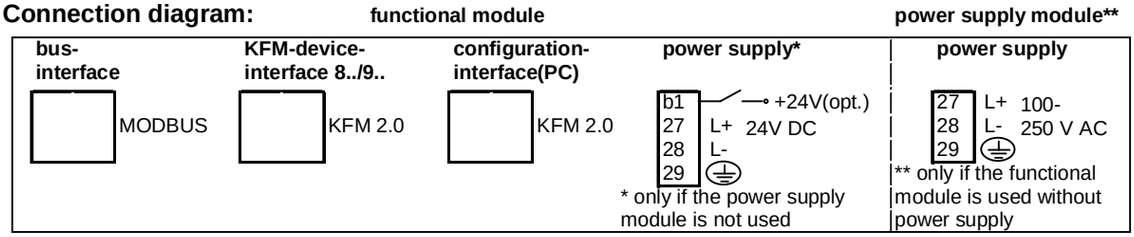
Technical data:

Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 24V DC, about 100 mA

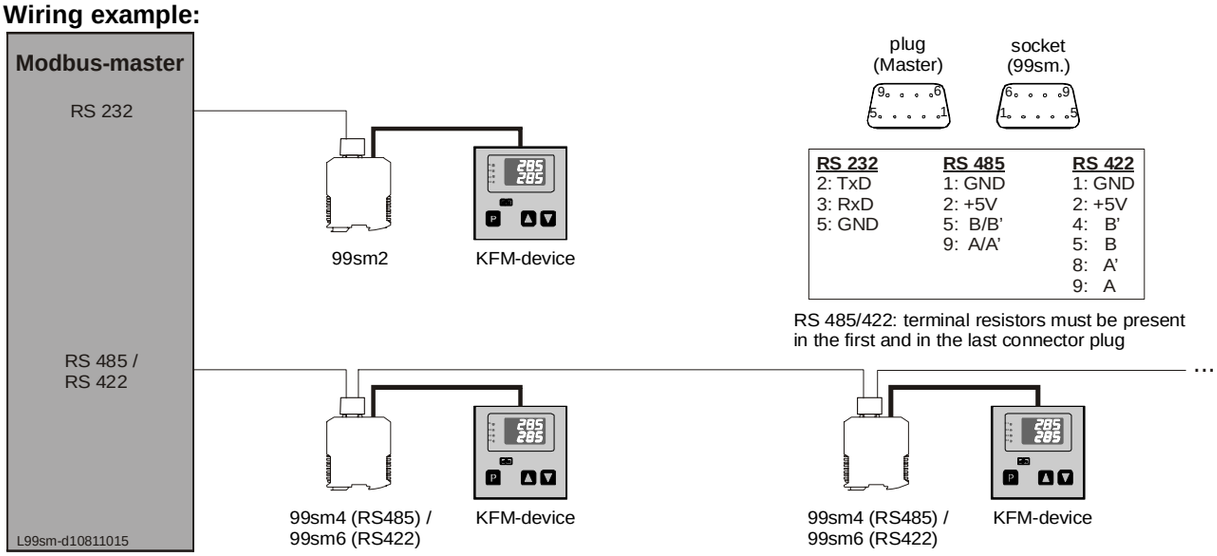
Technical data:

Modbus-interface:	RS232	RS485	RS422
Connection (serial):	asynch.,2-wire (+GND)	asynchronous, 2-wire	asynchronous, 4-wire
Cable lenght	15m	1000m	1000m
Max. number of devices:	1	31	31

Connection diagram:



Wiring example:



Data transmission:

The preadjusted transmission data are cyclically updated between the bus adapter and the connected KFM-device. By using the functions "read register" (function-code 0x03 and 0x04) as well as "write register" (function-code 0x10) the data can be accessed via modbus. For this purpose, the write- or read commands must contain the modbus- adapter address and the function-code in addition to the modbus-register wich is adjusted at the adapter, the number of data words (16 bit) to be transferred and the checksum (CRC). The data to be transferred depends on the type and uses 1 (status- and control word 1), 2 (analogue values or parameters) or 3 data words (status- and control words 2 and 3).

Hint: A freely adjustable memory area ("modbus- register") which is accessible via modbus, must be allocated in the adapter for each desired parameter code (see chapter parameter).

Structure of the supported modbus functions:

Modbus requests data (read, 0x03 / 0x04)

modbus adapter-adress	function-code	modbus-register	modbus-register	number of data words	number of data words	CRC	CRC

KFM-modbus adapter responds

modbus adapter-adress	function-code	number of bytes	value data w.1 hi-byte	value data w.1 lo-byte	value data w.2 hi-byte	value data w.2 lo-byte	value data w.3 hi-byte	value data w.3 lo-byte	CRC	CRC

Modbus transmits data (write, 0x10)

modbus adapter-adress	function-code	modbus-register	modbus-register	number of data words	number of data words	number of bytes	value data w.1 hi-byte	value data w.1 lo-byte	value data w.2 hi-byte	..	CRC	CRC

KFM-modbus adapter responds

modbus adapter-adress	function-code	para-meter code	para-meter code	number of data words	number of data words	CRC	CRC

Examples:

*Modbus requests modbus register 30 actual value 1 (code 1010 *) from modbus adapter with adress 5*

05	04	00	1E	00	02	75	4A

Modbus adapter with adress 5 responds with value 100

05	04	04	00	00	42	C8	8F	72

*Modbus transmits modbus Register 20 setpoint 1 (code 1060 *) value 100 to the modbus adapter with adress 5*

05	10	00	14	00	02	04	00	00	42	C8	17	F9

Modbus adapter with adress 5 responds

05	10	11	00	00	02	04	..	..

* see assignment table on page 1

Structure of the analog transmit values (2 data words)

Analogue data or parameters are transmitted in MODBUS-float-format (2 x 16 bit data words). The order of the individual bytes is switched compared to the single-float-format according to standard IEEE754. Depending on the master system used, this must be checked and adjusted if needed.

MODBUS-float-format

MMMMMMMM	MMMMMMMM	SEEEEEEE	EMMMMMMM

Single-float-format (32bit) according to standard IEEE 754

SEEEEEEE	EMMMMMMM	MMMMMMMM	MMMMMMMM

S = sign (1 bit); E = exponent (complement to base 2); M = normalized mantissa (23 bit)

Structure of status- and control words

read: (from KFM device)

status word 1 (1 data word, generally existent)

bit 15	bit 14	..	..	..	..	bit 2	bit 1

bit 1..7: status measuring input 1 .. 7
0 = error-free measurement; 1 = fault at the resp. input
bit 8: status KFM-device-interface, 1 = normal operation, 0 = conn. error

status word 2 (3 data words, only existing if code 1002 is configured)

bit 48	bit 47	..	..	..	..	bit 2	bit 1

Bit 1..40: status binary input 1 .. 40
0 = binary input deactivated; 1 = binary input activated

status word 3 (3 data words, only existing if code 1005 is configured)

bit 48	bit 47	..	..	..	..	bit 2	bit 1

Bit 1..40: status relays 1..40
0 = contact deactivated; 1 = contact activated

write: (to KFM device)

control word 1 (1 data word, generally existent)

bit 15	bit 14	..	..	..	..	bit 2	bit 1

bit 1 .. 4: : control bus-setpoint 1 .. 4
0 = bus-setpoint deactivated, internal sepoint (SP) active
1 = bus-setpoint active (SPB)

control word 2 (3 data words, only existing if code 1005 is configured)

bit 48	bit 47	..	..	..	..	bit 2	bit 1

bit 1 .. 40: control additional contact 1 .. 40, if the contact is configured to “BUS“
0 = deactivate contact
1 = activate contact

Diagnostics:

Two resettable internal fault memorys are available for communication error analysis on the modbus- and KFM-service-interface. The number of communication faults is recorded by code 5281(communication fault to the modbus) and 5282 (communication fault to the KFM-device). Both counter values are reset to zero by setting code 5280 (reset) to 1. Reading of the fault memorys and the reset function can only be achieved by the configuration-interface.

display	purpose	value range	CODE (HEX)
Operating indication:			
-	status- / control words 1..5		1001..05
-	status word type 821H75s.		100F
IST1	actual value 1..6		1010..15
Y(1)..5	controller output channel 1..5	-100...100	1020..24
Y	active controller output (e.g. 99g8.)	-100...100	102A
D.W.	difference actual value 1 – actual value 2		1052
M.W.	average actual value 1 / 2		1051
Setpoint level:			
(1)SP	(internal) set point value channel 1	Lo...Hi *(see level 2)*	1(1)00
(1)SP2	second set point value channel 1	Lo...Hi *(see level 2)*	1(1)01
(1..5SP) (rSP)	active set point value channel 1..5, also active ramp- / program set point value		1030..34
SP..	actual program step set point		3002
SPB	bus setpoint	Lo...Hi *(see level 2)*	1060..64
SP-F	switch over SP/SPE	0 = SP, 1 = SPE	111C
2SP	current sequential controller set point value		103F
P-CY	number of program cycles*	0...20	0148
Pro	actual program status	0=off,1=on,2=stop	3001
d15	density	500...1500	0152
Parameter level 1:			
FUE	guide controller on/off	0=off,1=on	014D
(1)P(1)..4	proportional band XP1..4 channel 1	0.0...999.9	1(1)03..06
(1)I(1)..4	integral action time Tn1..4 channel 1	0.0...999.9	1(1)07..0A
(1)d(1)..4	derivative time Tv1..4 channel 1	0.0..99.9/0.00..99.99	1(1)0B..0E
(1)Sh	neutral zone Xsh channel 1	0.05...1,0	1(1)0F
(1)SA1..2	switching interval 1..2 channel 1	0...range(bLo/Hi) *(see*	1(1)13..14
(1)Sd1..2	switching difference 1..2 channel 1	0...range(bLo/Hi) *level 2)*	1(1)15..16
SA1..8	switching interval addit.contact 1..8	0.0...range	2000..07
Sd1..8	switching diff. addit.contact 1..8	0.1...range	2008..0F
Parameter level 2(Usable parameters depending on the type, consider potential mutual interference !)			
Unit	display unit °C / °F	0=°C, 1=°F	013F
0bLo	min. val. range of actual val. 0 (diff/ aver.)	-999...bHi	1129
UNIT	viscosity	0=cst, 1=cP	0151
0bHi	max. val. range of actual val. 0 (diff/ aver.)	blo...4000	112A
1..6bLo	min. value range input 1..6	-999...bHi	010C..11
1..6bHi	max. value range input 1..6	blo...4000	0112..17
(1..3)SLo	min. value range signal output	-999...Shi	012A..2C
(1..3)SHi	max. value range signal output	SLo...4000	0130..32
0nst	decimal point actual value 0 (diff/ aver.)	0...2 (dep. on the range)	1128
FLo	low limit set point value guide controller	0... Fhi	1130
FHi	high limit set point value guide controller	Flo...400	1131
1..6nst	decimal point input 1..6	0...2 (dep. on the range)	0118..1d
1 Lo	low limit set point value	-999...bHi	112E
1 Hi	high limit set point value	blo...4000	112F
DT	allowed deviation actual val.(dt control)	0...400	1146
dSPL	lower display indication	0=OFF,1=SP,2=rSP,3=Y,4=°C, 5=°F,6=bar,7=%,8=Ist1,9=Ist2..	0140
DSP1..4	indication display line 1..4	0=OFF,1=1 SP,10/11=IST1/2	0164..67
EIN1..4	unit of measurement display line 1..4	3=m3_h, 4=C, 5=F, 6=%, 7=bar, 8=mbar, 9=mPas, 10=cSt,1=KGm3,12=mm	0168..6B
Pr-S	number of program steps	0...20	0149
SP.1 .. 20	1...20. program setpoint val., program 1*	Lo...Hi	4101..14
H' 1.. 20	1...20. holding time, program 1*	0...6000	3101..14

* (transmission only with deactivated program function)

INDEX

1 2 3 4 5 6 7 8 9 0

display	purpose	value range	CODE (HEX)
Configuration level: (Usable parameter depending on the type, consider potential mutual interference !)			
ConF	type of controller		013C
Cod1	code number	0...9999	0142
Cod2	code 2..4	0...9999	0161..63
LNG	language selection	0=DEUTSCH, 1=ENGLISH, 2=USER DEF, 3=OFF	8800
Ist1..6	correction actual value 1..6	blo...bHi (+/-)	0124..29
Ain1..6	type of measuring input 1..6	0=4-20, 1=2-10, 2=0-20, 3=0-10, 5=rtd, 20=n100	011E..23
SP-F	switch-over of the ext. setpoint via menu / bin. input (SP/SPE)	-2=AUS, -1=SPEB(bin.), 0=SPEM(menu), 1=SP2	014F
YE	switch-over SPE / YE	0=SPE,1=YE	114E
SPE	function of the ext. setpoint	2=AbS,3=Add,4=Sub	112D
REL_	switch.behaviour of the first step,step contr.	0=stat, 1=rel	1144
(1) Y"	travel time of actuator channel 1	6...600	1(1)3A
(1) TE	switch-on delay per step, step controller	0...600	1(1)43
Cy"	cycle time	2...120	013D
(1) TP	pause time step controller	0...60	1(1)45
(1)out	type of output signal 0 / 4...20mA	0=0-20,1=4-20	1(1)3B
(1)out	output direction di / in	0=in(in),1=(in)di,2=diin,3=didi	1(1)3C
dSLo	valve drop. minimum	0...50	1122
out	limitation selection (min / max)	0=Lo, 1=Hi	1127
dSHi	valve drop. maximum	50...100	1123
(1) ib	integration range limit channel 1	0...100	1(1)40
(1)YLo	low limit control output	0...Yhi	1(1)38
(1)YHl	limitation control output	-100...100	1(1)41
(1)YHi	high limit control output	YLo...100	1(1)39
(1) TY	control output slope	0...100	1(1)42
(1) DB	damping range	0...100	1(1)25
(1) D"	damping value	0...100	1(1)26
Gr1..2	gradient 1..2	0...100	1132..33
rF1..2	waiting window value 1..2	0.1...999.9	1134..35
td	dead range	0.0...10.0	113D
Sout(1..3)	signal output 0/4...20mA	0=0-20,1=4-20	0136..38
Sou1..5	assignment signal output	11=Ist1, 12=Ist2, 21=SP	0155..5A
(1)Y_S	output reaction at meas.fault (relais)	0=off,1=K1,2=K2	1(1)3E
(1)Y_S	output reaction at meas.fault (Y)	YLo...YHi (continuous)	1(1)3F
(1)YAP	operating point	YLO...Yhi	1(1)37
YH	switch over control val. on / off	0=off,1=on	1148
YH	external control value	0...100	1149
d.SP	max. deviation actual value	0.1...200.0	0147
t"	tolerance period act.value (ser. interface)	1...100	014E
rEL1..8	function selection additional contact 1..8	0=LCA, 1=LCE, 2=SuA, 3=SuE, 4=SoA, 5=SoE, 6=StA, 7=USA, 8=USE, 11=OFF, 12=ON	2010..17
rEL1..8	input selection additional contact 1..8	1...6=Ist1...6, 11=1Y...	2018..1F
rEL1..8	channel / setpoint selection additional contact 1..8	1...4=1..4SP, 11=rSP...	2020..27
rEL1..8	condition relay 1...8 for measuring line fault	0=SiA,1=SiE	2028..2F
Adr	controller address	1...255	0141
BAUD	baud rate	0=9600, 1=19200, 2=38400	2629
anSERin	analog input value (via interface)	-10000..10000	6200..09
digSERin	8-bit digital input value (via interface)	00 .. FF hex e.g. 0..255	6210..19
anSERout	analog output value (via interface)	-10000..10000	6220..29
digSERout	8-bit digital output value (via interface)	00 .. FF hex e.g. 0..255	6230..39

INDEX

1
2
3
4
5
6
7
8
9
0

The PROFIBUS serial fieldbus system helps to minimise the amount of cabling. Input and output modules, such as a PLC, become unnecessary. Instead of this, a bus cable is connected from one device to the next, and the entire communication between the individual control devices takes place over this bus line. All the PROFIBUS devices are addressed directly by the PROFIBUS controller card in the PLC or in the master computer.

In KFM controllers, the PROFIBUS interface replaces the cabling of external analogue signals (external set value inputs, actual values, set value outputs etc.).

TYPE 99spd: PROFIBUS-DP slave connection
The Profibus DP connection is implemented in accordance with EN 50170. The controller is connected directly to the bus line via a 9-pin D-SUB socket.

Technical data:

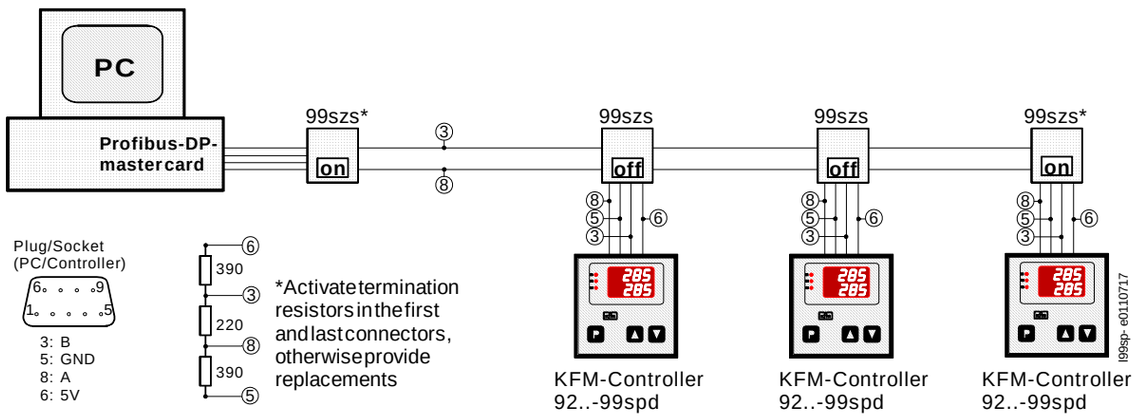
Protocol:	PROFIBUS-DP
Topology:	Linear bus with bus connections at each end
Interface:	RS 485
Addressing:	0...126 (can be set in the controller using a menu)
Max. number of devices:	32 per segment, can be increased to 127 with a repeater
Data format:	Modules for fixed or floating point data transmission
Baud rate:	Automatic baud rate detection up to max. 12 Mbaud

For other data, see the GSD file in the appendix

Pin-out of the 9-pin connector:

Pin no	Identification	Description
3	RxD / TxD-P	Receive/send data plus
4	CNTR-P	RTS control signal for optical fibres
5	DGND	Data reference potential for termination resistors
6	VP	5 V supply for termination resistors
8	RxD / TxD-N	Receive/send data minus

Wiring example:



Data modules:

The data to be transmitted are compiled in modules, data transmission is cyclical.
One module each is provided fixed decimal and floating decimal data transmission. The modules are selected via a configuration tool in the master assembly (e.g. COM profibus).

If no set values or actual values are available in the controller, the master must transmit the value 0 or the value 0 is sent from the controller

Fixed decimal data modules
Format A:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Actual value	R	50
3	Control byte	W	20
4	External set value	W	60

Format C:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Actual value 1	R	50
3	Actual value 2	R	50
4	Control byte	W	20
5	External set value 1	W	60
6	External set value 2	W	60

Format E:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Value 1, e.g. actual value 1	R	50
3	Value 2, " " 2	R	50
4	Value 3, " " 3	R	50
5	Control byte	W	20
6	Value 1, e.g. ext. set value 1	W	60
7	Value 2, e.g. ext. set value 2 or setting actual value 1*	W	60
8	Value 3, e.g. ext. set value 3 or 2FHi*	W	60

The values are displayed in the 16-bit fixed decimal - format with one decimal place (Fixpoint 1).
Range of values: -999.9 to +3200.0

Floating decimal data modules:
Format B:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Actual value	R	D1
3	Control byte	W	20
4	External set value	W	E1

Format D:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Actual value 1	R	D1
3	Actual value 2	R	D1
4	Control byte	W	20
5	External set value 1	W	E1
6	External set value 2	W	E1

Format F:

No.	Identification	Read / write	Value (hex)
1	Status byte	R	10
2	Value 1, e.g. actual value 1	R	D1
3	Value 2, e.g. actual value 2	R	D1
4	Value 3, e.g. actual value 3	R	D1
5	Control byte	W	20
6	Value 1, e.g. ext. set value 1	W	E1
7	Value 2, e.g. ext. set value 2 or setting actual value 1*	W	E1
8	Value 3, e.g. ext. set value 3 or EFHi (2Fhi)*	W	E1

The values are displayed in the 32-bit floating decimal - format according to standard 754 IEEE.

*= examples, other values on request; e.g.:
EFHi= external setting for parameter 2Fhi, displayed in the menu under EFHi
bLo/bHi = actual value setting: range boundaries can be adjusted via menu
- this setting is always valid and cannot be influenced by the associated status byte.-

Status byte: (from the controller)

Bit 8	Bit 7	Bit 6	Bit 5	Value 4	Value 3	Value 2	Value 1

Values 1 - 4: Message status measurement inputs
0 = measurement is error-free
1 = error on this measurement input
Example: ....1001 = Error measurement input with values 4 and 1

Bit 5 – 8: Status binary inputs, boundary values etc.; 0 = off, 1 = on

Control byte: (to the controller)

Bit 8	Bit 7	Bit 6	Bit 5	Value 4	Value 3	Value 2	Value 1

Values 1 - 4: Control unit external values
0 = value is not active, the internal value is effective (e.g. set value SP)
1 = value is active (e.g. ext. set value SPE)
Example: ....1010 = Values 4 and 2 are active, 3 and 1 are not active

Bit 5 – 8: Control unit binary outputs, additional relay etc.; 0 = off, 1 = on
Example: Bit 5 =: ...0.... = add. relay off; ...1.... = add. relay on

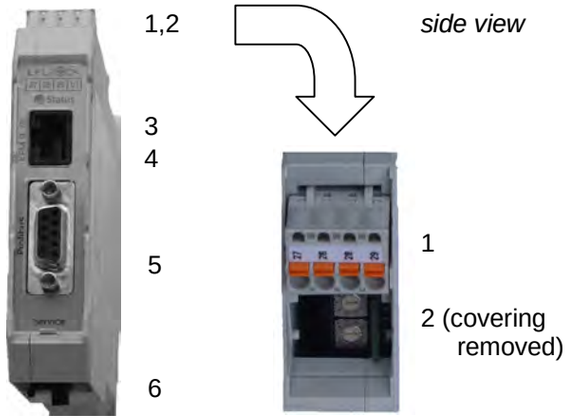
Setting the controller address:

The controller address "Adr" is the last parameter on the configuration level of the controller. The factory pre-setting is "126". If several users are connected to the bus, it should be ensured that all devices have separate addresses.
Note: A change of the controller address does not become effective until the controller supply voltage has been briefly turned off!

```
; GSD-file for product 9... - 99spd
; KFM-Regelungstechnik GmbH
; Version : 09.07.1998
; File : KFM_00EB.GSD
-----------------------------------------------------------------
#Profibus_DP
GSD_Revision          = 1
Vendor_Name           = "KFM-Regelungstechnik"
Model_Name            = "9...-99spd"
Revision              = "Rev. 1.01"
Ident_Number          = 0x00EB
Protocol_Ident        = 0 ; DP-Gerät
Station_Type          = 0 ; Slave
FMS_supp              = 0
Hardware_Release      = "HV V1.0"
Software_Release      = "SV V1.01"
9.6_supp              = 1
19.2_supp             = 1
45.45_supp            = 1
93.75_supp            = 1
187.5_supp            = 1
500_supp              = 1
1.5M_supp             = 1
3M_supp               = 1
6M_supp               = 1
12M_supp              = 1
MaxTsdr_9.6           = 60
MaxTsdr_19.2          = 60
MaxTsdr_45.45         = 60
MaxTsdr_93.75         = 60
MaxTsdr_187.5         = 60
MaxTsdr_500           = 100
MaxTsdr_1.5M          = 150
MaxTsdr_3M            = 250
MaxTsdr_6M            = 450
MaxTsdr_12M           = 800
Implementation        = "SPC3"
Bitmap_Device         = "KFM_9"
Redundancy            = 0
Repeater_Ctrl_Sig     = 2
; Slave-Specification:
OrderNumber           ="9...-99spd"
24V_Pins              = 0
Freeze_Mode_supp      = 1
Sync_Mode_supp        = 1
Auto_Baud_supp        = 1
Set_Slave_Add_supp    = 0
Min_Slave_Intervall   = 0x0032
Modular_Station       = 1
Max_Module            = 0x01
Max_Input_Len         = 32
Max_Output_Len        = 32
Max_Data_Len          = 64
; Module-Definitions:
Module = "Format A: Fixpoint1" 0x10,0x50,0x20,0x60
EndModule
Module = "Format B: Floating point" 0x10,0xD1,0x20,0xE1
EndModule
Module = "Format C: 2 x Fixpoint1" 0x10,0x50,0x50,0x20,0x60,0x60
EndModule
Module = "Format D: 2 x Floating point" 0x10,0xD1,0xD1,0x20,0xE1,0xE1
EndModule
Module = "Format E: 3 x Fixpoint1" 0x10,0x50,0x50,0x50,0x20,0x60,0x60,0x60
EndModule
Module = "Format F: 3 x Floating point" 0x10,0xD1,0xD1,0xD1,0x20,0xE1,0xE1,0xE1
EndModule
```

INDEX

1 Terminals supply voltage
2 Coding switches address adjustment
3 Status-LED
4 RJ-45 connector KFM device
5 9-pole D-SUB plug PROFIBUS
4 Configuration interface (service) for PC connection



General description:
The connection of KFM devices to the PROFIBUS DP is realised by the external bus adapter 99spde, which is configured to the requested transmission data e.g. actual value, setpoint. The PROFIBUS interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits). The PROFIBUS-DP interface is carried out as RS 485 bus interface referring to EN50170. The PROFIBUS adapter has to be connected via a 9-pole D-SUB plug directly to the bus wiring. The communication between the adapter and the service interface of the KFM device takes place by a patch cable(1,5m), which is delivered with each adapter. For each segment 32 devices could be installed, with a repeater up to 99. For the data transmission data modules for fixed and floating point operation are available. The baudrate is detected automatically up to 12 Mbaud. Further Information refer to the GSD file in the appendix.
An error bit makes it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory.

Types:

99spde04.	Adapter for 4 PROFIBUS values, power supply 24V DC
99spde12.	Adapter for 12 PROFIBUS values, power supply 24V DC
99spde28.	Adapter for 28 PROFIBUS values, power supply 24V DC

Device variants (last number):

.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies
..0b	Functional module with binary input 24V DC; terminal open: normal function / read and write possible, terminal closed: read only

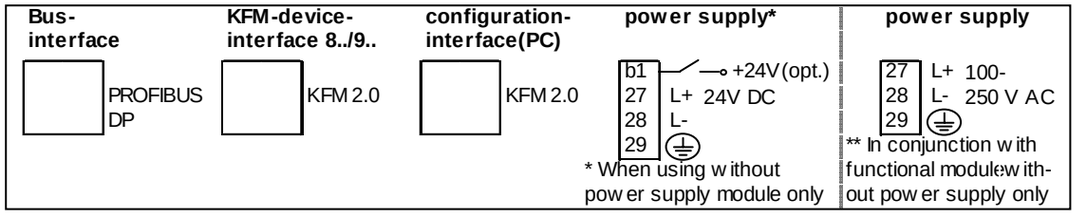
Power supply module:

99e500	Power supply module 100-250 V AC

Adjustments:
The PROFIBUS adapter is delivered preadjusted. In case of changes, the preadjustments except from the bus address, can easily be modified by a configuration program (WinPKS PC Software from version 1.9L).

		factory setting
Data word 1	Bus setpoint 1 (1060 ref. to protocoll KFM 2.0)	Bus setpoint 1
Data word 2	Actual value 1 (1010 " " ")	Actual value 1
Data word 3	Actual value 2* (1011 " " ")	
Data word 4	Control signal* (1020 " " ")	
	for further parameter codes refer to page 5 and 6	
	** = depending on type*	
Bus address	0..99, Coding switch, available after removing the covering below the power supply terminals	5
	Hint: In case of multiple bus participants different addresses have to be adjusted !	

connection diagram:



open printversion

Installation note:

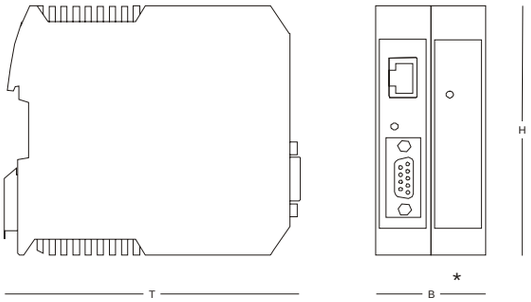
The modules must be locked on the designated mounting rail one after the other and then **pushed together**. The plug connectors connect the individual modules. Before removal, the modules must be **shifted apart** one after the other.

Commissioning:

Set the desired double-digit profibus-address by use of the two coding switches (available after removing the covering below the power supply terminals). Different addresses have to be configured on multiple adapters. Connect Profibus with 9-pole D-SUB connector and patch wire (1,5m) with service interface of the KFM device.The LED on the front signalises the operating status:

yellow permanent:	Normal operation
yellow flashing:	Communication error between KFM device and PROFIBUS-DP adapter Hint: all transmitted values are set to “0“, bit 8 of the respective status byte (communication error) ist set to “0“. The respective fault memory will be increased by 1.
red flashing:	Communication error PROFIBUS DP, PROFIBUS DP not active Hint: all transmitted values are set to “0“, the respective fault memory will be increased by 1.
red yellow flashing:	Communication error PROFIBUS DP and KFM device Hint: all transmitted values are set to “0“, each fault memory will be increased by 1.

Installation dimensions:

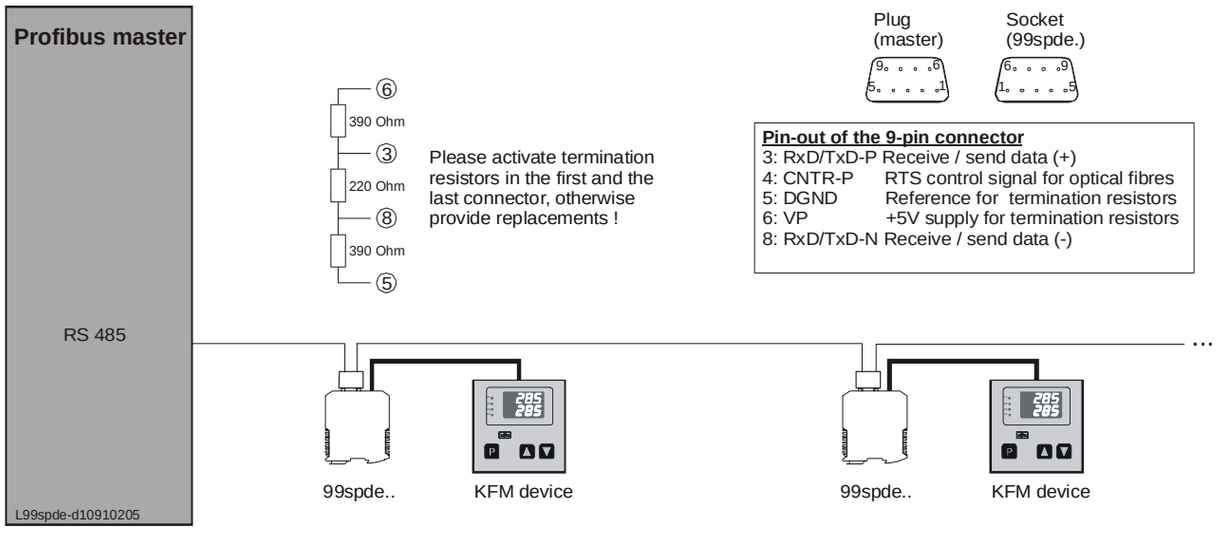


H= 99mm,
* version with or witout power supply module:
B = 22,5mm or 45mm, T = 116mm

Technical data:

Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply: 24V DC, about 100 mA,
alternative 100-250V AC, about 12 VA

Wiring example:



Data transmission:
The data to be transmitted are compiled in modules, data transmission is cyclical.
One module each is provided for fixed decimal and floating decimal data transmission. The modules are selected via a configuration tool in the master assembly.

The different modules differ in the number of transmission values according to the following table. Control word 2, status word 2, status word 3 or transmit resp. receive values are configurable via WinPKS-PC-software for data transmission.

module	transmission mode	number of transmission values*
Format O	fixed decimal (fix point)	4
Format P	floating decimal (floating point)	4
Format K	fixed decimal (fix point)	12
Format L	floating decimal (floating point)	12
Format M	fixed decimal (fix point)	28
Format N	floating decimal (floating point)	28

The data frame always contains control- and status word 1. Furthermore, the structures for control word 2, status word 2 and 3 as well as the resp. number of transmission values are available in the data frames K to P for each KFM-device. Depending on configuration, the resp. values are transmitted in these structures. In the older data frames A to H, the structures for control word 2, status word 2 and 3 are not available.

Data modules (fixed decimal / floating decimal):
Refer to the following table for construction of the data modules:
The transmit- and receive values of the fixed decimal data modules are displayed in the 16-bit fixed decimal - format with one decimal place (Fixpoint 1). Range of values: -999.9 to +3200.0

The transmit- and receive values of the *floating decimal data-modules* are displayed in the 32-bit floating decimal - format according to standard 754 IEEE.

The digital 8 bit modules (digital-SERin / SERout / module software, code 6210..19 resp. 6230..39) are transferred with values from 0..255.

	Read	**Value**
No	**Identification**	**Format fix.-/ float. dec.**
1	Status word 1 (1byte) #	0x10
2	Status word 2(5byte) # optional	0x14
3	Status word 3(5byte) # optional	0x14
4	Received value 1	0x50/ 0xD1
5	Received value 2	0x50/ 0xD1
6	Received value 3	0x50/ 0xD1
7	Received value 4	0x50/ 0xD1
..	Received value..*	0x50/ 0xD1

	Write	**Value**
No	**Identification**	**Format fix.-/ float. dec.**
1	Control word 1 (1byte) #	0x20
2	Control word 2(5byte) # optional	0x24
3	Transmitted value 1	0x60/ 0xE1
4	Transmitted value 2	0x60/ 0xE1
5	Transmitted value 3	0x60/ 0xE1
6	Transmitted value 4	0x60/ 0xE1
..	Transmitted value..*	0x60/ 0xE1

* = Number of receive-/ transmitt values depending on the selected data frame # = structure see page 4

Example: (complies to preadjusted parameters, format: floating point)
Data word 1 = bus-setpoint (1060) (write)
Data word 2 = actual value 1 (1010) (read)
Data word 3 = actual value 2 (1011) (read)

	Read	
No	**Value**	**Explanation**
1	0000 0000	Bit 1 = 0; Bit 2 = 0 measurements error-free
2	-	-
3	-	-
4	0x43 75 99 9A	actual value 1 = 245.6
5	0x43 46 19 9A	actual value 2 = 198.1
6	-	-
..	-	-

	Write	
No	**Value**	**Explanation**
1	0000 0001	Bit 1 = 1 bus-setpoint active
2	-	-
3	0x42 C8 00 00	bus-setpoint = 100.0
4	-	-
5	-	-
..	-	-

INDEX

format of status and control words

read: (from KFM device)

status word 1 (8 ASCII-characters, generally existent)

char. 8	char. 7	char. 6	char. 5	char. 4	char. 3	char. 2	char. 1

ASCII- character 1..7: status measuring input 1 .. 7
0 = error-free measurement; 1 = fault at the resp. input
ASCII- character 8: status KFM-device-interface, 1 = normal operation, 0 = conn. error

status word 2 (0 - 40 ASCII-characters depending on existing binary inputs,
only available if code 1002 (*for devices 9..*) is configured)

char. 40	char. 39	..	..	..	..	char. 2	char. 1

ASCII-character 1..40: status binary input 1 .. 40
0 = binary input deactivated; 1 = binary input activated

alternative:

status word 2 (10 ASCII-characters, only available if code 1005 (*for devices 8..*) is configured)

character 10				..	..	..	..	character 1			
bit 40	bit 39	bit 38	bit 37	..	..	..	..	bit 4	bit 3	bit 2	bit 1

bit 1..40: status binary input 1 .. 40
0 = binary input deactivated; 1 = binary input activated

status word 3 (0 - 40 ASCII-characters depending on existing additional contacts,
only available if code 1005 is configured)

char. 40	char. 39	..	..	..	..	char. 2	char. 1

ASCII-character 1..40: status additional contact 1..40
0 = contact deactivated; 1 = contact activated

write: (to KFM device)

control word 1 (2 ASCII-characters, generally existent)

character 2				character 1			
bit 4	bit 3	bit 2	bit 1	bit 8	bit 7	bit 6	bit 5

bit 1 .. 4: control bus-setpoint 1 .. 4 (only series 902 / 93)
0 = bus-setpoint deactivated, internal sepoint (SP) active
1 = bus-setpoint active (SPB)

control word 2 (10 ASCII-characters, only available if code 1005 is configured)

character 10				..	..	..	..	character 1			
bit 40	bit 39	bit 38	bit 37	..	..	..	..	bit 4	bit 3	bit 2	bit 1

bit 1 .. 40: control additional contact 1 .. 40, if the contact is configured to “BUS“
0 = contact deactivated; 1 = contact activated

Diagnose:

Two resettable internal fault memorys are available for communication error analysis on the profibus- and KFM-service-interface. The number of communication faults is recorded by code 5281(communication fault to the profibus), 5282 (communication fault to the KFM-device). Both counter values are reset to zero by setting code 5280 (reset) to 1. Reading of the fault memorys and the reset function can only be achieved by the configuration-interface.

Configuration level: (Usable parameter depending on the type, consider potential mutual interference !)

display	purpose	value range	CODE (HEX)
ConF	type of controller		013C
Cod1	code number	0...9999	0142
Cod2	code 2..4	0...9999	0161..63
LNG	language selection	0=DEUTSCH, 1=ENGLISH, 2=USER DEF, 3=OFF	8800
Ist1..6	correction actual value 1..6	blo...bHi (+/-)	0124..29
Ain1..6	type of measuring input 1..6	0=4-20, 1=2-10, 2=0-20, 3=0-10, 5=rtd, 20=n100	011E..23
SP-F	switch-over of the ext. setpoint via menu / bin. input (SP/SPE)	-2=AUS, -1=SPEB(bin.), 0=SPEM(menu), 1=SP2	014F
YE	switch-over SPE / YE	0=SPE,1=YE	114E
SPE	function of the ext. setpoint	2=AbS,3=Add,4=Sub	112D
REL_	switch.behaviour of the first step,step contr.	0=stat, 1=rel	1144
(1) Y"	travel time of actuator channel 1	6...600	1(1)3A
(1) TE	switch-on delay per step, step controller	0...600	1(1)43
Cy"	cycle time	2...120	013D
(1) TP	pause time step controller	0...60	1(1)45
(1)out	type of output signal 0 / 4...20mA	0=0-20,1=4-20	1(1)3B
(1)out	output direction di / in	0=in(in),1=(in)di,2=diin,3=didi	1(1)3C
dSLo	valve drop. minimum	0...50	1122
out	limitation selection (min / max)	0=Lo, 1=Hi	1127
dSHi	valve drop. maximum	50...100	1123
(1) ib	integration range limit channel 1	0...100	1(1)40
(1)YLo	low limit control output	0...Yhi	1(1)38
(1)YHI	limitation control output	-100...100	1(1)41
(1)YHi	high limit control output	YLo...100	1(1)39
(1) TY	control output slope	0...100	1(1)42
(1) DB	damping range	0...100	1(1)25
(1) D"	damping value	0...100	1(1)26
Gr1..2	gradient 1..2	0...100	1132..33
rF1..2	waiting window value 1..2	0.1...999.9	1134..35
td	dead range	0.0...10.0	113D
Sout(1..3)	signal output 0/4...20mA	0=0-20,1=4-20	0136..38
Sou1..5	assignment signal output	11=Ist1, 12=Ist2, 21=SP	0155..5A
(1)Y_S	output reaction at meas.fault (relais)	0=off,1=K1,2=K2	1(1)3E
(1)Y_S	output reaction at meas.fault (Y)	YLo...YHi (continuous)	1(1)3F
(1)YAP	operating point	YLO...Yhi	1(1)37
YH	switch over control val. on / off	0=off,1=on	1148
YH	external control value	0...100	1149
d.SP	max. deviation actual value	0.1...200.0	0147
t"	tolerance period act.value (ser. interface)	1...100	014E
rEL1..8	function selection additional contact 1..8	0=LCA, 1=LCE, 2=SuA, 3=SuE, 4=SoA, 5=SoE, 6=StA, 7=USA, 8=USE, 11=OFF, 12=ON	2010..17
rEL1..8	input selection additional contact 1..8	1...6=Ist1...6, 11=1Y...	2018..1F
rEL1..8	channel / setpoint selection additional contact 1..8	1...4=1..4SP, 11=rSP...	2020..27
rEL1..8	condition relay 1...8 for measuring line fault	0=SiA,1=SiE	2028..2F
Adr	controller address	1...255	0141
BAUD	baud rate	0=9600, 1=19200, 2=38400	2629
anSERin	analog input value (via interface)	-10000..10000	6200..09
digSERin	8-bit digital input value (via interface)	00 .. FF hex e.g. 0..255	6210..19
anSERout	analog output value (via interface)	-10000..10000	6220..29
digSERout	8-bit digital output value (via interface)	00 .. FF hex e.g. 0..255	6230..39

Operating indication:

display	purpose	value range	CODE (HEX)
-	status- / control words 1..5		1001..05
-	status word type 821H75s.		100F
IST1	actual value 1..6		1010..15
Y(1)..5	controller output channel 1..5	-100...100	1020..24
Y	active controller output (e.g. 99g8.)	-100...100	102A
D.W.	difference actual value 1 – actual value 2		1052
M.W.	average actual value 1 / 2		1051
Setpoint level:			
(1)SP	(internal) set point value channel 1	Lo...Hi *(see level 2)*	1(1)00
(1)SP2	second set point value channel 1	Lo...Hi *(see level 2)*	1(1)01
(1..5SP) (rSP)	active set point value channel 1..5, also active ramp- / program set point value		1030..34
SP..	actual program step set point		3002
SPB	bus setpoint	Lo...Hi *(see level 2)*	1060..64
SP-F	switch over SP/SPE	0 = SP, 1 = SPE	111C
2SP	current sequential controller set point value		103F
P-CY	number of program cycles*	0...20	0148
Pro	actual program status	0=off,1=on,2=stop	3001
d15	density	500...1500	0152
Parameter level 1:			
FUE	guide controller on/off	0=off,1=on	014D
(1)P(1)..4	proportional band XP1..4 channel 1	0.0...999.9	1(1)03..06
(1)I(1)..4	integral action time Tn1..4 channel 1	0.0...999.9	1(1)07..0A
(1)d(1)..4	derivative time Tv1..4 channel 1	0.0..99.9/0.00..99.99	1(1)0B..0E
(1)Sh	neutral zone Xsh channel 1	0.05...1,0	1(1)0F
(1)SA1..2	switching interval 1..2 channel 1	0...range(bLo/Hi) *(see*	1(1)13..14
(1)Sd1..2	switching difference 1..2 channel 1	0...range(bLo/Hi) *level 2)*	1(1)15..16
SA1..8	switching interval addit.contact 1..8	0.0...range	2000..07
Sd1..8	switching diff. addit.contact 1..8	0.1...range	2008..0F
Parameter level 2(Usable parameters depending on the type, consider potential mutual interference !)			
Unit	display unit °C / °F	0=°C, 1=°F	013F
0bLo	min. val. range of actual val. 0 (diff/ aver.)	-999...bHi	1129
UNIT	viscosity	0=cst, 1=cP	0151
0bHi	max. val. range of actual val. 0 (diff/ aver.)	blo...4000	112A
1..6bLo	min. value range input 1..6	-999...bHi	010C..11
1..6bHi	max. value range input 1..6	blo...4000	0112..17
(1..3)SLo	min. value range signal output	-999...Shi	012A..2C
(1..3)SHi	max. value range signal output	SLo...4000	0130..32
0nst	decimal point actual value 0 (diff/ aver.)	0...2 (dep. on the range)	1128
FLo	low limit set point value guide controller	0... Fhi	1130
FHi	high limit set point value guide controller	Flo...400	1131
1..6nst	decimal point input 1..6	0...2 (dep. on the range)	0118..1d
1 Lo	low limit set point value	-999...bHi	112E
1 Hi	high limit set point value	blo...4000	112F
DT	allowed deviation actual val.(dt control)	0...400	1146
dSPL	lower display indication	0=OFF,1=SP,2=rSP,3=Y,4=°C, 5=°F,6=bar,7=%,8=Ist1,9=Ist2..	0140
DSP1..4	indication display line 1..4	0=OFF,1=1 SP,10/11=IST1/2	0164..67
EIN1..4	unit of measurement display line 1..4	3=m3_h, 4=C, 5=F, 6=%, 7=bar, 8=mbar, 9=mPas, 10=cSt,1=KGm3,12=mm	0168..6B
Pr-S	number of program steps	0...20	0149
SP.1 .. 20	1...20. program setpoint val., program 1*	Lo...Hi	4101..14
H' 1.. 20	1...20. holding time, program 1*	0...6000	3101..14

* (transmission only with deactivated program function)

open printversion

Printout GSD-file:

```
; GSD file for types 9... - 99spd
; Date : 07.04.2009
; File  : KFM_00EB.GSD
-----------------------------------------------------------------
#Profibus_DP
GSD_Revision  = 1
Vendor_Name  = "KFM"
Model_Name    = "9...-99spd"
Revision          = "Rev. 1.05"
Ident_Number  = 0x00EB
Protocol_Ident  = 0       ; DP-Gerät
Station_Type    = 0       ; Slave
FMS_supp        = 0
Hardware_Release        = "HV V1.0"
Software_Release        = "SV V1.01"
9.6_supp          = 1
19.2_supp         = 1
45.45_supp        = 1
93.75_supp        = 1
187.5_supp        = 1
500_supp          = 1
1.5M_supp         = 1
3M_supp                   = 1
6M_supp                   = 1
12M_supp          = 1
MaxTsdr_9.6     = 60
MaxTsdr_19.2    = 60
MaxTsdr_45.45 = 60
MaxTsdr_93.75 = 60
MaxTsdr_187.5 = 60
MaxTsdr_500     = 100
MaxTsdr_1.5M  = 150
MaxTsdr_3M      = 250
MaxTsdr_6M      = 450
MaxTsdr_12M   = 800
Implementation = "SPC3"
Bitmap_Device = "KFM_9"
Redundancy      = 0
Repeater_Ctrl_Sig         = 2
; Slave-Specification:
Slave_Family    = 5       ; Controllers
24V_Pins          = 0
Freeze_Mode_supp        = 1
Sync_Mode_supp          = 1
Auto_Baud_supp          = 1
Set_Slave_Add_supp    = 0
Min_Slave_Intervall       = 0x0032
Modular_Station           = 1
Max_Module      = 0x01
Max_Input_Len = 128
Max_Output_Len          = 128
Max_Data_Len = 256
Max_Diag_Data_Len     = 64
```

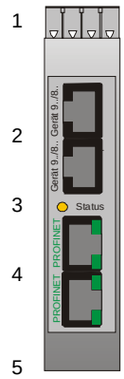
Continued on page 8 !

Printout GSD-file (continued from page 7):

```
; Module-Definitions:
Module = "Format A: Fixpoint1" 0x10,0x50,0x20,0x60
EndModule
Module = "Format B: Floating point" 0x10,0xD1,0x20,0xE1
EndModule
Module = "Format C: 2 x Fixpoint1" 0x10,0x50,0x50,0x20,0x60,0x60
EndModule
Module = "Format D: 2 x Floating point" 0x10,0xD1,0xD1,0x20,0xE1,0xE1
EndModule
Module = "Format E: 3 x Fixpoint1" 0x10,0x50,0x50,0x50,0x20,0x60,0x60,0x60
EndModule
Module = "Format F: 3 x Floating point" 0x10,0xD1,0xD1,0xD1,0x20,0xE1,0xE1,0xE1
EndModule
Module = "Format G: 3/16 x Fixpoint1"
0x10,0x10,0x50,0x50,0x50,0x20,0x20,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x6
0,0x60,0x60,0x60
EndModule
Module = "Format H: 3/16 x Floating point"
0x10,0x10,0xD1,0xD1,0xD1,0x20,0x20,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1
,0xE1,0xE1,0xE1,0xE1
EndModule
Module = "Format I: 4 x Fixpoint1" 0x10,0x50,0x50,0x50,0x50,0x20,0x60,0x60,0x60,0x60
EndModule
Module = "Format J: 4 x Floating point" 0x10,0xD1,0xD1,0xD1,0xD1,0x20,0xE1,0xE1,0xE1,0xE1
EndModule
Module = "Format K: 99spde12 Fixpoint1"
0x10,0x14,0x14,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x20,0x24,0x60,0x60,0x6
0,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60
EndModule
Module = "Format L: 99spde12 Floatingp."
0x10,0x14,0x14,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0x20,0x24,0xE1,0xE
1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1
EndModule
Module = "Format M: 99spde28 Fixpoint1"
0x10,0x14,0x14,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x5
0,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x50,0x20,0x24,0x60,0x60,0x60,0x60,0x60,0x60,0
x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60,0x60
,0x60,0x60
EndModule
Module = "Format N: 99spde28 Floatingp."
0x10,0x14,0x14,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0x
D1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0xD1,0x20,0x24,0xE1,0xE1,0xE1,0xE1,
0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE1,0xE
1,0xE1,0xE1,0xE1,0xE1,0xE1
EndModule
Module = "Format O: 99spde04 Fixpoint1"
0x10,0x14,0x14,0x50,0x50,0x50,0x50,0x20,0x24,0x60,0x60,0x60,0x60
EndModule
Module = "Format P: 99spde04 Floatingp."
0x10,0x14,0x14,0xD1,0xD1,0xD1,0xD1,0x20,0x24,0xE1,0xE1,0xE1,0xE1
EndModule
```

INDEX

1 Terminals power supply voltage *
2 RJ-45 device- connectors series 9../8..*
3 Status LED bus adapter
4 RJ-45 connector PROFINET
5 Configuration interface (service) for PC connection
* = Depending on version



General description:
The PROFINET interface is able to replace separate wiring of analogue (external setpoints, signal outputs) or digital signals (via binary inputs and status bits respectively via relay outputs and control bits).

The connection of devices series 9../8..* to the PROFINET-IO is realised by the intelligent bus adapter 99spne... The bus adapter is configured to the addresses of the connected devices and the requested transmission data e.g. actual value, setpoint and status word. The communication between the adapter and the service interface of the device / devices* takes place by a patch cable(1,5m), which is delivered with each adapter.

The PROFINET -connection is carried out as a standard-ethernet-interface (10 Base-T / 100 Base-TX; Baudrate: 10/100 MBit/s) in accordance with IEEE 802.3 and is inserted directly into the bus line at the in- and output side by the appropriate RJ-45 connectors.

Data modules for floating point operation are available for the data transmission, GSDML- files in the XML-format are enclosed. Error bits make it possible to monitor the function of the adapter. Additionally, connection errors are registered and available for diagnosis by the use of fault memory.
* Depending on version

Types:

99spne05d.	Adapter for 5 PROFINET values, pow. supply 24VDC, two device connectors for series 9../8..
99spne12.	Adapter for 12 PROFINET values, pow. supply 24VDC, one device connector for series 9..
99spne28.	Adapter for 28 PROFINET values, pow. supply 24VDC, one device connector for series 9..

Device variants (last number):

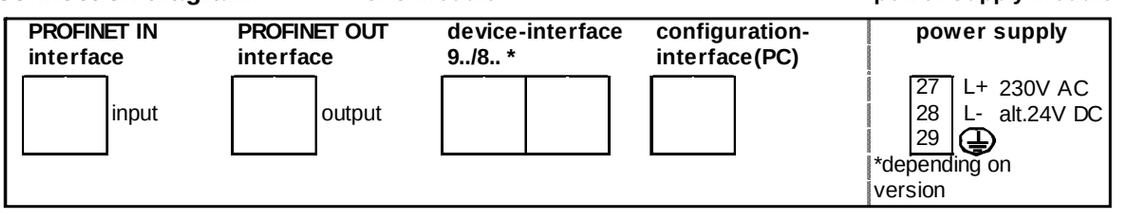
.0	Functional module without power supply for connection to power supply modules
.0i	Functional module for connection to power supply of already existing KFM-assemblies

Power supply module:

99e500	Power supply module 100-250V AC

Adjustments:
The PROFINET adapter is delivered preadjusted (IP-address: 192.168.1.254). Normally, the IP-address is managed dynamically by the Profinet-master. However, in case of changes to the IP-address or the transfer data between the adapter and the device 9../8.., the preadjustments can easily be modificated by a configuration program (WinPKS-PC-software, from version 2.01.39) using the configuration interface.

Connection diagram:



open printversion

Commissioning:

Connect the enclosed patch cable (1,5m) with the service- interface of the device series 9../8.. and the RJ-45 connector “9../8..“ of the bus adapter. The profinet connection takes place in- and optional output sided arbitrary at the ethernet- connectors.

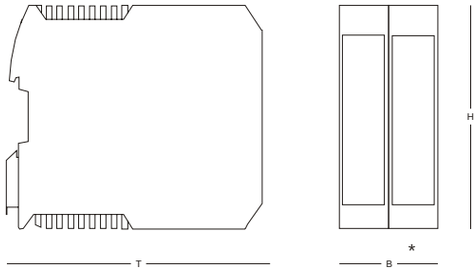
The LEDs on the front signalise the operating status:

LED	**display**	**meaning**
PROFINET-adapter, LED "status"	yellow permanent	*Normal operation*
	yellow flashing	*Communication error* between device 9../8.. and bus adapter
	red flashing	*Communication error* between bus adapter and profinet
	red yellow flashing	*Communication error* between device 9../8.. and bus adapter as well as between bus adapter and profinet
	red permanent	*Fault* when loading the parameter, send the device for repair
Power supply module, power LED	yellow permanent	*Power supply connected to the power supply module*

Technical data:

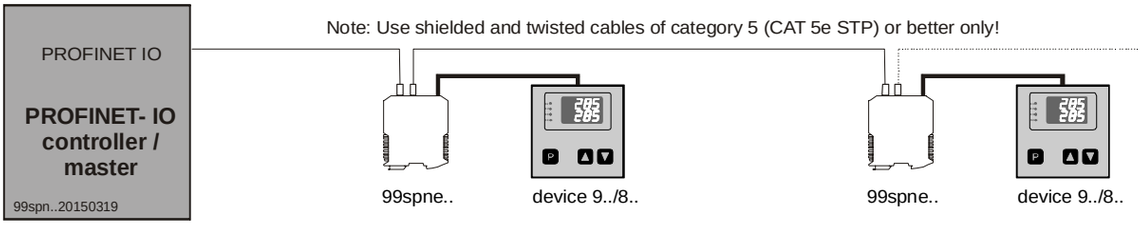
Housing: for fastening to 35mm mounting rail
Installation orientation: optional
Type of protection: IP20 according to EN 60529
Perm. ambient temperature: 0..60°C
Nominal temperature: 20°C
Power supply:, 24V DC about 12 VA,
alternative 100-250V AC, about 12 VA

Installation dimensions:



H= 99mm, * Version without or with power supply module: B = 22,5mm or 45mm, T = 116mm

Wiring example:



open printversion

Data transmission:

The data to be transmitted are compiled in modules, data transmission is cyclical.
Modules are provided for floating decimal data transmission. The modules are selected via a configuration tool in the master assembly.

The different modules differ in the number of transmission values according to the following table. Control word 2, status word 2, status word 3 or transmit resp. receive values are configurable via WinPKS-PC-software for data transmission.

module	transmission mode	number of transmission values*
GSDML-V2.3-KFM-99spne05d-20150901.xml	floating decimal (floating point)	5
GSDML-V2.3-KFM-99spne12-20150901.xml	floating decimal (floating point)	12
GSDML-V2.3-KFM-99spne28-20150901.xml	floating decimal (floating point)	28

The data frame always contains control- and status word 1. Furthermore, the structures for control word 2, status word 2 and 3 as well as the resp. number of transmission values are available. Depending on configuration, the resp. values are transmitted in these structures.

Data modules (99spne12 / 99spne28):

Refer to the following table for construction of the data modules

The transmit- and receive values of the *floating decimal data-modules* are displayed in the 32-bit floating decimal - format according to standard 754 IEEE.

	Read
Byte	**Identification**
n+0	Status word 1 (1Byte) #
n+1...5	Status word 2 (5Byte) # optional
n+6...10	Status word 3 (5Byte) # optional
n+11...14	Received value 1
n+15...18	Received value 2
n+19...22	Received value 3
n+23...26	Received value 4
..	Received value..*

	Write
Byte	**Identification**
n+0	Control word 1 (1Byte) #
n+1...5	Control word 2 (5Byte) # optional
n+6...9	Transmitted value 1
n+10...13	Transmitted value 2
n+14...17	Transmitted value 3
n+18...21	Transmitted value 4
..	Transmitted value..*

* = Number of receive-/ transmit values depending on the selected data frame # = structure see page 5

Example: (complies to preadjusted parameters, format: floating point)
Data word 1 = bus-setpoint (1060) (write)
Data word 2 = actual value 1 (1010) (read)
Data word 3 = actual value 2 (1011) (read)

	Read	
Byte	**Value**	**Explanation**
n+0	0000 0000	Bit 1 = 0; Bit 2 = 0 measurem. error-free
n+1...5	-	-
n+6...10	-	-
n+11...14	0x43 75 99 9A	actual value 1 = 245.6
n+15...18	0x43 46 19 9A	actual value 2 = 198.1
n+19...22	-	-
..	-	-

	Write	
Byte	**Value**	**Explanation**
n+0	0000 0001	Bit 1 = 1 bus-setpoint active
n+1...5	-	-
n+6...9	0x42 C8 00 00	bus-setpoint = 100.0
n+10...13	-	-
n+14...17	-	-
n+18...21	-	-

open printversion

Data modules (99spne05d):
Refer to the following table for construction of the data modules.

The transmit- and receive values of the *floating decimal data-modules* are displayed in the 32-bit floating decimal - format according to standard 754 IEEE.

	Read	
Byte	**Identification**	**KFM device**
n+0	Status word 1 (1Byte) #	device1:contr. 9..
n+1	Status word 1 (1Byte) #	device 2: malf. / control 8..
n+2...6	Status word 2 (5Byte)# optional	device1:contr.9..
n+7...11	Status word 2 (5Byte)# optional	device 2: malf. / control 8..
n+12...16	Status word 3 (5Byte)# optional	device1:contr.9..
n+17...21	Status word 3 (5Byte)# optional	device 2: malf. / control 8..
n+22...25	Received value 1	device1:contr.9..
n+26...29	Received value 2	device1:contr.9..
n+30...33	Received value 3	device1:contr.9..
n+34...37	Received value 4	device1:contr.9..
n+38...41	Received value 5	device1:contr.9..

	Write	
Byte	**Identification**	**KFM device**
n+0	Steuerwort 1 (1Byte) #	device1:contr.9..
n+1...5	Steuerwort 2 (5Byte)# optional	device1:contr.9..
n+6...10	Steuerwort 2 (5Byte)# optional	device 2: malf. / control 8..
n+11...14	Transmitted val. 1	device1:contr.9..
n+15...18	Transmitted val.2	device1:contr.9..
n+19...22	Transmitted val.3	device1:contr.9..
n+23...26	Transmitted val.4	device1:contr.9..
n+27...30	Transmitted val.5	device1:contr.9..

= structure see page 5

INDEX

format of status and control words

read: (from KFM Profinet adapter)

status word 1 (*1 byte*, generally existent)

bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1

bit 1..7: status measuring inputs 1 .. 7
0 = error-free measurement; 1 = fault at the resp. input
bit 8: status KFM- device-interface, 1 = normal operation, 0 = conn. error

status word 2 (*5 byte*, only available if code 100F (*for devices 8..*) or code 1002 (*for device 82.. and 9..*) is configured)

byte 5				..	..	..	..	byte 1			
bit 40	..	bit34	bit 33	..	..	..	..	bit 8	..	bit 2	bit 1

bit 1 .. 40: status binary inputs 1 .. 40
0 = binary input deactivated; 1 = binary input activated

status word 3 (*5 byte*, only available if code 1005 is configured)

byte 5				..	..	..	..	byte 1			
bit 40	..	bit34	bit 33	..	..	..	..	bit 8	..	bit 2	bit 1

bit 1..40: status additional contact 1..40
0 = contact deactivated; 1 = contact activated

write: (to KFM Profinet adapter)

control word 1 (*1 byte*, generally existent)

bit 8	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1

bit 1 .. 4: control bus-setpoint 1 .. 4 (only series 902 / 93)
0 = bus-setpoint deactivated, internal sepoint (SP) active
1 = bus-setpoint active (SPB)

control word 2 (*5 byte*, only available if code 1005 is configured)

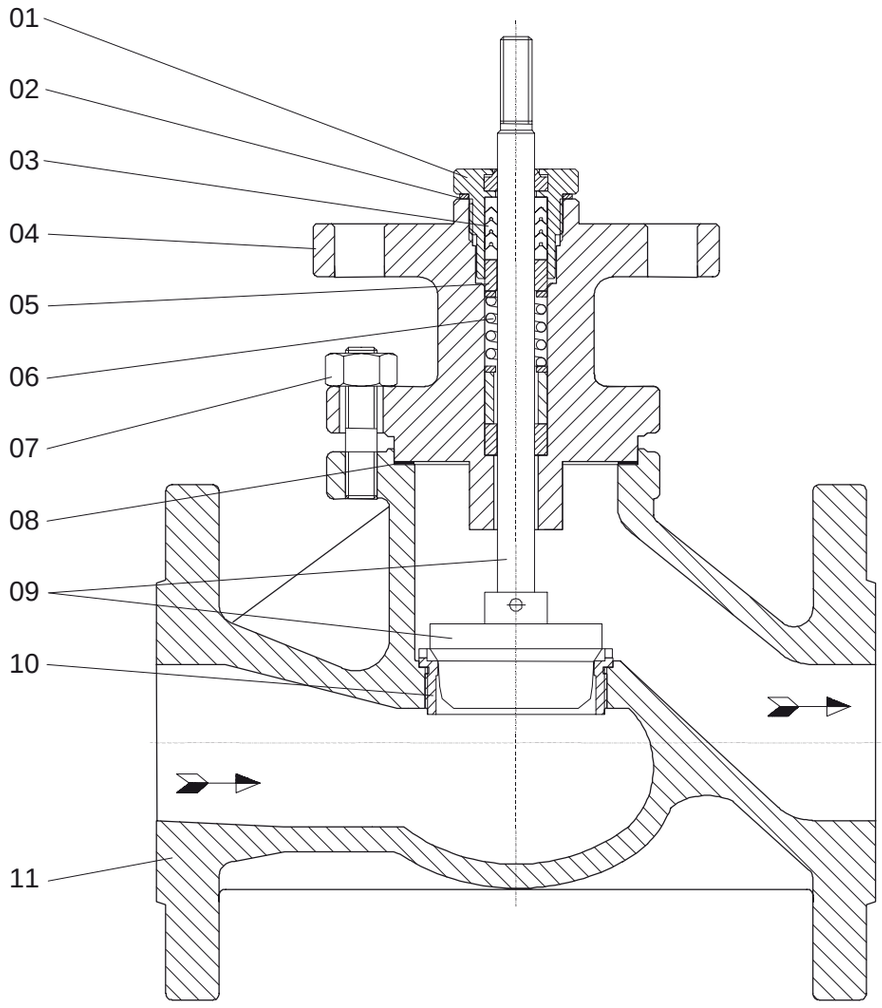
byte 5				..	..	..	..	byte 1			
bit 40	..	bit 34	bit 33	..	..	..	..	bit 8	..	bit 2	bit 1

bit 1 .. 40: control additional contact 1 .. 40, if the contact is configured to “BUS“
0 = deactivate contact
1 = activate contact

Diagnosis:

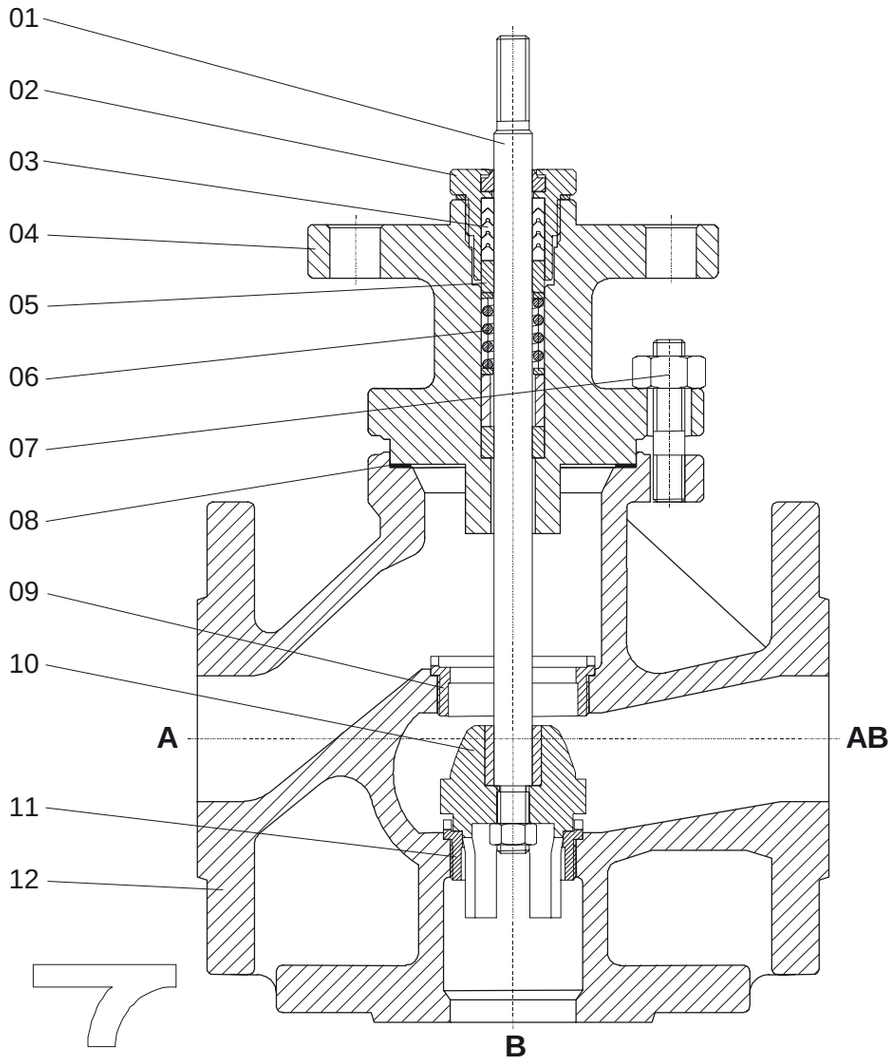
Three resettable internal fault memorys are available for communication error analysis on the Profinet- and KFM-service-interface. The number of communication faults is recorded by code 5281(communication fault to the Profinet), 5282 (communication fault to the KFM-device 1 / controller 9..) and 5283 (communication fault to the KFM-device 2 / malfunction device, control 8..). All counter values are reset to zero by setting code 5280 (reset) to 1. Reading of the fault memorys and the reset function can only be achieved by the configuration-interface.

open printversion



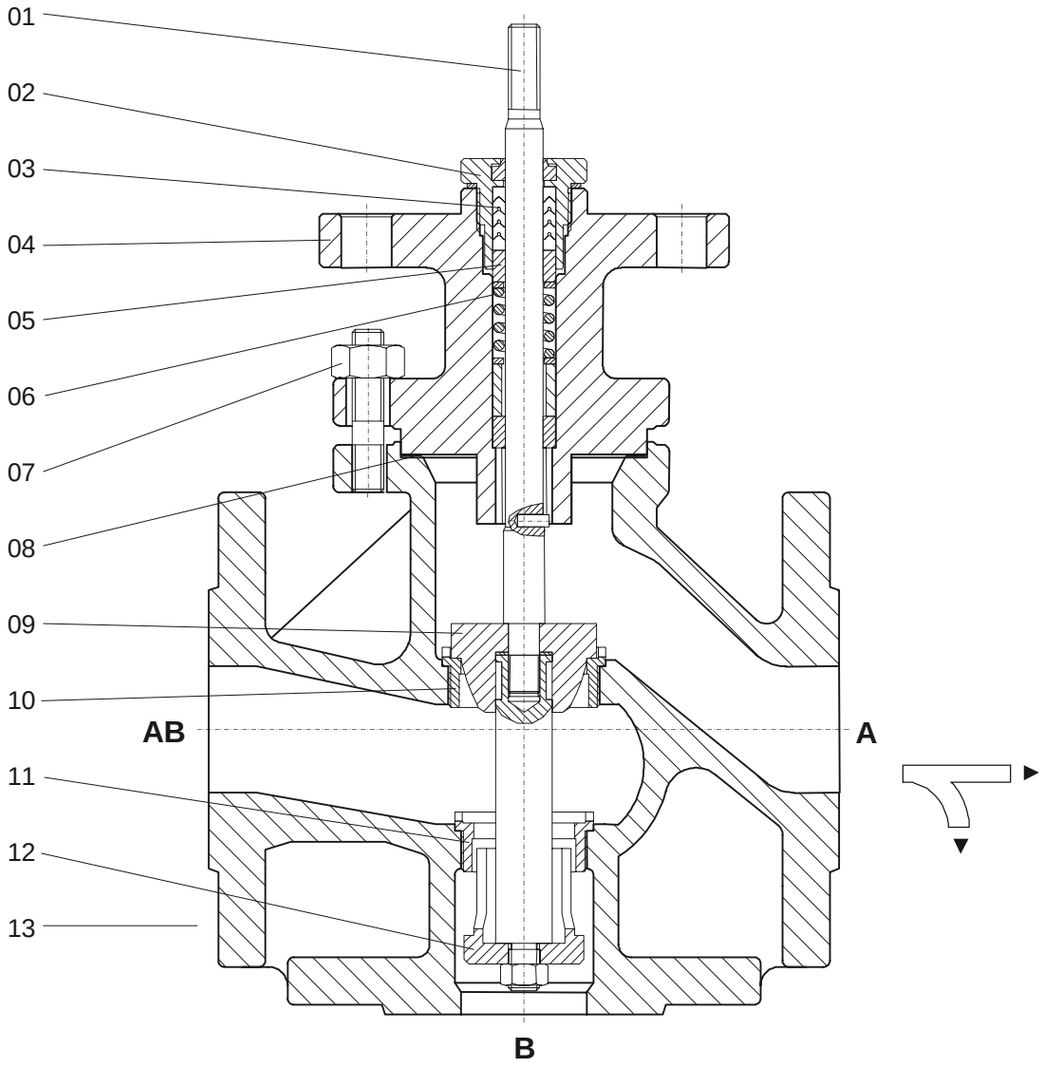
No.	Designation
01	Screw joint with scaper
02	Gasket
03	V-rings
04	Mounting bonnet
05	Guiding bush
06	Spring
07	Studs with hexagon nuts
08	Gasket
09	Plug with spindle
10	Seat ring
11	Valve body

open printversion



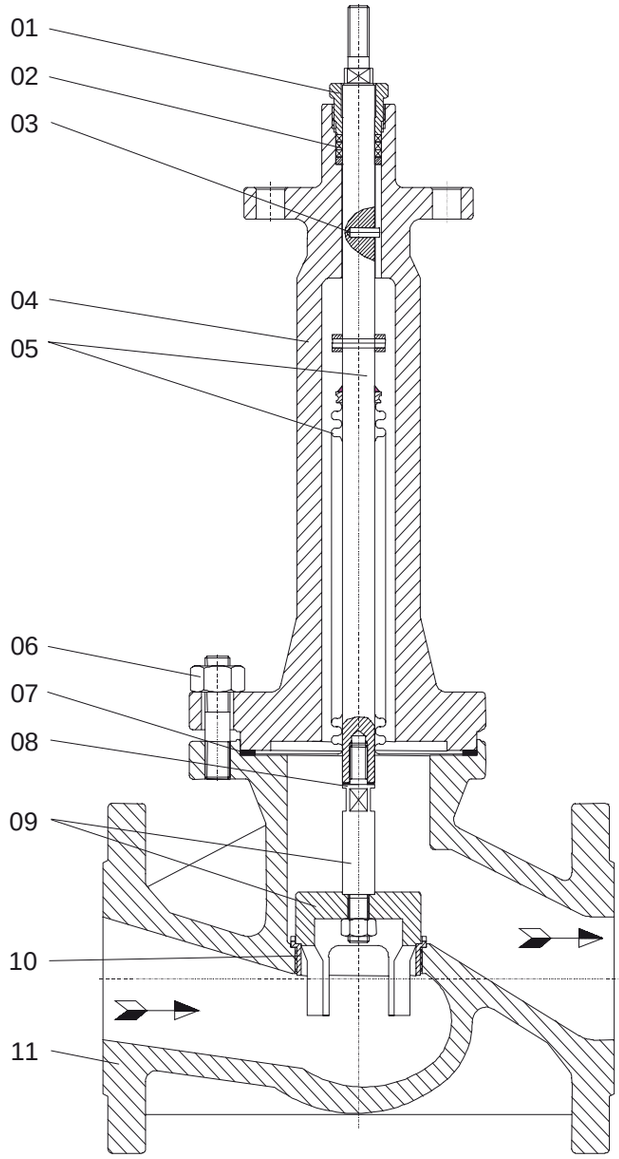
No.	Designation
01	Spindle
02	Screw joint with scaper
03	V-rings
04	Mounting bonnet
05	Guiding bush
06	Spring
07	Studs with hexagon nuts
08	Gasket
09	Upper seat ring
10	Plug
11	Lower seat ring
12	Valve body

open printversion



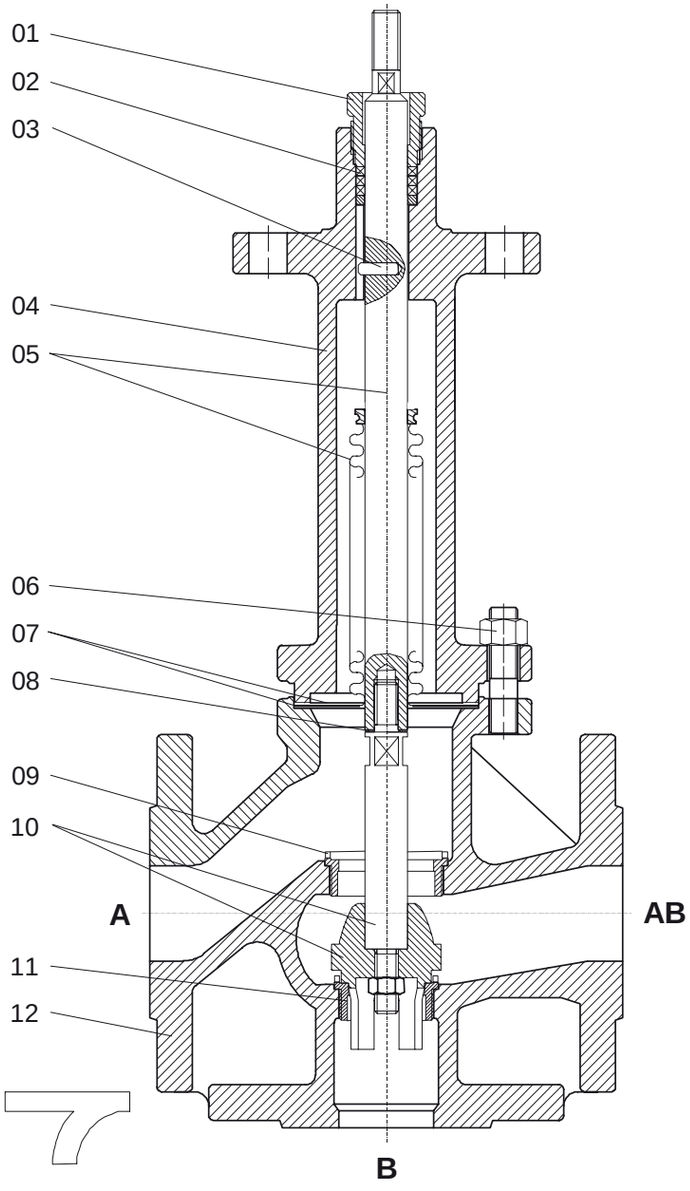
No.	Designation
01	Spindle
02	Screw joint with scaper
03	V-ring-unit
04	Mounting bonnet
05	Guiding bush
06	Spring
07	Studs with hexagon nuts
08	Gasket
09	Upper plug
10	Upper seat ring
11	Lower seat ring
12	Lower plug with spindle
13	Valve body complete

open printversion



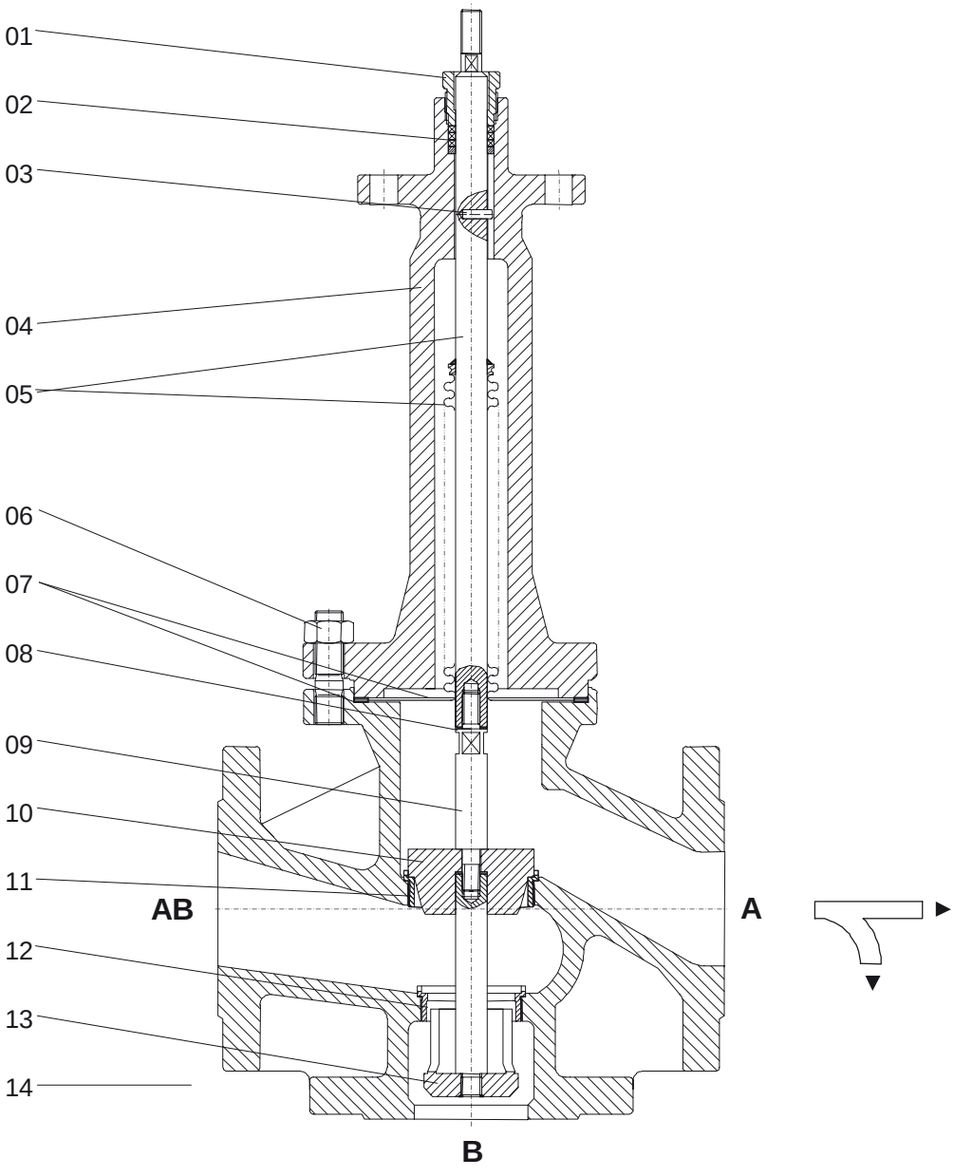
No.	Designation
01	Screw joint
02	Safety stuffing box
03	Pin
04	Mounting bonnet
05	Spindle with bellow
06	Studs with hexagon nuts
07	Gasket
08	Lock washer
09	Lower spindle with plug
10	Seat ring
11	Valve body

open printversion



No.	Designation
01	Screw joint
02	Safety stuffing box
03	Pin
04	Mounting bonnet
05	Spindle with bellow
06	Studs with hexagon nuts
07	Gasket
08	Lock washer
09	Upper seat ring
10	Lower spindle with plug
11	Lower seat ring
12	Valve body

open printversion



No.	Designation
01	Screw joint
02	Safety stuffing box
03	Pin
04	Mounting bonnet
05	Spindle with bellow
06	Studs with hexagon nuts
07	Gasket
08	Lock washer
09	Spindle middle part
10	Upper plug
11	Upper seat ring
12	Lower seat ring
13	Lower plug with spindle
14	Valve body complete

open printversion