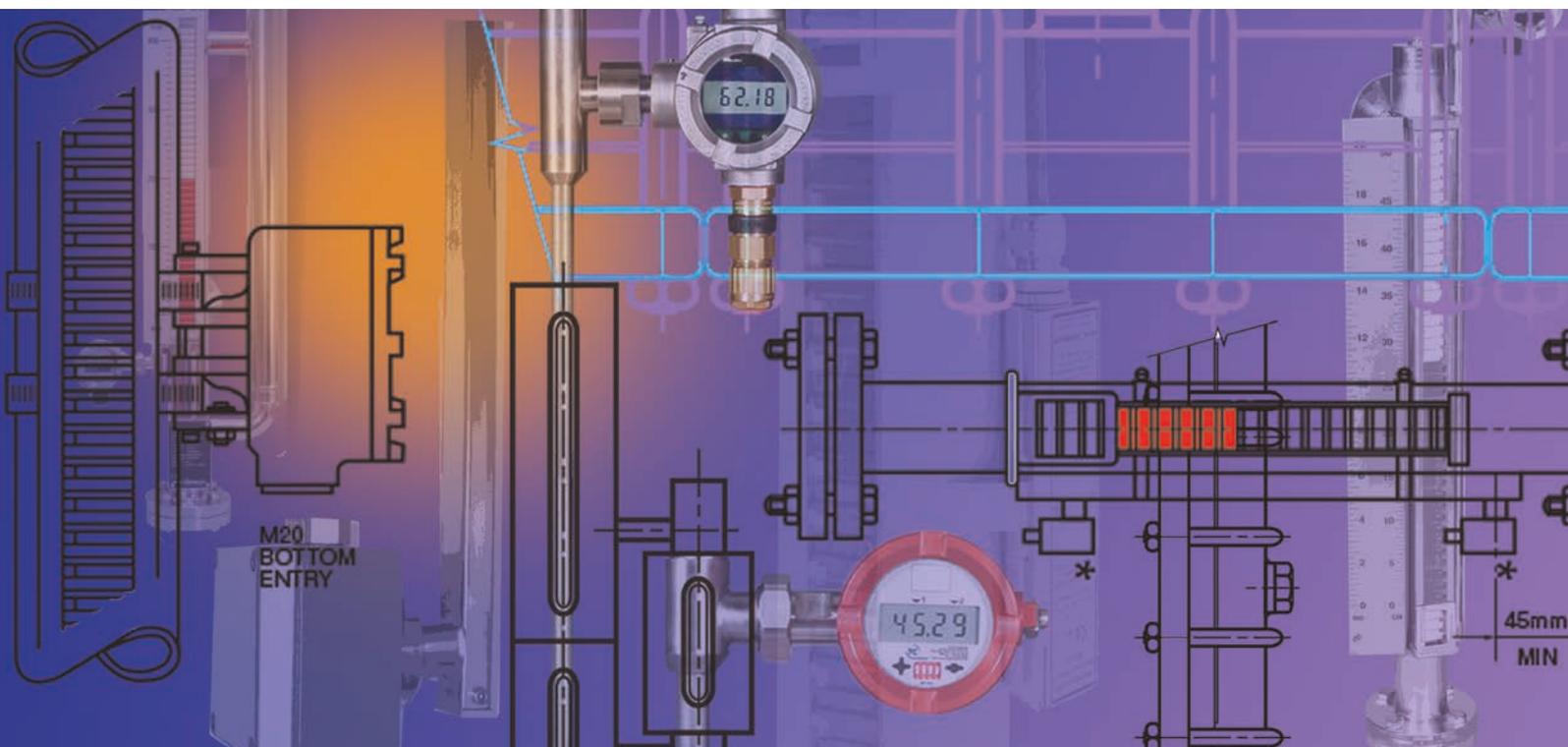


# Liquid level measuring instruments



# Introduction

Klinger is a global company and connects history with innovation. We offer a complete range of advanced technical components directly related to your production process. Quality, knowledge and reliability are our core values. Klinger has extensive experience with thorough knowledge and provides advice and training to solve complex issues.

We understand that the reliability of our products is an important prerequisite for the operational safety and livable environment surrounding the industry. Our employees have a great sense of responsibility and provide informed and thoughtful advice. We believe that sustainability is an important criterion for the future and therefore we prefer quality and long-term solutions.

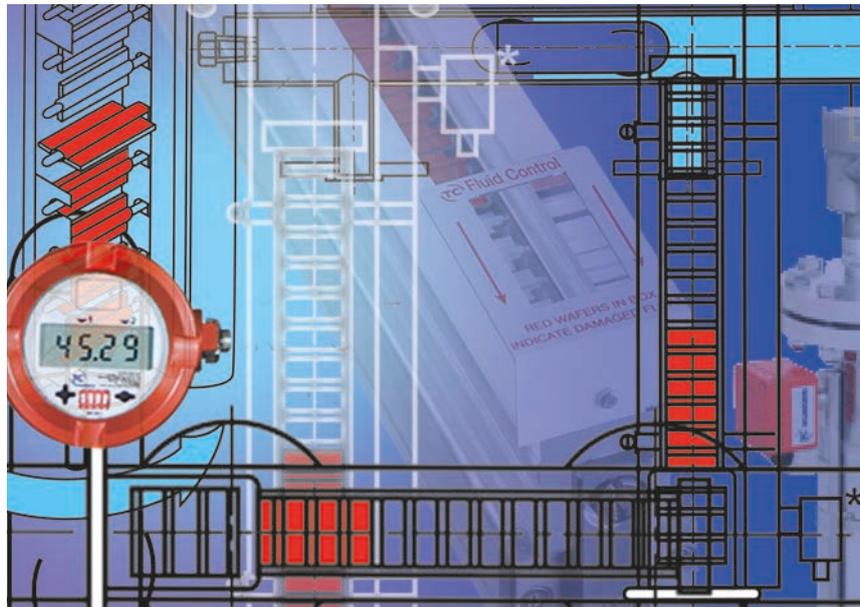


# Contents

	Magnetic Level Gauges	4
	LevelSure Gauges	10
	Magnetostrictive Liquid Level Transmitters	14
	Process Level Gauges	18
	Steam Level Gauges	26
	Enquiry Form	33



# Magnetic Level Gauges



Used throughout the world within a vast range of industries the Klinger range of Magnetic Level Gauges is particularly suited to applications where hazardous liquids or gases are in use. All of these instruments are made to order and our engineers will provide expert guidance on the design and manufacture of Magnetic Level Gauges for specific applications.



The well proven Klinger Magnetic Level Gauge is particularly suitable for duties where dangerous and toxic liquids or gases are involved and where the following features, benefits and options are required:-

- Immediate and accurate response to level changes, giving clear and sharp legibility.
- Continuous indication of liquid level.
- Local and remote display.
- Point switching facilities.
- Robust, shockproof and completely sealed for safety.
- No leakage to atmosphere. Particularly suitable for dangerous or toxic fluids.
- Ideal for liquid interface applications.
- Powerful omni-direction magnet system guide-free float.
- Display can be rotated through 360° irrespective of float position.
- Automatic float warning.
- High pressure capability – up to 400 bar unvented.
- High temperature capability – standard up to 450°C.
- Standard SG range 0.3 – 2.2
- Unlimited length (6m in continuous length).
- Top mounted options.
- PTFE/PFA lined, PP, PVDF and uPVC versions.
- Simple to engineer and easy to install.
- Eliminates preventive maintenance.
- An economical alternative to:-  
Conventional level gauges and other level measuring systems.
- Display unit protection up to IP66/67

## Design Considerations

Magnetic Level Gauges, depend not only on the integrity of the chamber but also on the float design and the ability to satisfy all design parameters, ie. specific gravity, pressure and temperature, without compromising the magnetic linkage to the display and associated controls.

Many competitive systems sacrifice display performance by using smaller and weaker magnet systems to achieve low SG and higher pressures, invariably with detrimental effect. Others use guided and vented floats to achieve the same result, which again can prove limiting and troublesome.

## The Advantages Of The System

The system, built on many years experience, has taken all these factors into consideration and designed out these problem areas.

This unique system uses a patented ferrite moulded wafer system, which combined with a sealed guide-free float carrying a powerful omni-directional magnet system, provides ultimate performance and reliability, even under the most severe conditions.

## Operation

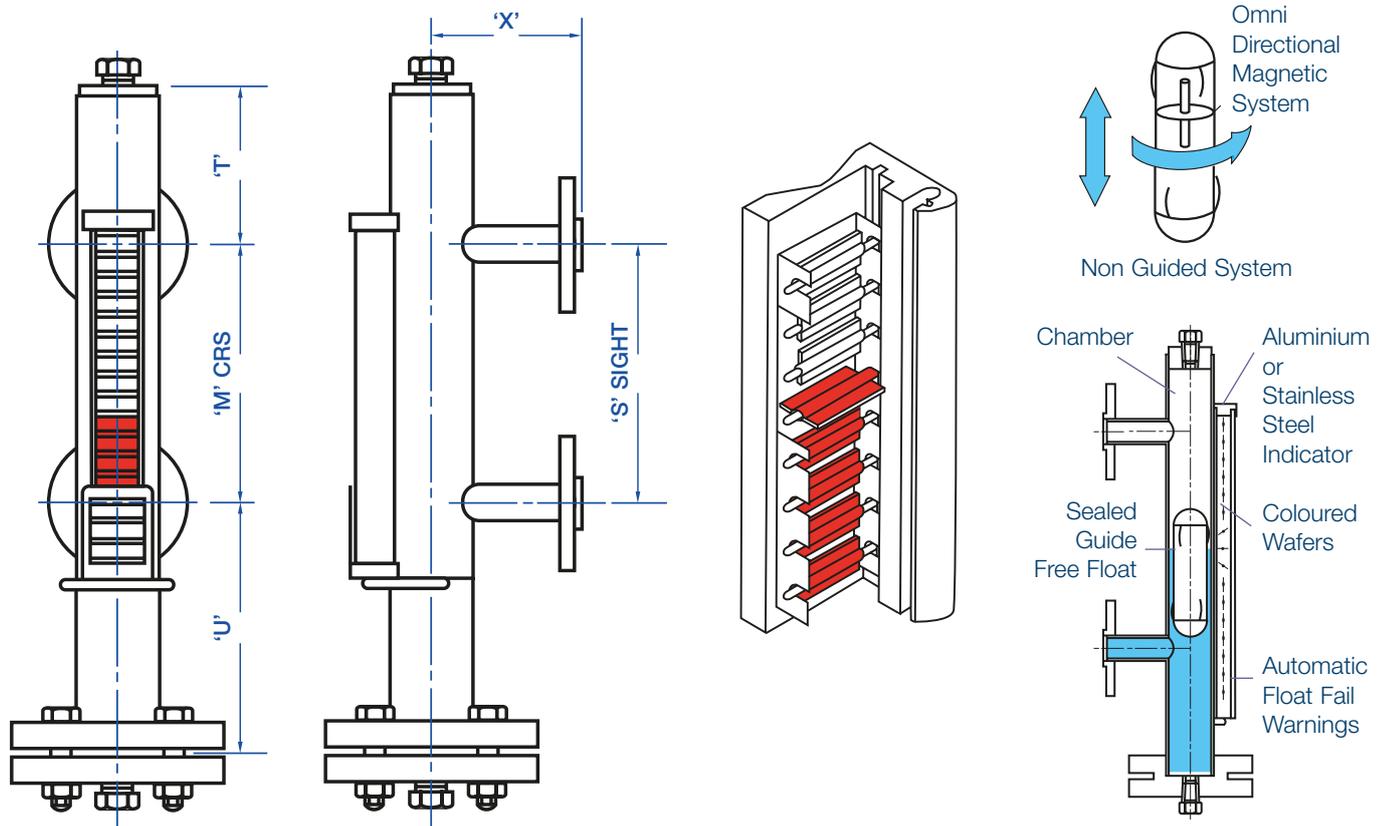
The Klinger Magnetic gauge is designed so that the liquid being measured is enclosed within a sealed chamber.

A stainless steel, titanium or plastic float fitted with a permanent omni-directional magnet moves freely inside the chamber and actuates the magnetic wafers within the indicator. As the float rises or falls with the liquid level each wafer rotates 180° and so presents a contrasting colour. Those wafers above the float show white, whilst those level and below show red – the indicator then presents a clearly defined and accurate level of the liquid in the chamber.

**The wafers resist accidental disturbance (e.g. vibration) due to their edge magnetisation and mutual attraction.**

To complement the range, the Magnetic Gauge can be supplied with Alarm Switches or Transmitter and Controller to remotely display the liquid level.

## Standard design (see enquiry form on page 33 for other options)



### Features and benefits

- **Indicator** Aluminium or Stainless Steel outer housing can be assembled to any length and mounted to suit the best viewing position.
- **Coloured Wafers** 25mm wide, red and white (or green, red, black and yellow) remain magnetically locked in the vertical position until disturbed by the greater magnetic force of the float magnet.
- **Automatic Float Warning** The wafers at the bottom of the indicator are mounted with their colours reversed. Should the float reach that level, they again present a sharp, immediately readable indication of float failure.
- **Sealed Float** of reinforced stainless steel, titanium or corrosion resistant plastic.
- **Sealed Chamber** Sealed chamber fabricated from stainless steel pipe, corrosion resistant plastics or other 'exotic' non magnetic metals.
- **Interface** The gauge is ideally suited for measuring liquid interfaces. Floats are available to meet a variety of specific gravities to suit the liquids being monitored.
- **Point Switches** can be fitted on the gauge at any level to provide signals at high, low and intermediate points.
- **Transmission and Monitoring for Remote Display** Can be offered as a complete original equipment package or retro-fitted to an existing Magnetic Gauge.
- **Versatility** - The simple concept of the Magnetic Gauge allows for flexible design to adapt to a variety of installation needs. Gauges can be manufactured to an almost unlimited length and in any configuration.

# Switches

- Simple Latching Operation suitable for I.S. Circuits with Approved Barriers
- Readily Adjustable Height Position
- Explosion Proof and I.S. Designs
- 0.5 to 6 Amp Options
- Micro Switch and Inductive proximity Options

**Klinger** Magnetic Gauge switches, attached to the side of the chamber can be used to provide a variety of alarm functions. The range comprises of three basic types, DR2, DR3 and DR8 (BGUV) series for a low cost solution on temperatures up to 150°C, with connection via a flying lead - available in non-hazardous, intrinsically safe and explosion proof and I.S. options. The DR4 (STMU) is for high temperature applications in non-hazardous environments (with inductive proximity variants) and the DR6 (MDA) is for explosion proof applications, plus heavy duty switching via micro switch operation.

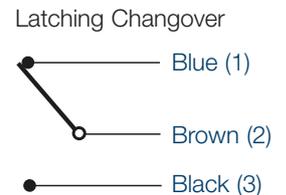
Other options are available on request including:-

- Special Variants for switching PLC control circuits
- NAMUR Circuit options to EN 60947-5-6
- Pneumatic operation

## Type DR2, DR3, DR8



Contact	Reed Contact
Contact Type	1 SPDT (Bistable)
Switch Rating	230V AC, 60VA, 1 AMP 230V DC, 30W, 0.5 AMP (for intrinsically safe circuits, certified 100mA and 30V max)
Max. Temperature	150°C
Cable Connection	3 metre silicon (longer on request) (Junction Box available on request)
Housing	Stainless Steel
Housing Protection	IP65 (IP68 EExd version)
Marking	DR3 Non Hazardous - None DR2 Intrinsically Safe - II 1G Ex ia IIC T3-T6 DR8 Explosion Proof - II 2G Ex d IIC T3-T6 LCIE 05 ATEX 6092X



## Type DR4



Contact	Reed Contact (Latching Rocker Arm)
Contact Type	1 SPDT (Bistable)
Switch Rating	230V AC, 60VA, 1 AMP 230V DC, 30W, 0.5AMP
Max. Temperature	380°C
Cable Connection	M20 Entry
Housing	Aluminium (Coated Red)
Housing Protection	IP65

(Note - Inductive Proximity Version available on request)



## Type DR6

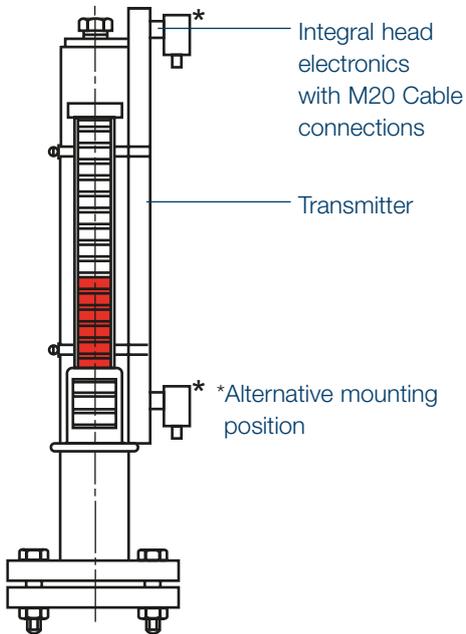


Contact	Reed Contact
Contact Type	1 SPDT (Bistable)
Switch Rating	230V AC, 60VA, 1 AMP 230V DC, 30W, 0.5 AMP
Max. Temperature	150°C
Cable Connection	1 x M20 entry (2 plugged 3/4" NPT)
Housing	Aluminium (Coated Grey)
Housing Protection	IP66

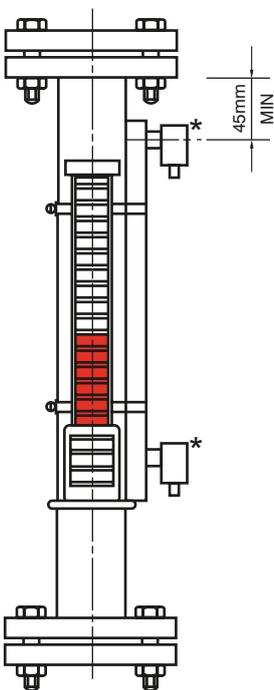
(Note - Micro switch option available - up to 6amp capacity)



# Reed Chain Transmitters



**KTX Transmitter**



**Flanged end connected arrangement**



## Liquid Level Transmitter

(See also 'Magnetostrictive' section - pages 15-17 for more options)

### KTX.I.S. (Intrinsically Safe)

II 2G Ex ia IIC T4-T6 KEMA 04 ATEX 1232X

### KTX.EXD (Explosion Proof)

II 2G Ex d IIC T6 TUV 09 ATEX 7632X

- Two wire 4-20mA current loop.
- Resolution 5mm, 10mm, 20mm Standard.
- Remote display and control.
- Transmits up to 6Km.
- No media contact.
- Simple application.
- Can be retro-fitted.
- Cost effective level measuring system.
- Approved ATEX Ex ia IIC T4-T6, Ex d IIC T4-T6.
- Low cost Non Approved version.
- HART® - Protocol (optional).
- PROFIBUS® PA (optional).
- FOUNDATION™ FIELDBUS (optional).

The transmitter is attached to the side of the magnetic level gauge chamber where it senses the position of the float. It can be supplied as an original equipment package or retro-fitted to an existing magnetic gauge, without interrupting the process.

The transmitter consists of a sensor tube containing a series of reed switches and resistors and an electronic circuit contained within a connection head, which can be supplied orientated to suit any gauge configuration or cable arrangement.

As the float rises and falls within the gauge chamber the corresponding reed switch closes altering the circuit resistance, this resistance is converted into a 4-20mA output signal by the electronic circuit.

The transmitter is approved intrinsically safe to Ex ia IIC T4-T6 when used with approved barriers.

For explosion proof duty approved to Ex d IIC T4-T6.

## Specification

Supply voltage 10-30Vdc. Polarity protected.

Output 4-20mA (profiled optional)

Float warning - Default Signal

Cable connections via epoxy coated aluminium or stainless steel mounted junction box with M20 cable entry

Protection IP65

Lengths to suit magnetic level gauge

For enquiry information: Refer to Separate Order Form on page 33

# Specification

## Standard Chamber Materials

<b>Body:</b>	Austenitic stainless steel to suit customers requirements.
<b>Flanges:</b>	Austenitic stainless or carbon steel depending upon application.
<b>Float:</b>	Austenitic Stainless Steel, Titanium, Hastelloy, Monel or Corrosion Resistant Plastic.
<b>Display Housing:</b>	Aluminium Alloy 6063T6 or Stainless Steel Outer Housed.
<b>RATINGS</b>	Process Pressures up to 400 bar (5800 psi). Saturated Steam pressure up to 180 bar. Temperatures from: -150°C to +450°C Higher temperatures on application.

## Special Chamber Material

Alloy 825, Titanium, Hastelloy, Sanicro 28/Duplex, Monel 400, 6Mo, Corrosion resistant plastics. Others on request.

## Approvals

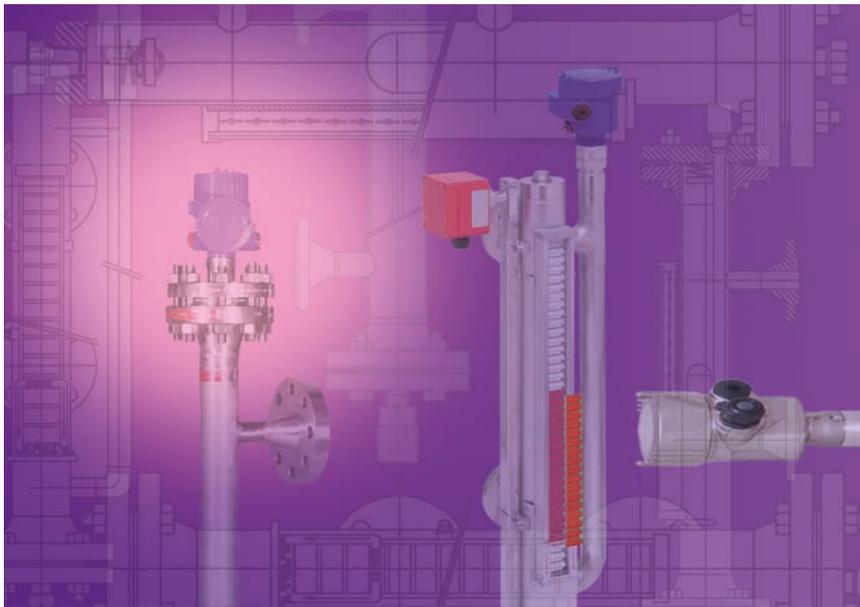
 PRESSURE EQUIPMENT DIRECTIVE 97/23/EC CATEGORY IV  
Type Approval COV 0312119/TEC Module B  
Certificate of Conformity COV 0312785/01 Module D

 II 1/2 Gc T1-T6 SIRA 04 ATEX 6126

GOST - R



# LevelSure Gauges



The Klinger LevelSure combines the operation of conventional float operated magnetic level indication with the proven technology of reed chain transmitter, magnetostrictive transmitter or guided wave radar in one unit.

The user benefits from the local visual readout and from the 4-20mA signals provided from the guided wave, reed chain and magnetostrictive transmitters with resolution down to 0.8mm available.

The LevelSure is a completely self-contained unit for mounting to a tank or vessel with threaded, flanged or welded connections to suit customer specification. It is particularly useful in conditions where a high level of confidence is required in critical level readings and where redundancy is required. Typical applications are offshore, petrochemical, power generation and pharmaceutical industries.

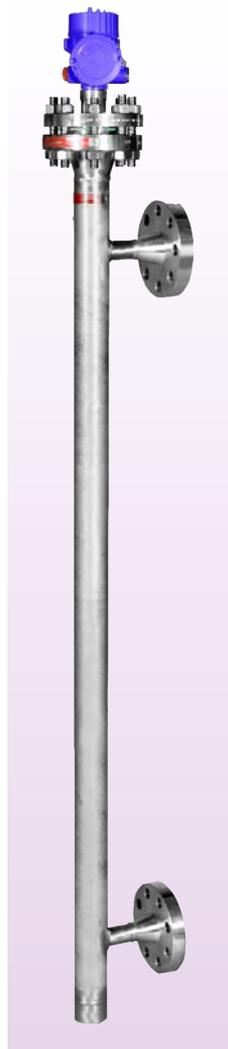
# Guided Wave Radar



By-Pass Mounting



Integral Mounting



Chamber Mounting

## Measuring Principles

Time Domain Reflectometry (TDR) - Microwave pulses are transmitted along a guide rod suspended from the top of the measuring chamber. As the pulses come in contact with the media, they are reflected back along the guide probe and are detected at the electronics in the head-shell. The time elapsed is evaluated to determine the liquid level with a measurement accuracy of +/- 3mm. Microwaves are generally not affected by process conditions. They are not sensitive to dust, vapours, foam or changes in liquid density. Even conditions such as steam environments do not influence the accuracy or reliability.

## Communications

HART • PROFIBUS • FIELDBUS

Options dependent on instruments used

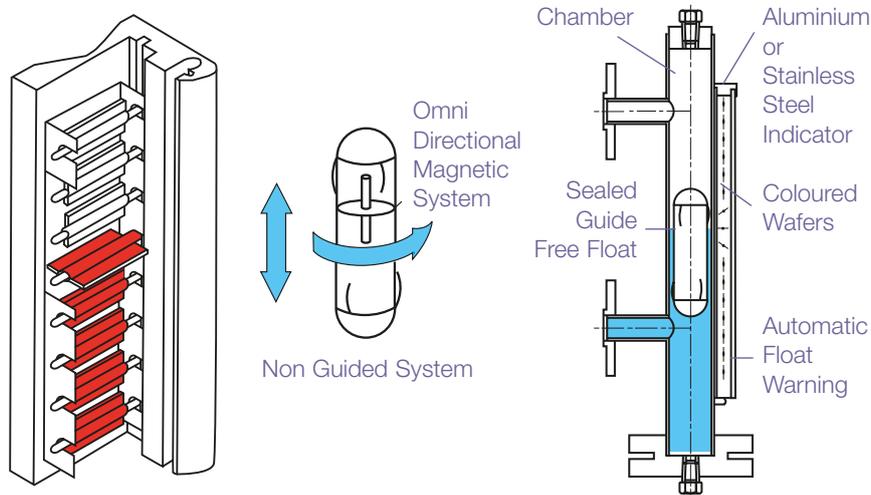


Exchangeable display and configuration module

## Approvals

Approvals dependent on instrument used. Please contact us for more information.

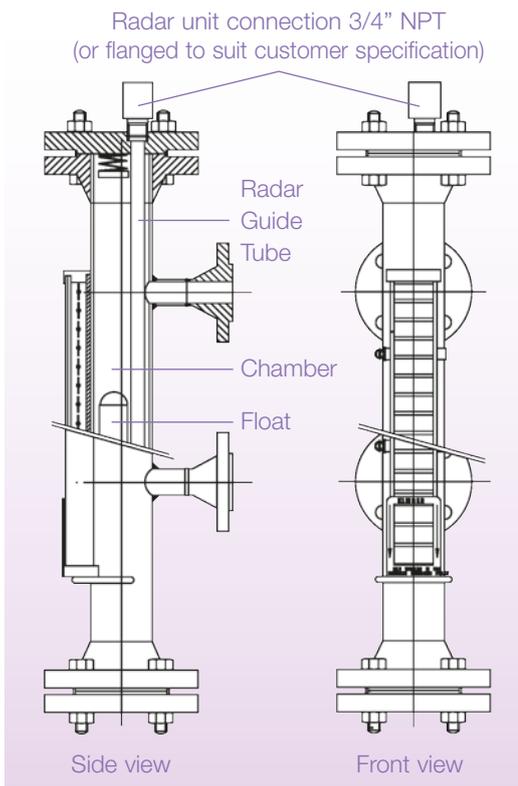
# LevelSure Gauges Mechanical Operation



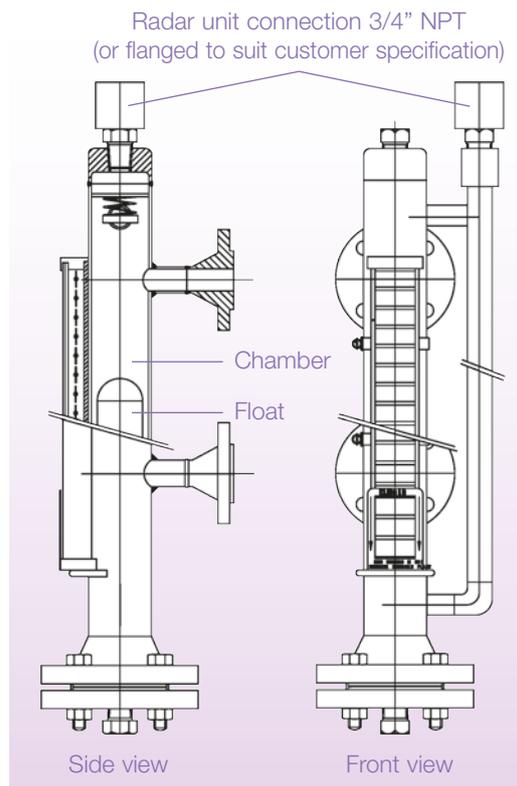
The Klinger Magnetic Gauge is designed so that the liquid being measured is enclosed within a sealed chamber. A stainless steel, titanium or plastic float fitted with a permanent omni-directional magnet moves freely inside the chamber and actuates the magnetic wafers within the indicator. As the float rises or falls with the liquid level each wafer rotates 180° and so presents a contrasting colour. Those wafers above the float show white, whilst those level and below show red – the indicator then presents a clearly defined and accurate level of the liquid in the chamber.

**The wafers resist accidental disturbance (e.g. vibration) due to their edge magnetisation and mutual attraction.**

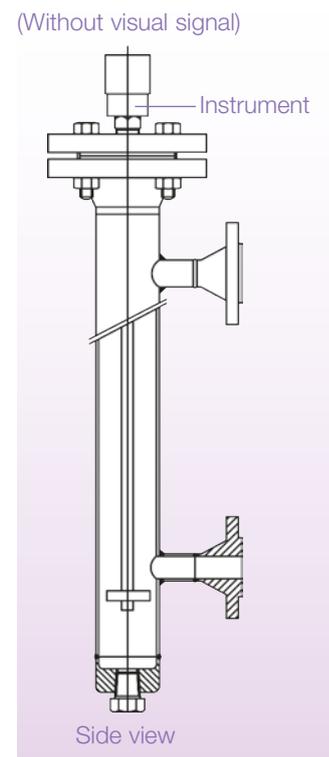
## Integral mounting



## By-Pass mounting



## Chamber mounted level instrument (Without visual signal)



# Specification

## Standard Chamber Materials

<b>Body:</b>	Austenitic stainless steel to suit customers requirements.
<b>Flanges:</b>	Austenitic stainless or carbon steel depending upon application.
<b>Float:</b>	Austenitic stainless steel, titanium, glass or corrosion resistant plastic.
<b>Display Housing:</b>	Aluminium Alloy 6063T6 or stainless steel outer housed.
<b>Ratings:</b>	Process Pressures up to 400 bar (5800 psi) saturated steam pressure up to 180 bar. Temperatures up to 450°C. Higher temperatures on application.
<b>Length:</b>	Length To suit customer requirement, (maximum single section length 6m).

## Special Body/Flange Material

Alloy 825, Titanium, Hasteloy, Sanicro 28/Duplex, Monel 400, 6mo/F44  
Others on request.

## Approvals - LevelSure Gauges

 PRESSURE EQUIPMENT DIRECTIVE 97/23/EC CATEGORY IV  
Type Approval COV 0312119/TEC Module B  
Certificate of Conformity COV 0312785/01 Module D

 II 1/2 Gc T1-T6 SIRA 04 ATEX 6126  
ATEX Protection concept - Constructional Safety 'c'.

Note: this approval is not available on all options, contact design office for information.

## Approvals - Transmitters/Radar

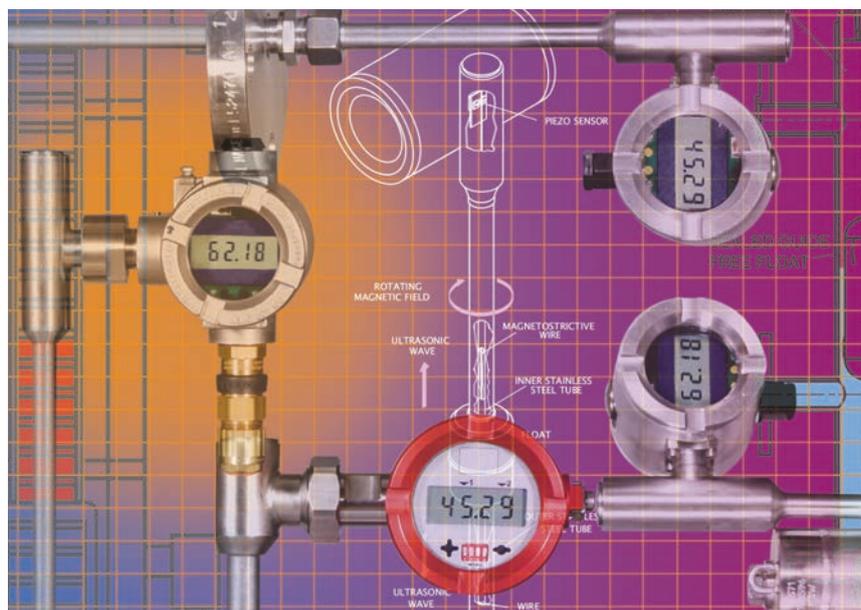
FM, CSA, GOST, ATEX, IEC, Exia and Exd

Marine Approvals on request

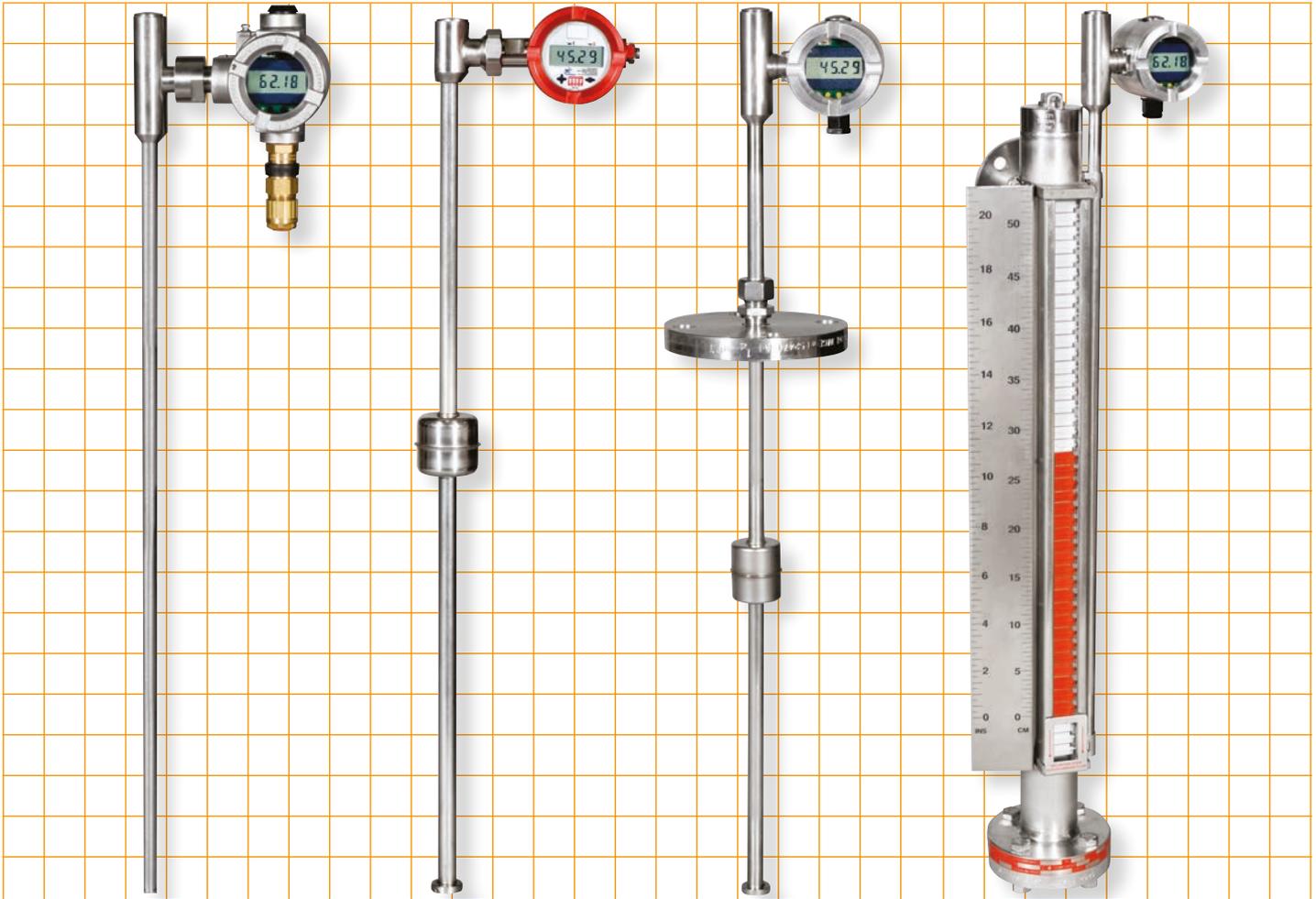
SIL2 Compliance on request



# Magnetostrictive Liquid Level Transmitters



Magnetostrictive liquid level transmitters based on the magnetostrictive principle which has considerable advantages over existing level transmitters. Exceptional reliability is a key benefit and these new transmitters will read to the highly accurate level of  $\pm 0.8\text{mm}$ . Easy to calibrate with push button operation or HART® and LCD display, they are not affected by high temperatures, vacuum or foaming contents.



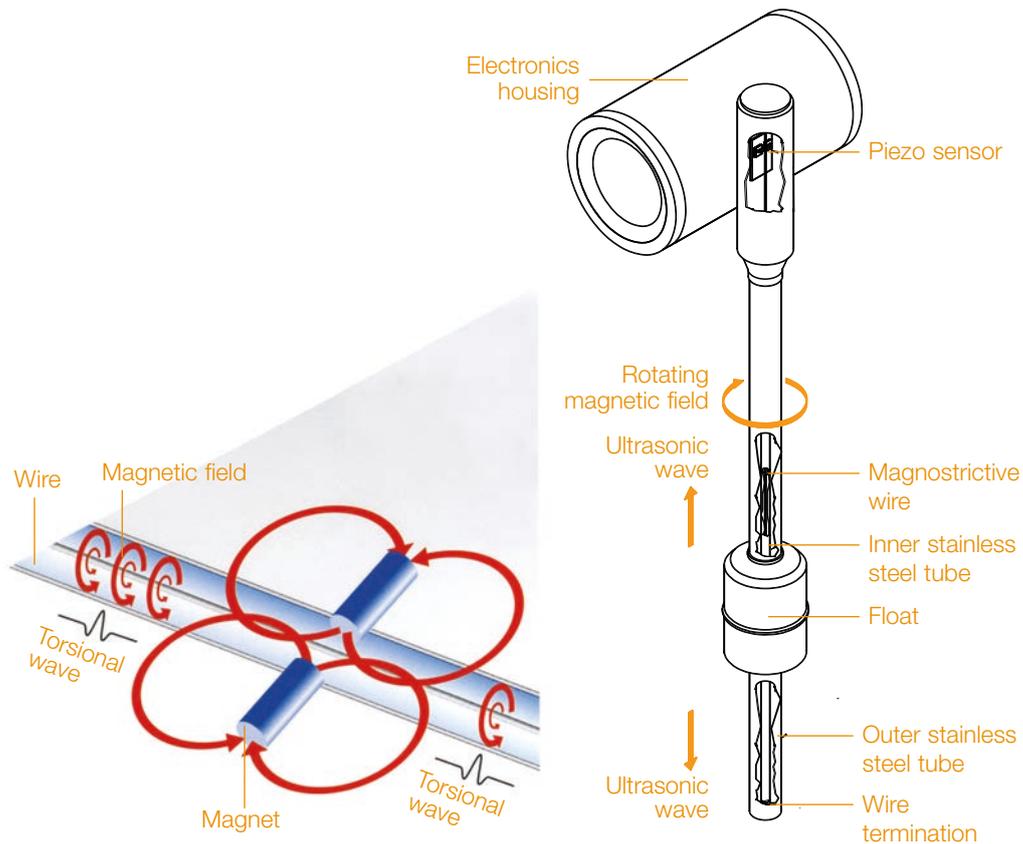
### Magnetostrictive - Key Features

Operators have the option to use as a stand alone 'In-Tank' unit or with the Klinger magnetic level gauge to which it can be retro-fitted if required. Used with the magnetic level gauge it will operate on tank temperatures of up to 400°C.

- 4.1/2 digit LCD local display - indicates process level measurement.
- Exia or Exd approval (IECEX and ATEX available).
- Microprocessor based 2-wire powered transmitter providing a 4-20mA current output relative to the liquid level.
- Continuous high accuracy measurement which goes beyond standard monitoring requirements to the accuracy required for inventory management.
- Stainless steel housing so no corrosion - especially appropriate for offshore and food environments.
- Other materials available for In-Tank models.
- Float failure alarm.
- No media contact (when used with Magnetic Level Gauge).
- Remote display and control is possible.
- Lengths of up to 6m as standard and specially engineered options for high pressure capability.
- Supplied with or without HART® communications.
- Screw or flange fitting to vessel

# Magnetostrictive System

## The New Generation



Magnetostriction is the change in the dimensions of a material when subjected to a magnetic field.

The measuring process begins with a current pulse. This current generates an axial magnetic field along the length of the wire made of a magnetostrictive material. This is held under tension inside the guide tube. The float, which sits on the liquid surface, is fitted with permanent magnets. When the pulse reaches the float the two magnetic fields interact and a torsional force results.

A torsional stress wave is induced in the wire. A piezoceramic pick-up in the electronics housing at the end of the wire converts this into an electrical signal. By measuring the elapsed time it is possible to determine the start point of the torsional stress wave and therefore the float position with a high degree of accuracy.

# Specification

## Electrical

<b>Supply Voltage:</b>	12-28V dc, polarity protected
<b>Signal Range:</b>	4-20mA
<b>Cable Entry:</b>	2x threaded to suit M20 Gland
<b>Float Failure Alarm:</b>	3.8mA.
<b>Calibration:</b>	By push button switches or HART®

## Performance

<b>Resolution:</b>	+/- 0.8mm
<b>Repeatability:</b>	+/- 0.8mm
<b>Hysteresis:</b>	+/- 1.6mm

## Machanical

<b>Minimum Length:</b>	150mm
<b>Maximum Length:</b>	6 metres
<b>Outer Tube:</b>	14mm diameter 316 Stainless Steel
<b>Electronics Housing:</b>	St/Stl
<b>Protection:</b>	IP67
<b>Temperature Range:</b>	Process: -40 to (up to) 250°C (dependent on temperature class) Ambient: -40 to +60°C (Ambient temp. limited to -5°C when fitted with LCD display). Storage: -40 to +80°C.

For operation at process temperatures outside this range insulation is required between the level gauge and transmitter.

**NOTE: Temperature limitations when used in hazardous areas, see approvals section.**

## Approvals

**Exd:** IIC T2-T6 Gb  II 2 G  
BASEEFA 09 ATEX0085X IEC Ex BAS09.0027X  
(See I.O.M. for temperature classes and operational considerations).

**Ex ia:** IIC T2-T6 BASEEFA 06 ATEX 0159  II 1G  
IEC Ex BAS 06.0038

Ui = 28VDC, Li = 93 mA, Pi = 0.65W, Li = 30 μH, Ci = 0

**Temperature Class:** T2 - T6

**Ambient Temperature Range:** -50 to +60°C (for T class T2-T5)  
-50 to +40°C (for T class T6)

**Temperature Range for Probe:** -40°C to (up to)  
+250°C dependent on T class

**SIL2 Compliance on request** (Model may vary)

**EMC 89/336/EEC**

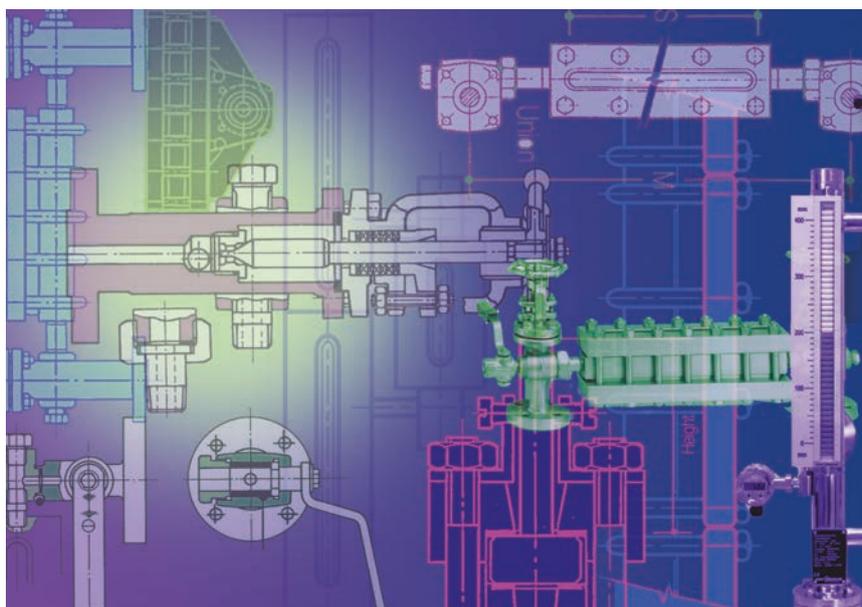
**Emissions:** EN61326:2004 Class B

**Immunity:** EN61326:2004 parts A1, A2 & A3

**When ordering, always specify operating temperature.**

*For other options and details, please consult Sales Office.*

# Process Level Gauges



Klinger originally invented the Reflex level gauge and the Group has since developed into a world market leader in liquid level monitoring equipment.

Today Klinger manufactures the most comprehensive range of Liquid level gauges suitable for the varied needs of the modern process plant. Used by most major process plant operators, engineering contractors and OEMs throughout the world, they can truly claim world leadership in this field. Our quality systems have been assessed to the requirements of BSEN ISO 9001.

Klinger produce level gauges to suit virtually any application, available in single or multi-sections, with a variety of shut-off valves, cocks and accessories.

## Gauge Selection Data

### 1. Select gauge type (see page 20)

Standard, large chamber or weld-on. Reflex and Transparent can be used on most process applications but Transparent is particularly recommended for:-

- a) Media which are corrosive to glass (eg. caustic alkalis, hydrofluoric acid, high pressure steam/water). In such cases Transparent Level Gauges must be protected by Mica or Kel-F shields (max. temp. 120°C).
- b) Viscous media
- c) Observation of colour or turbidity
- d) Interface applications
- e) Where lighting is inadequate and illuminators are required (see page 24)

Large Chamber Level Gauges are used only on applications where the medium boils or surges and 'Weld-On' Gauges for low pressure safe media applications.

### 2. Select the material (see page 21)

### 3. Select the pressure rating required (see page 20)

### 4. Select shut-off device (see page 21)

### 5. Select the required configuration (Refer to table on page 22)

Knowing the factors controlling the dimensions, (i.e. fixed vessel connections and/or fixed sight length, valve type RAV or DG and connections screwed or union) select from the tabulations the nearest gauge combination observing the following points:

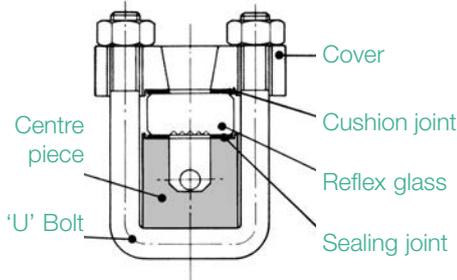
- a) Minimum vessel centres can be increased to suit the actual centres required.
- b) Maximum sight for any centre length is with side connected, offset inside.
- c) DG Cocks are usually supplied end connected.

# Reflex Level Gauges

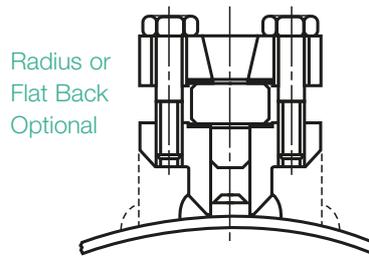
The Reflex Level Gauge, available in the range ANSI Class 150 to ANSI Class 1500, is particularly suitable for gas liquifaction plants, reactor vessels, low pressure boilers and storage vessels.

The Reflex Glass allows light to be absorbed in the liquid space giving a dark appearance and reflected in the gas space, thereby providing a clear indication of the liquid level.

## Standard Reflex



## Weld-On



- Distinct black and silver indication
- Temperature range -196°C to +400°C
- Pressures up to ANSI Class 1500 (250 bar)

## Reflex Gauges - Ratings

Type	Model	Rating
Standard	R100	PN100, ANSI 600
	R160	PN160, ANSI 900
	R250	PN250, ANSI 1500
Weld-On	UWR	PN100, ANSI 600

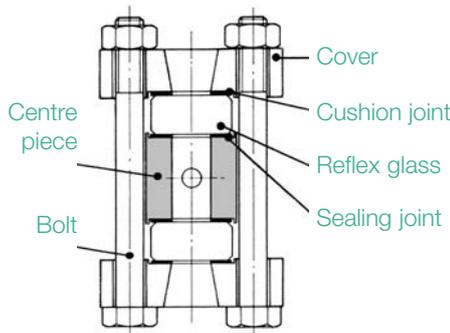
# Transparent Level Gauges

The Transparent Level Gauge, available in the range ANSI Class 150 to ANSI Class 1500, is particularly recommended for:-

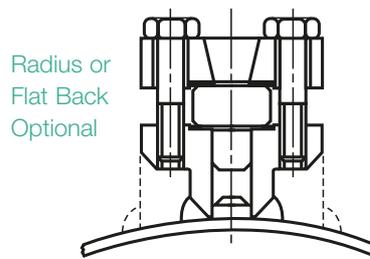
1. For media which are corrosive to glass, the glass can be fitted with protectors.
2. Viscous and coloured.
3. For interface applications.
4. Can be illuminated.

Glass tube level gauges, with associated Gauge Cocks and protectors are also available for low pressure (17 bar) non-hazardous applications.

## Standard Transparent



## Weld-On



- Pressures up to ANSI Class 1500 (250 bar).
- Temperature range -196°C to +400°C.

## Transparent Gauges - Ratings

Type	Model	Rating
Standard	T50	PN50, ANSI 300
	T100	PN100, ANSI 600
	T160	PN160, ANSI 900
	T250	PN250, ANSI 1500
Weld-On	UWR	PN100, ANSI 600

# Materials

Materials	FS/H	M/H	M
Centre Piece	Carbon steel ASTM A105	Stainless steel AISI 316L	Stainless steel AISI 316L
Cover	Carbon steel ASTM A105	Carbon steel ASTM A105	Stainless steel AISI 316
Glass	Toughened (BS3463)	Toughened (BS3463)	Toughened (BS3463)
Sealing Joint	KLINGER jointing	KLINGER jointing	KLINGER jointing
Cushion Joint	KLINGER jointing	KLINGER jointing	KLINGER jointing
Bolt	Steel	Steel	Stainless steel
Nut	Steel	Steel	Stainless steel

## Notes

1. All gauges, with the exception of 'Weld-On' are suitable for use with RAV Valves and DG Gauge Cocks.
2. Refer to page 22 for minimum centres, sight lengths and gauge configurations.
3. Ratings apply to standard and 'Weld-On' gauges in materials FS/H and M/H and large chamber gauges in all material grades.

## Valves and Cocks

Klinger manufacture two types of shut-off fittings, gauge valves type RAV, rated up to ANSI Class 1500 and gauge cocks type DG rated ANSI Class 900.

The RAV shut-off device is a metal seated valve with integral safety ball. Available in a variety of options it is suitable for most process requirements.

The DG gauge cock, with the replacable soft seated packing sleeve and quick 90° operation provides an economical alternative for the simpler applications.

### RAV Valves ANSI Class 900 and 1500

#### Inside Screwed ANSI 900/1500 (PN160-PN250)

##### Plain Nipple to Gauge-RAV946

<b>946/1</b>	Handwheel operation (ANSI 1500)
<b>946/2</b>	Weighted lever (ANSI 900)
<b>946/3</b>	Double ended lever (ANSI 900)
<b>946/5</b>	Quick closing handwheel (ANSI 900)

##### Union Nipple to Gauge – RAV947

<b>947/1</b>	Handwheel operation (ANSI 1500)
<b>947/2</b>	Weighted lever (ANSI 900)
<b>947/3</b>	Double ended lever (ANSI 900)
<b>947/5</b>	Quick closing handwheel (ANSI 900)

#### Outside Screwed ANSI 900/1500 (PN160-PN250)

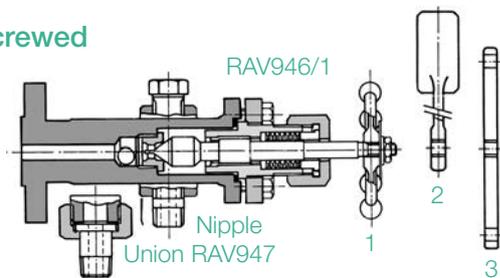
##### Plain Nipple to Gauge-RAV956

<b>956/1</b>	Handwheel operation (ANSI 1500)
<b>956/2</b>	Weighted lever (ANSI 900)
<b>956/3</b>	Double ended lever (ANSI 900)
<b>956/5</b>	Quick closing handwheel (ANSI 900)

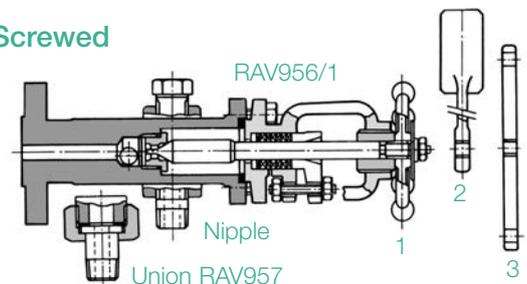
##### Union Nipple to Gauge – RAV957

<b>957/1</b>	Handwheel operation (ANSI 1500)
<b>957/2</b>	Weighted lever (ANSI 900)
<b>957/3</b>	Double ended lever (ANSI 900)
<b>957/5</b>	Quick closing handwheel (ANSI 900)

#### Inside Screwed

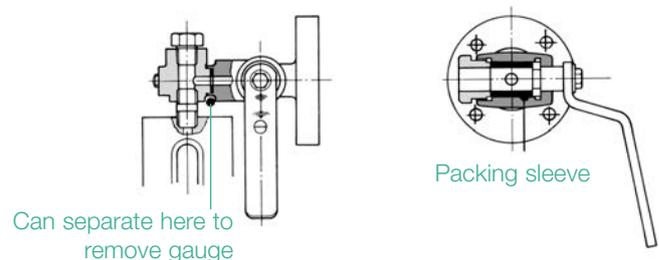


#### Outside Screwed



### DG Gauge Cocks ANSI 900 (PN160)

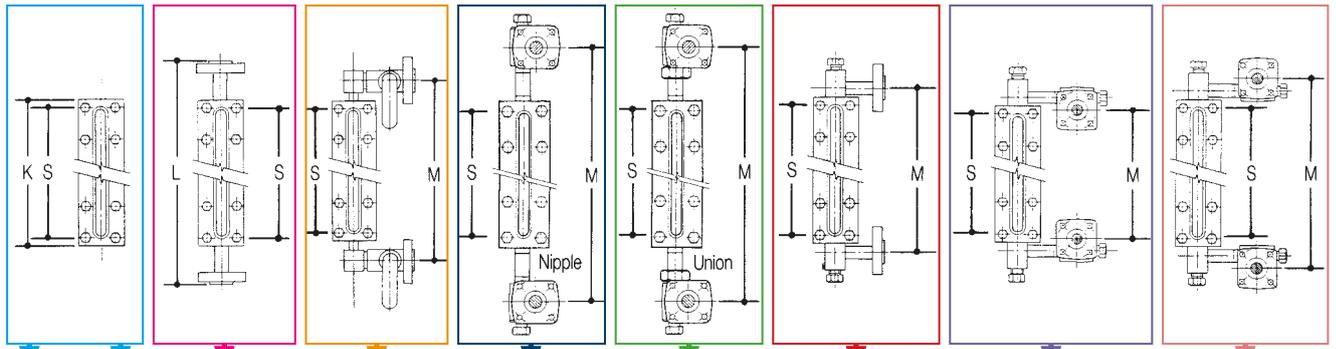
- Quick 90° lever operation
- Roddable for cleaning in situ
- Replacable packing sleeves (AB 18)
- Ball checks optional



End connected

1/2" End connected

Side/back connected



Gauge Size    Visible S    Body Length K    Flanged End L    DG Cock    RAV Type 946, 956    RAV Type 947, 957    Flanged 1/2" Screwed Side or Back    1/2" Offset Inside All RAV Types    1/2" Offset Outside All RAV Types

1-I	93	128	278	190	225	265	154	114	194
1-II	118	153	303	215	250	290	179	139	219
1-III	143	178	328	240	275	315	204	164	244
1-IV	168	203	353	265	300	340	229	189	269
1-V	198	233	383	295	330	370	259	219	299
1-VI	228	263	413	325	360	400	289	249	329
1-VII	258	293	443	355	390	430	319	279	359
1-VIII	298	333	483	395	430	470	359	319	399
1-IX	318	353	503	415	450	490	379	339	419
2-IV	373	408	558	470	505	545	434	394	474
2-V	433	468	618	530	565	605	494	454	535
2-VI	493	528	678	590	625	665	554	513	594
2-VII	553	588	738	650	685	725	614	574	654
2-VIII	633	668	818	730	765	805	694	654	734
2-IX	673	708	858	770	805	845	734	694	774
3-VI	758	793	943	855	890	930	819	779	859
3-VII	848	883	1033	945	980	1020	909	869	949
3-VIII	968	1003	1153	1065	1100	1140	1029	989	1069
3-IX	1028	1063	1213	1125	1160	1200	1089	1049	1129
4-VII	1143	1178	1328	1240	1275	1315	1204	1164	1244
4-VIII	1303	1338	1488	1400	1435	1475	1364	1324	1404
4-IX	1383	1418	1568	1480	1515	1555	1444	1404	1484
5-VII	1438	1473	1623	1525	1570	1610	1499	1459	1539
5-VIII	1638	1673	1823	1735	1770	1810	1699	1659	1739
5-IX	1738	1773	1923	1835	1870	1910	1799	1759	1839
6-VIII	1973	2008	2158	2070	2105	2145	2034	1994	2074
6-IX	2093	2128	2278	2190	2225	2265	2154	2114	2194
7-VIII	2308	2343	2493	2405	2440	2480	2369	2329	2409
7-IX	2448	2483	2633	2545	2580	2620	2509	2469	2549
8-VIII	2643	2678	2828	2740	2775	2815	2704	2664	2744
8-IX	2803	2838	2988	2900	2935	2975	2864	2824	2904
9-VIII	2978	3013	3163	3075	3110	3150	3039	2999	3079
9-IX	3158	3193	3343	3255	3290	3330	3219	3179	3259

Notes on Standard gauges    -    -    -    A    B    C    D & E    D & E

Notes on Large Chamber and Weld-on gauges    F & J    -    -    A    B    C    D & E    D & E

Notes (see also bottom of table opposite)

**Standard Gauges**     
(1-I to 9-IX)

- A. For 3/4" gauge connections dimensions as above.
- B. For 3/4" gauge connections add 14mm.
- C. For 3/4" screwed side or back add 34mm.
- D. T50-T100-T160-T250 with 1/2" back connections add 34mm.
- E. For 3/4" side or back connections add 34mm.

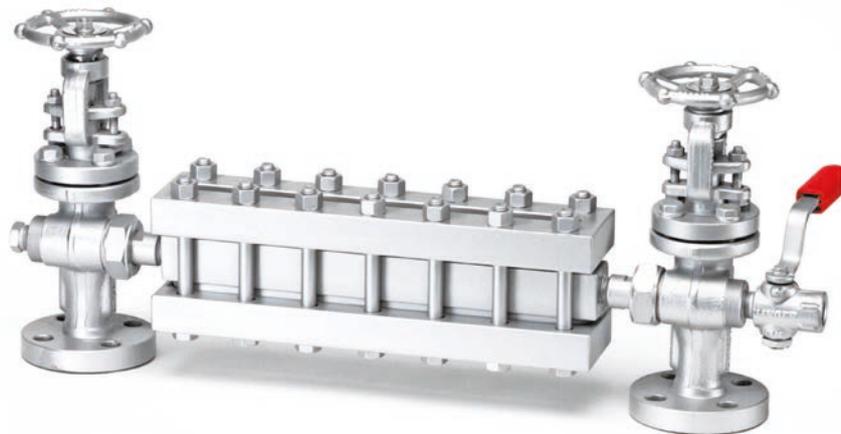
*Note: 3/4" screwed connections not available on T250 and R250.*

**Large Chamber Gauges**    
(1-I to 6-IX)

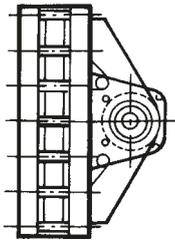
- F. Overall length 'K' add 32mm.
- G. For flanged end connections or 1/2" end connected DG/RAVs add 32mm.
- H. For flanged/screwed side or back add 49mm.
- I. Refer to T & C for all configurations (ie. 3/4" connections).

**Weld-On Gauges**   
(1-I to 4-IX)

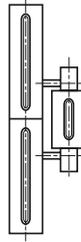
- J. No valves supplied dimensions as S and K.



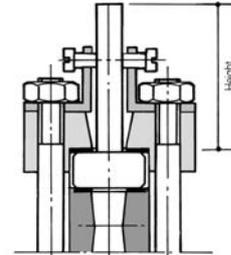
## Accessories



Fluorescent and LED illuminators are available on request.



Uninterrupted sight where blind spots are not permitted



Non-frost blocks to permit viewing through frost build-up

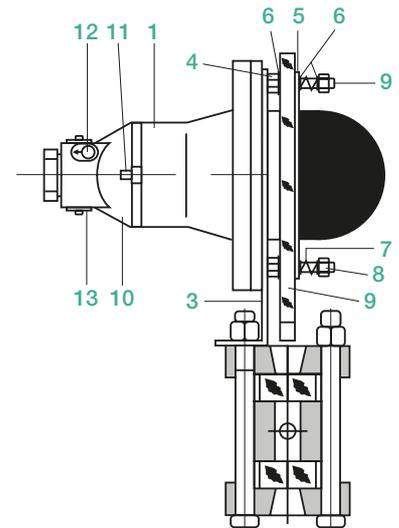
## Level gauge Illuminator for hazardous areas

### EEx rating according to type of bulb used

Type of E 27 bulb	Ex rating	Bulb ref.
15W incandescent (1)	Ex d Ilc T6	E27/15WI
60W incandescent (1)	Ex d Ilc T5	E27/60WI
75W incandescent (1)	Ex d Ilc T4	E27/75WI
15W fluocompact (2) (60W equivalent)	Ex d Ilc T6	E27/15WF

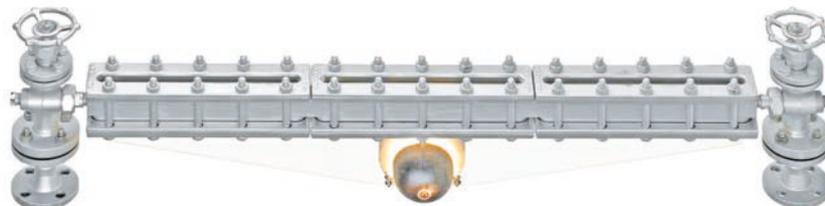
### Key to Illuminator diagram

- 1 Illuminator body
- 2 Diffuser (Plexiglas or glass)
- 3 Support bracket 4 Nut 5 Gasket
- 6 Washer 7 Spring 8 Nut 9 Bolt
- 10 Bonnet 11 Security pin
- 12 Earth screw 13 Name plate



### Electrical specification

- Voltage:** 110 - 230V AC (max 380V) - 50/60Hz, 6 to 48V DC
- Cable entry:** 3/4" NPT (M20 via adaptor)
- IP rating:** IP 65
- Ex approval:** ISSeP No. 98D. 103. 1283/970. 103.124



## Process gauge weights & bolt torques

To determine the weight of a multi-section gauge multiply the gauge size by the number of sections. The weights given are approximate only.

Gauge Type	Gauge size									Cover Bolt Torques (N.m)
	I	II	III	IV	V	VI	VII	VIII	IX	
<b>Reflex</b>	Gauge weight (Kg)									
R100	2.5	3	3	4	4	5	6	6	7	65
R160	3	4	4	5	6	6	8	8	8	75
R250	4	5	6	7	8	9	11	11	12	???
UOR	5	6	7	7	8	9	11	11	12	40
<b>Transparent</b>										
T50	4	4	5	6	6	7	8	9	10	60
T100	5	6	7	8	9.5	10.5	11.5	13	14	65
T160	8	9	11	12	14	16	17	20	21	75
T250	15	15	17.3	18.5	20.5	22	23.5	26	28	120
UOT	7	8	9	10	11	13	14	16	16	40

DG valves 8kg per set (does not include weight of drain or vent valve).

RAV valves 11kg per set (does not include weight of drain or vent valve).

## Other Accessories

### Non-frosting blocks (Max. temp. 110°C)

To ensure a clear level indication of the gauge where there is a possibility of frost build-up, a transparent acrylic block can be fitted into the glass face.

Recommended height of block for various temperature is as follows:-

Temperature of Medium °C	Height (mm)
0°C to -19°C	38
-20°C to -49°C	75
-50°C to -99°C	150
under -100°C	200

### Scales

Engraved scales, calibrated to customer requirements can be supplied for all **Klinger** level gauges.

### Specific gravity glass floats

Where the interface between two immiscible liquids is to be observed a special float can be provided in a transparent level gauge.

### External centre piece heating

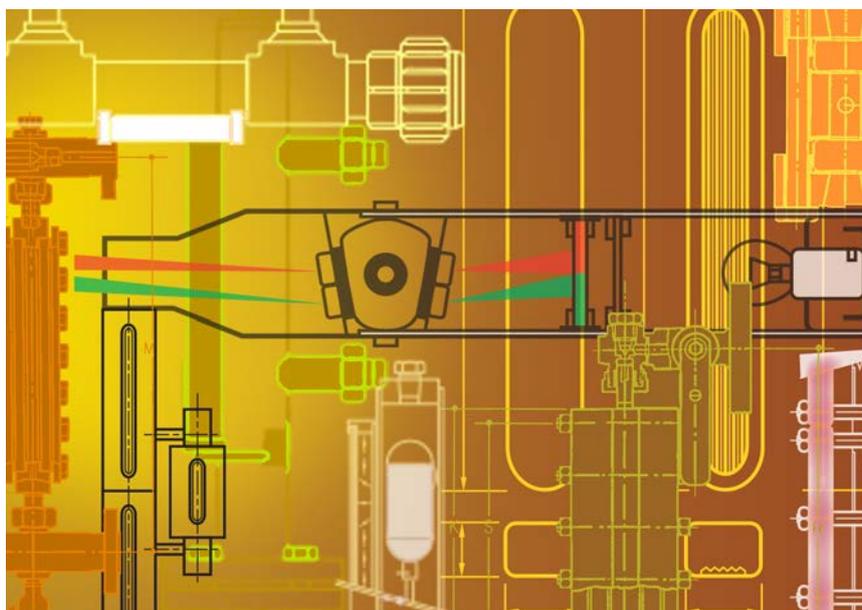
Heating tubes on outside of centre piece.

### Internal heating

Heating tube in contact with medium.



# Steam Level Gauges



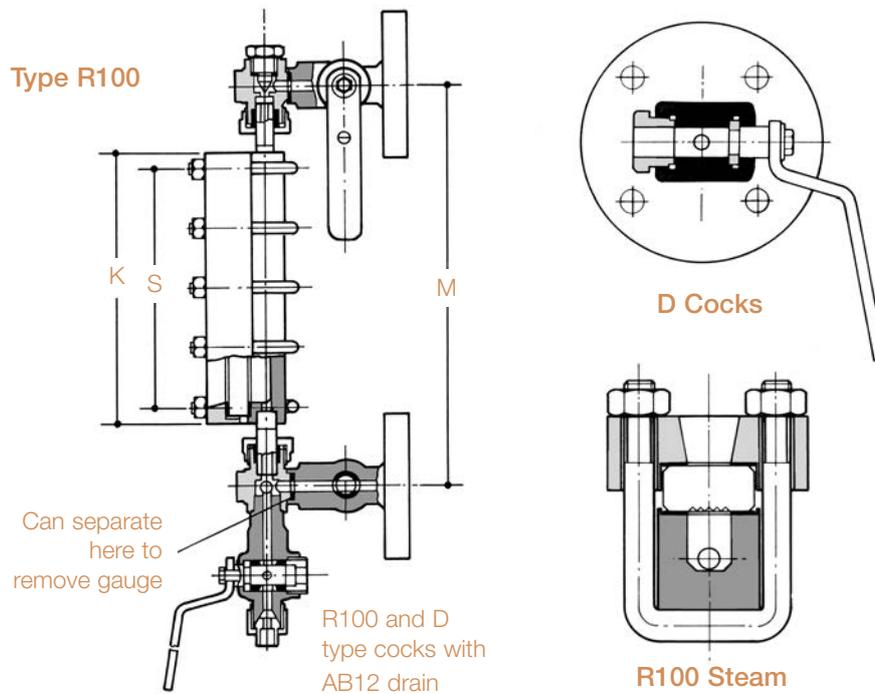
The Klinger range of steam level gauges comprises three main types:- **Reflex** (22 bar), **Transparent** (21-120bar) and **Bi-Colour** (70-210 bar). Generally, all steam level gauges are single section only, with end connected D type cocks or valves to suit the pressure rating required; so selection is simply achieved by referring to the relevant pages.

The **Reflex gauge**, with solid metal body and armoured reflex glass, provides maximum operator protection and a distinct level indication for low pressure applications.

Above 22bar, **Transparent level gauges** are used, fitted with extra thick micas to protect the glass against the action of steam and water. These gauges can be fitted with illuminators, a useful option particularly in dark areas.

Finally, high pressure **Bi-Colour gauges** are available with illuminators to give either a red and green or black and white indication, particularly useful for remote viewing.

## Reflex R100 with Gauge Cocks (steam up to 22bar)



Dimensions (mm)					
Gauge Size	Visible S	Body Length K	Centre to Centre (min) M		Assembled weights (Kg)
			R100	R100	
I	93	128	230	12	
II	118	153	255	13	
III	143	178	280	13	
IV	168	203	305	14	
V	198	233	335	15	
VI	228	263	365	15	
VII	258	293	495	16	
VIII	298	333	435	17	
IX	318	353	455	17	

**Maximum Flange Size**  
127mm dia.x 22mm thick

**Screwed Connections**  
Available on request

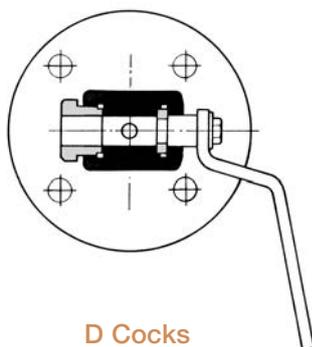
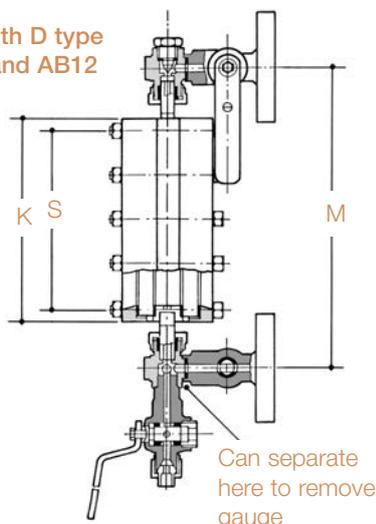
**Notes**

1. Suitable for right or left hand operation.
2. A ball check is fitted to the top and bottom arm as standard.
3. Fitted with 'B' Reflex Gauge Glass.
4. Combined Gauges available
5. R100 available with side gauges for continuous sight.

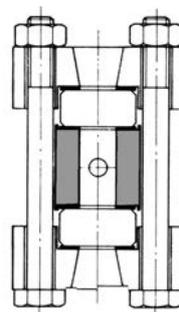


## Transparent T100 and T160 with Gauge Cocks (steam up to 21 and 40 bar)

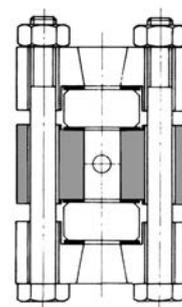
T100 with D type  
cocks and AB12  
drain



D Cocks



T100 (21 bar Steam)



T160 (40 bar Steam)

### Dimensions (mm)

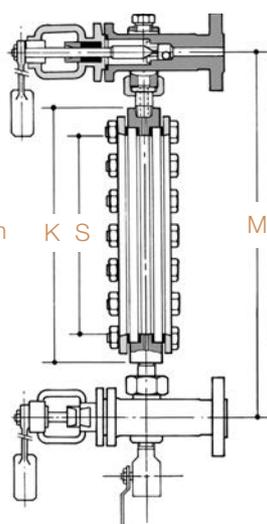
Gauge Size	Visible	Body Length	Centre to Centre (min)	Assembled weights (Kg)	
	S	K	M	T100	T160
I	93	128	230	14	14.5
II	118	153	255	15	15.5
III	143	178	280	16	17
IV	168	203	305	17	18
V	198	233	335	18.5	19.5
VI	228	263	365	19.5	20.5
VII	258	293	495	20.5	22.5
VIII	298	333	435	22	23.5
IX	318	353	455	23	24.5

### Notes

1. Maximum flange size: 127mm dia. x 22mm thick.
2. Suitable for right or left hand operation.
3. Fitted with 'B' type plate glasses and extra thick
4. A ball check is fitted to the top and bottom arm as standard.
5. Illuminators are available if required.
6. Combined section gauges are available if required.
7. T100 and T160 available with side gauges for continuous sight. Mica glass protectors fitted as standard.

## Transparent T85 with 957/2 Valves (steam up to 85 bar)

T85 with RAV  
957/2 valves  
and AB12 drain



### Notes

1. Maximum flange size: RAV957/2, 124mm dia. x 20mm thick.
2. Available for right or left hand operation.
3. Fitted with 'B' type plate glasses and extra thick micas as standard.
4. Ball checks both top and bottom, fitted as standard on RAV957/2.
5. Illuminators are available if required.
6. It is recommended that side arm gauges be fitted where continuous sight is required.
7. Longer gauges available on request.

### Dimensions (mm)

Gauge Size	Visible	Body Length	Centre to Centre (min)	Assembled weights (Kg)
	S	K	M	T85/957
I	143	215	355	26.8
IV	168	240	380	28
V	198	270	410	30
VI	228	300	440	31.5
VII	258	330	470	33
VIII	298	370	505	35.5
IX	318	390	530	37.5
2-IV	375	447	587	46.5
2-V	435	507	647	50.5
2-VI	495	567	707	53.5
2-VII	555	627	767	56.5
2-VIII	635	707	847	61.5
2-IX	675	747	887	65.5
2-VI	762	834	974	75.5
2-VII	852	924	1044	80
2-VIII	972	1044	1184	87.5
2-IX	1032	1104	1244	93.5

# Bi-Colour Porthole Steam Level Gauge

## Type SPH120 and SPH210

### General

Suitable for high pressure boilers up to 210 bar saturated steam. Bi-colour red/green reading of the level. Easy maintenance. Wide range of assemblies and C to C dimensions.

### Chamber Construction:

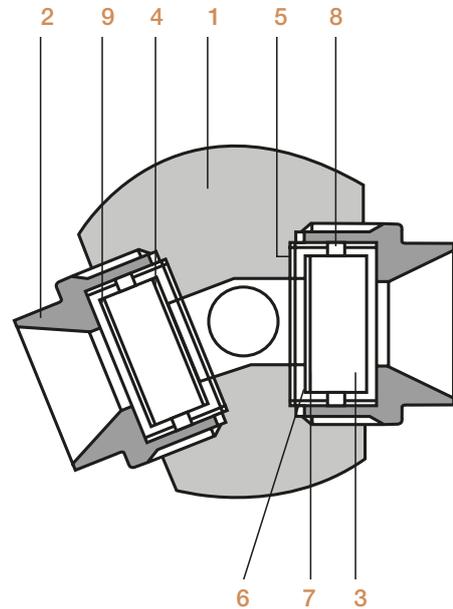
Forged ASTM A 182 F11 Cl.2 body (1 1/4Cr-1/2Mo). Rated to ANSI 1500 (PN250). Designed to BS1113:1998. PED Category - S.E.P./Cat.1.

### Versions:

Model SPH 120 for saturated steam up to 120 bar equipped with Borosilicate glasses. Model SPH 210 for saturated steam up to 210 bar equipped with Aluminosilicate glasses.



	Number of Sections	Visibility (mm)	Body (mm)	
One piece body	3	139	247	
	4	199	307	
	5	259	367	
	6	319	427	
	7	379	487	
	8	439	547	
	9	499	607	
	10	559	667	
	11	619	727	
	12	679	787	
	13	739	847	
	14	799	907	
	Two piece body	15	926	1034
		16	986	1094
17		1046	1154	
18		1106	1214	
19		1166	1274	
20		1226	1334	
21		1286	1394	
22		1346	1454	



- 1 Chamber body
- 2 Port cover nut
- 3 Glass
- 4 Glass carrier
- 5 Chamber gasket
- 6 Carrier gasket
- 7 Mica protector
- 8 Gland ring
- 9 Cushion gasket

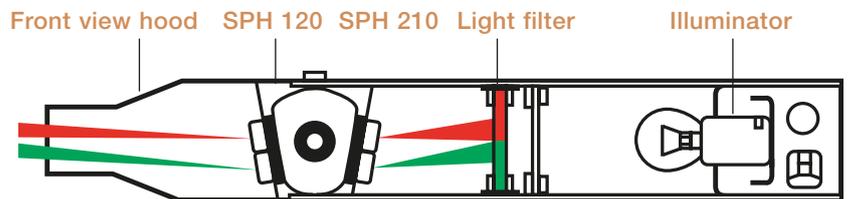
On a two piece body, the non visible area between the two glasses of each body is 127mm (instead of 60mm)

## Bi-Colour Porthole Gauge Illuminator

Light entering the gauge is refracted through the water and steam areas giving a bright green or red image of its level respectively.

**Options:** (IP Rating: IP30 & IP65)

**Voltage:** 24V DC, 110-120V AC 50/60Hz, 230-240V AC 50/60 Hz.



## Accessories

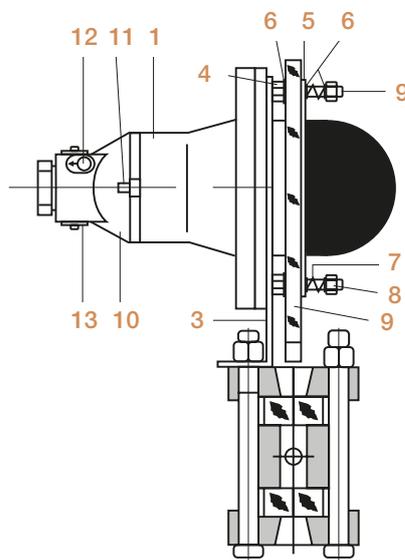
### Level Gauge Illuminator for hazardous areas

#### Ex rating according to type of bulb used

Type of E 27 bulb	Ex rating	Bulb ref.
15W incandescent (1)	Ex d Ilc T6	E27/15WI
60W incandescent (1)	Ex d Ilc T5	E27/60WI
75W incandescent (1)	Ex d Ilc T4	E27/75WI
15W fluocompact (2) (60W equivalent)	Ex d Ilc T6	E27/15WF

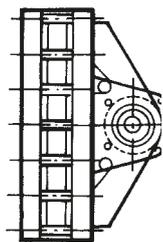
#### Electrical specification

<b>Voltage:</b>	110 - 230V AC (max 380V) - 50/60Hz, 6 to 48V DC
<b>Cable entry:</b>	3/4" NPT
<b>IP rating:</b>	IP 65
<b>Ex approval:</b>	ISSeP No. 98D. 103. 1283/970. 103.124

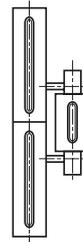


#### Key

- 1 Illuminator body
- 2 Diffuser (Plexiglas or glass)
- 3 Support bracket
- 4 Nut
- 5 Gasket
- 6 Washer
- 7 Spring
- 8 Nut
- 9 Bolt
- 10 Bonnet
- 11 Security pin
- 12 Earth screw
- 13 Name plate



Fluorescent and LED illuminators are available on request.



Uninterrupted sight where blind spots are not permitted

## Gauge Glasses, Micas, Shields and Gaskets

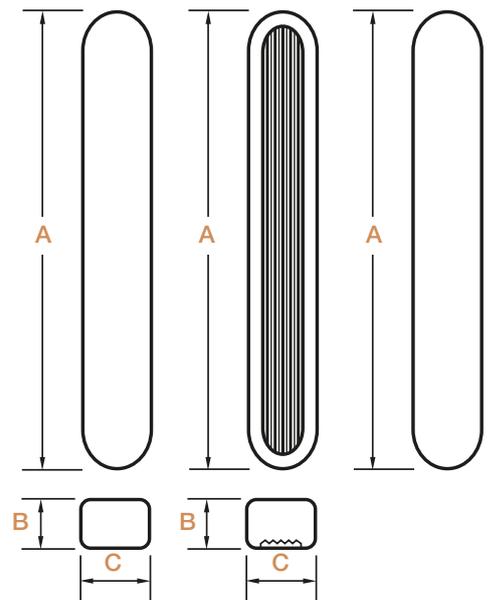
**Klinger** Glasses are high grade toughened Borosilicate “extra hard” with a low coefficient of thermal expansion. They have exceptionally high mechanical strength with excellent resistance against thermal shocks and temperature differentials in the glass. Type B reflex gauge glasses are used in all reflex level gauges. Type B transparent gauge glasses are used in all transparent level gauges, except TA120 and KTA gauges where TA28 glasses are used. Mica or Kel-F shields (max. temp 120oC) can be fitted on request.

### Type B (mm)

	I	II	III	IV	V	VI	VII	VIII	IX
<b>A</b>	115	140	165	190	220	250	280	320	340
<b>B</b>	17	17	17	17	17	17	17	17	17
<b>C</b>	34	34	34	34	34	34	34	34	34

### Type B (mm)

	I	II	III	IV	V	VI	VII	VIII	IX
<b>A</b>	113	138	163	188	218	248	278	318	338
<b>B</b>	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8
<b>C</b>	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6	27.6



*Klinger glasses comply with  
DN 7081, JIS 88211, BS 3463, SOD Spec.  
123MIL-G-184988*

### Micas

The micas fitted to thru-vision level gauges conform to: ISO 2185V.5.1 Stained A1 quality. Micas should always be specified when a thru-vision level gauge is being used on steam service above 20 bar.

### Gaskets

Standard graphite with stainless steel entangled layer and anti stick coating.

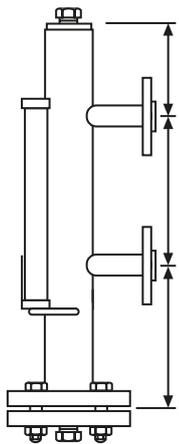
## Other Accessories

### Scales

Engraved scales, calibrated to customer requirements can be supplied for all **Klinger** level gauges.

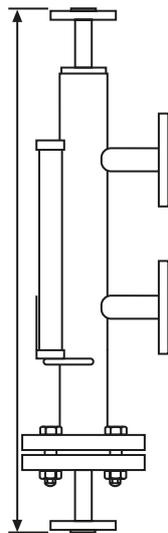


# Standard configurations



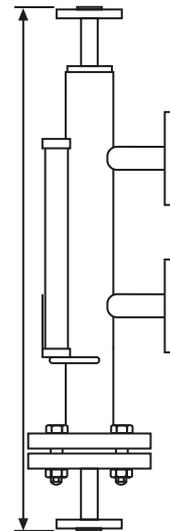
### Standard Arrangement Side/Back Connected

Standard Construction Side or Back connections to process. Vent and Drain Plugged.



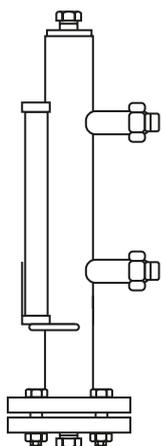
### Flanged Vent and Drain

Vent and Drain flanged. Flanges can be Slip-On or Weld Neck type.



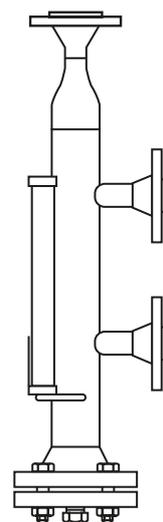
### Side & Top Connected

Special Variant with top end connected and bottom side connected to process – the flanges can be configured to exact client requirements. Flanges can be Slip-On or Weld Neck type.



### Screwed Side/Back via Union Connections

Process Connections are screwed via unions for easy gauge removal, or can be supplied with plain threaded ends in BSP or NPT.



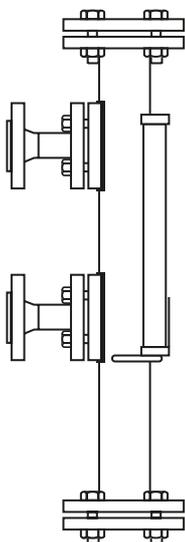
### All Butt Welded

Standard Construction Side or Back Vent and Drain Plugged Flanges are Weld Neck type for all Butt Welded construction. Note – the side branch to chamber weld is not a full penetration butt weld. Please advise if full penetration weld is required.



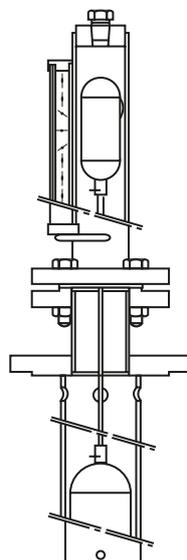
### PVDF, PP, uPVC Magnetic Gauge

Plastic Construction Side or Back connections to process. These gauges are used for highly corrosive duties i.e. acids/alkalines or if the vessel is plastic as the gauge will 'move' with the vessel due to expansion and contraction in changing temperatures.



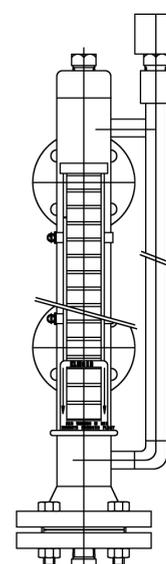
### PVDF/PFA Lined Gauge

Plastic Lined Construction Side or Back connections to process. These are used for highly corrosive duties i.e. acids/alkalines where the pressure is too great for all plastics gauges, or if the vessel is made from metals (or lined tanks).



### Top Mounted Gauge

Top mounted gauge to process. For underground tanks that need visual indication. The gauge can also transmit signals or point alarms.



### Combined MLG and Guided Wave Radar

## Enquiry Form For Magnetic Level Gauges and LevelSure Gauges

Detach, complete and send this form to [appendages@klinger.nl](mailto:appendages@klinger.nl)

Klinger The Netherlands Tel. +31 10 455 75 55

**Customer:** .....

**Customer Ref:** .....

**Contact:** .....

**Tel. No:** ..... **Fax No:** .....

**Email:** .....

### DUTY

Quantity of Gauges ..... Operating Pressure .....  Bar g  PSI g  
 Fluid Description ..... Operating Temp .....  Bar g  PSI g  
 Fluid SG(s) ..... Design Pressure .....  Bar g  PSI g  
 Measurement: Top Level ..... Design Temp .....  Bar g  PSI g  
 Interface Range of SG ..... Vacuum Service?.....  
 Dielectric Constant ..... *(D.C. needed for guided wave radar transmitter only)*

### GAUGE SPECIFICATION

Vessel Connections - Flange Size ..... Flange Standard & Rating .....  
 Vessel Connections - Screwed Size ..... Screw Standard ..... NPT  BSP   
 Vent Connection: Flanged  Plugged  Size.....Standard & Rating.....  
 Drain Connection: Flanged  Plugged  Size.....Standard & Rating.....  
 Centre to Centre Dimension 'M' (mm) ..... Face to Face Dimension 'L' (mm) .....  
 Visible Length (mm) ..... 'U' Dimension Restriction? .....mm  
*(See over for details of M, U & T dimensions)*

Material of Body ..... Material of Display: Aluminium  St/Sti

**For LevelSure gauges only:** Connection of Radar to Gauge body: Flanged  Screwed   
 (Size of flange and rating or screwed fitting required).....

Design Construction: ASME B31.3  AD2000  *(Generally ASME is more expensive - e.g. for refinery use. AD2000 is lighter construction for general industry use.)*

Welding Design - Butt Welded  *(More Expensive)* Slip-On Welded  *(Cannot be X-Rayed)*

**Configuration - see diagrams 1-9 on reverse or specify:**.....

### ELECTRICAL EQUIPMENT

**Switches** - Quantity per Gauge ..... Cable Entry: 3M Flying Lead  M20

**Transmitter Resolution:** 20mm  10mm  5mm  *(Reed chain transmitter)*

3mm  *(Guided wave radar transmitter)* 0.8mm  *(Magnetostrictive transmitter)*

Safe Area:  Hazardous Area:  E Exia  E Exd

Area Classification ..... Approval: ATEX  IEC EX  FM  CSA

Ambient Conditions *(Max. & Min Temp.)* .....

### ACCESSORIES

Vent Valve  *(Specify type)*..... Drain  *(Specify type)* .....

Paint finish *(Please specify)* .....

**Steam Heating:**  Insulation Jacket  Non-Frost Block  Temperatures -15°C and below

Graduated Scale St/Stl..... *(Please state inches or cms)*

### QUALITY REQUIREMENTS

**Non Destructive Tests:** Hydrostatic  Dye Penetrant (welds)%  X-Ray (welds)%

Positive Material I.D.  Base Materials Only  PMI of Welds

**NACE Compliance**  Specify NACE standard.....

### DOCUMENTATION REQUIREMENTS

**Manufacturing Procedures:** Welding Procedures ..... Hydrotest Procedure

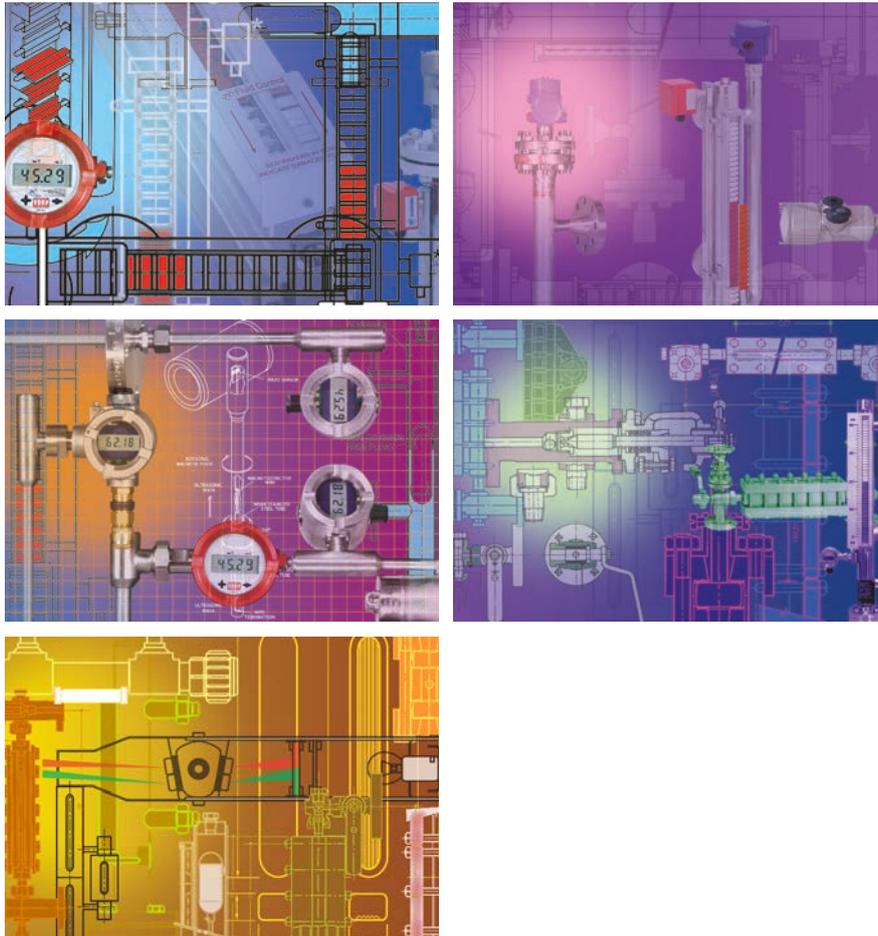
Document Schedule  G.A. Drawings  Production Schedule  Material Certs

IOM  Spares Quote  QA Plan  NDT Procedures *(Please sepecify)*.....

Manufacturing Record Book  Number of copies..... Format.....



# World leading liquid measuring instruments



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