Installation and Operating Instructions

TC FLUID CONTROL
A division of the WIKA group

Bypass Level Indicator. Magnetic Level Gauge. LevelSure Gauge

Revision 1 **27.07.2023**

WIKA
Smart in sensing

Contents

1 General information

- The WIKA Instruments Ltd. bypass level gauges described in this manual have been designed and manufactured to the relevant design code used as well as being compliant to the requirements as specified under the Pressure Equipment Directive 2014/68/EU for CE Marking or the Pressure Equipment Safety Regulations:2016 (UK SI 2016 No. 1105) for UKCA Marking.

- WIKA Alexander Wiegand SE & Co. KG, Alexander-Wiegand-Straße 30, 63911 Klingenberg, Germany is operating as an importer for WIKA Instruments Ltd and allows products of WIKA instruments Ltd available on the EU market within the meaning of the European Directives for CE marking. Additionally labelled will be fixed onto the product with the EU importer address along with the brand of WIKA Instruments Ltd.

- All components are subject to stringent quality controls during production against our quality management system certified to ISO 9001-2015. Welding quality system to EN 3834-2.

- These instructions contain important information covering the correct and safe use of the equipment when in service.

- It is the responsibility of the end user to observe any relevant international and local codes, laws, regulations, special requirements and any procedures for the safe use of this pressure equipment. Additional guidance is also given in the IOM.

- It is the user's responsibility to carry out their own risk assessment or to comply to own site standards. The user must take the necessary steps to ensure all modifications to hazardous area workplaces to the relevant standards.

- It is the responsibility of the end user to fit any rated isolation valves to aid safe removal and installations of the level gauge.

- These instructions should also be available for reference during the life of the equipment. Latest revisions may be downloaded from the WIKA Instruments Limited website.

- It is the end users responsibility to ensure that a competent person has read and understood these instructions prior to installation.

- It is the responsibility of the end user to fit an appropriate pressure relief safety device to protect against overpressure hazards.

- The general terms and conditions contained in the sales documentation shall apply.

- The level gauge must not be modified, as this will invalidate the warranty and or the product certification.

- Service life depends upon the combination of pressure / temperature, and the media. A majority of the gauges are constructed from stainless steel and should give a long service life due to concept of passive protection. The effects of chemical agents, corrosion and vibration are covered by the requirements of the PED 2014/68/EU / PE(S)R UKSI 2016:1105 Alternative materials can be supplied for certain arduous conditions. Check condition of the float and spring damper system (if fitted) periodically. Generally, service life for the gauge is 5 years unless otherwise specified (7000 cycles). It is recommended that the gauge system should be inspected on an annual basis. Inspect for corrosion and wear both internally and externally.

- All information and recommendations contained in this publication are to the best of our knowledge correct. Since conditions of use are beyond our control, user must satisfy them that the product is suitable for the intended processes and uses. No warranty is given or implied in respect of information or recommendations or that any use of products will not infringe rights belonging to other parties. In any event or occurrence, our liability is limited to our invoice value of the goods delivered by us to you. We reserve the right to change product designs and properties without notice.

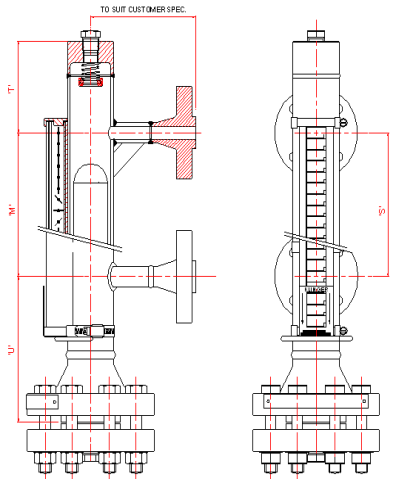
2 Design and Function

Under the requirements of the Pressure Equipment Directive (PED 2014/68/EU) or the Pressure Equipment Safety Regulations:2016, this Level Gauge cannot be classified as a pressure safety device. This equipment can only be used for liquid fluid level monitoring / measurement.

2.1 General description

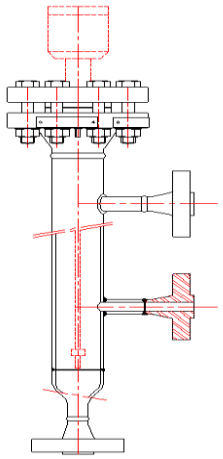
The level gauges system is designed to give an uninterrupted and immediate level indication for most liquids including steam condensate and arduous chemicals. The product range encompasses the magnetic level gauge configuration, instrument chambers and a combination of both, the LevelSure range. All products are fabricated from piping / tubing with standard pressure rated components and fitted with the appropriate ancillaries for indirect measuring.
A variety of accessories can be factory or retrofitted including transmitters and various switches with the appropriate approvals.

2.2 Principle of Operation – Magnetic Level Gauge, Type BNA



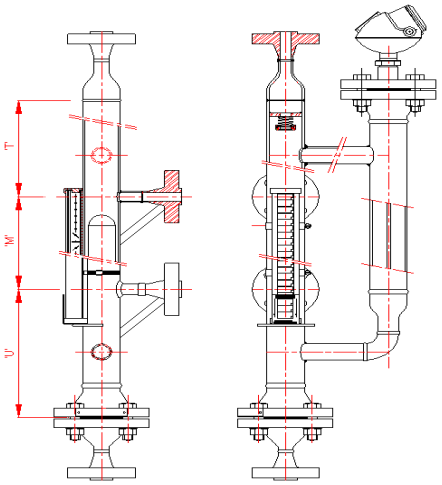
The magnetic level gauge system is designed to mimic a fluid level of a connecting vessel within a sealed chamber. A float system is fitted with a permanent omnidirectional magnet and moves freely inside the chamber and actuates a series of magnetised wafers within the indicator that is fixed on the outside of the chamber body.
As the float rises or falls with the liquid level, each wafer rotates 180° and exhibits a different coloured face. The wafers above the fluid liquid level will exhibit a white face, whereas the wafers below would indicate a red face. The indicator then presents a clearly defined liquid level within the chamber. The wafers can also resist accidental disturbance such as vibration due to their edge magnetisation and mutual attraction.

2.3 Instrument Chambers - Type BZG



The WIKA Instrument Chambers are used in conjunction with liquid level sensors and are designed to give an uninterrupted level indication of most liquids including steam condensate as well as arduous chemicals. For certain applications, it can also sense an interface level within the chamber.
The instrument chamber comprises of a sealed bridle / bypass arrangement fitted onto a vessel in which a variety of different liquid level sensors can be accommodated. The principle is dependent on the type of sensor fitted inside the chamber.
The unit is a fabricated welded construction of piping, flanges and pressure rated fittings and components.

2.4 LevelSure Chambers



The LevelSure system is the combination of a magnetic level gauge system with an instrument chamber. This can be a dual chamber configuration or an integral setup in which both the float system and level probe are incorporated into one chamber configuration. The electronic sensor can be: guided wave radar, tuning fork or capacitive technology, which can include various electrical outputs, approvals including functional safety - Please refer to the relevant transmitter documentation for details.

2.5 Certificate of Conformity

Level gauges are manufactured in accordance to the requirements as specified in the

- PED - Pressure Equipment Directive 2014/68/EU covering Modules B+D, or
- PE(S)R - Pressure Equipment Safety Regulations (UK SI 2016 No. 1105) covering Modules B+D.
  For dual labelling, the product must comply with the requirements of PED and PE(S)R.

and where applicable, the level gauge also complies to

- ATEX Directive 2014/34/EU for Non-Electrical Equipment.
- UKEx for Non-Electrical Equipment.
- IECEx for Non-Electrical Equipment.

Pressure Accessories:

Market:	EU Market	Great British Market
Directive / Regulations	PED - Pressure Equipment Directive 2014/68/EU	PE(S)R - Pressure Equipment Safety Regulations:2016 (UK SI 2016 No. 1105)
Conformity Assessment Modules	Up to and including Category IV	Up to and including Category IV
Modules:	**B + D**	**B + D**
Marking: (only applicable for equipment as evaluated from the PED /PE(S)R conformity assessment procedure)	CE	UK CA
Certification: (Category II, III, & IV Equipment)	EU Certifications of Conformity EU Type Examination Certificate – Production Type	Certifications of Conformity Type Examination Certificate – Production Type
Notified / Approved (CAB) Number: (Category II, III, & IV Equipment)	0343	0038
Notified / Approved Body:	Notified Body	Approved Body
Notified / Approved Body:	LRQA Nederland BV	LRQA Verification Ltd.
EU Importer	WIKA Alexander Wiegand SE & Co KG	-

Refer to the Declaration of Conformity or the Certificate of Conformity supplied with goods, covering the respective compliance detailing.

2.5.1. Design codes

Design codes employed for the construction for the level gauges are in accordance with either:

- ASME B31.3 (Process piping),
- ASME B31.1 (Power piping),
- AD2000 Merkblatt code.

Each design code will have certain limitations with the selection of the material choice. Check with the WIKA sales office.

2.6 Type of Pressure Equipment

Under the PED 2014/68/EU or the PE(S)R:2016 classification and the conformity assessment, this equipment falls under 'Pressure Accessories'**.** Both 'Vessels' and 'Piping' are considered and the higher of the two categories assessed is taken.

3 Safety

3.1 The following symbols are used in these operating instructions:

Warning: If ignored injury or damage to property can occur.

Danger: If ignored serious injury or damage to property can occur.

Caution: Failing to comply with these instructions can lead to malfunction or damage to the Level Gauge.

Ex Applications
Instructions that must be complied with when the unit is used in potentially explosive environments and to meet the requirements of the EU / UK type examination or IECEx certificate

Information
Facts and information concerning proper operation of the Level Gauge

Instructions for electrical installation
Information covering compliant electrical installation required.

Safety information

3.2 Intended Use

- Read these instructions before installation and putting into operation.
- Installation, commissioning and maintenance should only be carried out by suitably qualified personnel in conjunction with these instructions.
- Comply with the relevant safety regulations when using the equipment.
- Measures must be taken to prevent risks to persons and property in the event of a defect.
- Do not operate the level gauge in the immediate vicinity of strong electromagnetic fields (minimum distance: 1 m) as this may give rise to incorrect readings.
- Do not operate the level gauge instrument in direct vicinity of ferromagnetic environments (minimum distance 50 mm)
- Ensure vent and drain plugs / fittings are sealed prior to service. Check for tightness.
- It is recommended that the gauge system should be inspected periodically depending on use & service conditions. Inspect for corrosion and wear both internally and externally & condition of any float.
- When the level gauge instrument is used in a hazardous area, ensure that the gauge fitted is compliant with the appropriate certification.
- When applicable, earth bond appropriate equipment / ancillaries to comply with ATEX requirements.
- Remove the float when pressure testing the gauge or complete system.
- Ensure the gauge is protected from impact, any external loadings or vibration.
- Care must be taken from potential risk of sparking of titanium gauges from impacts.
- Ensure correct gaskets/seals are fitted and are compatible with the media and process conditions. Ensure the correct torque is applied to the appropriate bolting.
- This equipment must not be used as a support for other equipment or personnel.
- Where chamber supports are provided, ensure these are fixed accordingly.

3.3 Improper Use

- Ensure the level gauge instrument does not exceed the technical performance design parameters.
- Under the requirements of the Pressure Equipment Directive (PED 2014/68/EU) or the Pressure Equipment Safety Regulations:2016 (PE(S)R UKSI 2016:1105), the level gauge cannot be classified as a pressure safety device. This equipment can only be used for liquid fluid level monitoring and measurement.
- The maximum operating design conditions are specified on the tag plate and must not be exceeded. Exceeding these limits may lead to a failure of the chamber integrity and possible harm to persons/property.
- The gauge system must not be modified, as this will invalidate the certification.

3.4 Responsibility of the Client

- It is the responsibility of the client to ensure that the operating personnel have read and understood the content of this instruction manual.
- The material selection of the level gauge instrument must be suitable/ resistant for the media and environmental conditions.
- It is the client's responsibility to take appropriate measures to ensure no risk of over pressurisation of the level gauge in the event of an external fire.
- It is the client's responsibility to fit an appropriate pressure relief safety device within the system being monitored.
- It is the client's responsibility to ensure that the gauge is fitted to a vessel of a similar linear expansion rate. High differentials can cause additional stress exerted onto the nozzle connections. Consult WIKA Instruments Limited for alternative options.

3.5 Health and Safety

- Any work carried out on this equipment must be covered by a 'permit to work' procedure.
- Where there is a hazard or danger present, warning signs should be displayed according to the local and national standards. Any isolation device fitted must comply with these standards.
- The operators must use personal protective equipment (PPE) according to local circumstances, regulations or site requirements.
- Where design parameters allow the level gauge to operate at elevated temperatures, Measures should be in place protect the operator and to avoid contact with hot equipment.

4 Transport, packaging and storage

4.1 Transportation.

The shipment / transportation of level gauge/s should be kept in a clean dry and sheltered environment and not exposed to any adverse weather conditions. All gauges should be visually inspected upon receipt on site in order to access if any damage has occurred during shipment / transportation. Any such damage should be reported to WIKA Instruments Limited immediately.

4.2 Storage.

The level gauge should be stored indoors in its original packaging in a clean dry and sheltered ventilated area preferably between -40°C to +60°C.
It is recommended that the level gauge(s) is stored in their original packaging until ready for installation.

5 Commissioning, operation

5.1: Commissioning.

1. Installation and commissioning of the level gauge should only be carried out by qualified and experienced engineer/ personnel.
2. All cabling and electrical connections must be carried out in accordance with the regulations and standards applicable in the country where the equipment is installed and by qualified personnel.
3. It is recommended that isolation valves should be fitted between the gauge and the vessel. The selection of the gasket joints and fittings (bolting) to have the required corrosion resistance and rated accordingly.

5.2 Installation of the level gauge.

Before mounting the gauge into position, the following points should be taken into account.

1. Vessel connections on the vessel/tank must be vertically in line.
2. It is not recommended that connections are taken from inlet or discharge lines as excessive surging may occur within the gauge.
3. Centre to centre dimensions between vessel connections on the tank and gauge must be within 1.5 mm of each other.
4. Ensure connecting pipe work is adequately supported to reduce additional stress due to the gauge weight.

Fit the gauge to the vessel/tank using the appropriate rated fixtures and gaskets. Ensure that the gasket material is resistant to the media, temperature and its vapour. Make sure that the vessel flange bolting is tightened to the required torque value.
Optional extras such as the transmitter and switches are normally factory fitted onto the chamber. Switches can be adjusted accordingly.

5.2.1 Installation of Level Sensor (if not factory fitted)

Refer to the Level Sensor IOM / instructions for detailed assembly procedure:
General procedure is as follows;

1. Place a gasket on top of the instrument chamber flange.
2. Lower the sensor with flange/adaptor into the chamber.
3. Tighten the bolts as per bolt torque procedure (see Section 5.5) / screw unit in.
4. Connect housing unit as specified in respective IOM.

Ensure that any sensor probes do not come into contact with the inner wall of the instrument chamber. Ensure centralizing discs (where applicable) are fitted to aid centralisation. Also check that the probe does not touch the bottom of the instrument chamber (where applicable).
It is recommended that the setting up procedure is carried out prior to installation onto the vessel. Refer to the respective manual for the procedure. If required, a functional test also can be performed when fitted onto the vessel. Refer to section 5.8

5.2.2 Installation of standard floats.

Unpack the float from its protective case and proceed as follows:
It may be necessary to align the indicator wafers to represent their white face; this can be achieved by running a magnet along the length of the indicator unit. If a float failure warning indication is fitted, the bottom three wafers will show red. (Refer to the appropriate IOM sheets with regards to the setting up procedure required for the switches).

1. If the unit has been in service ensure it is free from internal pressure & adequately isolated
2. Remove the bottom flange from the chamber
3. Check that the float fits freely into the chamber. If bumper wires are fitted on the float, these can be pushed down to aid clearance. If there is insufficient clearance, please consult WIKA Instruments Limited.
4. Check that the specific gravity (SG) etched on the float is suitable for the media in question.
5. Clean the float of any adhering steel particles and install the float with the cap marked “TOP” uppermost in the chamber.
6. Replace the bottom flange and gasket. Bolt flange accordingly to the required torque value.

5.2.3 Installation of the Float – Up-side down gauges.

1. If the unit has been in service ensure it is free from internal pressure & adequately isolated
2. Remove the top flange from the chamber
3. Check that the float fits freely into the chamber. If bumper wires are fitted on the float, these can be pushed down to aid clearance. If there is insufficient clearance, please consult WIKA Instruments Limited.
4. Check that the specific gravity (SG) etched on the float is suitable for the media in question.
5. Check that the float has been fitted with a top ring or hook to aid lowering into the chamber.
6. Clean the float of any adhering steel particles and lower the float with the cap marked “TOP” uppermost in the chamber. Use an appropriate mechanism to aid lowering of the float without dropping.
7. Replace the top flange and gasket. Bolt flange accordingly to the required torque value.

5.2.4 Installation & inspection of special applications covering Vented Floats.

Vented float configurations are only used where sealed floats cannot achieve the required design pressure parameters. Care must be taken that the system environment does not change rapidly with pressure or surging fluctuations in order to prevent float collapse.

1. If the unit has been in service ensure it is free from internal pressure & adequately isolated
2. Site specific safety should be in place along with any risk assessment(s) before removing a float.
3. Before inserting a vented float into the chamber ensure the vent pipe is at the top & free from damage or blockage.
4. These floats must be checked periodically as part of a suitable maintenance programme for any fluid ingression and that the vent pipe system has not been compromised/blocked or restricted.
5. If build-up of product is anticipated or found during maintenance in the vent tube the product should be completely removed – if it cannot be removed it is critical the floats are replaced at suitable intervals to ensure blockage of the venting system does not occur.
6. If ingress of media is found within the float, it should be evacuated to ensure correct operation.
7. Exercise caution when removing the float from the level gauge due to remote possibility that the float has retained internal pressure due to the vent system being blocked or restricted.

5.3 Bolt Torque.

Nominal Chamber Size	Gasket Type	Bolt Material Grade	ANSI 150	ANSI 300	ANSI 600	ANSI 900	ANSI 1500	ANSI 2500
2”	Reinforced graphite Laminate	ASTM A193 B8 Cl.1 ASTM A194 Gr. 8	5/8” UNC 57 Nm	5/8” UNC 57 Nm	5/8” UNC -	7/8” UNC -	7/8” UNC -	1” UNC -
2-1/2”			5/8” UNC 57 Nm	¾” UNC 102 Nm	¾” UNC -	1” UNC -	1” UNC -	1 1/8” UNC -
3”	PSM or		5/8” UNC 57 Nm	¾” UNC 102 Nm	¾” UNC -	¾” UNC -	1 1/8” UNC -	1 1/4” UNC -
4”	Glass fibre + NBR binder		5/8” UNC 57 Nm	3/4” UNC 102 Nm	7/8” UNC -	7/8” UNC -	1 1/8” UNC -	1 1/2” UNC -
2”	Stainless Steel RTJ	ANSI 300 to ANSI 900 ASTM A193	5/8” UNC -	5/8” UNC 101 Nm	5/8” UNC 114 Nm	7/8” UNC 278 Nm	7/8” UNC 348 Nm	1” UNC 519 Nm
2-1/2”	or	B8.Cl.2 ASTM A194 Gr. 8 or	5/8” UNC -	¾” UNC 175 Nm	¾” UNC 175 Nm	1” UNC 415 Nm	1” UNC 467Nm	1 1/8” UNC 813 Nm
3”	Spiral wound 316/ Graphite (SWJ)	ANSI 600 to ANSI 2500	5/8” UNC -	¾” UNC 175 Nm	¾” UNC 197 Nm	7/8” UNC 348 Nm	1 1/8” UNC 739 Nm	1 1/4” UNC 1014 Nm
4”		ASTM A193 B7 ASTM A194 2H	5/8” UNC -	3/4” UNC 184 Nm	7/8” UNC 313 Nm	1 1/8” UNC 665 Nm	1 1/4” UNC 1014 Nm	1 1/2” UNC 1927 Nm
2”	Graphite Laminate Gasket	Bolting: ASTM A193 B8 Cl.2	5/8” UNC 101 Nm	5/8” UNC 101 Nm	5/8” UNC 114 Nm	7/8” UNC -	7/8” UNC -	1” UNC -
2-1/2”	SLS / PSM	Nuts ASTM A194 Gr. 8	5/8” UNC 101 Nm	¾” UNC 175 Nm	¾” UNC 175 Nm	1” UNC -	1” UNC -	1 1/8” UNC -
3”			5/8” UNC 127 Nm	¾” UNC 175 Nm	¾” UNC 197 Nm	7/8” UNC -	1 1/8” UNC -	1 1/4” UNC -
4”			5/8” UNC 96 Nm	3/4” UNC 175 Nm	7/8” UNC 313 Nm	1 1/8” UNC -	1 1/4” UNC -	1 1/2” UNC -
2”	Glass fibre + NBR binder	Bolting: ASTM A193 B8 Cl.2	5/8” UNC 101 Nm	5/8” UNC 101 Nm	5/8” UNC 114 Nm	7/8” UNC -	7/8” UNC -	1” UNC -
2-1/2”	KlingerSil	Nuts ASTM A194 Gr. 8	5/8” UNC 101 Nm	¾” UNC 175 Nm	¾” UNC 175 Nm	1” UNC	1” UNC	1 1/8” UNC -
3”			5/8” UNC 127 Nm	¾” UNC 175 Nm	¾” UNC 197 Nm	7/8” UNC -	1 1/8” UNC -	1 1/4” UNC -
4”			5/8” UNC 96 Nm	3/4” UNC 175 Nm	7/8” UNC 313 Nm	1 1/8” UNC -	1 1/4” UNC -	1 1/2” UNC -

Note:

- For ANSI 150 and 300 or similar, low strength bolting is recommended due to risk of flange rotation and gasket requirements
- Table covers bolt Co-efficient of 0.12. Torque 1 Nm. = 0.737562 ft-lb.
- Torque values are indicative and for general-purpose applications. Minimum Values stated are for guidance only.
- Re-torque as required for high temperature or cyclic applications.
- Always refer to the gasket manufacturer’s recommendations covering specific sealing requirements for the given gasket type and configuration.

5.4 Bolting.

ASTM Bolt Specification and Grade	Nut Specification and Grade	Type Table 1B ASME B16.5	Remarks	Tensile PSI	Yield PSI	Torque Values
ASTM A193 B7	ASTM A194 Gr. 2H	High Strength	Quenched & Tempered up to 2 ½"	125,000	105,000	As per ASTM A193 B7
ASTM A193 B7M	ASTM A194 Gr.2HM	Intermediate Strength		100,000	80,000	As per ASTM A193 B7
ASTM A320 L7	ASTM A194 Gr.4	High Strength	Low Temperature Service	125,000	105,000	As per ASTM A193 B7
ASTM A320 L43	ASTM A194 Gr.4/7	High Strength	Low Temperature Service	125,000	105,000	As per ASTM A193 B7
ASTM A193 B8 Cl.2	ASTM A194 Gr. 8	Intermediate Strength	Up to ¾"	125,000	100,000	-
ASTM A193 B8 Cl.2	ASTM A194 Gr. 8	Intermediate Strength	3/4" up to 1"	115,000	80,000	-
ASTM A193 B8 Cl.2	ASTM A194 Gr. 8	Intermediate Strength	1" up to 1 ¼"	105,000	65,000	-
ASTM A193 B8M Cl.2	ASTM A194 Gr. 8M	Intermediate Strength	Up to ¾" SS316	110,000	95,000	-
ASTM A320 B8 Cl.1	ASTM A194 Gr. 8	Low Strength	Carbide solution treated	75,000	30,000	-
ASTM A320 B8M Cl.1	ASTM A194 Gr. 8	Low Strength	SS316	110,000	95,000	-

5.5 Guidance Notes

1. Values are based on lubricated bolts (unless otherwise stated), fitted with corresponding nuts. Values are the minimum torque required to ascertain a seal. Please note that the final torque required to seal the gasket joint may vary greatly due to the effects of temperature, corrosion, level of lubrication and thread finish (higher torque values would be applied for non-lubricated bolting). When significant external mechanical or thermal loads are imposed on the flange joint, additional evaluation by an engineer may be required.
   Applied torque should not exceed 90% of the minimum ASME B31.3 specified Yield Strength.
2. The use of lubricants with a lower coefficient of friction lower than 0.11 can lead to excessive stress applied by wrenches or torque wrenches, and yielding or failure of flanges or bolting may result.
3. When significant external mechanical or thermal loads are imposed on the flange joint, additional evaluation by an engineer may be required. Applied torque should not exceed 90% of the minimum ASME B31.3 specified Yield Strength.
4. For alternative flanging, bolting and gasket configurations, consult WIKA Instruments Limited for advice.
5. Check the flange assembly alignment prior to re-assembly.
6. Bolts should be progressively tightened in a star pattern to ensure even gasket loading. The load should be applied in three stages, representing 30%, 60%, and 100% of the target torque values.

Flange Details	Bolting sequence- bolts numbered clockwise around the flange
4 Bolt Flange	1, 3, 2, 4.
8 Bolt flange	1, 5, 3, 7, 2, 6, 4, 8.
12 Bolt flange	1, 7, 4, 10, 2, 8, 5, 11, 3, 9, 6, 12.

7. Following the first torque pass, confirm that the flanges are parallel.
8. The information given in the above table should only be used as a guideline and are not mandatory.
9. The above table is based on ASME B16.5 flanges with designated sized bolts.
10. Torque tolerances: ± 2 ft-lb if torque value is less than or equal to 50 ft-lb
    ± 4 ft-lb if torque value is less than or equal to 100 ft-lb.
    ± 4 % if torque value is greater than 100 ft-lb.

11. Ensure all bolting is tightened to the required torque prior to bringing into service. It is recommended to re-tighten bolt/studs to the correct torque value after 24 hours in service when permissible.
12. Maximum and minimum service temperatures of the flange configuration are restricted by the materials selected (bolting and flanges).

5.6 D130 Chamber Flange.

Gauge Configuration	Bolt Specification and Grade	Nut Specification and Grade	Type	Remarks	Tensile N/mm²	0.2% Proof stress N/mm²	Gasket Joint Type	Torque Values μ = 0.1	Torque Values μ = 0.3
Type BNB Designed to AD20000 code	A4-70 M16 x 70 DIN 931	A4-70 M16 DIN 934	Intermediate Strength	Austenitic 316 Stainless Steel	700	450	Reinforced graphite Laminate. PSM or Klinger C4500	50 Nm 37 ft-lb	88 Nm 65 ft-lb

5.7 Vent and Drain Plugs.

Torque installation of pipe fittings is not a recommended practice. Thread taper and quality, fitting materials and varying thread sealants reduce the reliability of a torque connection.
Tighten the plug to the correct turns Past Finger Tight position. The applied torque should be in the region in the table below.

Plug Description	Dash size	Flank Angle	Turns Past Finger Tight - Turns	Total Thread Engagement - Turns	Suggested Torque Values with Sealant	Suggested Torque Values Without Sealant
½" BSPT R1/2" – 14 TPI British Standard Pipe Tapered	-	55º	2 to 3.0	3.5 to 6	27 to 47 Nm 20 to 35 ft-lb	47 to 60 Nm 35 to 45 ft-lb
¾ " BSPT R ¾ " – 14 TPI British Standard Pipe Tapered	-	55º	2 to 3.0	3.5 to 6	47 to 60 Nm 35 to 45 ft-lb	60 to 75 Nm 45 to 55 ft-lb
½" NPT 14 TPI American Standard Pipe Taper Thread	-08	60º	1.5 to 3.0	3.5 to 6	27 to 47 Nm 20 to 35 ft-lb	47 to 60 Nm 35 to 45 ft-lb
¾" NPT 14 TPI American Standard Pipe Taper Thread	-12	60º	1.5 to 3.0	3.5 to 6	47 to 60 Nm 35 to 45 ft-lb	60 to 75 Nm 45 to 55 ft-lb

Pipe thread fittings seal using a metal to metal connection. The metal of the plug and female fitting deforms during installation to create this seal. As a result, pipe thread connections tend to leak after a connection is made, then disassembled, and re-assembled. If the connection leaks after re-assembly, you may need to replace the plug. Continuing to tighten the connection will not necessarily eliminate the leak and can easily result in galling / stripping of the thread.

When appropriate, use a liquid thread sealant for connections in preference to Teflon tape.
The advantage of Teflon tape (when suitable) acts as a lubricant and reduces the risk of galling of the material when tightening the two respective threads. It also fills any voids that may cause leakage. Great care must be taken not to over-tighten the connection.

5.8 Functional Testing of the Gauge.

Before bringing the level gauge into service, it is advisable to carry out a functional test especially when switches and/or transmitter are fitted.

1. Ensure that the gauge system is isolated from the vessel.
2. Wire in any switches and/or transmitter as required following the correct electrical procedures.
3. The level within the gauge can be imitated by pouring water or a suitable media into the chamber via the top vent.
4. Make appropriate checks covering the performance of any ancillaries and indicator operation.
5. Open the drain/drain valve and allow the water/suitable media to run out, thus simulating a falling level.
6. Check ancillaries and the indicator unit accordingly.
7. Close vent and drain.

5.9 Bringing into service.

Prior to bringing into service / commissioning, all bolting, plugs, ancillary components, thread seals are check for tightness.
If there are no isolation valves fitted between the level gauge and vessel, then the gauge will automatically be brought into service along with the vessel.

When isolation valves are fitted, the procedure is as follows;

1. Allow time for the gauge to reach the operating temperature.
2. Ensure vent and drain connections are shut off.
3. **Slowly** open the isolation valve fitted to the **upper** vessel connection.
4. **Slowly** open the isolation valve fitted to the **lower** vessel connection. This will allow the liquid level to rise in the gauge chamber thereby rotating the wafers to indicate red.

The actual liquid level is shown by the red/white wafer interface.

5.10 High / Low temperature Service

For a level gauge operating above 130ºC or below 0ºC, insulation is fitted between the indicator unit and the gauge body. The level of insulation is dependent upon the temperature. This must be re-fitted whenever the indicator display is removed and replaced.

6 Faults

6.1 TROUBLE SHOOTING GUIDE

Problem	Possible cause	Action/ rectification procedure
Float fails to raise or fall	Isolation valves closed.	Open slowly as appropriate as per procedure 5.8.
	Blockage in the connecting pipe-work.	Clean blockage as required
	Float sticking in chamber.	Remove the float as per procedure 8.2 Check clearance between the bumper wires and the chamber bore. If insufficient clearance, push the bumpers down flat to aid clearance.
		Check that there is no sediment, scale or solidification of the media built up inside the chamber.
	Float damaged.	Check for puncture and ingress of media into float.
	Incorrect SG float used.	Check that the SG range etched on the float matches the corresponding media SG
Incorrect level is displayed.	The SG of the float differs to that of the media.	Check that the SG range etched on the float matches the corresponding media SG
	The float has been incorrectly installed upside down	Remove the float and replace with the top end uppermost in the chamber.
Banks or clusters of wafers are not turning.	The media has surged thus causing the float within the chamber to travel at abnormally high speed thus 'missing' the magnetic field of the wafers.	Reduce surging by fitting orifice plates or throttling the vessel valves accordingly.
	Damaged float magnet.	Replace with new float. Carry out functional test as per procedure 5.8
Inverse wafer operation.	Indicator unit upside down.	Check orientation of indicator. Note that 'top' is stamped on end cap of indicator.
Wafers in the indicator have discoloured.	Maximum temperature on the gauge tag plate has been exceeded.	Heat shield/s is required. If already fitted, then the insulation specification needs to be increased. Replace indicator if required.
	Heat shields have been removed and not replaced	Refit insulation between display and chamber. Replace indicator if required.
Loss of Display	Insufficient magnetic field from the float to activate the wafers in the display unit. Faulty Float. Excessive insulation used.	Check 'Damaged Float Panel' fitted on the indicator display. A larger magnet system may be required, consult WIKA Instruments Limited technical sales. If an insulation jacket is fitted, check that the indicator unit is fitted where the thickness of the jacket is reduced

7 Maintenance and cleaning

7.1 Maintenance

- No maintenance is required other than periodic inspection to ensure that the chamber is free from any foreign particles, sediment or scale build up, etc. allowing free movement of the float (see section 5.2.4 for additional requirements on vented floats). Freedom of float movement & operation may be checked by momentarily opening the drain valve if fitted, (depending upon the process, the isolation valve may have to be closed. Follow the procedure 5.9 Bringing into service). A drop in the indicated level will demonstrate that the float is free.
- A damaged or punctured float will sink and this would be indicated by the bottom three wafers changing colour (when warning panel fitted). In this event, the float must be replaced.
- Where integral level transmitters are fitted, refer to the separate IOM for details

7.2 Cleaning

- Prior to cleaning, isolate the gauge. Allow to cool (refer to section 8)
- Use an appropriate cleaning agent.

7.3 Steam application Blow down

- If the level gauge is subjected to a “blow down procedure”, refer to section 8.2 to remove the float. Re-commission the level gauge and carry out the blow down procedure. Upon completion, isolate the gauge, replace the float and re-commission the gauge

8 Removal of gauge, return and disposal

8.1 Removal of the gauge.

1. Isolate the gauge from the source of pressure/media by closing the appropriate isolation valves.
2. Relieve the gauge of any internal pressure and fluid contents by opening the drain valve. Ensure all safety precautions are in place for safe disposal of the contents. Time must be allowed for the gauge and contents to cool prior to this operation.
3. **Warning:** The pressurised level gauge or float may contain potential hazardous fluids. Wear appropriate protective clothing.
4. When the gauge has cooled / safe to handle, isolate and remove any ancillary equipment.
5. Dismantle respective vessel connections and remove the gauge.
6. If the gauge chamber is to be returned to WIKA Instruments Limited, it is the responsibility of the user to ensure that the chamber is clean and safe to handle without any special precautions. WIKA Instruments Limited must be contacted prior to the return of the chamber and any associated ancillaries (where applicable). WIKA Instruments Limited reserves the right to charge the user for safe disposal if these precautions are not adhered too.

8.2 Removal of the float.

1. Isolate the gauge from the source of pressure/media by closing the appropriate isolation valves.
2. Relieve the gauge of any internal pressure and fluid contents by opening the drain valve. Ensure all safety precautions are in place for safe disposal of the contents. Time must be allowed for the gauge and contents to cool prior to this operation.
3. When the gauge has cooled, remove the bottom flange.
4. Remove the float. For up-side down gauges, use a hook to extract the float.
5. Special Vented floats - When fitted, care should be exercised when removing a vented float from the chamber ensuring the vent pipe is not blocked and pressurised. **See section 5.2.4 for additional requirements.**

Warning:
When removing the float in a hazardous environment, ensure the float does not drop out of the gauge onto any hard surface. Take appropriate measures to reduce the risk of sparks caused by impacts especially in a potentially explosive atmosphere.

8.3 Disposal or Returns:

Disposal or return of this equipment should be in accordance to regional / national guidelines or directives. Ensure that there is no residue remaining within the gauge that could cause possible harm.

9 Spares

9.1 Spares.

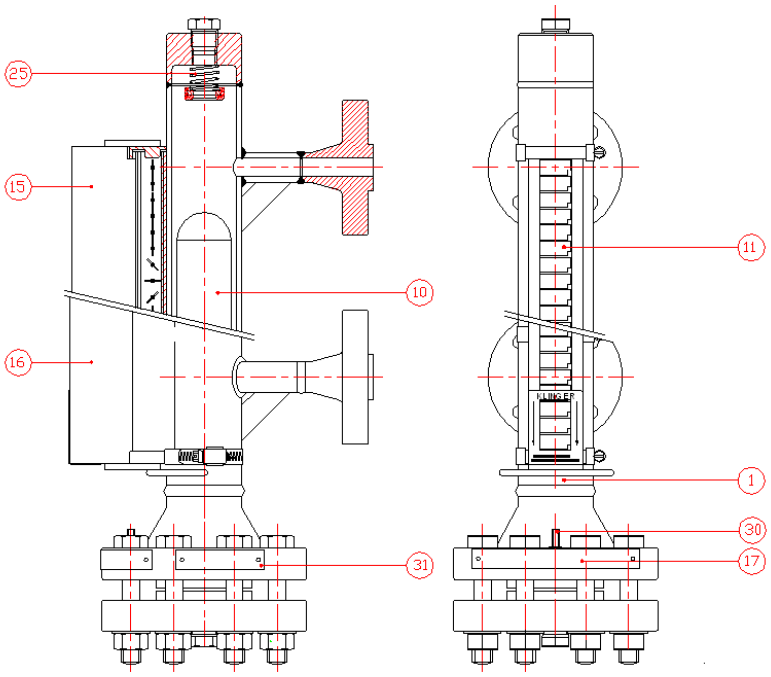
All replacement components must be genuine WIKA Instruments Limited spares. When ordering, the WIKA Job / order number including the tag number should be quoted. This information can be found on the nameplate which is normally fitted onto the bottom flange or the chamber body.

10 ATEX/ IECEx/ UKEX Applications

10.1 Gauges subjected to EU Directive 2014/34/EU (ATEX), UKEX or IECEx requirements

Where the level gauge is used in a potentially explosive atmosphere, protection concept ‘c’ constructional safety covering non-electrical equipment used in potentially explosive atmospheres as defined by EU directive 2014/34/EU, The gauges can be manufactured to be suitable for all ATEX, UKEX categories and IECEx EPL as marked on the equipment label.

	ATEX	EPL	IECEx
Category 1	SIRA 04ATEX6126	II 1 G Ex h IIC T1 to T6 Ga or II 1 G Ex h IIB T1 to T6 Ga	IECEx SIR 20.0005X
Category 1/2	SIRA 04ATEX6126	II 1/2 G Ex h IIC T1 to T6 Ga or II 1 G Ex h IIB T1 to T6 Ga/Gb	IECEx SIR 20.0005X
Category 2	SIRA 15ATEX6065X	II 2 G Ex h IIC T1 to T6 Gb or II 2 G Ex h IIB T1 to T6 Gb	IECEx SIR 20.0005X
Category 3	SIRA 15ATEX6065X	II 3 G Ex h IIC T1 to T6 Gc or II 3 G Ex h IIB T1 to T6 Gc	IECEx SIR 20.0005X



ITEM Number	DESCRIPTION
1	Magnetic Level Gauge Body
10	Sealed Float Unit
11	Indicator Display Unit
15	Non Frost Block
16	Stainless steel Cladding
17	PED or PE(S)R label
25	Cushioned / Non cushioned springs fitted top and bottom
30	M6 x 15 mm long Earth Post
31	ATEX/ IECEx / UKEX Label

For Cat1/2 (EPL Ga/Gb) applications, the equipment may be fitted across the boundary between a Zone 0 and a Zone 1. In this circumstance, the Category 2 (EPL Gb) requirements only apply to the indicator.

10.1.1 Instrument Chambers subjected to ATEX / IECEx / UKEX requirements

An instrument chamber is outside the scope of ATEX as there is no “self-source of ignition”. However by fitting an instrument (hazardous area approved) onto the gauge, the configuration then becomes an assembly, therefore considerations must be made for both approved and non-approved parts.

10.2 Temperature class

Relationship between ‘T’ rating Temperature class and Process Temperatures for Non-Electrical Equipment. Level Gauges only.

Temperature Class	Process Temperature
T1	≤ 450ºC
T2	≤ 300ºC
T3	≤ 200ºC
T4	≤135ºC
T5	≤ 100ºC
T6	≤ 85ºC

The operating conditions for the level gauge chamber only and must not exceed the maximum process temperature shown in the above table for a given ‘T’ rating. Also, refer to any ancillaries fitting and their respective IOM covering limitations of use.

10.3 Conditions for safe use

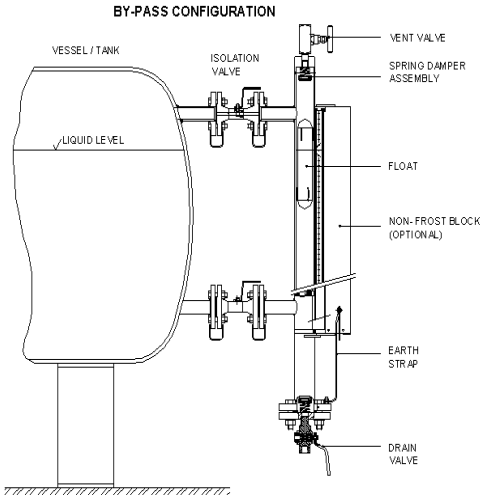
1. When Non-frost blocks are fitted, the gauge and the Non-frost block side plates must be earth bonded.
2. For ATEX categories 1 and 2 (EPL Ga and Gb), when titanium floats are fitted, damper springs / buffer bars must be fixed top & bottom in the gauge.
3. Clean the non-frost block vision panel only with a damp cloth.
4. Limit the maximum float velocity under surging conditions to 1 m/s by fixture the appropriate flow restrictions.
5. For any surging conditions (stainless steel or titanium floats), spring buffer system must be fitted to category 1, 2 and 3 applications.
6. Check periodically the condition of the float and spring assembly. Follow procedures as stated for the removal of the float.

7. Refer to Section 12 covering the maximum process temperature for when fitted with a PTFE/Graphite spring damping system. Buffer bar are limited to ATEX category 2 and 3 (EPL Ga and Gb) applications only.
8. For process media, which are subjected to gassing off or surging due to temperature changes, it is recommended to fit insulation around the gauge body.
9. No tools that may cause a spark to be used in a potentially explosive atmosphere unless covered by a 'Permit to Work' system / risk assessment.
10. For electrical equipment such as transmitters or switches, refer to the respective IOM.
11. Use stainless steel clad display indicator units for ATEX category I (EPL Ga) applications.
12. For gauges fitted with a steam heating jacket, ensure that the maximum steam temperature is less than the process 'T' rated temperature.
13. Titanium floats must be carbon coated for hydrogen gas service.
14. Titanium Gauges - For ATEX category 2 or 3 (EPL Gb or Gc) applications, certain restrictions apply with regard to risk of ignition hazard due to an impact between the titanium and any ferritic material such as a hammer / wrench etc. Do not strike the outside of the gauge, (impact velocity must be less than 1 m/s and the maximum potential energy less than 500J). Ensure any liquid surging / float velocity within the gauge is less than 1 m/s. Ensure no contact with corroded rusty particles / iron oxide film. Use non-sparking metal tools. Carbon steel flanges are not permitted on titanium gauges.
15. If vented floats are used the float should be periodically checked as part of suitable maintenance program. See section 5.2.4 for additional guidance.
16. Where there is a risk that has been identified, all isolated metallic parts must be earth bonded. Refer to section 10.5.
17. The coding T1 to T6 Ga/Gb recognises that the equipment may be fitted across the boundary between a Zone 0 and a Zone 1. In this circumstance, the Category 2 (EPL Gb) requirements only apply to the indicator.
18. Any level gauge used for hydrogen service (i.e. ASME B31.12) must be earth bonding including any ancillaries, displays and spools attached.

10.4 Valves

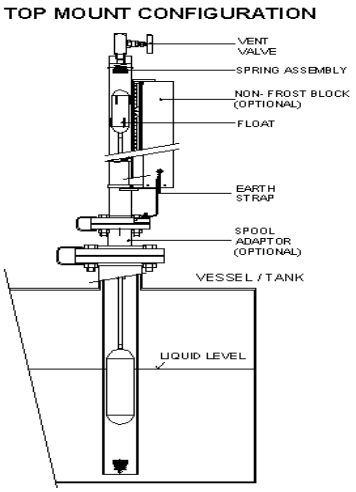
Manually operated vent, drain or isolation valves can be fitted to the gauge without any special requirements. Where there is potential for a build-up of static, charge due to the flow of the media through the valve the user should carry out an ignition risk assessment to ensure that no source of ignition will become active during operation.

1. The selection of the material used in the construction of the valve must be suitable / resistant for the media and operating conditions.
2. Any valve fitted must be pressure/temperature rated accordingly.
3. Valves to be sealed with the appropriate rated gasket or sealant as well as compatibility with the media.



10.5 Earth Bonding

1. It is the user's responsibility to earth bond the level gauge chamber configuration and any ancillaries fitted in a potentially explosive atmosphere.
2. It is the user's responsibility to carry out their own risk assessment or to comply to own site standards. The user must take the necessary steps to ensure all modifications to hazardous area workplaces to the relevant standards.
3. Recommended minimum earth cable size used = 16 mm^2.



10.6 Coatings – Coatings and paints

For ATEX/ IECEx/ UKEX applications where either the level gauge chamber or the indicator display is coated with a non-metallic material the following points should be noted.

- The gauge body must be connected to ground using the earth post provided.
- Where the surface resistance of the coating is > 1GΩ the maximum thickness is limited to 0.2mm for gas group IIC and 2mm for gas groups IIB and IIA.
- For static dissipative coatings or paints (Surface resistance < 1GΩ), there are no limitations on paint thickness.
- Thermally sprayed aluminium (TSA) coatings must be protected by a 'seal coat' with a maximum thickness of 0.2mm for gas group IIC and 2mm for gas groups IIB and IIA.
- Refer to Table 10.6 covering Non Anti-static Coatings ensuring preventing the build-up of an electrostatic charge for Group IIC.

Table 10.6 **Non Anti-static Coatings** **Group IIC**	**ATEX Category 1**	**ATEX Category 2**	**ATEX Category 3**
Compliance	Yes	Yes	Yes
Hazardous Area Zone	Zone 0	Zone 1	Zone 2
Equipment Protection Level	EPL Ga	EPL Gb	EPL Gc
Gas Group	Group IIC	Group IIC	Group IIC
Maximum total thickness of coating.		Less than 0.2 mm (200 microns)	Less than 0.2 mm (200 microns)
Breakdown voltage across layers		Less than 4kV	Less than 4kV
Surface resistance at 23±2°C and 50±5% humidity		Less than 1 G ohms	Less than 1 G ohms
Substrate		To be earth bonded	To be earth bonded

11 Ancillaries

11.1 Overhead Configuration

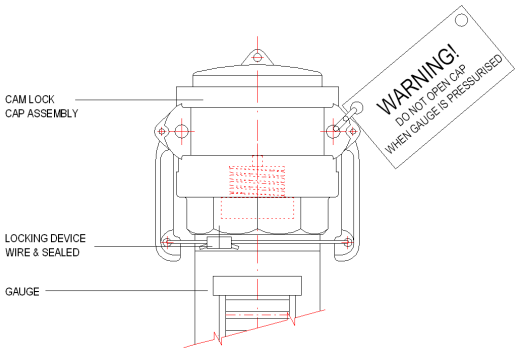
1. For low temperature applications below -50ºC, an overhead gauge configuration is recommended. Fitting of non-frost block is generally recommended and for ATEX compliance, earth bonding would be required.

11.2 Openings:

1. Ensure vent and drain plugs/fittings are sealed during service. Provisions should be made to stop any accidental venting to the atmosphere. Any removal of such devices must be re-installed.

11.3 Optional: Cam Lock fittings:

1. Follow the procedure as specified in Section 8 and allow the level gauge to cool.
2. Remove the locking device and warning label.
3. Open cam lock device. Ensure that the environment is suitable to carry out the required operation.
4. When closing the cam lock assembly, ensure that the locking device is replaced and attach the warning label.
5. Before returning the gauge to service, follow the procedure as specified in Section 5.
6. Cam lock assembly is locked into position via pins or wired and sealed as showed in the sketch.



11.4 Insulation Jackets.

Insulation jackets have a limited service temperature range from -60ºC to +250ºC. These are fabricated to suit a particular level gauge configuration. The construction of the jacket will have a reduced thickness panel in which the indicator display unit is located. When re-fitting an insulation jacket onto the level gauge, ensure that the indicator display unit is located back in its correct position otherwise there could be a risk of 'Loss of Display'.

12 ATEX / UKEX / IECEx Data Sheet

Parameter		Equipment Category 1 (EPL Ga)	Equipment Category 2 (EPL Gb)	Equipment Category 3 (EPL Gc)
Process parameters				
Equipment group		II	II	II
Level of protection		Very High	High	Normal
Zones Gas vapour mist		0	1	2
Process temperature range		Maximum & minimum temperature depends upon material selection. ATEX is limited to -150 ºC to 450ºC Note: maximum temperature also determined by 'T' rating, materials and any ancillaries fitted.	Maximum & minimum temperature depends upon material selection. ATEX is limited to -150 ºC to 450ºC Note: maximum temperature also determined by 'T' rating, materials and any ancillaries fitted.	Maximum & minimum temperature depends upon material selection. ATEX is limited to -150 ºC to 450ºC Note: maximum temperature also determined by 'T' rating, materials and any ancillaries fitted.
Label details				
Equipment Marking		II 1 G Ex h IIC T1 to T6 Ga or II 1 G Ex h IIB T1 to T6 Ga	II 2 G Ex h IIC T1 to T6 Gb or II 2 G Ex h IIB T1 to T6 Gb	II 3 G Ex h IIC T1 to T6 Gc or II 3 G Ex h IIB T1 to T6 Gc
Protection Concept		Constructional Safety 'c' to EN ISO 80079-37:2016		
CE / UKCA marked		Yes	Yes	Yes
ATEX Notified body No		SGS Fimko Oy 0598	No	No
UKEX Authorised body No		SGS Baseefa 1180	No	No
Certification Detail	ATEX	SIRA 04ATEX6126	SIRA 15ATEX6065X	
	UKEX	CSAE 21UKEX6060	CSAE 21UKEX6061X	
	IECEx	IECEx SIR 20.0005X	IECEx SIR 20.0005X	
Indicator details				
Display unit		Stainless steel clad	Aluminium Optional: Stainless steel clad	Aluminium Optional: Stainless steel clad
Non-Frost block fitted with stainless steel side cladding		Earth bonded to gauge body. User to connect to ground using the earth post provided, minimum 16mm^2 cable.		
Floats				
Use of titanium floats		Must be fitted with spring damping (cushioned)	Must be fitted with spring damping (cushioned)	Yes (spring damping optional)
Use of stainless steel floats		Yes	Yes	Yes
Use of plastic floats		No Permitted		
Spring damping system		Required if surging (float velocity) exceeds 1 m/s. Maximum process temperature PTFE/Carbon 260ºC, Graphite cushion 450ºC	Required if surging (float velocity) exceeds 1 m/s. Maximum process temperature PTFE/Carbon 260ºC, Graphite cushioned 450ºC.	Required if surging (float velocity) exceeds 1 m/s. Maximum process temperature PTFE/Carbon 260ºC, Graphite cushioned 450ºC.
Buffer bars (Alternative to springs when applicable)		No	Maximum process temperature PTFE/Carbon 260ºC.	Maximum process temperature PTFE/Carbon 260ºC.
Chamber				
Chamber Material		Austenitic stainless steel, super austenitic stainless steel and nickel based alloys. Titanium gauges not permissible.	Austenitic stainless steel, super austenitic stainless steel and nickel based alloys. Titanium Grade 2	Austenitic stainless steel, super austenitic stainless steel and nickel based alloys. Titanium Grade 2.
Vessel Flange Material		Carbon steel, duplex, austenitic stainless steel, super austenitic stainless steel and nickel based alloys.	Carbon steel, duplex, austenitic stainless steel, super austenitic stainless steel and nickel based alloys.	Carbon steel, duplex, austenitic stainless steel, super austenitic stainless steel and nickel based alloys.
Bottom chamber Flange Material		Carbon steel, duplex flanges, a spring damper must be fitted. Austenitic stainless steel, super austenitic stainless steel and nickel based alloys. Note: If float velocity exceeds 1 m/s a spring damper must be fitted	Carbon steel, duplex, flanges, a spring damper must be fitted. Austenitic stainless steel, super austenitic stainless steel and nickel based alloys. Note: If float velocity exceeds 1 m/s a spring damper must be fitted	Carbon steel, duplex, austenitic stainless steel, super austenitic stainless steel and nickel based alloys flanges. Note: If float velocity exceeds 1 m /s, a spring damper must be fitted.
Earth stud/bonding		Required if Non-frost block/s are fitted or coated gauge.		
Documentation				
Declaration of Conformity	ATEX	Yes EU Type Examination Certificate	Yes Type Examination Certificate	Yes Type Examination Certificate
	UKEX	Yes UK Type Examination Certificate	Yes Type Examination Certificate	Yes Type Examination Certificate
Harmonised / Designated Standards		EN ISO 80079-36:2016 EN ISO 80079-37:2016 EN IEC 60079-0:2018	EN ISO 80079-36:2016 EN ISO 80079-37:2016 EN IEC 60079-0:2018	EN ISO 80079-36:2016 EN ISO 80079-37:2016 EN IEC 60079-0:2018
Quality Assurance	ATEX	SGS Fimko Oy Notified Body No. 0598	-	-
	UKCA	SGS Baseefa Ltd Approved Body No.1180	-	-
	IECEx	SGS Baseefa Ltd	-	-
IOM		Yes	Yes	Yes

12 Data Sheet Notes:

1 For level gauges designed to ASME B31.3 covering Process piping, titanium floats must be carbon coated when a hydrogen gas may be present. Preferred option is the use Stainless steel floats

2 For saturated steam service only, the environment within the gauge will be non-hazardous regardless of the zone outside; a non-cushioned spring assembly can be fitted. (The maximum temperature is determined by 'T' rating, the material used and any ancillaries fitted).

3 Generally, the process temperature for a stainless steel float is limited to 450ºC and for standard range of grade 2 titanium float is restricted to 315ºC. Consult the technical sales office for temperatures outside specified range.

4 For low temperature applications, the indicator and non-frost block assembly must be insulated from the gauge body.

5 Magnetic level gauges fitted to Power boilers. Conditions and use for level gauge indication shall follow the rules and requirements as specified in ASME BPVC 1, all sections covered in PG-60 and PG-12.

13 Special conditions for safe use: (Indicated by an 'X' after certificate number)

1. For category 2 and 3 applications when the chamber body is manufactured from titanium the equipment must be protected by guarding or location to prevent the risk of impacts in service.

14 EU Importer

1. WIKA Alexander Wiegand SE & Co KG is operating as an importer for WIKA Instruments Ltd and allows products of WIKA Instruments LTD to be available on the EU market. Such products shall have an additional labelling fixed to the level gauge.

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Germany

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