**Installation and Operating Instructions**

FLUID CONTROL
A division of the WIKA group

# Bypass level indicator. Magnetic Level Gauge

**Revision E** **13.07.2018**

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# Contents

# 1 General information

- The bypass level indicators 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.

- All components are subject to stringent quality controls during production against our quality management system certified to ISO 9001. 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 local regulations subject to the pressure equipment.

- These instructions should also be ready available for reference during the life of the equipment. Latest revisions may be down loaded from the WIKA website.

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

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

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

- 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.

- 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. 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.

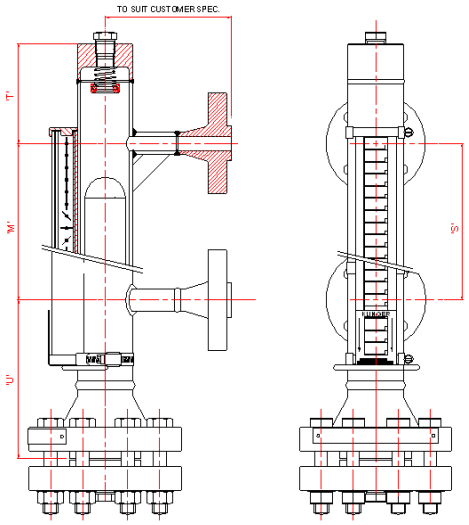
# 2 Design and Function

**Under the requirements of the Pressure Equipment Directive (PED 2014/68/EU), the Magnetic Level Gauge can't be classified as a pressure safety device. This equipment can only be used for liquid fluid level monitoring / measurement.**

## 2.1 General description

The WIKA level gauges are 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 level-sure 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 Gauges




The MLG system is designed to mimic a fluid level of a connecting vessel within a sealed chamber. A float system is fitted with a permanent omni-directional magnet and moves freely inside the chamber and actuates a series of magnetised wafers within the indicator which 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

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 Level-Sure Chambers

The Level Sure system is the combination of a magnetic level gauge system with an instrument chamber. This can be a dual chamber configuration and an integral setup in which both the float system and level probe are incorporated into one chamber configuration.

## 2.5 PED Approval – EU Certificate of Conformity

WIKA level gauges are manufactured in accordance to the requirements as specified in the Pressure Equipment Directive 2014/68/EU (Modules B+D) and where applicable to ATEX mechanical Directive 2014/34/EU.
Design codes used are in accordance to the requirements as specified in ASME B31.3 process piping / ASME B31.1 power piping under Lloyds Register (Notified Body Number 0038) or AD2000 code under TÜV (Notified Body Number 0036).
Refer to Declaration of Conformity supplied with completed order for full details.

## 2.6 Type of Pressure Equipment

Under the PED 2014/68/EU classification and conformity assessment, this equipment falls under **'Pressure Accessories'.** Both **'Vessels'** and **'Piping'** are considered and the higher of the two categories accessed 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 of or damage to the Level Gauge.

**Ex Applications**
Instructions which must be complied with when the unit is used in potentially explosive environments and to meet the requirements of the EC type examination 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 Magnetic 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 on an annual basis. Inspect for corrosion and wear both internally and externally.
- 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), the level Gauge can't be classified as a pressure safety device. This equipment can only be used for liquid fluid level monitoring / 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's

- It is the responsibility of the client's 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 Ltd. 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 wear protective clothes / 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.

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 magnetic 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 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 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 float.

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. Remove the bottom flange from the chamber
2. 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.
3. Check that the specific gravity (S.G.) etched on the float is suitable for the media in question.
4. Clean the float of any adhering steel particles and install the float with the cap marked “TOP” uppermost in the chamber.
5. Replace the bottom flange and gasket. Bolt flange accordingly to the required torque value.

### 5.2-2 Installation of float – Up-side down gauges.

- Remove the top flange from the chamber
- 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.
- Check that the specific gravity (S.G.) etched on the float is suitable for the media in question.

- Check that the float has been fitted with a top ring or hook to aid lowering into the chamber.
- 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.
- Replace the top flange and gasket. Bolt flange accordingly to the required torque value.

## 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. PSM | ASTM A193 B8 Cl.1 ASTM A194 Gr. 8 Un-lubricated - Maximum | 5/8” UNC 76 Nm 57 ft-lb | 5/8” UNC 76 Nm 57 ft-lb | - | - | - | - |
| 2” | Reinforced Graphite laminate. PSM | ASTM A193 B8 Cl.2 ASTM A194 Gr. 8 | 5/8” UNC 101 Nm 75 ft-lb | 5/8” UNC 101 Nm 75 ft-lb | 5/8” UNC 101 Nm 75 ft-lb | - | - | - |
| 2” | Spiral wound 316/graphite SWJ | ASTM A193 B8 Cl.2 ASTM A194 Gr. 8 | 5/8” UNC 101 Nm 75 ft-lb | 5/8” UNC 101 Nm 75 ft-lb | 5/8” UNC 114 Nm 84 ft-lb | 7/8” UNC 284 Nm 210 ft-lb | 7/8” UNC 355 Nm 262 ft-lb | 1” UNC 581 Nm 429 ft-lb |
| 2” | Stainless Steel RTJ | ASTM A193 B7 ASTM A194 2H (lubricated u = 0.12) | 5/8” UNC 101 Nm 75 ft-lb | 5/8” UNC 101 Nm 75 ft-lb | 5/8” UNC 114 Nm 84 ft-lb | 7/8” UNC 284 Nm 210 ft-lb | 7/8” UNC 355 Nm 262 ft-lb | 1” UNC 581 Nm 429 ft-lb |
| 2 1/2” | Reinforced graphite Laminate. PSM | ASTM A193 B8 Cl.2 ASTM A194 Gr. 8 | 5/8” UNC 101 Nm 75 ft-lb | 3/4” UNC 177 Nm 131 ft-lb | 3/4” UNC 177 Nm 131 ft-lb | - | - | - |
| 2 ½ “ | Spiral wound 316/graphite SWJ | ASTM A193 B7 ASTM A194 2H (lubricated u = 0.12) | 5/8” UNC 114 Nm 84 ft-lb | ¾” UNC 177 Nm 131 ft-lb | ¾” UNC 177 Nm 131 ft-lb | 1” UNC 423 Nm 312 ft-lb | 1” UNC 528 Nm 390 ft-lb | 1 1/8” UNC 771 Nm 569 ft-lb |
| 2 ½ “ | Stainless Steel RTJ | ASTM A193 B7 ASTM A194 2H (lubricated u = 0.12) | 5/8” UNC 101 Nm 75 ft-lb | ¾” UNC 177 Nm 131 ft-lb | ¾” UNC 177 Nm 131 ft-lb | 1” UNC 423 Nm 312 ft-lb | 1” UNC 475Nm 351 ft-lb | 1 1/8” UNC 848 Nm 626 ft-lb |
| 3” | Glass fibre + NBR binder | ASTM A193 B8 Cl.1 ASTM A194 Grade 8 | 5/8” UNC 76 Nm 57 ft-lb | ¾” UNC 135 Nm 100 ft-lb | - | - | - | - |
| 3” | Reinforced graphite Laminate. PSM | ASTM A193 B8 Cl.2 ASTM A194 Gr. 8 | 5/8” UNC 101 Nm 75 ft-lb | ¾” UNC 177 Nm 131 ft-lb | ¾” UNC 200 Nm 148 ft-lb | - | - | - |
| 3 “ | Spiral wound 316/graphite SWJ | ASTM A193 B7 ASTM A194 2H (lubricated u = 0.12) | 5/8” UNC 126 Nm 93 ft-lb | ¾” UNC 177 Nm 131 ft-lb | ¾” UNC 200 Nm 148 ft-lb | 7/8” UNC 355 Nm 262 ft-lb | 1 1/8” UNC 771 Nm 569 ft-lb | 1 1/4” UNC 1186 Nm 875 ft-lb |
| 3 “ | Stainless Steel RTJ | ASTM A193 B7 ASTM A194 2H (lubricated u = 0.12) | 5/8” UNC 101 Nm 75 ft-lb | ¾” UNC 177 Nm 131 ft-lb | ¾” UNC 200 Nm 148 ft-lb | 7/8” UNC 319 Nm 235 ft-lb | 1 1/8” UNC 771 Nm 569 ft-lb | 1 1/4” UNC 1078 Nm 796 ft-lb |
| 4” | Glass fibre + NBR binder | ASTM A193 B8 Cl.1 ASTM A194 Grade 8 | 5/8” UNC 76 Nm 57 ft-lb | 3/4” UNC 135 Nm 100 ft-lb | - | - | - | - |
| 4” | Reinforced graphite Laminate. PSM | ASTM A193 B8 Cl.2 ASTM A194 Gr. 8 | 5/8” UNC 101 Nm 75 ft-lb | 3/4” UNC 177 Nm 131 ft-lb | 7/8” UNC 319 Nm 235 ft-lb | - | - | - |
| 4” | Spiral wound 316/graphite SWJ | ASTM A193 B7 ASTM A194 2H (lubricated u = 0.12) | 5/8” UNC 114 Nm 84 ft-lb | 3/4” UNC 200 Nm 148 ft-lb | 7/8” UNC 355 Nm 262 ft-lb | 1 1/8” UNC 694 Nm 512 ft-lb | 1 1/4” UNC 1078 Nm 796 ft-lb | 1 1/2” UNC 2108 Nm 1556 ft-lb |
| 4” | Stainless Steel RTJ | ASTM A193 B7 ASTM A194 2H (lubricated u = 0.12) | 5/8” UNC 101 Nm 75 ft-lb | 3/4” UNC 177 Nm 131 ft-lb | 7/8” UNC 319 Nm 235 ft-lb | 1 1/8” UNC 694 Nm 512 ft-lb | 1 1/4” UNC 1078 Nm 796 ft-lb | 1 1/2” UNC 2108 Nm 1556 ft-lb |

**Note:**
Figures highlighted blue are reference only, For ANSI 150 and 300, low strength bolting is recommended due to risk of flange rotation and gasket requirements

## 5.4 Bolting.

| Bolt Specification and Grade | Nut Specification and Grade | Type Table 1B ASME B16.5 | Remarks | Tensile p.s.i | Yield p.s.i. | Torque Values (above Table) |
|---|---|---|---|---|---|---|
| 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 | 7/8" up to 1" | 125,000 | 80,000 | |
| ASTM A193 B8 Cl.2 | ASTM A194 Gr. 8 | Intermediate Strength | 1 1/8" 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 A193 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 | | | |

## 5.4 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. 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).

## 5.5 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 |

## 5.6 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** | | 55° | 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** | | 55° | 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 | 60° | 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 | 60° | 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 and 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.

## 5.7 Functional Testing of the Gauge.

Before bringing the magnetic 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.

## 5.8 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.

## 5.9 High / Low temperature Service

For 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 8.1. 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 S.G. float used. | Check that the S.G. range etched on the float matches the corresponding media S.G. |
| **Incorrect level is displayed.** | The S.G. of the float differs to that of the media. | Check that the S.G. range etched on the float matches the corresponding media S.G. |
| | 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 5.7. |
| **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.<br>If already fitted, then the insulation specification needs to be increased.<br>Replace indicator if required. |
| | Heat shields have been removed and not replaced | Refit insulation between display and chamber.<br>Replace indicator if required. |
| **Loss of Display** | Insufficient magnetic field from the float to activate the wafers in the display unit.<br>Faulty Float.<br>Excessive insulation used. | Check 'Damaged Float Panel' fitted on the indicator display.<br>A larger magnet system may be required, consult WIKA Instruments Ltd technical sales.<br>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 gauge is free from foreign particles, sediment or scale etc. Freedom of the float movement 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 5.8 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.

## 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 to remove the float. Re-commission the level gauge and carry out the blowdown 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 may contain potential hazardous fluids. Wear appropriate protective clothing.
4. When the gauge has cooled, 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 Ltd, it is the responsibility of the user to ensure that the chamber is clean and safe to handle without any special precautions. WIKA Instruments Ltd. must be contacted prior to the return of the chamber and any associated ancillaries (where applicable). WIKA Instruments Ltd. 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

**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.

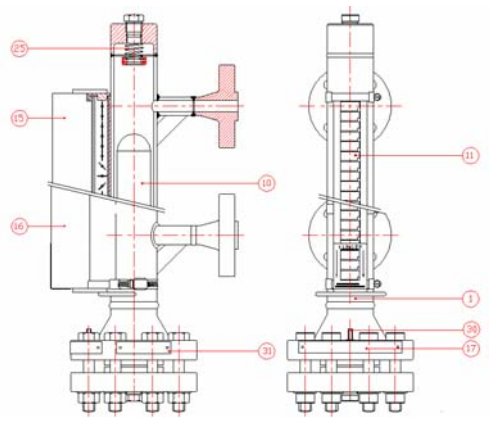
All replacement components must be genuine WIKA Instruments Ltd. spares. When ordering, the WIKA Instruments Ltd. Job / order number including the tag number should be quoted. This information can be found on

the nameplate which is normally fitted onto the bottom flange or the chamber body.

# 10 ATEX applications

## 10.1 Gauge subjected to ATEX requirements 2014/34/EU

The magnetic level gauge can be covered by EN 13463 for the use of non-electrical equipment for potentially explosive atmospheres as defined by EC directive 2014/34/EU, (Protection concept ‘c’ Constructional Safety). The gauges can be manufactured to be suitable for all ATEX categories.



| | |
|---|---|
| Category 1 | SIRA 04ATEX6126 |
| Category 1/2 | SIRA 04ATEX6126 |
| Category 2 | SIRA 15ATEX6065X |
| Category 3 | SIRA 15ATEX6065X |

| 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 label |
| 25 | Cushioned / Non cushioned springs fitted top and bottom |
| 30 | M6 x 15 mm long Earth Post |
| 31 | ATEX Label |

## 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 in ATEX category 1 & 2 applications, the gauge and the non-frost block must be earth bonded.
2. For ATEX categories 1 & 2, when titanium floats are fitted, damper springs / buffer bars must be fixed top & bottom in the gauge.
3. Clean 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 10 covering the maximum process temperature for ATEX categories 1, 2 and 3 applications when fitted with a PTFE/Graphite spring damping system. Buffer bar are limited to ATEX category 2 and 3 applications only.
8. For process media's 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 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 (PCVD) for hydrogen gas service.
14. Titanium Gauges - For ATEX category 2 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. Ensure the gauge is bonded. Although no special requirements are required for ATEX category 3, it is good practice to follow the guidelines as per Category 2 equipment.

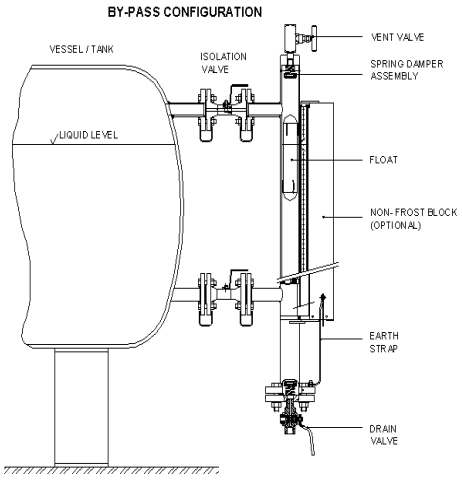
## 10.4 Ancillaries

- Where there is a risk that has been identified, all isolated metallic parts must be earth bonded. Refer to section 10.5.

## 10.4 Valves

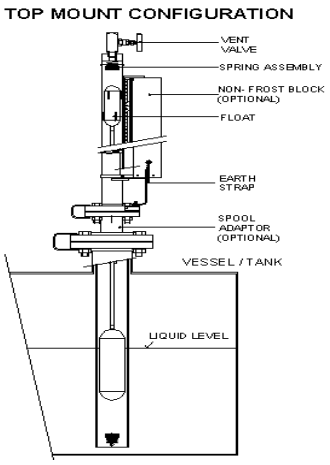
A 'simple' valve is defined as a valve where the only source of ignition is due to the static charge build up created by the flow of media through the valve and does not require any special earth bonding techniques. When such a valve is deemed outside the scope of the directive and is fitted onto the gauge, the user should still carry out an ignition risk assessment to ensure that no source of ignition will become active during operation.

1. General valves, cocks and ATEX compliant ball valves (manually operated) can be fitted on the gauge for category 1 & 2 applications.
2. The selection of the material used in the construction of the valve must be suitable / resistant for the media and operating conditions.
3. Flanged valves must be earth bonded for ATEX Category 1 & 2 applications or when appropriate.
4. Any valve fitted must be pressure/temperature rated accordingly.
5. 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 – Antistatic coating and paints EN 13463

For ATEX applications where either the magnetic level gauge chamber or the indicator display is coated with non-antistatic paint, the following points should be noted.

| Non Anti-static Coatings<br><br>Group IIC | ATEX Category 1 | ATEX Category 2 | ATEX Category 3 |
|---|---|---|---|
| Compliance | Magnetic level gauges / equipment can't be supplied coated under this scope. | Yes | Yes |
| Hazardous Area Zone | Zone 0 | Zone 1 | Zone 2 |
| Maximum total thickness of coating for Group II Gas group | | 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 ± 2ºC and 50±5% humidity | | Less than 1 G ohms | Less than 1 G ohms |
| Substrate | | To be earth bonded | To be earth bonded |

- For static dissipative coatings or paints, there are no limitations on paint thickness. Earth bonding would still be recommended.
- For Gas groups IIA and IIB, the maximum coating / painted thickness is limited to 2 mm. Note: appropriate labelling required.

# 11 Ancillaries

## 11.1 Overhead Configuration

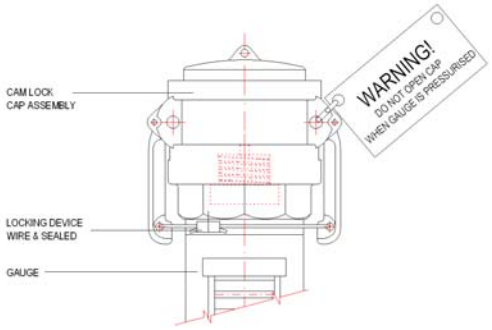
1. For low temperature applications below -50ºC, an overhead gauge configuration is recommended. Fitting of non-frost block is generally recommended and for ATEX compliance, earth bonding would be required.

## 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 magnetic 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 service temperature range from -60ºC to +250ºC and are fabricated to suit a particular magnetic 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 magnetic 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 Data Sheet

| Parameter | Equipment Category 1 | Equipment Category 2 | Equipment Category 3 |
|---|---|---|---|
| **Process parameters** | | | |
| Equipment group | II | II | II |
| Category | 1 | 2 | 3 |
| 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. |
| **ATEX Label details** | | | |
| Equipment Marking | II 1 G IIC c T1 to T6<br>II 1 G IIB c T1 to T6 | II 2 G IIC c T1 to T6<br>II 2 G IIC c T1 to T6 | II 3 G IIC c T1 to T6<br>II 3 G IIB c T1 to T6 |
| CE marked | Yes | Yes | Yes |
| Notified body Number | Baseefa 1180 | No | No |
| ATEX Number | SIRA 0518<br>SIRA 04ATEX6126<br>EC Type Examination | SIRA 15ATEX6065X | SIRA 15ATEX6065X |
| **Indicator details** | | | |
| Display unit | Stainless steel clad | Aluminium<br>Optional: Stainless steel clad | Aluminium<br>Optional: Stainless steel clad |
| Use of standard Non Frost block configuration without s/s side cladding or bonding. | No | No | Yes |
| Non Frost block fitted with stainless steel side cladding | Yes<br>To be bonded,<br>Minimum 16mm$^2$ cable. | Yes<br>To be bonded,<br>Minimum 16mm$^2$ cable. | Optional: Stainless steel cladding & bonding |
| **Floats** | | | |
| Use of titanium floats | Must be fitted with spring damping (cushioned) | Must be fitted with spring damping (cushioned) | Yes<br>(spring damping optional) |
| Use of stainless steel floats | Yes | Yes | Yes |
| Use of plastic floats | No | No | No |
| Dissipative plastic floats | - | - | - |
| 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(see section 20.14) | 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. | Required if Non-frost block/s are fitted or coated gauge. | Optional for Non Frost Blocks. Required on coated gauges. |
| **Documentation** | | | |
| Declaration of conformity | Yes<br>EU Type Examination Cert. | Yes | |
| Harmonised Standards | EN 13463-1:2009<br>EN 13463-5:2011<br>EN 1127-1 | EN 13463-1:2009<br>EN 13463-5:2011<br>EN 1127-1 | EN 13463-1:2009<br>EN 13463-5:2011<br>EN 1127-1 |
| Quality Assurance | SGS Baseefa Ltd.<br>Notified Body No. 1180 | | |
| IOM | Yes | Yes | Yes |

## 12 Data Sheet Notes:

1. Titanium floats must be carbon coated (PCVD) when hydrogen gas is presents.
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.

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