BM26A-8000 Handbook

Magnetic level indicator and level transmitter for liquid applications that require redundancy

KROHNE

IMPRINT

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1.1 Intended use

The BM26A-8000 is a magnetic level indicator that measures the level, interface or volume of liquids with an alternative, redundant level measurement device.

These devices are installed next to open or pressurized tanks. With the applicable options, they are resistant to difficult service conditions and liquids that are poisonous or flammable.

CAUTION!
Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

INFORMATION!
The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

This document does not have data about OPTIFLEX 7200, OPTIFLEX 8200, OPTIWAVE 7400 and BW25 level transmitters:

- If this magnetic level indicator has the OPTIFLEX 7200 option, then refer also to the OPTIFLEX 7200 C/F/S/D handbook.
- If this magnetic level indicator has the OPTIFLEX 8200 option, then refer also to the OPTIFLEX 8200 C/F/S handbook.
- If this magnetic level indicator has the OPTIWAVE 7400 option, then refer also to the OPTIWAVE 7400 C handbook.
- If this magnetic level indicator has the BW25 option, then refer also to the BW25 handbook.

1.2 Certification

Product marking

Figure 1-1: Examples of marking logo

The manufacturer certifies successful testing of the product by applying the conformity mark on the device.

This device fulfils the statutory requirements of the relevant directives.

For more information on the directives, standards and the approved certifications, please refer to the declaration of conformity supplied with the device or downloadable from the manufacturer's website.

DANGER!
For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

DANGER!
Level transmitter and limit switch options:
If a level transmitter or a limit switch is used in a potentially explosive atmosphere, then it must have the appropriate Ex approval option. For more data, refer to the applicable Ex supplementary instructions.

Other approvals and standards

BM26A-8000

- EU: Pressure Equipment Directive and ATEX Directive (Ex-approved devices)
- UK: Pressure Equipment (Safety) Regulations and Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations
- ASME B31.3 Code for Process Piping

LT40

- EU: Electromagnetic Compatibility Directive and ATEX Directive (Ex-approved devices)
- UK: Electromagnetic Compatibility Regulations and Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations

MS15 series / MS40 series

- EU: Low Voltage Directive (switches that do not have a NAMUR output) and ATEX Directive (Ex-approved devices)
- UK: Electrical Equipment (Safety) Regulations (limit switches that do not have a NAMUR output) and Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations

1.3 Pressure equipment regulations

PED

These devices are designed, assembled and tested to agree with the EU Pressure Equipment Directive (PED). The CE mark on the nameplate shows that the manufacturer did a conformity assessment. The PED conformity assessment is approved by a Notified Body. The identification number of the Notified Body is given on the nameplate.

PE(S)R

These devices are designed, assembled and tested to agree with the UK Pressure Equipment (Safety) Regulations (PE(S)R). The UKCA mark on the nameplate shows that the manufacturer did a conformity assessment. The PE(S)R conformity assessment is approved by an Approved Body. The identification number of the Approved Body is given on the nameplate.

A code on the nameplate gives data about the PED or PE(S)R rating of the device:

Example: PED/G1/III	
G	Gases and vapours
1	Fluid group 1
III	Category III

Table 1-1: Example of PED or PE(S)R rating

For more data about the nameplate refer to *Measuring chamber nameplate* on page 16 ("Namur").

ASME B31.3

If the device has the "ASME B31.3" option, it is designed, assembled and tested to agree with the ASME B31.3 Code for Process Piping. A special nameplate is used for ASME B31.3 data. For a description of the ASME nameplate, refer to *Measuring chamber nameplate* on page 16.

WARNING!
The process pressure and process temperature are given on the device nameplate and are only applicable to your measuring chamber. Do not use the device at a process pressure more than the maximum limit for a given process temperature. For more data, refer to Maximum process pressure: measuring chamber on page 119.

WARNING!
If the device has an Ex approval, then you must obey other temperature limits. For more data, refer to the Ex supplementary instructions.

The manufacturer did a risk analysis on the device that agrees with the EU Pressure Equipment Directive and the UK Pressure Equipment (Safety) Regulations. All personnel must know the design and operating conditions that follow to prevent the risk of damage and injury:

- This device is designed to function at almost constant pressure and temperature conditions. A maximum of 500 cycles is permitted along the full pressure range. A maximum of 2000 cycles is permitted along the full temperature range.
- This device is not designed for operating conditions where vibration or fatigue stress is present.

- Events that are not taken into account in the calculations include exceptional risks such as: earthquakes, bad weather, fire etc..
- The standard design calculation does not take into account the theoretical coefficient of corrosion. The product circulating in the device must not have properties that cause surface erosion.
- Our conformity declaration is limited to the parts of the device that are pressurized. It does not include parts that can be dismantled (valves etc.).
- The process connections must be attached correctly to prevent mechanical stress. The axis of the process connection must be parallel to and centred with the axis of the tank's process connections. Tighten the process connections in agreement with the design code.
- The user must take necessary steps to protect the installed device from shock waves (water hammer). A pressure-limiting valve must protect the installation.
- The effective pressure of the installation (the maximum pressure permitted by the pressure-limiting valve) must never be more than the maximum permitted pressure. The maximum permitted pressure is marked on the device nameplate.
- Make sure that the parts in contact with the fluid are compatible with the fluid and conform to the ageing characteristics of the measurement environment and the fluid used. These have either been recommended in the instructions or form the subject of a particular specification in the contract.
- The device is designed to measure a liquid with a gas phase. It is not designed to measure liquids that change to a solid phase because of changes in pressure (solidification) and temperature (freezing), e.g. water and ice.
- Make sure that there are no magnetic particles in the liquid. These particles can have an effect on the performance of the device.
- Make sure that the size of the particles in the liquid are less than 0.05 mm / 0.002¨ in diameter.
- Make sure that the device is correctly sealed. Do a leakage check between the device and the tank.
- The external pressure, Pext, must be equal to atmospheric pressure, Patmos (Pext = Patmos).

1.4 Safety instructions from the manufacturer

1.4.1 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.4.2 Product liability and warranty

The BM26A-8000 magnetic level indicator is designed solely for measuring the level or volume of liquids.

Responsibility as to suitability and intended use of these level indicators rests solely with the operator. The supplier does not accept any liability resulting from misuse by the operator. Improper installation and operation of the level transmitters may lead to loss of warranty. In addition, the "General conditions of sale" which forms the basis of the purchase agreement are applicable.

1.4.3 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer cannot accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of icons as shown below.

1.4.4 Warnings and symbols used

Safety warnings are indicated by the following symbols.

DANGER!
This warning refers to the immediate danger when working with electricity.

DANGER!
This warning refers to the immediate danger of burns caused by heat or hot surfaces.

DANGER!
This warning refers to the immediate danger when using this device in a hazardous atmosphere.

DANGER!
These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.

WARNING!
Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.

CAUTION!
Disregarding these instructions can result in damage to the device or to parts of the operator's plant.

INFORMATION!
These instructions contain important information for the handling of the device.

LEGAL NOTICE!
This note contains information on statutory directives and standards.

- HANDLING
  This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➲ RESULT
This symbol refers to all important consequences of the previous actions.

1.5 Safety instructions for the operator

WARNING!
In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.

2.1 Scope of delivery

Do a check of the packing list to make sure that your device agrees with the customer order. The device is supplied in one box.

INFORMATION!
Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

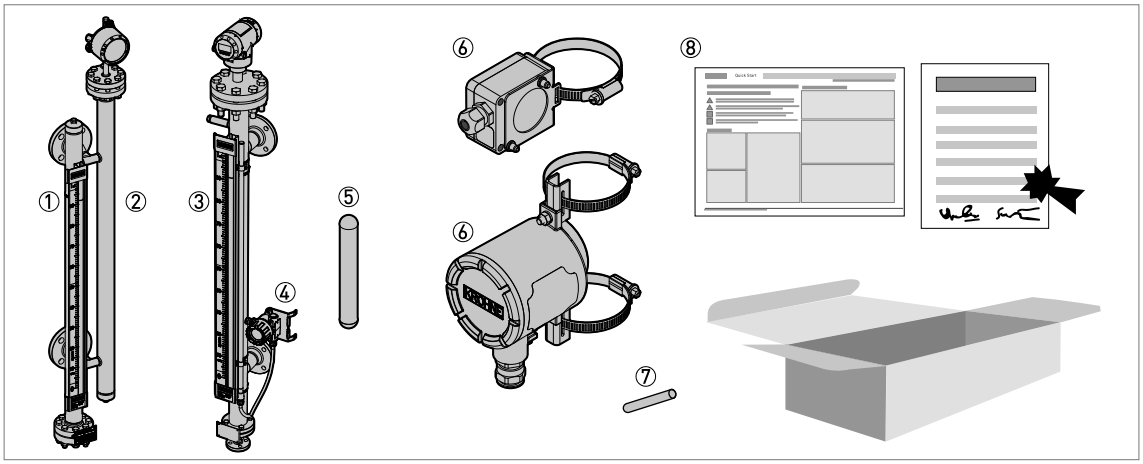

Figure 2-1: Scope of delivery

① **TWIN version:** primary measuring chamber with the indicator column and optional indicator scale
② **TWIN version:** secondary measuring chamber with a redundant level measurement device (OPTIFLEX 7200, OPTIFLEX 8200, OPTIWAVE 7400 or BW25 level transmitter)
③ **BI version:** measuring chamber with two compartments. The first compartment contains a magnetic float to show level on an indicator column. The second compartment contains the probe for a redundant level measurement device (OPTIFLEX 7200 level transmitter).
④ Optional reed-chain level transmitter - LT40 C/F
⑤ Float - not installed in the device before delivery. For the float installation procedure, refer to *How to put the float in the measuring chamber* on page 20.
⑥ Optional limit switches - MS15 series or MS40 series. If the customer order includes limit switches, they can be attached to the measuring chamber or can be supplied in preformed packing at one end of the box. You must attach them to the measuring chamber and make sure that they are in the correct position before operation. For the installation procedure, refer to *Installation - limit switches (MS15 series and MS40 series)* on page 32.
⑦ Magnet (to set the indicator column to zero after installation - if the flaps moved during transportation). The magnet is attached to the indicator column with adhesive tape.
⑧ Quick Start

Technical documentation for this device can be downloaded from the website (Download Centre).

2.2 Device description

2.2.1 BM26A-8000 magnetic level indicator

The BM26A-8000 is a magnetic level indicator that also has a redundant level transmitter. This device could be in a secondary measuring chamber or in a compartment that is in the same measuring chamber as the magnetic float that is used to show level on an indicator column. Level transmitter options include FMCW (non-contact) radar, TDR (Guided Radar) or displacer-type. The level transmitter is installed on top of the bypass chamber.

- A FMCW (non-contact) radar level transmitter is designed to continuously measure the level.

- A TDR (Guided Radar) level transmitter is designed to continuously measure the level, interface, or level and interface of liquids.
- A displacer-type level transmitter is designed to continuously measure the level or interface of liquids.

The measuring chamber of the magnetic level indicator can be made of:

- 316/316L (1.4401/1.4404) stainless steel or
- 304L (1.4307) stainless steel

The measuring chamber can be made of these materials on request:

- HASTELLOY® C-276 alloy (2.4819) or
- INCONEL® nickel-chromium alloy 625 (2.4856)

The BM26A-8000 is designed to measure the level or interface of liquids that have a density of 370...1200 kg/m³ / 23.10...74.91 lb/ft³, for a temperature range of -196...+400°C / -320.8...+752°F at a pressure of -1...400 barg / -14.5...5802 psig.

The illustration that follows shows the level transmitter options:

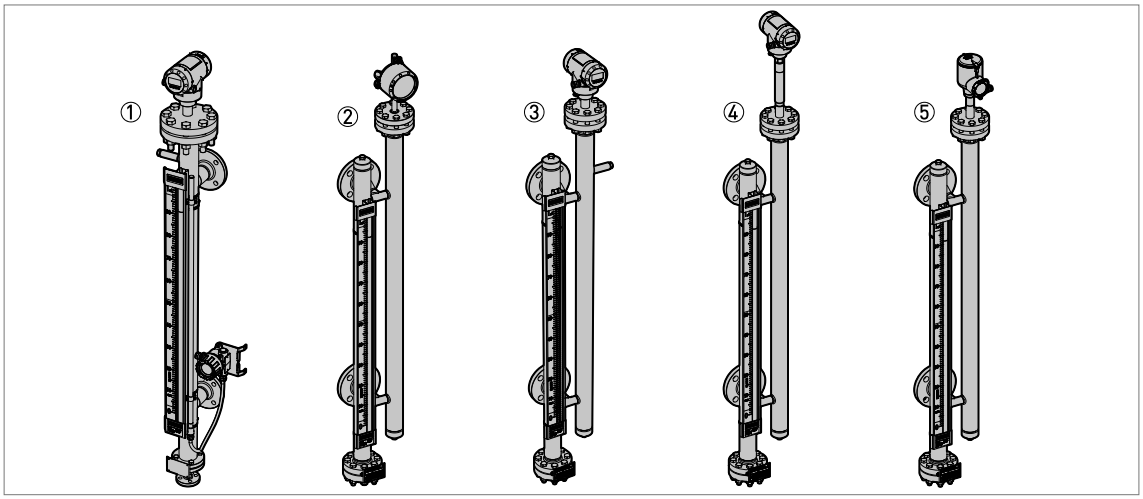

Figure 2-2: Level transmitter options

① BM26A-8000 BI with an OPTIFLEX 7200 C TDR (Guided Radar) level transmitter (top of the measuring chamber) and an LT40C reed-chain level transmitter (side of the measuring chamber)
② BM26A-8000 TWIN with a BW25 displacer-type level transmitter
③ BM26A-8000 TWIN with an OPTIFLEX 7200 C TDR (Guided Radar) level transmitter
④ BM26A-8000 TWIN with an OPTIFLEX 8200 C TDR (Guided Radar) level transmitter
⑤ BM26A-8000 TWIN with an OPTIWAVE 7400 C 24 GHz FMCW radar level transmitter

The density, temperature and pressure range of a level transmitter installed on a BM26A-8000 magnetic level indicator is:

Device	Density range		Temperature range		Pressure range	
	[kg/m³]	[lb/ft³]	[°C]	[°F]	[barg]	[psig]
BW25	370...1200 ①	23.09...74.91 ①	-40...+400	-40...+752	-1...400 ①	-14.5...5802 ①
OPTIFLEX 7200			-50...+250	-58...+482	-1...100 ①	-14.5...1450 ①
OPTIFLEX 8200			-50...+315	-58...+599	-1...320 ①	-14.5...4641 ①
OPTIWAVE 7400			-50...+200	-58...+392	-1...100 ①	-14.5...1450 ①

Table 2-1: Magnetic level indicator with a level transmitter option: density, pressure and temperature ranges

① The pressure rating of the measuring chamber and the version of the device (BI or TWIN) also gives the density range and the pressure range

INFORMATION!
For more data about the level transmitter options, refer to the related handbook (BW25, OPTIWAVE 7400, OPTIFLEX 7200 or OPTIFLEX 8200).

2.2.2 LT40 reed-chain level transmitter (option)

It is possible to have the level of the liquid shown as an output signal that can be monitored from a remote station.

The LT40 is an optional transmitter that has a column of reed resistors and a signal converter. The LT40 transmits an output signal that is proportional to the resistance given by the position of the magnetic float in the measuring chamber adjacent to the reed chain. This output signal can be analog (4...20 mA) or digital (HART®, PROFIBUS PA or FOUNDATION™ fieldbus). There is also an output signal option with an analog and digital signal (4...20 mA + HART).

2.2.3 MS15-series and MS40-series limit switches (option)

Limit switches let the user monitor important measurement limits. The limit switch is a bistable electrical device that is set to open or close when a magnetic object (float) goes near to it.

HIGH limit switch

The limit switch is set to open when the float is above the switching point.

LOW limit switch

The limit switch is set to open when the float is below the switching point.

2.3 Nameplates

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

2.3.1 Location of device labels

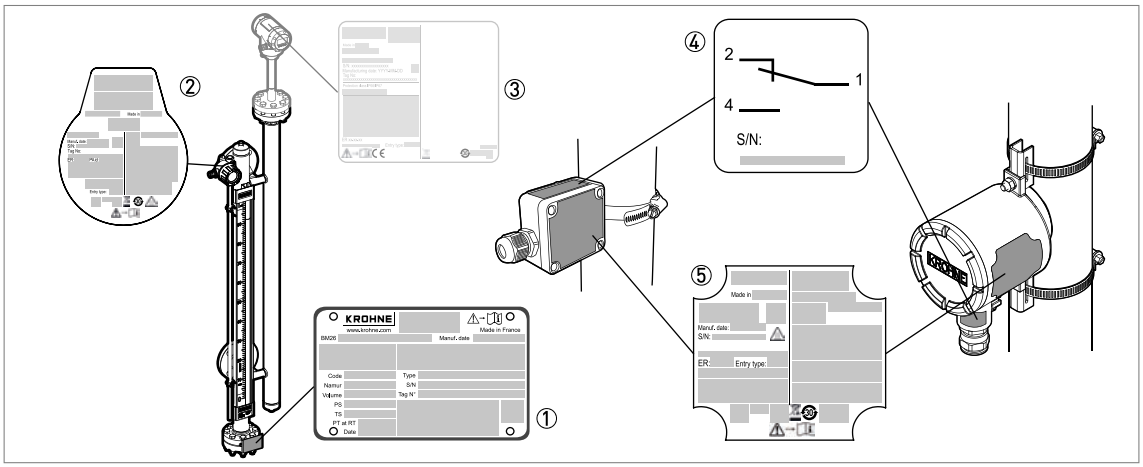

Figure 2-3: Location of device nameplates

① Measuring chamber nameplate
② LT40 reed-chain level transmitter nameplate (on the rear side of the housing)
③ Optional level transmitter nameplate - for more data, refer to the related handbook
④ MS15-series or MS40-series limit switch: electrical schematic label
⑤ MS15-series or MS40-series limit switch nameplate

INFORMATION!
For more data about the level transmitter options, refer to the related handbook (BW25, OPTIWAVE 7400, OPTIFLEX 7200 or OPTIFLEX 8200).

2.3.2 Measuring chamber nameplate

PED, PE(S)R and EN 13445 construction codes

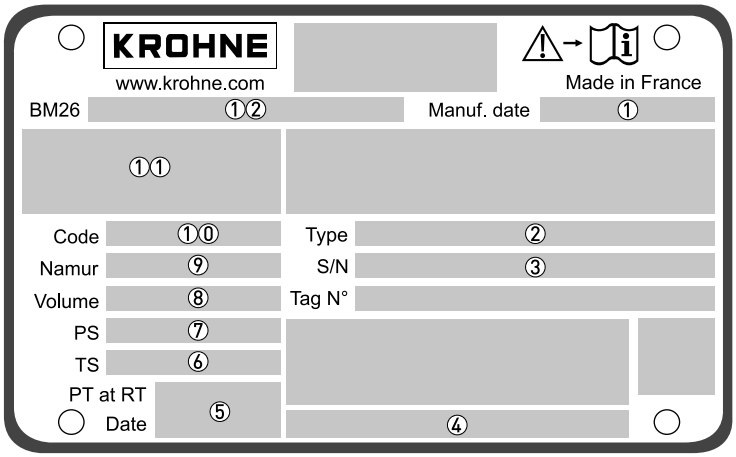

Figure 2-4: Measuring chamber nameplate (PED, PE(S)R and EN 13445 construction codes)

① Date of manufacture (Year . Month . Day)
② Designation code (VF or SF code given in the order)
③ Factory serial number
④ Name and address of the UK importer (if applicable)
⑤ Test pressure (PT) and test date
⑥ Process temperature range (TS)
⑦ Process pressure range (PS)
⑧ Measuring chamber volume
⑨ PED marking (PED/G1/III, PED/G1/IV or PED/G2/III). This marking agrees with NAMUR Recommendation NE 080. For more data, refer to *Pressure equipment regulations* on page 8.
①⓪ Construction code
①① CE marking (if applicable)
PED Notified Body code (0036) - if there is a PED marking given on the nameplate.

UKCA marking (if applicable)
PE(S)R Approved Body code (0168) - if there is a PE(S)R marking given on the nameplate.

Refer also to item ⑨ on this illustration.
①② Model name

ASME B31.3 construction code

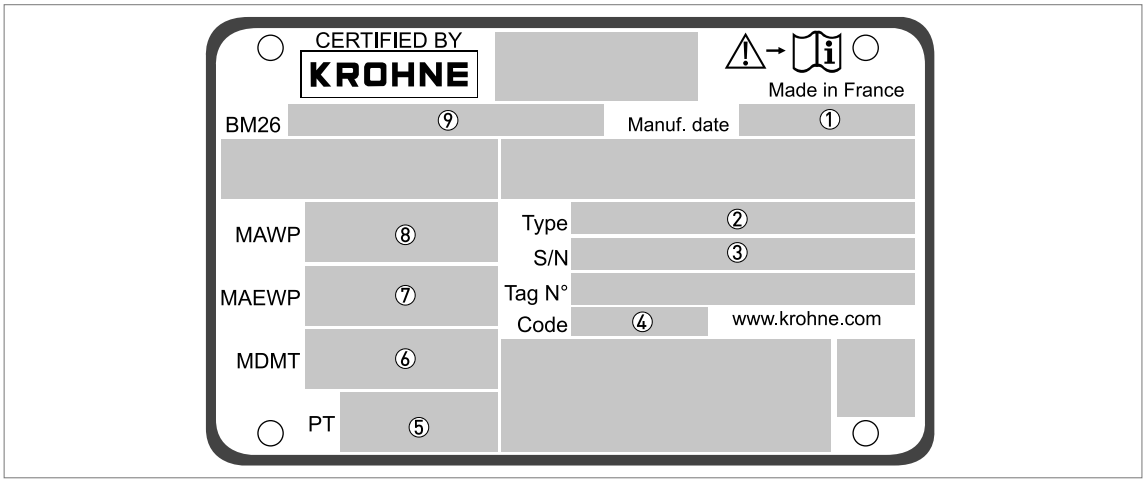

Figure 2-5: Measuring chamber nameplate (ASME B31.3 construction code)

① Date of manufacture (Year . Month . Day)
② Designation code (VF or SF code given in the order)
③ Factory serial number
④ Construction code
⑤ Test pressure (PT)
⑥ Maximum design metal temperature (MDMT)
⑦ Maximum allowable external working pressure (MAEWP)
⑧ Maximum allowable working pressure (MAWP)
⑨ Model name

2.3.3 LT40 reed-chain level transmitter nameplate

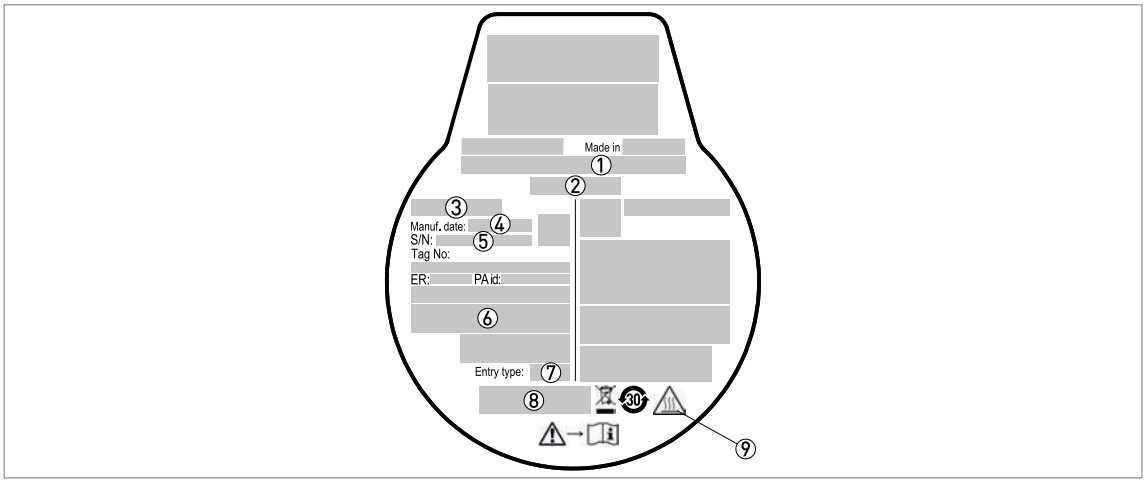

Figure 2-6: LT40 reed-chain level transmitter nameplate

① Name and address of the UK importer (if applicable)
② Model
③ Designation code (VF or SF code given in the order)
④ Date of manufacture
⑤ Factory serial number
⑥ Electrical data
⑦ Cable entry size
⑧ CE, UKCA or CMIM marking (if applicable)
⑨ WARNING! Hot surface. If the device is connected to a tank that operates at high temperature, there is a risk of injury.

2.3.4 Nameplate and electrical schematic label for the MS15-series and MS40-series limit switches

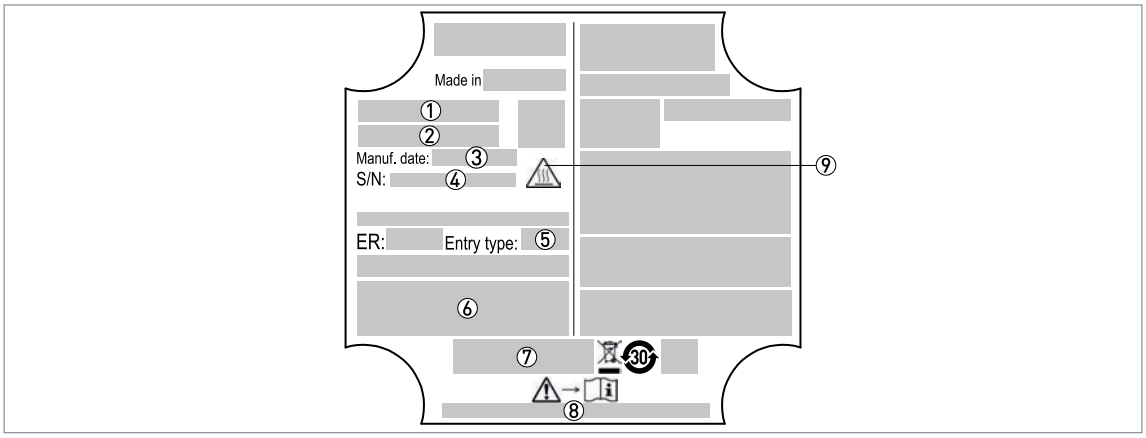

Figure 2-7: Limit switch nameplate (housing cover)

① Model
② Designation code (VF or SF code given in the order)
③ Date of manufacture
④ Factory serial number
⑤ Cable entry size (only for MS15 series)
⑥ Electrical data
⑦ CE, UKCA or CMIM marking (if applicable)
⑧ Name and address of the UK importer (if applicable)
⑨ WARNING! Hot surface. If the device is connected to a tank that operates at high temperature, there is a risk of injury.

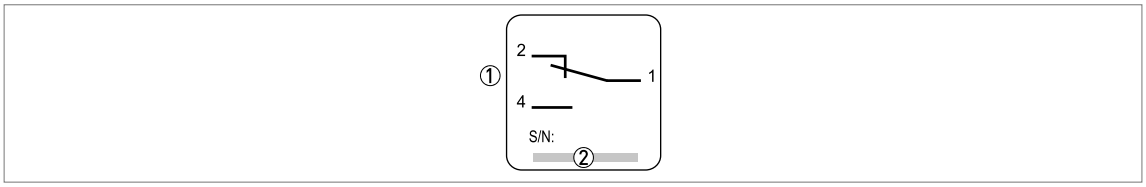

Figure 2-8: Electrical schematic label (limit switch housing)

① Electrical schematic
② Factory serial number

WARNING!
MS40 series: Make sure that the serial number on the electrical schematic label (limit switch housing) agrees with the serial number on the nameplate (limit switch housing cover).

3.1 General notes for installation

INFORMATION!
Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

INFORMATION!
Do a check of the packing list to make sure that you have all the elements given in the order.

This chapter gives procedures to:

- put the device into storage,
- move the device safely,
- prepare the device for installation, and
- install the device.

INFORMATION!

- ***Insulation:*** *If you install ROCKWOOL® or FOAMGLAS® insulation after you receive the device, write to the manufacturer for the installation procedure.*
- ***Low temperature applications:*** *If you send an order for the PLEXIGLAS® anti-icing cover option, make sure that you also send an order for insulating felt that must be installed between the metal support and the glass tube of the indicator column.*

3.2 Storage

- Do not keep the device in a vertical position before installation. Put the device on its side.
- Store the device in its original packing and in dry and dust-free location.
- **Storage temperature range:** refer to the table that follows.

Storage temperature

Device	Storage temperature	
	[°C]	[°F]
BM26A-8000 magnetic level indicator	-70...+80	-94...+176
LT40 C/F reed-chain level transmitter	-40...+80	-40...+176
MS15-series limit switch		
MS40-series limit switch		

Table 3-1: Storage temperature

INFORMATION!
For more data about the level transmitter options, refer to the related handbook (BW25, OPTIWAVE 7400, OPTIFLEX 7200 or OPTIFLEX 8200).

3.3 Transportation

Lift the device carefully. Make sure that the method used to transport the device is adapted to its weight and agrees with national regulations.

3.4 How to prepare the device for installation

3.4.1 Packings

Discard the packings and make sure that the float is in the measuring chamber and can move freely.

CAUTION!
Make sure that you do not discard the limit switches and the magnet that are attached to the indicator column with adhesive tape.

The float is not installed in the measuring chamber at the factory. For the procedure to put the float in the measuring chamber, refer to *How to put the float in the measuring chamber* on page 20.

CAUTION!
Make sure that the device does not contain unwanted objects (dirt etc.).

INFORMATION!
Optional limit switches are usually not attached to the measuring chamber before delivery. Examine the contents of the box for missing items, if it is necessary.

3.4.2 How to put the float in the measuring chamber

The float is not supplied in the device. Do the procedure that follows before you use the device.

WARNING!
Do not remove or change the shock absorber that is attached to the counter flange at the bottom of the measuring chamber. This component prevents damage to the float if there is a sudden change of level.

TWIN version

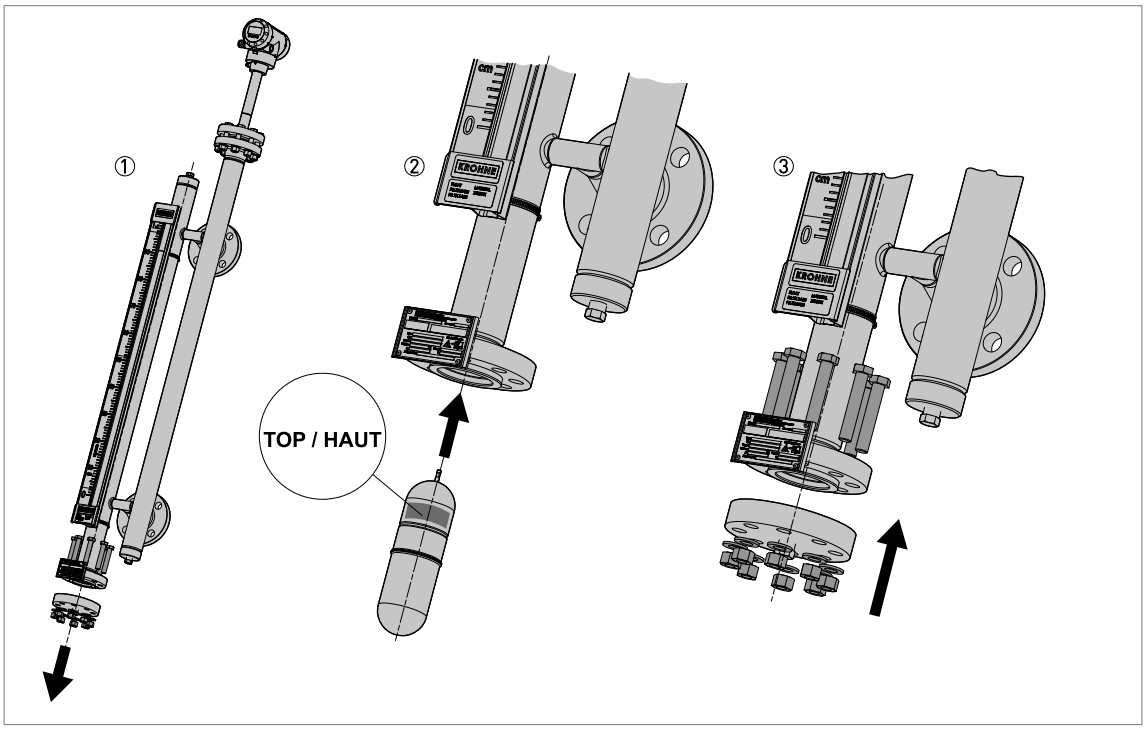

Figure 3-1: How to put the float in the measuring chamber - TWIN version

BI version

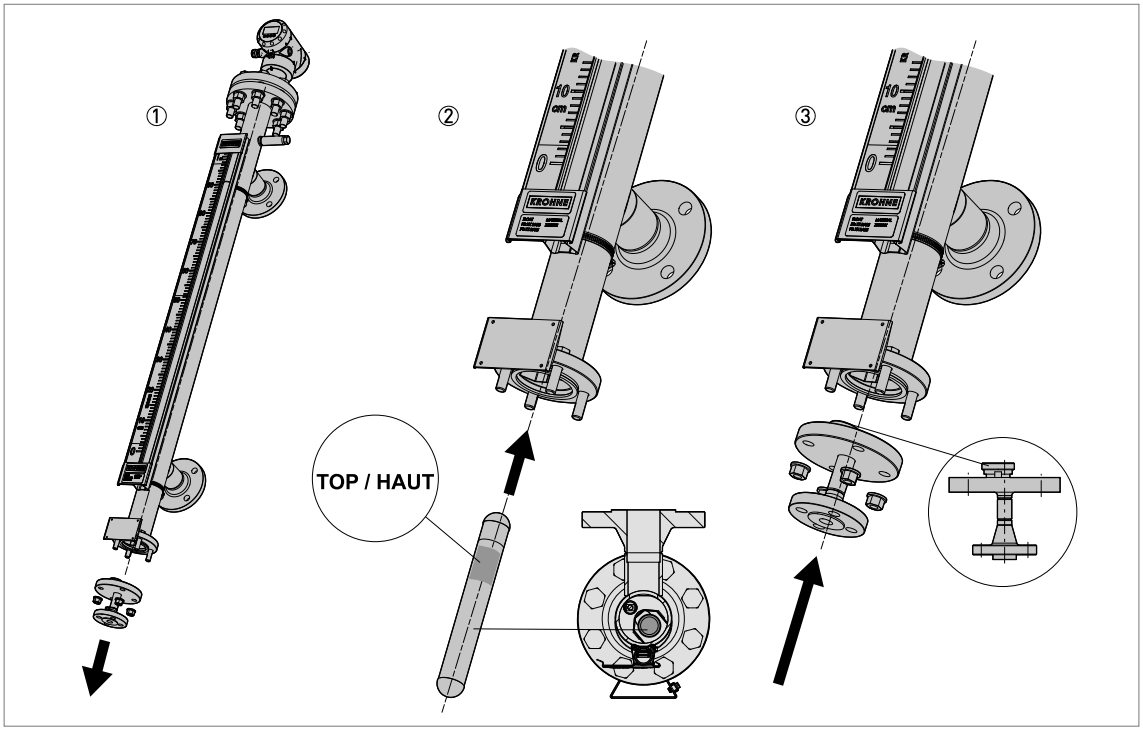

Figure 3-2: How to put the float in the measuring chamber - BI version

Equipment needed

- A torque wrench (not supplied)

Procedure

① Remove the bottom flange.
② Put the top of the float in the measuring chamber first (the end of the float that has the label "TOP / HAUT" on it). BI version only: make sure that the float is on the correct side of the baffle plate (refer to the illustration).
③ Align the gaskets.
④ BI version only: align the shock absorber on the bottom counter flange with the float compartment.
⑤ Attach the bottom counter flange and tighten the bolts to the correct torque. Refer to the table below to find the torque value for the related measuring chamber.
➲ End of the procedure. The device can be installed on the tank.

Measuring chamber: torque values for flange bolts

Pressure rating	Flange bolt size	Torque			
		Minimum torque		Maximum torque	
		[N·m]	[lbf·ft]	[N·m]	[lbf·ft]
PN40 / Class 150 / Class 300	M12	21	15.49	22	16.23
PN100 / Class 600	M16	54	39.83	68	50.15
PN160 / PN250 / Class 1500	M27	270	199.14	345	254.46
PN400 / Class 2500	M30	338	249.30	404	297.98

Table 3-2: Measuring chamber: torque values for flange bolts

WARNING!
Make sure that the torque applied on the bolts of the bottom flange agrees with the process or test conditions, the related standards and good engineering practice.

CAUTION!
BI version
When you put the float into the measuring chamber, make sure that it is on the correct side of the baffle plate.

Replacement of Ring Joint gaskets

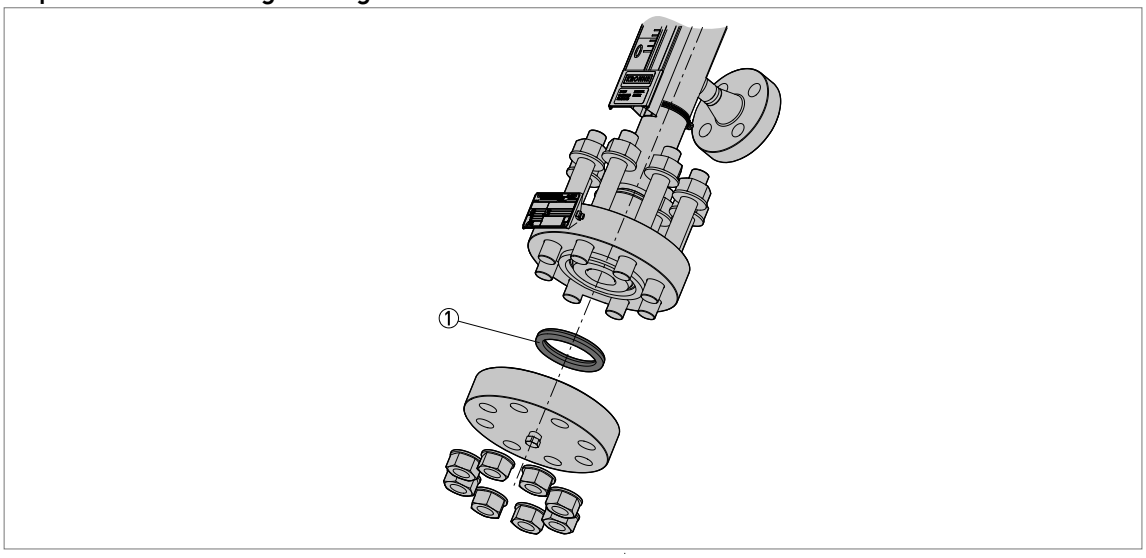

Figure 3-3: Ring Joint gaskets

① Ring Joint gasket

WARNING!
If the measuring chamber has Ring Joint gaskets, then make sure that you replace the gasket each time that you remove the bottom flange.

3.5 Installation - measuring chamber

3.5.1 General notes

The operating conditions that are applicable for your device are given on the device nameplate. For more data on where to find the operating conditions data for your device, refer to *Nameplates* on page 15. For general technical data about the device, refer to *Technical data* on page 82.

Make sure that the installation conditions obey the design constraints related to PED. For more data, refer to *Pressure equipment regulations* on page 8.

Other installation conditions

- Make sure that there is no contamination (dirt etc.) or unwanted objects in the measuring chamber.
- Install the magnetic level indicator vertically on the tank.
- Make sure that the device is correctly installed. The device nameplate is always at the bottom of the device.
- Select bolts and gaskets (not supplied) that agree with the pressure rating of the process connection and the process pressure.
- We recommend that you use braces to prevent damage to the process connections.

DANGER!
Make sure that the outer surface temperature of the device is less than +60°C / +140°F. If the surface temperature is more than +60°C / +140°F, use the device with precautions that agree with health and safety rules and regulations.

WARNING!
Do not apply weight on the process connections. There is a risk of damage to the device and the installation.

3.5.2 Pressure test

Make sure that you remove the float from the measuring chamber if you do a pressure test on this device version:

- BM26A-8000 PN250 / Class 1500
- BM26A-8000 PN400 / Class 2500

WARNING!
If the measuring chamber has Ring Joint gaskets, then make sure that you replace the gasket each time that you remove the bottom flange.

3.5.3 Isolation valves

We recommend that you install isolation valves between the device and the tank. The device can then be easily removed from the tank for the cleaning procedure. Drain the device only when it is isolated from the tank.

3.6 Installation - indicator column

3.6.1 General notes

The level indicator column is attached to the measuring chamber in the factory. Customer order data is used to adjust its position. No other adjustment is necessary.

CAUTION!
Customer order data is used to adjust the device. If liquid density changes, the device will not measure correctly. For example, if liquid density decreases, then the float does not follow the surface of the liquid and goes down to the bottom of the measuring chamber. For more data about errors and error handling, refer to Errors on page 51.

3.6.2 How to set the indicator column to zero

Before you fill the tank, make sure that the column of rotating flaps is set to zero. The rotating flaps will be all black (yellow/black indicator option) or all white (red/white indicator option).

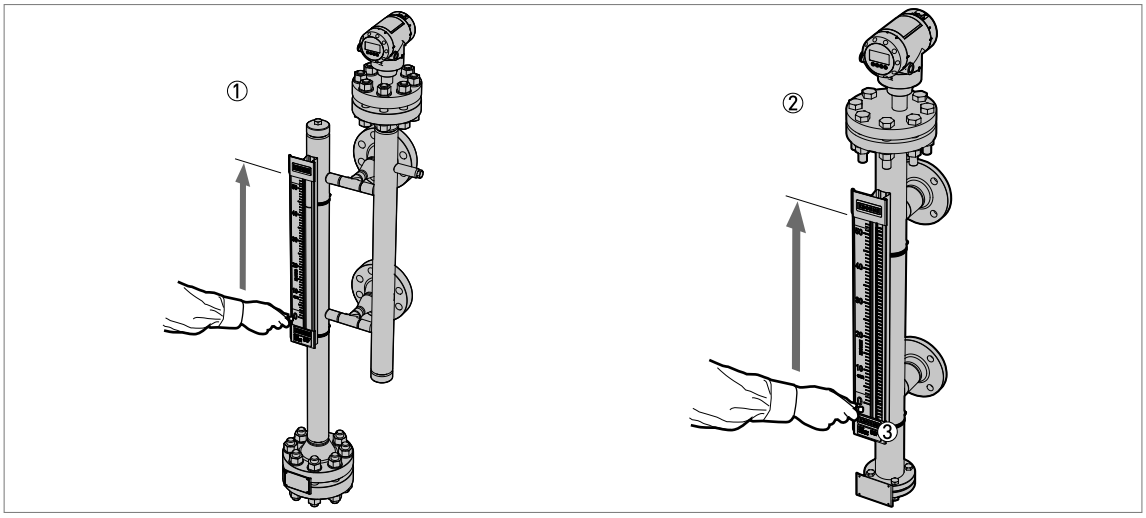

Figure 3-4: Set the indicator column to zero

① TWIN version
② BI version
③ Magnet - point the red end of the magnet at the glass tube

Equipment needed

- Magnet (to set the indicator column to zero after installation - if the flaps moved during transportation). The magnet is attached to the indicator column with adhesive tape for transportation.

CAUTION!
The indicator column is put in the correct position at the factory. Do not move the indicator column.

Procedure

- Hold the magnet in front of the glass tube at the bottom of the indicator column. Make sure the red end of the magnet points at the glass tube.
- Move the magnet slowly up to the top the glass tube.

➲ End of the procedure. The flaps all turn to black. The indicator column is set to zero. You can now fill the tank.

CAUTION!
If you do not do this procedure, the device can incorrectly indicate the level.

3.7 Level transmitter options

The level transmitter (OPTIFLEX 7200, OPTIFLEX 8200, OPTIWAVE 7400 or BW25) is attached to the bypass chamber at the factory.

3.8 Installation - reed-chain level transmitter (LT40)

3.8.1 General notes

If the reed-chain level transmitter is selected as an option in an order, it is attached to the measuring chamber at the factory. Customer order data is used to adjust its position. No other adjustment is necessary.

If the reed-chain level transmitter is a replacement device or it is ordered after the magnetic level indicator is delivered, refer to *How to install the LT40 on the measuring chamber* on page 29.

CAUTION!
Do not move the reed-chain level transmitter. If you adjust the position of this device, the output will be incorrect. If you must move this device, refer to How to install the LT40 on the measuring chamber on page 29.

CAUTION!
Customer order data is used to adjust the device. If liquid density changes, the device will not measure correctly. For example, if liquid density decreases, then the float does not follow the surface of the liquid and goes down to the bottom of the measuring chamber. For more data about errors and error handling, refer to Errors on page 51.

LT40 C

The compact converter of the LT40 C is attached to the reed-chain tube. The LT40 C can be attached to the TWIN version of the device.

WARNING!

Make sure that the compact converter of the reed-chain level transmitter does not touch the measuring scale. Make sure that the face of the cover on the converter is aligned with, and parallel to, the face of the measuring scale. Refer to the illustration that follows.

CAUTION!

Do not install the LT40 C on the BI version of the device.

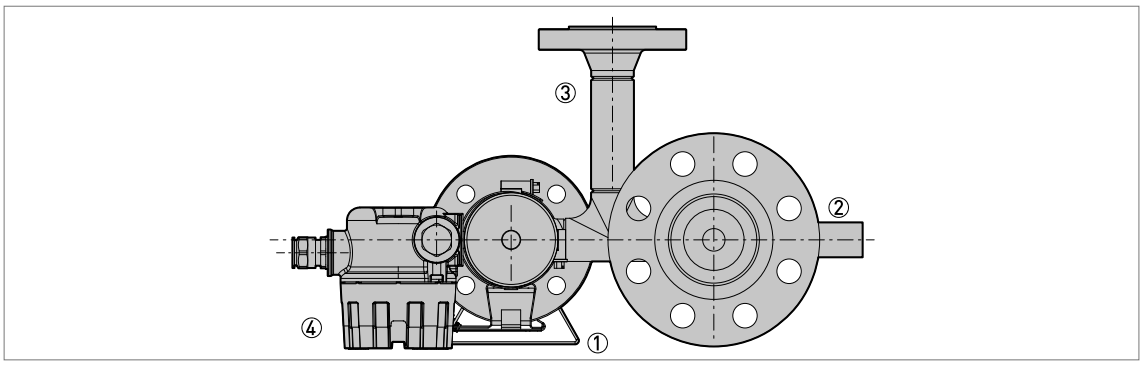

Figure 3-5: Compact converter: correct position (top view)

① Indicator column
② Optional vent
③ Process connection
④ LT40 compact converter

LT40 F

The remote converter of the LT40 F is connected to the reed-chain tube by an electrical cable. The electrical cable has a maximum length of 25 m / 82 ft. The remote converter can be attached to a pipe with two hose clamps or attached to a wall with two bolts. Refer to the illustration that follows:

WARNING!

Do not attach the remote converter of the LT40 F reed-chain level transmitter to the BM26A series bypass level indicator, or a hot or cold pipe.

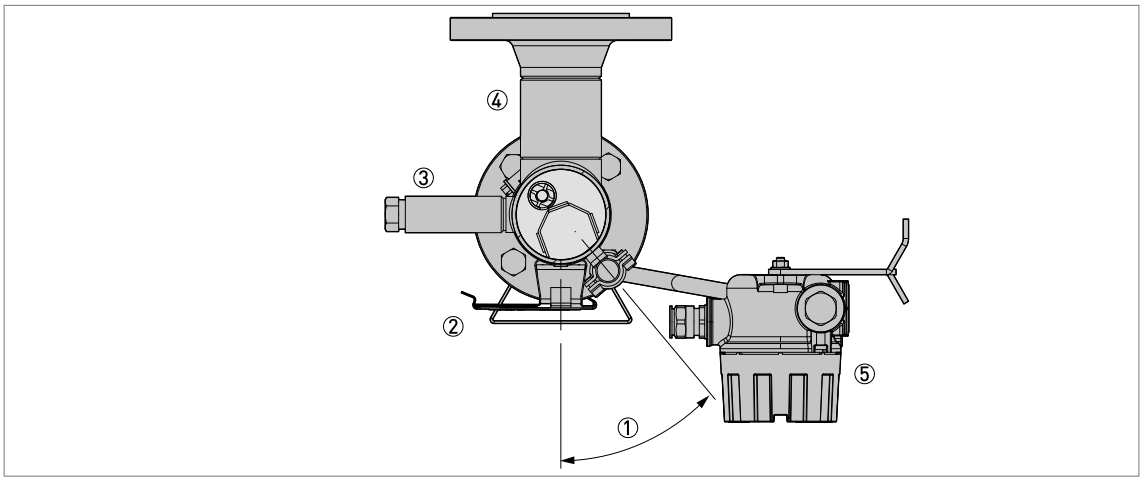

Figure 3-6: LT40 F: Installation of the reed-chain tube on the measuring chamber (top view)

① Angle between the indicator column and the reed-chain tube for the optional LT40 F: 40°
② Indicator column
③ Optional vent
④ Process connection
⑤ LT40 remote converter

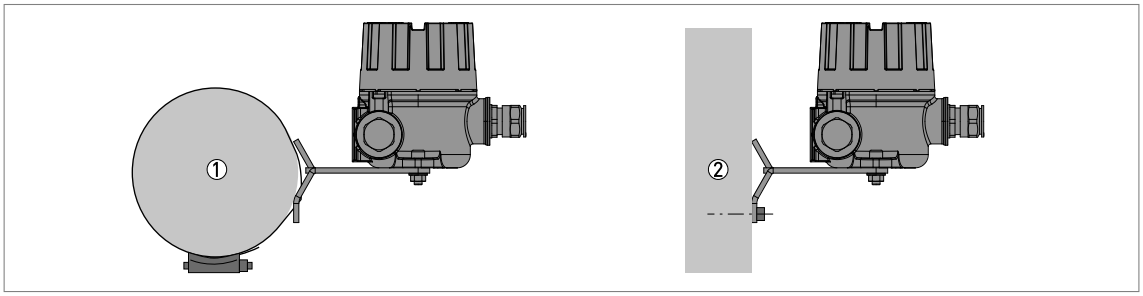

Figure 3-7: LT40 F: Installation of the remote converter - examples of locations (top view)

① The remote converter is attached to a tube with two hose clamps
② The remote converter is attached to a wall with two bolts

3.8.2 How to install the LT40 on the measuring chamber

If the reed-chain level transmitter (LT40) is not supplied attached to the magnetic level indicator, obey the instructions that follow.

Equipment needed

- Large, slotted screwdriver (not supplied)
- Power supply (not supplied)
- Ammeter (not supplied)

Installation - TWIN version

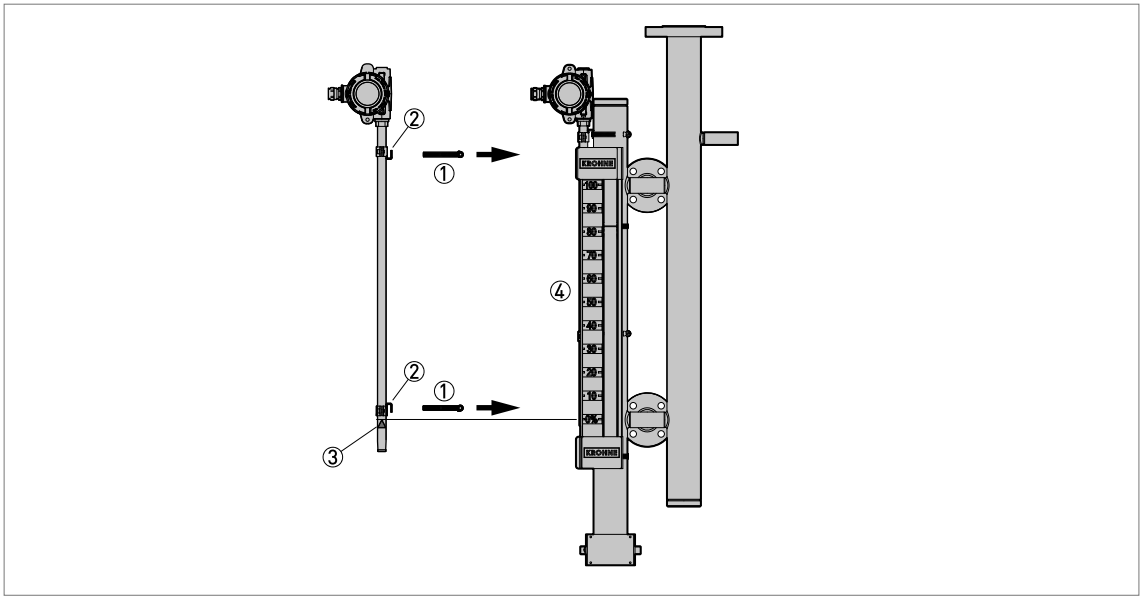

Figure 3-8: LT40: installation of the device on the TWIN version of the measuring chamber - side view

① Metal collar
② Hook to attach the LT40 to the measuring chamber
③ Red triangular sticker that shows the zero mark (0% / 4 mA) on the reed chain. Align the top point of the triangle with the "0" mark on the measuring scale.
④ Measuring scale

Installation - BI version

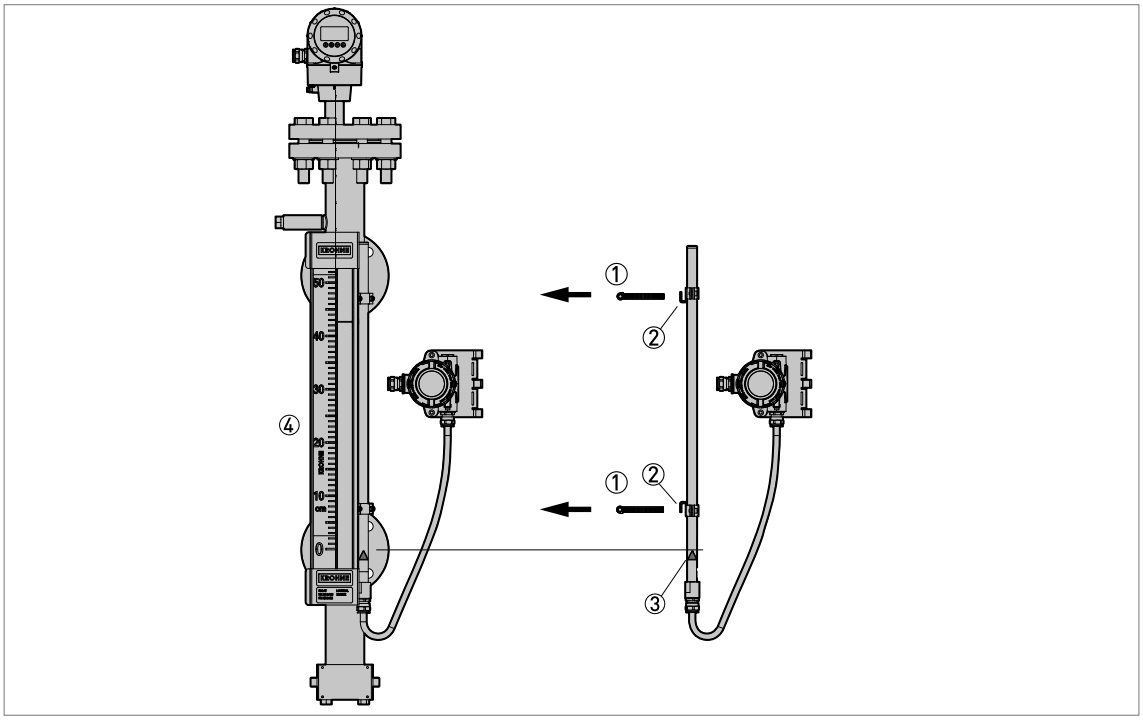

Figure 3-9: LT40: installation of the device on the BI version of the measuring chamber - side view

① Metal collar
② Hook to attach the LT40 to the measuring chamber
③ Red triangular sticker that shows the zero mark (0% / 4 mA) on the reed chain. Align the top point of the triangle with the "0" mark on the measuring scale.
④ Measuring scale

Procedure

- Remove the LT40 from its packaging. Make sure that there are a minimum of two metal collars supplied with the device. There is also one metal collar per metre of length of the reed-chain tube.
- Loosen the bottom metal collar that holds the indicator column on the measuring chamber with a large, slotted screwdriver.
- Attach the metal collars for the LT40 to the measuring chamber (between the process connections), but do not tighten them at this time.
- There are two hooks on the reed-chain tube. Put these hooks on the metal collars and tighten the collars until you can make small adjustments to the position of the LT40.

➲ Align the top of the red triangular sticker on the reed-chain tube with the minimum level, "0" on the indicator column.

CAUTION!
Make sure that the indicator column stays in the correct position when you attach the LT40 reed-chain level transmitter.

Adjustments for accurate measurement of level

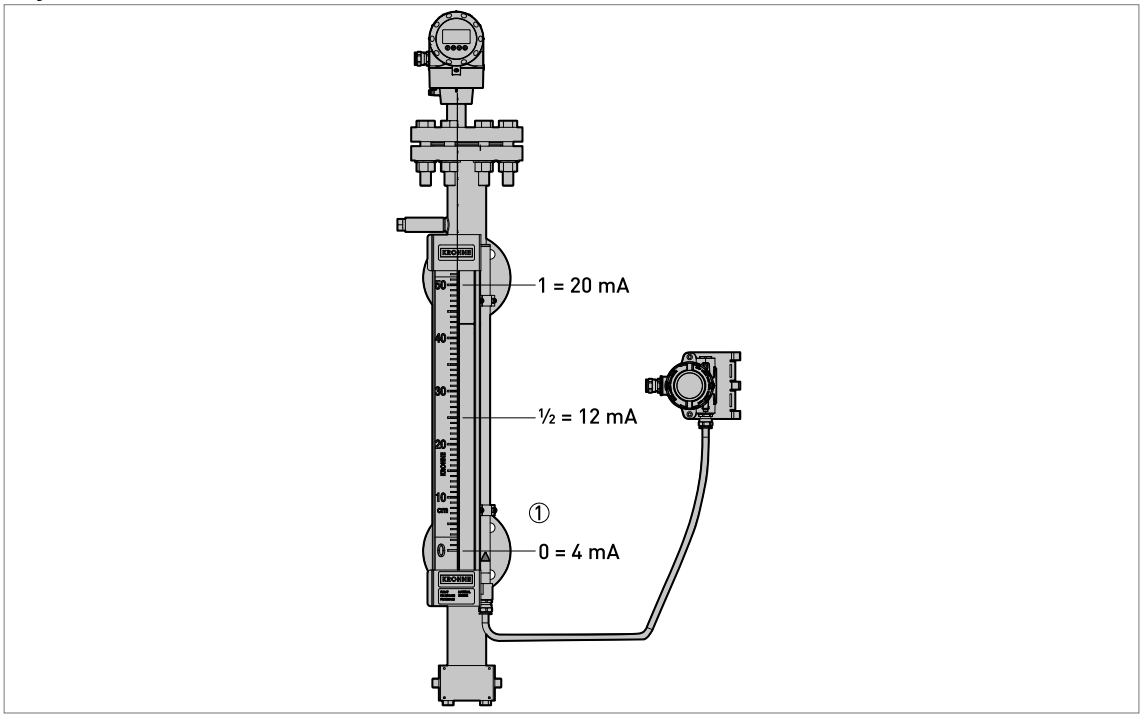

Figure 3-10: LT40: adjustments for accurate measurement of level

① Make small adjustments to the position of the LT40 until the output value is 4 mA

Procedure

- Connect the LT40 to a power supply. For more data, refer to *Reed-chain level transmitter* on page 38.
- Make sure that the display is set to measure current (mA) or connect an ammeter to the electrical circuit.
- Fill the measuring chamber to the minimum level ("0" on the measuring scale of the indicator column). Make sure that the ammeter shows 4 mA. If the value is not 4 mA, then make small adjustments to the position of the LT40 until the output value is 4 mA.
- Tighten the collars that hold the LT40 on the measuring chamber with the large, slotted screwdriver.

➲ The LT40 will give an accurate output value for level.

3.8.3 Thermal insulation

If you put thermal insulation around the magnetic level indicator, do not cover the housing of the reed-chain level transmitter. Make sure that there is approximately 15 mm / 0.6¨ of empty space between the housing and the thermal insulation.

3.9 Installation - limit switches (MS15 series and MS40 series)

3.9.1 General notes

The limit switches are supplied in the box with the magnetic level indicator. The packing solution agrees with good professional practice.

- If the limit switches are attached to the device, then they are at one end of the measuring chamber, but not in the correct position. Obey the procedure on page 33.
- If the limit switches are not attached to the device, then they are in preformed packing at one end of the box. Remove the limit switches from the packing and obey the procedure on page 33.

Make sure that you position the limit switch correctly. The density of the liquid, the position of the magnets in the float (float type), and the limit switch condition ("LOW limit" or "HIGH limit") will have an effect on the position of the limit switch on the measuring chamber.

Limit switch condition - LOW limit:
The limit switch is open when the float moves **below** the switching point.

Limit switch condition - HIGH limit:
The limit switch is open when the float moves **above** the switching point.

CAUTION!
The limit switch does not immediately change its condition when the float goes above or below the limit switch position. The limit switch has an offset (hysteresis) that causes the switch to change its condition to "open" when the float moves a small distance above or below its position. Thus, it is necessary to adjust the position of the limit switch to the offset to have the correct switching point.

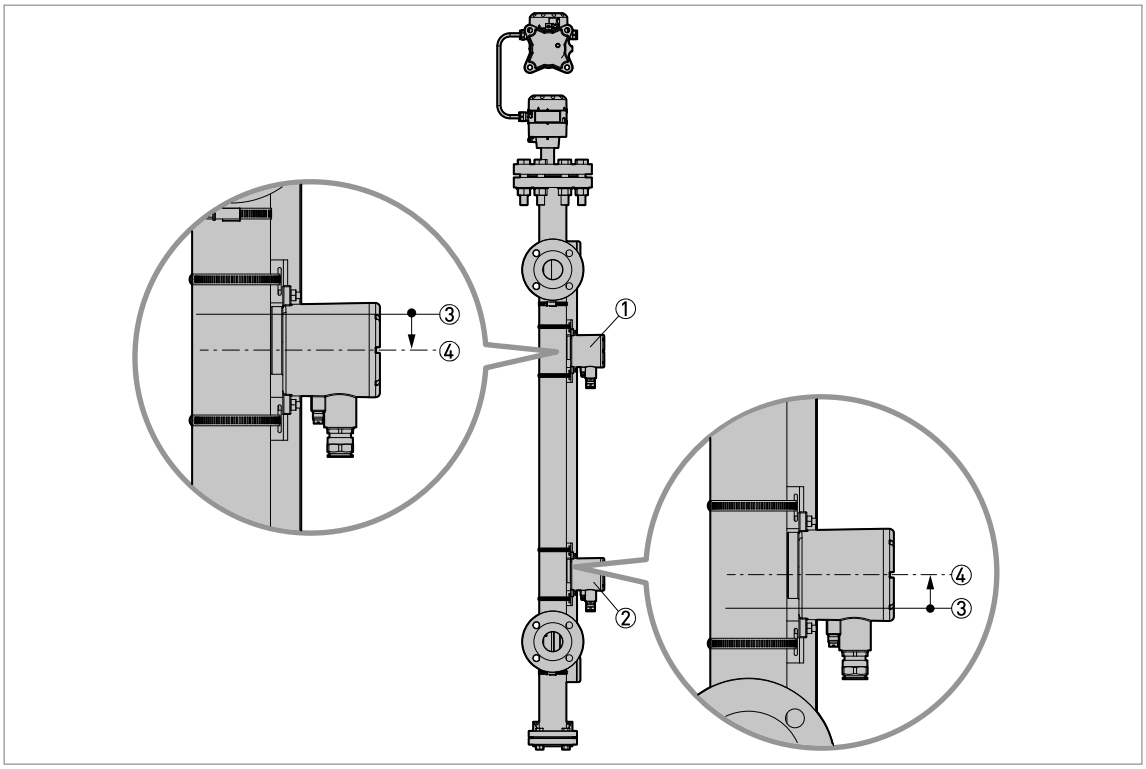

Figure 3-11: Definitions

① Limit switch in "HIGH limit" position
② Limit switch in "LOW limit" position
③ Switching point (the level at which the limit switch changes its condition from "closed" to "open")
④ Correct position of the limit switch in relation to the switching point. If it is a "HIGH limit" switch, put it below the switching point (at a distance equal to the switching point offset value). If it is a "LOW limit" switch, put it above the switching point (at a distance equal to the switching point offset value).

WARNING!
Risk of overfill. If liquid density changes, the limit switch will not detect level correctly. Recalculate the position of the limit switch to agree with the density of the liquid and repeat the installation procedure that follows.

CAUTION!
If you must use the limit switch in operating conditions that have a vibration class of 4M7 (1...200 Hz:3g), put it in a position that is as near as possible to the process connection. Mechanical resonance can cause damage to the limit switch.

3.9.2 Procedures

CAUTION!
TWIN version: *Make sure that the limit switch is attached to the chamber for the indicator column. If the limit switch is attached to the chamber for the level transmitter option, it will not operate correctly.*

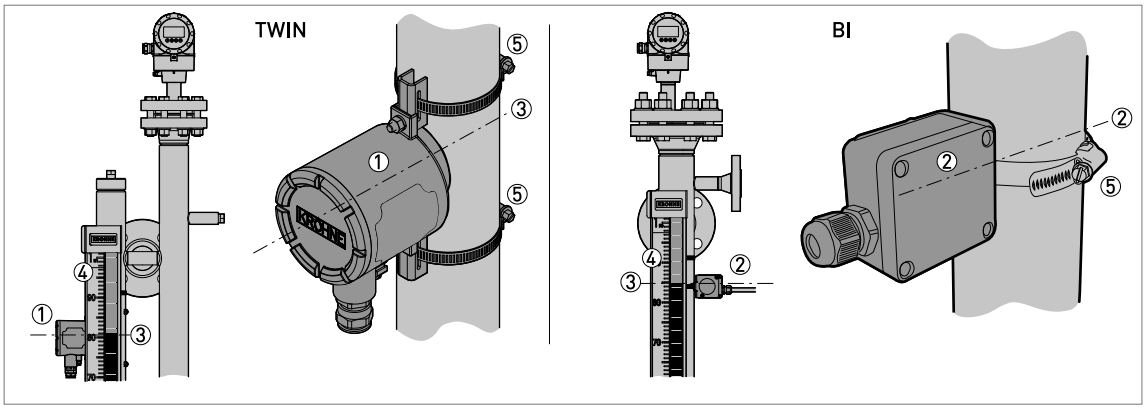

Figure 3-12: Vertical position of the limit switch in relation to the switching point

① MS15 limit switch
② MS40 limit switch
③ Limit switch position
MS15 series: a horizontal line at the same height as the centre of the cylindrical surface of the limit switch that touches the measuring chamber
MS40 series: a horizontal line at the same height as top of the clamp slot on the limit switch bracket
④ Level indicator and optional measuring scale
⑤ Limit switch clamp

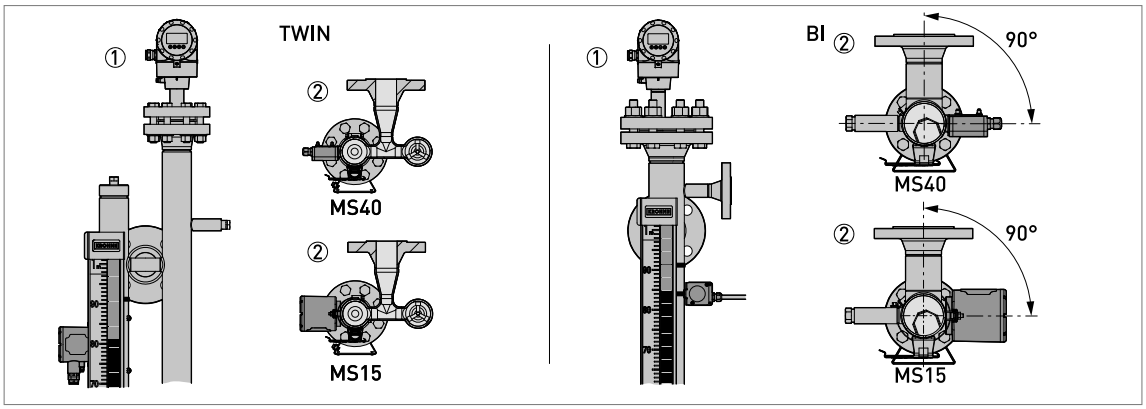

Figure 3-13: Horizontal position of the limit switch in relation to the indicator column (TWIN version) and the float compartment (BI version)

① Side view
② Top view

Equipment needed

- Large, slotted screwdriver (not supplied)

CAUTION!
Use the applicable cable gland with your device. Make sure that the cable gland is on the bottom half of the housing and is tight to stop leaks into the housing.

CAUTION!
Limit switches are not attached to the measuring chamber at the factory. Make sure that you include the switching point offset in your calculation when you adjust the position of the limit switch on the measuring chamber.

Make sure that the limit switch is in the correct position in relation to the float compartment. For more data about how to put the limit switch in the correct position, refer to the "Horizontal position of the limit switch in relation to the indicator column (TWIN version) and the float compartment (BI version)" illustration.

General procedure

- Use the clamp to attach the limit switch to the measuring chamber. Do not tighten the clamp.
- Refer to the "Horizontal position of the limit switch in relation to the indicator column (TWIN version) and the float compartment (BI version)" illustration to put the limit switch in the correct position. If the limit switch is not in the specified position, then it will not operate correctly.
- Put the limit switching in a position where the switching point centreline is at the level required. Refer to the indicator column scale to help you position the limit switch.
- Adjust the limit switch position for the switching point offset. For more data, refer to the "Switching point offset values" table in this section.
- Tighten the limit switch clamp.

➲ End of the procedure.

Switching point offset (hysteresis)

Limit switch - "HIGH limit" position

Put the limit switch below the switching point at a distance equal to the switching point offset value. Refer to the table that follows for the offset value.

Limit switch - "LOW limit" position

Put the limit switch above the switching point at a distance equal to the switching point offset value. Refer to the table that follows for the offset value.

Device pressure rating	Switch condition	Switching point offset, a	
		[mm]	[inches]
PN40	"HIGH limit" or "LOW limit"	20	0.8
PN100	"HIGH limit" or "LOW limit"	22	0.9
PN250	"HIGH limit" or "LOW limit"	26	1.0
PN400	"HIGH limit" or "LOW limit"	28	1.1

Table 3-3: Switching point offset values

Liquid level offset

If the indicator column does not have the scale option, it is necessary to calculate the offset of the float magnet in relation to the level of the liquid ("liquid level offset" or "vertical offset"). The liquid level offset is related to the float type and the liquid density.

For the liquid level offset values, refer to *Liquid level offset* on page 135 (Appendix).

INFORMATION!
If you sent an order for device that has a float with the "zero line" option, then the value of the liquid level offset is 0 mm / 0¨.

Installation of a limit switch for float failure detection

- Make sure the measuring chamber is empty and the float is in the chamber.
- Attach a limit switch to the bottom of the measuring chamber. Do not tighten the clamp.
- Connect the limit switch to the electrical circuit. Make sure that it is set to the "LOW" limit. For more data about electrical connections, refer to *Limit switches* on page 39.
- Energize the electrical circuit.
- Lift the limit switch up the measuring chamber until the limit switch status changes to "open".
- Hold the limit switch tightly in this position and tighten the clamp.

➲ End of the procedure. The limit switch is in the correct position.

For more data about the indication of float failure, refer to *Error indication* on page 51.

3.9.3 Thermal insulation

If you put thermal insulation around the magnetic level indicator, do not cover the housing of the limit switch. Make sure that there is approximately 15 mm / 0.6¨ of empty space between the housing and the thermal insulation.

WARNING!
Too much heat can cause damage to the limit switch.

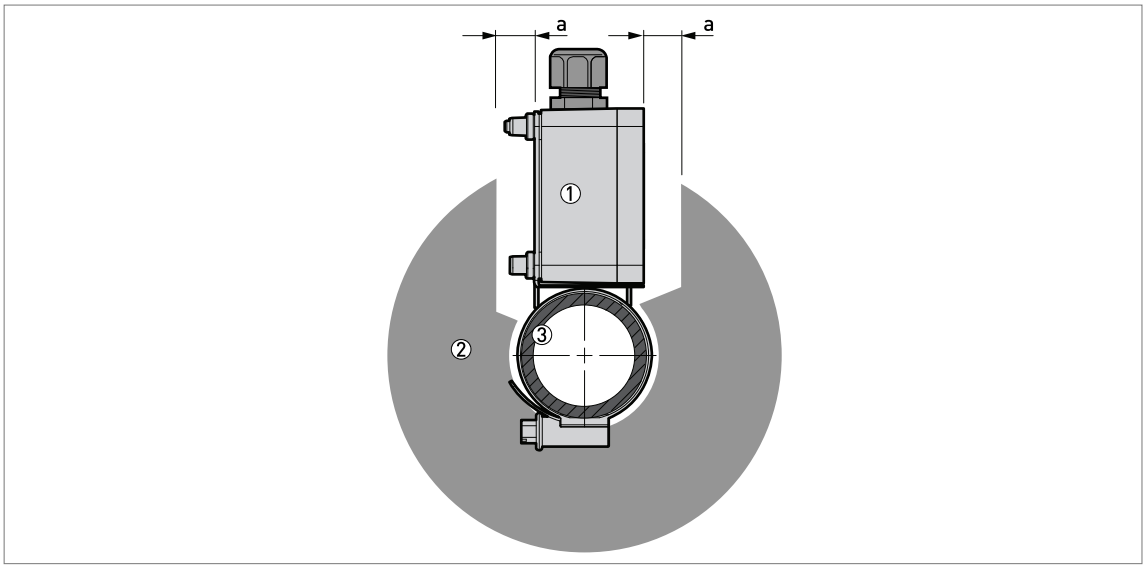

Figure 3-14: Limit switches and thermal insulation for the measuring chamber

① Limit switch housing
② Thermal insulation around the measuring chamber (cross-section)
③ Measuring chamber (cross-section)
Empty space between the limit switch and the thermal insulation for the measuring chamber, a ≥ 15 mm / 0.6¨.

4.1 Safety instructions

DANGER!
All work on the electrical connections may only be carried out with the power disconnected.
Take note of the voltage data on the nameplate!

DANGER!
Observe the national regulations for electrical installations!

WARNING!
Observe without fail the local occupational health and safety regulations.
Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

INFORMATION!
Look at the device nameplate to ensure that the device is delivered according to your order.
Check for the correct supply voltage printed on the nameplate.

4.2 OPTIFLEX 7200 guided radar level transmitter

This device is supplied as an option with the bypass chamber. For the electrical connection procedure, refer to the OPTIFLEX 7200 C/F/S/D handbook.

4.3 OPTIFLEX 8200 guided radar level transmitter

This device is supplied as an option with the bypass chamber. For the electrical connection procedure, refer to the OPTIFLEX 8200 /C/F/S handbook.

4.4 OPTIWAVE 7400 24 GHz FMCW radar level transmitter

This device is supplied as an option with the bypass chamber. For the electrical connection procedure, refer to the OPTIFLEX 7400 C handbook.

4.5 BW25 displacer-type level transmitter

This device is supplied as an option with the bypass chamber. For the electrical connection procedure, refer to the BW25 handbook.

4.6 Reed-chain level transmitter

4.6.1 General notes

The reed-chain level transmitter has 4 output options:

- 4...20 mA
- 4...20 mA + HART®
- PROFIBUS PA
- FOUNDATION™ fieldbus

Obey the wiring instructions that follow.

For more data about the reed-chain level transmitter, refer to *LT40 reed-chain level transmitter* on page 94.

CAUTION!
Make sure that the current is not more than 5 A or that there is 5 A-rated fuse in the electrical circuit that energizes the device.

4.6.2 Electrical schematics and procedure

4...20 mA and 4...20 mA + HART output modules

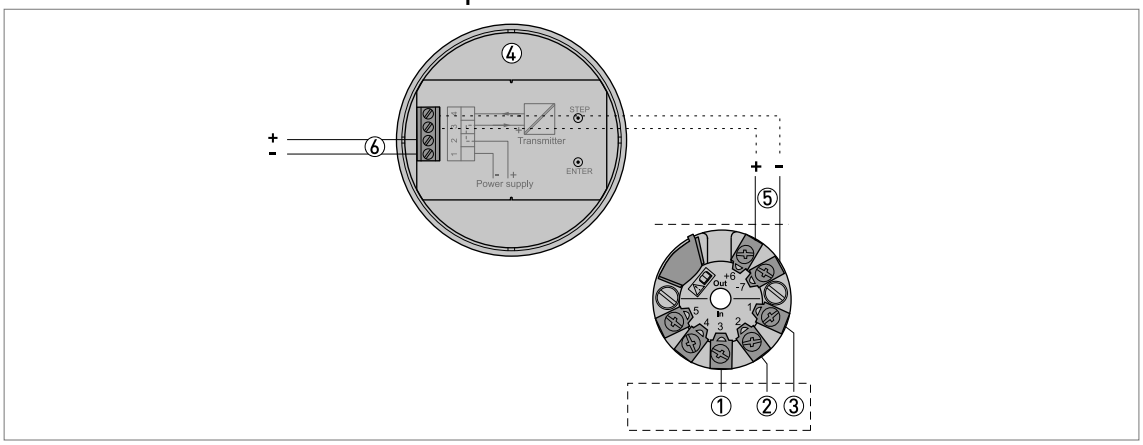

Figure 4-1: Electrical schematic for the 4...20 mA and 4...20 mA + HART output module

① Internal wiring - brown wire
② Internal wiring - red wire
③ Internal wiring - orange wire
④ Optional LCD indicator
⑤ Power supply terminals +/-, without LCD indicator (DC voltage range: 10...35 V (non-Ex or Ex db) or 10...30 V (Ex ia))
⑥ LCD indicator power supply terminals +/- (DC voltage range: 17...35 V)

CAUTION!
If the reed-chain level transmitter has the LCD indicator option, then there is a red wire between the positive (+) terminals and a black wire between the negative (-) terminals of the output module and the LCD indicator. Use the +/- terminals on the back the LCD indicator to connect the reed-chain level transmitter to the power supply.

FOUNDATION™ fieldbus / PROFIBUS PA module

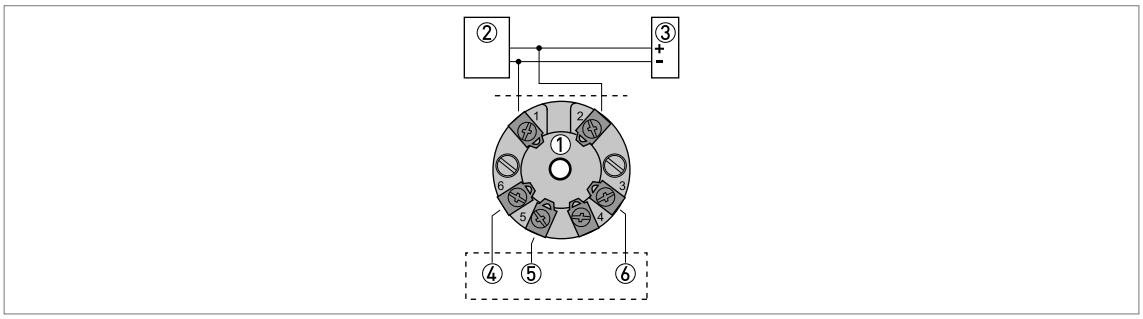

Figure 4-2: Electrical schematic for the FOUNDATION™ fieldbus / PROFIBUS PA module

① Bus connection terminals
② Segment coupler
③ Bus termination
④ Internal wiring - orange wire
⑤ Internal wiring - red wire
⑥ Internal wiring - brown wire

Equipment needed

- Small, slotted screwdriver (not supplied)
- Cable gland (if not supplied)

WARNING!
Close the housing cover tightly. This precaution prevents corrosion of the terminals.

WARNING!
Use the applicable cable gland with your device. Make sure that the cable gland is tight to stop leaks into the housing.

Procedure

- Remove the housing cover.
- Prepare the electrical wires for the device terminals. Do not remove more than 6 mm / 0.2¨ of insulation from the electrical wire.
- Connect the device to the electrical circuit. Make sure that this agrees with the electrical schematics in this section.
- Tighten the cable gland.
- Close the housing cover tightly.

➲ End of the procedure. You can energize the device.

4.7 Limit switches

4.7.1 General notes

There are four limit switch models:

- MS15
- MS15 NAMUR
- MS40
- MS40 NAMUR

Obey the wiring instructions that follow.

For more data, refer to *MS15-series and MS40-series limit switches* on page 99.

4.7.2 Electrical schematics and procedure

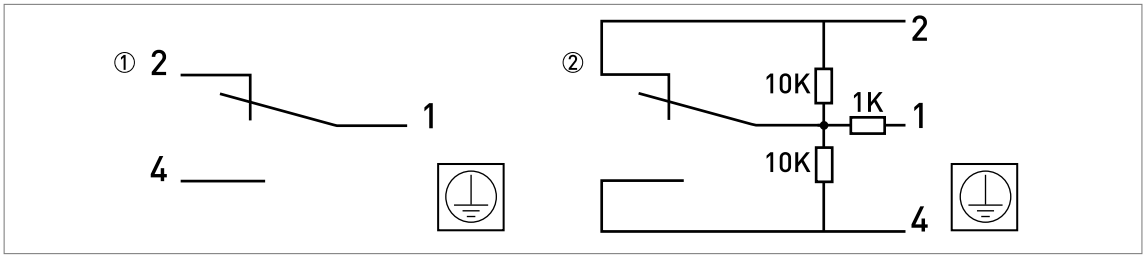

Figure 4-3: Electrical schematics for the MS15-series and MS40-series limit switches

① MS15 or MS40 limit switch
② MS15 or MS40 limit switch with a NAMUR output

Equipment needed

- Small, slotted screwdriver or small Phillips screwdriver (not supplied)
- Cable gland (if not supplied)

WARNING!
Close the housing cover tightly. This precaution prevents corrosion of the terminals.

CAUTION!
Use the applicable cable gland with your device. Make sure that the cable gland is on the bottom half of the housing and is tight to stop leaks into the housing.

CAUTION!
If the limit switch is set to "LOW limit", make sure that it is open when the float is below the switch position. If the limit switch is set to the "HIGH limit", make sure that it is open when the float is above the switching point.

Procedure

- Remove the housing cover.
- Prepare the electrical wires for the device terminals. Do not remove more than 6 mm / 0.2¨ of insulation from the electrical wire.
- Connect the device to the electrical circuit. Make sure that this agrees with the related electrical schematic in this section.
- Make sure that the limit switch is correctly grounded. For more data, refer to *Limit switches (option)* on page 42.
- Tighten the cable gland.
- Close the housing cover tightly.

➲ End of the procedure.

4.8 Grounding connections

4.8.1 Measuring chamber

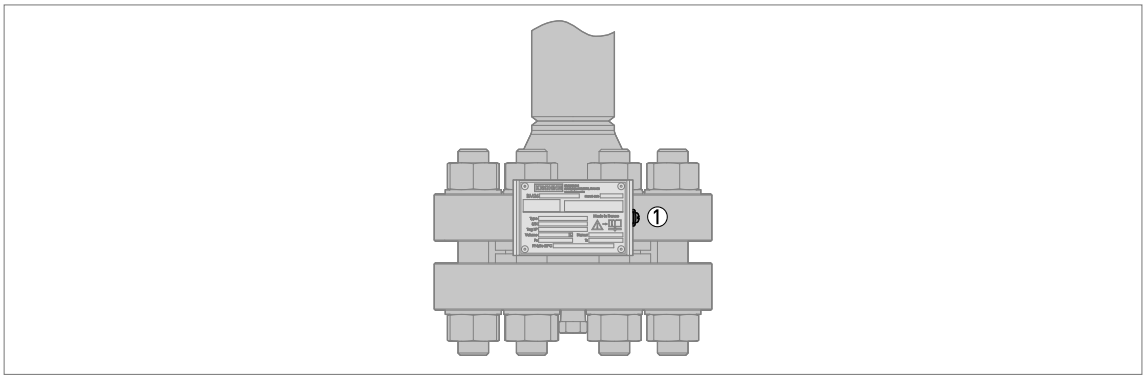

Figure 4-4: Measuring chamber - location of grounding terminal

① Grounding terminal on the side of the nameplate

4.8.2 Reed-chain level transmitter (option)

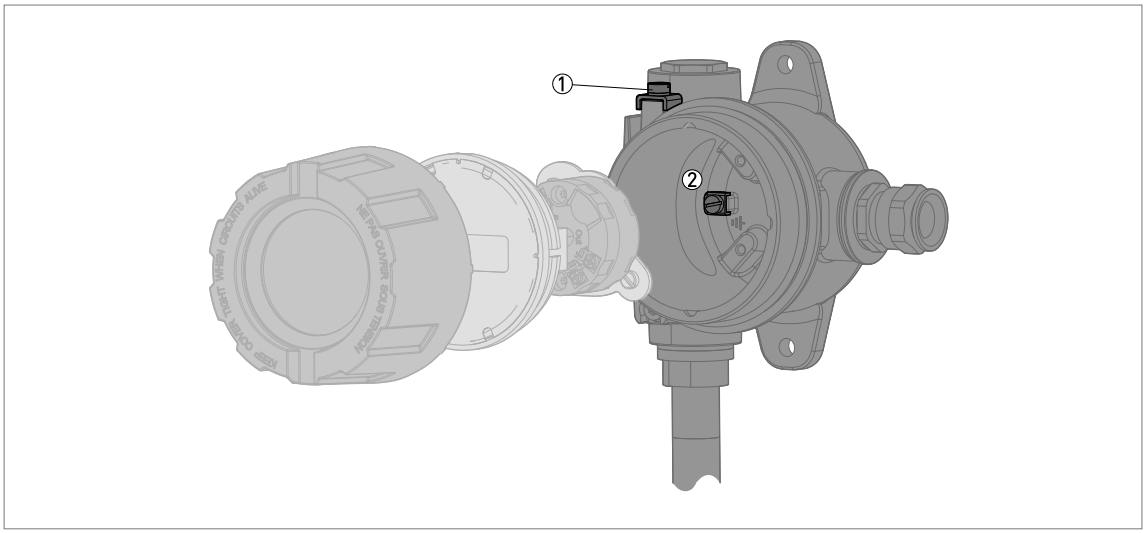

Figure 4-5: Reed-chain level transmitter - location of grounding terminals

① Grounding terminal on top of the housing
② Grounding (PE) terminal in the housing

4.8.3 Limit switches (option)

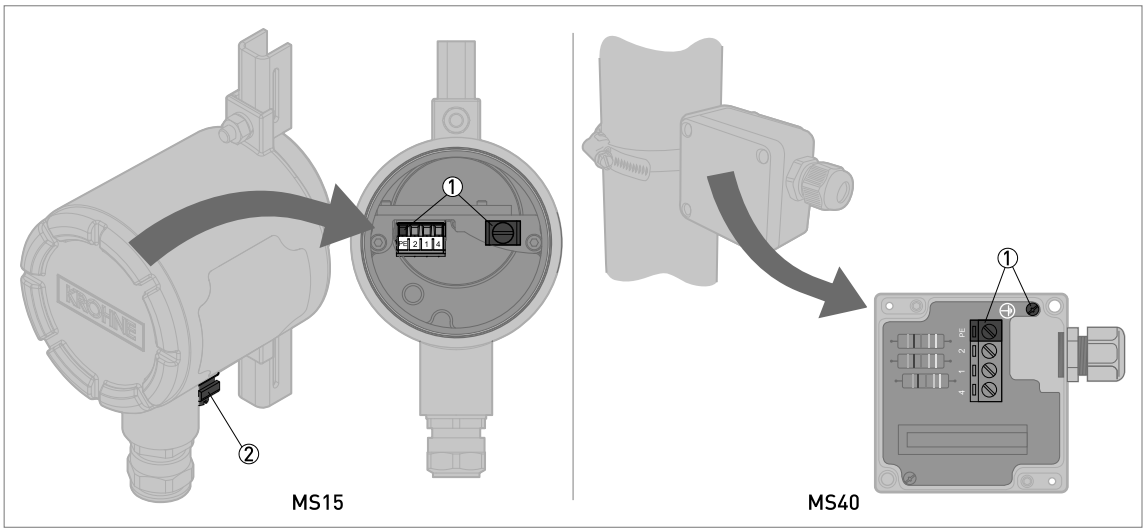

Figure 4-6: Limit switch - location of grounding terminals

① Grounding (PE) terminal in the housing (MS15 series and MS40 series)
② Grounding terminal on the housing (MS15 series only)

4.9 Protection category

IP ratings (IEC 60529)

For the IP (Ingress Protection) ratings of device options, refer to the table that follows:

Device housing	IP rating
LT40 reed-chain level transmitter	
Non-Ex / Ex i / Ex d	IP66 / IP68 ①
MS15-series limit switch	
Non-Ex / Ex i / Ex d	IP66 / IP68 ①
MS40-series limit switch	
Non-Ex / Ex i	IP66

Table 4-1: IP ratings (IEC 60529)

① IPx8 = in water at a depth of 1.5 metres for 2 weeks

INFORMATION!
For the IP ratings of other level transmitter options, refer to the related handbook (BW25, OPTIWAVE 7400, OPTIFLEX 7200 or OPTIFLEX 8200).

How to make sure that the electrical installation agrees with the IP rating

- Make sure that the gaskets are not damaged.
- Make sure that the electrical cables are not damaged.

- Make sure that the electrical cables agree with the national electrical code.
- Make sure that the electrical cables are in a loop in front of the device so water cannot enter the housing.
- Tighten the cable glands.
- Close cable glands without electrical cables with dummy plugs.

CAUTION!
Use the applicable cable gland with your device. Make sure that the cable gland is on the bottom half of the housing and is tight to stop leaks into the housing.

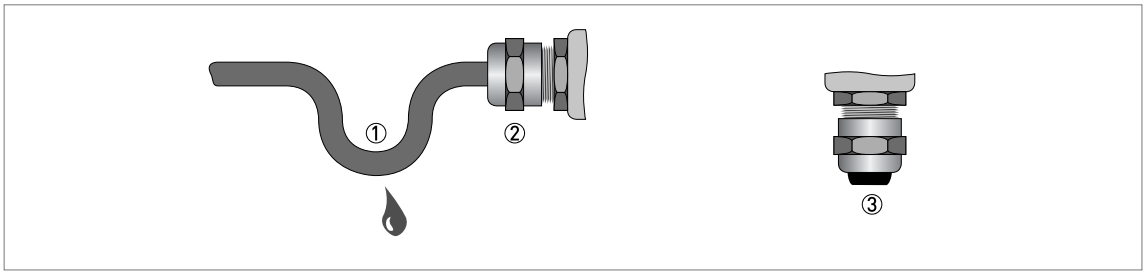

Figure 4-7: How to make sure that the electrical installation agrees with the IP rating

① Cable loop
② Cable gland
③ Dummy plug

5.1 Start-up checklist

Do these checks before you use the device:

- Are all the wetted components (measuring chamber, flanges and gaskets) resistant to the product in the tank?
- Does the information on the nameplate agree with the operating data? For more data about nameplates, refer to *Nameplates* on page 15.
- Did you put the float in the measuring chamber? For more data about the procedure, refer to *How to put the float in the measuring chamber* on page 20.
- Did you correctly install the device on the tank?
- Device options: Do the electrical connections agree with the national electrical codes?
- Do the electrical cables have properties that are applicable to the operating conditions?

DANGER!
Devices with Ex approval options: Make sure that the magnetic level indicator, electrical equipment and the installation agree with the requirements of all the related Ex certificates of compliance.

CAUTION!
If the device has a level transmitter option or electric heat tracing equipment, obey the instructions given in the related handbooks for this equipment.

5.2 How to start the device

- Attach the drainage plugs or close the drainage cock.
- Slowly open the isolation valves on the top and bottom process connections.
- Do a leak test.
- Energize the electrical equipment.

➲ End of the procedure.

DANGER!
Low-temperature or high-temperature versions: risk of burns. Put on protective clothing when you go near the device.

WARNING!
Do the servicing of device regularly to agree with the regulations of the site on which it is installed.

CAUTION!
Risk of damage to the device from shock waves. Open the valves slowly to prevent damage from water hammer. Use a pressure-limiting valve to prevent damage to the installation.

6.1 Operating concept

You can read level measurements with:

- An indicator column with or without a scale. Scale options include m/cm, ft/in, customized volume units and % (simplified).
- A reed-chain level transmitter. Output options include 4...20 mA, 4...20 mA + HART, FOUNDATION™ fieldbus and PROFIBUS PA. An LCD indicator option is also available for the 4...20 mA and 4...20 mA + HART output options.

You can receive a signal when the liquid gets to a specified level with:

- A limit switch

6.2 Description of display

6.2.1 Indicator column

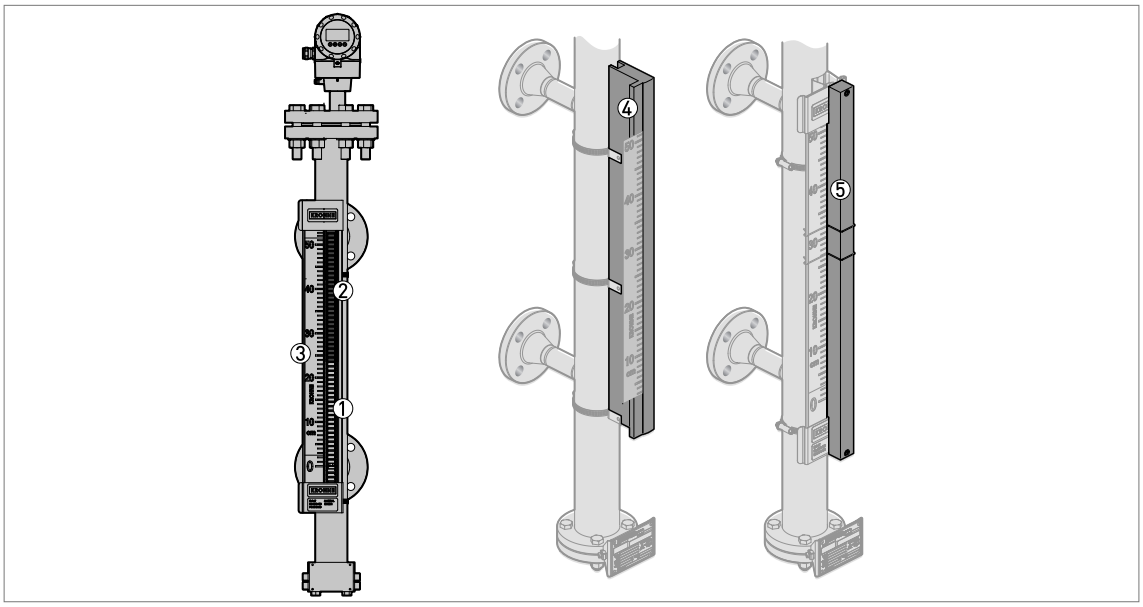

Figure 6-1: Display of data on an indicator column

① Yellow or red flaps: level of the liquid in the tank
② Black or white flaps: empty volume
③ Optional measuring scale in m/cm, mm, ft/in, customized volume units or % (simplified)
④ Low-temperature index option
⑤ PLEXIGLAS® anti-icing option

If the scale adjacent to the indicator column has % (simplified) units, then it has a range of 0...100% with an increment of 10% between each marking. "0%" agrees with the bottom of the measuring length of the bypass chamber. "100%" agrees with the top of the measuring length of the bypass chamber.

For data about the indication of float failure, refer to *Error indication* on page 51.

6.2.2 Reed-chain level transmitter (option)

Signal outputs

The reed-chain level transmitter has transmitter modules for analog and digital outputs (4...20 mA + HART®, FOUNDATION™ fieldbus and PROFIBUS PA®). Use the web links in the table that follows to download the software and device description files.

Transmitter output	Module	Manufacturer	Software	Device description files
4...20 mA	TT53 C	KROHNE INOR	N/A	N/A
4...20 mA + HART®	TT53 C	KROHNE INOR	N/A	DD ①
FOUNDATION™ fieldbus	5350B	PR electronics	PReset ②	DD ②
PROFIBUS PA	5350B	PR electronics	PReset ②	GSD ②

Table 6-1: Signal output options for the reed-chain level transmitter

① Go to the KROHNE website: www.krohne.com (Downloads > Software). DD files are available for field communicators, DTM, AMS and PDM.

② Go to the PR electronics website: www.prelectronics.com (Downloads > Software > Files for HART and bus communication)

LCD indicator (option)

The LCD indicator has a 4-digit display screen. The values on the display screen are in millimetres by default, but you can also select inches or %.

6.2.3 Level transmitter (OPTIFLEX 7200, OPTIFLEX 8200, OPTIWAVE 7400 or BW25)

For data about the display screen, refer to the handbook related to the level transmitter option.

6.3 How to change measurement units (LT40)

Example procedure: How to change the measurement units from mm to %

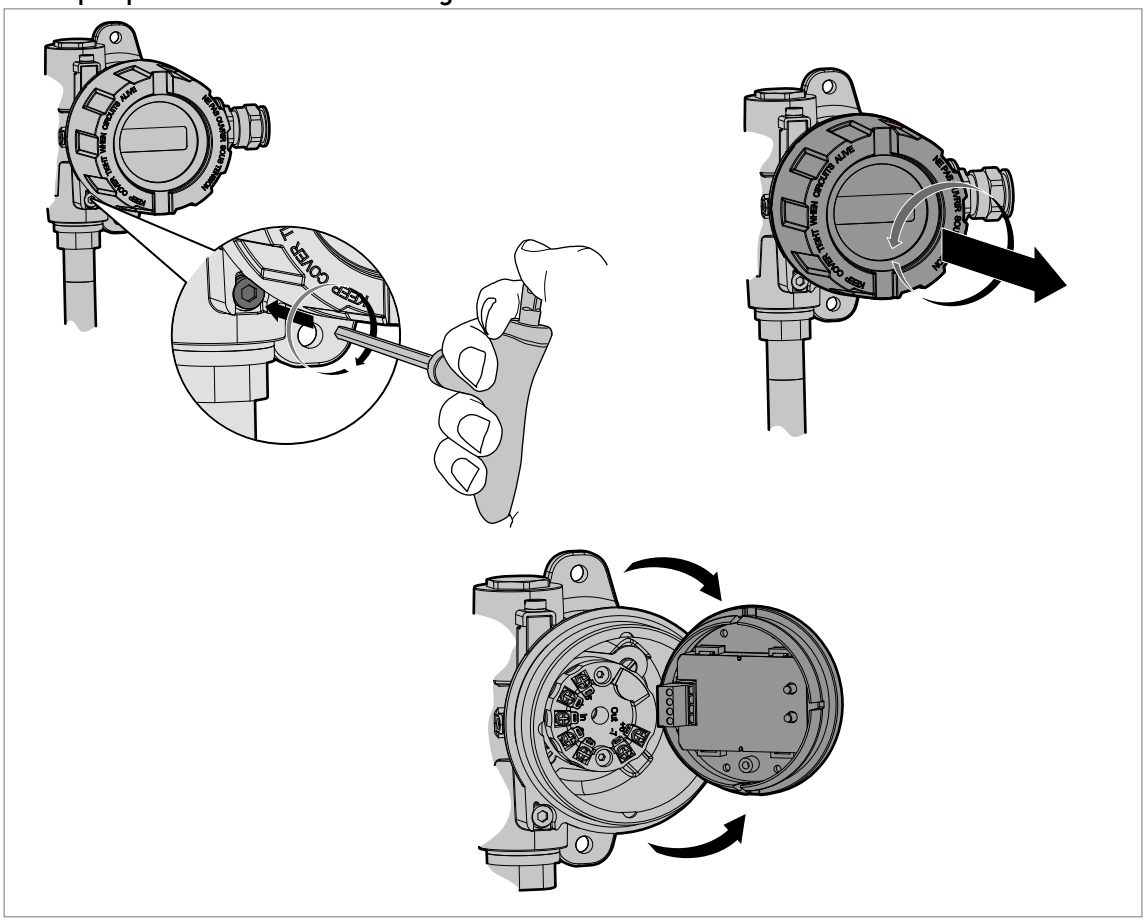

Figure 6-2: How to change the measurement units from mm to % - part 1

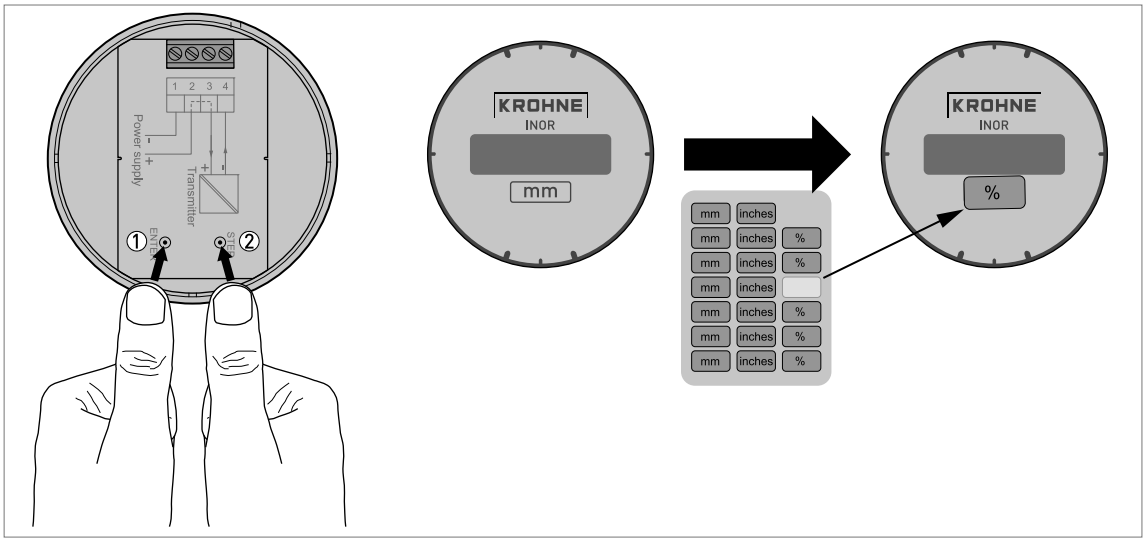

Figure 6-3: How to change the measurement units from mm to % - part 2

① ENTER button
② STEP button

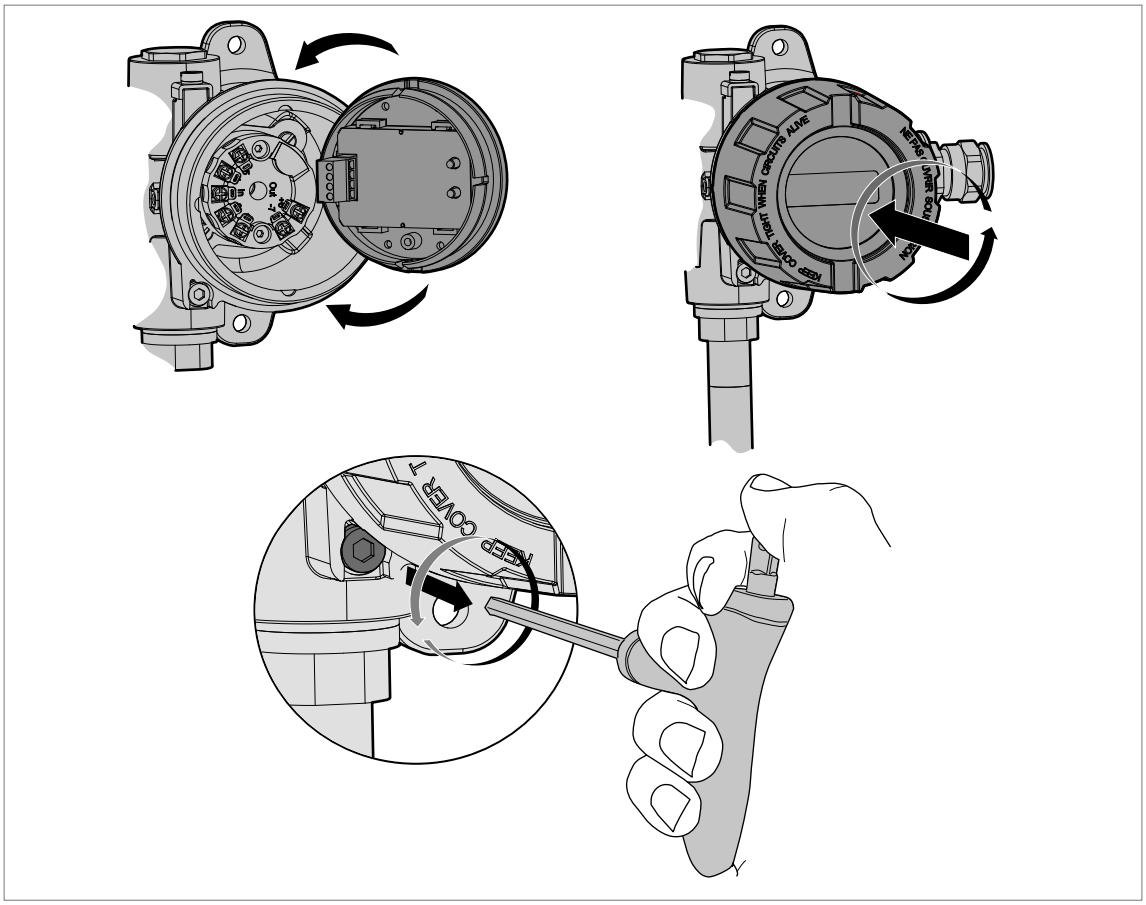

Figure 6-4: How to change the measurement units from mm to % - part 3

Equipment needed

- Sheet of stickers with measurement units - mm, inches and % (supplied)
- 3-mm Allen wrench (not supplied)

DANGER!
Do not open the housing in a hazardous location. For more data, refer to the supplementary instructions for the related Ex approval.

For more data about how to change parameters of the LCD indicator, refer to the key function and menu overview tables that follow:

- Turn the lock screw clockwise with a 3-mm Allen wrench to unlock the housing cover.
- Remove the housing cover.
- Remove the LCD indicator module from the housing.
- Turn the LCD indicator module to use the 2-button keypad ([STEP] and [ENTER]) on the back of the module to change the units.
- Push [STEP] for 10 seconds to access the menu of the LCD indicator module.

➲ The display screen shows the menu item "LO" (to set the parameter for the bottom of the scale). If you do not change the value in less than 20 seconds, then the display screen will automatically go back to measurement mode.

- Push [ENTER] one time to enter the new value. Make sure that the value is set to 0. For more data on how to change values, refer to the data that follows this procedure.
- Push [ENTER] to go to the End screen. If the value is correct, then push [ENTER] again to go back to the menu.
- Push [STEP] to show the menu item "HI" (to set the parameter for the top of the scale).
- Push [ENTER] one time to enter the new value. Make sure that the value is set to 100. For more data on how to change values, refer to the data that follows this procedure.
- Push [ENTER] to go to the End screen. If the value is correct, then push [ENTER] again to go back to the menu.
- If the parameters are correct, push [STEP] to show the menu item "SAVE" (to save the changed parameters). Push [ENTER] to go back to the measurement mode.
- If the parameters are incorrect, push [STEP] two times to show the menu item "ESC" (to cancel the changed values and keep the initial parameters). Push [ENTER] to go back to the measurement mode.
- Attach the LCD indicator module to the housing.
- Put the sticker with the correct measurement unit over the default units under the indicator screen.
- Attach the housing cover.
- Turn the lock screw counterclockwise with a 3-mm Allen wrench to lock the housing cover. Make sure that you cannot turn the housing cover.

➲ End of the procedure. The LCD indicator module shows a value between 0 and 100.

INFORMATION!

Make sure that the decimal point is in the correct position before you push [ENTER] to go back to the End screen and the menu.

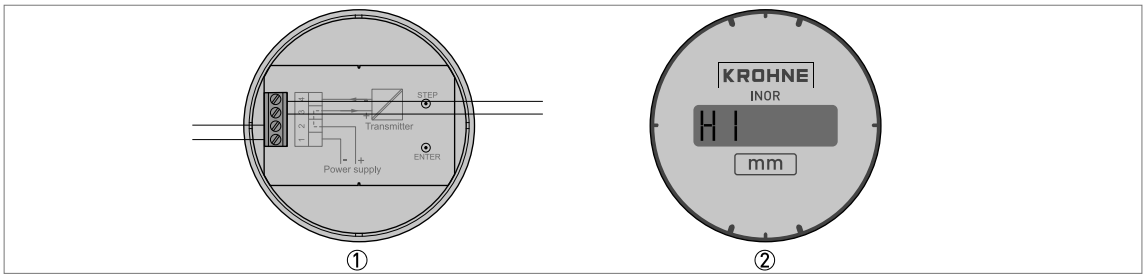

Figure 6-5: Front and back view of the LCD indicator module

① Back of the LCD indicator module
② Front of the LCD indicator module ("HI" is the menu item for the maximum value of the measuring range)

Key functions

Key	Function		
	Measurement mode	Menu	Menu item
[STEP] for 4 seconds	Get access to the menu.	N/A	N/A
[STEP]	N/A	Select a menu item.	Push intermittently to increase the value by increments of 1. If the cursor is on the first digit, it is possible to select the negative sign to have a negative value.
[ENTER]	N/A	Get access to a menu item. If you select "SAVE" or "ESC", these menu items save or cancel changes and put the LCD indicator module back into measurement mode.	Move the cursor one digit to the right. Add a decimal point. Go back to the menu.

Table 6-2: LT40 with LCD indicator module: key functions

Menu overview

Menu item	Function description	Range/Selection list	Default
LO	Minimum value on the scale for the reed-chain level transmitter.	-999...+9999	①
HI	Maximum value on the scale for the reed-chain level transmitter.	-999...+9999	①
SAVE	Push [ENTER] to save the changed parameters.	N/A	N/A
ESC	Push [ENTER] to cancel the changed values and keep the initial parameters.	N/A	N/A

Table 6-3: LT40 with LCD indicator module: menu overview

① This value is given in the customer order

How to enter a negative value

If the cursor is on the first digit, it is possible to select the negative (-) sign to enter a negative value.

How to add a decimal point

If the cursor is on the last digit, push [ENTER] again to put a decimal point between the first and second digit. You can then push [STEP] one time to move the decimal point one digit to the right. If you push [STEP] again when the decimal point is to the left of the last digit, then the display screen will show 4 digits without a decimal point.

6.4 How to change device parameters (OPTIFLEX 7200, OPTIFLEX 8200, OPTIWAVE 7400 or BW25)

For data about device parameters, refer to the handbook related to the level transmitter option.

6.5 Errors

6.5.1 Error indication

Indicator column

If the float goes to the bottom of the measuring chamber, the indicator column will show orange flaps.

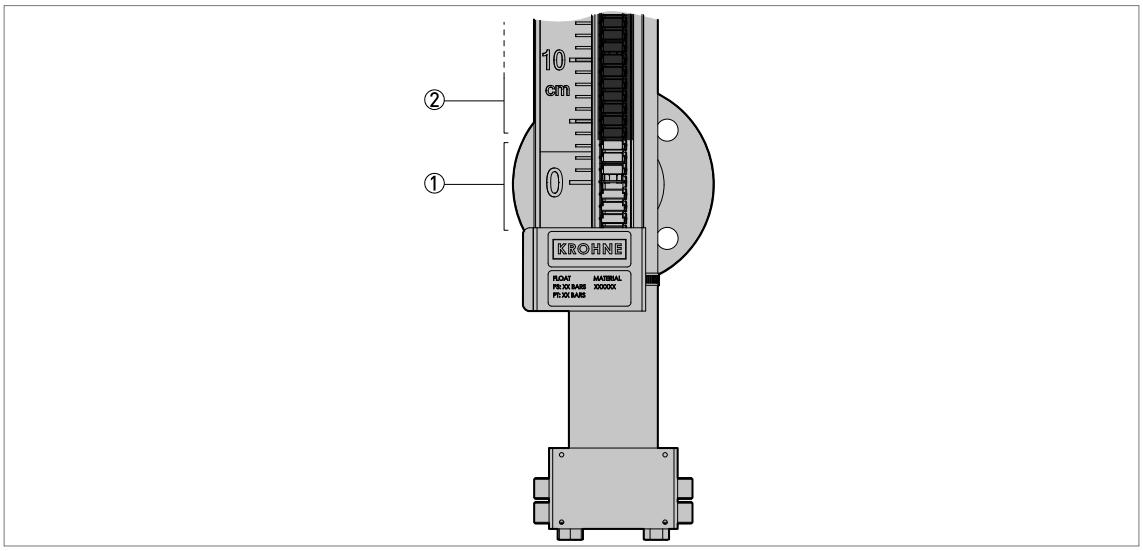

Figure 6-6: Error indication - indicator column

① Orange flaps: float failure
② Black flaps: empty volume

The indicator shows orange if:

- the float is at the bottom of the measuring chamber,
- the measuring chamber is completely empty, or
- the liquid density is less than the value given in the order.

For procedures to find and correct errors related to float failure, refer to *Error handling* on page 52.

LT40 reed-chain level transmitter (option)

If the float goes above or below the ends of the reed chain, then the display screen will flash the text "HI" at one-second intervals.

For procedures to find and correct errors related to the reed-chain level transmitter, refer to *Error handling* on page 52.

6.5.2 Error handling

Error	Description	Corrective action
Indicator column		
Float failure	The indicator shows orange flaps. The float is at the bottom of the measuring chamber.	• Make sure that the measuring chamber is not completely empty. • Make sure the density of the liquid is the same as the value given in the order data. • Speak to your local sales office to make sure that the float agrees with the density of the liquid. • If there is corrosion on the float or the float is damaged, it is necessary to replace the float. Send an order for a new float. • Isolate the measuring chamber and remove the liquid. Remove the bottom flange and the float. For the procedure to replace the float, refer to *How to put the float in the measuring chamber* on page 20.
There is too much liquid in the tank. The indicator continues to show a level that is below the maximum limit.	The density of the liquid is lower than the value given in the customer order data. The float is too low in the liquid.	Make sure that the density of the liquid is stable. Speak to your local sales office for more data and instructions.
The level of the liquid in the tank is above the minimum limit, but the indicator shows orange flaps.		
The level of the liquid is below the maximum limit. The indicator shows that the level is at its maximum limit.	The density of the liquid is higher than the value given in the customer order data. The float is too high in the liquid.	Make sure that the density of the liquid is stable. Speak to your local sales office for more data and instructions.
The quantity of liquid in the tank is too small. The indicator shows a level that is above the minimum limit.		
Level transmitter (OPTIFLEX 7200, OPTIFLEX 8200, OPTIWAVE 7400 or BW25)		
All errors	N/A	Refer to the "Description of errors and corrective actions" or "Error messages" table in the handbook related to the level transmitter option.

Error	Description	Corrective action

Reed-chain level transmitter (LT40)

LCD indicator module status: HI	The current output is more than 20.5 mA. Overfill. The level of the liquid is above the maximum limit.	Lower the level of liquid below the maximum limit.
	Current output is more than 20.5 mA. The LT40 is not in the same position as it was set in the factory. A value more than 20 mA is not equal to the maximum limit at this time.	Speak to your local sales office for more data and instructions.
	Current output is more than 20.5 mA. The LT40 is defective. A value more than 20 A is not equal to the maximum limit at this time.	
LCD indicator module status: LO	Current output is less than 3.8 mA. The level of the liquid is below the minimum limit.	Increase the level of liquid until it is above the minimum limit.
	Current output is less than 3.8 mA. The LT40 is not in the same position as it was set in the factory. A value less than 4 mA is not equal to the minimum limit at this time.	Speak to your local sales office for more data and instructions.
	Current output is less than 3.8 A. The LT40 is defective. A value less than 4 mA is not equal to the minimum limit at this time.	
The level of the liquid is at or is above the maximum level, but the LT40 output does not show that level is at its maximum limit yet.	The density of the liquid is lower than the value given in the customer order data. The float is too low in the liquid.	Make sure that the density of the liquid is stable. Speak to your local sales office for more data and instructions.
The LT40 output shows that the liquid is at or is below the minimum level, but the level of the liquid stays above the minimum limit.		
The level of the liquid is below the maximum level, but the LT40 output shows that level is at its maximum limit.	The density of the liquid is higher than the value given in the customer order data. The float is too high in the liquid.	Make sure that the density of the liquid is stable. Speak to your local sales office for more data and instructions.
The LT40 output is not at the minimum level at this time, but the level of the liquid is at or is below the minimum limit.		

Error	Description	Corrective action
Limit switch (MS15 series and MS40 series)		
The limit switch is in a high (maximum) position and set to "HIGH limit". Its status is "open".	Is there too much liquid in the tank? The level of the liquid is at or is above the maximum limit.	Lower the level of liquid below the maximum limit.
The limit switch is in a low (minimum) position and set to "LOW limit". Its status is “open”.	Is the tank empty? The level of the liquid is at or is below the minimum limit.	Increase the level of liquid until it is above the minimum limit.
The limit switch is in the float failure position and set to "LOW limit". Its status is "open".	Float failure. The float is at the bottom of the measuring chamber.	Is the measuring chamber empty? If the measuring chamber is not empty, then it is necessary to replace the float. Send an order for a new float to your local sales office. For the procedure to replace the float, refer to *How to put the float in the measuring chamber* on page 20.
The level switch does not detect the minimum limit correctly.	The limit switch (set to "LOW limit)" is "open", but the level of the liquid stays above the minimum limit. The density of the liquid is lower than the value given in the customer order data.	Make sure that the density of the liquid is stable. Recalculate the liquid density and repeat the installation procedure for the limit switch.
	The limit switch (set to "LOW limit") is “closed”, but the level of the liquid is at or is below the minimum limit. The density of the liquid is higher than the value given in the customer order data.	
The level switch does not detect the maximum limit correctly.	The level of the liquid is at or is above the maximum level, but the limit switch (set to "HIGH limit") is "closed". The density of the liquid is lower than the value given in the customer order data.	
	The level of the liquid is below the maximum level, but the limit switch (set to "HIGH limit") is "open". The density of the liquid is higher than the value given in the customer order data.	

Table 6-4: Error handling

7.1 Periodic maintenance

This device does not normally need maintenance. If the liquid is contaminated or build-up of deposits is possible, we recommend that you flush the device regularly.

WARNING!
The device must be regularly serviced to conform to the rules and regulations applicable to the site on which it is installed.

WARNING!
Follow accident prevention regulations carefully when you do work near pressurized tanks and dangerous chemical products.

How to flush the device

- Open the drain plug or drain valve.
- Flush the chamber.

➲ End of the procedure.

WARNING!
If you remove the float, close the isolation valves.

Float removal

- Close the isolation valves.
- If the device has a bottom side process connection, remove the flange at the bottom of the measuring chamber.
- Remove and clean the float.

➲ End of the procedure.

WARNING!
If the measuring chamber has Ring Joint gaskets, then make sure that you replace the gasket each time that you remove the bottom flange.

7.2 Cleaning

DANGER!
If you rub the anti-icing cover option with a dry cloth, there is a risk of electrostatic discharge. Clean the anti-icing cover option only with a damp cloth.

7.3 Service warranty

Maintenance is not necessary for most applications.

Servicing by the customer is limited by warranty to

- The removal and installation of limit switches. For the procedure, refer to *Electrical connections* on page 37.
- The removal and installation of the float. For the procedure, refer to *How to put the float in the measuring chamber* on page 20.
- The removal and installation of the indicator column. For the procedure, speak or write to your supplier.
- The removal and installation of the LT40 reed-chain level transmitter. For the procedure, speak or write to your supplier.

The indicator column, LT40 reed-chain level transmitter, MS15 series limit switch, and MS40 series limit switch can be removed under process conditions.

INFORMATION!
For data about the service warranty for the OPTIFLEX 7200, OPTIFLEX 8200, OPTIWAVE 7400 or BW25 level transmitter, refer to the handbook related to the level transmitter option.

The manufacturer supplies these spare parts:

- screws, nuts, studs, gaskets and counter flanges for flanged connections
- male and female plugs for drains and vents
- ball valves
- float

Use only KROHNE-authorized service staff to repair the device.

INFORMATION!
Make sure that you supply the data given on the device nameplate when you send an order for spare parts.

7.4 How to replace device components

If it is necessary to replace the float, refer to *How to prepare the device for installation* on page 20.

If it is necessary to replace a limit switch, refer to *Installation - limit switches (MS15 series and MS40 series)* on page 32.

7.5 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.

INFORMATION!
For more precise information, please contact your local sales office.

7.6 Returning the device to the manufacturer

7.6.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.

WARNING!
Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of the personnel, the manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*

WARNING!
If the device has been operated with toxic, caustic, radioactive, flammable or water-endangering products, you are kindly requested:

- *to check and ensure, if necessary by rinsing or neutralising, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that it is safe to handle and stating the product used.*

7.6.2 Form (for copying) to accompany a returned device

Company:		Address:
Department:		Name:
Tel. No.:		Fax No.:
The meter enclosed, type:		
Manufacturer's Order or Serial No.:		
has been operated with the following liquid:		
Because this liquid is:	☐	hazardous to water
	☐	toxic
	☐	caustic
	☐	flammable
	☐	We have checked that all cavities in the unit are free from such substances.
	☐	We have flushed out and neutralized all cavities in the unit.
We herewith confirm that in returning this unit there is no risk to man or environment through any residual liquid contained in it.		
Date:		Company stamp:
Signature:		

7.7 Disposal

§

LEGAL NOTICE!
Disposal must be carried out in accordance with legislation applicable in your country.

Separate collection of WEEE (Waste Electrical and Electronic Equipment):

According to the directive 2012/19/EU or UK Regulation 2013 No. 3113, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste**.
The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

7.8 Disassembly and recycling

This section shows you how to handle the MS15-series and MS40-series limit switches and the LT40 reed-chain level transmitter if they are at the end of their product life cycles or if they must be discarded. Data given in this section agrees with the EU Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) and the EU Directive 2008/98/EC on waste (Waste Framework Directive). Refer to the data and obey the instructions that follow to disassemble and prepare components for waste treatment.

INFORMATION!
The device does not contain dangerous gases or materials. If there is contamination from the process, refer to Returning the device to the manufacturer on page 57.

7.8.1 LT40 reed-chain level transmitter

INFORMATION!
*Words in **bold text** refer to electrical and electronic equipment.*

LT40 C - Compact Version

Product description

Product name and data

Type	Reed chain
Model	LT40 C (compact version)
Usage	Level measurement

Weight

Total weight	**Aluminium housing** ≤ 4.951 kg / ≤ 10.915 lb ①
	Stainless-steel housing ≤ 6.473 kg / ≤ 14.271 lb ①
Weight of metal parts	**Aluminium housing** ≤ 4.823 kg / ≤ 10.633 lb ①
	Stainless-steel housing ≤ 6.344 kg / ≤ 13.986 lb ①
Weight of plastic parts	~0.025 kg / ~0.055 lb

Dimensions

Volume	≤ 0.509 dm³ / ≤ 31.06 in³ ②

Table 7-1: LT40 C - product description

① The options will have an effect on the weight
② The options will have an effect on the volume

Parts list

Item	Description	Material
(1)	**Electronic transmitter**	FR-4, electronic components, solder, polycarbonate, stainless steel
(2)	Housing Ex d	aluminium or stainless steel
(3)	Gasket	aramid fiber
(4)	Cover	aluminium or stainless steel + glass
(5)	**Display**	FR-4, electronic components, solder
(6)	Gasket	aramid fiber
(7)	Threaded plug	stainless steel
(8)	Gasket	silicone
(9)	Threaded connection	stainless steel
(10)	Collar	stainless steel
(11)	Clamp	stainless steel
(12)	Screw	stainless steel
(13)	Screw	stainless steel
(14)	Adhesive label	polyester
(15)	Pipe	stainless steel Ex d-approved device: stainless steel + alumina
(16)	Cable gland	PA or nickel-brass or stainless steel
(17)	Gasket	silicone
(18)	**Reed chain**	polyimide, electronic components, solder
(19)	Profile	polycarbonate
(20)	Welded plug	stainless steel
(21)	Support	stainless steel
(22)	Plate	polycarbonate
(23)	Adapter	polycarbonate
(24)	Plate	polycarbonate

Table 7-2: LT40 C - parts list

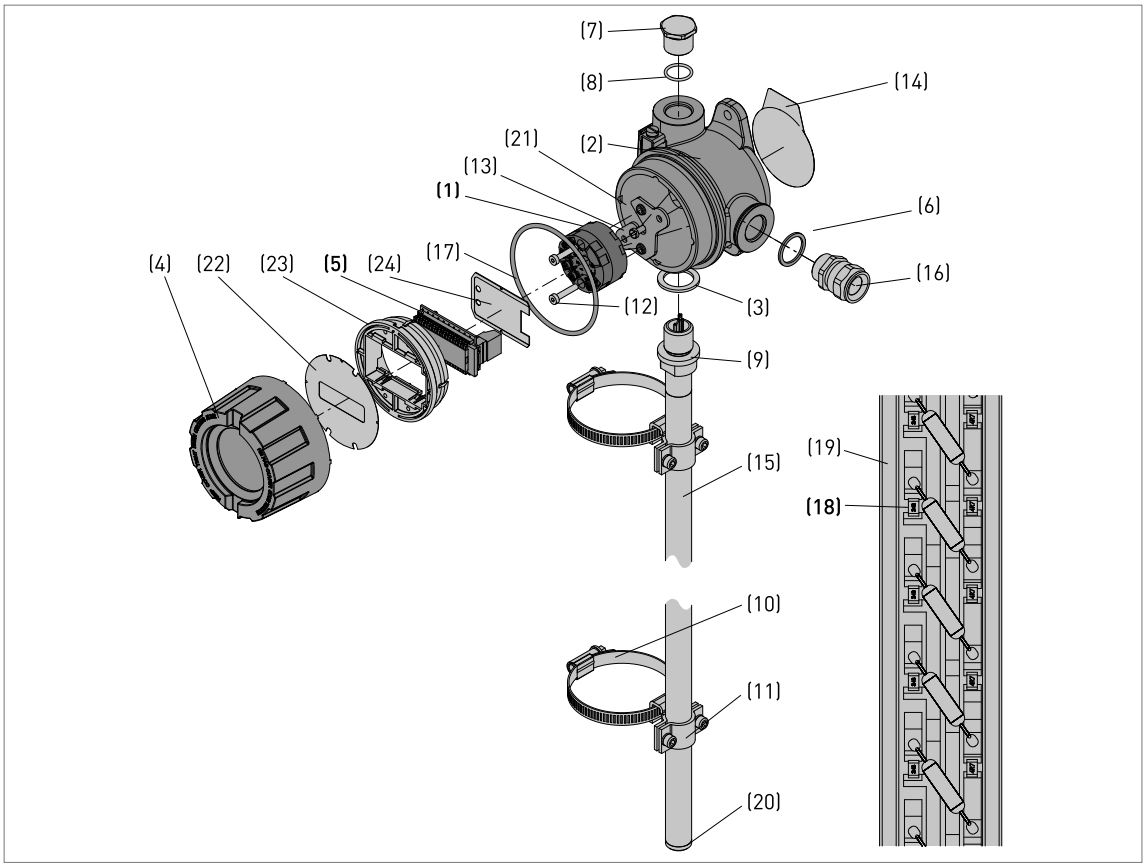

Figure 7-1: LT40 C - parts of the device (refer to "Parts list" table)

Procedure: how to disassemble the LT40 C reed-chain level transmitter

- Use a large, slotted screwdriver to remove the collar (10).
- Use a 4-mm Allen wrench to remove the clamp (11).
- Remove the cover (4).
- Remove the LCD indicator module (option - items (22) and (23)) and the **display (5)**.
- Use a small, slotted screwdriver to disconnect the electrical wires from **electronic transmitter (1)**
- Use a 2.5-mm Allen wrench to remove two screws (12). Remove the **electronic transmitter (1)**.
- Use a slotted screwdriver to remove two screws (13). Remove the support (21).
- Use a 24-mm open-end wrench to remove the cable gland (16) and the threaded plug (7).
- Use a heat gun to apply heat to the point where the threaded connection (9) is attached to the housing (2) to melt the thread locker adhesive.
- While the adhesive is warm, use a 21-mm open-end wrench to remove the threaded connection (9) and then the tube (15).
- Remove the profile (19) and the **reed chain (18)** from the pipe (15).

➲ You can send the parts to the approved location for waste treatment or recycling.

Materials and components that must be removed and independently prepared for treatment

Material	Weight		Additional information
	[kg]	[lb]	
Polychlorinated biphenyl	N/A	N/A	N/A
Mercury	N/A	N/A	N/A
Battery	N/A	N/A	N/A
Printed circuit boards, area > 10 cm² / > 1.55 in²	**(1) Electronic transmitter:**		**FR-4 or polyimide, electronic components, solder, silicone, polycarbonate, stainless steel**
	0.03	**0.07**	
	(5) Display:		
	0.013	**0.029**	
	(18) Reed chain:		
	< 0.1	**< 0.22**	
Toner cartridge	N/A	N/A	N/A
LCD screen (device), area > 100 cm² / > 15.5 in²	N/A	N/A	N/A
Plastic that contains brominated flame retardants	N/A	N/A	N/A
Asbestos	N/A	N/A	N/A
Cathode ray tube	N/A	N/A	N/A
CFC, HCFC, HFC or HC	N/A	N/A	N/A
Gas discharge lamp	N/A	N/A	N/A
External electric cable	N/A	N/A	N/A
Refractory ceramic fibers	N/A	N/A	N/A
Radioactive substance	N/A	N/A	N/A
Electrolyte capacitor > 25 mm / > 0.98¨	N/A	N/A	N/A

Table 7-3: LT40 C - materials and components that must be removed and independently prepared for treatment

Materials and components that can cause problems in the recycling process

Material	Part (item number)	Weight		Additional information
		[kg]	[lb]	
a mixture of metals and plastics	**(1) electronic transmitter**	**≤ 0.1**	**≤ 0.220**	**FR-4 or polyimide, electronic components, solder, silicone, polycarbonate, stainless steel**
	(5) display			
	(18) reed chain			
a mixture of metals and plastics	(16) cable gland	~0.01	~0.022	PA, nickel-brass or stainless steel ①
a mixture of metals and plastics	(2) housing	Aluminium housing		Aluminium or stainless steel + polycarbonate ①
		0.56 ②	1.235 ②	
		Stainless steel housing		
		1.64 ②	3.616 ②	
a mixture of metals and plastics	(4) cover	Aluminium housing		Aluminium or stainless steel + polycarbonate ①
		0.23 ②	0.507 ②	
		Stainless steel housing		
		0.67 ②	1.477 ②	
a mixture of metals	N/A	N/A	N/A	N/A
a mixture of plastics	N/A	N/A	N/A	N/A

Table 7-4: LT40 C - Materials and components that can cause problems in the recycling process

① The material depends on the device options
② The options will have an effect on the weight

Materials and components that can be recycled

Stainless-steel housing				
Material	Part (item number)	Weight		Additional information
		[kg]	[lb]	
Stainless steel	housing Ex d (2)	≤ 6.344	≤ 13.986	N/A
	threaded plug (4)			
	threaded connection (9)			
	collar (10)			
	clamp (11)			
	screw (12)			
	screw (13)			
	tube (15)			
	welded plug (20)			
	support (21)			
Plastic	gasket (3)	~0.001	~0.002	silicone
	gasket (8)	~0.001	~0.002	silicone
	gasket (17)	~0.001	~0.002	silicone
	profile (19)	~0.014	~0.031	polycarbonate
	adhesive label (14)	N/A	N/A	polyester
	plate (22)	N/A	N/A	polycarbonate
	adapter (23)	~0.02	~0.044	polycarbonate
	plate (24)	N/A	N/A	polycarbonate
Rubber	gasket (6)	N/A	N/A	aramid fiber
Noble metals	N/A	N/A	N/A	N/A
PCB	**electronic transmitter (1)**	**~0.10**	**~0.22**	**FR-4 or polyimide, electronic components, solder, silicone, polycarbonate, stainless steel**
	display (5)			
	reed chain (18)			
Total (average weight)	—	~6.481	~14.288	N/A

Table 7-5: LT40 C with a stainless-steel housing: materials and components that can be recycled

Aluminium housing				
Material	**Part (item number)**	**Weight**		**Additional information**
		[kg]	**[lb]**	
Stainless steel	threaded plug (7)	≤ 4.037	≤ 8.900	N/A
	threaded connection (9)			
	collar (10)			
	clamp (11)			
	screw (12)			
	screw (13)			
	tube (15)			
	welded plug (20)			
	support (21)			
Aluminium	housing Ex d (2)	~0.786	~1.733	polyester-coated (paint)
	cover (4)			
Plastic	gasket (3)	~0.001	~0.002	silicone
	gasket (8)	~0.001	~0.002	silicone
	gasket (17)	~0.001	~0.002	silicone
	profile (19)	~0.014	~0.031	polycarbonate
	adhesive label (14)	N/A	N/A	polyester
	plate (22)	N/A	N/A	polycarbonate
	adapter (23)	~0.02	~0.044	polycarbonate
	plate (24)	N/A	N/A	polycarbonate
Rubber	gasket (6)	N/A	N/A	aramid fiber
Noble metals	N/A	N/A	N/A	N/A
PCB	**electronic transmitter (1)**	**≤ 0.10**	**≤ 0.22**	**FR-4 or polyimide, electronic components, solder, silicone, polycarbonate, stainless steel**
	display (5)			
	reed chain (18)			
Total (average weight)	—	~4.96 ①	~10.93 ①	N/A

Table 7-6: LT40 C with an aluminium housing: materials and components that can be recycled

① This depends on the device options

LT40 F - Remote Version
Product description

Product name and data

Type	Reed chain
Model	LT40 F (remote version)
Usage	Level measurement

Weight

Total weight	≤ 5.433 kg / ≤ 11.978 lb
Weight of metal parts	≤ 5.245 kg / ≤ 11.561 lb ①
Weight of plastic parts	~0.1 kg / ~0.220 lb

Dimensions

Volume	≤ 0.6 dm^3 / ≤ 34.65 in^3 ②

Table 7-7: LT40 F - product description

① The options will have an effect on the weight
② The options will have an effect on the volume

Parts list

Item	Description	Material
(1)	**Electronic transmitter**	FR-4, electronic components, solder, polycarbonate, stainless steel
(2)	Housing Ex d	aluminium
(3)	Gasket	aramid fiber
(4)	Cover	aluminium + glass
(5)	**Display**	FR-4, electronic components, solder
(6)	Gasket	aramid fiber
(7)	Threaded plug	stainless steel or nickel-brass
(8)	Gasket	silicone
(9)	Threaded connection	stainless steel
(10)	Collar	stainless steel
(11)	Clamp	stainless steel
(12)	Screw	stainless steel
(13)	Screw	stainless steel
(14)	Adhesive label	polyester
(15)	Pipe	stainless steel Ex d-approved device: stainless steel + alumina
(16)	Cable gland or 1/2 NPT adapter	PA or nickel-brass or stainless steel (Ex)
(17)	Gasket	silicone

Item	Description	Material
(18)	**Reed chain**	polyimide, electronic components, solder
(19)	Profile	polycarbonate
(20)	Welded plug	stainless steel
(21)	Support	aluminium
(22)	Plate	polycarbonate
(23)	Adapter	polycarbonate
(24)	Plate	polycarbonate
(25)	Housing support	stainless steel
(26)	Washer M6×14×1.5	galvanized steel
(27)	Screw A2 70 HM6 - DIN 934	stainless steel
(28)	**Cable**	**copper + polyethylene + PVC**
(29)	Screw M6×20 ISO 4762	stainless steel
(30)	Cable gland	nickel-brass or stainless steel

Table 7-8: LT40 F - parts list

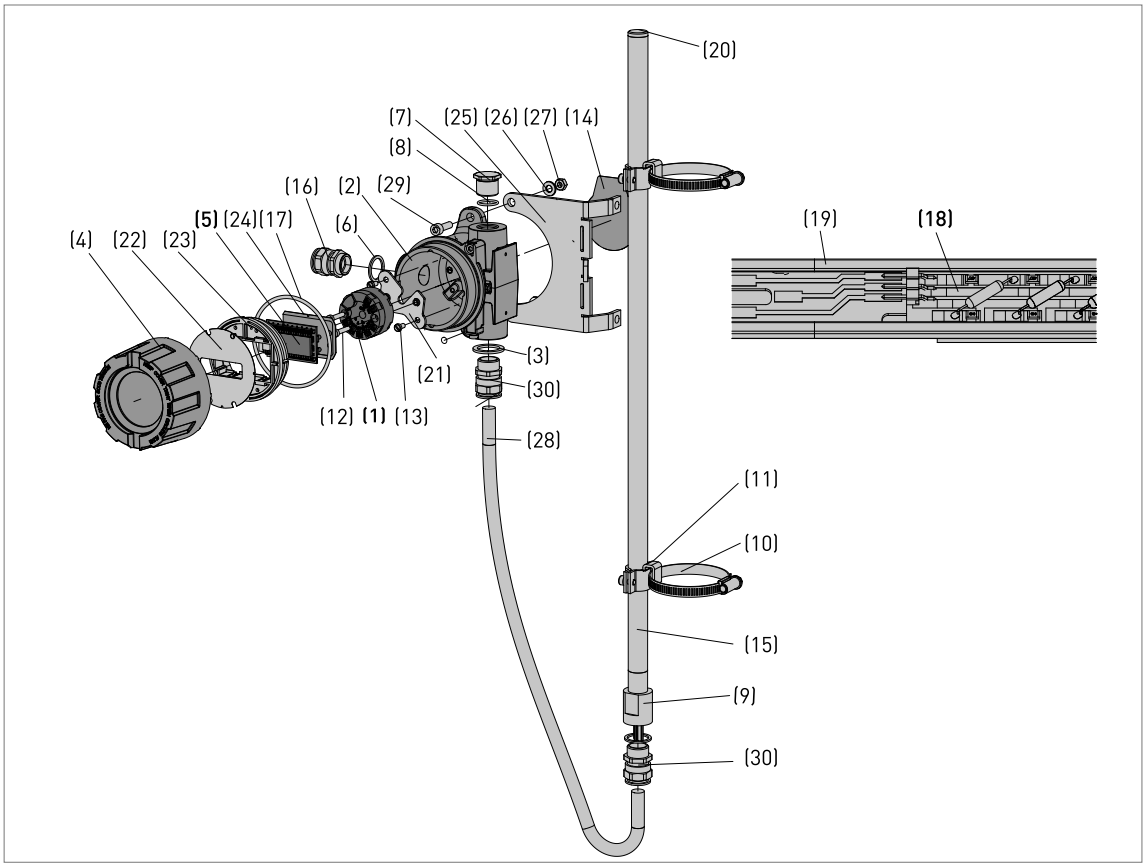

Figure 7-2: LT40 F - parts of the device (refer to "Parts list" table)

Procedure: how to disassemble the LT40 F reed-chain level transmitter

- Use a large, slotted screwdriver to remove the collar (10).

- Use a 4-mm Allen wrench to remove the clamp (11).
- Use a 5-mm Allen wrench to remove 2 screws. Remove the support (25) from the housing (2).
- Remove the cover (4).
- Remove the LCD indicator module (option - items (22) and (23)) and the **display (5)**.
- Use a small, slotted screwdriver to disconnect the electrical wires from **electronic transmitter (1)**
- Use a 2.5-mm Allen wrench to remove two screws (12). Remove the **electronic transmitter (1)**.
- Use a slotted screwdriver to remove two screws (13). Remove the support (21).
- Use a 24-mm open-end wrench to remove the cable gland (16) and the threaded plug (7).
- Use a heat gun to apply heat to the point where the cable gland (30) is attached to threaded connection (9) to melt the thread locker adhesive.
- While the adhesive is warm, use a 24-mm open-end wrench to remove the cable gland (30).
- Remove the **cable (28)**, profile (19) and the **reed chain (18)** from the pipe (15).

➲ You can send the parts to the approved location for waste treatment or recycling.

Materials and components that must be removed and independently prepared for treatment

Material	Weight		Additional information
	[kg]	[lb]	
Polychlorinated biphenyl	N/A	N/A	N/A
Mercury	N/A	N/A	N/A
Battery	N/A	N/A	N/A
Printed circuit boards, area > 10 cm² / > 1.55 in²	**(1) Electronic transmitter:**		**FR-4 or polyimide, electronic components, solder, silicone, polycarbonate, stainless steel**
	0.03	**0.07**	
	(5) Display:		
	0.013	**0.029**	
	(18) Reed chain:		
	< 0.1	**< 0.22**	
Toner cartridge	N/A	N/A	N/A
LCD screen (device), area > 100 cm² / > 15.5 in²	N/A	N/A	N/A
Plastic that contains brominated flame retardants	N/A	N/A	N/A
Asbestos	N/A	N/A	N/A
Cathode ray tube	N/A	N/A	N/A
CFC, HCFC, HFC or HC	N/A	N/A	N/A
Gas discharge lamp	N/A	N/A	N/A
External electric cable	The cable length will have an effect on the weight		①
Refractory ceramic fibers	N/A	N/A	N/A
Radioactive substance	N/A	N/A	N/A
Electrolyte capacitor > 25 mm / > 0.98"	N/A	N/A	N/A

Table 7-9: LT40 F - materials and components that must be removed and independently prepared for treatment

① Make sure that you obey Ex regulations when you discard or reuse the cable

Materials and components that can cause problems in the recycling process

Material	Part (item number)	Weight		Additional information
		[kg]	[lb]	
a mixture of metals and plastics	**(1) electronic transmitter**	**≤ 0.100**	**≤ 0.220**	**FR-4 or polyimide, electronic components, solder, silicone, polycarbonate, stainless steel**
	(5) display			
	(18) reed chain			
a mixture of metals and plastics	(16) cable gland or 1/2 NPT adapter (30) cable gland	~0.01	~0.022	PA, nickel-brass or stainless steel ①
a mixture of metals and plastics	(2) housing	0.56	1.235	Aluminium + polycarbonate
a mixture of metals and plastics	(4) cover	0.23	0.507	Aluminium + polycarbonate
a mixture of metals and plastics	**(28) cable**	②	②	**PE + PVC**
a mixture of metals	N/A	N/A	N/A	N/A
a mixture of plastics	N/A	N/A	N/A	N/A

Table 7-10: LT40 F - Materials and components that can cause problems in the recycling process

① The material depends on the device options

② The cable length will have an effect on the weight

Materials and components that can be recycled

Material	Part (item number)	Weight		Additional information
		[kg]	[lb]	
Stainless steel	threaded plug (7)	≤ 4.037	≤ 8.900	N/A
	threaded connection (9)			
	collar (10)			
	clamp (11)			
	screw (12)			
	screw (13)			
	tube (15)			
	cable gland or adapter (16)			
	welded plug (20)			
	cable gland (30)			
Aluminium	housing Ex d (2)	~0.793	~1.748	polyester-coated (paint)
	cover (4)			
	support (21)			
Plastic	gasket (3)	~0.001	~0.002	silicone
	gasket (8)	~0.001	~0.002	silicone
	adhesive label (14)	N/A	N/A	polyester
	cable gland (16)	~0.01	~0.022	polyester
	gasket (17)	~0.001	~0.002	silicone
	profile (19)	~0.014	~0.031	polycarbonate
	plate (22)	N/A	N/A	polycarbonate
	adapter (23)	~0.02	~0.044	polycarbonate
	plate (24)	N/A	N/A	polycarbonate
Rubber	gasket (6)	N/A	N/A	aramid fiber
Noble metals	N/A	N/A	N/A	N/A
PCB	**electronic transmitter (1)**	**≤ 0.10**	**≤ 0.22**	**polyimide, electronic components**
	display (5)			
	reed chain (18)			
Total (average weight)	—	~4.977 ①	~10.972 ①	N/A

Table 7-11: LT40 F: materials and components that can be recycled

① This depends on the device options

7.8.2 Level transmitter (OPTIFLEX 7200, OPTIFLEX 8200, OPTIWAVE 7400 or BW25)

For data about disassembly and recycling, refer to the handbook related to the level transmitter option.

7.8.3 MS15-series limit switch

INFORMATION!
*Words in **bold text** refer to electrical and electronic equipment.*

Product description

Product name and data

Type	Switch
Model	MS15
Usage	Electrical switch

Weight

Total weight	Aluminium housing: ~0.937...0.943 kg / ~2.066...2.079 lb ①
	Stainless-steel housing: ~2.198...2.204 kg / ~4.846...4.859 lb ①
Weight of metal parts	Aluminium housing: ~0.925...0.931 kg / ~2.039...2.053 lb ①
	Stainless-steel housing: ~2.186...2.192 kg / ~4.819...4.833 lb ①
Weight of plastic parts	~0.01 kg / ~0.022 lb

Dimensions

Volume	~0.290...0.296 cm³ / ~0.0177...0.0181 in³ ②

Table 7-12: MS15 series - product description

① The options for the housing will have an effect on the weight
② The options for the housing will have an effect on the volume

Parts list

Item	Description	Material
(1)	Housing	aluminium or stainless steel ①
(2)	Cover	aluminium or stainless steel ①
(3)	Gasket	silicone
(4)	Stirrup	stainless steel
(5)	Cable gland	PA or nickel-brass or stainless steel ①
(6)	Spring washer	stainless steel
(7)	Spring washer	stainless steel
(8)	Support	stainless steel
(9)	Nut	stainless steel
(10)	Screw	stainless steel
(11)	Earthing terminal	stainless steel
(12)	Screw	stainless steel
(13)	Locking screw M3 x 0.5	stainless steel

Item	Description	Material
(14)	Support	aluminium
(15)	Screw	stainless steel
(16)	Adhesive label	polyester
(17)	**PCB ②**	**FR4 + electronic components + solder**
(18)	Collar	stainless steel
(19)	Adapter M20 x 1.5 - 1/2 NPT	stainless steel or nickel-brass
(20)	Gasket	silicone
(21)	Screw	stainless steel
(22)	Cable	silicone + PE + copper
(23)	Spacer Ø4.3 x 2	brass

Table 7-13: MS15 series - Parts list

① This depends on the device options
② PCB = Printed circuit board. This depends on the output option.

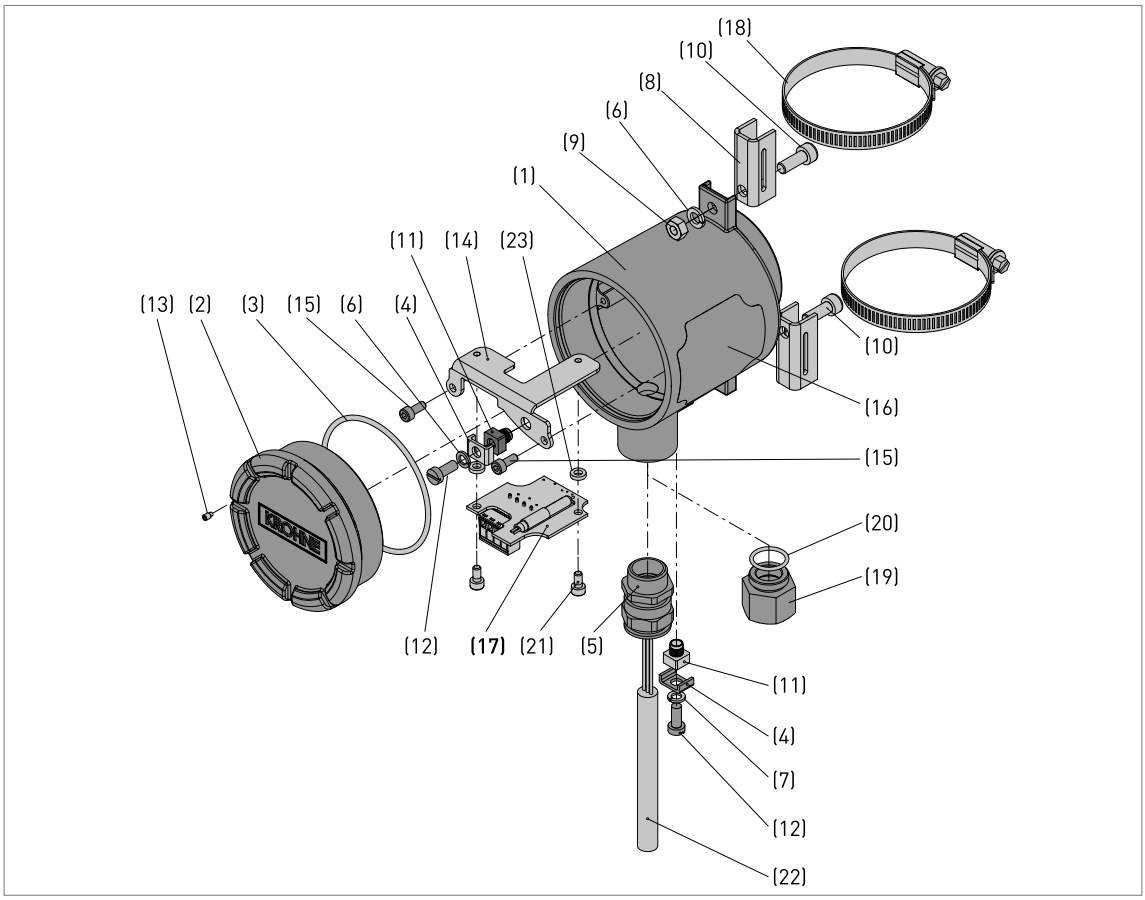

Figure 7-3: MS15 series - parts of the device (refer to "Parts list" table)

Procedure: how to disassemble the MS15 limit switch

- Remove the two collars (18), the support (8), the cable gland (5) and the adapter (19).
- Remove the cover (2). Gasket (3) is on the cover (2).

- Remove the two screws (15) to extract the assembly ((14), (11), (23), (4), (7), (12), (15), **(17)** and (21)).
- Remove the two screws (21) to remove the **PCB (17)**.

➲ You can send the parts to the approved location for waste treatment or recycling.

Materials and components that must be removed and independently prepared for treatment

Material	Weight		Additional information
	[kg]	[lb]	
Polychlorinated biphenyl	N/A	N/A	N/A
Mercury	N/A	N/A	N/A
Printed circuit boards, area > 10 cm² / > 1.55 in² (17)	**0.009** ①	**0.020** ①	**FR4 + electronic components + solder**
Toner cartridge	N/A	N/A	N/A
LCD screen (device), area > 100 cm² / > 15.5 in²	N/A	N/A	N/A
Plastic that contains brominated flame retardants	N/A	N/A	N/A
Asbestos	N/A	N/A	N/A
Cathode ray tube	N/A	N/A	N/A
CFC, HCFC, HFC or HC	N/A	N/A	N/A
Gas discharge lamp	N/A	N/A	N/A
External electric cable	N/A	N/A	N/A
Refractory ceramic fibers	N/A	N/A	N/A
Radioactive substance	N/A	N/A	N/A
Electrolyte capacitor > 25 mm / > 0.98"	N/A	N/A	N/A

Table 7-14: MS15 series - materials and components that must be removed and independently prepared for treatment

① This depends on the device options

Materials and components that can cause problems in the recycling process

Material	Part (item number)	Weight		Additional information
		[kg]	[lb]	
a mixture of metals and plastics	**PCB (17)**	**0.009**	**0.020**	**FR-4 + electronic components + solder**
a mixture of metals and plastics	cable gland (5)	0.065	0.14	stainless steel ①
		0.0093	0.021	PA ①
		0.07	0.154	nickel-brass ①
a mixture of metals and plastics	**cable (22)**	N/A	N/A	silicone + PE + copper
a mixture of metals and plastics	cover (2)	0.19	0.418	aluminium + polycarbonate ①
		0.558	1.230	stainless steel + polycarbonate ①
a mixture of metals	housing (1)	0.463	1.021	aluminium housing
a mixture of plastics	N/A	N/A	N/A	N/A

Table 7-15: MS15 series - materials and components that can cause problems in the recycling process

① This depends on the device options

Materials and components that can be recycled

Stainless-steel housing				
Material	**Part (item number)**	**Weight**		**Additional information**
		[kg]	**[lb]**	
Stainless steel	housing (1)	2.00... 2.16 ①	4.41... 4.76 ①	N/A
	cover (2)			
	stirrup (4)			
	spring washer (6)			
	spring washer (7)			
	screw (10)			
	earthing terminal (11)			
	screw (12)			
	locking screw M3 x 0.5 (13)			
	screw (15)			
	collar (18)			
	adapter (19)			
	gasket (20)			
	screw (21)			
	cable (22)			
	spacer Ø4.3 x 2 (23)			
Plastic	gasket (3)	~0.01	~0.002	silicone
Rubber	N/A	N/A	N/A	N/A
Noble metals	Adapter (19)	~0.07	~0.154	nickel-brass
PCB	**PCB (17)**	**0.009 ①**	**0.020 ①**	**FR-4 + electronic components + solder**
Total (average weight)	—	~2.089... 2.249 ①	~4.605... 4.958 ①	N/A

Table 7-16: MS15 series with a stainless-steel housing - materials and components that can be recycled

① This depends on the device options

Aluminium housing				
Material	**Part (item number)**	**Weight**		**Additional information**
		[kg]	**[lb]**	
Stainless steel	stirrup (4)	0.78... 0.85 ①	1.720... 1.874 ①	N/A
	spring washer (6)			
	spring washer (7)			
	support (8)			
	nut (9)			
	screw (10)			
	earthing terminal (11)			
	screw (12)			
	locking screw M3 x 0.5 (13)			
	screw (15)			
	collar (18)			
	adapter (19)			
	screw (21)			
	cable (22)			
	spacer Ø4.3 x 2 (23)			
	screw (7)			
	screw (10)			
Aluminium	housing (1)	0.66 ①	1.455 ①	External surfaces are painted
	cover (2)			
	support (14)			
Plastic	gasket (3)	~0.01	~0.022	silicone
Rubber	N/A	N/A	N/A	N/A
Noble metals	adapter (19)	~0.07	~0.154	nickel-brass
FR-4, electronic components	**PCB (17)**	**0.009** ①	**0.020** ①	**PCB**
Total (average weight)	—	~1.53... 1.60 ①	~3.373... 3.527 ①	N/A

Table 7-17: MS15 series with an aluminium housing - materials and components that can be recycled

① This depends on the device options

7.8.4 MS40-series limit switch

INFORMATION!
*Words in **bold text** refer to electrical and electronic equipment.*

Product description

Product name and data

Type	Switch
Model	MS40
Usage	Electrical switch

Weight

Total weight	~0.156...0.163 kg / ~0.344...0.359 lb ①
Weight of metal parts	~0.145...0.151 kg / ~0.320...0.333 lb ①
Weight of plastic parts	~0.0071 kg / ~0.016 lb

Dimensions

Volume	~76...77.5 cm³ / ~4.638...4.729 in³ ②

Table 7-18: MS40 series - product description

① The options for the housing will have an effect on the weight
② The options for the housing will have an effect on the volume

Parts list

Item	Description	Material
(1)	Support contact	stainless steel
(2)	Housing	aluminium
(3)	Screw CHC M4 x 20 A4 DIN 912	stainless steel
(4)	PCB ①	FR-4 electronic components + solder
(5)	Label 20 x 20	metallized polyester
(6)	Label 60 x 35	metallized polyester
(7)	Screw TC M4-8 A2	stainless steel
(8)	Hose clamp ②	stainless steel
(9)	Label 55 x 20	metallized polyester
(10)	Cable gland	polycarbonate
(11)	Screw CHC M4 x 20 A4 DIN 912	stainless steel
(12)	Cover	aluminium
(13)	Gasket (housing / cover)	silicone

Table 7-19: MS40 series - Parts list

① PCB = Printed circuit board. This depends on the output option.
② This depends on the output option.

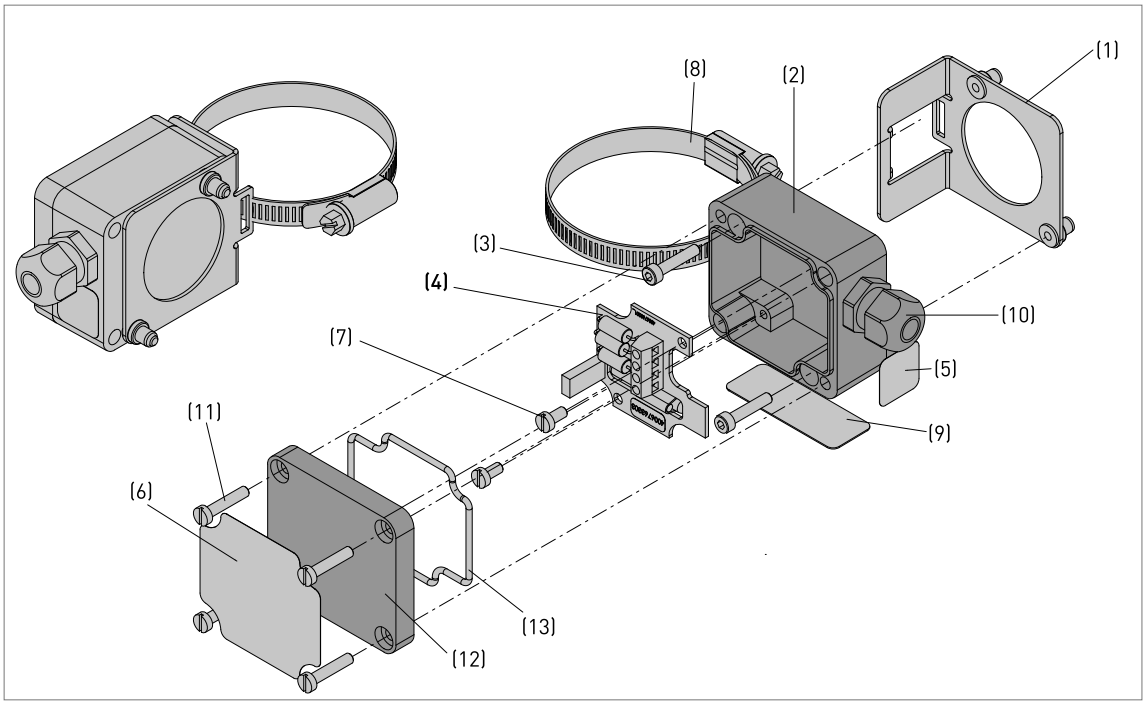

Figure 7-4: MS40 series - parts of the device (refer to "Parts list" table)

Procedure: how to disassemble the MS40 limit switch

- Remove the four screws (11) to remove the cover (12) and the gasket (13) from the housing (2)
- Remove the two screws (7) to remove the **PCB (4)**.
- Remove the two screws (3) to remove the support contact (1).
- Remove the cable gland (10) from the housing (2).

➲ You can send the parts to the approved location for waste treatment or recycling.

Materials and components that must be removed and independently prepared for treatment

Material	Weight		Additional information
	[kg]	[lb]	
Polychlorinated biphenyl	N/A	N/A	N/A
Mercury	N/A	N/A	N/A
Printed circuit boards, area > 10 cm² / > 1.55 in² (17)	**N/A**	**N/A**	**PCB is 5 cm²**
Toner cartridge	N/A	N/A	N/A
LCD screen (device), area > 100 cm² / > 15.5 in²	N/A	N/A	N/A
Plastic that contains brominated flame retardants	N/A	N/A	N/A
Asbestos	N/A	N/A	N/A
Cathode ray tube	N/A	N/A	N/A
CFC, HCFC, HFC or HC	N/A	N/A	N/A
Gas discharge lamp	N/A	N/A	N/A
External electric cable	N/A	N/A	N/A

Material	Weight		Additional information
	[kg]	[lb]	
Refractory ceramic fibers	N/A	N/A	N/A
Radioactive substance	N/A	N/A	N/A
Electrolyte capacitor > 25 mm / > 0.98¨	N/A	N/A	N/A

Table 7-20: MS40 series - materials and components that must be removed and independently prepared for treatment

Materials and components that can cause problems in the recycling process

Material	Part (item number)	Weight		Additional information
		[kg]	[lb]	
a mixture of metals and plastics	**PCB (4)**	**0.005**	**0.0110**	**FR-4 + electronic components + solder**
a mixture of metals and plastics	N/A	N/A	N/A	N/A
a mixture of metals	N/A	N/A	N/A	N/A
a mixture of plastics	N/A	N/A	N/A	N/A

Table 7-21: MS40 series - materials and components that can cause problems in the recycling process

Materials and components that can be recycled

Material	Part (item number)	Weight		Additional information
		[kg]	[lb]	
Stainless steel	support contact (1)	0.092... 0.098 ①	0.203... 0.216 ①	N/A
	screw CHC M4 x 20 A4 DIN 912 (3)			
	screw TC M4-8 A2 (4)			
	hose clamp (8) ②			
	screw CHC M4 x 20 A4 DIN 912 (11)			
Plastic	cable gland (10)	~0.0071	~0.0157	polycarbonate
	gasket (13)			silicone
Aluminium	housing (2)	~0.053	~0.117	N/A
	cover (12)			
PCB	**PCB (4)**	**~0.005**	**~0.011**	**FR-4 + electronic components + solder**
Total (average weight)	—	~0.156... 0.163 ①	~0.344... 0.359 ①	N/A

Table 7-22: MS40 series - materials and components that can be recycled

① This depends on the device options
② Hose clamp type depends on device options

8.1 Measuring principle

The device operates on the principle of communicating tubes. The measuring chamber is connected adjacent to the tank. The process conditions in the measuring chamber are the same as those of the tank.

A float is in the measuring chamber. The float contains magnets that rotate the flaps in the indicator column and operate the optional limit switches and analog transmitter on the side of the measuring chamber. The position of the magnets does not correspond to the level of liquid, so the scale is adjusted at the factory to take into account this difference. The offset of the magnets depends on the liquid density. Refer to the illustration that follows:

BI version - measuring chamber with two compartments

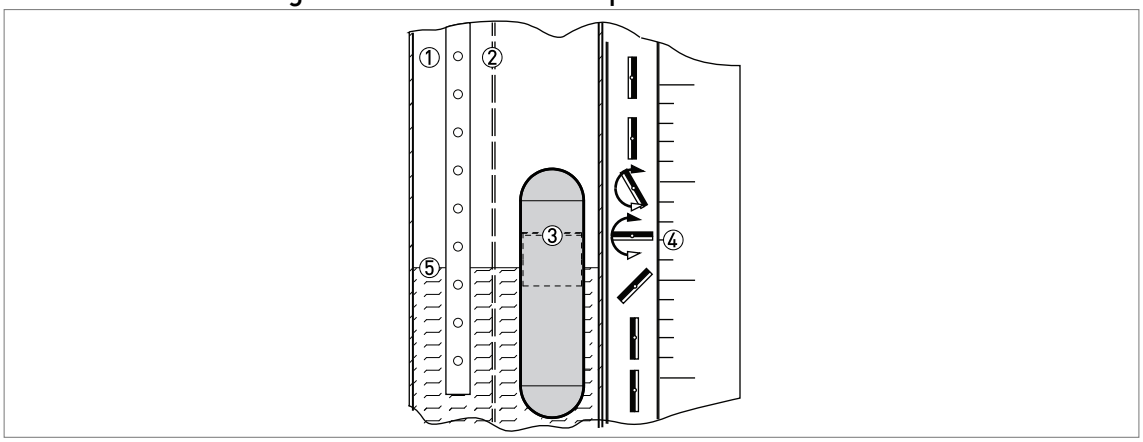

Figure 8-1: Measuring principle - BI version - chamber with two compartments

① Probe of the redundant level transmitter (OPTIFLEX 7200 shown in this illustration)
② Baffle plate between the two compartments in the measuring chamber
③ Top of the float magnet. The magnet field around the top of the magnet turns the flaps in the indicator column that shows the level in the tank.
④ Indicator column of yellow/black or red/white rotating flaps with the optional scale in m/cm, mm, ft/inch, % (simplified) or customized volume units
⑤ Level of the liquid

TWIN version - two connected measuring chambers

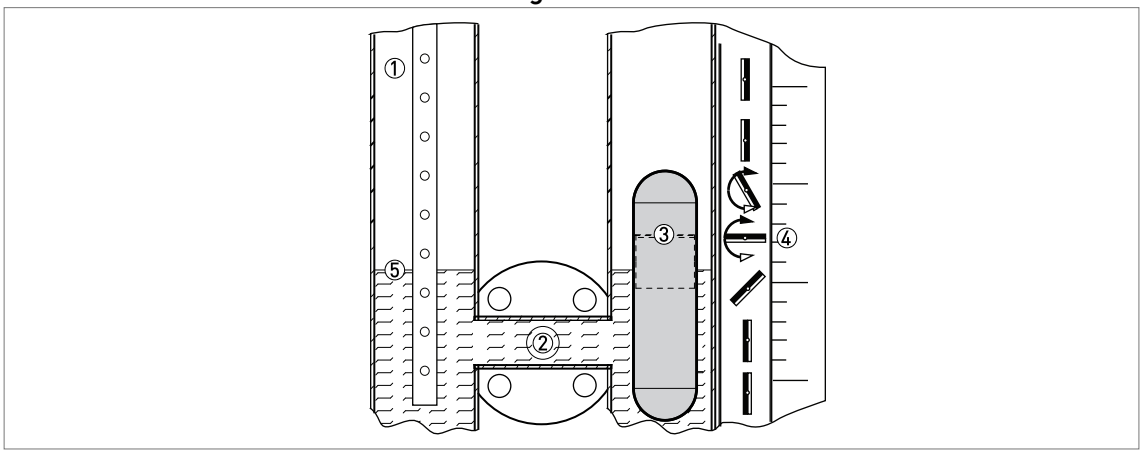

Figure 8-2: Measuring principle - TWIN version - two connected measuring chambers

① Probe of the redundant level transmitter (OPTIFLEX 7200 or OPTIFLEX 8200 shown in this illustration)
② Connecting tube between the two measuring chambers with process connection
③ Top of the float magnet. The magnet field around the top of the magnet turns the flaps in the indicator column that shows the level in the tank.
④ Indicator column of yellow/black or red/white rotating flaps with the optional scale in m/cm, mm, ft/inch, % (simplified) or customized volume units
⑤ Level of the liquid

INFORMATION!
If you sent an order for device that has a float with the "zero line" option, then the value of the liquid level offset is 0 mm / 0¨. For more data, refer to Liquid level offset on page 135.

8.2 Technical data

INFORMATION!

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).*

8.2.1 BM26A-8000 magnetic level indicator

BI and TWIN versions: PN40 / Class 300

Version	BI	TWIN

Measuring system

Measuring principle	Magnetic level indicator - one bypass chamber (principle of communicating tubes). A float in the measuring chamber (Ø73.03 mm / NPS 2 1/2 pipe) is magnetically coupled to a mechanical level indicator. A level transmitter supplies a redundant measurement.	Magnetic level indicator - two bypass chambers (principle of communicating tubes). A float in the measuring chamber (Ø73.03 mm / NPS 2 1/2 pipe) is magnetically coupled to a mechanical level indicator. A level transmitter supplies a redundant measurement.
Application range	Level indication of liquids in oil & gas and boiler applications	
Measured value		
Primary measured value	Level of the float magnets in the measuring chamber. Redundant measurement of level with a level transmitter.	
Secondary measured value	Level or volume of a liquid in the tank. Level of the interface, if there is more than one liquid in the tank.	

Design

Measuring chamber, variants	Side / side process connections on one chamber with two connected compartments	Side / side process connections between two chambers
Options	Level measurement	
	Interface level measurement (if there is more than one liquid in the measuring chamber)	
	Zero-line level measurement (level measurement without vertical offset of float magnets in relation to the liquid level)	
	OPTIFLEX 7200 guided-radar (TDR) level transmitter	OPTIFLEX 7200 guided-radar (TDR) level transmitter
		OPTIFLEX 8200 guided-radar (TDR) level transmitter
		OPTIWAVE 7400 FMCW radar level transmitter
		BW25 displacer-type level transmitter
	LT40 reed-chain level transmitter without LCD indicator module with a compact or a remote housing ①	
	LT40 reed-chain level transmitter with LCD indicator module with a compact or a remote housing ①	

Version	BI	TWIN
	Anti-icing cover for glass indicator tube	
	Thermal insulation (ROCKWOOL® or FOAMGLAS®) in a metal enclosure	Thermal insulation supplied on request
	Electric heat tracing system	
	Bistable limit switches ②	
Measuring range (ML)	0.3...5.5 m / 1...18 ft (longer on request)	
Display and user interface		
Display	Indicator column with magnetically coupled rotating flaps that have two colors: yellow/black; red/white	
	–	Indicator column with magnetically coupled low-temperature index ③
Float failure indication (at the bottom of the indicator column)	Rotating flaps: orange flaps	
	–	Low-temperature index: none
Scale marking options	No scale; m + cm; ft + inches; customized volume units, % (simplified) ④	

Measuring accuracy

Accuracy	±10 mm / 0.4¨
Repeatability	±10 mm / 0.4¨ (when density is constant)
Maximum rate of change	20 mm/s / 0.787¨/s

Operating conditions

Temperature		
Process temperature	-70...+250°C / -94...+482°F Ex: see supplementary instructions or approval certificates	-196...+400°C / -320.8...+752°F Ex: see supplementary instructions or approval certificates ⑤
Ambient temperature	-70...+80°C / -94...+176°F Ex: see supplementary instructions or approval certificates	
Storage temperature	-70...+80°C / -94...+176°F	
Pressure		
Process pressure	-1...40 barg / -14.5...580 psig ⑥	
Chemical properties		
Density	620...1200 kg/m³ / 38.71...74.91 lb/ft³ ⑦	370...1200 kg/m³ / 23.10...74.91 lb/ft³ ⑦
Minimum difference in density for interface measurement	≥ 200 kg/m³ / ≥ 12.49 lb/ft³ between the top liquid and the bottom liquid	
Viscosity	≤ 500 mPa·s / ≤ 500 cP	
Other conditions		
Ingress protection (IEC 60529)	Indicator column: IP66 / IP68 (0.15 barg)	

Materials

Measuring chamber (options)	Stainless steel (1.4404 / 316L or 1.4307 / 304L); HASTELLOY® C-276 alloy; INCONEL® nickel-chromium alloy 625
Float (options)	Stainless steel (1.4404 / 316L or 1.4307 / 304L); titanium; HASTELLOY® C-276 alloy (2.4819); INCONEL® nickel-chromium alloy 625 (2.4856)
Indicator column rail	Stainless steel (1.4401 / 316)

Version	BI	TWIN
Indicator column tube	Borosilicate glass 3.3 (agrees with ISO 3585) - hermetically sealed tube	
Scale (option)	Stainless steel (1.4401 / 316)	
Process connection (options)	Stainless steel (1.4404 / 316L or 1.4307 / 304L); HASTELLOY® C-276 alloy (2.4819); INCONEL® nickel-chromium alloy 625 (2.4856)	
Gasket (options)	Aramid (T ≤ +250°C / +482°F); graphite; 316L/graphite (spiral-wound); PTFE (T ≤ +250°C / +482°F)	
Braid insulation	Ceramic fiber (thermal insulation between the indicator column and the measuring chamber when the process temperature is +200...+400°C / +392...+752°F)	
Anti-icing cover	PLEXIGLAS® (option for glass indicator column tube) - when the liquid temperature is -70...+0°C / -94...+32°F	

Process connections

Flange, EN	
Size	DN15...50
Pressure rating	PN40 (welding neck or lap joint)
Facing type options	A; B1; C; D; E; F
Flange, ASME	
Size	NPS 1/2...2 ⑧
Pressure rating	Class 150 / 300 (welding neck)
Facing type options	RF; FF; LG; SG; LF; SF; LT; ST; LM; SM
Flange, JIS	
Size	25...50
Pressure rating	20K (Type A)
Facing type	RF

Transmitter connection

Flange, EN	DN80 in PN40 - Type B1	DN50, DN80 in PN40 - Type B1
Flange, ASME	NPS 3 in Class 300 RF ⑧	NPS 2, NPS 3 in Class 300 RF ⑧

Drain and vent connections

Drain options	
Thread	Without; G 3/8...3/4 (female) with plug; 3/8...3/4 NPT (female) with plug
Flange, EN	All process connection options
Flange, ASME	All process connection options
Vent options	
Thread	Without; G 1/2...3/4 (female) with plug; 1/2...3/4 NPT (female) with plug
Flange, EN	DN25
Flange, ASME	NPS 1 ⑧

Power supply

Limit switches	Refer to the technical data for the MS15 series and MS40 series
Reed-chain level transmitter	Refer to the technical data for the LT40

Version	BI	TWIN

Input and output

Parameter	Level detection or indication
Output signal	Refer to the technical data for the LT40 reed-chain level transmitter and the MS15-series and MS40-series limit switches

Approvals and certification

CE / UKCA	The device meets the essential requirements of the EU Directives and UK Regulations. The manufacturer certifies successful testing of the product by applying the CE or UKCA marking.
	For more data about the European Standards and UK Designated Standards related to this device, refer to the EU and the UKCA Declarations of Conformity. You can download this document free of charge from the website (Download Center).
Explosion protection	
ATEX	II 1/2 G Ex h IIC T6...T* Ga/Gb or II 2 G Ex h IIC T6...T* Gb ⑨
IECEx	Ex h IIC T6...T* Ga/Gb or Ex h IIC T6...T* Gb ⑨
UKEX - pending	II 1/2 G Ex h IIC T6...T* Ga/Gb or II 2 G Ex h IIC T6...T* Gb ⑨
Other standards and approvals	
Pressure	EU Pressure Equipment Directive
	UK Pressure Equipment (Safety) Regulations
	ASME B31.3 Code for Process Piping
Vibration resistance	EN 60721-3-4 - vibration class 4M4 (1...200 Hz:1g, 15g shock ½ sinus: 6 ms)
Construction code	Standard: EN 13445
	Option: NACE MR0175 / MR0103 / ISO 15156; ASME B31.3

Table 8-1: PN40 / Class 300 design for BI and TWIN versions: technical data

① For more data, refer to technical data for the LT40 reed-chain level transmitter in this section
② For more data, refer to technical data for the MS15-series and MS40-series limit switches in this section
③ For process temperatures less than +100°C / +212°F
④ If the scale adjacent to the indicator column has % (simplified) units, then it has a range of 0...100% with an increment of 10% between each marking
⑤ If the device has a vent or drain with a threaded connection, then the maximum process temperature is +250°C / +482°F
⑥ The maximum pressure is related to the type of process connection, pressure rating and the process temperature. For more data about 316-316L and 304L stainless-steel measuring chambers, refer to the "Maximum process pressure: measuring chamber" section in this chapter.
⑦ Higher density on request
⑧ NPS = Nominal Pipe Size. For more data about the dimensions of flanges, refer to the ASME B16.5 standard.
⑨ If the device has a PTFE or Aramid gasket, then T*= T2. For all other versions, T*= T1.

BI and TWIN versions: PN100 / Class 600

	BI	TWIN

Measuring system

Measuring principle	Magnetic level indicator - one bypass chamber (principle of communicating tubes). A float in the measuring chamber (Ø88.9 mm / NPS 3 pipe) is magnetically coupled to a mechanical level indicator. A level transmitter supplies a redundant measurement.	Magnetic level indicator - two bypass chambers (principle of communicating tubes). A float in the measuring chamber (Ø73.03 mm / NPS 2 1/2 pipe) is magnetically coupled to a mechanical level indicator. A level transmitter supplies a redundant measurement.
Application range	Level indication of liquids in oil & gas and boiler applications	
Measured value		
Primary measured value	Level of the float magnets in the measuring chamber. Redundant measurement of level with a level transmitter.	
Secondary measured value	Level or volume of a liquid in the tank. Level of the interface, if there is more than one liquid in the tank.	

Design

Measuring chamber, variants	Side / side process connections on one chamber with two connected compartments	Side / side process connections between two chambers
Options	Level measurement	
	Interface level measurement (if there is more than one liquid in the measuring chamber)	
	Zero-line level measurement (level measurement without vertical offset of float magnets in relation to the liquid level)	
	OPTIFLEX 7200 guided-radar (TDR) level transmitter	OPTIFLEX 7200 guided-radar (TDR) level transmitter
		OPTIFLEX 8200 guided-radar (TDR) level transmitter
		OPTIWAVE 7400 FMCW radar level transmitter
		BW25 displacer-type level transmitter
	LT40 reed-chain level transmitter without LCD indicator module with a compact or a remote housing ①	
	LT40 reed-chain level transmitter with LCD indicator module with a compact or a remote housing ①	
	Anti-icing cover for glass indicator tube	
	Thermal insulation (ROCKWOOL® or FOAMGLAS®) in a metal enclosure	
	Electric heat tracing system	
	Bistable limit switches ②	
Measuring range (ML)	0.3...5.5 m / 1...18 ft (longer on request)	
Display and user interface		
Display	Indicator column with magnetically coupled rotating flaps that have two colors: yellow/black; red/white	
	–	Indicator column with magnetically coupled low-temperature index ③
Float failure indication (at the bottom of the indicator column)	Rotating flaps: orange flaps	
	–	Low-temperature index: none
Scale marking options	No scale; m + cm; ft + inches; customized volume units, % (simplified) ④	

	BI	TWIN

Measuring accuracy

Accuracy	±10 mm / 0.4¨
Repeatability	±10 mm / 0.4¨ (when density is constant)
Maximum rate of change	20 mm/s / 0.787¨/s

Operating conditions

Temperature		
Process temperature	-70...+250°C / -94...+482°F ⑤	-196...+400°C / -320.8...+752°F ⑤
	Ex: see supplementary instructions or approval certificates	
Ambient temperature	-70...+80°C / -94...+176°F Ex: see supplementary instructions or approval certificates	
Storage temperature	-70...+80°C / -94...+176°F	
Pressure		
Process pressure	-1...100 barg / -14.5...1450 psig ⑥	
Chemical properties		
Density	740...1200 kg/m³ / 46.20...74.91 lb/ft³ ⑦	500...1200 kg/m³ / 31.21...74.91 lb/ft³ ⑦
Minimum difference in density for interface measurement	≥ 200 kg/m³ / ≥ 12.49 lb/ft³ between the top liquid and the bottom liquid	
Viscosity	≤ 500 mPa·s / ≤ 500 cP	
Other conditions		
Ingress protection (IEC 60529)	Indicator column: IP66 / IP68 (0.15 barg)	

Materials

Measuring chamber (options)	Stainless steel (1.4404 / 316L or 1.4307 / 304L); HASTELLOY® C-276 alloy; INCONEL® nickel-chromium alloy 625	
Float (options)	Titanium	Stainless steel (1.4404 / 316L or 1.4307 / 304L); titanium; HASTELLOY® C-276 alloy (2.4819); INCONEL® nickel-chromium alloy 625 (2.4856)
Indicator column rail	Stainless steel (1.4401 / 316)	
Indicator column tube	Borosilicate glass 3.3 (agrees with ISO 3585) - hermetically sealed tube	
Scale (option)	Stainless steel (1.4401 / 316)	
Process connection (options)	Stainless steel (1.4404 / 316L or 1.4307 / 304L); HASTELLOY® C-276 alloy (2.4819); INCONEL® nickel-chromium alloy 625 (2.4856)	
Gasket (options)	Aramid (T ≤ +250°C / +482°F); graphite; 316L/graphite (spiral-wound); ring joint ⑧	
Braid insulation	Ceramic fiber (thermal insulation between the indicator column and the measuring chamber when the process temperature is +200...+400°C / +392...+752°F)	
Anti-icing cover	PLEXIGLAS® (option for glass indicator column tube) - when the liquid temperature is -70...+0°C / -94...+32°F	

	BI	TWIN

Process connections

Flange, EN	
Size	DN15...50
Pressure rating	PN100 (welding neck)
Facing type options	B2; C; D; E; F
Flange, ASME	
Size	NPS 1/2...2 ⑨
Pressure rating	Class 600 (welding neck)
Facing type options	RF; RJ; LG; SG; LF; SF; LT; ST; LM; SM

Transmitter connection

Flange, EN	DN80 in PN100 - Type B2	DN50, DN80 in PN100 - Type B2
Flange, ASME	NPS 3 in Class 600 RF ⑨	NPS 2, NPS 3 in Class 600 RF ⑨

Drain and vent connections

Drain options		
Thread	Without; 3/8...3/4 NPT (female) with plug	
Flange, EN	DN15...50	DN25
Flange, ASME	NPS 1/2...2 ⑨	NPS 1 ⑨
Vent options		
Thread	Without; 3/8...3/4 NPT (female) with plug	
Flange, EN	DN25	
Flange, ASME	NPS 1 ⑨	

Power supply

Limit switches	Refer to the technical data for the MS15 series and MS40 series
Reed-chain level transmitter	Refer to the technical data for the LT40

Input and output

Parameter	Level detection or indication
Output signal	Refer to the technical data for the LT40 reed-chain level transmitter and the MS15-series and MS40-series limit switches

Approvals and certification

CE / UKCA	The device meets the essential requirements of the EU Directives and UK Regulations. The manufacturer certifies successful testing of the product by applying the CE or UKCA marking.
	For more data about the European Standards and UK Designated Standards related to this device, refer to the EU and the UKCA Declarations of Conformity. You can download this document free of charge from the website (Download Center).

	BI	TWIN
Explosion protection		
ATEX	II 1/2 G Ex h IIC T6...T* Ga/Gb or II 2 G Ex h IIC T6...T* Gb ①⓪	
IECEx	Ex h IIC T6...T* Ga/Gb or Ex h IIC T6...T* Gb ①⓪	
UKEX - pending	II 1/2 G Ex h IIC T6...T* Ga/Gb or II 2 G Ex h IIC T6...T* Gb ①⓪	
Other standards and approvals		
Pressure	EU Pressure Equipment Directive	
	UK Pressure Equipment (Safety) Regulations	
	ASME B31.3 Code for Process Piping	
Vibration resistance	EN 60721-3-4 - vibration class 4M4 (1...200 Hz:1g, 15g shock ½ sinus: 6 ms)	
Construction code	Standard: EN 13445	
	Option: NACE MR0175 / MR0103 / ISO 15156; ASME B31.3	

Table 8-2: PN100/ Class 600 design for BI and TWIN versions: technical data

① For more data, refer to technical data for the LT40 reed-chain level transmitter in this section
② For more data, refer to technical data for the MS15-series and MS40-series limit switches in this section
③ For process temperatures less than +100°C / +212°F
④ If the scale adjacent to the indicator column has % (simplified) units, then it has a range of 0...100% with an increment of 10% between each marking
⑤ If the device has a vent or drain with a threaded connection, then the maximum process temperature is +250°C / +482°F
⑥ The maximum pressure is related to the type of process connection, pressure rating and the process temperature. For more data about 316-316L and 304L stainless-steel measuring chambers, refer to the "Maximum process pressure: measuring chamber" section in this chapter.
⑦ Higher density on request
⑧ The ring joint is made of the same material as the measuring chamber
⑨ NPS = Nominal Pipe Size. For more data about the dimensions of flanges, refer to the ASME B16.5 standard.
①⓪If the device has a PTFE or Aramid gasket, then T*= T2. For all other versions, T*= T1.

TWIN version: PN250 / Class 1500 and PN400 / Class 2500

	PN250 / Class 1500	PN400 / Class 2500

Measuring system

Measuring principle	Magnetic level indicator - two bypass chambers (principle of communicating tubes). A float in the measuring chamber (Ø73.03 m / NPS 2 1/2 pipe) is magnetically coupled to a mechanical level indicator. A level transmitter supplies a redundant measurement.
Application range	Level indication of liquids in oil & gas and boiler applications
Measured value	
Primary measured value	Level of the float magnets in the measuring chamber. Redundant measurement of level with a level transmitter.
Secondary measured value	Level or volume of a liquid in the tank. Level of the interface, if there is more than one liquid in the tank.

Design

Measuring chamber, variants	Side / side process connections between two chambers
Options	Level measurement
	Interface level measurement (if there is more than one liquid in the measuring chamber)
	Zero-line level measurement (level measurement without vertical offset of float magnets in relation to the liquid level)
	OPTIFLEX 7200 guided-radar (TDR) level transmitter
	OPTIFLEX 8200 guided-radar (TDR) level transmitter
	OPTIWAVE 7400 FMCW radar level transmitter
	BW25 displacer-type level transmitter
	LT40 reed-chain level transmitter without LCD indicator module with a compact or a remote housing ①
	LT40 reed-chain level transmitter with LCD indicator module with a compact or a remote housing ①
	Anti-icing cover for glass indicator tube
	Thermal insulation (ROCKWOOL® or FOAMGLAS®) in a metal enclosure
	Electric heat tracing system
	Bistable limit switches ②
Measuring range (ML)	0.3...5.5 m / 1...18 ft (longer on request)
Display and user interface	
Display	Indicator column with magnetically coupled rotating flaps that have two colors: yellow/black; red/white
	Indicator column with magnetically coupled low-temperature index ③
Float failure indication (at the bottom of the indicator column)	Rotating flaps: orange flaps
	Low-temperature index: none
Scale marking options	No scale; m + cm; ft + inches; customized volume units, % (simplified) ④

	PN250 / Class 1500	PN400 / Class 2500

Measuring accuracy

Accuracy	±10 mm / 0.4¨
Repeatability	±10 mm / 0.4¨ (when density is constant)
Maximum rate of change	20 mm/s / 0.787¨/s

Operating conditions

Temperature		
Process temperature	-196...+400°C / -320.8...+752°F (Ex: see supplementary instructions or approval certificates)	
Ambient temperature	-70...+80°C / -94...+176°F (Ex: see supplementary instructions or approval certificates)	
Storage temperature	-70...+80°C / -94...+176°F	
Pressure		
Process pressure	1...250 barg / 14.5...3625 psig ⑤	-1...400 barg / -14.5...5802 psig ⑥
Chemical properties		
Density	660...1200 kg/m³ / 41.20...74.91 lb/ft³ ⑦	740...1200 kg/m³ / 46.20...74.91 lb/ft³ ⑦
Viscosity	≤ 500 mPa·s / ≤ 500 cP	
Other conditions		
Ingress protection (IEC 60529)	Indicator column: IP66 / IP68 (0.15 barg)	

Materials

Measuring chamber (options)	Stainless steel (1.4404 / 316L); HASTELLOY® C-276 alloy (2.4819); INCONEL® nickel-chromium alloy 625 (2.4856)
Float (options)	Titanium
Indicator column rail	Stainless steel (1.4401 / 316)
Indicator column tube	Borosilicate glass 3.3 (agrees with ISO 3585) - hermetically sealed tube
Scale (option)	Stainless steel (1.4401 / 316)
Process connection (options)	Stainless steel (1.4404 / 316L); HASTELLOY® C-276 alloy (2.4819); INCONEL® nickel-chromium alloy 625 (2.4856)
Gasket (options)	Ring joint ⑧
Braid insulation	Ceramic fiber (thermal insulation between the indicator column and the measuring chamber when the process temperature is +200...+400°C / -392...+752°F)
Anti-icing cover	PLEXIGLAS® (option for glass indicator column tube) - when the liquid temperature is -70...+0°C / -94...+32°F

Process connections

Flange, EN		
Size	DN15...50	
Pressure rating	PN160 or 250 (welding neck)	PN400 (welding neck)
Facing type options	B2; C; D; E; F	C

	PN250 / Class 1500	PN400 / Class 2500
Flange, ASME		
Size	NPS 1/2...2 ⑨	
Pressure rating	Class 1500 (welding neck)	Class 2500 (welding neck)
Facing type options	RJ; LG; SG; LF; SF; LT; ST; LM; SM	RJ

Transmitter connection

Flange, ASME		
Size	NPS 2 or NPS 3 ⑨	NPS 2 or NPS 3 ⑨
Pressure rating	Class 1500 (welding neck)	Class 2500 (welding neck)
Facing type options	LG; SG; LF; SF; LT; ST; LM; SM	RJ

Drain and vent connections

Drain options		
Thread	Without; 3/8...3/4 NPT (female) with plug	
Flange, EN	DN25	
Flange, ASME	NPS 1 ⑨	NPS 3/4...1 ⑨
Vent options		
Thread	Without; 3/8...3/4 NPT (female) with plug	
Flange, EN	DN25	
Flange, ASME	NPS 3/4...1 ⑨	

Power supply

Limit switches	Refer to the technical data for the MS15 series and MS40 series
Reed-chain level transmitter	Refer to the technical data for the LT40

Input and output

Parameter	Level detection or indication
Output signal	Refer to the technical data for the LT40 reed-chain level transmitter and the MS15-series and MS40-series limit switches

Approvals and certification

CE / UKCA	The device meets the essential requirements of the EU Directives and UK Regulations. The manufacturer certifies successful testing of the product by applying the CE or UKCA marking.
	For more data about the European Standards and UK Designated Standards related to this device, refer to the EU and the UKCA Declarations of Conformity. You can download this document free of charge from the website (Download Center).
Explosion protection	
ATEX	II 1/2 G Ex h IIC T6...T1 Ga/Gb or II 2 G Ex h IIC T6...T1 Gb
IECEx	Ex h IIC T6...T1 Ga/Gb or Ex h IIC T6...T1 Gb
UKEX - pending	II 1/2 G Ex h IIC T6...T1 Ga/Gb or II 2 G Ex h IIC T6...T1 Gb

	PN250 / Class 1500	PN400 / Class 2500
Other standards and approvals		
Pressure	EU Pressure Equipment Directive	
	UK Pressure Equipment (Safety) Regulations	
	ASME B31.3 Code for Process Piping	
Vibration resistance	EN 60721-3-4 - vibration class 4M4 (1...200 Hz:1g, 15g shock ½ sinus: 6 ms)	
Construction code	Standard: EN 13445	
	Option: NACE MR0175 / MR0103 / ISO 15156; ASME B31.3	

Table 8-3: PN250 / Class 1500 and PN400 / Class 2500 designs for TWIN version: technical data

① For more data, refer to technical data for the LT40 reed-chain level transmitter in this section
② For more data, refer to technical data for the MS15-series and MS40-series limit switches in this section
③ For process temperatures less than +100°C / +212°F
④ If the scale adjacent to the indicator column has % (simplified) units, then it has a range of 0...100% with an increment of 10% between each marking
⑤ The maximum pressure is related to the type of process connection, pressure rating and the process temperature. For more data about 316-316L and 304L stainless-steel measuring chambers, refer to the "Maximum process pressure: measuring chamber" section in this chapter.
⑥ The maximum pressure is related to the type of process connection, pressure rating and the process temperature. For more data about 316-316L stainless-steel measuring chambers, refer to the "Maximum process pressure: measuring chamber" section in this chapter.
⑦ Higher density on request
⑧ The ring joint is made of the same material as the measuring chamber
⑨ NPS = Nominal Pipe Size. For more data about the dimensions of flanges, refer to the ASME B16.5 standard.

8.2.2 Redundant level transmitter (OPTIFLEX 7200, OPTIFLEX 8200, OPTIWAVE 7400 or BW25)

For technical data about redundant level transmitters, refer to the handbook for the related level transmitter option.

8.2.3 LT40 reed-chain level transmitter

4...20 mA and 4...20 mA + HART® communication modules

Measuring system

Measuring principle	A reed resistor chain that is magnetically operated by a magnetic float in an adjacent measuring chamber
Primary measured value	Resistance
Secondary measured value	Level or volume of the liquid in the tank

Design

Description of device	Resistance reed chain with 2-wire loop-powered transmitter module attached adjacent to the measuring chamber of the magnetic level indicator. A transmitter module converts changes in resistance to an output signal. If the LT40 is used in multidrop mode, a maximum of 63 transmitters can be connected to a network that agrees with the HART® communication protocol.
Options	Transmitter module position: LT40 C - compact housing at the top of the reed resistor chain
	Transmitter module position: LT40 C - compact housing at the bottom of the reed resistor chain
	Transmitter module position: LT40 F - remote housing connected to the bottom of the reed resistor chain. Max. cable length: 25 m / 82 ft.
	LCD indicator module (non-Ex and Ex d-approved devices only)
Accessories	C 95 Basic universal power supply (Panel mount, 2 relays, 4-digit local indicator and non-Ex)
	C 95 Basic universal power supply (Panel mount, 2 relays, 4...20 mA output, 4-digit local indicator and non-Ex)
Display and user interface	
Display	Optional 2-wire loop-powered LCD indicator module (backlit)
	4-digit LCD with minus sign, 2-button keypad. Selectable number of decimals, 0 to 3.
Available units	mm; inches; %
Range	-1999...9999

Measuring accuracy

Resolution	Standard: ±10 mm / 0.4¨ (when density is constant)
	Option: ±5 mm / 0.2¨ (when density is constant)

Operating conditions

Temperature	
Ambient temperature, transmitter	-40...+80°C / -40...+176°F ①
Ambient temperature, LCD indicator	-20...+70°C / -4...+158°F ①
Process temperature	The ambient temperature limit is related to the process temperature. Do not put thermal insulation around the transmitter housing. Refer to the "Temperature limits: LT40 C/F reed-chain level transmitter" section in this chapter.
Storage temperature	-40...+80°C / -40...+176°F
Pressure	
Operating pressure	Atmospheric pressure

Other conditions	
Warm-up time	30 s
Response time	1....60 s ②
Ingress protection (IEC 60529)	IP66/IP68 (at a depth of 1.5 m for 2 weeks)
Relative air humidity (RH)	0...99%

Installation conditions

Notes	The LT40 is calibrated at the factory and attached to the measuring chamber before delivery
Dimensions	Refer to the "Dimensions" section

Materials

Housing	Polyester-coated aluminium
Reed-chain tube	Stainless steel (1.4401 / 316)
Clamp	Stainless steel (1.4401 / 316)
Cable gland	Plastic (for M20 × 1.5 only), nickel-plated brass or stainless steel

Power supply

Voltage, without LCD indicator	non-Ex or Ex db: 10...35 V DC
	Ex ia: 10...30 V DC
Voltage, with LCD indicator	non-Ex or Ex db: 17...35 V DC
EN 60947-1 electrical data	Overvoltage category I
Cable entry	M20 × 1.5; 1/2 NPT
Cable gland	None; M20 × 1.5; 1/2 NPT
Intrinsically safe circuit data for Ex ia-approved devices	Refer to supplementary instructions or approval certificates

Input and output

Current output	
Output range	4...20 mA
Error signal	High: 21 mA; Low: 3.6 mA - agrees with NAMUR NE 43
HART®	
Description	Digital signal transmitted with the current output signal (HART® protocol)
Version	7
Primary value (PV)	Indicator column with m + cm or mm scale markings: mm Indicator column with ft + inches scale markings: inches Indicator column with %, volume or other markings: %
Multidrop operation	Yes, current output = 4 mA. Polling address 1...15.

Approvals and certifications

CE / UKCA	The device meets the essential requirements of the EU Directives and UK Regulations. The manufacturer certifies successful testing of the product by applying the CE or UKCA marking.
	For more data about the European Standards and UK Designated Standards related to this device, refer to the EU and the UKCA Declarations of Conformity. You can download this document free of charge from the website (Download Center).

Explosion protection	
ATEX (EU Type Approval)	II 1 G Ex ia IIC T6...T1 Ga or II 2 G Ex ia IIC T6...T1 Gb ③
	II 2 G Ex db IIC T6...T1 Gb
IECEx	Ex ia IIC T6...T1 Ga or Ex ia IIC T6...T1 Gb ③
	Ex db IIC T6...T1 Gb
UKEX - pending	II 1 G Ex ia IIC T6...T1 Ga or II 2 G Ex ia IIC T6...T1 Gb ③
	II 2 G Ex db IIC T6...T1 Gb
Other standards and approvals	
EMC	EU Electromagnetic Compatibility Directive
	UK Electromagnetic Compatibility Regulations
	NAMUR NE 21 ④
Vibration resistance	EN 60721-3-4 - vibration class 4M4 (1...200 Hz:1g, 10g shock ½ sinus: 11 ms)
NAMUR	NAMUR NE 43

Table 8-4: LT40 (4...20 mA and 4...20 mA + HART® communication modules): technical data

① The ambient temperature limit is related to the process temperature. Do not put thermal insulation around the transmitter housing. Refer to the "Temperature limits: LT40 C/F reed-chain level transmitter" section in this chapter.
② This value is programmable
③ This Ex approval does not include the optional LCD indicator module
④ LT40 F: Applicable only for a resolution of ±10 mm / 0.4¨

Fieldbus communication module

	FOUNDATION™ fieldbus	PROFIBUS PA

Measuring system

Measuring principle	A reed resistor chain that is magnetically operated by a magnetic float in an adjacent measuring chamber
Primary measured value	Resistance
Secondary measured value	Level and volume of the liquid in the measuring chamber

Design

Description of device	Resistance reed chain with 2-wire loop-powered transmitter module attached adjacent to the measuring chamber of the magnetic level indicator. A transmitter module converts changes in resistance to an output signal.	
Description of transmitter module	Changes in resistance are converted to signals that agree with the FOUNDATION™ fieldbus communication protocol.	Changes in resistance are converted to signals that agree with the PROFIBUS PA communication protocol.
Options	Transmitter module position: LT40 C - compact housing at the top of the reed resistor chain	
	Transmitter module position: LT40 C - compact housing at the bottom of the reed resistor chain	
	Transmitter module position: LT40 F - remote housing connected to the bottom of the reed resistor chain. Max. cable length: 25 m / 82 ft.	
Display and user interface		
Display	None	

	FOUNDATION™ fieldbus	PROFIBUS PA

Measuring accuracy

Resolution	Standard: ±10 mm / 0.4¨ (when density is constant)
	Option: ±5 mm / 0.2¨ (when density is constant)

Operating conditions

Temperature	
Ambient temperature	-40...+80°C / -40...+176°F ①
Process temperature	The ambient temperature limit is related to the process temperature. Do not put thermal insulation around the transmitter housing. Refer to the "Temperature limits: LT40 C/F reed-chain level transmitter" section in this chapter.
Storage temperature	-40...+80°C / -40...+176°F
Pressure	
Operating pressure	Atmospheric pressure
Other conditions	
Ingress protection (IEC 60529)	IP66/IP68 (at a depth of 1.5 m for 2 weeks)
Relative air humidity (RH)	0...99%

Installation conditions

Notes	The LT40 is calibrated at the factory and attached to the measuring chamber before delivery
Dimensions	Refer to the "Dimensions" section

Materials

Housing	Polyester-coated aluminium
Reed-chain tube	Stainless steel (1.4401 / 316)
Clamp	Stainless steel (1.4401 / 316)
Cable gland	Plastic (for M20 × 1.5 only), nickel-plated brass or stainless steel

Power supply

Voltage	non-Ex or Ex db: 9...32 V DC	
	Ex ia: 9...30 V DC	
EN 60947-1 electrical data	Overvoltage category I	
Cable entry	M20 × 1.5; 1/2 NPT	
Cable gland	None; M20 × 1.5; 1/2 NPT	
Intrinsically safe circuit data for Ex ia-approved devices	Refer to supplementary instructions or approval certificates	
FOUNDATION™ fieldbus		
Description	FOUNDATION™ fieldbus protocol	N/A
PROFIBUS PA		
Description	N/A	PROFIBUS PA protocol Profile A&B, ver.3.0 (EN 50170 vol.2)

	FOUNDATION™ fieldbus	PROFIBUS PA

Approvals and certification

CE / UKCA	The device meets the essential requirements of the EU Directives and UK Regulations. The manufacturer certifies successful testing of the product by applying the CE or UKCA marking.
	For more data about the European Standards and UK Designated Standards related to this device, refer to the EU and the UKCA Declarations of Conformity. You can download this document free of charge from the website (Download Center).
Explosion protection	
ATEX (EU Type Approval)	II 1 G Ex ia IIC T6...T1 Ga or II 2 G Ex ia IIC T6...T1 Gb
	II 2 G Ex db IIC T6...T1 Gb
IECEx	Ex ia IIC T6...T1 Ga or Ex ia IIC T6...T1 Gb
	Ex db IIC T6...T1 Gb
UKEX - pending	II 1 G Ex ia IIC T6...T1 Ga or II 2 G Ex ia IIC T6...T1 Gb
	II 2 G Ex db IIC T6...T1 Gb
Other standards and approvals	
EMC	EU Electromagnetic Compatibility Directive
	UK Electromagnetic Compatibility Regulations
Vibration resistance	EN 60721-3-4 - vibration class 4M4 (1...200 Hz:1g, 10g shock ½ sinus: 11 ms)

Table 8-5: LT40 (fieldbus communication module): technical data

① The ambient temperature limit is related to the process temperature. Do not put thermal insulation around the transmitter housing. Refer to the "Temperature limits: LT40 C/F reed-chain level transmitter" section in this chapter.

8.2.4 MS15-series and MS40-series limit switches

	MS15 series	MS40 series

Measuring system

Measuring principle	Bistable reed switch (SPDT) that is magnetically operated by a magnetic float in an adjacent measuring chamber
Application range	Level detection

Design

Description of device	Limit switch attached adjacent to the measuring chamber of the magnetic level indicator

Measuring accuracy

Hysteresis	The hysteresis value agrees with the model of the magnetic level indicator. For more data, refer to *Limit switch adjustment data* on page 133.

Operating conditions

Temperature		
Ambient temperature	-40...+80°C / -40...+176°F ①	
Process temperature	The ambient temperature limit is related to the process temperature. Do not put thermal insulation around the limit switch housing. Refer to the "Temperature limits: MS15-series limit switch" and "Temperature limits: MS40-series limit switch" sections in this chapter.	
Operating temperature	-40...+115°C / -40...+239°F ②	-40...+120°C / -40...+248°F ②
Storage temperature	-40...+80°C / -40...+176°F	
Pressure		
Operating pressure	Atmospheric pressure Max. height above mean sea level: 2000 m / 6560 ft	
Other conditions		
Ingress protection (IEC 60529)	MS15 series: IP66 / IP68 (at a depth of 1.5 m for 2 weeks)	
	MS40 series: IP66	
Relative air humidity (RH)	0...99%	

Installation conditions

Notes	Adjust the switch position in relation to the hysteresis data (switching point offset) and the density of the liquid
Dimensions	Refer to the "Dimensions" section

	MS15 series	MS40 series

Materials

Housing	Aluminium with epoxy powder paint or stainless steel (1.4404 / 316L)	Aluminium with epoxy powder paint
Clamp	Stainless steel (1.4401 / 316)	
Cable gland	Plastic (for M20 × 1.5 only), nickel-plated brass or stainless steel	Plastic

Electrical connections

Switching capacity	MS15 / MS40: Absolute ratings: 250 V AC/DC; 1 A; 60 VA/W	
	MS15 NAMUR / MS40 NAMUR: Agrees with DIN 19234 (NAMUR); Umax = 13 V DC	
EN 60947-5-1 electrical data (MS15 and MS40 only)	Overvoltage category II	
	Rated insulation voltage, Ui: 250 V AC or 250 V DC	
	Rated impulse withstand voltage, Uimp: 2.5 kV	
	Rated conventional thermal current, Ith: 1 A	
	Pollution degree: 4	
Utilization category (EN 60947-5-1) with current and voltage ratings	AC13: Ie = 0.5 A; Umax = 60 V AC	
	AC13: Ie = 0.25 A; Umax = 250 V AC	
	DC12: Ie = 1 A; Umax = 60 V DC	
	DC13: Ie = 0.5 A; Umax = 60 V DC	
Short-circuit protection device	0.25 A fuse, type 1500 A interrupting rating (IEC 60127-2/1)	
	1 A fuse, application category gG (IEC 60269) or type 1500 A interrupting rating (IEC 60127-2/1)	
Intrinsically safe circuit data	Refer to supplementary instructions or approval certificates	
Cable entry	M20 × 1.5; 1/2 NPT	M16 × 1.5
Cable gland	None; M20 × 1.5; 1/2 NPT	M16 × 1.5

Approvals and certification

CE / UKCA	The device meets the essential requirements of the EU Directives and UK Regulations. The manufacturer certifies successful testing of the product by applying the CE or UKCA marking.
	For more data about the European Standards and UK Designated Standards related to this device, refer to the EU and the UKCA Declarations of Conformity. You can download this document free of charge from the website (Download Center).

	MS15 series	MS40 series
Explosion protection		
ATEX (EU Type Approval)	II 1 G Ex ia IIC T6...T1 or II 2 G Ex ia IIC T6...T1 Gb	
	II 2 G Ex db IIC T6...T1 Gb	N/A
IECEx	Ex ia IIC T6...T1 Ga or Ex ia IIC T6...T1 Gb	
	Ex db IIC T6...T1 Gb	N/A
UKEX - pending	II 1 G Ex ia IIC T6...T1 or II 2 G Ex ia IIC T6...T1 Gb	
	II 2 G Ex db IIC T6...T1 Gb	N/A
Other standards and approvals		
LVD	MS15 / MS40: EU Low-Voltage Directive (LVD); UK Electrical Equipment (Safety) Regulations	
	MS15 NAMUR / MS40 NAMUR: N/A	
Vibration resistance (EN 60721-3-4)	Aluminium housing: vibration class 4M7 (1...200 Hz:3g, 25g shock ½ sinus: 11 ms)	
	Stainless steel housing: vibration class 4M4 (1...200 Hz:1g, 10g shock ½ sinus: 11 ms)	N/A

Table 8-6: MS15-series and MS40-series limit switches: technical data

① The ambient temperature limit is related to the process temperature. Do not put thermal insulation around the limit switch housing. Refer to the "Temperature limits: MS15-series limit switch" and "Temperature limits: MS40-series limit switch" sections in this chapter.

② The operating temperature is the temperature of the electronic parts

8.3 Dimensions

8.3.1 PN40 - Class 300

BI version / side - side process connections

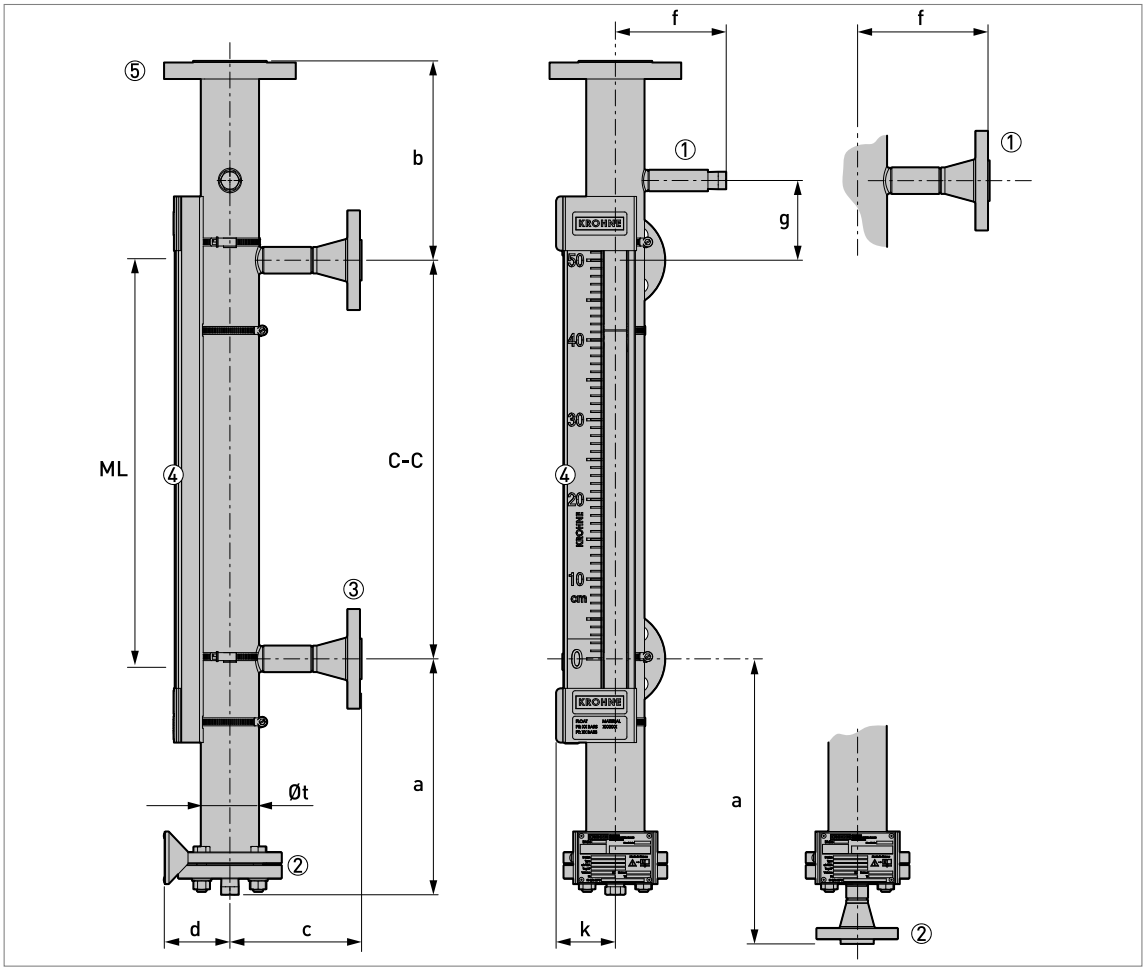

Figure 8-3: PN40 / Class 300 / BI version / side - side process connections

① Optional vent with 1/2...3/4 NPT or G 1/2...3/4 threaded connection (with plug), or DN25 / NPS 1 flange
② Optional drain with 3/8...3/4 NPT or G 3/8...3/4 threaded connection (with plug), or DN15...50 / NPS 1/2...2 flange
③ Process connection (flange connection)
④ Level indicator column with optional scale (mm, inch, % or volume)
⑤ Top flange (DN80 PN40 or NPS 3 Class 300) for level transmitter option

INFORMATION!

- *a = distance from the center axis of the bottom connection to the bottom of the device*
- *b = distance from the center axis of the top connection to the top of the device*
- *C-C = distance between the center axes of the top and bottom process connections*
- *ML = measuring length*

If the device has ASME flanges, then the flange facing type can change the dimension "c". If the flange facing type is "FF" or "RF", c + 0 mm / 0¨. If the flange facing type is "LG", "LF", "SG" or "SF", c + 3 mm / 0.1¨. If the flange facing type is "LT", "LM", "ST" or "SM", c + 5 mm / 0.2¨. This is applicable to Class 300 flanges.

Flanged vent and drain options have the same pressure rating as the flanges for the process connections.

Other dimensions are available on request.

Liquid density [kg/m³]	Dimensions [mm]								
	a	b	C-C (ML)	c	d	f	g	k	Øt
620...800	520 ①	250	300... 5500 ②	165	82 ③	139 ④	100 ⑤	74	73.03
800...950	335 ⑥								
950...1200	335 ⑥								

Table 8-7: PN40 / Class 300 - BI version (side - side process connections): general dimensions in mm

① Drain options are available. NPT or G connection (female) + plug: 520 mm. Flange, DN15...25 or NPS 1/2...1: 574 mm. Flange, DN40...50 or NPS 1 1/2...2: 649 mm.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ If the indicator column has the PLEXIGLAS® anti-icing cover option, then d = 98 mm (anti-icing cover). If indicator column has a low-temperature index and T < +100°C, then d = 120 mm (PLEXIGLAS® cover).
④ If an NPT or G connection. Flange, DN25 or NPS 1: 165 mm.
⑤ Vent options are available. NPT or G connection (female) + plug: 100 mm. Flange, DN25 or NPS 1: 165 mm.
⑥ Drain options are available. NPT or G connection (female) + plug: 335 mm. Flange, DN15...25 or NPS 1/2...1: 389 mm. Flange, DN40...50 or NPS 1 1/2...2: 464 mm.

Liquid density [lb/ft³]	Dimensions [inches]								
	a	b	C-C (ML)	c	d	f	g	k	Øt
38.70...349.94	20.47 ①	9.84	11.8... 216.5 ②	6.50	3.2 ③	5.47 ④	3.94 ⑤	2.9	2.9
49.94...59.30	13.19 ⑥								
59.30...74.91	13.19 ⑥								

Table 8-8: PN40 / Class 300 - BI version (side - side process connections): general dimensions in inches

① Drain options are available. NPT or G connection (female) + plug: 20.47¨. Flange, DN15...25 or NPS 1/2...1: 22.60¨. Flange, DN40...50 or NPS 1 1/2...2: 25.55¨.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ If the indicator column has the PLEXIGLAS® anti-icing cover option, then d = 3.9¨ (anti-icing cover). If indicator column has a low-temperature index and T < +212°F, then d = 4.7¨ (PLEXIGLAS® cover).
④ If an NPT or G connection. Flange, DN25 or NPS 1: 6.54¨.
⑤ Vent options are available. NPT or G connection (female) + plug: 3.94¨. Flange, DN25 or NPS 1: 6.49¨.
⑥ Drain options are available. NPT or G connection (female) + plug: 13.19¨. Flange, DN15...25 or NPS 1/2...1: 15.31¨. Flange, DN40...50 or NPS 1 1/2...2: 18.27¨.

TWIN version / side - side process connections

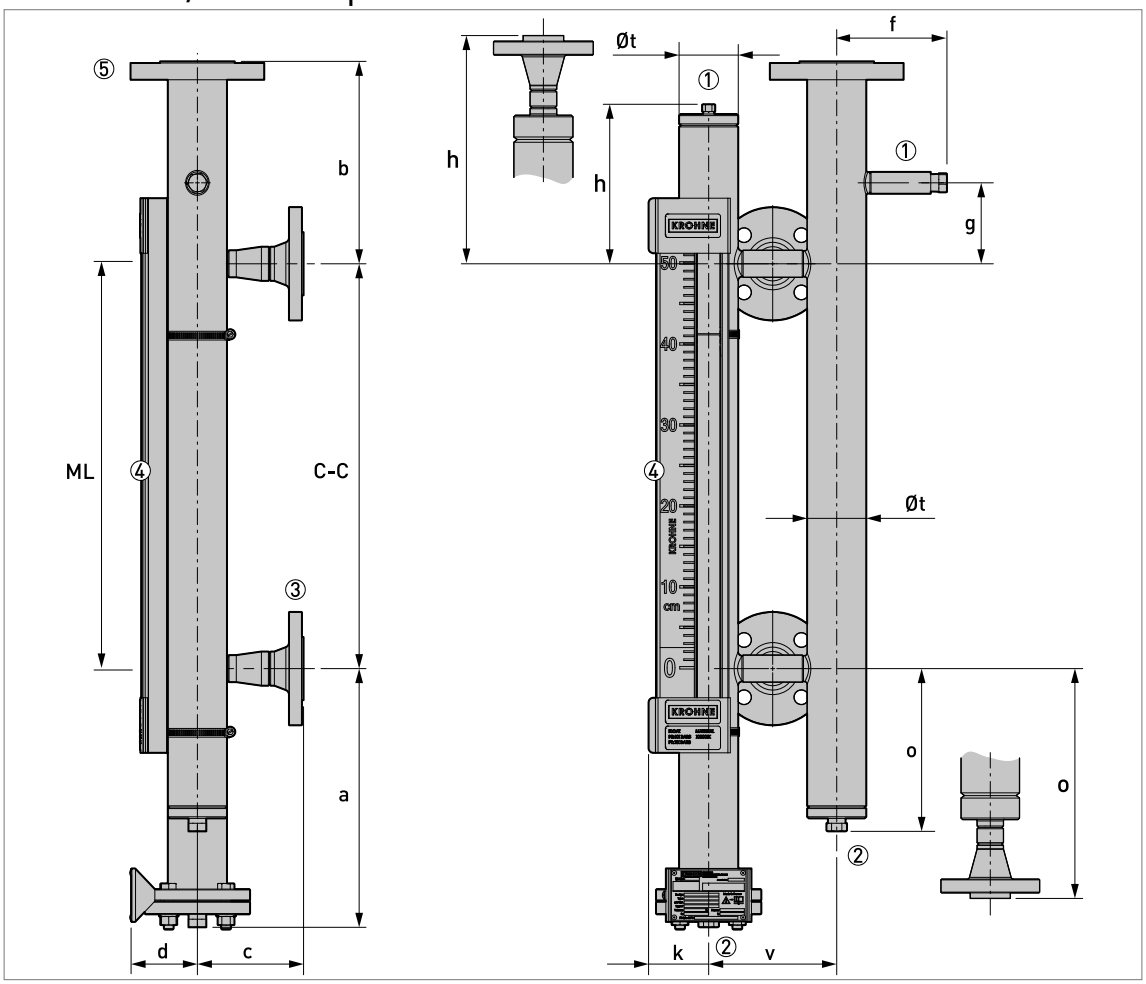

Figure 8-4: PN40 / Class 300 / TWIN version / side - side process connections

① Optional vent with 1/2...3/4 NPT or G 1/2...3/4 threaded connection (with plug), or DN25 / NPS 1 flange
② Optional drain with 3/8...3/4 NPT or G 3/8...3/4 threaded connection (with plug), or DN25 / NPS 1 flange
③ Process connection (flange connection)
④ Level indicator column with optional scale (mm, inch, % or volume)
⑤ Top flange (DN50 / DN80 PN40 or NPS 2 / NPS 3 Class 300) for level transmitter option

INFORMATION!

- *a = distance from the center axis of the bottom connection to the bottom of the device*
- *b = distance from the center axis of the top connection to the top of the device*
- *C-C = distance between the center axes of the top and bottom process connections*
- *ML = measuring length*

If the device has ASME flanges, then the flange facing type can change the dimension "c". If the flange facing type is "FF" or "RF", c + 0 mm / 0¨. If the flange facing type is "LG", "LF", "SG" or "SF", c + 3 mm / 0.1¨. If the flange facing type is "LT", "LM", "ST" or "SM", c + 5 mm / 0.2¨. This is applicable to Class 300 flanges.

Flanged vent and drain options have the same pressure rating as the flanges for the process connections.

Other dimensions are available on request.

Liquid density [kg/m³]	Dimensions [mm]											
	a	b	C-C (ML)	c	d	f	g	h	k	o	Øt	v
370...500	520 ①	340	300... 5500 ②	③	82 ④	136 ⑤	100	185 ⑥	74	185 ⑥	73.03	158
500...600	335 ⑦											
600...800	335 ⑦											
800...1200	335 ⑦											

Table 8-9: PN40 / Class 300 - TWIN version (side - side process connections): general dimensions in mm

① Drain options are available. NPT or G connection (female) + plug: 520 mm. Flange, DN25 or NPS 1: 575 mm.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ The length, c, is related to flange size. DN15: 127 mm, DN20: 129 mm, DN25: 165 mm, DN40: 147 mm, DN50: 162 mm, NPS 1/2 Class 150: 137 mm, NPS 3/4 Class 150: 142 mm, NPS 1 Class 150: 165 mm, NPS 1 1/2 Class 150: 164 mm, NPS 2 Class 150: 178 mm, NPS 1/2 Class 300: 142 mm, NPS 3/4 Class 300: 147 mm, NPS 1 Class 300: 165 mm, NPS 1 1/2 Class 300: 171 mm, NPS 2 Class 300: 184 mm.
④ If the indicator column has the PLEXIGLAS® anti-icing cover option, then d = 98 mm (anti-icing cover). If indicator column has a low-temperature index and T < +100°C, then d = 120 mm (PLEXIGLAS® cover).
⑤ Vent options are available. NPT or G connection (female) + plug: 136 mm. Flange, DN25 or NPS 1: 165 mm.
⑥ Drain options are available. G connection (female) + plug: 193 mm. NPT connection (female) + plug: 195 mm. Flange, DN25 or NPS 1: 271 mm.
⑦ Drain options are available. NPT or G connection (female) + plug: 335 mm. Flange, DN25 or NPS 1: 390 mm.

Liquid density [lb/ft³]	Dimensions [inches]											
	a	b	C-C (ML)	c	d	f	g	h	k	o	Øt	v
23.09...31.21	20.47 ①	13.39	11.8... 216.5 ②	③	3.2 ④	5.35 ⑤	3.94	7.28 ⑥	2.91	7.28 ⑥	2.9	6.22
31.21...37.45	13.19 ⑦											
37.45...49.94	13.19 ⑦											
49.94...74.91	13.19 ⑦											

Table 8-10: PN40 / Class 300 - TWIN version (side - side process connections): general dimensions in inches

① Drain options are available. NPT or G connection (female) + plug: 20.47¨. Flange, DN25 or NPS 1: 22.64¨.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ The length, c, is related to flange size. DN15: 5.00¨, DN20: 5.08¨, DN25: 6.50¨, DN40: 5.79¨, DN50: 6.38¨, NPS 1/2 Class 150: 5.39¨, NPS 3/4 Class 150: 5.59¨, NPS 1 Class 150: 6.50¨, NPS 1 1/2 Class 150: 6.46¨, NPS 2 Class 150: 7.01¨, NPS 1/2 Class 300: 5.59¨, NPS 3/4 Class 300: 5.79¨, NPS 1 Class 300: 6.50¨, NPS 1 1/2 Class 300: 6.73¨, NPS 2 Class 300: 7.24¨.
④ If the indicator column has the PLEXIGLAS® anti-icing cover option, then d = 3.9¨ (anti-icing cover). If indicator column has a low-temperature index and T < +212°F, then d = 4.7¨ (PLEXIGLAS® cover).
⑤ Vent options are available. NPT or G connection (female) + plug: 5.35¨. Flange, DN25 or NPS 1: 6.50¨.
⑥ Drain options are available. G connection (female) + plug: 7.60¨. NPT connection (female) + plug: 7.68¨. Flange, DN25 or NPS 1: 10.67¨.
⑦ Drain options are available. NPT or G connection (female) + plug: 13.19¨. Flange, DN25 or NPS 1: 15.35¨.

8.3.2 PN100 - Class 600

BI version / side - side process connections

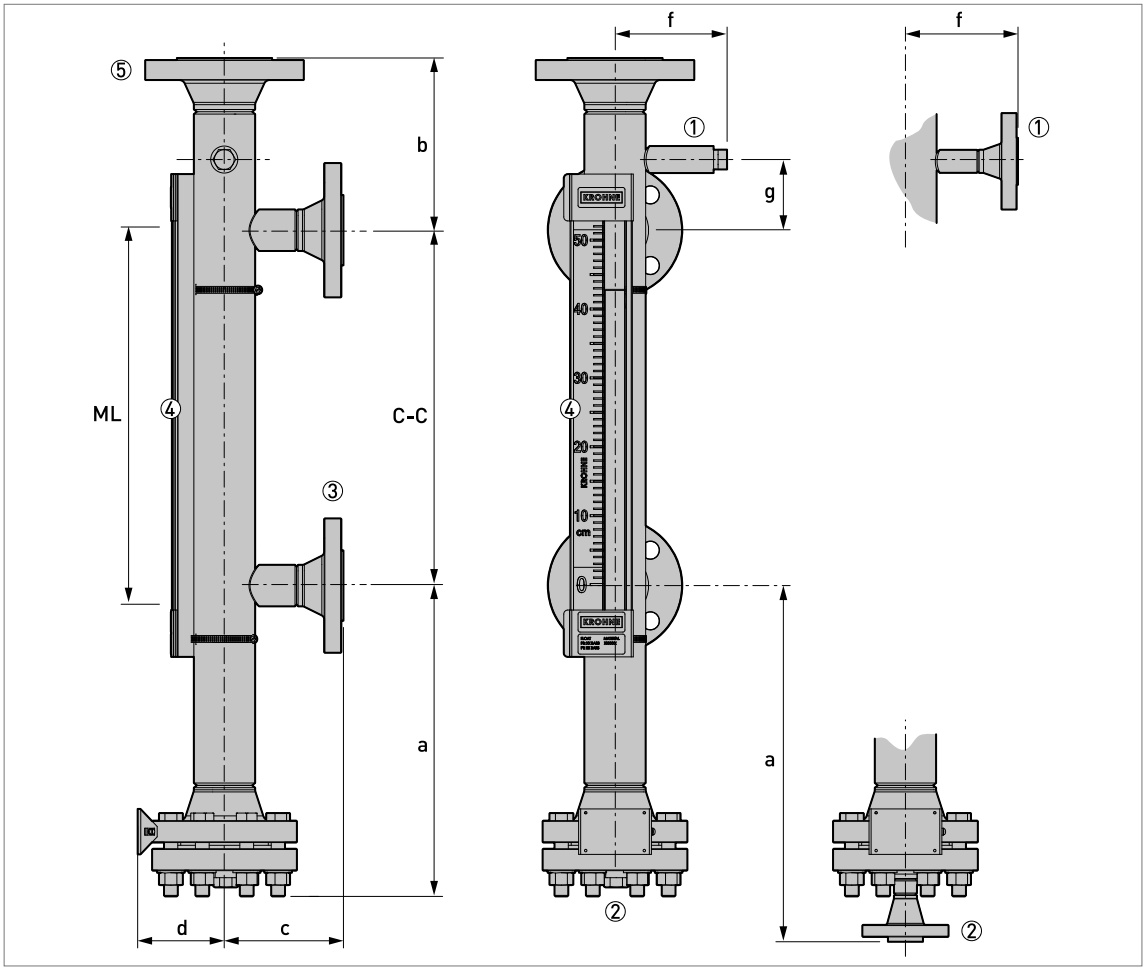

Figure 8-5: PN100 / Class 600 / BI version / side - side process connections

① Optional vent with 1/2...3/4 NPT or G 1/2...3/4 threaded connection (with plug), or DN25 / NPS 1 flange
② Optional drain with 3/8...3/4 NPT or G 3/8...3/4 threaded connection (with plug), or DN15...50 / NPS 1/2...2 flange
③ Process connection (flange connection)
④ Level indicator column with optional scale (mm, inch, % or volume)
⑤ Top flange (DN80 PN100 or NPS 3 Class 600) for level transmitter option

INFORMATION!

- *a = distance from the center axis of the bottom connection to the bottom of the device*
- *b = distance from the center axis of the top connection to the top of the device*
- *C-C = distance between the center axes of the top and bottom process connections*
- *ML = measuring length*

Flanged drain options have the same pressure rating as the flanges for the process connections.

Other dimensions are available on request.

Dimensions [mm]							
a	b	C-C (ML)	c	d	f	g	Øt
450 ①	250	300... 5500 ②	③	128	135 ④	100 ⑤	88.9

Table 8-11: PN100 / Class 600 - BI version (side - side process connections): general dimensions in mm

① Drain options are available. Flange, DN15...25 or NPS 1/2...1: 520 mm. Flange, DN40...50 or NPS 1 1/2...2: 585 mm.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ The length, c, is related to flange size. DN15: 149 mm, DN20: 152 mm, DN25: 162 mm, DN40: 166 mm, DN50: 172 mm, NPS 1/2: 163 mm, NPS 3/4: 168 mm, NPS 1: 173 mm, NPS 1 1/2: 181 mm, NPS 2: 184 mm.
④ If an NPT connection without a plug (with a plug: 150 mm). Flange DN20: 152 mm, DN25: 162 mm, NPS 3/4: 168 mm, NPS 1: 173 mm.
⑤ Vent options are available. NPT connection (female) + plug: 100 mm.

Dimensions [inches]							
a	b	C-C (ML)	c	d	f	g	Øt
17.71 ①	9.84	11.8... 216.5 ②	③	5.0	5.31 ④	3.94 ⑤	3.5

Table 8-12: PN100 / Class 600 - BI version (side - side process connections): general dimensions in inches

① Drain options are available. Flange, DN15...25 or NPS 1/2...1: 20.47¨. Flange, DN40...50 or NPS 1 1/2...2: 23.03¨.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ The length, c, is related to flange size. DN15: 5.87¨, DN20: 5.98¨, DN25: 6.37¨, DN40: 6.54¨, DN50: 6.77¨, NPS 1/2: 6.42¨, NPS 3/4: 6.61¨, NPS 1: 6.81¨, NPS 1 1/2: 7.13¨, NPS 2: 7.24¨.
④ If an NPT connection without a plug (with a plug: 5.91¨). Flange DN20: 5.98¨, DN25: 6.38¨, NPS 3/4: 6.61¨, NPS 1: 6.81¨.
⑤ Vent options are available. NPT connection (female) + plug: 3.94¨.

TWIN version / side - side process connections

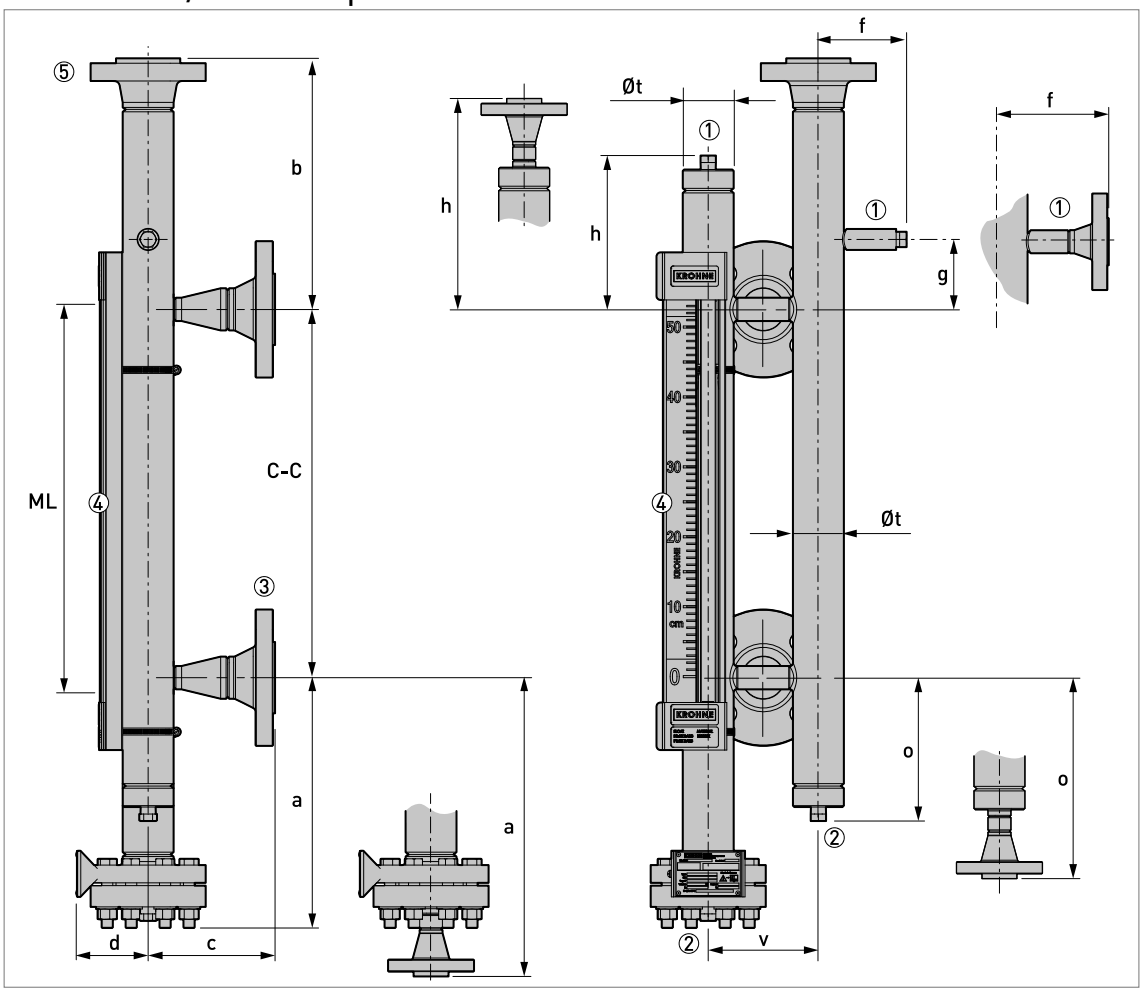

Figure 8-6: PN100 / Class 600 / TWIN version / side - side process connections

① Optional vent with 1/2...3/4 NPT threaded connection (with plug), or DN25 / NPS 1 flange
② Optional drain with 3/8...3/4 NPT threaded connection (with plug), or DN25 / NPS 1 flange
③ Process connection (flange connection)
④ Level indicator column with optional scale (mm, inch, % or volume)
⑤ Top flange (DN50 / DN80 PN100 or NPS 2 / NPS 3 Class 600) for level transmitter option

INFORMATION!

- *a = distance from the center axis of the bottom connection to the bottom of the device*
- *b = distance from the center axis of the top connection to the top of the device*
- *C-C = distance between the center axes of the top and bottom process connections*
- *ML = measuring length*

Flanged drain options have the same pressure rating as the flanges for the process connections.

Other dimensions are available on request.

Liquid density [kg/m³]	Dimensions [mm]										
	a	b	C-C (ML)	c	d	f	g	h	o	Øt	v
500...580	470 ①	340	300... 5500 ②	③	103 ④	⑤	100	⑥	185 ⑦	73.03	247
580...850	400 ⑧										
850...1200	400 ⑧										

Table 8-13: PN100 / Class 600 - TWIN (side - side process connections): general dimensions in mm

① Drain options are available. Flange, DN25 or NPS 1: 510 mm.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ The length, c, is related to flange size. DN15: 134 mm, DN20: 137 mm, DN25: 162 mm, DN40: 164 mm, DN50: 182 mm, NPS 1/2: 148 mm, NPS 3/4: 153 mm, NPS 1: 162 mm, NPS 1 1/2: 179 mm, NPS 2: 194 mm.
④ If indicator column has a low-temperature index and T < +100°C, then d = 120 mm (PLEXIGLAS® cover).
⑤ Vent options are available. NPT connection (female) + plug: 126 mm. Flange, DN20, DN25, NPS 3/4 or NPS 1: 165 mm.
⑥ Vent options are available. NPT connection (female) + plug: 200 mm. Flange, DN25 or NPS 1: 300 mm.
⑦ Drain options are available. NPT connection (female) + plug: 193 mm. Flange, DN25 and NPS 1: 285 mm.
⑧ Drain options are available. Flange, DN25 or NPS 1: 440 mm.

Liquid density [lb/ft³]	Dimensions [inches]										
	a	b	C-C (ML)	c	d	f	g	h	o	Øt	v
31.21...36.20	18.50 ①	13.39	11.8... 216.5 ②	③	4.1 ④	⑤	3.94	⑥	7.28 ⑦	2.9	9.72
36.20...53.06	15.75 ⑧										
53.06...74.91	15.75 ⑧										

Table 8-14: PN100 / Class 600 - TWIN (side - side process connections): general dimensions in inches

① Drain options are available. Flange, DN25 or NPS 1: 20.08¨.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ The length, c, is related to flange size. DN15: 5.28¨, DN20: 5.39¨, DN25: 6.38¨, DN40: 6.46¨, DN50: 7.17¨, NPS 1/2: 5.83¨, NPS 3/4: 6.02¨, NPS 1: 6.38¨, NPS 1 1/2: 7.05¨, NPS 2: 7.64¨.
④ If indicator column has a low-temperature index and T < +100°C, then d = 4.7¨ (PLEXIGLAS® cover).
⑤ Vent options are available. NPT connection (female) + plug: 4.96¨. Flange, DN20, DN25, NPS 3/4 or NPS 1: 6.50¨.
⑥ Vent options are available. NPT connection (female) + plug: 7.87¨. Flange, DN25 or NPS 1: 11.81¨.
⑦ Drain options are available. NPT connection (female) + plug: 7.60¨. Flange, DN25 or NPS 1: 11.22¨.
⑧ Drain options are available. Flange, DN25 or NPS 1: 17.32¨.

8.3.3 PN250 - Class 1500

TWIN version / side - side process connections

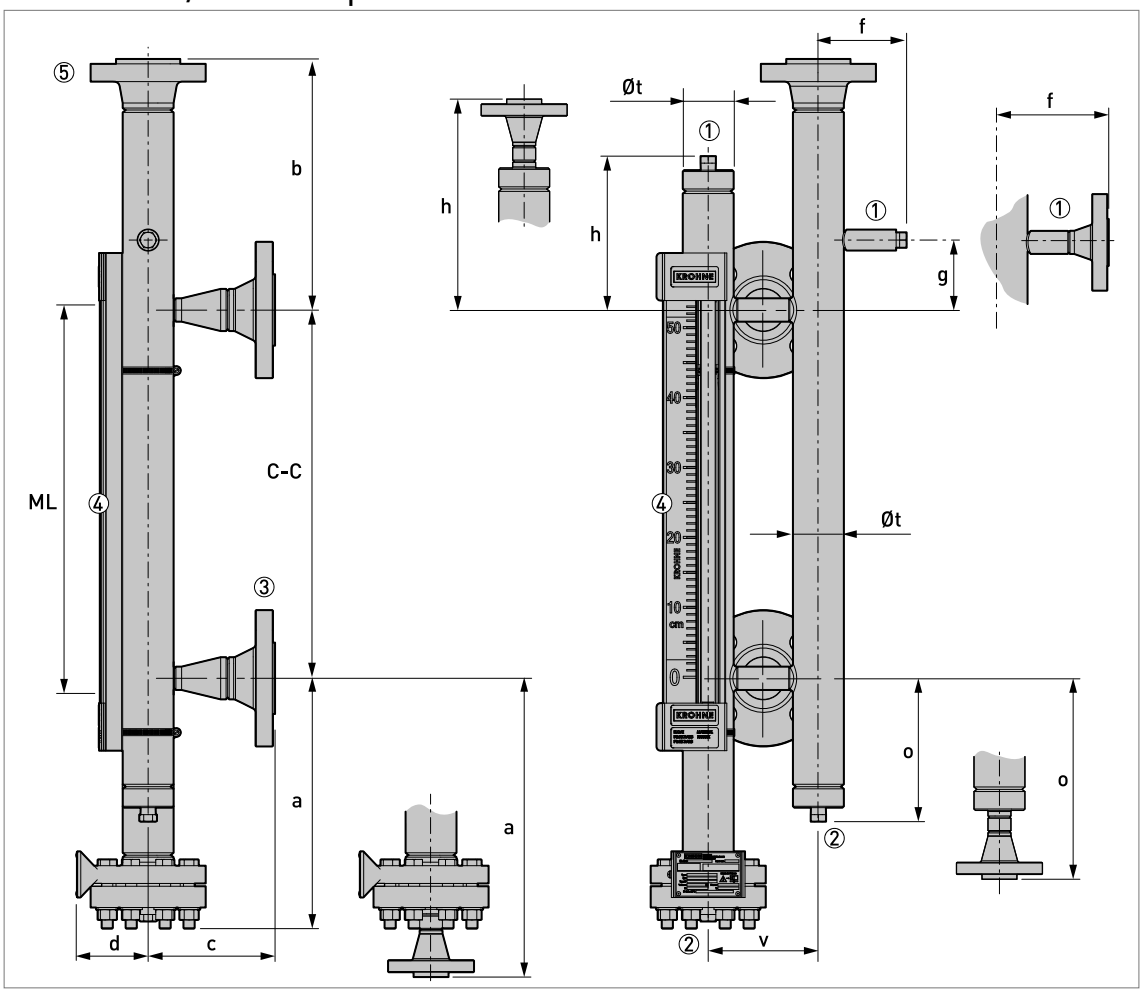

Figure 8-7: PN250 / Class 1500 / TWIN version / side - side process connections

① Optional vent with 3/8...3/4 NPT threaded connection (with plug), or DN25 / NPS 1 flange
② Optional drain with 3/8...3/4 NPT threaded connection (with plug), or DN25 / NPS 1 flange
③ Process connection (flange connection)
④ Level indicator column with optional scale (mm, inch, % or volume)
⑤ Top flange (NPS 2 / NPS 3 Class 1500) for level transmitter option

INFORMATION!

- *a = distance from the center axis of the bottom connection to the bottom of the device*
- *b = distance from the center axis of the top connection to the top of the device*
- *C-C = distance between the center axes of the top and bottom process connections*
- *ML = measuring length*

Flanged vent and drain options have the same pressure rating as the flanges for the process connections.

Other dimensions are available on request.

Liquid density [kg/m³]	Dimensions [mm]										
	a	b	C-C (ML)	c	d	f	g	h	o	Øt	v
660...720	730 ①	340	300... 5500 ②	③	145	④	100	⑤	185 ⑥	73.03	247
720...850	560 ⑦										
850...1200	405 ⑧										

Table 8-15: PN250 / Class 1500 - TWIN (side - side process connections): general dimensions in mm

① Drain options are available. Flange, DN25 or NPS 1: 817 mm.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ The length, c, is related to flange size and pressure rating. DN15 PN160: 133 mm, DN15 PN250: 149 mm, DN25 PN160: 165 mm, DN25 PN250: 165 mm, DN40 PN250: 182 mm, DN50 PN160: 189 mm, DN50 PN250: 199 mm, NPS 1/2: 155 mm, NPS 3/4: 165 mm, NPS 1: 167 mm, NPS 1 1/2: 191 mm, NPS 2: 224 mm.
④ Vent options are available. NPT connection (female) + plug: 126 mm. Flange, DN25 or NPS 1: 165 mm.
⑤ Vent options are available. NPT connection (female) + plug: 216 mm. Flange, DN25 or NPS 1: 318 mm.
⑥ Drain options are available. NPT connection (female) + plug: 201 mm. Flange, DN25 or NPS 1: 303 mm.
⑦ Drain options are available. Flange, DN25 or NPS 1: 647 mm.
⑧ Drain options are available. Flange, DN25 or NPS 1: 492 mm.

Liquid density [lb/ft³]	Dimensions [inches]										
	a	b	C-C (ML)	c	d	f	g	h	o	Øt	v
41.20....44.95	28.74 ①	13.39	11.8... 216.5 ②	③	5.71	④	3.94	⑤	7.28 ⑥	2.9	9.72
44.95...53.06	22.05 ⑦										
53.06...74.91	15.94 ⑧										

Table 8-16: PN250 / Class 1500 - TWIN (side - side process connections): general dimensions in inches

① Drain options are available. Flange, DN25 or NPS 1: 32.17¨.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ The length, c, is related to flange size and pressure rating. DN15 PN160: 5.24¨, DN15 PN250: 5.87¨, DN25 PN160: 6.50¨, DN25 PN250: 6.50¨, DN40 PN250: 7.17¨, DN50 PN160: 7.44¨, DN50 PN250: 7.83¨, NPS 1/2: 6.10¨, NPS 3/4: 6.50¨, NPS 1: 6.57¨, NPS 1 1/2: 7.52¨, NPS 2: 8.82¨.
④ Vent options are available. NPT connection (female) + plug: 4.96¨. Flange, DN25 or NPS 1: 6.50¨.
⑤ Vent options are available. NPT connection (female) + plug: 8.50¨. Flange, DN25 or NPS 1: 12.52¨.
⑥ Drain options are available. NPT connection (female) + plug: 7.91¨. Flange, DN25 or NPS 1: 11.93¨.
⑦ Drain options are available. Flange, DN25 or NPS 1: 25.47¨.
⑧ Drain options are available. Flange, DN25 or NPS 1: 19.37¨.

8.3.4 PN400 - Class 2500

TWIN version / side - side process connections

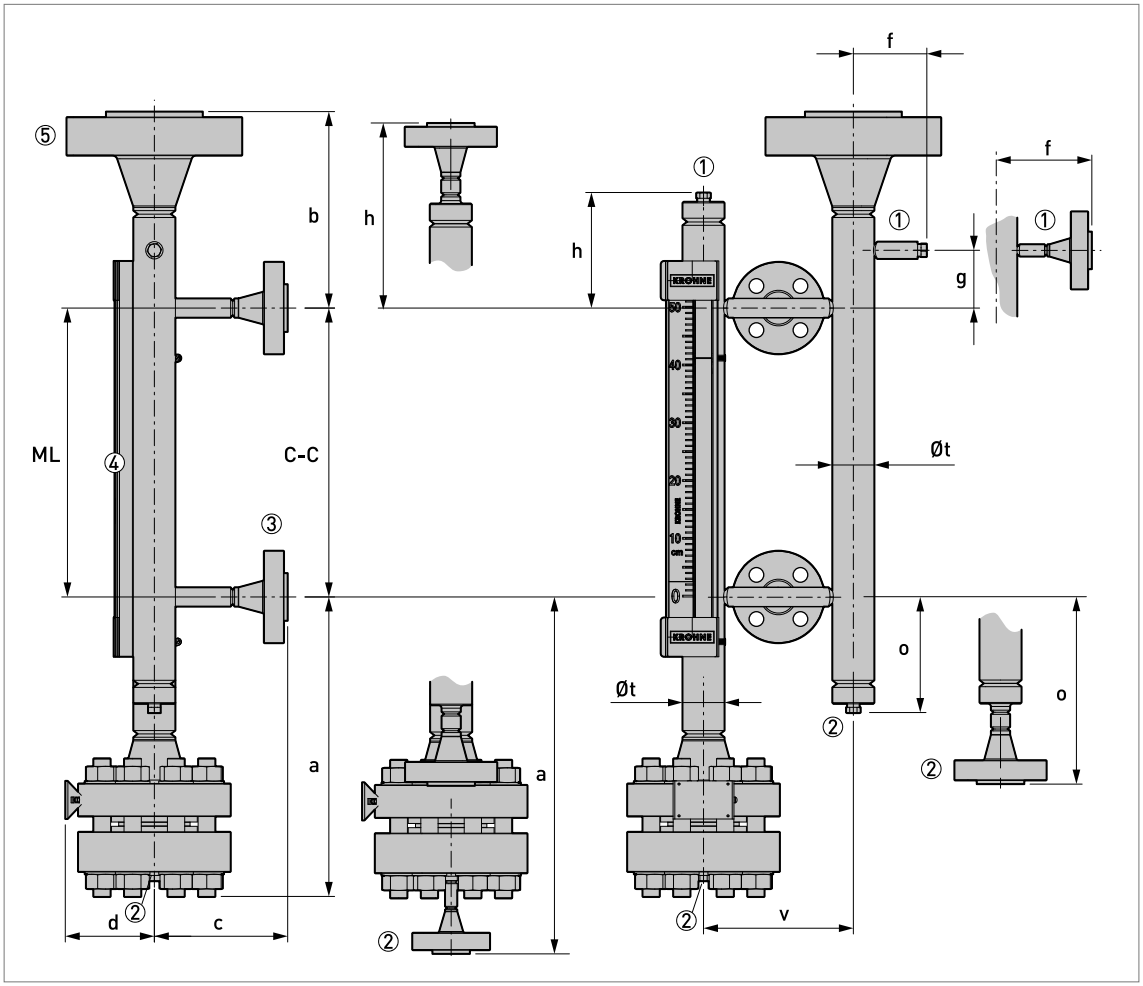

Figure 8-8: PN400 / Class 2500 / TWIN version / side - side process connections

① Optional vent with 3/8...3/4 NPT threaded connection (with plug)
② Optional drain with 3/8...3/4 NPT threaded connection (with plug)
③ Process connection (flange)
④ Level indicator column with optional scale (mm, inch, % or volume)
⑤ Top flange (NPS 2 / NPS 3 Class 2500) for level transmitter option

INFORMATION!

- *a = distance from the center axis of the bottom connection to the bottom of the device*
- *b = distance from the center axis of the top connection to the top of the device*
- *C-C = distance between the center axes of the top and bottom process connections*
- *ML = measuring length*

Flanged vent and drain options have the same pressure rating as the flanges for the process connections.

Other dimensions are available on request.

Liquid density [kg/m³]	Dimensions [mm]										
	a	b	C-C (ML)	c	d	f	g	h	o	Øt	v
740...800	680 ①	340	300... 5500 ②	231	155	③	100	④	⑤	73.03	260
800...1200	510 ⑥										

Table 8-17: PN400 / Class 2500 - TWIN (side - side process connections): general dimensions in mm

① Drain options are available. NPT connection (female) + plug: 688 mm. Flange, DN15...25 and NPS 1/2 or 1: 785 mm.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ Vent options are available. NPT connection (female) + plug: 128 mm. Flange, DN25 or NPS 1: 166 mm.
④ Vent options are available. NPT connection (female) + plug: 200 mm. Flange, DN25 or NPS 1: 323 mm.
⑤ Drain options are available. NPT connection (female) + plug: 200 mm. Flange, DN15...25 and NPS 1/2 or 1: 324 mm.
⑥ Drain options are available. NPT connection (female) + plug:518 mm. Flange, DN15...25 and NPS 1/2 or 1: 615 mm.

Liquid density [lb/ft³]	Dimensions [inches]										
	a	b	C-C (ML)	c	d	f	g	h	o	Øt	v
46.20...49.94	26.77 ①	13.39	11.8... 216.5 ②	9.09	6.10	③	3.94	④	⑤	2.9	10.24
49.94...74.91	20.08 ⑥										

Table 8-18: PN400 / Class 2500 - TWIN (side - side process connections): general dimensions in inches

① Drain options are available. NPT connection (female) + plug: 27.09¨. Flange, DN15...25 and NPS 1/2 or 1: 30.91¨.
② This value agrees with "ML" and the "C-C" dimension given in the customer order
③ Vent options are available. NPT connection (female) + plug: 5.04¨. Flange, DN25 or NPS 1: 6.54¨.
④ Vent options are available. NPT connection (female) + plug: 7.87¨. Flange, DN25 or NPS 1: 12.72¨.
⑤ Drain options are available. NPT connection (female) + plug: 7.87¨. Flange, DN15...25 and NPS 1/2 or 1: 12.76¨.
⑥ Drain options are available. NPT connection (female) + plug: 20.39¨. Flange, DN15...25 and NPS 1/2 or 1: 24.21¨.

8.3.5 Options

LT40 C reed-chain level transmitter - compact version

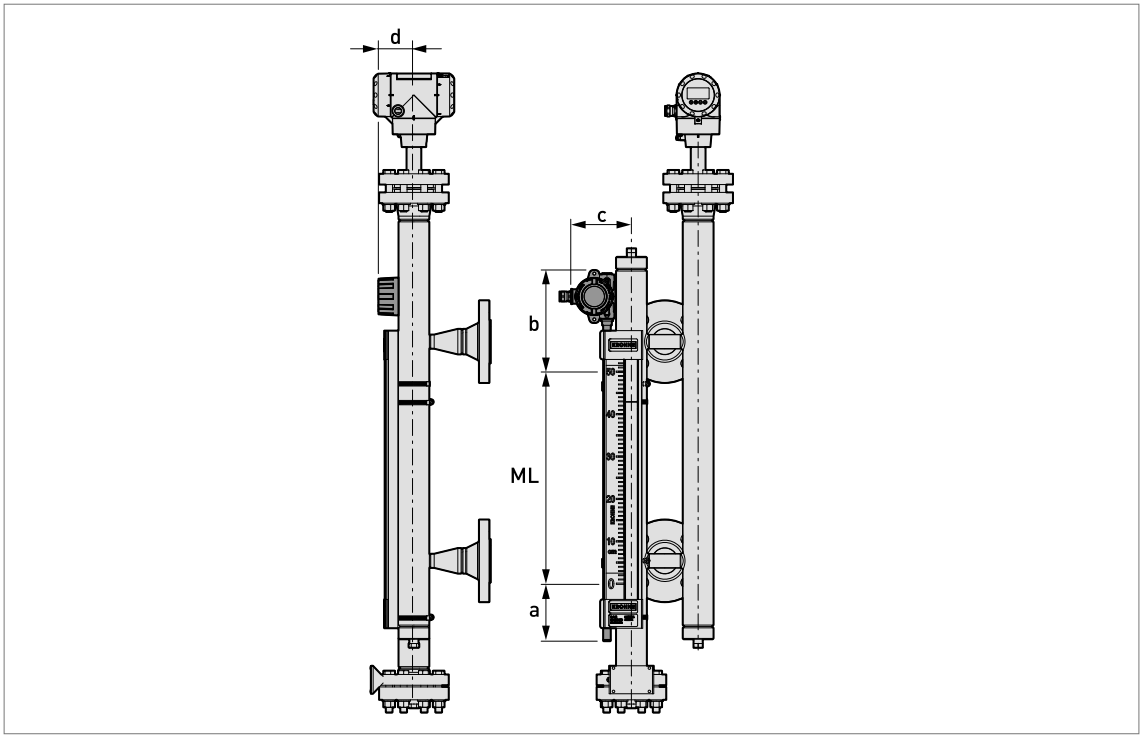

Figure 8-9: BM26A-8000 TWIN: LT40 C reed-chain level transmitter - compact version

Dimensions [mm]				
a	b	c	ML	d
66.5	272	170.5	300...5500	84

Table 8-19: LT40 C reed-chain level transmitter: dimensions in mm

Dimensions [inches]				
a	b	c	ML	d
2.6	10.7	6.71	11.8...216.5	3.3

Table 8-20: LT40 C reed-chain level transmitter: dimensions in inches

LT40 F reed-chain level transmitter - remote version

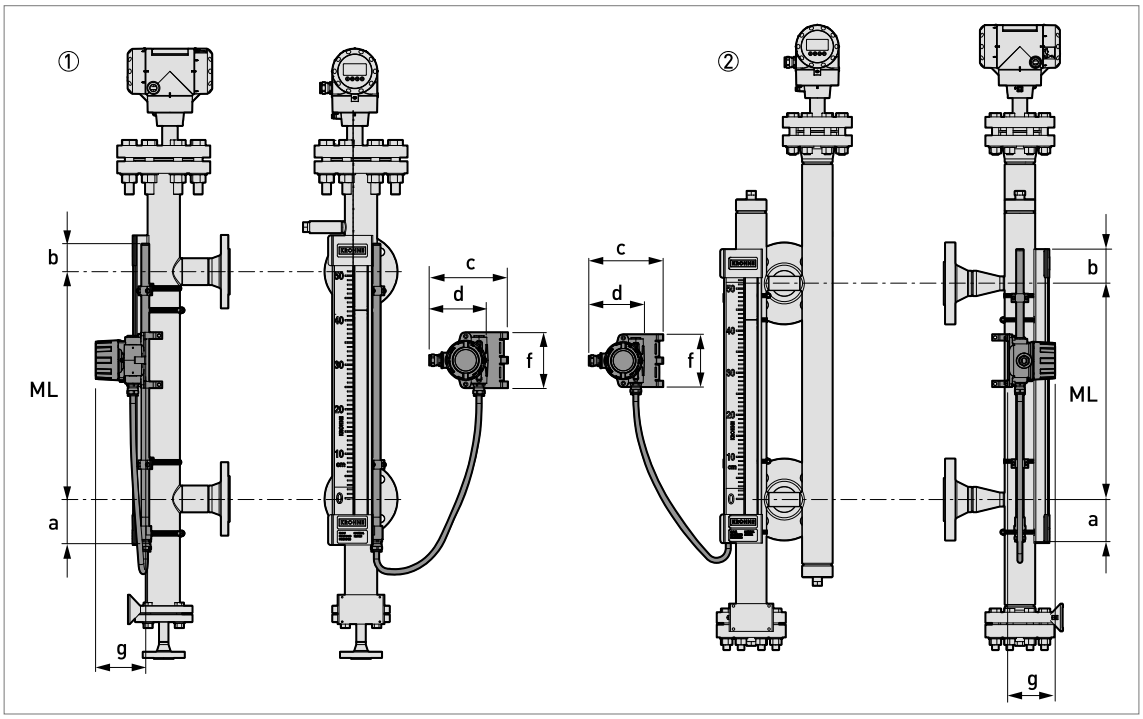

Figure 8-10: LT40 F reed-chain level transmitter - remote version

① BI version
② TWIN version

Dimensions [mm]							
a	b	c	d	ML	e	f	g
81.5	66.5	176	133	300...5500	50	125.5	62

Table 8-21: LT40 F reed-chain level transmitter: dimensions in mm

Dimensions [inches]							
a	b	c	d	ML	e	f	g
3.21	2.62	6.93	5.24	11.8...216.5	1.97	4.94	2.44

Table 8-22: LT40 F reed-chain level transmitter: dimensions in inches

Support for the LT40 F reed-chain level transmitter

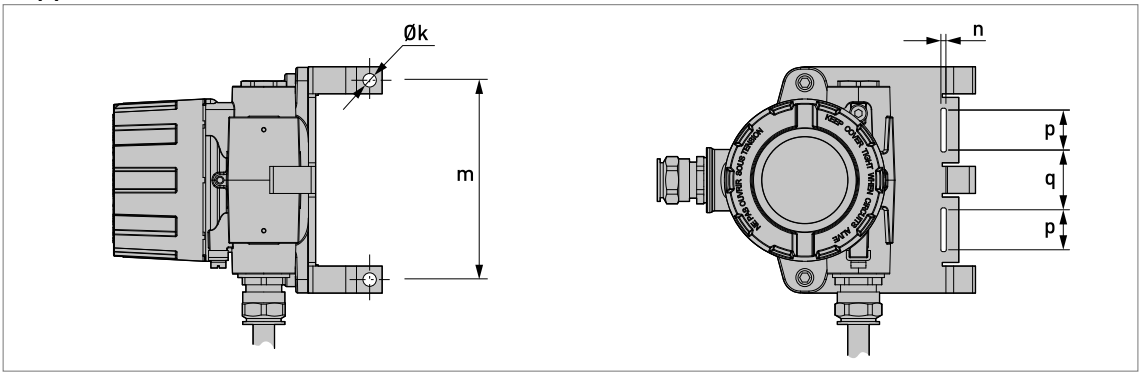

Figure 8-11: Support for the LT40 F reed-chain level transmitter

Dimensions [mm]				
Øk	m	n	p	q
7.5	107.75	3	24.25	31

Table 8-23: Support for the LT40 F reed-chain level transmitter: dimensions in mm

Dimensions [inches]				
Øk	m	n	p	q
0.30	4.24	0.12	0.95	1.22

Table 8-24: Support for the LT40 F reed-chain level transmitter: dimensions in inches

MS15 -series and MS40-series limit switches

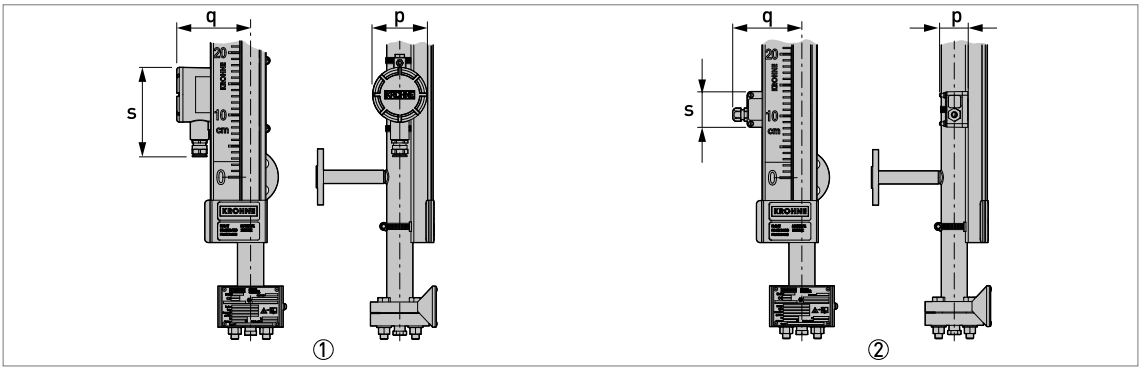

Figure 8-12: MS15-series and MS40-series limit switches

① Magnetic level indicator with an MS15-series limit switch
② Magnetic level indicator with an MS40-series limit switch

Limit switch version	Dimensions [mm]		
	p	q	s
MS15 series	88	138.9	143.5
MS40 series	46	129.6	56

Table 8-25: MS15-series and MS40-series limit switches: dimensions in mm

Limit switch version	Dimensions [inches]		
	p	q	s
MS15 series	3.46	5.47	5.65
MS40 series	1.81	5.10	2.20

Table 8-26: MS15-series and MS40-series limit switches: dimensions in inches

8.3.6 Accessories

Support bracket

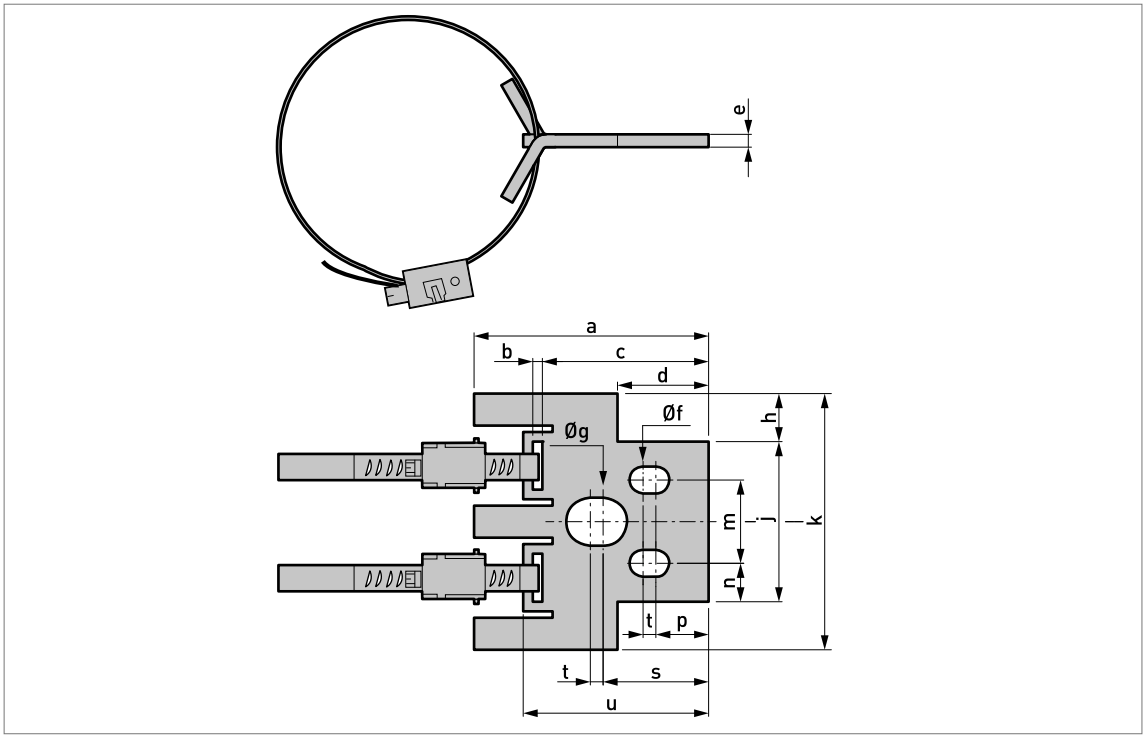

Figure 8-13: Support bracket

The support bracket is an accessory. If necessary, send an order to your supplier.

	Dimensions [mm]															
	a	b	c	d	e	Øf	Øg	h	j	k	m	n	p	s	t	u
Support bracket	73	3	52	28.5	4	8.4	15	15	50	80	26	12	16.5	33	4	58

Table 8-27: Support bracket: dimensions in mm

	Dimensions [inches]															
	a	b	c	d	e	Øf	Øg	h	j	k	m	n	p	s	t	u
Support bracket	2.87	0.12	2.05	1.12	0.16	0.33	0.59	0.59	1.97	3.15	1.02	0.47	0.65	1.30	0.16	2.28

Table 8-28: Support bracket: dimensions in inches

8.4 Maximum process pressure: measuring chamber

DANGER!
Do not use the device at a process pressure more than the maximum limit for a given process temperature.

WARNING!
The process temperature must agree with the temperature limits of the gasket material.

8.4.1 Magnetic level indicator with a 316 / 316 L measuring chamber

Maximum process pressure [barg] for a given maximum process temperature [°C]

EU PED, EN 13445 and UK PE(S)R								
Standard	Pressure rating	Maximum process temperature [°C]						
		-196	-70	-20	+20	+38	+50	+100
		Maximum process pressure [barg]						
EN 1092-1	PN40	40	40	40	40	40	40	40
	PN100	100	100	100	100	100	100	100
	PN160	160	160	160	160	160	160	160
	PN250	250	250	250	250	250	250	250
	PN400	400	400	400	400	400	392.3	358.1
ASME B16.5	Class 150	19	19	19	19	19	18.4	16
	Class 300	40	40	40	40	40	40	40
	Class 600	99.3	99.3	99.3	99.3	99.3	96.3	84.5
	Class 1500	248.2	248.2	248.2	248.2	248.2	240.6	210.9
	Class 2500	400	400	400	400	400	392.3	358.1
JIS B 2220	20K	34	34	34	34	34	34	34
ISO 228-1	G	40	40	40	40	40	40	40
ASME B1.20.1	NPT	100	100	100	100	100	100	100

Table 8-29: EU PED, EN 13445 and UK PE(S)R: maximum process pressure [barg] for a given maximum process temperature [°C]

EU PED, EN 13445 and UK PE(S)R							
Standard	Pressure rating	Maximum process temperature [°C]					
		+150	+200	+250	+300	+350	+400
		Maximum process pressure [barg]					
EN 1092-1	PN40	36.3	33.7	31.8	29.7	28.5	27.4
	PN100	90.9	84.2	79.5	74.2	71.4	68.5
	PN160	145.5	134.8	127.2	118.8	114.2	109.7
	PN250	227.3	210.7	198.8	185.7	178.5	171.4
	PN400	324	298.4	281.4	264.3	255.8	247.2
ASME B16.5	Class 150	14.8	13.6	12	10.2	8.4	6.5
	Class 300	36.3	33.7	31.8	29.7	28.5	27.4
	Class 600	77.1	71.2	66.7	63.1	61	58.9
	Class 1500	192.4	178.4	167	158.1	152.2	147.1
	Class 2500	324	298.4	281.4	264.3	255.8	247.2
JIS B 2220	20K	31	31	31	29	26	23
ISO 228-1	G	36.3	33.7	31.8	—	—	—
ASME B1.20.1	NPT	90.9	84.2	79.5	—	—	—

Table 8-30: EU PED, EN 13445 and UK PE(S)R: maximum process pressure [barg] for a given maximum process temperature [°C]

Maximum process pressure [psig] for a given maximum process temperature [°F]

EU PED, EN 13445 and UK PE(S)R								
Standard	Pressure rating	Maximum process temperature [°F]						
		-320.8	-94	-4	+68	+100.4	+122	+212
		Maximum process pressure [psig]						
EN 1092-1	PN40	580.2	580.2	580.2	580.2	580.2	580.2	580.2
	PN100	1450.4	1450.4	1450.4	1450.4	1450.4	1450.4	1450.4
	PN160	2320.6	2320.6	2320.6	2320.6	2320.6	2320.6	2320.6
	PN250	3625.9	3625.9	3625.9	3625.9	3625.9	3625.9	3625.9
	PN400	5801.5	5801.5	5801.5	5801.5	5801.5	5689.1	5193.8
ASME B16.5	Class 150	275.6	275.6	275.6	275.6	275.6	266.9	232.1
	Class 300	580.2	580.2	580.2	580.2	580.2	580.2	580.2
	Class 600	1440	1440	1440	1440	1440	1396.7	1225.6
	Class 1500	3599.8	3599.8	3599.8	3599.8	3599.8	3489.6	3058.8
	Class 2500	5801.5	5801.5	5801.5	5801.5	5801.5	5689.1	5193.8
JIS B 2220	20K	493.1	493.1	493.1	493.1	493.1	493.1	493.1
ISO 228-1	G	580.2	580.2	580.2	580.2	580.2	580.2	580.2
ASME B1.20.1	NPT	1450.4	1450.4	1450.4	1450.4	1450.4	1450.4	1450.4

Table 8-31: EU PED, EN 13445 and UK PE(S)R: maximum process pressure [psig] for a given maximum process temperature [°F]

EU PED, EN 13445 and UK PE(S)R							
Standard	Pressure rating	Maximum process temperature [°F]					
		+302	+392	+482	+572	+662	+752
		Maximum process pressure [psig]					
EN 1092-1	PN40	526.5	488.8	461.2	430.8	413.4	397.4
	PN100	1318.4	1221.2	1153.1	1076.2	1035.6	993.5
	PN160	2110.3	1955.1	1844.9	1723	1656.3	1591.1
	PN250	3296.7	3055.9	2883.4	2963.4	2588.9	2485.9
	PN400	4699.2	4327.9	4081.4	3833.3	3710.1	3585.3
ASME B16.5	Class 150	214.7	197.3	174	147.9	121.8	94.3
	Class 300	526.5	488.8	461.2	430.8	413.4	397.4
	Class 600	1118.2	1032.7	967.4	915.2	884.7	854.3
	Class 1500	2790.5	2587.5	2422.1	2293	2207.5	2133.5
	Class 2500	4699.2	4327.9	4081.4	3833.3	3710.1	3585.3
JIS B 2220	20K	449.6	449.6	449.6	420.6	377.1	333.6
ISO 228-1	G	526.5	488.8	461.2	—	—	—
ASME B1.20.1	NPT	1318.4	1221.2	1153.1	—	—	—

Table 8-32: EU PED, EN 13445 and UK PE(S)R: maximum process pressure [psig] for a given maximum process temperature [°F]

Maximum allowable working pressure [barg] for a given maximum process temperature [°C]

ASME B31.3								
Standard	Pressure rating	Maximum process temperature [°C]						
		-196	-70	-20	+20	+38	+50	+100
		Maximum allowable working pressure [barg]						
ASME B16.5	Class 150	19	19	19	19	19	18.4	16
	Class 300	40	40	40	40	40	40	40
	Class 600	84.5	84.5	84.5	84.5	84.5	84.5	84.5
	Class 1500	216	216	216	216	216	216	207
	Class 2500	282	282	282	282	282	282	275

Table 8-33: ASME B31.3: maximum allowable working pressure [barg] for a given maximum process temperature [°C]

ASME B31.3							
Standard	Pressure rating	Maximum process temperature [°C]					
		+150	+200	+250	+300	+350	+400
		Maximum allowable working pressure [barg]					
ASME B16.5	Class 150	14.8	13.6	12	10.2	8.4	6.5
	Class 300	36.3	33.7	31.8	29.7	28.5	27.4
	Class 600	77.1	71.2	66.7	63.1	61	58.9
	Class 1500	207	202	191	181	175	172
	Class 2500	275	275	275	275	275	274

Table 8-34: ASME B31.3: maximum allowable working pressure [barg] for a given maximum process temperature [°C]

Maximum allowable working pressure [psig] for a given maximum process temperature [°F]

ASME B31.3								
Standard	Pressure rating	Maximum process temperature [°F]						
		-320.8	-94	-4	+68	+100.4	+122	+212
		Maximum allowable working pressure [psig]						
ASME B16.5	Class 150	275.6	275.6	275.6	275.6	275.6	266.9	232.1
	Class 300	580.2	580.2	580.2	580.2	580.2	580.2	580.2
	Class 600	1225.6	1225.6	1225.6	1225.6	1225.6	1225.6	1225.6
	Class 1500	3132.8	3132.8	3132.8	3132.8	3132.8	3132.8	3002.3
	Class 2500	4090.1	4090.1	4090.1	4090.1	4090.1	4090.1	3988.5

Table 8-35: ASME B31.3: maximum allowable working pressure [psig] for a given maximum process temperature [°F]

ASME B31.3							
Standard	Pressure rating	Maximum process temperature [°F]					
		+302	+392	+482	+572	+662	+752
		Maximum allowable working pressure [psig]					
ASME B16.5	Class 150	214.7	197.3	174	147.9	121.8	94.3
	Class 300	526.5	488.8	461.2	430.8	413.4	397.4
	Class 600	1118.2	1032.7	967.4	915.2	884.7	854.3
	Class 1500	3002.3	2929.8	2770.2	2625.2	2538.2	2494.7
	Class 2500	3988.5	3988.5	3988.5	3988.5	3988.5	3585.3

Table 8-36: ASME B31.3: maximum allowable working pressure [psig] for a given maximum process temperature [°F]

8.4.2 Magnetic level indicator with a 304 L measuring chamber

Maximum process pressure [barg] for a given maximum process temperature [°C]

EU PED, EN 13445 and UK PE(S)R								
Standard	Pressure rating	Maximum process temperature [°C]						
		-196	-70	-20	+20	+38	+50	+100
		Maximum process pressure [barg]						
EN 1092-1	PN40	40	40	40	40	40	40	34.4
	PN100	100	100	100	100	100	100	86.1
ASME B16.5	Class 150	15.9	15.9	15.9	15.9	15.9	15.3	13.3
	Class 300	40	40	40	40	40	40	34.4
	Class 600	82.7	82.7	82.7	82.7	82.7	79.9	69.1
JIS B 2220	20K	34	34	34	34	34	34	34
ISO 228-1	G	40	40	40	40	40	40	34.4
ASME B1.20.1	NPT	100	100	100	100	100	100	86.1

Table 8-37: EU PED, EN 13445 and UK PE(S)R: maximum process pressure [barg] for a given maximum process temperature [°C]

EU PED, EN 13445 and UK PE(S)R							
Standard	Pressure rating	Maximum process temperature [°C]					
		+150	+200	+250	+300	+350	+400
		Maximum process pressure [barg]					
EN 1092-1	PN40	30.8	28	26	24.1	23	22
	PN100	77.1	70	65.2	60.4	57.6	55.2
ASME B16.5	Class 150	12	11.1	10.2	9.7	8.4	6.5
	Class 300	30.8	28	26	24.1	23	22
	Class 600	62.6	57.4	53.5	50.5	48	46.1
JIS B 2220	20K	31	31	31	29	26	23
ISO 228-1	G	30.8	28	26	—	—	—
ASME B1.20.1	NPT	77.1	70	65.2	—	—	—

Table 8-38: EU PED, EN 13445 and UK PE(S)R: maximum process pressure [barg] for a given maximum process temperature [°C]

Maximum process pressure [psig] for a given maximum process temperature [°F]

EU PED, EN 13445 and UK PE(S)R								
Standard	Pressure rating	Maximum process temperature [°F]						
		-302.8	-94	-4	+68	+100.4	+122	+212
		Maximum process pressure [psig]						
EN 1092-1	PN40	580.2	580.2	580.2	580.2	580.2	580.2	498.9
	PN100	1450.4	1450.4	1450.4	1450.4	1450.4	1450.4	1248.8
ASME B16.5	Class 150	230.6	230.6	230.6	230.6	230.6	221.9	192.9
	Class 300	580.2	580.2	580.2	580.2	580.2	580.2	498.9
	Class 600	1199.5	1199.5	1199.5	1199.5	1199.5	1158.9	1002.2
JIS B 2220	20K	493.1	493.1	493.1	493.1	493.1	493.1	493.1
ISO 228-1	G	580.2	580.2	580.2	580.2	580.2	580.2	498.9
ASME B1.20.1	NPT	1450.4	1450.4	1450.4	1450.4	1450.4	1450.4	1248.8

Table 8-39: EU PED, EN 13445 and UK PE(S)R: maximum process pressure [psig] for a given maximum process temperature [°F]

EU PED, EN 13445 and UK PE(S)R							
Standard	Pressure rating	Maximum process temperature [°F]					
		+302	+392	+482	+572	+662	+752
		Maximum process pressure [psig]					
EN 1092-1	PN40	446.7	406	377.1	349.5	333.6	319.1
	PN100	1118.2	1015.3	945.6	876	835.4	880.6
ASME B16.5	Class 150	174	161	147.9	140.7	121.8	94.3
	Class 300	446.7	406	377.1	349.5	333.6	319.1
	Class 600	907.9	832.5	776	732.4	696.2	668.6
JIS B 2220	20K	449.6	449.6	449.6	420.6	377.1	333.6
ISO 228-1	G	446.7	406	377.1	—	—	—
ASME B1.20.1	NPT	1118.2	1015.3	945.6	—	—	—

Table 8-40: EU PED, EN 13445 and UK PE(S)R: maximum process pressure [psig] for a given maximum process temperature [°F]

8.5 Temperature limits: LT40 C/F reed-chain level transmitter

WARNING!
Do not use the device at an ambient temperature more than the maximum limit for a given process temperature. Do not use the device at an ambient temperature less than the minimum limit for a given process temperature.

CAUTION!
The temperature limit calculations for these graphs include plots for devices that have thermal insulation options (ROCKWOOL® and FOAMGLAS®) supplied by the manufacturer.

8.5.1 Without a thermal insulation option and without the LCD indicator module

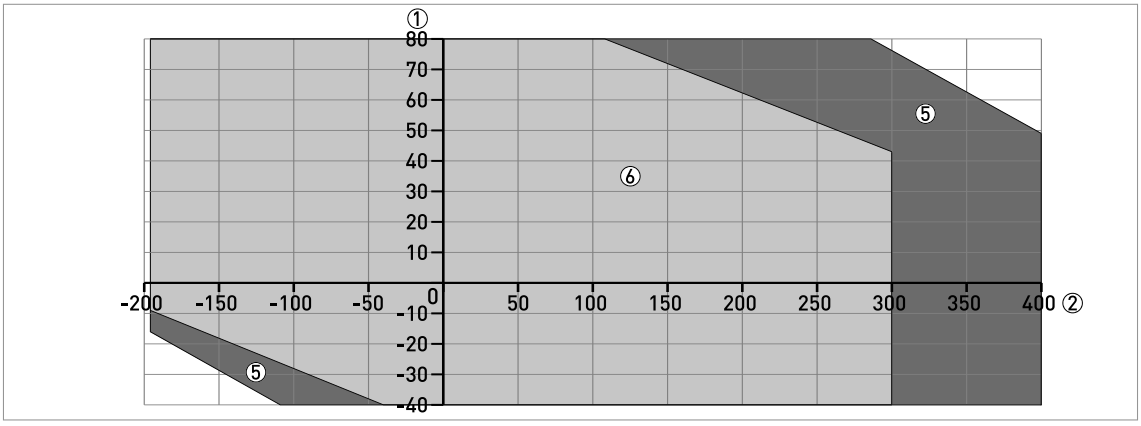

Figure 8-14: Ambient temperature / process temperature, in °C - without a thermal insulation option and without the LCD indicator module

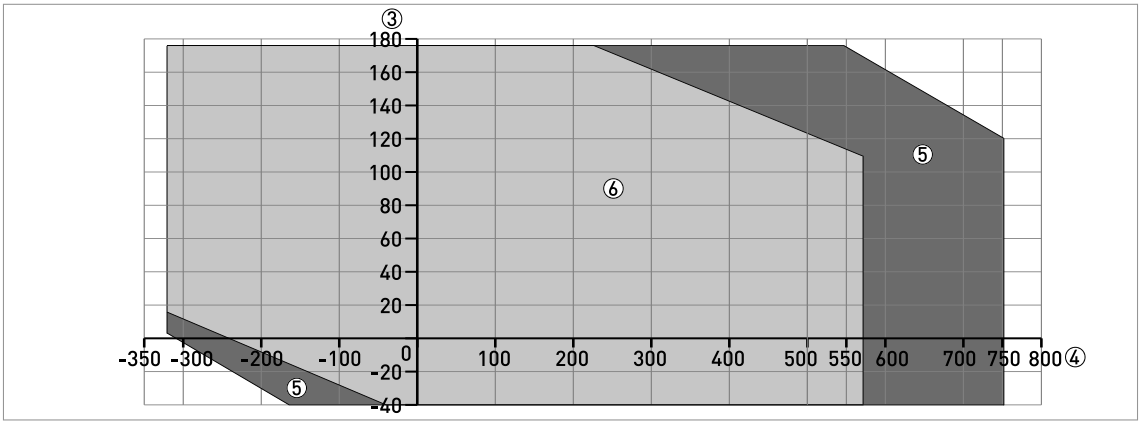

Figure 8-15: Ambient temperature / process temperature, in °F - without a thermal insulation option and without the LCD indicator module

① Ambient temperature, °C
② Process temperature, °C
③ Ambient temperature, °F
④ Process temperature, °F
⑤ LT40 F
⑥ LT40 C and LT40 F

8.5.2 Without a thermal insulation option and with the LCD indicator module

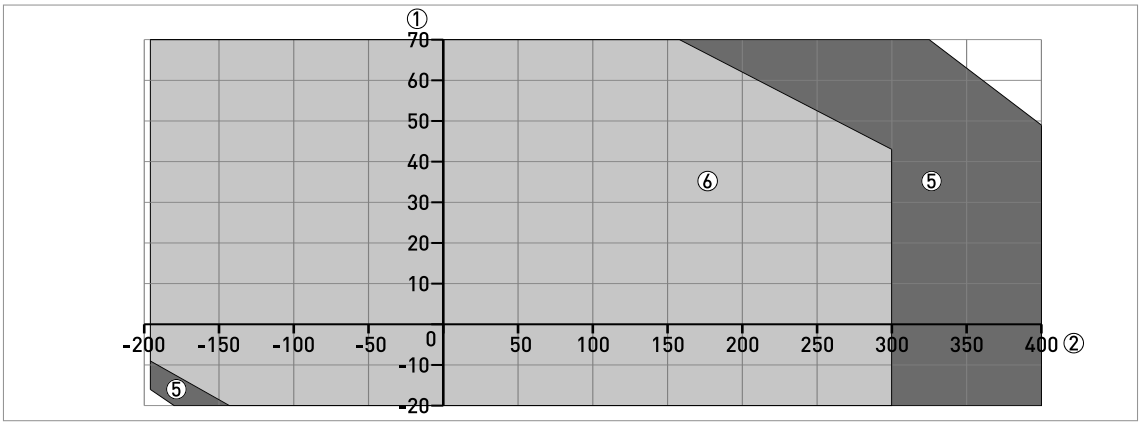

Figure 8-16: Ambient temperature / process temperature, in °C - without a thermal insulation option and with the LCD indicator module

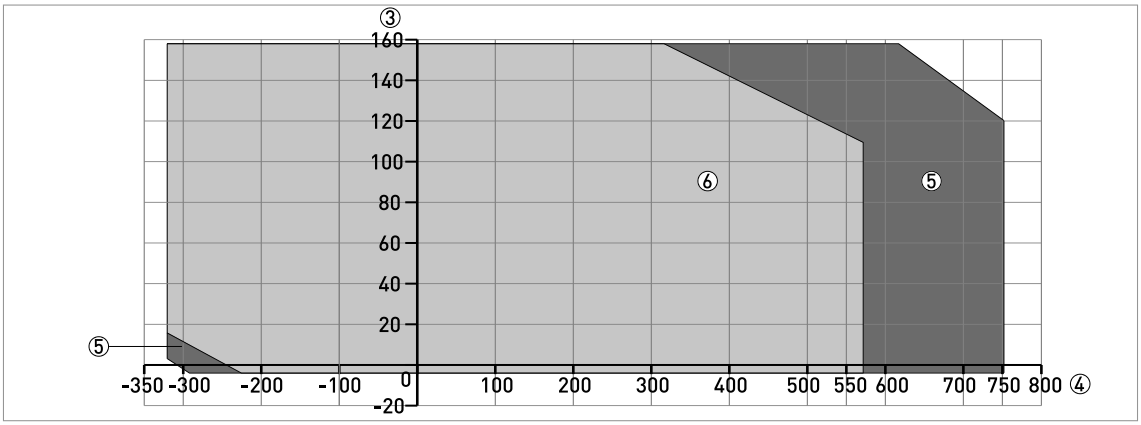

Figure 8-17: Ambient temperature / process temperature, in °F - without a thermal insulation option and with the LCD indicator module

① Ambient temperature, °C
② Process temperature, °C
③ Ambient temperature, °F
④ Process temperature, °F
⑤ LT40 F
⑥ LT40 C and LT40 F

8.5.3 With a thermal insulation option and without the LCD indicator module

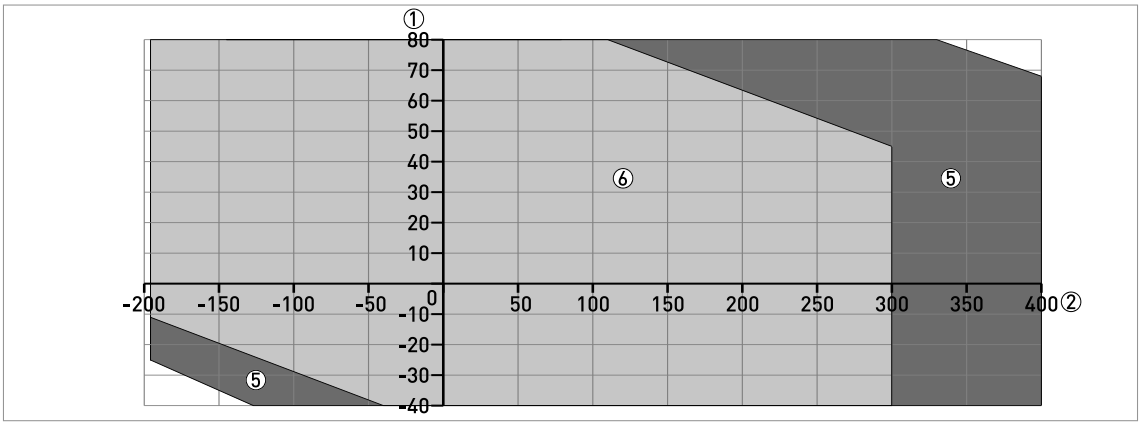

Figure 8-18: Ambient temperature / process temperature, in °C - with a thermal insulation option and without the LCD indicator module

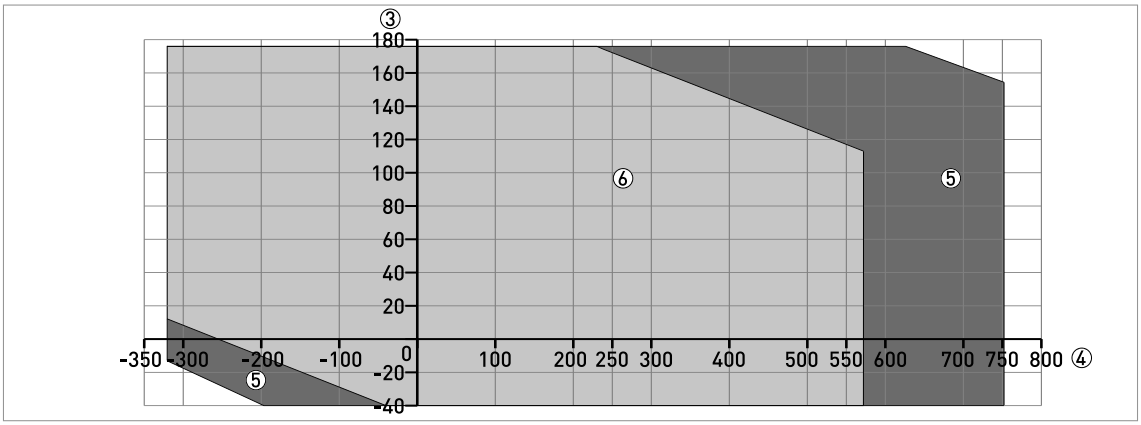

Figure 8-19: Ambient temperature / process temperature, in °F - with a thermal insulation option and without the LCD indicator module

① Ambient temperature, °C
② Process temperature, °C
③ Ambient temperature, °F
④ Process temperature, °F
⑤ LT40 F
⑥ LT40 C and LT40 F

8.5.4 With a thermal insulation option and with the LCD indicator module

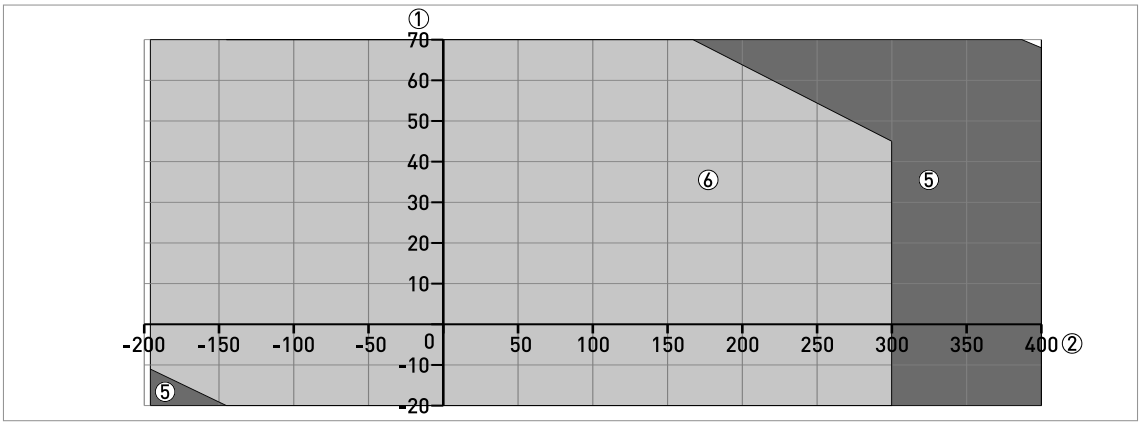

Figure 8-20: Ambient temperature / process temperature, in °C - with a thermal insulation option and with the LCD indicator module

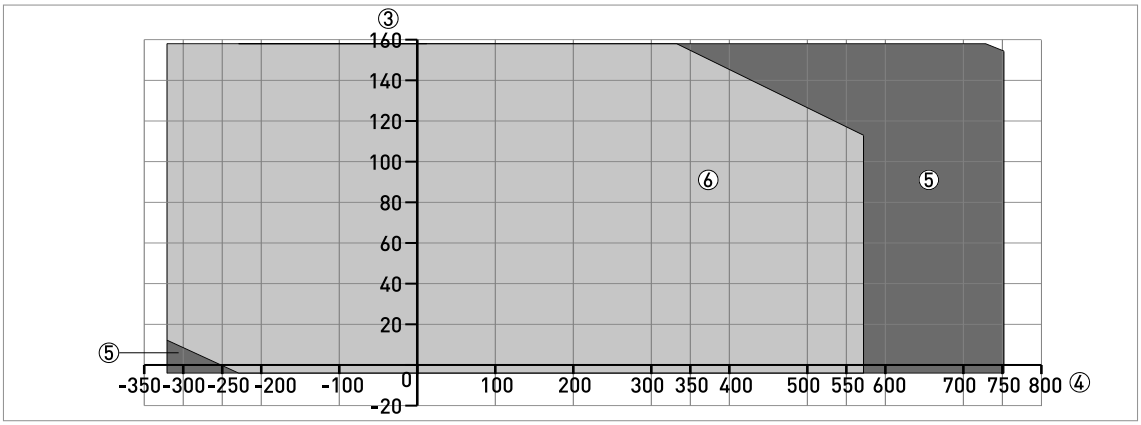

Figure 8-21: Ambient temperature / process temperature, in °F - with a thermal insulation option and with the LCD indicator module

① Ambient temperature, °C
② Process temperature, °C
③ Ambient temperature, °F
④ Process temperature, °F
⑤ LT40 F
⑥ LT40 C and LT40 F

8.6 Temperature limits: MS15-series limit switch

WARNING!
Do not use the device at an ambient temperature more than the maximum limit for a given process temperature. Do not use the device at an ambient temperature less than the minimum limit for a given process temperature.

CAUTION!
The temperature limit calculations for these graphs include plots for devices that have thermal insulation options (ROCKWOOL® and FOAMGLAS®) supplied by the manufacturer.

8.6.1 Aluminium housing

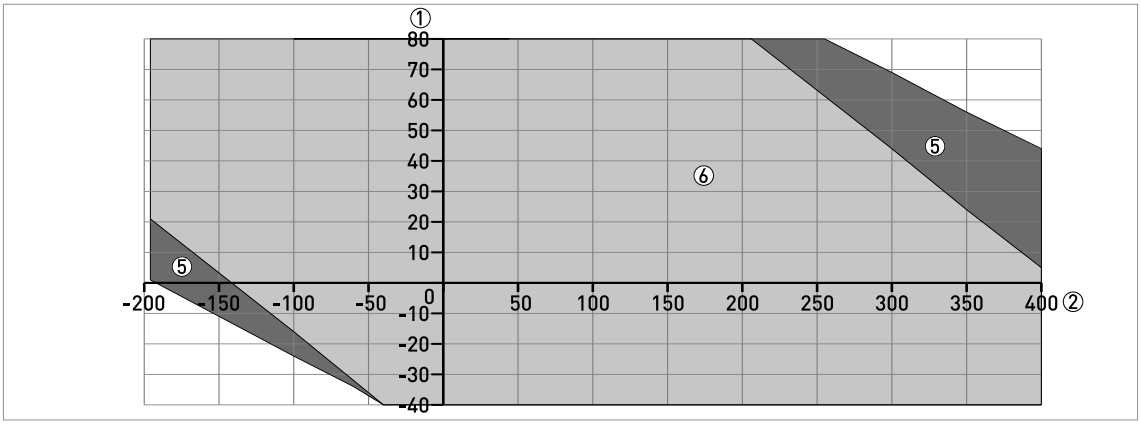

Figure 8-22: Ambient temperature / process temperature, in °C - MS15-series limit switch with the aluminium housing option

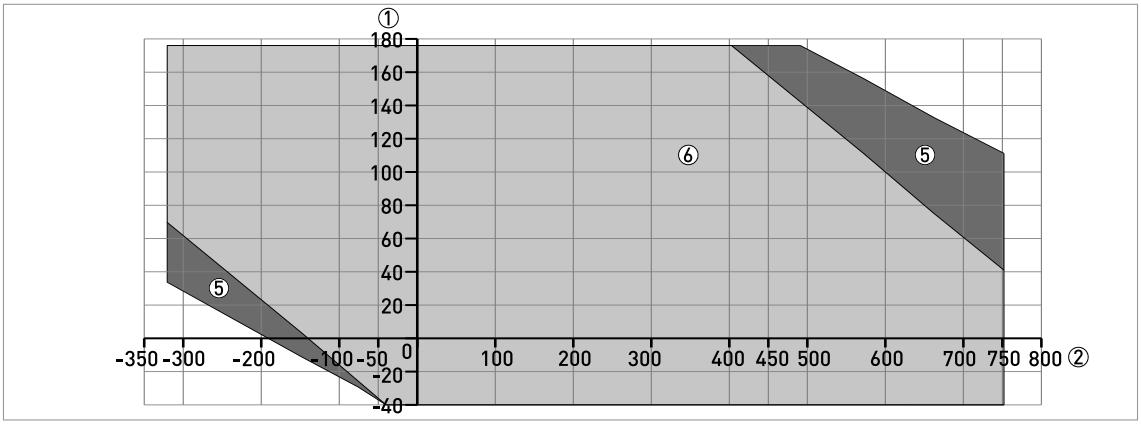

Figure 8-23: Ambient temperature / process temperature, in °F - MS15-series limit switch with the aluminium housing option

① Ambient temperature, °C
② Process temperature, °C
③ Ambient temperature, °F
④ Process temperature, °F
⑤ MS15-series limit switch - without a thermal insulation option
⑥ MS15-series limit switch - with or without a thermal insulation option

8.6.2 Stainless-steel housing

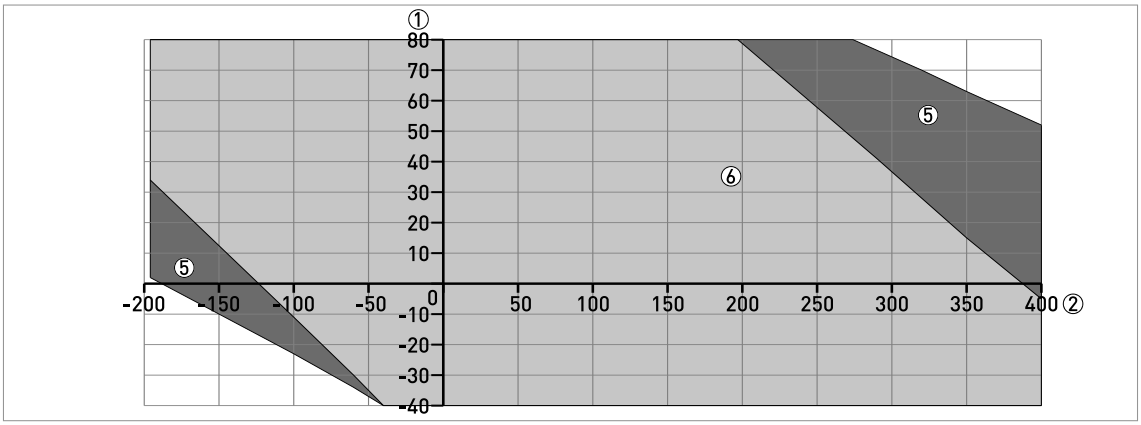

Figure 8-24: Ambient temperature / process temperature, in °C - MS15-series limit switch with the stainless-steel housing option

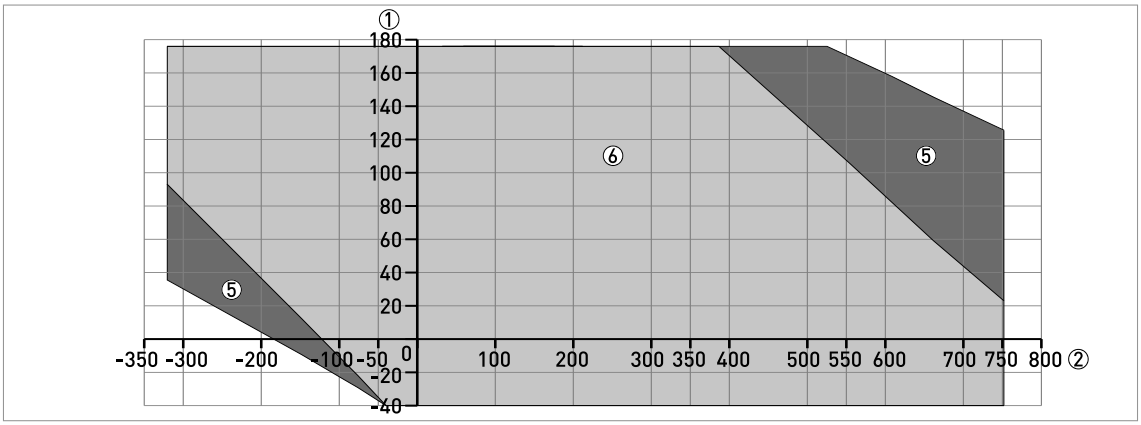

Figure 8-25: Ambient temperature / process temperature, in °F - MS15-series limit switch with the stainless-steel housing option

① Ambient temperature, °C
② Process temperature, °C
③ Ambient temperature, °F
④ Process temperature, °F
⑤ MS15-series limit switch - without a thermal insulation option
⑥ MS15-series limit switch - with or without a thermal insulation option

8.7 Temperature limits: MS40-series limit switch

WARNING!
Do not use the device at an ambient temperature more than the maximum limit for a given process temperature. Do not use the device at an ambient temperature less than the minimum limit for a given process temperature.

CAUTION!
The temperature limit calculations for these graphs include plots for devices that have thermal insulation options (ROCKWOOL® and FOAMGLAS®) supplied by the manufacturer.

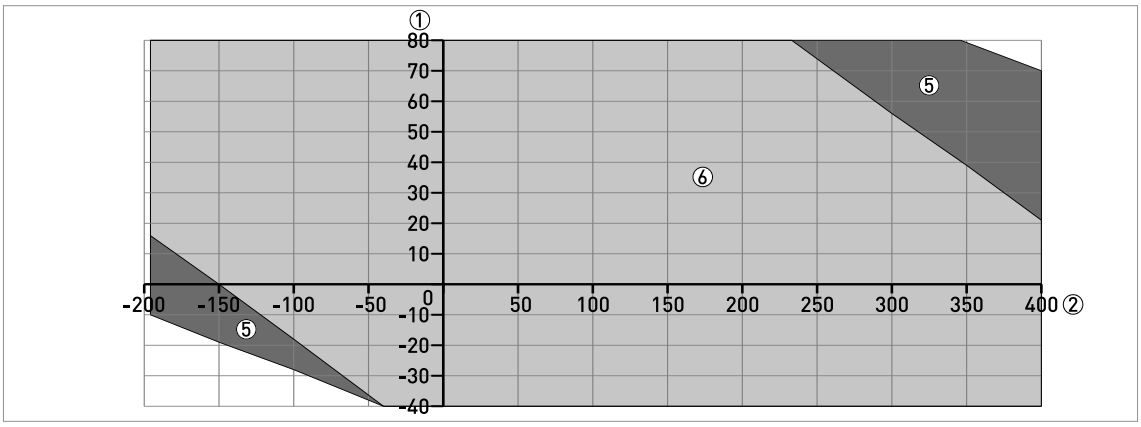

Figure 8-26: Ambient temperature / process temperature, in °C - MS40-series limit switch

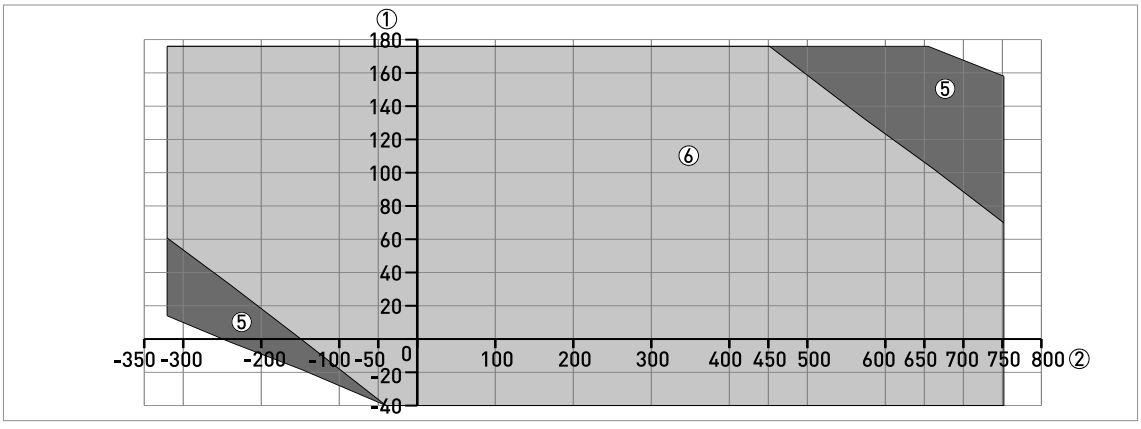

Figure 8-27: Ambient temperature / process temperature, in °F - MS40-series limit switch

① Ambient temperature, °C
② Process temperature, °C
③ Ambient temperature, °F
④ Process temperature, °F
⑤ MS40-series limit switch - without a thermal insulation option
⑥ MS40-series limit switch - with or without a thermal insulation option

9.1 Limit switch adjustment data

9.1.1 General notes

Refer to this section if there are limit switches in the customer order. The position of the limit switch on the measuring chamber must agree with:

- The density of the liquid and the float option.
- The model of the magnetic level indicator.
- The limit switch condition ("LOW limit" or "HIGH limit"). For more data about limit switch conditions, refer to *Switching point offset: examples* on page 133.

If the device has an indicator column with a scale, then it is not necessary to calculate the liquid level offset. But you must calculate the switching point offset (hysteresis) and move the limit switch a small distance to compensate for this property.

If the device does not have a scale, then refer to the sections that follow for the calculation of the liquid level offset and the switching point offset (hysteresis).

For more data about the installation procedure for the limit switch, refer to *Installation - limit switches (MS15 series and MS40 series)* on page 32.

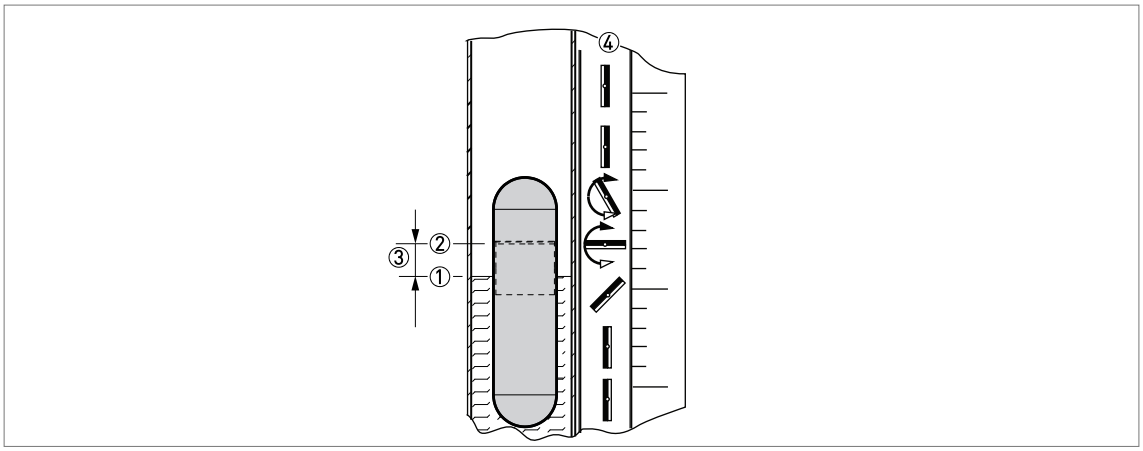

Figure 9-1: Offset between liquid level and the float magnet (liquid level offset)

① Level of the liquid
② Top of the float magnet. The magnet field around the top of the magnet turns the flaps in the indicator column that shows the level in the tank.
③ Liquid level offset. This offset is the difference between the level of the liquid and the top of the float magnet. The value is related to the type of float in the measuring chamber and the density of the liquid.
④ Indicator column of yellow/black or red/white rotating flaps with the optional scale in m/cm, ft/inch, % (simplified) or customized volume units

9.1.2 Switching point offset: examples

"High limit" level switch

The limit switch changes its condition to “open” when the float goes above the switching point.

The limit switch does not immediately change its condition when the float goes above the limit switch position. The limit switch has an offset (hysteresis) that causes the switch to change its condition to "open" when the float moves a small distance above its position. Thus, it is necessary to move the switch down the measuring chamber by a distance equal to the offset to have the correct switching point.

"Low limit" level switch

The limit switch changes its condition to “open” when the float goes below the switching point.

The limit switch does not immediately change its condition when the float goes below the limit switch position. The limit switch has an offset (hysteresis) that causes the switch to change its condition to "open" when the float moves a small distance below its position. Thus, it is necessary to move the switch up the measuring chamber by a distance equal to the offset to have the correct switching point.

Example 1: "HIGH limit" switch

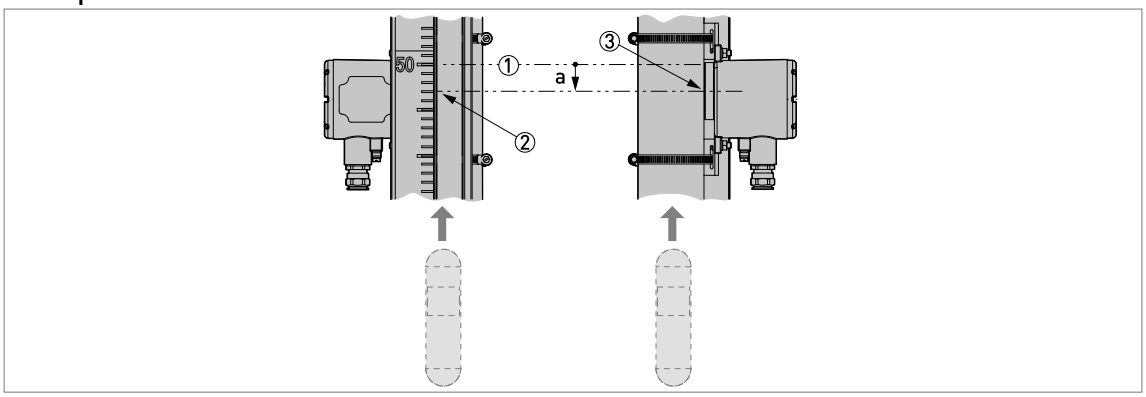

Figure 9-2: MS15 series: switching point offset (hysteresis) for a "HIGH limit" switch

① Switching point (in this example a level of 50 cm is shown on the indicator column)
② Position of the switch with the offset (hysteresis) included (for example, if the limit switch has an offset of 28 mm and the switching point is a level of 50 cm, then the correct position of the limit switch is at a level of 47.2 cm on the indicator column)
③ Correct position of the limit switch in relation to the switching point
a = switching point offset

Example 2: "LOW limit" switch

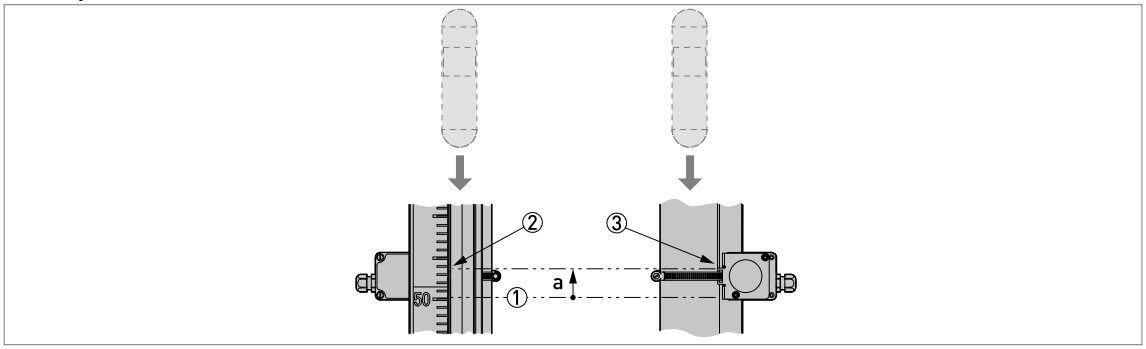

Figure 9-3: MS40 series: switching point offset (hysteresis) for a "LOW limit" switch

① Switching point (in this example a level of 50 cm is shown on the indicator column)
② Position of the switch with the offset (hysteresis) included (for example, if the limit switch has an offset of 28 mm and the switching point is a level of 50 cm, then the correct position of the limit switch is at a level of 52.8 cm on the indicator column)
③ Correct position of the limit switch in relation to the switching point
a = switching point offset

9.1.3 Liquid level offset

CAUTION!
Limit switches are not attached to the measuring chamber at the factory. Make sure that you include the liquid level offset in your calculation when you adjust the position of the limit switch on the measuring chamber. For more data about the installation of level switches, refer to Installation - limit switches (MS15 series and MS40 series) on page 32.

The float contains magnets that:

- turn the flaps in the indicator column,
- cause the limit switch to change state (open / close), and
- cause the output signal of the reed-chain level transmitter to change.

It is possible that the position of the magnets in the float is not the same as the level of liquid. The factory sets the position of indicator column scale in relation to this offset.

INFORMATION!
If the device has an indicator column with a scale, then it is not necessary to calculate the liquid level offset for the limit switch.

If you sent an order for device that has a float with the "zero line" option, then the value of the liquid level offset is 0 mm / 0¨.

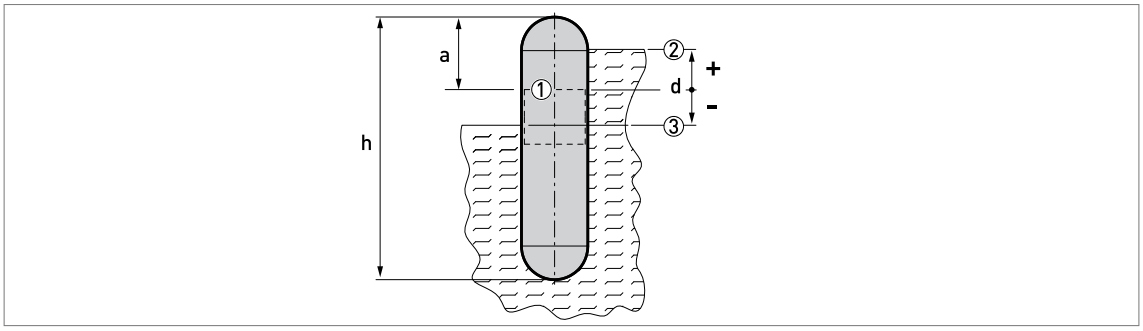

Figure 9-4: Liquid level offset (difference between the liquid level and the top of the float magnets)

① Top of the magnets
② Maximum liquid level - if the density of the liquid is low
③ Minimum liquid level - if the density of the liquid is high
"h" is the length of the float,
"a" is the distance from the top of the magnets in the float (zero point) to the top of the float
"d" is the distance from the top of the magnets in the float (zero point) to the liquid level. This distance is the liquid level offset.

If the distance "d" is a positive value, then the liquid level is above the top of the magnet (zero point). In relation to the switching point that you have selected on the measuring chamber, move the switch down the measuring chamber by distance "d".

If the distance "d" is a negative value, then the liquid level is below the top of the magnet (zero point). In relation to the switching point that you have selected on the measuring chamber, move the switch up the measuring chamber by distance "d".

Distance "d" is related to the device model, the float option and the density of the liquid. Refer to the data on the float data label (material etc.) to identify the float option in the table that follows:

Float option	Material	Product density	Dimensions [mm]		
		[kg/m³]	a	h	d
PN40 / Class 300					
BI version					
Float 7	Titanium	620...800	45	420	①
Float 8	Titanium	800...950	45	260	①
Float A	316L	950...1200	45	205	①
TWIN version					
Float B	Titanium	370...500	44	400	①
Float C	Titanium	500...600	34	210	①
Float D	316L	600...800	31.5	200	①
Float E	316L	800...1200	30.5	200	①
PN100 / Class 600					
BI version					
Float K	Titanium	740...1200	31	344	①
TWIN version					
Float L	Titanium	500...580	31	339	①
Float M	Titanium	580...850	39.3	250	①
Float N	316L	850...1200	33.5	250	①
PN250 / Class 1500					
TWIN version					
Float T	Titanium	660...720	38	583	①
Float U	Titanium	720...850	38	583	①
Float V	Titanium	850...1200	38	583	①
PN400 / Class 2500					
TWIN version					
Float X	Titanium	740...800	29.5	535	①
Float Y	Titanium	800...1200	29.5	357	①

Table 9-1: Liquid level offset: dimensions in mm and kg/m³

① Refer to the graphs that follow

Float option	Material	Product density	Dimensions [mm]		
		[lb/ft³]	a	h	d
PN40 / Class 300					
BI version					
Float 7	Titanium	38.70...49.94	1.77	16.54	①
Float 8	Titanium	49.94...59.30	1.77	10.23	①
Float A	316L	59.30...74.91	1.77	8.07	①
TWIN version					
Float B	Titanium	23.10...31.21	1.73	15.75	①
Float C	Titanium	31.21...37.46	1.34	8.27	①
Float D	316L	37.46...49.94	1.24	7.87	①
Float E	316L	49.94...74.91	1.20	7.87	①
PN100 / Class 600					
BI version					
Float K	Titanium	46.20...74.91	1.22	13.54	①
TWIN version					
Float L	Titanium	31.21...36.21	1.22	13.35	①
Float M	Titanium	36.21...53.06	1.55	9.84	①
Float N	316L	53.06...74.91	1.32	9.84	①
PN250 / Class 1500					
TWIN version					
Float T	Titanium	41.20...44.95	1.50	22.95	①
Float U	Titanium	44.95...53.06	1.50	22.95	①
Float V	Titanium	53.06...74.91	1.50	22.95	①
PN400 / Class 2500					
TWIN version					
Float X	Titanium	46.20...49.94	1.16	21.06	①
Float Y	Titanium	49.94...74.91	1.16	14.06	①

Table 9-2: Liquid level offset: dimensions in inches and lb/ft³

① Refer to the graphs that follow

BI version - PN40 / Class 300: Float magnet offset in relation to liquid level

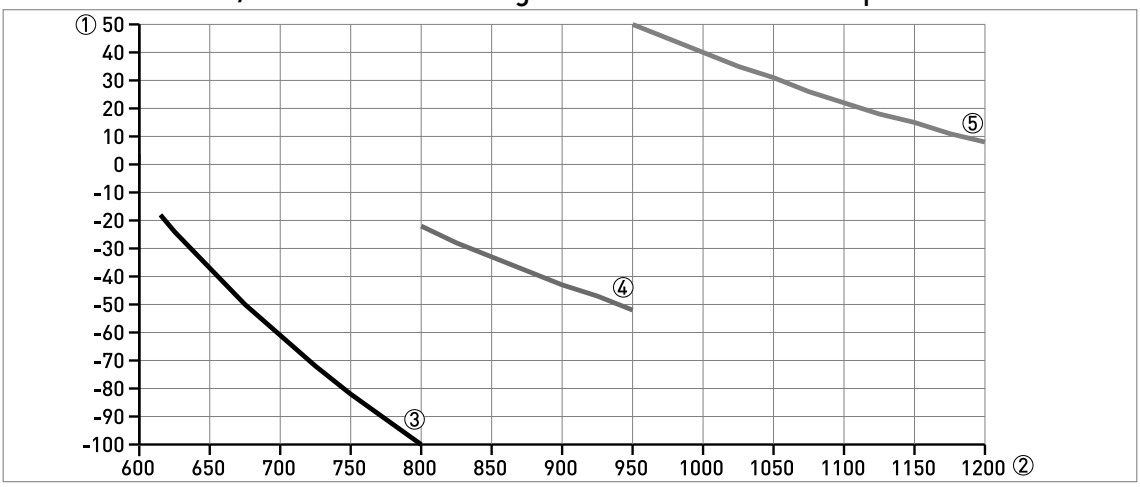

Figure 9-5: BI version - PN40 / Class 300: Float magnet offset in relation to liquid level in mm

① Liquid level in relation to the magnet zero point, d [mm]
② Liquid density, ρ [kg/m³]
③ Curve for PN40 / Class 300- float 7 (titanium)
④ Curve for PN40 / Class 300- float 8 (titanium)
⑤ Curve for PN40 / Class 300- float A (316L)

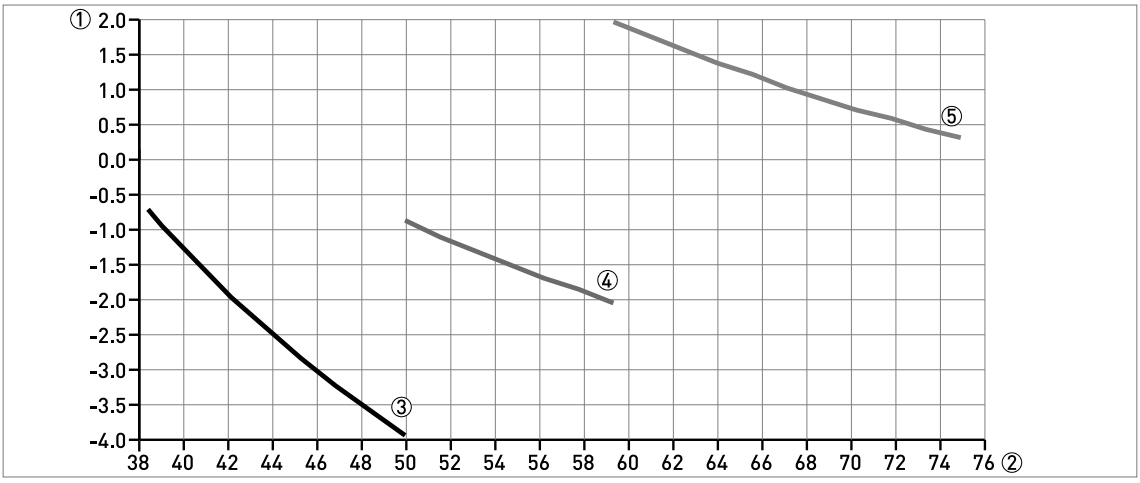

Figure 9-6: BI version - PN40 / Class 300: Float magnet offset in relation to liquid level in inches

① Liquid level in relation to the magnet zero point, d [inches]
② Liquid density, ρ [lb/ft³]
③ Curve for PN40 / Class 300 - float 7 (titanium)
④ Curve for PN40 / Class 300 - float 8 (titanium)
⑤ Curve for PN40 / Class 300 - float A (316L)

TWIN version - PN40 / Class 300: Float magnet offset in relation to liquid level

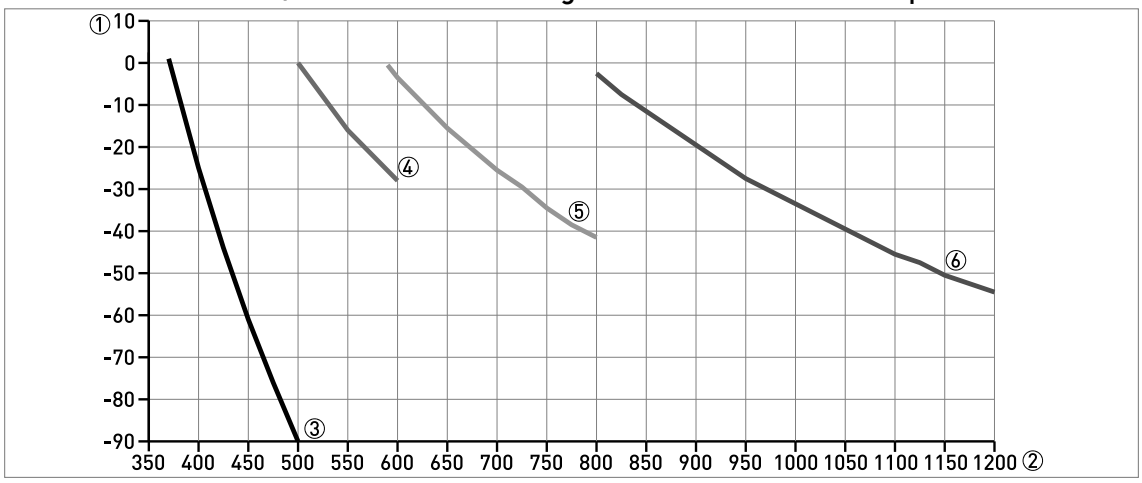

Figure 9-7: TWIN version - PN40 / Class 300: Float magnet offset in relation to liquid level in mm

① Liquid level in relation to the magnet zero point, d [mm]
② Liquid density, ρ [kg/m³]
③ Curve for PN40 / Class 300 - float B (titanium)
④ Curve for PN40 / Class 300 - float C (titanium)
⑤ Curve for PN40 / Class 300 - float D (316L)
⑥ Curve for PN40 / Class 300 - float E (316L)

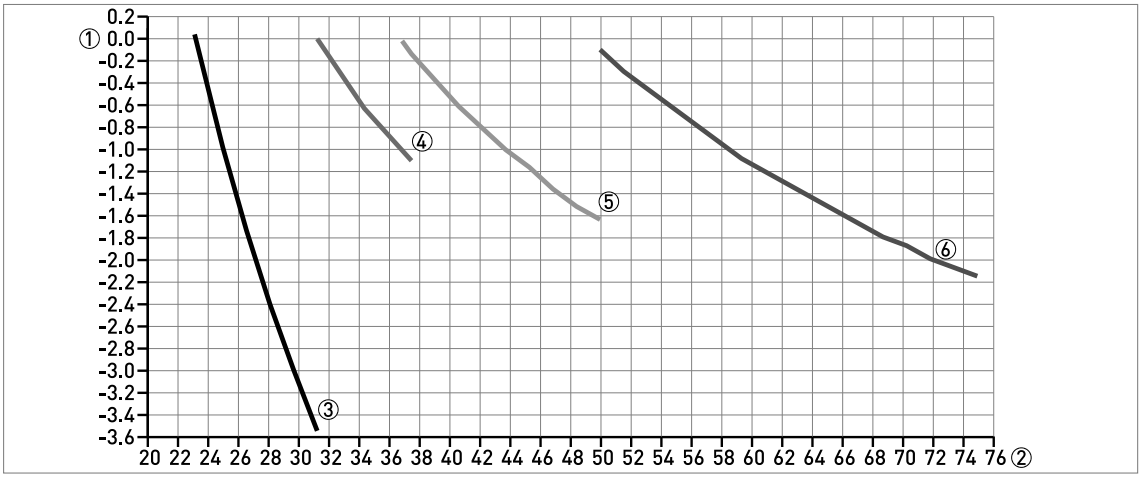

Figure 9-8: TWIN version - PN40 / Class 300: Float magnet offset in relation to liquid level in inches

① Liquid level in relation to the magnet zero point, d [inches]
② Liquid density, ρ [lb/ft³]
③ Curve for PN40 / Class 300 - float B (titanium)
④ Curve for PN40 / Class 300 - float C (titanium)
⑤ Curve for PN40 / Class 300 - float D (316L)
⑥ Curve for PN40 / Class 300 - float E (316L)

BI version - PN100 / Class 600: Float magnet offset in relation to liquid level

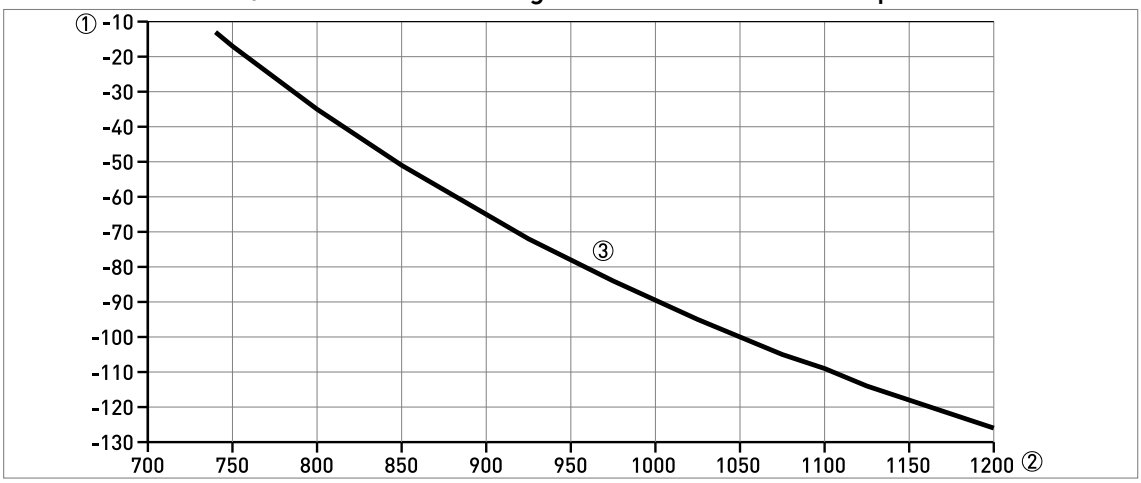

Figure 9-9: BI version - PN100 / Class 600: Float magnet offset in relation to liquid level in mm

① Liquid level in relation to the magnet zero point, d [mm]
② Liquid density, ρ [kg/m³]
③ Curve for PN100 / Class 600 - float K (titanium)

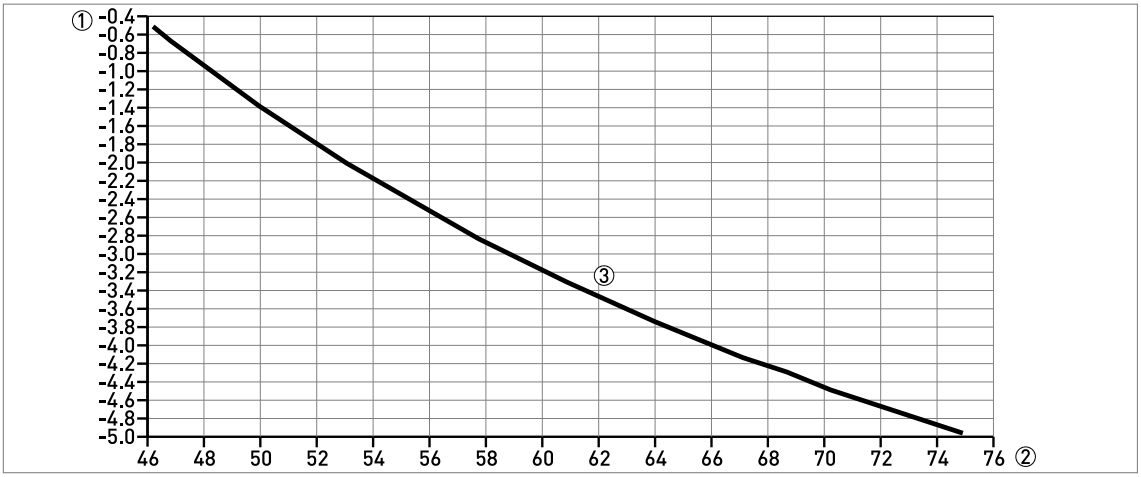

Figure 9-10: BI version - PN100 / Class 600: Float magnet offset in relation to liquid level in inches

① Liquid level in relation to the magnet zero point, d [inches]
② Liquid density, ρ [lb/ft³]
③ Curve for PN100 / Class 600 - float K (titanium)

TWIN version - PN100 / Class 600: Float magnet offset in relation to liquid level

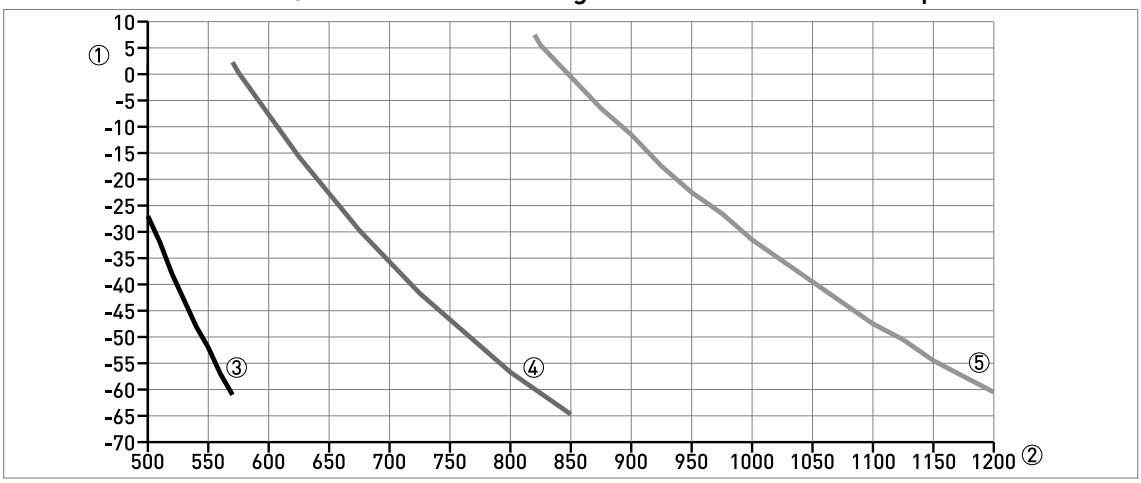

Figure 9-11: TWIN version - PN100 / Class 600: Float magnet offset in relation to liquid level in mm

① Liquid level in relation to the magnet zero point, d [mm]
② Liquid density, ρ [kg/m³]
③ Curve for PN100 / Class 600 - float L (titanium)
④ Curve for PN100 / Class 600 - float M (titanium)
⑤ Curve for PN100 / Class 600 - float N (316L)

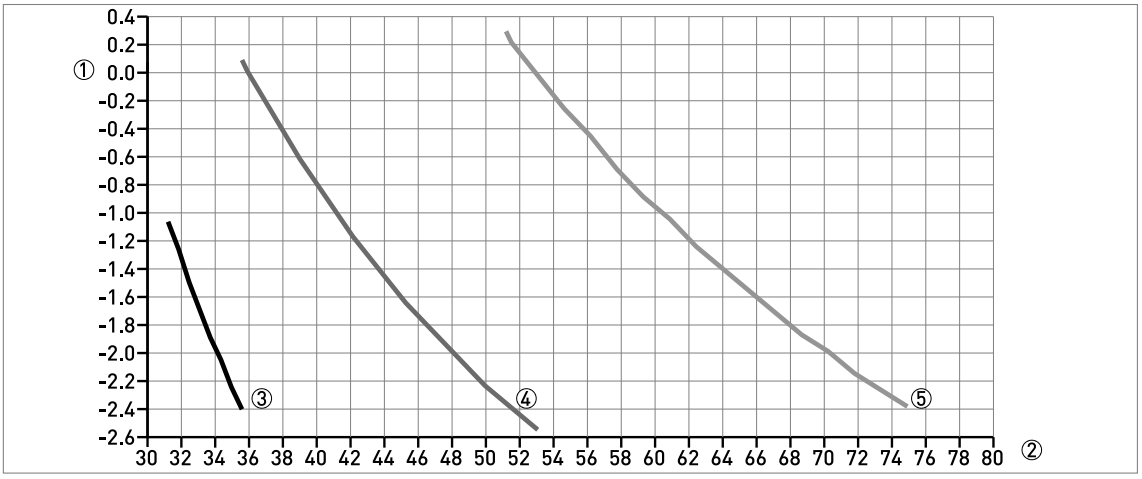

Figure 9-12: TWIN version - PN100 / Class 600: Float magnet offset in relation to liquid level in inches

① Liquid level in relation to the magnet zero point, d [inches]
② Liquid density, ρ [lb/ft³]
③ Curve for PN100 / Class 600 - float L (titanium)
④ Curve for PN100 / Class 600 - float M (titanium)
⑤ Curve for PN100 / Class 600 - float N (316L)

TWIN version - PN250 / Class 1500: Float magnet offset in relation to liquid level

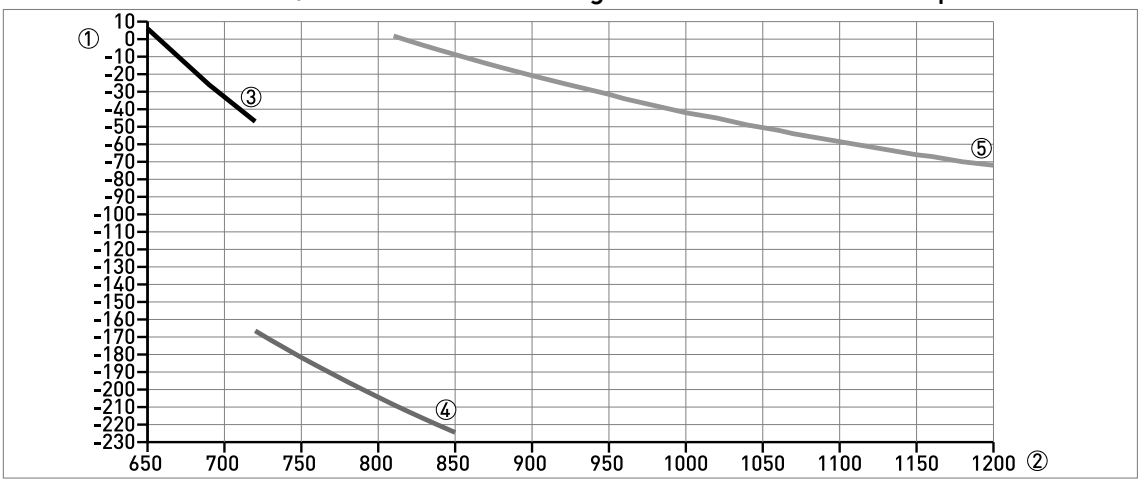

Figure 9-13: TWIN version - PN250 / Class 1500: Float magnet offset in relation to liquid level in mm

① Liquid level in relation to the magnet zero point, d [mm]
② Liquid density, ρ [kg/m³]
③ Curve for PN250 / Class 1500 - float T (titanium)
④ Curve for PN250 / Class 1500 - float U (titanium)
⑤ Curve for PN250 / Class 1500 - float V (titanium)

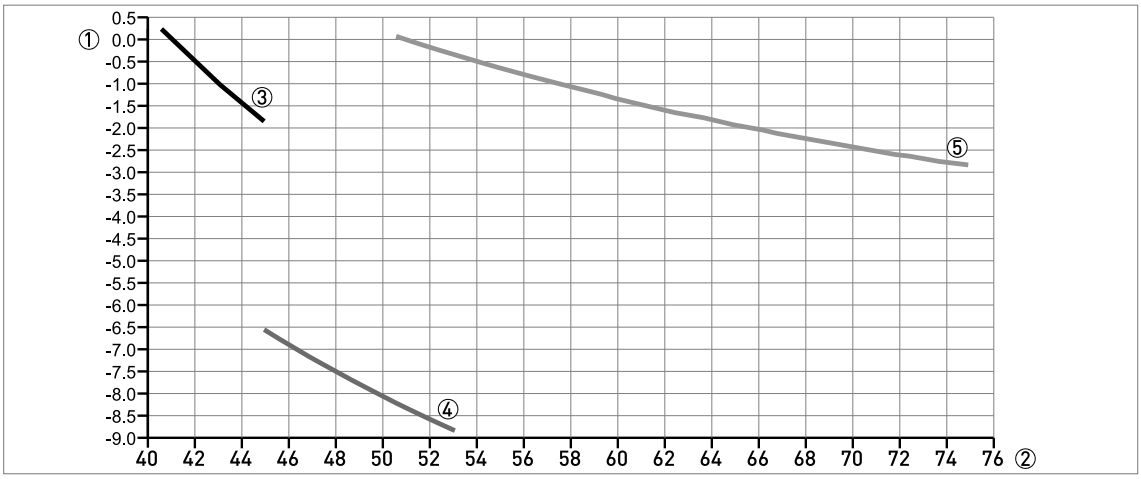

Figure 9-14: TWIN version - PN250 / Class 1500: Float magnet offset in relation to liquid level in inches

① Liquid level in relation to the magnet zero point, d [inches]
② Liquid density, ρ [lb/ft³]
③ Curve for PN250 / Class 1500 - float T (titanium)
④ Curve for PN250 / Class 1500 - float U (titanium)
⑤ Curve for PN250 / Class 1500 - float V (titanium)

TWIN version - PN400 / Class 2500: Float magnet offset in relation to liquid level

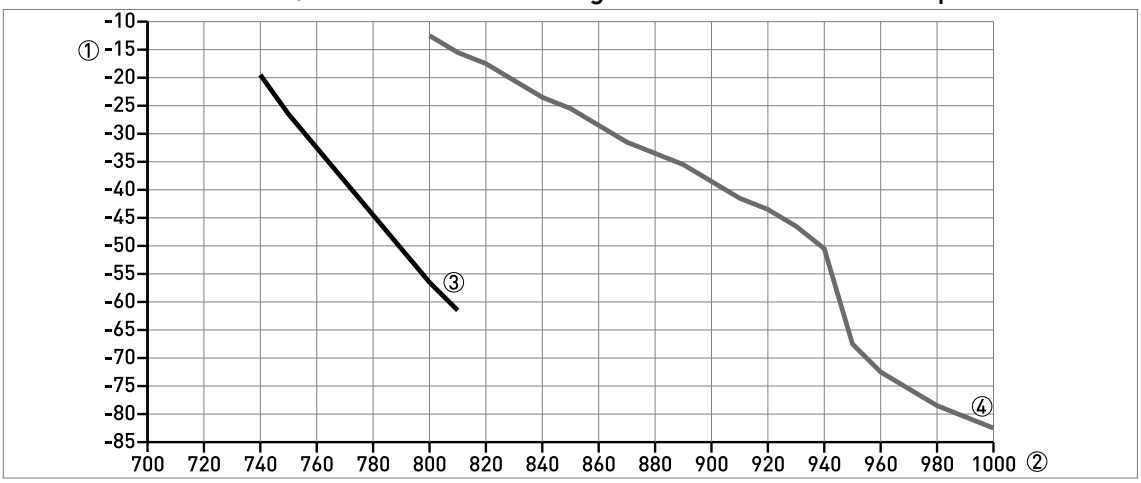

Figure 9-15: TWIN version - PN400 / Class 2500: Float magnet offset in relation to liquid level in mm

① Liquid level in relation to the magnet zero point, d [mm]
② Liquid density, ρ [kg/m³]
③ Curve for PN400 / Class 2500 - float X (titanium)
④ Curve for PN400 / Class 2500 - float Y (titanium)

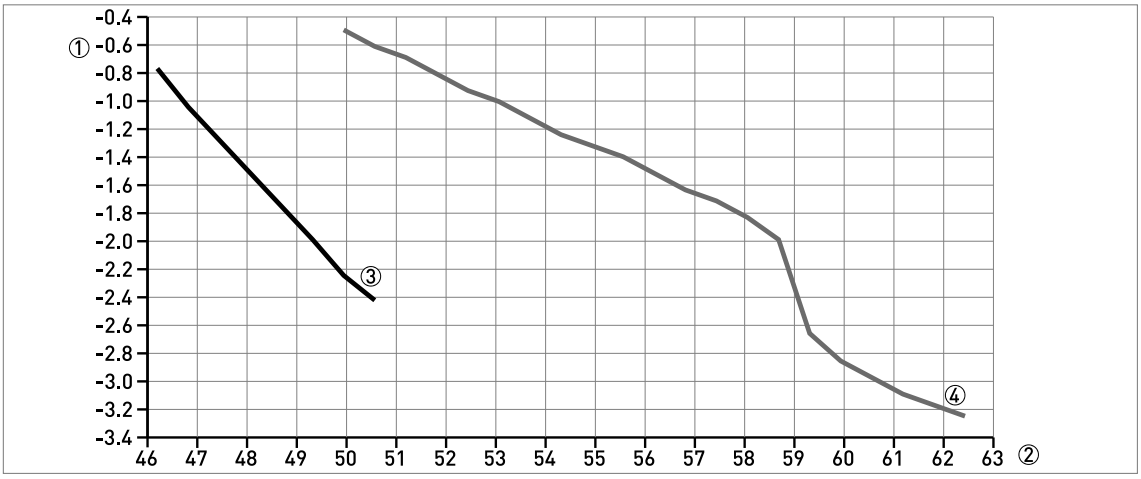

Figure 9-16: TWIN version - PN400 / Class 2500: Float magnet offset in relation to liquid level in inches

① Liquid level in relation to the magnet zero point, d [inches]
② Liquid density, ρ [lb/ft³]
③ Curve for PN400 / Class 2500 - float X (titanium)
④ Curve for PN400 / Class 2500 - float Y (titanium)

9.2 Spare parts

Spare parts are available for:

- the indicator column
- MS15 and MS40 limit switches
- LT40 reed-chain level transmitter
- the float
- Gaskets for drain plug and flange at the bottom of the measuring chamber
- Isolation valves for the vent, drain and process connections
- Metal collars

If you must send an order to replace a part, speak to your supplier.

9.3 Accessories

Accessory	Quantity	Part reference
Support bracket, BI version - PN100 / Class 600	1	XFP6000012
Support bracket, all other versions	1	XFP6000011
Ceramic fiber for high process temperatures ①	1	XFP6000050
Insulating felt for low process temperatures ②	1	XFP6000051

Table 9-3: Accessories

① This part must be between the indicator column and the measuring chamber if the process temperature is > +200°C / > +392°F)
② This part must be between the indicator column and the measuring chamber if the process temperature is -50...+40°C / -58...+104°F

For the procedure to install the ceramic fiber or insulating felt between the indicator column and the measuring chamber, write to the manufacturer.

9.4 Glossary

E

Electromagnetic compatibility Defines how much a device influences or is influenced by other devices that generate electromagnetic fields during operation. Refer to European standard EN 61326-1 and EN 61326-2-3 for further details.

F

Float An air-filled, sealed cylinder that contains magnets. The float stays on the surface of liquid in the measuring chamber. The magnetic field of the float operates equipment adjacent to the measuring chamber: this includes the level indicator column, the optional analog transmitter and optional limit switches.

I

Indicator column The indicator column is column of rotating 2-color flaps sealed in a heat-resistant glass tube. An optional scale shows the level in the tank in m + cm, feet + inches or % filled.

L

Limit switch An optional device with a reed contact that is operated by the magnetic field of the float. It is attached at one or more points adjacent to the measuring chamber. It indicates when the level of the liquid is at a reference point. The switch is bi-stable. The switch stays "open" or "closed" until the float goes back to its initial position.

M

Measuring chamber The measuring chamber is a bypass chamber that is attached adjacent to a tank with contents that must be measured. There are 2 process connections: 1 at the top and 1 at the bottom of the measuring chamber. The measuring chamber contains a float. Options include axial or lateral process connections, vents and drains.

R

Reed-chain level transmitter An optional device that transmits an output given by the position of a magnetic field along a resistance reed chain. The resistance reed chain is in a tube attached adjacent to the measuring chamber. Output options include 4...20 mA, HART, PROFIBUS PA and FOUNDATION™ fieldbus.

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