KSR KUEBLER
A division of the WIKA Group

# LEVEL MEASUREMENT

www.ksr-kuebler.com

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A division of the WIKA Group

# Who we are

**KSR KUEBLER**
**Headquarter Zwingenberg**

## Custom-made solutions for individual requirements

For over 50 years KSR KUEBLER Niveau-Messtechnik has been renown as competent specialist for all level measurement needs. Reliability of its products and the willingness to meet all market challenges helped to build up the reputation as one of the leading manufacturers world-wide. Proven products and innovative solutions help us to offer optimal solutions to our customers and strengthen our market position.

KSR KUEBLER AG today manufactures a broad range of level measurement devices covering temperatures up to 450 °C and pressures up to 500 bar. Tailor-made solutions for chemical and pharmaceutical plants, offshore and oil industry, shipbuilding, plant construction, food and beverages industry, water purification plants and an ever growing number of applications in the environmental industry make up a big share of our new developments.

Our highly qualified members of staff are constantly engaged in customising new solutions to solve individual problems. The latest in production technology, an uncompromising commitment to quality and national and international approvals are the foundations that build up the reputation of our company.

Since 2008 KSR is a member of the WIKA group of companies with over 7,900 employees world-wide. More than 500 experienced personnel in our local sales organisations help customers and users by working together as partners.

# Approvals

| | |
|---|---|
| | Sanitary Standards |
| | American Bureau of Shipping |
| | ATEX Atmosphère Explosibles |
| | Bureau Veritas |
| | Det Norske Veritas |
| | Factory Mutual |
| | Germanischer Lloyd |
| | HP0 |
| | ISO9000 |
| | Lloyds Register |
| | NEPSI |
| | NSQ100 |
| | Safety Integrity Level |
| WHG | Wasserhaushaltsgesetz |
| | EurAsian Conformity |

# Content

# Industries

## Process

- Power engineering
- Chemical
- Petrochemical
- Oil & Gas
- Water, waste water

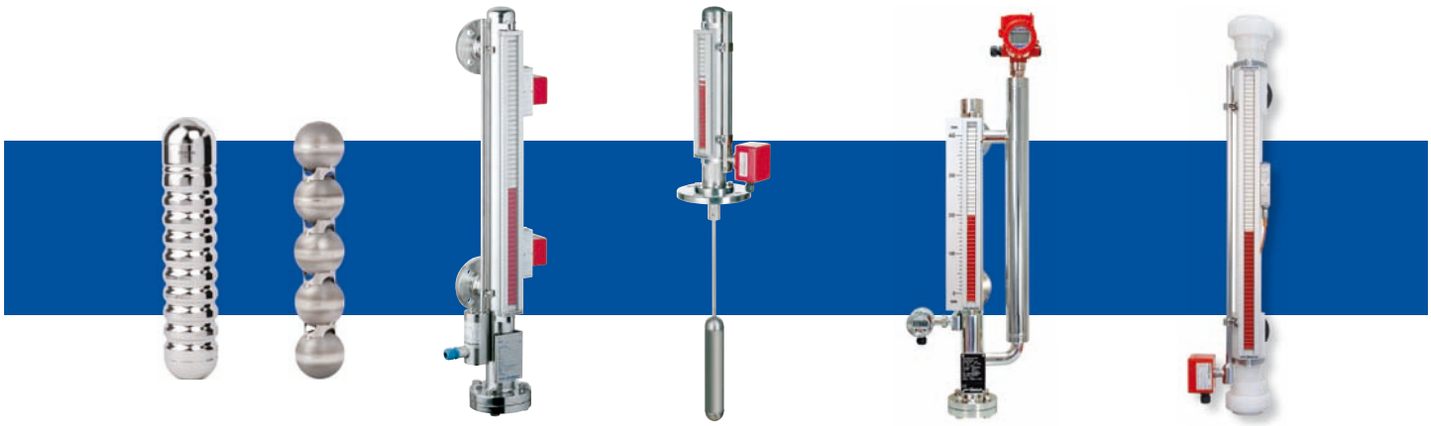
## Industrial

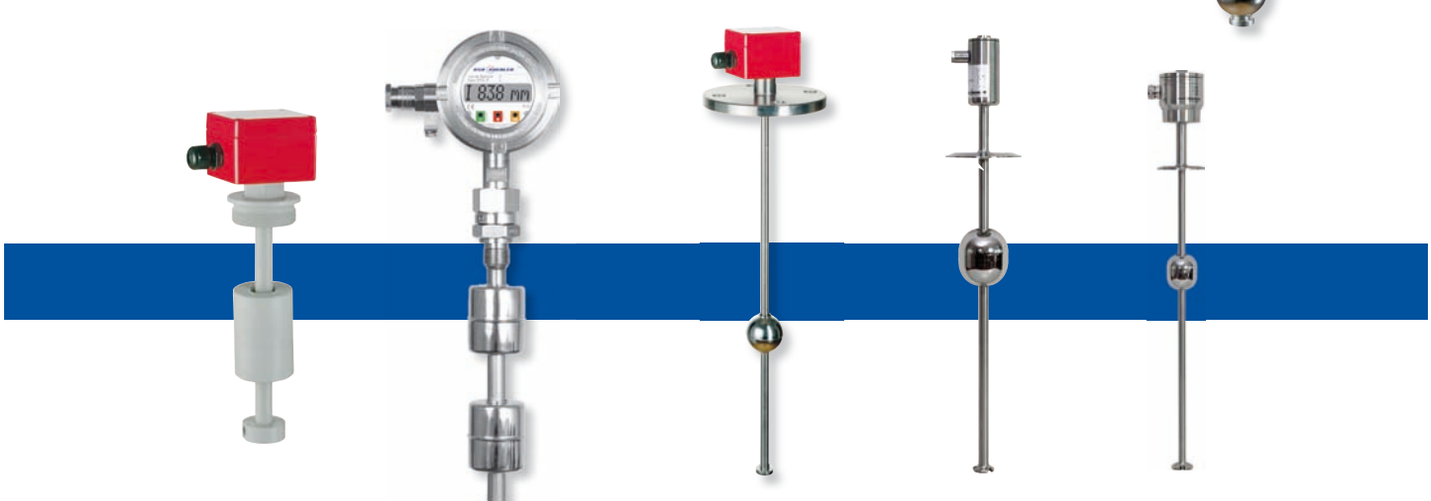
- Machine building
- Heating, Ventilation, Air-conditioning
- Refrigeration
- Technical gases
- Semiconductor

## Hygienic

- Food
- Pharmaceutical
- Beverage
- Biotechnology
- Cosmetics

# KSR Product diversity






# Product overview

## Bypass Level Indicators model BNA

**Continuous level measurement with visual indication of level without power supply**

- Simple, robust, and solid design
- Display proportional to the height of the level or the contents of the vessel
- Pressure- and gas-proof separation of chamber and display
- Available for applications in all areas of industry through versatile design and corrosion-resistant materials
- Explosion-proof designs
- Interface

## Magnetic Float Switches model FLS

**Detection of one or more distinct levels of a liquid**

- Suitable for virtually all liquids
- Switching operation is without direct contact with the liquid, free of wear and tear and does not require any power supply
- Universal signal processing of volt-free contacts:
  - PLC
  - Control circuit to DIN NAMUR 60947-5-6
- Multiple switch points in one unit (up to 8)
- Explosion-proof designs
- Interface
- Application specific designs available
- Simple installation and commissioning, maintenance-free

# Product overview

## Level Sensors model FLR/FLM

**Continuous level measurement, interface measurement**

- Protocols: HART, Profibus, Foundation Fieldbus ®
- Signal transmission over large distances
- Simple installation and commissioning, one-time calibration only, no re-calibration necessary
- Display proportional to the height of the level or the contents of the vessel
- Set point relays continuously adjustable over full range
- High repeatability of set points
- Interface
- Application specific designs available
- Explosion-proof designs

## Opto Level Switch model OLS

**Opto Level Switches are used for monitoring liquid levels**

- Option: Interface
- High precision
- Independent of color, density, dielectric constant, conductivity and refactive index
- Small measurement volume
- Small size
- Explosion-proof designs

# KSR – Your Partner for the Chemical and Petrochemical Industry

The manufacture of chemical products from natural gas and naphtha in refineries places high demands on the process instrumentation. In different process steps, such as cracking, condensation or distillation, the respective intermediate or finished products are manufactured under defined pressure and temperature conditions. The high precision and quality of KSR time-proven products ensures maximum plant availability here. Since the handling of the various gas mixtures and the highly flammable naphtha is not without danger, for example, our ATEX tested and certified measuring instruments make a contribution to the required safety.

Particularly in applications with aggressive media, in combination with high media temperatures, individual solutions are essential. For all application examples for level measurement, KSR offers an unrivalled programme of level measuring instruments.
Our standard product range includes products that can be used in numerous ways. Individually tailored advice and proposals, to match solutions to your needs, supplement our extensive offering of products. Our expertise and dependability, in addition to our worldwide sales and service network, has made WIKA a global contracting partner with many well-known names in the international chemical industry.

# Bypass level indicator
# With magnetic display
# Model BNA

KSR data sheet BNA

## Applications

- Continuous level indication without power supply
- Indication of the level proportional to height
- Individual design and corrosion resistant materials make the products suitable for a broad range of applications
- Chemical, petrochemical industry, oil and natural gas extraction (on- and offshore), shipbuilding, machine building, power generating equipment, power plants
- Process water and drinking water treatment, food industry, pharmaceutical industry

## Special features

- Process- and system-specific production
- Operating limits:
  - Operating temperature: T = -196 ... +450 °C
  - Operating pressure: P = vacuum to 400 bar
  - Limit density: $\rho \geq 340$ kg/m$^3$
- Wide variety of different process connections and materials
- Mounting of level sensors and magnetic switches possible as an option
- Explosion-protected versions

**Bypass level indicator, model BNA with level sensor and magnetic switch**

## Description

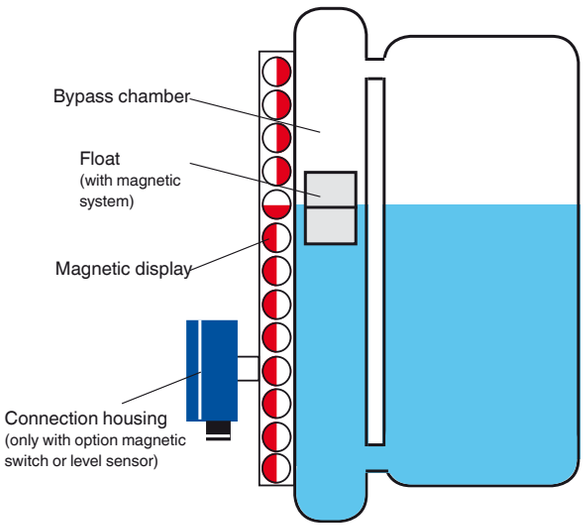
The bypass level indicator model BNA consists of a bypass chamber, which, as a communicating tube, is connected laterally to a vessel via at least 2 process connections (flanged, threaded or welded). Through this type of arrangement, the level in the bypass chamber corresponds to the level in the vessel. The float with a built-in permanent magnetic system, which is mounted within the bypass chamber, transmits the liquid level, contact-free, to the magnetic display mounted to the outside of the bypass chamber. In this are fitted, at 10 mm intervals, two-coloured plastic rollers or stainless steel flaps with bar magnets.

Through the magnetic field of the permanent magnetic system in the float, the display elements, through the wall of the bypass chamber, are turned through 180°. For an increasing level from white to red; for a falling level from red to white.
Thus the bypass level indicator clearly displays the level of a vessel **without power supply**.

## Further special features

- Simple, robust and solid design, long service life
- Bypass chamber and float from stainless steel 1.4571, 1.4404 or special materials
- Pressure- and gas-tight separation between measuring and display chamber
- Measuring and indicating of the level of aggressive, combustible, toxic, hot and contaminated media
- Functioning of the magnetic display guaranteed even in the case of power failures
- By using a variety of corrosion-resistant materials, applicable for virtually all industrial applications
- Continuous measurement of levels, independent of physical and chemical changes of the media such as: Foaming, conductivity, dielectric constant, vapours, bubble formation, boiling effects
- Interface-layer level measurement from Δ density 100 kg/m$^3$
- Special versions: Food compliant, coatings, liquid gas, heating jacket

## Illustration of the principle



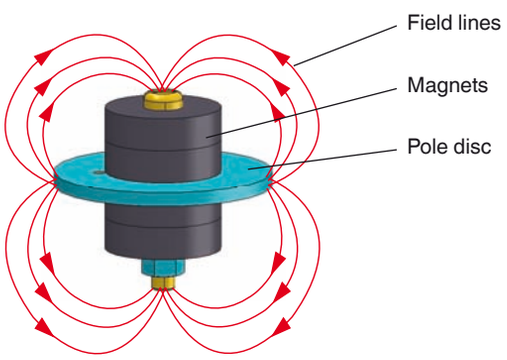

## Design and operating principle

- In a communicating bypass chamber mounted to the side of a vessel a float moves with the level of the medium to be measured.

- The magnetic field of the radial-symmetric magnetic system positioned in the float activates the magnetic display attached to the outside of the bypass chamber as well as the switching and measuring elements.

## Magnetic system

The magnetic system is assembled from a pole disc and various magnets. These can be individually adapted to the different chamber dimensions and for temperatures up to 450 °C.



## Model overview

| Bypass level indicator | Approval | | | | | | | Material | Max. pressure in bar | Medium temperature in °C |
|---|---|---|---|---|---|---|---|---|---|---|
| | without | Ex c | Ex c, GL | Ex c, DNV | GL | DNV | ABS | | | |
| **Compact version, model BNA-C** | x | x | x | x | x | x | | Stainless steel 1.4571 (316Ti) | 40 | -196 ... +150 |
| **Standard version, model BNA-S** | x | x | x | x | x | x | x | Stainless steel 1.4571 (316Ti), 1.4404 (316L), 1.4401/1.4404 (316/316L) | 64 | -196 ... +450 |
| **High-pressure version, model BNA-H** | x | x | x | x | x | x | | Stainless steel 1.4571 (316Ti), 1.4404 (316L) | 400 | -196 ... +450 |
| **Plastic version, model BNA-P** | x | | | | | | | PP, PVDF | 6 | -10 ... +100 |
| **DUPlus version, standard, model BNA-SD** | x | x | | | | | | Stainless steel 1.4571 (316Ti), 1.4404 (316L), 1.4401/1.4404 (316/316L) | 64 | -196 ... +450 |
| **DUPlus version, high pressure, model BNA-HD** | x | x | | | | | | Stainless steel 1.4571 (316Ti), 1.4404 (316L), 1.4401/1.4404 (316/316L) | 160 | -196 ... +450 |
| **Liquid gas/KOPlus version, model BNA-L** | x | x | | | | | | Stainless steel 1.4571 (316Ti), 1.4404 (316L) | 25 | -60 ... +300 |
| **Special materials, model BNA-X** | x | x | | | | | | Stainless steel 6Mo 1.4547 (UNS S31254) | 250 | -196 ... +450 |
| | x | | | | | | | Stainless steel 1.4571 (316Ti) with internal coating E-CTFE, ETFE or PTFE | 16 | depending on the medium |
| | x | x | x | x | x | x | | Titanium 3.7035 | 64 | -196 ... +450 |
| | x | x | x | x | x | x | | Hastelloy C276 (2.4819) | 160 | -196 ... +450 |
| **Heating jacket version, model BNA-J** | x | x | x | | x | | | Stainless steel 1.4571 (316Ti), 1.4404 (316L) | 64 | -60 ... +450 |

## Ex approvals

| Explosion protection | Ignition protection type | Model | Zone | Approval number |
|---|---|---|---|---|
| ATEX | Ex c | BNA-S, BNA-H, BNA-C, BNA-SD, BNA-HD, BNA-X, BNA-J | Zone 0/1, gas | KEMA 02 ATEX 2106 X II 1/2 G c T1 ... T6 |
| | Ex c + GL | BNA-S, BNA-H, BNA-C, BNA-X, BNA-J | Zone 0/1, gas | KEMA 02 ATEX 2106 X II 1/2 G c T1 ... T6 + GL - 35 949 - 87 |
| | Ex c + DNV | BNA-S, BNA-H, BNA-C, BNA-X | Zone 0/1, gas | KEMA 02 ATEX 2106 X II 1/2 G c T1 ... T6 + DNV - A-11451 |

## Type approval

| Approval | Model | Approval number |
|---|---|---|
| GL | BNA-S, BNA-H, BNA-C, BNA-X, BNA-J | GL - 35 949 - 87 HH |
| DNV | BNA-S, BNA-H, BNA-C, BNA-X | DNV A-11451 |
| ABS | BNA-S | ABS 07-HG218425-1-PDA |
| GOST-R | all | 0959333 |

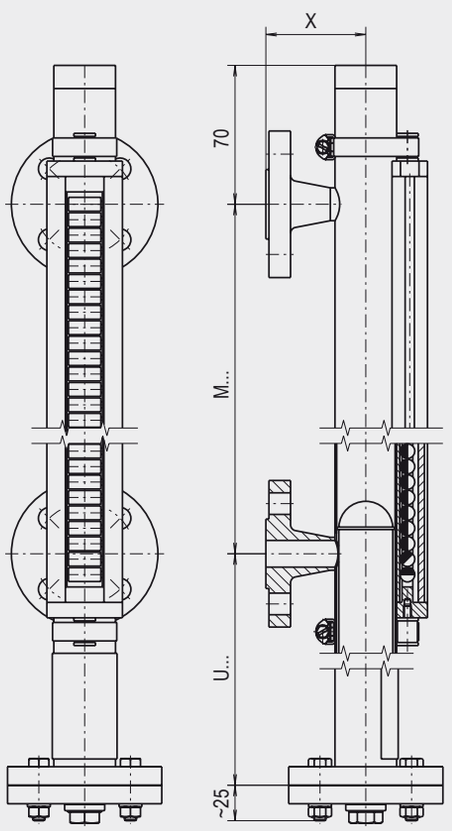
Further approvals on request

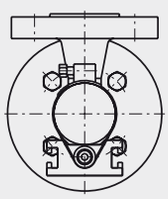
Detailed information on floats, magnetic displays, sensors (reed chains and magnetostrictive) and magnetic switches can be found in the following data sheets:

- Float; model BFT; see data sheet LM 10.02
- Magnetic display; model BMD; see data sheet LM 10.03
- Reed sensor; model BLR; see data sheet LM 10.04
- Magnetostrictive sensor; model BLM; see data sheet LM 10.05
- Magnetic switch; model BGU; see data sheet LM 10.06

# Bypass level indicator, compact version, model BNA-C

Bypass chamber from stainless steel



M = centre-to-centre distance of the process connections
U = float length (min. 150 mm)
X = according to process connection

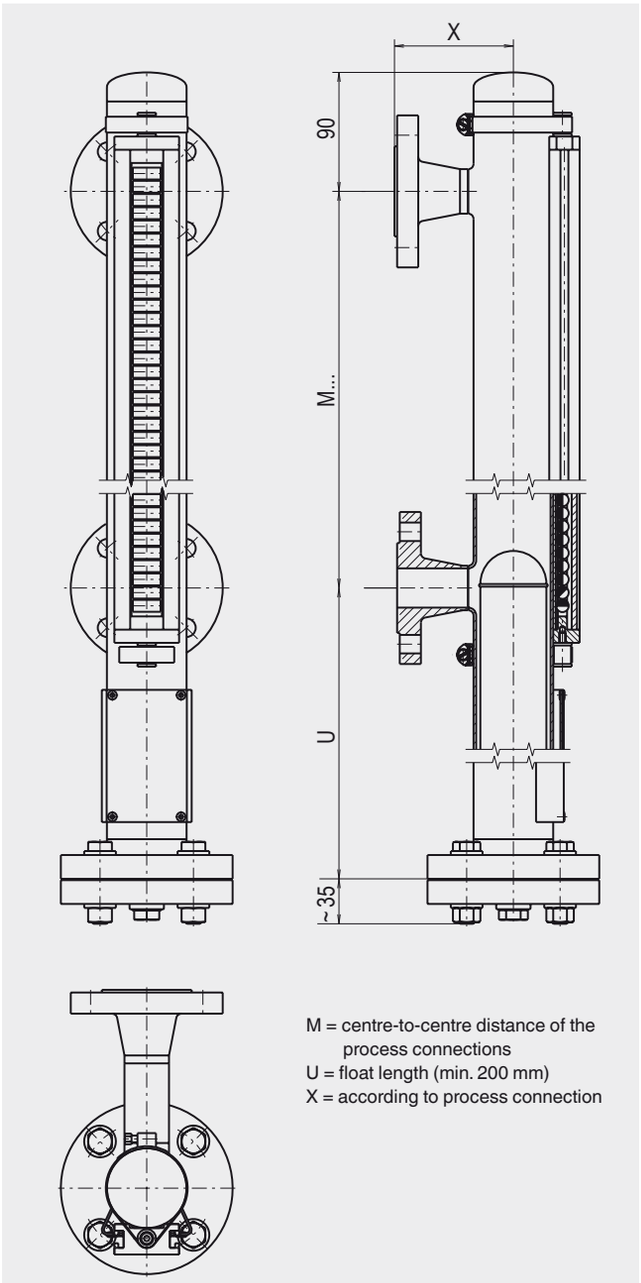
## Specifications

| | |
|---|---|
| Bypass chamber | Ø 42.2 x 2 mm, max. 40 bar |
| Chamber end top | Flat top, flange or threaded connection<br>Options: (see page 14)<br>■ Vent screw<br>■ Vent valve<br>■ Vent flange |
| Chamber end bottom | Flange connection or threaded connection<br>Options: (see page 14)<br>■ Drain plug<br>■ Drain valve<br>■ Drain flange |
| Process connections | 2 x lateral (options see page 15)<br>Flange EN 1092-1, DN 10 - DN 50, PN 6 - PN 40<br>Flange DIN, DN 10 - DN 50, PN 6 - PN 40<br>Flange ANSI B 16.5, 1/2" - 2,5",<br>class 150 - class 300<br>Weld stub 1/2" - 1"<br>Threaded bushing G/NPT 1/2" - 1"<br>Threaded nipple G/NPT 1/2" - 1" |
| Centre-to-centre distance | Min. 150 mm to max. 5,000 mm |
| Material | Stainless steel 1.4571 (316Ti) |
| Nominal pressure | Max. 40 bar |
| Temperature range | -196 ... +150 °C |
| Float | Cylindrical float, model BFT-H32, see data sheet LM 10.02 |
| Magnetic display | Magnetic display; model BMD-S; see data sheet LM 10.03 |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05 |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 |
| Approvals | Ex c, GL, DNV, GOST-R |

Special versions on request

# Bypass level indicator, standard version, model BNA-S

Bypass chamber from stainless steel



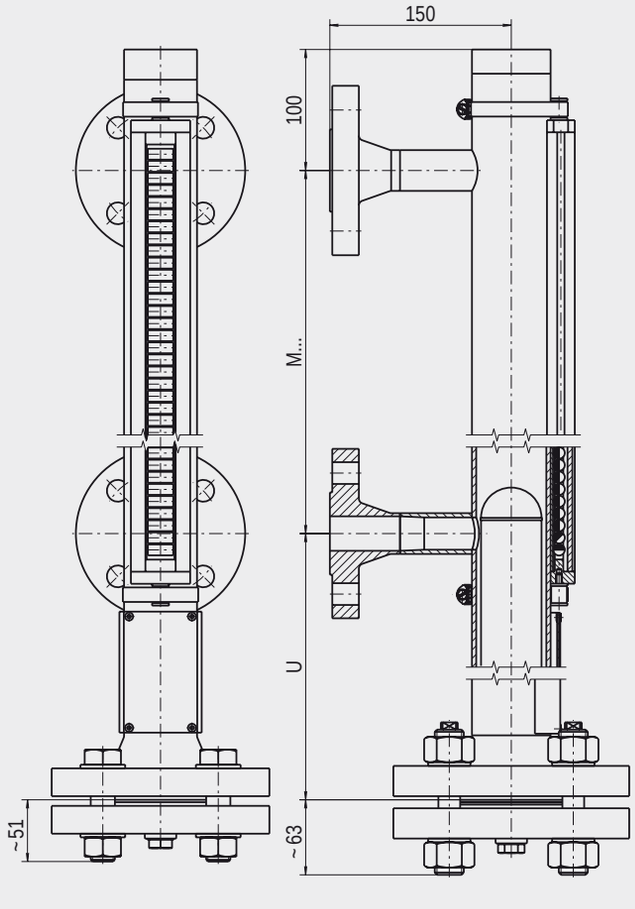

M = centre-to-centre distance of the process connections
U = float length (min. 200 mm)
X = according to process connection

| Specifications | |
|---|---|
| Bypass chamber | Ø 60.3 x 2 mm, max. 40 bar<br>Ø 60.3 x 2.77 mm, max. 64 bar |
| Chamber end top | Flat top or flange connection<br>Options: (see page 14)<br>■ Vent screw<br>■ Vent valve<br>■ Vent flange |
| Chamber end bottom | Flange connection<br>Options: (see page 14)<br>■ Drain plug<br>■ Drain valve<br>■ Drain flange |
| Process connections | 2 x lateral (options see page 15)<br>Flange EN 1092-1, DN 10 - DN 100, PN 6 - PN 63<br>Flange DIN, DN 10 - DN 100, PN 6 - PN 64<br>Flange ANSI B 16.5, 1/2" - 4", class 150 - class 600<br>Weld stub 1/2" - 1"<br>Threaded bushing G/NPT 1/2" - 1"<br>Threaded nipple G/NPT 1/2" - 1" |
| Centre-to-centre distance | Min. 150 mm to max. 6,000 mm (larger distances on request) |
| Material | Stainless steel 1.4571 (316Ti), 1.4404 (316L), 1.4401/1.4404 (316/316L) |
| Nominal pressure | Max. 64 bar |
| Temperature range | -196 ... +450 °C |
| Float | Cylindrical float, model BFT-H or corrugated float, model BFT-S, see data sheet LM 10.02 |
| Magnetic display | Standard version, model BMD-S: < 200 °C<br>High-temperature version, model BMD-F: > 200 °C, see data sheet LM 10.03 |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05 |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 |
| Approvals | Ex c, GL, DNV, ABS, GOST-R |

Special versions on request

# Bypass level indicator, high-pressure version, model BNA-H

Bypass chamber from stainless steel




M = centre-to-centre distance of the process connections
U = float length (min. 220 mm)

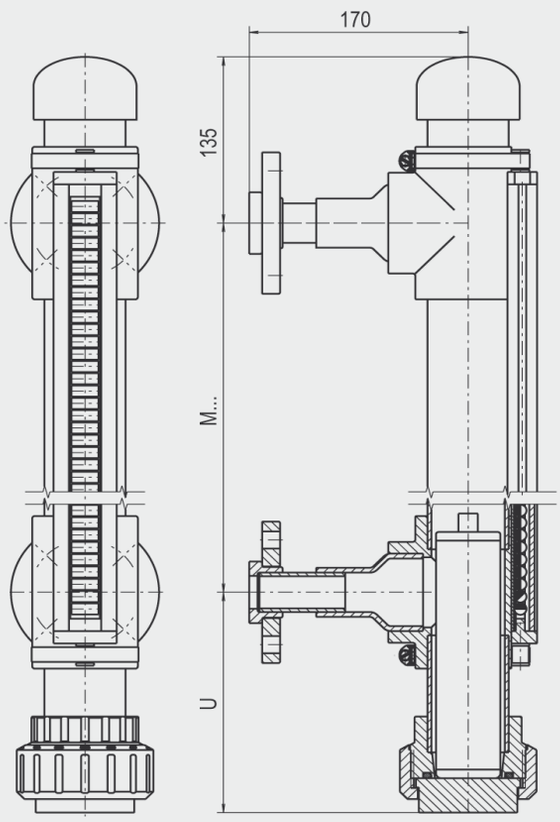
## Specifications

| | |
|---|---|
| Bypass chamber | Stainless steel 1.4571:<br>Ø 60.3 x 3.91 mm, max. 160 bar<br>Ø 76.1 x 5 mm, max. 160 bar<br>Ø 71 x 7.5 mm, max. 250 bar<br>Ø 76.1 x 10 mm, max. 420 bar<br><br>Stainless steel 1.4404:<br>Ø 60.3 x 3.91 mm, max. 100 bar<br>Ø 60.3 x 5.54 mm, max. 150 bar<br>Ø 73 x 7.01 mm, max. 150 bar |
| Chamber end top | Flat top or flange connection<br>Options: (see page 14)<br>■ Vent screw<br>■ Vent valve<br>■ Vent flange |
| Chamber end bottom | Flange connection<br>Options: (see page 14)<br>■ Drain plug<br>■ Drain valve<br>■ Drain flange |
| Process connections | 2 x lateral (options see page 15)<br>Flange EN 1092-1, DN 10 - DN 100, PN 63 - PN 400<br>Flange DIN, DN 10 - DN 100, PN 64 - PN 400<br>Flange ANSI B 16.5, 1/2" - 4", class 600 - class 2,500<br>Weld stub 1/2" - 1"<br>Threaded bushing G/NPT 1/2" - 1"<br>Threaded nipple G/NPT 1/2" - 1" |
| Centre-to-centre distance | Min. 150 mm to max. 6,000 mm (larger distances on request) |
| Material | Stainless steel 1.4571 (Ø 60.3 x 3.91 mm, Ø 76.1 x 5 mm, Ø 71 x 7.5 mm, Ø 76.1 x 10 mm) or stainless steel 1.4404 (Ø 60.3 x 3.91 mm, Ø 60.3 x 5.54 mm, Ø 73 x 7.01 mm) |
| Nominal pressure | Max. 400 bar |
| Temperature range | -196 ... +450 °C |
| Float | Cylindrical float, model BFT-H, ball-segment float, model BFT-K or foam float, model BFT-F, see data sheet LM 10.02 |
| Magnetic display | Standard version, model BMD-S: < 200 °C<br>High-temperature version, model BMD-F: > 200 °C, see data sheet LM 10.03 |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05 |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 |
| Approvals | Ex c, GL, DNV, GOST-R |

Special versions on request

# Bypass level indicator, plastic version, model BNA-P

Bypass chamber and float from PVDF or PP



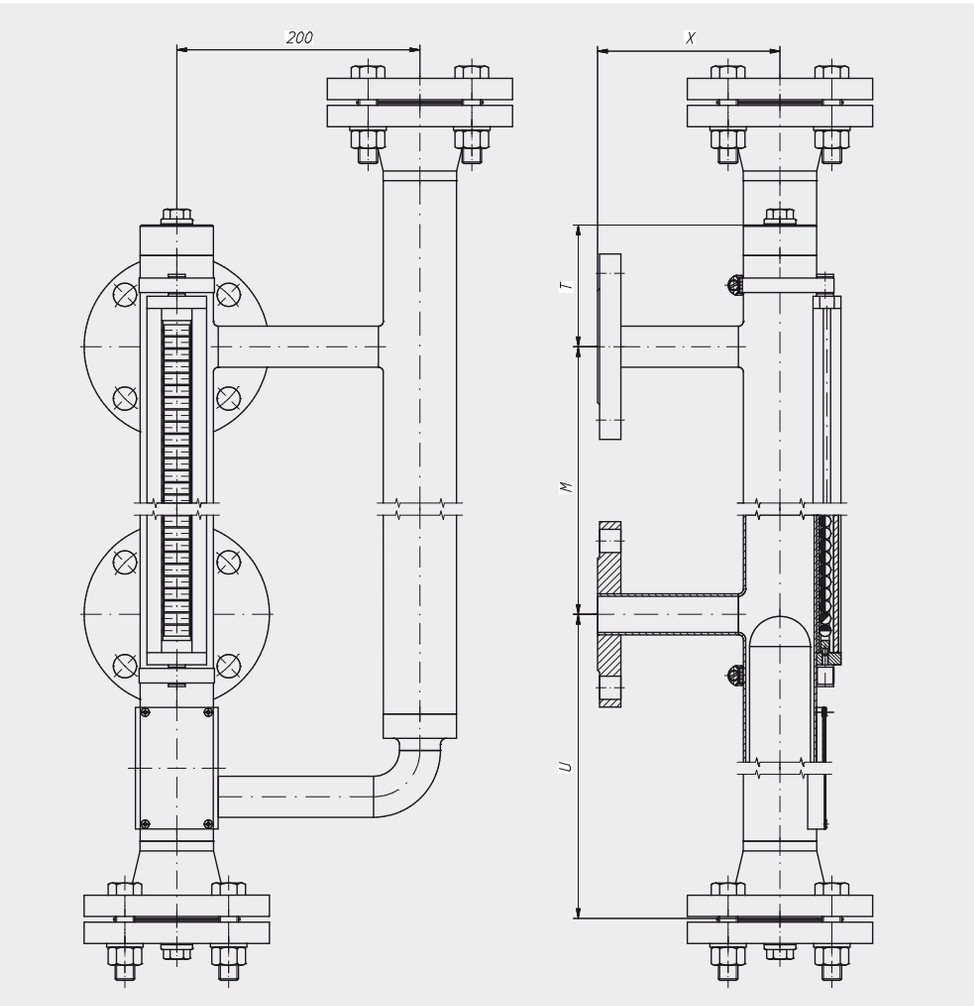

M = centre-to-centre distance of the process connections
U = float length (min. 155 mm)

| Specifications | |
|---|---|
| Bypass chamber | Ø 63 x 3 mm, max. 6 bar |
| Chamber end top | Welding cap, threaded connection<br>Options: (see page 14)<br>■ Vent screw<br>■ Vent valve<br>■ Vent flange |
| Chamber end bottom | Threaded connection<br>Options: (see page 14)<br>■ Drain plug<br>■ Drain valve<br>■ Drain flange |
| Process connections | 2 x lateral (options see page 15)<br>Flange EN 1092-1, DN 15 - DN 50, PN 16<br>Flange DIN, DN 15 - DN 50, PN 16<br>Flange ANSI B 16.5, 1/2" - 2", class 150<br>Weld stub 1/2" - 1"<br>Threaded bushing G/NPT 1/2" - 1"<br>Threaded nipple G/NPT 1/2" - 1" |
| Centre-to-centre distance | Min. 200 mm to max. 4,000 mm (larger distances on request) |
| Material | PVDF or PP |
| Nominal pressure | Max. 6 bar |
| Temperature range | PVDF: -10 … +100 °C<br>PP: -10 … +80 °C |
| Float | Plastic float, model BFT-P, see data sheet LM 10.02 |
| Magnetic display | Standard version, model BMD-S, see data sheet LM 10.03 |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05 |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 |
| Approvals | - |

Special versions on request

# Bypass level indicator, DUPlus version, standard, model BNA-SD

Bypass chamber from stainless steel




## Specifications

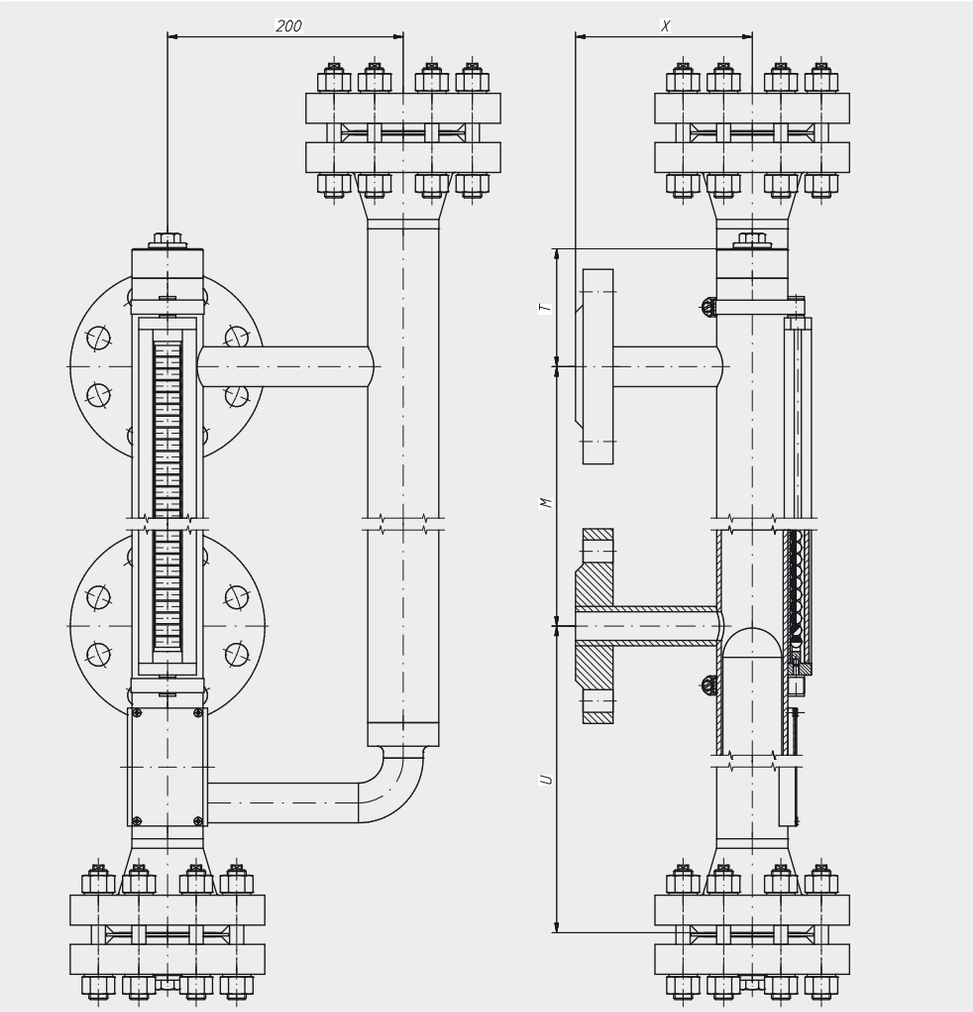
| | |
|---|---|
| Bypass chamber | Ø 60.3 x 2 mm, max. 40 bar<br>Ø 60.3 x 2.77 mm, max. 64 bar |
| Chamber end top | Flange connection<br>Options: (see page 14)<br>■ Vent screw<br>■ Vent valve<br>■ Vent flange |
| Chamber end bottom | Flat top or flange connection<br>Options: (see page 14)<br>■ Drain plug<br>■ Drain valve<br>■ Drain flange |
| Process connections | 2 x lateral (options see page 15)<br>Flange DIN, DN 10 - DN 100, PN 6 - PN 64<br>Flange ANSI B 16.5, 1/2" - 4",<br>class 150 - class 600<br>Weld stub 1/2" - 1"<br>Threaded bushing G/NPT 1/2" - 1"<br>Threaded nipple G/NPT 1/2" - 1" |
| External sensor connection | Flange EN 1092-1, DN 50, PN 6 - PN 64<br>Flange DIN, DN 50, PN 6 - PN 64<br>Flange ANSI B 16.5, 2" class 150 - class 600<br>Female thread G/NPT 3/4" - 2" |

| | |
|---|---|
| Centre-to-centre distance | Min. 150 mm to max. 6,000 mm<br>(larger distances on request) |
| Material | Stainless steel 1.4571, 1.4404 or 1.4401/1.4404 |
| Nominal pressure | Max. 64 bar |
| Temperature range | -196 ... +450 °C |
| Float | Cylindrical float, model BFT-H or corrugated float, model BFT-S, see data sheet LM 10.02 |
| Magnetic display | Standard version, model BMD-S: < 200 °C<br>High-temperature version, model BMD-F:<br>> 200 °C, see data sheet LM 10.03 |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05<br>Guided wave radar, model GTR, see data sheet LM 20.05 |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 |
| Approvals | Ex c, GOST-R |

Special versions on request

# Bypass level indicator, DUPlus version, high pressure, model BNA-HD

Bypass chamber from stainless steel



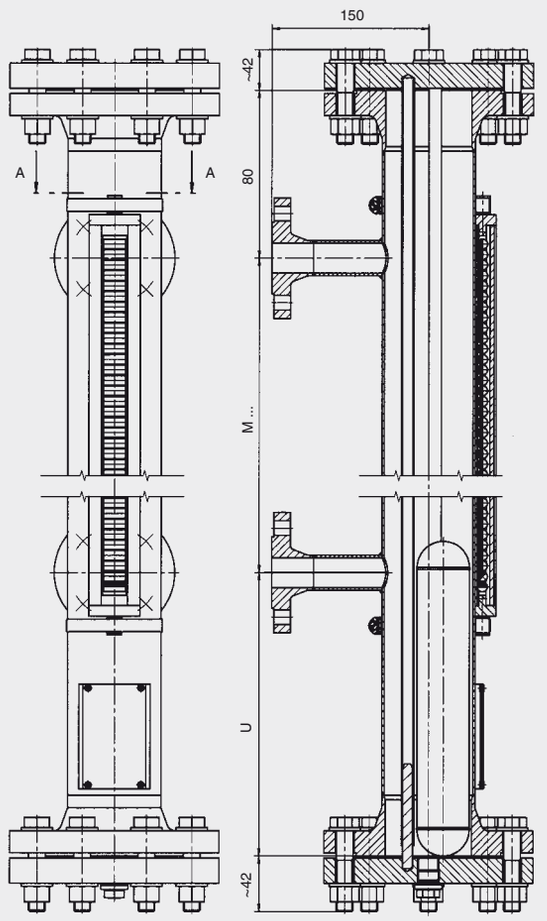

## Specifications

| | |
|---|---|
| Bypass chamber | Ø 60.3 x 3.91 mm, max. 160 bar |
| Chamber end top | Flange connection<br>Options: (see page 14)<br>■ Vent screw<br>■ Vent valve<br>■ Vent flange |
| Chamber end bottom | Flat top or flange connection<br>Options: (see page 14)<br>■ Drain plug<br>■ Drain valve<br>■ Drain flange |
| Process connections | 2 x lateral (options see page 15)<br>Flange DIN, DN 10 - DN 100, PN 64 - PN 160<br>Flange ANSI B 16.5, 1/2" - 4",<br>class 600 - class 1,500<br>Weld stub 1/2" - 1"<br>Threaded bushing G/NPT 1/2" - 1"<br>Threaded nipple G/NPT 1/2" - 1" |
| External sensor connection | Flange EN 1092-1, DN 50, PN 6 - PN 160<br>Flange DIN, DN 50, PN 6 - PN 160<br>Flange ANSI B 16.5, 2" class 150 - class 1,500<br>Female thread G/NPT 3/4" - 2" |
| Centre-to-centre distance | Min. 150 mm to max. 6,000 mm<br>(larger distances on request) |
| Material | Stainless steel 1.4571, 1.4404 or 1.4401/1.4404 |
| Nominal pressure | Max. 160 bar |
| Temperature range | -196 ... +450 °C |
| Float | Cylindrical float, model BFT-H, corrugated float, model BFT-S, ball-segment float, model BFT-K or foam float, model BFT-F, see data sheet LM 10.02 |
| Magnetic display | Standard version, model BMD-S: < 200 °C<br>High-temperature version, model BMD-F:<br>> 200 °C, see data sheet LM 10.03 |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05<br>Guided wave radar, model GTR, see data sheet LM 20.05 |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 |
| Approvals | Ex c, GOST-R |

Special versions on request

# Bypass level indicator, liquid gas/KOPlus version, model BNA-L

Bypass chamber from stainless steel



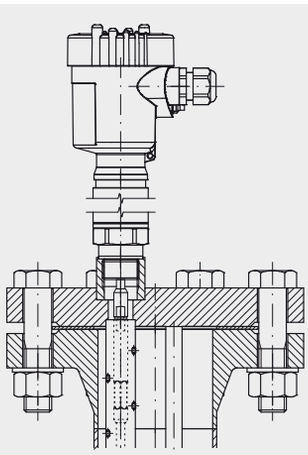

M = centre-to-centre distance of the process connections
U = float length (min. 220 mm)

## Specifications

| | |
|---|---|
| Bypass chamber | Ø 88.9 x 2 mm, max. 25 bar<br>Ø 88.9 x 2.9 mm, max. 40 bar |
| Chamber end top | Flange connection<br>Options: (see page 14)<br>■ Vent screw<br>■ Vent valve<br>■ Vent flange |
| Chamber end bottom | Flange connection<br>Options: (see page 14)<br>■ Drain plug<br>■ Drain valve<br>■ Drain flange |
| Process connections | 2 x lateral (options see page 15)<br>Flange EN 1092-1, DN 10 - DN 100, PN 6 - PN 63<br>Flange DIN, DN 10 - DN 100, PN 6 - PN 64<br>Flange ANSI B 16.5, 1/2" - 4", class 150 - class 600<br>Weld stub 1/2" - 1"<br>Threaded bushing G/NPT 1/2" - 1"<br>Threaded nipple G/NPT 1/2" - 1" |
| Centre-to-centre distance | Min. 150 mm to max. 6,000 mm (larger distances on request) |
| Material | Stainless steel 1.4571 (316Ti)<br>(Ø 88.9 x 2 mm, Ø 88.9 x 2.9 mm)<br>Stainless steel 1.4404 (316L) (Ø 88.9 x 2 mm) |
| Nominal pressure | Max. 40 bar |
| Temperature range | -60 ... +300 °C |
| Float | Cylindrical float, model BFT-H, see data sheet LM 10.02 |
| Magnetic display | Standard version, model BMD-S: < 200 °C<br>High-temperature version, model BMD-F:<br>> 200 °C, see data sheet LM 10.03 |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05<br>Guided wave radar, model GTR (for KOPlus version), see data sheet LM 20.05 |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 |
| Approvals | Ex c, GOST-R |

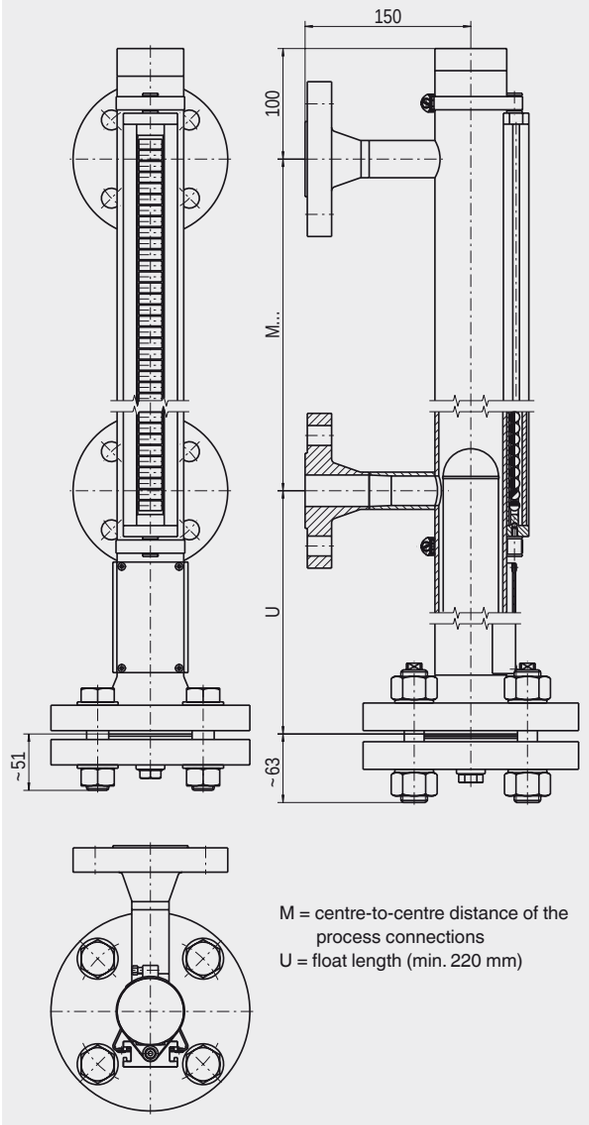
Special versions on request

**KOPlus version**



# Bypass level indicator, special materials, model BNA-X

Bypass chamber from Titanium, Hastelloy or stainless steel 6Mo




M = centre-to-centre distance of the process connections
U = float length (min. 220 mm)

## Specifications

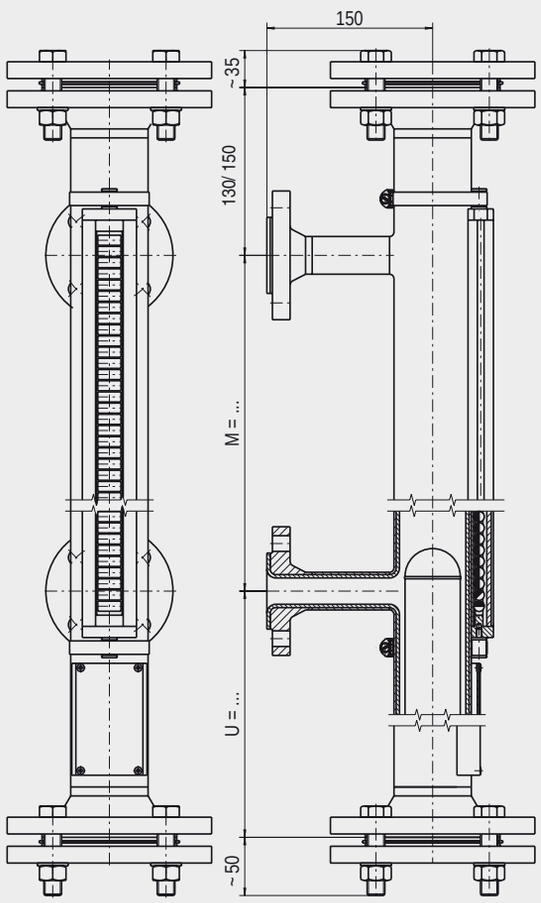
| | | | |
|---|---|---|---|
| Material [1] | Titanium 3.7035 | Hastelloy C276 | Stainless steel 6Mo 1.4547 (UNS S31254) |
| Bypass chamber | Ø 60.3 x 2 mm, max. 40 bar<br>Ø 60.3 x 2.77 mm, max. 64 bar | Ø 60.3 x 2.77 mm, max. 64 bar<br>Ø 60.3 x 3.91 mm, max. 160 bar | Ø 60.3 x 2.77 mm, max. 64 bar<br>Ø 60.3 x 3.91 mm, max. 160 bar<br>Ø 60.3 x 5.54 mm, max. 250 bar |
| Chamber end top | Flat top or flange connection<br>Options: (see page 14)<br>■ Vent screw<br>■ Vent valve<br>■ Vent flange | | |
| Chamber end bottom | Flange connection<br>Options: (see page 14)<br>■ Drain plug<br>■ Drain valve<br>■ Drain flange | | |
| Process connections (2 x lateral, options see page 15) | Flange EN 1092-1, DN 10 - DN 100, PN 6 - PN 63<br>Flange DIN, DN 10 - DN 100, PN 6 - PN 64<br>Flange ANSI B 16.5, 1/2" - 4", class 150 - class 600 | Flange EN 1092-1, DN 10 - DN 100, PN 6 - PN 400<br>Flange DIN, DN 10 - DN 100, PN 6 - PN 400<br>Flange ANSI B 16.5, 1/2" - 4", class 150 - class 2,500 | Flange EN 1092-1, DN 10 - DN 100, PN 63 - PN 400<br>Flange DIN, DN 10 - DN 100, PN 64 - PN 400<br>Flange ANSI B 16.5, 1/2" - 4", class 600 - class 2,500 |
| Centre-to-centre distance | Min. 150 mm to max. 6,000 mm (larger distances on request) | | |
| Nominal pressure | Max. 64 bar | Max. 160 bar | Max. 250 bar |
| Temperature range | -196 ... +450 °C | | |
| Float | Cylindrical float, model BFT-H or corrugated float, model BFT-S (titanium 3.7035 and stainless steel 1.4547), see data sheet LM 10.02 | | |
| Magnetic display | Standard version, model BMD-S: < 200 °C<br>High-temperature version, model BMD-F: > 200 °C, see data sheet LM 10.03 | | |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05 | | |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 | | |
| Approvals | Ex c, GL, DNV, GOST-R | Ex c, GL, DNV, GOST-R | Ex c, GOST-R |

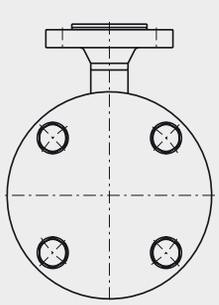
1) Other materials on request

Special versions on request

# Bypass level indicator, special materials, model BNA-X

Bypass chamber from stainless steel with internal coating E-CTFE, ETFE or PTFE



M = centre-to-centre distance of the process connections
U = float length (min. 200 mm)

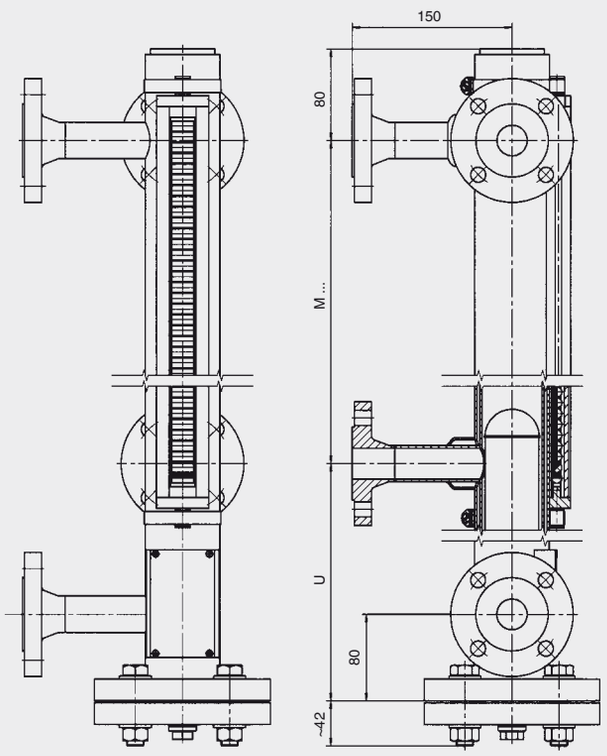
## Specifications

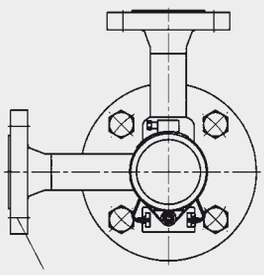
| | | | |
|---|---|---|---|
| Material | Stainless steel 1.4571 with internal coating | | |
| | E-CTFE | ETFE | PTFE |
| Bypass chamber | Ø 64 x 2 mm, max. 16 bar | Ø 70 x 2 mm, max. 16 bar | Ø 70 x 2 mm, max. 10 bar |
| Chamber end top | Flange connection<br>Options: (see page 14)<br>■ Vent flange | | |
| Chamber end bottom | Flange connection<br>Options: (see page 14)<br>■ Drain flange | | |
| Process connections | 2 x lateral (options see page 15)<br>Flange EN 1092-1, DN 10 - DN 50, PN 6 - PN 16<br>Flange DIN, DN 10 - DN 50, PN 6 - PN 16<br>Flange ANSI B 16.5, 1/2" - 4", class 150 - class 300 | | |
| Centre-to-centre distance | Min. 150 mm to max. ... mm<br>(overall pipe length max. 2,500 mm)<br>With overall pipe length > 2,500 mm: Bypass chamber separated by flange connection | | |
| Nominal pressure | Max. 16 bar | Max. 16 bar | Max. 10 bar |
| Temperature range | depending on the medium | | |
| Float | Cylindrical float, model BFT-H, see data sheet LM 10.02 | | |
| Magnetic display | Standard version, model BMD-S, see data sheet LM 10.03 | | |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05 | | |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 | | |
| Approvals | GOST-R | | |

Special versions on request

# Bypass level indicator, heating jacket version, model BNA-J

Bypass chamber and heating jacket pipe from stainless steel




M = centre-to-centre distance of the process connections
U = float length (min. 220 mm)

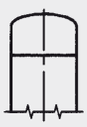

## Specifications

| | |
|---|---|
| Bypass chamber | Ø 60.3 x 2 mm, max. 40 bar<br>Ø 60.3 x 2.77 mm, max. 64 bar |
| Heating jacket pipe | Ø 70 x 2 mm |
| Chamber end top | Flat top<br>Options: (see page 14)<br>■ Vent screw<br>■ Vent valve<br>■ Vent flange |
| Chamber end bottom | Flange connection<br>Options: (see page 14)<br>■ Drain plug<br>■ Drain valve<br>■ Drain flange |
| Process connections | 2 x lateral (options see page 15)<br>Flange EN 1092-1, DN 10 - DN 100, PN 6 - PN 100<br>Flange DIN, DN 10 - DN 100, PN 6 - PN 100<br>Flange ANSI B 16.5, 1/2" - 4", class 150 - class 600<br>Weld stub 1/2" - 1"<br>Threaded bushing G/NPT 1/2" - 1"<br>Threaded nipple G/NPT 1/2" - 1" |
| Heating jacket connection | Flange EN 1092-1, DN 10 - DN 25, PN 6 - PN 40<br>Flange DIN, DN 10 - DN 25, PN 6 - PN 40<br>Flange ANSI B 16.5, 1/2" - 4", class 150 - class 300<br>Threaded bushing G/NPT 1/2" - 1"<br>Threaded nipple G/NPT 1/2" - 1" |
| Centre-to-centre distance | Min. 150 mm to max. 6,000 mm (larger distances on request) |
| Material | Stainless steel 1.4571 with bypass chamber Ø 60.3 x 2 mm (standard version)<br>Stainless steel 1.4404 with bypass chamber Ø 60.3 x 2.77 mm on request |
| Nominal pressure | Max. 64 bar |
| Temperature range | -60 ... +450 °C |
| Float | Cylindrical float, model BFT-H, see data sheet LM 10.02 |
| Magnetic display | Standard version, model BMD-S: < 200 °C<br>High-temperature version, model BMD-F: > 200 °C, see data sheet LM 10.03 |
| Level sensor | Reed sensor, model BLR, see data sheet LM 10.04<br>Magnetostrictive sensor, model BLM, see data sheet LM 10.05 |
| Magnetic switches | Magnetic switch, model BGU, see data sheet LM 10.06 |
| Approvals | Ex c, GL, GOST-R |

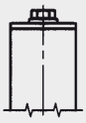
Special versions on request

## Option bypass chamber end

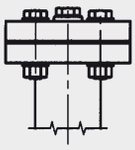
### Bypass chamber end top (examples)



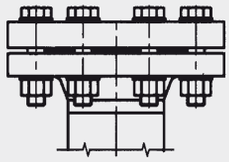
1
Flat top without venting



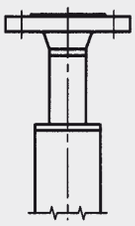
2
Flat top with vent plug G 1/2"



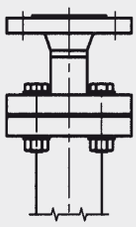
3
Flange connection with vent plug G 1/2"



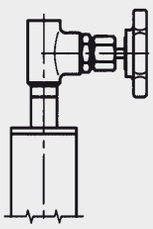
4
Flange connection e.g. sealing faces groove/tongue per DIN 2512



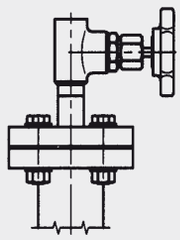
5
Flat top with vent flange



6
Flange connection vent flange



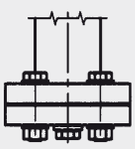
7
Flat top with vent valve



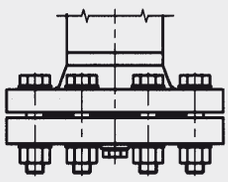
8
Flange connection with vent valve

Other ends on request

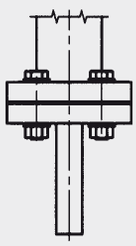
### Bypass chamber end bottom (examples)



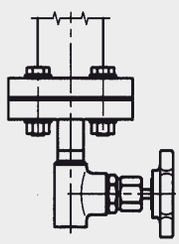
9
Flange connection with drain plug G/NPT 1/2"



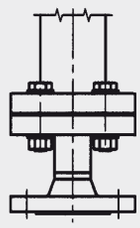
10
Flange connection e.g. sealing faces groove/ tongue per DIN 2512 with drain plug G 1/2"



11
Flange connection with drain nozzle



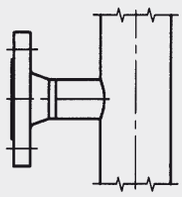
12
Flange connection with drain valve



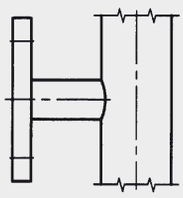
13
Flange connection with drain flange

Other ends on request

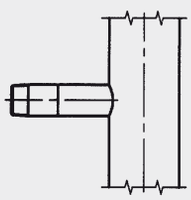
## Option process connection



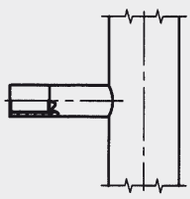
14
Welding neck flange
up to DN 25



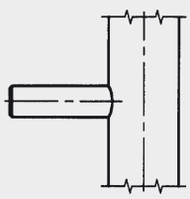
15
Blind flange
above DN 32



16
Threaded coupling
GN ... (male thread)

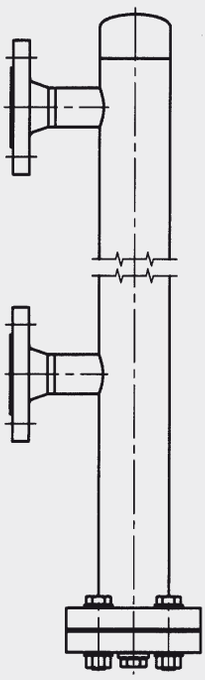


17
Threaded coupling
GM ... (female thread)

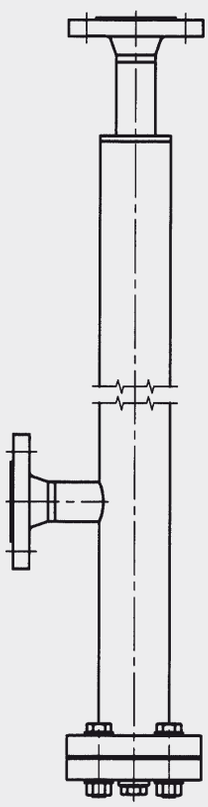


18
Weld stub S ...

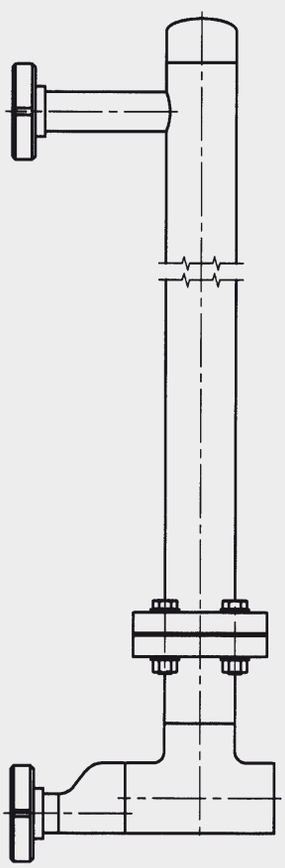
**Examples**



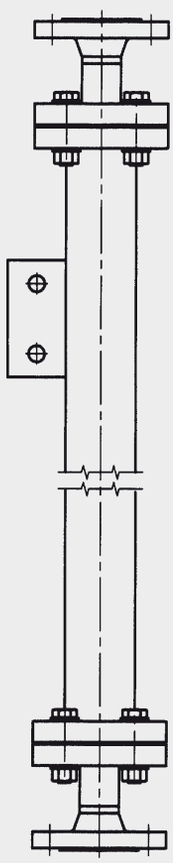
19
**Standard version**
Process connections
2 x lateral



20
1 process connection lateral
1 process connection vertical
(top)



21
2 process connections
to DIN 11851
Lower process connection via
eccentric reducer



22
2 process connections
vertical (top/bottom)
Option: Support bracket

Other connections on request

## CE conformity

**Pressure equipment directive**
97/23/EC, pressure accessory

**ATEX directive (option)**
94/9/EC, ignition protection type Ex c, zone 0/1, gas

## Approvals

- **GL**, ships, shipbuilding, offshore, Germany
- **DNV**, ships, shipbuilding, offshore, Norway
- **ABS**, ships, shipbuilding, offshore, USA
- **GOST**, national standard for Russia, Kazakhstan and Belarus

Approvals and certificates, see website

**Ordering information**
Model / Approval / Material / Process specifications (operating temperature and pressure, density) / Process connection / Centre-to-centre distance M ...

Detailed information on floats, magnetic displays, sensors (reed chains and magnetostrictive) and magnetic switches can be found in the following data sheets:

- Float, model BFT; see data sheet LM 10.02
- Magnetic display; model BMD; see data sheet LM 10.03
- Reed sensor; model BLR; see data sheet LM 10.04
- Magnetostrictive sensor; model BLM; see data sheet LM 10.05
- Guided wave radar, model GTR, see data sheet LM 20.05
- Magnetic switch; model BGU; see data sheet LM 10.06

# Appendix

## Cross Reference BNA

| Type | Description | Replaced Type |
|---|---|---|
| BNA-C | Compact version | BNA-../.. - M…-V42x2 - … |
| BNA-S | Standard version | BNA-../.. - M…-V60x..- ... (-Ex) |
| BNA-H | High-pressure version | BNA-../.. - M…-V..x..- ... (-Ex) |
| BNA-P | Plastic version | |
| | PVDF | BNA-../16 - M…-PF63x3 - ... |
| | PP | BNA-../16 - M…-PP63x3 - ... |
| BNA-SD | DUPlus version, standard | BNA-/DU../.. - M…-V60x2/60x2- ... |
| BNA-HD | DUPlus version, high pressure | BNA-/DU../.. - M…-V..x../..x..- ... |
| BNA-L | Liquid gas version | BNA-../.. - M…-V88x2 - ... |
| | KOPlus version | BNA/KO-../.. - M…-V88x2 - ... |
| BNA-X | Special version | |
| | E-CTFE-coated | BNA-../16 - M…-VEC64x2 - ... |
| | ETFE-coated | BNA-../16 - M…-VET70x2 - ... |
| | PTFE-coated | BNA-../16 - M…-VTF70x2 - ... |
| | Titanium 3.7035 | BNA-../.. - M…-T..x..- ... |
| | Hastelloy C276 | BNA-../.. - M…-HC..x..- ... |
| | 6Mo 1.4547 (UNS S31254) | BNA-../.. - M…-Mo..x..- ... |
| BNA-J | Heating jacket version | BNA-../.. - M…-V60/70- ... |

## Type Code

| Code | | | | | | |
|---|---|---|---|---|---|---|
| **1** | | **Basic type** | | | | |
| | BNA | Magnetic Level Indicator | | | | |
| **2** | | **Process connections** | | | | |
| | | 1st Key<br>Nom. size | 2nd Key<br>Nom. pressure | | 3rd Key<br>Flange face | |
| .../.../... | EN... | EN 1092 DN 10 - DN 100 | ... | PN6 - PN400 | ... | Form B1, B2, C, D |
| | ... | DIN DN 10 - DN 100 | | PN6 - PN400 | | Form, C, N, F |
| | ... | ANSI 1/2“ - 4“ | | Class 150 - Class 400 | | Form RF, SF, FF, RTJ |
| | JIS... | JIS DN 10 - DN 100 | | 5 K - 63 K | | Form RF, SF, FF, RTJ |
| | GN... | Thread male DIN | | | | |
| | GM... | Thread female DIN | | | | |
| | NPTN... | Thread male NPT | | | | |
| | NPTM... | Thrread female NPT | | | | |
| | S... | Welding stubs | | | | |
| **3** | | **Option: Level sensor** | | | | |
| ... | MG | Basic type without optional code | | | | |
| **4** | | **Distance centre-to-centre** | | | | |
| ... | M... | Distance between fl ange centres in mm | | | | |
| **5** | | **Material and chamber dimensions** | | | | |
| | | 1st Key<br>Material | | | 2nd Key<br>Chamber dimensions | |
| .../..x.. | V | Stainless steel 1.4571 | HC | Hastelloy C | ..x.. | Chamber OD x Wall thickness in mm |
| | L | Stainless steel 1.4404 | MO | SS 1.4529 (6Mo) | | |
| | VE | Stainless steel electro-polished | M | Monel | | |
| | VTF | Stainless steel PTFE-lined | PP | Polypropylene | | |
| | VET | Stainless steel E-TFE-coated | PF | PVDF | | |
| | VEC | Stainless steel E-CTFE-coated | | | | |

| 6 | | Magnetic Roller Display | | |
|---|---|---|---|---|
| | | 1st Key<br>Design | 2nd Key<br>Scale | |
| .../... | MRA | Aluminium case with plastic rollers | SK. | with scale (plastic), graduation in cm (printed) |
| | MRK | Aluminium case with ceramic rollers | SA. | Aluminium scale graved |
| | MNAV | Stainless steel case with plastic rollers | SV. | Stainless steel graved |
| | MNKV | Stainless steel with ceramic rollers | P. | with sight glass extender (for insulations)) |
| | MRAV | Stainless steel case with T-slot and plastic rollers | | |
| | MRFV | Stainless steel case with T-slot and stainless steel flaps | | |

| 7 | | Option Magnetic Switches 1st Key Quantity | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 2nd Key<br>Design | | | 3rd Key<br>Cable length | | 4th Key<br>Options | |
| .../.../.../... | M. | BGU | MVE. | BGU-V-E | 1 | 1 m | R22 | Pre resistance R22 for PLC |
| | ME. | BGU-E | MVD. | BGU-V-Exd | 2 | 2 m | N | NAMUR circuit according DIN EN 60947-5-6 |
| | MS12 | BGU-M12 | MHT | BGU-AHT | 3 | 3 m | | |
| | MES12 | BGU-E-M12 | MVHT | BGU-VHT | ... | ... | | |
| | MA | BGU-A | MIL/H | BGU-AIL/H | | | | |
| | MAE | BGU-A-E | MAR | BGU-AR | | | | |
| | MD. | BGU-Exd | MAD | BGU-AD | | | | |
| | MV. | BGU-V | MAM | BGU-AM | | | | |

| 8 | | Float (cylindrical) 2nd Key Diameter/Length in mm | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1st Key<br>Material | | | 3rd Key<br>Pressure class | | 4th Key<br>Magnetic system | |
| Z..S.. | .V... | Stainless steel 1.4571 | .G... | Borosilicate glass | PN16 | PN16 | R48H | R48H |
| | .T... | Titanium 3.7035 | .VEC... | Stainless steel 1.4571 E-CTFE-coated | PN25 | PN25 | K92 | K92 |
| | .HC... | Hastelloy C | | | ... | ... | K74 | K74 |
| | .CF... | CF340 | .TEC... | Titanium 3.7035 E-CTFE-coated | | | A90 | A90 |
| | .PP... | Polypropylene | | | | | A110 | A110 |
| | .PF... | PVDF | | | | | A125 | A125 |

| 9 | | Approvals |
|---|---|---|
| ... | Ex | Ex-Design |

## Ordering Example

| | Basic type | | Connection size | | Option level sensor | | Distance centre-tocentre | | Material Chamber dimensions | | Magnetic roller display | | Option Magnetic switch | | Float design | | Certificates |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | - | 3 | - | 4 | - | 5 | - | 6 | - | 7 | - | 8 | - | 9 |
| | BNA | - | EN25/16/B1 | - | MG | - | M1500 | - | V60x2 | - | MRA / SK | - | 3 / M / 2 | - | ZVSS185... | - | |

# Float
# For bypass level indicators
# Model BFT

KSR data sheet BFT

## Applications

- Float for the monitoring of liquids in bypass level indicators
- Individual design and corrosion resistant materials make the products suitable for a broad range of applications
- Chemical, petrochemical, natural gas, offshore, shipbuilding, machine building, power generating equipment, power plants
- Process water and drinking water treatment, food industry, pharmaceutical industry

## Special features

- Sealed, pressure retaining design
- Density range from 340 kg/m$^3$
- Pressures up to 400 bar
- Medium temperatures from -196 ... +450 °C
- Versions for interface layer

**Fig. left: Corrugated float, model BFT-S**
**Fig. centre: Cylindrical float, model BFT-H**
**Fig. right: Plastic float, model BFT-P**

## Description

The model BFT float serves for the monitoring of liquids in bypass level indicators. The magnetic system built into the float transmits the liquid level, contact-free, to externally mounted displays, switches and sensors. Due to its omni-directional, radial magnetic field, a guide within the tube is not needed.

The design will depend on the application, chemical resistance and the 3 physical quantities of pressure, temperature and density.

**Fig. left: Foam float, model BFT-F**
**Fig. right: Ball-segment float, model BFT-K**

## Model overview

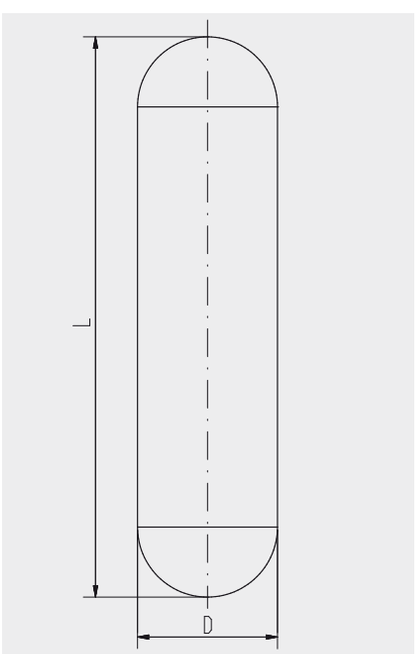
| Float | Material | Density range | Pressure range | Temperature range |
|---|---|---|---|---|
| **Cylindrical float, model BFT-H** | Stainless steel 1.4571 | > 470 kg/m³ | Vacuum ... 100 bar | -200 ... +450 °C |
| | Titanium 3.7035 | > 340 kg/m³ | | |
| **Corrugated float, model BFT-S** | Stainless steel 1.4571 | > 470 kg/m³ | Vacuum ... 25 bar | -50 ... +200 °C |
| | Titanium 3.7035 | > 340 kg/m³ | | |
| **Ball-segment float, model BFT-K** | Titanium 3.7065 | > 400 kg/m³ | Vacuum ... 250 bar | -200 ... +450 °C |
| **Plastic float, model BFT-P** | PP | > 590 kg/m³ | Vacuum ... 6 bar | -20 ... +80 °C |
| | PVDF | > 790 kg/m³ | | -50 ... +100 °C |
| **Foam float, model BFT-F** | Syntactic foam | > 750 kg/m³ | Vacuum ... 450 bar | -20 ... +100 °C |

## Classification of the floats

| Bypass level indicator | Suitable float | | | | |
|---|---|---|---|---|---|
| | Model BFT-S | Model BFT-H | Model BFT-P | Model BFT-F | Model BFT-K |
| **Standard version, model BNA-S** | x | x | | | |
| **High-pressure version, model BNA-H** | | x | | x | x |
| **Plastic version, model BNA-P** | | | x | | |
| **Compact version, model BNA-C** | | x | | | |
| **DUPlus version, model BNA-SD** | x | x | | | |
| **Heating jacket version, model BNA-SJ** | | x | | | |
| **Liquid gas/KOPlus version, model BNA-L** | | x | | | |

## Cylindrical float, model BFT-H32 (with order no.)

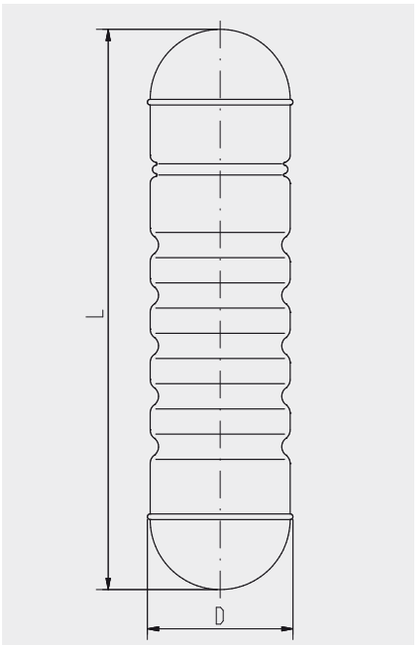
Permissible temperature: -200 ... +400 °C




| PN | Density range in kg/m³ | Diameter in mm | Length in mm | Material | Order no. |
|---|---|---|---|---|---|
| **16** | 1,270 ... 2,000 | 32 | 125 | Stainless steel (1.4571) | 506369 |
| | 1,090 ... 1,350 | 32 | 150 | Stainless steel (1.4571) | 030098 |
| | 940 ... 1,110 | 32 | 180 | Stainless steel (1.4571) | 029781 |
| | 850 ... 980 | 32 | 210 | Stainless steel (1.4571) | 100430 |
| | 780 ... 880 | 32 | 245 | Stainless steel (1.4571) | 110570 |
| | 730 ... 800 | 32 | 285 | Stainless steel (1.4571) | 032023 |
| **40** | 1,360 ... 2,000 | 32 | 125 | Stainless steel (1.4571) | 506374 |
| | 1,140 ... 1,400 | 32 | 155 | Stainless steel (1.4571) | 030108 |
| | 1,010 ... 1,180 | 32 | 185 | Stainless steel (1.4571) | 029808 |
| | 900 ... 1,020 | 32 | 225 | Stainless steel (1.4571) | 030107 |
| | 820 ... 910 | 32 | 265 | Stainless steel (1.4571) | 030106 |
| | 760 ... 830 | 32 | 315 | Stainless steel (1.4571) | 029828 |
| | 1,130 ... 2,000 | 32 | 125 | Titanium (3.7035) | 029834 |
| | 900 ... 1,100 | 32 | 160 | Titanium (3.7035) | 029835 |
| | 770 ... 900 | 32 | 200 | Titanium (3.7035) | 030104 |
| | 670 ... 770 | 32 | 240 | Titanium (3.7035) | 030293 |
| | 610 ... 680 | 32 | 290 | Titanium (3.7035) | 030090 |
| | 560 ... 620 | 32 | 350 | Titanium (3.7035) | 030743 |
| | 530 ... 570 | 32 | 420 | Titanium (3.7035) | 030101 |
| | 490 ... 530 | 32 | 510 | Titanium (3.7035) | 031537 |

## Corrugated float, model BFT-S50 (with order no.)

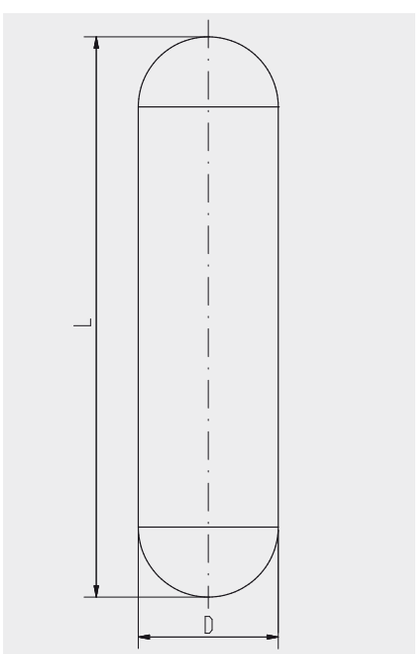
Permissible temperature: -50 ... +200 °C




| PN | Density range in kg/m³ | Diameter in mm | Length in mm | Material | Order no. |
|---|---|---|---|---|---|
| **25** | 990 ... 2,000 | 50 | 150 | Stainless steel (1.4571) | 029044 |
| | 830 ... 1,000 | 50 | 185 | Stainless steel (1.4571) | 029045 |
| | 730 ... 840 | 50 | 225 | Stainless steel (1.4571) | 029046 |
| | 640 ... 730 | 50 | 275 | Stainless steel (1.4571) | 029047 |
| | 590 ... 650 | 50 | 335 | Stainless steel (1.4571) | 029048 |
| | 550 ... 600 | 50 | 400 | Stainless steel (1.4571) | 031229 |
| | 520 ... 560 | 50 | 470 | Stainless steel (1.4571) | 031230 |
| | 490 ... 530 | 50 | 555 | Stainless steel (1.4571) | 031231 |
| | 470 ... 500 | 50 | 650 | Stainless steel (1.4571) | 031232 |
| | 820 ... 2,000 | 50.8 | 150 | Titanium (3.7035) | 031235 |
| | 710 ... 850 | 50.8 | 180 | Titanium (3.7035) | 030683 |
| | 600 ... 710 | 50.8 | 215 | Titanium (3.7035) | 030684 |
| | 540 ... 610 | 50.8 | 250 | Titanium (3.7035) | 029034 |
| | 480 ... 540 | 50.8 | 300 | Titanium (3.7035) | 029035 |
| | 430 ... 490 | 50.8 | 355 | Titanium (3.7035) | 029036 |
| | 400 ... 440 | 50.8 | 410 | Titanium (3.7035) | 029037 |
| | 380 ... 410 | 50.8 | 465 | Titanium (3.7035) | 029038 |
| | 370 ... 390 | 50.8 | 525 | Titanium (3.7035) | 029039 |
| | 360 ... 380 | 50.8 | 595 | Titanium (3.7035) | 029040 |
| | 340 ... 370 | 50.8 | 680 | Titanium (3.7035) | 029041 |

## Cylindrical float, model BFT-H

Permissible temperature: -200 ... +450 °C

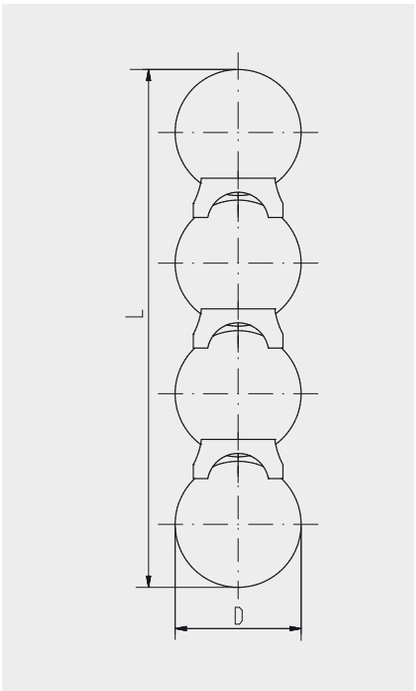



**Material:** Stainless steel 1.4571
**Diameter:** 50 mm
**Length:** 150 ... 650 mm (depending on pressure, density and temperature)
**Weight:** depending on pressure, density and temperature
**Magnetic system:** depending on pressure, density and temperature
**Nominal density:** depending on pressure, density and temperature
**Density range:** depending on pressure, density and temperature
**Max. pressure:** < 40 bar

**Material:** Titanium 3.7035
**Diameter:** 45, 50.8 or 60 mm
**Length:** 150 ... 650 mm (depending on pressure, density and temperature)
**Weight:** depending on pressure, density and temperature
**Magnetic system:** depending on pressure, density and temperature
**Nominal density:** depending on pressure, density and temperature
**Density range:** depending on pressure, density and temperature
**Max. pressure:** < 100 bar

## Ball-segment float, model BFT-K

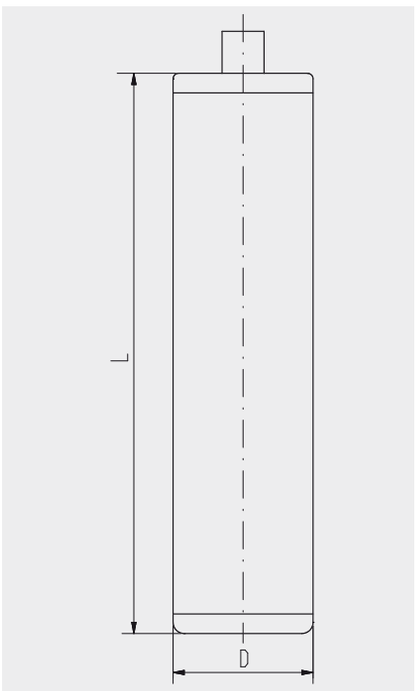
Permissible temperature: -200 ... +450 °C




| | |
|---|---|
| **Material:** | Titanium 3.7065 |
| **Diameter:** | 45, 50.8 or 60 mm |
| **Length:** | 150 ... 700 mm (depending on pressure, density and temperature) |
| **Weight:** | depending on pressure, density and temperature |
| **Magnetic system:** | depending on pressure, density and temperature |
| **Nominal density:** | depending on pressure, density and temperature |
| **Density range:** | depending on pressure, density and temperature |
| **Max. pressure:** | < 250 bar |

## Plastic float, model BFT-P

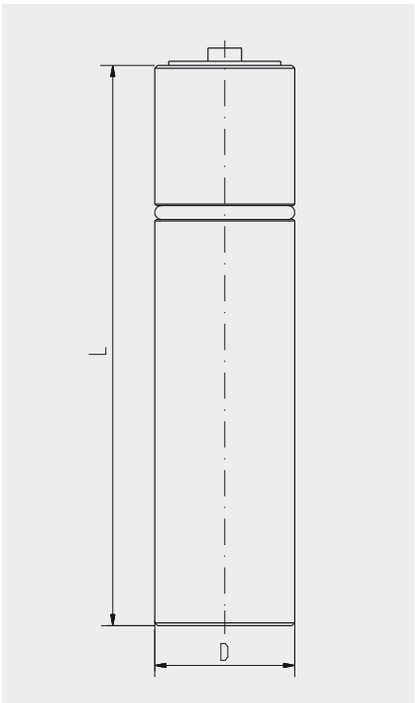
Permissible temperature: -20 ... +80 °C (PP), -50 ... +100 °C (PVDF)




| | |
|---|---|
| **Material:** | PP or PVDF |
| **Diameter:** | 50 mm |
| **Length:** | 150 ... 450 mm (depending on pressure, density and temperature) |
| **Weight:** | depending on pressure, density and temperature |
| **Magnetic system:** | depending on pressure, density and temperature |
| **Nominal density:** | depending on pressure, density and temperature |
| **Density range:** | depending on pressure, density and temperature |
| **Max. pressure:** | < 6 bar |

## Foam float, model BFT-F

Permissible temperature: -20 ... +100 °C




| | |
|---|---|
| **Material:** | Syntactic foam |
| **Diameter:** | 40 ... 80 mm |
| **Length:** | 150 ... 750 mm (depending on pressure, density and temperature) |
| **Weight:** | depending on pressure, density and temperature |
| **Magnetic system:** | depending on pressure, density and temperature |
| **Nominal density:** | depending on pressure, density and temperature |
| **Density range:** | depending on pressure, density and temperature |
| **Max. pressure:** | < 600 bar |

**Ordering information**

To order the described product the order number (if available) is sufficient.

Alternatively:
Model / Material / Diameter / Length / Pressure rating / Magnetic system / Interface layer

# Appendix

## Cross Reference BFT

| Replaced Type | Type | Description |
|---|---|---|
| ZVS | BFT-H | Cylindrical float, stainless steel |
| ZTS | BFT-H | Cylindrical float, titanium |
| ZVSS | BFT-S | Corrugated float, stainless steel |
| ZTSS | BFT-S | Corrugated float, titanium |
| ZPPS | BFT-P | Plastic float, PP |
| ZPFS | BFT-P | Plastic float, PVDF |
| ZFCS | BFT-F | Foam float |
| ZTKS | BFT-K | Ball-segment float |
| BG10xxx | Successor: BFT-. | Floats in various designs (Phönix).<br>Please contact our Customer Service. |

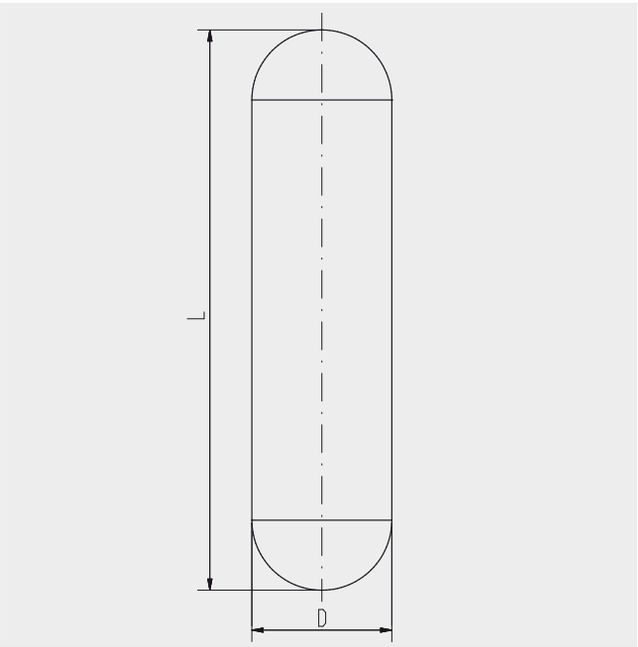
## Type Code

| Code | | |
|---|---|---|
| **1** | | **Basic type** |
| | ZVS | Cylindrical float, stainless steel |
| | ZTS | Cylindrical float, titanium |
| | ZVSS | Corrugated float, stainless steel |
| | ZTSS | Corrugated float, titanium |
| | ZPPS | Plastic float, PP |
| | ZPFS | Plastic float, PVDF |
| | ZFCS | Foam float |
| | ZTKS | Ball-segment float |
| **2** | | **Diameter** |
| | ... | in mm (omitted for OD 50 or 50,8) |
| **3** | | **Length** |
| | ... | in mm |
| **4** | | **Pressure stage** |
| | ... | in bar |
| **5** | | **Magnetic system** |
| | ... | |
| **6** | | **Interface float (omitted when not required)** |
| | ... | |

## Ordering Example

| | Basic type | | Diameter | | Length | | Pressure stage | | Magnetic system | | Interface |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | - | 3 | - | 4 | - | 5 | - | 6 |

## BFT-H32

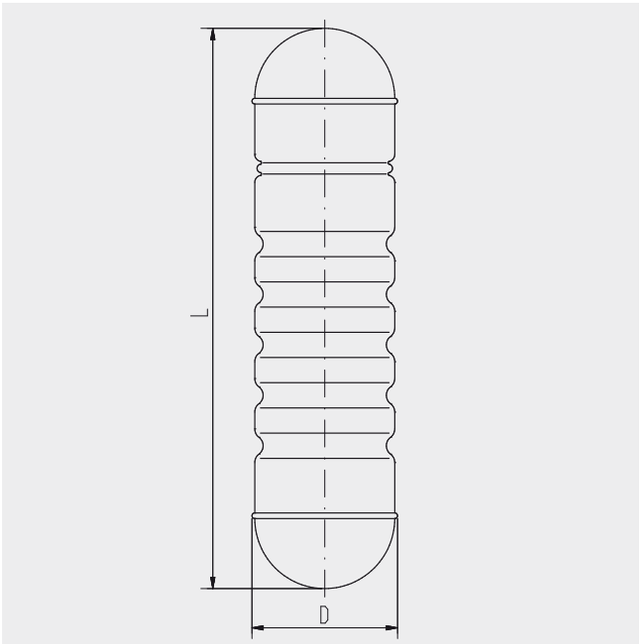



## Technical Specifications

Form: Cylindrical float
Temperature: -200 ... +400°C

| Type | PN | Density range [kg/m³] | Diameter [mm] | Length [mm] | Material | Order no. |
|---|---|---|---|---|---|---|
| ZVS32/125/PN16/A990 | 16 | 1270 – 2000 | 32 | 125 | Stainless steel (1.4571) | 506369 |
| ZVS32/150/PN16/A990 | 16 | 1090 – 1350 | 32 | 150 | Stainless steel (1.4571) | 030098 |
| ZVS32/180/PN16/A990 | 16 | 940 – 1110 | 32 | 180 | Stainless steel (1.4571) | 029781 |
| ZVS32/210/PN16/A990 | 16 | 850 – 980 | 32 | 210 | Stainless steel (1.4571) | 100430 |
| ZVS32/245/PN16/A990 | 16 | 780 – 880 | 32 | 245 | Stainless steel (1.4571) | 110570 |
| ZVS32/285/PN16/A990 | 16 | 730 – 800 | 32 | 285 | Stainless steel (1.4571) | 032023 |
| ZVS32/125/PN40/A990 | 40 | 1360 - 2000 | 32 | 125 | Stainless steel (1.4571) | 506374 |
| ZVS32/155/PN40/A990 | 40 | 1140 - 1400 | 32 | 155 | Stainless steel (1.4571) | 030108 |
| ZVS32/185/PN40/A990 | 40 | 1010 - 1180 | 32 | 185 | Stainless steel (1.4571) | 029808 |
| ZVS32/225/PN40/A990 | 40 | 900 - 1020 | 32 | 225 | Stainless steel (1.4571) | 030107 |
| ZVS32/265/PN40/A990 | 40 | 820 - 910 | 32 | 265 | Stainless steel (1.4571) | 030106 |
| ZVS32/315/PN40/A990 | 40 | 760 - 830 | 32 | 315 | Stainless steel (1.4571) | 029828 |
| ZTS32/125/PN40/A990 | 40 | 1130 - 2000 | 32 | 125 | Titanium (3.7035) | 029834 |
| ZTS32/160/PN40/A990 | 40 | 900 - 1100 | 32 | 160 | Titanium (3.7035) | 029835 |
| ZTS32/200/PN40/A990 | 40 | 770 - 900 | 32 | 200 | Titanium (3.7035) | 030104 |
| ZTS32/240/PN40/A990 | 40 | 670 - 770 | 32 | 240 | Titanium (3.7035) | 030293 |
| ZTS32/290/PN40/A990 | 40 | 610 - 680 | 32 | 290 | Titanium (3.7035) | 030090 |
| ZTS32/350/PN40/A990 | 40 | 560 - 620 | 32 | 350 | Titanium (3.7035) | 030743 |
| ZTS32/420/PN40/A990 | 40 | 530 - 570 | 32 | 420 | Titanium (3.7035) | 030101 |
| ZTS32/510/PN40/A990 | 40 | 490 - 530 | 32 | 510 | Titanium (3.7035) | 031537 |

# BFT-S50

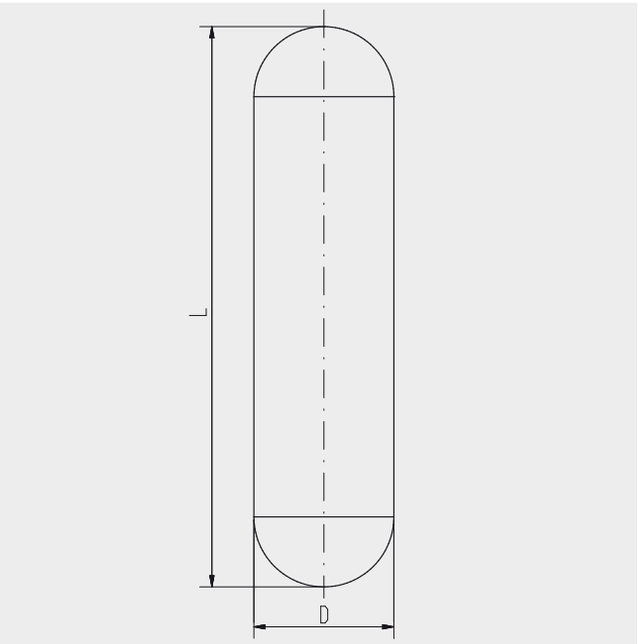



## Technical Specifications

Form: Corrugated float
Temperature: -50 ... +200°C

| Type | PN | Density range [kg/m³] | Diameter [mm] | Length [mm] | Material | Order no. |
|---|---|---|---|---|---|---|
| ZVSS150/PN25/R48H | 25 | 990 - 2000 | 50 | 150 | Stainless steel (1.4571) | 029044 |
| ZVSS185/PN25/R48H | 25 | 830 - 1000 | 50 | 185 | Stainless steel (1.4571) | 029045 |
| ZVSS225/PN25/R48H | 25 | 730 - 840 | 50 | 225 | Stainless steel (1.4571) | 029046 |
| ZVSS275/PN25/R48H | 25 | 640 - 730 | 50 | 275 | Stainless steel (1.4571) | 029047 |
| ZVSS335/PN25/R48H | 25 | 590 - 650 | 50 | 335 | Stainless steel (1.4571) | 029048 |
| ZVSS400/PN25/R48H | 25 | 550 - 600 | 50 | 400 | Stainless steel (1.4571) | 031229 |
| ZVSS470/PN25/R48H | 25 | 520 - 560 | 50 | 470 | Stainless steel (1.4571) | 031230 |
| ZVSS555/PN25/R48H | 25 | 490 - 530 | 50 | 555 | Stainless steel (1.4571) | 031231 |
| ZVSS650/PN25/R48H | 25 | 470 - 500 | 50 | 650 | Stainless steel (1.4571) | 031232 |
| ZTSS150/PN25/R48H | 25 | 820 - 2000 | 50,8 | 150 | Titanium (3.7035) | 031235 |
| ZTSS180/PN25/R48H | 25 | 710 - 850 | 50,8 | 180 | Titanium (3.7035) | 030683 |
| ZTSS215/PN25/R48H | 25 | 600 - 710 | 50,8 | 215 | Titanium (3.7035) | 030684 |
| ZTSS250/PN25/R48H | 25 | 540 - 610 | 50,8 | 250 | Titanium (3.7035) | 029034 |
| ZTSS300/PN25/R48H | 25 | 480 - 540 | 50,8 | 300 | Titanium (3.7035) | 029035 |
| ZTSS355/PN25/R48H | 25 | 430 - 490 | 50,8 | 355 | Titanium (3.7035) | 029036 |
| ZTSS410/PN25/R48H | 25 | 400 - 440 | 50,8 | 410 | Titanium (3.7035) | 029037 |
| ZTSS465/PN25/R48H | 25 | 380 - 410 | 50,8 | 465 | Titanium (3.7035) | 029038 |
| ZTSS525/PN25/R48H | 25 | 370 - 390 | 50,8 | 525 | Titanium (3.7035) | 029039 |
| ZTSS595/PN25/R48H | 25 | 360 - 380 | 50,8 | 595 | Titanium (3.7035) | 029040 |
| ZTSS680/PN25/R48H | 25 | 340 - 370 | 50,8 | 680 | Titanium (3.7035) | 029041 |

# BFT-H




## Technical Specifications

| Code 1<br>Basic type | Code 2<br>Diameter | Code 3<br>Length | Code 4<br>Pressure stage | Code 5<br>Magnetic system | [Code 6<br>Interface] |
|---|---|---|---|---|---|
| ZVS | [omitted] | ... | PN ... | ... | [...] |

s. Type code

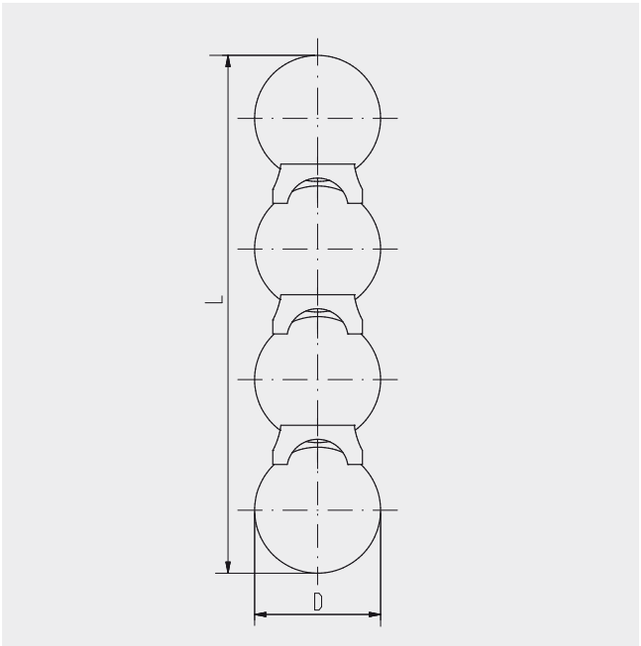
Design and float specification depending on pressure, density and temperature.

| | |
|---|---|
| Form: | Cylindrical float |
| Material: | Stainless steel 1.4571 |
| Diameter: | 50 mm |
| Length: | 150 – 650 mm (depends on pressure, density and temperature) |
| Max. pressure: | < 40 bar |
| Temperature: | -200 ... +450°C |

| Code 1<br>Basic type | Code 2<br>Diameter | Code 3<br>Length | Code 4<br>Pressure stage | Code 5<br>Magnetic system | [Code 6<br>Interface] |
|---|---|---|---|---|---|
| ZTS | ... | ... | PN ... | ... | [...] |

| | |
|---|---|
| Form: | Cylindrical float |
| Material: | Titanium 3.7035 |
| Diameter: | 45 / 50,8 / 60 mm |
| Length: | 150 – 650 mm (depends on pressure, density and temperature) |
| Max. pressure: | < 100 bar |
| Temperature: | -200 ... +450°C |

# BFT-K




## Technical Specifications

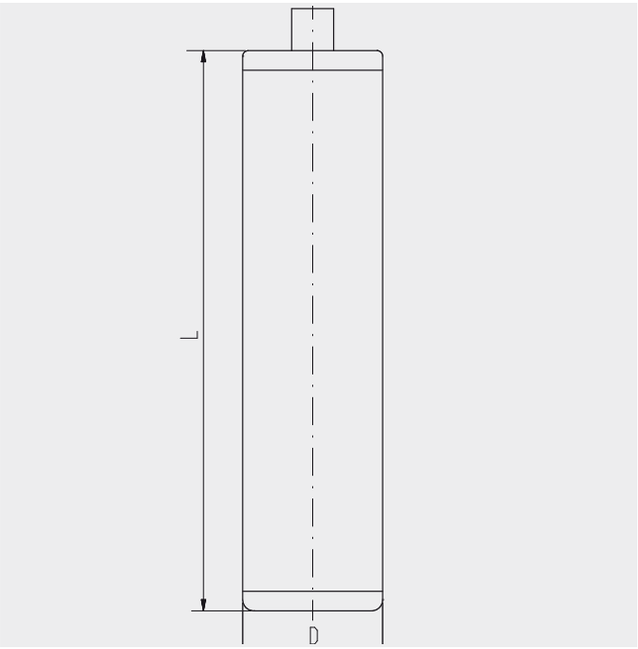
| Code 1<br>Basic type | Code 2<br>Diameter | Code 3<br>Length | Code 4<br>Pressure stage | Code 5<br>Magnetic system | [Code 6<br>Interface] |
|---|---|---|---|---|---|
| ZTKS | ... | ... | PN ... | ... | [...] |

s. Type code

Design and float specification depending on pressure, density and temperature.

| | |
|---|---|
| Form: | Ball-segment float |
| Material: | Titanium 3.7035 |
| Diameter: | 45 / 50,8 / 60 mm |
| Length: | 150 – 700 mm (depends on pressure, density and temperature) |
| Max. pressure: | < 250 bar |
| Temperature: | -200 ... +450°C |

# BFT-P




## Technical Specifications

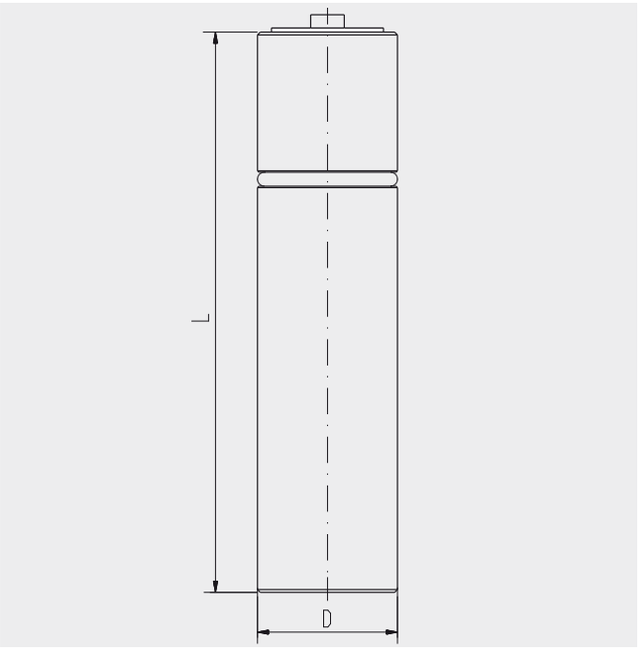
| Code 1<br>Basic type | Code 2<br>Diameter | Code 3<br>Length | Code 4<br>Pressure stage | Code 5<br>Magnetic system | [Code 6<br>Interface] |
|---|---|---|---|---|---|
| ZPPS<br>ZPFS | [omitted] | ... | PN ... | ... | [...] |

s. Type code

Design and float specification depending on pressure, density and temperature.

| | |
|---|---|
| Form: | Plastic float |
| Material: | PP / PVDF |
| Diameter: | 50 mm |
| Length: | 150 – 450 mm (depends on pressure, density and temperature) |
| Max. pressure: | < 6 bar |
| Temperature: | -20 ... +80°C (PP)<br>-50 ... +100°C (PVDF) |

# BFT-F




## Technical Specifications

| Code 1<br>Basic type | Code 2<br>Diameter | Code 3<br>Length | Code 4<br>Pressure stage | Code 5<br>Magnetic system | [Code 6<br>Interface] |
|---|---|---|---|---|---|
| ZFCS | ... | ... | PN ... | ... | [...] |

s. Type code

Design and float specification depending on pressure, density and temperature.

| | |
|---|---|
| Form: | Foam float |
| Material: | Syntactic Foam |
| Diameter: | 40 - 80 mm |
| Length: | 150 – 750 mm (depends on pressure, density and temperature) |
| Max. pressure: | < 600 bar |
| Temperature: | -20 ... +100°C |

# Magnetic display
# For bypass level indicators
# Model BMD

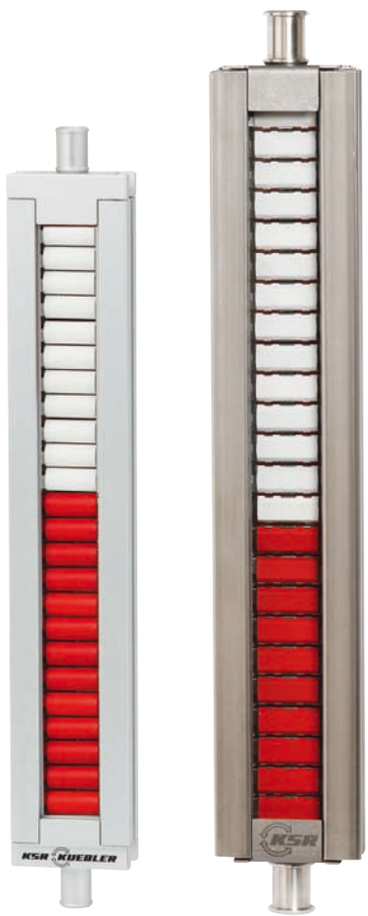


## Applications

- Display bar for the visualisation of levels in combination with bypass level indicators
- Individual design and corrosion resistant materials make the products suitable for a broad range of applications
- Chemical, petrochemical, natural gas, offshore, shipbuilding, machine building, power generating equipment, power plants
- Process water and drinking water treatment, food industry, pharmaceutical industry

## Special features

- Measured value display by means of rollers or flaps with permanent magnets
- Medium temperatures from -200 ... +450 °C
- Splash-proof
- Without power supply
- Hermetically sealed from the process



**Magnetic display**
**Fig. left: Plastic rollers, model BMD-SA**
**Fig. right: Stainless steel flaps, model BMD-FR**

## Description

The model BMD magnetic displays are used in combination with bypass level indicators for the display of levels. A magnetic system built into the float transmits the liquid level, contact-free, to the externally mounted display. In this are fitted, at 10 mm intervals, red/white plastic rollers or stainless steel flaps with bar magnets. Through the directional magnetic field of the permanent magnetic system in the bypass float, the magnetic rollers or flaps, through the wall of the bypass chamber, are turned through 180°.
For an increasing level from white to red; for a falling level from red to white. Thus the magnetic display indicates the level of a vessel as a red column, without power supply.

An integrated T-slot serves for the fastening of further attachment parts such as scales, sensors and switches.

For selecting the optimum magnetic display (plastic rollers/ stainless steel flaps, case, scale, measuring range etc.) we offer application-related technical advice.

## Model overview

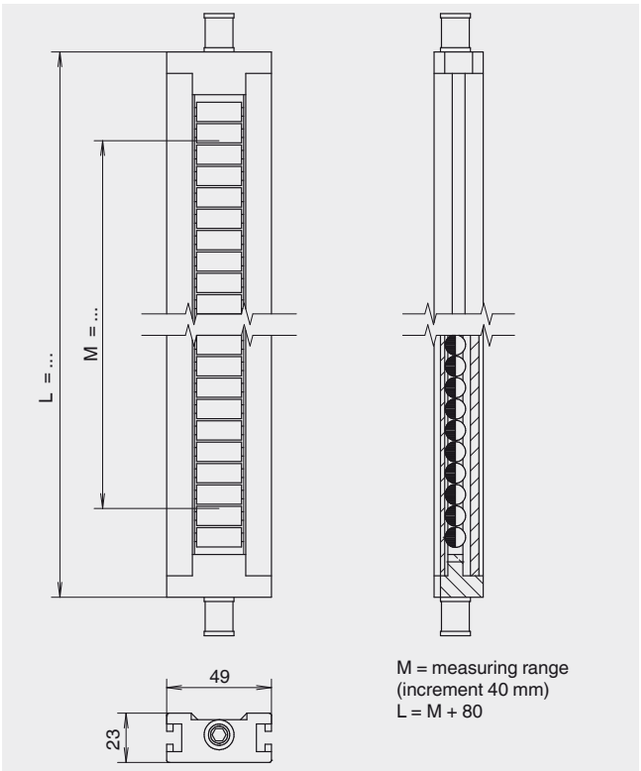
| Magnetic display model | Description |
|---|---|
| **BMD-SA** | Plastic rollers in aluminium case, with T-slot |
| **BMD-SR** | Plastic rollers in stainless steel case with T-slot |
| **BMD-FA** | Stainless steel flaps in aluminium case, with T-slot |
| **BMD-FR** | Stainless steel flaps in stainless steel case with T-slot |

## Options

- Scale with adhesive foil
- Scale engraved aluminium
- Scale engraved stainless steel
- Scale in cm, mm or %
- Special scale
- Acrylic sight glass extender for insulation at low temperatures
- Purge gas connection
- Display elements in the colours red, white, black and yellow (others on request)

## Magnetic display, plastic rollers in aluminium case, with T-slot, BMD-SA

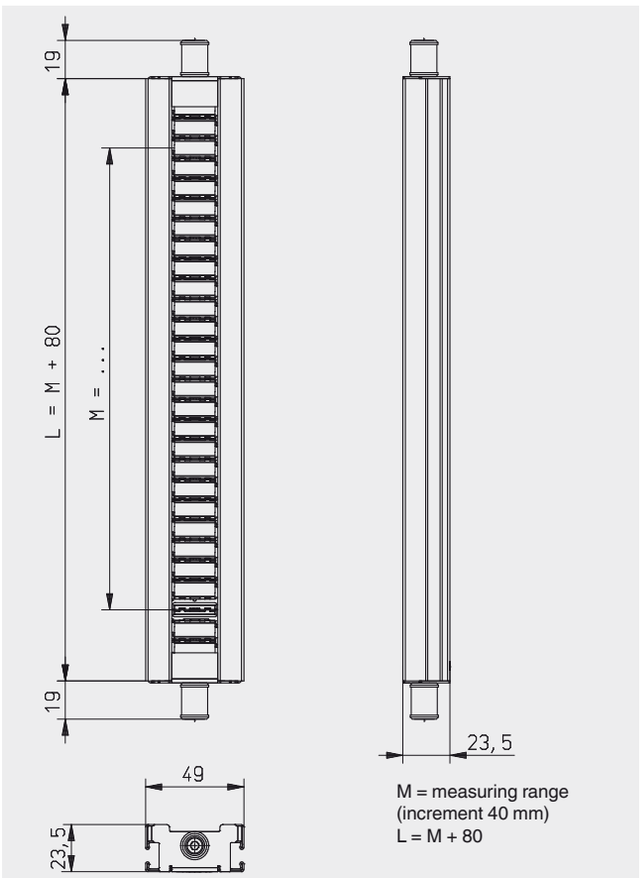
Permissible temperature: -50 ... +200 °C




| Specifications | |
|---|---|
| Case | Aluminium, anodised |
| Length L | 180 ... 6,000 mm |
| Display element | Plastic rollers, PBT, red/white |
| Indicator window | Polycarbonate |

## Magnetic display, plastic rollers in stainless steel case, with T-slot, BMD-SR

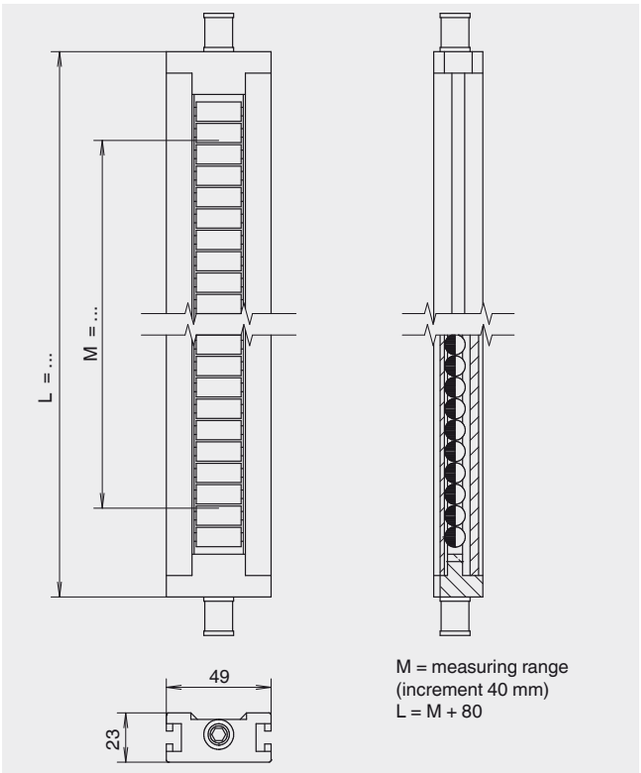
Permissible temperature: -50 ... +200 °C




| Specifications | |
|---|---|
| Case | Stainless steel |
| Length L | 180 ... 6,000 mm |
| Display element | Plastic rollers, PBT, red/white |
| Indicator window | Polycarbonate |

## Magnetic display, stainless steel flaps in aluminium case, with T-slot, BMD-FA

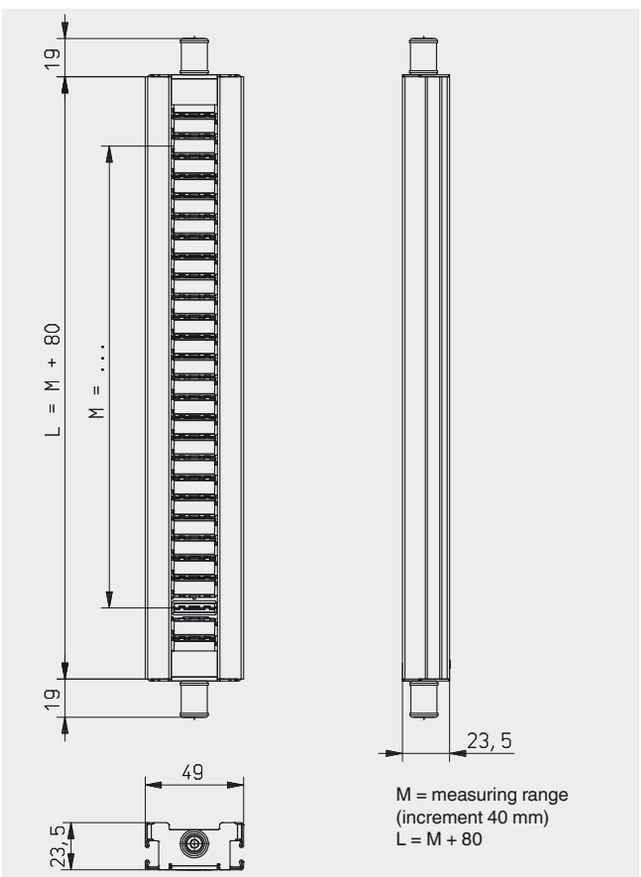
Permissible temperature: -200 ... +450 °C




| Specifications | |
|---|---|
| Case | Aluminium, anodised |
| Length L | 180 ... 6,000 mm |
| Display element | Stainless steel flaps, red/white |
| Indicator window | Glass |

## Magnetic display, stainless steel flaps in stainless steel case, with T-slot, BMD-FR

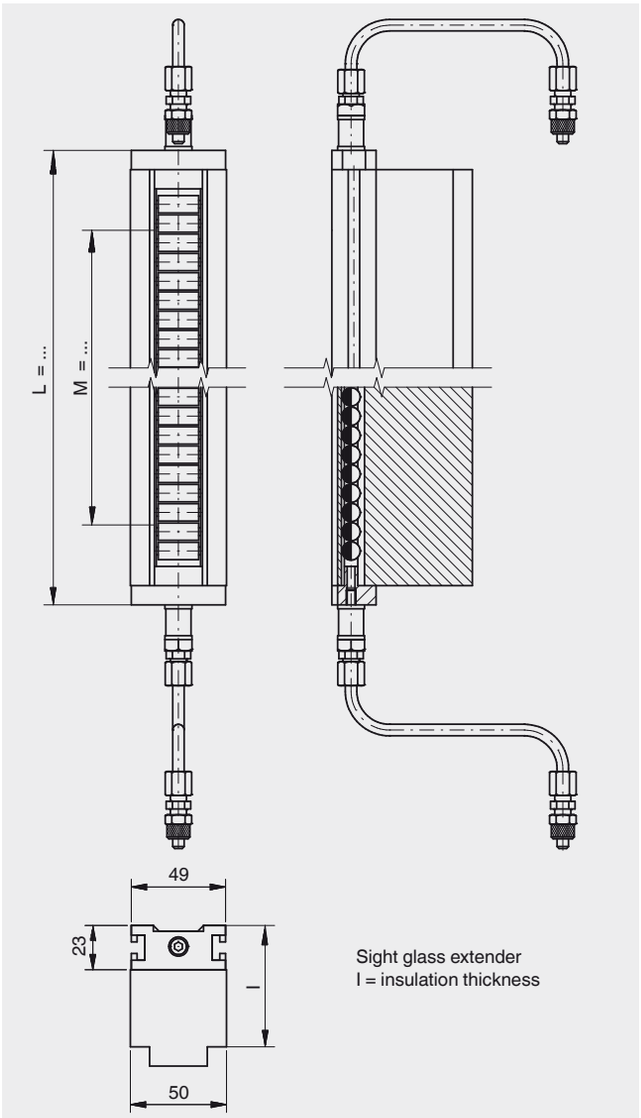
Permissible temperature: -200 ... +450 °C




| Specifications | |
|---|---|
| Case | Stainless steel |
| Length L | 180 ... 6,000 mm |
| Display element | Stainless steel flaps, red/white |
| Indicator window | Glass |

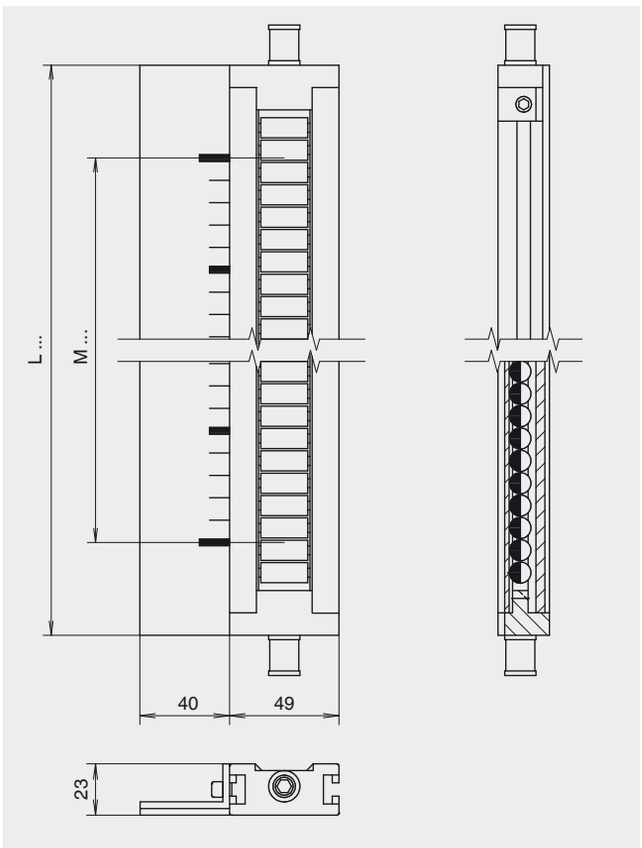
## Option

**With sight glass extender and purge gas connection**
**(with bypass chamber insulation)**




## Option

**Scale (adhesive foil, aluminium or stainless steel)**
**Aluminium with adhesive foil, cm-graduation**
**max. ambient temperature for the adhesive foil: 100 °C**
**Aluminium or stainless steel engraved, graduation selectable**




**Ordering information**
Model / Measuring range / Options

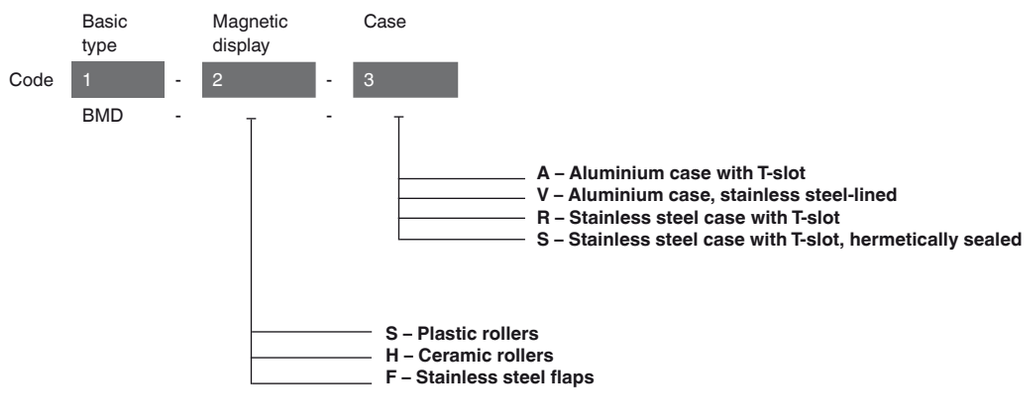
# Appendix

## Cross Reference BMD

| Former Type | Type | Replaced by | Description |
|---|---|---|---|
| MRA | BMD-SA | | Aluminium case with T-slot, plastic rollers |
| MRK* | BMD-HA* | BMD-FA | Aluminium case with T-slot, ceramic rollers |
| MRF | BMD-FA | | Aluminium case with T-slot, stainless steel flaps (new) |
| MNAV* | BMD-SV* | BMD-SR | Aluminium case stainless steel-lined, plastic rollers |
| MNKV* | BMD-HV* | BMD-FR | Aluminium case stainless steel-lined, ceramic rollers |
| MRAV | BMD-SR | | Stainless steel case with T-slot, plastic rollers (new) |
| MRFV | BMD-FR | | Stainless steel case with T-slot, stainless steel flaps (new) |
| | BMD-SS | | Stainless steel case with T-slot, plastic rollers, hermetically sealed (new) |
| | BMD-FS | | Stainless steel case with T-slot, stainless steel flaps, hermetically sealed (new) |
| AVG2* | | BMD-FS | Stainless steel rollers in glass tube, hermetically sealed (Phönix design) |
| AVG3* | | BMD-FA | Aluminium case, stainless steel rollers (Phönix design) |
| AVV2* | | BMD-FA | Aluminium case, stainless steel rollers (Vaihinger design) |

* obsolete

## Type Code



# Reed sensor
# For bypass level indicators
# Model BLR

KSR data sheet BLM

## Applications

- Sensor for continuous level measurement of liquids in bypass level indicators
- Chemical and petrochemical industries, oil and natural gas extraction (on- and offshore)
- Shipbuilding, machine building
- Power generating equipment, power plants
- Pharmaceutical, food, water treatment, environmental engineering industries

## Special features

- Installation of head-mounted transmitters in the connection housing possible
- Various contact separations selectable
- Programmable and configurable head-mounted transmitters for field signal 4 ... 20 mA, HART®, PROFIBUS® PA or FOUNDATION™ Fieldbus
- Explosion-protected versions
- Temperature ranges from -100 … +350 °C

**Reed sensor, model BLR-S**

## Description

The model BLR reed sensors are used for continuous monitoring and recording of the liquid level in connection with transmitters. They work on the float principle with magnetic transmission (permanent magnet, reed switch and resistance measuring chain) in a 3-wire potentiometer circuit.

A magnetic system built into the float actuates, through the walls of the bypass chamber and of the sensor tube, reed contacts at a resistance measuring chain (potentiometer). The measurement voltage generated by this is proportional to the fill level.

The resistance measuring chain is made up from reed contacts and resistors soldered onto a PCB. Depending on requirements and design several different contact separations from 5 to 18 mm are available.
For selecting the optimum sensor (sensor model, connection housing, electrical connection, sensor tube (material and total length), contact separation, head-mounted transmitter, measuring range, approval) we offer application-related technical advice.

## Model overview

| Sensor model | Description | Approval | | | | | | | Temperature range |
|---|---|---|---|---|---|---|---|---|---|
| | | without | Ex i | Ex d | GL | DNV | Ex i + GL | Ex i + DNV | |
| **BLR-S** | Reed sensor, standard | x | | | x | x | | | -50 ... +350 °C |
| **BLR-S-Ex i** | Reed sensor, intrinsically safe version Ex i | | x | | | | x | x | -50 ... +100 °C |
| **BLR-S-Ex d** | Reed sensor, explosion-protected version Ex d | | | x | | | | | -50 ... +100 °C |

## Ex approvals

| Explosion protection | Ignition protection type | Model | Zone | Approval number |
|---|---|---|---|---|
| ATEX | Ex i | BLR-S-Ex i | Zone 1, gas | KEMA 01ATEX1052 X II 2G Ex ia IIC T4 ... T6 Gb |
| | Ex d | BLR-S-Ex d | Zone 1, gas | TÜV 09 ATEX 7632 X II 2G Ex d IIC T6 |
| | Ex i + GL | BLR-S-Ex i | Zone 1, gas | KEMA 01ATEX1052 X II 2G Ex ia IIC T4 ... T6 Gb + GL 35949-87 HH |
| | Ex i + DNV | BLR-S-Ex i | Zone 1, gas | KEMA 01ATEX1052 X II 2G Ex ia IIC T4 ... T6 Gb + DNV A-11451 |

## Type approval

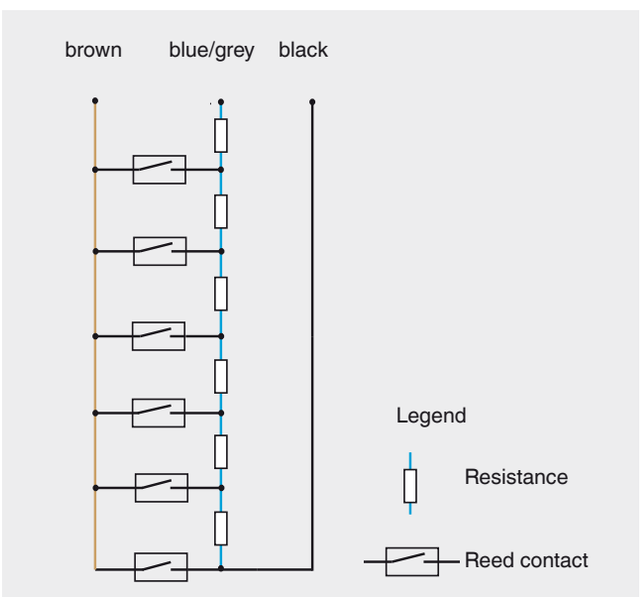
| Approval | Model | Approval number |
|---|---|---|
| GL | BLR-S | GL - 35 949 - 87 HH |
| DNV | BLR-S | DNV A-11451 |
| GOST-R | all | 0959333 |

Further approvals on request

## Options

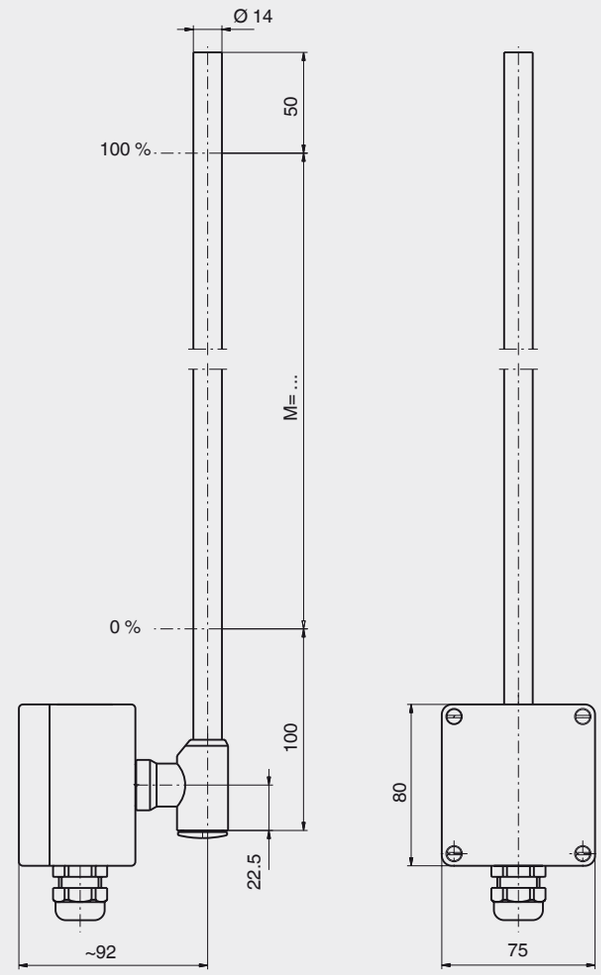
- 2-wire head-mounted transmitter in the connection housing
- Stainless steel connection housing with digital indicator

## Internal circuit diagram of the reed sensors

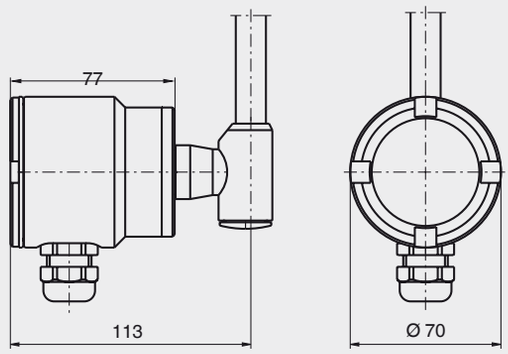


# Reed sensors, models BLR-S and BLR-S-Ex i

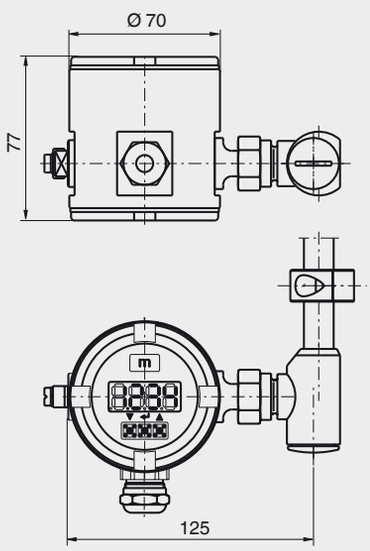
Aluminium and polyester connection housing




Stainless steel connection housing




Stainless steel connection housing with digital indicator (option)



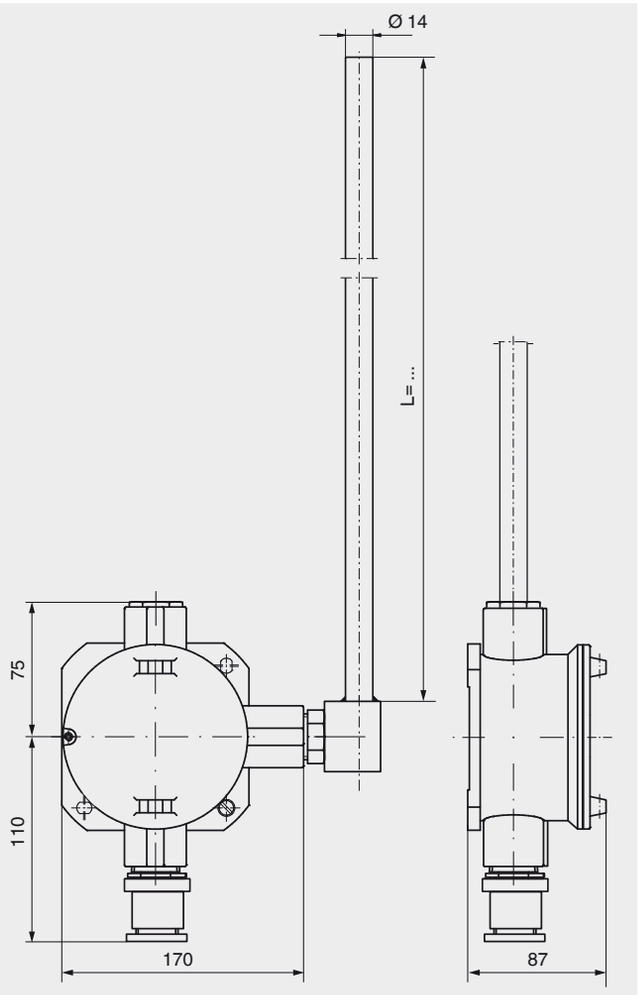

**Model BLR-S**

| Specifications | |
|---|---|
| Connection housing | Aluminium 80 x 75 x 57 mm<br>Polyester 80 x 75 x 55 mm<br>Stainless steel 1.4571 Ø 70 x 77 mm<br>Stainless steel 1.4571 with digital indicator Ø 70 x 77 mm |
| Sensor tube | Stainless steel 1.4571, tube Ø 14 x 1 mm |
| Contact separation | 18 mm, standard<br>15 mm, high temperature, low temperature<br>10 mm, standard, high temperature, low temperature<br>5 mm, standard, high temperature, low temperature |
| Overall resistance of the measuring chain | Length and separation dependent |
| Ambient temperature | Standard version -50 ... +100 °C<br>High temperature version -50 ... +200 °C<br>Low temperature version -100 ... +100 °C<br>Standard version with Microtherm® -50 ... +250 °C<br>High temperature version with Microtherm® -50 ... +350 °C |
| Ingress protection | Aluminium and polyester connection housing: IP 65<br>Stainless steel connection housing: IP 67 |

**Model BLR-S-Ex i**

| Specifications | |
|---|---|
| Connection housing | Aluminium 80 x 75 x 57 mm<br>Polyester 80 x 75 x 55 mm<br>Stainless steel 1.4571 Ø 70 x 77 mm<br>Stainless steel 1.4571 with digital indicator Ø 70 x 77 mm |
| Sensor tube | Stainless steel 1.4571, tube Ø 14 x 1 mm |
| Contact separation | 18 mm<br>10 mm<br>5 mm |
| Overall resistance of the measuring chain | 3.2 ... 50 kΩ |
| Max. permissible surface temperature at the sensor tube | T4 +100 °C<br>T5 +65 °C<br>T6 +50 °C |
| Ingress protection | Aluminium and polyester connection housing: IP 65<br>Stainless steel connection housing: IP 67 |
| Approval | Ex i |

# Reed sensor, model BLR-S-Ex d




## Specifications

| | | |
|---|---|---|
| Connection housing | Aluminium | 170 x 151 x 87 mm |
| Sensor tube | Stainless steel 1.4571, tube Ø 14 x 1 mm | |
| Contact separation | 18 mm<br>10 mm<br>5 mm | |
| Overall resistance of the measuring chain | Length and separation dependent | |
| Max. permissible surface temperature at the sensor tube | T4 +100 °C<br>T5 +65 °C<br>T6 +55 °C | |
| Ingress protection | IP 65 | |
| Approval | Ex d | |

## Head-mounted transmitter


**Model TE**


**Model T32E**


**Model T53F**


**Model TLEH**

| Model | 4 ... 20 mA | HART® | PROFIBUS® PA | Fieldbus™ | Exi | Display | Order no. |
|---|---|---|---|---|---|---|---|
| TE | x | | | | x | | 014832 |
| TS | x | | | | | | 005894 |
| T32E | x | x | | | x | | 025216 |
| T32S | x | x | | | | | 114795 |
| T53F | | | | x | x | | 025727 |
| T53P | | | x | | x | | 034422 |
| TLH | x | x | | | | x | 019989 |
| TLEH | x | x | | | x | x | 021104 |

## CE conformity

**Electromagnetic compatibility (EMC)**
2004/108/EC

**ATEX directive (option)**
94/9/EC, ignition protection type Ex i and Ex d, zone 1, gas

## Approvals

- **GL**, ships, shipbuilding, offshore, Germany
- **DNV**, ships, shipbuilding, offshore, Norway
- **GOST**, national standard for Russia, Kazakhstan and Belarus

Approvals and certificates, see website

**Ordering information**
To order the described product the order number (if available) is sufficient.

Alternatively:
Sensor model / Connection housing / Electrical connection / Sensor tube (material and total length) / Contact separation, head-mounted transmitter / Measuring range / Approval

# Appendix

## Cross Reference BLR

| Replaced Type | Type | Description |
|---|---|---|
| MG-A.VK../..L…/M…/14 | BLR-S | Level sensor reed, standard |
| MG-A.VK../..L…/M…/14-Ex | BLR-S-Ex i | Level sensor reed, intrinsically design Ex i |
| AF-ADF | BLR-S-Ex d | Level sensor reed, explosion proof design Ex d |

## Type code

| Code | | | | | | |
|---|---|---|---|---|---|---|
| **1** | | **Basic type** | | | | |
| | MG | Level sensor | | | | |
| **2** | | **Electrical connection (terminal box)** | | | | |
| ... | A | Aluminium - top | APL | Polyester - top (Ex-design) | AVG | Stainless steel - top with digital display |
| | AU | Aluminium - bottom | APLU | Polyester - bottom (Ex-design) | AVGU | Stainless steel - bottom with digital display |
| | AP | Polyester - top | AV4 | Stainless steel - top | | |
| | APU | Polyester - bottom | AV4U | Stainless steel - bottom | | |
| **3** | | **1st key<br>Material sensor tube** | **2nd key<br>Contact separation** | | **Optional code** | |
| .../ ... | V | Stainless steel | K18 | 18 mm | | Contact separation 5 / 10 / 15 mm only |
| | | | K15 | 15 mm | /HT.. | High temperature -50°C ... +350°C |
| | | | K10 | 10 mm | /TT.. | Low temperature -100°C ... +100°C |
| | | | K5 | 5 mm | | |
| **4** | | **(Option) Head mounted transmitter in terminal box** | | | | |
| ... | TS | 2-wire Standard | | | | |
| | TE | 2-wire Ex i | | | | |
| | TLH | 2-wire HART® with LCD display | | | | |
| | TLEH | 2-wire Ex i HART® with LCD display | | | | |
| | T32 | 2-wire Ex i HART® programmable | | | | |
| | T53P | Ex i Profibus PA programmable | | | | |
| | T53F | Foundation Fieldbus programmable | | | | |
| **5** | | **1st key<br>Sensor tube length** | **2nd key<br>Measuring range** | | **3rd key<br>Sensor tube dimensions** | |
| .../ .../ ... | L... | Length in mm | M... | Range in mm | 14 | OD Ø 14 mm |
| **6** | | **Optional code** | | | | |
| ... | Ex | Ex Control circuit EEx ib IIC or EEx ia IIC, resistance of measuring chain: 3.2 kOhm ... 50 kOhm | | | | |

## Ordering example

| | Basic type | | Electrical connection | | Material<br>Sensor tube<br>Contact separation | | Option<br>Head-mounted transmitter | | Sensor tube-length<br>Measuring range<br>Sensor tube-dimensions | | Optional code |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | - | 3 | - | 4 | / | 5 | - | 6 |
| | MG | - | AU | - | VK10 | - | TE | / | L1650 / M1500 / 14 | - | Ex |

# Magnetostrictive sensor
# For bypass level indicators
# Model BLM

KSR data sheet BLM

## Applications

- Sensor for continuous level measurement of liquids in bypass level indicators
- Chemical, petrochemical, offshore industries
- Shipbuilding, machine building
- Power generating equipment, power plants
- Pharmaceutical, food, water treatment, environmental engineering industries

## Special features

- Continuous level measurement on the outside of the bypass
- 2-wire technology 4 ... 20 mA
- Measured value output via digital interface and a selectable measured value as analogue signal
- Case from stainless steel (display from glass)
- Magnetostrictive level measuring instrument with high resolution

**Magnetostrictive sensor, model BLM**

## Description

Level sensors with a magnetostrictive, high-resolution measuring principle are used for continuous level measurement of liquids and are based on determining the position of a magnetic float following the magnetostrictive measuring principle. The sensors are mounted on the outside of a bypass level indicator.

The measuring process is triggered by a current impulse. This current produces a circular magnetic field along a wire made of magnetostrictive material, which is held under tension inside the sensor tube. At the point being measured (liquid level) there is a cylindrical float with permanent magnets acting as a position transducer, whose field lines run at right angles to the impulse magnetic field. This magnetic field of the float tensions the wire. The superposition of these two magnetic fields triggers a mechanical wave in the wire. This is converted into an electrical signal at the end of the wire in the sensor housing by a piezoceramic pick-up.

By measuring the elapsed transit time, it is possible to determine the start point of the torsional stress wave and therefore the float position with a high degree of accuracy.

## Model overview

| Sensor model | Description | Approval | | | | | Temperature range (process) |
|---|---|---|---|---|---|---|---|
| | | without | Ex i | Ex d | NEPSI Ex d | NEPSI nL | |
| **BLM-S** | Magnetostrictive sensor, standard | x | | | | | -60 ... +185 °C |
| **BLM-S-Ex i** | Magnetostrictive sensor, intrinsically safe version Ex i | | x | | | x | -60 ... +185 °C |
| **BLM-S-Ex d** | Magnetostrictive sensor, explosion-protected version Ex d | | | x | x | | -60 ... +185 °C |

| Level sensor model | Materials | | |
|---|---|---|---|
| | Stainless steel 1.4571 (316Ti) | Stainless steel 1.4404 (316L) | Titanium 3.7035 (grade 2) |
| **BLM-S** | x | x | x |
| **BLM-S-Ex i** | x | x | x |
| **BLM-S-Ex d** | x | x | x |

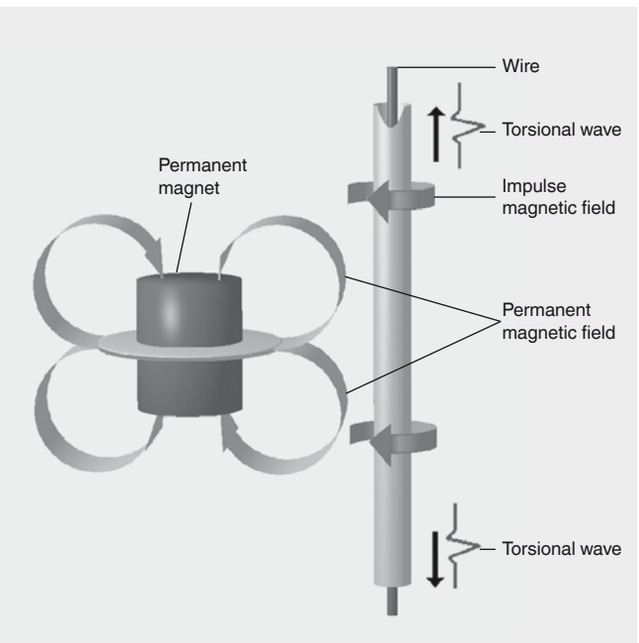
## Ex approvals

| Explosion protection | Ignition protection type | Model | Zone | Approval number |
|---|---|---|---|---|
| ATEX | Ex i | BLM-S-Ex i | Zone 1 | ZELM 10 ATEX 0439 II 1/2G Ex ia IIC T3 to T6 |
| | Ex d | BLM-S-Ex d | Zone 1 | ZELM 13 ATEX 0508 X II 1/2G Ex d IIB T3 to T6 Ga Gb |
| NEPSI | NEPSI Ex d | BLM-S-Ex d | Zone 1 | GYJ101053 Ex d II CT3-T6 |
| | NEPSI nL | BLM-S-Ex i | Zone 1 | - |

## Type approval

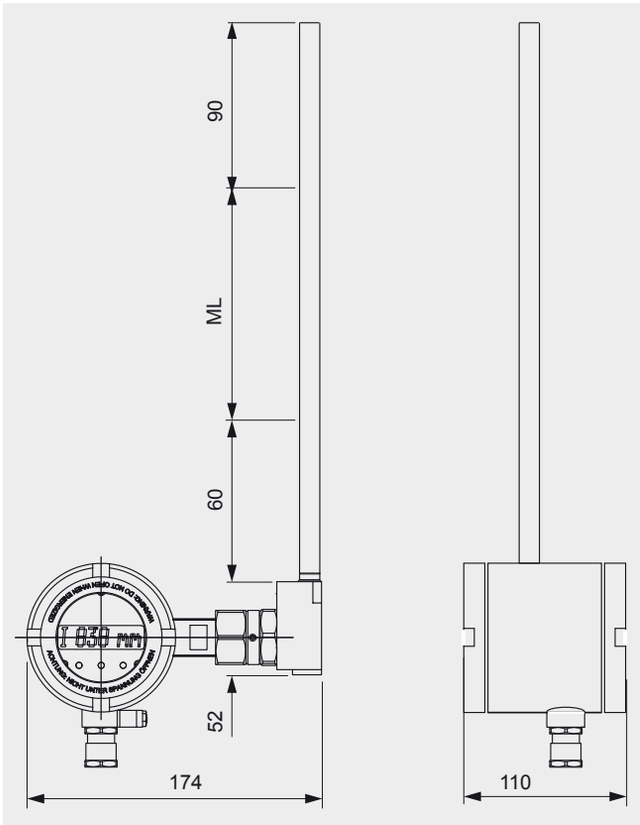
| Explosion protection | Model | Approval number |
|---|---|---|
| GOST-R | BLM-S (FFG-BP) | 0959333 |

### Illustration of the principle



# Magnetostrictive sensor, model BLM

| Specifications | |
|---|---|
| Connection housing (sensor housing) | Stainless steel 1.4404<br>Version with or without display, with window |
| Sensor tube | Stainless steel 1.4571, tube Ø 12 mm, tube length L max. 5,800 mm |
| Temperature range | Medium temperature: -60 ... +185 °C<br>Ambient temperature:<br>- Version without display: -40 ... +85 °C<br>- Version with display: -20 ... +70 °C<br>- Version Ex i: T3/T4/T5/T6 -20 °C ... +70/+70/+70/+60 °C<br>- Version Ex d: T3/T4/T5/T6 -40 °C ... +70/+70/+70/+60 °C |
| Output signal | 4 ... 20 mA, HART® |
| Power supply | DC 10 ... 30 V |
| Measuring accuracy | < ±0.5 mm |
| Resolution | < 0.1 mm |
| Load | max. 900 Ω at 30 V |
| Mounting position | Vertical ±30° |
| Ingress protection | IP 67 |




**Ordering information**

To order the described product the order number (if available) is sufficient.

Alternatively:

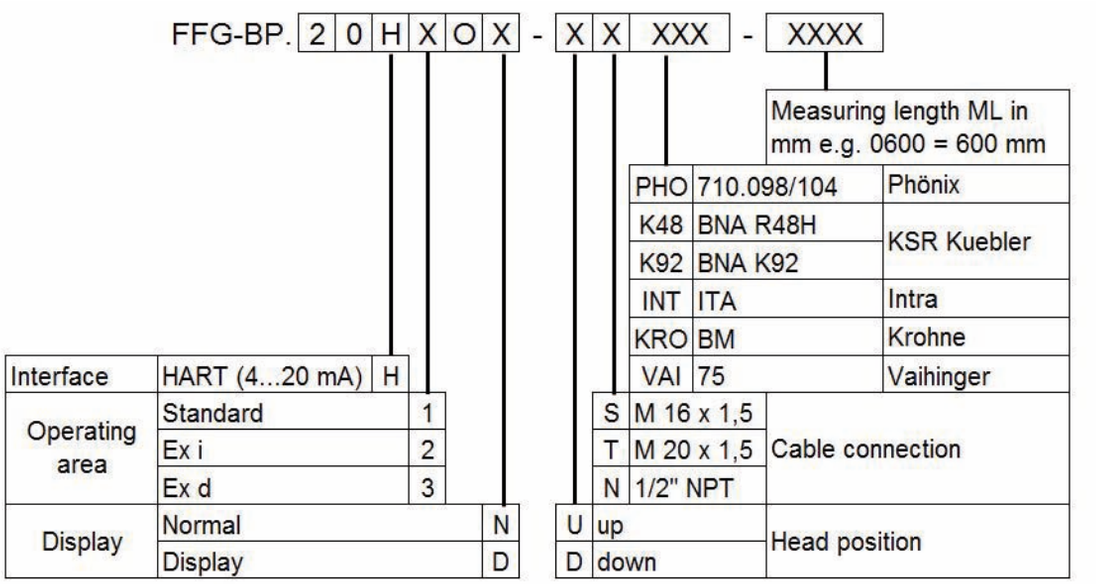
Sensor model / Connection housing / Electrical connection / Sensor tube (material and total length) / Contact separation, head-mounted transmitter / Measuring range / Approval

# Appendix

## Cross Reference BLM

| Replaced Type | Type | Description |
|---|---|---|
| FFG-BP | BLM-S | Magnetostrictive sensor, standard |
| FFG-BT | BLM-S | Magnetostrictive sensor, high temperature |
| 746.2xxx | Successor: BLM-S | Magnetostrictive sensor (Phönix design) |

## Type Code FFG-BP




## Type Code FFG-BT

| Code | | | | | | | |
|---|---|---|---|---|---|---|---|
| **1** | | **Basic type** | | | | | |
| | FFG-BT | | | | | | |
| **2** | | **Transmitter housing** | | | | | |
| | V | Transmitter housing and guide tube stainless steel | | | | | |
| **3** | | **Guide tube length** | | **Measuring range** | | **Diameter** | |
| .../.../... | L.../ | Length in mm | M.../ | Range in mm | ... | Tube OD | |
| **4** | | **Approvals** | | | | | |
| ... | Ex | Ex-Design | | | | | |

## Ordering Example

| | Basic type | | Transmitter housing | | Guide tube length measuring range / tube OD | | Approval |
|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | - | 3 | - | 4 |
| | FFG-BT | - | V | - | L950/M850/12 | - | Ex |

# Magnetic switch
# For bypass level indicators
# Model BGU



## Applications

- Magnetic switches for detecting the limits of filling levels in bypass level indicators
- Chemical and petrochemical industries, oil and natural gas extraction (on- and offshore)
- Shipbuilding, machine building
- Power generating equipment, power plants
- Pharmaceutical, food, water treatment, environmental engineering industries

## Special features

- Proper functioning, even under extreme environmental influences, e.g. dirt, humidity, gases, dust, chips
- Compact and operationally safe design
- Mounting of the switches with tightening strap or via T-slot at the magnetic display
- Medium temperatures from -196 ... +380 °C
- Versions with reed contact, proximity switch, micro switch or rotation magnet


**Magnetic switch**
**Fig. left: Reed switch, model BGU**
**Fig. right: High-temperature reed switch, model BGU-AHT**

## Description

The model BGU magnetic switches serve to detect the limits of filling levels in bypass level indicators. They generate a binary signal which can be fed to down-stream signalling or control equipment. Bistable versions enable the storage of signals.

The magnetic switches are mounted directly to the bypass level indicator with a tightening strap or to the magnetic display with sliding blocks.
The magnetic switches are available with different approvals and with SIL 1.

For selecting the optimum switch (switch model, approval, switching option, cable length, cable material) we offer application-related technical advice.

## Model overview

| Switch model | Description | Approval | | | | | Switching power | | | | Temperature range |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | without | Ex i | Ex d | GL | Ex i + GL | AC 230 V, 60 VA, 1 A | AC 250 V, 100 VA, 2 A | AC 250 V, 5 A (micro switch) | Proximity switch | |
| **BGU** | Reed, aluminium case, cable outlet | x | x | x | x | x | x | | | | -50 ... +180 °C |
| **BGU-A** | Reed, aluminium connection housing, cable gland | x | x | | x | x | x | | | | -50 ... +180 °C |
| **BGU-M12** | Reed, aluminium case, connector M12 | x | x | | | | x | | | | -40 ... +80 °C |
| **BGU-V** | Reed, stainless steel case, cable outlet | x | x | x | | | x | | | | -50 ... +180 °C |
| **BGU-AD** | Reed, aluminium case ATX, cable entry | x | | x | | | x | | | | -40 ... +55 °C |
| **BGU-AM** | Micro switch, aluminium case ATX, cable entry | x | | x | | | | | x | | -40 ... +55 °C |
| **BGU-AIH** | Proximity switch, high alarm, aluminium case, cable gland | x | | | | | | | | x | -40 ... +80 °C |
| **BGU-AIL** | Proximity switch, low alarm, aluminium case, cable gland | x | | | | | | | | x | -40 ... +80 °C |
| **BGU-AR** | Rotational switch, aluminium case, cable gland | x | | | | | | x | | | -60 ... +380 °C |
| **BGU-AHT** | Reed, high temperature, aluminium case, cable gland | x | | | | | x | | | | -196 ... +380 °C |
| **BGU-VHT** | Reed, high temperature, stainless steel case, cable gland | x | | | | | x | | | | -196 ... +380 °C |

## Ex approvals

| Explosion protection | Ignition protection type | Model | Zone | Approval number |
|---|---|---|---|---|
| ATEX | Ex i | BGU, BGU-A, BGU-M12, BGU-V | Zone 0, gas | LCIE 01 ATEX 6047 X / II 1 G Ex ia IIC T6-T3 |
| | Ex d | BGU, BGU-V | Zone 1, gas | LCIE 01 ATEX 6047 X / II 2 G Ex d IIC T6-T3 |
| | Ex d | BGU-AM, BGU-AD | Zone 1, gas/dust | LCIE 02 ATEX 6056 / II 2 G/D Ex d IIC T6-T5 |
| | Ex i + GL | BGU, BGU-A | Zone 0, gas | LCIE 01 ATEX 6047 X / II 1 G Ex ia IIC T6-T3 + GL - 99 355 - 97 HH |

## Type approval

| Approval | Model | Approval number |
|---|---|---|
| GL | BGU, BGU-A | GL - 99 355 - 97 HH |
| GOST-R | all | 0959333 |

Further approvals on request

## Manufacturer's declaration

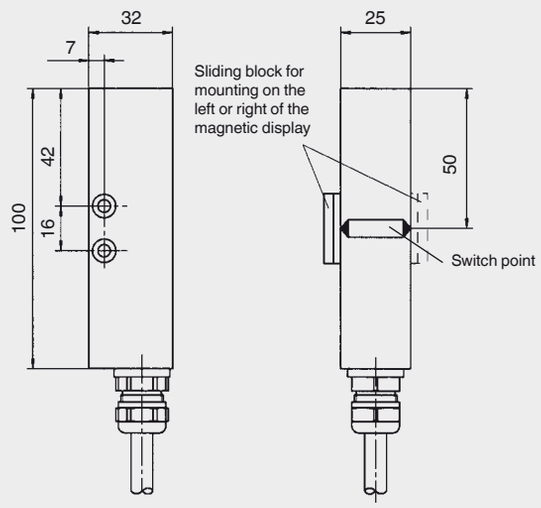
| Switching insert | Model | Zone |
|---|---|---|
| Proximity switch | BGU-AIL, BGU-AIH | Zone 1 |

## Options

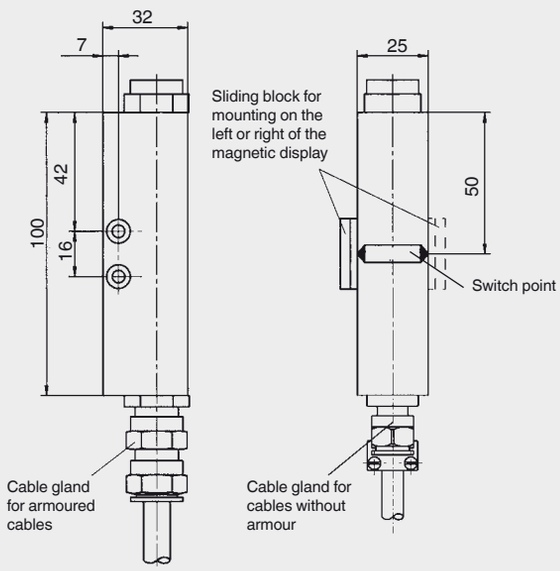
- Switching option (series resistance R22 for PLC, wiring in accordance with NAMUR per DIN EN 60497-5-6)
- Cable length (1, 2 or 3 m, others on request)
- Cable material (PVC cable, intrinsically safe PVC cable, silicone cable, armoured silicone cable, LMGSG cable for GL approval)

# Magnetic switch, reed, aluminium case, cable outlet, model BGU

**Model**
BGU
BGU-E




**Model**
BGU-Ex d




## Specifications

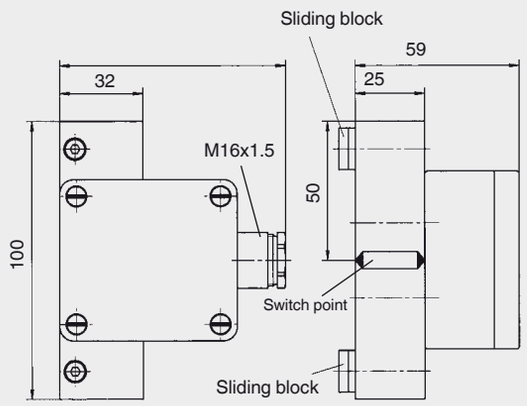
| | |
|---|---|
| Contact | Reed contact |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power<br>■ Model BGU<br>■ Model BGU-E | <br>AC 230 V, 60 VA, 1 A<br>DC 230 V, 30 W, 0.5 A<br>Only for connection to a certified intrinsically safe circuit with max. 100 mA and max. 30 V |
| Ambient temperature | -50 … +180 °C |
| Max. ambient temperature<br>■ Switch with connection cable from PVC<br>■ Switch with connection cable from LMGSG<br>■ Switch with connection cable from silicone<br>■ Switch model BGU-E with connection cable from PVC, blue | <br>90 °C<br>150 °C<br>180 °C<br>T6 to 85 °C |
| Case | Aluminium |
| Ingress protection | IP 65 |
| Approvals | Ex i |

## Specifications

| | |
|---|---|
| Contact | Reed contact |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power | AC 230 V, 60 VA, 1 A<br>DC 230 V, 30 W, 0.5 A |
| Ambient temperature | -40 … +150 °C |
| Max. ambient temperature<br>■ Switch with connection cable from PVC, grey<br>■ Switch with connection cable from silicone or armoured silicone | <br>T6 to 85 °C<br>T6 to 85 °C<br>T5 to 100 °C<br>T4 to 135 °C<br>T3 to 150 °C |
| Case | Aluminium |
| Ingress protection | IP 68 |
| Approvals | Ex d |

## Magnetic switch, reed, aluminium connection housing, cable gland, model BGU-A

| Model | Order no. |
|---|---|
| BGU-A | 100248 |
| BGU-A-E | 113169 |
| BGU-A-GL | |

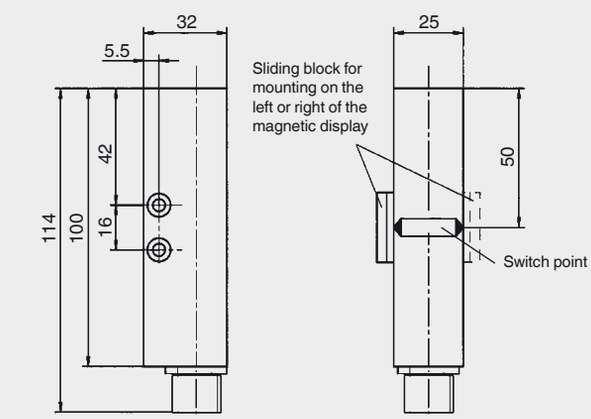



### Specifications

| | |
|---|---|
| Contact | Reed contact |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power | |
| ■ Models BGU-A, BGU-A-GL | AC 230 V, 60 VA, 1 A<br>DC 230 V, 30 W, 0.5 A |
| ■ Model BGU-A-E | Only for connection to a certified intrinsically safe circuit with max. 100 mA and max. 30 V |
| Ambient temperature | -50 … +180 °C |
| Max. ambient temperature | |
| ■ Model BGU-A | 180 °C |
| ■ Model BGU-A-GL | 150 °C |
| ■ Model BGU-A-E | T6 to 85 °C<br>T5 to 100 °C<br>T4 to 135 °C<br>T3 to 150 °C |
| Case | Aluminium, cable connection M16 x 1.5 |
| Ingress protection | IP 65 |
| Approvals | Ex i |

## Magnetic switch, reed, aluminium case, connector M12, model BGU-M12

| Model | Order no. |
|---|---|
| BGU-M12 | 114891 |
| BGU-E-M12 | |



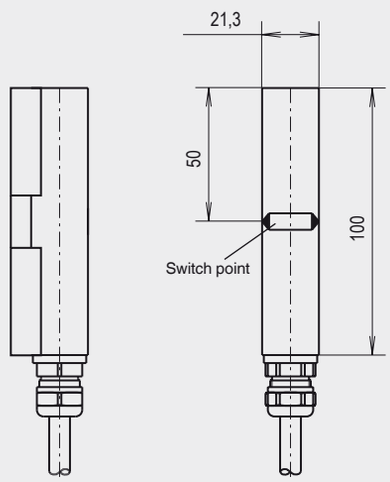

### Specifications

| | |
|---|---|
| Contact | Reed contact |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power | |
| ■ Model BGU-M12 | AC 230 V, 60 VA, 1 A<br>DC 230 V, 30 W, 0.5 A |
| ■ Model BGU-E-M12 | Only for connection to a certified intrinsically safe circuit with max. 100 mA and max. 30 V |
| Ambient temperature | -40 … +80 °C |
| Max. ambient temperature | |
| ■ Model BGU-M12 | 80 °C |
| ■ Model BGU-E-M12 | T6 to 80 °C |
| Case | Aluminium |
| Ingress protection | IP 67 |
| Approvals | Ex i |

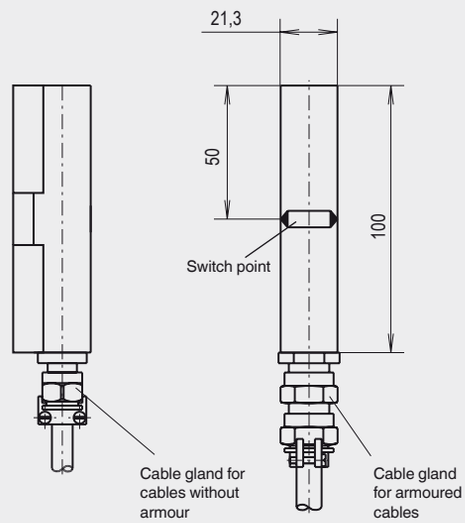
| Model | Order no. |
|---|---|
| BGU-M12, with mating connector and 2 m PVC cable | 114448 |

# Magnetic switch, reed, stainless steel case, cable outlet, model BGU-V

**Model**
BGU-V
BGU-V-E




**Model**
BGU-V-Ex d




## Specifications

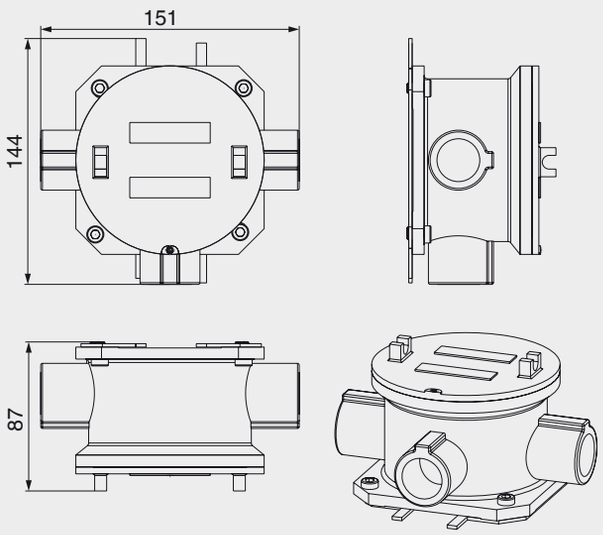
| | |
|---|---|
| Contact | Reed contact |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power<br>■ Model BGU-V<br>■ Model BGU-V-E | <br>AC 230 V, 60 VA, 1 A<br>DC 230 V, 30 W, 0.5 A<br>Only for connection to a certified intrinsically safe circuit with max. 100 mA and max. 30 V |
| Ambient temperature | -50 … +180 °C |
| Max. ambient temperature<br>■ Switch with connection cable from PVC<br>■ Switch with connection cable from silicone<br>■ Switch model BGU-V-E with connection cable from PVC, blue | <br>90 °C<br>180 °C<br>T6 to 85 °C |
| Case | Stainless steel 1.4571 (316Ti) |
| Ingress protection | IP 65 |
| Approvals | Ex i |

## Specifications

| | |
|---|---|
| Contact | Reed contact |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power | AC 230 V, 60 VA, 1 A<br>DC 230 V, 30 W, 0.5 A |
| Ambient temperature | -50 … +150 °C |
| Max. ambient temperature<br>■ Switch with connection cable from PVC, grey<br>■ Switch with connection cable from silicone or armoured silicone | <br>T6 to 85 °C<br>T6 to 85 °C<br>T5 to 100 °C<br>T4 to 135 °C<br>T3 to 150 °C |
| Case | Stainless steel 1.4571 (316Ti) |
| Ingress protection | IP 68 |
| Approvals | Ex d |

## Magnetic switch, reed, aluminium case ATX, cable entry, model BGU-AD

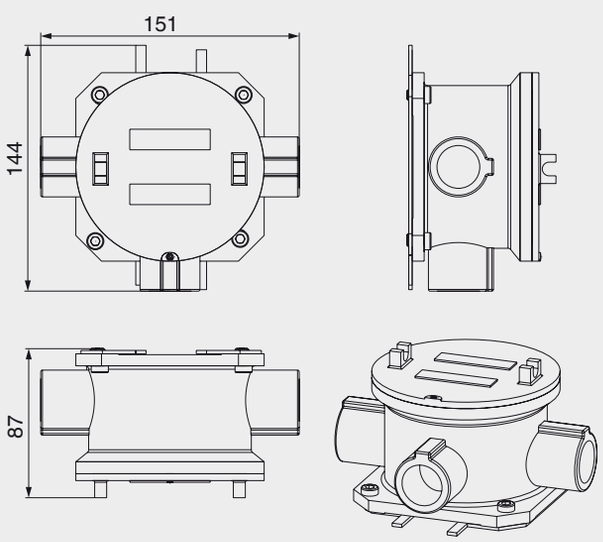
**Model**
BGU-AD-Ex d




| Specifications | |
|---|---|
| Contact | Reed contact |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power | AC 230 V, 60 VA, 1 A<br>DC 230 V, 30 W, 0.5 A |
| Ambient temperature | -40 … +55 °C |
| Max. ambient temperature | T6 to 40 °C<br>T5 to 55 °C<br>tD to 95 °C |
| Case | Aluminium |
| Cable entries | 1/2" NPT(F) with adapter<br>3/4" NPT(F)<br>M20 x 1.5 with adapter |
| Ingress protection | IP 66 |
| Approvals | Ex d |

## Magnetic switch, micro switch, aluminium case ATX, cable entry, model BGU-AM

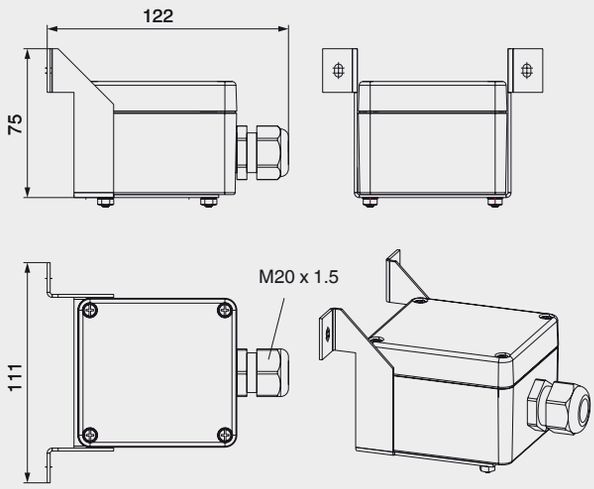
**Model**
BGU-AM-Ex d



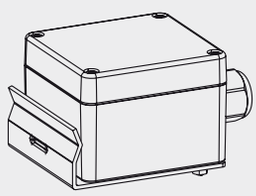

| Specifications | |
|---|---|
| Contact | Micro switch |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power | AC 250 V, 5 A |
| Ambient temperature | -40 … +55 °C |
| Max. ambient temperature | T6 to 40 °C<br>T5 to 55 °C<br>tD to 95 °C |
| Case | Aluminium |
| Cable entries | 1/2" NPT(F) with adapter<br>3/4" NPT(F)<br>M20 x 1.5 with adapter |
| Ingress protection | IP 66 |
| Approvals | Ex d |

## Magnetic switch, proximity switch, aluminium case, cable gland, model BGU-AIH, high alarm and model BGU-AIL, low alarm

Mounting to magnetic display with T-slot




Mounting with tightening strap



| Model | Normally open with | Mounting | Order no. |
|---|---|---|---|
| BGU-AIH | rising level | T-slot | 115162 |
| BGU-AIL | falling level | T-slot | 115163 |
| BGU-AIH | rising level | Tightening strap | 114687 |
| BGU-AIL | falling level | Tightening strap | 114688 |

### Specifications

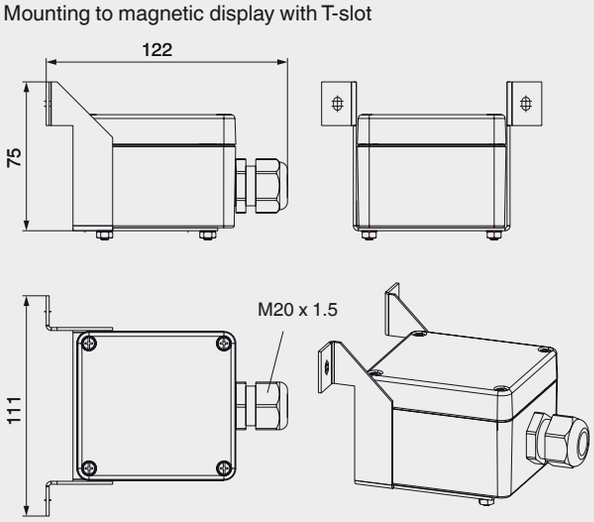
| | |
|---|---|
| Contact | Inductive proximity sensor<br>SJ 3.5-SN |
| Contact type | Code AIH: High alarm<br>Code AIL: Low alarm |
| Switch behaviour | Bistable |
| Nominal voltage | DC 8 V ($R_i$ ~1 kΩ) |
| Permissible residual ripple | < 5 % |
| Operating voltage $U_B$ | 5 ... 25 V |
| Current supply | active area free: > 3 mA<br>active area covered: > 1 mA |
| Permissible resistance of control cable | < 100 Ω |
| Self-inductance | 160 µH |
| Self-capacitance | 20 nF |
| Ambient temperature | -40 … +80 °C |
| Case | Aluminium, 80 x 75 x 57 mm<br>Cable connection M20 x 1.5 |
| Ingress protection | IP 65 |

**Accessories**

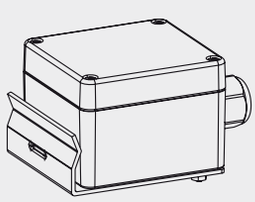
Tightening strap Standard: OD 50-70 mm
Option: OD 30-45, 40-60, 60-80, 80-100 mm

## Magnetic switch, rotational switch, aluminium case, cable gland, model BGU-AR

Mounting to magnetic display with T-slot




Mounting with tightening strap



| Model | Mounting | Order no. |
|---|---|---|
| BGU-AR | T-slot | 115636 |
| BGU-AR | Tightening strap | 115157 |
| BGU-AR m | Tightening strap (with Microtherm®) | 115158 |

### Specifications

| | |
|---|---|
| Contact | Rotary magnet with contact rocker switch |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power | AC 250 V, 100 VA, 2 A<br>DC 200 V, 40 W, 2 A |
| Ambient temperature [1)] | -60 ... +250 °C<br>-60 ... +380 °C with Microtherm® |
| Case | Aluminium, 80 x 75 x 57 mm<br>Cable connection M20 x 1.5 |
| Ingress protection | IP 65 |

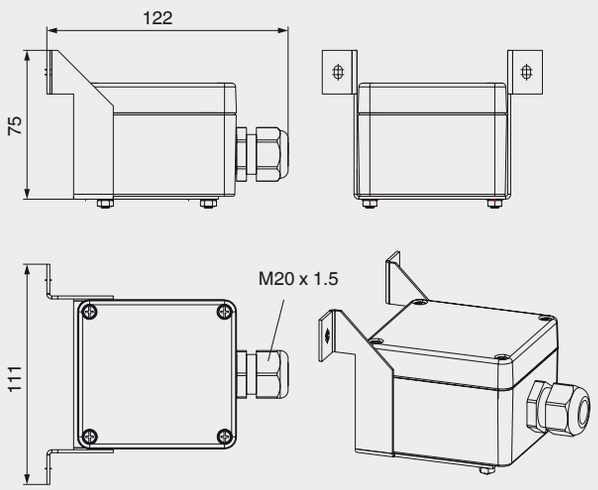
1 ) With additional insulation the temperature ranges can change

**Accessories**

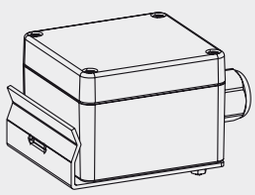
Tightening strap Standard: OD 50-70 mm
Option: OD 30-45, 40-60, 60-80, 80-100 mm

## Magnetic switch, reed, high temperature, aluminium case, cable gland, model BGU-AHT

Mounting to magnetic display with T-slot




Mounting with tightening strap



| Model | Mounting | Order no. |
|---|---|---|
| BGU-AHT | T-slot | 115159 |
| BGU-AHT | Tightening strap | 110486 |

### Specifications

| | |
|---|---|
| Contact | Reed contact |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power | AC 230 V, 60 VA, 1 A<br>DC 230 V, 30 W, 0.5 A |
| Ambient temperature [1)] | -196 ... +380 °C |
| Case | Aluminium, 80 x 75 x 57 mm<br>Cable connection M20 x 1.5 |
| Ingress protection | IP 65 |

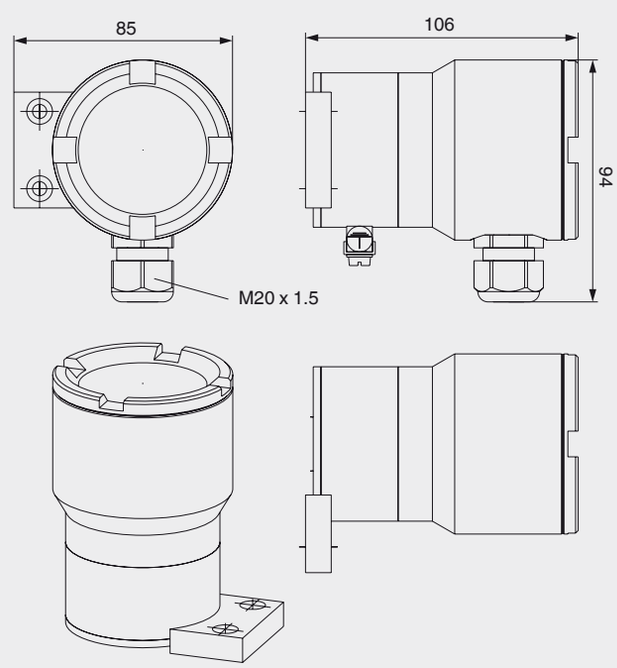
1 ) With additional insulation the temperature ranges can change

**Accessories**

Mounting with tightening strap, including Mikroterm®

## Magnetic switch, reed, high temperature, stainless steel case, cable gland, model BGU-VHT

Mounting to magnetic display with T-slot




| Model | Mounting | Order no. |
|---|---|---|
| BGU-VHT | Pipe Ø 42,3 mm | 115038 |
| BGU-VHT | Pipe Ø 60.3 mm | 111342 |

### Specifications

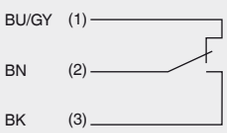
| | |
|---|---|
| Contact | Reed contact |
| Contact type | 1 change-over contact |
| Switch behaviour | Bistable |
| Switching power | AC 230 V, 60 VA, 1 A<br>DC 230 V, 30 W, 0.5 A |
| Ambient temperature [1)] | -196 ... +380 °C |
| Case | Stainless steel |
| Ingress protection | IP 67 |

1 ) With additional insulation the temperature ranges can change

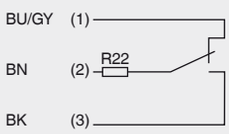
# Electrical connections

**Reed contact, micro switch, rotation magnet**

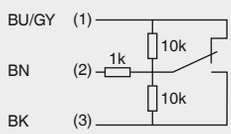
1 switch point




1 switch point
Wiring for operation with a PLC




1 switch point
NAMUR circuit per DIN EN 60947-5-6

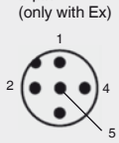


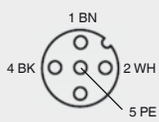

**Connector M12, pin assignment**
(for model BGU-M12)

Instrument

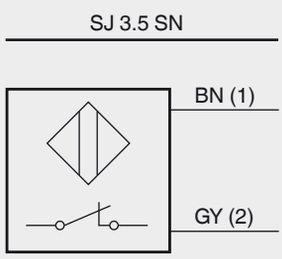

Mating connector with cable


5-pin
(only with Ex)




**Proximity switch**
(for models BGU-AIH and BGU-AIL)




### Connection cable
(for models BGU and BGU-V)

| Connection cable | Cross-section |
|---|---|
| PVC | 4 x 0.5 mm$^2$ |
| Silicone | 4 x 0.75 mm$^2$ |
| Armoured silicone | 4 x 0.75 mm$^2$ |
| LMGSG | 3 x 1.5 mm$^2$ |

### Colour coding per IEC 60757

| Colour | Short symbol |
|---|---|
| Black | BK |
| Brown | BN |
| Red | RD |
| Orange | OG |
| Yellow | YE |
| Green | GN |
| Blue | BU |
| Violet | VT |
| Grey | GY |
| White | WH |
| Pink | PK |
| Turquoise | TQ |
| Green-Yellow | GNYE |

## CE conformity

**Electromagnetic compatibility (EMC)**
2004/108/EC

**ATEX directive (option)**
94/9/EC, ignition protection type Ex i, zone 0, gas
94/9/EC, ignition protection type Ex d, zone 1, gas, dust

## Approvals

- **GL**, ships, shipbuilding, offshore, Germany
- **GOST**, national standard for Russia, Kazakhstan and Belarus

## Contact protection measures

The reed contacts should be protected against any voltage or current spikes that might occur.

Depending on the different load types different protective circuits are used.

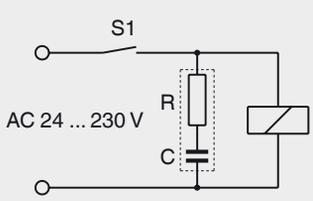
**Model KR 24**


**RC module**

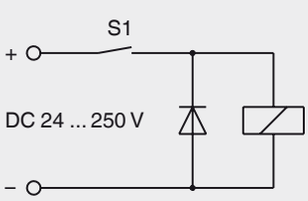
| Contact protection relays | Contacts | Input | Power supply | Approval marking | Order no. |
|---|---|---|---|---|---|
| KR 24 | 1 x change-over AC 250 V, 2 A | 2 x contacts | DC 20 ... 30 V | | 112941 |
| KR 24-EX | 2 x change-over AC 253 V, 2 A | 2 x contacts | DC 20 ... 30 V | PTB 02 ATEX 2072 / II(1) GD [EEx ia] IIC | 112944 |
| KR 230 | 1 x change-over AC 250 V, 2 A | 2 x contacts | AC 230 V | | 112942 |
| KR 230-EX | 2 x change-over AC 253 V, 2 A | 2 x contacts | AC 230 V | II 1 GD EEx ia IIC, PTB 02 ATEX 2073 / II(1) GD [EEx ia] IIC | 112943 |

| RC module | Capacity | Resistance | Voltage | Order no. |
|---|---|---|---|---|
| B3/115 | 0.33 µF | 470 Ω | AC 115 V | 110446 |
| B3/230 | 0.33 µF | 1000 Ω | AC 230 V | 110460 |

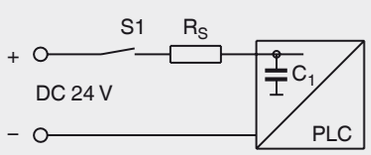
**Inductive load**
AC voltage




**Inductive load**
DC voltage




**Capacitive load**




**Ordering information**
To order the described product the order number (if available) is sufficient.

Alternatively:
Model / Approval / Switching option / Cable length / Cable material

# Appendix

## Cross Reference BGU

| Replaced Type | Type |
|---|---|
| STMI-H (KSR design) | BGU-AIH |
| STMI-L (KSR design) | BGU-AIL |
| STMU (KSR design) | BGU-AHT |
| STMU-V (KSR design) | BGU-VHT |
| MDA (KSR design) | BGU-AD |
| MSDA (KSR design) | BGU-AM |
| BGU-S716 (KSR design) | BGU-M12 |
| 740.0062 (Phönix design) | No replacement |
| 740.0064 (Phönix design) | Successor: BGU-AR |
| 740.0065 (Phönix deisgn) | Successor: BGU-A |
| 740.0200 (Phönix design) | Successor: BGU-AI |
| 75/90 (Vaihinger design) | Successor: BGU-AR |
| 75/51 (Vaihinger design) | Successor: BGU-AI |

# Type Code

| Code | | |
|---|---|---|
| **1** | | **Basic type** |
| | BGU | Reed, aluminium housing, cable outlet |
| | BGU-A | Reed, aluminium connection housing, cable gland |
| | BGU-M12 | Reed, aluminium housing, connector M12 |
| | BGU-V | Reed, stainless steel housing, cable outlet |
| | BGU-AD | Reed, aluminium housing ATX, cable entry, 230VAC, 60VA, 1A |
| | BGU-AM | Micro switch, aluminium housing ATX, cable entry, 250 VAC, 5A |
| | BGU-AIH | Proximity switch high alarm, aluminium housing, cable gland |
| | BGU-AIL | Proximity switch low alarm, aluminium housing, cable gland |
| | BGU-AHT | Reed, high temperature, aluminium housing, cable gland, 230VAC, 60VA, 1A |
| | BGU-VHT | Reed, high temperature, stainless steel housing, cable gland, 230VAC, 60VA, 1A |
| | BGU-AR | Rotational switch, aluminium housing, cable gland, 250VAC, 100VA, 2A |
| **2** | | **Approval** |
| | E | Ex i |
| | Ex d | Ex d |
| | GL | Germanischer Lloyd |
| **3** | | **Contact Option** |
| | R22 | With 22 Ohm resistor as protection for PLC use |
| | N | With circuit acc. to NAMUR EN 60947-5-6 |
| **4** | | **Cable length** |
| | 1 | 1m |
| | 2 | 2m |
| | 3 | 3m |
| | ... | ... |
| **5** | | **Cable material** |
| | PVC | Cable PVC |
| | SIL | Cable silicone |
| | SILA | Cable silicone armoured |
| | LMGSG | Cable LMGSG for GL approval |

# Ordering example

| | Basic type | | Approval | | Contact option | | Cable length | | Cable material |
|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | - | 3 | - | 4 | - | 5 |
| | BGU-V | - | E | - | /R22 | - | 1 | - | SIL |

# Magnetic float switch
# For vertical installation
# Model FLS

KSR data sheet FLS

for further approvals
see page 3

## Applications

- Level measurement for almost all liquid media
- Pump and level control and monitoring for distinct filling levels
- Chemical, petrochemical, natural gas, offshore, shipbuilding, machine building, power generating equipment, power plants
- Process water and drinking water treatment, food and beverage industry

## Special features

- Large range of application due to the simple, proven functional principle
- For harsh operating conditions, long service life
- Operating limits:
  - Operating temperature: T = -196 ... +350 °C
  - Operating pressure: P = Vacuum to 40 bar
  - Limit density: $\rho \geq 300$ kg/m$^3$
- Wide variety of different electrical connections, process connections and materials
- Explosion-protected versions

**Fig. left: Stainless steel version, mounting thread**
**Fig. right: Plastic version, flange connection**

## Description

A float with a permanent magnet moves reliably along with the liquid level on a guide tube. Within the guide tube is fitted a reed contact (inert gas contact), which is energised, through the non-magnetic walls of the float and guide tube, by the approach of the float magnet. By using a magnet and reed contact the switching operation is non-contact, free from wear and needs no power supply. The contacts are potential-free. Magnetic float switches are also available with multiple switch points.

The switch functions always refer to a rising liquid level: normally open, normally closed or change-over contact.

Through the use of a float for a max. of 2 switch points a bistable switch operation can be achieved, meaning that the switching status also remains available, when the filling level continues to rise above or drop below the switch point.

The float switch is simple to mount and maintenance-free, so the costs of mounting, commissioning and operation are low.

## Further special features

- Process connection, guide tube and float from stainless steel 1.4571, plastic or Buna
- Universal signal processing:
  connection direct to a PLC is possible, NAMUR connection, signal amplification / contact protection relays
- Works independently of foaming, conductivity, dielectricity, pressure, vacuum, temperature, steam, condensation, bubble formation, boiling effects and vibrations.
- Multiple functionality in a single instrument - up to 8 potential-free contacts
- Exact repeatability of the switch points
- Magnetic float switches qualify as passive electrical equipment in accordance with DIN IEC 60079-11 and can be installed in 'Zone 1' hazardous areas without certification, so long as the equipment is operated in a certified intrinsically safe circuit with a minimum explosion protection of EEx ib

## Options

- Customer-specific solutions
- Special versions for interface layer detection
  $\Delta$-$\rho \geq 100$ kg/m$^3$
- Process connection, guide tube material and float from stainless steel 1.4435, 1.4539, titanium, Hastelloy (others on request)

## Model overview

| Float switch model | Description | Approval | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | without | Ex i | Ex d | GL | Ex i + GL | ABS | DNV | 3-A |
| **FLS-S** | Magnetic float switch, standard version | x | x | x | x | x | x | x | |
| **FLS-SX** | Magnetic float switch, angled version, adjustable version, coated version | | | | | | | | |
| **FLS-M** | Magnetic float switch, 8 mm guide tube | x | x | | | | | | |
| **FLS-P** | Magnetic float switch, plastic version | x | | | | | | | |
| **FLS-H** | Magnetic float switch, pharmaceutical and food version | x | | | | | | | |
| | Magnetic float switch, 3-A hygienic version | | | | | | | | x |

| Float switch model | Materials | | | | | | | | | Temperature range |
|---|---|---|---|---|---|---|---|---|---|---|
| | Stainless steel 1.4571 (316Ti) | Stainless steel 1.4404 (316L) | Titanium 3.7035 (grade 2) | Stainless steel 1.4435 (316L) | Stainless steel 1.4571 (316Ti) / PP | Stainless steel 1.4571 (316Ti) / PA | Stainless steel 1.4571 (316Ti) / brass | PVC, PP, PVDF | Stainless steel 1.4571 (316Ti) / Buna (NBR) | |
| **FLS-S** | x | x | x | x | x | x | x | | x | -50 ... +350 °C |
| **FLS-SX** | x | x | | | | | | | | -10 ... +100 °C |
| **FLS-M** | x | x | | | x | | x | | x | -10 ... +100 °C |
| **FLS-P** | | | | | | | | x | x | -10 ... +100 °C |
| **FLS-H** | | x | | x | | | | | | -20 ... +200 °C |

## Ex approvals

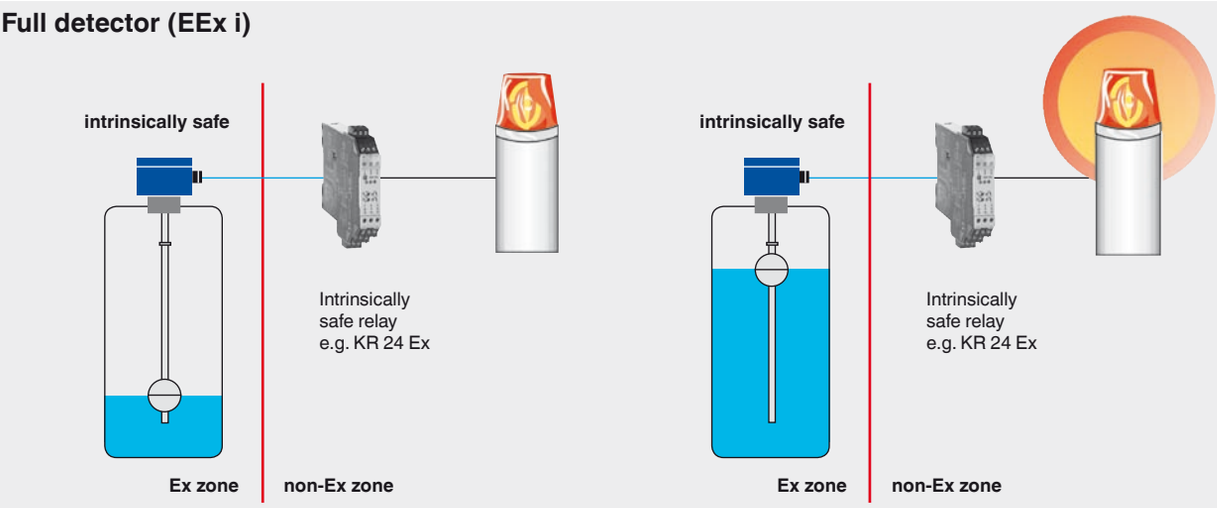
| Explosion protection | Ignition protection type | Model | Zone | Approval number |
|---|---|---|---|---|
| ATEX | Ex i | FLS-S | Zone 0, gas | KEMA 01 ATEX1053 X II 1/2G Ex ia IIC T3 ... T6 |
| | Ex i | FLS-M | Zone 0, gas | KEMA 01 ATEX1053 X II 1/2G Ex ia IIC T3 ... T6 |
| | Ex d | FLS-S | Zone 1, gas/dust | TÜV 13 ATEX 7399 X II 2G Ex d IIC T6 Gb / II 2 D Ex tb IIIC T80 °C Db |
| | Ex d | FLS-S | Zone 1, gas/dust | IECEx TUR 09.0002X -40 °C <= ta <= +55 °C Ex d IIC T6 Ex tD A21 IP 65 T80 °C |
| | Ex i + GL | FLS-S | Zone 0, gas | KEMA 01 ATEX1053 X II 1/2G Ex ia IIC T3 ... T6 + GL - 96 716 - 95 HH |

## Type approval

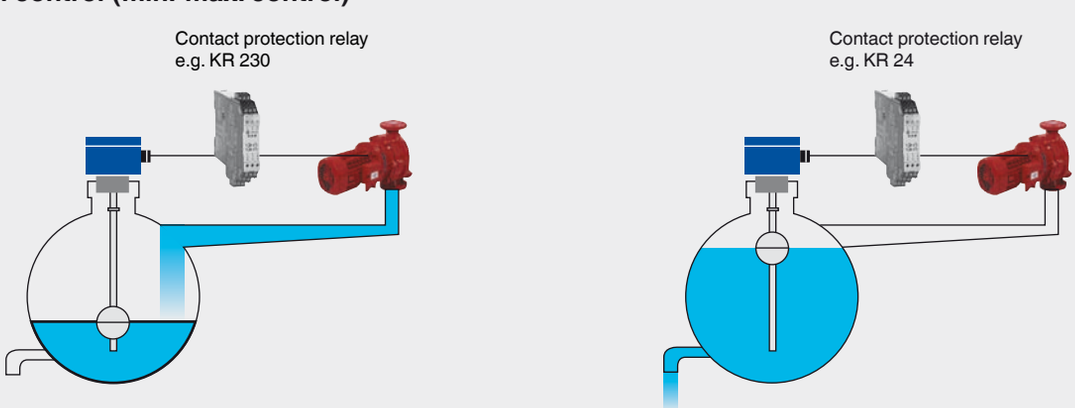
| Explosion protection | Model | Approval number |
|---|---|---|
| GL | FLS-S | GL - 96 716 - 95 HH |
| ABS | FLS-S | ABS-02-HG286246-2-PDA |
| DNV | FLS-S | DNV - A-11453 |
| GOST | FLS-S, FLS-P; FLS-H | 959333 |
| 3-A | FLS-H | 3-A Sanitary Standards, 1698 |

## Application examples

### Full detector (EEx i)

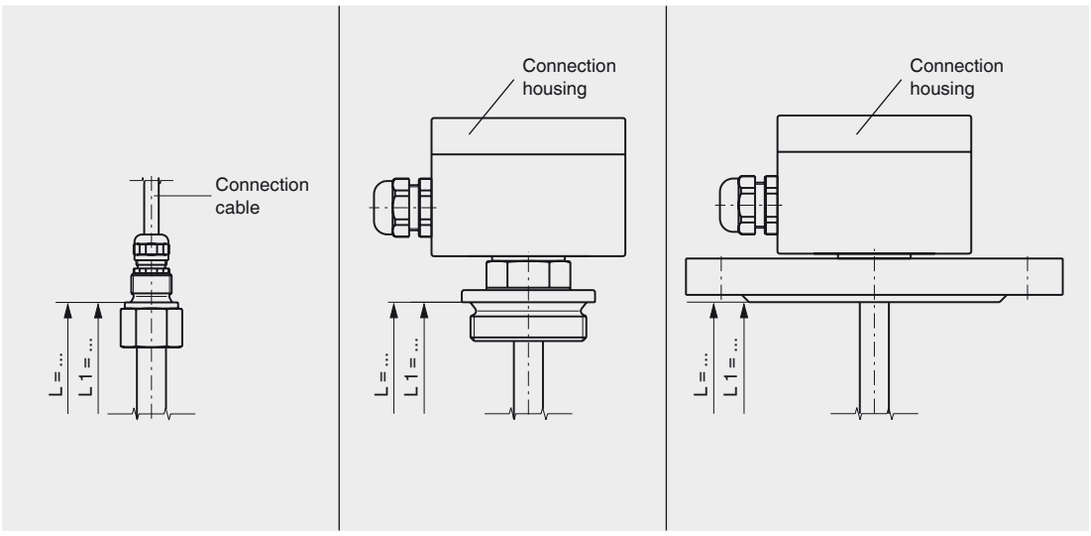



### Level control (min.-max. control)



# Magnetic float switch, standard version, model FLS-S

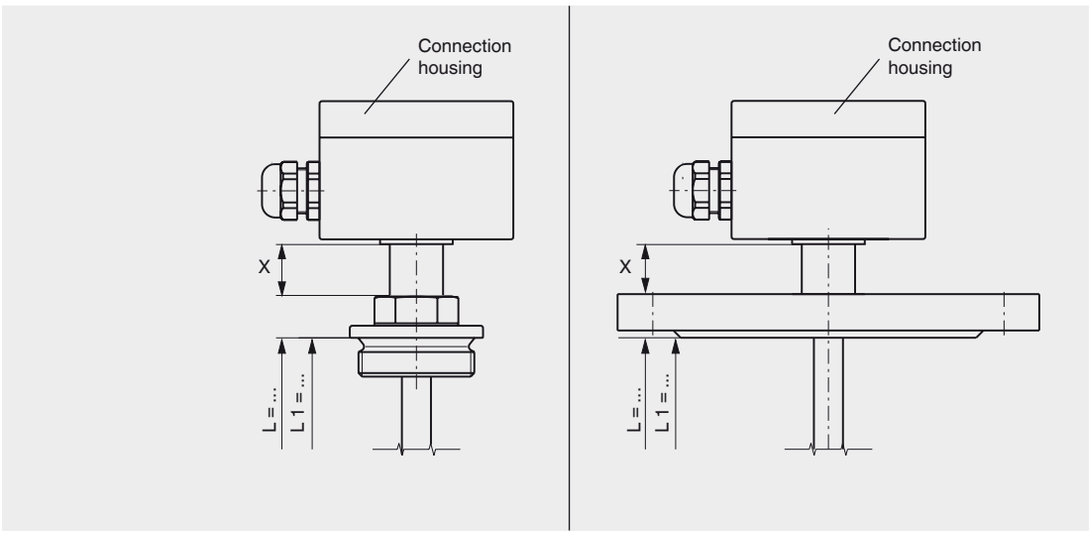
Process connection, guide tube material and float from stainless steel 1.4571 (316Ti)




| | Mounting thread (without connection housing) | | Mounting thread | | Flange | |
|---|---|---|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ Silicone ■ PUR | | Connection housing ■ Aluminium 64 x 58 x 34 mm, with 1 contact ■ Aluminium 80 x 75 x 57 mm, 2 or more contacts Option: Polypropylene, polyester, stainless steel | | | |
| Process connection | Mounting thread upwards G 3/8" (others on request) | G 1/2" (others on on request) | Mounting thread downwards G 1 1/2" or G 2" | | Mounting flange ■ DIN DN 50 ... DN 200, PN 6 ... PN 100 ■ ANSI 2" ... 8", class 150 ... 600 | |
| Guide tube diameter | 12 or 14 mm | 18 mm | 12 or 14 mm | 18 mm | 12 or 14 mm | 18 mm |
| Guide tube length L max. | 3,000 mm | 6,000 mm | 3,000 mm | 6,000 mm | 3,000 mm | 6,000 mm |
| Float | Material stainless steel 1.4571 (Option: Buna (NBR), titanium)<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 20 and 21) | | | | | |
| Temperature range standard | PVC cable -10 ... +80 °C<br>Silicone cable -30 ... +130 °C | | -30 ... +150 °C<br>Option: ■ High-temperature version: +150 ... +300 °C<br>Option: ■ Low-temperature version: -196 ... -30 °C | | | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | | | | | |
| max. number of contacts | PVC cable 6 x NO or NC, or 4 x SPDT<br>Silicone cable 5 x NO or NC, or 3 x SPDT | | 6 x NO or NC, or 4 x SPDT | | | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | | | | | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 20 and 21) | | | | | |
| Switching power | Normally open AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 40 VA; 1 A DC 230 V; 20 W; 0.5 A | | | | | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | | | | | |
| Mounting position | Vertical ±30° | | | | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | | | | |
| Materials | Stainless steel 1.4404, 1.4435, 1.4539, titanium, Hastelloy and others on request | | | | | |

# Magnetic float switch, explosion-protected version Ex i, intrinsically safe, model FLS-S

Process connection, guide tube material and float from stainless steel 1.4571 (316Ti)



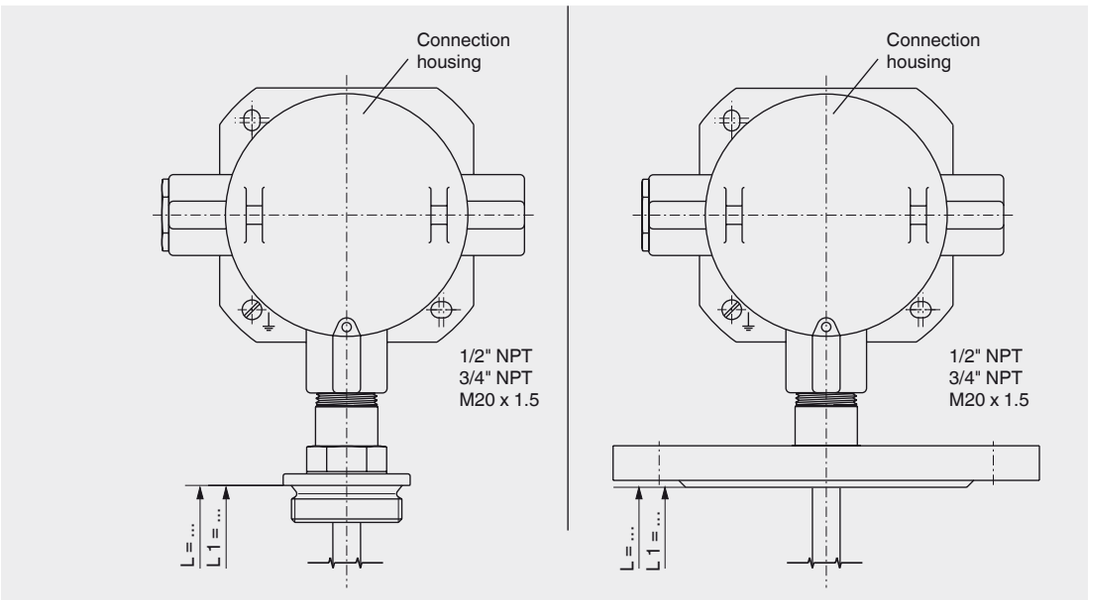

| | Mounting thread | | Flange | |
|---|---|---|---|---|
| Electrical connection | Connection housing ■ Aluminium 80 x 75 x 57 mm<br>Option: Polyester, stainless steel | | | |
| Process connection | Mounting thread<br>downwards<br>G 1 1/2" or G 2" (others on request) | | Mounting flange<br>■ DIN DN 50 ... DN 150, PN 6 ... PN 64<br>■ ANSI 2" ... 6", class 150 ... 600 | |
| Guide tube diameter | 12 or 14 mm | 18 mm | 12 or 14 mm | 18 mm |
| Guide tube length L max. | 3,000 mm | 6,000 mm | 3,000 mm | 6,000 mm |
| Float | Material stainless steel 1.4571 (Option: Buna (NBR), titanium)<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 20 and 21) | | | |

| Temperature class | | T3 | T4 | T5 | T6 |
|---|---|---|---|---|---|
| Process temperature | Max. | 180 °C | 130 °C | 95 °C | 80 °C |
| Ambient temperature at connection housing | Max. | 60 °C | 60 °C | 60 °C | 60 °C |

| | |
|---|---|
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level |
| max. number of contacts | 6 x NO or NC, or 4 x SPDT |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 20 and 21) |
| Switching power | Only for connection to a certified intrinsically safe circuit with Umax 36 V, Imax 100 mA |
| Mounting position | Vertical ±30° |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 |
| Options | ■ Housing heightening X (state dimension X)<br>■ Temperature resistance Pt100 or Pt1000<br>■ Bimetal thermal contact 40 ... 120 °C (in 5 degree steps) |
| Materials | Stainless steel 1.4435, titanium, Hastelloy on request |

# Magnetic float switch, explosion-protected version Ex d, flameproof enclosure, model FLS-S

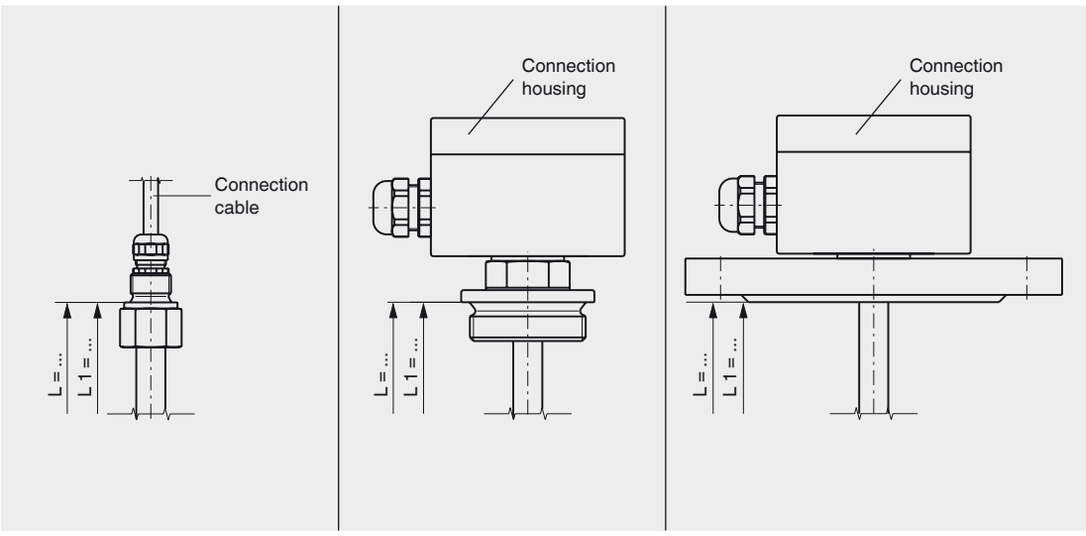
Process connection, guide tube and float from stainless steel 1.4571 (316Ti) or 1.4404 (316L)




| | Mounting thread | | Flange | |
|---|---|---|---|---|
| Electrical connection | Connection housing ■ Aluminium<br>Option: Stainless steel | | | |
| Process connection | Mounting thread<br>downwards<br>G 1 1/2" or G 2" (others on request) | | Mounting flange<br>■ DIN DN 50 ... DN 200, PN 6 ... PN 100<br>■ ANSI 2" ... 8", class 150 ... 600 | |
| Guide tube diameter | 12 or 14 mm | 18 mm | 12 or 14 mm | 18 mm |
| Guide tube length L max. | 3,000 mm | 6,000 mm | 3,000 mm | 6,000 mm |
| Float | Material stainless steel 1.4571<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 20 and 21) | | | |
| Temperature class<br>Process temperature | T4<br>Max. 120 °C | T5<br>95 °C | T6<br>80 °C | |
| Switching function | Change-over SPDT - on rising level | | | |
| max. number of contacts | 4 x SPDT | | | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | | | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 20 and 21) | | | |
| Switching power | Change-over | AC 230 V; 40 VA; 1 A<br>DC 230 V; 20 W; 0.5 A | **Please observe contact protection measures (see page 23)!** | |
| Mounting position | Vertical ±30° | | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | | |
| Options | ■ Temperature resistance Pt100 or Pt1000<br>■ Bimetal thermal contact 40 ... 120 °C (in 5 degree steps) | | | |
| Materials | Stainless steel 1.4404 and others on request | | | |

# Magnetic float switch, stainless steel and Buna, model FLS-S

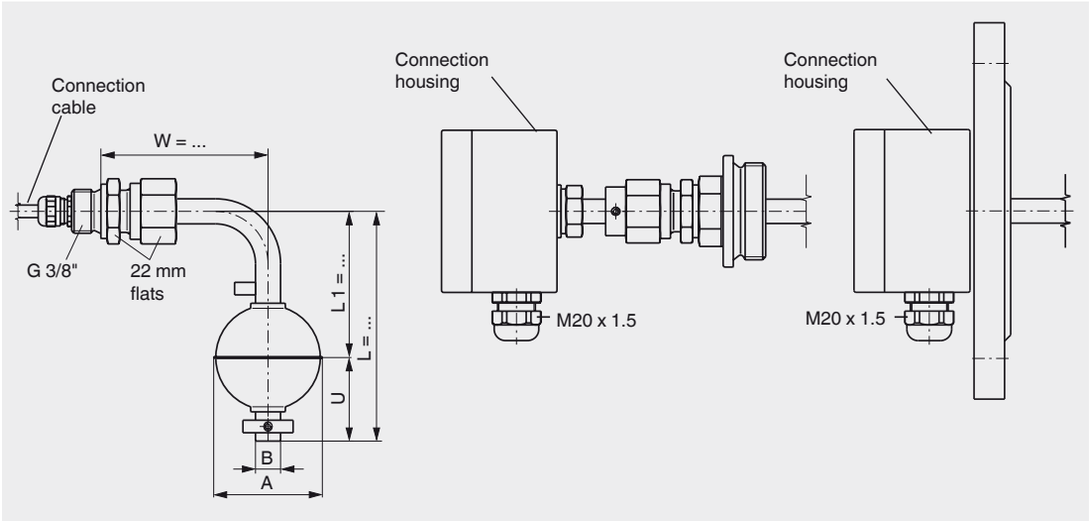
Process connection, guide tube from stainless steel 1.4571 (316Ti) and float from Buna




| | Mounting thread (without connection housing) | Mounting thread | Flange |
|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ Silicone ■ PUR | Connection housing ■ Aluminium 64 x 58 x 34 mm, with 1 contact ■ Aluminium 80 x 75 x 57 mm, 2 or more contacts Option: Polypropylene, polyester, stainless steel | |
| Process connection | Mounting thread upwards G 3/8" (others on request) | Mounting thread downwards G 1", G 1 1/2" or G 2" | Mounting flange ■ DIN DN 50 ... DN 200, PN 6 ... PN 40 ■ ANSI 1 1/2" ... 8", class 150 ... 300 |
| Guide tube diameter | 12 mm | | |
| Guide tube length L max. | 3,000 mm | | |
| Float | Material Buna (NBR) Float diameter from 44 ... 120 mm Float selection depending on guide tube diameter and process conditions (see page 20 and 21) | | |
| Temperature range standard | -10 ... +80 °C | | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | | |
| max. number of contacts | PVC cable 6 x NO or NC, or 4 x SPDT Silicone cable 5 x NO or NC, or 3 x SPDT | 6 x NO or NC, or 4 x SPDT | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 20 and 21) | | |
| Switching power | Normally open AC 230 V; 50 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 50 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 50 VA; 1 A DC 230 V; 20 W; 0.5 A<br>Protective conductor connection on request | | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |
| Materials | Stainless steel 1.4571, 1.4404, Buna (NBR) and others on request | | |

# Magnetic float switch, angled version, model FLS-SX

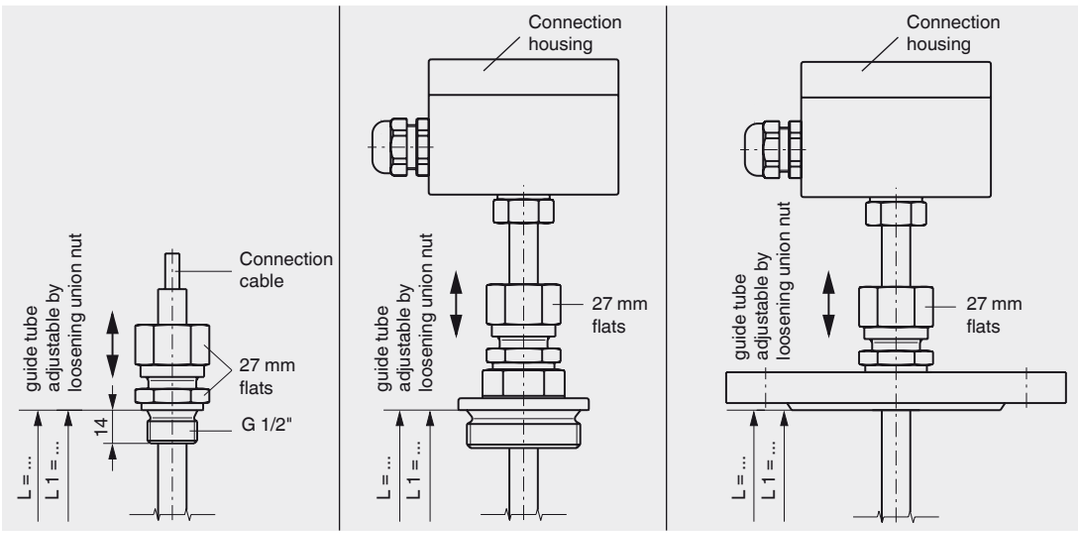
Process connection, guide tube and float from stainless steel 1.4571 (316Ti)




| | Mounting thread (without connection housing) | Mounting thread | Flange |
|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ Silicone ■ PUR | Connection housing ■ Aluminium 64 x 58 x 34 mm, with 1 contact ■ Aluminium 80 x 75 x 57 mm, 2 or more contacts Option: Polypropylene, polyester, stainless steel | |
| Process connection | Mounting thread lateral G 3/8" (others on request) | Mounting thread lateral G 1 1/2" or G 2" | Mounting flange ■ DIN DN 50 ... DN 200, PN 6 ... PN 40 ■ ANSI 1 1/2" ... 8", class 150 ... 300 |
| Guide tube diameter | 12 mm | | |
| Guide tube length L max. | 3,000 mm | | |
| Float | Material stainless steel 1.4571<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 20 and 21) | | |
| Temperature range standard | PVC/PUR cable -10 ... +80 °C<br>Silicone cable -30 ... +150 °C | -30 ... +150 °C | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | | |
| max. number of contacts | PVC cable 6 x NO or NC, or 4 x SPDT<br>Silicone cable 5 x NO or NC, or 3 x SPDT | 6 x NO or NC, or 4 x SPDT | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 20 and 21) | | |
| Switching power | Normally open AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)**!<br>Change-over AC 230 V; 40 VA; 1 A DC 230 V; 20 W; 0.5 A<br>Protective conductor connection on request | | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |
| Materials | Stainless steel 1.4571, 1.4404 and others on request | | |

# Magnetic float switch, version with adjustable guide tube, model FLS-SX

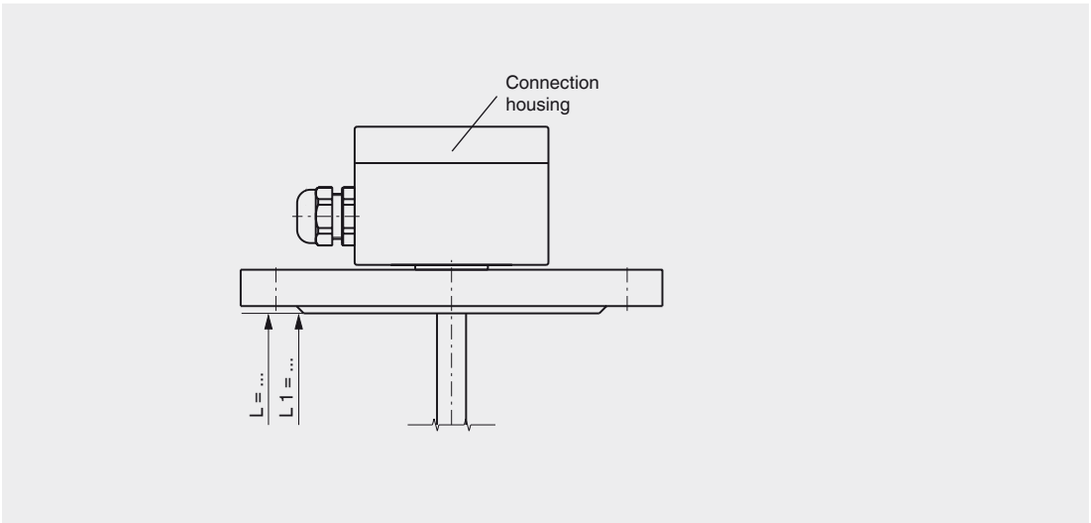
Process connection, guide tube and float from stainless steel 1.4571 (316Ti)




| | Mounting thread (without connection housing) | Mounting thread | Flange |
|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ Silicone ■ PUR | Connection housing ■ Aluminium 64 x 58 x 34 mm, with 1 contact ■ Aluminium 80 x 75 x 57 mm, 2 or more contacts Option: Polypropylene, polyester, stainless steel | |
| Process connection | Mounting thread downwards G 1/2" (others on request) | Mounting thread downwards G 1 1/2" or G 2" (others on request) | Mounting flange ■ DIN DN 50 ... DN 200, PN 6 ... PN 100 ■ ANSI 2" ... 8", class 150 ... 600 |
| Guide tube diameter | 12 mm | | |
| Guide tube length L max. | 3,000 mm | | |
| Float | Material stainless steel 1.4571 (Option: Buna (NBR), titanium)<br>Float diameter from 44 ... 83 mm<br>Float selection depending on guide tube diameter and process conditions (see page 20 and 21) | | |
| Nominal pressure | 5 bar | | |
| Temperature range standard | PVC / PUR cable -10 ... +80 °C<br>Silicone cable -30 ... +180 °C | -30 ... +150 °C | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | | |
| max. number of contacts | PVC cable 6 x NO or NC, or 4 x SPDT<br>Silicone cable 5 x NO or NC, or 3 x SPDT | 6 x NO or NC, or 4 x SPDT | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 20 and 21) | | |
| Switching power | Normally open AC 230 V; < 50 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; < 50 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; < 50 VA; 1 A DC 230 V; 20 W; 0.5 A<br>Protective conductor connection on request | | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 54 per EN 60529 / IEC 60529 | IP 65 per EN 60529 / IEC 60529 | |
| Materials | Stainless steel 1.4435, 1.4539, titanium, Hastelloy and others on request | | |

# Magnetic float switch, flange, E-CTFE coated, model FLS-SX

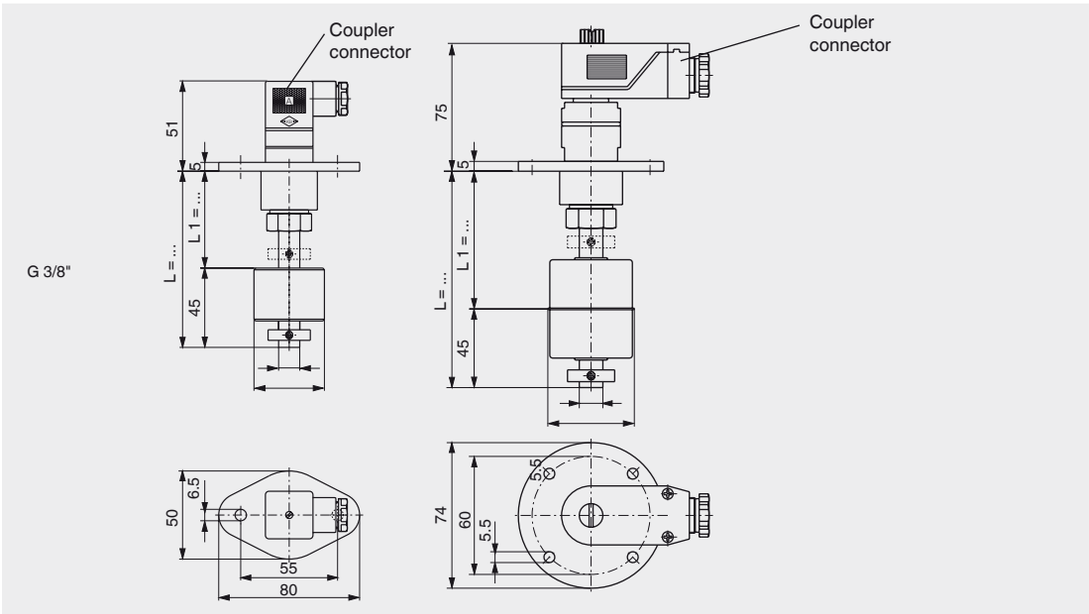
Process connection, guide tube and float from stainless steel 1.4571 (316Ti), E-CTFE coated




| | Flange (Guide tube diameter 12 mm) | Flange (Guide tube diameter 18 mm) |
|---|---|---|
| Electrical connection | Connection housing ■ Aluminium 64 x 58 x 34 mm, with 1 contact<br>■ Aluminium 80 x 75 x 57 mm, 2 or more contacts<br>Option: Polypropylene, polyester, stainless steel | |
| Process connection | Mounting flange<br>■ DIN DN 50 ... DN 200, PN 6 ... PN 40<br>■ ANSI 2" ... 8", class 150 ... 300 | |
| Guide tube diameter | 12 mm | 18 mm |
| Guide tube length L max. | 2,000 mm | 4,000 mm |
| Float | Material stainless steel 1.4571 (E-CTFE coated)<br>Float diameter from 45 ... 121 mm<br>Float selection depending on guide tube diameter and process conditions (see page 10) | |
| Temperature range | Depending on medium | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | |
| max. number of contacts | 3 x NO or NC, or 2 x SPDT | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 10) | |
| Switching power | Normally open AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 40 VA; 1 A DC 230 V; 20 W; 0.5 A | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | |
| Materials | Stainless steel 1.4571, E-CTFE coated, option anti-static | |

# Magnetic float switch, special flange, model FLS-SX

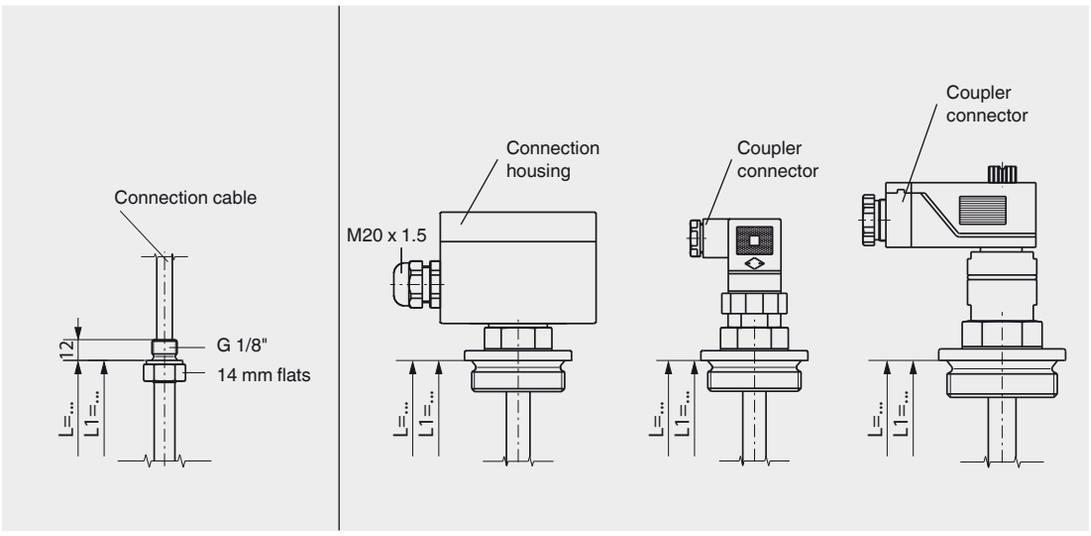
Process connection from polyamide or brass, guide tube from stainless steel 1.4571 (316Ti), float from Buna or stainless steel 1.4571 (316Ti)




| | Polyamide flange | Brass flange |
|---|---|---|
| Electrical connection | Connector C164-232-F-4P | Connector C164-332-F-5P<br>Connector C164-4337-F-7P |
| Process connection | Polyamide flange | Brass flange |
| Guide tube diameter | 12 mm | |
| Guide tube length L max. | 3,000 mm | |
| Float | Material Buna (NBR) or stainless steel 1.4571<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 20 and 21) | |
| Temperature range standard | -10 ... +80 °C | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | |
| max. number of contacts | 2 x NO or NC, or 4 x SPDT<br>Silicone cable 5 x NO or NC, or 3 x SPDT | 6 x NO or NC, or 4 x SPDT |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 20 and 21) | |
| Switching power | Normally open AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 40 VA; 1 A DC 230 V; 20 W; 0.5 A<br>Protective conductor connection on request | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | |
| Materials | Stainless steel 1.4571, 1.4404 and others on request | |

# Magnetic float switch, 8 mm guide tube, model FLS-M

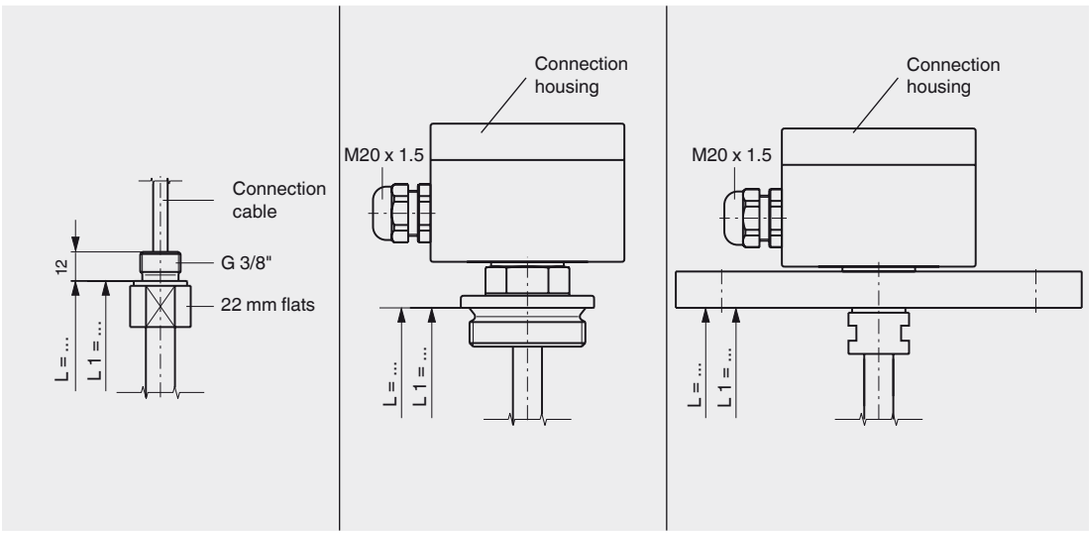
Process connection and guide tube from stainless steel 1.4571 (316Ti)




| | Mounting thread (without connection housing) | Mounting thread | | |
|---|---|---|---|---|
| Electrical connection | Connection cable<br>■ PVC<br>■ Silicone<br>■ PUR | Connection housing<br>■ Aluminium 64 x 58 x 34 mm | Coupler connector<br>■ M12, 4-pin (C164-232-F-4P) | Coupler connector<br>■ M12, 5-pin (C164-332-F-5P)<br>■ N6R, 7-pin (C164-4337-F-7P) |
| Process connection | Mounting thread upwards<br>G 1/8" (others on request) | Mounting thread downwards<br>G 3/4", G 1" (others on request) | | |
| Guide tube diameter | 8 mm | | | |
| Guide tube length L max. | 500 mm | | | |
| Float | Material stainless steel 1.4571 (option: Buna (NBR), polypropylene, titanium)<br>Float diameter from 20 ... 35 mm<br>Float selection depending on guide tube diameter and process conditions (see page 20 and 21) | | | |
| Temperature range | -10 ... +100 °C (float material stainless steel or titanium)<br>-10 ... +80 °C (float material Buna (NBR) or polypropylene) | | | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | | | |
| max. number of contacts | 3 x NO or NC, or 1 x SPDT | | | |
| Switching power | Normally open AC 250 V; 10 VA; 0.5 A DC 250 V; 5 W; 0.25 A<br>Normally closed AC 250 V; 10 VA; 0.5 A DC 250 V; 5 W; 0.25 A<br>Change-over AC 28 V; 6 VA; 0.6 A DC 28 V; 3 W; 0.3 A | | | **Please observe contact protection measures (see page 23)!** |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | | | |
| Mounting position | Vertical ±30° | | | |
| Ingress protection | IP 54 per EN 60529 / IEC 60529 | IP 65 per EN 60529 / IEC 60529 | | |

# Magnetic float switch, plastic version, 12 mm guide tube, model FLS-P

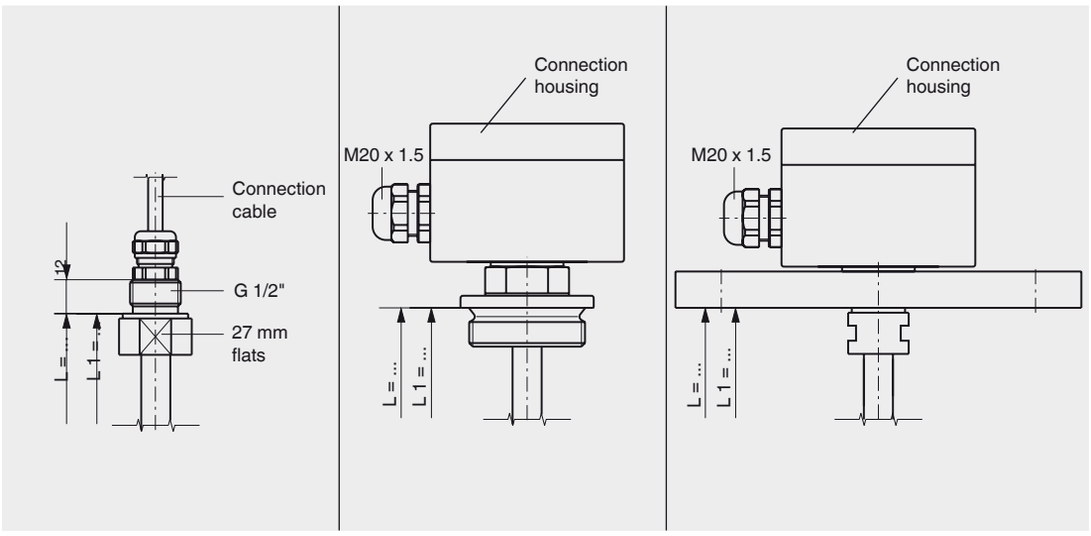
Process connection, guide tube and float from PVC or polypropylene




| | Mounting thread (without connection housing) | Mounting thread | Flange |
|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ PUR | Connection housing ■ Polypropylene 80 x 82 x 55 mm ■ Polyester 80 x 75 x 55 mm | |
| Process connection | Mounting thread, upwards G 3/8" (others on request) | Mounting thread, downwards G 1 1/2" or G 2" (others on request) | Mounting flange ■ DIN DN 50 ... DN 125, PN 10, form A ■ ANSI 2" ... 5", class 150 FF |
| Guide tube diameter | 12 mm | | |
| Guide tube length L max. | 500 mm | | |
| Float | Material ■ PVC ■ Polypropylene<br>Float diameter from 44 ... 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 21) | | |
| Temperature range | ■ PVC 0 ... +60 °C<br>■ Polypropylene -10 ... +80 °C | | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | | |
| max. number of contacts | 4 x NO or NC (PP max. 3), or 3 x SPDT (PP max. 2) | | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 21) | | |
| Switching power | Normally open AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 40 VA; 1 A DC 230 V; 20 W; 0.5 A | | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 54 per EN 60529 / IEC 60529 | IP 65 per EN 60529 / IEC 60529 | |
| Materials | PVC or polypropylene | | |

# Magnetic float switch, plastic version, 16 mm guide tube, model FLS-P

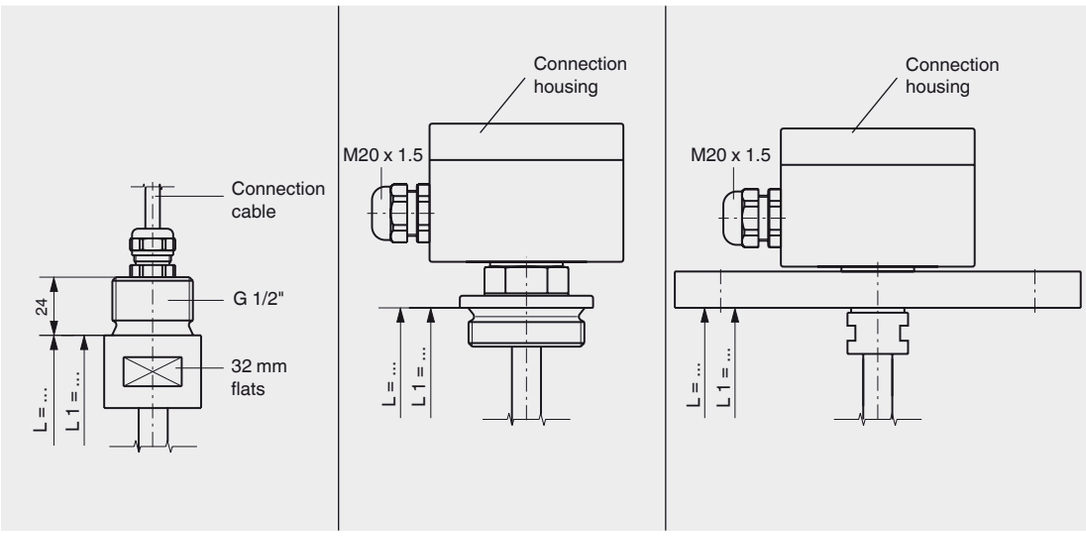
Process connection, guide tube material and float from PVC, polypropylene or PVDF




| | Mounting thread (without connection housing) | Mounting thread | Flange |
|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ PUR | Connection housing ■ Polypropylene 80 x 75 x 55 mm ■ Polyester 80 x 75 x 55 mm | |
| Process connection | Mounting thread, upwards G 1" (others on request) | Mounting thread, downwards G 2" (others on request) | Mounting flange ■ DIN DN 65 ... DN 125, PN 10, form A ■ ANSI 2 1/2" ... 5", class 150 FF |
| Guide tube diameter | 16 mm, strengthened with a metallic inner tube | | |
| Guide tube length L max. | 3,000 mm | | |
| Float | Material ■ PVC ■ Polypropylene ■ PVDF<br>Float diameter from 44 ... 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 21) | | |
| Temperature range | ■ PVC 0 ... +60 °C<br>■ Polypropylene -10 ... +80 °C<br>■ PVDF -10 ... +100 °C | | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | | |
| max. number of contacts | 6 x NO or NC, or 4 x SPDT | | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 21) | | |
| Switching power | Normally open AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 40 VA; 1 A DC 230 V; 20 W; 0.5 A | | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |
| Materials | PVC, polypropylene or PVDF | | |

# Magnetic float switch, plastic version, 22 mm guide tube, model FLS-P

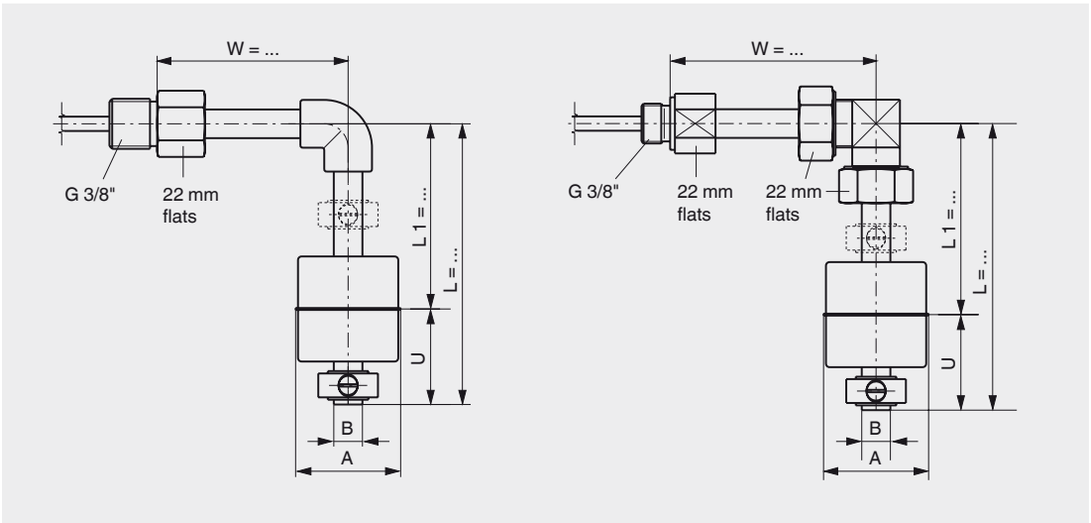
Process connection, guide tube material and float from PVC, polypropylene or PVDF




| | Mounting thread (without connection housing) | Mounting thread | Flange |
|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ PUR | Connection housing ■ Polypropylene 80 x 75 x 55 mm | |
| Process connection | Mounting thread, upwards G 1/2" (others on request) | Mounting thread, downwards G 2" (others on request) | Mounting flange ■ DIN DN 65 ... DN 125, PN 10, form A ■ ANSI 2 1/2" ... 4", class 150 FF |
| Guide tube diameter | 20 mm, strengthened with a metallic inner tube | | |
| Guide tube length L max. | 5,000 mm | | |
| Float | Material ■ PVC ■ Polypropylene ■ PVDF<br>Float diameter from 44 ... 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 21) | | |
| Temperature range | ■ PVC 0 ... +60 °C<br>■ Polypropylene -10 ... +80 °C<br>■ PVDF -10 ... +100 °C | | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | | |
| max. number of contacts | 6 x NO or NC, or 4 x SPDT | | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 21) | | |
| Switching power | Normally open AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 40 VA; 1 A DC 230 V; 20 W; 0.5 A | | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |
| Materials | PVC, polypropylene or PVDF | | |

# Magnetic float switch, plastic version, angled version, model FLS-PX

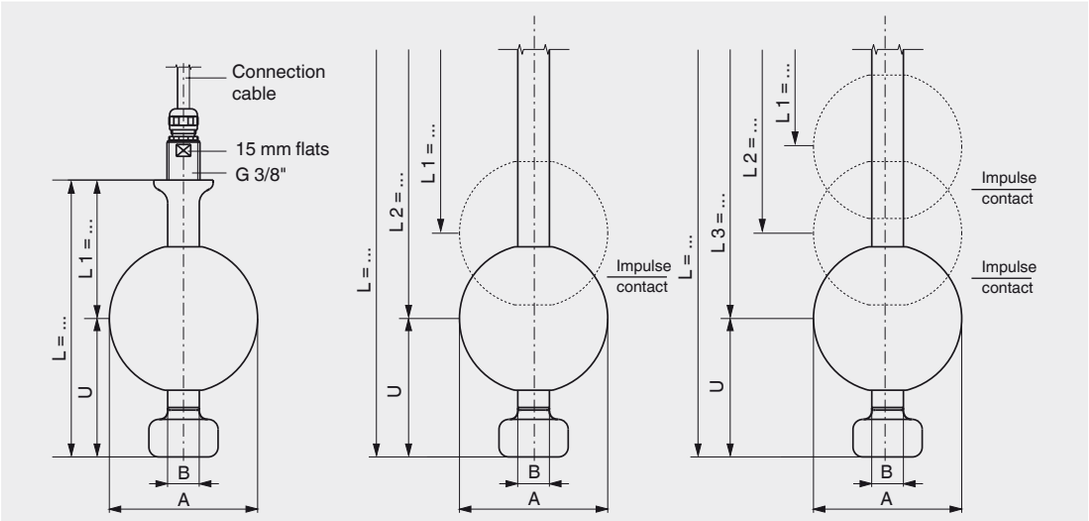
Process connection, guide tube and float from PVC or polypropylene




| | Mounting thread, PVC version | Mounting thread, polypropylene version |
|---|---|---|
| Electrical connection | Connection cable ■ PVC<br>■ PUR | |
| Process connection | Mounting thread, lateral G 3/8" (others on request) | |
| Guide tube diameter | 12 mm | |
| Guide tube length L max. | 1,000 mm | |
| Float | Material ■ PVC<br>■ Polypropylene<br>Float diameter from 44 ... 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 21) | |
| Temperature range | ■ PVC 0 ... +60 °C<br>■ Polypropylene -10 ... +80 °C | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | |
| max. number of contacts | 4 x NO or NC, or 3 x SPDT | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 21) | |
| Switching power | Normally open AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 40 VA; 1 A DC 230 V; 20 W; 0.5 A | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | |
| Materials | PVC or polypropylene | |

# Magnetic float switch, pharmaceutical version, model FLS-H

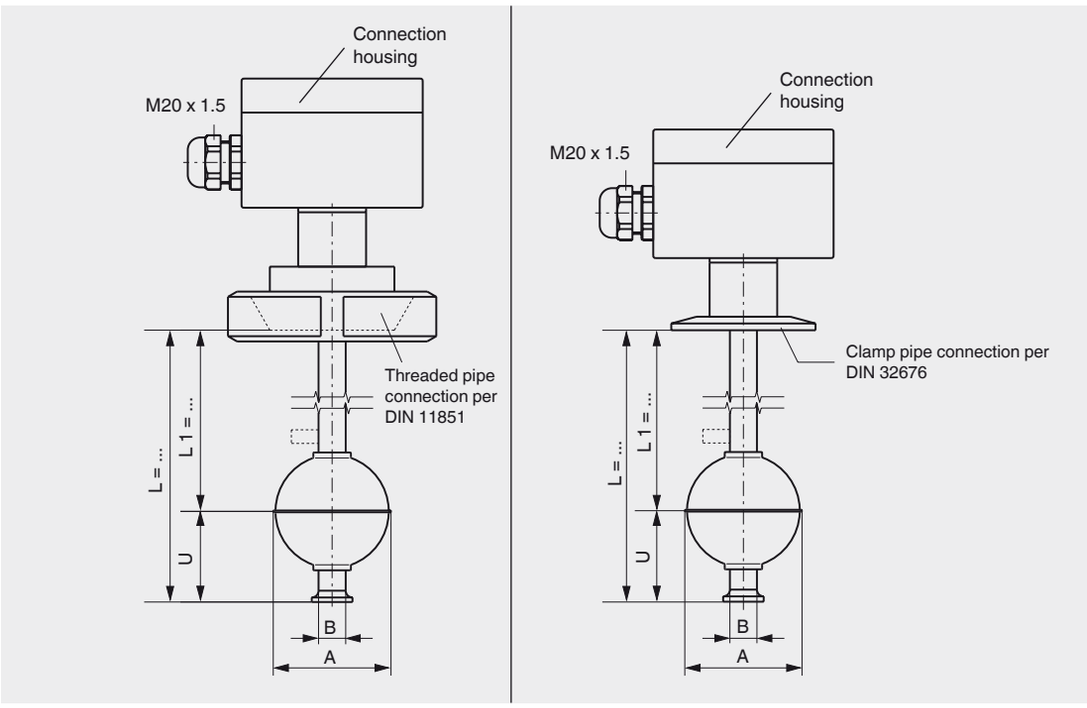
Process connection, guide tube and float from stainless steel




| | Mounting thread |
|---|---|
| Electrical connection | Connection cable ■ PVC<br>■ Silicone<br>■ PUR<br>Option connection housing |
| Process connection | Mounting thread, upwards G 3/8" (others on request)<br>Option ■ Mounting flange per DIN or ANSI<br>■ Threaded connection per DIN 11851<br>■ Clamp pipe connection per DIN 32676<br>■ Ingold sanitary fitting |
| Guide tube diameter | 17.2 mm (stainless steel 1.4435 or 1.4539, surface ground and polished) |
| Guide tube length L max. | 5,000 mm |
| Float | Material stainless steel 1.4435 or 1.4539<br>Float diameter from 44 ... 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 21) |
| Temperature range | ■ PVC and PUR -10 ... +80 °C<br>■ Silicone -30 ... +150 °C |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level |
| max. number of contacts | PVC and PUR 6 x NO or NC, or 4 x SPDT, silicone 3 x NO or NC, or 2 x SPDT |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 21) |
| Switching power | Normally open AC 230 V; 50 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 50 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 50 VA; 1 A DC 230 V; 20 W; 0.5 A |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding |
| Mounting position | Vertical ±30° |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 |

# Magnetic float switch, food version, model FLS-H

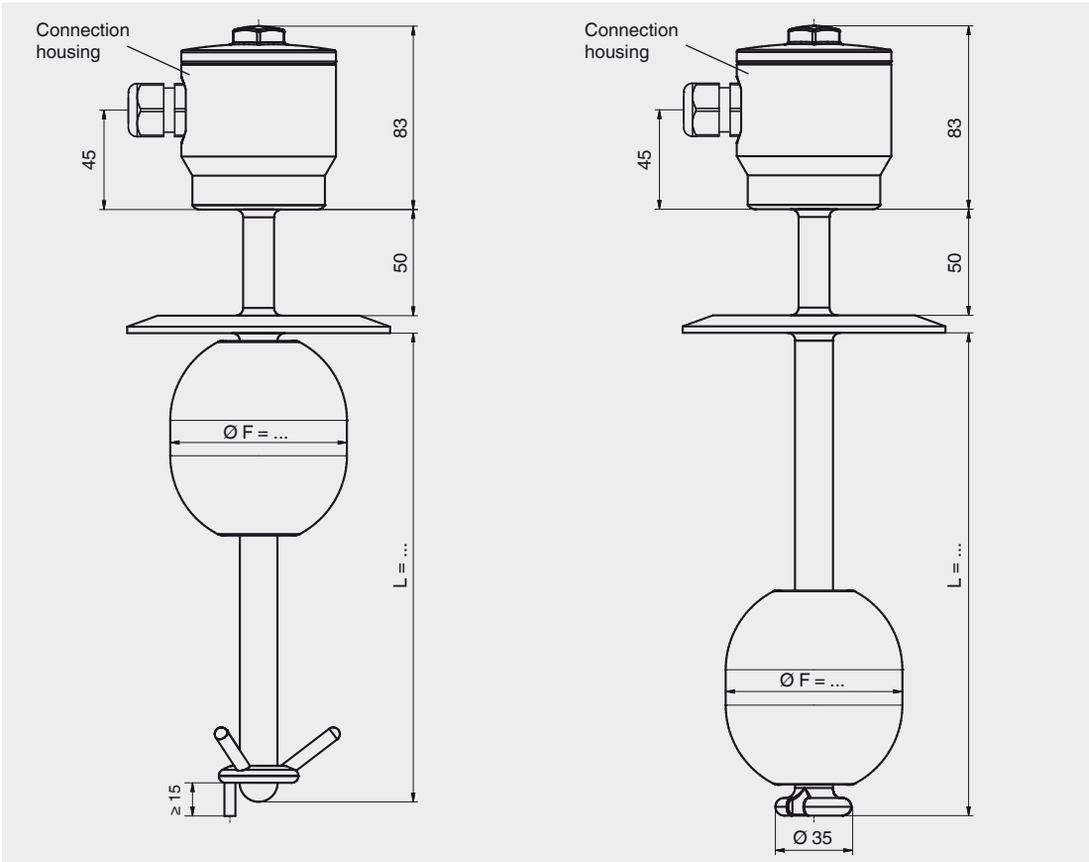
Process connection, guide tube and float from stainless steel




| | Threaded pipe connection | | Clamp pipe connection |
|---|---|---|---|
| Electrical connection | Connection housing ■ Aluminium 64 x 58 x 34 mm, with 1 contact<br>■ Aluminium 80 x 75 x 57 mm, 2 or more contacts<br>Option: Polypropylene, polyester, stainless steel | | |
| Process connection | Threaded pipe connection per DIN 11851, downwards DN 50 ... DN 150 (others on request) | | Clamp pipe connection per DIN 32676, DN 25 ... DN 100 or 1" ... 4" (others on request) |
| Guide tube diameter | 12 or 14 | 18 mm | |
| Guide tube length L max. | 3,000 mm | 6,000 mm | |
| Float | Material stainless steel 1.4435 or 1.4404, option electropolished<br>Float diameter from 44 ... 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 21) | | |
| Temperature range | -30 ... +150 °C | | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | | |
| max. number of contacts | 6 x NO or NC, or 4 x SPDT | | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | | |
| Distance between switch points | Minimum 20 mm (depending on the selection of the float and the contacts, see page 21) | | |
| Switching power | Normally open AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A<br>Normally closed AC 230 V; 100 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 40 VA; 1 A DC 230 V; 20 W; 0.5 A | | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |

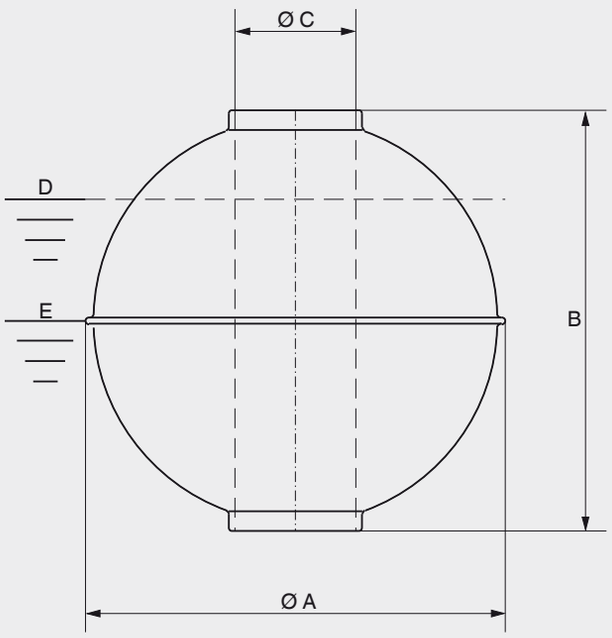
# Magnetic float switch, 3-A hygienic version, model FLS-H

Process connection, guide tube and float from stainless steel




| | Version with separate float bracket | Version with welded pipe end |
|---|---|---|
| Electrical connection | Connection housing Stainless steel | |
| Process connection | ■ Clamp connection ISO 2852 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Clamp connection DIN 32676 (DN 32 ... DN 100 or 1,5" ... 4")<br>■ Aseptic mounting thread downwards DIN 11864-1 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Aseptic collar connecting sleeve DIN 11864-1 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Aseptic flange connection DIN 11864-2 (DN 32 ... DN 50 or 1.5" ... 2")<br>■ Aseptic clamp connection DIN 11864-3 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ VARIVENT® (form F, N and G)<br>■ BioConnect® threaded connection (DN 32 ... DN 100 or 1.5" ... 2")<br>■ BioConnect® flange connection (DN 32 ... DN 100 or 1.5" ... 2")<br>■ BioConnect® clamp connection (DN 32 ... DN 100 or 1.5" ... 2") | |
| Guide tube diameter | 12, 14 or 17.2 mm (stainless steel 1.4435 or 1.4539, surface ground and polished, Ra < 0.8 µm | |
| Guide tube length L max. | 5,000 mm | |
| Float | Material stainless steel 1.4435 or 1.4404<br>Float diameter 50 or 80 mm<br>Float selection depending on guide tube diameter | |
| Temperature range | ■ Medium standard -40 ... +200 °C<br>■ Sensor housing -40 ... +85 °C | |
| Switching function | Alternatively normally open (NO), normally closed (NC) or change-over (SPDT) contact - on rising level | |
| max. number of contacts | 3 x NO, NC or SPDT | |
| Switch position | Dimensions $L_1$, $L_2$, $L_3$ ... (from sealing face, starting from top) | |
| Distance between switch points | Minimum 50 mm (depending on the selection of the float and the contacts, see page 21) | |
| Switching power | Normally open AC 230 V; 50 VA; 1 A DC 230 V; 50 W; 0.5 A<br>normally closed AC 230 V; 50 VA; 1 A DC 230 V; 50 W; 0.5 A **Please observe contact protection measures (see page 23)!**<br>Change-over AC 230 V; 50 VA; 1 A DC 230 V; 20 W; 0.5 A | |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage e.g. KSR contact protection relay or external grounding | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | |

# Spherical floats (K)



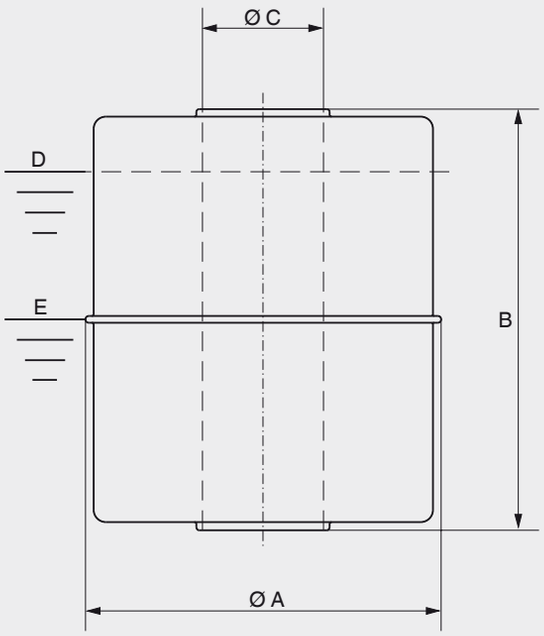

D = Limit density of the medium, immersed float volume 85 %

E = Nominal density of the medium, immersed float volume 50 %

| Material | Suits guide tube Ø mm | Ø A mm | B mm | Ø C mm | Max. operating pressure bar | Max. operating temperature °C | Limit density 85 % kg/m³ | Order no. |
|---|---|---|---|---|---|---|---|---|
| Stainless steel 1.4571 | **8** | 29 | 28 | 9 | 6 | 100 | 977 | 005454 |
| | **8** | 29 | 28 | 9 | 25 | 100 | 1069 | 027355 |
| | **12** | 52 | 52 | 15 | 40 | 300 | 769 | 005462 |
| | **12** | 62 | 61 | 15 | 32 | 300 | 597 | 005511 |
| | **12** | 83 | 81 | 15 | 25 | 300 | 408 | 005485 |
| | **18** | 80 | 76 | 23 | 25 | 300 | 679 | 005478 |
| | **18** | 98 | 96 | 23 | 25 | 300 | 597 | 005489 |
| | **18** | 105 | 103 | 23 | 25 | 300 | 533 | 020652 |
| | **18** | 120 | 117 | 23 | 25 | 300 | 389 | 021721 |
| Titanium 3.7035 | **8** | 29 | 28 | 9 | 30 | 100 | 822 | 005522 |
| | **12** | 52 | 52 | 15 | 25 | 300 | 707 | 005526 |
| | **12** | 52 | 52 | 15 | 60 | 300 | 852 | - |
| | **12** | 52 | 52 | 15 | 80 | 300 | 1060 | - |
| | **12** | 62 | 62 | 15 | 25 | 300 | 505 | 005536 |
| | **12** | 83 | 81 | 15 | 25 | 300 | 278 | 005544 |
| | **18** | 80 | 76 | 23 | 25 | 300 | 665 | 112263 |
| | **18** | 98 | 96 | 23 | 25 | 300 | 495 | - |
| | **18** | 105 | 103 | 23 | 25 | 300 | 369 | - |
| | **18** | 120 | 117 | 23 | 25 | 300 | 329 | - |
| Stainless steel 1.4571 E-CTFE coated | **12** | 53 | 53 | 14 | 25 | depending on medium | 745 | - |
| | **12** | 63 | 62 | 14 | 25 | depending on medium | 591 | - |
| | **12** | 84 | 82 | 14 | 25 | depending on medium | 403 | - |
| | **18** | 81 | 77 | 22 | 25 | depending on medium | 718 | - |
| | **18** | 99 | 97 | 22 | 25 | depending on medium | 675 | - |
| | **18** | 106 | 104 | 22 | 25 | depending on medium | 633 | - |
| | **18** | 121 | 118 | 22 | 25 | depending on medium | 459 | - |

Note: The optimum float will be selected after a feasibility test carried out by KSR.

# Cylindrical floats (Z)




D = Limit density of the medium, immersed float volume 85 %

E = Nominal density of the medium, immersed float volume 50 %

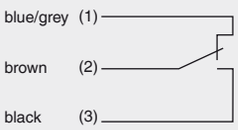
| Material | Suits guide tube Ø mm | Ø A mm | B mm | Ø C mm | Max. operating pressure bar | Max. operating temperature °C | Limit density 85 % kg/m³ | Order no. |
|---|---|---|---|---|---|---|---|---|
| Stainless steel 1.4571 | **8** | 27 | 31 | 10 | 16 | 100 | 787 | 009679 |
| | **12** | 44 | 52 | 15 | 16 | 300 | 818 | 009681 |
| Titanium 3.7035 | **12** | 44 | 52 | 15 | 16 | 300 | 720 | 009744 |
| Buna (NBR) | **8** | 20 | 20 | 9 | 3 | 80 | 939 | 009719 |
| | **8** | 23 | 25 | 9 | 3 | 80 | 802 | 009721 |
| | **8** | 25 | 14 | 9 | 3 | 80 | 787 | 009720 |
| | **8** | 30 | 45 | 13 | 3 | 80 | 683 | 034047 |
| | **12** | 40 | 30 | 15 | 3 | 80 | 581 | 009728 |
| | **12** | 40 | 120 | 15 | 3 | 80 | 409 | - |
| | **18** | 50 | 45 | 19 | 3 | 80 | 498 | 009725 |
| PVC | **12** | 44 | 44 | 14 | 3 | 60 | 651 | 033790 |
| | **16** | 55 | 54 | 22 | 3 | 60 | 798 | - |
| | **20** | 55 | 80 | 26 | 3 | 60 | 919 | - |
| | **16** | 55 | 70 | 22 | 3 | 60 | 674 | - |
| | **20** | 80 | 79 | 25 | 3 | 60 | 573 | 033796 |
| Polypropylene | **8** | 27 | 29 | 9 | 3 | 80 | 755 | 015516 |
| | **8** | 35 | 33 | 9 | 3 | 80 | 675 | 100347 |
| | **12** | 44 | 44 | 14 | 3 | 80 | 478 | 015514 |
| | **16** | 55 | 54 | 22 | 3 | 80 | 582 | 033792 |
| | **20** | 55 | 80 | 26 | 3 | 80 | 669 | - |
| | **20** | 80 | 79 | 25 | 3 | 80 | 431 | 033795 |
| PVDF | **12** | 44 | 55 | 14 | 3 | 100 | 782 | 033791 |
| | **16** | 55 | 69 | 22 | 3 | 100 | 821 | 116235 |
| | **20** | 55 | 80 | 26 | 3 | 100 | 1140 | - |
| | **20** | 80 | 79 | 25 | 3 | 100 | 681 | 033797 |
| Stainless steel 1.4571 E-CTFE coated | **12** | 45 | 53 | 14 | 16 | depending on medium | 782 | - |

Note: The optimum float will be selected after a feasibility test carried out by KSR.

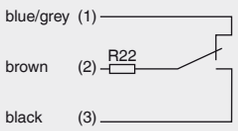
# Electrical connections

## Reed contact

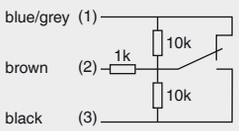
1 switch point




1 switch point
Wiring for operation with a PLC

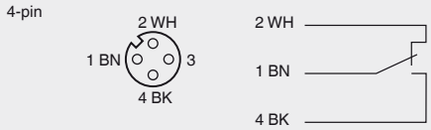



1 switch point
NAMUR circuit per DIN EN 60947-5-6

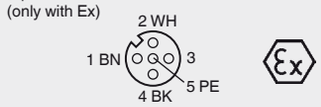



**Connector, pin assignment**

4-pin




5-pin
(only with Ex)




### Connection cable

| Connection cable | Cross-section |
|---|---|
| PVC | 4 x 0.5 mm$^2$ |
| Silicone | 4 x 0.75 mm$^2$ |
| Armoured silicone | 4 x 0.75 mm$^2$ |
| LMGSG | 3 x 1.5 mm$^2$ |

### Colour coding per IEC 60757

| Colour | Short symbol |
|---|---|
| Black | BK |
| Brown | BN |
| Red | RD |
| Orange | OG |
| Yellow | YE |
| Green | GN |
| Blue | BU |
| Violet | VT |
| Grey | GY |
| White | WH |
| Pink | PK |
| Turquoise | TQ |
| Green-Yellow | GNYE |

## Contact protection measures

The reed contacts should be protected against any voltage or current spikes that might occur.

Depending on the different load types different protective circuits are used.

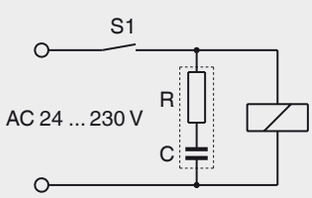
**Model KR 24**

**RC module**

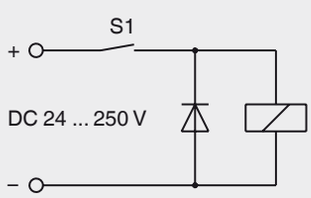
| Contact protection relays | Contacts | Input | Power supply | Approval number | Order no. |
|---|---|---|---|---|---|
| KR 24 | 1 x change-over AC 250 V, 2 A | 2 x contacts | DC 20 ... 30 V | | 112941 |
| KR 24-EX | 2 x change-over AC 253 V, 2 A | 2 x contacts | DC 20 ... 30 V | II 1 GD EEx ia IIC, PTB 02 ATEX 2073 | 112944 |
| KR 230 | 1 x change-over AC 250 V, 2 A | 2 x contacts | AC 230 V | | 112942 |
| KR 230-EX | 2 x change-over AC 253 V, 2 A | 2 x contacts | AC 230 V | II 1 GD EEx ia IIC, PTB 02 ATEX 2073 | 112943 |

| RC module | Capacitance | Resistance | Voltage | Order no. |
|---|---|---|---|---|
| B3/115 | 0.33 µF | 470 Ohm | AC 115 V | 110446 |
| B3/230 | 0.33 µF | 1,000 Ohm | AC 230 V | 110460 |

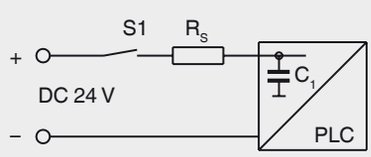
**Inductive load**
AC voltage




**Inductive load**
DC voltage




**Capacitive load**




### Ordering information

To order the described product the order number (if available) is sufficient.

Alternatively:
Model / Version / Electrical connection / Process connection / Guide tube diameter / Guide tube length L / Information about contact (switching function, number of switch points, switch position) / process details (operating temperature and working pressure, Limit density) / Options

# Appendix

## Cross Reference FLS

| Replaced Type | Type | Description |
|---|---|---|
| 60-ARV... | FLS-S | Approval: ATEX Ex-i; Process connection: mounting thread downwards |
| 60-AFV... | FLS-S | Approval: ATEX Ex-i; Process connection: flange connection |
| ARV... | FLS-S | Process connection: mounting thread downwards |
| ERV... | FLS-S | Process connection: mounting thread upwards |
| AFV... | FLS-S | Process connection: flange connection |
| RV... | FLS-S | Process connection: mounting thread downwards, adjustable |
| AFVEC... | FLS-S | Material: Stainless steel 1.4571 E-CTFE ; Option: anti-static |
| AL-ADF-RV... | FLS-S | Approval: ATEX Ex-d; Process connection: mounting thread downwards |
| AL-ADF-FV... | FLS-S | Approval: ATEX Ex-d; Process connection: flange connection |
| ASC4FPA... | FLS-S | Magnetic float switch with coupler plug |
| ASC... | FLS-S | Magnetic float switch with coupler plug |
| AMRV... | FLS-H | Food industry design, Process Connection: Dairy fitting |
| AFCV... | FLS-H | Food industry design, Process Connection: Clamp connection |
| SMS/FLS-HD... | FLS-H | 3-A Symbol Holder Licence, Standard 74-06 |
| Design with 8 mm guide tube OD | FLS-M | Material: Stainless Steel 1.4404 (316L) / 1.4571 (316Ti), Buna, Polypropylen |
| ERP... | FLS-P | Material: PVC; Process connection: mounting thread upwards |
| ERPP... | FLS-P | Material: Polypropylen; Process connection: mounting thread upwards |
| ERPF... | FLS-P | Material: PVDF; Process connection: mounting thread upwards |
| ABRP... | FLS-P | Material: PVC; Process connection: mounting thread downwards |
| ABRPP... | FLS-P | Material: Polypropylen; Process connection: mounting thread downwards |
| ABFPF ... | FLS-P | Material: PVDF; Process connection: flange connection |
| APRP... | FLS-P | Material: PVC; Process connection: mounting thread downwards |
| APRPP ... | FLS-P | Material: Polypropylen; Process connection: mounting thread downwards |
| APFPF ... | FLS-P | Material: PVDF; Process connection: flange connection |

# Type Code

| Code | | 1st key | | 2nd key | | 3rd key |
|---|---|---|---|---|---|---|
| **1** | | **Electrical connection** | | **Process connection** | | **Material process connection** |
| .../.../... | - | (none) - connection cable | ER | Mounting thread upwards (BSP) | V | Stainless steel SS 316 Ti |
| | A | Terminal box Aluminium | R | Mounting thread downwards (BSP) | VE | Stainless steel polished |
| | AB | Terminal box Polypropylene | ENPT | Mounting thread upwards (NPT) | VEC | Stainless steel ECTFE-coated |
| | AP | Terminal box Polyester | NPT | Mounting thread downwards (NPT) | VTF | Stainless steel PTFE-lined |
| | AV4 | Terminal box Stainless steel SS 316 Ti | MR | Dairy fitting acc. to DIN 11851 | T | Titanium |
| | AL-ADF | Terminal box, flameproof Aluminium | F | Flange (DIN, ANSI, JIS) | HC | Hastelloy C |
| | ASC4 | Coupler plug C 164-232-F-4P | FC | Clamp-connection acc. to DIN 32676 | P | PVC |
| | ASN 6R | Hirschmann coupler plug N6RAM 2D M20 | IS | Sanitary nozzle (Ingoldstutzen) | PP | Polypropylene |
| | ASM | Coupler plug M12 | | | PF | PVDF |
| | | | | | M | Brass flange OD 74 mm |
| | | | | | K | Oval flange, Polyamide |
| **2** | | **Process connection** | | | | |
| .../.../... | **...** | Mounting thread size in inches | | | | |
| | **...** | Threaded connection size DN 50 - DN 150 | | | | |
| | **.../** | **Flange nominal size** | **.../** | **Flange pressure rating** | **...** | **Flange face** |
| DIN | | DN 50 - DN 200 | | PN 6 - PN 100 | | Standard Form C optional E, A, F, N |
| DIN EN | | DN 50 - DN 200 | | PN 6 - PN 100 | | Standard Form B1 optional B2, A, C, D |
| ANSI | | 2“- 8“ | | Class 150 - 600 | | Standard RF optional RTJ, FF, ST, SG |
| JIS | | 2“(DN 50) - 8“(DN 200) | | 5 K- 63 K | | Standard RF optional RTJ, FF, ST, SG |
| Clamp | | DN 25 - DN 100; 1“- 4“ | | | | |
| **3** | | **1st key Guide tube material** | | **2nd key Contact function** | | **3rd key Optional code adder** |
| .../.../... | V | Stainless steel SS 316 Ti | S | Closing | /HT.. | High temperature +150°C...+300°C |
| | VE | Stainless steel electropolished | O | Opening | /TT.. | Low temperature -30 °C ... -196 °C |
| | VEC | Stainless steel ECTFE-coated | U | Change over | /H | Increased hysteresis |
| | VTF | Stainless steel PTFE-lined | | | /PT100 | Temperature probe PT 100 (2-,3- or 4-core) |
| | HB | Hastelloy B | | | /..TH.. | Temperature switch ... °C - closing or opening |
| | HC | Hastelloy C | | | /R... | Current limitation using resistor .. Ohm |
| | P | PVC | | | /N | acc. to NAMUR DIN EN 60947-5-6 |
| | PP | Polypropylene | | | | |
| | PF | PVDF | | | | |
| | W... | Angular design (V, P, PP) | | | | |
| **4** | | **Guide tube length** | | **OD Guide tube** | | |
| L.../... | L.../ | length in mm | ... | OD in mm | | |
| **5** | | **Float design** | | | | |
| .../... | .../ | Material (code 3, 1st key) | ... | Float OD in mm | | |
| **6** | | **Connection cable** | | **Cable material** | | |
| .../... | .../ | length inmMeter | — | PVC, grey | | |
| | | | blue | PVC, blue | | |
| | | | SIL | Silicone | | |
| | | | PUR | PUR | | |

| 7 | | Approval |
|---|---|---|
| .../.../... | - | none |
| | Ex | Ex i |
| | Ex d | ATEX |
| | Ex d | IECEx |
| | GL | Germanischer LLoyd |
| | DNV | Det Norske Veritas |
| | ABS | American Bureau of Shipping |
| | 3-A | 3-A certified |

## Ordering Example

| | Connection design / material | | Connection size | | Guide tube material contact function | | Guide tube length / Ø | | Float | | Cable length / material | | Approval |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | - | 3 | - | 4 | - | 5 | - | 6 | - | 7 |
| | AFV | - | 50/6/F | - | V S O U | - | L950/12 | - | V44A | - | - | - | - |

**Switch function on rising level**
Switch point L3 = 905 mm Chance over
Switch point L2 = 400 mm Opening
Switch point L1 = 190 mm Closing

# Magnetic float switch
# For horizontal installation
# Model HLS



## Applications

- Level measurement for almost all liquid media
- Pump and level control
- Chemical, petrochemical, natural gas, offshore, shipbuilding, machine building, power generating equipment, power plants
- Process and drinking water treatment

## Special features

- Large range of application due to the simple, proven functional principle
- For harsh operating conditions, long service life
- Operating limits:
  - Operating temperature: T = -196 ... +350 °C
  - Operating pressure: P = vacuum to 232 bar
  - Limit density: ρ ≥ 600 kg/m³
- Stainless steel and plastic versions
- Explosion-protected versions

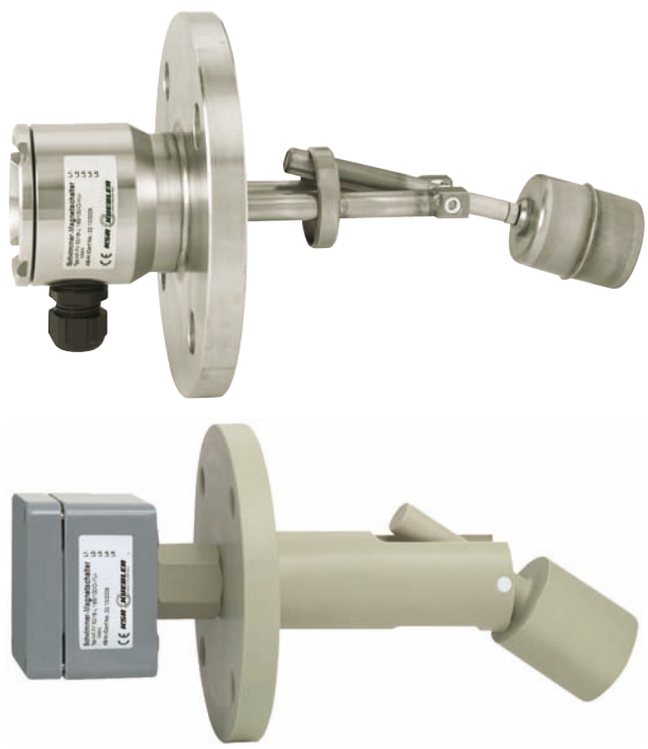


**Fig. top: Stainless steel version, model HLS-S**
**Fig. bottom: Plastic version, model HLS-P**

## Description

In addition to the various applications for float switches for vertical installation (model FLS), the model HLS horizontal float switches likewise offer innumerable possibilities to monitor and/or switch levels in order to indicate minimum/maximum levels.

The float is attached to a supported, swivelling lever and moves with the level of the medium being measured. By means of a permanent magnet, fixed to the end of the lever, when a preset switch point is reached, a reed contact (inert gas contact) within the contact pipe is actuated.

By using a permanent magnet and a reed contact the switching operation is non-contact, free from wear and needs no power supply. The functioning of the float switch is independent of foaming, conductivity, vapours, bubble formation and vibrations.

The signal processing is universal. Direct connection to PLCs, NAMUR connections, signal amplifiers or contact protection relays is possible.

The float switch is simple to mount and maintenance-free, so the costs of mounting, commissioning and operation are low.

## Model overview

| Float switch model | Description | Approval | | | | | |
|---|---|---|---|---|---|---|---|
| | | without | Ex i | Ex d | GL | ABS | Ex i + GL |
| **HLS-S** | Magnetic float switch, standard version | x | x | x | x | x | x |
| **HLS-P** | Magnetic float switch, plastic version | x | | | | | |

| Float switch model | Materials | | | Temperature range | Max. pressure |
|---|---|---|---|---|---|
| | Stainless steel 1.4571 (316Ti) | Stainless steel 1.4404 (316L) | Polypropylene | | |
| **HLS-S** | x | x | | -196 ... +350 °C | 232 bar |
| **HLS-P** | | | x | -10 ... +80 °C | 6 bar |

## Ex approvals

| Explosion protection | Ignition protection type | Model | Zone | Approval number |
|---|---|---|---|---|
| ATEX | Ex i | HLS-S-Ex i | Zone 0, gas<br>Zone 1, gas/dust | IBExU 03 ATEX1038X II 1G/2GD EEx ia IIC T2 ... T6 |
| | Ex d | HLS-S-Ex d | Zone 1, gas | TÜV 09 ATEX 7632X II 2G Ex d IIC T6,<br>II 2D Ex tD A21 IP 65 T80 °C |
| | Ex i + GL | HLS-S-Ex i | Zone 0, gas<br>Zone 1, gas/dust | IBExU03ATEX1038X II 1G/2GD EEx ia IIC T6-T2 +<br>GL-32527 - 06 HH |

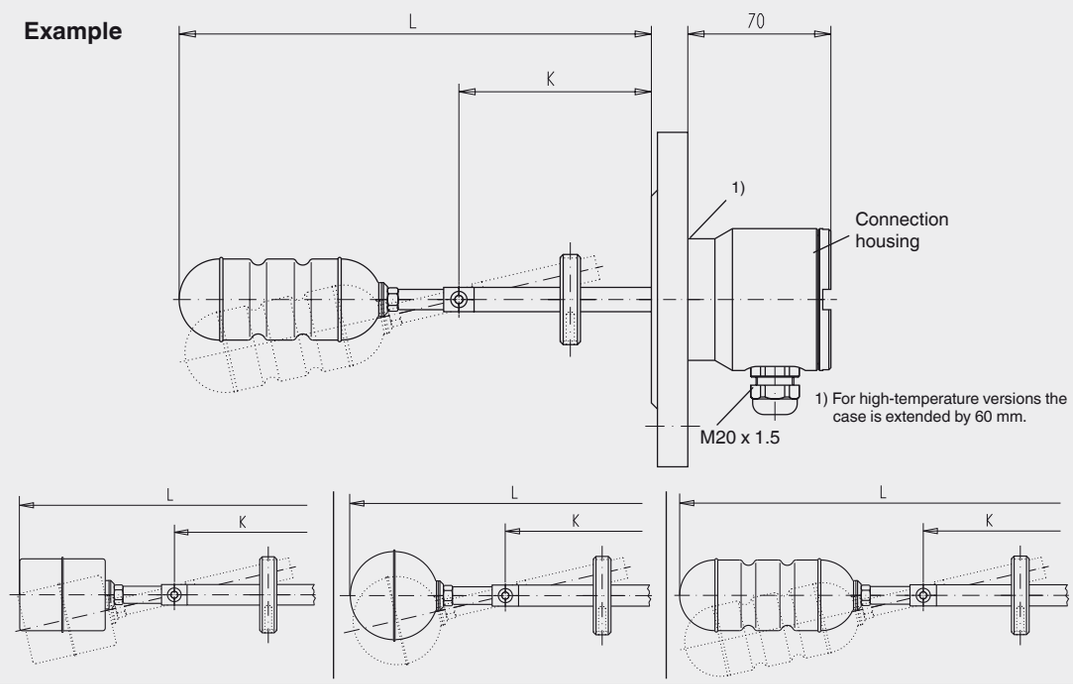
## Type approval

| Approval | Model | Approval number |
|---|---|---|
| GL | HLS-S | GL - 32 527 - 06 HH |
| ABS | HLS-S | ABS-02-HG286248-2-PDA |
| GOST | HLS-S, HLS-P | 959333 |

# Magnetic float switch, standard version, model HLS-S

Process connection, contact tube and float from stainless steel 1.4571

**Example**




| | Float model V44HI | Float model T52HI and T52HI/Gr. 5 | Float model ZVSS43/100HI |
|---|---|---|---|
| Electrical connection | Connection housing ■ Stainless steel 1.4571 | | |
| Process connection | Mounting flange ■ DIN DN 50 ... DN 100, PN 6 ... PN 400<br>■ EN 1092 DN 50 ... DN 100, PN 6 ... PN 400<br>■ ANSI 2" ... 4", class 150 ... 600<br>■ Square flange DN 80 and DN 92 (other flanges on request) | | |
| Contact tube<br>Insertion length L<br>Contact tube length K | <br>193 ... 990 mm<br>100 ... 900 mm | <br>185 ... 990 mm<br>100 ... 900 mm | <br>240 ... 990 mm<br>100 ... 900 mm |
| Float material | Stainless steel 1.4571 | Model T52HI: Titanium 3.7035, grade 2<br>Model T52HI/Gr. 5: Titanium 3.7165, grade 5 | Stainless steel 1.4571 |
| Float<br>Diameter<br>Length | <br>44 mm<br>52 mm | <br>52 mm<br>52 mm | <br>43 mm<br>100 mm |
| Max. operating pressure | 6 bar | Model T52HI: 100 bar<br>Model T52HI/Gr. 5: 232 bar | 20 bar |
| Min. density | 600 kg/m³ | | |
| Temperature range<br>Standard | <br>-40 ... +250 °C<br>Option: ■ High-temperature version: -20 ... +350 °C<br>Option: ■ Low-temperature version: -196 ... +250 °C | | |
| Switching function | selectable:<br>1 x change-over SPDT<br>1 x normally open NO - on rising level<br>1 x normally closed NC - on rising level<br>1 x proximity switch I - on rising or falling level | | |
| Switching power | AC 230 V; 40 VA; 1 A | DC 230 V; 20 W; 0,5 A | **Please observe contact protection measures!** |
| | Attention: Versions without protective conductor connection - operation only at safety extra-low voltage<br>e.g. contact protection relay or external grounding | | |
| Mounting position | Horizontal ±30° | | |
| Ingress protection | IP 67 per EN 60529 / IEC 60529 | | |

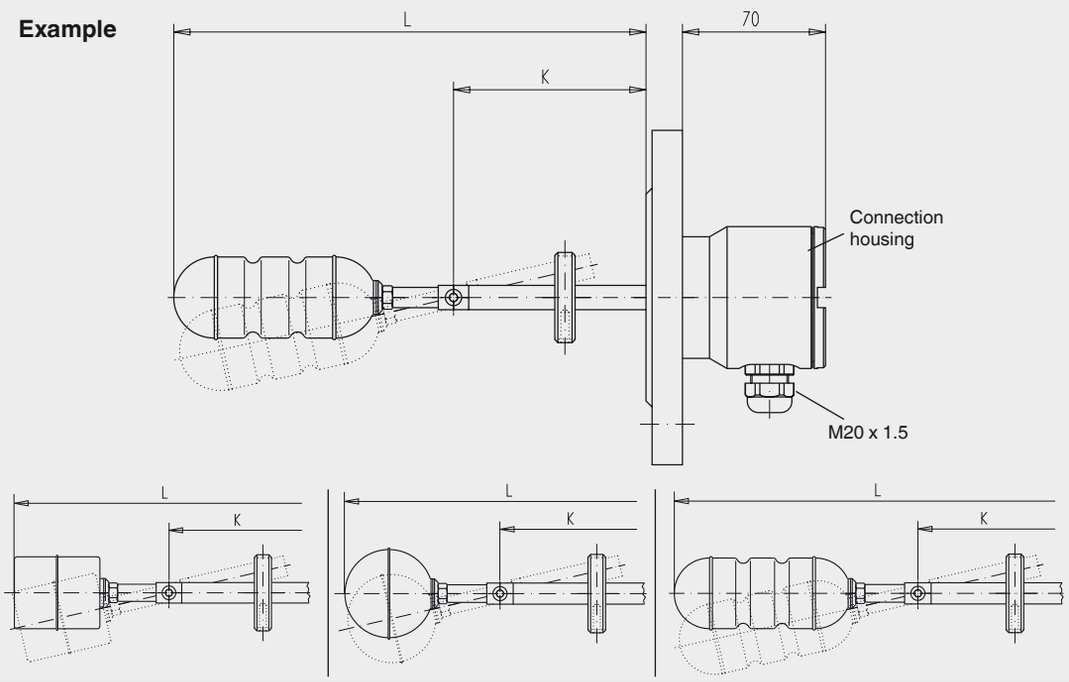
Versions in titanium, Hastelloy or other materials on request

# Magnetic float switch, intrinsically safe, model HLS-S-Ex i

IBExU 03 ATEX1038X II 1G/2GD EEx ia IIC T2 ... T6

Process connection, contact tube and float from stainless steel 1.4571

**Example**




| | Float model V44HI | Float model T52HI and T52HI/Gr. 5 | Float model ZVSS43/100HI |
|---|---|---|---|
| Electrical connection | Connection housing ■ Stainless steel 1.4571 | | |
| Process connection | Mounting flange ■ DIN DN 50 ... DN 100, PN 6 ... PN 160<br>■ EN 1092 DN 50 ... DN 100, PN 6 ... PN 160<br>■ ANSI 2" ... 4", class 150 ... 900<br>■ Square flange DN 80 and DN 92 (other flanges on request) | | |
| Contact tube<br>Insertion length L<br>Contact tube length K | <br>193 ... 990 mm<br>100 ... 900 mm | <br>185 ... 990 mm<br>100 ... 900 mm | <br>240 ... 990 mm<br>100 ... 900 mm |
| Float material | Stainless steel 1.4571 | Model T52HI: Titanium 3.7035, grade 2<br>Model T52HI/Gr. 5: Titanium 3.7165, grade 5 | Stainless steel 1.4571 |
| Float<br>Diameter<br>Length | <br>44 mm<br>52 mm | <br>52 mm<br>52 mm | <br>43 mm<br>100 mm |
| Max. operating pressure | 6 bar | Model T52HI: 100 bar<br>Model T52HI/Gr. 5: 180 bar | 20 bar |
| Min. density | 600 kg/m³ | | |

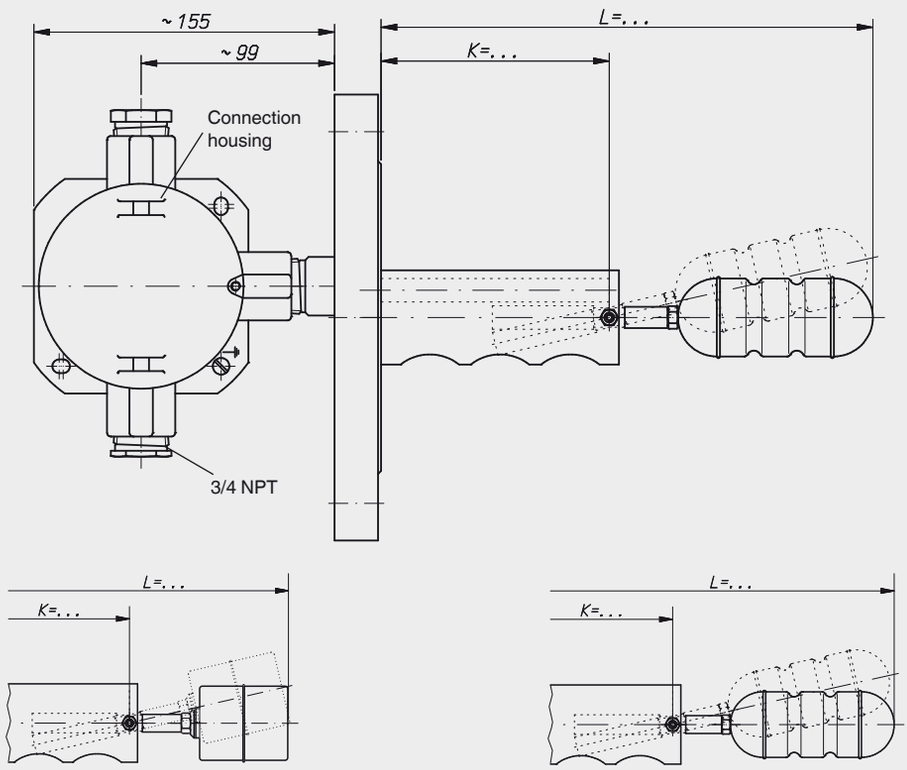
| Temperature class | | T2 | T3 | T4 | T5 | T6 |
|---|---|---|---|---|---|---|
| Process temperature | Max. | 180 °C | 160 °C | 108 °C | 80 °C | 65 °C |
| Ambient temperature at case | Max. | 80 °C | 80 °C | 80 °C | 80 °C | 60 °C |

| | |
|---|---|
| Switching function | 1 x change-over SPDT |
| Switching power | Only for connection to a certified intrinsically safe circuit with $U_{max}$ 36 V, $I_{max}$ 100 mA |
| Mounting position | Horizontal ±30° |
| Ingress protection | IP 67 per EN 60529 / IEC 60529 |

# Magnetic float switch, flameproof enclosure, model HLS-S-Ex d

TÜV 09 ATEX 7632X II 2G Ex d IIC T6, II 2D Ex tD A21 IP 65 T80 °C
Process connection, contact tube and float from stainless steel 1.4404

**Example**

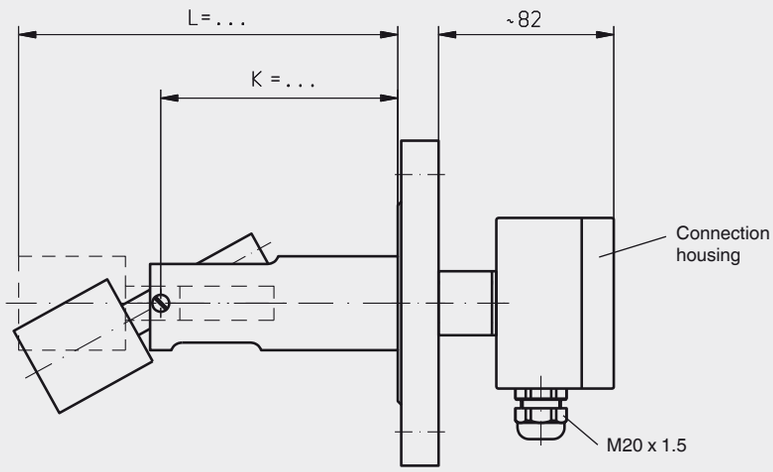



| | Float model V44HI | Float model ZVSS43/100HI |
|---|---|---|
| Electrical connection | Connection housing ■ Aluminium | |
| Process connection | Mounting flange ■ EN and DIN DN 65 ... DN 100, PN 6 ... PN 100<br>■ ANSI 2,5" ... 4", class 150 ... 600 (other flanges on request) | |
| Contact tube<br>Insertion length L<br>Contact tube length K | <br>150 mm<br>100 mm | <br>193 mm<br>100 mm |
| Float material | Stainless steel 1.4404 | |
| Float<br>Diameter<br>Length | <br>44 mm<br>52 mm | <br>43 mm<br>100 mm |
| Max. operating pressure | 6 bar | 20 bar |
| Min. density | 600 kg/m$^3$ | |
| Temperature range<br>Standard | <br>-10 ... +80 °C | |
| Switching function | 1 x change-over SPDT | |
| Switching power | AC 230 V; 40 VA; 1 A **Please observe contact protection measures!** | |
| Mounting position | Horizontal ±30° | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | |

# Magnetic float switch, plastic version, model HLS-P

Process connection, contact tube and float from polypropylene

**Example**

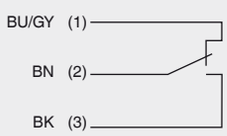



| | Float model PP44HI | |
|---|---|---|
| Electrical connection | Connection housing | ■ Polypropylene<br>■ Polyester |
| Process connection | Mounting flange | ■ DIN DN 50 ... DN 100, PN 16, form A<br>■ ANSI 2" ... 4", class 150 FF |
| Contact tube<br>Insertion length L<br>Contact tube length K | <br>176 mm<br>111 mm | |
| Float material | Polypropylene | |
| Float<br>Diameter<br>Length | <br>44 mm<br>52 mm | |
| Max. operating pressure | 6 bar | |
| Min. density | 750 kg/m³ | |
| Temperature range | -10 ... +80 °C | |
| Switching function | selectable:<br>1 x change-over SPDT<br>1 x normally open NO - on rising level<br>1 x normally closed NC - on rising level | |
| Switching power | AC 230 V; 40 VA; 1 A | DC 230 V; 20 W; 0.5 A **Please observe contact protection measures!** |
| | **Attention:** Versions without protective conductor connection - operation only at safety extra-low voltage<br>e.g. contact protection relay or external grounding | |
| Mounting position | Horizontal ±30° | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | |

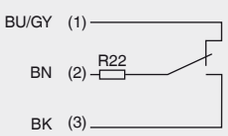
## Electrical connections

### Reed contact

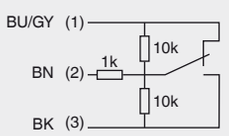
1 switch point



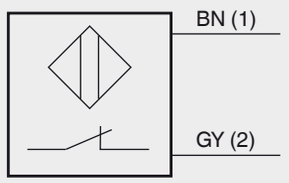

1 switch point
Wiring for operation with a PLC




1 switch point
NAMUR circuit per DIN EN 60947-5-6




### Proximity switch



## Contact protection measures

The reed contacts should be protected against any voltage or current spikes that might occur.

Depending on the different load types different protective circuits are used.

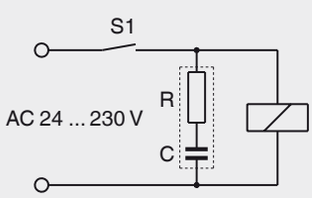
**Model KR 24**


**RC module**

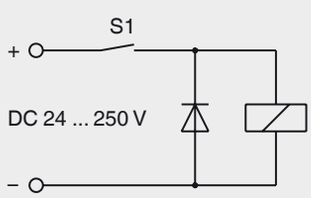
| Contact protection relays | Contacts | Input | Power supply | Approval number | Order no. |
|---|---|---|---|---|---|
| KR 24 | 1 x change-over AC 250 V, 2 A | 2 x contacts | DC 20 ... 30 V | | 112941 |
| KR 24-EX | 2 x change-over AC 253 V, 2 A | 2 x contacts | DC 20 ... 30 V | II 1 GD EEx ia IIC, PTB 02 ATEX 2073 | 112944 |
| KR 230 | 1 x change-over AC 250 V, 2 A | 2 x contacts | AC 230 V | | 112942 |
| KR 230-EX | 2 x change-over AC 253 V, 2 A | 2 x contacts | AC 230 V | II 1 GD EEx ia IIC, PTB 02 ATEX 2073 | 112943 |

| RC module | Capacitance | Resistance | Voltage | Order no. |
|---|---|---|---|---|
| B3/115 | 0.33 µF | 470 Ohm | AC 115 V | 110446 |
| B3/230 | 0.33 µF | 1,000 Ohm | AC 230 V | 110460 |

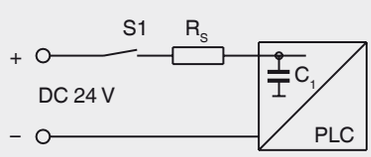
**Inductive load**
AC voltage




**Inductive load**
DC voltage




**Capacitive load**




**Ordering information**
To order the described product the order number (if available) is sufficient.

Alternatively:
Model / Version / Electrical connection / Process connection / Contact tube (insertion length L, contact tube length K) / Options

# Appendix

## Cross Reference HLS

| Replaced Type | Type | Description |
|---|---|---|
| HIF-FV… | HLS-S | Standard version |
| HIF-FPP… | HLS-P | Plastic version |
| HAG… | HLS-Exi | Ex i version |
| AL-ADF-HI… | HLS-Exd | Ex d version |

## Type Code

| Code | | | | | | |
|---|---|---|---|---|---|---|
| **1** | | **Basic type** | | | | |
| | HIF | Horizontal Float Switch | | | | |
| | HIF-GL | Horizontal Float Switch GL | | | | |
| | HAG | Horizontal Float Switch Ex i | | | | |
| | AL-ADF-HI… | Horizontal Float Switch Ex d | | | | |
| **2** | | **Material float switch** | | | | |
| | FV | Stainless steel 316Ti | | | | |
| | FPP | Polypropylene | | | | |
| | FL | Stainless steel 316L | | | | |
| **3** | | **Process connection** | | | | |
| | | 1. Key<br>Nominal width | | 2. Key<br>Pressure rating | | 3. Key<br>Flange facing |
| .../.../... | EN | EN 1092 DN 50 - DN 100 | ... | PN6 - PN400 | ... | Form B1, B2, C, D, E |
| | DIN | DIN DN 50 - DN 100 | | PN6 - PN400 | | Form, C, N, F, R13, V13 |
| | ANSI | ANSI 2“ - 4“ | | Class 150 - Class 2500 | | Form RF, RTJ, FF, RFSF |
| | Q | Square flange DN 80 and DN 92 | | | | |
| **4** | | **Dimensions** | | | | |
| | | 1. Key<br>Insertion length (depends on float) | | 2. Key<br>Length contact tube | | for float |
| L.../... | | 193mm… 990mm | | 100mm…900mm | | V44HI |
| | | 185mm…990mm | | 100mm…900mm | | T52HI |
| | | 240mm…990mm | | 100mm…900mm | | ZVSS43/100HI |
| | | 185mm…990mm | | 100mm…900mm | | T52HI/Gr. 5 |
| | | 185mm…990mm | | 100mm…900mm | | T62HI/Gr. 5 |
| | | 176mm | | 111mm | | PP44HI |
| **5** | | **Raised housing in mm** | | | | |
| / ... | 0 | without | | | | |
| | 60 | 60 mm | | | | |
| **6** | | **Material contact tube** | | | | |
| ... | V | Stainless steel 316Ti | | | | |
| | L | Stainless steel 316L | | | | |
| | PP | Polypropylene | | | | |
| **7** | | **Contact** | | | | |
| ... | U | Change-over SPDT | | | | |
| | S | Closing on rising level SPST | | | | |
| | O | Opening on rising level SPST | | | | |
| | I | Proximity switch | | | | |

| 8 | | Contact options | | |
|---|---|---|---|---|
| / ... | R22 | Protective resistor R22 for PLC | | |
| | N | NAMUR circuit to DIN EN 60497-5-6 | | |
| **9** | | **Float** | | |
| | **Type** | **Material** | **Pressure** | **Temperature range** |
| | V44HI | Stainless steel 316Ti | 6 bar | -196°C…350°C |
| | ZVSS43/100HI | Stainless steel 316Ti | 20 bar | -196°C…350°C |
| | T52HI | Titanium Gr. 2 | 100 bar | -196°C…350°C |
| | T52HI/Gr. 5 | Titanium Gr. 5 | 232 bar | -196°C…350°C |
| | T62HI/Gr. 5 | Titanium Gr. 5 | 232 bar | -196°C…350°C |
| | PP44HI | Polypropylene | 3 bar | -10°C…80°C |
| **10** | | **Approval** | | |
| ... | Ex | Ex i intrinsically safe | | |
| | Ex d | Ex d explosion-proof | | |

## Ordering example

| | Basic type | | Material process connection | Process connection | | Dimensi-ons | Raised housing | | Material contact tube | Contact | Contact options | | Float | | Approval |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | 3 | - | 4 | 5 | - | 6 | 7 | 8 | - | 9 | - | 10 |
| | HIF | - | FV | EN25/16/B1 | - | L193/100 | /0 | - | V | S | /R22 | - | V44HI | - | Ex |

# KSR – Your Partner for Machine Building

The many applications in the machine-building sector make a wide variety of demands on the components used. Thanks to our close cooperation with partners and professional associations, we are always able to keep an eye on the market.

Closeness to customers is an essential part of our company philosophy. Individually tailored advice and proposals, to match solutions to your needs, supplement our extensive offering of products and services.

# Magnetic float switch
# For horizontal installation, miniature design
# Model HLS-M

KSR data sheet HLS-M

## Applications

- For level monitoring and level indication of liquids
- Level measurement for almost all liquid media
- Pump and level control
- Alarm signals
- Dry-run and overflow protection

## Special features

- Lateral installation in the tank
- Plastic and stainless steel versions
- Space-saving installation
- Switch consists of only one component

**Fig. top: Plastic version, for installation from inside, cable outlet**
**Fig. bottom: Stainless steel version, for installation from outside, cable outlet**

## Description

With its compact design, the model HLS-M magnetic float switch for horizontal installation in miniature design is ideally suited for use in small tanks, for indicating minimum/maximum levels.

The float is attached to a supported, swivelling lever and moves with the level of the medium being measured. By means of a permanent magnet, when a preset switch point is reached, a reed contact (inert gas contact) is actuated.

By using a magnet and reed contact the switching operation is non-contact, free from wear and needs no power supply. The contacts are potential-free.

The switching function refers to a rising liquid level: Standard use as normally open contact (can be used as normally closed contact by a 180° rotation).

The magnetic float switch is simple to mount and maintenance-free, so the costs of mounting, commissioning and operation are low.

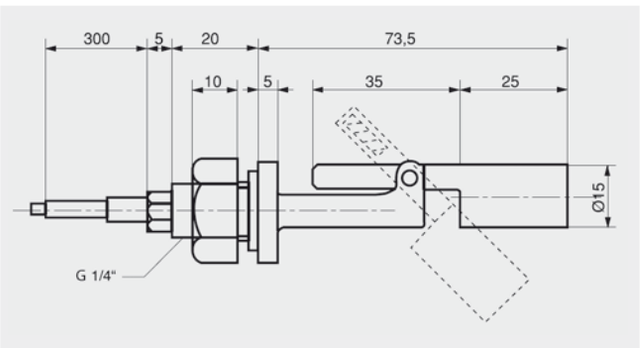
The following five magnetic float switches are available:

| Float switch model | Design | Installation | Electrical connection |
|---|---|---|---|
| **HLS-M11** | Plastic | from inside | Cable |
| **HLS-M12** | Plastic | from outside | Cable |
| **HLS-M21** | Stainless steel | from inside | Cable |
| **HLS-M22** | Stainless steel | from outside | Cable |
| **HLS-M23** | Stainless steel | from outside | Connector |

## Plastic version, for installation from inside, cable outlet, model HLS-M11

| Specifications | |
|---|---|
| **Switching power** | |
| Normally open contact<br>(can be used as normally closed contact by a 180° rotation) | AC 50 V; 25 VA; 0.5 A<br>DC 50 V; 25 W; 0.5 A<br>**Attention:** Operation only at safety extra-low voltage, e.g. with contact protection relay |
| **Mounting position** | horizontal |
| **Medium density** | ≥ 800 kg/m³ |
| **Medium temperature** | -10 … +80 °C |
| **Ingress protection** | IP 65 |
| **Max. operating pressure** | 1 bar |
| **Material** | Polypropylene |
| **Process connection** | Male thread G 1/4" |
| **Mounting** | for installation in the tank from inside |
| **Float** | Outer diameter 15 mm<br>Length 25 mm |
| **Electrical connection** | |
| Cable connection | PVC wires, 2 x 0.5 mm²<br>Cable length: 0.3 m |

### Dimensions in mm

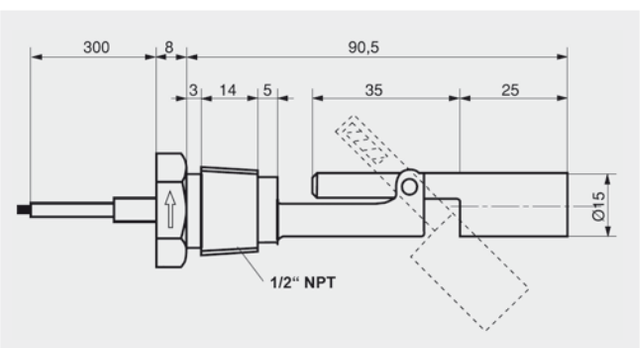



Order no.: 117612

## Plastic version, for installation from outside, cable outlet, model HLS-M12

| Specifications | |
|---|---|
| **Switching power** | |
| Normally open contact<br>(can be used as normally closed contact by a 180° rotation) | AC 50 V; 25 VA; 0.5 A<br>DC 50 V; 25 W; 0.5 A<br>**Attention:** Operation only at safety extra-low voltage, e.g. with contact protection relay |
| **Mounting position** | horizontal |
| **Medium density** | ≥ 800 kg/m³ |
| **Medium temperature** | -10 … +80 °C |
| **Ingress protection** | IP 65 |
| **Max. operating pressure** | 1 bar |
| **Material** | Polypropylene |
| **Process connection** | Male thread 1/2" NPT |
| **Mounting** | for installation in the tank from outside |
| **Float** | Outer diameter 15 mm<br>Length 25 mm |
| **Electrical connection** | |
| Cable connection | PVC wires, 2 x 0.5 mm²<br>Cable length: 0.3 m |

### Dimensions in mm

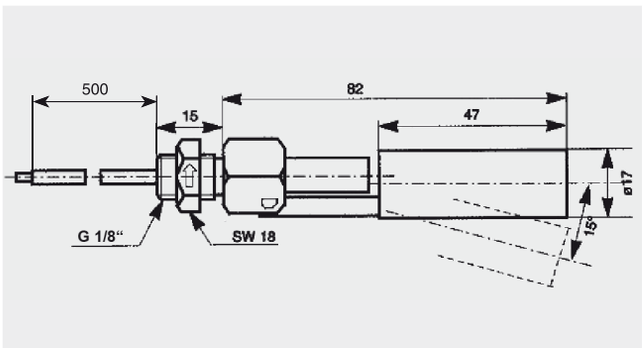



Order no.: 118329

## Stainless steel version, for installation from inside, cable outlet, model HLS-M21

| Specifications | |
|---|---|
| **Switching power**<br>Normally open contact<br>(can be used as normally closed contact by a 180° rotation) | AC 50 V; 25 VA; 0.5 A<br>DC 50 V; 25 W; 0.5 A<br>**Attention:** Operation only at safety extra-low voltage, e.g. with contact protection relay |
| **Mounting position** | horizontal |
| **Medium density** | ≥ 800 kg/m$^3$ |
| **Medium temperature** | -40 … +120 °C |
| **Ingress protection** | IP 65 |
| **Max. operating pressure** | 5 bar |
| **Material** | Stainless steel 1.4301 |
| **Process connection** | Male thread G 1/8" |
| **Mounting** | for installation in the tank from inside |
| **Float** | Outer diameter 17 mm<br>Length 47 mm |
| **Electrical connection**<br>Cable connection | PVC wires, 2 x 0.5 mm$^2$<br>Cable length: 0.5 m |

### Dimensions in mm

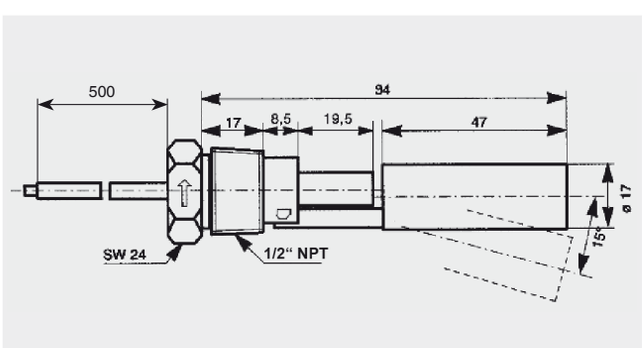



Order no.: 118330

## Stainless steel version, for installation from outside, cable outlet, model HLS-M22

| Specifications | |
|---|---|
| **Switching power**<br>Normally open contact<br>(can be used as normally closed contact by a 180° rotation) | AC 50 V; 25 VA; 0.5 A<br>DC 50 V; 25 W; 0.5 A<br>**Attention:** Operation only at safety extra-low voltage, e.g. with contact protection relay |
| **Mounting position** | horizontal |
| **Medium density** | ≥ 800 kg/m$^3$ |
| **Medium temperature** | -40 … +120 °C |
| **Ingress protection** | IP 65 |
| **Max. operating pressure** | 5 bar |
| **Material** | Stainless steel 1.4301 |
| **Process connection** | Male thread 1/2" NPT |
| **Mounting** | for installation in the tank from outside |
| **Float** | Outer diameter 17 mm<br>Length 47 mm |
| **Electrical connection**<br>Cable connection | PVC wires, 2 x 0.5 mm$^2$<br>Cable length: 0.5 m |

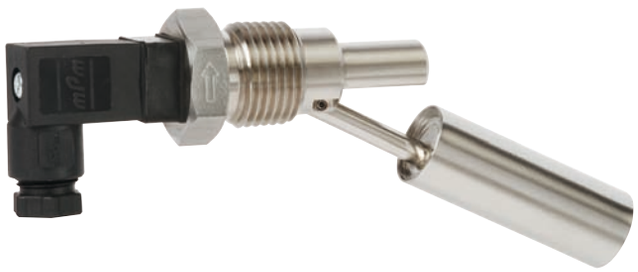
### Dimensions in mm



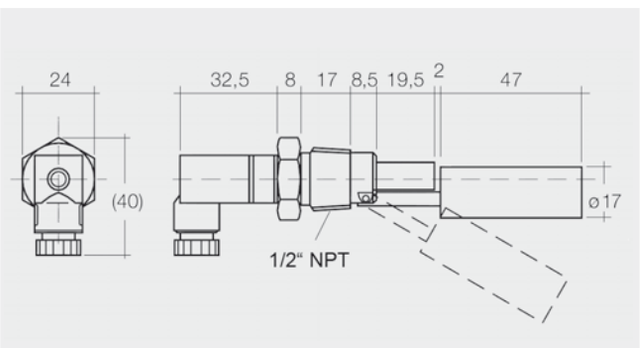

Order no.: 013955

## Stainless steel version, for installation from outside, plug connection, model HLS-M23

| Specifications | |
|---|---|
| **Switching power**<br>Normally open contact<br>(can be used as normally closed contact by a 180° rotation) | AC 50 V; 25 VA; 0.5 A<br>DC 50 V; 25 W; 0.5 A<br>**Attention:** Operation only at safety extra-low voltage, e.g. with contact protection relay |
| **Mounting position** | horizontal |
| **Medium density** | ≥ 800 kg/m³ |
| **Medium temperature** | -40 … +120 °C |
| **Ingress protection** | IP 65 |
| **Max. operating pressure** | 5 bar |
| **Material** | Stainless steel 1.4301 |
| **Process connection** | Male thread 1/2" NPT |
| **Mounting** | for installation in the tank from outside |
| **Float** | Outer diameter 17 mm<br>Length 47 mm |
| **Electrical connection**<br>Plug connection | Rectangular connector EN 175301-803, 2-pin |



### Dimensions in mm




Order no.: 118332

## Options

- Other versions on request
- Other cable lengths on request

## CE conformity

**EMC directive**
2004/108/EC, EN 61000-6-4 and EN 61000-6-2

**Ordering information**
To order the described product the order number is sufficient.

Alternatively:
Model / Material / Process connection / Electrical connection / Mounting / Pressure, temperature, density / Options

# ed float switch
# S

KSR data sheet SLS

## s

atment plants
ns

## ures

wage, wastewater and fluids containing

y friendly, since it is mercury and lead-free
eutral PP case
cal and electrical service life of the micro

r use in Ex zones 0, 1 and 2

**Suspended float switch**
**Fig. left: Model SLS-M2**
**Fig. centre: Model SLS-MS1**
**Fig. right: Model SLS-MS1-Ex**

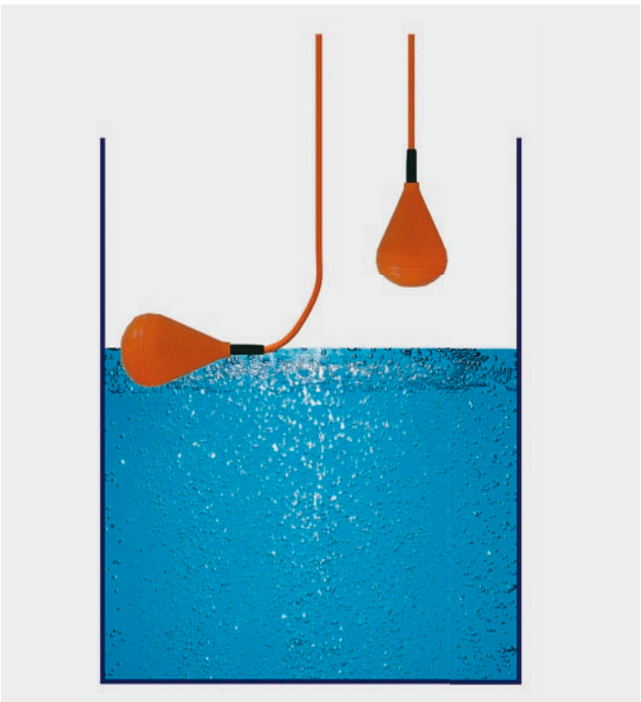
witches are attached to a highly flexib-
rom above and contain a micro switch,
d enclosed, shock and fracture-proof, in a
system. When the float body is immersed in
ulb tips and triggers the micro switch.

del range, a stabilisation weight is also

One suspended float switch is required for each switch point. The contact is designed as a change-over contact, so that it can be configured as a high alarm as well as a low alarm.

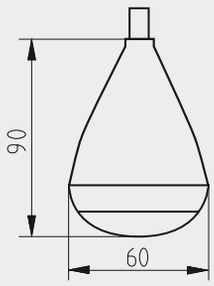
Through the patented, centrically mounted micro switch, the suspended float switch can switch in any direction, and not dependent on the direction in which the switch tips.

## Illustration of the principle

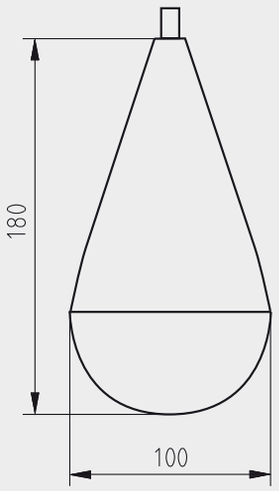


## Dimensions in mm

**Model SLS-M2**




**Models SLS-MS1 and SLS-MS1-Ex**




## CE conformity

**Low voltage directive**
2006/95/EC
**Environmental protection directive**
RoHS 2002/95/EC

## Specifications

| | Model SLS-M2 | | | Model SLS-MS1 | | | Model SLS-MS1-Ex | | |
|---|---|---|---|---|---|---|---|---|---|
| **Medium density** | 950 ... 1,050 kg/m$^3$ | | | 950 ... 1,050 kg/m$^3$ | | | 950 ... 1,050 kg/m$^3$ | | |
| **Maximum temperature** | 80 °C | | | 80 °C | | | 80 °C | | |
| **Switching power** | 2 A, 250 V | | | 5 A, 250 V | | | 1 ... 100 mA, 4 ... 40 V | | |
| **Case** | PP | | | PP | | | PP PRE-ELEC (anti-static) | | |
| **Colour** | orange | | | orange | | | black | | |
| **Ingress protection** | IP 68 | | | IP 68 | | | IP 68 | | |
| **Cable** | TPK/ PVC, orange | | | TPK/ PVC, orange | | | TPK/ PVC, blue | | |
| **Wire cross-section** | 3 x 0.5 mm$^2$ | | | 3 x 0.75 mm$^2$ | | | 4G0.75 mm$^2$ | | |
| **Cable length** | 5 m | 10 m | 20 m | 5 m | 10 m | 20 m | 5 m | 10 m | 20 m |
| **Order no.** | 006109 | 006110 | 006111 | 006115 | 006116 | 112391 | 010924 | 006119 | 006121 |
| **Approval** | - | | | - | | | II 1G EEx ia IIC T6 SNCH 01 ATEX 3249 | | |

**Ordering information**
To order the described product the order number is sufficient.

# Level sensor
# With reed-chain technology
# Model FLR

KSR data sheet FLR

## Applications

- Level measurement for almost all liquid media
- Chemical, petrochemical, natural gas, offshore, shipbuilding, machine building, power generating equipment, power plants
- Process water and drinking water treatment, food industry, pharmaceutical industry

## Special features

- Process- and system-specific solutions possible
- Operating limits:
  - Operating temperature: T = -80 ... +200 °C
  - Operating pressure: P = Vacuum to 80 bar
  - Limit density: ρ ≥ 400 kg/m³
- Wide variety of different electrical connections, process connections and materials
- Optionally with programmable and configurable head-mounted transmitter for 4 ... 20 mA field signals, HART®, PROFIBUS® PA and FOUNDATION™ Fieldbus
- Explosion-protected versions

**Level sensor with reed-chain technology, model FLR-S, flange connection**

## Description

The model FLR sensors with reed-chain technology are used for level measurement in liquid media. They work on the float principle with magnetic transmission.
The float's magnetic system in the guide tube actuates a resistance measuring chain that corresponds to a 3-wire potentiometer circuit. The measurement voltage generated by this is proportional to the fill level.
The measurement voltage is very finely-stepped due to the contact separation of the measuring chain and is thus virtually continuous. Resolutions between 5 and 18 mm are available depending on the requirements.

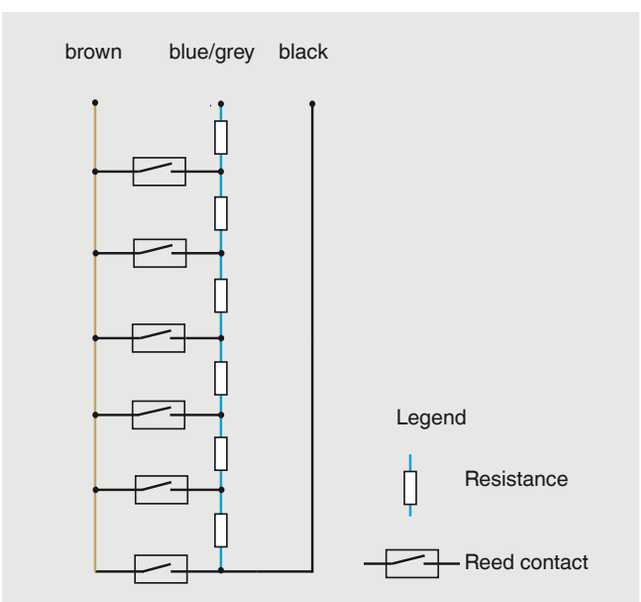
## Further special features

- Large scope of application due to the simple, proven functional principle
- Process connection, guide tube and float from stainless steel 1.4571 or plastic
- For harsh operating conditions, long service life
- Continuous measurement of levels, independent of physical and chemical changes of the media such as: Foaming, conductivity, dielectric, pressure, vacuum, temperature, vapours, condensation, bubble formation, boiling effects, density change
- Signal transmission over long distances
- Simple installation and commissioning, onetime calibration only, no recalibration necessary
- Level displayed proportional to volume or height
- High repeatability
- Interface measurement and overall level from Δ density 50 kg/m$^3$
- Level sensors with reed-chain technology qualify as passive electrical equipment in accordance with DIN IEC 60079-11 and can be installed in “zone 1” hazardous areas without certification, so long as the equipment is operated in a certified intrinsically safe circuit with a minimum explosion protection of EEx ib.

## Options

- Customised solutions
- Programmable and configurable head-mounted transmitters in connection housing, output signal 4 ... 20 mA, 2-wire, for HART®, PROFIBUS® PA and FOUNDATION™ Fieldbus
- Process connection, guide tube material and float from stainless steel 1.4435, 1.4539, titanium, Hastelloy (others on request)
- In combination with limit switch, stepless setting of the limit values over the entire measuring range

## Internal circuit diagram of the reed sensors



## Model overview

| Sensor model | Description | Materials | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Stainless steel | | | | | | Titanium 3.7035 (grade 2) | PVC | PP | PVDF | Buna |
| | | 1.4571 (316Ti) | 1.4404 (316L) | 1.4435 (316L) | 1.4571 (316Ti) / PP | 1.4571 (316Ti) / PA | 1.4571 (316Ti) / Ms | | | | | |
| **FLR-S** | Reed-chain sensor, standard version | x | x | x | x | x | x | x | | | | x |
| **FLR-P** | Reed-chain sensor, plastic version | | | | | | | | x | x | x | |
| **FLR-H** | Reed-chain sensor, sterile version | | x | x | | | | | | | | |

| Sensor model | Approval | | | | | | | | | | Temperature range (process) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | without | Ex i | Ex d | GL | Ex i + GL | ABS | DNV | Bureau Veritas | 3-A | FM | GOST | |
| **FLR-S** | x | x | x | x | x | x | x | x | | x | | -80 ... +200 °C |
| **FLR-P** | x | | | | | | | | | | | -10 ... +100 °C |
| **FLR-H** | x | | | | | | | | x | | x | -20 ... +200 °C |

## Ex approvals

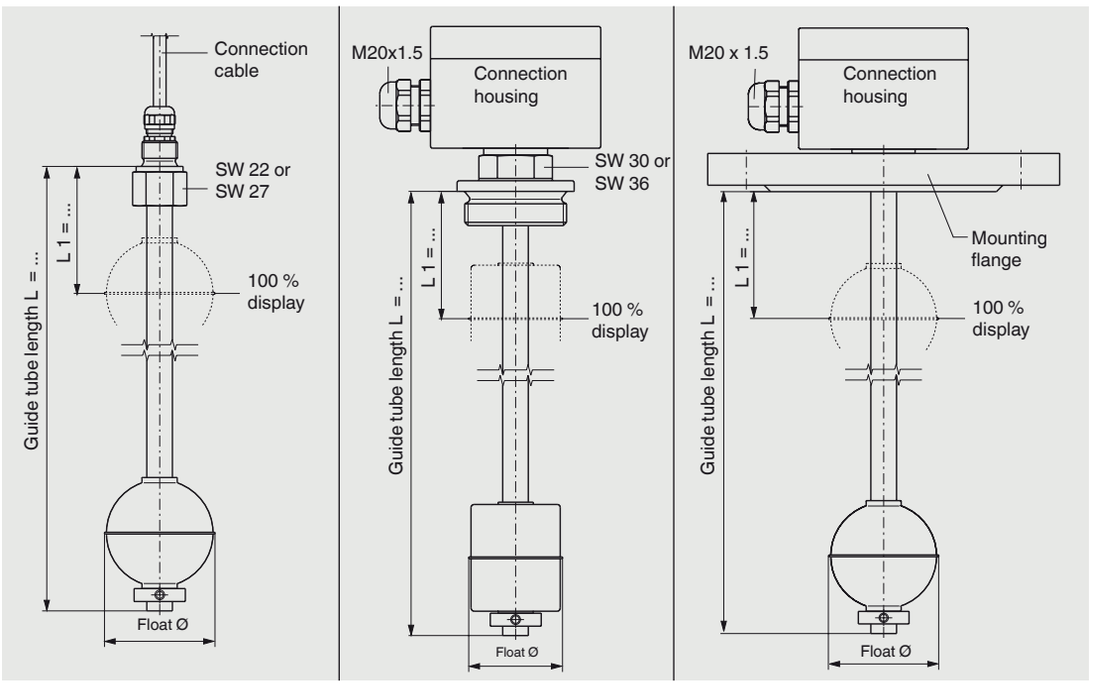
| Explosion protection | Ignition protection type | Model | Zone | Approval number |
|---|---|---|---|---|
| ATEX | Ex i | FLR-S | Zone 0/1/2 | KEMA 01 ATEX 1152 X II 1/2G Ex ia IIC T4 ... T6 - II 2 D T80 °C IP 6X |
| | Ex d | FLR-S | Zone 1/2 | TÜV 13 ATEX 7399 X II 2G Ex d IIC T6 Gb / II 2 D Ex tb IIIC T80 °C Db |
| | Ex d | FLR-S | Zone 1/2 | IECEx TUR 09.0002X -40 °C <= ta <= +55 °C Ex d IIC T6 Ex tD A21 IP 65 T80 °C |
| | Ex i + GL | FLR-S | Zone 1/2 | KEMA 01 ATEX 1152 X II 1/2G Ex ia IIC T4 ... T6 - II 2 D T80 °C IP 6X + GL-14788-99 HH |
| | Ex i + DNV | FLR-S | Zone 1/2 | KEMA 01 ATEX 1152 X II 1/2G Ex ia IIC T4 ... T6 - II 2 D T80 °C IP 6X + DNV-A-11452 |

## Type approval

| Explosion protection | Model | Approval number |
|---|---|---|
| GL | FLR-S | GL-14788-99 HH |
| DNV | FLR-S | DNV-A-11452 |
| GOST | FLR-S, FLR-P | 0959333 |
| 3-A | FLR-H | 3-A Sanitary Standards |

# Sensor, standard version, model FLR-S

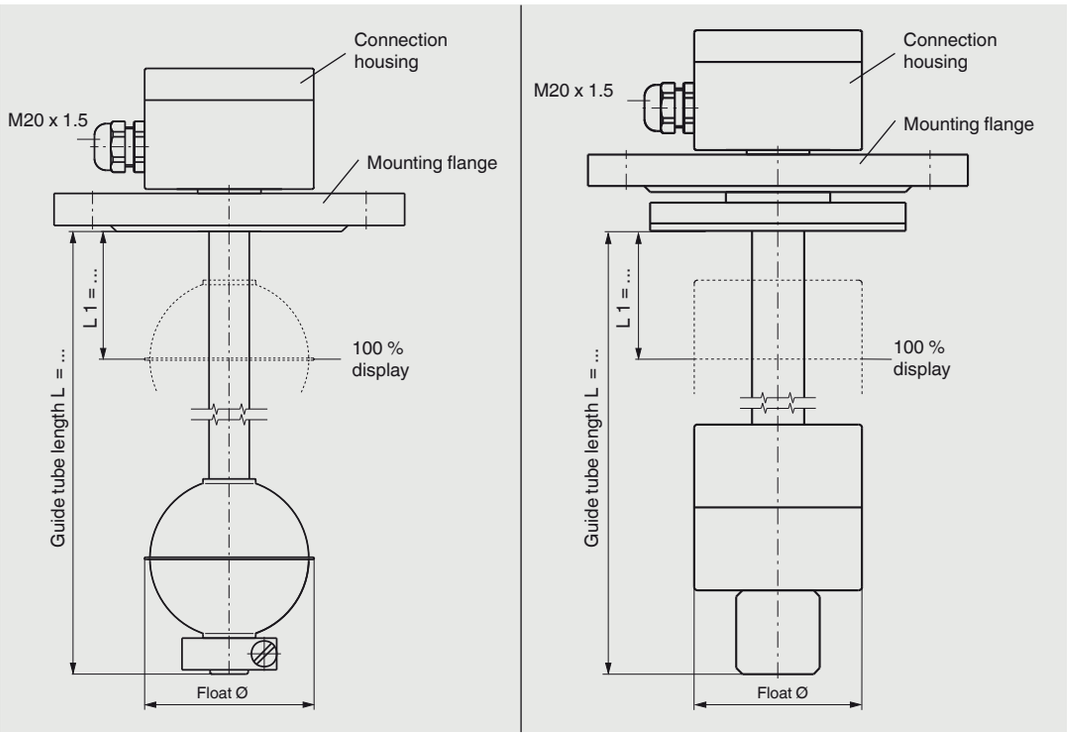
Process connection, guide tube material and float from stainless steel 1.4571




| | Mounting thread (without connection housing) | | | Mounting thread | | | Flange | | |
|---|---|---|---|---|---|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ Silicone ■ PUR | | | Connection housing ■ Aluminium 80 x 75 x 57 mm Option: Polypropylene, polyester, stainless steel | | | | | |
| Process connection | Mounting thread upwards | | | Mounting thread downwards G 1 1/2" or G 2" | | | Mounting flange ■ DIN DN 50 ... DN 200, PN 6 ... PN 100 ■ ANSI 2" ... 8", class 150 ... 600 | | |
| | G 3/8" (others on request) | | G 1/2" (others on request) | | | | | | |
| Guide tube diameter | 8 mm | 12 or 14 mm | 18 mm | 8 mm | 12 or 14 mm | 18 mm | 8 mm | 12 or 14 mm | 18 mm |
| Guide tube length L max. | 500 mm | 3,000 mm | 6,000 mm | 500 mm | 3,000 mm | 6,000 mm | 500 mm | 3,000 mm | 6,000 mm |
| Float | Material stainless steel 1.4571 (Option: Buna, titanium)<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 14 and 15) | | | | | | | | |
| Max. operating pressure | 80 bar, see table page 14 and 15 | | | | | | | | |
| Temperature range standard | PVC-/PUR cable -10 ... +80 °C<br>Silicone cable -10 ... +120 °C | | | -20 ... +120 °C<br>Option: ■ High-temperature version: +120 ... +200 °C<br>Option: ■ Low-temperature version: -80 ... -20 °C | | | | | |
| Contact separation | K 18 = 18 mm (not with option high and low temperature version)<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | | | | | | | | |
| Overall resistance of the measuring chain | Length and separation dependent | | | | | | | | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | | | | | | | | |
| Mounting position | Vertical ±30° | | | | | | | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | | | | | | | |
| Materials | Stainless steel 1.4571, 1.4404, 1.4435, 1.4439, titanium 3.7035 (grade 2), Hastelloy and others on request | | | | | | | | |

# Sensor, E-CTFE coated or PTFE sheathed, model FLR-S

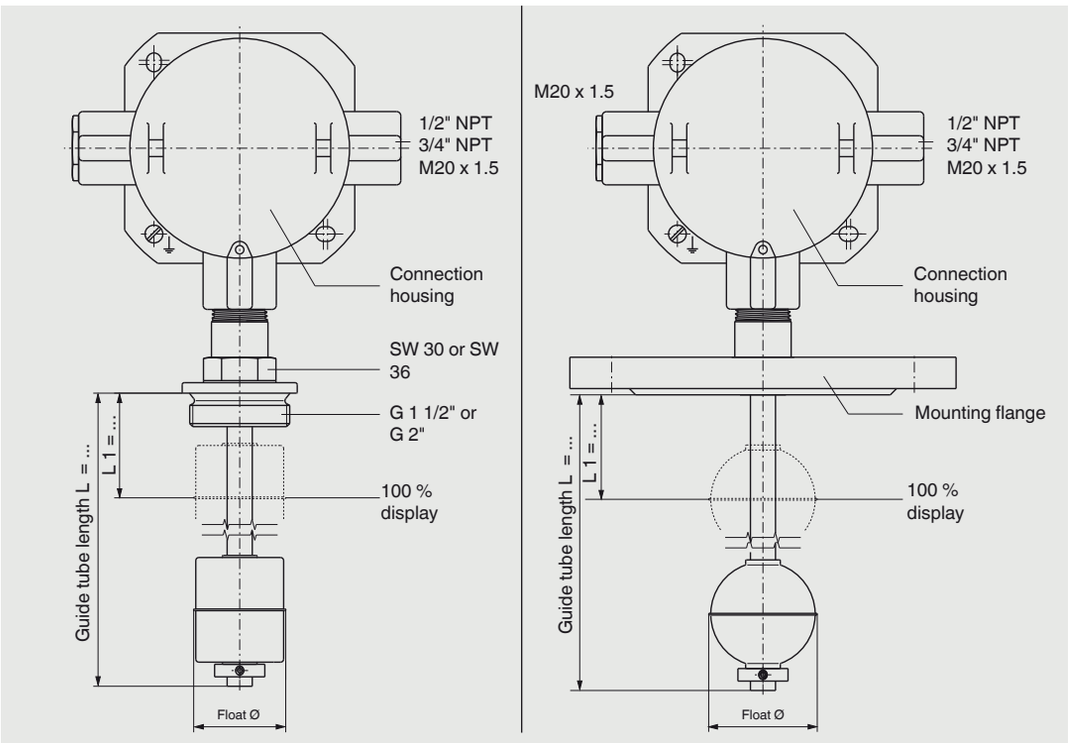
Process connection, guide tube and float from stainless steel 1.4571




| | Flange, E-CTFE coated | Flange, PTFE sheathed |
|---|---|---|
| Electrical connection | Connection housing ■ Aluminium 80 x 75 x 57 mm<br>Option: Polypropylene, polyester, stainless steel | |
| Process connection | Mounting flange<br>■ DIN DN 50 ... DN 200, PN 6 ... PN 100<br>■ ANSI 2" ... 8", class 150 ... 600 | |
| Guide tube diameter | 18 mm | 25 mm, PTFE sheath = 3.5 mm thick |
| Guide tube length L max. | 4,000 mm | 5,000 mm |
| Float | Material<br>■ Stainless steel 1.4571, E-CTFE coated<br>■ PVDF<br>■ PDFE<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 14 and 15) | |
| Max. operating pressure | see table page 14 and 15 | |
| Temperature range | Depending on medium | |
| Contact separation | K 18 = 18 mm<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | |
| Overall resistance of the measuring chain | Length and separation dependent | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | |
| Materials | Stainless steel 1.4571, E-CTFE coated, or PTFE sheathed (option: anti-static) | |

# Reed sensor, explosion-protected version Ex d, flameproof enclosure, model FLR-S

TÜV 13 ATEX 7399 X II 2G Ex d IIC T6 Gb / II 2 D Ex tb IIIC T80 °C Db
IECEx TUR 09.0002X -40 °C <= ta <= +55 °C Ex d IIC T6 Ex tD A21 IP 65 T80 °C
Process connection, guide tube and float from stainless steel 1.4571

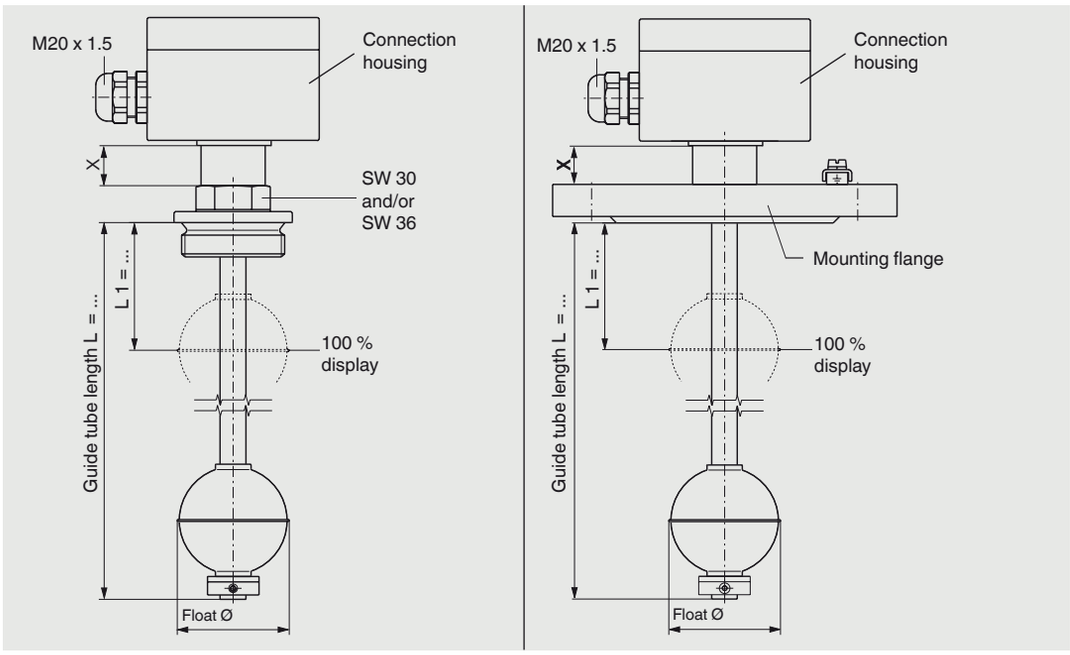



| | Mounting thread | | Flange |
|---|---|---|---|
| Electrical connection | Connection housing ■ Aluminium<br>Option: Stainless steel | | |
| Process connection | Mounting thread<br>downwards<br>G 1 1/2" or G 2" (others on request) | | Mounting flange<br>■ DIN DN 50 ... DN 350, PN 6 ... PN 40<br>■ ANSI 2" ... 14", class 150 ... 300 |
| Guide tube diameter | 12 and 14 mm | 18 mm | |
| Guide tube length L max. | 3,000 mm | 5,000 mm | |
| Float | Material stainless steel 1.4571<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 14 and 15) | | |
| Max. operating pressure | See table page 14 and 15 | | |
| Temperature range | T4: 120 °C, T5: 95 °C,T6: 80 °C | | |
| Contact separation | K 18 = 18 mm<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | | |
| Overall resistance of the measuring chain | Length and separation dependent | | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |
| Materials | Stainless steel 1.4571 | | |

# Sensor, explosion-protected version, intrinsically safe, model FLR-S

KEMA 01 ATEX 1052 X II 1/2G Ex ia IIC T4 ... T6 - II 2 D T80 °C IP 6X

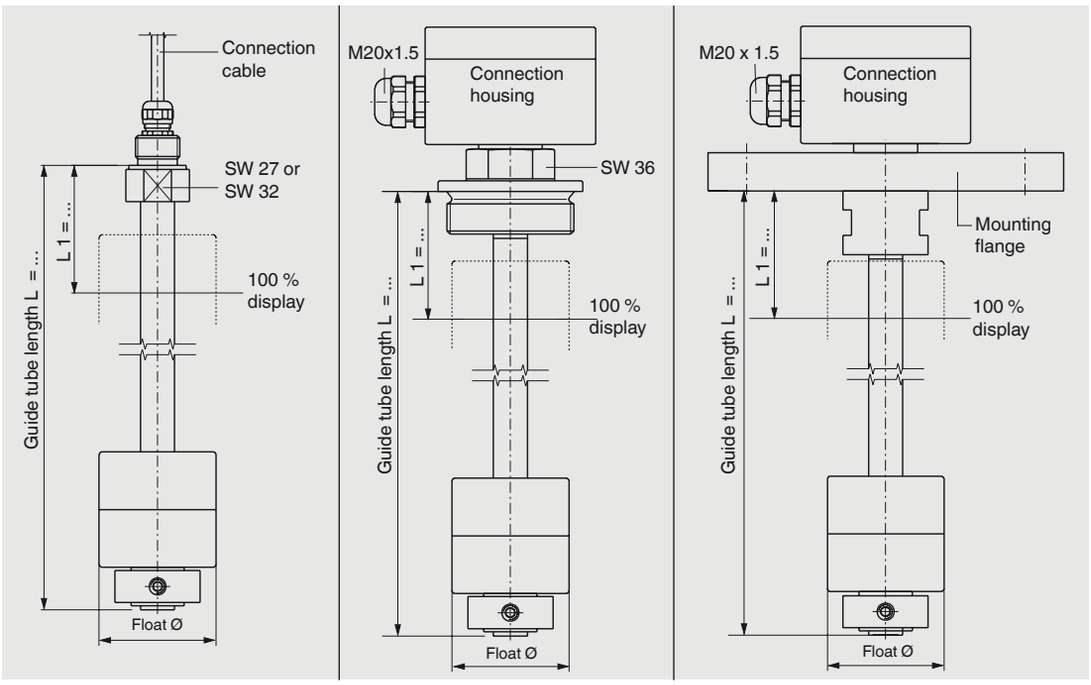
Process connection, guide tube and float from stainless steel 1.4571




| | Mounting thread | Flange |
|---|---|---|
| Electrical connection | Connection housing ■ Aluminium 80 x 75 x 57 mm<br>Option: Stainless steel, polyester | |
| Process connection | Mounting thread<br>downwards<br>G 1 1/2" or G 2" (others on request) | Mounting flange<br>■ DIN DN 50 ... DN 200, PN 6 ... PN 100<br>■ ANSI 2" ... 8", class 150 ... 600 |
| Guide tube diameter | 12, 14 or 18 mm | |
| Guide tube length L max. | See variants A and B on page 16 | |
| Float | Material stainless steel 1.4571 (Option: Buna, titanium)<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 14 and 15) | |
| Max. operating pressure | see table page 14 and 15 | |
| Temperature class<br>Surface temperature<br>Process temperature<br>Ambient temperature at connection housing | T4 / T5 / T6<br>Max. 135 °C / 100 °C / 85 °C<br>Max. 100 °C / 65 °C / 50 °C<br>Max. 60 °C / 60 °C / 60 °C | |
| Contact separation | K 18 = 18 mm<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | |
| Overall resistance of the measuring chain | Length and separation dependent | |
| Control circuit | Ignition protection type EEx ia IIC, only for connection to a certified intrinsically safe control circuit<br>Transmitter external with max. 120 mA, max. 28 V<br>Head-mounted transmitter in accordance with transmitter approvals | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | |
| Materials | Stainless steel 1.4571, 1.4404, titanium 3.7035 (grade 2), Hastelloy and others on request | |

# Sensor, plastic version, polypropylene, model FLR-P

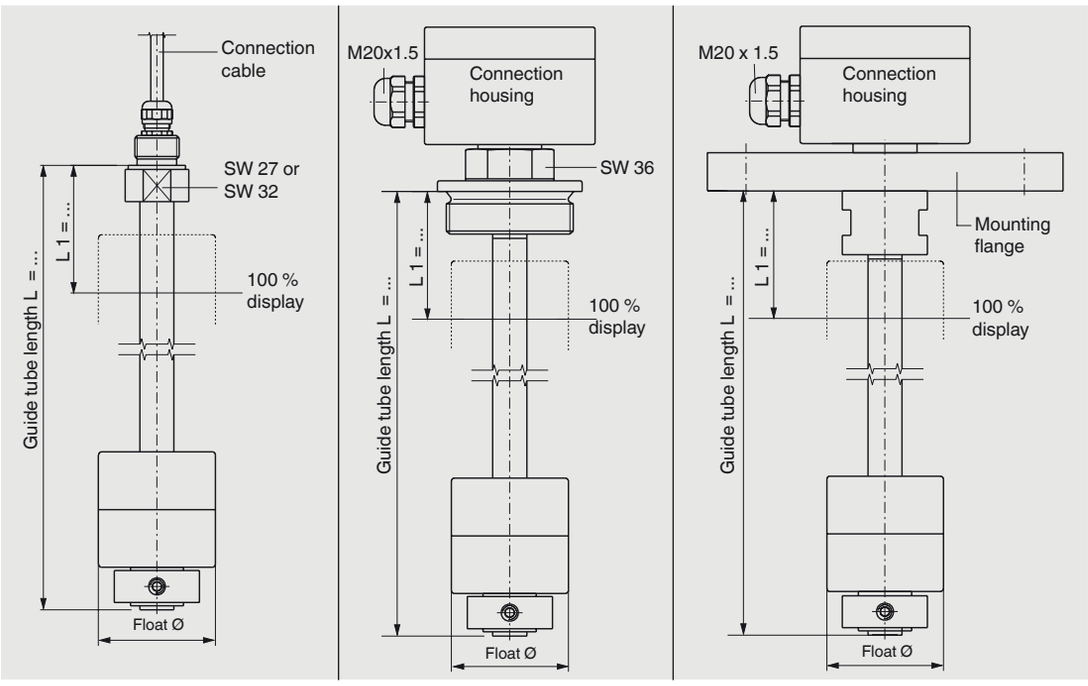
Process connection, guide tube and float from polypropylene




| | Mounting thread (without connection housing) | Mounting thread | Flange |
|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ Silicone ■ PUR | Connection housing ■ Polyester 80 x 75 x 55 mm | |
| Process connection | Mounting thread, upwards ■ G 1/2" (guide tube Ø 16 mm) ■ G 1" (guide tube Ø 20 mm) (others on request) | Mounting thread, downwards G 2" (others on request) | Mounting flange ■ DIN DN 65 ... DN 125, PN 10, form A ■ ANSI 2 1/2" ... 5", class 150 FF |
| Guide tube diameter | 16 or 20 mm (strengthened with a metallic inner tube) | | |
| Guide tube length L max. | ■ 3,000 mm (guide tube Ø 16 mm) ■ 5,000 mm (guide tube Ø 20 mm) | | |
| Float | Material polypropylene<br>Float diameter from 44 ... 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 14 and 15) | | |
| Max. operating pressure | 3 bar | | |
| Temperature range | -10 ... +80 °C | | |
| Contact separation | K 18 = 18 mm<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | | |
| Overall resistance of the measuring chain | Length and separation dependent | | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |

# Sensor, plastic version, PVDF, model FLR-P

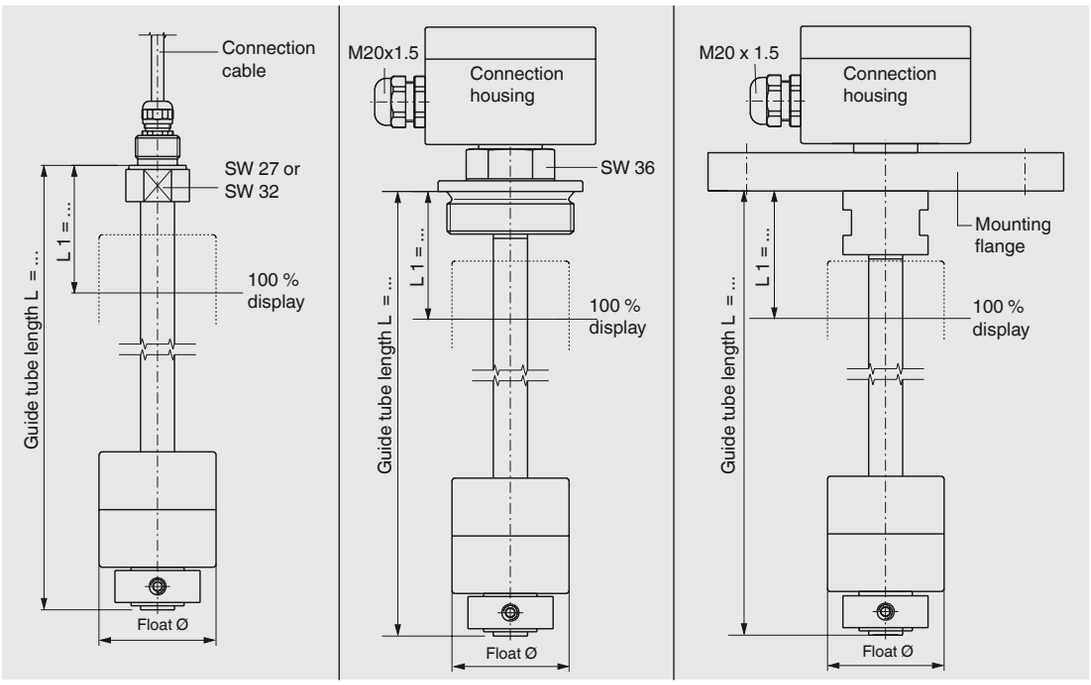
Process connection, guide tube and float from PVDF




| | Mounting thread (without connection housing) | Mounting thread | Flange |
|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ Silicone ■ PUR | Connection housing ■ Polyester 80 x 75 x 55 mm | |
| Process connection | Mounting thread, upwards<br>■ G 1/2" (guide tube Ø 16 mm)<br>■ G 1" (guide tube Ø 20 mm)<br>(others on request) | Mounting thread, downwards⌟G 2"<br>(others on request) | Mounting flange<br>■ DIN DN 65 ... DN 125, PN 10, form A<br>■ ANSI 2 1/2" ... 5", class 150 FF |
| Guide tube diameter | 16 or 20 mm (strengthened with a metallic inner tube) | | |
| Guide tube length L max. | ■ 3,000 mm (guide tube Ø 16 mm)<br>■ 5,000 mm (guide tube Ø 20 mm) | | |
| Float | Material PVDF<br>Float diameter from 44 ... 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 14 and 15) | | |
| Max. operating pressure | 3 bar | | |
| Temperature range | -10 ... +100 °C | | |
| Contact separation | K 18 = 18 mm<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | | |
| Overall resistance of the measuring chain | Length and separation dependent | | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |

# Sensor, plastic version, PVC, model FLR-P

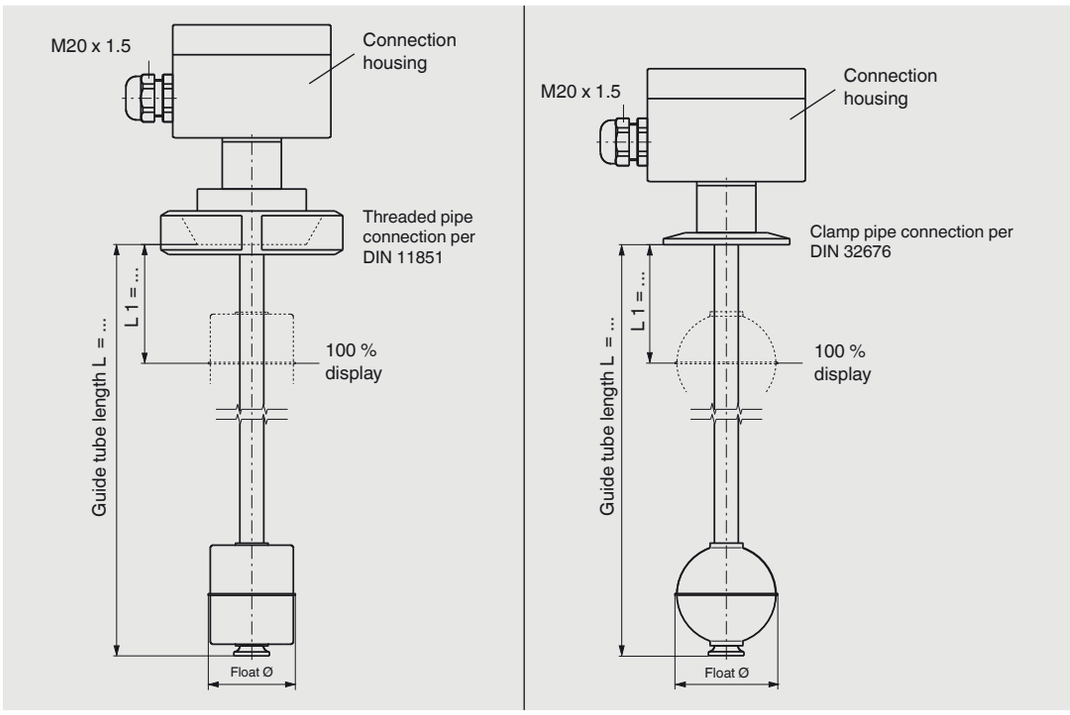
Process connection, guide tube and float from PVC




| | Mounting thread (without connection housing) | Mounting thread | Flange |
|---|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ Silicone ■ PUR | Connection housing ■ Polyester 80 x 75 x 55 mm | |
| Process connection | Mounting thread, upwards ■ G 1/2" (guide tube Ø 16 mm) ■ G 1" (guide tube Ø 20 mm) (others on request) | Mounting thread, downwards G 2" (others on request) | Mounting flange ■ DIN DN 65 ... DN 125, PN 10, form A ■ ANSI 2 1/2" ... 5", class 150 FF |
| Guide tube diameter | 16 or 20 mm (strengthened with a metallic inner tube) | | |
| Guide tube length L max. | ■ 3,000 mm (guide tube Ø 16 mm) ■ 5,000 mm (guide tube Ø 20 mm) | | |
| Float | Material PVC<br>Float diameter from 44 ... 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 14 and 15) | | |
| Max. operating pressure | 3 bar | | |
| Temperature range | 0 ... +60 °C | | |
| Contact separation | K 18 = 18 mm<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | | |
| Overall resistance of the measuring chain | Length and separation dependent | | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |

## Sensor, sterile version, model FLR-H

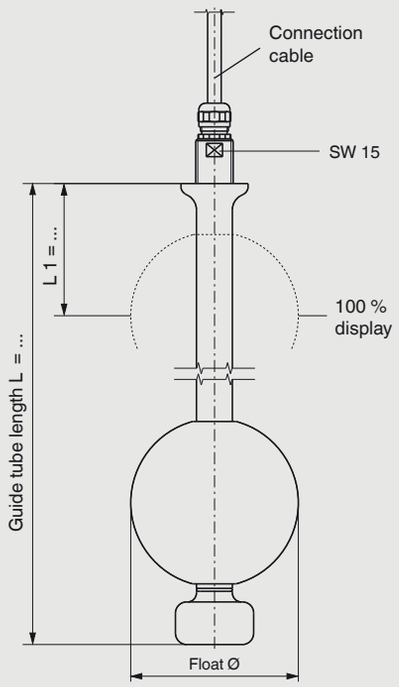
Process connection, guide tube and float from stainless steel 1.4435 (316L) or 1.4404 (316L), surface ground and polished Ra < 0.8 µm or Ra < 0.4 µm, alternatively electropolished




| | Threaded pipe connection per DIN 11851 | | Clamp pipe connection per DIN 32676 |
|---|---|---|---|
| Electrical connection | Connection housing ■ Aluminium 80 x 75 x 57 mm<br>Option: Polypropylene, polyester, stainless steel | | |
| Process connection | Threaded pipe connection per DIN 11851, downwards DN 50 ... DN 150 (others on request) | | Clamp pipe connection per DIN 32676, DN 25 ... DN 100 or 1" ... 4" (others on request) |
| Guide tube diameter | 12 or 14 | 18 mm | |
| Guide tube length L max. | 3,000 mm | 6,000 mm | |
| Float | Material stainless steel 1.4435 or 1.4404, option electropolished<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 14 and 15) | | |
| Max. operating pressure | see table page 14 and 15 | | |
| Temperature range standard | -20 ... +120 °C<br>Option: ■ High-temperature version: +120 ... +200 °C<br>Option: ■ Low-temperature version: -80 ... -20 °C | | |
| Contact separation | K 18 = 18 mm (not with high- and low-temperaturure version)<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | | |
| Overall resistance of the measuring chain | Length and separation dependent | | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | | |
| Mounting position | Vertical ±30° | | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | | |
| Materials | Stainless steel 1.4435 (316L) or 1.4404 (316L) | | |

## Sensor, sterile version, model FLR-H

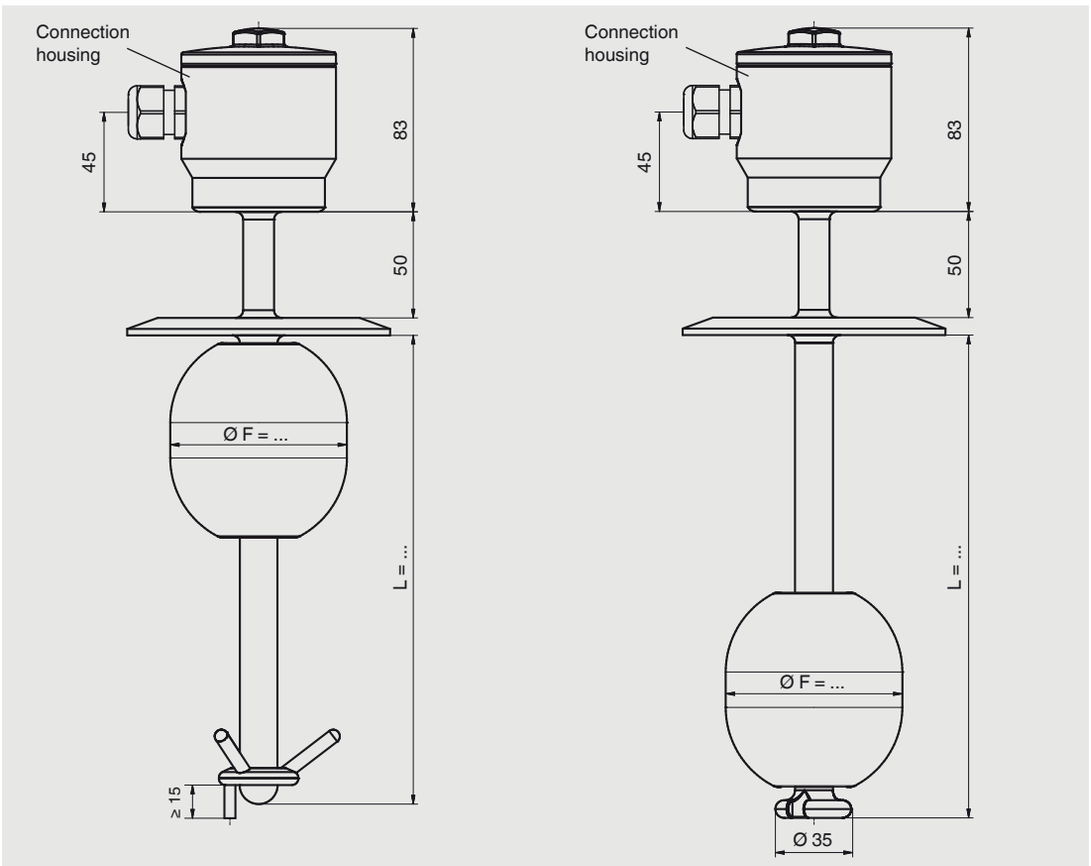
Process connection, guide tube and float from stainless steel 1.4435 (316L) or 1.4404 (316L), surface ground and polished Ra < 0.8 µm or Ra < 0.4 µm, alternatively electropolished




| | Mounting thread (without connection housing) | Mounting thread (without connection housing) |
|---|---|---|
| Electrical connection | Connection cable ■ PVC ■ Silicone ■ PUR | Connection housing ■ Aluminium 80 x 75 x 57 mm |
| Process connection | Mounting thread downwards G 3/8" (others on request) | ■ Mounting flange per DIN or ANSI ■ Threaded connection per DIN 11851 ■ Clamp pipe connection per DIN 32676 ■ Ingold sanitary fitting |
| Guide tube diameter | 17.2 mm (material stainless steel 1.4435, 1.4439 or 1.4404, surface ground and electropolished) | |
| Guide tube length L max. | 5,000 mm | |
| Float | Material stainless steel 1.4439 or 1.4404, surface ground and electropolished<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 14 and 15) | |
| Max. operating pressure | 25 bar | |
| Temperature range standard | PVC/PUR cable -10 ... +80 °C<br>Silicone cable -10 ... +120 °C | -20 ... +120 °C<br>Option: ■ High-temperature version: +120 ... +200 °C<br>Option: ■ Low-temperature version: -80 ... -20 °C |
| Contact separation | K 18 = 18 mm (not with high- and low-temperaturure version)<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | |
| Overall resistance of the measuring chain | Length and separation dependent | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 65 per EN 60529 / IEC 60529 | |
| Materials | Stainless steel 1.4435, 1.4439 and 1.4404 | |

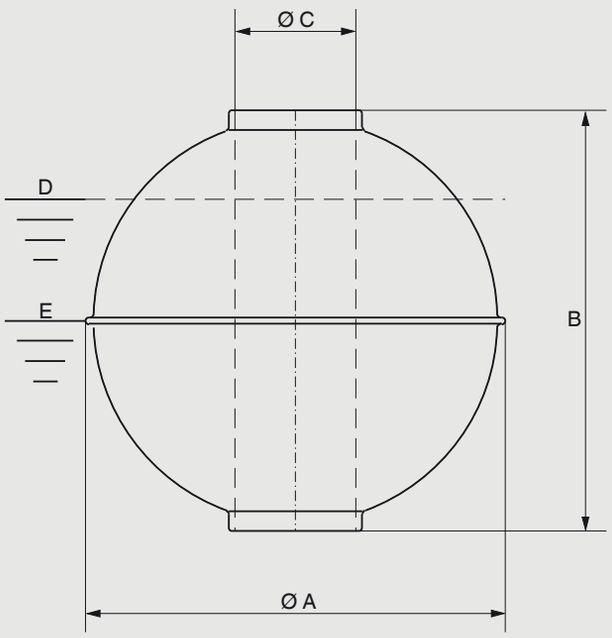
## Sensor, sterile version, 3-A certified, model FLR-H

Process connection, guide tube and float from stainless steel 1.4435 (316L) or 1.4404 (316L), surface ground and polished Ra < 0.8 µm or Ra < 0.4 µm, alternatively electropolished




| | Version with separate float bracket | Version with welded pipe end |
|---|---|---|
| Electrical connection | Connection housing Stainless steel (1.4571) with cable gland M20 x 1.5 (polyamide or hygienic design) | |
| Process connection | ■ Clamp connection ISO 2852 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Clamp connection DIN 32676 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Aseptic mounting thread downwards DIN 11864-1 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Aseptic collar connecting sleeve DIN 11864-1 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Aseptic flange connection DIN 11864-2 (DN 32 ... DN 50 or 1.5" ... 2")<br>■ Aseptic clamp connection DIN 11864-3 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ VARIVENT® (form F, N and G)<br>■ BioConnect® threaded connection (DN 32 ... DN 100 or 1.5" ... 2")<br>■ BioConnect® flange connection (DN 32 ... DN 100 or 1.5" ... 2")<br>■ BioConnect® clamp connection (DN 32 ... DN 100 or 1.5" ... 2") | |
| Guide tube diameter | 12, 14 or 17.2 mm (stainless steel 1.4435 or 1.4404, surface ground and polished, Ra < 0.8 µm | |
| Guide tube length L max. | 6,000 mm | |
| Float | Material stainless steel 1.4435 or 1.4404<br>Float diameter 50 or 80 mm<br>Float selection depending on guide tube diameter | |
| Max. operating pressure | 10 bar | |
| Temperature range | ■ Medium standard -40 ... +200 °C<br>■ Sensor housing -40 ... +85 °C | |
| Contact separation | K 18 = 18 mm<br>K 15 = 15 mm<br>K 10 = 10 mm<br>K 5 = 5 mm | |
| Overall resistance of the measuring chain | Length and separation dependent | |
| Connection cable to transmitter | Cable length max. 2,000 m, 3-wire, screened | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 68 per EN 60529 / IEC 60529 | |

# Spherical floats (K)



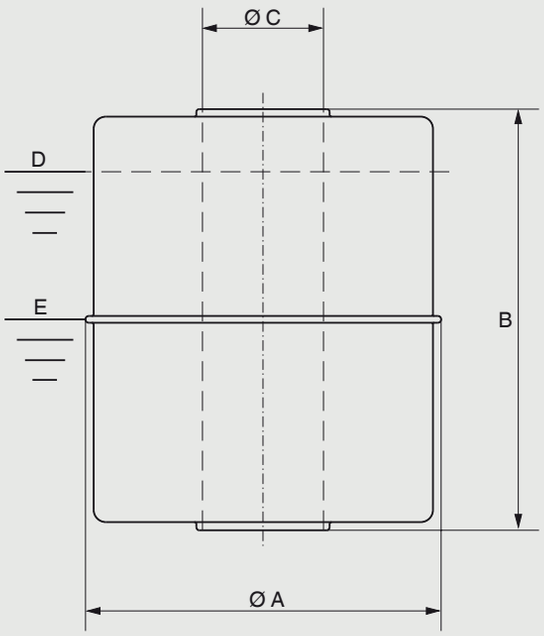

D = Limit density of the medium, immersed float volume 85 %

E = Nominal density of the medium, immersed float volume 50 %

| Material | Suits guide tube Ø mm | Ø A mm | B mm | Ø C mm | Max. operating pressure bar | Max. operating temperature °C | Limit density 85 % kg/m³ | Order no. |
|---|---|---|---|---|---|---|---|---|
| Stainless steel 1.4571 | **12** | 52 | 52 | 15 | 40 | 250 | 727 | 020913 |
| | **12** | 62 | 61 | 15 | 32 | 250 | 597 | 026026 |
| | **12** | 83 | 81 | 15 | 25 | 250 | 412 | 021089 |
| | **18** | 80 | 76 | 23 | 25 | 250 | 617 | 005479 |
| | **18** | 98 | 96 | 23 | 25 | 250 | 561 | 005490 |
| | **18** | 105 | 103 | 23 | 25 | 250 | 520 | 005494 |
| | **18** | 120 | 117 | 23 | 25 | 250 | 394 | 026726 |
| | **18-30** | 120 | 116 | 38 | 25 | 250 | 537 | - |
| | **18-30** | 200 | 192 | 56 | 16 | 250 | 581 | 005503 |
| | **18-30** | 300 | 294 | 56 | 16 | 250 | 342 | - |
| Titanium 3.7035 | **12** | 52 | 52 | 15 | 25 | 250 | 623 | - |
| | **12** | 52 | 52 | 15 | 60 | 250 | 790 | - |
| | **12** | 52 | 52 | 15 | 80 | 250 | 997 | - |
| | **12** | 62 | 62 | 15 | 25 | 250 | 482 | 005538 |
| | **12** | 83 | 81 | 15 | 25 | 250 | 343 | 005544 |
| | **18** | 80 | 76 | 23 | 25 | 250 | 866 | 005543 |
| | **18** | 98 | 96 | 23 | 25 | 250 | 536 | - |
| | **18** | 105 | 103 | 23 | 25 | 250 | 416 | 005549 |
| | **18** | 120 | 117 | 23 | 25 | 250 | 315 | 115002 |
| Stainless steel 1.4571 E-CTFE coated | **18** | 81 | 77 | 22 | 25 | depending on medium | 634 | - |
| | **18** | 99 | 97 | 22 | 25 | depending on medium | 653 | - |
| | **18** | 106 | 104 | 22 | 25 | depending on medium | 595 | - |
| | **18** | 121 | 118 | 22 | 3 | depending on medium | 435 | - |

Note: The optimum float will be selected after a feasibility test carried out by KSR.

# Cylindrical floats (Z)




D = Limit density of the medium, immersed float volume 85 %

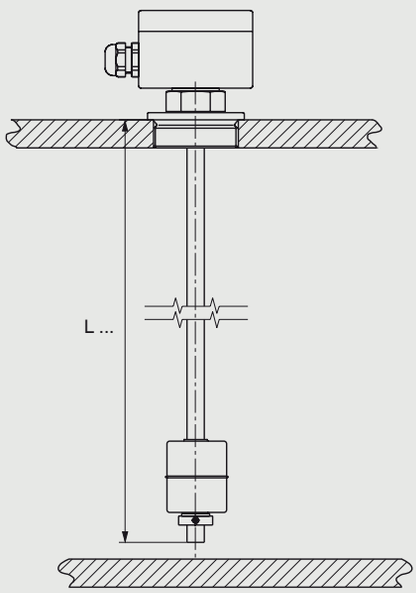
E = Nominal density of the medium, immersed float volume 50 %

| Material | Suits guide tube Ø mm | Ø A mm | B mm | Ø C mm | Max. operating pressure bar | Max. operating temperature °C | Limit density 85 % kg/m³ | Order no. |
|---|---|---|---|---|---|---|---|---|
| Stainless steel 1.4571 | **12** | 44 | 52 | 15 | 16 | 250 | 740 | 034196 |
| Titanium 3.7035 | **12** | 44 | 52 | 15 | 16 | 250 | 645 | 022639 |
| PVC | **16** | 55 | 54 | 22 | 3 | 60 | 805 | 033696 |
| | **20** | 80 | 79 | 25 | 3 | 60 | 577 | 033697 |
| Polypropylene | **16** | 55 | 54 | 22 | 3 | 80 | 592 | 033700 |
| | **20** | 80 | 79 | 25 | 3 | 80 | 438 | 033701 |
| PVDF | **16** | 55 | 69 | 22 | 3 | 100 | 809 | 033698 |
| | **20** | 80 | 79 | 25 | 3 | 100 | 706 | 033699 |
| PTFE | **16-20** | 80 | 100 | 28 | 3 | depending on medium | 667 | 115056 |
| | **16-20** | 90 | 100 | 28 | 3 | depending on medium | 584 | - |

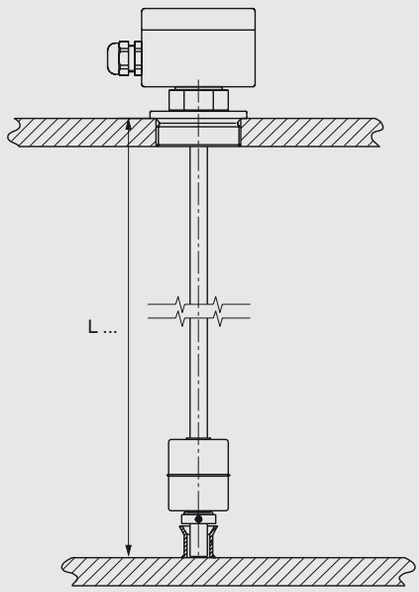
Note: The optimum float will be selected after a feasibility test carried out by KSR.

## Determination of the max. guide tube length L for explosion-protected version, intrinsically safe

**Version A: Fixed to the tank ceiling**

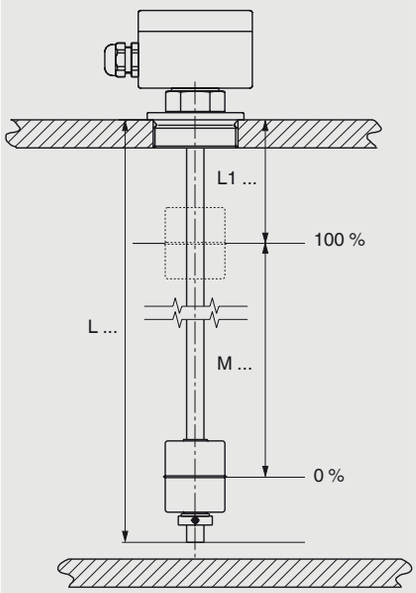



**Version B: Fixed to the tank ceiling and floor**




| Guide tube | Max. guide tube length L | |
|---|---|---|
| | Version A | Version B |
| Ø 12 x 1 | 660 mm | 3,500 mm |
| Ø 14 x 1 | 940 mm | 5,000 mm |
| Ø 14 x 2 | 1,600 mm | 6,000 mm |
| Ø 18 x 2 | 3,000 mm | 6,500 mm |

## Illustration with the required dimensions for ordering




Legend

L1 = 100 % Mark (distance sealing face-float center)

M = measuring range (distance 0 ... 100 %)

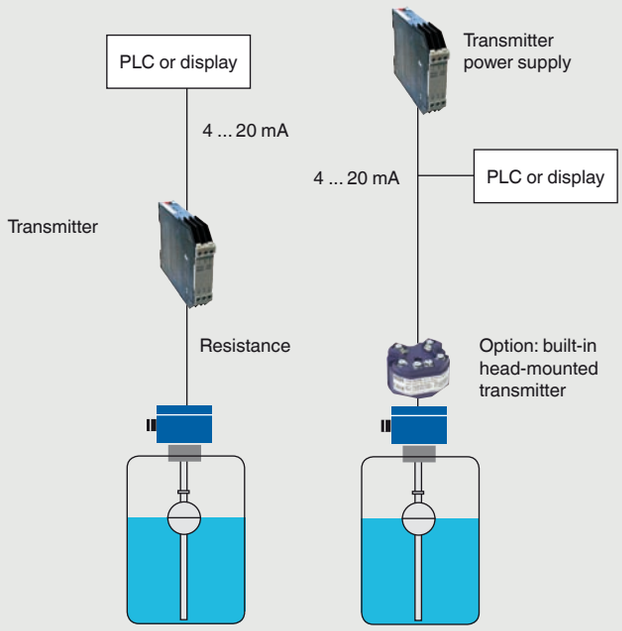
L = guide tube length and/or. insertion length of the sensor

On ordering, the dimension L1 and the guide tube length (immersion length) L must be given.

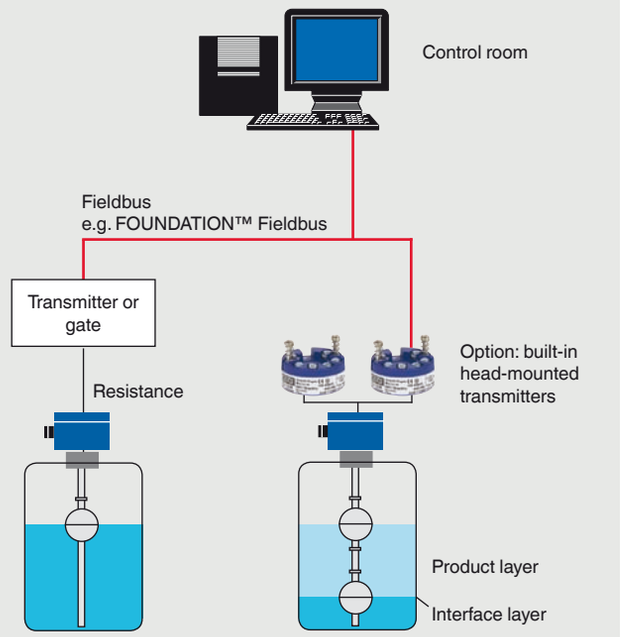
Subsequent alteration of the measuring range is not possible.

# Application examples

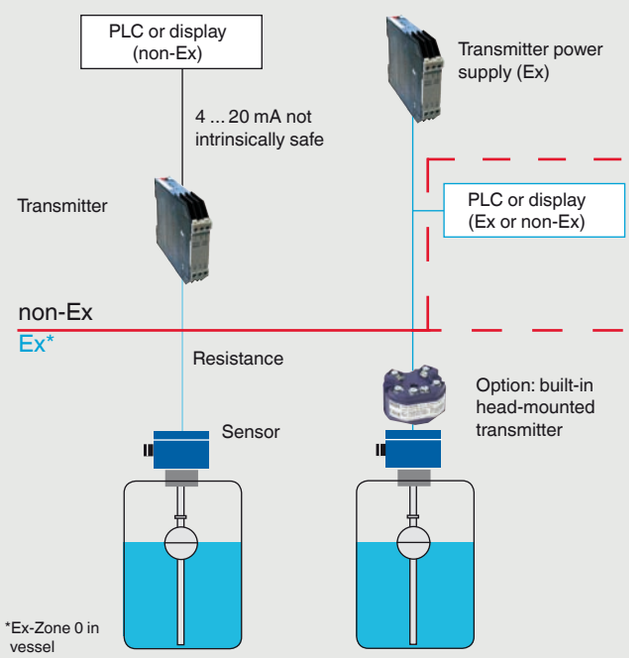
## Standard applications



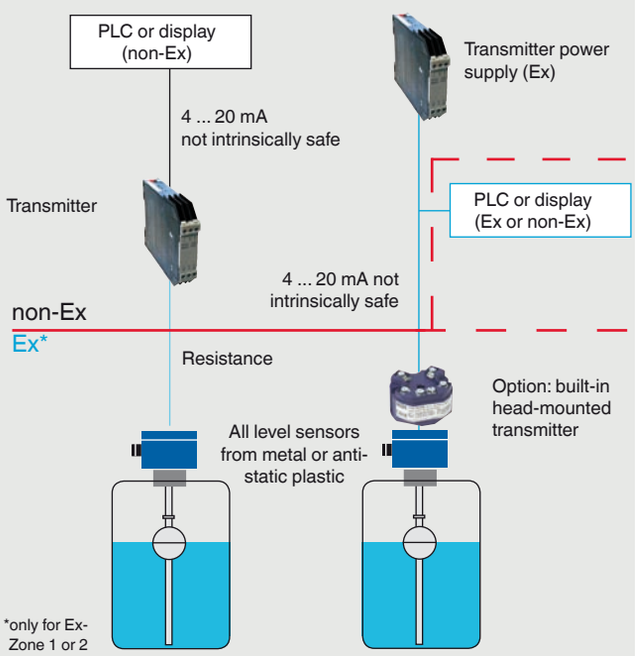

## Connection to bus systems



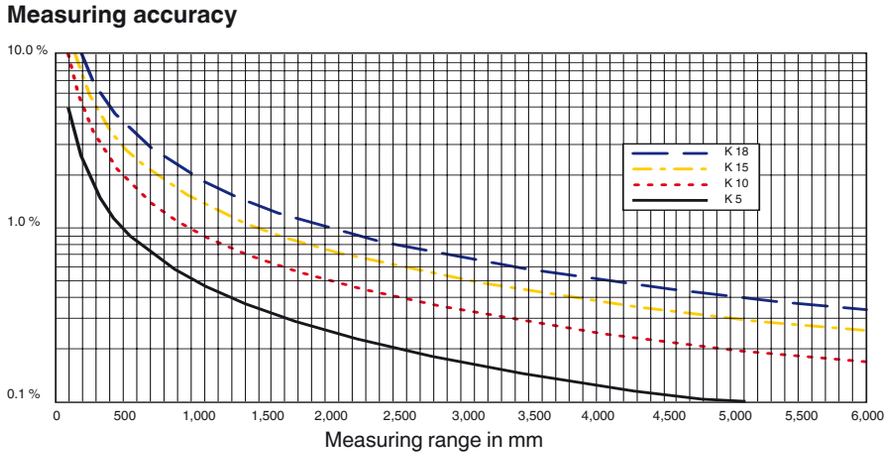

## Applications for Ex-Zone 0




## Applications for Ex-Zone 1, 2




## Measuring accuracy




Legend
K 18 Contact separation 18 mm
K 15 Contact separation 15 mm
K 10 Contact separation 10 mm
K 5 Contact separation 5 mm

## Head-mounted transmitter


**Model TE**


**Model T32E**


**Model T53F**

**Model TLEH**

| Model | 4 ... 20 mA | HART® | PROFIBUS® PA | Fieldbus™ | Exi | Display | Order no. |
|---|---|---|---|---|---|---|---|
| TE | x | | | | x | | 014832 |
| TS | x | | | | | | 005894 |
| T32E | x | x | | | x | | 025216 |
| T32S | x | x | | | | | 114795 |
| T53F | | | | x | x | | 025727 |
| T53P | | | x | | x | | 034422 |
| TLH | x | x | | | | x | 019989 |
| TLEH | x | x | | | x | x | 021104 |

**Ordering information**

Model / Version / Electrical connection / Process connection / Guide tube diameter / Guide tube length (insertion length) L / Contact separation / 100 % mark L1 / Measuring range M (span 0 % - 100 %) / Process specifications (operating temperature and pressure, limit density) / Options

To order the described floats and head-mounted transmitters the order number is sufficient.

# Appendix

## Cross Reference FLR

| Replaced Type | Type | Description |
|---|---|---|
| ERV... | FLR-S | Process connection: mounting thread upwards |
| ARV... | FLR-S | Process connection: mounting thread downwards |
| AFV... | FLR-S | Process connection: flange connection |
| AFVEC... | FLR-S | Material: Stainless steel 1.4571 E-CTFE-coated ; Option: anti-static |
| AFVTF... | FLR-S | Material: Stainless steel 1.4571 PTFE-coated ; Option: anti-static |
| AF-ADF... | FLR-S | Approval: ATEX Ex-d; Process connection: flange connection |
| NMG125... | FLR-S | Approval: ATEX Ex-i |
| AMRV... | FLR-H | Food industry design, Process Connection: Dairy fitting |
| AFCV... | FLR-H | Food industry design, Process Connection: Clamp connection |
| ERP... | FLR-P | Material: PVC; Process connection: mounting thread upwards |
| APRP... | FLR-P | Material: PVC; Process connection: mounting thread downwards |
| APFP ... | FLR-P | Material: PVC; Process connection: flange connection |
| ERPP... | FLR-P | Material: Polypropylen; Process connection: mounting thread upwards |
| ABRPP ... | FLR-P | Material: Polypropylen; Process connection: mounting thread downwards |
| APFPP ... | FLR-P | Material: Polypropylen; Process connection: flange connection |
| ERPF... | FLR-P | Material: Polypropylen; Process connection: mounting thread upwards |
| APRPF ... | FLR-P | Material: PVDF; Process connection: mounting thread downwards |
| APFPF ... | FLR-P | Material: PVDF; Process connection: flange connection |

## Type Code

| Code | | 1st key | | 2nd key | | 3rd key |
|---|---|---|---|---|---|---|
| **1** | | **Electrical connection** | | **Process connection** | | **Material process connection** |
| .../.../... | - | (none) - connection cable | ER | Mounting thread upwards (BSP) | V | Stainless steel 1.4571 |
| | A | Terminal box Aluminium | R | Mounting thread downwards (BSP) | VE | Stainless steel electro-polished |
| | AB | Terminal box Polypropylene | ENPT | Mounting thread upwards (NPT) | VEC | Stainless steel ECTFE-coated |
| | AP | Terminal box Polyester | NPT | Mounting thread downwards (NPT) | VTF | Stainless steel PTFE-lined |
| | AV4 | Terminal box Stainless steel 1.4571 with screw cap | MR | Dairy fitting acc. to DIN 11851 | T | Titanium |
| | ADF | Terminal box Aluminium flameproof | F | Flange (DIN, ANSI, JIS) | HC | Hastelloy C |
| | ASC4 | Coupler plug C 164-232-F-4P | FC | Clamp-connection acc. to DIN 32676 | P | PVC |
| | ASN6R | Hirschmann coupler plug N6RAM 2D M20 | IS | Sanitary nozzle (Ingoldstutzen) | PP | Polypropylene |
| | ASM12 | Plug M12x1-4-pole | | | PF | PVDF |
| **2** | | **Process connection** | | | | |
| .../.../... | **...** | Mounting thread size in inches | | | | |
| | **...** | Dairy pipe fitting size DN 50 - DN 150 | | | | |
| | **.../** | **Flange nominal size** | **.../** | **Flange pressure rating** | **...** | **Flange face** |
| DIN | | DN 50 - DN 200 | | PN 6 - PN 100 | | Standard Form C optional E, A, F, N |
| DIN EN | | DN 50 - DN 200 | | PN 6 - PN 100 | | Standard Form B1 optional B2, A, C, D |
| ANSI | | 2“- 8“ | | Class 150 - 600 | | Standard RF optional RTJ, FF, LT, LG |
| JIS | | 3/8” (DN 10) - 4”(DN 100) | | 5 K- 63 K | | Standard RF optional RTJ, FF, LT, LG |
| Clamp | | DN 25 - DN 100; 1“- 4“ | | | | |

| 3 | | Guide tube material | | Contact function | | Optional code adder |
|---|---|---|---|---|---|---|
| .../.../... | V | Stainless steel 1.4571 | K 18 | 18 mm | /HT.. | High temperature* +150 °C ... +200 °C |
| | VE | Stainless steel electro-polished | K 15 | 15 mm | /TT.. | Low temperature -10 °C ... -80 °C |
| | VEC | Stainless steel ECTFE-coated | K 10 | 10 mm | | * only contact separations 5/10/15 mm |
| | VTF | Stainless steel PTFE-lined | K 5 | 5 mm | /PT100 | Temperature probe PT 100 (2-,3- or 4-core) |
| | HC | Hastelloy C | | | /..TH.. | Temperature switch ... °C - closing or opening |
| | P | PVC | | | | |
| | PP | Polypropylene | | | | |
| | PF | PVDF | | | | |

| 4 | Option, Head-mounted transmitter in terminal box | | | |
|---|---|---|---|---|
| | TS | 2-wire standard analogue | T53F | Intrinsically safe Foundation Fieldbus programmable |
| | TE | 2-wire intrinsically safe analogue | T53P | Intrinsically safe Profibus PA programmable |
| | T32.1S | 2-wire intrinsically safe HART® programmable | TLH | 2-wire HART® programmable with LCD display |
| | T32.xS | 2-wire HART® programmable | TLEH | 2-wire intrinsically safe HART® programmable with LCD display |
| | T12 | universally programmable | none | - |

| 5 | | Guide tube length | | OD Guide tube |
|---|---|---|---|---|
| L.../... | L.../ | length in mm | ... | OD in mm |

| 6 | | Float design | | Durchmesser |
|---|---|---|---|---|
| .../... | **.../** | Material (code 3, 1st key) | **...** | Float OD in mm |

| 7 | | Connection cable | | Cable material |
|---|---|---|---|---|
| .../... | .../ | length in meter | — | PVC, grey |
| | | | blue | PVC, blue |
| | | | SIL | Silicone |
| | | | PUR | PUR |

| 8 | | Approval | | |
|---|---|---|---|---|
| .../.../... | - | none | GL | Germanischer LLoyd |
| | Ex | Ex i | DNV | Det Norske Veritas |
| | Ex d | ATEX | ABS | Bureau Veritas |
| | Ex d | IECEx | 3-A | 3-A certified |

## Ordering Example

| | Electrical Connection | | Process Connection | | Guided tube material | | Option | | Guide tube | | Float | | Cable | | Approval |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | design / material | | size | | contact separation | | transmitter | | length / Ø | | | | length / material | | |
| Code | 1 | - | 2 | - | 3 | - | 4 | - | 5 | - | 6 | - | 7 | - | 8 |
| | AFV | - | 50/6/F | - | VK 15/TT30 | - | TS | - | L950/12 | - | V44R | - | | - | |

# Level sensor
# Magnetostrictive, high-resolution measuring principle
# Models FFG-P, FFG-T, FFG-TP, FLM-H

KSR data sheet FFG-P, FFG-T, FFG-TP, FLM-H

## Applications

- High-accuracy level measurement for almost all liquid media
- Chemical, petrochemical, natural gas, offshore, shipbuilding, machine building, power generating equipment, power plants
- Process water and drinking water treatment, food industry, pharmaceutical industry

## Special features

- Process- and system-specific solutions possible
- Operating limits:
  - Operating temperature: T = -90 ... +400 °C
  - Operating pressure: P = Vacuum to 100 bar
  - Limit density: ρ ≥ 400 kg/m³
- Resolution < 0.1 mm
- Wide variety of different electrical connections, process connections and materials
- Explosion-protected versions


**Level sensor**
**Model FFG-T, flange connection**

## Description

The model FFG-P, FFG-T, FFG-TP and FLM-H sensors are used for the high-accuracy, continuous level measurement of liquids and are based on determining the position of a magnetic float according to the magnetostrictive measuring principle.

| Model | Description |
|---|---|
| FFG-P | Standard version |
| FFG-T | High-temperature version |
| FFG-TP | Plastic version |
| FLM-H | Sterile version |

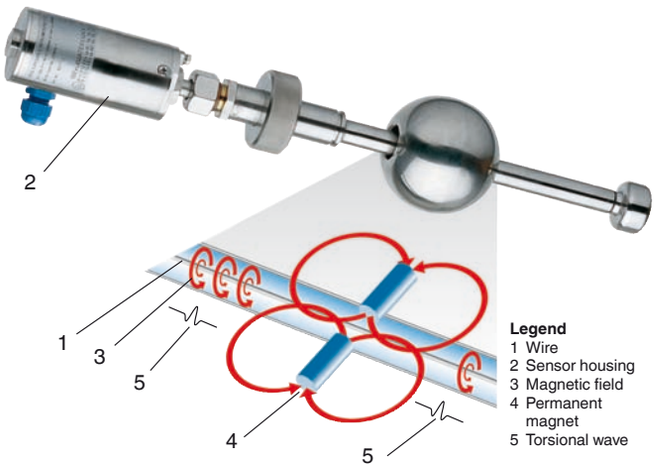
## Further special features

- Large scope of application due to the simple, proven functional principle
- Process connection, guide tube and float from stainless steel 1.4571, 1.4435, 1.4539 or plastic
- For harsh operating conditions, long service life
- Continuous measurement of levels, independent of physical and chemical changes of the media such as: Foaming, conductivity, dielectric constant, pressure, vacuum, temperature, vapours, condensation, bubble formation, boiling effects, density change
- Signal transmission over long distances
- Simple installation and commissioning, onetime calibration only, no recalibration necessary.
- Level displayed proportional to volume or height
- Parallel measurement of interface layer and overall level possible via HART® interface

## Options

- Customised solutions
- Process connection, guide tube material and float from special steel, titanium, Hastelloy (others on request)
- In combination with limit switch, stepless setting of the limit values over the entire measuring range

## Illustration of the principle




## Design and operating principle

- The measuring process is triggered by a current impulse. This current produces a circular magnetic field (3) along a wire (1) made of magnetostrictive material fixed in the guide tube.
- At the point being measured (liquid level) there is a float with permanent magnets (4) acting as a position transducer.
- The interaction of both magnetic fields generates a mechanical torsion wave (5) in the wire.
- This is converted into an electrical signal at the end of the wire in the sensor housing (2) by a piezoceramic converter.
- The measured propagation delay enables the origination point, and thus the float position, to be determined with high accuracy.

## Product overview

| Sensor model | Description | Materials | | | | | | Temperature range (process) |
|---|---|---|---|---|---|---|---|---|
| | | Stainless steel 1.4571 (316Ti) | Stainless steel 1.4404 (316L) | Titanium 3.7035 (grade 2) | Stainless steel 1.4435 (316L) | PP | PVDF | |
| **FFG-P** | Magnetostrictive sensor, standard | x | x | x | | | | -60 ... +185 °C |
| **FFG-T** | Magnetostrictive sensor, high temperature | x | x | x | | | | -90 ... +400 °C |
| **FFG-TP** | Magnetostrictive sensor, plastic | | | | | x | x | -10 ... +100 °C |
| **FLM-H** | Magnetostrictive sensor, sterile version | | x | | x | | | -40 ... +400 °C |

| Sensor model | Aproval (Option) | | | |
|---|---|---|---|---|
| | without | Ex i | Ex d | 3A |
| **FFG-P** | x | x | x | |
| **FFG-T** | x | x | | |
| **FLM-H** | x | | | x |

## Ex approvals

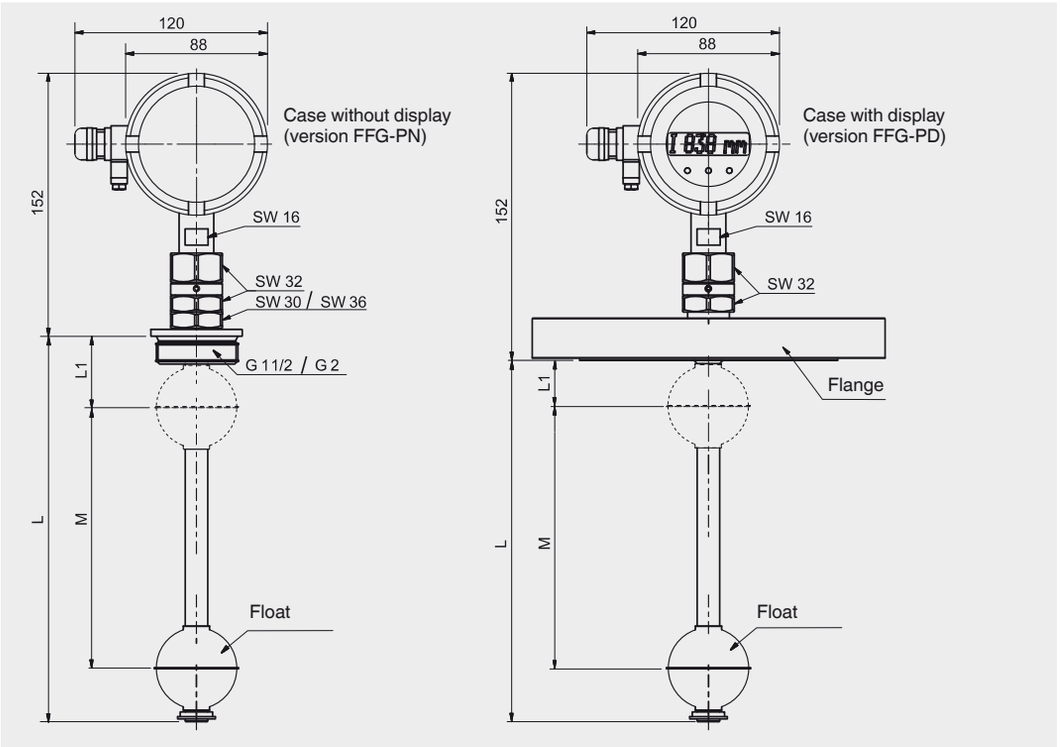
| Explosion protection | Ignition protection type | Model | Zone | Approval number |
|---|---|---|---|---|
| ATEX | Ex i | FFG-T-Ex i | Zone 0 | IBExU 02 ATEX 1124 X II 1/2G Ex ia IIC T3 ... T6 |
| | Ex i | FFG-P.22H2... | Zone 0 | ZELM 10 ATEX 0439 II 1/2G Ex ia IIC T3 ... T6 |
| | Ex d | FFG-P.22H3... | Zone 1 | ZELM 13 ATEX 0508 X II 1/2G Ex d IIB T3 to T6 Ga Gb |

## Type approval

| Approval | Model | Approval number |
|---|---|---|
| EAC-Ex | FFG-. | RU C-DE.GB08.B.00845 |
| EAC | FFG-. | TC N RU D-DE.AU14.B.21532 |
| 3A | FLM-H | 3-A Sanitary Standards 74-06 |

## Sensor, standard, model FFG-P

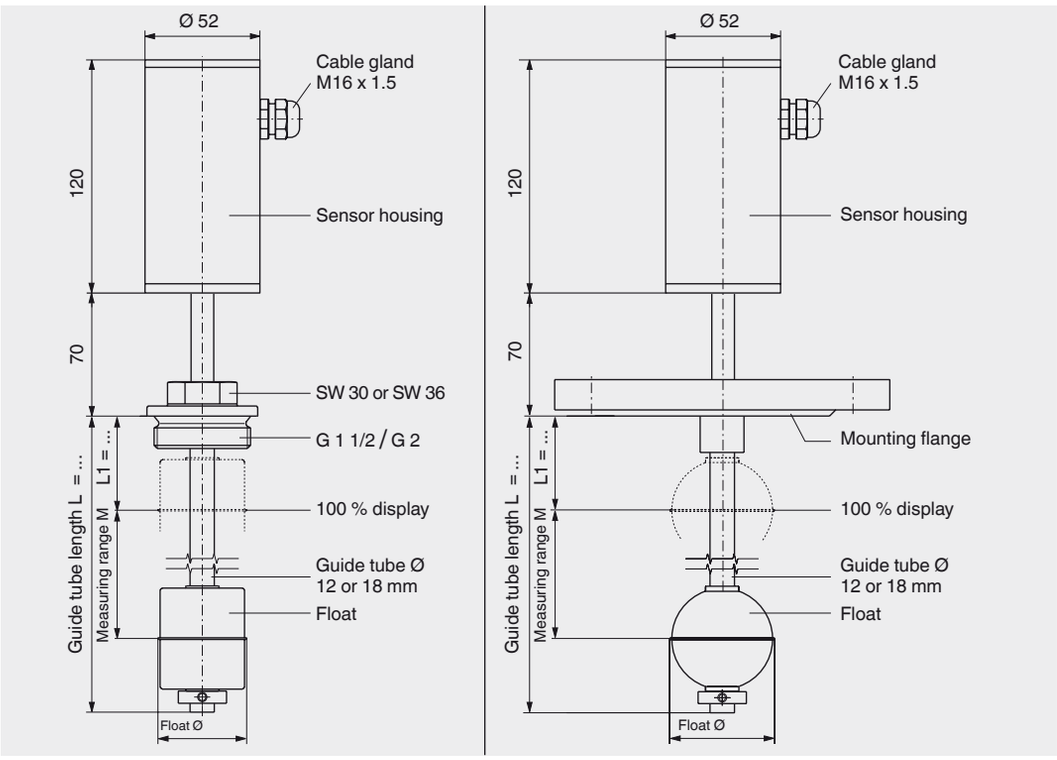
Process connection, guide tube and float from stainless steel 1.4571




| | Mounting thread | | Flange | |
|---|---|---|---|---|
| Electrical connection | Sensor housing, material stainless steel 1.4404 (316L)<br>Version FFG-PN without display<br>Version FFG-PD with window and display | | | |
| Display | LCD matrix (only version FFG-PD) | | | |
| Process connection | Mounting thread<br>downwards<br>G 1 1/2 or G 2 | | Mounting flange<br>■ DIN DN 50 ... DN 200, PN 6 ... PN 100<br>■ ANSI 2" ... 8", class 150 ... 600 | |
| Guide tube diameter | 14 mm | 18 mm | 14 mm | 18 mm |
| Guide tube length L max. | 3,000 mm | 5,800 mm | 3,000 mm | 5,800 mm |
| Float | Material stainless steel 1.4571 (option: Titanium)<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 8)<br>Attention: With Ex approval no floats from titanium may be used. | | | |
| Max. operating pressure | 40 bar (100 bar with float from titanium), see table on page 8 | | | |
| Temperature range<br>Standard | Medium: -60 ... +185 °C<br>Ambient temperature:<br>- Standard, version without display -40 ... +85 °C<br>- Standard, version with display -20 ...+70 °C<br>- Version Ex i T3/T4/T5: -20 °C ... +70 °C, T6: -20 °C ... +60 °C<br>- Version Ex d T3/T4/T5: -20 °C ... +70 °C, T6: -20 °C ... +60 °C | | | |
| Output signal | 4 ... 20 mA, HART® | | | |
| Power supply | DC 15 ... 30 V | | | |
| Measuring accuracy | < ±0.5 mm | | | |
| Resolution | < 0.1 mm | | | |
| Load | max. 900 Ω at 30 V | | | |
| Mounting position | Vertical ±30° | | | |
| Ingress protection | IP 67 per EN 60529 / IEC 60529 | | | |

# Sensor, high temperature, model FFG-T

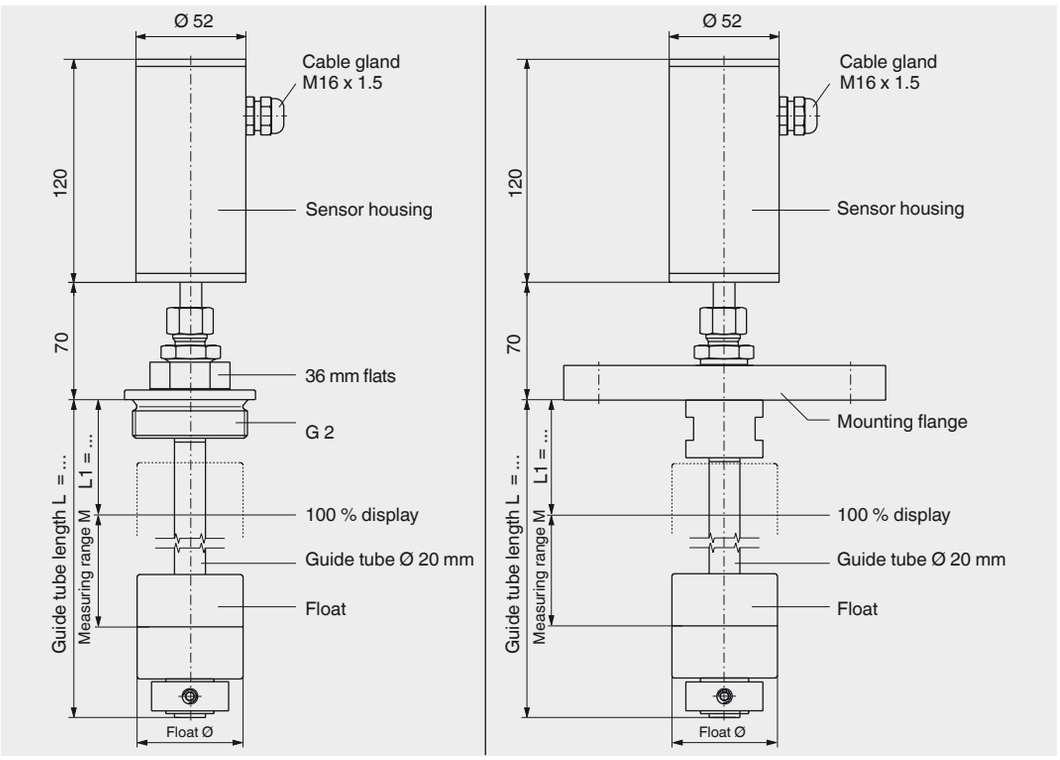
Process connection, guide tube and float from stainless steel 1.4571




| | Mounting thread | | Flange | |
|---|---|---|---|---|
| Electrical connection | Sensor housing, material stainless steel 1.4301 | | | |
| Process connection | Mounting thread<br>downwards<br>G 1 1/2 or G 2 | | Mounting flange<br>■ DIN DN 50 ... DN 200, PN 6 ... PN 100<br>■ ANSI 2" ... 8", class 150 ... 600 | |
| Guide tube diameter | 12 mm | 18 mm | 12 mm | 18 mm |
| Guide tube length L max. | 3,000 mm | 6,000 mm | 3,000 mm | 6,000 mm |
| Float | Material stainless steel 1.4571 (option: Titanium)<br>Float diameter from 44 ... 120 mm<br>Float selection depending on guide tube diameter and process conditions (see page 8) | | | |
| Max. operating pressure | 40 bar (100 bar with float from titanium), see table on page 8 | | | |
| Temperature range Standard | Medium:<br>- Version FFG-TH: -45 ... +400 °C<br>- Version FFG-TT: -90 ... +125 °C<br>Ambient temperature: -40 ... +85 °C | | | |
| Output signal | 4 ... 20 mA, HART® | | | |
| Power supply | DC 10 ... 30 V | | | |
| Measuring accuracy | < ±0.5 mm | | | |
| Resolution | < 0.1 mm | | | |
| Load | max. 900 Ω at 30 V | | | |
| Mounting position | Vertical ±30° | | | |
| Ingress protection | IP 68 per EN 60529 / IEC 60529 | | | |

# Sensor, plastic, model FFG-TP

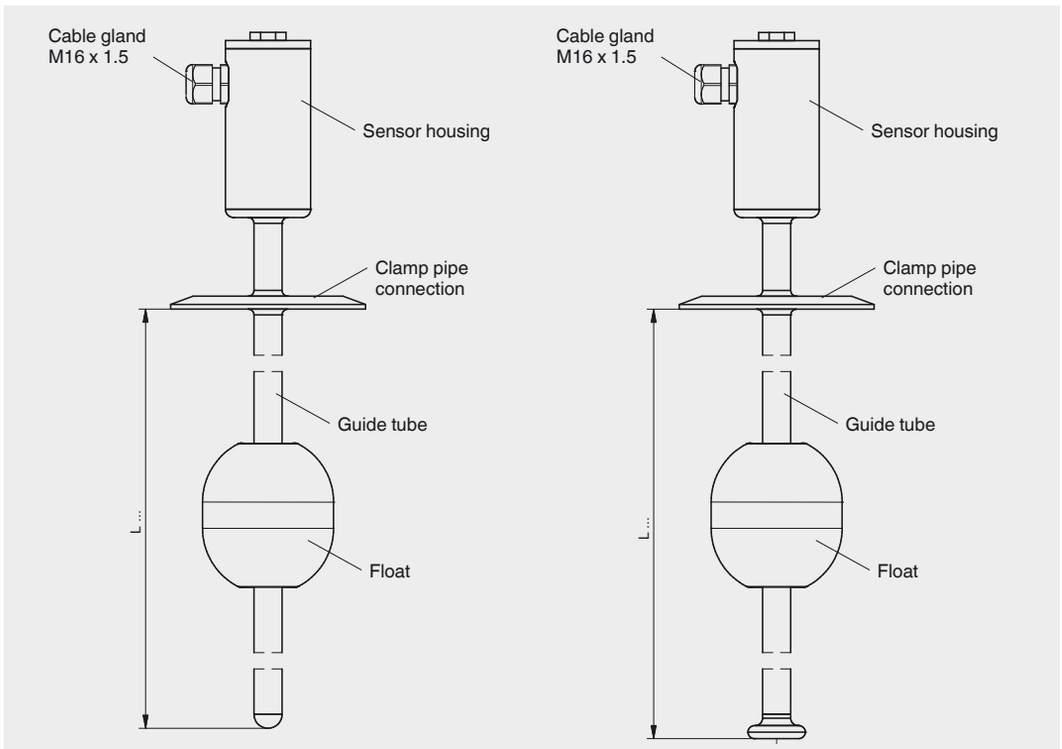
Process connection, guide tube and float from PVC, polypropylene or PVDF




| | Mounting thread | Flange |
|---|---|---|
| Electrical connection | Sensor housing, material stainless steel 1.4301 | |
| Process connection | Mounting thread<br>downwards<br>G 1 1/2 or G 2 | Mounting flange<br>■ DIN DN 50 ... DN 200, PN 6 ... PN 100<br>■ ANSI 2" ... 8", class 150 ... 600 |
| Guide tube diameter | 16 or 20 mm | |
| Guide tube length L max. | 5,000 mm | |
| Float | Material ■ Polypropylene<br>■ PVDF<br>Float diameter of 55 or 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 8) | |
| Max. operating pressure | 3 bar | |
| Temperature range Standard | Medium: ■ Polypropylene -10 ... +80 °C<br>■ PVDF -10 ... +100 °C<br>Ambient temperature: -40 ... +85 °C | |
| Output signal | 4 ... 20 mA, HART® | |
| Power supply | DC 10 ... 30 V | |
| Measuring accuracy | < ±0.5 mm | |
| Resolution | < 0.1 mm | |
| Load | max. 900 Ω at 30 V | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 68 per EN 60529 / IEC 60529 | |

## Sensor, sterile version, model FLM-H

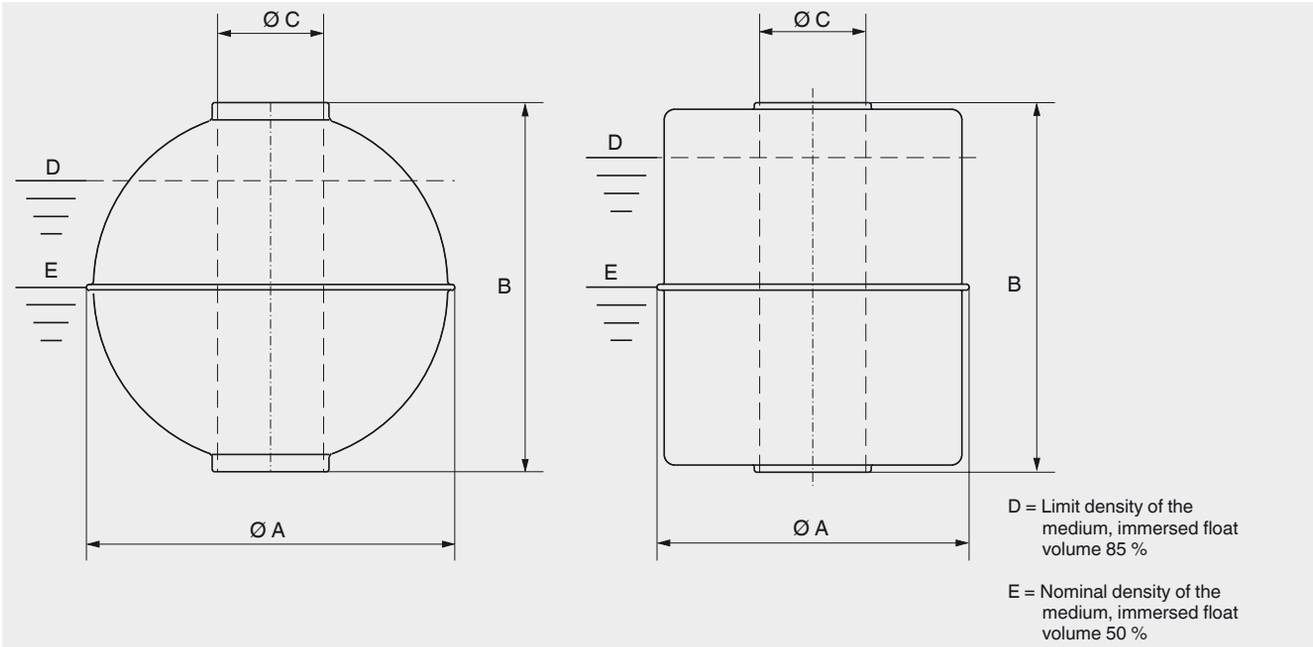
Process connection, guide tube and float from stainless steel 1.4435 (316L) or 1.4404 (316L), surface ground and polished Ra < 0.8 µm or Ra < 0.4 µm, alternatively electropolished




| | Version without floor fixture | Version with separate floor fixture |
|---|---|---|
| Electrical connection | Sensor housing, material stainless steel 1.4305 | |
| Process connection | Clamp ISO 2852<br>Clamp DIN 32767<br>Aseptic thread DIN 11864-1<br>Aseptic collar connecting sleeve DIN 11864-1<br>Aseptic flange DIN 11864-2<br>Aseptic clamp DIN 11864-3<br>VARIVENT®<br>BioConnect® | |
| Guide tube diameter | 17.2 mm | |
| Guide tube length L max. | 6,000 mm | |
| Float | Material stainless steel 1.4435 (316L) or 1.4539 (316L)<br>Float diameter of 80 mm<br>Float selection depending on guide tube diameter and process conditions (see page 8) | |
| Max. operating pressure | 10 bar | |
| Temperature range Standard | Medium:<br>- Standard, version FLM-H: -40 ... +250 °C<br>- High temperature, version FLM-HT: -40 ...+400 °C<br>Ambient temperature: -40 ... +85 °C | |
| Output signal | 4 ... 20 mA, HART® | |
| Power supply | DC 10 ... 30 V | |
| Measuring accuracy | < ±0.5 mm | |
| Resolution | < 0.1 mm | |
| Load | max. 900 Ω at 30 V | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 68 per EN 60529 / IEC 60529 | |

## Spherical floats (K)

## Cylindrical floats (Z)




D = Limit density of the medium, immersed float volume 85 %

E = Nominal density of the medium, immersed float volume 50 %

| Material | Version | Suits guide tube Ø mm | Form | Ø A mm | B mm | Ø C mm | Max. Operating pressure bar | Max. Operating temperature °C | Limit density 85 % kg/m³ | Nominal density 50 % kg/m³ |
|---|---|---|---|---|---|---|---|---|---|---|
| Stainless steel 1.4571 | **V44A** | **14** | Z | 44 | 52 | 15 | 16 | 200 | 818 | 1.390 |
| (316Ti) | **V52A** | **14** | K | 52 | 52 | 15 | 40 | 200 | 769 | 1.307 |
| | **V62A** | **14** | K | 62 | 61 | 15 | 32 | 200 | 597 | 1.015 |
| | **V83A** | **14** | K | 83 | 81 | 15 | 25 | 200 | 408 | 693 |
| | **V80A** | **18** | K | 80 | 76 | 23 | 25 | 200 | 679 | 1.155 |
| | **V98A** | **18** | K | 98 | 96 | 23 | 25 | 200 | 597 | 1.016 |
| | **V105A** | **18** | K | 105 | 103 | 23 | 25 | 200 | 533 | 907 |
| | **V120A** | **18** | K | 120 | 117 | 23 | 25 | 200 | 389 | 661 |
| | **V120/38A** | **18** | K | 120 | 116 | 38 | 25 | 200 | 537 | 914 |
| Titan 3.7035 | **T44A** | **14** | Z | 44 | 52 | 15 | 16 | 200 | 720 | 1.224 |
| (Grade 2) | **T52A** | **14** | K | 52 | 52 | 15 | 25 | 250 | 707 | 1.201 |
| | **T52/1A** | **14** | K | 52 | 52 | 15 | 110 | 250 | 1040 | 1.770 |
| | **T62A** | **14** | K | 62 | 62 | 15 | 25 | 250 | 505 | 859 |
| | **T83A** | **14** | K | 83 | 81 | 15 | 25 | 250 | 278 | 473 |
| | **T80A** | **18** | K | 80 | 76 | 23 | 25 | 250 | 665 | 1.130 |
| | **T98A** | **18** | K | 98 | 96 | 23 | 25 | 250 | 595 | 841 |
| | **T105A** | **18** | K | 105 | 103 | 23 | 25 | 250 | 369 | 627 |
| | **T120A** | **18** | K | 120 | 117 | 23 | 25 | 250 | 329 | 560 |
| PVC | **P55A** | **16** | Z | 55 | 54 | 22 | 3 | 60 | 798 | 1.357 |
| | **P80A** | **20** | Z | 80 | 79 | 25 | 3 | 60 | 537 | 974 |
| Polypropylen | **PP55A** | **16** | Z | 55 | 54 | 22 | 3 | 80 | 582 | 989 |
| | **PP80A** | **20** | Z | 80 | 79 | 25 | 3 | 80 | 431 | 723 |
| PVDF | **PF55A** | **16** | Z | 55 | 69 | 22 | 3 | 100 | 821 | 1.396 |
| | **PF80A** | **20** | Z | 80 | 79 | 25 | 3 | 100 | 681 | 1.157 |
| **Sterile version** | | | | | | | | | | |
| Stainless steel 1.4435 (316L) | **V80/88/ R4/3A/35** | **17.2** | K | 80 | 88 | 23 | 16 | 150 | 790 | 1.350 |
| Stainless steel 1.4539 (316L) | **V80/ R4/3A/39** | **17.2** | K | 80 | 76 | 23 | 16 | 150 | 621 | 1.056 |

Note: The optimum float will be selected after a feasibility test carried out by KSR.

**Ordering information**

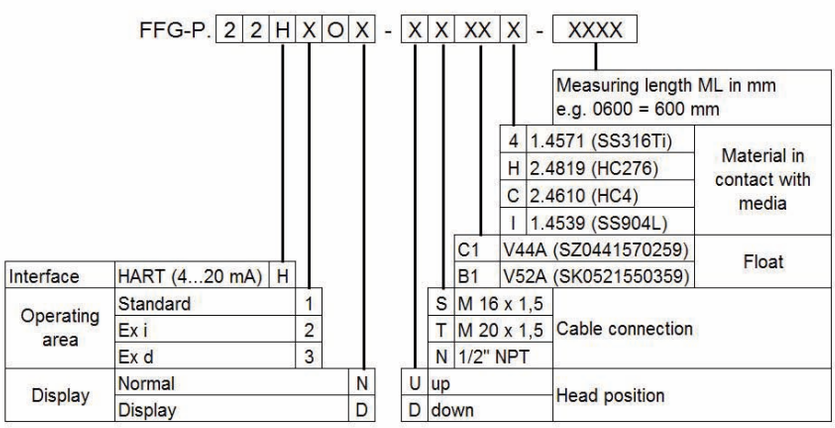
Model / Version / Electrical connection / Process connection / Guide tube diameter / Guide tube length (insertion length) L / 100 % mark L1 / Measuring range M (span 0 % - 100 %) / Process specifications (operating temperature and pressure, limit density) / Options

# Appendix

## Cross Reference FLM

| Replaced Type | Type | Description |
|---|---|---|
| FFG-P | FLM-S | Magnetostrictive sensor, standard |
| FFG-T | FLM-ST | Magnetostrictive sensor, high temperature |
| FFG-TP | FLM-SP | Magnetostrictive sensor, plastic |
| FFG-T-MRVE... | FLM-H | Magnetostrictive sensor, sterile version with dairy coupling |
| FFG-T-FCFE... | FLM-H | Magnetostrictive sensor, sterile version with clamp |
| FFG-T-IS... | FLM-H | Magnetostrictive sensor, sterile version with ingolde nossle |
| 746.2xxx | Successor: FLM-S | Magnetostrictive sensor (Phönix design) |

## Type Code FFG-P



# Type Code FFG-T

Code

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **1** | | **Basic type** | | | | | |
| | FFG | | | | | | |
| **2** | | **Transmitter housing** | | | | | |
| | T | Transmitter housing stainless steel | | | | | |
| **3** | | **Process connection** | | **Material (Process connection)** | | | |
| .../... | R | Mounting thread downwards (DIN) | V | Stainless steel 1.4571 (316Ti) | | | |
| | NPT | Mounting thread downwards (NPT) | VE | Stainless steel electropolished | | | |
| | MR | Dairy pipe fitting to DIN 11851 | VEC | Stainless steel E-CTFE-coated | | | |
| | F | Flange (DIN, ANSI or JIS ) | VTF | Stainless steel PTFE-lined | | | |
| | FC | Clamp-connection to DIN 32676 | T | Titanium | | | |
| | IS | Sanitary nozzle (Ingold nozzle) | HB | Hastelloy B | | | |
| | | | HC | Hastelloy C | | | |
| | | | P | PVC | | | |
| | | | PP | Polypropylene | | | |
| | | | PF | PVDF | | | |
| **4** | | **Size process connection** | | | | | |
| .../.../... | ... | Mounting thread size in inches | | | | | |
| | ... | Dairy pipe fitting size DN 50 - DN 150 | | | | | |
| | .../ | Flange nominal size | .../ | Flange pressure rating | ... | Flange face | |
| DIN | | DN 50 - DN 200 | | PN 6 - PN 100 | | Standard Form C optional E, A, F, N | |
| ANSI | | 2”- 8” | | Class 150 - 600 | | Standard RF optional RTJ, FF, ST, SG, LT, LG | |
| JIS | | 3/8” (DN 10) - 4”(DN 100) | | 5 K- 63 K | | Standard RF optional RTJ, FF, ST, SG, LT, LG | |
| Clamp | | DN 25 - DN 100; 1”- 4” | | | | | |
| **5** | | **Guide tube (sensor tube) material** | | | | | |
| ... | V | Stainless steel 1.4571 (316Ti) | HB | Hastelloy B | | | |
| | VE | Stainless steel electropolished | HC | Hastelloy C | | | |
| | VEC | Stainless steel E-CTFE-coated | P | PVC | | | |
| | VTF | Stainless steel PTFE-lined | PP | Polypropylene | | | |
| | T | Titanium | PF | PVDF | | | |
| **6** | | **Guide tube length** | | **Measuring range** | | **Diameter** | |
| .../.../... | L.../ | Length in mm | M.../ | Range in mm | ... | Tube OD | |
| **7** | | **Float design** | | | | | |
| .../... | .../ | Material | ... | Float OD in mm | | | |
| **8** | | **Approvals** | | | | | |
| ... | Ex | Ex-Design | | | | | |

# Ordering Example

| | Basic type | | Transmitter housing | | Connection material | | Connection size | | Guide tube material | | Guide tube length measuring range tube OD | | Float | | Approval |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | - | 3 | - | 4 | - | 5 | - | 6 | - | 7 | - | 8 |
| | FFG | - | T | - | FV | - | 50/6/F | - | V | - | L950/M850/12 | - | V44A | - | Ex |

# KSR – Your Partner for Food and Beverage

Taste, enjoyment and naturalness are three factors that consumers look for in soft drinks.
Beverage manufacturers must therefore handle the ingredients and flavours very carefully in order to produce a safe and perfectly flavoured drink. This premise holds true for breweries and dairies as well as for the soft drink and fruit juice manufacturers. In all process steps, from production to filling, the product must be handled gently and safely. The measuring instruments used for this must securely and accurately determine the measurement parameters. The hygienic design of product-carrying plant components is an essential pre-requisite to avoid microbiological contamination, which goes with ensuring the product‘s quality.

As part of the overall hygienic concept of a plant, the measuring instruments used must comply with special requirements on material, surface quality, process safety, connection engineering and cleaning in the scope of the CIP process.
KSR offers an extensive programme of measuring instruments with hygienic design. These enable easy cleaning both in the areas in contact with the product as well on the side that is away from the product itself. This is confirmed through the EHEDG (European Hygienic Engineering & Design Group) and 3-A Sanitary Standards, Inc. certificates.

# Level sensor
# Magnetostrictive, high-resolution measuring principle
# For sanitary applications, model FLM-H

KSR data sheet FLM-H

## Applications

- Food and beverage industry
- Pharmaceutical industry
- Biotechnology
- Level measurement in fermenters

## Special features

- Fully welded and dead space free
- Operating limits:
  - Operating temperature: T = -40 ... +250 °C
  - Operating pressure: P = Vacuum to 10 bar
- Insensitive to foaming, ideal for interface measurement
- High-precision level measurement: Accuracy < 0.5 mm
- Wide variety of hygienic process connections

**Level sensor, for sanitary applications, model FLM-H**

## Description

The model FLM-H magnetostrictive sensor has been specifically designed for the requirements of the food and beverage, pharmaceutical and biotechnology industries. The sensor is particularly suitable for the special conditions of CIP/SIP cleaning processes, such as chemical stability towards cleaning liquids and high temperatures.
The guide tube is directly welded to the process connection, which guarantees a crevice-free connection, additional sealings are not required.
The sensor is supplied with a DC voltage of 10 ... 30 V. Available output signals are 4 ... 20 mA or 4 ... 20 mA with HART® signal.

The hygienically designed sensor housing, with an ingress protection of up to IP 68, offers a secure protection for external cleaning with splash water and enables its use in high-humidity environments.
The model FLM-H sensor fulfils the high demands of sanitary applications. It is marked with the 3-A symbol and current version number, as it conforms, based on a third party verification, to the 3-A standard.

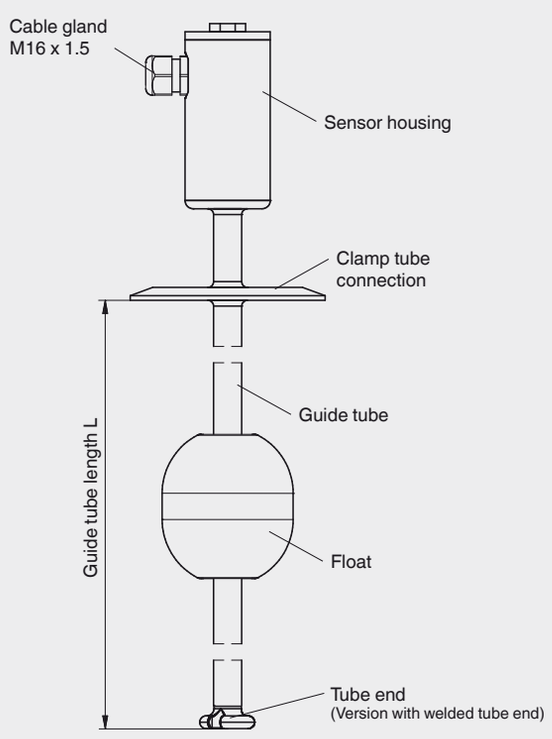
## Further special features

- Large range of application due to the simple, proven functional principle
- For harsh operating conditions, long service life
- Continuous measurement of levels, independent of physical and chemical changes of the media such as: Foaming, conductivity, dielectric, pressure, vacuum, temperature, vapours, condensation, bubble formation, boiling effects, density change
- Signal transmission over long distances
- Simple installation and commissioning, onetime calibration only, no recalibration necessary
- Level displayed proportional to volume or height

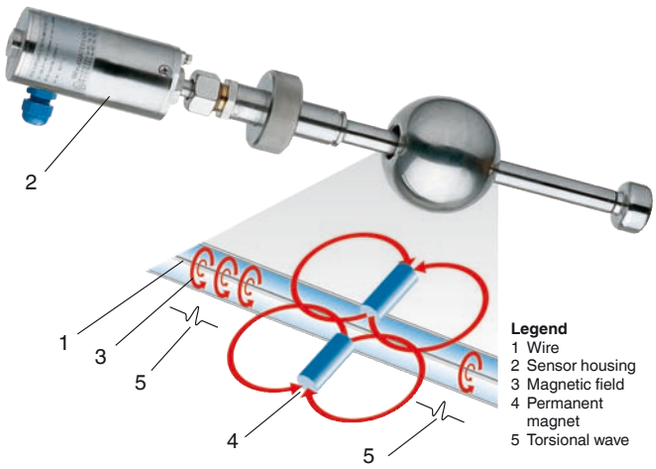
## Options

- Customised solutions

**Components of the level sensor, model FLM-H**



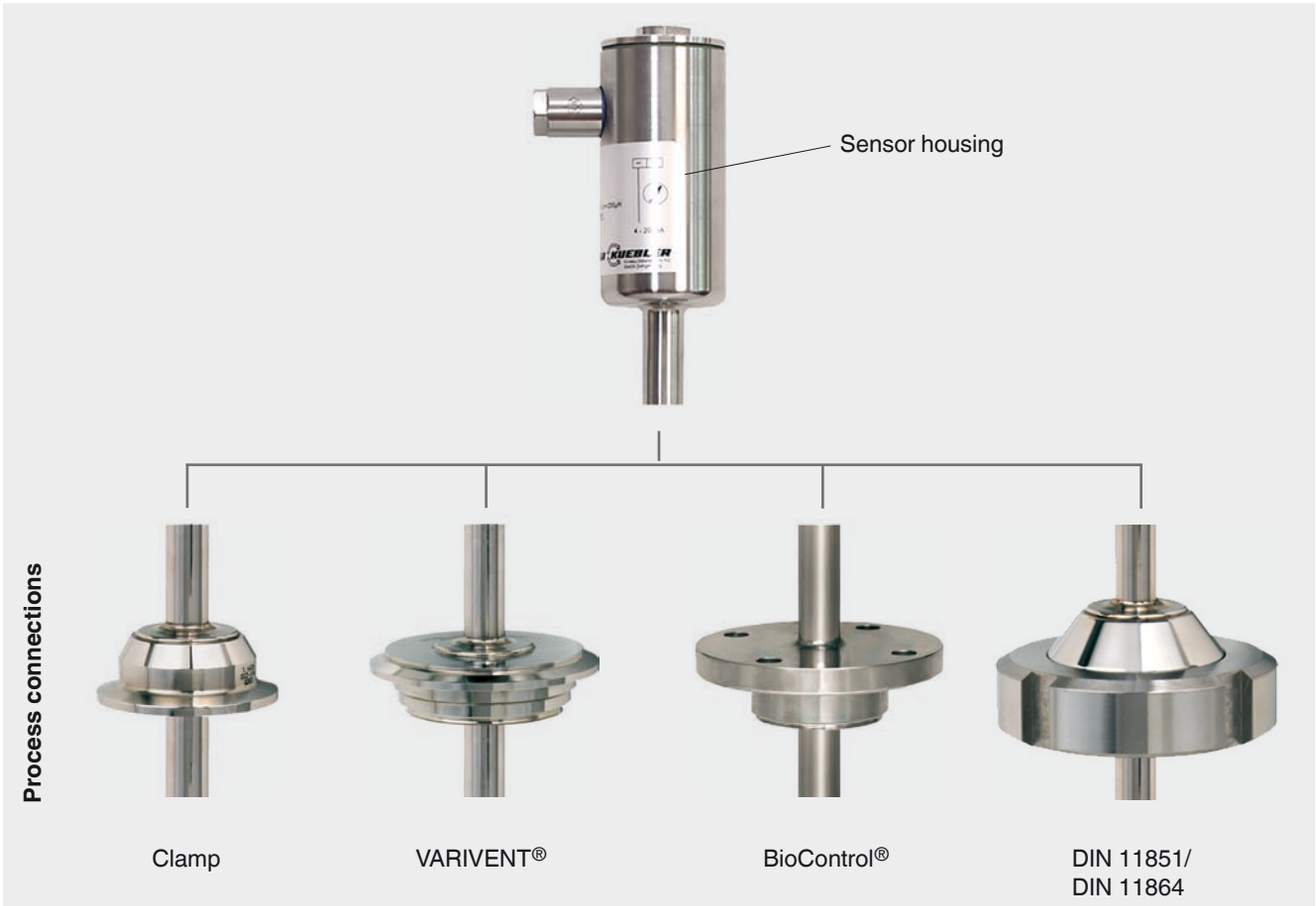

## Illustration of the principle




## Design and operating principle

- The measuring process is triggered by a current impulse. This current produces a circular magnetic field (3) along a wire (1) made of magnetostrictive material fixed in the guide tube.
- At the point being measured (liquid level) there is a float with permanent magnets (4) acting as a position transducer.
- The interaction of both magnetic fields generates a mechanical torsion wave (5) in the wire.
- This is converted into an electrical signal at the end of the wire in the sensor housing (2) by a piezoceramic converter.
- The measured propagation delay enables the origination point of the mechanical wave, and thus the float position, to be determined with high accuracy.

## Overview of the process connections

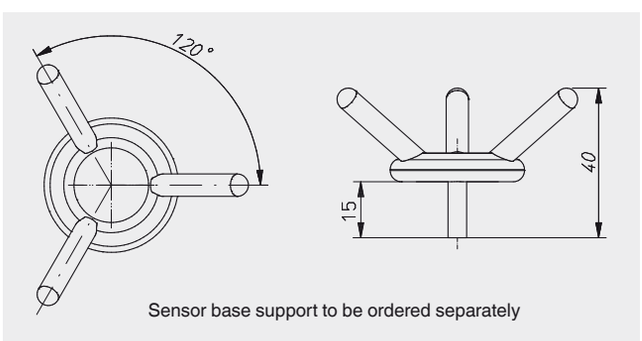



VARIVENT® is a registered trademark of the company GEA Tuchenhagen.
BioControl® is a registered trademark of the company NEUMO.

## Tube ends

### Version with separate sensor base support

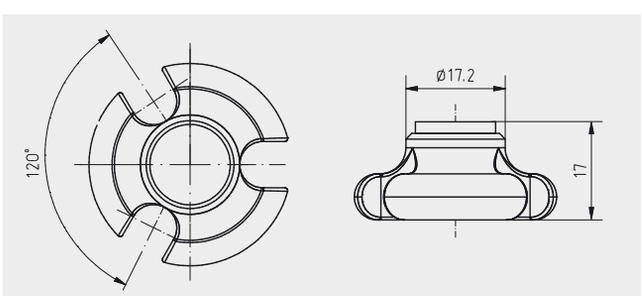
This sensor base support is welded “separately” at the bottom of the tank. When mounting the sensor, the guide tube with the float can be fitted into the sensor base support inside the vessel to fix it. Thus the float is held in position and serves as a position transducer for the level. With stirring movement within the container, the sensor is fixed.
Additional advantage: If the lid of the process vessel is large enough and the float can be placed onto the sensor, then small process connections can be used.




Sensor base support to be ordered separately

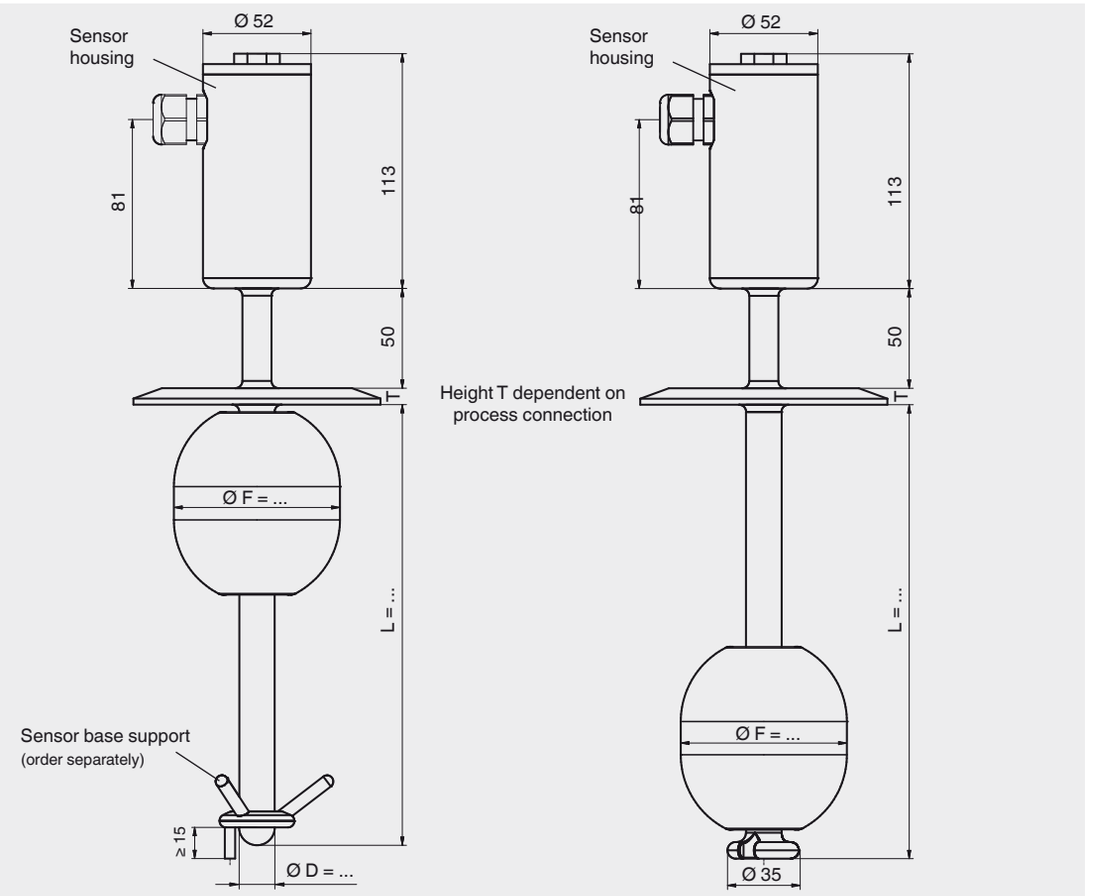
### Version with welded pipe end

This tube end is fully welded at the end of the guide tube and offers a dead-space free end to the sensor guide tube.
The geometry of the end of the guide tube enables CIP/SIP cleaning.
This variant can be selected when the sensor including the float (taking into account the float diameter) can be mounted through the process connection.



## Sensor, sterile version, model FLM-H

Process connection, guide tube and float from stainless steel 1.4435 (316L) or 1.4404 (316L), surface ground and polished Ra < 0.8 µm or Ra < 0.4 µm, alternatively electropolished




| | Version with separate sensor base support | Version with welded tube end |
|---|---|---|
| Electrical connection | Sensor housing | Stainless steel 1.4305 with cable gland M16 x 1.5 polyamide or hygienic design |
| Process connection | ■ Clamp connection ISO 2852 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Clamp connection DIN 32676 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Aseptic mounting thread downwards DIN 11864-1 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Aseptic collar connecting sleeve DIN 11864-1 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ Aseptic flange connection DIN 11864-2 (DN 32 ... DN 50 or 1.5" ... 2")<br>■ Aseptic clamp connection DIN 11864-3 (DN 32 ... DN 100 or 1.5" ... 4")<br>■ VARIVENT® (form F, N and G)<br>■ BioConnect® threaded connection (DN 32 ... DN 100 or 1.5" ... 2")<br>■ BioConnect® flange connection (DN 32 ... DN 100 or 1.5" ... 2")<br>■ BioConnect® clamp connection (DN 32 ... DN 100 or 1.5" ... 2") | |
| Guide tube diameter | 12, 14 or 17.2 mm (stainless steel 1.4435 or 1.4404, surface ground and polished, Ra ≤ 0.8 µm or Ra ≤ 0.4 µm) | |
| Guide tube length L max. | 6,000 mm | |
| Float | Material stainless steel 1.4435 or 1.4404<br>Float diameter 50 or 80 mm<br>Float selection depending on guide tube diameter | |
| Density range | Float diameter 50 mm: 1100 kg/m³ ... 1860 kg/m³<br>Float diameter 80 mm: 770 kg/m³ ... 1162 kg/m³ | |
| Max. operating pressure | 10 bar | |
| Temperature range | ■ Medium standard -40 ... +250 °C<br>■ Ambient temperature at the sensor housing -40 ... +85 °C<br>■ Storage temperature: -20 ... +60 °C | |
| Output signal | 4 ... 20 mA, HART® | |
| Power supply | DC 10 ... 30 V | |
| Accuracy | < ±0.5 mm | |
| Resolution | < 0.1 mm | |
| Load | max. 900 Ω at 30 V | |
| Mounting position | Vertical ±30° | |
| Ingress protection | IP 68 per EN 60529 / IEC 60529 | |

## Certificates (option)

- 2.2 test report
- 3.1 inspection certificate
- 3-A conformity
- Safety Integrity Level (SIL 2)

**Ordering information**
Model / Version / Cable gland / Process connection / Guide tube diameter / Guide tube length (insertion length) L / 100 % mark L1 / Measuring range (span 0 - 100 %) / Process specifications (operating temperature and pressure, limit density) / Options

# Appendix

## Cross Reference FLM-H

| Replaced Type | Type | Description |
|---|---|---|
| FFG-T-MRVE... | FLM-H | Process Connection: Dairy fitting |
| FFG-T-FCFE... | FLM-H | Process Connection: Clamp connection |
| FFG-T-IS... | FLM-H | Process Connection: Ingold nozzle |

## Type Code

| Code | | |
|---|---|---|
| 1 | | **Basic type** |
| | FLM-H | |
| 2 | | **Electrical connection** |
| | 7 | M 16 x 1,5 Polyamide |
| | 8 | M 16 x 1,5 Hygienic Design |
| 3 | | **Version** |
| | 2 | open end with separate float stopper |
| | 1 | welded float stopper at the end of the guide tube |
| 4 | | **Process connection** |
| | 1 | Clamp connection ISO 2852 (DN32 – DN100 or 1,5“ – 4“) |
| | B | Clamp connection DIN 32676 (DN32 – DN100 or 1,5“ – 4“) |
| | 2 | Aseptik-mounting thread downwards DIN 11864-1 (DN32 – DN100 or 1,5“ – 4“) |
| | 3 | Aseptik-liner blank DIN 11 864-1 (DN32 – DN100 or 1,5“ – 4“) |
| | 4 | Aseptik-flange connection DIN 11 864-2 (DN32 – DN50 or 1,5“ – 2“ ) |
| | 5 | Aseptik-clamp- connection DIN 11 864-3 (DN32 – DN100 or 1,5“ – 4“) |
| | 6 | Varivent (Form F, N and G) |
| | 7 | BioConnect® screwed version (DN32 – DN100 or 1,5“ – 2“) |
| | 8 | BioConnect® flange connection (DN32 – DN100 or 1,5“ – 2“) |
| | 9 | BioConnect® clamp- connection (DN32 – DN100 or 1,5“ – 2“) |
| 5 | | **Size process connection** |
| | | DIN DN 32 up to DN 100 |
| | | ANSI 1,5“ up to 4“ |
| | | Form F, N or G |
| 6 | | **Guide tube length** |
| | L.../ | Length in mm |
| 7 | | **Measuring range** |
| | L.../ | Length in mm |
| 8 | | **Guide tube OD** |
| | ... | 12 mm |
| | | 14 mm |
| | | 17,2 mm |
| 9 | | **Pressure** |
| | ... | |

| | | |
|---|---|---|
| **10** | | **Temperature** |
| | ... | |
| **11** | | **Density** |
| | ... | |
| **12** | | **Surface roughness** |
| | R | Ra ≤ 0,8 µm |
| | H | Ra ≤ 0,8 µm, electro-polished |

## Ordering Example

| | Basic type | | Electrical connection | | Version | | Proces connection | | Size process connection | | Guide tube length Measuring range Guide tube OD | | Pressure Temperature Density | | Surface rough-ness |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | - | 3 | - | 4 | - | 5 | - | 6/7/8 | - | 9/10/11 | - | 12 |
| | FLM-H | - | 8 | - | 1 | - | 1 | - | 2,5“ | - | L1000/M950/12 | - | 100/2/1000 | - | R |

# KSR – Your Partner for Oil and Gas

KSR level measuring instruments can be found worldwide in the field of oil and gas production and regeneration, offshore as well as onshore. Our measuring instruments are manufactured in close cooperation with members of ISO 15156 and NACE committee in accordance with the respective latest revision.

# Sight glass level indicator Model LGG

KSR data sheet LGG

## Applications

- Continuous level indication without power supply
- Direct indication of the level
- Individual design and corrosion resistant materials make the products suitable for a broad range of applications
- Chemical, petrochemical industry, oil and natural gas extraction (on- and offshore), shipbuilding, machine building, power generating equipment, power plants
- Oil and gas, heat transfer and refrigeration systems, plants for cryogenics

## Special features

- Process- and system-specific production
- Operating limits:
  - Operating temperature: -196 ... +374 °C [1)]
  - Operating pressure: Vacuum to 250 bar [1)]
- Wide variety of different process connections and materials
- Illumination optional
- Heating and/or insulation optional

1) Individual limit values. For application limits, the joint consideration of temperature and pressure is required!

**Sight glass level indicator model LGG-E**

## Description

The main element of the sight glass level indicator is the body. Incorporated into this body are the liquid channel (if necessary the heating channel) and the seating faces for the chambered seals and sight glasses.

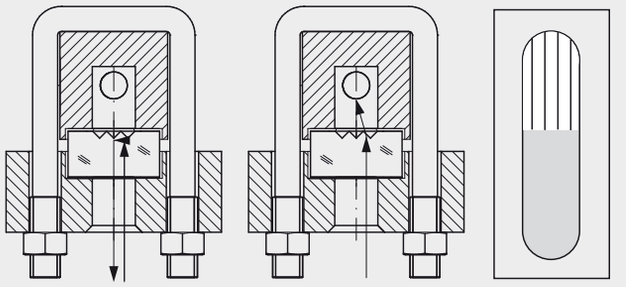
Onto the body are mounted, or are already integrated, the valve heads and process connections. Drain or vent are also possible.

The glasses and/or mica discs as well as the seals are fitted, secured and sealed with the aid of U-bolts and covers or pressure frames. Glasses from borosilicate glass in accordance with DIN 7081 are used.

For steam, the glasses can be used up to 243 °C, with mica design to 300 °C. For other media, temperatures up to 300 °C are possible, in special cases up to 374 °C. The use of mica is needed for specific applications.

## Operating principle

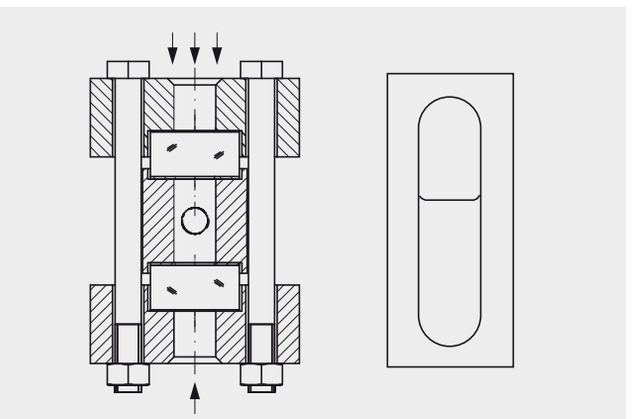
**Reflex glasses per DIN 7081**
In the viewing direction, incident light strikes the reflective grooves of the sight glass plate and are refracted into the liquid present. With gases, the light is reflected. Thus the filling level is visible as a darker column, the gaseous area as a silvery column over it.
Reflex glasses are very well suited for the display of clear liquids.



Viewing direction
Gas phase

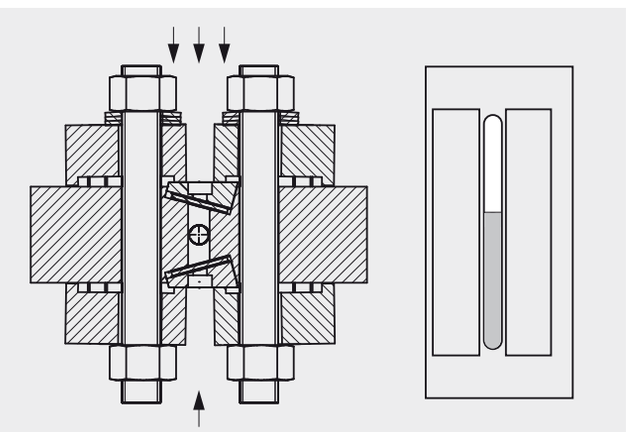
Viewing direction
Liquid phase

**Transparent glasses per DIN 7081**
From the rear, incident light passes through both sight glass plates with the media between them. The fill level is visible as a line (meniscus) or directly due to the liquid itself.



Viewing direction
per DIN 7081

**Refraction principle with mica shields**
From the rear, incident light from a lamp passes through both mica shields with the media between them. The lamp and the media are arranged at an angle. In the gaseous phase, the light passes straight through, with liquids, the light is refracted. Thus the level is visible as a black column, with the gaseous area visible as a light column above.



Viewing direction
Refraction type with mica shields

If unprotected sight glasses are used in boiler systems with aqueous media, high temperatures and high pH values can lead to increased glass erosion. The effect of glass corrosion is increased with the introduction of chemical additives, such as in water treatment. The geometric changes to the sight glass resulting from the erosion lead to risks in the operational safety.

For temperatures from 243 °C, KSR KUEBLER recommends the use of **transparent sight glasses with mica design**. These prevent chemical attack at high water temperatures on the otherwise unprotected glass.

## Construction of sight glass level indicators

**Body**
The main body of the sight glass level indicator, contains the liquid channel

**Cover**
For the clamping of the sight glass plate

**Flat gasket**
Chambered sealing between the liquid channel and the environment

**Glass**
Sight glass plates per DIN 7081 from borosilicate glass

**Cushion**
Mechanical protection between cover and glass

**U-bolt, nut**
Hold the forces from the internal pressure

**Glass size**
Standard lengths L of sight glass plates per DIN 7081, width 34 mm, thickness 17 mm

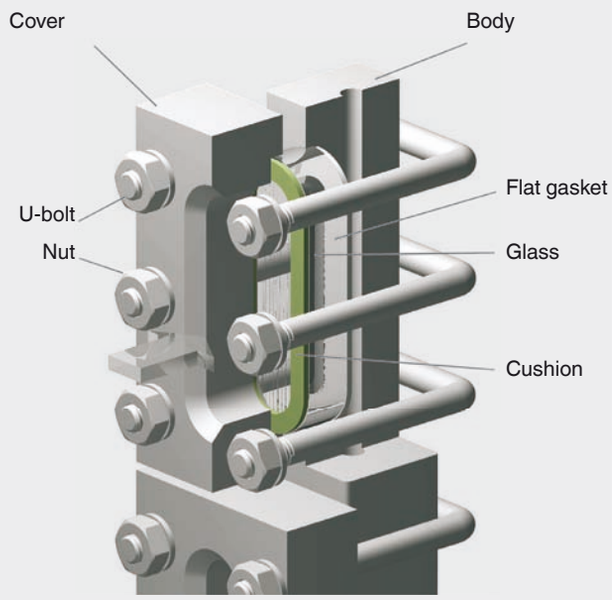
**Visible length VL**
The entire visible length in the sight glass, glass separations are included

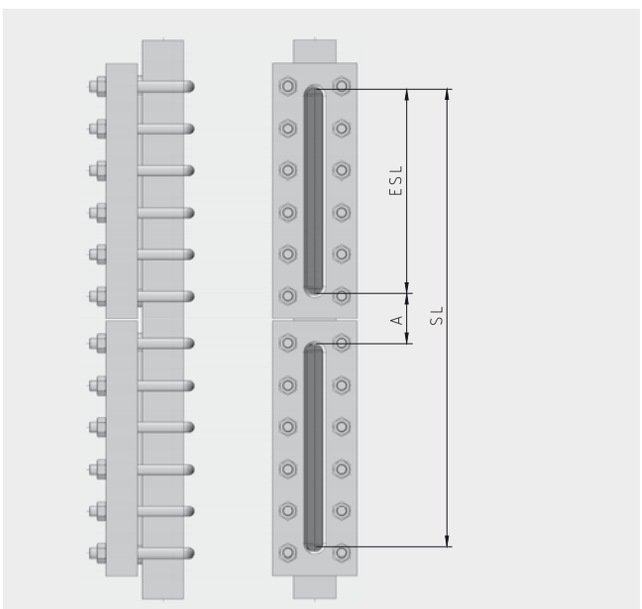
**Individual visible length ESL**
Visible range of a single segment

**Segment**
Field of view consisting of a single sight glass plate

**Glass distance A**
Non-visible range, results from the linking together of segments

**Example**




## Visible lengths and glass sizes in mm

| Length | Glass size | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| L | 140 | 165 | 190 | 220 | 250 | 280 | 320 | 340 | 370 | 400 |
| ESL | 120 | 145 | 170 | 200 | 230 | 260 | 300 | 320 | 350 | 380 |

| Number of segments | Visible length VL | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 120 | 145 | 170 | 200 | 230 | 260 | 300 | 320 | 350 | 380 |
| 2 | 285 | 335 | 385 | 445 | 505 | 565 | 645 | 685 | 745 | 805 |
| 3 | 450 | 525 | 600 | 690 | 780 | 870 | 990 | 1,050 | 1,140 | 1,230 |
| 4 | 615 | 715 | 815 | 935 | 1,055 | 1,175 | 1,335 | 1,415 | 1,535 | 1,655 |
| 5 | 780 | 905 | 1,030 | 1,180 | 1,330 | 1,480 | 1,680 | 1,780 | 1,930 | 2,080 |
| 6 | 945 | 1,095 | 1,245 | 1,425 | 1,605 | 1,785 | 2,025 | 2,145 | 2,325 | 2,505 |
| 7 | 1,110 | 1,285 | 1,460 | 1,670 | 1,880 | 2,090 | 2,370 | 2,510 | 2,720 | 2,930 |

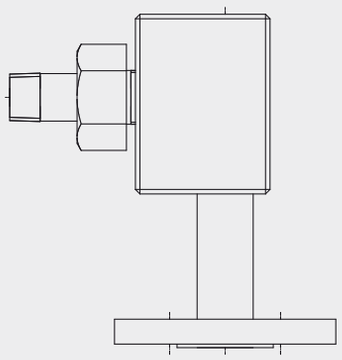
Matrix valid for glass separation A = 45 mm

The visible length SL can deviate from the specified value by ±3 mm due to construction.

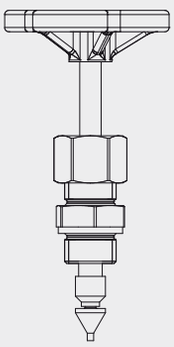
## Valve heads

Valve heads isolate the vessel from the sight glass level indicator. They consist of the valve body and the head piece. They are actuated by a valve with quick closing lever or handwheel. In general, they are fitted with a ball-check valve as a safety element.

**Valve body**

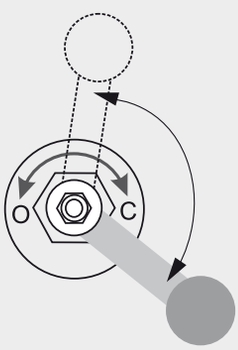


**Head piece**



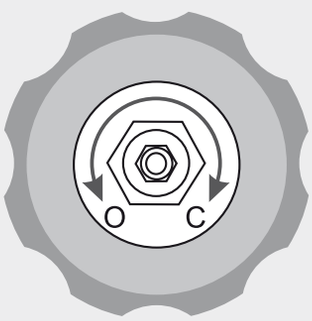
**Valve with quick closing lever**

**Open anti-clockwise**




**Handwheel**

**Open anti-clockwise**

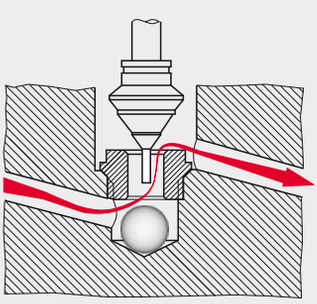



## Ball-check valve

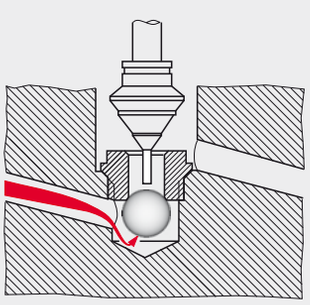
The ball-check valve should prevent any major spillage from the sight glass level indicator in the event of any glass or mica breakage or other sizable leakage. For this purpose there is, under the valve seat, a ball within a recess. As soon as the display starts to leak, the incipient flow lifts the ball from the recess and forces it against the valve seat (pressure > 0.5 bar). In this way, the flow is sharply reduced. The closing of the valve presses the ball back into its starting position.

**Illustration of the ball-check valve principle**

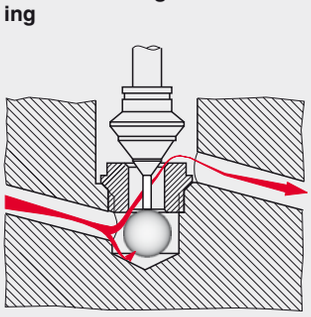
**Situation in normal operation**



**Ball-check valve on glass break**



**Situation during commission-ing**



## Model overview

| Sight glass level indicator | Material | Display | Max. pressure in bar | Temperature range in °C | Glass size | Number of segments |
|---|---|---|---|---|---|---|
| **Reflex indicator** | | | | | | |
| “Carbon-Line” version, model LGG-RP | Steel A350LF2 | Sight glass | 100 | -40 ... +300 | 4 ... 9 | 1 ... 5 |
| Compact version with side pieces, model LGG-E | Steel 1.0460/1.0570 | Sight glass | 40 | -10 ... +300 | 2 ... 11 | 1 ... 3 |
| Standard version, model LGG-RE | Steel 1.0570 (A350LF2) | Sight glass | 160 | -10 ... +300 | 2 ... 11 | 1 ... 5 |
| | Stainless steel 1.4404 (316L) | | | -196 ... +300 | | |
| High-pressure version, model LGG-RI | Steel 1.5415 (15Mo3) | Sight glass | 250 | -10 ... +100 | 2 ... 9 | 1 ... 5 |
| | Stainless steel 1.4404 (316L) | | | -196 ... +100 | | |
| Weld-in version, model LGG-WR | Steel 1.0570 (A350LF2) | Sight glass | 40 | -10 ... +300 | 2 ... 9 | 1 |
| | Stainless steel 1.4404 (316L) | | | -196 ... +300 | | |
| **Transparent indicator** | | | | | | |
| “Carbon-Line” version, model LGG-TP | Steel A350LF2 | Glass (mica) | 100 | -40 ... +300 | 4 ... 9 | 1 ... 5 |
| Standard version, model LGG-TE | Steel 1.0570 (A350LF2) | Glass (mica) | 160 | -10 ... +300 | 2 ... 11 | 1 ... 5 |
| | Stainless steel 1.4404 (316L) | | | -196 ... +300 | | |
| High-pressure version, model LGG-TI | Steel 1.5415 (15Mo3) | Glass (mica) | 250 | -10 ... +100 | 2 ... 9 | 1 ... 5 |
| | Stainless steel 1.4404 (316L) | | | -196 ... +100 | | |
| Superheated steam version, model LGG-T3 | Steel 1.5415 (15Mo3) | Glas + mica | 160 | -10 ... +100 | 2 ... 9 | 1 ... 5 |
| | Stainless steel 1.4404 (316L) | | | -196 ... +300 | | |
| Weld-in version, model LGG-WT | Steel 1.0570 (A350LF2) | Glass (mica) | 40 | -10 ... +300 | 2 ... 9 | 1 |
| | Stainless steel 1.4404 (316L) | | | -196 ... +300 | | |
| Glass tube, standard, model LGG-GA | Brass | Glass tube 13 mm | 10 | -10 ... +120 | 110 ... 1,200 mm | 1 |
| | Stainless steel 1.4571 (316Ti) | | | -10 ... +200 | | |
| Glass tube, for large lengths with interposing glass-holder, model LGG-GB | Stainless steel 1.4404 (316L) | Glass tube 16 mm | 25 | -10 ... +200 | 150 ... 4,500 mm | 1 ... 3 |
| **Refraction indicator** | | | | | | |
| Highest-pressure version, model LGG-M | Steel 1.5415 (15Mo3) | Mica | 160/250 | -10 ... +374 | 2 ... 11 | 1 ... 9 |

## Examples

**Reflex indicator, “Carbon-Line” version, model LGG-RP**

**Reflex indicator, compact version with side pieces, model LGG-E**

**Transparent indicator, standard version, model LGG-TE**


**Reflex indicator, high-pressure version, model LGG-RI**

## Model overview of valve heads

| Valve head | Material | | Max. pressure in bar | Operation | Ball-check valve | Mount | Thru-way |
|---|---|---|---|---|---|---|---|
| | Body | Head piece | | | | | |
| Glass tube fitting with hand-wheel, model LGV-01 | Stainless steel | Stainless steel | PN 250 | Handwheel | yes | top/bottom | Offset |
| Glass tube fitting with quick closing lever, model LGV-03 | Stainless steel | Stainless steel | PN 100 | Quick closing lever | yes | top/bottom | Offset |
| Compact glass tube fitting without valve, model LGV-04 | Stainless steel | Stainless steel | PN 10 | Handwheel | no | top/bottom | angled |
| Glass tube fitting compact with handwheel, model LGV-05 | Brass or stain-less steel | without | PN 10 | without | no | top/bottom | angled |
| Double valve, model LGV-18 | Steel 15Mo3 | Stainless steel | PN 160 | Double hand-wheel, double-lever | yes | lateral | angled |
| Double valve high pressure, model LGV-19 | Steel 15Mo3 | Stainless steel | PN 250 | Double hand-wheel, double-lever | yes | lateral | angled |
| Forged valve with handwheel, model LGV-33 | Steel A350LF2, nitrocarburised | Stainless steel | PN 250 | Handwheel | yes | top/bottom | Offset |
| Forged valve with quick closing lever, model LGV-38 | Steel A350LF2, nitrocarburised | Stainless steel | PN 100 | Quick closing lever | yes | top/bottom | Offset |
| Straight valve with handwheel, model LGV-51 | Steel, stainless steel | Stainless steel | PN 250 | Handwheel | yes | lateral, back | straight |
| Angled valve with handwheel, model LGV-52 | Steel, stainless steel | Stainless steel | PN 250 | Handwheel | yes | lateral | angled |
| Offset valve with handwheel, model LGV-53 | Steel, stainless steel | Stainless steel | PN 250 | Handwheel | yes | top/bottom | Offset |
| Straight valve with quick closing lever, model LGV-56 | Steel, stainless steel | Stainless steel | PN 100 | Quick closing lever | yes | lateral, back | straight |
| Angled valve with quick closing lever, model LGV-57 | Steel, stainless steel | Stainless steel | PN 100 | Quick closing lever | yes | lateral | angled |
| Offset valve with quick closing lever, model LGV-58 | Steel, stainless steel | Stainless steel | PN 100 | Quick closing lever | yes | top/bottom | Offset |

## Examples

**Forged valve with handwheel, model LGV-33**

**Angled valve with quick closing lever, model LGV-57**

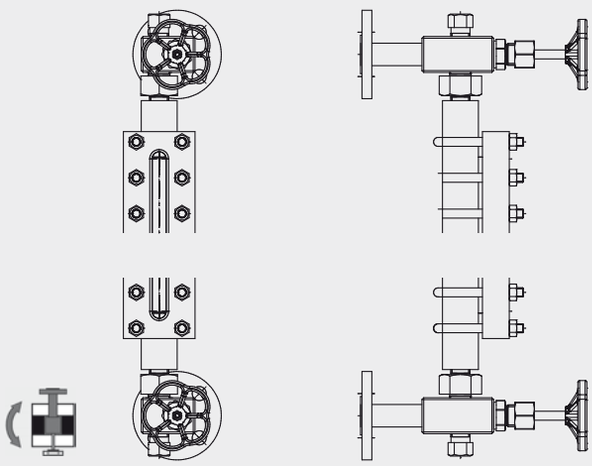
**Straight valve with handwheel, model LGV-51**

## Valve head arrangement

The valve arrangement is always specified in relation to the viewing direction.

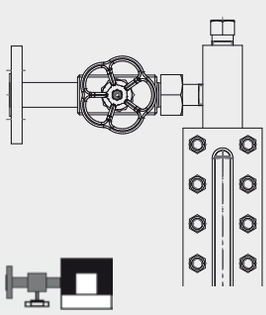
### Rotatable field of view

Offset valve
Top and bottom mount



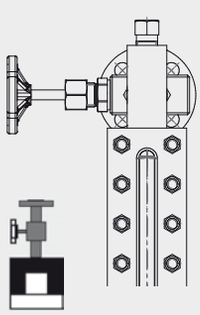
### Fixed field of view

Straight valve
Left mount (lateral)



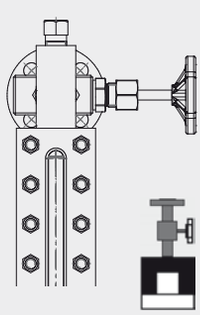
GLL

Straight valve
Back mount, left-handed



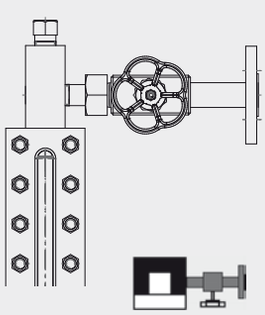
GHL

Straight valve
Back mount, right-hand



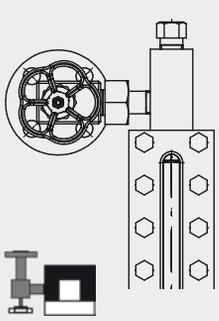
GHR

Straight valve
Right mount (lateral)



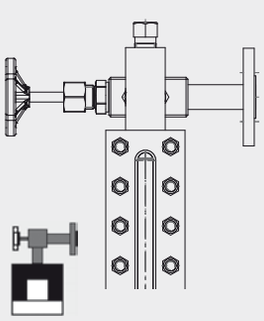
GRR

Angled valve
Left mount (lateral)



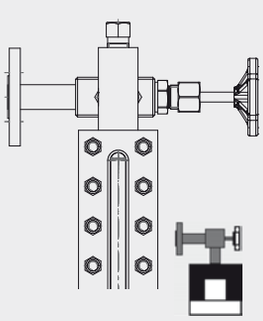
ELL

Angled valve
Back mount, left-handed



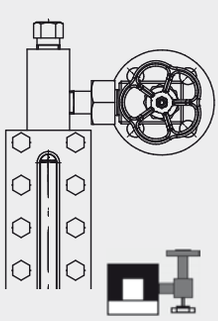
EHL

Angled valve
Back mount, right-hand



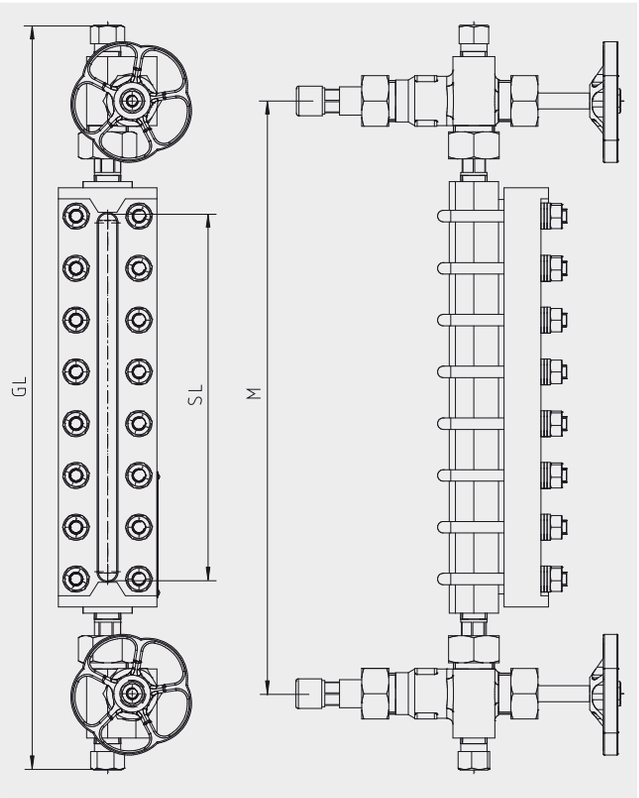
EHR

Angled valve
Right mount (lateral)



ERR

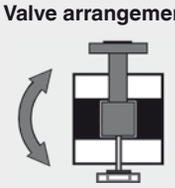
# Sight glass level indicator, reflex, “Carbon-Line” version
# Model LGG-RP



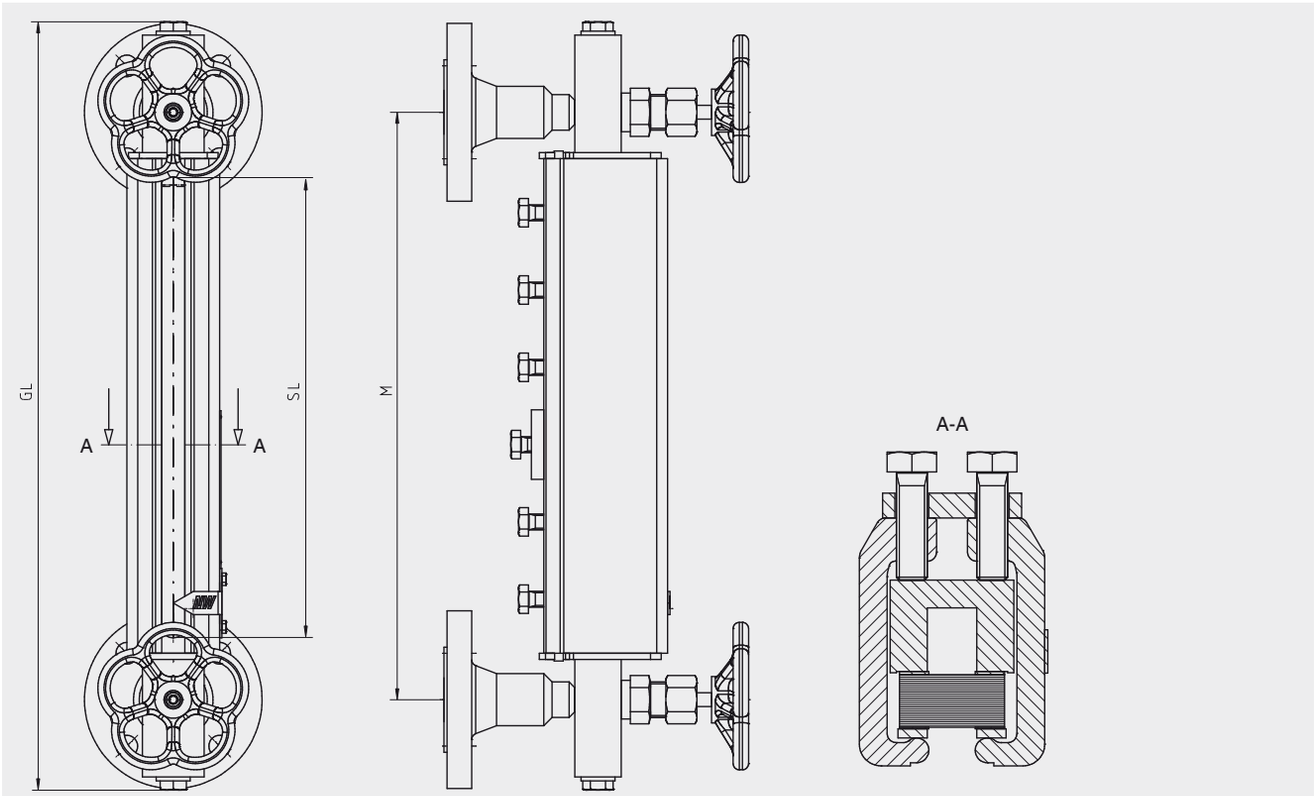

| Specifications | |
|---|---|
| Material | Steel A350 LF2, nitrocarburised |
| Body | 40 x 40 mm, forged |
| Cover | 80 x 30 mm, forged |
| Sight glass | Borosilicate, reflex per DIN 7081 |
| Max. operating pressure | 100 bar [1)] |
| Temperature range | -40 ... +243 °C (steam)<br>-40 ... +280 °C |
| Process connections | ■ Male thread 1/2 NPT, 3/4 NPT<br>■ Weld stub 1/2", 3/4"<br>■ Flange DIN/EN: DN 15 ... 50, PN 16 ... 100<br>■ Flange ANSI: 1/2 ... 2", class 150 ... 600 |
| Centre-to-centre distance M | freely selectable, min. visible length SL + 180 mm |
| Vent | Plug 1/2 NPT (option: Valve) |
| Drain | Plug 1/2 NPT (option: Valve) |
| Glass size | 4 ... 9 |
| Number of segments | 1 ... 5 |
| Suitable valve heads<br>■ Handwheel<br>■ Quick closing lever | <br>■ Model LGV-33 (PN 250)<br>■ Model LGV-38 (PN 100) |

1) Depending on the temperature, the material properties must be observed

**Valve arrangement**



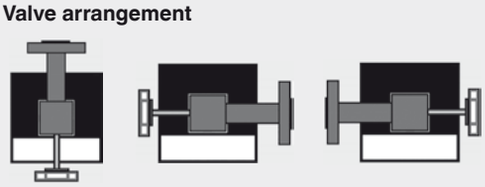
# Sight glass level indicator, reflex, compact version with side pieces
# Model LGG-E




| Specifications | |
|---|---|
| Material | Steel 1.0460, 1.0570 |
| Body | 40 x 30 mm, machined |
| Cover | Clamping through side components, hinged |
| Sight glass | Borosilicate, reflex per DIN 7081 |
| Max. operating pressure | 40 bar [1)] |
| Temperature range | -10 ... +243 °C (steam) |
| Process connections | ■ Flange DIN/EN: DN 15 ... 50, PN 16 ... 40<br>■ Flange ANSI: 1/2 ... 2", class 150 ... 300 |
| Centre-to-centre distance M | freely selectable, min. visible length SL + 80 mm |
| Vent | Plug G 3/8 (option: Valve, ball cock) |
| Drain | Plug G 3/8 (option: Valve, ball cock) |
| Glass size | 2 ... 11 |
| Number of segments | 1 ... 3 |
| Suitable valve heads | integrated with ball-check valve, mounting components from stainless steel |

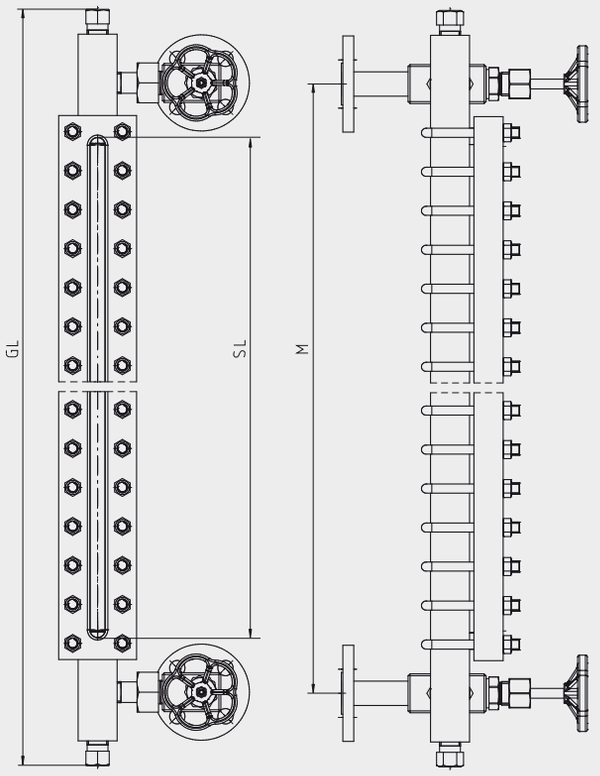
1) Depending on the temperature, the material properties must be observed

**Valve arrangement**

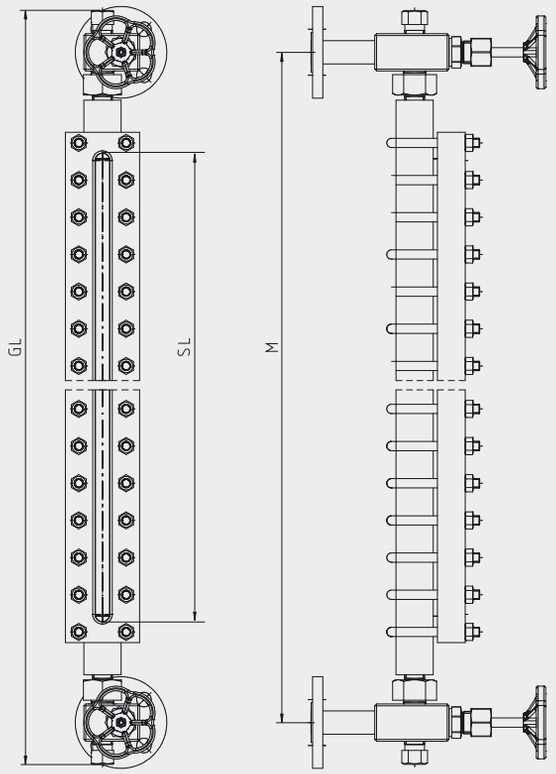


# Sight glass level indicator, reflex, standard version
# Model LGG-RE

**Version with valve head, lateral, model LGV-52**




**Version with valve head, top/bottom, model LGV-53**



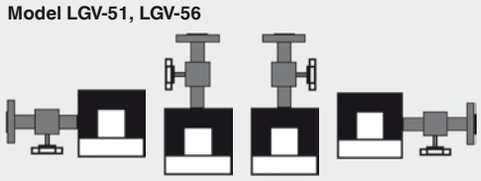

| Specifications | Steel version | Stainless steel version |
|---|---|---|
| Material | Steel 1.0570, A350 LF2 | Stainless steel 1.4404 (316L) |
| Body | 40 x 40 mm, machined | |
| Cover | ■ 80 x 30 mm, forged (PN 40, size 4 ... 9)<br>■ 80 x 30 mm, machined (PN 40)<br>■ 80 x 40 mm, machined (PN 100, PN 160) | ■ 80 x 30 mm, machined (PN 40)<br>■ 80 x 40 mm, machined (PN 100, PN 160) |
| Sight glass | Borosilicate, reflex per DIN 7081 | |
| Max. operating pressure | 40 bar, 100 bar, 160 bar [1] | |
| Temperature range | -10 ... +243 °C (steam)<br>-10 ... +300 °C | -196 ... +243 °C (steam)<br>-196 ... +300 °C |
| Process connections | ■ Male thread 1/2 NPT, 3/4 NPT<br>■ Weld stub 1/2", 3/4"<br>■ Flange DIN/EN: DN 15 ... 50, PN 16 ... 160<br>■ Flange ANSI: 1/2 ... 2", class 150 ... 900 | |
| Centre-to-centre distance M | ■ freely selectable, min. visible length SL + 180 mm (with mounted valve heads model LGV-33, LGV-38, LGV-53, LGV-58)<br>■ freely selectable, min. visible length SL + 80 mm (with mounted valve heads model LGV-51, LGV-52, LGV-56, LGV-57)<br>■ Special version, visible length = M (with mounted valve heads model LGV-51, LGV-52, LGV-56, LGV-57) | |
| Vent | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Drain | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Glass size | 2 ... 11 | |
| Number of segments | 1 ... 5 (more on request) | |
| Suitable valve heads<br>■ Handwheel<br>■ Quick closing lever | ■ Model LGV-33, LGV-51, LGV-52, LGV-53 (PN 250)<br>■ Model LGV-38, LGV-56, LGV-57, LGV-58 (PN 100) | ■ Model LGV-51, LGV-52, LGV-53 (PN 250)<br>■ Model LGV-56, LGV-57, LGV-58 (PN 100) |

1) Depending on the temperature, the material properties must be observed

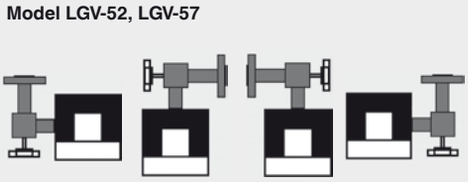
Other materials on request

**Valve arrangement**

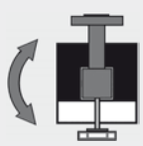
**Model LGV-51, LGV-56**




**Model LGV-52, LGV-57**

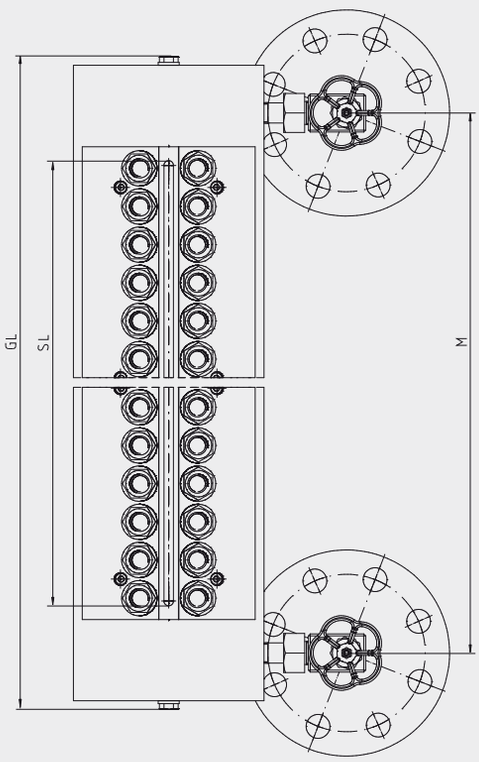



**Model LGV-33, LGV-38, LGV-53, LGV-58**

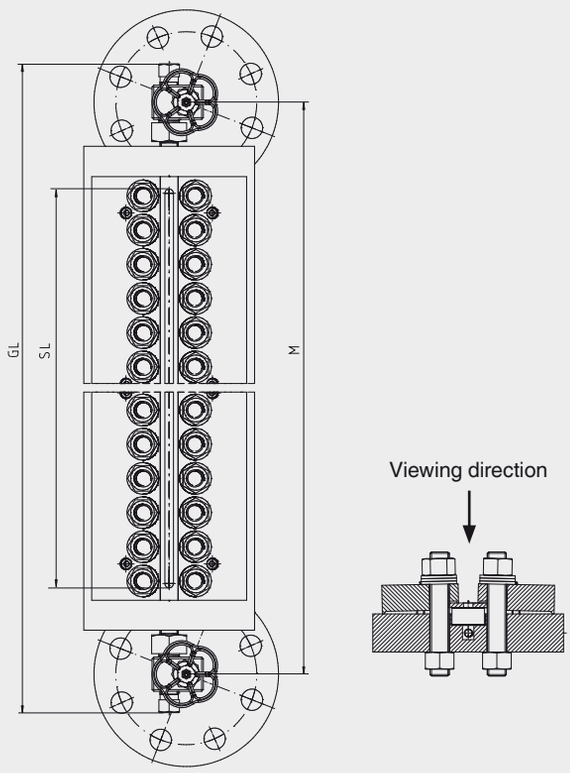


# Sight glass level indicator, reflex, high-pressure version
# Model LGG-RI

### Version with valve head, lateral, model LGV-52




### Version with valve head, top/bottom, model LGV-53



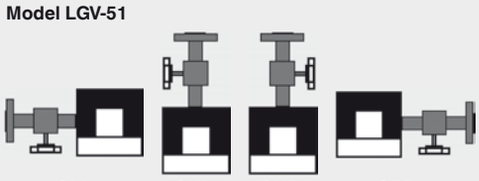

| Specifications | Steel version | Stainless steel version |
|---|---|---|
| Material | Steel 1.5415 (15Mo3) | Stainless steel 1.4404 (316L) |
| Body | 140 x 40 mm, machined | |
| Cover | Pressure frame | |
| Sight glass | Borosilicate, reflex per DIN 7081 | |
| Max. operating pressure | 250 bar [1)] | |
| Temperature range | -10 ... +100 °C | -196 ... +100 °C |
| Process connections | ■ Male thread 1/2 NPT, 3/4 NPT<br>■ Weld stub 1/2", 3/4"<br>■ Flange DIN/EN: DN 15 ... 50, PN 16 ... 250<br>■ Flange ANSI: 1/2 ... 2", class 150 ... 1,500 | |
| Centre-to-centre distance M | ■ freely selectable, min. visible length SL + 180 mm (with mounted valve head model LGV-53)<br>■ freely selectable, visible length SL ≤ M (with mounted valve heads model LGV-51, LGV-52) | |
| Vent | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Drain | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Glass size | 2 ... 9 | |
| Number of segments | 1 ... 5 | |
| Suitable valve heads<br>Handwheel | Model LGV-51, LGV-52, LGV-53 | |

1) Depending on the temperature, the material properties must be observed

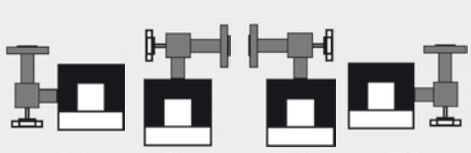
Other materials on request

### Valve arrangement

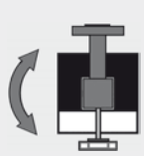
**Model LGV-51**




**Model LGV-52**

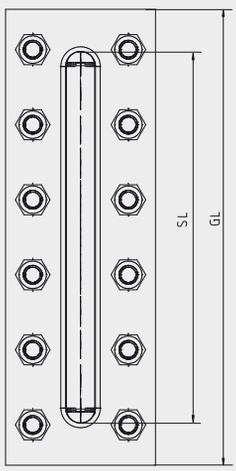



**LGV-53**



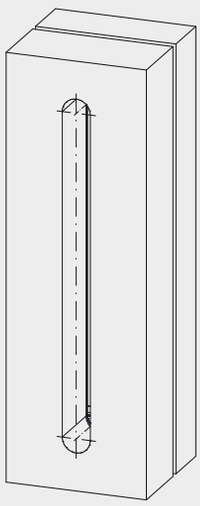
# Sight glass level indicator, reflex, weld-in version
# Model LGG-WR

**Front view**

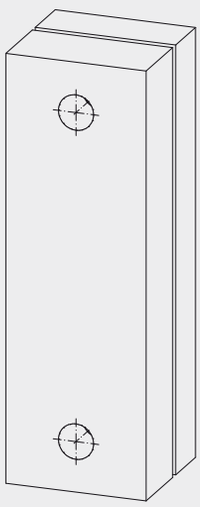



**Rear view**

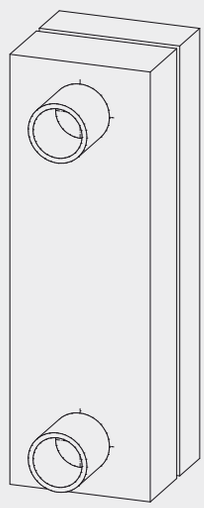
**slotted**



**drilled**



**with weld stub**

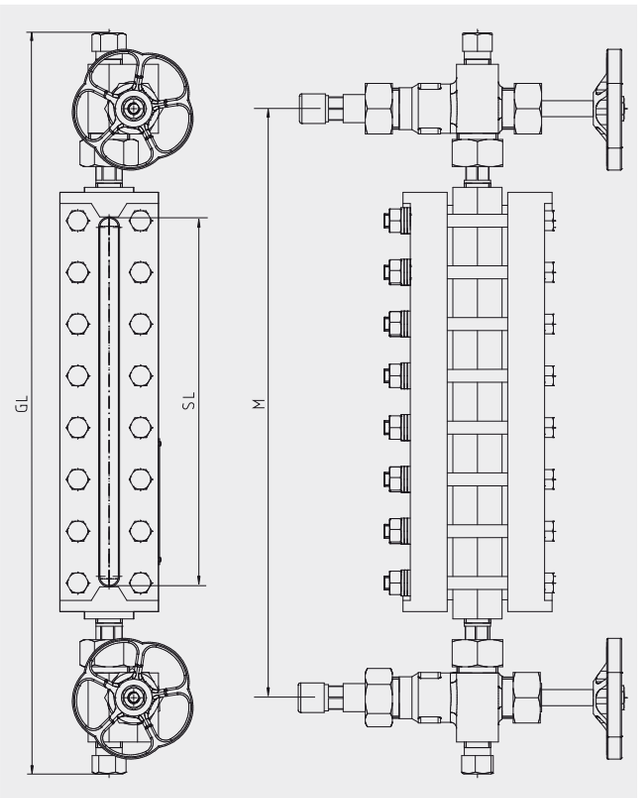


| Specifications | Steel version | Stainless steel version |
|---|---|---|
| Material | Steel 1.0570 | Stainless steel 1.4404 (316L) |
| Body | 40 x 40 mm, machined | |
| Cover | 40 x 40 mm, machined | |
| Sight glass | Borosilicate, reflex per DIN 7081 | |
| Max. operating pressure | 40 bar 1) (display must be included in the pressure test for the vessel) | |
| Temperature range | -10 ... +243 °C (steam)<br>-10 ... +300 °C | -196 ... +243 °C (steam)<br>-196 ... +300 °C |
| Overall length GL | Visible length SL + 43 mm | |
| Glass size | 2 ... 9 (larger on request) | |
| Number of segments | 1 | |

1) Depending on the temperature, the material properties must be observed

Other materials on request

# Sight glass level indicator, transparent, “Carbon-Line” version
# Model LGG-TP

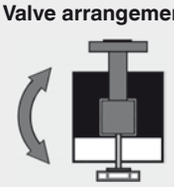



| Specifications | |
|---|---|
| Material | Steel A350 LF2, nitrocarburised |
| Body | 40 x 40 mm, forged |
| Cover | 80 x 34 mm, forged |
| Sight glass | Borosilicate, transparent per DIN 7081 (option: Mica design) |
| Max. operating pressure | 100 bar [1)] |
| Temperature range | -40 ... +243 °C (steam, without mica design)<br>-40 ... +300 °C (steam, with mica design)<br>-40 ... +300 °C |
| Process connections | ■ Male thread 1/2 NPT, 3/4 NPT<br>■ Weld stub 1/2", 3/4"<br>■ Flange DIN/EN DN 15 ... 50, PN 16 ... 100<br>■ Flange ANSI 1/2 ... 2", class 150 ... 600 |
| Centre-to-centre distance M | freely selectable, min. visible length SL + 180 mm |
| Vent | Plug 1/2 NPT (option: Valve) |
| Drain | Plug 1/2 NPT (option: Valve) |
| Glass size | 4 ... 9 |
| Number of segments | 1 ... 5 |
| Suitable valve heads<br>■ Handwheel<br>■ Quick closing lever | <br>■ Model LGV-33 (PN 250)<br>■ Model LGV-38 (PN 100) |

1) Depending on the temperature, the material properties must be observed

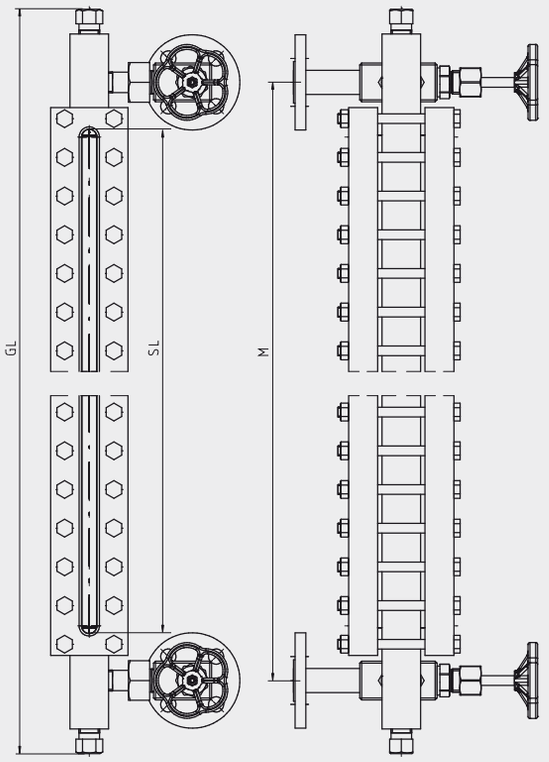
Other materials on request

**Valve arrangement**

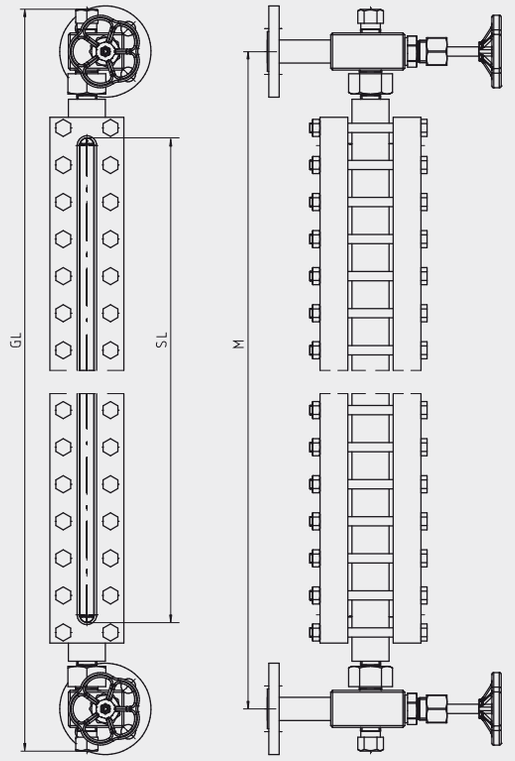


# Sight glass level indicator, transparent, standard version
# Model LGG-TE

### Version with valve head, lateral, model LGV-52




### Version with valve head, top/bottom, model LGV-53



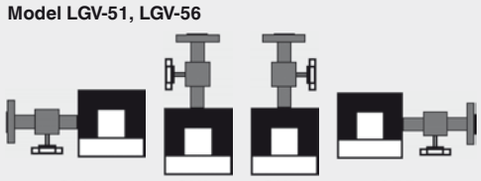

| Specifications | Steel version | Stainless steel version |
|---|---|---|
| Material | Steel 1.0570, A350 LF2 | Stainless steel 1.4404 (316L) |
| Body | 40 x 40 mm, machined | |
| Cover | ■ 80 x 30 mm, forged (PN 40, size 4 ... 9)<br>■ 80 x 30 mm, machined (PN 40)<br>■ 80 x 40 mm, machined (PN 100, PN 160) | ■ 80 x 30 mm, machined (PN 40)<br>■ 80 x 40 mm, machined (PN 100, PN 160) |
| Sight glass | Borosilicate, transparent per DIN 7081 (option: Mica design) | |
| Max. operating pressure | 40 bar, 100 bar, 160 bar [1] | |
| Temperature range | -10 ... +243 °C (steam, without mica design)<br>-10 ... +300 °C (steam, with mica design)<br>-10 ... +300 °C | -196 ... +243 °C (steam, without mica design)<br>-196 ... +300 °C (steam, with mica design)<br>-196 ... +300 °C |
| Process connections | ■ Male thread 1/2 NPT, 3/4 NPT<br>■ Weld stub 1/2", 3/4"<br>■ Flange DIN/EN DN 15 ... 50, PN 16 ... 160<br>■ Flange ANSI 1/2 ... 2", class 150 ... 900 | |
| Centre-to-centre distance M | ■ freely selectable, min. visible length SL + 180 mm (with mounted valve heads model LGV-33, LGV-38, LGV-53, LGV-58)<br>■ freely selectable, min. visible length SL + 80 mm (with mounted valve heads model LGV-51, LGV-52, LGV-56, LGV-57)<br>■ Special version, visible length = M (with mounted valve heads model LGV-51, LGV-52, LGV-56, LGV-57) | |
| Vent | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Drain | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Glass size | 2 ... 11 | |
| Number of segments | 1 ... 5 (more on request) | |
| Suitable valve heads<br>■ Handwheel<br>■ Quick closing lever | Model LGV-33, LGV-51, LGV-52, LGV-53 (PN 250)<br>Model LGV-38, LGV-56, LGV-57, LGV-58 (PN 100) | Model LGV-51, LGV-52, LGV-53 (PN 250)<br>Model LGV-56, LGV-57, LGV-58 (PN 100) |

1) Depending on the temperature, the material properties must be observed

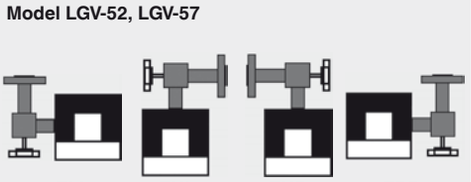
Other materials on request

### Valve arrangement

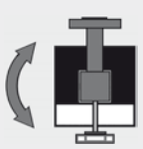
**Model LGV-51, LGV-56**




**Model LGV-52, LGV-57**

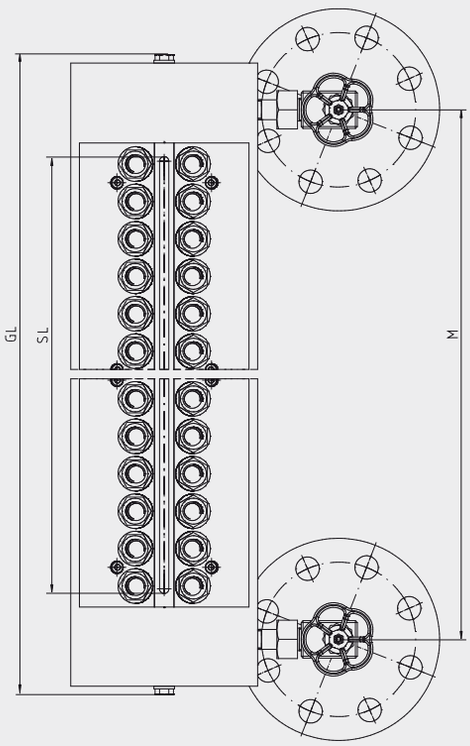



**Model LGV-33, LGV-38, LGV-53, LGV-58**

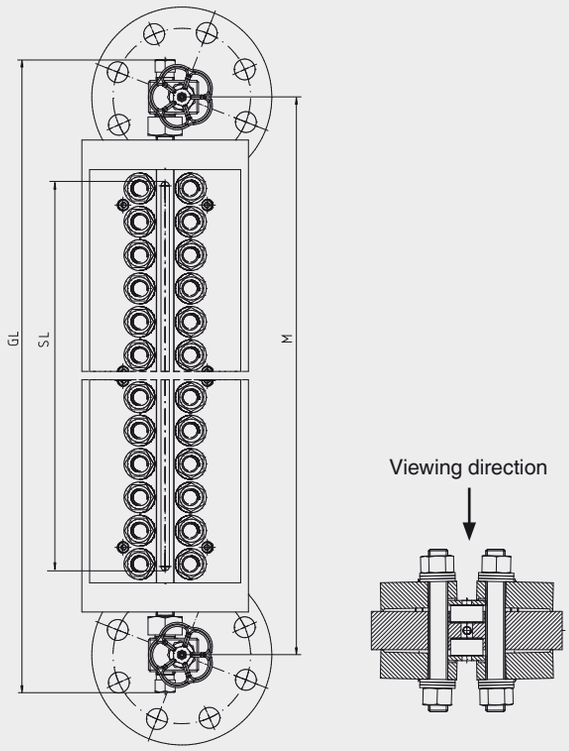


# Sight glass level indicator, transparent, high-pressure version
# Model LGG-TI

### Version with valve head, lateral, model LGV-52




### Version with valve head, top/bottom, model LGV-53



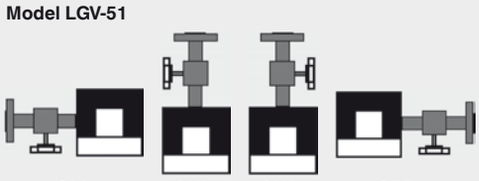

| Specifications | Steel version | Stainless steel version |
|---|---|---|
| Material | Steel 1.5415 (15Mo3) | Stainless steel 1.4404 (316L) |
| Body | 140x 40 mm, machined | |
| Cover | Pressure frame | |
| Sight glass | Borosilicate, transparent per DIN 7081 | |
| Max. operating pressure | 250 bar [1)] | |
| Temperature range | -10 ... +100 °C | -196 ... +100 °C |
| Process connections | ■ Male thread 1/2 NPT, 3/4 NPT<br>■ Weld stub 1/2", 3/4"<br>■ Flange DIN/EN DN 15 ... 50, PN 16 ... 250<br>■ Flange ANSI 1/2 ... 2", class 150 ... 1,500 | |
| Centre-to-centre distance M | ■ freely selectable, min. visible length SL + 180 mm (with mounted valve head model LGV-53)<br>■ freely selectable, visible length SL ≤ M (with mounted valve heads model LGV-51, LGV-52) | |
| Vent | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Drain | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Glass size | 2 ... 9 | |
| Number of segments | 1 ... 5 | |
| Suitable valve heads<br>■ Handwheel | Model LGV-51, LGV-52, LGV-53 | |

1) Depending on the temperature, the material properties must be observed

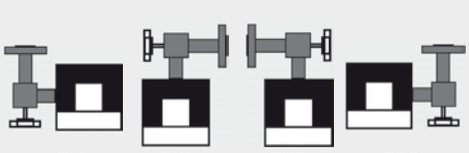
Other materials on request

### Valve arrangement

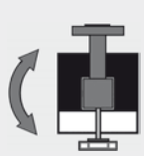
**Model LGV-51**




**Model LGV-52**

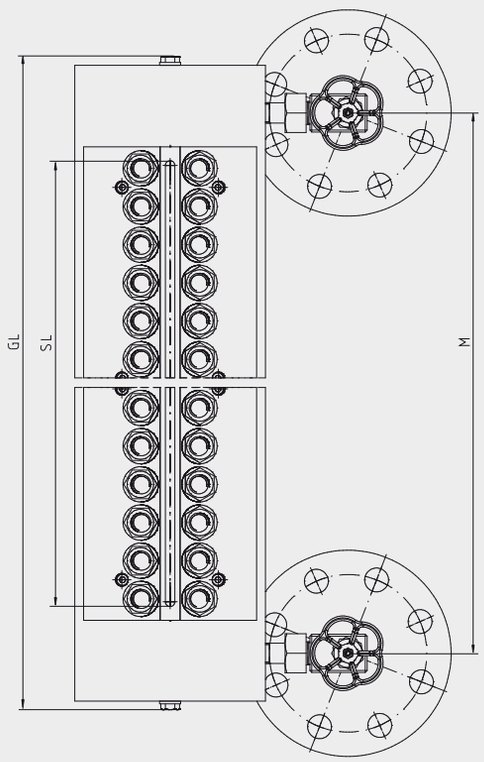



**LGV-53**

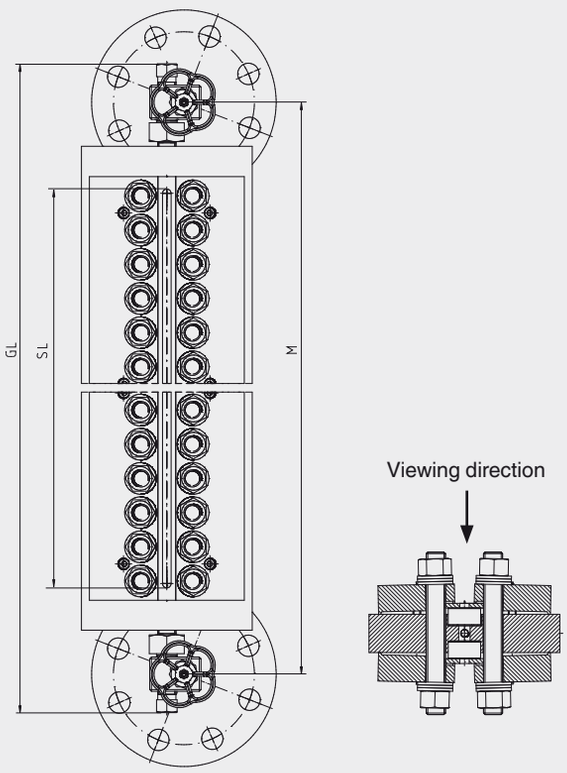


# Sight glass level indicator, transparent, superheated steam version
# Model LGG-T3

**Version with valve head, lateral, model LGV-52**




**Version with valve head, top/bottom, model LGV-53**



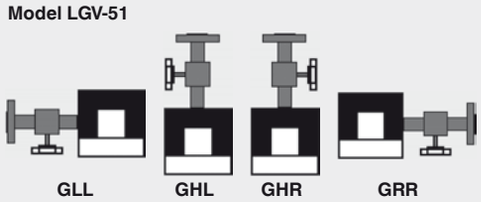

| Specifications | Steel version | Stainless steel version |
|---|---|---|
| Material | Steel 1.5415 (15Mo3) | Stainless steel 1.4404 (316L) |
| Body | 140 x 40 mm, machined | |
| Cover | Pressure frame | |
| Sight glass | Borosilicate, transparent per DIN 7081 (with mica design) | |
| Max. operating pressure | 160 bar [1)] | |
| Temperature range | -10 ... +300 °C | -196 ... +300 °C |
| Process connections | ■ Male thread G 1/2, G 3/4, 1/2 NPT, 3/4 NPT<br>■ Weld stub 1/2", 3/4"<br>■ Flange DIN/EN DN 15 ... 50, PN 16 ... 100<br>■ Flange ANSI 1/2 ... 2", class 150 ... 600 | |
| Centre-to-centre distance M | ■ freely selectable, min. visible length SL + 180 mm (with mounted valve head model LGV-53)<br>■ freely selectable, visible length SL ≤ M (with mounted valve heads model LGV-51, LGV-52) | |
| Vent | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Drain | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) | |
| Glass size | 2 ... 9 | |
| Number of segments | 1 ... 5 | |
| Suitable valve heads<br>Handwheel | Model LGV-51, LGV-52, LGV-53 | |

Other materials on request

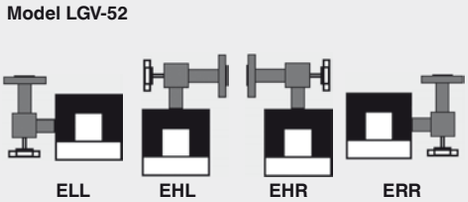
1) Depending on the temperature, the material properties must be observed

**Valve arrangement**

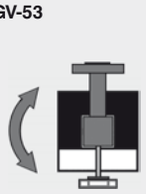
**Model LGV-51**




**Model LGV-52**

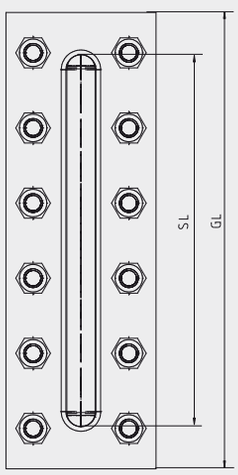



**LGV-53**



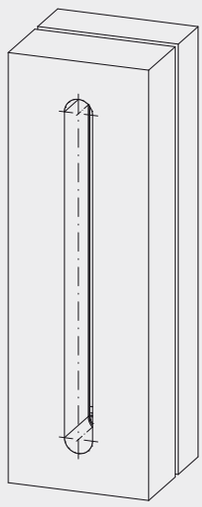
# Sight glass level indicator, transparent, weld-in version
# Model LGG-WT

**Front view**

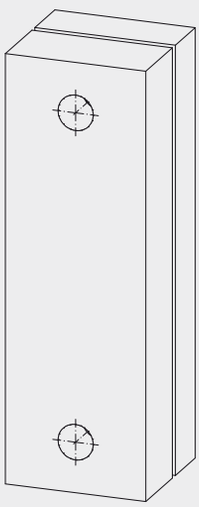



**Rear view**

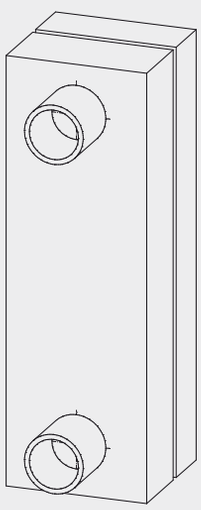
**slotted**



**drilled**



**with weld stub**



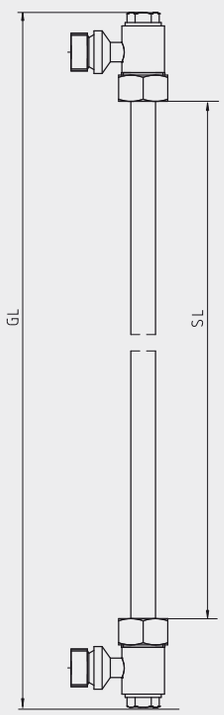
| Specifications | Steel version | Stainless steel version |
|---|---|---|
| Material | Steel 1.0570 | Stainless steel 1.4404 (316L) |
| Body | 40 x 40 mm, machined | |
| Cover | 40 x 40 mm, machined | |
| Sight glass | Borosilicate, transparent per DIN 7081 (option: Mica design) | |
| Max. operating pressure | 40 bar [1] (display must be included in the pressure test for the vessel) | |
| Temperature range | -10 ... +243 °C (steam, without mica design)<br>-10 ... +300 °C (steam, with mica design)<br>-10 ... +300 °C | -196 ... +243 °C (steam, without mica design)<br>-196 ... +300 °C (steam, with mica design)<br>-196 ... +300 °C |
| Overall length GL | Visible length SL + 43 mm | |
| Glass size | 2 ... 9 (larger on request) | |
| Number of segments | 1 | |

1) Depending on the temperature, the material properties must be observed

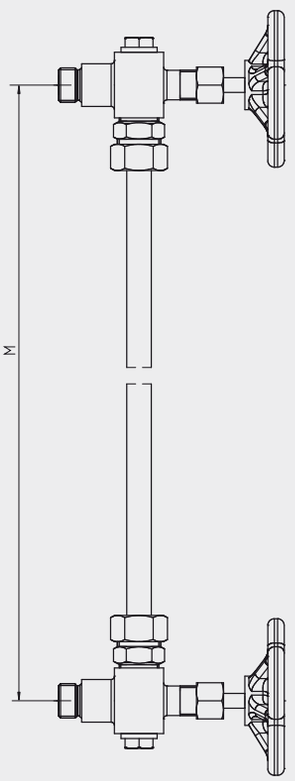
Other materials on request

# Sight glass level indicator, glass tube, standard
# Model LGG-GA

**Version without valve (only stainless steel)**




**Version with valve (brass or stainless steel)**

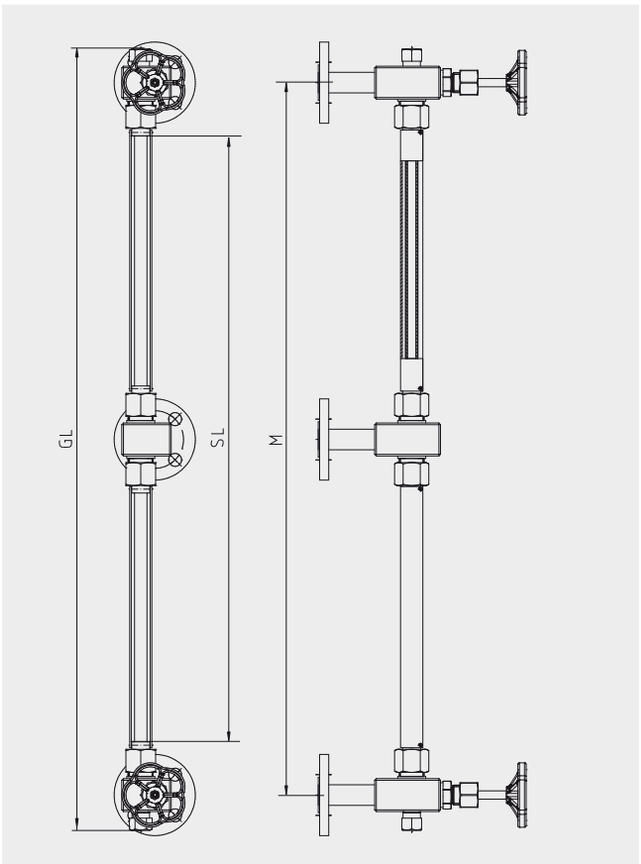



| Specifications | Version without valve | Version with valve |
|---|---|---|
| Material | Stainless steel 1.4571 | Stainless steel 1.4571 or brass 2.0401 |
| Sight glass | Glass tube, borosilicate, diameter 13 mm | |
| Max. operating pressure | 10 bar [1)] | |
| Temperature range | -10 ... +80 °C (with plexi protective cover)<br>-10 ... +150 °C (with stainless steel protection) | -10 ... +200 °C |
| Process connections | ■ Male thread G 1/2<br>■ Flange DIN/EN DN 15 ... 25, PN 10 | |
| Centre-to-centre distance M | 110 ... 1,200 mm, visible length SL + 70 mm | 150 ... 1,200 mm, visible length SL + 110 mm |
| Vent | Plug G 3/8 | Plug G 1/2 |
| Drain | Plug G 3/8 | Plug G 1/2 |
| Glass size | Centre-to-centre distance M - 20 mm | Centre-to-centre distance M - 65 mm |
| Number of segments | 1 | |
| Suitable valve heads<br>Glass tube fitting | Model LGV-04 | Model LGV-05 |

1) Depending on the temperature, the material properties must be observed

Other materials on request

# Sight glass level indicator, glass tube, for large lengths with interposing glass-holder Model LGG-GB

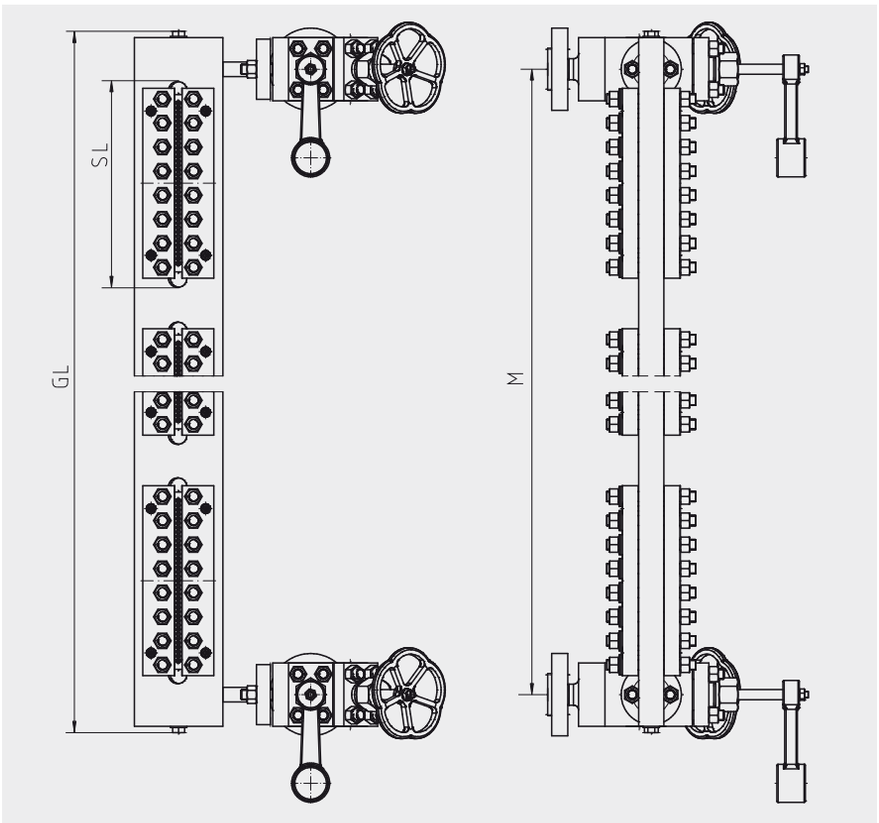



| Specifications | |
|---|---|
| Material | Stainless steel 1.4404 (316L) |
| Sight glass | Glass tube, borosilicate, diameter 16 mm |
| Max. operating pressure | 25 bar 1) |
| Temperature range | -10 ... +200 °C |
| Process connections | ■ Male thread G 1/2<br>■ Flange DIN/EN DN 15 ... 25, PN 25 |
| Centre-to-centre distance M | 150 ... 4,500 mm, visible length SL + 130 mm |
| Vent | Plug |
| Drain | Plug |
| Glass size | 150 ... 4,500 mm<br>(use interposing glass-holder from 1,500 mm) |
| Number of segments | 1 ... 3 |
| Suitable valve heads<br>Handwheel<br>Quick closing lever | <br>Model LGV-01<br>Model LGV-03 |

1) Depending on the temperature, the material properties must be observed

Other materials on request

# Sight glass level indicator, refraction, highest-pressure version
# Model LGG-M




| Specifications | |
|---|---|
| Material | Steel 1.5415 (15Mo3) |
| Body | 140 x 40 mm, machined |
| Cover | Pressure frame |
| Sight glass | Mica package (sight glass distance 120 mm) |
| Max. operating pressure | 250 bar [1)] |
| Temperature range | -10 ... +374 °C |
| Process connections | ■ Flange DIN/EN DN 15 ... 50, PN 16 ... 250<br>■ Flange ANSI 1/2 ... 2", class 150 ... 2,500 |
| Centre-to-centre distance M | freely selectable, min. visible length SL + 80 mm |
| Vent | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) |
| Drain | Plug G 3/8 (option: Weld stub, flange, valve or ball cock) |
| Glass size | 2 ... 11 |
| Number of segments | 1 ... 9 |
| Suitable valve heads<br>■ Handwheel and quick closing lever | <br>Model LGV-19 (PN 250)<br>Model LGV-18 (PN 160) |

1) Depending on the temperature, the material properties must be observed

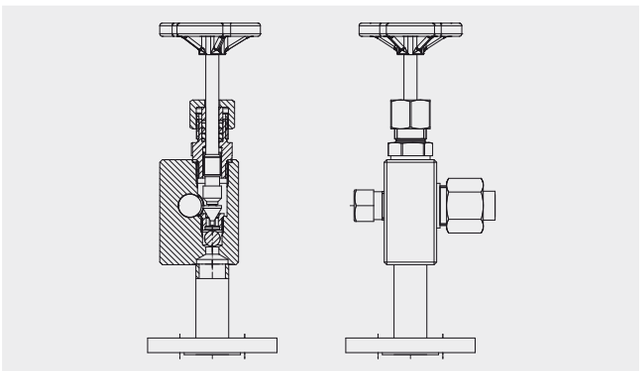
Other materials on request

**Valve arrangement**
**Model LGV-18, LGV-19**

**ELL** **ERR**

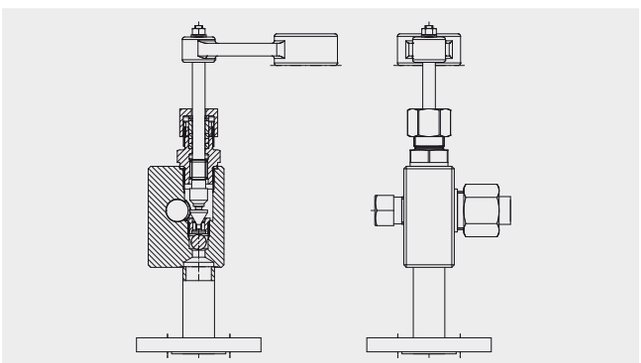
# Valve heads

## Model LGV-01
## Glass tube fitting with handwheel



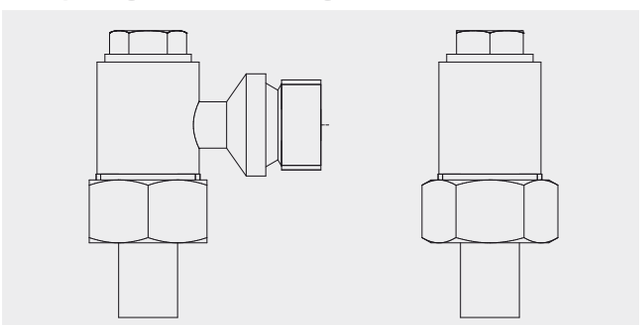
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Stainless steel |
| ■ Head piece | Stainless steel |
| Construction | machined |
| Pressure range | PN 25 |
| Operation | Handwheel |
| Mount | top/bottom |
| Connection to body | Glass tube 16 |
| Rotatable | yes |
| Thru-way | offset |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | yes |
| Ball-check valve | yes |

## Model LGV-03
## Glass tube fitting with quick closing lever



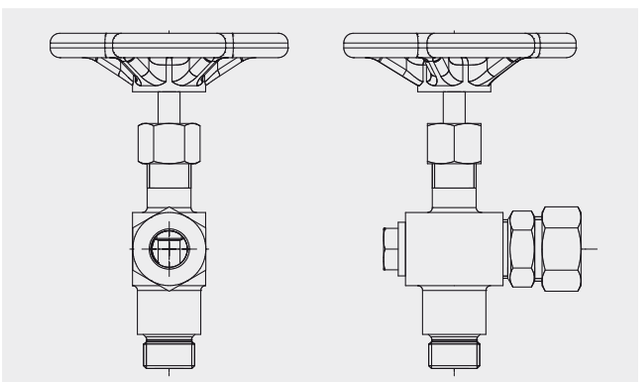
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Stainless steel |
| ■ Head piece | Stainless steel |
| Construction | machined |
| Pressure range | PN 25 |
| Operation | Quick closing lever |
| Mount | top/bottom |
| Connection to body | Glass tube 16 |
| Rotatable | yes |
| Thru-way | offset |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | no |
| Ball-check valve | yes |

## Model LGV-04
## Compact glass tube fitting without valve



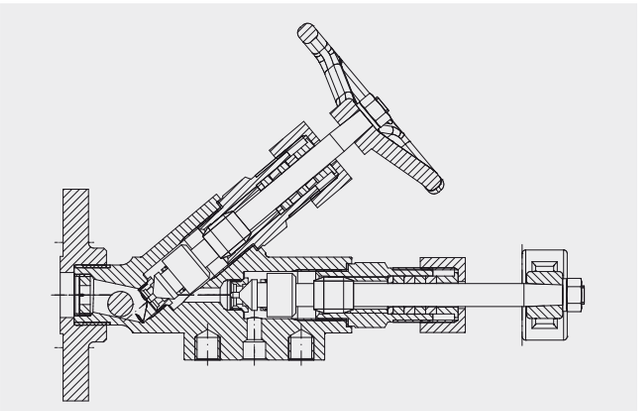
| Specifications | |
|---|---|
| Body material | Stainless steel 1.4571 |
| Construction | cast |
| Pressure range | PN 25 |
| Operation | without |
| Mount | top/bottom |
| Connection to body | Glass tube 13.5 |
| Rotatable | yes |
| Thru-way | angled |
| Seat position | without |
| Valve stem thread | without |
| Drain | yes, G 3/8 |
| Ball-check valve | no |

## Model LGV-05
## Compact glass tube fitting with handwheel



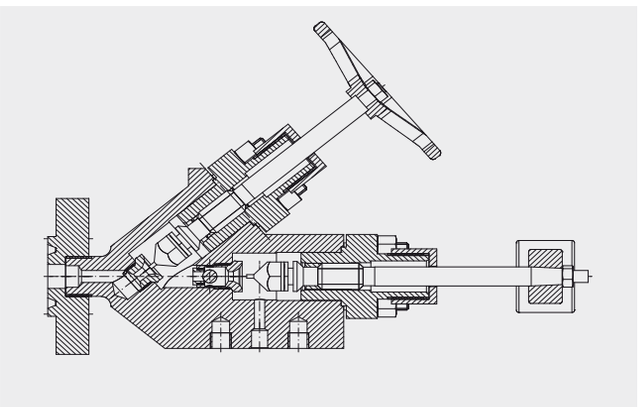
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Brass 2.0401 or stainless steel 1.4571 |
| ■ Head piece | Stainless steel |
| Construction | machined |
| Pressure range | PN 10 |
| Operation | Handwheel |
| Mount | top/bottom |
| Connection to body | Glass tube 13.5 |
| Rotatable | yes |
| Thru-way | angled |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | yes, G 1/4 |
| Ball-check valve | no |

## Model LGV-18, double valve



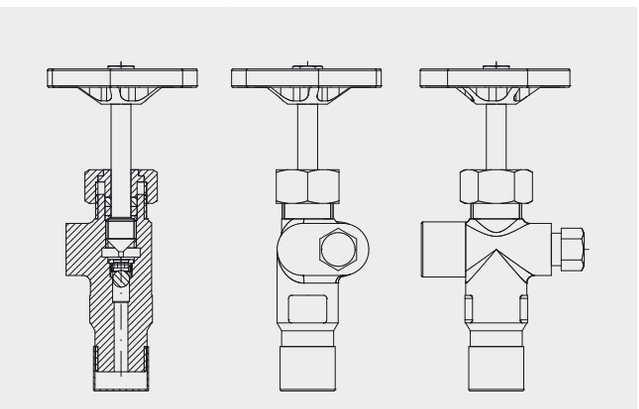
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Steel 15Mo3 |
| ■ Head piece | Stainless steel |
| Construction | forged |
| Pressure range | PN 160 |
| Operation | Double handwheel / lever |
| Mount | lateral |
| Connection to body | flanged |
| Rotatable | no |
| Thru-way | angled |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | no |
| Ball-check valve | yes |

## Model LGV-19, double valve high pressure



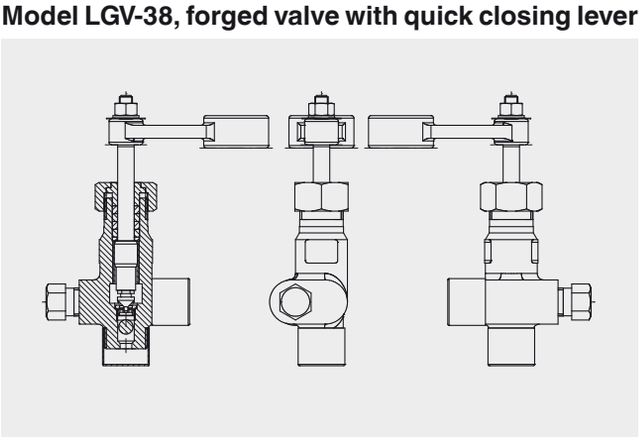
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Steel 15Mo3 |
| ■ Head piece | Stainless steel |
| Construction | machined |
| Pressure range | PN 250 |
| Operation | Double handwheel / lever |
| Mount | lateral |
| Connection to body | flanged |
| Rotatable | no |
| Thru-way | angled |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | no |
| Ball-check valve | yes |

## Model LGV-33, forged valve with handwheel



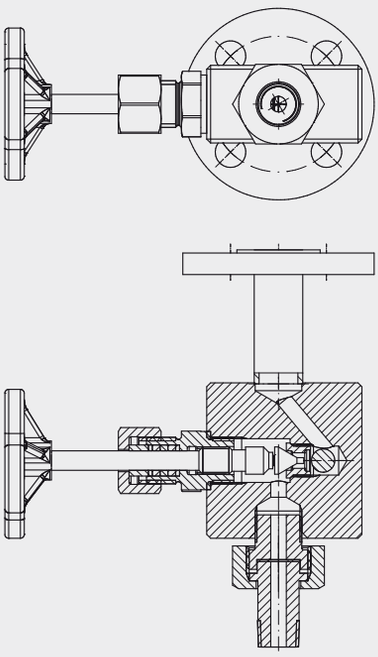
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Steel A350 LF2 |
| ■ Head piece | Stainless steel |
| Construction | forged |
| Pressure range | PN 250 |
| Operation | Handwheel |
| Mount | top/bottom |
| Connection to body | Screwed nipple |
| Rotatable | yes |
| Thru-way | offset |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | yes, 1/2 NPT |
| Ball-check valve | yes |

## Model LGV-38, forged valve with quick closing lever



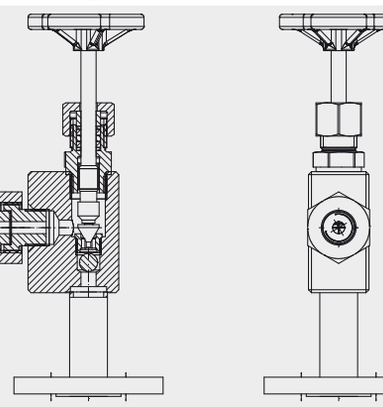
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Steel A350 LF2 |
| ■ Head piece | Stainless steel |
| Construction | forged |
| Pressure range | PN 250 |
| Operation | Quick closing lever |
| Mount | top/bottom |
| Connection to body | Screwed nipple |
| Rotatable | yes |
| Thru-way | offset |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | yes, 1/2 NPT |
| Ball-check valve | yes |

## Model LGV-51, straight valve with handwheel



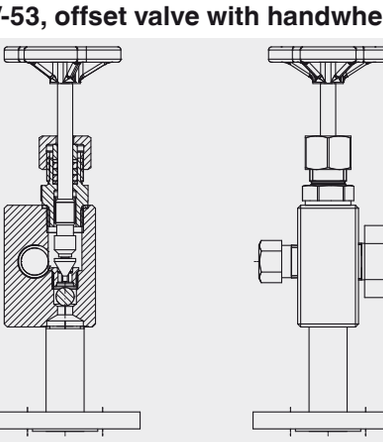
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Steel, stainless steel |
| ■ Head piece | Stainless steel |
| Construction | machined |
| Pressure range | PN 250 |
| Operation | Handwheel |
| Mount | lateral/back |
| Connection to body | Screwed nipple |
| Rotatable | no |
| Thru-way | straight |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | no |
| Ball-check valve | yes |

## Model LGV-52, angled valve with handwheel



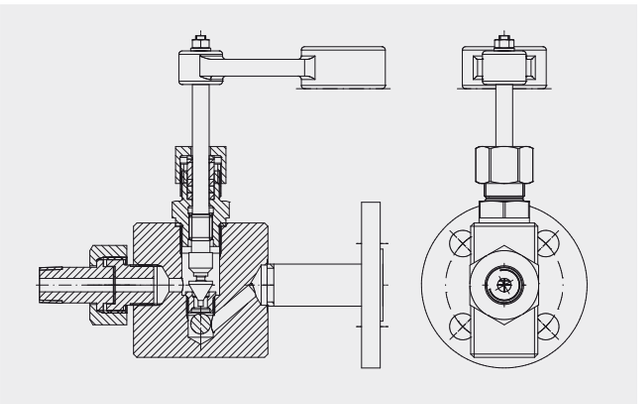
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Steel, stainless steel |
| ■ Head piece | Stainless steel |
| Construction | machined |
| Pressure range | PN 250 |
| Operation | Handwheel |
| Mount | lateral |
| Connection to body | Screwed nipple |
| Rotatable | no |
| Thru-way | angled |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | no |
| Ball-check valve | yes |

## Model LGV-53, offset valve with handwheel



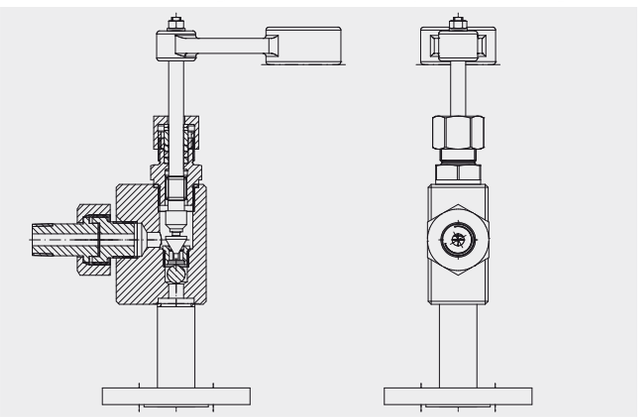
| Specifications | |
|---|---|
| Materials | |
| ■ Body | Steel, stainless steel |
| ■ Head piece | Stainless steel |
| Construction | machined |
| Pressure range | PN 250 |
| Operation | Handwheel |
| Mount | top/bottom |
| Connection to body | Screwed nipple |
| Rotatable | yes |
| Thru-way | offset |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | yes |
| Ball-check valve | yes |

## Model LGV-56, straight valve with quick closing lever



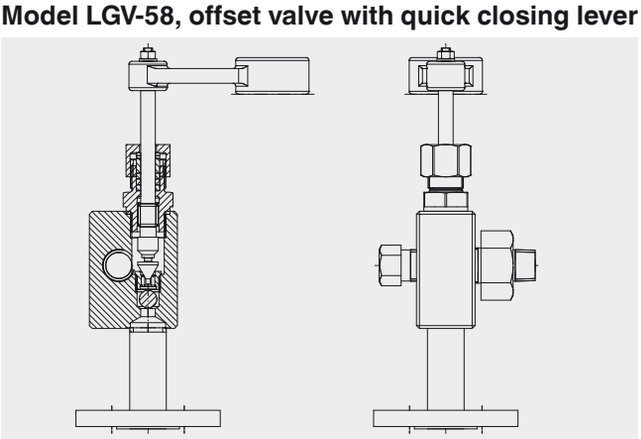
| Specifications | |
|---|---|
| Materials<br>■ Body<br>■ Head piece | <br>Steel, stainless steel<br>Stainless steel |
| Construction | machined |
| Pressure range | PN 100 |
| Operation | Quick closing lever |
| Mount | lateral/back |
| Connection to body | Screwed nipple |
| Rotatable | no |
| Thru-way | straight |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | no |
| Ball-check valve | yes |

## Model LGV-57 Angled valve with quick closing lever



| Specifications | |
|---|---|
| Materials<br>■ Body<br>■ Head piece | <br>Steel, stainless steel<br>Stainless steel |
| Construction | machined |
| Pressure range | PN 100 |
| Operation | Quick closing lever |
| Mount | lateral |
| Connection to body | Screwed nipple |
| Rotatable | no |
| Thru-way | angled |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | no |
| Ball-check valve | yes |

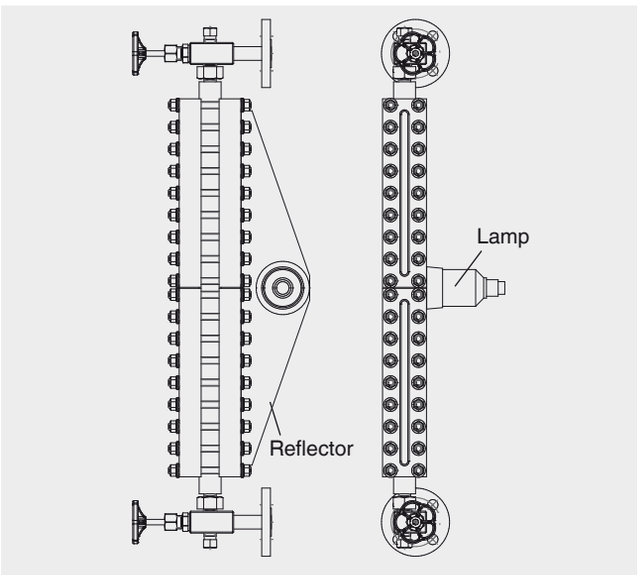
## Model LGV-58, offset valve with quick closing lever



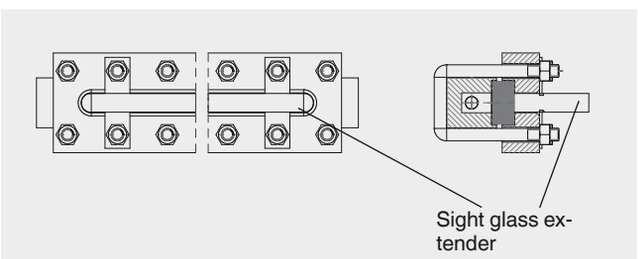
| Specifications | |
|---|---|
| Materials<br>■ Body<br>■ Head piece | <br>Steel, stainless steel<br>Stainless steel |
| Construction | machined |
| Pressure range | PN 100 |
| Operation | Quick closing lever |
| Mount | top/bottom |
| Connection to body | Screwed nipple |
| Rotatable | yes |
| Thru-way | offset |
| Seat position | inline |
| Valve stem thread | internal |
| Drain | yes |
| Ball-check valve | yes |

# Accessories

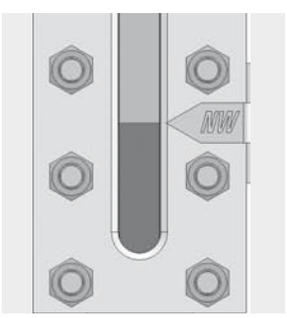
**Illumination**
The illumination is designed for backlighting of viewing slots in accordance with DIN 7081 and of viewing slots of mica indicators. Through the variation in the segment length and number, and also in the lighting strength, the illumination can be matched to the application. Versions for hazardous areas are also available.




**Sight glass extender**
Using the acrylic glass extender, the sight glass can be insulated from low temperatures. The window is thus maintained through the insulation.




**Indicator for low-water level**
This low-water mark serves as a warning indicator for the operator. Form, size and lettering vary depending on the design of the water-level indicator.
The position of the low-water mark is always specified from the centre of the lower process connection.



## Spare parts

| Name | Description | Order number |
|---|---|---|
| **Glass set Rx** | ■ **1x sight glass reflex borosilicate size x**<br>■ **1x flat gasket size x**<br>■ **1x cushion size x** | |
| Glass set R2 | Size 2 (140 x 34 x 17 mm) | 119442 |
| Glass set R3 | Size 3 (165 x 34 x 17 mm) | 119444 |
| Glass set R4 | Size 4 (190 x 34 x 17 mm) | 119446 |
| Glass set R5 | Size 5 (220 x 34 x 17 mm) | 119447 |
| Glass set R6 | Size 6 (250 x 34 x 17 mm) | 119448 |
| Glass set R7 | Size 7 (280 x 34 x 17 mm) | 119450 |
| Glass set R8 | Size 8 (320 x 34 x 17 mm) | 119451 |
| Glass set R9 | Size 9 (340 x 34 x 17 mm) | 119452 |
| Glass set R10 | Size 10 (370 x 34 x 17 mm) | 119453 |
| Glass set R11 | Size 11 (400 x 34 x 17 mm) | 119454 |
| **Glass set Tx** | ■ **1x sight glass transparent borosilicate size x**<br>■ **1x flat gasket size x**<br>■ **1x cushion size x** | |
| Glass set T2 | Size 2 (140 x 34 x 17 mm) | 119477 |
| Glass set T3 | Size 3 (165 x 34 x 17 mm) | 119476 |
| Glass set T4 | Size 4 (190 x 34 x 17 mm) | 119475 |
| Glass set T5 | Size 5 (220 x 34 x 17 mm) | 119473 |
| Glass set T6 | Size 6 (250 x 34 x 17 mm) | 119472 |
| Glass set T7 | Size 7 (280 x 34 x 17 mm) | 119467 |
| Glass set T8 | Size 8 (320 x 34 x 17 mm) | 119465 |
| Glass set T9 | Size 9 (340 x 34 x 17 mm) | 119462 |
| Glass set T10 | Size 10 (370 x 34 x 17 mm) | 119456 |
| Glass set T11 | Size 11 (400 x 34 x 17 mm) | 119455 |
| **Glass protection** | | |
| Glass protection M2 | 1x mica shield size 2 | 501577 |
| Glass protection M3 | 1x mica shield size 3 | 501578 |
| Glass protection M4 | 1x mica shield size 4 | 501579 |
| Glass protection M5 | 1x mica shield size 5 | 501580 |
| Glass protection M6 | 1x mica shield size 6 | 501581 |
| Glass protection M7 | 1x mica shield size 7 | 501582 |
| Glass protection M8 | 1x mica shield size 8 | 501583 |
| Glass protection M9 | 1x mica shield size 9 | 501585 |
| Glass protection M10 | 1x mica shield size 10 | 501587 |
| Glass protection M11 | 1x mica shield size 11 | 501588 |
| **Head piece** | | |
| Head piece KS1 | 1x head piece for LGG-E | 503765 |
| Head piece KS2 | 1x head piece for valve model LGV-01, LGV-51, LGV-52, LGV-53 | 503923 |
| Head piece KS3 | 1x head piece for valve model LGV-03, LGV-56, LGV-57, LGV-58 | 503924 |
| Head piece KS4 | 1x head piece for valve model LGV-18 (handwheel) | 503619 |
| Head piece KS5 | 1x head piece for valve model LGV-18 (lever, ball) | 503620 |
| Head piece KS6 | 1x head piece for valve model LGV-19 (handwheel) | 503621 |
| Head piece KS7 | 1x head piece for valve model LGV-19 (lever, ball) | 503622 |

**Ordering information**
To order the described product the order number (if available) is sufficient.

Alternatively:
Model / Version / Process connection / Centre-to-centre distance / Valve type / Valve head arrangement / Process specifications (operating temperature and pressure) / Options


# KSR – Your Partner for the Pharmaceutical Industry and Biotechnology

In view of the higher demands on quality and product safety from pharmaceutical production, sterile process engineering plays a significant part in the cost-effectiveness and safety of the production processes, in both upstream and downstream areas. Even in the further course of the process chain, up to cleaning and sterilisation, contamination-free processing is a crucial quality factor.

From measuring instruments, this demands a combination of the most up-to-date hygienic design and, at the same time, a high measuring accuracy.
For toxic, bioactive substances or very sensitive substances, special instrumentation options are available in order to integrate the measuring instruments into the plant without elastomers.

# Optoelectronic level switch
# Model OLS-S, standard version
# Model OLS-H, high-pressure version

KSR data sheet OLS-S

## Applications

- Chemical, petrochemical, natural gas, offshore industries
- Shipbuilding, machine building, refrigerator units
- Power generating equipment, power plants
- Process and drinking water treatment
- Wastewater and environmental engineering

## Special features

- Temperature ranges from -269 … +400 °C
- Versions for pressure ranges from vacuum to 500 bar
- Special versions: High pressure, interface measurement
- Explosion-protected versions
- Signal processing is made using a separate model OSA-S switching amplifier

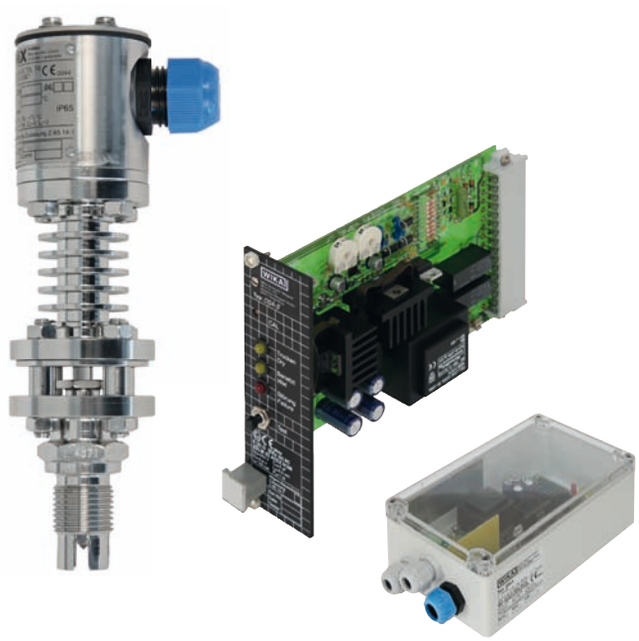


**Fig. left: Optoelectronic level switch, model OLS-H**
**Fig. centre: Switching amplifier, model OSA-S, 19" plug-in card**
**Fig. right: Switching amplifier, model OSA-S, polycarbonate add-on case**

## Description

The model OLS optoelectronic level switches are used for the detection of limit levels in liquids. This is widely independent of physical characteristics such as refractive index, colour, density, dielectric constant and conductivity. Measurement is also done in small volumes.

The switches consist of an infrared LED and a phototransistor. The light of the LED is directed into a prism. So long as the sensor tip of the prism is in the gas phase, the light is reflected within the prism to the receiver. When the liquid in the vessel rises and wets approximately 2/3 of the glass tip, the infrared lightbeam into the liquid is interrupted and only a small portion reaches the receiver. This difference is evaluated by the electronics and triggers a switching operation.

The model OLS optoelectronic level switch is also available as an explosion-protected version (zone 0 and zone 1). Together with the model OSA-S switching amplifier the sensor can be used as overflow control. The instruments are very robust and designed for rough operating conditions.

The cable to the switching amplifier does not need any shield, enabling easy and economic cabling. The model OSA-S switching amplifier is operated with an intrinsically safe signal circuit. For the 19" plug-in card version, all operating elements, except for the switch for changing the alarm direction and the potentiometers for the time delay, can be accessed from the front. If incorporated in an add-on case, a transparent cover allows seeing the switching statuses.

## Model overview

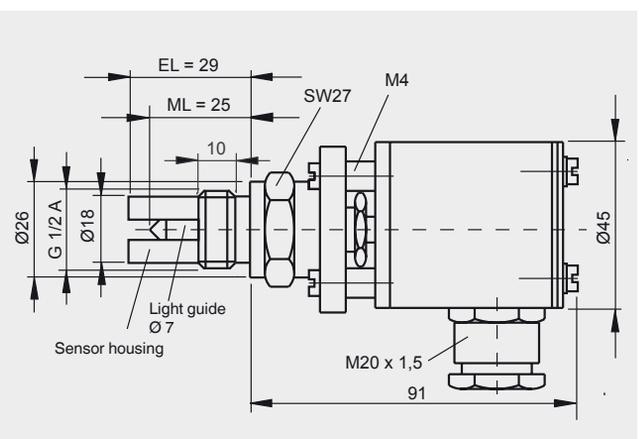
| Model | Description | Approval without | Ex i | Ex i + overflow control | without Ex i + overflow control | Max. pressure in bar | Medium temperature in °C | Ambient temperature in °C |
|---|---|---|---|---|---|---|---|---|
| **OLS-S** | Optoelectronic level switch, standard version | x | x | x | x | 250 | -269 ... +400 | -65 ... +95 |
| **OLS-H** | Optoelectronic level switch, high-pressure version | x | x | x | x | 500 | -269 ... +400 | -65 ... +95 |
| **OSA-S** | Switching amplifier for models OLS-S, OLS-H | x | x | x | x | - | - | -40 ... +60 |

## Approvals

| Explosion protection | Ignition protection type | Model | Zone | Approval number |
|---|---|---|---|---|
| ATEX | Ex i | OLS-S, OLS-H | Zone 0/1, gas | II 1/2 G Ex ib IIC T5, T6 ZELM 06 ATEX 0299 |
| | Ex i | OSA-S | Zone 1, gas | II (2) G [Ex ib] IIC, ZELM 06 ATEX 0300 |

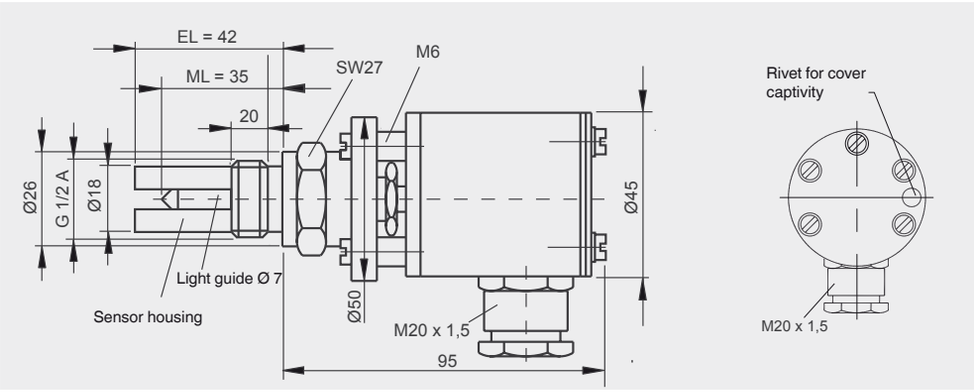
| Type approval | Model | Approval number |
|---|---|---|
| GOST-R | OLS-S, OLS-H, OSA-S | 0959333 |
| Overflow control per WHG §19 | OLS-S, OLS-H, OSA-S | Z-65.14-485 |
| SIL rating per IEC 61508 | OLS-S, OLS-H, OSA-S | SIL 1 in a combination of both instruments |

## Optoelectronic level switch, standard version, model OLS-S




| Specifications | |
|---|---|
| Switch point ML | Standard: 25 mm, max. 960 mm |
| Insertion length EL | Standard: 29 mm (switch point + 4 mm) |
| Medium temperature | -65 ... +250 °C |
| Ambient temperature | -65 ... +95 °C |
| Pressure range | 0 ... 250 bar |
| Measurement type | Level measurement with glass tip shape V, option: Interface layer |
| Glass protection | Guard finger |
| Process connection | G 1/2", NPT 1/2", option: Flange |
| Material | Stainless steel 1.4571<br>Option: Hastelloy, other materials on request |
| Light guide | Clad core glass<br>Option: quartz (ML: max. 200 mm)<br>sapphire (ML: max. 60 mm) |
| Mounting position | As required |
| Measuring accuracy | ±0.5 mm |
| Repeat accuracy | ±0.1 mm |
| Light source | IR light 930 nm |
| Ambient light | Max. 100 Lux |
| Cable gland | M20 x 1.5; Ex: blue |
| Terminal connection | 3 x 2.5 $mm^2$ |
| Ingress protection | IP 65 |
| Approval | Ex i (previous model designation KSR-OPTO.06XX) |

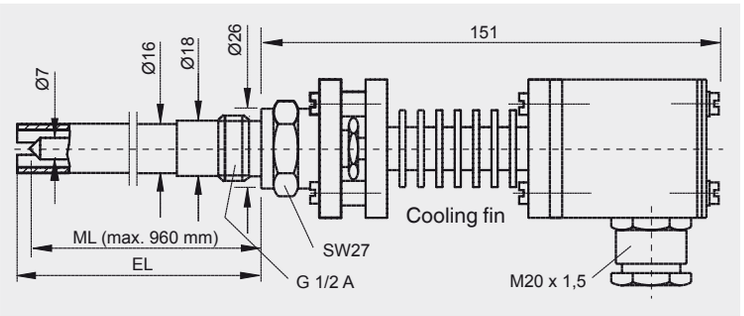
# Optoelectronic level switch, high-pressure version, model OLS-H




| Specifications | |
|---|---|
| Switch point ML | Standard: 35 mm, max. 960 mm |
| Insertion length EL | Standard: 42 mm (switch point + 7 mm) |
| Medium temperature | -65 ... +250 °C |
| Ambient temperature | -65 ... +95 °C |
| Pressure range | 0 ... 500 bar |
| Measurement type | Level measurement with glass tip shape V, option: Interface layer |
| Glass protection | Guard finger |
| Process connection | G 1/2", NPT 1/2", option: Flange |
| Material | Stainless steel 1.4571<br>Option: Hastelloy, other materials on request |
| Light guide | Clad core glass<br>Option: quartz (ML: max. 200 mm)<br>sapphire (ML: max. 60 mm) |
| Mounting position | As required |
| Measuring accuracy | ±0.5 mm |
| Repeat accuracy | ±0.1 mm |
| Light source | IR light 930 nm |
| Ambient light | Max. 100 Lux |
| Cable gland | M20 x 1.5; Ex: blue |
| Terminal connection | 3 x 2.5 $mm^2$ |
| Ingress protection | IP 65 |
| Approval | Ex i (previous model designation KSR-OPTO.06XX) |

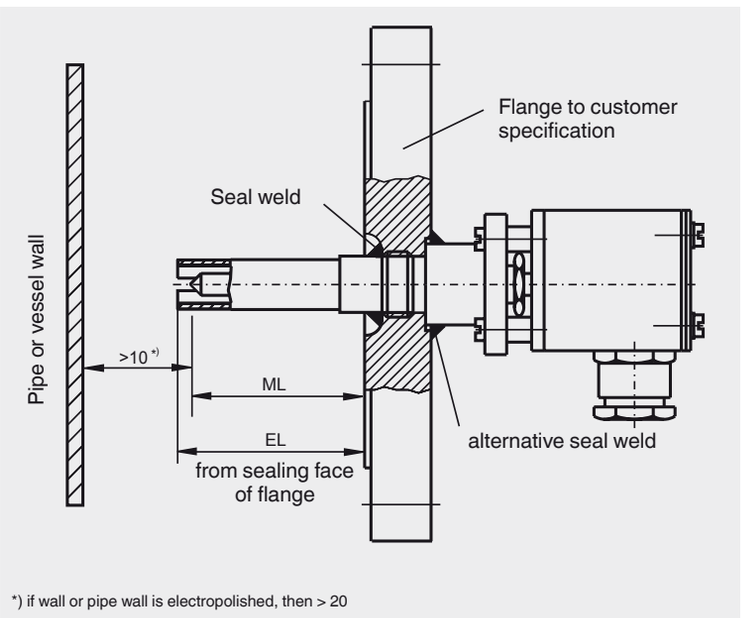
# Options for models OLS-S and OLS-H

### Cooling fin for high- and low-temperature version




| Specifications | |
|---|---|
| Temperature range | -269 ... +400 °C |
| Ambient temperature | -65 ... +95 °C |

### Flanged version

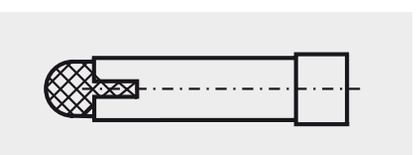



*) if wall or pipe wall is electropolished, then > 20

| Process connection | Nominal width | Pressure rating | Sealing face |
|---|---|---|---|
| Flange EN 1092-1 | DN 20 ... DN 50 | PN 16 ... PN 400 | B1, B2, C, D, E |
| Flange DIN | DN 20 ... DN 50 | PN 16 ... PN 400 | C, F, N |
| Flange ANSI | 1/2" ... 2" | Class 150 ... Class 2500 | RF, RTJ, FF |

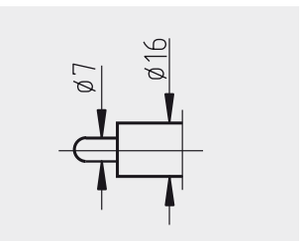
### Version with sieve

Protection from gas bubble formation at the glass tip

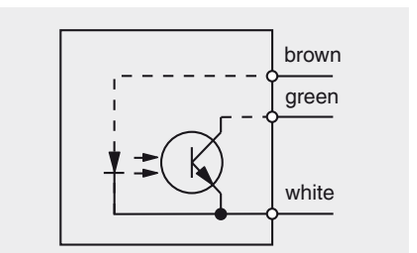


### Version for interface layer

Open glass tip, shape U



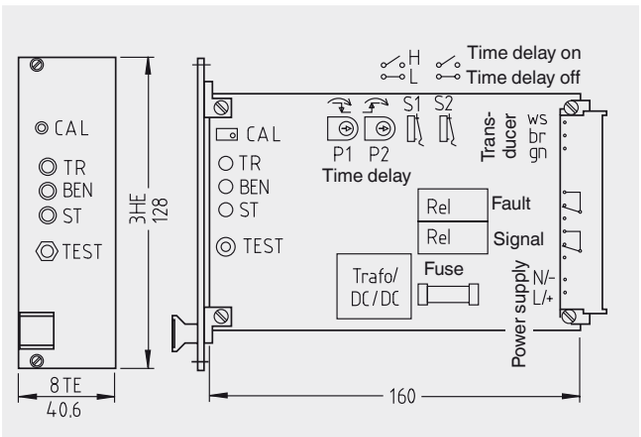

### Electrical connection diagram



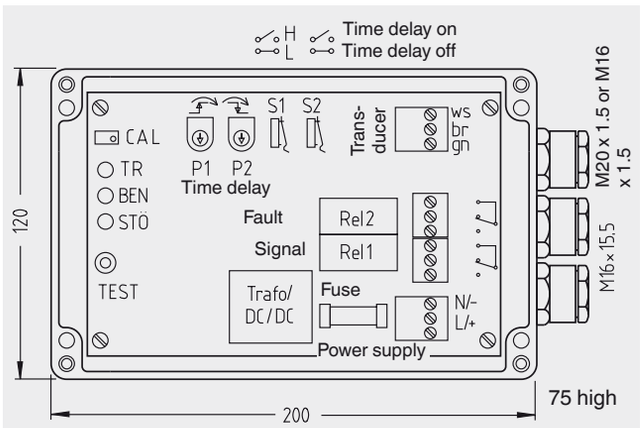
# Switching amplifier model OSA-S

**For optoelectronic level switch models OLS-S and OLS-H**

### Version 19" plug-in card




### Version in polycarbonate add-on case




| Specifications | |
|---|---|
| Ambient temperature | -25 ... +60 °C |
| Power supply | AC 230 V, AC 15/120 V, AC 24 V, DC 24 V |
| Power consumption | 2.8 VA, 3 W |
| Outputs | Signal relay, change-over contact, 250 V, 3 A, 100 VA<br>Failure relay, change-over contact, 250 V, 3 A, 100 VA |
| Cable gland | - |
| Max. connection cross-section | 2.5 mm² |
| Max. cable length | 175 ... 600 m (with 0.5 ... 1.5 mm²) |
| Ingress protection | IP 20 |
| Approval | Ex i (previous model designation KSR-OPTO.250X) |

| Specifications | |
|---|---|
| Ambient temperature | -40 ... +40 °C |
| Power supply | AC 230 V, AC 15/120 V, AC 24 V, DC 24 V |
| Power consumption | 2.8 VA, 3 W |
| Outputs | Signal relay, change-over contact, 250 V, 3 A, 100 VA<br>Failure relay, change-over contact, 250 V, 3 A, 100 VA |
| Cable gland | M16 x 1.5 / M20 x 1.5 Ex: blue |
| Max. connection cross-section | 2.5 mm² |
| Max. cable length | 175 ... 600 m (with 0.5 ... 1.5 mm²) |
| Ingress protection | IP 65 |
| Approval | Ex i (previous model designation KSR-OPTO.250X) |

### Application information

- 32-pin connector per DIN 41612, form F
- Operating elements accessible from the front
  Exceptions:
  - Switch for changing the alarm direction
  - Potentiometers for time delay

### Application information

- Transparent cover, good readability of the LED displays for dry/wetted/fault
- Ingress protection IP 65, field use possible

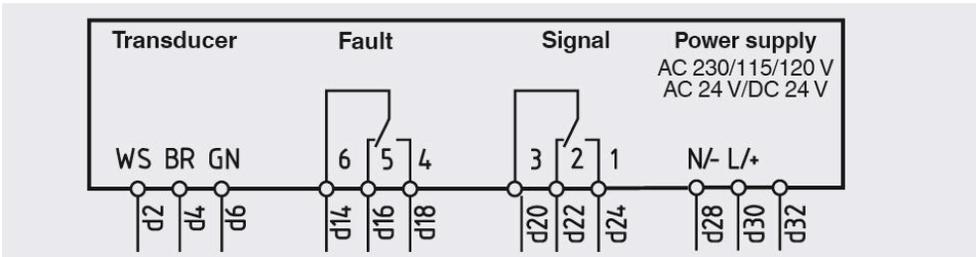
### General data

Functions
- Alarm direction selectable
- On-delay and drop-out delay for signal relay settable up to approx. 8 s

Monitoring
- Wire break signal circuit
- Short-circuit signal circuit
- Internal power supply, fail-safe

| Design data | |
|---|---|
| Max. external inductance $L_{max}$ | 0.5 mH |
| Max. external capacitance $C_{max}$ | 3 µF |
| $U_0$ | ≤ 9.6 V |
| $I_0$ | ≤ 149 mA |
| $P_0$ | ≤ 1.0 W |

### Electrical connection diagram




### Model overview

| Switching amplifier model OSA-S | Power supply | Explosion protection | Order no. |
|---|---|---|---|
| **Polycarbonate add-on case** | DC 24 V with potential isolation | Ex i | 500291 |
| | DC 24 V with potential isolation | - | 500281 |
| | DC 24 V without potential isolation | - | 500283 |
| | AC 24 V | Ex i | 500289 |
| | AC 24 V | - | 500279 |
| | AC 115/120 V | Ex i | 500287 |
| | AC 115/120 V | - | on request |
| | AC 230 V | Ex i | 500285 |
| | AC 230 V | - | 500275 |
| **19" plug-in card** | DC 24 V with potential isolation | - | 500282 |
| | DC 24 V with potential isolation | Ex i | 500292 |
| | DC 24 V without potential isolation | - | 500284 |
| | AC 24 V | Ex i | 500290 |
| | AC 24 V | - | 500280 |
| | AC 115/120 V | Ex i | 500288 |
| | AC 115/120 V | - | 500278 |
| | AC 230 V | Ex i | 500286 |
| | AC 230 V | - | 500277 |

### Ordering information

To order the described product the order number is sufficient.

Alternatively:
For models OLS-S or OLS-H: Model / Process connection / Approval / Measurement type / Switch point ML / Process specifications (operating temperature and pressure) / Material / Glass / Sieve
For model OSA-S: Model / Case / Power supply / Approval

# Appendix

## Cross Reference OLS-S/OLS-H

| Replaced Type | Type |
|---|---|
| KSR-OPTO.06XX (KSR design) | OLS-S/OLS-H |
| LSO.06 (WIKA design) | OLS-S/OLS-H |
| 720.06XX (Phönix design) | OLS-S/OLS-H |

## Type Code KSR-OPTO.06XX

**Code**

| | | | | | | |
|---|---|---|---|---|---|---|
| **1** | | **Basic type** | | | | |
| | KSR-OPTO. | Optoelectronical level switch | | | | |
| **2** | | **Approval** | | | | |
| | 11 | None | | | | |
| | 21 | Ex i | | | | |
| **3** | | **Measuring type** | | | | |
| | 1300 | Level | | | | |
| | 2300 | Interface | | | | |
| **4** | | **Switching point (ML) in mm *** | | | | |
| | 000 | 25 | 009 | 90 | 020 | 200 |
| | 005 | 50 | 010 | 100 | 030 | 300 |
| | 006 | 60 | 012 | 120 | 060 | 600 |
| | 008 | 80 | 015 | 150 | 080 | 800 |
| **5** | | **Elongation** | | | | |
| | 066 | Standard - switching point 25 mm | | | | |
| | 068 | With elongation - switching point 50 - 960 mm | | | | |
| **6** | | **Temperature** | | | | |
| | 0 | Without dissipator -60...+250°C | | | | |
| | 9 | With dissipator -269...+400°C | | | | |
| **7** | | **Housing** | | | | |
| | S | Standard housing max. 250 bar / 50°C (type OLS-S) | | | | |
| | H | Heavy housing max. 500 bar / 50°C (type OLS-H) | | | | |
| **8** | | **Material *** | | | | |
| | 1 | Stainless steel 316Ti (DIN 1.4571) | | | | |
| | 5 | Hastelloy C-276 (DIN 2.4819) | | | | |
| **9** | | **Glass** | | | | |
| | K | Cladded core glass | | | | |
| | Q | Quartz glass | | | | |
| | S | Sapphire | | | | |
| **10** | | **Option: sieve** | | | | |
| | O | Without sieve | | | | |
| | S | With sieve | | | | |
| **11** | | **Process connection** | | | | |
| | | **Size** | **Rating** | **Sealing face** | | |
| | G | Mounting thread G 1/2“ | | | | |
| | N | Mounting thread NPT 1/2“ | | | | |
| | EN../.../.. | EN 1092 DN 20 - DN 50 | PN 16 - PN 400 | B1, B2, C, D, E | | |
| | DIN../.../.. | DIN DN 20 - DN 50 | PN 16 - PN 400 | C, F, N | | |
| | ANSI../.../.. | ANSI 1/2“ - 2“ | Class 150 - class 2500 | RF, RTJ, FF | | |

* Further switching points on demand.

* Further materials on demand.

## Ordering Example

| | Basic type | Appro-val | Mea-suring type | Switching point in mm | Elongation | Tempe-rature | | Housing | Mate-rial | Glass | Sieve | Prozess connection |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | - | 7 | 8 | 9 | 10 | 11 |
| | KSR-OPTO. | 21 | 1300 | 000 | 066 | 0 | | S | 1 | K | O | EN25/400/B1 |

## Cross Reference OSA-S

| Replaced Type | Type |
|---|---|
| KSR-OPTO.250X (KSR design) | OSA-S |
| LSO.25 (WIKA design) | OSA-S |
| 720.250X (Phönix design) | OSA-S |

## Type Code KSR-OPTO.250X

| Code | | |
|---|---|---|
| 1 | | **Basic type** |
| | KSR-OPTO. 250 | Switching amplifier |
| 2 | | **Approval** |
| | 1 | None |
| | 2 | Ex i |
| 3 | | **Power supply** |
| | 1 | 230 VAC |
| | 2 | 115/120 VAC |
| | 3 | 24 VAC |
| | 4 | 24 VDC potential-free |
| | 7 | 24 VDC none-potential-free |
| 4 | | **Amplifier housing** |
| | 1 | Plastic housing (polycarbonate) |
| | 7 | 19“ plug-in module |

## Ordering Example

| | Basic type | Approval | | Power supply | Amplifier housing |
|---|---|---|---|---|---|
| Code | 1 | 2 | | 3 | 4 |
| | KSR-OPTO.250 | 1 | . | 4 | 7 |

# Optoelectronic OEM level switch
# Compact design
# Model OLS-C01, standard version



## Applications

- Machine tools
- Hydraulics
- Plant construction and machine building
- Pump technology
- For liquids, such as oils, water, distilled water, aqueous media


**Optoelectronic OEM level switch, model OLS-C01, with circular connector M8**

## Special features

- Compact design, no moving components
- Mounting position as required
- Accuracy ±0.5 mm
- Visual indication of the switching status
- Choice of electrical connections: PUR cable or circular connector M8

## Description

The model OLS-C01 optoelectronic OEM level switch is used for monitoring the level of liquids. The optoelectronic sensor consists of an infrared LED and a light receptor.

The light from the LED is directed into a prism which forms the tip of the sensor. So long as the tip is not immersed in liquid, the light is reflected within the prism to the receptor.

When the liquid rises within the vessel and surrounds the tip, the light beam is interrupted by the liquid, so that the reactor is no longer or only weakly reached by the light and reacts to this change by triggering a switching operation.

The switching status can be read directly on the sensor (red LED).

## Specifications

| General data | |
|---|---|
| **Measuring accuracy** | ±0.5 mm |
| **Minimum distance from the glass tip to an opposite surface** | ≥ 10 mm |
| **Mounting position** | as required |
| **Visual indication of the switching status** | 1 LED |
| **Process connection G** | G 3/8", G 1/2" or M12 x 1 (male) |

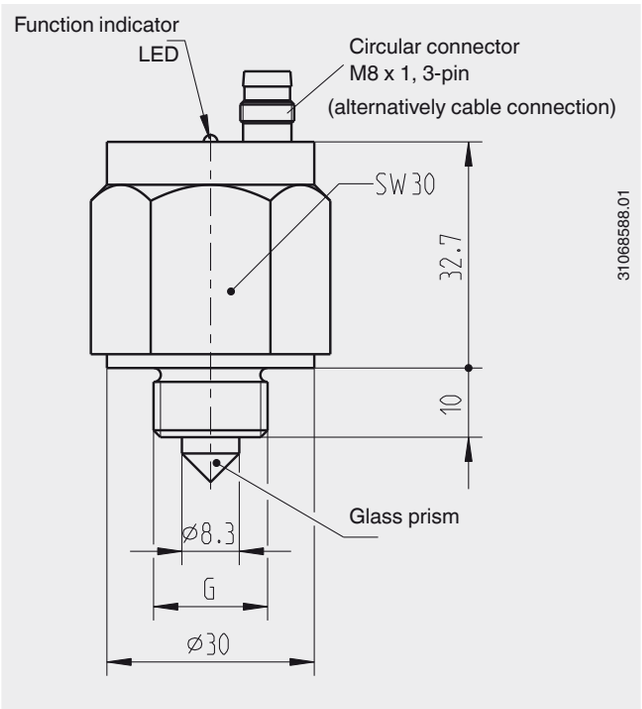
| Design data | |
|---|---|
| **Responsiveness** | preset, please specify the medium |
| **Medium temperature** | -30 … +100 °C |
| **Ambient temperature** | -25 … +70 °C |
| **Operating pressure** | 0 … 2.5 MPa (0 … 25 bar) |
| **Materials** | |
| ■ Light guide | Borosilicate glass |
| ■ Case and process connection G 3/8" and M12 x 1 | Stainless steel 1.4305 |
| ■ Case and process connection G 1/2" | Stainless steel 1.4571 |

| Electrical data | |
|---|---|
| **Power supply** | DC 12 … 32 V |
| **Max. current supply** | 40 mA |
| **Output** | PNP transistor, protected against reverse polarity |
| **Electrical connection** | |
| ■ PUR cable | Standard lengths: 2 and 5 m<br>Diameter: 3 x 0.25 mm$^2$<br>Cable end: cut to length |
| ■ Circular connector | M8 x 1, 3-pin |
| **Switching function** | Normally open (closed in medium) or normally closed (open in medium) |
| **Ingress protection** | IP 65 |
| **Number of switch points** | 1 |

## Options

- Other versions on request
- Accessories: Circular connector M8 with cable

## Dimensions in mm




**Ordering information**
Model / Process connection / Electrical connection / Switching function / Medium / Options

# Optoelectronic OEM level switch
# Compact design
# Model OLS-C02, with selectable switch length

KSR data sheet OLS-C02

## Applications

- Machine tools
- Hydraulics
- Plant construction and machine building
- Pump technology
- For liquids, such as oils, water, distilled water, aqueous media

## Special features

- Selectable switch length from 65 mm to 3,000 mm
- No moving components
- Mounting position as required
- Accuracy ±0.5 mm
- Choice of electrical connections: PUR cable, circular connector M12 or angular connector EN 175301-803 A

**Optoelectronic OEM level switch, model OLS-C02, with cable outlet**

## Description

The model OLS-C02 optoelectronic OEM level switch is used for monitoring the level of liquids. The optoelectronic sensor consists of an infrared LED and a light receptor.

The light from the LED is directed into a prism which forms the tip of the sensor. So long as the tip is not immersed in liquid, the light is reflected within the prism to the receptor.

When the liquid rises within the vessel and surrounds the tip, the light beam is interrupted by the liquid, so that the reactor is no longer or only weakly reached by the light and reacts to this change by triggering a switching operation.

The model OLS-C02 level switch offers the advantage that its switch length is selectable. This enables an optimal adaptation to the application-specific requirements.

## Specifications

| General data | |
|---|---|
| **Measuring accuracy** | ±0.5 mm |
| **Minimum distance from the glass tip to an opposite surface** | ≥ 10 mm |
| **Mounting position** | as required |
| **Switch length L** | Standard lengths: 150, 300, 500, 750, 1,000 and 1,500 mm;<br>other lengths on request<br><br>$L_{min}$ = 65 mm<br>$L_{max}$ = 3,000 mm |
| **Process connection** | G 1/2" (male) |

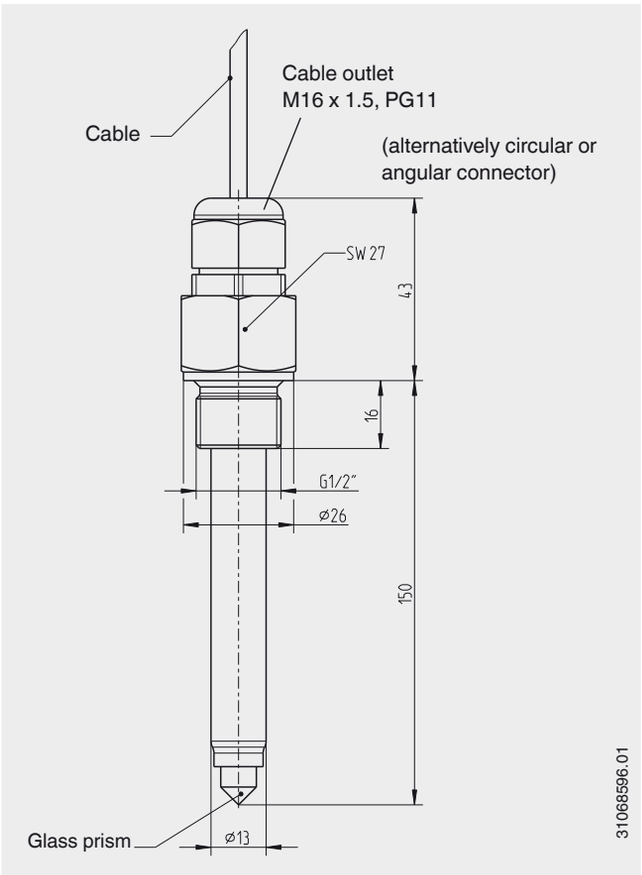
| Design data | |
|---|---|
| **Responsiveness** | preset, please specify the medium |
| **Medium temperature** | -30 … +100 °C |
| **Ambient temperature** | -25 … +70 °C |
| **Operating pressure** | 0 … 2.5 MPa (0 … 25 bar) |
| **Materials** | |
| ■ Light guide | Borosilicate glass |
| ■ Case und process connection | Stainless steel 1.4571 |

| Electrical data | |
|---|---|
| **Power supply** | DC 12 … 32 V |
| **Max. current supply** | 40 mA |
| **Output** | PNP transistor, protected against reverse polarity |
| **Electrical connection** | |
| ■ PUR cable | Standard lengths: 2 and 5 m<br>Diameter: 3 x 0.25 $mm^2$<br>Cable end: cut to length |
| ■ Circular connector | M12 |
| ■ Angular connector | per EN 175301-803 A |
| **Switching function** | Normally open (closed in medium) or normally closed (open in medium) |
| **Ingress protection** | IP 65 |
| **Number of switch points** | 1 |

## Options

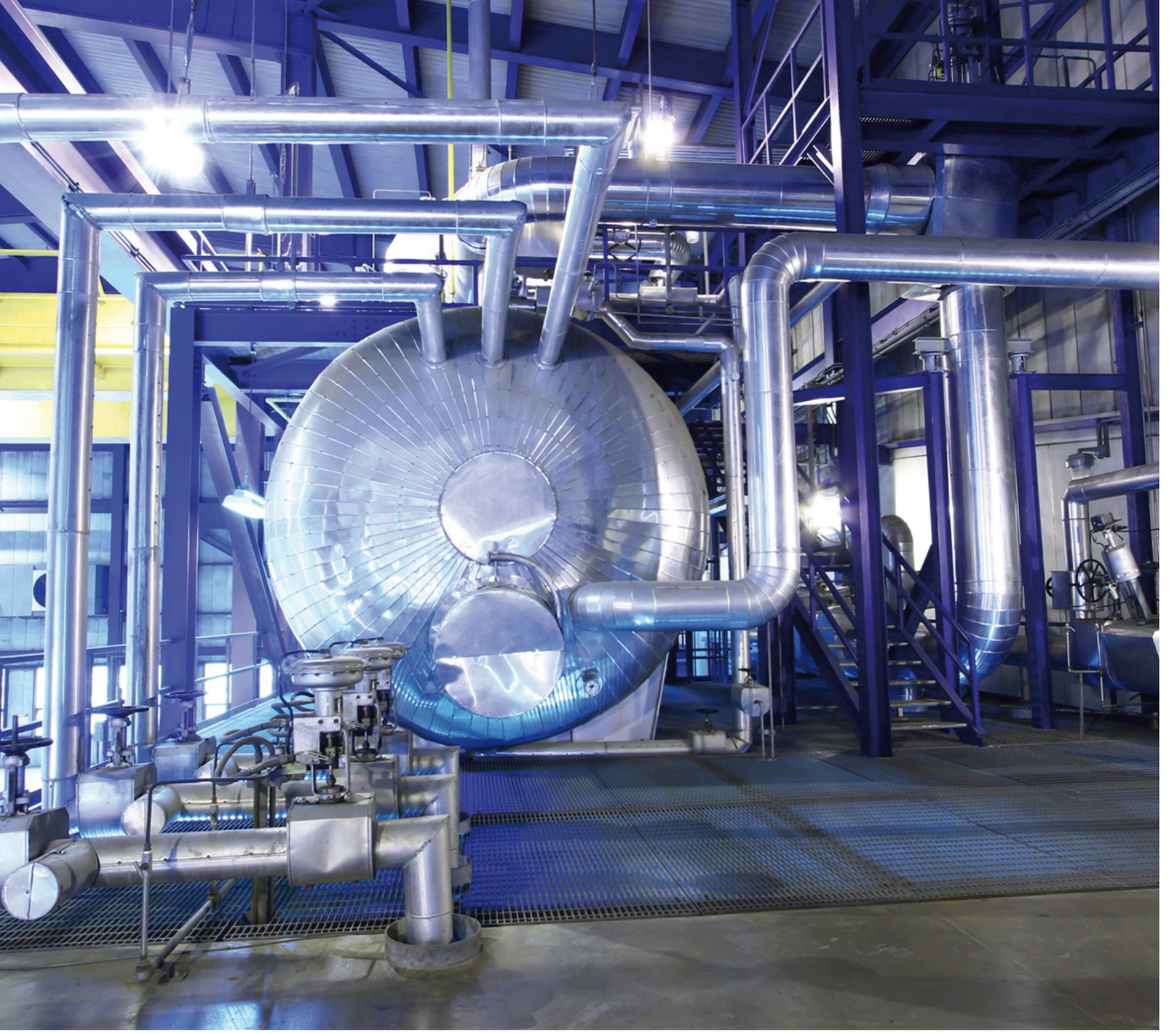
- Other versions on request
- Accessories: Circular connector M8 with cable

## Dimensions in mm




**Ordering information**

Model / Process connection / Electrical connection / Switching function / Medium / Switch length / Options



# KSR – Your Partner for Refrigeration

Within the refrigeration cycle and its periphery there are many points where level are measured and monitored. This serves to control the plant in order to guarantee a secure process run.
In view of the increasing requirements on refrigeration plants due to new refrigerants or leak-free systems the quality requirements for measuring instruments are also increasing. Thus the right choice of materials is decisive in order to get the best possible instrument.

Closeness to customers is an essential part of our company philosophy. Individually tailored advice and proposals, to match solutions to your needs, supplement our extensive offering of products and services.

# Optoelectronic OEM level switch
# Compact design
# Model OLS-C04, refrigerant version with transistor output

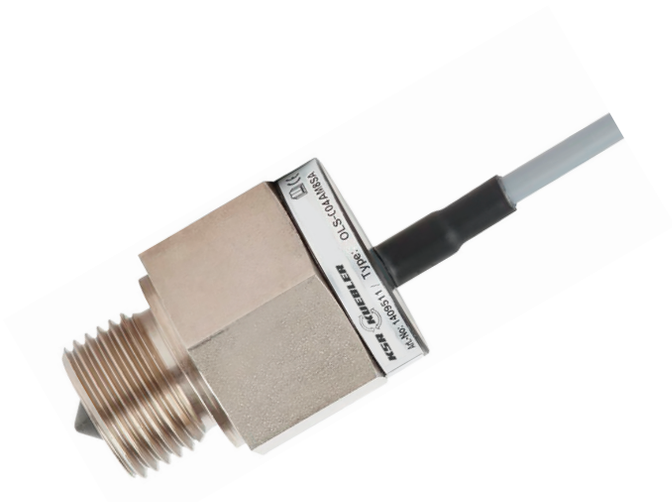
KSR data sheet OLS-C04

## Applications

- Level monitoring in refrigeration plants

## Special features

- Application with refrigerants
- Mounting position as required
- Accuracy ±0.5 mm
- Visual indication of the switching status
- Choice of electrical connections: PUR cable or connector M8




**Optoelectronic OEM level switch, model OLS-C04, with cable outlet**

## Description

The model OLS-C04 optoelectronic OEM level switch is used for monitoring the level of liquids. The optoelectronic sensor consists of an infrared LED and a light receptor.

The light from the LED is directed into a prism which forms the tip of the sensor. So long as the tip is not immersed in liquid, the light is reflected within the prism to the receptor.

When the liquid rises within the vessel and surrounds the tip, the light beam is interrupted by the liquid, so that the reactor is no longer or only weakly reached by the light and reacts to this change by triggering a switching operation.

The switching status can be read directly on the sensor (red LED).

The model OLS-C04 level switch can be used in refrigeration plants, since the glass prism is fused within the steel case.

## Specifications

| General data | |
|---|---|
| **Measuring accuracy** | ±0.5 mm |
| **Minimum distance from the glass tip to an opposite surface** | ≥ 10 mm |
| **Mounting position** | as required |
| **Visual indication of the switching status** | 1 LED |
| **Process connection** | G 1/2" or 1/2" NPT (male) |

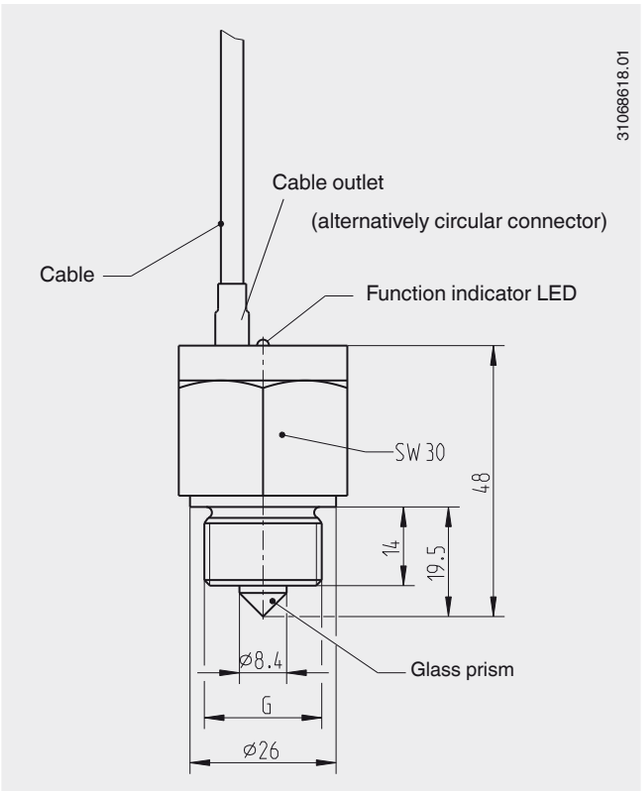
| Design data | |
|---|---|
| **Responsiveness** | preset, please specify the medium |
| **Medium temperature** | -40 … +100 °C |
| **Ambient temperature** | -30 … +70 °C |
| **Operating pressure** | 0 … 4 MPa (0 … 40 bar) |
| **Materials** | |
| ■ Light guide | Glass, fused within the steel case (without sealing) |
| ■ Case und process connection | Steel, nickel-plated |

| Electrical data | |
|---|---|
| **Power supply** | DC 12 … 32 V |
| **Max. current supply** | 40 mA |
| **Output** | PNP transistor, protected against reverse polarity |
| **Electrical connection** | |
| ■ PUR cable | Standard lengths: 2 and 5 m<br>Diameter: 3 x 0.25 mm$^2$<br>Cable end: cut to length |
| ■ Circular connector | M8 |
| **Switching function** | Normally open (closed in medium) or normally closed (open in medium) |
| **Ingress protection** | IP 65 |
| **Number of switch points** | 1 |

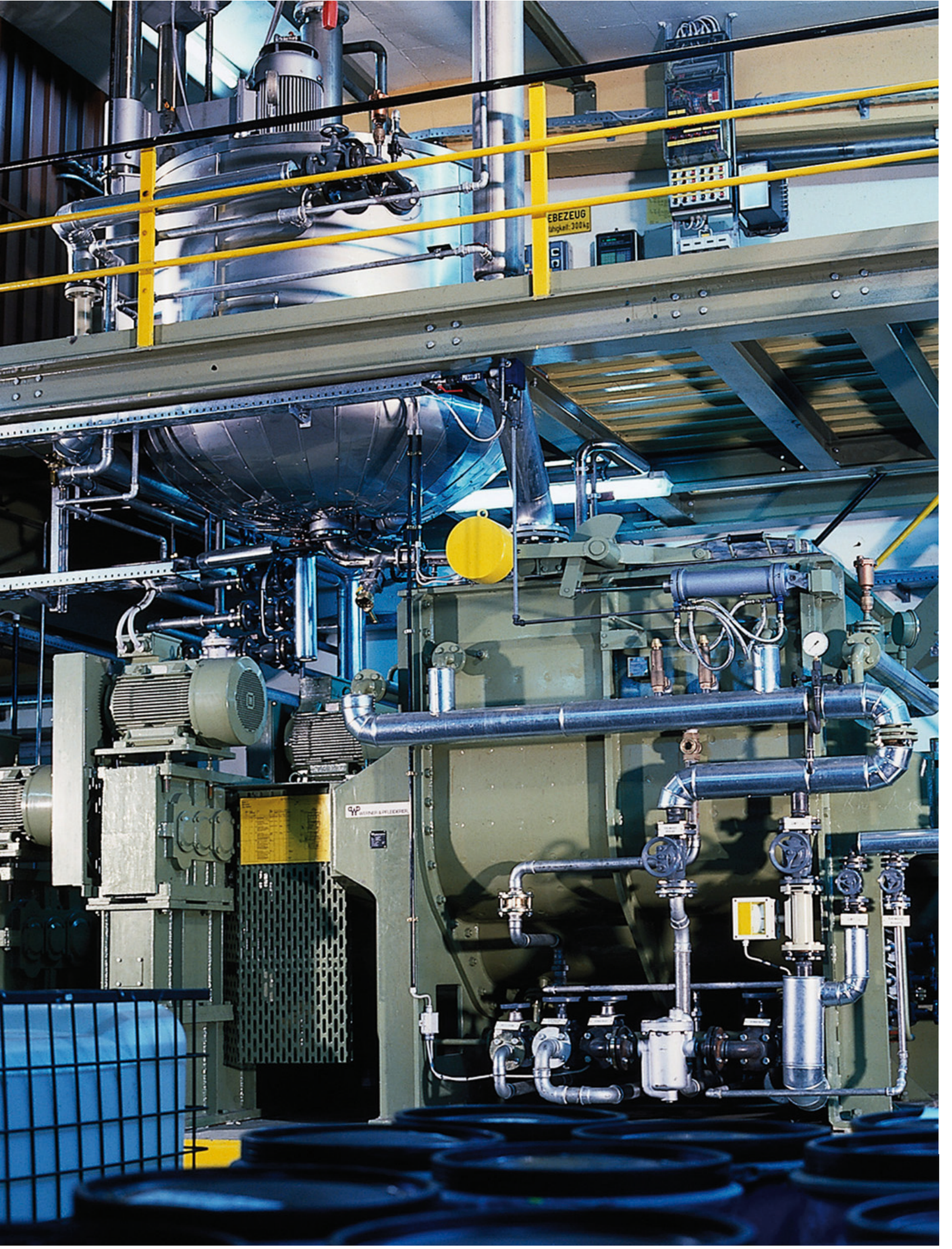
## Options

- Other versions on request
- Accessories: Circular connector M8 with cable

## Dimensions in mm




**Ordering information**
Model / Process connection / Electrical connection / Switching function / Medium / Options


EBEZEUG

# Optoelectronic OEM level switch
# Compact design
# Model OLS-C05, high-temperature version

KSR data sheet OLS-C05

## Applications

- Machine tools
- Hydraulics
- Plant construction and machine building
- Water technology
- For liquids, such as oils, water, distilled water, aqueous media

**Optoelectronic OEM level switch, model OLS-C05, with angular connector**

## Special features

- Use at temperatures of up to +150 °C
- Mounting position as required
- Accuracy ±0.5 mm
- Visual indication of the switching status
- Choice of electrical connections: PUR cable, circular connector M12 or angular connector EN 175301-803 A

## Description

The model OLS-C05 optoelectronic OEM level switch is used for monitoring the level of liquids. The optoelectronic sensor consists of an infrared LED and a light receptor.

The light from the LED is directed into a prism which forms the tip of the sensor. So long as the tip is not immersed in liquid, the light is reflected within the prism to the receptor.

When the liquid rises within the vessel and surrounds the tip, the light beam is interrupted by the liquid, so that the reactor is no longer or only weakly reached by the light and reacts to this change by triggering a switching operation.

The switching status can be read directly on the sensor (red LED).

The model OLS-C05 level switch is designed for use with liquids at high temperatures of up to +150 °C.

## Specifications

| General data | |
|---|---|
| **Measuring accuracy** | ±0.5 mm |
| **Minimum distance from the glass tip to an opposite surface** | ≥ 10 mm |
| **Mounting position** | as required |
| **Visual indication of the switching status** | 1 LED |
| **Process connection** | G 1/2" (male) |

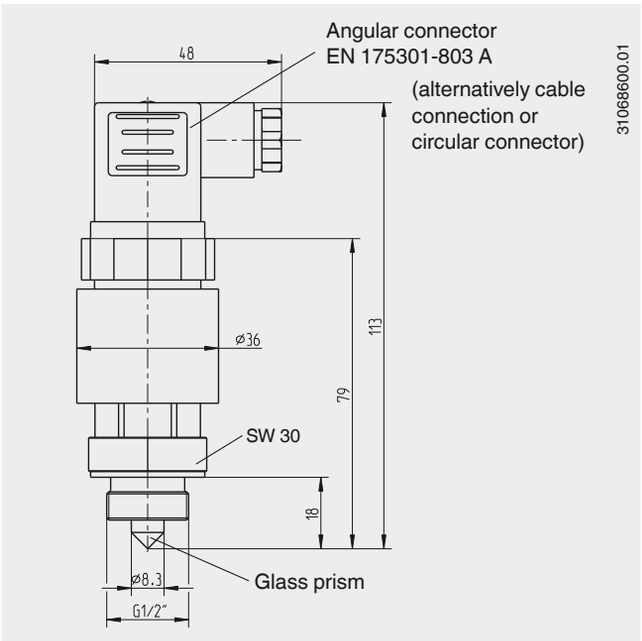
| Design data | |
|---|---|
| **Responsiveness** | preset, please specify the medium |
| **Medium temperature** | -40 … +150 °C |
| **Ambient temperature** | -30 … +80 °C |
| **Operating pressure** | 0 … 2.5 MPa (0 … 25 bar) |
| **Materials** | |
| ■ Light guide | Borosilicate glass |
| ■ Case | Stainless steel 1.4305 (non-wetted parts) |
| ■ Process connection | Stainless steel 1.4571 |

| Electrical data | |
|---|---|
| **Power supply** | DC 12 … 32 V |
| **Max. current supply** | 40 mA |
| **Output** | PNP transistor, protected against reverse polarity |
| **Electrical connection** | |
| ■ PUR cable | Standard lengths: 2 and 5 m<br>Diameter: 3 x 0.25 $mm^2$<br>Cable end: cut to length |
| ■ Circular connector | M12 |
| ■ Angular connector | per EN 175301-803 A |
| **Switching function** | Normally open (closed in medium) or normally closed (open in medium) |
| **Ingress protection** | IP 65 |
| **Number of switch points** | 1 |

## Options

- Other versions on request
- Accessories: Circular connector M8 with cable

## Dimensions in mm




**Ordering information**

Model / Process connection / Electrical connection / Switching function / Medium / Options

# Optoelectronic level switch
# Compact design
# Model OLS-C20, high-pressure version



## Applications

- Level measurement for liquid media
- Level control and monitoring of distinct filling levels
- Machine building
- Wastewater and environmental engineering

## Special features

- Compact design, no moving components
- Temperature ranges from -30 … +135 °C
- Versions for pressure ranges from vacuum to 50 bar
- Mounting position as required
- Visual indication of the switching status


**Optoelectronic level switch, model OLS-C20**

## Description

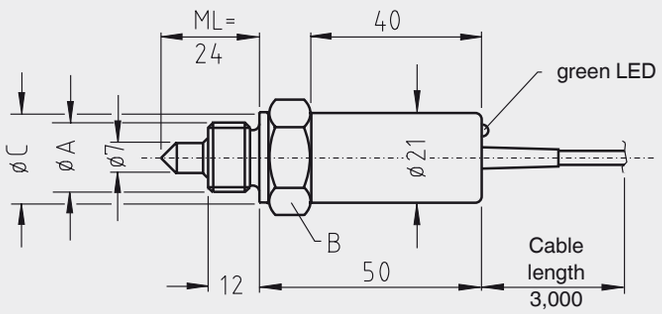
The model OLS-C20 optoelectronic level switches are used for the detection of limit levels in liquids. This is widely independent of physical characteristics such as refractive index, colour, density, dielectric constant and conductivity. Measurement is also done in small volumes.

The switches consist of an infrared LED and a phototransistor. The light of the LED is directed into a prism. So long as the sensor tip of the prism is in the gas phase, the light is reflected within the prism to the receiver. When the liquid in the vessel rises and wets approximately 2/3 of the glass tip, the infrared lightbeam into the liquid is interrupted and only a small portion reaches the receiver.

The O. C. pnp transistor output may be connected directly to the input of a control system or energise an external relay. The output is short-circuit proof and also current, voltage and power limited.

The switching status can be read directly on the sensor (green LED).

## Specifications, dimensions in mm

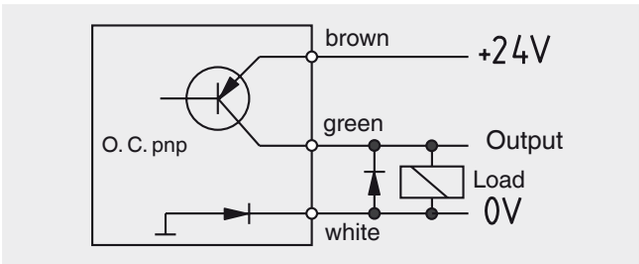



Legend
ML fixed measuring length 24 mm

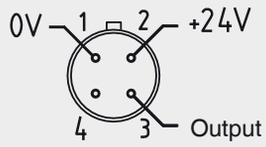
| Process connection Ø A | Spanner width B | Sealing face Ø C |
|---|---|---|
| M16 x 1.5 | SW 24 | 21 |
| G 1/2 | SW 30 | 26 |
| 1/2 NPT | SW 24 | - |

| Specifications | |
|---|---|
| Measuring accuracy | ±0.5 mm |
| Light source | IR light 930 nm |
| Ambient light | max. 10,000 Lux |
| Minimum distance from the glass tip to an opposite surface | > 10 mm<br>> 20 mm with electropolished surface |
| Mounting position | as required |
| Visual inspection | |
| ■ Switching status | green LED |
| ■ Switching direction | is factory-set |
| Medium temperature | -30 ... +135 °C |
| Ambient temperature | -25 ... +70 °C |
| Pressure range | 0 ... 50 bar |
| Materials | |
| ■ Sensor housing | Stainless steel |
| ■ Light guide | Quartz glass |
| ■ Packing | Graphite/PTFE |
| ■ Case | Stainless steel |
| Power supply | DC 24 V, -25 ... +30 % |
| Max. current supply | 40 mA |
| Output | O. C. pnp transistor, short-circuit proof, current, voltage and power limitation |
| Switching current ($T_u$ = 70 °C) | 0.5 A |
| Electrical connection | |
| ■ PVC cable | 3 x 0.14 mm$^2$ |
| ■ Connector | 4-pin series 712, M12 |
| Ingress protection | |
| ■ With connector | IP 65 per EN 60529 |
| ■ With cable | IP 66 per EN 60529 |

### Electrical connection diagram




### Connector assignment




### Model overview

| Process connection | Switching direction | Electr. connection | Cable length | Connector/ cable | Material | Order no. |
|---|---|---|---|---|---|---|
| **M16 x 1.5** | SE | Connector | - | M12 | Stainless steel 1.4571 | 100256 |
| | SA | Connector | - | M12 | Stainless steel 1.4571 | 100255 |
| | SE | Cable | 3 m | PVC | Stainless steel 1.4571 | 500224 |
| | SA | Cable | 3 m | PVC | Stainless steel 1.4571 | 500222 |
| **G 1/2"** | SE | Connector | - | M12 | Stainless steel 1.4571 | 100259 |
| | SA | Connector | - | M12 | Stainless steel 1.4571 | 100258 |
| | SE | Cable | 3 m | PVC | Stainless steel 1.4571 | 500233 |
| | SA | Cable | 3 m | PVC | Stainless steel 1.4571 | 500231 |
| **NPT 1/2"** | SE | Connector | - | M12 | Stainless steel 1.4571 | on request |
| | SA | Connector | - | M12 | Stainless steel 1.4571 | 100257 |
| | SE | Cable | 3 m | PVC | Stainless steel 1.4571 | 500229 |
| | SA | Cable | 3 m | PVC | Stainless steel 1.4571 | 500227 |

SE = immersing when switching (normally open on rising level)
SA = emerging when switching (normally closed on rising level)

### Ordering information

To order the described product the order number (if available) is sufficient.

Alternatively:
OLS-C20 / Process connection / Switching direction / Electrical connection

# Appendix

## Cross Reference OLS-C20

| Replaced Type | Type |
|---|---|
| KSR-OPTO.002X (KSR design) | OLS-C20 |
| LSO.02 (WIKA design) | OLS-C20 |
| 720.002X (Phönix design) | OLS-C20 |

## Type Code KSR-OPTO.002X

| Code | | |
|---|---|---|
| **1** | | **Basic type** |
| | KSR-OPTO.002 | Optoelectronical level switch |
| **2** | | **Process connection** |
| | 0 | M16x1,5 |
| | 1 | NPT 1/2“ |
| | 3 | G1/2“ |
| **3** | | **Switch direction** |
| | SE | Switching immersed - closing on rising level |
| | SA | Switching dry - opening on rising level |
| **4** | | **Electrical connection** |
| | K | Cable |
| | S | Plug |
| **5** | | **Cable length** |
| | 3 | 3m |
| | 5 | 5m |
| **6** | | **Cable/Plug** |
| | B | Coupler plug M12 4 pin |
| | P | Cable PVC |

## Ordering Example

| | Basic type | | Process connection | | Switch direction | | Electrical connection | | Cable length | | Cable/plug |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | - | 2 | - | 3 | -59 | 4 | - | 5 | - | 6 |
| | KSR-OPTO.002 | | 3 | | SE | | K | | 3 | | P |

# Optoelectronic level switch
# Compact design
# Model OLS-C29, refrigerant version with relay output



## Applications

- Level measurement for liquid media
- Level control and monitoring of distinct filling levels
- Machine building
- Refrigerator units

## Special features

- Temperature ranges from -30 … +120 °C
- Exchange of the electronics without opening the vessel, the process connection with the glass prism remains at the vessel
- Operating states can be read via the LED
- Various switching delays selectable
- Relay output

**Optoelectronic level switch, model OLS-C29**

## Description

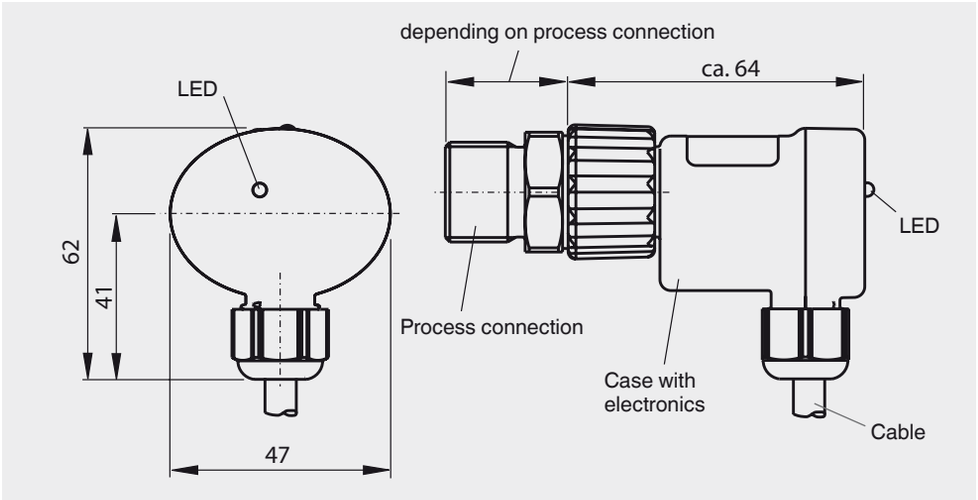
The model OLS-C29 optoelectronic level switches are used for the detection of limit levels in liquids. This is widely independent of physical characteristics such as refractive index, colour, density, dielectric constant and conductivity. Measurement is also done in small volumes.

The switches include an infrared LED and a phototransistor. The light of the LED is directed into a prism. So long as the sensor tip of the prism is in the gas phase, the light is reflected within the prism to the receptor. When the liquid in the vessel rises and wets approximately 2/3 of the glass tip, the infrared lightbeam into the liquid is interrupted and only a small portion reaches the receptor.

The switching status of the OLS-C29 can be read directly on the sensor.

The electronics can be exchanged without opening the vessel, while the glass prism remains within the vessel.

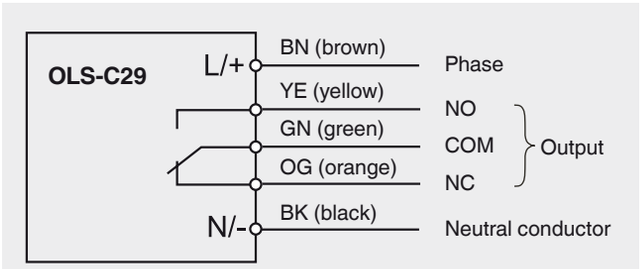
## Specifications, dimensions in mm



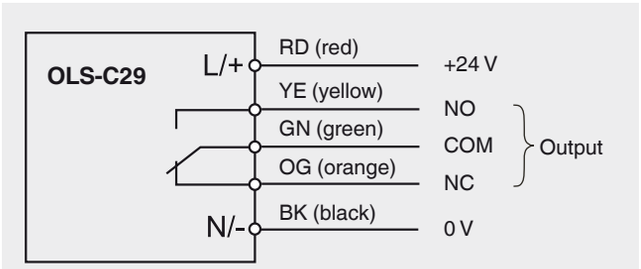

| Specifications | |
|---|---|
| Material | |
| ■ Electronic case | PA66, glass-fibre reinforced |
| ■ Process connection | Steel, nickel-plated |
| ■ Prism | Borosilicate glass |
| Mounting of case to process connection | Union nut |
| Light source | IR light 930 nm |
| Ambient light | max. 500 Lux |
| Medium temperature | -30 ... +120 °C |
| Ambient temperature | -30 ... +60 °C |
| Max. operating pressure | 42 bar |
| Mounting position | horizontal |
| Minimum distance from the glass tip to an opposite surface | > 10 mm |
| Visual indication of the switching status | red LED |
| Switching delay (factory-set, fixed) | approx. 1 s, others up to 12 s on request |
| Power supply | AC 110 ... 230 V ±15 % or DC 24 V ±15 % |
| Current supply max. | approx. 22 mA |
| Output relay | Change-over contact |
| Switching voltage, current, power | AC 250 V, NC = 5 A, NO = 7 A, 1,750 VA |
| Connection cable | 5 x 0.75 mm$^2$, L = 2 m, colour-coded |
| Mech. service life | approx. 10$^5$ switching cycles |
| Ingress protection | IP 54 |

### Electrical connection diagram

**Power supply 230 V**




**Power supply 24 V**



**Model overview**

■ Switch

| Process connection | Power supply | Switching delay | Cable length | Order no. |
|---|---|---|---|---|
| **M20 x 1.5** | DC 24 V | 1 s | 2 m | 115733 |
| | AC 230 V | 1 s | 2 m | 115826 |
| **1 1/8 UNEF** | DC 24 V | 1 s | 2 m | 115839 |
| | AC 230 V | 1 s | 2 m | 115841 |
| **NPT 1/2"** | DC 24 V | 1 s | 2 m | 115842 |
| | AC 230 V | 1 s | 2 m | 115843 |
| | DC 24 V | 5 s | 3 m | 115914 |
| **G 1/2"** | DC 24 V | 1 s | 2 m | 115859 |
| | DC 24 V | 1 s | 3 m | 115875 |
| | AC 230 V | 1 s | 2 m | 115858 |

Other versions on request

■ Electronics

| Power supply | Switching delay | Cable length | Order no. |
|---|---|---|---|
| DC 24 V | 1 s | 2 m | 114690 |
| AC 230 V | 1 s | 2 m | 115824 |
| DC 24 V | 1 s | 3 m | 115874 |
| DC 24 V | 5 s | 3 m | 115913 |

Other versions on request

## Cross reference

| Replaced Type | Type |
|---|---|
| KSR-OPTO.0029 | OLS-C29 |

**Ordering information**

To order the described product the order number (if available) is sufficient.

Alternatively:
OLS-C29 / Power supply / Process connection / Switching delay / Cable length

# KSR – Your Partner for Power Engineering

Level measuring instruments by KSR are used in all fields of power generation - from large-scale power plants (e.g. coal, gas, nuclear, hydro power) and peak-load electricity generation plants (e.g. gas turbine power plants) to decentralised systems (thermal power stations, wind power stations, biogas plants). At the same time measuring technology has to meet requirements which are as diverse as its application fields.

With our worldwide biggest standard product range of level measuring instruments we offer our customers a suitable solution for every measuring task. In close cooperation with development departments of our business partners special instrument versions are developed that can confidently meet required measuring criteria even under extreme conditions.

# Optoelectronic level switch
# Compact design
# Model OLS-C51, explosion-protected version

KSR data sheet OLS-C51

## Applications

- Machine tools
- Hydraulics
- Plant construction and machine building
- Water technology
- For liquids, such as oils, water, distilled water, aqueous media

**Optoelectronic level switch, model OLS-C51**

## Special features

- Application at medium temperatures up to +135 °C
- Mounting position as required
- Accuracy ±0.5 mm
- Explosion-protected version Ex i

## Description

The model OLS-C51 optoelectronic level switch is used for monitoring the level of liquids. The optoelectronic sensor consists of an infrared LED and a light receiver.

The light from the LED is directed into a prism which forms the tip of the sensor. So long as the tip is not immersed in liquid, the light is reflected within the prism to the receiver.

When the liquid rises within the vessel and surrounds the tip, the light beam is interrupted by the liquid, so that the reactor is no longer or only weakly reached by the light and reacts to this change by triggering a switching operation.

As an explosion-protected version, the model OLS-C51 level switch is designed for medium temperatures up to 135 °C in zone 0 and 1.

## Specifications

| General data | |
|---|---|
| **Measuring accuracy** | ±0.5 mm |
| **Minimum distance from the glass tip to an opposite surface** | ≥ 10 mm |
| **Mounting position** | as required |
| **Process connection** | G 1/2" (male) |
| **Approval** | Ex i (previous model designation OPG 051) |

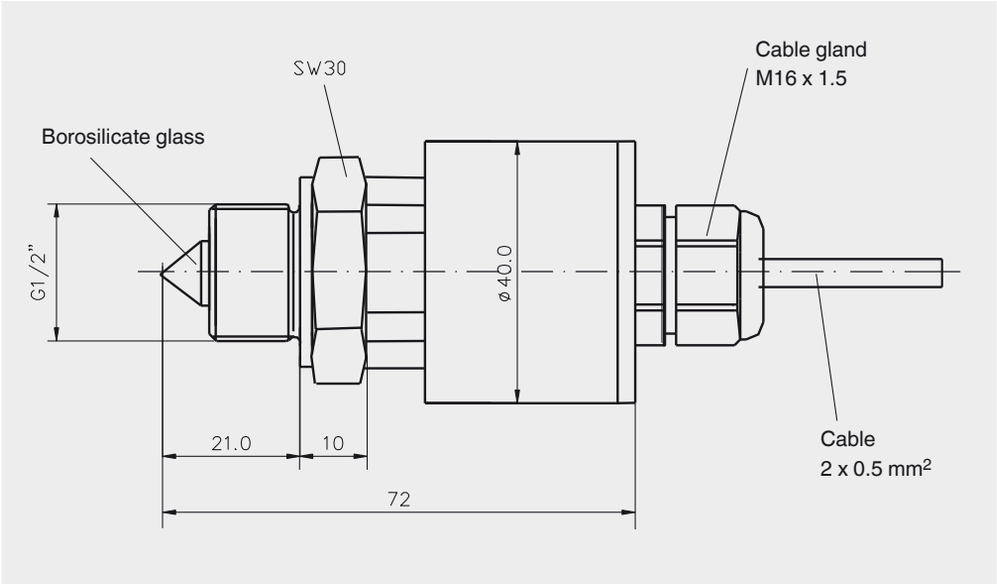
| Design data | |
|---|---|
| **Responsiveness** | preset, please specify the medium |
| **Medium temperature** | -30 … +135 °C |
| **Ambient temperature** | -30 … +80 °C |
| **Operating pressure** | 0 … 2.0 MPa (0 … 20 bar) |
| **Materials** | |
| ■ Light guide | Borosilicate glass |
| ■ Case | Stainless steel 1.4305 (non-wetted parts) |
| ■ Process connection | Stainless steel 1.4571 |

| Electrical data | |
|---|---|
| **Power supply** | DC 7.5 ... 30 V<br>$I_O$ = 100 mA, $U_O$ = 30 V, P = 1 W |
| **Output** | 4 ... 20 mA, protected against reverse polarity<br>Normally open: ≥ 4 mA to < 10 mA<br>Normally closed: ≥ 12 mA to 18 mA<br>Fault: < 4 mA, > 20 mA |
| **Electrical connection** | |
| ■ PUR cable halogen-free | Standard lengths: 2 and 5 m<br>Diameter: 3 x 0.25 $mm^2$ |
| **Switching function** | Normally open (closed in medium) or normally closed (open in medium) |
| **Ingress protection** | IP 65 |
| **Number of switch points** | 1 |

## Options

- Other versions on request

## Dimensions in mm




### Electrical connection diagram


### Ordering information

Model / Process connection / Electrical connection / Switching function / Medium / Options

# Appendix

## Cross Reference OLS-C51

| Type | Model |
|---|---|
| OLS-C51 | OPG 051 |

## Type Code OPG 051

| Code | | |
|---|---|---|
| **1** | | **Basic type** |
| | OPG 051 | Optoelectronical level switch |
| **2** | | **Process connection** |
| | A | Mounting thread G 1/2“ |
| | X | Other process connections on demand |
| **3** | | **Electrical connection** |
| | 2U | Cable outlet 2m PUR cable, standard |
| | 3U | Cable outlet 3m PUR cable |
| | 5U | Cable outlet 5m PUR cable |
| | XU | Cable outlet Xm PUR cable |
| **4** | | **Switching function** |
| | S | SPST (Closing on rising level, High >=12mA to <18mA |
| | O | SPDT (Opening on rising level, Low >4mA to <10mA) (Fault <4mA, >20mA) |
| **5** | | **Responsiveness** |
| | A | Responsiveness not adjustable (please specify fluid) |
| **6** | | **Approval** |
| | Ex | Intrinsically safe version Ex i |

## Ordering Example

| | Basic type | Process Connection | Electrical Connection | Switching function | Respon-siveness | Approval |
|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 |
| | OPG 051 | A | 2U | S | A | Ex |

# Flow monitor
# For monitoring the flow of liquid and gaseous media
# Model FWS

KSR data sheet FWS

## Applications

- Continuous flow indication without power supply
- Thirteen different versions and corrosion resistant materials make the products suitable for a broad range of applications
- Machine building, chemical industry, pharmaceutical industry, medical engineering
- Cooling systems and cooling circuits, transformers, central lubrication systems and recirculating oil lubrication systems
- Research and development


**Selection of different model FWS flow monitors**

## Special features

- High switching accuracy and functional safety
- Large switching range, low switch hysteresis
- Continuous switch point setting by the operator
- Viscosity compensated models available
- Explosion-protected versions

## Description

The model FWS flow monitors are used for the display and monitoring of the flow of liquid and gaseous media, e.g. in cooling systems and cooling circuits of welding machinery, laser and piping systems, dosing systems, pumps, compressors, hydraulic systems, high-pressure plants and many more.

The flow monitors operate in accordance with the float-body measuring principle. A float body is guided within a cylindrical slotted nozzle or in a cylindrical measuring tube. A reed contact is mounted outside of the flow circuit.

The reed contact is cast into a continuously adjustable case (switch case) and thus is protected from external influences.

The flowing medium moves the float body in the direction of the flow. When the float body, with its integrated magnet, reaches the position of the reed switch, this closes. When the flow rate rises, the float body moves further in the direction of the flow, maximally until it reaches a stop. This stop prevents the float body from being driven beyond the switching range of the reed switch (bistable characteristic).

## Switching ranges

All flow monitors are factory-fitted as standard with a normally open contact (option change-over contact).
The switch point can be adjusted continuously within the switching range. Depending on the flow rate itself, the actual flow volume can be much larger than the maximum scale value (typically: double).

## Position dependance

The model FWS-DWG, FWS-DWM/A, FWS-DWM and FWS-DWM-L flow monitors must be installed vertically, with the flow from bottom to top. For all other models, the mounting position is up to the user, however during installation, care must be taken to ensure the correct flow direction.

## Switch hysteresis

This refers to the travel of the float body between the switch-on and switch-off flow volume. The shorter the switch travel is, the lower the switch hysteresis. Through the selection of magnets and reed switches with small differences between response and drop-out excitation (close differential), a low switch hysteresis can be successfully maintained. A low switch hysteresis is always an advantage where precise control of the flow is required.

## Display

A local display is also possible. With models with sight-glasses, the upper edge of the float body is also the reading edge and displays the flow against the scale etched onto the sight-glass. Models with pointer scales can be read according to the scale. Please note that that the respective scales are matched to a specific medium.

## Voltage supply

A voltage supply is not required with the flow monitors as potential-free reed contacts are used.

## Maintenance information

The flow monitor has been specifically engineered to require minimal maintenance. With media containing magnetic particles, cleaning should be performed at regular intervals. These cleaning intervals can be significantly extended by using a filter with a magnetic separator.
The flow monitors work on a flow-dependent rather than a pressure-dependent basis.

## Model overview

| Flow monitor | Mounting position | Display | Viscosity compensation | Max. pressure in bar | Flow range l/min $H_2O$ | Nl/min air |
|---|---|---|---|---|---|---|
| **Vertical mounting position, sight-glass display, for water and similar media, model FWS-DWG** | Vertical | Sight-glass | No | 10 | 0.1 ... 50 | - |
| **Vertical mounting position, dial indicator, for water and similar media, model FWS-DWM/A** | | Dial indicator | No | 300 | 0.1 ... 50 | - |
| **Vertical mounting position, without display, for water and similar media, model FWS-DWM** | | Without | No | 300 | 0.1 ... 50 | - |
| **Vertical mounting position, without display, for gaseous media, model FWS-DWM-L** | | Without | No | 300 | - | 1 ... 1,450 |
| **Mounting position as required, sight-glass display, for water and similar media, model FWS-DUG** | As required | Sight-glass | No | 10 | 0.2 ... 250 | - |
| **Mounting position as required, dial indicator, for water and similar media, model FWS-DUM/A** | | Dial indicator | No | 300 | 0.2 ... 250 | - |
| **Mounting position as required, sight-glass display, for oil and similar media, model FWS-DKG** | | Sight-glass | Yes | 10/16 | 0.10 ... 90 | - |
| **Mounting position as required, dial indicator, for oil and similar media, model FWS-DKM/A** | | Dial indicator | Yes | 300 | 0.5 ... 110 | - |
| **Mounting position as required, without display, for oil and similar media, model FWS-DKM** | | Without | Yes | 350 | 0.5 ... 110 | - |
| **Mounting position as required, sight-glass display, for water and similar media, several variants, model FWS-RVO/U** | | Sight-glass | No | 10/16 | 0.005 ... 150 | - |
| **Mounting position as required, sight-glass display, for gaseous media, several variants, model FWS-RVO/U-L** | | Sight-glass | No | 10/16 | - | 0.2 ... 625 |
| **Mounting position as required, without display, for water and similar media, several variants, model FWS-RVM/U** | | Without | No | 350 | 0.005 ... 150 | - |
| **Mounting position as required, without display, for gaseous media, several variants, model FWS-RVM/U-L** | | Without | No | 350 | - | 0.6 ... 650 |

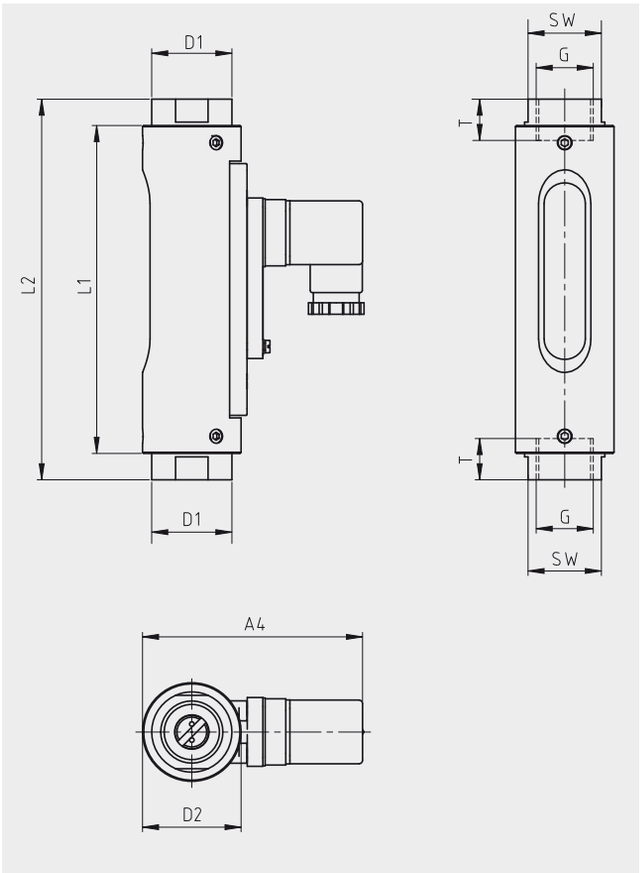
## Materials

Two different material versions (brass or stainless steel version) can be supplied. Special materials on request (e.g. Hastelloy, Monel)

| Component | Material | |
|---|---|---|
| | Brass version | Stainless steel version |
| **Wetted** | | |
| Main body | Nickel-plated brass | Stainless steel 1.4571 |
| Float body | Brass, nickel-plated brass | Stainless steel 1.4571 |
| Slotted nozzle | Nickel-plated brass | Stainless steel 1.4571 |
| Spring | Stainless steel 1.4571 (only models with mounting position as required) | |
| Compression fitting | Nickel-plated brass | Stainless steel 1.4571 |
| Sight-glass | Duran 50 | |
| Sealings | EPDM, NBR, FKM | |
| **Non-wetted** | | |
| Exterior case | Anodised aluminium (only models with sight-glass) | |

# Flow monitor, vertical mounting position, sight-glass display, for water and similar media, model FWS-DWG

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | Vertical |
| Display | Sight-glass |
| Process connections | Female thread G 1/4 ... 1 or 1/4 ... 1 NPT |
| Max. operating pressure | 10 bar |
| Pressure loss | 0.01 ... 0.2 bar |
| Tolerance | ±5 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

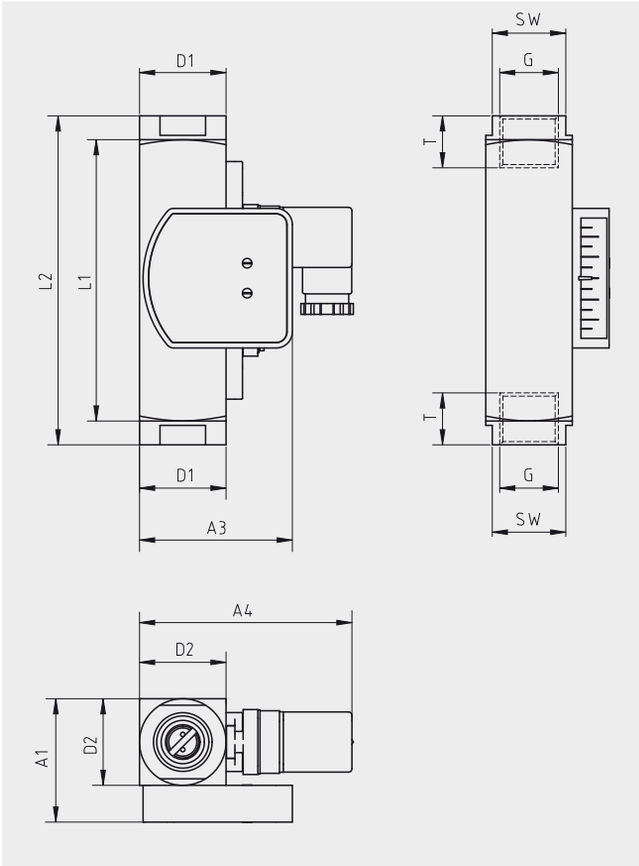
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | |
| **FWS-DWG-1.5** | 0.1 ... 1.5 | - | 35 | 43 | approx. 96 | 1/4" | 10 | 121 | 132 | 32 | 625 |
| | | | | | | 3/8" | 11 | 121 | 135 | | |
| | | | | | | 1/2" | 14 | 121 | 135 | | |
| **FWS-DWG-3** | 0.2 ... 3 | - | 35 | 43 | approx. 96 | 1/4" | 10 | 121 | 132 | 32 | 625 |
| | | | | | | 3/8" | 11 | 121 | 135 | | |
| | | | | | | 1/2" | 14 | 121 | 135 | | |
| **FWS-DWG-8** | 0.3 ... 8 | - | 35 | 43 | approx. 96 | 1/4" | 10 | 121 | 132 | 32 | 625 |
| | | | | | | 3/8" | 11 | 121 | 135 | | |
| | | | | | | 1/2" | 14 | 121 | 135 | | |
| **FWS-DWG-12** | 1 ... 12 | - | 35 | 43 | approx. 96 | 1/4" | 10 | 121 | 132 | 32 | 625 |
| | | | | | | 3/8" | 11 | 121 | 135 | | |
| | | | | | | 1/2" | 14 | 121 | 135 | | |
| **FWS-DWG-18** | 2 ... 18 | - | 35 | 43 | approx. 96 | 1/2" | 14 | 143 | 163 | 32 | 650 |
| | | | | | | 3/4" | 15 | 143 | 163 | | |
| **FWS-DWG-35** | 3 ... 35 | - | 45 | 50 | approx. 104 | 3/4" | 15 | 143 | 163 | 41 | 850 |
| | | | | | | 1" | 17 | 143 | 163 | 41 | 1,000 |
| **FWS-DWG-50** | 4 ... 50 | - | 45 | 50 | approx. 104 | 3/4" | 15 | 143 | 163 | 41 | 850 |
| | | | | | | 1" | 17 | 143 | 163 | 41 | 1,000 |

# Flow monitor, vertical mounting position, dial indicator, for water and similar media, model FWS-DWM/A

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | Vertical |
| Display | Dial indicator |
| Process connections | Female thread G 1/4 ... 1 or 1/4 ... 1 NPT |
| Max. operating pressure | 200 bar (stainless steel version 300 bar) |
| Pressure loss | 0.02 ... 0.2 bar |
| Tolerance | ±5 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

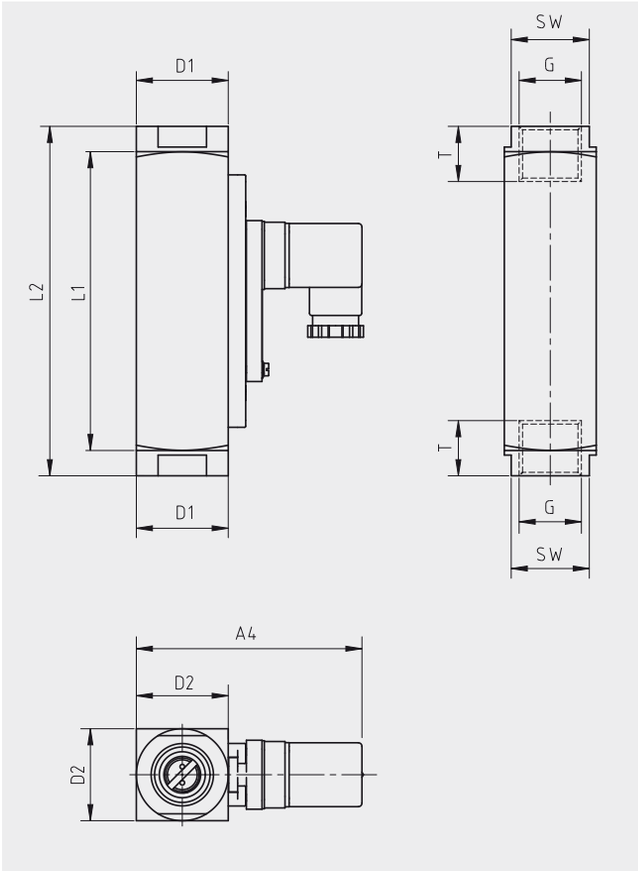
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1)] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1)] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D1 | D2 | A1 | A3 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-DWM/A-1.5** | 0.1 ... 1.5 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 850 |
| | | | | | | | | 3/8" | 11 | | | | |
| | | | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM/A-3** | 0.2 ... 3 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 850 |
| | | | | | | | | 3/8" | 11 | | | | |
| | | | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM/A-8** | 0.3 ... 8 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 850 |
| | | | | | | | | 3/8" | 11 | | | | |
| | | | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM/A-12** | 1 ... 12 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 850 |
| | | | | | | | | 3/8" | 11 | | | | |
| | | | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM/A-18** | 2 ... 18 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/2" | 14 | 132 | 146 | 27 | 800 |
| | | | 35 | 30 | | | | 3/4" | 15 | 132 | 174 | 32 | 1,010 |
| **FWS-DWM/A-35** | 3 ... 35 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,500 |
| | | | | | | | | 1" | 17 | 156 | 156 | 40 | 1,500 |
| **FWS-DWM/A-50** | 4 ... 50 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,500 |
| | | | | | | | | 1" | 17 | 156 | 156 | 40 | 1,500 |

# Flow monitor, vertical mounting position, without display, for water and similar media, model FWS-DWM

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | Vertical |
| Display | Without |
| Process connections | Female thread G 1/4 ... 1 or 1/4 ... 1 NPT |
| Max. operating pressure | 200 bar (stainless steel version 300 bar) |
| Pressure loss | 0.02 ... 0.2 bar |
| Tolerance | ±5 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

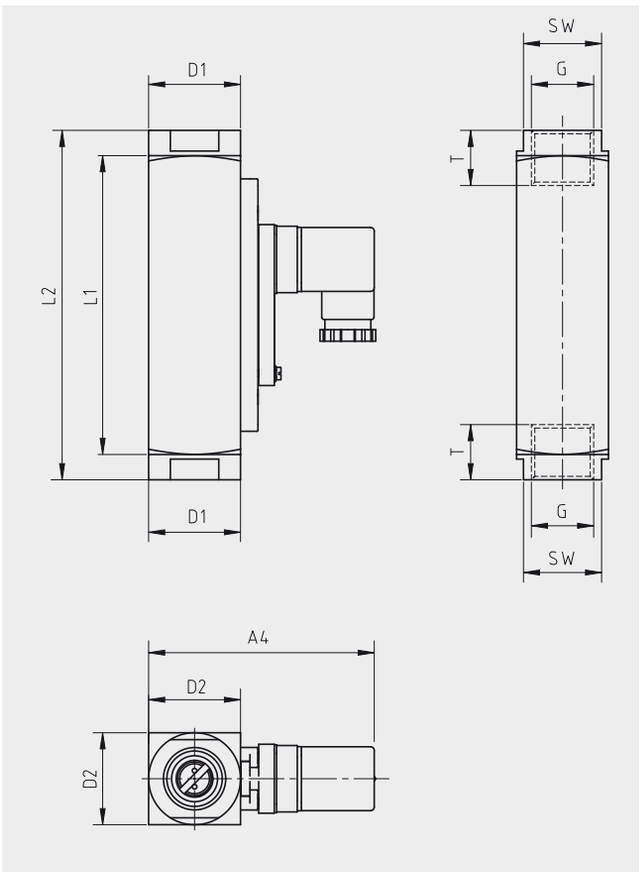
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-DWM-1.5** | 0.1 ... 1.5 | - | 30 | 30 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 800 |
| | | | | | | 3/8" | 11 | | | | |
| | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM-3** | 0.2 ... 3 | - | 30 | 30 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 800 |
| | | | | | | 3/8" | 11 | | | | |
| | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM-8** | 0.3 ... 8 | - | 30 | 30 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 800 |
| | | | | | | 3/8" | 11 | | | | |
| | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM-12** | 1 ... 12 | - | 30 | 30 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 800 |
| | | | | | | 3/8" | 11 | | | | |
| | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM-18** | 2 ... 18 | - | 30 | 30 | approx. 88 | 1/2" | 14 | 132 | 146 | 27 | 800 |
| | | | 35 | | | 3/4" | 15 | 132 | 174 | 32 | 960 |
| **FWS-DWM-35** | 3 ... 35 | - | 40 | 40 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,450 |
| | | | | | | 1" | 17 | 156 | 156 | 40 | 1,450 |
| **FWS-DWM-50** | 4 ... 50 | - | 40 | 40 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,450 |
| | | | | | | 1" | 17 | 156 | 156 | 40 | 1,450 |

# Flow monitor, vertical mounting position, without display, for gaseous media, model FWS-DWM-L

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | Vertical |
| Display | Without |
| Process connections | Female thread G 1/4 ... 1 or 1/4 ... 1 NPT |
| Max. operating pressure | 200 bar (stainless steel version 300 bar) |
| Pressure loss | 0.02 ... 0.4 bar |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 80 °C | IP 65 |
| 1 m cable | 80 °C | IP 67 |
| Instrument connector M12 x 1 | 80 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

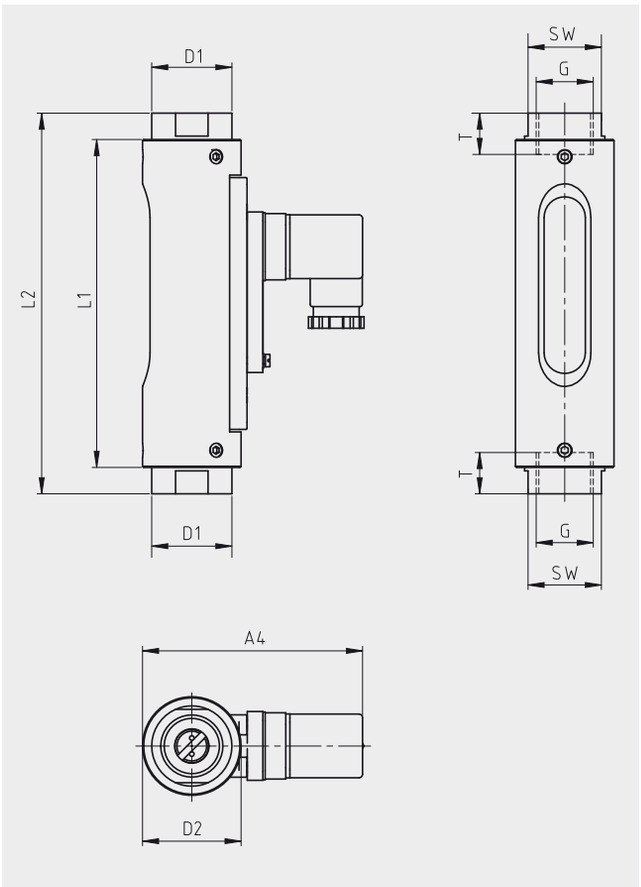
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ | Air at 1 bar abs. and 20 °C | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-DWM-L-1.5** | - | 1 ... 28 | 30 | 30 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 800 |
| | | | | | | 3/8" | 11 | | | | |
| | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM-L-3** | - | 4 ... 60 | 30 | 30 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 800 |
| | | | | | | 3/8" | 11 | | | | |
| | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM-L-8** | - | 6 ... 160 | 30 | 30 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 800 |
| | | | | | | 3/8" | 11 | | | | |
| | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM-L-12** | - | 20 ... 240 | 30 | 30 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 800 |
| | | | | | | 3/8" | 11 | | | | |
| | | | | | | 1/2" | 14 | | | | |
| **FWS-DWM-L-18** | - | 40 ... 360 | 30 | 30 | approx. 88 | 1/2" | 14 | 132 | 146 | 27 | 800 |
| | | | 35 | | | 3/4" | 15 | 132 | 174 | 32 | 960 |
| **FWS-DWM-L-50** | - | 60 ... 700 | 40 | 40 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,450 |
| | | | | | | 1" | 17 | 156 | 156 | 40 | 1,450 |
| **FWS-DWM-L-100** | - | 200 ... 1,450 | 40 | 40 | approx. 98 | 1" | 17 | 200 | 200 | 40 | 2,750 |

# Flow monitor, mounting position as required, sight-glass display, for water and similar media, model FWS-DUG

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | As required |
| Display | Sight-glass |
| Process connections | Female thread G 1/4 ... 1 1/4 or 1/4 ... 1 1/4 NPT |
| Max. operating pressure | 10 bar |
| Pressure loss | 0.02 ... 0.8 bar |
| Tolerance | ±5 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

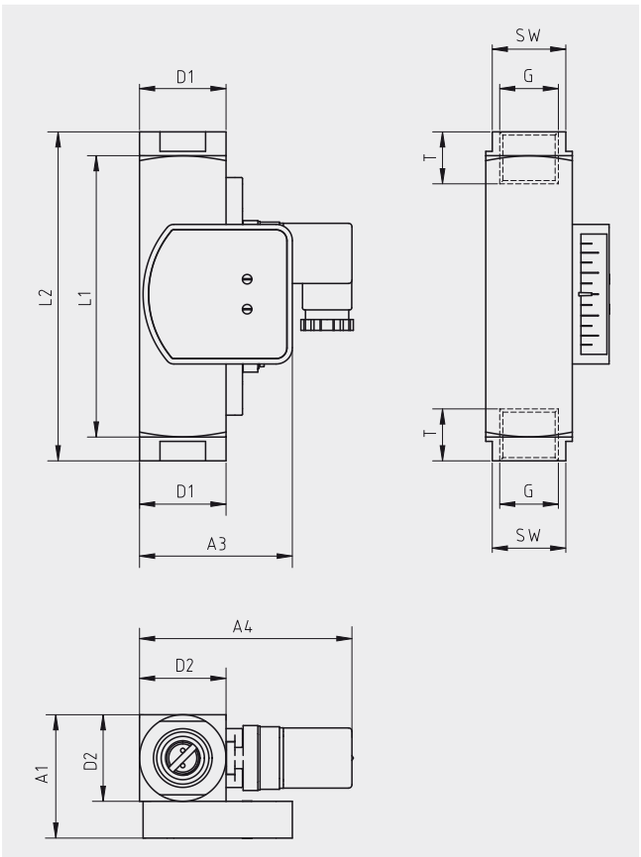
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | |
| **FWS-DUG-4** | 0.2 ... 4 | - | 35 | 43 | approx. 96 | 1/4" | 10 | 121 | 132 | 32 | 625 |
| | | | | | | 3/8" | 11 | 121 | 135 | | |
| | | | | | | 1/2" | 14 | 121 | 135 | | |
| **FWS-DUG-6** | 0.5 ... 6 | - | 35 | 43 | approx. 96 | 1/4" | 10 | 121 | 132 | 32 | 625 |
| | | | | | | 3/8" | 11 | 121 | 135 | | |
| | | | | | | 1/2" | 14 | 121 | 135 | | |
| **FWS-DUG-8** | 0.5 ... 8 | - | 35 | 43 | approx. 96 | 1/4" | 10 | 121 | 132 | 32 | 625 |
| | | | | | | 3/8" | 11 | 121 | 135 | | |
| | | | | | | 1/2" | 14 | 121 | 135 | | |
| **FWS-DUG-14** | 0.5 ... 14 | - | 35 | 43 | approx. 96 | 1/4" | 10 | 121 | 132 | 32 | 625 |
| | | | | | | 3/8" | 11 | 121 | 135 | | |
| | | | | | | 1/2" | 14 | 121 | 135 | | |
| **FWS-DUG-22** | 2 ... 22 | - | 35 | 43 | approx. 96 | 1/2" | 14 | 121 | 135 | 32 | 650 |
| **FWS-DUG-28** | 1 ... 28 | - | 35 | 43 | approx. 96 | 1/2" | 14 | 121 | 135 | 32 | 650 |
| **FWS-DUG-45** | 1 ... 45 | - | 35 | 43 | approx. 96 | 3/4" | 15 | 143 | 166 | 32 | 850 |
| **FWS-DUG-80** | 2 ... 80 | - | 45 | 50 | approx. 104 | 3/4" | 15 | 143 | 163 | 41 | 1,000 |
| | | | | | | 1" | 17 | 143 | 181 | 41 | 1,000 |
| **FWS-DUG-90** | 6 ... 90 | - | 45 | 50 | approx. 104 | 3/4" | 15 | 143 | 163 | 41 | 1,000 |
| | | | | | | 1" | 17 | 143 | 181 | 41 | 1,000 |
| **FWS-DUG-110** | 6 ... 110 | - | 45 | 50 | approx. 104 | 1" | 17 | 143 | 181 | 41 | 1,000 |
| **FWS-DUG-150** | 15 ... 150 | - | 55 | 55 | approx. 109 | 1 1/4" | 20 | 174 | 122 | 50 | 1,300 |
| **FWS-DUG-220** | 50 ... 220 | - | 60 | 60 | approx. 113 | 1 1/4" | 20 | 159 | 209 | 55 | 1,700 |
| **FWS-DUG-250** | 50 ... 250 | - | 55 | 55 | approx. 109 | 1 1/4" | 20 | 174 | 222 | 50 | 1,400 |

# Flow monitor, mounting position as required, dial indicator, for water and similar media, model FWS-DUM/A

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Dial indicator |
| Process connections | Female thread G 1/4 ... 1 1/2 or 1/4 ... 1 1/2 NPT |
| Max. operating pressure | 200 bar (stainless steel version 300 bar) |
| Pressure loss | 0.02 ... 0.8 bar |
| Tolerance | ±5 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

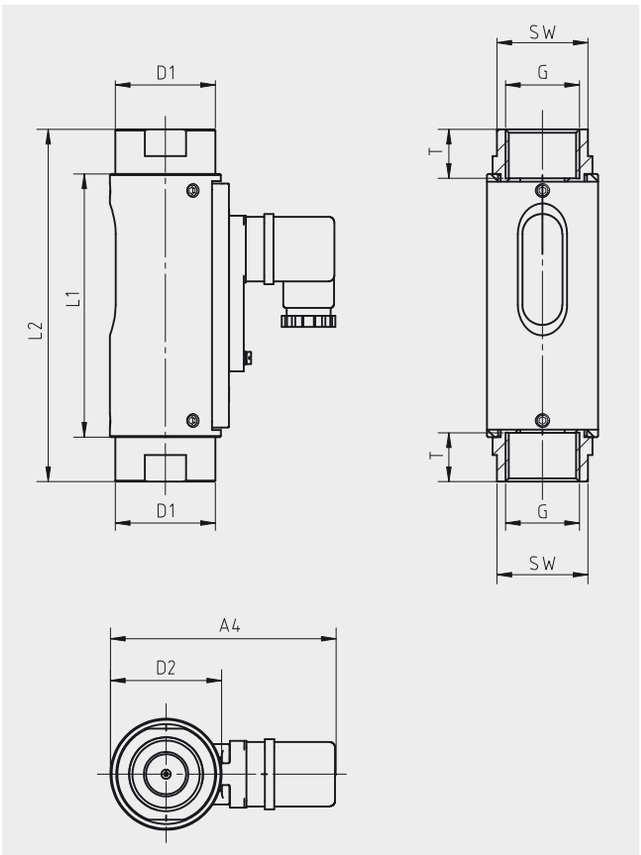
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D1 | D2 | A1 | A3 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-DUM/A-4** | 0.2 ... 4 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 900 |
| | | | | | | | | 3/8" | 11 | | | | |
| | | | | | | | | 1/2" | 14 | | | | |
| **FWS-DUM/A-5** | 0.6 ... 5 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 900 |
| | | | | | | | | 3/8" | 11 | | | | |
| | | | | | | | | 1/2" | 14 | | | | |
| **FWS-DUM/A-8** | 0.5 ... 8 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 900 |
| | | | | | | | | 3/8" | 11 | | | | |
| | | | | | | | | 1/2" | 14 | | | | |
| **FWS-DUM/A-14** | 1 ... 14 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 900 |
| | | | | | | | | 3/8" | 11 | | | | |
| | | | | | | | | 1/2" | 14 | | | | |
| **FWS-DUM/A-28** | 1 ... 28 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/4" | 10 | 117 | 131 | 27 | 900 |
| | | | | | | | | 3/8" | 11 | | | | |
| | | | | | | | | 1/2" | 14 | | | | |
| **FWS-DUM/A-40** | 2 ... 40 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/2" | 14 | 132 | 146 | 27 | 950 |
| | | | 35 | 30 | | | | 3/4" | 15 | 132 | 174 | 32 | 950 |
| **FWS-DUM/A-55** | 4 ... 55 | - | 30 | 30 | 47 | 65.5 | approx. 88 | 1/2" | 14 | 132 | 146 | 27 | 950 |
| | | | 35 | 30 | | | | 3/4" | 15 | 132 | 174 | 32 | 950 |
| **FWS-DUM/A-70** | 1 ... 70 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,450 |
| | | | | | | | | 1" | 17 | 156 | 156 | 40 | 1,150 |
| **FWS-DUM/A-90** | 8 ... 90 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,450 |
| | | | | | | | | 1" | 17 | 156 | 156 | 40 | 1,150 |
| **FWS-DUM/A-110** | 5 ... 110 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,450 |
| | | | | | | | | 1" | 17 | 156 | 156 | 40 | 1,150 |
| **FWS-DUM/A-150** | 10 ... 150 | - | 50 | 50 | 67 | 75.5 | approx. 108 | 1 1/4" | 20 | 200 | 200 | 50 | 2,800 |
| **FWS-DUM/A-220** | 35 ... 220 | - | 50 | 50 | 67 | 75.5 | approx. 108 | 1 1/4" | 20 | 200 | 200 | 50 | 1,450 |
| | | | 60 | 60 | 70.8 | 80.5 | approx. 108 | 1 1/2" | 20 | 200 | 200 | 60 | 1,150 |
| **FWS-DUM/A-250** | 35 ... 250 | - | 50 | 50 | 67 | 75.5 | approx. 108 | 1 1/4" | 20 | 200 | 200 | 50 | 1,450 |
| | | | 60 | 60 | 70.8 | 80.5 | approx. 108 | 1 1/2" | 20 | 200 | 200 | 60 | 1,150 |

# Flow monitor, mounting position as required, sight-glass display, for oil and similar media, model FWS-DKG-1

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | As required |
| Display | Sight-glass |
| Process connections | Female thread G 1/4 ... 1 or 1/4 ... 1 NPT |
| Max. operating pressure | 10 bar |
| Pressure loss | 0.02 ... 0.4 bar |
| Viscosity compensation | up to 600 mm²/s |
| Tolerance | ±10 % of full scale value |

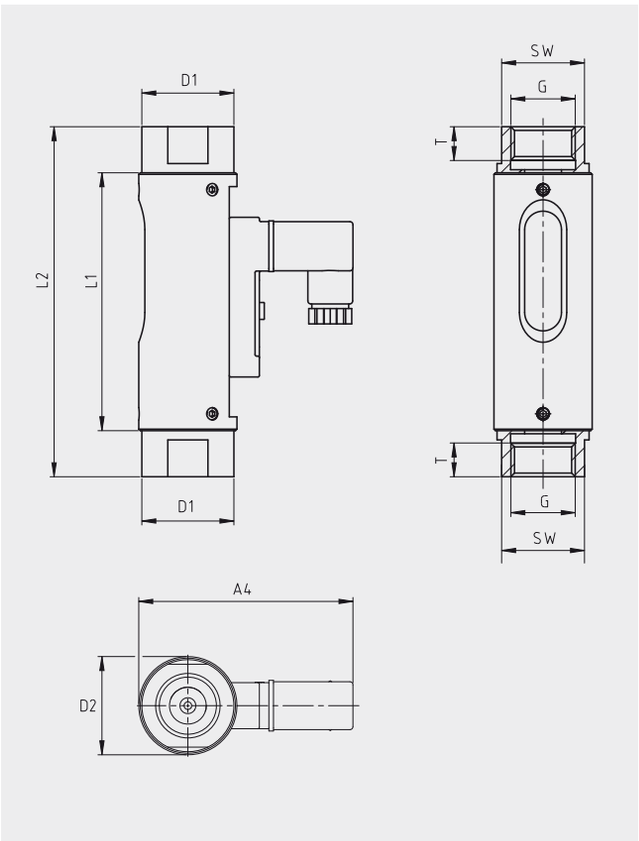
| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 120 °C (option 160 °C) | IP 65 |
| 1 m cable | 120 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oil, density 0.9 kg/m³ | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-DKG-1/1** | 0.1 ... 0.8 | - | 41 | 50 | approx. 99 | 1/4" | 10 | 118.5 | 144.5 | 41 | 850 |
| | | | | | | 1/2" | 14 | 118.5 | 144.5 | | |
| | | | | | | 3/4" | 15 | 118.5 | 138.5 | | |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |
| **FWS-DKG-1/2** | 0.5 ... 1.5 | - | 41 | 50 | approx. 99 | 1/4" | 10 | 118.5 | 144.5 | 41 | 850 |
| | | | | | | 1/2" | 14 | 118.5 | 144.5 | | |
| | | | | | | 3/4" | 15 | 118.5 | 138.5 | | |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |
| **FWS-DKG-1/4** | 1 ... 4 | - | 41 | 50 | approx. 99 | 1/4" | 10 | 118.5 | 144.5 | 41 | 850 |
| | | | | | | 1/2" | 14 | 118.5 | 144.5 | | |
| | | | | | | 3/4" | 15 | 118.5 | 138.5 | | |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |
| **FWS-DKG-1/8** | 2 ... 8 | - | 41 | 50 | approx. 99 | 1/2" | 14 | 118.5 | 144.5 | 41 | 850 |
| | | | | | | 3/4" | 15 | 118.5 | 138.5 | | |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |
| **FWS-DKG-1/10** | 3 ... 10 | - | 41 | 50 | approx. 99 | 1/2" | 14 | 118.5 | 144.5 | 41 | 850 |
| | | | | | | 3/4" | 15 | 118.5 | 138.5 | | |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |
| **FWS-DKG-1/15** | 5 ... 15 | - | 41 | 50 | approx. 99 | 1/2" | 14 | 118.5 | 144.5 | 41 | 850 |
| | | | | | | 3/4" | 15 | 118.5 | 138.5 | | |
| | | | | | | 1" | 17 | 118.5 | 159.5 | | |
| **FWS-DKG-1/24** | 8 ... 24 | - | 41 | 50 | approx. 99 | 1/2" | 14 | 118.5 | 144.5 | 41 | 850 |
| | | | | | | 3/4" | 15 | 118.5 | 138.5 | | |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |
| **FWS-DKG-1/30** | 10 ... 30 | - | 41 | 50 | approx. 99 | 3/4" | 15 | 118.5 | 138.5 | 41 | 850 |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |
| **FWS-DKG-1/45** | 15 ... 45 | - | 41 | 50 | approx. 99 | 3/4" | 15 | 118.5 | 138.5 | 41 | 850 |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |
| **FWS-DKG-1/60** | 20 ... 60 | - | 41 | 50 | approx. 99 | 3/4" | 15 | 118.5 | 138.5 | 41 | 850 |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |
| **FWS-DKG-1/90** | 30 ... 90 | - | 41 | 50 | approx. 99 | 3/4" | 15 | 118.5 | 138.5 | 41 | 850 |
| | | | | | | 1" | 17 | 118.5 | 158.5 | | |

# Flow monitor, mounting position as required, sight-glass display, for oil and similar media, model FWS-DKG-2




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | As required |
| Display | Sight-glass |
| Process connections | Female thread G 1/2 or 1/2 NPT |
| Max. operating pressure | 16 bar |
| Pressure loss | 0.02 ... 0.2 bar |
| Viscosity compensation | up to 600 $mm^2/s$ |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 120 °C (option 160 °C) | IP 65 |
| 1 m cable | 120 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |

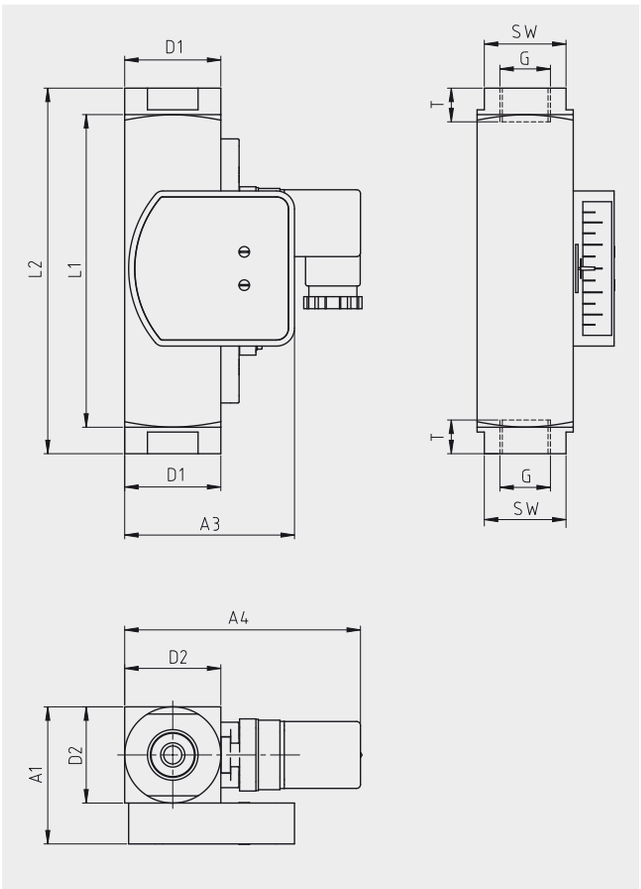
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 230 V / 3 A / 60 VA | 250 V / 1.5 A / 50 VA [1) 2)] |

1) Minimum load 3 VA
2) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oil, density 0.9 kg/$m^3$ | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-DKG-2/2** | 0.5 ... 1.7 | | | | | | | | | | |
| **FWS-DKG-2/4** | 1.3 ... 4 | - | 30 | 32 | approx. 70 | 1/2" | 14 | 84 | 114 | 27 | 300 |
| **FWS-DKG-2/8** | 2.5 ... 8 | | | | | | | | | | |

# Flow monitor, mounting position as required, dial indicator, for oil and similar media, model FWS-DKM/A-1

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Dial indicator |
| Process connections | Female thread G 1/4 ... 1 or 1/4 ... 1 NPT |
| Max. operating pressure | 200 bar (stainless steel version 300 bar) |
| Pressure loss | 0.02 ... 0.4 bar |
| Viscosity compensation | up to 600 mm²/s |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 120 °C (option 160 °C) | IP 65 |
| 1 m cable | 120 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

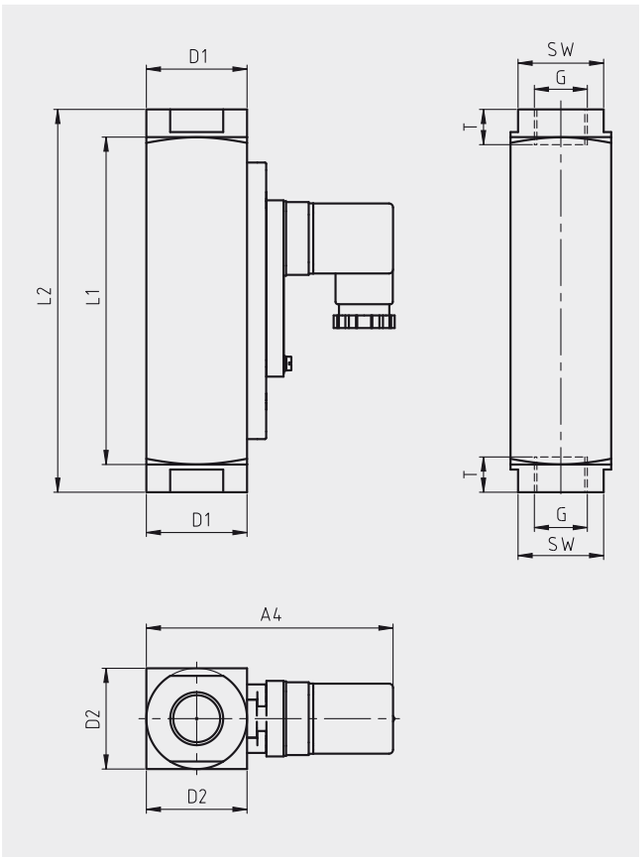
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oil, density 0.9 kg/m³ | Air | D1 | D2 | A1 | A3 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-DKM/A-1/2** | 0.5 ... 1.5 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 1/4" | 10 | 130 | 152 | 34 | 1,590 |
| | | | | | | | | 1/2" | 14 | 130 | 152 | 34 | 1,515 |
| | | | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,430 |
| | | | | | | | | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/4** | 1 ... 4 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 1/4" | 10 | 130 | 152 | 34 | 1,590 |
| | | | | | | | | 1/2" | 14 | 130 | 152 | 34 | 1,515 |
| | | | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,430 |
| | | | | | | | | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/8** | 2 ... 8 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 1/2" | 14 | 130 | 152 | 34 | 1,515 |
| | | | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,430 |
| | | | | | | | | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/10** | 3 ... 10 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 1/2" | 14 | 130 | 152 | 34 | 1,515 |
| | | | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,430 |
| | | | | | | | | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/15** | 5 ... 15 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 1/2" | 14 | 130 | 152 | 34 | 1,515 |
| | | | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,430 |
| | | | | | | | | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/24** | 8 ... 24 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 1/2" | 14 | 130 | 152 | 34 | 1,515 |
| | | | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,430 |
| | | | | | | | | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/30** | 10 ... 30 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,430 |
| | | | | | | | | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/45** | 15 ... 45 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,430 |
| | | | | | | | | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/60** | 20 ... 60 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,430 |
| | | | | | | | | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/90** | 30 ... 90 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 1" | 17 | 130 | 130 | 40 | 1,250 |
| **FWS-DKM/A-1/110** | 35 ... 110 | - | 40 | 40 | 57 | 70.5 | approx. 98 | 1" | 17 | 130 | 130 | 40 | 1,250 |

# Flow monitor, mounting position as required, without display, for oil and similar media, model FWS-DKM-1

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Without |
| Process connections | Female thread G 1/4 ... 1 or 1/4 ... 1 NPT |
| Max. operating pressure | 200 bar (stainless steel version 300 bar) |
| Pressure loss | 0.02 ... 0.4 bar |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 120 °C (option 160 °C) | IP 65 |
| 1 m cable | 120 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

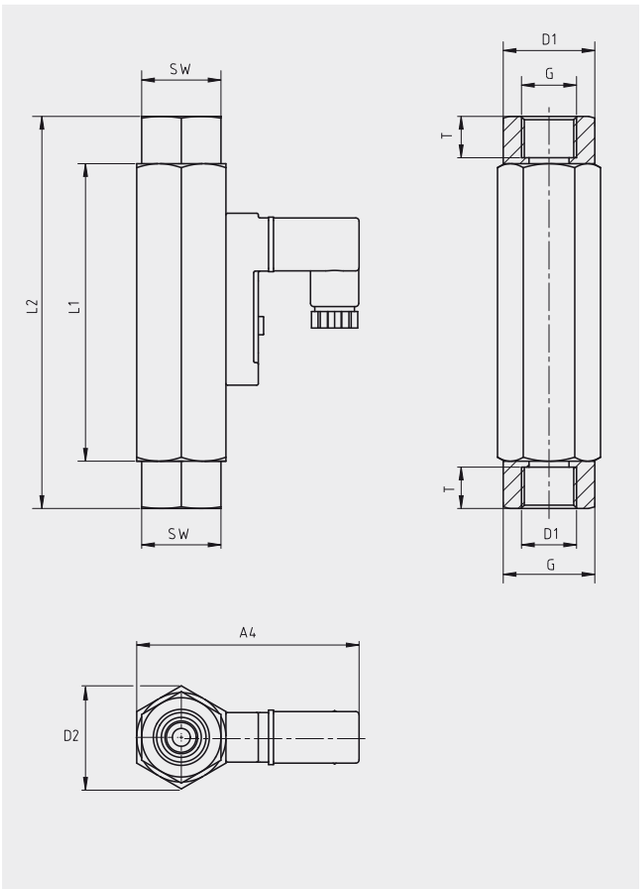
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oil, density 0.9 kg/m³ | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-DKM-1/2** | 0.5 ... 1.5 | - | 40 | 40 | approx. 98 | 1/4" | 10 | 130 | 152 | 34 | 1,500 |
| | | | | | | 1/2" | 14 | 130 | 152 | 34 | 1,425 |
| | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,340 |
| | | | | | | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/4** | 1 ... 4 | - | 40 | 40 | approx. 98 | 1/4" | 10 | 130 | 152 | 34 | 1,500 |
| | | | | | | 1/2" | 14 | 130 | 152 | 34 | 1,425 |
| | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,340 |
| | | | | | | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/8** | 2 ... 8 | - | 40 | 40 | approx. 98 | 1/2" | 14 | 130 | 152 | 34 | 1,425 |
| | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,340 |
| | | | | | | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/10** | 3 ... 10 | - | 40 | 40 | approx. 98 | 1/2" | 14 | 130 | 152 | 34 | 1,425 |
| | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,340 |
| | | | | | | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/15** | 5 ... 15 | - | 40 | 40 | approx. 98 | 1/2" | 14 | 130 | 152 | 34 | 1,425 |
| | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,340 |
| | | | | | | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/24** | 8 ... 24 | - | 40 | 40 | approx. 98 | 1/2" | 14 | 130 | 152 | 34 | 1,425 |
| | | | | | | 3/4" | 15 | 130 | 152 | 34 | 1,340 |
| | | | | | | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/30** | 10 ... 30 | - | 40 | 40 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,340 |
| | | | | | | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/45** | 15 ... 45 | - | 40 | 40 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,340 |
| | | | | | | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/60** | 20 ... 60 | - | 40 | 40 | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,340 |
| | | | | | | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/90** | 30 ... 90 | - | 40 | 40 | approx. 98 | 1" | 17 | 130 | 130 | 40 | 1,160 |
| **FWS-DKM-1/110** | 35 ... 110 | - | 40 | 40 | approx. 98 | 1" | 17 | 130 | 130 | 40 | 1,160 |

# Flow monitor, mounting position as required, without display, for oil and similar media, model FWS-DKM-2

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Without |
| Process connections | Female thread G 1/4 ... 1/2 or 1/4 ... 1/2 NPT |
| Max. operating pressure | 300 bar (stainless steel version 350 bar) |
| Pressure loss | 0.02 ... 0.2 bar |
| Viscosity compensation | up to 600 $mm^2/s$ |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 120 °C (option 160 °C) | IP 65 |
| 1 m cable | 120 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |
| Ex version (2 m cable) | 75 °C | IP 67 |

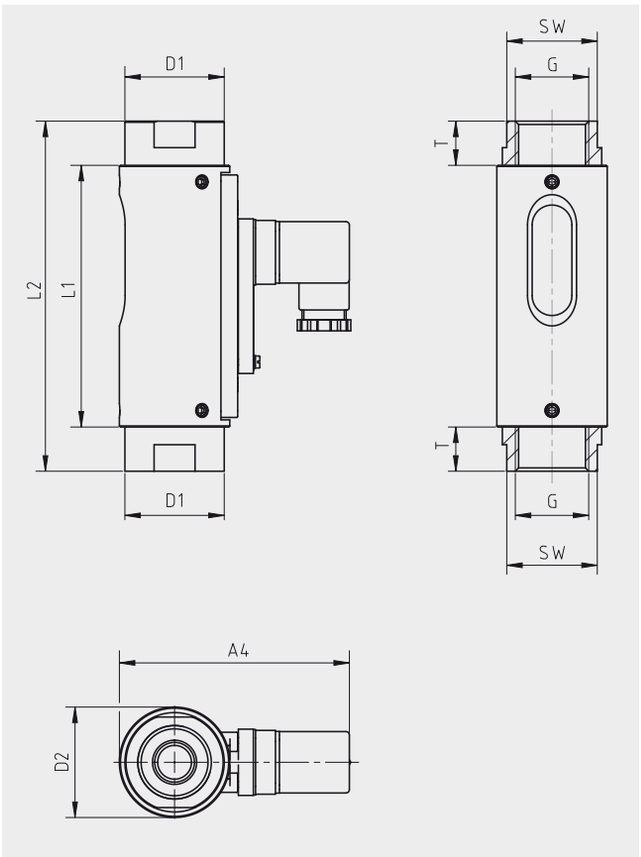
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 230 V / 3 A / 60 VA | 250 V / 1.5 A / 50 VA [1) 2)] |
| Ex version | 250 V / 2 A / 60 VA ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1)] |

1) Minimum load 3 VA
2) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oil, density 0.9 kg/$m^3$ | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| | | | 27.5 | 31 | approx. 68 | 1/4" | 10 | 90 | 98 | 24 | 400 |
| **FWS-DKM-2/2** | 0.5 ... 1.6 | - | 27.5 | 31 | approx. 68 | 3/8" | 11 | 90 | 119 | 24 | 450 |
| | | | 31 | 31 | approx. 68 | 1/2" | 14 | 90 | 90 | 27 | 350 |
| **FWS-DKM-2/3** | 0.8 ... 3 | - | 31 | 31 | approx. 68 | 1/2" | 14 | 90 | 90 | 27 | 350 |
| **FWS-DKM-2/7** | 2 ... 7 | - | 31 | 31 | approx. 68 | 1/2" | 14 | 90 | 90 | 27 | 350 |

# Flow monitor, mounting position as required, sight-glass display, for water and similar media, model FWS-RVO/U-1

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | As required |
| Display | Sight-glass |
| Process connections | Female thread G 3/4 ... 1 or 3/4 ... 1 NPT |
| Max. operating pressure | 10 bar |
| Pressure loss | 0.02 ... 0.4 bar |
| Tolerance | ±10 % of full scale value |

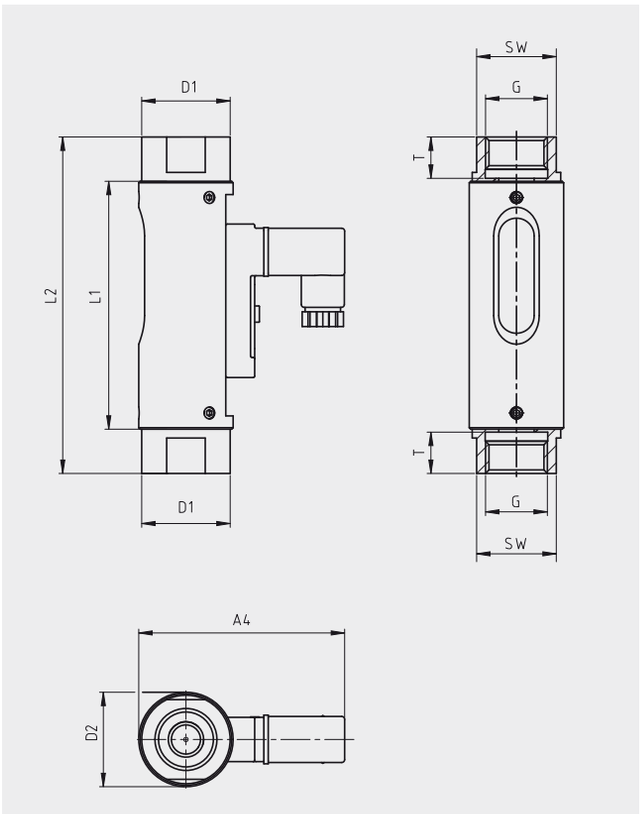
| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-RVO/U-1/30** | 8 ... 30 | - | 45 | 50 | approx. 105 | 3/4" | 15 | 119 | 139 | 41 | 800 |
| | | | | | | 1" | 17 | 119 | 159 | 41 | 900 |
| **FWS-RVO/U-1/45** | 15 ... 45 | - | 45 | 50 | approx. 105 | 3/4" | 15 | 119 | 139 | 41 | 800 |
| | | | | | | 1" | 17 | 119 | 159 | 41 | 900 |
| **FWS-RVO/U-1/90** | 30 ... 90 | - | 45 | 50 | approx. 105 | 3/4" | 15 | 119 | 139 | 41 | 800 |
| | | | | | | 1" | 17 | 119 | 159 | 41 | 900 |
| **FWS-RVO/U-1/150** | 60 ... 150 | - | 45 | 50 | approx. 105 | 1" | 17 | 119 | 159 | 41 | 900 |

# Flow monitor, mounting position as required, sight-glass display, for water and similar media, model FWS-RVO/U-2




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | As required |
| Display | Sight-glass |
| Process connections | Female thread G 1/2 or 1/2 NPT |
| Max. operating pressure | 16 bar |
| Pressure loss | 0.02 ... 0.3 bar |
| Tolerance | ±10 % of full scale value |

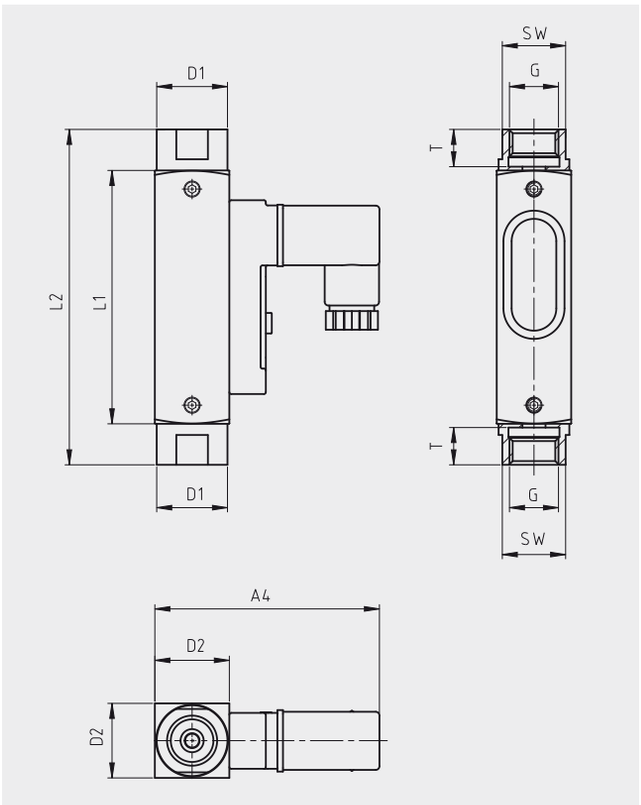
| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 230 V / 3 A / 60 VA | 250 V / 1.5 A / 50 VA [1) 2)] |

1) Minimum load 3 VA
2) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | |
| **FWS-RVO/U-2/05** | 0.2 ... 0.5 | - | 30 | 32 | approx. 69 | 1/2" | 14 | 84 | 114 | 27 | 300 |
| **FWS-RVO/U-2/1** | 0.3 ... 1.0 | - | | | | | | | | | |
| **FWS-RVO/U-2/2** | 0.7 ... 2.0 | - | | | | | | | | | |
| **FWS-RVO/U-2/4** | 1.6 ... 4 | - | | | | | | | | | |
| **FWS-RVO/U-2/8** | 3 ... 8 | - | | | | | | | | | |
| **FWS-RVO/U-2/15** | 6 ... 15 | - | | | | | | | | | |
| **FWS-RVO/U-2/20** | 8 ... 20 | - | | | | | | | | | |
| **FWS-RVO/U-2/28** | 12 ... 28 | - | | | | | | | | | |

# Flow monitor, mounting position as required, sight-glass display, for water and similar media, model FWS-RVO/U-4




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | As required |
| Display | Sight-glass |
| Process connections | Female thread G 1/2 or 1/2 NPT |
| Max. operating pressure | 16 bar |
| Pressure loss | 0.02 ... 0.2 bar |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |

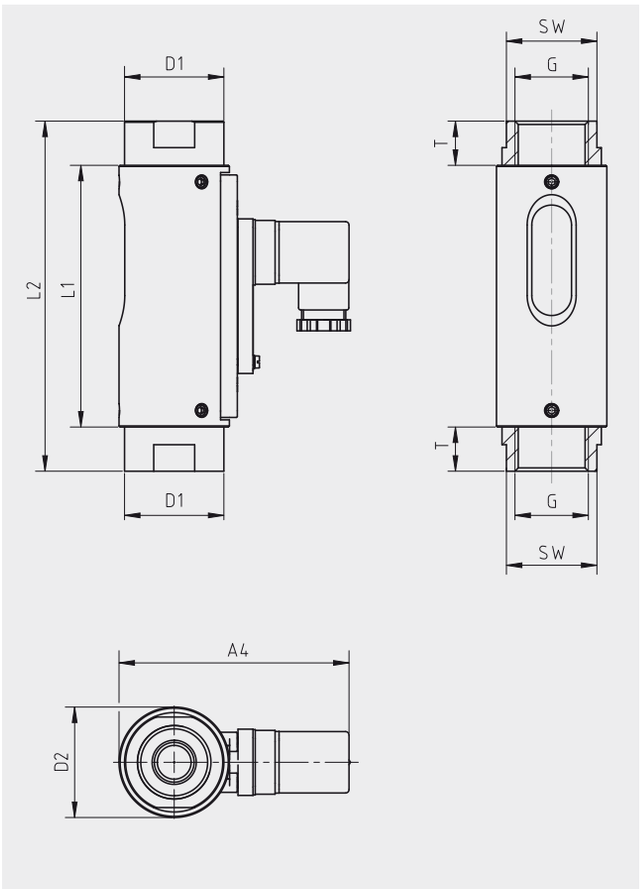
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 200 V / 1 A / 20 VA | 200 V / 1 A / 20 VA [1)] |

1) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | |
| **FWS-RVO/U-4/01** | 0.005 ... 0.06 | - | | | | | | | | | |
| **FWS-RVO/U-4/02** | 0.025 ... 0.13 | - | | | | | | | | | |
| **FWS-RVO/U-4/06** | 0.1 ... 0.6 | - | | | | | | | | | |
| **FWS-RVO/U-4/1** | 0.2 ... 1.2 | - | 19 | 20 | approx. 60 | 1/2" | 10 | 68 | 90 | 17 | 140 |
| **FWS-RVO/U-4/2** | 0.4 ... 2 | - | | | | | | | | | |
| **FWS-RVO/U-4/3** | 0.5 ... 3 | - | | | | | | | | | |
| **FWS-RVO/U-4/5** | 1 ... 5 | - | | | | | | | | | |

# Flow monitor, mounting position as required, sight-glass display, for gaseous media, model FWS-RVO/U-L1

Option: Explosion-protected version




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | As required |
| Display | Sight-glass |
| Process connections | Female thread G 3/4 ... 1 or 3/4 ... 1 NPT |
| Max. operating pressure | 10 bar |
| Pressure loss | 0.02 ... 0.4 bar |
| Tolerance | ±10 % of full scale value |

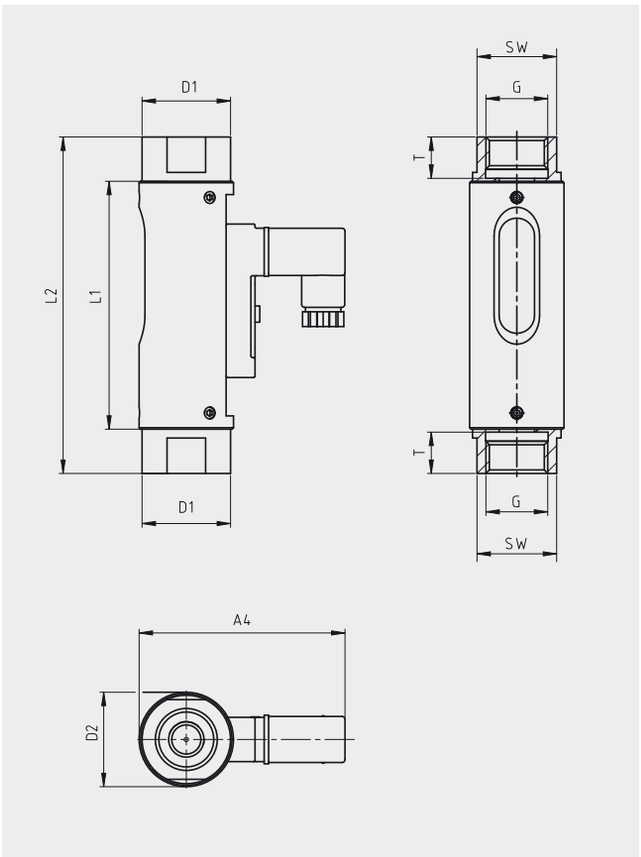
| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ | Air at 1 bar abs. and 20 °C | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-RVO/U-L10080** | - | 22.5 ... 80 | 45 | 50 | approx. 105 | 3/4" | 15 | 119 | 139 | 41 | 800 |
| | | | | | | 1" | 17 | 119 | 159 | 41 | 900 |
| **FWS-RVO/U-L10130** | - | 50 ... 130 | 45 | 50 | approx. 105 | 3/4" | 15 | 119 | 139 | 41 | 800 |
| | | | | | | 1" | 17 | 119 | 159 | 41 | 900 |
| **FWS-RVO/U-L10420** | - | 130 ... 420 | 45 | 50 | approx. 105 | 3/4" | 15 | 119 | 139 | 41 | 800 |
| | | | | | | 1" | 17 | 119 | 159 | 41 | 900 |
| **FWS-RVO/U-L10625** | - | 200 ... 625 | 45 | 50 | approx. 105 | 3/4" | 15 | 119 | 139 | 41 | 800 |
| | | | | | | 1" | 17 | 119 | 159 | 41 | 900 |

# Flow monitor, mounting position as required, sight-glass display, for gaseous media, model FWS-RVO/U-L2




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | As required |
| Display | Sight-glass |
| Process connections | Female thread G 1/2 or 1/2 NPT |
| Max. operating pressure | 16 bar |
| Pressure loss | 0.02 ... 0.3 bar |
| Tolerance | ±10 % of full scale value |

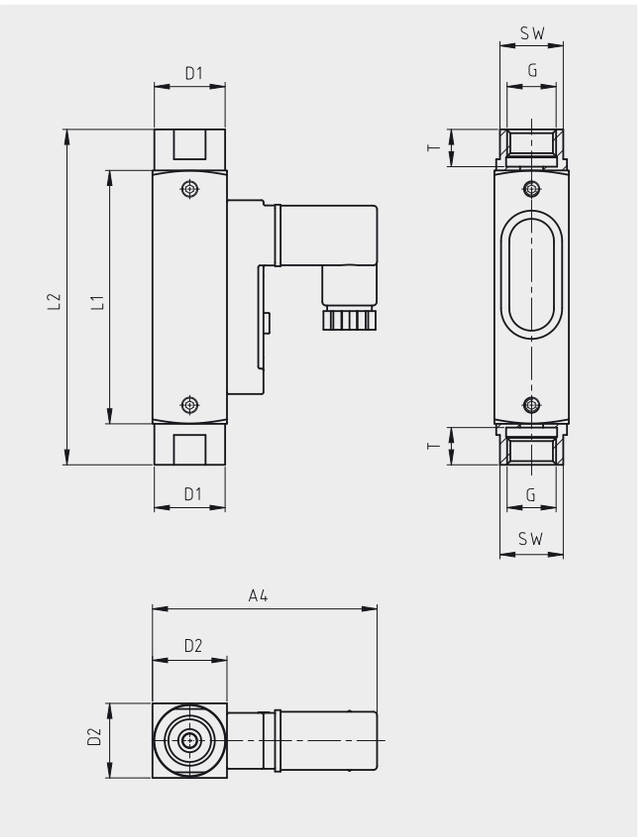
| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 230 V / 3 A / 60 VA | 250 V / 1.5 A / 50 VA [1) 2)] |

1) Minimum load 3 VA
2) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ | Air at 1 bar abs. and 20 °C | D1 | D2 | A4 | G | T | L1 | L2 | SW | |
| **FWS-RVO/U-L20012** | - | 3 ... 12 | | | | | | | | | |
| **FWS-RVO/U-L20030** | - | 7 ... 30 | | | | | | | | | |
| **FWS-RVO/U-L20040** | - | 12 ... 40 | | | | | | | | | |
| **FWS-RVO/U-L20125** | - | 28 ...125 | 30 | 32 | approx. 70 | 1/2" | 14 | 84 | 114 | 27 | 300 |
| **FWS-RVO/U-L20200** | - | 50 ... 200 | | | | | | | | | |
| **FWS-RVO/U-L2/15L** | - | 100 ... 420 | | | | | | | | | |
| **FWS-RVO/U-L2/20L** | - | 120 ... 480 | | | | | | | | | |

# Flow monitor, mounting position as required, sight-glass display, for gaseous media, model FWS-RVO/U-L4




| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571<br>Exterior case from anodised aluminium |
| Mounting position | As required |
| Display | Sight-glass |
| Process connections | Female thread G 1/4 or 1/4 NPT |
| Max. operating pressure | 16 bar |
| Pressure loss | 0.02 ... 0.2 bar |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |

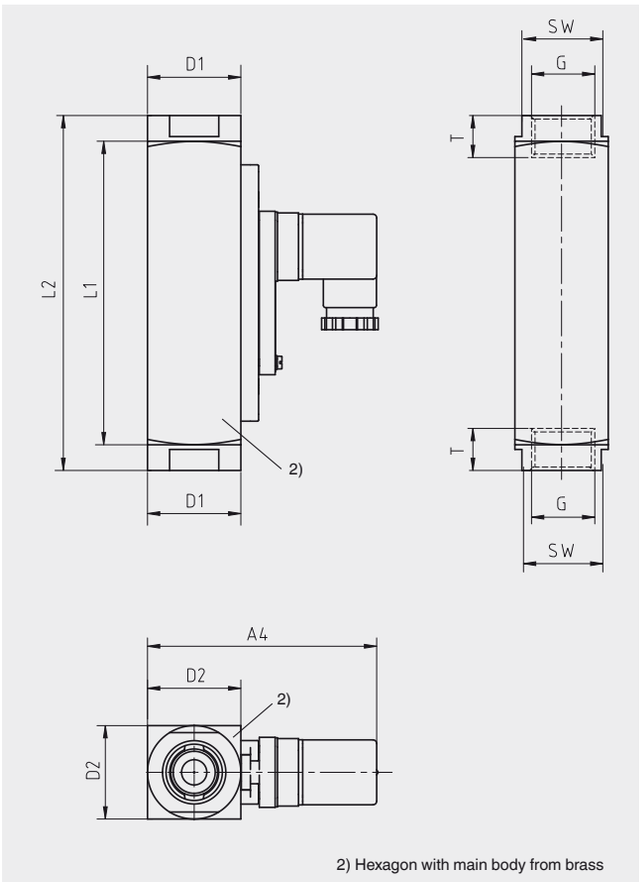
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 200 V / 1 A / 20 VA | 200 V / 1 A / 20 VA [1)] |

1) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ | Air at 1 bar abs. and 20 °C | D1 | D2 | A4 | G | T | L1 | L2 | SW | |
| **FWS-RVO/U-L40001** | - | 0.2 ... 1.3 | | | | | | | | | |
| **FWS-RVO/U-L40002** | - | 0.5 ... 2 | | | | | | | | | |
| **FWS-RVO/U-L40003** | - | 0.8 ... 3 | | | | | | | | | |
| **FWS-RVO/U-L40005** | - | 1.5 ... 5 | | | | | | | | | |
| **FWS-RVO/U-L40008** | - | 2 ... 8 | | | | | | | | | |
| **FWS-RVO/U-L40012** | - | 3 ... 12 | 19 | 20 | approx. 60 | 1/4" | 10 | 68 | 90 | 17 | 140 |
| **FWS-RVO/U-L40014** | - | 3.5 ... 14 | | | | | | | | | |
| **FWS-RVO/U-L40020** | - | 5.5 ... 20 | | | | | | | | | |
| **FWS-RVO/U-L40024** | - | 7 ... 24 | | | | | | | | | |
| **FWS-RVO/U-L40035** | - | 10 ... 35 | | | | | | | | | |
| **FWS-RVO/U-L40042** | - | 10 ... 42 | | | | | | | | | |

# Flow monitor, mounting position as required, without display, for water and similar media, model FWS-RVM/U-1

Option: Explosion-protected version




2) Hexagon with main body from brass

| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Without |
| Process connections | Female thread G 3/4 ... 1 or 3/4 ... 1 NPT |
| Max. operating pressure | 250 bar (stainless steel version 300 bar) |
| Pressure loss | 0.02 ... 0.4 bar |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1)] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1)] |

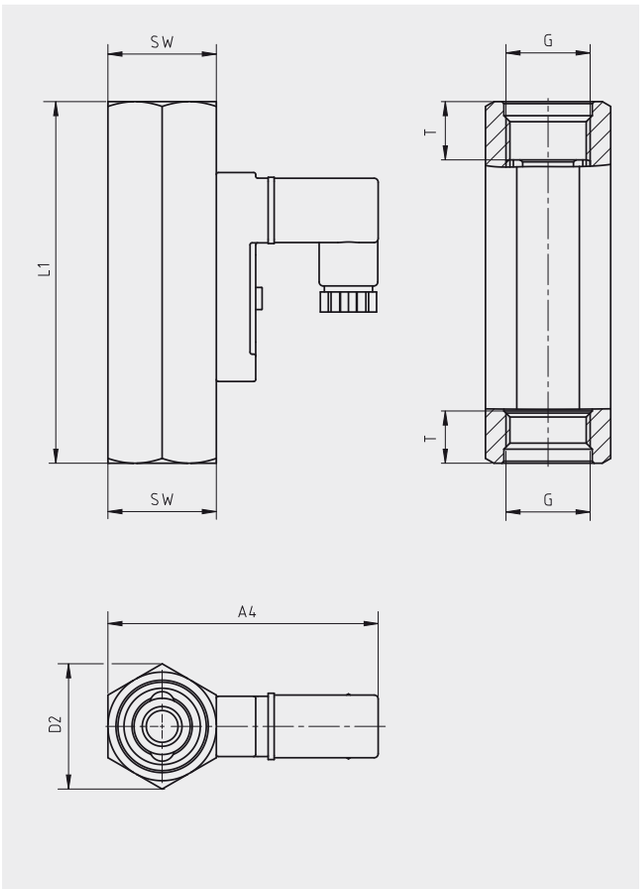
1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-RVM/U-1/30** | 10 ... 30 | - | 40 | 40 [3)] | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,200 |
| | | | | | | 1" | 17 | 130 | 130 | 41 | 1,050 |
| **FWS-RVM/U-1/45** | 15 ... 45 | - | 40 | 40 [3)] | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,200 |
| | | | | | | 1" | 17 | 130 | 130 | 41 | 1,050 |
| **FWS-RVM/U-1/60** | 20 ... 60 | - | 40 | 40 [3)] | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,200 |
| | | | | | | 1" | 17 | 130 | 130 | 41 | 1,050 |
| **FWS-RVM/U-1/90** | 30 ... 90 | - | 40 | 40 [3)] | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,200 |
| | | | | | | 1" | 17 | 130 | 130 | 41 | 1,050 |
| **FWS-RVO/U-1/150** | 60 ... 150 | - | 40 | 40 [3)] | approx. 98 | 1" | 17 | 130 | 152 | 41 | 1,050 |

3) With main body from brass, hexagon: 47.3 mm

# Flow monitor, mounting position as required, without display, for water and similar media, model FWS-RVM/U-2

Option: Explosion-protected version





| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Without |
| Process connections | Female thread G 1/2 or 1/2 NPT |
| Max. operating pressure | 250 bar (stainless steel version 300 bar) |
| Pressure loss | 0.02 ... 0.3 bar |
| Tolerance | ±10 % of full scale value |

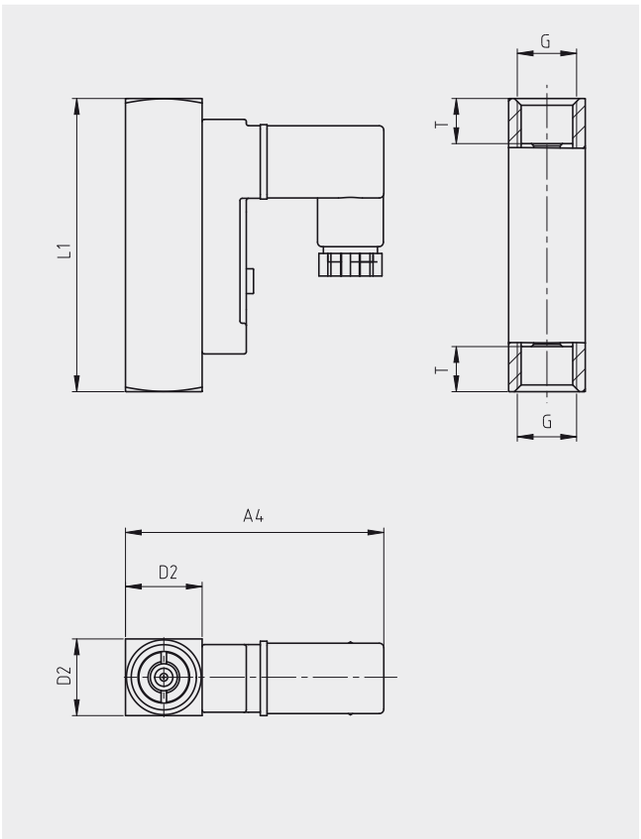
| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |
| Ex version (2 m cable) | 75 °C | IP 67 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 230 V / 3 A / 60 VA | 250 V / 1.5 A / 50 VA [1) 2)] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1)] |

1) Minimum load 3 VA
2) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D2 | A4 | G | T | L1 | SW | |
| **FWS-RVM/U-2/02** | 0.02 ... 0.2 | - | 32 | approx. 67 | 1/2" | 14 | 90 | 27 | 350 |
| **FWS-RVM/U-2/06** | 0.2 ... 0.6 | - | | | | | | | |
| **FWS-RVM/U-2/1** | 0.4 ... 1.8 | - | | | | | | | |
| **FWS-RVM/U-2/3** | 0.8 ... 3.2 | - | | | | | | | |
| **FWS-RVM/U-2/7** | 2 ... 7 | - | | | | | | | |
| **FWS-RVM/U-2/13** | 3 ... 13 | - | | | | | | | |
| **FWS-RVM/U-2/20** | 4 ... 20 | - | | | | | | | |
| **FWS-RVM/U-2/30** | 8 ... 30 | - | | | | | | | |

# Flow monitor, mounting position as required, without display, for water and similar media, model FWS-RVM/U-4


| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Without |
| Process connections | Female thread G 1/4 or 1/4 NPT |
| Max. operating pressure | 300 bar (stainless steel version 350 bar) |
| Pressure loss | 0.02 ... 0.2 bar |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |

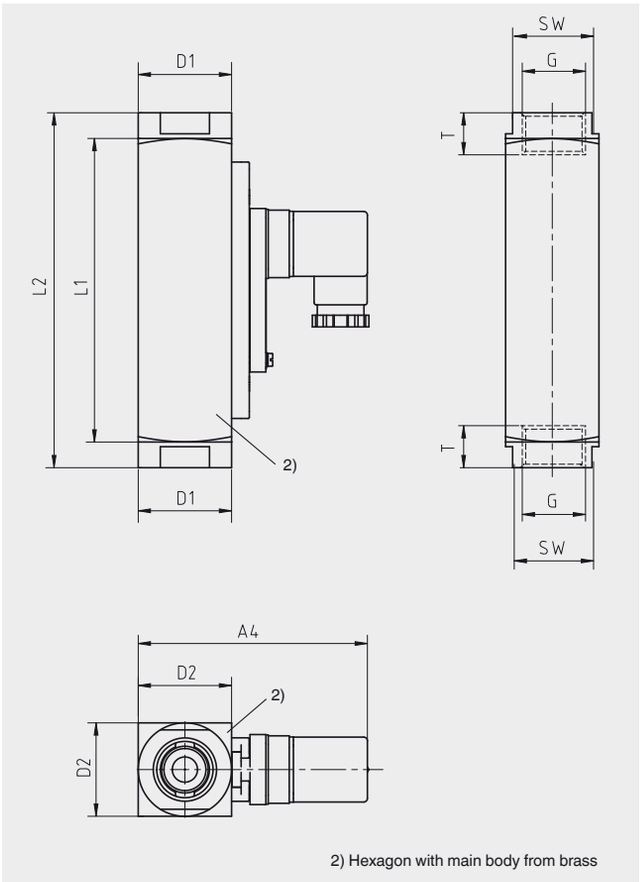
| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 200 V / 1 A / 20 VA | 200 V / 1 A / 20 VA 1) |

1) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ at 20 °C | Air | D2 | A4 | G | T | L1 | SW | |
| **FWS-RVM/U-4/01** | 0.005 ... 0.06 | - | | | | | | | |
| **FWS-RVM/U-4/02** | 0.04 ... 0.13 | - | | | | | | | |
| **FWS-RVM/U-4/06** | 0.1 ... 0.6 | - | | | | | | | |
| **FWS-RVM/U-4/1** | 0.2 ... 1.2 | - | 17 | approx. 57 | 1/4" | 10 | 65 | 17 | 140 |
| **FWS-RVM/U-4/2** | 0.4 ... 2 | - | | | | | | | |
| **FWS-RVM/U-4/3** | 0.5 ... 3 | - | | | | | | | |
| **FWS-RVM/U-4/5** | 1 ... 5 | - | | | | | | | |

# Flow monitor, mounting position as required, without display, for gaseous media, model FWS-RVM/U-L1

Option: Explosion-protected version




2) Hexagon with main body from brass

| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Without |
| Process connections | Female thread G 3/4 ... 1 or 3/4 ... 1 NPT |
| Max. operating pressure | 250 bar (stainless steel version 300 bar) |
| Pressure loss | 0.02 ... 0.4 bar |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form A | 100 °C (option 160 °C) | IP 65 |
| 1 m cable | 100 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 67 |
| Ex version (2 m cable) | 75 °C | IP 67 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 250 V / 3 A / 100 VA | 250 V / 1.5 A / 50 VA [1] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1] |

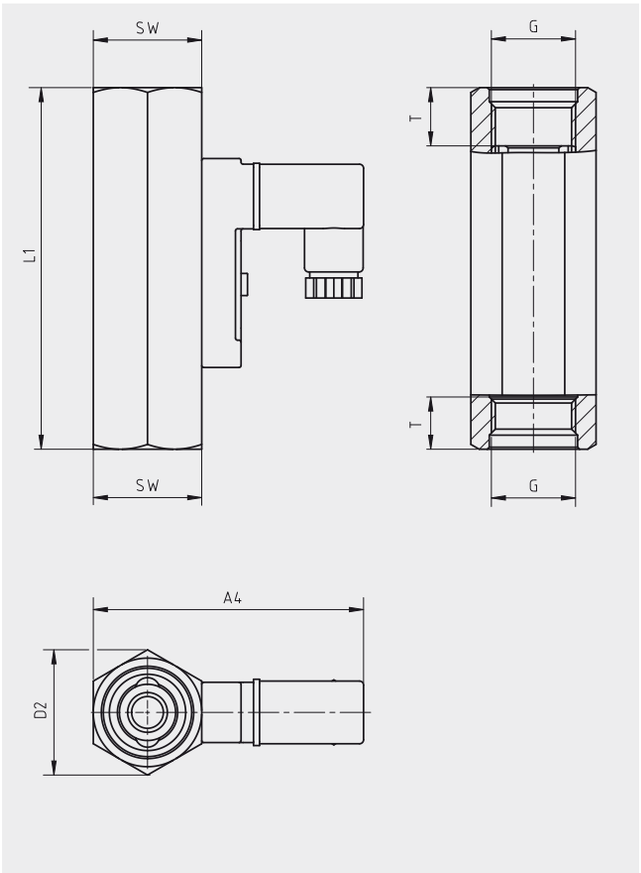
1) Minimum load 3 VA

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | | | Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ | Air at 1 bar abs. and 20 °C | D1 | D2 | A4 | G | T | L1 | L2 | SW | in g |
| **FWS-RVM/U-L10180** | - | 60 ... 180 | 40 | 40 [3] | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,200 |
| | | | | | | 1" | 17 | 130 | 130 | 41 | 1,050 |
| **FWS-RVM/U-L10180** | - | 100 ... 300 | 40 | 40 [3] | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,200 |
| | | | | | | 1" | 17 | 130 | 130 | 41 | 1,050 |
| **FWS-RVM/U-L10650** | - | 200 ... 650 | 40 | 40 [3] | approx. 98 | 3/4" | 15 | 130 | 152 | 34 | 1,200 |
| | | | | | | 1" | 17 | 130 | 130 | 41 | 1,050 |

3) With main body from brass, hexagon: 47.3 mm

# Flow monitor, mounting position as required, without display, for gaseous media, model FWS-RVM/U-L2

Option: Explosion-protected version


| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Without |
| Process connections | Female thread G 1/2 or 1/2 NPT |
| Max. operating pressure | 300 bar (stainless steel version 350 bar) |
| Pressure loss | 0.02 ... 0.3 bar |
| Tolerance | ±10 % of full scale value |

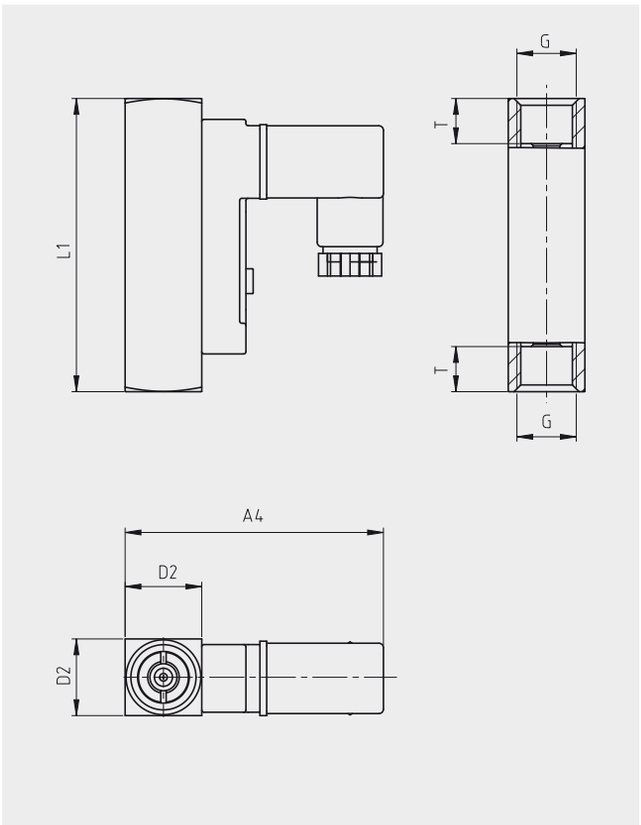
| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 120 °C (option 160 °C) | IP 65 |
| 1 m cable | 120 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |
| Ex version (2 m cable) | 75 °C | IP 67 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 230 V / 3 A / 60 VA | 250 V / 1.5 A / 50 VA [1) 2)] |
| Ex version | 250 V / 2 A / 60 VA<br>ATEX II 2G Ex mb II T6 | 250 V / 1 A / 30 VA [1)] |

1) Minimum load 3 VA
2) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ | Air at 1 bar abs. and 20 °C | D2 | A4 | G | T | L1 | SW | |
| **FWS-RVM/U-L20010** | - | 2.5 ... 10 | | | | | | | |
| **FWS-RVM/U-L20020** | - | 5.5 ... 20 | | | | | | | |
| **FWS-RVM/U-L20030** | - | 8 ... 30 | | | | | | | |
| **FWS-RVM/U-L20035** | - | 10 ... 35 | | | | | | | |
| **FWS-RVM/U-L2/3L** | - | 24 ... 90 | 32 | approx. 67 | 1/2" | 14 | 90 | 27 | 350 |
| **FWS-RVM/U-L20220** | - | 55 ... 220 | | | | | | | |
| **FWS-RVM/U-L20240** | - | 65 ... 240 | | | | | | | |
| **FWS-RVM/U-L20300** | - | 80 ... 300 | | | | | | | |
| **FWS-RVM/U-L20525** | - | 140 ... 525 | | | | | | | |

# Flow monitor, mounting position as required, without display, for gaseous media, model FWS-RVM/U-L4





| Specifications | |
|---|---|
| Main body | Nickel-plated brass or stainless steel 1.4571 |
| Mounting position | As required |
| Display | Without |
| Process connections | Female thread G 1/4 or 1/4 NPT |
| Max. operating pressure | 300 bar (stainless steel version 350 bar) |
| Pressure loss | 0.02 ... 0.2 bar |
| Tolerance | ±10 % of full scale value |

| Versions | Max. ambient temperature | Ingress protection |
|---|---|---|
| Instrument connector DIN 43650 form C | 120 °C (option 160 °C) | IP 65 |
| 1 m cable | 120 °C (option 160 °C) | IP 67 |
| Instrument connector M12 x 1 | 85 °C | IP 65 |

| Electrical data | Normally open | Change-over contact |
|---|---|---|
| Standard | 200 V / 1 A / 20 VA | 200 V / 1 A / 20 VA [1)] |

1) Only with instrument connector

| Model | Switching ranges in l/min | | Dimensions in mm | | | | | | Weight in g |
|---|---|---|---|---|---|---|---|---|---|
| | $H_2O$ | Air at 1 bar abs. and 20 °C | D2 | A4 | G | T | L1 | SW | |
| **FWS-RVM/U-L40002** | - | 0.6 ... 2.2 | | | | | | | |
| **FWS-RVM/U-L40006** | - | 1.7 ... 6 | | | | | | | |
| **FWS-RVM/U-L40008** | - | 2.5 ... 8 | | | | | | | |
| **FWS-RVM/U-L40012** | - | 3 ... 12 | | | | | | | |
| **FWS-RVM/U-L4/06L** | - | 3 ... 22 | 17 | approx. 57 | 1/4" | 10 | 65 | 17 | 140 |
| **FWS-RVM/U-L40024** | - | 7 ... 24 | | | | | | | |
| **FWS-RVM/U-L40034** | - | 12 ... 34 | | | | | | | |
| **FWS-RVM/U-L4/2L** | - | 16 ... 56 | | | | | | | |
| **FWS-RVM/U-L4/3L** | - | 20 ... 80 | | | | | | | |

## Contact protection measures

The reed contacts should be protected against any voltage or current spikes that might occur.

Depending on the different load types different protective circuits are used.

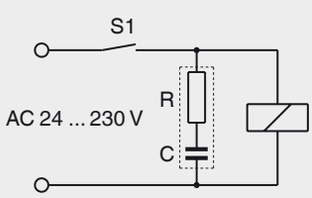
**Model KR 24**


**RC module**

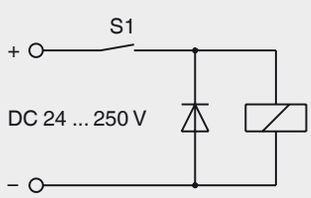
| Contact protection relays | Contacts | Input | Power supply | Approval number | Order no. |
|---|---|---|---|---|---|
| KR 24 | 1 x change-over AC 250 V, 2 A | 2 x contacts | DC 20 ... 30 V | | 112941 |
| KR 24-EX | 2 x change-over AC 253 V, 2 A | 2 x contacts | DC 20 ... 30 V | II 1 GD EEx ia IIC, PTB 02 ATEX 2073 | 112944 |
| KR 230 | 1 x change-over AC 250 V, 2 A | 2 x contacts | AC 230 V | | 112942 |
| KR 230-EX | 2 x change-over AC 253 V, 2 A | 2 x contacts | AC 230 V | II 1 GD EEx ia IIC, PTB 02 ATEX 2073 | 112943 |

| RC module | Capacitance | Resistance | Voltage | Order no. |
|---|---|---|---|---|
| B3/115 | 0.33 µF | 470 Ohm | AC 115 V | 110446 |
| B3/230 | 0.33 µF | 1,000 Ohm | AC 230 V | 110460 |

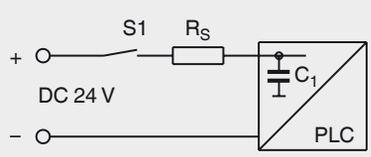
**Inductive load**
AC voltage




**Inductive load**
DC voltage




**Capacitive load**



**Ordering information**
To order the described product the order number (if available) is sufficient.

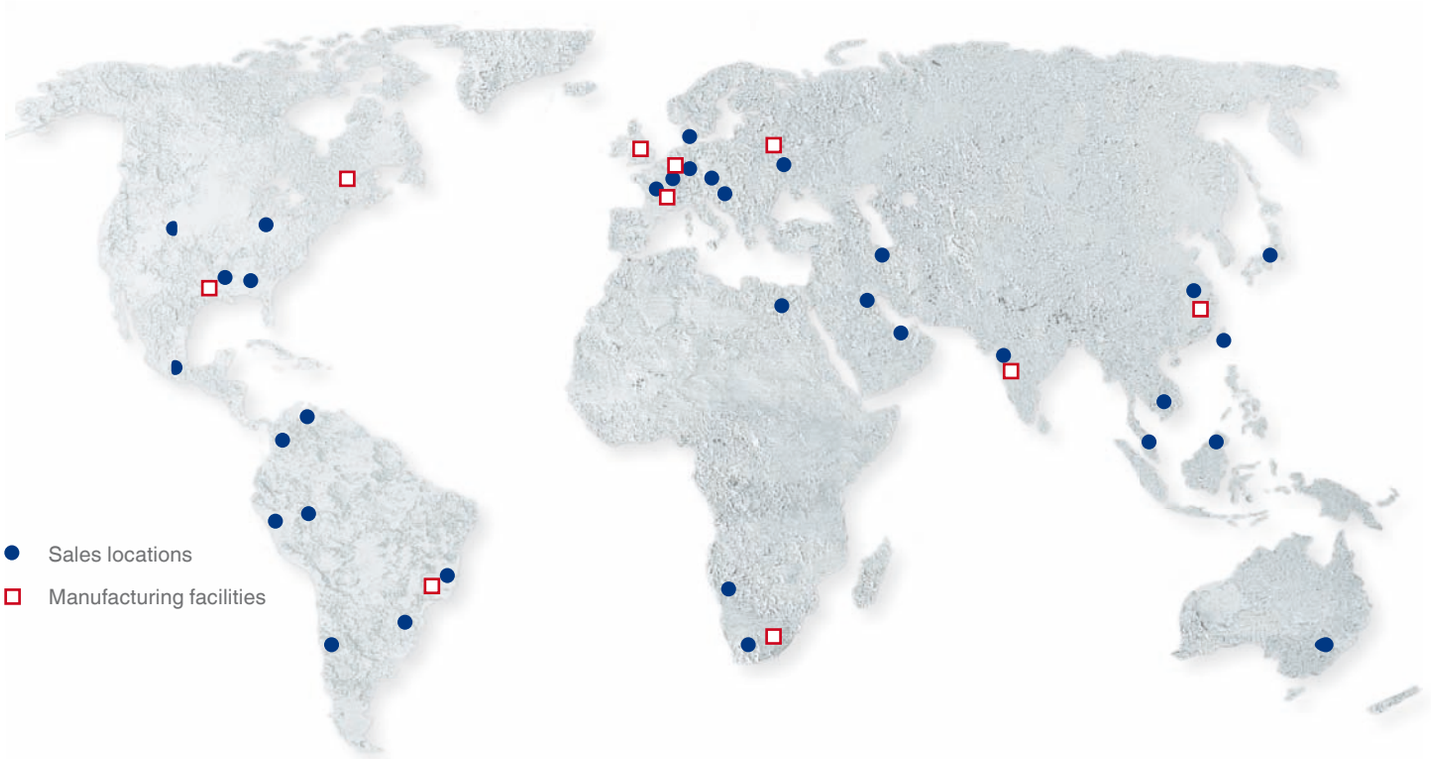
Alternatively:
Model / Medium / Process specifications (operating temperature and pressure) / Mounting position / Display / Switching range / Material / Thread size / Switch contact / Options (approvals)

# Manufacturing facilities - headquarter in Zwingenberg, Germany

## Administration & Hall 1

## Hall 2

# KSR - all over the world




# Further manufacturing facilities

**France**

KUBLER France SA

**China**

Shanghai KSR Kuebler Automation Instrument Co. Ltd.

**UK**


TC Fluid Control

**USA**


WIKA Instrument - Houston Facility

**India**

WIKA Instruments India Pvt. Ltd.

**Canada**

WIKA Instruments Ltd - Canada Headquarters

**Brazil**


WIKA DO BRASIL

**South Africa**


WIKA Instruments (Pty) Ltd.

# Bypass level indicator on low-pressure pre-heater or feedwater tank

In a communicating bypass chamber mounted to the side of a vessel a float moves with the level of the medium to be measured. The magnetic field of the radially symmetric magnetic system positioned in the float at submersion height activates the magnetic roller indicator attached to the outside of the bypass chamber as well as the switching and measuring elements.

This proven measurement system can be combined with further independent measurement principles such as a guided-wave radar system, a reed measurement chain or a limit switch. Thus for independent measurements, only two process connections are required, a full redundancy in the measurement is possible and a visual level measurement is permanently available.

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