



Trimod^BBesta

Level measurement A brand of Bachofen AG
www.trimodbesta.com

Trimod^BBesta

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Trimod Besta level switches are used worldwide in many industries



Oil & Gas

Bachofen Ltd. has extensive experience in the offshore industry. Some important features of the Trimod Besta product range for oil & gas applications include stainless steel housings in explosion-proof design, custom-made float chamber design and NACE compliance.



Shipbuilding

Trimod Besta level switches are specified by the world's major shipyards and owners. Much of Bachofen's product development and design has evolved from experience within the marine industry such as fully submersible housings and captive terminal components. Trimod Besta level switches are registered worldwide and include LRS, DNV, ABS, BV, RINA, RMRS and ClassNK shipping approvals.



Power Generation

Extreme reliability is vital in some of the applications in power plants. Shock and vibration resistant Trimod Besta level switches are used for critical turbine trip duties on HP/LP heater plants.



Chemical & Petrochemical Industry

In the chemical- and petrochemical industry Trimod Besta's modular design can solve many special application problems which may require high pressure, high temperature and corrosion resistant components. For measurement and control of highly aggressive or high purity media we offer a complete program of plastic switches.



Plant Engineering

Trimod Besta offers OEMs and plant manufacturers countless level switches from the standard and industrial series. Customised solutions with various tests and approvals are available from small quantities.



Water Management

For water management Bachofen Ltd. provides standard level switches together with accessories, such as counterflanges and test actuators. Various special executions can be used in highly contaminated media or in toilet systems.

Experts trust us

Trimod Besta level switches have been examined and approved by the most important and internationally recognized organisations. Numerous approvals together with periodic audits warrant continuous quality control throughout the production process. The list of approvals for Trimod Besta level switches and accessories is growing continuously. Contact us, for up to date information or go to www.trimodbesta.com for current certificates.



ClassNK

| | |
|--|-------------------------------|
| American Bureau of Shipping | ABS |
| Bureau Veritas | BV |
| Det Norske Veritas | DNV |
| Lloyds Register of Shipping | LRS |
| Registro Italiano Navale | RINA |
| Russian Maritime Register of Shipping | RMRS |
| Nippon Kaiji Kyōkai | ClassNK |
| exida Certification S.A. Safety Integrity Level | SIL IEC 61508/61511 |



| | | |
|---|--------------------------------|---|
| Bureau Veritas Consumer Products Services Germany GmbH | EPS 12 ATEX 1430 X | Ex eb db IIC T6...T5 Ga/Gb (Z...8) Ex ia IIC T6 Ga/Gb (B...8) Ex ia IIC T6...T1 Ga/Gb (I...8) |
| | IECEX EPS 15.0038 X | Ex eb db IIC T6...T5 Ga/Gb (Z...5) Ex ia IIC T6 Ga/Gb (B...5) Ex ia IIC T6...T1 Ga/Gb (I...5) |
| | EPS 22 UKEX 1261 X | Ex eb db IIC T6...T5 Ga/Gb (Z...7) Ex ia IIC T6 Ga/Gb (B...7) Ex ia IIC T6...T1 Ga/Gb (I...7) |
| EAC | EA3C N RU Д-CH.АД53.В.02795/18 | |
| Swiss Safety Center AG | PED-Z-COS.EP.5515489 | Kat. IV nach DGRL (PED) |

The unique three-modular level switch system



What you need ...

Trimod Besta's modular design is a unique deviation from conventional level switch construction. This modular system allows individual and numerous combinations of float, flange and switch modules to suit your specific requirements. Switch modules are available with electric, electronic or pneumatic output signals. Switch housings are standard to IP65 enclosure, but depending on environmental conditions IP66, IP67 or IP68 must be chosen. For hazardous areas explosion-proof switch modules can be used.



... is quickly installed ...

Trimod Besta flange modules are available in various standards. The flanges of Industrial and Plastic Range are manufactured according to international standards such as EN/DIN, ANSI or JIS. The benefit of the hinged cover, the captive screws and the selflifting terminal clamps is an easy installation. For convenience of wiring, the connection diagram is shown on the inside of the hinged lid. The interchangeability of the single modules allows high flexibility regarding maintenance or changing application requirements.



... and lasts forever.

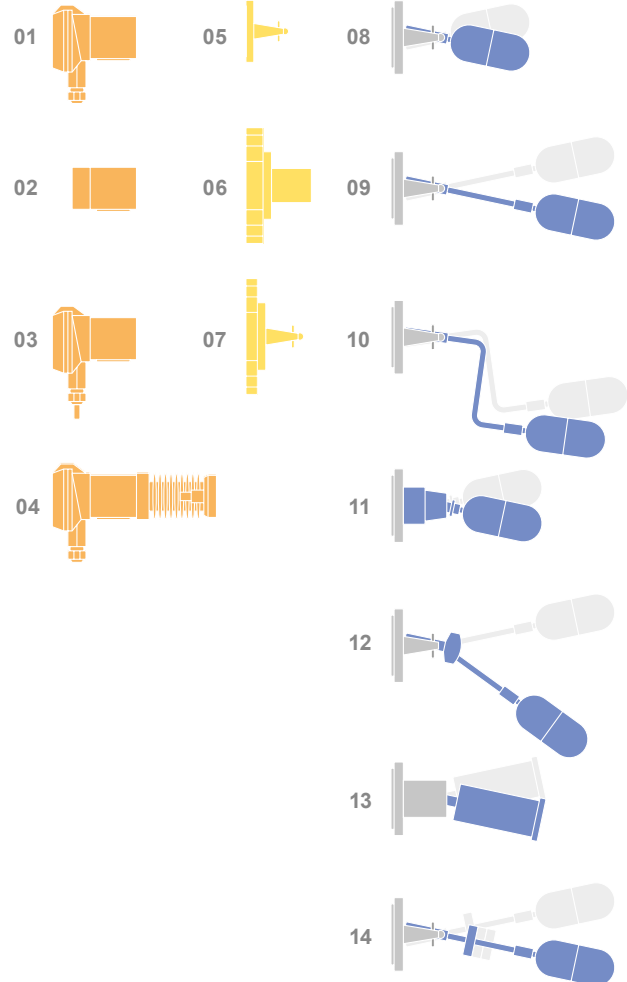
So far, hundreds of thousands of Trimod Besta level switches are on duty world-wide. The float movement caused by the rise and fall of the liquid level is transmitted by two repelling, permanent AlNiCo magnets. The sturdy design and the double snap effect as a result of the magnetic repulsion and the snap action of the microswitch guarantee a virtually unlimited lifetime. The float modules, like all wetted parts, are made of stainless steel, Hastelloy C or high quality plastics. A wide range of floats is available to suit various viscosity-, temperature- and pressure ranges for almost any process condition.



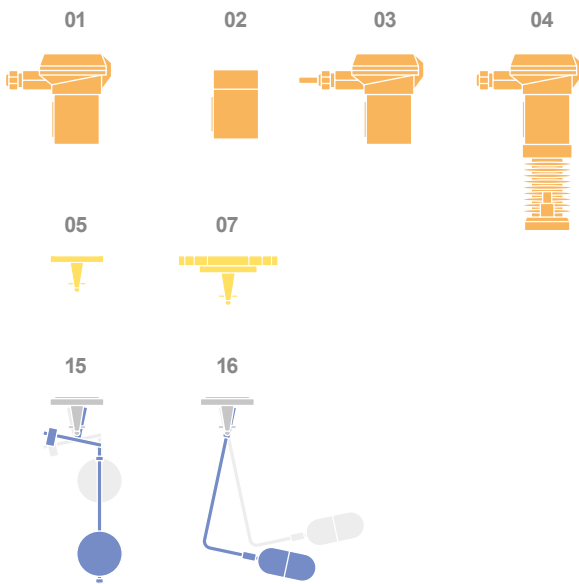
With modular compatibility all options are open

Side mount combinations

- 01 with microswitch or proximity switch, also available in explosion proof version
- 02 pneumatic switch module with ON/OFF or proportional output
- 03 with enclosure IP68 for underwater installation
- 04 with heat exchanger for very high or very low operating temperatures
- 05 square standard flange made of CrNiMo, 92 mm pitch circle diameter
- 06 industrial flange acc. to EN/DIN, ANSI and JIS made of PP and PTFE
- 07 industrial flange acc. to EN/DIN, ANSI and JIS made of CrNiMo and Hastelloy
- 08 with fixed operating differential
- 09 with rod extension for longer operating differentials
- 10 rod extension for switch point correction
- 11 with protective bellows for media with solids content
- 12 with adjustable operating differential for pump control
- 13 plastic version for aggressive media
- 14 for separation layer monitoring of two media with different densities
- 15 for vertical mounting
- 16 for vertical mounting with rod extension



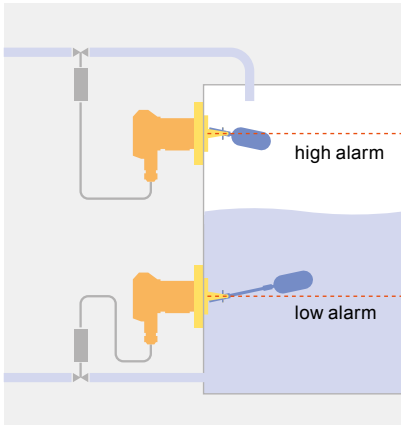
Top mount combinations



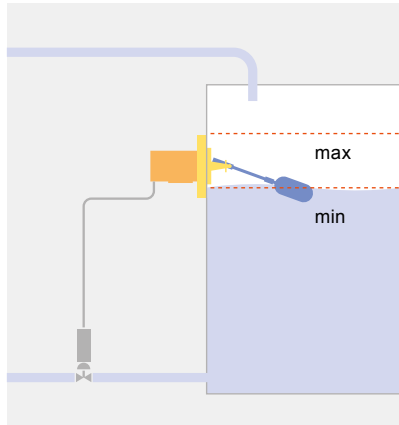
Application examples

Alarm, limit and control functions with Trimod Besta

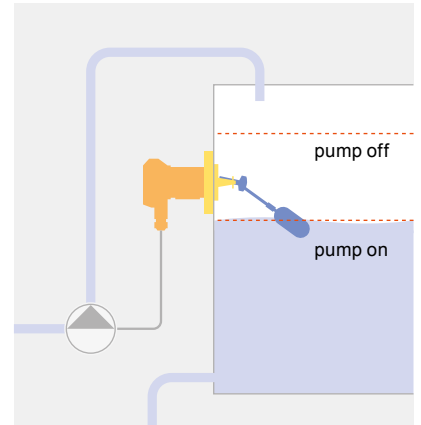
Max/min limits



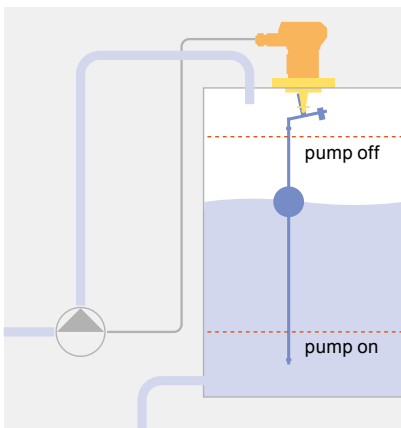
Pneumatic control



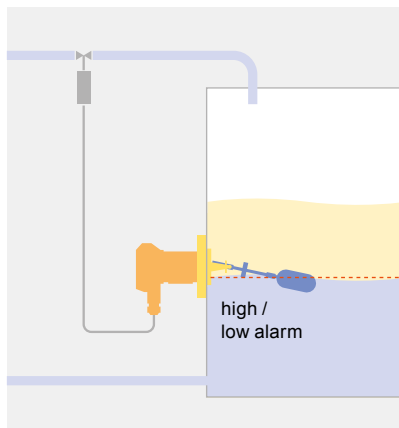
Pump and valve control



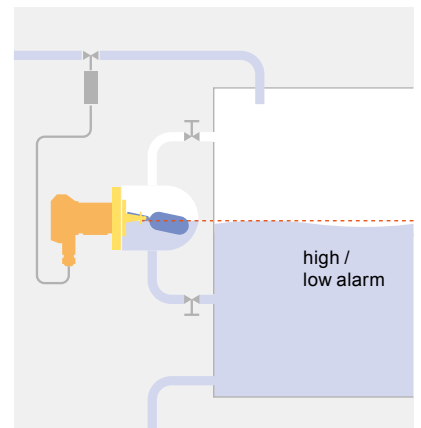
Pump and valve control



Separation layer control



External level control



Typical Standard Range switches to handle the majority of applications

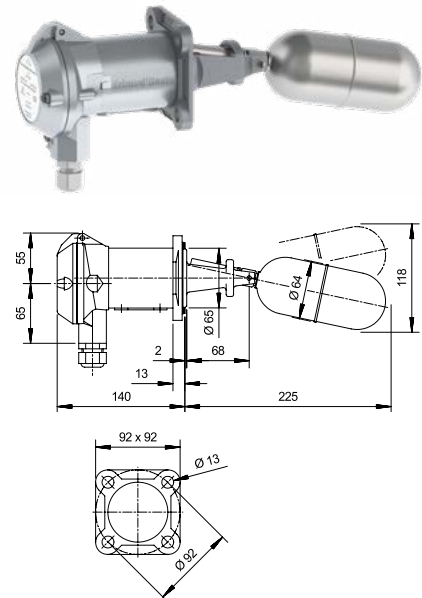
The characteristic of a Trimod Besta level switch of the Standard Range is the square flange in stainless steel with bolt holes on a 92 mm PCD and a nominal pressure rating of PN 25.

The following pages show the level switches which are most commonly used. However, countless more combinations of types are possible. Detailed information can be found on all the modules available with the possible combinations on pages 20 to 34. For accessories, such as test actuators, counterflanges and float chambers see pages 36 to 39.

Typical applications:
shipbuilding, refrigeration, food industry, drinking water supply, water management etc.

Type A 01 04 – For general purpose

| | |
|------------------------------|--|
| Nominal pressure | PN 25 max. 25 bar up to 300°C |
| Operating temperature | 0 to 300°C |
| Ambient temperature | 0 to 70°C |
| Density of liquid | min. 0.7 kg/dm ³ |
| Operating differential | fixed 12 mm |
| Rod extensions | see page 34 |
| Wetside material | Stainless steel (CrNiMo) |
| Flange material | Stainless steel (CrNiMo) |
| Housing material | Sea water resistant die cast aluminium |
| Flange dimensions | square 92 x 92 mm, PCD 92 mm |
| Counterflange | see page 36 |
| Switch element | Microswitch SPDT with silver contacts |
| Switch rating | 250 VAC, 5 A 30 VDC, 5 A |
| Enclosure | IP65 |
| Weight | approx. 1.8 kg |
| Safety Integrity Level (SIL) | SIL 1 (Type AA 01 04: SIL 2) |



Type A 01 041 – Low cost solution

This type is the same as the A 01 04 but there is no possibility for mounting a rod extension.

Type A 01 01 – For installation in limited space

The overall length of this type is 194 instead of 225 mm. Minimum liquid density: 0.8 kg/dm³. All other data as type A 01 04.

Type 5A 01 04 – For corrosive environments

As type A 01 04 except that the complete switch housing (excluding the cable gland), is manufactured in stainless steel (CrNiMo) and is therefore highly corrosion resistant. Weight approx. 2.7 kg.

Type A 01 07 – For low density fluids

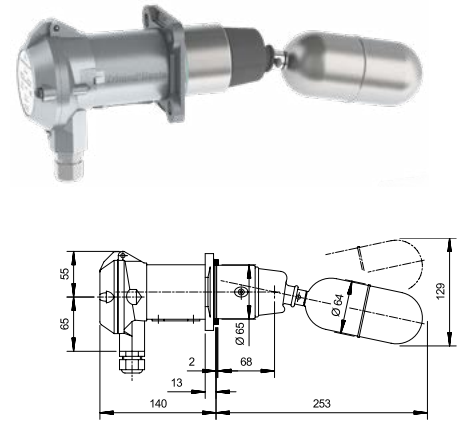
This level switch can be used for liquids with densities as low as 0.5 kg/dm³. All other technical data as type A 01 04. Weight approx. 2 kg.



Type A 01 051 to A 01 054 – For contaminated or crystallizing media.
Bellows to prevent jamming of the float mechanism.

| | | |
|------------------------------|---|---------------|
| Bellow materials | A 01 051 | Perbunan/Buna |
| | A 01 052 | Silicon |
| | A 01 053 | FPM |
| | A 01 054 | PTFE |
| Operating temperatures | A 01 051 | 0 to 120°C |
| | A 01 052 | 0 to 200°C |
| | A 01 053 | 10 to 200°C |
| | A 01 054 | 0 to 250°C |
| Mounting length | 253 mm | |
| Weight | approx. 2 kg | |
| Density of liquid | min. 0.75 kg/dm ³ | |
| Safety Integrity Level (SIL) | SIL 1 (Types AA 01 051 – AA 01 054: SIL 2) | |

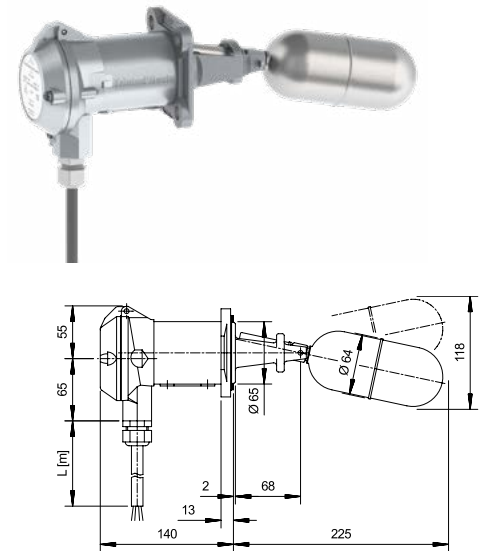
All other technical data as type A 01 04



Type U3A 01 04 to U11A 01 04 – For submersible applications

| | | |
|------------------------------|--|----------------|
| Operating temperature | -30 to 80°C | |
| Ambient temperature | -30 to 80°C | |
| Housing material | Sea water resistant die cast aluminium | |
| Enclosure | IP68 switch housing is pressure tight up to 100 meters WC (Water column) | |
| Length of encapsulated cable | U3A 01 04 | 3 m |
| | U5A 01 04 | 5 m |
| | U11A 01 04 | 11 m |
| Weight | U3A 01 04 | approx. 2.5 kg |
| | U5A 01 04 | approx. 2.8 kg |
| | U11A 01 04 | approx. 4 kg |
| Safety Integrity Level (SIL) | SIL 1 (Types U3AA 01 04 – U11AA 01 04: SIL 2) | |

All other technical data as type A 01 04

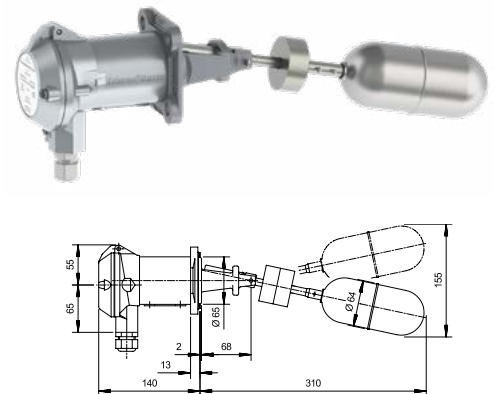


Type A 01 08T1 – For interface application

| | | |
|------------------------------|-------------------------------|--|
| Density of heavier liquids | min. 0.8 kg/dm ³ | |
| Difference in density | min. 0.22 kg/dm ³ | |
| Operating differential | approx. 20 mm | |
| Rod length | 100 mm | |
| Weight | approx. 2.4 kg | |
| Safety Integrity Level (SIL) | SIL 1 (Type AA 01 08T1: SIL2) | |

All other technical data as type A 01 04

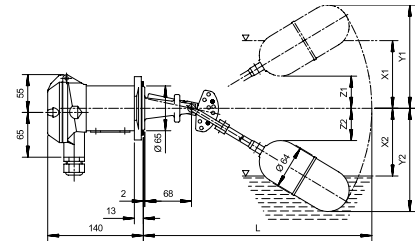
The position of the weight on the rod extension is calculated in reference to the densities of the media and is factory preset.



Type A 01 090 to A 01 095 – For adjustable operating differential

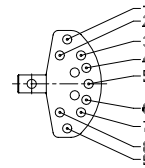
These level switches are mainly used for two-point operation, for example pump control.

| | |
|------------------------------|--|
| Nominal pressure | PN 25, max. 25 bar up to 300°C |
| Operating temperature | 0 to 300°C |
| Ambient temperature | 0 to 70°C |
| Density of liquid | min. 0.75 kg/dm ³ (A 01 095: min. 0.9 kg/dm ³) |
| Operating differential S | see table |
| Wetside material | Stainless steel (CrNiMo) |
| Flange material | Stainless steel (CrNiMo) |
| Housing material | Sea water resistant die cast aluminium |
| Flange dimensions | square 92 x 92 mm, PCD 92 mm |
| Counterflange | see page 36 |
| Switch element | Microswitch SPDT with silver contacts |
| Switch rating | 250 VAC, 5 A 30 VDC, 5 A |
| Enclosure | IP65 |
| Weight | approx. 2 kg |
| Safety Integrity Level (SIL) | SIL 1 (Types AA 01 090 – AA 01 095: SIL 2) |



Adjustment of switching differential

The switching differential can be set by inserting pegs in holes 1 to 9 of the adjustment block (see drawing). The resulting differentials, the positions of the switching points and the float travel can be seen in the table below. The values are in mm and are referenced to water at 20°C and density of 1.0 kg/dm³.



| Type L | A 01 090 278 mm | | | | | A 01 091 361 mm | | | | | A 01 092 461 mm | | | | | A 01 093 561 mm | | | | | A 01 095 246 mm | | | | |
|--------|--------------------|------|---------|---------|---------|--------------------|------|---------|---------|---------|--------------------|------|---------|---------|---------|--------------------|------|---------|---------|---------|--------------------|-----|---------|---------|---------|
| Pos. | X1 | X2 | Diff. S | Y1 (Z2) | Y2 (Z1) | X1 | X2 | Diff. S | Y1 (Z2) | Y2 (Z1) | X1 | X2 | Diff. S | Y1 (Z2) | Y2 (Z1) | X1 | X2 | Diff. S | Y1 (Z2) | Y2 (Z1) | X1 | X2 | Diff. S | Y1 (Z2) | Y2 (Z1) |
| 1-4 | +108 | +60 | 48 | 175 | (10) | +157 | +85 | 72 | 238 | (20) | +230 | +125 | 105 | 315 | (50) | +292 | +160 | 132 | 395 | (75) | +100 | +55 | 45 | 147 | (10) |
| 1-5 | +108 | +15 | 93 | 175 | 35 | +157 | +25 | 132 | 238 | 37 | +230 | +39 | 191 | 315 | 39 | +292 | +48 | 244 | 395 | 42 | +100 | +18 | 82 | 147 | 35 |
| 1-6 | +108 | -25 | 133 | 175 | 85 | +157 | -37 | 194 | 238 | 105 | +230 | -51 | 281 | 315 | 135 | +292 | -65 | 357 | 395 | 165 | +100 | -18 | 118 | 147 | 74 |
| 1-7 | +108 | -52 | 160 | 175 | 125 | +157 | -90 | 247 | 238 | 165 | +230 | -124 | 354 | 315 | 215 | +292 | -160 | 452 | 395 | 265 | +100 | -46 | 146 | 147 | 115 |
| 1-8 | +108 | -80 | 188 | 175 | 153 | +157 | -128 | 285 | 238 | 206 | +230 | -171 | 401 | 315 | 275 | +292 | -215 | 507 | 395 | 345 | +100 | -70 | 170 | 147 | 128 |
| 1-9 | +108 | -110 | 218 | 175 | 175 | +157 | -160 | 317 | 238 | 238 | +230 | -212 | 442 | 315 | 315 | +292 | -265 | 557 | 395 | 395 | +100 | -90 | 190 | 147 | 147 |
| 2-5 | +98 | +15 | 83 | 153 | 35 | +122 | +25 | 97 | 206 | 37 | +181 | +39 | 142 | 275 | 39 | +230 | +48 | 182 | 345 | 42 | +79 | +18 | 61 | 128 | 35 |
| 2-6 | +98 | -25 | 123 | 153 | 85 | +122 | -37 | 159 | 206 | 105 | +181 | -51 | 232 | 275 | 135 | +230 | -65 | 295 | 345 | 165 | +79 | -18 | 97 | 128 | 74 |
| 2-7 | +98 | -52 | 150 | 153 | 125 | +122 | -90 | 212 | 206 | 165 | +181 | -124 | 305 | 275 | 215 | +230 | -160 | 390 | 345 | 265 | +79 | -46 | 125 | 128 | 115 |
| 2-8 | +98 | -80 | 178 | 153 | 153 | +122 | -128 | 250 | 206 | 206 | +181 | -171 | 352 | 275 | 275 | +230 | -215 | 445 | 345 | 345 | +79 | -70 | 149 | 128 | 128 |
| 2-9 | +98 | -110 | 208 | 153 | 175 | +122 | -160 | 282 | 206 | 238 | +181 | -212 | 393 | 275 | 315 | +230 | -265 | 495 | 345 | 395 | +79 | -90 | 169 | 128 | 147 |
| 3-5 | +58 | +15 | 43 | 125 | 35 | +81 | +25 | 56 | 165 | 37 | +122 | +39 | 83 | 215 | 39 | +145 | +48 | 97 | 265 | 42 | +52 | +18 | 34 | 115 | 35 |
| 3-6 | +58 | -25 | 83 | 125 | 85 | +81 | -37 | 118 | 165 | 105 | +122 | -51 | 173 | 215 | 135 | +145 | -65 | 210 | 265 | 165 | +52 | -18 | 70 | 115 | 74 |
| 3-7 | +58 | -52 | 110 | 125 | 125 | +81 | -90 | 171 | 165 | 165 | +122 | -124 | 246 | 215 | 215 | +145 | -160 | 305 | 265 | 265 | +52 | -46 | 98 | 115 | 115 |
| 3-8 | +58 | -80 | 138 | 125 | 153 | +81 | -128 | 209 | 165 | 206 | +122 | -171 | 293 | 215 | 275 | +145 | -215 | 360 | 265 | 345 | +52 | -70 | 122 | 115 | 128 |
| 3-9 | +58 | -110 | 168 | 125 | 175 | +81 | -160 | 241 | 165 | 238 | +122 | -212 | 334 | 215 | 315 | +145 | -265 | 410 | 265 | 395 | +52 | -90 | 142 | 115 | 147 |
| 4-6 | +25 | -25 | 50 | 85 | 85 | +31 | -37 | 68 | 105 | 105 | +48 | -51 | 99 | 135 | 135 | +63 | -65 | 128 | 165 | 165 | +23 | -18 | 41 | 74 | 74 |
| 4-7 | +25 | -52 | 77 | 85 | 125 | +31 | -90 | 121 | 105 | 165 | +48 | -124 | 172 | 135 | 215 | +63 | -160 | 223 | 165 | 265 | +23 | -46 | 69 | 74 | 115 |
| 4-8 | +25 | -80 | 105 | 85 | 153 | +31 | -128 | 159 | 105 | 206 | +48 | -171 | 219 | 135 | 275 | +63 | -215 | 278 | 165 | 345 | +23 | -70 | 93 | 74 | 128 |
| 4-9 | +25 | -110 | 135 | 85 | 175 | +31 | -160 | 191 | 105 | 238 | +48 | -212 | 260 | 135 | 315 | +63 | -265 | 328 | 165 | 395 | +23 | -90 | 113 | 74 | 147 |
| 5-7 | -15 | -52 | 37 | 35 | 125 | -33 | -90 | 57 | 37 | 165 | -40 | -124 | 84 | 39 | 215 | -50 | -160 | 110 | 42 | 265 | -12 | -46 | 34 | 35 | 115 |
| 5-8 | -15 | -80 | 65 | 35 | 153 | -33 | -128 | 95 | 37 | 206 | -40 | -171 | 131 | 39 | 275 | -50 | -215 | 165 | 42 | 345 | -12 | -70 | 58 | 35 | 128 |
| 5-9 | -15 | -110 | 95 | 35 | 175 | -33 | -160 | 127 | 37 | 238 | -40 | -212 | 172 | 39 | 315 | -50 | -265 | 215 | 42 | 395 | -12 | -90 | 78 | 35 | 147 |
| 6-9 | -55 | -110 | 55 | (10) | 175 | -80 | -160 | 80 | (20) | 238 | -105 | -212 | 107 | (50) | 315 | -135 | -265 | 130 | (75) | 395 | -45 | -90 | 45 | (10) | 147 |

Type A 01 140 to A 01 141 – For vertical mounting

| | |
|------------------------------|---|
| Nominal pressure | PN 16, max. 16 bar up to 300°C |
| Operating temperature | 0 to 300°C |
| Ambient temperature | 0 to 70°C |
| Density of liquid | Pump control: min. 0.45 kg/dm ³ Alarm: min. 0.30 kg/dm ³ |
| Operating differential S | A 01 140: 12 to 1340 mm A 01 141: 12 to 2840 mm |
| Wetside material | Stainless steel (CrNiMo) |
| Flange material | Stainless steel (CrNiMo) |
| Housing material | Sea water resistant die cast aluminium |
| Flange dimensions | square 92 x 92 mm, PCD 92 mm |
| Counterflange | see page 36 |
| Switch element | Microswitch SPDT with silver contacts |
| Switch rating | 250 VAC, 5A 30 VDC, 5A |
| Enclosure | IP65 |
| Weight | A 01 140: approx. 2.5 kg A 01 141: approx. 2.7 kg |
| Safety Integrity Level (SIL) | SIL 1 (Types AA 01 140 – AA 01 141: SIL 2) |

Setting the switching differential**1. For pump control (two switch points):**

The required differential is set by fixing the two stop collars in the appropriate positions on the rod. The counterweight is adjusted to compensate for the rod weight (without float), until the cross arm is balanced. The float slides up and down the rod with the liquid level and actuates the switch at the set position of the stop collars. The switch remains latched between the two positions, which are for applications such as pump control where the contactor coil would need to remain energised throughout the pumping cycle.

2. For alarm duty (one switch point):

Only the lower collar is fixed on the rod (below the float). Within the limit of the rod length, the height of the alarm point can be chosen as required. The counterweight has to be set to outweigh the rod (without float). The alarm switching differential is 12 mm, fixed.

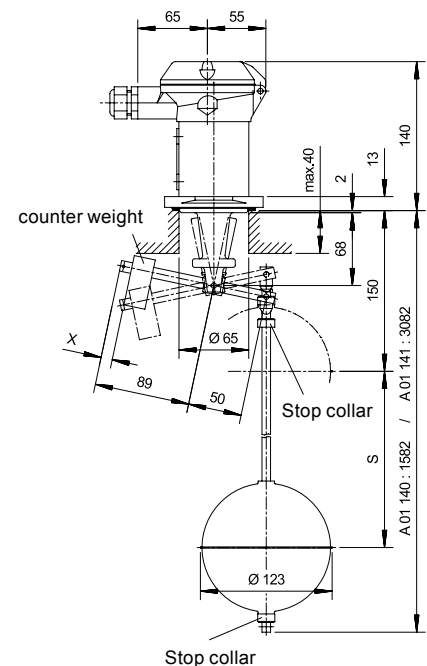
Installation

Over open tanks or sumps on a bracket. On closed tanks on the manhole cover with float mounted from the inside. In the absence of a manhole, i.e. the float cannot be mounted from the inside, an intermediate flange of at least DN 125/5" should be used. If turbulence occurs, the rod should be guided loosely at the lower end. For counterweight setting, refer to data sheet LTDS02EN.

Type U3A 01 140 to 141 – For vertical submersible mounting

| | |
|------------------------------|--|
| Operating temperature | -30 to 80°C |
| Ambient temperature | -30 to 80°C |
| Enclosure | IP68 switch housing is pressure proof up to 100 meters WC (Water column) |
| Length of cast-in cable | 3 m |
| Weight | U3A 01 140 approx. 3.2 kg U3A 01 141 approx. 3.4 kg |
| Safety Integrity Level (SIL) | SIL 1 (Types U3AA 01 140 – U3AA 01 141: SIL 2) |

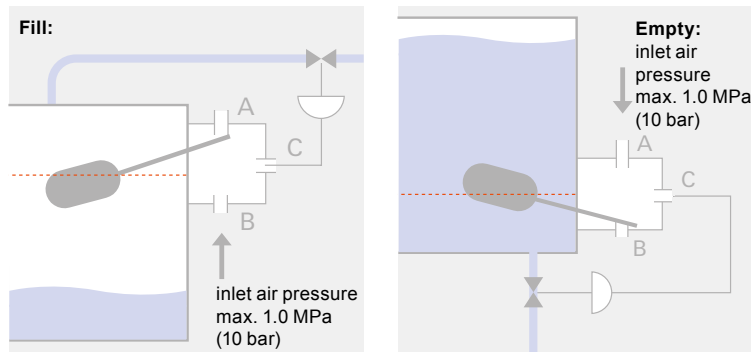
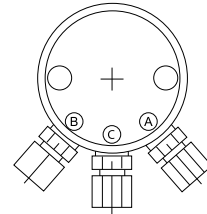
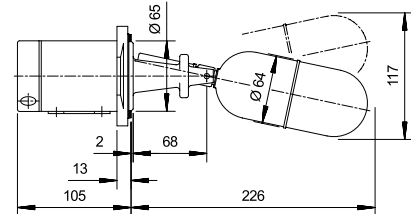
All other technical data as described above



Type P 01 04 – For pneumatic control applications

Equipped with a directly controlled 3/2 way valve (ON/OFF) for control air of 0 to 10 bar. Operation with other non-corrosive gases or fluids is possible.

| | |
|---------------------------------|---|
| Nominal pressure | PN 25, max. 25 bar up to 250°C |
| Operating temperature | 1 to 250°C |
| Ambient temperature | 1 to 80°C |
| Density of liquid | min. 0.7 kg/dm ³ |
| Operating differential | fixed 12 mm |
| Rod extensions | see page 34 |
| Control connections | G 1/8" (BSPP) inside thread |
| Max. control pressure | 10 bar |
| Internal orifice | 1.5 mm |
| Kv Factor | 1 |
| Internal leakage rate at 10 bar | max. 1 cm ³ /min |
| Air flow | 90 NI/min at 6 bar |
| Pressure drop | 1 bar |
| Wetside material | Stainless steel (CrNiMo) |
| Flange material | Stainless steel (CrNiMo) |
| Housing material | Sea water resistant die cast aluminium |
| Flange dimensions | square 92 x 92 mm, PCD 92 mm |
| Counterflange | see page 36 |
| Weight | approx. 1.7 kg |
| Air quality | class 4, acc. to ISO 8573-1 (max. particle size 15 µm, max. particle density 8 mg/m ³) |



The air supply to the 3/2 way valve may be connected to either A or B, according to whether filling or emptying operation is desired or whether the actuator is normally closed or open when pressurized. E.g. pressure can be applied through A to C and exhausted from C through B, alternatively pressure can be applied through B to C and exhausted from C through A.

Type 5P 01 04 – For critical environments or high temperatures. All parts stainless steel. As P 01 04, but switch housing also in stainless steel (CrNiMo) and therefore, highly corrosion resistant and suitable for temperatures up to 300°C. Weight approximately 2.2 kg.

Type PV 01 04 – For moist control air. As P 01 04, but with drain valve for condensate removal.

Type FP 01 04 – For hazardous applications. As P 01 04, but functionally tested. With declaration of conformity for use in explosion proof areas.

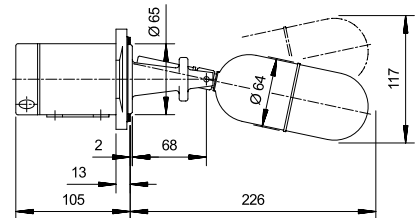
Type FPV 01 04 – For moist control air in hazardous applications. As FP 01 04, but with drain valve for condensate removal. With declaration of conformity for use in explosion proof areas.



Type M 01 04 – For pneumatic proportional control applications

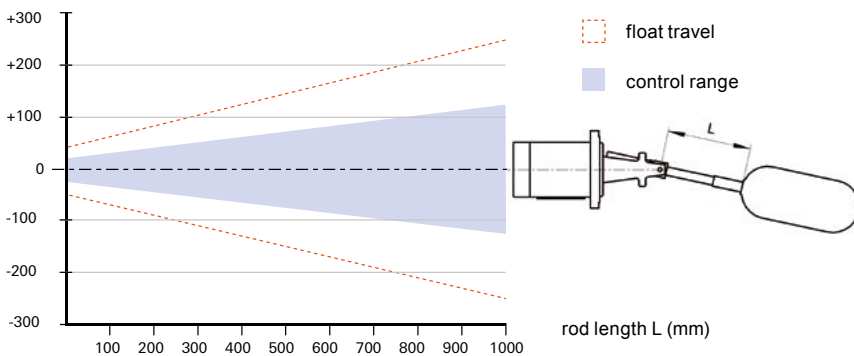
Equipped with a pneumatic control valve which converts the supply pressure of 1.4 bar to an output signal of 0.2 to 1 bar (Option: 7 to 15 psi), proportional to changes in the liquid level.

| | |
|-----------------------|---|
| Nominal pressure | PN 25, max. 25 bar up to 250°C |
| Operating temperature | 1 to 250°C |
| Ambient temperature | 1 to 80°C |
| Density of liquid | min. 0.7 kg/dm ³ |
| Control range | see table below |
| Control connections | G 1/8" (BSPF) inside thread |
| Control pressure | 1.4 bar |
| Output signal | 0.2 to 1 bar |
| Linearity | ±5% (of full scale output) |
| Air flow | 3.5 to 6.0 NI/min. (can be increased by using external booster valve) |
| Air consumption | max. 0.4 Nm ³ /h |
| Wetside material | Stainless steel (CrNiMo) |
| Flange material | Stainless steel (CrNiMo) |
| Housing material | Sea water resistant die cast aluminium |
| Flange dimensions | square 92 x 92 mm, PCD 92 mm |
| Counterflange | see page 36 |
| Weight | approx. 1.7 kg |
| Air quality | class 3, acc. to ISO 8573-1 (max. particle size 5 µm, max. particle density 5 mg/m ³) |



For operation at higher control pressure up to max. 10 bar

| Control pressure in bar | Output signal in bar | | Control range P max / P min |
|-------------------------|----------------------|------|-----------------------------|
| | min. | max. | |
| 2 | 0.25 | 1.5 | 6 |
| 4 | 0.6 | 3.1 | 5.17 |
| 6 | 1.1 | 4.8 | 4.36 |
| 8 | 1.8 | 6.5 | 3.61 |
| 10 | 2.5 | 8.3 | 3.32 |



Control range

The normal control range is 30 mm, i.e. +15 mm/-15 mm from the centre line, measured in water at 20°C. With the float in the central position, the output is 0.6 bar. The control range can be increased by lengthening the float arm (see graph left).

Type 5M 01 04 – For critical environments or high temperatures

All parts stainless steel. As M 01 04, but housing also in stainless steel (CrNiMo) and therefore, highly corrosion resistant and suitable for operating temperatures up to 300°C. Weight approximately 2.2 kg.

**Type MV 01 04 – For moist control air**

As M 01 04, but with drain valve for condensate removal.

**Type FM 01 04 – For hazardous applications**

As M 01 04, but functionally tested. With declaration of conformity for use in explosion proof areas.

**Type FMV 01 04 – For moist control air in hazardous applications**

As FM 01 04, but with drain valve for condensate removal. With declaration of conformity for use in explosion proof areas.

Control function

The standard air connection configuration is shown here (fig. A). When filling, the output signal is decreasing proportionally to the rising level. The reverse function is obtained by turning the switch housing 180°C (see fig. B). This can be accomplished without interrupting the process.

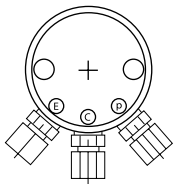


figure A

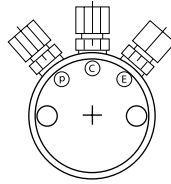
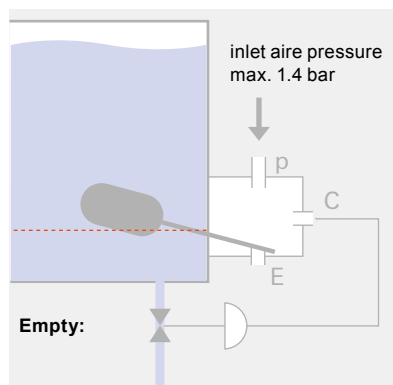
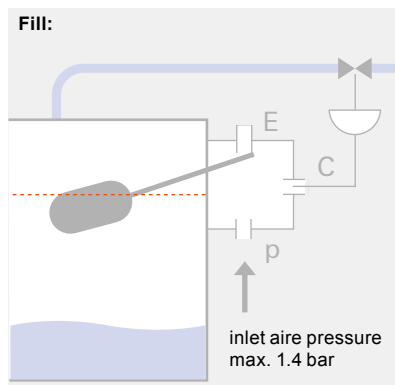


figure B



The Industrial Range offers numerous flange combinations

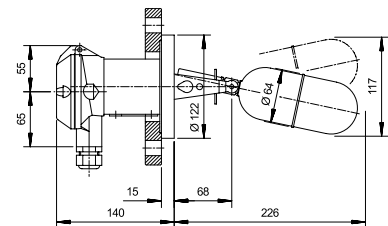
The main feature of the Industrial Range is the wide choice of flange modules, manufactured according to international standards such as EN/DIN, ANSI or JIS. Available in various steel qualities, nominal sizes and pressure ratings (e.g. up to PN 250 acc. to EN/DIN or cl. 1500 acc. to ANSI). Shown here are only a few typical combinations, many more possibilities can be found in the module descriptions. All types in the Standard Range shown on the previous pages can of course also be combined with industrial flanges.

Type A 22C 04 – For general purpose

| | |
|------------------------------|--|
| Nominal pressure | PN 40 |
| Operating temperature | 0 to 330°C |
| Ambient temperature | 0 to 70°C |
| Density of liquid | min. 0.7 kg/dm ³ |
| Operating differential | fixed 12 mm |
| Rod extensions | see page 34 |
| Wetside material | Stainless steel (CrNiMo) |
| Flange material | Seal part: Stainless steel (CrNiMo) Slip-on Flange: Carbon steel P265GH, zinc galvanised and passivated |
| Housing material | Sea water resistant die cast aluminium |
| Flange | DN 65, PN 40 acc. to EN 1092-1 |
| Flange facing | Raised face type B1 |
| Switch element | Microswitch SPDT with silver contacts |
| Switch rating | 250 VAC, 5 A 30 VDC, 5 A |
| Enclosure | IP65 |
| Weight | approx. 5.4 kg |
| Safety Integrity Level (SIL) | SIL 1 (Type AA 22C 04: SIL 2) |

Frequently used on off-shore rigs, in steam boilers and plants, power stations, chemical and petrochemical engineering, heating and refrigeration, i.e. airconditioning technology.

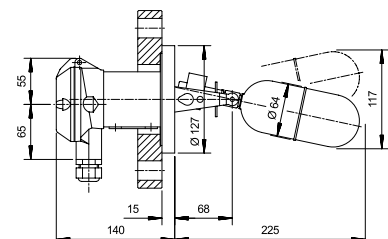
SIL
IEC 61508/61511 SIL 3 Capable



Type B 132R 07 – For low voltage circuits and low density liquids

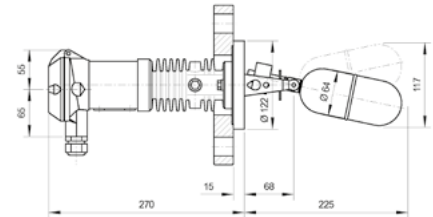
For use in low-voltage controls or logic circuits. Especially when long downtimes or sulfur-containing environments are to be expected. For hazardous area see also Ex-level switches page 40.

| | |
|------------------------------|--|
| Nominal pressure | ANSI cl. 300 |
| Operating temperature | 0 to 330°C |
| Ambient temperature | 0 to 70°C |
| Density of liquid | min. 0.5 kg/dm ³ |
| Operating differential | fixed 12 mm |
| Wetside material | Stainless steel (CrNiMo) |
| Flange material | Seal part: Stainless steel (CrNiMo) Slip-on Flange: Carbon steel P265GH, zinc galvanised and passivated |
| Housing material | Sea water resistant die cast aluminium |
| Flange | DN 3", PN cl. 300 ANSI B16.5 |
| Flange facing | Raised face |
| Switch element | Microswitch SPDT with gold plated |
| Enclosure | IP65 |
| Weight | approx. 8.6 kg |
| Safety Integrity Level (SIL) | SIL 1 (Type BB 132R 07: SIL 2) |



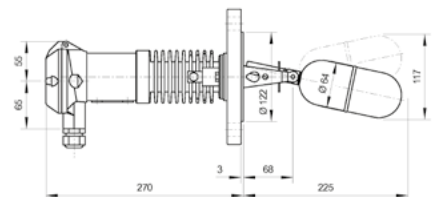
Type HA 24E 02 – For high temperature

| | |
|------------------------------|---|
| Nominal pressure | PN 100 |
| Operating temperature | 0 to 400°C |
| Ambient temperature | 0 to 135°C |
| Density of liquid | min. 0.7 kg/dm ³ |
| Operating differential | fixed 12 mm |
| Rod extensions | see page 34 |
| Wetside material | Stainless steel (CrNiMo) |
| Flange material | Seal part: Stainless steel (CrNiMo) Slip-on Flange: Carbon steel P265GH, zinc galvanised and passivated |
| Housing material | seawater resistant, die cast aluminium |
| Flange | DN 65, PN 100 acc. to EN 1092-1 |
| Flange facing | Raised face type B2 |
| Switch element | Microswitch SPDT with silver contacts |
| Switch rating | 250 VAC, 5 A 30 VDC, 5 A |
| Enclosure | IP65 |
| Weight | approx. 9.6 kg |
| Safety Integrity Level (SIL) | SIL 1 (Type HAA 24E 02: SIL 2) |

**Type 5TDI 22CF 041 – For low temperature and severe environmental conditions**

Completely in stainless steel with fixed flange.
For hazardous area see also Ex-level switches page 40.

| | |
|------------------------------|--|
| Nominal pressure | PN 40 |
| Operating temperature | -196°C to 270°C |
| Ambient temperature | -10°C to 80°C |
| Density of liquid | min. 0.7 kg/dm ³ |
| Operating differential | fixed 12 mm |
| Wetside material | Stainless steel (CrNiMo) |
| Flange material | Stainless steel (CrNiMo) |
| Housing material | Stainless steel (CrNiMo) |
| Flange | DN 65, PN 40 acc. to EN 1092-1 |
| Flange facing | Raised face type B1 |
| Switch element | Inductive proximity switch acc. to NAMUR/EN 60947-5-6 |
| Nominal voltage | 8.2 VDC ±5% |
| Operating voltage | 5 to 25 VDC |
| Current output | Proximity open: ≥2.2 mA float down Proximity closed: ≤1 mA float up |
| Function | as high alarm: at closed circuit as low alarm: at operating circuit |
| For inverse function | Type 5TDIN 22CF 041 |
| Enclosure | IP66/IP67 |
| Weight | approx. 7.7 kg |
| Safety Integrity Level (SIL) | SIL 1 |



The Plastic Range for corrosive or high purity media

The main feature of the Plastic Range is that all wet-side materials are in corrosion resistant plastics such as PP or PTFE. Following are two typical examples, but these are by no means the limit of possible combinations which can be specified by reference to the module descriptions on pages 20 to 34.

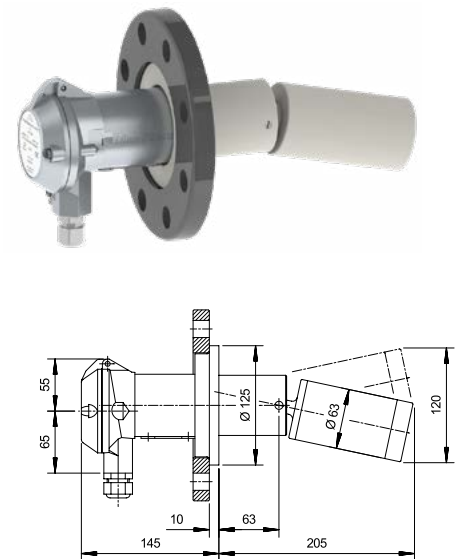
Type A 301 99 – For general use in PP

| | | |
|------------------------|--|--|
| Nominal pressure | PN 10 | max. 10 bar up to 25°C max. 5 bar at 45°C max. 2.5 bar at 60°C |
| Operating temperature | 0 to 60°C | |
| Ambient temperature | 0 to 60°C | |
| Density of liquid | min. 0.65 kg/dm ³ | |
| Operating differential | fixed 12 mm | |
| Rod extensions | see page 34 | |
| Wet-side material | PP | |
| Flange material | Seal part: PP Slip-on Flange: PVC | |
| Housing material | Sea water resistant die cast aluminium | |
| Flange | DN 80, PN 10 acc. to EN 1092-1 | |
| Flange facing | Raised face type B1 | |
| Switch element | Microswitch SPDT with silver contacts | |
| Switch rating | 250 VAC, 5 A 30 VDC, 5 A | |
| Enclosure | IP65 | |
| Weight | approx. 1.9 kg | |

Vacuum Applications:

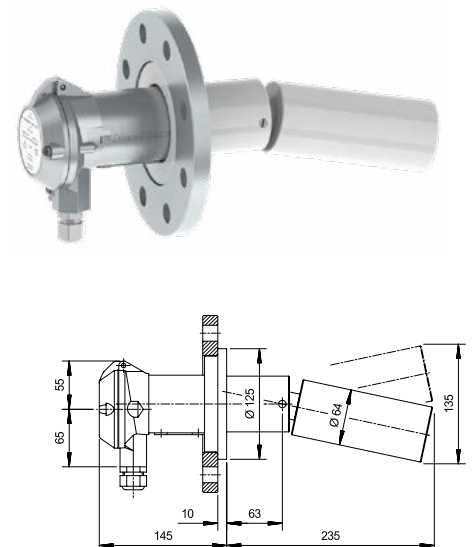
For vacuum duty a modified sealing must be used, suffix to flange code is E20, e.g. A 301E20 99. This must be specified in the purchase order. The vacuum sealing unit is capable of operating to 0 bar absolute pressure.

Proven application areas: chemical and petrochemical engineering, pulp and paper, electroplating, food industry, etc.



Type A 304 98 – For high temperature and corrosive applications in PTFE

| | | |
|------------------------|--|---|
| Nominal pressure | PN 6 | max. 6 bar up to 65°C max. 4.5 bar at 100°C max. 3 bar at 200°C |
| Operating temperature | 0 to 200°C | |
| Ambient temperature | 0 to 70°C | |
| Density of liquid | min. 0.75 kg/dm ³ | |
| Operating differential | fixed 12 mm | |
| Rod extensions | see page 34 | |
| Wet-side material | PTFE | |
| Flange material | Seal part: PTFE 25% GRP Slip-on Flange: Carbon steel P265GH, zinc galvanised and passivated | |
| Housing material | Sea water resistant die cast aluminium | |
| Flange | DN 80, PN 10 acc. to EN 1092-1 | |
| Flange facing | Raised face type B1 | |
| Switch element | Microswitch SPDT with silver contacts | |
| Switch rating | 250 VAC, 5 A 30 VDC, 5 A | |
| Enclosure | IP65 | |
| Weight | approx. 5 kg | |



Switch modules

The switch module is selected according to the type of control required, switching capability, environmental conditions and the working temperature in the vessel. The key on page 21 shows how the designation code is structured. The details of the switch modules are listed in the following tables 1 to 11. In accordance with the relevant EU-directives resp. UK Regulations and where applicable, Trimod Besta level switches are marked CE resp. UKA .

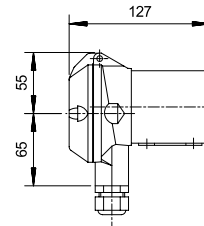


Table 1

Electrical/Electronic Basic Modules, IP65

With 1 or 2 switches, galvanically isolated and with earthed encapsulation. Enclosure type IP65. Housing in sea water resistant die cast aluminium, with cable gland M20x1.5.

| Type | Function | SIL | Rating | * Temperature in °C | | Connection diagram |
|------|--|-------|---|---------------------|---------|--------------------|
| | | | | Operating | Ambient | |
| A | SPDT Microswitch with silver contacts | SIL 1 | 250 VAC, 5 A 30 VDC, 5 A | 0 to 330 | 0 to 70 | |
| AA | Dual SPDT Microswitches with silver contacts, galvanically isolated | SIL 2 | 250 VAC, 5 A 30 VDC, 5 A | 0 to 330 | 0 to 70 | |
| B | SPDT Microswitch with gold plated contacts | SIL 1 | 0.3 A / 30 VDC | 0 to 330 | 0 to 70 | |
| BB | Dual SPDT Microswitches with gold plated contacts, galvanically isolated | SIL 2 | 0.3 A / 30 VDC | 0 to 330 | 0 to 70 | |
| I | Proximity switches acc. to NAMUR/EN 60947-5-6. As high alarm in the quiescent current mode or as a low alarm in the working current mode. Float up: Proximity switch damped: $I \leq 1$ mA Float down: Proximity switch undamped: $I \geq 2.2$ mA | SIL 1 | $U_N 8.2$ VDC $\pm 5\%$ ($U_B 5$ to 25 VDC) | 0 to 150 | 0 to 70 | |
| IN | Proximity switches acc. to NAMUR/EN 60947-5-6. As low alarm in the quiescent current mode or as a high alarm in the working current mode. Float up: Proximity switch undamped: $I \geq 2.2$ mA Float down: Proximity switch damped: $I \leq 1$ mA | SIL 1 | $U_N 8.2$ VDC $\pm 5\%$ ($U_B 5$ to 25 VDC) | 0 to 150 | 0 to 70 | |
| II | Dual proximity switches acc. to NAMUR/EN 60947-5-6. High/low level, galvanically isolated. Combination of I and IN. | SIL 1 | $U_N 8.2$ VDC $\pm 5\%$ ($U_B 5$ to 25 VDC) | 0 to 150 | 0 to 70 | |
| IE9 | Self-checking proximity switch acc. to NAMUR/EN 60947-5-6, TÜV approved. As high alarm in the quiescent current mode. Float up: proximity switch damped: $I \leq 1$ mA For self-checking operate in quiescent current mode. | SIL 1 | $U_N 8.2$ VDC $\pm 5\%$ ($U_B 5$ to 25 VDC) | 0 to 150 | 0 to 70 | |
| INE9 | Self-checking proximity switch acc. to NAMUR/EN 60947-5-6, TÜV approved. As low alarm in the quiescent current mode. Float down: proximity switch damped: $I \leq 1$ mA For self-checking operate in quiescent current mode | SIL 1 | $U_N 8.2$ VDC $\pm 5\%$ ($U_B 5$ to 25 VDC) | 0 to 150 | 0 to 70 | |
| IIE9 | Dual self-checking proximity switches acc. to NAMUR/EN 60947-5-6, TÜV approved. High/low level, galvanically isolated. Combination of IE9 and INE9. | SIL 1 | $U_N 8.2$ VDC $\pm 5\%$ ($U_B 5$ to 25 VDC) | 0 to 150 | 0 to 70 | |

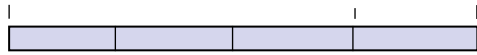
* The combinations of the temperature maximum values are to be avoided. Actual values must be requested from the manufacturer!

Key to type numbers

Switch module

Prefix

Basic module



- Switch module (electric / electronic / pneumatic)
- Increased protection (IP66 / IP67 / IP68)
- High or low temperature version
- Switch module housing material option (chromated/complete in stainless steel CrNiMo)
- Cable gland other than M20x1.5

Flange module

Page 25



Float module

Page 30



Thread for cable gland

The types in tables 1, 2, 4 and 5 are available on request with a cable gland thread other than M20x1.5.

| Prefix | Cable gland |
|--------|--|
| 10 | Marine execution (DIN 89280), Type W |
| 30 | Marine execution (DIN 89280), Type Z |
| 40 | Internal thread 3/4" NPT (without cable gland) |

Housing material coatings for enhanced requirements

Chromated housing (ROHS conform)

The types in tables 1, 2 and 7 are also available with chromated housing. The designation prefix is 2. The types in tables 3, 4, 5, 8 and 9 are chromated as standard.

Example: 2DA or Z2K8

Stainless steel housing (CrNiMo/316SS)

All switch modules in tables 1 to 9 are also available in stainless steel. The designation prefix is 5.

Example: 5DA or Z5K8

Epoxy coated housing

Most switches are available with Epoxy coating.

Designation suffix: E46 Epoxy coating grey

Example: DAE46

Table 2

Increased protection enclosure IP66/IP67

All basic modules in table 1 are also available in IP66/IP67. The designation prefix is D. All data in table 1, except for the temperature rating remain unchanged. For high temperatures (operating -40°C to +200°C, ambient -40°C to +120°C), add E28, e.g. DAE28



| Type | * Temperature in °C | |
|-----------------------|---------------------|------------|
| | Operating | Ambient |
| DA / DAA | -30 to 120 | -30 to 120 |
| DB / DBB | -30 to 120 | -30 to 120 |
| DI / DIN / DII | -30 to 120 | -20 to 90 |
| DIE9 / DINE9 / DIIIE9 | -30 to 120 | -30 to 90 |

Safety Integrity Level (SIL)
Types DA / DB: SIL 1
Types DAA / DBB: SIL 2
Types DI / DIN / DII / DIE9 / DINE9 / DIIIE9: SIL 1

Table 3

Submersible version IP68

All basic modules in table 1 are also available for submerged applications (IP68) to 100 m depth with chromated housing. The designation prefix is U3, U5 or U11. The designation 3, 5 and 11 specifies standard lengths of encapsulated cable in meters (longer cables are available). All data in table 1, except for temperature rating, remain unchanged. Housing: chromated.



| Type | * Temperature in °C | |
|--------------------------|---------------------|-----------|
| | Operating | Ambient |
| U3A / U3AA | -30 to 80 | -30 to 80 |
| U3B / U3BB | -30 to 80 | -30 to 80 |
| U3I / U3IN / U3II | -25 to 80 | -25 to 80 |
| U3IE9 / U3INE9 / U3IIIE9 | -30 to 80 | -30 to 80 |

Safety Integrity Level (SIL)
Types U3A / U3B: SIL 1
Types U3AA / U3BB: SIL 2
Types U3I / U3IN / U3II / U3IE9 / U3INE9 / U3IIIE9: SIL 1

Table 4

High operating temperature

All basic modules in table 1 are also available in a high temperature version with chromated housing IP65. The designation prefix is H. All data in table 1, except for temperature rating and connection diagram, remain unchanged.



| Type | * Temperature in °C | |
|-----------------------|---------------------|----------|
| | Operating | Ambient |
| HA / HAA | 0 to 400 | 0 to 135 |
| HB / HBB | 0 to 400 | 0 to 135 |
| HI / HIN / HII | 0 to 300 | 0 to 75 |
| HIE9 / HINE9 / HIIIE9 | 0 to 300 | 0 to 75 |

Safety Integrity Level (SIL)
Types HA / HB: SIL 1
Types HAA / HBB: SIL 2
Types HI / HIN / HII / HIE9 / HINE9 / HIIIE9: SIL 1

Table 5

Low operating temperature

All basic modules in table 1 are also available in a low temperature version with chromated housing IP66/IP67. The designation prefix is TD. All data in table 1, except for temperature rating and connection diagram, remain unchanged.



| Type | * Temperature in °C | |
|--------------------------|---------------------|-----------|
| | Operating | Ambient |
| TDA / TDAA | -196 to 270 | -10 to 80 |
| TDB / TDBB | -196 to 270 | -10 to 80 |
| TDI / TDIN / TDII | -196 to 270 | -10 to 80 |
| TDIE9 / TDINE9 / TDIIIE9 | -196 to 270 | -10 to 80 |

Safety Integrity Level (SIL)
Types TDA / TDB: SIL 1
Types TDAA / TDBB: SIL 2
Types TDI / TDIN / TDII / TDIE9 / TDINE9 / TDIIIE9: SIL 1

* The combinations of the temperature maximum values are to be avoided. Actual values must be requested from the manufacturer!

Table 6

Ex-Switches for intrinsically safe circuits (Ex-i)

The level switches with switch modules of types I, IE9 and B are designed also for use in hazardous areas, Zone 1 (EPL b), float: Zone 0 (EPL a) Technical details, see page 40.

Example: IE98.

| Approved types | Designation | Type acc. to | Approval authority | Classification | Certificate |
|----------------|-------------|---------------------|--------------------|-------------------------|---------------------|
| I... / IE9... | 8 | 2014/34/EU | BV CPS | Ex ia IIC T6...T1 Ga/Gb | EPS 12 ATEX 1430 X |
| I... / IE9... | 5 | IECEX Scheme | BV CPS | Ex ia IIC T6...T1 Ga/Gb | IECEX EPS 15.0038 X |
| I... / IE9... | 7 | UK SI 2016 No. 1107 | BV CPS | Ex ia IIC T6...T1 Ga/Gb | EPS 22 UKEX 1261 X |
| B... | 8 | 2014/34/EU | BV CPS | Ex ia IIC T6 Ga/Gb | EPS 12 ATEX 1430 X |
| B... | 5 | IECEX Scheme | BV CPS | Ex ia IIC T6 Ga/Gb | IECEX EPS 15.0038 X |
| B... | 7 | UK SI 2016 No. 1107 | BV CPS | Ex ia IIC T6 Ga/Gb | EPS 22 UKEX 1261 X |

Table 7

Hermetically sealed Ex-Switches for use in Zone 1 (EPL b), float: Zone 0 (EPL a)

The type «eb» (increased safety) housing is equipped with 1 or 2 «db» (flameproof) microswitches, galvanically isolated with earthed encapsulation. Enclosure type: IP66/IP67



Housing in sea water resistant die cast aluminium or optional stainless steel; prefix «5».

Cable gland thread: M20x1.5 (without cable gland)

| Type | Function | SIL | * Temperature in °C | | Connection diagram |
|------|--|-------|---------------------|-----------|--------------------|
| | | | Operating | Ambient | |
| ZK. | SPDT Microswitch with silver contacts | SIL 1 | -30 to 200 | -45 to 80 | |
| ZKK. | Dual SPDT Microswitches, galvanically isolated, with silver contacts | SIL 2 | -30 to 200 | -45 to 80 | |

Switching rating: 250 VAC, 5A 30 VDC , 5 A
 50 VDC , 3 A
 75 VDC , 1 A
 125 VDC , 0.5 A
 250 VDC , 0.25 A

Table 8

Submersible version IP68

All modules in table 7 are also available for submerged applications (IP68) to 100 m depth. The designation prefix is U3, U5, U11 etc. The designation 3, 5, 11 etc. specifies standard lengths of encapsulated cable in meters (other cable lengths are available). All data in table 7, except for temperature rating, remain unchanged. Housing: chromated. Only permitted for certification designation 5, 7 and 8!



| Type | * Temperature in °C | |
|-----------------|---------------------|-----------|
| | Operating | Ambient |
| ZU..K., ZU..KK. | -30 to 80 | -30 to 80 |

Safety Integrity Level (SIL)
 Type ZU..K.: SIL 1
 Type ZU..KK.: SIL 2

Table 9

High and low operating temperature

All basic modules in table 7 are also available in a high/low temperature version with chromated housing to IP66/IP67.

The designation prefix is ZHT or optional stainless steel; prefix is Z5HT.

Connection diagram see table 7.



| Type | * Temperature in °C | |
|----------------|---------------------|-----------|
| | Operating | Ambient |
| ZHTK. / ZHTKK. | -196 to 380 | -45 to 80 |

Safety Integrity Level (SIL)
 Type ZHTK: SIL 1
 Type ZHTKK: SIL 2

* The combinations of the temperature maximum values are to be avoided. Actual values must be requested from the manufacturer!

Table 10

Designation code and approval for hermetically sealed Ex-Switches, Type Z

The designation number refers to the Certificate of Conformity and follows the module type. Example: ZK8

| Designation | Type acc. to | Approval authority | Classification | Certificate |
|-------------|---------------------|--------------------|----------------------------|---------------------|
| 8 | 2014/34/EU | BV CPS | Ex eb db IIC T6...T5 Ga/Gb | EPS 12 ATEX 1430 X |
| 5 | IECEx Scheme | BV CPS | Ex eb db IIC T6...T5 Ga/Gb | IECEx EPS 15.0038 X |
| 7 | UK SI 2016 No. 1107 | BV CPS | Ex eb db IIC T6...T5 Ga/Gb | EPS 22 UKEX 1261 X |

Table 11

Pneumatic modules

The pneumatic modules are described in detail on pages 14 to 16.
The housings are in sea water resistant aluminium. Pressure connections: G 1/8" (BSPP) inside thread.



| Type | Function | Connection diagram | * Temperature in °C Operating | Ambient |
|------------|---|--------------------|----------------------------------|---------|
| P | Pneumatic switch with ON/OFF 3/2 way valve. Input air pressure 0 to 10 bar | | 1 to 250 | 1 to 80 |
| PV | Pneumatic switch with ON/OFF 3/2 way valve and drain valve for condensate removal. Input air pressure 0 to 10 bar | | 1 to 250 | 1 to 80 |
| FP | Pneumatic switch with ON/OFF 3/2 way valve, 0 to 10 bar function checked, may be used in hazardous areas. | | 1 to 250 | 1 to 80 |
| FPV | Pneumatic switch with ON/OFF 3/2 way valve, 0 to 10 bar function checked, may be used in hazardous areas with drain valve for condensate removal. | | 1 to 250 | 1 to 80 |
| M | Pneumatic proportional control valve, input air pressure 1.4 bar (max. 10 bar). Output signal 0.2 to 1 bar (3-15 psi). | | 1 to 250 | 1 to 80 |
| MV | Pneumatic proportional control valve and drain valve for condensate removal. Input air pressure 1.4 bar (max. 10 bar). Output signal 0.2 to 1 bar (3-15 psi). | | 1 to 250 | 1 to 80 |
| FM | Pneumatic proportional control valve, input air pressure 1.4 bar (max. 10 bar). Output signal 0.2 to 1 bar (3-15 psi) function checked may be used in hazardous areas. | | 1 to 250 | 1 to 80 |
| FMV | Pneumatic proportional control valve and drain valve for condensate removal. Input air pressure 1.4 bar (max.10 bar). Output signal 0.2 to 1 bar (3-15 psi) function checked, may be used in hazardous areas. | | 1 to 250 | 1 to 80 |

* The combinations of the temperature maximum values are to be avoided.
Actual values must be requested from the manufacturer!

Chromated housing

The types in table 11 are also available with chromated housing. Designation prefix is 2.
Example: 2P or F2M

Stainless steel housing

All switch modules in table 11 are also available in stainless steel. The operating temperature range is increased to 400°C.
Designation prefix is 5.
Example: 5MV or F5MV

Flange modules

The flange module is selected according to the required flange standard, nominal pressure rating (PN), nominal size (DN), type of gasket, properties of the medium and flange material. A basic distinction is made between flange modules for the Standard Range, the Industrial Range and the Plastic Range. The flange modules may be installed either horizontally or vertically.

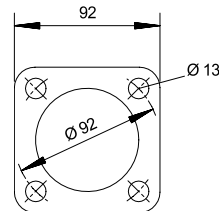
Pressure equipment directive (PED):
For switches according to directive 2014/68/EU add the letter «P» after flange name. e.g. A 01P 041



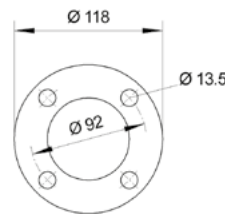
Table 12
Flange modules for the Standard Range

Type Standard flanges

| | |
|-------------------|-----------------------------------|
| 01 | Square flange incl. gasket |
| Material | 1.4408 |
| Nominal pressure | PN 25, max. 25 bar up to 300°C |
| Flange facing | Raised face |
| Temperature range | -196 to 300°C |
| Counterflange | see page 36 |

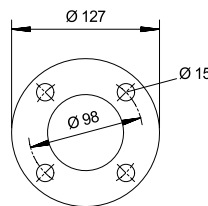


| | |
|-------------------|--|
| 011 | Round flange incl. gasket |
| Material | 1.4571 |
| Nominal pressure | PN 25, max. 25 bar up to 300°C max. 23 bar at 400°C |
| Flange facing | Raised face |
| Temperature range | -196 to 400°C |
| Counterflange | see page 36 |

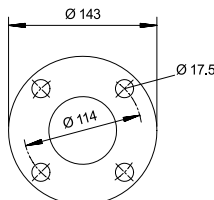


Type Special flanges

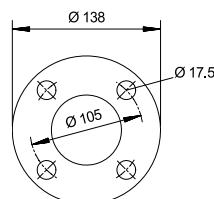
| | |
|-------------------|--|
| 03 | Round flange incl. gasket |
| Material | 1.4571 |
| Nominal pressure | PN 25, max. 25 bar up to 300°C max. 23 bar at 400°C |
| Flange facing | Raised face |
| Temperature range | -196 to 400°C |



| | |
|-------------------|--|
| 04 | Round flange incl. gasket |
| Material | 1.4571 |
| Nominal pressure | PN 25, max. 25 bar up to 300°C max. 23 bar at 400°C |
| Flange facing | Raised face |
| Temperature range | -196 to 400°C |



| | |
|-------------------|--|
| 06 | Round flange incl. gasket |
| Material | 1.4571 |
| Nominal pressure | PN 25, max. 25 bar up to 300°C max. 23 bar at 400°C |
| Flange facing | Raised face |
| Temperature range | -196 to 400°C |



Key to type numbers

Switch module

Page 20



Flange module

Table 12 to 14



Float module

Page 30



(Table 13)

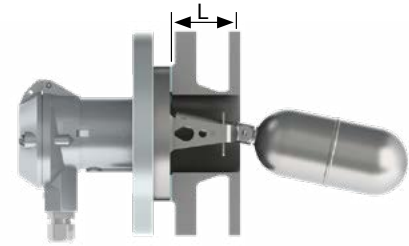
Other bracket length than 68 mm, and/or fixed flange execution and/or other materials, and/or PED conformity

Flange facing

Nominal pressure (PN)

Nominal bore (DN)

Standard (for EN/DIN without code)



Important note:

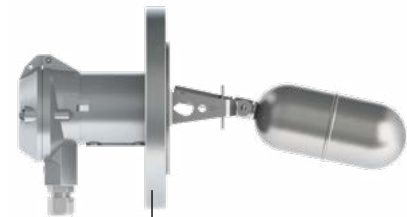
Ensure that nozzle length L and diameter provide sufficient clearance for float movement. See table 23, page 33.

Flange modules for the Industrial Range acc. to EN/DIN, ANSI, JIS

For economic reasons, the flange modules of the Industrial Range are manufactured in two different executions. The fixed flange for the most demanding requirements in respect of temperature range and corrosion resistance and the composite flange for best economy.

Fixed flange

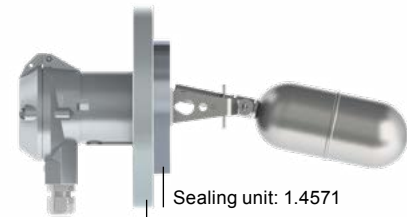
| | |
|-------------------|--|
| Temperature range | -196 to 400°C |
| Material | 1.4571 |
| Options | 1.4435 (316L), Hastelloy C |
| | If a fixed flange is required please consult us to select the correct type number. |
| | Type designation see table 13. |



Fixed flange: 1.4571

Composite flange

| | |
|-------------------|---|
| Temperature range | -10 to 400°C (EN/DIN) |
| | -29 to 400°C (ANSI) |
| Materials | Sealing unit 1.4571 (316Ti) |
| | Slip-on Flange Carbon steel P265GH zinc galvanized and passivated |
| Options | Sealing unit 1.4435 (316L), Hastelloy C |
| | Type designation see table 13. |
| | Slip-on Flange 13 CrMo 4-5 (high temp. steel) |
| | A 350-LF2 (low temp. steel) |



Sealing unit: 1.4571

Slip-on Flange: Carbon steel P265GH zinc galvanized and passivated

Table 13

Type of flange module according to EN 1092-1

| | PN 16 | PN 40 | PN 63 | PN 100 | PN 160 | PN 250 |
|---------------|-------|-------|-------|--------|--------|--------|
| DN 65 | 21. | 22. | 23. | 24. | 25. | - |
| DN 80 | 31. | 32. | 33. | 34. | 35. | 36. |
| DN 100 | 41. | 42. | 43. | 44. | 45. | 46. |
| DN 125 | 51. | 52. | 53. | 54. | - | - |
| DN 150 | 61. | 62. | 63. | 64. | - | - |

Suffix for flange facings:

| | | |
|------------------------|----------|---|
| Raised face | type B1 | C |
| Raised face | type B2 | E |
| Male | type E | V |
| Groove | type D | N |
| Tongue face | type C | F |
| Groove for metal joint | DIN 2696 | L |

Example:

EN/DIN Flange module, DN 65, PN 40, type E (male): **22V**

Type of flange module according to ANSI B16.5

| | cl. 150 | cl. 300 | cl. 400 | cl. 600 | cl. 900 | cl. 1500 |
|--------------|---------|---------|---------|---------|---------|----------|
| DN 3" | 131. | 132. | - | 134. | 135. | 136. |
| DN 4" | 141. | 142. | 143. | 144. | 145. | 146. |
| DN 5" | 151. | 152. | 153. | 154. | - | - |
| DN 6" | 161. | 162. | 163. | 164. | - | - |

Suffix for flange facings:

| | | |
|--------------|-----|---|
| Raised face | RF | R |
| Small male | SMF | M |
| Small tongue | STF | T |
| Small groove | SGF | G |
| Ring joint | RTJ | J |

Example:

ANSI-Flange module DN 4", PN cl. 900, small groove: **145G**

Type of flange module according to JIS B 2220

| | 5K | 10K | 16K | 20K | 30K | 40K | 63K |
|---------------|------|------|------|------|------|------|------|
| DN 65 | 329. | 320. | 328. | 321. | 322. | 323. | 324. |
| DN 80 | 339. | 330. | 338. | 331. | 332. | 333. | 334. |
| DN 100 | 349. | 340. | 348. | 341. | 352. | 343. | 344. |
| DN 125 | - | 350. | - | 351. | 352. | 353. | 354. |

Suffix for flange facings:

| | |
|--------------------|---|
| Large raised face: | R |
| Male: | M |
| Tongue: | T |
| Groove: | G |

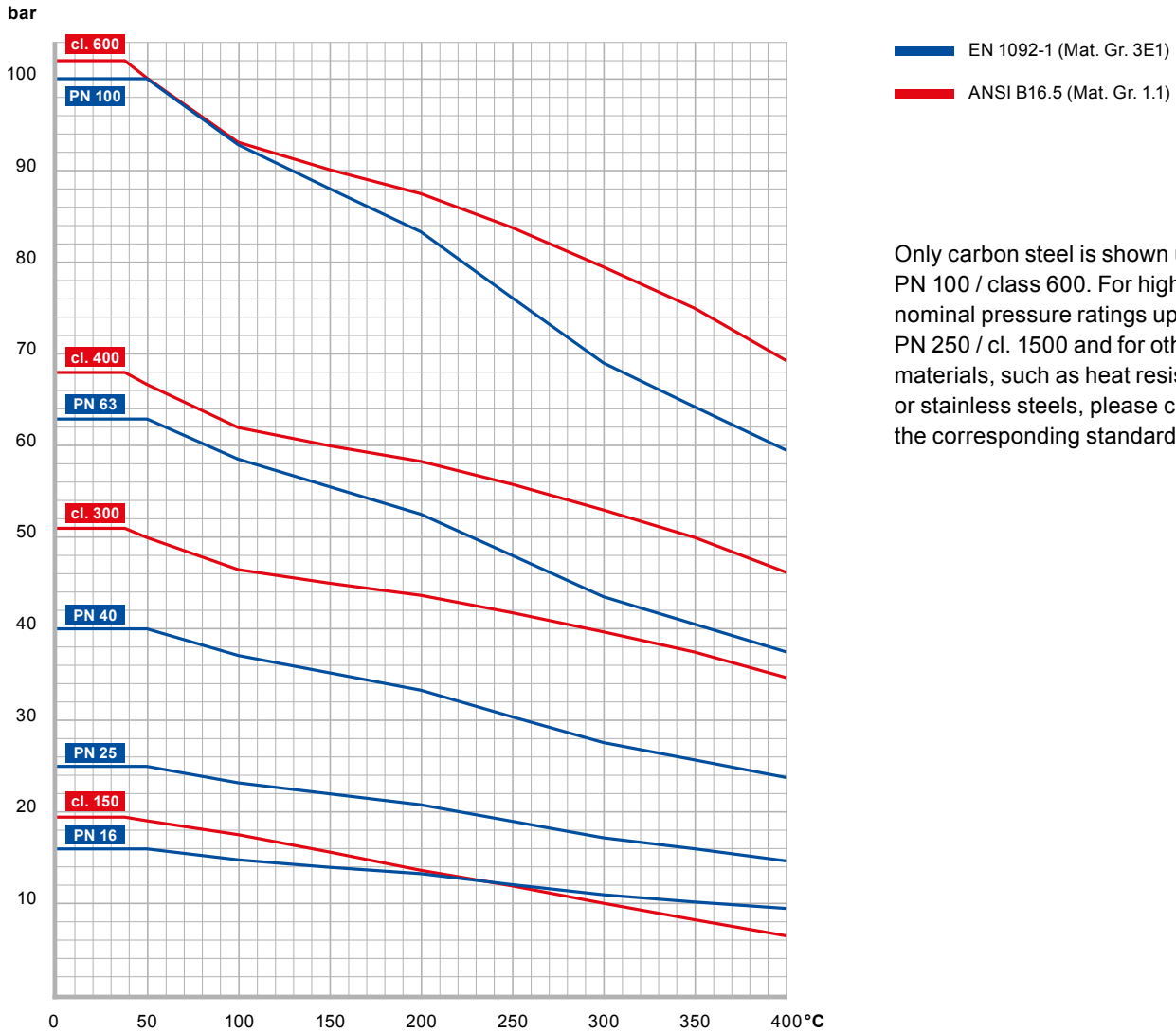
Example:

JIS-Flange module DN 80A, PN 30K, groove: **332G**

Types 5K: only fixed flange

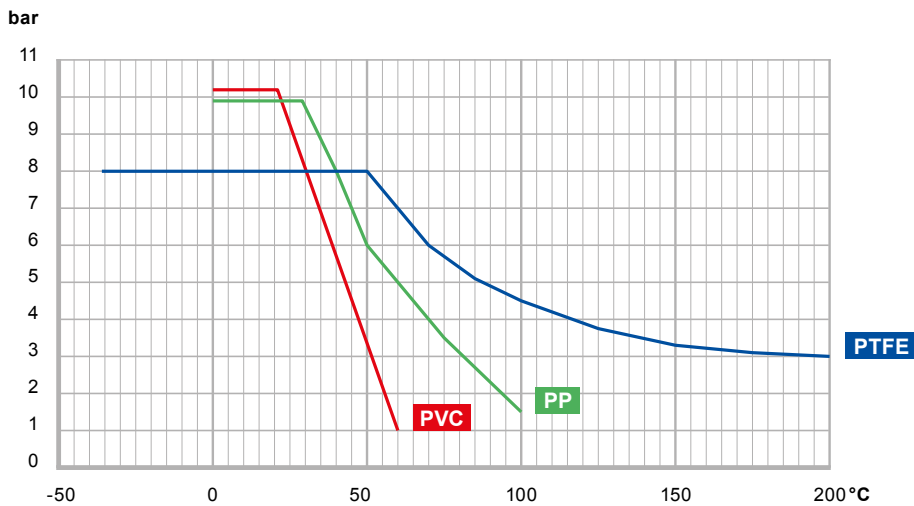
Types 40K and 63K: only composite flange

Pressure/Temperature Diagram acc. to EN 1092-1 and ANSI B16.5



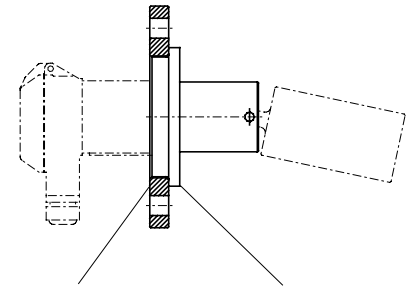
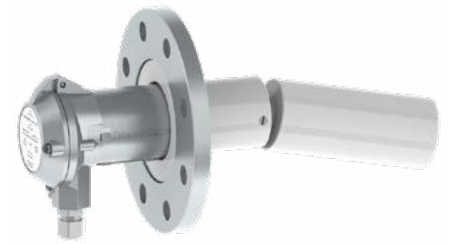
Only carbon steel is shown up to PN 100 / class 600. For higher nominal pressure ratings up to PN 250 / cl. 1500 and for other materials, such as heat resistant or stainless steels, please consult the corresponding standards.

Pressure/Temperature Diagram Plastics



Flange modules for the Plastic Range acc. to EN/DIN, ANSI, JIS

| | | |
|-------------------|---|-----------------------|
| Wetted parts | PP (Polypropylene) or PTFE | |
| | Sealing unit in PTFE with 25% GRP | |
| | Option: sealing unit and pivot pin in Virgin-PTFE | |
| | Suffix: E104 | |
| Slip-on Flange | PVC (for EN/DIN only) or P265GH (carbon steel), zinc galvanised and passivated | |
| | Option: stainless steel for low temp. application | |
| Flange facing | Raised face | |
| Temperature range | PP version with: | |
| | PVC-Slip-on Flange | 0 to 60°C |
| | P265GH-Slip-on Flange | 0 to 100°C |
| | PTFE version with: | |
| | PVC-Slip-on Flange | 0 to 60°C |
| | P265GH-Slip-on Flange | -10 to 200°C (EN/DIN) |
| | P265GH-Slip-on Flange | -29 to 200°C (ANSI) |
| | Stainless steel slip-on Flange | -196 to 200°C |
| Pressure range | max. 10 bar | |
| Vacuum duty | The vacuum sealing unit is capable of operating to 0 bar absolute pressure, but this requirement must be specified in the purchase order. | |
| | Suffix PTFE version: | E19 (e.g. 302E19) |
| | Suffix PP version: | E20 (e.g. 301E20) |



Slip-on flange PVC
or P265GH
Option:
stainless steel 1.4571

Sealing unit
PP or PTFE
Option: pure PTFE

Table 14

Type of flange module according to EN 1092-1 PN 10

| Material | DN 65 | DN 80 | DN 100 | DN 125 | DN 150 |
|---------------|-------|-------|--------|--------|--------|
| PVC / PP | - | 301 | 401 | 501 | 601 |
| PVC / PTFE | 202 | 302 | 402 | 502 | 602 |
| P265GH / PP | - | 303 | 403 | 503 | 603 |
| P265GH / PTFE | - | 304 | 404 | 504 | 604 |
| 1.4571 / PP | - | 307 | - | - | - |
| 1.4571 / PTFE | - | 308 | - | - | - |

Type of flange module acc. to ANSI B16.5 PN cl. 150 reduced

| Material | DN 3" | DN 4" | DN 5" | DN 6" |
|---------------|-------|-------|-------|-------|
| P265GH / PP | 1313 | 1413 | 1513 | 1613 |
| P265GH / PTFE | 1314 | 1414 | 1514 | 1614 |
| 1.4571 / PP | 1137 | - | - | - |
| 1.4571 / PTFE | 1138 | - | - | - |

Type of flange module according to JIS B 2220 PN 10K

| Material | DN 80 | DN 100 | DN 125 | DN 150 |
|---------------|-------|--------|--------|--------|
| P265GH / PP | 3303 | 3403 | 3503 | 3603 |
| P265GH / PTFE | 3304 | 3404 | 3504 | 3604 |

Float modules

The float module should be selected acc. to the following parameters:

1. Function (alarm or control)
2. Minimum liquid density
3. Operating pressure
4. Operating temperature
5. Wetside material
6. Solids content
7. Mounting horizontally, vertically or in chamber
8. For explosion-proof or non explosion-proof applications
9. Liquids

Key to type numbers

Switch module

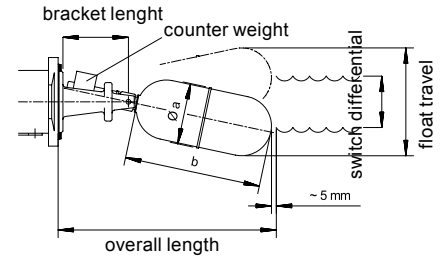
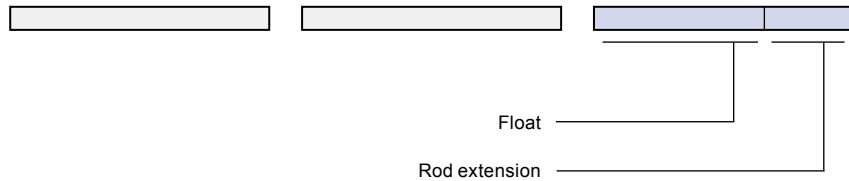
Page 20

Flange module

Page 25

Float module

Tables 15 to 27



Rod extension see page 34

The most commonly used float modules are listed in tables 15 to 21. The choice of modules is, however, much greater. If you do not find the float you require, please ask us. Most float modules are also available in Hastelloy C. The type number changes e.g. from 04 to 404 etc. For exact type specification please ask.

NACE: stainless steel- and Hastelloy-floats are also available acc. to NACE Standard.

Table 15

Float modules with a 12 mm fixed differential

Float material: 1.4571 (SS316Ti equiv.)



| Type | Float dimensions (mm) ø a x b | Bracket length (mm) | Overall length (mm) | Float travel (mm) | counter weight | Up to nominal pressure PN | | | Min. density (kg/dm ³) | Approved for hazardous areas | Rod extensions (page 34) |
|------|----------------------------------|---------------------|---------------------|-------------------|----------------|---------------------------|----------|---------|------------------------------------|------------------------------|--------------------------|
| | | | | | | DIN bar | ANSI cl. | JIS bar | | | |
| 01 | 64 x 110 | 68 | 194 | 104 | - | 40 | 300 | 30 | 0.8 | x | G1, G2, G3 |
| 04 | 64 x 142 | 68 | 226 | 117 | - | 40 | 300 | 30 | 0.7 | x | G1, G2, G3 |
| 041 | 64 x 142 | 68 | 226 | 117 | - | 40 | 300 | 30 | 0.7 | x | - |
| 07 | 64 x 142 | 68 | 226 | 117 | x | 40 | 300 | 30 | 0.5 | x | G1, G2 |
| 76 | 64 x 200 | 102 | 316 | 114 | x | 63 | 400 | 40 | 0.4 | x | G1, G2 |
| 02 | 64 x 142 | 68 | 224 | 117 | x | 100 | 600 | 63 | 0.7 | x | G1, G2 |
| 26 | 64 x 200 | 102 | 316 | 114 | x | 100 | 600 | 63 | 0.35 | x | G1, G2 |
| 27 | 64 x 142 | 102 | 321 | 115 | x | 100 | 600 | 63 | 0.5 | x | G1, G2 |
| 03 | 64 x 142 | 102 | 258 | 98 | x | 250 | 1500 | 63 | 0.75 | x | G1, G2 |
| 031 | 64 x 142 | 142 | 431 | 115 | x | 250 | 1500 | 63 | 0.7 | x | G1, G2 |
| 032 | 64 x 142 | 142 | 421 | 112 | x | 250 | 1500 | 63 | 0.5 | x | G1, G2 |

Table 16

Float modules with protective bellows and fixed operating differential 12 mm, float material: 1.4571 (SS316Ti equiv.)



| Type | Float dimensions (mm) ø a x b | Bracket length (mm) | Overall length (mm) | Float travel (mm) | Counter-weight | Up to nominal pressure PN | | | Min. density (kg/dm ³) | Approved for hazardous areas | Rod extension (page 34) | Bellows material |
|------|-------------------------------|---------------------|---------------------|-------------------|----------------|---------------------------|----------|------------|------------------------------------|------------------------------|-------------------------|------------------|
| | | | | | | EN/DIN bar | ANSI cl. | JIS Rating | | | | |
| 011 | 64 x 110 | 68 | 221 | 115 | - | 40 | 300 | 30K | 0.8 | x | G1, G2, G3 | Perbunan |
| 012 | 64 x 110 | 68 | 221 | 115 | - | 40 | 300 | 30K | 0.8 | - | G1, G2, G3 | Silicon |
| 013 | 64 x 110 | 68 | 221 | 115 | - | 40 | 300 | 30K | 0.8 | - | G1, G2, G3 | FPM |
| 051 | 64 x 142 | 68 | 253 | 129 | - | 40 | 300 | 30K | 0.75 | x | G1, G2, G3 | Perbunan |
| 052 | 64 x 142 | 68 | 253 | 129 | - | 40 | 300 | 30K | 0.75 | - | G1, G2, G3 | Silicon |
| 053 | 64 x 142 | 68 | 253 | 129 | - | 40 | 300 | 30K | 0.75 | - | G1, G2, G3 | FPM |
| 054 | 64 x 142 | 68 | 253 | 129 | - | 40 | 300 | 30K | 0.75 | - | G1, G2 | PTFE |
| 071 | 64 x 142 | 68 | 253 | 129 | x | 40 | 300 | 30K | 0.5 | x | G1, G2 | Perbunan |
| 072 | 64 x 142 | 68 | 253 | 129 | x | 40 | 300 | 30K | 0.5 | - | G1, G2 | Silicon |
| 073 | 64 x 142 | 68 | 253 | 129 | x | 40 | 300 | 30K | 0.5 | - | G1, G2 | FPM |
| 074 | 64 x 142 | 68 | 253 | 129 | x | 40 | 300 | 30K | 0.5 | - | G1, G2 | PTFE |
| 761 | 64 x 200 | 102 | 345 | 121 | x | 63 | 400 | 40K | 0.45 | x | G1, G2 | Perbunan |
| 762 | 64 x 200 | 102 | 345 | 121 | x | 63 | 400 | 40K | 0.45 | - | G1, G2 | Silicon |
| 763 | 64 x 200 | 102 | 345 | 121 | x | 63 | 400 | 40K | 0.45 | - | G1, G2 | FPM |
| 764 | 64 x 200 | 102 | 345 | 121 | x | 63 | 400 | 40K | 0.45 | - | G1, G2 | PTFE |

Perbunan = Buna (NBR)

Table 17

Float modules with adjustable differential for dual point control, float material: 1.4571 (SS316Ti equiv.)



| Type | Float dimensions (mm) ø a x b | Bracket length (mm) | Overall length (mm) | Float travel (mm) | Operating differential (mm) | Counter-weight | Up to nominal pressure PN | | | Min. density (kg/dm ³) | Approved for hazardous areas | Remarks |
|------|-------------------------------|---------------------|---------------------|-------------------|-----------------------------|----------------|---------------------------|----------|------------|------------------------------------|------------------------------|------------------------------------|
| | | | | | | | EN/DIN bar | ANSI cl. | JIS Rating | | | |
| 090 | 64 x 142 | 68 | 278 | 160 to 350 | 37 to 218 | - | 40 | 300 | 30K | 0.8 | x | switching differential see page 12 |
| 091 | 64 x 142 | 68 | 361 | 202 to 476 | 56 to 317 | - | 40 | 300 | 30K | 0.75 | x | |
| 092 | 64 x 142 | 68 | 461 | 254 to 630 | 83 to 442 | - | 40 | 300 | 30K | 0.75 | x | |
| 093 | 64 x 142 | 68 | 561 | 307 to 790 | 97 to 557 | - | 40 | 300 | 30K | 0.75 | x | |
| 095 | 64 x 110 | 68 | 246 | 148 to 294 | 34 to 190 | - | 40 | 400 | 40K | 0.9 | x | |

Table 18

Float modules for interface applications, horizontal mounting, float material: 1.4571 (SS316Ti equiv.)



| Type | Float dimensions (mm) ø a x b | Bracket length (mm) | Overall length (mm) | Float travel (mm) | Counter-weight | Up to nominal pressure PN | | | Min. density (kg/dm ³) | Approved for hazardous areas | Min. density difference | Rod extension (mm) |
|------|-------------------------------|---------------------|---------------------|-------------------|----------------|---------------------------|----------|------------|------------------------------------|------------------------------|-------------------------|--------------------|
| | | | | | | EN/DIN bar | ANSI cl. | JIS Rating | | | | |
| 08T1 | 64 x 142 | 68 | 509 | 236 | - | 40 | 300 | 30K | 0.75 | x | 0.1 | 300 |
| | | | 409 | 194 | - | 40 | 300 | 30K | 0.75 | x | 0.14 | 200 |
| | | | 309 | 152 | - | 40 | 300 | 30K | 0.8 | x | 0.22 | 100 |
| 28T1 | 64 x 142 | 102 | 541 | 174 | x | 100 | 600 | 63K | 0.8 | x | 0.16 | 300 |
| | | | 441 | 147 | x | 100 | 600 | 63K | 0.72 | x | 0.22 | 200 |
| | | | 341 | 120 | x | 100 | 600 | 63K | 0.6 | x | 0.37 | 100 |

Table 19

Float modules with bellows for interface application,
horizontal mounting, float material: 1.4571 (SS316Ti equiv.)



| Type | Float dimensions (mm) ø a x b | Bracket length (mm) | Overall length (mm) | Float travel (mm) | Counter-weight | Up to nominal pressure PN | | | Min. density (kg/dm ³) | Approved for hazardous areas | Min. density difference | Rod length (mm) | Bellows material |
|-------|-------------------------------|---------------------|---------------------|-------------------|----------------|---------------------------|----------|------------|------------------------------------|------------------------------|-------------------------|-----------------|------------------|
| | | | | | | EN/DIN bar | ANSI cl. | JIS Rating | | | | | |
| 081T1 | 64 x 142 | 68 | 536 | 248 | - | 40 | 300 | 30K | 0.8 | x | 0.1 | 300 | Perbunan |
| | | | 436 | 206 | - | 40 | 300 | 30K | 0.8 | x | 0.13 | 200 | Perbunan |
| | | | 336 | 163 | - | 40 | 300 | 30K | 0.9 | x | 0.19 | 100 | Perbunan |
| 082T1 | 64 x 142 | 68 | 536 | 248 | - | 40 | 300 | 30K | 0.8 | - | 0.1 | 300 | Silicon |
| | | | 436 | 206 | - | 40 | 300 | 30K | 0.8 | - | 0.13 | 200 | Silicon |
| | | | 336 | 163 | - | 40 | 300 | 30K | 0.9 | - | 0.19 | 100 | Silicon |
| 083T1 | 64 x 142 | 68 | 536 | 248 | - | 40 | 300 | 30K | 0.8 | - | 0.1 | 300 | FPM |
| | | | 436 | 206 | - | 40 | 300 | 30K | 0.8 | - | 0.13 | 200 | FPM |
| | | | 336 | 163 | - | 40 | 300 | 30K | 0.9 | - | 0.19 | 100 | FPM |
| 084T1 | 64 x 142 | 68 | 536 | 248 | - | 40 | 300 | 30K | 0.8 | - | 0.1 | 300 | PTFE |
| | | | 436 | 206 | - | 40 | 300 | 30K | 0.8 | - | 0.13 | 200 | PTFE |
| | | | 336 | 163 | - | 40 | 300 | 30K | 0.9 | - | 0.19 | 100 | PTFE |

Perbunan = Buna (NBR)

Table 20

Plastic float modules with fixed operating differential 12 mm



| Type | Float dimensions (mm) ø a x b | Bracket length (mm) | Overall length (mm) | Float travel (mm) | Counter-weight | Up to nominal pressure PN | | | Min. density (kg/dm ³) | Material | Rod extension see page 34 |
|------|-------------------------------|---------------------|---------------------|-------------------|----------------|---------------------------|-------------------|-------------------|------------------------------------|----------|---------------------------|
| | | | | | | EN/DIN bar | ANSI cl. | JIS Rating | | | |
| 98 | 64 x 150 | 68 | 240 | 132 | - | 8 | 150 ^{a)} | 10K ^{a)} | 0.75 | PTFE | P1, V1, V2, V3 |
| 99 | 63 x 120 | 68 | 205 | 118 | - | 10 | 150 ^{b)} | 10K ^{b)} | 0.65 | PP | K1, K2, K3 |

^{a)} Max. operating pressure 8 bar (test pressure 13 bar)

^{b)} Max. operating pressure 10 bar (test pressure 15 bar)

Table 21

Float modules for vertical mounting
Float material: 1.4571 (SS316Ti equiv.)

Can be used as an alarm or pump control, for setting the switching differential and installation, see page 13.



| Type | Float dimensions (mm) ø a x b | Bracket length (mm) | Overall length (mm) | Float travel (mm) | Counter-weight | Up to nominal pressure PN | | | Min.f) density (kg/dm ³) | Approved for hazardous areas |
|------|-------------------------------|---------------------|---------------------|-------------------|----------------|---------------------------|-------------------|-------------------|--------------------------------------|------------------------------|
| | | | | | | EN/DIN bar | ANSI cl. | JIS Rating | | |
| 140 | 120 | 68 | 1582 | 12 to 1340 | x | 16 | 150 ^{d)} | 10K ^{d)} | 0.45 | - |
| 141 | 120 | 68 | 3082 | 12 to 2840 | x | 16 | 150 ^{d)} | 10K ^{d)} | 0.45 | - |
| 145 | 120 x 164 | 68 | 1582 | 12 to 1300 | x | 25 | 150 ^{d)} | 10K ^{e)} | 0.45 | x |
| 146 | 120 x 164 | 68 | 3082 | 12 to 2800 | x | 25 | 150 ^{d)} | 10K ^{e)} | 0.45 | x |

^{d)} Max. operating pressure 16 bar (test pressure 24 bar)

^{e)} Max. operating pressure 25 bar (test pressure 38 bar)

^{f)} Minimum density for pump control 0.45 kg/dm³, for alarm 0.3 kg/dm³

Table 22
Maximum operating temperature for float modules

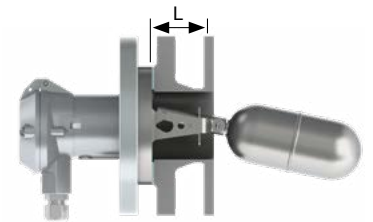
| Float material | Temperature range in °C |
|-------------------------------|-------------------------|
| Stainless steel 1.4571 | -196 to 400 |
| Polypropylene PP | 0 to 100 |
| Polytetrafluorethylene PTFE | -200 to 200 |
| Polyamid-coated CrNiMo floats | -50 to 80 |
| Halar-coated CrNiMo floats | -60 to 150 |

| Bellow material | Temperature range in °C |
|-----------------------------|-------------------------|
| Perbunan / Buna (NBR) | 0 to 120 |
| Silicon | -40 to 200 |
| FPM | 10 to 200 |
| Polytetrafluorethylene PTFE | -200 to 250 |

Note: When selecting a float module also consider the temperature rating of the switch- and flange module.

Table 23
Maximum length of connection flange, L

To allow sufficient float clearance a maximum length «L» for the connection flange is shown in the following table according to the type of float module and the nominal flange size (dimensions in mm).



| Nominal bore (flange) | Float module type | | | | | | | | | | | | |
|--------------------------|-------------------|------------|------------|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 01 | 011 to 013 | 04 and 041 | 051 to 053 | 054 | 090 | 091 | 092 | 093 | 095 | 07 | 076 | 02 |
| DN 65 acc. to EN 1092-1 | 80 | 105 | 80 | 105 | 70 | 70 | 70 | 70 | 70 | 70 | 80 | 110 | 80 |
| DN 80 acc. to EN 1092-1 | 90 | 110 | 90 | 110 | 110 | 90 | 90 | 90 | 90 | 90 | 90 | 140 | 90 |
| DN 100 acc. to EN 1092-1 | ∞ | 140 | 140 | 140 | 140 | 90 | 100 | 100 | 100 | 90 | 140 | 220 | 140 |
| DN 125 acc. to EN 1092-1 | ∞ | ∞ | ∞ | ∞ | ∞ | 90 | 110 | 110 | 110 | 90 | ∞ | ∞ | ∞ |
| DN 150 acc. to EN 1092-1 | ∞ | ∞ | ∞ | ∞ | ∞ | 90 | 120 | 120 | 120 | 90 | ∞ | ∞ | ∞ |
| 3" accord. to ANSI B16.5 | 90 | 110 | 90 | 110 | 110 | 90 | 90 | 90 | 90 | 90 | 90 | 140 | 90 |
| 4" accord. to ANSI B16.5 | 140 | 140 | 140 | 140 | 140 | 90 | 100 | 100 | 100 | 90 | 140 | 220 | 140 |
| 5" accord. to ANSI B16.5 | ∞ | ∞ | ∞ | 190 | 190 | 90 | 110 | 110 | 110 | 90 | ∞ | ∞ | ∞ |
| 6" accord. to ANSI B16.5 | ∞ | ∞ | ∞ | ∞ | ∞ | 90 | 120 | 120 | 120 | 90 | ∞ | ∞ | ∞ |

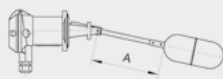
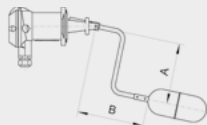

Minimum bore diameter for above listed float modules: ø 65 mm.

Rod extensions

Where the float pivot needs to be protected from contaminated media or to provide an increased switching differential the float can be equipped with a rod extension.

Table 24

Type of rod extensions (Dimensions in mm)

| Rod extension material | To match float modules |  |  |  |
|--------------------------|--------------------------|---|--|---|
| Stainless steel (CrNiMo) | Stainless steel (CrNiMo) | Type: G1 A max: 1000 A min: 100 | Type: G2 A+B max: 1000 A/B: ≤ 4 A min: 100 B min: 100 | *Type: G3 A+B max: 1000 A/B: ≤ 4 A min: 50 B min: 60 |
| PP | PP | Type: K1 A min: 100 A max: 1000 | Type: K2 A+B max: 1000 A min: 100 B min: 200 | Type: K3 A+B max: 1000 A/B: ≤ 3 A min: 100 B min: 100 |
| PVDF | PTFE | Type: V1 A min: 100 A max: 1000 | Type: V2 A+B max: 1000 A min: 100 B min: 200 | Type: V3 A+B max: 1000 A/B: ≤ 4 A min: 100 B min: 100 |
| PTFE | PTFE | Type: P1 A min: 100 A max: 300 | - | - |

* Rod extension type G3 is available with 90° or 135° angle.

Since rod extensions add-on weight to the float, the minimum value for the density will change according to the following tables. Tables 25 to 27 list the minimum densities for float module 04 with extensions G1, G2 and G3 only. For other float modules and rod extensions with other dimensions or materials, please consult the factory.

Table 25

Minimum density for float module 04G1

| Rod length A (mm) | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
|------------------------------------|------|------|------|------|------|------|------|------|------|------|
| Min. density (kg/dm ³) | 0.66 | 0.66 | 0.67 | 0.69 | 0.71 | 0.74 | 0.76 | 0.79 | 0.81 | 0.84 |



Table 26

Minimum density for float module 04G2 (kg/dm³)

| A (mm) | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
|---------------|------|------|------|------|------|------|------|------|
| B (mm) | | | | | | | | |
| 100 | 0.69 | 0.68 | 0.70 | 0.71 | 0.72 | 0.74 | 0.75 | - |
| 200 | 0.67 | 0.67 | 0.68 | 0.69 | 0.70 | 0.71 | 0.72 | 0.73 |
| 300 | 0.68 | 0.69 | 0.69 | 0.70 | 0.71 | 0.71 | 0.72 | |
| 400 | 0.70 | 0.70 | 0.71 | 0.71 | 0.72 | 0.73 | | |
| 500 | 0.72 | 0.73 | 0.73 | 0.73 | 0.74 | | | |
| 600 | 0.74 | 0.75 | 0.75 | 0.75 | | | | |
| 700 | 0.77 | 0.77 | 0.77 | | | | | |
| 800 | 0.79 | 0.80 | | | | | | |
| 900 | 0.82 | | | | | | | |



Table 27

Minimum density for float module 04G3 (kg/dm³)

| A (mm) | 50-500 | 600 | 700 | 800 |
|---------------|--------|------|------|------|
| B (mm) | | | | |
| 50 | 0.71 | - | - | - |
| 100 | 0.69 | - | - | - |
| 200 | 0.68 | 0.68 | 0.68 | 0.68 |
| 300 | 0.69 | 0.69 | 0.69 | |
| 400 | 0.71 | 0.71 | | |
| 500 | 0.73 | | | |
| 600 | 0.75 | | | |
| 700 | 0.77 | | | |
| 800 | 0.80 | | | |
| 900 | 0.82 | | | |
| 950 | 0.83 | | | |



Specification sheet

If you have a special requirement for a Trimod Besta level switch, please send us a completed copy of this specification sheet together with any relevant drawing etc. and we will respond with a quotation.

Liquid _____ Operating/ambient temperature _____ °C / _____ °C
 Density _____ kg/dm³ Tank material _____
 Operating pressure _____ bar Tank measurement _____

Application

- High alarm
- Low alarm
- 2-point control
- Interface application
- Regulating (pneumatic)

Type of mounting

- Side mounted
- Top mounted
- In float chamber (by-pass)

Switch module type

| | | | | | |
|------------------------------|---|--|---|-------------------------------|---|
| Contact type | Electric | | Electronic | | Pneumatic |
| | <input type="checkbox"/> SPDT | <input type="checkbox"/> 2 x SPDT | <input type="checkbox"/> I | <input type="checkbox"/> IE9 | <input type="checkbox"/> On/Off |
| | <input type="checkbox"/> Silver | <input type="checkbox"/> Gold plated | <input type="checkbox"/> IN | <input type="checkbox"/> INE9 | <input type="checkbox"/> proportional |
| Safety Integrity Level (SIL) | <input type="checkbox"/> SIL 1 | <input type="checkbox"/> SIL 2 | | | |
| Approval classification | <input type="checkbox"/> Ex eb db IIC T6...T5 Ga/Gb (Microswitch Ex-db) | | <input type="checkbox"/> Ex ia IIC T6 Ga/Gb (Microswitch gold contacts) | | <input type="checkbox"/> Ex ia IIC T6...T1 Ga/Gb (Proximity switch) |
| Cable gland | <input type="checkbox"/> M20 x 1.5 | | <input type="checkbox"/> 3/4" NPT | | |
| Enclosure material | <input type="checkbox"/> Die cast aluminium | <input type="checkbox"/> Die cast aluminium, chromated | | | <input type="checkbox"/> Stainless steel |
| Enclosure rating | <input type="checkbox"/> IP65 | <input type="checkbox"/> IP66/IP67 | <input type="checkbox"/> IP68, cable length _____ | | |
| Remarks | _____ | | | | |

Flange module type

| | | | | |
|-------------------------|---|---------------------------------------|---|---|
| Flange type | <input type="checkbox"/> Square flange 92 x 92 | <input type="checkbox"/> Fixed Flange | <input type="checkbox"/> Slip-on Flange | |
| DN/PN | <input type="checkbox"/> ANSI | <input type="checkbox"/> EN/DIN | <input type="checkbox"/> DN _____ | <input type="checkbox"/> PN _____ Seal type _____ |
| Wetted parts material | <input type="checkbox"/> CrNiMo | <input type="checkbox"/> Hastelloy C | <input type="checkbox"/> PP | <input type="checkbox"/> PTFE Other _____ |
| Slip-on Flange material | <input type="checkbox"/> Carbon steel P265GH zinc galvanized and passivated | | | Other _____ |
| Remarks | _____ | | | |

Float module type

| | | | | |
|----------------|---|--------------------------------------|------------------------------|-------------------------------|
| Float material | <input type="checkbox"/> CrNiMo | <input type="checkbox"/> Hastelloy C | <input type="checkbox"/> PP | <input type="checkbox"/> PTFE |
| Differential | <input type="checkbox"/> Fixed 12 mm | Variable between _____ | | |
| Bellows | <input type="checkbox"/> Perbunan (NBR) | <input type="checkbox"/> Silicon | <input type="checkbox"/> FPM | <input type="checkbox"/> PTFE |
| Remarks | _____ | | | |

Options

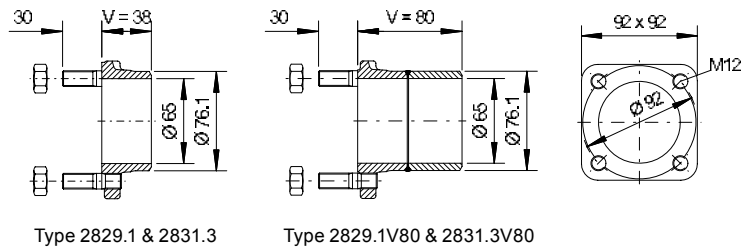
| | | | | |
|--------------------------------|---------------------------------------|---------------------------------------|--|---|
| Float rod extension | <input type="checkbox"/> G1 | <input type="checkbox"/> G2 | <input type="checkbox"/> G3 | Dim. A _____ mm Dim. B _____ mm |
| Counterflanges | <input type="checkbox"/> Carbon steel | <input type="checkbox"/> CrNiMo | | |
| Test actuators | <input type="checkbox"/> CrNiMo / FPM | | <input type="checkbox"/> CrNiMo / EPDM | |
| Test certificates (See page 6) | <input type="checkbox"/> EN 10204-2.1 | <input type="checkbox"/> EN 10204-2.2 | <input type="checkbox"/> EN 10204-3.1 | <input type="checkbox"/> Test certificate - function test |
| Tag No. | _____ | | | |

Accessories

Counterflanges with and without test actuator

The simplest method of installing any Trimod Besta level switch of the Standard Range, is to use our standard weld-on counterflanges. There are carbon steel (GP240GH) and stainless steel (1.4408) versions in two different lengths available. The test actuator allows a periodic manual function check of the level switch in operating status. The function of the switching element (microswitch, proximity switch, pneumatic valve) and movement of the float can be tested.

Counterflange not for use with the test actuator



Type 2829.1 & 2831.3

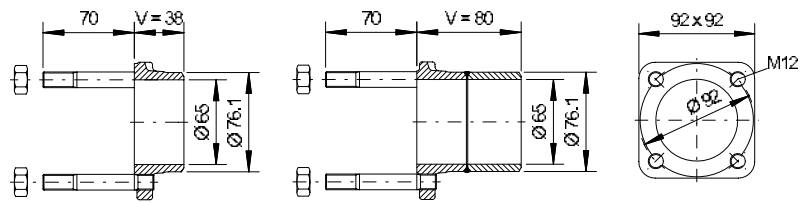
Type 2829.1V80 & 2831.3V80

Table 28

| Type | Flange length | Material Flange | Material Stud | Stud length | Temperature range in °C |
|------------|---------------|-----------------|---------------|-------------|-------------------------|
| 2829.1 | V = 38 mm | GP240GH | 5.8 | 30 mm | -10 to 300 |
| 2831.3 | V = 38 mm | 1.4408 | A2 | 30 mm | -196 to 400 |
| 2829.1V80* | V = 80 mm | GP240GH | 5.8 | 30 mm | -10 to 300 |
| 2831.3V80* | V = 80 mm | 1.4408 | A2 | 30 mm | -196 to 400 |

Operating pressure: -1 to 25 bar

Counterflange for use with the test actuator (Type 2382 & 2383)



Type 2829.2 & 2831.4

Type 2829.2V80 & 2831.4V80

Table 29

| Type | Flange length | Material Flange | Material Stud | Stud length | Temperature range in °C |
|------------|---------------|-----------------|---------------|-------------|-------------------------|
| 2829.2 | V = 38 mm | GP240GH | 5.8 | 70 mm | -10 to 300 |
| 2831.4 | V = 38 mm | 1.4408 | A2 | 70 mm | -196 to 400 |
| 2829.2V80* | V = 80 mm | GP240GH | 5.8 | 70 mm | -10 to 300 |
| 2831.4V80* | V = 80 mm | 1.4408 | A2 | 70 mm | -196 to 400 |

Operating pressure: -1 to 25 bar

*Important:

Not for use in applications on top of the tank.

Counterflange with test actuator

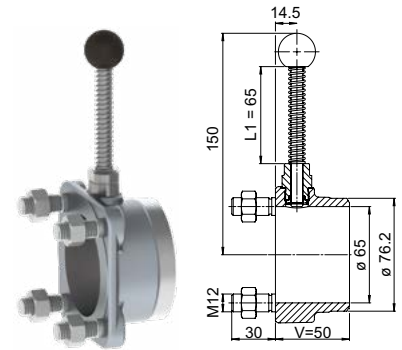
Important:

Positioning of counterflanges with G 3/8" thread for test actuator. If the level switch is used for high alarm the thread has to look upwards. For a low level alarm, the thread has to look downwards.

Counterflange **V=50 mm** with test actuator

Table 30

| Type | Material Flange | Material Stud | Material Test actuator | Material O-Ring | Temperature range in °C | Operating pressure in bar |
|------|-----------------|---------------|------------------------|-----------------|-------------------------|---------------------------|
| 2865 | P250GH | 5.8 | 1.4305/1.4404 | FPM | 0 to 150 | -1 to 25 |
| 2866 | P250GH | 5.8 | 1.4305/1.4404 | EPDM | -10 to 150 | -1 to 25 |



Test actuator

The test actuators 2382 and 2383 can be used, if the tank is already equipped with a counterflange, type 2829.2, 2831.4, 2829.2V80 or 2831.4V80.

Table 31

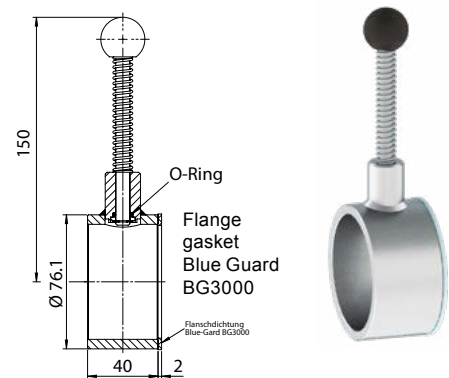
| Type | Material Test actuator | Material O-Ring | Temperature range in °C | Operating pressure in bar |
|------|------------------------|-----------------|-------------------------|---------------------------|
| 2382 | 1.4305/1.4404 | FPM | 0 to 150 | -1 to 25 |
| 2383 | 1.4305/1.4404 | EPDM | -30 to 150 | -1 to 25 |

Test actuators are supplied with flat gaskets.



Table 32

| Application | Use as high (HA) or low (LA) alarm | Mounting position |
|--|------------------------------------|-------------------|
| Checking switch function and float movement under operating conditions (PS = -1 to 25 bar) | HA | |
| | LA | |

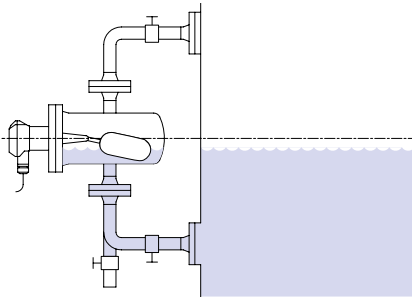


Important:

For use of the counterflange on top of the tank (vertical switch) please contact us for correct application.

Float chambers

Wherever it is not possible or desirable to install float switches directly onto a vessel, horizontal Trimod Besta level switches can be mounted externally in a float chamber. This type of installation allows functional checks and servicing to be carried out without interrupting operation, provided that isolation and drain valves are included in the process connections.



Float chambers may be divided into 2 groups.

Standard chambers PN 25

In various steel qualities and configurations with process connection acc. to EN/DIN or ANSI.

For use with the Trimod Besta level switches from the standard range with:

Square flange type: 01 or
Round flange type: 011

Industrial chambers up to PN 250 acc. to EN/DIN or PN cl. 1500 acc. to ANSI

In various steel qualities and configurations with switch- and process connections acc. to EN/DIN or ANSI.

For use with the Trimod Besta level switches from the industrial range with EN/DIN-flanges DN 65 or ANSI-flanges DN 3".



Table 33

Standard chambers PN 25

| | |
|--------------------------------------|--|
| Types | According to figures A to H |
| Process connections | DN 25, 50 in accordance with EN/DIN DN 1", 2" in accordance with ANSI |
| Material | Carbon steel High temperature steel CrNi steel CrNiMo steel |
| Flange facing of process connections | in accordance with EN 1092-1 and ANSI B16.5 |
| Options | <ul style="list-style-type: none"> ■ Special dimensions ■ Vent and drain connection ■ Long studs for mounting a test actuator ■ Float chambers for low temperature applications ■ Float chambers with max. hardness of HRC 22 in accordance with NACE |

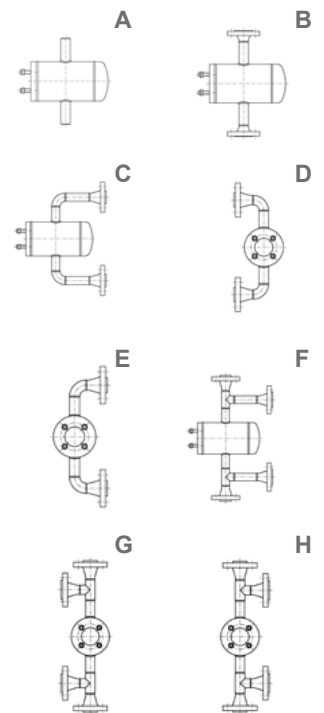
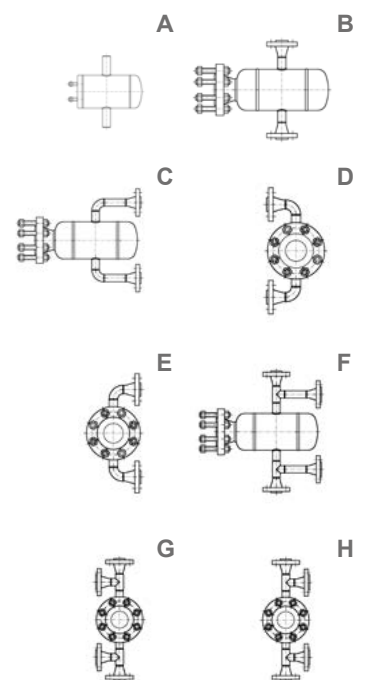


Table 34

Industrial chambers PN 40 to PN 100 and ANSI PN cl. 150 to PN cl. 600

| | |
|--------------------------------------|---|
| Types | According to figures A to H |
| Process connections | DN 25, 50 in accordance with EN/DIN DN 1", 2" in accordance with ANSI |
| Material | Carbon steel High temperature steel CrNi steel CrNiMo steel |
| Flange facing of process connections | in accordance with EN 1092-1 and ANSI B16.5 |
| Options | <ul style="list-style-type: none"> ■ Special dimensions ■ Vent and drain connection ■ Chambers up to PN 250 in accordance with EN/DIN, PN cl. 1500 with ANSI ■ Float chambers for low temperature applications ■ Float chambers with max. hardness of HRC 22 in accordance with NACE |



For float chambers in tables 33 and 34, the following options, tests and documentation are available:

- incl. declaration of conformity according to 2014/68/EU
- incl. certificate of construction and pressure test
- incl. list of materials and material certificates 3.1
- Non-destructive material testing such as ultrasonic, X-ray or dye penetrant methods
- Priming and protective coatings

Trimod Besta Level Switches in hazardous areas

For level monitoring in hazardous areas, the following Trimod Besta level switches are available:

Hermetically sealed Trimod Besta Level Switches

These switches are available in three versions.

Protection classifications:

| | | |
|----------------------------|-------------------------------|---------------------|
| Ex eb db IIC T6...T5 Ga/Gb | for switch modules Z...8 etc. | EPS 12 ATEX 1430 X |
| Ex eb db IIC T6...T5 Ga/Gb | for switch modules Z...5 etc. | IECEX EPS 15.0038 X |
| Ex eb db IIC T6...T5 Ga/Gb | for switch modules Z...7 etc. | EPS 22 UKEX 1261 X |

For type designations or details see page 23.



Hermetically sealed version

Trimod Besta Level Switches for use in intrinsically safe installations

Level switches with proximity switches acc. to NAMUR (type range I.. and IE9.. etc.) or micro switches with gold plated contacts (type range B) are for connection to intrinsically safe circuits and approved, depending on national regulations, for Zone 1, floats in Zone 0.

Protection classifications:

| | | |
|-------------------------|--|---------------------|
| Ex ia IIC T6...T1 Ga/Gb | for switch modules I...8, IE9...8 etc. | EPS 12 ATEX 1430 X |
| Ex ia IIC T6...T1 Ga/Gb | for switch modules I...5, IE9...5 etc. | IECEX EPS 15.0038 X |
| Ex ia IIC T6...T1 Ga/Gb | for switch modules I...7, IE9...7 etc. | EPS 22 UKEX 1261 X |
| Ex ia IIC T6... Ga/Gb | for switch modules B...8 etc. | EPS 12 ATEX 1430 X |
| Ex ia IIC T6... Ga/Gb | for switch modules B...5 etc. | IECEX EPS 15.0038 X |
| Ex ia IIC T6... Ga/Gb | for switch modules B...7 etc. | EPS 22 UKEX 1261 X |

For type designations or details see pages 20 and 22.



For intrinsically safe installation

Pneumatic Trimod Besta Level Switches and Level Controllers

Pneumatic level switches of the type ranges FP and FM are approved for installation in Zone 1, floats in Zone 0. For type designations and details see page 24.



Pneumatic version

Mode of installation

All Trimod Besta level switches of the Ex-proof range may be side or top mounted.

Micro- and proximity switches

Additional information to the switch module descriptions on pages 20 to 24.

Microswitches of the switch module range type A

Electrical data acc. to microswitch manufacturer shown in table 35.

Microswitches of the switch module range type B

The silver contacts of these microswitches are gold plated and intended for use in low-current circuits. Though the max. rating can be as per table 35, please be aware, that the gold plating will be permanently damaged when used for values greater than applicable for intrinsically safe circuits or high voltage/power applications.

Table 35

| Voltage V | Resistive Load A | Tungsten Lamp Load | | Inductive Load A |
|--------------|---------------------|--------------------|---------|---------------------|
| | | NC A | NO A | |
| AC bis 250 | 5 | 0.5 | 0.5 | 5 |
| DC bis 30 | 5 | 1.5 | 1.0 | 5 |
| DC bis 50 | 3 | 0.8 | 0.8 | 2.5 |
| DC bis 75 | 1 | 0.6 | 0.6 | 0.5 |
| DC bis 125 | 0.5 | 0.5 | 0.5 | 0.07 |
| DC bis 250 | 0.25 | 0.25 | 0.25 | 0.03 |

Only approximate values can be given for the allowable charge of gold contacts. These must be reduced under unfavourable impedance conditions. The product of current and voltage should not exceed 0.12 VA. The current should move at ≤ 300 mA and voltage at ≤ 30 V. For alternating currents these values must be interpreted as maximum values.

Microswitches of the switch module range type B...8, B...5, B...7

Electrical data acc. to Type-examination acc. to ATEX, IECEx and UKCA Ex.

Gold plated contacts
max. 30 VDC, max. 300 mA, max. 0.12 VA
Li ≈ 0 μ H, Ci ≈ 0 nF

Microswitches of the switch module range type Z...8, Z...5, Z...7

Electrical data acc. to Type-examination acc. to ATEX, IECEx and UKCA Ex.

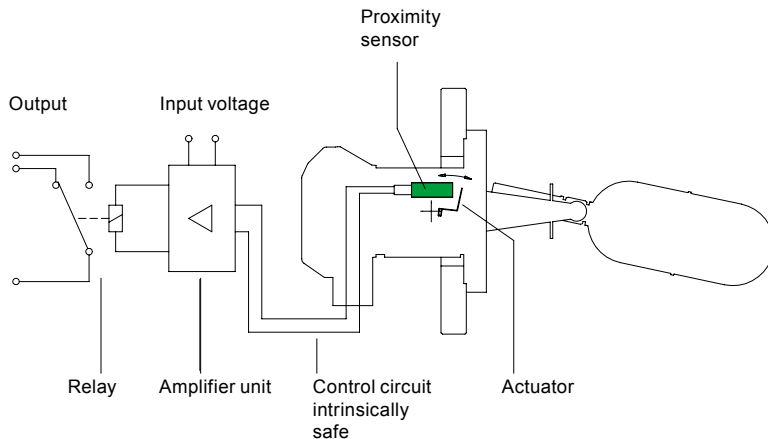
250 VDC, 0.25 A 250 VAC, 5 A
125 VDC, 0.5 A
75 VDC, 1 A
50 VDC, 3 A
30 VDC, 5 A

Inductive proximity switches acc. to NAMUR/EN 60947-5-6

The switch modules of the type ranges I and IE9 are especially suitable for applications in hazardous areas*. The switching element, an inductive proximity sensor (Pepperl+Fuchs) contains only the oscillator. The signal is processed by a remote mounted relay amplifier unit as shown in the connection diagram.

*(ATEX, IECEx and UKCA Ex)

Connection diagram:



Electrical data of inductive proximity switches

| | |
|--------------------------|-------------|
| Nominal voltage UN | 8,2 VDC ±5% |
| Operating voltage UB | 5 to 25 VDC |
| Current consumption | |
| sensor uncovered | ≥ 2,2 mA |
| sensor covered | ≤ 1 mA |
| Control line: resistance | ≤ 50 Ω |

Special self checking failsafe features

If the switch is connected for maximum current/voltage in the non alarm state the circuit can be monitored constantly for line and/or instrument failure to initiate operation of a safety shutdown.

The sensor circuit of the switch modules IE9, INE9, and IIE9, are also self checking and approved for safety circuits (TÜV tested). With these sensors, automatic switching to the alarm state in the event of component failure is guaranteed. When specifying a safety circuit, approved amplifiers and transistor relays must be incorporated.

For use in hazardous areas the following data should be observed for Trimod Besta level switches with inductive proximity sensors:

| | | | |
|-----------------------|-------------------|---------------------|-----------------|
| Type I, IN, II: | $U_{max.}$ 16 VDC | $Li \leq 50 \mu H$ | $Ci \leq 45 nF$ |
| Type IE9, INE9, IIE9: | $U_{max.}$ 16 VDC | $Li \leq 150 \mu H$ | $Ci \leq 50 nF$ |

Trimod^BBesta

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Level switches with electric, electronic and pneumatic switch elements.
Numerous shipbuilding register certificates and explosion proof approvals.

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Homepage

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www.trimodbesta.com

Quality Management

The Bachofen quality management system acc. to
ISO 9001 was established in 1994.

Registered Trade Marks

Trimod and Besta are registered trade marks of
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Your Trimod Besta level switch distributor:

| |
|--|
| |
|--|