BACHOFEN
Industrial Automation

Shipbuilding solutions

Level

Flow

Pressure

Hundreds of thousands of Trimod Besta level switches ensure the safe voyage of vessels on our oceans

Since 1967 the Shipbuilding industry trusts the unique Trimod Besta level switches. Today, hundreds of thousands are installed on:

- Cargo vessels
- Tankers
- Cruise ships
- Navy ships
- Submarines
- Fregattes
- Catamarans
- Crane ships
- Container ships
- Ferries
- Offshore supply vessels
- Icebreakers
- LPG carriers
- Tug boats

Typical Applications

- Fresh & waste water tanks
- Fuel oil tanks
- Bilge
- Lubrication tanks
- Hydraulic units
- Separation layer detection
- Balance tanks
- Inert gas production
- LPG tanks
- Vacuum toilets

Trimod Besta Approvals

SIL 3 Capable

Bilge Switches

Rugged and reliable switches with stainless steel housing for use in bilge areas and waste water treatment applications.

Type	UNS-VA/SB1	UNS-VA/SB4	UNS-VA/SB-VA52
Temperature	-20 to 80 °C	-20 to 70 °C	-20 to 80 °C
Pressure	max. 10 bar	max. 3 bar	max. 10 bar
Density of liquid	min. 0.7 g/cm³	min. 0.8 g/cm³	min. 0.7 g/cm³
Housing material	SS 1.4571	SS	SS 1.4571
Float material, diameter	SS 1.4401, 52 mm	Polyethylen (PE), 33 mm	SS 1.4401, 52 mm
Test actuator	No	No	Yes
Cable length	2 m (optional 5 m, 10 m)	2 m, 5 m, 10 m, 15 m	2 m (optional 5 m, 10 m)
Contact type	NO / NC or SPDT	Variable NO or NC	NO / NC or SPDT
Contact rating	NO / NC: 250 VAC/DC, 3 A, 100 W/VA SPDT: 140 VAC/DC, 1 A, 60 W/VA	max. 230 VAC/DC, 2 A, 40 W/VA	NO / NC: 250 VAC/DC, 3 A, 100 W/VA SPDT: 140 VAC/DC, 1 A, 60 W/VA
Approvals	GL, BV, RMRS	GL, BV	GL, BV, RMRS

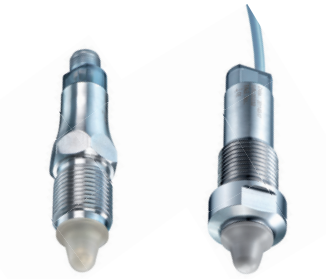
Single- and Multipoint Switches

Rugged single- and multipoint level switches with up to 5 switch points for hydraulic and OEM applications. Our vibration resistant versions carry ABS, BV and DNV shipping approvals. Special versions include additional PT100 temperature sensors, high temperature silicone cables and flanges with 1" and 2" thread openings for local mounting to avoid transport damages.

	Single Point Switches	Multi Point Switches
Housing material	Brass, stainless steel, gun metal, plastic	Stainless steel 1.4571, 1.4408
Float material	Buna N, Stainless Steel	Buna N, Stainless Steel 1.4571
Function	NO / NC / SPDT	NO / NC / SPDT
Process Connection	Threads (from G 1/8"), flanges	Various threads and flange types
Temperature	-20 to 105 °C (PVC cable)	-20 to 70 °C
Special temp. version	-40 to 150 °C (Silicone cable)	-40 to 150 °C (Silicone cable)
Pressure	max. 4 bar	max. 3 bar / max. 10 bar
Density	min. 0.57	min. 0.54
Sensor Length	Max. 600 mm, telescope 160 to 600 mm	1000 / 2000 mm
Cable	PVC or Silicone, 1 m, 3 m, 5 m	Cable version w/shipping approval
Contact rating	NO / NC: 230 V AC/DC, 2 A, 40 VA/W	NO / NC: 230 V AC/DC, 2 A, 40 VA/W
	SPDT: 125 V AC/DC, 0.4 A, 5 VA/W	SPDT: 150 V AC/DC, 0.2 A, 3 VA/W
Approvals		ABS, BV, DNV, GL, RINA, LRS

BLS Level Sensor

State of the art stainless steel sensor with peek measuring tip for use in liquids, solids and even sticky substances with a dielectric constant DK (ε) ≧ 2.5



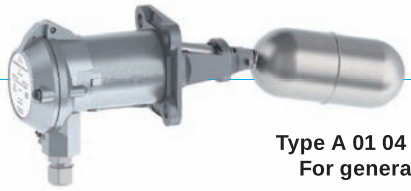
BLS 10, 11, 30 BLS 20

Type	BLS 10	BLS 11	BLS 20	BLS 30 [1]
Process pressure	100 bar	100 bar	100 bar	100 bar
Process temperature	-40 to 115 °C	-40 to 115 °C	-40 to 85 °C	-40 to 115 °C
Ambient temperature	-40 to 85 °C	-40 to 85 °C	-40 to 70 °C	-40 to 85 °C
Power supply max.	12...30 VDC, 35 mA	12...30 VDC, 35 mA	12...30 VDC, 35 mA	12...30 VDC, 35 mA
Output configuration	PNP, max. 20 mA	PNP, max. 20 mA	PNP, max. 20 mA	PNP, max. 20 mA
Enclosure	IP67	IP67	IP67	IP67
Approval	DNV	DNV	DNV	DNV
ATEX Approval				Ex ia IIC T5, ATEX II 1G (Gas)
Electrical connection	Connector M12	Connector M12	Cable 5 m	Connector M12
Process connection	G 1/2"	G 1/2"	G 1/2"	G 1/2"
Housing material	1.4404 / ASI 316L	1.4301 / ASI 304	1.4404 / ASI 316L	1.4404 / ASI 316L
Installation	Universal position	Universal position	Universal position	Universal position

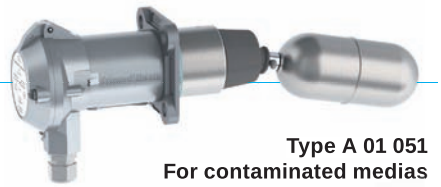
[1] Isolation module needed

Horizontal level switches

Trimod Besta level switches



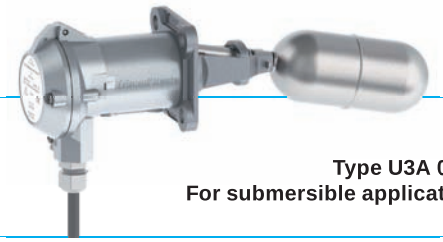
Type A 01 04 / A 01 041
For general purpose



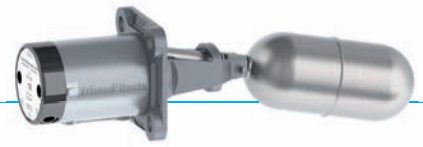
Type A 01 051
For contaminated medias

Nominal pressure	PN 25	PN 25
Minimum density of liquid	min. 0.7 kg/dm³	min. 0.75 kg/dm³
Flange	92 x 92 mm, PCD 92 mm	92 x 92 mm, PCD 92 mm
Wetside material	Stainless steel (CrNiMo)	Stainless steel (CrNiMo)
Flange material	Stainless steel (1.4408)	Stainless steel (1.4408)
Housing material	Seawater resistant aluminium	Seawater resistant aluminium
Enclosure	IP65	IP65
Ambient temperature	0 to 70 °C	0 to 70 °C
Operating temperature	0 to 300 °C	0 to 120 °C
Bellow material		Perbunan/Buna
Switch element	Microswitch SPDT with silver contacts	Microswitch SPDT with silver contacts
Switch rating	250 VAC, 5 A / 30 VDC, 5 A	250 VAC, 5 A / 30 VDC, 5 A
Switching distance	12 mm, fixed	12 mm, fixed
Option of rod extension	Yes, with type A 01 04	Yes
Safety Integrity Level (SIL)	SIL 1 (types AA 01 04 or AA 01 041: SIL 2)	SIL 1 (type AA 01 051: SIL 2)
Approvals	BV, LRS, DNV, ABS, GL, RINA, RMRS	BV, LRS, DNV, ABS, GL, RINA, RMRS

Trimod Besta level switches



Type U3A 01 04
For submersible applications



Type P 01 04
For pneumatic control applications

Nominal pressure	PN 25	PN 25
Minimum density of liquid	min. 0.7 kg/dm³	min. 0.7 kg/dm³
Flange	92 x 92 mm, PCD 92 mm	92 x 92 mm, PCD 92 mm
Wetside material	Stainless steel (CrNiMo)	Stainless steel (CrNiMo)
Flange material	Stainless steel (1.4408)	Stainless steel (1.4408)
Housing material	Seawater resistant aluminium	Seawater resistant aluminium
Enclosure	IP68	
Ambient temperature	-30 to 80 °C	1 to 80 °C
Operating temperature	-30 to 80 °C	1 to 250 °C
Switch element	Microswitch SPDT with silver contacts	3/2 way valve
Switch rating	250 VAC, 5 A / 30 VDC, 5 A	max. 10 bar
Switching distance	12 mm, fixed	12 mm, fixed
Option of rod extension	Yes	Yes
Safety Integrity Level (SIL)	SIL 1 (type U3AA 01 04: SIL 2)	
Approvals	BV, LRS, DNV, ABS, GL, RINA, RMRS	BV, LRS, DNV, ABS, GL, RINA, RMRS

Rod extensions

G1

G2

G3

Vertical level switch - For top mount installations

Trimod Besta level switch	**Type A 01 140 and A 01 141**
Function	2-point control (pump) or 1 switching point (alarm)
Nominal pressure	PN 16 according to DIN
Operating temperature	0 to 300 °C
Ambient temperature	0 to 70 °C
Density of the liquid	Pump control: min. 0.45 kg/dm³, Alarm: min. 0.30 kg/dm³
Operating differential	A 01 140: 12 to 1340 mm, A 01 141: 12 to 2840 mm
Wetside material	Stainless steel (CrNiMo)
Housing material	Seawater resistant aluminium
Flange dimensions	Square 92 x 92 mm, PCD 92 mm
Switch element	Microswitch SPDT with silver contacts
Switch rating	250 VAC, 5 A / 30 VDC, 5 A
Enclosure	IP65
Safety Integrity Level (SIL)	SIL 1 (types AA 01 140 and AA 01 141: SIL 2)
Approvals	BV, LRS, DNV, ABS, GL, RINA, RMRS

Horizontal level switch - For alarm and limit functions with a square flange

Compact Switch	**Type C 01C 05**
Nominal pressure	PN 10
Operating temperature	0 to 150 °C
Ambient temperature	0 to 70 °C
Density of the liquid	min. 0.7 kg/dm³
Operating differential	12 mm, fixed
Wetside material	Stainless steel (CrNiMo)
Flange material	Stainless steel (CrNiMo)
Housing material	Seawater resistant aluminium
Flange	Square 92 x 92 mm, PCD 92 mm
Switch element	Microswitch SPDT with silver contacts
Switch rating	250 VAC, 3 A / 30 VDC, 0.5 A
Cable entry	Internal thread M20 x 1.5
Enclosure	IP65
Weight	approx. 0.9 kg
Safety Integrity Level (SIL)	SIL 1
Approval	LRS

Counterflange with and without test actuator

The simplest method of installing any Trimod Besta level switch of the Standard Range and the Compact Switch with a square flange, is to use our standard weld-on counterflanges. 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.

	Counterflanges (2829.xxxx, 2831.xxxx)	**Test actuators (2382*, 2383*)**
Length	38 mm or 80 mm	
Flange material	C22.8 or 1.4404	
Temperature	C22.8: -10 to 300 °C 1.4404: -196 to 400 °C	
Actuator material		1.4305 and 1.4404
O-Ring material		FPM or EPDM
Temperatures		FPM: 0 to 150 °C EPDM: -30 to 150 °C
Pressure		-1 to 25 bar

* Note: Test actuators 2382 and 2383 not for use with the Compact Switch.

Level

Level transmitter

Seawater resistant transmitter made of brass alloy for typical media in shipbuilding and offshore applications. The submersible sensor has a cable with built-in air hose for pressure reference and is installed in the tank via a mounting clamp or in a pipe.

Type	BLP1
Housing material	Copper Nickel Alloy (CuNiFe) , Option 1.4404
Membrane material	Ceramic Al_2O_3
Seal	FPM
Process connection	Submersible, G 1 1/2" thread, Option: DN25 or DN40 flange
Temperature	-25 to 125 °C
Enclosure	IP68
Measuring range	0.06 to 20 bar (0.6 to 200 m water column)
Output signal	4 to 20 mA, 2-wire
Supply voltage	Standard: 10 to 32 VDC, (UB = 10 V, max. 20 mA), Ex Version: 12 to 28 VDC
Ex-Version	II 1 G Ex ia IIB T4
Cable	Halogen free thermoplastic elastomer, with built-in air hose for pressure reference
Approval	GL

Flow

Flow switch for water

These flow switches are suitable for monitoring water and have a continuously adjustable set point. They can be mounted in any position and come with or without a display. N-Versions carry shipbuilding approvals.

Type	BFS-10-N, BFS-10-O
Materials of construction	Brass, nickel-plated or fully stainless steel
Medium	Water
Process Connections	G 1/2"
Measuring range	2 to 7 l/min. or 4 to 20 l/min.
Temperature	Standard 100 °C / Option 160 °C
Pressure	Brass 300 bar / SS 350 bar
Uncertainty	+/- 10 % of F.S.
Enclosure	IP65 / IP67
Electrical connection	Plug acc. to DIN EN 175301-803
Output signal	NO, SPDT
Supply voltage	230 VAC, 3 A, 60 VA (NO) 250 VAC, 1.5 A, 50 VA (SPDT)
Safety	Standard (ATEX option available)
Approvals	GL (max 100 bar), BV

Flow switch for oil

These flow switches are suitable for monitoring oils and have a continuously adjustable set point. They can be mounted in any position and come with or without a display. N-Versions carry shipbuilding approvals.

Type	BFS-30-N, BFS-30-O
Materials of construction	Brass, nickel-plated or fully stainless steel
Medium	Oil (viscosity compensated 30 to 600 cSt)
Process Connections	G 1"
Measuring range	2 to 8 l/min. or 8 to 24 l/min.
Temperature	Standard 120 °C / Option 160 °C
Pressure	Brass 250 bar / SS 300 bar
Uncertainty	+/- 10 % of F.S.
Enclosure	IP65 / IP67
Electrical connection	Plug acc. to DIN EN 175301-803
Output signal	NO, SPDT
Supply voltage	250 VAC, 3 A, 100 VA (NO) 250 VAC, 1.5 A, 50 VA (SPDT)
Safety	Standard (ATEX option available)
Approvals	GL (max 100 bar), BV

Pressure Switches

The new generation pressure switch with a 320° rotatable display monitors applications in hydraulics, pneumatics and plant engineering. Select from the dual switching output function or the analogue output with either 4 to 20 mA or 0 to 10 Volts.

Type	BPS 3000
Sensor element	Ceramic sensor; at 600 bar piezo resisitve sensor
Materials of construction	Wetted parts: stainless steel 1.4301, Housing: V2A or Polyamid
Seal	FKM
Process Connections	G1/4" M, 1/4" NPT, G 1/2"
Electrical connection	Plug M12 x 1
Measuring range	10, 50, 100, 200, 400, 600 bar
Temperature compensation range	-10 to 70 °C
Repeatability	±0.1% of full scale
Enclosure	IP67
Switching output	Transistor PNP: NO, NC
Analog output	4 to 20 mA or 0 to 10 V
Supply voltage	15..32 VDC, reverse polarity protected

Mechanical Pressure Switches

The D1T/D2T are direct acting metal diaphragm pressure switches with single or dual microswitch outputs. The measuring range is adjustable from 0.005 to 10.3 bar or -0.006 to -1 bar (vacuum) and has a repeatablility of ±1%. They are designed for machine- and tool engineering, autoclaves, cooling and shipbuilding applications.

Type	D1T/D2T
Switching rate	max. 20/ min
Materials of construction	Wetted parts: stainless steel 17 7PH / 304
Process Connections	1/4" NPT female thread (option: 1/2" NPT female thread)
Electrical connection	WAGO terminal, cable gland M20 x 1.5 (cable Ø 5 - 11 mm)
Measuring range	+0.005 to +10.3 bar or -0.006 to -1 bar (vacuum)
Temperature range	-40 to 75 °C
Repeatability	±0.1% at constant temperature
Enclosure	IP65
Switching output	SPDT / DPDT (gold contacts optional)
Supply voltage	Various AC and DC ranges up to 250 Volts
Safety	Standard, Ex ia and Ex d versions available

Compact Pressure Switches

Series 8000

The modular 8000 Series pressure switch comes in a piston or diaphragm design. It features a 30 x 30 x 92 front face and the advantage of very low and precise switch point settings. Suitable for OEM-, hydraulic- and pneumatic, as well as heavy industry applications, its measuring range is 0.6 to 600 bar.

Type	Series 8000
Switching rate	Piston: max. 60/min; Diaphragm: max 30/min
Materials of construction	Standard housing: Aluminium, Options: Stainless steel 1.4305, SS 304, Version VA
Wetted parts	Fitting: stainless steel 1.4301; Piston: steel, Seal: NBR; PTFE (for bronze and steel)
Process Connections	CETOP flange Ø 40 x 40 mm
Electrical connection	Cable plug DIN EN 175301-803A (former DIN 43650)
Measuring range	0.6 to 600 bar
Temperature range	Piston: -40 to 80 °C; Diaphragm: -20 to 80 °C
Repeatability	±1% piston pressure switch, ±2% diaphragm pressure switch
Enclosure	IP65; IP68 (cable) UL
Switching output	SPDT microswitch (gold contacts optional)
Supply voltage	Various AC and DC ranges up to 250 Volts
Safety	Standard, Ex ia IIB T6 (DIN plug); Ex ia IIC T6 (cable)
Approvals	GL, Ex, SIL, UL (Canada & US)

Series 9000

The compact 9000 Series piston type pressure switch features high quality materials and is 100% function tested. With a measuring range from 10 to 400 bar it is suitable for shipbuilding, mobile and industrial hydraulics, OEM- and heavy industry applications.

Type	Series 9000
Switching rate	Max. 60/min
Materials of construction	Housing: AlMg4.5Mn, Electric plug: Polyamide (PA), Adjustment screw: Stainless steel
Wetted parts	Fitting: AlMg4.5Mn, Piston: steel (100Cr6), Seal: PTFE/FKM
Process Connections	G 1/4" female thread DIN ISO 228-1
Electrical connection	Cable plug DIN EN 175301-803A (former DIN 43650)
Measuring range	10 to 400 bar
Temperature range	Piston: -20 to 80 °C, Storage: -40 to 80 °C
Repeatability	± 2% (typically)
Enclosure	IP65
Switching output	SPDT microswitch
Supply voltage	250 VAC, 24 VDC
Safety	Standard
Approvals	GL, BV