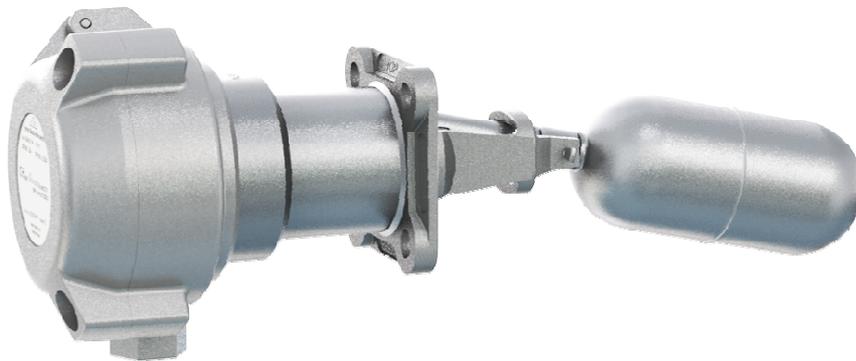




Operating Instruction

Trimod Besta Level Switch – types XI...5, XIE9...5

for use in potentially explosive atmospheres acc. to IECEx scheme



Subject to technical modification

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Legend



Information: Application hints and important information. To be followed for optimal function.



Attention: Requirements and prohibitions to prevent damages, especially to material and the environment.



Danger: Dangerous situation that can lead to injury and death if instructions are not followed.

1. Safety instructions

-  The operating manual must be read and understood before installation. If you are uncertain on any point, please contact Bachofen AG, Switzerland.
-  The electrical connection may only be carried out by qualified personnel who have been authorised by the operator.
-  All attached cables and cable bushings must comply with the requirements of IEC 60079-0 Appendix A – explosion-proof cables and cable entries.
-  The supply voltage may only be applied after the cover has been closed. Please ensure that you always observe the special regulations concerning work on explosion-proof devices and during work in potentially explosive atmospheres at the operators site.
-  Every Trimod Besta level switch must be selected by qualified, trained personnel in accordance with the specifications stipulated by the customer. These specifications must be kept by the operator in a safe place, together with the operating instruction, the customer-specific designation and the type number (see type plate). In the event of any deviation of the physical quantities (pressure, temperature, density, etc.) from the original specification, the suitability of the level switch must be checked again by qualified, trained personnel or by the manufacturer, with regard to the new specifications.
-  If the device is mounted in a partition wall, which separates zones from one another, and if category 1 or 2 equipment is necessary, an equipotential bond must be made (contact resistance $\leq M\Omega$) between the metal housing of the level switch and the wall of the container.
-  The float and flange module must be included in the regular plant pressure tests.
-  Process vessels / float chambers must be brought to atmospheric pressure before work is carried out and must be appropriately vented.
-  The devices may, under no circumstances, be used as a support aid or as a security fixture for equipment structures or for persons.

SIL When you are using a Trimod Besta level switch in a safety application according to IEC 61508 and IEC 61511, the safety manual must be taken into consideration before installing and commissioning the switch. The safety manual lists the restrictions and limitations of the IEC 61508 certification of the Besta Trimod level switch. The safety manual can be downloaded from <http://www.trimodbesta.com/en/downloads/approvals/sil.html>

2. Conformity of standards

Trimod Besta level switches conform with the requirements of:

EN 60079-0, EN 60079-1, EN 60079-11, EN 60079-26
IEC 61508:2010 (Safety Integrity Level)

3. Technical data

Ex-protection-data

Explosion protection	Ex ia d IIC T6...T2 Ga/Gb
IECEX Certificate of Conformity	IECEX EPS 12.0037 X

Safety Integrity Level (SIL)

Types XI...5, XIN...5, XIE9...5, XINE9...5	SIL 1
Types XII...5, XIIE9...5	SIL 1

-  **Electrical connection** The electrical connection should be carried out in accordance with the regulations of NAMUR/EN 60947-5-6 and the safety regulations.
-  Not suitable for the switching of motor loads and incandescent lamp loads. The device is not protected against excess current.



Supply voltage

U_N 8,2 VDC $\pm 5\%$ / U_B 5 to 25 VDC
EMC acc. to EN 60947-5-2

Isolating switching amplifier



The selection of the isolating switching amplifier has an indirect influence on the maximum temperature of the initiator. Therefore, the values U_0 , I_0 and P_0 must all lie below the limit values U_i , I_i and P_i specified in the relevant certificate of conformity.

Therefore, the following apply

U_0 (Isolating switching amplifier)	<	U_i (Proximity switch)
I_0 (Isolating switching amplifier)	<	I_i (Proximity switch)
P_0 (Isolating switching amplifier)	<	P_i (Proximity switch)

The max. ambient temperature $T_{i(max.)}$ of the initiator is obtained via the certified maximum values and the medium dependent temperature class acc. to the selection of the isolating switching amplifier by the operator. For correct operation, further consideration must be given to ensure that the isolating switching amplifier satisfies the relevant requirements of the evaluation circuit and the supply circuit, so that the external capacitance and inductance (incl. the supply cable values) do not exceed the internal capacitance of the isolating switching amplifier.

Therefore, the following apply

C_a (Isolating switching amplifier)	>	C_i (Proximity switch) + C_{Line}
L_a (Isolating switching amplifier)	>	L_i (Proximity switch) + L_{Line}

Recommended evaluation electronics (isolating switching devices)

for types XI...5, XIN...5, XII...5 Pepperl + Fuchs KFA6-SR2-EX1.W, KFA6-SR2-EX2.W

for types XIE9...5, XINE9...5, XIIE9...5 Pepperl + Fuchs KHA6-SH-EX1, ED2-SH-EX2.R1,
ED2-SH-EX1.R1

Principles of use

Type XI... As high alarm using the closed-circuit principle or as low alarm using the open-circuit principle.

Float at the top: proximity switch damped $I \leq 1$ mA

Float at the bottom: proximity switch undamped $I \geq 2.2$ mA

Type XIN... As low alarm using the closed-circuit principle or as low alarm using the open-circuit principle.

Float at the top: proximity switch undamped $I \geq 2.2$ mA

Float at the bottom: proximity switch damped $I \leq 1$ mA

Type XII... With two proximity switches. Galvanically isolated. Combination of I... and IN...

Type XIE9... TÜV tested. As high alarm using the closed-circuit principle.

Float at the top: proximity switch damped $I \leq 1$ mA

For self-checking, must be operated using the closed-circuit principle.

Type XINE9... TÜV tested. As low alarm using the closed-circuit principle.

Float at the bottom: proximity switch damped $I \leq 1$ mA

For self-checking, must be operated using the closed-circuit principle.

Type XIIE9... With two proximity switches. TÜV tested. Galvanically isolated.

Combination of IE9... and INE9...

For self-checking, must be operated using the closed-circuit principle.

Evaluation and supply circuit (Type 1...4)



Type of protection Intrinsic Safety Ex ia IIC/IIB for connection to intrinsically safe circuits only.

		Type 1	Type 2	Type 3	Type 4
Effective internal voltage	U_i	max. 16 VDC	max. 16 VDC	max. 16 VDC	max. 16 VDC
Effective internal current	I_i	max. 25 mA	max. 25 mA	max. 52 mA	max. 76 mA
Effective internal power	P_i	max. 34 mW	max. 64 mW	max. 169 mW	max. 242 mW

For relationship between type of connected circuit, temperature class, maximum permissible ambient temperature as well as the effective internal reactance for the respective sensor, reference is made to the table below:

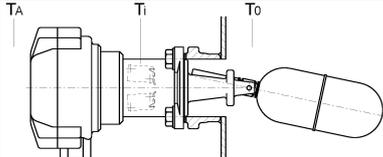
Switch module type XI...5 (Proximity switch Type NJ2-11-N)

		Type 1			Type 2			Type 3			Type 4		
Certified internal capacitance Ci nF	Certified internal inductance Li μH	Maximum permissible ambient temperature in °C for application in temperature class											
		T6	T5	T4 - T1	T6	T5	T4 - T1	T6	T5	T4 - T1	T6	T5	T4 - T1
≤ 45	≤ 50	73	88	100	66	81	100	45	60	89	30	45	74

Switch module type XIE9...5 (Proximity switch Type NJ2-11-SN)

		Type 1			Type 2			Type 3			Type 4		
Certified internal capacitance Ci nF	Certified internal inductance Li μH	Maximum permissible ambient temperature in °C for application in temperature class											
		T6	T5	T4 - T1	T6	T5	T4 - T1	T6	T5	T4 - T1	T6	T5	T4 - T1
≤ 50	≤ 150	73	88	100	66	81	100	45	60	89	30	45	74

Special conditions for safe use

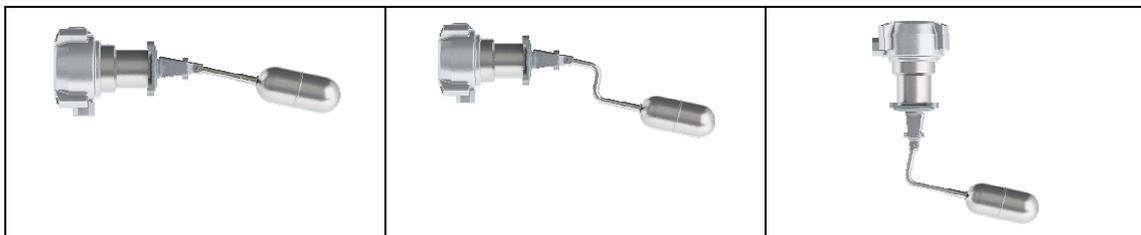
	Limits Proximity switch Ti	Ambient temperature (acc. to EN 60079-0 -20°C to 60°C) TA	Operating temperature To
XI...5, XII...5	-25°C to 100°C	-30°C to 80°C	-30°C to 150°C
XIE9...5, XIIE9...5	-40°C to 100°C	-50°C to 80°C	-50°C to 150°C

The rated cross-section of the conductor to be considered here must be at least 0,5 mm².
Connection cables may not be bared for a distance of more than 3 mm from the terminal screw.
Wire end ferrules must always be used.

i The cable gland is not a component of the supply.

4. Installation and initial start-up

During installation, the correct operating position must be observed.



👉 For side mounting, observe the “Top” arrow on the type plate.

👉 The float must be able to move freely over the whole range of movement and must not be restricted by the tanks walls or by fittings in the tank.

👉 Installation positions that are subject to turbulence impair the function and should always be avoided.

Process connection flange - Industrial range

For switches in the industrial range with flanges according to DIN, ANSI, etc., the seals ¹⁾ and connecting studs ¹⁾ that are used must correspond to the industry standard for material, pressure class and type of seal and must be tightened to the corresponding tightening torques.

¹⁾ not a component of the supply.

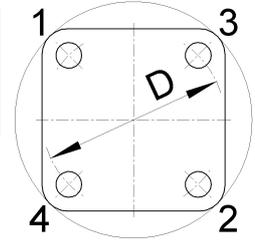
 In case of uncertainty on any point, refer to the corresponding standard or consult the manufacturer.

Process connection flange - Standard range

For switches of the standard range PN 25 (360 psi), corresponding seals are supplied with the unit. Minimum tightening torques and tightening sequence:

Flange	D	Seal	Stud Carbon steel	Stud Stainless steel
01 / 011	92 mm	Garlock Blue Gard 3000	18 Nm ⁽²⁾	22 Nm ⁽²⁾

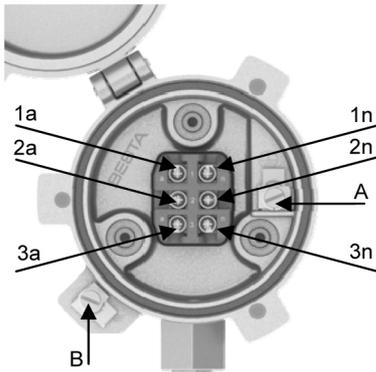
²⁾ Data refer to lubricated studs

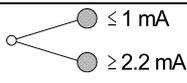
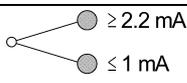
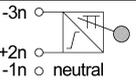


Connecting

1. Loosen the cover screws, remove the protective plug from the cable entry and fit the cable gland.
2. Insert the cable and connect to the wires according to the connection diagram (see inside the housing cover and instructions). All terminal connections are self-opening. Connect the earth A (inside the housing) and equipotential bonding B (external, near to cable entry).

Connection diagram



Type	Connection diagram
XI...5, XIE9...5 	-1a  +2a  3a  neutral
XIN...5, XINE9...5 	-1a  +2a  3a  neutral
XII...5, XIIE9...5	-1a  +2a  3a  neutral  -3n  -1n  neutral

 3. First close the cover and then apply the supply voltage!

5. Maintenance

 Level switches must be periodically tested and cleaned, at least once annually.

Procedure:

-  1. Before opening the housing, disconnect the supply voltage; electric shocks can be life-threatening.
-  2. Process vessels / float chambers must be brought to atmospheric pressure before work is carried out and must be appropriately vented. If necessary, lower the fill level. If the switch is mounted in a chamber, close the corresponding shut-off valves and, depending on the requirement, empty or vent the chamber.
3. Loosen the flange connection and remove the switch.
4. Check the float and mechanism for damage and contamination.

5. Remove deposits and metal particles by means of suitable and approved methods. Care must be taken to ensure that no mechanical damage occurs as a result of the cleaning.
6. In the case of floats with protective bellows, the bellows must be removed before cleaning and should be cleaned separately, both internally and externally.
7. Check the float and mechanism for complete deflection, as well as for smooth and unrestricted operation.
8. In the event that it becomes necessary to replace individual components, please note that only original spare parts, split pins, float, switch module, etc. may be installed.
-  9. After completion of the cleaning / inspection work, the switch module must be checked for correct function by means of a test device or similar with simultaneous deflection of the float, followed by recording in the inspection log book.
10. In order to guarantee the absence of leaks between process vessel / float chamber, the flange seal must be replaced after each dismantling.
11. After carrying out the inspection work, the device is re-fitted at the intended location.

6. Replacing the switch insert

-  Defective switch elements must be replaced by new, works-tested units. The case of uncertainty on any point, please contact the local Trimod Besta agent or the manufacturer.

Replacing the switch insert

Important notes: The switch does not have to be removed from the process vessel in order to replace the switch element.

Repairs to explosion-proof level switches may only be carried out by specialists who have been approved by the relevant local authorities. The replacement of a switch insert must be recorded accordingly.

Procedure:

1. Observe chapter 1 «Safety instructions»
2. Follow the installation instruction **LT1005X** «Replacement switch insert type X...»

7. Fire protection

-  Trimod Besta level switches must be protected against external fires.

8. Disposal

Trimod Besta level switches are free of asbestos or otherwise hazardous materials (2011/65/EU - RoHS). Disposal to be carried out according to environmental and local regulations.

9. IECEx - Certificate of Conformity

See <http://iecex.com/>

Subject to technical modification

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