SIL Instructions

Safety-related parameters

Safety Integrity Level		SIL2		
Operating Modes		Low demand mode		
Architecture		1oo1		
Device Type		A		
Hardware Fault Tolerance	HFT	0		
		BN4xxx BP4xxx	**BE4xxx BR4xxx**	**BE2xxx BG2xxx**
Safe Failure Fraction	SFF	87,19 %	87,15 %	95,6 %
Failure rate for safe detected failures	λ_S	$1{,}30 \times 10^{-7}$ 1/h	$1{,}32 \times 10^{-7}$ 1/h	$3{,}99 \times 10^{-7}$ 1/h
Failure rate for dangerous detected failures	λ_{DD}	$9{,}14 \times 10^{-8}$ 1/h	$9{,}76 \times 10^{-8}$ 1/h	$1{,}14 \times 10^{-7}$ 1/h
Failure rate for dangerous undetected failures	λ_{DU}	$3{,}25 \times 10^{-8}$ 1/h	$3{,}39 \times 10^{-8}$ 1/h	$2{,}37 \times 10^{-8}$ 1/h
Probability of a dangerous undetected failure on demand Test interval T_1=1 year	PFD	$1{,}43 \times 10^{-4}$	$1{,}49 \times 10^{-4}$	$1{,}05 \times 10^{-4}$ 1/h
Mean time between failures = Mean time to failure	MTBF = MTTF	450 a	433 a	213 a
Mean time to dangerous failure	$MTTF_d$	3512 a	3367 a	4817 a

for MTTR = MRT = 8 h

1 General Information

These SIL Instructions contain information and instructions for using the device as part of a protection system according to IEC/EN 61508. In addition to these instructions, please take all relevant legal requirements, applicable standards as well as the additional technical specifications on the accompanying data sheet into account (see www.labom.com).

1.1 Safety Function

The safety function of the device according to IEC/EN 61508 is the switching of the contact.

1.2 Validity

The safety function can only be guaranteed if the option "Functional safety according to IEC/EN 61508" has been chosen for the device. These devices are marked as shown on the right.

SIL marking on the unit.

2 Technical Data

The following technical data applies to the safety function of the device.

2.1 Accuracy

The accuracy according to the data sheet resp. the order documents also applies during safety operation.

For devices with diaphragm seal take the error of the diaphragm seal into account as well.

2.2 Reaction Times

Additional elements in the process connection, such as capillaries, can extend the reaction time in the event of sudden pressure changes in the process.

2.3 Fault Detection

Fault detection is part of the regular checks, see section 3.2, and by using a suitable evaluation unit.

3 Requirements for the Operator

The operator has to consider the following requirements to ensure that the safety function is not jeopardised.

3.1 Requirements for Safety Function

Ensure compatibility of wetted materials with process media and cleaning agents.

Avoid environmental conditions that exceed the data sheet limits.

Operating temperature for SIL-application:

	BN4xxx / BP4xxx / BE4xxx	**BR4xxx**	**BE2xxx/BG2xxx**
standard- and safety case S3, IP65, without liquid filling	Media / ambient -20...70 °C	Media / ambient -20...70 °C	Media / ambient -20...60 °C
standard case, with liquid filling	Media / ambient -20...70 °C	Media / ambient -20...70 °C	Media / ambient -20...60 °C
safety case S3, IP66, with liquid filling	Media / ambient -20...60 °C	Media -20...60 °C Ambient -20...50 °C	Media / ambient -20...40 °C

Avoid a pressure load that exceeds the permissible pressure limits as per the data sheet.

For operation in applications up to SIL2, the device must be connected to a suitable evaluation unit for safety applications.

Pay attention to the specified polarity (+ and -) when connecting circuits to the switching contacts.

The safe status of the switch contacts for all devices is a high-impedance status (low signal). Applications with an evaluation unit or safety functions, where the safe status is a low-impedance status (high signal), have not been evaluated. Only use evaluation units in compliance with EN 60947-5-6 (NAMUR) to guarantee the safety of the safety circuit in compliance with SIL2.

Note the maximum connection values as per the operating instructions and TA_039.

3.2 Regular Inspections

Dangerous undetected faults during operation can be detected with a high level of certainty during regular inspections. The inspection interval is one year. The test must be carried out manually.

Not only the device but the complete measuring chain should be tested during inspection. It is the responsibility of the plant operator to determine an adequate test of the safety function.

The following inspection procedure is recommended for the device to achieve a high fault detection.

- Apply one or more pressure levels - depending on the safety-related pressure range - and check whether the correct value is displayed. It is recommended to check the accuracy at 0%, 50% and 100% of the span as well as at the switching point. If necessary, carry out a zero point correction according to the operating instructions.
- Visual monitoring of damages