

SIL Instructions

Safety-related parameters

Safety Integrity Level		SIL2
Operating modes		Low and continuous demand mode
Architecture		1oo1
Device type		A
Hardware fault tolerance	HFT	0
Safe failure fraction	SFF	91.67 %
Failure rate for safe detected failures	λ_{SD}	$4 \cdot 10^{-9}$ 1/h
Failure rate for safe undetected failures	λ_{SU}	0 1/h
Failure rate for dangerous detected failures	λ_{DD}	$2.5 \cdot 10^{-9}$ 1/h
Failure rate for dangerous undetected failures	λ_{DU}	$5 \cdot 10^{-10}$ 1/h
Probability of a dangerous undetected failure per hour	PFH	$5 \cdot 10^{-10}$ 1/h
Mean time between failures = Mean time to failure (Failure rate = $\Sigma\lambda$)	MTBF = MTTF	16,308 a
Mean time to undetected, dangerous failure	MTTF _d	228,311 a

For resistance thermometers with 2 x Pt100 / 2 x Pt1000 design, the values listed apply to each individual Pt100 / Pt1000. Perform a SIL calculation separately for each sensor circuit.

Inspection interval	T ₁	1 year	2 years	3 years	5 years
Probability of a dangerous undetected failure on demand	PFD	$2.21 \cdot 10^{-6}$	$4.40 \cdot 10^{-6}$	$6.59 \cdot 10^{-6}$	$1.10 \cdot 10^{-5}$

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).

Also note the SIL documentation for the transmitter!

1.1 Safety function

The safety function of the device in accordance with IEC/EN 61508 is the temperature-dependent change of resistance within the stated accuracy class.

1.1.1 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.

The logo consists of the text "SIL2" in a blue, sans-serif font. The "2" is significantly larger than the "SIL" and is positioned to the right of the "L".

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.

Clamp-on: The accuracy and response time of the entire system is dependent on the geometry of the pipe, the media and the ambient temperature (see data sheet).

2.2 Reaction times

Note that the wall thickness of the sensor bulb or thermowell has an impact on the response time.

Clamp-on (GA261x): The accuracy and response time of the entire system is dependent on the geometry of the pipe, the media and the ambient temperature.

The response time in the event of a detected error depends on the analysis unit.

2.3 Fault detection

Continuous monitoring of line interruption, cable breakage and short circuiting must be guaranteed by the use of an appropriate analysis unit. In the event of multiple wires, all wires must be monitored.

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.

Avoid temperature levels that exceed the permissible temperature limits as per data sheet.

3.2 Regular inspections

Dangerous undetected faults during operation can be detected with a high level of certainty during regular inspections. The operator can define the inspection interval depending on the PFD value required.

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.

- Calibration of the measured temperature value in the operating range of the measuring device
- Visual inspection regarding damages, especially dirt and corrosion

When carrying out the recommended tests, a PTC value (Proof Test Coverage) of 100 % can be assumed following Namur NA106, section D3.