(Safety) Temperature Limiter

(Safety) Temperature Monitor

certificated on DIN EN 14 597

B 70.1130

Operating Instructions

06.07/00456272

Please read these operating instructions before commissioning the instrument. Keep the manual in a place which is accessible to all users at all times.

Please assist us in improving these operating instructions where necessary.

Your comments will be appreciated.

For technical question

Phone support in Germany:

Phone: +49 661 6003-300 or -653 or -899
Fax: +49 661 6003-881729
E-mail: Service@jumo.net

Austria:

Phone: +43 1 610610
Fax: +43 1 6106140
E-mail: info@jumo.at

Switzerland:

Phone: +41 1 928 24 44
Fax: +41 1 928 24 48
E-mail: info@jumo.ch

If any difficulties should nevertheless arise during start-up, please do not manipulate the unit in any way. You could endanger your rights under the instrument warranty!

Please contact the nearest subsidiary or the head office in such a case.

If servicing is required, the instrument must be returned to the main plant.
Based on the recommendation of Germanische Lloyd, availability of a replacement instruments must be guaranteed for certain applications.

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1.1 Description

Application areas for (safety) temperature limiters and monitors ((S)TB or (S)TW) may be found wherever thermal processes are monitored and the system must be placed in a safe operating state when faults occur. If the permissible temperature limit is reached or if an error occurs (sensor break or short circuit, failure of a component, power failure) within the permissible temperature range, the instrument shuts off without delay. If no fault is present, manual unlocking is required for TB and STB. This can be done either with an unlocking button on the instrument or by an external unlocking button. Flow of energy is not enabled until the temperature is lower (O function) or higher (S function) than the set limit value by the amount of the switching differential. A brief power failure (≤ 1 min) in the OK range of the system is followed by automatic enable after the power is restored. The switching differential is 3°C, 10°C, 30°C, or 100°C.

The analog limit value adjuster for the limit temperature is located on the front. Unintentional or unauthorized adjustment of the limit value is prevented by a lead-sealable see-through cover. Instruments are designed as installation devices for fastening to a mounting rail as specified by DIN EN 60715. Screw terminals, conductor cross-section max. 2.5 mm^2 for the electrical connection are in a wiring plane.

Instruments work in defined temperature ranges from 0 to 1800°C (for extra code "DIN" and "SIL," from 0 to 1400°C).

1.1.1 Functional control and regulating instrument

Temperature monitor TW*

Functional temperature monitors for heat-generating systems, with automatic reset upon activation after the sensor temperature has risen or fallen an amount equal to the switching differential above or below the set limit value.

(Function 2B)

* For more detailed explanation, see DIN EN 14 597

1.1.2 Safety control and regulating instruments

Safety temperature monitor STW*

Safety temperature monitors for heat-generating systems, with automatic reset upon activation after the sensor temperature has risen or fallen an amount equal to the switching differential above or below the set limit value.

(Function 2B, 2K, 2P)

Temperature limiter TB*

Safety temperature limiter for heat-generating systems that can only be reset manually or with a tool.

(Functions 2B, 2J, 2V adjustable with tool)

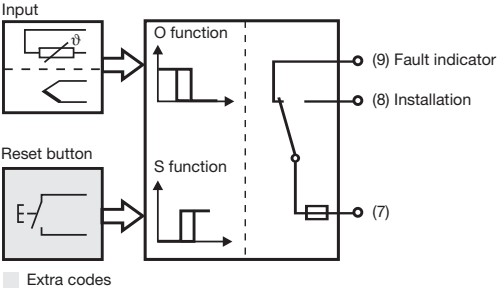
Safety temperature limiter STB*

Safety temperature limiter for heat-generating systems that can only be reset manually or with a tool.

(Functions 2B, 2J, 2V, 2K, 2P and adjustable with special tool)

* For more detailed explanation, see DIN EN 14 597

1.2 Block structure



1.3 Type description

	(1)		(2)		(3)		(4)
701130 /	****	–	***	–	**	/	***

(1) Basic type extension	
0151	Temperature monitor with O function
0152	Temperature monitor with S function
0153	Temperature limiter with O function
0154	Temperature limiter with S function
0251	Safety temperature monitor with O function
0252	Safety temperature monitor with S function
0253	Safety temperature limiter with O function
0254	Safety temperature limiter with S function

(2) measurement inputs	
001	Resistance thermometer Pt100 in a 2-wire circuit
042	Fe-CuNi "L"
043	NiCr-Ni "K"
044	Pt10Rh-Pt "S"
046	Pt30Rh-Pt6Rh "B"

(3) Power supply	
02	AC 230V +10%/-15%, 48...63Hz
05	AC 115V +10%/-15%, 48...63Hz
08	AC 24V +10%/-15%, 48...63Hz

(4) Extra codes	
202	Switching differential 3 °C (only for Pt 100!)
205	Switching differential 10 °C
206	Switching differential 30 °C
208	Switching differential 100 °C
229	Lead resistance 1Ω internally considered*
231	Lead resistance 10Ω internally considered*
233	Lead resistance 30Ω internally considered*
235	Lead resistance 50Ω internally considered*
245	Internal unlocking button (extra code for TB only)
056	DIN approval
057	SIL certification and DIN approval
062	GL

* Lead Compensation Resistor LCR (10Ω) is included with delivery

Accessories
External unlocking button RT Sales No.: 70/97097865
Fastening plate BS Sales No.: 70/00059172
Lead Compensation Resistor LCR (10Ω) Sales No.: 70/00322800

1.4 Registration number

For type 701130/... : TB/TW/STB/STW 1091 07

1.5 Date of manufacture

See manufacturing number on the nameplate.

F-Nr. 00305923000**0401**0001 (example)

year

calendar week

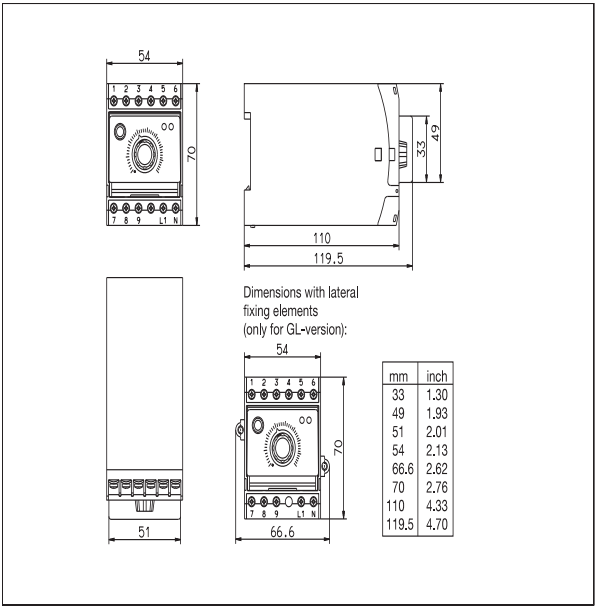
Declarations of conformity

You can find the declarations of conformity on the Internet under: www.jumo.net ➔products

2.1 Mounting location and climatic conditions

The requirements for mounting location and climatic conditions must meet the specifications described in Technical data (⇨ Section 8).

2.2 Dimensions

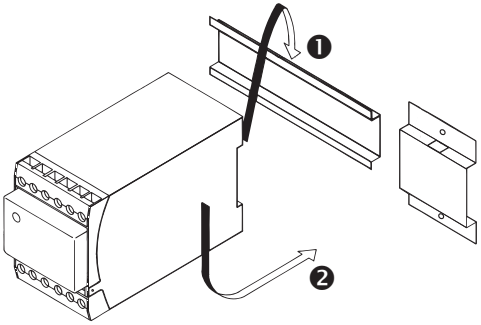


mm	inch
33	1.30
49	1.93
51	2.01
54	2.13
66.6	2.62
70	2.76
110	4.33
119,5	4.70

2.3 Fastening on a mounting rail or fastening plate

Instruments are designed to be installed and meet the requirements of protection class IP20 in their standard configuration.

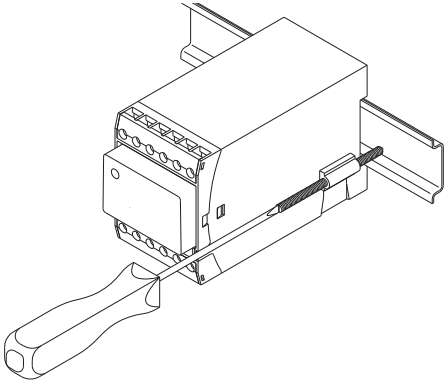
* Insert the device into the mounting rail or indentation of the fastening plate from above ❶ and rotate it down until it locks into place ❷



Mounting with GL design:

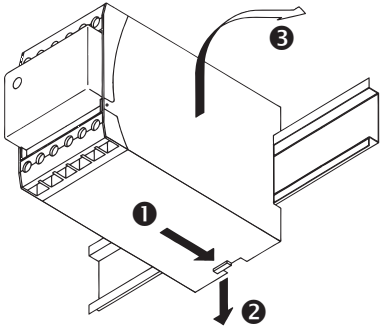
* Push the mounting brackets into the side guides
* Insert the device into the mounting rail from above and rotate it down until it locks into place (as above)
* Place the mounting brackets against the mounting rail and tighten them evenly with a screwdriver

(see illustration on next page!)



2.4 Disassembly

* Push the screwdriver in the direction of the arrow under the lock ❶
* Press the lock down ❷ while at the same time rotating the instrument up ❸



3.1 Installation notes

- The choice of cable material for the installation and for fuses and electrical connections of the instrument must conform to the requirements of VDE 0100 “Regulations on the Installation of Power Circuits with Nominal Voltages below 1000V” or the appropriate local regulations.
- The electrical connection must only be carried out by qualified personnel.
- Disconnect both positive and negative connections between the instrument and the mains power if parts conducting voltage could be touched during work.
- The Electromagnetic Compatibility (EMC) must meet the requirements of standards and regulations cited in Technical data.
  ⇨ Section 8
- The sensor and output or power supply lines should be kept physically separate from each other. They should not be laid parallel to each other.
- Sensor lines must be designed twisted and shielded. If possible, do not lay the lines close to components or lines through which current is flowing.
- No other consumers can be connected to the power terminals of the instrument.
- The instrument is not suitable for installation in areas with an explosion hazard.
- Suppress the interference of inductive consumers in the vicinity of the instrument, for example contactors or solenoid valves with RC combinations.
- Approval of the instrument to DIN EN 14 597 is valid only if the temperature sensors identified by * in Section 8 "Technical data" are used.
  If temperature sensors that are not identified or listed are used, the instrument and temperature sensors must be checked to ensure approval.

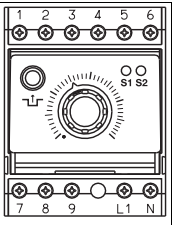
3 Electrical connection

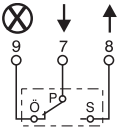
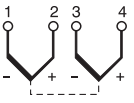
- All incoming and outgoing lines without a connection to the power supply network must be laid with shielded and twisted lines.
  Lay the shield on the device side to the ground potential.

The electrical connection must only be performed by qualified personnel.

Instruments with approval according to **DIN EN 14 597** must only be used with temperature sensors as described in Data sheets 90.1006 and 90.2006. If other temperature sensors are used, their registration must be checked.

3.2 Connection diagram

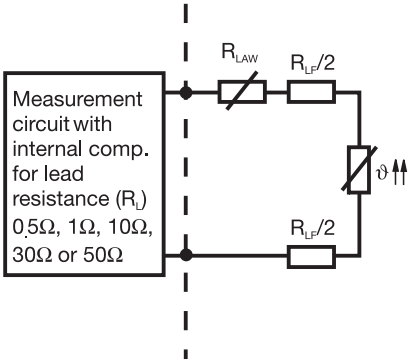


Connection for	Terminal assignment	
Relay output 230 V, 2 A, resistive load	7 pins 8 Make (SPST-NO) 9 Break (SPST-NC)	
Power supply acc. to nameplate	L1 External conductor N Neutral conductor	
External unlocking button	5 6	
Resistance thermometer in 2-wire circuit	1 2 LCR= Lead Compensation Resistor	
Thermocouple	1 – Thermocouple 1 2 + 3 – Thermocouple 2 4 +	

3.3 Lead compensation

Standard configuration includes a 0.5-Ω internal lead resistor. Also available on request are1Ω,10Ω, 30Ω or 50Ω (extra code).

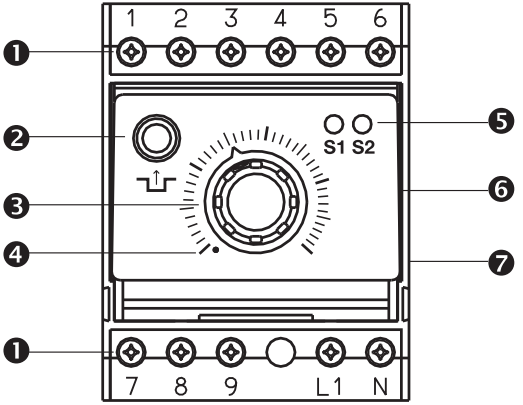
If Pt 100 resistance thermometers are connected, a lead compensation resistor LCR is required (10Ω; included with delivery for the corresponding extra code).



Condition for compensation: $\mathbf{R_L = R_{LCR} + R_{LS}}$

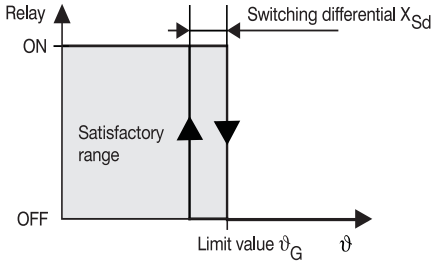
R_L - The internally considered lead resistance of measurement circuit
R_{LCR} - Resistance of the Lead Compensation Resistor
R_{LF} - Resistance of the sensor lines

4.1 Displays and controls



❶	Screw terminals, max. 2.5 mm^2
❷	Unlocking key (only for TB extra code)
❸	Limit value adjuster
❹	Limit value scale
❺	Fault indicator for channel 1 (S1) and channel 2 (S2) S2 only with STB and STW
❻	Lead-sealed see-through cover
❼	Plastic housing

4.2 O function



Behavior in normal operation

– $\vartheta<\vartheta_G$
– Temperature is rising
⇒ Relay is de-energized at $\vartheta=\vartheta_G$.

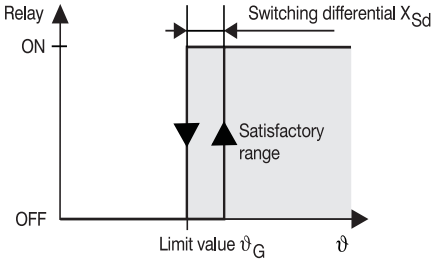
Behavior after limit value is exceeded

– $\vartheta>\vartheta_G$
– Temperature is falling
⇒ The relay is energized automatically at $\vartheta=\vartheta_G-X_{sd}$ (STW and TW) or must be unlocked manually (STB and TB)

Response in case of error

If an error occurs (sensor break or short circuit, electronic fault or power failure), the relay is de-energized.
If
– Error eliminated
– $\vartheta\leq\vartheta_G-X_{sd}$
⇒ For STW and TW, the relay is automatically energized. STB and TB must be unlocked manually. Automatic enable occurs when the power is restored only in the OK range of the system after a brief power failure (≤ 1 min).

4.3 S function



Behavior in normal operation

– $\vartheta > \vartheta_G$
– Temperature is falling
⇒ Relay is de-energized at $\vartheta = \vartheta_G$.

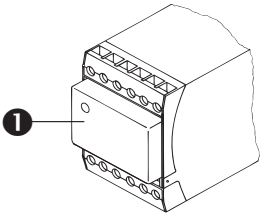
Behavior after value falls below lower limit

– $\vartheta < \vartheta_G$
– Temperature is rising
⇒ The relay is energized automatically at $\vartheta = \vartheta_G + X_{sd}$ (STW and TW) or must be unlocked manually (STB and TB)

Response in case of error

If an error occurs (sensor break or short circuit, electronic fault or power failure), the relay is de-energized.
If
– Error eliminated
– $\vartheta \geq \vartheta_G + X_{sd}$
⇒ For STW and TW, the relay is automatically energized. STB and TB must be unlocked manually. Automatic enable occurs when the power is restored only in the OK range of the system after a brief power failure (≤ 1 min).

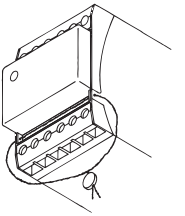
The setting of the limit value must not change by itself under operating conditions. A lead-sealed see-through cover ❶ must therefore be placed over it to prevent unintentional or unauthorized adjustment.



- ✱ The see-through cover must swing up and be removable.
- ✱ Set the required limit value on the limit value scale with the limit value adjuster. The adjustable limit value is also easy to read when the see-through cover is in place. The beginning and end of the range are limited by stops.
- ✱ After the limit value is set, perform the functional test (⇨ Section 6) and lead-seal the see-through cover.

Each time the electrical power is turned on or interrupted, the safety circuit must be unlocked by the internal or external button (only for TB and STB).
Automatic enable occurs when the power is restored only in the OK range of the system after a brief power failure (≤ 1 min).

Two holes are provided to the left and right of the see-through cover through which wire can be guided for lead sealing to connect the cover to the housing. The wire ends are secured with the lead seal.



6.1 Test run

An annual functional test must be performed for STW and STB.

Normally the functional test always begins in the OK range of the system, i. e. the fault indicator diodes must not be lit and the STBs must be unlocked.

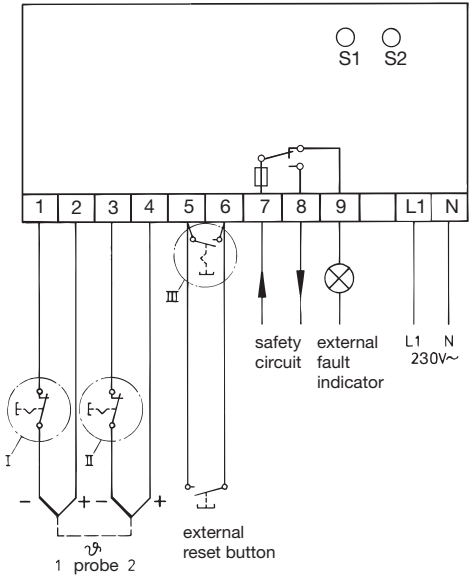
To perform the functional test, the measurement circuit(s) must be short circuited or interrupted. The Reset button must also be short circuited during the test process.

For a quick functional test, we therefore recommend installing buttons I, II, and III in the measurement circuit or unlocking circuit.

When connecting thermocouples and buttons, make certain no additional thermotensions are caused (differences in temperature on the terminal points).
When connecting resistance thermometers and buttons, make certain no transitional resistance that is too high results ($0.4\,\Omega \approx 1\,°K$ error).

Perform a functional test after every fault!

6.2 Test of STB and STW with O function and connected thermocouples



- ✱ Short circuit the unlocking button
- ✱ To simulate broken sensor of thermocouple 1:
  - ☐ LEDs S1 and S2 must be lit.
  - ☐ The external fault indicator must be lit. The safety circuit must be interrupted.
  - ☐ After about 5 sec, LEDs S1 and S2 must go out.
  - ☐ The external fault indicator remains lit and the safety circuit remains interrupted.

- ✱ To eliminate the short circuit in the unlocking button:
  - ☐ LEDs S1 and S2 are lit again.
  - ☐ The external fault indicator stays on.
- ✱ To eliminate the broken sensor:
  - ☐ If the sensor temperature is in the permitted temperature range or **under** the limit value according to the hysteresis value, the two LEDs S1 and S2 must go out after about 5 sec.
  - ☐ For the STW, the external fault indicator must also go out and the safety circuit must close.
  - ☐ For the STB, the external fault indicator must remain lit and the safety circuit must remain uninterrupted. The safety circuit is not enabled until after the unlocking key is pressed.
- ✱ Repeat the process for thermocouple 2.

Check the behavior after a power failure. (STB)

In the OK range of the system:

- ✱ To turn off the mains power supply:
  - ☐ Wait about 1 min
- ✱ To turn on the mains power supply:
  - ☐ LEDs S1 S2 and must light up for about 5 sec and then go out
  - ☐ The external fault indicator must go out after about 2 sec and the safety circuit must close automatically.

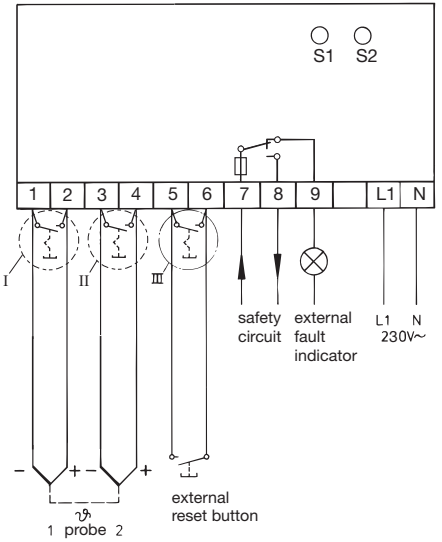
In case of error:

- ✱ To simulate broken sensor of thermocouple 1:
  - ☐ LEDs S1 and S2 must be lit.
- ✱ To eliminate broken sensor of thermocouple 1:
  - ☐ LEDs S1 and S2 must go out after about 5 sec.
  - ☐ The safety circuit remains interrupted.
- ✱ Turn off the mains power supply for at least 5 seconds.

✱ Turn on the mains power supply:

- ☐ LEDs S1 and S2 must light up for about 5 sec and then go out.
- ☐ The external fault indicator remains lit and the safety circuit remains interrupted. The safety circuit is not enabled and the external fault indicator does not go out until the unlocking button is confirmed.

6.3 Test of STB and STW with S function and connected thermocouples



✱ Short circuit the unlocking button

✱ To simulate sensor short circuit of thermocouple 1:

- ☐ LEDs S1 and S2 must be lit.
- ☐ The external fault indicator must be lit. The safety circuit must be interrupted.
- ☐ After about 5 sec, LEDs S1 and S2 must go out.
- ☐ The external fault indicator remains lit and the safety circuit remains interrupted.

✱ To eliminate the short circuit in the unlocking button:

- ☐ LEDs S1 and S2 are lit again.
- ☐ The external fault indicator stays on.

✱ To eliminate the sensor short circuit:

- ☐ If the sensor temperature is in the permitted temperature range or **over** the limit value according to the hysteresis value, the two LEDs S1 and S2 must go out after about 5 sec.
- ☐ For the STW, the external fault indicator must also go out and the safety circuit must close.
- ☐ For the STB, the external fault indicator must remain lit and the safety circuit must remain uninterrupted. The safety circuit is not enabled until after the unlocking key is pressed.

✱ Repeat the process for thermocouple 2.

Check the behavior after a power failure. (STB only)

In the OK range of the system:

✱ Turn off the mains power supply:

- ☐ Wait about 1 min

✱ Turn on the mains power supply:

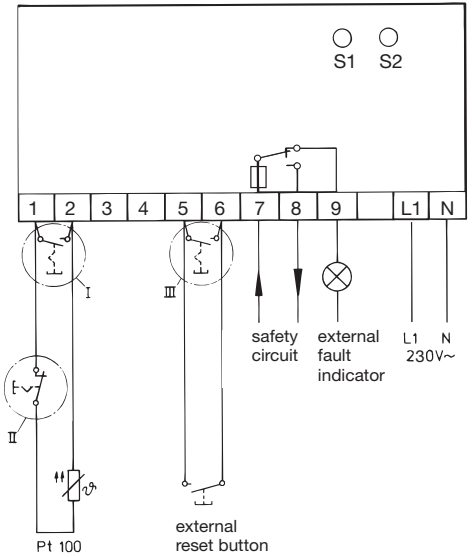
- ☐ LEDs S1 and S2 must light up for about 5 sec and then go out.
- ☐ The external fault indicator must go out after about 2 sec and the safety circuit must close automatically.

In case of error:

6 Functional test

- ✱ To simulate sensor short circuit of thermocouple 1:
  - ☐ LEDs S1 and S2 must be lit.
- ✱ Eliminate sensor short circuit of thermocouple 1:
  - ☐ LEDs S1 and S2 must go out after about 5 sec.
  - ☐ The safety circuit remains interrupted.
- ✱ Turn off the mains power supply for at least 5 seconds
- ✱ Turn on the mains power supply:
  - ☐ LEDs S1 and S2 must light up for about 5 sec and then go out.
  - ☐ The external fault indicator remains lit and the safety circuit remains interrupted. The safety circuit is not enabled and the external fault indicator does not go out until the unlocking button is activated.

6.4 Test of STB and STW with O or S function and connected resistance thermometers



- ✱ Short circuit the unlocking button
- ✱ Simulate broken sensor:
  - ☐ LEDs S1 and S2 must be lit.
  - ☐ The external fault indicator must be lit. The safety circuit must be interrupted.
  - ☐ After about 5 sec, LEDs S1 and S2 must go out.
  - ☐ The external fault indicator remains lit and the safety circuit remains interrupted.

- ✱ To eliminate the short circuit in the unlocking button:
  - ☐ LEDs S1 and S2 are lit again.
  - ☐ The external fault indicator stays on.
- ✱ To eliminate the broken sensor:
  - ☐ If the sensor temperature is in the permitted temperature range or under (O function) the limit value or over the limit value (S function) according to the hysteresis value, the two LEDs S1 and S2 must go out after about 5 sec.
  - ☐ For the STW, the external fault indicator must also go out and the safety circuit must close.
- ✱ For the STB, the external fault indicator must remain lit and the safety circuit must remain uninterrupted. The safety circuit is not enabled until after the unlocking key is pressed.
- ✱ Short circuit the unlocking button
- ✱ Simulate sensor short circuit:
  - ☐ LEDs S1 and S2 must be lit.
  - ☐ After about 5 sec, LEDs S1 and S2 must go out.
- ✱ To eliminate the short circuit in the external unlocking button:
  - ☐ LEDs S1 and S2 are lit again.
- ✱ To eliminate the sensor short circuit:
  - ☐ If the sensor temperature is in the permitted temperature range or under (O function) the limit value or over the limit value (S function) according to the hysteresis value, the two LEDs S1 and S2 must go out after about 5 sec.
  - ☐ For the STW, the external fault indicator must also go out and the safety circuit must close.
  - ☐ For the STB, the external fault indicator must remain lit and the safety circuit must remain interrupted. The safety circuit is not enabled until the unlocking button is activated.

Check the behavior after a power failure

In the OK range of the system:

- ✱ Turn off the mains power supply:

- ☐ Wait about 1 min

✱ Turn on the mains power supply:

- ☐ LEDs S1 and S2 must light up for about 5 sec and then go out.
- ☐ The external fault indicator must go out after about 2 sec and the safety circuit must close automatically.

In case of error:

✱ Simulate broken sensor:

- ☐ LEDs S1 and S2 must be lit.

✱ Eliminate broken sensor:

- ☐ LEDs S1 and S2 must go out after about 5 sec.
- ☐ The safety circuit remains interrupted.

✱ Turn off the mains power supply for at least 5 seconds

✱ Turn on the mains power supply:

- ☐ LEDs S1 and S2 must light up for about 5 sec and then go out.
- ☐ The external fault indicator remains lit and the safety circuit remains interrupted. The safety circuit is not enabled and the external fault indicator does not go out until the unlocking button is activated.

7 Test in case of error

If a fault is present in the system, the instrument turns the system off. This state is indicated by the S1 LED being lit (for instruments with extended safety S1 and S2). At the same time, the system fault is indicated by the external fault indicator. In this state the relay for the temperature limiting device (STB, TB, STW, TW) is not activated.

Output state: STB has turned off the system.

Fault indicators are lit	**Fault indicators are off**
The error is still present in the system (over-/ undertemperature, broken sensor, sensor short circuit) * Press the unlock key (at least 5 s) until S1 and S2 go out If the safety circuit remains interrupted, the system and sensor circuit should be checked.	* Press the unlocking key If the instrument remains locked even after the unlocking key is pressed, install the replacement instrument and run the function test.

8.1 Scope of application

Application areas for (safety) temperature limiters and monitors ((S)TB or (S)TW) may be found wherever thermal processes are monitored and the system must be placed in a safe operating state when faults occur.
If the permissible temperature limit is reached or if an error (sensor break or short circuit, failure of a component, power failure) occurs within the permissible temperature range, the instrument shuts off without delay.

If no fault is present, manual unlocking is required for TB and STB. This can be done either with an unlocking button on the instrument or by an external unlocking button.
Flow of energy is not enabled until the temperature is lower (O function) or higher (S function) than the set limit value by the amount of the switching differential.

A brief power failure ($\leq$ 1 min) in the OK range of the system is followed by automatic enable after the power is restored.
The switching differential is 3°C, 10°C, 30°C, or 100°C.
The analog limit value adjuster for the limit temperature is positioned on the front. Unintentional or unauthorized adjustment of the limit value is prevented by a lead-sealable see-through cover.

Instruments are designed as installation devices for fastening to a mounting rail as specified by DIN EN 60715. Screw terminals (conductor cross-section max. 2.5 mm^2) for the electrical connection are in a wiring plane.

Failure of the instruments could affect the safety of persons and/or the safety of the environment.

Certification to IEC 61 508 is provided because of the worldwide use of these systems.

The temperature monitoring unit with extra code "057" meets the requirements

- for safety function up to SIL 3 per IEC 61 508
- per DIN EN 14 597
- per EN 60 730-2-9
- per EN 61 326
- according to the Pressure Device Regulation

8.2 Validity of the Safety Manual

The evaluation described in this Safety Manual in terms of functional safety and display of certificates applies to the specified designs of temperature monitoring units including sensor designs.

Information that does not take the sensor system into consideration is identified as such.

Type	Designa-tion	SIL device incl. sensor	Architecture		SFF		PFD avg device incl. sensors	Channel A, device without sensors in fit	
			Logic	Sensor	Logic	Sensor		λdd	λdd
701130/0253-001-XX/XXX	STB-O, w	2	1oo2D	1oo1	69.98	95.60	1.19E-03	64.55	212.71
701130/0153-001-XX/XXX	TB-O, w	2	1oo1	1oo1	77.46		6.72E-03	20.16	124.33
701130/0251-001-XX/XXX	STW-O, w	2	1oo2D	1oo1	69.09	95.60	1.22E-03	64.55	221.71
701130/0151-001-XX/XXX	TW-O, w	2	1oo1	1oo1	75.87		6.72E-03	11.16	133.33
701130/0253-0XX-XX/XXX	STB-O, t	3	1oo2D	1oo2	72.23	90.04	1.95E-04	102.46	213.71
701130/0153-0XX-XX/XXX	TB-O, t	2	1oo1	1oo1	74.38		8.56E-03	35.91	158.21
701130/0251-0XX-XX/XXX	STW-O, t	3	1oo2D	1oo2	71.38	90.04	2.04E-04	102.46	222.71
701130/0151-0XX-XX/XXX	TW-O, t	2	1oo1	1oo1	72.97		8.56E-03	26.91	167.21
701130/0254-001-XX/XXX	STB-S, w	2	1oo2D	1oo1	71.11	95.53	2.12E-03	86.11	206.47
701130/0154-001-XX/XXX	TB-S, w	2	1oo1	1oo1	76.92		8.43E-03	42.1	129.73
701130/0252-001-XX/XXX	STW-S, w	2	1oo2D	1oo1	70.21	95.53	2.15E-03	86.11	215.47
701130/0152-001-XX/XXX	TW-S, w	2	1oo1	1oo1	75.37		8.43E-03	33.1	138.73
701130/0254-0XX-XX/XXX	STB-S, t	3	1oo2D	1oo2	73.12	90.04	1.85E-04	116.74	203.46
701130/0154-0XX-XX/XXX	TB-S, t	2	1oo1	1oo1	76.20		9.55E-03	55.07	153.48
701130/0252-0XX-XX/XXX	STW-S, t	3	1oo2D	1oo2	72.24	90.04	1.94E-04	116.74	212.46
701130/0152-0XX-XX/XXX	TW-S, t	2	1oo1	1oo1	74.84		9.55E-03	46.07	162.48

Requirements regarding proof-check interval and lifetime apply only in terms of functional safety.

Requirements as specified by DIN EN 14 597 are defined in Operating Instructions B 70.1130 and are independent of the requirements of this Safety Manual.

Temperature sensor

Permissible measuring ranges must be observed for instruments with approval according to DIN EN 14 597 and SIL certification. If other temperature sensors than those described by JUMO datasheets 90.1006 and 90.2006 are used, their registration and suitability for use must be verified.

Resistance thermometer:
Pt 100 in 2-wire circuit:
0...600°C

Ambient temperature effect: 0.8K / 10K

Lead compensation:
In standard configuration, the lead resistance of 0.5Ω is taken into consideration internally. 1Ω, 10Ω, 30Ω, or 50Ω are available on request

For connection to resistance thermometers with max. operating temperature of 700°C, a lead compensation resistance LCR of (10Ω) is required.

Double thermocouples:
NiCr-Ni "K":
200...600°C, 400 ...800°C, 600 ...1000°C

Pt10Rh-Pt "S":
400...800°C, 800 ...1200°C

Pt30Rh-Pt6Rh "B":
800...1200°C, 1000 ...1400°C

Fe-CuNi "L":
50...450°C, 200 ...600°C

Ambient temperature effect: 2.0K/10K

8.3 Definitions

8.3.1 Relevant standards

- DIN EN 61 508 Parts 1 to 7:
  Functional Safety - Safety Related Electrical /Electronic / Programmable Electronic Systems
- DIN EN 61 511 Parts 1 to 3:
  Functional Safety - Safety-Related Systems for the Process Industry
- DIN EN 14 597:2005-12
  Temperature Regulation Equipment and Temperature Limiter for Heat-Generating Systems
- DIN EN 60 730-2-9
  Automatic Electrical Control and Regulating Devices for Household Use and Similar Applications Parts 2-9: Special Requirements for Temperature-Dependent Control and Regulating Devices

8.3.2 Terms

The terms listed here are defined according to DIN EN 61 508 Part 4 and DIN EN 61 511 Part 1.

Name	Description
Actuator	Part of a safety-instrumented system that intervenes in the process to achieve a safe state.
EUC	EUC (equipment under control) equipment, machine, apparatus or system used for manufacturing, shaping materials, for transport, medical or other activities.
E / E / PE	Electrical/electronic/programmable electronic (E/E/EP): based on electrical (E) and / or electronic (E) and/or programmable electronic (PE) technology
Failure	End of the ability of a functional unit to perform a required function.

Name	Description
Diagnostic coverage	Partial reduction in the probability of dangerous hardware failures due to the use of automatic diagnostic tests.
Errors	A non-normal condition that can cause a reduction or the loss of the ability of a functional unit to perform a required function.
Functional safety	A part of overall safety related to the EUC and EUC control system that depends on the correct function of the E/E/EP safety-relevant system, safety-relevant systems of other technology, and external equipment for risk reduction.
Functional unit	Unit consisting of hardware or software or both that is suitable for performing a specified task.
Dangerous failure	A failure with the potential of placing the safety-related system in a dangerous state or a state without functional capability.
Safe failure	A failure without the potential of placing the safety-related system in a dangerous state or state without functional capability.
Hazard	Potential source of damage
Safety	Absence of unjustifiable risks
Safety function	A function that is performed by an E / E / PE safety-related system, safety-related system based on some other technology, or external equipment for reducing risk with the goal of achieving or maintaining a safe state for the EUC taking into consideration a specified dangerous event.
Safety integrity	The probability that a safety-related system will perform the required safety function under all specified conditions within a specified period of time according to requirements.
Safety Integrity Level (SIL)	One of four discrete levels for specifying the requirement for safety integrity of the safety functions assigned to the E/E/PE safety related system. Safety Integrity Level 4 represents the highest level of safety integrity, while Safety Integrity Level 1 represents the lowest.

Name	Description
Safety-related system	A system that - performs necessary safety functions that are required to reach or maintain a safe state for the EUC and - is designed by itself or with other E / E / PE safety-related systems of other technology or external equipment for risk reduction to achieve the necessary safety integrity for the required safety functions.
Safety-Instrument System (SIS)	Safety-instrumented system to perform one or more safety-related functions. A SIS consists of sensor(s), logic system and actuator(s).

8.3.3 Abbreviations

Abbreviation	Description (English)	Description (German)
λ	Failure rate per hour	Ausfallrate pro Stunde
λ_D	Dangerous failure rate per hour	Rate gefahrbringender Ausfälle je Stunde
λ_{DD}	Detected Dangerous failure rate per hour	Rate erkannter gefahrbringender Ausfälle je Stunde
λ_{DU}	Undetected Dangerous failure rate per hour	Rate unerkannter gefahrbringender Ausfälle je Stunde
λ_S	Safe failure rate per hour	Rate ungefährlicher Ausfälle je Stunde
λ_{SD}	Detected Safe failure rate per hour	Rate erkannter ungefährlicher Ausfälle je Stunde
λ_{SU}	Undetected Safe failure rate per hour	Rate unerkannter ungefährlicher Ausfälle je Stunde
BPCS	Basic process control system	Betriebs- und Überwachungseinrichtungen als ein System
DC	Diagnostic coverage	Diagnose-Deckungsgrad
FIT	Failure in Time ($1x10^{-9}$ per h)	Fehler pro Zeit ($1x10^{-9}$ pro h)
HFT	Hardware fault tolerance	Hardware-Fehlertoleranz
PFD	Probability of failure on demand	Wahrscheinlichkeit eines Ausfalls bei Anforderung
PFD_{avg}	Average probability of failure on demand	Mittlere Wahrscheinlichkeit eines Ausfalls bei Anforderung
MooN	Architecture with M out of N channels	Architektur mit M aus N-Kanälen
MTBF	Mean Time Between Failures	Mittlere Zeitdauer zwischen zwei Ausfällen
MTTR	Mean Time To Repair	Mittlere Zeitdauer zwischem dem Auftreten eines Fehlers und der Reparatur
SFF	Safe failure fraction	Anteil ungefährlicher Ausfälle
SIL	Safe integrity level	Sicherheits-Integritätslevel
SIS	Safety instrumented system	Sicherheitstechnisches System

8.4 Determining the Safety Integrity Level (SIL)

The achievable Safety Integrity Level is determined by the following safety-related parameters:

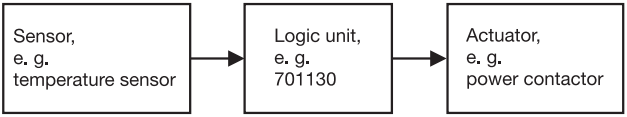
- Average probability of dangerous failures of a safety function on demand (PFD_{avg}),
- Hardware Fault Tolerance (HFT) and
- Safe Failure Fraction (SFF).

The specific safety-related parameters for the 701130 measuring system may be found in the table of the section "Safety-related parameters."

The following table shows how the "Safety Integrity Level" (SIL) depends on the "average probability of dangerous failures of a safety function of the entire safety-related system" (PFD_{avg}) as defined by DIN EN 61 508. The "Low demand mode" is considered, i. e. the demand rate for the safety-related system averages once a year.

Safety Integrity Level (SIL)	Operating mode with low demand rate PFD_{av} (Low demand mode)
4	$\geq 10^{-5} \ldots < 10^{-4}$
3	$\geq 10^{-4} \ldots < 10^{-3}$
2	$\geq 10^{-3} \ldots < 10^{-2}$
1	$\geq 10^{-2} \ldots < 10^{-1}$

The sensor, logic unit and actuator together form a safety-related system that performs a safety function. The "average probability of dangerous failures of the entire safety-related system" (PFD_{avg}) is usually divided up into the subsystems sensor, logic unit, and actuator according to the following diagram.



Typical subdivision of the "average probability of dangerous failures of a safety function on demand" (PFD_{avg}) into subsystems

Information related to functional safety in this Safety Manual includes sensors (resistance temperature sensors, thermocouples), logic unit (701130), and (as message contact) the relay output in the 701130 system.

The actuator, for example a power contactor, is system-related and must be separately included in consideration according to the standard for the safety loop.

8.4.1 Safety integrity of the hardware

According to DIN EN 61 508, a distinction must be made between systems of type A and systems of type B.

A sub-system can be considered as being of type A if

a) the failure behavior of all components that are used is sufficiently defined to achieve the safety function and

b) the behavior of the subsystem can be completely determined under error conditions and

c) reliable failure data is available for the subsystem from experience in the field to demonstrate that the assumed failure rates are achieved for detected and undetected dangerous failures.

A sub-system can be considered as being of type B if

a the failure behavior of at least one of the components that are used is not sufficiently defined to achieve the safety function or

b) the behavior of the subsystem cannot be completely determined under error conditions or

c) there is not sufficiently reliable failure data available for the subsystem from experience in the field to support the assumed failure rates for detected and undetected dangerous failures.

The 701130 temperature monitoring unit corresponds to a type A system.
The following table shows the achievable Safety Integrity Level (SIL) as a function of the fraction of non-dangerous failures (SFF) and the hardware fault tolerance (HFT) for safety-related type A subsystems.

Table A applies to the 701130:

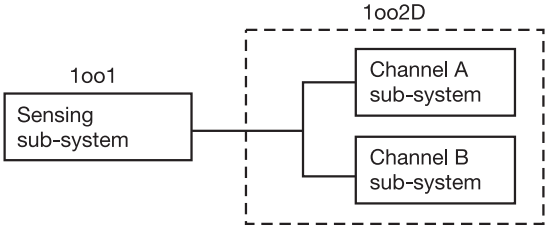
Safe Failure Fraction (SFF)	Hardware fault tolerance (HFT) for type A		
	0	1	2
<60%	SIL 1	SIL 2	SIL 3
60 ... <90%	SIL 2	SIL 3	SIL 4
90 ... <99%	SIL 3	SIL 4	SIL 4
≥99%	SIL 3	SIL 4	SIL 4

8.4.2 Safety-relevant system properties

Device designs differ in the following architectures:

The evaluation unit of the 701130 in designs STW, STB is implemented as 1oo2D architecture.

Types with Pt-100 resistance temperature sensors are designed with a single-channel sensor system (1oo1).

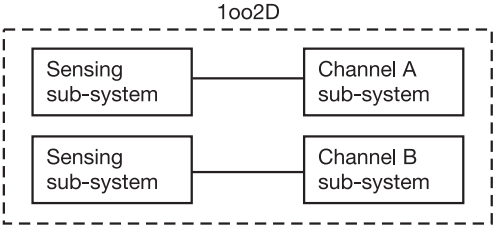


The system monitors

- broken sensor
- sensor short circuit
- random hardware failure

in one channel.

- Variants with double thermocouples are consistently structured with two channels.

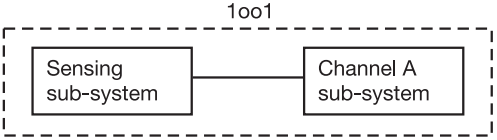


The system monitors

- broken sensor
- sensor short circuit
- reverse polarity of sensors
- random hardware failure

in one channel.

The evaluation unit of the 701130 in designs TW and TB is implemented as 1oo1 architecture, regardless of the sensor system.



- The system monitors
- broken sensor
- sensor short circuit
- reverse polarity of sensors
  (only if a double thermocouple is connected).

Systems have a lifetime of ten years.

The proof check for SIL 2 certified systems is also ten years. For SIL 3 certified systems, it is two years with an MTTR of 72 h.

If the temperature is above / below the permissible limits, the system switches to the safe state without delay. Premature switches is permitted if a fault situation is detected.

8.5 Other applicable instrument documentation

The measures, values, and requirements specified in these Operating Instructions regarding mounting, electrical connection, function, and commissioning for temperature monitoring unit 701130 must be observed.

8.6 Behavior during operation and in case of fault

Behavior during operation and in case of fault is described in the Operating Instructions.

The required functional tests are described in Section 6 of the Operating Instructions.

The test to be performed in case of error is explained in Section 7 of the Operating Instructions.

A functional test must be performed after commissioning, repair in the safety system, or a change in safety-related parameters.

If a fault is detected during a functional test, measures must be taken to ensure the functional capability of the safety system again. This can be done by replacing the logic unit, for example.

Appropriate documentation of tests that are performed is recommended.

8.7 Regular tests

No test is required for SIL 2 certified systems, since the proof check equals the lifetime. Each is ten years.

Type	Designation	SIL device incl. sensor	Proof check interval	Lifetime
701130/0253-001-XX/XXX	STB-O, w	2	10 years	10 years
701130/0153-001-XX/XXX	TB-O, w	2	10 years	10 years
701130/0251-001-XX/XXX	STW-O, w	2	10 years	10 years
701130/0151-001-XX/XXX	TW-O, w	2	10 years	10 years
701130/0153-0XX-XX/XXX	TB-O, t	2	10 years	10 years
701130/0151-0XX-XX/XXX	TW-O, t	2	10 years	10 years
701130/0254-001-XX/XXX	STB-S, w	2	10 years	10 years
701130/0154-001-XX/XXX	TB-S, w	2	10 years	10 years
701130/0252-001-XX/XXX	STW-S, w	2	10 years	10 years
701130/0152-001-XX/XXX	TW-S, w	2	10 years	10 years
701130/0154-0XX-XX/XXX	TB-S, t	2	10 years	10 years
701130/0152-0XX-XX/XXX	TW-S, t	2	10 years	10 years

For SIL 3 certified systems an appropriate test must be performed every two years according to the proof-check interval. The lifetime is ten years.

Type	Designation	SIL device incl. sensor	Proof check interval	Lifetime
701130/0253-0XX-XX/XXX	STB-O, t	3	2 years	10 years
701130/0251-0XX-XX/XXX	STW-O, t	3	2 years	10 years
701130/0254-0XX-XX/XXX	STB-S, t	3	2 years	10 years
701130/0252-0XX-XX/XXX	STW-S, t	3	2 years	10 years

After the lifetime expires, the systems no longer meet the requirements according to their SIL certification.

Performing the test for the proof check

Tests correspond to the functional tests under No. 6 in the Operating Instructions. They must be performed according to specifications for the relevant systems.

8.8 Safety instrumented parameters related to the temperature monitoring unit

(evaluation unit and sensors)

Type	Designation	SIL	Architecture	Life-time (yrs)	Proof check interval	MTTR (h)	SFF	PFD_{avg}
701130/0253-001-XX/XXX	STB-O, w	2	1oo1D	10	10	72	69.98	1.19E-03
701130/0153-001-XX/XXX	TB-O, w	2	1oo1	10	10	72	77.46	6.72E-03
701130/0251-001-XX/XXX	STW-O, w	2	1oo1D	10	10	72	69.09	1.22E-03
701130/0151-001-XX/XXX	TW-O, w	2	1oo1	10	10	72	75.87	6.72E-03
701130/0253-0XX-XX/XXX	STB-O, t	3	1oo2D	10	2	72	72.23	1.95E-04
701130/0153-0XX-XX/XXX	TB-O, t	2	1oo1	10	10	72	74.38	8.56E-03
701130/0251-0XX-XX/XXX	STW-O, t	3	1oo2D	10	2	72	71.38	2.04E-04
701130/0151-0XX-XX/XXX	TW-O, t	2	1oo1	10	10	72	72.97	8.56E-03
701130/0254-001-XX/XXX	STB-S, w	2	1oo1D	10	10	72	71.11	2.12E-03
701130/0154-001-XX/XXX	TB-S, w	2	1oo1	10	10	72	76.92	8.43E-03
701130/0252-001-XX/XXX	STW-S, w	2	1oo1D	10	10	72	70.21	2.15E-03
701130/0152-001-XX/XXX	TW-S, w	2	1oo1	10	10	72	75.37	8.43E-03
701130/0254-0XX-XX/XXX	STB-S, t	3	1oo2D	10	2	72	73.12	1.85E-04
701130/0154-0XX-XX/XXX	TB-S, t	2	1oo1	10	10	72	76.20	9.55E-03
701130/0252-0XX-XX/XXX	STW-S, t	3	1oo2D	10	2	72	72.24	1.94E-04
701130/0152-0XX-XX/XXX	TW-S, t	2	1oo1	10	10	72	74.84	9.55E-03

Hardware FMEDA

- Error models corresponding to requirements of the IEC 61508 for compliance with SIL2 or SIL 3
- Failure rate of components according to the RDF 2000 UTE C 80-810 standard
- Sensors modeled as subsystem:
  Single-channel resistance thermometer
  dual channel double thermocouples

8.9 Certificates

TÜV NORD

Certificate

No. SLA-0070/2010, V1.0

TÜV Nord SysTec GmbH & Co.KG hereby certifies

JUMO GmbH & Co.KG
Moritz-Juchheim-Straße 1
36039 Fulda

that the Series 701130 (see next page for typelist)

"Electronic temperatur monitor/limiter TB/TW"
and
"Safety temperatur monitor/limiter STB/STW"

is capable for safety related applications up to SIL 2
and meets the requirements listed in the following standards.

IEC 61508/-1/-2:2010
DIN EN 60730-2-9:2005

The certification is based on the report
SLA-0070/2010TB-1 in the valid version.
This certificate entitles the holder to use
The pictured Safety Approved mark.

Expire date: 2015-11-29
Reference No.: G.SCC.DL.06.052.01.SLA

Augsburg, 2010-11-29

Gerhard M. Rieger

TÜV NORD Safety Approved
TÜV NORD SysTec GmbH & Co. KG
Voluntary Certification
IEC 61508/-1/-2:2010
type A
capable up to SIL 2
DIN EN 60730-2-9:2005
Proof-Check-Interval=10year
Lifetime=10year
SLA-0070/2010

TÜV NORD SysTec GmbH & Co.KG Branch South Halderstraße 27 D-86150 Augsburg

Product-Typelist for certificate SLA-0070/2010, Version V1.0

Types		Architectur	SFF	PFD avg
701130/0253-001-XX/XXX	STB-O, w	1oo2D	69,98%	$1,19*10^{-3}$
701130/0153-001-XX/XXX	TB-O, w	1oo1	77,46%	$6,72*10^{-3}$
701130/0251-001-XX/XXX	STW-O, w	1oo2D	69,09%	$1,22*10^{-3}$
701130/0151-001-XX/XXX	TW-O, w	1oo1	75,87%	$6,72*10^{-3}$
701130/0153-0XX-XX/XXX	TB-O, t	1oo1	74,38%	$8,56*10^{-3}$
701130/0151-0XX-XX/XXX	TW-O, t	1oo1	72,97%	$8,56*10^{-3}$
701130/0254-001-XX/XXX	STB-S, w	1oo2D	71,11%	$2,12*10^{-3}$
701130/0154-001-XX/XXX	TB-S, w	1oo1	76,92%	$8,43*10^{-3}$
701130/0252-001-XX/XXX	STW-S, w	1oo2D	70,21%	$2,15*10^{-3}$
701130/0152-001-XX/XXX	TW-S, w	1oo1	75,37%	$8,43*10^{-3}$
701130/0154-0XX-XX/XXX	TB-S, t	1oo1	76,20%	$9,55*10^{-3}$
701130/0152-0XX-XX/XXX	TW-S, t	1oo1	74,84%	$9,55*10^{-3}$

Reference No.: G.SCC.DL.06.052.01.SLA

TÜV NORD SysTec GmbH & Co.KG Branch South Halderstraße 27 D-86150 Augsburg

TÜV NORD

Certificate

No. SLA-0070/2010-2, V1.0

TÜV Nord SysTec GmbH & Co.KG hereby certifies

JUMO GmbH & Co.KG
Moritz-Juchheim-Straße 1
36039 Fulda

that the products (see next page for typelist)

"Electronic Safety temperatur monitor/limiter STB/STW"

is capable for safety related applications up to SIL 3
and meets the requirements listed in the following standards.

IEC 61508/-1/-2:2010
DIN EN 60730-2-9:2005

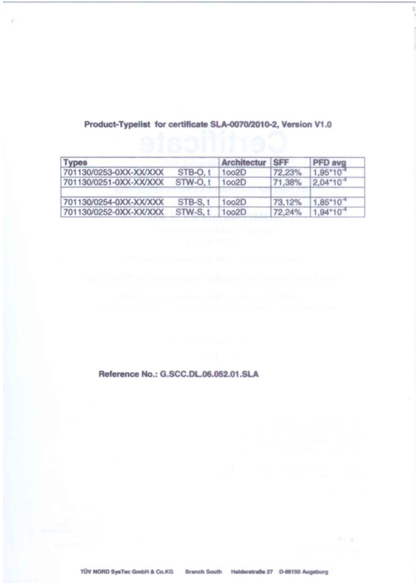
The certification is based on the report
SLA-0070/2010TB-1 in the valid version.
This certificate entitles the holder to use
The pictured Safety Approved mark.

Expire date: 2015-11-29
Reference No.: G.SCC.DL.06.052.01.SLA

Augsburg, 2010-11-29

Gerhard M. Rieger

TÜV NORD SysTec GmbH & Co.KG Branch South Halderstraße 27 D-86150 Augsburg



Product-Typelist for certificate SLA-0070/2010-2, Version V1.0

Types		Architectur	SFF	PFD avg
701130/0253-0XX-XX/XXX	STB-O, t	1oo2D	72,23%	1,95*10⁻⁴
701130/0251-0XX-XX/XXX	STW-O, t	1oo2D	71,38%	2,04*10⁻⁴
701130/0254-0XX-XX/XXX	STB-S, t	1oo2D	73,12%	1,85*10⁻⁴
701130/0252-0XX-XX/XXX	STW-S, t	1oo2D	72,24%	1,94*10⁻⁴

Reference No.: G.SCC.DL.06.052.01.SLA

TÜV NORD SysTec GmbH & Co.KG Branch South Halderstraße 27 D-86150 Augsburg

Inputs

Permissible measuring ranges must be observed for instruments with approval according to DIN EN 14 597 and SIL certification. Available measurement ranges and temperature sensors are identified by "✱." If other temperature sensors than those described by JUMO datasheets 90.1006 and 90.2006 are used, their registration and suitability for use must be verified.

Resistance thermometer:

Pt 100 in 2-wire circuit:
0 ... 120 °C*, 0 ... 300 °C*, 0 ... 400 °C*, 0 ... 600 °C*, 200 ... 500 °C*
perm. temperature range of sensors for DIN and SIL: 0 to 600 °C

Ambient temperature effect: 0.8 K/10 K

Lead compensation:
Standard configuration includes a 0.5 Ω internal lead resistor. Also available on request are 1 Ω, 10 Ω, 30 Ω or 50 Ω.
For connecting to resistance thermometers, a line compensation resistor LCR (10 Ω) is required.

Double thermocouples:

NiCr-Ni "K":
200 ... 600 °C*, 400 ... 800 °C*, 600 ... 1000 °C*, 800 ... 1200 °C
perm. temperature range of sensors for DIN and SIL: 200 to 1000 °C

Pt10Rh-Pt "S":
400 ... 800 °C*, 800 ... 1200 °C*, 1000 ... 1400 °C, 1200 ... 1600 °C
perm. temperature range of sensors for DIN and SIL: 400 to 1300 °C

Pt30Rh-Pt6Rh "B":
800 ... 1200 °C*, 1000 ... 1400 °C*, 1200 ... 1600 °C, 1400 ... 1800 °C
perm. temperature range of sensors for DIN and SIL: 800 to 1500 °C

Fe-CuNi "L":
50 ... 450 °C*, 200 ... 600 °C*, 500 ... 900 °C
perm. temperature range of sensors for DIN and SIL: 50 to 700 °C

Ambient temperature effect: 2.0 K/10 K

Outputs

Relays

with potential-free switching contact

Contact rating: 2 A, 230 VAC, resistive load
protected by fuse 2A M

Contact life: 100,000 switching operations at normal load

Key general parameters

Switching point accuracy: ±2% of the range of the scale

Switching differential: 3K (only for Pt100!), 10K, 30K, or 100K

Power supply:
- AC 230V +10% / -15%, 48...63Hz
- AC 115V +10% / -15%, 48...63Hz
- AC 24V +10% / -15%, 48...63Hz

Power consumption: about 4VA

Permissible ambient temperature range: 0...55 °C

Permissible storage temperature: -40...+80 °C

Climatic conditions: rel. humidity ≤ 75%, no condensation

Enclosure protection: IP20 (to EN 60529)

Electrical safety:
To EN 60730-1
Creep zones:
Mains supply to electronics and sensors ≥ 8mm
Mains supply to relay ≥ 3mm
Relay to electronics and sensors ≥ 8mm
Instrument can be connected to SELV circuits.

Test voltages:

to EN 60730-1

Electromagnetic compatibility:

to EN 61 326
Interference emission: Class B
Interference immunity: to industrial requirements

Environmental requirements: to EN 60 730-1
Pollution degree 3
Overvoltage category III

Operating conditions:

The instrument is designed as an installation device as defined by:
- DIN EN 50 178 5.5.1.3

Operating position: any

Weight: approx. 250 g

Dimensions (WxHxD): 54 mm x 70 mm x 110 mm

Enclosure:
Plastic
Flammability class V0

For extra code "GL":

The instrument meets the requirements of application category C
per GL Regulation.
Temperature: 0...55°C
Rel. humidity: ≤ 100% r.H.
Vibration: ≤ 0.7g

Standard accessories

- Operating Manual B 70.1130
- 2 mounting brackets (only for GL design)
- LCR (only for extra code 229, 231, 233, 235!)

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JUMO

EU Konformitätserklärung

EU Declaration of Conformity / Déclaration CE de conformité

Dokument-Nr. *Document No. / Document n°*	CE 199
Hersteller *Manufacturer / Etabli par*	JUMO GmbH & Co. KG
Anschrift *Address / Adresse*	Moltkestr. 13 - 31 36039 Fulda
Produkt *Product / Produit*	Beschreibung: Temperatur - Wächter / - Begrenzer Sicherheitstemperatur - Wächter / - Begrenzer
	Typ/ Serie: 701130/... Typenblatt-Nr.: 70.1130

Wir erklären in alleiniger Verantwortung, dass das bezeichnete Produkt die Schutzanforderungen der Europäischen Richtlinien erfüllt.
We hereby declare in sole responsibility that the designated product fulfills the safety requirements of the European directives.
Nous déclarons sous notre seule responsabilité que le produit remplit les directives européennes.

Richtlinie *Directive / Directive*			Datum der Erstanbringung des CE-Zeichens auf dem Produkt *Date of first application of the CE mark to the product* *Date de 1ère application du sigle CE sur le produit*
2004/108/EG	[EMV-Richtlinie]		02.1997
2006/95/EG	[Niederspannungs-Richtlinie]		01.1997
97/23/EG	[Druckgeräterichtlinie]	Modul B+D, Kategorie IV	05.2003

Angewendete Normen
Standards applied / Normes appliquées

EN 61 326	Ausgabe: 05.2004
DIN EN 60 730-2-9	Ausgabe: 10.2005
DIN EN 14597	Ausgabe: 12.2005
AD 2000 Merkblätter	Ausgabe: 10.2004

Anerkannte Qualitätssicherungssysteme der Produktion
Recognized quality assurance systems used in production / Organisme notifié agréé

nach / *to / suivant*
EU-Richtlinie 94/9/EG */ EU Directive 94/9/EC / Directive européenne 94/9/CE*
TÜV Hannover, Am TÜV 1, D 30519 Hannover, Germany
Kennnummer 0032, Mitteilungsnummer TÜV 99 ATEX 1454 Q.
Identification No. 0032, Notification No. TÜV 99 ATEX 1454 Q / N° d'identification 0032, N° de signification TÜV 99 Atex 1454 Q

nach / *to / suivant*
EU-Richtlinie 97/23/EG Modul D */ EU Directive 97/23/EC Module D / Directive européenne 97/23/CE module D*
TÜV Industrie Service GmbH, D 68167 Mannheim, Germany
Kennnummer 0036, Zertifikat-Nr. DGR-0036-QS-179-02
Identification No. 0036, Certificate No. DGR-0036-QS-179-02 / N° d'identification 0036 , N° de certificat DGR-0036-QS-179-02

Aussteller:
Issued by: / Etabli par:

Firma */ Company / Société*
JUMO GmbH & Co. KG, Fulda

Ort, Datum:
Place, date: / Lieu, date:

Fulda, 2007-07-23

Rechtsverbindliche Unterschrift
Legally binding signature
Signature juridiquement valable

Geschäftsbereichsleitung Verkauf und Produktion
Head of Division Sales and Production
Direction du department Ventes et Production

ppa. Günter Bott

JUMO GmbH & Co. KG

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