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# JUMO safetyM STB/STW

## Safety Temperature Limiter, Safety Temperature Monitor

### According to DIN EN 14597

#### Brief description

The safety temperature limiter JUMO safetyM STB and the safety temperature monitor JUMO safetyM STW are used to reliably detect and avert hazards that could cause injuries to people, that could be harmful to the environment, or that could cause destruction of production plants and produced goods at an early stage.

Its primary task is to reliably monitor thermal processes and switch the systems to an operational safe status in the event of malfunctions.

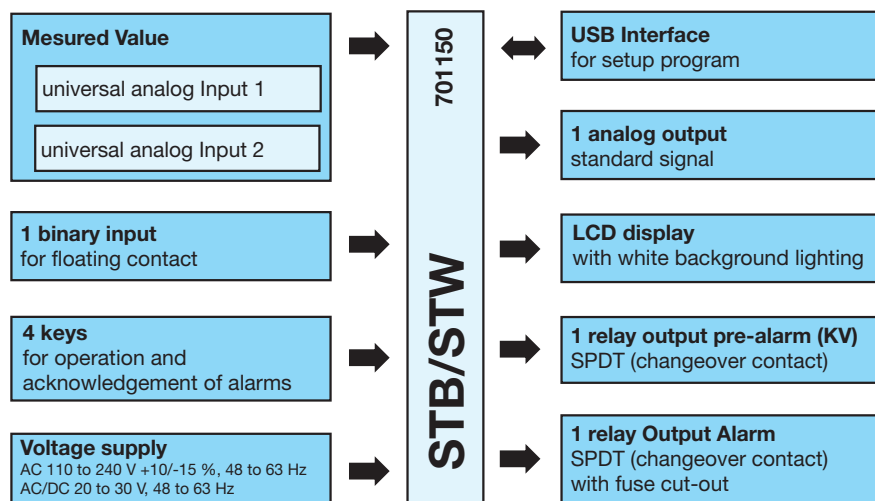
The measured value at the analog input can be recorded by various probes or standard signals. The exceedance of the limit value is indicated by the installed LEDs K1 and K2 (red) for each channel, and the **safety relevant relay output alarm (terminal 14 and 16)** switches the system to an operational safe status (**alarm range**).

The high standards of DIN EN 61508 and DIN EN ISO 13849 are met by a device concept that has a 1oo2D structure (2-channel structure with diagnostic channel) which ensures reliable detection of errors. This device concept can also be used for applications that correspond to the new machinery directive 2006/42/EC.



Type 701150/ ...

#### Block diagram



#### Special features

- 1oo2D structure for a high degree of process safety and reliability
- LCD display with background lighting and plain text display for more comfortable operation
- Setup program for configuration and archiving via USB interface
- Digital input filter with adjustable filter time constant
- Pre-alarm absolute, adjustable as a margin from the limit value or window function
- Wide voltage supply range from AC 110 to 240 V +10 %/-15 % or AC/DC 20 to 30 V
- Can be configured as STB or STW
- 12 linearizations can be set
- Internal and external unlocking possible
- Approvals for DIN EN 14597, SIL, PL (Performance Level), GI and UL
- Two relay outputs can be used as pre-alarm or limit value alarm

Approvals/approval marks (see "Technical Data")



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## Technical data

### Analog inputs

#### RTD temperature probe

| Designation               | Measuring range   | Accuracy<br>2/3-wire circuit <sup>1</sup> | Ambient temperature error |
|---------------------------|---|---|---------------------------|
| Pt100 DIN IEC 60751:2008  | -200 to +850 °C   | 0.5 %/0.1 %                               | 50 ppm/K                  |
| Pt1000 DIN IEC 60751:2008 | -200 to +850 °C   | 0.5 %/0.1 %                               | 50 ppm/K                  |
| Connection type           | Maximum lead wire resistance 2-wire circuit 15 Ω, 3-wire circuit 30 Ω |   |                           |
| Sampling rate             | 210 ms  |   |                           |
| Error tolerance time      | ≤ 5 s: time taken into account for all diagnostic tests               |   |                           |
| Input filter              | Digital filter, 2nd order; filter constant can be set from 0 to 100 s |   |                           |
| Special features          | Single probe Pt100 2-wire, display can also be programmed in °F       |   |                           |

#### Thermocouples

| Designation                                       | Measuring range   | Accuracy <sup>1</sup> | Ambient temperature influence |
|---|---|-----------------------|-------------------------------|
| Fe-CuNi "L" DIN 43710: 1985-12                    | -200 to +900 °C   | 0.4 %                 | 100 ppm/K                     |
| Fe-CuNi "J" DIN EN 60584-1:1996-10                | -200 to +1200 °C  | 0.4 %                 | 100 ppm/K                     |
| Cu-CuNi "U" DIN 43710:1985-12                     | -200 to +600 °C   | 0.4 %                 | 100 ppm/K                     |
| Cu-CuNi "T" DIN EN 60584-1:1996-10                | -200 to +400 °C   | 0.4 %                 | 100 ppm/K                     |
| NiCr-Ni "K" DIN EN 60584-1:1996-10                | -200 to +1372 °C  | 0.4 %                 | 100 ppm/K                     |
| Pt10Rh-Pt "S" DIN EN 60584-1:1996-10              | -50 to +1768 °C   | 0.4 %                 | 100 ppm/K                     |
| Pt13Rh-Pt "R" DIN EN 60584-1:1996-10              | -50 to +1768 °C   | 0.4 %                 | 100 ppm/K                     |
| Pt30Rh-Pt6Rh "B" DIN EN 60584-1:1996-10           | 0 to 1820 °C  | 0.4 % <sup>2</sup>    | 100 ppm/K                     |
| NiCrSi-NiSi „N“ DIN EN 60584-1:1996-10            | -100 to +1300 °C  | 0.4 % <sup>2</sup>    | 100 ppm/K                     |
| W3Re-W25Re "D" ASTM E1751M-09 (bis 2315 °C): 2009 | 0 to 2495 °C  | 0.4 %                 | 100 ppm/K                     |
| W5Re-W26Re „C“ ASTM E230M-11: 2011                | 0 to 2315 °C  | 0,4 %                 | 100 ppm/K                     |
| Cold junction                                     | Pt100 internal  |                       |                               |
| Cold junction accuracy                            | ±1 K  |                       |                               |
| Sampling rate                                     | 210 ms  |                       |                               |
| Error tolerance time                              | ≤ 5 s: time taken into account for all diagnostic tests               |                       |                               |
| Input filter                                      | Digital filter, 2nd order; filter constant can be set from 0 to 100 s |                       |                               |

1. The accuracy refers to the maximum extent of the measuring range.

2. The accuracy is guaranteed above 300° C

#### Direct current

| Measuring range               | Accuracy  | Ambient temperature influence |
|-------------------------------|---|-------------------------------|
| 4 to 20mA, voltage drop < 2 V | 0.2 %   | 150 ppm/K                     |
| Scaling                       | Can be freely programmed within the limits                            |                               |
| Sampling rate                 | 210 ms  |                               |
| Error tolerance time          | ≤ 5 s: time taken into account for all diagnostic tests               |                               |
| Input filter                  | Digital filter, 2nd order; filter constant can be set from 0 to 100 s |                               |
| Special features              | Single probe 4 to 20 mA   |                               |

### Analog output

|         | Signal type | Accuracy | Residual ripple  | Load influence | Temperature influence | Load resistance |
|---------|-------------|----------|------------------|----------------|-----------------------|-----------------|
| Current | 4 to 20 mA  | ≤ 0.5 %  | ± 0.5 % at 300 Ω | ± 0.05 mA/100Ω | 150 ppm/K             | ≤ 500 Ω         |
|         | 0 to 20 mA  |          |                  |                |                       |                 |
| Voltage | 2 to 10 V   | ≤ 0.5 %  | ± 0.5 %          | ± 15 mV        | 150 ppm/K             | ± 500 Ω         |
|         | 0 to 10 V   |          |                  |                |                       |                 |

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## Binary input

| Connection         | Function  |
|--------------------|---|
| 1 floating contact | Unlocking, key inhibit, level inhibit can be configured |

## Relay outputs

|                    |  |
|--------------------|--|
| Relay output KV    | Relay (changeover contact) without contact protection<br>30000 switching operations at a switching capacity of 250 V, 3 A, 50 Hz (resistive load) or up to DC 30 V, 3 A. Minimum current DC 12 V, 100 mA.  |
| Relay output alarm | Relay (changeover contact)<br><b>Contact protection circuit:</b> fuse cut-out 3.15 AT, installed in the N/O contact arm<br>30000 switching actions at a switching capacity of 230 V, 3 A, 50 Hz (resistive load) or up to DC 30 V, 3 A. Minimum current DC 12 V, 100 mA. |

## Measuring circuit monitoring

|                          | RTD temperature probe in 3-wire circuit and double thermocouples  | Thermocouples   | Current 4 to 20 mA  |
|--------------------------|---|---|---|
| Overrange and underrange | Is detected<br>LED K1, K2, KD, and KV are lit;<br>">>>>" flashes in the display for overrange, "<<<<" for underrange. |   |   |
| Probe/cable break        | Is detected<br>LED K1, K2, KD, and KV are lit<br>">>>>" flashes in the display; relay output alarm is inactive        |   | LED K1, K2, KD, and KV are lit;<br>">>>>" flashes in the display;<br>relay output alarm is inactive |
| Probe short circuit      | Is detected<br>LED K1, K2, KD, and KV are lit<br>"<<<<" flashes in the display;<br>relay output alarm is inactive     | Is detected by difference monitoring of the analog inputs | LED K1, K2, KD, and KV are lit;<br>"<<<<" flashes in the display;<br>relay output alarm is inactive |

## Voltage supply

|   |                              |  |
|---|------------------------------|--|
| Voltage supply  | AC/DC 20 to 30V, 48 to 63 Hz | AC 110 to 240V +10% /-15%, 48 to 63 Hz |
| Power consumption, Power loss   | max. 12 W                    | max. 12 W                              |
| Power consumption, Power loss for the following mode:<br>Analog output 10mA; background lighting Display off; Relay output "Alarm" on;<br>Relay output pre-alarm off; Sensor: 2xPt100 | 5 W                          | 5 W                                    |

## Test voltages according to EN 60730, part 1

|   |              |
|---|--------------|
| Input and output against voltage supply           |              |
| - At voltage supply AC 110 to 240 V +10 % / -15 % | 3.7 kV/50 Hz |
| - At voltage supply AC/DC 20 to 30 V, 48 to 63 Hz | 3.7 kV/50 Hz |

## Electrical safety

|   | Clearances / creepage distances  |
|---|--|
| Mains voltage to electronic components and probes | ≥ 6 mm / ≥ 8 mm  |
| Mains voltage to the relay                        | ≥ 6 mm / ≥ 8 mm  |
| Relay to electronic components and probes         | ≥ 6 mm / ≥ 8 mm  |
| Electrical safety                                 | According to DIN EN 14597 (DIN EN 60730-2-9)<br>Overvoltage category III, pollution degree 2 |
| Protection rating I                               | With internal separation to SELV electrical circuits   |

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## Environmental influences

|                                   |  |
|-----------------------------------|--|
| Ambient temperature range         | 0 to +55 °C  |
| Storage temperature range         | -30 to +70 °C  |
| Temperature influence             | $\leq \pm 0.005 \% / K$ dev. from $23 \times C^1$ for RTD temperature probe<br>$\leq \pm 0.01 \% / K$ dev. from $23 \times C^1$ for thermocouple, current  |
| Terminal temperature Range        | <p>If the temperature range of -10 °C to +80 °C is exceeded or undercut, the device shows the error message "Terminal temperature Range".</p> <p>The output changes to a safe state (quiescent current principle).</p> <p>The message can only be acknowledged, if the temperature is back again in the valid range.</p> |
| Resistance to climatic conditions | 85 % rel. humidity without condensation<br>(3K3 with extended temperature range according to DIN EN 60721-3-3)   |
| EMC                               | According to DIN EN 14597 and standards from the standard series DIN EN 61326  |
| Interference emission             | Class B  |
| Interference immunity             | Evaluation criteria FS according to DIN EN 14597, regulation and control devices (RS)  |

1. All specifications refer to the measuring range end value

## Case

|                       |  |
|-----------------------|--|
| Material              | Polycarbonate  |
| Flammability class    | UL 94 V0   |
| Electrical connection | On the front via screw terminals up to 2.5 mm <sup>2</sup> |
| Installation          | On 35 mm DIN rail acc. to EN 60715                         |
| Installation position | vertical   |
| Weight                | Approx. 230 g  |
| Protection type       | IP 20 acc. to EN 60529                                     |

## Approvals/approval marks

| Approval marks               | Testing agency                                | Certificates/certification numbers | Inspection basis                      | Valid for            |
|------------------------------|---|------------------------------------|---------------------------------------|----------------------|
| DIN                          | DIN CERTCO                                    | STB/STW1223                        | DIN EN 14597                          | All device versions: |
| SIL2, SIL3                   | TÜV Nord (German Technical Inspection Agency) | SEBS-A.102606/16-2 V1.0            | DIN EN 61508                          | All device versions: |
| PL e                         |   |                                    | DIN EN ISO 13849-1                    | All device versions: |
| c UL us                      | Underwriters Laboratories                     | E325456-20120611                   | UL 60730-2-9 submitted                | All device versions: |
| GL                           | Germanischer Lloyd                            | 36 790-11HH                        |                                       | All device versions: |
| Pressure Equipment Directive | TÜV Süd (German Technical Inspection Agency)  | 07 202 1045 Z 0031/14/D0046        | Pressure Equipment Directive 97/23/EG | All device versions: |

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## Display and control elements

| Legend: | Comment  |
|---------|--|
| 3       | <b>LCD display</b><br>Black/white with background lighting 96 x 64 pixels  |
| 6       | <b>LED KV (yellow)</b><br>Is lit if the pre-alarm is triggered.  |
| 7       | <b>LED KD (yellow)</b><br>Is lit if the diagnostic processor has performed a switch-off  |
| 8       | <b>Keys</b><br>(can only be operated when the transparent hood is folded upward)<br>Increase value,  Decrease value<br>Programming<br>RESET                |
| 12      | <b>Setup interface</b>   |
| 13      | <b>LED K2 (red)<sup>a</sup></b><br>Is always simultaneously lid with K1 when errors occur on analog input 1 or 2 or in the event of limit value exceedance |
| 14      | <b>LED K1 (red)<sup>a</sup></b><br>Is always simultaneously lid with K2 when errors occur on analog input 1 or 2 or in the event of limit value exceedance |
| 15      | <b>LED OK</b><br>Green: Good range<br>Off: Error occurred  |

a. The exceedance of the limit value is indicated by the installed LEDs K1 and K2 (red) for each channel, and the safety relevant relay output alarm (terminal 14 and 16) switches the system to an operational safe status (alarm range).

## Electrical isolation

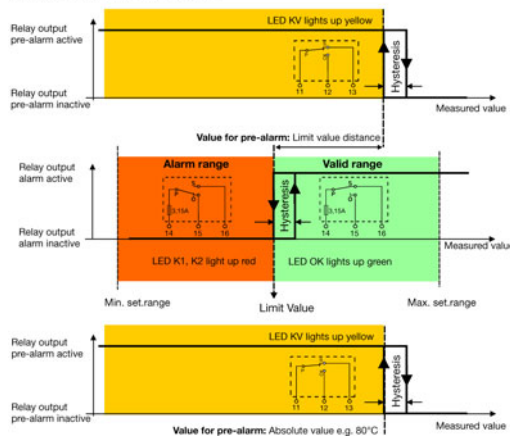
|  |  |  |
|--|--|--|
| (1) Analog inputs<br>(3) Binary input<br>(5) Setup interface<br>(6) Display<br>(7) Analog output<br>(8) Voltage supply |  | (2) Relay output alarm<br>(4) Relay output pre-alarm |
|--|--|--|



## Switching behavior of the relay output pre-alarm

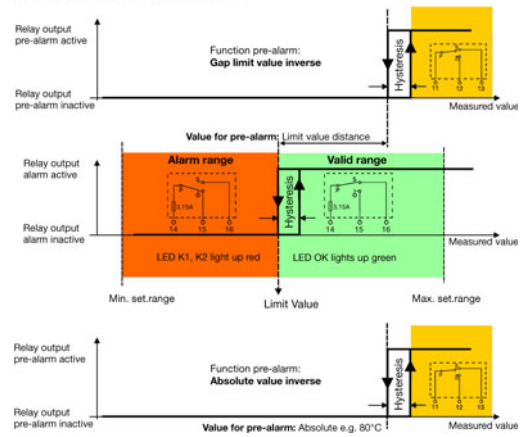
### Absolute value or Limit val. dist. direct

Min. alarm (older devices: S-Function)

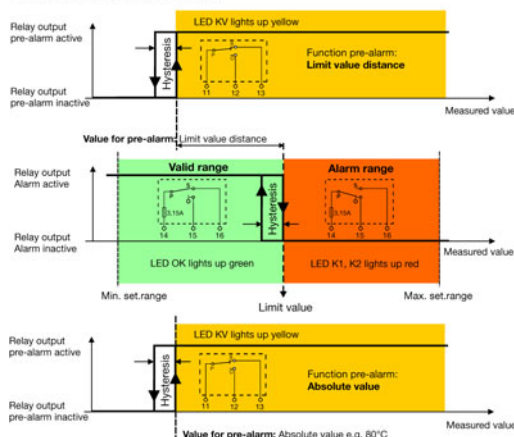


### Absolute value or Limit val. dist. inverse

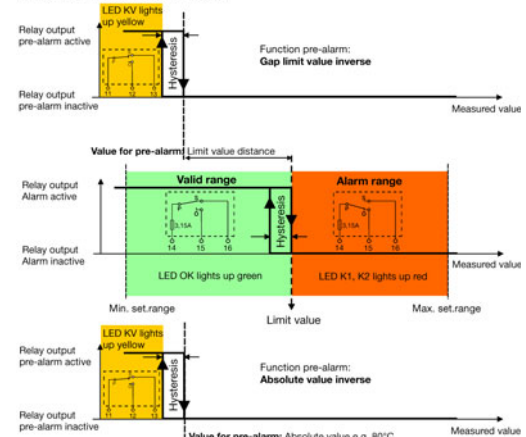
Min-Alarm (ältere Gerätetypen: S-Funktion)



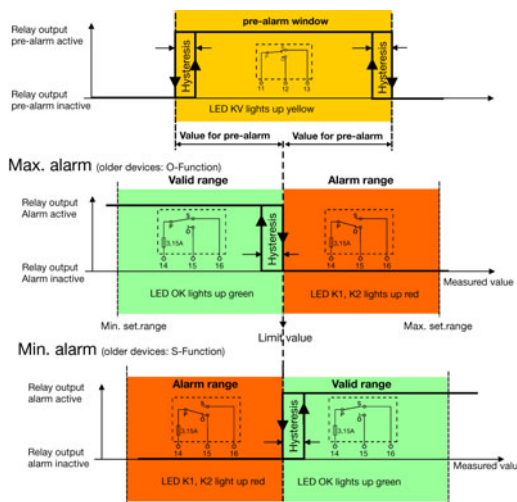
Max. alarm (older devices: O-Function)



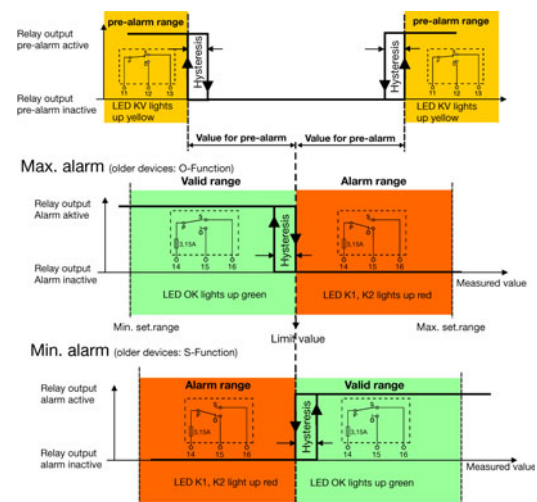
Max. alarm (older devices: O-Function)



### Window direct (it is irrelevant if Min-Alarm or Max-Alarm is set)

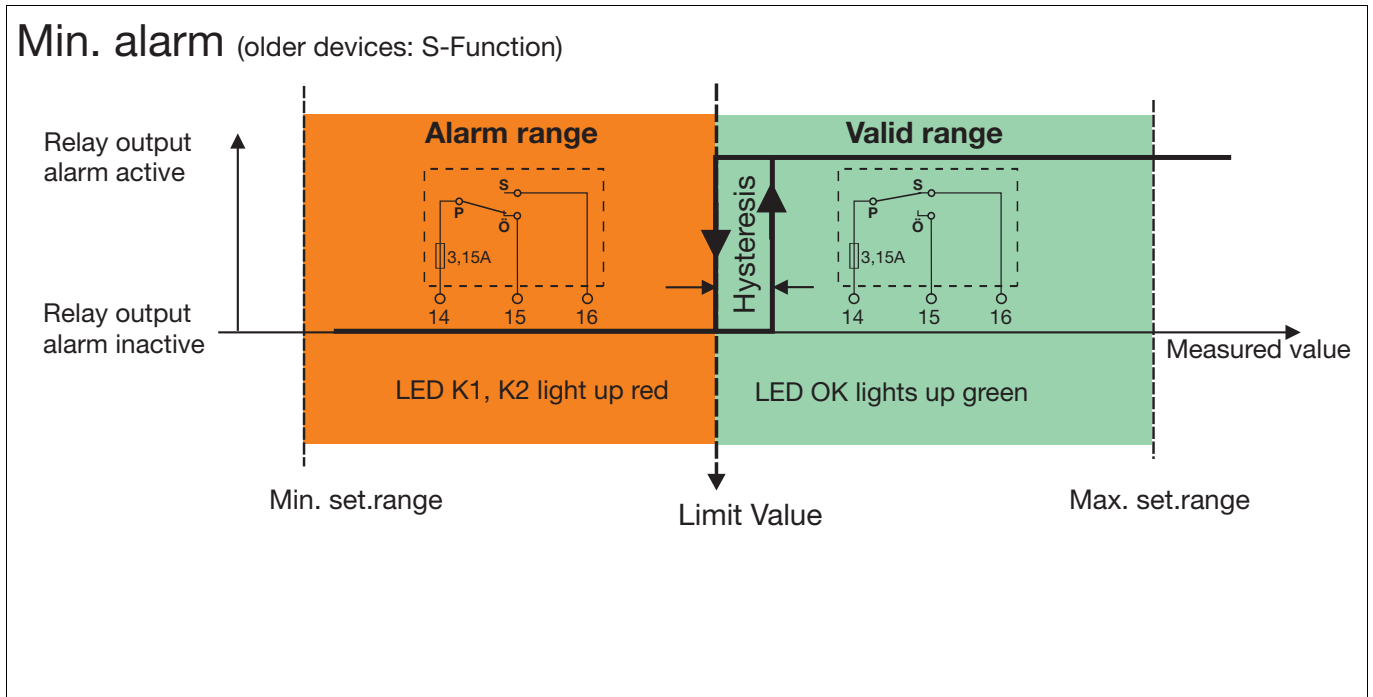


### Window inverse (it is irrelevant if Min-Alarm or Max-Alarm is set)

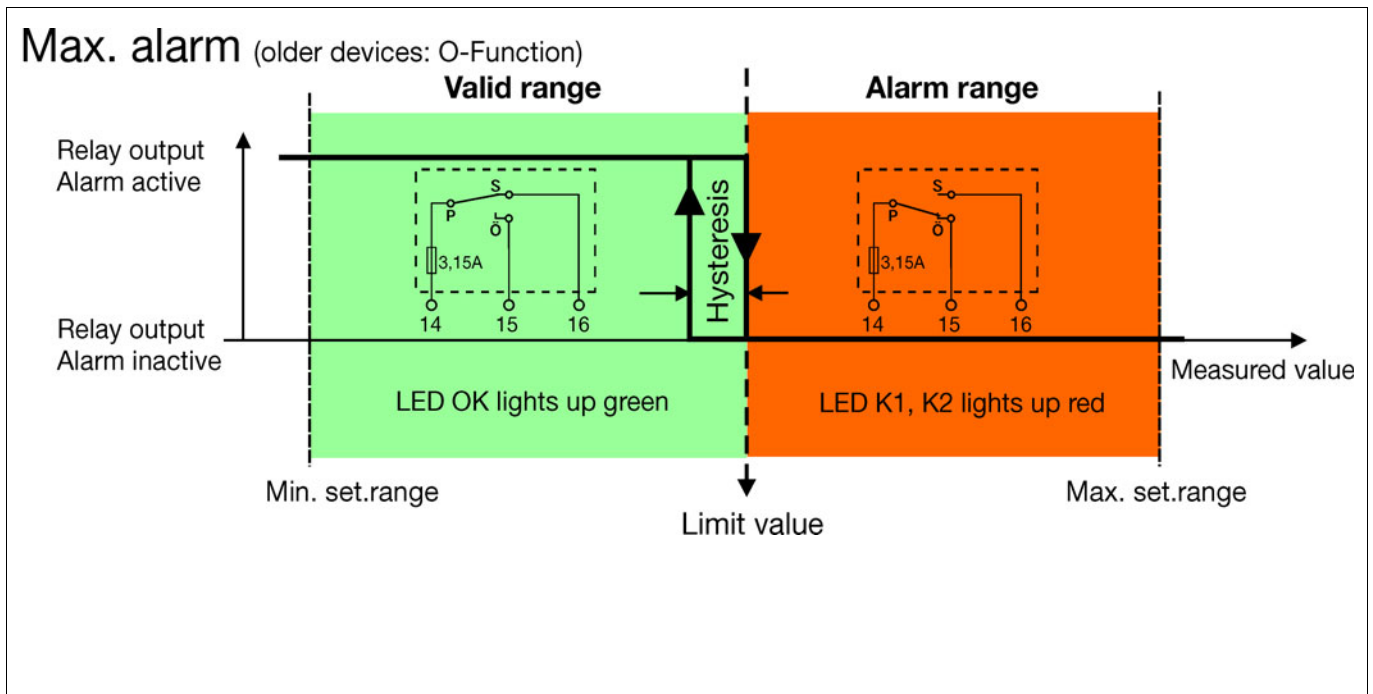




### Switching behavior min. alarm



### Switching behavior max. alarm (factory set)



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




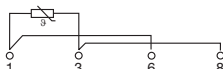


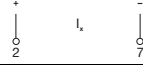
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## Connection diagram

The connection diagram in the data sheet provides preliminary information about the connection possibilities. For the electrical connection only use the installation instructions or the operating manual. The knowledge and the correct technical execution of the safety information/instructions contained in these documents are mandatory for installation, electrical connection, and startup as well as for safety during operation.

|  |   |                                 |
|--|---|---------------------------------|
| The connection occurs via screw terminals.<br><br> | <b>Lead</b>                                     | <b>Admissible cross section</b> |
|  | 1 wire  | ≤ 2.5 mm <sup>2</sup>           |
|  | Fine-strand, with ferrule                       | ≤ 1.5 mm <sup>2</sup>           |
|  | Tightening torque of the screws:<br>max. 0.5 Nm |                                 |

| Legend: | Comment   | Screw terminals   | Screw terminals   |
|---------|---|---|---|
| 1, 2    |   | <b>Analog input 1 (E1)</b>  | <b>Analog input 2 (E2)</b>  |
|         | Thermocouple, <b>Double thermocouple</b>  |    |  |
|         |  When double-thermowells are connected to the measuring circuits (E1) and (E2) they have to be isolated. That means that both thermowells have no electrical connection to the protection fitting and furthermore no galvanically connection against each other (isolated assembly). |   |   |
|         | <b>RTD temperature probe in 2-wire circuit</b>  |    |  |
|         |  Enter the lead wire resistance for RTD temperature probes in 2-wire circuit when using greater line lengths.<br>Setup program: <i>analog inputs</i>   |   |   |
|         | <b>RTD temperature probe Pt100/Pt1000 in 3-wire circuit</b>   |    |  |
|         | RTD temperature probe Pt100 in 2-wire circuit, individual sensor for both analog inputs   |  |   |
|         | <b>Caution:</b><br>When only one probe (SIL2) is connected, the temperature limiter device is reduced from <b>SIL3 to SIL2!</b> However, the internal 2-channel structure (1oo2D) in the device is still retained. Both channels measure the same sensor due to the simplified external circuit.  |   |   |
|         | <b>(4) to 20 mA</b>   |    |  |
|         | (4) to 20 mA for both analog inputs   |  |   |
|         | <b>Caution:</b><br>When only one probe (SIL2) is connected, the temperature limiter device is reduced from <b>SIL3 to SIL2!</b> However, the internal 2-channel structure (1oo2D) in the device is still retained. Both channels measure the same current signal due to the simplified external circuit.  |   |   |



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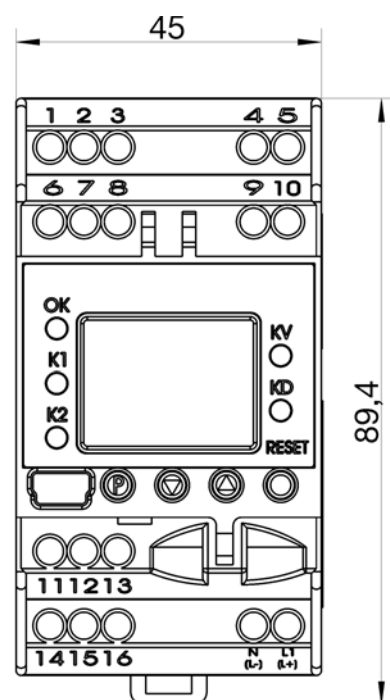
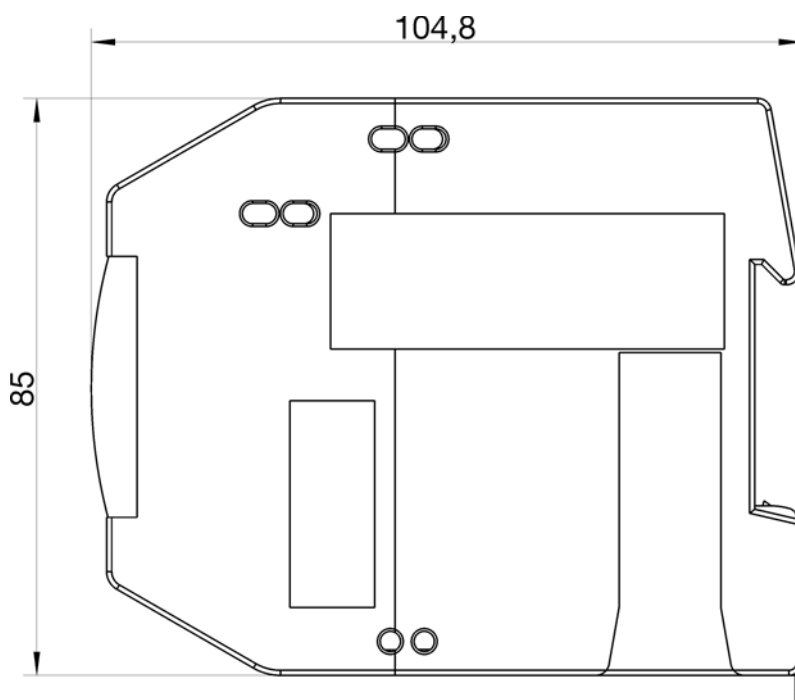
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| Legend: | Comment  | Screw terminals  | Screw terminals            |
|---------|--|--|----------------------------|
| 4       | <b>Binary input</b><br>Connection to a floating contact  | Ground   |                            |
| 5       | <b>Analog output:</b><br>0 to 20 mA<br>4 to 20 mA (factory set)<br>0(2) to 10 V                |  |                            |
| 9       | <b>Voltage supply</b><br>Acc. to nameplate   | <b>AC:</b><br>L1 line conductor<br>N neutral conductor | <b>DC:</b><br>(L+)<br>(L-) |
| 10      | <b>Relay output alarm (zero-current state)</b><br>Relay (changeover contact) with fuse cut-out |  |                            |
| 11      | <b>Relay output pre-alarm (KV)</b><br>Relay (changeover contact)                               |  |                            |

## Dimensions

Type 701150/...



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## Probes for the operating-medium air

**Note:** Because of the high response accuracy, the use of **thermowells** (pockets) is **not admissible**.

| Actual type designation                         | Old type designation | Probe type              | Temperature range | Nom. length mm | Process connection                   |
|---|----------------------|-------------------------|-------------------|----------------|--------------------------------------|
| <b>RTD temperature probe Data Sheet 90.2006</b> |                      |                         |                   |                |                                      |
| 902006/65-228-1003-1-15-500-668/000             | -                    | 1 x Pt100               | -170 ... +700°C   | 500            |                                      |
| 902006/65-228-1003-1-15-710-668/000             | -                    |                         |                   | 710            |                                      |
| 902006/65-228-1003-1-15-1000-668/000            | -                    |                         |                   | 1000           |                                      |
| 902006/55-228-1003-1-15-500-254/000             | -                    | 1 x Pt100               | -170 ... +700°C   | 500            |                                      |
| 902006/55-228-1003-1-15-710-254/000             | -                    |                         |                   | 710            |                                      |
| 902006/55-228-1003-1-15-1000-254/000            | -                    |                         |                   | 1000           |                                      |
| 902006/65-228-2003-1-15-500-668/000             | 90.271-F01           | 2 x Pt100               | -170 ... +700°C   | 500            | Stop flange,<br>movable              |
| 902006/65-228-2003-1-15-710-668/000             | 90.272-F01           |                         |                   | 710            |                                      |
| 902006/65-228-2003-1-15-1000-668/000            | 90.273-F01           |                         |                   | 1000           |                                      |
| 902006/55-228-2003-1-15-500-254/000             | -                    | 2 x Pt100               | -170 ... +700°C   | 500            | movable<br>G1/2 compression<br>clamp |
| 902006/55-228-2003-1-15-710-254/000             | -                    |                         |                   | 710            |                                      |
| 902006/55-228-2003-1-15-1000-254/000            | -                    |                         |                   | 1000           |                                      |
| <b>Thermocouples Data Sheet 90.1006</b>         |                      |                         |                   |                |                                      |
| 901006/65-547-2043-15-500-668/000               | 90.019-F01           | 2 x NiCr-Ni, Type „K“   | -35 ... +800°C    | 500            | Stop flange,<br>movable              |
| 901006/65-547-2043-15-710-668/000               | 90.020-F01           |                         |                   | 710            |                                      |
| 901006/65-547-2043-15-1000-668/000              | 90.021-F01           |                         |                   | 1000           |                                      |
| 901006/65-546-2042-15-500-668/000               | 90.019-F11           | 2 x Fe-CuNi, Type „L“   | -35 ... +700°C    | 500            |                                      |
| 901006/65-546-2042-15-710-668/000               | 90.020-F11           |                         |                   | 710            |                                      |
| 901006/65-546-2042-15-1000-668/000              | 90.021-F11           |                         |                   | 1000           |                                      |
| 901006/66-550-2043-6-500-668/000                | 90.023-F01           | 2 x NiCr-Ni, Type „K“   | -35 ... +1000°C   | 500            |                                      |
| 901006/66-550-2043-6-355-668/000                | 90.023-F02           |                         |                   | 355            |                                      |
| 901006/66-550-2043-6-250-668/000                | 90.023-F03           |                         |                   | 250            |                                      |
| 901006/66-880-1044-6-250-668/000                | 90.021               | 1 x PT10Rh-PT, Type „S“ | 0 ... 1300°C      | 250            |                                      |
| 901006/66-880-1044-6-355-668/000                | 90.022               |                         |                   | 355            |                                      |
| 901006/66-880-1044-6-500-668/000                | 90.023               |                         |                   | 500            |                                      |
| 901006/66-880-2044-6-250-668/000                | 90-D-021             | 2 x PT10Rh-PT, Type „S“ | 0 ... 1300°C      | 250            | Stop flange,<br>movable              |
| 901006/66-880-2044-6-355-668/000                | 90-D-022             |                         |                   | 355            |                                      |
| 901006/66-880-2044-6-500-668/000                | 90-D-023             |                         |                   | 500            |                                      |

|                                  |          |                            |                |     |  |
|----------------------------------|----------|----------------------------|----------------|-----|--|
| 901006/66-953-1046-6-250-668/000 | 90.027   | 1 x PT30Rh-PT6Rh, Type „B“ | 600 ... 1500°C | 250 |  |
| 901006/66-953-1046-6-355-668/000 | 90.028   |                            |                | 355 |  |
| 901006/66-953-1046-6-500-668/000 | 90.029   |                            |                | 500 |  |
| 901006/66-953-2046-6-250-668/000 | 90-D-027 | 2 x PT30Rh-PT6Rh, Type „B“ | 600 ... 1500°C | 250 |  |
| 901006/66-953-2046-6-355-668/000 | 90-D-028 |                            |                | 355 |  |
| 901006/66-953-2046-6-500-668/000 | 90-D-029 |                            |                | 500 |  |

## Probes for operating medium water and oil

**Note:** Because of the high response accuracy, the use of **thermowells** (pockets) is **not admissible**.

| Actual type designation                         | Old type designation | Probe type            | Temperature range | Nom. length mm | Process connection                |
|---|----------------------|-----------------------|-------------------|----------------|-----------------------------------|
| <b>RTD temperature probe Data Sheet 90.2006</b> |                      |                       |                   |                |                                   |
| 90.2006/10-402-1003-1-9-100-104/000             |                      | 1 x Pt100             | -40 ... +400°C    | 100            | G1/2 screw connection             |
| 90.2006/10-402-2003-1-9-100-104/000             |                      | 2 x Pt100             |                   | 100            |                                   |
| 902006/54-227-2003-1-15-710-254/000             | 90.272-F02           | 2 x Pt100             | -170 ... 550°C    | 65...670       | movable<br>G1/2 compression clamp |
| 902006/54-227-1003-1-15-710-254/000             | 90.272-F03           | 1 x Pt100             |                   | 65...670       |                                   |
| 902006/10-226-1003-1-9-250-104/000              | 90.239               | 1 x Pt100             | -170 ... 480°C    | 250            | G1/2 screw connection             |
| 902006/10-226-2003-1-9-250-104/000              | 90-D-239             | 2 x Pt100             |                   | 250            |                                   |
| <b>Thermocouples Data Sheet 90.1006</b>         |                      |                       |                   |                |                                   |
| 901006/54-544-2043-15-710-254/000               | 90.020-F02           | 2 x NiCr-Ni, Type „K“ | -35 ... 550°C     | 65...670       | movable<br>G1/2 compression clamp |
| 901006/54-544-1043-15-710-254/000               | 90.020-F03           | 1 x NiCr-Ni, Type „K“ |                   | 65...670       |                                   |
| 901006/54-544-2042-15-710-254/000               | 90.020-F12           | 2 x FeCuNi, Type „L“  |                   | 65...670       |                                   |
| 901006/54-544-1042-15-710-254/000               | 90.020-F13           | 1 x FeCuNi, Type „L“  |                   | 65...670       |                                   |

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## Probes for operating medium water and oil

**Note:** Because of the high response accuracy, **only use thermowells** (pockets) that are **included in the scope of delivery**.

| Actual type designation                         | Old type designation | Probe type  | Temperature range | Nom. length mm | Process connection |
|---|----------------------|---|-------------------|----------------|--------------------|
| <b>RTD temperature probe Data Sheet 90.2006</b> |                      |   |                   |                |                    |
| 902006/53-505-2003-1-12-190-815/000             | 90D239-F03           | 2 x Pt100   | -40 ... +400 °C   | 190            |                    |
| 902006/53-507-2003-1-12-100-815/000             | 90.239-F02           | 2 x Pt100   | -40 ... +480 °C   | 100            |                    |
| 902006/53-507-2003-1-12-160-815/000             | 90.239-F12           | (arranged one below the other in protection tube) |                   | 160            |                    |
| 902006/53-507-2003-1-12-190-815/000             |                      |   |                   | 190            |                    |
| 902006/53-507-2003-1-12-220-815/000             | 90.239-F22           |   |                   | 220            |                    |
| 902006/53-507-1003-1-12-100-815/000             | 90.239-F01           | 1 x Pt100   | -40 ... +480 °C   | 100            | weld-in sleeve     |
| 902006/53-507-1003-1-12-160-815/000             | 90.239-F11           |   |                   | 160            |                    |
| 902006/53-507-1003-1-12-220-815/000             | 90.239-F21           |   |                   | 220            |                    |
| 902006/53-505-1003-1-12-190-815/000             | 90.239-F03           |   |                   | 1 x Pt100      |                    |
| 902006/53-505-3003-1-12-100-815/000             | 90.239-F07           | 3 x Pt100   | -40 ... +400 °C   | 100            |                    |
| 902006/53-505-3003-1-12-160-815/000             | 90.239-F17           |   |                   | 160            |                    |
| 902006/53-505-3003-1-12-220-815/000             | 90.239-F27           |   |                   | 220            |                    |
| 902006/40-226-1003-1-12-220-815/000             | 90.280-F30           | 1 x Pt100   | -170 ... +480 °C  | 220            | weld-in sleeve     |
| 902006/40-226-1003-1-12-160-815/000             | 90.280-F31           |   |                   | 160            |                    |
| 902006/40-226-1003-1-12-100-815/000             | 90.280-F32           |   |                   | 100            |                    |
| <b>Thermocouples Data Sheet 90.1006</b>         |                      |   |                   |                |                    |
| 901006/53-543-1042-12-220-815/000               | 90.111-F01           | 1 x Fe-CuNi Type „L“                              | -35 ... 480°C     | 220            | weld-in sleeve     |
| 901006/53-543-2042-12-220-815/000               | 90.111-F02           | 2 x Fe-CuNi Type „L“                              |                   | 220            |                    |

## Probes for the operating medium air, water, and oil

**Note:** Because of the high response accuracy, the use of **thermowells** (pockets) is **not admissible**.

| Actual type designation                         | Old type designation | Probe type            | Temperature range | Install. length mm | Process connection |
|---|----------------------|-----------------------|-------------------|--------------------|--------------------|
| <b>RTD temperature probe Data Sheet 90.2006</b> |                      |                       |                   |                    |                    |
| 90.2006/10-390-1003-1-8-250-104/000             | 90.210-F95           | 1 x Pt100             | max. 300°C        | 250                |                    |
| <b>Thermocouples Data Sheet 90.1006</b>         |                      |                       |                   |                    |                    |
| 901006/45-551-2043-2-xxxx-11-xxxx               |                      | 2 x NiCr-Ni, Type „K“ | max. 1150°C       | 50...2000          |                    |

**Note:** The probes described in data sheets 901006 and 902006 are also certified for the Pressure Equipment Directive

## Safety control and regulating devices

### Safety temperature monitor STW<sup>1</sup>

The safety temperature monitor is a device that is automatically reset when activated once the sensor temperature has fallen below or risen above the set limit value by an amount equal to the switching differential. Possible settings: monitoring for limit value overrange or underrange.

Mode of operations:

Minimum requirements: 2B, 2K, 2P

Additional requirements: 2N, 2D

### Safety temperature limiter STB<sup>1</sup>

The safety temperature limiter is a device that is permanently locked after responding.

Manual reset using the RESET key is possible once the probe temperature has fallen below / has exceeded the limit value by the amount of the switching differential. Possible settings: monitoring for overrange or underrange.

Mode of operations:

Minimum requirements: 2B, 2J, 2V, 2K, 2P and adjustable with special tools

Additional requirements: 2N, 2F, 2D

<sup>1</sup> For more detailed explanation, see DIN EN 14 597.



## Connection possibilities of the sensors (SIL)

The JUMO safetyM STB/STW 701150 evaluation device structure is basically identical. Various possibilities to connect the sensors are available. These possibilities are listed in the following table along with the achievable SIL level:

| Variant | Connected sensors  | Architecture  |        | Achievable SIL                   |   |  |  |
|---------|--|---|--------|----------------------------------|---|--|--|
|         |  | Sensor system   | Logics |                                  |   |  |  |
| 1       | 1 x Pt100 in 2-wire circuit individual sensor  | 1oo1  | 1oo2D  | 2                                |   |  |  |
| 1a      | 2x Pt100/1000 2-wire circuit   | 1oo2  | 1oo2D  | 3                                |   |  |  |
| 2       | 2x Pt100/1000 3-wire circuit   | 1oo2  | 1oo2D  | 3                                |   |  |  |
| 3       | 2x thermocouple  | 1oo2  | 1oo2D  | 3                                |   |  |  |
| 4       | 1x Pt100/1000 2-wire and 3-wire circuit<br>1x thermocouple   | 1oo2  | 1oo2D  | 3                                |   |  |  |
| 5       | STB/STW 70.1150 without sensor system 1oo2D architecture no probe or use 4 to 20 mA (means that the sensor is not taken into account for the calculation). | Sensors connected by the system user Architecture acc. to connection 1oo1 or 1oo2 | 1oo2D  | SIL of the used sensor (HW only) | The systematic capability (SC) of the used sensor | Max. achievable SIL of the system with 1oo1 sensor system architecture | Max. achievable SIL of the system with 1oo2 sensor system architecture |
|         |  |   |        | 1                                | 1   | 1  | 1  |
|         |  |   |        | 1                                | 2   | 1  | 2  |
|         |  |   |        | 2                                | 2   | 2  | 2  |
|         |  |   |        | 2                                | 3   | 2  | 3  |
| 3       | 3  | 3   | 3      |                                  |   |  |  |

### Note:

Variants 1 to 4 were evaluated with JUMO probes according to data sheets 901006 and 902006. For variant 5 no sensor system was taken into account. In this case, the user selects the sensor system. For this reason, the user is responsible for evaluating the achievable SIL. If the used SIL-capable sensor consists of hardware and software (e.g. transmitter), the maximum SIL that can be achieved – irrespective of the architecture – is the one according to which the sensor software was developed (so, for example, if the sensor software has SIL 2, the max. achievable SIL is 2).

The possibility to connect passive sensors such as double thermocouples, Pt100, or Pt1000 sensors means that the sensors do not necessarily require a SIL qualification. In this case, the specification of the failure rates for the passive sensors is sufficient for the SIL qualification of the overall system. The user of the system must always determine the PFD<sub>avg</sub> and/or PFH value of the overall safety circuit to evaluate the achieved SIL.

## Failure rates and SFF for 70.1150...23 (AC 240 V)

| Variant | $\lambda_s$ [Fit] | $\lambda_{dd}$ [Fit] | $\lambda_{dd}$ [Fit] | SFF  | PFH (1/h)            | PFD <sub>avg</sub>   |
|---------|-------------------|----------------------|----------------------|------|----------------------|----------------------|
| 1       | 865.21            | 306.24               | 32.31                | 96 % | 4.56 e <sup>-9</sup> | 2.02 e <sup>-4</sup> |
| 1a      | 865.21            | 306.24               | 32.31                | 96 % | 1.05 e <sup>-9</sup> | 4.57 e <sup>-5</sup> |
| 2       | 868.17            | 303.28               | 32.31                | 96 % | 1.05 e <sup>-9</sup> | 4.57 e <sup>-5</sup> |
| 3       | 881.62            | 326.78               | 33.62                | 96 % | 1.03 e <sup>-9</sup> | 4.49 e <sup>-5</sup> |
| 4       | 887.68            | 343.82               | 35.52                | 96 % | 1.22 e <sup>-9</sup> | 5.30 e <sup>-5</sup> |
| 5       | 881.02            | 313.43               | 35.57                | 96 % | 1.04 e <sup>-9</sup> | 4.48 e <sup>-5</sup> |

## Failure rates and SFF for 70.1150...25 (AC/DC 24 V)

| Variant | $\lambda_s$ [Fit] | $\lambda_{dd}$ [Fit] | $\lambda_{dd}$ [Fit] | SFF  | PFH (1/h)            | PFD <sub>avg</sub>   |
|---------|-------------------|----------------------|----------------------|------|----------------------|----------------------|
| 1       | 799.3             | 306.32               | 33.61                | 96 % | 6.59 e <sup>-9</sup> | 2.91 e <sup>-4</sup> |
| 1a      | 799.3             | 306.32               | 33.61                | 96 % | 3.07 e <sup>-9</sup> | 1.35 e <sup>-4</sup> |
| 2       | 802.26            | 303.36               | 33.61                | 96 % | 3.07 e <sup>-9</sup> | 1.35 e <sup>-4</sup> |
| 3       | 827.25            | 324.71               | 37.91                | 96 % | 3.13 e <sup>-9</sup> | 1.37 e <sup>-4</sup> |
| 4       | 833.31            | 341.75               | 39.81                | 96 % | 3.23 e <sup>-9</sup> | 1.41 e <sup>-4</sup> |
| 5       | 818.96            | 323.07               | 36.26                | 96 % | 3.05 e <sup>-9</sup> | 1.33 e <sup>-4</sup> |

### Note:

Variants 1 to 4 were evaluated with JUMO probes according to data sheets 901006 and 902006. For variant 5 no sensor system was taken into account. In this case, the user selects the sensor system. The PFH and PFD<sub>avg</sub> values were calculated assuming that the time to restore the system is 8 h (MTTR = 72 h). Furthermore, the calculation was based on a lifetime of 10 years (T<sub>1</sub> = 10 y). The Common Cause Factor was determined according to the tables of DIN EN 61508 for sensor systems and logic.

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### Calculations DIN EN ISO 13849-1 Performance Level - low voltage 230 V

| Variant | MTTF <sub>d</sub>                  | DC <sub>avg</sub> | CCF | PL  |
|---------|------------------------------------|-------------------|-----|---|
| 1       | 100 years <sup>3</sup> (337 years) | 90 %              | 80  | PLd   |
| 1a      | 100 years <sup>3</sup> (337 years) | 90 %              | 80  | PLe   |
| 2       | 100 years <sup>3</sup> (340 years) | 90 %              | 80  | PLe   |
| 3       | 100 years <sup>3</sup> (317 years) | 91 %              | 80  | PLe   |
| 4       | 100 years <sup>3</sup> (313 years) | 91 %              | 80  | PLe   |
| 5       | 100 years <sup>3</sup> (327 years) | 91 %              | 80  | See "Connection possibilities of the sensors" table |

### Calculations DIN EN ISO 13849-1 Performance Level - extra low voltage (ELV) 24 V

| Variant | MTTF <sub>d</sub>                  | DC <sub>avg</sub> | CCF | PL  |
|---------|------------------------------------|-------------------|-----|---|
| 1       | 100 years <sup>3</sup> (336 years) | 90 %              | 80  | PLd   |
| 1a      | 100 years <sup>3</sup> (336 years) | 90 %              | 80  | PLe   |
| 2       | 100 years <sup>3</sup> (339 years) | 90 %              | 80  | PLe   |
| 3       | 100 years <sup>3</sup> (315 years) | 90 %              | 80  | PLe   |
| 4       | 100 years <sup>3</sup> (311 years) | 90 %              | 80  | PLe   |
| 5       | 100 years <sup>3</sup> (318 years) | 90 %              | 80  | See "Connection possibilities of the sensors" table |

3. The MTTF<sub>d</sub> value of a partial system must be limited to 100 years according to the DIN EN ISO 13849-1 requirements.

### Scope of delivery

|   |
|---|
| 1 JUMO safetyM STB/STW in ordered version |
| 1 operating manual                        |

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## Order details

|                                 |  |
|---------------------------------|--|
| <b>(1) model</b>                |  |
| 701150                          | Safety temperature limiter / monitor       |
| <b>(2) configuration</b>        |  |
| 8                               | with factory settings                      |
| 9                               | with customer settings                     |
| <b>(3) language</b>             |  |
| 01                              | German                                     |
| 02                              | English                                    |
| 03                              | French                                     |
| <b>(4) basic type extension</b> |  |
| 0251                            | Safety temperature monitor (O-function)    |
| 0252                            | Safety temperature monitor (N.O.-function) |
| 0253                            | Safety temperature limiter (O-function)    |
| 0254                            | Safety temperature limiter (N.O.-funct.)   |
| <b>(5) measuring input</b>      |  |
| 1003                            | 1x Pt100 2-wire                            |
| 1053                            | 1x 4..20mA                                 |
| 2001                            | 2x Pt100 3-wire                            |
| 2003                            | 2x Pt100 2-wire                            |
| 2005                            | 2x Pt1000 2-wire                           |
| 2006                            | 2x Pt1000 3-wire                           |
| 2036                            | 2x W5Re-W26Re "C"                          |
| 2037                            | 2x W3Re-W25Re "D"                          |
| 2039                            | 2x Cu-CuNi "T"                             |
| 2040                            | 2x Fe-CuNi "J"                             |
| 2041                            | 2x Cu-CuNi "U"                             |
| 2042                            | 2x Fe-CuNi "L"                             |
| 2043                            | 2x NiCr-Ni "K"                             |
| 2044                            | 2x Pt10Rh-Pt "S"                           |
| 2045                            | 2x Pt13Rh-Pt "R"                           |
| 2046                            | 2x Pt30Rh-Pt6Rh "B"                        |
| 2048                            | 2x NiCrSi-NiSi "N"                         |
| 2053                            | 2x 4..20mA                                 |
| <b>(6) Voltage supply</b>       |  |
| 23                              | AC 110..240V +10/-15%,48..63Hz             |
| 25                              | AC/DC 20..30V,48..63Hz                     |
| <b>(7) output</b>               |  |
| 001                             | 0..20mA analog                             |
| 005                             | 4..20mA analog                             |
| 040                             | 0..10V analog                              |
| 070                             | 2..10V analog                              |
| <b>(8) GL approval</b>          |  |
| 000                             | without approval                           |
| 062                             | with GL approval                           |
| <b>(9) extra code</b>           |  |
| 000                             | without approval                           |
| 058                             | with SIL- and PL-approval                  |

**Order code**

(1) (2) (3) (4) (5) (6) (7) (8) (9)

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## Accessories

| Article                      | Part no. |
|------------------------------|----------|
| Setup program, multilingual  | 00548742 |
| USB cable                    | 00506252 |
| External unlocking button RT | 97097865 |