Electronic temperature monitors/temperature limiters and safety temperature monitors/safety temperature limiters according to DIN EN 14 597

Brief description
The areas of application for (safety) temperature limiters or monitors ((S)TB or (S)TW) are to be found wherever thermal processes need to be monitored, and where the system must be set to a safe condition in the event of a fault.

If the permitted temperature limit is reached or a fault occurs within the permitted temperature range (probe break, short-circuit, component defect, power failure), then the device switches off without any delay. If the fault is no longer present, then limiters TB and STB must be reset manually. This can be done by means of a reset pushbutton on the instrument, or by an external pushbutton. The flow of energy is only enabled again when the temperature is lower (O-function) or higher (S-function) than the preset temperature limit by the amount of the switching differential. In the event of a short-term supply failure (not exceeding 1 min) in the satisfactory range of the system, the instrument will be automatically enabled after the power has been restored. The switching differential is 3°C, 10°C, 30°C or 100°C.

The analog setpoint knob for the limit temperature is mounted on the front panel. An unintentional or unauthorized adjustment of the limit setting is prevented by a clear cover which can be lead-sealed.

The devices are intended for use as built-in units for fixing onto standard rails to EN 50022-35. The screw terminals for the electrical connections (for a conductor cross-section of max. 2.5 mm²) are on one wiring level. The devices function over defined temperature ranges between 0 and 1800 °C (with extra code “SIL” and “DIN”: 0 to 1400 °C).

Functional control and regulating instrument
Temperature monitors TW¹
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)

Safety control and regulating instruments
Safety temperature monitors STW¹
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 TB¹
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)

Safety temperature limiters STB¹
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)

Special features
- Input for RTD temperature probes or twin thermocouples
- O- and S-function for rising and falling temperatures
- Connection for external reset button (TB, STB)
- DIN EN 14 597 approval
- GL approval
- In conjunction with temperature probes as per JUMO data sheet 90.1006 and 90.2006 the devices are certified as per SIL 2 or SIL 3.

¹For more detailed explanation, see DIN EN 14 597.
Example 1: Monitoring heating elements in an incinerator

In the event of a fault, action must be taken to prevent overheating causing damage to the heating elements. The energy flow must be switched off when the furnace temperature has risen above the maximum setpoint value.

In this case, a safety temperature limiter with an O-function is used.

![Diagram of O-Function](image)

**O-Function**

**Response in normal operation**
- \( \vartheta < \vartheta_G \)
- temperature rises
\( \Rightarrow \) the relay drops out at \( \vartheta = \vartheta_G \).

**Response after falling below the limit**
- \( \vartheta > \vartheta_G \)
- temperature falls
\( \Rightarrow \) relay pulls in automatically at \( \vartheta = \vartheta_G + X_{sd} \) (STW and TW) or must be reset manually (STB and TB)

**Response under fault conditions**
In the event of a fault (probe break or short-circuit, faulty electronics, supply failure) the relay drops out. When
- the fault has been cleared
- \( \vartheta < \vartheta_G + X_{sd} \)
\( \Rightarrow \) for STW and TW: the relay pulls in automatically.
STB and TB must be reset manually. Only in the event of a short-term supply failure (not exceeding 1 min) in the satisfactory range of the system, the instrument will be enabled automatically after the power has been restored.

Example 2: Sawdust feed in a furnace

In the event of a fault, action must be taken to prevent a blowback.

The feed of the sawdust must be switched off when the furnace temperature has fallen below the minimum setpoint value.

In this case, a safety temperature limiter with an S-function is used.

![Diagram of S-Function](image)

**S-Function**

**Response in normal operation**
- \( \vartheta > \vartheta_G \)
- temperature falls
\( \Rightarrow \) the relay drops out at \( \vartheta = \vartheta_G \).

**Response after falling below the limit**
- \( \vartheta < \vartheta_G \)
- temperature rises
\( \Rightarrow \) relay pulls in automatically at \( \vartheta = \vartheta_G + X_{sd} \) (STW and TW) or must be reset manually (STB and TB)

**Response under fault conditions**
In the event of a fault (probe break or short-circuit, faulty electronics, supply failure) the relay drops out. When
- the fault has been cleared
- \( \vartheta > \vartheta_G + X_{sd} \)
\( \Rightarrow \) for STW and TW: the relay pulls in automatically.
STB and TB must be reset manually. Only in the event of a short-term supply failure (not exceeding 1 min) in the satisfactory range of the system, the instrument will be enabled automatically after the power has been restored.

Example 3: Cooling foodstuffs

In the event of a fault, action must be taken to prevent the food becoming spoilt.

The system must be switched into continuous operation when the temperature of the cold-storage room is above the minimum setpoint value.

In this case, a safety temperature limiter with an O-function is used.

![Diagram of O-Function](image)
Technical data

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.

RTD temperature probes
Pt 100 in 2-wire circuit:
- 0 to 120°C*, 0 to 300°C*, 0 to 400°C*, 0 to 600°C*, 200 to 500°C* permissible temperature range for the probes according to DIN and SIL: 0 to 600°C

Ambient temperature error
0.8K/10K

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

Twin thermocouples
NiCr-Ni K:
- 200 to 600°C*, 400 to 800°C*, 600 to 1000°C*, 800 to 1200°C permissible temperature range for probes according to DIN and SIL: 200 to 1200°C

Pt10Rh-Pt S:
- 400 to 800°C*, 800 to 1200°C*, 1000 to 1400°C, 1200 to 1600°C permissible temperature range for probes according to DIN and SIL: 400 to 1300°C

Pt30Rh-Pt6Rh B:
- 800 to 1200°C*, 1000 to 1400°C*, 1200 to 1600°C, 1400 to 1800°C permissible temperature range for probes according to DIN and SIL: 800 to 1500°C

Fe-CuNi L:
- 50 to 450°C*, 200 to 600°C, 500 to 900°C permissible temperature range for probes according to DIN and SIL: 50 to 700°C

Ambient temperature error
2.0K/10K

Outputs

Relay
with floating SPDT (changeover contact)

Switch rating
2 A, 230 VAC, resistive load geschützt mit Sicherung 2 A M

Contact life
100,000 switching operations at rated load

General data

Switching point accuracy ±2% of span

Switching differential (Xsd) 3K (only for Pt 100), 10K, 30K or 100K

Voltage supply
230V AC +10%/ -15%, 48 to 63Hz, 115V AC +10%/ -15%, 48 to 63Hz, 24V AC +10%/ -15%, 48 to 63Hz

Power consumption
approx. 4VA

Permissible ambient temperature range
0 to 55°C

Permissible storage temperature
-40 to +80°C

Climatic conditions
≤ 75% rel. humidity, no condensation

Protection type
IP 20 (as per EN 60 529)

Electrical safety
as per EN 60 730-1

Electromagnetic compatibility
according to EN 61 326

Ambient conditions
as per EN 50 178-1

Pollution degree 3

Overvoltage category III

Operating conditions
The instrument is designed as a built-in device as per DIN EN 50 178 5.5.1.3

Any

Weight
approx. 250g

Dimensions (W x H x D)
54mm x 70mm x 110mm

Case
Plastic
flammability class V0

Extra code GL:
The extra code GL means that the instrument complies with the regulations of Germanischer Lloyd for use on ships and maritime installations. The instrument meets application category C according to the GL guideline.

Temperature: 0 to 55°C

Rel. humidity: not exceeding 100% r.H.

Vibration: not exceeding 0.7g

Serial accessories
- Operating Instructions 70.1130.0
- 2 mounting brackets
  (only for GL-version)
- LAW
  (only for extra code 229, 231, 233, 235)

Accessories

External reset button RT

Checking
as per EN 60 947-5-1

Contact capability
max. 6A at 230V, 50Hz

Electrical Connection
Via screw terminals 2 x 2,5mm²

Protection type
IP50

Fixing
Safety temperature monitor STW*
Ø 22mm

Weight
approx. 50g

Mounting plate BS
Mounting plate for wall mounting

*R available measuring ranges and temperature probes.
Response in normal operation

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Screw terminals, conductor cross section up to max. 2,5mm²</td>
</tr>
<tr>
<td>(2)</td>
<td>External reset button (only for TB extra code)</td>
</tr>
<tr>
<td>(3)</td>
<td>Limit setting knob</td>
</tr>
<tr>
<td>(4)</td>
<td>Limit scale</td>
</tr>
<tr>
<td>(5)</td>
<td>Fault indicator (S2 only for STB and STW)</td>
</tr>
<tr>
<td>(6)</td>
<td>Lead-sealable clear cover</td>
</tr>
<tr>
<td>(7)</td>
<td>Plastic housing</td>
</tr>
</tbody>
</table>

Connection diagram

<table>
<thead>
<tr>
<th>Connection for</th>
<th>Connection assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relay output</td>
<td>7 Pole</td>
</tr>
<tr>
<td></td>
<td>8 make contact</td>
</tr>
<tr>
<td></td>
<td>9 break contact</td>
</tr>
<tr>
<td>Voltage supply as per nameplate</td>
<td>L1 external conductor</td>
</tr>
<tr>
<td></td>
<td>N neutral conductor</td>
</tr>
<tr>
<td>External reset button</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td>RTD temperature probe in 2-wire circuit</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>LAW = lead compensating resistance</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>1 - thermocouple 1</td>
</tr>
<tr>
<td></td>
<td>2 +</td>
</tr>
<tr>
<td></td>
<td>3 - thermocouple 2</td>
</tr>
<tr>
<td></td>
<td>4 +</td>
</tr>
</tbody>
</table>

Dimensions

- Dimensions with lateral fixing elements (only for 0L version)
SIL approval

In conjunction with temperature probes as per JUMO data sheet 90.1006 and 90.2006 the instruments are certified as per SIL 2 or SIL 3. If different probes are used, the SIL capability must be calculated using the specified FIT values ($\lambda_{du \ channel \ A}$).

### Instruments as per SIL 2

<table>
<thead>
<tr>
<th>Type Designation</th>
<th>SIL device incl. sensor</th>
<th>Architecture</th>
<th>SFF</th>
<th>PFD avg device incl. probe</th>
<th>channel A, device without probe in fit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Logic</td>
<td>Sensor</td>
<td>Logic</td>
<td>Sensor</td>
<td>$\lambda_{dd}$</td>
</tr>
<tr>
<td>701130/0253-001-XX/XXX STB-O, w</td>
<td>2</td>
<td>1oo2D</td>
<td>1oo1</td>
<td>69.98</td>
<td>95.60</td>
</tr>
<tr>
<td>701130/0153-001-XX/XXX TB-O, w</td>
<td>2</td>
<td>1oo1</td>
<td>1oo1</td>
<td>77.46</td>
<td>6.72E-03</td>
</tr>
<tr>
<td>701130/0251-001-XX/XXX 701130/0251-001-XX/XXX</td>
<td>2</td>
<td>1oo2D</td>
<td>1oo1</td>
<td>69.09</td>
<td>95.60</td>
</tr>
<tr>
<td>1,22E-03 TW-O, w</td>
<td>2</td>
<td>1oo1</td>
<td>1oo1</td>
<td>75.87</td>
<td>6.72E-03</td>
</tr>
<tr>
<td>701130/0153-0XX-XX/XXX TB-O, t</td>
<td>2</td>
<td>1oo1</td>
<td>1oo1</td>
<td>74.38</td>
<td>8.56E-03</td>
</tr>
<tr>
<td>701130/0151-0XX-XX/XXX TW-O, t</td>
<td>2</td>
<td>1oo1</td>
<td>1oo1</td>
<td>72.97</td>
<td>8.56E-03</td>
</tr>
<tr>
<td>701130/0254-001-XX/XXX STB-S, w</td>
<td>2</td>
<td>1oo2D</td>
<td>1oo1</td>
<td>71.11</td>
<td>95.53</td>
</tr>
<tr>
<td>701130/0154-001-XX/XXX TB-S, w</td>
<td>2</td>
<td>1oo1</td>
<td>1oo1</td>
<td>76.92</td>
<td>8.43E-03</td>
</tr>
<tr>
<td>701130/0252-001-XX/XXX STW-S, w</td>
<td>2</td>
<td>1oo2D</td>
<td>1oo1</td>
<td>70.21</td>
<td>95.53</td>
</tr>
<tr>
<td>701130/0152-001-XX/XXX TW-S, w</td>
<td>2</td>
<td>1oo1</td>
<td>1oo1</td>
<td>75.37</td>
<td>8.43E-03</td>
</tr>
<tr>
<td>701130/0154-0XX-XX/XXX TB-S, t</td>
<td>2</td>
<td>1oo1</td>
<td>1oo1</td>
<td>76.20</td>
<td>9.55E-03</td>
</tr>
<tr>
<td>701130/0152-0XX-XX/XXX TW-S, t</td>
<td>2</td>
<td>1oo1</td>
<td>1oo1</td>
<td>74.84</td>
<td>9.55E-03</td>
</tr>
</tbody>
</table>

### Instruments as per SIL 3

<table>
<thead>
<tr>
<th>Type Designation</th>
<th>SIL device incl. sensor</th>
<th>Architecture</th>
<th>SFF</th>
<th>PFD avg device incl. probe</th>
<th>channel A, device without probe in fit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Logic</td>
<td>Sensor</td>
<td>Logic</td>
<td>Sensor</td>
<td>$\lambda_{dd}$</td>
</tr>
<tr>
<td>701130/0253-0XX-XX/XXX STB-O, t</td>
<td>3</td>
<td>1oo2D</td>
<td>1oo2</td>
<td>72.23</td>
<td>90.04</td>
</tr>
<tr>
<td>701130/0251-0XX-XX/XXX STW-O, t</td>
<td>3</td>
<td>1oo2D</td>
<td>1oo2</td>
<td>71.38</td>
<td>90.04</td>
</tr>
<tr>
<td>701130/0254-0XX-XX/XXX STB-S, t</td>
<td>3</td>
<td>1oo2D</td>
<td>1oo2</td>
<td>73.12</td>
<td>90.04</td>
</tr>
<tr>
<td>701130/0252-0XX-XX/XXX STW-S, t</td>
<td>3</td>
<td>1oo2D</td>
<td>1oo2</td>
<td>72.24</td>
<td>90.04</td>
</tr>
</tbody>
</table>
### DIN-approved probes for operation in air

<table>
<thead>
<tr>
<th>Probe type</th>
<th>Temperatur range</th>
<th>Nom. length mm</th>
<th>Process connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x Pt100</td>
<td>-170 to +700°C</td>
<td>500, 700 and 1000</td>
<td>Stop flange, movable</td>
</tr>
<tr>
<td>2 x Pt100</td>
<td>-170 to +700°C</td>
<td>500, 700 and 1000</td>
<td>Screwed pipe joint G1/2</td>
</tr>
</tbody>
</table>

### DIN-approved probes for operation in water and oil

<table>
<thead>
<tr>
<th>Probe type</th>
<th>Temperatur range</th>
<th>Fitting length mm</th>
<th>Process connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x Pt100</td>
<td>-40 to +400°C</td>
<td>100</td>
<td>Screw fitting G1/2</td>
</tr>
<tr>
<td>2 x Pt100</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>2 x Pt100</td>
<td>-170 to +550°C</td>
<td>65 to 670</td>
<td>movable G1/2 com-pression clamp</td>
</tr>
<tr>
<td>1 x Pt100</td>
<td>-170 to +480°C</td>
<td>250</td>
<td>Screw fitting G1/2</td>
</tr>
<tr>
<td>2 x Pt100</td>
<td></td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>1 x Pt100</td>
<td>-40 to +480°C</td>
<td>100, 160, 220</td>
<td>Weldable sleeve</td>
</tr>
<tr>
<td>1 x Pt100</td>
<td>-40 to +400°C</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>2 x Pt100</td>
<td>-40 to +400°C</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>2 x Pt100</td>
<td>-40 to +480°C</td>
<td>100, 160, 220</td>
<td></td>
</tr>
<tr>
<td>3 x Pt100</td>
<td>-40 to +400°C</td>
<td>100, 160, 220</td>
<td></td>
</tr>
<tr>
<td>1 x Pt100</td>
<td>-170 to +480°C</td>
<td>100, 160, 220</td>
<td></td>
</tr>
</tbody>
</table>

### Thermocouples as per Data Sheet 90.1006

<table>
<thead>
<tr>
<th>Probe type</th>
<th>Temperatur range</th>
<th>Fitting length mm</th>
<th>Process connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 x NiCr-Ni, type K</td>
<td>-35 to +800°C</td>
<td>500, 700 and 1000</td>
<td>Stop flange, movable</td>
</tr>
<tr>
<td>2 x FeCuNi, type L</td>
<td>-35 to +700°C</td>
<td>500, 700 and 1000</td>
<td></td>
</tr>
<tr>
<td>2 x NiCr-Ni, type K</td>
<td>-35 to +1000°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 x PT10Rh-PT, type S</td>
<td>0 to 1300°C</td>
<td>250, 355, 500</td>
<td></td>
</tr>
<tr>
<td>2 x PT10Rh-PT, type S</td>
<td>0 to 1300°C</td>
<td>250, 355, 500</td>
<td></td>
</tr>
<tr>
<td>1 x PT30Rh-PT6Rh, type B</td>
<td>600 to 1500°C</td>
<td>250, 355, 500</td>
<td></td>
</tr>
<tr>
<td>2 x PT30Rh-PT6Rh, type B</td>
<td>600 to 1500°C</td>
<td>250, 355, 500</td>
<td></td>
</tr>
</tbody>
</table>

1. This is the probe temperature range. The approval of the device does only apply to the temperature ranges listed on page 1/3, which is often smaller than the probe range.
Order details:  

**electronic temperature monitor/ temperature limiter and safety temperature monitor/ safety temperature limiter according to DIN EN 14 597**

**1) Basic type**  
- 701130  
  electronic temperature monitor/ temperature limiter  
  and safety temperature monitor/ safety temperature limiter according to DIN EN 14 597

**2) Basic type extension**  
- 0151  
  Temperature monitor with O-Function (Relay inactive at \( u \geq u_G \))  
- 0152  
  Temperature monitor with S-Function (Relay inactive at \( u \leq u_G \))  
- 0153  
  Temperature limiter with O-Function (Relay inactive at \( u \geq u_G \))  
- 0154  
  Temperature limiter with S-Function (Relay inactive at \( u \leq u_G \))  
- 0251  
  Safety temperature monitors with O-Function \(^2\)  
  (Relay inactive at \( u \geq u_G \))  
- 0252  
  Safety temperature monitors with S-Function \(^2\)  
  (Relay inactive at \( u \leq u_G \))  
- 0253  
  Safety temperature limiter with O-Function \(^2\)  
  (Relay inactive at \( u \geq u_G \))  
- 0254  
  Safety temperature limiter with S-Function \(^2\)  
  (Relay inactive at \( u \leq u_G \))

**3) Measuring inputs**  
- 001  
  RTD temperature probe Pt100 in 2-wire circuit  
- 042  
  Fe-Con L  
- 043  
  NiCr-Ni K  
- 044  
  Pt10Rh-Pt S  
- 046  
  Pt30Rh-Pt6Rh B

**4) Voltage supply**  
- 02  
  230V AC +10/-15%, 48 to 63Hz  
- 05  
  115V AC +10/-15%, 48 to 63Hz  
- 08  
  24 V AC +10% /-15%, 48 to 63 Hz

**5) 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 10 internally compensated (incl. LAW 10Ω)  
- 231  
  Lead resistance 100 internally compensated (incl. LAW 10Ω)  
- 232  
  Leitungswiderstand 301 Intern berücksichtigen (inkl. LAW 10Ω)  
- 235  
  Lead resistance 500Ω internally compensated (incl. LAW 10Ω)  
- 245  
  Internal reset button  
- 056  
  DIN approval\(^3\)  
- 062  
  SIL approval and DIN approval\(^3\)  
- 229  
  Internally compensated (incl. LAW 10Ω)

**Order code**  
- 701130  
  / 0253  
  / 001  
  - 02  
  / 205, 245  

**Order example**  
- 701130  
  / 0253  
  - 001  
  - 02  
  / 205, 245

\(^2\) External reset button necessary for annual test (as standard)  
\(^3\) Only possible if the permissible range values are observed.  
\(^4\) List extra codes in sequence, separated by commas, measurement range must be given in plain text.

**DIN EN 14 597**  
Instruments with approval as per DIN EN 14 597 must only be used in conjunction with the temperature probes specified in the JUMO data sheets 90.1006 and 90.2006. If other temperature probes are used, their registration must be checked.

**SIL**  
JUMO provides SIL-certified temperature probes that are suitable for the particular instrument. They correspond to the temperature probes as per DIN EN 14 597, which are listed in the data sheets 90.1006 and 90.2006. If other temperature probes are used, their usability must be checked.

**Declarations of Conformity**  
The Declarations of Conformity can be found on our website at: www.jumo.net ➔ Products

**Accessories**  
- External reset button RT  
- Mounting plate BS  
- Lead compensating resistance LAW (10Ω)  

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03.08/00336594