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# Electronic Temperature Monitor/ Limiter and Safety Temperature Monitor/Limiter to DIN 3440



## 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/cable break, short-circuit, component defect, power failure), then the instrument 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 1min) in the satisfactory range of the system, the instrument will be automatically enabled after the power has been restored. The size of 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 instruments 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. 2.5mm<sup>2</sup>) are on one wiring level.

The instruments function over defined temperature ranges between 0 and 1800 °C (with extra code "SIL" and "DIN": 0 to 1400 °C).

### Temperature monitor TW\*

Temperature monitors are devices which, after cutting out, are automatically reset when the probe temperature has fallen below the preset limit temperature by the amount of the switching differential.

### Safety temperature monitor STW\*

Safety temperature monitors are temperature monitors which, in addition, meet the requirements for enhanced safety according to DIN 3440.

### Temperature limiter TB\*

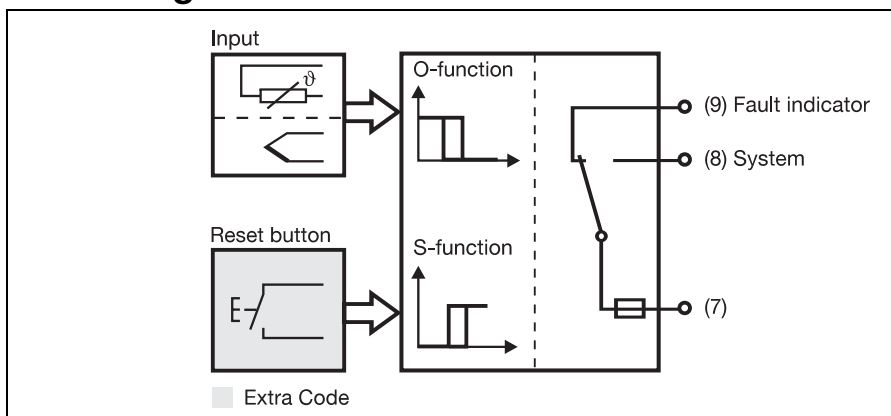
Temperature limiters are devices which are locked out after cutting out. They can be reset, either manually or by means of a tool, when the probe temperature has fallen below the limit temperature by the amount of the switching differential.

### Safety temperature limiter STB\*

Safety temperature limiters are temperature limiters which, in addition, meet the requirements for enhanced safety according to DIN 3440.

\* Extract from DIN 3440

## Block diagram

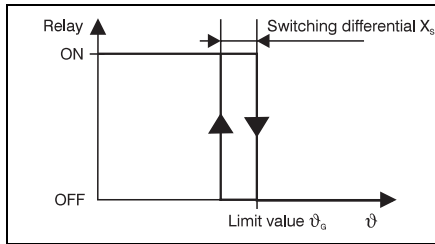


Type 701130/...

## Key features

- Input for resistance thermometer or double thermocouple
- O- and S-function for rising and falling temperatures
- Connection for an external reset pushbutton (TB, STB)
- Approved to DIN 3440
- GL approval

### O-function



**Response in normal operation**

- $\vartheta$  is less than  $\vartheta_G$
- temperature rises
- $\Rightarrow$  the relay drops out at  $\vartheta = \vartheta_G$ .

**Response after rising above the limit**

- $\vartheta$  is greater than  $\vartheta_G$
- temperature falls
- $\Rightarrow$  the 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**

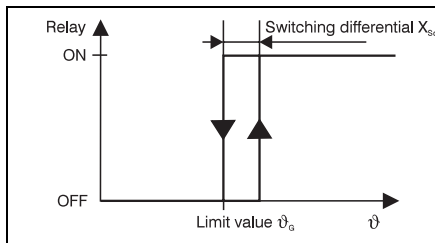
In the event of a fault (probe break or short-circuit, faulty electronics, supply failure) the relay drops out.

When

- the fault has been cleared
- $\vartheta$  is not greater than  $\vartheta_G - X_{sd}$
- $\Rightarrow$  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.

### S-function



**Response in normal operation**

- $\vartheta$  is greater than  $\vartheta_G$
- temperature falls
- $\Rightarrow$  the relay drops out at  $\vartheta = \vartheta_G$ .

**Response after falling below the limit**

- $\vartheta$  is less than  $\vartheta_G$
- temperature rises
- $\Rightarrow$  the 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
- $\vartheta$  is not less than  $\vartheta_G + X_{sd}$
- $\Rightarrow$  for STW and TW: the relay pulls in automatically.

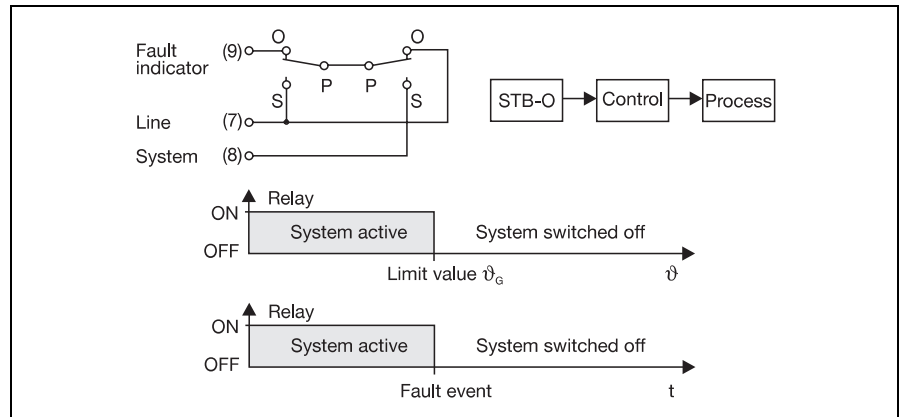
STB and TB must be reset manually. Only in the event of a short-term supply failure (not exceeding 1 min) in the satisfactory range of the system, the instrument will be enabled automatically after the power has been restored.

### Example 1: Monitoring heating elements in a furnace

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.

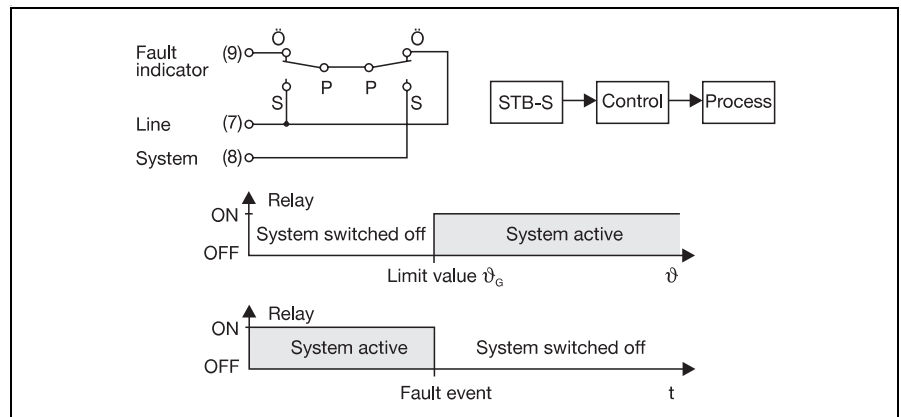


### Example 2: Sawdust feed in a furnace

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.

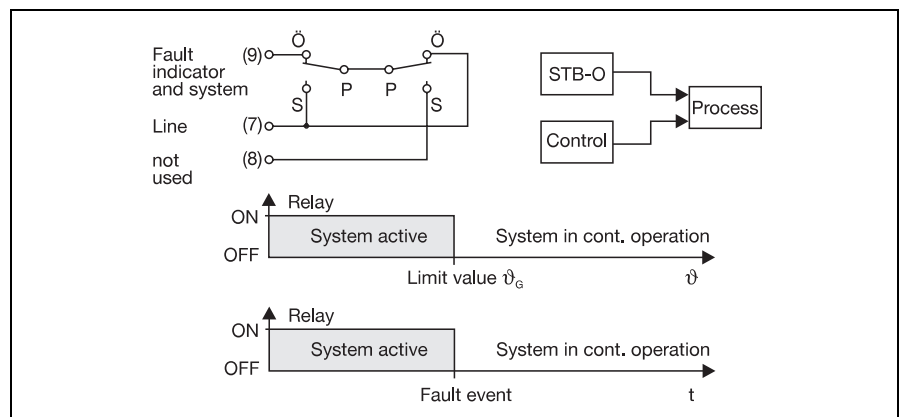


### Example 3: Cooling foodstuffs

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.

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



## Technical data

### Inputs

For instruments with approval to DIN 3440 and SIL certification, the permissible measurement ranges must be observed. Available ranges and temperature probes are marked with “\*”. If other probes are used than those specified in the JUMO data sheets 90.1006 and 90.2006, their registration and usability must be checked.

### Resistance thermometer

Pt100

in 2-wire circuit:	0 to	120 °C*
permissible meas. range	0 to	300 °C*
for DIN and SIL:	0 to	400 °C*
0 to 600 °C	0 to	600 °C*
	200 to	500 °C*

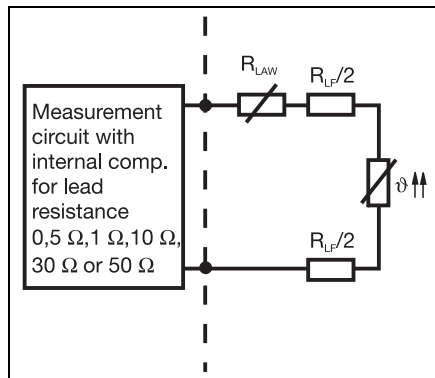
### Ambient temperature error

0.8°C/10°C

### Lead compensation

A lead resistance of 0.5Ω is internally allowed for as standard; 1Ω, 10Ω, 30Ω or 50Ω to special order (extra code).

A lead compensation resistor LAW is required for connection to Pt100 resistance thermometers with a max. operating temperature of 700 °C.



$$R_L = R_{LAW} + R_{LF}$$

$R_L$  internally compensated lead resistance of the measuring circuit

$R_{LAW}$  resistance of the lead compensation resistor

$R_{LF}$  resistance of the probe leads

### Double thermocouples

NiCr-Ni K:	200 to	600 °C*
permissible meas. range	400 to	800 °C*
for DIN and SIL:	600 to	1000 °C*
200 to 1000 °C	800 to	1200 °C
Pt10Rh-Pt S:	400 to	800 °C*
permissible meas. range	800 to	1200 °C*
for DIN and SIL:	1000 to	1400 °C
400 to 1300 °C	1200 to	1600 °C
Pt30Rh-Pt6Rh B:	800 to	1200 °C*
permissible meas. range	1000 to	1400 °C*
for DIN and SIL:	1200 to	1600 °C
800 to 1500 °C	1400 to	1800 °C
Fe-Con L:	50 to	450 °C*
permissible meas. range	200 to	600 °C*
for DIN and SIL:	500 to	900 °C
50 to 700 °C		

### Ambient temperature error

2.0°C/10°C

## Outputs

### Relay

with floating changeover contact

### Switching capacity

2A, 230V AC, resistive load protected by fuse 2A M

### Contact life

100,000 switching operations at rated load

## General data

### Switching point accuracy

±2% of span

### Switching differential $X_{sd}$

10°C, 30°C or 100°C

for Pt100 : also 3°C

### Supply voltage

230V AC, +10%/-15% 48 – 63Hz  
 115V AC, +10%/-15% 48 – 63Hz  
 24V AC, +10%/-15% 48 – 63Hz

### Power consumption

4 VA approx.

### Permissible ambient temperature

0 to 55 °C

### Permissible storage temperature

-40 to +80 °C

### Climatic conditions

rel. humidity not exceeding 75%, no condensation

### Protection

IP20 (to EN 60 529)

### Electrical safety

to EN 60 730-1

creepage distances:

- mains to electronics 8 mm min.
- mains to relay 3 mm min.
- relay to electronics and probe 8 mm min.

Instrument can be connected to SELV circuits.

### Test voltages

to EN 60 730-1 Table 13.2

### Electromagnetic compatibility

to EN 61326

interference emission: Class B

immunity to interference: to industrial requirements

### Ambient conditions

to EN 60 730-1 Para. 2.12.6

“normal”

### Operating conditions

The instrument is designed as a built-in device according to: EN 50178 5.5.1.3

### Operating position

unrestricted

### Weight

250 g approx.

### Dimensions (W x H x D)

54 mm x 70 mm x 110 mm

## Housing

Plastic

Combustibility class V0

### With 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% rH

Vibration: not exceeding 0.7g

## Standard accessories

- Operating Instructions B 70.1130
- 2 fixing elements (only for GL-version)
- Lead compensation resistor LAW (only with extra code 229, 231, 233, 235)

## Accessory

### Reset pushbutton RT



### Testing

to EN 60947-5-1

### Contact capability

max. 6A at 230V, 50Hz

### Electrical connection

via screw terminals 2 x 2.5 mm<sup>2</sup>

### Protection

IP50

### Mounting

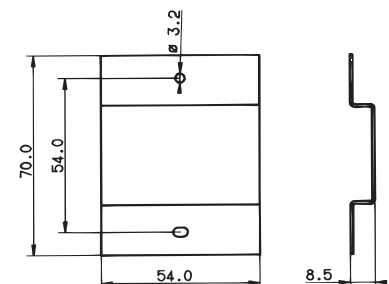
by threaded frontal ring in fixing hole 22mm dia.

### Weight

50g approx.

### Mounting plate BS

Mounting plate for wall fixing



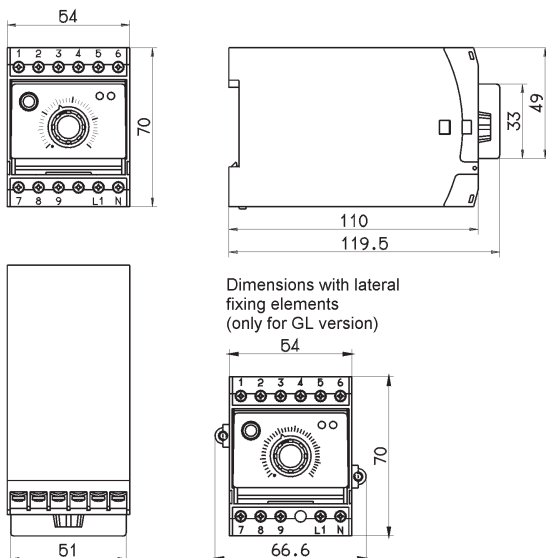
### Frontal view

	(1)	Screw terminals, conductor cross-section max. 2.5mm <sup>2</sup>
	(2)	Reset pushbutton (extra code with TB only)
	(3)	Limit setting knob
	(4)	Limit scale
	(5)	Fault indicator (S2 only for STB and STW)
	(6)	Lead-sealable clear cover
	(7)	Plastic housing

### Connection diagram

Connection for	Terminals	
Relay output	7 common 8 (S) n.o. (make) 9 (O) n.c. (break)	
Supply voltage as on label	L1 line N neutral	
External reset pushbutton	5 6	
Resistance thermometer in 2-wire circuit	1 2 LAW = lead compensation resistor	
Thermocouple	1 - thermocouple 1 2 + 3 - thermocouple 2 4 +	

### Dimensions



## SIL Certification

When used in conjunction with the temperature probes listed in the JUMO data sheets 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 ( $\lambda_{du \text{ channel A}}$ ).

### Instruments as per SIL 2



Type	Architecture	SFF	PFD avg	$\lambda_{du \text{ channel A}}$
701130/0253-001-XX/XXX STB-O, w	1oo2D	69.98%	1.19E-03	212.71
701130/0153-001-XX/XXX TB-O, w	1oo1	77.46%	6.72E-03	124.33
701130/0251-001-XX/XXX STW-O, w	1oo2D	69.09%	1.22E-03	221.71
701130/0151-001-XX/XXX TW-O, w	1oo1	75.87%	6.72E-03	133.33
701130/0153-0XX-XX/XXX TB-O, t	1oo1	74.38%	8.56E-03	158.21
701130/0151-0XX-XX/XXX TW-O, t	1oo1	72.97%	8.56E-03	167.21
701130/0254-001-XX/XXX STB-S, w	1oo2D	71.11%	2.12E-03	206.47
701130/0154-001-XX/XXX TB-S, w	1oo1	76.92%	8.43E-03	129.73
701130/0252-001-XX/XXX STW-S, w	1oo2D	70.21%	2.15E-03	215.47
701130/0152-001-XX/XXX TW-S, w	1oo1	75.37%	8.43E-03	138.73
701130/0154-0XX-XX/XXX TB-S, t	1oo1	76.20%	9.55E-03	153.48
701130/0152-0XX-XX/XXX TW-S, t	1oo1	74.84%	9.55E-03	162.48

### Instruments as per SIL 3



Type	Architecture	SFF	PFD avg	$\lambda_{du \text{ channel A}}$
701130/0253-0XX-XX/XXX STB-O, t	1oo2D	72.23%	1.95E-04	213.71
701130/0251-0XX-XX/XXX STW-O, t	1oo2D	71.38%	2.04E-04	222.71
701130/0254-0XX-XX/XXX STB-S, t	1oo2D	73.12%	1.85E-04	203.46
701130/0252-0XX-XX/XXX STW-S, t	1oo2D	72.24%	1.94E-04	212.46

## Type designation

If the standard version does not meet your requirements, then you can configure your own instruments by using the numerical codes.

(1)        (2)        (3)        (4)        (5)\*  
 701130 / \*\*\*\* - \*\*\* - \*\* / \*\*\* , ...

\* List extra codes in sequence, separated by commas.

**The measurement range must be given in plain text!**

(1) Basic type	
701130	Electronic temperature monitor/limiter and safety temperature monitor/limiter to DIN 3440

(2) Basic type extensions	
0151	Temperature monitor with O-function (relay drops out at $\vartheta \geq \vartheta_G$ )
0152	Temperature monitor with S function (relay drops out at $\vartheta \leq \vartheta_G$ )
0153	Temperature limiter with O-function (relay drops out at $\vartheta \geq \vartheta_G$ )
0154	Temperature limiter with S-function (relay drops out at $\vartheta \leq \vartheta_G$ )
0251	Safety temperature monitor with O-function (relay drops out at $\vartheta \geq \vartheta_G$ ) <sup>1</sup>
0252	Safety temperature monitor with S-function (relay drops out at $\vartheta \leq \vartheta_G$ ) <sup>1</sup>
0253	Safety temperature limiter with O-function (relay drops out at $\vartheta \geq \vartheta_G$ ) <sup>1</sup>
0254	Safety temperature limiter with S-function (relay drops out at $\vartheta \leq \vartheta_G$ ) <sup>1</sup>

(3) Measurement inputs (see Technical data for ranges)	
001	Pt100 resistance thermometer in 2-wire circuit
042	Fe-Con L
043	NiCr-Ni K
044	Pt10Rh-Pt S
046	Pt30Rh-Pt6Rh B

(4) Supply voltage	
02	230V AC +10% / -15%, 48 – 63Hz
05	115V AC +10% / -15%, 48 – 63Hz
08	24V AC +10% / -15%, 48 – 63Hz

(5) Extra codes	
202	Switching differential 3°C (only for Pt100)
205	Switching differential 10°C
206	Switching differential 30°C
208	Switching differential 100°C
229	Lead resistance 1Ω internally compensated (incl. LAW 10Ω)
231	Lead resistance 10Ω internally compensated (incl. LAW 10Ω)
233	Lead resistance 30Ω internally compensated (incl. LAW 10Ω)
235	Lead resistance 50Ω internally compensated (incl. LAW 10Ω)
245	Internal reset button (extra code with TB)
056	DIN approval <sup>2</sup>
057	SIL certification and DIN approval <sup>2</sup>
062	GL approval (Germanischer Lloyd)

1. Internal reset button necessary for annual test (as standard)

2. Only possible if the permissible range values are observed.

Accessories
External reset button RT Sales-No. 70/97097865
Mounting plate BS Sales-No. 70/00059172
Lead compensation resistor LAW (10Ω) Sales-No. 70/00322800

### DIN 3440

Instruments with approval to DIN 3440 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 approved to DIN 3440, 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](http://www.jumo.net) → Products

## Available from stock

Type	Setting range	Transducer	Sales No.
701130/0253-001-02/205, 245	0 to 120°C	1xPt100	70/00335259
701130/0253-001-02/205, 245	0 to 400°C	1xPt100	70/00335260
701130/0253-001-02/205, 245	200 to 500°C	1xPt100	70/00335261
701130/0253-043-02/206, 245	600 to 1000°C	2xNiCr-Ni K	70/00335262
701130/0254-001-02/205, 245	0 to 400°C	1xPt 100	70/00335263
701130/0151-001-02/205	0 to 300°C	1xPt100	70/00335264
External reset button RT	—	—	70/97097865
Mounting plate	—	—	70/00059172