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JUMO GmbH & Co. KG
Delivery address: Mackenrodtstraße 14, 36039 Fulda, Germany
Postal address: 36035 Fulda, Germany
Phone: +49 661 6003-0
Fax: +49 661 6003-607
e-mail: mail@jumo.net
Internet: www.jumo.net

JUMO Instrument Co. Ltd.
JUMO House
Temple Bank, Riverway
Harlow, Essex CM 20 2TT, UK
Phone: +44 1279 635533
Fax: +44 1279 635262
e-mail: sales@jumo.co.uk
Internet: www.jumo.co.uk

JUMO Process Control, Inc.
8 Technology Boulevard
Canastota, NY 13032, USA
Phone: 315-697-JUMO
1-800-554-JUMO
Fax: 315-697-5867
e-mail: info@jumo.us
Internet: www.jumo.us

JUMO safetyM TB/TW Temperature limiter, temperature monitor according DIN EN 14 597

with LCD for mounting on 35mm DIN rails

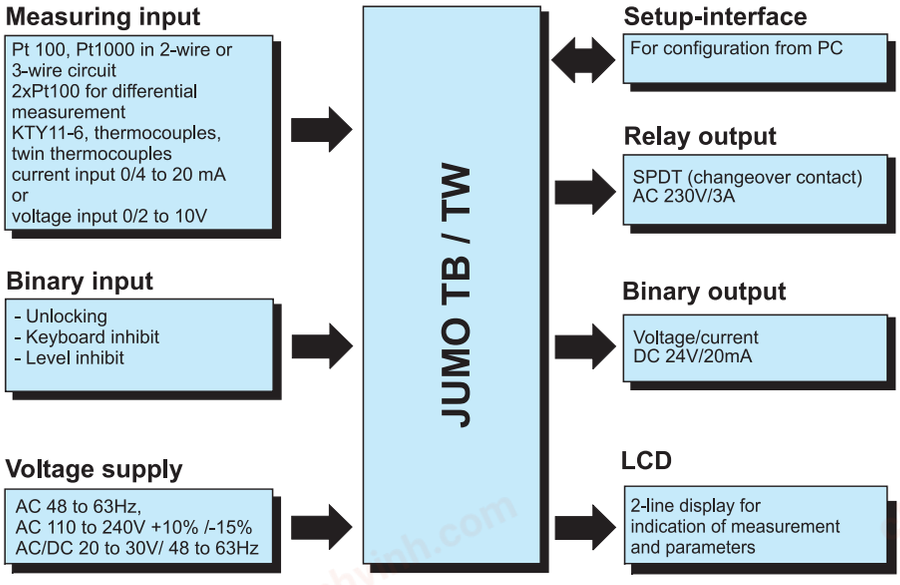


Typ 701160/ ...

Brief description

The JUMO safety**M** TB/TW is a freely programmable temperature limiting device.
The measurement input is freely configurable for RTD temperature probes and thermocouples, as well as for current and voltage signals.
TB/TWs monitor thermal processes in systems for a set limit value.
If this is exceeded, the
built-in relay (with internal fuse) switches the system to a safe operational state and the LED K1 switches from green to red.
When the system returns to the o.k. region, the reset button (on the TB) has to be released manually using an appropriate tool.
The TW, on the other hand, is reset automatically without any external action.
The binary output 24V/20mA produces a pre-alarm signal at an adjustable temperature before reaching the limit value, which is additionally indicated via the LED KV.
TB/TWs are mounted on DIN rails and wired up by means of screw terminals with 2.5mm² max. conductor cross-section.
A PC setup program is available as an accessory, which can be used to set and store probe type, range, output action and inhibits.

Block diagram



Special features

- Setup program for configuration and archive data backup
- Clear, easy-to-read alphanumerical display
- Digital input filter with adjustable filter time constant
- adjustable as absolute value or relative to limit value
- Wide supply voltage range 110 — 240V AC +10% /-15%
- Configurable as TB or TW
- 17 linearizations can be set
- Internal and external locking options
- input 2 x Pt100 for differential measure-ment

Approval/approval marks (see technical data)

2011-12-31/00506174

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Technical data

Analog inputs

RTD temperature probe

Designation	Measuring range	Accuracy[1]
Pt 100 EN 60751	-200 … +850°C	0.1%
KTY11-6 PTC	-50 ... 150°C	1%
Pt 1000 DIN	-200 … +850°C	0.1%
connection types	2-wire, 3-wire circuits	
Sampling	210ms	
Input filter	2nd order digital filter; filter constant adjustable from 0 to 100secs	
Special features	2x Pt100 for differential measurement, display can also be programmed in °F	

thermocouples

Designation	Measuring range	Accuracy[1]
Fe-CuNi "L" DIN 43710	-200 to +900°C	0.4%
Fe-CuNi "J" EN 60584	-200 to +1200°C	0.4%
Cu-CuNi "U" DIN 43710	-200 to +600°C	0.4%
Cu-CuNi "T" EN 60584	-200 to +400°C	0.4%
NiCr-Ni "K" EN 60584	-200 to +1372°C	0.4%
NiCrSi-NiSi "N" EN 60584	-100 to +1300°C	0.4%
Pt10Rh-Pt "S" EN 60584	0 to +1768°C	0.4%
Pt13Rh-Pt "R" EN 60584	0 to +1768°C	0.4%
Pt30Rh-Pt6Rh "B" EN 60584	300 to 1820°C	0.4%
W3Re-W25Re "D"	0 ... 2495°C	0.4%
Cold junction	Pt 100, internal	
Cold junction accuracy	± 1K	
Sampling rate	210 ms	
Input filter	2nd order digital filter; filter constant adjustable from 0 to 100secs	
Special features	also programmable in °F	

1. Accuracy refers to the maximum extent of the measuring range.
If the measuring range is smaller, the linearisation accuracy is reduced .

DC voltage, DC current

Measuring range	Accuracy
0 to 20mA, voltage drop < 2 V 4 to 20mA, voltage drop < 2 V	0.2%
0 to 10V, input resistance > 100 kΩ 2 to 10V, input resistance > 100 kW	0.1%
Scaling	freely programmable within the limits
Sampling rate	210 ms
Input filter	2nd order digital filter; filter constant adjustable from 0 to 100secs

Measuring circuit monitoring

	RTD temperature probe and KTY11-6	Twin thermocouples	Thermocouples	Current 0 to 20 mA, 4 to 20mA Voltage 0 to 10 V, 2 to 10 V
Overrange and underrange	is detected LEDs K1 and KV light up; "1999" flashes in the display			
Probe and lead break	is detected LEDs K1 and KV light up; "1999" flashes in the display; relay K1 is active.			is detected at 4 to 20mA and 2 to 10V LEDs K1 and KV light up; "1999" flashes in the display Relay K1 is inactive
Probe short circuit	is detected LEDs K1 and KV light up;"1999" flashes in the display Relay K1 is inactive		is **not** detected	

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Binary input

connection	Function
1 floating contact	Configurable unlocking, keyboard inhibit, level inhibit

Binary outputs

Relay	100.000 operations at a contact rating of 3.15A/250V, 50Hz resistive load
	contact suppression safety fuse 3.15AT, installed in the pole contact arm within the device
Binary output	24 V DC / 20mA logic signal, short-circuit proof

Voltage supply

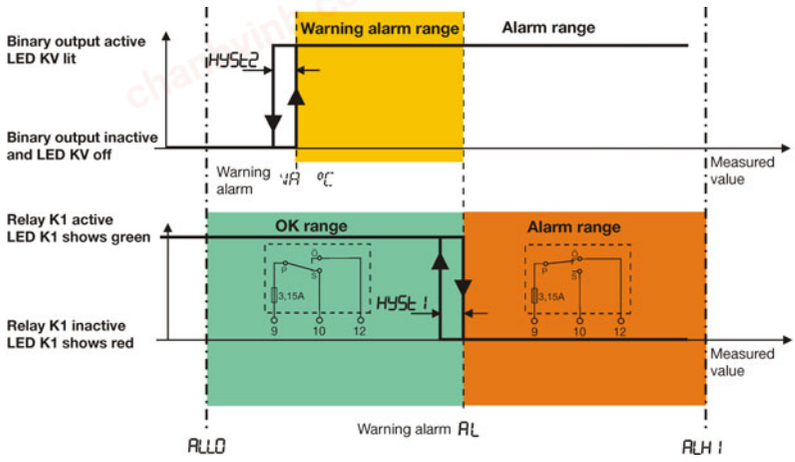
voltage supply	20 - 30V AC/DC, 48 ...63 Hz 110V/240V AC, +10% /-15%
Power consumption	5 VA

Aapproval/Marks

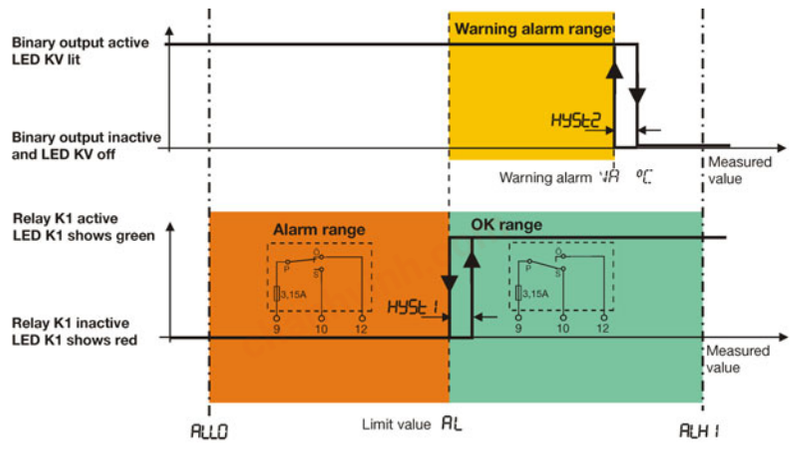
approval marks	Inspection authority	Certificate/Inspection numbers	inspection basics	valid for
DIN	DIN CERTCO	TW/TB 1206 08	DIN EN 14597	all instrument versions
c UL us	Underwriters Laboratories	20091123-E325456	UL 60730-2-9	all instrument versions

Switching action at limit value

Switching action inverse



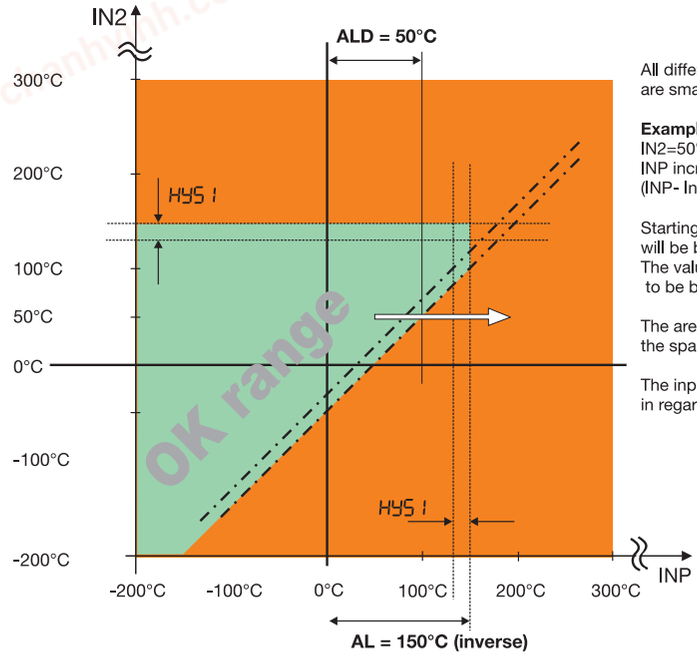
Switching action direct



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Switching action at differential measurement

Switching action inverse



All difference values within the OK range (green) are smaller than the setting for ALD=50K

Example (refer to arrow):
IN2=50°C
INP increases to 101°C and leaves the OK range (INP- In2 ≥ ALD) (101K-50K=51K).

Starting at a value of INP=99 the difference value will be back in the OK range.
The value of INP must drop additionally the hysteresis to be back into the OK range. INP=99

The area between the dot and dash lines indicate the span of the hysteresis (factory setting: 1K)

The inputs INP and IN2 are additionally monitored in regards to the limit value AL=150

Test voltages to EN 60730, Part 1

Between input or output and supply	
- at 110 - 240 V AC supply +10% /-15%	3.7kV/50Hz
- at 20 - 30V AC/DC supply, 48 - 63 Hz	3.7kV/50Hz

Electrical safety

	Clearances / creep paths
Mains to electronic components and probe	≥ 6 mm / ≥ 8 mm
Mains to the relay	≥ 6 mm / ≥ 8 mm
Relay to electronic components and probe	≥ 6 mm / ≥ 8 mm
Electrical safety	according to DIN EN 14597 (DIN EN 60730-2-9) Overvoltage category III, pollution degree 2
Protection type I	with internal separation to SELV current circuits

Environmental influences

Ambient temperature range	0 ... +55°C
Storage temperature range	-30 ... +70°C
Temperature error	≤ ± 0.005 % / K dev. from 23°C[1] for resistance thermometers
	≤ ± 0.01 % / K dev. from 23°C[1] for thermocouple, current, voltage
Climatic conditions	85 % rel. humidity, no condensation (3K3 with extended temperature range to EN 60721)
EMC	to EN 14597 and standards from the EN 61326 series of standards
Interference emission	Class B
Interference immunity	Test level for safety, control and regulating instruments (RS) to EN 14597

1. All details refer to the full scale value

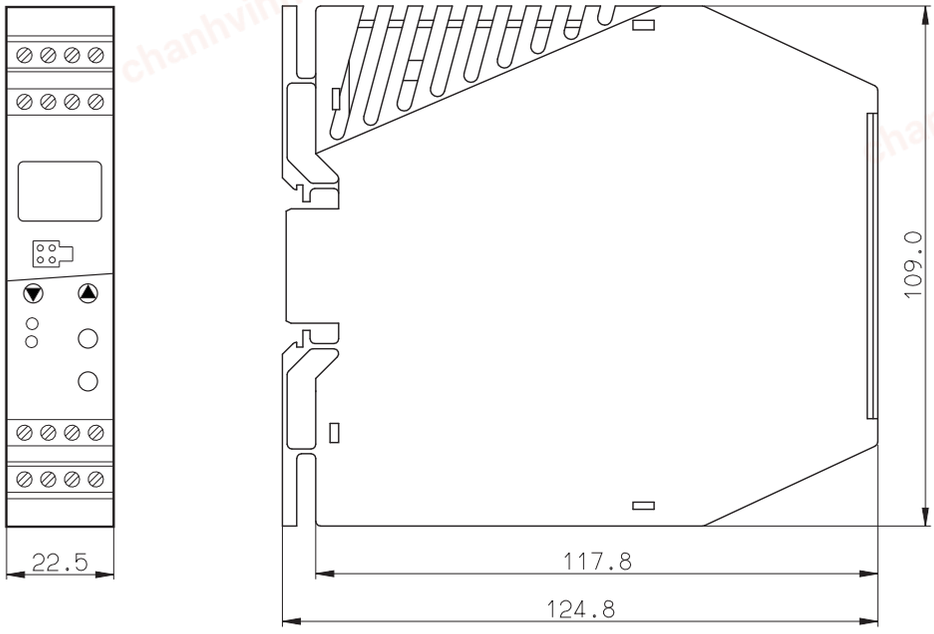
Housing

Material	polyamide (PA 6.6)
Screw terminal	0.2 - 2.5mm^2 screw terminal
Mounting	on 35mm x 7.5mm DIN rail to EN 60715
mounting position	vertical
Weight	approx. 160g
Protection type	IP 20 to EN 60529

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Dimensions

Type 701160/...



DIN-approved probes for operation in 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
RTD temperature probe Data Sheet 90.2006					
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, 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 G1/2 compression clamp
902006/55-228-2003-1-15-710-254/000	-			710	
902006/55-228-2003-1-15-1000-254/000	-			1000	
Thermocouples Data Sheet 90.1006					
901006/65-547-2043-15-500-668/000	90.019-F01	2 x NiCr-Ni, Type „K“	-35 ... +800°C	500	Stop flange, 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, 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	

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DIN-approved probes for operation in 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
RTD temperature probe Data Sheet 90.2006					
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 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	
Thermocouples Data Sheet 90.1006					
901006/54-544-2043-15-710-254/000	90.020-F02	2 x NiCr-Ni, Type „K“	-35 ... 550°C	65...670	movable 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	

DIN-approved probes for operation in 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
RTD temperature probe Data Sheet 90.2006					
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 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	
Thermocouples Data Sheet 90.1006					
901006/54-544-2043-15-710-254/000	90.020-F02	2 x NiCr-Ni, Type „K“	-35 ... 550°C	65...670	movable 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	

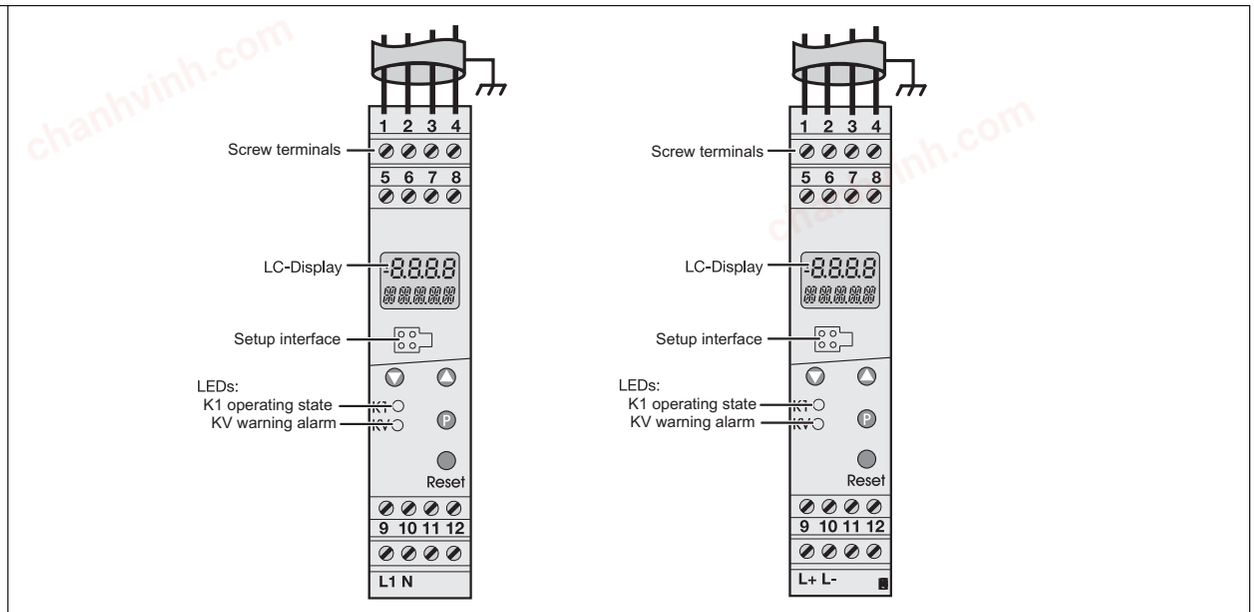
DIN-approved probes for operation air, water and oil

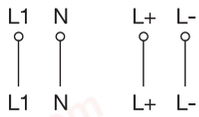
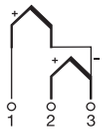
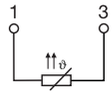
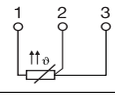
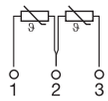
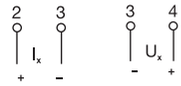
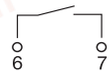
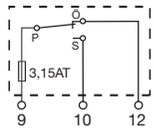
Note: Because of the high response accuracy, the use of **thermowells** (pockets) is **not admissible**.

Actual type designation	Old type designation	Probe type	Temperature range	Install. length mm	Process connection
RTD temperature probe Data Sheet 90.2006					
90.2006/10-390-1003-1-8-250-104/000	90.210-F95	1 x Pt100	max. 300°C	250	
Thermocouples Data Sheet 90.1006					
901006/45-551-2043-2-xxxx-11-xxxx		2 x NiCr-Ni, Type „K“	max. 1550°C	50...2000	

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Connection diagram



	Voltage supply as on nameplate	**AC** L1 External conductor N Neutral conductor	**DC** L+ L-	
	Analog inputs	Thermocouple		
		Twin thermocouple		
		RTD temperature probe or KTY11-6 PTC in 2-wire circuit If an RTD temperature probe in 2-wire circuit with longer cable lengths is connected, the lead resistance must be entered into the setup program and transmitted to the device.		
		Resistance thermometer in 3-wire circuit		
		Resistance thermometers 2 x Pt100 in 2-wire circuit for differential measurement (lead compensation not possible)		
		0(4) ... 20 mA or 0(2) ... 10 V		
	Binary input	for connection to floating contact		
	Binary output	24 V DC / 20 mA (short-circuit proof)		
	Relay output	Relay with safety fuse for pole contact		

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Order details

Basic type

701160 — Temperature limiter (TB) / temperature monitor (TW)

Version

8	factory setting
9	configuration to customer specification

Switching action

0151	Inverse temperature monitor
0152	Direct temperature monitor
0153	Inverse temperature limiter
0154	Direct temperature limiter

Measurement input (programmable)

001	Pt100 in 3-wire circuit
003	Pt100 in 2-wire circuit
005	Pt1000 in 2-wire circuit
006	Pt1000 in 3-wire circuit
024	2 x Pt100 for differential measurement
037	W3Re-W25Re "D"
039	Cu-CuNi "T"
040	Fe-CuNi "J"
041	Cu-CuNi "U"
042	Fe-CuNi "L"
043	NiCr-Ni "K"
044	Pt10Rh-Pt "S"
045	Pt13Rh-Pt "R"
046	Pt30Rh-Pt6Rh "B"
048	NiCrSi-NiSi "N"
052	0 - 20 mA
053	4 - 20 mA
063	0 - 10 V
071	2 - 10 V
601	KTY11-6

Supply

23	110 - 240 V AC +10% /-15%, 48 - 63 Hz
25	20 - 30 V AC/DC, 48 - 63 Hz

701160 / 8 - 0153 - 001 - 23

factory setting

Scope of delivery

1 JUMO safety**M** TB/TW in the ordered version
1 Operating Instructions 701160.0

Accessories

	Sales No.
Setup Programm, multilingual	70/00514193
PC interface with TTL/RS232 converter and adapter (socket)	70/00350260
PC interface with USB/TTL converter, adapter (socket) and adapter (pins)	70/00456352
External reset button RT	70/97097865