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JUMO exTHERM-DR
Two-state controller with ATEX and IECEX approval

Brief description

The JUMO exTHERM-DR is a two-state controller for heating or cooling applications. The intrinsically safe **Ex (ia)** measurement input allows the direct connection of the corresponding type tested probes. Use of a barrier is no longer required.
Other than the relay output "Controller" K1, the JUMO exTHERM-DR also has the second relay output K2. It signals when limit values have been exceeded or are not met.
Alternatively, a binary signal of 0/10 V is also available for the controller output or the limit value signaling.
The current measured value or the setpoint value is issued via the standard analog output.
The vibrant display for plain text and with backlight shows information about measured value, setpoint value, limit value, etc. in a clearly arranged manner.
Clear operation enables quick configuration and thereby reduces the startup times.
Alternatively, the configuration and parameterization can also take place via a setup program and the standard USB interface.

Devices with **blue** terminals are marked as follows:

II (1) G [Ex ia Ga] IIC

II (1) D [Ex ia Da] IIIC

Devices with **black** terminals are marked as follows:

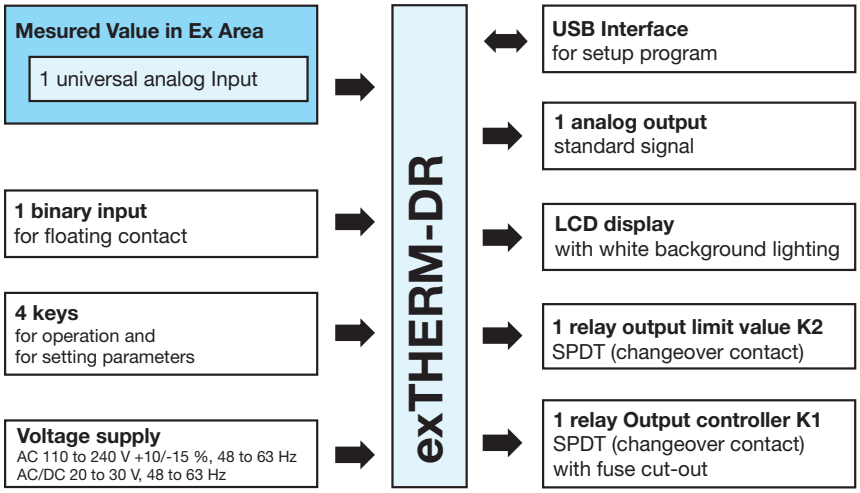
II (2) G [Ex eb Gb] IIC

II (2) D [Ex tb Db] IIIC

Type 701055/ ...044

Type 701055/ ...045

Block diagram



Special features

- Approval according to
  Ex II (1) G [Ex ia Ga] IIC,
  Ex II (1) D [Ex ia Da] IIIC
  Ex II (2) G [Ex eb Gb] IIC
  Ex II (2) D [Ex tb Db] IIIC
- Controller output (relay)
- Limit value output (relay) for alarm indication
- Analog output configurable as actual value output, setpoint value output, or logic output 0/10 V for control of solid state relay
- LCD display for process information
- USB interface on front and setup program for simple startup

Approvals/approval marks (see "Technical data")

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Technical data

Analog inputs

RTD temperature probes

Designation	Measuring range	Accuracy Two/three-wire circuit[1]	Ambient temperature influence
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 line resistance in two-wire circuit: 15 Ω; three-wire circuit: 30 Ω		
Sampling rate	210 ms		
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100 s		
Special features	Individual probe Pt100 two-wire, display can also be programmed in °F		

Thermocouples

Designation	Measuring range	Accuracy[1]	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 %[2]	100 ppm/K
NiCrSi-NiSi "N" DIN EN 60584-1:1996-10	-100 to 1300 °C	0.4 %[2]	100 ppm/K
W3Re-W25Re "D" ASTM E1751M-09 (up to 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		
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100 s		

1. The accuracy refers to the maximum measuring range.
2. The accuracy specifications are only guaranteed as of 300 °C.

Direct current

Measuring range	Accuracy	Ambient temperature influence
4 to 20 mA, voltage drop < 2 V	0.2 %	150 ppm/K
Scaling	Can be freely programmed within the limits	
Sampling rate	210 ms	
Input filter	Digital filter, 2nd order; filter constant can be set from 0 to 100 s	
Special features	Individual 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/100 Ω	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					
Logic output	Binary signal 0/10 V	≤ 0.5 %	± 0.5 %	±15 mV	150 ppm/K	≥ 500 Ω

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Digital input

Connection	Function
1 potential-free contact	Keyboard lock, level inhibit configurable

Relay outputs

Relay output controller K1	Relay (changeover contact) **Contact protection circuit:** fuse cut-out 3.15 AT, installed in the N/O contact arm 30000 switching operations at a switching capacity of AC 230 V, 3 A, 50 Hz (resistive load) or up to DC 30 V, 3 A. Minimum current: DC 12 V, 100 mA.
Relay output limit value K2	Relay (changeover contact) without contact protection 30000 switching operations at a switching capacity of AC 250 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 probes	Thermocouples	Current 4 to 20 mA
Overrange and underrange	is detected in the display, ">>>>" flashes for overrange and "<<<<" for underrange.		
Probe/cable break	is detected ">>>>" flashes in the display; relay output controller K1 is inactive		">>>>" flashes in the display; relay output controller K1 is inactive
Probe short circuit	is detected "<<<<" flashes in the display; relay output controller K1 is inactive	is not detected	"<<<<" flashes in the display; relay output controller K1 is inactive

Voltage supply

Voltage supply	AC/DC 20 to 30 V, 48 to 63 Hz, AC 110 to 240 V+10 % /-15 %, 48 to 63 Hz
Power consumption	12 VA
Power loss	< 12 W

Test voltages according to EN 60730, Part 1

Input and output against voltage supply	
- With a voltage supply AC 110 to 240 V+10 % /-15 %	3.7 kV/50 Hz
- With a 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 relays	≥ 6 mm / ≥ 8 mm
Relays to electronic components and probes	≥ 6 mm / ≥ 8 mm
Electrical safety	According to DIN EN 60730-1, overvoltage category III, pollution degree 2
Protection rating I	With internal isolation from SELV electrical circuits

Environmental influences

Ambient temperature range	0 to +55 °C
Storage temperature range	-30 to +70 °C
Temperature influence	≤ ±0.005 %/K dev. from 23 °C[1] for RTD temperature probes
	≤ ± 0.01 %/K dev. from 23 °C[1] for thermocouple, current
Resistance to climatic conditions	85 % rel. humidity without condensation (3K3 with extended temperature range according to DIN EN 60721-3-3)
EMC	Standards from the standards series DIN EN 61326
Interference emission	Class B

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Interference immunity	According to DIN EN 60730

1. All specifications refer to the measuring range end value

Housing

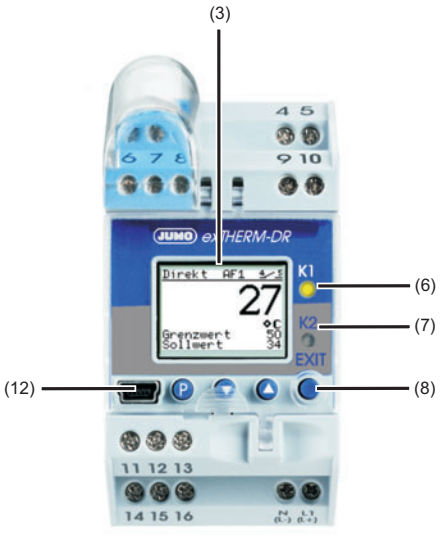
Material	Polycarbonate
Flammability class	UL 94 V0
Electrical connection	On the front via screw terminals up to max. 2.5 mm^2
Mounting	On 35 mm DIN rail according to DIN EN 60715
Installation position	Vertical
Weight	Approx. 230 g
Protection type	IP 20 according to DIN EN 60529

Approvals/approval marks

Approval mark	Test facility	Certificate/certification numbers	Inspection basis	Valid for
ATEX "i"	TÜV Nord (German Technical Inspection Agency)	TÜV 15 ATEX 163874 X	Directive 94/9/EC	Devices with **blue** terminals
IECEx "i"	TÜV Nord (German Technical Inspection Agency)	IECEx TUN 16.0022X	IEC 60079-0 IEC 60079-11	
ATEX "e" and "t"	Eurofins / Electrosuisse Product Testing	SEV 17 ATEX 0177 X	Directive 2014/34/EU	Devices with **black** terminals

Display and control elements

Legend	Comment
3	**LCD display** Black/white with background lighting, 96 x 64 pixels
6	**LED K1 (yellow)** Lights up when the relay output controller K1 is active.
7	**LED K2 (yellow)** Lights up when the relay output limit value K2 is active.
8	**Keys** (can only be operated when the transparent hood is folded upward) Increase value, Decrease value Programming EXIT
12	Setup interface



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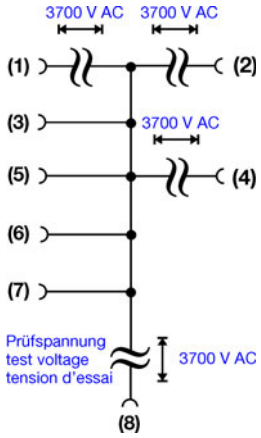
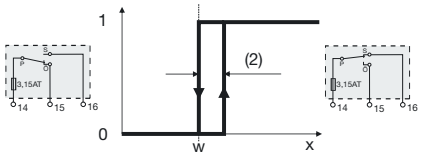
Galvanic isolation

Test voltages: (1) Analog input (3) Digital input (5) Setup interface (6) Display (7) Analog output / logic output (8) Voltage supply		(2) Relay output controller K1 (4) Relay output limit value K2

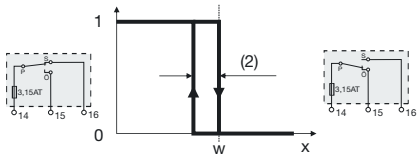
Relay output controller K1

Direct control direction (cooling function)
If the measured value exceeds the setpoint value + hysteresis, relay output controller K1 switches on.
If the measured value is below the setpoint value, the relay switches off.



(2) Hysteresis w Setpoint value

Inverse control direction (heating function)
If the measured value is below the setpoint value + hysteresis, relay output controller K1 switches on.
If the measured value exceeds the setpoint value, the relay switches off.

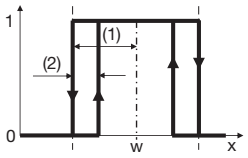


(2) Hysteresis w Setpoint value

Alarm functions

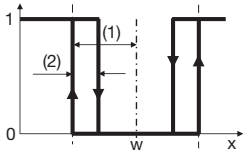
The relay output limit value K2 can be set for monitoring of the following functions.

AF1: ON circuit in the window around the setpoint value



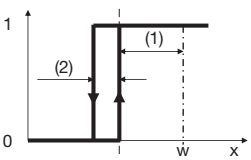
(1) Limit value is gap compared to setpoint value w (2) Hysteresis

AF2: OFF circuit in the window inversely around the setpoint value



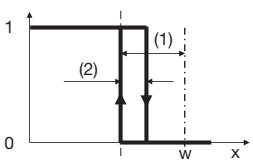
(1) Limit value is gap compared to setpoint value w (2) Hysteresis

AF3: ON circuit before reaching the setpoint value



(1) Limit value is gap compared to setpoint value w (2) Hysteresis

AF4: OFF circuit before reaching the setpoint value



(1) Limit value is gap compared to setpoint value w (2) Hysteresis

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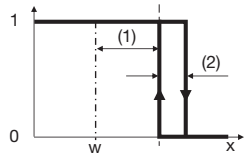
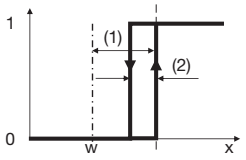
AF5: OFF circuit after exceeding the setpoint value



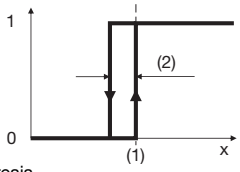
(1) Limit value is gap compared to setpoint value w (2) Hysteresis

AF6: ON circuit after exceeding the setpoint value



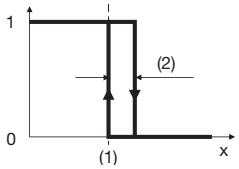
(1) Limit value is gap compared to setpoint value w (2) Hysteresis

AF7: ON circuit from a fixed limit value



(1) Limit value (2) Hysteresis

AF8: OFF circuit from a fixed limit value



(1) Limit value (2) Hysteresis

Connection diagram

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

The connection is made via screw terminals.

Caution:
The cover cap must be removed prior to wiring and put back on when finished.
This is necessary for the proper operation the probes in the Ex-area!

Wire	Admissible cross section
1-wire	≤ 2.5 mm²
Fine-strand, with ferrule	≤ 1.5 mm²

Tightening torque of the screws:
max. 0.5 Nm

Legend	Comment	Screw terminals	Screw terminals
1, 2		**Analog input 1**	**Analog input 2**
	Thermocouple		Terminals 6, 7, and 8 are not used.
	RTD temperature probe in 2-wire circuit		Terminals 6, 7, and 8 are not used.

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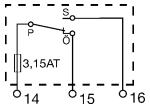
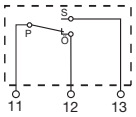
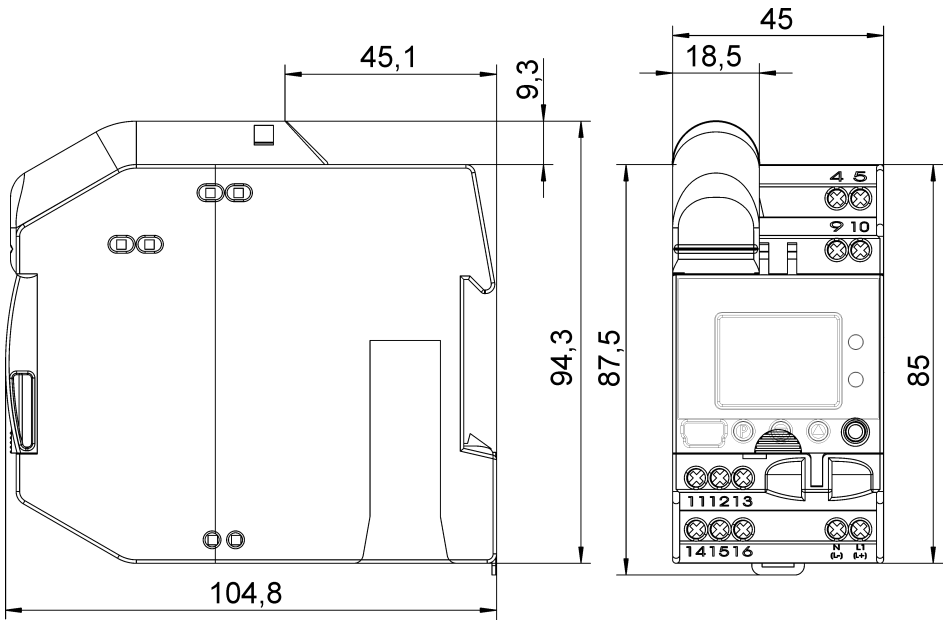
Legend	Comment	Screw terminals	Screw terminals
	Enter the line resistance for RTD temperature probes in two-wire circuit when using greater line lengths. Setup program: *edit => analog inputs*		
	RTD temperature probe Pt100/Pt1000 in three-wire circuit		Terminals 6, 7, and 8 are not used.
	(4) ... 20 mA		Terminals 6, 7, and 8 are not used.
4	**Digital input** Connection to a potential-free contact	Ground 	
5	**Analog output / logic output:** 0 to 20 mA 4 to 20 mA (factory set) 0(2) to 10 V		
9	**Voltage supply** Acc. to nameplate	**AC:** L1 line conductor N neutral conductor 	**DC:** (L+) (L-) 
10	**Relay output controller K1** (zero-current state) Relay (changeover contact) with fuse cut-out		
11	**Relay output limit value K2** (zero-current state) Relay (changeover contact)		

Dimensions

Type 701055/...



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Note about suitable probes

The probes in data sheet 902820, 902821 with JUMO declaration of manufacturer and other approved probes can be connected.

Note about probes in the following tables

The following should be noted:
There is no reliable galvanic isolation between the sensor and housing. As a result, the sensor connections are to be considered grounded for the safety assessment.
Among other things EN 60079-0 requires for the EPL Ga that the mass fraction of aluminum must be less than 10 % for the manufacturing of metallic housings. The terminal head of the probes used by JUMO contains more than 10 % aluminum. The terminal head must therefore be secured by suitable impact protection for the use of EPL Ga (zone 0). The impact protection must securely prevent friction sparks, contact-breaking sparks, and impact sparks. Otherwise there is a risk of ignitable sparks. No other precautions have to be taken when used in EPL Gb (zone 1).

DIN-approved probes for the operating medium air

Note: because of the high response accuracy, **the use of thermowells** (immersion sleeves) **is not admissible**.

Current type designation	Probe type	Temperature range	Nom. length mm	Process connection
RTD temperature probe data sheet 902006				
902006/65-228-1003-1-15-500-668/922	1 × Pt100	-170 to +700 °C	500	
902006/65-228-1003-1-15-710-668/922			710	
902006/65-228-1003-1-15-1000-668/922			1000	
902006/55-228-1003-1-15-500-254/922	1 × Pt100	-170 to +700 °C	500	
902006/55-228-1003-1-15-710-254/922			710	
902006/55-228-1003-1-15-1000-254/922			1000	
902006/65-228-2003-1-15-500-668/922	2 × Pt100	-170 to +700 °C	500	Stop flange displaceable
902006/65-228-2003-1-15-710-668/922			710	
902006/65-228-2003-1-15-1000-668/922			1000	
902006/55-228-2003-1-15-500-254/922	2 × Pt100	-170 to +700 °C	500	Displaceable screw connection G1/2
902006/55-228-2003-1-15-710-254/922			710	
902006/55-228-2003-1-15-1000-254/922			1000	
Thermocouples data sheet 901006				
901006/65-547-2043-15-500-668/922	2 × NiCr-Ni, type "K"	-35 to +800 °C	500	Stop flange displaceable
901006/65-547-2043-15-710-668/922			710	
901006/65-547-2043-15-1000-668/922			1000	
901006/65-546-2042-15-500-668/922	2 × Fe-CuNi, type "L"	-35 to +700 °C	500	
901006/65-546-2042-15-710-668/922			710	
901006/65-546-2042-15-1000-668/922			1000	
901006/66-550-2043-6-500-668/922	2 × NiCr-Ni, type "K"	-35 to +1000 °C	500	
901006/66-550-2043-6-355-668/922			355	
901006/66-550-2043-6-250-668/922			250	
901006/66-880-1044-6-250-668/922	1 × PT10Rh-PT, type "S"	0 to 1300 °C	250	
901006/66-880-1044-6-355-668/922			355	
901006/66-880-1044-6-500-668/922			500	
901006/66-880-2044-6-250-668/922	2 × PT10Rh-PT, type "S"	0 to 1300 °C	250	Stop flange displaceable
901006/66-880-2044-6-355-668/922			355	
901006/66-880-2044-6-500-668/922			500	

Current type designation	Probe type	Temperature range	Nom. length mm	Process connection
901006/66-953-1046-6-250-668/922	1 × PT30Rh-PT6Rh, type "B"	600 to 1500 °C	250	
901006/66-953-1046-6-355-668/922			355	
901006/66-953-1046-6-500-668/922			500	
901006/66-953-2046-6-250-668/922	2 × PT30Rh-PT6Rh, type "B"	600 to 1500 °C	250	
901006/66-953-2046-6-355-668/922			355	
901006/66-953-2046-6-500-668/922			500	

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DIN-approved probes for the operating media water and oil

Note: because of the high response accuracy, **the use of thermowells** (immersion sleeves) **is not admissible**.

Current type designation	Probe type	Temperature range	Nom. length mm	Process connection
RTD temperature probe data sheet 902006				
902006/10-226-1003-1-9-250-104/922	1 × Pt100	-40 to +480 °C	250	Screw connection G1/2
902006/10-226-2003-1-9-250-104/922	2 × Pt100		250	
902006/54-227-2003-1-15-710-254/922	2 × Pt100	-170 to 550 °C	65 to 670	Displaceable screw connection G1/2
902006/54-227-1003-1-15-710-254/922	1 × Pt100		65 to 670	
902006/10-402-1003-1-9-100-104/922	1 × Pt100	-170 to 400 °C	100	Screw connection G1/2
902006/10-402-2003-1-9-100-104/922	2 × Pt100		100	
Thermocouples data sheet 901006				
901006/54-544-2043-15-710-254/922	2 × NiCr-Ni, type "K"	-35 to 550 °C	65 to 670	Displaceable screw connection G1/2
901006/54-544-1043-15-710-254/922	1 × NiCr-Ni, type "K"		65 to 670	
901006/54-544-2042-15-710-254/922	2 × FeCuNi, type "L"		65 to 670	
901006/54-544-1042-15-710-254/922	1 × FeCuNi, type "L"		65 to 670	

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

Current type designation	Probe type	Temperature range	Nom. length mm	Process connection
RTD temperature probe data sheet 902006				
902006/53-505-2003-1-12-190-815/922	2 × Pt100	-40 to +400 °C	190	
902006/53-507-2003-1-12-100-815/922	2 × Pt100 (arranged beneath each other in the sheath)	-40 to +480 °C	100	
902006/53-507-2003-1-12-160-815/922			160	
902006/53-507-2003-1-12-190-815/922			190	
902006/53-507-2003-1-12-220-815/922			220	
902006/53-507-1003-1-12-100-815/922	1 × Pt100	-40 to +480 °C	100	Weldable sleeve
902006/53-507-1003-1-12-160-815/922			160	
902006/53-507-1003-1-12-220-815/922			220	
902006/53-505-1003-1-12-190-815/922	1 × Pt100	-40 to +400 °C	190	
902006/53-505-3003-1-12-100-815/922	3 × Pt100	-40 to +400 °C	100	
902006/53-505-3003-1-12-160-815/922			160	
902006/53-505-3003-1-12-220-815/922			220	
902006/40-226-1003-1-12-220-815/922	1 × Pt100	-170 to +480 °C	220	Weldable sleeve
902006/40-226-1003-1-12-160-815/922			160	
902006/40-226-1003-1-12-100-815/922			100	
Thermocouples data sheet 901006				
901006/53-543-1042-12-220-815/922	1 × Fe-CuNi type "L"	-35 to 480 °C	220	Weldable sleeve
901006/53-543-2042-12-220-815/922	2 × Fe-CuNi type "L"		220	

DIN-approved probes for the operating media air, water, and oil

Note: because of the high response accuracy, **the use of thermowells** (immersion sleeves) **is not admissible**.

Current type designation	Probe type	Temperature range	Nom. length mm	Process connection
RTD temperature probe data sheet 902006				
902006/10-390-1003-1-8-250-104/22	1 × Pt100	max. 300 °C	250	Screw-in threat G1/2
Thermocouples data sheet 901006				
901006/45-551-2043-2-xxxx-11-xxxx	2 × NiCr-Ni, type "K"	max. 1150 °C	50 to 2000	

Important information: The probes described in data sheets 901006 and 902006 are also certified for the Pressure Equipment Directive.
If other probes are used, their suitability must first be tested.

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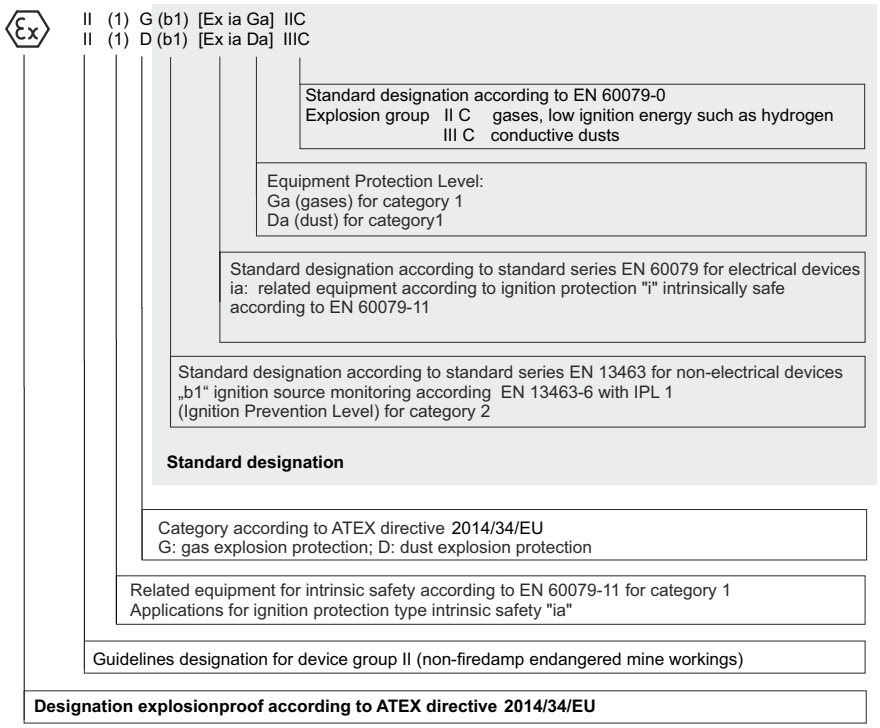
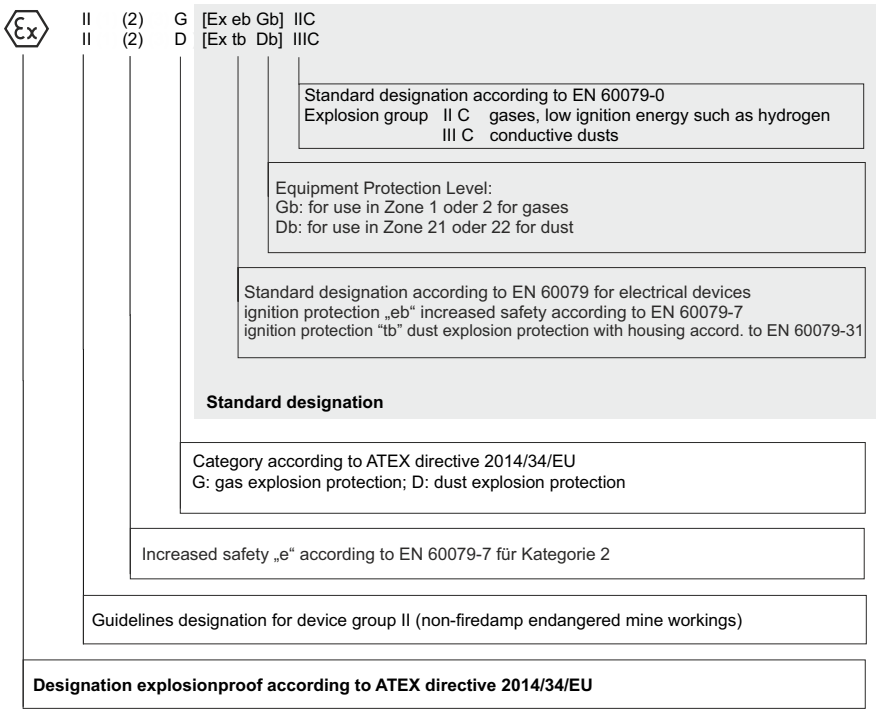
ATEX identification marking, ignition protection type "i"

Type: 701055/...-044 [Ex i]



ATEX identification marking, ignition protection type "e" and "t"

Type: 701055/...-045 [Ex e, t]



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IECEx identification marking

[Ex ia Ga] IIC

Associated apparatus which is set up outside the gas atmosphere but the intrinsically safe electrical circuit "ia" (protection through double protective measures) leads into zone 0.

[Ex ia Da] IIIC

Associated apparatus which is set up outside the dust atmosphere but the intrinsically safe electrical circuit "ia" (protection through double protective measures) leads into zone 20.

Explanation

[Ex ia Ga] IIC
[Ex ia Da] IIIC

Normkennzeichnung gemäß IEC 60079-0
Explosionsgruppe II C Gase, niedrige Zündenergie z.B. Wasserstoff
III C leitfähige Stäube

Normkennzeichnung nach Normenreihe IEC 60079 für elektrische Geräte
ia: Zugehöriges Betriebsmittel nach Zündschutzart „i" Eigensicherheit gemäß IEC 60079-11,
„ia" (2-Fehlersicher) für Kategorie 1
„EPL" (Equipment Protection Level)
Ga (Gase) für Kategorie 1
Da (Staub) für Kategorie 1

Scope of delivery

1 JUMO exTHERM-DR in the ordered version
1 operating manual 70105500T90Z000K000
1 ATEX cover cap for analog input

Order details

					Basic type
701055					exTHERM-DR
					Version
	8				Default setting
	9				Configured acc. to customer specifications
					Voltage supply
		23			AC 110 to 240 V +10 % /-15 %, 48 to 63 Hz
		25			AC/DC 20 to 30 V, 48 to 63 Hz
					Ignition protection type
			044		[Ex ia] associated apparatus, installation outside the Ex-area
			045		[Ex eb, tb] associated apparatus, "eb" for gas, "tb" for dust, installation outside the Ex-area
701055/	**8**	**-**	**23**	**- 044**	

Accessories

Item	Part no.
Setup program, multilingual	00548742
USB cable	00506252

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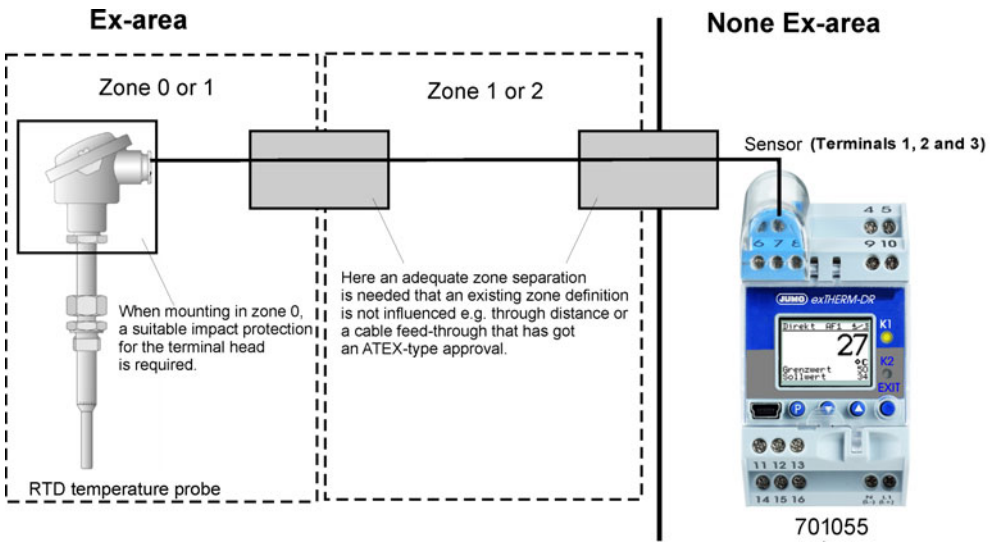
Probe arrangement in the Ex-area

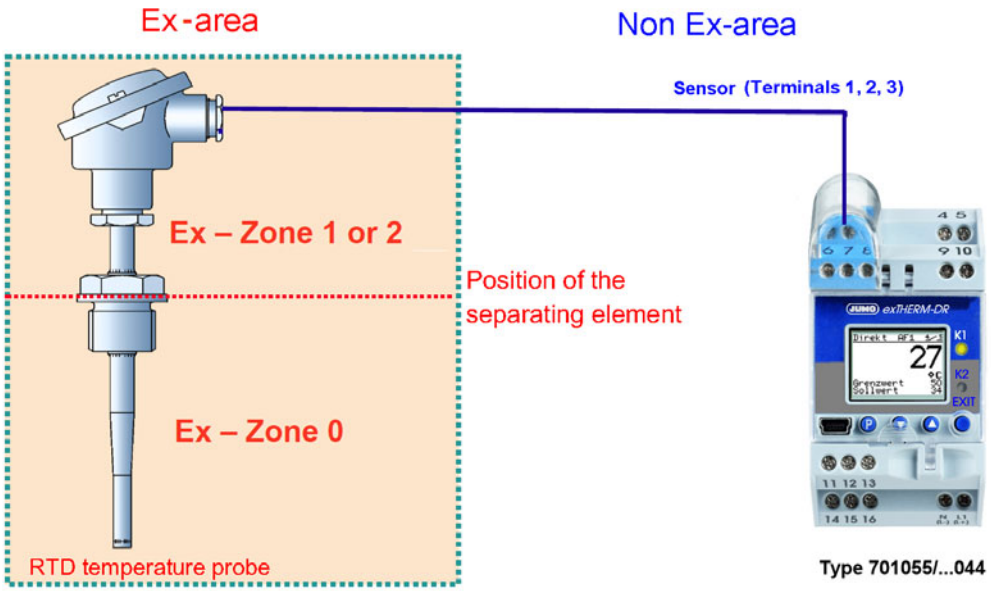
The JUMO exTHERM-DR has the following maximum output data at the intrinsically safe inputs:				
U_o = 6.0 V	I_o = 41.2 mA	P_o = 61.8 mW	C_o = 36.3 µF	L_o = 20 mH

Example: Pt100 with protection tube constant 80 K/W: temperature increase of 80 K/W x 61.8 mW = 4.9 K.
If a separate temperature increase for dust is specified in the technical data sheet from JUMO, this means that the protection fitting is completely covered in dust.



Important information:
The sensor technology specified in Page 8 does not have zone separation.
The type of zone separation as well as the cable selection must be implemented or selected in such a way that the defined zone classifications and their requirements continue to be in place.

Use of a probe with EPL "Gb" with a separation element (DIN EN 60079-26). The figure shows a probe with active zone separation according to DIN EN 60079-26. The terminal head must not be mounted in zone 0!
However, use in zone 0 is permitted below the separation element. The same requirements as in the above figure apply for the zone classification.



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ATEX "e" and "t"