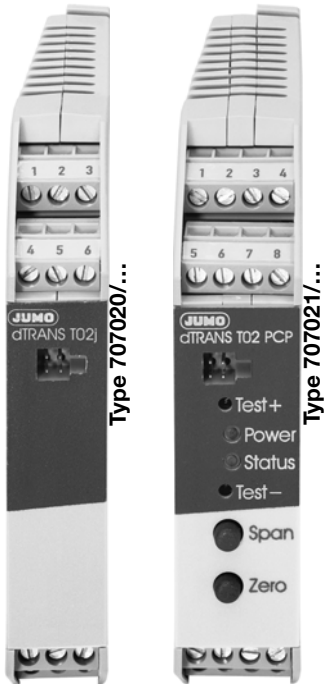
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JUMO dTRANS T02
Programmable 4-wire Transmitter (Smart Transmitter)

with isolation of the standard signal for mounting on DIN rail 35mm x 7.5mm to EN 60715



Brief description

The JUMO dTRANS T02 transmitters incorporate a microprocessor for digital signal processing. Input and output are electrically isolated. They can be mounted on a DIN rail, the electrical connection is by screw terminals for stranded or solid wire up to 2.5mm² conductor cross-section.
Depending on the type, the 0/4 — 20mA or 0/2 — 10V output signal is available either linearized (linear with temperature) or inverted (option). The transmitters can be programmed via the PC setup program, which is supplied as an accessory (sensor type, range, output action, fine calibration, custom linearization).
On types 707021/... and 707022/... it is possible to additionally program the limits of the limit comparators, and the frequency output.
Current and voltage outputs are available directly on terminals. No hardware alterations are required.

Overview of function

	dTRANS T02j (junior) Type 707020/...	dTRANS T02 PCP Type 707021/...	dTRANS T02 LCD Type 707022/...	dTRANS T02 EX Type 707025/...
Housing width	17.5mm	22.5mm	22.5mm	22.5mm
Display	none	2 LEDs	2 LEDs and LCD display	2 LEDs
Keys	none	2 keys	3 keys	2 keys
Supply	24V DC	20 — 53V AC/DC 110 — 240V AC	20 — 53V AC/DC 110 — 240V AC	230V AC 20 — 53V AC/DC
Inputs	thermocouple, resistance thermometer (restricted), potentiometer, voltage (≤100mV), current with ext. shunt	thermocouple, resistance thermometer, resistance transmitter, potentiometer, voltage (up to ±10V), current (up to ±20mA)	thermocouple, resistance thermometer, resistance transmitter, potentiometer, voltage (up to ±10V), current (up to ±20mA)	thermocouple, resistance thermometer, resistance transmitter, potentiometer, voltage (up to ±10V), current (up to ±20mA)
Outputs	0/4 — 20mA, 0 — 10V	0/4 — 20mA, 0/2 — 10V, 2 open-collector	0/4 — 20mA, 0/2 — 10V, 2 open-collector	0/4 — 20mA, 0/2 — 10V
Internal	linearization, customized linearization	linearization, customized linearization, 2 limit comparators or 1 limit comparator and 1 frequency output	linearization, customized linearization, 2 limit comparators or 1 limit comparator and 1 frequency output	linearization, customized linearization 2 limit comparators (indication only via the power and status LEDs)
Operation	fine calibration via setup program	fine calibration and limits via instrument keys and setup program	fine calibration and limits via instrument keys and setup program	fine calibration via instrument keys and setup program



Technical data for type 707020

Input for thermocouple

Designation				Range limits	Range	Accuracy[a]
Fe-Con	L	DIN	43710	-200 to +900 °C	-200 to +900 °C	0.25 %
Fe-Con	J	EN	60584	-210 to +1200 °C	-200 to +1200 °C	0.25 %
Cu-Con	U	DIN	43710	-200 to +600 °C	-200 to +600 °C	0.25%
Cu-Con	T	EN	60584	-270 to +400 °C	-200 to +400 °C	0.25 %
NiCr-Ni	K	EN	60584	-270 to +1372 °C	-150 to +1372 °C	0.25 %
NiCr-Con	E	EN	60584	-270 to +1000 °C	-200 to +1000 °C	0.25 %
NiCrSi-NiSi	N	EN	60584	-270 to +1300 °C	-100 to +1300 °C	0.25 %
Pt10Rh-Pt	S	EN	60584	-50 to +1768 °C	-50 to +1768 °C	0.25 %
Pt13Rh-Pt	R	EN	60584	-50 to +1768 °C	-50 to +1768 °C	0.25 %
Pt30Rh-Pt6Rh	B	EN	60584	0 — 1820 °C	400 — 1820 °C	0.25 %
MoRe5-MoRe41				0 — 2000 °C	500 — 2000 °C	0.25 %
W3Re-W25Re	D			0 — 2495 °C	500 — 2495 °C	0.25 %
W5Re-W26Re	C			0 — 2320 °C	500 — 2320 °C	0.25 %
Shortest span				Type L, J, U, T, K, E, N: 50 °C Type S, R, B: 500 °C Type MoRe5-MoRe41: 500 °C Type D, C: 500 °C		
Range start/end				freely programmable range limits		
Cold junction				Pt100 internal or external cold junction (0 — 80 °C is adjustable)		
Cold junction accuracy				± 1 °C		
Sampling rate				> 1 measurement per second		
Input filter				1st order digital filter; filter constant adjustable from 0 to 125 sec		
Special features				also programmable in °F; input isolated from output		

[a] The accuracy refers to the maximum range span.
For small ranges, as well as for short spans, the linearization accuracy is reduced.

Input for resistance thermometer

Designation		Range limits	Range	Accuracy
Pt 100	EN 60751	-200 to +850 °C	-100 to +200 °C -200 to +850 °C	±0.4 °C ±0.8 °C
Pt 100	JIS	-200 to +649 °C	-100 to +200 °C -200 to +649 °C	±0.4 °C ±0.8 °C
Pt 500	DIN	-200 to +250 °C	-100 to +200 °C -200 to +250 °C	±0.4 °C ±0.8 °C
Pt 1000	DIN	-200 to +250 °C	-100 to +200 °C -200 to +250 °C	±0.4 °C ±0.8 °C
Ni 100		-60 to +180 °C	-60 to +180 °C	±0.8 °C
Ni 500, Ni 1000		-60 to +150 °C	-60 to +150 °C	±0.8 °C
Connection circuit		2-, 3- or 4-wire		
Shortest span		20 °C		
Range start/end		freely programmable range limits		
Sensor lead resistance - for 3-, 4-wire connection - for 2-wire connection		≤ 11 Ω per conductor meas. resistance + ≤22 Ω internal lead resistance		
Sensor current		< 0.6 mA		
Sampling rate		> 1 measurement per second		
Input filter		1st order digital filter; filter constant adjustable from 0 to 125 sec		
Special features		also programmable in °F; input isolated from output		

Input for potentiometer

Range	Accuracy
up to 400Ω up to 2000Ω	±500mΩ ±1Ω
Connection circuit	2-, 3- or 4-wire circuit
Shortest span	6Ω
Resistance values	freely programmable within the limits in 0.1Ω steps
Sensor lead resistance - for 3-, 4-wire connection - for 2-wire connection	 ≤ 11Ω per conductor meas. resistance + ≤22Ω internal lead resistance
Sampling rate	> 1 measurement per second
Input filter	1st order digital filter; filter constant adjustable from 0 to 125sec
Special features	also programmable in °F; input isolated from output

Input for DC voltage, DC current

Range	Accuracy	Input resistance
0 — 100mV	±150µV	R_{IN} > 10 MΩ
Shortest span	5mV	
Range start/end	freely programmable within the limits (up to 999mV in 0.1mV steps, above 1V in 1mV steps)	
Sampling rate	> 1 measurement per second	
Input filter	1st order digital filter; filter constant adjustable from 0 to 125sec	
Current input	The current input can only be implemented in conjunction with an external shunt (not included in delivery). Example: a 5Ω shunt results in 0 — 20mA current input, with a programmed voltage range of 0 — 100mV. The accuracy corresponds to the voltage input plus the inaccuracy of the shunt.	

Measurement circuit monitoring

	Resistance thermometer	Thermocouple
Underrange	linear drop to 3.8mA or 0mA (as per NAMUR recommendation 43)	
Overrange	linear rise to 20.5mA (as per NAMUR recommendation 43)	
Probe short-circuit / Probe/lead break	0mA or ≥ 21.0mA (configurable)	0mA or ≥ 21.0mA (configurable)[a]

[a] Probe short-circuit recognition is not possible for thermocouple.

Analog outputs

	Current output
Output signal	proportional DC current 0 — 20mA or 4 — 20mA programmable
Transfer characteristic	linear with temperature
	inversion of the output signal
Max. burden	750Ω
Burden error	≤ ± 0.02% / 100Ω
1st order digital filter	0 — 125sec configurable
Step response 0 — 100 %	< 2sec (with filter constant 0sec)
Switch-on delay	5sec (correct measurement after connecting the supply voltage)
	Voltage output
Output range	0 — 10V
Accuracy	± 5mV
Linearity error	± 2mV
Load resistance	≥ 2kΩ
Load error	± 15mV
Ripple	± 1% referred to 10V, 0 — 90kHz

Custom linearization

Number of calibration points	40 max.
Interpolation	linear

Electrical data

Supply voltage	24V DC +10%/-15%
Power consumption	1W
Supply voltage error	≤ ± 0.01% per V deviation from 24V
Test voltage	to DIN 61010, Part 1 510V/50Hz, 1min
Isolation - between input and output - between input and mains supply - between output and mains supply - between input and setup plug	 50V 50V 50V no isolation between input and setup plug

Technical data type 707021/..., type 707022/... and type 707025/...

Input for thermocouple

Designation				Range limits	Range	Accuracy[a]
Fe-Con	L	DIN	43710	-200 to +900°C	-200 to +900°C	0.1% above -150°C
Fe-Con	J	EN	60584	-210 to +1200°C	-200 to +1200°C	0.1% above -100°C
Cu-Con	U	DIN	43710	-200 to +600°C	-200 to +600°C	0.1% above -100°C
Cu-Con	T	EN	60584	-270 to +400°C	-200 to +400°C	0.1% above -100°C
NiCr-Ni	K	EN	60584	-270 to +1372°C	-200 to +1372°C	0.1% above -60°C
NiCr-Con	E	EN	60584	-270 to +1000°C	-200 to +1000°C	0.1% above -60°C
NiCrSi-NiSi	N	EN	60584	-270 to +1300°C	-100 to +1300°C	0.1% above -80°C
Pt10Rh-Pt	S	EN	60584	-50 to +1768°C	-50 to +1768°C	0.15% above 0°C
Pt13Rh-Pt	R	EN	60584	-50 to +1768°C	-50 to +1768°C	0.15% above 0°C
Pt30Rh-Pt6Rh	B	EN	60584	0 — 1820°C	400 — 1820°C	0.15% above 400°C
W3Re-W25Re	D			0 — 2495°C	500 — 2495°C	0.15% above 500°C
W5Re-W26Re	C			0 — 2320°C	500 — 2320°C	0.15% above 500°C
Shortest span				Type L, J, U, T, K, E, N: 100°C; type S, R, B, D, C: 500°C		
Range start/end				freely programmable within the limits in 0.1°C steps		
Cold junction				Pt100 internal or external cold junction (adjustable from 0 to 100°C)		
Cold junction accuracy				± 1°C		
Sampling rate				≤ 100msec		
Special features				also programmable in °F; input isolated from output		

[a] The accuracy refers to the maximum range span.
For small ranges, as well as for short spans, the linearization accuracy is reduced.

Input for resistance thermometer

Designation		Connection circuit	Range limits	Range	Accuracy
Pt 100	EN 60751	2/3-wire 2/3-wire 4-wire 4-wire	-200 to +850°C	-100 to +200°C -200 to +850°C -100 to +200°C -200 to +850°C	±0.4°C ±0.8°C ±0.4°C ±0.5°C
Pt 100	JIS	2/3-wire 2/3-wire 4-wire 4-wire	-200 to +649°C	-100 to +200°C -200 to +649°C -100 to +200°C -200 to +649°C	±0.4°C ±0.8°C ±0.4°C ±0.5°C
Pt 500	DIN	2/3-wire 2/3-wire 4-wire 4-wire	-200 to +850°C	-100 to +200°C -200 to +850°C -100 to +200°C -200 to +850°C	±0.4°C ±0.8°C ±0.4°C ±0.5°C
Pt 1000	DIN	2/3-wire 2/3-wire 4-wire 4-wire	-200 to +850°C	-100 to +200°C -200 to +850°C -100 to +200°C -200 to +850°C	±0.4°C ±0.8°C ±0.4°C ±0.5°C
Ni 100		2/3-wire 4-wire	-60 to +180°C	-60 to +180°C -60 to +180°C	±0.8°C ±0.5°C

Designation	Connection circuit	Range limits	Range	Accuracy
Ni 500, Ni 1000	2/3-wire 4-wire	-60 to +150°C	-60 to +150°C -60 to +150°C	±0.8°C ±0.5°C
Connection circuit	2-, 3- or 4-wire circuit			
Shortest span	15°C			
Range start/end	freely programmable within the limits in 0.1°C steps			
Sensor lead resistance	≤ 30Ω per conductor (for 3- and 4-wire circuit) ≤ 15Ω per conductor (for 2-wire circuit)			
Sensor current	< 0.6mA			
Sampling rate	≤ 100msec			
Input filter	2nd order digital filter; filter constant adjustable from 0 to 20.0sec			

Input for resistance transmitter and potentiometer

Range	Accuracy
up to 200Ω up to 400Ω up to 800Ω up to 2000Ω up to 3900Ω	±300mΩ ±600mΩ ±1Ω ±2Ω ±3Ω
Connection circuit	resistance transmitter: 3-wire potentiometer: 2-, 3- or 4-wire
Shortest span	6Ω
Resistance values	freely programmable within the limits in 0.1Ω steps
Sensor lead resistance	≤ 30Ω per conductor for 4-wire circuit ≤ 15Ω per conductor for 2- and 3-wire circuit up to 200Ω range: ≤ 10Ω per conductor for 2- and 3-wire circuit
Sampling rate	≤ 100msec
Input filter	2nd order digital filter; filter constant adjustable from 0 to 20.0sec

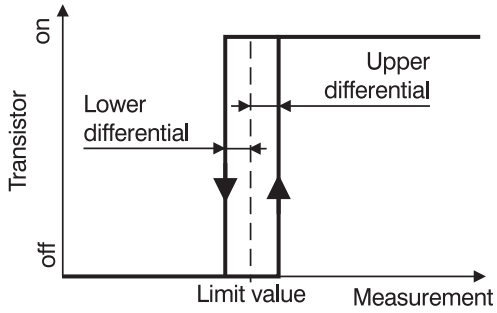
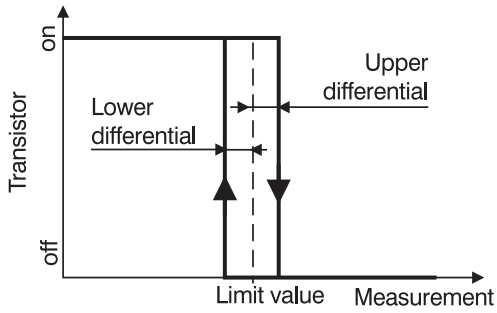
Input for DC voltage, DC current

Range	Accuracy	Input resistance
-25 to +75mV	±100µV	R_{IN} > 10 MΩ
0 to 100mV	±100µV	R_{IN} > 10 MΩ
-100 to +100mV	±150µV	R_{IN} > 10 MΩ
0 to 200mV	±150µV	R_{IN} > 10 MΩ
-500 to +500mV	±1mV	R_{IN} > 10 MΩ
0 to 1V	±1mV	R_{IN} > 10 MΩ
-1 to +1V	±2mV	R_{IN} > 10 MΩ
-5 to +5V	±10mV	R_{IN} > 0.5 MΩ
0 to 10V	±10mV	R_{IN} > 0.5 MΩ
-10 to +10V	±15mV	R_{IN} > 0.5 MΩ
Shortest span	5mV	
Range start/end	freely programmable within the limits (up to 999mV in 0.1mV steps, above 1V in 1mV steps)	
4 to 20mA	±20µA	burden voltage ≤ 2.6V
0 to 20mA	±20µA	burden voltage ≤ 2.6V
-20 to +20mA	±40µA	burden voltage ≤ 2.6V
Shortest span	0.5mA	
Range start/end	freely programmable within the limits in 0.1mA steps	
Sampling rate	≤ 100msec	
Input filter	2nd order digital filter; filter constant adjustable from 0 to 20.0sec	

Analog outputs

	Current output
Output range	proportional DC current 0 — 20mA or 4 — 20mA programmable
Accuracy	± 0.015mA
Linearity error	± 0.005mA
Max. burden	750Ω
Burden error	± 0.01mA
Ripple	± 1% referred to 20mA, 0 — 90kHz; above 90kHz: tested to EN 50081
Output current on probe break, over/underrange	0mA or 22mA (programmable)
	Voltage output
Output range	0 — 10V or 2 — 10V
Accuracy	± 5mV
Linearity error	± 2mV
Load resistance	≥ 2kΩ
Burden error	± 15mV
Ripple	± 1% referred to 10V, 0 — 90kHz
Output voltage on probe break, over/underrange	0V or 11V (programmable)

Digital outputs (only for types 707021/... and 707022/...)

2 open-collector outputs	
Output 1	Ik7 or Ik8 or fault output
Output 2	Ik7 or Ik8 or frequency output
Function Ik7	
Function Ik8	
Switching capacity of open-collector	35V, 100mA
Voltage drop	in switched condition ≤ 1.2V
Short-circuit strength	not available
Frequency output	
Function	the frequency output produces the latest measurement as a frequency; the frequency at range start/end is programmable
Smallest / highest frequency	10Hz / 1000Hz
Error output	
Activation	due to probe break, over/underrange and internal errors (Pt100 of cold junction faulty, EEPROM does not respond)

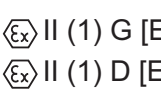
Customized linearization

Interpolation: linear	max. 41 calibration points
Interpolation: square-law	max. 53 calibration points
Interpolation: cube-law	max. 61 calibration points
Input of calibration points	through setup program (accessory)

Electrical data

Supply voltage - types 707021/... and 707022/... - type 707025/...	 20 — 53V AC/DC, 48 — 63Hz or 110 — 240V AC +10/-15%, 48 — 63Hz 230V AC ±10%, 48 — 63Hz or 20 — 53V AC/DC, 48 — 63Hz
Power consumption	max. 5VA
Test voltage - between input or output and supply - with AC supply - with AC/DC supply - between input and output	to DIN 61010, Part 1 2.3kV/50Hz, 1min 510V/50Hz, 1min 510V/50Hz, 1min
Isolation - between input and output - between input and mains supply - between output and mains supply - between output and setup plug	 50V 250V 250V no isolation between output and setup plug

Version 707025/... (Ex)

Marking  	 [Ex ia Ga] IIC [Ex ia Da] IIIC
Ambient temperature range	-10 to +60°C
Supply circuit (terminals L1(L+), N(L-) and PE) Max. safe voltage	230V AC ±10%, 48 — 63Hz or 20 — 53V AC/DC, 48 — 63Hz U_m = 253V
Output circuit (terminals 9(+) and 10(-)) Max. safe voltage	0 — 20mA U_m = 253V
Output circuit (terminals 11(-) and 12(+)) Max. safe voltage	0 — 10V U_m = 253V
Setup circuit Max. safe voltage	5V TTL level U_m = 253V
Sensor circuit (terminals 1 through 5) type of protection Intrinsic Safety Ex ia IIC or Ex ia IIIC Maximum values: For relationship between explosion group and the external reactances reference is made to the table:	U_0 = 6.0V I_0 = 18.9mA P_0 = 28.4mW linear characteristic L_i negligibly low C_i negligibly low

	IIC	IIB	IIA
L_o	20 mH	20 mH	20 mH
C_o	1.3 µF	7.1 µF	10 µF

Approvals/marks of conformity

Mark of conformity	Testing laboratory	Certificates / certification numbers	Test basis	valid for
II (1) G [Ex ia Ga] IIC II (1) D [Ex ia Da] IIIC	PTB	PTB 01 ATEX 2149	EN 60079-0:2012 + A11:2013 EN 60079-11:2012	Type 707025/...
[Ex ia Ga] IIC [Ex ia Da] IIIC	PTB	IECEx PTB 14.0034	IEC 60079-0:2011 IEC 60079-11:2011	Type 707025/...

For all types

Electrical data

Electrical safety	to EN 61010
Electromagnetic compatibility (EMC) - interference emission - immunity to interference	EN 61326-1 Class B[a] to industrial requirements

[a] The product is suitable for industrial use as well as for households and small businesses.

Environmental influences

Ambient/storage temperature range	-10 to +60 °C / -10 to +70 °C
Temperature error	≤ ± 0.005 % per °C deviation from 22 °C[a]
Climatic conditions	< 75 % rel. humidity, no condensation

[a] All specifications refer to the range-end value 20 mA.

Housing

Material	polyamide (PA 6.6)
IP protection	IP20 (EN 60529)
Screw connection	screw terminal 0.2 — 2.5 mm²
Mounting	on 35 mm x 7.5 mm DIN rail to EN 60715
Operating position	upright
Weight	approx. 50 g

Setup interface

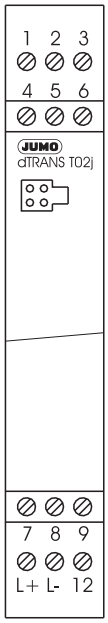
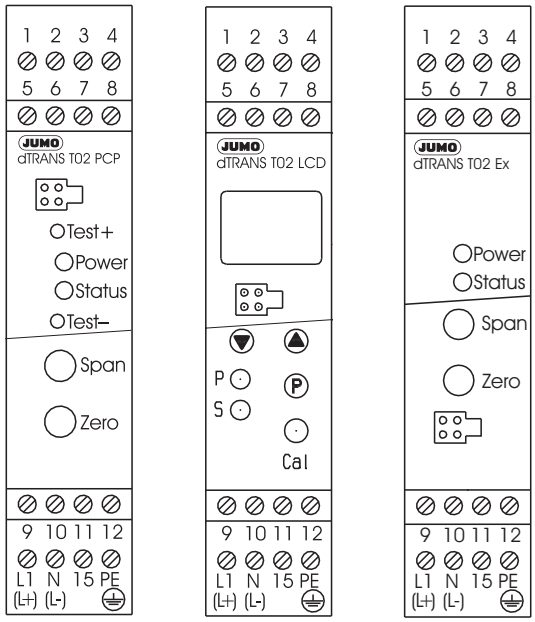
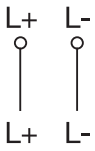
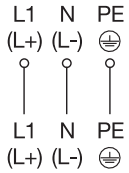
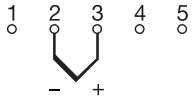
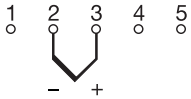
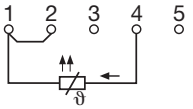
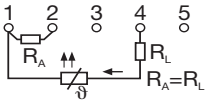
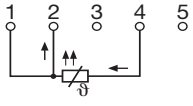
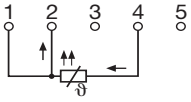
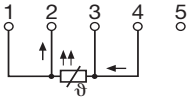
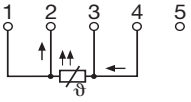
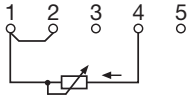
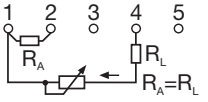
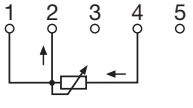
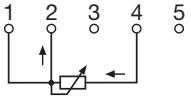
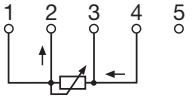
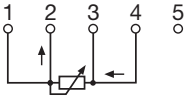
The setup interface is used for configuring the transmitter from a PC. Connection is via the PC interface with a TTL/RS232 converter (or an USB/TTL converter) and adapter.

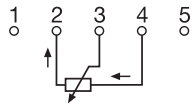
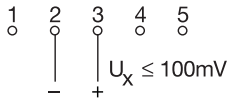
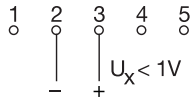
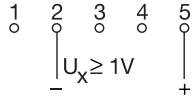
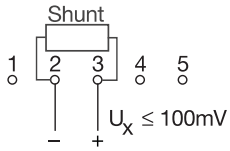
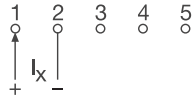
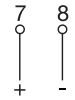
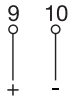
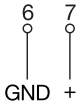
Configurable parameters		
TAG number (6 characters on type 707020/..., for all the others: 10 characters)	Sensor type	Connection circuit (2-/3-/4-wire)
External and internal cold junction	Customized linearization	Range limits
Selection of type lk7 or lk8 (not on type 707020/...)	Input of limit (not on type 707020/...)	Input of differential (upper and lower) (not on type 707020/...)
Output signal rising/falling (inversion)	Digital filter	Response to probe break/short-circuit
Recalibration (fine calibration)	Lead resistance for 2-wire circuit	

Fine calibration

Fine correction means correction of the output signal. The signal can be corrected in the range ± 5 % of the 20 mA end value.
Fine calibration is performed using the setup program.
On type 707021/..., type 707022/... and 707025/... fine calibration can also be carried out from the instrument keys.

Connection diagram

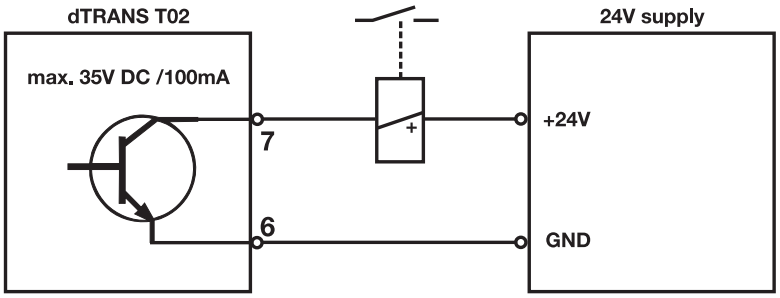
	Type 707020/...	Type 707021/..., Type 707022/... and Type 707025/...
		
Connection for		
Supply see nameplate		
Analog inputs		
Thermocouple		
Resistance thermometer in 2-wire circuit		
Resistance thermometer in 3-wire circuit		
Resistance thermometer in 4-wire circuit		
Potentiometer in 2-wire circuit		
Potentiometer in 3-wire circuit		
Potentiometer in 4-wire circuit		

	Type 707020/...	Type 707021/..., Type 707022/... and Type 707025/...
Resistance transmitter in 3-wire circuit	not possible	
Voltage input < 1V		
Voltage input ≥ 1V	not possible	
Current input	 The voltage drop on the shunt[a] must not exceed 100 mV	
Analog outputs		
Voltage output		
Current output		
Digital outputs		
Open-collector output 1	not possible	 not possible on type 707025/...[b]
Open-collector output 2	not possible	 not possible on type 707025/...[b]

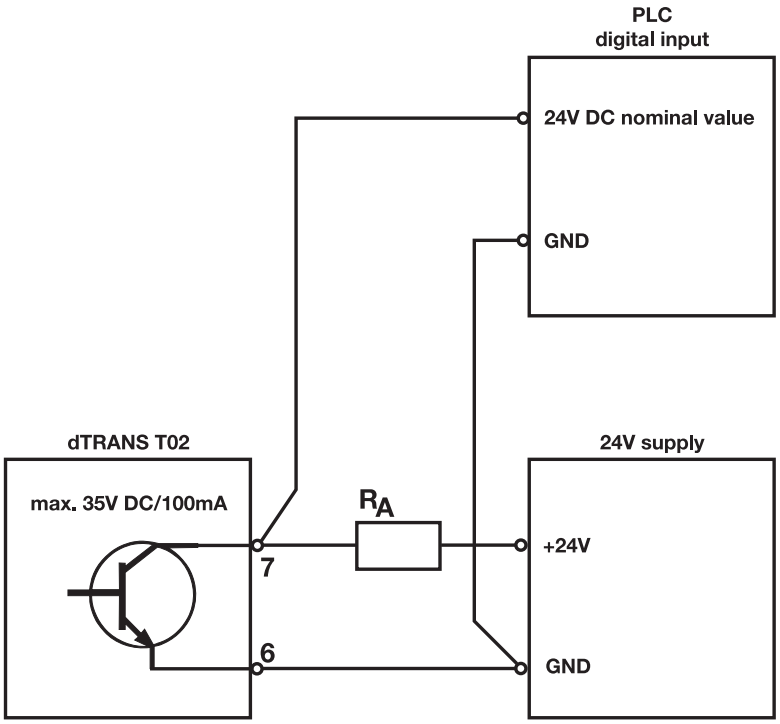
[a] When using a shunt resistor, the signal leads and the shunt must be provided with a crimp connector.
[b] On type 707025/... the limits are indicated only via the status and power LEDs.

Connection example for the open-collector output

Connection of a relay

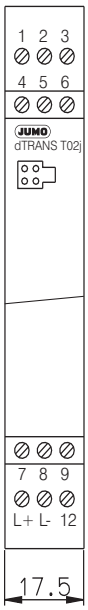


Connection of a PLC

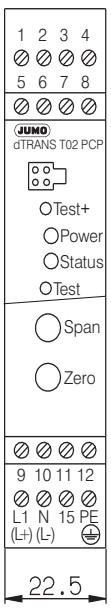


Dimensions

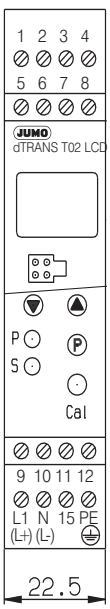
Type 707020/...



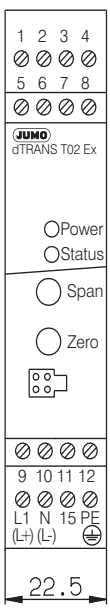
Type 707021/...

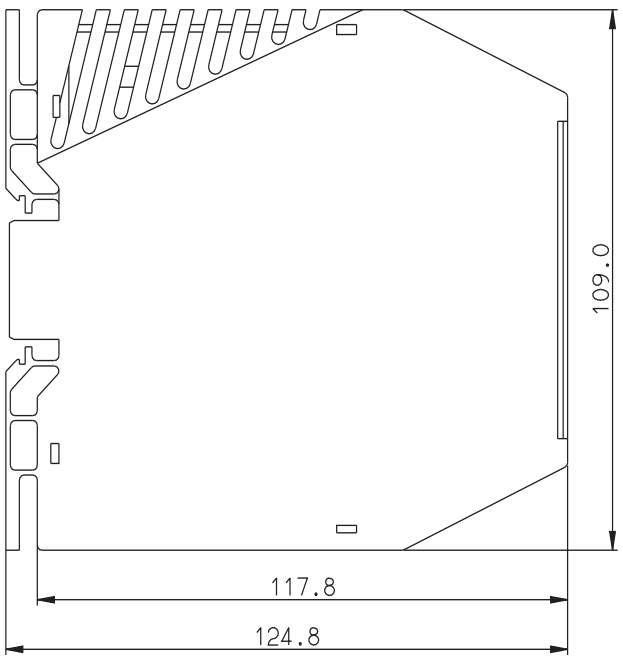


Type 707022/...



Type 707025/...





Order details: JUMO dTRANS T02

Programmable 4-wire Transmitter (Smart Transmitter)

(1) Basic version

707020	dTRANS T02j - programmable transmitter
707021	dTRANS T02 PCP - programmable transmitter
707022	dTRANS T02 LCD - programmable transmitter with LCD display
707025	dTRANS T02 Ex - programmable transmitter Ex protection

(2) Input (programmable)

888	factory-set (Pt100 DIN vl / 0 to 100 °C)
999	configuration to customer specification[a]

(3) Output (proportional DC current - programmable)

888	factory-set (0 — 20 mA)
999	configuration to customer specification (4 — 20 mA or 0 — 10 V or 2 — 10 V)

(4) Supply

03	230 V AC ±10 %, 48 — 63 Hz
22	20 — 53 V AC/DC, 48 — 63 Hz
23	110 — 240 V AC +10/-15 %, 48 — 63 Hz
29	24 V DC +10/-15 %

	(1)		(2)		(3)		(4)
Order code		/		-		-	
Order example	707021	/	888	-	888	-	22

[a] For configuration to customer specification, probe type and range have to be specified in plain text.

Standard accessories

- 1 Operating Instructions

Accessory

	Part no.
- Setup program, multilingual	00378730
- PC interface with USB/TTL converter, adapter (socket) and adapter (pins)	00456352