JUMO dTRANS T05

Programmable 2-Wire Transmitter

B 707050.0

Operating Manual

JUMO

2012-08-13/00576951

Contents

Contents

1.1 Safety information

General information

This manual contains information that must be observed in the interest of your own safety and to avoid damage to assets. This information is supported by symbols which are used in this manual as follows.

Please read this manual before commissioning the device. Keep the manual in a place accessible to all users at all times.

If difficulties occur during commissioning, please refrain from carrying out any manipulations that could jeopardize your warranty rights.

Warning signs

CAUTION!
This symbol in combination with the signal word indicates that **damage to assets or data loss** will occur if suitable precautions are not taken.

Note signs

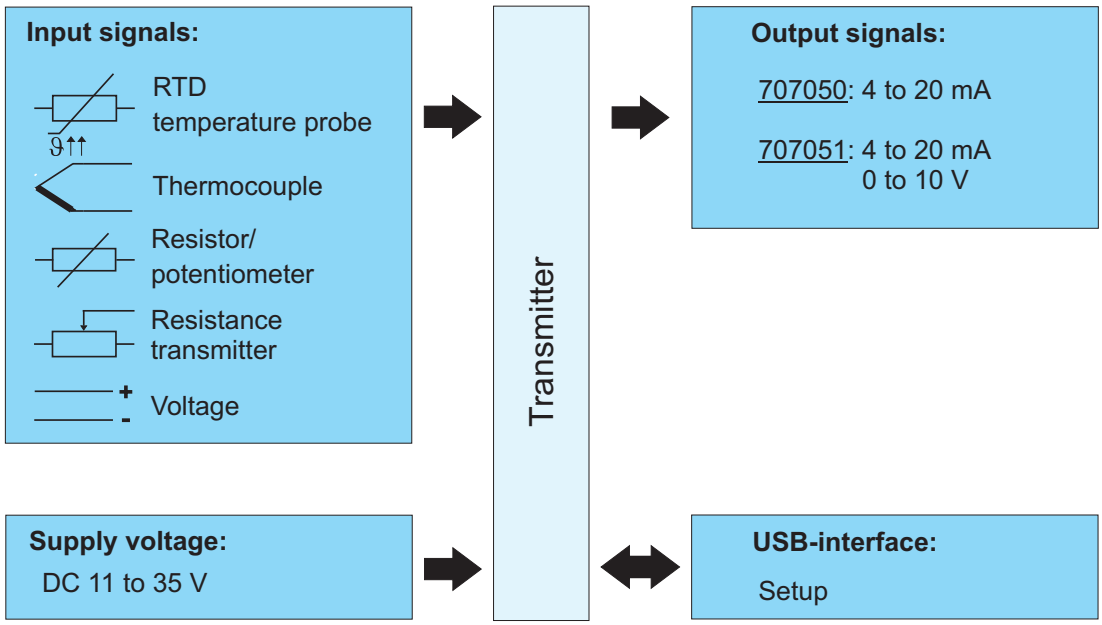
TIP!
This symbol refers to **important information** about the product or its handling or additional use.

1 Introduction

1.2 Brief description

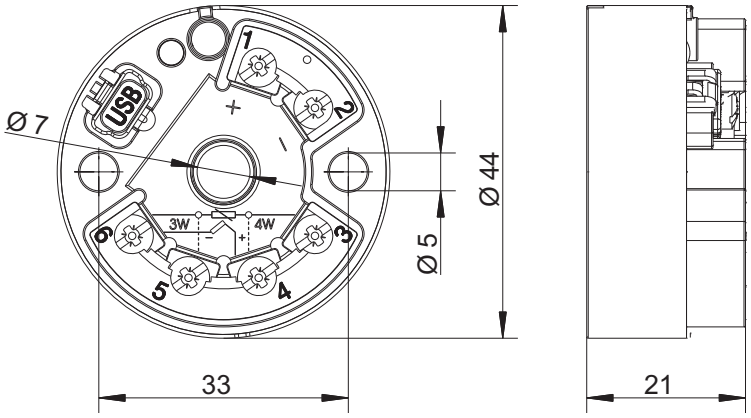
The transmitters record sensor signals from RTD temperature probes, thermocouples, resistance transmitters, or resistances/potentiometers. When using a resistance/potentiometer or RTD temperature probe, the sensor on the input side can be connected with a 2-wire, 3-wire, or 4-wire circuit. Voltage signals in the range from -100 to +1100 mV can be recorded in the same way. Depending on the selected measuring input, the linear and temperature-linear linearization variants and the possibility of easily configurable customer specific linearization are available.
Type 707050 delivers 4 to 20 mA as an output signal. Type 707051 delivers 4 to 20 mA or 0 to 10 V as an output signal. The measuring input and the output signal are electrically isolated from one another. It is possible to reverse the output signal in both types.
The transmitter configuration with respect to probe type, probe connection technology, measuring range (freely configurable), and linearization is carried out by means of a setup program on the PC. The connection to the PC is established via a USB interface which does not require additional auxiliary voltage. Via the USB interface, the min./max. process value and the min./max. operating temperature recorded by the transmitter can be read and the sensor wiring can be checked online.
The operating status of the transmitter is indicated by a two-color control LED (red/green). This is lit green during fault-free operation. A fault such as a probe break will be shown by the corresponding LED indication.

1.3 Block diagram

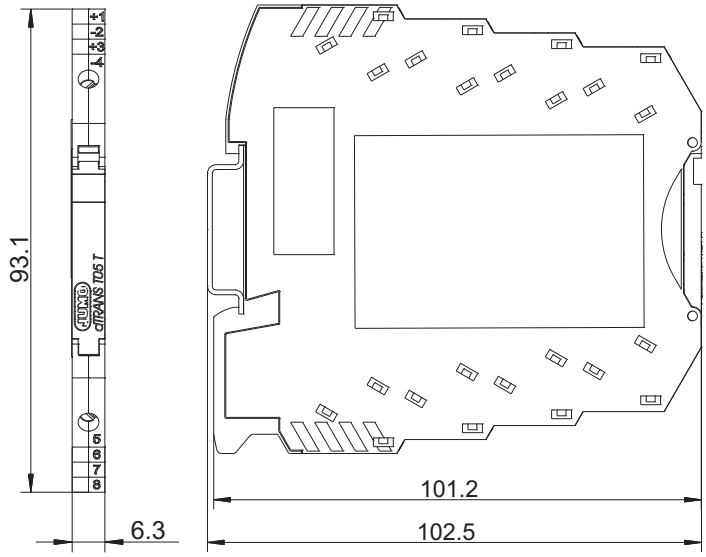


1.4 Dimensions

1.4.1 dTRANS T05 B (707050) transmitter



1.4.2 dTRANS T05 T (707051) transmitter



This figure shows type 707051 installed on a TH 35-7.5 DIN rail. The specifications concerning dimensions are only valid for installation on this DIN rail and change accordingly if a TH 35-15 DIN rail is used.

1 Introduction

2.1 Nameplate

Nameplate specification	Description	Example
Typ	Device type	707050/8-06
TN	Part no.	00582219
F-Nr	Fabrication number	0167938001012140001
⎓	Voltage supply	DC 11 to 35 V ⎓
⊕→	Input symbol	Programmable⊕→
⊖→	Output symbol	4 to 20 mA⊖→

Device type (Typ)

Compare the specifications on the respective nameplate to your order documents. The supplied device version can be identified using the order details in Chapter 2.2 "Order details", page 10.

Part no. (TN)

The part no. clearly identifies an article in the catalog. It is important for communication between the customer and the sales department.

Fabrication no. (F-Nr)

Among other things, the fabrication number indicates the production date (year/week) and the hardware version number.

Production date

Example: F-Nr = 0167938001012140001

The figures concerned are in positions 12, 13, 14, and 15 (from the left).

The device was produced in the 14th calendar week of 2012.

2 Identifying the device version

2.2 Order details

			(1) Basic type
		707050	dTRANS T05 B - 2-wire transmitter
		707051	dTRANS T05 T - 2-wire transmitter in mounting rail case
			(2) Configuration
x	**x**	8	Factory-set (0 to 100 °C, Pt100 3-wire circuit, 4 to 20 mA)
x	**x**	9	Customer-specific setting
			(3) Electrical connection type
x	**x**	06	Screw terminals
	x	07	Spring-cage terminals

	(1)		(2)		(3)
Order code		/		-	
Order example	707050	/	8	-	06

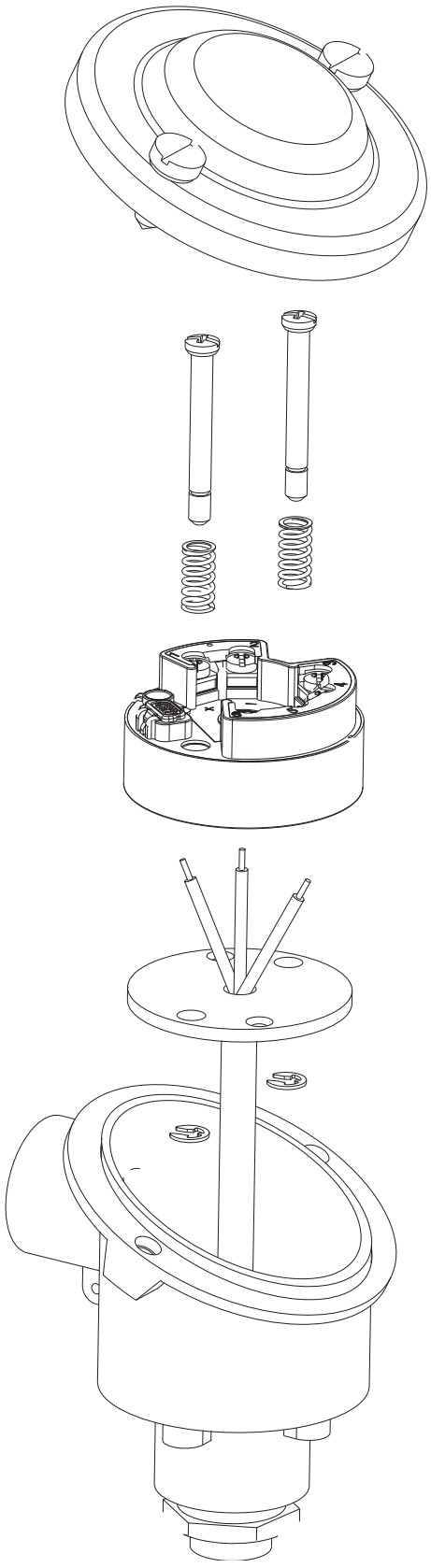
2.3 Scope of delivery

1 transmitter in the ordered version For type 707050: including fastening material (2 screws, 2 pressure springs, and 2 retaining washers)
1 operating manual B 707050.0

2.4 Accessories

Article	**Part no.**
Setup program on CD-ROM, multilingual	00574959
Operating manual B 707050.0	00576951
USB cable, A-connector on mini B-connector, length 3 m	00506252
Screw-on end clamp for mounting rail	00528648
Mounting element for installation of type 707050 on mounting rail	00352463

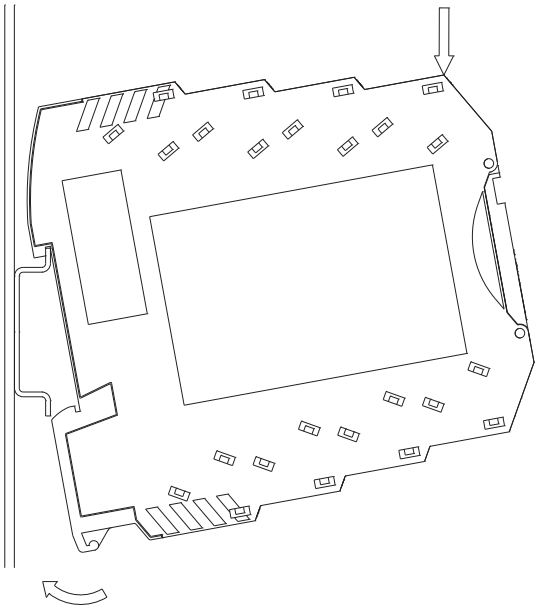
3.1 Installation of the dTRANS T05 B



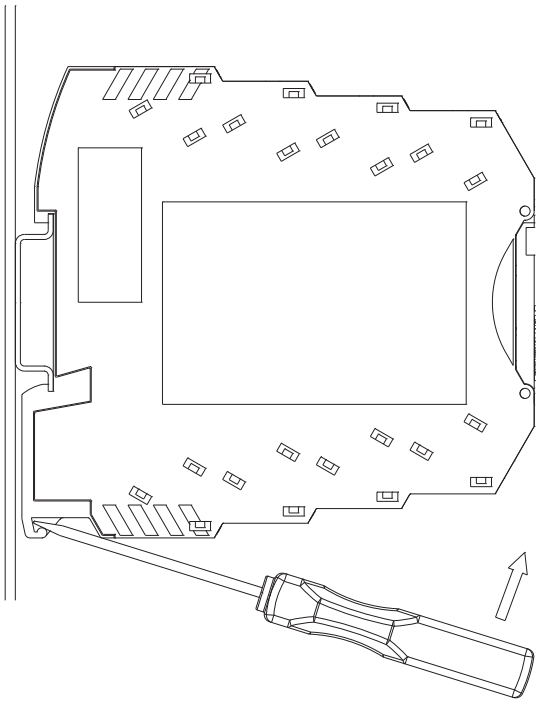
3 Installation

3.2 Installation/dismounting of dTRANS T05 T

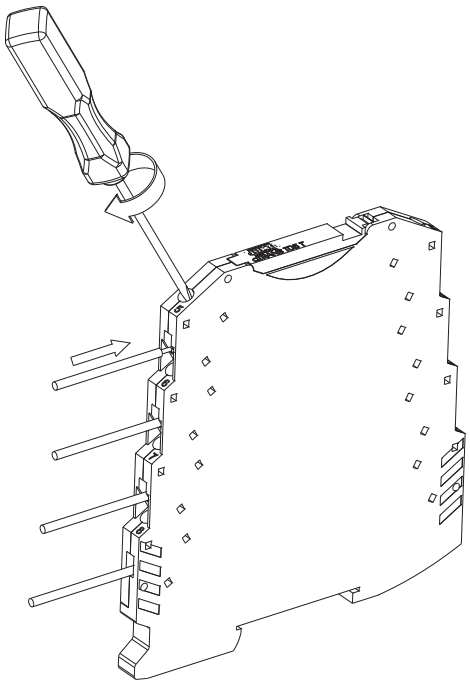
Installation



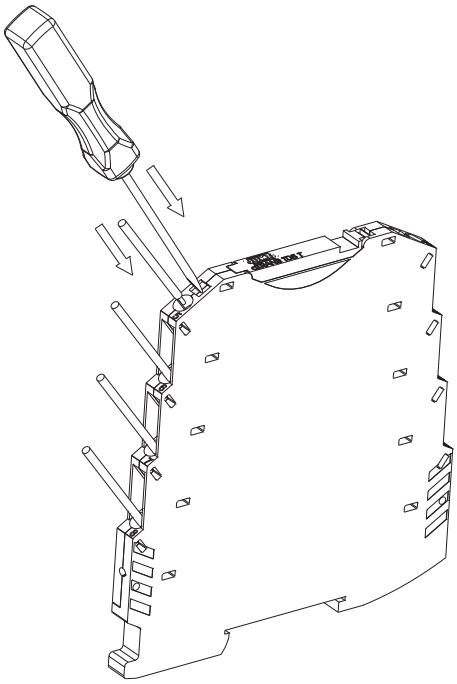
Dismounting



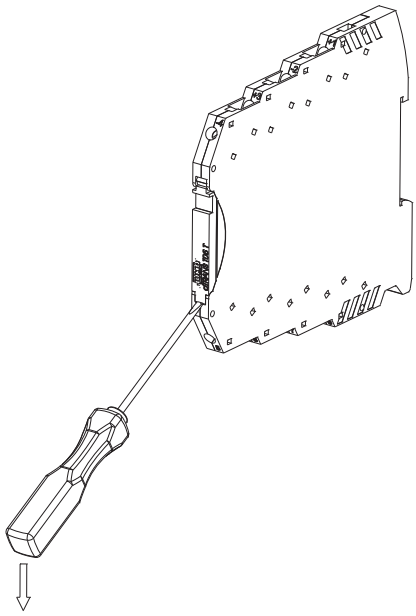
3.2.1 Connecting the wire to dTRANS T05 T with screw terminals



3.2.2 Connecting the wire to dTRANS T05 T with spring-cage terminals



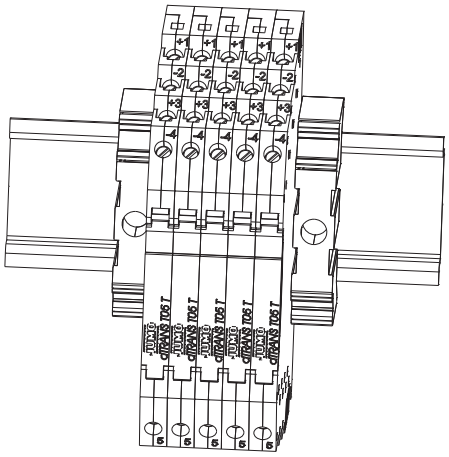
3.2.3 Opening the hinged cover



TIP!
Close the hinged cover again after completing the configuration of the transmitter via the USB port.

3.2.4 DIN rail installation

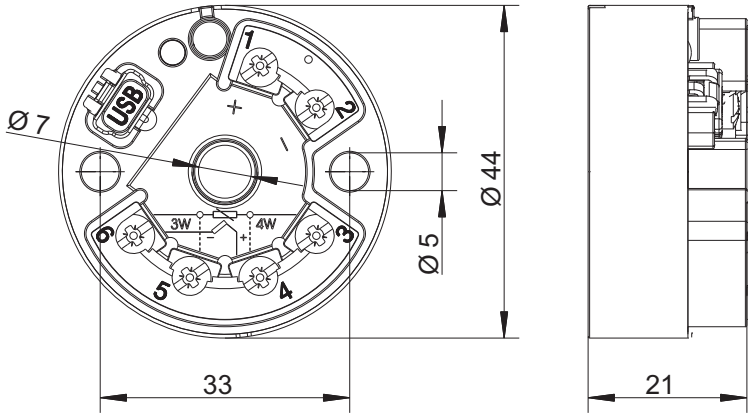
Ensure that the device cannot slip off the DIN rail. For this purpose, attach end brackets for mounting rails alongside the outermost devices on the DIN rail. These are available as accessories.



4.1 Safety information

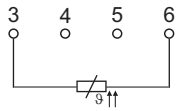
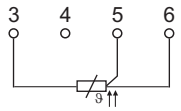
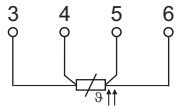
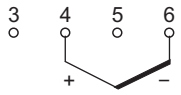
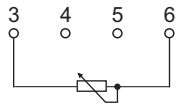
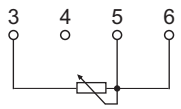
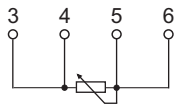
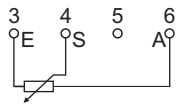
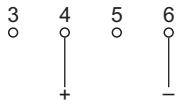
- The electrical connection must only be carried out by qualified personnel.
- When mounting, connecting, and operating the transmitter, ensure that no electrostatic charging can take place.
- The transmitter is not suitable for installation and application areas with an explosion hazard.
- Never expose the transmitter to magnetic or electrical fields (e.g. caused by transformers, walkie-talkies, or electrostatic discharge).
- An electrical connection that deviates from the connection diagram can destroy the transmitter.
- The transmitter is suitable for use in SELV or PELV current circuits according to protection rating 3. The case implements basic insulation of up to 50 V towards neighboring devices.

4.2 Terminal assignment and dimensions (mm) of dTRANS T05 B

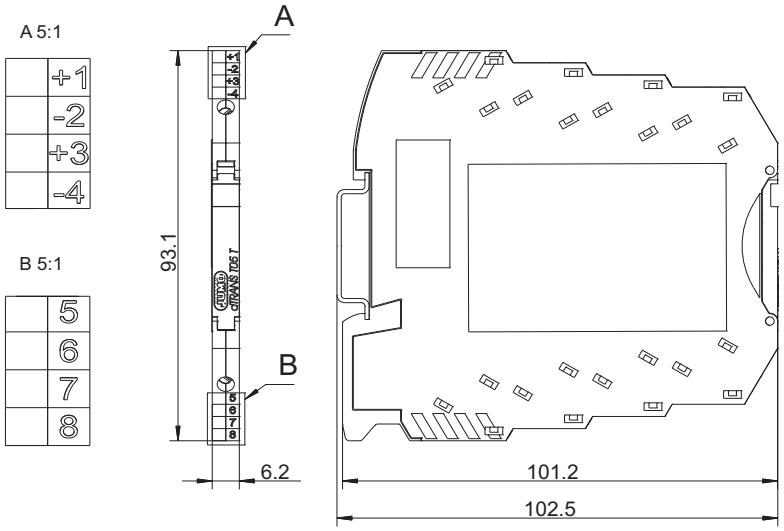


Connection for	Terminal assignment	
Voltage supply Type 707050 DC 11 to 35 V	$R_B = (V_b - 11\ V)/22\ mA$	
Current output 4 to 20 mA	R_B = Load resistance V_b = Voltage supply	

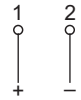
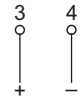
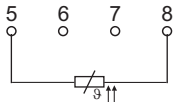
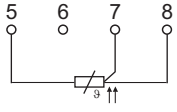
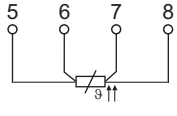
4 Electrical connection

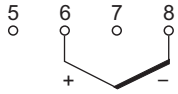
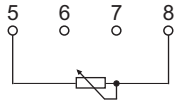
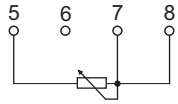
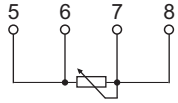
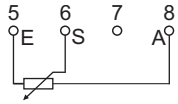
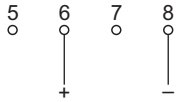
Connection for	Terminal assignment	
Analog inputs		
RTD temperature probe 2-wire circuit	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
RTD temperature probe 3-wire circuit (3W)	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
RTD temperature probe 4-wire circuit (4W)	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
Thermocouple		
Resistance/potentiometer 2-wire circuit	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
Resistance/potentiometer 3-wire circuit (3W)	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
Resistance/potentiometer 4-wire circuit (4W)	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
Resistance transmitter	E = End S = Slider A = Start	
Voltage 0 to 1 V		

4.3 Terminal assignment and dimensions (mm) of dTRANS T05 T



This figure shows type 707051 installed on a TH 35-7.5 DIN rail. The specifications concerning dimensions are only valid for installation on this DIN rail and change accordingly if a TH 35-15 DIN rail is used.

Connection for	**Terminal assignment**	
Voltage supply Type 707051 DC 11 to 35 V Current output 4 to 20 mA	$R_B = (V_b - 11\ V)/22\ mA$ R_B = Load resistance V_b = Voltage supply	
Voltage output 0 to 10 V		
Analog inputs		
RTD temperature probe 2-wire circuit	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
RTD temperature probe 3-wire circuit (3W)	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
RTD temperature probe 4-wire circuit (4W)	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	

Connection for	Terminal assignment	
Thermocouple		
Resistance/potentiometer 2-wire circuit	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
Resistance/potentiometer 3-wire circuit (3W)	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
Resistance/potentiometer 4-wire circuit (4W)	$R_L \leq 11\ \Omega$ R_L = Lead wire resistance per wire	
Resistance transmitter	E = End S = Slider A = Start	
Voltage 0 to 1 V		

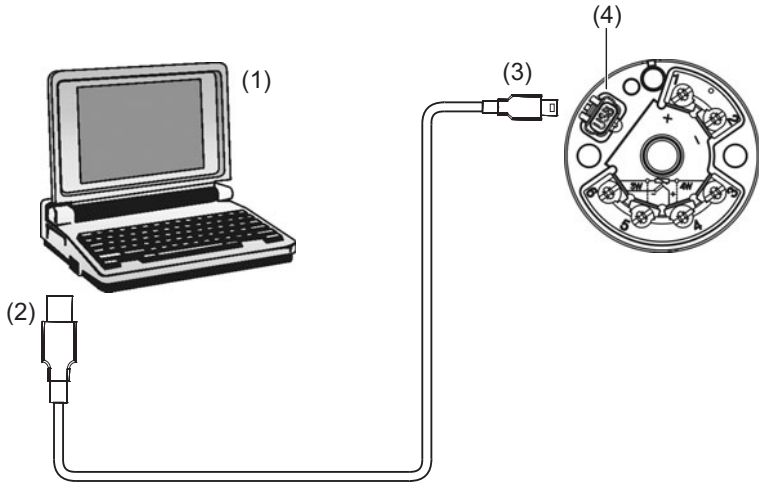
4.4 PC interface for dTRANS T05, type B and T

Connection for	Type	Terminal assignment	
USB connection to the PC	USB interface 2.0 (Mini-B; Full-Speed)	Standard (5-pin)	

5.1 Establishing connection between PC and transmitter

The connection between transmitter and PC is established via a USB cable.

Connection between PC and transmitter, using the example of type 707050



(1) Laptop/PC
(2) USB plug
(3) Mini USB plug type B
(4) USB socket for USB plug type B

For setup via USB, establish the following connections:

Step	Activity
1	Insert the USB plug (2) of the USB cable into the laptop/PC (1).
2	Insert the mini USB plug (3) of the USB cable into the transmitter socket (4).

TIP!
If the connection between the PC and the transmitter is established via USB and the transmitter is not wired on the output side, the energy is supplied to the transmitter via the USB interface of the PC. The current output (and the voltage output for dTRANS T05 T) and the two-color LED are then not in operation.
When the transmitter is operated without a USB connection, the USB interface is deactivated.

TIP!
To guarantee smooth operation of the transmitter via a USB interface it must correspond to USB specification 2.0.

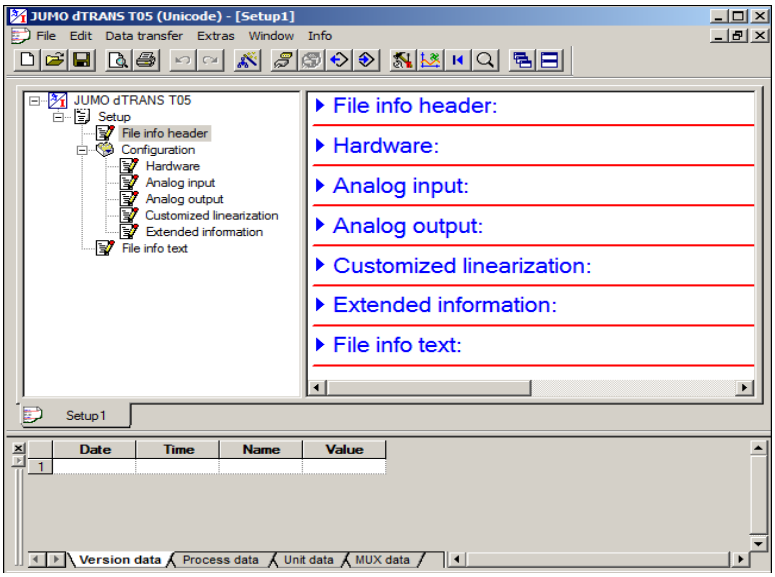
CAUTION!
Do not connect the USB with a grounded sensor, even if the ground of the PC is grounded (e.g. a desktop PC). The measuring input and the USB interface are not electrically isolated.

CAUTION!
Avoid a short circuit between the USB ground and the sensor terminals.

5 Configuration

5.2 Setup program

The transmitter is configured on the PC with the setup program. The connection between transmitter and PC is established via a USB cable. The transmitter interface is a USB port of the Mini-B type. It supports standard 2.0 "Full Speed". Once configuration of the transmitter has been completed make sure that the attached hinged-on lid is back on the transmitter's USB interface.



Configurable parameters

Sensor type	
Connection type 2/3-wire circuit or 4-wire circuit for RTD temperature probes or resistors/potentiometers	
Linearization	
Customer-specific linearization	
Sensor factor for thermocouple/RTD temperature probe	
Lead wire resistance with 2-wire circuit	
External or internal cold junction for thermocouple	
Scaling	
Digital filter	
Offset	
Unit	
Behavior in the event of a probe break/short-circuit	
Output signal increasing or decreasing (reversion)	
Output functions, current Type 705050 and type 705051	4 to 20 mA 4 to 20 mA scalable (start/end) Constant current source
Output functions, voltage Only type 705051	0 to 10 V 0 to 10 V scalable (start/end) Constant voltage source

TAG number (10-digit) and description (20-digit)
Installation date
Data pertaining to version, process and device of the transmitter can be displayed

Hardware and software requirements

For operation and the installation of the setup program the following hardware and software requirements have to be met.

Microsoft[a] Windows[a] XP, Windows Vista[a], Windows 7 32-bit/64-bit
1 GB RAM
200 MB free hard disk space
1 USB interface

[a] Microsoft, Windows, and Windows Vista are registered trademarks of Microsoft Corporation.

5.3 Working with the setup program

5.3.1 Establishing communication with the transmitter

The correct transmitter type must be selected in the setup program in order to use the setup program to transfer a configuration to the transmitter or to establish the connection so that device data can be queried.

Device wizard with automatic detection of connected hardware

Step	Activity
1	Connect the transmitter with the USB cable.
2	Start the setup program.
3	In the navigation window, double-click **SETUP** > **CONFIGURATION** > **HARDWARE**.
4	In the device wizard, select **AUTOMATIC DETECTION** and click **NEXT**.
5	Once the correct type is displayed, click **FINISH**.
6	The transmitter is connected.

➥ Device and process data can be displayed and data transfer is possible. This can be performed via the menu **DATA TRANSFER** > **DATA TRANSFER TO DEVICE...** or **DATA TRANSFER FROM DEVICE...** or the corresponding buttons.

Device wizard with custom setting

Step	Activity
1	Connect the transmitter with the USB cable.
2	Start the setup program.
3	In the navigation window, double-click **SETUP** > **CONFIGURATION** > **HARDWARE**.
4	In the device wizard, select **USER-DEFINED SETTING** and click **NEXT**.

Step	Activity
5	Select the correct transmitter type and click **NEXT**.
6	Once the correct type is displayed, click **FINISH**.
7	The transmitter is connected.

➥ Device and process data can be displayed and data transfer is possible. This can be performed via the menu **DATA TRANSFER** > **DATA TRANSFER TO DEVICE...** or **DATA TRANSFER FROM DEVICE...** or the corresponding buttons.

Saving/using an existing configuration

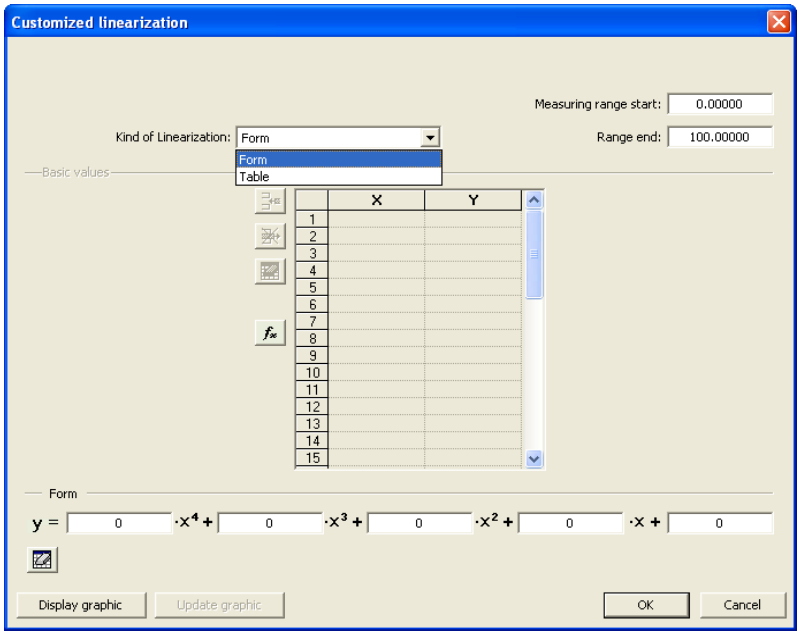
Once the configuration of a transmitter has been completed, the configuration can be saved under **FILE** > **SAVE AS ...**. All configured parameters and settings are saved in this setup file. These can be accessed and changed at any time, even if no device is connected.

Step	Activity
1	Start the setup program. The setup that was opened most recently will be opened again. Close it if required.
2	Select a setup file under **FILE** > **OPEN** and confirm with **OPEN**. The file is loaded.
3	The configuration can also be performed without a transmitter being connected.
4	To load or read the configuration on a transmitter, the transmitter must be connected and the connection must be established via the device manager or under **DATA TRANSFER** > **ESTABLISH CONNECTION**.

➥ Device and process data can be displayed and data transfer is possible. This can be performed via the menu **DATA TRANSFER** > **DATA TRANSFER TO DEVICE...** or **DATA TRANSFER FROM DEVICE...** or the corresponding buttons.

5.3.2 Customer specific linearization

The dTRANS T05 B and T transmitters provide the option of customer specific linearization of measured values. The corresponding configuration screen can be accessed in the setup program via the **EDIT** > **CUSTOMIZED LINEARIZATION** menu or in the tree structure under **SETUP** > **CONFIGURATION** > **CUSTOMIZED LINEARIZATION**. Linearization is performed via a table of values or a 4th order polynomial.



Linearization on the basis of the 4th order polynomial

For linearization on the basis of the 4th order polynomial, the **FORMULA** entry must be selected in the **KIND OF LINEARIZATION** selection field. The coefficients of the polynomial can be entered directly and the table is locked to entries. The graphic display is enabled by clicking the **DISPLAY GRAPHIC** button.

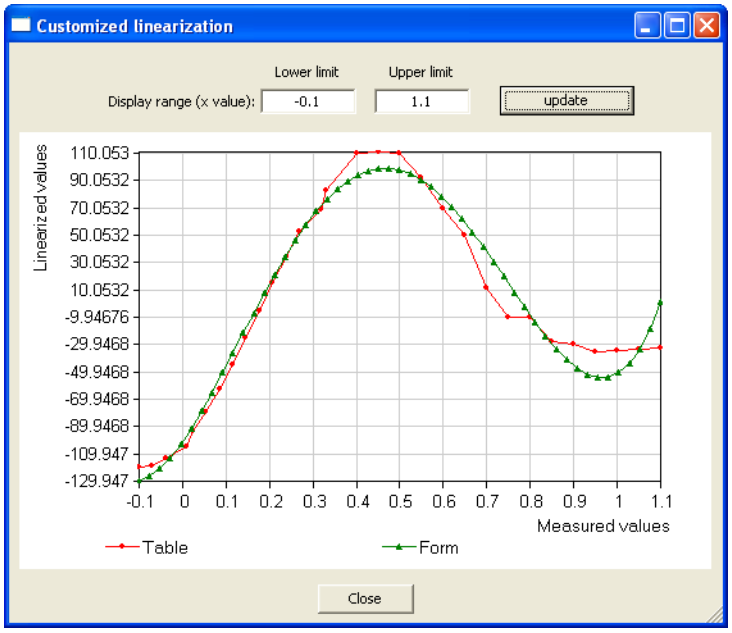
Linearization on the basis of the table of values

If the linearization is to be performed using a table with value pairs, the **TABLE** entry must be selected in the **KIND OF LINEARIZATION** selection field. It is not possible to enter polynomial coefficients. The X and Y values can then be entered in the table and displayed by clicking the **DISPLAY GRAPHIC** button.

Linearization with calculated polynomial coefficients

If at least two value pairs are used for linearization, the setup program provides the option for calculating the polynomial coefficients from these values. The linearization is then performed on the basis of the polynomial. For this purpose, the **TABLE** entry must be selected in the selection field. If the respective value pairs are entered, the polynomial coefficients can be calculated automatically by clicking the $\mathbf{f_x}$ button. The graphic display is enabled by clicking the **DISPLAY GRAPHIC** button. The following figures show the example of a table with value pairs and the graph of the value pairs with a superimposed graph of the polynomial.

	X	Y
1	-0.1	-120
2	-0.069231	-118.2529
3	-0.038462	-113.0647
4	0.007692	-104.5929
5	0.023077	-93.09511
6	0.053846	-78.92058
7	0.084615	-62.5
8	0.115385	-44.33232
9	0.146154	-24.96954
10	0.176923	-5
11	0.207692	14.96954
12	0.238462	34.33232
13	0.269231	52.5
14	0.32	68.92058
15	0.330769	83.09511



5.3.3 Drag indicator function

The drag indicator function records the minimum and maximum process variables (e.g. temperature) that appeared on the sensor during transmitter operation. These values can be reset. The reset times for the drag indicator are saved in the device and are also displayed. In addition to the actual minimum and maximum process values, the time at which the respective variables occurred will be displayed – measured in operating hours since the reset time. This enables conclusions to be drawn with regard to special features of the plant.

To view this data, the **ONLINE DATA** checkbox in the **WINDOW** menu must be selected in the set-up program and the **PROCESS DATA** tab must be selected at the bottom of the setup program window.

	Date	Time	Name	Value
1	8/7/2012	**7:47:37 AM**	Input	111.04 Ohm
2	8/7/2012	**7:47:37 AM**	Input (linearized)	28.382 °C / 83.088 °F
3	8/7/2012	**7:47:37 AM**	Output	21.760 mA
4	8/7/2012	**7:47:37 AM**	Type	JUMO dTRANS T05 Type B
5	8/7/2012	**7:47:37 AM**	Device status	Test mode
6	8/7/2012	**7:47:37 AM**	Reset time of the minimum process variables (Slave pointer)	**19.06.2012 - 08:21**
7	8/7/2012	**7:47:37 AM**	Minimum process variables Time of occurance (in working hours after reset)	**36 °C / 96.8 °F** **26 h**
8	8/7/2012	**7:47:37 AM**	Reset time of the maximum process variables (Slave pointer)	19.06.2012 - 08:21
9	8/7/2012	**7:47:37 AM**	Maximum process variables Time of occurance (in working hours after reset)	244.2 °C / 471.6 °F 0 h
10	8/7/2012	**7:47:37 AM**	Temperature in the case	21.6 °C / 70.8 °F

Version data | Process data | Device data | Service data

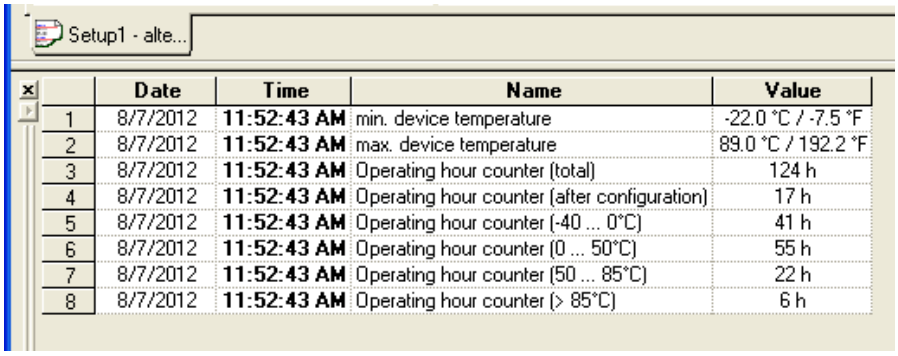
The drag indicator can be reset via the menu item **EXTRAS** > **RESET DRAG INDICATOR**.

Example

In the figure above, the reset time of the minimum process variable is on June 19, 2012 at 08:21 a.m. Should you wish to establish the time at which the minimum process variable occurred, the value must be read in the corresponding line. In the example, this was 36.0 °C and occurred 26 hours after the reset time. According to the example, the minimum process variable occurred on June 20, 2012 at 10:21 a.m.

5.3.4 Operating hours counter

The minimum and maximum device temperature, operating hours in various ambient temperature ranges, and overall operating hours can be viewed using the operating hours counter function. To display this data, the **ONLINE DATA** checkbox in the **WINDOW** menu must be selected in the setup program and the **DEVICE DATA** tab must be selected at the bottom of the setup program window.



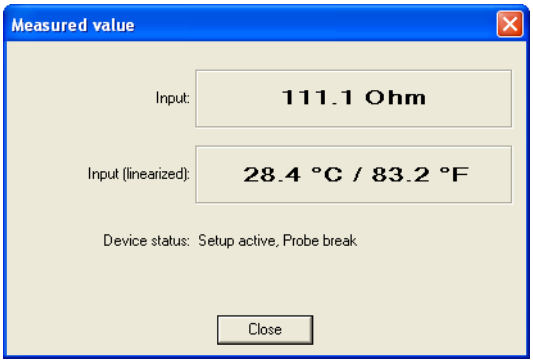
	Date	Time	Name	Value
1	8/7/2012	11:52:43 AM	min. device temperature	-22.0 °C / -7.5 °F
2	8/7/2012	11:52:43 AM	max. device temperature	89.0 °C / 192.2 °F
3	8/7/2012	11:52:43 AM	Operating hour counter (total)	124 h
4	8/7/2012	11:52:43 AM	Operating hour counter (after configuration)	17 h
5	8/7/2012	11:52:43 AM	Operating hour counter (-40 ... 0°C)	41 h
6	8/7/2012	11:52:43 AM	Operating hour counter (0 ... 50°C)	55 h
7	8/7/2012	11:52:43 AM	Operating hour counter (50 ... 85°C)	22 h
8	8/7/2012	11:52:43 AM	Operating hour counter (> 85°C)	6 h

The operating hours counter (according to the configuration) can be called up and reset via the **EXTRAS** > **OPERATING HOURS COUNTER** menu item. No other operating hours counters can be reset.

TIP!
The calculated min./max. time is derived with hourly resolution from the reset time of the drag indicator.

5.3.5 Displaying the current measured value/device status

In the setup program, the current input value and the linearized value can be displayed using the "Display measured value" function. The current device status is also displayed. Values that are out of range and wiring problems are displayed in text form. The function can be accessed by clicking the button with the magnifying glass symbol or in the menu under **EXTRAS** > **DISPLAY MEASURED VALUE**.



5 Configuration

6.1 Technical data

6.1.1 LED indication

Display	Example	Meaning
The two-color LED is continually lit green		OK
The two-color LED is continually lit red		Sensor error
The two-color LED alternately flashes red/green		Out of range
The two-color LED is continually lit red and green simultaneously		Initialization phase, Test mode "Permanent Current Output" mode

6.1.2 Analog input

All analog inputs are equipped with a digital filter of second order (filter constant adjustable from 0 to 10 s) and have a sampling rate of > 2 measurements per second.

RTD temperature probe

Designation	Standard	ITS	Connection type	Measuring range in °C		Measuring accuracy[a]
				Min.	Max.	
Pt100 Pt500 Pt1000 $T_K = 3.85 \times 10^{-3}$ 1/K	IEC 60751:2008	ITS-90	2/3-wire	-100	200	±0.2 K
			2/3-wire	-200	850	±0.4 K
			4-wire	-100	200	±0.1 K
			4-wire	-200	850	±0.2 K
Pt100 $T_K = 3.917 \times 10^{-3}$ 1/K	GOST 6651-2009 A.2	ITS-90	2/3-wire	-100	200	±0.2 K
			2/3-wire	-200	850	±0.4 K
			4-wire	-100	200	±0.15 K
			4-wire	-200	850	±0.25 K
Pt50 $T_K = 3.91 \times 10^{-3}$ 1/K			2/3-wire	-200	850	±0.5 K
			4-wire	-200	850	±0.3 K
Ni100 $T_K = 6.18 \times 10^{-3}$ 1/K	DIN 43760	IPTS-68	2/3-wire	-60	250	±0.4 K
			4-wire	-60	250	±0.2 K
Ni500 $T_K = 6.18 \times 10^{-3}$ 1/K			2/3-wire	-60	250	±0.4 K
			4-wire	-60	250	±0.2 K
Ni1000 $T_K = 6.18 \times 10^{-3}$ 1/K			2/3-wire	-60	250	±0.4 K
			4-wire	-60	250	±0.2 K

6 Appendix

Designation	Standard	ITS	Connection type	Measuring range in °C		Measuring accuracy[a]
				Min.	Max.	
Ni 100 $T_K = 6.17 \times 10^{-3}$ 1/K	GOST 6651-2009 A.5	ITS-90	2/3-wire	-60	180	±0.4 K
			4-wire	-60	180	±0.2 K
Cu50 $T_K = 4.28 \times 10^{-3}$ 1/K	GOST 6651-2009 A.3	ITS-90	2/3-wire	-180	200	±0.5 K
			4-wire	-180	200	±0.3 K
Cu100 $T_K = 4.28 \times 10^{-3}$ 1/K			2/3-wire	-180	200	±0.4 K
			4-wire	-180	200	±0.2 K

[a] The accuracy value refers to the complete measuring range.

Connection type	2-wire, 3-wire, or 4-wire circuit
Sensor lead resistance	
- For 3/4-wire circuit	≤ 11 Ω per line
- For 2-wire circuit	Measuring resistance + ≤ 22 Ω inner line resistance
Sensor current	< 0.3 mA

Thermocouples

Designation	Type	Standard	ITS	Measuring range in °C		Measuring accuracy[a]
				Min.	Max.	
Pt13Rh-Pt	R	IEC 584-1	ITS-90	-50	1768	± 0.15 % from +50 °C
Pt10Rh-Pt	S	IEC 584-1	ITS-90	-50	1768	± 0.15 % from +20 °C
Pt30Rh-Pt6Rh	B	IEC 584-1	ITS-90	0	1820	± 0.15 % from +400 °C
Fe-CuNi	J	IEC 584-1	ITS-90	-210	1200	± 0.1 % from -100 °C
Cu-CuNi	T	IEC 584-1	ITS-90	-270	400	± 0.1 % from -150 °C
NiCr-CuNi	E	IEC 584-1	ITS-90	-270	1000	± 0.1 % from -80 °C
NiCr-Ni	K	IEC 584-1	ITS-90	-270	1372	± 0.1 % from -80 °C
NiCrSi-NiSi	N	IEC 584-1	ITS-90	-270	1300	± 0.1 % from -80 °C
Fe-CuNi	L	DIN 43710	IPTS-68	-200	900	± 0.1 %
Cu-CuNi	U	DIN 43710	IPTS-68	-200	600	± 0.1 % from -100 °C
Chromel-Copel (Ni9.5Cr-Cu44Ni)	L	GOST R 8.585-2001	ITS-90	-200	800	± 0.1 % from -80 °C
Chromel-Alumel		GOST R 8.585-2001	ITS-90	-270	1372	± 0.1 % from -80 °C
W5Re-W20Re	A1	GOST R 8.585-2001	ITS-90	0	2500	± 0.15 %
W5Re-W26Re	C	ASTM E230/E230M-11	ITS-90	0	2315	± 0.15 %
W3Re-W25Re	D	ASTM E1751/E1751M-09	ITS-90	0	2315	± 0.25 %
PL II (Platinel[b] II)		ASTM E1751/E1751M-09	ITS-90	0	1395	± 0.15 %

Cold junction	Pt1000 internal or external cold junction; temperature adjustable 0 to 80 °C
Cold junction accuracy	± 1 K

[a] The accuracy values refer to the complete measuring range.

[b] Platinel is a registered trademark of Engelhardt Corp.

Resistance transmitter and resistor/potentiometer

Designation	Measuring range	Measuring accuracy
Resistance transmitter	Up to 10000 Ω	±10 Ω
Resistor/potentiometer	≤ 400 Ω	±400 mΩ
	≥ 400 Ω to ≤ 4000 Ω	± 4 Ω
	> 4000 Ω to ≤ 10000 Ω	±10 Ω

Designation	Measuring range	Measuring accuracy
Connection type	Resistance transmitter: 3-wire circuit (A = Start, S = Slider, E = End) Resistor/potentiometer: 2-wire circuit, 3-wire circuit, and 4-wire circuit	
Sensor lead resistance	≤ 11 Ω per line for 2-wire circuit, 3-wire circuit, and 4-wire circuit	

Direct current

Designation	Measuring range	Accuracy[a]	Input resistance
Input for mV generator	-100 to 1100 mV	±0.05 %	R_E ≥ 1 MΩ

[a] The accuracy value refers to the complete measuring range.

6.1.3 Measuring circuit monitoring

	Type 707050	Type 707051
Underrange	Linear drop up to 3.8 mA (According to NAMUR recommendation 43)	Linear drop up to 3.8 mA (According to NAMUR recommendation 43) Linear drop up to -0.12 V
Overrange	Linear increase up to 20.5 mA (According to NAMUR recommendation 43)	Linear increase up to 20.5 mA (According to NAMUR recommendation 43) Linear increase up to 10.31 V
Probe short-circuit/probe and cable break	RTD temperature probe: (configurable) ≤ 3.6 mA, ≥ 21.7 mA Or free setting: 3.6 mA to 23 mA	RTD temperature probe: (configurable) ≤ 3.6 mA, ≥ 21.7 mA Or free setting: 3.6 mA to 23 mA
		≤ -0.2 V, ≥ 11.0 V Or free setting: -0.25 V to 11.875 V
	Thermocouple: (configurable)[a] ≤ 3.6 mA, ≥ 21.7 mA Or free setting: 3.6 mA to 23 mA	Thermocouple: (configurable)[a] ≤ 3.6 mA, ≥ 21.7 mA Or free setting: 3.6 mA to 23 mA
		≤ -0.2 V or ≥ 11.0 V Or free setting: -0.25 V to 11.875 V
Current limiting in the event of a probe short circuit or probe break	≤ 23 mA	

[a] For thermocouples and mV generator a probe short-circuit detection is not possible.

6.1.4 Output

	Type 707050	**Type 707051**
Output signal	Load-independent direct current: Free setting: 4 to 20 mA or 20 to 4 mA	Load-independent direct current: Free setting: 4 to 20 mA or 20 to 4 mA
		Voltage signal: Free setting: 0 to 10 V or 10 to 0 V
Electrical isolation Test voltage	Between input and output: Û = 3.75 kV/50 Hz	Between input and output: Û = 1.875 kV/50 Hz
Transmission behavior	Linear, temperature-linear Customer specific Reversion of the output signal	
Step response 0 to 100 %	< 2 s (with filter constant 0 s)	
Switch-on delay	5 s (correct measured value after the supply voltage is applied)	
	Current output	
Load (R_b)	$R_b = (U_b - 11\ V)/0.022\ A$	
Load error	≤ ±0.02 %/100 Ω	
Calibration conditions/accuracy	DC 24 V at approx. 22 °C/±0.05 %[a]	
	Voltage output	
Load resistance	≥ 2 kΩ	
Load influence	± 15 mV	
Residual ripple	± 1 % referring to 10 V, 0 to 90 kHz	
Calibration conditions/accuracy	DC 24 V at approx. 22 °C/±0.05 %[b]	

[a] All specifications refer to the measuring range end value of 20 mA

[b] All specifications refer to the measuring range end value of 10 V

6.1.5 Customer-specific linearization

Method	**Characteristics**
Pairs of values	Max. number: 40
	Interpolation: linear
Formula	Number of coefficients: 5
	Polynomial: 4th order

6 Appendix

6.1.6 Voltage supply

	707050	**707051**
Voltage supply (U_b)	DC 11 to 35 V (with reverse voltage protection[a]) Only for operation in SELV, PELV current circuits according to DIN EN 50178	
Voltage supply error	≤ ± 0.01 %/V deviation from 24 V[b]	

[a] Prerequisite for use of the voltage output of type 707051 is a supply voltage of at least 15 V

[b] All specifications refer to the measuring range end value of 20 mA

6.1.7 Environmental influences

	707050	**707051**
Operating temperature range	-40 to +85 °C	-10 to +70 °C
Storage temperature range	-40 to +100 °C	-10 to +70 °C
Temperature influence		
RTD temperature probe	≤ ±0.005 %/K deviation from 22 °C[a]	
Resistance transmitter	≤ ±0.01 %/K deviation from 22 °C[a]	
Resistor/potentiometer	≤ ±0.01 %/K deviation from 22 °C[a]	
Thermocouple	≤ ±0.005 %/K deviation from 22 °C[a] (plus accuracy of the cold junction)	
Direct current	≤ ±0.01 %/K deviation from 22 °C[a]	
Long-term stability	≤ 0.1 K/year[b] or ≤ 0.05 %/year[c]	
Resistance to climatic conditions		
In terminal head, form B	Rel. humidity ≤ 95 %, with condensation	
Open assembly	Rel. humidity ≤ 95 %, without condensation	
On DIN rail		Rel. humidity ≤ 95 %, without condensation
Vibration resistance		
DIN EN 60068-2-6	Max. 2 g at 10 to 2000 Hz	Max. 2 g at 10 to 55 Hz
DIN EN 60068-2-27	Shock; 10 g/6 ms	Shock; 10 g/6 ms
Germanischer Lloyd	Characteristic line 2	-
Electromagnetic compatibility (EMC)	According to DIN EN 61326-1	
Interference emission	Class B	
Interference resistance	Industrial requirements	

	707050	707051
IP protection type		
In terminal head, form B	IP54/IP65 (depending on the version)	
Open assembly	IP00	
On DIN rail		IP20

[a] All specifications refer to the measuring range end value of 20 mA or 10 V

[b] Under calibration conditions

[c] % refer to the set measuring span. The greater value of the long-term stability applies.

6.1.8 Case

	707050	707051
Material	Polycarbonate UL 94 V2 (grouted)	Polybutylene terephthalate UL 94 V0
Terminal type	Screw terminals:	Screw terminals:
Wire type	Rigid and flexible wires	Rigid and flexible wires
	≤ 1.75 mm²;	0.2 mm² to 2.5 mm² AWG/kcmil min. 26, max 12 Stripping length 12 mm
	Max. torque 0.6 Nm	Torque 0.5 - 0.6 Nm
		Spring-cage terminals
		Rigid and flexible wires
		0.2 mm² to 2.5 mm² AWG/kcmil min. 26, max 12 Stripping length 8 mm
Assembly type	In terminal head, form B (DIN EN 50446); In the surface-mounted case (see accessories); In the control cabinet (mounting element required)	On DIN rail TH 35-7.5 Or TH 35-15 (DIN EN 60715);
Installation position	Any	
Weight	~ 35 g	~ 50 g