

LUMEL

**PROGRAMMABLE TRANSDUCER
OF TEMPERATURE
AND STANDARD SIGNALS**

P11T



SERVICE MANUAL

CE

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1. APPLICATION

The P11T transducer is destined to the conversion of temperature, resistance, voltage from the shunt and standard signals into a d.c. current or d.c. voltage standard signal. The output signal is galvanically isolated from the input signal and the supply.

The P11T transducer is offered in two basic versions:

- P11T-1, with programmed parameters by the producer acc. the ordered execution code.
- P11T-2, with programmed parameters by the producer acc. the ordered execution code and with the possibility to change the parameters by the user by means of a computer through the PD11 programmer.

The PD11 programmer is a universal device serving to programme all the P11 and P12 series transducers.

The PD11 programmer realizes also following functions:

- conversion of the measured value into an optional output signal on the base of the individual linear characteristic,
- switching on or off the automatic compensation and possibility to introduce a manual correction,
- storage of maximal and minimal values,
- programming of the measurement averaging time,
- blocking of the parameter introduction by means of a password.

Using the PD11 programmer, one can read out in any time from the P11T transducer:

- the measured value,
- the maximal and minimal value,
- the signal on the analogue output in percentage of the range.

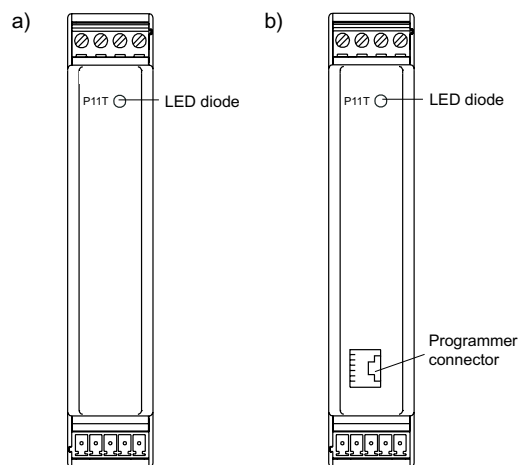


Fig. 1 Frontal view of the transducer: a) P11T-1, b) P11T-2

2. SET OF THE P11 T TRANSDUCER

The set is composed of:

- P11T transducer 1 pc
- Service manual 1 pc
- Warranty card 1 pc
- Plug with screw or self-locking terminals 2 pcs
- Hole plug of the programmer socket
(only in P11T-2 execution) 1 pc

3. BASIC REQUIREMENTS, OPERATIONAL SAFETY

Symbols located in this service manual mean:



- Especially important, one must acquaint with this before connecting the transducer. The non-observance of notices marked by these symbols can occasion the damage of the transducer.



- One must take note of this when the transducer is working inconsistently to the expectations.

In the security scope the transducer meets the requirements of the EN 61010-1 standard.

Remarks concerning the operator safety:

P11T transducers are destined to be mounted on 35 mm DIN rails. In the range of operational safety they are in conformity with the EN 61010-1 standard requirements.

- The installation and transducer connection should be operated by a qualified personnel.
- One must take into consideration all accessible protection requirements.
- Before switching the instrument on, one must check the correctness of the network lead connection.
- In case of the protection terminal connection with a separate lead one must remember to connect it before the connection of network leads.
- Do not connect the instrument to the network through an auto-transformer.
- Before taking the transducer housing out, one must turn the supply off.
- The removal of the transducer housing during the warranty contract period may cause its cancellation.
- The programmer connector is destined only for the PD11 programmer connection. After the transducer programming, one should put the hole plug of the programmer connector.

4. INSTALLATION

4.1 Fitting way

P11T transducers are designed to be installed on a 35 mm DIN rail acc. DIN EN 50 022-35. The transducer casing is made from a self-extinguishing plastic material. On the external side of the transducer there are screw or self-locking terminal strips enabling the connection of up to 2.5 mm² external leads (supply and output) and up to 1.5 mm² leads (input).

External and assembly dimensions are shown on the fig.2.

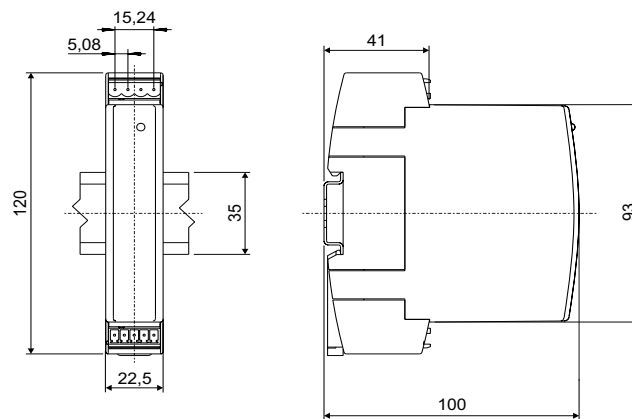


Fig. 2 Overall dimensions and fixing way of the P11T transducer.

4.2. Diagrams of external connections

The P11T transducer has two sockets of terminal strips to which two connectors are connected. A screw plug or a self-locking plug are included depending on the chosen type by the user in the order code. The Fig.3 shows the connection way of external signals. The connection diagram is also placed on the transducer housing.

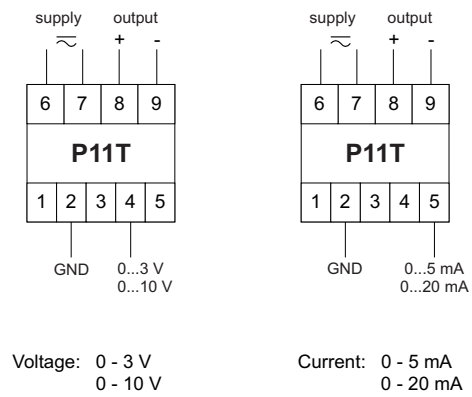
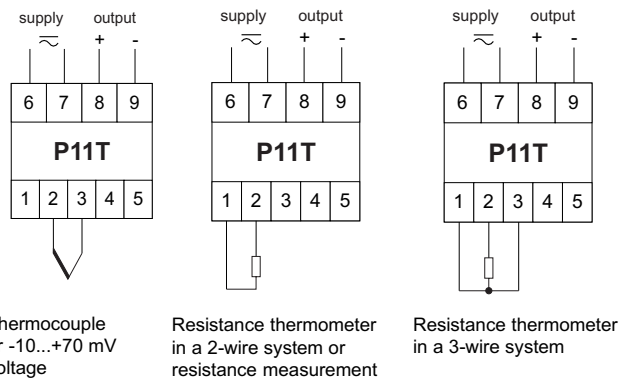


Fig. 3 Description of terminal strips of the P11T transducer.

The P11T transducer works with the function of automatic compensation of the lead resistance in case of resistance thermometer sensors (and in the case of thermocouples, with the temperature compensation of the reference junction). It is possible in the P11T-2 transducer to turn off the automatic compensation and turn on the manual compensation.

In case of transducers working in an environment of high interferences one should use screened leads on the transducer input and output. As a feeder cable one must use a two-wire cable and choose the lead cross-section such that in case of a short-circuit from the device side, the protection was ensured by means of the electric installation fuse. Requirements related to the feeder cable are regulated by the EN 61010-1 standard.

5. SERVICE

After connecting external signals and turning on the power supply, the transducer is ready to work. The lighted LED diode indicates only the turn-on of the transducer to the mains and signals the transducer work.

The P11T-1 transducer works with programmed parameters according the execution code and there is no possibility to change these parameters. Such a possibility exists in the case of a P11T-2 transducer. To this effect, a PD11 programmer and a computer are necessary.

Modification way of the P11T-2 parameters

In case of the PD11 programmer connection to the computer DB9 connector, one should use a DB9/DB25 adapter (included in the PD11 programmer kit).

The programmable parameters of the transducer are shown in the table 1.

The programming of parameters is possible after the previous introduction of the password

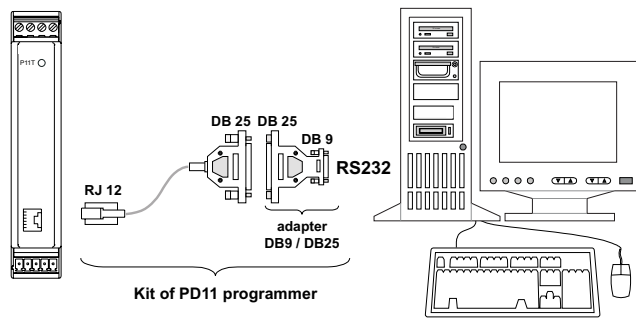
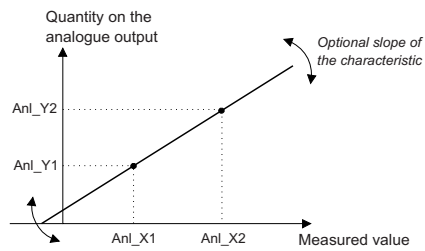


Fig. 4. Connection way of the P11T-2 transducer with the computer.




The Anl_X1 value on the transducer input => Anl_Y1 value on the analogue input
 The Anl_X2 value on the transducer input => Anl_Y2 value on the analogue input.
 The other points of the characteristic can be evaluate.

Fig. 5 Individual characteristic of the analogue output

Table 1

	Parameter description	Range of changes
Input parameters	Kind of input signal	Resistance thermometers: Pt100 Pt500 Pt1000 Cu100 Ni100 Thermocouples: Thermocouple J - (Fe-CuNi) Thermocouple K - (NiCr-NiAl) Thermocouple N - (NiCrSi-NiSi) Thermocouple E - (NiCr-CuNi) Thermocouple R - (PtRh13-Pt) Thermocouple S - (PtRh10-Pt) Thermocouple T - (Cu-CuNi) Resistance measurement up to 400 Ω Resistance measurement up to 4 k Ω Voltage measurement -10...70 mV Voltage measurement 0...3 V Voltage measurement 0...10 V Current measurement 0...5 mA Current measurement 0...20 mA
	Kind of compensation of sensor working condition changes: - in case of a resistance thermometer and resistance measurement concerns the compensation of resistance changes of leads connecting the sensor to the transducer - in case of a thermocouple concerns the compensation of cold junction temperature changes The automatic compensation do not work in case of resistance measurement up to 4 k Ω , Pt1000 and Pt500.	Automatic: Automatic compensation (in case of resistance thermometers and resistance measurement requires a three-wire line). 0...60°C - value of the fiducial temperature for thermocouples. 0...40°C - resistance of two leads for resistance thermometers and resistance measurement. Accuracy of data introducing ± 0.1 . The inscription of a value from out the interval of the manual compensation cause the turn-on of the automatic compensation.
	Averaging time of the measurement	0...9999.9 s The inscription of 0 causes the turn-off of the measurement and stop the transducer work.

Output parameters	<p>Turn-off or on of the individual user's linear characteristic (individual characteristic of the analogue output)</p>	<p>On - characteristic turned on Off - characteristic turned off When the characteristic is turned off, then the transducer operates with its maximal range depending on the type of input or output.</p>
	<p>Parameters of the individual characteristic of the analogue output. On the base of given coordinates of two points by the user, the transducer determines (from the system of equations) the coefficients a and b of the individual characteristic.</p> $\begin{cases} Anl_Y1 = a \cdot Anl_X1 + b \\ Anl_Y2 = a \cdot Anl_X2 + b \end{cases}$ <p>Where: Anl_X1 and Anl_X2 - measured value Anl_Y1 and Anl_Y2 - expected value on the analogue output. The Fig.5 shows the graphic presentation explaining the idea of the individual characteristic of the analogue output.</p>	<p>Possibility of setting: - 99999... 99999</p> <p style="text-align: center; color: gray; font-size: 1.2em; transform: rotate(-45deg); opacity: 0.5;">ACCESSIBLE WHEN THE INDIVIDUAL CHARACTERISTIC IS TURNED ON</p>
Service parameters	<p>Manufacturer's parameters The manufacturer's parameters are shown in the table 2.</p>	
	<p>Introduction of a new password</p>	<p>- 99999... 99999</p>
	<p>Possibility of setting the current time. Time format: hh:mm:ss When there is a lack of supply the parameter is not remembered.</p>	<p>00:00:00 ... 23:59:00</p>

Caution! 

- In case of transducer work with a resistance thermometer in a two-wire system, the option choice of the automatic compensation of lead resistance changes will cause the defective work of the transducer.
- The automatic compensation is turned off at the choice of a **Pt1000, Pt500** sensor and resistance measurement up to **4 kΩ**
- In case of the analogue output individual characteristic turn-on, the measurement result is linearly transformed acc. introduced **Anl_X** and **Anl_Y** parameters.
- The transducer controls up to date the value of the currently introduced parameter. In case when the introduced value exceeds the upper or lower range of change given in the table 1, the transducer do not make the parameter recording.

Standard parameters of the P11T transducer

Table 2

Parameter description	Standard value
Type of input	Pt100
Kind of compensation	manual = 0
Averaging time of the measurement	1s
Characteristic of the analogue output	Turn off
Anl_X1, Anl_X2	0
Anl_Y1, Anl_Y2	0
Password	0
Current time	00:00:00

6. TECHNICAL DATA

Basic parameters:

- input signals:

Pt100	(- 200... + 850)°C
Pt500	(- 200... + 850)°C
Pt1000	(- 200... + 850)°C
Cu100	(- 50... + 180)°C
Ni100	(- 60... + 180)°C
J (Fe-CuNi)	(- 100... + 1200)°C
K (NiCr-NiAl)	(- 100... + 1370)°C
N (NiCrSi-NiSi)	(- 100... + 1300)°C
E (NiCr-CuNi)	(- 100... + 900)°C
R (PtRh13-Pt)	(0... + 1760)°C
S (PtRh10-Pt)	(0... + 1760)°C
T (Cu-CuNi)	(- 50... + 400)°C
resistance measurement	0... 400 Ω
resistance measurement	0... 4000 Ω
voltage measurement	-10... 70 mV
voltage measurement	0...3 V , input resistance >1 MΩ
voltage measurement	0...10 V, input resistance >1 MΩ
current measurement	0...5 mA, input resistance < 4 Ω
current measurement	0...20 mA, input resistance < 4 Ω
thermocouple characteristics according	EN 60584-1
resistance thermometer characteristics acc.	EN 60751+A2: 1997

- analog output galvanically

isolated with a resolution

0.01% of the range:

- current programmable	0/4...20 mA
	load resistance ≤ 500 Ω
- voltage programmable	0...10 V
	load resistance ≥ 500 Ω

- accuracy class	0.2 0.3 for Cu100 and Ni100; the minimal subrange in P11T-2 is 4 times smaller than the full range
- additional error from the ambient temperature change	$\pm (0.1\% \text{ of the range}/10 \text{ K})$ $\pm (0.2\% \text{ of the range}/10 \text{ K})$ for resistance thermometers and thermocouples of T type.
- conversion time:	
- P11T-1	< 200 ms
- P11T-2	min 200 ms (averaging time min 100 ms + output response time 100 ms)
- power input	< 3 VA
- current intensity flowing through the resistance thermometer	< 0.17 mA
- resistance of leads connecting the resistance thermometer with the transducer	< 20 Ω / 1 lead
- preheating time of the transducer	10 min.
Nominal operating conditions:	
- supply voltage depending on the execution code	85... <u>230</u> ...253 V a.c./d.c. 20... <u>24</u> ...50 V a.c./d.c.
- frequency of the supply a.c. voltage	40... <u>50</u> ...440 Hz
- ambient temperature	-25... <u>23</u> ...55°C
- storage temperature	-25... + 85°C
- air relative humidity	< 95% (without condensat.)
- working position	any

Sustained overload:

- thermocouples, resistance thermometers 1%
- measurement of voltage, current and resistance 20%

Short duration overload (3 s):

- inputs of sensors and voltage 30 V
- current input 10 In

Communication parameters with the computer (only in P11T-2):

- interface RS232, 8N1 mode
- data bit 8
- even parity lack
- stop bit 1
- baud rate 9600 bit/s
- flow control lack

Ensured protection degree:

- for P11T-1 execution IP 50
- for P11T-2 execution IP 40
- from the terminal side IP 20

Dimensions 22.5 x 120 x 100 mm

Weight 125 g

Fixing on a 35 mm DIN rail

Current decay immunity acc. EN 50082-2

Electromagnetic compatibility:

- immunity EN 50082-2
- emission EN 50081-2

Security requirements acc. EN 61010-1

- installation category III
- pollution level 2
- maximal working voltage in respect to the earth 300 V a.c.



7. BEFORE A FAILURE WILL BE DECLARED

SYMPTOMS	PROCEDURE	NOTES
1. the LED is not lighting	Check the connection of the feeder cable	
2. A signal inconsistent with our expectations occurs on the transducer output	Check if the resistance of the analogue output load is in accordance with technical data.	
	Check if the individual characteristic is turned on. In case of necessity, change parameters of the individual characteristic (see Fig. 5) or introduce parameters set by the producer.	Only in P11T-2
3. The transducer is not communicating with the computer	Check if the PD11 programmer is connected correctly. Check if the proper communication port has been chosen.	Only in P11T-2

8. EXECUTION CODES

Execution codes of the P11T transducer

Table 3

P11T TRANSDUCER	X	XX	X	X	X	XX	X
Kind of transducer: programmed by the producer 1 programmable* 2							
Input signal: write the input signal code from the table 4 XX							
Output signal: voltage, 0... 10 V 1 current, 0... 20 mA 2 current, 4... 20 mA 3 current, 0... 5 mA 4 on order 9							
Supply: 85... 253 V a.c./d.c. 1 20... 50 V a.c./ d.c. 2							
Kind of terminals: socket - screw plug 0 socket - self-locking plug 1							
Execution: standard 00 custom-made** XX							
Acceptance tests: without a quality inspection certificate 0 with a quality inspection certificate 1 acc. user's agreement*** X							

- * The programmable transducer has a universal input. When ordering one must give the code of the output signal which will be to programmed.
 ** After agreeing by the producer
 *** The producer will establish the execution code number

The transducer maintains its class to the fourfold decrease of the basic range of the input signal. In the P11T-1 transducer, besides the basic range, one must give the required sub-range in remarks. In case when the given sub-range is smaller than the basic range divided by four, one must precise the input signal on the order as XX.

Table 4

Input signal:		Code
Pt100	(-200... +850)°C	00
Pt500	(-200... +850)°C	01
Pt1000	(-200... +850)°C	02
Cu100	(-50... +180)°C	03
Ni100	(-60... +180)°C	04
Thermocouple J - (Fe-CuNi)	(-100... +1200)°C	05
Thermocouple K - (NiCr-NiAl)	(-100... +1370)°C	06
Thermocouple N - (NiCrSi-NiSi)	(-100... +1300)°C	07
Thermocouple E - (NiCr-CuNi)	(-100... +900)°C	08
Thermocouple R - (PtRh13-Pt)	(0... +1760)°C	09
Thermocouple S - (PtRh10-Pt)	(0... +1760)°C	10
Thermocouple T - (Cu-CuNi)	(-50... +400)°C	11
Measurement of resistance up to 400 Ω	(0... 400) Ω	12
Measurement of resistance up to 4 kΩ	(0... 4000) Ω	13
Measurement of voltage -10...70 mV	(-10...70) mV	14
Measurement of voltage 0...3 V	(0...3) V	15
Measurement of voltage 0...10 V	(0...10) V	16
Measurement of current 0...5 mA	(0...5) mA	17
Measurement of current 0...20 mA	(0...20) mA	18
On order		XX

Coding example:

The **P11T-1-00-1-1-0-00-0** code means: the execution of a P11T transducer programmed by the producer without the possibility to re-programme it by the user, with an input signal: PT100 resistance thermometer, output signal: 0 -10 V, supply voltage: 85...253 V a.c./d.c., with a socket-screw plug, standard execution, without a quality inspection certificate.

9. MAINTENANCE AND WARRANTY

The P11T transducer does not require any periodical maintenance.
In case of some incorrect unit operations:

1. In the period of 12 months from the date of purchase:

One should take the transducer down from the installation and return it to the Manufacturer's Quality Control Dept.
If the unit has been used in compliance with the instructions, the Manufacturer warrants to repair it free of charge.

2. After the guarantee period:

One should turn over the transducer to repair in a certified service workshop.
The disassembling of the housing causes the cancellation of the granted warranty.

Spare parts are available for the period of ten years from the date of purchase.

The Manufacturer reserves the right to make changes in design and specifications of any products as engineering advances or necessity requires.

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