Notes

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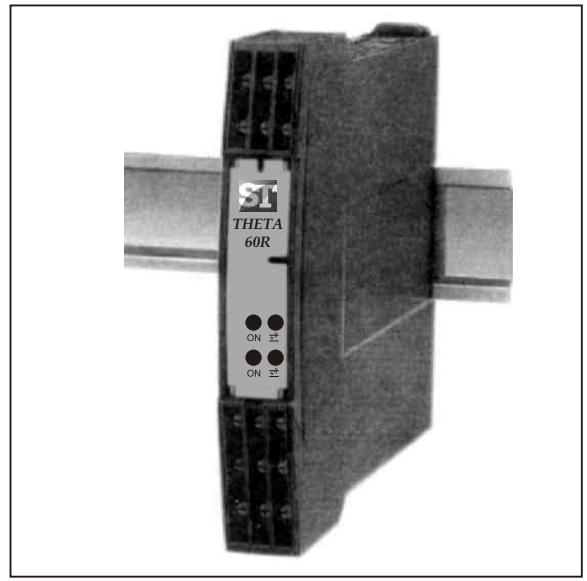
Operating Instructions
Measuring Transmitter *THETA 60R* Transducer



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Operating Instructions
Measuring Transmitter *THETA 60R* Transducer

Contents

1. Read first and then...

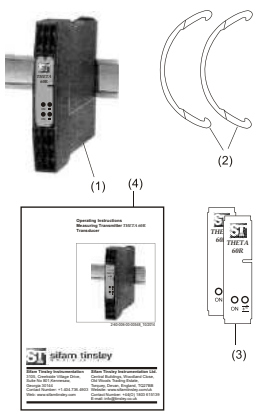
The proper and safe operation of the device assumes that the Operating Instructions are **read** and the safety warning given in the various Sections.

9. Mounting
10. Electrical connections
12. Commissioning

are **observed.**

The device should only be handled by appropriately trained personnel who are familiar with it and authorised to work in electrical installations.

2. Scope of supply (Fig. 1)



Transmitter (1)
2 **Pull-out clamps (2)** (for withdrawing the device from its housing)
2 **Front plates (3)** (for notes)
1 **Operating Instructions (4)** in English

3. Ordering infromations

DESCRIPTION	MARKING
1. Mechanical design	
Housing S17	602 - 1
2. Number of measuring inputs/ measuring ranges	
With 1 meas. input / meas, range	1
With 2 meas. inputs / meas, ranges	2
3. Version / Power supply →◯	
Standard, 24... 60 V DC/AC	1
Standard, 85... 230 V DC/AC	2
4. Connection mode (applies to inputs 1 and 2)	
Two-wire connection RL 1 [Ω]	1
RL 2 [Ω]	
Three-wire connection`	2
Four-wire connection	3
5. Measuring input 1	
Meas. range 0...100°C, configurable	1
Measuring range [°C] - 150 to + 800 °C, span min. 50K, max. 700 K	9
6. Measuring input 2	
Measuring input 2 not used	0
Meas. range 0...100°C, configurable	1
Measuring range 2 [°C] Possible measuring ranges see measuring input 1	9
7. Measuring output 1 or 2 (applies to outputs 1 and 2)	
Output 0/4...20 mA (configurable by plug-in jumpers)	1
Output 0...10 V	2
Output 4/0...20ma (configurable by plug-in jumpers)	3
8. Certificate	
Without test certificate	0
With test certificate	1

4. Brief description

The measurement transmitter ***THETA 60R*** converts the resistance of a Pt 100 feeler to a linear output signal to the proportional to the temperature.

Depending on the version of the unit, the Pt 100 can be connected by two, three or four wires.

The desired measuring range can be set within wide limits with the aid of DIP switches and a potentionmeter.

WARRANTY

Dear Customer,

You are now the privileged owner of Transducer a product that ranks the first of its kind in the world.
Company provides 12 months warranty from the original date of purchase against defective material and workmanship.
In the unlikely event of failure of this Transducer within the warranty period, Company will repair the Transducer free of charge. Please hand over the Transducer to the dealer / Stockiest from whom you have purchased along with this card and relevant cash memo / Invoice. This warranty entitles you to bring the Transducer at your cost to the nearest stockiest / dealer and collect it after repairs.

NO TRANSPORTATION CHARGES WILL BE REIMBURSED

The warranty is not valid in following cases:

1) Warranty card duly signed / stamped and original cash memo / invoice are not sent along with the Transducer .
2) Complete warranty card is not presented to authorised person at the time of repairs.
3) Transducer not used as per the instruction in the user manual.
4) Defect caused by misuse, negligence, accidents, tampering and acts of god.
5) Improper repairing by any person not authorised by the company.
6) Any sort of modification, alteration is made in electrical circuitry.
7) Seal provided inside is broken.

In case of dispute to the validity of warranty, the decision of Company's service center will be final.
If you bought this Transducer directly from the company, and if you notice transit Damage, then you must obtain the insurance surveyors report and forward it to Company.

Thank you.

(To be filled by authorized dealer)

Model No. : _____

Serial Number : _____

Date of Purchase : _____

Cash Memo / Invoice No. : _____

Dealer's Signature : _____

Dealer's Stamp : _____

Scope of Supply:

1) Transducer
2) Instruction manual
3) Test Certificate
4) Warranty Card
5) RS-232 Interface Cable*
6) Software*

* Only with *Theta 40* Transducer

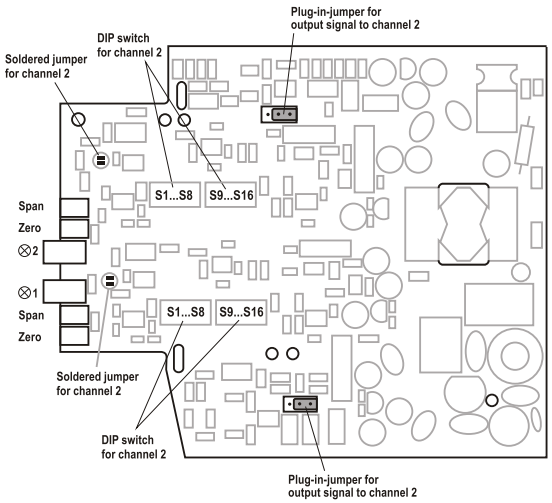


Fig. 10. Position of the DIP switches S1...S16, plug-in jumpers and soldered jumpers.

12. Commissioning

Switch on the measuring inputs and the power supply. The green LED's lights continuously after switching on.

The power supply unit must to capable of supplying a brief current surge when switching on. The instruments presents a low impedance at the instant of switching which requires a current I_{start} of ...

... $I_{start} \geq 160$ mA for the version with a power supply range of 24 - 60 V DC/AC

or

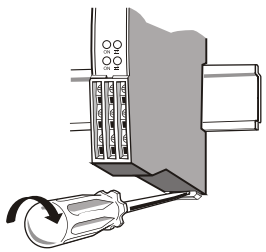
... $I_{start} \geq 35$ mA for the version with a power supply range of 85 - 230 V DC/AC

13. Maintenance

No maintenance is required.

14. Releasing the transmitter

Release the transmitter from a top-hat rail as shown in Fig. 11.



15. Dimensional drawings

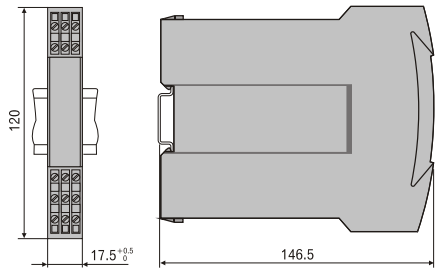


Fig. 12. in housing S17 clipped onto a top-hat rail (35 x 15 mm or 35 x 7.5 mm. acc. to EN 50 022).

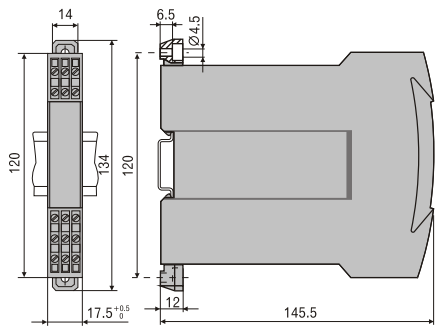


Fig. 13. in housing **S17** screw hole mounting brackets pulled out.

5. Overview of the parts

Figure 2 shows those parts of the device of consequence for mounting, electrical connections and other operations described in the Operating Instructions.

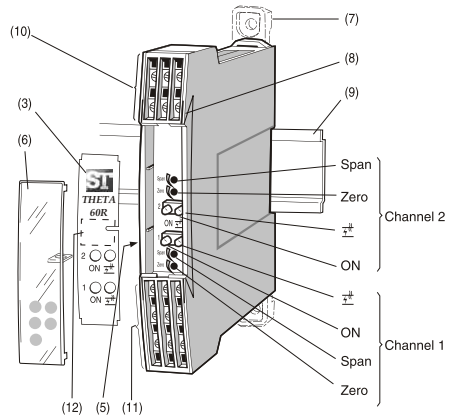


Fig. 2. The two-channel version of ***THETA 60R***

(3) Front label
(5) Type label
(6) Transparent Cover
(7) Fixing bracket
(8) Opening for Pull-out clamps (for opening the housing)
(9) Top-hat rail 35 x 15 mm or 35 x 7.5 mm (EN 50 022)
(10) Terminals
(11) Terminals
(12) Space for notes
ON Green LED's for indicating device standing by
Red LED's for indicating operation of open-circuit or short-circuit

6. Technical data

Measuring input

Temperatures with resistance thermometer	
for two-wire connection:	- 150 to + 800°C
for three- or four-wire connection:	- 170 to + 800°C
Min. span	50 K
Max. span	700 K
Measuring ranges:	Set within wide limits on DIP switches and a potentiometer
Feeler current:	< 1 mA
Max. lead resistance:	25Ω per lead (loop resistance 50Ω)

Measuring outputs

DC current :	0/4 ... 20 mA switchable
Burden voltage:	10 V
External resistance:	R_{ext} Max. ≥ 500 Ω
DC voltage:	0 ... 10 V
Load capacity:	R_{ext} min. ≤ 2 kΩ
Residual ripple of output current:	< 1.5% p.p.
Response time:	< 500 ms

Open-circuit sensor circuit and short-circuit supervision

Pick-up level:	- At open-circuit approx. 1 to 400 kΩ - At short-circuit approx. 0 ... 30 Ω
Fault signalling mode:	- Frontplate signals Red LED for signalling fault - Output signal at 0/4...20 mA. output approx. 25 mA at 0...10V, output approx. 12.5 V

Power supply H

AC/DC power pack (DC and 45 ...400 Hz)

Table 1: Rated voltages and permissible variations

Nominal voltages U_N	Permissible variation
24... 60 V DC / AC	DC - 15... + 33% AC ± 15 %
85...230 V [1] DC / AC	

[1] An external supply fuse must be provided for DC supply voltages >125 V.

Power consumption:	≤ 1.8 W resp. ≤ 3.4 VA

Accuracy data (acc. to DIN/IEC 770)

Basic accuracy:	Max. error ≤ ±0.5% including linearity and repatabilty errors

Installation data

Terminals:	DIN/VDE 0609 Screw terminals with wire guards for light PVC wiring and max. 2 x 0.75 mm² or 1 x 2.5 mm²
Permissible vibrations:	2 g acc. to EN 60 068-2-6
Shock:	50 3 shocks each in 6 directions acc. to EN 60 068-2-27

Electrical insulation: All circuits (measuring inputs/ measuring outputs / power supply) are electrically insulated.

Standards

Housing protection (acc. to IEC 529 resp. EN 60 529): IP 40
Terminals IP 20

Electrical standards: Acc. to IEC 1010 resp. EN 61 010

Test voltage: Power supply versus:
- all 3.7 kV, 50 Hz, 1 min.

Measuring inputs versus:
- Measuring outputs 2.3 kV, 50 Hz, 1 min.

Measuring input versus:
- Measuring input 2 2.3 kV, 50 Hz, 1 min.

Measuring output 1 versus:
- Measuring output 2 2.3 kV, 50 Hz, 1 min.

Environmental conditions

Commissioning temperature: - 10 to + 55°C

Operating temperature: - 25 to + 55°C

Storage temperature: - 40 to + 70°C

Annual mean relative humidity: ≤75%

7. Exchanging frontplates

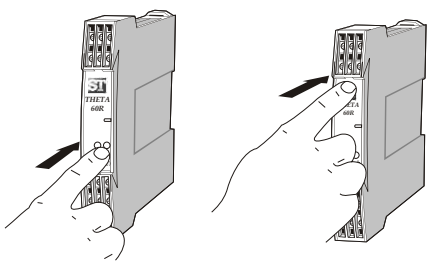


Fig. 3 Left : Removing the transparent cover
Right : Inserting the transparent cover

Apply gentle pressure to the transparent cover as shown in Fig. 3 until pops out on the opposite side. The label in the cover can be replaced and used for notes.

After replacing the label in the transparent cover, the transparent cover can be snapped into the front of the device again. This is done by inserting it behind the edge at the bottom and pressing it gently down and to the rear with the finger until it snaps into place (right side of Fig. 3)

8. Withdrawing and inserting the device

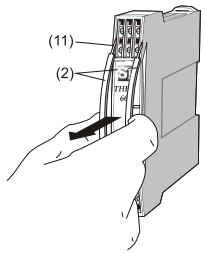


Fig. 4

Insert the pull-out clamps S17 (2) into the openings (9) until they snap into place. Withdraw the front part together with the main PCB out of the housing.

To reassemble the unit, insert the front part together with the main PCB into the housing until the swallow-tailed sections engage in each other.

9. Mounting

The *THETA 60R* can be mounted either on a top-hat rail or directly onto a wall or mounting plate.

Make sure that the ambient temperature stays within the **permissible limits:**
-25 and + 55 °C

9.1 Top-hat rail mounting

Simply clip the device onto the top-hat rail (EN 50 022) (see Fig. 5).

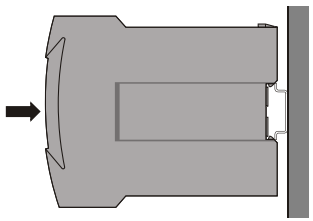


Fig. 5. Mounting on top-hat rails 35 x 15 or 35 x 7.5 mm.

9.2 Wall mounting

Drill 2 holes in the wall or panel as shown in the drilling pattern (Fig.6). Now secure the power pack to the wall or panel using two 4 mm diameter screw.

11.4. Switch positions (S14...S16) for linearisation

A switch combination has to be set to linearise the range that depends on the minimum value of the measuring range (TA) and the temperature range (TE - TA). Fig. 9 shows how the switch positions are determined for the example of a measuring range of 100...600°C. The correct switch positions for this example are "OFF-ON-ON".

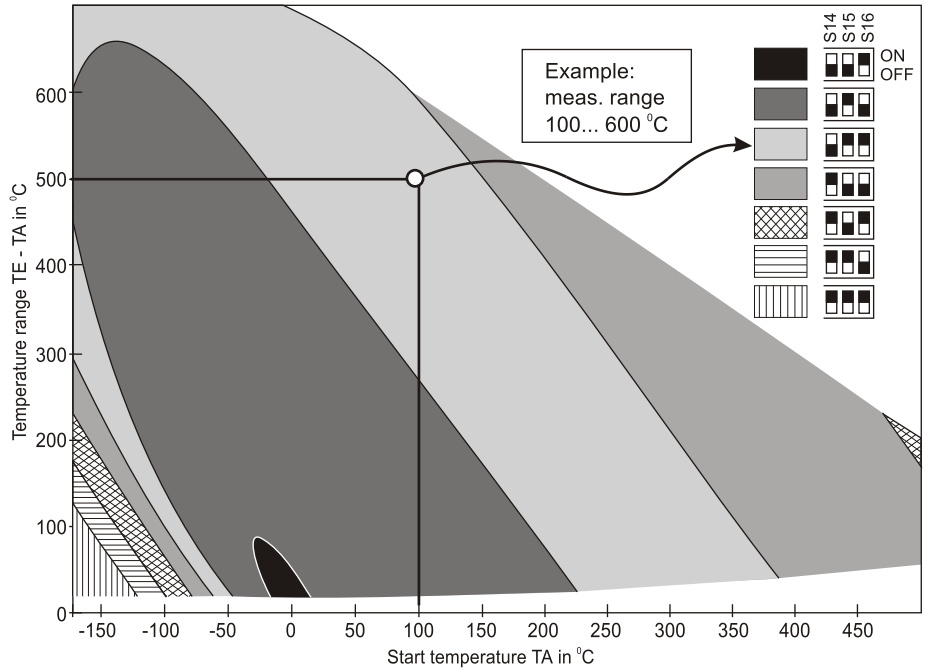


Fig. 9. Switch positions (S14...S16) for linearisation.
TA = Measuring range start value
TE = Measuring range end value

11.5 Jumper plug positions for output signal range

There is a jumper plug for each channel that enables the output current range to be selected (see Fig. 10).

Current [mA]	Plug-in-jumpers
0...20	
4...20	

Measuring range start value °C	S2 ... S7	Measuring range start value °C	S2 ... S7
- 170 ... -149		295 ... 301	
-149 ... -119		301 ... 306	
-119 ... -98		306 ... 315	
-98 ... -76		315 ... 326	
-76 ... -58		326 ... 335	
-58 ... -41		335 ... 344	
-41 ... -20		344 ... 350	
-20 ... 0		350 ... 359	
0 ... 24		359 ... 367	
24 ... 47		367 ... 375	
47 ... 64		375... 384	
64 ... 82		384 ... 393	
82 ... 99		393... 400	
99 ... 116		400 ... 408	
116 ... 131		408 ... 415	
131 ... 146		415 ... 422	
146 ... 163		422 ... 429	
163 ... 180		429 ... 435	
180 ... 197		435 ... 443	
197 ... 209		443 ... 450	
209 ... 219		450 ... 456	
219 ... 228		456 ... 462	
228 ... 240		462 ... 466	
240 ... 251		466 ... 470	
251 ... 265		470 ... 476	
265 ... 275		476 ... 481	
275 ... 281		481 ... 488	
281 ... 286		488 ... 494	
286 ... 291		494 ... 499	
291 ... 295		499 ... 500	

11.2.2. Two-wire connection

To determine the switch positions for the desired minimum value of the measuring range, add the resistances of the sensor and the leads (R_L total). If the total lead resistance (R_L total) exceeds 25Ω , subtract 25Ω.

Example 2:
Measuring range 0...100°C
Total lead resistance R_L 35Ω (subtract 25Ω)
The minimum value is given by sensor + lead resistance:
R_{total} = 100Ω + 10 Ω

At 26°C, a Pt 100 has a resistance of 110Ω. The minimum value of the measuring range that has to be set on DIP switches S2...S7 is therefore 26°C i.e. the switches positions are "ON-ON-OFF-OFF-ON-ON".

11.3 Switch positions for setting the span (S8...S13)

Select the desired span in the following table and place switch S8 in block 1 and switches S9...S13 in block 2 in the corresponding positions.

Example 3:
Measuring span 616°C
Switch positions "ON-ON-ON-OFF-OFF-ON"

Measuring span °C	S8 ... S13	Measuring span °C	S8 ... S13
50 ... 68		...445	
... 85		...450	
...101		...458	
...122		...466	
...140		...477	
...150		...485	
...159		...490	
...174		...494	
...193		...502	
...207		...512	
...220		...519	
...237		...526	
...254		...535	
...271		...544	
...288		...553	
...303		...561	
...318		...570	
...329		...578	
...339		...584	
...353		...589	
...364		...597	
...370		...603	
...376		...606	
...387		610	
...399		...616	
...408		...623	
...417		...628	
...423		...633	
...428		...640	
...434		...646	
...440		...700	

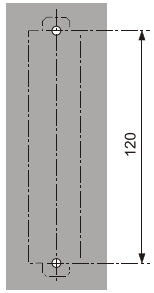


Fig. 6. Drilling pattern.

The wile pressing the latch (18) in the base of the device (Fig. 7, left), pull out the transmitter securing brackets (10).

Now secure the transmitter to the wall or panel using two 4 mm diameter screws.

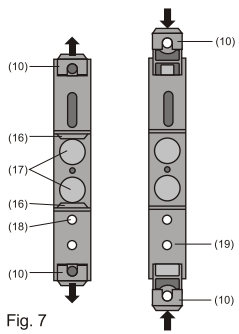


Fig. 7

Fig. 7.Rear of device.
(10) Screw hole brackets
(16) Top-hat rail clip
(17) Rubber buffers
(18) Latch for pulling the screw hole brackets out
(19) Latch for pushing the screw hole brackets in

Note :
To return the brackets to their original positions, the latch (19) in the base of the device has to be depressed before applying pressure to the securing brackets (10) (see Fig. 7, right).

10. Electrical connections

The electrical connections are made to screw terminals which are easily accessible from the front of the transmitter and can accommodate wire gauges up to1 x 2.5 mm².

Make sure that the cables are not live when making the connections !

The 230 V power supply is potentially dangerous.

Note that , ...

... the data required to carry out the prescribed measurement must correspond to those marked on the nameplate of ***THETA 60R* 602**(⊖→ input E,⊖→ output A and →○ power supply H)!

... the total loop resistance connected to the output (receiver plus leads) **does not** exceed the maximum permissible value R_{ext}. See **"Measuring output"** in Section "6. Technical data" for the maximum values of R_{ext} "

... the signal input and output cables should be twisted pairs and run as far as possible away from heavy current cables !

In all other respects, observe all local regulations when selecting the type of electrical cable and installing them!

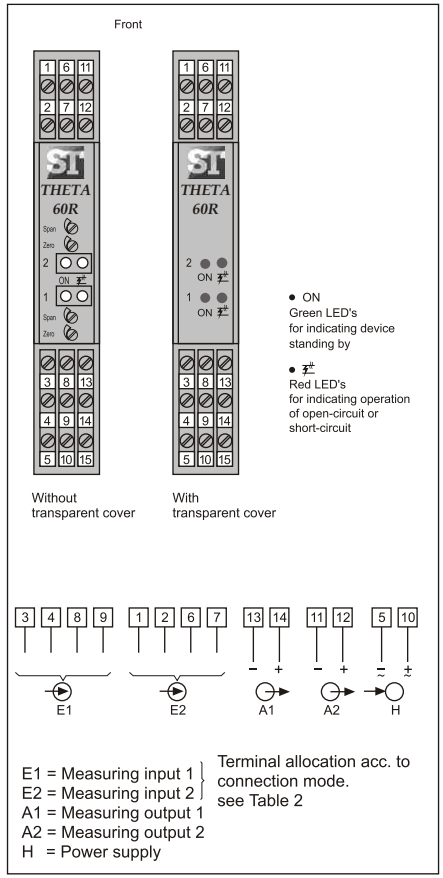
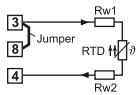
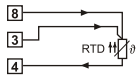
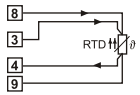
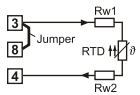
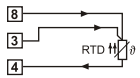
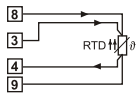
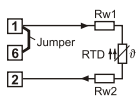
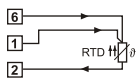
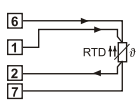


Table 2: Connections of the measuring input leads E1 and E2

Measuring inputs		Connecting mode*	Connecting diagram Terminal arrangement
Version with 1 input and 1 output	Measuring input ⊕ E1	**Two-**wire connection	
		Three-wire connection	
		Four-wire connection	
Version with 2 inputs and 2 outputs	Measuring input ⊕ E1	**Two-**wire connection	
		Three-wire connection	
		Four-wire connection	
	Measuring input ⊕ E2	**Two-**wire connection	
		Three-wire connection	
		Four-wire connection	

*THETA 60R units with the designations 602-1XX**1** and 602-1XX**2** can operate with either two-or three wire connections, but units with the type designation 602-1XX**3** only operate with a four-wire connection.*

Notes

10.1 Connection to resistance thermometers

10.1.1. Two-wire connection (connection diagram Table 2)

Connect terminals 3 and 8 on the single-channel version for a two-wire connection to the feeler.

Connect terminals 3 and 8 and also 1 and 6 on the two-channel version. A resistance up to 25Ω per lead is permissible which is taken into account during configuration (see Section 11.2.2.)

10.1.2. Three-wire connection (connection diagram Table 2)

It is assumed that the three leads of a three-wire connection have identical resistance and no compensation is necessary. The lead resistance must not be greater than 25Ω per lead.

10.1.3. Four-wire connection (connection diagram Table 2)

The four-wire measurement is independent of lead resistance within wide limits and therefore no compensation is necessary. The lead resistance must not be greater than 25Ω per lead.

10.2 Measuring output leads

Connect the output leads for output A1 to terminals 13(-) and 14(+) and for output A2 (field indicator) to terminals 11 (-) and 12(+) acc. to Section "10. Electrical connections".

Note! The maximum permissible external resistance R_{ext} max. of the *THETA 60R* **Transducer** must not be exceeded (see Section "6. Technical data")

10.3 Connecting the power supply

Connect the power supply to terminals 5(~) and 10 (±) acc. to Section "10. Electrical Connections".

A two-pole switch must be included in the supply connection where facility for switching *THETA 60R* **Transducer** off is desired.

Note: An external supply fuse must be provided for DC supply voltage > 125 V.

11. Configuration

The coarse calibration is performed on the DIP switches (Fig. 8) and the fine calibration on the potentiometers marked "Zero" and "Span" (see Section"10. Electrical connection"). It is necessary to remove the cover to set the DIP switches (see Section"8. Withdrawing and Inserting the device").

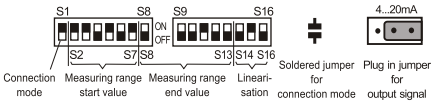


Fig.8. DIP switches, soldered jumper and jumper plug for configuring the *THETA 60R* (illustration for the preferred single-channel version).

11.1. Switch position S1 and soldered jumper (⏚) for connection mode of the resistance thermometer

As can be seen from the following table, measurement transmitters 602-1...1 and 602-1...2 can be used for **two** and **three-wire connection.** The device must be recalibrated if the connection mode is changed.

Devices with the type designation 602-1...3 are only intended for a four-wire connection and cannot be changed.

Connection mode	Lead resistance R_L	Soldered jumper	Switch position S1
Two-wire connection	R_L total 0...25 Ω	closed	ON
	R_L total >25...50 Ω		OFF
Three-wire connection	≤25 Ω per lead	open	ON
Four-wire connection			

11.2. Switch positions (S2...S7) for measuring range start value

11.2.1. Three and four-wire connection

Set DIP switches S2...S7 to the positions given in the following table for the desired minimum value of the measuring range.

Example 1:
Minimum value of the measuring range 82°C
Switch positions "ON-ON-OFF-OFF-OFF-ON"