TTY 65, TTY 65-Ex
TTY 125, TTY 125-Ex
TTY 245, TTY 245-Ex

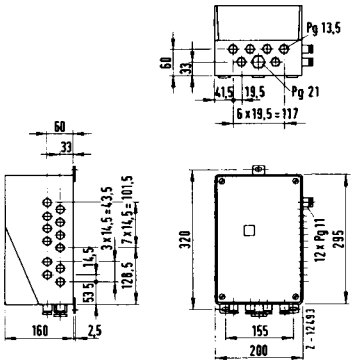
Reference junction thermostats

Operating manual

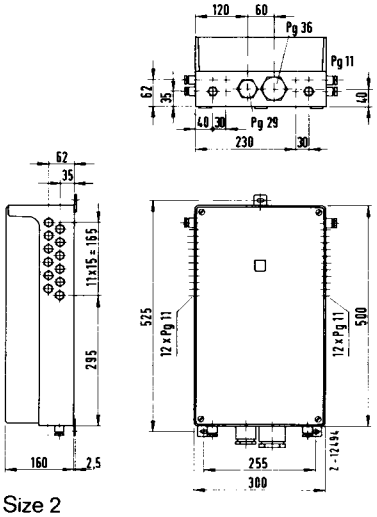
42/10-29 EN

Rev. 2.0

Contents



Size 1



Size 2

Fig. 1 Dimensional drawings (dimensions in mm)

Note

The industrial standards and regulations (DIN, VDE, VDI etc.) as well as the directives, specifications and requirements governing explosion protection (ElexV, Ex-RL, DIN, VDE) referred to in this Operating Manual are applicable in the Federal Republic of Germany. When using this device outside German Federal jurisdiction, the relevant specifications, standards and regulations applicable in the country where the device is used must be observed.

These apparatuses have been designed and tested in accordance with DIN 57 411 Part 1/VDE 0411 Part 1 (based on IEC Publication 348), Safety Requirements for Electronic Measuring Apparatus, and have been supplied in a safe condition. The present Operating Manual contains some information and warnings which have to be followed by the user to ensure safe operation and to retain the apparatuses in a safe condition.

TECHNICAL DESCRIPTION

1 Field of application

In temperature measurement with thermocouples, a millivoltage is generated that depends on the temperature at the measuring point, the reference junction temperature and the material composition of the thermocouple.

Reference junction thermostats maintain the temperature of the reference junction at a constant value of e.g. 50 °C, allowing the temperature at the measuring point to be determined from the millivoltage with the aid of the standardized base value tables for thermocouples. The reference junction thermostats combine 6, 12 or 24 measuring points, i.e. several thermocouples located near to each other are collected together in a reference junction thermostat with an extension lead wire for each thermocouple, and are connected via a collecting cable with copper wires to instruments with mV input in the control room. From the point of view of installation therefore, the reference junction thermostat also acts as a subsidiary distributing box.

2 Technical data

Input/output

Number of measuring points 6, 12 or 24

Connectable thermocouple types	Type L (Fe-CuNi) DIN 43710, Type U (Cu-CuNi) DIN 43710, Type K (NiCr-Ni) DIN IEC 584, Type S (Pt10Rh-Pt) DIN IEC 584 (mixed complement possible)

Transient response

Reference junction temperature 50 °C, optionally 60 °C or 70 °C

Reference junction temperature deviation (including tolerance of opposed junctions)	For type L (Fe-CuNi) DIN 43710, Type U (Cu-CuNi) DIN 43710 and Type K (NiCr-Ni) DIN IEC 584: ± 0.5 K For type S (Pt10Rh-Pt) DIN IEC 584: ± 1.6 K
Control fluctuation	≦ 0.1 K (peak-to-peak)
Effect of temperature in permitted temperature range	≦ 0.1 %/10 K
Built-in resistance thermometer Pt 100 DIN IEC	Tolerance class A to DIN IEC 751

Environmental capabilities

H&B climate group	3[1]
Application class	ZZR, ZVR or ZTR to DIN 40040
Permitted ambient temperature	−20 °C... +45 °C for 50 °C } reference −20 °C... +55 °C for 60 °C } junction −20 °C... +65 °C for 70 °C } temperature
Transportation and storage temperature	−25 °C... +70 °C
Relative humidity	≦ 90 % annual average, condensation tolerated

Mechanical capabilities

Mechanical test class	2/2 sF (WN 120-201)

Case and mounting

Material	Plastic
Size (see dimensional drawings page 2)	TTY 65-Ex, TTY 65 size 1 TTY 125-Ex, TTY 125 size 1 or 2 optionally TTY 245-Ex, TTY 245 size 2
Weight	Size 1: approx. 3.5 kg Size 2: approx. 8.7 kg
Color	TTY ..5-Ex: RAL 9011 (black) TTY ..5: RAL 7032 (gray)
Degree of protection to DIN 40050	IP 54 in version with Pg cable glands IP 40 in version with diaphragm fittings
Mounting location	Wall mounting
Electrical connections	Screw terminals for max. 2.5 mm²
Test voltage	Power supply and ground with respect to thermocouples: 2.5 kV/50 Hz/2 s

Power supply

Alternating voltage	220 V; 127 V; 110 V; 24 V: −15 %... +10 %, 48... 62 Hz/15 VA
Direct voltage	24 V: −15 %... +25 %, 12 W

Explosion protection

Manufacturer's identification code	49/10-07 Ex
Type test certificate	PTB No. III B/E-29932
Type of protection of reference junction thermostat	(Ex)eis G5 for ambient temperatures 45 °C and 55 °C (Ex)eis G4 for ambient temperature 65 °C
Type of protection of signal circuits	(Ex)i G5, only for connection to intrinsically safe circuits with short-circuit current up to 100 mA
Mounting location	Within the hazardous area

[1] For upper and lower limit temperature see permitted ambient temperature

3 Mode of operation

Fig. 2 shows the external wiring – measuring point 1, type S (Pt10Rh-Pt) DIN IEC 584 – and the internal circuitry of the reference junction thermostat.

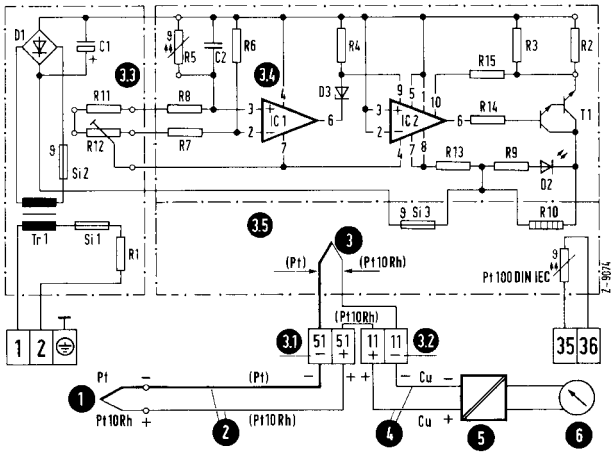


Fig. 2 Functional diagram with wiring example for measuring point 1

1 Thermocouple
2 Extension lead wire
3 Reference junction thermostat
3.1 Input terminals
3.2 Output terminals
3.3 Power supply unit
3.4 Control electronics
3.5 Metal block (heated)
4 Copper wire
5 Measuring amplifier
6 Indicating instrument
Pt10Rh Platinum-rhodium
(Pt10Rh) Platinum-rhodium equivalent
Pt Platinum
(Pt) Platinum equivalent

The thermocouple (1) is connected via the extension lead wire (2) to the input terminals (3.1). Embedded in the heated metal block (3.5) is an opposed thermocouple at a constant temperature of e. g. 50 °C, this being the reference junction. The thermoelectric voltage, referred to e. g. 50 °C, is made available at the output terminals (3.2) and is passed via a copper cable (4) to a millivolt amplifier (5) which may drive an indicating instrument (6). At each of terminals 11+ and 11– a transition from Pt10Rh equivalent to copper takes place. It is a requirement that both terminals are at the same temperature, so that the thermoelectric voltages produced at the output terminals are cancelled out in the circuit as a whole due to the opposite polarity. The embedded opposed thermocouples are isolated within the metal block (3.5) so that electrical isolation between the thermoelectric circuits and ground potential is ensured.

In the case of thermocouple type L (Fe-CuNi) DIN IEC 43 710 or type K (NiCr-Ni) DIN IEC 584 the opposed thermocouple is implemented with 3 poles, the two thermocouple types having at the apparatus input a common "+" pole and two different "–" terminales.

The metal block is controlled by a precision electronic on/off controller via the heater winding (R 10); the LED (D 2) lights up when the heating is switched on and thus serves for operational monitoring. Remote monitoring of the block temperature is possible with an optionally built in Pt 100 DIN IEC resistance thermometer connected to an external alarm signaling unit (min and max switching point). The power supply assembly (3.3) is only fitted with a transformer for 220 V AC, 110 V AC and 127 V AC power supplies; for 24 V AC/ DC the power supply is connected directly to the bridge rectifier (D1).

4 Construction

The instruments are supplied in the following basic versions:

TTY 65 and TTY 65-Ex	case size 1 for 6 measuring points (see Fig. 3)
TTY 125 and TTY 125-Ex	case size 1 for 12 measuring points (see Fig. 3)
TTY 125 and TTY 125-Ex	case size 2 for 12 measuring points (see Fig. 4)
TTY 245 and TTY 245-Ex	case size 2 for 24 measuring points (see Fig. 4)

The following assemblies: power supply unit (1), block (2), input terminals (3), output terminals (4), power terminals (5), Pt 100 terminals (6) and shield terminals (7) are screwed to a metal plate fastened to the base of the plastic case (see Figs. 3 and 4).

The "power supply" assembly is partly encapsulated (explosion-proof versions). Located on the projecting part of the pcb are a mains fuse and adjustment resistors R11, R12 for the reference junction temperature.

The "block" assembly contains both the on/off controller pcb and the metal block for the opposed thermocouples, both being encapsulated (explosion-proof versions).

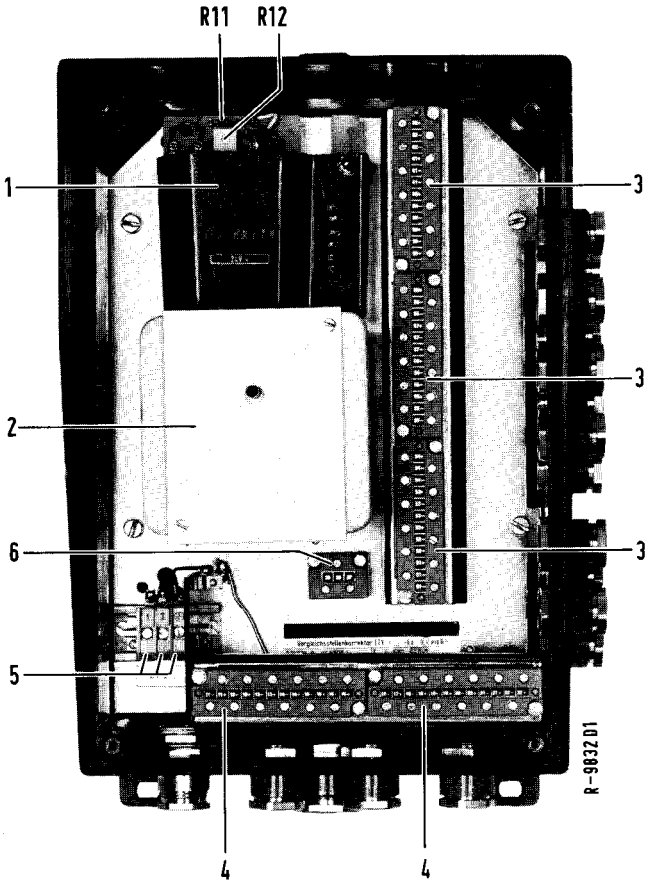


Fig. 3 TTY 65-Ex, TTY 125-Ex, case size 1 (opened)

1 Power supply unit
2 Block
3 Input terminals
4 Output terminals
5 Power terminals
6 Pt 100 terminals
R11 Fixed resistor } For setting the reference
R12 Potentiometer } junction temperature

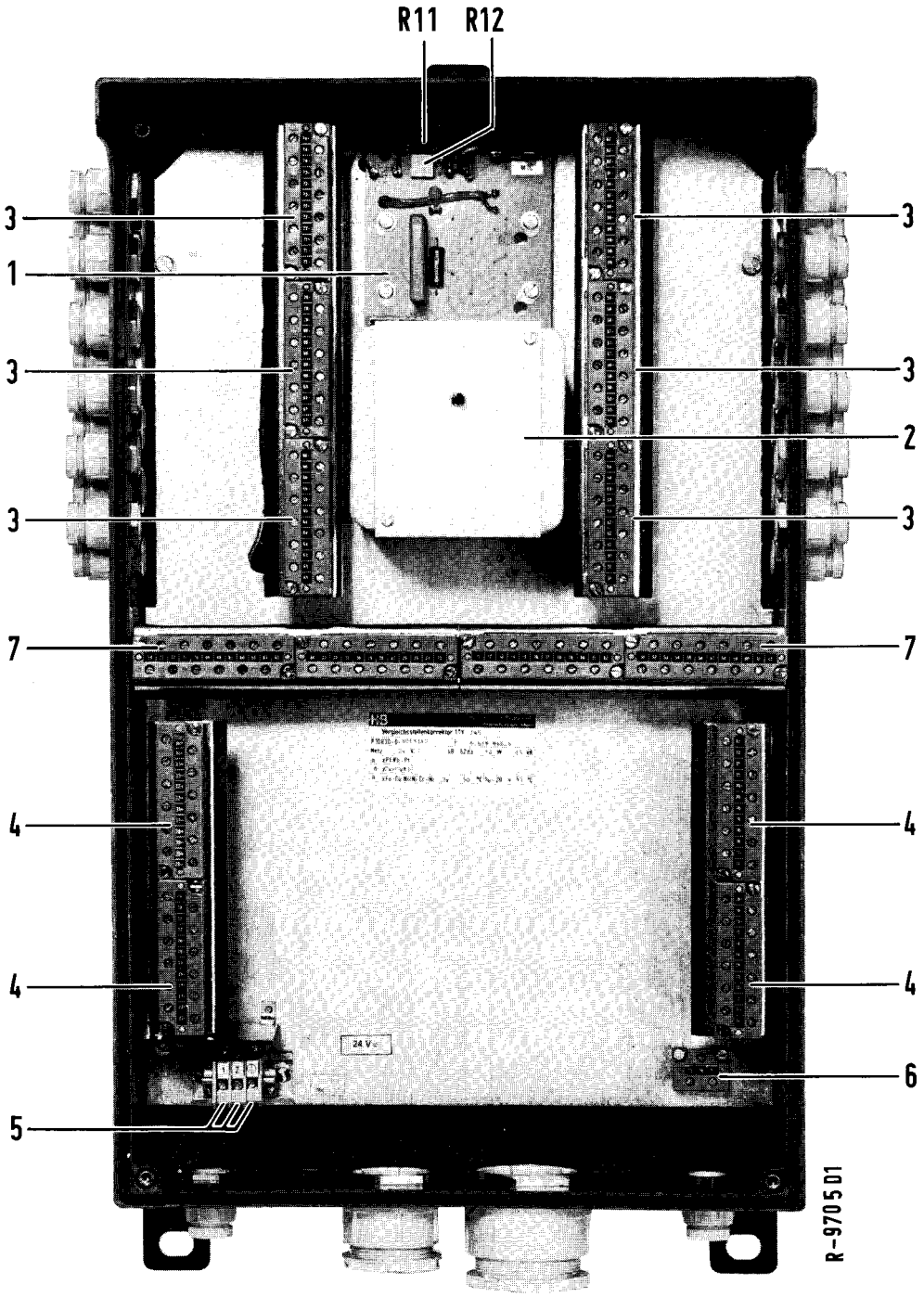


Fig. 4 TTY 125, TTY 245, case size 2 (opened)

1 Power supply unit
2 Block
3 Input terminals
4 Output terminals
5 Power terminals
6 Pt 100 terminals
7 Shield terminals
R11 Fixed resistor } For setting the reference
R12 Potentiometer } junction temperature

5 Mounting and connecting instructions

5.1 Mounting the instrument

The instrument is designed for wall mounting and must be fastened by its projecting mounting straps with the power terminals pointing downwards.

Important! The instrument must be mounted so that it is not directly exposed to heat radiation (from the sun, furnaces, boilers etc.). The ambient temperature must at all times remain within the limits (see Section 2).

5.2 Installing the signal and power lines

The appropriate extension lead wires (note color code!) must be routed from the thermocouples to the terminal strip in the reference junction thermostat.

All measuring circuit wiring must be laid strictly separately from lines that conduct more than 40 V.

Reference junction thermocouples for thermocouple type L (Fe-CuNi) DIN 43 710 and type K (NiCr-Ni) DIN IEC 584 are constructed as a combination with a common positive lead. Fig. 5, for example, shows at measuring points 1 and 6 the different connection of the extension lead wires for type L (Fe-CuNi) DIN 43 710 and type K (NiCr-Ni) DIN IEC 584. Extension lead wires of thermocouples type U (Cu-CuNi) DIN 43 710 or type S (Pt10Rh-Pt) DIN IEC 584 are to be connected as shown in the example for measuring point (6) 12.

Connection leads for line shields (optionally available) where shielded extension lead wires and connecting leads are used:

TTY 65: Terminals 11...16

TTY 125: Terminals 11...22 and 51...62
(not possible with case size 1)

TTY 245: Terminals 11...34 and 51...74

Thermostat temperature monitoring (optionally available): Pt 100 DIN IEC resistance thermometer connected to terminals 35 and 36.

The instrument can optionally be fitted with terminal strips for through-connecting line shields. Great care must be taken to ensure that the shields of the spur lines are connected with the internal shields of the wire pair for the associated measuring channel in the collecting cable.

Important! The line shield must be grounded at one point only for each measuring channel.

When selecting the line material, care must be taken to ensure that with Pg cable glands the requirements of degree of protection of case IP 54 are still met. The lines are connected at screw terminals for up to max. 2.5 mm². Correct polarity – shown in Fig. 5 – must be observed without fail.

In the explosion-proof versions the thermocouple circuits (inputs and outputs) and if applicable also the resistance thermometer circuit, must be identified as intrinsically safe circuits. If they are color-coded, the color used must be light blue.

(See Section 8 for information on power line connection in explosion-proof instruments.)

Important! The grounding terminal must be connected in each case with the potential equalizer or grounding conductor.

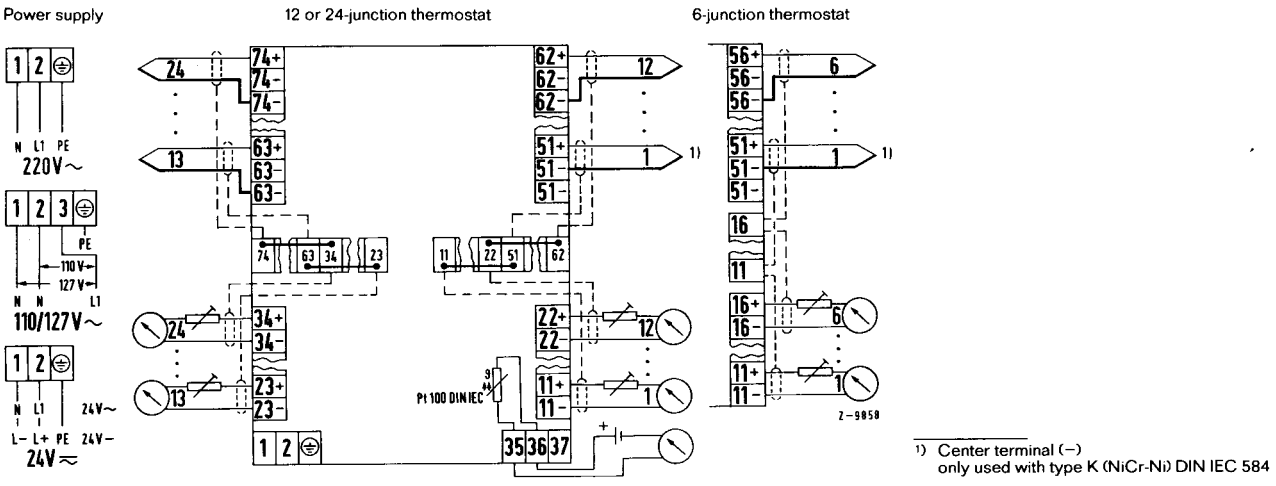


Fig. 5 Terminal connection diagram

6 Commissioning/maintenance

After connecting the wiring, the reference junction thermostat can be placed into operation by switching on the mains voltage. The metal block reaches its final temperature approximately 30 minutes after switching on, and measurement (display, recording or control) can then begin. The reference junction thermostats are fully electronic and require no maintenance.

7 Altering the reference junction temperature

The reference junction temperature can be raised to 60 °C or 70 °C by changing the metal film resistor R11 (fine adjustment with potentiometer R12). The following values for R11 are provided:

ϑ_V	50 °C	60 °C	70 °C
R11	5.62 kΩ	2.43 kΩ	0 Ω (jumper)

(See Figs. 3 and 4 for position of R11 and R12)

Important! Metal film resistors size 0207, application class EKF, tolerance 1%, TC < 50 ppm/K must be used.
(See also Spare Parts Data Sheet 10-9.55 EN)

If changes are made to the explosion-proof version, the instructions in Section 8.1 must be observed.

8 Explosion protection

Resistance thermometer circuit (terminals 35 and 36) and thermocouple circuits (terminals 11 to 34 and 51 to 74) with protection type "intrinsic safety" (Ex)i G5 are only approved for connection to intrinsically safe circuits with short-circuit currents up to 100 mA. The thermocouple circuits are electrically isolated from each other and from the resistance thermometer circuit; series voltage 60 V.

The power line to be installed in accordance with type of protection "increased safety" must have its sheathing removed for 23...27 mm and its insulation removed for 5...7 mm at the connection point.

When choosing the installation site, carrying out installation, and selecting, installing and connecting the wiring material, the following directives, regulations and certificates must be observed:

- Directives on electrical installations in areas subject to explosion hazard (Elex V)
- Regulations on the installation of power systems with rated voltages up to 1000 V (VDE 0100)
- Regulations on the installation of electrical systems in areas subject to explosion hazard (VDE 0165)
- Type test certificates PTB No. III/B/E-29932 with annex.

8.1 Operational check, alteration and repair

Work may be carried out on the explosion-proof instrument **after elimination of the explosion hazard.**

If repairs or alterations are effected on parts of the instruments on which the explosion protection depends, prior to placing back into service an expert must test and certify that in the features essential for explosion protection according to its type and version the instrument corresponds to the apparatus described in the certificate.

If a repair is carried out by the manufacturer, for instance by a member of the H&B Service staff who is able to identify himself with the appropriate certificate, or if it is carried out at the manufacturer's works, a marking is affixed to the rating plate concerning the repair and subsequent individual test. A demonstration before an expert is not necessary in this case.

8.2 Accessories

Enclosed with each explosion-proof instrument, as well as the type test certificate (see Technical Data for number), is the H&B Service Information 43/00-100 "Explosion-Proof Version".

9 Packing instructions

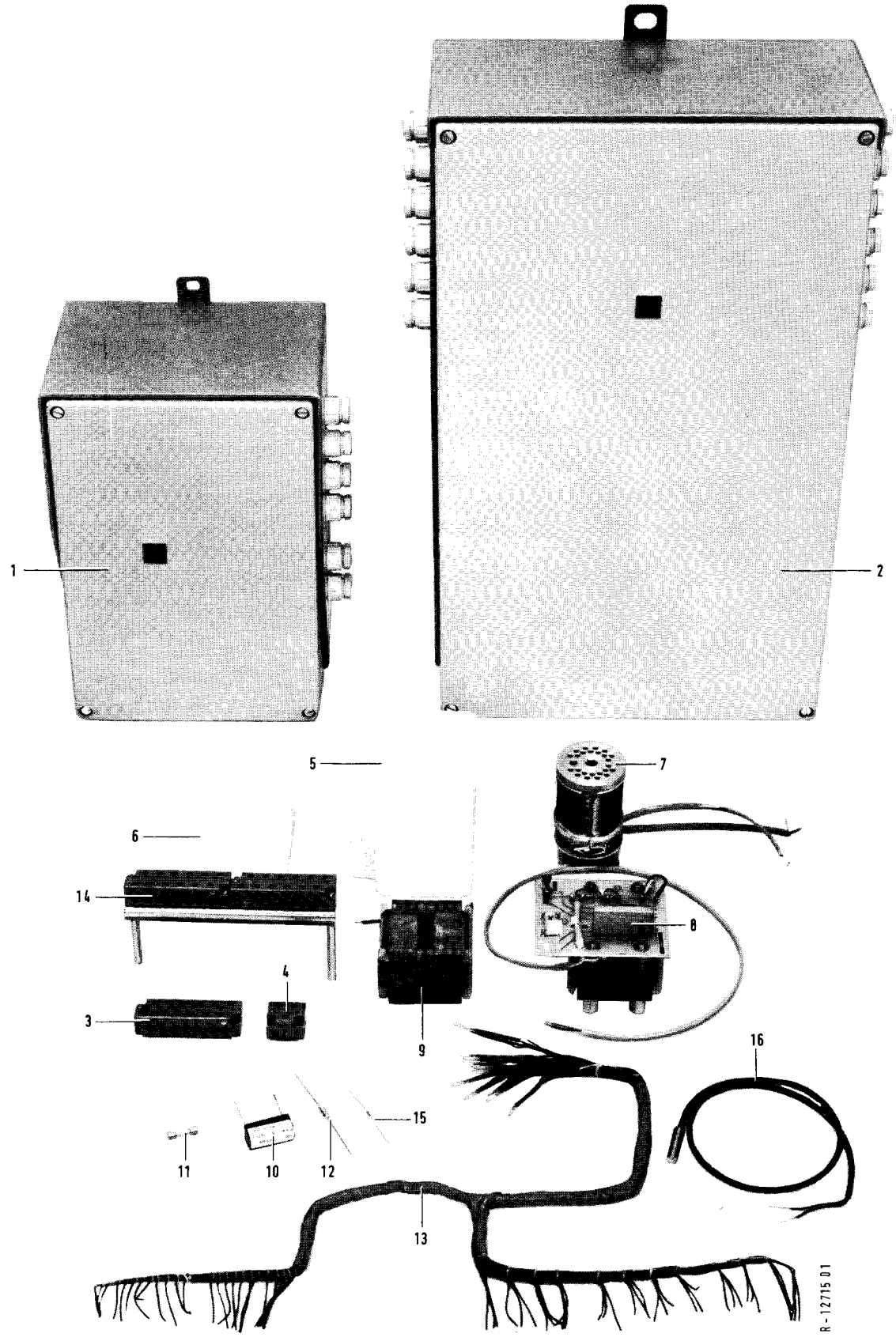
If the original packing is no longer available, the reference junction thermostat must be wrapped in paper and packed in a sufficiently large crate lined with shock-absorbing material (excelsior, spun rubber or similar). If excelsior is used, the packed layer should be at least 15 cm on all sides.

For overseas shipment the reference junction thermostat must additionally be sealed airtight in polyethylene at least 0.2 mm thick together with a dessicant (e. g. silica gel). Furthermore, for this type of shipment the crate should be lined with a double layer of bitumen paper.

These packing instructions also apply when returning the instrument to the manufacturer (for recalibration or repair).

Spare parts

**for Reference Junction Thermostats TTY 65, TTY 125, TTY 245,
TTY 65-Ex, TTY 125-Ex, TTY 245-Ex**



Ordering information

For ordering, the Catalog No. (B-Nr.) suffices.

The assignment of spare parts to instruments can be obtained from the column "Spare part code" in the text, with the aid of the adjacent table.

Case size	TTY 65	TTY 125	TTY 245	TTY 65-Ex	TTY 125-Ex	TTY 245-Ex
1	a	b	–	e	f	–
2	–	c	d	–	g	h

Spare part code	Designation	Illustration no.[1]	g approx.	Catalog No.	Price	Delivery time
a b	Case 1, gray	1	3000	10804-4-0388928		
c d	Case 2, gray	2	5000	10804-4-0388924		
e f	Case 1, black	1	3000	10804-4-0806342		
g h	Case 2, black	2	5000	10804-4-0806341		
a b c d e f g h	Set of terminals on rail, 220 V AC, 24 V AC/DC	–	115	10804-4-0389224		
a b c d e f g h	Set of terminals on rail, 110/127 V AC	–	125	10804-4-0389225		
a b c d e f g h	12-pole terminal strip for inputs/outputs/screens	3	40	94382-4-0870319		
a b c d e f g h	3-pole terminal strip for Pt 100	4	18	94382-4-0870320		
a b c d e f g h	Styropor jacket for heating block	5	10	10805-4-0458053		
a b c d e f g h	Styropor lid for heating block	6	2	10805-4-0458054		
a b c d	Block with printed circuit board	7	400	10804-4-0387800		
e f g h	Block with printed circuit board[2]	7	500	10804-4-0806311		
e f g h	Power supply unit 220 V AC[2]	8	1500	10804-4-0806350		
e f g h	Power supply unit 110/127 V AC[2]	8	1500	10804-4-0806351		
e f g h	Power supply unit 24 V AC/DC[2]	8	400	10804-4-0806352		
a b c d	Power supply unit 220 V AC	8	400	10804-4-0387794		
a b c d	Power supply unit 110/127 V AC	8	400	10804-4-0387795		
a b c d	Power supply unit 24 V AC/DC	8	100	10804-4-0387796		
a b c d	Mains transformer 220 V AC	9	330	10804-4-0802973		
a b c d	Mains transformer 110/127 V AC	9	330	10804-4-0803183		
e f g h	Mains fuse 220 V AC (Si 1)[2]	10	15	10804-4-0809906		
e f g h	Mains fuse 110/127 V AC (Si 1)[2]	10	15	10804-4-0809909		
a b c d	Mains fuse M 125 C for 220 V AC (Si 1)	11	1	94682-4-0864873		
a b c d	Mains fuse M 250 C for 110/127 V AC (Si 1)	11	1	94382-4-0882457		
a b c d	Mains fuse M 1 C for 24 V AC/DC (Si 1)[4]	11	1	94382-4-0881508		
a b c d	Thermal trip for heating block (Si 3)	12	1	94682-4-0869960		
a e	Preformed cable type L (Fe-CuNi) DIN 43710 or type K (NiCr-Ni) DIN IEC 584 (6 measuring points)	13	35	10804-4-0806365		
a e	Preformed cable type S (Pt 10 Rh-Pt) DIN IEC 584 (6 measuring points)	13	35	10804-4-0806366		
a e	Preformed cable type U (Cu-CuNi) DIN 43710 (6 measuring points)	13	35	10804-4-0806367		
b f	Preformed cable type L (Fe-CuNi) DIN 43710 or type K (NiCr-Ni) DIN IEC 584 (12 measuring points)	13	70	10804-4-0806369		
b f	Preformed cable type S (Pt 10 Rh-Pt) DIN IEC 584 (12 measuring points)	13	70	10804-4-0806370		
b f	Preformed cable type U (Cu-CuNi) DIN 43710 (12 measuring points)	13	70	10804-4-0806371		
c d g h	Preformed cable type L (Fe-CuNi) DIN 43710 or type K (NiCr-Ni) DIN IEC 584 (12 measuring points)	13	70	10804-4-0806377		
c d g h	Preformed cable type S (Pt 10 Rh-Pt) DIN IEC 584 (12 measuring points)	13	70	10804-4-0806378		
c d g h	Preformed cable type U (Cu-CuNi) DIN 43710 (12 measuring points)	13	70	10804-4-0806379		
c d g h	Double bracket for screen terminals (meas. points 1...12)	14	175	10804-4-0852637		
c d g h	Double bracket for screen terminals (meas. points 13...24)	14	175	10804-4-0852636		
a b c d e f g h	Metal film resistor R_{11} 5.62 kΩ for 50 °C[3]	15	1	94682-4-0858866		
a b c d e f g h	Metal film resistor R_{11} 2.43 kΩ for 60 °C[3]	15	1	94682-4-0870620		
a b c d e f g h	Resistance thermometer Pt 100 DIN IEC 751	16	20	10805-4-0852704		
a b c d e f g h	Retrofit set Pt 100 DIN IEC 751	–	50	10804-4-0389226		

[1] See photos on page 1 of this Data Sheet
[2] Encapsulated component
[3] R_{11} bridged at 70 °C
[4] Encapsulated in the power supply unit for explosion-proof instruments

Subject to technical changes.

ABB Automation Products GmbH
Borsigstrasse 2
D-63755 Alzenau
Tel. +49(0)60 23 92 - 0
Fax +49(0)60 23 92 - 33 00
http://www.abb.com/automation

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