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Thread Mounted Resistance Thermometers
Model TR211, Measuring Insert Exchangeable
Model TR212, Measuring Insert Not Exchangeable

Applications

- Machinery, plant and tank construction
- Power transmission engineering
- Air-conditioning and refrigeration systems

Special Features

- Application ranges from -200 °C to +600 °C
- Compact design
- Universal application
- Direct installation in the process
- Intrinsically safe versions (ATEX)

**Thread Mounted Resistance Thermometers,
Measuring Insert Exchangeable, Model TR211**

Description

This series of resistance thermometers is designed for the measurement of liquid or gaseous media at low and medium pressures.

The resistance thermometer is screwed directly into the process and terminals in the connection head are used for electrical connection (protected against splash water). The measuring insert of model TR211 can be exchanged very quickly and easily without opening the process.

Insertion length, process connection and sensor can be selected for the respective application from the order information text.

Intrinsically safe designs are available for applications in hazardous areas.
The models of the TR211 and TR212 series are provided with a type test certificate for "intrinsically safe" type of protection according to directive 94/9/EC (ATEX).
Manufacturer's Declarations in accordance with EN 50 020 are also available.

Thread Mounted Resistance Thermometers *Model TR201* *see data sheet TE 60.15*
Sheathed Resistance Thermometers *Model TR7X0* *see data sheet TE 60.40*

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Sensor

The sensor is located in the tip of the measuring insert.

Sensor method of connection

- 2 wire
- 3 wire
- 4 wire

With 2 wire connection the lead resistance of the measuring insert compounds the error.

Sensor limiting error

- class B to DIN EN 60 751
- class A to DIN EN 60 751 (-50 °C ... +450 °C)
- ⅓ DIN B at 0 °C

It makes no sense to combine 2 wire connection with class A or 2 wire connection with ⅓ DIN B, because the lead resistance of the cable overrides the higher sensor accuracy.

Basic values and limiting errors

Basic values and limiting errors for the platinum measurement resistances are laid down in DIN EN 60 751.
The nominal value of Pt 100 sensors is 100 Ω at 0 °C. The temperature coefficient α can be stated simply to be between 0 °C and 100 °C with:

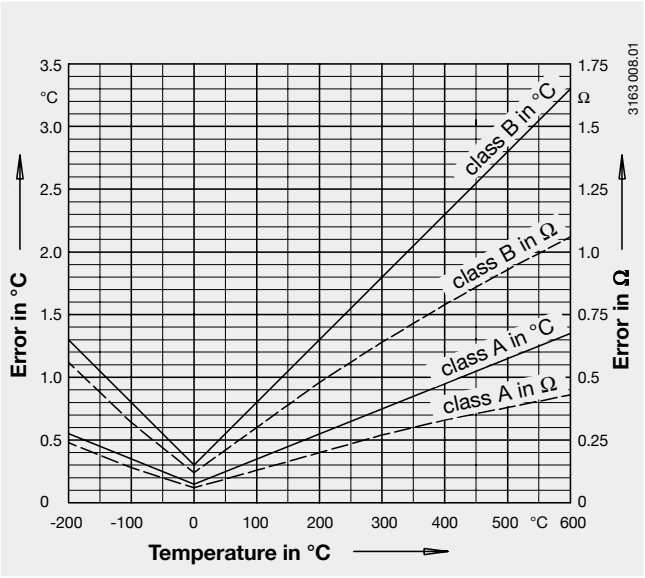
$$\alpha = 3.85 \cdot 10^{-3}\ °C^{-1}$$

The relationship between the temperature and the electrical resistance is characterised by polynomials which are defined in DIN EN 60 751. Furthermore, this standard lays down the basic values in °C stages.

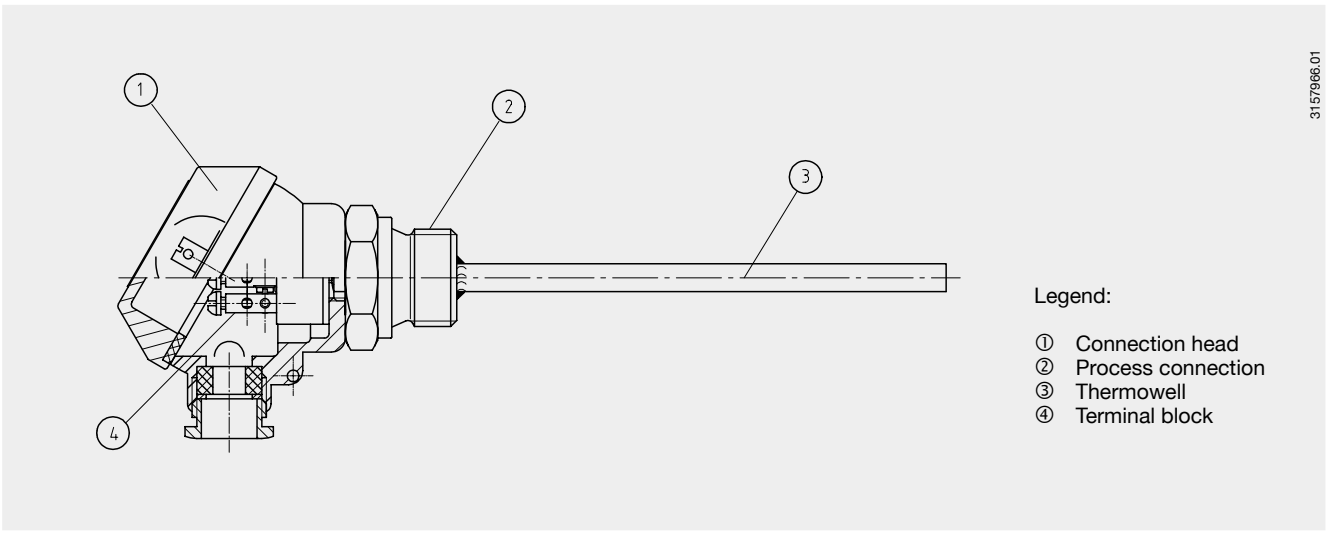
Class	Limiting error in °C
A	0.15 + 0.002 • | t | [1]
B	0.3 + 0.005 • | t |

1) | t | is the value of the temperature in °C without consideration of the sign

Temperature (ITS 90)	Basic value	Limiting error DIN EN 60 751 Class A		Class B	
°C	Ω	°C	Ω	°C	Ω
-200	18.52	± 0.55	± 0.24	± 1.3	± 0.56
-100	60.26	± 0.35	± 0.14	± 0.8	± 0.32
-50	80.31	± 0.25	± 0.10	± 0.55	± 0.22
0	100	± 0.15	± 0.06	± 0.3	± 0.12
50	119.40	± 0.25	± 0.10	± 0.55	± 0.21
100	138.51	± 0.35	± 0.13	± 0.8	± 0.30
200	175.86	± 0.55	± 0.2	± 1.3	± 0.48
300	212.05	± 0.75	± 0.27	± 1.8	± 0.64
400	247.09	± 0.95	± 0.33	± 2.3	± 0.79
500	280.98	± 1.15	± 0.38	± 2.8	± 0.93
600	313.71	± 1.35	± 0.43	± 3.3	± 1.06



TR211 and TR212 components



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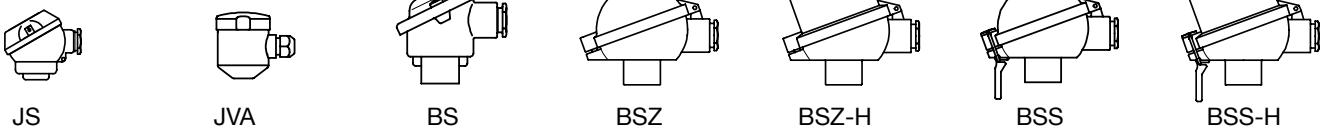
Connection head



JS | JVA | BS | BSZ, BSZ-K | BSZ-H, BSZ-HK | BSS | BSS-H

Model	Material	Cable entry	Ingress protection	Cap	Surface finish
JS	aluminium	M16 x 1.5	IP54	cap with 2 screws	silver bronze, painted
JVA	stainless steel	M12 x 1.5 1)	IP65	screw cover	blank
BS 2)	aluminium	M20 x 1.5	IP65	cap with 2 screws	silver bronze, painted
BSZ 2)	aluminium	M20 x 1.5	IP65	flap cap with screw	silver bronze, painted
BSZ-K 2)	plastic	M20 x 1.5	IP65	flap cap with screw	blank
BSZ-H 2)	aluminium	M20 x 1.5	IP65	flap cap with screw	silver bronze, painted
BSZ-HK 2)	plastic	M20 x 1.5	IP65	flap cap with screw	blank
BSS 2)	aluminium	M20 x 1.5	IP65	flap cap with clip	silver bronze, painted
BSS-H 2)	aluminium	M20 x 1.5	IP65	flap cap with clip	silver bronze, painted

1) Cable gland, metal
2) not with Model TR211

Connection head with digital indicator (option)

Model TR211
The mounting of a connection head with digital indicator is not possible. Instruments with indicator see Model TR212 or Model TR201 (data sheet TE 60.15).

Model TR212
As an optional alternative to the standard connection head the thermometer may be equipped with the digital indicator DIH10. The connection head used in this case is similar to the head model BSZ-H. For operation a 4 ... 20 mA transmitter is necessary, which is mounted to the measuring insert. The scale range of the indicator is configured to the same measuring range as the transmitter.
Intrinsically safe versions, explosion protection type EEx (i), are also available.
For stability reasons a minimum neck diameter of 8 mm is recommended for versions with extension neck.

Fig. Connection head with digital indicator, Model DIH10

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Transmitter (option)

Model TR211
Mounting of a transmitter not possible.
Instruments with transmitter see Model TR212 or Model TR201 (data sheet TE 60.15).

Model TR212
Depending on used connection head a transmitter can be mounted into the thermometer.

- o mounted instead of terminal block
- ● mounted within the cap of the connection head
- – mounting not possible

Connection	Transmitter					
	T12	T19	T24	T32	T42	T5350
JS	–	–	–	–	–	–
JVA	–	–	–	–	–	–
BS	–	o	o	–	–	o
BSZ / BSZ-K	o	o	o	o	o	o
BSZ-H / BSZ-HK	●	●	●	●	●	●
BSS	o	o	o	o	o	o
BSS-H	●	●	●	●	●	●

Model	Description	Explosion protection	Data sheet
T19	Analogue transmitter, configurable	without	TE 19.01
T24	Analogue transmitter, PC configurable	optional	TE 24.01
T12	Digital transmitter, PC configurable	optional	TE 12.01
T32	Digital transmitter, HART protocol	optional	TE 32.01
T42	Digital transmitter, PROFIBUS PA	optional	TE 42.01
T5350	Digital transmitter FOUNDATION Fieldbus and PROFIBUS PA	standard	TE 53.01

Measuring insert

Model TR211
The measuring insert is exchangeable.
The sensor is located in the tip of the measuring insert.

Model TR212
The measuring insert is not exchangeable.
The sensor is located directly in the tip of the thermowell.

Thermowell

- Material: stainless steel

Thermowell Ø	Insertion length U_1 in mm [2]						
in mm	50	75	100	150	160	250	400
6	x	x	x	x	x	x	x
8	-	-	x	x	x	x	x
9 [1]	-	-	x	x	x	x	x

1) only TR212
2) max. insertion length for TR211: 150 mm

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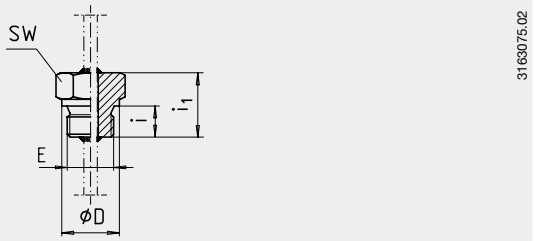
Process connection

- Male thread or compression fitting

Male thread
Firmly connected to the thermowell
Insertion length U_1: to customer specification

- Material: stainless steel,
  other on request

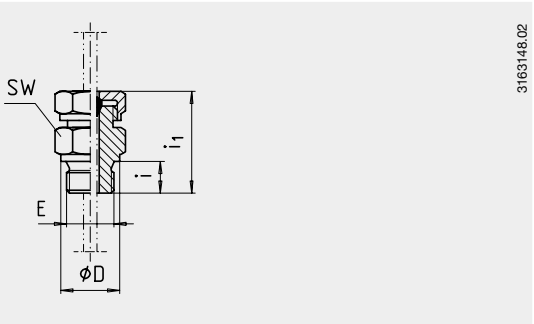


Compression fitting
Allows simple adaptation to the required insertion length at the installation point

- Material: stainless steel
- Sealing ring material: stainless steel or PTFE

Sealing rings of stainless steel can be adjusted once, after unscrewing, sliding along the sheath is no longer possible.

Sealing rings of PTFE can be adjusted several times, after unscrewing, repeated sliding along the sheath is still possible.
- Max. temperature at process connection 150 °C



Extension neck

Model TR211
Without extension neck.
Instruments with extension neck see Model TR212 or Model TR201 (data sheet TE 60.15).

Model TR212
With Model TR212 it is possible to choose between versions with and without extension neck.
The extension neck is screwed to the connection head (with connection head JVA welded in).
The length of the extension neck depends on the application. Generally the extension neck serves for the bridging of an insulation. In many applications it is also used as a part cooling element between connection head and medium in order to protect any head mount transmitters from high medium temperatures.

- Material: stainless steel

Thermowell Ø in mm	Neck length M_H in mm			
	50	75	100	130
6	x	x	-	-
8	-	x	x	x
9	-	x	x	x

Permissible temperature

- Application ranges
  TR211: -50 °C ... +450 °C
  TR212: -50 °C ... +450 °C or
  -200 °C ... +600 °C (minimum neck length 100 mm)
- at the head: -40 °C ... +125 °C
- at the transmitter: -40 °C ... + 85 °C
- Storage: -40 °C ... + 60 °C

Dimensions and suitability of process connections

Process connection	Male thread E	Dimensions in mm i	i_1	ØD	SW	suitable for thermowell Ø in mm
Male thread	G ¼ B	12	24	18	19	6
	G ½ B	14	29	26	27	6, 8, 9 1)
	½ NPT	-	29	-	27	6, 8, 9 1)
Compression fitting	G ¼ B	12	ca. 41	18	19	6
	G ½ B	14	ca. 44	26	27	6, 8, 9 1)
	½ NPT	-	ca. 47	-	22	6, 8, 9 1)

1) Thermowell diameter d = 9 mm only with Model TR212

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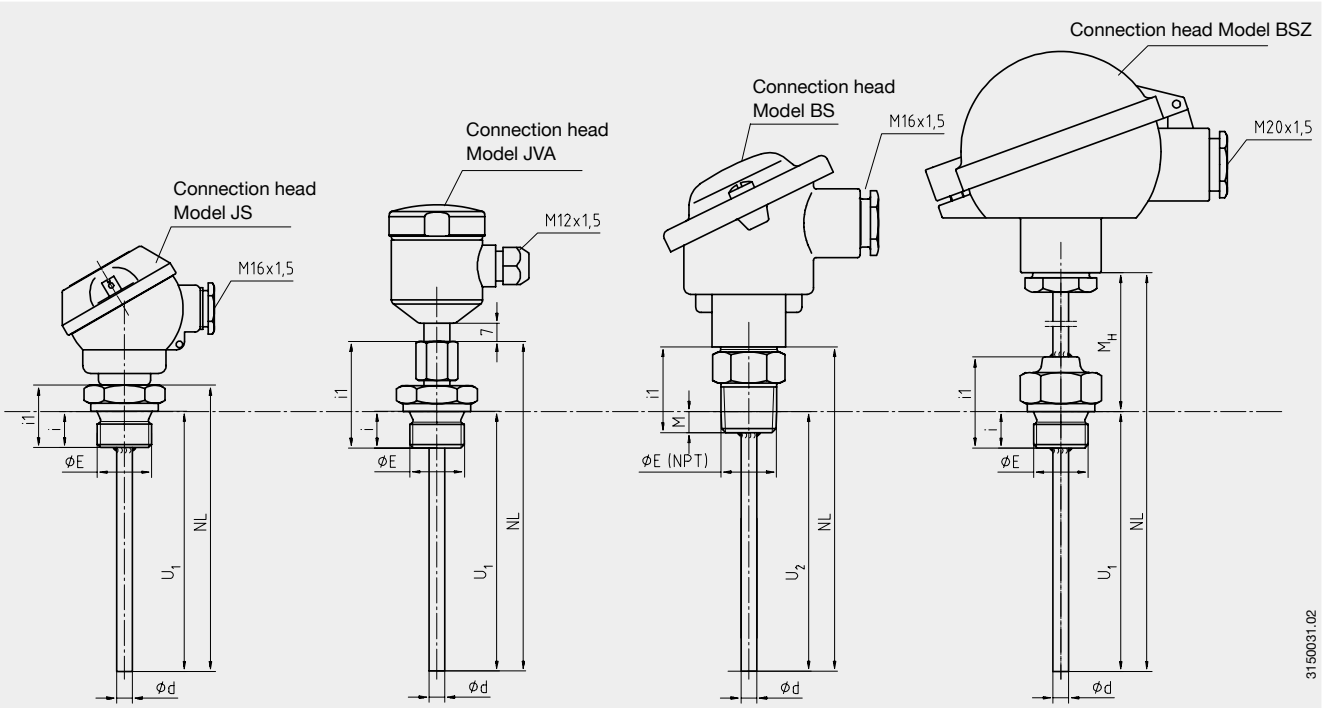
Possible combinations of thermowell diameter, number of sensors and sensor method of connection

Thermowell Ø in mm	Sensor 1 x Pt100 Sensor method of connection			Sensor 2 x Pt100 Sensor method of connection	
	2 wire	3 wire	4 wire	2 wire	3 wire
6	x	x	x	x	x [2]
8	x	x	x	x	x [2]
9 [1]	x	x	x	x	x [2]

1) only TR212
2) not with connection head JS and JVA

Dimensions in mm



The combinations of process connection and connection head shown above are exemplary.

Legende:

U_1	Insertion length (with cylindrical threads)
U_2	Insertion length (with conical threads)
E	Thread
Ød	Thermowell Ø
NL	Nominal length
M_H	Neck length
i	Screw-in length
i_1	Process connection total length
M	Screw-in length by hand - with ½ NPT approx. 8.1 mm - with ¾ NPT approx. 8.6 mm

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Explosion protection (option)

Resistance thermometers of the Model series TR211 and TR212 are available with a type test certificate for "intrinsically safe" ignition protection (TÜV 02 ATEX 1793 X). These thermometers comply with the requirements of directive 94/9/EC (ATEX), EEx-i, for gases and dust. Manufacturer's Declarations in accordance with EN 50 020 are also available.

The classification / suitability of the instrument (permissible power P max., minimum neck length and permissible ambient temperature) for the respective category can be seen on the type test certificate and in the operating instructions.

Explosion protection for:		Model TR211 / TR212 with connection head						
		JS	JVA	BS [1]	BSZ [1] BSZ-K [1]	BSZ-H [1] BSZ-HK [1]	BSS [1]	BSS-H [1]
	Zone	Supply circuit						
Gases	0	ia	ia	ia	ia	ia	ia	ia
	1	ib	ib	ib	ib	ib	ib	ib
	2	ib	ib	ib	ib	ib	ib	ib
Dusts	20	-	ia	ia	ia	ia	ia	ia
	21	-	ib	ib	ib	ib	ib	ib
	22	-	ib	ib	ib	ib	ib	ib

1) not with Model TR211

The minimum neck length is defined as the distance between the lower edge of the connection head and the heat-radiating surface and is to be selected according to the table "instrument classification" of the type test certificate / operating instructions.

Built-in transmitters have their own approval.
The permissible ambient temperature ranges of the built-in transmitters can be taken from the corresponding transmitter approval.

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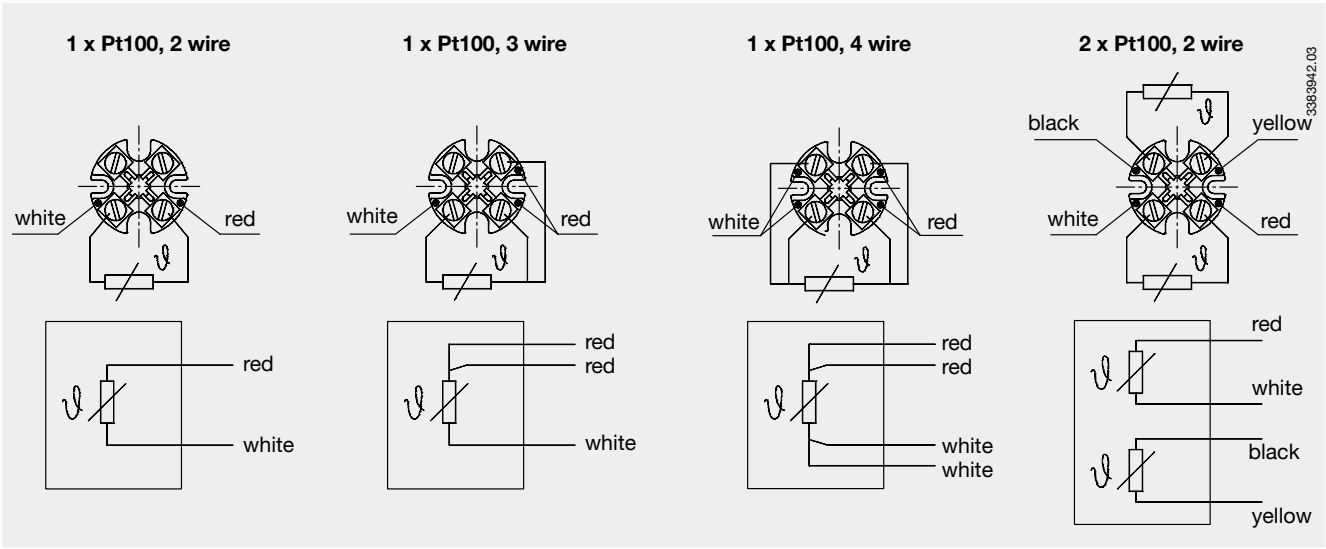
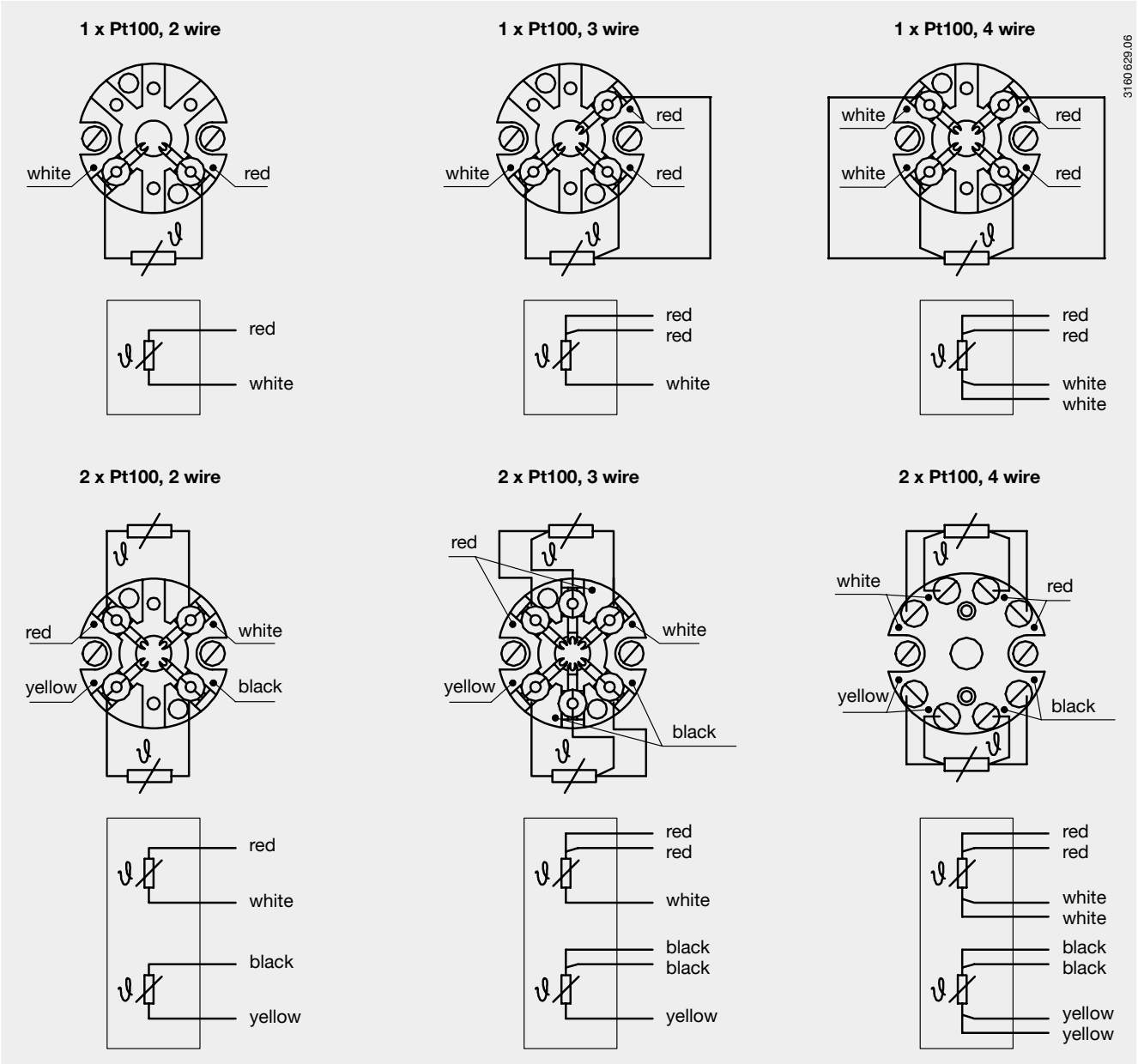
Electrical connection

Connection heads JS and JVA



Connection heads form B



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Ordering information

Field No.		Code	Features	
			Model	
		TR211	TR211, measuring insert exchangeable	
1		**TR212**	TR212, measuring insert not exchangeable	
			Explosion protection	
		Z	without	
		Y	according to directive 94/9/EC (ATEX) EEx-i G for gases [1]	
2		**H**	according to directive 94/9/EC (ATEX) EEx-i GD for gases and dusts [1]	*not with connection head JS*
			Type and number of sensors	
		1	1 x Pt100 application range -50 °C ... +250 °C	
		2	2 x Pt100 application range -50 °C ... +250 °C [2]	
		R	1 x Pt100 application range -50 °C ... +450 °C	
		S	2 x Pt100 application range -50 °C ... +450 °C [2]	
		3	1 x Pt100 application range -200 °C ... +600 °C	*not with TR211*
		4	2 x Pt100 application range -200 °C ... +600 °C [2]	*not with TR211*
3		**?**	other	*please state as additional text*
			Sensor method of connection	
		2	2 wire	
		3	3 wire	
4		**4**	4 wire	
			Sensor limiting error	
		B	class B per DIN EN 60751	
		A	class A per DIN EN 60751 (-50 °C ... +450 °C)	*not with 2-wire connection*
		C	1/3 DIN B at 0 °C	*not with 2-wire connection*
5		**?**	other	*please state as additional text*
			Process connection	
		GB	G 1/4 B	*only with thermowell outer diameter 6 mm*
		GD	G 1/2 B	
		ND	1/2 NPT	
6		**?**	other	*please state as additional text*
			Design of process connection	
		G	male thread	
7		**K**	compression fitting	
			Thermowell outer diameter	
		3	6 mm	
		E	8 mm	
		4	9 mm	*not with TR211*
8		**?**	other	*please state as additional text*
			Insertion length	
		0050	50 mm	*only with thermowell outer diameter 6 mm*
		0075	75 mm	*only with thermowell outer diameter 6 mm*
		0100	100 mm	
		0150	150 mm	
		0160	160 mm	*not with TR211*
		0250	250 mm	*not with TR211*
		0400	400 mm	*not with TR211*
9			length in mm, e.g. 0850 for 850 mm	
			Thermowell material	
		1	stainless steel 1.4571	
10		**?**	other	*please state as additional text*
			Neck length	
		Z	without (double nipple at the connection head)	
		1	without (instrument versions with compression fitting)	
		B	50 mm	*not with TR211*
		K	75 mm	*not with TR211*
		C	100 mm	*not with TR211*
		2	130 mm	*not with TR211*
11		**?**	other	*please state as additional text*

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Ordering information, continued

Field No.		Code	Features	
			Connection head	
		9	model JS (aluminium)	*transmitter installation not possible*
		V	model JVA (stainless steel)	*transmitter installation not possible*
		1	model BS (aluminium)	*only transmitter T19/T24 as option possible*
		2	model BSZ (aluminium)	
		3	model BSZ-H (aluminium)	*mounting of an optional transmitter in the cap possible*
		T	model BSZ-K (plastic)	
		S	model BSZ-HK (plastic)	*mounting of an optional transmitter in the cap possible*
		4	model BSS (aluminium)	
		5	model BSS-H (aluminium)	*mounting of an optional transmitter in the cap possible*
		8	model BVA (stainless steel)	
		H	model BSZ-H with digital temperature indicator DIH10 (set to transmitter range)	*only without explosion protection, for use a transmitter (4...20 mA) is required*
		J	model BSZ-H with digital temperature indicator DIH10-Ex (set to transmitter range)	*for use a transmitter (4...20 mA) in Ex-version is required*
12		**?**	other	*please state as additional text*
			Cable entry to connection head	
		5	M16 x 1.5	*connection head JS*
		7	M12 x 1.5	*connection head JVA*
		4	M20 x 1.5	*connection head form B, not with TR211*
13		**?**	other	*please state as additional text*
			Transmitter	
		ZZ	without	
		TA	mounted on the measuring insert	*not with TR211*
14		**TB**	mounted in the cap of the connection head	*not with TR211*

		Additional order info		
		YES	**NO**	
15		**T**	**Z**	quality certificates *see price list*
16		**T**	**Z**	additional text *Please state as clearly understandable text!*

1) Please pay attention to the data sheet TE 60.17.
2) 2 x Pt100 in combination with 2 transmitters on request.

Order code:

1		2		3	4	5		6		7	8	9	10	11	12	13	14		15	16
	-		-				-		-									**Z Z**	-	

Additional text: _____

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12003816 01/2005 GB

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