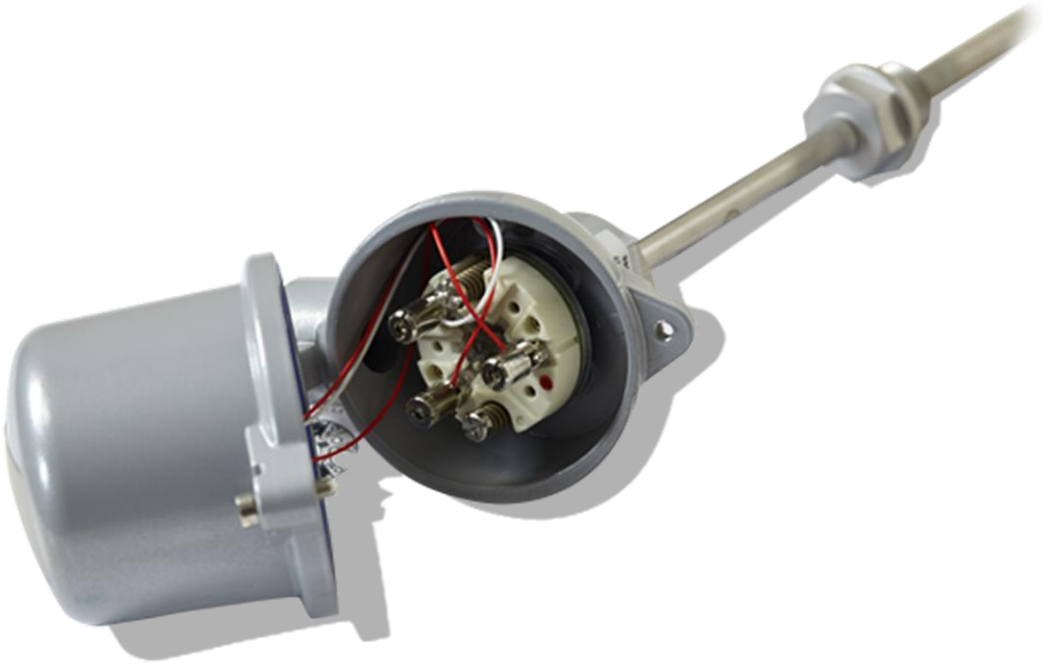
RECKMANN

Operating Instructions

temperature sensors with protection shell and measuring insert for operation in hazardous areas

Sensor types:
resistance temperature detector (RTD)
mineral insulated thermocouples (MIT)
Doc 141921 | Rev. 08



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For your memo

1. Basic information

1.1 About this operating manual

This operating manual has been prepared in accordance with the product-specific and application-relevant specifications from legal requirements, provisions, regulations, technical standards, guidelines and conventions.

EU - Type Examination Certificate BVS 17 ATEX E 110 X
IECEx Certificate of Conformity BVS 17.0091X

This operating manual allows the user to become familiar with the design and function of the temperature sensors.

1.2 Purpose/function

The listed temperature sensors with cable for operation in hazardous areas are used for measuring process temperatures in solid, liquid and gaseous media.

NOTE
The approval is based on the power supply with only one intrinsically safe electrical circuit, which means that a double sensor is also supplied by only one intrinsically safe electrical circuit.

The temperature class classification depends on the ambient temperature of the connection point and the electrical characteristics of the intrinsically safe electrical circuit (U_0, I_0 and P_0) with which the sensor is powered and it is described in the following operating instructions for the different operating conditions.

The standard ambient operating temperature of Ex devices ranges from -20°C to +40°C, unless otherwise specified by the manufacturer and special codes are not required.

Different atmospheric conditions (e.g. temperatures) are described in the operating instructions with the applicable operating conditions.

The standard specified safety factor (see DIN EN 60079-0, Sec. 26.5.1.3) for calculation of the process temperature of less 5 K for temperature classes T6 to T3 (or the characterised temperatures ≤ 200 °C) and less 10 K for temperature classes T2 and T1 (or the characterised temperatures ≥ 200 °C) is already taken into account in the following calculations.

1.3 Use in line with intended use

The listed explosion-proof temperature sensors are intended exclusively for temperature measurement within the following standard values and parameters, particularly the electrical and thermal limits.

1.4 Reasonably foreseeable misuse

Any use that does not conform to the intended use or is outside the standard values and parameters listed in this document is considered misuse.

1.5 Guarantee and liability

The general terms and conditions of RECKMANN GMBH apply in all instances.

For the warranty to take effect, the following conditions must be met:

The temperature sensors may only be used as intended within the standard values and parameters listed in this document.
No technical modifications may be undertaken by the user.
Only original spare parts and consumable parts that have been approved by the manufacturer may be used for repairs.

Limitation of liability

The manufacturer does not accept any liability for damage due to the following circumstances:

Non-compliance with this manual
Use outside the intended use
Use by untrained personnel
Unauthorised modifications
Technical changes
Use of non-approved spare parts

1.6 Items supplied

The actual items supplied may vary from the explanations and illustrations described in this manual due to the use of special models, the utilisation of additional options in the order or the most recent technical changes.

The obligations agreed in the delivery contract, the general terms and conditions and the terms of delivery of the manufacturer and the statutory regulations valid at the time of the contract are all applicable.

1.7 Contact details

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2. Safety

2.1 Standards and guidelines

The explosion-proof temperature sensors have been designed according to the currently applicable rules of engineering and accepted safety standards.

During the design phase, all basic safety requirements, standards and directives were applied. The safety of the sensors is documented
by the EU Declaration of Conformity (⇗ chapter 7 "EU Declaration of Conformity of Conformity").

All specifications pertaining to safety relate to the currently valid regulations of the European Union. Applicable laws and national regulations in other countries must be adhered to.

In addition to the safety instructions in this manual, general accident prevention and environmental protection regulations must also be complied with. All requirements of the operating instructions must be followed without restriction.

2.2 Labels

The temperature sensors documented in our instructions are labelled in accordance with their model and area of operation (see also Doc 141917).

For operation in mines with potentially explosive atmosphere (methane):

I M2 Ex ia I Mb

For operation in the hazardous area of Zone 0, 1 and 2 with gas:

II 1G Ex ia llC T1 ... T6 Ga,
II 1/2G Ex ia llC T1 ... T6 Ga/Gb
II 2G Ex ia llC T1 ... T6 Gb

For operation in the hazardous area of Zone 20, 21 and 22 with dust:

II 1D Ex ia lllC T13S°C Da,
II 1/2D Ex ia lllC T13S°C Da/Db
II 2D Ex ia lllC T13S°C Db

2.3 Formulation of safety information

The safety notices in this document are marked with safety symbols and formulated in accordance with the SAFE principle. They contain specifications relating to the type and source of danger, the possible consequences, as well as the prevention of the danger.

DANGER

Warns of an accident that will occur if the instructions are not followed. The accident can lead to severe, potentially life-threatening injuries or death, e.g. by contact with high-voltage electrical components.

WARNING

Warns of an accident that may occur if the instructions are not followed. The accident may lead to severe, potentially life-threatening injuries or death,
e.g. by touching high-voltage electrical components.

CAUTION

Warns of an accident that may occur if the instructions are not followed. The accident may lead to moderate injury, for example burns, injury to the skin or crushing.

WARNING

Warns of potential material damage

NOTE

Important general notice

3. Operating and process temperatures

Measuring resistors or thermocouples (in the mineral insulated thermocouple MTE) are used as sensor elements with the following operating temperatures:

Resistance sensors:

area of application from - 196°C to + 600°C depending on sensor type (PT100, Ni100 or PT1000)

Thermocouples in mineral insulated thermocouples:

area of application from - 200°C to max. + 1300°C depending on thermocouple (TC) type (T, J, E, K, N, R or S)

Protection shells depending on material and welding process:

area of application from - 196°C to max + 1200°C

Because ambient temperatures of the connection point and the actual process temperature are often very different, suitable planning is required to ensure that the process and connection head and/or connection cable are safely decoupled. Separating elements must meet the minimum requirements of DIN EN 60079-26. The pipe lengths must be adapted to the process temperature.

4. Operating conditions (X-Conditions)

The following special conditions are applicable for installation, operation and replacement of sensors.

NOTE
The approved ambient temperature ranges for the sensors can be found in the applicable sections of "Electrical and thermal parameters"

For measurement in different process temperatures the specification of the ambient temperature range or the temperature class depending on the type is based exclusively on the connection head or connection cable and plug connector. The influence of the process temperature on the temperature of the neck tube must be considered separately in the operation of the temperature sensors and measuring inserts.

Suitable measures, e.g. corresponding selection of the neck tube or length of the sensor, depending on the type will ensure that the temperature of the connection head, connection cable and plug connector is safely decoupled from the process temperature.

The instructions for use of the manufacturer of all components of the intrinsically safe measure circuit must be observed with reference to the approved process conditions.

The following applies for measuring inserts type WR14-X-****-* and TR14-X-****-*:

The measuring insert must be installed in a matching enclosure that will guarantee at least protection class IP20.
The internal wiring must be conform to the conditions of Section 6.3.12 of EN 60079-11:2012. It must be installed so the air gaps between the unpainted parts of intrinsically safe circuits and the metallic enclosure parts are a minimum of 3 mm.

The following applies for the sensors with marking code II 1/2G Ex ia IIC T1 ... T6 Ga/Gb and II 1/2D Ex ia IIIC T135°C Da/Db:

The partition (stainless steel measuring tube) is ≥ 1 mm thick:
The sensors must be set up in gas hazardous areas to eliminate the possibility of electrostatic charges.
The metal parts of the sensors must be included in the equipotential bonding.
The installation of the sensors in a partition with EPL Ga/Gb or Da/Db requirements must be with standardised connections.
The installation location must be technically sealed.
The instructions in accordance with IEC / EN 60079-26 must be observed.
Sensors with NL > 8000 mm are not certified, but can be used as a simple piece of electrical equipment with conformity assessment in potentially explosive atmospheres according to IECEx marking:
Ex ia IIC T1...T6 Ga or Ex ia IIIC T135°C Da,
Ex ia IIC T1...T6 Gb or Ex ia IIIC T135°C Db or
Ex ia IIC T1...T6 Gc or Ex ia IIIC T135°C Dc

NOTE

The following sensors (or sensors that are not isolated) are considered not isolated or earthed in accordance with IEC/EN 60079-11:

Ø 3 mm; more than 4 internal conductors
Ø < 3 mm
Ø 3 mm; more than 6 internal conductors
Sensors with NL > 8000 mm

For technical safety reasons these sensors must be connected to the equipotential bonding of the system throughout the complete length of the intrinsically safe electrical circuit. The special conditions in accordance with IEC / EN 60079-14 must be observed.

All Reckmann sensors must be used only in accordance with their intended use and must not be exposed to environmental or process conditions that could affect their "outer case".

For the operation of the temperature sensors with specific customer-approved Ex i transducers, Ex i digital display and/or a connection cable, the confirmation of intrinsic safety is required. Ex i confirmation and operating instructions of the additional components are part of the Ex-documentation in this case.

If fittings from sources other than the manufacturer are used as wiring and cable glands, they must have an approval as per IECEx and/or ATEX and must guarantee as a minimum protection class IP65.

The specific requirements of IEC/EN60079-14 and IEC/EN 60079-25 must be observed for installation of our sensors.

Metallic materials of the ex-sensors must not exceed the following mass percentages acc. to IEC / EN 60079-0:

For group I:
15% aggregate aluminium, magnesium, titanium, zirconium, and
7.5% aggregate magnesium, titanium, zirconium.

For group II:
for EPL Ga 10% aggregate aluminium, magnesium, titanium, zirconium and
7.5% aggregate magnesium, titanium, zirconium;
for EPL Gb 7.5% aggregate magnesium, titanium, zirconium;
for EPL Gc no requirements concerning temperature sensors.

For group III:
for EPL Da and Db 7.5% aggregate magnesium, titanium, zirconium;
for EPL Dc no requirements concerning temperature sensors.

5. Type codes of the models

5.1 Model R15 VA for mines with potentially explosive atmosphere

Type code for potentially explosive atmosphere areas (mining)

Parts/model	#	-#	#	#	#	-#	-#
Sensor type							
resistance temperature detector	BWR15						
Model protection shell							
Form 2 with union nuts		B					
Form 8 (2GoH)		C					
Form 2G		D					
Number of sensors							
Single			1				
Double			2				
Sensors							
PT100				PT100			
PT1000				PT1000			
Measuring insert model R14							
R144					D		
Measuring insert diameter							
3.00 mm						300	
6.00 mm						600	
8.00 mm						800	
Cable connection							
Cable gland							X
M12 insert plug VA							A
M12 insert socket VA							B

Tab. 1: R15 VA model/designation

5.1.1 Type of protection code

The type BWR15-****-*-* thermometers are intended for operation with the following types of protection:

I M2 Ex ia I Mb

5.1.2 Electrical and thermal parameters

WARNING

Risk of accident due to misuse of the explosion-proof temperature sensors!

Do not use the sensors outside the approved temperature ranges. Do not use the sensors in corrosive and/or abrasive media.

The following parameters must be observed for operation in the range with "Mb" device protection level:

Electrical parameters:

maximum input voltage:	U_i	15 V DC
maximum input current:	I_i	100 mA
maximum input power:	P_i	see table
maximum internal capacity:	C_i	negligible
maximum internal inductance:	L_i	negligible

Thermal parameters:

Ambient temperature connection head	-40°C to +80°C
max. surface temperature*	150°C

*)
On all surfaces on which a layer of coal dust may accumulate.

The permissible process temperature [°C] depends on the input power (Pi) and the diameter of the measuring insert.

$T_{process} = T_{max} - P_i \times R_{th}$

Power ratings:

R_{th} .=183 at BWR15-****-300-*
R_{th} .=105 at BWR15-****-600-* and BWR15-****-800-*

Model	P_i = 20 mW	P_i = 50 mW	P_i = 250 mW	P_i = 500 mW	P_i = 750 mW
BWR15-****-300-*	146	140	104	58	12
BWR15-****-600-*	147	144	123	97	71
BWR15-****-800-*	147	144	123	97	71

Tab. 2: BWR15 power ratings

5.1.3 Area of use of WTH R15 VA mining

The following table shows the usage range of the WTH R15 VA for mining depending on the ambient temperature and process temperature:

Model WTH mining	Marking	Sensor #	ambient temperature/ max. process temperature
BWR15- B**D-*-*	I M2 Ex ia I Mb	PT100 PT1000	-40°C to +80°C (see Table 2)
BWR15- C**D-*-*	I M2 Ex ia I Mb	PT100 PT1000	-40°C to +80°C (see Table 2)
BWR15- D**D-*-*	I M2 Ex ia I Mb	PT100 PT1000	-40°C to +80°C (see Table 2)

Tab. 3: Area of use of WTH mining

5.2 Model R15

Type code for gas/dust explosion hazardous areas

Parts/model	#	-#	#	#	#	-#	-#
Sensor type							
resistance temperature detector	WR15						
mineral insulated thermocouple	TR15						
Model protection shell							
Form 2		B					
Form 8 (2GoH)		C					
Form 2G		D					
Form 2F		E					
Form 3		F					
Form 3GoH		G					
Form 3G		H					
Form 3F		J					
Form 4 without protection tube		K[1)]					
Form 4F without protection tube		L1[)]					
Form 2GoH without protection tube		CX[1)]					
Form 2F without protection tube		EX[1)]					
Number of sensors							
single			1				
double			2				
Sensors							
PT100	WR15			PT100			
PT1000	WR15			PT1000			
Ni100	WR15			Ni100			
Cu-CuNi Type T	TR15			T			
Fe-CuNi Type J	TR15			J			
NiCr-CuNi Type E	TR15			E			

Parts/model	#	-#	#	#	#	-#	-#
NiCr-Ni Type K	TR15			K			
NiCrSi-NiSi Type N	TR15			N			
Pt13%Rh-Pt Type R	TR15			R			
Pt10%Rh-Pt Type S	TR15			s			
Measuring insert model							
R144					D		
R149 [2)]					Q		
Measuring insert diameter							
3.00 mm						300	
6.00 mm						600	
8.00 mm						800	
Cable connection							
Cable gland							X
M12 insert plug							A
M12 insert socket							B

Tab. 4: R15 – model/designation

1)
The calculations of the model R14 measuring inserts from chapter 5.3 ff are applicable for this model.

2)
Confirmation of intrinsic safety is required with installation of an approved Ex_i transducer.

5.2.1 Type of protection code

NOTE

The following specifications and calculations are not applicable for the models "without protection tube" WR- and TR-K/ WR- and TR-L /WR- and TR-CX / WR- and TR-EX.

These models must be considered equivalent to our model WR- and TR14 measuring insert. The process and surface temperatures for this can be found in the specifications in chapter 5.3.

The type WR15/TR15-****-*-* thermometers are intended for operation with the following types of protection:

II 1/2 G Ex ia IIC T1 … T6 Ga/Gb
II 1/2 D Ex ia IIIC T135 °C Da/Db

5.2.2 Electrical and thermal parameters Ga/Gb

WARNING

Risk of accident due to misuse of the explosion-proof temperature sensors!

Do not use the sensors outside the approved temperature ranges. Do not use the sensors in corrosive and/or abrasive media.

The following parameters must be observed for operation in the range with "Ga" and "Gb" device protection level:

Electrical parameters:

maximum input voltage:	U_i	30 V DC
maximum input current:	I_i	100 mA
maximum input power:	P_i	see table
maximum internal capacity:	C_i	negligible
maximum internal inductance:	L_i	negligible

Thermal parameters:

T6…T5 (ambient temperature range)	-40°C to +80°C
T4…T1 (ambient temperature range)	-40°C to +100°C

NOTE

If the cable gland is replaced with a M12 plug connector, the ambient temperature is reduced to -40°C to 80°C for T1…T6.

The permissible process temperature [°C] depends on the maximum input power (P_i) and the temperature class.

$T_{process} = T_{max} - P_i \times R_{th}$

Power ratings:

R_{th} = 91 with WR15-****-300-* (in the protection tube Ø ≥6x1 mm):

Temperature class	P_i = 20 mW	P_i = 50 mW	P_i = 250 mW	P_i = 500 mW	P_i = 750 mW
T1 (450°C)	438	435	417	394	371
T2 (300°C)	288	285	267	244	221
T3 (200°C)	193	190	172	149	126
T4 (135°C)	128	125	107	84	61
T5 (100°C)	93	90	72	49	26
T6 (85°C)	78	75	57	34	11

Tab. 5: WR15 – Rth=91 power ratings

R_{th} = 52 with WR15-****-600-* and WR15-****-800-* (in the protection tube Ø ≥9x1 mm):

Temperature class	P_i = 20 mW	P_i = 50 mW	P_i = 250 mW	P_i = 500 mW	P_i = 750 mW
T1 (450°C)	439	437	427	414	401
T2 (300°C)	289	287	277	264	251
T3 (200°C)	194	192	182	169	156
T4 (135°C)	129	127	117	104	91
T5 (100°C)	94	92	82	69	56
T6 (85°C)	79	77	67	54	41

Tab. 6: WR15 – Rth=52 power ratings

5.2.3 Electrical and thermal parameters Da/Db

WARNING

Risk of accident due to misuse of the explosion-proof temperature sensors!

Do not use the sensors outside the approved temperature ranges. Do not use the sensors in corrosive and/or abrasive media.

The following parameters must be observed for operation in the range with "Da" and "Db" device protection level:

Electrical parameters:

maximum input voltage:	U_i	30 V DC
maximum input current:	I_i	100 mA
maximum input power:	P_i	see table
maximum internal capacity:	C_i	negligible
maximum internal inductance:	L_i	negligible

Thermal parameters:

Intrinsically safe equipment is suitable for full dust covering or for any dust layer if with power adjustment to the temperature sensors the feasible power corresponds to the values of the following overview and the sustained short-circuit current is below 250 mA. The intrinsically safe sensor is marked with "T135°C".

max. ambient/process temperature [°C]	40	70	100
permissible power conversion [mW]	750	650	550

For operation in zones 20/21 with type of protection II 1/2 D Ex ia IIIC T135 °C Da/Db the following conditions apply:

Power P_i	**ambient/process temperature**
750 mW	-40°C to +40°C
650 mW	-40°C to +70°C
550 mW	-40°C to +100°C

5.2.4 Area of use for WTH R15

Gas explosion hazardous areas

The following table shows the usage range of the WTH R15 with enclosed protection shell depending on the ambient temperature and temperature class:

Model WTH gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEx		
WR15- B, C, D, E, F, G, H, J*#*-300-*	II 1/2G	Ex ia IIC T1…T6 Ga/Gb	PT100 PT1000 Ni100	-40°C to 80°C (T6…T5)
WR15- B, C, D, E, F, G, H, J*#*-300-X	II 1/2G	Ex ia IIC T1…T6 Ga/Gb	PT100 PT1000 Ni100	-40°C to 100°C (T4…T1)
WR15- B, C, D, E, F, G, H, J*#*-300-A, B	II 1/2G	Ex ia IIC T1…T6 Ga/Gb	PT100 PT1000 Ni100	-40°C to 80°C (T6…T1)
WR15- B, C, D, E, F, G, H, J*#*-600, 800-*	II 1/2G	Ex ia IIC T1…T6 Ga/Gb	PT100 PT1000 Ni100	-40°C to 80°C (T6…T5)
WR15- B, C, D, E, F, G, H, J*#*-600, 800-X	II 1/2G	Ex ia IIC T1…T6 Ga/Gb	PT100 PT1000 Ni100	-40°C to 100°C (T4…T1)
WR15- B, C, D, E, F, G, H, J*#*-600, 800-A, B	II 1/2G	Ex ia IIC T1…T6 Ga/Gb	PT100 PT1000 Ni100	-40°C to 80°C (T6…T1)

Tab. 7: Area of use of WTH R15 (gas)

Dust explosion hazardous areas

The following table shows the usage range of the WTH R15 with enclosed protection shell depending on the ambient temperature and power:

Model WTH dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEx		
WR15- B, C, D, E, F, G, H, J*#*-*-*	II 1/2D	Ex ia IIIC T135°C Da/Db	PT100 PT1000 Ni100	-40°C to 40°C (750 mW)
WR15- B, C, D, E, F, G, H, J*#*-*-*	II 1/2D	Ex ia IIIC T135°C Da/Db	PT100 PT1000 Ni100	-40°C to 70°C (650 mW)
WR15- B, C, D, E, F, G, H, J*#*-*-X	II 1/2D	Ex ia IIIC T135°C Da/Db	PT100 PT1000 Ni100	-40°C to 100°C (550 mW)
WR15- B, C, D, E, F, G, H, J*#*-*-A, B	II 1/2D	Ex ia IIIC T135°C Da/Db	PT100 PT1000 Ni100	-40°C to 80 °C (550 mW)

Tab. 8: Area of use of WTH R15 (dust)

5.2.5 Special features of the thermal parameters of thermocouples

NOTE

Due to the special physical properties of thermocouples
(Peltier/Thomson effect) there is practically no self-heating at the measuring tip.

Therefore, for the type code TR15 (Table 4), with the calculation of the maximum process temperature a total self-heating of 5K at power adjustment
(P_0 = ¼ x U_0 x I_0 = ¼ x 30 V x 0.1 A = 0.75 W) can be assumed.

Type code TR15-**-**** at device protection level "Ga" and "Gb"

The following table shows the approved process temperature [°C] for all temperature classes with power adjustment:

Temperature class	P_i = 750 mW
T1 (450°C)	435
T2 (300°C)	285
T3 (200°C)	190
T4 (135°C)	125
T5 (100°C)	90
T6 (85°C)	75

Tab. 9: TR15 – approved process temperatures

Type code TR15-**-**** at device protection level "Da" and "Db"

For operation in zones 20/21 with type of protection II 1/2 D Ex ia IIIC T135 °C Da/Db the following conditions apply:

Power P_i	**ambient/process temperature**
750 mW	-40°C to +40°C
650 mW	-40°C to +70°C
550 mW	-40°C to +100°C

5.2.6 Area of use for MTE R15

Gas explosion hazardous areas

The following table shows the usage range of the MTE R15 with protection shell depending on the ambient temperature and temperature class:

Model WTH gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEx		
TR15- B, C, D, E, F, G, H, J*#*-*-*	II 1/2 G	Ex ia IIC T1…T6 Ga/Gb	Type T, J, E, K, N, R, S	-40°C to +80°C (T6…T5)
TR15- B, C, D, E, F, G, H, J*#*-*-X	II 1/2 G	Ex ia IIC T1…T6 Ga/Gb	Type T, J, E, K, N, R, S	-40°C to +100°C (T4…T1)
TR15- B, C, D, E, F, G, H, J*#*-*-A, B	II 1/2 G	Ex ia IIC T1…T6 Ga/Gb	Type T, J, E, K, N, R, S	-40°C to +80°C (T6…T1)

Tab. 10: Area of use of MTE R15 (gas)

Dust explosion hazardous areas

The following table shows the usage range of the MTE R15 with protection shell depending on the ambient temperature and power:

Model WTH dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEx		
TR15- B, C, D, E, F, G, H, J*#*-*-*	II 1/2D	Ex ia IIIC T135 °C Da/Db	Type T, J, E, K, N, R, S	-40°C to 40°C (750 mW)
TR15- B, C, D, E, F, G, H, J*#*-*-*	II 1/2D	Ex ia IIIC T135 °C Da/Db	Type T, J, E, K, N, R, S	-40°C to 70°C (650 mW)
TR15- B, C, D, E, F, G, H, J*#*-*-X	II 1/2D	Ex ia IIIC T135 °C Da/Db	Type T, J, E, K, N, R, S	-40°C to 100°C (550 mW)
TR15- B, C, D, E, F, G, H, J*#*-*-A, B	II 1/2D	Ex ia IIIC T135 °C Da/Db	Type T, J, E, K, N, R, S	-40°C to 80°C (550 mW)

Tab. 11: Area of use of MTE R15 (dust)

5.3 Measuring insert model R14

Type code for gas/dust explosion hazardous areas

Parts/model	#	-#	-#	#	#	#	-#
Sensor type							
resistance temperature detector	WR14						
mineral insulated thermocouple	TR14						
Measuring insert model							
Model B		J					
without connection head		X					
Form R144			D				
Form R149 [1] with free ends			Q				
Measuring insert diameter							
3.00 mm				300			
6.00 mm				600			
8.00 mm				800			
Number of sensors							
single					1		
double					2		
Sensors							
PT100	WR14					PT100	
PT1000	WR14					PT1000	
Ni100	WR14					Ni100	
Cu-CuNi Type T	TR14					T	
Fe-CuNi Type J	TR14					J	
NiCr-CuNi Type E	TR14					E	
NiCr-Ni Type K	TR14					K	
NiCrSi-NiSi Type N	TR14					N	
Pt13%Rh-Pt Type R	TR14					R	
Pt10%Rh-Pt Type S	TR14					s	

Cable connection [2]							
without (with ME)/ cable gland							X
M12 insert plug							A
M12 insert socket							B

Tab. 12: R14 – model/designation

1)
Only possible as single sensor. Confirmation of intrinsic safety is required with installation of an approved Ex i transducer.

2)
Only for model B.

5.3.1 Type of protection code

The type WR14-****-*-* thermometers are intended for operation with the following types of protection:

II 2 G Ex ia IIC T1 … T6 Gb
II 2 D Ex ia IIIC T135 °C Db

NOTE
A measuring insert (type WR14/TR14) in hazardous areas is permissible solely when installed in a suitable protection shell or in model B (installed in an enclosure with minimum protection class IP 20).

5.3.2 Electrical and thermal parameters Gb

WARNING

Risk of accident due to misuse of the explosion-proof temperature sensors!

Do not use the sensors outside the approved temperature ranges. Do not use the sensors in corrosive and/or abrasive media.

The following parameters must be observed for operation in the range with "Gb" device protection level:

Electrical parameters:

maximum input voltage:	U_i	30 V DC
maximum input current:	I_i	100 mA
maximum input power:	P_i	see table
maximum internal capacity:	C_i	negligible
maximum internal inductance:	L_i	negligible

Thermal parameters:

T6…T5 (ambient temperature range)	-40°C to +80°C
T4…T1 (ambient temperature range)	-40°C to +100°C

The permissible process temperature [°C] depends on the maximum input power (P_i) and the temperature class.

$T_{process} = T_{max} - P_i \times R_{th}$

Power ratings:

R_{th} = 183 at WR14-*-*300**-*:

temperature class	P_i = 20 mW	P_i = 50 mW	P_i = 250 mW	P_i = 500 mW	P_i = 750 mW
T1 (450°C)	436	430	394	348	302
T2 (300°C)	286	280	244	198	152
T3 (200°C)	191	185	149	103	57
T4 (135°C)	126	120	84	38	/
T5 (100°C)	91	85	49	3	/
T6 (85°C)	76	70	34	/	/

Tab. 13: R14 – Rth 183 power ratings

R_{th} = 105 at WR14-*-*600**-* and WR14-*-*800**-*:

Temperature class	P_i = 20 mW	P_i = 50 mW	P_i = 250 mW	P_i = 500 mW	P_i = 750 mW
T1 (450°C)	437	434	413	387	361
T2 (300°C)	287	284	263	237	211
T3 (200°C)	192	189	168	142	116
T4 (135°C)	127	124	103	77	51
T5 (100°C)	92	89	68	42	16
T6 (85°C)	77	74	53	27	1

Tab. 14: R14 – Rth 105 power ratings

5.3.3 Electrical and thermal parameters Db

WARNING

Risk of accident due to misuse of the explosion-proof temperature sensors!

Do not use the sensors outside the approved temperature ranges. Do not use the sensors in corrosive and/or abrasive media.

The following parameters must be observed for operation in the range with "Db" device protection level:

Electrical parameters:

maximum input voltage:	U_i	30 V DC
maximum input current:	I_i	100 mA
maximum input power:	P_i	see table
maximum internal capacity:	C_i	negligible
maximum internal inductance:	L_i	negligible

Intrinsically safe equipment is suitable for full dust covering or for any dust layer if with power adjustment to the temperature sensors the feasible power corresponds to the values of the following overview and the sustained short-circuit current is below 250 mA. The intrinsically safe sensor is marked with "T135°C".

max. ambient/process temperature [°C]	40	70	100
permissible power conversion [mW]	750	650	550

For operation in zone 21 with type of protection II 2 D Ex ia IIIC T135 °C Da/Db the following conditions apply:

Power P_i	**ambient/process temperature**
750 mW	-40°C to +40°C
650 mW	-40°C to +70°C
550 mW	-40°C to +100°C

5.3.4 Area of use

Gas explosion hazardous areas

The following table shows the usage range of the WTH R14 measuring inserts and R15 without protection tube depending on the ambient temperature and temperature class:

Model WTH gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEx		
WR14-*-*300*#-*/ WR15- K, L, CX, EX*#*-300-*	II 2G	Ex ia IIC T1…T6 Gb	PT100 PT1000 Ni100	-40°C to 80°C (T6…T5)
WR14-*-*300*#-X/ WR15- K, L, CX, EX*#*-300-X	II 2G	Ex ia IIC T1…T6 Gb	PT100 PT1000 Ni100	-40°C to 100°C (T4…T1)
WR14-*-*300*#-A, B/ WR15- K, L, CX, EX*#*-300-A, B	II 2G	Ex ia IIC T1…T6 Gb	PT100 PT1000 Ni100	-40°C to 80°C (T6…T1)
WR14-*-*600800*#-*/ WR15- K, L, CX, EX*#*-600, 800-*	II 2G	Ex ia IIC T1…T6 Gb	PT100 PT1000 Ni100	-40°C to 80°C (T6…T5)
WR14-*-*600, 800*#-X/ WR15- K, L, CX, EX*#*-600, 800-X	II 2G	Ex ia IIC T1…T6 Gb	PT100 PT1000 Ni100	-40°C to 100°C (T4…T1)
WR14-*-*600, 800*#-A, B/ WR15- K, L, CX, EX*#*-600, 800-A, B	II 2G	Ex ia IIC T1…T6 Gb	PT100 PT1000 Ni100	-40°C to 80°C (T6…T1)

Tab. 15: Area of use of WTH R14/WTH R15 (gas)

Dust explosion hazardous areas

The following table shows the usage range of the WTH R14 measuring inserts and WTH R15 without protection tube depending on the ambient temperature and power:

Model WTH dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEx		
WR14-*-***#-*/ WR15- K, L, CX, EX*#*-*-*	II 2D	Ex ia IIIC T135°C Db	PT100 PT1000 Ni100	-40°C to 40°C (750 mW)
WR14-*-***#-*/ WR15- K, L, CX, EX*#*-*-*	II 2D	Ex ia IIIC T135°C Db	PT100 PT1000 Ni100	-40°C to 70°C (650 mW)
WR14-*-***#-X/ WR15- K, L, CX, EX*#*-*-X	II 2D	Ex ia IIIC T135°C Db	PT100 PT1000 Ni100	-40°C to 100°C (550 mW)
WR14-*-***#-A, B/ WR15- K, L, CX, EX*#*-*-A, B	II 2D	Ex ia IIIC T135°C Db		-40°C to 80°C (550 mW)

Tab. 16: Area of use of WTH R14 (dust)

5.3.5 Special features of the thermal parameters of thermocouples

NOTE

Due to the special physical properties of thermocouples
(Peltier/Thomson effect) there is practically no self-heating at the measuring tip.

Therefore, for the type code TR14 (Table 12) and TR 15 (Table 4), with the calculation of the maximum process temperature a total self-heating of 10K at power adjustment
(P_0 = ¼ x U_0 x I_0 = ¼ x 30 V x 0.1 A = 0.75 W) can be assumed.

Type code TR14-*-****-* at device protection level "Gb"

The following table shows the approved process temperature [°C] for all temperature classes with power adjustment:

Temperature class	P_i = 750 mW
T1 (450°C)	430
T2 (300°C)	280
T3 (200°C)	185
T4 (135°C)	120
T5 (100°C)	85
T6 (85°C)	70

Tab. 17: TR14 – approved process temperatures

Type code TR14-*-****-* at device protection level "Db"

For operation in zone 21 with type of protection II 2 D Ex ia IIIC T135 °C Da/Db the following conditions apply:

Power P_i	**ambient/process temperature**
750 mW	-40°C to +40°C
650 mW	-40°C to +70°C
550 mW	-40°C to +100°C

5.3.6 Area for use

Gas explosion hazardous areas

The following table shows the usage range of the MTE R14 measuring inserts and MTE R15 without protection tube depending on the ambient temperature and temperature class:

Model WTH gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEx		
TR14-*-***#-*/ TR15- K, L, CX, EX*#*-*-*	II 2 G	Ex ia IIC T1…T6 Gb	Type T, J, E, K, N, R, S	-40°C to 80°C (T6…T5)
TR14-*-***#-X/ TR15- K, L, CX, EX*#*-*-X	II 2 G	Ex ia IIC T1…T6 Gb	Type T, J, E, K, N, R, S	-40°C to 100°C (T4…T1)
TR14-*-***#-A, B/ TR15- K, L, CX, EX*#*-*-A, B	II 2 G	Ex ia IIC T1…T6 Gb	Type T, J, E, K, N, R, S	-40°C to 80°C (T6…T1)

Tab. 18: Area of use of MTE R14/MTE R15 (gas)

Dust explosion hazardous areas

The following table shows the usage range of the MTE R14 measuring inserts and MTE R15 without protection tube depending on the ambient temperature and power:

Model WTH dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEx		
TR14-*-***#-*/ TR15- K, L, CX, EX*#*-*-*	II 2D	Ex ia IIIC T135°C Db	Type T, J, E, K, N, R, S	-40°C to 40°C (750 mW)
TR14-*-***#-*/ TR15- K, L, CX, EX*#*-*-*	II 2D	Ex ia IIIC T135°C Db	Type T, J, E, K, N, R, S	-40°C to 70°C (650 mW)
TR14-*-***#-X/ TR15- K, L, CX, EX*#*--X	II 2D	Ex ia IIIC T135°C Db	Type T, J, E, K, N, R, S	-40°C to 100°C (550 mW)
TR14-*-***#-A, B/ TR15- K, L, CX, EX*#*-*-A, B	II 2D	Ex ia IIIC T135°C Db	Type T, J, E, K, N, R, S	-40°C to 80°C (550 mW)

Tab. 19: Area of use of MTE R14/MTE R15 (dust)

6. Operation/maintenance

Note the following before commissioning:

Before commissioning all ex-relevant parameters of the wired components must be checked.
Resistance temperature detectors and thermocouples must be checked to ensure the correct connection type and polarity.

Note the following for all maintenance and repair work:

The European and international regulations for maintenance and repair must be observed.
The function of temperature sensors must be tested regularly. This is particularly important for the parts that determine the type of protection.
Defective sensors must be replaced exclusively with new sensors of the same type.

7. EU Declaration of Conformity

RECKMANN

Your partner for temperature.

EU-Declaration of Conformity

Document-No.: 04-2018

We, the company RECKMANN GMBH 58097 Hagen, confirm that the Temperature Sensors of the following types:

BWR15-****-*-*	I M2 Ex ia I Mb
WR15-B***-*-*, WR15-C***-*-*, WR15-D***-*-*, WR15-E***-*-*, WR15-F***-*-*, WR15-G***-*-*, WR15-H***-*-*, WR15-J***-*-*, TR15-B***-*-*, TR15-C***-*-*, TR15-D***-*-*, TR15-E***-*-*, TR15-F***-*-*, TR15-G***-*-*, TR15-H***-*-*, TR15-J***-*-*	II 1/2G Ex ia IIC T1 ... T6 Ga/Gb II 1/2D Ex ia IIIC T135°C Da/Db
WR15-K***-*-*, WR15-L***-*-*, WR15-CX***-*-*, WR15-EX***-*-*, TR15-K***-*-*, TR15-L***-*-*, TR15-CX***-*-*, TR15-EX***-*-*, WR14-J-****-*, TR14-J-****-*, WR14-X-****-*, TR14-X-****-*	II 2G Ex ia IIC T1 ... T6 Gb II 2D Ex ia IIIC T135°C Db
WR14-O*-****, TR14-O*-****, WR14-P*-****, TR14-P*-****, WR14-M*-***, TR14-M*-***, RKW-8-*-****, RKW-9-*-****	II 1G Ex ia IIC T1 ... T6 Ga II 1D Ex ia IIIC T135°C Da

are in conformity with the directive
Explosion protection (ATEX) 2014/34/EU

This declaration is based on test certificate BVS 17 ATEX E 110 X

issued by: DEKRA Testing and Certification GmbH,
Dinnendahlstraße 9
44809 Bochum,
NB-No. 0158

The conformity with the described provision is assured by the compliance to the following standards:

EN IEC 60079-0:2019-09	**general requirements**
EN 60079-11:2012-06	**intrinsic safety „i“**
EN 60079-26:2024-10	**equipment with equipment protection level (EPL Ga)**

RECKMANN GMBH
Hagen, 2025-04-08

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