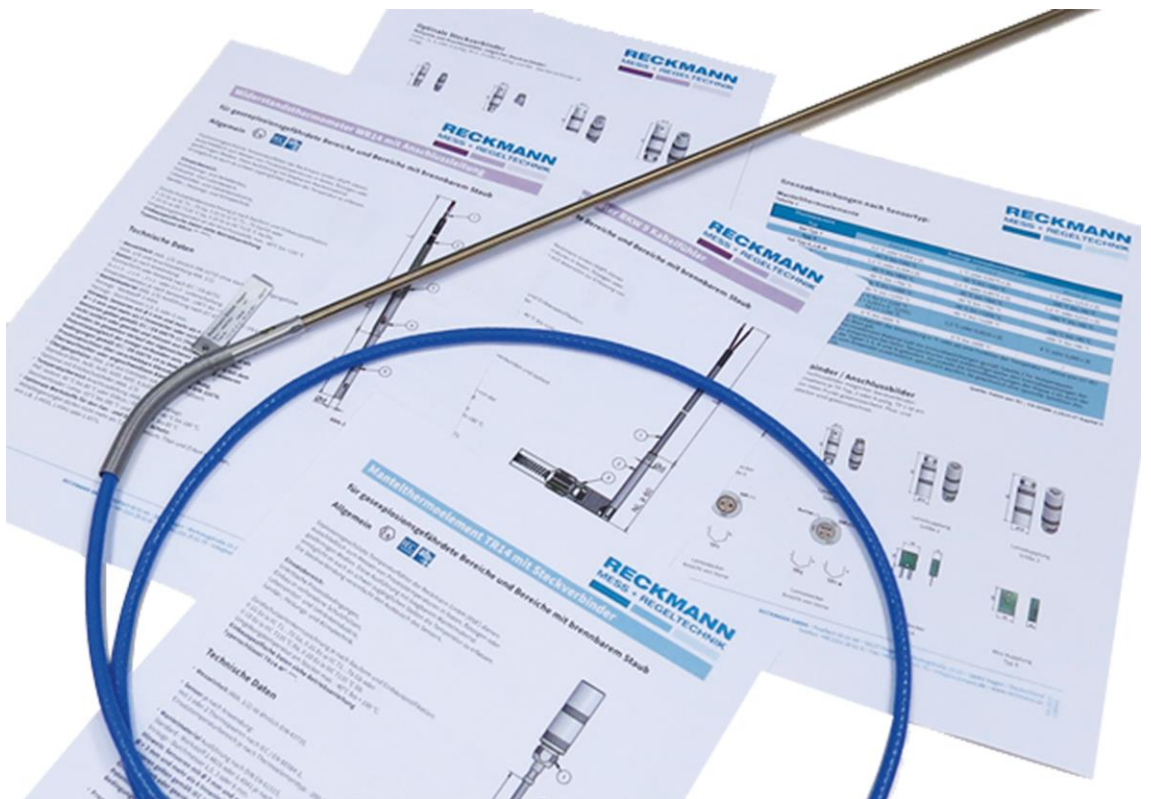


## Operating Instructions



temperature sensors with cable  
for operation in hazardous areas

Sensor types:  
resistance temperature detector (RTD)  
mineral insulated thermocouples (MIT)  
Doc 141917 | Rev. 11





RECKMANN GMBH

Werkzeugstr. 19-23  
58093 Hagen

T +49 2331 3501-0  
F +49 2331 3501-70  
M [info@reckmann.de](mailto:info@reckmann.de)  
W [www.reckmann.de](http://www.reckmann.de)

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# 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  $-20^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$ , 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  $\leq 200^{\circ}\text{C}$ ) and less 10 K for temperature classes T2 and T1 (or the characterised temperatures  $\geq 200^{\circ}\text{C}$ ) 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

RECKMANN GMBH  
Werkzeugstr. 19-23  
58093 Hagen

T +49 2331 3501-0  
F +49 2331 3501-70

M [info@reckmann.de](mailto:info@reckmann.de)  
W [www.reckmann.de](http://www.reckmann.de)

## 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“).

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 141921).

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 (gas)

# II 1G Ex ia IIC T1...T6 Ga,

# II 1/2G Ex ia IIC T1...T6 Ga/Gb

# II 2G Ex ia IIC T1...T6 Gb

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

# II 1D Ex ia IIC T135°C Da,

# II 1/2D Ex ia IIC T135°C Da/Db

# II 2D Ex ia IIC T135°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 sleeve, connection cable and plug connector. The influence of the process temperature on the temperature of the sleeve (RKW sensor sleeve) must be considered separately in the operation of the temperature sensors with cables.

Suitable measures, e.g. corresponding selection of the length of the sensor, depending on the type will ensure that the temperature of the sleeve, 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 the sensors type WR14-O\*-\*\*\*\*, TR14-O\*-\*\*\*\*, WR14-P\*-\*\*\*\*, TR14-P\*-\*\*\*\*, RKW-8-\*-\*\*\*\*, RKW-9-\*-\*\*\*\* with code II 1G Ex ia IIC T1 ... T6 Ga and II 1D Ex ia IIIC T135°C Da:

# In gas – explosive areas, the sensors have to be installed in such way, that electrostatic charging is excluded.

The following applies for the sensors type WR14-O\*-\*\*\*\*, TR14-O\*-\*\*\*\*, WR14-P\*-\*\*\*\*, TR14-P\*-\*\*\*\*, WR14-M\*-\*\*\*, TR14-M\*-\*\*\*, RKW-8-\*-\*\*\*\*, RKW-9-\*-\*\*\*\* with code II 1G Ex ia IIC T1 ... T6 Ga and II 1D Ex ia IIIC T135°C Da:

- # 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:

- #  $\varnothing$  3 mm; more than 4 internal conductors
- #  $\varnothing$  < 3 mm
- #  $\varnothing$  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 and/or Ex i digital displays, the confirmation of intrinsic safety is required. The 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 entries, 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 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 R14 with cable

Type code for gas/dust explosion hazardous areas

Parts/model	#	-#	#	-#	#	#	#
Sensor type							
resistance temperature detector	WR14						
mineral insulated thermocouple	TR14						
Measuring insert model							
Type D		O					
Type DST (D with plug connector)		P					
Measuring insert diameter							
1.5 mm (single sensor only)			150				
2.0 mm (single sensor only)			200				
3.0 mm			300				
6.0 mm			600				
8.0 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		
Connection cables							
PVC/PVC						A	
PVC/shield/PVC						B	
glass silk/silicone						C	
glass silk/silicone/glass silk/shield						D	
FEP or PTFE						E	
FEP shield or PTFE shield or all cable with outer VA shielding						F	
Cable connection							
Cable with free ends							X
mini-compensation plug connector							A
Lemo plug connector							B
M12/M8 plug connector							C

Tab. 1: R14 with cable – model/designation

### 5.1.1 Type of protection code

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

- # II 1 G Ex ia IIC T1...T6 Ga
- # II 1 D Ex ia IIIC T135°C Da

## 5.1.2 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 +75°C
T4...T1 (ambient temperature range)	-40°C to +100°C



**NOTE**

For operation in Zone 0 with type of protection II 1 G Ex ia IIC T1...T6 Ga the process temperature is equal to the ambient temperature.

The ambient temperatures for temperature sensors with connection cable are also determined and restricted by the operating temperatures of the connection cables and/or plug connectors.

The installation of the temperature sensors with connection cable must conform to the requirements of IEC / EN 60079-14 and IEC / EN 60079-25.

## Temperature ranges and Ex-relevant electrical parameters:

### Compensating/thermocouple extension cables (permanently installed and max. length: 50 m):

PVC/PVC and PVC/shield/PVC		-25°C to +80°C
Gls/silicone and Gls/silicone/Gls/shield		-25°C to +180°C
PFA/PVA/VA shield		-196°C to 250°C
PTFE/PTFE and PTFE/shield/PTFE		-50°C to + 260°C
Gls/Gls/VA and all cable with outer VA shield		up to +350°C
maximum internal capacity:	C <sub>i</sub>	0.2 nF/m
maximum internal inductance:	L <sub>i</sub>	1 µH/m

### WTH connection cables (permanently installed and max. length: 50 m):

PVC/PVC and PVC/shield/PVC		-40°C to +80°C
silicone/FEP and silicone/shield/FEP		-40°C to +180°C
PFA/PVA/VA shield		-196°C to 250°C
PTFE/PTFE and PTFE/shield/PTFE		-50°C to + 260°C
Gls/Gls/VA and all cable with outer VA shield		up to +350°C
maximum internal capacity:	C <sub>i</sub>	0.2 nF/m
maximum internal inductance:	L <sub>i</sub>	1 µH/m

### Plug connectors:

Lemo plug connector	-40°C to +200°C
M12 plug connectors	-40°C to +85°C
Miniature compensation plug connectors	-40°C to +200°C

In the standard installation the sensor does not have a conductive connection to the external sheath. The insulation thicknesses are defined to meet the requirements for dielectric strength.



#### 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

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.



The permissible process temperature [°C] depends on the maximum input power (P<sub>i</sub>) and the temperature class.

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

## Power ratings

R<sub>th</sub> = 281 at WR14-\*150-\*\*\*\* and WR14-\*200-\*\*\*\* (not isolated):

Temperature class	P <sub>i</sub> = 20 mW	P <sub>i</sub> = 50 mW	P <sub>i</sub> = 250 mW	P <sub>i</sub> = 500 mW	P <sub>i</sub> = 750 mW
T1 (450°C)	434	426	369	300	229
T2 (300°C)	284	276	219	150	79
T3 (200°C)	189	181	124	55	/
T4 (135°C)	124	116	59	/	/
T5 (100°C)	89	81	24	/	/
T6 (85°C)	74	66	9	/	/

Tab. 2: WR14 – Rth 281 power ratings

R<sub>th</sub> = 183 at WR14-\*300-\*\*\*\*:

Temperature class	P <sub>i</sub> = 20 mW	P <sub>i</sub> = 50 mW	P <sub>i</sub> = 250 mW	P <sub>i</sub> = 500 mW	P <sub>i</sub> = 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. 3: WR14 – Rth 183 power ratings

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

Temperature class	$P_i = 20 \text{ mW}$	$P_i = 50 \text{ mW}$	$P_i = 250 \text{ mW}$	$P_i = 500 \text{ mW}$	$P_i = 750 \text{ mW}$
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. 4: WR14 – Rth 105 power ratings

### 5.1.3 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".

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



### NOTE

For operation in Zone 20 with type of protection II 1 G Ex ia IIC T135°C Da the process temperature must be set equal to the ambient temperature.

See the following overview:

Power P <sub>i</sub>	ambient/process temperature
750 mW	-40°C to +40°C
650 mW	-40°C to +70°C
550 mW	-40°C to +100°C

## 5.1.4 Area of use

### Gas explosion hazardous areas

The following table shows the usage range of the RTD R14 with cable depending on the ambient temperature and temperature class:

Model WTH gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEX		
WR14-O150, 200*##*X	II 1 G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)
WR14-O150, 200*##C, D, E, FX	II 1 G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)
WR14-O300*##*X	II 1 G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)
WR14-O300*##C, D, E, FX	II 1 G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)
WR14-O600, 800*##*X	II 1 G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)

Model WTH gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEX		
WR14-O600, 800*#C, D, E, FX	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)
WR14-P150, 200*#A, B, C	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)
WR14-P150, 200*#C, D, E, FA, B	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)
WR14-P300*#A, B, C	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)
WR14-P300*#C, D, E, FA, B	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)
WR14-P600, 800*#A, B, C	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)
WR14-P600, 800*#C, D, E, FA, B	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)

Tab. 5: Area of use of RTD R14 (Gas)

## Dust explosion hazardous areas

The following table shows the usage range of the RTD R14 with cable depending on the ambient temperature and power:

Model WTH dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEX		
WR14-O***X	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 40°C (750 mW)
WR14-O***X	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 70°C (650 mW)
WR14-O**#C, D, E, FX	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 100°C (550 mW)
WR14-P***A, B, C	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 40°C (750 mW)
WR14-P***A, B, C	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 70°C (650 mW)
WR14-P**#C, D, E, FA, B	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 100°C (550 mW)

Tab. 6: Area of use of RTD R14 (dust)

## 5.1.5 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 from Table 1, with the calculation of the maximum process temperature a total self-heating of 10K at power adjustment ( $P_0 = \frac{1}{4} \times U_0 \times I_0 = \frac{1}{4} \times 30 \text{ V} \times 0.1 \text{ A} = 0.75 \text{ W}$ ) can be assumed.

### Type code TR14-\*\*-\*\*\*\* 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	$P_i = 750 \text{ mW}$
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. 7: TR14 – approved process temperatures

### Type code TR14-\*\*-\*\*\*\* at device protection level "Da" and "Db"



### NOTE

For operation in Zone 20 with type of protection II 1 G Ex ia IIIC T135°C Da the process temperature must be set equal to the ambient temperature.

See the following overview:

<b>Power <math>P_i</math></b>	<b>ambient/process temperature</b>
750 mW	-40°C to +40°C
650 mW	-40°C to +70°C
550 mW	-40°C to +100°C

## 5.1.6 Area of use

### Gas explosion hazardous areas

The following table shows the usage range of the MIT R14 with cable depending on the ambient temperature and temperature class:

Model WTH gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEX		
TR14-O***#X	II 1 G	Ex ia IIC T1...T6 Ga	Type T, J, E, K, N, R, S	-40°C to 75°C (T6...T5)
TR14-O***#C, D, E, FX	II 1 G	Ex ia IIC T1...T6 Ga	Type T, J, E, K, N, R, S	-40°C to 100°C (T4...T1)
TR14-P***#A, B, C	II 1 G	Ex ia IIC T1...T6 Ga	Type T, J, E, K, N, R, S	-40°C to 75°C (T6...T5)
TR14-P***#C, D, E, FA, B	II 1 G	Ex ia IIC T1...T6 Ga	Type T, J, E, K, N, R, S	-40°C to 100°C (T4...T1)

Tab. 8: Area of use of MIT R14 (gas)

### Dust explosion hazardous areas

The following table shows the usage range of the MIT R14 with cable depending on the ambient temperature and power:

Model WTH dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEX		
TR14-O***#X	II 1 D	Ex ia IIIC T135°C Da	Type T, J, E, K, N, R, S	-40°C to 40°C (750 mW)
TR14-O***#X	II 1 D	Ex ia IIIC T135°C Da	Type T, J, E, K, N, R, S	-40°C to 70°C (650 mW)
TR14-O***#C, D, E, FX	II 1 D	Ex ia IIIC T135°C Da	Type T, J, E, K, N, R, S	-40°C to 100°C (550 mW)
TR14-P***#A, B, C	II 1 D	Ex ia IIIC T135°C Da	Type T, J, E, K, N, R, S	-40°C to 40°C (750 mW)
TR14-P***#A, B, C	II 1 D	Ex ia IIIC T135°C Da	Type T, J, E, K, N, R, S	-40°C to 70°C (650 mW)
TR14-P***#C, D, E, FA, B	II 1 D	Ex ia IIIC T135°C Da	Type T, J, E, K, N, R, S	-40°C to 100°C (550 mW)

Tab. 9: Area of use of MIT R14 (dust)

## 5.2 Model R14 with plug connector

### Type code for gas/dust explosion hazardous areas

Parts/model	#	-#	#	-#	#	#
Sensor type						
resistance temperature detector	WR14					
mineral insulated thermocouple	TR14					
Measuring insert model						
Type L		P				
Measuring insert diameter						
1.5 mm (single sensor only)			150			
2.0 mm (single sensor only)			200			
3.0 mm			300			
6.0 mm (only with Lemo plug connector)			600			
8.0 mm (only with Lemo plug connector)			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						
Mini-compensation plug connector						A
Lemo plug connector						B

Tab. 10: R14 – model/designation

### 5.2.1 Type of protection code

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

- # II 1 G Ex ia IIC T1...T6 Ga
- # II 1 D Ex ia IIIC T135°C Da

## 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

For operation in Zone 0 with type of protection II 1 G Ex ia IIC T1...T6 Ga the process temperature is equal to the ambient temperature.

The ambient temperatures for temperature sensors with connection cable are also determined and restricted by the operating temperatures of the connection cables and/or plug connectors.

The installation of the temperature sensors with connection cable must conform to the requirements of IEC / EN 60079-14 and IEC / EN 60079-25.

#### Temperature ranges and Ex-relevant electrical parameters:

Lemo plug connector	-40°C to +200°C
Mini-compensation plug connector	-40°C to +200°C

In the standard installation the sensor does not have a conductive connection to the external sheath. The insulation thicknesses are defined to meet the requirements for dielectric strength.



## 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

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.

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

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

## Power ratings

$R_{\text{th}} = 281$  at WR14-\*150-\*\*\*\* and WR14-\*200-\*\*\*\* (not isolated):

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)	434	426	369	300	229
T2 (300°C)	284	276	219	150	79
T3 (200°C)	189	181	124	55	/
T4 (135°C)	124	116	59	/	/
T5 (100°C)	89	81	24	/	/
T6 (85°C)	74	66	9	/	/

Tab. 11: WR14 – Rth 281 power ratings

$R_{\text{th}} = 183$  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. 12: WR14 – 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. 13: WR14 – Rth 105 power ratings

### 5.2.3 Electrical and thermal Da/Db 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 "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

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



**NOTE**

For operation in Zone 20 with type of protection II 1 G Ex ia IIC T135°C Da the process temperature must be set equal to the ambient temperature.

See the following overview:

<b>Power P<sub>i</sub></b>	<b>ambient/process temperature</b>
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

### Gas explosion hazardous areas

The following table shows the usage range of the RTD R14 with plug connector depending on the ambient temperature and temperature class:

Model WTH gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEX		
WR14-M150, 200-***	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 80°C (T6...T5)
WR14-M150, 200-***	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)
WR14-M300-***	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)
WR14-M300-***	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)
WR14-M600, 800-***	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)
WR14-M600, 800-***	II 1G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)

Tab. 14: Area of use of RTD R14 (Gas)

## Dust explosion hazardous areas

The following table shows the usage range of the RTD R14 with plug connector depending on the ambient temperature and power:

Model WTH dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEX		
WR14-M*-*#*	II 1D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 40°C (750 mW)
WR14-M*-*#*	II 1D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 70°C (650 mW)
WR14-M*-*#*	II 1D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 100°C (550 mW)

Tab. 15: Area of use of RTD R14 (dust)

## 5.2.5 Special features of the thermal parameters with thermocouples

**i** **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 from Table 10, with the calculation of the maximum process temperature a total self-heating of 10K at power adjustment ( $P_0 = \frac{1}{4} \times U_0 \times I_0 = \frac{1}{4} \times 30 \text{ V} \times 0.1 \text{ A} = 0.75 \text{ W}$ ) can be assumed.

### Type code TR14-M\*-\*\*\* 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 <sub>i</sub> = 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. 16: TR14 – approved process temperatures

### Type code TR14-M\*-\*\*\*\* at device protection level "Da" and "Db"

**i** **NOTE**  
 For operation in Zone 20 with type of protection II 1 G Ex ia IIIC T135°C Da the process temperature must be set equal to the ambient temperature.

See the following overview:

<b>Power P<sub>i</sub></b>	<b>ambient/process temperature</b>
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

### Gas explosion hazardous areas

The following table shows the usage range of the MIT R14 with plug connector depending on the ambient temperature and temperature class:

Model MIT gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEX		
TR14-M*-*##	II 1 G	Ex ia IIC T1...T6 Ga	Type T, J, E, K, N, R, S	-40°C to 80°C (T6...T5)
TR14-M*-*##	II 1 G	Ex ia IIC T1...T6 Ga	Type T, J, E, K, N, R, S	-40°C to 100°C (T4...T1)

Tab. 17: Area of use of MIT R14 (gas)

### Dust explosion hazardous areas

The following table shows the usage range of the MIT R14 with plug connector depending on the ambient temperature and power:

Model MIT dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEX		
TR14-M*-*##	II 1 D	Ex ia IIIC T135°C Da	Type T, J, E, K, N, R, S	-40°C to 40°C (750 mW)
TR14-M*-*##	II 1 D	Ex ia IIIC T135°C Da	Type T, J, E, K, N, R, S	-40°C to 70°C (650 mW)
TR14-M*-*##	II 1 D	Ex ia IIIC T135°C Da	Type T, J, E, K, N, R, S	-40°C to 100°C (550 mW)

Tab. 18: Area of use of MIT R14 (dust)



### 5.3 Model RKW cable sensor

#### Type code for gas/dust explosion hazardous areas

Parts/model	#	-#	-#	-#	#	#	#
Sensor type							
resistance temperature detector	RKW						
Model cable sensor							
without clip		8					
with clip		9					
Sensor diameter							
3.0 mm			300				
4.0 mm			400				
6.0 mm			600				
8.0 mm			800				
Number of sensors							
single				1			
double				2			
Sensors							
PT100	WR14				PT100		
PT1000	WR14				PT1000		
Ni100	WR14				Ni100		
Connection cables							
PVC/PVC						A	
PVC/shield/PVC						B	
glass silk/silicone						C	
glass silk/silicone/glass silk/shield						D	
FEP or PTFE						E	
FEP shield or PTFE shield or all cable with outer VA shielding						F	

Cable connection							
Cable with free ends							X
Mini-compensation plug connector							A
Lemo plug connector							B
M12/M8 plug connector							C

Tab. 19: RKW – model/designation

### 5.3.1 Type of protection code

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

- # II 1 G Ex ia IIC T1...T6 Ga
- # II 1 D Ex ia IIIC T135°C Da

### 5.3.2 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 +75°C
T4...T1 (ambient temperature range)	-40°C to +100°C



#### NOTE

For operation in Zone 0 with type of protection II 1 G Ex ia IIC T1...T6 Ga the process temperature is equal to the ambient temperature.

The ambient temperatures for temperature sensors with connection cable are also determined and restricted by the operating temperatures of the connection cables and/or plug connectors.

The installation of the temperature sensors with connection cable must conform to the requirements of IEC / EN 60079-14 and IEC / EN 60079-25.

## Temperature ranges and Ex-relevant electrical parameters:

### Compensating/thermocouple extension cables (permanently installed and max. length: 50 m):

PVC/PVC and PVC/shield/PVC		-10°C to +80°C
Gls/silicone and Gls/silicone/Gls/shield		-40°C to +180°C
PFA/PVA/VA shield		-196°C to 250°C
PTFE/PTFE and PTFE/shield/PTFE		-50°C to + 260°C
Gls/Gls/VA shield and all cable with outer VA shield		up to +350°C
maximum internal capacity:	C <sub>i</sub>	0.2 nF/m
maximum internal inductance:	L <sub>i</sub>	1 μH/m

### WTH connection cables (permanently installed and max. length: 50 m):

PVC/PVC and PVC/shield/PVC		-40°C to +80°C
silicone/FEP and silicone/shield/FEP		-40°C to +180°C
PFA/PVA/VA shield		-196°C to 250°C
PTFE/PTFE and PTFE/shield/PTFE		-50°C to + 260°C
Gls/Gls/VA shield and all cable with outer VA shield		up to +350°C
maximum internal capacity:	C <sub>i</sub>	0.2 nF/m
maximum internal inductance:	L <sub>i</sub>	1 μH/m

### Plug connectors:

Lemo plug connector		-40°C to +200°C
M12 plug connectors		-40°C to +85°C
miniature compensation plug connectors		-40°C to +200°C

The permissible process temperature [°C] depends on the maximum input power (P<sub>i</sub>) and the temperature class.

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

### Power ratings

R<sub>th</sub> = 292 at RKW-\*-300-\*\*\*\*/RKW-\*- RKW-\*-400-\*\*\*\*/RKW-\*-600-\*\*\*\*/  
RKW-\*-800-\*\*\*\*;

Temperature class	P <sub>i</sub> = 20 mW	P <sub>i</sub> = 50 mW	P <sub>i</sub> = 250 mW	P <sub>i</sub> = 500 mW	P <sub>i</sub> = 750 mW
T1 (450°C)	434	425	367	294	221
T2 (300°C)	284	275	217	144	71
T3 (200°C)	184	175	117	44	/
T4 (135°C)	124	115	57	/	/
T5 (100°C)	89	80	22	/	/
T6 (85°C)	74	65	7	/	/

Tab. 20: RKW – Rth 292 power ratings

### 5.3.3 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 <sub>i</sub>	30 V DC
maximum input current:	I <sub>i</sub>	100 mA
maximum input power:	P <sub>i</sub>	see table
maximum internal capacity:	C <sub>i</sub>	negligible
maximum internal inductance:	L <sub>i</sub>	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".

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



### NOTE

For operation in Zone 20 with type of protection II 1 G Ex ia IIC T135°C Da the process temperature must be set equal to the ambient temperature.

See the following overview:

<b>Power P<sub>i</sub></b>	<b>ambient/process temperature</b>
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 RKW cable sensors depending on the ambient temperature and temperature class:

Model RKW gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEx		
RKW-8-*-*#**	II 1 G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)
RKW-8-*-*#C, D, E, FX, B	II 1 G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)
RKW-9-*-*#**	II 1 G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 75°C (T6...T5)
RKW-9-*-*#C, D, E, FX, B	II 1 G	Ex ia IIC T1...T6 Ga	PT100 PT1000 Ni100	-40°C to 100°C (T4...T1)

Tab. 21: Area of use of RKW (gas)

## Dust explosion hazardous areas

The following table shows the usage range of the RKW cable sensors depending on the ambient temperature and power:

Model RKW dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEX		
RKW-8-*-*#**	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 40°C (750 mW)
RKW-8-*-*#**	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 70°C (650 mW)
RKW-8-*-*#C, D, E, FX, B	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 100°C (550 mW)
RKW-9-*-*#**	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 40°C (750 mW)
RKW-9-*-*#**	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 70°C (650 mW)
RKW-9-*-*#C, D, E, FX, B	II 1 D	Ex ia IIIC T135°C Da	PT100 PT1000 Ni100	-40°C to 100°C (550 mW)

Tab. 22: Area of use of RKW (dust)

## 5.4 Model RKT cable sensor

**with conformity assessment for use in potentially explosive atmospheres according to Ex ia IIC T1...T6 Ga or Ex ia IIIC T135°C Da**

In terms of the protection type intrinsic safety 'i' in accordance with DIN EN 60079-11:2012, para. 5.7, temperature sensors represent a so-called simple piece of electrical equipment if they are connected to only one intrinsically safe electrical circuit.

Simple electrical equipment which fulfils the requirements of the standard mentioned above and standard DIN EN 60079-14:2014 (VDE 0165 part 1), para. 16.4 do not have to be certified. Such components do not fall under the scope of Directive 2014/34/EU as they do not have an intrinsic potential source of ignition. When using a simple piece of electrical equipment in a hazardous area, the planner of the intrinsically safe system must provide evidence of adherence to the standards mentioned above including material data sheets and test reports, if necessary.

### Type code for gas/dust explosion hazardous areas

Parts/model	#	-#	-#	-#	#	#	#
Sensor type							
thermocouple	RKT						
Model cable sensor							
Insertion sensor flat with bayonet cap		1					
Insertion sensor flat with adapter sleeve		2					
Insertion sensor 118° with bayonet cap		3					
Screw-in sensor with anti-kink spring		4					
Insertion sensor with bayonet nipple and cap		5					
Insertion sensor flat with fixing lug		6					
Angle sensor with variable installation length		7					
Insertion sensor without bayonet cap		8					
with pipe clip		9					
Angle sensor with square block		10					
Surface sensor with square block		11					
Sensor diameter							

Parts/model	#	-#	-#	-#	#	#	#
3.0 mm			300				
4.0 mm			400				
6.0 mm			600				
8.0 mm			800				
Number of sensors							
single				1			
double				2			
Thermocouple type							
NiCr-Ni					K		
NiCrSi-NiSi					N		
Fe-CuNi					J		
Cu-CuNi					T		
NiCr-CuNi					E		
Connection cables							
PVC/PVC						A	
PVC/shield/PVC						B	
glass silk/silicone						C	
glass silk/silicone/glass silk/shield						D	
FEP or PTFE						E	
FEP shield or PTFE shield or all cable with outer VA shielding						F	
Cable connection							
Cable with free ends							X
Mini-compensation plug connector							A
Lemo plug connector							B
M12/M8 plug connector							C

Tab.23: RKW – model/designation



### 5.4.1 Type of protection code

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

- # Ex ia IIC T1...T6 Ga
- # Ex ia IIIC T135°C Da

### 5.4.2 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 <sub>i</sub>	30 V DC
maximum input current:	I <sub>i</sub>	100 mA
maximum input power:	P <sub>i</sub>	see table
maximum internal capacity:	C <sub>i</sub>	negligible
maximum internal inductance:	L <sub>i</sub>	negligible

**Thermal parameters:**

T6...T5 (ambient temperature range)	-40°C to +75°C
T4...T1 (ambient temperature range)	-40°C to +100°C



**NOTE**

For operation in Zone 0 with type of protection Ex ia IIC T1...T6 Ga the process temperature is equal to the ambient temperature.

The ambient temperatures for temperature sensors with connection cable are also determined and restricted by the operating temperatures of the connection cables and/or plug connectors.

The installation of the temperature sensors with connection cable must conform to the requirements of IEC / EN 60079-14 and IEC / EN 60079-25.

### Temperature ranges and Ex-relevant electrical parameters:

#### Compensating/thermocouple extension cables (permanently installed and max. length: 50 m):

PVC/PVC and PVC/shield/PVC		-10°C to +80°C
Gls/silicone and Gls/silicone/Gls/shield		-40°C to +180°C
PFA/PVA/VA shield		-196°C to 250°C
PTFE/PTFE and PTFE/shield/PTFE		-50°C to + 260°C
Gls/Gls/VA shield and all cable with outer VA shield		up to +350°C
maximum internal capacity:	C <sub>i</sub>	0.2 nF/m
maximum internal inductance:	L <sub>i</sub>	1 μH/m

#### WTH connection cables (permanently installed and max. length: 50 m):

PVC/PVC and PVC/shield/PVC		-40°C to +80°C
silicone/FEP and silicone/shield/FEP		-40°C to +180°C
PFA/PVA/VA shield		-196°C to 250°C
PTFE/PTFE and PTFE/shield/PTFE		-50°C to + 260°C
Gls/Gls/VA shield and all cable with outer VA shield		up to +350°C
maximum internal capacity:	C <sub>i</sub>	0.2 nF/m
maximum internal inductance:	L <sub>i</sub>	1 μH/m

#### Plug connectors:

Lemo plug connector	-40°C to +200°C
M12 plug connectors	-40°C to +85°C
miniature compensation plug connectors	-40°C to +200°C

### 5.4.3 Special features of the thermal parameters of thermocouples

**i** **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 from Table 1, with the calculation of the maximum process temperature a total self-heating of 10K at power adjustment  
 ( $P_0 = \frac{1}{4} \times U_0 \times I_0 = \frac{1}{4} \times 30 \text{ V} \times 0.1 \text{ A} = 0.75 \text{ W}$ ) can be assumed.

Type code RKT-\*\_\*-\*\*\* 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 <sub>i</sub> = 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. 24: TR14 – approved process temperatures

Type code RKT-\*\_\*-\*\*\* at device protection level "Da" and "Db"

**i** **NOTE**  
 For operation in Zone 20 with type of protection II 1 G Ex ia IIIC T135°C Da the process temperature must be set equal to the ambient temperature.

See the following overview:

Power P <sub>i</sub>	ambient/process temperature
750 mW	-40°C to +40°C
650 mW	-40°C to +70°C
550 mW	-40°C to +100°C

## 5.4.4 Area of use

### Gas explosion hazardous areas

The following table shows the usage range of the MIT R14 with cable depending on the ambient temperature and temperature class:

Model WTH gas	Marking		Sensor #	ambient temperature/ temperature class
	ATEX	IECEX		
RKT-*-.*##**	without	Ex ia IIC T1...T6 Ga	Type T, J, E, K, N	-40°C to 75°C (T6...T5)
RKT-*-.*##**	without	Ex ia IIC T1...T6 Ga	Type T, J, E, K, N	-40°C to 100°C (T4...T1)

Tab.25: Area of use of MIT R14 (gas)

### Dust explosion hazardous areas

The following table shows the usage range of the MIT R14 with cable depending on the ambient temperature and power:

Model WTH dust	Marking		Sensor #	ambient temperature/ power
	ATEX	IECEX		
RKT-*-.*##**	without	Ex ia IIIC T135°C Da	Type T, J, E, K, N	-40°C to 40°C (750 mW)
RKT-*-.*##**	without	Ex ia IIIC T135°C Da	Type T, J, E, K, N	-40°C to 70°C (650 mW)
RKT-*-.*##**	without	Ex ia IIIC T135°C Da	Type T, J, E, K, N	-40°C to 100°C (550 mW)

Tab.26: Area of use of MIT R14 (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

## 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  
EN 60079-11:2012-06  
EN 60079-26:2024-10

general requirements  
intrinsic safety „i“  
equipment with equipment protection level (EPL Ga)

RECKMANN GMBH  
Hagen, 2025-04-08



Authorized Person for Explosion Prevention  
Stefan Grobe