



winkler



## HEATING SOLUTIONS FOR EXHAUST MEASUREMENT TECHNOLOGY



2011-11

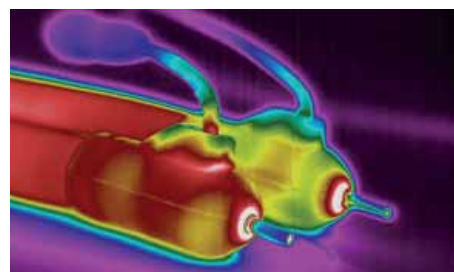
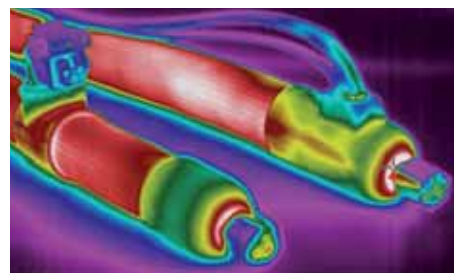
## WINKLER TECHNOLOGY

With more than 30 years of experience, Winkler is synonymous with reliable products and clever innovations in the field of industrial heat technology. We offer the widest possible range of flexible heating systems, control technologies and accessories to match the most demanding analysis measurement technology.

Heated lines, wall bushings, parallel heating tapes and heating jackets from Winkler are used in analyser systems. They serve in the transport of measuring gas samples without measured value inaccuracies from the removal point to the gas preparation system and analyser. They have proven their reliability for years, round the clock and under trying conditions. The entire range of heating solutions from Winkler is also used in motor test stands for calibration and optimisation when developing combustion motors, and in role test benches for legal emission tests and vehicle certification.

The accuracy and reproducibility with which the sensors and instruments in the analysis systems can work primarily depends on the measuring gas preparation and thus on the correct heating of the measuring gas path as per the relevant standards and regulations. The requirements in this field will increase further owing to the stricter legal stipulations and the constantly improving measurement technology. Heating within an analysis system is thus an important component of every system and always a case for the experts of Winkler.

**Trust our experience and try our competitiveness!**



## WINKLER SERVICE

Service is an important part of our cooperation with our customers. Winkler not only supplies reliably functioning products, but also complete solutions from one single source. We see ourselves as service providers to and development partners of our customers. Together with you – and with flexibility and creativity – we will find a solution, even for very complex applications.

As a system supplier to manufacturers of high-standard analytical devices and systems we are familiar with the requirements in practice and the application conditions. Often it is certain details that will make the product ideally suited to a particular task.

**Make use of our know-how to stay ahead!**

In addition to the options already listed, all the products in this catalogue can be individually adapted to your specific projects. In other words, we can offer you a solution that is exactly tailored to the requirements of your application. This approach is technically more elegant, and in the long run it will normally also prove to be more economic.

**Don't hesitate and get in touch with our specialists – they'll be happy to advise you!**

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## WINKLER QUALITÄT

The technical experience and high level of quality assurance are reflected in all Winkler products so that our customers can rely on tested and proven products for their applications.

Our heating systems are characterized by an even distribution of heating power and a generously dimensioned heating conductor arrangement. This enables relatively direct and careful heat transfer to the fluid or object to be heated.

We only use high-quality, tried and tested materials and components, and there is no compromise in this respect when it comes to the selection of and cooperation with our suppliers. Our customers are therefore offered excellent and trustworthy products with a long service life, even under heavy load conditions.

Winkler products are 100% routine tested. There are two documented tests already during production, and during the third and final test the analytical measurement lines are again subjected to strict quality inspection. This triple testing procedure ensures a high degree of safety and reliability. And in the long run, these high quality and safety standards are beneficial.

Our quality management system is certified to ISO 9001:2008. Winkler is a certified manufacturer in accordance with Directive 94/9/EC, Appendix VII (ATEX).



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# 1. HEATED LINES AND ACCESSORIES









# 1.1 CODES FOR HEATED LINES

## Codes for the outer jacket

Protective braidsings ▶ Page 8

<b>G 0</b>	Polyamide (PA) braiding - black
<b>G 1</b>	Polyamide (PA) braiding - red
<b>G 2</b>	Polyamide (PA) braiding - orange
<b>G 3</b>	Polyamide (PA) braiding - blue
<b>G 4</b>	Polyamide (PA) braiding - grey
<b>G 8</b>	Galvanised steel braiding
<b>G 9</b>	Stainless steel braiding

Silicone covers ▶ Page 8

<b>S 1</b>	Black silicone skin (DM 33 mm)
<b>S 2</b>	Black silicone skin (DM 43 mm)
<b>S 3</b>	Black silicone skin (DM 53 mm)
<b>S 6</b>	White silicone skin (DM 33 mm)
<b>S 7</b>	White silicone skin (DM 43 mm)
<b>S 8</b>	White silicone skin (DM 53 mm)
<b>I 0</b>	Industrial hose, white
<b>I 1</b>	Industrial hose, red

Corrugated hoses ▶ Page 10

<b>W 2</b>	Black PA corrugated hose
<b>W 7</b>	Black PUR spiral hose
<b>W 8</b>	Galvanised steel spiral hose
<b>W 9</b>	Stainless steel spiral hose

## Codes for the maximum operating temperature $T_{max}$ in °C

Maximum operating temperature  $T_{max}$  in °C  
(Heated lines with heating cable)

10 = 100°C	30 = 300°C
20 = 200°C	35 = 350°C
25 = 250°C	40 = 400°C

## Codes for the basic hose and fittings ▶ Page 24

<b>0</b>	PTFE-hose	<b>5</b>	Stainless steel tube
<b>1</b>	Exchangeable PTFE hose in hose	<b>6</b>	Exchangeable PTFE hose
<b>2</b>	PTFE-hose+stainless steel braiding	<b>7</b>	Stainless steel corrugated hose
<b>3</b>	PTFE basic hose + RSL-fittings	<b>8</b>	Exchangeable PTFE hose + exchange. RSL-fittings
<b>4</b>	Exchangeable PTFE hose + RSL-fittings	<b>9</b>	Exchangeable PTFE hose + ferrule fittings

<b>W</b>	<b>A</b>	<b>K</b>	<b>W</b>	<b>2</b>	<b>0</b>	<b>3</b>	-	<b>2</b>	<b>3</b>	<b>0</b>	<b>X</b>	<b>P</b>	<b>0</b>	<b>0</b>	<b>6</b>	-	<b>1</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>S</b>	<b>T</b>	<b>N</b>	<b>D</b>																
			Serial code																The length of the heated line refers to the total length – including fittings				Configuration STDN = Standard product																	
			Special number																				Length of heated line L (cm) ▶ Page 22																	
																							Nominal diameter DN ▶ Page 21																	
																							Sensor type & options ▶ Page 23																	
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### Note:

All the descriptions and illustrations of the products in this catalogue are non-binding and correspond to our current state of knowledge.  
Winkler reserves the right to modify the products described here at any time and without prior notice if considered necessary for the purpose of further development or constructional reasons.



Only for inside use



Attention!

## 1.2.1 HEATED LINES SERIES WAKG + WAKS

$T_{max} = 100^{\circ}\text{C} \mid 200^{\circ}\text{C} \mid 250^{\circ}\text{C}$

$T_{max} = 300^{\circ}\text{C} \mid 400^{\circ}\text{C}$

$T_{max} = 600^{\circ}\text{C}^*$

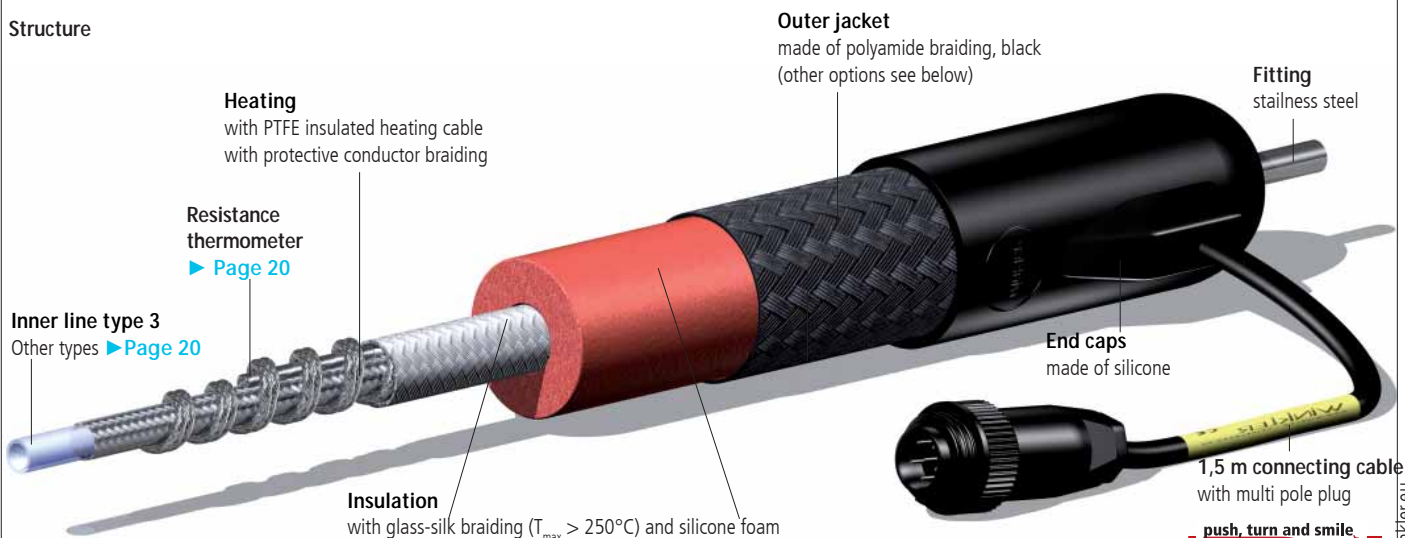
**\*\*with stainless steel hose or corrugated hose**

### Applications

Heated lines for the transport of gas samples in the temperature range up to  $250^{\circ}\text{C}$ . Well suited for fix installation and mobile use in- and outdoors with normal mechanical strain.

Versions for high temperatures up to  $600^{\circ}\text{C}$  (only use for indoor).

### Structure



### Features and Benefits

- PTFE hose with stainless steel braiding and tube stubs made of stainless steel 1.4305.
- Options for inner lines, basic hoses and fittings as well as their available nominal diameters [▶ Page 21](#).
- Heating with PTFE ( $T_{max} < 250^{\circ}\text{C}$ ) or glass silk ( $T_{max} > 250^{\circ}\text{C}$ ) insulated heating cable.
- Soft and extremely flexible insulation structure with glass silk braiding ( $T_{max} > 250^{\circ}\text{C}$ ) and silicone foam.
- Standard-insulation structure approx. 40 mm (up to DN 16) and approx. 63 mm (from DN 20). Options underneath.
- Outer jacket with protective braiding in different versions (WAKG) or silicon skin (WAKS) and silicon caps.
- Built-in resistance thermometer [▶ Page 23](#) for the operation with a controller. [▶ Page 52](#)
- Ready to connect with plug.




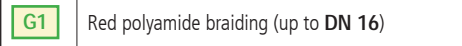



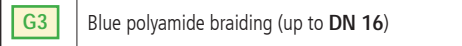
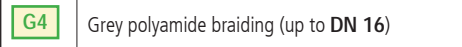

**push, turn and smile**



Operation with Controller [▶ Page 50](#)

## Versions of protective hoses for the outer jacket of Series WAKG and WAKS

### STANDARD

		
Code <b>G0</b> Black polyamide braiding. Use for standard applications. Available up to DN 32	Code <b>G8</b> Galvanised steel braiding. Very robust. Use for higher strain. Available up to DN 32	Code <b>S1</b> Black silicone skin. Washable. Ideal for cabinets + mobile use. Available up to DN 6 and lengths up to 20 m, DM ca. 33 mm, $T_{max} = 180^{\circ}\text{C}$
		
		
		
		
	Code <b>G9</b> Stainless steel braiding. Best performance. Ideal for a long-lasting perfect look. Available up to DN 32	Code <b>S2</b> Black silicone skin. Washable. Combines flexibility and durability. Available up to DN 10 and lengths up to 20 m, DM ca. 43 mm
		
		Code <b>S3</b> Black silicone skin. Washable. Combines flexibility and durability. Available up to DN 16 and lengths up to 20 m, DM ca. 53 mm For use in climate chambers, thicker insulation available up to DN 10.



Technical drawing of a cable assembly. The drawing shows a cable with a multi-pole plug at one end and a connector at the other. Dimensions are indicated by arrows and labels:

- LL = 1.500 mm**: Length of the cable section between the plug and the connector.
- DK**: Diameter of the A-side connector.
- DM**: Diameter of the DM (middle) section.
- LE**: Length of the E-side connector.
- LK**: Length of the E-side connector.
- L**: Total length of the cable assembly.
- HK**: Height of the E-side connector.
- A-side**: Label for the left connector.
- E-side**: Label for the right connector.
- Multi pole plug**: Label for the plug at the top.
- Page 23**: Reference to the next page.

- MOTOR – Heated Lines 9

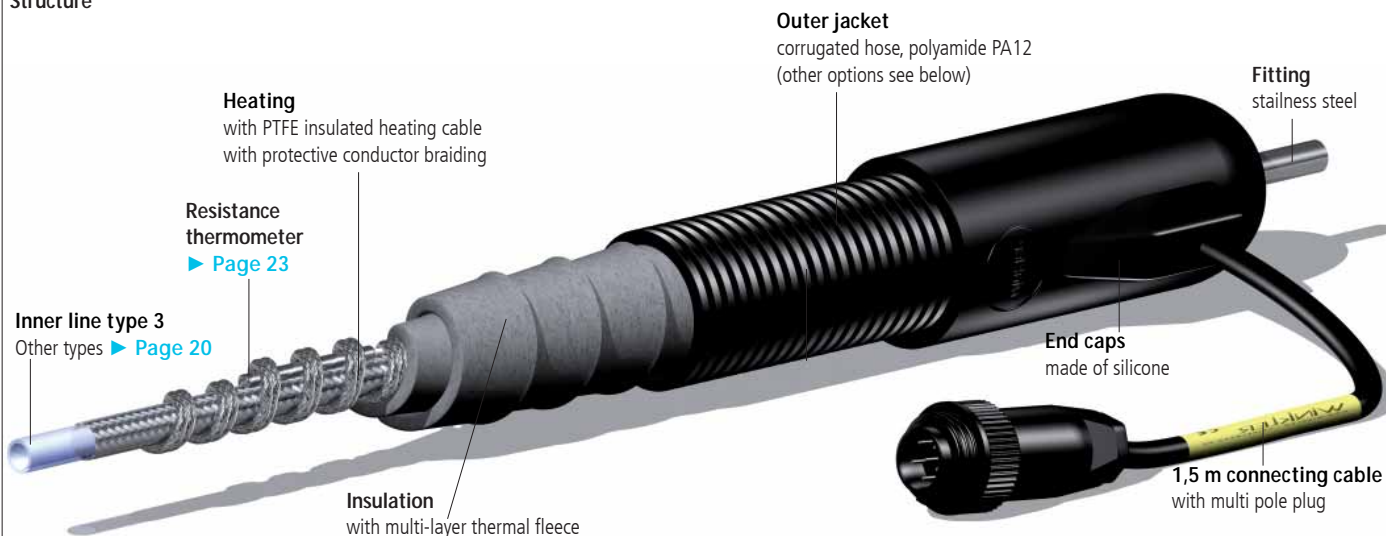
## 1.2.2 HEATED LINES SERIES WAKW

$T_{max} = 200\text{ }^{\circ}\text{C}$

### Applications

Heated lines for the transport of gas samples in the temperature range up to 200°C.  
Very well suited for fix installation - outdoors - and the mobile use with higher mechanical strain

### Structure



### Features and Benefits

- PTFE hose with stainless steel braiding and tube stubs made of stainless steel 1.4305.
- Options for inner lines, basic hoses and fittings as well as their available nominal diameters ▶ Page 21.
- Heating with PTFE insulated heating cable with protective braiding.
- Flexible insulating structure with multilayer thermal fleece.
- Standard insulation structure approx. 40 mm (up to DN 13) and approx. 50 mm (DN 16). Options underneath.
- Outer cover with sturdy protective hoses in different versions and silicon caps.
- Built-in resistance thermometer ▶ Page 23 for the operation with a controller. ▶ Page 52.
- Ready to connect with plug.

push, turn and smile

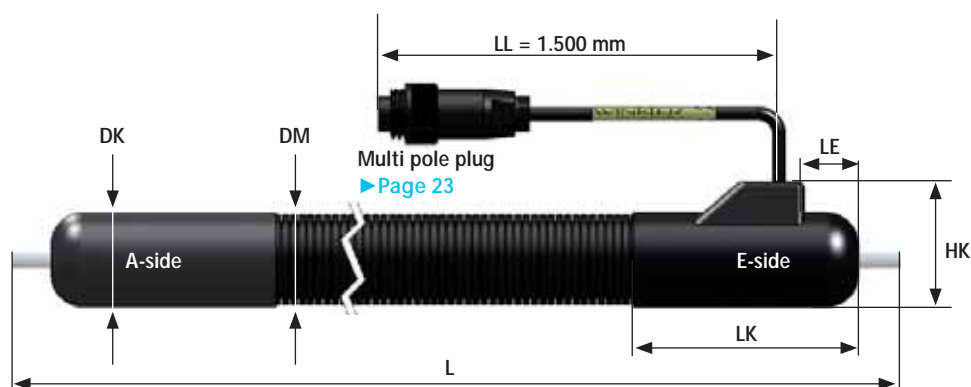


Operation with  
Controller ▶ Page 50

### Variations of protective hoses for the outer cover of Series WAKW

STANDARD		
		
<b>Code</b> <b>W2</b>	<b>Code</b> <b>W8</b>	<b>Code</b> <b>W9</b>
Black polyamide (PA) corrugated hose Use for standard applications. Available up to <b>DN 16</b>	Galvanised steel spiral hose. Crush-resistant. Use for higher strain. Available up to <b>DN 13</b>	Galvanised steel spiral hose. Crush-resistant. Use for higher strain. Available up to <b>DN 13</b>

## Technical data series WAKW



- L:** Length of the heated line  
**OD:** Outer diameter inner line  
**DK:** Outside diameter of cap  
**DM:** Outside diameter of outer jacket  
**LK:** Length of cap  
**LE:** Recess of cable outlet  
**LL:** Length of connecting cable  
**HK:** Height of cap with cable outlet  
**A-side:** Sample side  
**E-side:** Electrical connection side

Dimensions and bend radiuses (Tolerances of length  $\pm 2\%$ , tolerances of diameter  $\pm 5\%$ )

DN	2	4	6	8	10	13 (12*)	16 (15*)
OD	4 mm	6 mm	8 mm	10 mm	12 mm	15 mm	18 mm
DK	48 mm						
DM	42,5 mm						
LA	25 mm				26 mm	28 mm	30 mm
LK	105 mm						
LE	25 mm						
HK	62 mm						
Min. bend radius	200 mm				300 mm		

\*Heated line with inner line type 7, corrugated stainless steel hose

Maximum operating temperatures and power (Tolerances of power  $\pm 10\%$ , ambient temperatures  $-20^{\circ}\text{C}$  up to  $+40^{\circ}\text{C}$ )

T <sub>max</sub>	DN	2	4	6	8	10	13	16
100°C	fest	–	100 W/m			125 W/m		150 W/m
100°C	austauschb.	100 W/m		125 W/m		150 W/m	–	
200°C	fest	–	100 W/m			125 W/m		150 W/m
200°C	austauschb.	100 W/m		125 W/m		150 W/m	–	

Maximum lengths for operating voltages of 230 VAC and 115 VAC with one heating circuit (Tolerance of length  $\pm 2\%$ )

T <sub>max</sub>	DN	2	4	6	8	10	13	16
100°C	230 V	52 m				41 m		34 m
	115 V	25 m				20 m		17 m
200°C	230 V	52 m				41 m		34 m
	115 V	25 m				20 m		17 m

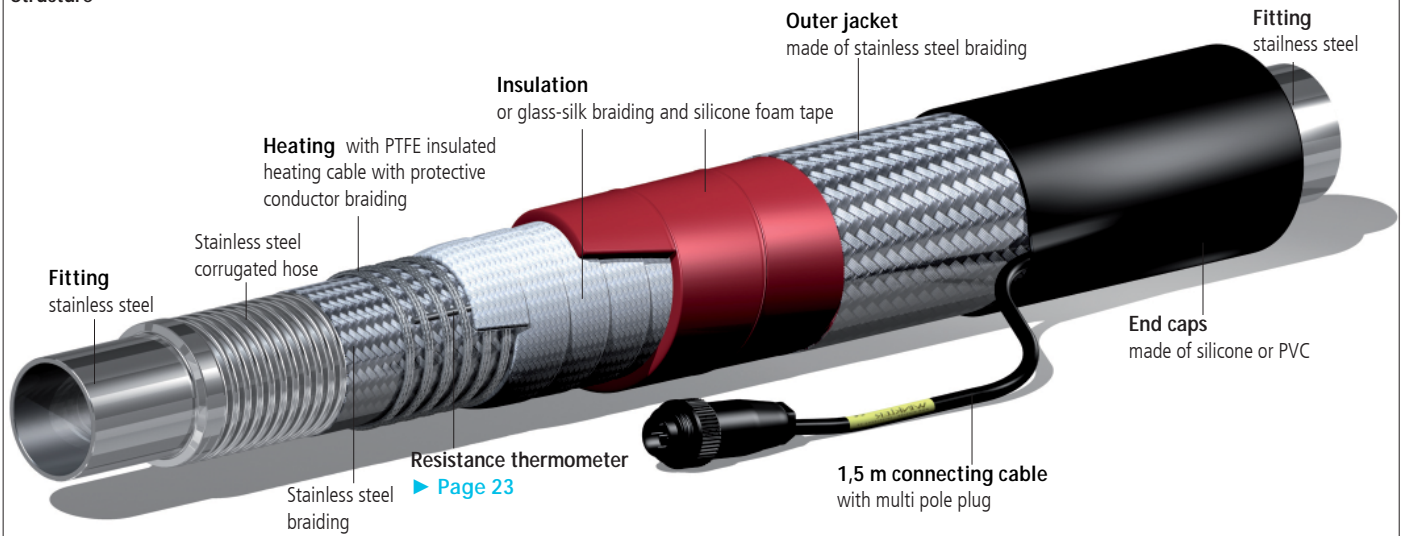
Other voltages available on request

1.2.3 HEATED LINES SERIES WAM

T<sub>max</sub> = 250 °C

**Applications**  
Heated lines for the channelling of exhaust gases and for gas sampling directly at the exhaust pipe in the temperature range up to 250°C. Available in nominal diameters from DN 40

Structure



- Features and Benefits**
- Stainless steel corrugated hose with stainless steel protective braiding and stainless steel tube stubs.
  - Heating with PTFE insulated heating cable with protective braiding.
  - Flexible insulation structure with multilayer thermal fleece (T<sub>max</sub> = 200°C) or glass silk braiding (T<sub>max</sub> > 250°C) and silicon foam.
  - Outer cover with rugged stainless steel protective braiding and silicon or PVC caps.
  - Built-in resistance thermometer ▶ [Page 23](#) for the operation with a controller ▶ [Page 52](#)
  - Ready to connect with plug.



Technical data series WAM						
<div><div>L: Length of the heated line</div><div>OD: Outer diameter inner line</div><div>DK: Outside diameter of cap</div><div>DM: Outside diameter of outer jacket</div><div>LK: Length of cap</div><div>LE: Recess of cable outlet</div><div>LL: Length of connecting cable</div><div>HK: Height of cap with cable outlet</div><div>A-side: Sample side</div><div>E-side: Electrical connection side</div></div>						
DN	OD	DK	DM	LA	LK	Min. bend radius
80	88,9 mm	120 mm	110 mm	50 mm	180 mm	800 mm

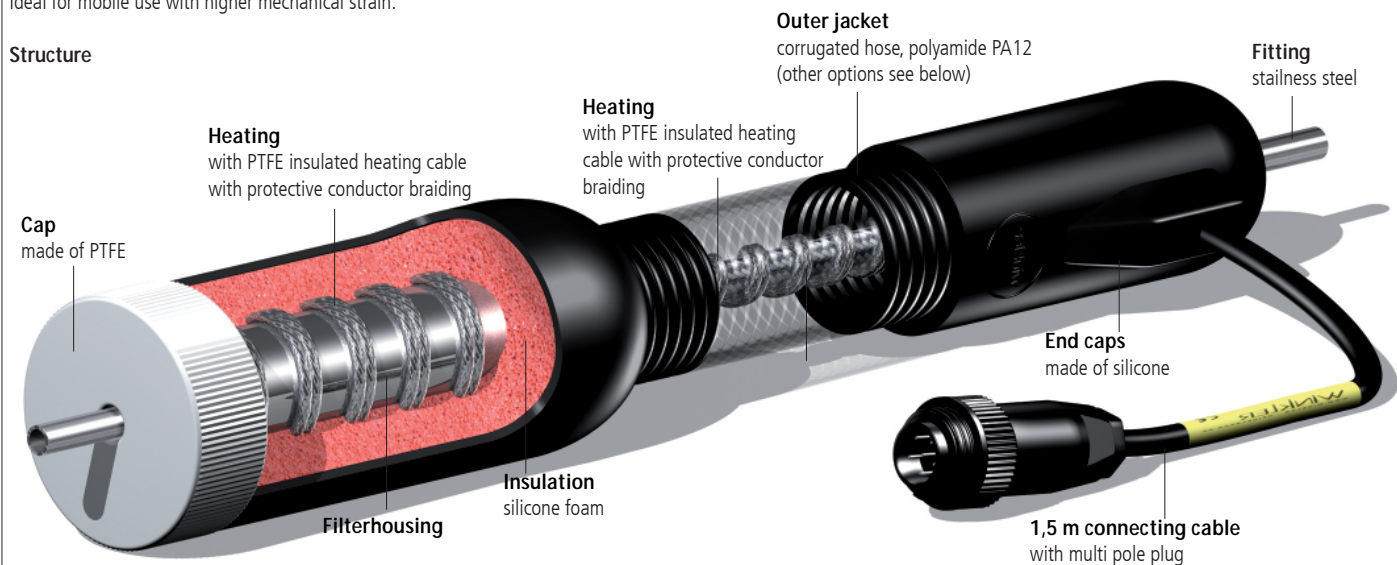
## 1.2.4 HEATED LINES SERIES WAF WITH FILTER HOUSING (WITHOUT FILTER ELEMENT)

$T_{\max} = 200\text{ }^{\circ}\text{C}$

### Applications

Heated lines for the transport of gas samples charged with particles in the temperature range up to 200°C.  
Ideal for mobile use with higher mechanical strain.

### Structure



### Features and Benefits

- Quick replacement and optimum cleanability of the filter element.
- Heating with PTFE insulated heating cable with protective braiding.
- Flexible insulating structure with multilayer thermal fleece and sturdy protective hoses in different versions or with flexible silicone foam and protective braiding in different versions. Options underneath.
- Built-in resistance thermometer ▶ [Page 23](#) for the operation with a controller ▶ [Page 52](#)
- Ready to connect with plug

push, turn and smile



Operation with Controller ▶ [Page 50](#)

### Variations of protective hoses for the outer cover of SerieS WAF

#### STANDARD



**Code**  
**W2**  
Black polyamide (PA12) corrugated hose  
Use for standard applications.  
Available up to **DN 6** standard for filter housing

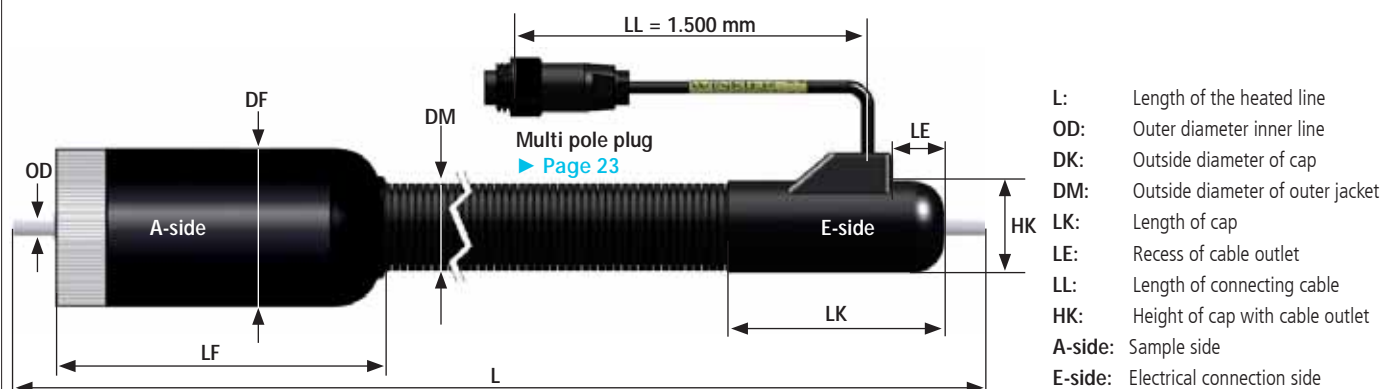


**Code**  
**G0**  
...  
**Code**  
**G9**  
Black polyamide braiding. (Code 0) and other colors (Code G1-G9 ▶ [Seite 13](#))  
Use for standard applications.  
Available up to **DN 6**, standard for filter housing



**Code**  
**S1**  
...  
**Code**  
**S8**  
Black silicone skin  
(Code S1-S8 ▶ [Seite 13](#)), Washable.  
Ideal for cabinets + mobile use.  
Available up to **DN 6**, for filter housing

### Technical data series WAF



- L:** Length of the heated line  
**OD:** Outer diameter inner line  
**DK:** Outside diameter of cap  
**DM:** Outside diameter of outer jacket  
**LK:** Length of cap  
**LE:** Recess of cable outlet  
**LL:** Length of connecting cable  
**HK:** Height of cap with cable outlet  
**A-side:** Sample side  
**E-side:** Electrical connection side

DN	OD	DF	DM	LF	LA	LK	LE	HK	Min. bend radius
4	6 mm	65 mm	43 mm	132 mm	25 mm	105 mm	25 mm	62 mm	200 mm
6	8 mm								



## 1.3 HEATED FILTER CARTRIDGES SERIES WAZF

$T_{\max} = 200\text{ }^{\circ}\text{C}$

### Application

The heated filter element filters e. g. soot particles from measurement gases. Contamination of the analyser is thus prevented.

### Structure



### Versions heated filter cartridges, filter holders and filter elements

#### Filter cartridge

Art.-No. WAZF0250

#### Technical data:

- Filter fineness:  $2\text{ }\mu\text{m}$ , up to  $200^{\circ}\text{C}$
- Filter surface:  $300\text{ cm}^2$
- Material: Stainless steel 1.4571 supporting pipe made of stainless steel 1.4301
- multipath use; may be cleaned in an ultrasonic bath

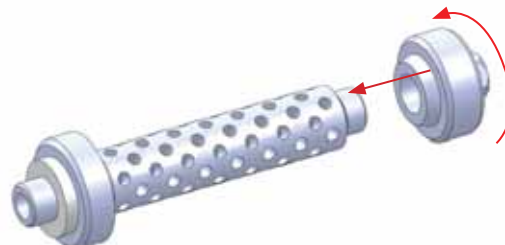


#### Filter holder and screw connection

Art.-No.: WAZF0260

#### Technical data:

- Material: Stainless steel 1.4571 / 1.4404



#### Filter element

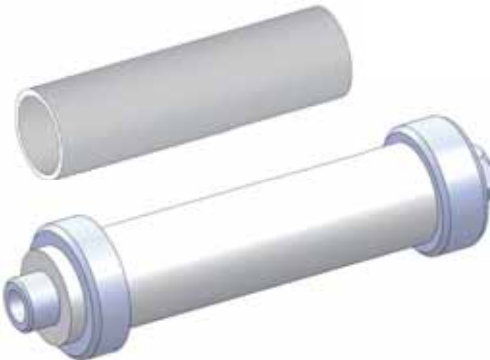

Art.-No.: WAZF0261-012TS057

#### Technical data:



- Filter fineness:  $2\text{ }\mu\text{m}$ , up to  $200^{\circ}\text{C}$ , used with filter adapter WAZF0260
- Filter surface:  $88\text{ mm}^2$
- Material: Sintered PTFE
- one-way use



Filter element on filter holder

<p><b>Filter element</b> Art.-No.: WAZF0261-012MG057</p> <p><b>Technical data:</b></p> <ul style="list-style-type: none"> <li>Filter fineness: 2 µm, up to 200°C, used with filter adapter WAZF0260</li> <li>Filter surface: 88 mm²</li> <li>Material: Micro-glass fiber</li> <li>one-way use</li> </ul>	 <p>Filter element on filter holder</p>
<p><b>Filter element</b> Art.-No.: WAZF0261-012VX057</p> <p><b>Technical data:</b></p> <ul style="list-style-type: none"> <li>Filter fineness: 2 µm, up to 200°C, used with filter adapter WAZF0260</li> <li>Filter surface: 88 mm²</li> <li>Material: 5-layer sintered stainless steel meshed fabric, 1.4401</li> <li>one-way use</li> </ul>	 <p>Filter element on filter holder</p>

#### Accessories + spare parts for heated filter elements

<p><b>Flat gasket</b> Art.-No.: WAZF0261-000VI000</p> <p><b>Technical data:</b></p> <ul style="list-style-type: none"> <li>Material: Viton</li> </ul>	
<p><b>Special mounting tool</b> Art.-No.: WAZF0251</p> <p><b>Technical data:</b></p> <ul style="list-style-type: none"> <li>Material: Red anodized aluminium</li> <li>SW10 for filter element type WAZF0250 and WAZF0260</li> </ul>	
<p><b>Thread paste</b> Art.-No.: WAZF0253</p> <p><b>Technical data:</b></p> <ul style="list-style-type: none"> <li>Content: 8ml</li> </ul>	

## 1.3.1 VERSIONS HEATED FILTER HOUSINGS AND FILTER SYSTEMS FOR HEATED LINES

$T_{\max} = 200\text{ }^{\circ}\text{C}$

### Filter housings with RSL fitting

DN 4 (OD = 6 mm)

DN 6 (OD = 8 mm)

made of stainless steel 1.4571



### Filter housing with „Quick-Lock“ fitting

(male type QLM / compatible with DN 4 and DN 6)

for connecting heated lines and filter housings quickly.



### Filter housing with „Quick-Lock“ fitting

(male type QLM / compatible with DN 4 and DN 6)

for connecting heated lines and filter housings quickly.

Filter housings with female „Quick-Lock“ fitting.



**Filter housing with „Quick-Lock“ fitting**

(both sides male type QLM / compatible with DN 4 and DN 6) with integrated „Puck-controller“ for accurate temperature control ► [Page 52](#)

- Temperature preset ex-works in the range between 0 °C...200 °C
- Programming takes place ex-works
- The temperature is engraved in the small window


**Filter housing with „Quick-Lock“ fitting**

(female and male type QLM / compatible with DN 4 and DN 6) with integrated „Puck-controller“ for accurate temperature control ► [Page 52](#)

- Temperature preset ex-works in the range between 0 °C...200 °C
- Programming takes place ex-works
- The temperature is engraved in the small window


**Application example:**

Heated hose with heated filter housing with „Quick-Lock“ connection and a second, preheated filter housing for the quick switch operation.

## 1.4 CONNECTION SYSTEM „QUICK-LOCK“

$T_{\max} = 200\text{ }^{\circ}\text{C}$

### Application

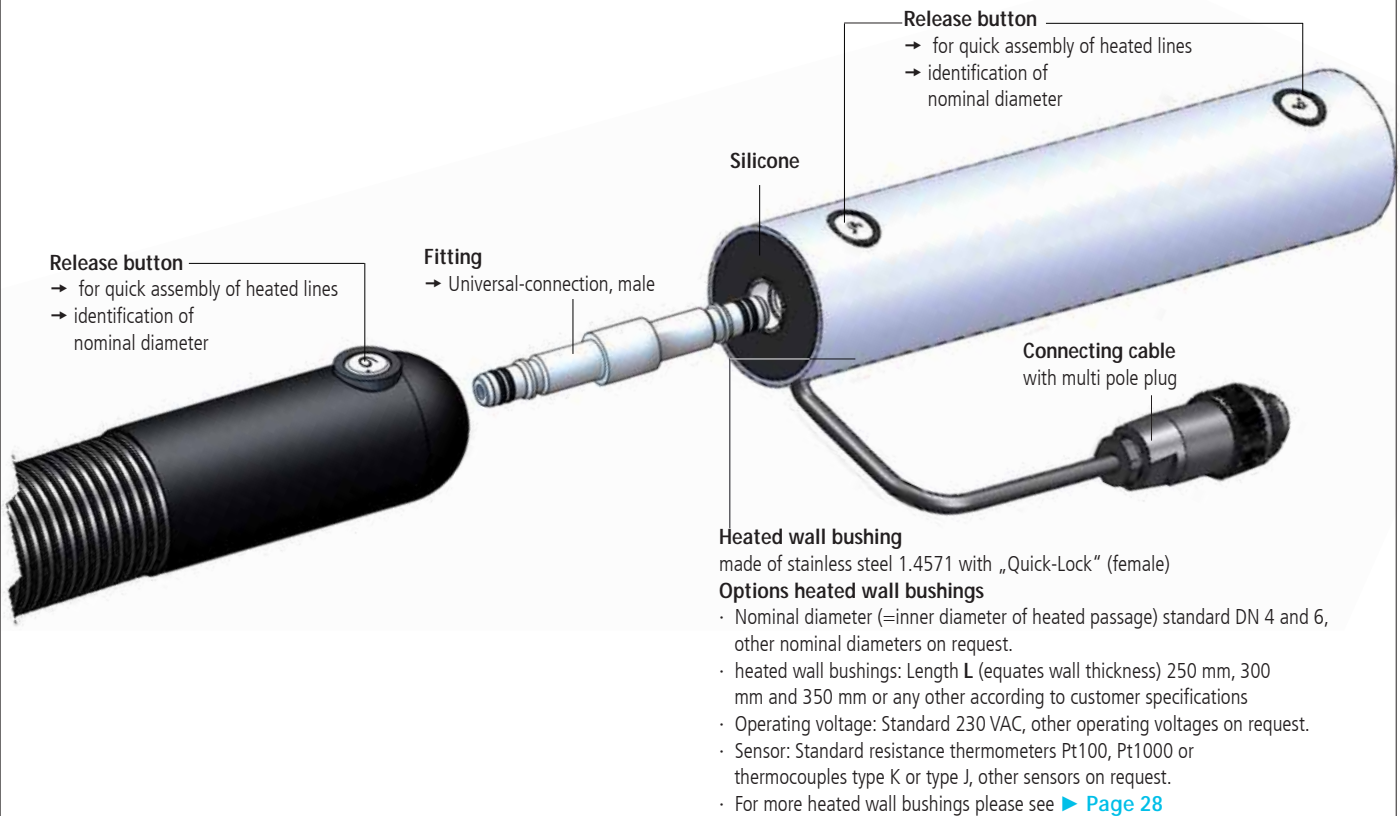
For quick assembly of heated lines.

Used at dynamometer and engine test beds for carriage of measuring gas into the analysing room safe and conforming to standards.

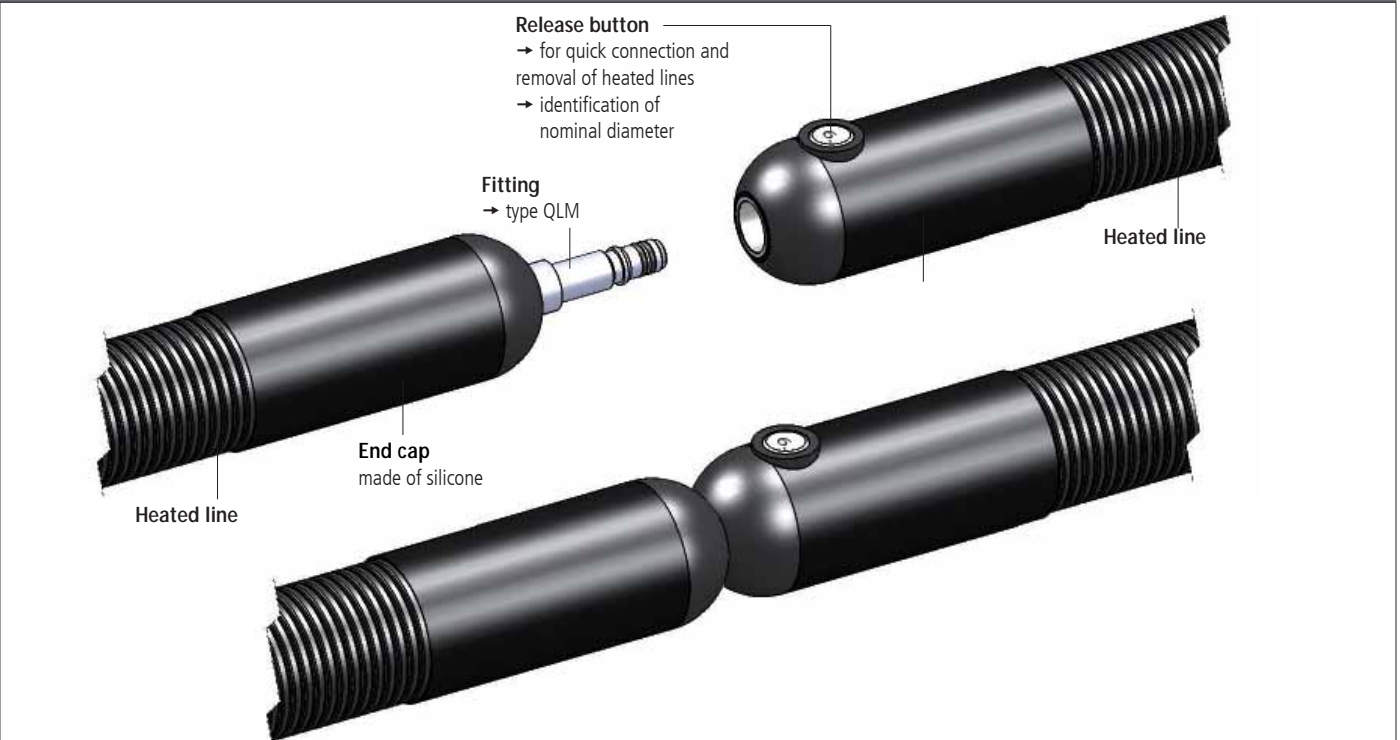
### Features and benefits

- Rugged structure made of high quality materials. The system is designed for sustained operating temperatures of up to 200°C.
- Seamless (conforming to standards) heating without cold spots between the wall bushing and the heated line and the heated line coupling.

### „Quick-Lock“ for heated wall bushings



### „Quick-Lock“ für beheizte Analysenleitungen





## Accessories for „Quick-Lock“ system

Winkler „Quick-Lock“ = **connecting flexibility** + **gas tightness** + **continuous heating without cold spots!**

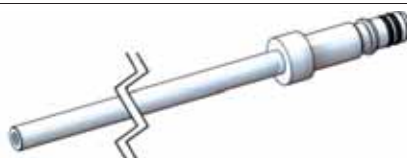
Universal connection QLM - QLM  
to connect two heated lines  
(compatible with DN 4 and DN 6)  
**Art.-No. WAZQLMMB**

**Fitting „Quick-Lock“ female (type QLM)**  
available for heated lines in DN 4 and DN 6



**Fitting „Quick-Lock“ female (type QLM)**  
available for heated lines in DN 4 and DN 6

			
Universal blind plug male compatible with DN 4 and DN 6, material stainless steel <b>Art.-No.: WAZQLMBB</b>	Universal blind plug male compatible with DN 4 and DN 6 with safety rope for fixing, material stainless steel <b>Art.-No.: WAZQLMBZ</b>	Universal blind plug female compatible with DN 4 and DN 6 with safety rope for fixing, material stainless steel <b>Art.-No.: WAZQLWBB</b>	Adapter QL-female light on ferrule fitting to tube with safety rope, OD 8 mm, material stainless steel <b>Art.-No.: WAZQLWLK-000VZ008</b>
			
Adapter QL-male with outside thread, tapered NPT 1/8\" - 27, material stainless steel <b>Art.-No.: WAZQLM18</b>	Adapter QL-male with outside thread tapered NPT 1/4\" - 18, material stainless steel <b>Art.-No.: WAZQLM14</b>	Adapter QL-male with ferrule fitting without union nut 1/2\" - 20 UNF, material stainless steel <b>Art.-No.: WAZQLMXR-012VZ000</b>	Spare seals (O-Ring) for quick-connect master fitting 7,5X1,5 mm; material viton <b>Art.-No.: WAZQVDRB</b>
			
Fitting „Quick-Lock“ male with screw thread for heated lines with interchangeable inner line type 8, material stainless steel <b>Art.-No.: WAZQLMA4 (DN 4)</b>	Fitting „Quick-Lock“ male with screw thread for heated lines with interchangeable inner line type 8, material stainless steel <b>Art.-No.: WAZQLMA6 (DN 6)</b>	Adapter QL-female on ferrule fitting to tube, OD 6 or 8 mm, material stainless steel, with silicone insulation <b>Art.-No.: WAZX1037-000VZ006</b> <b>Art.-No.: WAZX1037-000VZ008</b>	Adapter QL-male with RSL fitting to tube, OD 6 oder 8 mm; material stainless steel, with silicone insulation <b>Art.-No.: WAZQLWRL-250VZ006</b> <b>Art.-No.: WAZQLWRL-250VZ008</b>



Connection QLM - RSL fitting <b>25 mm</b> <b>Art.-No.: WAZQLMRL-025VZ006</b> mit OD 6 mm <b>Art.-No.: WAZQLMRL-025VZ008</b> mit OD 8 mm	Connection QLM - RSL fitting <b>50 mm</b> <b>Art.-No.: WAZQLMRL-050VZ006</b> mit OD 6 mm <b>Art.-No.: WAZQLMRL-050VZ008</b> mit OD 8 mm	Connection QLM - RSL fitting <b>100 mm</b> <b>Art.-No.: WAZQLMRL-100VZ006</b> mit OD 6 mm <b>Art.-No.: WAZQLMRL-100VZ008</b> mit OD 8 mm
Connection QLM - RSL fitting <b>150 mm</b> <b>Art.-No.: WAZQLMRL-150VZ006</b> mit OD 6 mm <b>Art.-No.: WAZQLMRL-150VZ008</b> mit OD 8 mm	Connection QLM - RSL fitting <b>200 mm</b> <b>Art.-No.: WAZQLMRL-200VZ006</b> mit OD 6 mm <b>Art.-No.: WAZQLMRL-200VZ008</b> mit OD 8 mm	Connection QLM - tube inox <b>500 mm</b> (soft-annealed) <b>Art.-No.: WAZQLMRL-500VZ006</b> mit OD 6 mm <b>Art.-No.: WAZQLMRL-500VZ008</b> mit OD 8 mm

## 1.5 STANDARD BASIC HOSES AND FITTINGS

Example: Type 3 → WAKW2203-230XP006-1500STND

Available basic hoses and fittings for heated lines of the types listed. Depending on design, basic hoses with PTFE hose can be employed for fluid temperatures up to 250°C. Heated lines with stainless steel pipes and corrugated stainless steel hoses are designed for higher fluid temperatures, depending on the type of insulation. Higher temperatures and special solutions available on request.

### Types Heated Lines

WAKG	WAKS	WAKW	WAM	WAF	WEX
► Page 8	► Page 8	► Page 10	► Page 12	► Page 13	► Page 20
available on request	available on request	available on request			
available on request	available on request	available on request			
DN 4 DN 6 DN 8 DN 10 DN 13	DN 4 DN 6 DN 8 DN 10	DN 4 DN 6 DN 8 DN 10 DN 13			DN 4 DN 6 DN 8 DN 10 DN 13
DN 2 DN 4 DN 6 DN 8 DN 10 DN 13 DN 16,20 DN 25,32	DN 4 DN 6 DN 8 DN 10	DN 4 DN 6 DN 8 DN 10 DN 13 DN 16		WAF DN 4 DN 6	DN 2 DN 4 DN 6 DN 8 DN 10 DN 13
DN 4 DN 6 DN 8	DN 4 DN 6 DN 8	DN 4 DN 6 DN 8			
OD 1/8" OD 1/4" DN 4 DN 6 DN 8 other sizes available on request	OD 1/8" OD 1/4" DN 4 DN 6 DN 8 other sizes available on request	OD 1/8" OD 1/4" DN 4 DN 6 DN 8 other sizes available on request			
DN 2 DN 4 DN 6 DN 8	DN 2 DN 4 DN 6 DN 8	DN 2 DN 4 DN 6 DN 8			
DN 6 DN 8 DN 10 DN 12 DN 15	DN 6 DN 8 DN 10	DN 6 DN 8 DN 10 DN 12 DN 15	WAM DN 40 DN 50 DN 65 DN 80 DN 100 DN 125 DN 150		
DN 2 DN 4 DN 6 DN 8	DN 2 DN 4 DN 6 DN 8	DN 2 DN 4 DN 6 DN 8			
DN 4 DN 6 DN 8	DN 4 DN 6 DN 8	DN 4 DN 6 DN 8			

**Type 0** PTFE hose (overlapping 500 mm on both ends)

$T_{max} = 250^{\circ}\text{C}$

**Type 1** Exchangeable PTFE hose in hose (overlapping 500 mm on both ends)

$T_{max} = 250^{\circ}\text{C}$

**Type 2** PTFE-hose with stainless steel braiding (overlapping 500 mm on both ends)

$T_{max} = 250^{\circ}\text{C}$

**Type 3** PTFE basic hose + stainless steel tube stubs

$T_{max} = 250^{\circ}\text{C}$

**Type 4** PTFE carrier hose with exchangeable PTFE hose (overlapping 500 mm on both ends) + stainless steel tube stubs

$T_{max} = 250^{\circ}\text{C}$

**Type 5** Stainless steel tube (overlapping 50 mm on both ends)

$T_{max} = 600^{\circ}\text{C}$

**Type 6** PTFE carrier hose with exchangeable PTFE hose (overlapping 500 mm on both ends)

$T_{max} = 250^{\circ}\text{C}$

**Type 7** Corrugated stainless steel hose + stainless steel stubs

$T_{max} = 600^{\circ}\text{C}$

**Type 8** PTFE carrier hose with exchangeable PTFE hose + exchangeable stainless steel tube stubs

$T_{max} = 250^{\circ}\text{C}$

**Type 9** PTFE carrier hose with exchangeable PTFE hose + stainless steel ferrule fittings

$T_{max} = 250^{\circ}\text{C}$

## 1.6 NOMINAL DIAMETERS DN

Example: DN=6 → WAKW2203-230XP006-1500STND

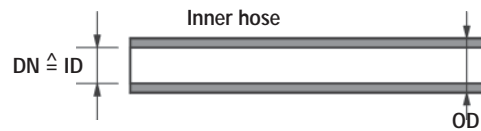


### Important!

The nominal diameter **DN** of a heated line always refers to the inner diameter **ID** in mm of the inner hose.

### Attention!

The nominal diameter is not to be confused with the dimensions of the fitting.




Nominal diameter		Inner diameter ID (mm) inner hose	Outer diameter OD (mm) inner hose	Inner diameter ID (mm) inner hose	Outer diameter OD (mm) inner hose
DN	Code	for basic hoses types 3		for basic hoses types 0, 1, 2, 4, 5*, 6, 8, 9	
4	004	4,8	8,2	4	6
6	006	6,4	10,0	6	8
8	008	8,1	11,8	8	10
10	010	10,5	14,0	10	12
13	013	13,0	17,5	13	15
16	016	15,8	20,0	16	18
20	020	20,8	26,0	—	—
25	025	25,0	30,0	—	—

\*Exception for inch dimensions

→ Dimensions of corrugated stainless steel hose type 7 available on request

## Inner lines

 PTFE hose	$T_{max} = 250^{\circ}C$	<b>PTFE hose</b> Standard in all basic hoses of types 0, 1, 3, 4, 6, 8 and 9. Resistant to all chemical agents, acids and bases of any concentration. Exception: alkaline metals and fluorine compounds.	<b>Stainless steel tube for replacement:</b> DN 4: Art.-No.: <b>WAZ02742-004TX006</b> DN 6: Art.-No.: <b>WAZ02743-006TX008</b> DN 8: Art.-No.: <b>WAZ02744-008TX010</b> DN 10: Art.-No.: <b>WAZ02745-010TX012</b>
	$T_{max} = 250^{\circ}C$	<b>Option antistatic PTFE hose</b> For basic hoses of types 2 and 3 and all basic hose with exchangeable hoses of types 0, 1, 4, 6, 8 and 9. Available in DN 4 - DN 10	
	$T_{max} = 250^{\circ}C$	<b>Option PFA hose</b> For basic hoses of types 2 and 3 and all basic hose with exchangeable hoses of types 0, 1, 4, 6, 8 and 9. Available in DN 4 and DN 6	
	$T_{max} = 250^{\circ}C$	<b>Option PFA hose, antistatic</b> For basic hoses of types 2 and 3 and all basic hose with exchangeable hoses of types 0, 1, 4, 6, 8 and 9. Available in DN 4 and DN 6	
	$T_{max} = 200^{\circ}C$	<b>Option FEP hose</b> For basic hoses of type 2 and all basic hoses with exchangeable hoses of types 0, 1, 4, 6, 8 and 9. Available in DN 4 and DN 6	
	$T_{max} = 600^{\circ}C$	<b>Stainless steel tube 1.4571</b> Standard in heated lines of type 5 Available in DN 4- DN 8 Other DN available on request  <b>Stainless steel tube 1.4404</b> Standard in heated lines of type 5 Available in OD 1/8" Other imperial versionen available on request	<b>Stainless steel tube for replacement:</b> DN 4: Art.-No.: <b>WAZ02753-004VV006</b> DN 6: Art.-No.: <b>WAZ02754-006VV008</b>
 Stainless steel tube			

## 1.7 LENGTH OF HEATED LINES L

Example: L = 15m → WAKW2203-230XP006-1500STND

### Lengths of heated lines

We supply heated lines to the exact length required, ranging from 0,30 m to 82 m.

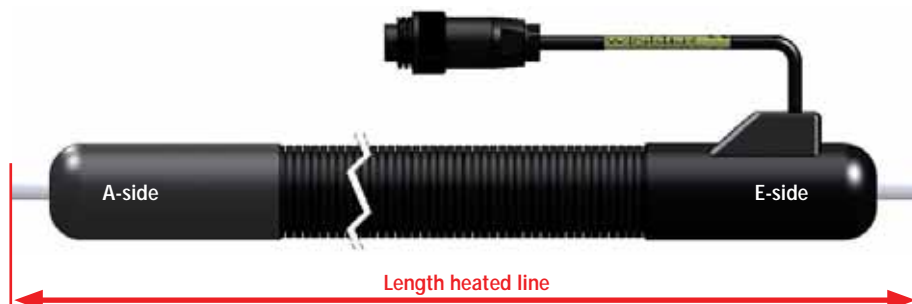
As from certain lengths, several heating circuits or three-phase arrangements will be necessary, depending on voltage, temperature and power.

### Manufacturing tolerance: ±2 %

During operation the length of the hose may vary by ± 2 % due to changes in pressure and temperature load.

### Measurement of heated line length

The length of the heated line refers to the total length – with fittings (see illustration).




A-side: Sample side  
E-side: Electric connection side

## Exchangeable tube stubs in stainless steel 1.4571 for basic hoses type 8

	Hose adapter DN 4 mm Thread M 12 x 1,5 mm - SW 17	Hose adapter DN 6 mm Thread M 14 x 1,5 mm - SW 19	Hose adapter DN 8 mm Thread M 18 x 1,5 mm - SW 22
<b>STANDARD L = 25 mm</b>	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-004VV006-0025STND 6 / 8 WAZRSLAM-004VV008-0025STND	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-006VV006-0025STND 6 / 8 WAZRSLAM-006VV008-0025STND 8 / 10 WAZRSLAM-006VV010-0025STND	Tube stub (ID / OD mm) 6 / 8 WAZRSLAM-008VV008-0025STND 8 / 10 WAZRSLAM-008VV010-0025STND
L = 50 mm	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-004VV006-0050STND 6 / 8 WAZRSLAM-004VV008-0050STND	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-006VV006-0050STND 6 / 8 WAZRSLAM-006VV008-0050STND 8 / 10 WAZRSLAM-006VV010-0050STND	Tube stub (ID / OD mm) 6 / 8 WAZRSLAM-008VV008-0050STND 8 / 10 WAZRSLAM-008VV010-0050STND
L = 100 mm	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-004VV006-0100STND 6 / 8 WAZRSLAM-004VV008-0100STND	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-006VV006-0100STND 6 / 8 WAZRSLAM-006VV008-0100STND 8 / 10 WAZRSLAM-006VV010-0100STND	Tube stub (ID / OD mm) 6 / 8 WAZRSLAM-008VV008-0100STND 8 / 10 WAZRSLAM-008VV010-0100STND
L = 150 mm	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-004VV006-0150STND 6 / 8 WAZRSLAM-004VV008-0150STND	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-006VV006-0150STND 6 / 8 WAZRSLAM-006VV008-0150STND 8 / 10 WAZRSLAM-006VV010-0150STND	Tube stub (ID / OD mm) 6 / 8 WAZRSLAM-008VV008-0150STND 8 / 10 WAZRSLAM-008VV010-0150STND
L = 200 mm	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-004VV006-0200STND 6 / 8 WAZRSLAM-004VV008-0200STND	Tube stub (ID / OD mm) 4 / 6 WAZRSLAM-006VV006-0200STND 6 / 8 WAZRSLAM-006VV008-0200STND 8 / 10 WAZRSLAM-006VV010-0200STND	Tube stub (ID / OD mm) 6 / 8 WAZRSLAM-008VV008-0200STND 8 / 10 WAZRSLAM-008VV010-0200STND

## RSL / RSS Tube stub light / heavy series

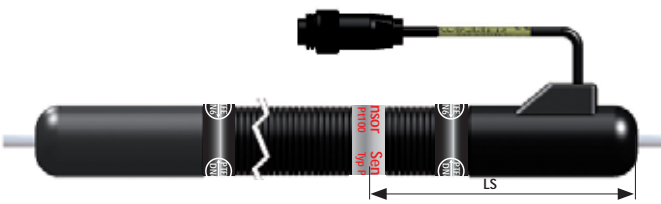


	DN	ID (mm)	RSL		RSS	
			OD* (mm)	LA** (mm)	OD (mm)	LA (mm)
 Material: Stainless steel	4	3	6	25	8	27
	6	5	8	25	10	29
	8	7	10	26	12	29
	10	9	12	26	14	33

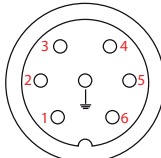
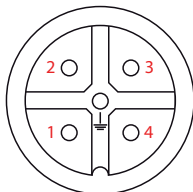
\* Outer diameter of tube stub

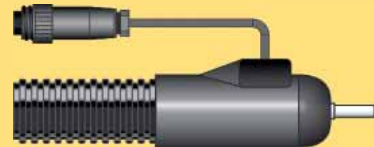
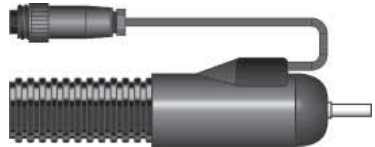

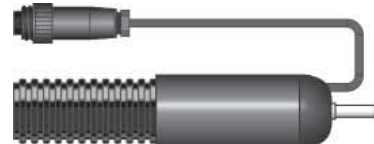
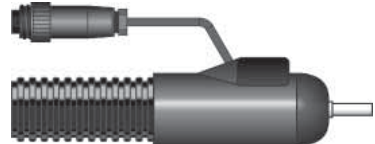
\*\* Length of tube stub

## 1.8 TECHNICAL OPTIONS

<b>Operating voltages</b>	<b>Example: 230V → WAKW2203-230XP006-1500STND</b>
<b>STANDARD   230 VAC-50 Hz</b>	<b>STANDARD One heating circuit = one heating zone</b>
<b>Options:</b> 12 VAC, 24 VAC, 48 VAC, 100 VAC, 115 VAC, 120 VAC, 200 VAC, 240 VAC, 400 VAC, 480 VAC, 12 VDC, 24 VDC, 48 VDC other voltages available on request	<b>Options:</b> More heating circuits → more heating zones. Three phase version possible.

<b>Temperature sensors</b>	<b>Example: Pt100 → WAKW2203-230XP006-1500STND</b>
<b>STANDARD   Temperature sensor types</b> <ul style="list-style-type: none"> <li>Resistance thermometer Pt 100 (2 wire) (potential free) <b>Code XP</b></li> <li>Thermocouple type K (NiCr-Ni) (potential free) <b>Code XK</b></li> <li>Thermocouple type J (Fe-CuNi) (potential free) <b>Code XJ</b></li> </ul> <b>Options for types of sensors:</b> <ul style="list-style-type: none"> <li>Resistance thermometer Pt 100 (3 wire) <b>Code XT</b></li> <li>Resistance thermometer Pt 100 (4 wire) <b>Code XQ</b></li> <li>Bi-metal temperature controller <b>Code XB</b></li> <li>Temperature fuse <b>Code XS</b></li> </ul> <b>Options for multiple sensors and sensor combinations:</b> <ul style="list-style-type: none"> <li>Multiple sensors</li> <li>2 x Pt 100 (2 wire) <b>Code ZP</b></li> <li>3 x Pt 100 (2 wire) <b>Code DP</b></li> <li>2 x thermocouple type K (potential free) <b>Code ZK</b></li> <li>...etc.</li> <li>Sensor combination e.g. Pt100 + thermocouple type K <b>Code PK</b></li> <li>...etc.</li> </ul>	<b>STANDARD   Sensor position:</b> <ul style="list-style-type: none"> <li>The sensor position is always measured from the electrical connection side.</li> <li><b>LS = 300 mm</b> for heated lines with heating cable.</li> <li><b>LS = 1.000 mm</b> for heated lines with parallel heating tape.</li> </ul> <b>Optional sensor positions:</b> <p>Please indicate your desired sensor position LS in your order.</p> <p>The correct position of the sensor is particularly important in cases of (partial) installation in switch cabinets, through walls or outdoors.</p> <p>Please ask our specialists for advice.</p> 
 <b>Important!</b> <p>Exposure to wind, as in the case of outdoor installations, can cool down the heated line quite considerably.</p> <p>Under these conditions, the heated line should be laid with appropriate protection, provided with stronger insulation (see options) and/or more power (W/m), while the temperature sensors have to be strategically placed. If the heated line runs through areas with different ambient temperatures, the internal line temperature will vary accordingly. This can be prevented by incorporating different heating zones with separate control.</p>	<b>Option thermal fuse:</b> <p>Please specify your desired position of the thermal fuse when placing an order. The correct position of the thermal fuse is especially important in case the heated line is (partly) installed in switching cabinets, outdoors or put through walls. Please consult our specialists for this.</p> 

<b>Connecting cables and plugs</b>									
<b>STANDARD   Sensortypen</b> <ul style="list-style-type: none"> <li>Electric connection and sensor cable together.</li> <li>Cable exit sideways according to type 1.</li> <li>Length of connecting cable: 1,5 m</li> <li>7-pin round plug (&lt; 10 A), 5-pin round plug (&lt; 20 A)</li> <li>Cable ends with ferrules (series WEX)</li> </ul>	<b>Pin assignment (7-pin round plug)</b>  <table> <tr> <td>1: Power (L)</td> <td>5: Sensor (+)</td> </tr> <tr> <td>2: Power (N)</td> <td>6: Sensor (-)</td> </tr> <tr> <td>3: free</td> <td>PE: Earth</td> </tr> <tr> <td>4: free</td> <td></td> </tr> </table>	1: Power (L)	5: Sensor (+)	2: Power (N)	6: Sensor (-)	3: free	PE: Earth	4: free	
1: Power (L)	5: Sensor (+)								
2: Power (N)	6: Sensor (-)								
3: free	PE: Earth								
4: free									
<b>Options:</b> <ul style="list-style-type: none"> <li>Electric connection cable and sensor line separately lead through</li> <li>Connection options types 2, 3, 4 or 5</li> <li>Other connection lines from 0.1 m onwards possible.</li> <li>Without plug (with ferrules)</li> <li>Other plugs: A type and design apart from the standard design can be determined as per your requirements. If you do not know the exact type, send us a sample and the pin assignment.</li> </ul>	<b>Pin assignment (5-pin round plug)</b>  <table> <tr> <td>1: Power (L)</td> <td>3: Sensor (+)</td> </tr> <tr> <td>2: Power (N)</td> <td>4: Sensor (-)</td> </tr> <tr> <td></td> <td>PE: Earth</td> </tr> </table>	1: Power (L)	3: Sensor (+)	2: Power (N)	4: Sensor (-)		PE: Earth		
1: Power (L)	3: Sensor (+)								
2: Power (N)	4: Sensor (-)								
	PE: Earth								

<b>Standard   Type 1</b> 	<b>Type 2</b> 	<b>Type 3</b> 
<b>Type 4</b> 	<b>Type 5</b> 	



## 1.9 ACCESSORIES AND SPARE PARTS: PLUGS, COUPLINGS AND FLANGE SOCKETS

### Art.-No.: WZZS0904-2507P10A

Plug 6+PE with cap  
250 V, 10 A, IP 65, screw connections, -40 °C / +100°C



### Art.-No.: WZZS0908-2507P10A

Coupling 6+PE with cap  
250 V, 10 A, IP 65, screw connections, -40 °C / +100°C



### Art.-No.: WZZS0906-2507P10A

Flange socket 6+PE with cap and screws  
250 V, 10 A, IP 65, screw connections, -40 °C / +100°C



### Art.-No.: WZZS0939-4005P20A

Plug 4+PE with cap  
400 V, 20 A, IP 65, screw connections, -40 °C / +100°C



### Art.-No.: WZZS0971-4005P20A

Coupling 4+PE with cap  
400 V, 20 A, IP 65, screw connections, -40 °C / +100°C



### Art.-No.: WZZS0940-4005P20A

Flange socket 4+PE with cap and screws  
400 V, 20 A, IP 65, screw connections, -40 °C / +100°C



### Art.-No.: WZZS0942-4004P16A

Plug 3+PE with cap  
400 V, 16 A, IP 65, screw connections, -40 °C / +100°C



Foto similari

### Art.-No.: WZZS0943-4004P16A

Coupling 3+PE with cap  
400 V, 16 A, IP 65, screw connections, -40 °C / +100°C



Foto similari







### Art.-No.: WZZS0993-4004P16A

Flange socket 3+PE with cap and screws  
400 V, 16 A, IP 65, screw connections, -40 °C / +100°C



Foto similari

## Silicone caps

<b>Applications</b> Covering of line ends, repair of outer covers, strengthening of passages, manufacturing of insulations. <b>Technical data</b> Black, smooth, elastic and extremely tear proof. Wall thickness approx. 3 mm. High chemical resistance. <b>Handling</b> Very low humidity absorption, very good elasticity. Long time temperature stability -60 °C / + 240 °C. Tolerances of dimensions ±10% Cut with a sharp knife. Expand slightly to cover and glue with silicon Art.-No.: WZZ00629-000ST090.		
<b>Art.-No WZK00715-028SB034</b>  <ul style="list-style-type: none"> <li>Black silicone cap</li> <li>without cable outlet</li> <li>ID 28 mm</li> <li>OD 34 mm</li> <li>length 100 mm</li> </ul>	<b>Art.-No WZK00709-038SB044</b>  <ul style="list-style-type: none"> <li>Black silicone cap</li> <li>without cable outlet</li> <li>ID 38 mm</li> <li>OD 44 mm</li> <li>length 110 mm</li> </ul>	<b>Art.-No WZK00704-058SB064</b>  <ul style="list-style-type: none"> <li>Black silicone cap</li> <li>without cable outlet</li> <li>ID 58 mm</li> <li>OD 64 mm</li> <li>length 110 mm</li> </ul>
<b>Art.-No WZK00716-028SB034</b>  <ul style="list-style-type: none"> <li>Black silicone cap</li> <li>with cable outlet</li> <li>ID 28 mm,</li> <li>OD 34 mm</li> <li>length 100 mm</li> </ul>	<b>Art.-No WZK00708-038SB044</b>  <ul style="list-style-type: none"> <li>Black silicone cap</li> <li>with cable outlet</li> <li>ID 38 mm</li> <li>OD 44 mm</li> <li>length 110 mm</li> </ul>	<b>Art.-No WZK00703-058SB064</b>  <ul style="list-style-type: none"> <li>Black silicone cap</li> <li>with cable outlet</li> <li>ID 38 mm</li> <li>OD 44 mm</li> <li>length 110 mm</li> </ul>

## Silicone foam hoses

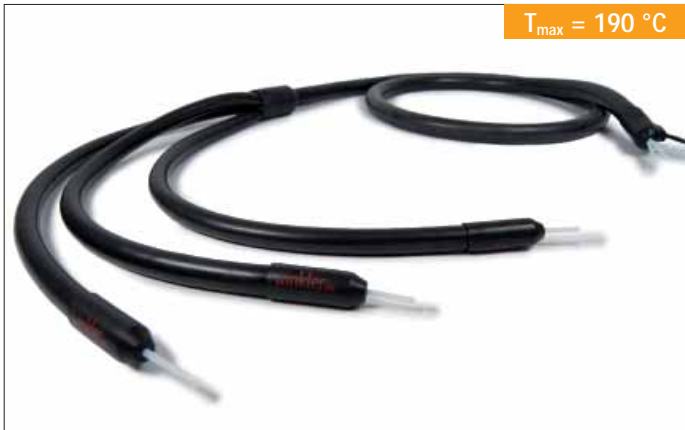
<b>Applications</b> Insulation of tubes, fittings and passages, mechanical protection of sensitive parts. <b>Technical data</b> Fine pored, closed cell silicon foam hose sold by the meter. Light, elastic, tear proof. High chemical resistance. <b>Handling</b> Very low humidity absorption, very good elasticity. Long time temperature stability -60 °C / + 240 °C. Tolerances of dimensions ±10% Cut to length with a sharp knife. Fix with Velcro tape Art.-No WZZ00622-005HF020.		
<b>Art.-No WZI01336-018SR030</b>  <ul style="list-style-type: none"> <li>Red silicone foam hose</li> <li>ID 18 mm</li> <li>OD 30 mm,</li> <li>sold by the meter</li> </ul>	<b>Art.-No WZI01313-021SR040</b>  <ul style="list-style-type: none"> <li>Red silicone foam hose</li> <li>ID = 21 mm</li> <li>OD = 40 mm</li> <li>sold by the meter</li> </ul>	<b>Art.-No WZI01355-030SR040</b>  <ul style="list-style-type: none"> <li>Red silicone foam hose</li> <li>ID = 30 mm</li> <li>OD = 40 mm</li> <li>sold by the meter</li> </ul>
<b>Art.-No WZI01337-018SB032</b>  <ul style="list-style-type: none"> <li>Silicone foam hose with black silicone skin</li> <li>ID 18 mm</li> <li>OD 32 mm</li> <li>sold by the meter</li> </ul>	<b>Art.-No WZI01315-021SB042</b>  <ul style="list-style-type: none"> <li>Silicone foam hose with black silicone skin</li> <li>ID = 21 mm</li> <li>OD = 42 mm</li> <li>sold by the meter</li> </ul>	<b>Art.-No WZI03314-008SB042</b>  <ul style="list-style-type: none"> <li>Silicone foam hose with black silicone skin</li> <li>ID = 8 mm</li> <li>OD = 42 mm</li> <li>sold by the meter</li> </ul>
<b>Art.-No WZIO4710-034SR052</b> Red silicone foam hose ID 35 mm · OD 52 mm · sold by the meter 	<b>Art.-No.: WZIO1312-040SR060</b> Red silicone foam hose ID 40 mm · OD 60 mm · sold by the meter 	<b>Art.-No.: WAZX1020</b> <b>Insulation</b> Silicone foam hose red with black silicone skin and velcro tape ID 21 mm · OD 42 mm · Länge 75 mm 
<b>Art.-No.: WZZ00622-005HF020</b> Velcro tape, hooks on front side · fleece on rear side · 20 mm wide · 5 mm strong · 5 m reel 	<b>Art.-No.: WZZ00629-000ST090</b> Transparent silicone glue: 90 ml tube incl. nozzle and winding hook 	

$T_{\max} = 200\text{ }^{\circ}\text{C}$



Heated line with two heating circuits and fittings to connect to a heated wall bushing (Quick connect)

$T_{\max} = 190\text{ }^{\circ}\text{C}$



Heated line with three branches for measuring gas output

$T_{\max} = 200\text{ }^{\circ}\text{C}$



Bundle heated line for engine test beds

$T_{\max} = 300\text{ }^{\circ}\text{C}$



Heated line with stainless steel tube for engine and dynamometer test benches

$T_{\max} = 600\text{ }^{\circ}\text{C}$



Heated line for high temperatures

$T_{\max} = 600\text{ }^{\circ}\text{C}$



Heated line for high temperatures with two heating circuits, resistant up to 600 °C

$T_{\max} = 190\text{ }^{\circ}\text{C}$



Heated distribution line for the processing measuring technology; distribution of measuring gas flow

$T_{\max} = 190\text{ }^{\circ}\text{C}$



Heated line with branch; second measuring gas output



Heated line with integrated filter



Heated filter for heated lines



Heated line with large diameter for exhaust gas discharge at the exhaust



Flexible heated lines for exhaust gas measurement at muffler



Heated line for high temperatures



Heated line with integrated heating jacket für motor test benches



Heated line with corrugated hose made of stainless steel



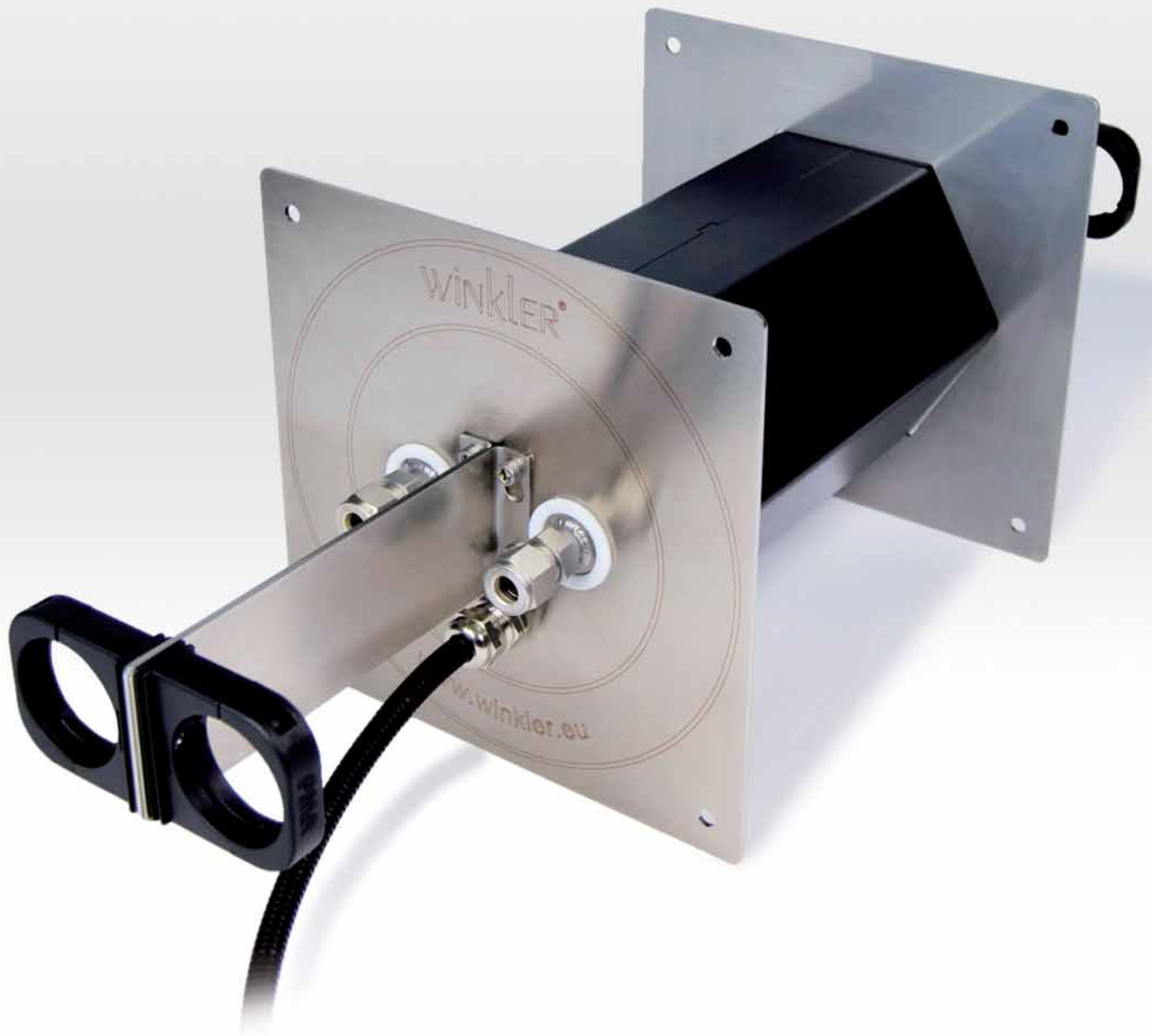
Heated mixing vessel



## 2. HEATED WALL BUSHINGS







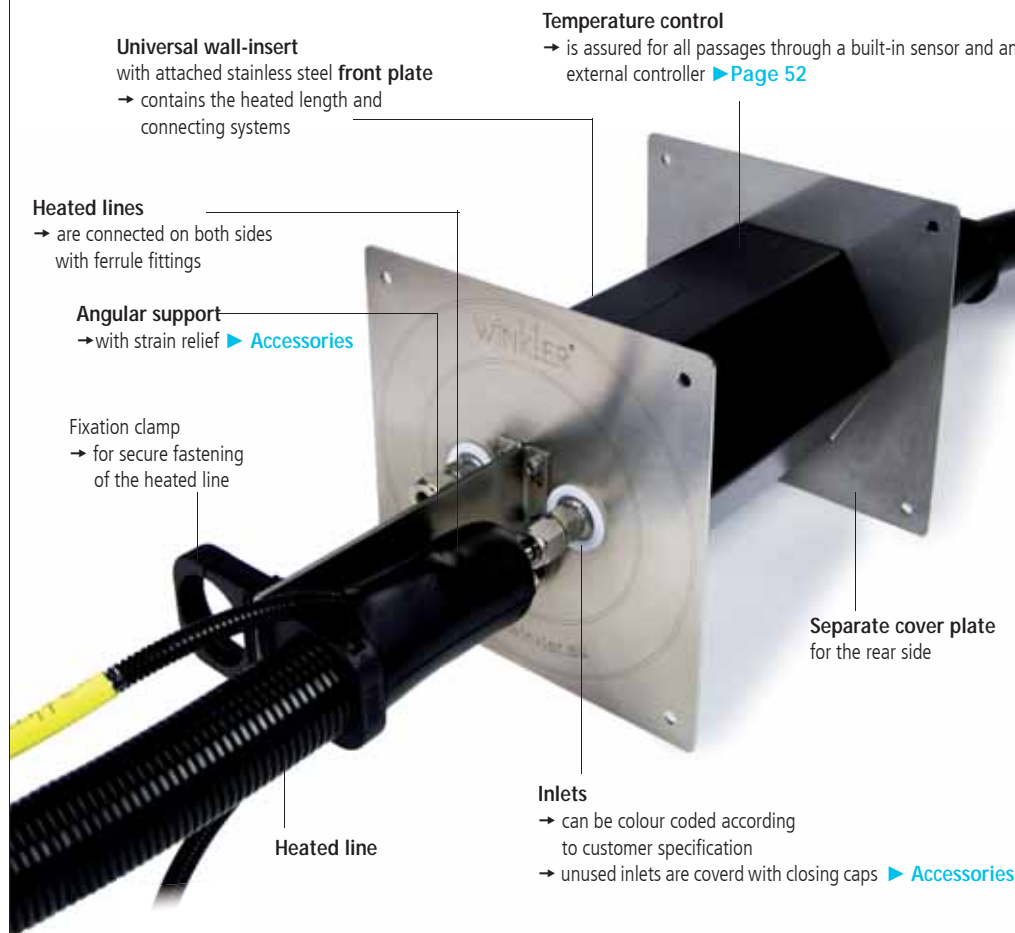
## 2.1 HEATED WALL BUSHINGS SERIES WAWHS

$T_{\max} = 200\text{ }^{\circ}\text{C}$

### Applications

On engine test beds or roller dynamometer test beds to channel measuring gases to the analyzer-room securely and according to norms.

### Structure



### Features and Benefits

- Rugged design made of high-quality materials. The system is engineered for permanent operating temperatures up to 250°C.
- Due to the design, dimensional or angular variations of the wall are compensated without compromising function.
- Very efficient heating and very good insulation → low power consumption of 50 W/passage (at 250 mm length).
- Delivery fully-fledged including insulation sleeves WAZX1027 and all required fixation elements ▶ [Accessories](#).

### Models

- Nominal diameter (=inner diameter of the heated passages) standard DN 6 and 4, others upon request.
- Length L (corresponds to wall thickness): 250 and 300 mm or any other according to customer specification
- Operating voltage: standard 230 VAC, other operating voltages upon request
- Sensor: standard Pt 100 resistance thermometer or thermocouples type K or type J, other sensors upon request.

### Options and versions

- Versions with separately temperature-controlled heated passages.

### Easy installation:



1. Installation of the wall-insert in the wall



2. Opening of the fixation clamp



3. Insertion and connection of the heated lines



4. Installation of the insulation sleeve

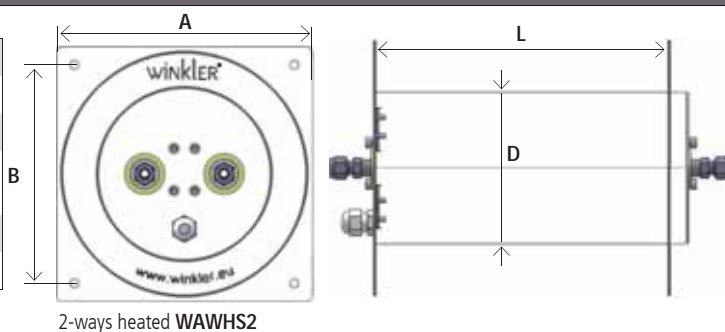
**push, turn and smile**



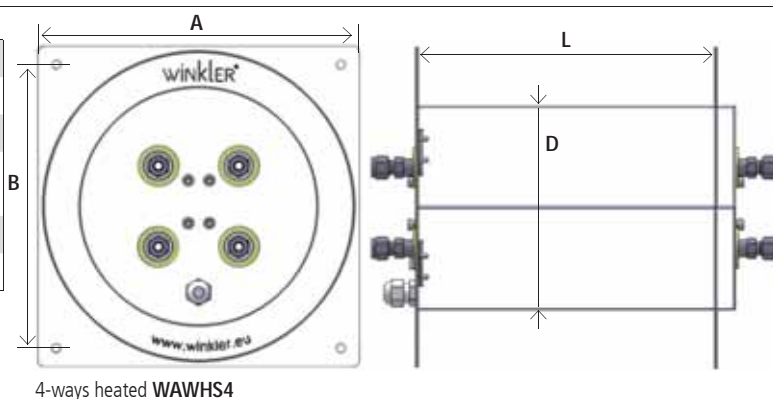
Operation with  
Controller ▶ [Page 52](#)

## Technical Details Series WAWHS

<b>Model WAWHS</b>	1-way + 2-ways heated
<b>A:</b> Width of plate	210 mm
<b>B:</b> Hole distance	180 mm
<b>L:</b> Length (= wall thickness)	250, 300 mm or acc. to customer specification
<b>D:</b> Diameter	146 mm
Core hole bore	150 - 170 mm



<b>Model WAWHS</b>	3-ways + 4-ways heated
<b>A:</b> Width of plate	260 mm
<b>B:</b> Hole distance	230 mm
<b>L:</b> Length (= wall thickness)	250, 300 mm or acc. to customer specification
<b>D:</b> Diameter	196 mm
Core hole bore	200 - 220 mm



## Accessories + replacements Series WAWHS



**Angular support complete with fixation clamps**  
Stainless steel 1.4301  
Art.-No.: **WAZX1026**

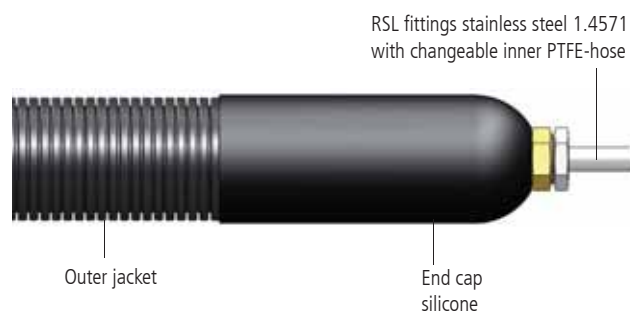


**Fixation clamps**  
Art.-No.: **WZXS3600**



**Insulation sleeves with glas silk**  
Art.-No.: **WAZX1027**

## HEATED LINES WITH TUBE FITTINGS (detailed information ► [Page 20](#) onwards)



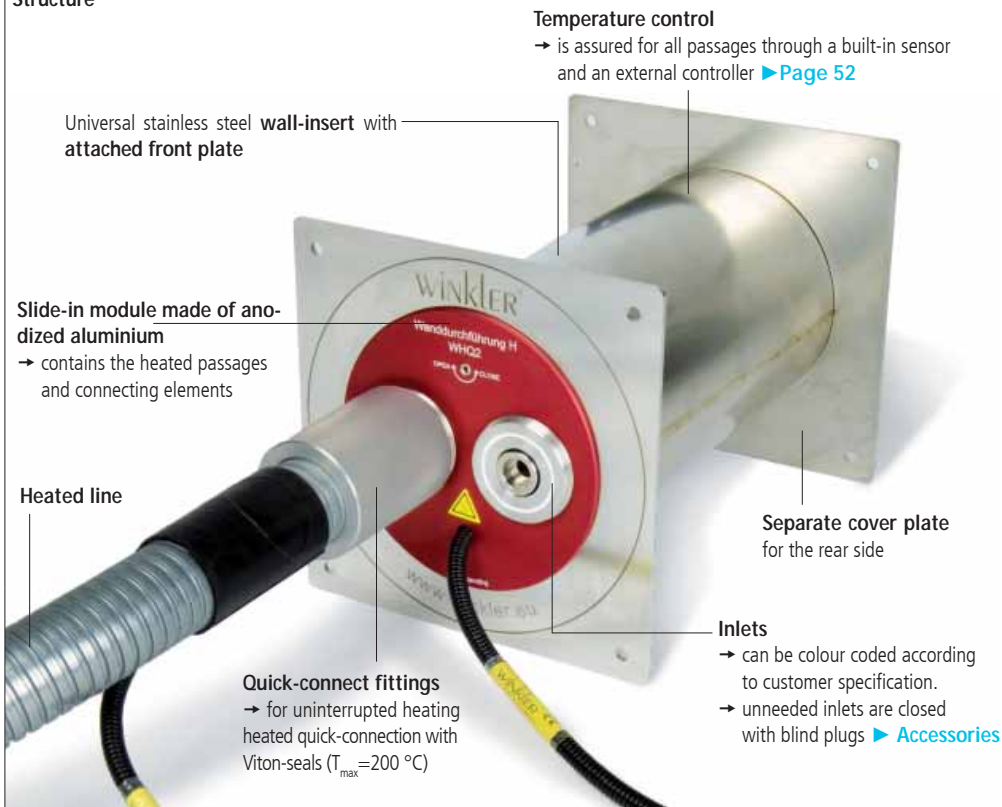
## 2.2 HEATED WALL BUSHINGS SERIES WAWHQ AND WAWEP

$T_{\max} = 200\text{ }^{\circ}\text{C}$

### Applications

On engine test beds or roller dynamometer test beds to channel measuring gases to the analyzer-room securely and according to norms.

### Structure



### Benefits

- Rugged design made of high-quality materials. The system is engineered for permanent operating temperatures up to  $200^{\circ}\text{C}$ .
- Due to the design, dimensional or angular variations of the wall are compensated without compromising function.
- Easy maintenance and repair. A replacement of the slide-in module is easily and quickly done without having to open the wall-insert or damaging the wall.
- Very efficient heating and very good insulation → low power consumption of 50 W/passage (at 280 mm length).
- Continuous heating without cold spots (according to norm) between wall bushing and heated line.
- Delivery fully-fledged including insulating tape and all required fixation elements.

### Models

- Nominal diameter (=inner diameter of the heated passages) standard DN 6 and 4, others upon request.
- Length L (corresponds to wall thickness): 200 mm, 240 mm and 280 mm or any other according to customer specification
- Operating voltage: standard 230 VAC, other operating voltages upon request
- Sensor: standard Pt 100, Pt1000 or thermocouples type K or type J, other sensors upon request.

### Options and versions

- Versions with separately temperature-controlled heated passages.
- Versions for climate chambers with frost-free PVC rear cover plate.

## Electric wall bushings series WAWEP

### Applications and structure

- On engine test beds or roller dynamometer test beds to connect heated lines securely and according to norms.
- Basic design as with WHQ but without the heated passages and connecting elements. Plugs and sockets to connect heated lines are on built in on both sides and interconnected inside.

### Options and versions

- Plugs and sockets according to customer specification
- Versions for climate chambers with heated slide-in module and frost-free PVC rear cover plate
- Combined wall bushings heated/electric
- Wall bushings for water, compressed air or other fluids according to customer specification.



push, turn and smile



Operation with Controller ► [Page 52](#)

### Easy installation:



1. Installation of the wall-insert in the wall



2. Insertion of the slide-in module



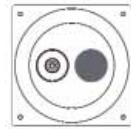
3. Locking with blind plug



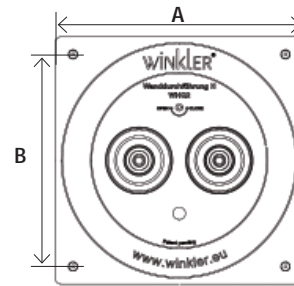
4. Heated lines are connected and secured with the union nut

## Technical details series WAWHQ and WAWEP

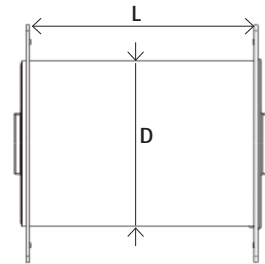
Model	WAWHQ WAWEP	1-way + 2-ways heated 2-ways + 4-ways electric
A: Width of plate		210 mm
B: Hole distance		180 mm
L: Length (= wall thickness)		200, 240, 280 mm or acc. to customer specification
D: Diameter		146 mm
Core hole bore		150 - 170 mm



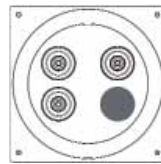
1-way heated WAWHQ1



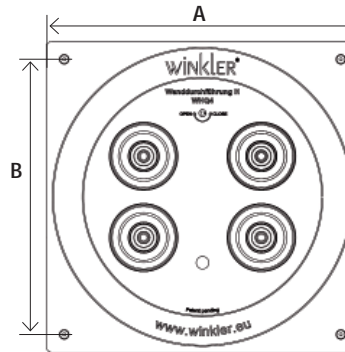
2-ways heated WAWHQ2



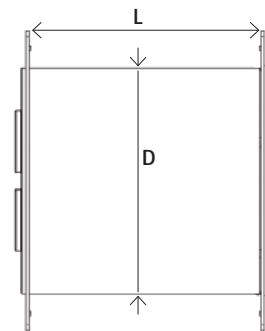
Model	WAWHQ WAWEP	3-ways heated 4-ways heated
A: Width of plate		260 mm
B: Hole distance		230 mm
L: Length (= wall thickness)		200, 240, 280 mm or acc. to customer specification
D: Diameter		196 mm
Core hole bore		200 - 220 mm



3-ways heated WAWHQ3



4-ways heated WAWHQ4



## Accessories Series WAWHQ



„Quick-Connect“ Blind plug DN 6  
Stainless steel 1.4305 with Viton-seals  
Art.-No.: WAZWBS06

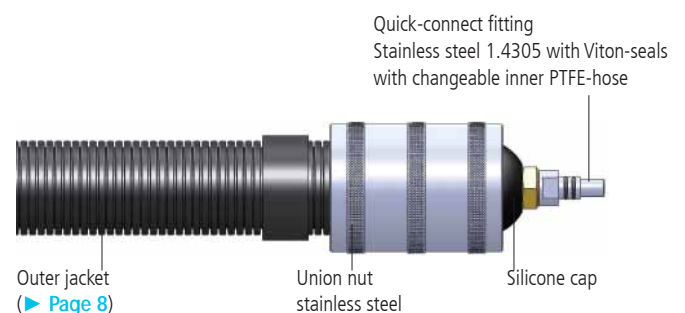
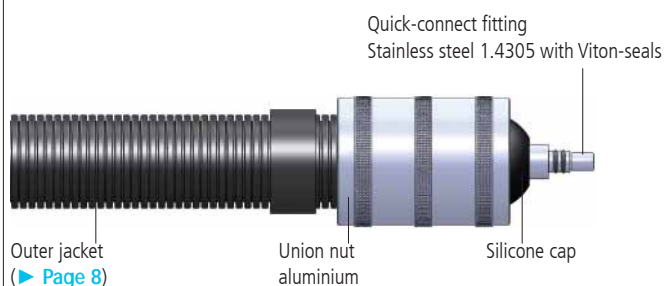


„Quick-Connect“ Blind plug DN 6, support 2 x  
Anodized aluminium (incl. fixation elements,  
without blind plugs)  
Art.-No.: WAZWBSH2



„Quick-Connect“ Blind plug support 4 x  
Anodized aluminium (incl. fixation elements,  
without blind plugs)  
Art.-No.: WAZWBSH4

## Heated lines with „quick-connect“ fitting

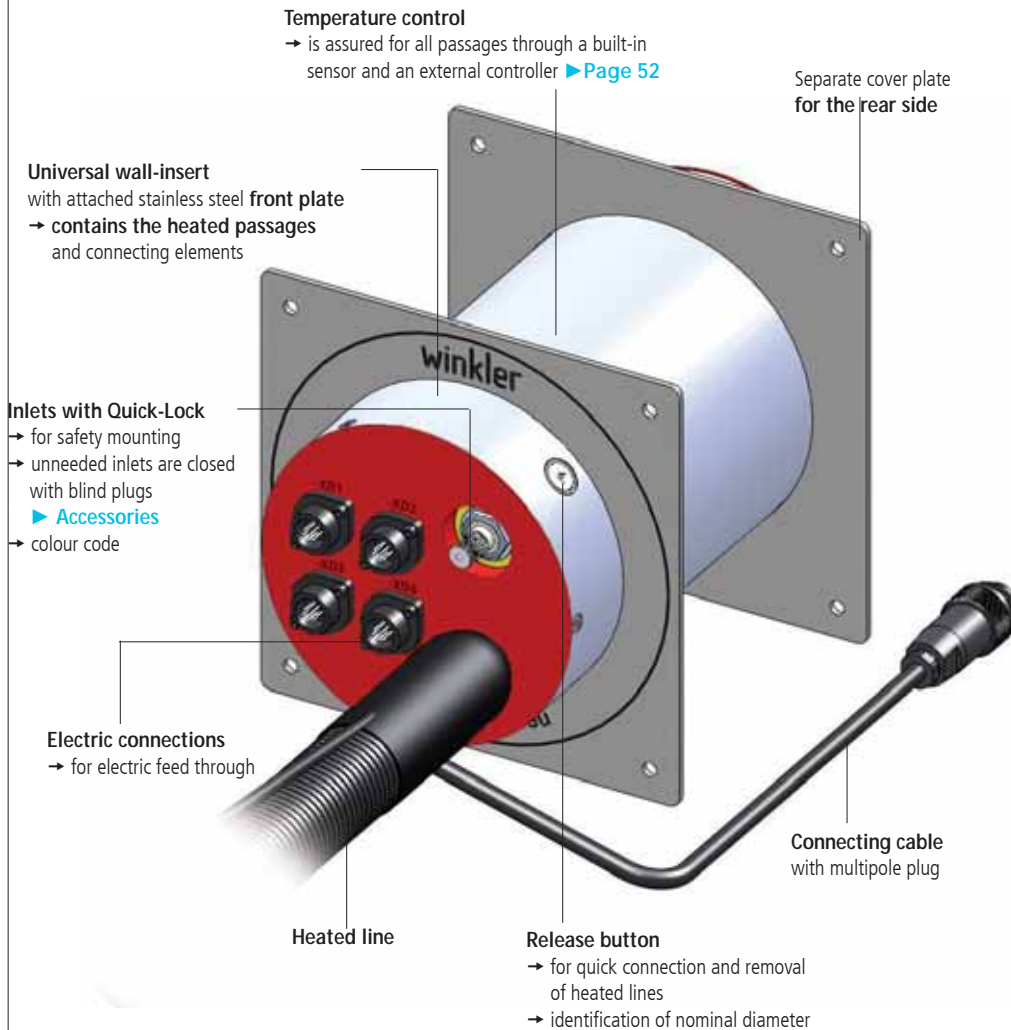




### Applications

On engine test beds or roller dynamometer test beds to channel measuring gases to the analyzer-room securely and according to norms.

### Structure



### Benefits

- Rugged design made of high-quality materials. The system is engineered for permanent operating temperatures up to 250°C.
- Due to the design, dimensional or angular variations of the wall are compensated without compromising function.
- Easy maintenance and repair. A replacement of the slide-in module is easily and quickly done without having to open the wall-insert or damaging the wall.
- Very efficient heating and very good insulation → low power consumption of 50 W/passage (at 280 mm length).
- large variety of heated line models for the junction to the heated wall bushing
- quick and clean connection of heated lines

### Models

- Nominal diameter (=inner diameter of the heated passages) standard DN 6 and 4, others upon request.
- Length L (corresponds to wall thickness): 200 mm, 250 mm and 300 mm (or any other according to customer specification) in addition to the overhang on both ends of 52 mm each
- Operating voltage: standard 230 VAC, other operating voltages upon request
- Sensor: standard Pt 100, Pt 1000 or thermocouples type K or type J, other sensors upon request.

### Options and versions

- plugs and connectors according to customer specification
- wall bushings for water, compressed air and fluids according to customer specification upon request

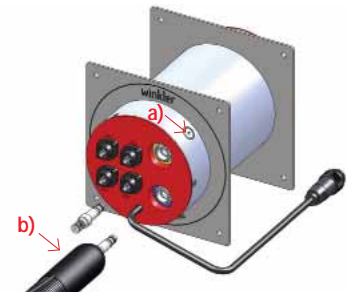
### Easy installation:



1. Remove rear cover plate



2. Installation of the wall-insert in the wall



3. a) Press release button and  
b) connect heated line



4. Unneeded inlets are closed with blind plugs

push, turn and smile



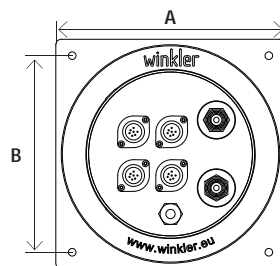
Operation with  
Controller ▶ [Page 52](#)

## Technical Details Series WAWHQL

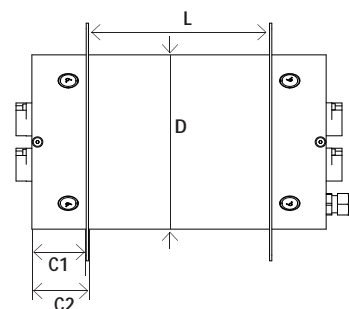
Model	WAWHQL	1-fach + 2-fach beheizt
A: Width of plate		210 mm
B: Hole distance		180 mm
C1: Plate distance		49 mm
C2: Wall distance		50 mm
L: Length (= wall thickness)		200, 250, 300 mm or acc. to customer specification
D: Diameter		154 mm
Core hole bore		160 - 180 mm



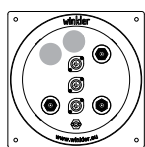
1-way heated WAWHQL1



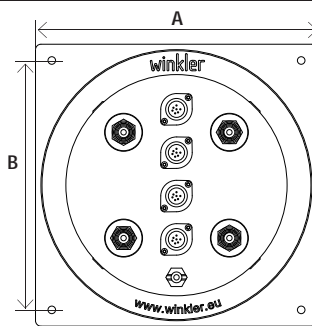
2-ways heated WAWHQL2



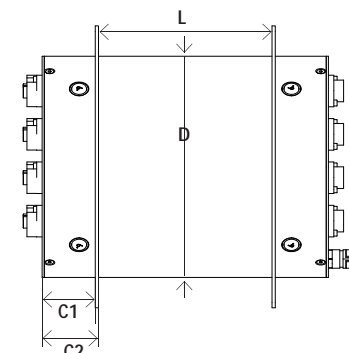
Model	WAWHQL	3-fach + 4-fach beheizt
A: Width of plate		260 mm
B: Hole distance		230 mm
C1: Plate distance		49 mm
C2: Wall distance		50 mm
L: Length (= wall thickness)		200, 250, 300 mm or acc. to customer specification
D: Diameter		204 mm
Core hole bore		210 - 230 mm



3-ways heated WAWHQL3



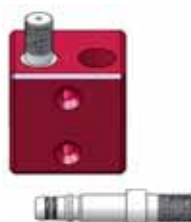
4-ways heated WAWHQL4



## Accessories + replacements Series WAWHQL



„Quick-Lock“ Blind plug DN 6  
Stainless steel 1.4305 with Viton-seals  
Art.-No.: WAZQLMBB



„Quick-Lock“ Blind plug DN 6, support 2 x  
Anodized aluminium (incl. fixation elements, without blind  
plugs)



„Quick-Lock“ Blind plug DN 6, support 4 x  
Anodized aluminium (incl. fixation elements,  
without blind plugs)

## Heated lines with „Quick-lock“ (detailed information ►Page 18)

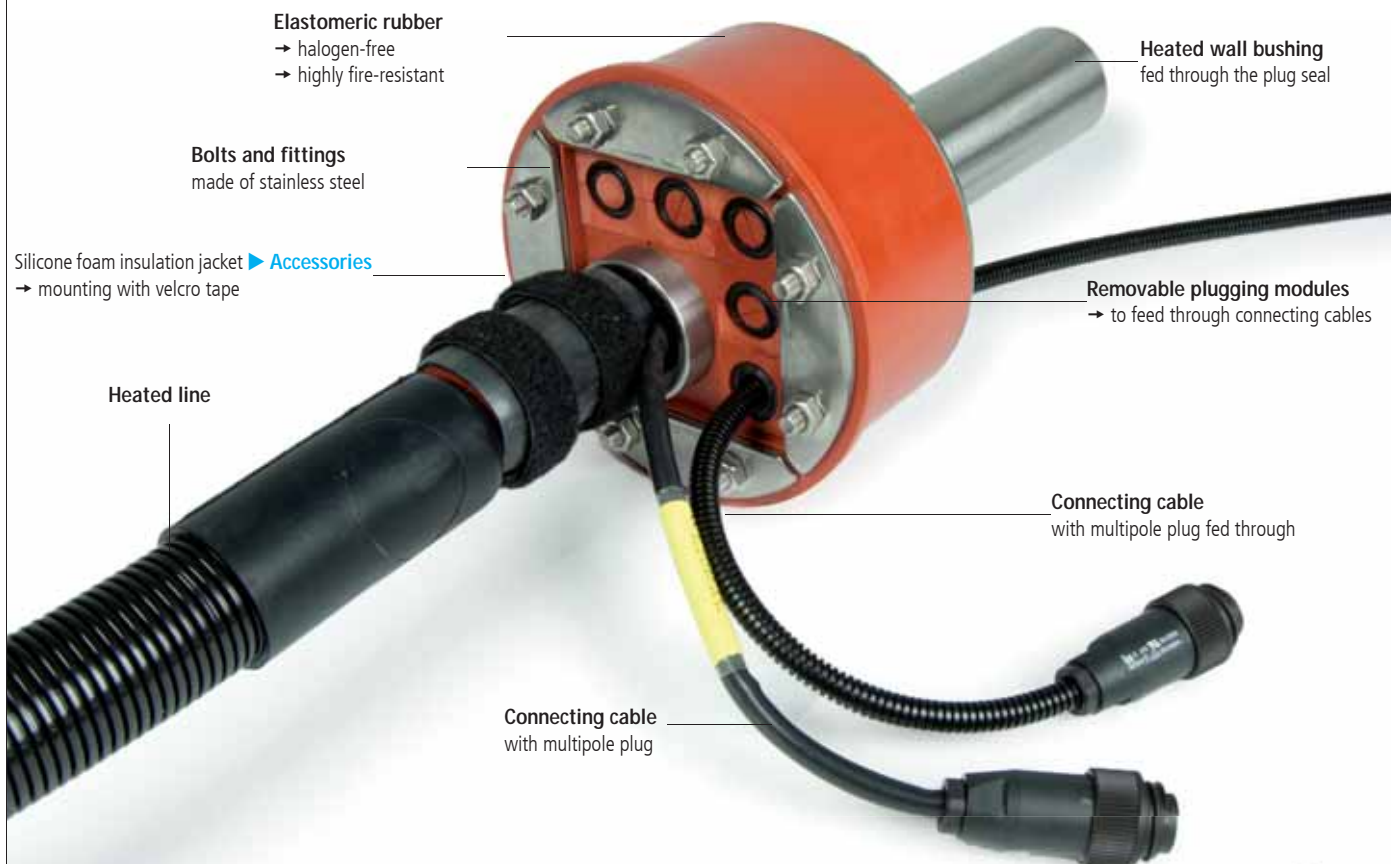


## 2.4 HEATED WALL BUSHING SERIES WAWX

$T_{\max} = 200\text{ }^{\circ}\text{C}$

### Applications

On engine test beds or roller dynamometer test beds to channel measuring gases to the analyzer-room securely and according to norms.



### Features and Benefits

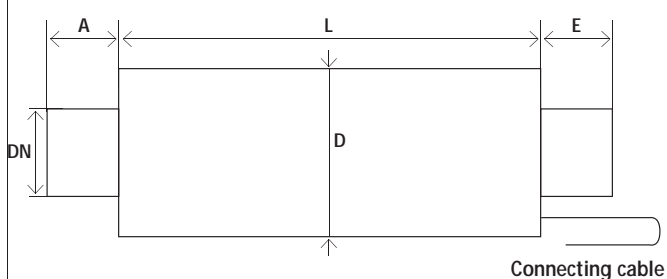
- Rugged design made of high-quality materials.
- The system is engineered for permanent operating temperatures up to 200°C.
- Continuous heating without cold spots
- Easy integration of the „Puck-Controller“ [▶ Page 52](#) for fix temperature setting

### Models

- Nominal diameter (=inner diameter of the heated passages) standard DN 4 and 6 others upon request.
- Length L (corresponds to wall thickness): 200 mm, 250 mm and 300 mm or any other according to customer specification
- Operating voltage: standard 230 VAC, other operating voltages upon request
- Sensor: standard Pt 100 resistance thermometer or thermocouples type K or type J, other sensors upon request.



### Technical Details Series WAWX



- A: Overhang (A-side)
- E: Overhang electric connection side (E-side)
- L: Length (= wall thickness)
- DN: Nominal diameter
- D: Outer diameter

### Accessories + replacements Series WAWX



Insulation jacket  
Art.-Nr. WAZX1020

# Technical Details Series WAWX

Heated wall bushing made of stainless steel, sealed with silicone



<b>A:</b> Overhang (A-side)	25 mm or acc. to customer specification
<b>E:</b> Overhang electric connection side (E-side)	25 mm or acc. to customer specification
<b>L:</b> Length (= wall thickness)	250, 300, 350 mm or acc. to customer specification
<b>DN:</b> Nominal diameter	4 (6 x 1 mm); 6 (8 x 1 mm); 8 (10 x 1 mm); 10 (12 x 1 mm)
<b>D:</b> Outer diameter	54 mm
Core hole bore	60 - 80 mm



<b>A:</b> Overhang (A-side)	100 mm or acc. to customer specification
<b>E:</b> Overhang electric connection side (E-side)	100 mm or acc. to customer specification
<b>L:</b> Length (= wall thickness)	or acc. to customer specification
<b>DN:</b> Nominal diameter	80 (88,9 x 2 mm)
<b>D:</b> Outer diameter	154 mm
Core hole bore	160 - 180 mm



<b>A:</b> Overhang (A-side)	100 mm or acc. to customer specification
<b>E:</b> Overhang electric connection side (E-side)	100 mm or acc. to customer specification
<b>L:</b> Length (= wall thickness)	or acc. to customer specification
<b>DN:</b> Nominal diameter	150 (154 x 2 mm)
<b>D:</b> Outer diameter	204 mm
Core hole bore	210 - 230 mm

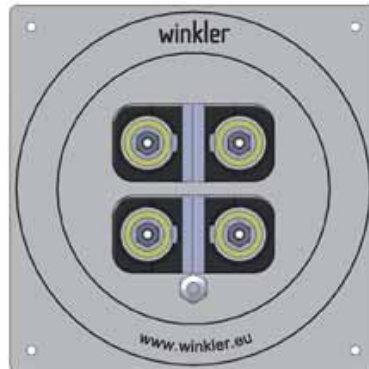


<b>A:</b> Overhang (A-side)	100 mm or acc. to customer specification
<b>E:</b> Overhang electric connection side (E-side)	100 mm or acc. to customer specification
<b>L:</b> Length (= wall thickness)	or acc. to customer specification
<b>DN:</b> Nominal diameter	200 (204 x 2 mm)
<b>D:</b> Outer diameter	254 mm
Core hole bore	260 - 280 mm





Series WAWHS



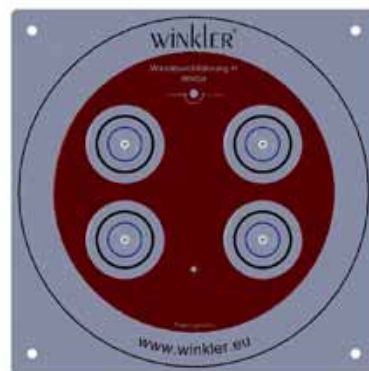
Series WAWHS



Special design



Series WAWHQ



Series WAWHQ



Special design



Series WAWEP



Special design



Special design



## 2.6 VERSIONS HEATED WALL BUSHINGS WITH QUICK-LOCK



Series WAHQ



Series WAHQ



Series WAHQ



Special design



Special design



Special design



Series WAHQ with cover

Cover open



Cover closed

### 3. ATEX HEATED LINES AND DIGITAL ATEX-CONTROLLER-LIMITER- AND POWER SELECTOR COMBINATION





### Applications

Heated lines for the transport of gas samples in the temperature range up to +200°C.

For applications in potentially explosive atmospheres classified zone **1/2 (Gas) and 21/22 (Dust)** areas. Not suitable for zone 0 and 20 areas.

### Structure (WEX8)



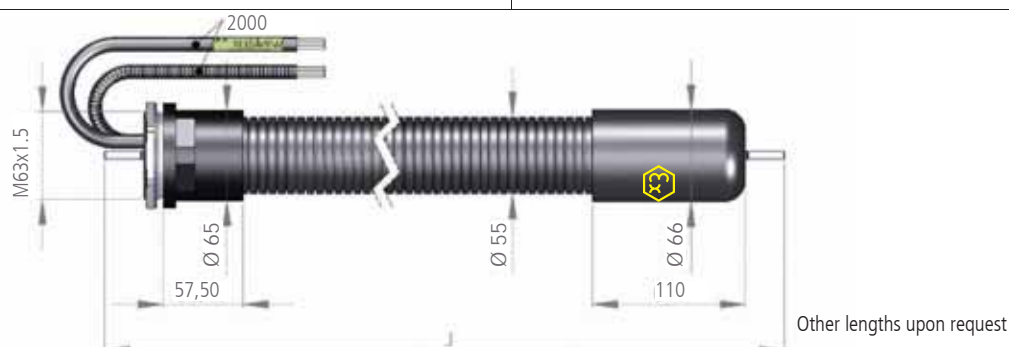
### Features and benefits

- Very robust structure made of durable, high-quality materials. Suitable for indoor and outdoor installation. Protection classes Gas IP66/Dust IP6X.
- Large variety of nominal diameters, inner hoses, fittings, terminations and cable exits to cover most applications.
- High flexibility → very easy installation especially of higher lengths and at low temperatures (up to -20°C)
- Ready to connect, complete system tested and certified according to ATEX with EC-type examination certificate.
- The lines are supplied fully fitted and terminated and can be directly connected and put into operation without further inspection or approval.
- Operation only with controller and limiter. Two resistance thermometers ATEX-Pt100 are built-in at 300 mm from E-side for the temperature control and limitation.
- (Other sensor positions upon request)

### Technical data for 230 VAC (115 VAC on request, tolerances: lengths ±2%, diameters ±5%, power ±10%)

Series <b>WEX8</b> (fix inner lines)	DN 4	DN 6	DN 8	DN 10
Series <b>WEX9</b> (exchangeable, antistatic inner hoses)	DN 2	—	DN 4	DN 6
Nominal power at ambient temperature Ta = +10°C	100 W/m	100 W/m	100 W/m	125 W/m
Temperature maintained at ambient temperature Ta = -20°C	+200 °C			
Temperature class	T3			
Max. permissible operating temperature	+200 °C			
Min. installation temperature	-20 °C			
Admissible range of ambient temperatures	-40°C / +85°C			
Max. length L at Ta = -25°C	46 m	46 m	46 m	37 m
Min. admissible bending radius	250 mm			
Marking	CE 0123 Ex II 2G Ex ma e IIC T3 CE 0123 Ex II 2G Ex ma D tD Ta=-40..+85 °C T 200 °C			
EC type examination certificate	TPS 09 ATEX 1006			

### Dimensions (WEX89)





## Versions: Available terminations and cable exits

Depending on applications, ATEX heated lines series WEX8 and WEX9 can be terminated with silicone caps or threaded metric connectors on both the electrical connection side (E-side) or the opposite ending side (A-side). Please indicate the kind of termination when ordering. Other versions upon request.



**WEX83** / **WEX93**  
with silicone caps on both sides



**WEX84** / **WEX94**  
with threaded connectors M63x1,5 on both sides



**WEX88** / **WEX98**  
with silicone cap on E-side and threaded connector M63x1,5 on A-side



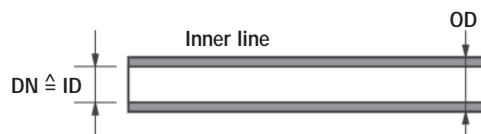
**WEX89** / **WEX99**  
With threaded connector M63x1,5 on E-side and silicone cap on A-side

## Versions: Available nominal diameters

Nominal diameter (DN) Inner line	Inner diameter (ID) Inner line	Outer diameter (OD) Inner line
2 2/3	2 mm	3 mm
4 4/6	4 mm	6 mm
6 6/8	6 mm	8 mm
8 8/10	8 mm	10 mm
10 10/12	10 mm	12 mm

### Attention!

The nominal diameter (DN) of the heated lines always refers to the inner diameter (ID) of the inner line.



## Versions: Available inner lines and fittings

### Series WEX8 (fix inner lines)



**WEX83**  
PTFE basic hose with stainless steel tube stubs 1.4571



**WEX85**  
Stainless steel tube 1.4404 (protruding 50 mm on both sides)

### Series WEX9 (exchangeable, antistatic inner lines)



**WEX94**  
PTFE basic hose with stainless steel tube stubs 1.4571 and exchangeable antistatic PTFE hose (protruding 500 mm on both sides)



**WEX96**  
PTFE basic hose with sleeves and exchangeable antistatic PTFE hose (protruding 500 mm on both sides)



**WEX99**  
PTFE basic hose with stainless steel clamping fittings 1.4571 and exchangeable antistatic PTFE hose (protruding 500 mm on both sides)



## 3.2 DIGITAL ATEX-CONTROLLER-LIMITER- AND POWER SELECTOR COMBINATION SERIES WEXRBL25



### Application

Comprehensive solution for controlling and limiting the temperature in areas with potentially explosive gas or dust atmospheres according to **zones 1 / 2** and **21 / 22**, incl. power selector function. Appropriate for ATEX heated lines and heated hoses, ATEX heating mantles and ATEX drum heaters.

### Structure (interior view)

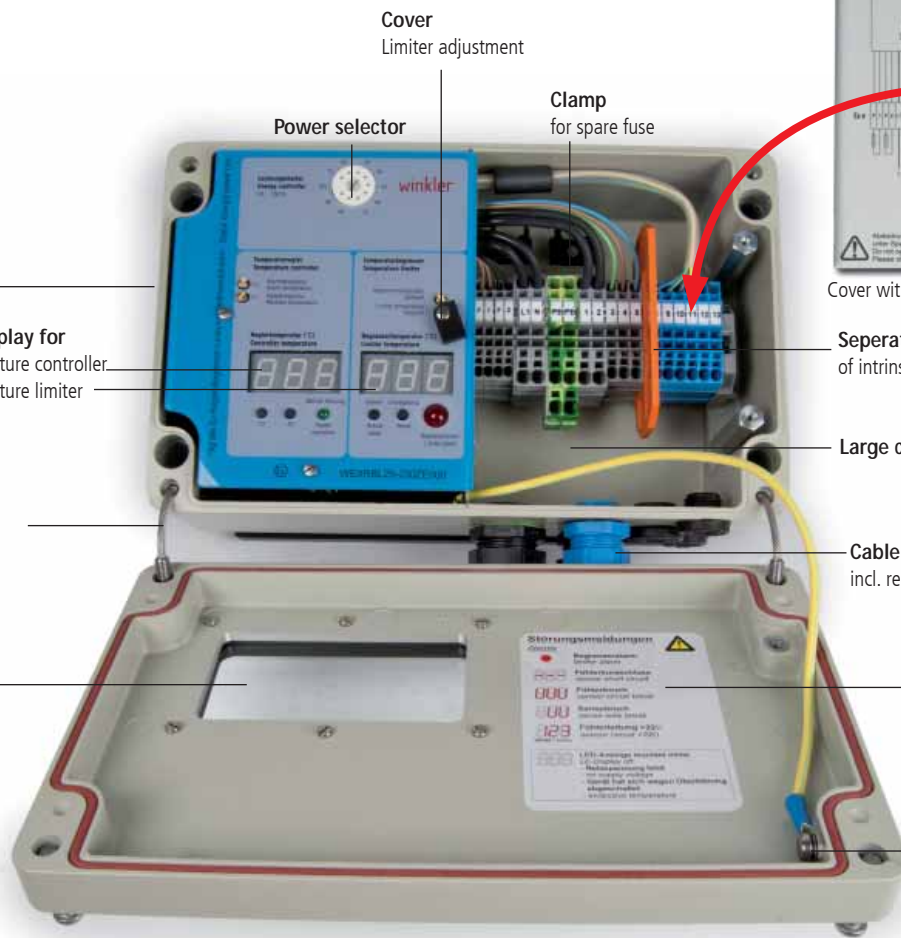


External grounding,  
body

Big display for  
temperature controller  
temperature limiter

Fixture  
for cover

Clear glass window  
for easy reading of  
temperature display



Cover  
Limiter adjustment

Power selector

Clamp  
for spare fuse

Cover with connection diagram

Separation  
of intrinsically safe circuit (Ex i)

Large connection box

Cable glands  
incl. reserve screw connector

Short information  
malfunctional display

Interior grounding  
Cover

### Structure (Cable insertion)

#### Factory terminated cable insertion

Sensors (M20)

Mains supply (M25)

Heater (M20)



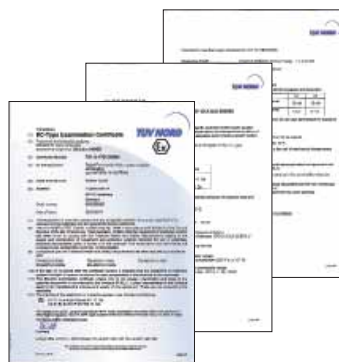
Robust body  
made of aluminum, IP64

Additional cable insertions  
incl. screw connectors  
► enclosed accessories

Heat sink

### Features and benefits

- Approved to zones 1/2 (gas) and 21/22 (dust)
- **Not appropriate for applications in zones 0 (gas) and 20 (dust)**
- Approved to explosion groups IIC hydrogen and IIIC static dust
- Appropriate for temperature classes T1, T2, T3, T4, T5, T6
- Approval / certified to latest standards
  - EN 60079-7:2003 Protection standard - e - high safety
  - EN 60079-11:2007 Protection standard - i - intrinsic safety
  - EN 60079-18:2004 Protection standard - m - encapsulation
  - EN 60079-31:2009 Protection standard - t - protection by body
- Complete documentation

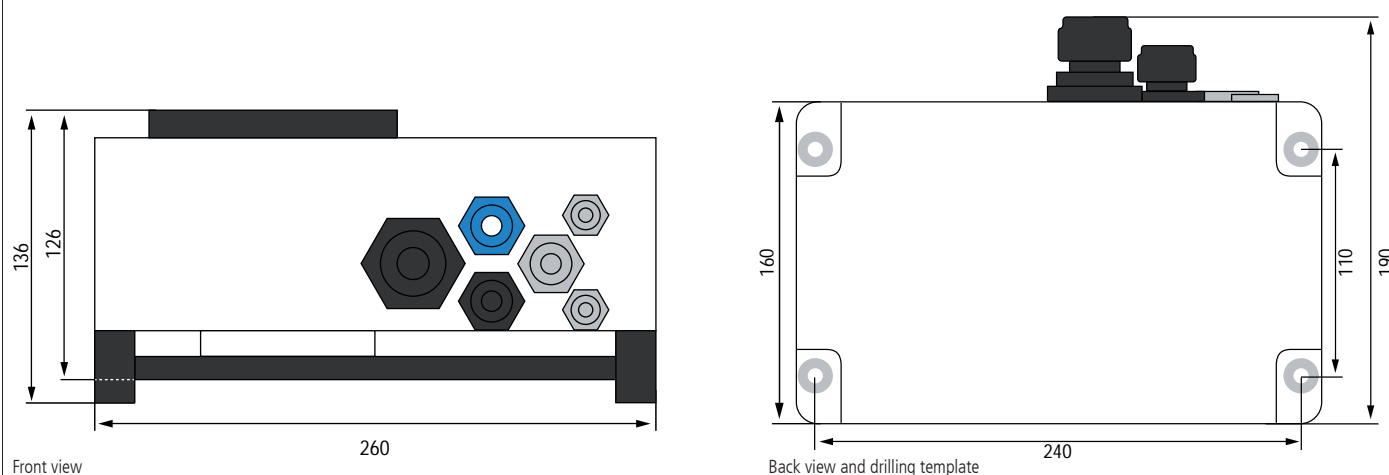


EC-Type examination certificate



Operating manual

## Technical data



Required for heated lines WEX8... and WEX9... for temperature controlling and limitation.  
Adequate for WEX0... to WEX3... for optional temperature controlling and limitation.

Ex-marking:	II 2 G Ex e ib [ib Gb] mb IIC T4 Gb II 2 D Ex tb IIIC IP6X T90°C Db	Measuring range:	0 ... 450°C
EC prototype test certificate:	TÜV 10 ATEX 556065	Dimensions / weight:	260 x 160 x 135 mm / 6 kg
Supply voltage:	230 VAC (-15% to +10%); 50-60 Hz	Assembly:	Wall mounting, mounting on base panel
Load output:	electronic solid state relay with 25 A nominal current	Housing / protection standard:	Aluminum / IP 64 according to DIN EN 60529
External fuse:	25 A automatic cut out, Typ A, B, C (Siemens), or Z, B, C (ABB)	Ambient temperature:	-20 °C ... +40 °C
Power input:	≤ 11 VA (without load)	Excess temperature protection:	Integrated temperature switch (cut-off temperature approx. 90 °C)
Sensor:	Pt100 DIN resistance thermometer	Profile connection clamps	Mains input 0,5..6 mm <sup>2</sup> (≤ 4 mm <sup>2</sup> with ferrules) Load output 0,5..6 mm <sup>2</sup> (≤ 4 mm <sup>2</sup> with ferrules) Sensors 0,2..4 mm <sup>2</sup> (≤ 2,5 mm <sup>2</sup> with ferrules) Reset/signal. 0,2..4 mm <sup>2</sup> (≤ 2,5 mm <sup>2</sup> with ferrules)
Measuring circuit: - intrinsically safe -	[Ex ib] IIC U <sub>o</sub> =6,3 V; I <sub>o</sub> =22 mA; P <sub>o</sub> =35 mW max. outer capacitance 1,5 µF max. outer inductance 10 mH [Ex ib] IIB U <sub>o</sub> = 6,3 V; I <sub>o</sub> = 22 mA; P <sub>o</sub> =35 mW max. outer capacitance 8,2 µF max. outer inductance 10 mH		

## Enclosed Accessories

<p><b>Additional cable glands</b> 1x M20 2x M16</p>	<p><b>Bridges</b> 2x Brücken für Betrieb mit Zweileiter Pt100</p>	<p><b>Mounting</b> 4x Gewindeschrauben</p>	<p><b>Option</b> Plug connecting version</p>
---	---	--	--

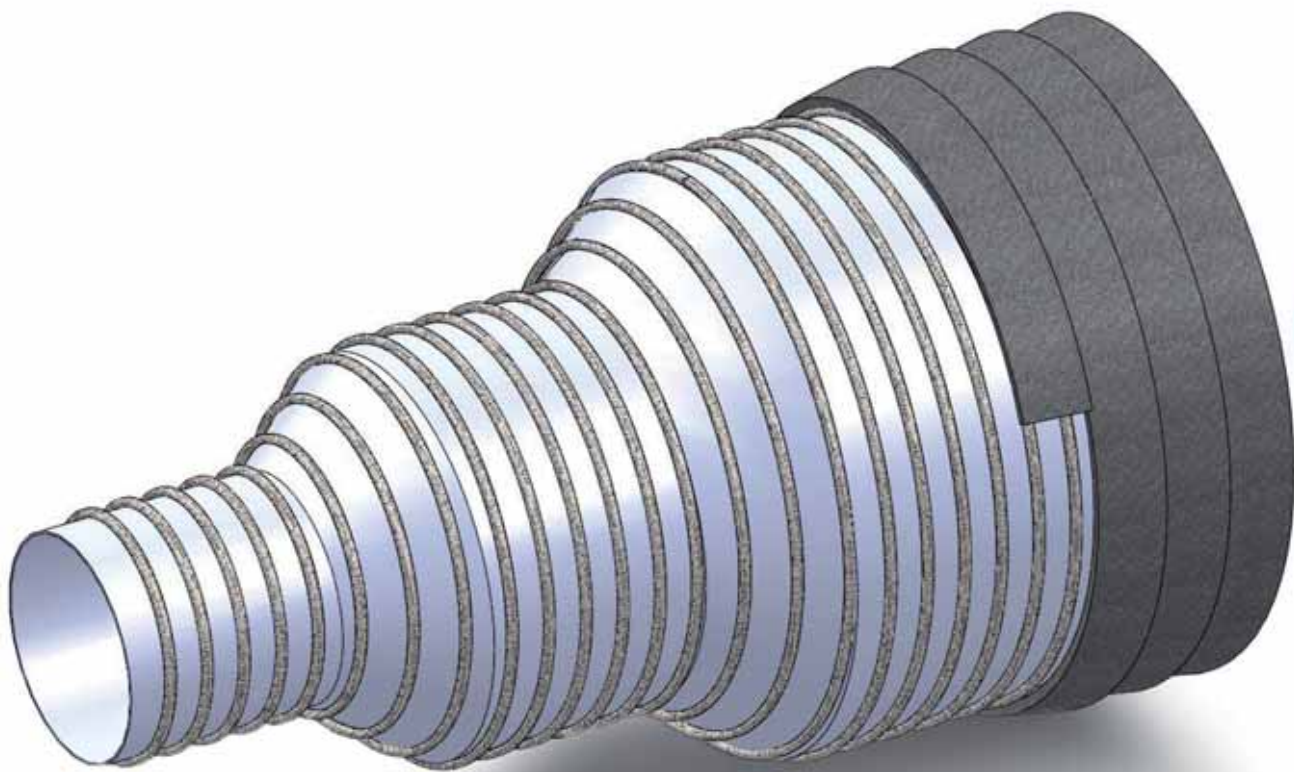
## Optional Accessories

Terminal enclosures for the prolongation of connection cables in potentially explosive atmospheres.  
Material: Polyester. For higher ambient temperatures up to 100 °C (available on stock)

<p><b>Art.-Nr. WZX188EX</b> Marking: II 2G Ex e IIC T6 II 2D Ex tD A21 T+80°C IP66 Equipment: 2 cable glands, 2 blind plugs, 6 terminal blocks Dimensions (LxWxH): 122 x 120 x 90 mm</p>	<p><b>Art.-Nr. WZX189EX</b> Marking: II 2G Ex ia IIC T6 II 2D Ex tD A21 T+85°C IP66 Equipment: 3 cable glands, 1 blind plug, 7 terminal blocks Dimensions (LxWxH): 122 x 120 x 90 mm</p>
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## 4. PARALLEL HEATING TAPES

### WBP00185 AND WBP00260



Heating of a dilution tunnel





## 4.1 PARALLEL HEATING TAPES WBP00185 AND WBP00260

$T_{\max} = 120\text{ °C} \mid 200\text{ °C}$

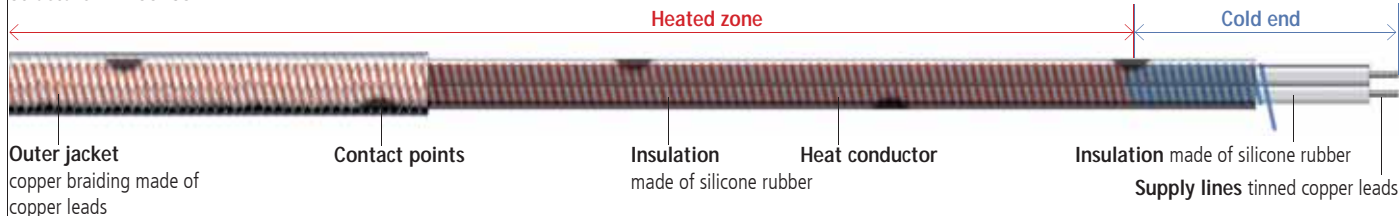
### Applications

Frost protection heating, temperature maintenance, as well as heating of dilution tunnels, pipeline systems, filters, etc.  
To ensure the service life of the heating tapes, we recommend the use of a temperature regulator. ▶ [Page 52](#)

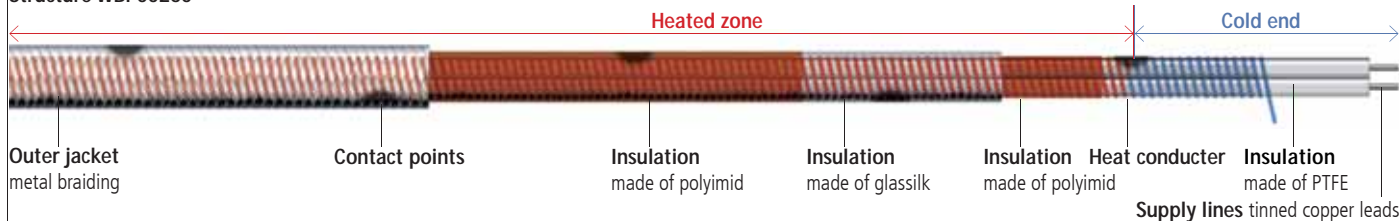
### Characteristics and Advantages

- constant output per unit of length (regardless of temperature)
  - WBP00185 can be assembled in up to 100 m of heat circuit length
  - WBP00260 can be assembled in up to 75 m of heat circuit length
- integrated power cable, no additional connection required
  - easy configuration and assembly on site
- great flexibility
  - also suited for heating complicated isometries
- high heat resistance
  - WBP00185 (switched off at 200 °C) for process temperatures to 120 °C
  - WBP00260 (switched off at 260 °C) for process temperatures to 200 °C
  - customer-specific length configuration ex factory is possible

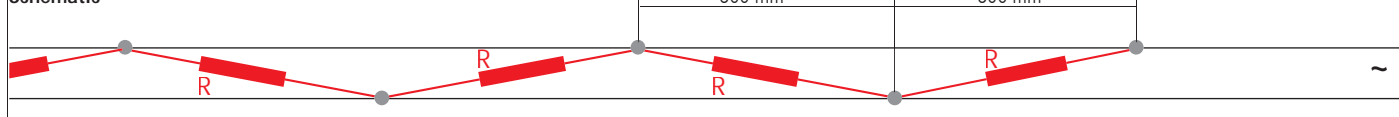
### Structure WBP00185



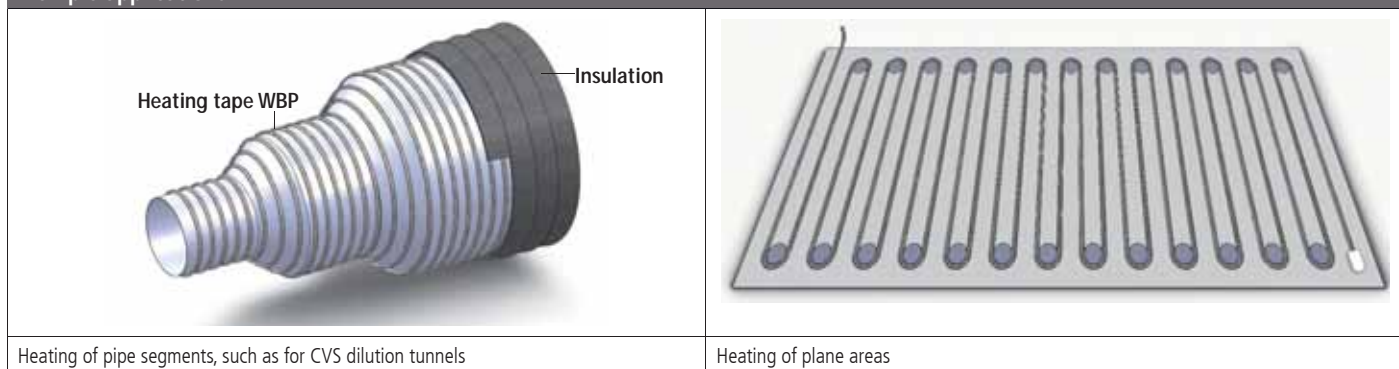
### Structure WBP00260



### Schematic



### Example applications



### Technical data

	Heizband WBP00185	Heizband WBP00260
Operating voltage	230 V AC or 400 V AC	230 V AC
max. permissible operating temperature	on 120 °C	on 200 °C
	off 200 °C	off 260 °C
Power	40 W/m	60 W/m
Length	max. length of heating circuit 100 m	max. length of heating circuit 75 m
Dimensions	B × H = 10,5 × 6,5 mm	B × H = 8 × 5 mm
min. bending radius	25 mm	25 mm
Weight	140 g/m	110 g/m
Test voltage	2000 V AC	2000 V AC
Operating temperature range	-70 °C - 200 °C	-70 °C - 260 °C
Insulation material	Silicone/Silicone	PTFE/Polymid



## Delivery options



Material sold by the meter for self assembling

- **Art.-Nr.**  
**WBP00185-230XX120-00000040**  
230 VAC; ex stock
- **Art.-Nr.**  
**WBP00185-115XX120-00000040**  
115 VAC; ex stock
- **Art.-Nr.**  
**WBP00185-400XX120-00000040**  
400 VAC; upon request
- **Art.-Nr.**  
**WBP00260-230XX200-00000060**  
230 VAC; ex stock



Factory terminated with connecting cable

- **Art.-No.**  
**WBP00185-230XX120-LLLLX040**  
230 VAC; delivery time ca. 2 weeks
- **Art.-No.**  
**WBP00260-230XX200-LLLLX060**  
230 VAC; delivery time ca. 2 weeks
- **Art.-No.**  
**WBP00185-115XX120-LLLLX040**  
115 VAC; upon request
- **Art.-No.**  
**WBP00185-400XX120-LLLLX040**  
400 VAC; upon request

## Accessories Type WBP

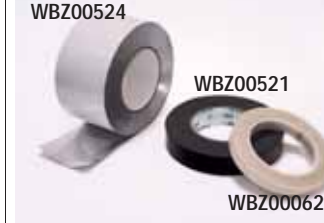


**Art.-No. WBZ00060**  
Assembling set  
Bonds with silicone adhesive **WBZ00061**  
(ordered separately)  
The set is sufficient for five heating tapes

**Art.-No. WBZ00061** Tmax = 200 °C  
Elastic silicone adhesive (85 ml)



**Art.-No. WBZ00260** Tmax = 260 °C  
Assembling set  
Bonds with silicone adhesive **WBZ00061**  
(ordered separately)  
The set is sufficient for five heating tapes



**Art.-No. WBZ00524** Tmax = 80 °C  
Adhesive tape: Aluminum foil  
100 m, width 75 mm  
**Art.-No. WBZ00521** Tmax = 80 °C  
Adhesive tape: Textile tape  
50 m, width 25 mm  
**Art.-No. WBZ00062** Tmax = 200 °C  
Adhesive tape: Glasfabric tape  
33 m, width 12 mm



**Art.-No. WBZ00102** Tmax = 300 °C  
Aluminum foil for effective heating  
Length 150 m, width 300 mm



**Art.-No. WZX00187** - 40 °C bis +90 °C  
Terminal enclosure for heating tapes  
· Housing made of polyester, grey  
· Protection standard IP 65, UV-proof  
· Mounting rail TS 35 mounted on distance sleeve  
· 2 PE-terminal blocks USLKG 4, green/yellow  
· 4 terminal blocks UK 5, grey  
· 2 bridges  
· Cable insertion top:  
2 blind plugs PG 16  
· Cable insertion below:  
2 cable glands PG 16  
· Dimensions B × H × T: 118 × 90 × 120 mm



**Art.-No. WZX00186** - 40 °C bis 90 °C  
Terminal enclosure for sensor  
· Housing made of polyester, grey  
· Protection standard IP 65, UV-proof  
· Mounting rail TS 15 mounted on distance sleeve  
· 3 terminal blocks MBK 205, grey  
· cable insertion below:  
2 × PG 11 cable glands  
· Dimensions B × H × T: 75 × 55 × 80 mm



push, turn and smile  
▶ Page 52

**Art.-No. WRW-200**  
**Standard equipment**  
· Robust housing IP 54  
· Universal power supplier 90 ... 250 V, 50 ... 60 Hz  
· Single button operation (incremental encoder)  
· Low-wear relay in hybrid circuit 10 A / 16 A  
· PID-control with self-optimisation or thermostat function  
· Operating hours meter  
· Resistance thermometers type Pt100, Pt1000, thermocouple Type K und Type J  
· Dimensions B × H × T: 150 × 206 × 100 mm



**Art.-No. WFMP1250** Tmax = 250 °C  
Resistance thermometer Pt 100 two wire  
· Length 50 mm  
· Diameter 4 mm  
· Cable length 3,0 m



**Art.-No. WBZ00141**  
Insulation bushing PG16  
to put the heating tape through  
**Art.-No. WBZ00142**  
Insulation bushing PG16  
to put the connecting cable through



**Art.-No. WBZ00541**  
Mounting angle and screws made of stainless steel for mounting terminal enclosures and temperature controllers on tube segments.

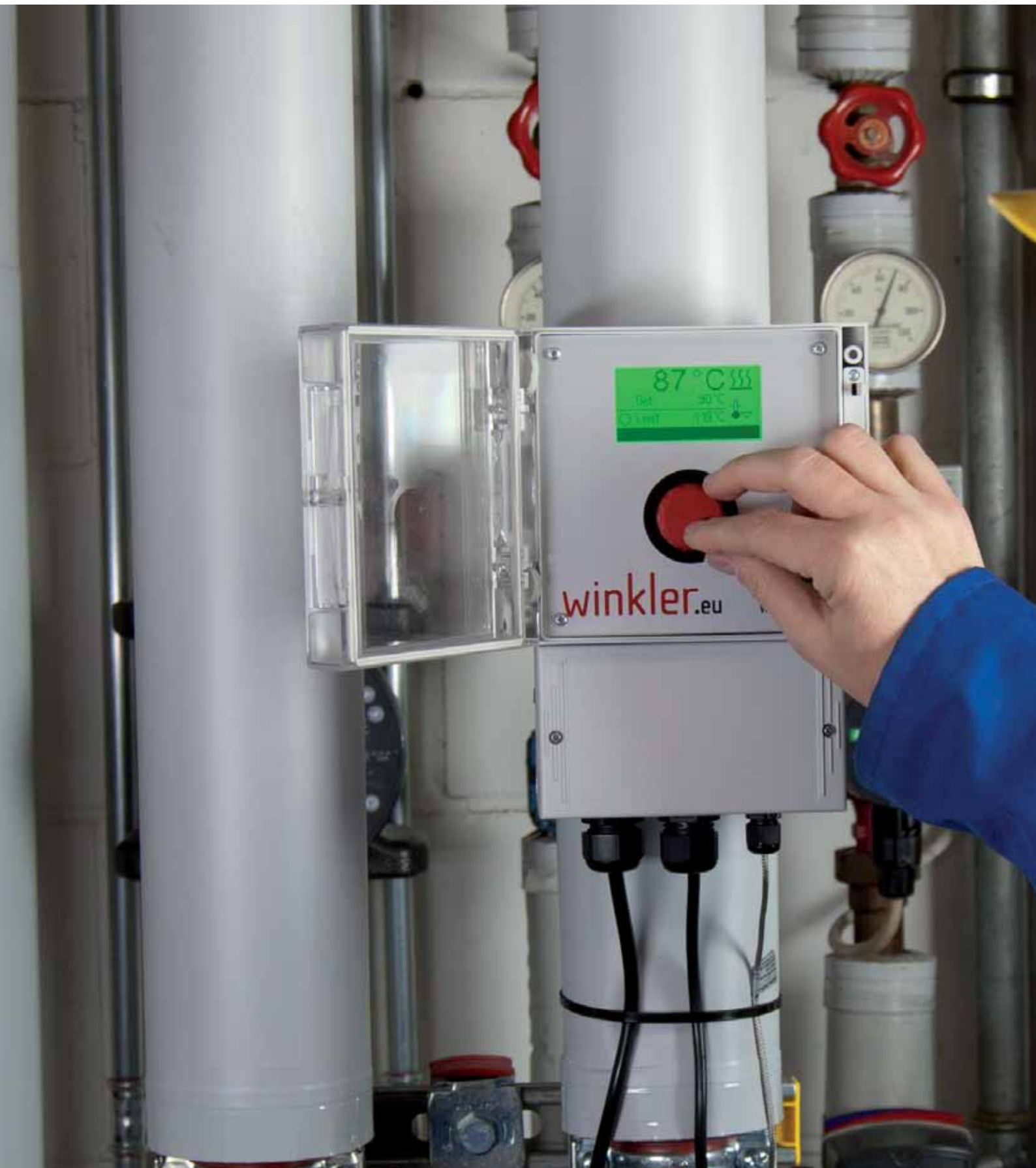


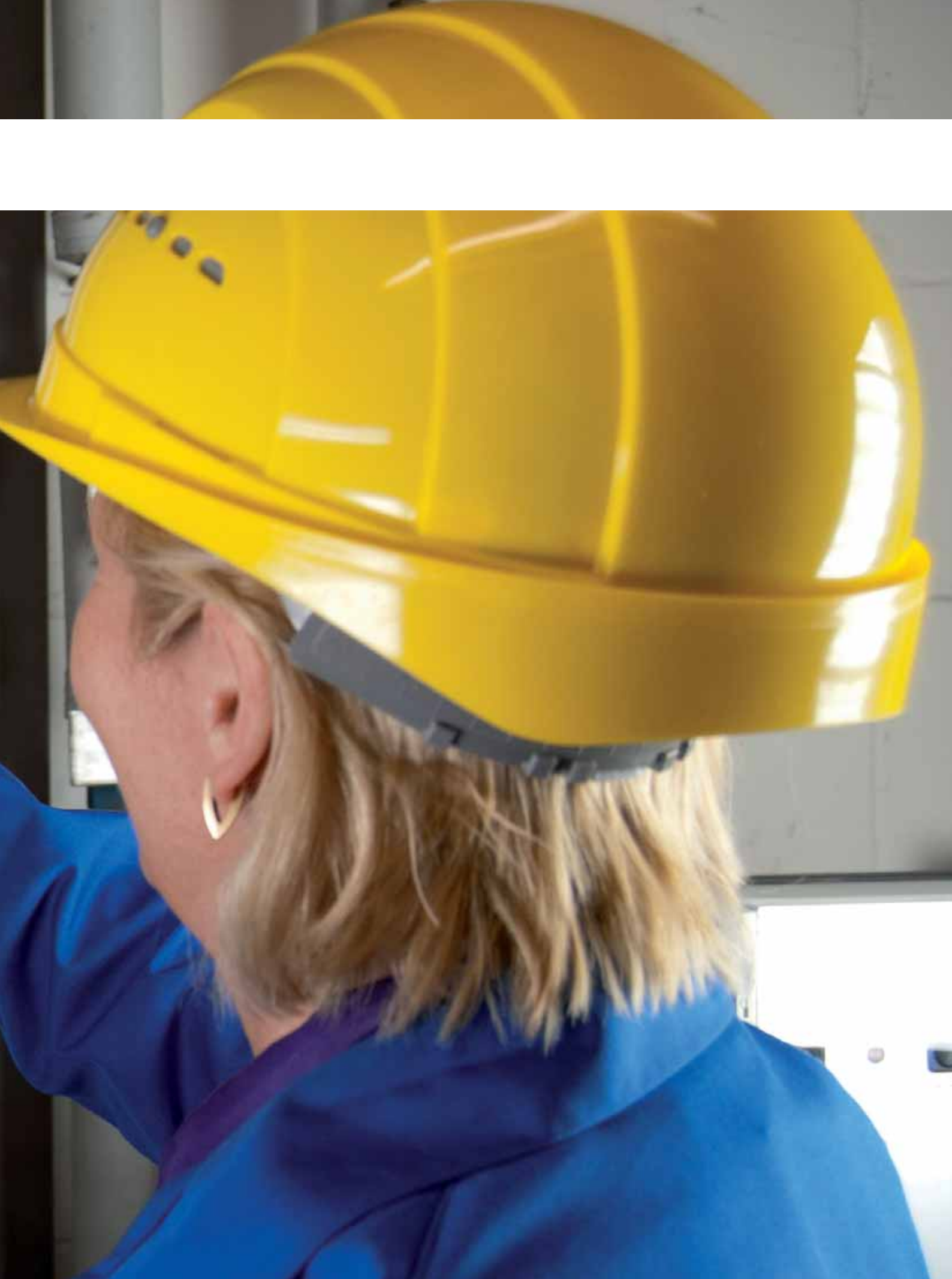
**Art.-No. WBZ00542**  
Steel band incl. 1 lock  
length 1,0 mm  
for mounting **WBZ00541**



**Art.-No. WZX00531**  
Warning sign, adhesive  
„Electrical heat tracing“

## 5. TEMPERATURE CONTROL UNITS







## 5.1 TEMPERATURE CONTROL UNIT FOR WALL MOUNTING WRW-200 SERIES

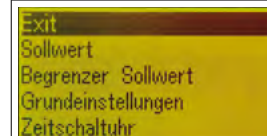
### Applications:

For simple control of electrical heating systems. Temperature controller or temperature controller/limiter combination

### Display examples



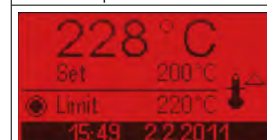
Operation aid



Selection



Standard operation



Over heat Display

**push, turn and smile**



### Standard equipment

- Robust housing with separate terminal cover and transparent hinge cover IP 54
- Universal power supply 90 ... 250 V, 50 ... 60 Hz
- LCD graphic display with polychrome background lighting
- Single button operation (incremental encoder)
- Text-prompted menu navigation
- Low-wear relay in hybrid circuit 10 A / 16 A
- **Timer function with buffered real-time clock**
- PID control with self-optimisation or thermostat function
- Operating hours meter

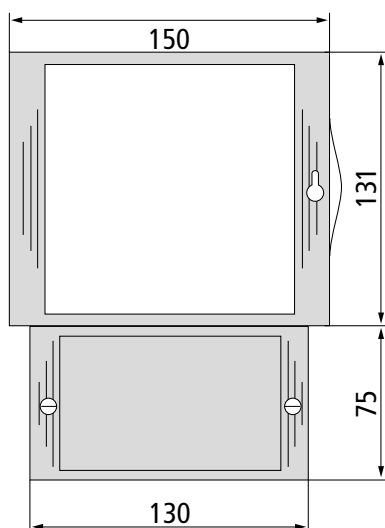
**Suitable for all heating systems with type Pt100, Pt1000 sensors, type K and type J thermocouples**

### Communication module option

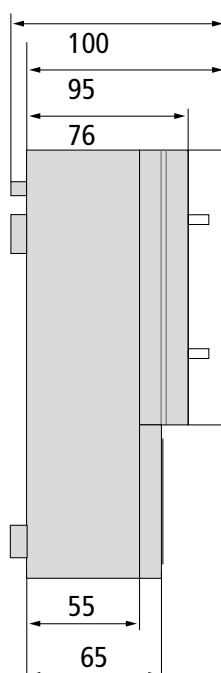
#### Can be used in process documentation

- 2 inputs / 3 outputs incl. 1 x additional screw connection
- Logic input for start/stop, remote reset, configurable setpoint switchover
- Analog input 4...20 mA for external setpoint default
- Analog output 4...20 mA as actual value output
- Floating signal contact (configurable general fault signal)
- Control output 0/12 VDC for external SSR

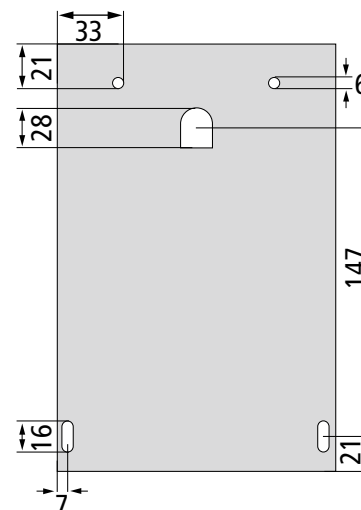
## Dimensions



Front view









Side view



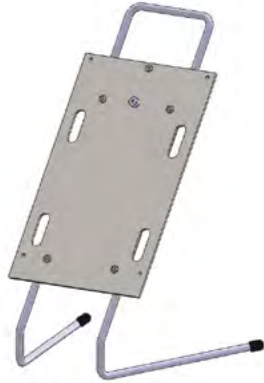



Rear view

Technical Data	
<b>Rated voltage</b>	90...250 V
<b>Switching output</b>	10 A relay (low-wear hybrid circuit) 16 A relay (low-wear hybrid circuit)
<b>Internal fuse</b>	T 10 A / 250 V (16 A version without fuse)
<b>Sensor types</b>	Pt100 / Pt1000 / type J and type K thermocouples
<b>Setpoint range</b>	-100...1000 °C
<b>Display</b>	Monochrome LCD graphic display 64 × 128 pixel
<b>Functions (depending on version)</b>	Two-step controller with thermostat function Two-step controller (PID controller) <i>Temperature controller/limiter combination</i>
<b>Housing</b>	ABS light grey, transparent cover
<b>Dimensions</b>	H 206 × W 150 × D 100 mm

Technical Data	
<b>Protection standard</b>	IP 54 (splashproof and dust protected) when transparent cover is closed correctly
<b>Ambient temperature</b>	0...50 °C
<b>Mains connection</b>	1.5 m mains cable with "Schuko" plug (CEE 7/7)
<b>Heating circuit connection</b>	depending on version
<b>Communication module (option)</b>	<ul style="list-style-type: none"> <li>· "Logic input for start/stop, remote reset,</li> <li>· configurable setpoint switchover</li> <li>· Analog input 4...20 mA (setpoint value)</li> <li>· Analog output 4...20 mA (actual value)</li> <li>· Signal contact (e.g. configurable as general fault signal)</li> <li>· Control output 0/12 VDC for external SSR"</li> </ul>
<b>Weight</b>	· 1,6 kg

Unit variants and article numbers					
10 A Units		16 A Units		20 A Units	
<b>Controller 10 A</b> Terminal connections WRW00220-UNIXW000 Selectable sensor	<b>Controller 10 A</b> 6+PE plug-in solution WRW00210-UNIPM000 (for Pt100 or Pt1000) WRW00210-UNIKJ000 (for TE* type K or type J)	<b>Controller 16 A</b> Terminal connections WRW00223-UNIXW000 Selectable sensor	<b>Controller 16 A</b> 4+PE plug-in solution WRW00213-UNIPM000 (for Pt100 or Pt1000) WRW00213-UNIKJ000 (for TE* type K or type J)		<b>Controller 20 A</b> ready for connection 4+PE WRW00214-UNIPM000 (for Pt100 or Pt1000) WRW00214-UNIKJ000 (for TE* type K or type J)
<b>Controller/Limiter 10 A</b> Terminal connections WRWB0220-UNIWW000 2 selectable sensor	<b>Controllers/Limiter 10 A</b> 6+PE plug-in solution WRWB0210-UNIZP000 (for 2x Pt100 or Pt1000) WRWB0210-UNIZK000 (for 2x TE* type K or type J)	<b>Controller/Limiter 16 A</b> Terminal connections WRWB0223-UNIWW000 2 selectable sensor		<b>Controller/Limiter 16 A</b> plug-in solution 10 pol. WRWB0213-UNIZP000 (for 2x Pt100 or Pt1000) WRWB0213-UNIZK000 (for 2x TE* type K or type J)	
					
* Thermocouple					
Communication module option code „-UNIXW00K“					

Accessories			
<b>WRZ200KG (yellow)</b> <b>WRZ200KR (red)</b> Labelling of terminal cover with sticker (10 × 6 cm) on customer request Colour: yellow or red	<b>WRZ200MP</b> Stainless steel fixing plate with 2 stainless steel bands and locks → for fixing to pipes, etc	<b>WRZ200BA</b> Stainless steel fixing plate on small stainless steel pipe bracket → for floor set-up	<b>WRZ00226</b> External SSR module for DIN rail mounting → for wear-free actuation of heating circuits up to 600 V / 30 A
			



## 5.2 „PUCK“-TEMPERATURE CONTROLLER

### Application

Ideal for applications where no external controller can or should be used and that operate at a fix setpoint. Customized integration possible upon request.

### Features and benefits

- Extremely compact and powerful temperature controller with PID-Characteristics, which can be integrated directly in the heating system
- Very robust and shock resistant due to the metal cased design
- Customized integration possible upon request.

Heating phase



Set temperature reached



### Application example



Puck controller on heated line



Puck controller on heated wall bushing

Technical Details	
<b>Housing:</b>	Anodized black aluminium
<b>Dimensions:</b>	diameter approx. 50 mm x height approx. 20 mm
<b>Weight:</b>	60 g
<b>Temperature sensor:</b>	thermocouple type K
<b>Switching power:</b>	max. 1.300 W (230V) Integrated fuse 6,3 A
<b>Set point temperature:</b>	to be chosen by customer 0 °C...600 °C, programmed in factory programmed temperature engraved in the window
<b>Display:</b>	Heating phase: LED permanently red Set temperature reached: LED permanently green
<b>Diagnose functions:</b>	Sensor failure: flashing red Interruption in heating circuit: flashing green
<b>Protection rating:</b>	IP54

### 5.3 MORE TEMPERATURE CONTROL UNITS

#### Compact microprocessor-based controller for top hat rail mounting

Art.-No. **WRH00141-230XW000**



##### Outputs

- Switching output: 230 V, 8 A, 500 W
- 2 relay outputs (closing contact) or 1 relay output (closing contact) and 1 logic output for SSR; contact load of relay outputs: < 250 V AC, < 8 A ohmic load.
- Typically 10<sup>6</sup> switching cycles for 500 VA.

##### Inputs

- Universal sensor input for Pt100 two-wire, three-wire and thermocouples.
- Standard signal
- Configurable logic input

##### Features

- Selectable control characteristics with self-optimisation
- Fast and easy operation via film keys.
- 4-digit LED display 0 – 999°C. 4 LEDs for display of the switching status.
- Dimensions B × H × T: 45 × 75 × 110 mm

#### Compact microprocessor-based controller for front panel mounting

Art.-No. **WRF00148-230XW000**



##### Outputs:

- Switching output: 230 V, 8 A, 500 W
- 2 relay outputs (closing contact) and 1 logic output or 1 analogue output (optional)
- contact load of relay outputs: < 250 V AC, < 8 A ohmic load.
- Typically 500 VA in case of 10<sup>6</sup> switching cycles.

##### Inputs

- Universal sensor input for Pt100 two-wire, three-wire and thermocouples.
- Standard signal
- Configurable logic input

##### Features

- Selectable control characteristics with self-optimisation
- Fast and easy operation via film keys.
- 4-digit LED display 0 – 999°C. 4 LEDs for display of the switching status.
- Dimensions B × H × T: 96 × 48 × 85 mm

#### Micro-processor-based ready-to-plug controller for wall mounting

Art.-No. **WRW00110-230XP000** for operation with Pt100 resistance thermometer

Art.-No. **WRW00110-230XK000** for operation with thermocouple type K

Art.-No. **WRW00110-230XJ000** for operation with thermocouple type J



##### Output

- Switching output: 230 V, 10 A, 2.300 W

##### Input

- Ready-to-plug device. Connection of the heating system via 7-position round socket.

##### Features

- 4-digit LED display 0 - 999 °C. 2 LEDs for display of the switching status.
- Fast and easy operation via film keys.
- Dimensions B × H × T: 130 × 130 × 76 mm

#### Micro-processor-based controller for wall mounting

Art.-No. **WRW00120-230XW000**



##### Output

- Switching output: 230 V, 10 A, 2300 W

##### Input

- Universal sensor input for Pt100 and thermocouples type K and type J (selectable)

##### Features

- Connection via screw terminal strip.
- For operation with Pt 100 resistance thermometer and Type K / J thermocouples (selectable)
- 4-digit LED display 0...999 °C. 2 LEDs for display of the switching status.
- Fast and easy operation via film keys.
- Dimensions B × H × T: 130 × 130 × 76 mm

## 6. HEATING MATS AND HEATING JACKETS







### Applications

Heating mats and heating jackets are used in a lot of fields, such as in industries, research and production, as well as in laboratories and technical centres. The following can be heated: Trestles, reactors, vacuum systems, valves, pipings, flanges, reservoirs, barrels, gas bottles, containers, etc.

Heating mats and heating jackets are manufactured to project specifics. The workpieces or

models to be heated are required for the manufacturing. Heating jackets can thus be manufactured with an accurate fit. Almost all body shapes can be heated. A heating cable is used to supply heat. In case of low temperatures, the heating cable is sewn on to a carrier material. In case of high heating power and complex geometries, it is then crocheted into the glass or silicate thread.

### Features and benefits

- Complete system consisting of a heating system, sensor, thermal insulation, electrical connection and a lock with velcro, tension straps and lace-up hooks, manufactured as per the customer specifications.
- Uniform heat supply prevents the risk of local overheating
- Handmade products that are precisely and accurately adapted to the workpiece or the model
- Excellent processing of high-value materials with a long service life
- Optimum heat transfer
- Form stability
- Easy installation and removal

### Structure of heating mats

#### Crocheted heating mat series WOT/WOG/WOQ

**Carrier material for heating cable**  
Yarn made of glass silk or silicate fibres



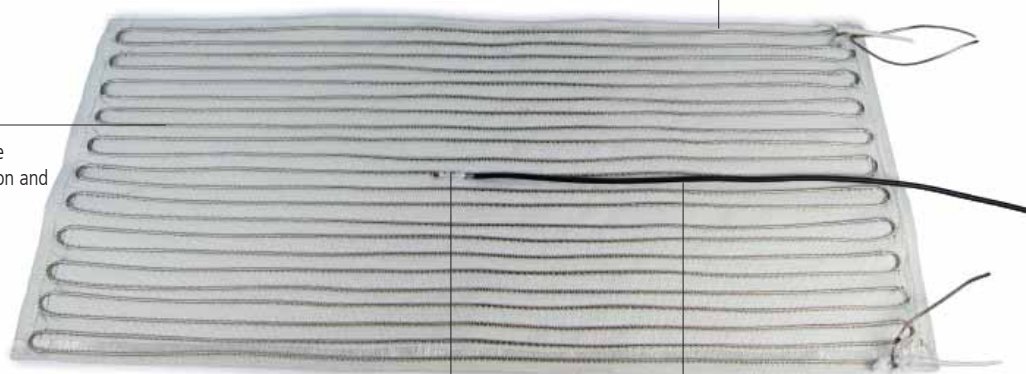
**Heating**  
with heating cable (type  
depending on application and  
temperature)  
► Page 60



#### Sewn heating mat series WOT/WOG

**Carrier material for heating cable**  
Fabric made of glass silk

**Heating**  
with heating cable (type  
depending on application and  
temperature)  
► Page 60



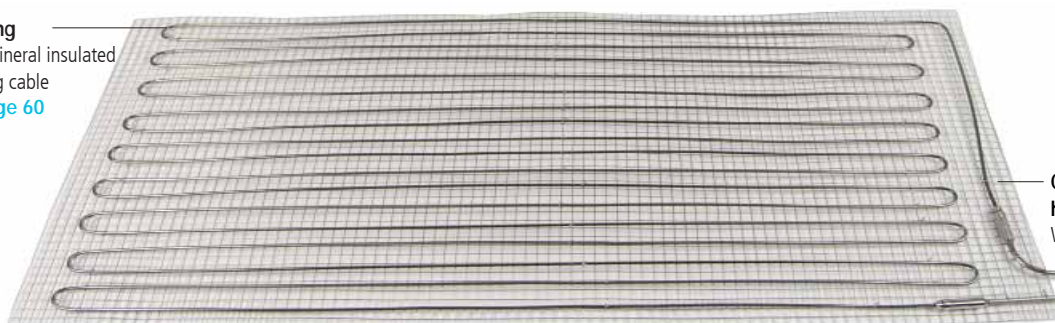
Sensor for controller operation

Sensor cable



#### Wire mesh heating mat series WOM

**Heating**  
with mineral insulated  
heating cable  
► Page 60



**Carrier material for  
heating cable**  
Wire



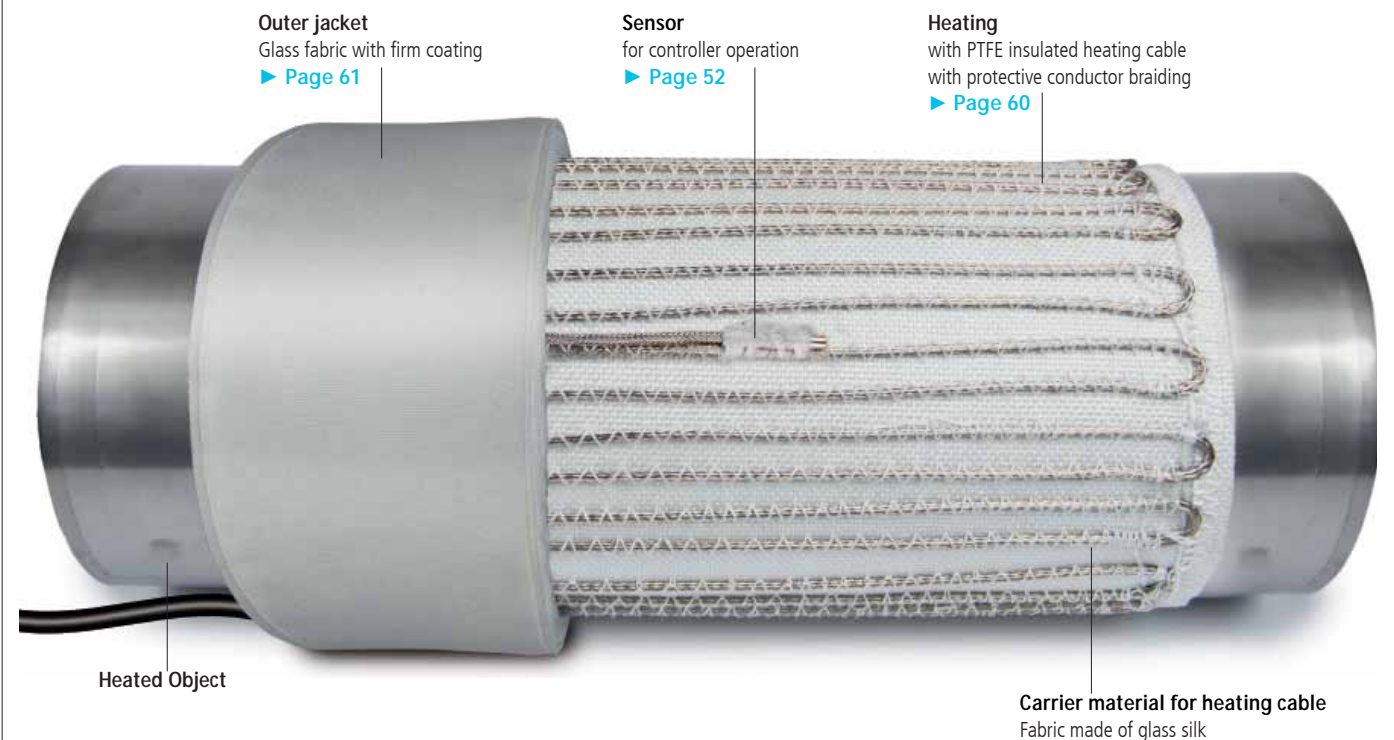


## Structure of heating jackets

### Crocheted heating jacket



### Sewn heating jacket



Sewn



Crocheted



Wire mesh

Technical data				
Heating mats and heating jackets series	WOT	WOG	WOQ	WOM
Permissible operating temperature	max. 250 °C	max. 600 °C*	max. 900 °C	max. 600 °C**
Operating voltage	up to 500 V	up to 500 V	up to 500 V	up to 500 V
Heating power of crocheted model	up to ca. 3,5 kW/m <sup>2</sup>	up to ca. 10 kW/m <sup>2</sup>	up to ca. 16 kW/m <sup>2</sup>	—
Heating power of sewn model	up to ca. 2 kW/m <sup>2</sup>	up to ca. 6 kW/m <sup>2</sup>	—	—
heating power of wire mesh model	—	—	—	up to ca. 6 kW/m <sup>2</sup>
Moisture protection	✓	—	—	✓
Protective earth conductor	✓	up to 600 °C ✓	—	✓
ATEX protection	possible	—	—	possible

\* depending on the design

\*\* higher temperatures upon enquiry

## Versions of heating cables for heating mats and heating jackets

### Series WOT

$T_{\max} = 250\text{ °C}$



- heating with PTFE insulated heat conductor
- with protective braiding made of nickel-plated copper wires
- humidity-protected design

### Series WOG

$T_{\max} = 600\text{ °C}$



- heating with glass silk insulated heat conductor
- with protective braiding made of pure nickel wires
- available with or without protective earth conductor

### Series WOQ

$T_{\max} = 900\text{ °C}$



- Heating with quartz insulated heating spiral
- without protective braiding (up to 600 °C possible with protective braiding)

### Series WOM

$T_{\max} = 600\text{ °C}$



- Heating with mineral insulated heat conductor
- moisture proof design

## Legend heating mats and heating jackets:

W	O	T
Code for heating cable insulation		
T: PTFE insulated		
G: Glass fibre insulated		
Q: Quartz insulated		
M: Mineral insulated		
O = Surface heaters		
W = Winkler		



Sewn



Crocheted



Wire mesh

Versions outer jackets for heating jackets



**Aluminium coated glass silk fabric**

Washable, grounded

Series WOT, WOG, WOQ



**Standard PTFE coated glass silk fabric**

Washable, lye and acid resistant, extremely resistant to high outside temperatures

Series WOT, WOG, WOQ



**Silicone coated glass silk fabric**

White, washable, suitable for pharmaceutical applications

Series WODW



**Glass silk fabric with firm structure**

Extremely resistant against high outside temperatures

Series WOT, WOG, WOQ



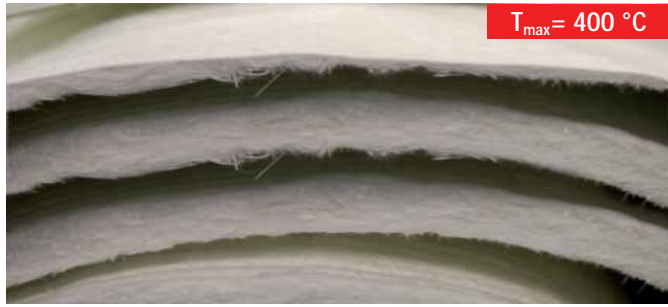
**Aluminium sheet**

Extremely rugged, suitable for rough use and use in outdoor areas

Series WOT, WOG, WOQ

Different outer jackets available on request

## Insulation materials for heating jackets



$T_{\max} = 400\text{ °C}$

**Glass needle mat**

**Material thickness:** Standard 40 mm or as per the application/customer demand  
Series WOT, WOG



$T_{\max} = 900\text{ °C}$

**Silicate fibre mat**

**Material thickness:** Standard 40 mm or as per application/customer demand  
Series WOT, WOG

## Lock types (depending on the heating jacket design and insulation)



$T_{\max} = 80\text{ °C}$

**Velcro**

Crochet and fleece made of polyamide, extremely safe, suitable for intensive applications and for seaming.

Series WOT, WOG, WOQ



$T_{\max} = 180\text{ °C}$

**High-temperature velcro**

Crochet made of rust-free stainless steel, fleece containing 100% aramide, resistant to extremely high temperatures, self-extinguishing.

Series WOT, WOG, WOQ



$T_{\max} = 80\text{ °C}$

**Tension straps with latch**

Strap made of polyester fabric, lock made of high-quality plastic.

Series WOT



$T_{\max} = 250\text{ °C}$

**Lace-up hooks**

Made of rust-free steel, thread made of glass fibre fabric.

Series WOT, WOG, WOQ



## Connection options



**Made up ready for connection with ferrules**  
**Connection cable and sensor cable separate**  
 Sensor Pt100 or type K or Type J



**Made up ready for connection with ferrules**  
**Connection cable and sensor cable together**  
 Sensor Pt100 or type K or type J

## Plug options



**Safety plug**  
 230V AC; cable length 1,0 m; current 16 A



**Swiss plug type J, SEV1011**  
 230V AC; cable length 1,0 m; current 10 A



**Multi-pin plug 3+PE without sensor connection**  
 Multi-pin plug 3+PE (4-pos.) with cover cap  
 400 V, 16 A, IP 65, screw connection,  
 -40 °C / +100 °C

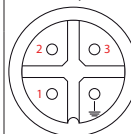


**Multipole coupling 3+PE (4-pos.) with cover cap**  
 400 V, 16 A, IP 65, screw connection,  
 -40 °C / +100 °C

### Pin assignment (4-pos. round plug)

- 1 Power (L) 3 free
- 2 Power (N) ⚡ Protective earth conductor heating

400 V, 16 A, IP 65, screw connection,  
 -40 °C up to +100 °C



**Multi-pin plug 4+PE with sensor connection**  
 Multi-pin plug 4+PE (5-pos.) with cover cap  
 400 V, 20 A, IP 65, screw connection,  
 -40 °C / +100 °C

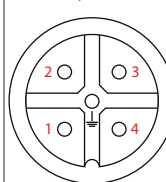


**Multipole coupling 4+PE (5-pos.) with cover cap**  
 400 V, 20 A, IP 65, screw connection,  
 -40 °C / +100 °C

### Pin assignment (5-pos. round plug)

- 1 Power (L) 3 Sensor (+)
- 2 Power (N) 4 Sensor (-)
- ⚡ Protective earth conductor heating

400 V, 20 A, IP 65, screw connection,  
 -40 °C up to +100 °C



**Multi-pin plug 6+PE with sensor connection**  
 Multi-pin plug 6+PE (7-pos.) with cover cap  
 250 V, 10 A, IP 65, screw connection,  
 -40 °C / +100 °C

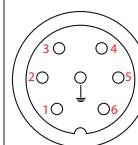


**Multipole coupling 6+PE (7-pos.) with cover cap**  
 250 V, 10 A, IP 65, screw connection,  
 -40 °C / +100 °C

### Pin assignment (7-pos. round plug)

- 1 Power (L) 4 free
- 2 Power (N) 5 Sensor (+)
- 3 free 6 Sensor (-)
- ⚡ Protective earth conductor heating

250 V, 10 A, IP 65, screw connection,  
 -40 °C up to +100 °C



Pin 3+4 are used when using a second temperature sensor.  
 Other plug variants are possible on request.





Type WOQ – Heating of a pipe system



Types WOG – Heating jacket for 3-way ball cock



Types WOT – Heating of a complex geometry



Types WOT – Heating jackets for column pipes



Types WOT – Heating for a pipe system



Types WOG – Heating jacket for apparatus



Types WOG – small heating jacket for nozzle heating



Series WOT – Heating for a T piece



Types WOG – Heating jacket for measuring equipment



Series WOG – Heating jacket for pump housing



Series WOT – Heating jacket for 3-way ball cock



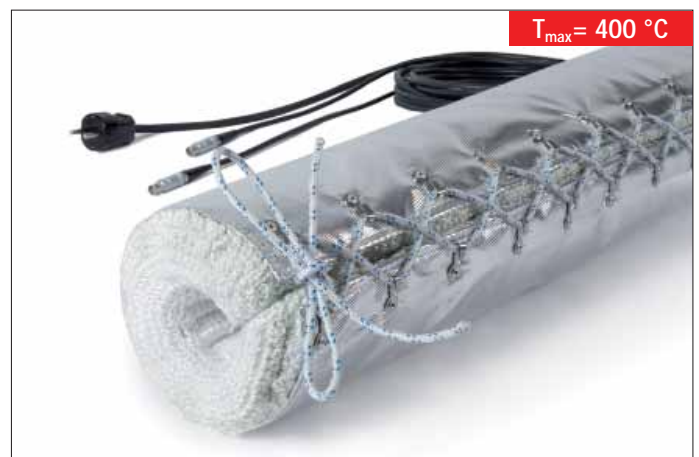
Series WOG – Heating jacket for exhaust gas extraction pipe



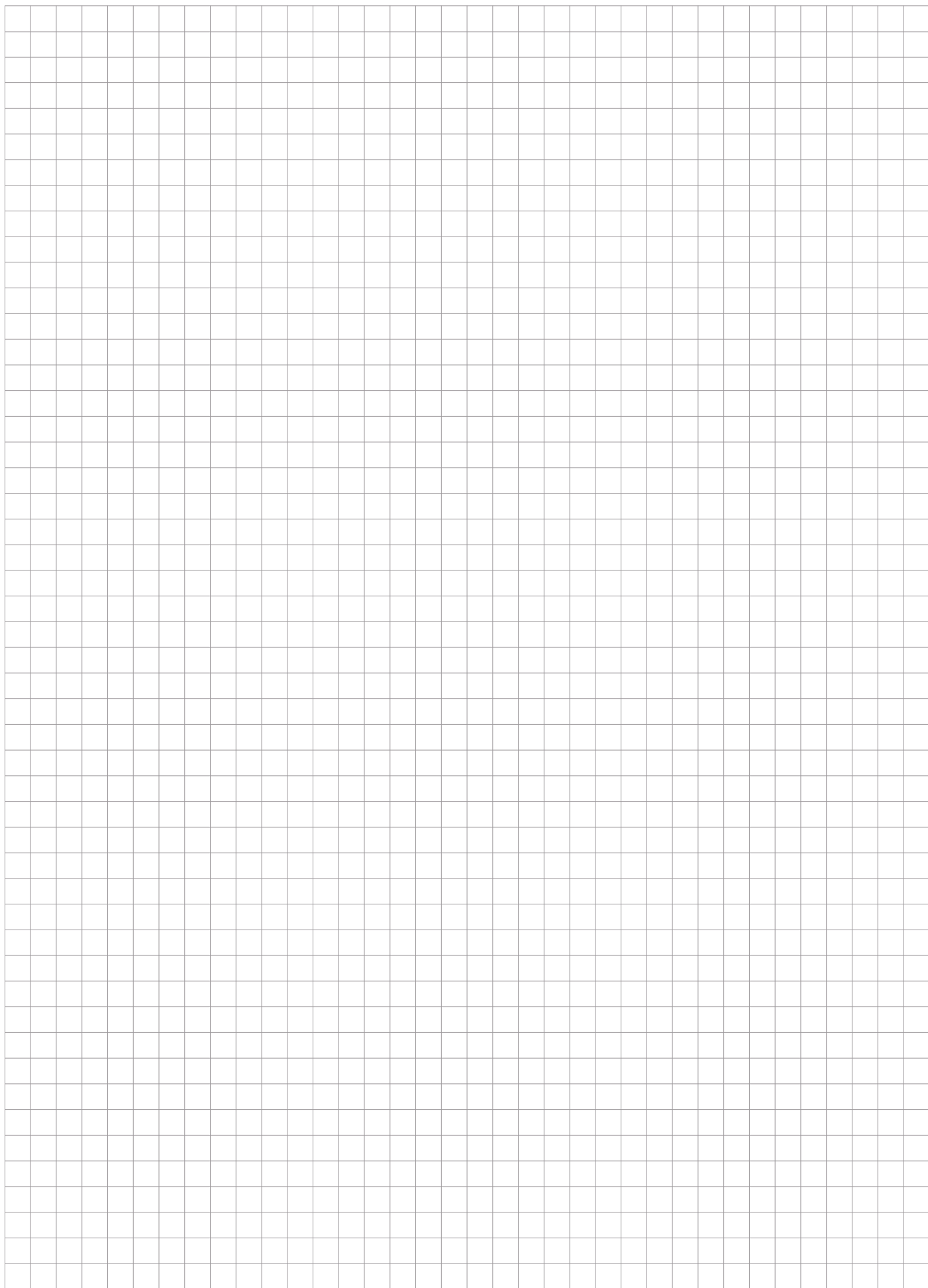
Series WOT – Heating jacket for pipeline



Series WOG – Heating jacket for exhaust gas line



Series WOT – Heating jacket for column pipe



## FOR YOUR NOTES

Winkler GmbH is an independent, medium-sized company located in Heidelberg (Germany). For more than 30 years we have been developing and manufacturing a broad range of electric heating solutions for industry and laboratory applications.

**We supply reliable and durable products made of high-quality materials.**

We are the right partner for innovative and quick answers to your requirements. Customized solutions and flexible manufacturing are our particular strengths. Our experienced specialists will offer you sound advice and - together with you - develop the heating solution tailored to your application.

**Winkler - Your heating solution!**



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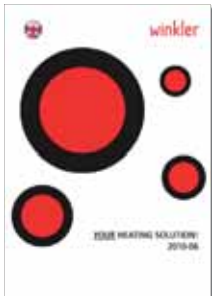
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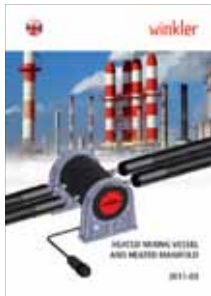
### Our product range



Company presentation



Heating solutions for exhaust measurement technology



Heated mixing vessels and manifolds



ATEX heated lines



Heated hoses for glueing technology and for filling and dosing systems



Silicone heaters and heating foils



Drum and IBC heaters



Heating solutions for rail applications



Laboratory heaters

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