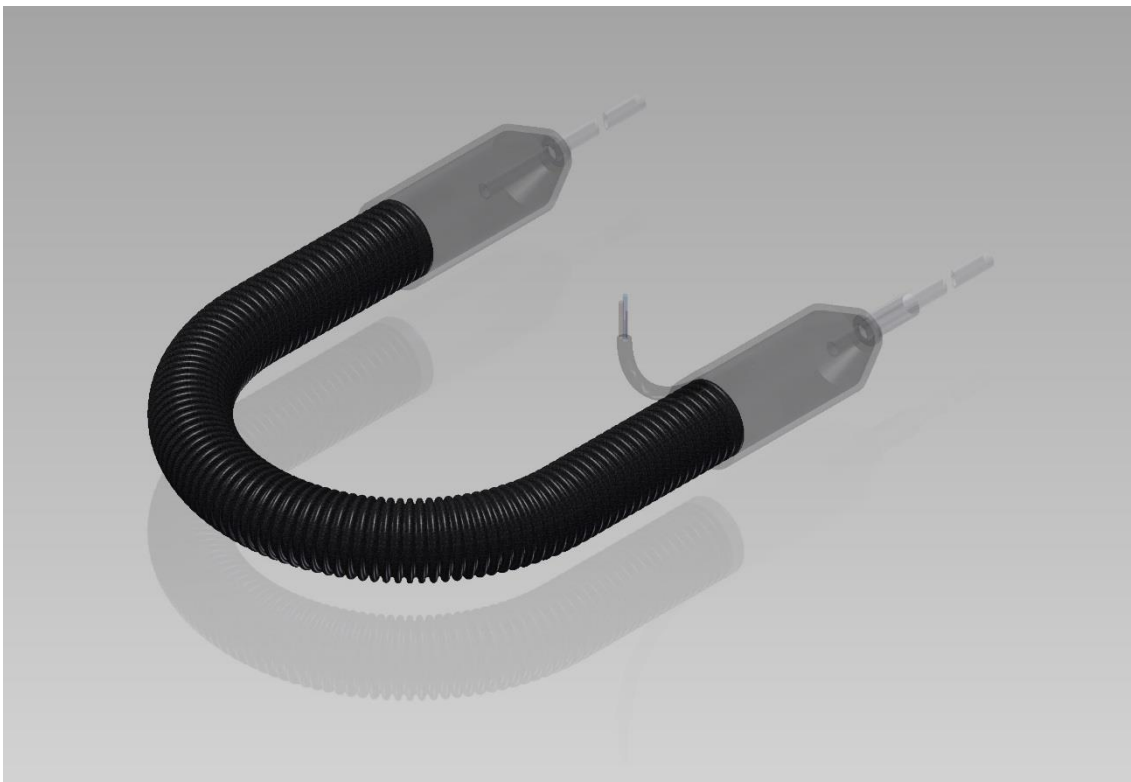


# Electrically Heated Sample Lines

## Type 3/4/5-N/M/H (Ex), PSP 4M(-W), Type 3/4/5-5/30/50/80/100/120 (Ex)

Instruction Manual  
Version 1.00.01





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**Dear customer,**

Thank you for buying our product. In this instruction manual you will find all necessary information about this M&C product. The information in the instruction manual is fast and easy to find, so you can start using your M&C product right after you have read the manual.

If you have any question regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor. You will find all the addresses in the appendix of this manual.

For additional information about our products and our company, please go to M&C's website [www.mc-techgroup.com](http://www.mc-techgroup.com). There you will find the data sheets and manuals of all our products in German, English and French.

Disclaimer

This manual does not claim to be complete and it may be subject to technical modifications.

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## 1 General information

The product described in this manual has been built and tested in our production facility.

All M&C products are packed to be shipped safely. To ensure the safe operation and to maintain the safe condition, all instructions and regulations stated in this manual need to be followed. This manual includes all information regarding proper transportation, storage, installation, operation and maintenance of this product by qualified personnel.

Please follow all instructions and warnings closely.

Please read this manual carefully before commissioning and operating the device. If you have any questions regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor.

## 2 Declaration of conformity



Das in dieser Bedienungsanleitung beschriebene Produkt erfüllt die im Folgenden aufgeführten EU – Richtlinien.

### EMV-Richtlinie

Es werden die Anforderungen der EU – Richtlinie 2014/30/EU “Elektromagnetische Verträglichkeit“ erfüllt.

### Niederspannungsrichtlinie

Es werden die Anforderungen der EU – Richtlinie 2014/35/EU “Niederspannungsrichtlinie“ erfüllt. Die Einhaltung dieser EU – Richtlinie wurde geprüft nach DIN EN 61010.

### Konformitätserklärung

Die EU –Konformitätserklärung steht auf der **M&C** – Homepage zum Download zur Verfügung oder kann direkt bei **M&C** angefordert werden.



### 3 Safety instructions

**Please follow these safety directions and instructions regarding installation, commissioning and operation of this equipment:**

Read this manual before commissioning and operating the product. Please make sure to follow all safety instructions.

Installation and commissioning of electrical devices must be carried out only by qualified skilled personnel in compliance with the current regulations.

The installation and commissioning of the device must conform to the requirements of VDE 0100 (IEC 364) 'Regulations on the Installation of Power Circuits with Nominal Voltages below 1000V' and must be in compliance with all relevant regulations and standards.

Before connecting the device, please make sure to compare the supply voltage with the specified voltage on the product label.

Protection against damages caused by high voltages:

Disconnect the power supply before opening the device for access. Make sure that all external power supplies are disconnected.

Operate the device only in the permitted temperature and pressure ranges. For details please refer to the technical data sheet or manual.

Install the device only in protected areas, sheltered from rain and moisture. The product should not be exposed to the elements.

This device is NOT certified to be installed or operated in explosive hazardous areas.

Installation, maintenance, inspections and any repairs of the devices must be carried out only by qualified skilled personnel in compliance with the current regulations.

### 4 Warranty

In case of a device failure, please contact immediately M&C or your M&C authorized distributor.

We have a warranty period of 12 months from the delivery date. The warranty covers only appropriately used products and does not cover the consumable parts. Please find the complete warranty conditions in our terms and conditions.

The warranty includes a free-of-charge repair in our production facility or the free replacement of the device. If you return a device to M&C, please be sure that it is properly packaged and shipped with protective packaging. The repaired or replaced device will be shipped free of delivery charges to the point of use.

## 5 Used terms and signal indications



**Danger**

The 'Danger' warning sign indicates that death, serious injury and/or significant material damage will be the consequence, if the appropriate precautions should not be taken.



**Warning**

The 'Warning' warning sign indicates that death, serious injury or damage to property may occur if the relevant precautionary measures are not observed.



**Caution**

The 'Caution' warning sign indicates that slight personal injury can occur if the appropriate safety precautions are not observed.

**Caution**

'Caution' indicates that damage to property can occur if the appropriate safety precautions are not observed.

**Attention**

'Attention' indicates that an unintended result or situation can occur if the corresponding information is not taken into account.



**Note**

'Note' indicates important information relating to the product or highlights parts of the documentation for special attention.

**Qualified personnel**

'Qualified personnel' are experts who are familiar with the installation, mounting, commissioning and operation of these types of products.



## 6 Introduction

A big challenge for the extractive continuous gas analysis are undesired accompanying substances, like dust, water vapour and corrosive acids, which are formed by gas components combined with condensed water vapour.

In order to perform a maintenance-free measurement, the condensation of water vapour and gas components, between sample probe and gas cooler, must be prevented. This avoids washing out of the gas components as well as an eventual acid formation, and freezing or blocking of the sample line.

The heated M&C sample lines solve this problem. If the heated M&C sample lines are correctly adapted to your process conditions, they guarantee minimum maintenance work.

Basically, the amount of sample gas should be kept as low as possible to guarantee a minimum of maintenance work and a maximum of availability. This can be realized by using an optimum downstream gas conditioning unit with M&C components.

### 6.1 Serial number

The product label with the serial number is located on the connection cap of the sample line.



**Note**

Please refer to this serial number if you have any questions about your heated sample line.

### 6.2 Power supply

The sample lines are available in 115 VAC or 230 VAC. For detailed information, please refer to the product label.

### 6.3 Warnings and notes



**Note**

Be sure to follow all warnings and notes in this instruction manual!



## 7 Technical data

### 7.1 Electrically heated controlled sample line Type 3/4/5-N/M/H

Sample lines Type 3/4/5-N/M/H	N	M	H
Operating temperature max.	+100 °C	+200 °C	250 °C
Power consumption for NW 4/6	100 W/m	100 W/m	125 W/m
Power consumption for NW 6/8	100 W/m	100 W/m	125 W/m
Operating pressure max.	Type 3 = 5 bar, Type 4 = 3 bar, Type 5 = 100 bar		
Admissible ambient temperature	-20 °C to +65 °C		
Hose / Tube NW	Optional 4/6 or 6/8 mm		
Final caps for sample line	See connection and closing fittings A-E and W-Z		
Electrical Connection	1,5 m connection cable with plug 7-poles for max. 10 A or 5-poles for max. 20 A according to required power, for mains and PT100 sensor connection		
Additional voltage	230 V AC standard, current supply via temperature regulator, see data sheet 2-6.2		
PT100 sensor positioning	0,25 m from standard current connection		
Weight	1st meter = 2 kg / each further meter 0,9 kg – standard execution		
Length of sample line	max. 30 m in one length		
7 pole plug 10 A on connection fitting A-E up to max. length	23 m		18 m
5 pole plug 20 A on connection fitting A-E length from / to	23,1 m to 30 m		18,1 m to 30 m
Connection measuring gas	Type 3 = barrel nipple of stainl. steel SS316, optional Ø 6 or 8 mm, length 26 mm Type 4 = PTFE tube, optional Ø 6 or 8 mm, 0,5 m on both sides Type 5 = tube stainl. steel SS316, optional Ø 6 or 8 mm, 0,5 m on both sides		
Outside diameter	42,5 mm		
Thermal isolation	Fibre glass and bonded fabrics		
Protective coating	Corrugated hose of polyamide, black		
Application areas / Smallest bending radius	Mobile and stationary, Indoor and outdoor mounting / 300 mm		

Technical data are only valid for 230 V / 50 Hz, on request 115 V / 60 Hz is available.

## 7.2 Electrically heated controlled sample line type 3/4/5-N/M Ex

Sample line type 3/4/5-N/M	N	M
Operating temperature max.	+100 °C	+200 °C
Power consumption for NW 4/6	100 W/m	100 W/m
Power consumption for NW 6/8	100 W/m	100 W/m
Operating pressure max.	Type 3 = 5 bar, Type 4 = 3 bar, Type 5 = 100 bar	
Admissible ambient temperature	-20 °C to +65 °C	
Hose / tube NW	Optional 4/6, 6/8 or 8/10 mm	
Final caps for sample line	See connection and closing fittings C-E and W-Z	
Electrical Connection	1,5 m connection cable, for mains and 2x PT100 sensor connection with screwed cable gland M12 x 1,5 Ex	
Additional voltage	230 V AC standard, current supply via temperature regulator	
PT100 Sensor positioning	1 m from standard current connection	
Weight	max. 1,5 kg/m	
Length of sample line	max. 30 m in one length	
Connection measuring gas	Type 3 = barrel nipple of stainl. steel SS316, optional Ø 6 or 8 mm, length 26 mm Type 4 = PTFE tube, optional Ø 6 or 8 mm, 0,5 m on both sides Type 5 = tube stainl. steel SS316, optional Ø 6 or 8 mm, 0,5 m on both sides	
Outside diameter	55 mm (62 mm near to the electrical connection, length approx. 300-400 mm)	
Thermal isolation	Fibre glass and bonded fabrics	
Protective coating	Corrugated hose of polyamide, black, antistatic	
Application areas / Smallest bending radius	Mobile and stationary, indoor and outdoor mounting / 500 mm	

Technical data are only valid for 230V/50Hz, on request 115 V / 60 Hz is available.

### 7.3 Selfregulating sample lines Type 3/4/5-5/30/50/80/100/120 (Ex)

Sample line Type 3/4/5... NW4 or 6	.../5-.. (Ex)	.../30-.. (Ex)	.../50-.. (Ex)	.../80-.. (Ex)	.../100-.. (Ex)	.../120-.. (Ex)
Inside tube/ hose	Type 3/4/...: PTFE, Ø 4/6 mm or Ø 6/8 mm, Type 3/... not exchangeable, Type 4/... exchangeable Type 5/...: stainl. Steel SS316, Ø 4/6 mm or Ø 6/8 mm, not exchangeable in case of complete manufacturing at works, 500 mm proud on both sides					
Holding temperature at -20 °C Ambient temperature	+5 °C	+30 °C	+50 °C	+80 °C	+100 °C	+120 °C
Version Ex-temperature class	T6	T6	T3	T3	T3	T2
Power consumption, Cold start at -20 °C Cold start at 0 °C Cold start at +10 °C At operating temperature	16 W/m 13 W/m 9,2 W/m 11,5 W/m	45 W/m 37 W/m 30 W/m 20 W/m	45 W/m 40 W/m 38 W/m 28 W/m	54 W/m 49,5 W/m 47 W/m 30,5 W/m	54 W/m 49,5 W/m 47 W/m 26 W/m	71 W/m 66 W/m 63 W/m 35 W/m
Max. additional length at -20 °C ambient temperature	109 m	52 m	65 m	55 m	55 m	40 m
Max. length in one piece	99 m					
Max. admissible operat. temp. for mains ON	65 °C		120 °C			
Max. admissible operat. temp. for mains OUT	85 °C		200 °C			
Admissible ambient temperature	Standard: -20 °C to +65 °C					
Outside sheath corrugated hose of polyamide, black	Ø 42,5 mm a					Ø 55 mm a
Thermal isolation	Thermal bonded fabrics					
Operating pressure, max.	Type 3/4/...: max. 3 bar, Type 5/...: max. 100 bar					
Heater band	Self-limiting, to be cut into any length you like Version Ex: Type ELSR..., Ex II 2 G EEx e IIC T6, Confirmation of conformity LCIE 01 ATEX6019X or ..XTV2-CT, Ex II 2 G EEx e II T4/T3/250°C (T2), Confirmation of conformity PTB 98 ATEX1105X					
Additional voltage	230 V 50 Hz* or 115 V 60 Hz, overload release according to request, max. 25 A time-lagged, C-characteristic					
Power consumption	According to the length of the line and the version : ..W/m x length (m) = ..W total					



Sample line Type 3/4/5... NW4 or 6	.../5-.. (Ex)	.../30-.. (Ex)	.../50-.. (Ex)	.../80-.. (Ex)	.../100-.. (Ex)	.../120-.. (Ex)
Electrical connection for Type 3/4/5/... NW4 or 6	Directly to the heater band via shrinking technique; Completely manufactured at works with 1 m silicone connection cable 3x1,5 mm <sup>2</sup> , temperature resistant					
Electrical connection for Type 3/4/5/... Ex NW4 or 6	Lead through the heater band and put into the Ex connecting box; Manufactured at works: 1 m heater band leaded to EEx e connecting box; 122 x 120 x 90 mm, with 2x M25 cable glands and blind plug each, terminals 6x 2,5mm <sup>2</sup>					
Electrical equipment standard	EN61010, EN60335-1 / Version Ex: EN50014, EN50018, EN50019					
Degree of protection	IP64 EN60529					
Weight	Per meter approx. 0,9 kg plus connection and closing cap 1,1 kg					
Application area / Smallest bending radius	Mobile and stationary, Inside and outside mounting / 300 mm					

Technical data only valid for 230V/50Hz, on request 115V/60Hz is available.

\*Standard

#### 7.4 Electrically heated controlled sample line Type PSP 4M

<b>Sample line</b>	<b>PSP 4M, PSP 4M-W</b>
Operating temperature max.	+200 °C
Power consumption	110 W/m
Operating pressure max.	3 bar
Admissible ambient temperature	-20 °C to +60 °C
Electrical connection	1,5 m connection cable with plug 7 poles for max. 10A, for mains and PT100 sensor connection
Additional voltage	230V AC standard, current supply via temperature regulator
PT100 sensor positioning	0,25 m von supply connection - standard
Weight	1st meter = 2 kg / every further meter 0,9 kg – standard execution
Outside diameter	Type PSP 4M: 45mm      Type PSP 4M-W: 35mm
Length of sample line	Type PSP 4M: max 30m    type PSP 4M-W: max 10m
Thermal isolation	Fibre glass and bonded fabrics
Protection coating	Corrugated hose of polyamide, black
Application areas / Smallest bending radius	Mobile and stationary, inside and outside mounting / 300mm

Technical data only valid for 230V/50Hz, on request 115 V / 60 Hz available.

## 8 Manufacturing tolerances of the heated sample lines

### 8.1 Length of sample lines

The sample line length as indicated in our correspondence includes the following:

- In case of sample lines with connection fittings:  
The heated hose length including fittings (L1).
- In case of sample lines without connection fittings:

The heated hose length completely assembled.

The length of the proud hose core is indicated separately.

The indicated tolerances are referred to a temperature of +24°C, changes of the length depending on pressure and temperature are not considered.

Admissible deviations from the measure L1 when the sample lines are completely mounted.

The manufacturing tolerances correspond to DIN 20066.

Length L1 (mm)	Tolerances up to DN 25
up to 630	+7 / -3 mm
above 630 up to 1250	+12 / -4 mm
above 1250 up to 2500	+20 / -6 mm
above 2500 up to 8000	+1,5% / -0,5%
above 8000	+3% / -1%

### 8.2 Inside diameter / wall thickness

#### Industrial hoses of PTFE

Diameter inside (mm)	Tolerance (mm)	Wall thickness (mm)	Tolerance (mm)
1,0 – 5,0	+/- 0,20	0,10 – 0,30	+/- 0,05
5,1 – 7,0	+/- 0,25	0,31 – 0,60	+/- 0,10
7,1 – 10,0	+/- 0,30	0,61 – 1,00	+/- 0,15
10,1 – 15,0	+/- 0,35	1,01 – 2,00	+/- 0,20

#### Stainless steel tube lines

Standard tolerance of the outside diameter in the range up to 10mm	+/- 0,13 mm
Tolerance of wall thickness	+/- 10%

### 8.3 Compression stress of uncovered PTFE Industrial hoses

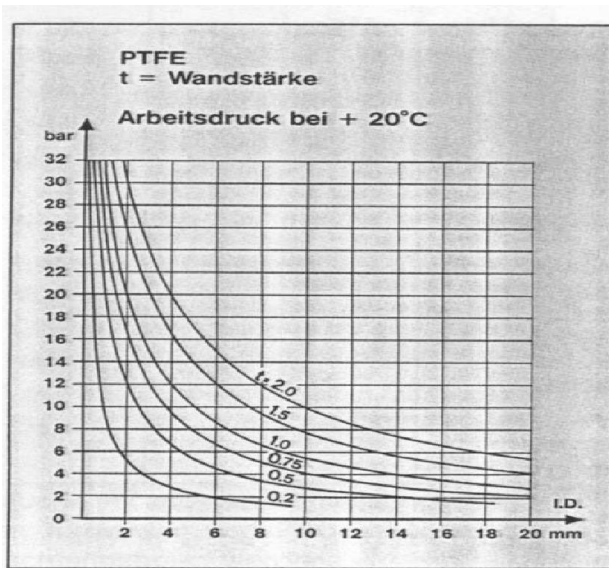


Figure 1 Compression stress of uncovered PTFE Industrial hoses

The diagram above should help you to determine the operating pressure for PTFE-tubes.

At operating temperatures of more than +20°C the pressures, indicated in the diagram have to be multiplied with the corresponding lowering factors F.

For temperatures lower than +20°C, no lowering factors F have to be considered.

Temperature °C	Lowering factor F
50	0,87
75	0,77
100	0,68
150	0,53
200	0,39
250	0,28

### 8.4 Power tolerances

Power consumption (W)	Tolerance
≤ 200	+/- 10%
≥ 200	+ 5 / - 10 %

## 8.5 Voltage tolerances

Nominal voltage	+/- 10%
-----------------	---------

## 8.6 Temperature tolerances

The following parameters have an influence on the temperature tolerances of the controlled heated sample lines:

- Tolerances and indexing precision of the used control devices
- Length and section of the used extension cable for the temperature sensor
- Material and resistance of the connection terminals
- Fall of temperature inside the sample line on unheated, non-isolated connection fittings.
- The temperature drop depends on the ambient temperature and can be avoided by using heated connectors or isolation.

## 9 Applications

The electrically heated, ready-to-plug-in M&C sample lines 3/4/5-N/M/H (Ex) are used in gas analysis systems for protection against data falsification and at the same time to protect the test samples against freeze during transport from the sample point to the gas conditioning system or directly to the heated analyser (above dew point).

The electrically heated, self-regulating M&C sample lines 3/4/5/-5/30/50/80/100/120 (Ex) give protection against data falsification and freeze within the lower temperature range of +5 °C to +120°C. However, a temperature control of the total heated line is not possible due to the parallel heater band function.

The electrically heated, ready-to-plug-in M&C sample lines type PSP 4M and PSP 4M-W are used in connection with portable M&C components such as portable gas conditioning systems series PSS and portable sample probes series PSP4000.

## 10 Description

### 10.1 Self-regulated sample lines 3/4/5/-5/30/50/80/100/120 (Ex)

The self-regulated M&C sample lines 3/4/5/-5/30/50/80/100/120 (EX) are supplied at a fixed length, completely assembled or by the metre for assembly at client's location. There are 3 hose/tube variants (3/4/5/) available and 6 versions of temperature ranges (5/30/50/80/100/120) in each NW 4mm, NW 6 mm and bigger (-4/6/8/10).

The sample lines for versions 3/4/5/-5/30/50/80/100/120 Ex for use in Ex-Zone 1 and 2 are supplied with EEx approved self-limiting heater bands. The sample lines assembled at works are equipped with a 1 m connection cable coming out axially or with a heater band in case of the Ex version. There is a hose or tube jut out of 500 mm. For the assembly at client's location, corresponding accessories are available.



The operating temperature (guaranteed minimum temperature) of the self-regulated heated M&C sample lines is referred to an ambient temperature of -20 °C. There is no need of an external temperature controller.

## **10.2 Electrically heated controlled sample lines 3/4/5-N/M/H**

The electrically heated M&C sample lines 3/4/5-N/M/H are supplied with a fixed length and completely assembled at works according to the client's request. Combinations are possible with 3 versions of temperature ranges (N-100 °C, /M-200 °C, /H-250 °C), 3 hose/tube variants (3/4/5) in NW 4/6 and 6/8 mm each as well as 5 connection fittings (A/B/C/D/E) and 4 end fittings (W/X/Y/Z).

The use of an external temperature controller is not necessary.

## **10.3 Electrically heated sample lines 3/4/5-N/M Ex**

The electrically heated M&C sample lines 3/4/5-N/M Ex are delivered in a fixed length and completely assembled at works according to client's request. Combinations are possible with 2 versions of temperature ranges (N-100 °C /M-200 °C), 3 hose/tube variants (3/4/5) in each DN 4/6, 6/8 and 8/10mm as well as 3 connection fittings (C/D/E) and 3 end fittings (W/Y/Z). It is necessary to use a special explosion-proof external temperature regulator.

## **10.4 Controlled sample lines PSP 4M and PSP 4M-W**

The electrically heated M&C sample lines PSP 4M and PSP 4M-W are delivered in a fixed length and completely assembled at works according to client's request. The type PSP 4M-W has got a reduced outside diameter compared with the standard lines PSP 4M. The current supply for the portable probe series PSP4000 is included inside the line. For the temperature acquisition, a PT100 is provided inside the sample line. It is necessary to use an external temperature controller.

# **11 Design**

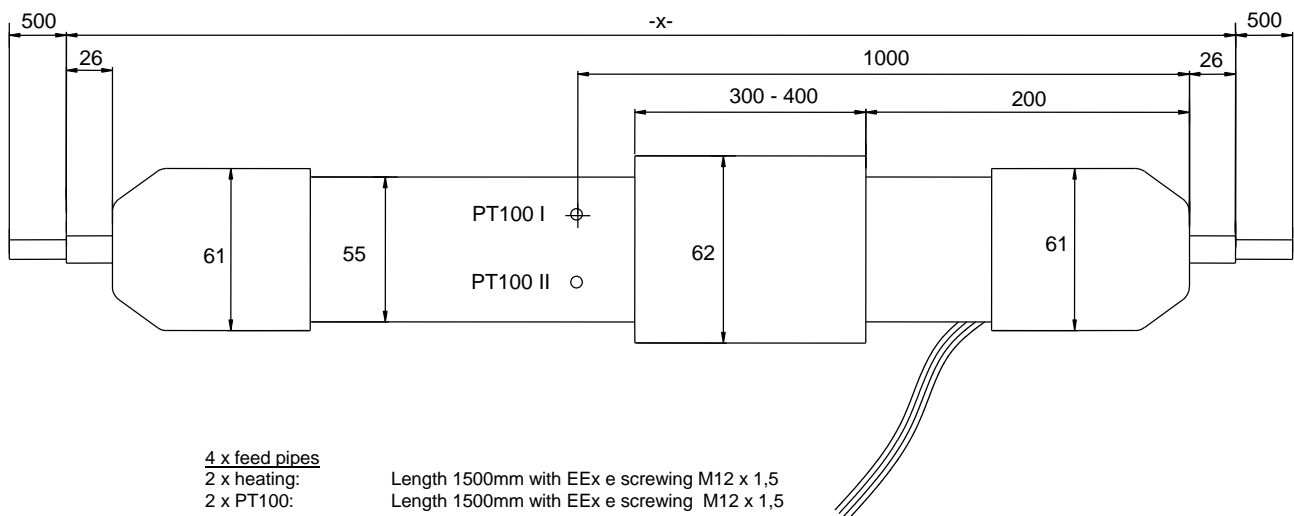
## **11.1 Self-regulating sample lines 3/4/5/-5/30/50/80/100/120 (Ex)**

The robust construction of the sample lines consists of the inner sample hose/tube, the parallel self-regulating heater band, both parts fixed by a cover of heat-conducting aluminium foil, further a heat insulation according to requirements and outside the black corrugated hose sheath of polyamide. At the end of the line, finishing fittings out of temperature-resistant silicone are mounted.

## **11.2 Controlled sample lines 3/4/5-N/M (EX)**

The robust construction of the sample lines consists of the inner sample hose/tube, a heat conducting support of braided stainless steel hose, the axially rolled high-capacity heat conductor and a double-shifted heat isolation. The outside sheath is a corrugated antistatic hose of polyamide. The end fitting out of temperature resistant silicone guarantees the heating of the sample line up to the end connection. For detecting the temperature 2 PT100 are installed inside the sample line.





**Figure 2 Design of the sample line type 3/4/5-N/M EX**

### 11.3 Controlled sample line PSP 4M and PSP 4M-W

The robust construction of the sample line consists of the inner sample hose/tube, a heat conducting support of braided stainless steel hose, the axially rolled high-capacity heat conductor and a double-shifted heat isolation. The outside sheath is a corrugated hose of polyamide. The end fitting out of temperature resistant silicone guarantee the heating of the sample line up to the connection end.

## 12 Reception and storage

- Carefully remove the sample line and eventual accessories out of the packing immediately on arrival and inspect the contents of supply against the packing list;
- Check the items for any damage in transit and, if required, inform the shipping insurance company immediately of the damage found;
- Check equally all technical data according to the test certificate, if possible upon receipt of goods but before mounting at the latest.
- The explosion-proof sample lines have got a special certificated Ex equipment (type examined). Please make sure that you also have been given the respective certificates of an authorized certifier for this equipment. The test number that is indicated in the certificate must correspond to the imprint on the equipment (list of possible equipment: see annex).
- With our separate manufacturer's declaration, we confirm the correct design and mounting of the operating equipment inside explosion-proof sample lines.



**Note**

The sample line must be stored in a weather-protected frost-free area!

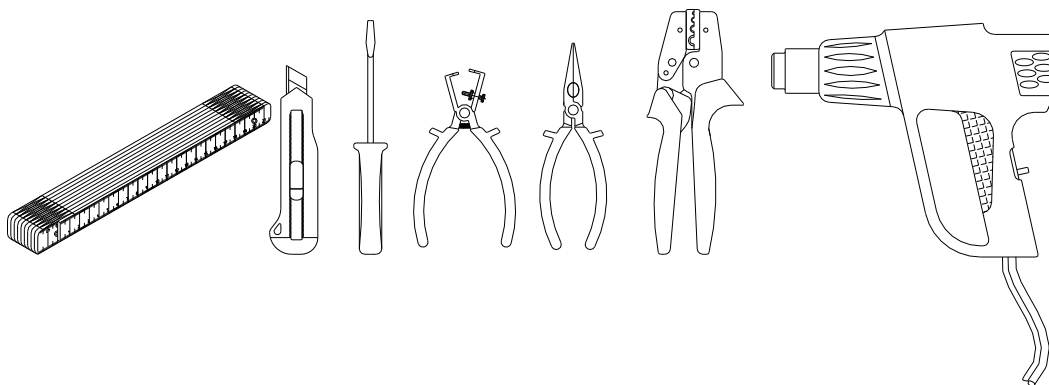


### 13 Preparation for mounting

- When installing the line, a minimum bending radius of 300 mm (400mm for explosion proof controlled lines) must be considered.
- Check whether the mains voltage corresponds to the indication on the type plate.
- Check whether the materials in touch with the sample are resistant.
- Be careful when bundling the lines as well as when installing the line on machine parts with elevated temperature.
- Note: The ambient temperature on the detection place determinates the inside temperature of the complete sample line. Therefore, the detector should be installed in the area with the highest ambient temperature in order to avoid overheating.
- When installing the sample line, take care that it is protected against wind because wind leads to important losses of heat on the outside sheath.
  - Changing ambient temperatures in the area of the tubing lead to changing inside temperatures. In the area with lower ambient temperature, the inside tube temperature will be below, in case of elevated ambient temperature it will be above the controlled temperature value.

#### 13.1 Assembling the self-regulated sample line

**Recommended tools:**



		Piece list for self-regulating M&C sample lines 3/4/5/-5/30/50/80	Piece list for self-regulating M&C sample lines 3/4/5/-100/120
a	1 piece	End cap of silicone with kink protection	End cap of silicone with kink protection
b	1 piece	End cap of silicone without kink protection	End cap of silicone without kink protection
c	1,2 m	Hose line of silicone; 3 x 1,5 m <sup>2</sup> ; red	Hose line of silicone; 3 x 1,5 m <sup>2</sup> ; red
d	3 pieces	Wire end ferrule; 1,5 mm <sup>2</sup> ; black	Wire end ferrule; 1,5 mm <sup>2</sup> ; black

e	1 piece	Aluminium type plate; 0,3 mm; unlabeled	Aluminium type plate; 0,3 mm; unlabeled
		<b>Connection set for ELSR heater band</b>	<b>Connection set for ELSR-H heater band</b>
f	2 pieces	Shrink sleeve black; Di=3,2 mm; 32 mm.	Shrink sleeve natural; Di=3,2 mm; 20 mm
g	2 pieces	Shrink sleeve black; Di=6,4 mm; 40 mm	Shrink sleeve natural; Di=4 mm; 32 mm
h	1 piece	Shrink sleeve black; Di=9,5 mm; 40 mm	Shrink sleeve natural; Di=8,9/4,8 mm; 40 mm
i	1 piece	Shrink sleeve black; Di=9,5 mm; 25 mm	Shrink sleeve natural; Di=8,9/4,8 mm; 25 mm
j	1 piece	Shrink sleeve black; Di=12,7 mm; 65 mm	Shrink sleeve natural; Di=11,4/7,9mm; 65mm
k	1 piece	Shrink sleeve black; Di=12,7 mm; 120mm	Shrink sleeve natural; Di=11,4/7,9 mm; 120mm
l	2 pieces	Nickel bush; 3,2 x 0,4 x 9,0 mm	Nickel sleeve; 3,2 x 0,4 x 9,0 mm
m	1 piece	Nickel bush; 4,0 x 0,4 x 9,0 mm	Nickel sleeve; 4,0 x 0,4 x 9,0 mm
n		Connecting Instructions for ELSR	Connecting Instructions for ELSR

<b>Additional material (sufficient for approx. 5 heating hoses)</b>		
Silicone adhesive	OMNIVISC 1002	90 gr. tube
ELB-02 20m glass scotch tape	0,19 mm; Tmax. = 140°C;	1 roll

1. Heated hose in the length as required and additionally 150 mm minimum on each side for the electrical connection, to be cut off.



2. Cut in the outer sheath of the heated hose according to the required excess length of the inside core assembly.



3. Remove the outer sheath of the hose as long as required for the connection length. In case of a braided sheath, protect the cut end against fanning out by means of a scotch tape.



4. Remove the isolation and the aluminium foil below the sheath and shorten to the same level as the outside sheath.



### Termination of the heating tape

5. Dismantle the outside sheath of the heating tape for approx. 40mm. Push back the protective braiding, fan out and twist.





Remove about 30mm of the heater band insulation.

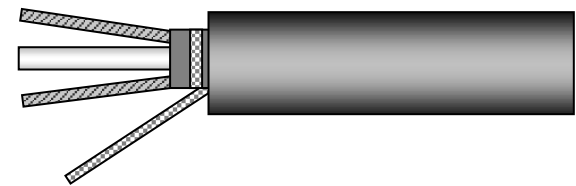
6. Uncover the bus wire and remove the heating element (or heating element and spacer).



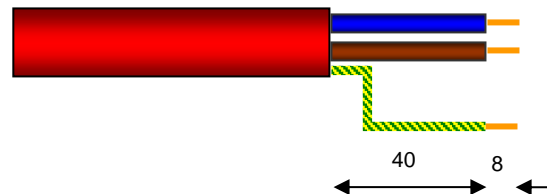
7. Push the thin shrink sleeve (f) over the bus wire and shrink.



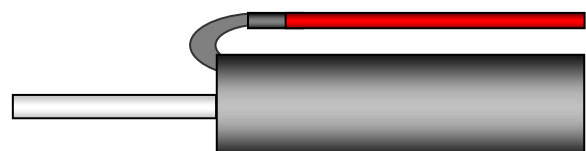
8. Push the medium size shrink sleeve (i) over and shrink. While still warm, squeeze the shrink sleeve between the bus wires with pointed pliers.



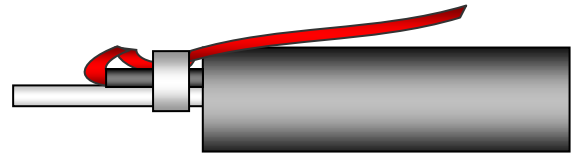
9. Deposit the cold cable (c) as shown.



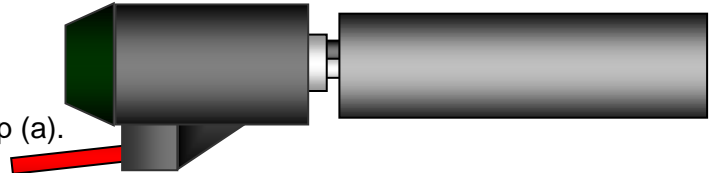
10. Push the long shrink sleeve (k) over the connection cable. Push the shrink sleeves (g) over the blue and brown wire of the connection cable. Connect the blue and brown wire to the bus wires of the heating tape with a crimp (l). Push the shrink sleeves (g) over the connections and shrink. Connect braid and earth-wire of the connection cable with a crimp (m). Deposit the long shrink sleeve (k) over the connection so that the ends are laying above the outer sheath of the heater tape and the connection cable, then shrink.



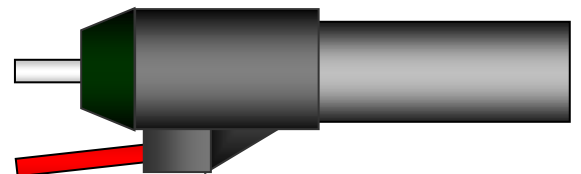
11. Attach the cold cable or the heating tape at the inner core with adhesive tape. Insulate the connection part.



12. **Only for end caps with bending protection**  
Push the connection cable through the punched bushings of the silicone cap (a).

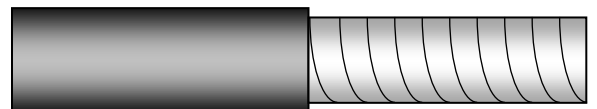


13. Apply silicone adhesive onto the end of the heating hose as well as the end cap (a). Push the cap (a) onto the hose and let the adhesive dry.

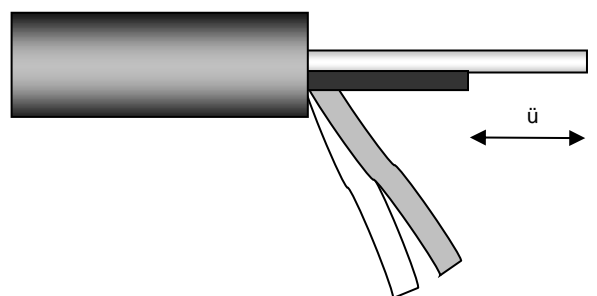


### End termination

14. Push the outside sheath of the heated hose backwards according to the required length of the protruding inner hose plus 150mm for the end termination of the heating tape.

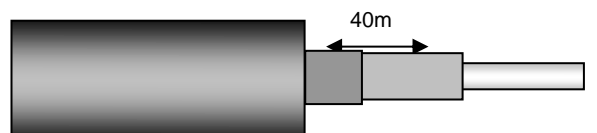


15. Expose the inner core and the heating tape. Do not cut off insulation and aluminium foil. Shorten the heating tape by the required protrusion of the inner hose ( $\ddot{u}$ ).

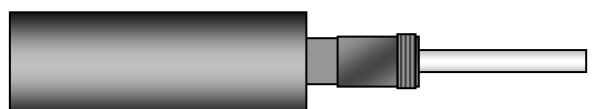


16. **For connection of heated hoses via a coupling box, follow the instructions attached to the coupling box.**

17. Dismantle approx. 40mm of the outer insulation of the heating tape and remove the braiding.

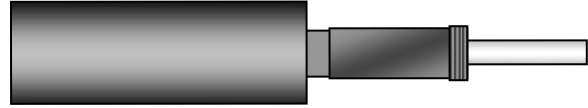


18. Shorten the heating tape by 20mm. Push the shrink sleeve (h) half way over and shrink.

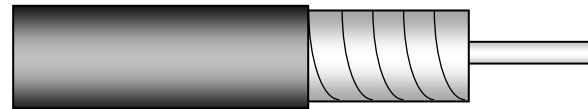


While still warm, press the projecting end with pointed pliers.

19. Put the shrink sleeve (j) approx. 15 mm over the outer jacket of the heating tape and shrink. While still warm, press the projecting end with pointed pliers.



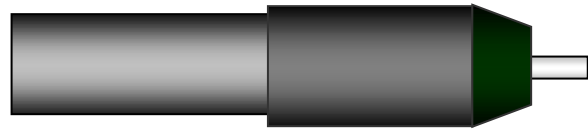
20. After having prepared the end of the heating tape, the heating tape is to be attached to the inner hose, covered with aluminium foil and insulation. The projecting parts of the insulation and the aluminium foil shall be cut off at the end of heating tape.



21. Now, put the outer sheath again around the complete insulation and over the end termination of the heating tape. Shorten the sheath acc. To the required dimension.



22. Apply silicone adhesive on the end of the heated hose and the end cap (b). Push the cap onto the hose and let adhesive dry.

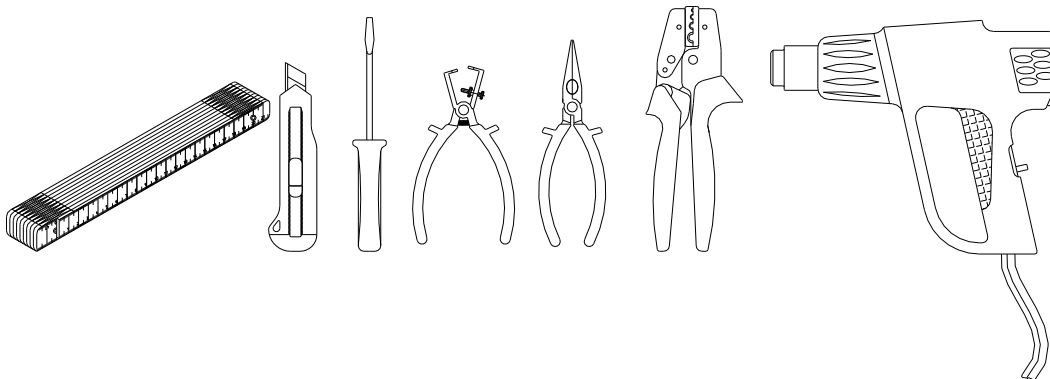


**NOTE!**

**Before operating the hose, perform an insulating resistance test! Do not operate hoses with insufficient electric insulation (<math><20\text{ M}\Omega</math>)!**

## 13.2 Assembly of the self-regulating explosion proof sample lines

Recommended tools:



		<b>Piece list for self-regulating M&amp;C sample lines 3/4/5/-5/30/50/80 Ex</b>	<b>Piece list for self-regulating M&amp;C sample lines 3/4/5/-100/120 Ex</b>
a	2 pcs.	Silicone end cap without kink protection	Silicone end cap without kink protection
b	1 pc.	Aluminium type plate; 0,3 mm; blank	Aluminium type plate; 0,3 mm; blank
		Connection and end termination set for ELSR heating tape	Connection and end termination set for XTV heating tape

<b>Additional material (sufficient for approx. 5 heating hoses)</b>		
Silicone adhesive	OMNIVISC 1002	90 gr. tube
ELB-02 20m glass scotch tape	0,19 mm; Tmax=140°C;	1 roll

1. Cut the heating hose according to the required length plus at least 1650 mm for the electrical connection (1500 mm for the connection side, 150 mm for the end termination).



2. Incise the outer sheath of the heating hose according to the required projecting end of the inner core.



3. Remove the outer sheath of the heating hose up to the required connection length. In case of a braided sheath, protect the cut end against fanning out by means of a scotch tape.



4. Remove the insulation and aluminium foil beneath and cut it to the same level of the outer sheath.



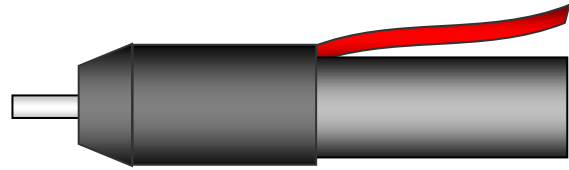
#### 5. Assembly of the heating tape

See separate instructions inside the connection set of the heating tape.

6. Fasten the heating tape directly behind the insulation with a scotch tape on the inside core and bend it back.

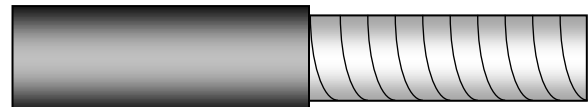


7. Apply silicone adhesive onto the end of the heating hose and the end cap (a). Push the cap (a) on the hose and let the adhesive dry.

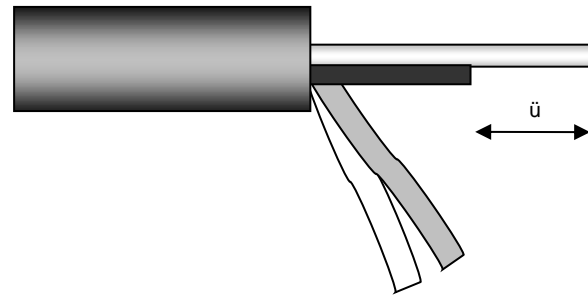


### End termination

8. Push back the outside sheath of the heating hose according to the required projecting end of the inside hose plus 150mm for the end termination of the heating tape.



9. Uncover carefully the inside core and the heating tape. Do not cut the insulation and the aluminium foil. Shorten the heating tape by the desired projecting end of the inside hose ( $\ddot{u}$ ).

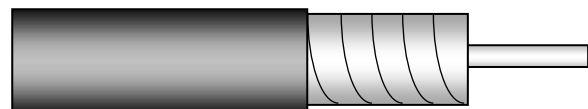


10. **For connections of heating tapes via a coupling box, follow the instructions attached to the coupling box.**

### 11. End termination of the heating tape

See separate instructions attached to the connection set of the heating tape.

12. After having prepared the end of the heating tape, the heating tape is fixed to the inside hose and covered with aluminium foil and insulation. Cut off the projecting parts of the insulation and the aluminium foil at the end of the heating tape.

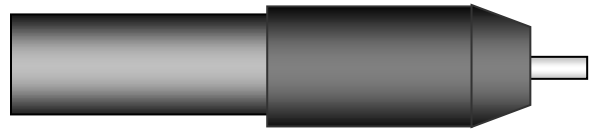


13. Now, the outer sheath is pushed again over the complete insulation and over the terminated heating tape. Shorten the sheath to the dimension required.





14. Apply silicone adhesive on the ends of the heating hose and the end cap (b). Push over the cap and let the adhesive dry.



**NOTE!**

**Before operating the hose, perform an insulating resistance test! Do not operate hoses with insufficient electric insulation (<20 MΩ)!**

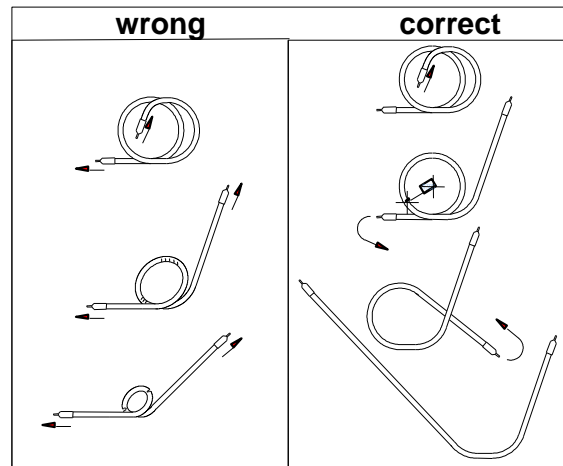
## 14 Mounting

The **M&C** sample lines are developed for stationary use and they guarantee a long operation time and a minimum of maintenance provided a professional selection and mounting.

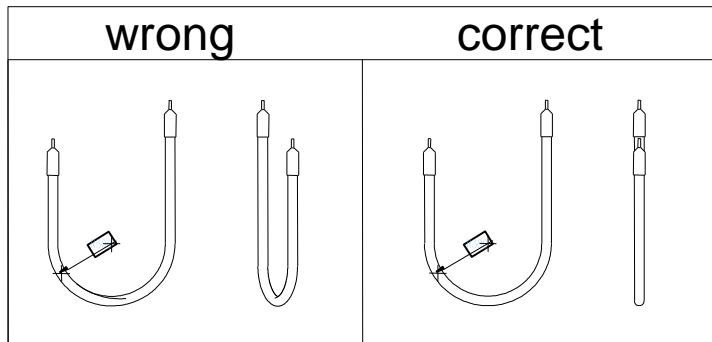
- In case the sample line is caught with holding clamps, the pressing must not decrease its outside diameter more than 10%. When this 10% limit is exceeded, the heat conductor, the control lines and the detecting lines will be damaged.
- Do not pull the sample line on the mounting part. Each mounting part is resistant against pressure but not against pulling.
- Do not fix the sample line in a wall or in foam!
- Take care of a stable ground for mounting.
- All connection and detecting lines must be installed in a stationary and protected manner.
- When choosing the mounting place of an explosion-proof sample line, the admissible surrounding according the device group and the permitted ambient temperatures must be considered.



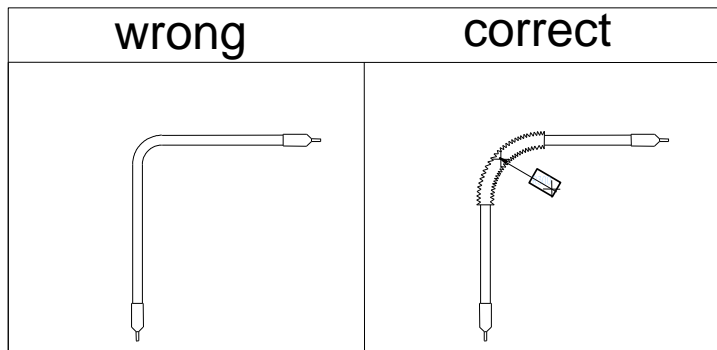
Normally, the heating hoses are delivered in rolled up condition. Do not pull off the heating hoses because this may cause a decrease of the smallest bending radius. Always unroll the heating hose.



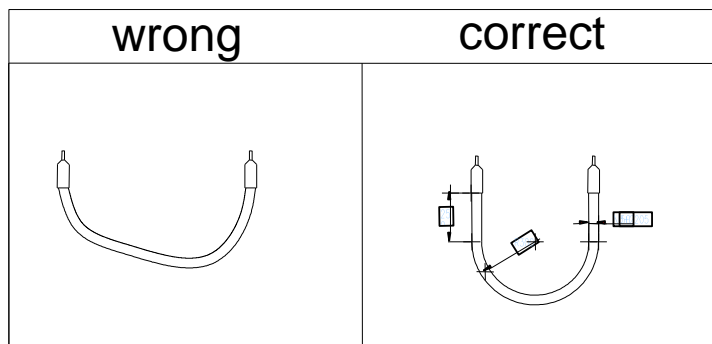
The axes of the hose should always be parallel so that the direction of the movement is on one level.



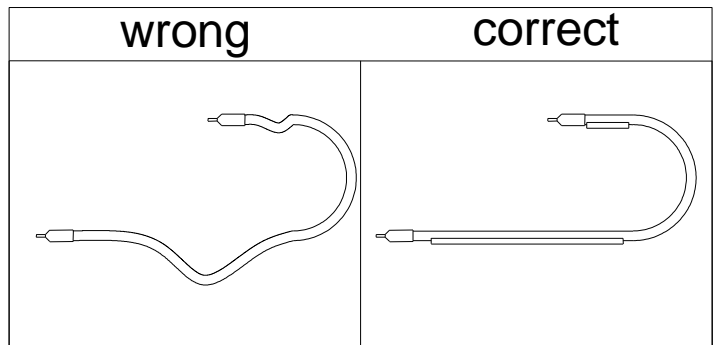
In order to avoid a kink with a hand-held equipment, an anti-kink device should be applied according to the working position.



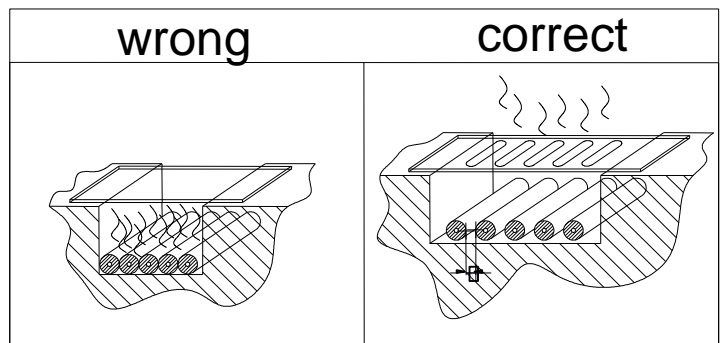
For the indication of the hose length you should consider on each connection end a straight piece with a length of approx. 5 x hose diameter.



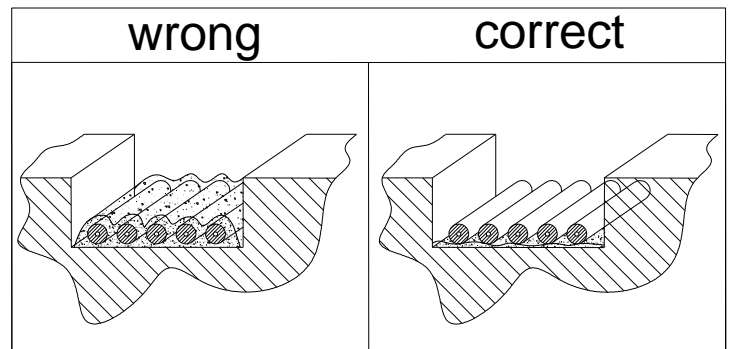
The heating hose should not sag when installed.  
Please provide a respective support.



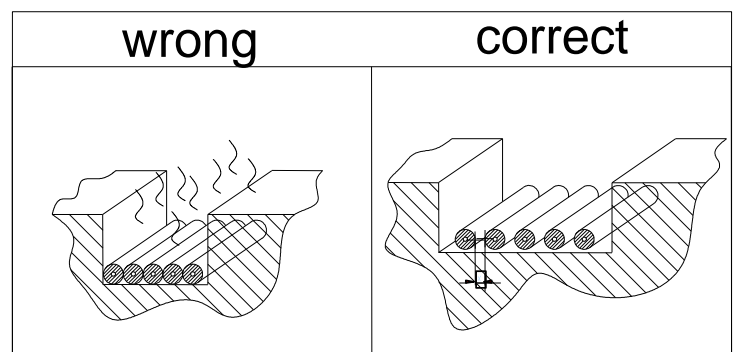
An installation in closed spaces causes a heat accumulation. The heating hoses must not touch each other and a sufficient aeration must be provided.



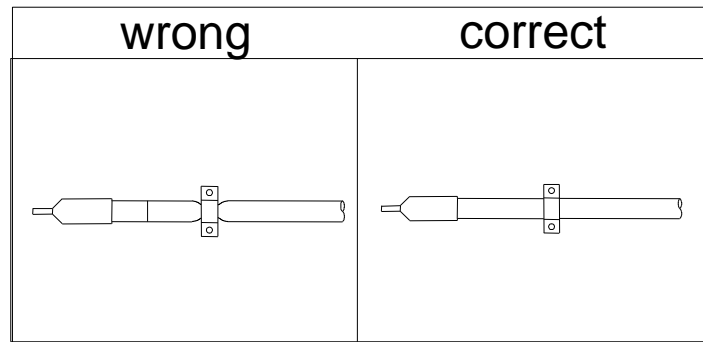
The heating hoses must be cleaned in regular intervals because a high degree of dirt (powdery substances, adhesives) also causes a heat accumulation.



Equally, an overheating will be caused if the heating hoses touch each other. When installing, take care to keep enough space between the hoses.



When fastening the heating hoses, take care that the hoses are not squeezed.



#### 14.1 Mounting of Type 3/4/5-N/M Ex with leadthrough to an analyse cabinet

For the mounting of the controlled explosion-proof sample line **3/4/5-N/M Ex** through the wall of an analyse cabinet, a two-piece wall fastening is attached. This device is to be fixed on the 500mm corrugated hose with an enlarged diameter of 62mm (see figure 2). Depending on the position of the wall fastening on the corrugated hose, the hose length inside the analysing cabinet can vary between 200mm and 700mm.

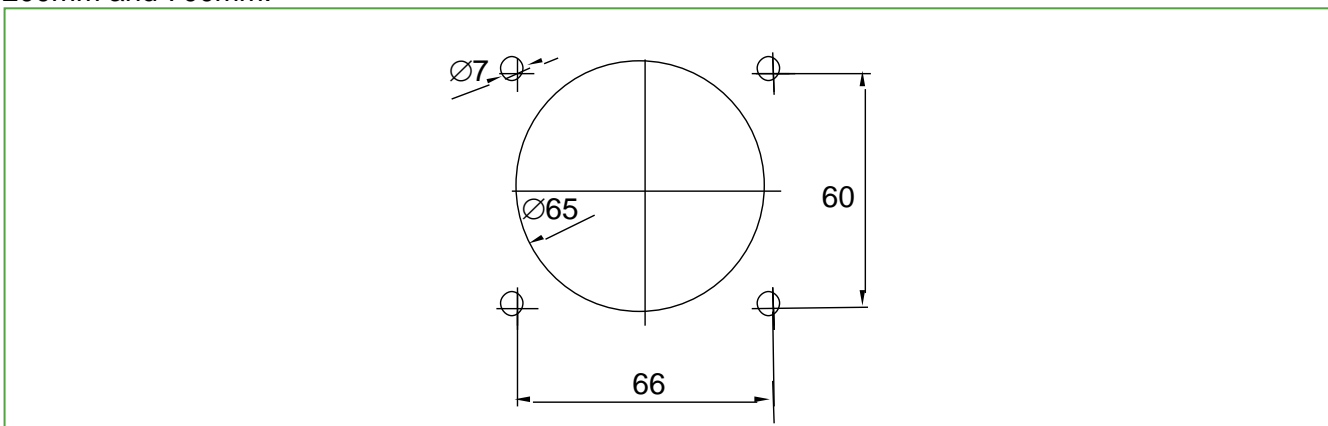


Figure 3 Mounting holes for the lead through of the analyse cabinet of type 3/4/5-N/M Ex

#### 14.2 Test of the sample line after installation

After installation of a heating hose, the following steps are to be effected:

- Visual control of the heating hose for eventual mechanical damages. Damaged heating hoses must not be used and have to be exchanged.
- Test the insulation resistance.

The insulation resistance of the heating hose has to be measured between each single supply line and shall be noted as follows:

Testing voltage  $2 \times U + 1000 \text{ V}$ , duration of the test 1 min.

Regardless of the length of the heating circuit, the insulation resistance must not fall below  $20 \text{ M}\Omega$ . In case the insulation resistance is below this limit, the function error must be found and eliminated.

- Test of the correct position of the temperature sensors, if any.
- Resistance test of the heating hoses as indicated in the drawing attached hereto.

## 15 Electrical connection



**Warning**

The wrong supply voltage may destroy the device. Take care that the supply voltage corresponds to the indication on the type plate when connecting the instrument!



**Note**

When setting high-power electrical units with nominal voltages of up to 1000V, attention must be paid to the requirements of IEC 364 (DIN VDE 0100) together with the associated standards and stipulations !

A main switch must be provided externally.

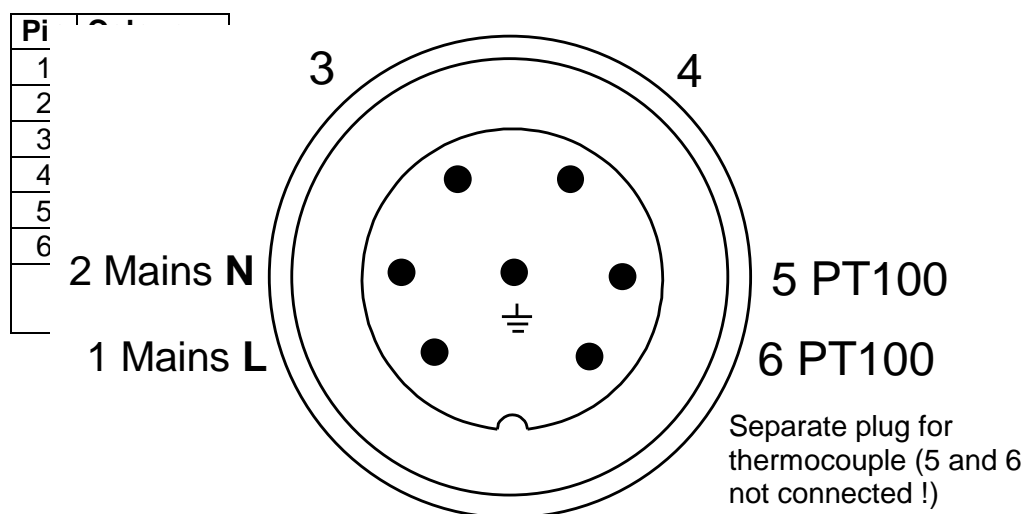
The supply circuit of the device must be equipped with a fuse that corresponds to the nominal voltage (overload current protection); the electrical indications to be taken from the technical data.

### 15.1 Controlled heated sample line Type 3/4/5-N/M/H and PSP 4M(-W)

The controlled heated lines type 3/4/5-N/M/H have got as standard a 5- or 7-poles connector plug for the electrical connection depending on the length of the line that can be connected directly with the suitable M&C temperature regulator type TRN, TRM or TRH (see data sheet 2-6.2).

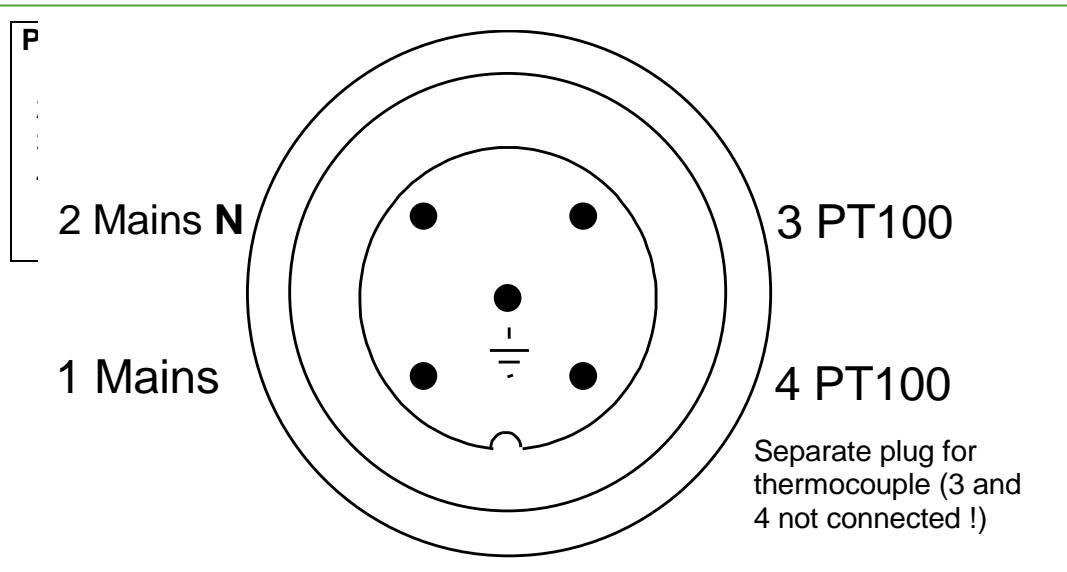
The sample lines type PSP 4M and PSP 4M-W are equipped with a 7-pole plug and a 7-pole socket on its connection ends for connection to the regulator or the portable gas conditioning unit type PSS as well as to the portable sample probe type PSP4000.

**Plug, 7-poles (up to 10 A; 1,5 mm<sup>2</sup>):**



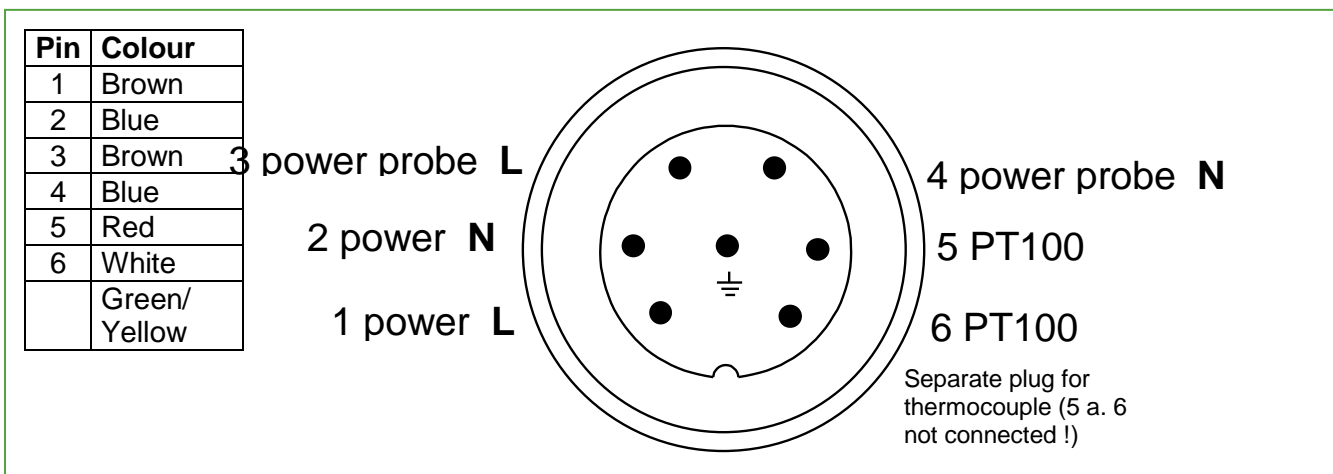
**Figure 4** Electrical connection of the controlled heated sample line type 3/4/5-N/M/H to 10 A

**Plug, 5-poles (up to 20 A; 2.5 mm<sup>2</sup>):**



**Figure 5** Electrical connection of the controlled heated sample line type 3/4/5-N/M/H to 20A

**Plug, 7-poles (up to 10A; 1,5mm<sup>2</sup>):**



**Figure 6** Electrical connection of the controlled heated sample line type PSP 4M(-W)

**15.2 Self-controlled heated sample line Type 3/4/5/-5/30/50/80/100/120 (Ex)**

For the electrical connection of the self-controlled heated sample lines, the cable ends of the heat conductor are connected in a respective connection box.



**Note**

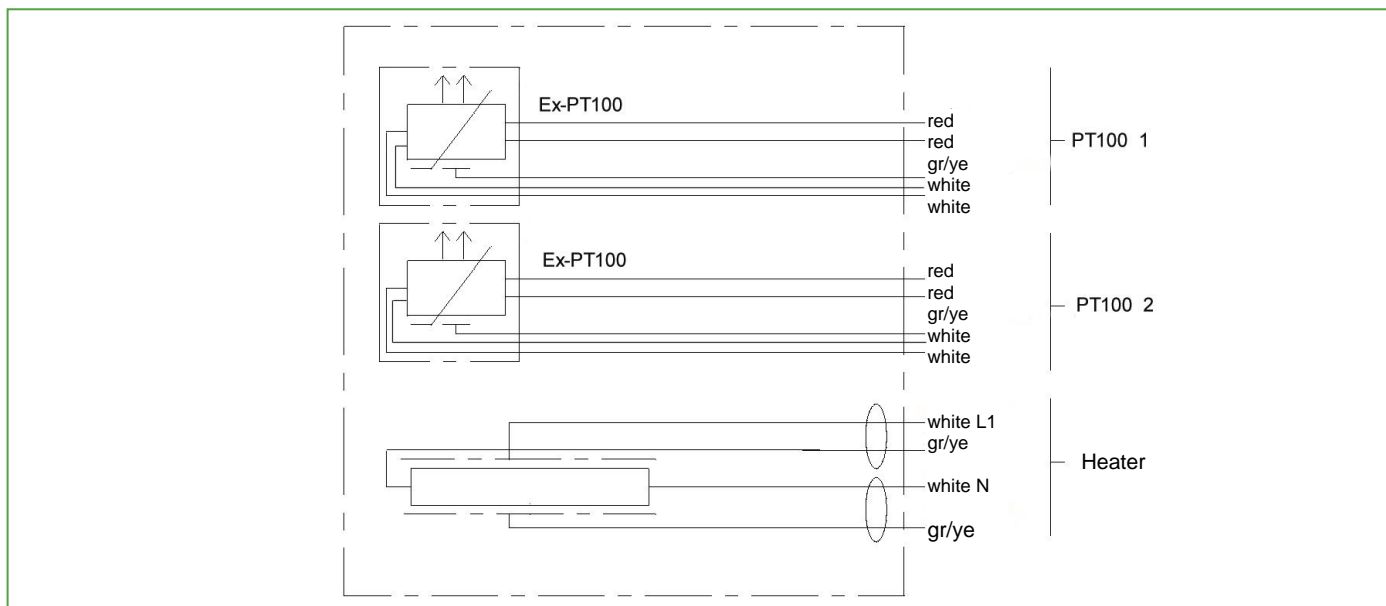
For connecting the explosion-proof self-controlling sample lines, a respective explosion-proof connecting box and suitable cable glands must be used. Appropriate fittings are to be found in the attached connection set.

### 15.3 Controlled heated sample line Type 3/4/5-N/M Ex

The controlled heated sample lines 3/4/5-N/M EX must be operated with a controller that is approved for the respective explosion zone. The controller can be approved for mounting inside or outside the explosion zone and must only be connected to the voltage indicated on the type plate. The sample lines may obtain temperatures above the permitted temperature limit according T-classification and must therefore only be operated in connection with temperature controller and –limiter.

For the electrical connection of the heater as well as both Ex-PT100, screwed cable glands M12 x 1,5 are attached.

- The temperature sensors PT100 are to be connected to appropriate controllers. The controller must not exceed the following operating data:  
 Max. Measuring current 10 A;  
 Max. Measuring voltage 1,3 V in T6 / T80 and T5 / T100  
 1,5 V in T4 / T130  
 1,7 V in T3 / T195 and T2 / T235h
- All connection and sensor lines are to be installed in a stationary and protected manner.



**Figure 7 Electrical connection plan of the sample lines 3/4/5-N/M EX**



## 16 Starting

During operation and maintenance works, the following prescriptions have to be observed:

- the Operating Manual
- the prescriptions actually in force regarding the installation of electrical units in explosive areas
- the standard EN 60519-1 „Safety in Electrical Heating Facilities“ Part 1: General Requirements
- the standard EN 60519-2 „Safety in Electrical Heating Facilities“ Part 2: Special Instructions for Facilities with Resistance Heating
- the standard VDE 0100 or similar regional prescriptions
- eventually applicable standards and prescriptions (i.e. Employer's liability insurance association in Germany).

Check before starting that the supply voltage corresponds to the indication on the type plate.

Check before starting whether the sample line is installed in an explosive area and whether the sample line has got the respective system of explosion protection.

Switch on the mains voltage.

The total heating up time for the sample lines is max. 20–25 minutes.

Now, the sample line is ready for work.

Defective or damaged devices must not be operated. This applies at the latest when the heating hose or its mounted parts

- show visible damages
- do not work at all or do not work correctly
- Have been overstressed.

## 17 Operation and maintenance

The admissible operating conditions according to chapter 2 „Technical data“ (device group, voltage, current, operating temperature, maximum ambient temperature, degree of IP protection) are to be observed.

- For the operation of the heated sample lines, a protective switch FI (30 mA) is to be used.
- The outside envelope provides a mechanical protection for the heating hoses below the thermal insulation and must not be damaged or removed.
- The heating hoses should not be used in chemically aggressive surroundings that may lead to damages of the heating hoses.
- In case any repair shall be executed on heated parts of the installation, the heating hose must be protected against damages.
- After termination of the repair works, the heating hose must be checked again.

Generally, the heated M&C sample lines are working free of maintenance. However, it is recommended to check in regular intervals the mounted heating hoses and its connection and sensor lines for any damage.



Only in the sample line type 4 the inside PTFE core can be exchanged in case of blocking or damage. The exchange can be effected up to a line length of 30 m.

For the changing, the complete sample line should be disassembled and be laid down in a straight manner.

Then connect the old PTFE core with the new one by using a cable and pull the new PTFE core into the line by pulling the old PTFE core out.



### Warning

Before starting any repair work on electrical parts, the mains voltage must be switched off on all poles! The same is applicable for all eventually connected alarm or control circuits.

Any repair on sample lines has exclusively to be carried out by M&C.

## 18 Closing down

Before closing down, i.e. switching off the heating, the sample line should be purged with inert gas or air in order to avoid a condensation and an eventual acidification.

## 19 Spare parts list

Heated Sample Line					
(C) Consumable parts					
(R) Recommended spare parts					
(S) Spare parts					
					recommended amount based on number of years of operation [years]
Part No.	Description	C/R/S	1	2	3
02 B 1000	PTFE hose, DN 4/6mm. Price per meter.	R			
02 B 2000	PTFE hose, DN 6/8mm. Price per meter.	R			

## 20 Annexe

Ex-Certification (EC Declaration of conformity) for controlled and self-controlling sample lines



Further product documentation to be taken from our internet catalogue under :  
[www.mc-techgroup.com](http://www.mc-techgroup.com)

### Type examined operating material in explosion proof sample lines

Explosion proof sample lines are equipped with one or more than one operating material that is type examined. The device group for the sample line is indicated on the type plate. The group is followed from the summary of the most restrictive features of the device groups of every single operating material.

The following type examined operating materials are used:

#### Controlled heated Sample Line Type 3/4/5-N/M Ex

Operating Material	Device Group	Place of Indication
Heating line ELK-A...	II 2G EEx e T5...T3	Connecting line
Coupling sleeve stainl.steel	II 2G EEx e T5...T3	Connecting line
Coupling sleeve PEEK	II 2GD EEx e T6...T2 IP 65 Tx	Sleeve
Pt 100 with PVC line	II 2G EEx d T6	Sensor line
Pt 100 with PTFE line	II 2 GD EEx e T6...T2 IP 65 Tx	Sensor line

#### Self-controlled heated Sample Line Type 3/4/5-5/30/50/80/100/120 Ex

Operating Material	Device Group	Place of Indication
Heating hose ELSR-	II 2G EEx e T6	Connecting line
Heating hose ELSR-H	II 2G EEx e T3	Connecting line
Heating hose XTV	II 2G EEx e T3	Connecting line
Pt 100 with PTFE line	II 2 GD EEx e T6...T2 IP 65 Tx	Sensor line

**EG-Konformitätserklärung EC Declaration of Conformity CE Déclaration de Conformité**

Produkt / Product / Producto: Heizschlauch / Heated Hose / Flexible Chauffant  
 Typen / Types: ELH...-Ex; ELH...sb...-Ex; ELSH...-Ex

**Explosionsgruppe / Explosion Group / Groupe d'Explosion: siehe Typenschild / see type plate / lire l'étiquette d'identification**

Das bezeichnete Produkt stimmt mit den Vorschriften der folgenden europäischen Richtlinien überein / The designated product is in conformity with the European Directives / Le produit désigné est conforme à la Directives Européennes:

- 2014/35/EU (Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die Bereitstellung elektrischer Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen auf dem Markt)  
 2014/35/EU (harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits)  
 2014/35/UE (harmonisation des législations des États membres concernant la mise à disposition sur le marché du matériel électrique destiné à être employé dans certaines limites de tension).
- 2011/65/EU (Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten)  
 2011/65/EU (restriction of the use of certain hazardous substances in electrical and electronic equipment)  
 2011/65/UE (limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques)
- 2014/34/EU (Harmonisierung der Rechtsvorschriften der Mitgliedstaaten für Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen (Neufassung))  
 2014/34/EU (harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast))  
 2014/34/UE (harmonisation des législations des États membres concernant les appareils et les systèmes de protection destinés à être utilisés en atmosphères explosibles (refonte))

Angewendete harmonisierte Normen / Applied harmonized Standards / Normes harmonisées applicables:  
 EN 60079-0:2012+A11:2013, EN 60079-7:2007, EN 60079-30-1:2007, EN 60079-31:2014

Zu Grunde liegende Baumusterprüfbescheinigungen / Associated EC-Type Examination Certificates / Attestations d'examen CE associées:

IBExU13ATEX1124X, IBExU04ATEX1004X für/for/pour ELH...-Ex  
 IBExU09ATEX1047X für/for/pour ELH...sb...-Ex

Zertifikat „Qualitätssicherung Produkt“ / Certificate „Product Quality Assurance“ / Certificat d'assurance „qualité produit“: IBExU15ATEXQ010 (IBExU Institut f. Sicherheitstechnik GmbH / [www.ibexu.de](http://www.ibexu.de))

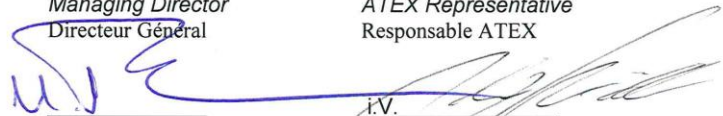
Ort, Datum / Place, Date / Ville, Date: 57299 Burbach, 08.01.2016

Name / Nom:  
 Position:

M. Thomas  
 Geschäftsführer  
 Managing Director  
 Directeur Général

P. Schmidt  
 ATEX Beauftragter  
 ATEX Representative  
 Responsable ATEX

Unterschrift / Signature:



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**EG-Konformitätserklärung**  
**EC Declaration of Conformity**  
**CE Déclaration de Conformité**

Produkt / *Product* / *Produit*: Heizschlauch / *Heated Hose* / *Flexible Chauffant*  
 Typen / *Types*: ELH...

Das bezeichnete Produkt stimmt mit den Vorschriften der folgenden europäischen Richtlinien überein / *The designated product is in conformity with the European Directives* / Le produit désigné est conforme à la Directives Européennes:

- 2014/35/EU (Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die Bereitstellung elektrischer Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen auf dem Markt)  
*2014/35/EU (harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits)*  
 2014/35/UE (harmonisation des législations des États membres concernant la mise à disposition sur le marché du matériel électrique destiné à être employé dans certaines limites de tension).
  
- 2011/65/EU (Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten)  
*2011/65/EU (restriction of the use of certain hazardous substances in electrical and electronic equipment)*  
 2011/65/UE (limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques)

Angewendete harmonisierte Normen / *Applied harmonized Standards* / Normes harmonisées applicables: EN 60519-1:2011, EN 60519-2:2006

Ort, Datum / *Place, Date* / Ville, Date: 57299 Burbach, 15.04.2016

Name : P. Schmidt  
 Position : Leiter Entwicklung  
 R&D Manager  
 Responsable R&D

Unterschrift / *Signature*:

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