

Heated Adapter Tube

AR-500-RX

Instruction Manual
Version 1.02.00



**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. There you will find the data sheets and manuals of our products in German and English.

Disclaimer

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

© 07/2023 M&C TechGroup Germany GmbH. Reproduction of this document or its content is not allowed without permission from M&C.

With the release of this version all older manual versions will no longer be valid.

The German instruction manual is the original instruction manual. In case of arbitration only the German wording shall be valid and binding.

SP® is a registered trademark of M&C Techgroup Germany GmbH.

Viton® is a registered trademark of DuPont Performance Elastomere.

Novapress® is a registered trademark for elastomer-bonded gasket material by Frenzelit GmbH, Germany

Version: 1.02.00



Contents

1 General information.....4
2 Declaration of conformity4
3 Safety instructions.....5
4 Warranty.....5
5 Warning signs and definitions.....6
6 Introduction.....7
6.1 Serial number.....7
7 Technical Data8
8 Description9
9 Design.....9
10 Receiving the adapter tube.....11
11 Preparation for installation.....11
12 Mounting12
13 Electrical connection.....13
14 Preparations for commissioning.....14
15 Starting up14
16 Maintenance.....15
17 Switching off.....15
18 Proper disposal of the device16
19 Spare parts list.....16
20 Risk assessment16
21 Appendix.....19

List of illustrations

Figure 1 Dimensions and design: adapter tube AR-500-R19
Figure 2 Dimensions and design: adapter tube AR-500-R10
Figure 3 Dimensions and design of the adapter tube AR-500-R/BB with 3/4" thread10
Figure 4 Electrical wiring plan.....14
Figure 5 Overview risk assessment17



Head Office

M&C TechGroup Germany GmbH ♦ Rehhecke 79 ♦ 40885 Ratingen ♦ Germany

Telephone: 02102 / 935 - 0

Fax: 02102 / 935 - 111

E - mail: info@mc-techgroup.com

www.mc-techgroup.com

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.

Follow all instructions and warnings closely.

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



The product described in this operating manual complies with the following EU directives:

EMV-Instruction

The requirements of the EU directive 2014/30/EU 'Electromagnetic compatibility' are met.

RoHS Directive

The requirements of the RoHS2 ('Restriction of Hazardous Substances 2') directive 2011/65/EU and its annexes are met.

Low Voltage Directive

The requirement of the EU directive 2014/35/EU 'Low Voltage Directive' are met.
The compliance with this EU directive has been examined according to DIN EN 61010.

Declaration of conformity

The EU Declaration of conformity can be downloaded from the **M&C** homepage or directly requested from **M&C**.

3 SAFETY INSTRUCTIONS

Follow these safety directions and instructions regarding installation, commissioning and operation of the 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 1000 V' 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 damage 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 sun, 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 WARNING SIGNS AND DEFINITIONS



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.



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



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



Toxic!
Acute toxicity (oral, dermal, inhalation)! Toxic when in contact with skin, swallowed or inhaled.



Corrosive!
These substances destroy living tissue and equipment upon contact. Do not breathe vapors; avoid contact with skin and eyes.

Caution

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



'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.



Hot surface!
Contact may cause burn! Do not touch!



High voltages!
Protect yourself and others against damage which might be caused by high voltages.



Wear protective gloves!
Working with chemicals, sharp objects or extremely high temperatures requires wearing protective gloves.



Use foot protection



Use safety helmet and full protective goggles

6 INTRODUCTION

During continuous gas sampling for analytic measurements and when using M&C sampling equipment, there is already an ultra-fine filtration directly at the sampling point. This way, part of the necessary maintenance work for a system is concentrated on a single point. This filter technology provides the great advantage that dust mixtures consisting of ultra-fine and coarse dusts can be optimally retained as well as the least possible maintenance work.

Optimal adaptation of the adapter tube and the sample probe to the measuring work and the processing conditions is a necessary condition for a perfect function of the whole measuring system. Basically, the quantity of the sampled gas should be kept to a necessary minimum. Accordingly, the downstream gas conditioning unit should be chosen, the respective components are available at M&C.

Only in this way it is possible to reduce maintenance to a minimum while ensuring a maximum availability.

6.1 SERIAL NUMBER

The type plate bearing the serial number and the voltage is located on the electrical connection box. Always quote the device's serial number when making enquiries and ordering replacement parts.

7 TECHNICAL DATA

	AR-500-R		AR-500-R1	
Part.-No.	20S9398	20S9398a	20S9317	20S9317a
Mains supply	230 V 50/60 Hz	110 V 60 Hz	230 V 50/60 Hz	110 V 60 Hz
Heating capacity	158 W	175 W	158 W	175 W
Electrical connection	Clamps, max 4 mm ²		Clamps, max 4 mm ²	
Protection Clamp box	IP54 EN 60529		IP54 EN 60529	
Temperature regulation	Thermostate*		Thermostate*	
Low temperature alarm contact	250 V, 3 A~, 0.25 A=		250 V, 3 A~, 0.25 A=	
Switch point	T=+30 °C to Tset		T=+30 °C to Tset	
Operating temperature	0-200 °C		0-200 °C	
Ambient temperature	-20 °C to 60 °C		-20 °C to 60 °C	
Sampling pressure max.	0.4 – 6 bar absolute		0.4 – 6 bar absolute	
Sampling temperature max.	550 °C		550 °C	
Ready for operation	After 2 h		after 2 h	
Material	SS 1.4571		SS 1.4571	
Mounting flange both sides	DN 65 PN 6*		DN 65 PN 6*	
Material Probe flange sealing	Novapress®		Novapress®	
Length with flange	570 mm*		Approx. 570 mm*	
Weight	Approx. 20 kg		Approx. 20 kg	
for prefilter	V12-1 Part.-No.: 93S2300		V20-2 Part.-No.: 20S9125	
	AR-500-R		AR-500-R1	
Options on demande				
	Other length available			
	Other flange dimensions			
	Pt100 instead of thermostat			
	Back purging option BB			
	Flange with connection thread to sample tube mounting G ¾"			

* Standard, others on request.

8 DESCRIPTION

Electrically heated adapter tubes type AR-500-RX are used for heating of prefilter frits that are placed outside the process in question. The typical use of an adapter tube AR-500-RX is in case there is any danger of dew point underflow on the prefilter frit when mounting the prefilter directly into the process.

This may lead to a choking or corrosion of the prefilter frit.

Another application is for processes with very high temperatures or high abrasion on the sampling point when pre frits are no longer stable. In case of high dust concentration, the option of backpurging can be used. The adapter tube AR-500-R1 is used for absorbing the prefilter frits of steel or PTFE type V20-X. The adapter tube AR-500-R is used for absorbing prefilter frits of ceramic type V12-X.

It is possible to mount the M&C probes type SP2000-H with the standard flange DN 65 PN 6 directly on the adapter tube.

9 DESIGN

The AR-500-R1 adapter tube consists of two flanges at opposite ends. The coupling tube is completely insulated and heated. The mains connection box is mounted onto the side of the adapter tube.

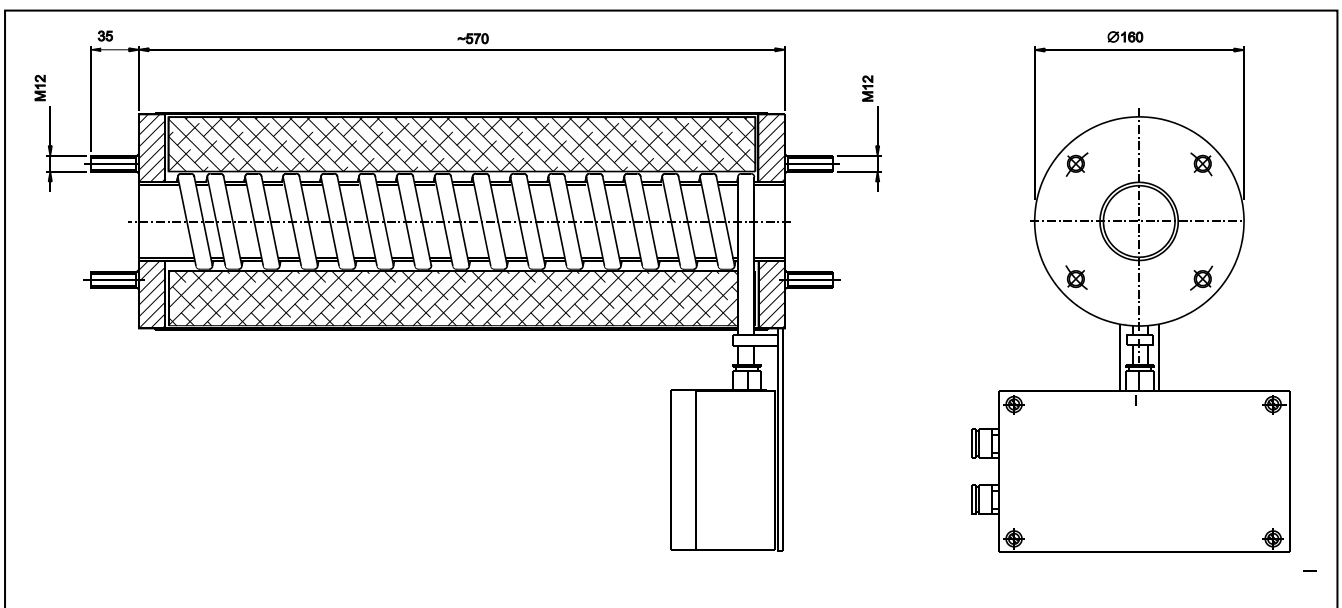


Figure 1 Dimensions and design: adapter tube AR-500-R1

With the AR-500-R version, a flange is designed as a fitting for ceramic pre-frit V12-1

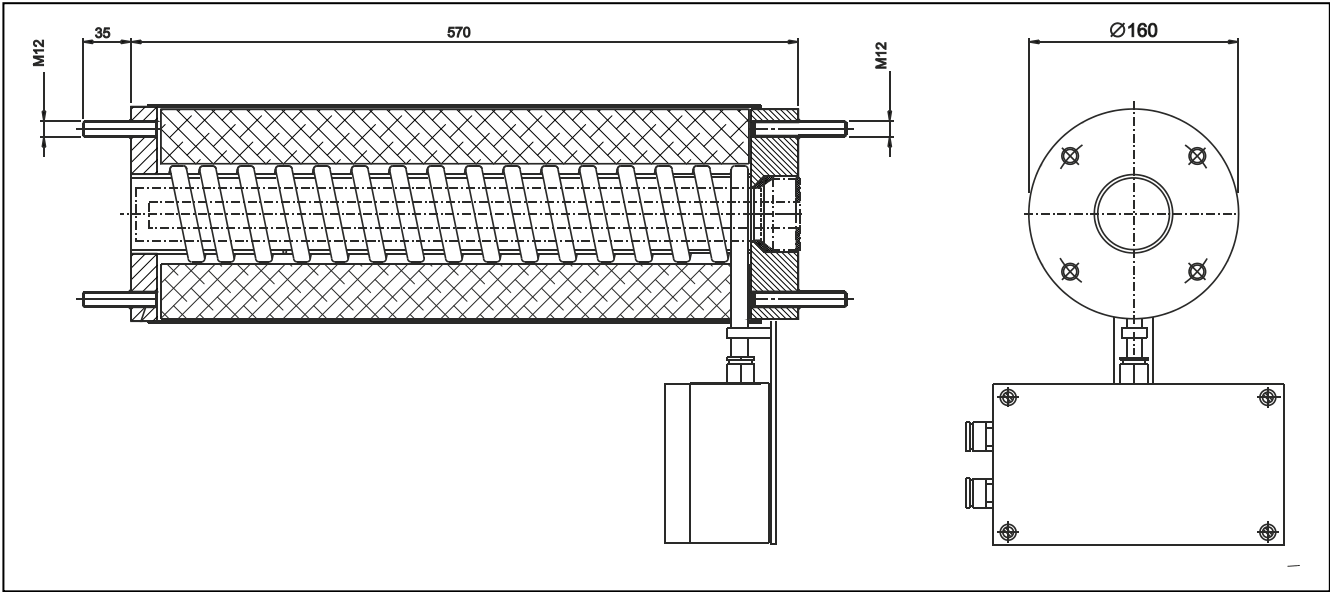


Figure 2 Dimensions and design: adapter tube AR-500-R

With the AR-500-R/BB version, one flange is designed as a fitting for ceramic pre-frit V12-1. The option BB makes the back purging of the adapter tube possible. The following drawing shows the dimensions and design of the adapter tube AR-500-R/BB with 3/4" thread for mounting an additional sample tube.

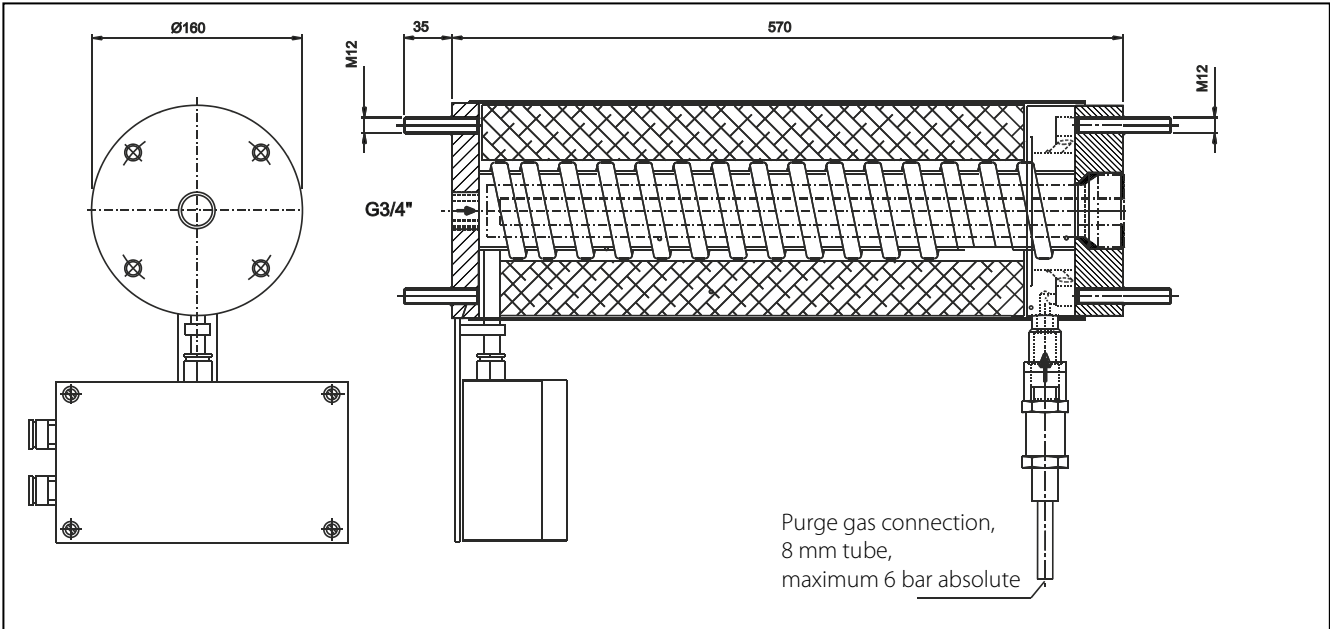


Figure 3 Dimensions and design of the adapter tube AR-500-R/BB with 3/4" thread

10 RECEIVING THE ADAPTER TUBE

The adapter tube normally is delivered in 1 packaging unit:

- Adapter tube with flange sealing and nuts

Upon receipt, the adapter tube should be removed carefully from the packaging and checked immediately for completeness against the delivery note.

Check the goods for any damage incurred during transport and if necessary, inform your transport insurer of any damage.

11 PREPARATION FOR INSTALLATION

- In accordance with the generally applicable guidelines, select the optimum sampling point or coordinate with the competent authorities.
- Locate the sampling point in such a way that there is adequate space for inserting and removing the adapter tube and probe and pay attention to the insertion length of the probe tube.
- Make certain that the probe is easily accessible so that you can carry out any subsequent maintenance work without trouble.
- As far as possible choose the sample socket (tube) in such a way that the temperature of the socket is always above the acid dew point in order to avoid corrosion and blocking problems.
- The adapter tube to be mounted must be adapted to the existing operating conditions.

Before starting installation, the existing operating parameters must be checked accordingly:

weatherproof mounting position	_____present	_____set	
Under / over pressure situation	mbar	bar	
Process temperature	°C, Min.	°C, Max.	
Dust loading	g/m ³		
Dust composition - grain size	µm		
Gas composition	corrosive	toxic	explosive
Which parameters should be measured, e.g. O₂, CO, SO₂, NO_x,...	vol%	mg/Nm ³	ppm
Required amount of gas	l/h, Min.	l/h, Max.	
Necessary T₉₀ time	sec.		

12 MOUNTING

The adapter flange is designed for stationary application and ensures - if chosen correctly – a longtime functioning and a minimum of maintenance. The optimal mounting position is horizontal with 10° descending gradient to the process.

- The position of the connecting box of version AR-500-R1 is variable. When mounting the connecting box near to the sampling socket, consider in any case the temperature on the socket because the connecting box may be heated up to >60 °C due to radiant heat. In this case, the end user must install a heat reflecting sheet metal in order to protect the connecting box.
- The connecting box of version AR-500 with option BB must be installed into direction of the sampling socket. The temperature of the socket must be considered because the radiant heat may heat the connecting box up to >60°C. In this case, the connecting box must be protected by a heat reflecting sheet metal.
- The connecting box of version AR-500-R must point to the probe.
- Put the flange sealing against the sampling socket, place upon the adapter tube and fasten it by using the attached nuts.
- On version AR-500-R, insert now the ceramic frit with the respective sealings.
- Place the second flange sealing upon the adapter tube.
- Mount the probe according to the probe's instruction manual.
- When using the adapter tube with option BB (back purging), the back purge gas has now to be connected by using a suitable tube connector 8 mm. Observe the process parameters when selecting the back-flushing gas. Backflushing should be executed cyclically with several pressure pulses, i.e. 2-5 pressure pulses of 1-2 seconds each. Maximum pressure: 6 bar.

13 ELECTRICAL CONNECTION



Warning

When connecting the equipment, please ensure that the supply voltage is identical with the information provided on the model type plate.



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



Note

In any case we recommend the use of temperature resistant cable! A main switch and matching fuse must be provided externally!

The main circuit must be equipped with a fuse corresponding to the nominal current (over current protection); for electrical details see technical data. We recommend that you always use the low temperature alarm contact to stop the gas flow in case of an alarm in order to protect the downstream components.

Do not use the AR-500 for gases or gas compositions, which could be potentially explosive without the presence of air. Do not use gases or gas compositions which can alter the relevant safety-related material properties of the adapter tube materials. The gas or gas compositions need to be free of particles which could cause, in combination with the materials of the adapter tube, sparks by friction or impact.

This also applies to specific gases or gas compositions, which enter the AR-500 via the calibration gas adapter / back purge connections. Make sure that all gases or gas compositions which enter the adapter tube, do not react with the environment or the process.



Warning

Prevent any potential sources of ignition (for example burning or smoldering particles, small smoldering fires, foreign objects) from entering the adapter tube during operation.



Warning

If the adapter tube is used for sampling toxic or oxygen displacing gases, the gas-carrying parts must be purged with inert gas or air before opening. Furthermore, the occupational safety regulations of the facility must be observed.

The junction box is attached to the side of the adapter tube. The cover also contains an electrical connection diagram. A cable gland is available for both mains and signal cables.

The following steps have to be carried out:

- Remove the lid of the connecting box;
- Insert the mains cable through the cable gland (**use respective temperature resistant cables**) and connect it to the clamps according to wiring plan;
- Insert the signal cable through the cable connect it to the respective clamps;
- Screw the lid again;

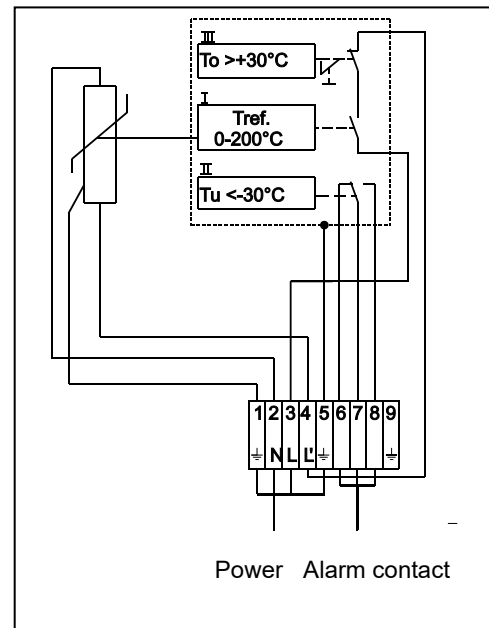


Figure 4 Electrical wiring plan

14 PREPARATIONS FOR COMMISSIONING

Before initial startup, all plant- and process-specific safety measures must be observed. It is mandatory for the operator to complete the enclosed risk assessment of the product.

The gas exposure risk must be assessed by the operator with regard to the hazards posed by process and calibration gas and the setup at the installation site (e.g. tubing, system cabinet/container/plant). If the risk assessment reveals increased exposure hazards, further measures are required.

A visible label must be attached to the installation site in accordance with the risk assessment provided by the operator.

15 STARTING UP

Before starting up, check whether the mains power supply voltage corresponds with the information stated on the type plate.

- Switch on mains power supply. The total heating-up time is approximately 2 hours. After about 1 hour the heated adapter tube is already sufficiently heated for the temperature to have exceeded the temperature failure alarm value (160 °C), but it still takes about another hour until operating temperature is reached.
- The sample gas can now be extracted via the probe after this minimum heating-up time of 2 hours.

16 MAINTENANCE

Prior to carrying out maintenance and repairs, the system and process-specific safety measures must be observed.



Warning



Prior to carrying out maintenance work on electrical parts, mains voltage should be disconnected from all poles!

This also applies to any external control circuits which may be connected.

.

Recommendations of a maintenance cycle cannot be made. Depending on the process conditions, a meaningful maintenance cycle must be determined according to the specific application.

An indication that a filter maintenance may be necessary could be shown by a constant decline of the amount of sample gas in your analyse system.

The maintenance of the adapter tube is restricted essentially to replacing the filter element and checking the seals.



Warning



Aggressive condensate is possible.

Wear protective glasses and proper protective clothing! High surface temperatures!



Wear protective gloves!

- Switch off the heating of the adapter tube and the mounted probe.
- Dismount the probe according to the probe's instruction manual.
- Change the prefilter, use new seals.
- Clean the adapter tube from inside.
- Mount the probe on the adapter tube according to the probe instruction manual. Use a new flat gasket.

17 SWITCHING OFF

Before switching off, i.e. switching off the heating, the adapter tube needs to be flushed with inert gas or air in order to avoid condensation of aggressive components from the process gas.

18 PROPER DISPOSAL OF THE DEVICE

At the end of the life cycle of our products, it is important to take care of the appropriate disposal of obsolete electrical and non-electrical devices. To help protect our environment, please follow the rules and regulations of your country regarding recycling and waste management.

19 SPARE PARTS LIST

Wear, tear and replacement part requirements depend on specific operating conditions. The recommended quantities are based on experience and they are not binding.

Heated adapter tube type AR-500-RX					
(C) Consumable parts (R) Recommended spare parts (S) Spare parts					
					Recommended quantity being in operation [years]
Part No.	Description	C/R/S	1	2	3
90S2077	Flange gasket DN 65 PN 6 (67) Novapress®	R	1	1	1
90S2081	Flange seal DN 65 PN 6 V11 (40) Novapress®	R	1	1	1
93S2340	Assembly of seals for V12-1	R	1	1	1
93S2300	SP2000/V12-1 Insitu filter tube	R	1	1	1
20S9125	SP2000/V20-2 Insitu filter tube	R	1	1	1

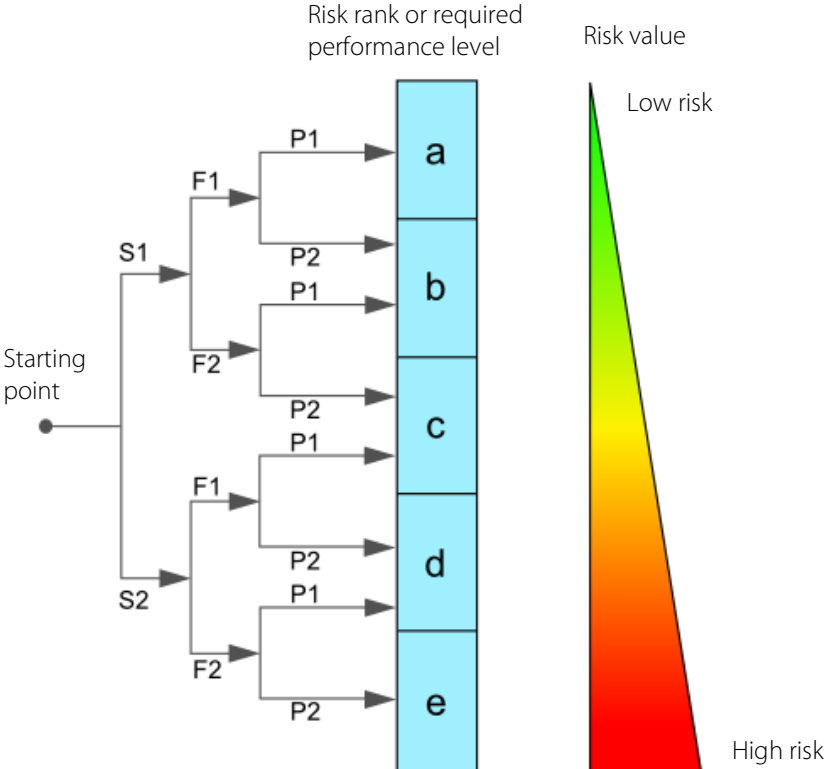
20 RISK ASSESSMENT

The risk assessment provided in this chapter is intended for all work activities on the product. The hazards can occur in the work steps of assembly, commissioning, maintenance, disassembly and in the event of a product fault. During normal operation, the product is protected by a system cabinet or appropriate covers.

Only qualified personnel is permitted to perform the work. The following minimum knowledge is required for the work:

- Employee instruction provided in process engineering
- Employee instruction provided in electrical engineering
- Detailed knowledge of the instruction manual and the applicable safety regulations

The product complies with the current regulations according to state-of-the-art science and technology. Nevertheless, not all sources of danger can be eliminated while observing technical protective measures. Therefore, the following risk assessment and the description of exposure hazards refer to the work steps mentioned above.



Severity of injury:

S1 = 1 = minor (reversible injury)
S2 = 2 = serious (irreversible injury, death)

Frequency and duration:

F1 = 1 = infrequent or short exposure to hazard
F2 = 2 = frequent (more than once per hour/shift)

Possibility of preventing or limiting the damage

P1 = 1 = possible
P2 = 2 = hardly possible

Figure 5 Overview risk assessment



Aggressive condensate possible

Risk rank group A

Chemical burns due to aggressive media possible!
This applies to all liquids in vessels and in the product.
In general, for electrical and mechanical work on the product, wear personal protective equipment (PPE) in accordance with the risk assessment.



Caution hot surfaces

Risk rank group A

The temperature inside the product can be higher than $> 180\text{ }^{\circ}\text{C}$.

The hot parts are shielded by mechanical devices. Before opening the products, they must be disconnected from the power supply and a cooling time of more than > 180 minutes must be observed. In general, for electrical and mechanical work on the product, wear personal protective equipment (PPE) in accordance with the risk assessment.



Caution electric shock

Risk rank group C

When installing high-power systems with nominal voltages of up to 1000 V , the requirements of VDE 0100 and their relevant standards and regulations must be observed!

This also applies to any connected alarm and control circuits. Before opening the products, they must always be disconnected from the power supply.



Gas hazard

Risk rank group A-B-C

The hazard potential mainly depends on the gas to be extracted.

If toxic gases, oxygen displacing or explosive gases are conveyed with the product, an additional risk assessment by the operator is mandatory.

In principle, the gas paths must be purged with inert gas or air before opening the gas-carrying parts.

The escape of potentially harmful gas from the open process connections must be prevented.

The relevant safety regulations must be observed for the media to be conveyed. If necessary, flush the gas-carrying parts with a suitable inert gas. In the event of a gas leakage, the product may only be opened with suitable PPE or with a monitoring system.

Furthermore, the work safety regulations of the operator must be observed.



Caution crushing hazard

Risk rank group A

The work must be performed by trained personnel only.

This applies to products weighing less than $< 40\text{ kg}$ [$\approx 88.2\text{ lbs}$]:

The product can be transported by 1 to 2 person(s). The instructions for appropriate personal protective equipment (PPE) must be observed.

The weight specifications are contained in the technical data of this product. Furthermore, the work safety regulations of the operator must be observed.

21 APPENDIX



Further product documentation can be seen and downloaded from our home page:
www.mc-techgroup.com

- Data sheet: Prefilter series **SP**