

Gas Sample Probe Series SP[®]

SP3110 /..

SP3110V /..

 **II 2 G**

Instruction Manual
Version 1.00.03



**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.

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Version: 1.00.03



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1 GENERAL INFORMATION

The product described in this instruction 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 instruction manual need to be followed. This instruction 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:

ATEX-Directive

The product described in this manual is produced in accordance with the EU directive for devices and protection systems for appropriate use in hazardous areas 2014/34/EU appendix II. The type of protection depends on the variant of the probe (see table 1).

EMV-Instruction

The requirements of the EU directive 2014/30/EU "Electromagnetic compatibility" 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.

RoHS Directive

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

Declaration of conformity

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



3 DEVICE STANDARD

The respective protection class depends on the gas sample probe version (see Table 1).

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4 SAFETY INFORMATION

Observe the following fundamental safety precautions when using the device:

- Read these operating instructions carefully before start-up and use of the device! The information and warnings given in these operating instructions must be heeded.
- Pay attention to the declaration of conformity (see appendix).
- Work on electrical equipment may only be carried out by qualified personnel in accordance with the current valid regulations.
- The requirements of VDE 0100 and its associated standards and regulations must be observed when erecting high-voltage power installations with rated voltages to 1000 V.
- Relevant national and international standards and regulations must be observed when using the device in potentially explosive environments.
- The device must be connected to a mains supply with the same voltage as specified on the rating plate.
- Protection against contact with high electrical voltages:
The device must be safely isolated from the mains supply before it is opened. The same applies to any connected external control circuits.
- Only use the device within the permissible temperature ranges.
- Check that the instalment location is weather protected. Do not expose directly to rain or to moisture.
- Installation, maintenance, inspection, and repair work may only be carried out by authorised personnel. Such work must be carried out in accordance with applicable rules and regulations.

5 INFORMATION ON USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES

See Table 1 for the markings of the individual variants.

Detailed information and a copy of the declaration of conformity are contained in the appendix to these operating instructions. The devices must be installed and used in accordance with the conditions and installation instructions given in the EX-Certificate (see appendix). Only then, a safe operation in potentially explosive atmospheres is guaranteed.



Any changes to the standard configuration with unspecified parts or parts not authorised by M&C as well as repair or service work with unspecified parts mean to an immediate loss of ex-certification.

*- In case of any doubt, please contact **M&C** directly or your **M&C** franchise dealer.*

6 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.

7 TERMS AND SYMBOLS USED IN THESE OPERATING INSTRUCTIONS



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.



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, commissioning, maintenance, and operation of these types of products. The following knowledge is at least required for the work:

- Instructed person in EX-protection
- Trained person in the electrotechnical field
- Detailed knowledge of the manual and the applicable safety regulations



'Ex' indicates important information about the product or about the corresponding parts in the instruction manual, relating to usage in potentially explosive atmospheres.



High voltages!

Protect yourself and others against damages which might be caused by high voltages.



Hot surface!

Contact may cause burn! Do not touch!



Corrosive!

These substances destroy living tissue and equipment upon contact.

Do not breathe vapors; avoid contact with skin and eyes.



Wear protective gloves!

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



Wear safety glasses!

Protect your eyes while working with chemicals or sharp objects.

Wear safety glasses to avoid getting something in your eyes.



Wear protective clothes!

Working with chemicals, sharp objects or extremely high temperatures requires wearing protective clothes.

8 APPLICATION

The probes of type **SP3110..** and **SP3110V..** are used for continuous gas sampling in dust-laden processes or processes with high temperatures (according to Table 5, chapter 13) or high gas moisture. The modular construction of the probes and the variety of possible options guarantee optimum adaptation of the probes to complex process and environmental conditions.

The probes of the type **SP3110..** and **SP3111V..** are available in both, an unheated and an electrically heated version.



The probes must not be used for sampling of gases or gas mixtures that could be explosive, even in absence of air or which change safety-relevant material properties. The gases or gas mixtures must also not contain any solid particles that could generate ignitable friction or percussion sparks in combination with the materials of the probe.

It is not allowed that during operation potential sources of ignition (e.g. smouldering or burning particles, glowing embers, foreign objects) are brought into the gas sample probe.

9 DESCRIPTION

The probes type **SP3110(V)..** have been designed for easy use, long life and uncomplicated service and maintenance.

The internal filter element can be replaced without the need of tools or dismounting of the sample line. After having removed the internal filter element, both the filter chamber and the sample tube can be cleaned easily.

9.1 SP3110 AND SP3110V (COMBUSTIBLE GASES):

The gas sample probes type **SP3110..** and **SP3110V..** are suitable for the sampling of gases and installation in hazardous areas of zone 1 (combustible gases). The only difference between both types is the sealing material of the filter housing. Version **SP3110** has got a filter housing sealing out of graphite for special types which are heated above 185 °C [365 °F]. Version **SP3110V** has got filter housing sealings of Viton® for special types which are heated below or up to 185 °C [365 °F]. The probe housing and all options are suitable for use in hazardous areas of zone 1 (combustible gases). Please read the identification in Table 4.

The filter system of type SP3110(V) is suitable for dusts with a fineness up to 2 µm.

After the filtration, i.e. at the outlet of the gas sample probe, the sample gas is free of dust. This means that in the absence of explosive sample gas downstream analysers can be used without any special protective measures.

The maximum surface temperature of the gas sample probe depends on the process media temperature and the used options (blow back unit RS, ball valve drive MS1 and probe heating HEX4 or HEX1). The permissible process media temperatures are not allowed to exceed 185°C [365 °F] at options 2-way-ball-valve VA and 3/2-way-ball-valve 3VA.



For variants without these last mentioned options it is not allowed to exceed 200 °C [392 °F]. The consequential maximum surface temperatures and the derivable temperature classes of the gases are shown in Table 1.

The intended use limits the process media temperature and the choice of options insofar as the maximum surface temperature has to be below the limit temperature of the flammable process dust mentioned in Table 5 resp. it has to correspond to the temperature class of the flammable process gases.

SP3110 for sampling from zone 1 flammable gases									
Type	Ex-marking	Max. process-media temperature	T-class	Max. surface temperature	Type	Ex-marking	Max. process media temperature	T-class	Max. surface temperature
SP3110 with graphite sealing					SP3110/V with Viton® sealing				
SP3110	II 2 G / 2 GD	< 68 [154.4 °F]	T6	85 [185 °F]	SP3110/V	II 2 G / 2 GD	< 68 [154.4°F]	T6	85 [185 °F]
	II 2 G / 2 GD	< 80 [176 °F]	T5	100 [212 °F]		II 2 G / 2 GD	< 80 [176 °F]	T5	100 [212 °F]
	II 2 G / 2 GD	< 108 [226.4 °F]	T4	135 [275 °F]		II 2 G / 2 GD	< 108 [226.4°F]	T4	135 [275 °F]
	II 2 G / 2 GD	< 160 [320 °F]	T3	200 [392 °F]		II 2 G / 2 GD	< 160 [320 °F]	T3	200 [392 °F]
	II 2 G / 2 GD	< 200 [392 °F]	T2	250 [482 °F]		II 2 G / 2 GD	< 185 [365 °F]	T2	232 [449.6°F]
Blow back RS with solenoid valve									
SP3110/R S	II 2 G / 2 GD	< 130 [266 °F]	T4	135 [275 °F]	SP3110/V/ RS	II 2 G / 2 GD	< 130 [266 °F]	T4	135 [275 °F]
	II 2 G / 2 GD	< 195 [383 °F]	T3	200 [392 °F]		II 2 G / 2 GD	< 185 [365 °F]	T3	190 [374 °F]
	II 2 G / 2 GD	< 200 [392 °F]	T2	205 [401 °F]					
2-way ball valve VA									
SP3110/V A (Option MS1 pneumatic drive implies at least temperatur e class T4.)	II 2 G / 2 GD	< 68 [154.4 °F]	T6	85 [185 °F]	SP3110/V/ VA (Option MS1 pneumatic drive implies at least temperatur e class T4.)	II 2 G / 2 GD	< 68 [154.4°F]	T6	85 [185 °F]
	II 2 G / 2 GD	< 80 [176 °F]	T5	100 [212 °F]		II 2 G / 2 GD	< 80 [176 °F]	T5	100 [212 °F]
	II 2 G / 2 GD	< 108 [226.4 °F]	T4	135 [275 °F]		II 2 G / 2 GD	< 108 [226.4°F]	T4	135 [275 °F]
	II 2 G / 2 GD	< 160 [320 °F]	T3	200 [392 °F]		II 2 G / 2 GD	< 160 [320 °F]	T3	200 [392 °F]
	II 1 G / 2 GD	< 185 [365 °F]	T2	232 [449.6°F]		II 2 G / 2 GD	< 185 [365 °F]	T2	232 [449.6°F]

3-way ball valve 3VA									
SP3110/3 VA (Option MS1 pneumatic drive implies at least temperatur e class T4.)	II 2 G / 2 GD	< 80 [176 °F]	T6	85 [185 °F]	SP3110/V/ 3VA (Option MS1 pneumatic drive implies at least temperatur e class T4.)	II 2 G / 2 GD	< 80 [176 °F]	T6	85 [185 °F]
	II 2 G / 2 GD	< 95 [203 °F]	T5	100 [212 °F]		II 2 G / 2 GD	< 95 [203 °F]	T5	100 [212 °F]
	II 2 G / 2 GD	< 130 [266 °F]	T4	135 [275 °F]		II 2 G / 2 GD	< 130 [266 °F]	T4	135 [275 °F]
	II 2 G / 2 GD	< 185 [365 °F]	T3	190 [374 °F]		II 2 G / 2 GD	< 185 [365 °F]	T3	190 [374 °F]
Blow back RS with solenoid valve and 2-way ball valve VA									
SP3110/R S/VA	II 2 G / 2 GD	< 130 [266 °F]	T4	135 [275 °F]	SP3110/V/ RS/VA	II 2 G / 2 GD	< 130 [266 °F]	T4	135 [275 °F]
	II 2 G / 2 GD	< 185 [365 °F]	T3	190 [374 °F]		II 2 G / 2 GD	< 185 [365 °F]	T3	190 [374 °F]
Blow back RS with solenoid valve and 3-way ball valve 3VA									
SP3110/R S/3VA	II 2 G / 2 GD	< 130 [266 °F]	T4	135 [275 °F]	SP3110/V/ RS/3VA	II 2 G / 2 GD	< 130 [266 °F]	T4	135 [275 °F]
	II 2 G / 2 GD	< 185 [365 °F]	T3	190 [374 °F]		II 2 G / 2 GD	< 185 [365 °F]	T3	190 [374 °F]
Option 2X second sample gas outletzweiter Messgasausgang possible for every version.									
Option FW spun glass possible for every version.									
Option MS1 pneumatic drive Drehantrieb implies at least temperature class T4.									
Option HEX4-135 implies at least temperature class T4.									
Option HEX4-180 implies at least temperature class T3.									

Table 1 Markings for sampling from zone 1 flammable gases

The following figure shows the basic version of the gas sample probe **SP3110(V)**.

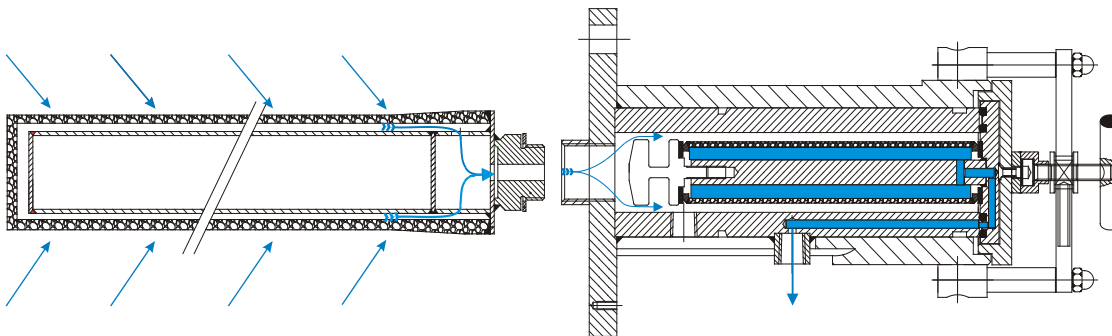


Figure 1 Probes SP3110(V) without options with preliminary filter type V20



Warning



SP3110 and SP3110V:

In case the gas-dust mixture to be examined must be classified as potentially explosive because it contains combustible gases, only downstream devices (flowmeters, analysers) with corresponding marking according to directive **2014/34/EU** must be used.

Suitable explosion isolation with a flame arrestor must be established. This instruction manual does not cover any downstream units.

For the use of sample tubes in connection with the probe SP3110(V), please look into the following table.

Sample tube Type	Part No.	Max. temp. °C	Material Tube/ Connection	Length "L1" ¹⁾ mm	Length "L max" mm	Connec tion thread "G"	Tube ø OD/ID [mm]	Connec tion ø OD "EM" [mm]
SP2000/SS	20S9065	600	Stainless steel 316Ti	1000	2500	G 3/4" male	25/22	37
SP2000/SS-Vm	20S9067	600	Stainless steel 316Ti	1000	2500	G 3/4" male	25/06	37
SP2000/HC	20S9090	900	Hastelloy® x	1000	2500	G 3/4" male	25/22	37
SP2000/KA	20S9080	1300	Kanthal®/ 316Ti	1000	1500	G 3/4" male	27/20	37
SP2000/IN	20S9077	1100	Inconel®	1000	2500	G 3/4" male	25/22	37

Table 2 Sample tubes for use with the probe SP3110(V)

In dependence on the dust composition, a filter or a preliminary filter can be selected from the table below.

Type	Part No.	Material	Dimensions [mm]	Filter fineness [µm]
Filter in the probe:				
S-3 SS150	90F0126	316L	150 x 30	2
S-2K150	90S0020	Ceramic Aerolith	150 x 30	2
Option spun glass cartridge FW				
Filter FW (spun glass)	93S2083	Spun glass, high temperature resistant		
Selectable preliminary filters:				
SP2000ST/V20-T	20S9315	PTFE needled felt (antistatic)	450 x 40	3
SP2000ST/V20-0	20S9105	316L	200 x 50	3
SP2000ST/V20-0/HC	20S9115	Hastelloy® x	200 x 50	3
SP2000ST/V20-1	20S9145	316L	500 x 60	3
SP2000ST/V20-1/HC	20S9155	Hastelloy® x	500 x 60	3
SP2000ST/V20-1/HC 0.5 µm	20S9156	Hastelloy® x	500 x 60	0.5
SP2000ST/V20-3	20S9300	316L	1000/300 x 31	3

Table 3 Possible filters and preliminary filters for use inside the probe

The preliminary filter can be extended with the following extension tubes.

Extension [mm] with volume displacer	Part No.
500	20S9165
1000	20S9170
1500	20S9175

Table 4 Extension tubes

10 OPTIONS

The following options 10.1 to 10.9 are available for use in potentially explosive atmospheres. Please see Table 4 for the markings for the respective zones.



Warning

Attention must be paid to the operating parameters when selecting options.

Diagram with Feeding of calibration gas or back-purging

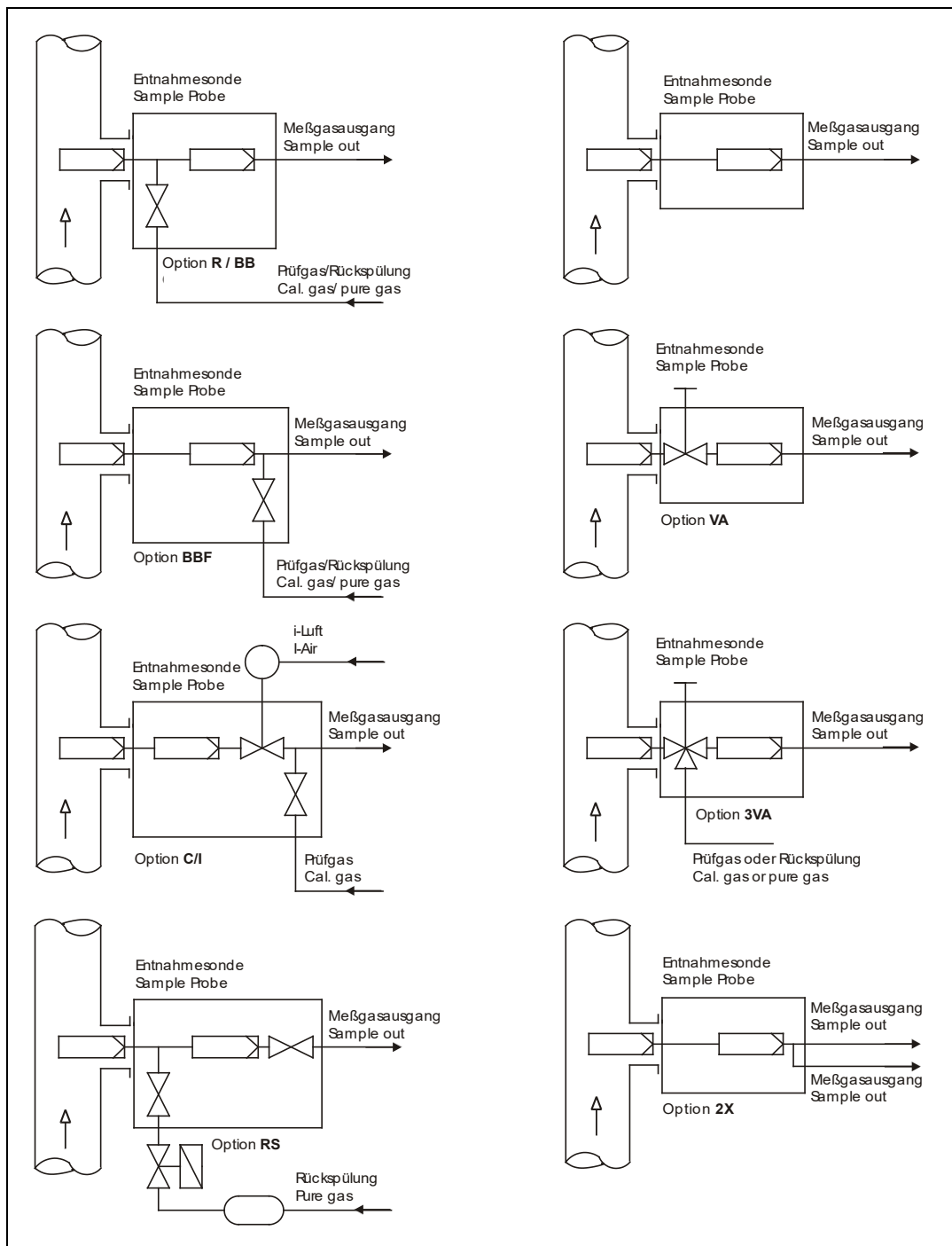


Figure 2 Schematic view of the options for back-purging and feeding of calibration gas

General safety instructions for back-purging and feeding of calibration gas

A back-purging gas suitable for the sampling point must be selected for back-purging.

The back-purging pressure must always be higher than the process pressure. This minimum pressure must be monitored with a press switch at the inlet side of the accumulator or the check valve. If the flush gas pressure drops below the process pressure, the back-purging solenoid valve must not be operated.



Warning

The maximum permissible pressures of 6 bar abs. must not be exceeded (see technical data).

Do not choose back flush intervals longer than 3 seconds because in case of strong pollution of the pre-filter pressure inside the probe would be rising and then discharging to the analyzer via the patented pressure control valve in the outlet of the probe due to a defined leak rate of this valve.

At sampling points with inerting, back-purging must be performed with corresponding inert gas. It must be ensured that the inert gas does not introduce oxygen or combustible gases into the system.

10.1 BACK-PURGING UNIT TYPE RS:

The back-purging unit type RS consists of a pressure relief valve, solenoid valve, accumulator and patented pressure control valve in the probe outlet.

The cyclical operation of the solenoid valve and monitoring of the back-purging pressure must be effected externally. The electrical connection of the solenoid valve must be made in an Ex e connection box. An additional solenoid valve in the sample gas outlet of the probe is not necessary because the patented pressure control valve shuts the probe outlet during back-purging in order to protect the downstream analysis against the pressure push of the back purge.

10.2 OPTION /R, /BB AND /BBF FOR FEEDING OF CALIBRATION GAS OR BACK-PURGING VIA CHECK VALVE R 1/4", BB 3/8" OR BBF 3/8":

For back-purging of the probe tube or the preliminary filter, flush gas is fed via the check valve. Hereby, it is recommended to separate the downstream analysing system from the probe in order to avoid pressure pushes to the system (Option /I). The opening pressure of the check valve is 0.7 bar. The flush gas or calibration gas pressure should be higher than 0.7 bar.

Options /R and /BB are for backflush of the inside space of the probe and the preliminary filter, the option /BBF is for backflush of the probe filter and the preliminary filter.



Note

In order to avoid the cooling down of the inside probe, it is recommended to effect the backflush in short intervals of < 1 s.

During the feeding of test gas, the analyze system remains connected. The quantity of test gas should be at least 25 % higher than the quantity of measuring gas which is taken in by the analysing system, thus avoiding a mixture with the test gas.

For processes with overpressure, this kind of feeding the test gas is not recommended. In this case, you should use an integrated ball valve in the inlet of the probe as stop valve.

In principle, you need only a small quantity of test gas for probes with an integrated ball valve, because the probe is separated from the process when the ball valve is activated so that there is no danger of a mixture with the process gas.

In case of manual operation, please turn the turning handle to the right side until the limit stop in order to shut off the probe.



Note

In case of low pressure operation, please take into consideration that as from 300 mbar secondary air will be taken in via the non-closed check valve.

10.3 OPTION /C/ FEEDING OF TEST GAS VIA CHECK VALVE BEHIND THE PROBE FILTER WITH PNEUMATIC STOP VALVE FOR THE PROBE OUTLET TO THE PROCESS

By activating the pneumatic stop valve with compressed air, the measuring gas way behind the probe filter is shut off. Now, you can feed test gas via the check valve to the sample gas outlet of the probe without any loss.

10.4 OPTION 2-WAY BALL VALVE /VA

For any service work, eg. changing of the filter element or cleaning works, the stop valve in the probe inlet is actuated from outside with the turning handle. This becomes necessary eg. in case of overpressure or in case of toxic gas components.



Danger

In case of toxic gas components, the probe must be flushed after shut off and before opening!

10.5 OPTION SPUN GLASS CARTRIDGE FW

For option FW the filter element is dropped and a spun glass cartridge is mounted at the filter housing lid. This spun glass cartridge is filled with a high temperature resistant spun glass. The option FW is used at sample points with risk of quickly blocking filter surfaces due to soot or sticky substances.

The use of standard filter elements S-3SS150 or S-2K150 is not possible with option FW.

10.6 OPTION /3VA FEEDING OF TEST GAS AND BACK-PURGING VIA 3/2-WAY BALL VALVE

With the 3/2-way ball valve, you can execute both functions „back-purging“ and „test gas feeding“ one after the other. Only one operation each may be automated via the pneumatic actuation.

This kind of gas feeding provides the advantage that during back-purging the downstream analyse system is automatically separated from the process, respectively, the probe is automatically separated from the process during test gas feeding. For that reason, you need a lower quantity of test gas as no mixture with the process gas may occur.

For the measuring operation, the ball valve must be put into the central position.

For back-purging, the ball valve must be put into the corresponding position.

This means in case of manual operation to turn the handle from the central position to the left side as far as it will go.

For the test gas feeding, the ball valve must be turned to the right side as far as it will go.
For the measuring operation, return the ball valve into the neutral position.

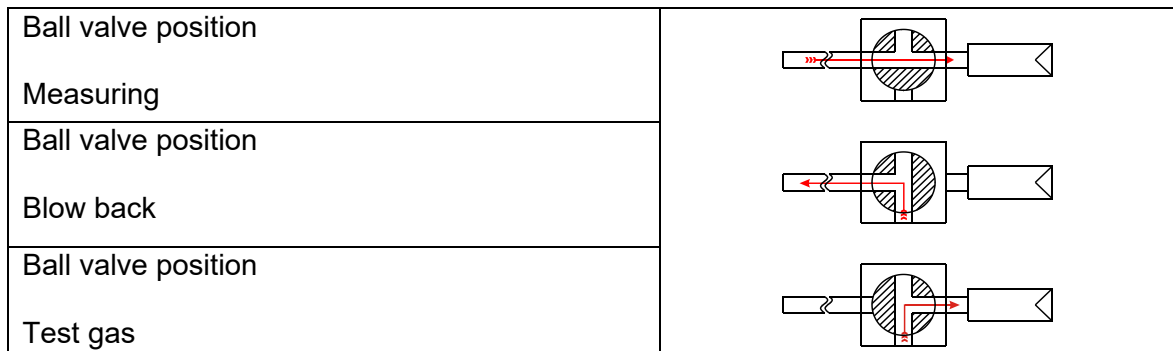


Figure 3 Function schema of option 3/2-way ball valve /3VA

For back-purge, a back-purge gas suitable for the sampling point must be selected. At sampling points with inerting, the back-purging must be performed with the appropriate inert gas. It is essential to prevent oxygen and flammable gases from being introduced into the system by the inert gas.



Warning

The back-purge pressure and test gas pressure must always be higher than the process pressure. This minimum pressure must be monitored on the inlet side with a pressure switch. If the purging gas pressure drops below the process pressure, the ball valve must not be operated.

The permissible maximum pressures of 6 bar abs. must not be exceeded (see chapter 11 Technical data)

The probes **SP3110** with back-purge option or test gas option 3VA must not be used for gas sampling from zone 0.

10.7 BALL VALVE DRIVE MS1

The following drives are available:

Pneumatic drive with spring return type **MS/ NC** or **NO**

Hereby 2 operating conditions can be realised:

a. Using a shut off ball valve VA the conditions:

"Open=measuring" and "shut".

b. Using a 3/2-way ball valve 3VA either the conditions:

"Open=measuring" and "blow back" **or**

"Open=measuring" and "test gas feeding"

Type **MS-C** for test gas feeding and type **MS-B** for blow back.

When placing the order specify, if the ball valve is

NC, (shut without control air), or

NO, (open without control air). Standard = **NC**

10.8 OPTION /2X SECOND SAMPLE GAS OUTLET ON THE PROBE

With this option, the probe has got two sample gas outlets ¼" NPT female.

10.9 PROBE HEATING

The probe heating type **HEX1-1** is suitable for temperature ranges of 0 to 185 °C [32 to 365 °F] (temperature class T3). It consists of a heating plate with heating cartridges and a control electronic Ex-de.




Please read the technical data in the separate operating instructions.




The probe heating type **HEX1-3** is suitable for temperature ranges of 0 to 185 °C [32 to 365 °F] (temperature class T3). It consists of a heating plate with heating cartridges and a control electronic for mounting in Ex-free area. Please read the technical data in the separate operating instructions.

The probe heating type **HEX4-..** is designed for two temperature ranges. It consists of a heating plate with two self-regulating heating cartridges, terminal box and weather protection shield.

Please read the technical data in the separate operating instructions of electrical heater type **HEX 4** .

11 TECHNICAL DATA

Gas sample probe type	SP3110V (up to 185 °C [365 °F])	SP3110 (more than 185 °C [365 °F])
Part No.	20S5615	20S5610
Weather protection cover	Yes	
Filter housing material	Stainless steel 316/316Ti	
Sealing materials	Graphite, FKM	Graphite
Probe flange sealing material	Graphite	
Pre-filter/sample tubes	Optional, see data sheet 2.14 and 2.17	
Sample pressure max.	0.5 to 6 bar abs.	
Ambient temperature	-20 [-4 °F] to the max. ambient temperature specified on type plate	
Permissible process gas temperature	Depending on the temperature class, however max. 200 °C [392 °F] at the probe entry	
Filter chamber volume	120 cm ³	
Filter element, porosity	F-3SS150= stainless steel*, 3 µm S-2K150= ceramic**, 2 µm	
Sample gas outlet connection	1x 1/4" NPT female for max. 8 mm-tube connectors	
Connection gas outlet at option RS	6 mm Swagelok® connector	
Mounting flange	DN 65 PN 6, Form B, SS316Ti* >DN or ANSI possible**	
Weight	7 kg [≈ 15.4 lbs]	
Marking	 II 2G/2GD -20°C ≤ Ta ≤ +60°C EXAM BVS 04 ATEX H 045X	
Admissible medium temperature	The admissible medium temperature is limited by the used materials (< 200 °C [392 °F]) and further by the maximum admissible surface temperatures as shown in Table 4.	
Option heating type HEX4	HEX4-135	HEX4-180
Part No.	20S5510	20S5520
Mounting controller	In the Ex-zone 1, 2 or 21, 22	
Control	Self-regulating	
Power supply	115 V – 230 V 50/60 Hz	
Electrical connection	Cable gland, terminal range 7 – 12 mm, terminals max. 4 mm ²	
Marking	 II 2 G Ex em T3..T4 /  II 2 D IP66 135°C...180°C EXAM BVS 04 ATEX E 253	
Case protection	IP66, EN 60529	
Power	400 W	
Max. temperature	120 °C [248 °F]	160 °C [320 °F]
Min. temperature	90 °C [194 °F]	120 °C [248 °F]
Ambient temperature	-20 to +60 °C [-4 to 140 °F]	
Low temperature alarm contact	< 60 °C [140 °F], 1 contact MC-NO, 230 V 1.5 A AC, 0.5 A DC	< 100 °C [212 °F], 1 contact MC-NO, 230 V 1.5 A AC, 0.5 A DC
Option heating type HEX1	HEX1-3	
Part No.	20S9037(a)	
Mounting controller	Outside the Ex-zone	

Gas sample probe type	SP3110V (up to 185 °C [365 °F])	SP3110 (more than 185 °C [365 °F])
Control	Electronic	
Power supply	230 V 50/60 Hz or 115 V 50/60 Hz (a)	
Electrical connection	3 x 1.5 mm ²	
Marking	 II 2 G Ex d ib IIC T3*, others on request	
Power	400 W	
Case protection	IP54, EN 60529	
Temperature	0 to 180 °C [32 to 356 °F] T3 or 0 - 135 °C [32 to 275 °F] T4	
Ambient temperature	-20 to +40 °C [-4 to 104 °F]	
Low temperature alarm contact	<120 °C [248 °F], 1 change-over contact, 230V 1.5 A AC, 0.5 A DC	
Option heating type HEX1	HEX1-1	
Part No.	20S903(a)	
Mounting controller	Inside the Ex-zone 1, 2	
Control	Electronic	
Power supply	230 V 50 Hz or 115 V 60 Hz (a)	
Electrical connection	3 x 1.5 mm ²	
Marking	 II 2 G Ex d e ib IIC T3*, others on request	
Power	400 W	
Case protection	IP54, EN 60529	
Temperature	0 to 180 °C [32 to 356 °F] T3	
Ambient temperature	-20 to +40 °C [-4 to 104 °F]	
Low temperature alarm contact	< 120 °C [248 °F], 1 change-over contact, 230 V 1.5 A AC, 0.5 A DC	
Option back purge unit type RS	RS	
Part No.	20S5560(a)	
Power supply	230 V 50/60 Hz 9 W or 115 V 50/60 Hz 9 W (a)	
Electrical connection	Cable 3 x 1 mm ²	
Marking	 II 2GD Ex m II 135 °C	
Connection	G 1/2"i at the buffer vessel	
Max. back purge pressure	6 bar abs.	
Volume buffer vessel	2 liters	
Ambient temperature	-20 to 55 °C [-4 to 131 °F]	
Option 2-way-ball valve in the probe entrance	/VA	
Part No.	20S9050	
Operating temperature	-20 up to 185 °C [-4 up to 365 °F]	
Option 2/3-way-ball valve in the probe entrance	/3VA	
Part No.	20S9325	
Backflush / Test gas connection	6 mm tube	

Gas sample probe type	SP3110V (up to 185 °C [365 °F])	SP3110 (more than 185 °C [365 °F])
Operating temperature	-20 up to +185°C [-4 up to 365 °F]	
Option pneum. drive for ball valve /VA o. /3VA	MS1	
Part No.	20S9055	
Connection control air	G 1/4" female	
Pressure control air	5 to 10 bar	
Option valve for blowback or calibration gas 1/4"	/R	
Part No.	20S9045	
Opening pressure	> 0.7 bar	
Connection	6 mm tube	
Maximum blow back pressure	6 bar abs.	
Maximum operating temperature	+185 °C [365 °F]	
Option high performance blow back valve	/BB	/BBF
Part No.	20S9008	20S9006
Way of blow back gas	Via filter chamber	Via probe filter element
Check valve	High performance check valve 3/8"	
Opening pressure	> 0.7 bar	
Connection	8 mm tube	
Maximum blow back pressure	6 bar abs.	
Maximum operating temperature	185 °C [365 °F]	
Option test gas valve/shut-off valve	/C + /I	
Part No.	20S9011 + 20S9009	
Way of test gas	Via sample gas outlet with shut-off to the process	
Check valve	check valve 1/4"	
Opening pressure	> 0.7 bar	
Connection	6 mm tube	
Shut-off valve	Bellow-type valve with pneumatic drive	
Pressure control air	3 to 10 bar	
Connection control air	1/8" NPT female	
Option second sample gas outlet	/2X	
Part No.	20S9015	
Connection	1/4" NPT female	
Option spun glass cartridge	/FW	
Part No.	20S9047	20S9046
Material	SS316Ti, Novapress®	SS316Ti, Graphite

11.1 MAXIMUM SURFACE TEMPERATURE OF THE GAS SAMPLE PROBE

The maximum surface temperature of the gas sample probe depends on the process media temperature and the used options (blow back unit RS, ball valve drive MS1 and probe heating HEX4 or HEX1). The permissible process media temperatures are not allowed to exceed 185 °C [365 °F] at options 2-way-ball-valve VA and 3/2-way-ball-valve 3VA.



For variants without these last mentioned options it is not allowed to exceed 200 °C [392 °F]. The consequential maximum surface temperatures and the derivable temperature classes of the gases are shown in Table 1.

The intended use limits the process media temperature and the choice of options insofar as the maximum surface temperature has to be below the limit temperature of the flammable process dust mentioned in Table 5 resp. it has to correspond to the temperature class of the flammable process gases.

12 RECEIPT AND STORAGE

- The probe and any special accessories should be unpacked carefully immediately upon delivery and checked against the delivery note for completeness.
- The delivery should be checked for transport damage and the transport insurer notified immediately of any damage.
- The gas sample probe is usually delivered in two packages:
 - gas sample probe with the necessary fastening bolts, nuts and flange gasket;
 - sample tube or preliminary filter – possibly with extension tube.



Note

The probe should be stored in a room protected from frost!

13 PREPARATIONS FOR INSTALLATION

- First make sure that conditions at the intended place of use correspond to the data on the rating plate.
- The temperature of the process must be taken into account when selecting the sampling point.
- Heating of the probe or preliminary filter above the temperature limit given in table 5 must be prevented.
- **It must be ensured that the temperature class of the probe corresponds to the ignition temperatures of the combustible gases/vapours.**



Warning



- Select the optimum sampling point in accordance with general guidelines or agree on a sampling point with the responsible authorities.
- Place the sampling point in such a way that there is sufficient space for installation and removal of the probe. Do not forget to include the insertion length of the sample tube in your considerations.
- Easy access to the probe must be ensured to facilitate later maintenance work.
- The customer-side sample nozzle should be dimensioned so that the temperature of the nozzle is always above the process dew point to prevent corrosion and blockages.
- If the ambient temperature in the nozzle area is higher than the maximum ambient temperature specified on the type plate due to radiant heat, a radiant heat reflection plate must be installed on site to protect the probe.
- The mounting flange connection for the nozzle should be DN 65 PN 6. If another connection size is desired, an optional intermediate flange adapter **/SO10** is available.
- The necessary minimum flange size or minimum nozzle diameter depends on the diameter of the sample tube or preliminary filter used.

The prevailing operating parameters must be checked against the following table prior to installation:

Operating parameters for combustible gas (SP3110(V))			
Gas composition	<input type="checkbox"/> <input type="checkbox"/> Corrosive	<input type="checkbox"/> <input type="checkbox"/> Toxic	<input type="checkbox"/> <input type="checkbox"/> Explosive
Zone classification process side			
Zone classification environment			
Ignition temperature of the gas/vapours	°C (> max. surface temperature from table 4)	Corresponds to temperature class	
Explosion group	<input type="checkbox"/> <input type="checkbox"/> IIA	<input type="checkbox"/> <input type="checkbox"/> IIB	<input type="checkbox"/> <input type="checkbox"/> IIC
Process conditions			
Low pressure/Overpressure situation	mbar	mbar	
Process temperature	min. °C,	max. °C,	
What parameters should be measured, e.g. O ₂ , CO, SO ₂ , NOX,...	vol%	mg/Nm ³	ppm
Required gas flow rate	min. l/h,	max. l/h,	
Necessary T90 time	sec.		

Table 5 Operating parameters

14 INSTALLATION

The **M&C** probes **SP3110** and **SP3110V** have been developed for stationary use. With correct selection and installation, they will guarantee many years of trouble-free service with a minimum of maintenance.

We recommend a horizontal mounting position with the sample gas outlet showing downwards (this is not absolutely essential for proper functioning of the probe). The probe should be installed with an inclination of approximately 10° with respect to the process.



Warning

Qualified personnel

Work on the gas sample probe may only be carried out by qualified personnel when the process and environment have been declared to explosion-free zones, i.e. they are free of explosive atmospheres.



The following procedure is recommended:

- Remove the probe cover after opening the two toggle-type fasteners.

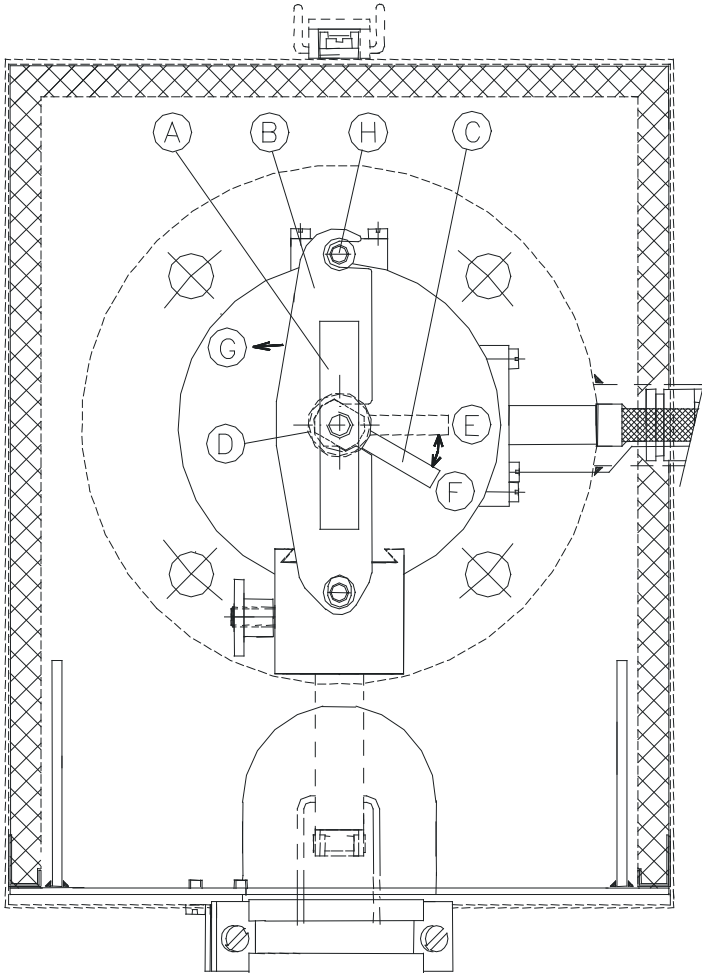


Figure 4 Schematic drawing of the filter housing cover

Turn handle **A** about one full turn anticlockwise so that the cover is lifted.

- Place handle **C** in position **E**.
- Swing out clamp **B** to the left (in the direction of **G**).
- Pull out the filter housing cover with handle **A**.

The following figures illustrate the steps described above.

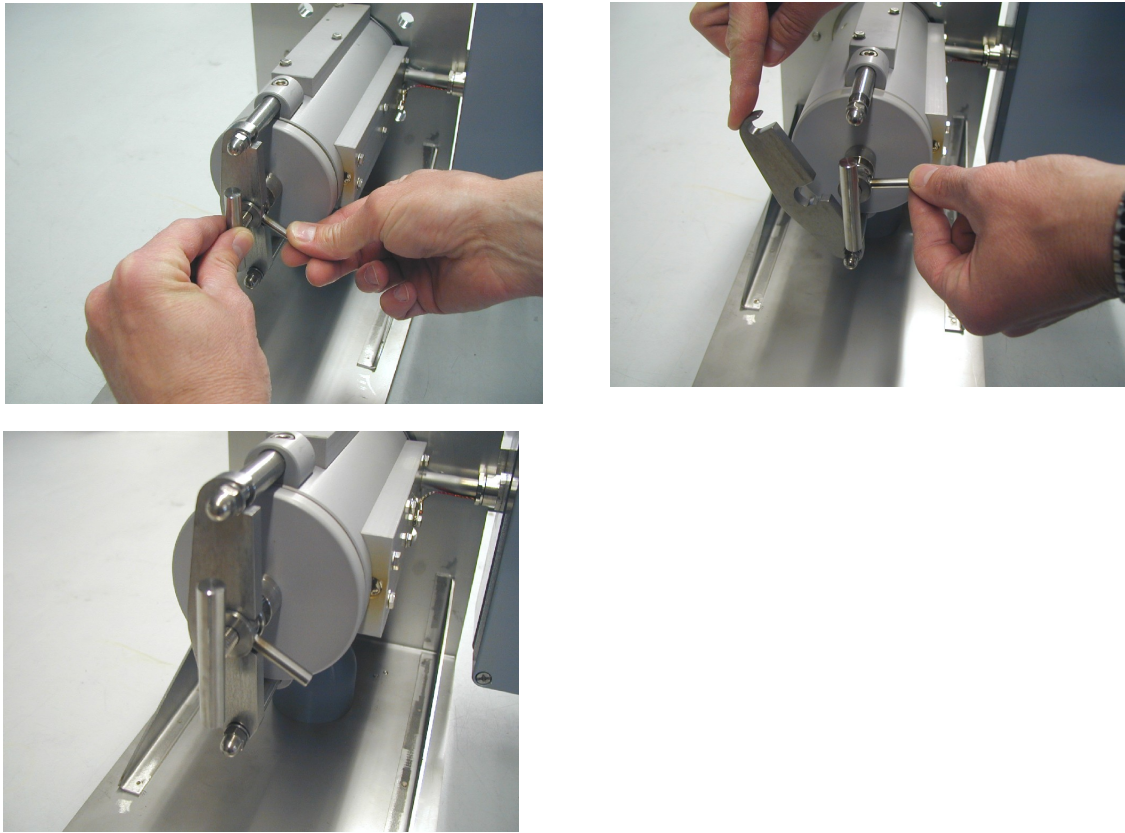


Figure 5 Removal of the filter housing cover

- Check that the filter element is screwed on firmly.
- Insert the filter holder part again.

The filter holder part is closed in reverse order.

- Push the $\frac{3}{4}$ " flat gasket on to the thread of the preliminary filter or extension tube, screw the filter or tube into the $\frac{3}{4}$ " internal thread in the flange and tighten.

If the sample nozzle does not match with the size of the standard flange connection DN 65 PN 6, mount the optional flange adapter attached to the consignment on to the probe in the same way.

- Place the flange gasket on to the sample nozzle.
- Insert the complete probe unit into the process-side sample nozzle and screw tight with the nuts and bolts delivered.

14.1 CONNECTION OF THE SAMPLE LINE

- A 1/4" NPT female thread is provided on the probe side for connection of the sample line. Suitable connecting unions for explosion-protected lines in the sizes Ø 6 mm (standard), 8 mm or 10 mm can be screwed into this thread using PTFE sealing tape.



Warning

The fittings must be tightened carefully to avoid damaging the internal components. The fittings must not be overtightened.

In the event of leaks do not tighten the fittings further. Instead, the relevant fitting should be removed completely and then refitted.

Then check the connection for leaks.

The sample line is connected as follows:

- Loosen the toggle-type fasteners on the isolating cover and remove the cover.
- Loosen the thumb screw of the heat conducting plates and remove the plates.
- Screw a suitable union into the probe head using sealing tape.
- Remove the top part of the sample line mounting clamp and insert the sample line through the silicon cap in the bottom part of the bracket plate and into the union.
- Screw on the top part of the mounting clamp. In the case of larger sample line diameters it might be necessary for centric mounting of the sample line to move a little the small mounting bracket of the mounting clamp after having loosened the two screws and then tighten again.
- Connect the line to the union. For Swagelok® fittings:
 - Insert the line with supporting sleeve fully into the union.
 - Tighten the union nut finger-tight.
 - Before tightening, mark the union nut in 6 o'clock position.
 - Grip the body with a spanner and tighten the union nut by 1¼ turns; after a full turn, the marking must be turned further to 9 o'clock position.
- Then place the heat conducting plates in the guide slots on the side of the sample gas connection and tighten with the thumb screw.



Note

A supporting sleeve must always be used when connecting hose assemblies to stainless steel unions.

The connection must be checked for leaks.

When using the option back-purging unit /RS the corresponding line must be connected to the accumulator.

A back-purging gas suitable for the sampling point must be selected for back-purging.

The back-purging pressure must always be higher than the process pressure. This minimum pressure must be monitored at the inlet side of the accumulator with a pressure monitoring switch. If the flush gas pressure drops below the process pressure, the back-purging solenoid valve must not be operated.

At sampling points with inerting, back-purging must be performed with corresponding inert gas. It must be ensured that the inert gas does not introduce oxygen or combustible gases into the system.




Warning

The back-purging pressure must not exceed 6 bar abs.

Do not choose back purge intervals longer than 3 seconds because in case of strong pollution of the pre-filter pressure inside the probe would be rising and then discharging to the analyzer via the patented pressure control valve in the outlet of the probe due to a defined leak rate of this valve.

The probe SP3110 with back-purging option must not be used for gas sampling from Zone 0.

When using the back-purging unit on the probe SP3110, the identification of the probe is  II 2 G/ 2 GD.

- Now, refit the cover and fasten it with the toggle-type fasteners.

The probe and all options must be earthed. The leak resistance must be $< 10^6 \Omega$ everywhere.



Warning



The function of the probe must be monitored by a flow controller at the downstream analyser. A steady decline in the sample gas flow can be an indication of a need for maintenance work on the probe. The probe must be serviced when the flow rate drops below 50 %.

Check probe after installation for tightness.

For option **3VA** connect the suitable tube (blow back or test gas) at the probe.

A back-purging gas suitable for the sampling point must be selected for back-purging. At sampling points with inerting, back-purging must be performed with corresponding inert gas. It must be ensured that the inert gas does not introduce oxygen or combustible gases into the system.

The back-purging pressure must always be higher than the process pressure. This minimum pressure must be monitored with a press switch at the inlet side of the accumulator or the check valve. If the flush gas pressure drops below the process pressure, the back-purging solenoid valve must not be operated.



Warning

The maximum permissible pressures of 6 bar abs. must not be exceeded (see chapter 11 Technical data).

The probes **SP3110** and **SP3110V** with blow back option or test gas option 3VA must not be used for taking sample from zone 0.

For option pneumatic ball valve drive **MS1** connect the suitable tube (e.g. control air) at the probe.

The permissible pressures of 3 up to 8 bar are not allowed to be exceeded or to fall below (see chapter 11 Technical data).

The used pressure air can be dry or oily.

15 ELECTRICAL CONNECTIONS



Warning

A wrong supply voltage can damage the device. Make sure that the supply voltage corresponds to the voltage shown on the rating plate before connecting the device.



The requirements of VDE 0100 and its associated standards and regulations must be observed when erecting high-voltage power installations with rated voltages of up to 1000 V! In any case, we recommend the use of heat-resistant cables.



An external main switch must be provided.



The cable of the solenoid valve must be connected in a suitable Ex e connection box.

A fuse suitable for the rated current of the solenoid valve (max. 3xIB per DIN 41571 or IEC 127) or protective motor switch with short-circuit and thermal rapid release (set on the rated current) must be installed in front of the solenoid valve as short circuit protection.

**Warning**

The rated voltage of the fuse must be equal to or higher than the specified rated voltage of the solenoid valve. The breaking capacity of the fuse link must be equal to or higher than the maximum conceivable short circuit current at the place of installation (usually 1500 A). The fuse value is specified on the solenoid coil.

**Fuse:****0.1 A for 230V/50 Hz****0.2 A for 115V/60 Hz****1 A for 24 V****Note**

The solenoid valve should be operated cyclically every 60 minutes (carry out min. 1 pulse/s).

16 START-UP

The requirements of VDE 0100 and its associated standards and regulations must be observed when erecting high-voltage power installations with rated voltages of up to 1000 V.



An external main switch must be provided.

The control circuit of the solenoid valve must be protected with a 0.1A_T fuse for 230 V/50 Hz, a 0.2 A_T fuse for 115 V/60 Hz or a 1 A_T fuse for 24 V.

Make sure that the supply voltage corresponds to the voltage shown on the rating plate before starting the device.

Switch on the power supply.

**Caution**

At ambient temperatures higher than 40 °C [104 °F], the temperature at the protective or isolating cover is higher than 60 °C [140 °F].



Wear protective gloves.

17 MAINTENANCE



When working during operation:

High surface temperatures!

Touching the surfaces can result in burns. Wear protective gloves.



Aggressive condensate possible!

Wear safety goggles and suitable protective clothing.



Warning

The requirements of VDE 0100 and its associated standards and regulations must be observed when erecting and servicing high-voltage power installations with rated voltages of up to 1000 V!



Work on the gas sample probe must only be carried out when the environment has been declared as non-hazardous area, i.e. it is free of explosive atmospheres.



Warning

The process side must also be declared as non-hazardous area – free of explosive atmospheres – before the filter chamber is opened.



The back-purging unit must be switched off before the filter chamber is opened.

The gas sample probe with preliminary filter and internal filter must be checked for temperature and dust deposits in suitable intervals of time depending on the process conditions. Dust layers of more than 5 mm [$\approx 0.2''$] must be removed immediately. The filters must be checked for damage and replaced if necessary. Also remove the dust deposits under the cover.



The probe must be shut down when the respective maximum surface temperature is exceeded.

The system and process-specific safety measures must be observed for all maintenance work.

Maintenance intervals cannot be recommended. They must be determined on site depending on the specific application and process conditions. An indication of the need for maintenance work on the probe can be a steady decline in the sample gas flow to the analyser system.

Check the probe every 3 years latest.

The testing steps are described as follows.

17.1 REPLACEMENT OF THE FILTER ELEMENT

Maintenance of the probe is mainly limited to replacement of the filter elements and inspection of the seals and gaskets. For this:

For probes with graphite sealing the lid sealing has to be changed whenever the probe is opened.

Probes Sp3xxx/V have O-ring sealings which have to be changed only in case of damage or embrittlement.



Warning

Necessary spare parts (1pc. each).
Graphite sealing M&C Part No. 93S0030

O-ring for probes Sp3xxx/V
O-ring 39 Part No. 93S0020
O-ring 55 Part No. 93S0025

- Remove the protective cover after opening the toggle-type fasteners.
- Dismount the filter holder part (see Figure 3).
- Unscrew the filter thumb screw and replace the filter element.
- Inspect the filter element seals and replace them if necessary.
- Inspect the flat graphite or Viton® gasket in the cover and replace if necessary.
- Clean the filter chamber.
- Insert the filter holder part again and tighten hand-tight.
- Fit the protective cover.
- **Check tightness of the probe after each opening**



Warning

Any replacement gaskets required must be made of graphite or Viton®.

17.2 REPLACEMENT OF THE PRELIMINARY FILTER

The complete probe unit must be removed from the process before replacing the preliminary filter. The preliminary filter can, depending on the type and degree of contamination, be cleaned mechanically or in an ultrasonic bath and is then reusable.

17.3 BACK-PURGING OPTION RS

For probes with option RS function and tightness of the solenoid valve and the non-return valve have to be checked.

17.4 BALL VALVE VA OR 3VA

For probes with option ball valve function and tightness of the ball valve have to be checked. Also grounding resp. the copper band at the driving shaft has to be checked for proper condition.

17.5 BALL VALVE DRIVE MS1

For probes with option ball valve drive function and tightness of the drive have to be checked.

17.6 CLEANING OF THE PROBE

The gas sample probe must be inspected at suitable intervals in time. Dust layers of more than 5 mm [≈ 0.2 "] must be removed immediately. The dust deposits under the cover must also be removed.



Warning

To prevent static charging, the probe should always be cleaned with a moist cloth.

18 SHUTDOWN

Before shutdown, i.e. switching off the heater, the probe should be flushed with a suitable inert gas to prevent condensation of aggressive components of the process gas.

19 PROPER DISPOSAL OF THE DEVICE

At the end of the service life 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, follow the rules and regulations of your country regarding recycling and waste management.

20 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.

Gas sample probe SP3110 and SP3110V					
(C) Consumable parts (R) Recommended spare parts (S) Spare parts					
					Recommended quantity being in operation [years]
Part No.	Indication	C/R/S	1	2	3
90F0126	Filter element F-3SS150 , SS 316L, 3 µm, 150 mm	C	6	12	18
90S0020	Filter element S-2K150 , ceramic, 2 µm, 150 mm	C	6	12	18
93S0055	Gasket (30) for filter element, material graphite	R	4	8	12
93S0020	O-ring (39) for lid SP3110V, material FKM	R	2	4	8
93S0025	O-ring (55) for lid SP3110V, material FKM	R	2	4	8
93S0030	Gasket (69) for lid SP3110, material graphite	R	2	4	8
90S2072	Gasket for sample tube, 3/4", material graphite	R	1	2	3
90S2084	Flange seal DN 65 PN 6 (67mm ID.), material graphite	R	1	1	1

21 APPENDIX

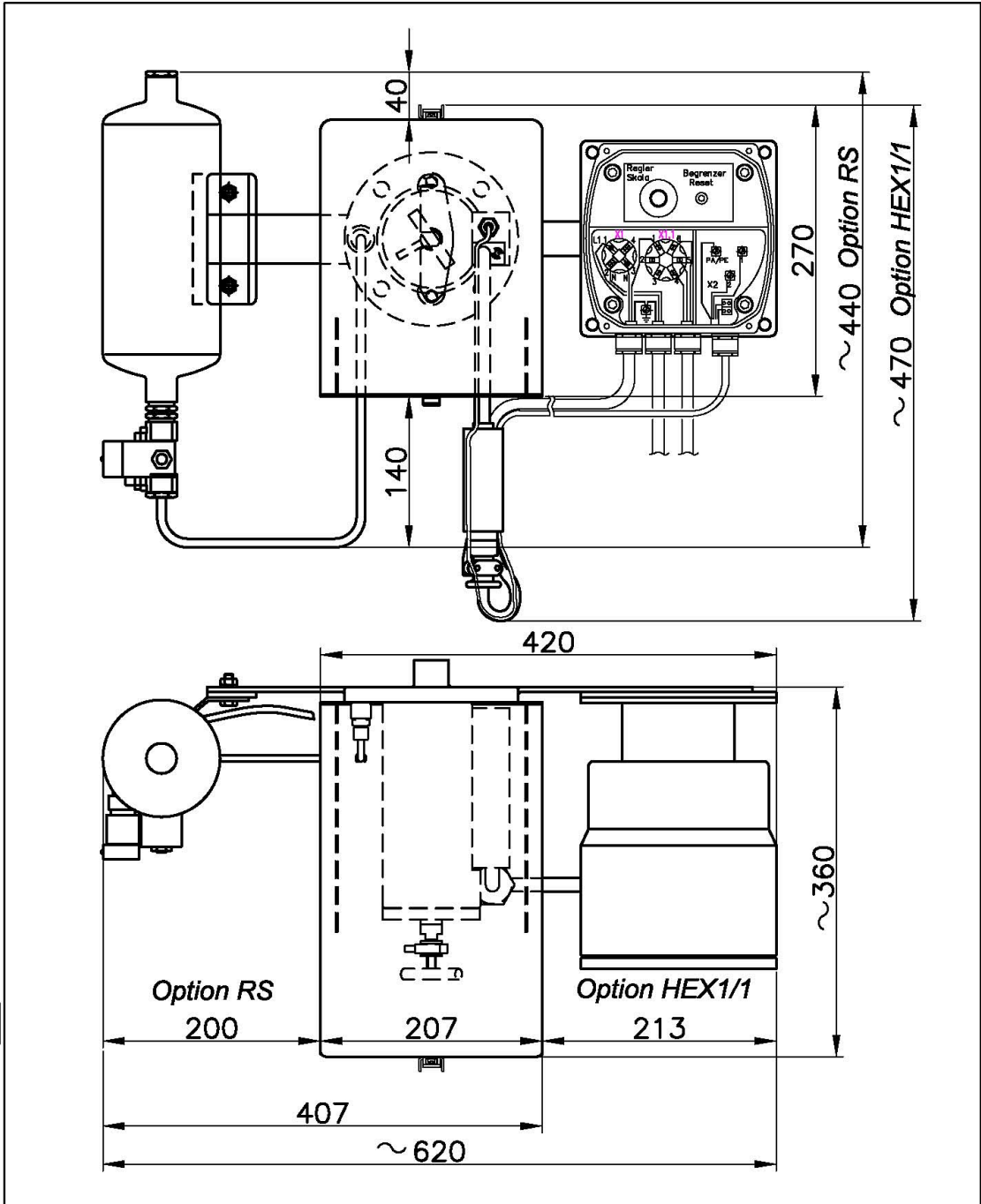
- Drawing **SP3110 RS, HEX1/1**
- Drawing **SP3110 RS, HEX4**



Further product documentation can be found in and downloaded from our online catalogue at www.mc-techgroup.com

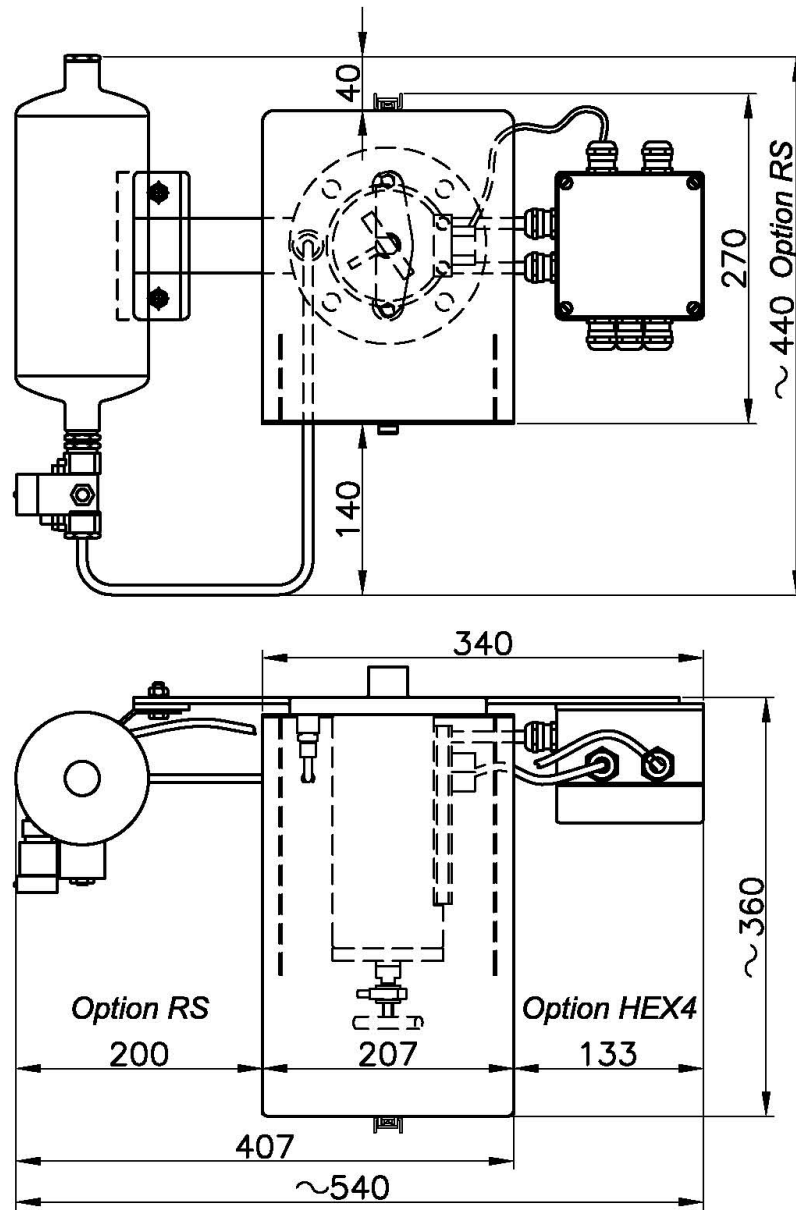


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		Maße ohne Toleranzangabe nach DIN 7168 m		Oberflächenzeichen nach DIN ISO 1302 Reihe 2 Format DIN A4 quer		Maßstab 1:5		Art.Nr.:	
				Datum		Werkstoff		%	
		Bear. 12.01.05		Name		Benennung		Baumaße SP3110	
		Gepr.		Ge.				RS, HEX1/1	
		Norm				Zeichnungs-Nr.		Blatt	
		M&C Products Analystechnik GmbH Rehhecke 79 40885 Ratingen				2467-1.06.5		1	
								1 Bl.	
Zust.	Änderung	Datum	Name	(Urspr.)	(Ers.f.:			(Ers.d.:	

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				Maße ohne Toleranzangabe nach DIN 7168 m	Oberflächenzeichen nach DIN ISO 1302 Reihe 2 Format DIN A4 quer	Maßstab 1:5	Art.Nr.:
					Datum	Werkstoff	
				Bear. 12.01.05	Name	%	
				Gepr.	Ge.	Benennung	
				Norm		Baumaße SP3110 RS, HEX4	
						Zeichnungs-Nr.	Blatt
						2467-1.06.4	1
							1 Bl.
Zust.	Änderung	Datum	Name	(Urspr.)	(Ers.f.)	(Ers.d.)	