Embracing Challenge M&C®

Electrically Heated Separator Series SDH

SDH-1, SDH-2

Instruction Manual
Version 1.00.01

Dear customer,

we have made up this operating manual in such a way that all necessary information about the product can be found and understood quickly and easily.
Should you still have any question, please do not hesitate to contact **M&C** directly or go through your appointed dealer. Respective contact addresses are to be found in the annexe to this operating manual. Please also contact our homepage **www.mc-techgroup.com** for further information about our products. There, you can read or download the data sheets and operating manuals of all **M&C** products as well as further information in German, English and French.

Version: 1.00.01

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1 GENERAL INFORMATION

The product described in this operating manual has been examined before delivery and left our works in perfect condition related to safety regulations. In order to keep this condition and to guarantee a safe operation, it is important to heed the notes and prescriptions made in this operating manual. Furthermore, attention must be paid to appropriate transportation, correct storage, as well as professional installation and maintenance work.
All necessary information a skilled staff will need for appropriate use of this product are given in this operating manual.

2 DECLARATION OF CONFORMITY

CE - Certification

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.

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

Please take care of the following basic safety procedures when mounting, starting up or operating this equipment:

Read this operating manual before starting up and use of the equipment. The information and warnings given in this operating manual must be heeded.

Any work on electrical equipment is only to be carried out by trained specialists as per the regulations currently in force.

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

Check the details on the type plate to ensure that the equipment is connected to the correct mains voltage.

Protection against touching dangerously high electrical voltages:
Before opening the equipment, it must be switched off and hold no voltages. This also applies to any external control circuits that are connected.

The device is only to be used within the permitted range of temperatures and pressures.

Check that the location is weather-protected. It should not be subject to either direct rain or moisture.

The device must not be used in hazardous areas.

Installation, maintenance, monitoring and any repairs may only be done by authorized personnel with respect to the relevant stipulations.

4 WARRANTY

If the equipment fails, please contact **M&C** directly or else go via your appointed **M&C** dealer.
We offer a one year warranty as of the day of delivery as per our normal terms and conditions of sale and assuming technically correct operation of the device. Consumables are hereby excluded. The terms of the warranty cover repair at the factory at no cost or the replacement at no cost of the equipment free ex user location. Reshipments must be sent in a sufficient and proper protective packaging.

5 USED TERMS AND SIGNAL INDICATIONS

 **DANGER!**	This means that death, severe physical injuries and/or important material damages **will occur** in case the respective safety measures are not fulfilled.
 **WARNING!**	This means that death, severe physical injuries and/or important material damages **may occur** in case the respective safety measures are not fulfilled.
 **CAUTION!**	This means that minor physical injuries **may occur** in case the respective safety measures are not fulfilled.
CAUTION!	Without the warning triangle means that a material damage may **occur** in case the respective safety measures are not met.
ATTENTION	This means that an unintentional situation or an unintentional status **may occur** in case the respective note is not respected.
 **NOTE!**	These are important information about the product or parts of the operating manual which require user's attention.
SKILLED STAFF	These are persons with necessary qualification who are familiar with installation, use and maintenance of the product.

6 INTRODUCTION

A great problem during extractive and continuous gas analysis are the gas components leading to salt formation when the sample gas is cooled down. This would result in choking of the downstream conditioning.
In order to realize a measurement easy to maintain, this interfering components have to be separated.

The heated **M&C** separators series **SDH** provide a solution for this problem. Adequately adapted to the process conditions, these separators allow a minimum of maintenance.

During the continuous gas sampling for the analytical measurement, a selective precipitation and removal of the interfering components in the separators **SDH** happens. This way, a great extent of maintenance work on the analysing system is avoided.

7 APPLICATION

The separators type **SDH** are used for continuous gas sampling in processes where solid particles may precipitate when the sample gas is cooled down. **M&C** has developed these separators for e.g. continuous gas sampling in waste gas of DENOX plants (SCR) where NH_3 is added to the flue gas in order to reduce the NO_X content. With temperatures below 300 °C, ammonium salts precipitate due to the chemical reaction of NH_3 and SO_2/SO_3 in the flue gas. This salification will choke filters and sample lines in a very short time and so lead to an interruption of the continuous measurement.

8 TECHNICAL DATA

Heated separator type	**SDH-1**	**SDH-2**
Part number	01F3505 (a)	01F3500 (a)
Temperature regulation	Thermostat	electronic temperature controller
Heating	max. 320 °C	
Ambient temperature	+5 °C to +60 °C ** optionally with GRP-housing -20 °C to +60 °C	
Media wetted parts	FPM, glass, PTFE, SS316Ti, Hastelloy	
Sampling pressure max.	0,4 –2 bar abs.	
Volume	ca. 500 cm^3 without volume displacer balls	
Ready for work	after 0,5h	
Connection gas outlet	Threaded hose coupling DN 4/6	
Connection gas inlet	Pipe connection Ø 8 mm	
Power supply	230V 50/60Hz, 350W, optionally 115V 60Hz (a)	
Electrical connection	Terminals max. 2,5 mm^2, clamping range 0,75 – 4mm	
Standard of electrical equipment	EN 61010, EN 60519-1	
Weight	8 kg	
Options		
Condensate removal with peristaltic pump SR25.1-G, completely mounted, with tubing and electrical connection		
Volume displacer balls for extension of the reaction surface, Art. Nr. 93F0145		

***** = Standard ** = Option

9 DESCRIPTION

The separators have been designed for easy mounting, safe operation, easy maintenance and a great variety of applications.
For separator **SDH-1** the temperature control is done by an integrated capillary thermostat, adjustable in a range of 50 to 320°C, incl. excess temperature limiter and low temperature alarm. For separator **SDH-2** the temperature control is done by an electronic controller 70304G with excess and low temperature alarm as well as excess temperature limiter with shutoff.
The sample gas is lead via a heated connection adapter into a non-heated collection vessel. Inside the glass vessel, filled with glass balls (option) to enlarge the surface, the chemical reaction of the sample gas takes place and the solid particles and salts are deposited. Additionally water vapour is condensing in the vessel.
The evolved solids resp. salt deposits dissolve in the condensate. Via the optionally available peristaltic pump SR25.1G this solution is removed.

Because of the heated connection adapter and the hot gas flow, the operating temperature inside of the collection vessel is increased in comparison to the ambient temperature.
Due to the fact that the gas components are solved to a negligible extent in the warm condensate, the application of this sampling technique in DENOX systems with a low content of NH_3 (normally a few ppm) allows to analyse SO_2 and NO_X without important losses. These will be a few ppm only and can normally be neglected. In order to examine the extent of the losses exactly, test gas can be fed via the separator to determine the possible measuring fault that can be considered for calibration afterwards.

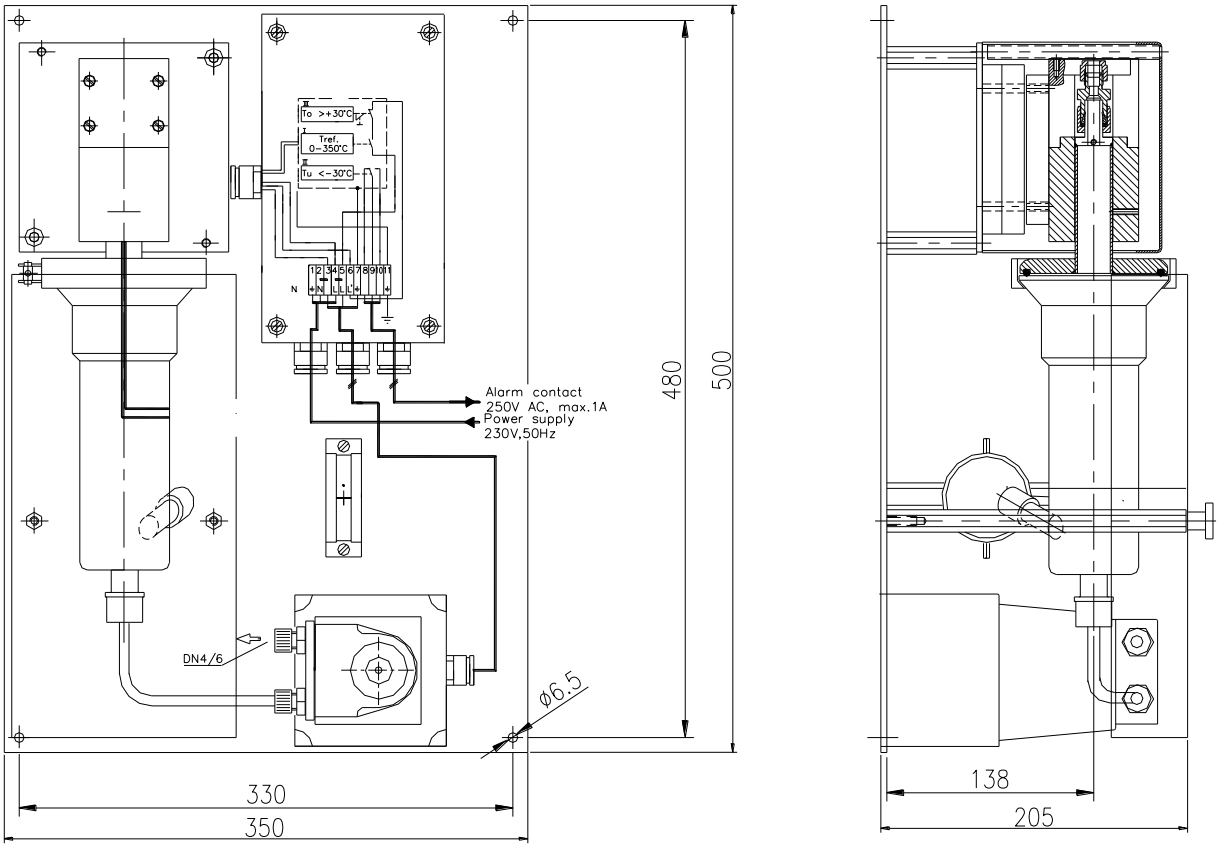

Figure 1 Construction of the separator SDH-1 with option peristaltic pump

10 RECEIPT OF GOODS AND STORAGE

- The heated separator and any special accessories 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.

The heated separator normally is delivered in one packaging unit.

NOTE!

The equipment should be stored in a protected, frost-free room!

11 INSTALLATION INSTRUCTIONS

The **M&C** separators **SDH-1** and **SDH-2** are arranged on a mounting plate for wall mounting. The mounting plate is fixed with 4 screws (see Fig. 1).

NOTE!

The perfect function of the seperation and drainage procedures will only be guaranteed if the equipment is used in a vertical position.

The heated separator should be installed in an area well away from any heat emitting sources in order to prevent demage caused by an accumulation of heat.
Pay attention to a non critical installation for individuals.

In winter, the equipment has only to be used in frost-free areas; observe the degree of protection.

12 SUPPLY CONNECTIONS

12.1 MOUNTING THE SAMPLE LINE

- Open the fastening clip for the heated sample line.
- Unscrew the union nut ① of the connecting adapter GL18-DN4/6 and put it together with the clamping ring ② in the correct order and direction over the 6mm PTFE core of the heated sample line.
- Put the PTFE core on the connection piece ③ inside of the connection adapter and fasten the union nut with clamping ring hand-tight.
- Shut the fastening clip for the heated sample line.

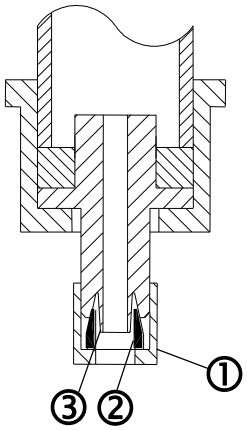

Figure 2 Tube connection on GL adapter

NOTE!

For the separators it is important to use a heated line with exchangeable PTFE core only.

12.2 CONNECTING THE CONDENSATE REMOVAL

The connection of the condensate removal has to be carried out at the GL-adapter in the bottom of the separator glass. With option peristaltic pump the connection has to be carried out at the fitting DN4/6 of the condensate outlet of the pump. In order to remove the condensate, a tube with 6mm outer diameter has to be connected to the condensate outlet DN4/6.

WARNING!

Aggressive condensate possible.

Wear safety glasses and appropriate protective clothes!

12.3 ELECTRICAL CONNECTION

WARNING!

Wrong supply voltage can destroy the equipment. When conecting the device, please ensure that the supply voltage is identical with the information provided on the type plate!

WARNING!

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

12.3.1 VERSION SDH-1 WITH CAPILLARY TUBE THERMOSTAT

The electrical connection is to be made according to the terminal connecting plan as shown in figure 3 and described as follows:

- Remove the lid of the connection box. Inside of the lid, there is the terminal connecting plan.
- Insert the mains cable (min. 3 x 1,5 mm^2, terminal range 6-12mm) through the left cable gland and connect it to the appropriate terminals.
- Insert the signal cable (terminal range 6-12mm) through the right cable gland and connect it to the appropriate terminals.
- Screw lid on again.

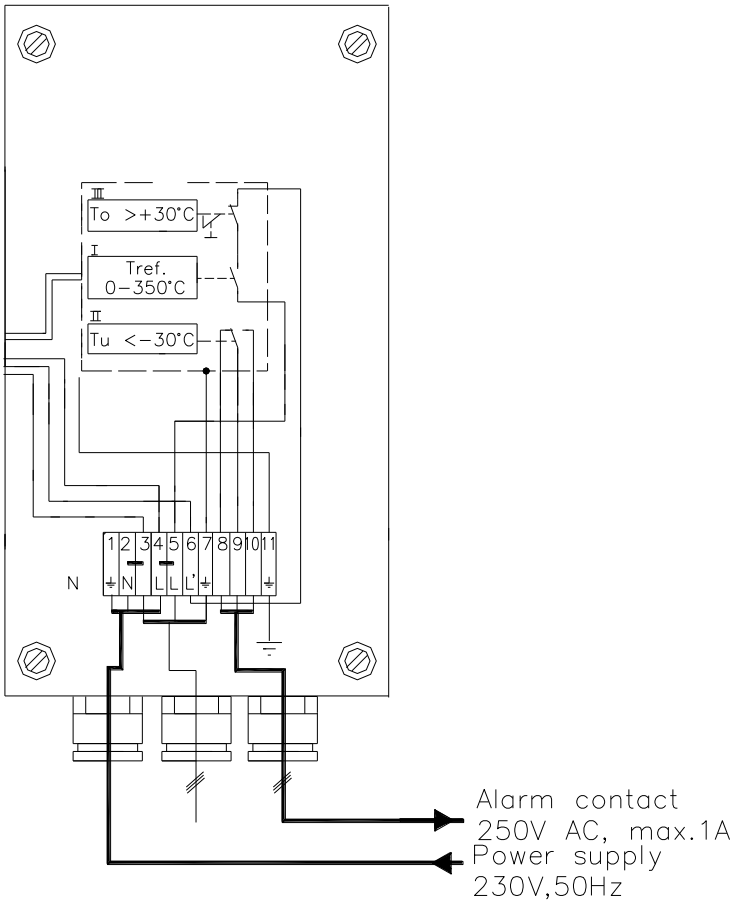

Figure 3 Electrical connection SDH-1 with thermostat

12.3.2 VERSION SDH-2 WITH ELECTRONIC TEMPERATURE CONTROLLER

The electrical connection of the temperature controller **Type 70304G** is to be made according to the terminal connecting plan as shown in figure 4 and described as follows:

- Remove the lid of the controller. Inside of the lid, there is the terminal connecting plan.

- Insert the mains cable (min. 3 x 1,5 mm^2, terminal range 6 – 12mm) into the third cable gland from the left side of the controller and connect it to the appropriate terminals.

- Insert the cable for the alarm contact (terminal range 6 – 12mm) into the right cable gland and connect it to the appropriate terminals.

CAUTION! **In case not all cable glands are used when connecting the temperature controller, it is important to shut the cable glands in order to provide the tightness of the housing.**

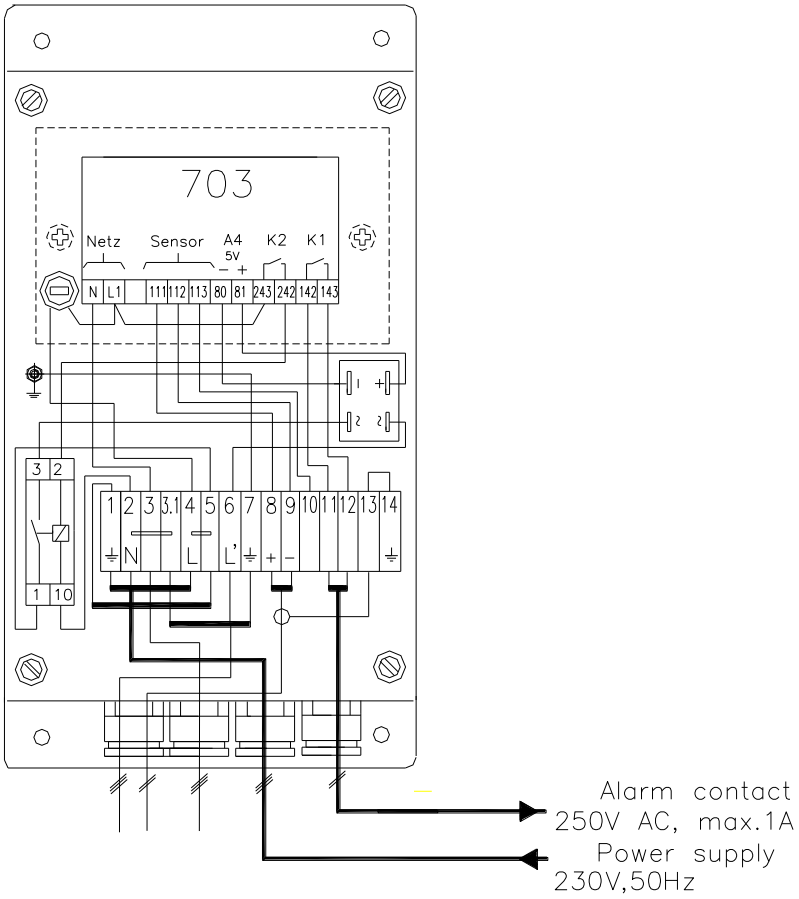

Figure 4 Electrical connection SDH-2 with electronic controller 70304G

13 STARTING UP

- Before starting up, check whether the supply voltage corresponds to the indication on the type plate.
- Switch on the power supply.
- Check the set value on the thermostat or on the electronic controller (see 13.1).
- The total heating time is approx. 0,5 h.
- Now, the separator is ready for work.

NOTE!

In case the set value indication on the thermostat is adjusted during operation in one step for more than 28°C downwards, this activates the thermostat's excess temperature switch off! For switching on again, the reset button has to be actuated.

WARNING!

For works during operation:
High surface temperatures!
Any contact may cause burnings.
Wear protective gloves and protect the probe against unauthorized access!

13.1 ADJUSTMENT OF THE SET VALUE TEMPERATURE

The heated separator SDH-2 with temperature controller 70304G is already parameterized for operation. The adjusted set value of the temperature is 320°C.
In case another parameter than the set value temperature has to be changed, you can read how to proceed in the separate operating manual of the temperature controller 70304G (2-5.1.1MD).

CAUTION! **The maximum temperature of 320°C has to be heeded because otherwise the equipment may be damaged or destroyed.**

13.1.1 VERSION SDH-1

- Open the lid of the connection box.
- The adjustment of the set value is made via the control knob of the thermostat to be found inside the connection box. The value can be adjusted between 50°C and max. 320°C.
- The thermostat has got an excess temperature limiter that switches off the heating automatically and permanently in case the set value temperature is exceeded by 30°C. For switching on the heating again, the RESET-button has to be actuated which is situated below the opening in the mounting plate of the thermostat.

13.1.2 VERSION SDH-2

To change parameters, the level inhibit on the user level has to be removed.
To remove it, act as follows:

- Standard display (below setpoint, up actual value) has to be visible
- Press key PGM and ▼ simultaneously for 5sec.,
  display = **Code 3** (all levels are locked)
- Press PGM
- Change value from **3** to **2** with key ▼
- The value is blinking after 2sec. and the change is taken over
- The user level is unlocked now
- Press **EXIT**

To activate the level inhibit, act as follows:

- Standard display (below setpoint, up actual value) has to be visible
- Press key PGM and ▼ simultaneously for 5sec.,
  display = **Code 2** (all levels are locked)
- Press PGM
- Change value from **2** to **3** with key ▼
- The value is blinking after 2sec. and the change is taken over
- The user level is locked now
  Press EXIT

The following steps have to be effected on the controller **70304G**:

- Push the PGM-key. “USEr” appears on the display.
- Push the PGM-key. “SP” appears on the display.
- Push the PGM-key. “SP” is blinking.
- Adjust the desired set value by using the arrow keys ↑ ↓ in the above display.
- Wait until the set value is flashing for a short time, then it is fixed.
- Push the EXIT-key twice for return to the normal reading.

14 CLOSING DOWN

Before closing down, i.e. switching off the heating, the separator should be purged with inert gas or air to avoid condensation and eventual acidification.

15 MAINTENANCE AND REPAIR

Prior to any maintenance work, the safety instructions specific to the plant and the process have to be observed!
It is difficult to give any recommendation as to a particular maintenance cycle. Depending on your process conditions, a meaningful maintenance cycle has to be found for your specific application.
An indication for maintenance can be a constant decrease of the sample gas quantity in your analysis system.
Separator maintenance is essentially to be concentrated on the cleaning of the separator and control of the seals.

WARNING!

Aggressive condensate possible.

Wear protective glasses and protective clothes!

WARNING!

For works during operation:
High surface temperatures!

Any contact may lead to burnings.
Wear protective gloves and protect the probe against unauthorized access!

15.1 MAINTENANCE OF THE OPTIONAL MOUNTED PERISTALTIC PUMP SR25.1G

Before the maintenance work is carried out, it is necessary that the specific safety procedures pertaining to the system and operational process are observed!

DANGER

Dangerous voltage!
It is necessary to take the peristaltic pump off the mains before any assembly, maintenance and repair work is carried out!

Flexible tube, conveying belt, contact pulleys and contact springs are the only parts of the pump subject to wear. They are simple to change.

15.1.1 CHANGE OF THE PUMP TUBE

CARE!

Aggressive condensate is possible!
Wear protective glasses and proper protective clothing!

NOTE!

If you send back the peristaltic pump to the M&C service for repair, please let us know what kind of condensate has been pumped.
Before sending the pump back clean all parts from dangerous or highly aggressive contaminants.

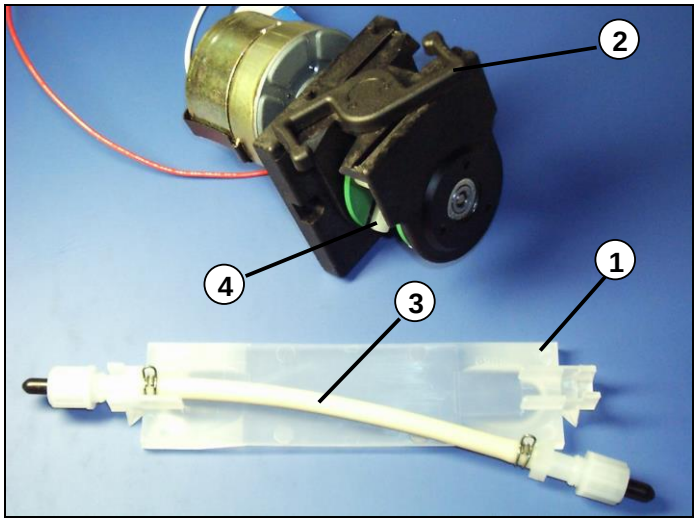

Figure 5 Change of the pump tube

- Disconnect the separator from mains;
- Open hose connectors at the pump;
- Press conveying belt ① at the recessed grips and turn Sbolt 2 clockwise up to limit stop;
- Take away conveying belt ① and remove the old hose set ③ from the guides by the hose connectors;
- Press the two contact pulleys ④ and check whether the spring pressure is still sufficient, if not, the contact springs have to be changed;
- Put the new hose set ③ with the hose connectors into the guides of the conveying belt ① ;

NOTE!

Only the usage of the original hose set guarantees a perfect function.
Never lubricate the hose.
Before mounting the pump check all parts for impurity and clean if necessary.

- Put the conveying belt ① with the new hose ③ into the dovetail guide of the pump body;
- Press conveying belt at the recessed grips and simultaneously turn the S-bolt ② anticlockwise until it snaps;
- Switch on pump.

15.1.2 CHANGE OF CONTACT PULLEYS AND SPRINGS

- Disconnect the separator from mains;
- Unscrew the nut of the pump head (span of the jaw 5,5);
- Draw the pump head out of the motor shaft;

Now the driver can picked out of the pump head and is ready for maintenance.

- The removal of the springs (4 pcs.) away from the driver is possible without the aid of any tools. Therefore press together the spring and take it out of the groove in the driver respectively out of the boring in the axle. Now the roller bearing axle can be dismounted and the contact pullets are ready for change.
- Remounting happens in the opposite way.

NOTE!

While mounting pay attention to the fit of 'rotational axisdriver'.
Use genuine spare parts only!

15.1.3 CLEANING THE PUMP HEAD

- When changing flexible tube or other parts, inspect all parts for dirt before assembling the pump head and clean them if necessary.
- As far as possible clean the parts with a dry cloth. Solvents should not be used as they can attack the plastics and synthetic rubber parts. If a compressed air line is available, blow the parts out with it.

CARE!

Aggressive sample is possible!
Wear protective glasses and proper protective clothing during disassembly, repair or cleaning!

16 SPARE PARTS LIST

Electrically heated separator SDH					
(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**
90 F 3000	Cartridge heater element L=100mm, 230VAC/350W	S	1	1	1
93 F 0135	Quick clamping ring for seperator type SDH material: SS316	S	1	1	1
93 F 0140	O-ring (80x5mm) for glass vessel on electrically heated separator type SDH. Material: Viton	S	1	2	3
93 F 0130	Spare glass for SDH with glass-flange	S	1	1	1
93 S 0090	Fingerscrew M6 for SP2000 connection protection	S	1	1	1
93F0145	Volume displacer balls for extension of the reaction surface	S	1	1	1

Option peristaltic pump SR25.1					
(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**
90 P 1007	Hose set ③ SR25.1 with PVDF-tube connectors 4/6mm, standard	C	1	2	4
90 P 1020	Driver SR25, complete	S	-	1	1
90 P 1010	1 set (4 pcs) contact springs SR25 for driver	R	1	2	2
90 P 1045	Contact pulleys SR25 PVDF ④ for driver	S	2	4	4
90 P 1050	Conveying belt SR25.1 ①	S	-	1	2
90 P 1025	S-bolt ② SR25.1	S	-	-	1
01 P 1300	Peristaltic pump SR25.2, complete 230V/115V, 50/60Hz	R	-	-	1
90 P 1030	Heat peristaltic pump SR25, complete without motor and gears	S	-	-	1

17 ANNEX

Further product documentation is available on our internet catalogue:
www.mc-techgroup.com