Embracing Challenge

Gas Conditioning Unit Series CSS®

CSS
19” with temperature controller 70304

Instruction Manual
Version 1.01.00

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.

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.

Version: 1.01.00

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1 GENERAL INFORMATION

The product described in this manual has been built and tested in our production facility.
All M&C products are packed to be shipped safely. To ensure the safe operation and to maintain the safe condition, all instructions and regulations stated in this manual need to be followed. This manual includes all information regarding proper transportation, storage, installation, operation and maintenance of this product by qualified personnel.
Please follow all instructions and warnings closely.
Please read this manual carefully before commissioning and operating the device. If you have any questions regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor.

2 DECLARATION OF CONFORMITY

CE - Certification

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

EMC-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 CSS:

Read this manual before commissioning and operating the product. 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.

Make sure to compare the supply voltage with the specified voltage on the product label before connecting the device.

Protection against damage caused by high voltages:
Disconnect the power supply before opening the device for access. Make sure that all extern power supplies are disconnected.

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

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

3.1 INTENDED USE

The CSS gas conditioning unit is intended for use in general purpose areas (non-hazardous environments). The CSS can only be operated in compliance with the information in chapter "Technical data". You must meet the requirements of the ambient temperature and pressure characteristics.

Do not use this product for any other purpose. Improper use and handling can create hazards and cause damage. For more information, please refer to the safety information in this instruction manual.

4 WARRANTY

In case of a device failure, please contact immediately M&C or your M&C authorized distributor.
We have a warranty period of 12 months from the delivery date. The warranty covers only appropriately used products and does not cover the consumable parts. Please find the complete warranty conditions in our terms and conditions.
The warranty includes a free-of-charge repair in our production facility or the free replacement of the device. If you return a device to M&C, please be sure that it is properly packaged and shipped with protective packaging. The repaired or replaced device will be shipped free of delivery charges to the point of use.

5 USED TERMS AND SIGNAL INDICATIONS

Danger

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

Warning

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Caution

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Attention

Attention is used to address practices not related to physical injury.

Note

These are important information about the product or parts of the operating manual which require user's attention.

Qualified Personnel

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

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

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.

Contains gas under pressure. Do not open container!
Check pressure before opening container, and adjust pressure to atmospheric pressure.

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

Caution, risk of being crushed due to rotating parts.
Do not open the device. Use personal protective equipment (PPE).

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.

Use foot protection

Use safety helmet and full protective goggles

6 INTRODUCTION

This **M&C** unit provides completely pre-installed sample gas conditioning for continuous use and can be excellently integrated within analysis systems. It is equipped with:

- 1 x sample gas inlet
- Electric gas cooler
- Sample gas pump
- Condensation pump
- Micro fine filter with glass-fiber element (0.1 µm)
- External or manual switching for testing with zero or span gas by 3-way and 2-way solenoid valves
- Status alarm with display for cooler temperature, flow alarm and liquid alarm
- 2 x sample gas outlets with flow meters incl. needle valve (70 l/h or rather 250 l/h)
- PTFE hosing
- Optional: electronic temperature controller for heated sample lines

Its compact construction means that it takes up little space. The **CSS** unit is ready for use within a matter of a few minutes. This at last makes the usual time-consuming procurement of individual components and assembly superfluous.

6.1 SERIAL NUMBER

The type plates bearing the serial number are located on the back panel of the 19"-rack-housing.
Always quote the device's serial number when making inquiries and ordering spare parts.

6.2 POWER SUPPLY

Depending on the version, the **CSS** is operated with 115 or 230 V AC.
Precise details can be found on the device's type plate.

In dependence of the cooler type, the power supply and the version .../C -test gas to the probe- the following types of the **CSS** can be distinguished:

Part number	Type	Cooler - gas flow [l/h]	Power supply
03G1000	CSS 230 V	ECP 1000 – 140 l/h	230 V 50/60 Hz
03G1000a	CSS 115 V	ECP 1000 – 140 l/h	115 V 60 Hz
03G1100	CSS/C* 230 V	ECP 1000 – 140 l/h	230 V 50/60 Hz
03G1100a	CSS/C* 115 V	ECP 1000 – 140 l/h	115 V 60 Hz
03G2000	CSS-2 230 V	ECP 2000 - 2 x 140 l/h	230 V 50/60 Hz
03G2000a	CSS-2 115 V	ECP 2000 - 2 x 140 l/h	115 V 60 Hz
03G3000	CSS-3 230 V	ECP 3000 – 350 l/h	230 V 50/60 Hz
03G3000a	CSS-3 115 V	ECP 3000 – 350 l/h	115 V 60 Hz
03G3100	CSS-3/C* 230 V	ECP 3000 – 350 l/h	230 V 50/60 Hz
03G3100a	CSS-3/C* 115 V	ECP 3000 – 350 l/h	115 V 60 Hz
Options			
03G9000	Extra charge for CSS... with integr. temp. controller 70304 f. heated sample line		
03G9020(a)	Extra charge for CSS... with altogether 3 check valves		
03G9025(a)	Extra charge for CSS... with altogether 4 check valves		
03G9030(a)	Extra charge for CSS... with altogether 5 check valves		

* Version CSS.../C: test gas to sample probe
(a) : 115V-Version

7 TECHNICAL DATA

Gas flow rate**	CSS(/C) : max. 140 l/h CSS-2 : max. 2 x 140 l/h CSS-3(/C) : max. 350l/h
Flow meter	CSS(/C), CSS-2: 2 x with needle valve, adjustable to 70 l/h, flow meter FM1 with flow alarm sensor CSS-3(/C) : 2 x with needle valve, adjustable to 250 l/h, flow meter FM1 with flow alarm sensor
Gas pressure	0.7 to 1.4 bar abs.
Sample inlet temperature**	Max. 150°C
Sample inlet dew point**	Max. 80°C
Sample outlet dew point	Range of adjustment: +2 to +15 °C, factory setting: +5 °C
Dew point stability	At constant conditions < ±0.1 °C
Gas filter F-0,1GF50	Glass fiber, retention rate 99,99 % for particles > 0.1 µm
Ambient temperature**	+5 to +45 °C
Storage temperature	-25 to +65 °C
Relative humidity	< 80 %
Housing	19"-rack housing mounting 6 U, depth 350 mm
Degree of protection	IP20, DIN 40050
Weight	CSS(/C) : approx. 15 kg CSS-2, CSS-3(/C): approx. 16.5 kg
Gas connections	G 1/4 i* - DIN ISO 228/1
Power supply	230 V 50/60 Hz or 115 V 60 Hz, CSS : 150 VA CSS-2/3: 250 VA
Electrical connection	Power terminals max. 4 mm^2 (4 x PG 13,5) Alarm-/Control signal 15 pin Sub-D-Connector
Warm up time	Approx. 10 min.
Material of sample contacting parts	PVDF, glass, Viton®, Novoprene, PTFE
Status signal for	Measure/Check, cooler temperature, liquid alarm, flow alarm: potential free change over contact, max. 24 V/1 A
Test gas inlet - 2 x	Solenoid valve actuated by manual or external switch
Option: Electronic PID temperature controller for heated sample lines	Front panel mounting Control range : 0 to 200 °C Sensor inlet : PT 100 and Fe-CuNi Controlling outlet : 10 A solid state relay # Status alarm : integrated into the status signal Parameter : free adjustable
Electrical equipment standard	EN 61010

* other connections on request

** Maximum values in technical data must be rated in consideration of total cooling capacity at 25 °C ambient temperature and an outlet dew point of 5 °C.

standard for max. 20 m heated sample line at 110 W/m

Viton® is a registered trademark for fluoroelastomers by DuPont Performance Elastomers, USA.

8 DESCRIPTION

The components of the **M&C** gas conditioning sampling system type **CSS** are mounted in a 19"-rack-housing. The **CSS** may also be configured with an optional wall-mounting-bracket **(Part-No. 03G9005)**.

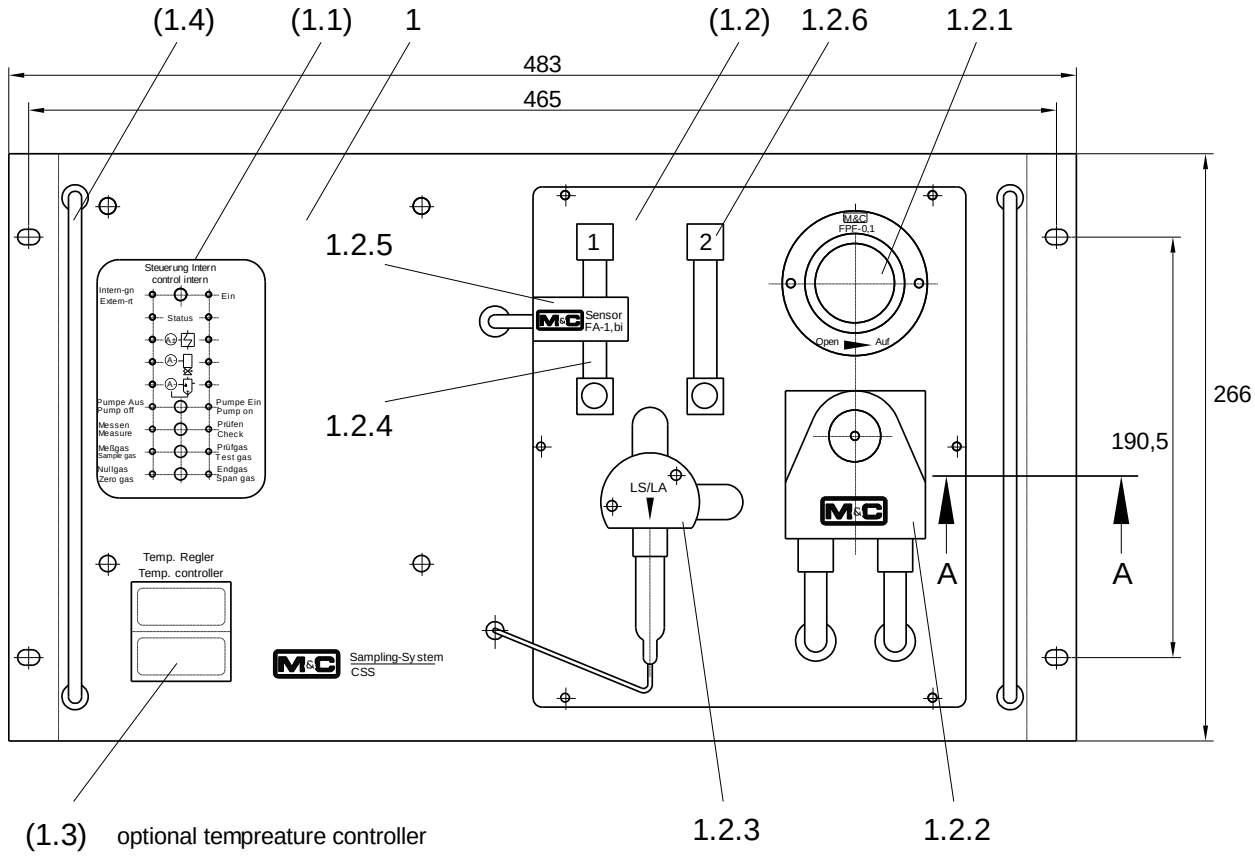


Figure 1 Front view of the CSS

The front plate (1) displays the following components:

(1.1) Operation and control board

(1.2) Flow components sub panel

(1.3) Option*- temperature controller for heated sample line **(Part No. 03G9000)**

(1.4) Handles

* If the temperature controller option is not chosen a plastic plate will cover the opening.

Figure 2 shows the operation and control board (1.1). The different functions are selected by toggle switches and indicated with LED's. The internal or external function is configured through the wiring in the Sub-D-Plug (see 4.1) and indicated by a dual-colored LED on the operation and control board.

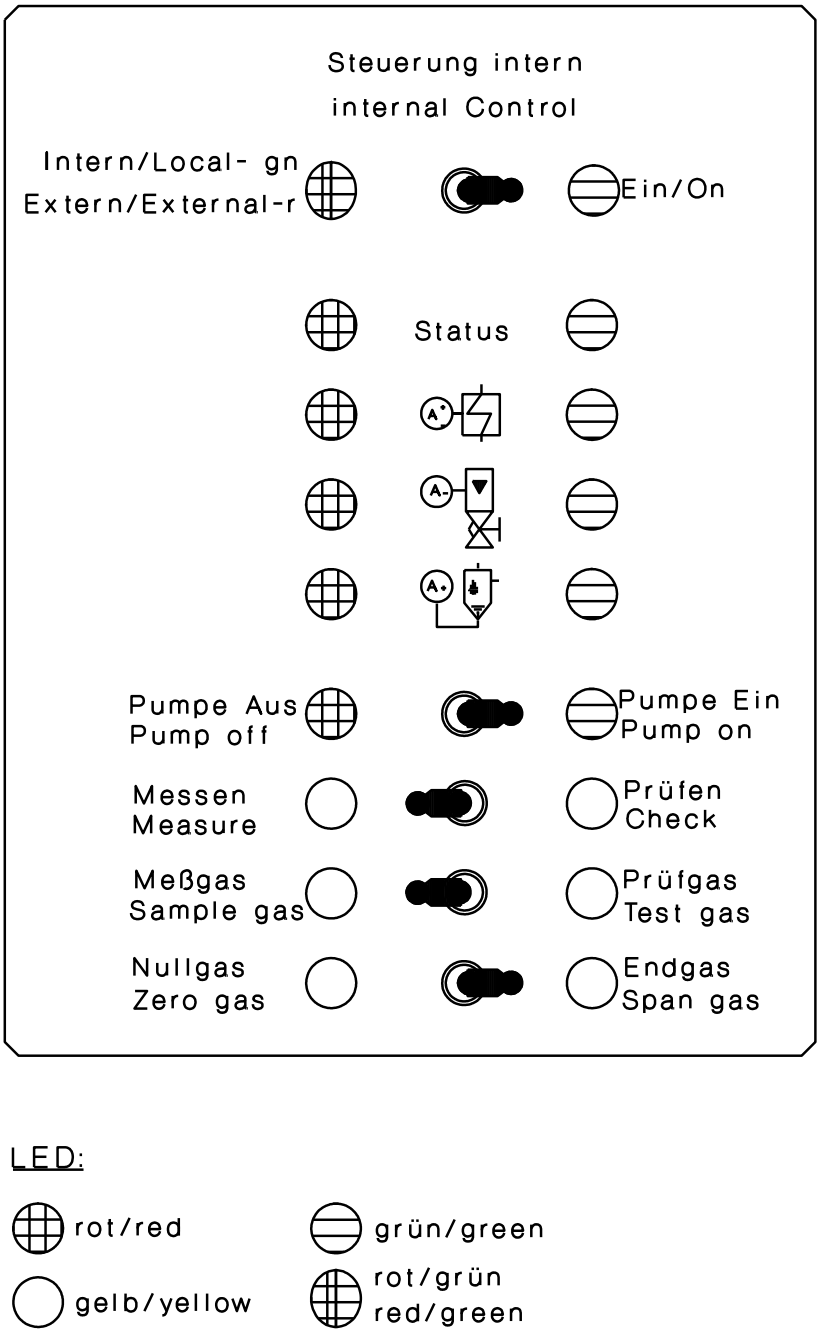
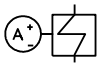
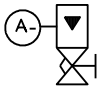


Figure 2 Operation and control board

The following chart describes the functions of the operation and control board.

Function	Description	Switch		LED
		l	r	
Local Control (intern)	Control of the CSS with operation and control board; link between pin 1 and 9 (connector **X2**, s. 10.2.2); control power supply;			(dual-colored) green
External Control (extern)	External control with Sub-D-Plug **X2** (s. 10.2.3), switches of the operation and control board out of function; control power supply after switching the CSS on;			(dual-colored) red
On	Internal control activated;		X	green*
Off	Switches CSS off	X		no LED
Status	No alarm: CSS ready for operation; Alarm : cooler-/temperature-controller alarm; flow alarm; liquid alarm.			green* red*
Cooler- Alarm 	No alarm: CSS ready for operation; Alarm : CSS not ready for operation, temperature of cooler <2 °C or >8 °C, or optional temperature-controller: controller not in range			green* red*
Flow-Alarm 	No alarm: CSS in operation; Alarm : no gas flow (i.e. inlet or outlet is blocked), sample gas pump not in operation, liquid alarm, cooler-/temperature-controller alarm;			green* red*
Liquid-Alarm 	No alarm: CSS ready for operation Alarm : condensate alarm;			green* red*
Pump Off	Sample gas pump off;	X		red
Pump On	Sample gas pump on;		X	green*
Measure	CSS in sample mode, signal contact available;	X		yellow*
Check	CSS in test mode, signal contact available;		X	yellow*
Sample Gas	3-way solenoid valve open for sample mode;	X		yellow*
Test Gas	3-way solenoid valve open for test mode;		X	yellow*
Zero Gas	2-way solenoid valve open for zero gas;	X		yellow*
Span Gas	2-way solenoid valve open for span gas;		X	yellow*

* LED display also for external control

All of the maintenance components are mounted on the flow components sub panel (1.2) (s. Fig. 1 and 3) and are easily accessed by removing front panel mounting screws. These are:

(1.2.1) Gas filter **FPF-0,1GF**

(1.2.2) Peristaltic pump **SR25.2**

(1.2.3) Liquid alarm sensor **LA1** with flow chamber **LS**

(1.2.4) Flow meter 1 **FM40,** measuring range **7-70l** or **25-250l****

(1.2.5) Optical bi stable flow alarm sensor **FA-1,bi**

(1.2.6) Flow meter 2 **FM40,** measuring range **7-70l** or **25-250l****

(1.2.7) Gas pump **N3 KPE** or **N9 KPE****;

(1.2.8) Terminal **X8**

(**with version CSS-3... and CSS-3/C...)

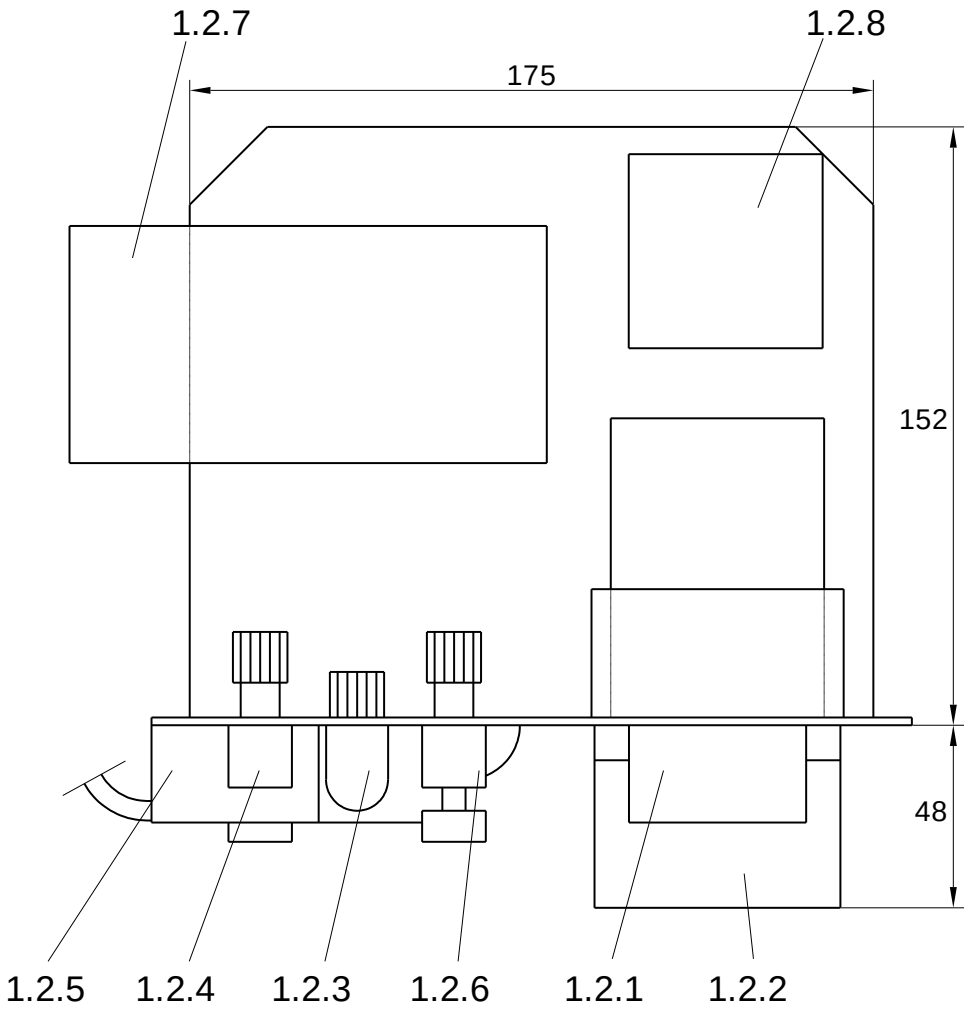


Figure 3 Plan view of the components mounted on the Flow components sub panel

For maintenance it is possible to pull out the rack-housing (1.2), without dismounting the complete unit.

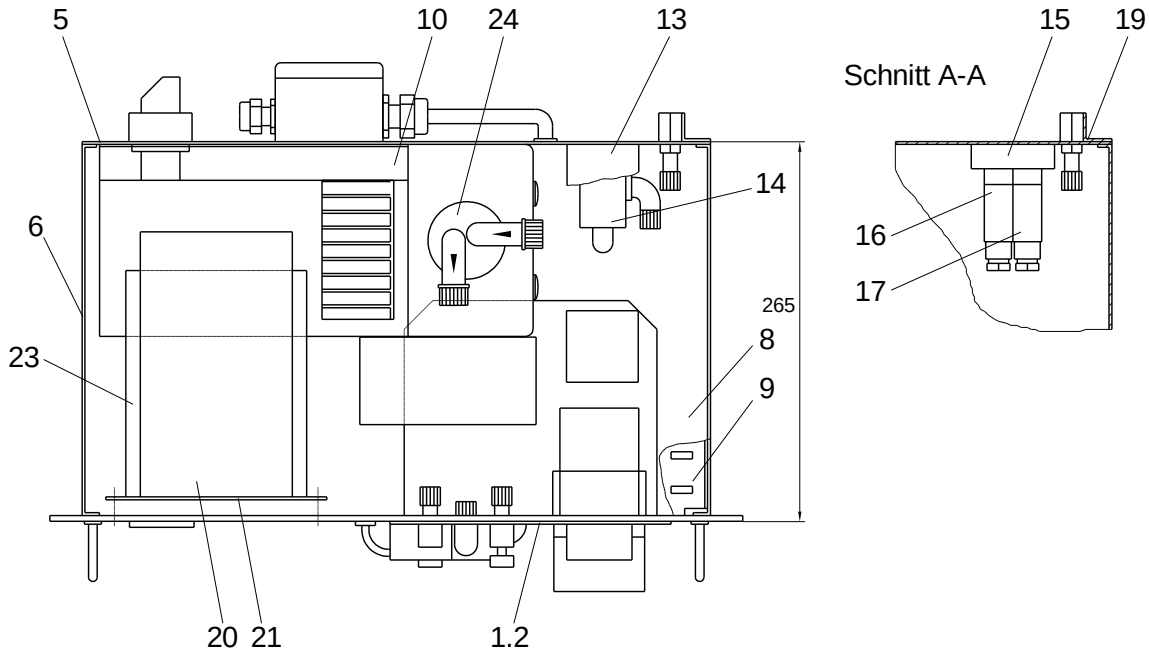


Figure 4 Components mounted in the 19“-rack-housing

The gas cooler (10) is fixed on the back panel of the 19“-rack-housing. With respect to the maximum flow rate required, the following versions are available:

Cooler	Max. flow rate [l/h]
ECP1000	140
ECP2000	2 x 140
ECP3000	350

Ambient air enters the chassis through the slots in the bottom (8) and top plate (9) of the 19“-rack-housing. This allows ventilation and cooling of the internal components including the gas cooler.
The cooler fan exhausts air out of the cut out in the side wall (6) of the 19“-rack-housing.

Note

The PSS must be stored in a weather-protected frost-free area! Allows adequate ventilation around the housing!

The 3-way solenoid valve (14), for switching of the sample and test gas, is mounted in a special holder (13) on the back panel (5).

Sectional view A-A in illustration 4 shows the two 2-way solenoid valves (16) and (17), for zero and span gas. They are mounted with valve block (15) below the valve (14) on the back panel of the 19"-rack-housing. Additional 3 span gas valves are possible as option (see page 8). The span gas valves are preselected by snap switch 1.5 (Fig. 1).

The combined card for flow- and liquid alarm LFC-2 (20) is connected on the main circuit board (21). The **CSS** is protected by fuse (F1= 2 A, see wiring diagram in appendix).

All the electrical and tube-/hose connections are located on the back panel of the 19"-rack-housing. These are:

(A) Sub-D-Plug **X2** (see chapter 10.2):

- external status inquiry { device status / measuring/test mode
- control functions { internal (the link between pin 1 and 9 is factory installed and must exist for the local control to function) / external (with potential free contacts)

(A1) Reserve
(B) electrical junction box **X1** (see chapter 10.1):
- power supply
- option: connection heated sample line and temperature-sensor

(C)* sample gas inlet
(D) sample and test gas outlet 1 with flow alarm
(E) sample and test gas outlet 2
(F) zero gas inlet
(G) span gas inlet
(H) condensate outlet
(I) test gas to the probe**
(J) ventilation**
(K) option: span gas 2 inlet, condensate outlet 2***
(L) option: span gas 3 inlet, sample gas outlet 3***
(M) sample gas inlet 2***
(N) option: span gas 4 inlet

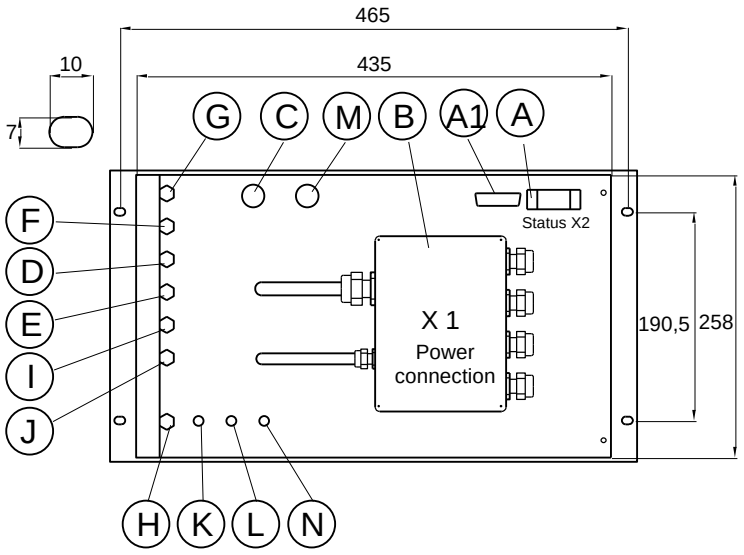
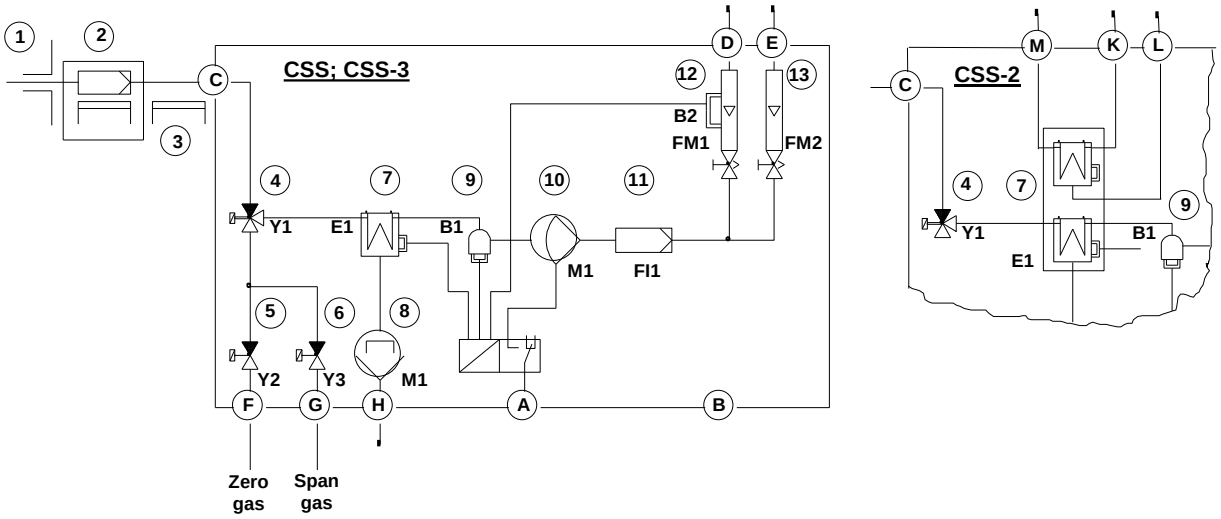


Figure 5 Back-panel of the 19"-rack-housing

* (C) - (M) are PVDF G 1/4" i fittings
** only version CSS.../C, test gas to probe
*** only version CSS-2

9 FUNCTION

The gas flow schematic of the **CSS** is shown in the following illustration.



CSS/C, CSS-3/C with Option 3 additional test gas valves

1

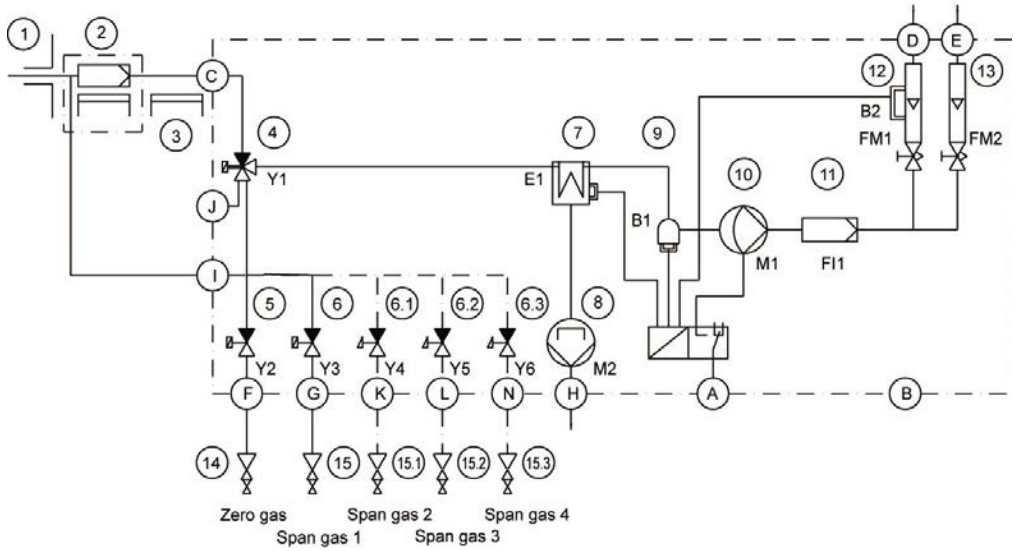


Figure 6 Gas flow schematic

Principally, there are two main ways for gas to enter and flow through the **CSS**:

- Sample gas flow (C, 4, 7, 9, 10, 12 and 13, D and E);
  (version CSS-2 additional: M, 7, K);
- Test gas flow (F or G, 5 or 6, 4, 7, 9, 10, 11, 12 and 13, D or E)
  (version **CSS**.../C: F or G, 5 or 6, I, 2, C, 4, ... see above).

The gas sample pump (10) transports the sample gas via the gas sample probe, consisting of a sample tube (1) and a filter (2), to the **CSS**. The heated sample line (3) is connected at the sample gas inlet (C). In order to prevent early condensation of the sample gas, components (2) and (3) are heated.
In the measuring mode, the 3-way solenoid valve (4) allows the flow to the gas cooler (7).

The dew point of the gas is maintained at a stable value of +5 °C ±0.1 °C (for further specifications see appendix).
The peristaltic pump (8) draws and removes the condensate via the condensation outlet (H) on back panel.

The liquid alarm sensor (9) which located after the gas cooler protects the gas analyzers in the event of faulty gas drying. In the event of an alarm in the condensate removal, cooling or heating functions, the 3-way solenoid valve is automatically closed. Also, the measuring pump is switched off so that no wet gases can reach the gas outlets (D) and (E). The alarm is shown on the operation and control board of the **CSS** and is available on Sub-D-Plug **X2** (A) as a status contact outlet (see chapter 10.2.2 and 10.2.3).

After the sample gas pump (10) is a gas filter (11) for precipitation of the finest particles.

After the filter, the sample gas flows through both flow meters: the flow meters **FM1** (12) and **FM2** (13), and the measuring outlets (D) and (E). Both flow meters are individually adjustable by a needle valve. In order to keep the gas outlet dew point of 5 °C, the total flow rate should not exceed the specified maximum value (see chapter 7.).

The minimum flow rate is determined by the sample gas pump (see chapter 19.1). If the flow rate remains under the minimum value the pump membrane can be premature destroyed by over pressure.

The flow rate is controlled via needle valve on the flow meter **FM1** and the optical bi stable flow sensor. The flow sensor can be moved on the flow meter glass and adjusted to an alarm value of your choice. The flow is below the alarm value, this effects a flow alarm which is shown on the operation and control board of the **CSS** and which is also available on Sub-D-Plug **X2** (A) as a status contact (see 10.2).

In the test mode, the 3-way solenoid valve (4) is switched to allow zero or span gas to enter the system. The inlets (F) and (G) are then available and the 2-way valves (5) or (6) open respectively.
Additional 3 span gas valves (K, L, N) are possible as option (see page 8). The span gas valves are preselected by snap switch 1.5 (Fig. 1).

The versions **CSS.../C** are configured in such a way that the test gases first flow via the sample gas probe and then via the sample gas inlet (C) to the gas cooler. Therefore, the **CSS.../C** is equipped with the additional inlet fittings (I) and (J). The test gas outlet (I) is connected with the test gas inlet of the sample gas probe.

In Version CSS-2 the gas cooler **ECP2000** with two heat exchangers is mounted. Thus it is possible to operate with a second independent sample gas flow. The sample gas line for the second independent sample gas flow has to be connected to the inlet (M) and outlet (K) by customer. Condensate removal happens via the condensate outlet (L). Sample gas pump, condensate pump, gas filter and alarm sensors have to be installed extern by customer.

In case of alarm, the 3-way solenoid valve automatically opens the gas way (4) - (J) and closes the way (4) - (C). This guarantees that no sample gas or test gas can enter the system.

Zero and span gas both flow through the heat exchanger of the gas cooler. This configuration guarantees the same conditions during measuring and calibration.

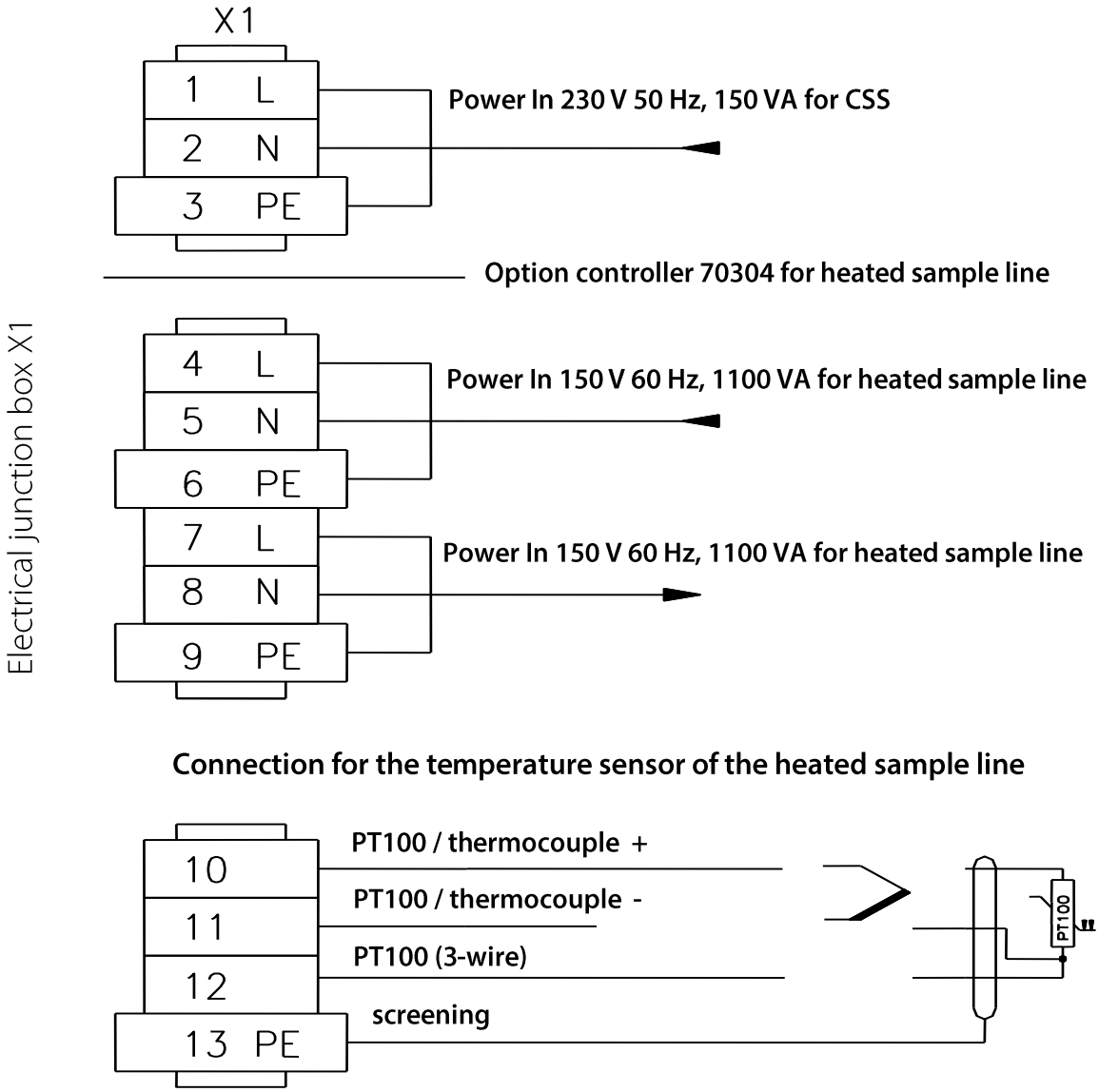
The **CSS** gets its respective voltage via an electrical junction box **X1** (B). Here, you can also find the connections for the option "heated sample line with temperature controller" (specification see chapter 10.1).

10 ELECTRICAL WIRING DIAGRAM

The electrical connections are located on the back panel of the 19"-rack-housing (see fig. 5)

10.1 ELECTRICAL JUNCTION BOX X1

Figure 7 shows the possible connections of the electrical junction box **X1** (B).



For devices from 12/2001 to 01/2008 with controller 703: thermocouple + at terminal 11, thermocouple – at terminal 12

Figure 7 Electrical junction box X1 (B)

The **CSS** is protected by fuse (F1= 2 A, see wiring diagram in appendix). The fuse is located on the main circuit board (see fig. 4).

10.2 SUB-D-PLUG X2

Note

To guarantee the function of the CSS, the SUB-D-Plug must be mounted!

10.2.1 STATUS CONTACTS

Two potential free switches operating in 'Safety-First' function and guarantee an adequate signal for **CSS** being in test mode, alarm mode or loosen voltage.

For one of the above mentioned situations the circuit is closed by the contacts **MC** (master contact, 5 and 15) and **NC** (normal closed, 7 and 14). In case that the **CSS** is ready for operation the contacts **MC** and **NO** (normal open, 6 and 13) are switched.

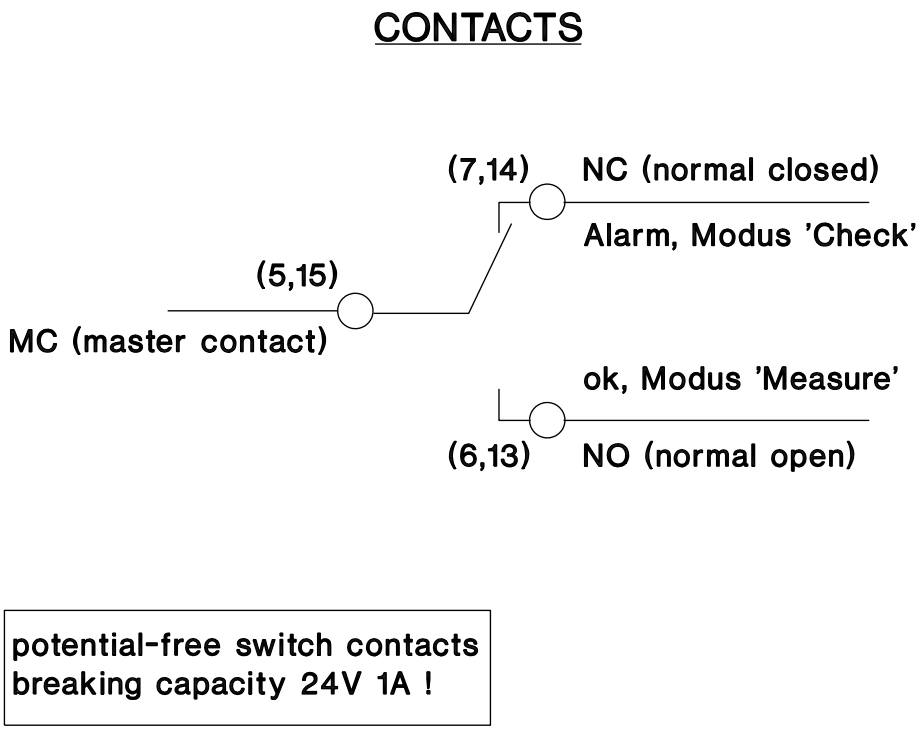


Figure 8 Status contacts

Note

Breaking capacity: maximum 24 V 1 A!

The kind of alarm is displayed on the operation and control board (see fig. 2).

10.2.2 LOCAL CONTROL

For local control all functions of the **CSS** are affected by the operation and control board (functions see chapter 8.).

Note **For local control, the link between PIN 1 and 9 in the SUB-D-Plug is necessary!**

The way for gas to enter the **CSS** is chosen by operating the adequate switch on the operation and control board (see chapter 8.). All other possible gas ways will be automatically closed. This avoids measuring inaccuracy by simultaneous feeding the **CSS** with different gases.

For version **CSS.../C** -test gas to sample gas probe (see chapter 9.)- pin 1 and 4 in the Sub-D-Plug are shorted-out.

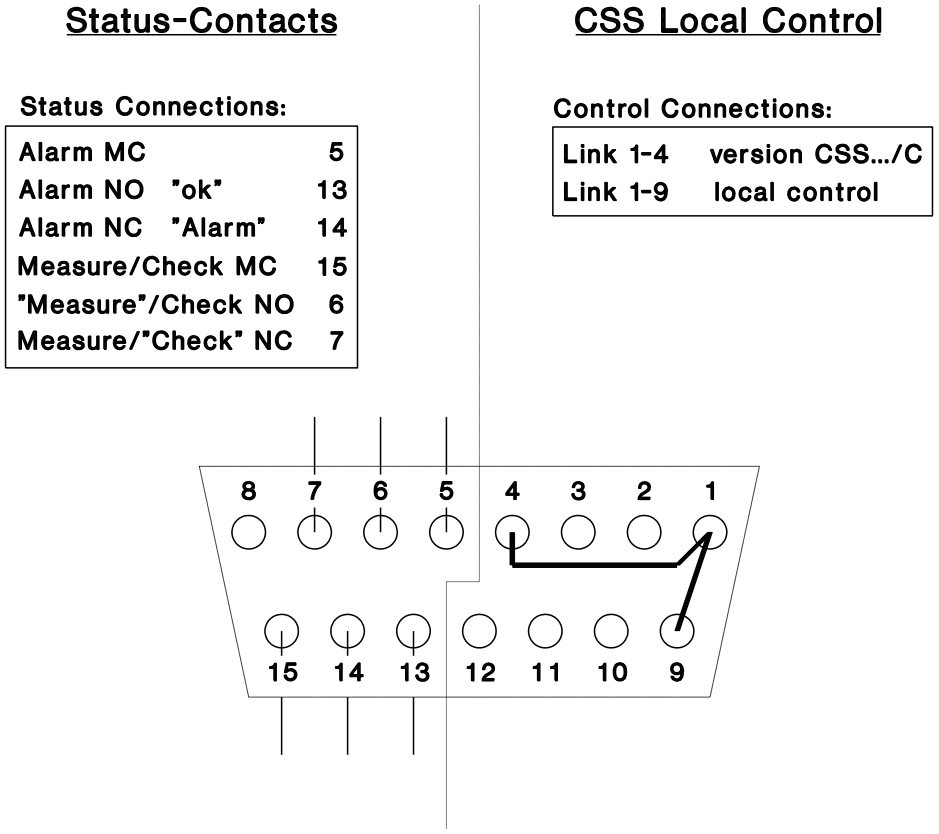


Figure 9 Terminal connections in Sub-D-Plug X2 (A) for local control of CSS... and CSS.../C

10.2.3 EXTERNAL CONTROL

The external control off the **CSS** has to be realized by the customer by means of potential free switches. The selector switch functions of the control board (s. chapter 8.) are out of operation.

Note

For external control, the link between PIN 1 and 9 in the D-SUB-Plug must be removed!
Operating error by feeding the CSS simultaneous with sample- and test gas must be excluded by customer!

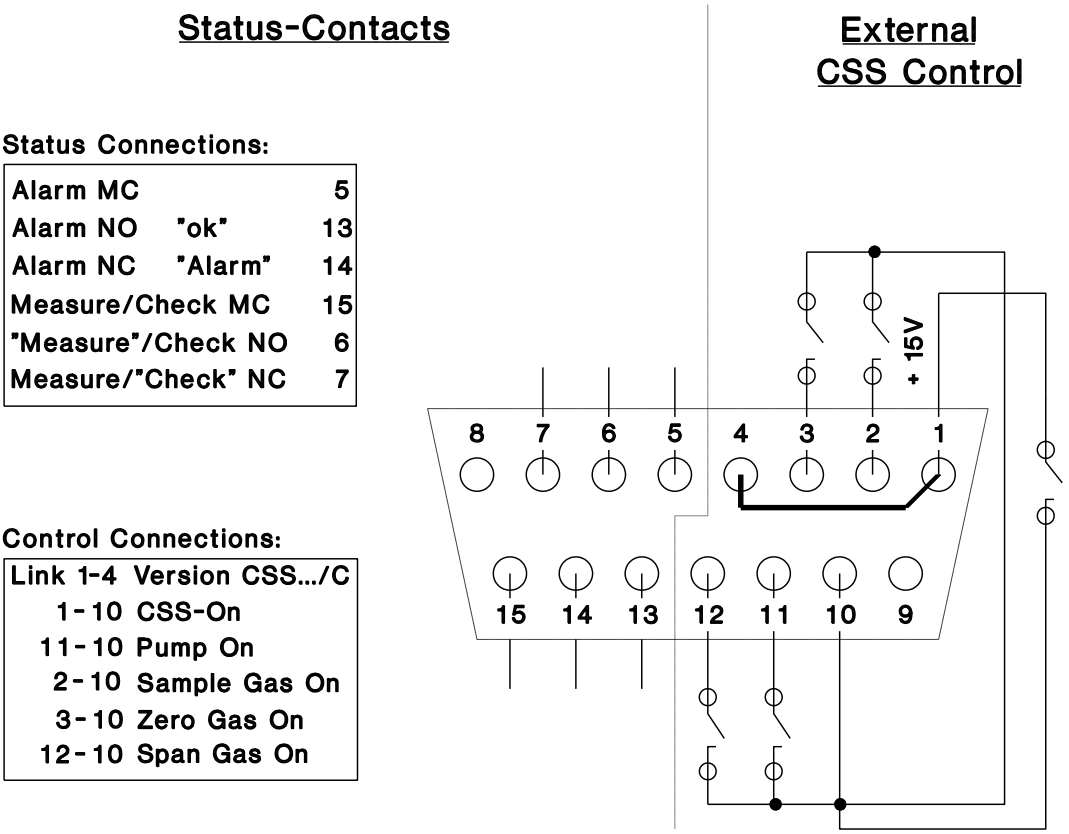


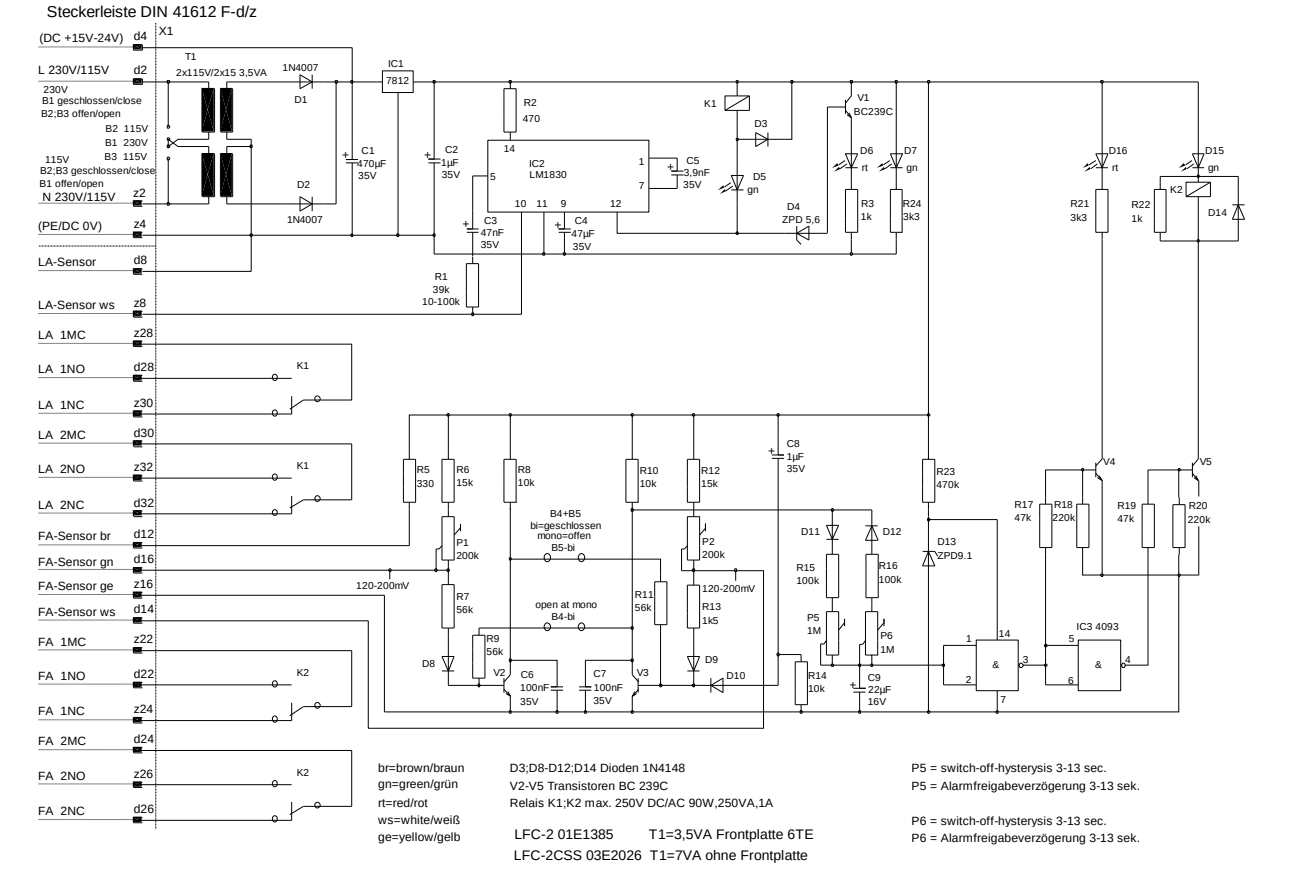
Figure 10 Terminal connections in D-Sub-Plug X2 (A) for external control of CSS... and CSS.../C

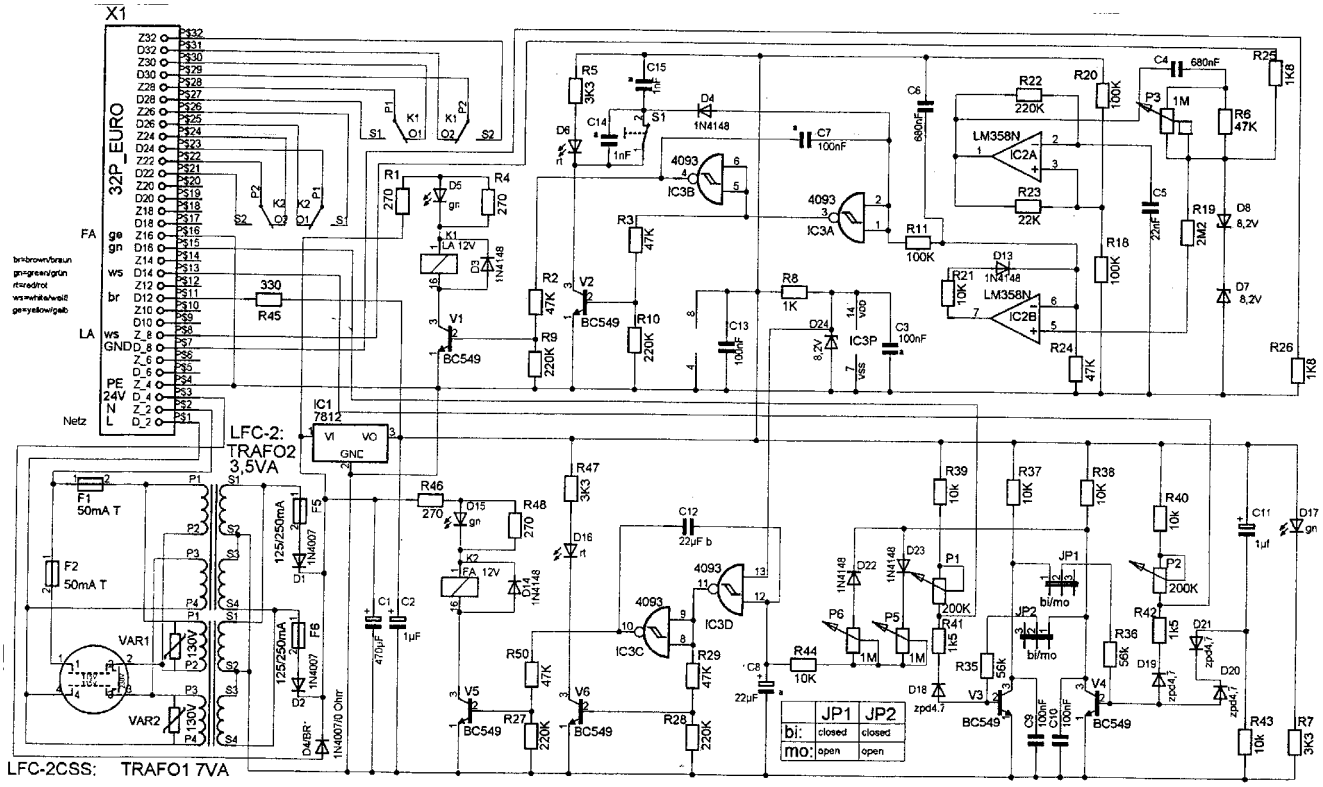
For version **CSS.../C** -test gas to sample gas probe a link between pin 1 and 4 in the D-Sub-Plug is mounted.

10.3 LIQUID- AND FLOW ALARM CARD LFC-2

The **LFC-2** is a combined electronic card operating the flow alarm sensor **FA1bi** and the liquid alarm sensor **LA1**. Pulsating gas flow can release a unintentional flow alarm. To avoid this the **LFC-2** is equipped with slow operation -time lag to eliminate the alarm- and slow release -alarm with time lag. Times in between 3 and 13 seconds (3 seconds are factory-aligned) are continuously adjustable by the potentiometers P5 and P6 (see Fig. 11, wiring diagram **LFC-2**). For more specific information about the liquid alarm sensor **LA1** and the flow alarm sensor **FA1bi** please see the data sheets. The plan of terminal connections is displayed in the following chart.

Terminal	Path	Connections	Terminal	Path	Connections
d2	power 230/115 V	L	d32	Alarm contact 2	NC
z2	power 230/115 V	N	d12	FA sensor	brown
z4	power 230/115 V	PE	d16	FA sensor	green
d4	*supply*	*+15 V up to +24 V DC*	d14	FA sensor	white
z4	*supply*	*0V DC*	z16	FA sensor	yellow
d8	LA sensor	shielding	z22	alarm contact 1	MC
z8	LA sensor	white	d22	alarm contact 1	NO
z28	alarm contact 1	MC	z24	alarm contact 1	NC
d28	alarm contact 1	NO	d24	alarm contact 2	MC
z30	alarm contact 1	NC	z26	alarm contact 2	NO
d30	alarm contact 2	MC	d26	alarm contact 2	NC
z32	alarm contact 2	NO			





Starting from Version 03.2000

Figure 11 Circuit diagram LFC-2

11 DESCRIPTION OF THE OPTIONAL TEMPERATURE CONTROLLER 70304 FOR HEATED SAMPLE LINES

(1) **Actual value display**
red, 10mm high, 4 digits

(2) **Active Setpoint**
Factory setting SP1

(3) **Setpoint**
Four digit, green; decimal place is configurable;
Also used for operator prompting (display of parameter and level symbols)

(4) **PGM-key** in order to select parameters
in order to change values
in order to change values
Exit-key in order to leave the levels

(5) **Indication**
yellow for
- Switch status of binaryoutputs 1 – 6 (display lights up = on)
- ramp/programm function is active
- manual operation is active

(6) **16-segment display for the unit °C / °F**
factory setting °C

Figure 12 Display/control elements

12 OPERATING PRINCIPLE OF THE CONTROLLER 70304

Operating and programming of the controller takes place on two levels. On the first level for normal operation, alarms can be reset or in case of startup a control circuit, self-optimising is activated.
Underneath there is the user level. All important adjustments of the controller are combined on the user level and can be changed after removing the level inhibit.

12.1 PARAMETER OF THE USER LEVEL WITH FACTORY SETTING

- Setpoint **SP,** factory setting = **180** °C
- Max. low temperature difference to the setpoint **Lo-t,** factory setting = **10** °C. In case of falling below, an alarm signal takes place
- Function of the controller **Fnct**, factory setting = **0** : fixed-setpoint controller. Other values are not adequate for the operation of M&C products.
- Sensor type **SenS,** factory setting = **2**: Resistance thermometer in 2-wire circuit
  1: Resistance thermometer in 3-wire circuit
  2: Resistance thermometer in 2-wire circuit
  4: Thermocouple
- Linearization **Lin,** factory setting = **1**, Pt100

  1: Pt100
  9: Fe-CuNi J
  11: Fe-CuNi L
  12: NiCr-Ni K

Further information is in the separate instruction manual of the controller 70304. The manual is available for download on the **M&C**-website www.mc-techgroup.com.

13 CHANGE OF PARAMETERS

To change parameters the level inhibit on the user level has to be removed.

Warning

Observe the maximum temperature of the device to be controlled to avoid damaging the same.

13.1 REMOVING AND ACTIVATING THE LEVEL INHIBIT

To remove the level inhibit, act as follows:

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

13.2 MENU STRUCTURE

Generally:

- Changing to the user level with PGM-key (display = User)
- To choose the first parameter press PGM-key again (display = SP)
- Changing to the next parameter with ▼ -key
- Back to the standard display press EXIT-key (2 x)

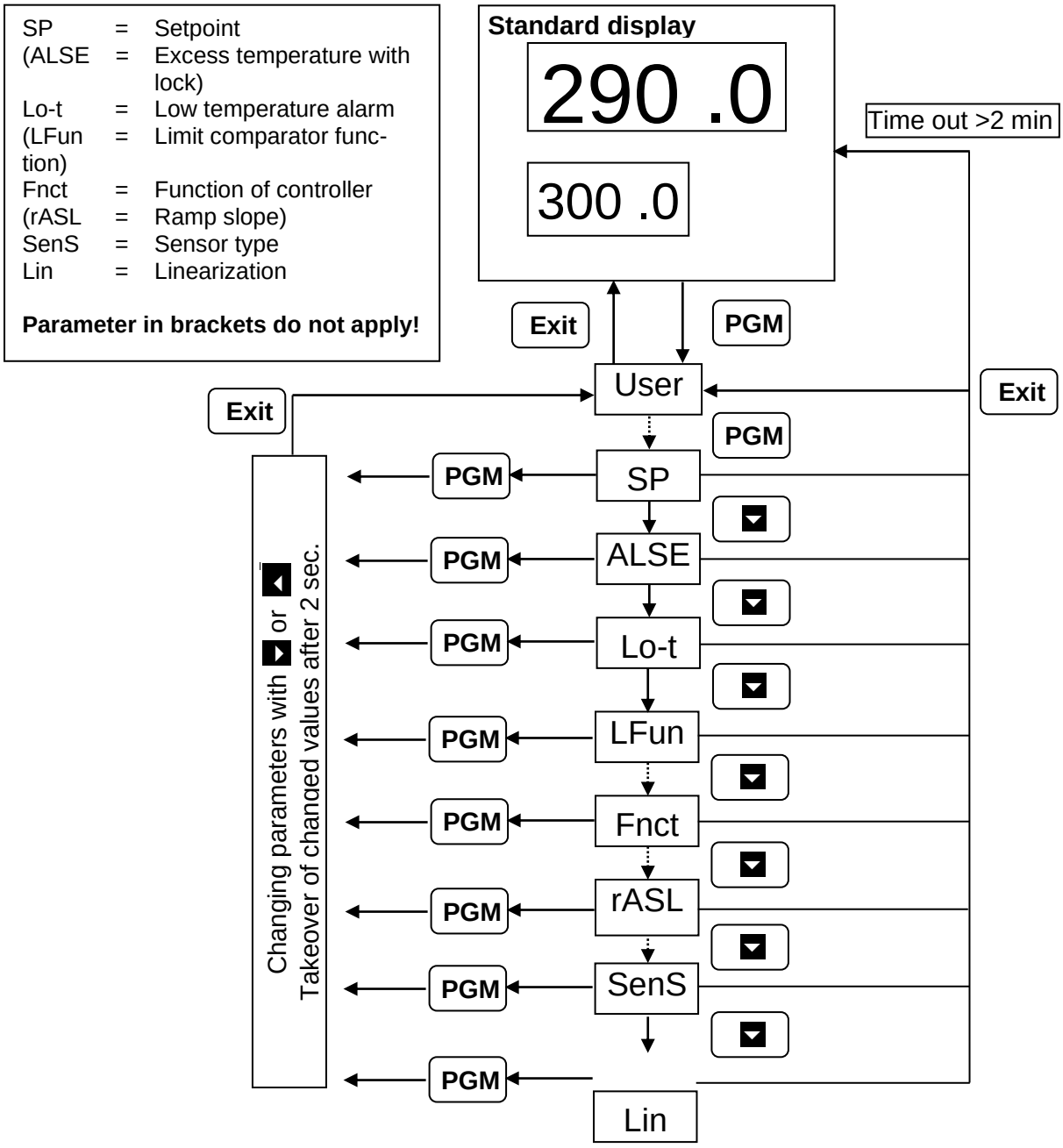


Figure 13 Menu structure

13.3 TIME OUT

If no operation takes place, the controller automatically returns to the standard display after about 2 minutes using any changed parameters.

14 RECEIPT OF GOODS AND STORAGE

The **CSS** is completely pre-installed and normally delivered in one packaging unit.

- Please take the gas conditioning system and possible special accessories carefully out of the packaging material immediately after arrival, and compare the goods with the items listed on the delivery note;
- Check the goods for any damage caused during delivery and, if necessary, notify your transport insurance company without delay of any damage discovered.

Note

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

15 INSTALLATION INSTRUCTIONS

The compact construction of the **CSS** means that it takes up little space and that the 19" unit can be excellently integrated within analysis systems.

Note

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

The gas conditioning system should be installed in an area well away from any heat emitting sources in order to prevent damage caused by an accumulation of heat.

Pay attention to a non-critical installation for individuals.

The compact gas conditioning system is preferably designed for mounting in a cabinet. When the cabinet is installed outside, ample protection against the effects of direct sunlight and dampness must be provided. In winter, the equipment must only be used in frost-free areas; pay attention to the protection class of the device.

In order to guarantee the operational safety of the gas conditioning system and the additionally connected analyzers, and to avoid false alarms, the gas conditioning system should not be used at temperatures other than those specified.

It is of great importance that the analyzers which have been additionally connected be used at temperatures well above the specified gas outlet dew point of +5 °C. This prevents the gas in the connector lines from condensing completely.
In the event of the unheated sample gas lines being connected to the gas conditioning system on a slope, it is not necessary to carry out a preliminary condensate removal.

16 PNEUMATIC CONNECTIONS

Note

The CSS is equipped with G1/4“ i connections.
Do not mix up the hose connections: they are clearly marked. After all the hoses have been connected, the tightness of such leads should be checked.

Connection hoses with dimensions DN 4/6 mm are utilised for all models.

The following lines have to be connected (Fig. 5):

- sample gas line to connection (C) respectively to connection (M), operating with version CSS-2 (second independent gas flow);
- zero gas line to connection (F);
- span gas line to connection (G);
- line -test gas to sample gas probe (CSS.../C)- to connection (I);
- analyzer(s) to outlets (D) and (E); maximum two sample gas outlets are available; with version CSS-2 an additional sample gas outlet (K) is available;
- connect the condensate hose to the outlet (H) respectively to the outlet (L), operating with version CSS-2 (second independent gas flow); the hose must be laid with slope to a ventilated sewer or reservoir; it is absolutely necessary to install the ventilation outside the analyzers cabinet and analyzers house;

Note

The tightness of the connections can only be guaranteed if the connecting hose has a straight rim (hose cutter).

Warning

Aggressive condensate is possible.

Chemical burns caused by aggressive media possible!

Wear protective gloves and protective glasses!

Wear proper protective clothing!

17 ELECTRICAL CONNECTIONS

Warning

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

Note

For the erection of power installations with rated voltages up to 1000 V, the requirements of VDE 0100 and relevant standards and specifications must be observed!

The main circuit must be equipped with a fuse corresponding to the nominal current (over current protection); for electrical details see technical data.

- Connect power supply (optional heated sample line with temperature sensor) to the corresponding terminals of the electrical junction box **X1** (Fig.7); intend for a main switch and a corresponding fuse protection; the dual-colored LED for local control shines green if the **CSS** is alive.

18 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.

19 STARTING

Before starting the gas conditioning system please pay attention to the site-oriented and process oriented precautions.

The following description is valid for starting the device at ambient temperatures > +8 °C.
The following steps should be carried out before initial start-up:

- The function of the CSS is only guaranteed when the sub-D-plug **X2** is mounted;
- For internal control of the CSS a bridge between contact 1 and 9 in the sub-D-plug is necessary;

For external control of the CSS operating errors caused by feeding test- and sample gas simultaneous have to be prevented by the customer.

19.1 MEASURE

- Turn switch to 'On' (see fig.2, LED green); for external control the dual-colored LED shines red;

Switching the **CSS** into operation displays the following alarms:

Cooler alarm (LED red):

after the cooler is ready for operation (cooler temperature > 2 °C and < 8 °C) the alarm is eliminated (LED green). The 3-way solenoid (4) (see fig.6) opens automatically for sample gas and the sample gas pump (10) (see fig. 6) is ready for operation.

Flow alarm (LED red):

up to now there is no gas flow. Even when the ball of the flow meter passes the alarm value the alarm is eliminated (LED green).

- Turn switch to 'Measure' (LED yellow); available as contact outlet (see Fig. 9)

If the cooler alarm is eliminated:

- Turn switch to 'Pump on' (LED green)
- Adjust flow meter with needle valve to the demanded value

Note

Adjust the flow meter FM1 to a flow rate above the demanded alarm value. Because of breaking the outlet dew point (5 °C) the total flow rate should not pass the specified maximum value (see chapter 7.).
The minimum flow rate is determined by the sample gas pump. This requires the following minimum values:

N3 KPE: approx. 60 l/h

N9 KPE: approx. 200 l/h

If the flow rate remains under the minimum value the pump membrane can be premature destroyed by over pressure!

19.2 CHECK/CALIBRATION

- turn switch to 'Check' (LED yellow); is available as contact outlet;
- turn switch to 'Test gas' (LED yellow);
- turn switch to 'Zero gas' (LED yellow);

After this calibration or checking the measuring range with zero gas can happen.

- turn switch to 'Span gas' (LED yellow); For the optional extension of the CSS to a maximum of four final gas paths, the corresponding final gas valve must be preselected using the rotary switch 1.5 (Fig. 1).

Now calibration or checking the measuring range with span gas can be started.
For returning to the measuring mode:

- turn switch to 'Sample gas' (LED yellow);

If the analyzer has reached the measuring range:

- turn switch to 'Measure' (LED yellow).

19.3 SELF-OPTIMISING (PID-FUNCTION) OF THE CONTROLLED SYSTEM

The controller type 70304 has the possibility of a self-optimisation-function if it operates as a PID-controller. In all **M&C** components this function is pre-adjusted. This means that a self-optimisation is necessary starting up the component.

Note

For self-optimising of the control circuit, the heating of the heated sample line must be connected to the appropriate terminals of the CSS (s. chapter 10.1).

Warning

Before connecting the heated sample line, isolate the unit from the supply!

The self-optimising function can be activated as follows:

- After cable connection (Figure 7), switch on the supply.
- When the actual value (top display, red indicator) reaches the setpoint value (bottom display, green indicator), press ▼ + ▲ keys simultaneously for longer than 2 seconds. The word "**tUnE**" now flashes in the setpoint value display and the self-optimising function is activated.
- Self-optimization has finished when the display changes to the standard display. The time of self-optimizing depends on the control circuit.

To cancel the self-optimization press the keys ▼ + ▲ simultaneously.

The heated sample line now works in optimized operation.

20 CLOSING DOWN

Note

Before de-commissioning the CSS, sample gas should be expelled with inert gas (Nitrogen or air).

The area in which the equipment is situated when not in use must be kept free of frost at all times.

For de-commissioning the **CSS** carry out the following steps:

- turn switch to 'Pump off' (LED red); is not displayed on the control board in case of external control
- switch the **CSS** off; for local control turn the switch 'On' left (LED extinguishes)

21 MAINTENANCE

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

Warning

Dangerous voltage. It is necessary to take the equipment off the mains before any assembly, maintenance or repair work is carried out.

In order to do this the mains power plug has to be removed from the mains plug socket!

The frequency of the maintenance work depends on the operational process and can therefore only be determined in each individual case. Maintenance instructions pertaining to individual components can be found in the instruction manual for individual components.

All parts which require maintenance work are housed in the gas conditioning system in such a way so that they are easily accessible. These are:

- The filter element of the preliminary filter **FPF-0,1GF**.

Note

In order to protect the analyzers which have been additionally connected, it is recommended that in the event of a condensation irruption the moist filter elements be replaced.

- The preliminary filter for the peristaltic pump **PF2.** If the condensate contains particle residue, the preliminary filter should be replaced at regular intervals. The 'one-way' filter is situated in the suction side of the pump hose and can be easily replaced;
- Hoses of the Condensate pump **SR25.2**. These should be checked every six months and, if necessary, replaced;
- Diaphragm of the sample gas pump **N3KPE** or **N9KPE**.. These should be checked every six months and, if necessary, replaced;

21.1 MAINTENANCE OF THE INTEGRATED PERISTALTIC PUMP TYPE SR25.2

Before starting any maintenance work, make sure that any work done on the device is in compliance with all relevant regulations and standards.

Warning

Inhalation hazard possible, if using toxic or asphyxiant gases!

Purge peristaltic pump with inert gas or air before opening! If the pump is used for toxic gas or asphyxiant (oxygen-displacing) gas, it needs to be purged with inert gas or air before opening. Follow closely all relevant occupational safety regulations during operation.

Warning

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

Aggressive condensate possible!

Media residues in tubing!
Chemical burns caused by aggressive media possible!

Wear protective gloves and protective glasses!

Wear proper protective clothing!

Peristaltic pump is under pressure! Do not open housing!

A peristaltic pump might be part of a system, which is under pressure. Check pressure before opening peristaltic pump, and adjust pressure to atmospheric pressure.

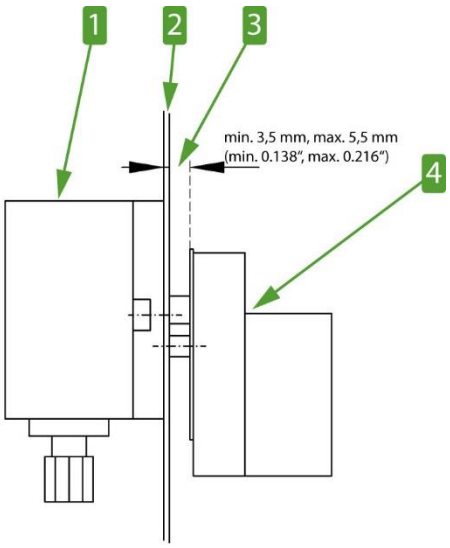
Flexible tube, conveying belt, contact pulleys and contact springs are the only parts of the pump subject to wear. They are simple to change.

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.

21.1.1 MOUNTING INSTRUCTIONS FOR PERISTALTIC PUMP

Make sure to mount the pump to the front of the cooler with a minimum distance of 3.5 mm [≈ 0.138″] and a maximum distance of 5.5 mm [≈ 0.216″] between the pump motor and the front panel. The minimum distance avoids damage to the pump motor and the maximum distance prevents the motor shaft from getting loose.



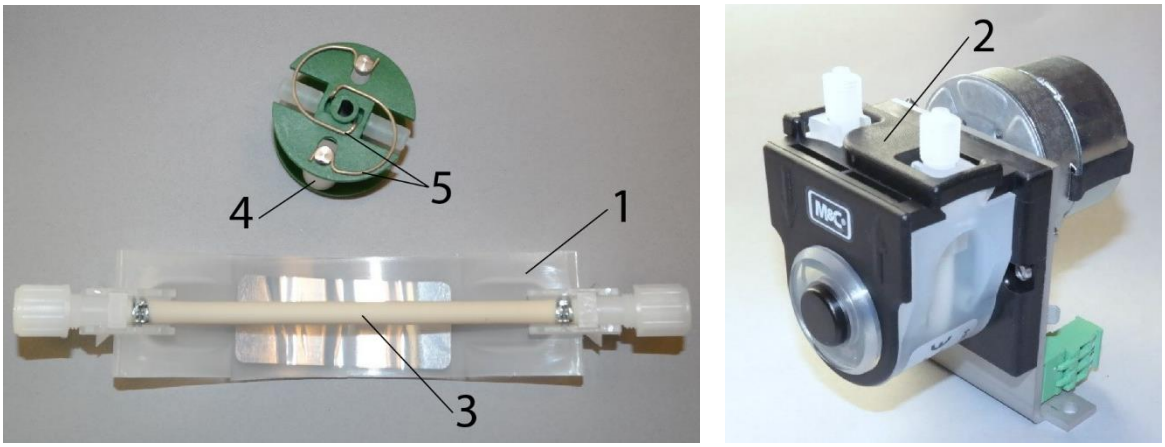
1 Pump head (outside the device housing) 2 Device front panel
3 Recommended mounting distance 4 Pump motor (inside the device housing)

Figure 14 SR25.2: Mounting distance between front panel and pump motor

Note

For detailed mounting instructions, see the instruction manual for the peristaltic pump series SR®: The manual is available on our website www.mc-techgroup.com.

21.1.2 CHANGING THE PUMP TUBING



1 *Conveying belt* **2** *S-bolt* **3** *Tubing set*
4 *contact pulley* **5** *springs*

Figure 15 Changing the pump tubing

For changing the pump tubing please proceed as follows:

1. Unplug the pump from the mains voltage. The device needs to be voltage free.
2. Open tube connections at the pump;
3. Press conveying belt ① at the recessed grips and turn S-bolt ② clockwise up to limit stop;
4. Take away conveying belt ① and remove the old tubing set ③ from the guides by pulling on the tube connectors;
5. Press the two contact pulleys ④ and check whether the spring pressure is still sufficient, if not, the contact springs have to be changed (see chapter 21.1.3);
6. Put the new tubing set ③ with the tube connectors into the guides of the conveying belt ① ;

Warning

Only the usage of the original tubing set guarantees a proper functionality.
Never lubricate the tube.
Before mounting the pump check all parts for contaminations and clean if necessary.

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

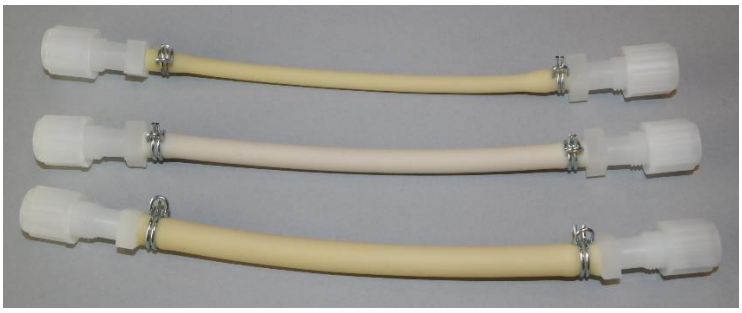


Figure 16 Different pump tube sizes

21.1.3 CHANGING CONTACT PULLEYS AND SPRINGS

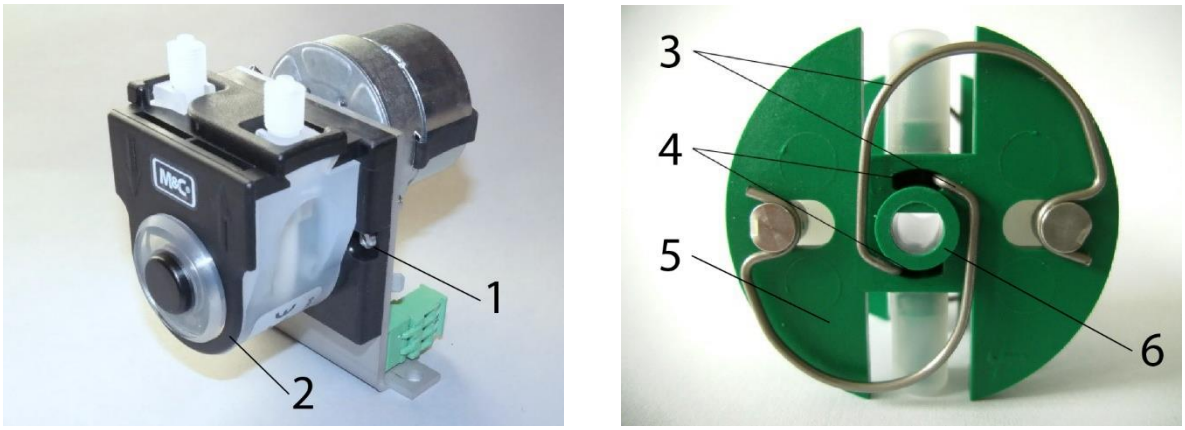
Note

While mounting, make sure that the center of rotation and the driver are aligned.
Use genuine spare parts only!

Follow these instructions to change the contact pulley and springs:

1. Disconnect the peristaltic pump from power supply.

2. Unscrew nuts of the pump head (wrench size 5.5) ①.



1 *Pump head nuts* **2** *Pump head* **3** *Springs*
4 *Groove* **5** *Driver (roll carrier)* **6** *Collar of the shaft bore*

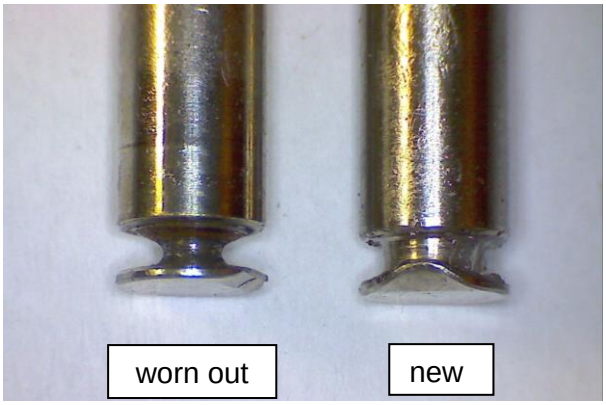
Figure 17 Disassembly of pump head and driver

3. Remove the pump head ② from the motor shaft.

4. Now the driver can be removed from the pump head and is ready for maintenance.

5. The removal of the springs 4 pcs.) ③ away from the driver is easily possible without the aid of any tools. For this take spring out of the groove ④ near to the shaft bore.

6. Dismount roller axes and change contact pulleys. Take care that axes are not worn out by the springs and have damaged the dent at the axes front end. In case of abrasion the axes have to be changed (see Figure 18).



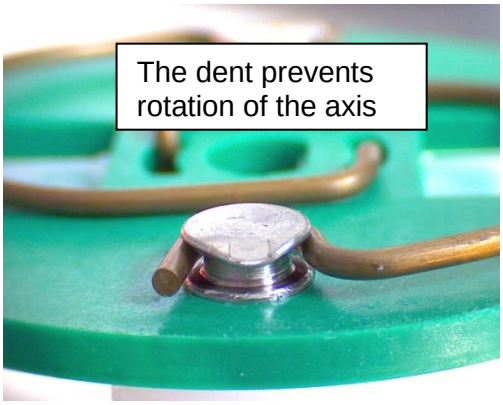


Figure 18 Check of axes and rolls

Note

The springs may come in different colorings. This is not a quality impairment. Make sure to use the right spring strength. This can be identified by the spring wire diameter.

The 'standard version for Novoprene pump tubing' (Part No. 90P1010) has a diameter of 1.1 mm and the 'reinforced version for FKM-, Acidflex®- or Masterflex®-tubing' (Part No. 90P1015) has a diameter of 1.2 mm.

Note

Two different types of springs are mounted inside the driver (right and left springs) for the first delivery.
When spare springs are ordered, for simplified storage, only one type will be delivered (right spring) which can be used for all four springs and will replace without any problems the initial springs. The replacement springs guarantee full functionality when all four springs are replaced.

1. Make sure that contact pulleys move easily on the axis. After remounting the axis with contact pulley into the driver the spring has to be mounted as shown as in Figure 18. Please pay attention to the alignment of the dent.

21.1.4 REASSEMBLY OF THE DRIVER

Reassemble the driver in reverse order:

1. Insert the roll carrier back into the pump head
2. Push the pump head with the roll carrier onto the motor shaft ②
3. Tighten the nuts of the pump head fastening (SW 5.5) ①.

Note

While mounting, make sure that the center of rotation and the roll carrier (driver) are aligned.
Make sure that the collar of the shaft bore (see Figure 17) faces towards the front of the pump head while mounting the roll carrier.
Use genuine spare parts only!

21.1.5 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.
We recommend cleaning the parts with a dry cloth. Solvent should not be used, because it can damage the plastics and synthetic rubber parts. Use oil-free compressed air to clean the parts if available.

Aggressive condensate possible!

Media residues in tubing!
Chemical burns caused by aggressive media possible!

Wear protective gloves and protective glasses!

Wear proper protective clothing!

21.1.6 REPAIR INFORMATION FOR INTEGRATED PERISTALTIC PUMP TYPE SR25.2

Note

When sending the peristaltic pump to M&C customer service for repair, please indicate the type of medium pumped. Before shipping the pump, please remove hazardous or aggressive contaminations from all parts of the pump!

22 DISMOUNTING THE FLOW COMPONENTS SUB PANEL

The dismounting of the flow components sub panel is carried out stepwise as follows:

- Check if the **CSS** is disconnected from all power supplies
- Loosen the fastening screw from the flow alarm sensor;
- Remove the sensor from the flow meter glass;
- Turn the union nut of the liquid alarm sensor left by hand (fix the sensor while loosen the nut);
- Pull out the sensor of the flow chamber;
- Unscrew the hose connections of the condensate pump;

Warning

Aggressive condensate is possible.

Chemical burns caused by aggressive media possible!

Wear protective gloves and protective glasses!

Wear proper protective clothing!

- release the fastening screws from the flow components sub panel;
- pull out half the sub panel and lower so that the backside tube connections are accessible;

Note

The flow components sub panel is not rail mounted!

- release the tube connections at the top of the flow meters **FM1** and **FM2**;
- disconnect the tube 'flow chamber/heat exchanger' on the side of the chamber;
- pull out the hoses of the condensate pump through the guides in the sub panel;
- pull out the plug in connection from the connector block **X8** (see fig.3).

Now the sub panel can be completely taken out of the 19" housing.

Mounting the sub panel happens in opposite order. Please pay attention to the following instructions:

- mounting the plug in connection look out for the sequence of numbers;
- after the implementation of the condensate hoses pay attention of possible folds;
- tighten the union nut of the liquid alarm sensor by hand;
- position the flow alarm sensor and tighten the fastening screw by hand.

23 ALARMS AND ELIMINATION

The alarms are displayed on the operation and control board (see fig.2) by LED's. The alarms are available as a status contact in the Sub-D-Plug (s. chapter 10.2.2 u. 10.2.3).

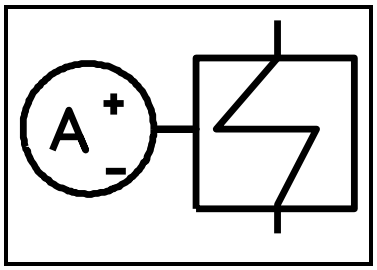
23.1 VOLTAGE LOSS

At a voltage loss the operation and control board of the **CSS** is out of function and the LED's are extinguished (see chapter 8.).
A signal is available at the alarm status contact in the Sub-D-Plug (s. chapter 10.2.1).

Carry out the following controlling steps:

- check the position of the main switch;
- check the external fuse; if necessary exchange the fuse;
- check the fine fuse (F1=2 A, see circuit diagram in the appendix) on the main board of the **CSS**; if necessary exchange the fuse.

23.2 COOLER ALARM/TEMPERATURE CONTROLLER ALARM

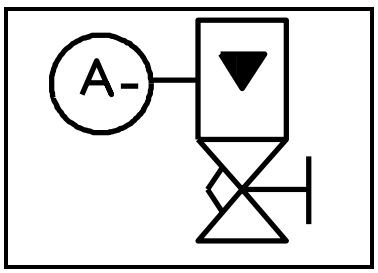


Cooler alarm is released if the cooler temperature is < 2 °C or > 8 °C, also in the period till the **CSS** is ready for operation. As well cooler alarm is released if the temperature controller (option) of the heated sample line is out of range. The operative cooler/temperature controller opens the 3-way solenoid valve and makes the function 'Pump On' possible.

For alarm elimination please check:

- the function of the cooler; see separate instruction manual
- ambient temperature > 2 °C?
- the function of the temperature controller; see separate instruction manual

23.3 FLOW ALARM



The gas flow is adjusted by the flow meter **FM1** and observed by an optical bi stable flow alarm sensor. The sensor can be moved on the flow meter glass and adjusted to any alarm value. The sensor recognises the variation in direction of the ball in the flow meter. If the ball passes the alarm limit in the direction of increasing flow rates the alarm is eliminated. In opposite direction alarm is released.

Possible reasons for flow alarm are:

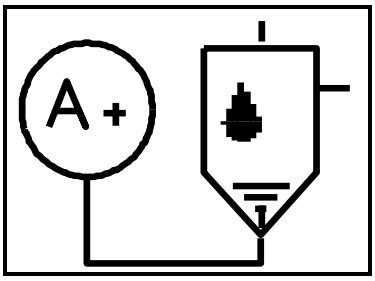
- period till the **CSS** is ready for operation;
- sample gas pump is out of order;
- the flow rate is adjusted below the alarm limit;
- cooler alarm/temperature controller alarm; the 3-way solenoid valve is automatically closed and the sample gas pump is switched out of order;
- liquid alarm; the 3-way solenoid valve is automatically closed and the sample gas pump is switched out of order;
- the tubes are blocked so gas flow isn't possible;

The following steps are possible to eliminate the flow alarm:

- check if the adjusted flow rate is above the alarm limit;
- check if the sample pump is switched on (see fig.2, LED green);
- check if there is no other alarm; correction see chapter 23.2 and 23.4
- check if the gas can pass through the gas tubes.

If the alarm cannot be eliminated in spite of the above-mentioned steps the electronic card **LFC-2** has to be checked.

23.4 LIQUID ALARM



The **M&C** liquid sensor alarm unit **LA1** is useful whenever liquid can damage a gas analyzer system. This may occur if a gas dryer unit or a drain system fails.
The **M&C LA1** liquid sensor is constructed in the following way that any droplets of liquid in the sample gas are attracted under gravity to the sensor surface and even the smallest liquid droplets trigger a sure and rapid alarm.
In the event of an alarm the liquid alarm sensor switches the sample gas pump off and closes the 3-way solenoid valve for sample gas.

Possible causes of condensate breakdown are insufficient gas drying or defective condensate disposal.

To eliminate the alarm carry out the following steps:

- switch the **CSS** off;
- disconnect the line to the analyzer;
- open the sample gas inlet;
- check the hoses of the condensate pump **SR25.2**; if they are defective change hoses;
- switch power supply on and check the condensate pump if it works;
- let the condensate pump work, until no more condensate is conveyed;
- dismount the LA sensor;
- dry the sensor;

- remove the filter element from the gas filter **FPF-0,1GF**;
- before starting the **CSS** with sample gas the gas ways must be dry. For this the **CSS** must be sweeping about 1 hour with ambient air. The filter element remains dismounted and the sample gas inlet and outlets remain open, disconnected from the system.
- install dry or new filter element.

If the elimination of the alarm is not possible in spite of the above-mentioned steps you should check the following components:

- gas cooler;
- electronic card **LFC-2**.

24 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.

25 SPARE PART LISTS

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

19" GAS CONDITIONING UNIT TYPE CSS... (C) consumable parts, (R) recommended spare parts, (S) spare parts					
			recommended quantity in operation [years]		
Part No.	Description	C/R/S	1	2	3
Cooler ECP-1000/ECP-2000, ECP-3000: 10 (s. Fig.4)					
93K0130	Jet-Stream heat exchanger ECP-1000/2000G 90°	R	0	1	1
93K0150	Jet-Stream heat exchanger ECP-3000G 90°	R	0	1	1
90K0115	Thermal conductivity paste, 50g	R	1	1	2
93K0020	Power supply board compl. for ECP1000-3000	R	-	1	1
93K0530	ECP-1000 Netzteilplatine kompl.	R	-	-	1
93K0030	Fine fuse 0,8AT 5x20 ECP-1000	R	2	4	4
93K0540	Fuse 5 X 20, 1,6 AT for ECP-2000/3000	R	2	4	4
93K0010	ECP-1000 fan 12 V DC	C	-	-	1
93K0036	Diode ECP-1000	R	-	-	1
90K2010	Rectifier for cooler type ECP1000-3000	R	-	-	1
90K2020	Power transistor BUZ11 for ECP1000-3000	R	-	-	1
93K0040	PT-100 temperature sensor	R	-	-	1
93K0045	ECP-1000 peltier element 4/4	R	-	-	1
93K0520	ECP-2000/3000 peltier element 6/6	R	-	-	1
90K0145	ECP-alarm relay DSP1	R	-	-	1
Peristaltic pump SR25: 1.2.2 (s. Fig.3)					
90P1007	SR25 pump hose with PVDF tube connectors DN 4/6 mm	C	1	2	4
90P1020	Driver complete for peristaltic pump SR25.2	S	-	1	1
90P1010	Set contact spring for SR25.2 (4 pcs.)	R	1	2	2
90P1045	Contact pulley(1 pc.) for (2 pcs./pump required)	S	2	4	4
90P1050	Conveying belt for SR25	S	-	1	2
90P1025	S-bolt	S	-	-	1
01P1000	Peristaltic pump complete, 230/115V 50/60Hz	R	-	-	1
3-Way solenoid valve: 14 (s. Fig.4)					
90K6040	3-Way solenoid valve, 230V f. CSS(/C)/CSS-3(/C)	S	-	-	1
90K6041	3-Way solenoid valve, 115V f. CSS(/C)/CSS-3(/C)	S	-	-	1
2-Way solenoid valve: 16 (s. Fig.4)					
90G3000	2/2-way solenoid valve 6011 for CSS 230V 50Hz for CSS(/C) and CSS-3(/C)	S	-	-	1
90G3005	2/2-way solenoid valve 6011 for CSS, 115V for CSS(/C) and CSS-3(/C)	S	-	-	1
Universal filter FPF-0,1: 1.2.1 (s. Fig.3)					
90F0009	Filter element type F-0,1GF50 0,1µm	R	4	8	12
90F0118	Filter glass F-45	R	1	2	2
90F0044	Viton-O-ring, 35 for FPF-0,1	R	1	2	2
90F0095	PVDF filter element clamp FPF-GF	S	-	1	1

19“ GAS CONDITIONING UNIT TYPE CSS...

(C) consumable parts, (R) recommended spare parts, (S) spare parts

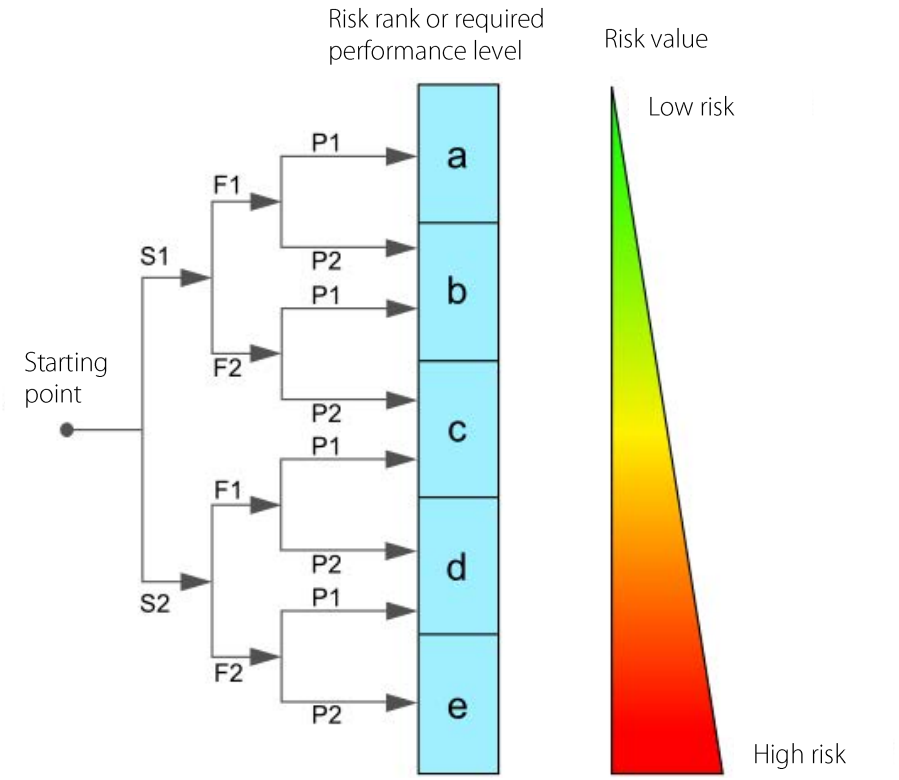
			recommended quantity in operation [years]		
		C/R/S	1	2	3
Flowmeter FM40: 1.2.4 (s. Abb.3)					
90A0015	Flow meter glass for FM40 range 7-70 l/h air for version CSS... and CSS.../C	S	-	1	1
94F0015	Flow meter glass for FM40 range 25-250 l/h air for version CSS... and CSS.../C	S	-	1	1
90A0018	Viton O-ring 9 für flow meter glass	R	2	4	6
09F4000	Flow meter FM40 7-70l/h (compl.), for versions CSS... und CSS.../C	S	-	-	1
09F4010	Flow meter FM40 25-250l/h (compl.), for versions CSS... und CSS.../C	S	-	-	1
Liquid sensor LA1S: 1.2.3 (s. Abb.3)					
90E1000	O-ring, Viton - 14, LA1	R	1	2	3
90E1010	Ring, PVDF - 16, LA1	R	1	2	3
Fine-wire fuse CSS:					
90G3010	Fuse 5 X 20mm, 2 AT for **CSS**	R	2	4	4
Internal tubing:					
05V6600	Ferrule 4/6 PV	R	10	15	15
05V6605	Union nut M10-4/6 PV	R	10	15	15
02B1000	PTFE- tube NW 4/6, quantity per meter	S	2	4	6
10T1000	Hose cutter	S	1	1	1
Diaphragm pump type N3 KPE/KP18; N5 KPE/KP18					
90P2100	Square cap type D3 for N3-N5 KPE, PVDF, 1/8"i	S	-	-	1
90P2120	Membrane type S3, Viton/PTFE for N3-N5KPE	C	1	2	3
90P2111	Valve reed type V3 with O-ring type O3, for N3-N5, 1 pc, material: Viton® (2 pieces per pump required)	C	2	4	6
90P2105	Spacer type Z3, for N3-N5 KPE, material: PVDF	S	-	-	1
Diaphragm pump type N9 KPE/KP18					
90P2200	Square cap type D9 for N9 KPE, PVDF, 1/8"i	S	-	-	1
90P2220	Diaphragm type S9, for N9 KPE, material: Viton/PTFE	C	1	2	3
90P2211	Valve plate with seal for N9 KPE, 1 pc., material: Viton. (2 pcs./pump)	C	2	4	6
90P2205	Spacer type Z9, for N9 KPE, material: PVDF	S	-	-	1

26 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 19 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 risk of being crushed by rotating parts

Risk rank - group A
The product contains rotating parts. Do not open covers until the device has been switched off.

Caution glass

Risk rank - group A
The product contains glass components. 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 > 60 °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 > 20 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 kg [≈ 88.2 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.

27 APPENDIX

- Pin assignment for external drive of the **CSS**
- Circuit diagram gas conditioning **CSS**,
  drawing number: **2443-5.01.5**;
- **CSS** wit 4 x span solenoid valves,
  drawing number: **2443-5.03.0**;

For further product documentation, please see our internet catalogue:
www.mc-techgroup.com

- Instruction manual electric gas cooler **ECP 1000/2000/3000**
- Instruction manual peristaltic pump **SR25.2**
- Instruction manual diaphragm pump **series N**
- Instruction manual Universal-Filter **FPF-0,1**
- Data sheet flowmeter **FM 40**
- Data sheet optical bi-stable flow alarm sensor **FA-1, bi**
- Data sheet liquid alarm sensor **LA1...**
- Instruction manual temperature controller **70304**

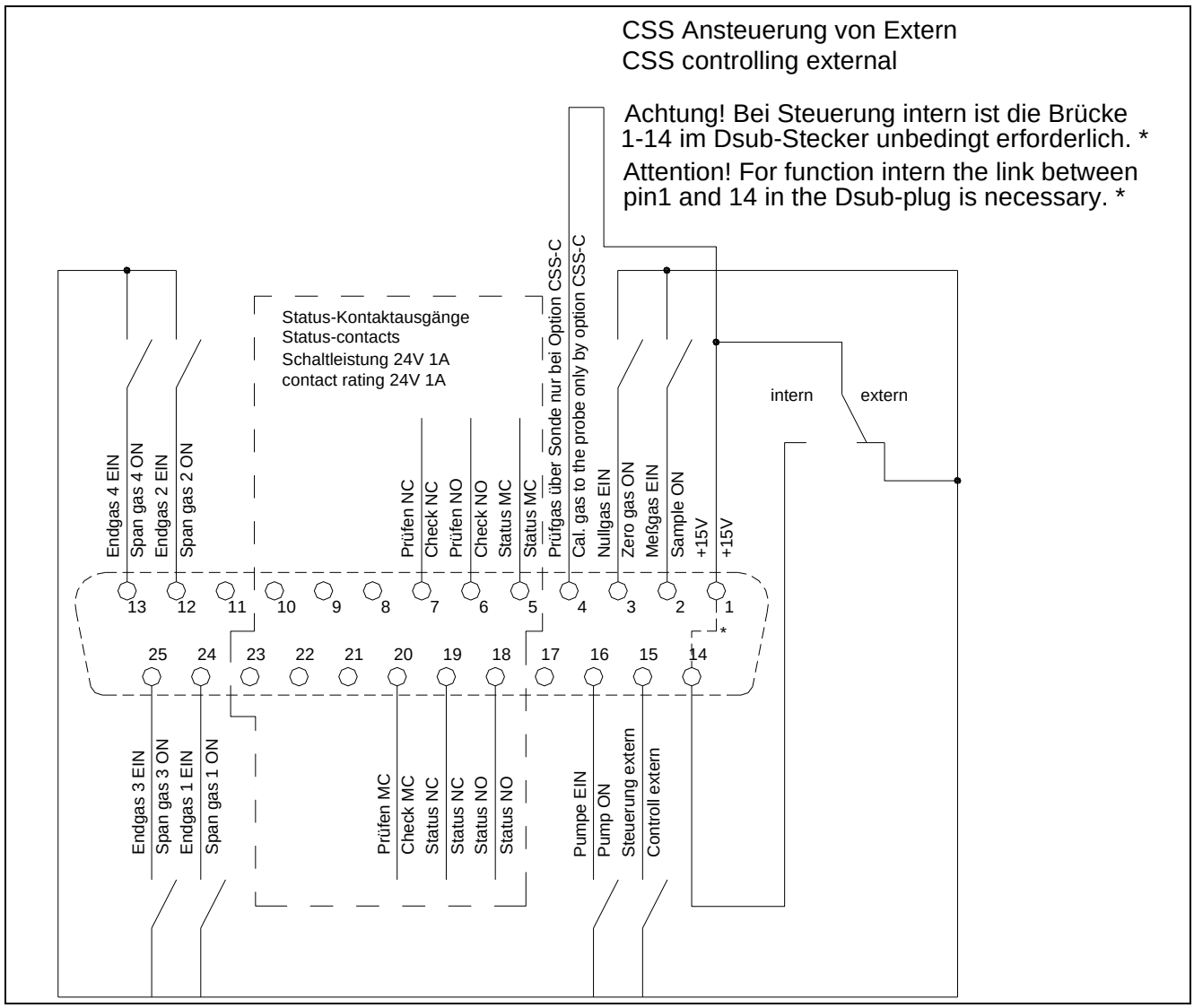


Figure 20 Pin assignment for external drive of the CSS

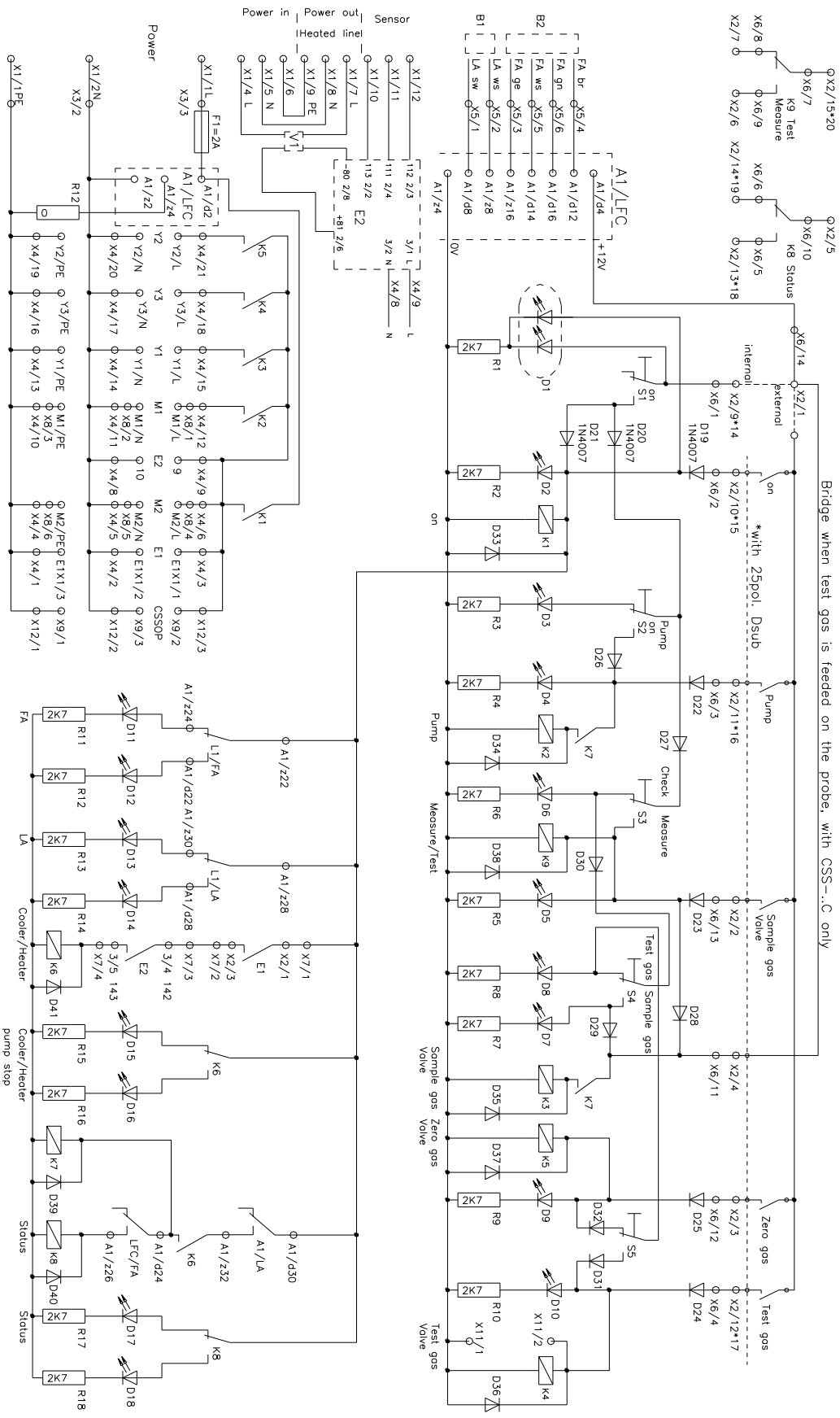


Figure 21 Circuit diagram gas conditioning CSS

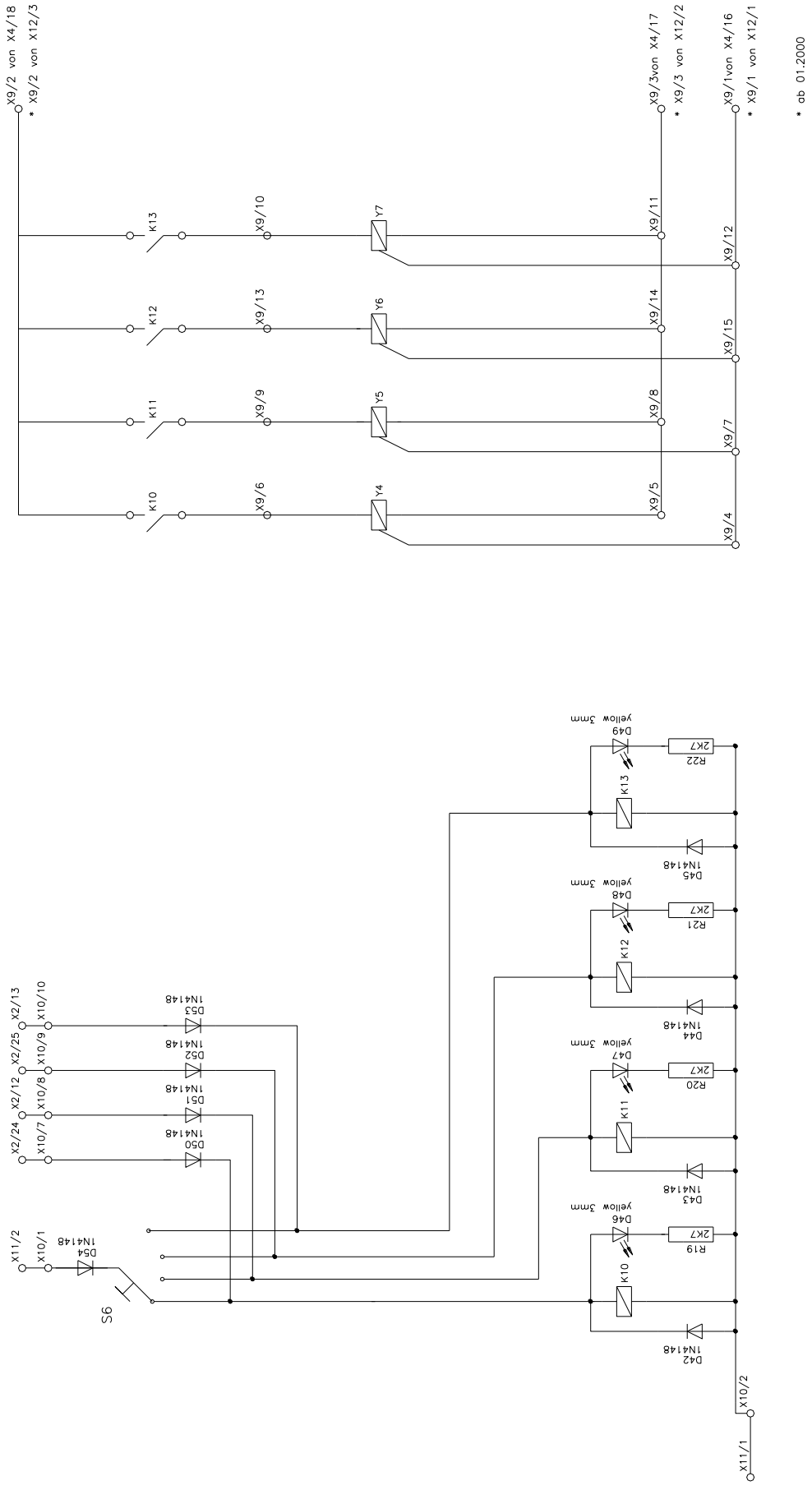


Figure 22 CSS with 4 x span solenoid valves