Medi*Control MC2025E*

Central Gas Distribution System

- Description of functions
- Instructions for use
- Installation instructions
- Maintenance and service

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Contents

Definitions

Main supply / reserve supply

- In a distribution system with tank, the tank is the main supply source and the cylinder batteries (bundles of cylinders) form the reserve supply (emergency supply).
- In a distribution system with cylinder batteries, the two cylinder batteries form the main supply source and another cylinder battery acts as reserve supply.

Reducer panel

- In a distribution system with tank, the reducer panel reduces the pressure of the tank on the network pressure.
- In a distribution system with cylinder batteries, the reducer panel reduces the pressure of the reserve supply on the network pressure.

Use

The central gas distribution system **Medi*Control*** guarantees a continuous supply with medical or technical gases (oxygen, nitrous oxide, carbon dioxide and other gases). In line with DIN EN 737-3, the system is rated for 3 supply sources. It consists basically of 3 components: the electronic switch-over system with integrated electronic switch-over component, a reducer panel and the manifolds.

The electronic switch-over system controls and monitors the supply of the gas distribution system. At the same time it reduces the pressure of the cylinder batteries. The status of the whole system can be checked at any time on a graphic display.

The reducer panel reduces the pressure of the tank or the reserve supply (for 2 cylinder batteries + 1 reserve supply) on the network pressure.

The system can be configured in three different versions:

⇒ Tank + 2 reserve supply sources (2 cylinder batteries)
⇒ 2 cylinder batteries + 1 reserve supply
⇒ 2 cylinder batteries as reserve supply

Standards

The following standards or specifications have been taken into consideration, among others:
DIN EN 737-3, DIN EN 738-2, E DIN EN 13221, DIN VDE 0107, DIN 477

Description of functions
The central gas distribution system **Medi*Control*** is intended to safeguard the continuous supply with medical or technical gases.

The gas is brought from the cylinder batteries through the manifolds to the switch-over system. The high pressure on the cylinder batteries is reduced in two stages in the switch-over system. The two high reducers (DM1, DM2) reduce the high pressure from the cylinder batteries to a medium pressure. The left-hand high reducer (DM1) is adjusted to a pressure of approx. 850 kPa, the right-hand one to approx. 750 kPa. This guarantees priority for the reducer on the left side, even in the event of a power failure. Each high reducer is equipped with a safety valve (SV1, SV2) which opens at a pressure of approx. 1100 kPa.

The medium pressure is reduced by two low reducers (DM3, DM4) to the network pressure. Each reducer has an output which corresponds to the rated output, i.e. even when one of the reducers is removed or being serviced, the switch-over system still performs to the rated output level. When the network pressure exceeds 600 kPa, a safety valve opens (SV3).

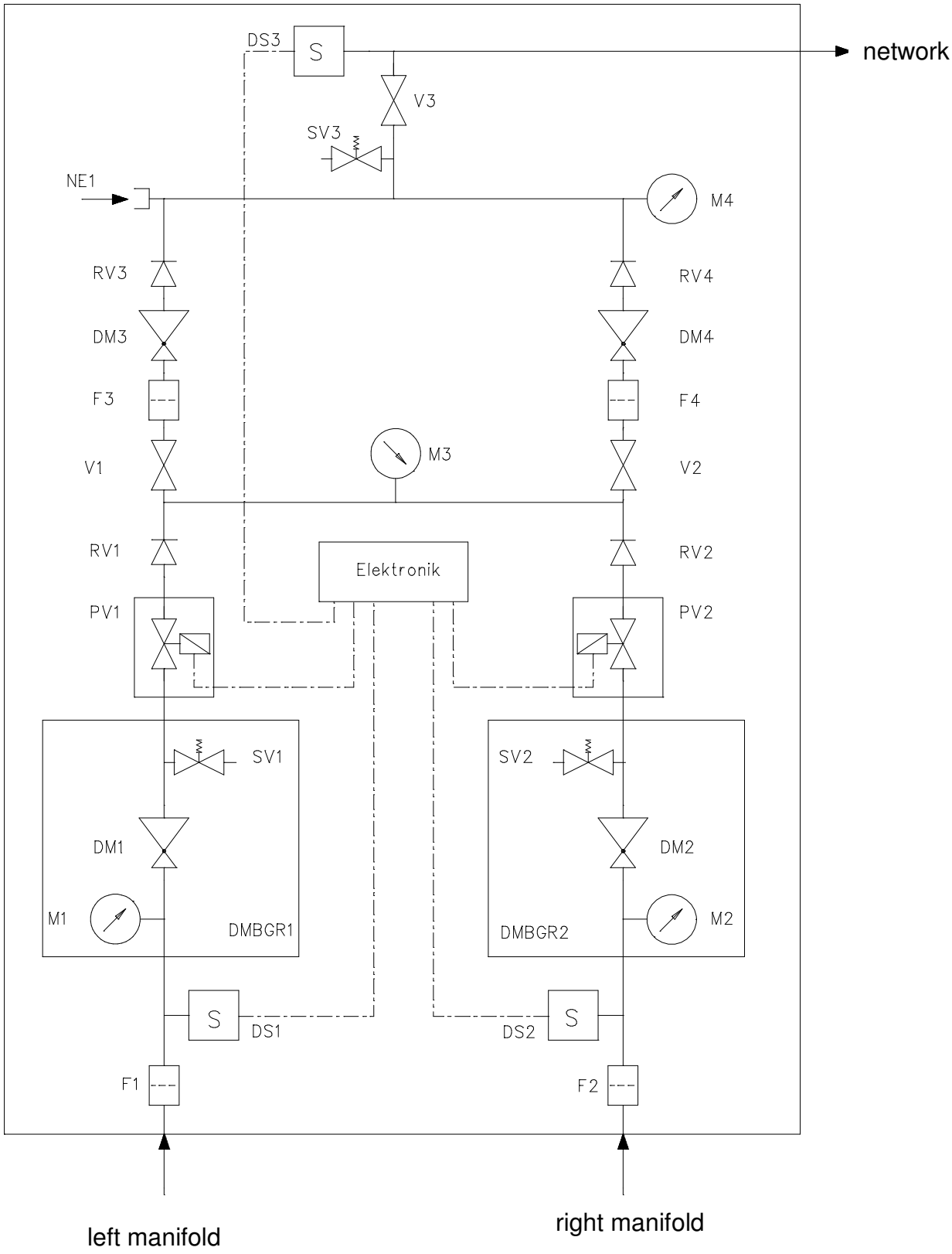
An emergency supply point (NE1) allows for the supply network to be supplied via a NIST-connector coupling in an emergency. Gas supply can then be provided for example by means of a gas cylinder. Please note that the corresponding shut-off valves of the system are closed during an emergency supply, and that after an emergency supply, the system has to be started up again according to the chapter "initial commissioning".

The electronic switch-over system **Medi*Control* 9.1** controls and monitors the central gas distribution system. The current status of the system is shown on a display. Pressure sensors measure the pressure of the cylinder batteries (DS1, DS2) and the network pressure (DS3). Two pneumatic valves (PV1, PV2) are responsible for controlling the gas flow of the two cylinder batteries.

There are pressure gauges at all important control points so that the state of the system can still be assessed even in the event of a power failure.

Schematic structure of the switch-over system

(example: two cylinder batteries)



Key for the schematic structure

DM1/DM2	High-pressure reducer
DM3/DM4	Low-pressure reducer
DMBGR1/DMBGR2	Reducer assembly
DS1/DS2	Pressure sensor cylinder battery, 0-25000 kPa
DS3	Pressure sensor network-pressure, 0-1600 kPa
F1/F2/F3/F4	Filter
M1/M2	Pressure gauge 0-31500 kPa
M3/M4	Pressure gauge 0-1600 kPa
NE1	Emergency supply point (NIST)
PV1/PV2	Pneumatic valve
RV1/RV2	one-way valve medium-pressure
RV3/RV4	one-way valve low-pressure
SV1-SV2	Safety valve medium-pressure, 1100 kPa
SV3	Safety valve network-pressure, 600 kPa
V1-V2	Shut-off valves, low-pressure
V3	Main shut-off valve cylinder supply

Technical data

Electronic switch-over system

Design:	twin-designed, two-stage network pressure reduction with pneumatic priority switching, removable painted steel plate housing with easily opened hood, safety valves for medium pressure and network pressure, emergency supply point (NIST)
Dimensions:	approx. 390x840x300 (WxHxD), approx. 35 kg
Capacity:	25 Nm³/h Input pressure: max. 20000 kPa Output pressure: 500 kPa Programmed alarm limits: 450/550 kPa
Incoming:	G3/4” flat (cylinder batteries)
Outgoing:	to the distribution panel: copper pipe Ø 22 mm Safety valves: copper pipe Ø 8 mm

Electronic switch-over component

Design:	multiple line graphic status display, programmable, chromated metal housing, terminal strip on electronic housing, sensor technique, RS-485 interface
Dimensions:	integrated in the switch-over system
Power supply:	230 V AC ± 5%; 24 DC ± 5%
Power consumption:	< 30 W
Pressure transducers:	pressure sensors 4 - 20 mA optional: pressure switches
Outgoing:	9 potential-free contacts, max. 1 A/60 V
Interfaces:	RS485 (9600 Baud, none parity, 8 data-bits, 1 stopp-bit, ANSI-emulation)
Solenoids:	24 V DC ± 5%

Reducer panel reserve supply

Design:	double-stage pressure reduction, emergency supply point, pressure sensor, safety valve, pressure gauge
Dimensions:	approx. 600x300x200 (WxHxD), weight approx. 20 kg
Capacity:	flow: appr. 50 Nm³/h input pressure: max. 20000 kPa output pressure: 400 kPa
Incoming:	copper pipe Ø 22 mm
Outgoing:	to the distribution panel: copper pipe Ø 22 mm Safety valves: copper pipe Ø 12 mm

Manifolds

Design:	rated for up to 5 cylinders, venting valve, main shut-off valve, non-return valve for every cylinder, cylinder support
Dimensions:	approx. 1200x600x460 (WxHxD), weight approx. 15 kg
Capacity:	incoming pressure: max. 20000 kPa
Incoming:	connection according to the specification of DIN 477
Outgoing:	G¾”a flat

Installation instructions

Space required

A distribution system with gas cylinders should be installed in a specially designed room, or a room which has been suitable modified, which is well ventilated and fire-proof.

Recommended installation procedure

- Attachment of the switch-over system to the wall
- Attachment of the manifolds to the wall
- Connection of the manifolds to the switch-over system
- Route the vent pipes of the safety valves and the manifolds outside
  - ➢ The vent pipes for the medium pressure stage and those for the network pressure must be routed separately
- After installation, rinse the whole system
- Route and connect up the electrical connections
  - ➢ Connect the pressure sensor of the reducer panel to the electronic component!

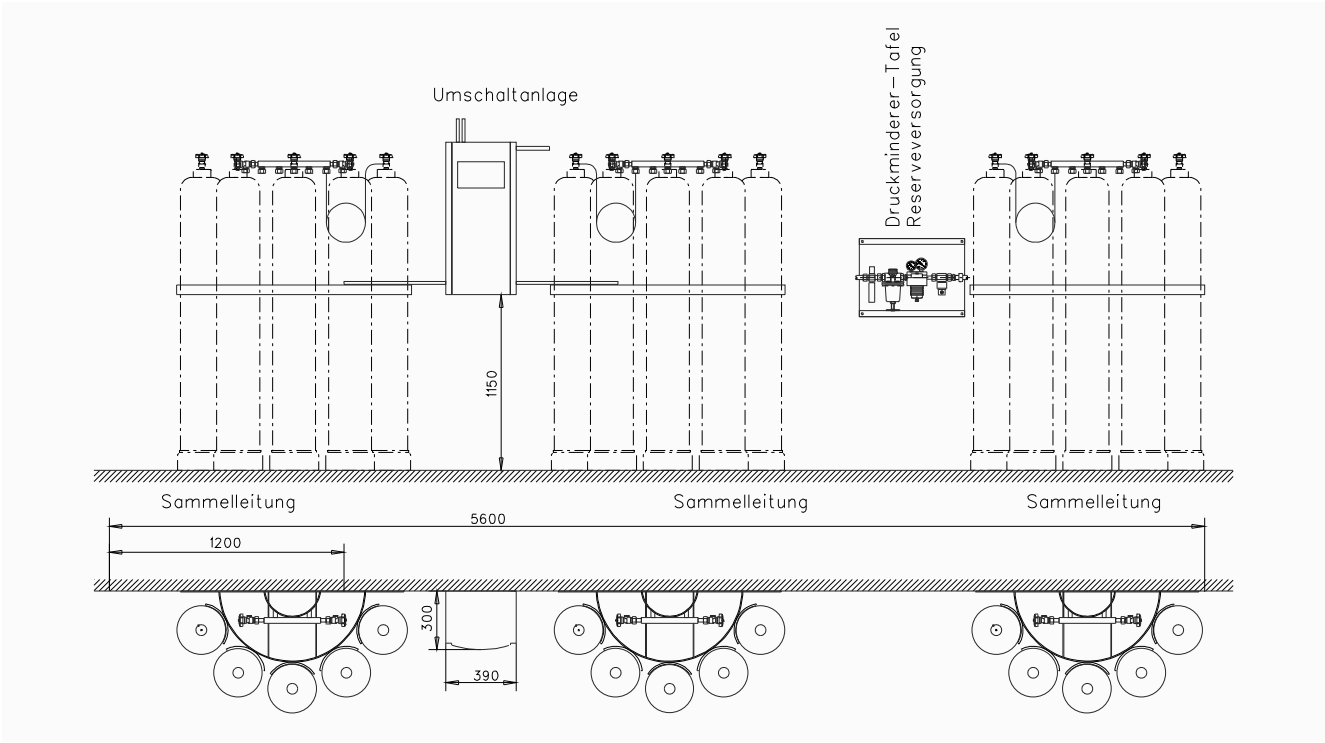
!!! Caution !!!

During soldering work, the pipes **must**
be rinsed with inert gas!

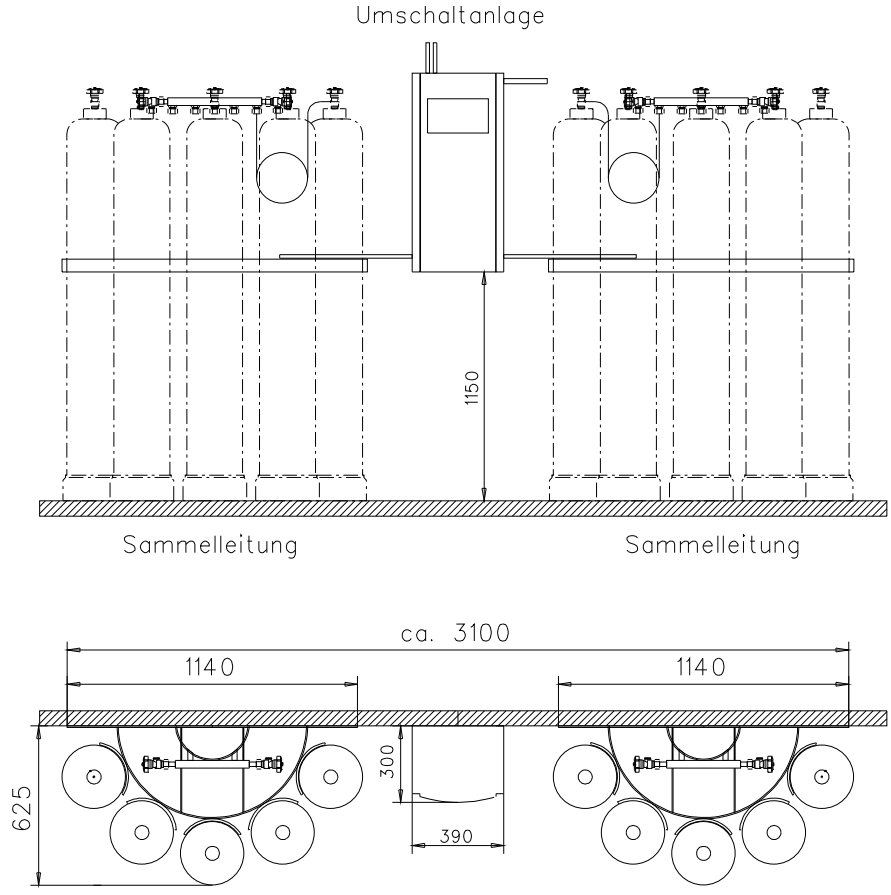
Installation instructions

- Installation may only be carried out by authorised qualified staff.
- Only copper pipes as per DIN 1786 may be used for installation.
- Reports must be kept of the acceptance and handing over procedures for the gas distribution system.
- All pipes and connections must always be kept free of oil and grease!
  - ➢ Risk of explosion !!!
- To connect the cylinders with the high pressure header use a tool to hold the high pressure check-valve! New check-valves shall be installed with a torsion force of appr. 40 Nm.

Structure of the central gas distribution system



2 cylinder batteries + 1 reserve supply



2 cylinder batteries as reserve supply

Initial commissioning

Before initial commissioning, the system must be vented and all shut-off valves must be **closed.**

- Installation must be finished completely
- The electronic switch-over component may **not** be in operation

1. **Slowly open the main shut-off valves of the manifolds.**
   - Observe the pressure at pressure gauges M3, it must remain constant and adjust to a pressure of approx. 850 kPa
   - The pressure on the left-hand side should be approx. 100 kPa higher than on the right-hand side. In the event of inadequate pressure difference, it is possible to feed both cylinder batteries into the supply network at the same time with the electronic component switched off.
   - If the pressure increases slowly, the reducer must be checked.
2. **Open shut-off valve V1 to V2**
   - Observe the pressure at pressure gauge M4, it must adjust to the network pressure and remain constant.
   - If the pressure increases slowly, the reducer must be checked.
3. **Slowly open shut-off valve V3**
   - Observe pressure at pressure gauge M4, it must adjust to the network pressure
4. **Switch on the power supply for the electronic component.**
   - No fault message may appear on the display of the electronic component.

Maintenance / Inspection

Inspection

The whole gas distribution system should be subject to visual inspection at regular intervals by an authorised qualified technician, checking the functions and pressure conditions in the system.

Maintenance

Maintenance of the system is recommended once every twelve months and may only be carried out by an authorised qualified technician. This includes among others, checking the correct pressure conditions and tightness of the pipe connections together with the valves. All service parts should be replaced every 5 years.

If individual components have to be removed for maintenance or repair, the corresponding shut-off valves before and after the component have to be closed. The redundant design with double components in the switch-over system means that the network continues to be supplied with gas, so that it is not necessary to adjust the reducers.

If the system has to be decommissioned for a brief time (major repairs, replacement of whole components), it is possible for gas to be supplied by the emergency supply. Please note that the main shut-off valve of the system is closed during emergency gas supply. To start up the system again for normal operation, please proceed according to the chapter "initial commissioning".

Service parts

Order no.	Designation
325.284	Maintenance kit for low-pressure reducer MC2025E
325.285	Maintenance kit for high-pressure reducer MC2025E
325.286	Maintenance kit pneumatic valve assembly MC2025E
325.277	Maintenance kit for connections MC2025E

Changing the cylinders

If one of the cylinder batteries is empty, a corresponding empty message appears on the display and does not go off until the cylinder battery replaced.

In order to change a cylinder battery, the corresponding main shut-off valve of the manifold have to be closed, and the manifold vented at the venting valve. During this procedure, the gas supply is provided by the other cylinder battery. After changing the cylinders, the main shut-off valve of the cylinder battery has to be opened again **slowly** (vent valve must be closed). Avoid sudden increases in pressure, danger of explosion! The display on the electronic switch-over component changes from "empty" to "ready".

Electronic switch-over component

The electronic switch-over component ***MediControl* 9.1** controls and monitors the central gas distribution system. It is located in a separate housing within the system. On the front of the housing there is a display, a red alarm LED and the RESET and SWITCH keys. The current status of the system is shown on the display. This includes among others the status of each gas source (*OPERATION, READY, EMPTY)* together with fault and alarm messages. In the event of an alarm message (an empty message from a supply source is not a fault and therefore does not cause an alarm), in addition a red LED flashes. A window in the hood makes it possible to check the condition of the system on the display even when the hood is closed. Pressure sensors measure the pressure of the cylinder batteries, the tank and the network pressure. Two pneumatic valves (PV1, PV2) control the gas flow of the two cylinder batteries. A serial interface (RS 485) allows for simple link-up of the electronic switch-over component to central monitoring systems.

When the system is assembled in the factory, the electronic component is programmed to the requirements. The following parameters can be programmed in the factory:

- Switch-over between the three versions
  ⇒ Tank + 2 reserve supply sources (cylinder batteries)
  ⇒ 2 main supply sources + 1 reserve supply
  ⇒ 2 cylinder batteries as reserve supply
- Types of gas
  Oxygen (O2), laughing gas (N2O), carbon dioxide (CO2), synthetic air (AIR), nitrogen (N2), helium (HE), hydrogen (H2), argon (AR), other gases (SONST)
- Language of the system messages
  German, English, French, Dutch, Turkish
- System with/without tank
  for systems with a tank, the tank symbol is shown on the display and the corresponding pressure sensor queried.
- Limit values
  empty- and operation messages of the gas supply sources, network pressure monitoring (0 ... 2000 kPa) standard programming:
  cylinder batteries empty 600 kPa
  cylinder batteries full 2000 kPa
  tank empty 700 kPa
  tank full 800 kPa
  network pressure too low 450 kPa
  network pressure too high 550 kPa
- Inverting the potential-free contacts
- Selection pressure switch/sensor
  a mixed use of pressure switches and sensors is not possible. When using pressure switches, the pressure is no longer shown in the display.

The current status of the system can be queried via an RS-485 interface or potential free contacts (relays). The contacts can be inverted in the factory. The following potential-free outputs are available:

- left side empty
- right side empty
- tank empty
- network pressure too low
- network pressure too high
- collective fault

Relaycontact is **open,** when the message applies

- left side operation
- right side operation
- tank operation

All alarm messages are shown on the display in plain text. Up to 7 messages can appear at the same time. The display changes approx. every 5 seconds from showing the messages to showing the system status. The following messages are possible:

#1 "Sensor left side defect!"
#2 "Sensor right side defect!"
#3 "Sensor medium pressure defect!"
#4 "Sensor network pressure defect!"
#5 "Network pressure too high!"
#6 "Network pressure too low!"
#7 "All gas sources empty!"
#8 "Solenoid defect!"
#9 "Key defect!"
#10 "LED defect!"

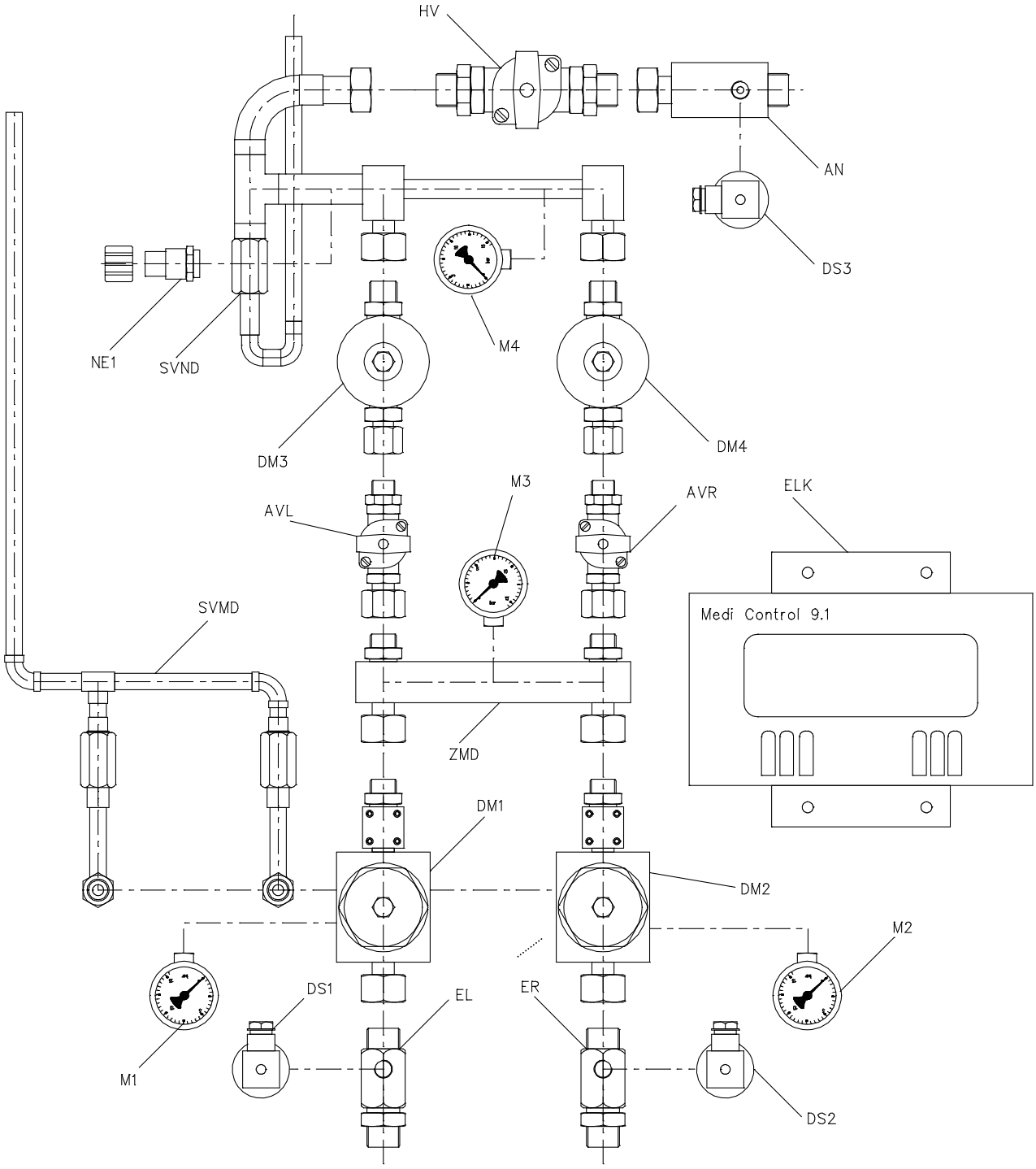
collective fault

When alarm messages appear, in any case the RESET key has to be pressed twice! When an alarm occurs, the LED starts flashing. On first RESET, it stays on permanently (confirmation for the service personnel that the fault has been registered). Even if the cause of the alarm no longer prevails, RESET has to be pressed a second time to switch off the LED. The function of the potential-free outputs remains unaffected.

Continua the RS-485 interface transmit the pressure and current status of the gas sources and network. The following parameter must be programmed in the terminal program:

baud:	9600
parity:	none / kein
stoppbits:	1
emulation:	ANSI

Explosion drawing



Legend explosion drawing

Abbreviation	Assembly
AN	Outgoing to the network
AVL	shut-off valve left
AVR	shut-off valve right
DM1	Left high pressure reducer with pneumatic valve
DM2	Right high pressure reducer with pneumatic valve
DM3	Left low reducer
DM4	Right low reducer
DS1	Pressure sensor left cylinder battery, 0-25000 kPa
DS2	Pressure sensor right cylinder battery, 0-25000 kPa
DS3	Pressure sensor network pressure, 0-1600 kPa
ELK	Elektronik MediControl 9.1
EL	Incoming, left cylinder battery
ER	Incoming, right cylinder battery
HV	Main shut-off valve
M1	Left high pressure gauge
M2	Right high pressure gauge
M3	medium pressure gauge
M4	Network pressure gauge
NE1	Emergency supply point (NIST)
SVMD	Safety valve medium pressure, 1100 kPa
SVND	Safety valve network pressure, 600 kPa
ZMD	Junction medium pressure

Plan of terminal connections

The housing of the electronic switch-over component has four connector strips with the following terminals.

Connector 1: 3 pole Connector 3: 12 pole
Connector 2: 8 pole Connector 4: 18 pole

Connection	Terminal designation	Connector	Pin
Power supply	Ground PE	1	1
230 V AC	Neutral N	1	2
or	Phase L	1	3
24V DC	+24 V	3	1
	GND	3	2
Sensors			
Tank	4 .. 20 mA / +24V	2	1 / 2
Right side	4 .. 20 mA / +24V	2	3 / 4
Left side	4 .. 20 mA / +24V	2	5 / 6
Network pressure	4 .. 20 mA / +24V	2	7 / 8
pressure switches			
Tank	4 .. 20 mA / +5V	2 / 3	1 / 9
Right side	4 .. 20 mA / +5V	2 / 3	3 / 9
Left side	4 .. 20 mA / +5V	2 / 3	5 / 9
Network pressure	4 .. 20 mA / +5V	2 / 3	7 / 9
Solenoids			
Tank	+V1 / -V1	3	3 / 4
Right side	+V2 / -V2	3	5 / 6
Left side	+V3 / -V3	3	7 / 8
Potential-free contacts			
Collective fault	R1	4	1 / 2
Network pressure too high	R2	4	3 / 4
Tank in operation	R3	4	5 / 6
Right side in operation	R4	4	7 / 8
Left side in operation	R5	4	9 / 10
Network pressure too low	R6	4	11 / 12
Tank empty	R7	4	13 / 14
Right side empty	R8	4	15 / 16
Left side empty	R9	4	17 / 18
Serial interface			
RS485	-RS485 / +RS485	3	10 / 11