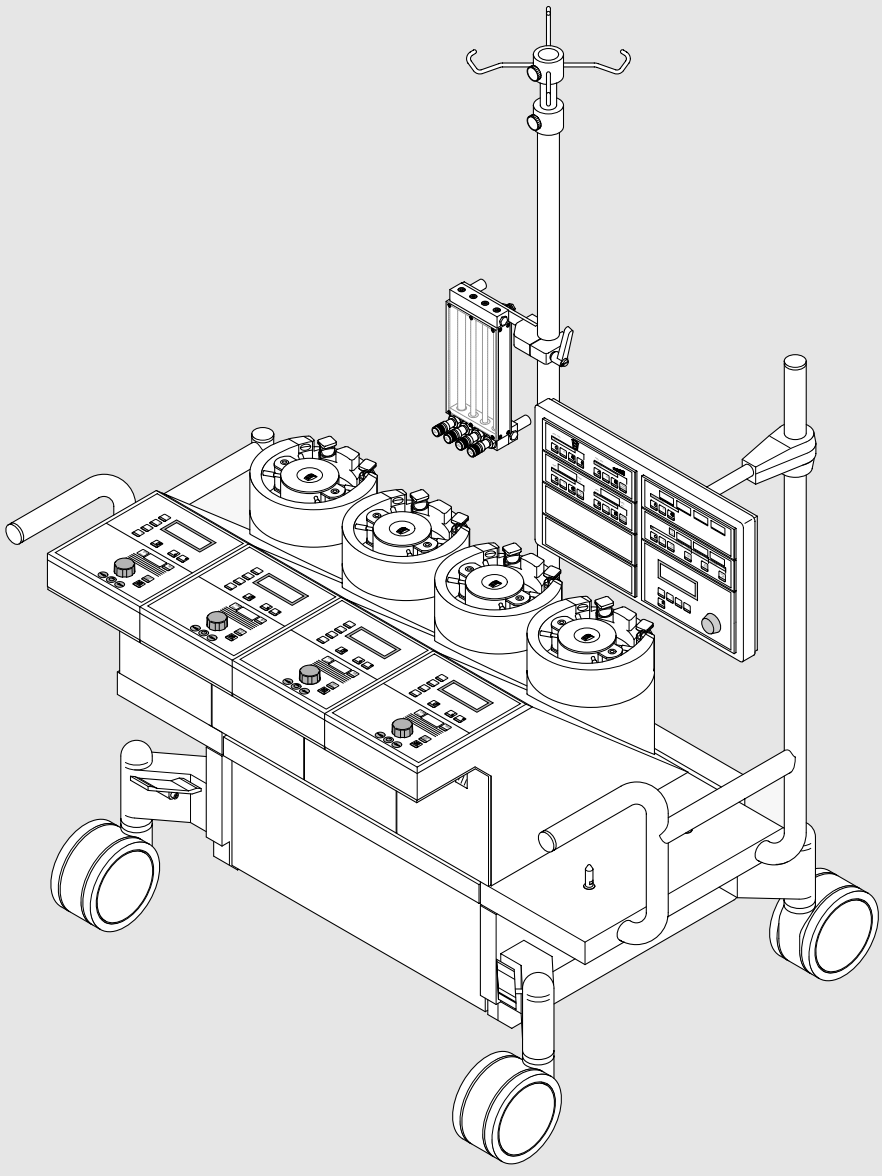
STÖCKERT
INSTRUMENTE GMBH

S/5



Service Manual 05/00
SM-5311-0001.05E

Important Note

This service manual is only intended for persons trained and authorized by STÖCKERT INSTRUMENTE GMBH for servicing the S3 system.
The knowledge of the instructions for use is presupposed.
If the technical state of the unit deviates from the service manual, please inform the technical service.
Dangers are only indicated if they cannot be identified by technically trained personnel. Danger notices relating to the operation of the S3 system may be taken from the instructions for use.

In case you detect faults, incomplete or unclear items in this version, please inform us.

STÖCKERT INSTRUMENTE GMBH

Technical Service

Lindberghstraße 25

D-80939 Munich, Germany

Phone:	49 - 89/	323 01-0	Switchboard
		323 01-125	Service Department
FAX:	49 - 89/	323 42 38	Switchboard
		324 34 29	Service Department

Tlx.: 5 215 952 stoe d

Catalogue of Issue Status

This description is valid for:

Unit descrption:	S3
Edition:	5. edition
Issue date:	May 2000
Total number of pages:	206 pages

No./ Designation of modified page	Issue status	Issue date

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General Information 1

1.1 Safety Regulations

For operation and repair of the S3 the following safety regulations, or their local equivalents must be strictly obeyed:

- VBG 93	safety rule
- VDE 0107	electrical installation
- DIN IEC 601/ VDE 0750 part 1, 0751	electrical safety, general
- DIN 57836/ VDE 0836	electrical safety
- Med GV (group 1) or the applicable local medical equipment ordinances	German safety regulations for medical instruments

In the following paragraphs extracts from the above mentioned safety regulations are listed. These extracts, however, do not replace the detailed knowledge of the safety regulations.

1.1.1 Electrical Safety

The S3-system corresponds to safety class 1 (VDE 0750) and thus must only be operated under the following conditions (national regulations are to be observed):

- The instrument must be connected to a properly grounded mains supply according to the technical data.
- The instrument must be connected to a separately secured plug socket according to VDE 0107.

Splash water near the instrument must be avoided.

1.1.2 Explosion and Fire Hazard

Caution!

The S3-system may not be installed or used in explosion hazard areas or in the vicinity of inflammable anaesthetics or easily volatile substances such as alcohol.

1.1.3 Med GV

The instrument must be checked according to the safety regulations:

- after initial installation and after every location change,
- after every repair,
- at least after 1000 operation hours or every year, whichever applies first.

The specific steps to be performed in Germany are described in the appendix. Other nations may have different regulations. The operator has the responsibility for the observance of these regulations.
The specific checks to be performed in the Federal Republic of Germany are described in the Appendix. As the medical equipment ordinances vary from country to country, the operator or clinic must carry the responsibility of ensuring that the applicable requirements are met.

1.2 Installation, Maintenance and Repair

Installation, maintenance and repair may only be performed by Stöckert trained service personnel or a local service representative recommended by your distributorship. Only original Stöckert Instrumente GmbH spare parts must be used. When ordering spare parts, please provide the AC line voltage and frequency to ensure that the parts you receive are factory calibrated to your AC where necessary.

1.3 Responsibilities

The system is only to be used after

- it has been handed over ready for use by authorized service personnel or service representatives,
- the acceptance has been performed by the respective personnel,
- all safety preparations have been performed,
- operating personnel are familiarized with normal and emergency operation.

1.4 Warranty

For a description of warranty refer to the operating instructions.

1.5 Operation

A thorough familiarity with the operation of the system is a precondition for the usage of this Service Manual. If there are any unclear points about the use of the equipment, consult the Operator's Manual.

Notes:

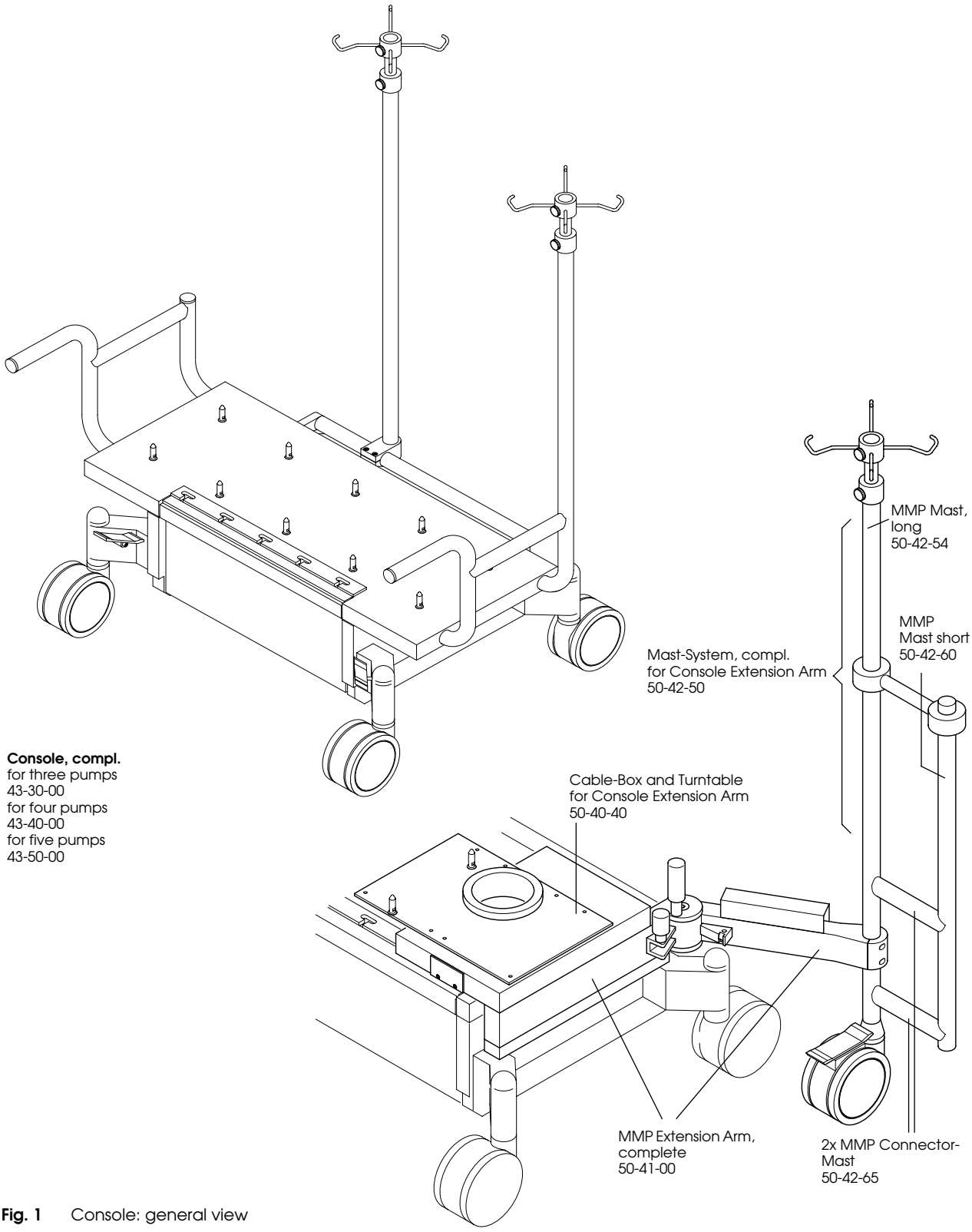


Fig. 1 Console: general view

2.1 Description

The electronic power supply pack (E/P-pack) is located in a separate housing of the base console. It includes the central power supply and the uninterruptable emergency power supply. The sensor cables may be led to the E/P-pack through lateral openings in the base console.

The pump table of stainless steel is screwed to the console and includes stainless steel pins for receiving and fixing the pump housing. In case other devices are used, these pins may be removed.

The pump tables will be supplied for 3, 4 or 5 pumps. The pump tables for 4 and 5 pumps include two a.c. power sockets each for connecting external devices. The overall performance of the external devices must not exceed l000W. Each socket is protected with 5A and/or l0A, depending on the mains voltage.

2.1.1 Technical Data

Input voltage:	230V~ +6% -10%, 50Hz
optional:	100V~, 115V~, 240V~, 50Hz or 60Hz
Primary protection:	Back-switchable, thermal protection automat, serving at the same time as main switch.
Release current:	5A at 230V/240V; 10A at 100V/115V
Pump connection points:	The central power supply branches to 7 connection points, each protected by a time-lag fuse 10A according to DIN 41662.
Instrument protection:	Protection class I, IPX 1
Dimensions:	Console for 3 pumps: width 620mm, depth 730mm, weight 118kg Console for 4 pumps: width 800mm, depth 730mm, weight 144kg Console for 5 pumps: width 1000mm, depth 730mm, weight 168kg Height of all models up to pump surface: 710mm

Note:

Systems operated in the U.K. must, in accordance with btitish standard BS1363, be equipped with a fused AC-connector. The recommended fuse value for the S3 system is 13A.

2.1.2 Spare Parts

2.1.2.1 Basic Console

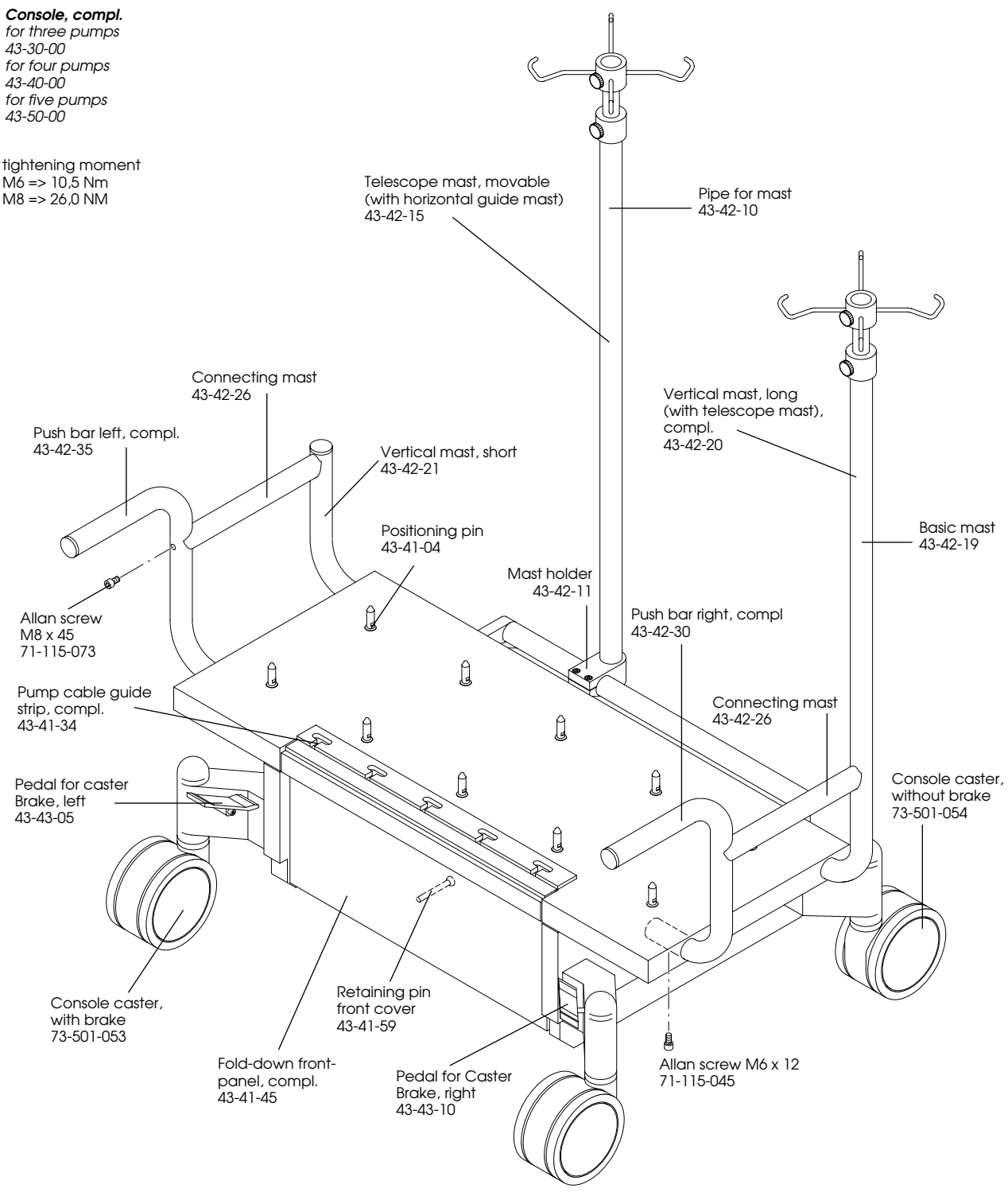


Fig. 2 Console: spare parts basic console

2.1.2.2 Console Amplification for mast-mounted Roller Pumps

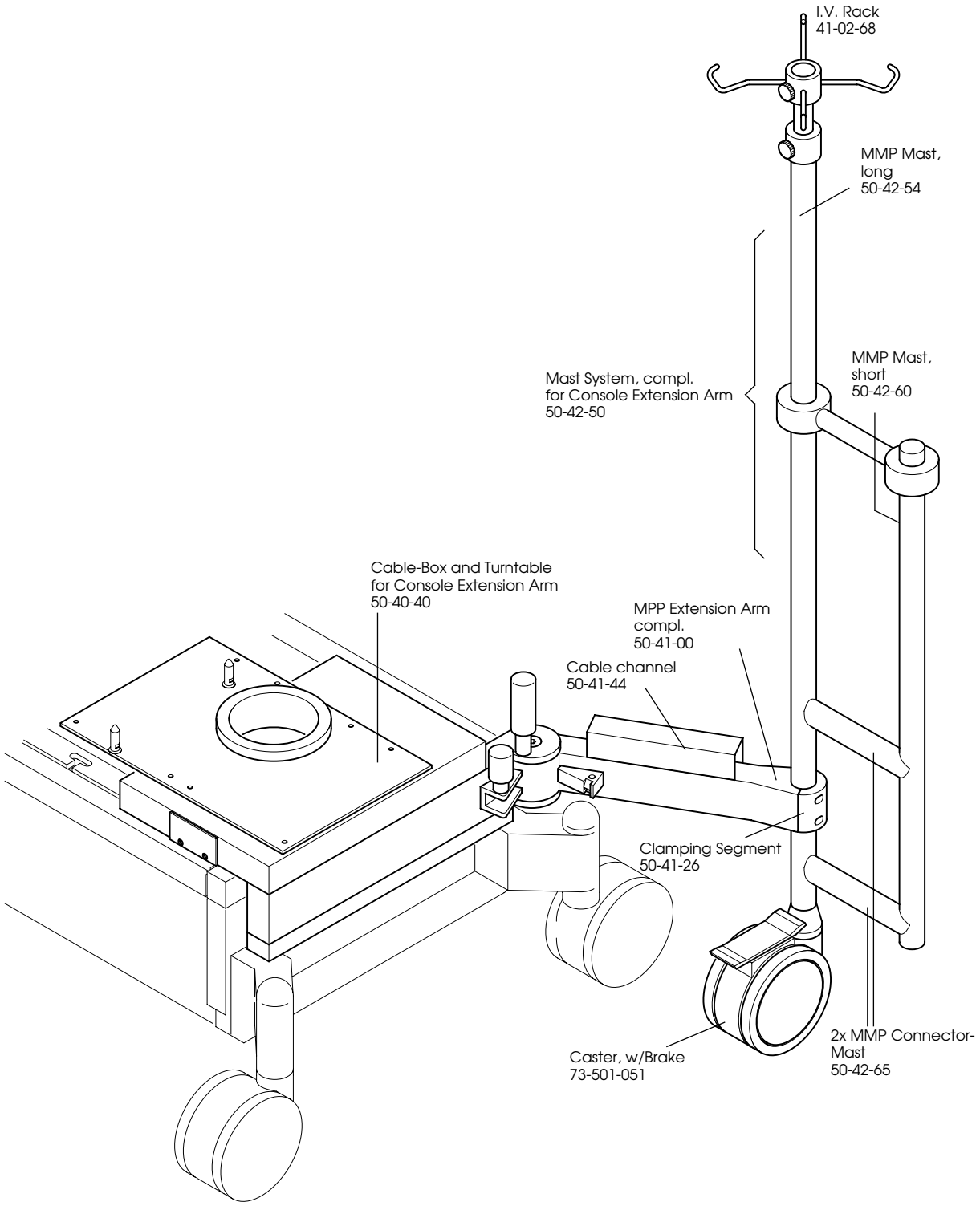
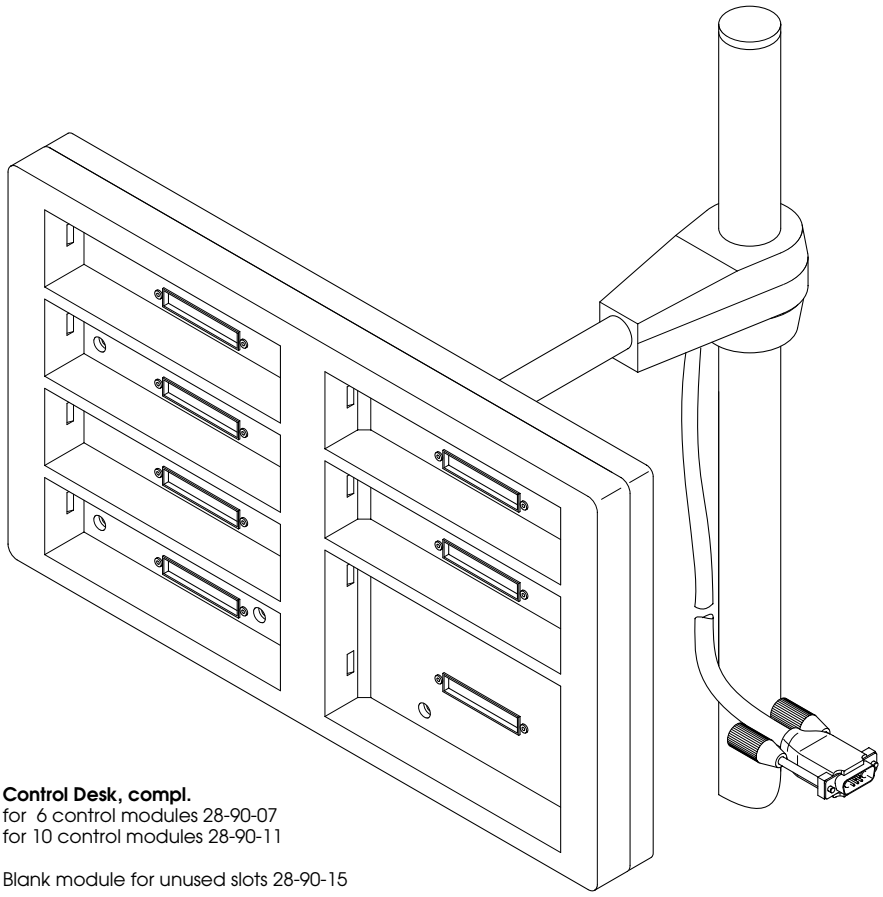


Fig. 3 Console: spare parts console amplification for mast-mounted roller pumps

2.2 Control Desk



Control Desk, compl.
for 6 control modules 28-90-07
for 10 control modules 28-90-11

Blank module for unused slots 28-90-15

Fig. 4 Control Desk: general view

2.2.1 Functional Description

The S3 control desk houses the control modules of all monitoring, controlling and measuring instruments. It is either mounted on the left or right side of the standard mast system. The control desk may be swivelled to any desired position by means of a ball-and-socket joint: this guarantees an optimum field of view for the perfusionist. Depending on the customer's requirements, a control desk for 6 or 10 control modules may he supplied. The control modules may be arranged as desired. The supply voltage and CAN-bus connections are established automatically when the module is inserted into the control desk. In case several identical devices shall be used, a module number has to be set via the DIP-switch (this will be described in detail in the relevant module chapter). Non-occupied slots are covered with blank slide-in elements.

2.2.2 Spare Parts

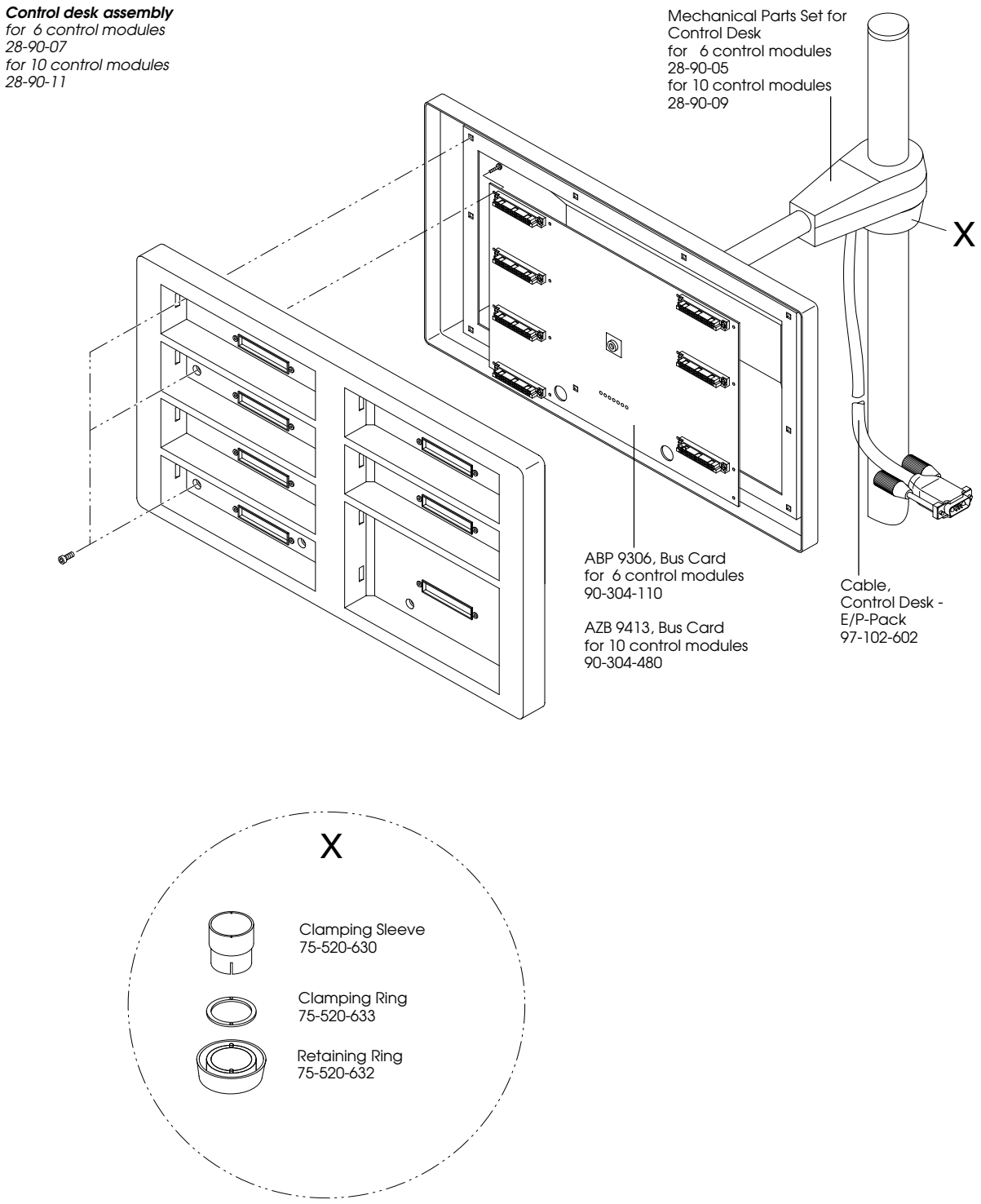


Fig. 5 Control Desk: spare parts

2.3 E/P-Pack

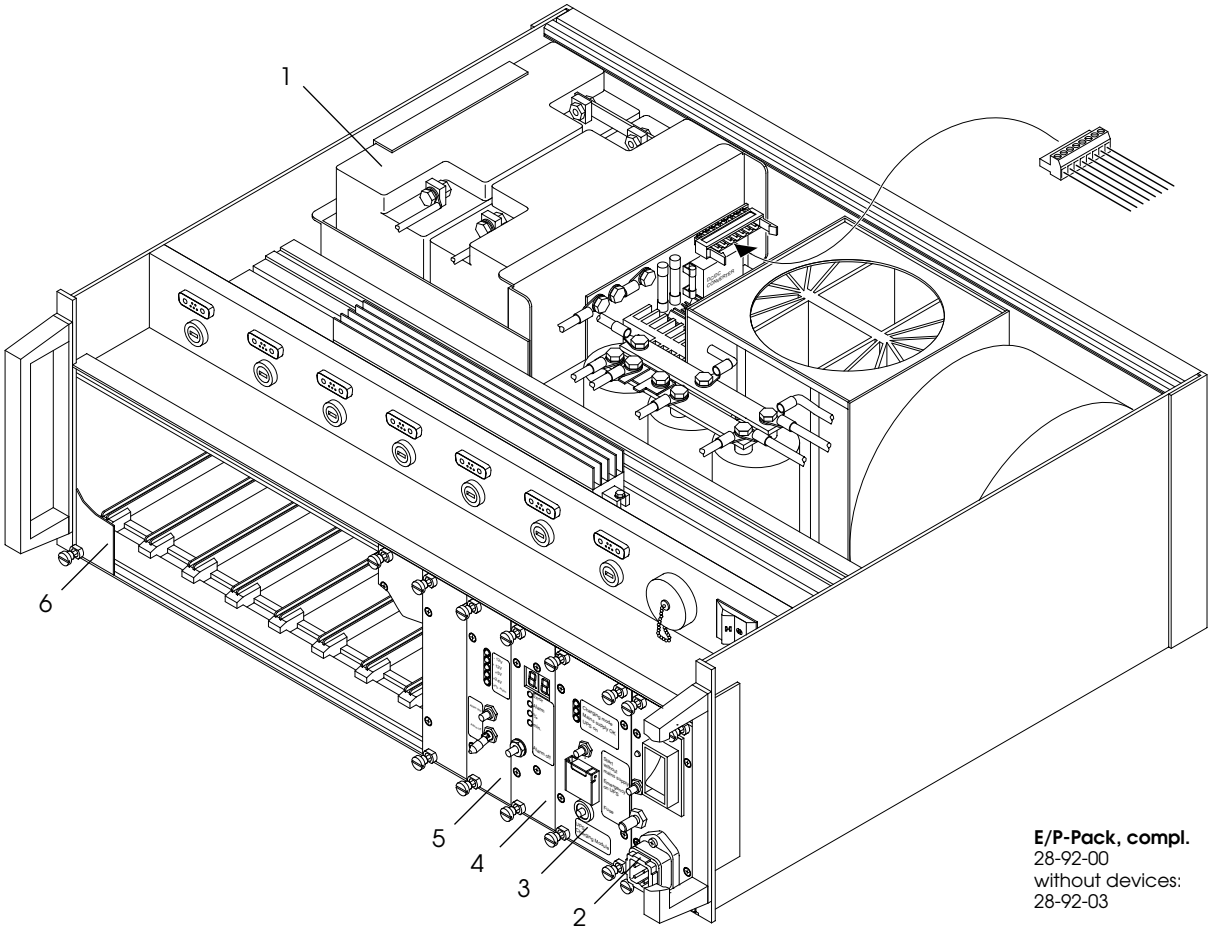


Fig. 6 E/P-Pack: general view

2.3.1 Functional Description

The electronic and power supply pack (E/P-pack) supplies voltage for all S3 devices. During normal operation the mains voltage will be transformed. In case of a power supply failure the E/P-pack switches to the emergency power supply without interruption. The emergency power supply is fed by battery pack (1).

In standard configuration, the E/P-pack is equipped with the modules

(2) -> Power Supply Module 29-12-00

(3) -> UPS-Charging Module 28-92-80

(4) -> UPS-Control Module 28-92-15

(5) -> DC/DC Module 28-92-20,

described in detail on the following pages. The positions of these modules are fixed. The slots to their left serve for house the modules used in the individual S3-system. Each one of these nine slots is independent and may house any desired module. The slots which are not used will be closed with blank panels (6).

2.3.2 Spare Parts

E/P-pack, compl.
28-92-00
without devices:
28-92-03

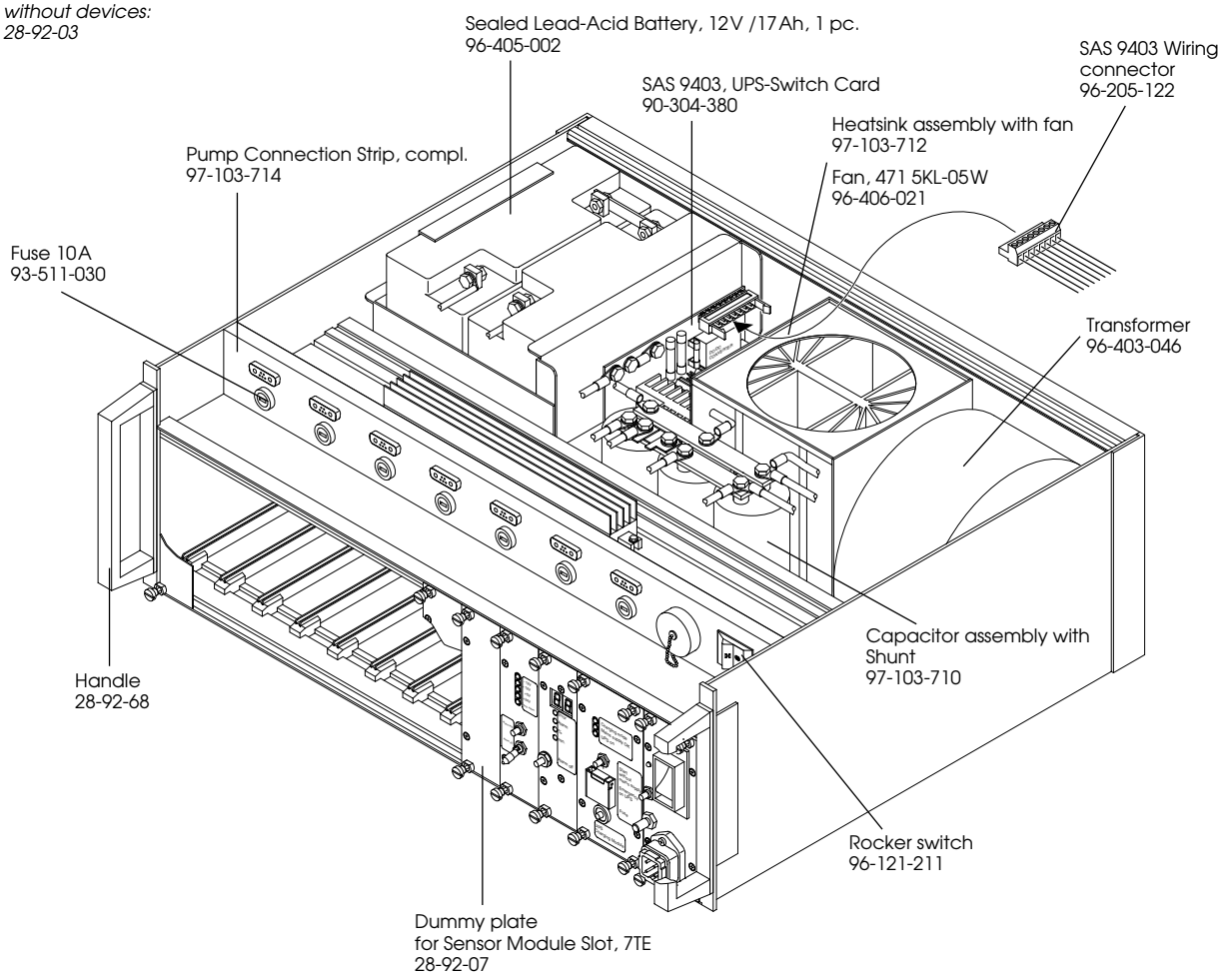


Fig. 7 E/N-Block: spare parts

2.4 Voltage Supply

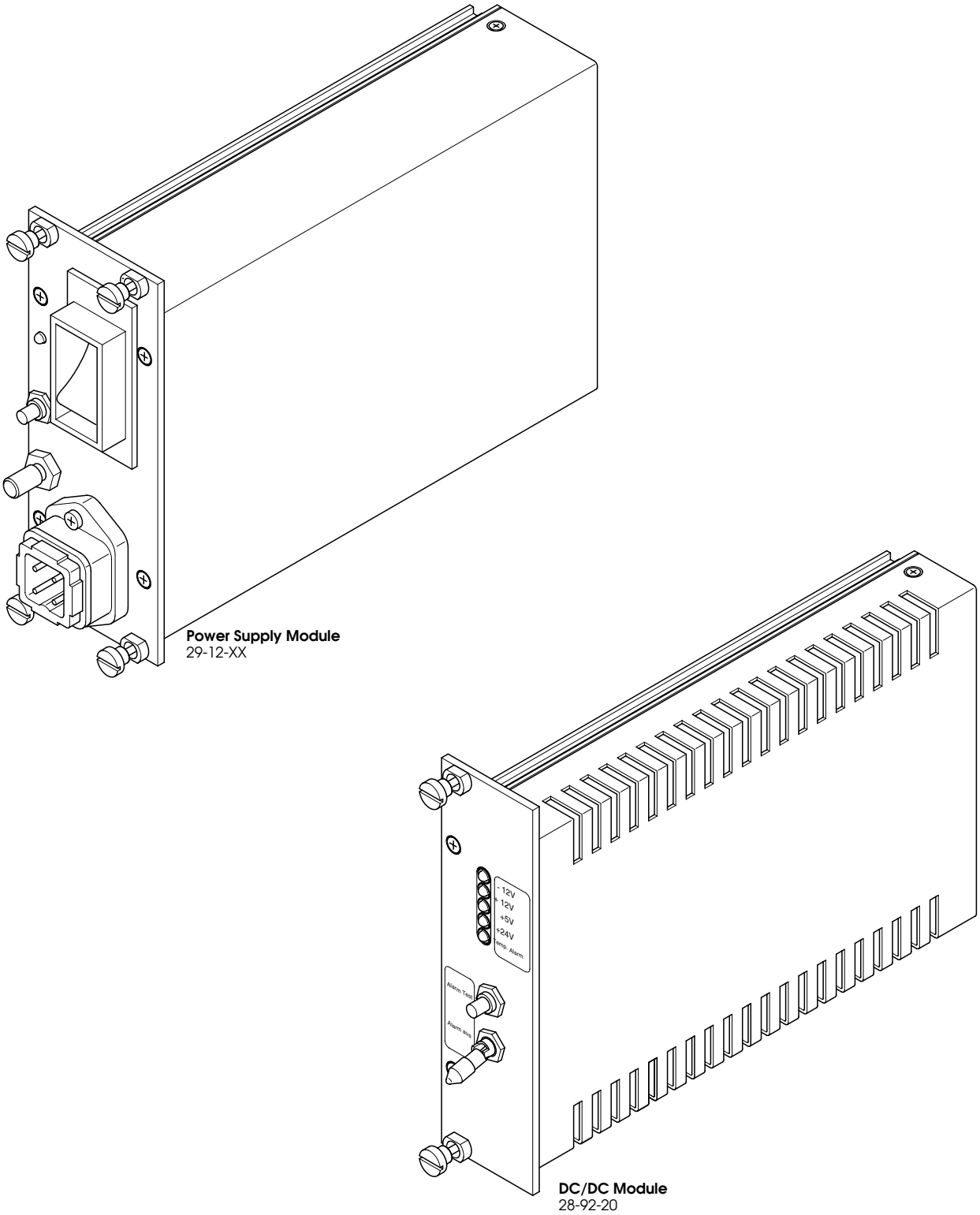


Fig. 8 Console/ Voltage Supply Modules: general view

2.4.1 Functional Description

2.4.1.1 Power Supply Module

The power supply module is the interface of the S3-system power supply to the public supply network. It consists of the following essential components: mains socket, mains switch with overload release, mains filter, start current limiter (TSE), emergency key and equipotential bonding connection. There is one version each for the three voltage groups 110V, 115V and 230V-240V.

The power supply module electronics limit the starting current of the S3 power unit to the rated breaking current of the overload release in the mains switch. In the most adverse case (starting at a load of 1kW, charging capacitors in power supply module discharged) a current peak of 200A might appear for 10ms.

In case of an electronic system failure the current limitation will be performed by a bi-metal thermal overload. In case the power supply module is activated when the high-temperature conductor is cold, the starting current rush is below the rated breaking current of the overload release. If the power supply module is activated when the high-temperature conductor is warm, the starting current rush might trigger the overload release.

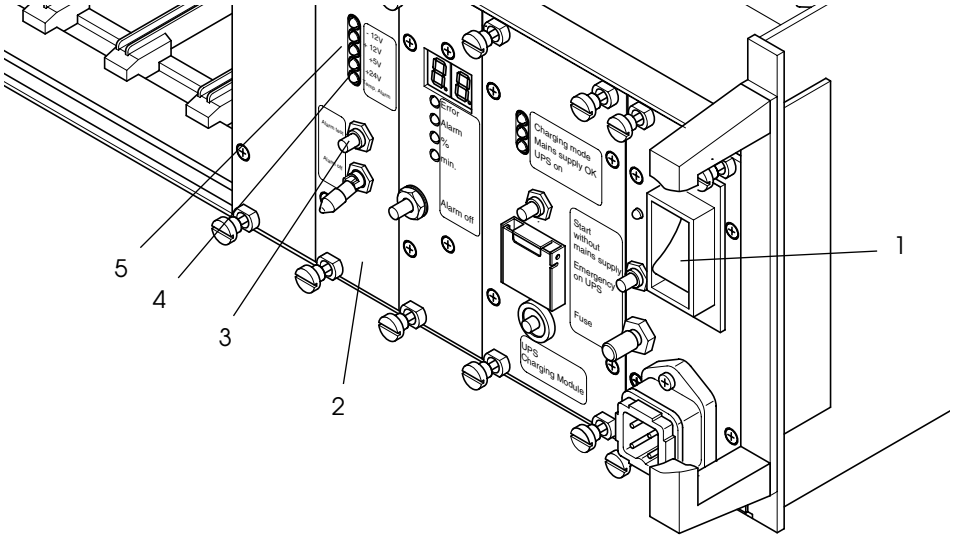
For suppressing disturbances in the power supply line the power supply module includes a filter.

2.4.1.2 DC/DC-Module

The DC/DC-module transforms the 24V DC voltage into +12V, -12V, +5V. These voltages will be supplied to the modules in the E/P-pack. The function of the voltage supplies will be displayed by LED's. In addition the DC/DC-module monitors the temperature in the E/P-pack and reports any deviation by optical and acoustic alarm; at the same time the fan will be set to maximum rate of rotation to decrease the temperature. The acoustic alarm may be switched off by the rocker switch "ALARM OFF"; the LED "TEMP ALARM" lights until the temperature has decreased.

2.4.1.3 Functional Test DC/DC-Module

For safety reasons a functional test of the DC/DC-module has to be performed prior to each operation and after each repair.



- After switching on the console by the main switch (1), observe the front panel of the DC/DC module (2):
  - The LED's (5) of the voltages have to light up.
  - In case a LED lights only faintly or not at all the DC/DC module may have to be replaced.
  - If the LED "TEMP ALARM" lights up when switching on the system and if there is no overheating, the DC/DC module may have to be replaced.
- Press the button "ALARM TEST" (3): the LED "TEMP ALARM" (4) has to light up and a warning signal has to be given. The fan has to operate with maximum rate of rotation.

2.4.2 Spare Parts

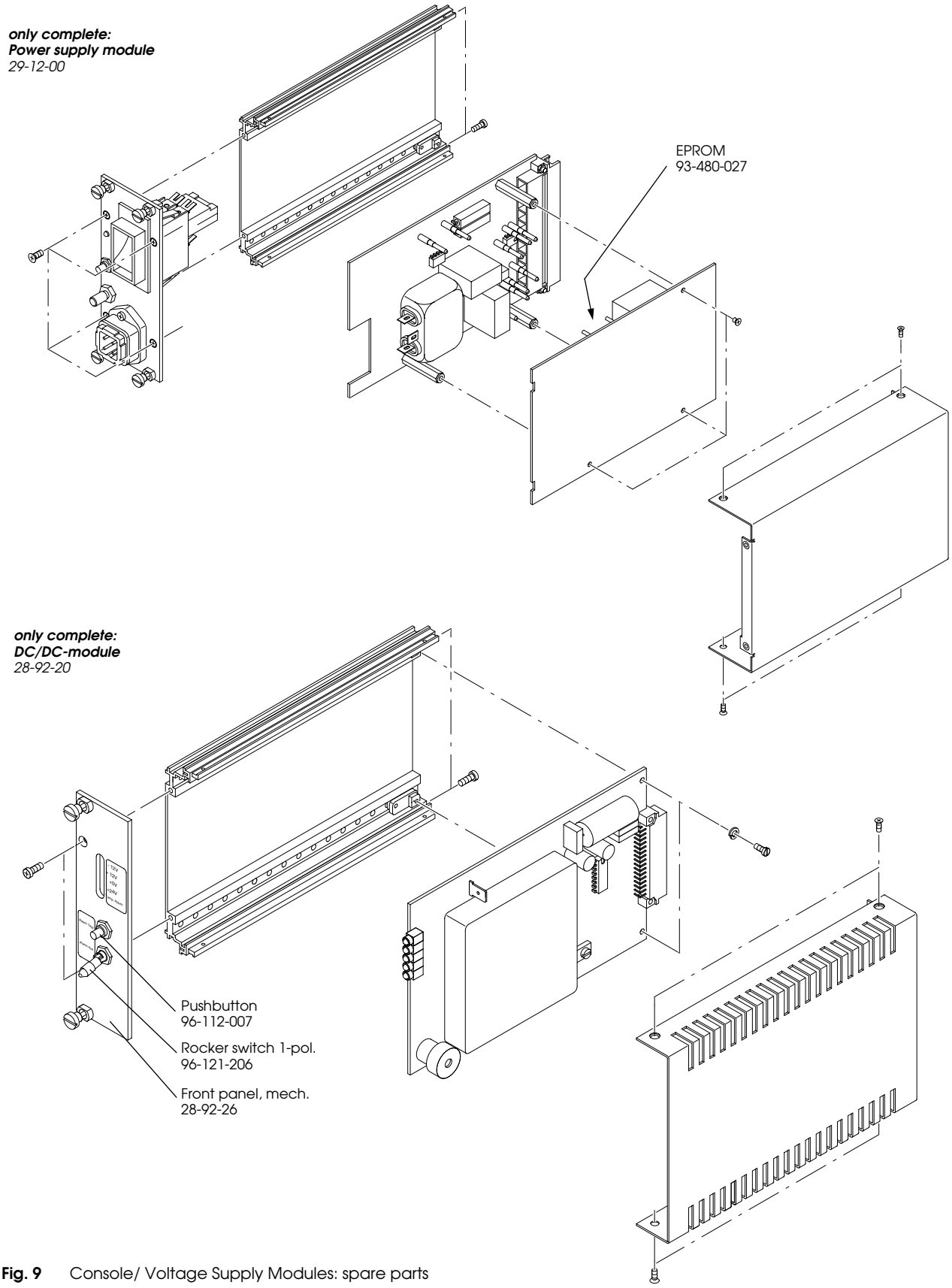


Fig. 9 Console/ Voltage Supply Modules: spare parts

2.5 Emergency Power Supply

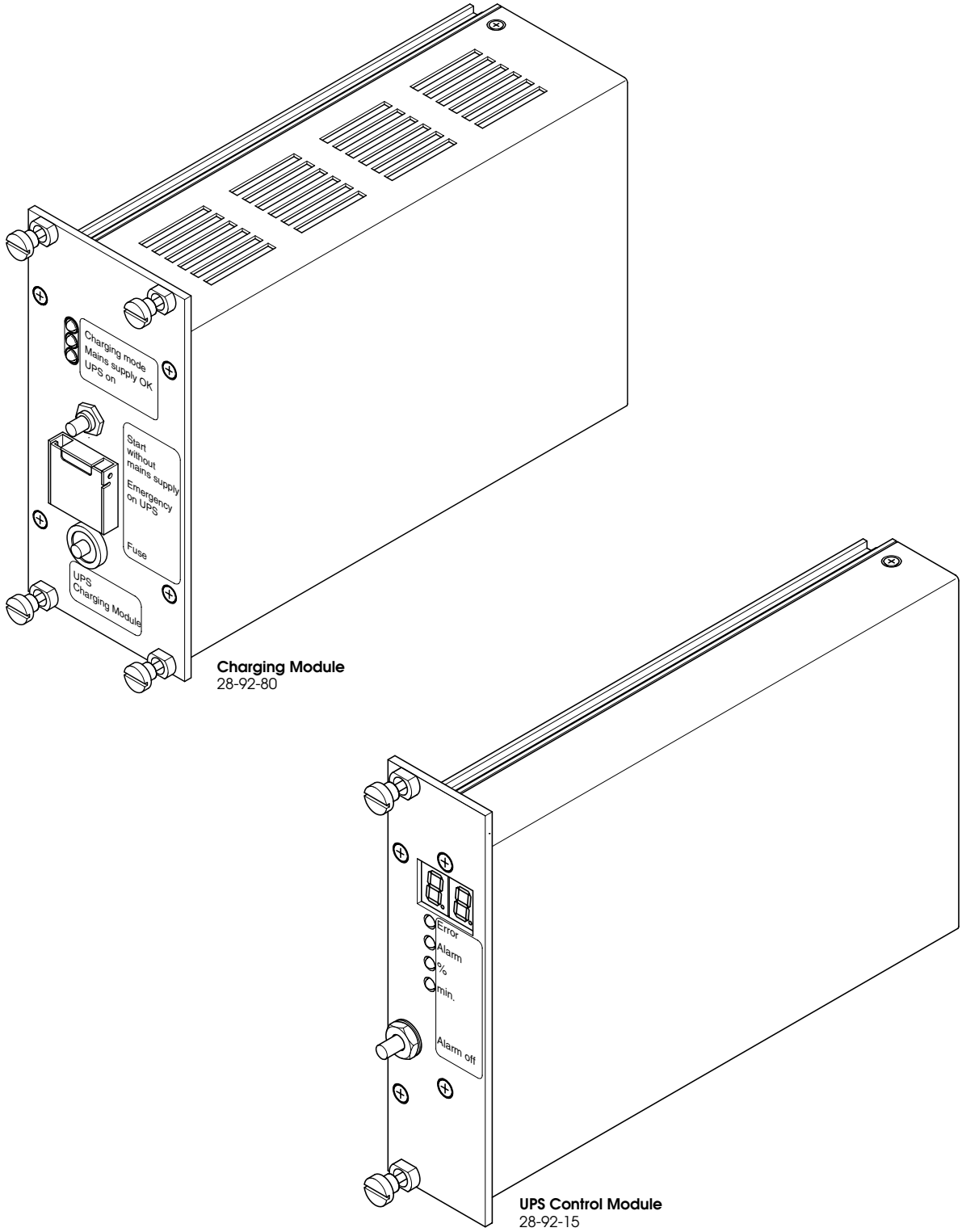


Fig. 10 Console/ Emergency Power Supply Modules: general view

2.5.1 Functional Description

The uninterruptable power supply (UPS) includes two 12V accumulators, an electric switch with fuse, the UPS control module and the charging module. The accumulators and the "accumulator switch" board are housed inside the E/P-pack. An accumulator discharge unit is included in the S3-system delivery for the accumulators' functional test, which has to be performed at regular intervals. The functional test is described on page 34.

The S3-system may also be started if there is no mains voltage. The main switch has to be switched on and the key "start without mains supply" of the charging module has to be pressed.

The emergency power supply offers a comfortable and reliable support for the preparation of the S3-system. The S3-system may be prepared completely in the HLM setup area and then pushed into the operating theatre with battery operation. There it may again be supplied with mains voltage.

If the batteries are fully charged, the S3-system may be battery-operated for about 20 minutes (load of about 400W) and for 130 minutes in case only one pump is on (load of about 100W).

2.5.1.1 Charging Module

The mains control board in the charging module monitors the mains voltage and, in case it drops below the required voltage, it switches to battery operation via the board "accumulator switch". In this operating mode, the LED "mains OK" of the charging module is extinguished. At the same time the LED "UPS on" lights up and a short warning signal is given. If the mains control does not recognize the mains power failure due to an error, the battery operation may be obtained by pressing the key "EMERGENCY ON UPS". For safety reasons the key is covered by a cap.

2.5.1.2 Control Module

The two-digit 7-segment display on the UPS control module shows the remaining running time of the accumulators while the UPS is active (up to 99 min.).

If there is an error in the UPS, this is displayed by the LED "error" on the UPS control module together with an error code. The error message may be read in plain text on the CDM.

While in "Charging Mode", the "%" LED is lit and the 7-segment display shows the charge level of the accumulators. The LED "Charging Mode" (on the Charging Modul) flashes. The display on line 4 of the start menu of the CDM reads "UPS is charging". Once the accumulators are fully charged, the 7-segment display shows "On" and the CCDM display changes to "UPS". When operating the UPS, the displays change. On the CDM, the display reads "UPS activ". The 7-segment displays the time remaining for UPS operation. Anything over 99 minutes will be displayed as "99". The LED "min" is lit as the LED "UPS on" on the Charging Module.

2.5.1.3 CDM

The remaining running time of the accumulators may also be taken from the CDM. In emergency cases it is possible to allow a total discharge of the accumulators. The CDM provides an alternate means of resetting the 5 min. audio override of the "UPS-active" alarm.

2.5.2 Technical Data

Output voltage:	nominal output voltage:	24V (2 x 12V)
	minimum output voltage:	20V (2 x 10V)
	maximum output voltage:	32V
Output:	maximum:	400W
Capacity:	new accumulators:	17Ah
Fuse protection:	of accumulators:	2 x 20A slow
Service life of UPS:	at an output of 400W:	20 minutes
	at an output of 100W:	130 minutes
Charging time:	maximum:	15 hours

2.5.3 Accumulator Disposal

In accordance with environmental protection laws problem waste has to be disposed of separately and professionally. The authorized hospital personnel has to be informed explicitly about this issue.

If the accumulator test performed at regular intervals shows that the accumulators of the power supply are in a bad physical condition, they have to be replaced by the service personnel. The user has to take care that the accumulators will be disposed adequately.

2.5.4 Functional Accumulator Test

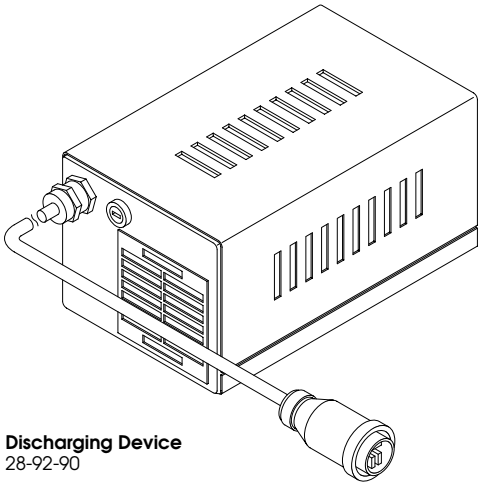
After a period of four months a message on the CDM recommends the testing of the accumulators. This warning takes the form of the CDM display "UPS Warning". This display occurs starting 10 days before the current 120 day validity cycle expires. This test is absolutely necessary for guaranteeing a correct accumulator display. An accumulator discharge unit is required for the functional testing.
The discharging device, item no. 28-92-90, is included in the basic S3 equipment. The device is easy to handle and does not require special maintenance. The device should be stored in the engine room under normal conditions.

- Connect the S3-system to mains supply.
- Switch off S3-system.
- Connect discharge device to discharge socket (1).
- Press "ALARM OFF" key (3) on the UPS control module and hold it down.
- Activate main switch (2).
- Release "ALARM OFF" key.
- The CDM screen indicates "UPS Test".
  - If the accumulators are not yet charged when switching on the S3-system, they will be charged first, in order to guarantee a correct test sequence. The CDM screen indicates "Phase 1 (%)".
  - The charged accumulators are automatically discharged by means of the discharge device. The measured values gained will be stored and serve as calculatory basis for the display of the accumulators' remaining time during a power failure or after starting without mains power. The CDM screen indicates "Phase 2 (h:min)".
  - After termination of the discharge procedure, the accumulators will be charged again (normal charging state).
  - When the message "UPS OK" appears on the CDM screen, the UPS is ready for operation again.
  - During the test procedure the LED "charging mode" flashes.

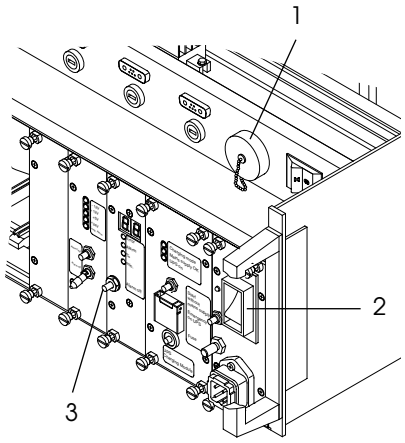
Important:
The accumulator test has to be terminated in any case, as otherwise the UPS is not ready for operation.

Note:

A thermal load on the accumulators, e.g. by a defective ventilator, may result in a wrong accumulator time display.



Discharging Device
28-92-90



E/P-Pack
28-92-00

2.5.5 Trouble Shooting

symptom:	possible cause/ remedy
Fuse of the charging device blows repeatedly.	- Error in the charging module. Replace charging module.
LED indicator "CHARGING MODE" does not light as specified.	- Error in the charging module. Replace charging module.
LED indicator "MAINS OK" does not light as specified.	- Error in power supply module. Replace power supply module.
UPS does not start as specified.	- Press "EMERGENCY ON UPS".
An error code is given on the UPS control module.	- Open UPS menu and observe plaintext messages on CDM.
LED "TEMP ALARM" in DC/ DC-module lights up and a warning signal is given.	- Temperature in E/P-pack too high. Fan is automatically set to maximum rate of rotation. LED extinguishes as soon as temperature drops.
No fan noise.	- Defective fan. Replace fan.
LED "EMERGENCY ON" on power supply module does not flash and light as specified and voltage-LED's on DC/DC-module remain dark.	- Fault in the electronics of the startup current limitation. Press key "EMERGENCY ON" for approx. 10 seconds, until S3-system starts and LED extinguishes.
No mains supply, however system has to be switched on.	- Switch on main switch. Press key "START WITHOUT MAINS SUPPLY".
No display on CDM.	- Check electrical connections. - Check ON/OFF switch on control desk.
When turning on the main switch "1.1.80, 00.00h" is displayed on the CDM instead of the current date and the hour is calculated anew.	- This is a hint that the CDM buffer battery does no longer work correctly. Consequence: All settings made by the user have been cancelled and replaced by the basic values set by the factory. Check the values, put them in anew for the planned operation. After switching off the system the data are cancelled again. - Replace buffer battery. Put in the settings anew. Open individual unit menus and perform all settings.

2.5.6 Spare Parts

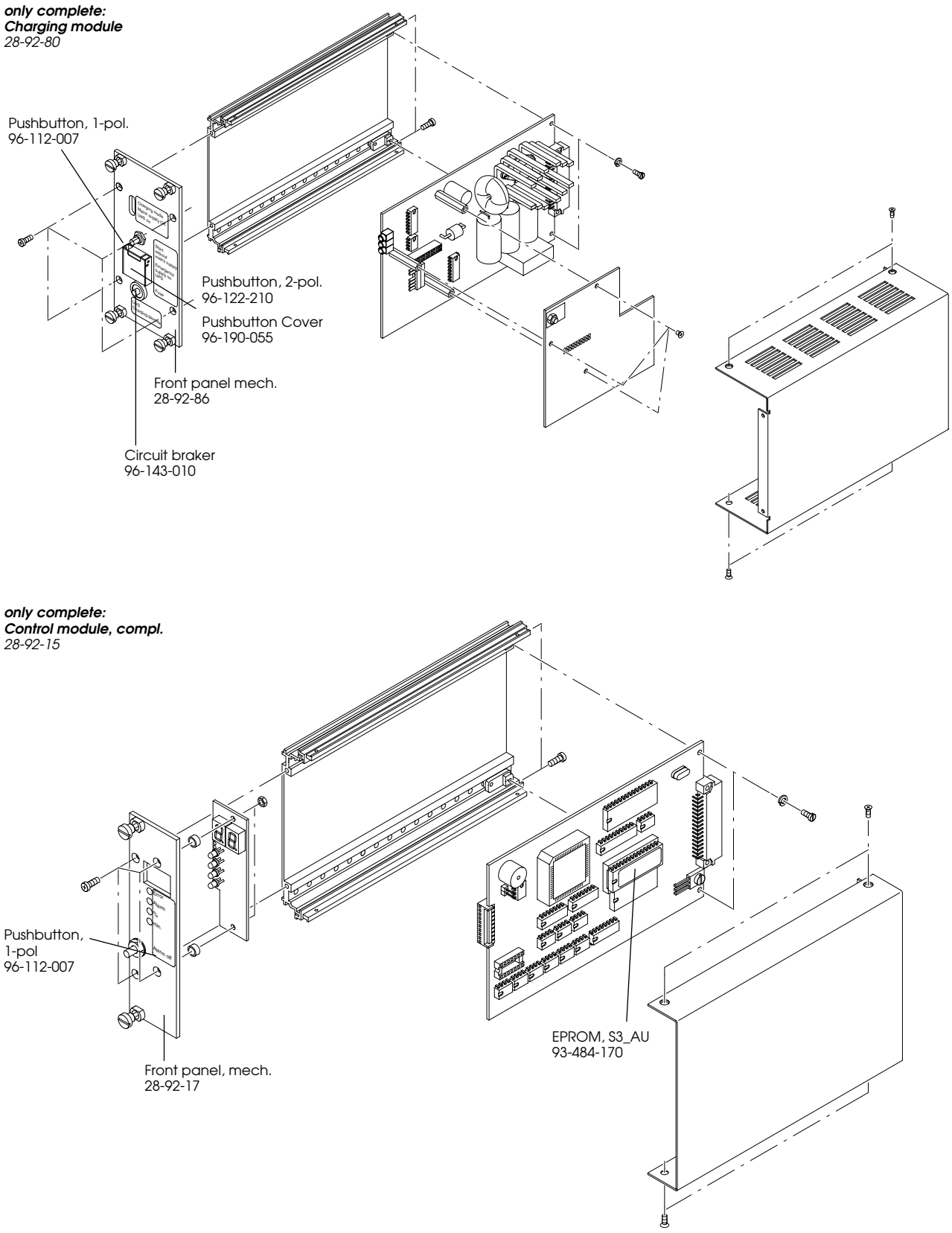


Fig. 11 Console/ Emergency Power Supply Modules: spare parts

Notes:

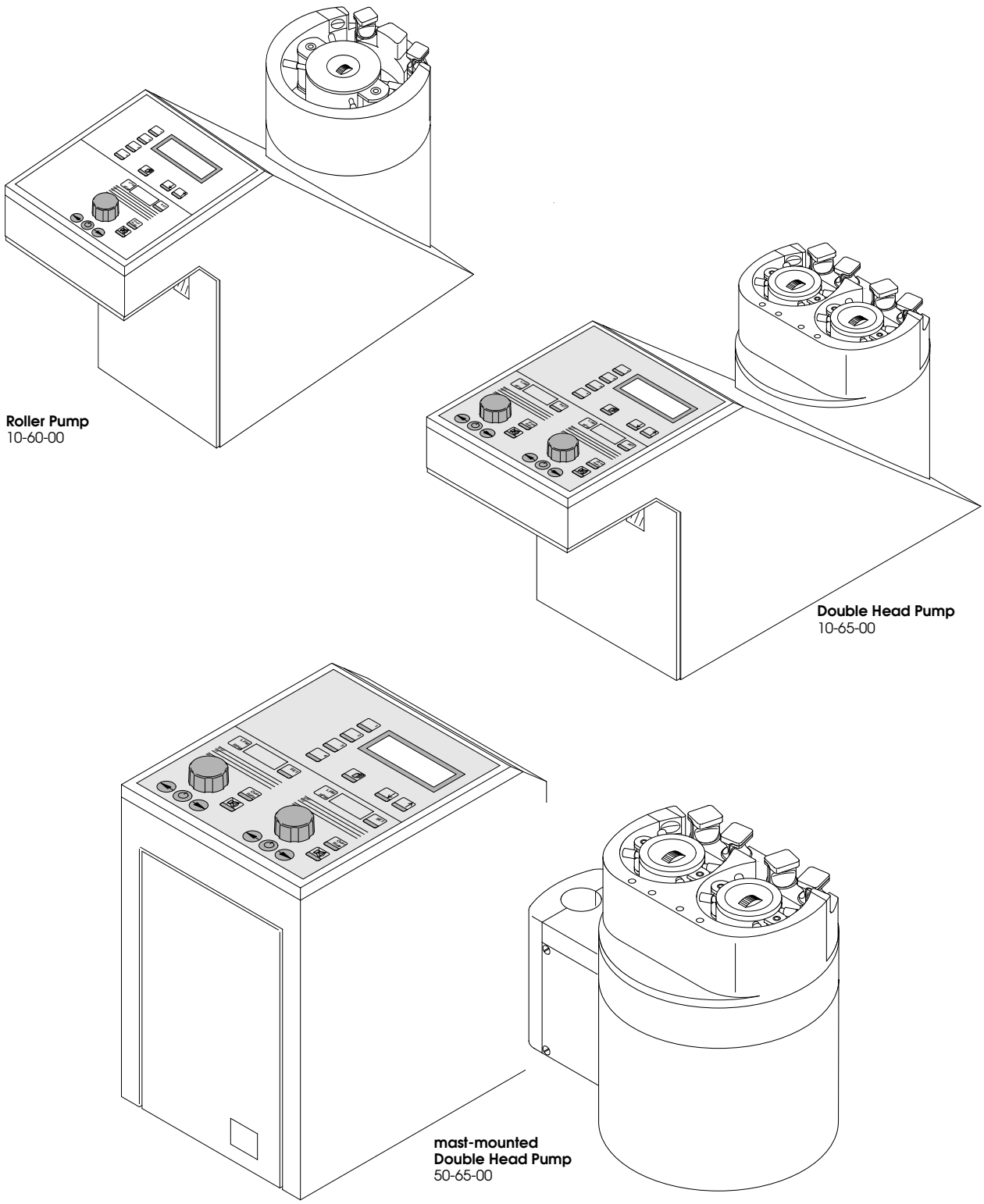


Fig. 12 Roller Pump/Double Head Pump: general view

3.1 CAN-Structure

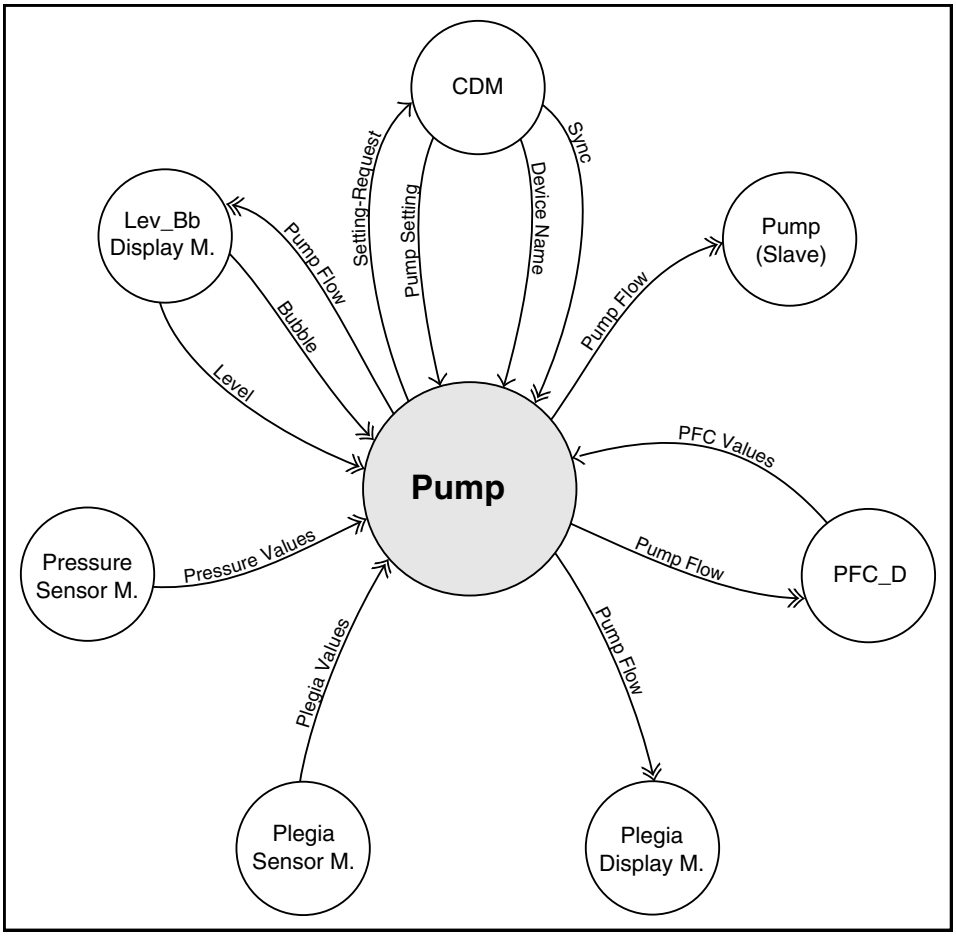


Fig. 13 Roller Pump/Double Head Pump: CAN-structure

3.2 Functional Description

The pump constitutes the basic component of the S3 perfusion. The pumps stand on the pump table of the console and are connected to the E/P-pack. Two types are used:

The S3 roller pump is mainly used for arterial bloodflow, for suction and deaeration.

The S3 double head pump includes two roller pumps within one housing; these pumps work independently of each other and may be operated separately. Each pump may be considered an independent pump. The double head pump is mainly used for applications with low flow rates, such as perfusion of children, as a cardioplegia pump and for suction and deaeration.

In this chapter the term "pump" is used, if the description for the roller pump and the double head pump is identical. In case of deviations, the terms "roller pump" or "double head pump" are used.

The pump's digital display shows the current values for rotor speed (RPM) or flow rate (LPM). The pump is controlled by the internal electronics. An electric control guarantees that the speed is completely independent of 24VDC power supply fluctuations and almost independent of load changes. The speed of the pump head is read by a Hall sensor that scans a timing gear. Thus the actual flow rate is displayed; even in the case of overloading (e.g. overocclusion).
The pump is operated by a disk armature motor. The motor control permits extremely rapid speed changes, thus making the pump also suitable for pulsatile operation.

In case defects appear during pump operation, it automatically stops and the display flashes as a warning. The display indicates an error code. In case of mains power failure the S3-system switches to UPS and back to mains power as soon as the power has returned. The pump operates without interruption.

The pump may be monitored, stopped, reduced in its speed or controlled by other devices of the S3-systems. The influence of the devices can be suppressed by pressing the appropriate key on the pump.

The pump may be repressed by key depression at the pump. Two pumps may be interlinked with each other and operated as master/slave pumps. The speed of the slave pump is then dependent on the master pump.

Different tubing diameters may be used. The rotor's direction of rotation may be reversed. The occlusion may be set by a knurling wheel at the rotor. By turning the knurling wheel in the direction of the arrow the rollers move to the outside and the occlusion gets greater, by turning in the opposite direction the rollers move to the inside and the occlusion will be reduced.

If required, the pump also may be operated manually by means af the crank handle supplied together with the console. In this case the electronic monitors whether the pump is being turned into the set direction, otherwise it will give a warning signal.

3.3 Installation into the S3-System

3.3.1 Roller Pump/ Double Head Pump

- Switch off S3-system.
- Open front door of console.
- Lift pump as shown in Fig. 14 (do not lift at pump head) and put it onto the pins of a free position on the pump table. Make sure that the pump is not put onto the pump cable and ensure that the cable runs correctly in the guides.
- Connect pump plug with E/P-pack. The pump number is automatically determined by the socket to which the pump plug is connected. Socket no. 1 is for pump no. 1 and so on. This is valid up to socket no. 5. In case a pump is connected to the "Option" socket, this pump is named "No. 6".
- Set the pump's standard direction of rotation together with the perfusionist and mark it on the pump by one of the direction arrows supplied.
  Note: When laying the tubes the direction arrows should remind of the blood flow direction.
- Check pump function.

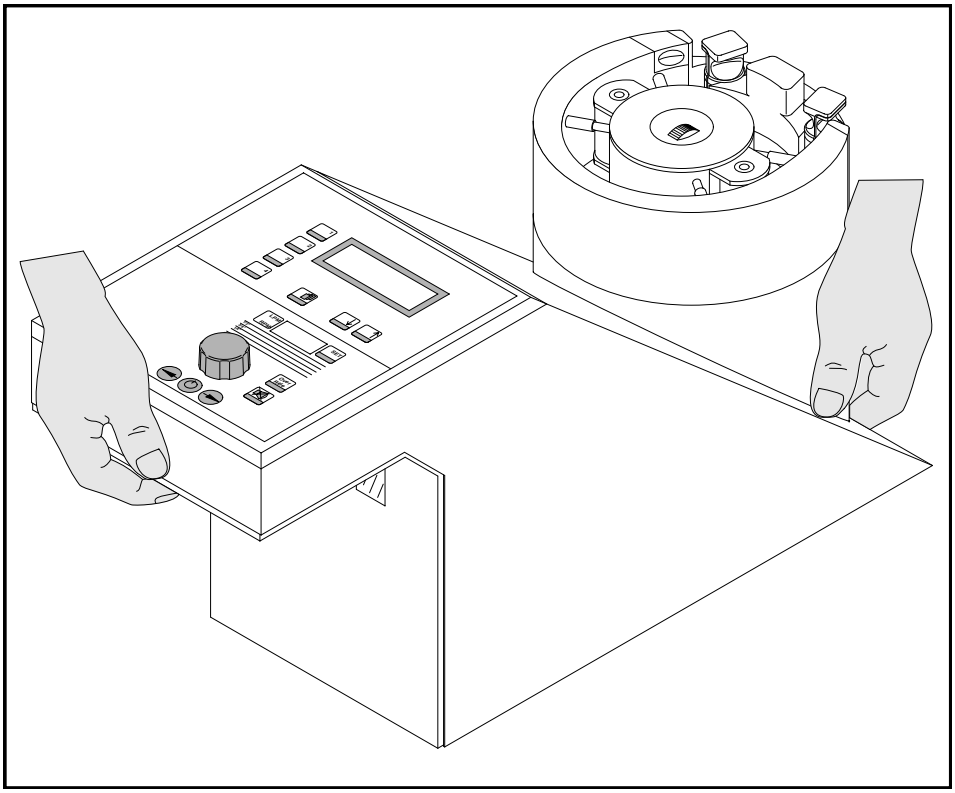


Fig. 14 Pump: Lifting

3.3.2 Mast-Mounted Double Head Pumps

3.3.2.1 Preparing console for S3 Mast Pump

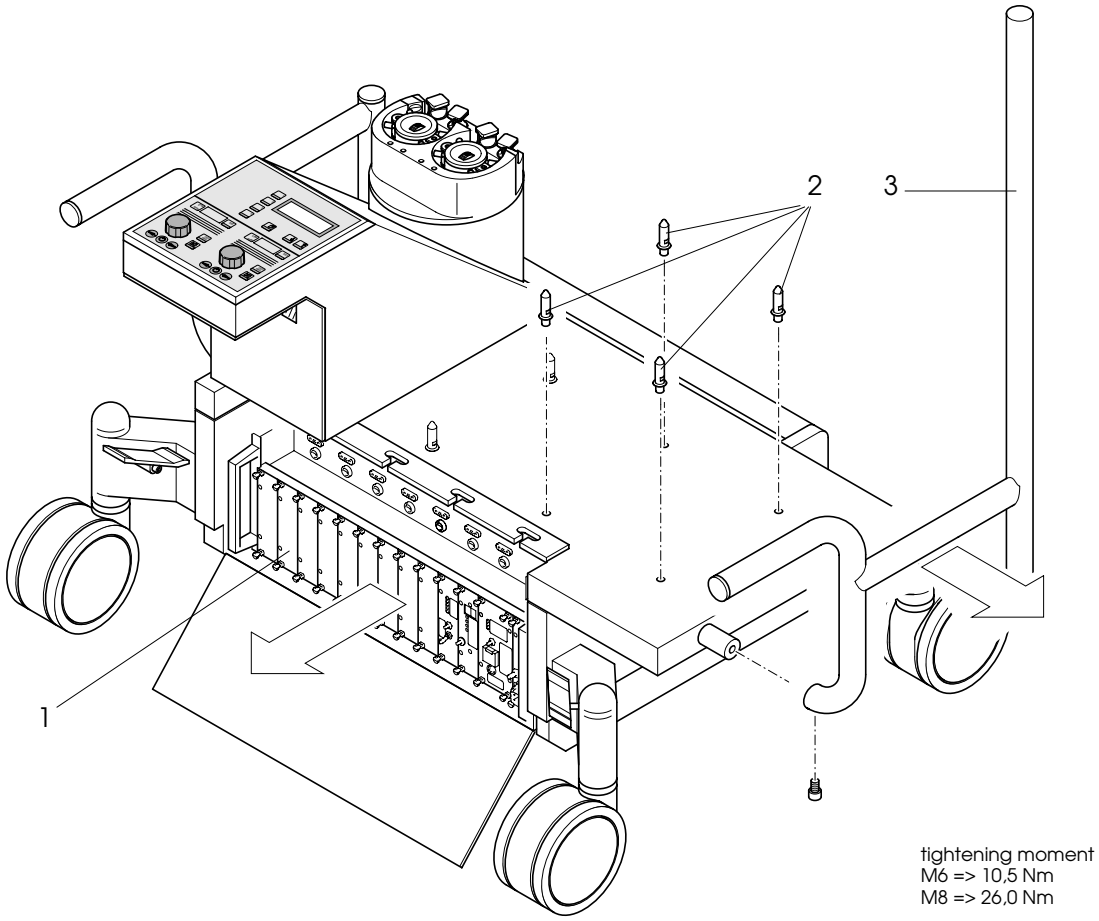


Fig. 15 Double Head Pump, mast-mounted: Preparing console for installation

- Switch off S3-system.
- Open front door of console.
- Disconnect E/P-pack(1) and remove it from console.
- Remove masts(3) including the pushing handle from this side of the console to which the mast pump shall be mounted.
- Remove positioning pins(2) from pump table thus freeing two pump spaces on the respective side of console.

3.3.2.2 Installing the S3 Mast Pump

- Activate release mechanism(7) and move swivel arm(2) as far out as possible (max. opening angle approx. 120°). Secure this position with the joint locking mechanism(8).
- Remove masts(5) from swivel arm(2).
- Fasten the support arm(1) to the pump table with two screws.
- Set cable box(9) and swivel plate(10) onto the support arm and fasten them with two screws from the bottom.
- Place the hollow feet of the two control and operating units over the positioning pins(11).When lowering the units onto the the cable box run the cables through the opening of the rotary joint.
- Fasten set screws(12) in the feet of the control and operation units.
- Move the telescope mast with the assembled mast system(5) to the swivel arm(2) and fasten it by screwing on the mounting bracket(3) with four screws.
- Mount the pump housing(6) on the telescope mast, using the mounting bracket(4) and four screws. Position the pump head in such a way that the tubing channels point towards the patient.

Important:
Basically, each mast in the S3 Mast Pump System can carry a weight of 20kg, but the total load on the system must not exceed 50kg. This means that a maximum of approx. 9kg per external mast may be added to the weight of one pump head (approx. 11kg) on the extension arm. If the extension arm is not loaded to its maximum capacity, the rest of the weight can be distributed on the console. The max. height for mounting accessories is 1.20m at a max. projection of 20cm.

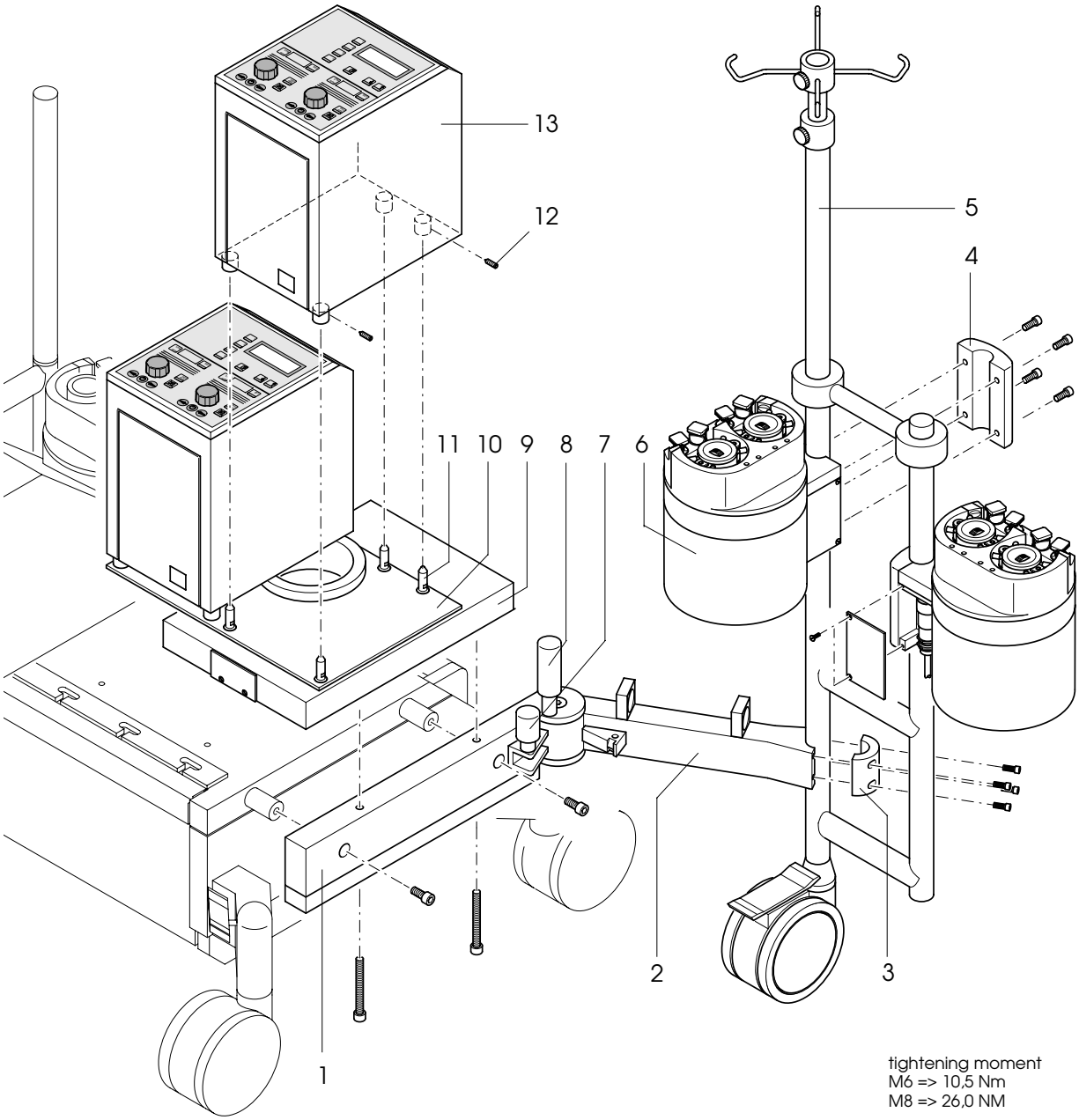


Fig. 16 Double Head Pump, mast-mounted: Installation

3.3.2.3 Running the S3 Mast Pump cables

- Run cables of the contol and operation units through swivel joint(4) into cable box(1).
- Run cables through the openings in cable box(1) to the pumps and to E/P pack as shown in Fig. 17.
  - Two connecting cables to the pump housing (circular connectors)
  - One connecting cable to the E/P pack (pump plug).

  Through the access opening(3) the cables inside the cable box(1) can be rearranged and distributed to the openings.
- Run each pair of cables (with circular connectors) neatly around the swivel joint(5) and through the cable retaining holders(6) on the swivel arm to the corresponding pump housing.
- Remove cover plates(7) from both sides of the mountig block and connect cables to their sockets.

Important:
When running the cables make sure that the cables are connected to the correct pump housing.

- For connection to the E/P pack insert the cable into the appropriate cut-out in the pump table, run it to the connection point and plug it in. The pump number is automatically determined by the socket to which the pump plug is connected. Socket no. 1 is for pump no. 1 and so on. This is valid up to socket no. 5. In case a pump is connected to the "Option" socket, this pump is named "No. 6".
- Set the pump's standard direction of rotation together with the perfusionist and mark it on the pump by one of the direction arrows supplied.

  Note: When laying the tubes the direction arrows should remind of the blood flow direction.
- Check pump function.

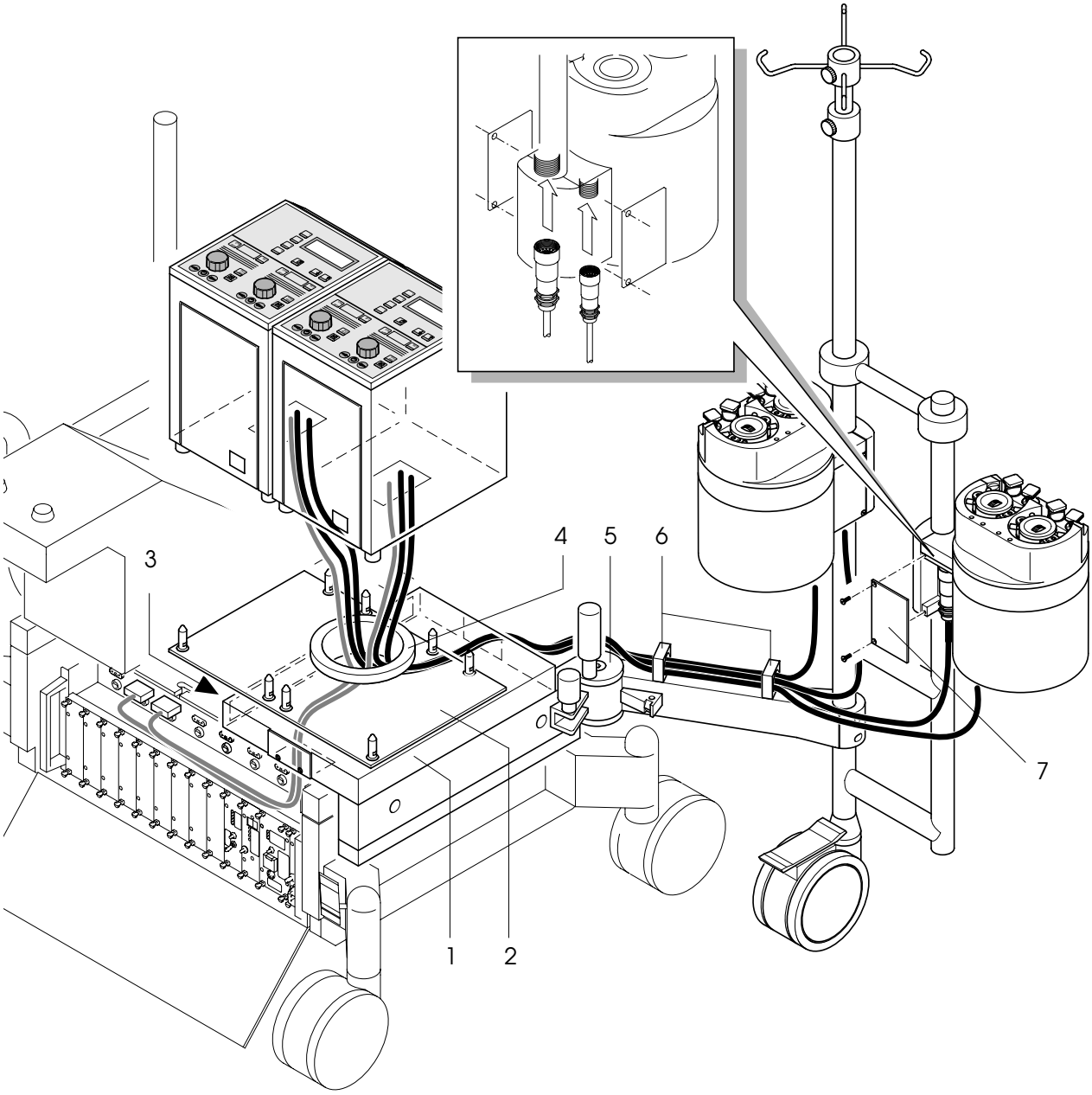


Fig. 17 Double Head Pump, mast-mounted: Running of connecting cables

3.4 Technical Data

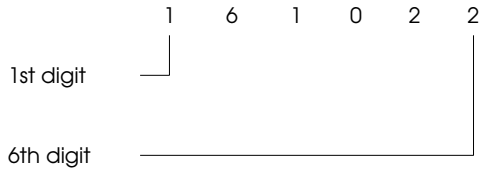
	roller pump	double head pump
Height, width, depth:	200mm, 315mm, 585mm	200mm, 315mm, 585mm
Weight:	17.5kg	17kg
Power supply:	24V DC via system power supply	24V DC via system power supply
Power input:	max. 160 Watt	max. 100 Watt
Operating temperature:	+10°C to +40°C	+10°C to +40°C
Storing temperature:	0°C to +40°C	0°C to +40°C
Speed range:	0-250 RPM	0-250 RPM
Accuracy of speed:	±1% refered to end value of scale 250 RPM	±1% refered to end value of scale 250 RPM
Direction of rotation	Clockwise or counterclockwise	Clockwise or counterclockwise
Flow rate at 250 RPM:	0 to 3.29 LPM for 1/4" tubings 0 to 6.98 LPM for 3/8" tubings 0 to 11.3 LPM for 1/2" tubings 0 to 16.2 LPM for 5/8" tubings	0 to 1.6 LPM for 1/4" tubings 0 to 2.0 LPM for 5/16" tubings
Concentricity Raceway: Occlusion: Occlusion rollers:	 0.03mm 0.03mm 0.015mm	 0.03mm 0.03mm 0.015mm
Raceway Ø:*	150mm	85mm
Occl. rollers Ø:	30.5mm	15mm

*) The pump raceway has a patented course algorithm (horseshoe form). The form has been used for the first time at the S3-system and is unique in the world. It leads to a considerable reduction in the pressure fluctuation produced by the pump head.

3.5 Trouble Shooting

On the third display line a 6-digit hexadecimal figure is issued, referring to error causes. At double head pump the sedecimal figure is issued in the third line for channel A and in the fourth line for channel B. Each of the six digits may refer to four errors at the same time. In the following tables the relation between error display and cause is given by points.

Example:



Error code, 1st digit:																
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	Communication processor reports:
								•	•	•	•	•	•	•	•	MAX component faulty
				•	•	•	•					•	•	•	•	pump number faulty
		•	•			•	•			•	•			•	•	error in program sequence
	•		•		•		•		•		•		•		•	rated value error

Error code, 2nd digit:																
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	Communication processor reports:
								•	•	•	•	•	•	•	•	wrong direction of rotation
				•	•	•	•					•	•	•	•	index sensor error
		•	•			•	•			•	•			•	•	runaway error (peak)
	•		•		•		•		•		•		•		•	runaway error (mean)

Error code, 3rd digit:																
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	Communication processor reports:
								•	•	•	•	•	•	•	•	not used
				•	•	•	•					•	•	•	•	CRC error
		•	•			•	•			•	•			•	•	wrong RP-address
	•		•		•		•		•		•		•		•	timeout serial interface

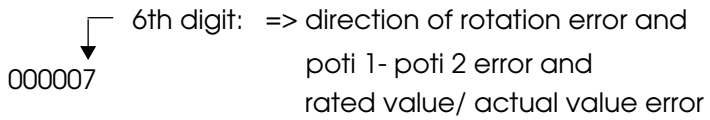
Error code, 4th digit:																
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	Control processor reports:
								•	•	•	•	•	•	•	•	relay test CP faulty
				•	•	•	•					•	•	•	•	relay test RP faulty
		•	•			•	•			•	•			•	•	start key has got caught
	•		•		•		•		•		•		•		•	PFC pulse too long

Error code 5th digit:																
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	Control processor reports:
								•	•	•	•	•	•	•	•	timeout serial interface
				•	•	•	•					•	•	•	•	starting test RP faulty
		•	•			•	•			•	•			•	•	serial error (CRC+Inv)
	•		•		•		•		•		•		•		•	reference voltage faulty

Error code 6th digit:																
0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	Control processor reports:
								•	•	•	•	•	•	•	•	index error
				•	•	•	•					•	•	•	•	rated value/ actual value error
		•	•			•	•			•	•			•	•	poti 1-poti 2 error
	•		•		•		•		•		•		•		•	direction of rotation error

Example:

If the error message "000007" appears, this means that the following errors have been detected:



In case of fault the following error codes are issued on the 7-segment display of the pump:

fault indication:	possible cause/ remedy
excess temperature error (on LCD)	notice in the first line of the display at >80°C or if temperature sensor is defective (from KP V1.2 on) => fan operates at maximum rate of rotation.
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E04	- EEPROM error.
E05	- A/D-converter error
E06	- Timer test error.
E08 (on LCD)	- Display driver faulty.
E09	- Error in operating system (Overflow in an internal buffer).

3.6 Spare Parts Roller Pump

3.6.1 Elektronic Components

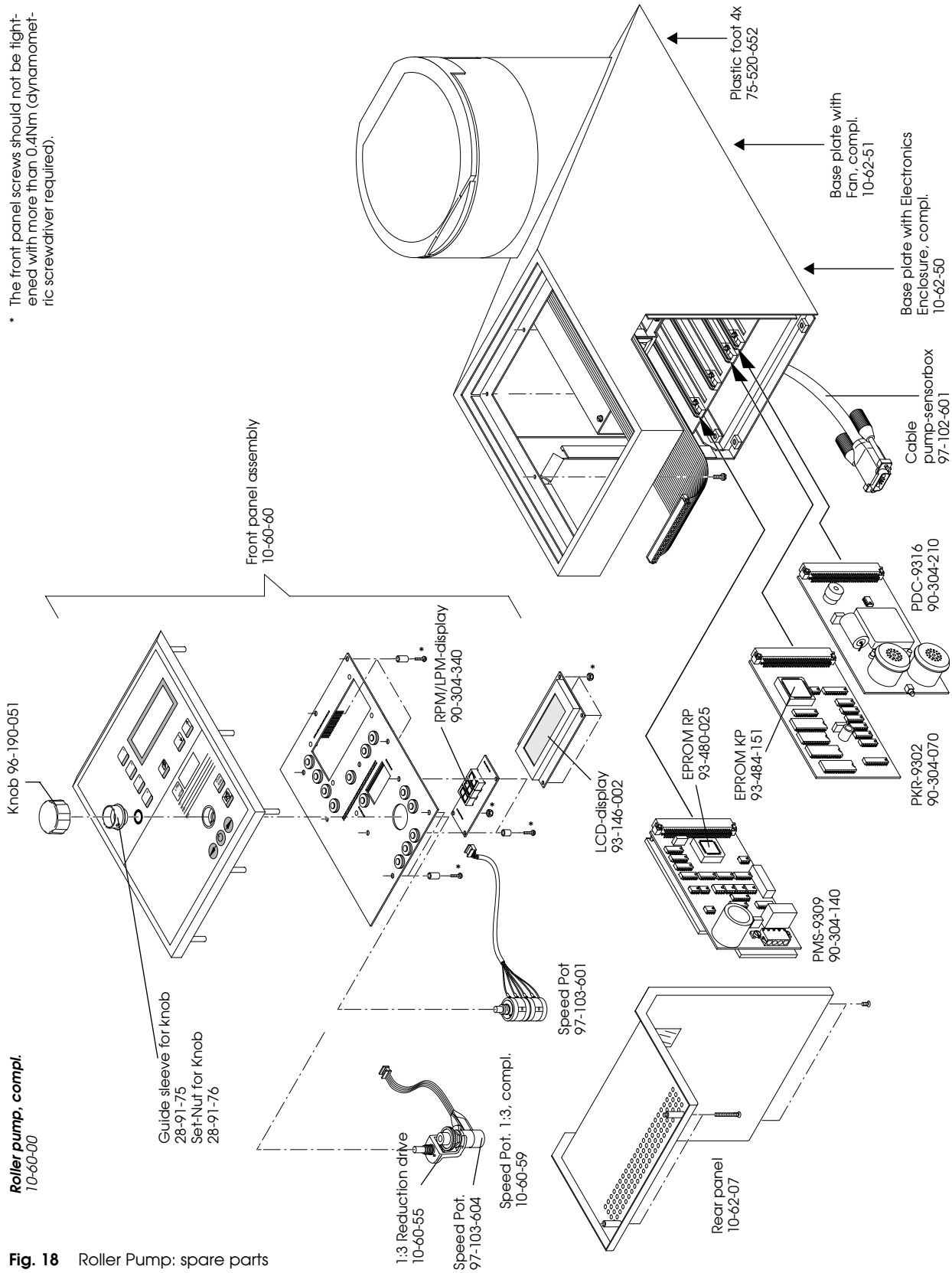


Fig. 18 Roller Pump: spare parts

3.6.2 Pump Head

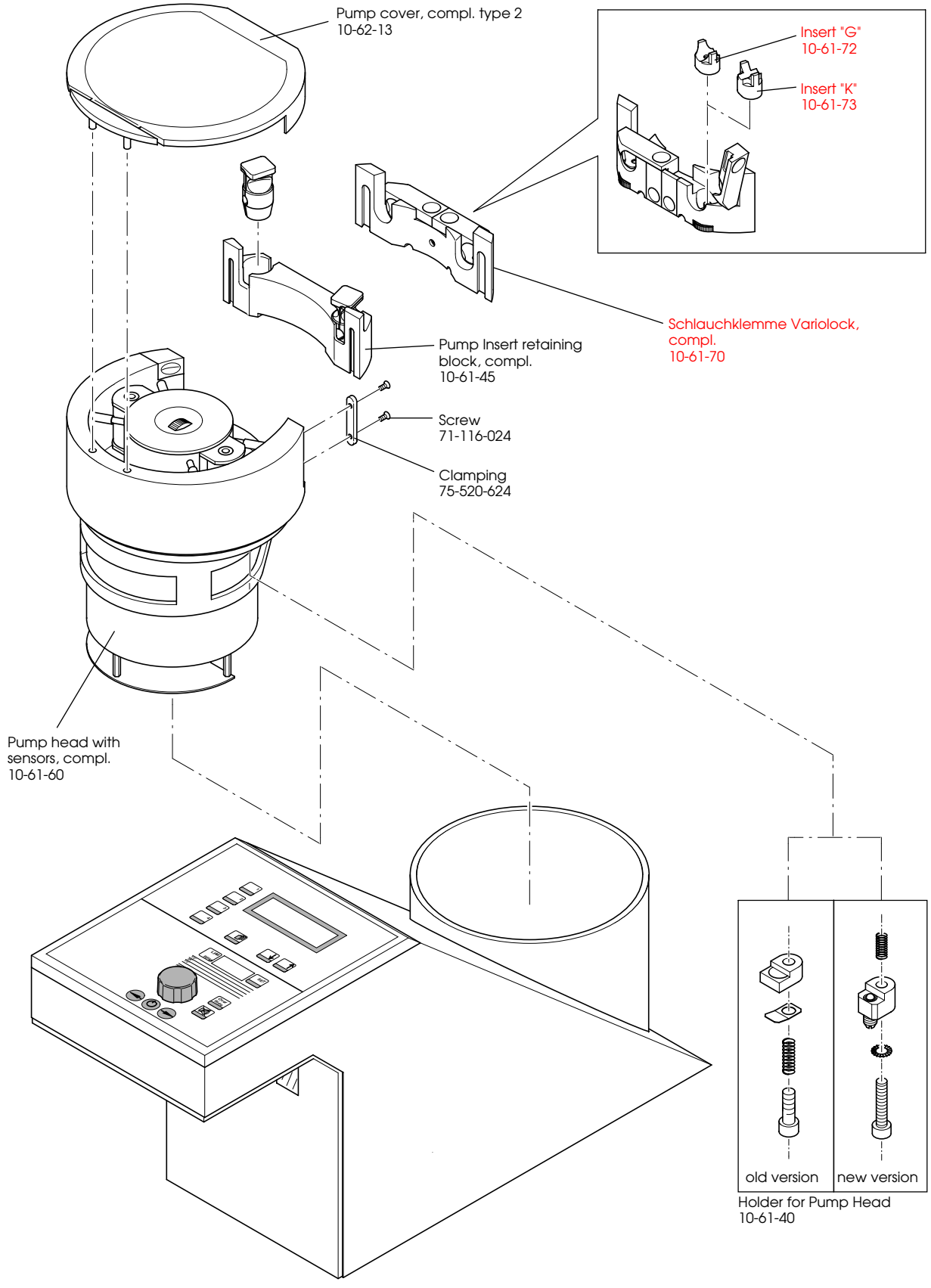


Fig. 19 Roller Pump: spare parts of pump head (1)

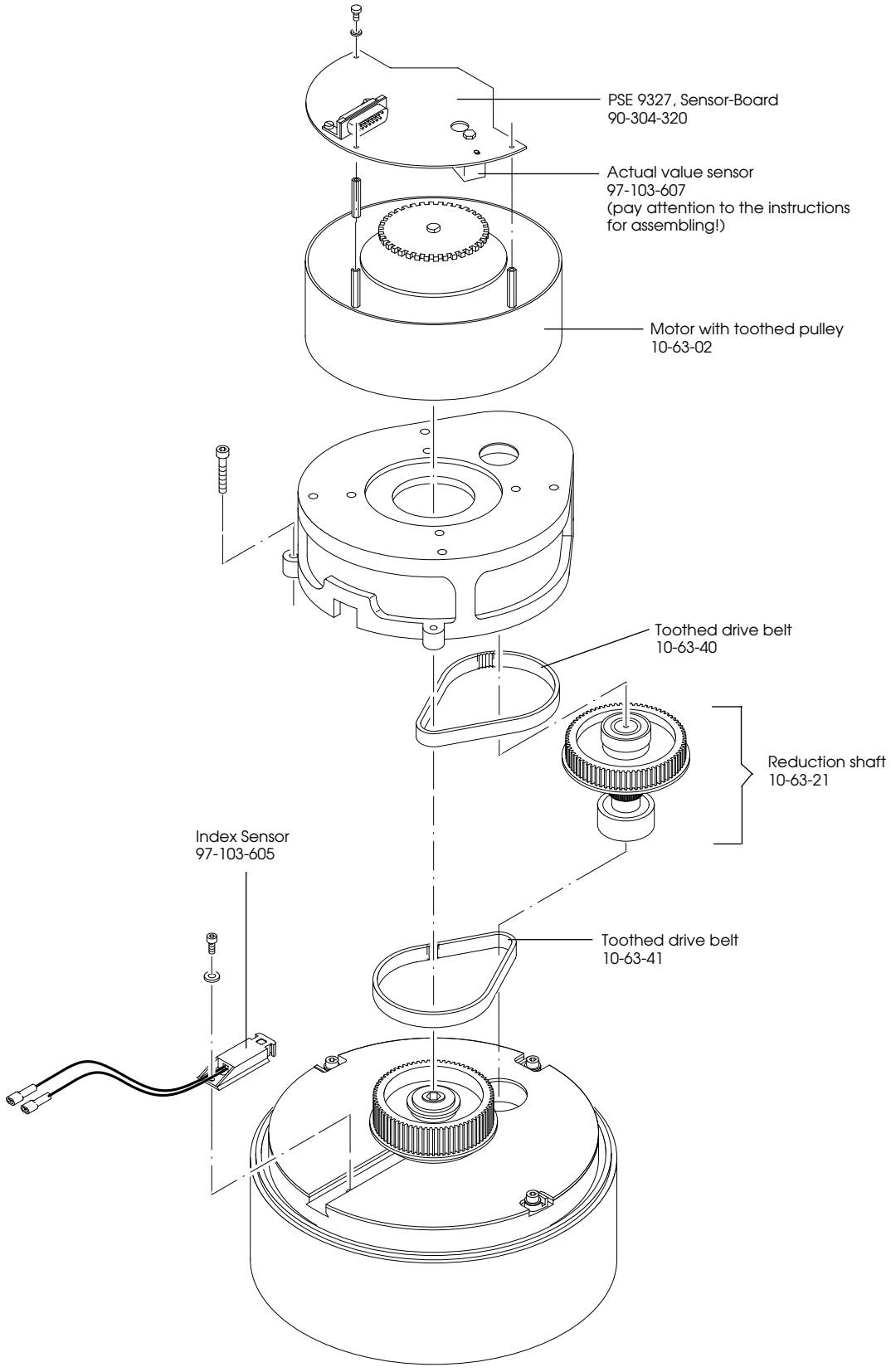


Fig. 20 Roller Pump: spare parts of pump head (2)

Notes:

3.7 Spare Parts Double Head Pump

3.7.1 Electronic Components

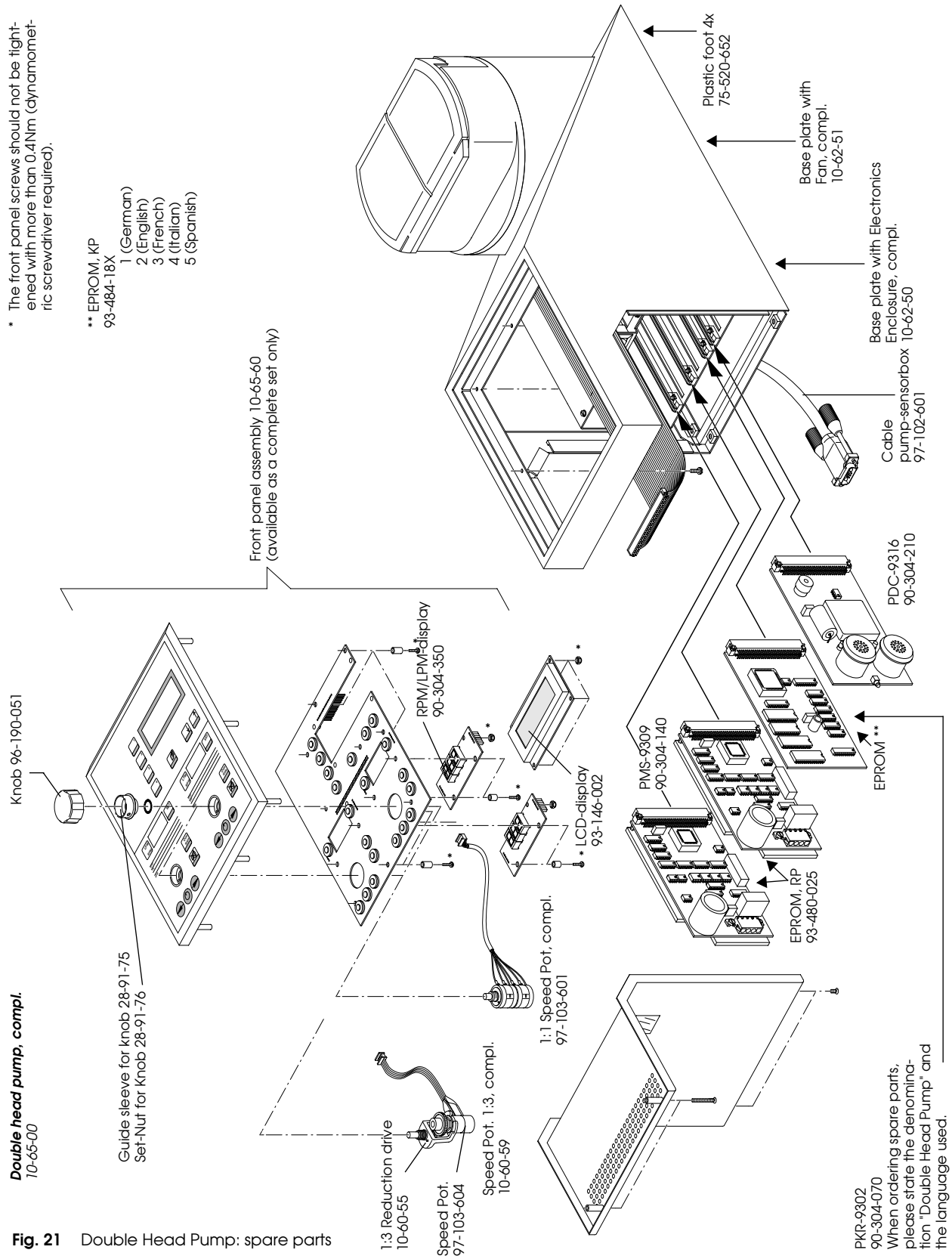


Fig. 21 Double Head Pump: spare parts

3.7.2 Pump Head

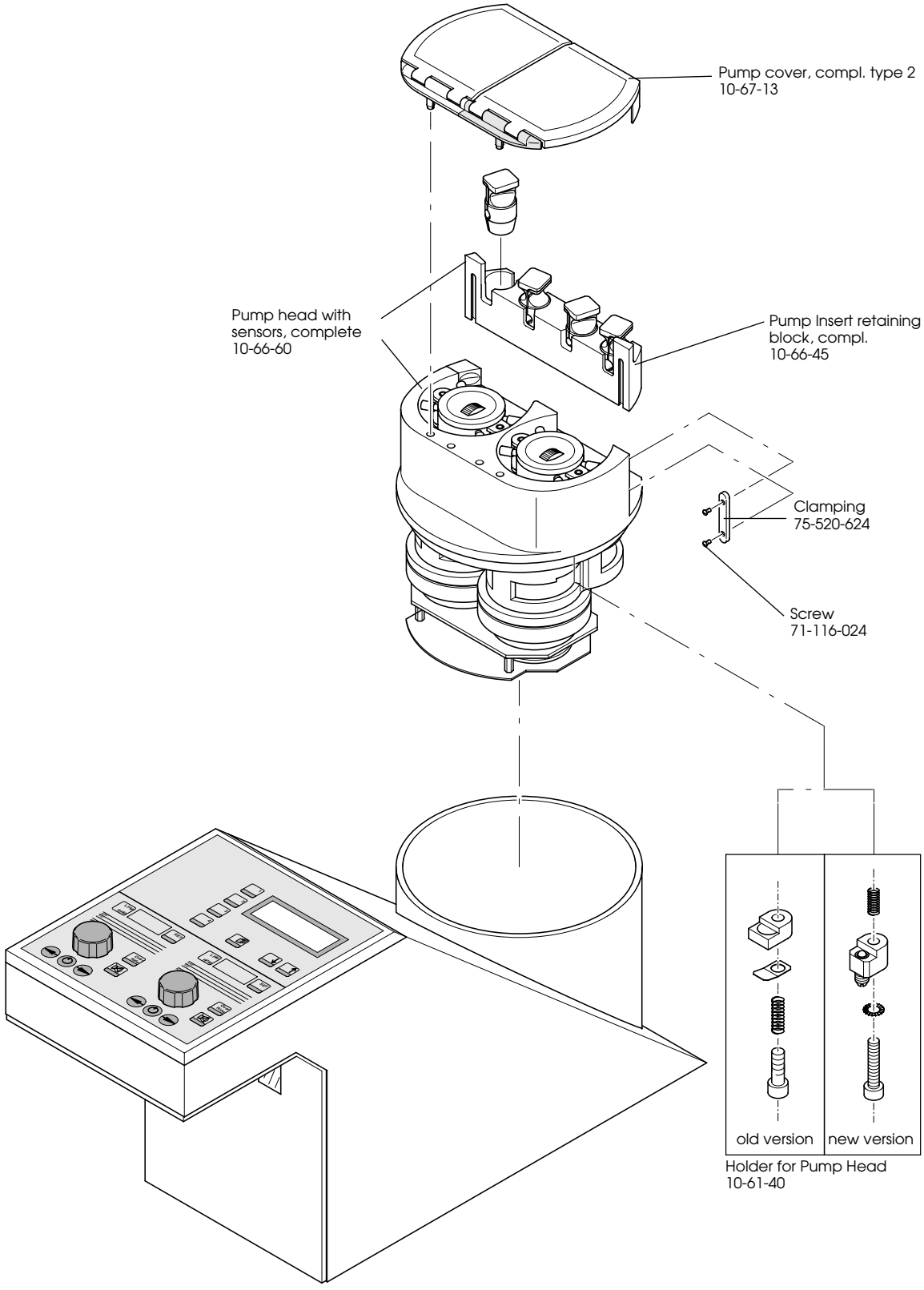


Fig. 22 Double Head Pump: spare parts of pump head (1)

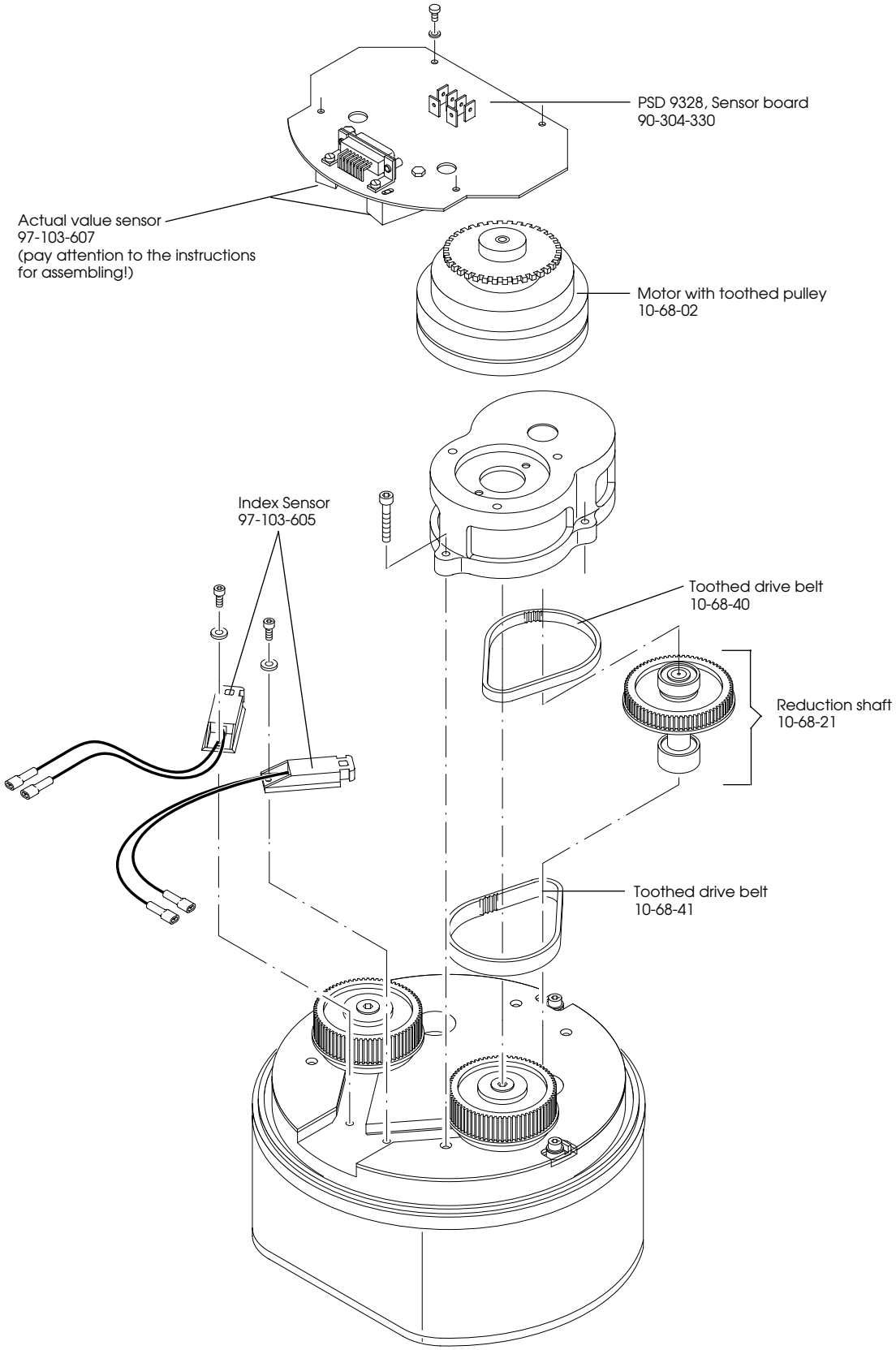


Fig. 23 Double Head Pump: spare parts of pump head (2)

3.7.3 Mast-mounted Pump Head

mast-mounted pump head housing
50-40-60

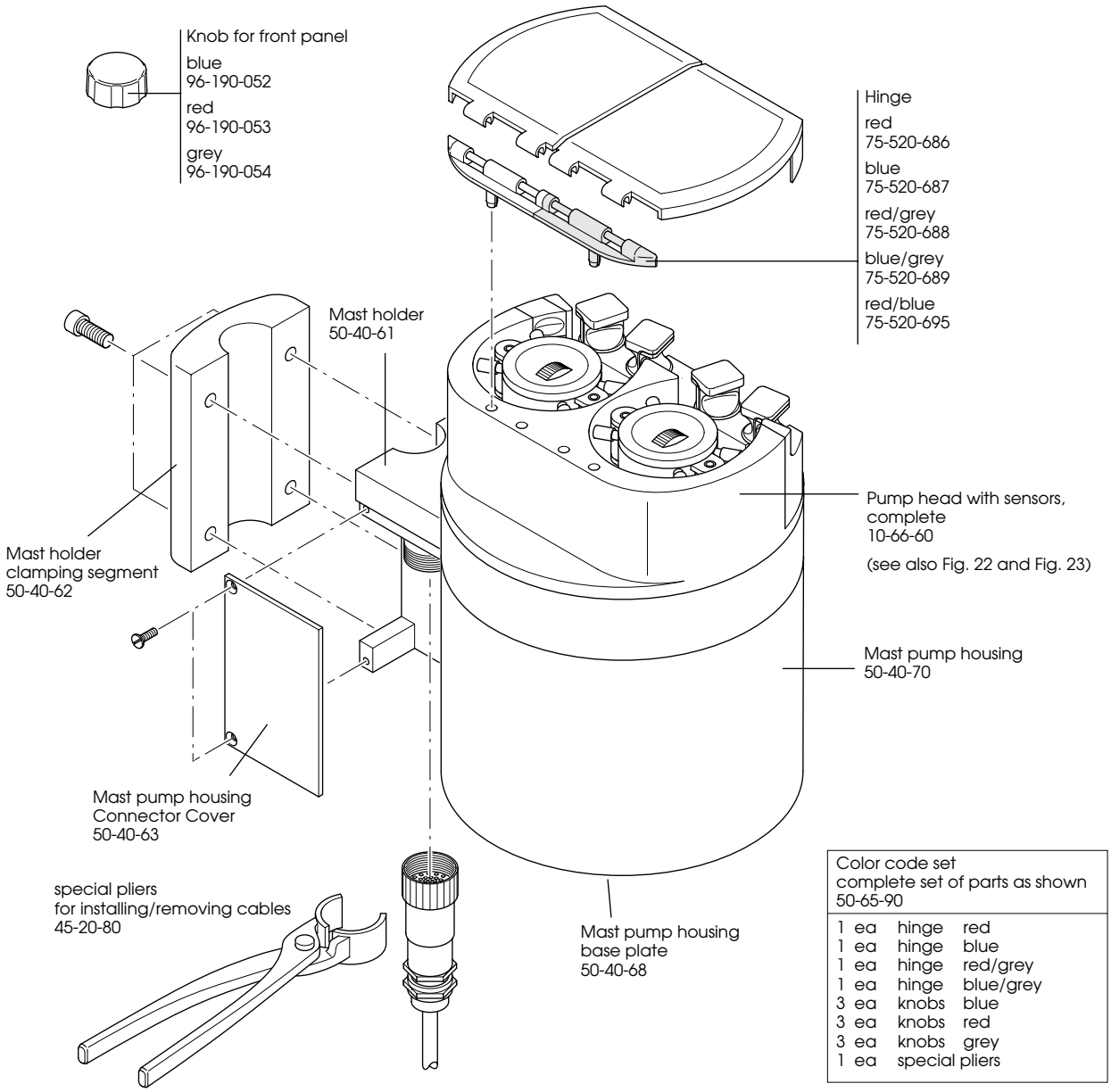


Fig. 24 Double Head Pump: Spare parts of mast-mounted double head pump (1)

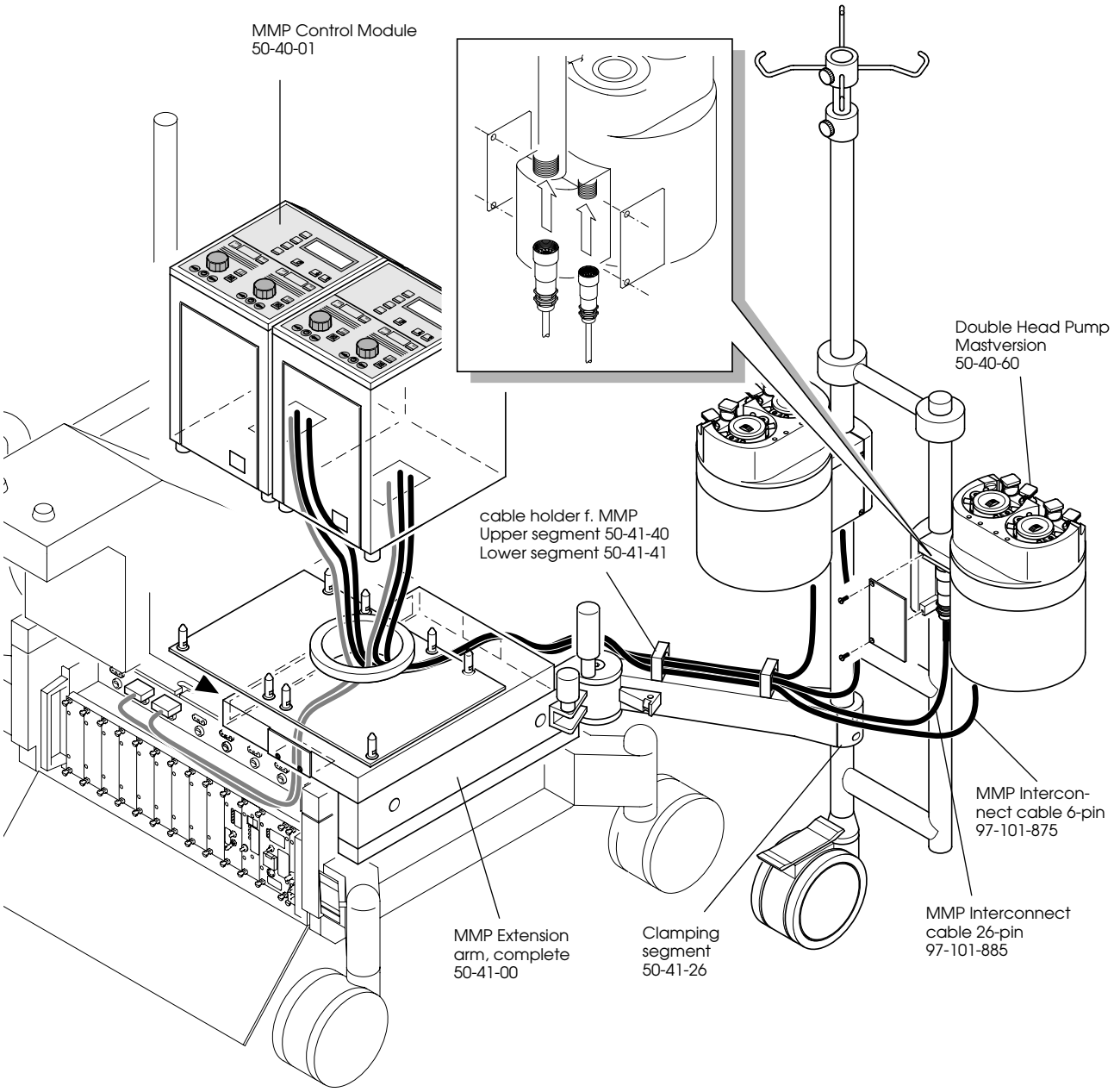
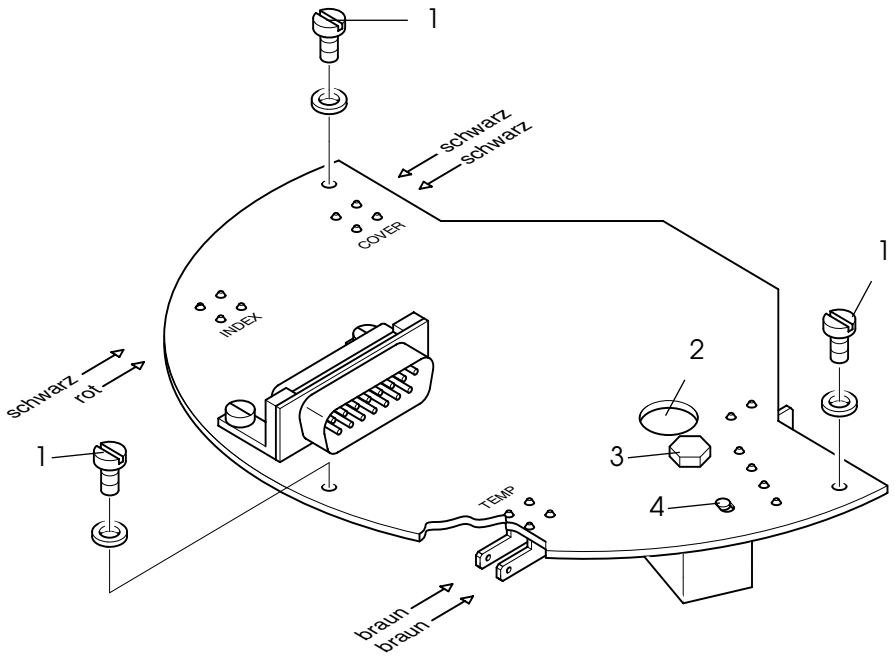


Fig. 25 Double Head Pump: Spare parts of mast-mounted double head pump (2)

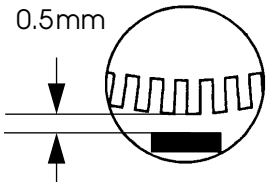
3.8 Component Replacement

3.8.1 Sensor Board Roller Pump

If a sensor board is defective, it has to be replaced as follows:



- Disconnect pump of S3-system.
- Open pump housing by removing bottom plate.
- Disconnect all electrical connections to sensor board.
- Remove three screws(1) and replace sensor board.
- Fix new sensor board with three screws(1) and secure one of the three screws with lacquer.
- Re-establish all electrical connections to sensor board (see above).
- Adjust the distance between sensor and index disk in the adjustment bore(2) to 0.5mm by a feeler gauge. During this process the sensor has to be centric to the index disk (see figure on the right).

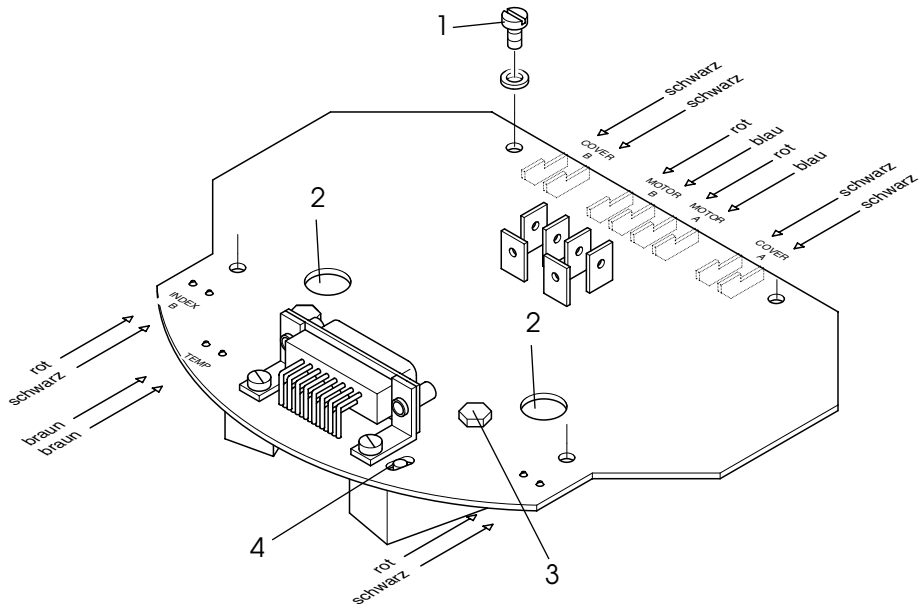


Important:

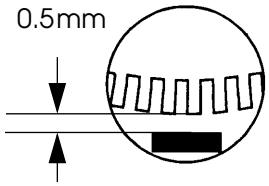
- The 5.5mm hexagon head screw(3) for fixing the sensor shall be tightened with a maximum of 0.6Nm.
- Secure the screw with lacquer.
- The guide pin(4) of the sensor has to be in the guide hole of the board.

3.8.2 Sensor Board Double Head Pump

If a sensor board is defective, it has to be replaced as follows:



- Disconnect pump of S3-system.
- Open pump housing by removing bottom plate.
- Disconnect all electrical connections to sensor board.
- Remove three screws(1) and replace sensor board.
- Fix new sensor board with four screws(1) and secure one of the four screws with lacquer.
- Re-establish all electrical connections to sensor board (see above).
- Adjust the distance between sensors and index disks in the adjustment bores(2) to 0.5mm by a feeler gauge. During this process the sensor has to be centric to the index disk (see figure on the right).



Important:

- The 5.5mm hexagon head screw(3) for fixing the sensor shall be tightened with a maximum of 0.6Nm.
- Secure the screw with lacquer.
- The guide pins(4) of the sensors has to be in the guide hole of the board.

3.8.3 Replacement of Potentiometer Megatron RP 19 (1:1 or 1:3)

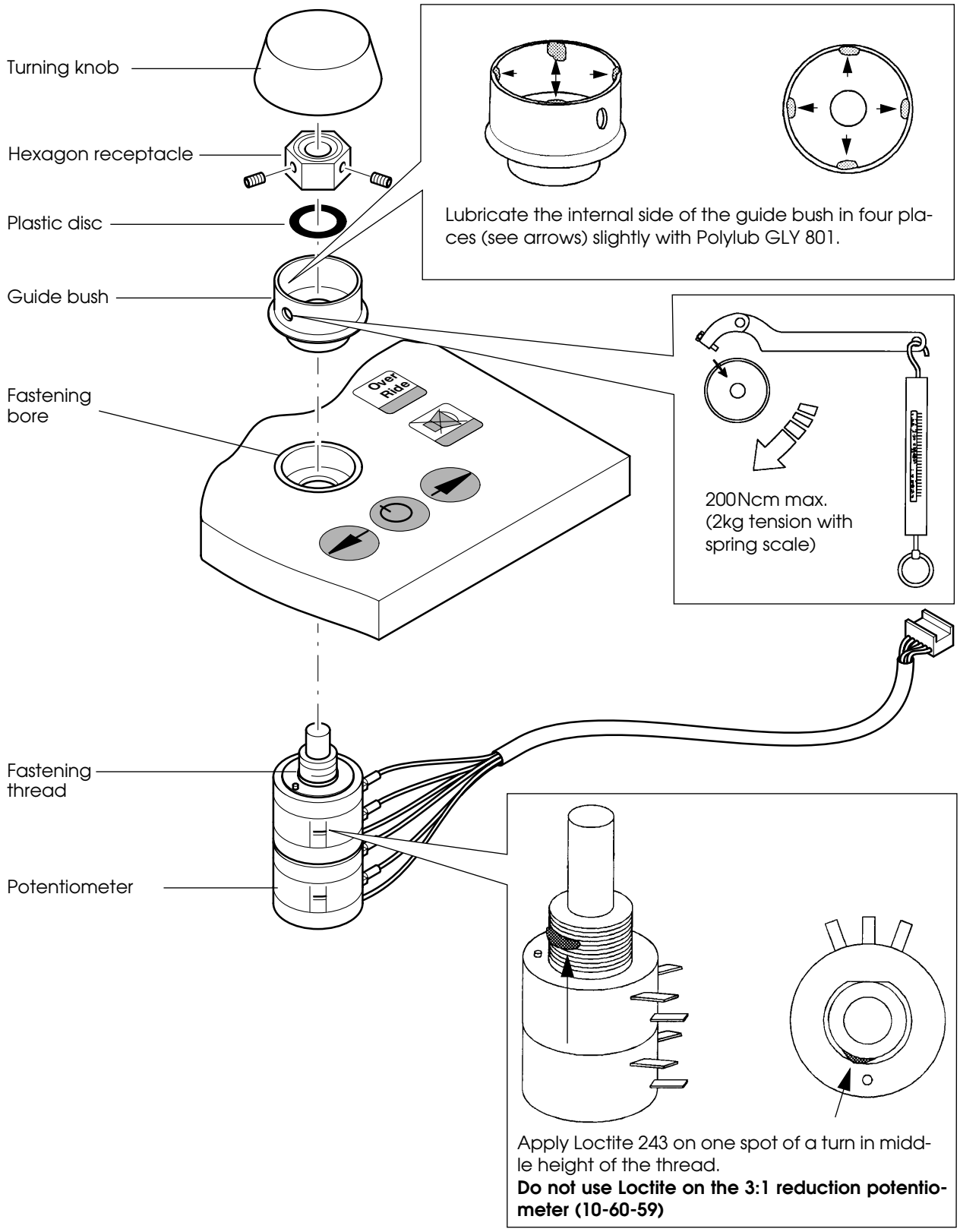


Fig. 26 Potentiometer for double head pump and roller pump

The following work steps describe the installation of a potentiometer into the roller pump or into the double head pump. The disassembly will correspondingly be performed in reverse sequence. To avoid damage, the potentiometer has to be held fast when screwed off.

Only inspected potentiometer equipped with cable harness must be used.

- Remove the assembly parts from the potentiometer supplied (hexagon nut and tooth lock washer). These are not required for installation.
- De-grease fastening thread and guide bush with a cloth moistened with alcohol. Make absolutely sure that no alcohol gets into the potentiometer.
- Apply Loctite 243 on three spots in middle height of the fastening thread.

Important:
Make absolutely sure that no Loctite gets into the axis of the potentiometer or into the potentiometer.

- Insert potentiometer from below into the opening provided. The locking pin has to be positioned into the bore provided in order to avoid distortion of the potentiometer.
- Slightly grease the guide bush on the internal side with Polylub GLY 801 as shown in Fig. 26.
- Screw together guide bush and potentiometer from panel top. Use an appropriate sickle spanner and a spring balance. The maximum torque should be 200Ncm.
- Slide plastic disk onto the potentiometer axis.
- Slightly grease hexagon receptacle on all six sides with Polylub GLY 801.
- Slide hexagon receptacle on the potentiometer axis until it gets in contact with the plastic disk.
- Clamp hexagon receptacle with the two set screws to the potentiometer axis (Allan key 1.5).

Important:
Do not press hexagon receptacle to the bottom against the plastic disk when fastening the screw. The receptacle shall be only in slight contact with the disk.

- Put turning knob loosely onto the guide bush.
- Let turning knob snap on by slight pressure onto the guide bush.
- Connect socket of cable harness with board.
- Check the mechanical functions of the potentiometer as follows:
  Turn potentiometer in both directions to the limit. It should be possible to turn the potentiometer by the knob easily over the total range without slippage. If it is turned beyond the limit, the knob turns on the guide bush, thus avoiding damaging of the potentiometer.

Notes:

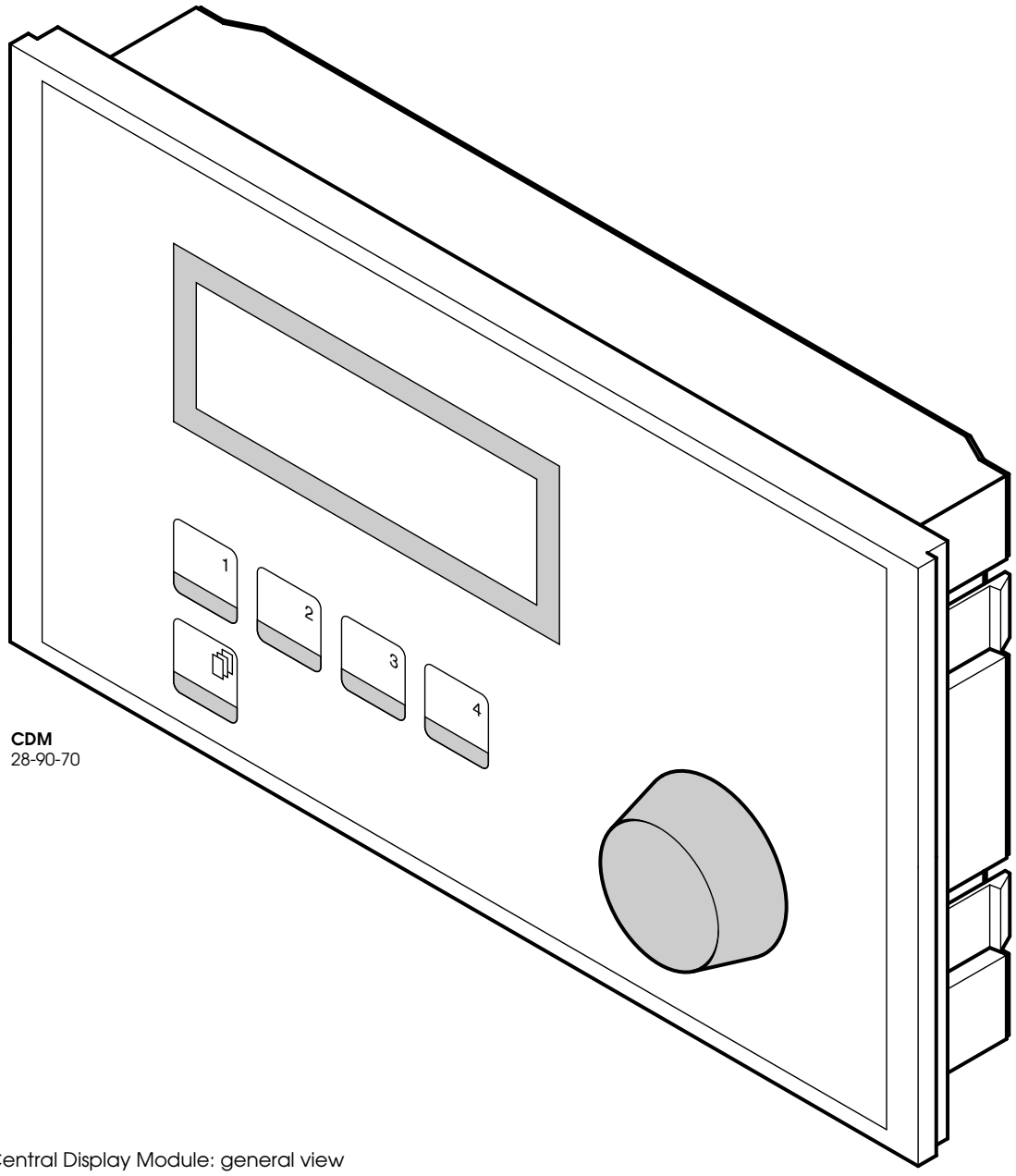


Fig. 27 Central Display Module: general view

4.1 CAN-Structure

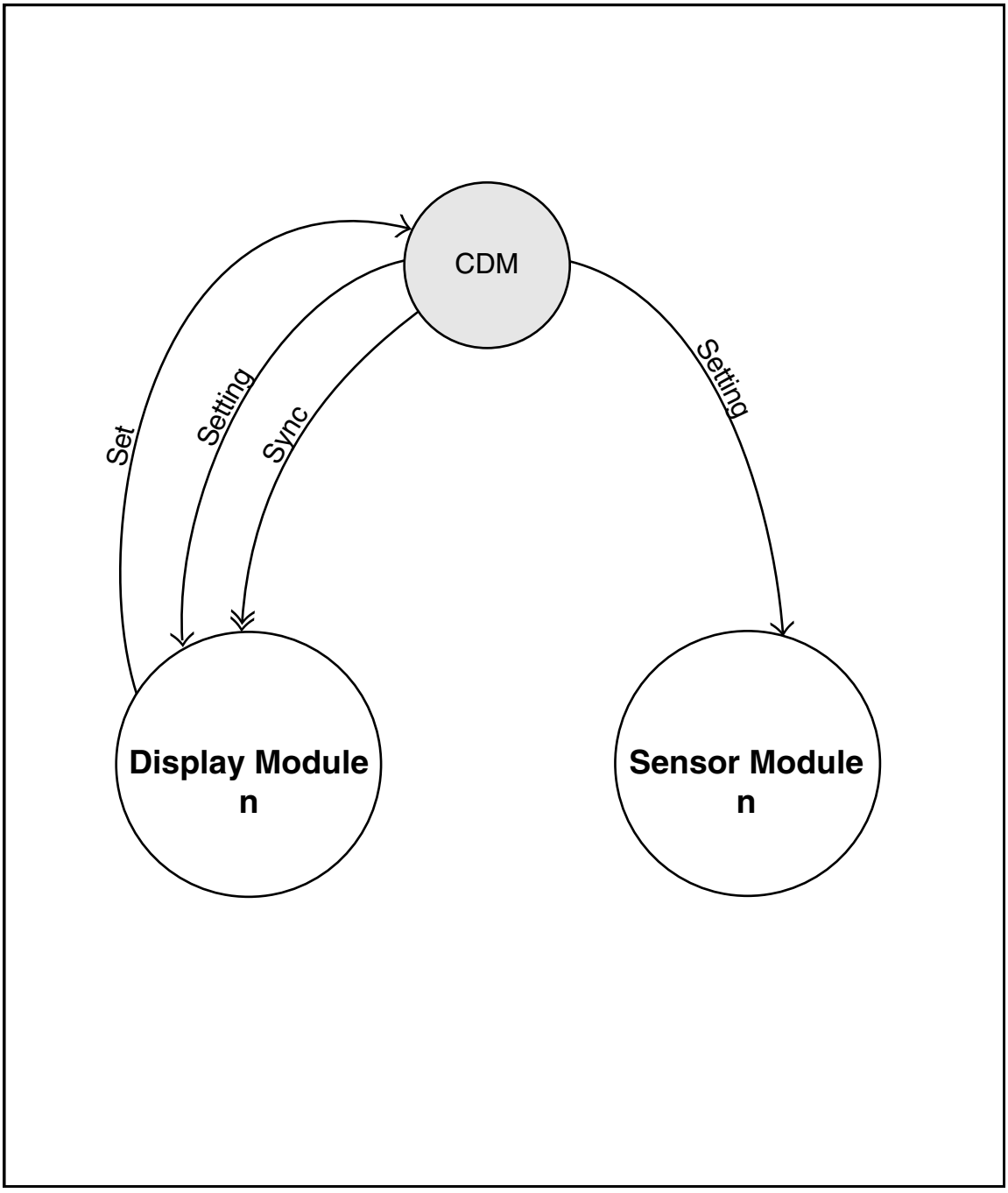


Fig. 28 Central Display Module: CAN-structure

4.2 Functional Description

The central display module, short CDM, serves to set the parameters of the individual control modules plugged in and to allocate the pumps.

As soon as the "SET" key of any module is activated, the CDM display shows the initial module menu in its LCD display. The keys "1" to "4" serve to select menu items. The settings made possible by the selected menu item, are performed by turning the adjusting knob on CDM. The "LEAF" key serves to change to the next menu (if existing). The settings are given to the relevant module by the CAN-bus.

4.3 Technical Data

Height:	55mm
Width:	200mm
Depth:	35mm
Weight:	300g
Power supply:	via DC/DC-module in control desk
Power input:	max. 30Watt
Patch panel with 6 plug-ins, completely equipped.	max. 30W
Patch panel with 10 plug-ins, completely equipped.	max. 45W
Operating temperature:	+10°C to +40°C
Storing temperature:	0°C to +40°C

4.4 Battery Disposal

In accordance with environmental protection laws problem waste has to be disposed of separately and professionally. The authorized hospital personnel has to be informed explicitly about it.

Every five years at the latest, i.e. after an error message, the buffer battery in the CDM has to be replaced by service personnel. The user has to take care of a correct waste disposal.

4.5 CDM-Reset

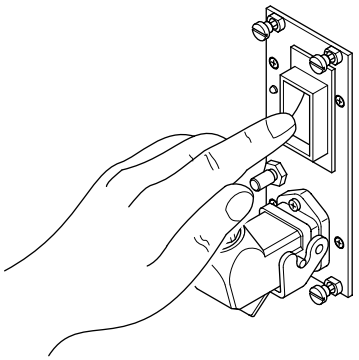
After each EPROM exchange, either after a repair or a retrofit, the CDM has to be reset. Thus the CDM reads and stores the current values of all EPROMs in the system.

Note:

The CDM reset procedure resets all user settings to their factory default values. Note all settings prior to performing this procedure. Reset all of the module settings to the values the customer uses after you are done.

Reset procedure

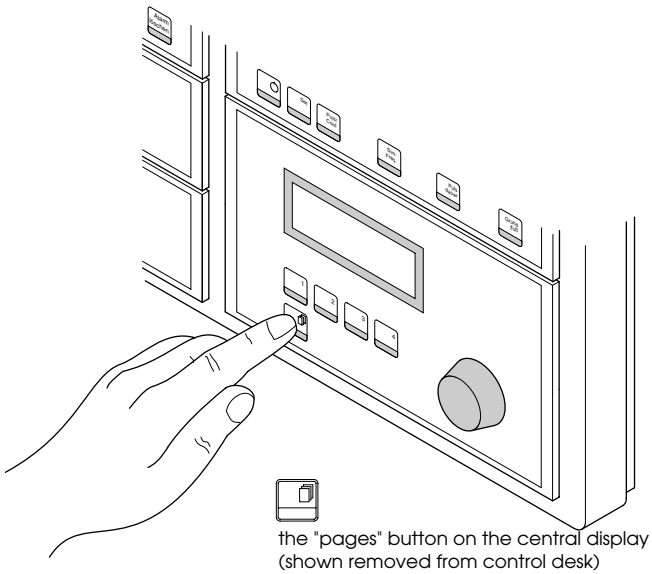
- The system must be completely switched off using the mains switch of the Power Supply Module.



mains switch on the power supply module
(shown without AC cable connected)

Leave the system switched off for about one minute. This way all values stored in the non-buffered RAM are lost.

- Press and hold the "pages" button on the central display module.



the "pages" button on the central display module
(shown removed from control desk)

- With the "pages" button still pressed, switch the system on. Here again, use the mains switch of the power supply module.
  The central display module will make one "beep". This will not be very loud, so please listen carefully for it.

- After the CDM has "beeped" one time, release the "pages" button and press it three more times. The CDM should "beep" once for each time the button is pressed.

The system should now be completely reset. The CDM display should show "0:00" for the actual time and "01.01.1980" for the actual date.

Note:

The individual modules in the S3 system each have their own RAM. If the CDM reset is done while the system is powered up, the RAM memory in each module may not be completely erased. Previously stored settings (e.g., pressure limit information) may still be present. To ensure that the individual modules and the CDM are both fully re-written based on the new EPROM, the above listed reset procedure must be used.
In the event of any replacement action involving EPROMs in the modules, in the control desk or sensor box, a CDM-Reset (as described above) must be performed. This is the only way to ensure that the system uses the new program information instead of the old.
Again, please note: this reset procedure resets all user settings to their default values. Ensure that the system is re-configured the way it was when you started work on it.

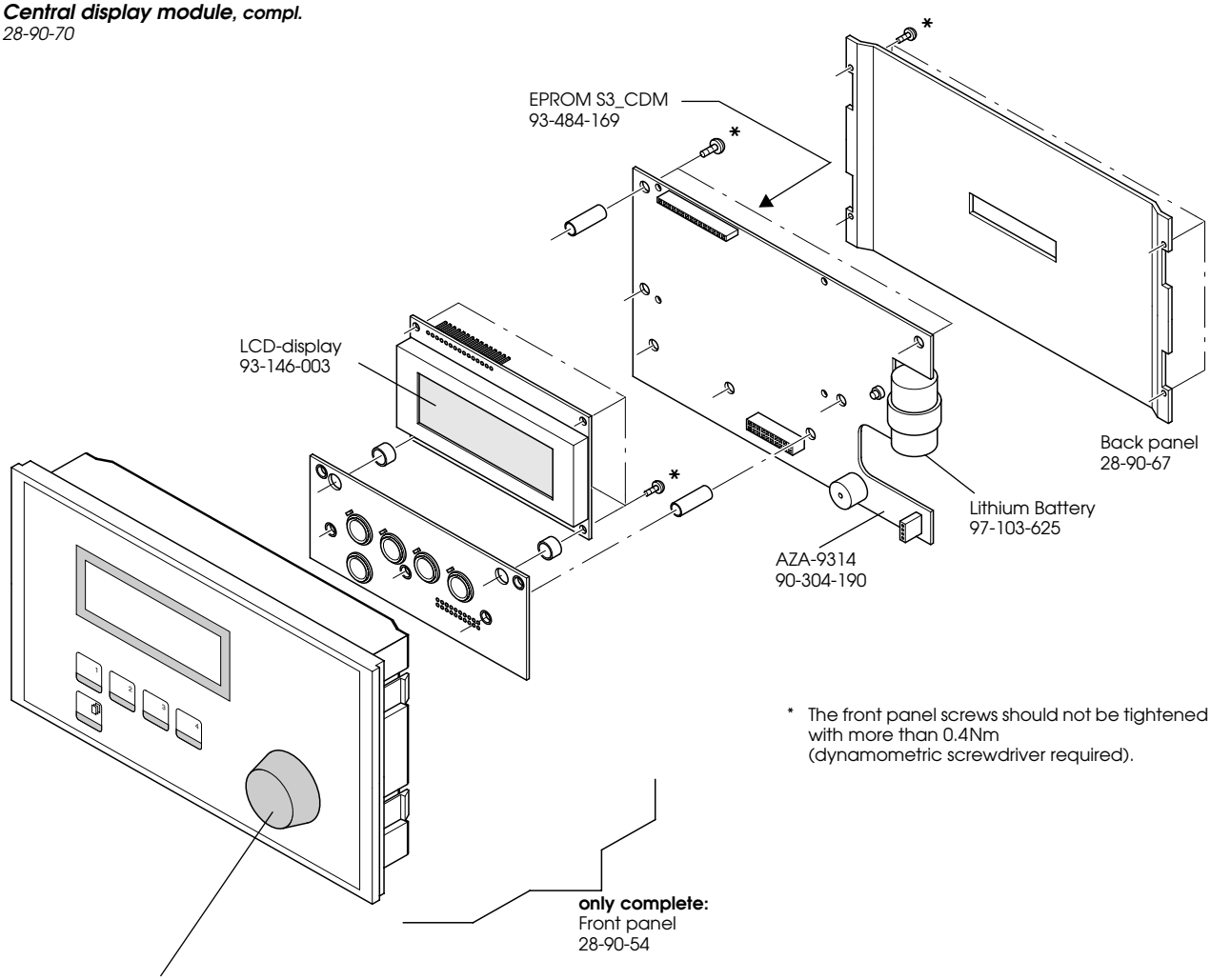
4.6 Trouble Shooting

In case of an error the following error codes are displayed on the 7-segment display of the CDM:

fault indications:	possible cause/ remedy
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E05	- Connection point faulty The CDM has to be connected at the connector marked with "Control Desk".
System resets to "1.01.1980" and to German language every time it is switched on.	- Battery defective. Please replace it.

4.7 Spare Parts

Central display module, compl.
28-90-70



Knob	96-190-051
Set-Nut for Knob	28-91-76
Guide sleeve for Knob	28-91-75
O-Ring	72-103-034
Shaft Angle Encoder (SAE), compl.	97-103-602

Fig. 29 Central Display Module: spare parts

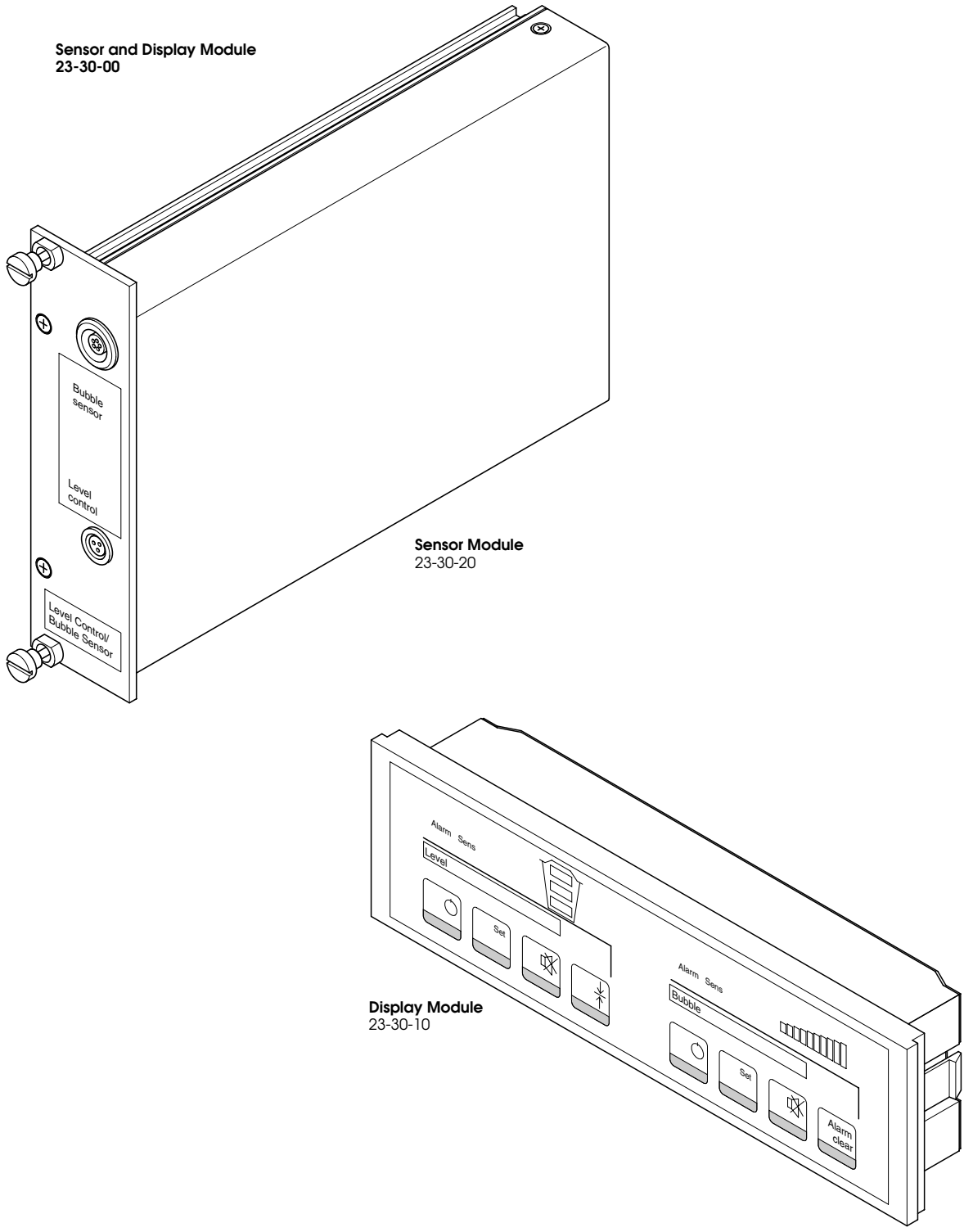


Fig. 30 Level Control/ Bubble Detector: general view

5.1 CAN-Structure

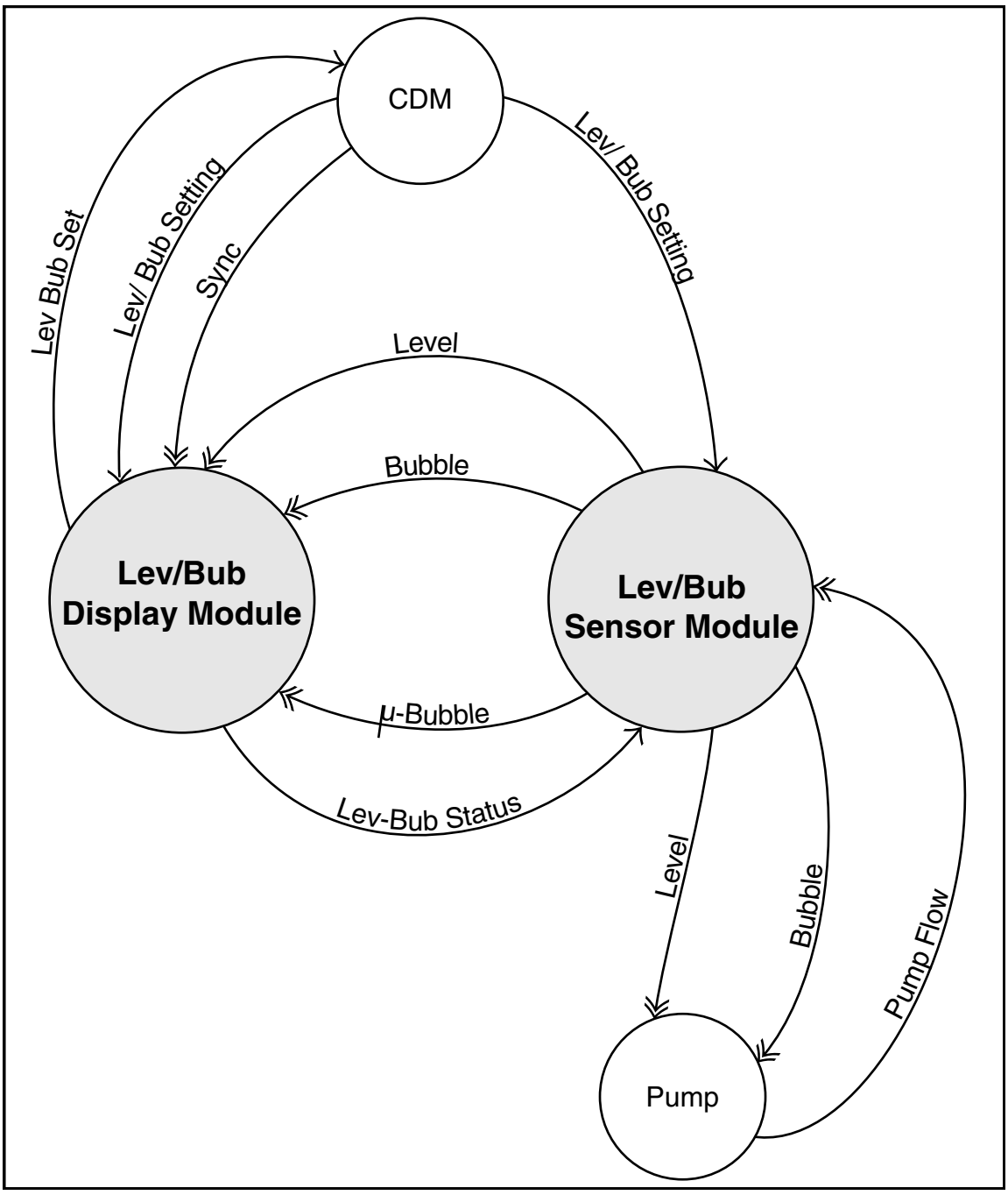


Fig. 31 Level Control/ Bubble Detector: CAN-structure

5.2 Functional Description

The module level control/ bubble detector is able to perform two tasks:
It is able to monitor the fixed minimum blood level in an oxygenator or in a reservoir. The device reacts to blood as well as to clear liquids. The selected pump will be stopped when it drops below the preset level and the pump speed will be reduced. As soon as the preset level has been reached again, the pump starts again and/or the speed reduction will be terminated. The level control system may be used for most hard shell oxygenators and reservoirs.
The second function checks the extra-corporal blood circulation for air bubbles. In case air bubbles are detected, the selected pump is stopped until the user has removed the air bubbles and terminates the stop function by key depression. A second stop-pump can be selected in the SET-menu. This is a stop only function regardless of the selected mode of operation.

5.2.1 Level Control

The level control may operate the selected pump in start-stop mode or control mode. In both operating modes the filling quantity in a reservoir is determined by a high frequency sensor attached from the outside. The level control recognizes two thresholds, an upper and a lower threshold. The difference between these two thresholds depends on the type of reservoir used.

5.2.1.1 Start-Stop Mode

In the start-stop mode the selected pump works at the speed determined by the user. If the amount of liquid in the reservoir drops below the lower threshold value of the HF-sensor, the selected pump is stopped. The display of the stop status and the display "Low Level" (red) will light and the display !!ALARM!! will flash. The pump will be started again automatically, as soon as the level has reached the upper threshold level of the HF-sensor again. The "High Level" display (yellow) will light up, !!ALARM!! will extinguish.

5.2.1.2 Control Mode

In the control mode the user sets the maximum desired pump speed at the pump. When the blood level in the reservoir has dropped to the upper threshold value, the pump speed will be reduced by the level control until the blood level has reached the upper threshold. The green display in the middle will light up and thus shows the control status. If the lower threshold value is reached in the control mode, the pump will be stopped. The "Low Level" display (red) will light and !!ALARM!! will flash. The display !!ALARM!! will flash in the LEVEL line of the pump display.

When the pump speeds up such that the upper threshold value is reached, the "High Level" display (yellow) will light up. The pump is not in the control mode (and pumps at the speed set by the user).

When switching to the start-stop mode, the pump will at first be accelerated slowly until the set desired value is attained. During this time the green display in the middle will light ("CONTROL"). The display CONTROL will be present in the LEVEL line of the pump display.

In case of a sensor or device defect it may happen that the control and the start-stop mode fail at the same time, as both operating modes use the same hardware!

5.2.2 Bubble Detector

The bubble detector serves for the detection of air bubbles in the extra-corporal circulation. If the bubbles reach a size above 3mm, the selected pump will be stopped.

The scanning for bubbles is constantly performed by a HF-sender/receiver clamped above the tubing with a frequency of 25kHz.

The HF-impulses emitted by the sender penetrate the tubing and the liquid inside and will be recorded by the receiver. The sensor module evaluates the received signal and thus bubbles can be detected. Smaller bubbles (below 3mm) are registered by the sensor module and reported to the display module as "µ-bubble". The display module indicates an excistence of bubbles (>300µm). However, this has no influence on the pump.

If bubbles having a diameter above 3mm are detected, the message "Bubble" is given to the selected pump and to the display module. The pump stops immediately and the display module releases an optical and acoustical alarm. The display "ALARM" flashes in the BUBBLE line of the pump display.

In case there is air inside the tubing, gel has dried or the sensor is open and/or not connected, the "SENS" display will light. It extinguishes as soon as the sensor is properly connected and no more air can be detected in the tubing. However, alarm and pump stop will be maintained until the "CLEAR ALARM" key is depressed.

Even an internal unit fault may be reset by pressing "CLEAR ALARM", if it has only once been triggered by a too faint sensor signal. Switching the bubble control off and on again also cancels the alarm.

The max pump speed of 250 RPM results in a blood speed of <2m/s. At the maximum reaction time of 500ms the bubble might move 1m if the most adverse circumstances are assumed. As a consequence the distance between patient and sensor has to be more than 1m.

An additional stop-pump can be selected in the SET-menu.

Important:
The sensor type (1/2" or 1/4") must be selected in the SET-menu. Selection of the incorrect type produces Alarm symptoms.

5.3 Technical Data

	Display module	Sensor module
Height, width, depth:	55mm, 200mm, 35mm	128mm, 33.4mm, 178.5mm
Weight:	300g	400g
Power supply:	via DC/DC-module in control desk	via DC/DC-module in E/P-pack
Power input:	max. 3 Watt	max. 3 Watt
Operating temperature:	+10°C to +40°C	+10°C to +40°C
Storing temperature:	0°C to +40°C	0°C to +40°C

Level control	
Accuracy of stop threshold	±10mm (may be exceeded during transient in the control mode)

Bubble detector	minimum size of bubble for alarm
1/2" - 3/8"-sensor	0.02cm^3±30%
1/4"- 3/16" sensor	0.002cm^3±30%
Micro bubble detection	≥300µm

5.4 Accessories

included in the supply scope 23-30-00:

Bubble detector for 1/2"-tubings	23-07-45
alternatively: bubble sensor for 1/4"-tubings	23-07-40
old:	
Bubble detector for 3/8"-tubings	23-07-50
Bubble detector for 3/16"-tubings	23-07-55
Mast holders for bubble sensors	23-26-45
Sensor for level control	23-27-40
Fixtures for level sensors (100 pieces)	23-27-41
Ultrasonic gel, 250ml bottle (only required for 23-07-45)*	96-06-10

*) state bubble sensor when ordering

5.5 Installation into S3-System

- Switch off S3-system.
- Remove blank slide-in from free module slot (if available).
- Insert display module into free slot.
- Remove cover from one of the first nine slots in the E/P-pack.
- Insert sensor module into the free slot until the connection engages.
- Tighten fixing screws.
- Connect level and bubble sensor to the connection sockets of the sensor module.
- Check level control and bubble detector function.

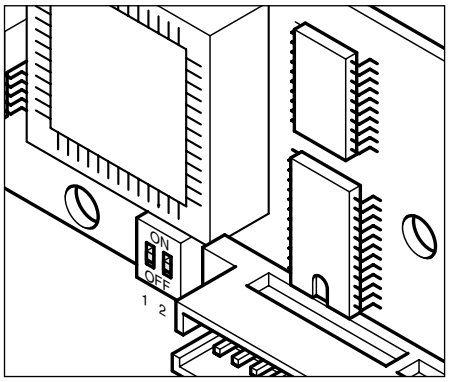
5.5.1 Installation of several identical devices

When using more than one level control/ bubble detector, the relevant display and control modules have to be allocated to each other. The CAN-bus may manage up to four level control/ bubble detectors. The differentiation will be made by a device number which has to be set on the display module and on the sensor module. The device number will be set by the DIP-switch shown in Fig. 32.

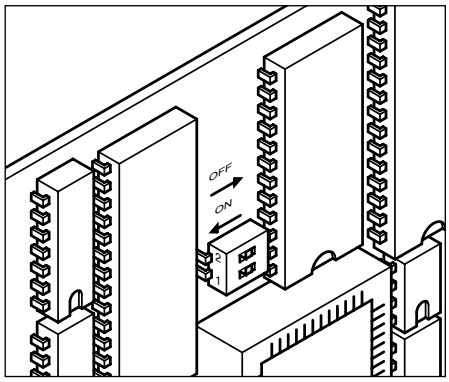
The following table shows the relation between DIP-switch position and device number.

DIP-switch no.	1	OFF	ON	OFF	ON
	2	OFF	OFF	ON	ON
Device no.:		1*	2	3	4

*) The device no."1" is not shown on CDM.



DIP-switch on the ABR-board
of the display module



DIP-switch on the SLB-board
of the sensor module

Fig. 32 Level Control/ Bubble Sensor: DIP-switch

5.6 Trouble Shooting

5.6.1 On the Display Module

Alarm	SENS	possible cause/ remedy
lights	lights	- Error in display module.
flashes	flashes	- Error in sensor module. The bubble signal is possibly too faint in bubble detector.
off	flashes	- Connection to sensor module interrupted. Sensor module possibly not connected.
flashes	lights	- Sensor not connected or interrupted. In case of bubble detector this may happen, if e.g. air is inside the tubing or gel has dried.
flashes	off	- The function monitored is in the alarm state. The level has dropped below the stop level of the level control or the bubble detector has found a bubble larger than 3mm.

5.6.2 In the Pump

fault indication	possible cause/ remedy
!!ALARM!!	- The function is in the alarm state or wrong sensor type is selected in SET-menu (BUBBLE only).
No COM!	- No communication 1. after starting the pump, 2. if there is no connection, 3. if an error has been detected.
OFF	- The function is switched off.
!!STOP!!	- External intervention (no alarm situation).
CONTROL	- External intervention (no alarm situation).

5.7 Spare Parts

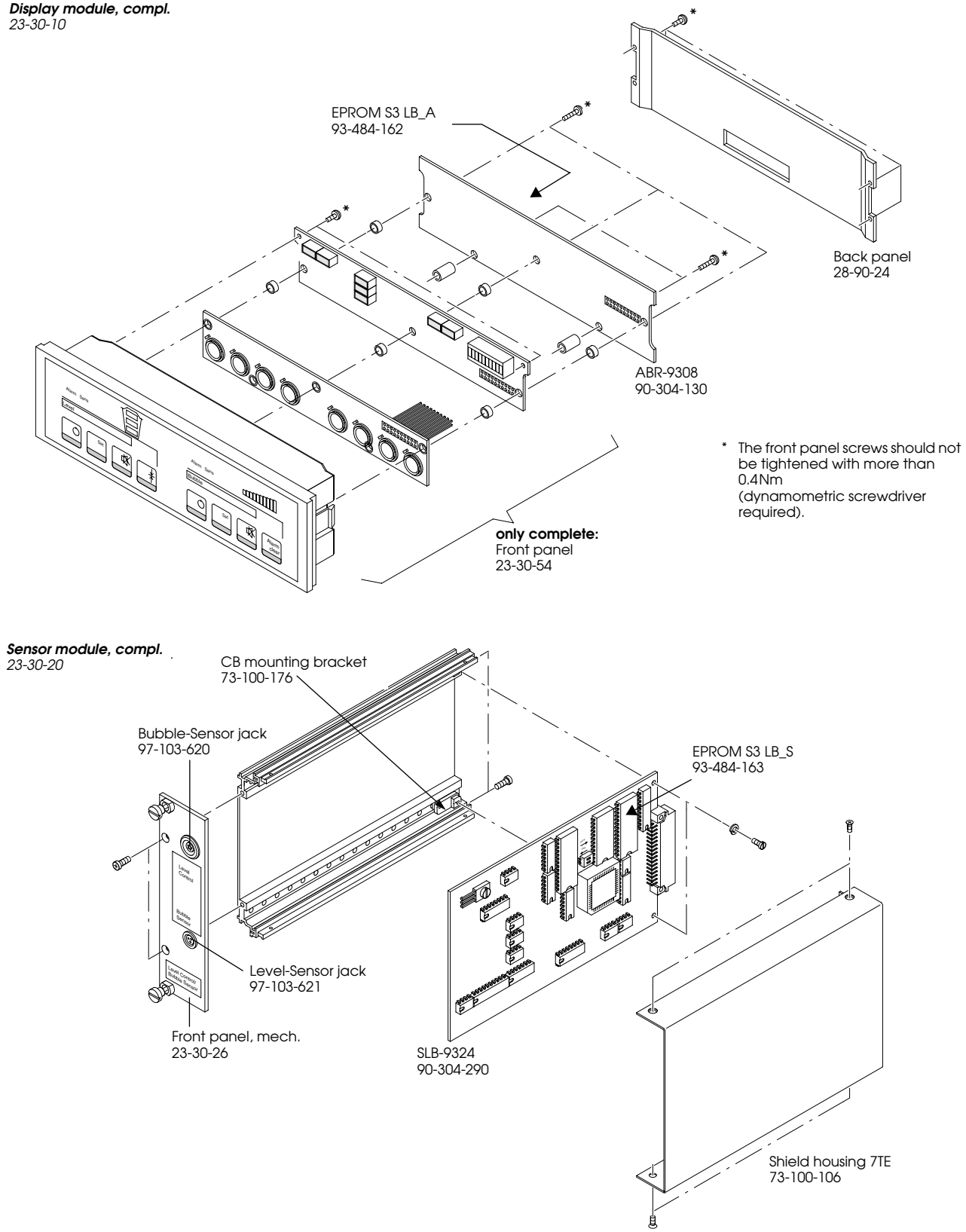


Fig. 33 Level Control/ Bubble Detector: spare parts

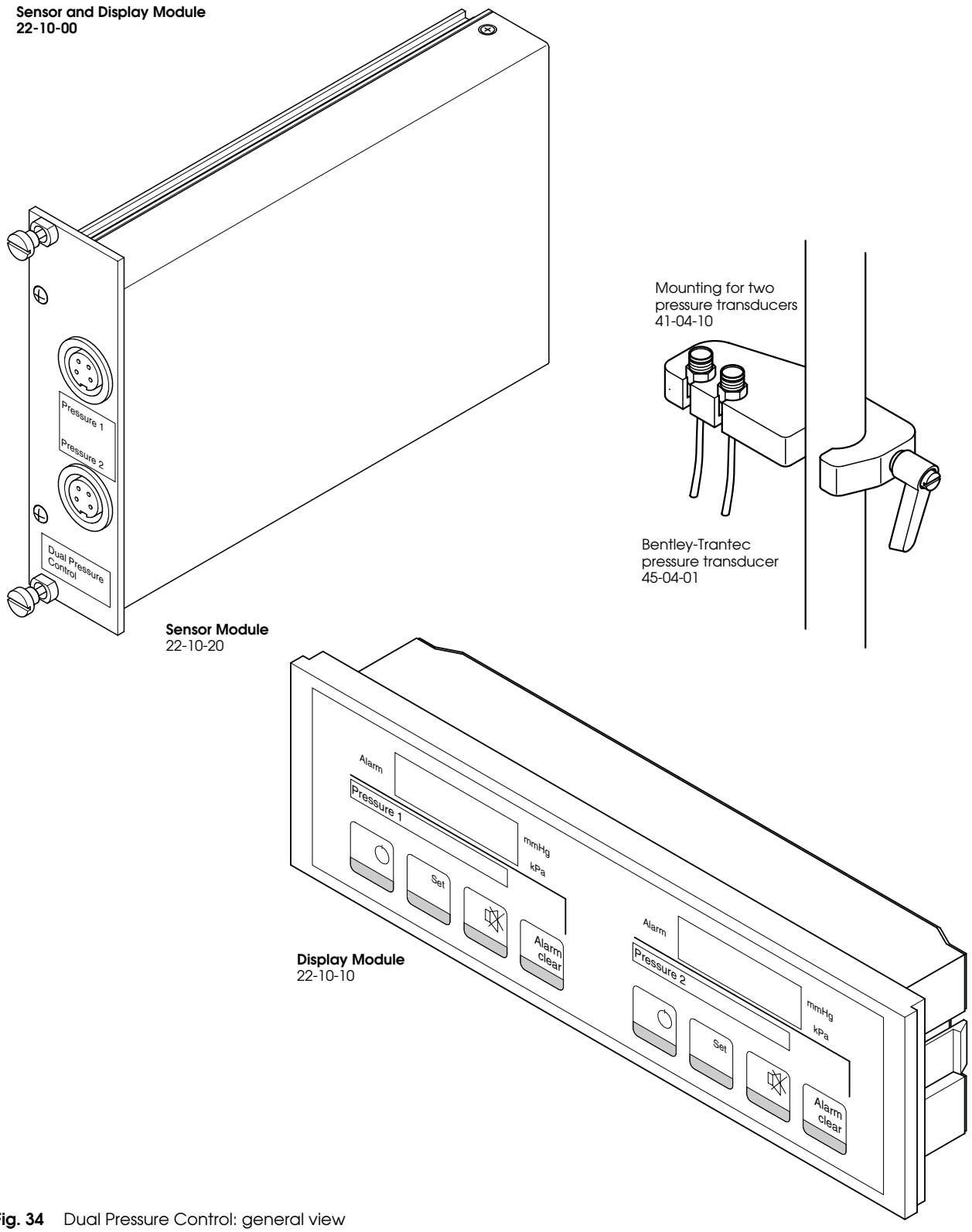


Fig. 34 Dual Pressure Control: general view

6.1 CAN-Structure

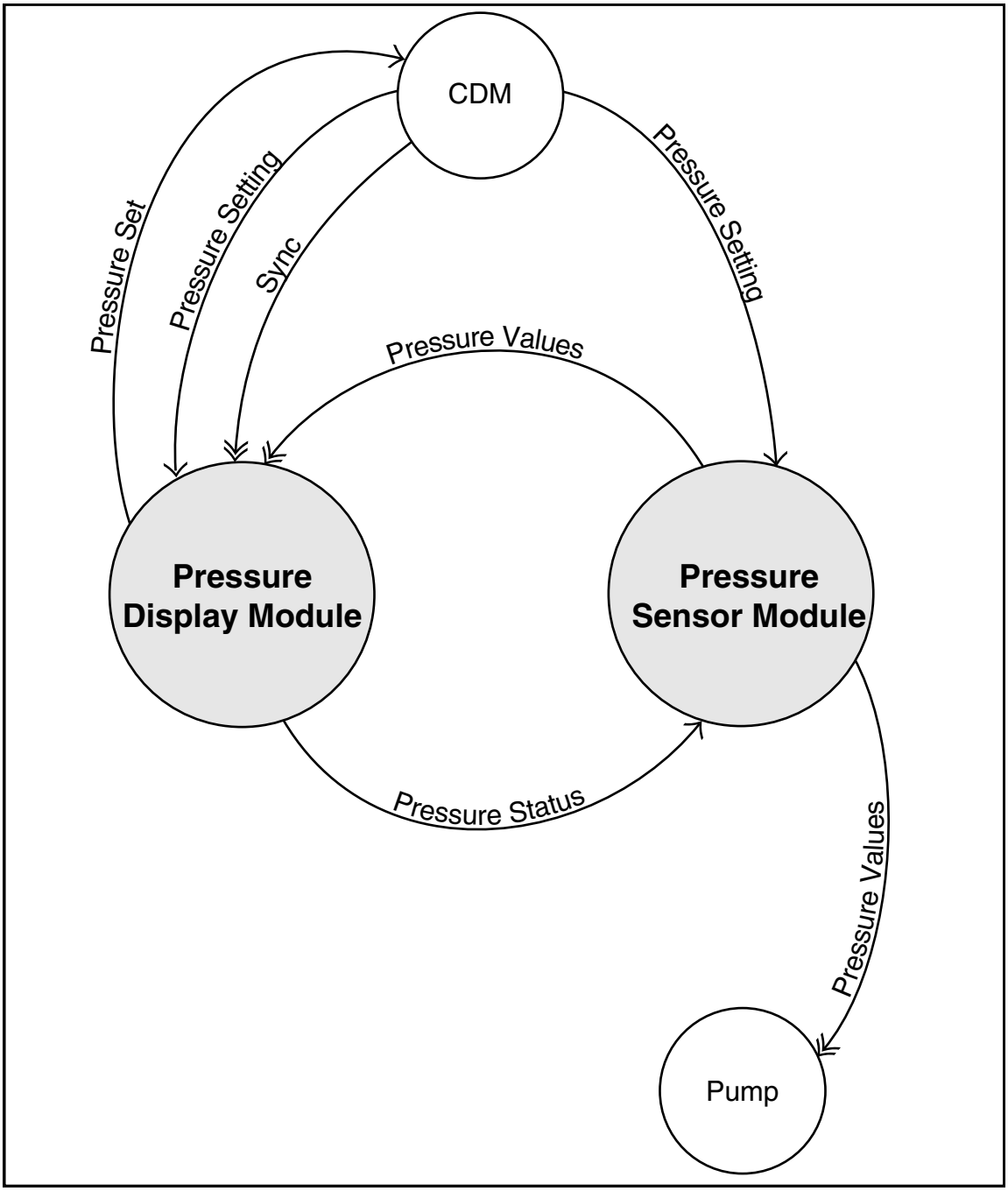


Fig. 35 Dual Pressure Control: CAN-structure

6.2 Functional Description

The S3 dual pressure control includes:

- a display module, inserted into the console desk,
- a sensor module, integrated into the E/P-pack of the console.

The dual pressure control serves to measure the blood pressure in the extra-corporal circulation by two independent measurement circuits. One pump may be allocated to each pressure control. However, it is also possible to allocate one pump to both pressure controls. The user may put in a rated pressure value and an upper limit. The speed of the allocated pump is reduced by the pressure control until the set rated pressure value is attained. When exceeding the limit the pump is stopped by the pressure control and an acoustic alarm will be given.
The alarm and the pump stop will be maintained until "Clear alarm" is pressed.

The pressure is absorbed via transducers that are interlinked with the sensor module. The transducers have to be lined up by means of a sphygmomanometer.

The sensor module sends the pressure values to the relevant display module. The pump stops because of a message transmitted via the CAN-bus.

After pressing the "SET" key the display module sends the menu items of the dual pressure control to the CDM. The setting of the pump allocation, the pressure values, the null balance as well as the intensification setting are performed on the CDM.

From the CDM the settings are transmitted via CAN-bus to the display module and to the sensor module of the pressure control.

The sensor module collects the current pressure values and passes them via CAN-bus to the display module. The display module shows the current pressure values in its 7-segment display.

6.3 Technical Data

	Display module	Sensor module
Height, width, depth:	55mm, 200mm, 35mm	128mm, 33.4mm, 178.5mm
Weight:	300g	400g
Power supply:	via DC/DC-module in console desk	via DC/DC-module in E/P-pack
Power input:	max. 3 Watt	max. 4 Watt
Operating temperature:	+10°C to +40°C	+10°C to +40°C
Storing temperature:	0°C to +40°C	0°C to +40°C

Display range:	-500mmHg to +500mmHg or -66.7kPa to +66.7kPa mit SDD9208 - 9208A -200mmHg to +800mmHg or -26.7 to +106.7kPa with SDD9208B or later
Display resolution:	1mmHg
Measurement accuracy:	±5mmHg
Range of null balance:	mind. ±100mmHg
Range of amplification:	±20% pressure control
Accuracy:	±5% of the preset limit value
Linearity:	±5% of the display range
Reaction time	< 5 seconds

6.4 Installation into S3-System

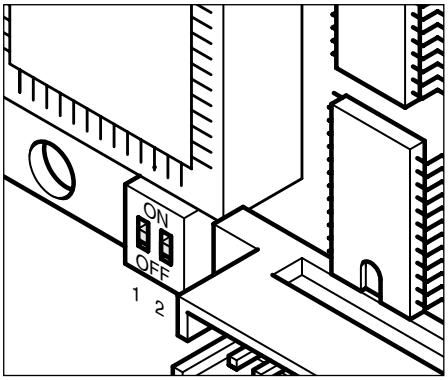
- Switch off S3-system.
- Take off blank slide-in from a free module slot (if available).
- Insert the display module into the free slot.
- Take off cover from one of the first nine slots in the E/P-pack.
- Insert the sensor module into the free slot until the plug-in connection engages.
- Tighten the fastening screws.
- Connect the transducers to the sockets of the sensor module.
- Check function of the dual pressure control.

6.4.1 Installation of several identical devices

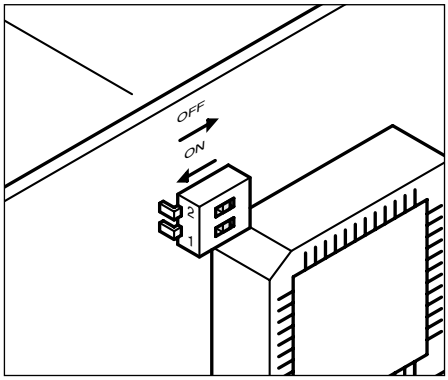
In case more than one dual pressure control is used, the relevant display and control modules have to be allocated to each other. The CAN-bus is able to manage up to four dual pressure controls. The device number which has to be set on the display module and on the sensor module, serves for differentiation. The device number has been set via the DIP-switch shown in Fig. 36.

The following table reflects the correlation between DIP-switch position and device number.

DIP-switch no.:	1	OFF	ON	OFF	ON
	2	OFF	OFF	ON	ON
Device no.:		1 & 2	3 & 4	5 & 6	7 & 8



DIP-switch on the ABR-board
of the display module



DIP-switch on the SDD-9208 board
of the sensor module

Fig. 36 Dual Pressure Control: DIP-switch

6.5 Trouble Shooting

6.5.1 On the Display Module

fault indications:	possible cause/ remedy
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E08	- Display driver faulty.
E10	- Internal device fault in sensor module.
E13	- No communcation with sensor module.
E20	- General error in display module.

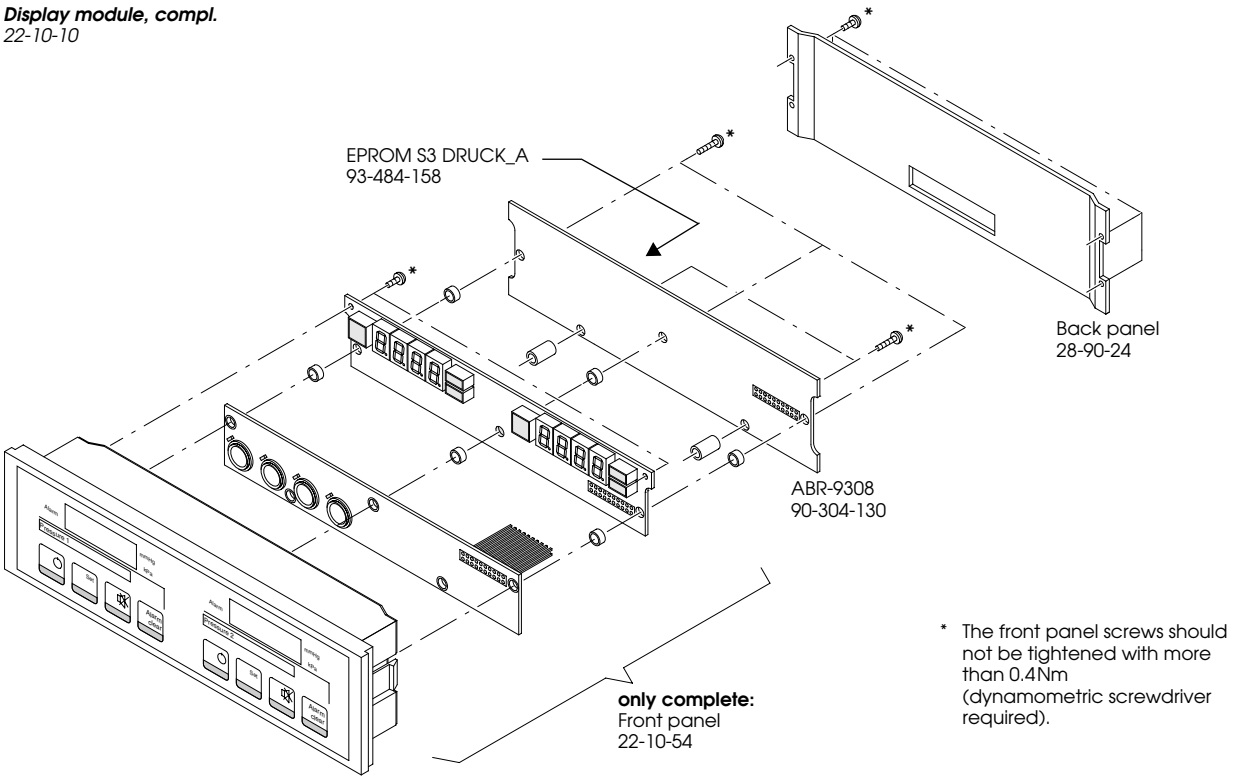
6.5.2 In the Pump

fault indication	possible cause/ remedy
!!ALARM!!	- The function is in the alarm state.
No COM!	- No communication 1. after starting the pump, 2. if there is no connection, 3. if an error has been detected.
OFF	- The function is switched off.
!!STOP!!	- External intervention (no alarm situation).*
CONTROL	- External intervention (no alarm situation).

*) If there is a pressure value above the rated limit but below the stop limit, the pump speed will be reduced. This may lead to a pump stop, if the pressure does not fall below the rated limit. An acoustic signal from the pump will be given. Check the tubing system for undesired occlusion.

6.6 Spare Parts

Display module, compl.
22-10-10



Sensor module, compl.
22-10-20

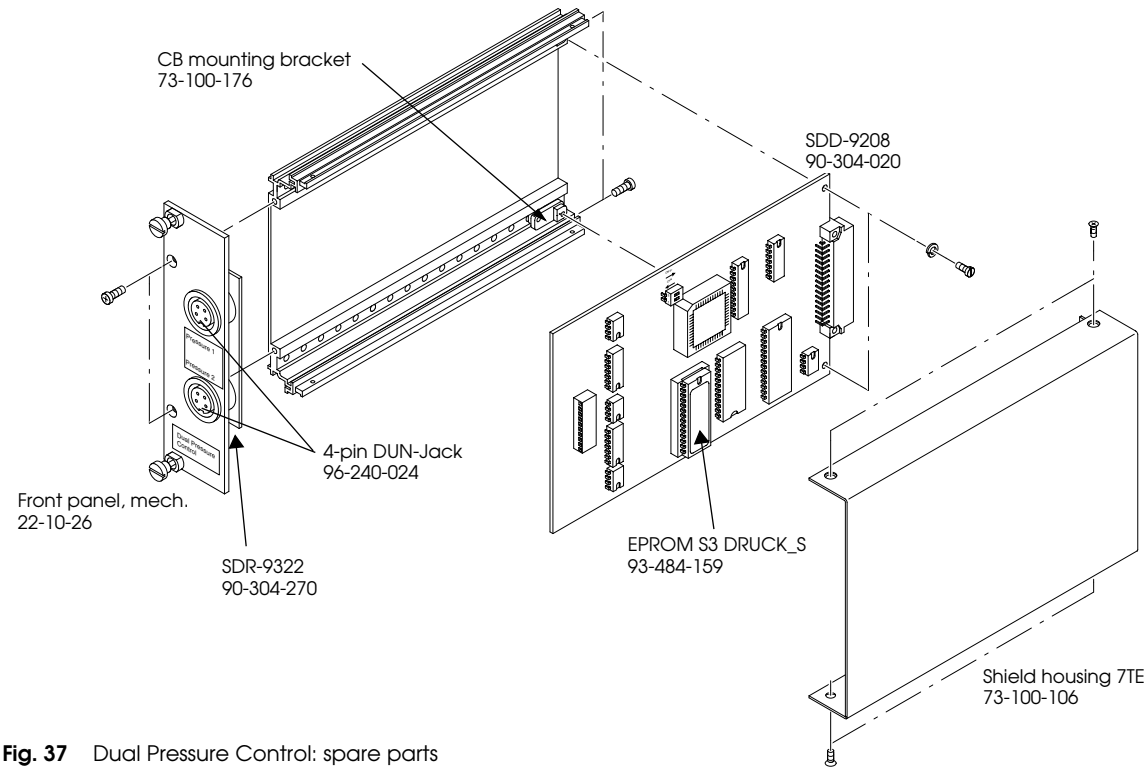


Fig. 37 Dual Pressure Control: spare parts

Notes:

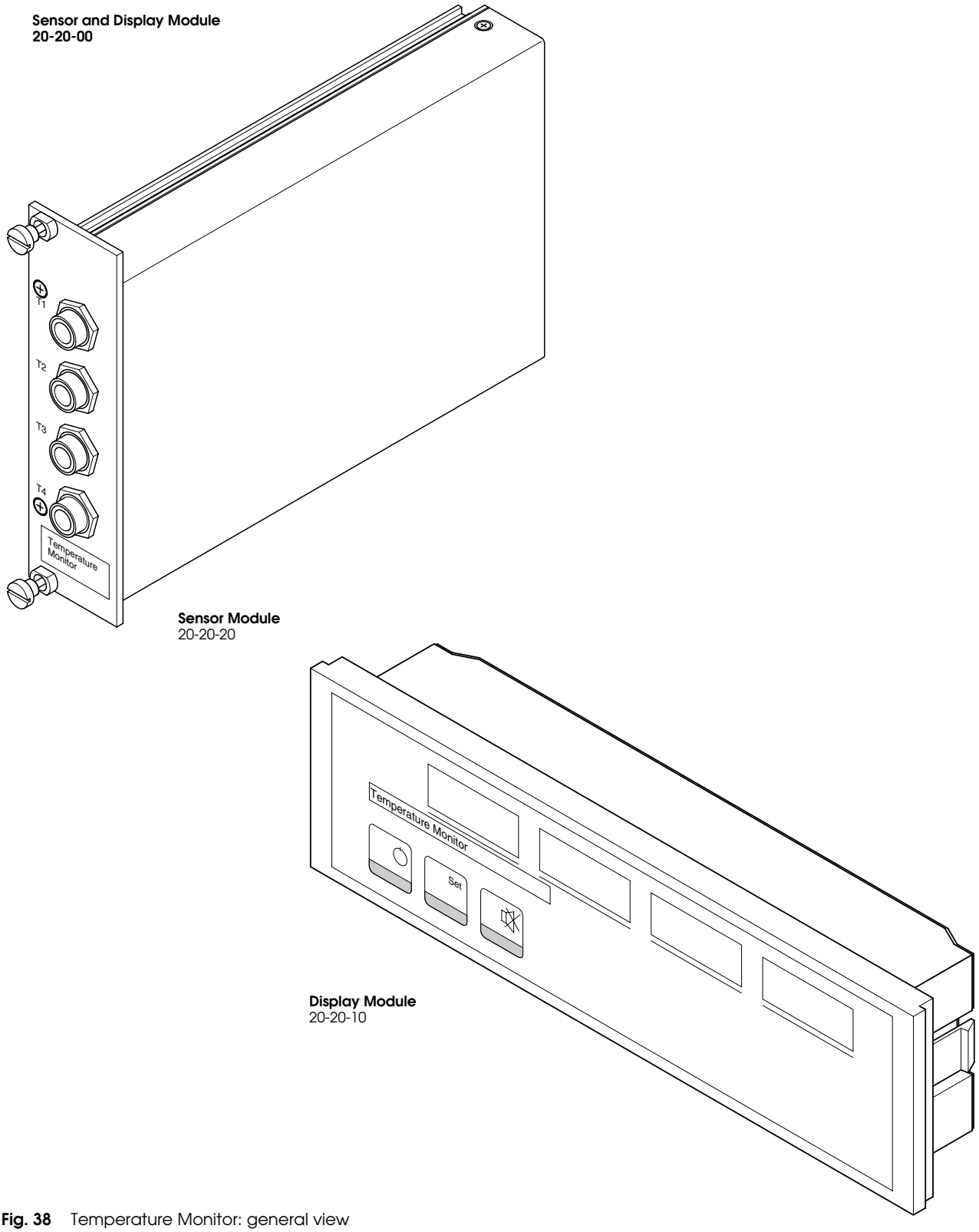


Fig. 38 Temperature Monitor: general view

7.1 CAN-Structure

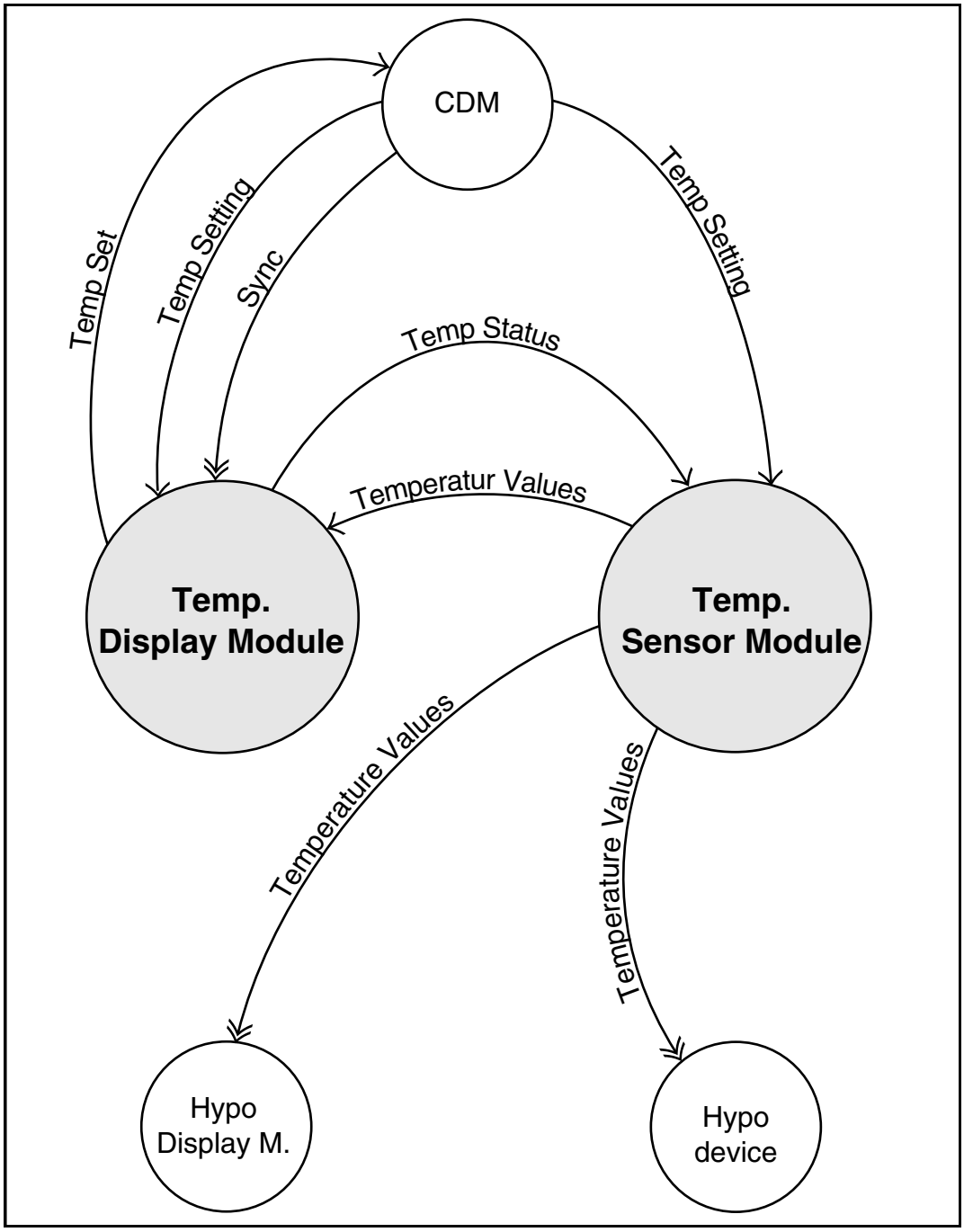


Fig. 39 Temperature Monitor: CAN-structure

7.2 Functional Description

The temperature monitor is able to take up to four temperature values. Via CDM limit values may be assigned to the first channel. The exceeding o these values will be announced by an acoustic alarm.

The temperature is taken via temperature probes connected to the sensor module. The probes have to correspond to the specifications of a YSI 400 and they must have a BF-insulation.

After pressing the "SET" key the display module transmits the menu items for setting the temperature monitor to the CDM. The user may perform the following settings for channel 1:

Set maximum temperature.

Set minimum temperature.

The settings will be passed from the CDM via CAN-bus to the display module and to the sensor module of the temperature monitor.

The sensor module takes the current temperature values and passes them on to the display module via CAN-bus. The display module shows the current temperature values in its 7-segment display.

7.3 Technical Data

	Display module	Sensor module
Height, width, depth:	55mm, 200mm, 35mm	128mm, 33.4mm, 178.5mm
Weight:	300g	400g
Power supply:	via DC/DC-converter on control desk	via DC/DC-module in E/P-pack
Power input:	max. 3 Watt	max. 3 Watt
Operating temperature:	+10°C to +40°C	+10°C to +40°C
Storing temperature:	0°C to +40°C	0°C to +40°C
Range of temperature monitor:	0°C to +50°C	
Display resolution:	0.1°C	
Measurement accuracy:	±0.2°C	
Refresh rate of display:	1Hz	
Qualification:	PTB-qualification	

7.4 Temperature Probes

Sensor, made of vinyl for esophageal or rectal temperature, 4.8mm diameter (corresponds to YSI 401)	45-03-01
thin, flexible sensor (same use as 45-03-01), 2.8mm diameter, 165mm long (corresponds to YSI 402)	45-03-02
thin, flexible sensor made of nylon with epoxy point (same use as 45-03-01) 3.2mm diameter, 75mm long (corresponds to YSI 423)	45-03-03
Surface sensor made of stainless steel for skin, mouth and arm-pit (corresponds to YSI 408)	45-03-04
Surface sensor: one side of epoxy, the other of stainless steel, suitable for temperature connectors (corresponds to YSI 409)	45-03-05
Rod sensor for liquids, 4.0mm diameter, 115 mm long (corresponds to YSI 403)	45-03-07
Connector for temperature probe 45-03-05:	
1/2″	31-15-01
3/8″	31-15-02
1/4″	31-15-03
Temperature probes for direct measurement in oxygenator:	
for COBE-oxygenators (corresponds to COBE 042 229 000)	45-03-10
for DIDECO and BENTLEY oxygenators (corresponds to BAXTER 40 TEMPRO)	45-03-11
for SHILEY oxygenators (corresponds to SHILEY TMPOY)	45-03-12
for MEDTRONIC oxygenators (corresponds to MEDTRONIC SK1384)	45-03-13

7.5 Installation into S3-System

- Switch off S3-system.
- Take off blank slide-in from a free module slot (if available).
- Insert the display module into tne free slot.
- Take off cover from one of the first nine slots in the E/P-pack.
- Insert the sensor module into the free slot until the plug-in connection engages.
- Tighten the fastening screws.
- Connect the temperature probes to the sockets of the sensor modul.
- Check function of the temperature monitor.

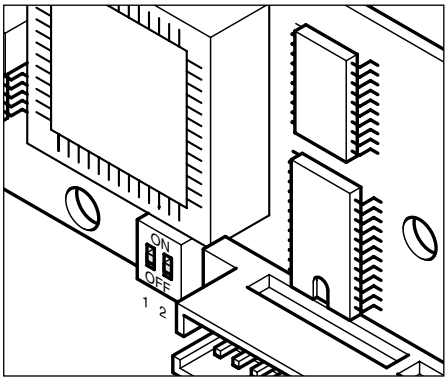
7.5.1 Installation of several identical devices

In case more than one temperature monitor is used, the relevant display and control modules have to be allocated to each other. The CAN-bus is able to manage up to four temperature monitors. The device number which has to be set on the display module and on the sensor module serves for differentiation. The device number will be set via the DIP-switch shown in Fig. 40.

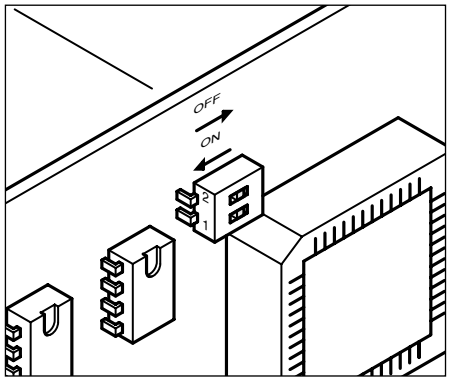
The following table reflects the correlation between DIP-switch position and device number.

DIP-switch no.:	1	OFF	ON	OFF	ON
	2	OFF	OFF	ON	ON
device no.:		1*	2	3	4

*) The device no."1" is not shown on the CDM.



DIP-switch on the ABR-board
of the display module



DIP-switch on the STE-9207
of the sensor module

Fig. 40 Temperature Monitor: DIP-switch

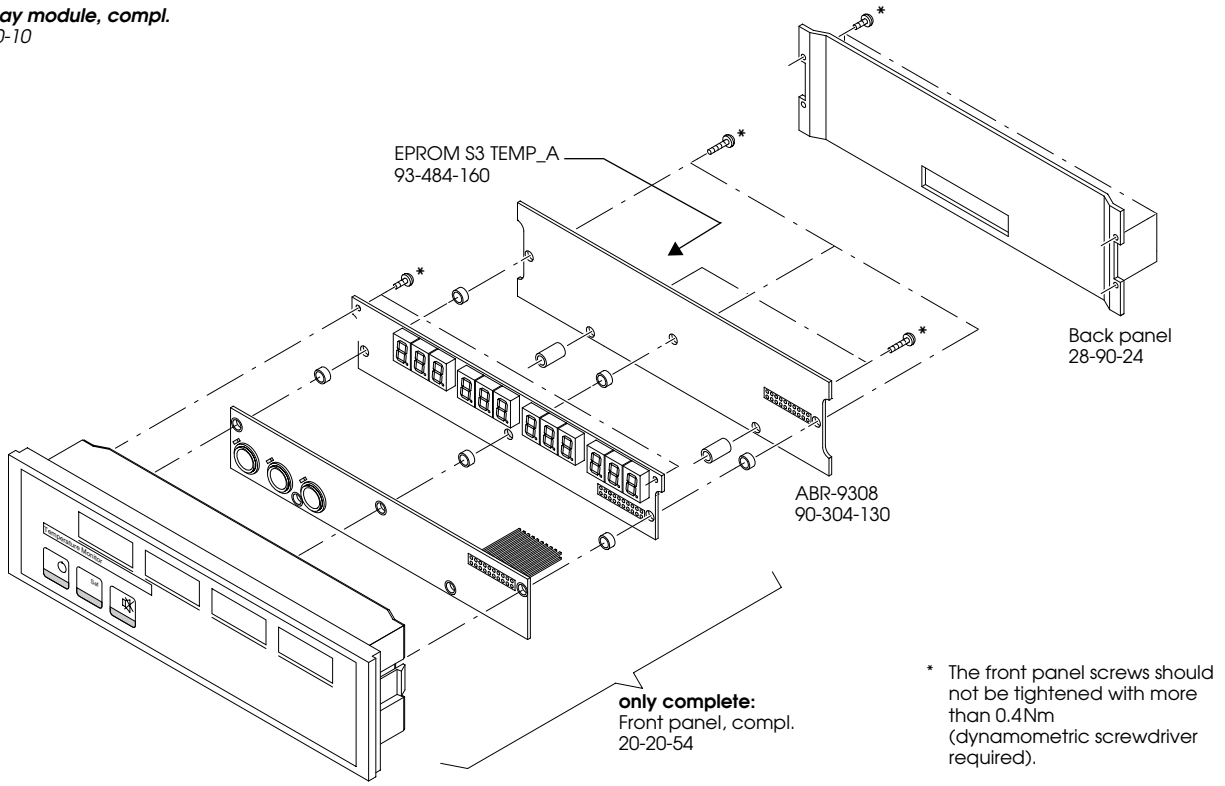
7.6 Trouble Shooting

7.6.1 Error Indications

symptoms:	possible cause/ remedy
sensor module indicates:	
E10	- Internal device fault in sensor module.
- - -	- Sensor not connected.
E13	- No communication with display module.
display module indicates:	
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E08	- Display driver faulty.
E10	- Internal device fault in sensor module.
E13	- No communcation with sensor module.
E20	- General error in display modul.
HI	- Measured temperature >50°C Check the temperature sensor.
LO	- Measured temperature <0°C Check the temperature sensor.
optical and acoustical alarm	- Channel 1 limit exceeded or not reached.

7.7 Spare Parts

Display module, compl.
20-20-10



Sensor module, compl.
20-20-20

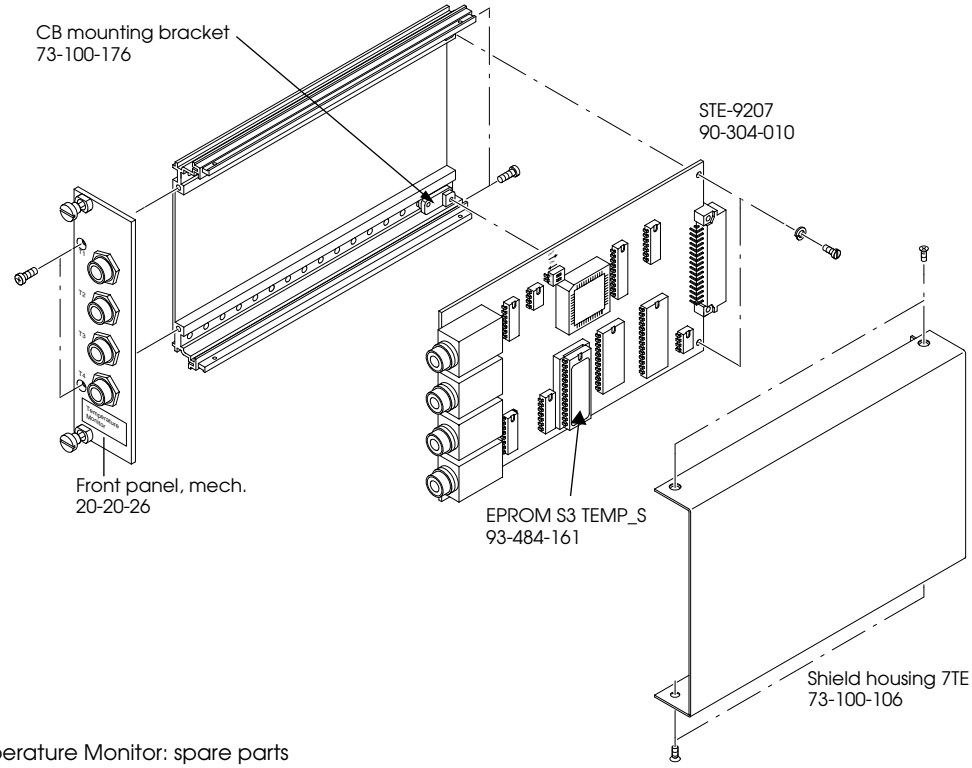
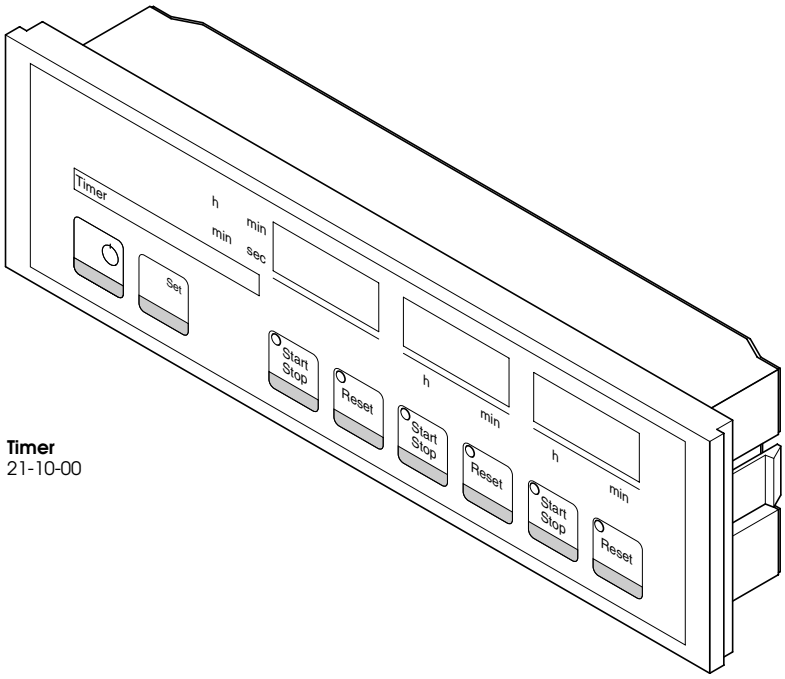


Fig. 41 Temperature Monitor: spare parts

Notes:



Timer
21-10-00

Fig. 42 Timer: general view

8.1 CAN-Structure

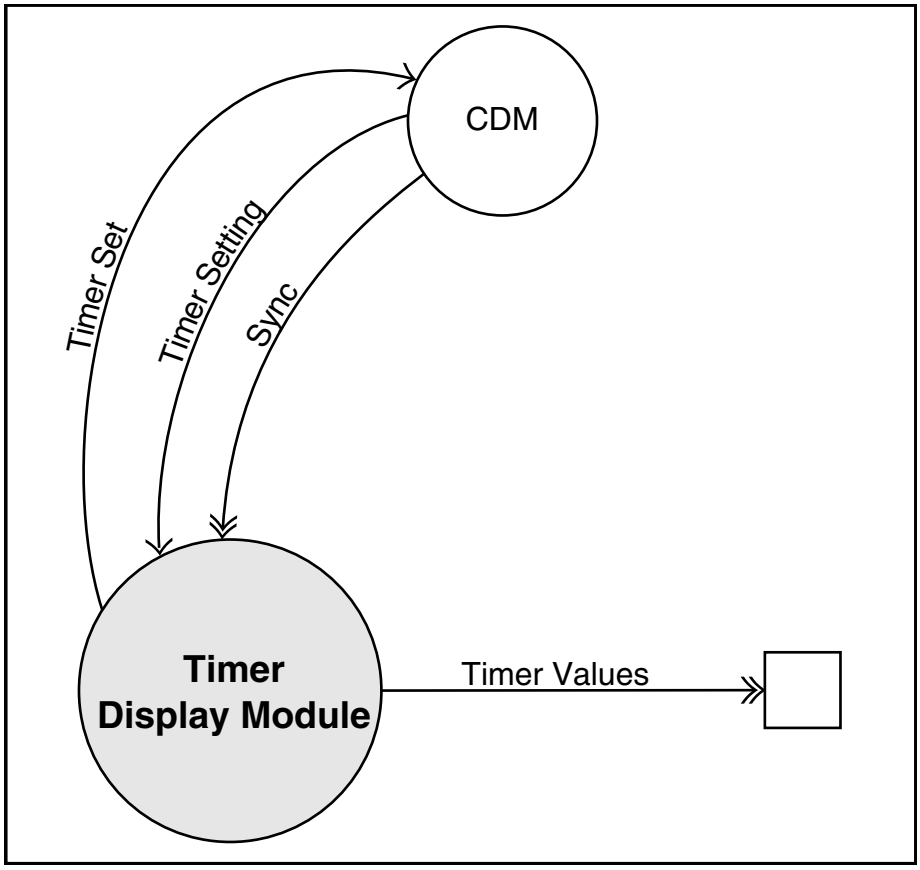


Fig. 43 Timer: CAN-structure

8.2 Functional Description

The timer consists of one display module which is inserted into the control desk. It includes three timer channels working independently of each other. Each channel may be started and/or stopped separately. If the channels are started and/or stopped several times, the times may be displayed in accumulated form.

After pressing the "SET" key the timer display module sends the menu items for setting timer "1" to the CDM. The user may set timer "1" as follows:

- timer 1 Mode (h:min.)
- timer 1 Mode (min.:sec.)

During the counting procedure timer "1" may be switched from "min.:sec." mode to "h:min." mode. This does not interrupt the counting procedure. This permits a resolution of 1 second in the first 9min. 59sec. and a resolution from 1 minute up to 9h 59min.

The setting is transfered from the CDM via CAN-bus to the timer display module. The display module shows the current timer values in its 7-segment display.

8.2.1 Technical Data

Height, width, depth:	55mm, 200mm, 35mm
Weight:	300g
Power supply:	via DC/DC-converter in control desk
Power input:	max. 3 Watt
Operating temperature:	+10°C to +40°C
Storing temperature:	0°C to +40°C
Measurement range:	0min. to 9h 59min.
Timer 1 optional:	0sec. to 9min. 59sec.

8.3 Installation into S3-System

- Switch off S3-system.
- Remove blank slide-in from free module slot (if available).
- Insert display module into free slot.
- Check function of timer.

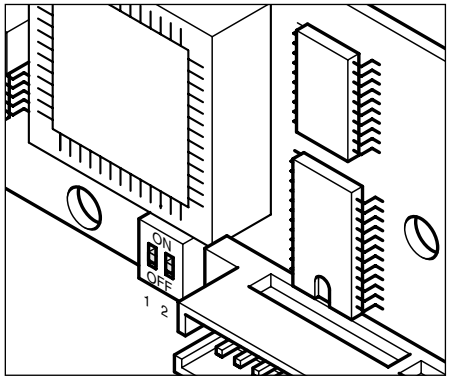
8.3.1 Installation of several identical devices

The CAN-bus is able to manage up to four timer modules. The device number which has to be set on the display module and on the sensor module serves to make their differentiation possible. The device number will be set via the DIP-switch shown in Fig. 44.

The following table reflects the correlation between DIP-switch position and device number.

DIP-switch no.:	1	OFF	ON	OFF	ON
	2	OFF	OFF	ON	ON
device no.:		1*	2	3	4

*) The device no. "1" is not shown on the CDM.



DIP-switch on the ABR-board
of the display module

Fig. 44 Timer: DIP-switch

8.4 Trouble Shooting

fault indications:	possible cause/ remedy
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E08	- Display driver faulty.
E10	- Internal device fault in sensor module.
E13	- No communcation with sensor module.
E20	- General error in display module.

8.5 Spare Parts

Timer, kpl.
21-10-00

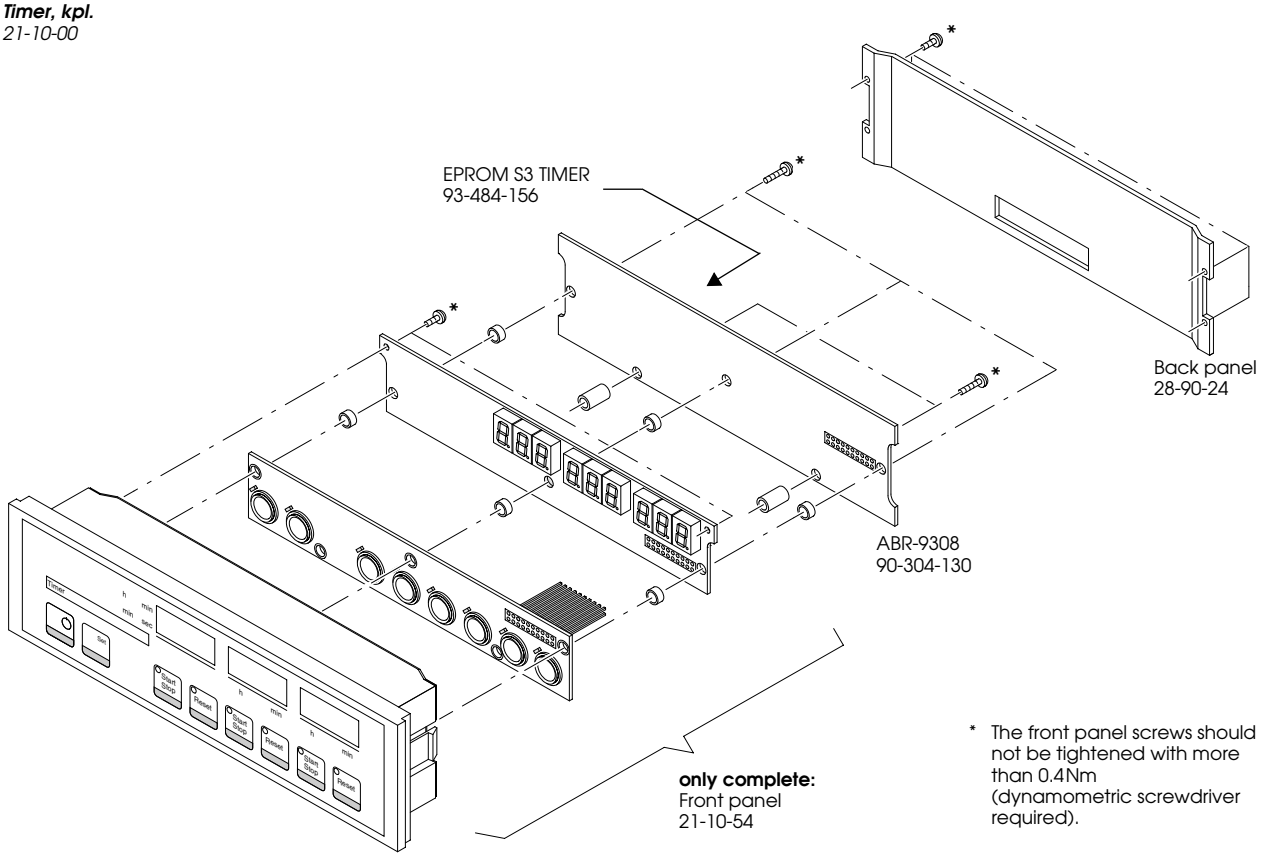


Fig. 45 Timer: spare parts

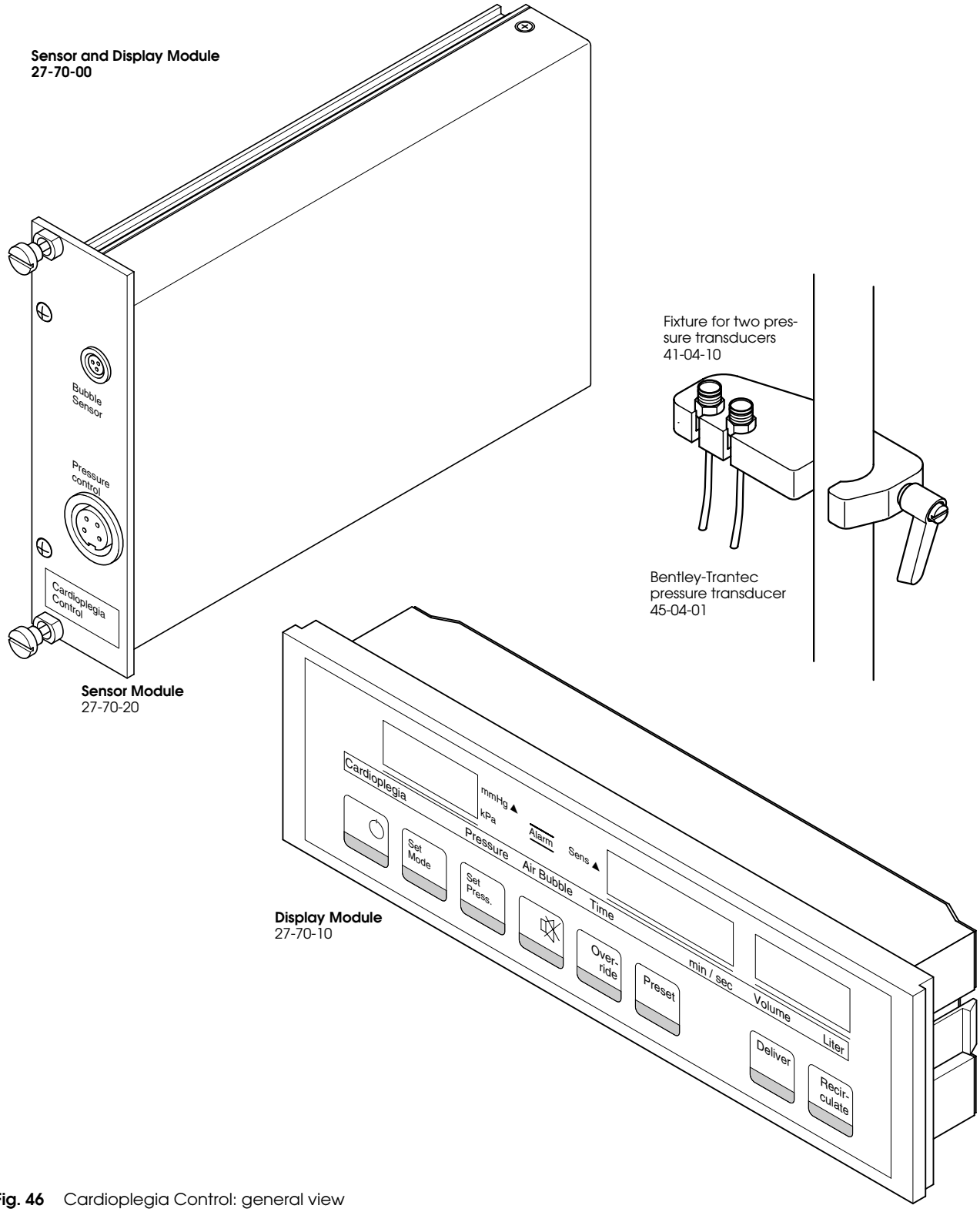


Fig. 46 Cardioplegia Control: general view

9.1 CAN-Structure

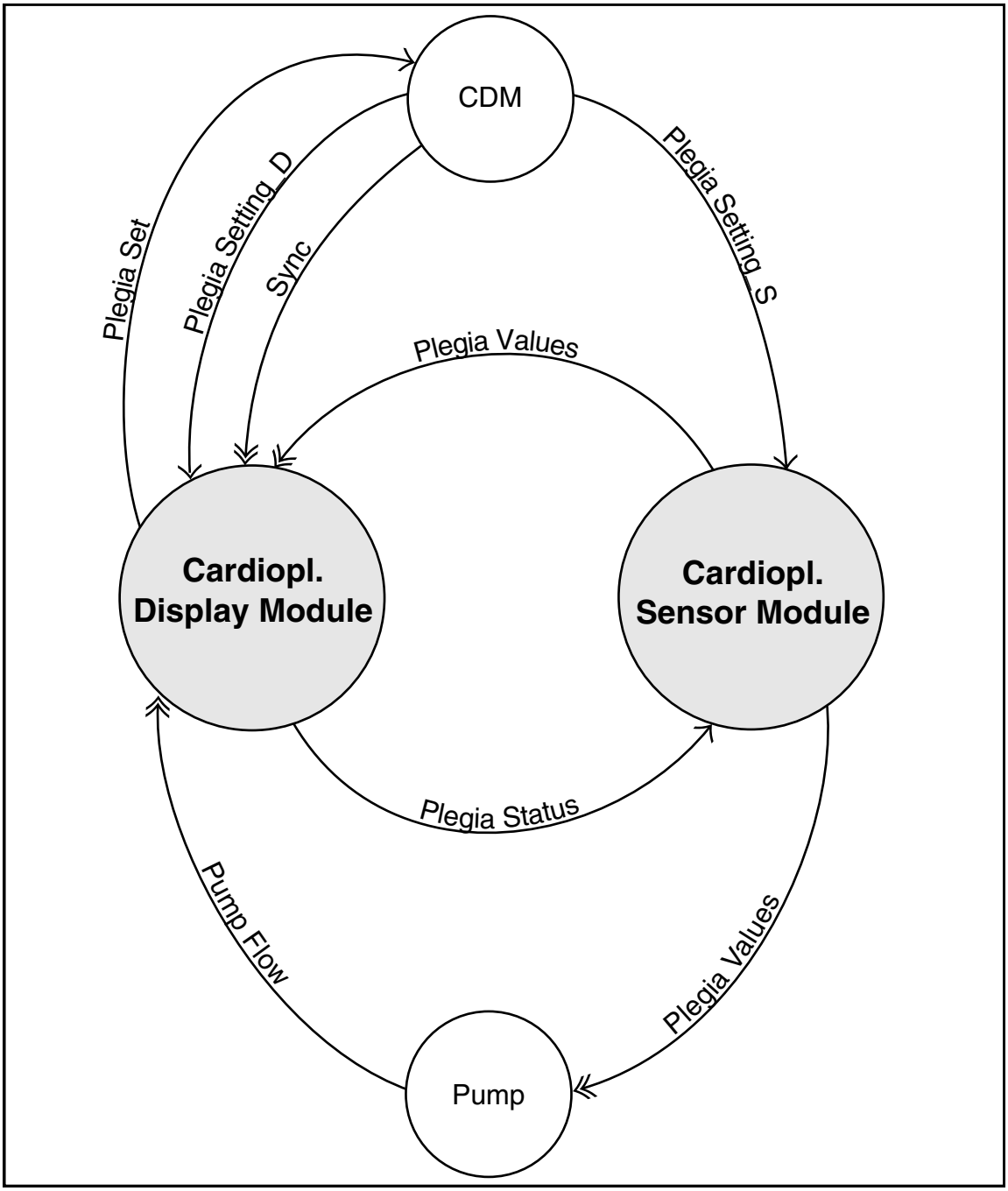


Fig. 47 Cardioplegia Control: CAN-structure

9.2 Functional Description

In connection with a S3 roller pump or a S3 double head pump this unit serves to administer cardioplegia solutions during an operation.
It consists of:

- a display module, inserted into the control desk,
- a sensor module, integrated into the E/P-pack of the console.

For giving the cardioplegia solution the cardioplegia control has five operating modes, which can be selected at the central display module in the control desk.

In all operating modes the integrated timer starts automatically at pump stop and thus registers the time that has passed since the last cardioplegia solution was administered.

The solution is being given with the help of pressure control and the pressure limits for antegrade and also retrograde cardioplegia can be set.

In case the preset pressure value (stop limit) is exceeded, the cardioplegia pump stops and no more cardioplegia will be given. At the same time an optical and acoustic alarm will be given.

When the preselected rated pressure value is reached, the flow will be regulated by an automatic pump speed variation and the pressure will be kept constant.

A bubble sensor may be used in the cardioplegia cycle, with the sensor being fixed onto tubing leading to the patient.

Mode 1: volume add.
A variable dose between 0 and 5.0 liters will be given in steps of 10ml. The dose administered will be counted up starting from "0" on the volume display and the pump will stop when the set dose is reached.

Mode 2: volume sub.
This operating mode also guarantees that a preset dose will be accurately delivered. However, the volume display starts at the preset dose value and will count down to "0". Then the pump will stop.

Mode 3: time add.
In this operating mode the administration time will be preselected. The time on the time display will be counted up starting with "0" and the pump will stop as soon as the preset administration time is reached.

Modus 4: time sub.
In this case the administration time will be selected. However, contrary to Mode 3 the timer starts at the preselected administration time and counts down to "0". Then the pump will stop.

Mode 5: kont
In this operating mode no administration time or dose will be selected. The administration of cardioplegia will be controlled manually. The volume display indicates the volume already delivered.

- The volume administered since cardioplegia start (overall volume) will be accumulated and displayed.
- By using two roller pumps in master/slave operation (e.g. when using the two roller pumps of a dual head pump) a cardioplegia mixing solution may be given in fine doses and optional mix ratio. In this case the

flow rates of both roller pumps in volume-controlled cardioplegia administration will be added (mode 1).

- Cardioplegia administration with two roller pumps in Cpleg_a and Cpleg_b operation is especially suitable for blood cardioplegia. Refer to Operator's Manual for more information.

9.3 Technical Data

	Display module	Sensor module
Height, width, depth:	55mm, 200mm, 35mm	128mm, 33.4mm, 178.5mm
Weight:	300g	400g
Power supply:	via DC/DC-module in control desk	via DC/DC-module in E/P-pack
Power input:	max. 3 Watt	max. 3 Watt
Operating temperature:	+10°C to +40°C	+10°C to +40°C
Storing temperature:	0°C to +40°C	0°C to +40°C

Display range:	0 to +500mmHg
Resolution:	1mmHg
Measurement accuracy:	±5mmHg
Null balance range:	min. ±100mmHg
Amplification range:	±20%
Pressure control:	stop limit and rated value for antegrade and retrograde pressure control
Accuracy:	±5% of preset limit value
Linearity:	±5% of the display range
Reaction time:	<5 seconds

9.4 Installation into S3-System

- Switch off S3-system.
- Remove blank slide-in from free module slot (if available).
- Insert display module into free slot.
- Remove cover from one of the first nine slots in E/P-pack.
- Insert sensor module into the free slot until the plug connection engages.
- Tighten fastening screws.
- Connect level and bubble sensors to the connecting sockets of the sensor module.
- Check function of cardioplegia control.

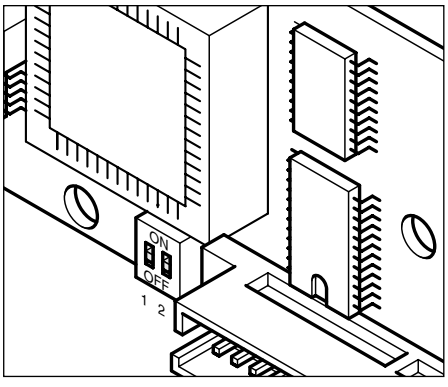
9.4.1 Installation of several identical devices

In case more than one cardioplegia control is used, the relevant display and control modules have to be allocated to each other. The CAN-bus is able to manage up to four cardioplegia controls. The device number, which has to be set on the display module and on the sensor module, serves for differentiation. The device number is set via the DIP-switch shown in Fig. 48.

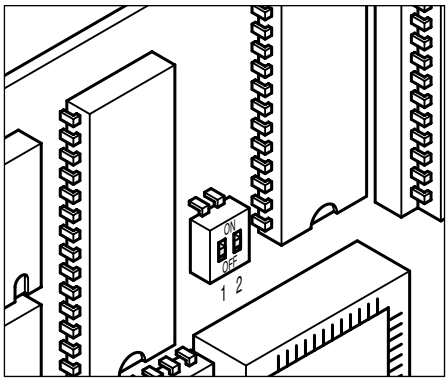
The following table reflects the correlation between DIP-switch position and device number.

DIP-switch no.:	1	OFF	ON	OFF	ON
	2	OFF	OFF	ON	ON
device no.:		1*	2	3	4

*) The device no. "1" is not shown on the CDM.



DIP-switch on the ABR-board
of the control desk



DIP-switch on the SLP 9415-board
of the sensor module

Fig. 48 Cardioplegia Control: DIP-switch

9.5 Trouble Shooting

9.5.1 On the Display Module

fault indications:	possible cause/ remedy
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E08	- Display driver faulty.
E10	- Internal device fault in sensor module.
E13	- No communcation with sensor module.
E20	- General error in display module.

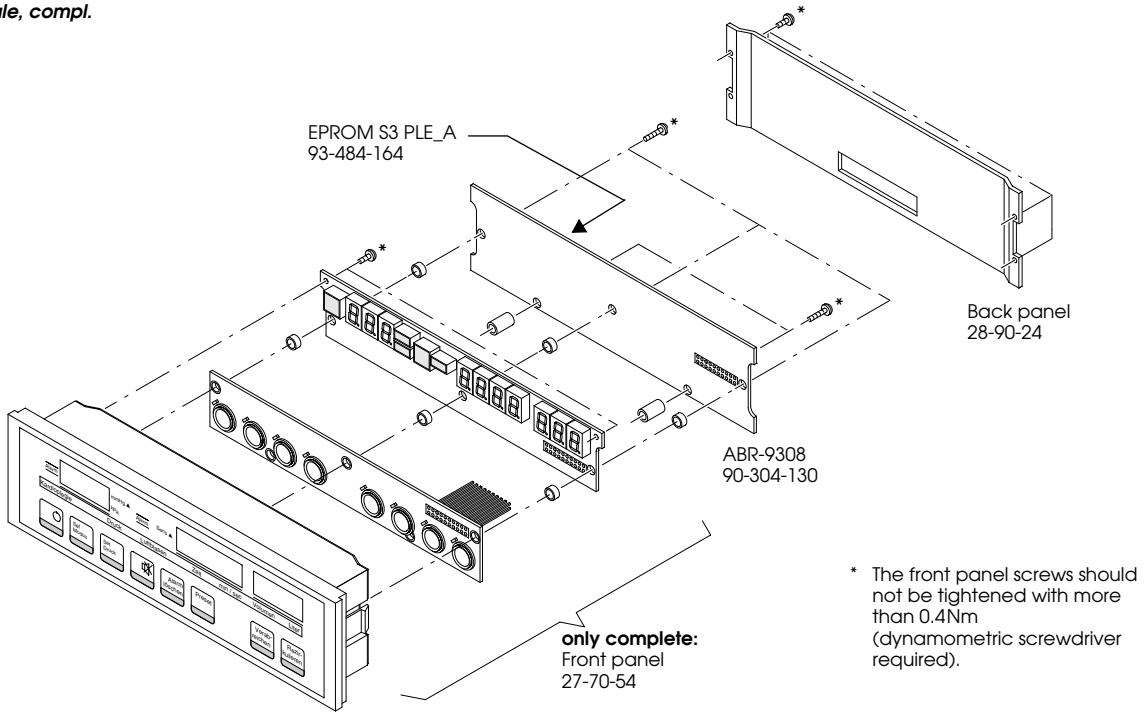
9.5.2 In the Pump

fault indication	possible cause/ remedy
!!ALARM!!	- The function is in the alarm state.
No COM!	- No communication 1. after starting the pump, 2. if there is no connection, 3. if an error has been detected.
OFF	- The function is switched off.
!!STOP!!	- External intervention (no alarm situation).*
CONTROL	- External intervention (no alarm situation).

*) If there is a pressure value above the rated limit but below the stop limit, the pump speed will be reduced. This may lead to a pump stop, if the pressure does not fall below the rated limit. An acoustic signal from the pump will be given. Check the tubing system for undesired occlusion.

9.6 Spare Parts

Display module, compl.
27-70-10



Sensor module, compl.
27-70-20

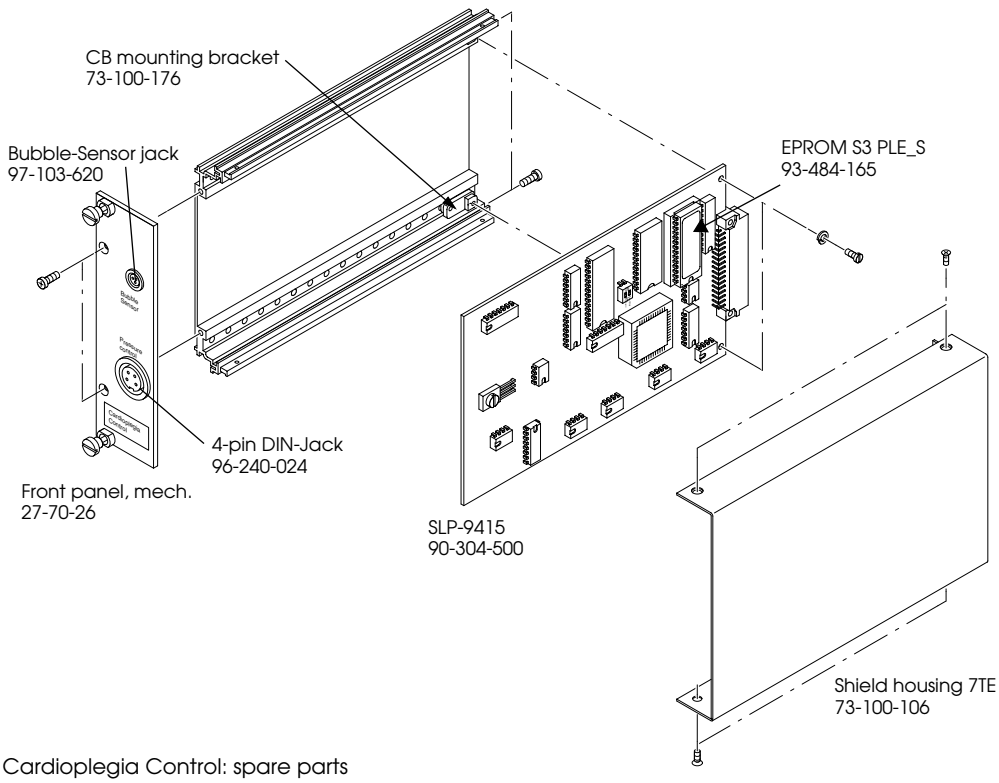
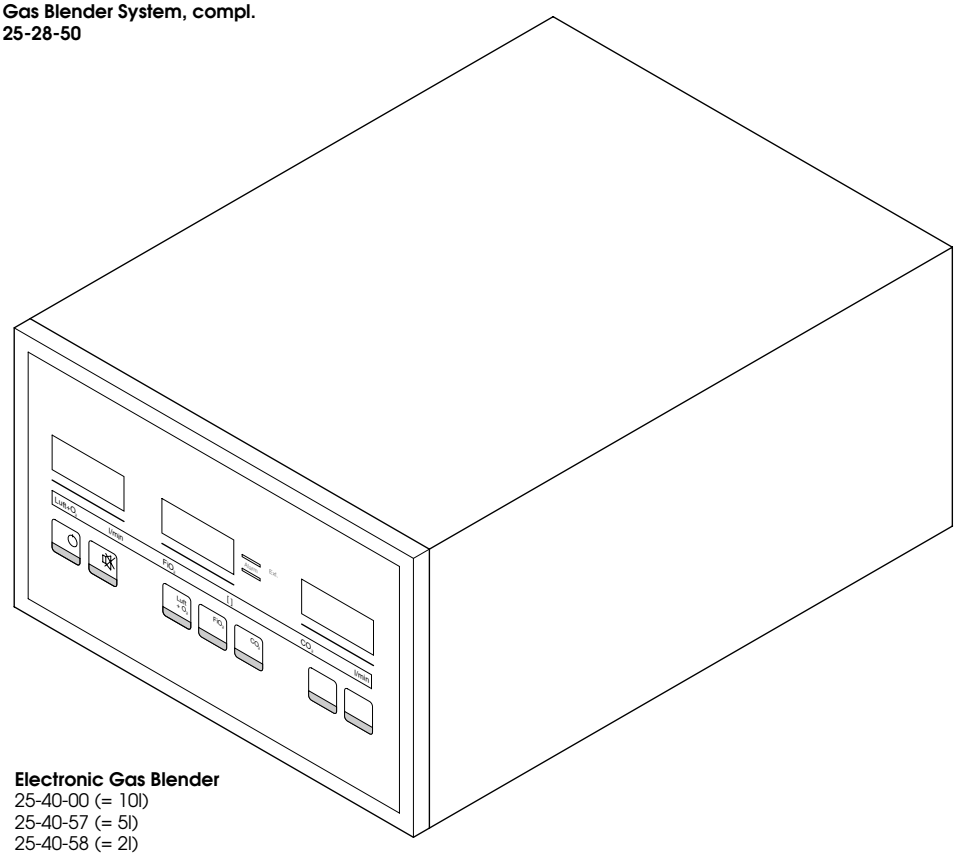


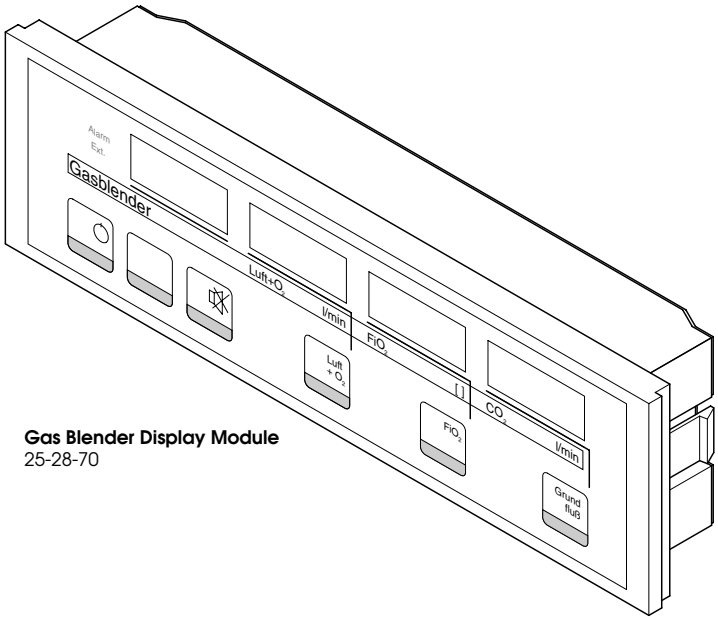
Fig. 49 Cardioplegia Control: spare parts

Notes:

Gas Blender System, compl.
25-28-50



Electronic Gas Blender
25-40-00 (= 10l)
25-40-57 (= 5l)
25-40-58 (= 2l)



Gas Blender Display Module
25-28-70

Fig. 50 Gas Blender System: general view

10.1 CAN-Structure

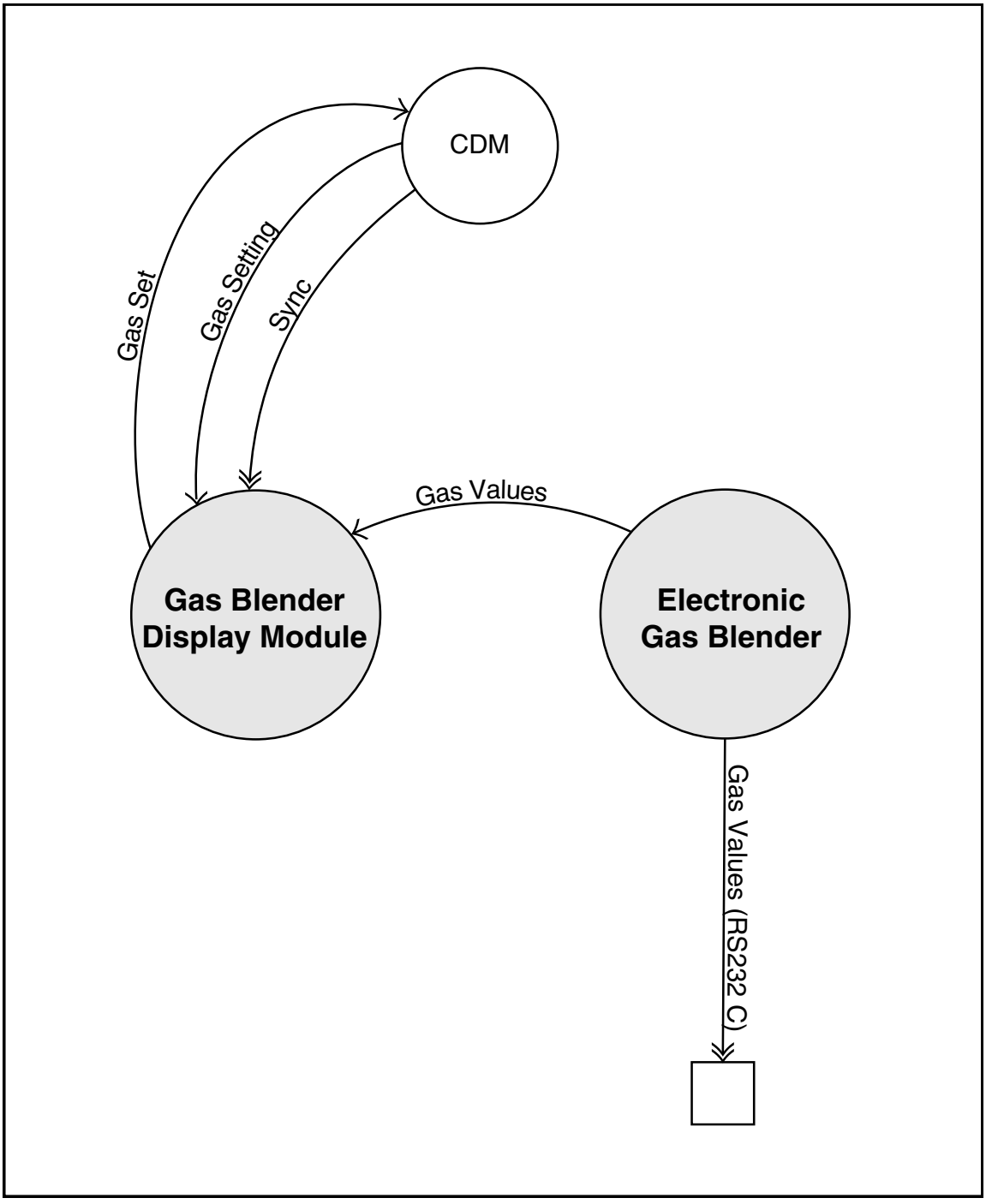


Fig. 51 Gas Blender System: CAN-structure

10.2 Functional Description

The Gas Blender System includes:
- the Electronic Gas Blender, part no. 25-30-00
- the Gas Blender Display Module, part no. 25-28-65

The electronic gas blender is used for measuring and monitoring gas flows without controlling them. Via the display dodule the values measured by the gas blender may also be read on the control panel. In addition the display module permits the setting of limit values, an optical and acoustic alarm will being started in case these limits are violated.

10.3 Installation into S3-System

Electronic Gas Blender

- Switch off S3-system.
- Connect the connection "supply" to a free pump socket or to the socket "option" of the E/P-pack.
- Check funktion of Electronic Gas Blender.

Gas Blender Display Module

- Remove blank slide-in from free module slot (if available).
- Insert display module into free slot.
- Check function of Gas Blender System.

10.4 Technical Data

	Electr. Gas Blender	Display module
Height, width, depth:	185mm, 200mm, 130mm	55mm, 200mm, 35mm
Weight:	2.5kg	300g
Power supply:	24V via S3 central power supply in E/P-Pack	via DC/DC-module in console desk
Power input:	3Watt max.	3Watt max.
Operating temperature:	+10°C to +40°C	+10°C to +40°C
Storing temperature:	+10°C to +40°C	0°C to +40° C
Max. admissible input pressure per connector	3bar	
Mounting position of gas monitor housing	upright, horizontal	

GAS MIX	
Measuring range:	0 to 10.0LPM
Resolution:	0.1LPM
Measuring error (max.)	±3% of end value (F.S.)*
Linearity (max.)	±3% measured value (R)*
zero point drift (max.)	±0.06%/°C (F.S.)
end value drift (max.)	±0.088%/°C (F.S)

FiO_2	
Display range:	0.21to 1.00
Resolution	0.01
Measuring error	$\Delta FiO_2 < \frac{0,24l \S min}{Flow(Air + O_2)}$

*) under cal. conditions (21°C, 1013mbar)

10.5 Trouble Shooting

10.5.1 On the Display Module

fault indication:	possible cause/ remedy
- - -	- The gas monitor is not or not properly connected.
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E08	- Display driver faulty.
E10	- internal device fault in gas monitor.
E11	- No or faulty calibration.
E20	- Malfunktion of display module.

fault indication:	possible cause/ remedy
One of the arrow indicators ARROW UP or ARROW DOWN flashes and one or several display flashes/ flash.	- One or several alarm limit values exceeded. Look for cause and eliminate, e.g. pump stop through low level in blood reservoir, air bubble, tubing kinked, etc.

10.5.2 On the Electr. Gas Blender

fault indication:	possible cause/ remedy
Gas Blender not airtight.	- Short circuit gas tubing on Gas Blender.
Display on Gas Blender is not identical with setting on mechanical Gas Blender.	- Check if connections are airtight. - Change Gas Blender.

10.6 Spare Parts

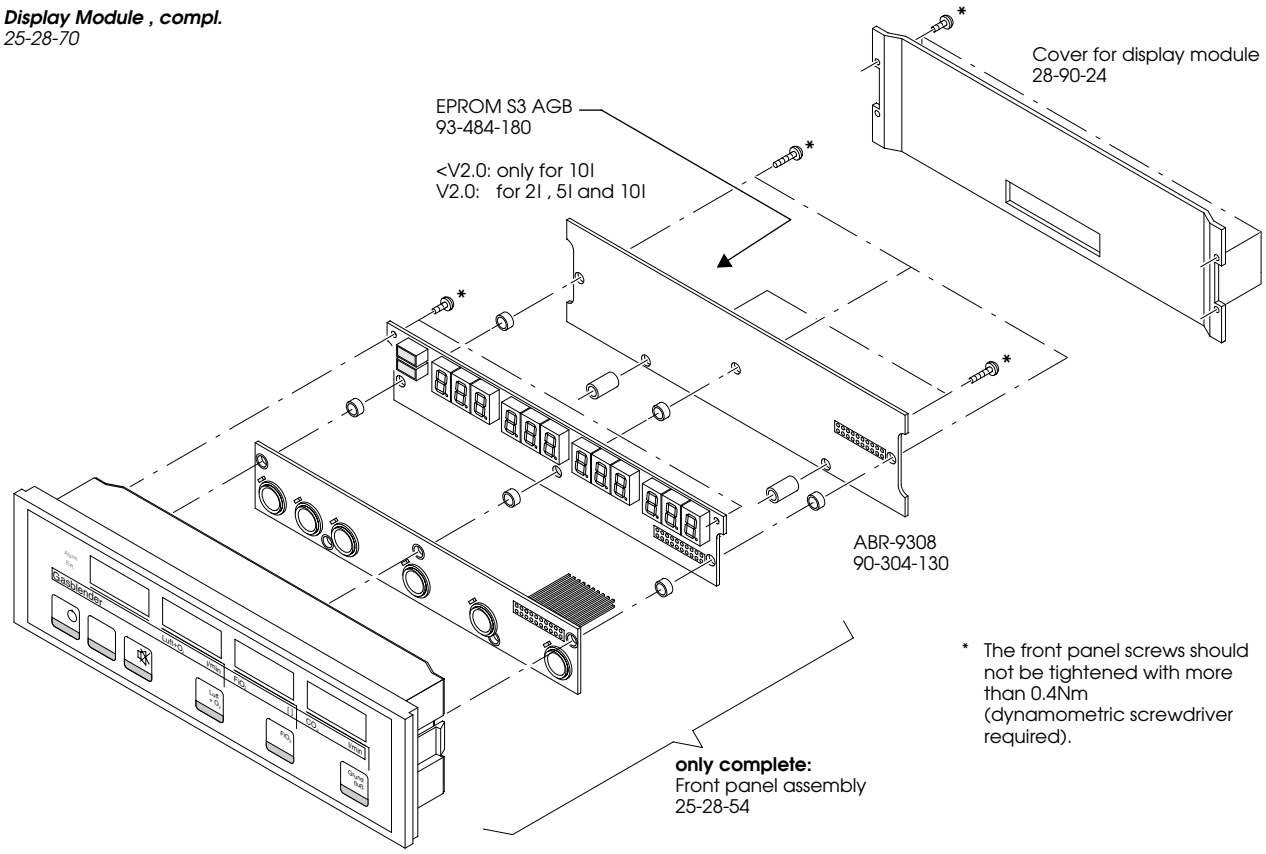


Fig. 52 Gas Blender Display Module: spare parts

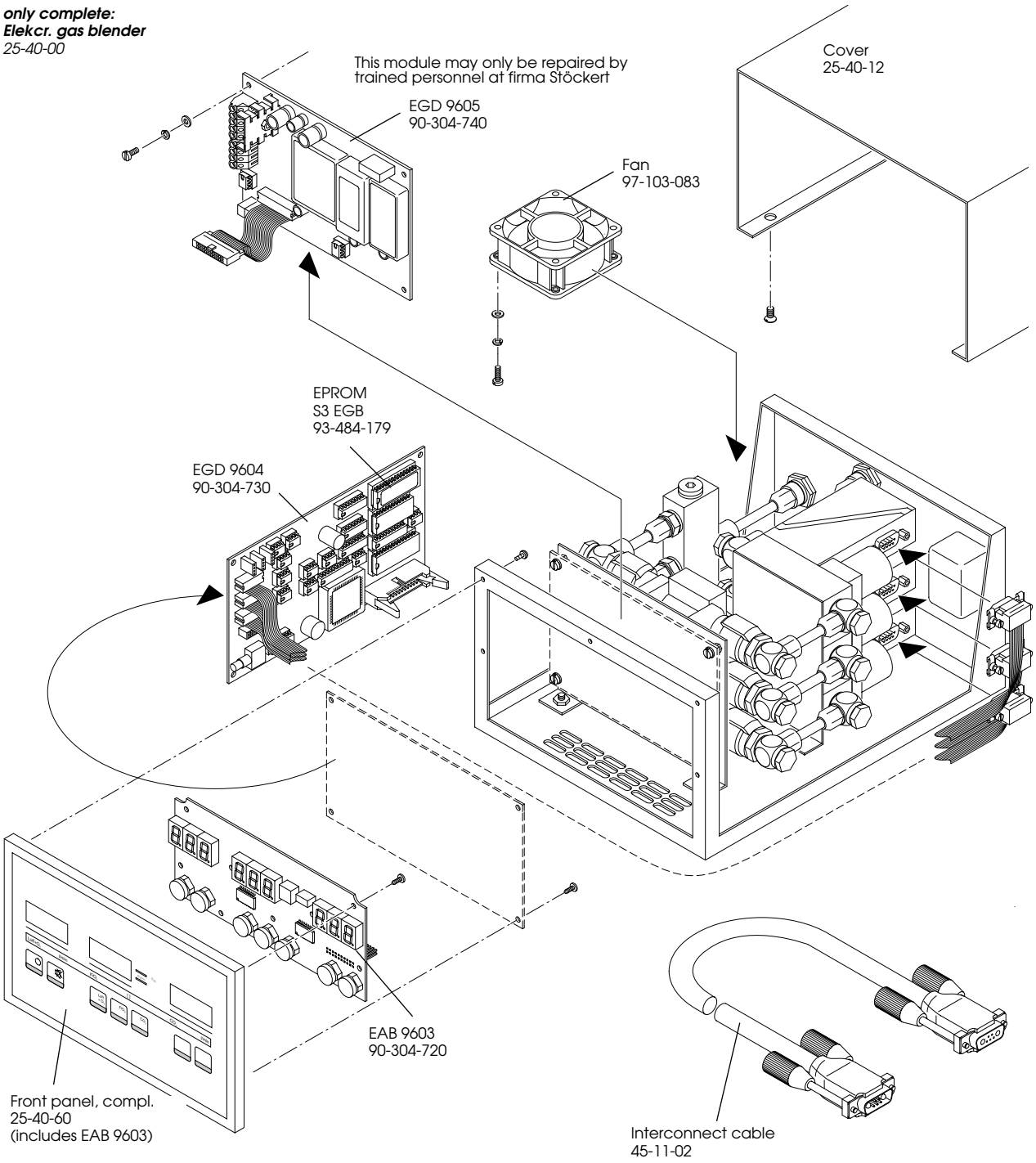
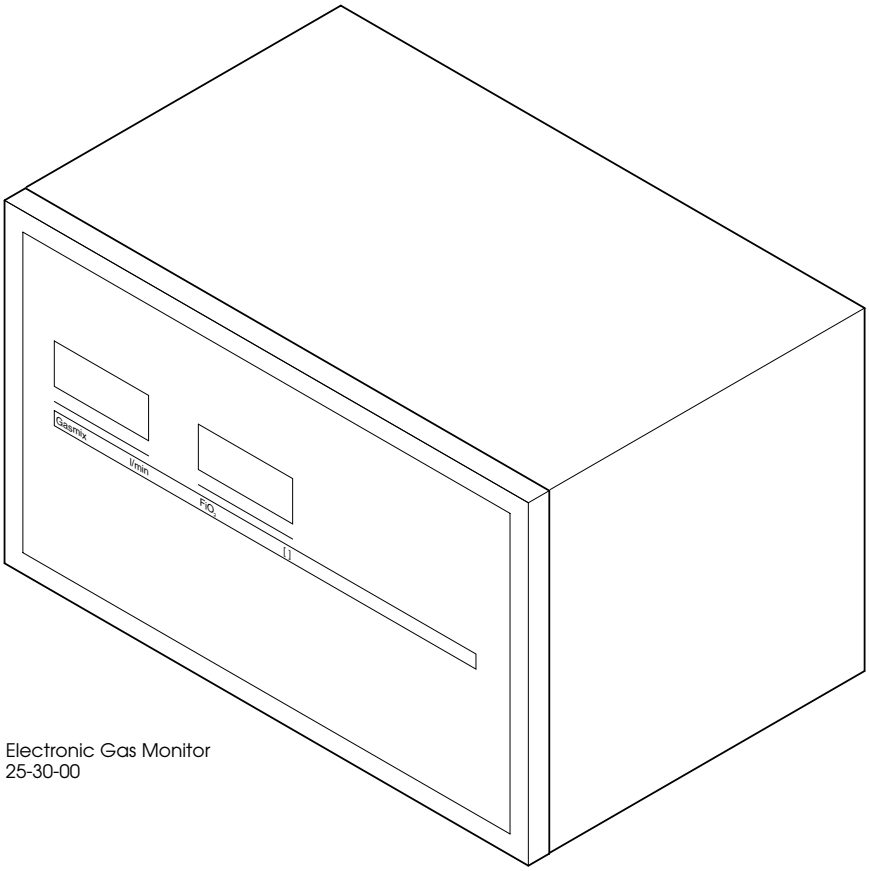
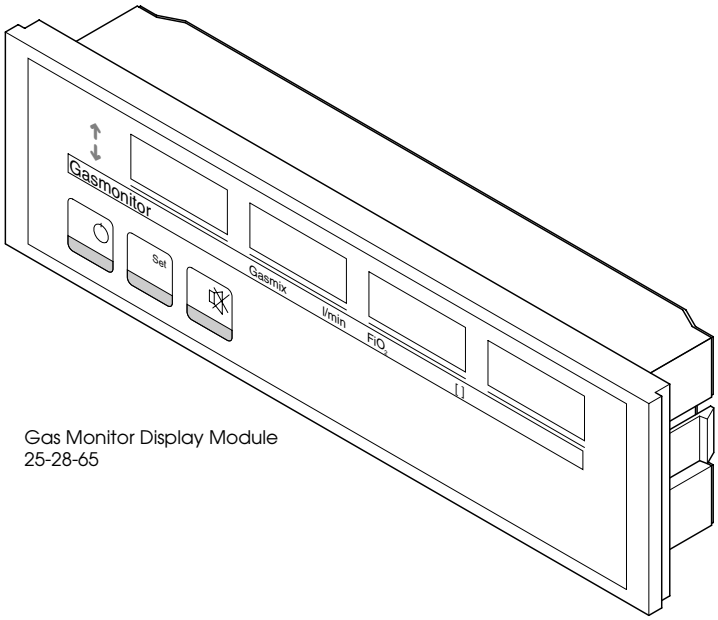


Fig. 53 Electr. Gas Blender: spare parts

Notes:



Electronic Gas Monitor
25-30-00



Gas Monitor Display Module
25-28-65

Fig. 54 Gas Monitor System: general view

11.1 CAN-Structure

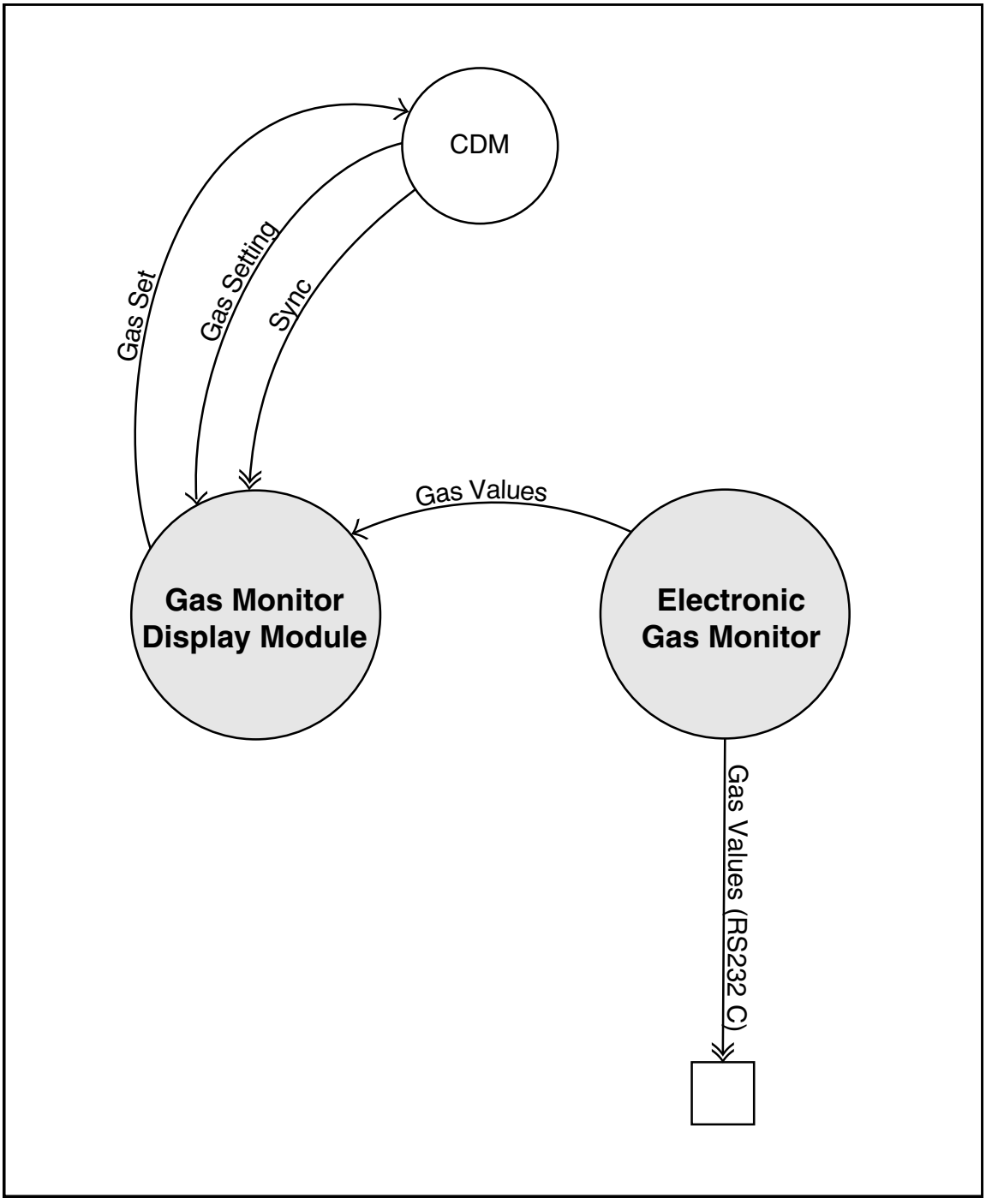


Fig. 55 Gas Monitor System: CAN-structure

11.2 Functional Description

The Gas Monitor System includes:
- the Electronic Gas Monitor, part no. 25-30-00
- the Gas Monitor Display Module, part no. 25-28-65

The electronic gas monitor is used for measuring and monitoring gas flows without controlling them. In practice it is always operated together with a mechanical gas blender. Via the display dodule the values measured by the gas blender may also be read on the control panel. In addition the display module permits the setting of limit values, an optical and acoustic alarm will being started in case these limits are violated.

11.3 Installation into S3-System

Electronic Gas Monitor

- Switch off S3-system.
- Connect the connection "supply" to a free pump socket or to the socket "option" of the E/P-pack.
- Check funktion of Electronic Gas Monitor.

Gas Monitor Display Module

- Remove blank slide-in from free module slot (if available).
- Insert display module into free slot.
- Check function of Gas Monitor System.

11.4 Technical Data

	Electr. Gas Monitor	Display module
Height, width, depth:	128mm, 33.4mm, 130mm	55mm, 200mm, 35mm
Weight:	2.5kg	300g
Power supply:	24V via SIII central power supply in E/P-Pack	via DC/DC-module in console desk
Power input:	3Watt max.	3Watt max.
Operating temperature:	+10°C to +40°C	+10°C to +40°C
Storing temperature:	+10°C to +40°C	0°C to +40° C
Max. admissible input pressure per connector	3bar	
Mounting position of gas monitor housing	upright, horizontal	

GAS MIX	
Measuring range:	0 to 10.0LPM
Resolution:	0.1LPM
Measuring error (max.)	±2% of end value (F.S.)*
Linearity (max.)	±3% measured value (R)*
zero point drift (max.)	±0.06%/°C (F.S.)
end value drift (max.)	±0.088%/°C (F.S)

FiO_2	
Display range:	0.21to 1.00
Resolution	0.01
Measuring error	$\Delta FiO_2 < \frac{0,24l \S min}{Flow(Air + O_2)}$

*) under cal. conditions (21°C, 1013mbar)

11.5 Trouble Shooting

11.5.1 On the Display Module

fault indication:	possible cause/ remedy
- - -	- The gas monitor is not or not properly connected.
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E08	- Display driver faulty.
E10	- internal device fault in gas monitor.
E11	- No or faulty calibration.
E20	- Malfunktion of display module.

fault indication:	possible cause/ remedy
One of the arrow indicators ARROW UP or ARROW DOWN flashes and one or several display flashes/ flash.	- One or several alarm limit values exceeded. Look for cause and eliminate, e.g. pump stop through low level in blood reservoir, air bubble, tubing kinked, etc.

11.5.2 On the Elect. Gas Monitor

fault indication:	possible cause/ remedy
Gas monitor not airtight.	- Short circuit gas tubing on gas monitor.
Display on gas monitor is not identical with setting on mechanical gas blender.	- Check if connections are airtight. - Change gas monitor.

11.6 Spare Parts

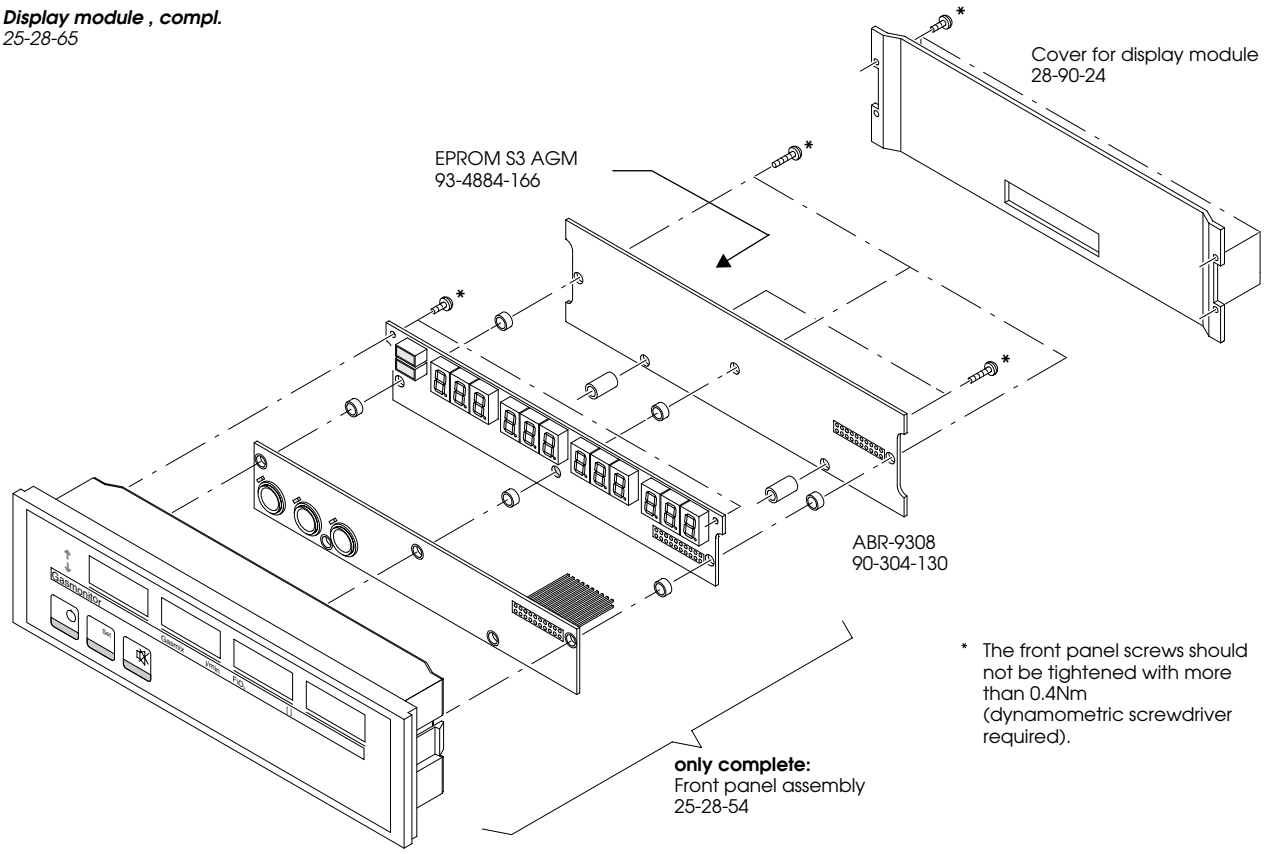


Fig. 56 Gas Monitor Display Module: spare parts

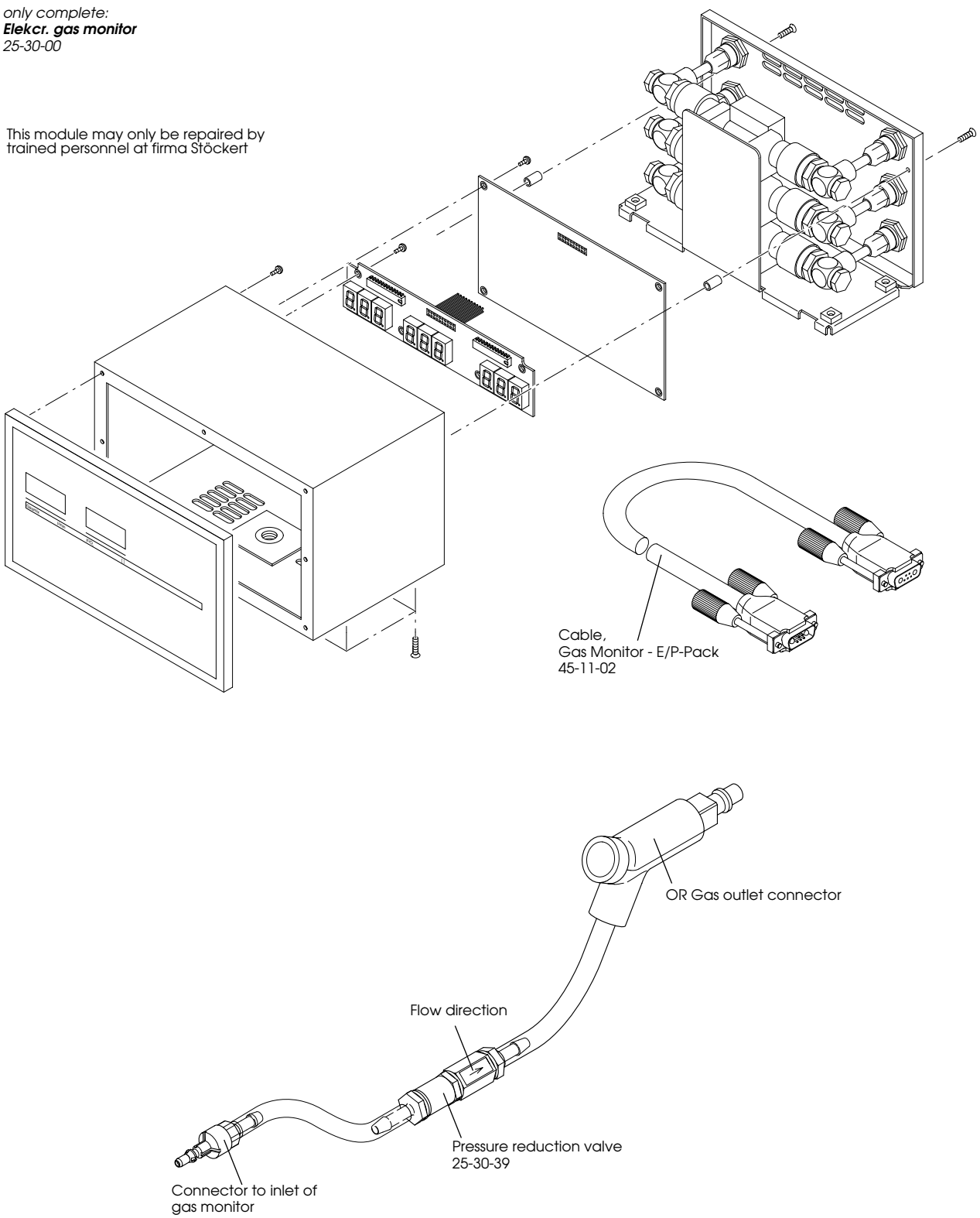
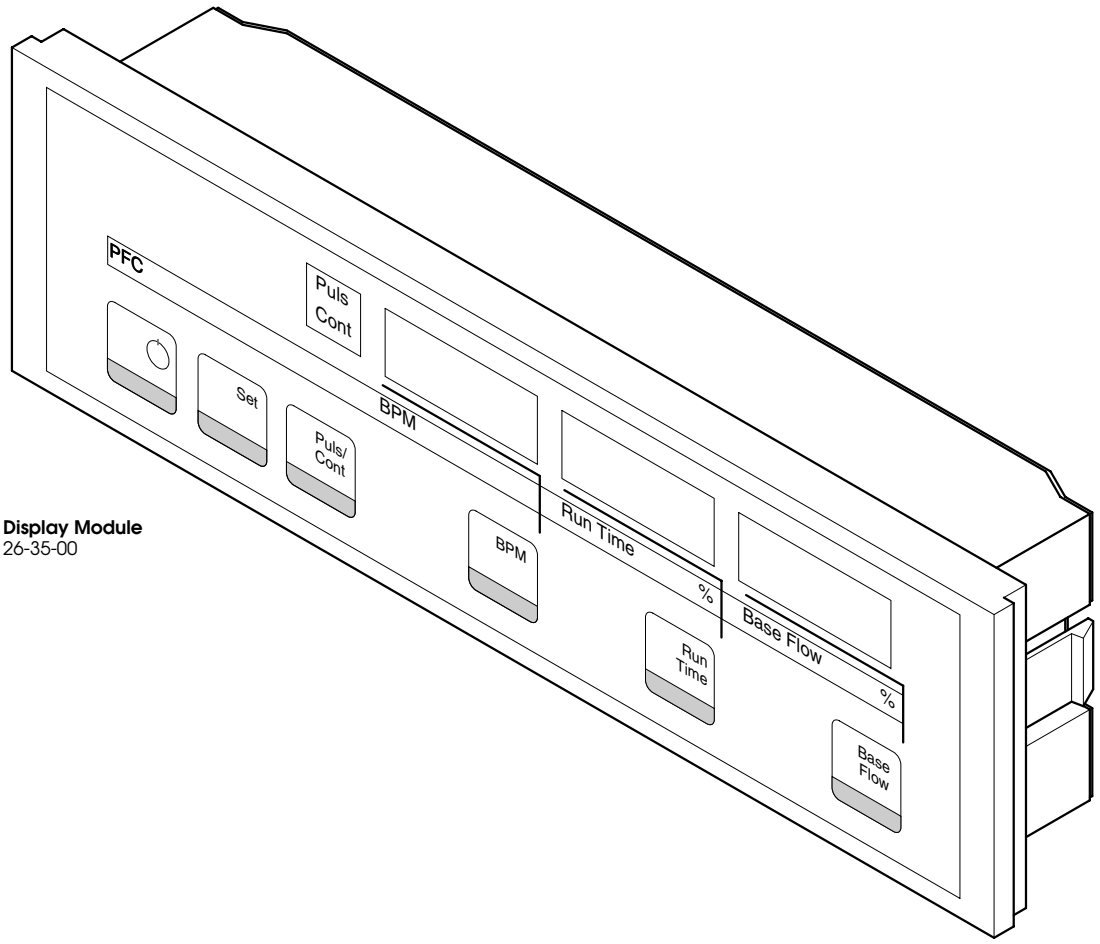


Fig. 57 Electr. Gas Monitor: spare parts

Notes:



Display Module
26-35-00

Fig. 58 Pulsatile Control PFC: general view

12.1 CAN-Structure

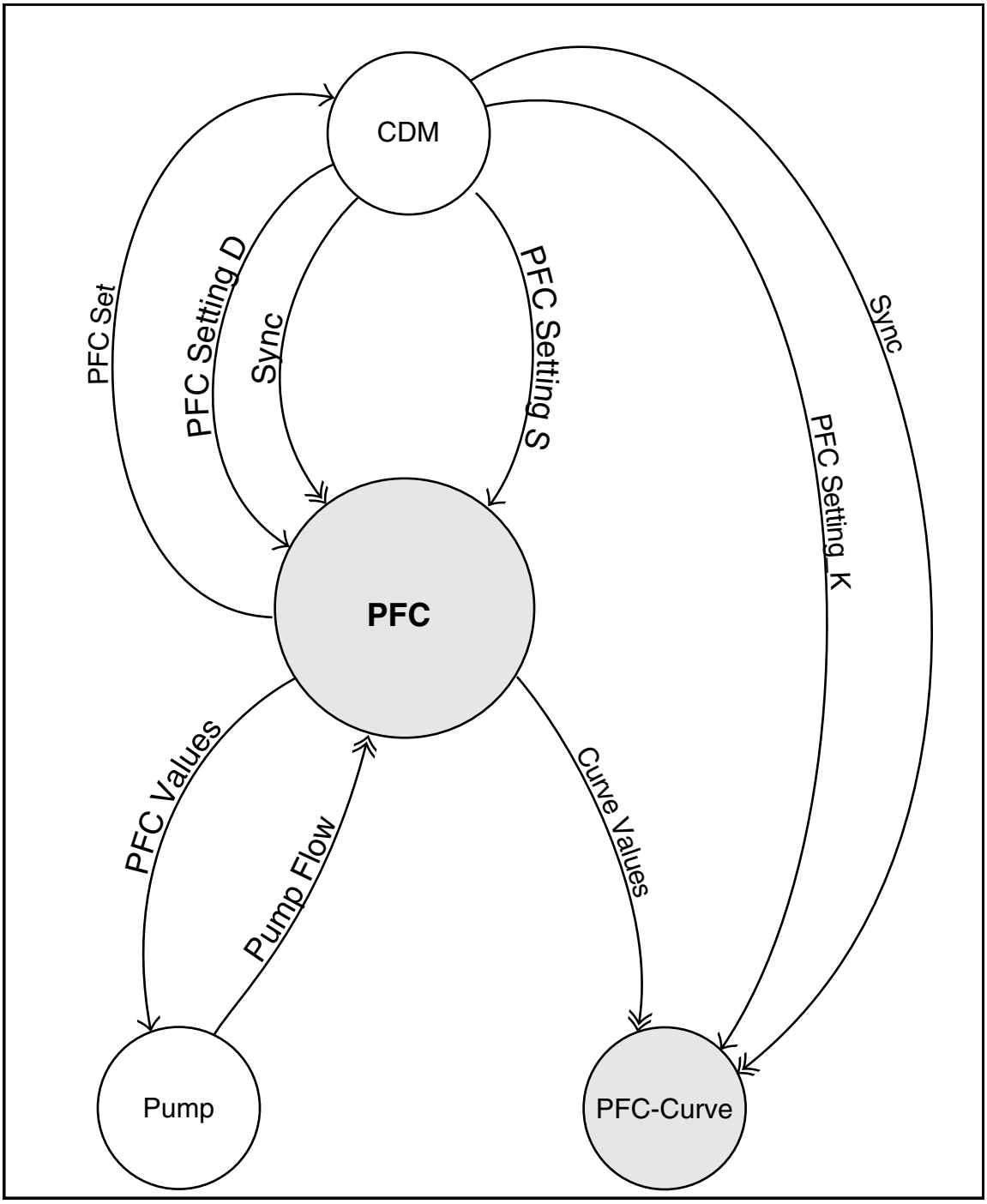


Fig. 59 Pulsatile Control PFC: CAN-structure

12.2 Functional Description

This unit serves for pulsatile pump control in total bypass with the help of an internal ECG simulator. The pulsatile control consists of a display module, inserted into the control desk.

- Pulsatile flow may be switched to continuous flow by key depression and vice versa.
- The preselected flow rate remains constant, even if the operating mode will be changed.
- The frequency of the internal ECG simulator may be adjusted in steps of 1BPM.
- The portion of pump action per ECG cycle may be chosen within wide limits and will be displayed in % of the ECG cycle time.
- The pulsatile flow may be backed by an adjustable continuous basic flow, thus preventing negative pressure peaks.
- The ECG frequency, the pump action portion per ECG cycle and the continuous basic flow will be set on the central display module in the control desk.

12.3 Technical Data

Height, width, depth:	55mm, 200mm, 35mm
Weight:	300g
Power input:	max. 3 Watt: power supply via central power unit in E/P-pack
Operating temperature:	+10°C to +40°C
Storing temperature:	0°C to +40°C
ECG simulator frequency:	30-150BPM, adjustable in steps of 1BPM
Portion of pump action:	20-80%, adjustable in steps of 1%
Portion of basic flow:	0-100%, adjustable in steps of 1%

12.4 Trouble Shooting

12.4.1 On the Display Module

fault indications:	possible cause/ remedy
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E08	- Display driver faulty.
E10	- Internal device fault in sensor module.
E13	- No communication with sensor module.
E20	- General error in display modul.

12.4.2 In the Pump

fault indication	possible cause/ remedy
!!ALARM!!	- The function is in the alarm state.
No COM!	- No communication 1. after starting the pump, 2. if there is no connection, 3. if an error has been detected.
OFF	- The function is switched off.
!!STOP!!	- External intervention (no alarm situation).
CONTROL	- External intervention (no alarm situation).

12.5 Spare Parts

Display module, compl.
26-35-00

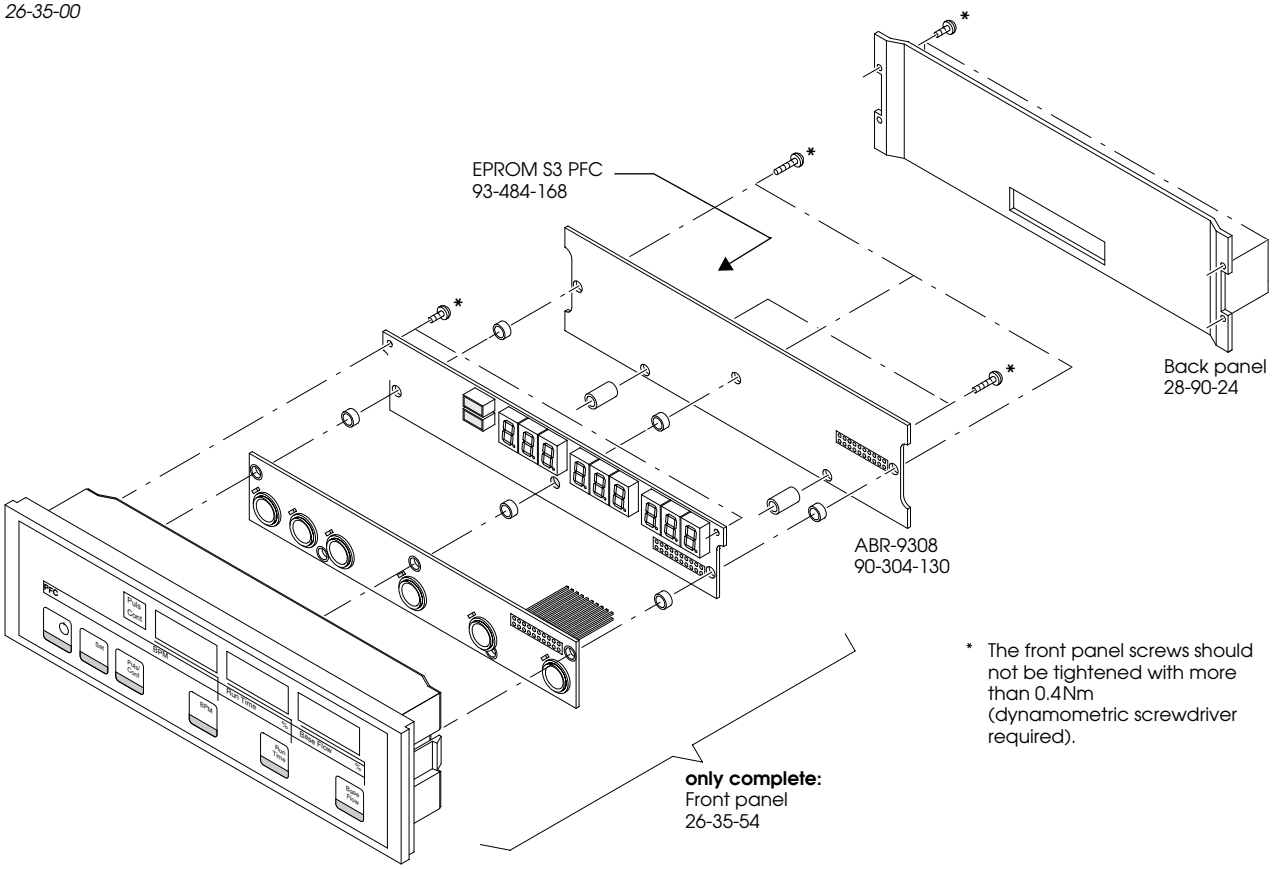


Fig. 60 Pulsatile Control PFC: spare parts

Notes:

Venous Line Clamp, compl.
12-40-00
old:
12-30-00

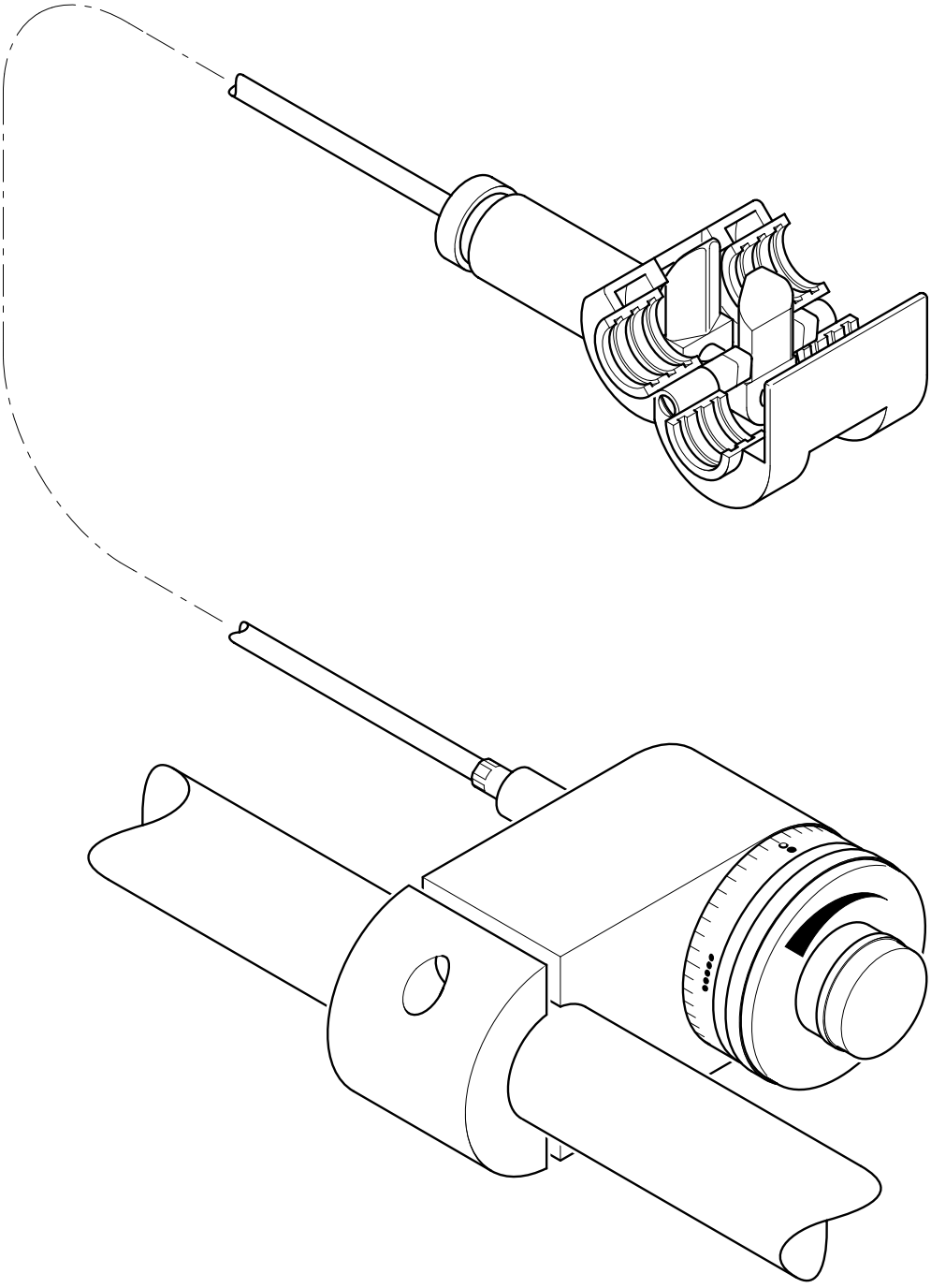


Fig. 61 Venous Line Clamp: general view

13.1 Spare Parts

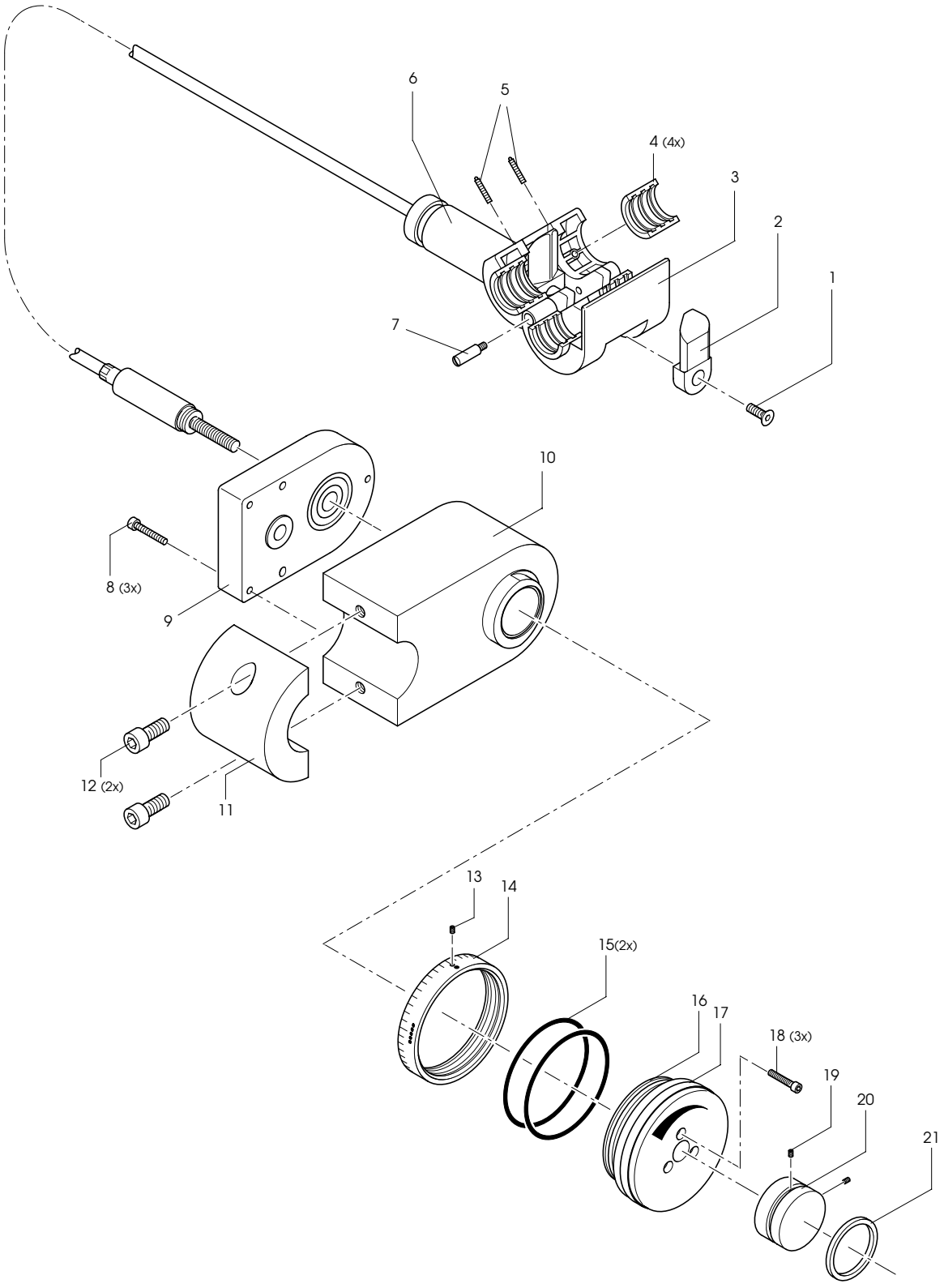


Fig. 62 Venöus Line Clamp: spare parts

Pos.	Item	Order-Number for 12-30-00[1)]	Order-Number for 12-40-00
1	countersunk screw DIN7991-M4x12 VA	71-114-216	71-114-216
2	lever	12-30-52	12-30-78
3	clamp head compl.	–	12-30-85
4	tubing insert 1/4"x 1/16", red	10-07-20	10-07-20
	tubing insert 1/4"x 3/32", yellow	10-07-21	10-07-21
	tubing insert 3/8"x 1/16", black	10-07-22	10-07-22
	tubing insert 3/8"x 3/32", blue	10-07-23	10-07-23
	tubing insert 1/2"x 1/16", silver	10-07-24	10-07-24
	tubing insert 1/2"x 3/32", green	10-07-25	10-07-25
	tubing insert 5/8"x 3/32", brown	10-07-26	10-07-26
5	stainless thrust GN616 M4-KN	73-500-052	73-500-052
6	clamp head compl. + bowden cable	–	12-40-10
	clamp head compl.	12-30-46	–
	bowden cable compl.	12-30-42	–
7	bolt for locking holder	12-30-58	12-30-58
8	allen drive screw DIN912-M3x20	71-115-003	71-115-003
9	housing cover	12-30-12	12-30-12
10	housing	12-30-10	12-30-10
11	locking plug	12-30-14	12-30-14
12	allen drive screw DIN912-M6x16	71-115-046	71-115-046
13	set screw DIN913-M3x3	71-118-301	71-118-301
14	scale für control knob	12-30-20	12-30-20
15	o-ring 52x2 NBR	72-103-125	72-103-125
16	coarse adjustment knob	12-30-06	12-30-06
17	Kantseal 24.99x3.4 NBR	72-102-024	72-102-024
18	allen drive screw DIN912-M3x16	71-115-046	71-115-046
19	set screw DIN916-M3x8	71-118-305	71-118-305
20	fine adjustment knob	12-30-22	12-30-22
21	gasket 53.34x5.16 NBR	72-102-025	72-102-025

1) not in production since April 1997

13.2 Technical Data

Maximum opening range:	0 to 20 mm
Resolving limit	0.1 mm
Necessary turns at knob for rapid feed	4 turns
Transmission ratio between fine adjustment and rapid feed	5:1
Opening diameter for mounting	for mast diameter 33…40 mm
Usable tubing size (Tubing insert colour)	1/4"x1/16", red 1/4"x3/32", yellow 3/8"x1/16", black 3/8"x3/32", blue 1/2"x1/16", silver 1/2"x3/32", green 5/8"x3/32", brown
Bowden cable length	1000 mm
Weight clamping	150 g
Weight operating element	1160 g

13.3 User information

Instructions for using the Venous Line Clamp see S3-Operator's-Manual.

13.4 Replacement of components

13.4.1 Replacement of Bowden cable

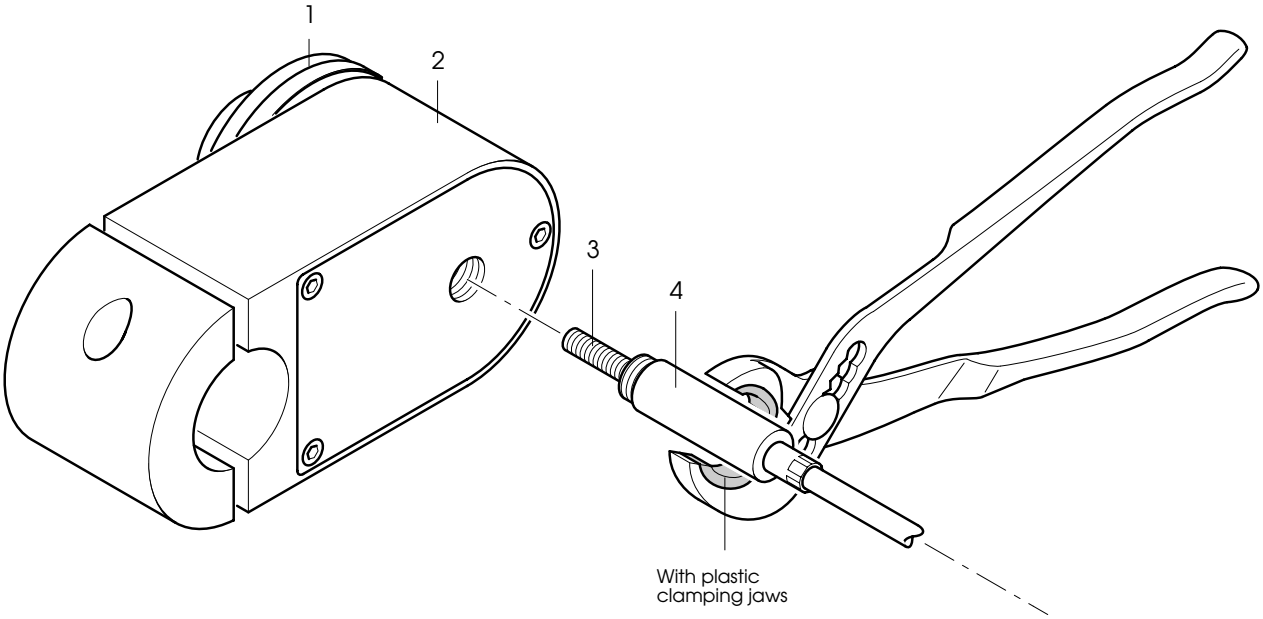


Fig. 63 Venous line clamp: replacement of Bowden cable

13.4.1.1 Disassembly of old Bowden cable

- Open clamping jaws of flow clamp completely by turning at the main drive (1) counter-clockwise.
- Draw shaft of Bowden cable (4) with a pipe wrench (with plastic clamping jaws) counter-clockwise out of the housing of the picture element (2).

13.4.1.2 Assembly of the new cable

- Put threading of the Bowden cable core (3) by hand to the internal threading of the housing (2) and connect external and internal threading by turning it clock-wise (one turn is sufficient).
- Turn turning knob for main drive clock-wise to the limit.
  The Bowden cable core is now fixed.
- Turn shaft of Bowden cable (4) manually clock-wise into the housing.
- Fasten the shaft with a pipe wrench (with plastic clamping jaws).

Notes:

Water mixer, compl.
11-10-00

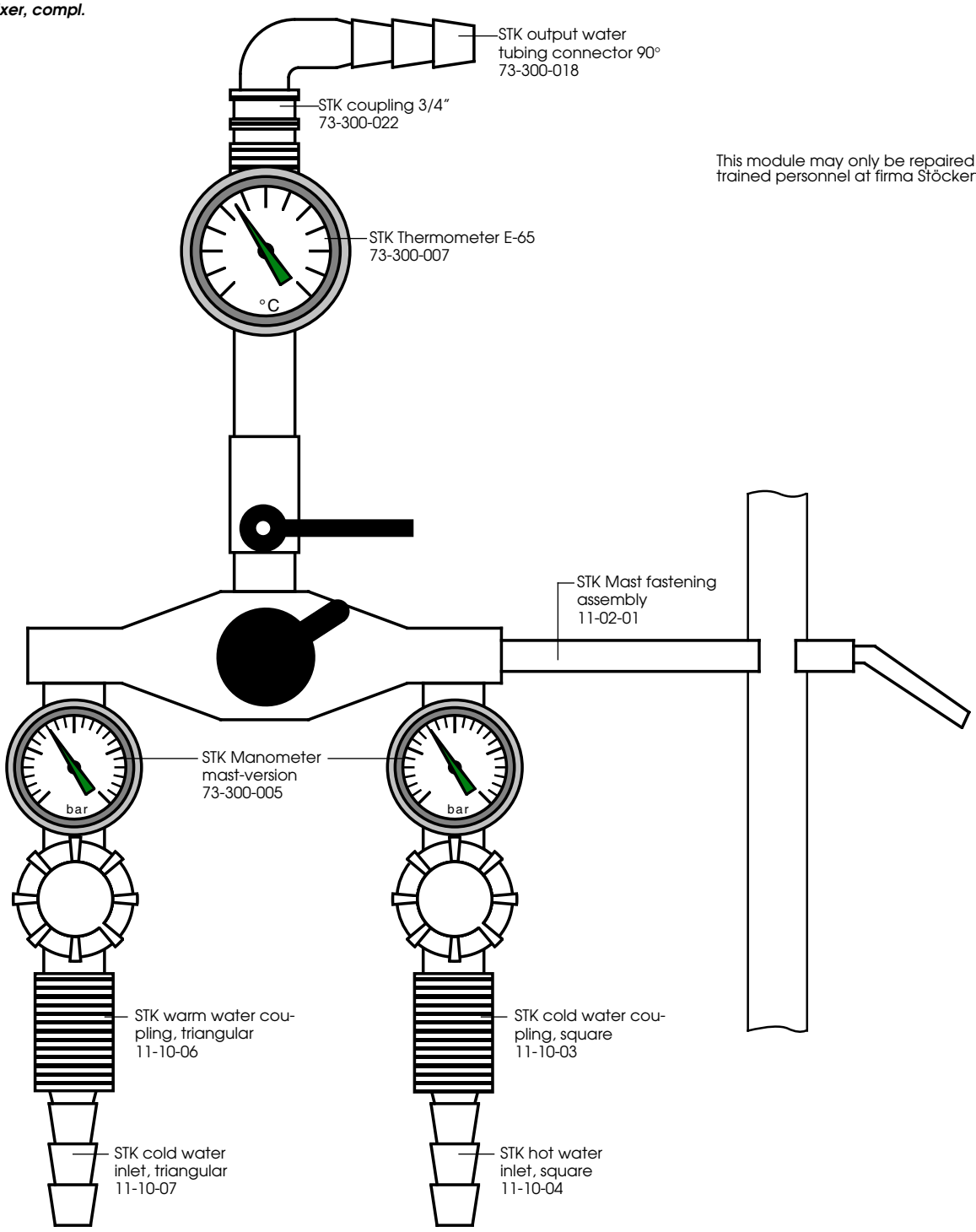


Fig. 64 Water Mixer: general view

14.1 Functional Description

The water mixer is simple and economical means of controlling the blood temperature. It produce the required temperature by mixing hot and cold water from the operation room water supply.

Other features include:

- Water input pressure is adjusted via pressure reducing valves located in the inlet pipes.
- Inlet pressure values downstream from pressure reducing valves are indicated.
- The input water temperature is adjusted with a single mixing valve.
- A quick-action thermometer indicates the temperature of the output water.
- In case of a cold water supply stoppage the hot water supply is stopped automatically for safety reasons.
- The preset temperature is controlled via a special thermal-element.
- The output water temperature is always limited to 42°C irrespective of the preset temperature.

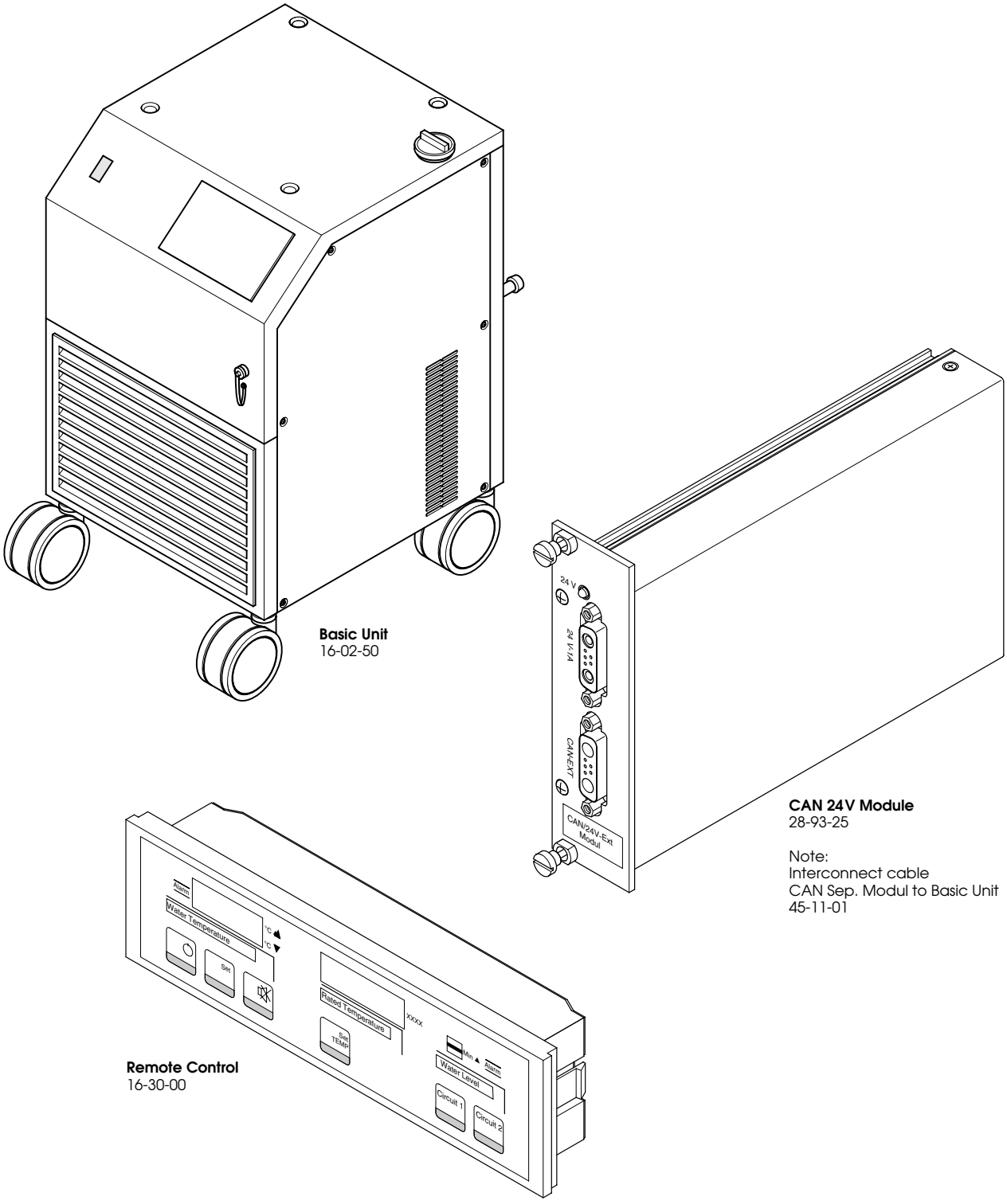


Fig. 65 Heater-Cooler: general view

15.1 CAN-Structure

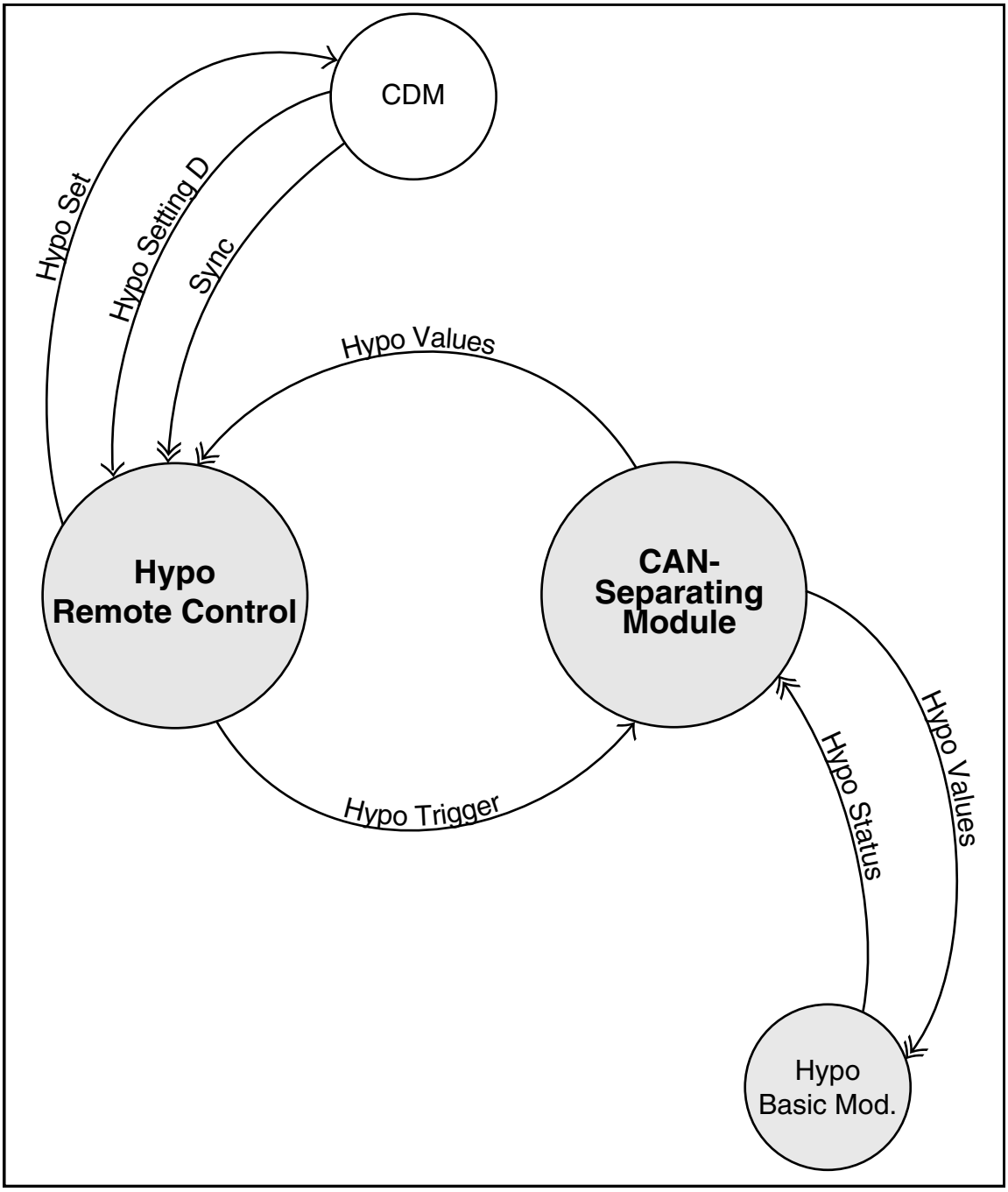


Fig. 66 Heater-Cooler: CAN-structure

15.2 Functional Description

The heater-cooler permits the precise and rapid control of the patient's blood temperature independently of the cold/warm water supply in the operating theatre. It is an independent unit with two water circles. The unit is controlled and monitored at the control panel of the unit.

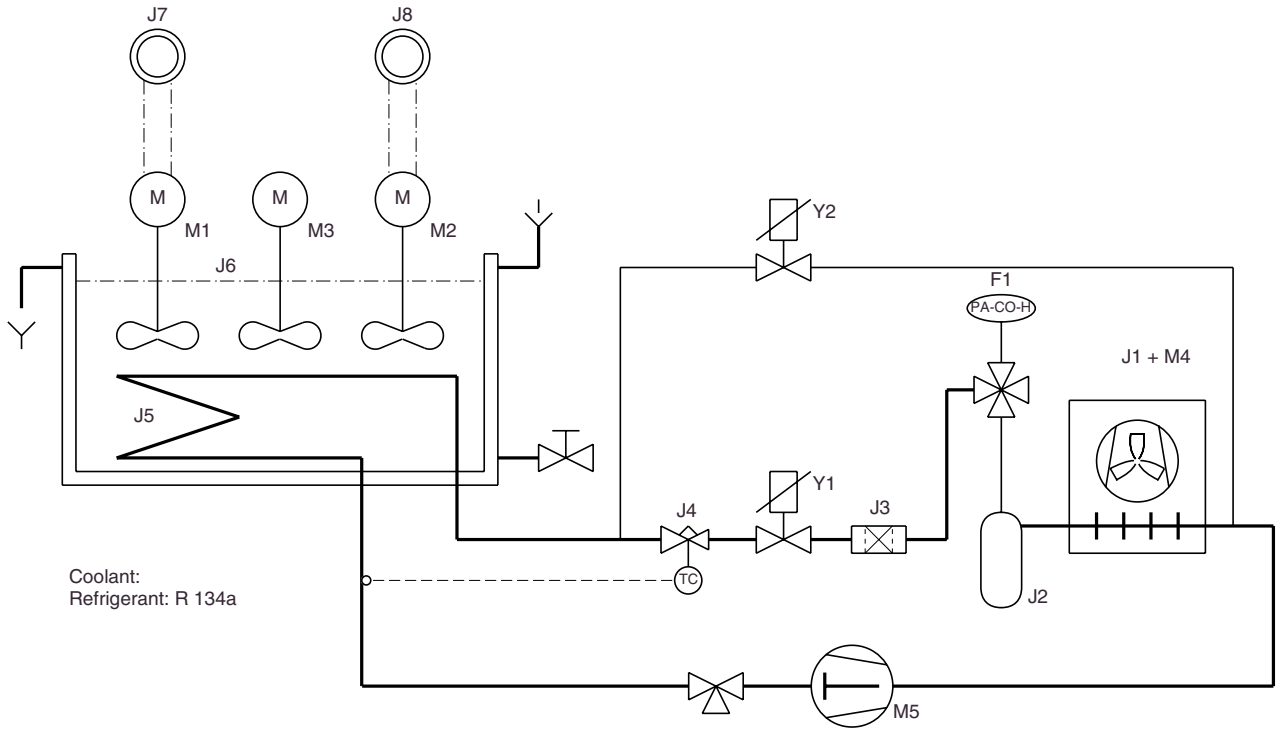
As an option the heater-cooler may be operated by a remote control unit, which is integrated into the control desk. It is connected to the CAN-bus of the S3-system via a CAN separating module, which is integrated into the E/P-pack.

15.3 Technical Data

Height, Width, Depth:	840mm, 500mm, 550mm
Weight (with ice container):	90.5kg
Power supply:	230VAC ±10%, 50Hz or 115VAC, 60Hz
Power input:	max. 16A
Safety fuse:	Thermal excess-current cut-out 230VAC, 60Hz
Operating temperature:	+10°C to +40°C
Storing temperature:	0°C to +40°C
Cooling capacity:	see cooling capacity diagram
Heating capacity:	2000W at 230VAC
Tank contents:	min. 6l H_2o, max. 9l*
Operating noise:	≤ 56dB (A)

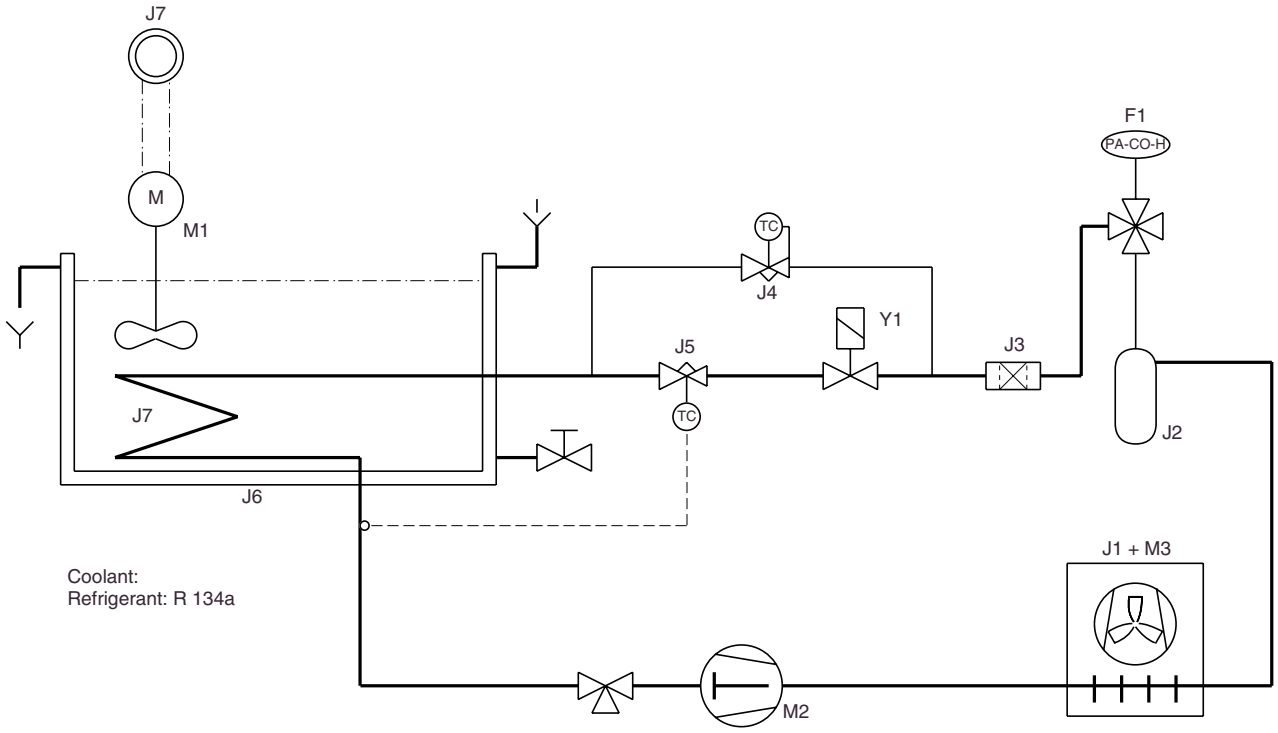
*) from serial no. 16S315 tank has to be filled only with 5l max. (3 LED's indicated)

15.3.1 Pipe Plan



Item	Designation	Type	Order-No.
F1	excess pressure switch	ES 002	96-410-516
J1	Tube bundle condensor		– – –
J2	Receiver		– – –
J3	Drier	EO 004	– – –
J4	Injection valve	EVE 099 + EVZ 029	– – –
J5	Exchanger		– – –
J6	Liquid bath		– – –
J7, J8	External consumer		– – –
M1/M2	Pump motor	EM 103	96-410-520
M3	Stirrer motor	EM 039	96-410-521
M4	Fan		– – –
M5	Compressor		– – –
Y1	Solenoid valve "cooling"		96-410-528
Y2	Solenoid valve "bypass",		96-410-528

15.3.2 Refrigeration Circuit



Item	Designation	Type	Order-No.
F1	excess pressure switch	ES 002	96-410-516
J1	Tube bundle condensor		– – –
J2	Receiver		– – –
J3	Drier	EO 004	– – –
J4, J5	Injection valve	EVE 099 + EVZ 029	– – –
J6	Exchanger		– – –
J7	Liquid bath		– – –
J8	External consumer		– – –
M1	Pump motor	EM 103	96-410-520
M2	Compressor		– – –
M3	Fan		– – –
Y1	Solenoid valve "cooling"		96-410-528

15.4 Calibration

15.4.1 Calibration of Temperature Sensors

The subsequent calibration has to be performed every time a component of the basic unit has been replaced or a maladjustment (divergence of more than 0.3°C) is suspected.

Caution!

The calibration may only be performed by a trained service engineer. Unqualified manipulation may lead to disabling important safety measures. This may result in a risk for the patients, or the unit not functioning.

Testing means:

- Calibrated digital thermometer with 0.01°C resolution.
  As a substitute a digital thermometer with a resolution of 0.1°C may be used.

Preparation

- Check whether the unit is filled to the maximum, fill up if required.
- Provide the two pump circles with a short circuit hose each (about 1m long).
- Remove the lateral walls, take off the two uppermost screws on the back wall.
- Swing open unit.
- Immerse the thermometer through an adequate rubber opening on the cover plate into the bath.

Seting the lower calibration point

- Switch on unit.
- Set rated value to 5.0°C.
- Switch off both pumps when the set temperature is reached.
- Start calibration mode by activating the calibration key with a screw driver through a bore in the covering cap of the operating part and simultaneously the keys "RATED-up" and "RATED-down" for at least ten seconds. The calibration mode is indicated by a flashing display. The pumps are now switched on (better circulation).
- Wait for at least three minutes until the control system is no longer subject to the transient effect.
- Read off the temperature at the thermometer and set this value on the unit by using the keys "RATED-up" and "RATED-down", rounding up or down, if necessary. Then activate key "PUMP1" (=> lower calibration point).
  - LED "PUMP1-active" has to light up (check!).
  - The water temperature display must indicate the set value now (check!).
- Exit calibration mode by activating the keys "RATED-up" and "RATED-down" simultaneously.

Setting the upper calibration point

- Set rated value to 40.0°C.
- Start calibration mode as described above and wait for at least three minutes, until the control system is no longer subject to the transient effect.
- Read off temperature at the thermometer and set this value on the unit by using the keys "RATED-up" and "RATED-down", rounding up or down, if necessary. Then activate key "PUMP2" (=> upper calibration point).
  - LED "PUMP2-active" has to light up (check!).
  - The water temperature display must indicate the set value (check!).

Calibrating the protection system sensor

- Wait until the control system is no longer subject to the transient effect.
- The unit and the digital thermometer must both indicate 40.0°C (check!). If this prerequisite is fulfilled, activate key "AUDIO-OFF" (=> calibrate protection system sensor).
- LED "AUDIO-OFF-active" has to light up (check!).
- No error code and no temperature alarm must be indicated (check!).

- Leave calibration mode by activating the keys "RATED-up" and "RATED-down" simultaneously.

Test calibration

- Set rated value to 40.0°C.
- Switch on both pumps, wait until temperature has been reached, if necessary.
- Have the temperature of the protection system sensor displayed by activating the keys "RATED-up" and "RATED-down" simultaneously (instead of rated temperature value). The display must indicate 40.0°C +0.2°C (check!).

15.4.1.1 What to do if you make a mistake during calibration

If an error is made during the calibration of the temperature sensors (e.g., pressing the wrong "Circuit #" button), the following procedure will reset the stored values in the EEPROM on the UL 457 circuit card to nominal values. A new calibration will then be required.

"Audio OFF" pressed at 5°C

- Fill the tank with 40°C water.
- Enter calibration mode (see 15.4.1).
- Press "Audio Off".
- Exit calibration mode (see 15.4.1).
- Recalibrate the unit using section 15.4.1, carefully.

"Circuit 1" pressed at 40°C - or - "Circuit 2" pressed at 5°C

- Enter calibration mode (see 15.4.1).
  The water temperature is irrelevant for this procedure.
- Press *either* (not both) the "°C↑" or the "°C↓" button and hold it down.

- Press the "Circuit 2" button.
  (there are now two buttons being pressed and held).
- Release both buttons.
- The display shows "P..3".
- Exit calibration mode (see 15.4.1).
- Recalibrate the unit using section 15.4.1, carefully.

If these procedures do not clear the problem caused by the error during calibration, then you will need to order a new EEPROM. The ordering information for the IC is:

96-410-542 EEPROM, 85C92, DIL8

15.4.2 Check of protection system cut-off temperature

- Disconnect the unit, unplug connection "X4" on the printed circuit board (refrigerating machine).
- Switch on unit.
- Set to 40.5°C.
- Switch on both pumps.
  - After reaching 40.5°C the heating switches off. However, since the pumps are working, the bath continues to heat up. When 41.0°C are reached temperature alarm has to be generated and the pumps must switch off (check!).
- Disconnect unit and plug in "X4" again.

15.4.3 Check of Pressure Switches

- Switch on unit, switch on both pumps.
- Fill unit until the maximum level is indicated by 3 LEDs on the level indication. On the upper course no water should drain off (check!).
- Drain the water at the water outlet and watch the level indication.

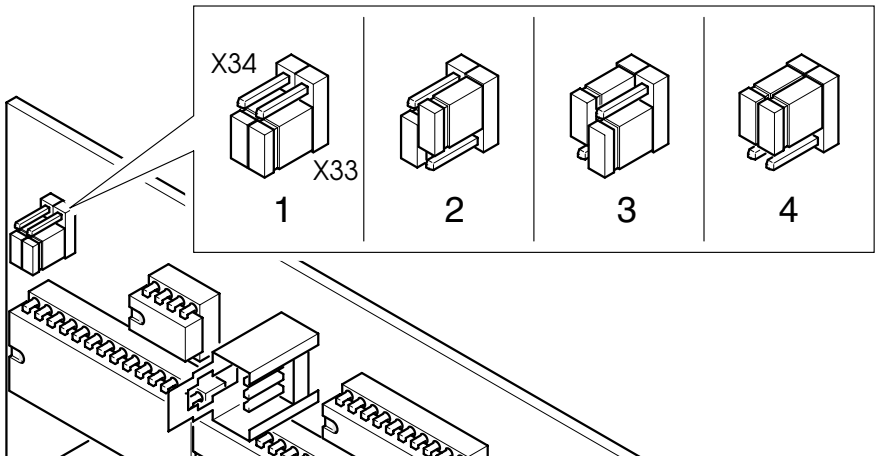
All level LEDs have to extinguish one after the other. After the lowest LED has extinguished, the level alarm has to be generated (check!).

15.5 Installation of several identical devices

The S3-system may control up to four heater-cooler units. For clear differentiation these will be labeled with numbers. The first heater-cooler is labeled "heater-cooler 1/2" to identify the water circuits "1" and "2".
The other heater-cooler units will be designated as "heater-cooler 3/4", heater-cooler 5/6" and "heater-cooler 7/8".

Adjust CAN unit address of heater-cooler

- Open heater-cooler.
- Adjust the unit address with the jumpers X33 and X34 on the "WKS control board (UL 457)" according to the following table:



Jumper		Unit no.
X34	X33	
OFF	OFF	1/2 standard setting
OFF	ON	3/4
ON	OFF	5/6
ON	ON	7/8

- Close heater-cooler and make sure it functions.

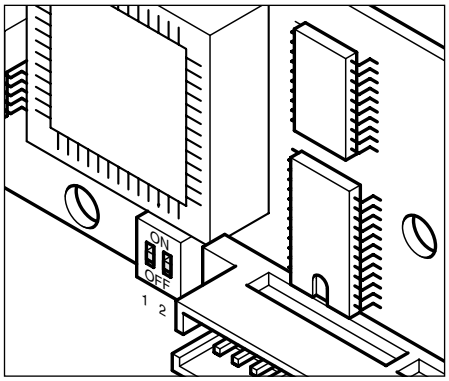
Adjust CAN unit address of remote control

- Open remote control.
- Adjust the unit address with the jumper on the ABR board according to the following table.

DIP-switch no.:	1	OFF	ON	OFF	ON
	2	OFF	OFF	ON	ON
device no.:		1*	2	3	4

*) The device no. "1" is not shown on the CDM.

- Close remote control and make sure it functions.



DIP-switch on the ABR-board
of the control desk

Fig. 67 Heater-Cooler/ Remote Control: DIP-switch

15.6 Trouble Shooting

15.6.1 Switch-off conditions

The following table gives the conditions leading to a switch-off of the heater-cooler. The switch-off assembly is marked in the (P) column for the protection system and in the (C) column for the control system.

Switch-off conditions	P	C
Protection system temperature sensor reports temperature above 41°C.	•	•
Control system temperature sensor reports temperature above 41°C.	•	•
In case of measured values above 35°C: if the measured values of protection and control system differ by more than1°C.	•	•
In case of measured values below 35°C: if the measured values of protection and control system differ by more than 3°C.	•	•
Control system detects temperature alarm.	•	
Protection system detects temperature alarm.		•
Water level in the reservoir falls below the minimum*.	•	•

*) The level is determined by means of a float and 7 Hall sensors. For double safety the protection system temperature sensor is fixed to the uppermost winding of the radiator. When the fixing level is too low, the radiator is no longer emersed in the H_2O and therefore heats quickly above the switching-off value of 41°C.

15.6.2 Error indications

fault indication:	possible cause/ remedy
Remote control displays:	
E01	- RAM read/write error after starting.
E02	- EPROM checksum error after starting.
E08	- display driver faulty.
E10	- internal device fault in sensor module.
E13	- no communication with sensor module.
E20	- general error in display module.
Protection system indicates:	
E30	- calibration key activated when starting
E31	- short circuit of PIN 11 on PIN 3, PIN 7, PIN 8 or PIN 10
E32	- triac or relay does not start
E33	- triac does not switch off
E34	- relay does not switch off
E35	- inadmissible TSTEPS value

fault indication:	possible cause/ remedy
E40	- timeout during communication with control system
E41	- fault during relay-triac test
E42	- faulty EEPROM access
E43	- reference resistance beyond tolerance
E44	- internal fault "control unit"
E45	- internal fault "display"
E46	- calibration value for protection system sensor beyond tolerance
Control system indicates:	
E51	- EPROM error in protection system
E52	- faulty EEPROM access
E53	- timeout during communication with protection system
E54	- timeout during communication via CAN interface
E55	- no access to CAN control unit
Input/ Output unit indicates:	
E60	- key gets caught

15.7 Coolant Disposal

In accordance with environmental protection laws problem waste has to be disposed of separately and professionally. The authorized hospital personnel has to be informed explicitly about this issue.

It has to be taken care that only authorized and competent technical personnel will refill and/or replace the coolant in the heater-cooler and that the coolant will then be disposed of correctly, i.e. in accordance with the rules and regulations.

15.8 Spare Parts

15.8.1 Basic Unit

Basic unit, compl.
16-02-50

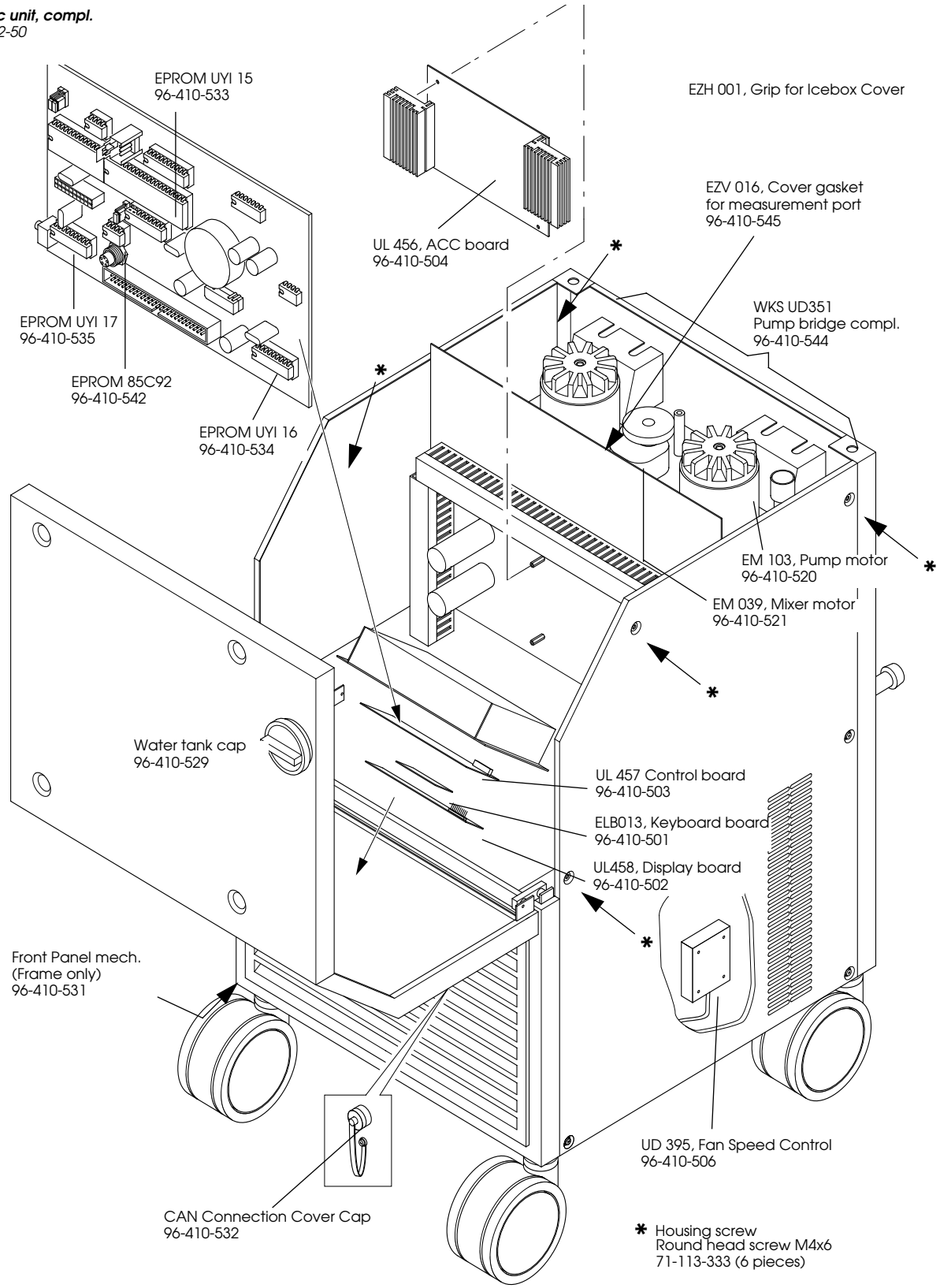


Fig. 68 Heater-Cooler: spare parts

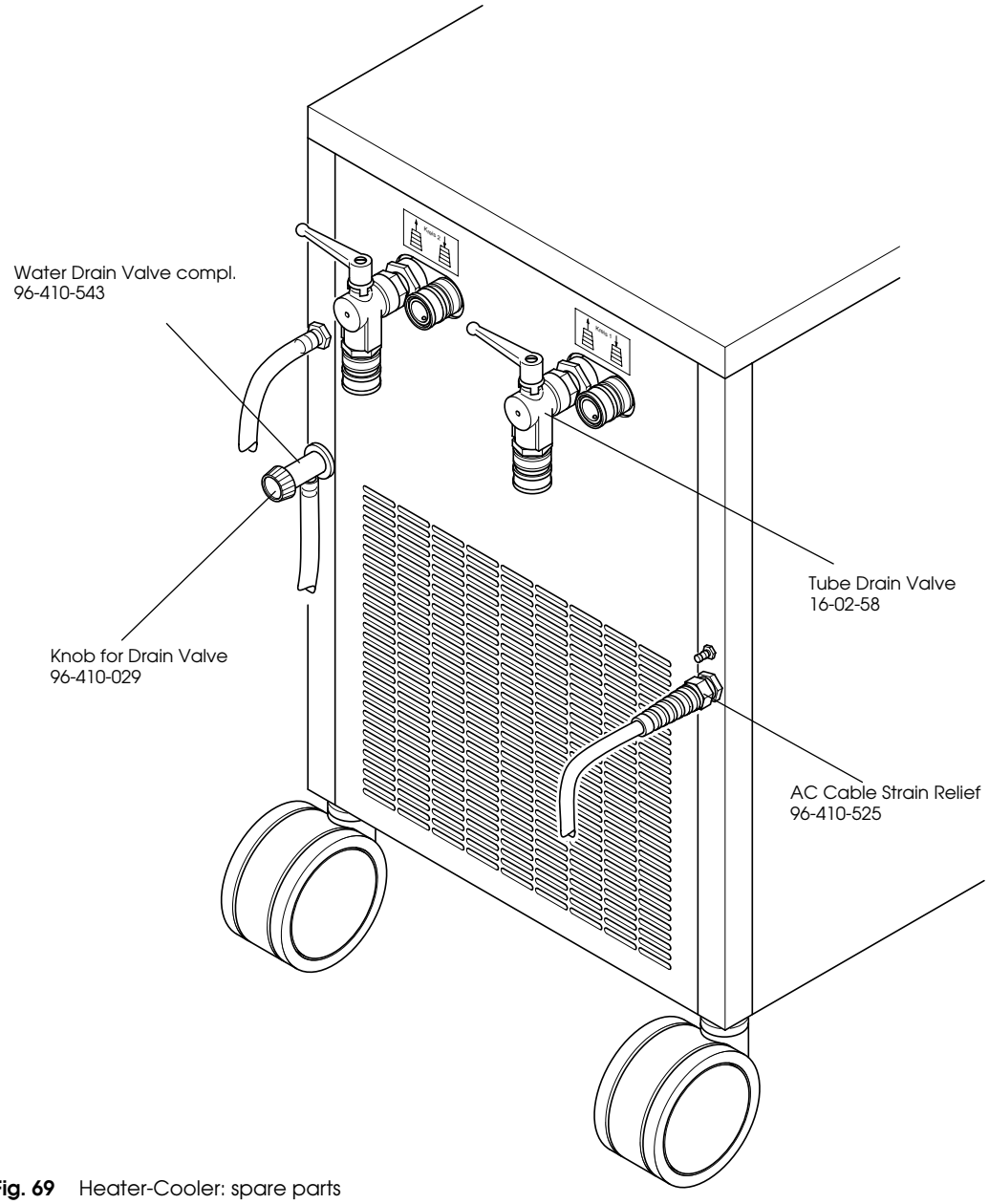


Fig. 69 Heater-Cooler: spare parts

15.8.2 Remote Control

Remote control, compl.
16-30-00

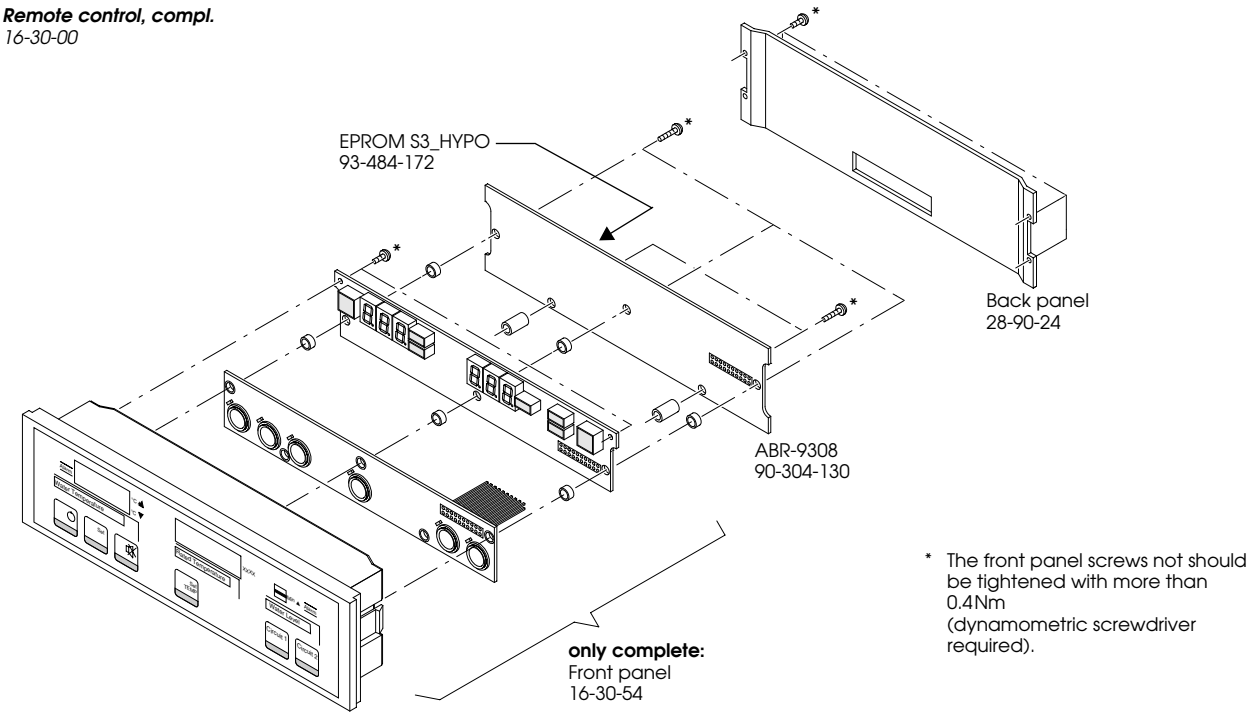


Fig. 70 Remote Control: spare parts

15.8.3 CAN/24V-Module

only complete:
CAN/24V-module
28-93-25

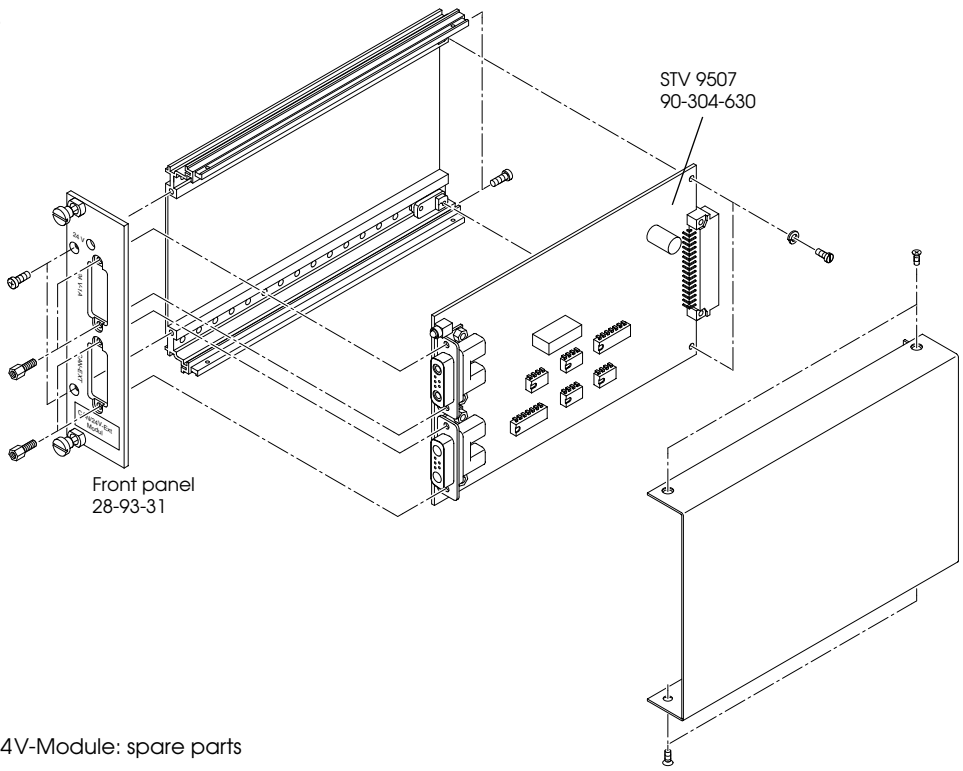
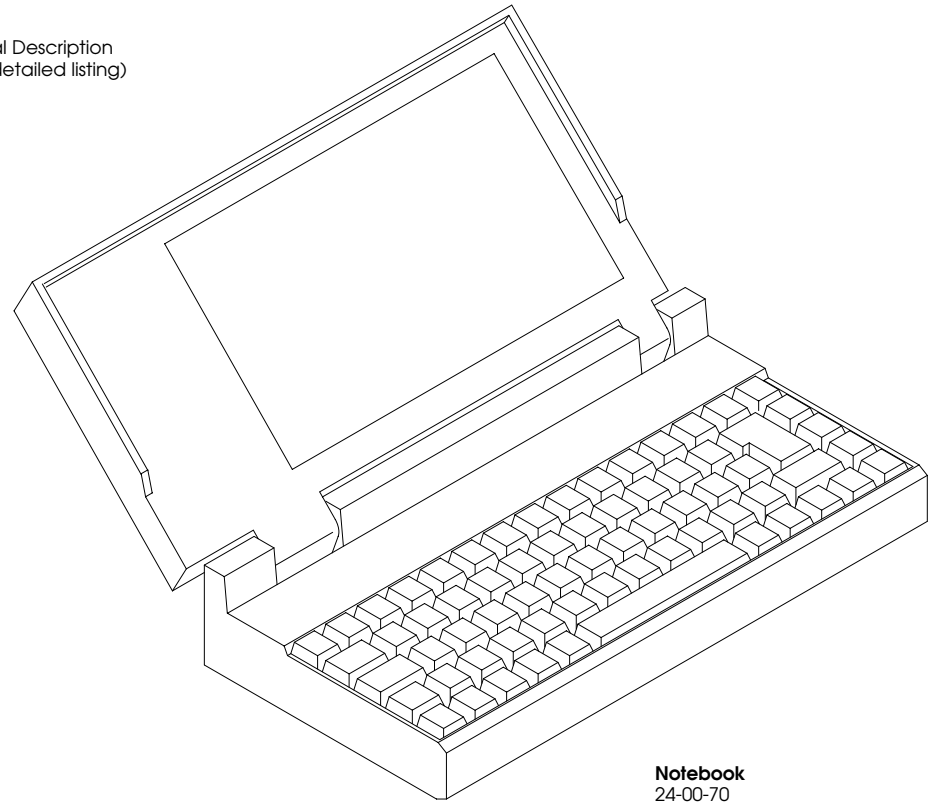


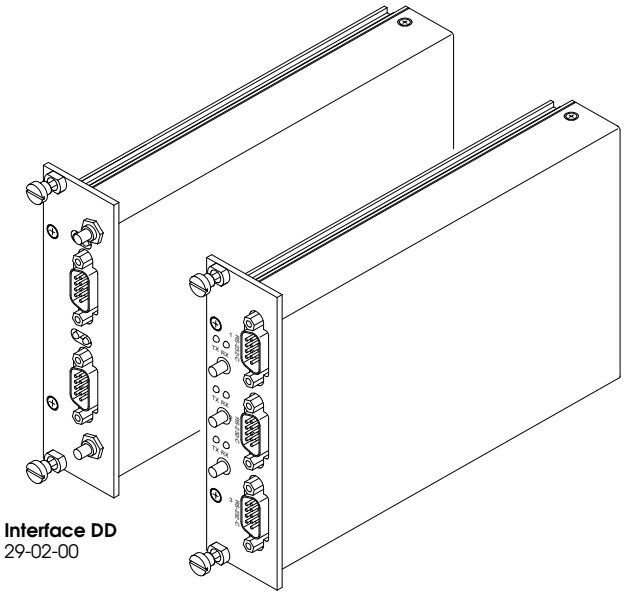
Fig. 71 CAN/24V-Module: spare parts

Notes:

DMS, compl.
24-10-50
(see Functional Description
page 156 for detailed listing)

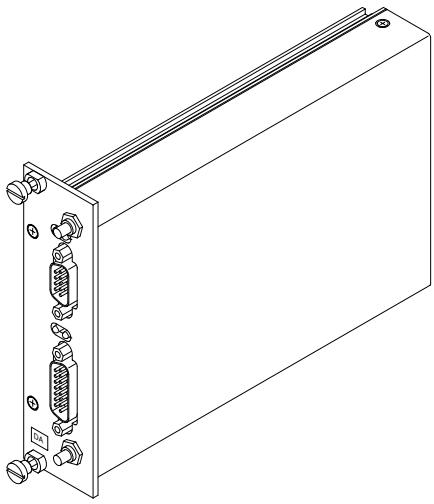


Notebook
24-00-70
(available as part of the DMS only)



Interface DD
29-02-00

Interface DDD
29-02-20



Interface DA
29-02-10

Fig. 72 DMS: general view

16.1 Functional Description

The S3 data management system offers a variety of possibilities to make work safe and comfortable with S3. At the same time it permits extensive documentation of all relevant data. It is a pure data collection system and for safety reasons it never interferes with the S3-functions. The S3 data management system includes:

- a standard notebook with 486-processor, colour display, 8MB RAM, mouse or trackball and all necessary connections.
- a slewable plate for placing the notebook on top (may be installed at any desired place of the S3 mast system).
- the S3 monitor software with pre-, intra- and postoperative program part.
- a S3-interface DD and a S3-interface DA
- an interface cable to the data interface in the S3-console.

The essential features of the S3 data management systems are:

- All data available at the S3 will be automatically passed on to the processor and stored for later evaluations.
- A variety of data may be put in before and after the perfusion or may be taken over, calculated and stored by the clinic processor (pre- and postoperative data processing). Even during perfusion these data are always available on the screen. During perfusion events of any kind (times, critical conditions, administration of medicaments, fluid output, notes) will be stored synchronously upon key depression.
- Important data are always visible on the screen and may be grasped at a glance.
- The essential machine data is displayed in graphic form up for to 8 hours on the screen to visualize the time sequence (trend analysis).
- A user-specific perfusion record of the stored data will automatically be made.
- The perfusion sequence is displayed in the form of a graphic chart and likewise in the form of a table.
- All data and events are stored in a standard data bank format und may be further processed for statistic evaluations and for transmission to other processors, as depending on the requirements.
- The S3 monitor software has a networking capability.
- It is very easy to handle the S3 monitor software because of the integrated operator guidance.
- The S3 data management system even processes online data of external devices such as data of the blood gas analysis unit, patient monitors etc (A list of all external devices that can be connected will be supplied upon request.). These external devices will be connected to the processor via S3 data interfaces (see accessories). The notebook is equipped with an internal accumulator which carries the operation on in case of power failure. The notebook is easily detachable and not fixed to a certain place. The receiving plate for the notebook may be very easily installed at any desired place of the S3 mast system and may be swiveled to any working position. The overall concept of the S3 data management system is designed in such a flexible way that special customer requests are met to a very large extent.

16.2 Spare Parts

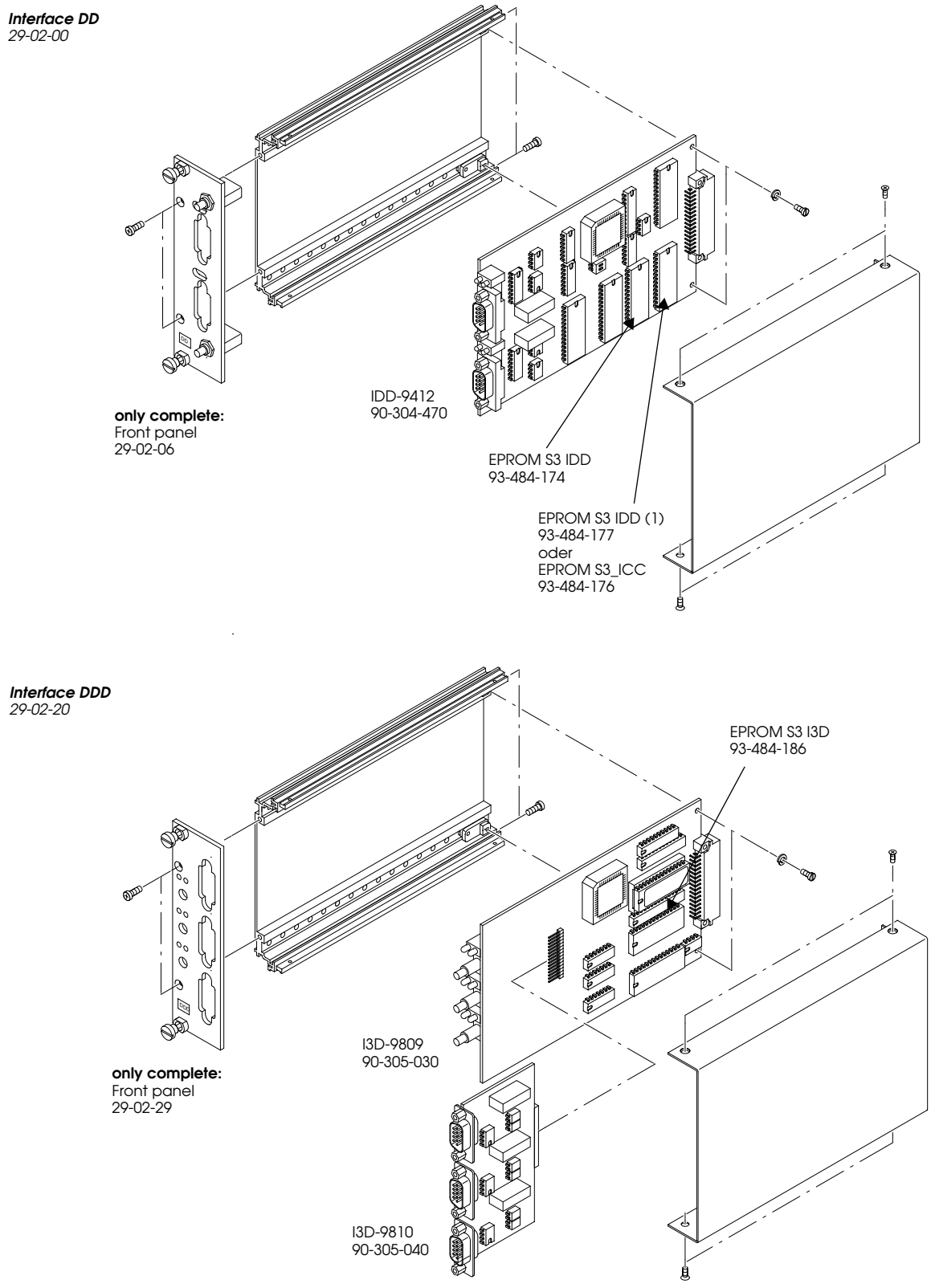


Fig. 73 DMS: spare parts 1

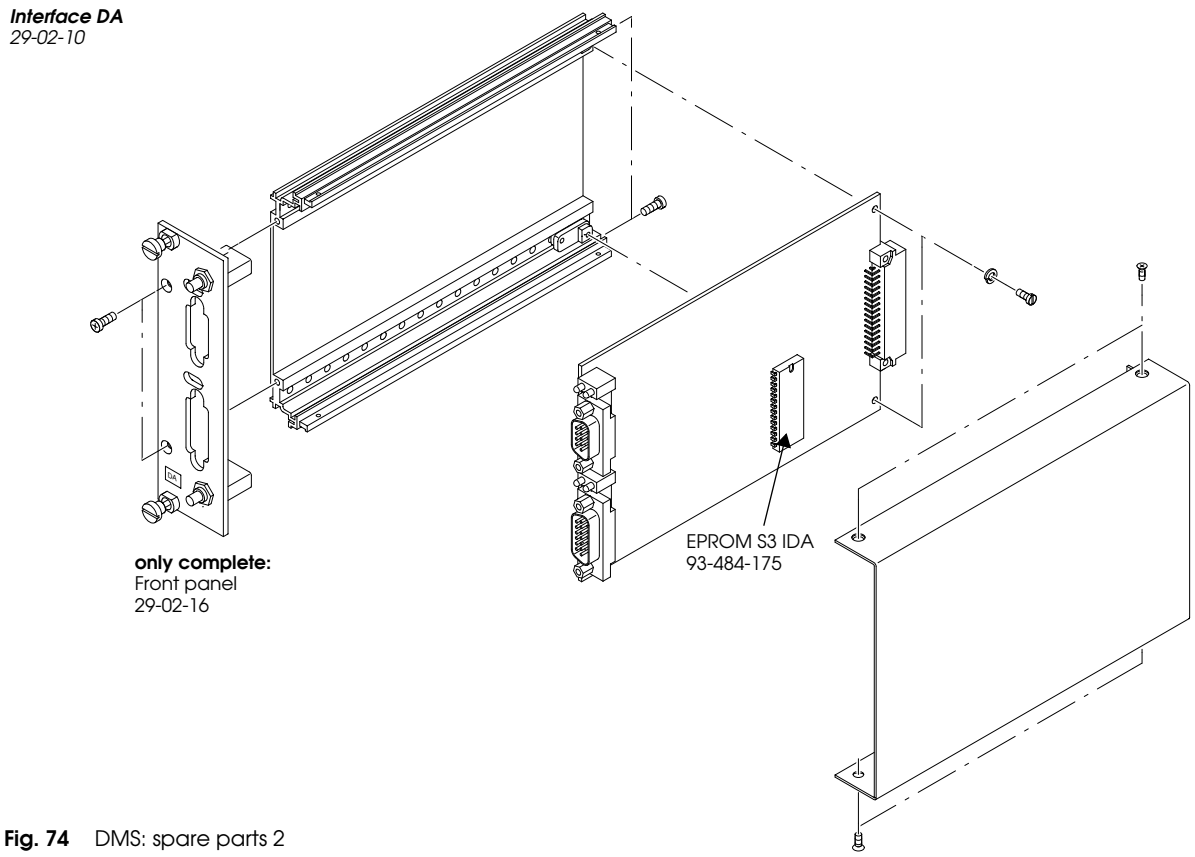


Fig. 74 DMS: spare parts 2

Connection Diagrams 17

18.1 Console, 43.xx.00

43-30-00	Console for three pumps
43-40-00	Console for four pumps
43-50-00	Console for five pumps
41-01-22	Hand Crank for Pump HLM
41-02-68	I.V. Rack
43-31-33	Pump table 3 modules
43-41-04	Position pin for pump console
43-41-34	Cable guide strip, compl.
43-41-41	Pump table 4 modules
43-41-43	Hand crank holder
43-41-45	Fold-down frontpanel, compl.
43-41-59	Retaining pin front cover
43-42-10	Pipe for mast
43-42-11	Mast holder
43-42-15	Telescope mast, movable (with horizontal guide mast)
43-42-19	Basic mast
43-42-20	Vertical mast, long (with telescope mast), complete
43-42-21	Vertical mast, short length: 230mm above pumphead level
43-42-26	Connecting mast
43-42-30	Pushbar right, compl.
43-42-35	Pushbar left, compl.
43-43-05	Pedal for caster brake, left
43-43-10	Pedal for caster brake, right
43-43-23	Position pin Biomed. plate
43-51-51	Pump table 5 modules
50-40-40	Cable-Box and turntable for console extension arm
50-41-00	MMP extension arm, compl.
50-41-26	Clamping segment
50-41-44	Cable channel
50-42-50	Mast-system, compl. for console extension arm
50-42-54	MMP Mast, long
50-42-60	MMP Mast, short
50-42-65	MMP connector mast
71-115-045	Allan screw (bottom), M6x12
71-115-058	Allan screw DIN912, M6x90
71-115-073	Allan screw (crossways), M8x45
71-120-504	Washer VA 6x4 A6,4
73-100-032	Snap-lock for front-Cover

73-501-051	Caster, w/brake
73-501-053	Console caster D=150mm, with brake
73-501-054	Console caster D=150mm, without brake
75-520-640	Plexi tray for 3 pump
75-520-641	Plexi tray for 4 pump
75-520-642	Plexi tray for 5 pump
97-102-605	Cable RDP3/ EP-pack extent. 0.75m
97-103-701	AC wiring assembly 220/240
97-103-702	AC wiring assembly 115 USA
97-103-703	AC wiring assembly 230 FRA
97-103-704	AC wiring assembly 230 CH

18.2 Control Desk Frame for 6/10 Units + CDM, 28-90-XX

28-90-07	Control desk 6 w/o module CD6
28-90-11	Control desk 10 w/o module CD10
28-90-05	Control desk 6 mech. parts CD6
28-90-09	Control desk 10 mech. parts CD10
28-90-15	Blank panel for unused slots
75-520-630	Mast sleeve for operator panel
75-520-632	Lockring for S3 operator panel
75-520-633	Ring for holder on S3 operator panel
90-304-110	ABP 9306 Bus 6-plug PAN3
90-304-480	AZB 9413 Bus card CD-10
96-401-011	Line Filter FN610
97-102-602	Cable control desk/ E/P-pack CD

18.3 Electronic-Block, 28-92-00 (complete) or 28-92-03 (without devices)

28-92-07	Dummy Plate elox cpl. 7TE SBOX
28-92-30	Plastic foot E/P-Pack SBOX
28-92-60	Fan exhaust hood, complete
28-92-68	Handle for module housing
90-304-090	SBP 9304 Bus wiring card SBOX
90-304-310	SPS 9326 Pump connection SBOX
90-304-380	SAS 9403 UPS switch card SBOX
90-304-430	SPP 9408 TSE back panel SBOX
92-215-689	Elytic Capacitor, 22000µF/ 40V
93-511-030	Glass Fuse, 10A/ slow 5x20
93-511-530	Glass fuse 20A/ slow 6x32
96-121-211	Rocker switch 2-pole 10A
96-205-122	SAS 9403Wiring connector
96-403-046	Transformer, BV 46436, ring-core SBOX
96-405-002	SLA Battery 12V / 17Ah LC-RC1217P (Panasonic)

96-406-021	Fan 4715KL-05W
97-103-710	Capacitor assembly with shunt
97-103-712	Heatsink assembly with fan
97-103-714	Pump connection strip assembly SBOX
97-103-718	Temperature-sensor PTC complete SBOX

18.4 Voltage Supply

18.4.1 Power Supply Module, 29-12-00

93-480-027	EPROM
	This module can only be ordered as a complete unit. Please provide AC voltage and frequency information, e.g., 220V/ 50Hz

18.4.2 DC/DC Module, 28-92-20

28-92-26	Frontpanel, DC/DC Module mech.
96-112-007	Pushbutton 1x2POS (I-Touch) WWR
96-121-206	Toggle with lock 1x2Pos (I-I) SDR

18.5 Emergency Power Supply

18.5.1 UPS-Control Module, 28-92-15

28-92-17	Front panel UPS module mech.
93-484-170	PRG EPROM UPS USV-Module SBOX
96-112-007	Button 1x2POS (I-Touch) WWR

18.5.2 UPS-Charging Module, SBOX, 28-92-80

28-92-86	Frontpanel UPS Charging mech.
96-112-007	Pushbutton 1x2POS (I-Touch) WWR
96-122-210	Pushbutton 2-pole Emergency ON
96-143-010	Circuit Breaker 3.0A P30
96-190-055	Pushbutton Cover Emergency ON

18.6 Battery Discharge-Adapter, 28-92-90

28-92-91	Housing for battery discharge adapter
75-520-505	Plastic foot for baseplates
91-215-019	Wire Resistor 3R3 10%, 200W
93-511-030	Glass Fuse, 10A/ slow 5x20
96-140-211	Temp.Switch 50°C R20A214
96-406-003	Fan 614 24V Papst RDP3
96-408-030	Relay 6531 N024V, Finder
96-531-006	Pump Foot Inset, adhes. D=10mm

18.7 External Power Supply for S3 Units, 29-15-00

43-41-04	Position pin for pump
90-304-550	PNT 9420, Power supply board
91-450-021	PTC Resist. B59901-D60A40
93-154-028	PSB 35/02 Rectifier
93-511-030	Glass fuse 10A/ slow 5x20
96-141-022	CRCT.BRKR.Switch 2.0A P7T1R09D
96-251-001	German AC-plug ST442GU
96-401-011	Line Filter FN610
96-403-047	Transformator BV47450 for PNT
96-406-003	Fan 614 24V (Papst)
96-510-001	Cable strain relief 5-7mm

18.8 Rollerpump, 10-60-00

18.8.1 Module housing

10-61-40	Holder for Pumphead, compl.
10-61-45	Pump insert retaining block, compl.
10-61-60	Pumphead with Sensors, compl. RP3
10-62-07	Rear panel
10-62-10	Pump cover RP3 compl. (old)
10-62-13	Pump cover, compl. type 2
10-62-14	Polyurethan ins. for cover RDP3
10-62-80	Module housing, mech. complete
10-63-02	Motor with toothed pulley
10-63-21	Reduction shaft
10-63-40	Toothed Drive Belt 255-09 RP3
10-63-41	Toothed Drive Belt 255-15 RP3
71-116-024	Screw cyl. M3x6
75-520-624	Holder for Insert Block RDP S3
90-304-320	PSE 9327 Pump Sensor plate RP3
96-531-004	Spacing stud rubber housing RP/DP
97-102-605	Cable RDP3/ EP-pack extent. 0.75m
97-102-605	Cable RDP3/ EP-pack extent. RDP3
97-103-605	Index sensor
97-103-607	Actual Value Sensor compl. RDP3
97-103-609	Cover open Sensor compl. RDP3
97-103-611	Temperature Sensor compl. RDP3

18.8.2 Front panel

10-60-54	Frontpanel with keyboard displ. RP3
10-60-55	Reduction drive
10-60-59	Speedpoti assembly 1:3
10-60-60	Frontpanel, compl.
28-91-75	Guide sleeve for knob
28-91-76	Set-Nut for knob
45-30-50	Tandempoti Testbox
71-120-514	Plastic washer 6.2x12
74-200-002	Loctite 243e
74-100-005	Polylub LY 801
90-304-340	RPM/LPM display
93-146-002	LCD-display
96-190-051	Knob
97-103-601	Speedpoti with harness compl.
97-103-604	Speedpoti for reduction drive 1:3 with harness compl.

18.8.3 Base plate (part 1, forward section)

10-62-06	Mounting bracket for switch
10-62-29	Plastic foot for module housing; new: 75-520-652
10-62-35	Electronic housing
10-62-50	Base plate with electronics, complete
73-100-173	Guide bead for boards
73-100-174	Track lock
75-520-652	Plastic foot for module housing
90-304-070	PKR 9302 Communications processor board
90-304-100	PBP 9305 Back plane bus board
90-304-140	PMS 9309 Motor control board
90-304-210	PDC 9316 DC/ Alarm board
93-480-025	UC 87C198 Microcontr. PMS
93-484-151	PRG EPROM
96-121-211	Rocker switch 2-pol., 10A
96-401-012	Line filter FN232 Z1005
96-531-005	Plastic foot adhesive, D=15.9mm
96-531-006	Pump Foot Inset, adhes. D=10mm
97-102-601	Cable pump-sensorbox

18.8.4 Base plate (rear section)

10-62-29	Plastic foot for module housing; new: 75-520-652
10-62-51	Base plate with fan complete
75-520-652	Plastic foot for module housing
96-406-003	Fan 614 24V Papst
96-531-005	Plastic foot adhesive, D=15.9mm
96-531-006	Pump Foot Inset, adhes. D=10mm

18.9 Double Head Pump, 10-65-00

18.9.1 Module housing

10-61-40	Holder for Pumphead
10-66-45	Tubing-insert retain block
10-66-60	Pump head mech/el. complete
10-66-80	Module housing, complete
10-67-10	Pump cover, complete (old)
10-67-13	Pump cover, compl. type 2
10-68-02	Motor GDM with toothed pulley
10-68-21	Reduction shaft
10-68-40	Toothed belt 1, 3MR-06
10-68-41	Toothed belt 2, 3MR-09
71-116-024	Screw cyl. M3x6
72-102-031	Polyurethane insert for cover
75-520-624	Holder for Insert Block
90-304-330	PSD 9328 Pump Sensor plate
96-531-004	Spacing stud rubber housing
97-102-605	Cable RDP3/ EP-pack extent.; 0.75m
97-103-605	Index Sensor compl.
97-103-607	Actual Value Sensor compl.
97-103-609	Cover open Sensor compl.
97-103-611	Temperature Sensor compl.

18.9.2 Front panel

10-60-55	Reduction drive for potentiometer
10-60-59	Speedpotentiometer assembly 1:3
10-65-54	Frontpanel, with keyboard display
10-65-60	Frontpanel, complete
28-91-75	Guide sleeve for knob
28-91-76	Set-Nut for knob
45-30-50	Tandempot Testbox
71-120-514	Plastic washer 6.2x12
74-200-002	Loctite 243e
74-100-005	Polylub LY 801
90-304-350	RPM/LPM display
93-146-002	LCD display
96-190-051	Knob
97-103-601	Speedpot with harness compl.
97-103-604	Speedpotentiometer for reduction drive 1:3

18.9.3 Base plate (part 1, forward section)

10-62-06	Mounting bracket for switch
10-62-35	Electronic housing
10-62-50	Base plate with electronics, complete
73-100-173	Guide bead for boards
73-100-174	Track lock
75-520-652	Plastic foot for module housing
90-304-070	PKR 9302 Communications processor
90-304-100	PBP 9305 Back plane bus card
90-304-140	PMS 9309 Motor control card
90-304-210	PDC 9316 DC/Alarm card
93-480-025	UC 87C198 Microcontr. PLCC52
93-484-181	PRG Eprom DPUMP-KP german
93-484-182	PRG Eprom DPUMP-KP english
93-484-183	PRG Eprom DPUMP-KP french
93-484-184	PRG Eprom DPUMP-KP italian
93-484-185	PRG Eprom DPUMP-KP spanish
96-121-211	Rocker switch 2-pol., 10A
96-401-012	Line filter FN232 Z1005
96-531-005	Plastic foot adhesive, D=15.9mm
96-531-006	Pump Foot Inset, adhes. D=10mm
97-102-601	Cable pump-sensorbox

18.9.4 Base plate (part 2, rear section)

10-62-51	Base plate with fan, compl.
75-520-652	Plastic foot for module housing
96-406-003	Fan 614 24V Papst
96-531-005	Plastic foot adhesive, D=15.9mm
96-531-006	Pump Foot Inset, adhes. D=10mm

18.10 Mast-mounted double head pump 50-65-00

10-66-60	Pump head with sensors, compl.
45-20-80	Special pliers for installing/ removing cables
50-40-01	MMP Control module
50-40-60	mast-mounted pump head housing
50-40-61	Mast holder
50-40-62	Mast holder clamping segment
50-40-63	Mast pump housing connector cover
50-40-68	Mast pump housing base plate
50-40-70	Mast pump housing
50-41-00	MMP Extension arm, compl.
50-41-26	Clamping segment

50-41-40	Cable holder for MMP, upper segment
50-41-41	Cable holder for MMP, lower segment
50-65-90	Color code set
75-520-686	Hinge, red
75-520-687	Hinge, blue
75-520-688	Hinge, red/grey
75-520-689	Hinge, blue/grey
75-520-695	Hinge, ref/blue
96-190-052	Knob for frontpanel, blue
96-190-053	Knob for frontpanel, red
96-190-054	Knob for frontpanel, grey
97-101-875	MMP Interconnect cable, 6-pin
97-101-885	MMP Interconnect cable, 26-pin

18.11 Central Display Module (CDM), 28-90-70

28-90-54	Frontpanel, with keyboard + display
28-90-67	Back panel for CDM, metallized
28-91-75	Guide sleeve for knob
28-91-76	Set-Nut for knob
72-103-034	O-ring
90-304-190	AZA 9314 CDM processorboard
93-146-003	LCD-display
93-484-169	PRG EPROM ZAB-A CDM display
96-190-051	Knob
97-103-602	Encoder SAE with harness
97-103-625	Lithium Battery with cable

18.12 Level Control/ Bubble Detector, 23-30-00

23-30-10	**Display Module, complete**
23-30-54	Frontpanel with keyboard/ display
28-90-24	Backpanel for display module
90-304-130	ABR 9308 Processor display
93-484-162	PRG EPROM, L/B-A display
23-30-20	**Sensor Module, complete**
23-30-26	Frontpanel LB mech. sensorbox
73-100-106	Shield housing 7TE
73-100-176	Circuitcard mounting bracket
90-304-290	SLB 9324 IL/B Processor and analog
93-484-163	PRG EPROM, L/B-S sensorbox
97-103-620	Bubble sensor-jack + harness
97-103-621	Level sensor-jack + harness

18.13 Dual Pressure Control, 22-10-00

22-10-10	**Display Module, complete**
22-10-54	Frontpanel with keyboard/ display
28-90-24	Back panel for display module, metallized
90-304-130	ABR 9308 Processor display
93-484-158	PRG EPROM DD-A display
22-10-20	**Sensor Module, complete**
22-10-26	Frontpanel DD mech. sensorbox
73-100-106	Shield housing 7TE
73-100-176	Circuitcard mounting bracket
90-304-020	SDD 9208 Processor board
90-304-270	SDR 9322 Processor board
93-484-159	PRG EPROM DD-S
96-240-024	DIN Jack 4-pin T330
41-04-10	Mounting for two pressure transducers
45-04-01	Bentley-Trantec pressure transducer

18.14 Temperature Monitor, 20-20-00

20-20-10	**Display Module, complete**
20-20-54	Frontpanel with keyboard/ display
28-90-24	Backpanel for display module
90-304-130	ABR 9308 Processor board
93-484-160	PRG EPROM TEMP-A display
20-20-20	**Sensor Module, complete**
20-20-26	TMP frontpanel mech.
73-100-106	Shield housing 7TE
73-100-176	Circuitcard mounting bracket
90-304-010	STE 9207 Processor board
93-484-161	PRG EPROM TEMP-S

18.15 Timer Module, 21-10-00

21-10-54	Frontpanel with keyboard/ display
28-90-24	Backpanel for display module
90-304-130	ABR 9308 Processor board
93-484-156	PRG EPROM TIM-A display

18.16 Cardioplegia Control, 27-70-00

27-70-10	**Display Module, complete**
27-70-54	Frontpanel with keyboard/ display
28-90-24	Backpanel for display module
90-304-130	ABR 9308 Processor board
93-484-164	PRG EPROM, PLEG-A display
27-70-20	**Sensor Module, complete**
27-70-26	Frontpanel PL mech.
73-100-106	Shield housing 7TE
73-100-176	Circuitcard mounting bracket
90-304-500	SLP 9415 Processor board
93-484-165	PRG EPROM, PLEG-S
96-240-024	DIN Jack 4-pin T330
97-103-620	Bubble sensor jack + harness
41-04-10	Mounting for two pressure transducers
45-04-01	Bentley-Trantec pressure transducer

18.17 Gas Blender System, 25-28-50

18.17.1 Electrictronic Gas Blender, 25-40-00 (10l), 25-40-57 (5l), 25-40-58 (2l)

This module may only be repaired by trained personnel at firma Stöckert!

25-40-12	Cover
25-40-60	Frontpanel, compl.
45-11-02	Cable gas monitor - E/P-pack
90-304-720	EAB 9603
90-304-730	EGD 9604
90-304-740	EGD 9605
93-484-179	EPROM, S3_EGB
97-103-083	Fan

18.17.2 Gas Blender Display Module, 25-28-70

25-28-54	Frontpanel with keyboard/ display
28-90-24	Backpanel for display module
90-304-130	ABR 9308, processor board
93-484-180	EPROM, S3_AGB <V2.0: only for 10l V2.0: for 2l, 5l and 10l

18.18 Gas Monitor System

18.18.1 Electrical Gas Monitor, 25-30-00

This module may only be repaired by trained personnel at firma Stöckert!

45-11-02	Cable gas monitor - E/P-pack
25-30-39	Pressure reduction valve

18.18.2 Gas Monitor Display Module, 25-28-65

25-28-54	Frontpanel with keyboard/ display
28-90-25	Backpanel for display module
90-304-54	ABR 9308, processor board
93-484-166	EPROM, S3_AGM

18.19 Pulsatile Flow Control PFC, 26-35-00

26-35-54	Frontpanel with keyboard/ display
28-90-24	Backpanel for display module
90-304-130	ABR 9308 Processor board
93-484-168	PRG EPROM, PFC-A display

18.20 Venous Line Clamp

Numbers of spare parts and accessories see page 133.

18.21 Water Mixer, 11-10-00

This module may only be repaired of trained personnel at firma Stöckert!

11-02-01	STK mast fastening assembly
11-10-03	STK cold water coupling, square
11-10-04	STK hot water inlet, square
11-10-06	STK warm water coupling, triangular
11-10-07	STK hot water inlet, triangular
73-300-005	STK manometer, mast version
73-300-007	STK thermometer E-65
73-300-018	STK output water tubing connector 90°
73-300-022	STK coupling 3/4"

18.22 Heater-Cooler

18.22.1 Heater-Cooler Basic Unit, 16-02-50

16-02-58	Tube drain valve
71-113-333	Round Head Screw, M4x6, Phillips Nr.2
73-501-051	Caster, with brake D=125mm
73-501-052	Caster, w/o brake, D=125mm
96-410-029	Knob for Drain Valve
96-410-501	ELB 013, Keyboard board
96-410-502	UL 458, Display board
96-410-503	UL 457, Control board
96-410-504	UL 456, AC-board
96-410-505	UL 459, Floater Switch board
96-410-506	UD 395, Fan Speed Control board
96-410-507	ETP 042 Temp. Sensor PT 500
96-410-508	EKS 043 Temp. Sensor Fan
96-410-509	ECA Motor capacitor, 5µF
96-410-510	Run Capacitor Compressor
96-410-511	Start Capacitor Compressor
96-410-512	EH 148 Heat Element, 230V 2kW
96-410-514	EEF 014 Fuse F1 0.8A
96-410-515	Clixon for Compressor
96-410-516	ES 002, Excess pressure switch
96-410-517	ES 041, Excess pressure switch, 0.4bar
96-410-518	ES 042, Excess pressure switch, 0.45bar
96-410-519	Start Relay Compressor
96-410-520	EM 103 Water Pump Motor
96-410-521	EM 039 Mixer Motor
96-410-522	Compressor
96-410-523	EM L 027 Fan Motor
96-410-524	EST 067 Mains Switch
96-410-525	EKN 008 Mains Cable
96-410-526	EKZ 035 Mains term. Strip
96-410-527	ERD 018, CAN Interface Jack
96-410-528	EVM 027 Magnetic Valve
96-410-529	Water tank cap
96-410-530	Cooling grid
96-410-531	Frontpanel with keyboard/ display
96-410-532	CAN-Jack cover
96-410-533	UYI 015 Microcontroller
96-410-534	UYI 016 Microcontroller
96-410-535	UYI 017 Microcontroller
96-410-536	EIT 091, Transformator T1
96-410-537	ER 036, Main relay (K1)
96-410-538	ER 035 Relay K2-4 UL 456

96-410-539	EAA 005, Buzzer B5-27A
96-410-540	Mains switch cover
96-410-541	Plug 90° for control cable
96-410-542	EEPROM, 85C92
96-410-543	Water drain valve, compl.
96-410-544	WKS UD351, Pump bridge, compl.
96-410-545	EZV 016, Cover gasket for measurement port

18.22.2 CAN/24V-Module, 28-93-25

28-93-31	Frontpanel CAN-IS/ 24V mech.
90-304-630	STV 9507 CAN-Isol./ 24V

18.22.3 Remote Control for Heater-Cooler , 16-30-00

16-30-54	Frontpanel with keyboard/ display
28-90-24	Backpanel for display module
90-304-130	ABR 9308 Processor board
93-484-172	PRG EPROM, HYPO-A display

18.23 Data Management System (DMS), 24-10-50

29-02-00	**Interface Digital/ Digital, komplett**
29-02-06	Frontpanel IDD mech.
90-304-470	IDD-9412
93-484-174	PRG EPROM IDD-S
93-484-176	PRG EPROM ICC-S
93-484-177	EPROM, S3_IDD
29-02-10	**Interface Digital/ Analog, komplett**
29-02-16	Frontpanel IDA mech.
93-484-175	PRG EPROM IDA-S
29-02-20	**Interface Digital/Digital/Digital**
29-02-29	Frontpanel IDA mech.
90-305-030	IDDD 9809
90-305-040	IDDD 9810
93-484-186	EPROM, S3_IDDD
24-00-70	**Notebook**

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