Perfusor® compact

Service Manual

Version 2.1 english

B BRAUN
SHARING EXPERTISE

This Service Manual is valid for

Designation	Part No.:
Perfusor® compact (230 ...240 V, Euro cable)	0871 4827
Perfusor® compact (230 ...240 V, BSI cable)	0871 4828
Perfusor® compact (100 ... 120 V)	0871 4835

This Service Manual is available under the following part number:

Designation	Part No.
Service Manual Perfusor® compact, english	8713 9112

Languages of this Manual

The Service Manual for this unit can be supplied in the following languages:

Designation	Part No.
Service Manual Perfusor® compact, german	8713 9111

The complete Service Manual contains the following pages:

Table of Contents

0

0 Table of Contents

Service Work

The present manual is for your information only. The possession of this manual does not authorize the performance of service work. Service tasks may only be executed by persons, who

- have received appropriate training on the system from B. Braun
- are included in the revision service
- possess the necessary test equipment and mechanical aids, and
- fulfill the personal requirements (training and knowledge).

Technical Safety Checks

The user is obliged to perform or to have performed the Technical Safety Checks on those medial products for which these checks have been prescribed by the manufacturer and to carry them out according to the indications of the manufacturer as well as the generally approved technical standards while adhering to the periods stated (§ 6 MP BetreibV).

B. Braun also recommends training on the Technical Safety Checks, or to perform at least the steps indicated in the current version of the manual, as:

- the TSC requires that the instructions in the manuals are observed
- the manuals are a reference for measurements
- depending on the unit type, the Service Program must be called which may lead to a dangerous unit condition in case of inappropriate operation. Furthermore, a special service connector may be necessary.

Current Versions

This manual version corresponds to the state when the manual was written. B Braun reserves the right to make technical modifications. The state of the revision is indicated by the index number in the footer of every page.

Revision Service

The possession of this manual does not automatically mean inclusion in the revision service. You will be included in the revision service after:

- technical training by B. Braun Melsungen or
- a written order placed with the sales department of B. Braun (fee required).

Responsibility of the Manufacturer

The manufacturer, person who assembles, installs or imports the device can only be held responsible for safety, reliability and performance if

- mounting, enhancements, new settings, changes or repairs are carried out by duly authorized persons,
- the electrical installation in the corresponding room meets the requirements of the VDE 0107, VDE 0100 part 710 or IEC 60364-7-710 and the national standards,
- the device is used in accordance with the instructions for use and the Service Manual,
- the Technical Safety Checks are performed at regular intervals,
- a current manual which corresponds to the revision state is used when carrying out maintenance, repair and service,
- the service technician takes part in the revision service,
- the technician has participated in a technical training course for the specific B. Braun unit.

Quality Management

B. Braun is certified in accordance with DIN EN ISO 9001 and ISO 13485. This certification also includes maintenance and service.

The unit has the CE label. The CE label confirms that the device corresponds to the "Directive of the Council for Medical Products 93/42/EC" of June 14, 1993.

Checks and Repair

Training may only be performed by B. Braun. The possession of the manual does not authorize the performance of repairs. The instructions on electrostatic sensitive components (ESD standards) must be observed.

After repair a device check or diagnosis is to be carried out.

Notes on ESD

Semiconductors can be destroyed by electrostatic discharge. Especially MOS components can be damaged by interference from electrostatic fields, even without discharge via contact. This type of damage is not immediately recognizable. Unit malfunctions can even occur after a longer period of operation.

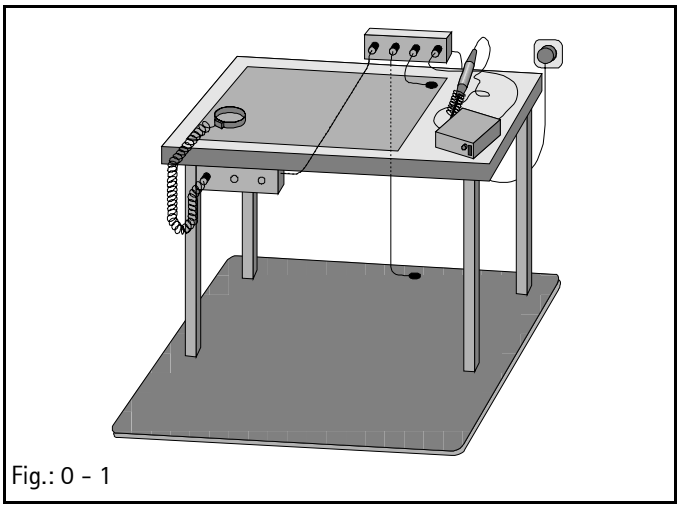


Fig.: 0 - 1

Each workstation must be equipped according to the recommendations with the necessary static protective measures, if ESD components or boards are handled.

Each workstation must be equipped with a conductive table surface. The conductive surface, the soldering iron or the soldering stations must be grounded via protective resistors.

Chairs must be of antistatic design. The floor or floor mats should be of electrically conductive material.

Personnel must wear conductive wristbands which are connected to a central ground potential via protective resistors, e.g. the ground contact of a wall outlet. Furthermore it is recommended that personnel wear cotton clothing and electrically conductive shoes to prevent electrostatic charge.

Spare Parts and Test Equipment

Only use original spare parts from the manufacturer. Do not tamper with assembly groups which can only be exchanged completely. The spare parts required are listed in Section 9.

Service personnel are responsible for the calibration of their test equipment. Original test equipment can be calibrated at the works of B. Braun. Further information is available upon request.

Setting Off

Additional notes and warnings are set off as follows:

Note

Is used for additional or special notes concerning information and working steps.

CAUTION

Is used for working steps which may result in damage to the unit, system or to a connected device.

WARNING

IS USED FOR WORKING STEPS WHICH MAY RESULT IN PERSONAL INJURY.

References to chapters are shown as follows
(see "Setting Off" ➨ pg. 0 - 8)

References to figures and tables are shown as follows
Fig.: 2 - 3 or Table 2 - 1

References to item numbers in figures are shown as follows (Fig.: 1 - 1 / Item 1)
In this case "Fig.: 1 – 1" is the figure number and "Item 1" the item number within the figure.

When the Service Manual is stored as pdf-file, these references are displayed green. Click with the mouse button on a reference to jump to the corresponding source.

Menu commands are described as:
Menu ***File***.

List of Abbreviations

Abbreviations which are not generally known, but are used in this manual, are listed below.

A-Module	Analog Module
E-Module	Electronic Module
ESD	Electrostatic Discharge
IfU	Instructions for Use
LCD	Liquid Crystal Display
MFC	Multi-Function Connector
PS-Module	Power Supply Module
TSC	Technical Safety Check
TEMP	Temperature

Contact Persons 0

Technical Training

Via local representative.

Entry for Technical Training

Application for a technical training course must be made via the responsible representative.

Ordering of Spare Parts and Test Equipment

Please contact your local B. Braun subsidary.

International Technicians (Intercompany)
Nadja Machal
Fax: +49 5661 / 75 -47 89
e-mail: nadja.machal@bbraun.com

Service Hotline

Karl Tippel, Tanja Kördel
Phone: +49 5661 / 71 - 35 25
Fax: +49 5661 / 71 - 35 26
e-mail: karl.tippel@bbraun.com
e-mail: tanja.koerdel@bbraun.com

Return of Spare Parts and Test Equipment

B. Braun Melsungen AG
Schwarzenberger Weg 73-79
Wareneingang Werk C
34 212 Melsungen
Germany

Safety Officer (§ 30 MPG)

Dr. Dirk Woitaschek
e-mail: dirk.woitaschek@bbraun.com

Translation

PAS GmbH, Brückner GmbH, Germany

Contact Persons

For your notes:

System Overview 1

Physical Construction

The Perfusor compact is a compact, stacking, portable and lightweight syringe pump which is used for precise dosing of small to high volumes of fluids in infusion and alimentary therapies.

The standard delivery rate range is 0.1 to 99.9 ml/h (in increments of 0.1 ml/h).

All important information is displayed on an LC-display. The device is easy to operate via the membrane keyboard. The syringes are changed semi-automatically, the function process and monitoring is microprocessor controlled. The Perfusor compact has a long service life and is easy-to-service due to its modular design. Individual modules can be replaced easily and quickly, and the Service Program runs on a PC.

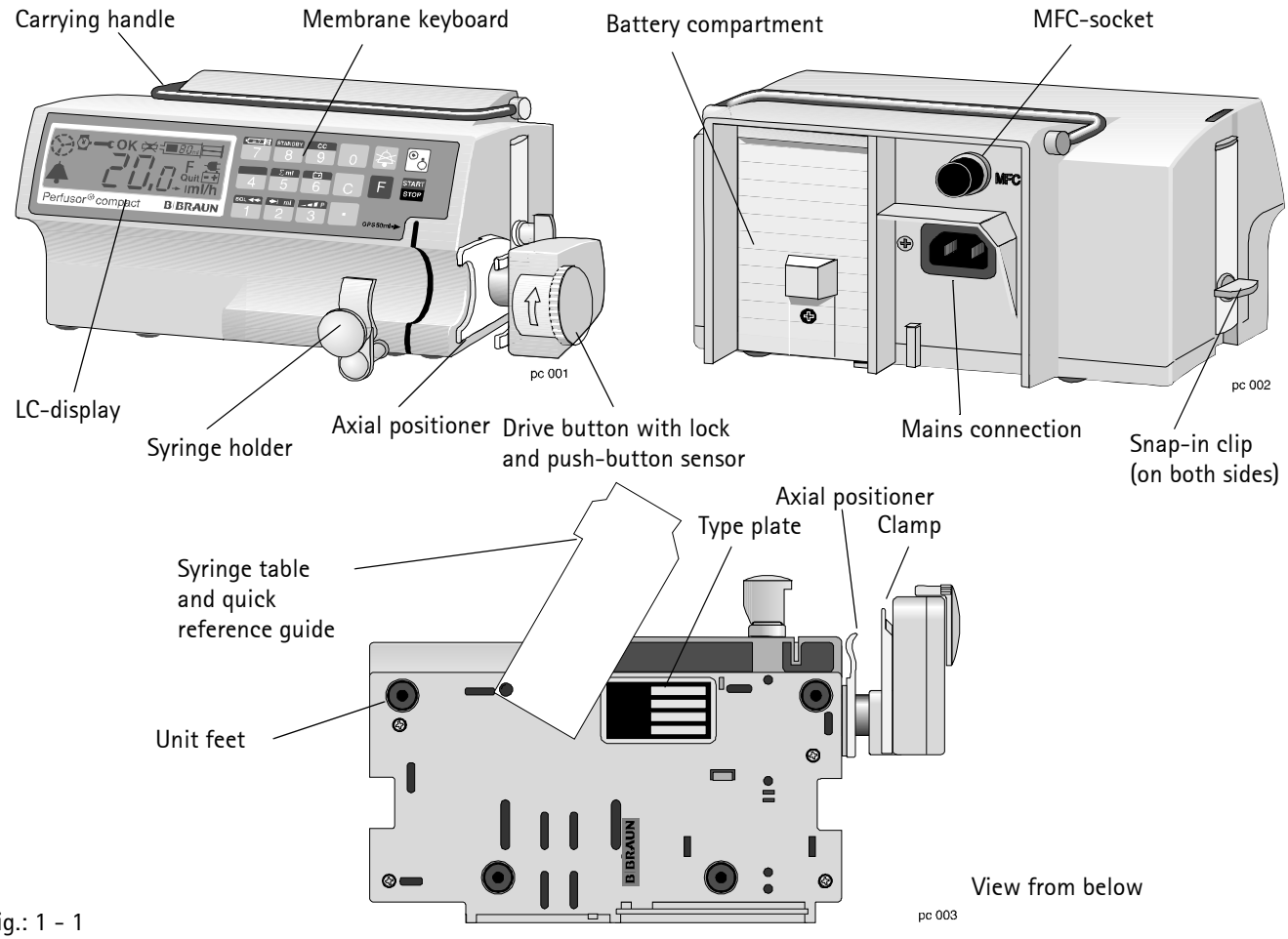


Fig.: 1 - 1

Function

The electronics of the Perfusor compact consists of the following components:

1. A-Module with MFC board as the central power supply and interface
2. E-Module as operating and control unit
3. Drive unit, consisting of
   - drive board with the complete sensor technology, light barriers for syringe pre- and end-alarm, syringe size recognition and motor operation control
   - push-button sensor board for the inserted syringe
   - positive locking sensor board for the frictional connection between nut and spindle of the drive.

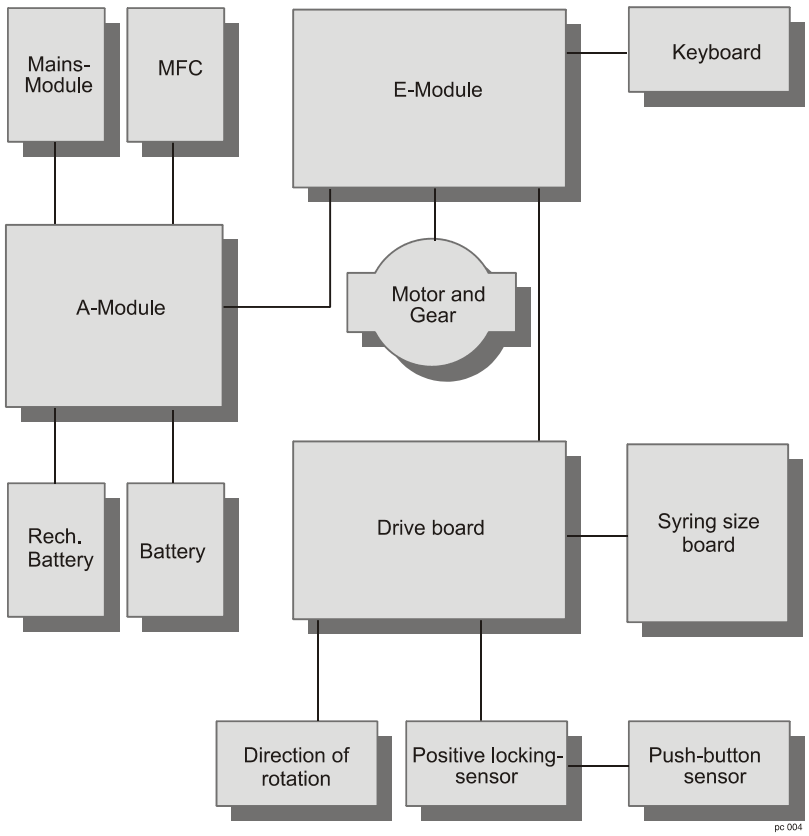


Fig.: 1 - 2 Block diagram

Accessories

Designation	Ord. No.
Unit connecting lead 200-240 V	3450 2718
Unit connecting lead 100-120 V.	3450 5423
Pole clamp (universal clamp, rotating)	3450 9054
Battery pack	3450 1690

For your notes:

Software 2

Approved Software Versions

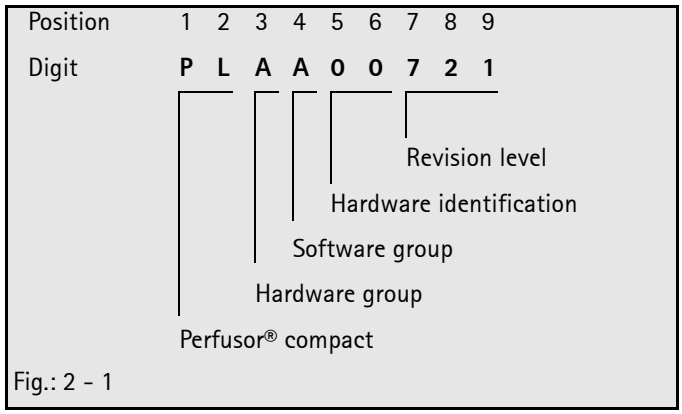


Fig.: 2 - 1

The software and hardware revision level is displayed on the LC-display when the unit is switched on. The characters on the display must correspond with the indication on the instructions for use.

The software can only be updated by replacing the E-Module.

Unit Software

PLAA00035.5	PLAA00070.0 (Dianet^{Star})
PLAA00040.0	PLAA00071.1 (Dianet^{Star})
PLAA00041.0	PLAA00072.1 (Dianet^{Star})
PLAA00063.3	

Version Display during Switch-On Test

1. Switch on unit.
2. The following information is displayed one after the other on screen:

   888.8

   111.1

   222.2

   555.5

   AA — Reference to the instructions for use (hard- and software group)
3. The Perfusor® compact switches over to normal operation.

Extended Version Display during Switch-On Test

1. Switch on unit.
2. Press the F button and keep the button pressed during normal switch-on test. The following information (examples) appears on screen after the information displayed during normal switch-on test:

   00 — Hardware identification

   0711 — Software version

   1234 — 1234 operating hours

   9999 — Maintenance interval timer
3. Release the F button to exit. The Perfusor® compact switches over to normal operation.

Error Messages and Alarms

In case of a unit malfunction a continuous signal is activated, and the function processor displays an alarm and an error code. The error code of the control microprocessor can be queried with the F button. Please state both error codes if you have any questions. Acknowledge alarm and switch device off.

Device Alarms of the Function Processor

LC-Display	Description
1	Different syringe recognition
2	Different FP- and CMP condition
3	Rate of FP- and CMP different
4	Different function mode
5	Different rate of delivery
6	Different target volume
7	Different step volume (low)
8	Different motor steps
19	State/motor state
20	Invalid normal state
21	return from PlcMain
22	Unexpected reset
28	No sync at Plc_Down
29	No sync at Plc_On
30	Different CMP/FP mode ports
31	Invalid mode ports
32	Invalid variable values
33	Error in ROM test
34	Different software version
40	Unexpected interrupt
49	Faulty sensor sync
51	Motor on during reverse run
52	Step cumulation > 10 steps
53	Illegal setting of Mot_Ok
54	Different recognition of direction of rotation
55	Reverse polarity of motor

Table 2 - 1 (Part 1 of 2)

LC-Display	Description
56	Invalid syringe
57	Overflow of motor step counter
59	No sync at Mot_Test
61	Different SW button NEC<>H8
62	Timeout KBD watchdog
63	Error in switch-on test
70	Control timer overflow (int)
71	Control timer underflow
72	Control timer overflow
73	100 ms cycle overflow
75	Tim_WaitUntil overflow
81	Error upon reading of EEPROM
83	Error of EEP data consistency
84	Ad difference between NEC/H8
85	Bw difference between NEC/H8
86	Md difference between NEC/H8
90	Syringe state in Oper_Syr
91	Set syringe type
92	Consistency error
93	Difference between setting and display
94	Timer synchronization
100	Division by zero
101	Illegal zero pointer
102	Illegal switch to default
105	No contact to NEC in OFF
110	Alarm on CMP side
111 ... 119	Motor test 1 ... 9
120	Motor current flow in OFF
121	Battery discharged during test
125	ASSERT error
126	Alarm synchron. (coming)
127	Alarm synchron. (going)
248	Motor test 8 from NEC
251	NEC: Battery discharged during test

Table 2 - 1 (Part 2 of 2)

Device alarms of the control microprocessor

LC-Display	Description
128	Unexpected reset
129	Unexpected hardware interrupt
130	Access of zero pointer
131	Attempted division by zero
132	Internal software error
134	State/motor state
135	Invalid variable values
136	Invalid operating condition
137	Illegal mode – port value
138	H8 indicates GA F14_H8GA_K16
150	Different software versions
151	Double CRC error
153	Different states
154	Different rates
155	Different F-mode
156	Different mode values
157	Different alarm recognition
158	Different alarm clearance
159	Err. current volume
160	Err. preselected volume
161	Err. volume per step
170	Sensor sync. failed
171 ... 174	Sensor - dark test error
180	ROM test error
181	RAM test error
182	Keyboard test error column
183	Dynamic memory test
184	Motor test no sync
185	Keyboard test error
186	Timer test error
187	CPU test error
188	Battery test error
191	Different software buttons

Table 2 - 2 (Part 1 of 2)

LC-Display	Description
192	Keyboard timeout error
200	Cycle > 100 ms
202	Time > Until
203	Watchdog interrupt
204	Error when waiting for H8
205	Time-out when switching H8 on
206	Time-out when switching H8 off
207	No sync at Plc_Down
208	No sync at Plc_On
209	CMP/FP timer – end sync error
220	Different phases (busy)
221	Different phases (idle)
222	Motor on at reverse steps
223	Too many pending steps
224	Motor current error
225	Error of motor step number
226	Reverse polarity of motor
227	Motor steps overflow
230	Different syringe recognition
231	CMP/FP syringe state
232	CMP/FP syringe type set
241 ... 249	Motor test 1 ... 9 errors
250	Motor ON in OFF-mode
251	Battery voltage low

Table 2 - 2 (Part 2 of 2)

Note

Operating alarms are specified in the instructions for use.

For your notes:

Service Program 3

Software Compatibility

Designation	Ord. No.
Interface cable	0871 1661

Compatibility

Unit Software	Service Program	Ord. - No.
PLAA00035.5	5.3502	
PLAA00040.0	5.4003	
PLAA00041.0	5.4003	
PLAA00063.3	5.5004	3450 7302
PLAA00070.0 (Dianet^{Star})	6.0001	3452 0473
PLAA00071.1 (Dianet^{Star})	6.0001	3452 0473
PLAA00072.1 (Dianet^{Star})	6.0001	3452 0473

Note

The following description refers to the Service Program version 6.0001.

Introduction

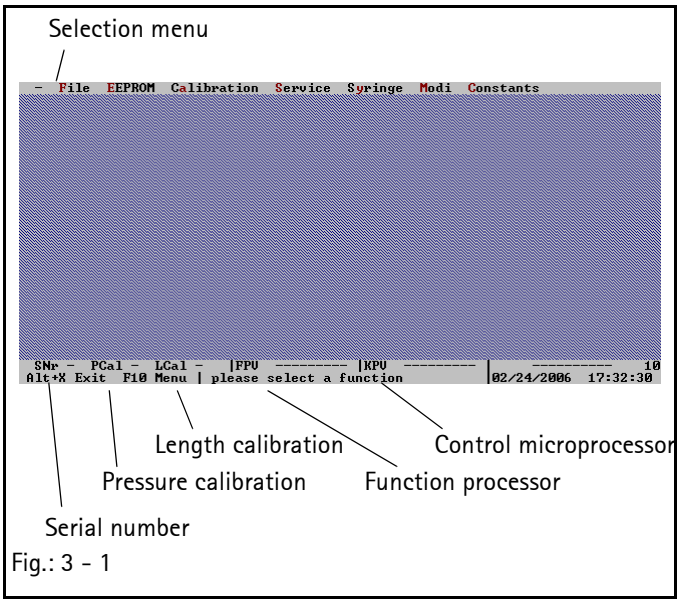


Fig.: 3 - 1

The Service Program runs on a PC. All functions are easy to operate in the pulldown-menus as in Windows.

The special keys on the keyboard have the following functions:

-	ESC	Escape
-	F1	Start
-	F2	Default EEPROM
-	F3	Read-out EEPROM
-	F4	Serial number
-	F5	Length calibration
-	F6	Pressure calibration
-	F7	Write EEPROM
-	F8	Save
-	Alt + A	Alternatively: Alt + bold letter
-	Tab	to jump to a field
-	<	to move the cursor
-	>	to move the cursor

WARNING

NEVER RUN SERVICE MODE WHEN A PATIENT IS CONNECTED! DO NOT CONNECT THE MFC SERVICE CONNECTOR OR THE SERVICE CABLE WHEN A PATIENT IS CONNECTED TO THE UNIT! FIRST SWITCH THE UNIT OFF BEFORE ANY FURTHER USE AFTER WORKING WITH THE MFC SERVICE CONNECTOR. CARRY OUT A CHECK ACCORDING TO THE PROCEDURAL INSTRUCTIONS FOR INSPECTION AFTER THE SERVICE PROGRAM WAS RUN (see „Procedural Instructions for Inspection after Modifications via the Service Program" ➨ p. 3 - 11).

When the Service Program is installed and the PC is connected to the Perfusor compact, the following functions can be executed:

- Drive calibration
- Reading / loading pump data
- Displaying operation values
- Displaying and changing parameters
- Documentation of pump hardware modifications
- Saving all data to a diskette, hard disk or similar

Installation

1. Insert diskette.
2. Start the File Manager or Windows Explorer.
3. Start Setup.exe with a double-click. The directory C:\PLC_SERV is created automatically by the program. Calibration and default data is also saved in this directory (if no other directory is specified). The directory name can be changed without any problems.

Note

The system configuration of the PC is not changed when the Service Program was installed.

Uninstall

1. Delete the Plc_serv.exe file to uninstall.

Note

If the complete directory PLC_SERV is deleted all unit data is deleted from the PC.

Configuration

1. Select the language, interface and the screen display desired in the *File* ➨ *Configuration* menu.
2. Acknowledge with *OK*.

Working with the Service Program

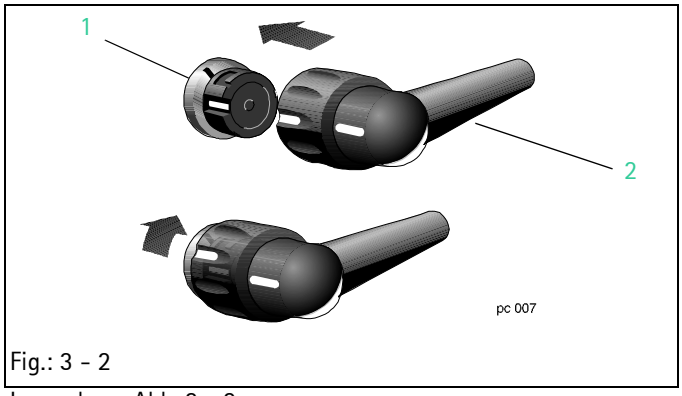


Fig.: 3 - 2

Legende zu Abb. 3 - 2:

Item	Designation
1	MFC connector on the unit
2	MFC service cable

Preparation

1. Connect service cable (Fig.: 3 - 2 / Item 2) to MFC connector (Fig.: 3 - 2 / Item 1) and the PC serial port (COM 1 or COM 2).
2. Connect mains cable to the unit.
3. Start the Service Program on the PC.
4. To start communication press the ON key on the Perfusor® compact until „Release On/Off key" is displayed on the PC. and are displayed on the LC-display.

Display / Save the Unit Settings

1. Menu *File* ➨ *Connect*.
2. Menu *EEPROM* ➨ *Read*.
3. Menu *File* ➨ *Save*.
4. Call menu *Modes* ➨ *Modification* and menu *Syringes* ➨ *Syringe selection* or *Syringe types*. Note down parameters prior to any modification (e.g. new E-Module).

Adjust Unit Settings

1. Menu *File* ➨ *Connect*.
2. Menu *EEPROM* ➨ *Read*.
3. Desired modifications / display, please see:
   - *Operation* ➨ *Operation values*
   - *Modes* ➨ *Modification data*
   - *Calibration* ➨ *Pressure calibration* (required in case of bolus rate change)
   - *Syringes* ➨ *Syringe selection* or *Syringe types*
   - *Constants* ➨ *Service interval*
4. Menu *EEPROM* ➨ *Write* transmits data to the device. Menu *File* ➨ *Save* saves the data on the hard disc.
5. Enter the user number 0 upon query.
6. Check unit according to the procedura instructions for inspection (see „Procedural Instructions for Inspection after Modifications via the Service Program" ➨ p. 3 - 11).

Unit Calibration

The unit is to be calibrated (see „Unit Calibration" ➨ p. 3 - 14) after the E-Module or the drive was replaced or the bolus rate was changed.

Defaut Data

The Service Program contains the Default.dat file with the factory settings of the unit. These values can be adjusted via the Syringe or Modes menu if required.

Max. delivery rate (basal rate)	99.9 ml/h
Bolus rate	800 ml/h
Staff call	dynamic with Off-alarm
Alarm tone	0 (3 Hz interval tone)
Pressure stage	3
Dianet address	1
Syringe selection	Table
Service interval	20440 hrs.

What to Do if (Trouble Shooting)

... the length calibration does not start?

Could communication be started successfully? Does the motor still not start?

Then: Select Termination. Switch off pump. Repeat communication start. Switch pump on again.

... the communication to the pump is missing?

Is the service cable connection okay? Is the MFC correctly connected?

Then: Select Termination. Switch off pump.
Repeat communication start. Switch pump on again.

... the communication cannot be started?

Was the setting in the File / Configuration file (COM 1 oder 2) menu selected correctly? Is the service cable connection okay? Is the MFC correctly connected?

... the communication starts and is then interrupted?

Then: Press the ON-key on the Perfusor compact until the symbols and disappear.

... the unit does not accept any syringe after a service was carried out?

Is syringe selection set to „free type", but „free type" was not loaded?

Then: Set syringe selection to table / OPS or load corresponding syringe.

Menu Description

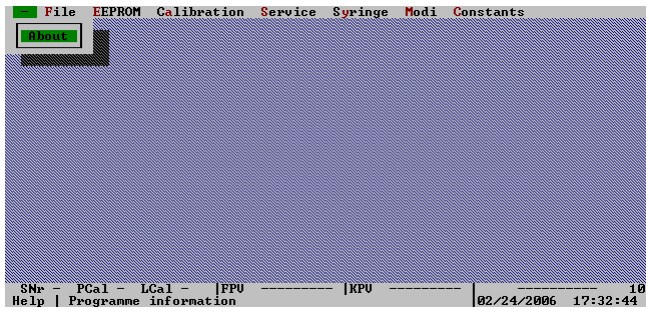


Fig.: 3 - 3

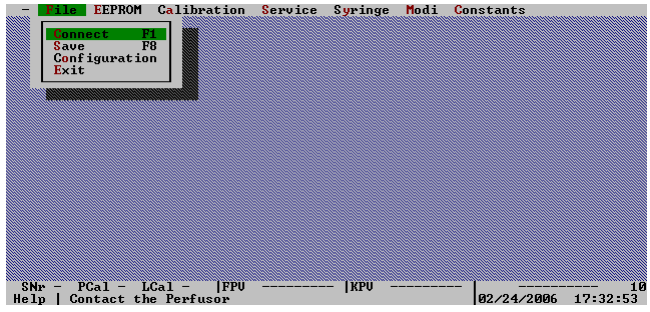


Fig.: 3 - 4

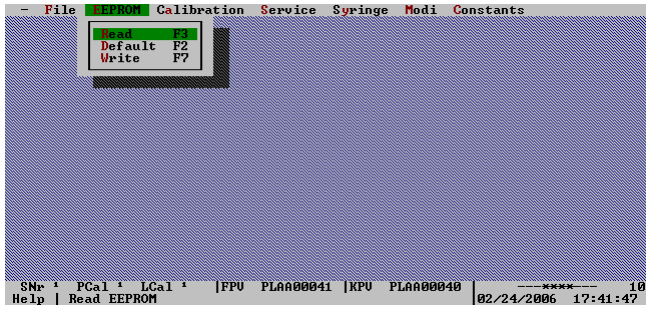


Fig.: 3 - 5

Info Menu

1. Version number of the Service Program

   Click on the line before ***File***, then click on ***Info***.

File Menu

1. ***Connect*** (F1)

   Starts communication with the Perfusor® compact.

2. ***Save*** (F8)

   Saves the unit data, e.g. on the hard disk. Enter the user number 0 upon query.

3. **Configuration**

   To select the language, interface and the screen display desired. Changed parameters are saved in the PLC_SERV.CFG configuration file.

4. **Exit**

   Exits the Service Program.

EEPROM Menu

1. ***Read*** (F3)

   The data of the Perfusor® compact can be checked and modified in the Service Program after they were read out.

Note

The hyphens after the menu items SNr, DAbg and LAbg in the footer are deleted and replaced by the figure 1. This means that calibration data is now transmitted to the program.

2. ***Default*** (F2)

   Loads data of the Default file in the Service Program and overwrites all previous settings. Therefore, settings which can be changed should be read out and noted down (see „Checklist after Operation of the Service Program" ➨ p. 3 - 16). Recalibrate the unit and enter serial number.

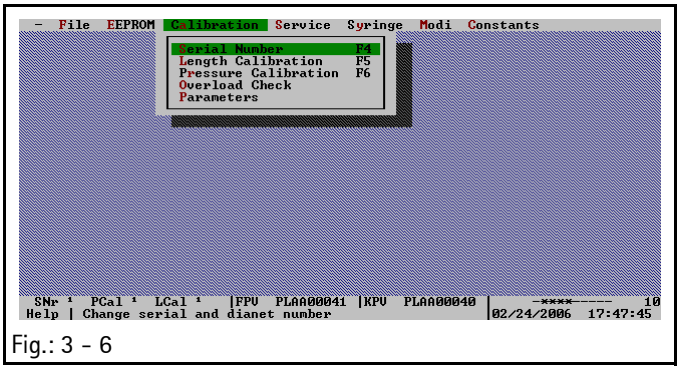


Fig.: 3 - 6

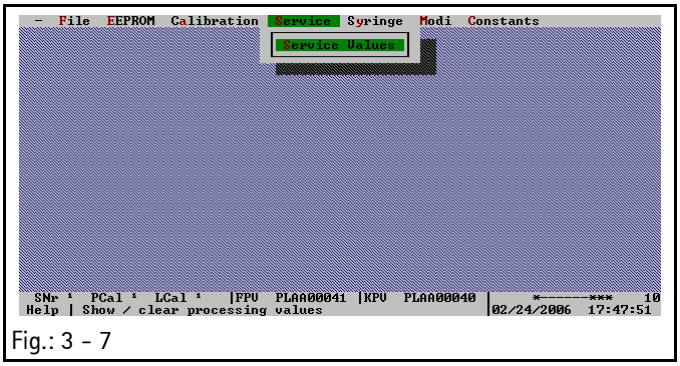


Fig.: 3 - 7

3. ***Write*** (F7)

   The modified values must be loaded in the Perfusor® compact after calibration, modification of data or the serial number was input. The status displays „SNr", „DAbg" and „LAbg" must be ticked. Writing of data is acknowledged by „Writing completed successfully". Save the modified data with Menu / File and store on a storage medium if necessary.

Calibration Menu

(see „Unit Calibration" ➨ p. 3 - 14)

1. ***Serial Number*** (F4)

   Enter the serial number when the E-Module is exchanged as otherwise the EEPROM cannot be written (Dianet type = 1200).

2. ***Length Calibration*** (F5)

   The position of the prealarm light barriers and the drive end is determined by length calibration. The motor steps determined are displayed after calibration is terminated.

3. ***Pressure Calibration*** (F6)

   The motor parameters for setting the 3 pressure stages and the correct switch-off in bolus mode is determined by pressure calibration.

4. ***Overload Check*** (see „Overload Check" ➨ p. 3 - 15)

   The dynamic pressure test is used to determine whether the unit was damaged after having been dropped, due to a shock or impact or when the drive head was dismounted. The drive must build-up a pressure of ≥1.6 bar, and the positive locking sensor must not open.

5. ***Parameters***

   Displays the calibration parameters.

Operation Menu

1. ***Service Values***

   The service values are displayed. These values cannot be changed. When the default data was specified the service values are set to zero.

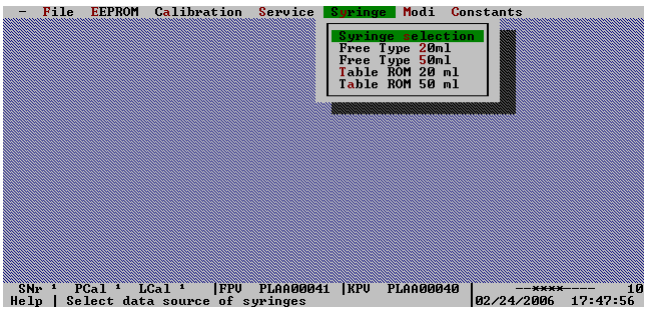


Fig.: 3 - 8

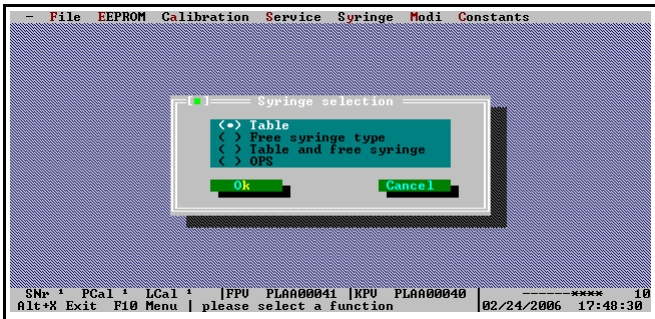


Fig.: 3 - 9

Syringe Menu

1. Syringe selection

   Selection of the syringe types which can be used with the Perfusor® compact.

   - Table

     Allows to select all syringe types saved in the Perfusor® compact.

   - Free type

     Only the free syringe types can be used (can be loaded).

   - Table and free type

     Allows to select all syringe types which are saved and can be loaded in the Perfusor compact.

   - OPS

     Defines that only OPS 50 ml and OPS 20 ml syringes can be used.

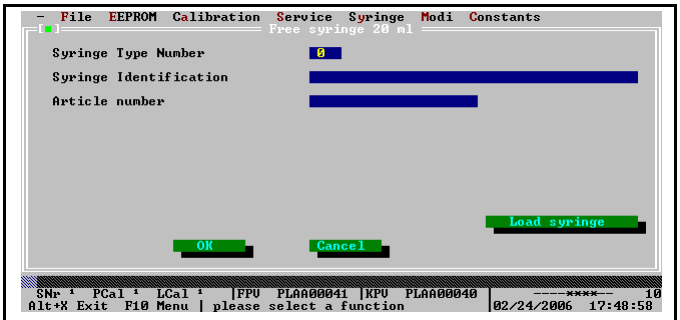


Fig.: 3 - 10

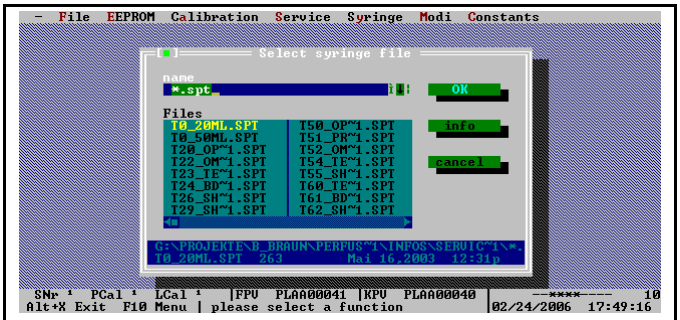


Fig.: 3 - 11

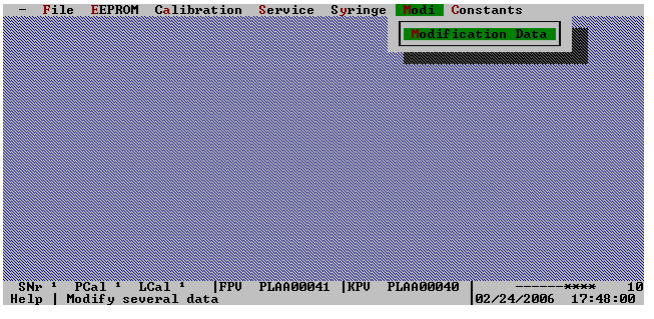


Fig.: 3 - 12

2. Free 20ml and 50ml type

   The files that can be loaded for setting free syringe types are saved in the directory of the Service Program or are available from B.Braun.

   - Reloading free types
     Select syringe types which can be reloaded from the file list. Then load the corresponding type. The data is displayed when the type was loaded. Note the syringe type number and the syringe type on the unit to ensure a clear assignment. The article number and the syringe type are only displayed after loading. Nothing is displayed under "Version, free 20ml/50ml types"!
   - Deleting free types
     Reload the 20ml_0.spt or 50ml_0.spt file with zero-value syringes. Now, the corresponding free syringe type is deleted. If necessary adapt the syringe selection (e.g. when the selection was set to "Free type", but all free types were deleted).

Note

Adapt the syringe table after all modifications were carried out (see „Syringe Table and and Quick Reference Guide" ➨ p. 4 - 5)

3. ROM 20 ml/ ROM 50 ml table

   Display of the syringe types saved in the Perfusor compact ROM.

Modes Menu

1. Modification data

   Display and setting of:
   max. basal rate, bolus rate, staff call, alarm tone, pressure stage, last syringe type and Dianet address.

   Alarm tone setting:

   - For units with unit software up to PLAA00063.3 (Service Program version 55004):
     0 = continuous tone with 3 Hz intermittent
     1 = continuous tone
     2 = continuous tone with modulation 2.4 kHz
     3 = continuous tone with modulation 4.8 kHz
     Do not use mode 3.

- For units with unit software up to PLAA00071.1:
  (Service Program version 6.001)
  0 = continuous tone with 3 Hz intermittent
  1 = continuous tone

Note

Please pay attention to the notes given with the staff call cable.

CAUTION

The pressure stage which was set last and the syringe type that was selected last are overwritten with the pump settings when the unit is switched off.

The values set are to be checked directly on the Perfusor® compact when the maximum delivery rate, the bolus rate and the syringe selection were changed and the Service Program is quit.

CAUTION

A pressure calibration must be carried out if the bolus rate was changed.

Constants Menu

1. Service interval

   Reads and resets the service interval timer. When the time set has elapsed a service interval alarm is triggered when the unit is switched on.

   The timer can be set to 20440 hours (corresponds to an average operation of 7 hours per day over 8 years). If the timer runs down to zero, a service alarm is triggered every time the Perfusor® compact is switched on and a service key flashes on the LC-display. The audible alarm can be acknowledged for the therapy time.

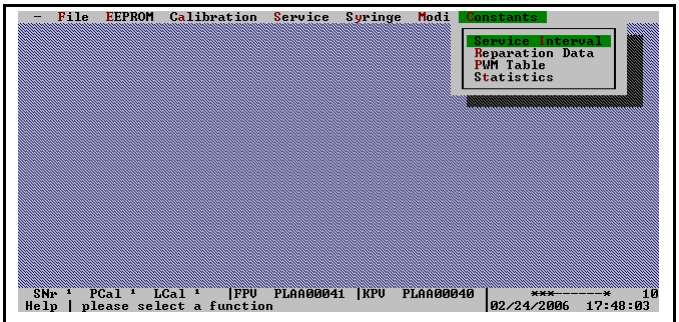


Fig.: 3 - 13

Note

Other menu items are of no importance to service.

Procedural Instructions for Inspection after Modifications via the Service Program

Serial Number

1. Switch on unit.
2. Start the Service Program.
3. Read out EEPROM and compare the serial number in Calibration / Serial number with the serial number indicated on the type plate.
4. Switch device off.

Maximum Basal Rate

1. Switch on unit.
2. Insert syringe and confirm (or select), e.g. OPS 50 ml.
3. Set delivery rate 99.9 and start.
4. When the basal rate is reduced the unit triggers an alarm and displays the maximum basal rate.
5. Acknowledge by starting again. Now the unit delivers the maximum basal rate.

Bolus Rate (if not blocked)

1. Press the F1 key (bolus rate). The value displayed must correspond to the bolus rate set.
2. Start bolus (press F and 1 simultaneously). Pump must deliver in bolus mode and the volume infused in bolus mode is displayed.

Staff Call

1. Plug MFC service connector on the MFC connector of the unit.
2. Open syringe holder. An alarm is triggered and the LED on the service connector flashes.
   a) If „dynamic" was set the red LED lights up for one second.
   b) If „static" was set the red LED lights up until the alarm is acknowledged.
3. Switch device off. If "dynamic with alarm off" was set the red LED on the service connector lights up for one second.
4. Pull off MFC service connector.

Alarm Tone

1. Switch on unit.
2. Insert syringe and confirm (or select), e.g. OPS 50 ml.
3. Enter rate and actuate the Start button to start delivery.
4. Open syringe holder, an alarm is triggered.
5. Compare the alarm tone with the settings:

- For units with unit software up to PLAA00063.3
  (Service Program version 55004):
  0 = continuous tone with 3 Hz intermittent
  1 = continuous tone, static
  2 = continuous tone with modulation 2.4 kHz
  3 = continuous tone with modulation 4.8 kHz
- For units with unit software up to PLAA00070.0:
  (Service Program version 6.001)
  Continuous tone with 3 Hz intermittent
  Continuous tone, static

Syringe / Syringe Selection

Note

Note down the current code for 20 ml and 50 ml syringes before starting the test.

	Test Code 20 ml	Test Code 50 ml
Wildcard in the subsequent text	XX	YY
up to unit number 50920	21	51
from unit number 50921 on	24	61

Table 3 - 1

Test for table or internal setting:

1. Open holder, then press keys 7 C X X F and 7 C Y Y F
   The syringe is accepted (if an alarm is triggered, then the syringe selection is not correct!).
2. If a free type was input but is not accessible, then you should check in addition:
   Press keys 7 C {number of the 20 ml free type} F and keys 7

C {number of the 50 ml free type} F – alarm (if the syringe is accepted, then the syringe selection setting is not correct!)

Test for setting the free type or EEPROM:

3. Open holder, press keys 7 C {number of the 20 ml free type} F and keys 7 C {number of the 50 ml free type} F – syringe is accepted (if an alarm is triggered, then the syringe selection setting is not correct!)
   Press keys 7 C X X F and keys 7 C Y Y F – alarm (if the syringe is accepted, then the syringe selection setting is not correct!)

Test for table and free type setting:

4. Open holder, press keys 7 C X X F and keys 7 C Y Y F – syringe is accepted (if an alarm is triggered, then the syringe selection setting is not correct!)
5. Open holder, press keys 7 C {number of the 20 ml free type} F and keys 7 C {number of the 50 ml free type} F – syringe is accepted (if an alarm is triggered, then the syringe selection setting is not correct!)

Test for OPS setting:

6. Open holder, press keys 7 C 5 0 F and keys 7 C 2 0 F – syringe is accepted (if an alarm is triggered, then the syringe selection setting is not correct!)
7. Press keys 7 C X X F and keys 7 C Y Y F – alarm (if the syringe is accepted, then the syringe selection setting is not correct!)
8. Reset syringe types after the test is finished!

Syringes 20 ml Free Type / Syringe Type Number

1. Open holder, press keys 7 C {number of the 20 ml free type} F – syringe is accepted (if an alarm is triggered, then the syringe selection setting is not correct!) Check whether the free type was marked on the unit (please see syringe table).
2. Reset syringe types after the test is finished!

Syringes 50 ml Free Type / Syringe Type Number

1. Press keys 7 C {number of the 50 ml free type} F – syringe is accepted (if an alarm is triggered, then the syringe selection setting is not correct!) Check whether the free type was marked on the unit (please see syringe table).
2. Reset syringe types after the test is finished!

Syringe Selection

Reset syringe selection according to the condition as the unit was delivered.

Unit Calibration

General

1. Connect unit to PC and start the Service Program (see „Working with the Service Program" ➨ p. 3 - 3).

Calibration

1. Start communication via menu ***File*** ➨ ***Connect*** (F1).
2. After activities on the drive:

   Transfer data via menu ***EEPROM*** ➨ ***Read*** (F3) from the unit to PC.
3. After replacement of the E-Module:

   Call in default data from the PC via menu ***EEPROM*** ➨ ***Default*** (F2). The existing values are deleted.
4. Check or input the serial number in menu ***Calibration*** ➨ ***Serial Number.*** Default data cannot be transferred to the device if the serial number was not input.
5. Calibrate length via menu ***Calibration*** ➨ ***Length Calibration*** (F5).
   a) Insert zero point gauge in OPS slot.
   b) Push drive manually to gauge and lock.
   c) Start calibration.
6. Pressure calibration:
   a) Open drive lock before starting pressure calibration.
   b) Calibrate pressure via menu ***Calibration*** ➨ ***Pressure Calibration*** (F6). Insert calibration gauge (66-80N) in Ops slot when prompted.
   c) Check PWM values
   Calibration point 1: Force 20 N, PWM max. 45%

Calibration point 2: Force 60 N, PWM max. 78%
Replace drive when the PWM values are exceeded.

7. Transfer data to device via menu ***EEPROM*** ➨ ***Write*** (F7).
8. Data can be saved on the hard disk of the PC via menu ***File*** ➨ ***Save*** (F8) if necessary. Enter the user number 0 upon query.
9. Check unit according to the procedural instructions for inspection (see „Procedural Instructions for Inspection after Modifications via the Service Program“ ➨ p. 3 - 11).

Overload Check

1. Connect 50 ml OPS syringe filled with water (drawn up to 25 to 30 ml) via infusion line to vented pressure gauge.
2. Insert syringe and start overload check via menu ***Calibration*** ➨ ***Overload Test***.
   Overload check is started with a force of 50 % and can be modified in 5 % increments up to 1.6 bar. If an open positive locking sensor is detected, the drive is defective and cannot be repaired and must be replaced.

Checklist after Operation of the Service Program

CAUTION

Does not replace Check after Repair.

		Condition as delivered	Condition as shipped	Test ok
Calibration	Serial number			❒
Modes	max. basal rate			❒
Modes	Bolus rate			❒
Modes	Staff call	❒ dynamic ❒ static ❒ Off-alarm	❒ dynamic ❒ static ❒ Off-alarm	❒
Modes	Alarm tone			❒
Syringes	Syringe selection	❒ Table ❒ Free type ❒ Table + free type ❒ OPS	❒ Table ❒ Free type ❒ Table + free type ❒ OPS	❒
Syringes	Free 20 ml type Free 50 ml type Syringe type number			❒
Syringes delivered	Syringe selection as de- ..... 20 ml ..... 50 ml			❒

Unit Elements 4

4.1 Fundamental Repair Information

Battery Pack and Batteries

Designation	Ord. No.
Battery pack	3450 1690

Note

Always disconnect unit from mains.

Prior to repair:

1. Switch off the Perfusor® compact.
2. Disconnect the unit from mains.
3. Remove batteries to avoid short circuits or consequential damage.

Note

The battery may only be removed when the device is switched off as otherwise alarm 022 is displayed upon startup. Press the ON-/OFF-button to delete the alarm 022 until the alarm symbol is no longer displayed. If the alarm 105 is triggered afterwards switch the unit off.

Before startup:

4. If batteries are used switch the device first on without mains connection. If the battery pack is used, then the device is to be switched on with mains connection.

Note

Defective batteries must be disposed of according to the regulations, e.g. return to B. Braun (see „Return of Spare Parts and Test Equipment“ ➨ p. 0 - 9).

Fitting Plastic Screws

In order to avoid damage to the thread:
Turn anti-clockwise (until the thread is found), then turn clockwise to fasten (max. 0.5 Nm).

Designation	Ord. No.
Small parts kit for 5 units	3450 7736
containing:	
45 KB 30x16,	
5 split rivet for quick reference guide,	
5 screw split rivet for battery compartment cover,	
5 blind plug for syringe holder,	
5 countersunk screw M 3x10,	
5 flat head screw M 3x5,	
10 flat head screw M 3x6,	
5 board holder,	
5 flat head screw M 3 x 14,	
10 countersunk screw M 4x12,	
25 Ejot KM 22x8,	
15 tamper-proof cap	
Unit connecting lead, hospital grade	3450 5458
Unit connecting lead 220-240 V.	3450 2718

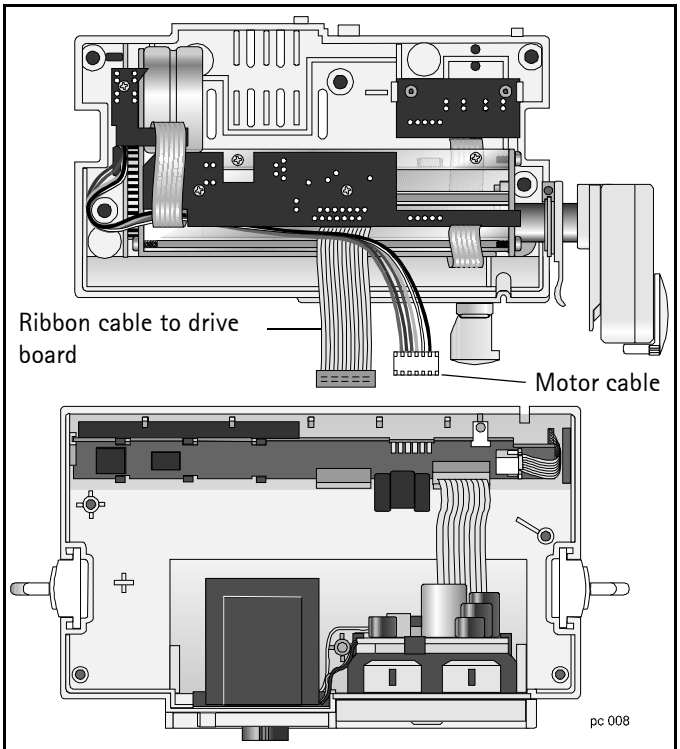


Fig.: 4 - 1

Open unit

1. Loosen 5 screws from the bottom.
2. Open housing carefully, then
3. Pull off the ribbon cable from the E-Module and the connection cable from the motor. Hold the white board holder on the E-Module when disconnecting!
4. Dismount both housing halves.

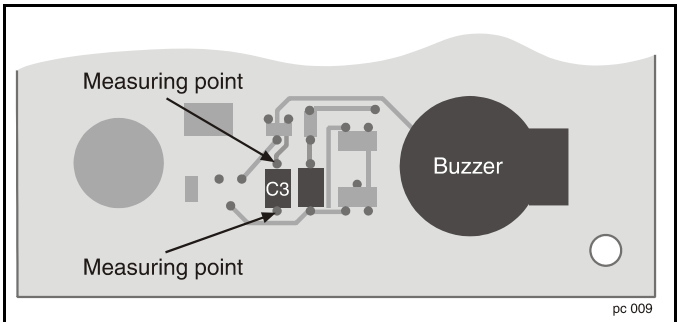


Fig.: 4 - 2 A-Module board (up to serial number 38100)

Always check A-Module before replacing the board.

Other modules can only be exchanged without danger of consequential damage if there is no overvoltage.

Connect mains cable when the housing is open. Measure voltage parallel with capacitor C3. The set value is 6.2 to 6.8 volt.

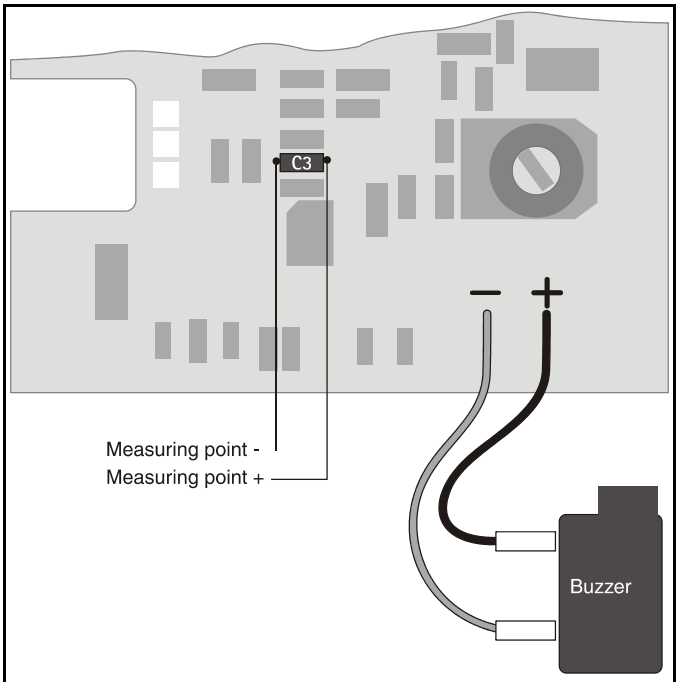


Fig.: 4 - 3 A-Module board (from serial number 38101 on)

Close Unit

1. Close unit in reverse order of opening.

Note

Do not squeeze motor cable.

Checks after Repair

Procedural instructions (see „Procedural Instructions for Inspection after Modifications via the Service Program" ➨ p. 3 - 11).

A calibration in the Service Program is to be carried out if a new E-Module is installed or the drive is replaced (see „Service Program" ➨ p. 3 - 1).

4.2 Syringe Table and and Quick Reference Guide

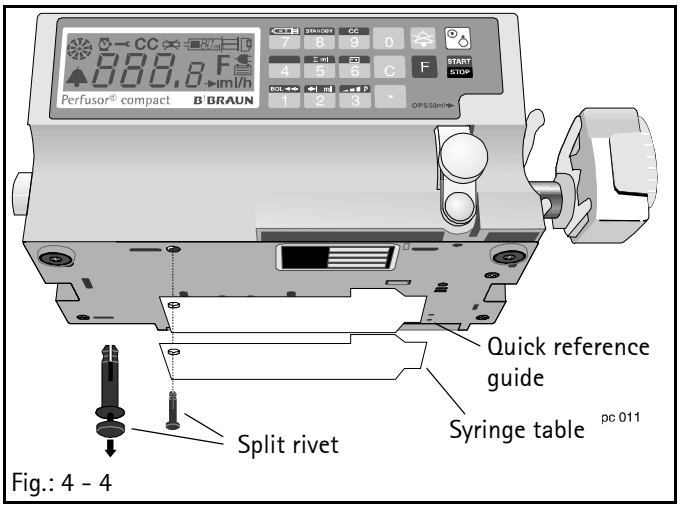


Fig.: 4 - 4

Designation **Ord. No.**

Instructions for use, complete

Language:

German	3891 1302
English	3891 1310
French	3891 1329
Spanish	3891 1337
Dutch	3891 1345
Italian	3891 1353
Portuguese	3891 1361
Norwegian	3891 1370
Finnish	3891 1388
Swedish	3891 1396
Czech	3891 1400
Turkish	3891 1418
Polish	3891 1426
Danish	3891 1434

Exchange

1. Remove split rivet. First pull up the head, then remove rivet completely.
2. Insert new syringe table and quick reference guide.

4.3 Syringe Holder

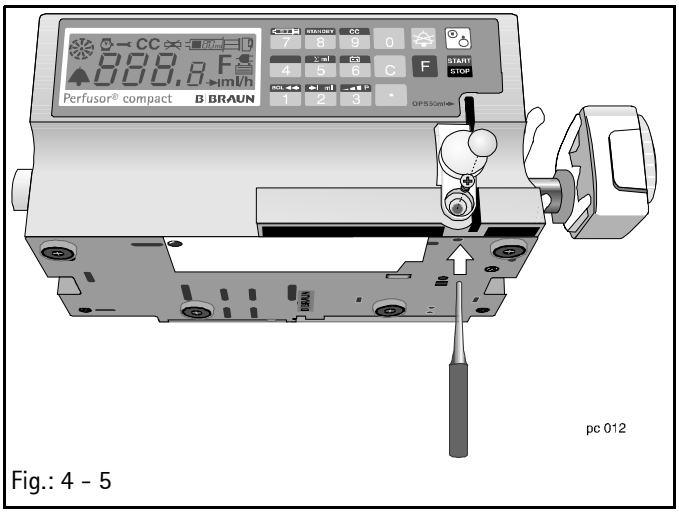


Fig.: 4 - 5

Designation	Ord. No.
Syringe holder, complete with screw and cap	3450 6608

Exchange

1. Pierce through the cap and remove.
2. Fasten syringe holder with pin punch.
3. Remove screw.
4. Pull off holder.
5. Push spacer washer 0.8x4x3.2 on the shaft if the syringe is not recognized.
6. Insert new syringe holder.
7. Fit new screw (not the old one) and safety lock with Loctite 274.
8. Replace new cap.

4.4 Unit Feet

Designation	Ord. No.
Unit feet	3450 6640

Note

The feet can be turned and used once again. Pull feet out and turn around or exchange.

4.5 Battery Compartment Cover

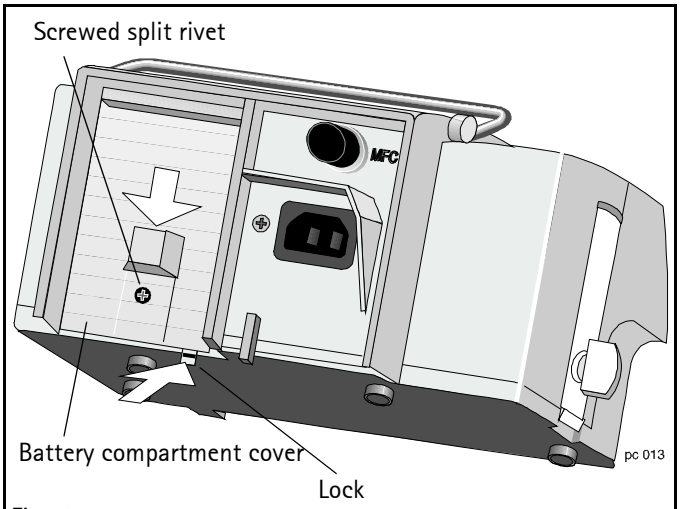


Fig.: 4 - 6

Designation **Ord. No.**

Battery compartment cover 3450 6632

Exchange

1. Screw out screwed split rivet.
2. Press the lock and push battery compartment cover downward.
3. Put on new battery compartment cover and press in screwed split rivet.

Note

Make sure that the battery compartment cover does not get jammed. Check for tight fit. The battery compartment cover is also the holder plate for the pole fixation.

4.6 Snap-in Clip

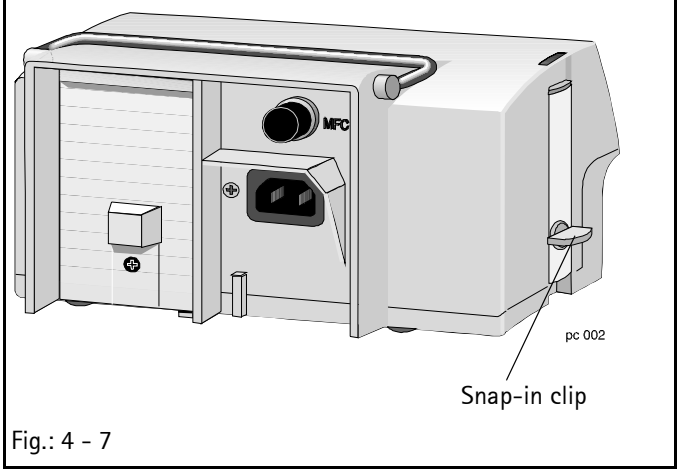


Fig.: 4 - 7

Designation **Ord. No.**

Snap-in clip and snap-in lever 3450 6616

Exchange

1. Loosen 5 screws from the bottom and carefully open housing (pay attention to the cable lengths).
2. Exchange snap-in clip and snap-in lever.
3. Close the unit.

Note

Do not squeeze the cable (see „Close Unit" ➨ p. 4 - 4).

4.7 A-Module

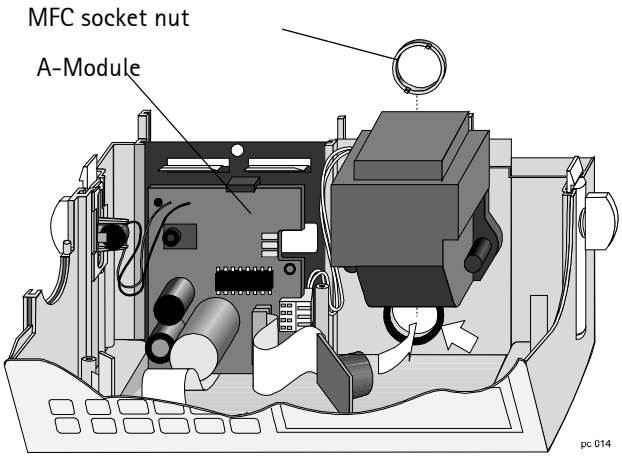


Fig.: 4 - 8

Designation	Ord. No.
A-Module, complete, with board, MFC and buzzer (replaces A-Module up to serial number 38100)	3450 5288
Buzzer	3450 8643

Exchange

1. Open unit (see „Open unit" ➨ p. 4 - 3).
2. Loosen MFC socket nut (M18) from the outside and press MFC socket inwards.
3. Pull off the N-Module connector (slightly pull out the A-Module).
4. Pull off connector on the E-Module.
5. Replace A-Module and check snap-in hook on the board.
6. Assembly is done in reverse order. Connect mains connector correctly to the A-Module. Do not squeeze the cable (see „Close Unit" ➨ p. 4 - 4).

Note

The connector on the E-Module can be easily connected when the E-Module is swivelled out (see „E-Module" ➨ p. 4 - 10).

4.8 LS-Clip

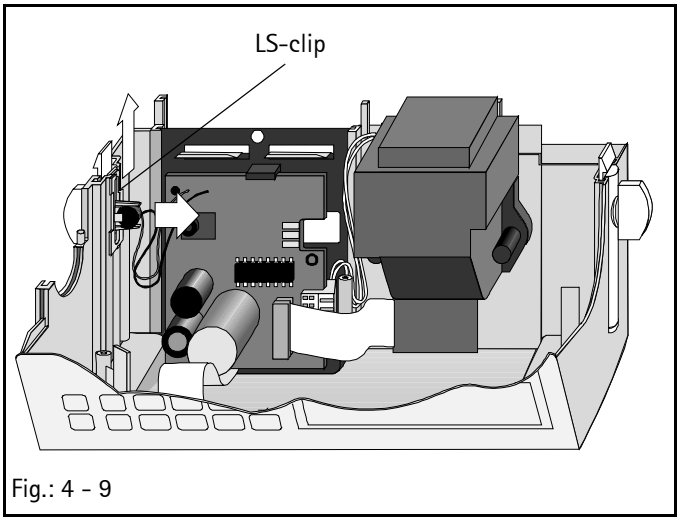


Fig.: 4 - 9

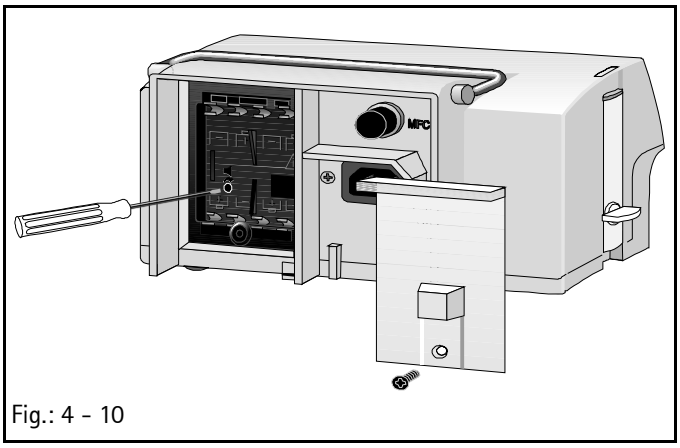


Fig.: 4 - 10

Designation	Ord. No.
LS-clip	3450 7710

Exchange

1. Open unit (see „Open unit" ➨ p. 4 - 3).
2. Press buzzer out of the holder.
3. Pull LS-clip out of the guide and exchange.
4. Assembly is done in reverse order.

Setting the Loudness of the Alarm Tone (from serial number 38100 on)

1. Open battery compartment (see „Battery Compartment Cover" ➨ p. 4 - 7).
2. Remove batteries.
3. Connect unit to mains and switch unit on.
4. Disconnect from mains for a short moment when the switch-on test is finished. Pull mains connector and plug in again to trigger a device alarm (code 22, continuous tone).
5. Put a small flat blade screw driver (carefully) through the battery compartment opening and set the volume desired.
6. Switch unit off via the keyboard.
7. Insert batteries.
8. Close battery compartment.

4.9 E-Module

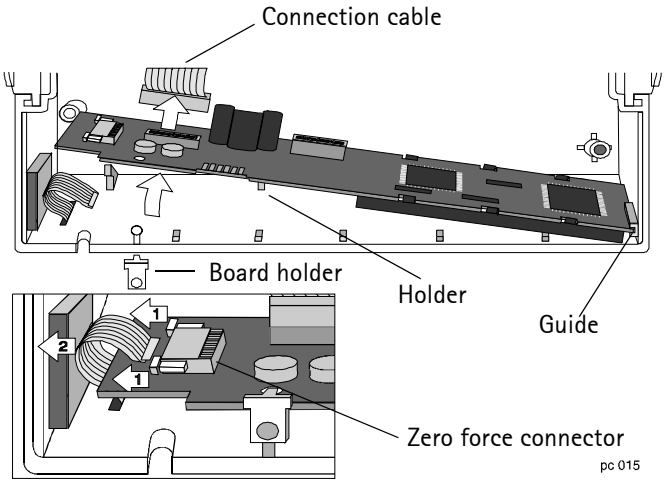


Fig.: 4 - 11

Designation	Ord. No.
E-Module with DIANET	3450 6675
E-Module with DIANET^{Star} (from serial number 50921 on)	3452 0465

Exchange

Prior to exchange: Read and note down user-specific settings and reset after modification (see „Display / Save the Unit Settings" ➨ p. 3 - 3).

1. Open unit (see „Open unit" ➨ p. 4 - 3).
2. Unlock zero force connector on both sides and pull off ribbon cable.
3. Remove white board holder.
4. Push E-Module to the left and swivel out.
5. Pull off connection cable.

Note

Before assembly: Remove protective foil from display, unlock zero force connector and lay ribbon cable.

6. Connect connection cable.
7. Insert new E-Module at the side into the guide and position behind the holder. (Caution! Do not damage the components.)
8. Push board in the guide to the right and insert a new board holder (must engage in hole).
9. Push ribbon cable in zero force connector until stop and lock on both sides (can get jammed, lock both sides).
10. Close the unit. Do not squeeze the cable (see „Close Unit" ➨ p. 4 - 4).
11. Calibrate in Service Program (see „Calibration after Replacement of E-Module" ➨ p. 7 - 1).

Note

Swivel out the E-Module so that the connector can be connected more easily.
Disconnect or connect ribbon cable only when the E-Module is fastened.

4.10 N-Module

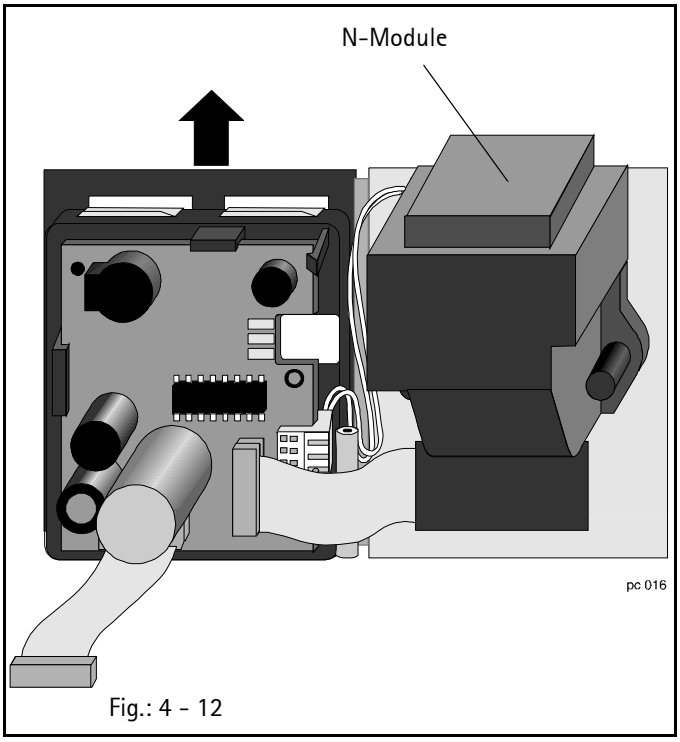


Fig.: 4 - 12

Designation	Ord. No.
N-Module (220 -240 V)	3450 6683
N-Module (100 -120 V)	3450 6730

Exchange

1. Open housing (see „Open unit" ➨ p. 4 - 3).
2. Remove MFC socket.
3. Pull off the N-Module connector on the A-Module (slightly pull out the A-Module).
4. Loosen both screws (on the rear) and exchange N-Module.
5. Assembly is done in reverse order.

Note

Lay two-wire cable with mains connector behind bearing. Connect mains connector correctly to the A-Module (please see figure). Do not squeeze the cable (see „Close Unit" ➨ p. 4 - 4).

Note

The connector on the E-Module can be easily connected when the E-Module is swivelled out (see „E-Module" ➨ p. 4 - 10).

4.11 Housing Upper Part, Complete

Designation	Ord. No.
Housing upper part incl. membrane keyboard, carrying handle and LS-clip	3450 6586

Exchange

1. Open housing (see „Open unit" ➨ p. 4 - 3).
2. Modify modules.
3. Close housing.

Note

Do not squeeze the cable (see „Close Unit" ➨ p. 4 - 4).

4.12 Carrying Handle

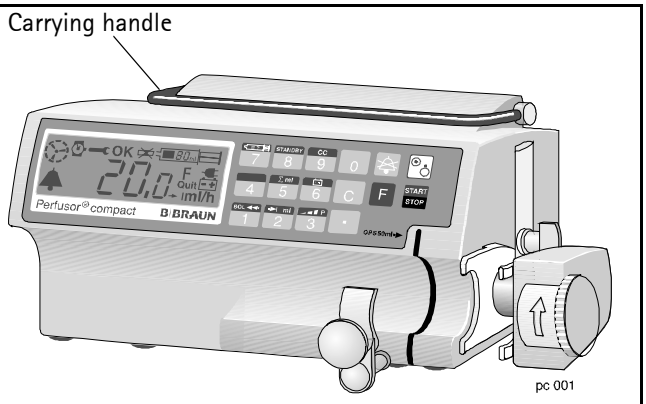


Fig.: 4 - 13

Designation **Ord. No.**

Carrying handle 3450 6438

Exchange

Note

Not recommended as special tools are required.

1. Open housing (see „Open unit" ➨ p. 4 - 3).
2. Remove N-Module (see „N-Module" ➨ p. 4 - 11).
3. Pull adapter sleeve out of the joints.
4. Pull off handle and remove both joints.
5. Assembly is done in reverse order.

Note

Press in adapter sleeves carefully and do not kink.

4.13 Drive

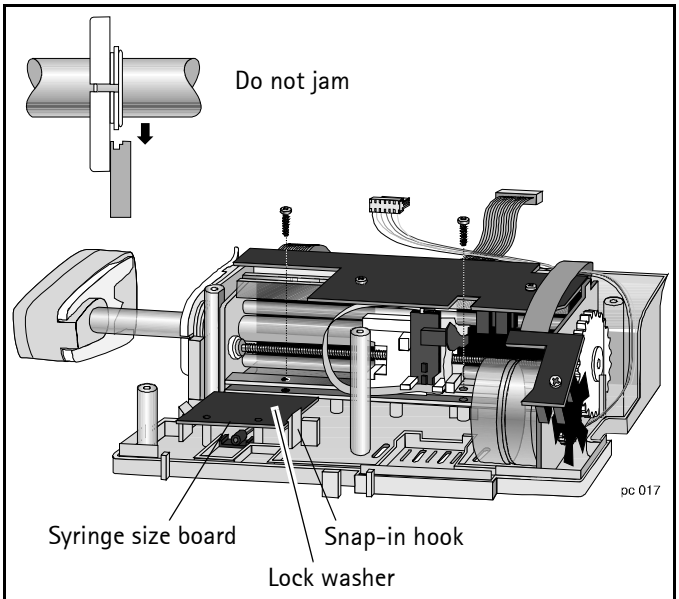


Fig.: 4 - 14

Designation **Ord. No.**

Drive, complete (with motor) 3450 6624

Straight pin lock 3450 9100

WARNING

THE DRIVE CONSISTS OF SAFETY RELEVANT PARTS. OPERATIONAL RELIABILITY CAN ONLY BE GUARANTEED WHEN THE DRIVE IS EXCHANGED COMPLETELY.

Exchange

1. Open unit (see „Open unit" ➨ p. 4 - 3).
2. Move drive arm to middle position and lock.
3. Loosen screw on syringe size board, spread snap-in hook and remove board.
4. Loosen both screws on drive and remove drive.
5. Insert syringe size board.
6. Mount scraper ring and axial positioner and screw down drive.
7. Snap in syringe size board on both sides.

Note

Always fasten syringe size board with screws to centering bearing.

8. Pay attention to cable laying (please see Fig.: 4 - 14).
9. Close unit (see „Close Unit" ➨ p. 4 - 4).

Note

Do not squeeze cable.

10. Calibrate in Service Program (see „Calibration after Replacement of Drive" ➨ p. 7 - 1).

4.14 Axial Positioner

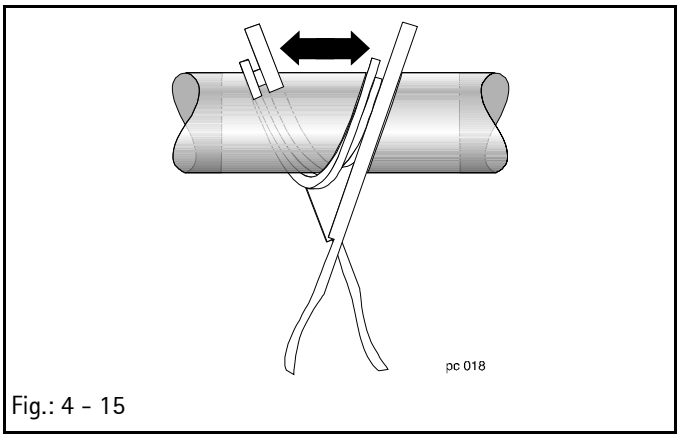


Fig.: 4 - 15

Designation **Ord. No.**

Axial positioner 3450 6659

Exchange

1. Open unit (see „Open unit" ➨ p. 4 - 3).
2. Move drive arm to middle position and lock.
3. Loosen both screws on drive.
4. Lift drive until the axial positioner is free.
5. Remove axial positioner by forcing apart. Replace new axial positioner and make sure that the scraper ring is correctly fitted.
6. Assembly is done in reverse order.

Note

Do not squeeze the cable (see „Close Unit" ➨ p. 4 - 4).

7. Calibration is required in Service Program (see „Calibration after Replacement of Drive" ➨ p. 7 - 1), as the drive was dismounted.

4.15 Drive Board

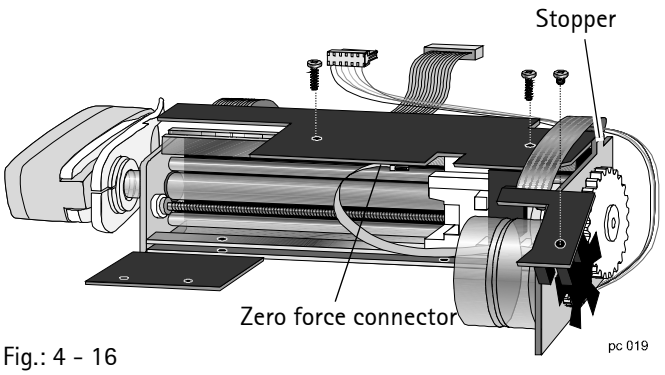


Fig.: 4 - 16

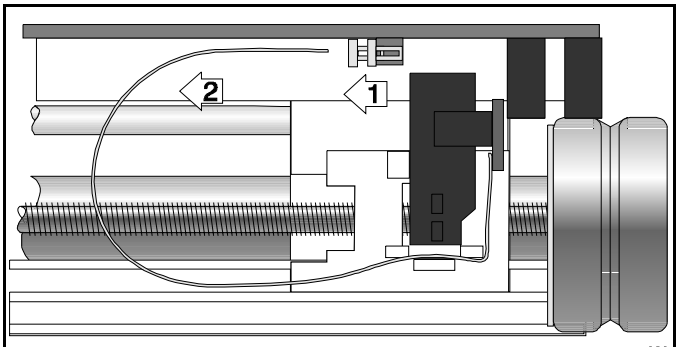


Fig.: 4 - 17

Designation **Ord. No.**

Drive board 3450 6691
with main PCB and satellite boards
for syringe size recognition
and recognition of direction of rotation

Exchange

1. Open unit (see „Open unit" ➨ p. 4 - 3).
2. Dismount drive (see „Drive" ➨ p. 4 - 12).
3. Disconnect zero force connector on the underside of the main PCB.
4. Loosen main PCB and the direction of rotation board.
5. Remove drive board.
6. Place new main PCB on aluminium profile and slide until stopper of the aluminium profile from the motor side.

CAUTION

Cable layout according to figure.

7. Press board against stopper when screwing down. Tighten screws hand-tight.
8. Fix satellite board.
   Cable layout please see fig. pc_20. Lay motor cable under the direction of rotation board before fixing the board. Make sure that the slotted disk can turn freely and smoothly.
9. Insert ribbon cable vertically in zero force connector and lock connector with a screw driver. Position connector carefully: the plug contacts can bend!
10. Assembly is done in reverse order. Do not squeeze the cable (see „Close Unit" ➨ p. 4 - 4).

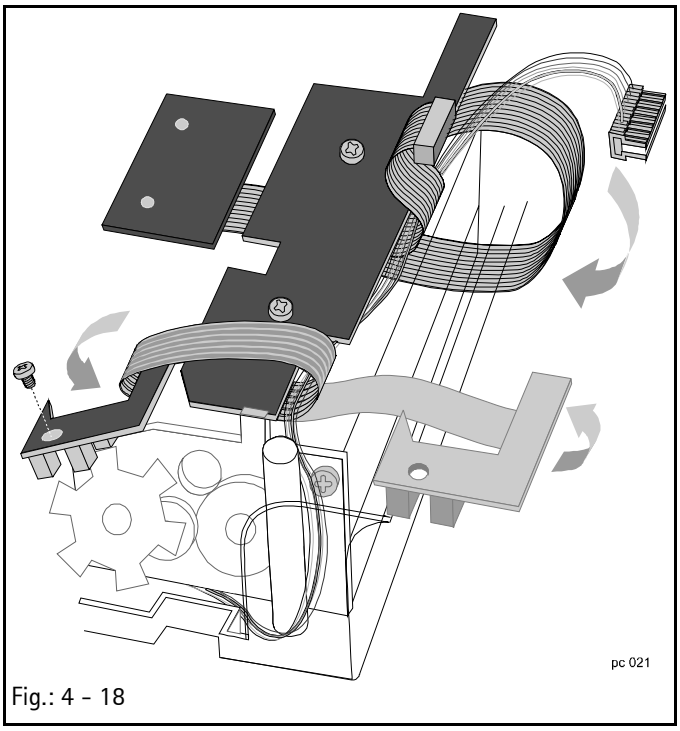
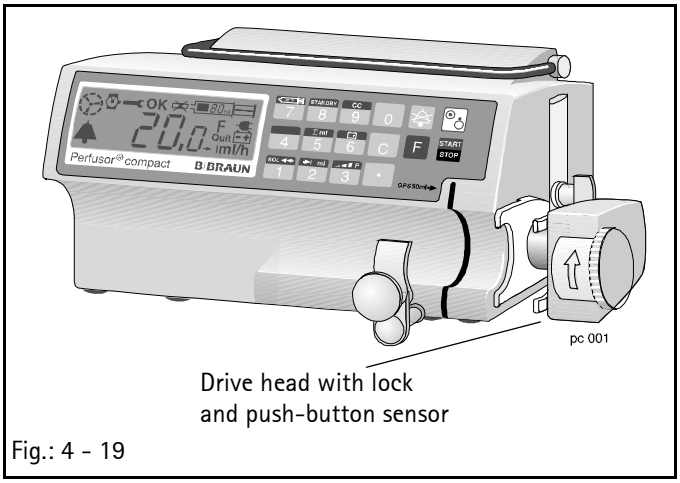


Fig.: 4 - 18

11. Calibrate in Service Program (see „Calibration after Replacement of Drive" ➡ p. 7 - 1).

4.16 Drive Head



Drive head with lock
and push-button sensor

Fig.: 4 - 19

Designation	Ord. No.
Drive head, complete	3450 1720
Toggle	3450 1711

Exchange

1. Open toggle, pull out drive head and close toggle again.
2. Pierce tamper-proof caps in drive head with a pointed screw driver and remove caps.

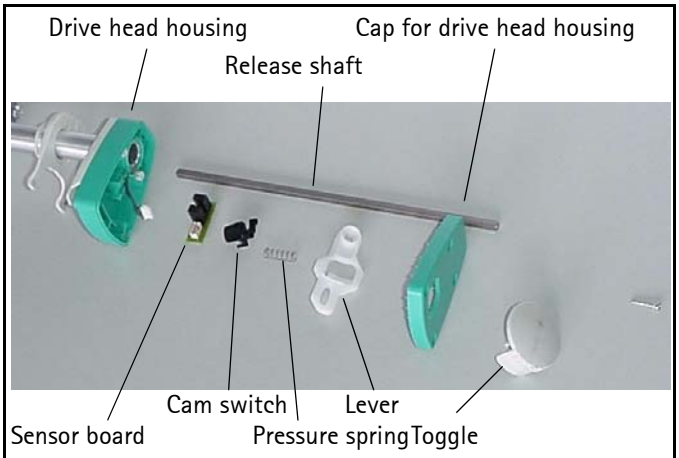


Fig.: 4 - 20

3. Unscrew four screws.
4. Remove cover for drive head housing with toggle, lever and release shaft (square).
5. Sketch the cable layout.

Note

Pay attention to spring when removing the housing cover.

6. Remove cam switch with pressure spring and pressure pin.
7. Remove push-button sensor board and disconnect plug connector.

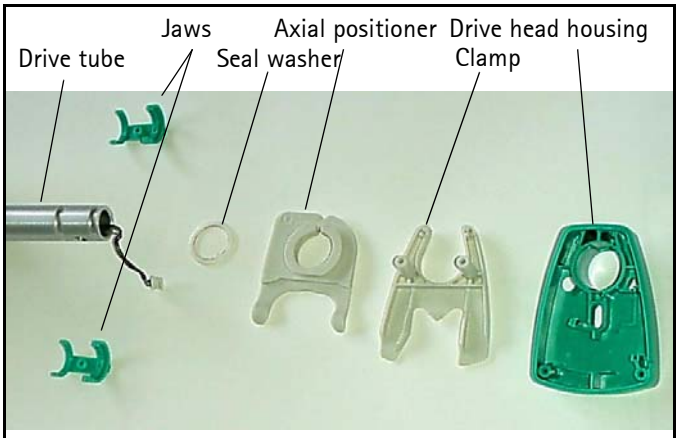


Fig.: 4 - 21

8. Push drive head housing towards the unit.
9. Pull jaws off the drive tube.
10. Pull drive head housing together with clamp off the drive tube.
11. Assembly is done in reverse order.

Fig.: 4 - 22

Note

Pay attention to cable layout. The cable must be laid between the pins and under the light barrier.

4.17 Housing Bottom Part, Complete

Designation	Ord. No.
Housing bottom part, complete	3450 6594

Exchange

1. Open housing (see „Open unit" ➨ p. 4 - 3).
2. Shift type plate.
   a) Warm up type plate with a hair dryer until the adhesive can be removed (not too hot as otherwise the housing is damaged).
   b) Clean adhesive position on new housing and stick type plate. New type plates can only be ordered as spare parts if the old type plates are returned to B.Braun (see „Ordering of Spare Parts and Test Equipment" ➨ p. 0 - 9).
3. Remove drive from old housing (see „Drive" ➨ p. 4 - 12).
4. Install drive in new housing (see „Drive" ➨ p. 4 - 12).
5. Close housing.

Note

Do not squeeze the cable (see „Close Unit" ➨ p. 4 - 4).

6. Calibrate in Service Program (see „Calibration after Replacement of Drive" ➨ p. 7 - 1).

For your notes:

Checks after Repair 5

General

Carry out the respective check blocks depending on the activity performed. The individual steps are described hereafter in more detail.

Carry out an overload test if the unit has been dropped (see „Overload Check" ➨ p. 3 - 15).

Check List for Checks after Repair

Visual Inspection	Electrical Safety according to IEC/EN 60601-1 or VDE 0750 and VDE 0751	Functional Inspection
❒ Cleanliness ❒ Completeness ❒ Damage and faults affecting safety ❒ Damage to and readability of the label ❒ Syringe holder, axial positioner, drive head ❒ Syringe table, quick reference guide ❒ Membrane keyboard ❒ Battery compartment cover, battery compartment and -contacts ❒ Unit feet ❒ MFC connector ❒ Holder for pole fixation, side snap-in mechanism ❒ Mains lead	❒ Mains voltage acc. to TSC _____ V ❒ Protective conductor resistance acc. to TSC _____ Ω ❒ Patient leakage current acc. to TSC _____ µA	Mechanical inspection ❒ Holder for pole fixation ❒ Stacking function ❒ Syringe holder ❒ Drive head lock Switch on unit ❒ LC display ❒ Self-test ❒ Audible alarm Operation ❒ Infusion ❒ Staff call ❒ Bolus Pressure cut-off with calibration gauge ❒ Pressure stage 1 (15 - 35 N)_____ N ❒ Pressure stage 2 (30 - 55 N)_____ N ❒ Pressure stage 3 (45 - 70 N)_____ N Syringe recognition ❒ 20 ml ❒ 50 ml Pre- and end alarm ❒ Pre-alarm ❒ End alarm

5 Checks after Repair

Visual Inspection

1. Check unit for cleanliness, completeness, damage and faults affecting safety. Pay special attention to the following parts:
   - Syringe holder, axial positioner, drive head
   - Syringe table and quick reference guide
   - Membrane keyboard
   - Battery compartment cover, battery compartment and -contacts
   - Unit feet
   - MFC connector
   - Holder for pole fixation, side snap-in mechanism
   - Mains lead

Functional Inspection

Mechanical Inspection

1. Check function of the holder for pole fixation.
2. Check stacking function of the unit with respect to other units.
3. Check function of the syringe holder with syringe.
4. Check function of the drive head lock.

Switch on unit

1. Switch on unit and keep ON-button pressed for max. 20 sec. Check the screen display during this time. A device alarm is triggered if the button is actuated for more than 20 sec.
2. The following information appears on-screen when the button is released:

   111.1

   222.2

   555.5

   AA — Reference to the instructions for use (hard- und software group)

   Last syringe type
3. An audible alarm sounds three times.

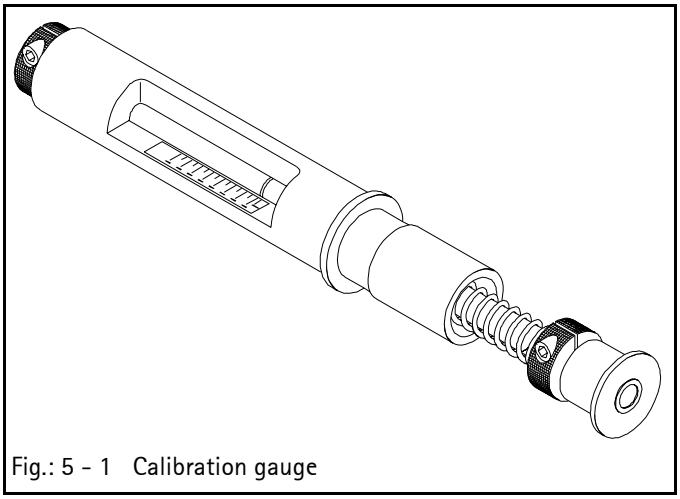


Fig.: 5 - 1 Calibration gauge

Operation

1. Open lock (drive head).
   Check push-button sensor alarm. The piston rod symbol must flash on the LC-display if a syringe was not inserted.
2. Insert calibration gauge in the OPS 50 ml slot and close syringe holder.
   The lock must engage automatically and the syringe symbol in the LC display must not flash.
3. Confirm calibration gauge as OPS with F-button. Program as OPS syringe type beforehand if necessary.
4. Start pump with a delivery rate of 12.3 ml/h (key sequence 1 2 3).
   The pump delivers. The delivery rate set must be displayed.
5. Open lock.
   Alarm by buzzer and positive locking sensor alarm. Drive stops. Lock must not engage in upper position.
6. Plug in MFC service connector and actuate the START button. Drive delivers at 12.3 ml/h.
7. Change delivery rate to 96 ml/h (key sequence C 9 6 F) during infusion.
   The pump delivers. The delivery rate set must be displayed.

Note

The following staff call modes can be selected in the Service Program if the unit is switched off: static, dynamic with and without alarm.

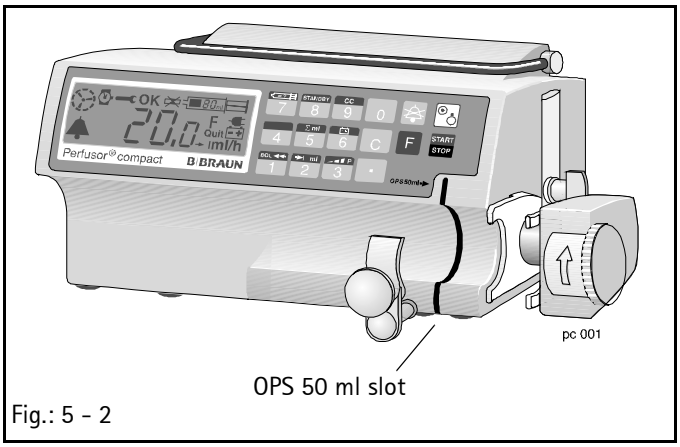


Fig.: 5 - 2

8. Pull syringe holder.
   Staff call: red LED in MFC service connector lights up. Drive stops.

Pressure Cut-Off

CAUTION

The limit values of the Checklist for Checks after Repair do not correspond to the TSC values.

1. Set pressure stage 1 (key sequence F 3 C 1 F START).
2. Pump continues to deliver at 96.0 ml/h and switches off when the specified pressure is reached.
3. Enter value in check list.
4. Set pressure stage 2 (key sequence F 3 C 2 F START).
5. Pump continues to deliver at 96.0 ml/h and switches off when the specified pressure is reached.
6. Enter value in check list.
7. Set pressure stage 3 (key sequence F 3 C 3 F START).
8. Pump continues to deliver at 96.0 ml/h and switches off when the specified pressure is reached.
9. Enter value in check list.

WARNING

DANGER OF INJURY! DO NOT OPEN TOGGLE AS CALIBRATION GAUGE CAN RELEASE SUDDENLY.

10. Release calibration gauge (key sequence F 3 0) with service connector.

Syringe Recognition

1. Insert 20 ml potentiometer calibration gauges.
   The 20 ml syringe symbol is displayed.
2. Remove potentiometer calibration gauge.
3. Insert max. 50 ml potentiometer calibration gauges.
   The 50 ml syringe symbol is displayed.
4. Remove potentiometer calibration gauge.

Pre- and End Alarm

1. Draw up a 50 ml OPS syringe to 6 ml and insert syringe.
2. Confirm OPS with F-button
3. Change delivery rate to 99 ml/h (key sequence C 9 9) and press START.
   Pump delivers and triggers pre-alarm at a volume of 5 ml.
4. Bolus (press buttons F and 1 simultaneously and keep buttons pressed) until end alarm (pump must not trigger pressure alarm).
5. Draw up a 20 ml OPS syringe to 6 ml and insert syringe.
6. Confirm syringe type 20 with F-button.
7. Press START button.
   Pump delivers and triggers pre-alarm at a volume of 5 ml.
8. Bolus (press buttons F and 1 simultaneously and keep buttons pressed) until end alarm (pump must not trigger pressure alarm).

Electrical Safety

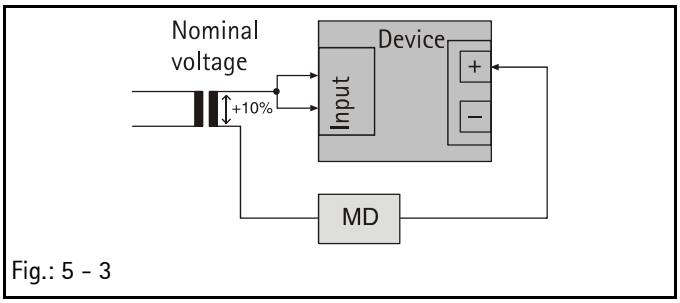


Fig.: 5 - 3

1. Measure mains voltage and note down.
2. Measure protective conductor resistance and note down.
3. Measure patient leakage current as described hereafter and note down.
   - Remove battery pack or batteries. Unit is at rest.
   - Apply nominal voltage + 10 %.
   - Measure patient leakage current between short-circuited mains inlet and plus pole (right top battery compartment).
   - Enter value in check list.

For your notes:

Maintenance 6

The unit is maintenance-free.

A Technical Safety Check (TSC) (see „Technical Safety Check TSC" ➨ p. 7 - 1) is to be carried out every 24 months to check the operational capability of the Perfusor® compact.

For your notes:

Technical Safety Check TSC

Index 01
(Master - to be added to the documentation)

Checklist for Technical Safety Checks – Every 24 Months

Unit: Perfusor compact infusion syringe pump
Manufacturer: B. Braun Melsungen AG

User

Observe the service manual and the instructions for use. All measured values are to be documented. Accessories used should be included in testing. Make exclusive use of calibrated measuring equipment.

Article No.	Unit No.	Year of Procurement

1. Visual Inspection

- ❒ Unit clean, complete, undamaged
- ❒ Syringe fastening: Syringe holder, axial positioner, drive head, clamp, push-button sensor
- ❒ Membrane keyboard
- ❒ Battery compartment cover and battery contacts
- ❒ Unit feet
- ❒ Mains lead and connector
- ❒ MFC lead and connector
- ❒ Holder for pole fixation, side snap-in mechanism

2. Functional Inspection

Switch on unit.

- ❒ Compare with instructions for use: LCD self-test and audible alarm
- ❒ Compare: set delivery date and value displayed
- ❒ Check switching capability of staff call (accessories)
- ❒ Switch on unit in battery mode and check self-test

Note

If „Battery discharged" is displayed:
Charge battery or replace batteries and repeat test.

- ❒ Compare status display 000„A" or 000„b" with battery cells used.
- ❒ Check push-button sensor alarm
- ❒ Check positive locking sensor alarm

3. Pressure Cut-Off

(alternatively with manometer or check gauge)

With manometer and 50 ml syringe:

- ❒ Pressure stage 1 <0.6 bar
- ❒ Pressure stage 2 <0.9 bar
- ❒ Pressure stage 3 <1.2 bar

With check gauge current step Order - No. 0770 1616:

- ❒ Pressure stage 1 <40 N
- ❒ Pressure stage 2 <59 N
- ❒ Pressure stage 3 <75 N

CAUTION

Danger of injury: Remove check gauge only when released.

4. Syringes

Syringe selection

- ❒ OPS
- ❒ internal
- ❒ EEprom

Syringe table readable

- ❒ Yes
- ❒ No

Syringe recognition

Manufacturer (code) used

- ❒ 20 ml
- ❒ 50 ml
- ❒ _____
- ❒ _____

(Part 1 of 2)

5. Electrical Safety	6. Accessories	7. Optional	
acc. to EN 60601 (VDE 0750/0751) ❒ Protective conductor resistance Mains lead < 0.1 Ohm Ohm ..... ❒ Mains voltage V~ ..... ❒ Patient leakage current ≤10 µA µA ..... **Note** Measure between short-circuited mains inlet and plus pole in battery compartment (top right).	Enter MFC, battery etc.:	❒ Rate limitation ml/h ..... ❒ Bolus rate limitation ml/h	

(Part 2 of 2)

Infusion line used for Technical Safety Check:
Type: _____Manufacturer: _____
Test result: Defects found which could endanger patients, users or third parties: ☐ Yes ☐ No
Measures to be taken: ☐ Repair
☐ _____

Special features / Documentation:

Inspection performed by:

Unit handed over to/on:

Date / Signature:

Next deadline:

Procedural Instructions on the TSC 8

Visual Inspection

Unit, in General

Completeness, external damage, safe fit of the battery compartment cover and syringe table.

Check cleanliness of device. Check labels and readability.

Syringe Fastening

Check function with OPS 50 ml syringe.

(Syringe holder, axial positioner, drive head, clamp, and push-button sensor)

Membrane Keyboard

Check adhesion, cleanliness and fit.

Battery Compartment and -Contacts

Check state of contacts (tight fit, not bent).

Unit Feet

Check unit feet for completeness and proper fit.

Mains Lead and Connector

Completeness, damage.

MFC Lead and Connector

Completeness, damage.

Holder for Pole Fixation, Side Snap-in Mechanism

Check function.

Functional Inspection

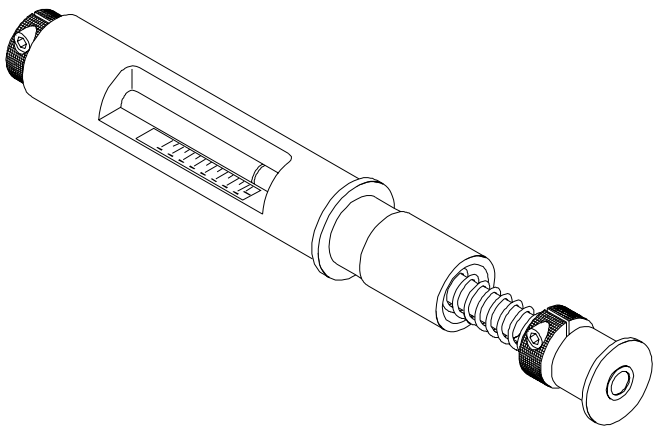


Fig.: 8 - 1 Current step gauge

Switch on unit

1. Switch on Perfusor and keep ON-button pressed for max. 20 sec. Check the screen display during this time. A device alarm is triggered if the button is actuated for more than 20 sec.
2. The following information appears on-screen when the button is released:

   111.1

   222.2

   555.5

   AA — Reference to the instructions for use (hard- und software group)

   Last syringe type
3. An audible alarm sounds three times.
4. Open lock (drive head).
   Check push-button sensor alarm. The piston rod symbol must flash on the LC-display if a syringe was not inserted.
5. Insert current step gauge in the OPS 50 ml slot and close syringe holder.
   The lock must engage automatically and the syringe symbol in the LC display must not flash.
6. Confirm current step gauge as OPS with F-button. Program as OPS syringe type beforehand if necessary.
7. Start pump with a delivery rate of 12.3 ml/h (key sequence 1 2 3).
   The pump delivers. The delivery rate set must be displayed.
8. Open lock.
   Alarm by buzzer and positive locking sensor alarm. Drive stops. Lock must not engage in upper position.
9. Plug in MFC service connector and actuate the START button. Drive delivers at 12.3 ml/h.
10. Change delivery rate to 96 ml/h (key sequence C 9 6 F) during infusion.
    The pump delivers. The delivery rate set must be displayed.

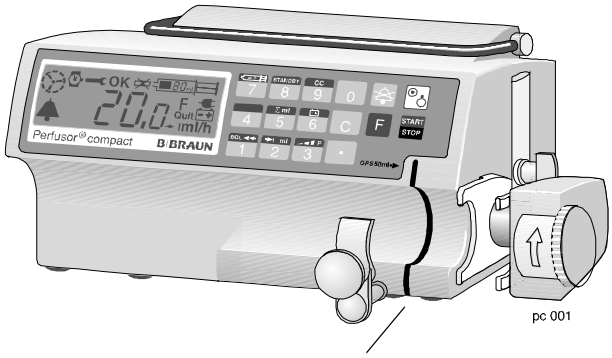


Fig.: 8 - 2

11. Pull syringe holder.
    Staff call: red LED in MFC service connector lights up. Drive stops.

Note

The following staff call modes can be selected in the Service Program if the unit is switched off: static, dynamic with and without alarm.

12. Pull syringe holder.
    Staff call: red LED in MFC service connector lights up. Drive stops.
13. Switch device off.
14. Disconnect unit from mains.
15. Switch unit on in battery mode.

Pressure Cut-Off

1. Set pressure stage 1 (key sequence F 3 C 1 F START).

CAUTION

The limit values of the Checklist for Checks after Repair do not correspond to the TSC values.

2. Pump continues to deliver at 96.0 ml/h and switches off when the specified pressure is reached.
3. Enter value in check list.
4. Set pressure stage 2 (key sequence F 3 C 2 F START).
5. Pump continues to deliver at 96.0 ml/h and switches off when the specified pressure is reached.
6. Enter value in check list.
7. Set pressure stage 3 (key sequence F 3 C 3 F START).
8. Pump continues to deliver at 96.0 ml/h and switches off when the specified pressure is reached.
9. Enter value in check list.

WARNING

DANGER OF INJURY! DO NOT OPEN TOGGLE AS CURRENT STEP GAUGE CAN RELEASE SUDDENLY.

10. Release current step gauge (key sequence F 3 0) with service connector.

11. Wait until the current step gauge is completely released. Then remove current step gauge and close syringe holder slowly.

Syringes

1. Check syringe selection (see „Syringe / Syringe Selection“ ➡ p. 3 - 12).

Note

internal	= table in ROM
EEPROM	= free type
internal and EEPROM	= table and free type

2. Check whether syringe table is readable.
3. Check syringe recognition.
   a) Insert 20 ml potentiometer calibration gauges. The 20 ml syringe symbol is displayed.
   b) Remove potentiometer calibration gauge.
   c) Insert max. 50 ml potentiometer calibration gauges. The 50 ml syringe symbol is displayed.
   d) Remove potentiometer calibration gauge.

Electrical Safety

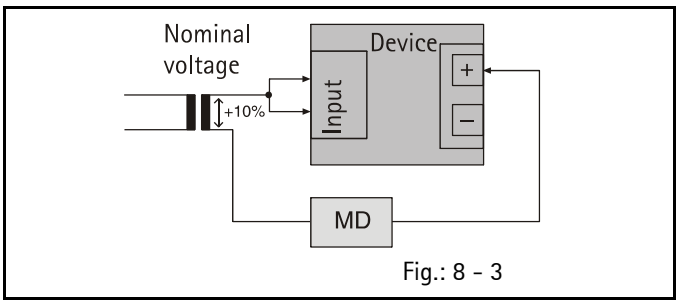


Fig.: 8 - 3

1. Measure mains voltage and note down.
2. Measure protective conductor resistance and note down.
3. Measure patient leakage current as described hereafter and note down.
   - Remove battery pack or batteries. Unit is at rest.
   - Apply nominal voltage + 10 %.
   - Measure patient leakage current between short-circuited mains inlet and plus pole (right top battery compartment).
   - Enter value in check list.

Accessories

Enter accessories, e.g. MFC interface lead or battery in TSC.

Optional

Enter rate limitation and bolus rate limitation in TSC.

8 Procedural Instructions on the TSC

For your notes:

Test Equipment and Special Tools 9

Designation	Ord. No.
Zero point gauge	3450 1703
Calibration gauge (6.6 -80 N)	0770 1535
Current step gauge (10 -130 N) (for TSC, as option)	0770 1616
Potentiometer calibration gauge, 20 ml.	0770 1543
Potentiometer calibration gauge, max. 50 ml	0770 1624
MFC service connector	3450 1215
Socket spanner for MFC connector	0770 1497
Interface cable	0871 1661

For your notes:

Spare Parts List 10

Designation	Ord. No.
Perfusor® compact	
Battery pack	3450 1690
Small parts kit for 5 units	3450 7736
Unit connecting lead, hospital grade	3450 5458
Unit connecting lead 220-240 V	3450 2718
Instructions for use, complete	
Language:	
German	3891 1302
English	3891 1310
French	3891 1329
Spanish	3891 1337
Dutch	3891 1345
Italian	3891 1353
Portuguese	3891 1361
Norwegian	3891 1370
Finnish	3891 1388
Swedish	3891 1396
Czech	3891 1400
Turkish	3891 1418
Polish	3891 1426
Danish	3891 1434
Syringe holder, complete with screw and cap	3450 6608
Unit feet	3450 6640
Battery compartment cover	3450 6632
Snap-in clip and snap-in lever	3450 6616
A-Module, complete, with board, MFC and buzzer (replaces A-Module up to serial number 38100)	3450 5288
Buzzer	3450 8643
LS-clip	3450 7710
E-Module with DIANET	3450 6675
E-Module with DIANET^{Star} (from serial number 50921 on)	3452 0465
N-Module (220 -240 V)	3450 6683
N-Module (100 -120 V)	3450 6730
Housing upper part incl. membrane keyboard, carrying handle and LS-clip	3450 6586
Carrying handle	3450 6438

Drive, complete (with motor) 3450 6624

Straight pin lock 3450 9100

Axial positioner 3450 6659

Drive board 3450 6691
with main PCB and satellite boards
for syringe size recognition
and recognition of direction of rotation

Drive head, complete 3450 1720

Toggle 3450 1711

Housing bottom part, complete 3450 6594

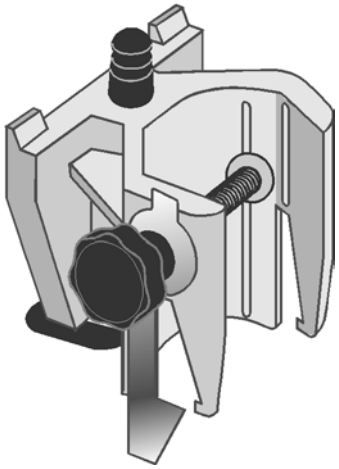


Fig.: 10 - 1 Universal Clamp (Poleclamp)

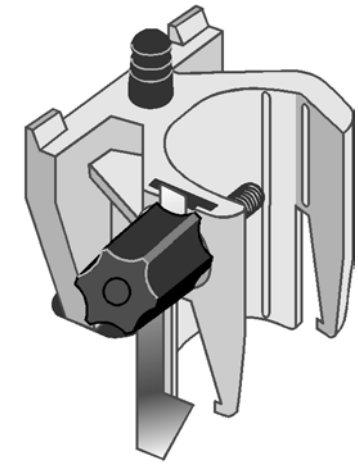


Fig.: 10 - 2 Universal clamp

Designation	Ord. No.
Poleclamp	
Pole clamp (universal clamp, rotating)	3450 9054
Universal Clamp (Poleclamp)	
Universal clamp, complete	3450 5857
Universal clamp	3450 8325
Threaded rod	3450 8333
Star handle body	3450 8384
Safety clip	3450 8341
Safety hook	3450 8368
Plate (2 pcs.)	3450 2610
Connection cap D12/4 (5 pcs.)	3477 4149
Bellows (5 pcs.)	3477 3274
Pressure spring (5 pcs.)	3477 4165
Universal Clamp	
Universal clamp, complete	not available any more
Threaded rod	34 50 5903
Safety hook	34 50 5865
Turning handle	34 50 5890
Rubber cover (5 pcs.)	34 77 3290
Bellows (5 pcs.)	34 77 3274
Connection cap (5 pcs.)	34 77 3304
Pressure spring for pole fixation (5 pcs.)	34 77 3282

For your notes:

Index 11

11 Index

Appendix A

Revision Service-Documentation

Version 2.1

This Service Manual was approved by B. Braun on 16.03.2006.

This manual has been completely revised. The most important changes are listed below:

- Changed manual structure
- New software
- New spare parts
- Total list of spare parts
- Checking the pressure cut-off during Bolus after repair

Current Information

If you hear a scraping noise when the drive arm is pulled out, the straight pin (under the spindle) may have come loose. In this case, an additional straight pin lock (Ord. No. 3450 9100) can be inserted in units up to serial No. 66725. From serial No. 66725 on this straight pin lock is already fitted. Observe the instructions attached.

A Appendix A

For your notes:

Modification Instructions for Syringe

B

Holder

Description

The syringe holder must be modified as recognition of syringes with a large outer diameter by the light barrier system was difficult. This modification is limited to installation of a washer.

Modification

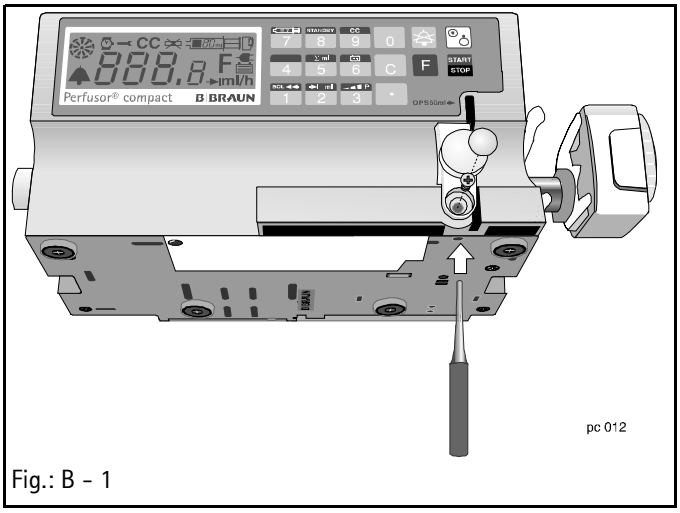


Fig.: B - 1

1. Pierce through the cap and remove.
2. Fasten syringe holder with pin punch.
3. Remove screw.
4. Pull off holder.
5. Push washer 0.8x4x3.2 on the shaft.
6. Insert syringe holder.
7. Fit new screw (not the old one) and safety lock with Loctite 274.
8. Place on cap.
9. Check syringe recognition for proper function (see „Functional Inspection" ➨ p. 5 - 2).

B Modification Instructions for Syringe Holder

For your notes: