This Service Manual is valid for

Voltage 230 V:
- Infusomat® fmS, German.................. 871 5424
- Infusomat® fmS, French.................. 871 5521
- Infusomat® fmS, Dutch .................. 871 5530
- Infusomat® fmS, Italian .................. 871 5564
- Infusomat® fmS, Danish .................. 871 5432
- Infusomat® fmS, Norwegian .............. 871 5491
- Infusomat® fmS, Swedish ................ 871 5505
- Infusomat® fmS, Finnish ................ 871 5513
- Infusomat® fmS, Czech .................. 871 5580
- Infusomat® fmS, Polish .................. 871 5599

Voltages 200 V / 230 V / 240 V, switchable:
- Infusomat® fmS, English .................. 871 5440
- Infusomat® fmS, English .................. 871 5548
- Infusomat® fmS, Spanish.................. 871 5459
- Infusomat® fmS, Portuguese............... 871 5467
- Infusomat® fmS, Turkish ................. 871 5572

Voltages 100 V / 110 V / 120 V, switchable:
- Infusomat® fmS, English .................. 871 5416
- Infusomat® fmS, Dutch .................. 871 5475
- Infusomat® fmS, Spanish ................ 871 5483
- Infusomat® fmS, Portuguese............... 871 5394

This Service Manual is available under
the following part number:

Designation                  Part No.
Service Manual Infusomat® fmS, English .... 8713 9124

Languages of this Manual

Designation                  Part No.
Service Manual Infusomat® fmS, German .... 8713 9123

The complete Service Manual contains
the following pages:

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Page 1-1 to page 1-12
Page 2-1 to page 2-8
Page 3-1 to page 3-10
Page 4-1 to page 4-20
Page 5-1 to page 5-2
Page 6-1 to page 6-2
Page 7-1 to page 7-4
Page 8-1 to page 8-8
Page 9-1 to page 9-2
Page 10-1 to page 10-4
Page 11-1 to page 11-2
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Important Preliminary Remarks

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,
Important Preliminary Remarks

- 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.

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.
Important Preliminary Remarks

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.

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<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CC</td>
<td>Computer Controlled</td>
</tr>
<tr>
<td>CLR</td>
<td>Clear</td>
</tr>
<tr>
<td>Dig</td>
<td>Digit</td>
</tr>
<tr>
<td>ESD</td>
<td>Electrostatic Discharge</td>
</tr>
<tr>
<td>UA</td>
<td>Unit Alarm</td>
</tr>
<tr>
<td>FuP</td>
<td>Function Microprocessor</td>
</tr>
<tr>
<td>KuP</td>
<td>Control Microprocessor</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid Crystal Display</td>
</tr>
<tr>
<td>OIL</td>
<td>Original Infusomat Line</td>
</tr>
<tr>
<td>PCA</td>
<td>Patient Controlled Analgesia</td>
</tr>
<tr>
<td>TSC</td>
<td>Technical Safety Check</td>
</tr>
<tr>
<td>TEMP</td>
<td>Temperature</td>
</tr>
</tbody>
</table>
Contact Persons

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 subsidiary.

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
Dr. Ludwig Schütz
(§ 30 MPG)
e-mail: ludwig.schuetz@bbraun.com

Translation
Brückner GmbH, Germany
Contact Persons

For your notes:

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
System Overview

Physical Construction

The Infusomat® fmS is a compact volumetric peristaltic infusion pump.

Standard delivery rate range 0.1 to 999.9 ml/h

The unit is operated via a membrane keyboard. It is equipped with an LCD-display (liquid crystal display) for the display of the delivery rate and the operating support of the user. Two control LEDs display alarms, and the running of the infusion pump.

Barcode

A barcode label is attached to the left front side of new Infusomat® fmS unit versions which can be retrofitted on previous devices. This barcode label is used to read the serial and DIANET type number via a scanner when the Infusomat® fmS is operated in an fm-system.
Infusion Lines
The Infusomat® fmS can be operated with the Original Infusomat® Line (OIL) and the Infusomat® Space Line. The lines are distinguished by the different silicone pump segments. They have to be inserted in a different way; in addition the TSC differs.

**WARNING**
OPERATING THE UNIT ALTERNATELY WITH THE ORIGINAL INFUSOMAT® LINE AND THE INFUSOMAT® SPACE LINE IS NOT RECOMMENDED.

**Note**
Please observe the “Instruction for Technical Service - Adjustment to Space Line” when using the Infusomat® Space Line for the first time.
Operation Flow Chart

Switch On

Standard operation
Service connector plugged ...
Special functions ...

Set delivery rate
Volume preselection
Time preselection
Rate calculation

Start infusion
Stop infusion
Change delivery rate ...
Recall info
Recall Bolus
KOR Mode

1 See Service Program diagram
2 Only when preselected time or preselected volume has expired
3 Please pay attention to activation in Service Program
4 Only available with IFMC
5 From software IFMe, IFME on
6 From software IFME on

Fig.: 1 - 2

See instructions for use for detailed information.
Function

Two independent software-controlled microprocessor systems control and monitor the hardware. On the basis of their functions, they are defined respectively as a control and a function processor. Both systems work with independent clock frequencies and have access to different program and data memories. All safety-relevant functions are handled by both microprocessors and the results are counter checked (CF- and FC-latch).

The input via the keyboard is fed to both processors. Additionally the acknowledgement signal of the ON/OFF key is fed to the mains power supply logic (voltage E/A-TAS). The function processor has also access to this logic via E/A-INT.

Description of the voltage signals (see „Signal Table“ ➤ p. 1 - 6).
The voltage supply is generated either directly from mains, via the FM connector (14 V connection to the fluid manager system), or via the MFC-connector (11 to 16 V) and as an internal supply via the internal 7.2 V NiCD battery. The mains module is available in three versions: 230 V, 220 / 230 / 240 V and 100 / 110 / 120 V. The rated voltage has a tolerance of + 10% to − 15 %.

A voltage of 11 V to 18 V is available after transformation and rectification. This voltage is fed to the battery charge circuit and the unit supply. This is also valid for an external 12 V supply from the MFC- or FM-connector. The FET V10 switches between the external and the internal voltage supply. The transistor V10b works as an ON/OFF switch for the operating voltages UPS, UMOT and +5V. The +5V supplies the complete electronics including the double channel microprocessor system. A window comparator constantly monitors the +5V for undervoltage or overvoltage. The function is checked during switch-on. The operating voltage UPS supplies the stepper motor and the UMOT, the stepper motor drive.

The transistor V47 switches the operating voltage UMOT. In case of an alarm the motor is switched off by V47. Additionally the switching function of the transistor is checked during the switch-on test.

The circuit has two separate assembly groups with separate supply voltages UBA and UBB. The ON/OFF circuit has a retriggerable delay switch-off. A follow-up charging circuit drives the transistor V10b.

The alarm logic (operating voltage UBB) is an RS latch. This is set when the unit is running and activates the alarm circuit. The alarm buzzer and driver are also driven by UBB. The ON/OFF circuit is activated and the voltage supply is switched on by pressing the ON/OFF key. The alarm latch is reset simultaneously. A function test of the voltage monitoring, motor circuit and alarm activation is performed. The voltage supply is maintained by cyclic self-holding pulses fed to the logic. The alarm latch is also activated.
## System Overview

### Signal Table

<table>
<thead>
<tr>
<th>Signal</th>
<th>Meaning</th>
<th>Signal</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>Voltage supply electronic</td>
<td>PKS2</td>
<td>Pump Head Sensor 2</td>
</tr>
<tr>
<td>5V-HT</td>
<td>Overvoltage test</td>
<td>PKSS</td>
<td>Pump Head Sensor Control</td>
</tr>
<tr>
<td>5V-LT</td>
<td>Undervoltage Test</td>
<td>PRS</td>
<td>Staff Call Relay Control</td>
</tr>
<tr>
<td>AK-I</td>
<td>Battery Charge and Discharge Current</td>
<td>PRS-F</td>
<td>Staff Call Relay Function Channel</td>
</tr>
<tr>
<td>AK-LAD</td>
<td>Battery Capacity ON/OFF</td>
<td>PRS.RUF</td>
<td>Staff Call Relay Control</td>
</tr>
<tr>
<td>AK-Test</td>
<td>Battery Test</td>
<td>RDE</td>
<td>Rate Display Enable</td>
</tr>
<tr>
<td>ALA-UB</td>
<td>Operating Voltage Alarm</td>
<td>RES</td>
<td>Power on Reset</td>
</tr>
<tr>
<td>CS</td>
<td>Chip Select</td>
<td>RES-F</td>
<td>Reset Function Channel</td>
</tr>
<tr>
<td>DI</td>
<td>Data Input</td>
<td>RES-K</td>
<td>Reset Control Channel</td>
</tr>
<tr>
<td>DO</td>
<td>Data Output</td>
<td>RTS</td>
<td>Return to Send (DIANET)</td>
</tr>
<tr>
<td>E/A-INT</td>
<td>ON/OFF by Microprocessor</td>
<td>Rx</td>
<td>Receive Data</td>
</tr>
<tr>
<td>E/A-ST</td>
<td>ON/OFF Status</td>
<td>SCK</td>
<td>Serial Data Clock</td>
</tr>
<tr>
<td>E/A-TAS</td>
<td>ON/OFF Key</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 - 1  Signal table (Part 1 of 2)
When the unit is connected to mains the unit supply voltage is switched on for the duration of the switch-off delay time. If the microprocessor recognizes a sufficient mains voltage for charging, the voltage supply is maintained. In this case only a battery balance is carried out, because a key was not pressed. The current battery capacity and the battery operating hours are displayed in the LCD. The unit is switched off when the ON/OFF key is pressed for at least 2 seconds. Thereby the self-holding is triggered and the alarm latch is reset with a delay. After another 20 seconds the unit is switched off, because the pulses are missing. If the Infusomat® fmS is switched off in mains operation with the ON/OFF key, the internal mains voltage is still present.
System Overview

In mains operation battery function is checked during the switch-on test. Therefore the charge and discharge current are measured and the charging of the battery is interrupted for the duration of measurement.

Battery Operation

The battery function is monitored by the following data: charge current, discharge current and time, and self-discharge time. In battery operation the battery function is checked during switch-on test. The theoretical load condition is read from the clock module of the battery. Then the battery is connected to UPS and the voltage is measured. If the minimum requirements are not reached a battery alarm is activated.

Alarm Circuit

The alarm generation consists of:
- Standstill of pump due to switch-off of MS (motor circuit) and UMOT (motor operating voltage)
- Audible alarm due to the drive via ALA-AK (control channel) or via ALA-UB. The alarm volume is about 65dBA.
- Optical alarm. Is displayed in the LCD- and a separate LED-display. Additionally the set rate flashes with AAAA.
- Staff call via the MFC staff call cable.

The user must check the optical and audible alarm during the switch-on test. An alarm must be activated to test the staff call alarm of the Infusomat® fmS, e.g. open pump cover during operation.

Pump Unit

The pump head is driven by a stepper motor. Each full step of the motor is realized by 5 microsteps. The motor is driven by an FET output stage. The function processor controls the motor with the MS signal. A slot disc which is mounted on the pump head axle is scanned by two light barriers (PKS1 and PKS2 signal). Thereby the control microprocessor monitors the direction of rotation and speed of the pump head.

The pump head position is also determined with the PKS2 signal. The motor can therefore be accelerated during the withdrawal phase. Thus a nearly pulse-free flow is realized in the lower delivery range (<100 ml/h). The total pump head cycles and running time are available in the Service Program under history data.
**System Overview**

**Mechanical Occlusion Pressure:**

The Infusomat® fmS has a linear peristaltic pump. This pump has 12 slides which are driven by a camshaft.

When the pump cover is closed, the pump tube is squeezed (occlusion) by at least one of the slides, independent of the pump head position. The complete pump unit is mounted behind the front panel in the cabinet frame. The hinges and the locking bow for the pump cover are led through the front panel. The pump cover is automatically closed when the operating unit door is closed. The slides are pressed against the pump cover by a spring system in the pump unit. Thereby a delivery pressure is realized and mechanically limited by the springs.

If the pressure limit is exceeded there is no volume delivery. The drop sensor activates an alarm. If one of the springs fails, the spring system will ensure that an unsafe condition cannot occur (free flow). The two remaining springs ensure an appropriately high occlusion pressure.

**Electronic Occlusion Pressure:**

The electronic occlusion sensor is mounted on the output side of the pump. A spring pressure loaded slide is seated on the infusion line. An increase of pressure in the infusion line leads to a deflection of the coil core via the pressure slide. The depth of immersion is measured inductively. When a preset pressure threshold is reached the pump drive is switched off, and an alarm is activated. The electronic occlusion pressure is a single channel circuit. In case of a failure, the mechanically limited maximum pressure can be reached.

**Motor Switch-Off by Both Processors:**

Function processor: MS signal to switch off the motor drive. - Control processor: MOTEIN signal to switch off the drive of the motor operating voltage.

**Computer Interface**

The Infusomat® fmS is equipped with a computer interface. It can be connected to the optical interface or via the MFC service connector. To activate the computer operation please ask for a detailed description from B. Braun.

Up to software version IFMC: DIANET
From software version IFMe, IFME on: Dianet^Star
Braun fluid manager system (fm system)  

The Infusomat® fmS can be operated as a stand-alone unit or integrated in an intensive care unit, e.g. the B. Braun fluid manager system (fm system). It is integrated by simply snapping the unit into the system. Mains supply and data communication are automatically connected. Thereby data acquisition and transmission to higher computer system levels are possible.

Internal Assignment

Fig.: 1 - 5
## Accessories

<table>
<thead>
<tr>
<th>Designation</th>
<th>Ord. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting clip for drop chamber &quot;TK 2000&quot;</td>
<td>3477 3223</td>
</tr>
<tr>
<td>Mounting clip for drop chamber &quot;Intrafix air&quot;</td>
<td>3477 3215</td>
</tr>
<tr>
<td>Drop sensor, complete</td>
<td>3450 578A</td>
</tr>
<tr>
<td>Short pole clamp</td>
<td>3450 5873</td>
</tr>
<tr>
<td>Drop chamber holder</td>
<td>3477 3088</td>
</tr>
<tr>
<td>Mains lead (200-240V~)</td>
<td>3450 2718</td>
</tr>
<tr>
<td>Mains lead (100-120V~)</td>
<td>3450 5423</td>
</tr>
<tr>
<td>Mains lead USA / CAN</td>
<td>3450 5393</td>
</tr>
<tr>
<td>Universal clamp, complete</td>
<td>3450 5857</td>
</tr>
<tr>
<td>Pole clamp (universal clamp, rotating)</td>
<td>3450 9054</td>
</tr>
</tbody>
</table>
Software Update

Designation | Ord. No.
-------------|---------
Update kit IFMC02003 | 3450 645A
Update kit IFMe02004 / IFME03004 | 3450 645C
Update kit IFMe02005 / IFME03005 | 3450 645D
Update kit IFMe02006 / IFME03006 | 3450 645E
Update kit IFMe02007 / IFME03007 | 3450 645F
MFC interface line | 0871 1661

The higher digit always replaces the lower digit for the revision level, e.g. IFME02007 replaces IFME02006.

Units with an old software version (e.g. IFMC02001) can be updated to the new software version IFME03007.

When the software group changes the unit functions are changed, too. Therefore unit users must be informed (e.g. instruct the user and exchange the instructions for use – software coding (e.g. IFME) is to be found on the cover page of the instructions for use.)

**Note**
Do not use an update program on Windows NT systems.

**Note**
Mark the unit after having updated the software! The new software version must be clearly recognizable.

Only update from old to new software versions, never in reverse order (e.g. never update from IFMC02003 to IFMC02001!).

All units used in one ward should have the same software status and basic setup to avoid operator mistakes.

**Note**
Software updates must be reported to B. Braun for registration. Observe the notes of the update program and the supplements!
Approved Software Versions

IFMC02001
- Basic software
  (Must not be used any more. Please contact the Technical Service of B. Braun).

IFMC02002
- Error elimination
  at Bolus special function
  at staff call on the fm system
- Optimized air sensor evaluation

IFMC02003
- EMC optimized
- New error code FF16, defective membrane keyboard

IFMe02002
- Preselected volume and time counted down to 0
- Interface changed to DIANET Star
  (not compatible with Dianet)
- New special function dose calculation
- New special function Piggyback
- New special function clock
- Storage of alarms in case of malfunctions, which can be recalled in the Service Program, function 230

IFME03002
Only controller board with loudspeaker (see „Controller Board“ p. 4 – 5).
Like IFMe02002 and in addition:
- Alarm volume can be set
- History function

IFMe02003
- Dianet Star corrected

IFME03003
- Additionally History corrected
- Log of volume delivered
- New event: normal mode / piggy mode

IFMe02004 / IFME03004
- Optimized dose calculation
- New language “Hungarian” in language group E
IFMe02005 / IFME03005
- Cyclical battery test
- Retaining or deleting last dose calculation when unit is switched off, can be set in the Service Program

IFMe02006 / IFME03006
- Optimized switch-off cycle of Service Program

IFMe02007 / IFME03007
- Reset the battery capacity from 0 mAh to 1 mAh in the event of a negative battery test result.
- Reset the battery voltage acceptance thresholds from 7.55 V to 7.35 V.
Error Messages and Alarms

Alarms of the function processor 80c535 are displayed in the text box of the LCD-display. Alarms of the control processor 68HC11 are displayed in the 7 segment display. The alarms help to troubleshoot unit malfunctions. As not all malfunctions can be considered, unit malfunctions with different messages, which are not listed, can be displayed, or there may be no message.

Detected unit alarms are displayed in the text box as “Unit Alarms” in the selected language. Additionally the error number is displayed in the text box.

Function Processor 80c535

<table>
<thead>
<tr>
<th>Text Box</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>defective RAM memory</td>
</tr>
<tr>
<td>101</td>
<td>UMOT cannot be switched on</td>
</tr>
<tr>
<td>102</td>
<td>UMOT still switched on despite overvoltage</td>
</tr>
<tr>
<td>103</td>
<td>UMOT still switched on despite MOTEIN=0</td>
</tr>
<tr>
<td>104</td>
<td>UMOT still switched on despite undervoltage</td>
</tr>
<tr>
<td>105</td>
<td>ON/OFF key pressed longer than 14 sec</td>
</tr>
<tr>
<td>106</td>
<td>defective air sensor (calibration value?)</td>
</tr>
<tr>
<td>107</td>
<td>defective program memory</td>
</tr>
<tr>
<td>108</td>
<td>defective program flow</td>
</tr>
<tr>
<td>109</td>
<td>different number of pump head cycles</td>
</tr>
<tr>
<td>110</td>
<td>different keyboard gaps between 80c838 and 68hc11</td>
</tr>
<tr>
<td>111</td>
<td>different program versions between 80c535 and 68hc11</td>
</tr>
<tr>
<td>112</td>
<td>defective program flow</td>
</tr>
<tr>
<td>113</td>
<td>testbit! =0 out of switch-on test</td>
</tr>
<tr>
<td>116</td>
<td>defective program memory – text</td>
</tr>
<tr>
<td>117</td>
<td>defective program memory – text does not match with program</td>
</tr>
<tr>
<td>118</td>
<td>reset during active operation</td>
</tr>
<tr>
<td>119</td>
<td>defective ROM</td>
</tr>
</tbody>
</table>

Table 2 - 1
Control Microprocessor 68hc11

FFxx is displayed in the 7 segment display with flashing dots. FFxx is the error code.

<table>
<thead>
<tr>
<th>7 Segment Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF01</td>
<td>dummy for test</td>
</tr>
<tr>
<td>FF02</td>
<td>battery not present / missing battery current</td>
</tr>
<tr>
<td>FF03</td>
<td>defective RAM memory</td>
</tr>
<tr>
<td>FF04</td>
<td>defective program memory</td>
</tr>
<tr>
<td>FF05</td>
<td>defective program memory</td>
</tr>
<tr>
<td>FF06</td>
<td>calibration data error from EEPROM</td>
</tr>
<tr>
<td>FF07</td>
<td>pump head cycle not plausible</td>
</tr>
<tr>
<td>FF08</td>
<td>failure / inaccuracy of system clock</td>
</tr>
<tr>
<td>FF09</td>
<td>failure 100msec system clock</td>
</tr>
<tr>
<td>FF10</td>
<td>reset during active operation</td>
</tr>
<tr>
<td>FF12</td>
<td>no dynamic pressure sensor signal (EDB)</td>
</tr>
<tr>
<td>FF16</td>
<td>defective membrane keyboard (from IFMC02003 on)</td>
</tr>
</tbody>
</table>

Table 2 - 2
### Software Default Values

<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Default</th>
<th>Customer Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard function</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User language</td>
<td>depending on Art. No.</td>
<td></td>
</tr>
<tr>
<td>Alarm type</td>
<td>single stage</td>
<td></td>
</tr>
<tr>
<td>Staff call</td>
<td>static without OFF Alarm, without switch-on pulse</td>
<td></td>
</tr>
<tr>
<td>Ward identification</td>
<td>“Ward Identification”</td>
<td></td>
</tr>
<tr>
<td>Drug 0</td>
<td>blank</td>
<td></td>
</tr>
<tr>
<td>Drug 1 ... 9</td>
<td>drug 1 ... 9</td>
<td></td>
</tr>
<tr>
<td>Operating alarms</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Minimum delivery rate</td>
<td>0.1 ml/h</td>
<td></td>
</tr>
<tr>
<td>Maximum delivery rate</td>
<td>999.9 ml/h</td>
<td></td>
</tr>
<tr>
<td>Maximum air rate</td>
<td>1.5 ml/h</td>
<td></td>
</tr>
<tr>
<td>Maximum air bubble</td>
<td>0.30 ml</td>
<td></td>
</tr>
<tr>
<td><strong>Special functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dose calculation</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>Bolus</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>Standby</td>
<td>activated</td>
<td></td>
</tr>
<tr>
<td>Drug selection</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>CC Mode 2)</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>Switch-off pressure</td>
<td>activated</td>
<td></td>
</tr>
<tr>
<td>Drop control</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>Piggyback 1)</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>Battery capacity</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>Data lock</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>Alarm tone 1)</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td>Clock 1)</td>
<td>deactivated</td>
<td></td>
</tr>
<tr>
<td><strong>SM menu</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interval Bolus dose</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>Online rate setting</td>
<td>On</td>
<td></td>
</tr>
<tr>
<td>Double rate entry</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td><strong>User data</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch-off pressure</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>Contrast</td>
<td>optimum contrast</td>
<td></td>
</tr>
<tr>
<td>CC Address 2)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Drug</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Data lock</td>
<td>Off</td>
<td></td>
</tr>
<tr>
<td>Standby time</td>
<td>24h 00min</td>
<td></td>
</tr>
<tr>
<td>Drop control</td>
<td>On</td>
<td></td>
</tr>
</tbody>
</table>

1) From software IFMe, IFME on
2) No longer available in software IFMe, IFME
<table>
<thead>
<tr>
<th>Menu Item</th>
<th>Default</th>
<th>Customer Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolus key</td>
<td>On</td>
<td></td>
</tr>
<tr>
<td>Bolus rate</td>
<td>999.9 ml/h</td>
<td></td>
</tr>
<tr>
<td><strong>Calibration data</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air sensor calibration value</td>
<td>182 mV</td>
<td>must not be changed</td>
</tr>
<tr>
<td>Scale factor</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td><strong>Unit specific data</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIANET type no.</td>
<td>depending on unit</td>
<td></td>
</tr>
<tr>
<td>Unit No.</td>
<td>depending on unit</td>
<td></td>
</tr>
<tr>
<td>Operating hours</td>
<td>depending on unit</td>
<td></td>
</tr>
<tr>
<td>Battery hours</td>
<td>depending on unit</td>
<td></td>
</tr>
<tr>
<td>Number of pump head cycles</td>
<td>depending on unit</td>
<td></td>
</tr>
</tbody>
</table>
Software

For your notes:
Structure of the Service Program

Service connector plugged

Switch On

Short display: software version, user language

Standard operation (see operating flow diagram)

Service Program activated

Group: Unit data
- Software version 100.0
- Drug 110.0
- Ward identification 120.0
- Serial number 140.0
- DIANET type no. 150.0

Group: History data
- Operating hours 200.0
- Battery op. hours 210.0
- Pump head cycles 220.0
- Alarms 230.0

Group: Test
- Air inline sensor 300.0
- Pressure sensor 310.0

Group: Unit modification
- Service language 400.0
- User language 410.0
- Alarm tone 420.0
- Staff call 430.0
- Special function 440.0

Group: Calibration
- Scale factor 510.0
- Air inline sensor 520.0
- Pressure stage 540.0
- Pump data 550.0
- History 2)
- Menu 450.0
- Delivery rate 460.0
- Air alarm 470.0
- Dianet mode Display 1)
- Delete dose values 490

1 From software IFMe, IFME on
2 From software IFME on

Fig.: 3 – 1
Additional Functions with Plugged Service Connector

Software Version and User Language
1. Plug service connector on MFC socket at the rear of the unit.
2. Switch on unit and keep the ON/OFF button pressed (for max. 15 s).
3. The software version and user language are displayed in the LCD-display.
4. The unit is switched on when the ON/OFF button is released.
5. ** appears in the LCD-display if the service connector is plugged.

Two LEDs are integrated in the service connector:
- green = Power supply active
- red = Alarm

The following conditions are activated:
- The operating alarms are muted.
- All special functions are accessible (including the disabled).
- The special functions are slightly modified. (Example: SM battery capacity has keys for 0 min/32 min presetting).
- The battery capacity display switches between the nominal and the actual capacity. If the maximum battery capacity is not reached "?” will be displayed before the new nominal capacity.

Contrast Setting
1. Select "Contrast Setting" with the SM key. The softkey symbols will flash.
2. Set display contrast with the (+) or (-) key.
3. Return to main menu with END.

Disabling the Pressure Sensor (Occlusion Pressure Mechanical)
The electronic pressure monitoring can be deactivated to check the mechanical occlusion pressure.
1. Select "Occlusion Pressure" with the SM key.
2. Select "Mechanical".
3. Return to main menu with END.

A too low pump speed is indicated in the display by "Pressure Alarm" with underlined stars.
Start / Quit the Service Program

1. Plug service connector on MFC socket at the rear of the unit. - "" appears in the display.
2. Select "Service Program" with the SM key. When the service program is activated the red alarm LED flashes. The LED displays the code number of the selected group and function.

FUNCTION
- END Jumps to the initial function
- GR+ Selects group
- FU+ Selects function in the activated group
- OK Activates the selected function or if necessary skips to the sub-functions with NEXT

Quit the Service Program
1. Press END in the main menu. - A data storage query is activated: "Save changes? Yes / No".
   Y / N terminates the Service Program.
   Press END to jump to the last function.
2. Switch off unit and remove service connector.

Note
Disconnect the unit from mains for at least 30 seconds after termination of the Service Program (memory is deleted). Then the unit can be switched on again.

Unit Data

Software Version
1. Select sub-functions with NEXT.
2. The current software version is displayed in the LCD-display:
   - User program version with date
   - Language with text version. Further languages with (+).
   - Service Program version
   - Service language with text version
3. Return to initial function with END.
Drug Name  
Function 110.0
Memory for maximum 10 drugs and 20 characters per name.
1. Display stored drug names with NEXT key.
2. Delete displayed entry with CLR.
3. Press YES to modify a drug name:
   Move cursor to character with NEXT.
   Select new character from line 3 with << or >>.
4. Repeat procedure for each character.
5. Return to initial function with END.

Ward Identification  
Function 120.0
Enter and display of a ward specific unit identification. Permanent display if the unit is connected to mains and switched off.
1. Delete displayed entry with CLR. Press YES to enter modifications:
   Move cursor to character with NEXT.
   Select new character from line 3 with << or >>.
2. Repeat procedure for each character.
3. Return to initial function with END.

Serial Number  
Function 140.0
The displayed serial number must correspond with the number on the unit type plate, as this number is used in interface mode.
1. YES activates the entry mode. Enter via the numeric keyboard.
2. YES stores the changed or new number.
3. Return to initial function with END.

DIANET Type Number  
Function 150.0
The displayed serial number must correspond with the number on the unit type plate, as this number is used in the interface mode.
1. YES activates the entry mode. Enter via the numeric keyboard.
2. YES stores the changed or new number.
3. Return to initial function with END.

Operating Hour Counter  
Function 200.0
1. OK activates the display.
2. Return to initial function with END.

Battery Operating Hours  
Function 210.0
1. OK activates the display.
2. Return to initial function with END.

**Pump Head Cycles**  
Function 220.0  
Display of the pump head cycles (delivered volume).  
1. OK activates the display.  
2. Return to initial function with END.

**Operating Alarms**  
Function 230.0  
The last 20 operating alarms can be recalled.  
They are displayed as 16 bit binary codes and each bit position can be set from 0 to 1.  
1. OK activates the alarm display.  
2. Display operating alarms -01 to -20 with the (+) and (-) key.  
3. Delete operating alarms with CLR.  
4. Return to initial function with END.  
Unit alarms will also be displayed from software version IFMe, IFME on.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1</td>
<td>Battery empty (battery alarm)</td>
</tr>
<tr>
<td>14</td>
<td>0</td>
<td>Pump cover open</td>
</tr>
<tr>
<td>13</td>
<td>0</td>
<td>Drop alarm</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>Air alarm</td>
</tr>
<tr>
<td>11</td>
<td>0</td>
<td>Occlusion alarm</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>Expired standby time</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>CC alarm (interface)</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>KOR end alarm</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>free</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>Operating alarm</td>
</tr>
</tbody>
</table>

Example for alarm "Pump cover open":  
```
1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
```

**Test**  
After exchange check the function of the air inline sensor.  
See TSI-List for permissible check values (see „Technical Safety Check TSC“ ⊗ p. 7 – 1).  
1. Press OK. The received signal amplitude is displayed as a measured value.  
(The test value with NEXT is not important).  
2. Insert an infusion line filled with air and check the maximum permissible air value.  
3. Insert an infusion line filled with fluid and check the minimum permissible water value.  
4. Return to initial function with END.

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Inline Sensor</td>
<td>Function 300.0</td>
</tr>
<tr>
<td></td>
<td>After exchange check the function of the air inline sensor.</td>
</tr>
<tr>
<td></td>
<td>See TSI-List for permissible check values (see „Technical Safety Check TSC“ ⊗ p. 7 – 1).</td>
</tr>
</tbody>
</table>
|             | 1. Press OK. The received signal amplitude is displayed as a measured value.  
(The test value with NEXT is not important).  |
|             | 2. Insert an infusion line filled with air and check the maximum permissible air value.  |
|             | 3. Insert an infusion line filled with fluid and check the minimum permissible water value.  |
|             | 4. Return to initial function with END.  |
Pressure Sensor

Test Equipment
Calibration gauge 4 mm

(see „Test Equipment and Special Tools“ p. 9 – 1)

1. Push in the bottom slide of the finger pump.
2. Activate function with OK button.
3. Open unit door.
4. Note value measured by the pressure sensor (actual value).
5. Insert the 4 mm calibration gauge and close unit door.
6. The measured value read on the pressure sensor must be 5 to 15 digits above the value noted.
7. Quit function with END.

Note
If the 5 to 15 digits are not reached, the pressure sensor unit must be mechanically adjusted (see „Pressure Sensor“ p. 4 – 14).

Unit Modifications

Service Language

Function 400.0
English or German can be selected.
1. OK activates the function.
2. Select language with NEXT.
3. Acknowledge with YES.
4. Return to initial function with END.

User Language

Function 410.0
Four user languages per language group are available (depending on software).
1. OK activates the function.
2. Select language with NEXT.
   The language no. and text version are displayed.
3. Acknowledge with YES.
4. Return to initial function with END.

Alarm Tone

Function 420.0
Different alarm modes can be selected:
- Single stage
- A “10 minutes off” alarm can be selected.
  In this mode the audible alarm is activated with a delay of 10 minutes.
The activation of the "10 minutes off" alarm is only permissible, if:
- the staff call is connected and
- the Infusomat® fmS has an attention label (label drawing no. M007100000F04).

1. OK activates the function.
2. Select alarm tone with NEXT.
3. Acknowledge with YES.
4. Return to initial function with END.

**Staff Call** Function 430.0

Different staff call modes can be selected:
- Dynamic with OFF Alarm
- Dynamic without OFF Alarm
- Static without OFF Alarm

For further details see staff call line in the instructions for use.

An additional switch-on pulse (YES/NO) can be activated for each mode to test the staff call unit.

1. OK activates the function.
2. Select staff call type with NEXT.
3. Acknowledge with YES.
4. Return to initial function with END.

**Special Functions** Function 440.0

Special functions can be activated in the Service Program, which are then available on the user interface. Deactivated special functions will not be displayed. The SM softkey will not be displayed in standard operation, if all special functions are deactivated. Special functions to be selected, see Fig.: 1 – 2.

1. OK activates the function.
2. Select special functions with NEXT.
3. Activate / deactivate the respective function with YES/NO.
4. Return to main menu with END.
Menu Function 450.0

The availability of menus on the user interface can be set.
- Double rate entry
- Online rate entry
- Interval Bolus

1. OK activates the function.
2. Activate / deactivate the decimal function with NEXT.
3. Acknowledge with YES.
4. Return to main menu with END.

Delivery Rate Function 460.0

The maximum and minimum delivery rates can be set. Range of adjustment of the delivery rate: 0.1 to 999.9 ml/h

1. OK activates the function.
2. Select min./max. delivery rate with NEXT.
3. Acknowledge with YES.
4. Enter value with a numeric key.
5. Acknowledge with OK.
6. Return to initial function with END.

Air Alarm Function 470.0

The air inline sensor sensitivity of the air rate alarm in ml/h (total air alarm) and of the maximum air bubble in ml (single bubble) can be adjusted.
Setting range air rate: 0.5 to 3.5 ml/h
Setting range air bubble: 0.01 to 0.3 ml/h

1. OK activates the function.
2. Select air rate (ml/h) or air bubble (ml) with NEXT.
3. Acknowledge with YES.
4. Enter value with a numeric key.
5. Acknowledge with OK.
6. Return to initial function with END.
Dianet Mode Display

When operated with DianetStar the respective DianetStar-mode (CA, CC, CD) with address 01, e.g. mode CA and address 01 is displayed by: "###CA01###".
The duration of the display after the last data transmission can be set between 0 and 255 seconds.

Deleting Dose Data

When this function is activated operation can be continued with the dose data of the previous therapy.

Calibration

Note

All safety relevant parameters are set by the manufacturer. If these parameters are changed, a new calibration must be performed with calibrated test equipment.

Scale Factor

The scale factor can be set in the limits 40 to 99 digits. Every digit step is equivalent to a 0.5 % modification of the delivery rate. An increase of the scale factor reduces the pump speed, and a decrease increases the pump speed.

A test infusion line (OIL test infusion line with an Infusomat® fmS adjusted for the Original Infusomat® line, and a Space calibration line with an Infusomat® fmS set for the Infusomat® Space Line is to be used for determining the correction value (see „Test Equipment and Special Tools“ p. 9 - 1).

1. OK activates the function.
2. The value can be changed with the entry keyboard (see „Delivery Accuracy“ p. 8 - 6).
3. Acknowledge with YES.
4. Return to initial function with END.
5. Quit the Service Program and save changes with YES.
6. Switch on unit and check delivery rate (see „Delivery Accuracy“ p. 8 - 6).
   If necessary repeat the delivery rate measurement.
Service Program

Air Inline Sensor  
Function 520.0
Alignment or check of the air inline sensor value (alarm threshold)  
(see „Air Inline Sensor“  p. 4 – 17).
1. OK activates the function.
2. Press OK again to activate the air inline sensor value.
3. The value can be changed with the entry keyboard.
4. Acknowledge with YES.
5. AIR SENSOR IS SET acknowledges the entry.
6. Return to initial function with END.
7. Quit the Service Program and save changes with YES.

Occlusion Level  
Function 540.0
Calibrate (see „Pressure Sensor“  p. 4 – 14).

Pump Data  
Function 550.0

Note
Compatibility between controller board and pump must be  
checked before acknowledgement. Only press YES if pump corre-
sponds to controller board.

History  
Function 560.0 *
The history function can be activated or deactivated.
1. Press OK key twice to activate the function.
2. Select the history function with NEXT.
3. ON activates the function. The history protocol memory is ini-
tialized (the current software version and the serial number  
are registered).  
Press OFF key to deactivate the function. The history protocol  
memory is deleted.
4. Return to initial function with END.

Note
See instructions for use for detailed information.

* Only software IFME
Unit Elements

4.1 Mains Fuses

Designation | Ord. No.
--- | ---
Fuse T 0.16 A for 200 / 230 / 240 V (10 pcs.) | 3477 2847
Fuse T 0.315 A for 100 / 110 / 120 V (10 pcs.) | 3477 0534
Fuse holder | 3450 0979

Note
Only use recommended fuses.

Exchange
1. Press the expansion clamps at the fuse holder on the recessed mains plug with a screw driver in direction of the arrows and pull out fuse holder.
2. Replace blown fuses and press in fuse holder. Only use recommended fuses.

Check
Safety check, functional check.

4.2 Battery

Designation | Ord. No.
--- | ---
Battery incl. connector 1.2 AH / 7.2 V and holder | 3450 2556

Exchange
1. Switch off unit and disconnect from mains.
2. Loosen screw, open battery compartment cover and remove battery.
3. Pull off battery connector.
4. Assembly is done in reverse order.
5. After having exchanged the battery the Infusomat® fmS must be connected to mains, before switching on the unit. Thereby the charge and discharge currents are aligned.
6. Charge battery (16 h).

Note
Defective batteries must be orderly disposed of, e.g. send back to B. Braun Melsungen AG, Wareneingang.

Check
Perform switch-on test in battery operation and check the battery running time, if necessary.
4.3 Door Lock

![Diagram of Door Lock](image)

**Designation**

<table>
<thead>
<tr>
<th>Description</th>
<th>Ord. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door lock complete with push button</td>
<td>3450 5601</td>
</tr>
<tr>
<td>Spring holder for door lock</td>
<td>3450 5440</td>
</tr>
<tr>
<td>Mounting for door lock</td>
<td>3477 2790</td>
</tr>
</tbody>
</table>

**Exchange**

1. Open door and unlatch the spring holder.
2. Remove countersunk screw and press out the mounting by pressing the holder for the door lock.
3. Remove door lock in an upward direction and exchange.
4. Assembly is done in reverse order.

**Check**

Pump unit check (only mechanical occlusion pressure).
4.4 Pump Cover

Designation	Ord. No.
Pump cover with lock	3450 5717
Blind plug 7.1 mm (10 pcs.)	3477 3207
Torsion spring in lever / pump cover (5 pcs.)	3477 3363
Torsion spring for pump cover (5 pcs.)	3477 3355
Lever (pump cover)	3477 4092
Hinge pin for pump cover	3477 3967
Hinge pin for pump cover lever	3450 5725

Exchange
Tools: Pin punch 1.8 mm, pin punch 6 mm, 4 mm gauge
1. Open door and remove hinge pin with pin punch (1.8 mm)
   from below. Do not lose torsion spring.
2. Disassemble pump cover.
3. Insert torsion spring in new pump cover. Insert hinge pin with
   pin punch (6 mm) from above.
4. Check pressure sensor with 4mm gauge in the Service Pro-
   gram, and calibrate, if necessary.

Check
Safety check, pump unit check.
4.5 Housing and Handle

Designation | Ord. No.  
--- | ---  
Housing labelling  
German | 3450 1843  
French | 3450 2130  
Dutch | 3450 2149  
Italian | 3450 2157  
English | 3450 2165  
Spanish | 3450 2173  
Danish | 3450 2181  
Norwegian | 3450 2190  
Swedish | 3450 2203  
Finnish | 3450 2211  
Portuguese | 3450 2220  
Czech | 3450 2238  
Polish | 3450 2246  
Turkish | 3450 2459  
Foot stand complete with rubber feet | 3450 5415  
Rubber feet (20 pcs.) | 3477 3096  
Unit handle with O-rings and PT screws | 3450 1789

Exchange

1. Remove battery (see „Battery“ p. 4 – 1).
2. Loosen 4 screws from the foot stands and remove foot stands.
3. Remove safety seal from rear panel, break tamper-proof cap and remove screw.
4. Slidly widen the sides at the bottom of the housing and pull off to the top.
5. Assembly is done in reverse order. To do so, place unit on front side.
6. Safety seal the rear panel screw after functional check.

Check

Safety check.
4.6 Controller Board

Controller board with buzzer, raw material no. 3810 7651, software IFMC, can be updated to software IFMe:

<table>
<thead>
<tr>
<th>Language Group*</th>
<th>New Part</th>
<th>Exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Ord. No.: 3450 1967</td>
<td>Ord. No.: 3488 0844</td>
</tr>
<tr>
<td>B</td>
<td>Ord. No.: 3450 1975</td>
<td>Ord. No.: 3488 0852</td>
</tr>
<tr>
<td>C</td>
<td>Ord. No.: 3450 1983</td>
<td>Ord. No.: 3488 0860</td>
</tr>
<tr>
<td>D</td>
<td>Ord. No.: 3450 1991</td>
<td>Ord. No.: 3488 0879</td>
</tr>
<tr>
<td>E</td>
<td>Ord. No.: 3450 2033</td>
<td>Ord. No.: 3488 0887</td>
</tr>
</tbody>
</table>

Controller board with loudspeaker, volume control and history function, raw material no. 3810 7996, software IFME:

<table>
<thead>
<tr>
<th>Language Group*</th>
<th>New Part</th>
<th>Exchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Ord. No.: 3450 8759</td>
<td>Ord. No.: 3488 1019</td>
</tr>
<tr>
<td>B</td>
<td>Ord. No.: 3450 8708</td>
<td>Ord. No.: 3488 1190</td>
</tr>
<tr>
<td>C</td>
<td>Ord. No.: 3450 8716</td>
<td>Ord. No.: 3488 1204</td>
</tr>
<tr>
<td>D</td>
<td>Ord. No.: 3450 8724</td>
<td>Ord. No.: 3488 1212</td>
</tr>
<tr>
<td>E</td>
<td>Ord. No.: 3450 8732</td>
<td>Ord. No.: 3488 1240</td>
</tr>
</tbody>
</table>

The controller boards (raw material no. 3810 7651 and 3810 7996) are completely compatible.

This allows older units to be upgraded with the new features (loudspeaker, volume control, and history function) without any problems. In this case the controller board must be ordered as new part.

**Exchange**

1. Remove battery [see „Battery“ p. 4 – 1).
2. Dismount cover [see „Housing and Handle“ p. 4 – 4).
3. Press snap-in pin together at the distance sleeves and remove board carefully.
4. Pull off connector (see figure).
5. Exchange board or buzzer.

* Language Group:
A German, French, Dutch, Italian
B English, Dutch, Spanish, Castellano
C Danish, Norwegian, Swedish, Finnish
D Spanish, Portuguese, English, Turkish
E Czech, Polish, German, English
6. Assembly is done in reverse order. Be careful with the optical components. Insert board in the lower guide parallel to the base plate. (Otherwise problems with the optical interface can occur.)

**Note**

If “Calibration Defective” is displayed after having exchanged the controller board, check whether the correct board (risk of mix-up) was assembled.

**Check**

Safety check, functional check.

---

### 4.7 Rear Panel

<table>
<thead>
<tr>
<th>Designation</th>
<th>Ord. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear panel with screws (M3) and seal</td>
<td>3450 1860</td>
</tr>
<tr>
<td>Cover for optical interface</td>
<td>3477 3164</td>
</tr>
<tr>
<td>Strip seal for rear panel</td>
<td>3477 3142</td>
</tr>
<tr>
<td>MFC connector board</td>
<td>3450 3374</td>
</tr>
<tr>
<td>Potential equalization bolt</td>
<td>3477 0550</td>
</tr>
<tr>
<td>fm recessed plug (3 pin)</td>
<td>3477 3177</td>
</tr>
<tr>
<td>Screw 30x8 for fm recessed plug (20 pcs.)</td>
<td>3477 3185</td>
</tr>
<tr>
<td>Plain washer 3.2 (20 pcs.)</td>
<td>3477 3193</td>
</tr>
<tr>
<td>Power supply module 200/230/240 V</td>
<td>3450 1886</td>
</tr>
<tr>
<td>Power supply module 100/110/120 V</td>
<td>3450 1894</td>
</tr>
<tr>
<td>Power supply module 230 V</td>
<td>3450 1908</td>
</tr>
<tr>
<td>Drop sensor socket incl. cable and plug</td>
<td>3450 1878</td>
</tr>
</tbody>
</table>

---

Fig.: 4 - 6
## Unit Elements

![Diagram of MFC connections](image)

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Uext-</td>
<td>Input of external supply voltage, connection of shield</td>
</tr>
<tr>
<td>Pin 2</td>
<td>not assigned</td>
<td></td>
</tr>
<tr>
<td>Pin 3</td>
<td>GND</td>
<td>Reference level 0V</td>
</tr>
<tr>
<td>Pin 4</td>
<td>Staff call</td>
<td>Output open collector or standard 74HC level each with 220 -series resistance</td>
</tr>
<tr>
<td>Pin 5</td>
<td>Ub</td>
<td>Output supply voltage</td>
</tr>
<tr>
<td>Pin 6</td>
<td>MFC-KAD</td>
<td>Analog input K</td>
</tr>
<tr>
<td>Pin 7</td>
<td>Emergency Off</td>
<td>Input interface</td>
</tr>
<tr>
<td>Pin 8</td>
<td>MFC-FAD</td>
<td>Analog input F</td>
</tr>
<tr>
<td>Pin 9</td>
<td>Tx</td>
<td>Transmit line interface</td>
</tr>
<tr>
<td>Pin 10</td>
<td>STB</td>
<td>Output with 470 -series resistance, activation of MFC circuit</td>
</tr>
<tr>
<td>Pin 11</td>
<td>Rx</td>
<td>Receive line interface</td>
</tr>
<tr>
<td>Pin 12</td>
<td>Uext+</td>
<td>Input of external supply voltage</td>
</tr>
</tbody>
</table>

*Table 4 - 1  MFC pin assignment*
Exchange Rear Panel

1. Remove battery (see „Battery“ p. 4 – 1).
2. Dismount cover (see „Housing and Handle“ p. 4 – 4).
3. Pull off rear panel connectors and loosen both screws on the unit bottom.
Exchange MFC Connector Board
Tools: Special socket spanner M18
1. Remove nuts at the fm recessed plug (red/blue).
2. Pull off connector to the mains power supply and drop sensor, see Fig.: 4 - 6.
3. Loosen MFC socket with special socket spanner M18.
4. Assembly is done in reverse order.

Exchange fm Recessed Plug
1. Loosen screws and nuts.

Note
The new recessed plug must be slightly moveable after assembly.

Exchange Potential Equalization Bolt
1. Remove nuts with ring spanner.
2. Exchange bolt.
Exchange Mains Module
1. Loosen 3 screws and remove the power supply unit.

Note
The voltage selection for switchable power supplies is at the fuse element.

Exchange Drop Sensor Socket
1. Loosen nut and exchange drop sensor socket.
2. Safety lock with Sicomet 50.
3. Make ground connection.

Check
Safety check, functional check.
4.8 Front Frame

Designation | Ord. No.
---|---
Front frame without flow inhibitor and pressure spring | 3450 5822
Circular seal 571 mm / 45 mm | 3477 3126
Flow inhibitor with pressure spring | 3477 3258
Pressure spring for flow inhibitor (5 pcs.) | 3477 3266
Tamper-proof caps 10 mm (50 pcs.) | 3477 3134
Reed sensor | 3450 1754

Exchange

Tools: Pin punch
1. Remove battery (see „Battery“ ∘ p. 4 – 1).
2. Dismount cover (see „Housing and Handle“ ∘ p. 4 – 4).
3. Disassemble pump cover (see „Pump Cover“ ∘ p. 4 – 3).
4. Loosen countersunk screws by piercing a screwdriver through the caps and remove caps.

**Note**
Do not loosen the assembly screw on the lower pressure sensor board! Otherwise the pump has to be recalibrated with a 4mm gauge.

5. Press Reed sensor out of holder on the rear side, see Fig.: 4 – 13.
6. Press both snap-in pins inwards (rear side top and bottom). Then remove front frame to the front.
7. Remove flow inhibitor with pressure spring and Reed sensors and assemble in new front frame.
8. Insert the seal. Assembly is done in reverse order. Snap-in pins manually. Insert Reed sensor and fasten cables firmly with cable ties.

Check
Safety check, pump unit check.
4.9 Pump Unit

<table>
<thead>
<tr>
<th>Designation</th>
<th>Ord. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finger pump (without motor) including pump, pump cover, seal membrane and boards</td>
<td>3450 1738</td>
</tr>
<tr>
<td>Finger pump (without motor and board) incl. pump, pump cover, and seal membrane</td>
<td>3450 9038</td>
</tr>
<tr>
<td>Membrane incl. seal</td>
<td>3450 5733</td>
</tr>
<tr>
<td>Motor with pinion for finger pump.</td>
<td>3450 1924</td>
</tr>
</tbody>
</table>

**Exchange**

1. Remove battery (see „Battery“ p. 4 – 1).
2. Dismount cover (see „Housing and Handle“ p. 4 – 4).
3. Disassemble front frame (see „Front Frame“ p. 4 – 11).
4. Loosen motor screws, pull off motor connector and remove motor from pump unit.

**Note**

Do not loosen the assembly screw on the lower pressure sensor board! Otherwise the pump has to be recalibrated with a 4mm gauge.

5. Pull off connector from controller board.
6. Press down snap-in pins (from the inside) and tilt pump forward and unhinge.
7. Assembly is done in reverse order.

**Note**

Be sure that the cable of the Reed sensor and air inline sensor do not hinder the function of the pressure sensor and the monitoring of the motor speed (slot disc).

The complete pump unit (pump without motor, pump cover, membrane, boards) was calibrated by B.Braun. After a complete exchange the unit data and user data must be entered in the Service Program again as the data memory is on the pump board:

8. Enter unit and user data in the EEPROM.
   - Serial number according to the type plate
   - DIANET type number according to the type plate
     - If necessary enter:
       - Drug name
       - Ward identification
       - Alarm tone
       - Delivery rate min./max.
- Air alarm: air bubbles in ml and air rate in ml/h respectively
- User language
- Special functions (ON/OFF)
- Menu
- Staff call type

**Note**

If data is not entered, "Calibration data faulty" may be displayed after the unit is switched on again.

9. After ending the Service Program save the data.
The counters for operating hours, battery operation and pump head cycles are reset to zero when the pump unit is exchanged. If "Calibration data faulty" is displayed, select the Service Program and quit with "Save? Yes".

**Check**

Safety check, pump unit check.
4.10 Pressure Sensor

CAUTION

The pressure sensor unit is mechanically very sensitive. It must not be dismounted, which means that the pressure sensor board and the spring element must not be detached from the pressure sensor support (plastic part). Make sure that the movement of the coil core inside the coil is not hindered.

The pressure sensor consists of the light barrier board with EEPROM and the pressure sensor board with holder. Coil core and bending element are screwed to this holder. Both boards are connected via a flat cable.

1. Dismount rear panel (see „Rear Panel“ ⊗ p. 4 – 6) or pump unit (see „Pump Unit“ ⊗ p. 4 – 12).
2. Pull off the connecting cable to the microprocessor board.
3. Loosen and remove screw (1) of the light barrier board.
4. Loosen screw (2) of the pressure sensor and remove it together with plain washer and serrated lock washer. Then remove pressure sensor with pressure sensor board and light barrier board.
5. Fit pressure sensor with pressure sensor- and light barrier board.

Note

Make sure that the pressure sensor slide can smoothly run in the guides and that the coil core can move inside the coil.

6. Calibrate pressure sensor:
   a) Switch on unit and call in the pressure sensor reading in the Service Program (see „Pressure Sensor Function 310.0“ ⊗ p. 3 – 6)
   b) Loosen screw (2) on the side of the pressure sensor unit (2.5 mm Allen key).
c) Push pressure sensor with pressure sensor board to the rear until stopper.
d) Move lower slide of the finger pump rearwards.
e) Note down pressure sensor value.
f) Insert 4 mm calibration gauge.
g) Push pressure sensor with pressure sensor board slightly forward.
h) Tighten screw (2). The measured value read on the pressure sensor must be 5 to 15 digits above the value noted.

**Note**
Pull nut slightly out of the pressure sensor housing.

i) After calibration return to the initial function with END.
j) Select SAVE NO. (Do not actuate the YES key.)
k) Switch off unit.

7. Assembly is done in reverse order.
8. Check the user data and reenter, if necessary, as data was saved in the EEPROM of the exchanged light barrier board.
9. Calibrate pressure sensor:

**Note**
Calibration weights are required to calibrate the pressure sensor. An alignment with infusion lines is not permitted.

a) Clean the pump front side.
b) Place the Infusomat® fmS without mains lead and drop sensor and the service connector inserted horizontally (front facing upwards) in the cellular packing of the calibration device.
c) Switch on unit and call in the pressure sensor reading in the Service Program (see „Pressure Sensor Function 310.0“ p. 3 – 6).
d) Open pump cover.
e) Fasten holders for the calibration weights under the pump cover and let snap in at the locking bow.
f) Position weight 1 (100 g) for 400 mbar carefully in the holder on the pressure sensor. The weight must be placed without any friction in the holder.
g) Note down measured value.
h) Repeat steps f) and g) with weight 2 (128 g) for 800 mbar and weight 3 (166 g) for 1200 mbar.
i) Remove weight and holder and do not save data.

j) Call in calibration of pressure stage (function 540) in the Service Program.

k) Enter the calibration values via the keyboard and acknowledge with "yes".

l) Quit Service Program and save data.

m) Register the changed pressure values in the unit book.

n) Check the electronic occlusion pressure (see „Pressure Cut-Off, Electronic“ \textcopyright p. 8 – 5).

Check
Safety check, functional check.
4.11 Air Inline Sensor

Designation
Air inline sensor incl. connector . . . . . . . . . . . . 3450 193A

Exchange
1. Remove battery (see „Battery“ ♦ p. 4 – 1).
2. Dismount cover (see „Housing and Handle“ ♦ p. 4 – 4).
3. Dismount controller board (see „Controller Board“ ♦ p. 4 – 5).
4. Disassemble front frame (see „Front Frame“ ♦ p. 4 – 11).
5. Press the complete sensor from behind and out of the frame.
6. Insert new sensor and fasten cables firmly with cable ties.

Note
Shielded air inline sensors are installed from serial no. 34504 on.

Note
Be sure that the cables of the Reed sensor and air inline sensor do not hinder the function of the pressure sensor and the monitoring of the motor speed (slot disc).

Check
After exchange of the air inline sensor, please check:
- Air value
- Water value
- Calibration value (alarm threshold), adjust if necessary

Safety check, functional check.
4.12 Operating Unit

**Membrane keyboard with support plate and seal**
- Designation: 3450 1797

**LCD module**
- Designation: 3450 1819

**Frame incl. pressure spring and magnet**
- Designation: 3450 1827

**Round cord 42 mm (5 pcs.)**
- Designation: 3477 3347

**Circular seal**
- Designation: 3477 3126

**Hinge unit**
- Designation: 3450 5571

**Hinge pin (3 mm)**
- Designation: 3450 5580

**Magnet**
- Designation: 3450 5849

**Flex cable, preformed**
- Designation: 3450 8830

**Exchange**
1. Remove battery (see „Battery“ p. 4 – 1).
2. Disassemble door lock.
3. Loosen countersunk screw and bridge.
4. Remove tamper-proof caps (6 pieces) on the door frame by piercing a screwdriver through the caps and loosen countersunk screws.
5. Unlatch zero insertion force connector and loosen flex cable.

**Note**
The position of the flex cable must not be changed, i.e. the preformed section must be in the hinge area (pivot). Mark cable, if necessary.

6. Disassemble either LCD module or support plate with membrane keyboard or door hinge pins respectively and exchange door frame.

7. Assemble is done in reverse order. Pay attention to the correct direction of the door hinge pin during assembly.

**Note**
Do not kink either of the flex cables. Push the contacts to the stopper of the zero insertion force connector and lock in same position.

**Check**
Electrical safety, functional check, pump unit check.
4.13 Barcode Label

Designation                          Ord. No.
Barcode label                        3450 9070

Exchange
1. Remove old barcode label, if existing.
2. Clean adhesion surface with an alcoholic cleaning agent and let dry.
3. Loosen barcode label from the base material and stick it on.

**Note**
Destroy the type plate delivered.

**Check**
Check that serial number and pump symbol in the plain text field of the barcode label correspond with the type plate on the pump of the Infusomat® fmS.

---

4.14 Frame with Seal

Designation                          Ord. No.
Seal plate between frame and front frame (exchange not recommended)         3477 3240
Frame with seal plate                3450 1762

Exchange
1. Disassemble all parts as described before and exchange frame with seal plate.

**Check**
Electrical safety, functional check, pump unit check.
Unit Elements

For your notes:
Checks after Repair

Depending on the work carried out, perform the relevant check blocks (1., 2. and / or 3.).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Infusomat® fmS:</td>
<td>Mains voltage</td>
<td>Switch on unit</td>
</tr>
<tr>
<td>Cleanliness, completeness, damage and faults affecting safety</td>
<td>Protective conductor resistance incl. mains cable &lt; 0.2</td>
<td>Self-test</td>
</tr>
<tr>
<td>Particularly:</td>
<td>Insulation resistance &gt;&gt; 2 M</td>
<td>Audible alarm</td>
</tr>
<tr>
<td>Damage to and readability of the labels</td>
<td>Earth leakage current at NC 30 A</td>
<td>Status displays</td>
</tr>
<tr>
<td>Completeness, damage and readability of the additional labels on an Infusomat® fmS set for the Infusomat® Space Line</td>
<td></td>
<td>LCD lighting</td>
</tr>
<tr>
<td>Pump sealing diaphragm</td>
<td></td>
<td>Display (all symbols and pixels) in the LCD display</td>
</tr>
<tr>
<td>Membrane keyboard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locking mechanism of the pump cover</td>
<td></td>
<td>Operation</td>
</tr>
<tr>
<td>Flow inhibitor</td>
<td></td>
<td>Opening and closing mechanism of the door</td>
</tr>
<tr>
<td>Mains plug connector</td>
<td></td>
<td>Functions of the buttons</td>
</tr>
<tr>
<td>MFC connector incl. MFC cable</td>
<td></td>
<td>Enter delivery rate, volume and time. The values displayed in the LCD display correspond to the values entered.</td>
</tr>
<tr>
<td>Check voltage values 100/110/120 V = T 0.315 A 200/230/240 V = T 0.16 A</td>
<td></td>
<td>Staff call</td>
</tr>
<tr>
<td>Mains cable</td>
<td></td>
<td>Test incl. MFC staff call line, if used</td>
</tr>
<tr>
<td>Drop sensor with cable and plug connector</td>
<td></td>
<td>Pump cover alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alarm suppression</td>
</tr>
</tbody>
</table>

Pressure cut-off, electronic

(Reference values measured with electronic pressure sensor)
- Delivery rate: 50 ml/h
- Volume: 250 ml
- Test without drop sensor

Note

Depending on the setting, the measurement should be performed only with one of the two lines.

- With original Infusomat® line
  - Pressure level, low
  - Pressure level, middle
  - Pressure level, high
- With Infusomat® Space line
  - Pressure level, low
  - Pressure level, middle
  - Pressure level, high

(Part 1 of 2)
## Checks after Repair

### 1. Visual Inspection
according to IEC / EN 60601-1 or VDE 0750 and VDE 0751

### 2. Electrical Safety
(Reference values measured with electronic pressure sensor)
- With original Infusomat® line
  - $P_{\text{max}}$
  - $P_{\text{min}}$
- With Infusomat® Space line
  - $P_{\text{max}}$
  - Value $P_{\text{max}}$ by min. 0.10 bar higher than pressure level, high, electronic
  - $P_{\text{min}}$

### 3. Functional Inspection

- Safety clamp (flow inhibitor)
  - $P_{\text{min}}$

- Delivery accuracy
  - Ambient temperature 20 ... 25 °C
  - Delivery rate: 250 ml/h
  - Measured volume: 25 ml
- Divergence

- Drop sensor
  - Delivery rate: 400 ml/h
  - Drop sensor alarm, occlusion
  - Drop sensor alarm, flow

- Air inline sensor
  - Delivery rate: 250 ml/h
  - Water value
  - Air alarm
  - Air value
  - Threshold value

- Battery test
  - Operation mains/battery/mains:
    - Uninterrupted operation
    - Switch on unit without mains connection
    - Self-test is executed

---

Observe the procedure information (see „Procedural Instructions on the TSC“ ⚫ p. 8 - 1)!
Maintenance

It is recommended every 2 years. In addition to the technical safety inspection, the following assemblies/components are to be checked:

1. Check rubber feet and if necessary exchange.
2. Check easy running of the pump cover, lock mechanism and door.
3. Check easy running of the flow inhibitor, clean and if necessary exchange pressure springs.
4. Check seal membrane and if necessary exchange.
5. Check the drop sensor optics and spring mechanics and clean, if necessary.
7. Check mechanical occlusion pressure and if necessary calibrate.
8. Check electronic occlusion pressure and if necessary calibrate (see „Pressure Sensor“ p. 4 – 14).
9. Assemble and seal unit ready for operation.
For your notes:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Technical Safety Check TSC

Checklist for Technical Safety Check – Every 24 Months

**Unit: Infusomat® fmS**
**Manufacturer: B. Braun Melsungen AG**

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.

<table>
<thead>
<tr>
<th>Article No.</th>
<th>Unit No.</th>
<th>Year of Procurement</th>
<th>Stock No.</th>
<th>Visual Inspection</th>
<th>Electrical Safety</th>
<th>Functional Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Infusomat® fmS:</td>
<td>Mains voltage</td>
<td>Switch on unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cleanliness, completeness, damage and faults affecting safety</td>
<td>600 V AC</td>
<td>Self-test</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Particularly:</td>
<td>Protective conductor resistance</td>
<td>Audible alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Damage to and readability of the labels</td>
<td>incl. mains</td>
<td>Status displays</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Completeness, damage and readability of the additional labels on an Infusomat® fmS set for the Infusomat® Space Line</td>
<td>cable &lt; 0.2</td>
<td>LCD lighting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pump sealing diaphragm</td>
<td>Insulation resistance</td>
<td>Display (all symbols and pixels) in the LCD display</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Membrane keyboard</td>
<td>Earth leakage current at NC</td>
<td>Operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rubber feet</td>
<td>30 A</td>
<td>Opening and closing mechanism of the door</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Operating unit</td>
<td></td>
<td>Functions of the buttons</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Locking mechanism of the pump cover</td>
<td></td>
<td>Enter delivery rate, volume and time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Flow inhibitor</td>
<td></td>
<td>The values displayed in the LCD display correspond to the values entered.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mains plug connector</td>
<td></td>
<td>Staff call</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MFC connector incl. MFC cable</td>
<td></td>
<td>Test incl. MFC staff call line, if used</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Check voltage values</td>
<td></td>
<td>Pump cover alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100/110/120 V = T 0.315 A</td>
<td></td>
<td>Alarm suppression</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>200/230/240 V = T 0.16 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mains cable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Drop sensor with cable and plug connector</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Part 1 of 3)
### Technical Safety Check TSC

<table>
<thead>
<tr>
<th>Visual Inspection</th>
<th>Electrical Safety</th>
<th>Functional Inspection</th>
</tr>
</thead>
<tbody>
<tr>
<td>according to IEC / EN 60601-1 or VDE 0750 and VDE 0751</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pressure cut-off, electronic**

(Reference values measured with electronic pressure sensor)

- **Delivery rate**: 50 ml/h
- **Volume**: 250 ml
- **Test without drop sensor**

**Note**

Depending on the setting, the measurement should be performed only with one of the two lines.

- With original Infusomat® line
  - **Pressure level, low** (0.25 ... 0.65 bar) ________ bar
  - **Pressure level, middle** (0.55 ... 0.95 bar) ________ bar
  - **Pressure level, high** (0.90 ... 1.30 bar) ________ bar
- With Infusomat® Space line
  - **Pressure level, low** (0.21 ... 0.61 bar) ________ bar
  - **Pressure level, middle** (0.48 ... 0.88 bar) ________ bar
  - **Pressure level, high** (0.83 ... 1.23 bar) ________ bar

**Pressure limitation, mechanical**

(Reference values measured with electronic pressure sensor)

- With original Infusomat® line
  - **P<sub>max</sub>** (1.35 ... 1.76 bar) ________ bar
  - **P<sub>min</sub>** (> 0.95 bar) ________ bar
- With Infusomat® Space line
  - **P<sub>max</sub>** (1.30 ... 1.70 bar) ________ bar
  - **Value P<sub>max</sub> by min. 0.10 bar higher than pressure level, high, electronic**
  - **P<sub>min</sub>** (> 0.83 bar) ________ bar

**Safety clamp (flow inhibitor)**

- **P<sub>min</sub>** (> 0.40 bar) ________ bar

(Part 2 of 3)
## Technical Safety Check TSC

### Visual Inspection

according to IEC / EN 60601-1 or VDE 0750 and VDE 0751

### Electrical Safety

Delivery accuracy
- Ambient temperature 20 ... 25 °C
- Delivery rate: 250 ml/h
- Measured volume: 25 ml
- Divergence (± 5%) ______ %

Drop sensor
- Delivery rate: 400 ml/h
- Drop sensor alarm, occlusion ______ s (< 5s)
- Drop sensor alarm, flow

Air inline sensor
- Delivery rate: 250 ml/h
- Water value (> 481 mV) ______ mV
- Air alarm
- Air value (< 78 mV) ______ mV
- Threshold value (< 182 mV) ______ mV

### Functional Inspection

Battery test
- Operation mains/battery/mains:
  - Uninterrupted operation
  - Switch on unit without mains connection
  - Self-test is executed

---

(Master – to be added to the documentation)

(Part 3 of 3)
## Technical Safety Check TSC

### Lines Used
- Original Infusomat line (OIL)
- Infusomat® Space Line
- Manufacturer: __________________
  Type: __________________________
- Manufacturer: __________________
  Type: __________________________

### Accessories Used
- MFC staff call line
- __________________________

### Calibrated for usage of:
- Original Infusomat Line (OIL)
- Infusomat® Space Line
  (Note the stickers and retrofit, if necessary)

### 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 on:**

**To:**

**Date / Signature:**

**Next deadline for TSC:**
Visual Inspection

1. Check the Infusomat® fmS and accessories for cleanliness.

2. Check the Infusomat® fmS and accessories for completeness and check configuration. Pay special attention to the following parts:
   a) Check the special additional labels of the Infusomat® fmS adjusted for the Infusomat® Space Line, please see Fig.: 8 - 1.

3. Check the Infusomat® fmS and its accessories for damage and the labels for readability. Pay special attention to the following parts:
   a) Pump sealing diaphragm
   b) Membrane keyboard
   c) Rubber feet
   d) Operating unit
   e) Lock mechanism of the pump cover
   f) Flow inhibitor
   g) Mains plug connector
   h) MFC plug connector
   i) Check fuse values
      A fuse with T 0.315 A must be installed for devices for 100/110/120 V.
      A fuse with T 0.16 A must be installed for devices for 200/230/240 V.
Electrical Safety
according to IEC / EN 60601-1
or VDE 0750 and VDE 0751

The values to be measured are specified in the TSC (see „Technical Safety Check TSC“ p. 7 - 1). The measured values are to be recorded.

1. Disconnect all connection and interface cables from the device.

**Protective Conductor Resistance**

1. Measure between the protective conductor of the mains cable and the following parts:
   - Potential equalization bolt
   - Bolt for door lock
   - Left-hand contact (when looking at the connector) of the FM connector
   - Unit housing:
     a) If the unit is not sealed, countersunk screw at the rear of the unit.
     b) If the unit is sealed, remove lacquer from one of the holes in the foot stands.
     c) Document largest value.

**Note**

Do not use the foot stand assembly screws as alternative measurement points.

**Insulation Resistance**

1. Measurement with 500 V between the short-circuited mains connectors and the potential equalization bolt.

**Earth Leakage Current**

1. Measure the earth leakage current without single fault condition (NC = Normal Condition) incl. mains cable.

2. Measure the earth leakage current without single fault condition (NC = Normal Condition) incl. mains cable with reversed polarity.

3. Document largest value.
Procedural Instructions on the TSC

Functional Inspection

Switch on Unit
1. Switch on unit and check the following details:
   - Self-test
   - Audible alarm
     One short and afterwards two short tones
   - Status displays
     LEDs (red, green) light up for a short moment
   - LCD lighting
   - Display on the LC display
     All symbols and display pixels flash for a short moment
     Fig.: 8 - 2. Then „000.0ml/h“ is displayed

Operation
1. Open door.
   Pump cover must automatically open when the unit door is opened.
2. Insert the Original Infusomat Line (OIL). If the unit is designed for an Infusomat® Space Line, then insert an Infusomat® Space Line.
3. Close door.
   The door must lock smoothly and close correctly at the top and bottom.
4. Carry out infusion with intermediate bolus and press all but
   - tons at least once.
   Infusion and bolus are performed and all buttons trigger the function desired.
5. Plug MFC service connector on the MFC socket.
6. Trigger a staff call (e.g. open pump cover during operation).
   The red LED in the MFC service connector lights up.
   - if “dynamic” is set, 1 sec.
   - if “static” is set, until the alarm is acknowledged.
   Check the MFC staff call line if installed.
7. Press the alarm button.
   The current alarm is suppressed for 2 minutes.
Test Setup

Perform test setup with the subassemblies listed below, please see also Fig.: 8 - 3:

An electronic manometer should be used for the measurement described hereafter.

If a mechanic manometer is used instead values which are approx. 100 mbar lower are to be expected. Proceed as follows:

**Note**

The liquid level in the container must be approx. 80 cm above the lower edge of the device.

- Original Infusomat® Line  
  (new, can be used for the complete TSC incl. functional check)  
  (1 piece)

  or

- Infusomat® Space Line  
  (new, can be used for the complete TSC incl. functional check)  
  (1 piece)

- Infusion bag or bottle, min. 500 ml  
  (1 piece)

- Three-way valve  
  (2 pieces for measurement with electronic manometer)

- 10 ml syringe (air buffer for measurement with electronic manometer)  
  (syringe drawn up with air to 10 ml and piston fixed mechanically)  
  (1 piece)

- 1 ml syringe for air bubble injection  
  (1 piece)

- Electronic manometer with peak value recognition  
  (1 piece)

- Pressure cell (option of electronic manometer)  
  Diameter 100 mm / 160 mm, measuring range 2.5 bar / 4 bar  
  (1 piece)

- Graduated cylinder 25 ml, +/- 0.4 ml  
  (1 piece)
Procedural Instructions on the TSC

Pressure Cut-Off, Electronic
The MFC service connector must not be plugged.
The drop sensor must not be connected.
1. Insert the line of the test setup in the device.
2. Enter a delivery rate according to the TSC.
3. Select pressure stage according to the TSC.
4. Vent test setup, position of the three-way cocks please see Fig.: 8 - 4.
5. Start infusion and deliver first of all in to an open system (without manometer).
6. Switch over three-way cocks, please see Fig.: 8 - 5, and deliver against the manometer.
Read off maximum value on the pressure gauge upon an alarm and before an automatic pressure reduction and compare with the specifications in the TSC.
7. Check all pressure stages listed in the TSC and document values.

Pressure Limitation, Mechanical
The drop sensor must not be connected.
1. Plug MFC service connector on the MFC plug connector.
2. Activate the occlusion pressure mechanical (see „Disabling the Pressure Sensor (Occlusion Pressure Mechanical)“ → p. 3 - 2).
3. Enter a delivery rate according to the TSC.
4. Start infusion and deliver first of all in to an open system (without manometer).
5. Deliver against the manometer.
Read off the corresponding value on the manometer and compare with the specifications of the TSC for $P_{\text{max}}$ and $P_{\text{min}}$.

Safety Clamp (Flow Inhibitor)
1. Stop infusion from the pressure limitation test mechanically and unlock the operating unit,
read off value on the manometer and compare with the specifications in the TSC.
2. Document value.
3. Pull off the MFC service connector.

**WARNING**

SWITCH THE DEVICE OFF AFTER THE SAFETY CLAMP WAS CHECKED SO THAT THE ELECTRONIC PRESSURE CONTROL IS RE-ACTIVATED AFTER A RESTART.

4. Switch device off.

**Delivery Accuracy**

Requirements:
- Mount test setup as shown in Fig.: 8 - 6.
- Ambient temperature and delivery rate according to the TSC.

1. Insert line of the test setup in the device.
2. Vent test setup. Bottom part of drop chamber must be 2/3 filled.
3. Insert cannula in empty graduated cylinder.
4. Set delivery rate according to the TSC.
5. Simultaneously start infusion and stop watch.
6. Stop the stop watch when the measured volume defined in the TSC is reached.
7. Evaluate deviation in percent according to Table 8 - 1 and record.

<table>
<thead>
<tr>
<th>Measuring Time</th>
<th>Deviation %</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 min 40.0 sec</td>
<td>-10</td>
</tr>
<tr>
<td>6 min 18.9 sec</td>
<td>-5</td>
</tr>
<tr>
<td>6 min 15.0 sec</td>
<td>-4</td>
</tr>
<tr>
<td>6 min 11.1 sec</td>
<td>-3</td>
</tr>
<tr>
<td>6 min 7.3 sec</td>
<td>-2</td>
</tr>
<tr>
<td>6 min 3.6 sec</td>
<td>-1</td>
</tr>
<tr>
<td>6 min 0.0 sec</td>
<td>0</td>
</tr>
<tr>
<td>5 min 56.4 sec</td>
<td>1</td>
</tr>
<tr>
<td>5 min 52.9 sec</td>
<td>2</td>
</tr>
<tr>
<td>5 min 49.5 sec</td>
<td>3</td>
</tr>
<tr>
<td>5 min 46.2 sec</td>
<td>4</td>
</tr>
<tr>
<td>5 min 42.9 sec</td>
<td>5</td>
</tr>
<tr>
<td>5 min 27.3 sec</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 8 - 1
The accuracy of the delivery rate can be checked using a normal infusion line when the TSC is carried out.

A test infusion line (OIL test infusion line with an Infusomat® fmS adjusted for the Original Infusomat® line, and a Space calibration line with an Infusomat® fmS set for the Infusomat® Space Line) is to be used for calibration (see „Scale Factor Function 510.0“ ⇦ p. 3–9) (see „Test Equipment and Special Tools“ ⇦ p. 9–1).

**Drop Sensor**

1. Set delivery rate according to the TSC.
2. Connect drop sensor to the device.
3. Start infusion according to the specifications of the TSC.
4. Squeeze off line above the pump. The drop sensor triggers an alarm.
5. Squeeze the drop chamber bottom part, to generate a jet. The drop sensor triggers an alarm immediately.

**Air Inline Sensor**

1. Plug MFC service connector on the MFC plug connector.
2. Insert a line filled with water in the device and close operating unit.
3. Read off test value of the air inline sensor via the function 300.0 “Air inline sensor” in the Service Program (see „Air Inline Sensor Function 300.0“ ⇦ p. 3–5).
4. Read off value after approximately 10 seconds and compare with the water value specifications of the TSC.
5. Document values.
6. Enter a delivery rate of 250 ml/h and a volume of 250 ml.
7. Start infusion.
8. Generate an air bubble of approx. 0.4 ml (approx. 56 mm length of line with air) in the supply line to the pump. An alarm is triggered when the air bubble is detected.
9. Insert a line filled with air in the device and close operating unit, or disconnect the line at the container and “vent” in order to remove the water out of the line.
10. Read off test value of the air inline sensor via the function 300.0 “Air inline sensor” in the Service Program (see „Air Inline Sensor Function 300.0“ ⇦ p. 3–5).
11. Read off value after approximately 10 seconds and compare with the air value specifications of the TSC.
12. Read off threshold value via the function 520.0 “Air inline sensor” in the Service Program (see „Air Inline Sensor Function 520.0“ ⇦ p. 3–10).
13. Compare value with the threshold value specifications of the TSC.

Battery Check
1. Disconnect the device from the mains supply during operation.
2. The symbol for the mains plug on the LC display goes off. An error message is not triggered and operation of the unit is continued.
3. Reconnect unit to the mains.
4. The symbol for the mains plug is displayed on the LC display. An error message is not triggered and operation of the unit is continued.
5. Switch device off.
6. Disconnect unit from mains.
7. Switch on unit.
   A self-test is carried out.
For Repair / for TSC

Test equipment case Infusomat fm (complete) . . . . . 0770 1527
with:
Calibration gauge 4 mm (for adjustment after exchange
of the pump cover) . . . . . . . . . . . . . . . . . . . . . . . . . 0770 1489
Pin punch 1.8 mm x 160 mm (for hinge pin/
disassembly of the pump cover) . . . . . . . . . . . . 0770 1446
Pin punch 6 mm x 125 mm (for hinge pin/
assembly of the pump cover) . . . . . . . . . . . . . . . 0770 1454
Flat tool 100 x 20 mm (for assembly/
disassembly of the tube adapter) . . . . . . . . . . . . 0770 1462
Special socket spanner M18 (for disassembly of
the recessed plug) . . . . . . . . . . . . . . . . . . . . . . . . . 0770 1497
Manometer 0 - 4 bar . . . . . . . . . . . . . . . . . . . . . . . . . 0770 1357
Service connector (red) . . . . . . . . . . . . . . . . . . . . . . . 0770 0709
MFC service connector . . . . . . . . . . . . . . . . . . . . . . . 3450 1215
OIL-test infusion line . . . . . . . . . . . . . . . . . . . . . . . . . 0770 1500
Space calibration line . . . . . . . . . . . . . . . . . . . . . . . . 0770 1610
Pressure calibration device . . . . . . . . . . . . . . . . . . . . . 0770 5018
## Unit Elements

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order – No.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Battery</strong></td>
<td></td>
</tr>
<tr>
<td>Battery incl. connector plug</td>
<td></td>
</tr>
<tr>
<td>1.2 Ah / 7.2 V and holder</td>
<td>3450 2556</td>
</tr>
<tr>
<td><strong>Mains Fuses</strong></td>
<td></td>
</tr>
<tr>
<td>Fuse T 0.16 A</td>
<td></td>
</tr>
<tr>
<td>for 200 / 230 / 240 V (10 pcs.)</td>
<td>3477 2847</td>
</tr>
<tr>
<td>Fuse T 0.315A</td>
<td></td>
</tr>
<tr>
<td>for 100 / 110 / 120 V (10 pcs.)</td>
<td>3477 0534</td>
</tr>
<tr>
<td>Fuse holder</td>
<td>3450 0979</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td></td>
</tr>
<tr>
<td>Housing Labelling</td>
<td></td>
</tr>
<tr>
<td>German</td>
<td>3450 1843</td>
</tr>
<tr>
<td>French</td>
<td>3450 2130</td>
</tr>
<tr>
<td>Dutch</td>
<td>3450 2149</td>
</tr>
<tr>
<td>Italian</td>
<td>3450 2157</td>
</tr>
<tr>
<td>English</td>
<td>3450 2165</td>
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<tr>
<td>Spanish</td>
<td>3450 2173</td>
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<tr>
<td>Danish</td>
<td>3450 2181</td>
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<td>Norwegian</td>
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<td>Swedish</td>
<td>3450 2203</td>
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<td>Finnish</td>
<td>3450 2211</td>
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<tr>
<td>Portuguese</td>
<td>3450 2220</td>
</tr>
<tr>
<td>Czech</td>
<td>3450 2238</td>
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<tr>
<td>Polish</td>
<td>3450 2246</td>
</tr>
<tr>
<td>Turkish</td>
<td>3450 2459</td>
</tr>
<tr>
<td>Foot stand complete with rubber feet</td>
<td>3450 5415</td>
</tr>
<tr>
<td>Unit handle with O-rings and PT screws</td>
<td>3450 1789</td>
</tr>
<tr>
<td><strong>Controller Board</strong></td>
<td></td>
</tr>
<tr>
<td>Distance sleeve</td>
<td>3450 3366</td>
</tr>
<tr>
<td>Buzzer</td>
<td>3450 3447</td>
</tr>
<tr>
<td>Loudspeaker</td>
<td>3450 8848</td>
</tr>
</tbody>
</table>

## Rear Panel

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order – No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear panel with screws (M3) and seal</td>
<td>3450 1860</td>
</tr>
<tr>
<td>Cover for optical interface</td>
<td>3477 3164</td>
</tr>
<tr>
<td>Strip seal for rear panel</td>
<td>3477 3142</td>
</tr>
<tr>
<td>MFC connector board</td>
<td>3450 3374</td>
</tr>
<tr>
<td>Potential equalization bolt</td>
<td>3477 0550</td>
</tr>
<tr>
<td>fm recessed plug (3 pin)</td>
<td>3477 3177</td>
</tr>
<tr>
<td>Screw 30x8 for fm recessed plug (20 pcs.)</td>
<td>3477 3185</td>
</tr>
<tr>
<td>U Washer 3.2 (20 pcs.)</td>
<td>3477 3193</td>
</tr>
<tr>
<td>Mains module 200 / 230 / 240 V</td>
<td>3450 1886</td>
</tr>
<tr>
<td>Mains module 100 / 110 / 120 V</td>
<td>3450 1894</td>
</tr>
<tr>
<td>Mains module 230 V</td>
<td>3450 1908</td>
</tr>
<tr>
<td>Drop sensor socket incl. cable and plug</td>
<td>3450 1878</td>
</tr>
</tbody>
</table>

## Pump Cover

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order – No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump cover with lock</td>
<td>3450 5717</td>
</tr>
<tr>
<td>Blind plug 7.1 mm (10 pcs.)</td>
<td>3477 3207</td>
</tr>
<tr>
<td>Torsion spring in lever/pump cover (5 pcs.)</td>
<td>3477 3363</td>
</tr>
<tr>
<td>Torsion spring for pump cover (5 pcs.)</td>
<td>3477 3355</td>
</tr>
<tr>
<td>Lever (pump cover)</td>
<td>3477 4092</td>
</tr>
<tr>
<td>Hinge pin for pump cover</td>
<td>3477 3967</td>
</tr>
<tr>
<td>Hinge pin for pump cover lever</td>
<td>3450 5725</td>
</tr>
</tbody>
</table>

## Front Panel

<table>
<thead>
<tr>
<th>Designation</th>
<th>Order – No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front panel without flow inhibitor</td>
<td></td>
</tr>
<tr>
<td>and pressure spring</td>
<td>3450 5822</td>
</tr>
<tr>
<td>Circular seal 570 mm / 45 mm</td>
<td>3477 3126</td>
</tr>
<tr>
<td>Flow inhibitor with pressure spring</td>
<td>3477 3258</td>
</tr>
<tr>
<td>Pressure spring for flow inhibitor (5 pcs.)</td>
<td>3477 3266</td>
</tr>
<tr>
<td>Tamper-proof caps 10 mm (50 pcs.)</td>
<td>3477 3134</td>
</tr>
<tr>
<td>Reed sensor</td>
<td>3450 1754</td>
</tr>
<tr>
<td>Designation</td>
<td>Order – No.</td>
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<td><strong>Pump Unit</strong></td>
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<td>Finger pump (without motor) incl. pump, pump cover, seal membrane and boards</td>
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<td>Finger pump (without motor and board) incl. pump, pump cover, and seal membrane</td>
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<tr>
<td>Membrane incl. seal.</td>
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<td>Motor with pinion for finger pump</td>
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<td><strong>Pressure Sensor</strong></td>
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<td>Mounting for door lock</td>
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<td><strong>Operating Unit</strong></td>
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<td>Membrane keypad with support plate and seal</td>
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<td>Frame incl. pressure spring and magnet</td>
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<td>Flexible cable 42 mm (5 pcs.)</td>
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<td>Hinge unit</td>
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<td>Hinge pin (3 mm)</td>
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**Spare Parts List**

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<td>Universal clamp</td>
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<td>Threaded rod</td>
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<td>Safety hook</td>
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<tr>
<td>Bellows (5 pcs.)</td>
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<tr>
<td>Pressure spring (5 pcs.)</td>
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**Fig.: 10 - 1 Universal Clamp (Poleclamp)**

**Fig.: 10 - 2 Universal Clamp**

<table>
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<td>Pressure spring for pole fixation (5 pcs.)</td>
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Spare Parts List

For your notes:

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Revision Documentation

Revision Service-Documentation

Version 2.0
This manual has been completely revised. The most important changes are listed below:
- Changed manual structure
- New TSI list
- New paragraph pressure sensor (exchange / calibration)
- New test equipment for pressure sensor
- New software
- New spare parts
- Total list of spare parts

Version 2.1
- New TSI list
- New controller board
- New software

Version 2.2
This version was approved by B. Braun on 19.04.2006.
The most important changes of this version are listed below:
- New software
- New Service Program functions
- New spare parts
- Changed occlusion pressure data

Version 2.3
This version was approved by B. Braun on 18.02.2008.
The most important changes of this version are listed below:
- New software
- Possible use of the Infusomat® Space line
- New TSC
- Revised procedural instructions on the TSC

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