

Syringe Infusion Pumps

S100, S200, S300, S300PCA



Service manual

medima

CE
1011

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1 Contact details

Address:

MEDIMA Sp. z o.o.
Al. Jerozolimskie 200
02-486 Warsaw
POLAND

Contact details:

Service Department

Tel. +48 22 313 22 57
Tel./Fax +48 22 313 22 49
e-mail: serwis@medima.pl

A [contact form](#) of the Service Department is also available at the company's website in the Service tab.

Sales Department

Tel. +48 22 313 22 60
Tel. +48 22 313 22 65
e-mail: sales@medima.pl

2 General remarks

This service manual describes the maintenance of pumps with software version 3.0.4.xxxx or higher. Pumps with lower software version number must be upgraded as described in chapter 9 (p. 25).

2.1 SCOPE OF THE DOCUMENT

This document contains information that enables repair of the following equipment:

- Syringe pump S100
- Syringe pump S200
- Syringe pump S300
- Syringe pump S300PCA

2.2 RELATED DOCUMENTS

Full technical service of the pumps requires the following documents:

1. Pump S100, S200, S300 and S300PCA User Manual
2. User Manual for the Medima ToolBox 3.0 software (Introduction to toolbox).

The aforementioned documents are not included in this service manual. The current versions of the aforementioned documents are available at the Medima website in the [Download](#) tab. The **user name** and **password** required to log in are available from the Service Department. In the event of any issues with access to the website, please contact Medima Service Department directly (contact details provided in chapter 1 (p. 7)).

Maintenance of the pumps also requires familiarity with the following standards:

1. EN 62353:2014
2. EN 60601-1:2006
3. EN 60601-2-24:2015

2.3 PURPOSE OF THE DOCUMENT

The document is intended for technical staff who have appropriate knowledge related to repairs of medical equipment. It is recommended that persons performing service undergo training for the aforementioned products concerning their:

- maintenance,
- configuration,
- testing, calibration and repair procedures.

Additionally, the technical staff authorized to conduct repairs should be trained in the area of:

- safe work with equipment supplied from the electrical mains,
- ESD protection,
- use of Medima ToolBox software,
- the standards listed in chapter 2.2 (p. 7).

3 Description of the requirements pertaining to the repair station

3.1 ESD PROTECTION

The repair station should be equipped with standard ESD protection means, subject to periodic effectiveness checks. The checks must cover both the equipment and the personal means of protection used by the technical staff.

The technical staff must be trained regarding the use of ESD protection means and obligated to use them in a restrictive manner.

3.2 SAFETY

The equipment being repaired may be connected to the power supply mains only through a properly installed, certified isolation transformer with the power of at least 50 W. If such a transformer is unavailable at the repair site, the equipment may also be supplied from a **TA-55 15V DC** power supply through a **TA-7 DC** power cable - both included in the Medima service toolset.

Note!!!

One must also comply with all the regional requirements set forth in the relevant safety standards.

3.3 TOOLS

3.3.1 MEDIMA SERVICE TOOL SET (M-060.9.2275.xx)

The service toolset contains specialized instruments, tools, and software necessary for proper performance of inspections and repairs of the Medima infusion pumps. Placement of the elements in the toolset is shown in **Fig. 1**.

Information on the contents of the service toolset can be found in **Table 1**. The content list contains elements used for inspection and repair of both volumetric pumps P100/P200/P300 and syringe pumps S100/S200/S300/S300PCA. The equipment in the service toolset necessary for repairs, inspections and calibration of S100/S200/S300/S300PCA syringe pumps is indicated with a "✓" sign in column **Pump Sx00 service** in **Table 1**. Gray background indicates elements that are not used in inspection, calibration or repair of syringe pumps.

In the **Tool number** column, under some TA-nn designations, additional designations in parenthesis can be found: e.g. TA-46 (T15A). The designation in parenthesis is shown in messages on the pump display during tests and calibrations.

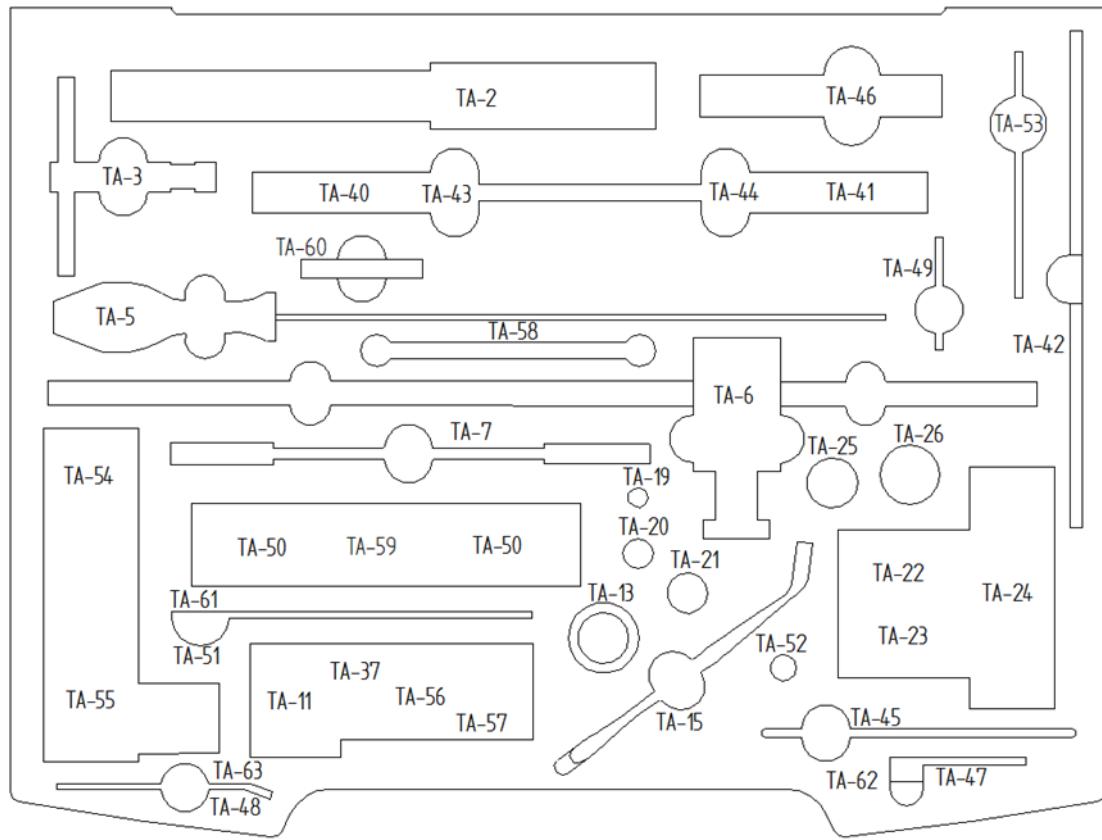


Fig. 1 Placement of the elements in the toolset

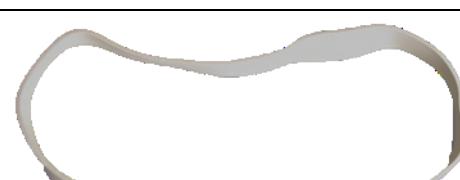
Table 1 Contents of the MEDIMA SERVICE TOOL SET

Tool number	Tool name	Picture	Tool drawing number	Quantity	Pump Sx00 service
TA-2 (T12)	Force calibrator		001.2.0206.xx	1	✓
TA-3	Special wrench for clamp PT82		001.2.1160.xx	1	✓
TA-5	Screwdriver torx T10x300		-	1	✓
TA-6	Burette with handle TP7		060.9.2278.xx	1	
TA-7	DC power cable		060.9.2284.xx	1	✓
TA-11	RJ12 to RJ12 cable		RWD-001-01.11-xx	1	✓
TA-15	Curved tweezers			1	✓

Tool number	Tool name	Picture	Tool drawing number	Quantity	Pump Sx00 service
TA-16 (T13)	Arm calibration roller		001.2.1226.xx	1	✓
TA-19 (T11 10mm)	Ø10 mm calibration roller		001.2.1225.xx	1	✓
TA-20 (T11 15mm)	Ø15 mm calibration roller		001.2.1225.xx	1	✓
TA-21 (T11 20mm)	Ø20 mm calibration roller		001.2.1225.xx	1	✓
TA-22	Burette connecting tube 0,2 m		060.9.2282.xx	1	
TA-23	Outflow tube 1 m		060.9.2283.xx	1	
TA-24 (TP3)	Pressure calibrator		002.2.2287.xx	1	

Tool number	Tool name	Picture	Tool drawing number	Quantity	Pump Sx00 service
TA-25 (T11 25mm)	Ø25 mm calibration roller		001.2.1225.xx	1	✓
TA-26 (T11 30mm)	Ø30 mm calibration roller		001.2.1225.xx	1	✓
TA-37	Extension line 0,3 m			1	
TA-40	Torque screwdriver 0,8 Nm			1	✓
TA-41	Torque screwdriver 0,4 Nm			1	✓
TA-42	Replaceable shaft Torx T10			1	✓
TA-43	Replaceable shaft Torx T8			1	✓
TA-44	Replaceable shaft Torx T6			1	✓
TA-45	Special device for speaker and buzzer			1	✓
TA-46 (T15A)	Voltage calibrator T15A Note!!! TA-31 is not a replacement for TA-46			1	✓

Tool number	Tool name	Picture	Tool drawing number	Quantity	Pump Sx00 service
TA-47	Special device for accumulator		021.2.3967.xx	1	
TA-48	Special device for syringe pump mechanism assembly		020.2.4106.xx	1	✓
TA-49	Potentiometer adjuster		020.2.4126.xx	1	✓
TA-50	Cable for programming the pump			2	✓
TA-51	Stylus for touchscreen			1	✓
TA-52	Technological distance for PCA cover assembly			1	✓
TA-53	Special device for potentiometer assembly			1	✓
TA-54	Adapter for electrical safety test			2	✓

Tool number	Tool name	Picture	Tool drawing number	Quantity	Pump Sx00 service
TA-55 (T86A)	Power supply 15V 1.6A DC		-	1	✓
TA-56	26 pin IDC flat ribbon extension cable		060.9.2280.xx	1	✓
TA-57	Band for the pump Px00			2	
TA-58	FFC extension line			6	
TA-59	Adapter for pressure calibration TA-24 (TP3)			1	
TA-60	Medima ToolBox hardware key			1	✓
TA-61	Tool for cleaning the air detectors		060.2.4196.xx	1	
TA-62	Tool for dilating FFPC housing		021.2.4172.xx	1	✓
TA-63	0,1 mm feeler gauge			1	✓

Note!!!

Voltage calibrator TA31 (T15), which was a part of MEDIMA SERVICE TOOLSET M-060.9.2275.01 for syringe pumps S/S1/S2 and volumetric pumps P/P1/P2, can not be used as a replacement for the voltage calibrator TA-46 (T15A)!!! For maintenance of the device families Px00 and Sx00 only the TA-46 (T15A) voltage calibrator must be used. Using the wrong voltage calibrator may result in damage to the device and loss of warranty!!!

Each toolset is identified with a unique serial number and contains a list of marked equipment.

Measuring instruments are subject to periodic technical and accuracy inspections. All instruments that must be inspected are delivered together with technical inspection reports. Further technical inspections of the equipment are recommended to be performed at Medima.

The following documents and software are available on the website, after logging in:

- **Medima ToolBox 3.0** software;
- **Medima Loader 3.0** user manual;
- service manual for P100, P200, P300 volumetric pumps (PDF) with instruction videos;
- service manual for S100, S200, S300, S300PCA syringe pumps (PDF) with instruction videos;
- forms **F1** (chapter 18 (p. 145)) and **F2** (chapter 19 (p. 149)) recommended by Medima for use during inspections and repairs (PDF, in the service manual folders).

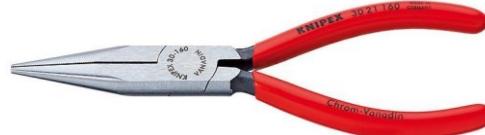
All documents that may be of assistance in the service process, including the current version of the service manual and the information on the current version of the **Medima ToolBox** software, can be found at the Medima website in the [Service](#) tab.

User name and **password** are available by contacting Medima technical service. In the event of any issues with accessing the content of the website, please contact the Medima Service Department directly (see chapter 1 (p. 7)).

3.3.2 Additional standard tools

In addition to the specialist tools in the **MEDIMA SERVICE TOOL SET**, repairs require additional standard tools that are listed below (**Table 2**).

Table 2 Additional standard tools

Designation	Tool name	Picture	Qty
TB-1	Torx screwdriver T10x100		 1
TB-2	Torx screwdriver T8x60		 1
TB-3	Torx screwdriver T6x60		 1
TB-4	Torx screwdriver T20x100		 1
TB-5	Flat screwdriver 0,5x3x80		 1
TB-6	Flat-nosed pliers		1
TB-7	Thread sealant – strong, e.g. Wurth 0893573050		1
TB-8	Thermal conductive paste, e.g. EHTC10S		1

Designation	Tool name	Picture	Qty
TB-9	Technical vaseline		1
TB-10	Structural adhesive, e.g. Wurth 0890100110		1
TB-11	High-proof alcohol e.g. Denatured alcohol (methylated spirit) or Isopropyl alkohol		1
TB-12	Machine oil		1

3.4 DIAGNOSTIC DEVICES

The repair station should be equipped with a measuring instrument for electric safety tests compliant with the EN 60601-1 or EN 62353 standards, depending on the local regulations.

Note!!!

The measurement device for electrical safety tests must undergo periodic inspections, in accordance with the manufacturer's recommendations and local regulations.

3.5 DIAGNOSTIC PARTS

The diagnostic parts used in the troubleshooting procedures should be the standard equipment at the repair station. The diagnostic parts are not any different than the parts used in the pumps; however, it is recommended to mark them (e.g. with colour stickers) and leave as permanent equipment of the repair station. The marking of the diagnostic parts is intended to protect it from accidental use as spare parts. A list of the necessary diagnostic parts can be found in chapter 17 (p. 138).

Note!!!

All diagnostic parts, during their use and storage, should be subject to ESD protection.

Note!!!

All diagnostic parts must undergo periodic inspections. Periodic inspection may be performed by replacing parts in a working pump and performing tests regarding given component.

3.6 REQUIRED DOCUMENTS

Before beginning servicing procedures, print the forms, which can be found in this manual (see chapter 18 (p. 145) F1-IS-Sx00-01-EN-01 , chapter 19 (p. 149) F2-IS-Sx00-01-EN-01). They are also available in electronic version on the Medima website in the [Service](#) tab (after logging in).

4 Description of pumps S100, S200, S300, S300PCA

4.1 DESIGN OF PUMPS S100, S200, S300

A detailed description of the syringe pumps P100, P200 and P300 can be found in the user manual. The most important information is presented below.

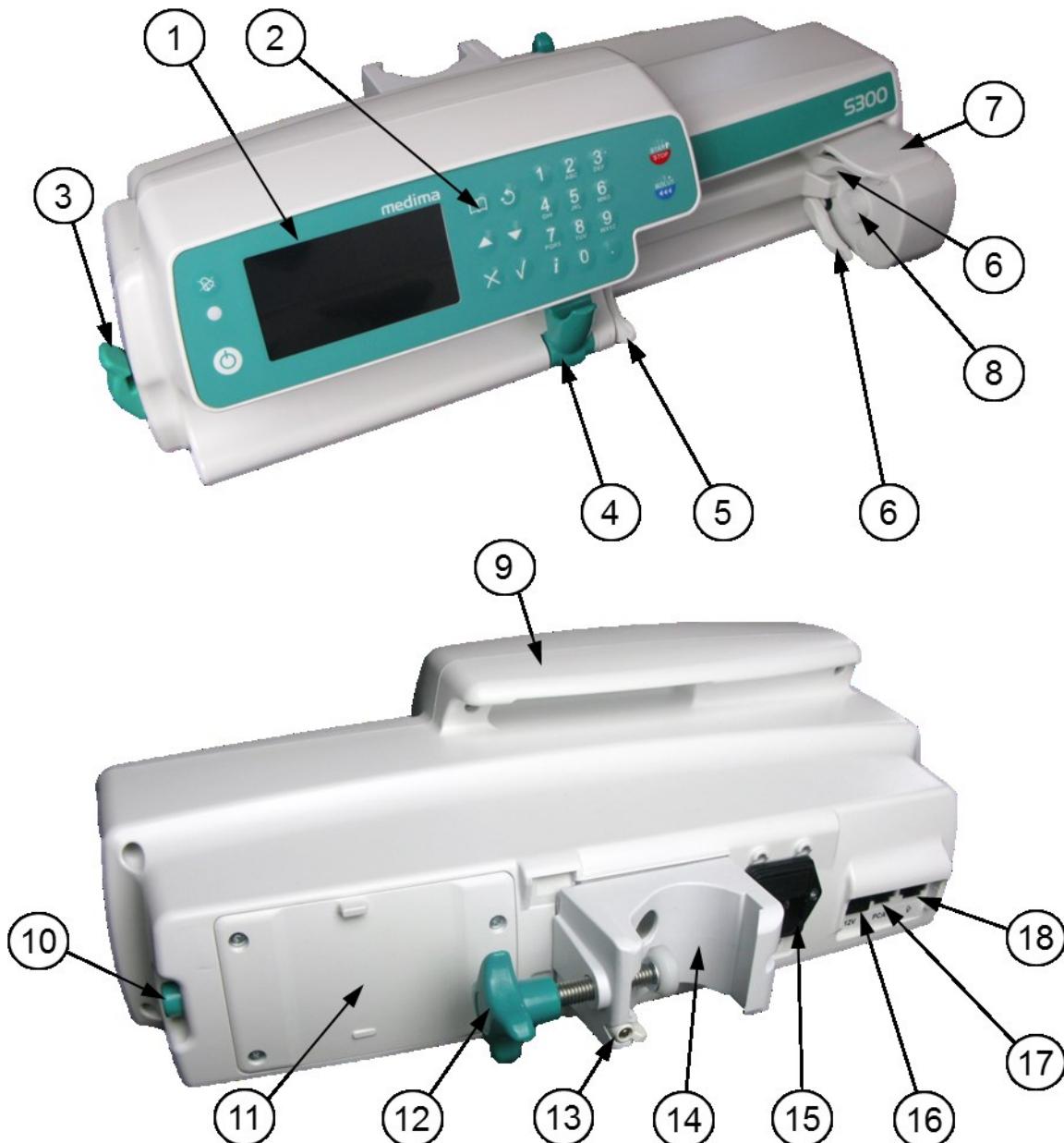


Fig. 2 Main elements of the S100 / S200 / S300 pump

- | | |
|--------------------------|----------------------------------------|
| 1. Touch panel | 10. Docking station release button |
| 2. Alphanumeric keyboard | 11. Battery chamber |
| 3. IV set holder | 12. Clamp knob |
| 4. Syringe clamp | 13. Pole clamp blocking mechanism |
| 5. Syringe flange clamp | 14. Rotatable pole clamp |
| 6. Plunger grippers | 15. AC power supply socket with a fuse |
| 7. Pump stem end | 16. DC power supply socket |
| 8. Sensor button | 17. PCA button/RS232 socket |
| 9. Carrying handle | 18. Nurse alarm socket |

4.2 DESIGN OF PUMP S300PCA

A detailed description of the S300PCA syringe pump can be found in the user manual. The most important information is presented below.



Fig. 3 Main elements of the S300PCA pump

- 19. Patient's bolus button
- 20. Patient's bolus button mounting handle
- 21. PCA lock
- 22. PCA cover

4.3 TECHNICAL DATA

Detailed technical data is included in the syringe pump user manual.

4.4 PUMP CONFIGURATION

Pump configuration can be performed using the **Medima Configurator** software included in the **Medima Service ToolBox 3.0** software package. The detailed description of pump configuration using the **Medima Configurator** software is provided in the user manual for that software.

Note!!!

Changing the configuration should be done only after consulting the user!

Note!!!

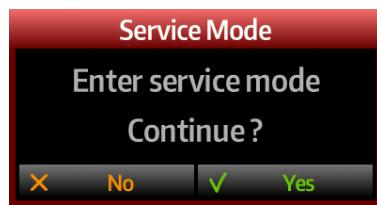
If the CPU board was replaced, before returning the pump to use, enter pump configuration according to the user's requirements!

4.5 SERVICE MENU

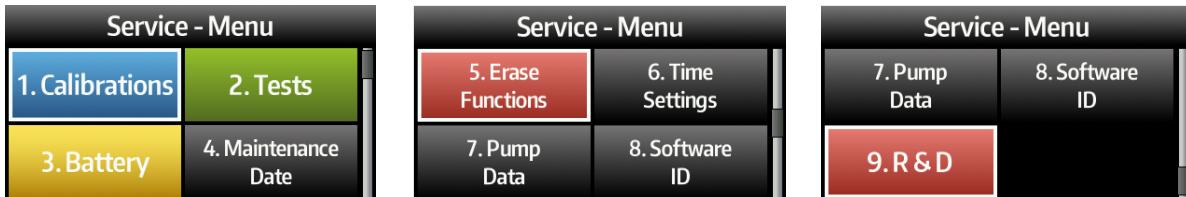
In order to enter the service mode:

1. Connect the mains power.
2. If the pump is switched on, switch it off by pressing and holding the  button.

3. Press the buttons in this sequence: The following window will appear:



4. After confirming (pressing "Yes" or) the service menu will be displayed:

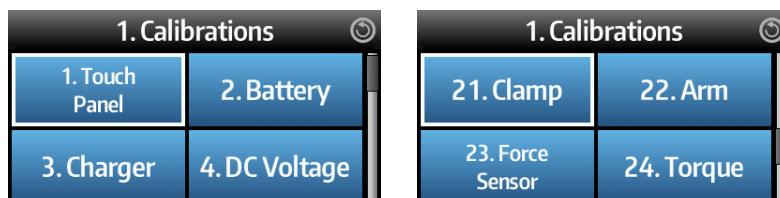


Service menu screens can be scrolled with the buttons.

In order to leave the service mode, press and hold the button for about 3 s.

4.5.1 1. Calibrations

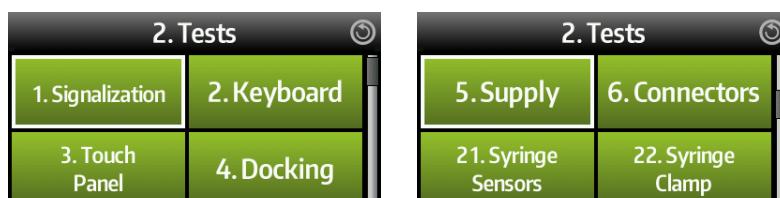
Choosing the „1. Calibrations” option from the service menu enters the calibration procedures menu (scroll the screen with the buttons to see all procedures):



- | | |
|----------------------------------|---------------------------|
| 1.1. Touch panel | see chapter 11.1 (p. 55). |
| 1.2 Battery | see chapter 11.2 (p. 56). |
| 1.3. Charger | see chapter 11.3 (p. 58). |
| 1.4 DC Voltage | see chapter 11.4 (p. 60). |
| 1.21. Clamp | see chapter 11.5 (p. 61). |
| 1.22. Arm | see chapter 11.6 (p. 62). |
| 1.23. Force Sensor | see chapter 11.7 (p. 63). |
| 1.24. Torque | see chapter 11.8 (p. 64). |

4.5.2 2. Tests

Choosing the „2. Tests” option from the service menu enters the tests menu (scroll the screen with the buttons to see all procedures):



2. Tests	
23. Gripper	24. Gripping
25. Clamp Run-in	26. Mechanism Run-in
27. Syringe Diamet.. measuring	28. Force Sensor Verification
29. PCA case & lock	

- 2.1. **Signalization** see chapter 10.5.1 (p. 39).
- 2.2. **Keyboard** see chapter 10.5.2 (p. 40).
- 2.3. **Touch Panel** see chapter 10.5.3 (p. 40).
- 2.4. **Docking** Used only in the manufacturing process by Medima.
- 2.5. **Supply** see chapter 10.5.4 (p. 41).
- 2.6. **Connectors** Used only in the manufacturing process by Medima.
- 2.21. **Syringe Sensors** Used only in the manufacturing process by Medima.
- 2.22. **Syringe Clamp** see chapter 10.5.5 (p. 43).
- 2.23. **Gripper** see chapter 10.5.6 (p. 43).
- 2.24. **Gripping** see chapter 10.5.7 (p. 44).
- 2.25. **Clamp Run-in** Used only in the manufacturing process by Medima.
- 2.26. **Mechanism Run-in** Used only in the manufacturing process by Medima.
- 2.27. **Syringe Diameter measuring** see chapter 10.5.8 (p. 45).
- 2.28. **Force Sensor Verification** Used only in the manufacturing process by Medima.
- 2.29. **PCA case & lock** see chapter 10.5.11 (p. 47).

4.5.3 3. Battery

Choosing the „3. Battery” option from the service menu enters the battery service menu (scroll the screen with the buttons to see all procedures):

3. Battery	
1. General Information	2. Capacity
3. Resistance	4. Capacity Tests
3. Resistance Test	6. New Battery

- 3.1. **General Information** see chapter 10.7.2 (p. 51).
- 3.2. **Capacity** see chapter 10.7.2 (p. 51).
- 3.3. **Resistance** see chapter 10.7.2 (p. 51).
- 3.4. **Capacity Tests**

Orders a battery capacity test. It consists of a following cycle:
Charge → Discharge → Charge.
During the test both capacity and internal resistance are measured (see chapter 10.7.3 (p. 51)).
The results of the test are displayed after choosing the **3.2. Capacity** option.
- 3.5. **Resistance Test**

Orders a battery internal resistance test (see chapter 10.7.4 (p. 52)).
The results of the test are displayed after choosing the **3.3. Resistance** option.
- 3.6. **New Battery**

This procedure should be initiated only after battery replacement. All previous statistics and measurement history will be completely erased (see chapter 10.7.5 (p. 53)).
Initiating the procedure requires a password. In order to receive the password, please contact Medima Service Department.

4.5.4 4. Maintenance Date

Allows setting service dates:

- **Last factory service** – this date is set to the current date (as set in the pump) whenever the **Next factory service** date is changed. **Last factory service** date can be manually set to any value, but it will be changed again to the current date after changing the **Next factory service** date.
- **Next factory service** – recommended date for the next factory service. This date should be set only after successfully completing the service procedure.
- **Last hospital service** - this date is set to the current date (as set in the pump) whenever the **Next hospital service** date is changed. **Last hospital service** date can be manually set to any value, but it will be changed again to the current date after changing the **Next hospital service** date.
- **Next hospital service** - recommended date for the next hospital service. This date should be set only after successfully completing the service procedure.

Setting the dates for next factory and hospital service allows the user to be notified at the appropriate time about the need to hand over the pump for service. A reminder about the need for inspection will be shown on the pump's display each time it is switched on after the date of the next factory or hospital service.

Note!!!

Before setting the next service date, make sure that the current date and time are correctly set in the pump (see 38/Table 10 (p. 79)).

4.5.5 5. Erase Functions

Note!!!

The erase functions should be used only if the contents of the pump's Data Flash memory get corrupted.

Note!!!

Incorrect or unjustified use of the erase functions may result in the need to repair the pump in the Medima factory service.

Executing the erase procedure requires entering a password. To obtain the password, please contact the Medima Service Department.

- 5.1. Flash Mem. – **do not use**;
- 5.2. Service Data – **erases the pump's service data**;
- 5.3. Drug Library – **erases the drug library**;
- 5.4. State Reg. – **do not use**;
- 5.5. Infusion History – **do not use**;

Note!!!

This function erases the contents of the Event log. Therefore, its use must first be consulted with the user and, if necessary, the data must be read and archived (please contact the Medima Service Department regarding data archiving).

- 5.6. Nv Ram – **do not use**.

4.5.6 6. Time Settings

This option allows setting the current time and date fromservice menu level. Time or date starts after pressing  button. Time and date can be also changed when the pump is off and mains is connected. Time and date setting can be set by  button press and hold and then "Settings" option select.

4.5.7 7. Pump Data

4.5.7.1 Serial Number

The serial number may be modified (doing so requires entering the **0000** password). The number entered must be the same as the serial number on the pump's Serial Number sticker (Fig. 13). If the sticker was damaged or lost, please contact the Medima Service Department directly.

Note!!!

Entering the serial number is only allowed after replacing the „CPU board set” part (see chapter 13.6 (p. 100)).

Note!!!

Pay special attention when entering the pump's serial number.

4.5.7.2 Production Date

The production date may be modified (doing so requires entering the **0000** password).

Note!!!

Entering the production date is only allowed after replacing the „CPU xxxx board set” part (see chapter 13.6 (p. 100), where xxxx means the pump type). In such case, the production date should be set to the date of the repair.

4.5.7.3 New stem end

This option allows initializing data fields relating to stem end replacement. Using this option requires entering the **0000** password.

After using this option, performing the following will be required:

- syringe clamp test (chapter 10.5.5 (p. 43)),
- gripper test (chapter 10.5.6 (p. 43)),
- syringe gripping test (chapter 10.5.7 (p. 44)),
- syringe clamp calibration (chapter 11.5 (p. 61)),
- arm position calibration (chapter 11.6 (p. 62)),
- force sensor calibration (chapter 11.7 (p. 63)),
- SM1 motor torque calibration (chapter 11.8 (p. 64)).

4.5.7.4 New mechanism

This option allows initializing data fields relating to mechanism replacement. Using this option requires entering the **0000** password.

After using this option, performing the following will be required:

- syringe clamp test (chapter 10.5.5 (p. 43)),
- gripper test (chapter 10.5.6 (p. 43)),
- syringe gripping test (chapter 10.5.7 (p. 44)),
- syringe clamp calibration (chapter 11.5 (p. 61)),
- arm position calibration (chapter 11.6 (p. 62)),
- force sensor calibration (chapter 11.7 (p. 63)),
- SM1 motor torque calibration (chapter 11.8 (p. 64)).

4.5.8 8. Software ID

Displays information about compilation, revision and version of the software modules:

- **MPU** – main pump control program,
- **PPU** – auxiliary processor program,
- **FLASHER** – controls and upgrades the pump's firmware,
- **START** – responsible for integrity control and starting the main program,
- **DATABASE** – main resources for the user interface,
- **DATAEXT** – additional resources for the user interface (e.g. additional languages).

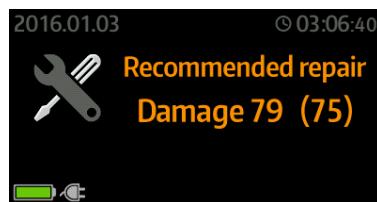
4.5.9 9. R&D

Used only in the manufacturing process by Medima.

4.6 INFORMATION ABOUT PERFORMED TESTS AND CALIBRATIONS

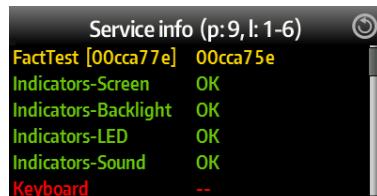
The need for calibrations and tests may arise:

- after repair or part replacement (see recommendations in chapter 14 (p. 133) and chapter 15 (p. 136),
- if the pump displays the following message after powering on:



The pump will prevent access to the infusion menu until all of the required calibrations and tests are performed. Only entering service mode will be possible.

List of required calibrations and tests can be displayed by pressing and holding the button, and then pressing the button. A list of tests and calibrations will be displayed:



The list can be scrolled with and . Entries in green have already been performed, entries in red have not.

If a test or calibration is displayed in red, perform the appropriate procedure.

Name in the Service info window	Procedure description
Indicators-Screen	10.5.1
Indicators-Backlight	
Indicators-LED	
Indicators-Sound	
Keyboard	10.5.2
Touch Panel	10.5.3
Syringe sensor	factory procedure
Syringe clamp	10.5.5
Gripper	10.5.6
Gripping	10.5.7
Connection	factory procedure
Mains&Load	10.5.4
Docking OptoRS	factory procedure
Clamp Run-in	factory procedure
Mechanism Run-in	factory procedure
Touch Panel	11.1
Clamp	11.5
Arm	11.6
Battery Voltage	11.2
Charger	11.3
DC Voltage	11.4
Force Sensors	11.7

Torque	11.8
--------	------

5 Stops in pump operation

In case of longer stops in pump operation, refer to the instructions in the pump User Manual (see: chapter 14. „Longer interruptions in pump operation”).

6 Preparation for use

Infusion pumps should be prepared for use according to the instructions in the pump User Manual (see sections: „UNPACKING”, „PREPARING THE PUMP” and „PUMP INSTALLATION”).

7 Pump service – order of actions

Regardless of whether the device requires repair or only inspection, the following actions must be performed in the order specified below:

1. Print the F1-IS-Sx00-01-EN-01 form (chapter 18 (p. 145));
2. Clean the pump (chapter 8 (p. 24));
3. Upgrade the software (chapter 9 (p. 25));
4. Perform pump inspection (chapter 10 (p. 30));
5. If necessary, perform pump calibration (chapter 11 (p. 55));
6. Perform the final steps after pump repair/inspection (chapter 15 (p. 136));

Further steps depend on the results of the tests:

- if defects were found – perform appropriate actions described in chapter 12.3 (p. 71), depending on the nature of the defects.
- if no defects were found – continue the service according to the above description.

8 Pump cleaning

Note!!!

The pump must be cleaned/disinfected with agents which do not cause damage to the PC-ABS and ABS plastic of which the case and parts of the pump are made. Cleaning agents recommended by Medima: Meliseptol Foam Pure and Anios Surfa'Safe.

Perform pump cleaning according to the following procedure:

1. Remove the syringe and then turn the pump off.
2. Disconnect the pump from external power supply.
3. Disconnect the patient's bolus button (only for the S300PCA pumps) and clean its outside surfaces with a cloth dampened with a recommended cleaning agent.

Note!!!

Do not wash the patient's bolus and the pump button in running water and do not immerse it in cleaning agents.

4. Wipe the outside surfaces of the pump with a cloth dampened with a recommended cleaning agent.
5. After the pump has been cleaned, dry it with a dry cloth and wait until the parts are completely dry.

Note!!!

In case of heavy soiling or internal flooding, clean the pump's interior.

9 Medima pumps software upgrade

Software upgrade can be performed using the Medima Loader software included in the Medima Service ToolBox 3.0 software package.

Note!!!

Using the Medima Tool Box 3.0 software is possible only after inserting the TA-60 hardware key into the PC's USB port.

Medima Service ToolBox 3.0 software can be installed by running the installation software available at the www.medima.pl website in the [Download](#) tab. Downloading the installation software requires entering a login and a password (how to get them - see chapter 2.2 (p. 7)). If the Medima Service ToolBox 3.0 package is already installed, check in the [Download](#) tab if a newer version is available.

Note!!!

Software upgrade should always be performed using the newest version of the Medima Service ToolBox 3.0 software package.

Instructions on the use of the Medima Loader software can be found in the Medima Loader user manual, the newest version of which is available at the www.medima.pl website, in the [Download](#) tab.

Before performing software upgrade, connect the pump to the mains power supply.

Note!!!

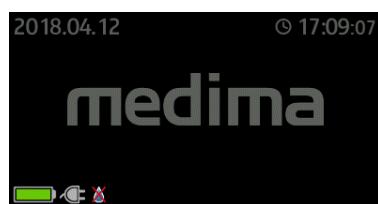
Even if the pump can not be switched on, software upgrade should still be attempted, following the instructions in chapter 9.3 (p. 28)

Note!!!

If software upgrade failed before repair, it should be attempted again after the repair.

9.1 IDENTIFYING SOFTWARE VERSION

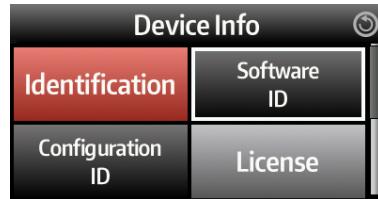
1. Connect the pump to the mains power supply. Turn the pump off with the  button.



2. Press and hold  to enter the menu. Select **Device Info**.



3. Select **Software ID**.



4. Read the current version number for the MPU entry. In the example below it is: **v3.1.0 27406**

Software ID	
MPU	3.1.0
	27406
PPU	3.0.4
	26916

9.2 CHECKING THE PUMP-COMPUTER COMMUNICATION

The pump may experience issues in communicating with the computer due to:

- hardware causes,
- software causes (corrupted or outdated software in the pump).

The purpose of this procedure is determining the cause of communication breakdown. After making sure that the computer's communication port is properly configured (correct and up to date drivers) and unoccupied:

- connect the pump to the mains power supply.
- make sure that no other pump is connected to the computer.
- connect the pump to the computer according to the instructions in the **Medima Loader** user manual.
- Start the **Medima ToolBox 3.0** and then the **Loader**.

The software should establish a connection with the pump and display device information. Fig. 4 shows sample data recovered from the pump (markings 1, 2, 3).

The screenshot shows the Medima Loader software interface. The main window title is "Medima Loader 3.0.0.2446". The top right corner shows "Logged in: wojtek". The left side has a sidebar titled "medima" with a list of ports: COM1 [Port komunikacyjny], COM16 [USB Serial Port], COM27 [USB Serial Port], COM33 [Sterownik Bluetooth SPP], COM34 [Sterownik Bluetooth SPP], and COM36 [USB Serial Port]. The "COM27" row is highlighted with a red box and labeled "2". The right side displays a table with columns: Pump, Status of action, and Progress of action. One row is highlighted with a red box and labeled "1". The bottom section shows detailed pump information: Pump (300000000), FW status ([Rev. 28683] 3.1.0), Configuration status (eng_default v 1.00....), and Drug library status (<??>). This row is also highlighted with a red box and labeled "3". At the bottom, there are buttons for "Update all", "Import data", "Send to MedimaNet", and "Exit". A progress bar at the bottom indicates 82% completion.

Fig. 4 Correct communication with the pump

If communication with the pump is not established due to hardware causes, the **Loader** software window looks like in Fig. 5 (marked areas contain no information).

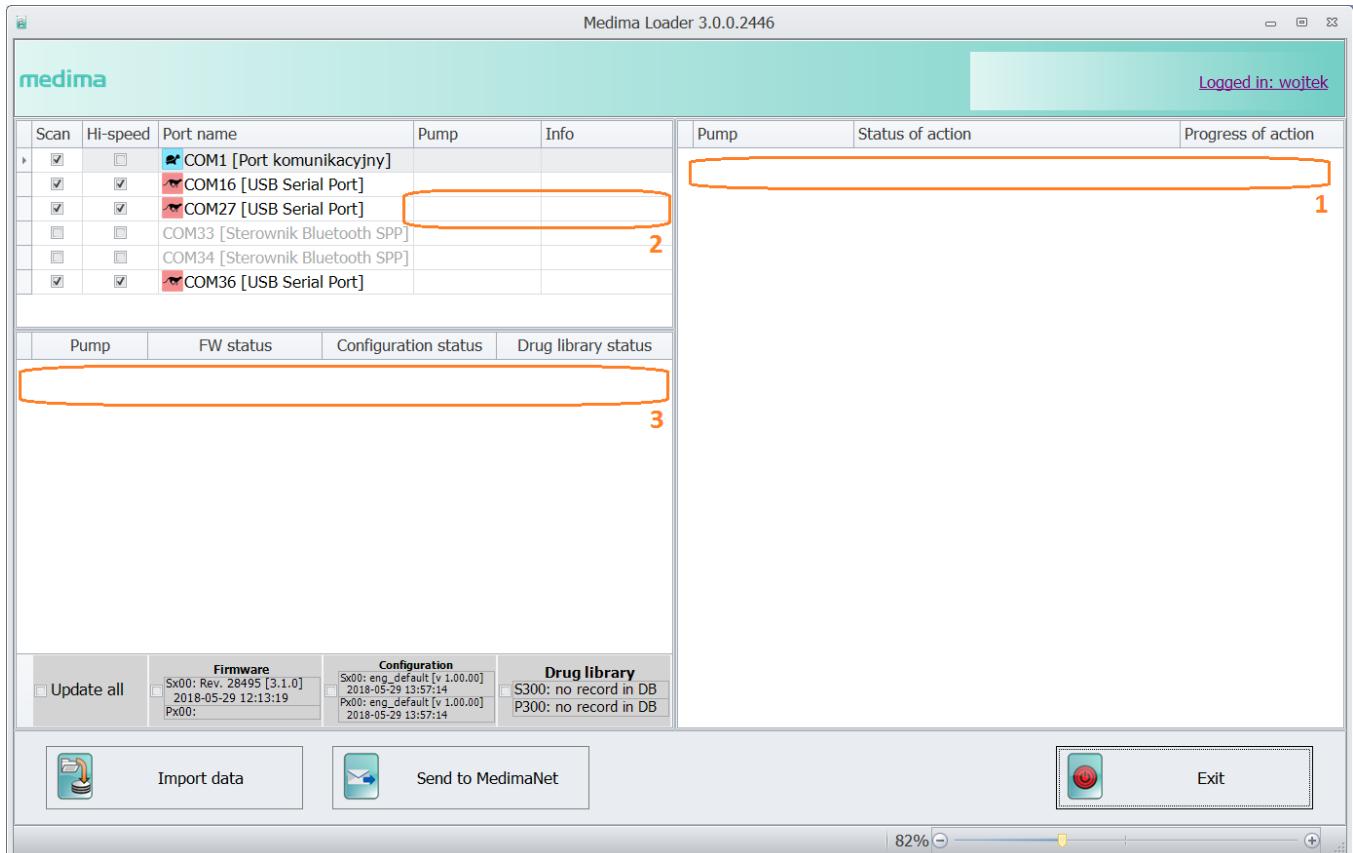


Fig. 5 No communication with the pump

In the event of the **Loader** software losing the connection that was previously established (unstable connection, disconnecting the cable), marked areas 2 and 3 will be greyed out Fig. 6.

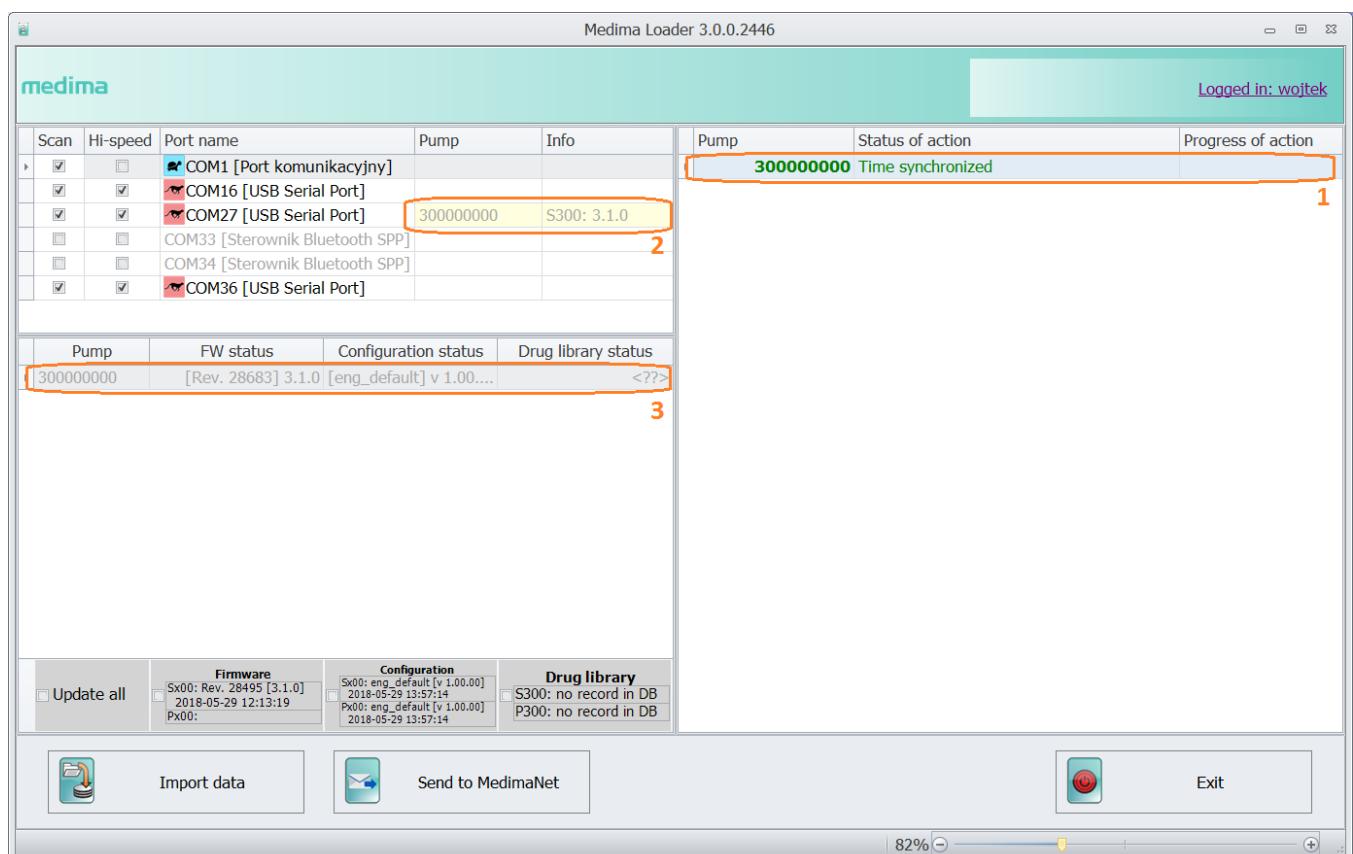


Fig. 6 Communication with the pump lost

In the specific case of pump software being outdated or corrupted, area 1 (Fig. 6) will show a time synchronization operation, but areas 2 and 3 will contain question marks '??'

Note!!!

Drug library status is presented only for pumps S300 and S300PCA, if Drug library is installed.

9.3 SOFTWARE UPGRADE

1. Required tools:
 - PC,
 - Medima Loader 3.0 software,
 - Cable for programming the pump (TA-50).
2. Install Medima Toolbox on the PC. At the end of the installation process you will be asked to create new user credentials for the installer (see Fig. 7).

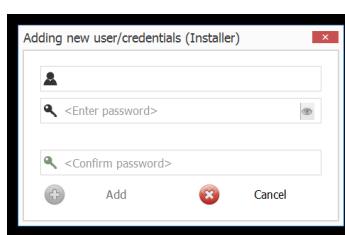


Fig. 7 Adding new user/credentials window during firmware instalation

3. Run Medima Toolbox and click Loader in Launcher menu (see Fig. 8).

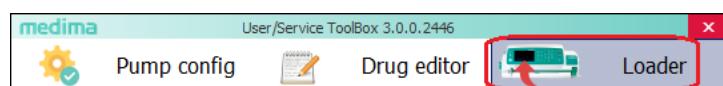


Fig. 8 User/Service Toolbox Launcher menu window

4. Define a new user for the Loader module using credentials defined during the installation process (see Fig. 9).

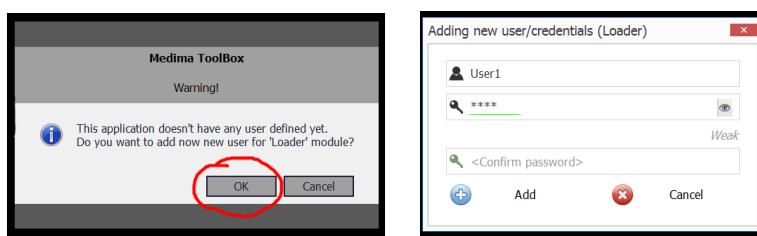


Fig. 9 Adding new user/credentials windows during Loader launching

5. Import new firmware file to the Loader module. Use "Import data" button (see 5/Fig. 10).

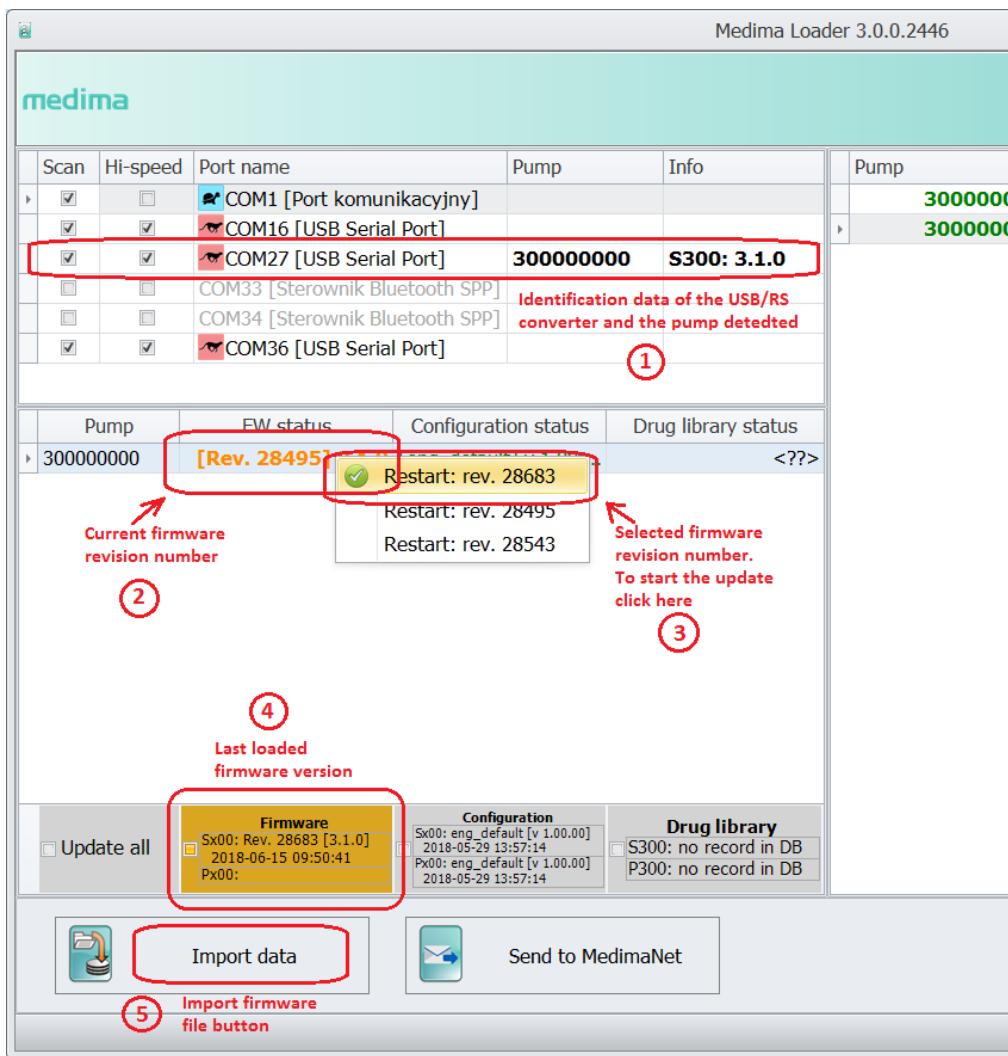


Fig. 10 Loader window

6. Connect the pump to the mains power supply. Connect the pump (PCA connector) to the PC using **TA-50** cable (RS232c cable with USB/RS converter). Make sure that the pump has been detected. Check if the firmware version numbers are as expected (see 1/Fig. 10).

Note!!!

You can connect many pumps to Medima Loader in the same time and load the new firmware simultaneously to all of them.

Troubleshooting:

If the loader doesn't detect the pump:

- Make sure that USB /RS converter has been detected (USB virtual COM driver must be properly installed on the PC);
- switch the pump ON/OFF by pressing .

7. Click right mouse button on current firmware revision number (2/Fig. 10). List of Available firmware versions will be displayed (3/Fig. 10). Select and click left mouse button on firmware number which should be loaded into the pump. The firmware file will be transferred to the pump. Transfer progress is displayed as shown in Fig. 11.

Medima Loader 3.0.0.2446			
	Pump	Status of action	Progress of action
0: 3.1.0	300000000	Time synchronized	
	300000000	Loading upgrade package 1/5	Rev. 28495: 76%

Fig. 11 Firmware transfer progress window

- After the pump receives complete firmware file, it starts the flashing process automatically (see Fig. 12).



Fig. 12 Progress of firmware flashing window

- The whole process takes up to 10 minutes. After successful flashing the pump starts automatically.

10 Technical safety check of the pump

10.1 GENERAL REMARKS

- Before beginning the inspection:
 - print the F1-IS-Sx00-01-EN-01 form – see chapter 18 (p. 145);
 - upgrade the pump's software to the newest version – see chapter 9).
- The pump must be connected to the mains power supply through an isolation transformer or supplied from a **TA-55** 15V DC power supply through a DC power cord **TA-7** included in the **service toolset**.
- Perform all the recommended actions listed in **Table 3** in the specified order.
- Follow the recommendations after the technical safety check – see chapter 15 (p. 136).

10.2 FREQUENCY OF INSPECTIONS

The table below presents the recommended actions depending on the type of inspection.

Table 3 List of inspection types and actions.

Actions	Type of inspection							
	Pre-operational check	Hospital inspection	Service inspection	Inspection after repair	Inspection after spilling of liquids, dropping or strong mechanical impact	Inspection after a break in use of 3 to 12 months	Inspection after a break in use of 12 to 24 months	
Exterior inspection - chapter 10.3 (p. 32)	+	+	+	+	+	+	+	+
Interior inspection – chapter 10.4 (p. 37)	-	-	+/-	+/-	+	-	-	-
Infusion test - chapter 10.6.2 (p. 49)	+/-	+	+	+	+	+	+	+
Basic tests - chapter 10.5 (p. 38)	-	+	+	+	+	+	+	+
Functional tests - chapter 10.6 (p. 48)	-	-	+	+	+	-	-	+
Calibrations - chapter 11 (p. 55)	-	-	-	+/-	+/-	-	-	-
Electrical safety tests - chapter 10.8 (p. 53)	-	+/-	+	+	+	-	-	+
Battery tests - chapter 10.7.3 (p. 51)	-	+/-	+/-	+/-	-	+	+	+

Key:

- (+) actions must be performed during the inspection;
- (-) actions are not performed during the inspection;
- (+/-) actions must be performed or are not performed depending on the nature of the repairs.

1. Service inspections must be performed at least once every 24 months.
2. The frequency of hospital inspections depends on the hospital's internal regulations. Medima recommends performing hospital inspections:
 - whenever the hospital staff reports problems during the use of the pump;
 - after the device is dropped, suffers a strong impact, or other mechanical exposures;
 - after the device is flooded with infusion liquids or cleaning agents;
 - in accordance with the battery test schedule (which depends on the way the pump is used, see chapter 10.7.1 (p. 50)).

10.3 EXTERIOR INSPECTION

10.3.1 External appearance

Table 4 External appearance check procedure for the Sx00 pump

CHECKED ELEMENT shown in Fig. 13. Element number in parenthesis	COURSE OF ACTION
Front case (1)	
Back case (2)	
Pump stem end (3)	
Syringe grippers (4)	Check all visible surfaces for fractures, scratches and deformations.
Syringe clamp (5)	
Syringe flange clamp (6)	
IV set holder (7)	
Slot designation sticker (8)	
Pump type sticker (9)	Check if the sticker is present and legible and if it is not torn or faded.
Fuse sticker (10)	
S/N REF sticker (11)	
Nurse alarm socket (12)	
PCA button / RS232 socket (13)	
DC power supply socket (14)	Check for signs of liquid spills and corrosion and if the sockets are not cracked.
AC power supply socket with a fuse (15)	
Battery chamber (16)	
Alphanumeric keyboard (17)	Check around all edges of the element if it is securely glued to the case. Check for fractures, scratches, deformations and other damage. Check if all buttons are in working condition, by pressing with the index finger.
Pump base stands (18)	Check if all base stands are intact.
Syringe pump (19)	Check for signs of liquid spills. Check, by shaking gently, if there are no loose elements inside the case.

For the S300PCA pump the list of additional checks is shown in table below:

Table 5 External appearance check procedure for the S300PCA pump

CHECKED ELEMENT shown in Fig. 14. Element number in parenthesis	COURSE OF ACTION
Patient's bolus button (20)	Check all visible surfaces for fractures, scratches and deformations. Check for signs of liquid spills.
Patient's bolus button mounting handle (21)	Check if it is firmly fixed to the pump case and firmly holds the Patient's bolus button.
Patient's bolus button plug (22)	Check for signs of liquid spills and pin corrosion.
PCA cover (23)	Check the hinges and smoothness of its movement. Check all visible surfaces for fractures, scratches and deformations.
PCA bottom cover (24)	Check if the element is not loose. Check all visible surfaces for fractures, scratches and deformations.
PCA lock (25)	Check if it is firmly mounted to pump housing and locks the PCA cover.

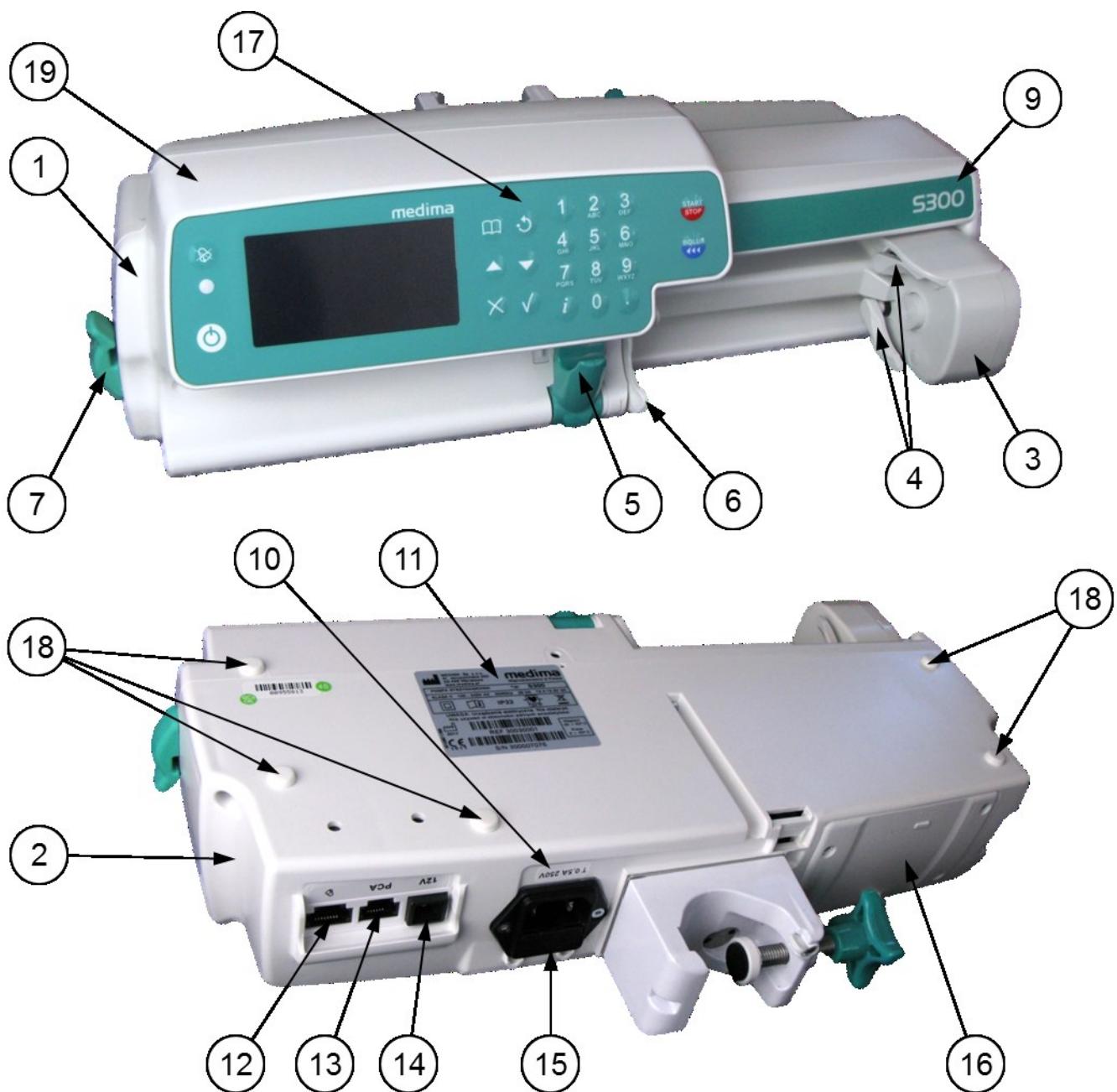


Fig. 13 Location of the checked elements – pump Sx00

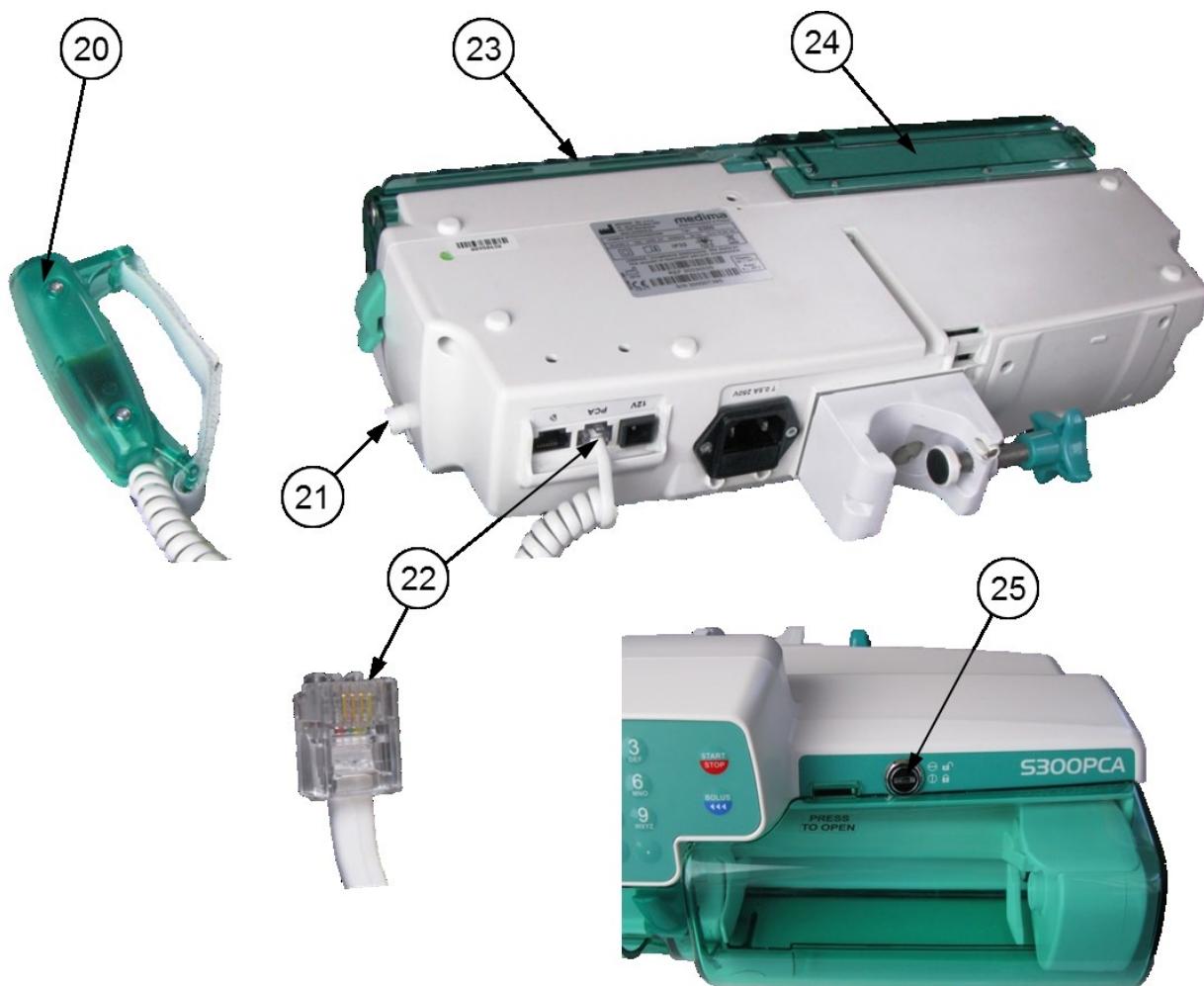


Fig. 14 Location of the checked elements – pump S300PCA

Table 6 External appearance check negative results – pump Sx00

CHECKED ELEMENT shown in Fig. 13 Element number in parenthesis	ISSUE / COURSE OF ACTION
Front case (1)	
Back case (2)	
Pump stem end (3)	
Syringe grippers (4)	fractures / element replacement
Syringe clamp (5)	deformation / element replacement
Syringe flange clamp (6)	scratches / inspection
IV set holder (7)	
Socket designation sticker (8)	
Pump type sticker (9)	element missing / attaching a new one
Fuse sticker (10)	element illegible / element replacement
S/N REF sticker (11)	element torn / element replacement

Nurse alarm socket (12)	
PCA button / RS232 socket (13)	
DC power supply socket (14)	liquid spill / pump internal inspection corrosion / element replacement
AC power supply socket with a fuse (15)	
Battery chamber (16)	surface liquid spill / pump cleaning internal flooding / internal inspection fractures / element replacement and internal inspection
Alphanumeric keyboard (17)	peeling off / element replacement fractures / element replacement and internal inspection faulty buttons / element replacement
Pump base stands (18)	element missing / installing a new one
Syringe pump (19)	surface liquid spill / pump cleaning internal flooding / internal inspection loose elements / internal inspection

Table 7 External appearance check negative results – S300PCA pump

CHECKED ELEMENT shown in Fig. 14. Element number in parenthesis	COURSE OF ACTION
Patient's bolus button (20)	surface liquid spill / internal inspection fractures / element replacement faulty button / element replacement
Patient's bolus button mounting handle (21)	element missing / installing a new one fractures / element replacement and internal inspection loose connection / tightening the element
Patient's bolus button plug (22)	liquid spill / pump internal inspection corrosion / element replacement
PCA cover (23)	loose fixing / correct fixing fractures / element replacement
PCA bottom cover (24)	deformation / element replacement scratches / inspection
PCA lock (25)	surface liquid spill / pump cleaning internal flooding / internal inspection loose elements / correct fixing faulty operation / element replacement

10.3.2 Pole clamp



Fig. 15 Pole clamp fixed to a vertical column and a horizontal rail

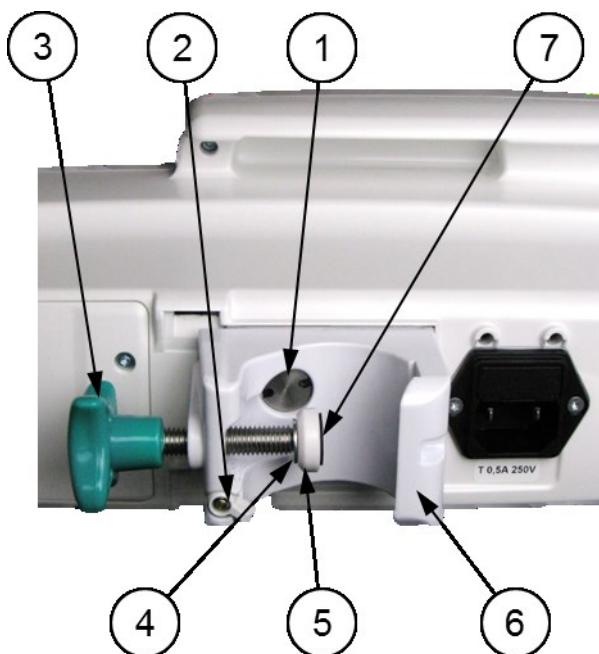


Fig. 16 Pole clamp elements

Table 8 Pole clamp check procedure.

CHECKED ELEMENT shown in Fig. 16 Element number in parenthesis	COURSE OF ACTION
Clamp knob (3)	Check for surface fractures. Check the thread by screwing the knob all the way in and out.
4,3x12x1 metal washer (4)	
Clamp knob end (5)	Check for presence and condition of the element.
Friction disc (7)	
Clamp (6)	Check for surface fractures.
Pole clamp screw (1)	Check if the clamp is securely attached to the case. Pay special attention to possible movement.

Clamp rotation lock (2)	Check the clamp rotation lock. In both extreme positions, the clamp should be locked so that it cannot rotate. When the lock is released, it should be possible to change the clamp's position.
-------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Table 9 Pole clamp check negative results.

CHECKED ELEMENT shown in Fig. 16 Element number in parenthesis	ISSUE / COURSE OF ACTION
Clamp knob (3)	fractures / element replacement faulty thread / element replacement
4,3x12x1 metal washer (4)	element missing / installing a new one
Clamp knob end (5)	element damaged / element replacement
Friction disc (7)	
Clamp (6)	fractures / element replacement
Pole clamp screw (1)	loose attachment / tightening of the screw
Clamp rotation lock (2)	clamp is not locked in the extreme positions / element replacement clamp does not rotate with the lock released / element replacement

10.4 INTERIOR INSPECTION

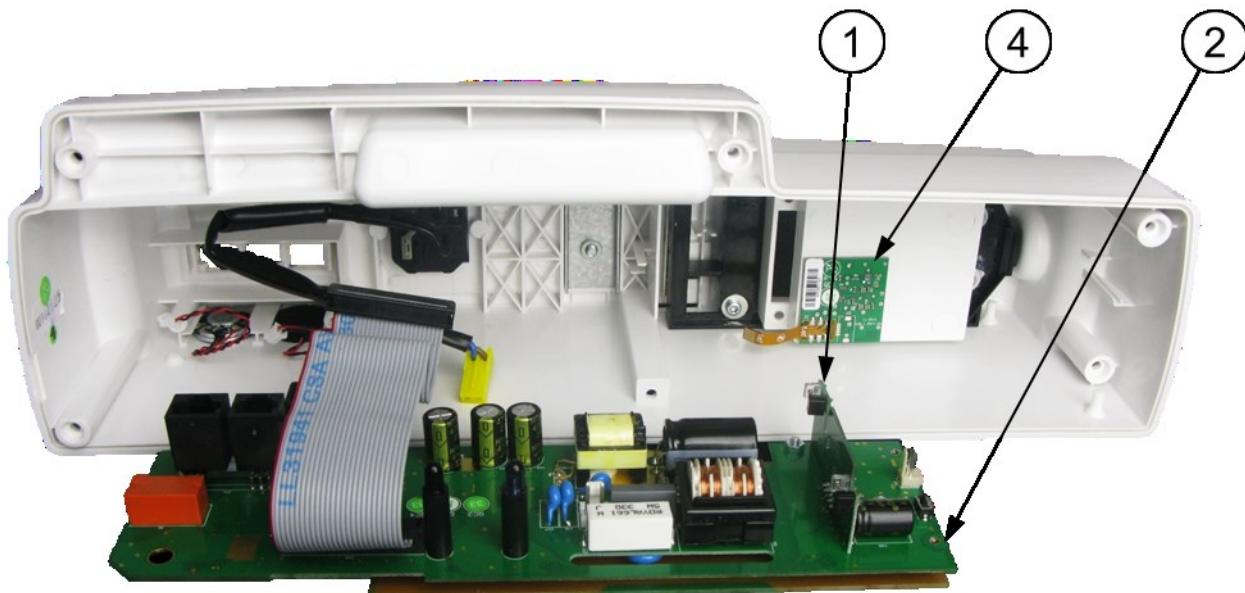


Fig. 17 Pump's internal elements – Back case

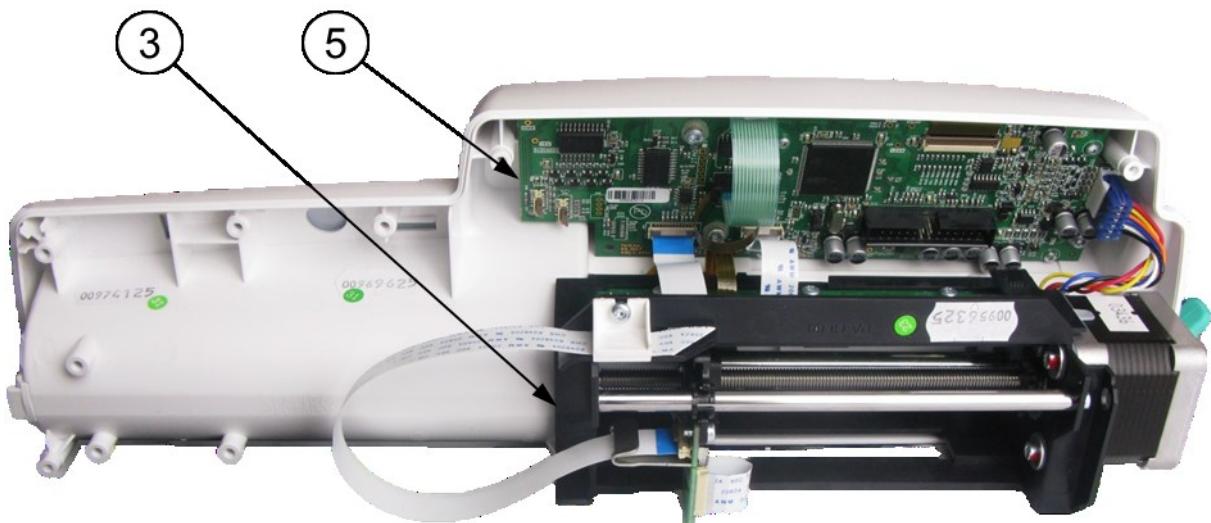


Fig. 18 Pump's internal elements – Front case

Interior inspection procedure

CHECKED ELEMENT shown Fig. 18 A, B. Element number in parenthesis	COURSE OF ACTION
Pump's interior	Check for any loose elements (loose screws, pulled out or incorrectly connected FFC ribbons or plugs, etc.). Check the interior surfaces of the case for signs of flooding.
Power supply board (2)	
Docking detectors board (1)	
Battery controller board(4)	Check for signs of flooding or corrosion.
CPU board (3)	
Drive mechanism (5)	Check for loose elements by shaking gently. Check if the ribbon cables are properly connected.

Negative result

CHECKED ELEMENT shown Fig. 18 A, B. Element number in parenthesis	ISSUE / COURSE OF ACTION
Pump's interior	loose element / fastening the element flooding / cleaning the elements In case of significant corrosion, replacement of the corroded elements is recommended.
Power supply board (2)	
Docking detectors board (1)	
Battery controller board (4)	
CPU board (3)	
Drive mechanism (5)	loose element / fastening the element

10.5 BASIC TESTS

Basic tests are executed from the service menu. Accessing the service menu is described in chapter 4.5 (p. 18). Basic tests are located in submenu **2. Tests**.

10.5.1 Signalization and display test

The purpose of this test is checking the pump's sound signalization systems and the LCD display. Checks include: volume scale of the main speaker, operation of the support speaker, quality and brightness of the display.

Test procedure

1. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.2 (p. 19)) select the „**2. Tests**” and then „**1. Signalization**” options.
2. After the test begins, the pump displays, in **1s** intervals, subsequent screens of increasing brightness with numbers **1** to **9** and a "Main speaker" label:



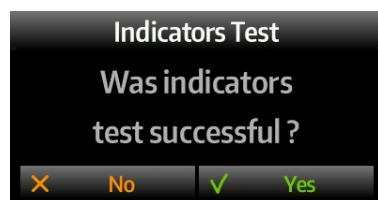
Assess:

- if the displayed image is uniform and contains no dots of different colour (e.g. faulty lines);
 - if the volume of sound from the main speaker increases along with the displayed numbers;
 - if the brightness of the display increases along with the displayed numbers;
 - if the LED on the left side of the front panel changes colour in the: red, green, blue sequence.
3. After the last screen numbered **9** a screen with a „**Support speaker**” label is displayed:



Assess:

- if an interrupted sound can be heard from the pump's support speaker (buzzer).
4. The test repeats indefinitely. Press button to end it. The following screen is shown:



5. If the test was successful, save the results by pressing "Yes". Record the test results in the **F1** form.

Positive result

Positive result of each part of the test.

Negative result

Negative result	Repairs
Visible lines or discolorations on the display	see: Table 10/24 (p. 76) – „Display damage or backlight fault”
Display illegible (faulty lighting)	
One of the LEDs on the front panel does not light up	
No alarm sound or sound is distorted	see: Table 10/25 (p. 77) – „No alarm sound or sound is
No sound from the main speaker	

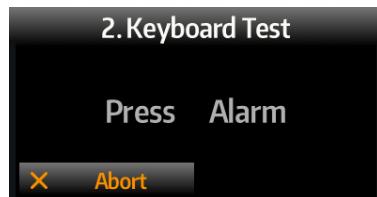
No sound from the support speaker	distorted"
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10.5.2 Keyboard test

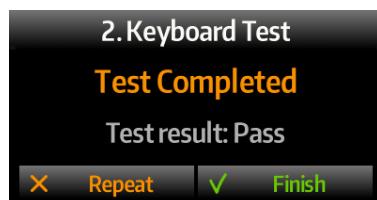
This test checks all the keyboard buttons.

Test procedure

1. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.2 (p. 19)) select the „2. Tests” and then „2. Keyboard” options.
2. Press buttons in the order shown on the display.



3. After the test is finished, the result will be displayed:



4. If the result is Pass or Pass+, save it by pressing or "Finish" and record the result in the F1 form.

Positive result

Test result: **Pass, Pass+.**

Negative result

Negative result	Repairs
No reaction to a button press or an incorrect symbol displayed.	Follow the instructions for the error code 078 (051) (Table 11 (p. 92)), starting with p. A.2.

10.5.3 Touch panel test

This test checks if the touch panel is functioning and adequately precise.

Note!!!

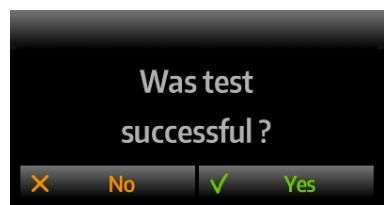
Depending on the pump's configuration, the touch panel may be inactive when the pump is supplied with DC power.
Perform this test when the pump is supplied with the mains AC power.

Test procedure

1. Prepare the **TA-52** stylus.
2. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.2 (p. 19)) select the „2. Tests” and then „3. Touch panel” options.



3. Use the stylus to touch different places along the whole surface of the panel and note if a white dot is displayed near the touched places – placement of the dot might differ slightly from the point touched;
4. In order to end the test, press . A summary screen will be displayed:



5. If the test was successful, save the results by pressing "Yes". Record the test results in the F1 form.

Positive result:

Position of the dots on the display differs by no more than 3mm.

Negative result

Negative result	Repairs
Dots are not displayed at all	A. Course of action A.1. Repeat the test with the mains AC power connected A.2. If the issue persists, follow the instructions for the error code 046 (238) (Table 11 (p. 85)), starting with p. A.3.
Not all dots are displayed after touching with the stylus (e.g. near the display borders) or the distance between the dot and touched point is larger than 3 mm	A. Course of action A.1. Repeat the test. A.2. If the issue persists, perform touch panel calibration (chapter 11.1 (p. 55)).
After 2 correctly performed touch panel calibrations, not all dots are displayed after touching with the stylus or the dots are too far from the touched point	A. Course of action A.1. Follow the instructions for the error code 046 (238) (Table 11 (p. 85)), starting with p. A.3

10.5.4 Power supply test

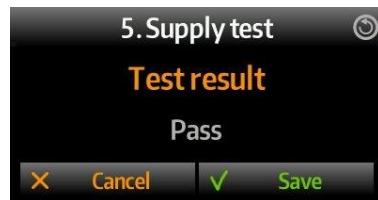
This test checks the AC power supply connection.

Test procedure

1. Connect the mains AC power to the pump.
2. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.2 (p. 19)) select the „2. Tests” and then „5. Supply” options.



3. After the test, the result will be displayed.



4. If the result is Pass or Pass+, save it by pressing "Save". Record the result in the F1 form.

Positive result

Test result: **Pass, Pass+.**

Negative result

One of the error codes **Err2.5/n** - where **nn** is the error number.

Error no.	Cause and course of action
Err 2.5/1	<p>Software error.</p> <p>A. Course of action:</p> <ul style="list-style-type: none"> A.1. Upgrade the pump's software if it is not up to date (see chapter 9.3 (p. 28)) and repeat the test. A.2. Leave the service mode holding button for about 3s. A.3. Enter the service mode again (see chapter 4.5 (p. 18)) and repeat the test. A.4. If the issue persists, contact Medima Service Department (see chapter 1 (p. 7)).
Err 2.5/2	<p>No correct data received from battery controller.</p> <p>A. Course of action:</p> <ul style="list-style-type: none"> A.1. Leave the service mode holding button for about 3s. A.2. Wait 1 minute. Enter the service mode again (see chapter 4.5 (p. 18)) and repeat the test. A.3. If error 049 (291) occurs, perform repairs like for error code 049 (291) (Table 11 (p. 86)).
Err 2.5/3	<p>Time to connect AC power exceeded (with DC power disconnected).</p> <p>A. Course of action:</p> <ul style="list-style-type: none"> A.1. Disconnect DC power and repeat the test with AC power connected. A.2. If the issue persists perform repair like for error code 060 (296) (Table 11 (p. 87)).
Err 2.5/4	<p>Automatic AC power disconnection error.</p> <p>A. Course of action:</p> <ul style="list-style-type: none"> A.1. Repeat the test with AC power connected. A.2. If the issue persists and DC power was not connected perform repair like for error code 061 (296) (Table 11 (p. 89)) and repeat the test.
Err 2.5/5	<p>DC power connected or AC power disconnected during the measurement.</p> <p>A. Course of action:</p> <ul style="list-style-type: none"> A.1. Repeat the test with AC power connected. A.2. If the issue persists and DC power was not connected perform repair like for error code 060 (296) (Table 11 (p. 89)) and repeat the test.
Err 2.5/6	<p>No increment of the controller discharge time counter during waiting for the full load setting</p> <p>A. Course of action:</p> <ul style="list-style-type: none"> A.1. Disconnect DC power and repeat the test with AC power connected. A.2. If the issue persists perform repair like for error code 060 (296) (Table 11 (p. 89)).
Err 2.5/7	<p>No predicted increment of the controller discharge time counter during the measurement of full load current.</p> <p>Course of action like for Err 2.5/6.</p>
Err 2.5/8	<p>Exceeded permissible full load current range.</p> <p>Course of action like for Err 2.5/6.</p>
Err 2.5/9	<p>No increment of the controller discharge time counter during waiting for the reduced load setting.</p> <p>Course of action like for Err 2.5/6.</p>
Err 2.5/10	<p>No predicted increment of the controller discharge time counter during the measurement of reduced load current.</p> <p>Course of action like for Err 2.5/6.</p>
Err 2.5/11	<p>Exceeded permissible reduced load current range.</p> <p>Course of action like for Err 2.5/6.</p>
Err 2.5/12	<p>Software error.</p> <p>Course of action like for Err 2.5/1.</p>
Err 2.5/13	<p>Calibration interrupted by the user.</p> <p>A. Course of action:</p>
Err 2.5/14	

	A.1. Repeat the calibration following the procedure and instructions on screen.
Err 2.5/15	Software error.
Err 2.5/16	Course of action like for Err 2.5/1.

10.5.5 Syringe clamp test

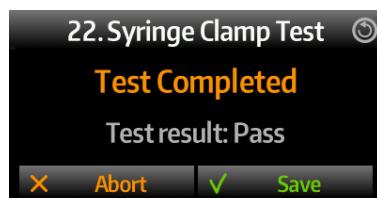
This test checks the operation of the syringe clamp.

Test procedure

1. Place the pump on a table.
2. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.2 (p. 19)) select the „**2. Tests**” and then „**22. Syringe Clamp**” options. The following screen will be displayed:



3. Pull the syringe clamp to the table level and wait for a maximum of 5 seconds for the test to finish and the following to be displayed:



4. If the result is Pass or Pass+, save it by pressing "Save". Record the result in the F1 form.

Positive result

Test result: **Pass, Pass+.**

Negative result

Negative result	Repairs
Test result did not appear after 5 seconds.	Clamp position detector fault Course of action like for error 016 (064) (Table 11 (p. 82)).

10.5.6 Gripper test

This test checks the operation of the syringe gripper.

Test procedure

1. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.2 (p. 19)) select the „**2. Tests**” and then „**23. Gripper**” options. The progress screen will be displayed:



2. Wait for the test to finish and for appearance of the following screen:



3. If the result is Pass or Pass+, save it by pressing "Save". Record the result in the F1 form.

Positive result

Test result: **Pass, Pass+**.

Negative result

One of the error codes **Err2.23/n** - where **nn** is the error number.

Error no.	Cause and course of action
Err 2.23/1	SM2_TACHO line short-circuit A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/2	OPEN line short-circuit A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/3	optoOPEN diaphragm lets light through A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/4	optoTACHO diaphragm lets light through A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/5	optoBUTTON diaphragm lets light through A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/6	optoOPEN line sensitivity too low A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/7	optoTACHO line sensitivity too low A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/8	optoBUTTON line sensitivity too low A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/9	OPEN and TACHO line sensitivity too low – probable faulty LED A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/10	Stem end motor (SM2) jam A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.23/11	Signal from the force signal preamplifier out of range A. Course of action like for error 029 (042) (Table 11 (p. 83)).
Err 2.23/12	Signal from the force sensor below acceptable range A. Course of action like for error 029 (042) (Table 11 (p. 83)).
Err 2.23/13	Signal from the force sensor above acceptable range A. Course of action like for error 029 (042) (Table 11 (p. 83)).
Err 2.23/14	No connection or complete jam of stem end motor (SM2) A. Course of action like for error 023 (207) (Table 11 (p. 82)).

10.5.7 Syringe gripping test

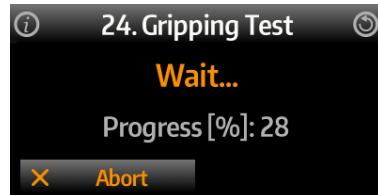
This test checks the syringe gripping operation.

Test procedure

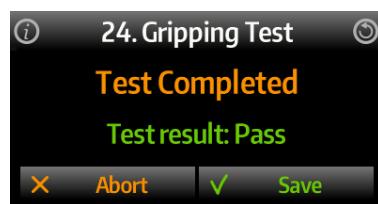
- Required equipment: BD Plastipak 50ml syringe.
- In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.2 (p. 19)) select the „2. Tests” and then „24. Gripping” options. The following screen will be displayed:



3. Install the syringe in the pump. After correct installation, the gripping procedure will start automatically and the following progress screen will be displayed:



4. Wait for the test result screen:



5. Record the results. Press „Save” to save the test status or „Abort” to finish without saving.

Positive result

Test result: **Pass, Pass+**.

Negative result

One of the error codes **Err2.24/n** - where **n** is the error number.

Error no.	Cause and course of action
Err 2.24/1	No syringe or incorrect syringe- use a 50ml BD Plastipak syringe.
Err 2.24/2	Too low force increase during syringe gripping. A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.24/3	Too low force increase during syringe gripping (in maximum power mode). A. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 2.24/4	Incorrect operation of arm main motor. A. Course of action like for error 045 (044) (Table 11 (p. 84)).
Err 2.24/5	Incorrect syringe fixing. A. Course of action: A1. Install and press the syringe again A2. If the issue persists, use a different 50ml BD Plastipak syringe.

10.5.8 Syringe diameter measuring test

This test checks the correctness of the syringe diameter identification and the syringe clamp operation.

Test procedure

1. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.2 (p. 19)) select the „**2. Tests**” and then „**27. Syringe Diameter measuring**” options.
2. Install a calibration roller or syringe of precisely known diameter and read the measurement result:



Positive result

Measurement error is within the $\pm 0,2\text{mm}$ range and there is no message displayed below diameter value.

Negative result

1. Measurement error is outside the $\pm 0,2\text{mm}$ range (syringe clamp calibration needs to be performed again (chapter 11.5 (p. 61)).
2. "Misload" or "Moving" message is displayed despite clamp is in stable position.



10.5.9 Pump fixing in the docking station test

This test checks the operation of the pump docking mechanism.

Test procedure

1. Connect external power supply to the pump.
2. Turn the pump off. **medima** logo will be visible on the display.
3. Press and hold the pump release button (see Fig. 19) for approximately 10 seconds. The following alarm should be raised: **Incorrect fixing in docking station**.

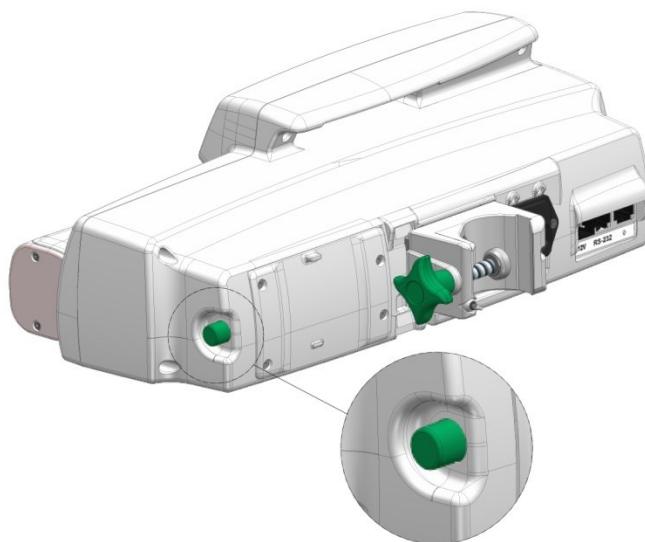


Fig. 19 Placement of the docking release button

4. Release the release button, checking if the **Lock** mechanism returned to its regular position without jamming. The "Incorrect fixing in docking station" alarm should automatically disappear.
5. Install the pump in a docking station connected to the mains power. **medima** logo should be displayed by the pump.
6. Check if the pump is securely fixed in the docking station, it can not be removed without pressing the release button and the "Incorrect fixing in docking station" alarm is not raised.

Incorrect result

1. No “Incorrect fixing in docking station” alarm while the release button is held - repairs (see p. 27, Table 10 (p. 77)).
2. The medima logo screen is not displayed after inserting the pump into the docking station - repairs (see p. 3, Table 10 (p. 72))
3. The pump is not correctly fixed in the docking station – perform pump disassembly according to chapter 13.4 (p. 99). If necessary, clean the **Lock** (see chapter 8 (p. 24)) and, if necessary, replace Back case set according to chapter 13.19 (p. 122).

10.5.10 Patient's bolus button test (S300PCA only)

This test allows checking the patient's bolus button operation.

Note!!!

Test performed only for the S300PCA pumps.

Test procedure

1. Turn the pump off and connect the **Patient's bolus button**, see Fig. 14.
2. Attach the patient's button to the magnetic mounting handle on the side of the pump and check, by shaking lightly, if the attachment is secure.
3. Turn the pump on. A yellow LED should light up inside the patient's button case.
4. Install a syringe and program a PCA infusion with the following parameters:
 - Dose period 1 Hr
 - Vol. Limit 5 ml
 - Pat. Bolus:
 - Dose 0.5 ml
 - Time 0:05 min:sec
 - Flow Rate 400 ml/h
 - Lockout Time 1 min
 - Basal Rate 1 ml/h
5. Close the PCA cover and lock and start the infusion.
6. Press the patient's button. The pump should begin patient's bolus supply and a blue LED should light up inside the patient's button case.
7. Wait until the end of the bolus supply. Yellow LED should light up inside the patient's button case again.

Negative result

1. Patient's button does not attach to the pump's case – replace the button with a diagnostic button SP-23 and check if the issue persists. If so, replace the patient's button's attachment magnet; otherwise, replace the patient's button.
2. After connecting, the patient's button is not detected or the yellow LED does not light up. Replace the button with a diagnostic button SP-23 and repeat the test. If the issue persists, proceed according to procedure for error 109 (304) (Table 11 (p. 93)).
3. The blue LED does not light up after beginning patient's bolus supply. Replace the button with a diagnostic button SP-23 and repeat the test. If the issue persists, proceed according to procedure for error 109 (304) (Table 11 (p. 93)).

10.5.11 PCA cover and lock test (S300PCA only)

This test allows checking PCA cover and lock operation.

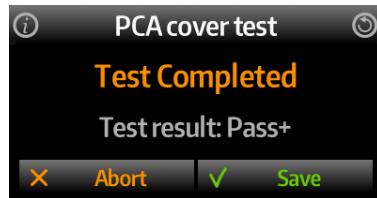
Note!!!

Test performed only for the S300PCA pumps.

Test procedure

1. Turn the pump off and disconnect the **Patient's bolus button**.
2. Check if the **PCA cover** is not damaged and if the **PCA lock** is fixed to the pump's case without excessive clearance.

3. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.2 (p. 19)), select the „**2. Tests**” and then „**29. PCA case & lock**” options and proceed according to the displayed instructions. After the test, the following will be displayed:



4. If the result is Pass or Pass+, save it by pressing "Save". Record the result in the **F1** form.

Positive result

Test result: **Pass, Pass+.**

Negative result

Error number	Cause and course of action
Err 2.29/1	Lock opto detector line short-circuit A. Course of action like for error 151 (306) (Table 11 (p. 95)).
Err 2.29/2	Cover opto detector line short-circuit A. Course of action like for error 151 (306) (Table 11 (p. 95)).
Err 2.29/3	Lock diaphragm inoperative A. Course of action like for error 151 (306) (Table 11 (p. 95)).
Err 2.29/4	PCA cover diaphragm inoperative A. Course of action A1. Check if the cover hook is not broken. Replace the cover if necessary, (13.20). A2. If the issue persists, course of action like for error 151 (306) (Table 11 (p. 95)).
Err 2.29/5	Lock opto detector sensitivity out of limit A. Course of action like for error 151 (306) (Table 11 (p. 95)).
Err 2.29/6	Cover opto detector sensitivity out of limit A. Course of action like for error 151 (306) (Table 11 (p. 95)).

10.6 FUNCTIONAL TESTS

10.6.1 Syringe installation test

The purpose of this test is checking syringe installation.

Note!!!

The test requires a single-use syringe, preferably with a capacity of 50 ml. The syringe may be used for the test a maximum of 50 times. Medima recommends using BD Plastipak 50 ml syringes.

Test procedure

1. Turn the pump off.
2. Install an empty syringe in the pump. The pump should begin approach and grip the syringe. Check if the foot of the plunger was gripped firmly and without any clearance.
3. Pull the **Syringe clamp** and allow the pump's **Arm** to retreat.
4. Release the **Syringe clamp**. The pump should begin approach and grip the syringe again. Check if the foot of the plunger was gripped firmly and without any clearance.
5. Repeat the **Arm's** approach/retreat at least two more times to make sure the mechanism operates correctly.

Positive result

The syringe was gripped firmly and without any clearance.

Negative result

1. An error was reported during the test – see Table 10 (p. 71), Table 11 (p. 81).

- Correct syringe installation is not possible – check if an appropriate syringe was chosen for the test; if the issue persists, see p 35, Table 10 (p. 79).

10.6.2 Infusion test

The infusion test allows assessment of uniformity of the arm movement.

Note!!!

Uniformity of the infusion may be determined only with special, very precise instruments, operating in accordance to the PN-EN 60601-2-24 norm. In case of suspicion of pump's mechanical damage due to a fall or impact, such tests will be necessary to assess the severity of mechanism damage.

Test procedure

- Install a full syringe (plunger pulled to 50ml). The pump should grip the syringe. Check if the foot of the plunger was gripped firmly and without any clearance.
- Program a continuous infusion with a flow rate of 800 ml/h and confirm the remaining parameters.
- Perform the programmed infusion until the end of the syringe, observing the movement of the pump's **Arm** (not the plunger). Observed **Arm** movement should be fluid, without noticeable leaps.

Note!!!

Lack of uniformity of the arm movement may be caused by using a low quality syringe or one that was used too many times. Medima recommends only syringes from reputable manufacturers (e.g. BD Plastipak / Perfusion).

Positive result

Arm movement was fluid, without noticeable leaps.

Negative result

- An error was reported during the test – see Table 10 (p. 71), Table 11 (p. 81).
- A false occlusion alarm was raised – replace the syringe with a new one, check the set occlusion threshold and possibly raise it, perform **Force sensor** calibration if necessary (see chapter 11.7 (p. 63)).

10.6.3 Occlusion alarm test

The occlusion alarm test allows checking the accuracy of occlusion signalling.

Test procedure

- Install a full syringe (plunger pulled to 50ml). The pump should grip the syringe. Check if the foot of the plunger was gripped firmly and without any clearance.
- Program a continuous infusion with a flow rate of 800 ml/h and confirm the remaining parameters.
- Set occlusion threshold 6.
- Start the infusion. Wait for 2 minutes. During the test the pressure level indicator should not exceed threshold 2 and a false occlusion alarm should not be raised.
- Gradually press the plunger to the **Pump stem end**, observing the pressure indicator located in the bottom-right corner of the **Display**. When the pressure level shown by the indicator reaches the occlusion threshold marker, an occlusion alarm should be raised.

Note!!!

In case of setting the occlusion threshold to the maximum value, significant force may be necessary to cause the occlusion alarm!

Positive result

An occlusion alarm was raised when the pressure level shown by the indicator reached the occlusion threshold marker.

Negative result

- False occlusion alarms are raised or pressure indicator is inconsistent with current situation (indicator shows high pressure with no movement or with plunger not pressed to the pump stem end) – replace the syringe with a new

- one and repeat the test. If the issue persists, perform **Force sensor** calibration (chapter 11.7 (p. 63)) and repeat the test.
2. Pressure indicator does not increase despite pressing the foot of the plunger to the **Pump stem end** with significant force – replace **Pump stem end** (see chapter 13.7 (p. 103)).

10.7 BATTERY TESTS

Note!!!

It is recommended to replace the battery at most two years after the installation date (see chapter 10.7.1 (p. 50)).

10.7.1 General recommendations

The battery tests should be performed in the following cases:

1. When the pump indicates the necessity with a "Battery test recommended" message (see chapter 10.7.3 (p. 51)).
2. Inspection or repair requires performing the test (see Table 3).
3. Whenever there is suspicion of battery defects or its condition is unknown (e.g. after performing **CPU Px00 board with display replacement**, chapter 13.6 (p. 100) or **Power supply board replacement**, chapter 13.13 (p. 111)) or according to recommendations after part replacement (see chapter 14 (p. 133)).
4. According to the following recommendations concerning the use of the pumps:

a) Stationary operation in a hospital

- the pumps are permanently connected to the mains power supply,
- the standard time of operation of the pumps in places without access to the mains power supply is no longer than 1 hour.

A battery test is recommended once every 6 months or according to the messages displayed by the pump. The battery must be replaced when the test results indicate:

- capacity below 1300 mAh or
- resistance above 2.5 Ohm.

b) Stationary operation in ambulances

- the pumps are permanently connected to low-voltage DC power supply,
- the standard time of operation of the pumps in places without access to the mains power supply is no longer than 2 hours,
- the temperature inside the ambulance is within the recommended operating temperature range for the pumps, i.e. 5-40 °C.

A battery test is recommended once every 6 months or according to the messages displayed by the pump. The battery must be replaced when the test results indicate:

- capacity below 1450 mAh or
- resistance above 2.2 Ohm.

c) Patient transport outside hospitals

- the pumps are often used without being connected to a power supply,
- operation without access to the power supply may be longer than 2 hours,
- the temperature inside the ambulance is always within the recommended operating temperature range for the pumps, i.e. 5-40 °C.

A battery test is recommended once every 4 months. The battery must be replaced when the test results indicate:

- capacity below 1500 mAh or
- resistance above 2.2 Ohm

d) The method of use and storage of the pumps can not be determined

A battery test is recommended once every 3 months. The battery must be replaced when the test results indicate:

- capacity below 1500 mAh or

- resistance above 2.0 Ohm

10.7.2 Battery state information

- In the service menu (see chapter 4.5 (p. 18)) select the **3. Battery** and then **1. General Information** options. Battery information will be displayed.

1. General Information	
Install date:	29.05.2018
Capacity [mAh]:	1800/1800
Resistance [Ohm]:	0.8
0.3C charging time:	0 Hr
0.1C charging time:	17 Hr
Voltage [V]:	11.5
Temperature [C]:	32.0

Install date	dd.mm.yyyy	(battery installation date)
Capacity [mAh]	xxxx/yyyy	(nominal / actual as measured)
Resistance [Ohm]	x.xx	(measured battery resistance)
0.3C charging time	xx Hr	(total time of high current charging)
0.1C charging time	xx Hr	(total time of low current charging)
Voltage [V]	xx.x	(current battery voltage)
Temperature [C]	xx.x	(current battery temperature)

- In the service menu (see chapter 4.5 (p. 18)) select the **3. Battery** and then **2. Capacity** options. A history of the last eight battery tests will be displayed.

2. Capacity		
Date	Capac.[mAh]	Reist.[Ohm]
2018.03.04	1924 (1800)	0.86 (0.89)
2018.03.04	1915 (1800)	0.89 (1.06)
2018.03.04	1909 (1800)	1.06 (0.86)
2018.03.03	1923 (1800)	0.86 (0.81)
2018.03.03	1918 (1800)	0.81 (0.78)

yyy.mm.dd xxxx(yyyy) z.zz(q.qq)

where:

yyyy.mm.dd date of the test

xxxx capacity measured in the test

yyyy nominal capacity

z.zz resistance measured after the battery test

q.qq resistance measured before the battery test

- In the service menu (see chapter 4.5 (p. 18)) select the **3. Battery** and then **3. Resistance** options. A history of the last eight resistance tests will be displayed.

3. Resistance	
Date	Resistance [Ohm]
2018.06.22	0.70
2018.06.17	0.62
2018.06.12	0.63
2018.06.08	0.50

yyy.mm.dd r.rr

where:

yyyy.mm.dd date of the test

r.rr measured resistance

10.7.3 Battery capacity test

The capacity test measures the battery capacity and internal resistance.

It consists of 3 stages: Charge -> Discharge -> Charge.

Note!!!

The test involves a controlled discharge of the battery and may take up to 15 hours.

Note!!!

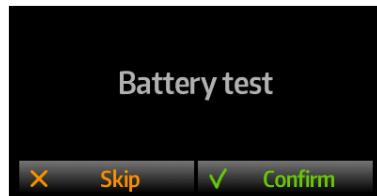
The battery test can be interrupted at any time; however, keep in mind that the battery may be completely discharged.

Note!!!

The test may also be performed when the "Battery test recommended" message is displayed.

Test procedure

1. In the service menu (see chapter 4.5 (p. 18)) select the **3. Battery** and then **4. Capacity Tests** options. When the following is displayed:



Confirm the test.

2. During the test, the battery will be charged (if necessary) and then completely discharged. While the test is in progress, if the pump is in the OFF state, it displays information about the test and estimated time until completion and an icon allowing stopping the test.
3. At the end of the test the battery will be charged.
4. After charging, resistance will be measured.
5. Read the test results (see chapter 10.7.2 (p. 51)), and evaluate the results according to the recommendations in chapter 10.7.1 (p. 50) (4).

Note!!!

While the test is in progress, normal operation of the pump is allowed.

Note!!!

Connecting the pump to the 12V DC power supply during the test will interrupt the test.

Note!!!

Depending on the current stage of the test, disconnecting the AC power supply during the test will result in:

- stage 1 (charge) – test will be interrupted;
- stage 2 (discharge) – after a period no longer than 2 minutes, a message will be displayed asking about continuation of the test;
- stage 3 (charge) – charging will stop until the AC power supply is reconnected.

Positive result

Test result meets the recommendations in chapter 10.7.1 (p. 50) (4).

No messages concerning the battery were displayed.

Negative result

1. In the OFF state messages: „Recommended repair Damage 52”, „Battery replacement recommended” „Capacity test recommended Press  to Start Test” are displayed – proceed to Table 10/11 (p. 73).
2. Test result does not meet one of the recommendations – see chapter 10.7.1 (p. 50) (4.)

10.7.4 Battery resistance test

This test allows measuring the internal resistance of the battery.

1. Battery resistance test is performed automatically every 5 days and after the battery capacity test.
2. Read the result – see chapter 10.7.2 (p. 51), and evaluate the result according to the recommendations in chapter 10.7.1 (p. 50) (4).

Positive result

Test result meets the recommendations in chapter 10.7.1 (p. 50) (4).

No messages concerning the battery were displayed.

Negative result

1. Test result does not meet one of the recommendations – see chapter 10.7.1 (p. 50) (4).
2. In the OFF state messages: „Recommended repair Damage 52”, „Battery replacement recommended” „Capacity test recommended Press  to Start Test” are displayed – proceed to Table 10/11 (p. 73).

10.7.5 Battery replacement

The battery must be replaced with a new one, when:

- the time since its installation in the pump exceeds 2 years. The installation date can be read from the pump (see chapter 10.7.2 (p. 51)).
- the results of the test, in relation to the pump's operating conditions (see chapter 10.7.1 (p. 50)) indicate the necessity of replacement.
- the pump has indicated the necessity of replacement with the **Battery replacement recommended** message (see Table 10/11 (p. 73)).

Note!!!

Removing the battery resets the pump's clock. Set the correct date and time; otherwise wrong battery installation date will be saved in the pump.

Note!!!

Before choosing the "3. Battery > 6. New Battery" options in the menu, make sure the current date and time are correctly set. Current date and time are used to set the battery installation date.

Battery replacement procedure is described in chapter 13.3 (p. 98).

10.8 ELECTRICAL SAFETY TEST

The tests must be performed in accordance with the EN 60601-1 standard. Value ranges are given in the table below. Record the results in the Electrical safety test section of the F1 form (chapter 18 (p. 145)).

Type of test	Requirement
Measurements in accordance with the requirements for:	Class II type CF
Measurement of insulation resistance	>4.0 kV AC
Measurement of leakage current (normal conditions)	60 – 100 µA AC
Measurement of leakage current (single fault condition)	70 – 250 µA AC

10.8.1 Measurement of insulation resistance

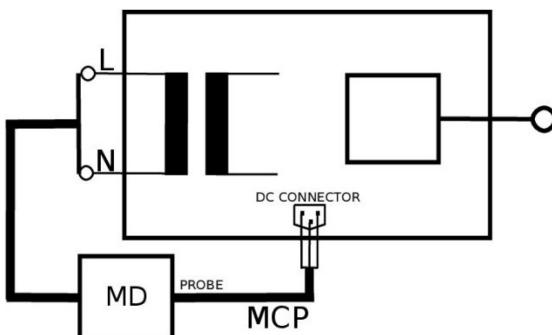


Fig. 20 Circuit for measuring insulation resistance

- MD a device for measuring insulation resistance
 MCP Medima adapter cable (TA-54)

Assemble the measurement setup as shown in the figure above. Measure the insulation resistance together with the AC power supply cable. Do not touch the tested device or the cable during the test.

Insulation resistance test is performed by applying test voltage of 4.0 kV AC for 1 minute, then waiting for the result. A detailed description can be found in the EN 60601-1 standard, chapter 8.8.3.

Positive result

No breakdown occurred during the test.

Negative result:

Breakdown during the test – follow the procedure described in Table 10/28 (p. 77)).

10.8.2 Measurement of leakage current in normal conditions

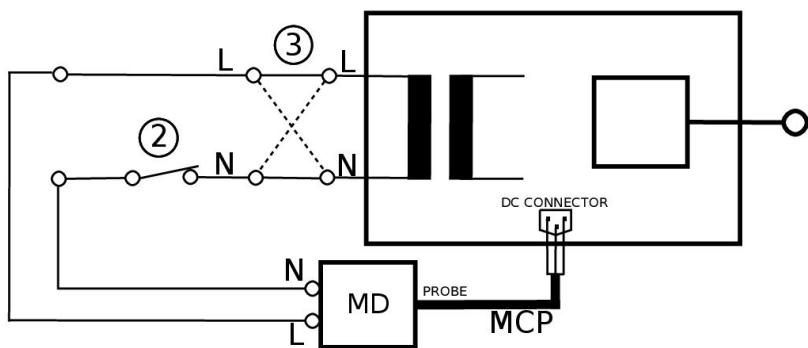


Fig. 21 Circuit for measuring leakage current

- MD a device for measuring leakage current; an example of the device is shown in Figure 12 in the EN 60601-1 standard.
 (2) switch to simulate a single fault - closed.
 (3) switch to exchange the L and N wires.

Assemble the measurement setup as shown in the figure above. Do not touch the tested device during the test. Measure the leakage current in both states of switch 3. Record the larger of the two values in the form. A detailed description of the test can be found in the EN 60601-1, pt 8.7.

Positive result

Leakage current is within the 60 – 100 μA AC range.

Negative result:

Leakage current out of range - (see p. 29, Table 10 (p. 78)).

10.8.3 Measurement of leakage current in the single fault condition.

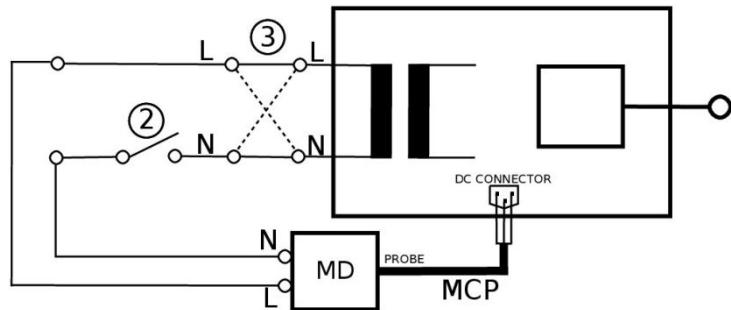


Fig. 22 Circuit for measuring leakage current in the single fault condition

- MD a device for measuring leakage current; an example of the device is shown in Figure 12 in the EN 60601-1 standard.
(2) switch to simulate a single fault - open.
(3) switch to exchange the L and N wires.
MCP Medima adapter cable (TA-54).

Assemble the measurement setup as shown in the figure above. Do not touch the tested device during the test. Measure the leakage current in both states of switch 3. Record the larger of the two values in the form. A detailed description of the test can be found in the EN 60601-1, pt 8.7.

Positive result

Leakage current is within the 70 – 250 µA AC range.

Negative result:

Leakage current out of range - follow the procedure described in Table 10/30 (p. 78).

Note!!!

When evaluating the leakage current of the tested pump, consider the leakage current of the measurement setup (the measured value should be reduced by the value of the measurement setup leakage current).

11 Pump calibration

Calibrations are executed from the service menu. Accessing the service menu is described in chapter 4.5 (p. 18). Calibrations are located in submenu 1. **Calibrations**

The order of the tests and calibrations should be the following:

1. Touch panel calibration (chapter 11.1 (p. 55)),
2. Battery calibration (chapter 11.2 (p. 56)),
3. Charger calibration (chapter 11.3 (p. 58)),
4. DC voltage calibration (chapter 11.4 (p. 60)),
5. Clamp calibration (chapter 11.5 (p. 61)),
6. Arm calibration (chapter 11.6 (p. 62)),
7. Force sensor calibration (chapter 11.7 (p. 63)),
8. Torque calibration (chapter 11.8 (p. 64)).

The results of the calibrations and tests must be entered into appropriate fields of the F1-IS-Sx00-01-EN-01 form (see chapter 18 (p. 145)).

11.1 TOUCH PANEL CALIBRATION

The purpose of this calibration is improving the precision of the touch panel use. Touch panel calibration is necessary:

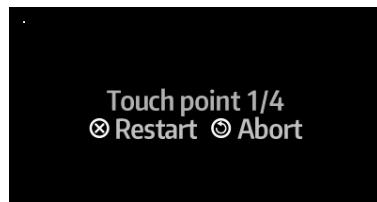
- if the positions of interactive elements of the graphical interface differ significantly from the points of their activation by touch,
- after replacing the front case.

Note!!!

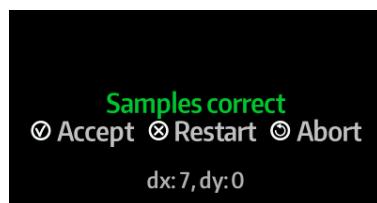
Depending on pump configuration the touch panel may be inactive when the pump is connected to DC power.
Perform the calibration while the pump is connected to AC power.

Calibration procedure

1. Prepare the TA-52 stylus.
2. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.1 (p. 19)) select the „1. Calibrations” and then „1. Touch panel” options. The following will be displayed:



3. Using the stylus, touch the dot displayed in the top-left corner of the screen. Repeat for the dots subsequently displayed in the other corners. After successfully completing the procedure the following will be displayed:



4. The "Samples correct" message indicates the test was successful. Press to save the results in the pump. Record the results in the F1 form.

Positive result:

"Samples correct" message displayed at the end of the procedure.

Negative result

1. Following message displayed at the end of the procedure:



Repeat the calibration (press the button).

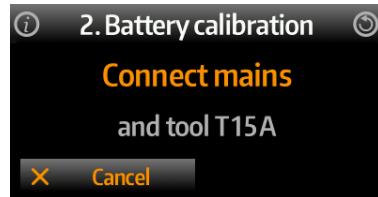
2. Two subsequent calibration attempts failed. Course of action like for error code 046 (238) (Table 11 (p. 85)), starting with p. A.3.

11.2 BATTERY CALIBRATION

The purpose of this procedure is calibration of the battery voltage measurement system. It is necessary for correct assessment of the condition of the battery.

Calibration procedure

1. Prepare device **TA-47** (T15A).
2. Remove battery compartment cover and disconnect battery.
3. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.1 (p. 19)) select the „**1. Calibrations**” and then „**2. Battery**” options. The following will be displayed:



4. Connect the mains power supply and connect device **TA-47** in place of the battery, as shown in Fig. 23.

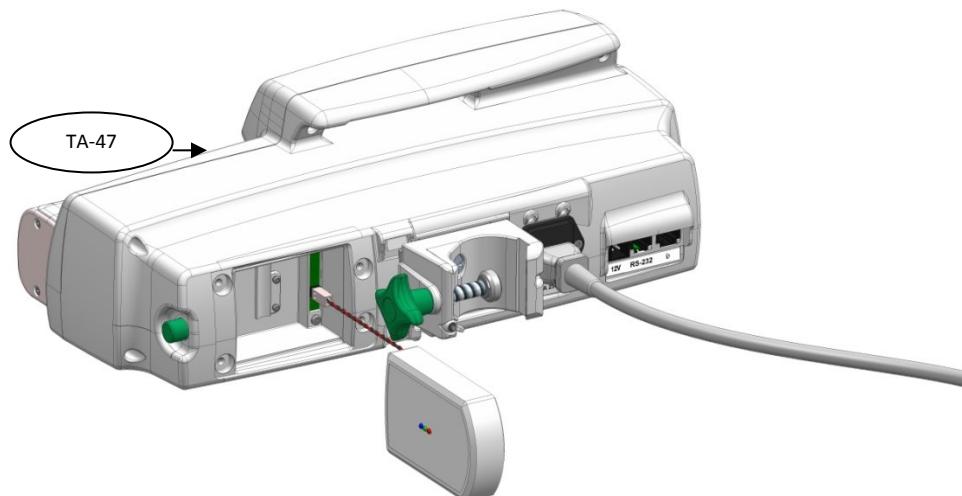
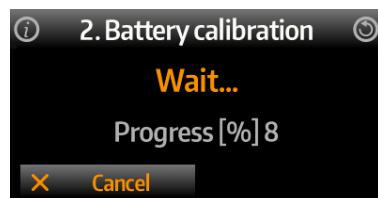
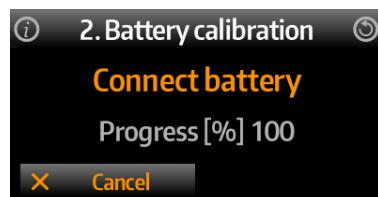


Fig. 23 Connecting device TA-47

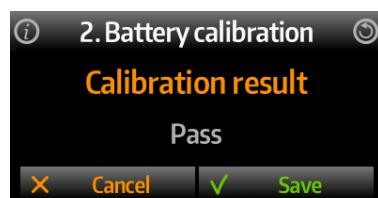
5. Calibration process starts after connecting device **TA-47**.



6. After the calibration, the following will be displayed:



7. After correctly connecting the battery, the following will be displayed:



8. Press "Save" or to save the result in the pump. Record the result in the **F1** form.

Positive result

Calibration result: **Pass, Pass+**.

Negative result

Calibration resulted in an error **Err 1.2/n** – perform actions appropriate for the corresponding error number.

Error number	Cause and course of action
Err 1.2/1	Software error. A. Course of action: <ul style="list-style-type: none"> A.1. Upgrade the pump's software if it is not up to date (see chapter 9 (p. 25)) and repeat the test. A.2. Leave the service mode holding  button for about 3s. A.3. Enter the service mode again (see chapter 4.5 (p. 18)) and repeat the test. A.4. If the issue persists, contact Medima Service Department (see chapter 1 (p. 7)).
Err 1.2/2	No correct data received from the battery controller. A. Course of action: <ul style="list-style-type: none"> A.1. Leave the service mode holding  button for about 3s. A.2. Wait about 1 minute. Enter the service mode again (see chapter 4.5 (p. 18)) and repeat the test. A.3. If error 049 (291) occurs, perform repairs like for error code 049 (291) (Table 11 (p. 86)).
Err 1.2/3	Time to connect device TA-46 exceeded. A. Course of action: <ul style="list-style-type: none"> A.1. Repeat the calibration. A.2. If the issue persists, access battery general information (chapter 10.7.2 (p. 51)). Connect calibrator TA-46 and wait for 1 minute. Check voltage; it should be within 8.8V +/- 0.5V range. A.3. If voltage differs from 8.8V more than 0.5V, perform repairs like for error code 120 (292) (Table 11 (p. 94)); in other case repeat the battery calibration. A.4. If the issue persists, contact Medima Service Department (see chapter 1 (p. 7)).
Err 1.2/4	Incorrect measurement data. Course of action like for Err 1.2/3
Err 1.2/5	DC power was connected during the calibration. A. Course of action: <ul style="list-style-type: none"> A.1. Repeat the calibration. A.2. If the issue persists and DC power has not been connected perform repairs like for error code 060 (296) (Table 11 (p. 89)).
Err 1.2/6	Software error
Err 1.2/7	Course of action like for Err 1.2/1
Err 1.2/8	
Err 1.2/9	
Err 1.2/10	Calibration interrupted by the user. A. Course of action: <ul style="list-style-type: none"> A.1. Repeat the calibration following the procedure and instructions on screen.
Err 1.2/11	Software error
Err 1.2/12	Course of action like for Err 1.2/1

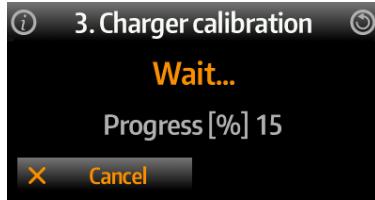
11.3 CHARGER CALIBRATION

1. Connect the pump to the mains power supply;

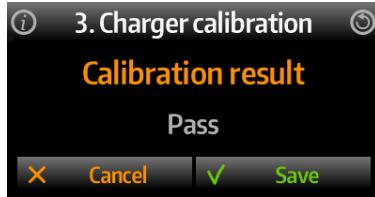
Note!!!

DC power must be disconnected during the calibration.

2. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.1 (p. 19)) select the „**1. Calibrations**” and then „**3. Charger**” options.
3. The pump will start the calibration and display a progress screen. The calibration process will take several minutes.



4. After the calibration a summary screen will be displayed:



5. If the result is Pass or Pass+, press "Save" or to save the result in the pump. Record the result in the F1 form.

Positive result

Calibration result: **Pass, Pass+.**

Negative result

Calibration resulted in an error **Err 1.3/n** – perform actions appropriate for the corresponding error number.

Error number	Cause and course of action
Err 1.3/1	Software error. <p>A. Course of action:</p> <ul style="list-style-type: none"> A.1. Upgrade the pump's software if it is not up to date (see chapter 9 (p. 25)) and repeat the test. A.2. Leave the service mode holding button for about 3s. A.3. Enter the service mode again (see chapter 4.5 (p. 18)) and repeat the test. A.4. If the issue persists, contact Medima Service Department (see chapter 1 (p. 7)).
Err 1.3/2	No correct data received from the battery controller. <p>A. Course of action :</p> <ul style="list-style-type: none"> A.1. Leave the service mode holding button for about 3s. A.2. Wait about 1 minute. Enter the service mode again (see chapter 4.5 (p. 18)) and repeat the test. A.3. If error 049 (291) occurs, perform repairs like for error code 049 (291) (Table 11 (p. 86)).
Err 1.3/3	Time to connect AC power exceeded (with DC power disconnected). <p>A. Course of action:</p> <ul style="list-style-type: none"> A.1. Disconnect DC power and repeat the calibration with AC power connected. A.2. If the issue persists, perform repairs like for error code 060 (296) (Table 11 (p. 89)).
Err 1.3/4	DC power connected or AC power disconnected during the measurement. <p>A. Course of action:</p> <ul style="list-style-type: none"> A.1. Repeat the calibration with AC power connected. A.2. If the issue persists and DC power was not connected, perform repairs like for error code 060 (296) (Table 11 (p. 89)).
Err 1.3/5	50 mA current measurement error.
Err 1.3/8	Course of action like for Err 1.3/3
Err 1.3/11	
Err 1.3/14	
Err 1.3/17	
Err 1.3/20	
Err 1.3/23	

Error number	Cause and course of action
Err 1.3/6	200 mA current measurement error. Course of action like for Err 1.3/3
Err 1.3/9	
Err 1.3/12	
Err 1.3/15	
Err 1.3/18	
Err 1.3/21	
Err 1.3/24	
Err 1.3/7	600 mA current measurement error. Course of action like for Err 1.3/3
Err 1.3/10	
Err 1.3/13	
Err 1.3/16	
Err 1.3/19	
Err 1.3/22	
Err 1.3/25	
Err 1.3/26	Software error Course of action like for Err 1.3/1
Err 1.3/27	
Err 1.3/28	
Err 1.3/29	Calibration interrupted by the user.
Err 1.3/30	A. Course of action: A.1. Repeat the calibration following the procedure and instructions on screen.
Err 1.3/31	Software error Course of action like for Err 1.3/1
Err 1.3/32	

11.4 DC VOLTAGE CALIBRATION

- Required equipment: power supply **TA-55** (T86A) and DC power cable **TA-7**;
- In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.1 (p. 19)) select the „**1. Calibration**” and then „**4. DC Voltage**” options.
- Connect power supply **TA-55** through DC power cable **TA-7** to the pump’s **12V** socket and disconnect mains power.
- The pump will perform the measurements and signal completion of the procedure.
- If the test result is Pass or Pass+, press "Save" or to save the result in the pump. Record the result in the **F1** form.

Positive result

Calibration result: **Pass or Pass+**

Negative result

Calibration resulted in an error **Err 1.4/n** – perform actions appropriate for the corresponding error number.

Error number	Cause and course of action
Err 1.4/1	Software error. A. Course of action: A.1. Upgrade the pump’s software if it is not up to date (see chapter 9 (p. 25)) and repeat the test. A.2. Leave the service mode holding button for about 3s. A.3. Enter the service mode again (see chapter 4.5 (p. 18)) and repeat the test. A.4. If the issue persists, contact Medima Service Department (see chapter 1 (p. 7)).
Err 1.4/2	No correct data received from the battery controller. A. Course of action : A.1. Leave the service mode holding button for about 3s. A.2. Wait about 1 minute. Enter the service mode again (see chapter 4.5 (p. 18)) and repeat the test. A.3. If error 049 (291) occurs, perform repairs like for error code 049 (291) (Table 11 (p. 86)).
Err 1.4/3	Time to connect device TA-55 exceeded. A. Course of action: A.1. Repeat the calibration. A.2. If the issue persists and DC power was not connected, perform repairs like for error code 060 (296) (Table 11 (p. 89)).

Error number	Cause and course of action
Err 1.4/4	Incorrect measurement data. Course of action like for Err 1.4/3
Err 1.4/5	DC power connected during the calibration. A. Course of action: A.1. Repeat the calibration. A.2. If the issue persists and DC power was not connected, perform repairs like for error code 060 (296) (Table 11 (p. 89)).
Err 1.4/6	Software error
Err 1.4/7	Course of action like for Err 1.4/1
Err 1.4/8	
Err 1.4/9	Calibration interrupted by the user. A. Course of action: A.1. Repeat the calibration following the procedure and instructions on screen.
Err 1.4/10	User did not save the calibration result. A. Course of action: A.1. Repeat the calibration.
Err 1.4/11	Software error
Err 1.4/12	Course of action like for Err 1.4/1

11.5 SYRINGE CLAMP CALIBRATION

The purpose of this procedure is calibration of the syringe clamp to allow measuring the syringe diameter in [mm].

Calibration procedure

- Required equipment - a set of five calibration rollers: **TA-19** (T11-10 mm), **TA-20** (T11-15 mm), **TA-21** (T11-20 mm), **TA-25** (T11-25 mm), **TA-26** (T11-30 mm).



- Before starting the calibration the syringe clamp must be empty and completely lowered. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.1 (p. 19)) select the „**1. Calibrations**” and then „**21. Clamp**” options.
- After starting the calibration the following screen is displayed and the level of the lowered clamp is calibrated:



- Afterwards the pump displays instructions to insert subsequent rollers and, after their detection, measurement information:

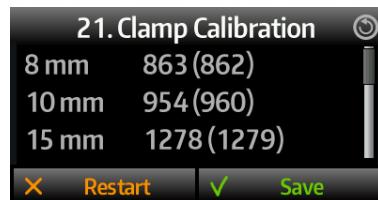




Note!!!

After inserting a roller, push the syringe clamp to eliminate any clearance that may cause a calibration error!

5. After the last roller measurement, a summary screen will be displayed.



6. Press „Save” to save the result and finish. Record a **Positive** result in the **F1** form.

Positive result

At the end of the calibration a summary screen with a list of calibration points was displayed.

Negative result

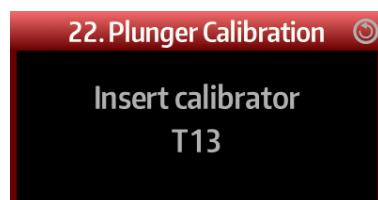
1. Calibration was interrupted with the or button. Repeat the calibration.
2. Despite inserting a roller with diameter matching the displayed instructions, the procedure does not proceed to measurement – course of action like for error 016 (064) (Table 11 (p. 82)).

11.6 ARM POSITION CALIBRATION

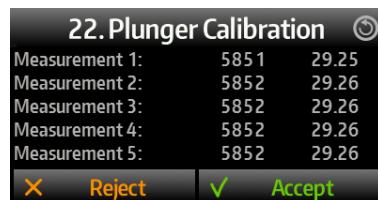
The purpose of this procedure is calibration of the arm position to allow precise determination of syringe plunger position.

Calibration procedure

1. Required equipment: arm calibration roller **TA-16** (T13):
2. Before starting the calibration the syringe clamp must be empty and completely lowered.
3. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.1 (p. 19)) select the „**1. Calibrations**” and then „**22. Arm**” options.



4. Install the **TA-16** (T13) calibration roller in the syringe clamp. After correct installation the calibration will start automatically. When the calibration is finished, the following screen will be displayed:



5. Press „Save” to save the result and finish. Record a **Positive** result in the **F1** form.

Positive result

At the end of the calibration a summary screen with a list of measurements was displayed.

Negative result

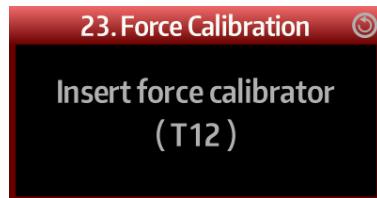
Error number	Cause and course of action
Err 1.22/1	Incorrect installation of the T13 device <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Install and press the T13 device again, eliminating any clearance between the clamp and the T13 and repeat the calibration. A2. If the issue persists, course of action like for error 045 (044) (Table 11 (p. 84)).
Err 1.22/2	Clamp pulled <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Course of action like for error Err 1.22/1
Err 1.22/3	Incorrect position measurement results <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Install and press the T13 device again, eliminating any clearance between the clamp and the T13 and repeat the calibration. A2. If the issue persists, use a different T13 device. A3. If the issue persists, course of action like for error 045 (044) (Table 11 (p. 84)).
Err 1.22/4	Incorrect button press distance measurement results <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Course of action like for error 023 (207) (Table 11 (p. 82)).
Err 1.22/5	Drive can not perform required operations <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Course of action like for error 045 (044) (Table 11 (p. 84)).
Err 1.22/6	User interrupted the process before finishing <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Repeat the calibration.

11.7 FORCE SENSOR CALIBRATION

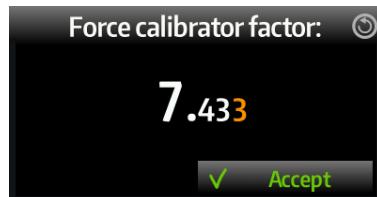
The purpose of this procedure is calibration of the force sensor to allow precise measurement of pressure in the syringe.

Calibration procedure

1. Required equipment: force calibrator **TA-2** (T12).
2. Before starting the calibration the syringe clamp must be empty and completely lowered. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.1 (p. 19)) select the „**1. Calibrations**” and then „**23. Force Sensor**” options. After starting the calibration the following screen will be displayed:



3. Install the calibrator in the syringe clamp. Factor entering screen will be displayed. Read the factor value from a sticker on the calibrator, enter it and press „Accept”.



4. The calibration will start automatically. After the calibration a summary screen will be displayed:

23. Force Calibration		
Force[kG]	Sensor[ADC]	Diff.[%]
0.05	26	8.3
0.25	83	5.1
0.50	167	1.8

X ✓ Save

5. Press „Save” to save the result and finish. Record a **Positive** result in the **F1** form.

Positive result

At the end of the calibration a summary screen was displayed.

Negative result

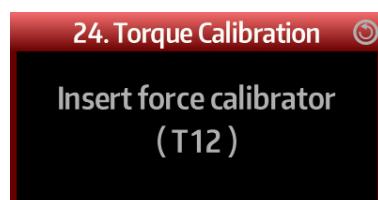
Error number	Cause and course of action
Err 1.23/1	Incorrect position of the T12 calibrator <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Install and press the T12 device again, eliminating any clearance between the clamp and the T12 and repeat the calibration. A2. If the issue persists, course of action like for error 016 (064) (Table 11 (p. 82)).
Err 1.23/2	Clamp pulled <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Course of action like for error Err 1.23/1
Err 1.23/3	Incorrect measurement results <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. If the issue persists, course of action like for error 045 (044) (Table 11 (p. 84)). A2. If the issue persists, course of action like for error 023 (207) (Table 11 (p. 82)).
Err 1.23/4	Drive can not perform required operations <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Course of action like for error Err 1.23/3
Err 1.23/5	User interrupted the process before finishing <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> Repeat the calibration.

11.8 SM1 MOTOR TORQUE CALIBRATION

The purpose of this procedure is calibration of the torque to allow determination of motor control parameters depending on motion resistance.

Calibration procedure

- Required equipment: force calibrator **TA-2** (T12).
- Before starting the calibration the syringe clamp must be empty and completely lowered. In the service menu (see chapter 4.5 (p. 18) and chapter 4.5.1 (p. 19)) select the „**1. Calibrations**” and then „**24. Torque**” options. After starting the calibration the following screen will be displayed:



- After correct installation of the **TA-2** (T12) calibrator the calibration will start automatically. After the calibration a summary screen will be displayed:

24. Torque Calibration			
Threshold	Sensor[ADC]	Diff.[%]	
1	440 (1.42 kG)	-13.6	
2	876 (2.88 kG)	-14.2	
3	1238 (4.13 kG)	-21.2	

X Reject **✓** Save

4. Press „Save” to save the result and finish. Record a **Positive** result in the **F1** form.

Positive result

At the end of the calibration a summary screen was displayed.

Negative result

Error number	Cause and course of action
Err 1.24/1	Incorrect position of the T12 calibrator <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Install and press the T12 device again, eliminating any clearance between the clamp and the T12 and repeat the calibration. A2. If the issue persists, course of action like for error 016 (064) (Table 11 (p. 82)).
Err 1.24/2	Clamp pulled <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Course of action like for error Err 1.24/1
Err 1.24/3	Incorrect measurement results <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Install and press the T12 device again, eliminating any clearance between the clamp and the T12 and repeat the calibration. A2. If the issue persists, course of action like for error 045 (044) (Table 11 (p. 84)). A3. If the issue persists, course of action like for error 023 (207) (Table 11 (p. 82)).
Err 1.24/4	Drive can not perform required operations <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> A1. Course of action like for error Err 1.24/3
Err 1.24/5	User interrupted the process before finishing <ul style="list-style-type: none"> A. Course of action <ul style="list-style-type: none"> Repeat the calibration.

12 Troubleshooting and pump repair

12.1 GENERAL PRINCIPLES OF PERFORMING REPAIRS

1. Instruments designated **TA-X** are contained in the service toolset (see chapter 3.3.1 (p. 8)).
2. Instruments designated **TB-X** are recommended equipment at the service department (see chapter 3.3.2 (p. 14)).
3. Before any repairs, if possible, upgrade the pump's software to the most recent version (see chapter 9 (p. 25)).
4. The pump must be connected to the mains power through an isolation transformer or the **TA-55** 15V DC power supply and the **TA-7** DC power cable.
5. Look up the repair procedure in **Table 10** (p. 71) and **Table 11** (p. 81) according to:
 - displayed error number;
 - information displayed on screen;
 - reported issue.
6. During the diagnostics, use the **SP-xx diagnostic parts** (see chapter 3.5 (p. 15)) according to the list of parts for each repair procedure.

Note!!!

During repair, swap only one pump element with a diagnostic part at a time. Perform diagnostics after each swap. If the swap does not solve the issue, swap the original part back in and continue repairs.

7. If the repairs eliminate the issue, but a new one arises, go to the corresponding repair procedure, skipping the actions after part replacement.
8. In order to facilitate access to the pump's mechanisms, use the **TA-12** IDC extension and the **TA-58** FFC extension.
9. If repairs according to the described procedures were unsuccessful:
 - Make sure that diagnostic parts in working condition were used in the diagnostics (see chapter 3.5 (p. 15)).
 - Make sure that the required ESD protection means were used.
 - Make sure that a new infusion set was used for the diagnostics.
 - Repeat the repairs, replacing the diagnostic elements with new ones.
 - Contact the Service Department of Medima Sp. z o.o. (contact data – see chapter 1 (p. 7)).
10. After the repair is completed, perform actions described in chapter 15.2 (p. 136).
11. If the **SP-41B-„Sx00 Pump-back”/SP-42B-„S300PCA Pump-back”** diagnostic pump with a connected battery was used during the repairs, perform battery test according to chapter 10.7.3 (p. 51) after the repairs.
12. During the repairs, check ribbon cable connections:
 - correct ribbon cable connection is shown in Fig. 24.

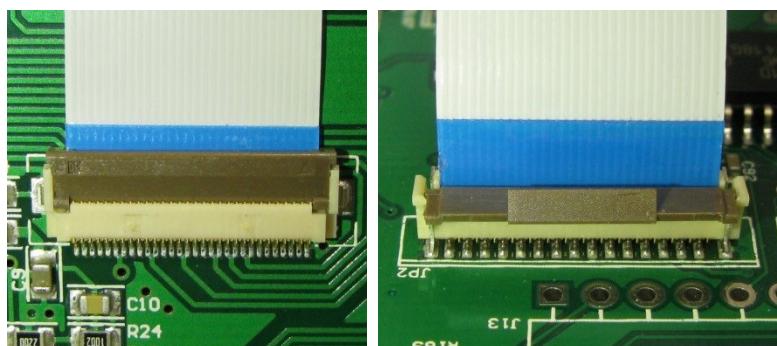


Fig. 24 Correct ribbon cable connection for horizontal and vertical slots

- incorrect ribbon cable connection is shown in Fig. 25.

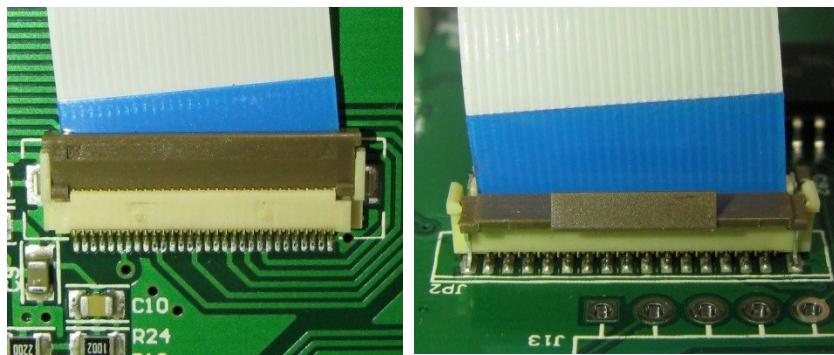


Fig. 25 Incorrect ribbon cable connection for horizontal and vertical slots

- lack of ribbon cable connection is shown in Fig. 26.

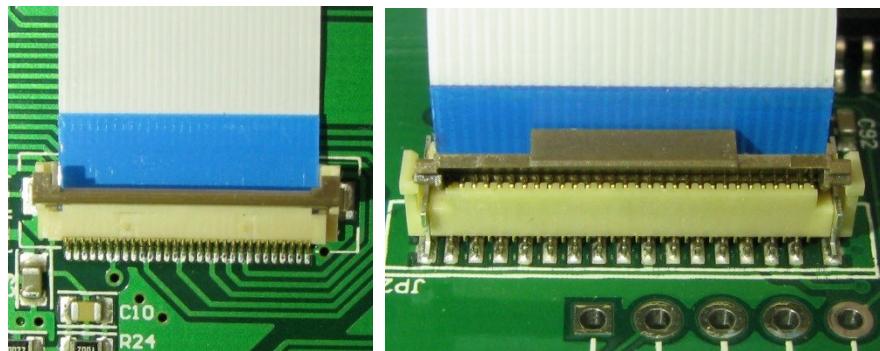


Fig. 26 Lack of ribbon cable connection for horizontal and vertical slots

12.2 INTERNAL CONNECTIONS OF PUMP SUBASSEMBLIES

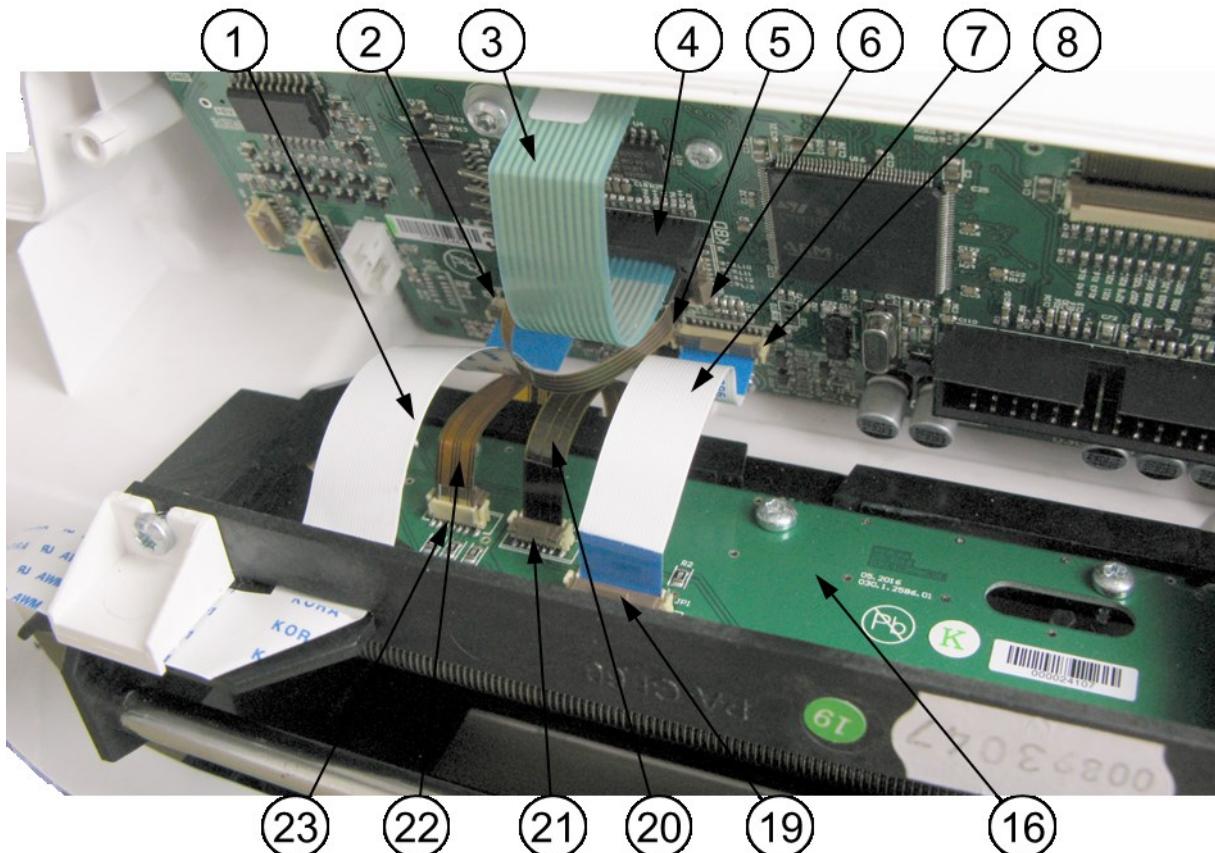


Fig. 27 Syringe pump internal connections – sockets view in Front case

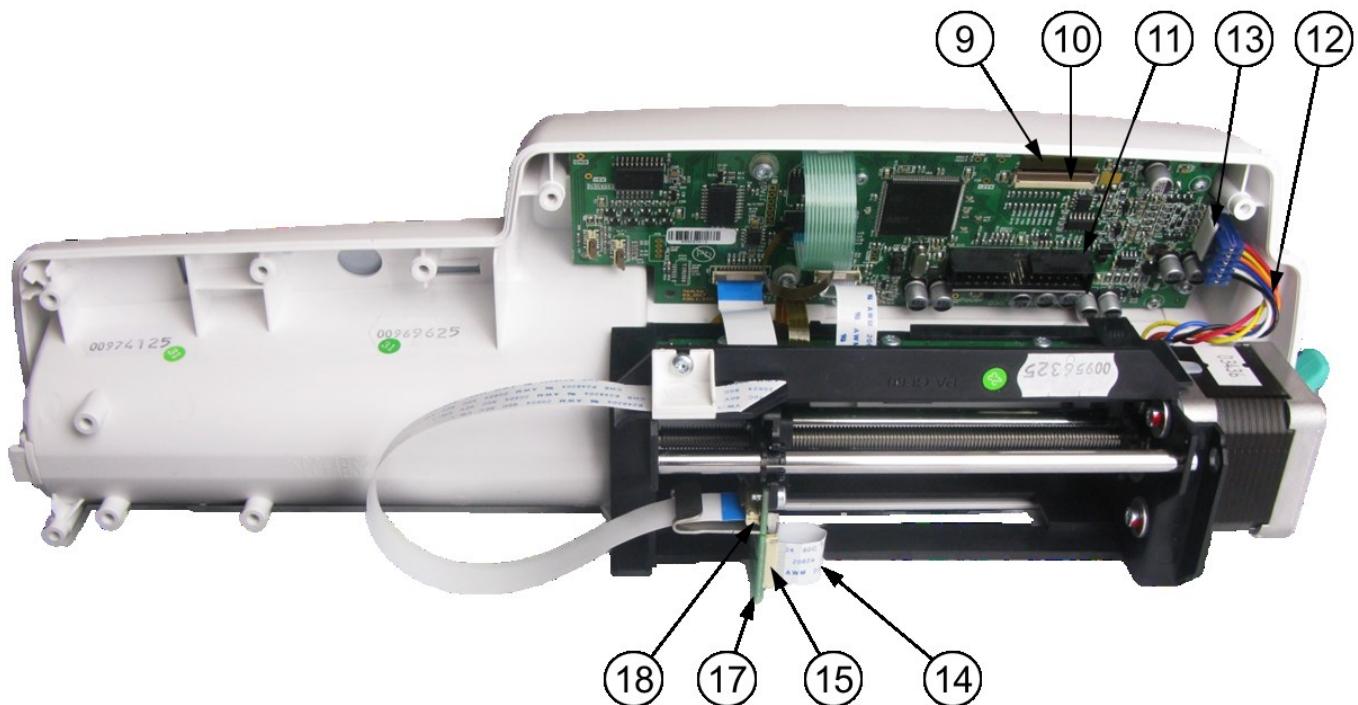


Fig. 28 Syringe pump internal connections – Front case back view

Syringe pump internal connections - front Fig. 28:

1. Guide board / CPU board FFC ribbon (0,5x24x300).
2. CPU board FFC slot A.
3. Keyboard ribbon.
4. Keyboard ribbon FFC slot.
5. Touch panel ribbon.
6. Touch panel ribbon FFC slot.
7. Drive mechanism board / CPU board FFC ribbon (0,5x20x75).
8. CPU board FFC slot B.
9. Display ribbon.
10. Display ribbon FFC slot.
11. Power supply board ribbon IDC26 slot.
12. Mechanism motor cables.
13. Mechanism motor socket.
14. Guide board / stem end FFC ribbon (0,5x24x240).
15. Guide board FFC slot C.
16. Drive mechanism board.
17. Guide board.
18. Guide board FFC slot D.
19. Drive mechanism board FFC slot E.
20. Potentiometer FFC ribbon.
21. Potentiometer ribbon slot.
22. Syringe sensors ribbon.
23. Syringe sensors ribbon slot.

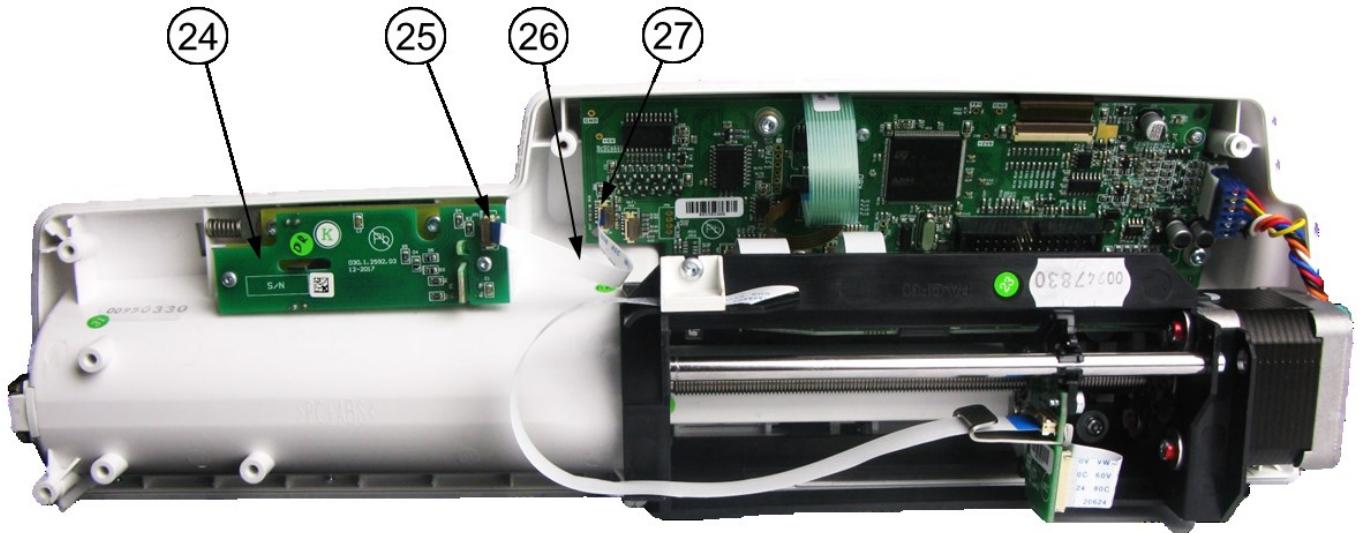


Fig. 29 Syringe pump S300PCA internal connections - front

Syringe pump S300PCA internal connections – front Fig. 29.

- 24. PCA lock mechanism.
- 25. PCA lock FFC ribbon slot.
- 26. PCA lock board / CPU board FFC ribbon (0,5x10x80).
- 27. PCA lock FFC ribbon slot.

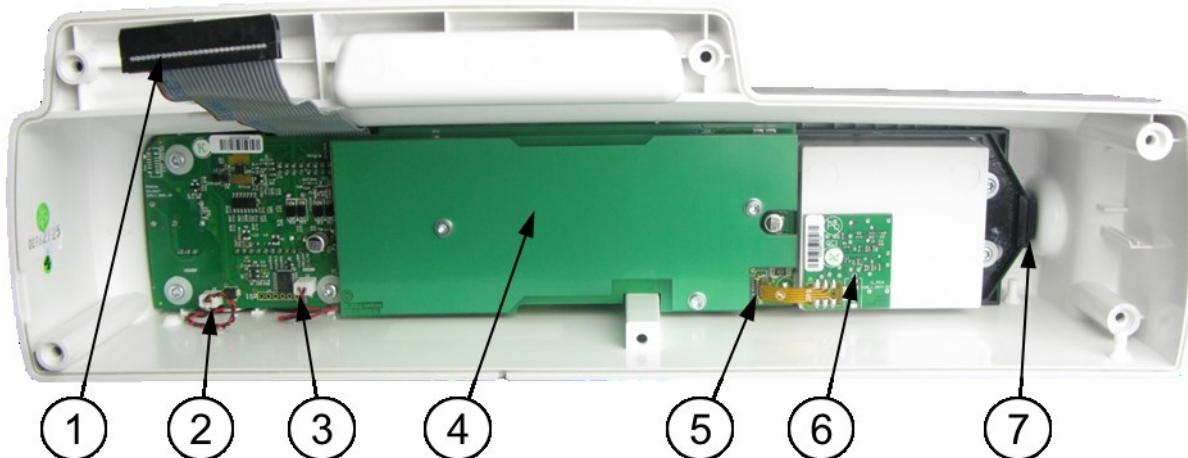


Fig. 30 Syringe pump internal connections - back

Syringe pump S100 / S200 / S300 internal connections - back Fig. 30:

- 1. Power supply board set ribbon.
- 2. Main speaker socket.
- 3. Support speaker (buzzer) socket.
- 4. Power supply board set.
- 5. Battery controller slot.
- 6. Battery controller.
- 7. Docking lock set.



Fig. 31 Syringe pump S300PCA internal connections - back

Syringe pump S300PCA internal connections - back Fig. 31:

8. Patient's bolus button mounting handle.

12.3 REPAIR

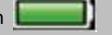
- Connect the pump to the mains power through an isolation transformer or the **TA-55 15V DC** power supply and the **TA-7 DC** power cable.
- Check if the information in the **USER NOTIFICATION AND ALARM SYSTEM** section of the **User manual** is sufficient to solve the issue.
- Look up the repair procedure in Table 10 (p. 71) and Table 11 (p. 73) to error number or information displayed on screen.
- Perform all the recommended actions as specified.

12.3.1 Troubleshooting

Table 10 Troubleshooting

No.	Information on screen – description of the event	Course of action
1	Occlusion – new IV set installed	<p>A. Course of action</p> <p>A.1. Check the instructions in the USER NOTIFICATION AND ALARM SYSTEM section of the User manual.</p> <p>A.2. Check if occlusion threshold is set to a value corresponding to the parameters of performed infusion.</p> <p>A.3. Perform the occlusion alarm test (see chapter 10.6.3 (p. 49)). If the result is negative, proceed according to the instructions in the test description.</p>
2	Incorrect fixing in docking station – pump correctly fixed in docking station j	<p>A. Course of action</p> <p>A.1. Check the instructions in the USER NOTIFICATION AND ALARM SYSTEM section of the User manual.</p> <p>A.2. If the issue persists, perform repairs like for error 058 (296) (Table 11 (p. 89)).</p>

3	<p>No mains – pump connected to the mains power.</p>	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Check if the information in the USER NOTIFICATION AND ALARM SYSTEM section of the User manual is sufficient to solve the issue. A.2. Check if the AC power supply is in working condition (e.g. by connecting it to a working pump). Perform diagnostics, starting with p. B.2. A.3. Check the fuse and replace if blown (chapter 13.2 (p. 97)). If the cause was found, correct it and repeat diagnostics in p. B. A.4. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.5. Check the connection of: <ul style="list-style-type: none"> A.1.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.6. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.7. Perform diagnostics in p. B. A.8. If the issue persists: <ul style="list-style-type: none"> A.8.1. Swap the original part back in. A.8.2. Continue until the cause is found, beginning with p. A6. A.9. If the issue is solved: <ul style="list-style-type: none"> A.9.1. Replace the diagnostic part with a new part; A.9.2. Repeat diagnostics in p. B. A.10. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. Connect the pump to the mains AC power. B.2. Power the pump ON and OFF (with the power button ). B.3. In case of correct detection of AC power, the pump displays the  symbol, which should not blink. B.4. If the issue is solved, finish repairs according to p. A.10. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)). C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)). <p>Note!!! After disassembling Power supply board set assess the AC cord (2/Fig. 79, 8/Fig. 60) and if an issue is detected, replace it (chapter 13.18 (p. 121)).</p>
4	<p>Blinking battery charge state icon  „Battery test to end xx:xx“ message (without a „Press  to Cancel Test“ message)</p>	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Wait until the battery is charged (according to the displayed value). Situation acceptable only after battery replacement (chapter 10.7.5 (p. 53)). After charging the icon stops blinking and the " Battery test to end xx:xx " message disappears.
5	<p>Blinking battery charge state icon  „Recommended repair Damage 49 (291)“ and „Battery fault“ messages</p>	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Repairs like for error 049 (291) (Table 11 (p. 86)).
6	<p>Blinking battery charge state icon  „Recommended repair Damage 53 (292)“ and „Battery fault“ messages</p>	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Repairs like for error 053 (292) (Table 11 (p. 87)).
7	<p>Blinking battery charge state icon  „Recommended repair Damage 54 (292)“ message</p>	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Repairs like for error 054 (292) (Table 11 (p. 87)).
8	<p>Blinking battery charge state icon  „Recommended repair Damage 56 (292)“ message</p>	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Repairs like for error 056 (292) (Table 11 (p. 87)).
9	<p>„Disconnect mains!“ message disappearing after disconnecting power</p>	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Repairs like for error 055 (292) (Table 11 (p. 87)).

10	„Disconnect battery!” message disappearing after disconnecting the battery or connecting power	A. Course of action A.1. Repairs like for error 057 (292) (Table 11 (p. 89)).
11	Blinking battery charge state icon  Messages: „Battery replacement recommended” or „Recommended repair Damage 51 (295)” or „Recommended repair Damage 52 (295)” and „Battery test recommended Press  to Start Test”	A. Course of action A.1. Repairs like for error 051 (295) (Table 11 (p. 86)).
12	„Battery test recommended Press  to Start Test” message	A. Course of action A.1. Perform battery capacity test (chapter 10.7.3 (p. 51)), proceeding accordingly.
13	Blinking AC power state indicator  „Recommended repair Damage 60 (296)” message	A. Course of action A.1. Repairs like for error 060 (296) (Table 11 (p. 89)).
14	„Recommended repair Damage 61 (296)” message	A. Course of action A.1. Repairs like for error 061 (296) (Table 11 (p. 89)).
15	Blinking DC power state indicator ()	A. Course of action A.1. Disconnect AC power, connect the TA-55 power supply through the TA-7 DC power cable and wait for 5 minutes. A.2. If the 12V DC power indicator is blinking, perform repairs like for error 060 (296) (Table 11)
16	Blinking AC power state indicator  „Recommended repair Damage 63” message	A. Course of action A.1. Repairs like for error 063 (296) (Table 11 (p. 90)).
17	Blinking AC power state indicator  „Recommended repair Damage 62” message	A. Course of action A.1. Repairs like for error 062 (296) (Table 11 (p. 90)).
18	Short pump operation time on battery.	A. Course of action A.1. Perform battery capacity test (chapter 10.7.3 (p. 51)), proceeding accordingly. A.2. If the issue persists, contact the Manufacturer’s Service Department (chapter 1 (p. 7))

19	Pump can not be switched on – external power supply connected.	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Connect the mains AC power (disconnect external DC power). The  indicator should be displayed. If it is not, proceed according to Table 10/10 (p. 73) (No mains). A.2. Wait for a maximum of 5 minutes. If the pump shows a message or reports an error, solve the issue following Table 10 (p. 71) or Table 11 (p. 81). A.3. Perform keyboard test. If the result is negative, proceed like for error code: 078 (051) (Table 11 (p. 92)). A.4. If the pump's software was not upgraded, do so (chapter 9 (p. 25)) and perform diagnostics in p. B. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.5. Check the connection of Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.6. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.7. Perform diagnostics in p. B. A.8. If the issue persists: <ul style="list-style-type: none"> A.8.1. Swap the original part back in. A.8.2. Continue until the cause is found, beginning with p. A.7. A.9. If the issue is solved: <ul style="list-style-type: none"> A.9.1. Replace the diagnostic part with a new part. A.9.2. Repeat diagnostics in p. B. A.10. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. Connect the mains AC power and switch the pump on with the  button. If the pump can not be switched on, continue the repairs with the mains AC power connected. B.2. If the issue is solved, finish repairs according to p. A.11. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)). C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)). <p>Note!!! After disassembling Power supply board set assess the AC cord (2/Fig. 79, 8/Fig. 60) and if an issue is detected, replace it (chapter 13.18 (p. 121)).</p>
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20	<p>No communication between the pump and Medima Toolbox 3.0 software.</p> <p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Perform diagnostics in p. B. If the cause is in the software, upgrade it and repeat the diagnostics. A.2. Check if the issue occurs for another pump. If so, first eliminate the cause of the issue in the connection between the pump and the PC or in the PC's software. A.3. Perform diagnostics in p. B. A.4. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.5. Check the connection of Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.6. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.7. Perform diagnostics in p. B. A.8. If the issue persists: <ul style="list-style-type: none"> A.8.1. Swap the original part back in. A.8.2. Continue until the cause is found, beginning with p. A.6. A.9. If the issue is solved: <ul style="list-style-type: none"> A.9.1. Replace the diagnostic part with a new part. A.9.2. Repeat diagnostics in p. B. A.10. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. Follow the procedure in chapter 9.2 (p. 26). B.2. If the issue is solved, finish repairs according to p. A.10. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)). C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)).
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21	No communication with the MedimaNet system – no docking errors reported	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Make sure that the pump's serial number (reading the serial number – see chapter 18.1 (p. 145) is the same as the one on the S/N REF sticker. A.2. Perform diagnostics in p. B. to make sure that another working pump placed in the same docking station slot communicates correctly with MedimaNet. A.3. Make sure that the pump's serial number is the same as the one on the S/N REF sticker. A.4. Perform diagnostics in p. B. A.5. Perform disassembly of the pump chapter 13.4 (p. 99). A.6. Check the connection of Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.7. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.8. Perform diagnostics in p. B. A.9. If the issue persists: <ul style="list-style-type: none"> A.9.1. Swap the original part back in. A.9.2. Continue until the cause is found, beginning with p. A.6. A.10. If the issue is solved: <ul style="list-style-type: none"> A.10.1. Replace the diagnostic part with a new part; A.10.2. Repeat diagnostics in p. B. A.11. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). <p>B. Diagnostics</p> <p>Note: The MedimaNet user manual will be required.</p> <ul style="list-style-type: none"> B.1. Install the switched off pump in a DS300 docking station connected to working MedimaNet. B.2. Switch the pump on. After a while the station should indicate communication with the pump with an orange light. If so, the pump's electronics are not faulty (skip steps A.5 to A.10). B.3. After a maximum of 10s MedimaNet should display correct pump information – issue solved, go to p. A.10. B.4. No MedimaNet reaction to inserting the pump indicates a docking station or slot issue. Go to p. A.5. B.5. Error messages concerning the serial number or service date require correction/update. Afterwards, repeat the diagnostics. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)). C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)).
22	Incorrect keyboard operation	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Repairs like for error 078 (051) (Table 11 (p. 92)). A.2. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).
23	One of the LEDs on the front panel does not light up	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Replace the display board in CPU board with display (chapter 13.6.3 (p. 102), 13.6.4 (p. 102)). A.2. If the issue is solved, go to p. A.4. A.3. Replace CPU board with display (chapter 13.6 (p. 100)). A.4. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).
24	Display damage or backlight fault	

25	No alarm sound or sound is distorted	<p>A. Course of action</p> <p>A.1. Check the connection of:</p> <p>A.1.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B.</p> <p>A.1.2. Buzzer or Speaker cord to the Power supply board set (1, 2/Fig. 74). If the cause was found, correct it and repeat diagnostics in p. B.</p> <p>A.2. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.</p> <p>A.3. Perform diagnostics in p. B.</p> <p>A.4. If the issue persists:</p> <p>A.4.1. Swap the original part back in.</p> <p>A.4.2. Continue until the cause is found, beginning with p. A.2.</p> <p>A.5. If the issue is solved:</p> <p>A.5.1. Replace the diagnostic part with a new part.</p> <p>A.5.2. Repeat diagnostics in p. B.</p> <p>A.6. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Perform signalization and display test (chapter 10.5.1 (p. 39)). If the speaker or buzzer does not work correctly, continue repairs.</p> <p>B.2. If the issue is solved, finish repairs according to p. A.6.</p> <p>C. List of parts</p> <p>C.1. [SP-27] Speaker</p> <p>C.2. [SP-28] Buzzer</p> <p>C.3. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)).</p> <p>C.4. [SP-45] CPU board with display (chapter 13.6 (p. 100)).</p>
26	Alarm call system transmitter does not function	<p>A. Course of action</p> <p>A.1. Check the connection to the alarm call system (User manual: 13.4), using another working pump. If the test shows that the issue is with the pump, proceed like for error code 115 (065) (Table 11 (p. 93)).</p>
27	Incorrect fixing in docking station alarm not shown while release button is held.	See: Incorrect fixing in docking station (Table 10/2 (p. 71)).
28	Pump's breakdown voltage below 4kV AC.	<p>A. Course of action</p> <p>A.1. Replace the pump's power supply cord.</p> <p>A.2. Perform diagnostics in p. B.</p> <p>A.3. Perform disassembly of the pump (chapter 13.4 (p. 99)).</p> <p>A.4. Replace Power supply board set (chapter 13.13 (p. 111)).</p> <p>A.5. Perform diagnostics in p. B.</p> <p>A.6. If the issue persists, replace AC cord (chapter 13.18 (p. 122)).</p> <p>A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Perform Measurement of insulation resistance (chapter 10.8.1 (p. 53)). If the issue persists, continue repairs.</p> <p>B.2. If the issue is solved, finish repairs according to p. A.7.</p> <p>C. List of parts</p> <p>C.1. [SP-44] Power supply board set (chapter 13.13 (p. 111)).</p>

29	Leakage current in normal conditions out of range	A. Course of action A.1. Replace the pump's power supply cord. A.2. Perform diagnostics in p. B. A.3. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.4. Replace Power supply board set (chapter 13.13 (p. 111)) and perform diagnostics in p. B. A.5. If the issue persists, replace AC cord (chapter 13.18 (p. 121)) and perform diagnostics in p. B. A.6. If the issue persists, contact the Medima Service Department (see chapter 1 (p. 7)). A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).
30	Leakage current in the single fault condition out of range	B. Diagnostics B.1. Perform measurement of leakage current in normal conditions chapter 10.8.2 (p. 54). If the issue persists, stop diagnostics and continue repairs. B.2. Perform measurement of leakage current in the single fault condition chapter 10.8.3 (p. 55). If the issue persists, continue repairs. B.3. If the issue is solved, finish repairs according to p. A.7.
31	Patient's bolus button does not light up after connecting (S300PCA pump only).	A. Course of action A.1. Connect the Patient's bolus button to the PCA button socket (13/Fig. 13) of the S300PCA pump and perform diagnostics in p. B. A.2. If the issue persists, replace the Patient's bolus button with a Diagnostic button SP-23 and repeat diagnostics in p. B. A.3. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.4. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.5. Perform diagnostics in p. B. A.6. If the issue persists: A.6.1. Swap the original part back in. A.6.2. Continue until the cause is found, beginning with p. A.4. A.7. If the issue is solved: A.7.1. Replace the diagnostic part with a new part A.7.2. Repeat diagnostics in p. B. A.8. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). B. Diagnostics B.1. Perform the patient's bolus button test (chapter 10.5.10 (p. 47)). B.2. If the issue is solved, finish repairs according to p. A.8. C. List of parts C.1. [SP-41B] Sx00 Pump-back – the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)).
32	Patient's bolus button does not function – no patient's bolus (S300PCA pump only).	A. Course of action 1. Check the PCA option configuration – see the S300PCA pump User manual, subsection pump configuration > PCA options. 2. Check the PCA infusion bolus settings - see the S300PCA pump User manual, subsection PCA infusion. 3. If the issue persists, perform repairs like for p. 31 in this table.

33	Constant „Close PCA cover” message despite closed cover (S300PCA pump only)	<p>A. Course of action</p> <p>A.1. Check if the PCA cover hook (22/Fig. 3) is not broken. If it is, replace the PCA cover according to chapter 13.20 (p. 123).</p> <p>A.1.1. If the cause was found, correct it and repeat diagnostics in p. B.</p> <p>A.2. Perform disassembly of the pump chapter 13.4 (p. 99).</p> <p>A.3. Check:</p> <p>A.3.1. Connection of PCA lock mechanism (24/Fig. 29 to CPU board with display (25, 26, 27/Fig. 29).</p> <p>A.3.2. Completeness and correct operation of PCA cover lock elements chapter 13.20 (p. 123).</p> <p>A.4. If the cause was found, correct it and repeat diagnostics in p. B.</p> <p>A.5. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.</p> <p>A.6. Perform diagnostics in p. B.</p> <p>A.7. If the issue persists:</p> <p>A.7.1. Swap the original part back in.</p> <p>A.7.2. Continue until the cause is found, beginning with p. A.5.</p> <p>A.8. If the issue is solved:</p> <p>A.8.1. Replace the diagnostic part with a new part.</p> <p>A.8.2. Repeat diagnostics in p. B.</p> <p>A.9. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Perform the PCA cover and lock test chapter 10.5.11 (p. 47).</p> <p>B.2. If the issue is solved, finish repairs according to p. A.10.</p> <p>C. List of parts</p> <p>C.1. [SP-45] CPU board with display (chapter 13.6 (p. 100)).</p> <p>C.2. If after disassembly it was decided that any part is missing, damaged or worn out:</p> <ul style="list-style-type: none"> - PCA cover (p. chapter 13.20 (p. 125)); - Bottom PCA cover (p. chapter 13.21 (p. 126)); - PCA board Set. (p. chapter 13.22 (p. 126)); - PCA lock Set (p. chapter 13.23 (p. 127)).
34	No arm retreat after opening syringe clamp.	Course of action like for 016 (064) (Table 11 (p. 82)).
35	Gripping the syringe impossible.	<p>A. Course of action</p> <p>A.1. Check if the syringe is correctly installed in the pump – see User manual, section Syringe installation.</p> <p>A.2. Check if the syringe is on the list of syringes accepted for use with the pump (see: User manual).</p> <p>A.3. If the pump does not begin gripping the syringe, perform the syringe diameter measuring test chapter 10.5.8 (p. 45), proceeding accordingly.</p> <p>A.4. If the pump tries to grip the syringe (the arm approaches, but gripping is unsuccessful – the „Remove syringe” message or Autoinfusion alarm appears), perform the gripper test chapter 10.5.6 (p. 43) and the syringe gripping test chapter 10.5.7 (p. 44), proceeding accordingly.</p>
36	Check Syringe message– correct syringe installed.	
37	Syringe missing from the list of accepted syringes.	<p>A. Course of action</p> <p>A.1. Check if the syringe is on the list of syringes accepted for use with the pump (see: User manual).</p> <p>A.2. Check if the number of used syringes was not limited – see Medima User/Service Toolbox User manual. Make sure the correct syringe set was selected.</p> <p>A.3. Use a syringe from the list (A.1.) and check if the pump correctly recognises the syringe. If it does not, perform the syringe clamp calibration again.</p> <p>A.4. If the issue persists, proceed like for 016 (064) (Table 11 (p. 82)).</p>
38	Date and time not set message displayed when powering on	<p>A. Course of action:</p> <p>A.1. Set date and time (see chapter 4.5.6 (p. 21)).</p>

39	Reminder containing an error code displayed in the OFF state	A. Course of action: A.1. According to the displayed error code (see Table 11 (p. 81)).
40	Pump does not respond (display is dark) despite connected power.	<p>A. Course of action</p> <p>A.1. Make sure that the power supply and cord are not faulty and the voltage is correct. A.2. Make sure the fuse is not blown (chapter 13.2 (p. 97)). A.3. If the fuse was replaced, perform diagnostics in p. B. A.4. Perform disassembly of the pump (chapter 13.4 (p. 99)) A.5. Check the connection of Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.6. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.7. Perform diagnostics in p. B. A.8. If the issue persists: A.8.1. Swap the original part back in. A.8.2. Continue until the cause is found, beginning with p. A.6. A.9. If the issue is solved: A.9.1. Replace the diagnostic part with a new part. A.9.2. Repeat diagnostics in p. B. A.10. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. After connecting the power, wait a few seconds for the pump to respond with the pump status indicator light or display activation. B.2. If the indicator light is on and the display is dark wait for a maximum of 60s for display activity. B.3. If the pump can be switched on and no errors are reported, finish repairs according to p. A.10.</p> <p>C. List of parts</p> <p>C.1. [SP-41B] Sx00 Pump-back – w if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)). C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)).</p> <p>Note!!! After disassembling Power supply board set assess the AC cord (2/Fig. 79, 8/Fig. 60) and if an issue is detected, replace it (chapter 13.18 (p. 121)).</p>

41	Pump does not respond (display and pump status indicator light are dark) despite connected power.	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Make sure that the power supply and cord are not faulty and the voltage is correct. A.2. Make sure the fuse is not blown (chapter 13.2 (p. 97)). A.3. If the fuse was replaced, perform diagnostics in p. B. A.4. Perform disassembly of the pump (see chapter 13.4 (p. 99)). A.5. Check the connection of Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.6. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.7. Perform diagnostics in p. B. A.8. If the issue persists: <ul style="list-style-type: none"> A.8.1. Swap the original part back in. A.8.2. Continue until the cause is found, beginning with p. A.6. A.9. If the issue is solved: <ul style="list-style-type: none"> A.9.1. Replace the diagnostic part with a new part. A.9.2. Repeat diagnostics in p. B. <p>A.10. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. After connecting the power, wait a few seconds for the pump to respond with the pump status indicator light or display activation. B.2. If the indicator light is on and the display is dark wait for a maximum of 60s for display activity. B.3. If the display is active, the issue has been solved. Finish repairs according to p. A.10 <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)). C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)). <p>Note!!! After disassembling Power supply board set assess the AC cord (2/Fig. 79, 8/Fig. 60) and if an issue is detected, replace it (chapter 13.18 (p. 121)).</p>
42	Pump docking issue.	<p>Note!!! Make sure that the docking station slot is intact – checking attachments, sockets, possible case damage. If an issue is found, correct it or perform the test on a different docking station.</p> <p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Make sure that the docking procedure is performed correctly – see the User manual. A.2. If any errors are reported, proceed according to the reported error code (see Table 11 (p. 81)). A.3. Perform the Pump fixing in the docking station test (chapter 10.5.9 (p. 46)), proceeding accordingly. A.4. If the issue persists, perform repairs like for error 058 (296) (Table 11 (p. 89)).

12.3.2 Error codes

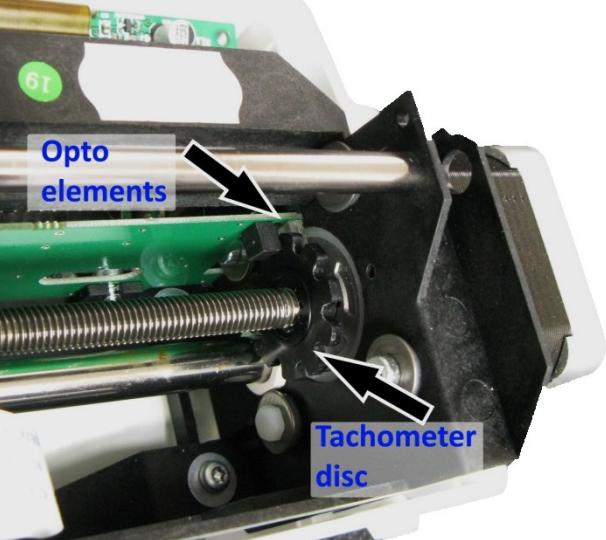
Table 11 Troubleshooting based on error codes

No.	Error no.	Description	Solution
1	000 (197)	Secondary language data corrupted.	Upgrade the pump's software (see chapter 9 (p. 25)). If the issue persists, contact the Medima Service Department (see chapter 1 (p. 7)).
2	000 (280)	Primary language library crc error.	
3	001 (197)	Secondary language data corrupted.	
4	002 (197)	Secondary language data does not match the configuration.	

5	003 (280)	Analog-digital converter error.	
6	004 (280)	Secondary language library crc error.	
7	007 (280)	Flasher program crc error.	
8	008 (280)	Main program crc error.	
9	009 (280)	Hardware metric fault.	Contact the Medima Service Department (see chapter 1 (p. 7)).
10	010 (177)	Factory configuration crc error.	Repairs like for 000 (197).
11	010 (280)	Factory configuration crc error.	
12	011 (280)	Incorrect alarm memory contents.	
13	012 (074)	Internal RTC oscillator fault.	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Upgrade the pump's software (see chapter 9 (p. 25)) A.2. Disconnect both external power and the battery. Hold the  button for at least 15 seconds. A.3. If the issue persists, replace CPU board with display (chapter 13.6 (p. 100)). A.4. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).
14	013 (074)	RTC format error	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Upgrade the pump's software (see chapter 9 (p. 25)). A.2. Disconnect both external power and the battery. Hold the  button for at least 15 seconds. A.3. If the issue persists, contact the Medima Service Department (see chapter 1 (p. 7)).
15	014 (074)	RTC fault.	
16	015 (074)	RTC fault.	
17	016 (064)	Incorrect signal from the syringe clamp	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Disassembly of the pump chapter 13.4 (p. 99). A.2. Inspection: <ul style="list-style-type: none"> A.2.1. Connection of the ribbons and slots: 20, 21, 19, 7, 8/Fig. 22. A.3. If any repairs were performed after the inspection, perform diagnostics in p. B. A.4. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.5. Perform diagnostics in p. B. A.6. If the issue persists: <ul style="list-style-type: none"> A.6.1. Swap the original part back in. A.6.2. Continue until the cause is found, beginning with p. A.4. A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. Connect the power and turn the pump on. B.2. If no issues are reported, finish repairs according to p. A.7. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-47] Drive mechanism board (chapter 13.9 (p. 106)). C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)). C.3. [SP-41A] Sx00 pump complete (chapter 13.10 (p. 107)).
23	022 (064)	Syringe clamp measurement line fault.	
24	023 (207)	Force measurement system power line fault	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Disassembly of the pump chapter 13.4 (p. 99). A.2. Inspection: <ul style="list-style-type: none"> A.2.1. Connection of the ribbons and slots: 1, 2, 7, 8, 19, 18, 15, 14/Fig. 28. A.3. If any repairs were performed after the inspection, perform diagnostics in p. B. A.4. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.

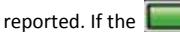
			<p>A.5. Perform diagnostics in p. B.</p> <p>A.6. If the issue persists:</p> <ul style="list-style-type: none"> A.6.1. Swap the original part back in. A.6.2. Continue until the cause is found, beginning with p. A.4. <p>A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. Connect the power and turn the pump on. B.2. If no issues are reported, finish repairs according to p. A.7. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-46] Guide board (chapter 13.10 (p. 107)). C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)). C.3. [SP-48] Pump stem end (chapter 13.7 (p. 103)).
25	024 (207)	Force measurement system power line fault	Repairs like for 016 (064).
26	026 (042)	Plunger grippers drive complete jam	Repairs like for 023 (207).
27	027 (042)	Sensor button stuck in pressed position	
28	027 (046)	Sensor button stuck in pressed position	
29	028 (042)	Sensor button stuck in released position	Repairs like for 016 (064).
30	029 (042)	Plunger grippers position detector line fault	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Disassembly of the pump chapter 13.4 (p. 99). A.2. Inspection: <ul style="list-style-type: none"> A.2.1. Connection of the ribbons and slots: 1, 2, 7, 8, 19, 18, 15, 14/Fig. 28. A.3. If any repairs were performed after the inspection, perform diagnostics in p. B. A.4. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.5. Perform diagnostics in p. B. A.6. If the issue persists: <ul style="list-style-type: none"> A.6.1. Swap the original part back in. A.6.2. Continue until the cause is found, beginning with p. A.4. <p>A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. Connect the power and perform the gripper test chapter 10.5.6 (p. 43). B.2. If no issues are reported: <ul style="list-style-type: none"> B.2.1. If a diagnostic part was used, replace it with a new part and repeat diagnostics in p. B. B.2.2. Finish repairs according to p. A.7. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-48] Pump stem end. Do not install, connect the ribbon to the slot (15/Fig. 28). C.2. [SP-46] Guide board. Connect the ribbons only (1, 14/Fig. 28). <p>Note!!!</p> <p>The board can not touch metal elements of the pump.</p> <p>C.4. [SP-45] CPU board with display (chapter 13.6 (p. 100)).</p>
34	032 (046)	Pump stem end position detector line fault	Course of action

35	033 (046)	Pump stem end position detector line fault	<p>A.1. Disassembly of the pump chapter 13.4 (p. 99).</p> <p>A.2. Interior inspection:</p> <p> A.2.1. Connection of the ribbons and slots: 7, 8, 19/Fig. 28.</p> <p> A.3. If any repairs were performed after the inspection, perform diagnostics in p. B.</p> <p> A.4. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.</p> <p> A.5. Perform diagnostics in p. B.</p> <p> A.6. If the issue persists:</p> <p> A.6.1. Swap the original part back in.</p> <p> A.6.2. Continue until the cause is found, beginning with p. A.4.</p> <p> A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p> B.1. Connect the power and turn the pump on.</p> <p> B.2. Perform the syringe installation test (chapter 10.6.1 (p. 48)).</p> <p> B.3. If the issue is solved:</p> <p> B.3.1. If a diagnostic part was used, replace it with a new part and repeat diagnostics in p. B.</p> <p> B.3.2. Finish repairs according to p. A.7.</p> <p>C. List of parts</p> <p> C.1. [SP-47] Drive mechanism board (p. chapter 13.9 (p. 106)).</p> <p> C.2. [SP-45] CPU board with display (p. chapter 17 (p. 138)).</p> <p> C.3. Drive mechanism set (chapter 13.8).</p>
36	034 (046)	Force sensor line fault	Repairs like for 029 (042).
37	035 (046)	Force sensor line fault	Repairs like for 033 (046).
38	036 (046)	Pump stem end position detector line fault	Repairs like for 033 (046).
39	037 (046)	Pump stem end position detector line fault	Repairs like for 033 (046).
40	037 (047)	Pump stem end position detector line fault	Repairs like for 033 (046).
41	038 (046)	SM1 motor tachometer line fault	Repairs like for 029 (042).
42	038 (046)	SM1 motor tachometer line fault	Repairs like for 029 (042).
43	039 (045)	Incorrect force signal value	Repairs like for 029 (042).
44	039 (046)	Incorrect signal value on force sensor under no load	Repairs like for 029 (042).
45	039 (339)	Incorrect signal value on force sensor under no load	Repairs like for 029 (042).
46	040 (045)	Incorrect force signal value	Repairs like for 029 (042).
47	040 (046)	Incorrect signal value on force sensor under no load	Repairs like for 029 (042).
48	040 (339)	Incorrect signal value on force sensor under no load	Repairs like for 029 (042).
49	041 (046)	Force measurement or sensor button line fault	A. Course of action
50	045 (044)	Stem end drive jammed	

51	045 (046)	Stem end drive jammed	<p>A.1. Disassembly of the pump chapter 13.4 (p. 99).</p> <p>A.2. Inspection:</p> <ul style="list-style-type: none"> A.2.1. Check the connection of mechanism motor cables (5/Fig. 28). Remove and re-insert the plug and then perform diagnostics in p. B. A.2.2. Connection of the ribbons and slots: 1, 2, 7, 8, 19, 18, 15, 14/ Fig. 28. A.2.3. Opto elements near the tachometer disc (grease, foreign objects); see figure below. <p>A.3. If any repairs were performed after the inspection, perform diagnostics in p. B.</p> <p>A.4. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.</p> <p>A.5. Perform diagnostics in p. B.</p> <p>A.6. If the issue persists: <ul style="list-style-type: none"> A.6.1. Swap the original part back in. A.6.2. Continue until the cause is found, beginning with p. A.4. </p> <p>A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Connect the power and turn the pump on.</p> <p>B.2. Perform the syringe installation test 10.6.1.</p> <p>B.3. If the issue is solved: <ul style="list-style-type: none"> B.3.1. If a diagnostic part was used, replace it with a new part and repeat diagnostics in p. B. B.3.2. Finish repairs according to p. A.7. </p> <p>C. List of parts</p> <p>C.1. [SP-46] Guide board (p. 13.10).</p> <p>C.4. [SP-45] CPU board with display. If the issue persists, replace Drive mechanism set (chapter 13.8 (p. 105)).</p> 
52	046 (238)	Incorrect touch panel ADC measurement.	<p>A. Course of action</p> <p>A.1. Upgrade the pump's software (see chapter 9 (p. 25)).</p> <p>A.2. Check the instructions in the USER NOTIFICATION AND ALARM SYSTEM section of the User manual. If the cause was found, correct it and perform diagnostics in p. B.</p> <p>A.3. If the issue persists, perform disassembly of the pump chapter 13.4 (p. 99).</p> <p>A.4. Check the connection of Touch panel ribbon (5/Fig. 28) to the CPU board touch panel ribbon FFC slot (6/Fig. 28). If the cause was found,</p>
53	047 (238)	Touch panel line short-circuit.	

			<p>correct it and repeat diagnostics in p. B.</p> <p>A.5. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.</p> <p>A.6. Perform diagnostics in p. B.</p> <p>A.7. If the issue persists:</p> <ul style="list-style-type: none"> A.7.1. Swap the original part back in. A.7.2. Continue until the cause is found, beginning with p. A.5. <p>A.8. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Perform touch panel test (chapter 10.5.3 (p. 40)).</p> <p>B.2. If the issue is solved, finish repairs according to p. A.8.</p> <p>C. List of parts</p> <p>C.1. [SP-45] CPU board with display (chapter 13.6 (p. 100)).</p> <p>C.2. Front case (chapter 13.10 (p. 107)).</p>
54	049 (291)	Battery controller error	<p>A. Course of action</p> <p>A.1. Perform diagnostics in p. B.</p> <p>A.2. Perform disassembly of the pump according to chapter 13.4 (p. 99).</p> <p>A.3. Check the connection of:</p> <ul style="list-style-type: none"> A.3.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28) A.3.2. Battery controller slot (5/Fig. 30). A.3.3. If the cause was found, correct it and repeat diagnostics in p. B <p>A.4. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.</p> <p>A.5. If the issue persists:</p> <ul style="list-style-type: none"> A.5.1. Swap the original part back in; A.5.2. Continue until the cause is found, beginning with p.A.5. <p>A.6. If the issue is solved:</p> <ul style="list-style-type: none"> A.6.1. Replace the diagnostic part with a new part; A.6.2. Repeat diagnostics in p. B. <p>A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Check the battery state information (chapter 10.7 (p. 50)).</p> <p>B.2. Perform the power supply test according to procedure (chapter 10.5.4 (p. 41)).</p> <p>B.3. If the issue is solved, finish repairs according to p. A.8.</p> <p>C. List of parts</p> <p>C.1. [SP-41B] Sx00 Pump-back equipped with a battery – if the issue is solved, use for further diagnosis of parts:</p> <ul style="list-style-type: none"> C.1.1. [SP-43] Battery controller board (chapter 13.14 (p. 113)). C.1.2. [SP-44] Power supply board set (chapter 13.13 (p. 112)) <p>C.2. If the issue persists, contact the Medima Service Department (see chapter 1 (p. 7)).</p>
55	050 (295)	Battery cell fault	<p>A. Course of action</p> <p>A.1. Perform diagnostics in p. B.</p> <p>A.2. If the issue persists, replace the battery with a new one chapter 13.3 (p. 98).</p> <p>A.3. Select the New battery option (chapter 10.7.5 (p. 53))</p> <p>A.4. Perform diagnostics in p. B.</p> <p>A.5. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p>
56	051 (295)	Low battery capacity	
57	052 (295)	High battery resistance	

			<p>B. Diagnostics</p> <p>B.1. Perform the battery resistance test (chapter 10.7.4 (p. 52)). B.2. Perform the battery capacity test (chapter 10.7.3 (p. 51)). B.3. If the issue is solved, finish repairs according to p. A.3.</p>
58	053 (292)	Battery disconnected	<p>A. Course of action</p> <p>A.1. Check battery connection according to the Battery connection section of the user manual. A.2. If the issue persists, perform battery calibration (chapter 11.2 (p. 56)). If the issue is solved, finish repairs according to p. A.6. A.3. If the issue persists, perform disassembly of the pump (chapter 13.4 (p. 99)). A.4. Check the connection of:</p> <p>A.4.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). A.4.2. Battery controller slot (5/Fig. 30). A.4.3. If the cause was found, correct it and repeat diagnostics in p. B.</p> <p>A.5. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.6. If the issue persists:</p> <p>A.6.1. Swap the original part back in; A.6.2. Continue until the cause is found, beginning with p. A.5.</p> <p>A.7. If the issue is solved:</p> <p>A.7.1. Replace the diagnostic part with a new part; A.7.2. Repeat diagnostics in p. B.</p> <p>A.8. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>Note! Perform diagnostics with the battery connected.</p> <p>B.1. Perform the power supply test according to procedure (chapter 10.5.4 (p. 41)). B.2. If the issue is solved, finish repairs according to p. A.8.</p> <p>C. List of parts</p> <p>C.1. [SP-16] Battery package set. C.2. [SP-41B] Sx00 Pump-back equipped with a battery – if the issue is solved, use for further diagnosis of parts: C.2.1. [SP-43] Battery controller board (chapter 13.14 (p. 99)). C.2.2. [SP-44] Power supply board set (chapter 13.13 (p. 111)). C.3. If the issue persists, contact the Medima Service Department (see chapter 1 (p. 7)).</p>
59	054 (292)	Battery charging current too low. Possible power supply charger fault.	<p>A. Course of action</p> <p>A.1. Perform diagnostics in p. B. A.2. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.3. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.4. Perform diagnostics in p. B. A.5. If the issue persists:</p> <p>A.5.1. Swap the original part back in; A.5.2. Continue until the cause is found, beginning with p. A.2.</p> <p>A.6. If the issue is solved:</p> <p>A.6.1. Replace the diagnostic part with a new part; A.6.2. Repeat diagnostics in p. B.</p> <p>A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>Note! Perform diagnostics with the battery connected.</p> <p>B.1. Disconnect external power and discharge the battery, performing infusion with flow rate 400ml/h until the battery charge is at 50% or lower. B.2. Fully charge the battery, leaving external power connected for at least 1 hour afterwards.</p>
60	055 (292)	Maintenance current while not charging too high. Possible power supply fault.	
61	056 (292)	Battery charging current too high. Possible power supply charger fault.	

		<p>B.3. If the issue is solved, finish repairs according to p. A.7.</p> <p>C. List of parts</p> <p>C.3. [SP-41B] Sx00 Pump-back equipped with a battery – if the issue is solved, use for further diagnosis of parts:</p> <ul style="list-style-type: none"> C.3.1. [SP-43] Battery controller board (chapter 13.14 (p. 113)). C.3.2. [SP-44] Power supply board set (chapter 13.13 (p. 111)). <p>C.4. If the issue persists, contact the Medima Service Department (see chapter 1 (p. 7)).</p>
62	057 (292)	<p>Discharge current while operating on battery too high.</p> <p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.2. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.3. Perform diagnostics in p. B. A.4. If the issue persists: <ul style="list-style-type: none"> A.4.1. Swap the original part back in; A.4.2. Continue until the cause is found, beginning with p. A.2. A.5. If the issue is solved: <ul style="list-style-type: none"> A.5.1. Replace the diagnostic part with a new part; A.5.2. Repeat diagnostics in p. B. A.6. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). <p>B. Diagnostics</p> <p>Note! Perform diagnostics with the battery connected.</p> <ul style="list-style-type: none"> B.1. Fully charge the battery. B.2. Disconnect external power. B.3. Perform infusion with flow rate 400ml/h until the battery charge is at 50% or lower. During the test no errors concerning the battery should be reported. If the  icon starts blinking during the infusion, proceed according to Table 10/18 (p. 73). B.4. If the issue is solved, finish repairs according to p. A.6. <p>C. List of parts</p> <p>C.1. [SP-41B] Sx00 Pump-back equipped with a battery – if the issue is solved, use for further diagnosis of parts:</p> <ul style="list-style-type: none"> C.1.1. [SP-43] Battery controller board (chapter 13.14 (p. 113)). C.1.2. [SP-44] Power supply board set (chapter 13.13 (p. 111)). <p>C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)).</p> <p>C.3. Drive mechanism set (chapter 13.8 (p. 105)).</p>

63	058 (296)	1. docking detector detection error	A. Course of action A.1. Make sure the pump is not under intense light (especially sunlight) and move the pump if necessary. A.2. Check the instructions in the USER NOTIFICATION AND ALARM SYSTEM section of the User manual . A.3. Perform diagnostics in p. B. A.4. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.5. Check the connection of: A.5.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.6. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.7. Perform diagnostics in p. B. A.8. If the issue persists: A.8.1. Swap the original part back in; A.8.2. Continue until the cause is found, beginning with p. A.6. A.9. If the issue is solved: A.9.1. Replace the diagnostic part with a new part; A.9.2. Repeat diagnostics in p. B. A.10. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).
64	059 (296)	2. docking detector detection error	B. Diagnostics B.1. Perform the pump fixing in the docking station test (chapter 10.5.9 (p. 46)). B.2. If the issue is solved, finish repairs according to p. A.10.
			C. List of parts C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set according to chapter 13.13 (p. 111).
65	060 (296)	Power line error (negative balance)	A. Course of action A.1. Perform diagnostics, starting with p. B.2. A.2. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.3. Check the connection of: A.3.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.4. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.5. Perform diagnostics in p. B. A.6. If the issue persists: A.6.1. Swap the original part back in; A.6.2. Continue until the cause is found, beginning with p. A.5. A.7. If the issue is solved: A.7.1. Replace the diagnostic part with a new part; A.7.2. Repeat diagnostics in p. B. A.8. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).
66	061 (296)	Power line error (positive balance)	B. Diagnostics Note! Perform diagnostics with the battery connected. B.1. Connect AC power (disconnect external DC power). B.2. Turn the pump on and off (with the power button). B.5. Test is successful if for 4 minutes the error is not reported again. B.6. If the issue is solved, finish repairs according to p. A.9.
			C. List of parts C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set according to chapter 13.13 (p. 111); C.2. [SP-45] CPU board with display according to chapter 13.6 (p. 100).

			<p>Note!!!</p> <p>In case of the error occurring only in an ambulance, pay special attention to the condition of cables and security of connections.</p>
67	062 (296)	DC voltage unstable	<p>A. Course of action</p> <p>A.1. Check if the connection to the DC power socket is not loose. Correct the loose connection and perform diagnostics, starting with p. B.2. After a successful test, finish repairs.</p> <p>A.2. Connect the TA-55 power supply to the DC power socket with a TA-7 cable. Perform diagnostics, starting with p. B.2.</p> <p>A.3. Perform disassembly of the pump (chapter 13.4 (p. 99)).</p> <p>A.4. Check the connection of:</p> <p style="padding-left: 2em;">A.4.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B.</p> <p>A.5. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.</p> <p>A.6. Perform diagnostics in p. B.</p> <p>A.7. If the issue persists:</p> <p style="padding-left: 2em;">A.7.1. Swap the original part back in;</p> <p style="padding-left: 2em;">A.7.2. Continue until the cause is found, beginning with p. A.5.</p> <p>A.8. If the issue is solved:</p> <p style="padding-left: 2em;">A.8.1. Replace the diagnostic part with a new part;</p> <p style="padding-left: 2em;">A.8.2. Repeat diagnostics in p. B.</p> <p>A.9. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Connect the original DC power supply.</p> <p>B.2. Turn the pump on and off (with the power button).</p> <p>B.7. Test is successful if for 5 minutes the error is not reported again and the  icon is not blinking.</p> <p>B.8. If the issue is solved, finish repairs according to p. A.9.</p> <p>C. List of parts</p> <p>C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)).</p> <p>C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)).</p> <p>Note!!!</p> <p>In case of the error occurring only in an ambulance, pay special attention to the condition of cables and security of connections.</p>
68	063 (296)	Power line state unstable	<p>A. Course of action</p> <p>A.1. Check if the connection to the AC power socket is not loose. Correct the loose connection and perform diagnostics, starting with p. B.2. After a successful test, finish repairs.</p> <p>A.2. Connect the pump to a different docking station slot or power cable. Perform diagnostics, starting with p. B.2. A successful test indicates the power supply or cable previously connected is faulty. Finish pump repairs.</p> <p>A.3. Perform disassembly of the pump (chapter 13.4 (p. 99)).</p> <p>A.4. Check the connection of:</p> <p style="padding-left: 2em;">A.4.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B.</p> <p>A.5. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.</p> <p>A.6. Perform diagnostics in p. B.</p> <p>A.7. If the issue persists:</p> <p style="padding-left: 2em;">A.7.1. Swap the original part back in</p> <p style="padding-left: 2em;">A.7.2. Continue until the cause is found, beginning with p. A.6.</p> <p>A.8. If the issue is solved:</p> <p style="padding-left: 2em;">A.8.1. Replace the diagnostic part with a new part;</p> <p style="padding-left: 2em;">A.8.2. Repeat diagnostics in p. B.</p> <p>A.9. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p>

			<p>136).</p> <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. Connect the original AC power supply. B.2. Turn the pump on and off (with the power button). B.3. If for 5 minutes the error is not reported again and the  icon is not blinking, finish repairs according to p.A.9. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)); C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)).
69	064 (033)	Incorrect data received from the auxiliary processor (PPU).	<p>A. Course of action</p> <ul style="list-style-type: none"> A.2. Perform/force pump's software upgrade. If afterwards the error is not reported again, go to p. A.8. A.3. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.4. Check the connection of: <ul style="list-style-type: none"> A.4.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.5. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.6. Perform diagnostics in p. B. A.7. If the issue persists: <ul style="list-style-type: none"> A.7.1. Swap the original part back in; A.7.2. Continue until the cause is found, beginning with p. A.6. A.8. If the issue is solved: <ul style="list-style-type: none"> A.8.1. Replace the diagnostic part with a new part; A.8.2. Repeat diagnostics in p. B. A.9. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.2. Connect external power. B.3. Test is successful if the default start screen is displayed and the error is not reported again for 20 seconds. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace with Power supply board set (chapter 13.13 (p. 111)); C.1. [SP-45] CPU board with display (chapter 13.6 (p. 100)).
70	065 (033)	UART frame error during communication with the auxiliary processor (PPU).	Repairs like for 013 (064)
71	066 (033)	Incorrect structure of data received from the auxiliary processor (PPU).	
72	067 (033)	Error while receiving data from the auxiliary processor (PPU).	
73	068 (033)	Error while sending data to the auxiliary processor (PPU).	
74	069 (065)	LED test error.	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.2. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.3. Perform diagnostics in p. B. A.4. If the issue persists: <ul style="list-style-type: none"> A.4.1. Swap the original part back in; A.4.2. Continue until the cause is found, beginning with p. A.6. A.5. If the issue is solved: <ul style="list-style-type: none"> A.5.1. Replace the diagnostic part with a new part; A.5.2. Repeat diagnostics in p. B. A.6. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).

			136).
			<p>B. Diagnostics</p> <p>B.1. Perform the Signalization and display test chapter 10.5.1 (p. 39). B.2. Turn the pump on – no errors concerning display damage should be reported. B.3. If the issue is solved, finish repairs according to p.A.6.</p>
			<p>C. List of parts</p> <p>C.1. [SP-30] Display- if the issue persists, replace CPU board with display (chapter 13.6 (p. 100)).</p>
75	070 (056)	Can not create partition.	Contact the Medima Service Department (chapter 1(p. 7)).
76	071 (056)	Flash partition structure fault.	
77	071 (056)	DF memory format incompatible.	
78	072 (073)	Time setting error.	Course of action like for error 013 (074)
79	075 (075)	Pump calibration missing	<p>A. Course of action</p> <p>A.1. Perform the missing calibrations chapter 10.6.3 (p. 49).</p>
80	076 (075)	User configuration missing	Enter user configuration (chapter 4.4 (p. 18))
81	076 (299)	User configuration or Drug library missing or incorrect.	
82	077 (075)	Required pump tests missing.	Perform basic tests chapter 10.5 (p. 38).
83	078 (051)	Keyboard button short-circuit.	<p>A. Course of action</p> <p>A.1. Perform diagnostics in p. B. (it may be impossible to start the test – use the touch panel instead of some buttons). A.2. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.3. Check the condition and connection of the Keyboard ribbon to the CPU board with display slot (see: 3, 4/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.4. Install diagnostic CPU board with display (chapter 13.6 (p. 100)). Perform diagnostics in p. B. A.5. Swap the original part back in. A.6. Replace Front case (chapter 13.10 (p. 107)). A.7. Replace the diagnostic part with a new part. A.8. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Attempt the Keyboard test - (chapter 10.5.2 (p. 40)). B.2. If the issue is solved, finish repairs according to p. A.7.</p>
84	079 (075)	Pump's manufacturing tests missing	Contact the Medima Service Department (see chapter 1 (p. 7)).
85	080 (075)	Incorrect pump calibration data.	
86	086 (054)	Data Flash #1 fault.	<p>A. Course of action</p> <p>A.1. Upgrade the pump's software (see chapter 9 (p. 25)). A.2. Disconnect both external power and the battery. Hold the  button for at least 15 seconds.</p>
87	088 (054)	Data Flash #1 and #2 fault.	
88	087 (054)	Data Flash #2 fault.	<p>A.3. If the issue persists, replace CPU board with display (chapter 13.6 (p. 100)). A.4. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p>
89	107 (075)	Service data error	Erase service data chapter 4.5.5 (p. 21).

90	109 (304)	PCA button line fault	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Disconnect the PCA button. A.2. Perform diagnostics in p. B. A.3. If no error is reported, replace the PCA button for a working one and go to p. A.10. A.4. Check the pump's PCA socket, paying attention to foreign objects and bent connectors. Remove any faults found and perform diagnostics in p. B. A.5. If no error is reported, perform PCA button operation test (user manual) and after a positive result go to p. A.10. A.6. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.7. Replace pump back with [SP-41B] Sx00 Pump-back. A.8. If the issue persists, contact the Medima Service Department (see chapter 1 (p. 7)). A.9. If the issue is solved, replace Power supply board set (chapter 13.13 (p. 111)). A.10. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. Perform the turn off – turn on – turn off sequence on the pump. B.2. If the default start screen is displayed and the error is not reported again for 20 seconds, finish repairs according to p. A.10.
91	110 (280)	LCD control error.	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.2. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.3. Perform diagnostics in p. B. A.4. If the issue persists: <ul style="list-style-type: none"> A.4.1. Swap the original part back in; A.4.2. Continue until the cause is found, beginning with p. A.6. A.5. If the issue is solved: <ul style="list-style-type: none"> A.5.1. Replace the diagnostic part with a new part; A.5.2. Repeat diagnostics in p. B. A.6. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136). <p>B. Diagnostics</p> <ul style="list-style-type: none"> B.1. Perform the Signalization and display test (chapter 10.5.1 (p. 39)). B.2. Turn the pump on – no errors concerning display damage should be reported. B.3. If the issue is solved, finish repairs according to p. A.6. <p>C. List of parts</p> <ul style="list-style-type: none"> C.1. [SP-30] Display (chapter 13.6.3 (p. 102), chapter 16 (p. 137)). C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)).
92	111 (280)	Data flash memory contents corrupted.	Contact the Medima Service Department (see chapter 1 (p. 7)).
93	115 (065)	Alarm call system transmitter fault.	<p>A. Course of action</p> <ul style="list-style-type: none"> A.1. Perform disassembly of the pump (chapter 13.4 (p. 99)). A.2. Check the connection of: <ul style="list-style-type: none"> A.2.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B. A.3. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C. A.4. If the issue persists: <ul style="list-style-type: none"> A.4.1. Swap the original part back in; A.4.2. Continue until the cause is found, beginning with p. A.3. A.5. If the issue is solved: <ul style="list-style-type: none"> A.5.1. Replace the diagnostic part with a new part;

			<p>A.4.2. Repeat diagnostics in p. B.</p> <p>A.7. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Turn the pump on, skip syringe installation and wait until the No user activity alarm is raised.</p> <p>B.2. If after the alarm is raised (max. 3 seconds) or before then the error message is not displayed, finish repairs according to p.A.7.</p> <p>C. List of parts</p> <p>C.1. [SP-41B] Sx00 Pump-back – if the issue is solved, replace Power supply board set (chapter 13.13 (p. 111)).</p> <p>C.2. [SP-45] CPU board with display (chapter 13.6 (p. 100)).</p>
94	120 (292)	Incorrect battery voltage measurement	<p>A. Course of action</p> <p>A.1. Perform diagnostics in p. B.</p> <p>A.1.1. If voltage is below 6 V, replace the battery (chapter 13.3 (p. 98)).</p> <p>A.1.1.1. Perform diagnostics in p. B.</p> <p>A.1.1.2. If the issue persists, go to p. A.2.</p> <p>A.1.1.3. If the issue is solved, go to p. A.8.</p> <p>A.1.2. If voltage is above 15V, go to p. A.2.</p> <p>A.1.3. If the issue is solved, go to p. A.8.</p> <p>A.2. Perform disassembly of the pump (chapter 13.4 (p. 99)).</p> <p>A.3. Check the connection of:</p> <p>A.3.1. Power supply board set ribbon (1/Fig. 30) to the CPU board with display slot (11/Fig. 28). If the cause was found, correct it and repeat diagnostics in p. B.</p> <p>A.4. Swap appropriate part with the corresponding diagnostic part, following the order of the list in p. C.</p> <p>A.5. Perform diagnostics in p. B.</p> <p>A.6. If the issue persists:</p> <p>A.6.1. Swap the original part back in;</p> <p>A.6.2. Continue until the cause is found, beginning with p. A.4.</p> <p>A.7. If the issue is solved:</p> <p>A.7.1. Replace the diagnostic part with a new part;</p> <p>A.7.2. Repeat diagnostics in p. B.</p> <p>A.8. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Enter the service mode and select: 3. Battery – 1. General information (chapter 10.7 (p. 50)).</p> <p>B.2. Connect the TA-46 instrument.</p> <p>B.3. Wait for 1 minute.</p> <p>B.4. Check battery voltage.</p> <p>B.5. If the voltage differs significantly from 8.8 V, perform battery calibration (chapter 11.2 (p. 56)) and repeat steps B.2 to B.4; if the voltage differs significantly from 8.8V again, go to p. A.2.</p> <p>B.6. Reconnect the battery and wait for 1 minute.</p> <p>B.7. If the voltage is below 6 V, replace the battery.</p> <p>B.8. If the issue is solved, finish repairs according to p.A.8.</p> <p>C. List of parts</p> <p>C.1. [SP-41B] Sx00 Pump-back - if the issue is solved, use for further diagnosis of parts:</p> <p>C.1.1. [SP-43] Battery controller board (p. chapter 13.14 (p. 99)).</p> <p>C.1.2. [SP-44] Power supply board set (chapter 13.13 (p. 111)).</p> <p>C.2. If the issue persists, replace CPU board with display (chapter 13.6 (p. 100)).</p>
95	123 (074)	RTC quartz resonator fault.	Repairs like for 012 (074)

96	125 (033)	Auxiliary processor (PPU) software out of date	<p>A. Course of action</p> <p>A.1. Upgrade the pump's software (see chapter 9 (p. 25)). A.2. If the issue persists, contact the Medima Service Department (see chapter 1 (p. 7)).</p>
97	147 (046)	Incorrect signal from the stem end position detection system	Repairs like for 032 (046).
98	147 (047)		
99	148 (304)	PCA button line fault	Repairs like for 109 (304)
100	151 (306)	PCA cover closure detection line fault	<p>A. Course of action</p> <p>A.1. Perform disassembly of the pump chapter 13.4 (p. 99). A.2. Check the connection of PCA lock mechanism (24/Fig. 29) to CPU board with display (25, 26, 27/Fig. 29). A.3. Disconnect the ribbon (26/Fig. 29) from the elements above (slots: 25, 27/Fig. 29). If the ribbon is damaged, replace it with a new one and connect it. Perform diagnostics in p. B. A.4. Connect the power and turn the pump on. A.5. If the error is not reported, replace PCA board Set (chapter 13.22 (p. 126)); otherwise, replace CPU board with display (chapter 13.6.3 (p. 102)). A.6. Connect the ribbon (reversing p. A.3.) and perform diagnostics in p. B. A.7. If the issue persists, contact the Medima Service Department (see chapter 1 (p. 7)). A.8. If parts were replaced during the repairs, perform the actions in chapter 14 (p. 133); otherwise, perform steps after repair in chapter 15 (p. 136).</p> <p>B. Diagnostics</p> <p>B.1. Perform the PCA cover and lock test chapter 10.5.11 (p. 47). B.2. If the issue is solved, finish repairs according to p.A.9.</p>
101	152 (306)	PCA cover lock detection line fault	Repairs like for 151 (306)
102	316 (073)	Time conversion error.	Contact the Medima Service Department (see chapter 1(p. 7)).
103	382 (280)	Non-volatile memory contents corrupted	

13 Replacement of the pump subassemblies

13.1 GENERAL PART REPLACEMENT RULES

Note!!!

Only original parts made by Medima Sp. z o.o. must be used to repair the pump. Use of parts other than the original parts may result in improper operation of the pump and danger to the health and lives of the patients and the staff.

Note!!!

Before you start repairs, make sure that the device is not connected to the power supply.

13.1.1 Part replacement report

The repair of the pump and the replacement of the parts must be entered in form no. F2-IS-Sx00-01-EN-01 Part replacement report. When filling out the form, follow the instructions:

- the form must be prepared (printed) before the repair starts and must be filled in an ongoing manner in the course of the repair;
- if a module has two numbers, the higher number must be entered (see Fig. 32);

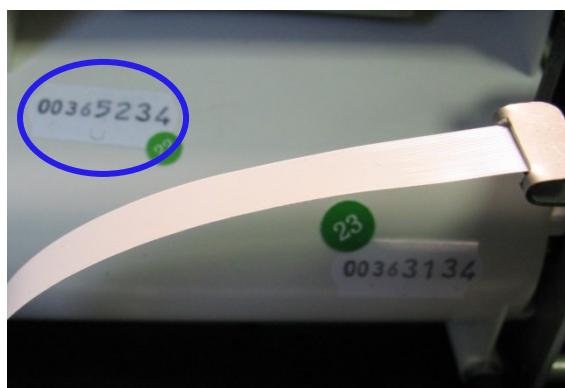


Fig. 32 Spare part serial number

- after the part has been changed, check the relevant field indicating **The type of the repair**: warranty or post-warranty;
- enter the number of the defective part and the number of the new part;
- if the **Back case set** is replaced, remove the sticker with the old serial number and attach it to the form and write the serial number on the new sticker; secure the new sticker with the transparent sticker enclosed in the package.

The filled out form must be sent to the Service Department of Medima as an electronic scan or by fax contact details provided in chapter 1 (p. 7).

13.1.2 Rules for driving screws into plastic materials ([video](#))

Screwing of the screws into holes made of plastic elements should be carried out according to the following procedure:

- insert the screw into the hole;
- turn the screw by shaft (without any force) counterclockwise until you hear a characteristic "click". This means that the tip of the screw hit the existing thread cut during the first screwing;
- screw the screw in until you hear the "click" sound of the dynamometric screwdriver.

Note!!!

Failure to comply with the above principles may cause damage to the thread and make it impossible to fix the elements properly.

13.1.3 Replaceable TA-40, TA-41 torque screwdriver bits removal/installation

1. Removal of the replaceable **TA-40, TA-41** torque screwdriver bits should be done by energetically pulling the shaft in the direction from the handle. ([video](#))
2. Installation of the replaceable **TA-40, TA-41** torque screwdriver bits should be made by pressing the bit into the screwdriver socket. ([video](#))

13.2 FUSE REPLACEMENT

Note!!!

Before replacing make sure that the device is disconnected from the power supply.

1. Set the pump as shown in **Fig. 33**. Slide the screwdriver **TB-6** into the slot shown in **Fig. 33**.



Fig. 33. Fuse replacement – sliding out the drawer

2. Pry and pull out the **Fuse drawer (1)** as shown in **Fig. 34**.

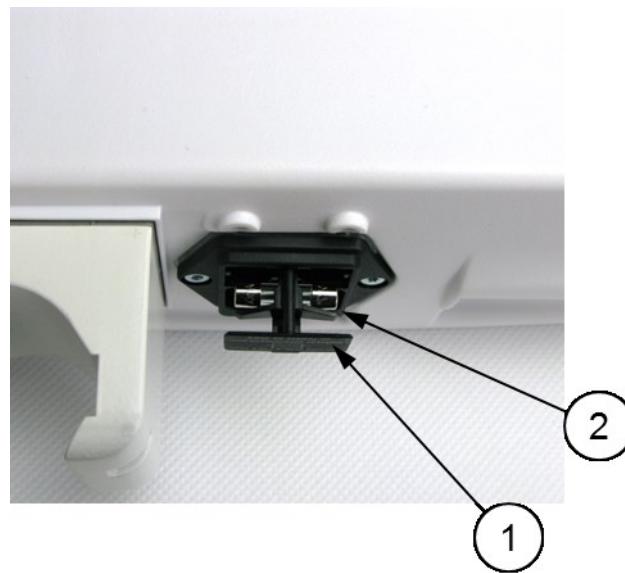


Fig. 34. Fuse replacement – Fuse drawer

3. Take out and check the **T 0,5A 250V fuse (2)** showed in **Fig. 34** (possible damage: visible mechanical damage burned wire or measured discontinuity of the circuit).
4. If the **T 0,5 A 250 V 5x20 mm fuse (2)** (see **Fig. 34**) is damaged, replace it with a new one.
5. Push in the **Fuse drawer (1)** (see **Fig. 34**) and check the operation of the device by performing the basic tests (see chapter **10.5** (p. 38)).

13.3 BATTERY PACKAGE REPLACEMENT (M-001.1.0344.XX)

13.3.1 Battery package removal ([video](#))

1. Turn the **Rotatable pole clamp (8)** by 90° as shown in Fig. 35.
2. Using the **TB-1** screwdriver unscrew four **M3x8 screws (1)** which fixing the **Battery cover (2)**. Pull out the **Battery cover (2)** as shown in Fig. 35.
3. Disconnect the **Battery package connector (3)** from the **Battery package socket (7)**, pull out the **Battery package (4)** from the **Battery chamber (5)** as shown in Fig. 35.
4. Remove the heat transfer compound **TB-8** from the **Battery bed (6)** (see Fig. 35).

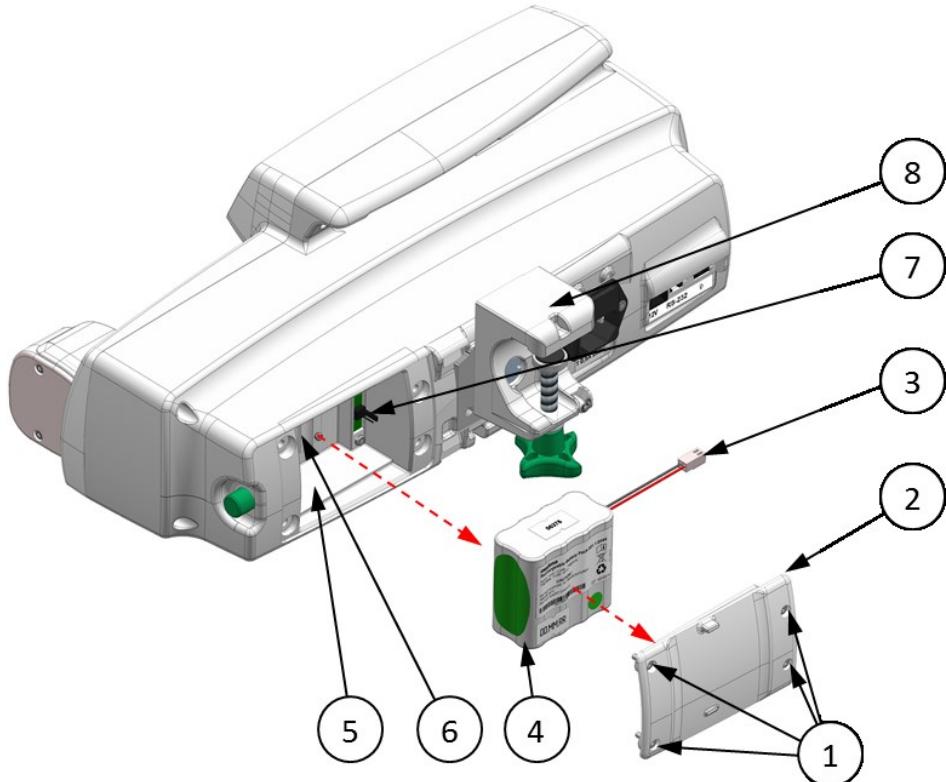


Fig. 35. Battery package removal/installation

13.3.2 Battery package installation ([video](#))

1. Apply the heat transfer compound **TB-8** on **Battery bed (6)** inside the **Battery chamber (5)** (see Fig. 35) with amount shown in Fig. 36.



Fig. 36. Amount of TB-8 heat transfer compound

2. Connect the **Battery pack connector (3)** to the **Battery pack socket (7)** and then place the **Battery package (4)** in the **Battery chamber (5)** as shown in Fig. 35. The part of the **Battery package (4)** with no protective foil must adhere to the **Battery bed (6)**.
3. Attach the **Battery cover (2)** and use the **TB-1** screwdriver to screw in four **M3x8 screws (1)** that fix the **Battery Cover** as shown in Fig. 35.

4. Connect the **Syringe pump** to the mains and perform the steps described in chapter **14/1** (p. 133) if battery was replaced.

Note!!!

Disconnecting the **Battery package** will clear the clock settings. Set the correct date and time otherwise the pump will remember the incorrect date of installation of the new battery.

Note!!!

Choosing the "Service-> 3. Battery-> 6. New Battery" function is necessary to properly format the new battery.

13.4 SYRINGE PUMP DISASSEMBLY

1. Remove the **Batery package** as described in chapter **13.3.1** (p. 98).
2. Using the **TB-1** screwdriver unscrew six **3x12 screws for plastics** (**1**) as shown in **Fig. 37**.

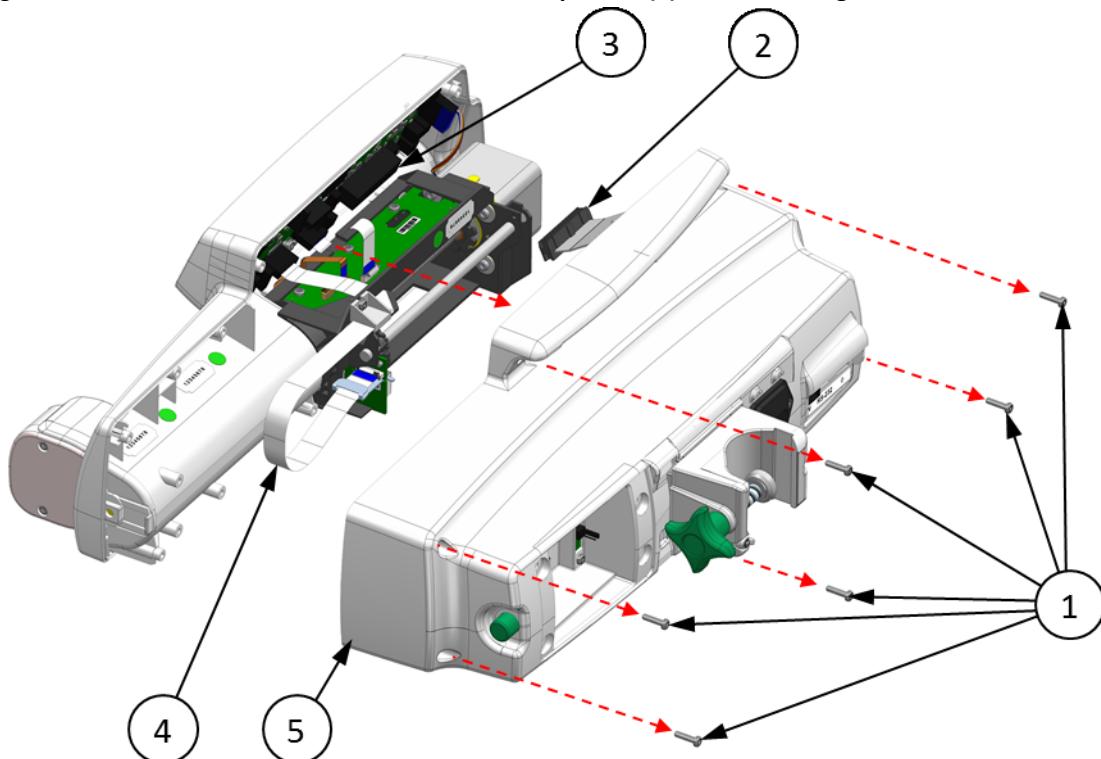


Fig. 37 Syringe pump disassembly/assembly

3. Carefully separate both parts of the case, making sure not to let the **Case gasket** (**6**) fall out of the groove in the **Back case set** (**5**) as shown in **Fig. 38**.
4. Disconnect the **IDE Ribbon** (**2**) from the **Ribbon socket** (**3**) as shown in **Fig. 37**.

13.5 SYRINGE PUMP ASSEMBLY

Note!!!

Before assembly, check if the **Battery pack set** is disconnected.

1. Check if the **Case gasket** (**6**) did not fall out of the groove in **Back case set** (**5**) as shown in **Fig. 38**. If the **Case gasket** (**6**) did fall out then place it gently back in the groove using the **TA-15** tweezers.

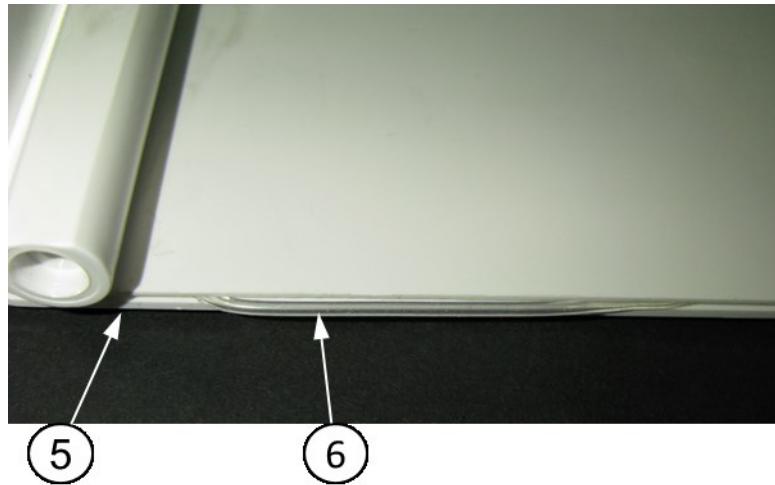


Fig. 38 Possible way to fall out the Case gasket

2. Connect the **IDE ribbon (2)** to the **Ribbon socket (3)** (see Fig. 37).
3. Connect both parts of the case, making sure that:
 - the **IV set holder** is placed in the **Front case (5)**;
 - **Moving ribbon (4)** and **IDE Ribbon (2)** are not bent and are placed as shown in Fig. 37.
4. Using a **TA-41** torque screwdriver with **TA-42** replaceable bit screw six **3x12 screws for plastic (1)** into the holes in **Back case set (6)**(see Fig. 38) as shown in Fig. 37. Screw the screws in, according to guidelines described in chapter **13.1.2**.
5. Install the **Battery package** as described in chapter **13.3.2** (p. 98).
6. Perform the **Electrical safety tests** as described in chapter **10.8** (p. 53).
7. Perform the **Basic pump tests** as described in chapter **10.5** (p. 38).

13.6 CPU BOARD SET REPLACEMENT (S-030.9.4062.XX, S-030.9.4063.XX, S-030.9.4064.XX, S-030.9.4065.XX)

Note!!!

Replacement of the CPU board set is possible only with another piece of the same type, dedicated to the same pump model (S100, S200, S300, S300 PCA). If a CPU Board set dedicated to another type of pump is installed, it may be unstable, causing danger to the health and lives of patients.

13.6.1 CPU board set removal

1. Disassemble the **Syringe pump** as described in chapter **13.4** (p. 99).
2. Disconnect the: **Touch-screen ribbon (1)**, **Keyboard ribbon (2)**, **Stem end extension FFC ribbon (3)**, **Drive mechanism FFC ribbon (4)** and **Engine plug (5)** as shown in Fig. 39.

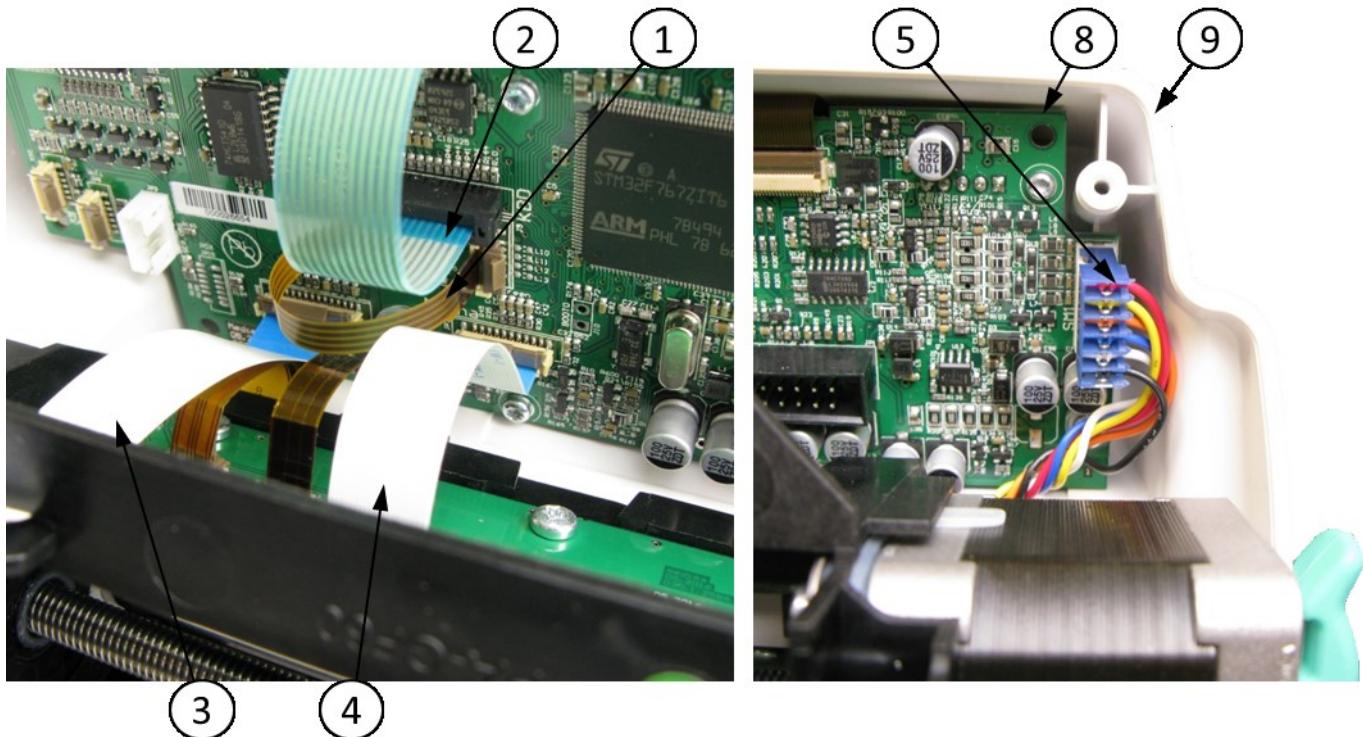


Fig. 39 CPU board set removal/installation

3. Using the **TB-1** screwdriver unscrew three **3x8** screws for plastic (6) with the **3,2x8x0,8** polyamide washers (7) (see Fig. 40).

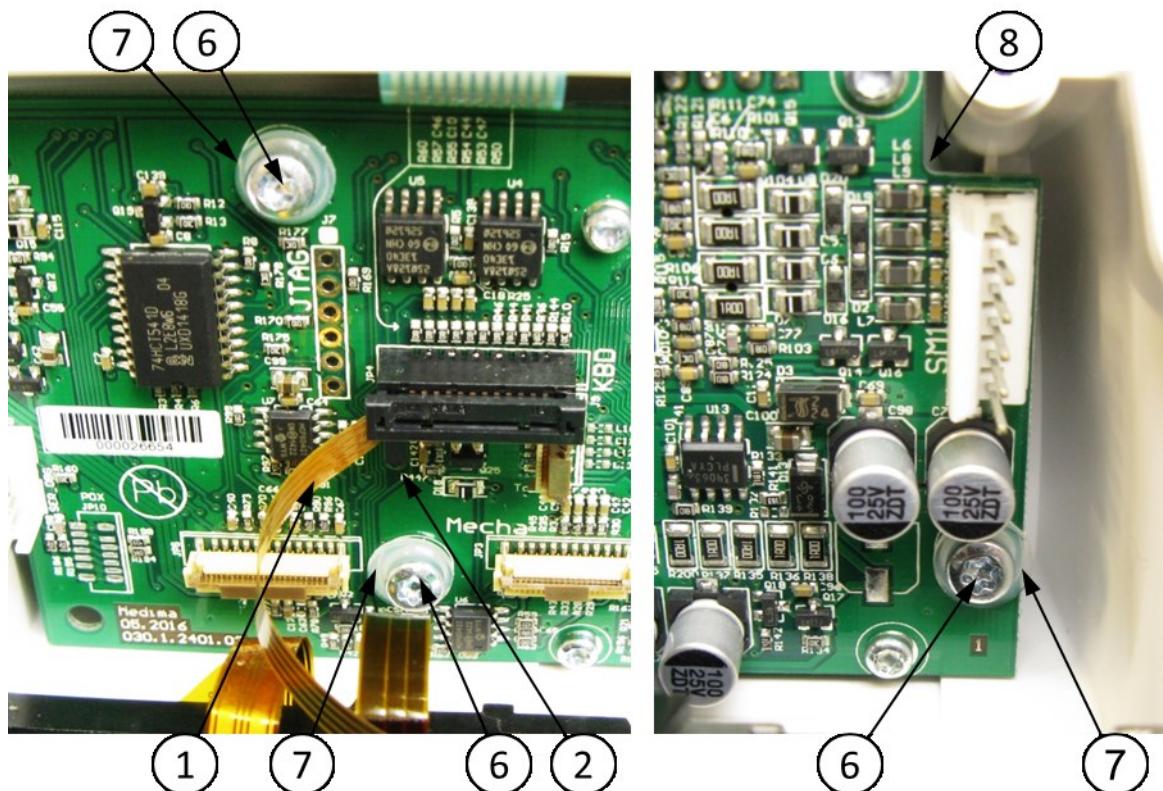


Fig. 40 Fixing the CPU board set to the Front case

4. Remove the **CPU board set (8)** from the **Font case (9)** (see Fig. 39).

13.6.2 CPU board set installation

1. Drag the **Touch-screen ribbon (1)** through the **Hole (2)** in the **CPU board set (3)** as shown in **Fig. 40**.
2. Insert the **CPU board set (8)** into the **Front case (9)** as shown in **Fig. 39**.
3. Using the **TA-41** torque screwdriver with **TA-42** bit screw in three **3x8 screws for plastics (6)** with **3,2x8x0,8 polyamide washers (7)** as shown in **Fig. 40**.
4. Connect the **Touch-screen ribbon (1)** and **Keyboard ribbon (2)** as shown in **Fig. 40**.
5. Connect the **Stem end extension FFC ribbon (3)**, **Drive mechanism FFC ribbon (4)** and **Engine plug (5)** as shown in **Fig. 39**.
6. Assemble the **Syringe pump** as described in chapter **13.5** (p. 99).

13.6.3 Display board removal (M-030.9.2409.xx) ([video](#))

Note!!!

Try not to touch the surface of display. Do not put the Display board with display towards the surface of the ground on which the assembly is carried out.

1. Remove the **CPU board set** as described in chapter **13.6.1** (p. 100).
2. Disconnect the **Display board FFC ribbon** as shown in **Fig. 41**.
3. Using the **TB-3** screwdriver unscrew four **2,5x16 screws for plastics (2)** as shown in **Fig. 41**.
4. Remove **Display board (1)** and four **Plastic sleeves (3)** in the direction indicated by red arrows in **Fig. 41**.

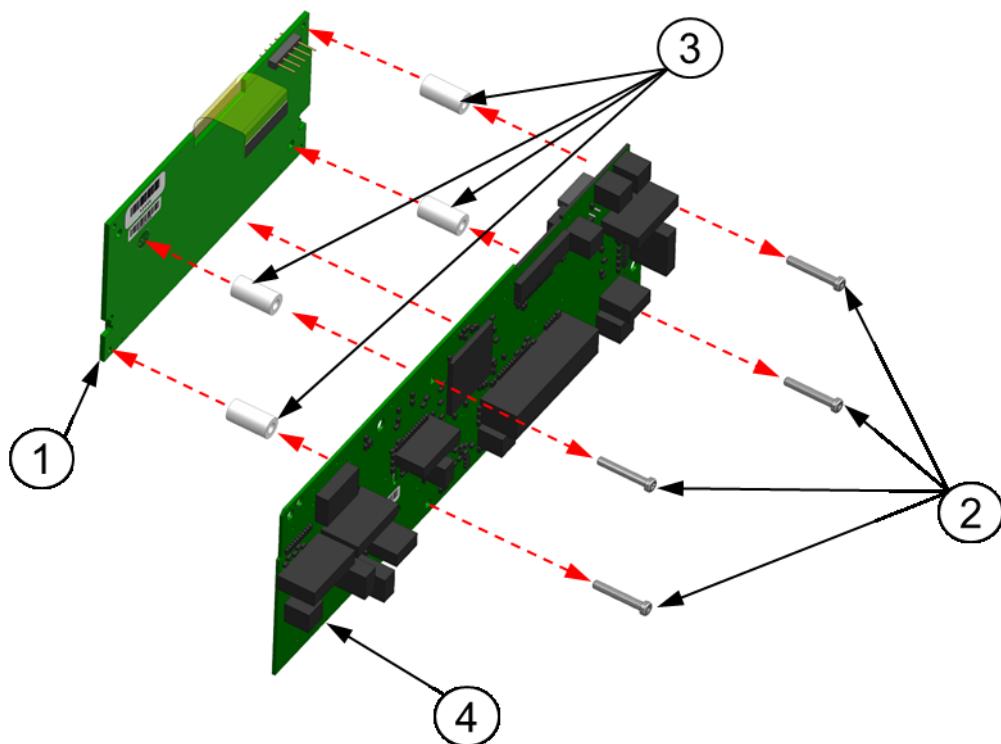


Fig. 41 Display board removal/installation

13.6.4 Display board installation (M-030.9.2409.xx) ([video](#))

1. Put four **2,5x16 screws for plastics (2)** through the **CPU board (4)** and four **Plastic sleeves (3)** and then using the **TA-41** torque screwdriver with the **TA-44** bit screw in four **2,5x16 screws for plastics (2)** opposite to the direction indicated by red arrow in **Fig. 41**.
2. Plug the **Display board (1)** FFC ribbon into the **CPU board (4)**.
3. Install the **CPU board set** as described in chapter **13.6.2** (p. 102).

13.7 PUMP STEM END REPLACEMENT (M-020.9.1085.XX)

13.7.1 Pump stem end removal ([video](#))

1. Disassemble the **Syringe pump** as described in chapter 13.4 (p. 99).
2. By rotating the **Tachometer disc** (1) move the **Pump stem end** (2) to the position shown in Fig. 42 – the **Shutter pivot** (3) placed on the **Guide** (4) should be seen on the left end of the oblong **Revision window** (5) of the mechanism.

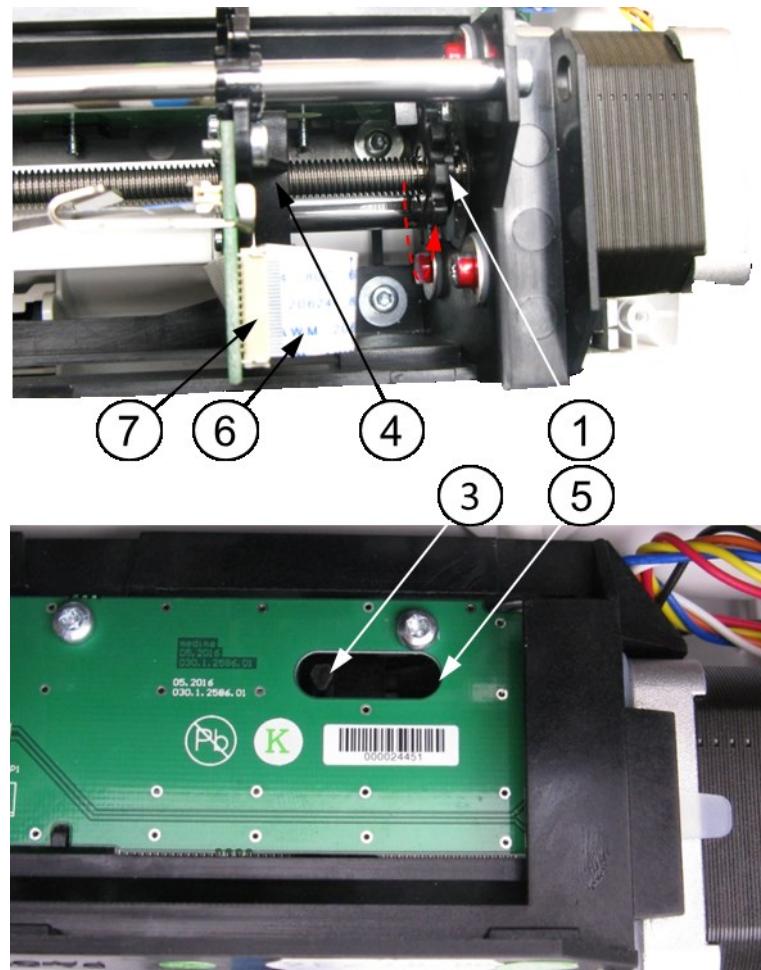


Fig. 42 Proper Pump stem end position for disassembly.

3. Disconnect the **Pump stem end FFC cable** (6) from the **Socket** (7) (Fig. 42).
4. Using the **TB-1** screwdriver unscrew the **Screw** (8) (Fig. 43) rotating it by 3÷3,5 revolutions.

Note!!!

Unscrewing the Screw (8) more than 3÷3,5 revolutions may cause permanent damage to the Guide (4).

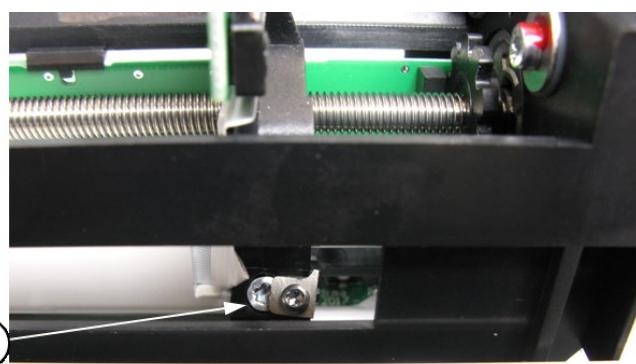


Fig. 43 Pump stem end fixing screw

5. Pull out the **Pump stem end** (2) from the **Guide** (4).

6. Push **Pump stem end axle (10)** towards the **Front case (11)** and keeping its strained position remove the **Pump stem end axle socket (9)** as shown in Fig. 44.
7. Pull out the **Pump stem end axle (10)** from the **Front case (11)** as shown in Fig. 44.

Note!!!

After pulling out the Pump stem end axle place it on paper towel and put it away in a place isolated from dust and other impurities.

8. Pull out the **Pump stem end (2)** from the **Front case (11)** as shown in Fig. 44.

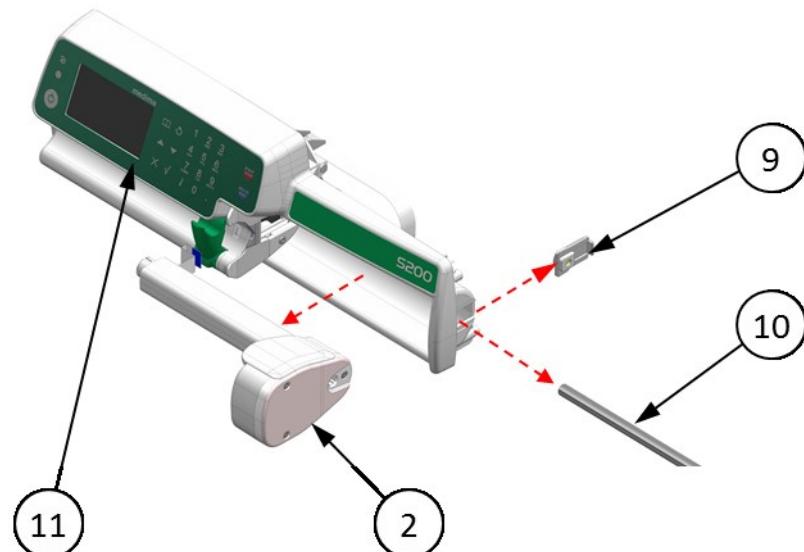


Fig. 44 Pump stem end removal/installation

13.7.2 Pump stem end installation ([video](#))

1. Insert the **Pump stem end (2)** to the **Front case (11)** into the direction contrary to the red arrow in the Fig. 44.

Note!!!

Make sure the Pump stem end axle bushing is placed as shown in Fig. 44. Otherwise place the part correctly into its socket in the Mechanism using the TA-15 Tweezers.

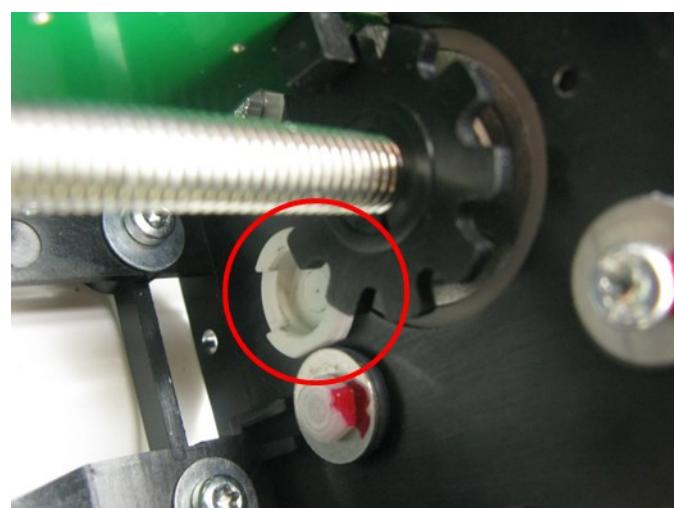


Fig. 45 Pump stem end axle bushing correct position

2. Insert the **Pump stem end axle (10)** to the **Pump stem end (2)** placed in the **Front case (11)** into the direction contrary to the red arrow in the Fig. 44.

3. Insert **Pump stem end axle socket** (9) into the direction contrary to the red arrow in the **Fig. 44** until it latches with a „click” sound.
4. Insert the **Pump stem end** (2) to the **Guide** (4) until it latches with a „click” sound.
5. Place the **Pump stem end** (2) on the edge of a workshop table (**Stem end** upwards, **Stem body** downwards). Using the **TA-40** torque screwdriver with the **TA-42** bit, screw in **Screw** (8) as shown in **Fig. 43**.
6. Using the **TA-63** feeler gauge measure the gap between the **Guide** (4) and the **Pump stem end** (2). If measured gap is greater than 0,1 mm, repeat the steps from the two previous points.
7. Plug the **Pump stem end FFC cable** (6) to the **Socket** (7) as shown in **Fig. 42**.
8. Assemble the **Syringe pump** as described in chapter 13.5 (p. 99).

13.8 DRIVE MECHANISM REPLACEMENT (M-020.9.1076.XX)

13.8.1 Drive mechanism removal ([video](#))

1. Remove the **Pump stem end** as described in chapter 13.7.1 (p. 103).
2. Disconnect the following cables: **Potentiometer foil** (4), **Microswitches foil** (5), **FFC ribbon 0,5x24x300** (6), **FFC ribbon 0,5x20x75** (7) and **Motor power plug** (8) as shown in **Fig. 47**.
3. Using the **TB-1** screwdriver unscrew two **3x10** screws for plastic (9) with **3,2x10x0,5** metal washers (10).
4. Using the **TA-5** screwdriver unscrew two **M3x12** screws (1) with **2,5x1** o-rings (2). Remove the part **Syringe flange clamp** (3).

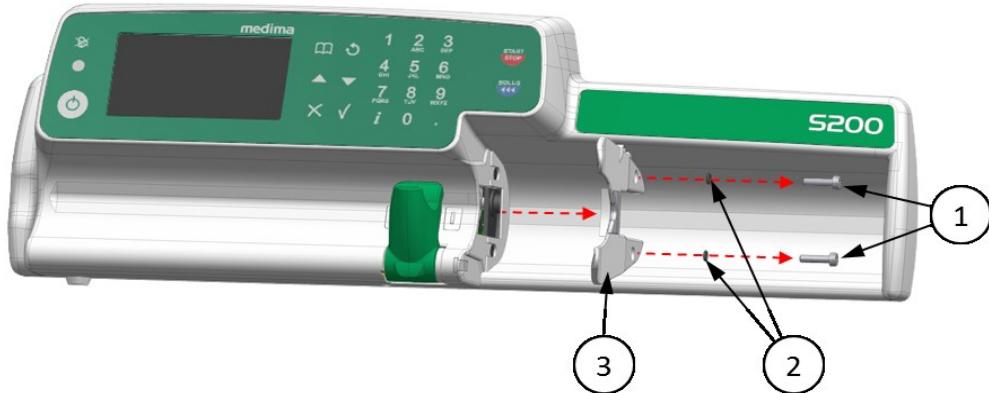


Fig. 46 Syringe flange clamp removal/installation

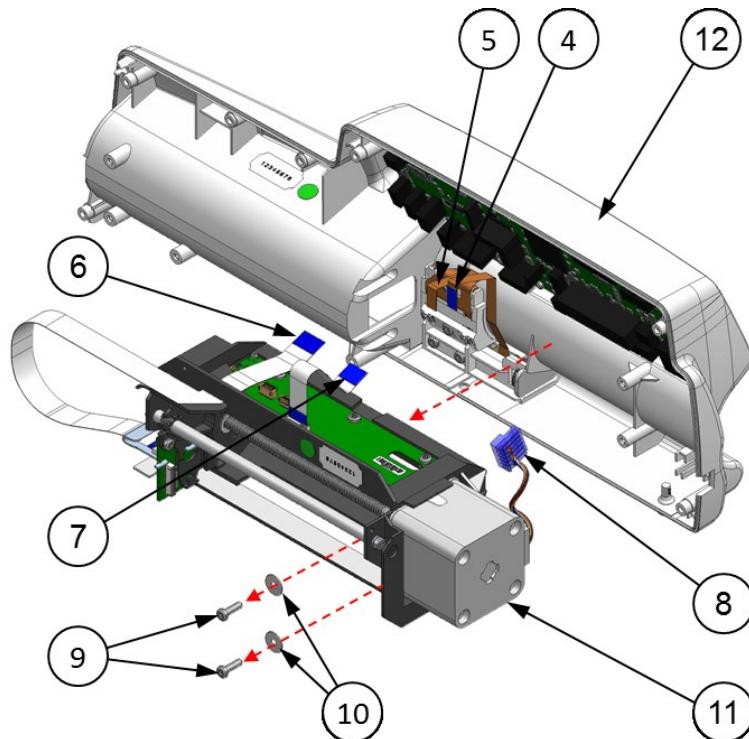


Fig. 47 Drive mechanism removal/installation

- Remove the Drive mechanism (11) from the Front case (12) as shown in Fig. 47.

13.8.2 Drive mechanism installation ([video](#))

- Insert the Drive mechanism (11) to the Front case (12) as shown in Fig. 47.
- Holding the Drive mechanism (11) together with the Front case (12) screw two M3x12 screws (1) with two 2,5x1 o-rings (2) and Syringe flange clamp (3) as shown in Fig. 46.
- Using the TA-41 screwdriver with a bit TA-42 and the tool TA-48 screw two screws 3x10 (9) with 3,2x10x0,5 metal washers (10) according to the following procedure:
 - insert TA-48 below one of the Washers 3,2x10x0,5 (10) as shown in Fig. 48, then screw the 3x10 screw for plastic (9);
 - slowly proceed with unscrewing the 3x10 screw for plastic (9) simultaneously pulling the TA-48 as shown in Fig. 49. Stop the unscrewing process when the TA-48 is completely drawn;
 - repeat the above mentioned procedure with the second 3x10 screw for plastic (9).

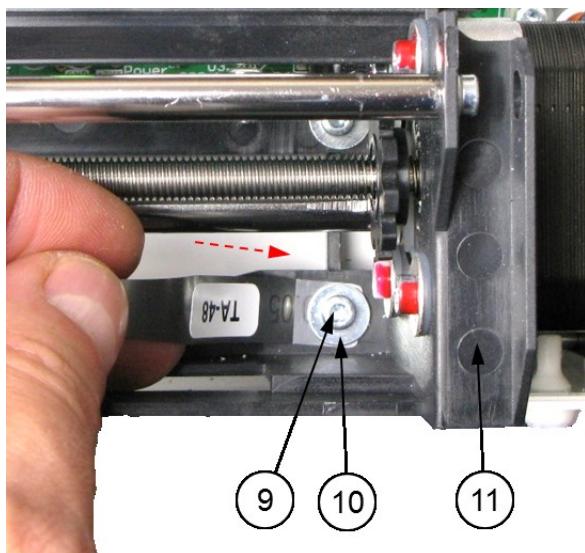


Fig. 48 Inserting the TA-48 tool

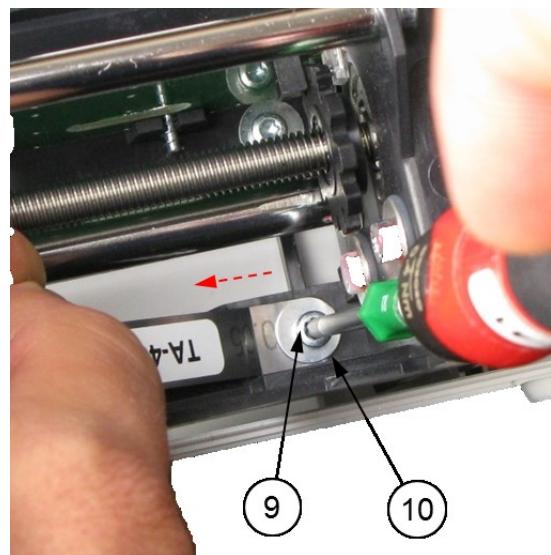


Fig. 49 Unscrewing/screwing drive mechanism

- Connect the following cables to their sockets: Potentiometer foil (4), Microswitches foil (5), FFC ribbon 0,5x24x300 (6), FFC ribbon 0,5x20x75 (7) and Motor power plug (8).
- Install the Pump stem end as described in chapter 13.7.1 (p. 103).

13.9 DRIVE MECHANISM BOARD REPLACEMENT (M-030.9.2587.XX).

13.9.1 Drive mechanism board removal ([video](#))

- Disassemble the Syringe pump as described in chapter 13.4 (p. 99).
- Using the TB-1 screwdriver unscrew three 3x6 screws for plastic (1) as shown in Fig. 50.
- Remove the Drive mechanism board (2) in the direction indicated by red arrows in Fig. 50.

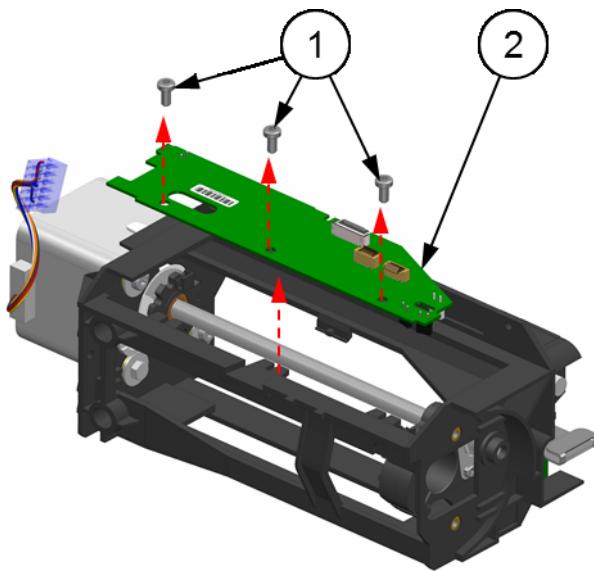


Fig. 50 Drive mechanism board removal/installation

13.9.2 Drive mechanism board installation ([video](#))

1. Insert the **Drive mechanism board (2)** opposite to the direction indicated by the red arrow in Fig. 50.
2. Using the **TB-1** screwdriver screw three **3x6 screws for plastic (1)** until the screws are fully screwed and first mechanical resistance occurs (Fig. 50).
3. Assemble the **Syringe pump** as described in chapter 13.5 (p. 99).

13.10 DRIVE MECHANISM DIRECT BOARD REPLACEMENT (S-030.9.4208.XX)

13.10.1 Drive mechanism direct board removal ([video](#))

1. Disassembly the **Syringe pump** as described in the chapter 13.4 (p. 99).
2. By rotating the **Tachometer disc (1)** move the **Guide (2)** to a distance **20÷30 mm** from the wall of the **Drive mechanism** as shown in Fig. 51.

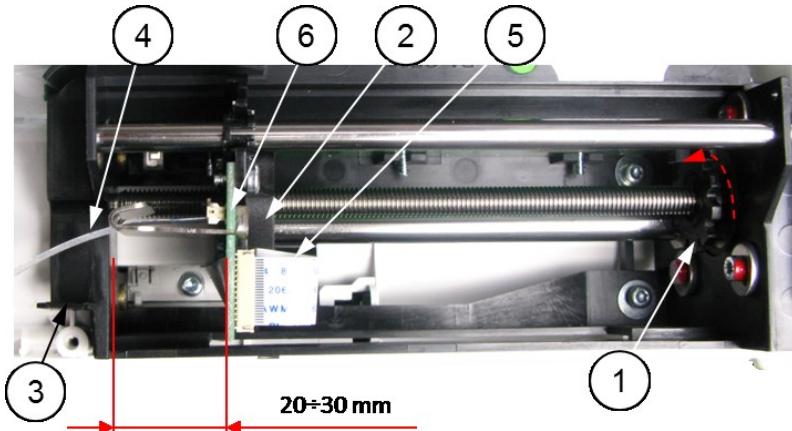


Fig. 51 Position of the Drive mechanism direct board for removal/installation

3. Disconnect the **FFC ribbon 0,5x24x300 (4)** and **FFC ribbon 0,5x20x75 (5)** from their sockets in the **Drive mechanism direct board (6)** (Fig. 51).
4. Using the **TB-1** screwdriver unscrew one **3x6 screw for plastic (7)** as shown in Fig. 52.

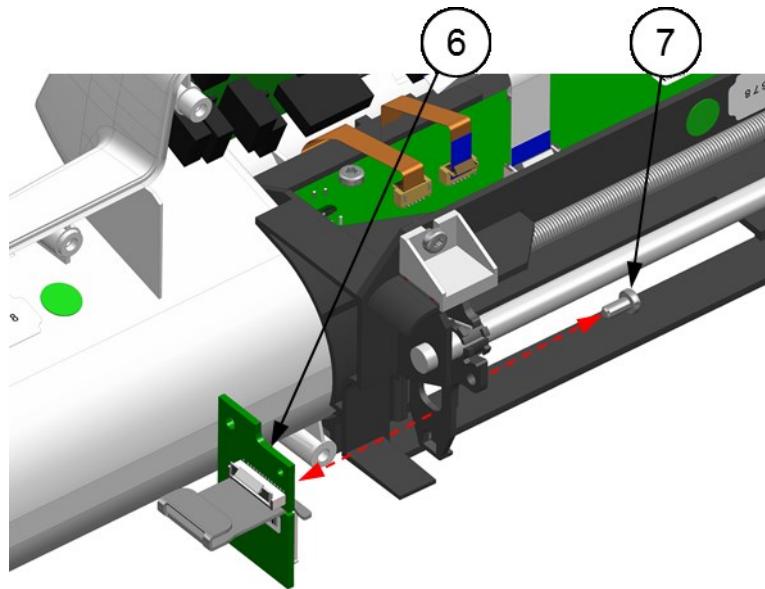


Fig. 52 Drive mechanism direct board removal/installation

5. Using Flat-nosed pliers TB-6 remove the **Drive mechanism direct board (6)** by drawing it in from the pin on the **Guide (2)** as shown in **Fig. 52**.

13.10.2 Drive mechanism direct board installation ([video](#))

1. Using **TB-6** flat-nosed pliers press the **Drive mechanism direct board (6)** on the **Pin (8)** on the **Guide (2)**. Perform the assembly opposite to the direction indicated by the red arrow in **Fig. 52**.
2. Using the **TA-41** screwdriver with the **TA-42** bit screw one **3x6 screw for plastic (7)**.
3. Plug the **FFC ribbon 0,5x24x300 (4)** and **FFC ribbon 0,5x20x75 (5)** to their sockets in the **Drive mechanism direct board (6)** (**Fig. 53**).

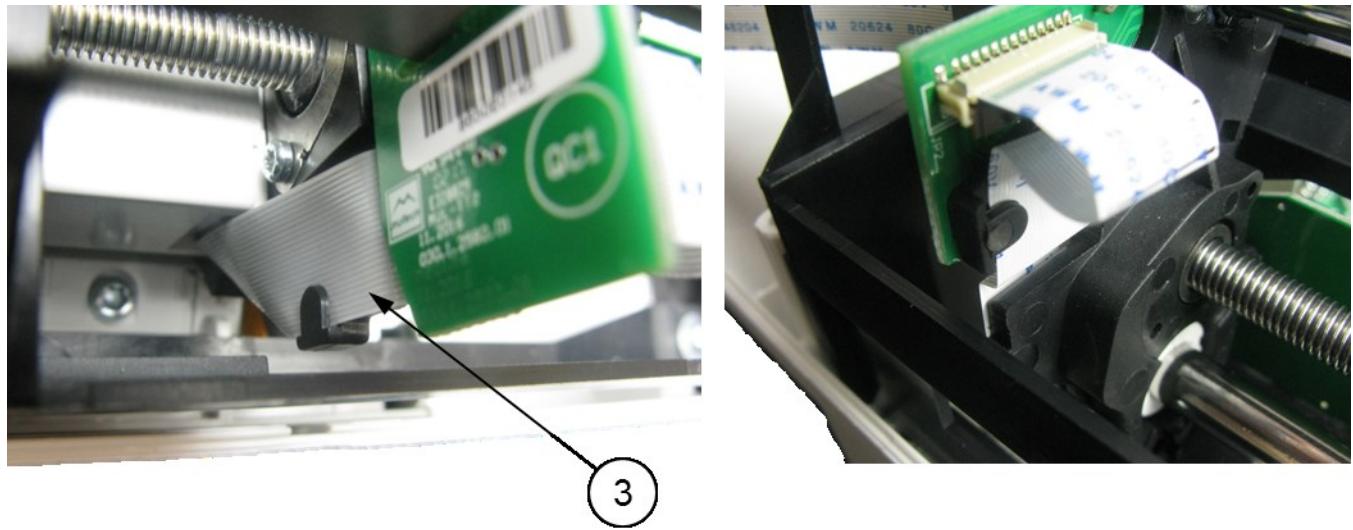


Fig. 53 FFC ribbon 0,5x24x300 connection

4. Assembly the **Syringe pump** as described in chapter **13.5** (p. 99).

13.11 FRONT CASE REPLACEMENT (S-020.9.4011.XX)

13.11.1 Front case disassembly

1. Remove the **Drive mechanism** as described in chapter **13.8.1** (p. 105).
2. Remove the **CPU boards set** as described in chapter **13.6.1** (p. 100).

13.11.2 Front case assembly

1. Install the **CPU board set** as described in chapter **13.6.2** (p. 102).
2. Install the **Drive mechanism** as described in chapter **13.8.2** (p. 106).

13.12 POTENTIOMETER REPLACEMENT (M-020.9.1029.XX)

13.12.1 Potentiometer removal ([video](#))

1. Remove **Drive mechanism** as described in chapter **13.8.1** (p. 105).
2. By using the **TB-1** unscrew two **M3x8** screws (1) from an **Axle bearing fixture** (2) detail. In the next step, by using a **TB-6** flat-nosed pliers, remove the **Axle bearing fixture** (2) detail as shown in **Fig. 54**.

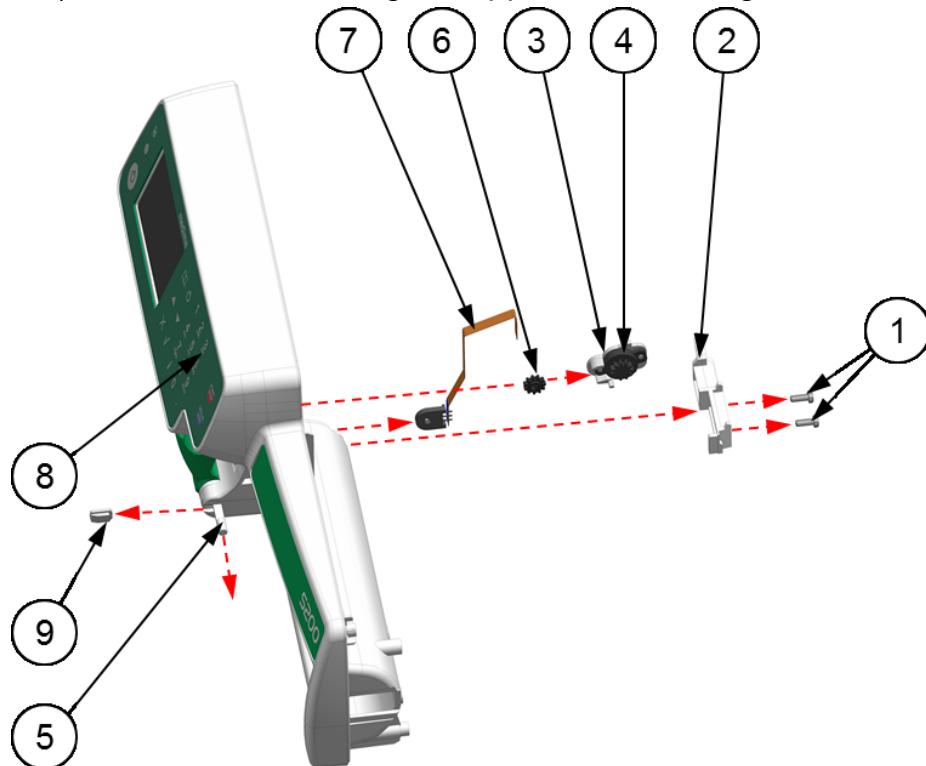


Fig. 54 Potentiometer removal/installation

3. Using **TB-6** flat-nosed pliers, remove a **Rotary damper case** (3) together with a **Damper** (4) as shown in **Fig. 54**.
4. Using **TA-15** curved tweezers remove the **Gearwheel** (6) from the **Syringe clamp axle** (5) as shown in **Fig. 54**.
5. Using **TB-5** screwdriver, remove assembly glue from the **Potentiometer** (7).
6. Using **TB-5** screwdriver remove the **Axle socket plug** (9) detail from a **Front case** (8) as shown in **Fig. 54**.
7. Using **TA-5** torx screwdriver, remove the **Syringe clamp axle** (5) as shown in **Fig. 54**.
8. Using **TB-6** flat-nosed pliers hold part of the **Syringe clamp axle** (5) detail sticking out of the **Front case** (8) and carefully pull it over observing the position of its other end.

Note!!!

Pulling should be stopped when the Syringe clamp axle (5) has got out of the Potentiometer (7) socket.

9. By using **TB-6** flat-nosed pliers hold the **Potentiometer** (7) and pull it out of the socket from the **Front case** (8).

13.12.2 Potentiometer installation ([video](#))

1. Using the **TA-49** potentiometer adjuster, set the **Potentiometer** (7) in the correct position as indicated on **Fig. 55**.

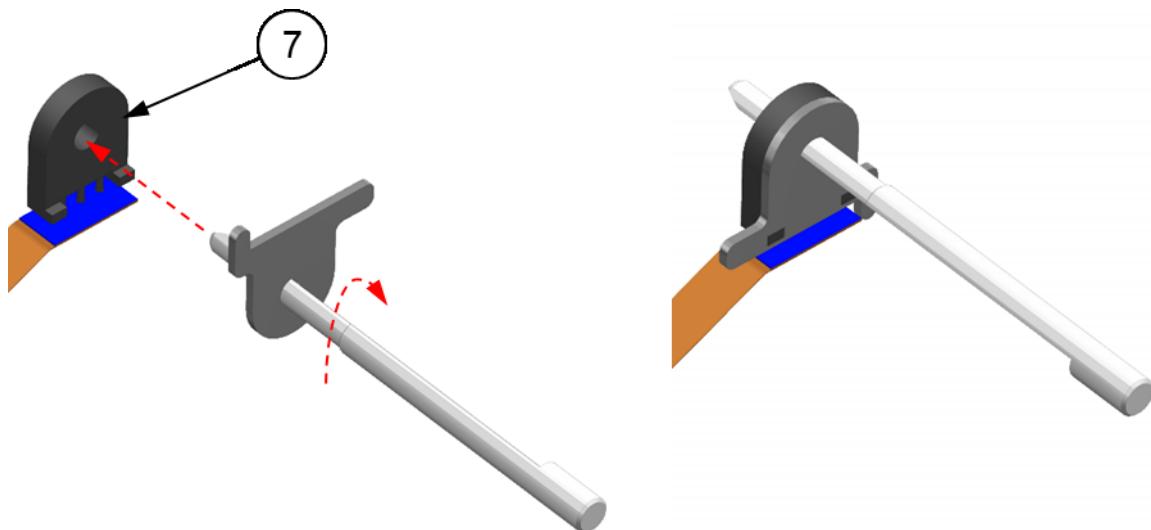


Fig. 55 Potentiometer adjusting

2. Using a sheet of paper towel soaked with **TB-11** alcohol clean the socket of the **Potentiometer (7)** in the **Front case (8)**.
3. By watching not to change the **Potentiometer (7)** socket position, slide the **Potentiometer (7)** detail in the socket in the **Front case (8)** opposite to the direction indicated by the red arrow in **Fig. 54**.
4. By using the **TA-53** special device for potentiometer assembly press the **Potentiometer (7)** in the socket in the **Front case (8)** opposite to the direction indicated by the red arrow in **Fig. 54**.
5. By using the **TB-1** screwdriver, press the **Syringe clamp axle (5)** detail in to the mechanical end opposite to the direction indicated by the red arrow in **Fig. 54**.
6. In the **Front case (8)** socket, place the **Axle socket plug (9)** opposite to the direction indicated by the red arrow in **Fig. 54**.
7. Apply **TB-10** structural adhesive on the lower part of the **Potentiometer (7)** in the quantity indicated on the **Fig. 56**.

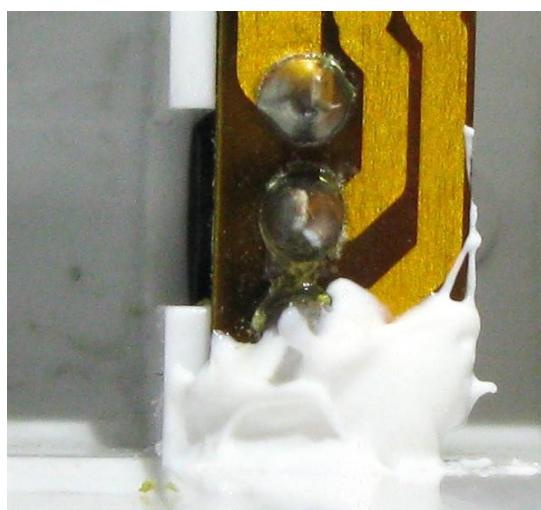


Fig. 56 Correct structural adhesive quantity

8. Using the **TA-15** curved tweezers place the **Gearwheel (6)** detail on the end of the **Syringe clamp axle (5)** detail, and then slide it on the **Axle (5)**.
9. Piece the **Rotary damper case (3)** together with the **Damper (4)** opposite to the direction indicated by the red arrow in **Fig. 54**.
10. In the **Front case (8)** place the **Axle bearing fixture detail (2)** opposite to the direction indicated by the red arrow in **Fig. 54**.
11. By using the **TA-41** screwdriver with the **TA-42** replaceable shaft screw two **M3x8 (1)** screws, fastening **Axle bearing fixture (2)** to the **Front case (8)**.
12. Install the **Drive mechanism set** as described in chapter **13.8.2** (p. 106).

13.13 POWER SUPPLY BOARD SET REPLACEMENT (M-030.9.2607.XX)

13.13.1 Power supply board set removal ([video](#))

1. Disassemble of the **Syringe pump** as described in chapter 13.4 (p. 99).
2. Using the **TA-15** tweezers disconnect the **Battery controller tape (2)**. Using the **TB-5** flat-nosed pliers disconnect the **Buzzer (3)** and **Speaker (1)** shown in Fig. 57.

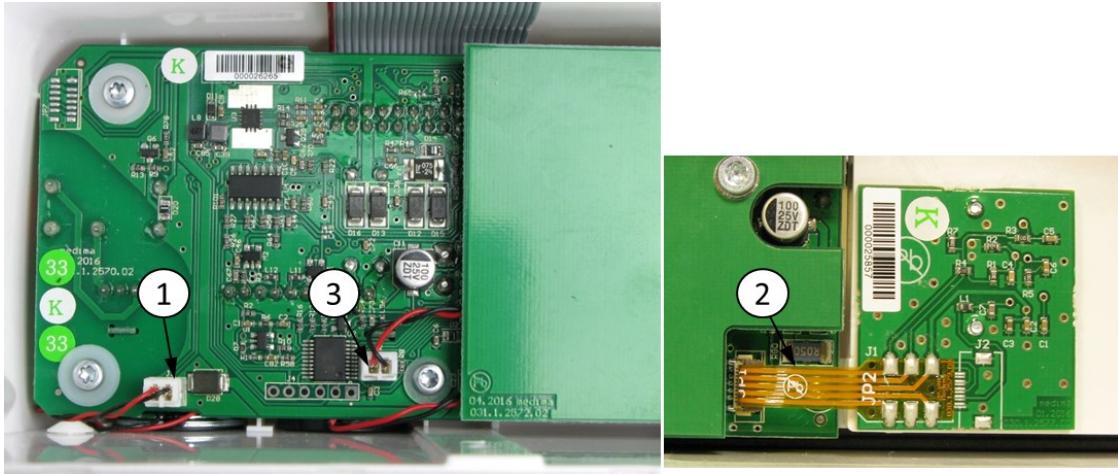


Fig. 57 Battery controller tape, Buzzer and Speaker disconnection/connection

3. By using the **TB-1** torx screwdriver unscrew three **3x10 screws for plastic (4)** with **2,7x10x1 polyamide washers (5)** and two **3x6 screws for plastic (6)** located in the battery chamber (Fig. 58).
4. Tear the **IDE tape (7)** off being fixed to the **Back case (8)** by the **Two-sided foam tape (11)**.

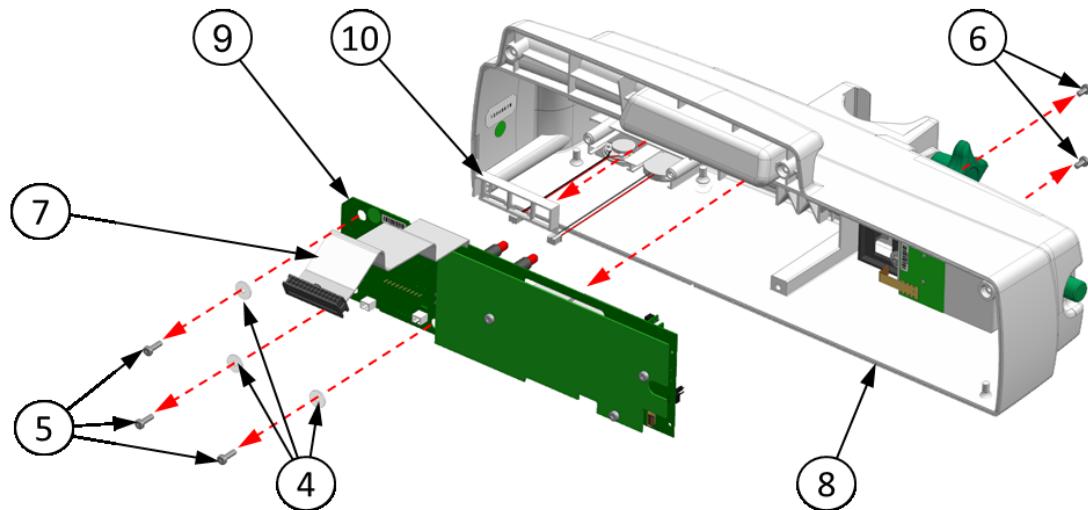


Fig. 58 Power supply board set removal/installation

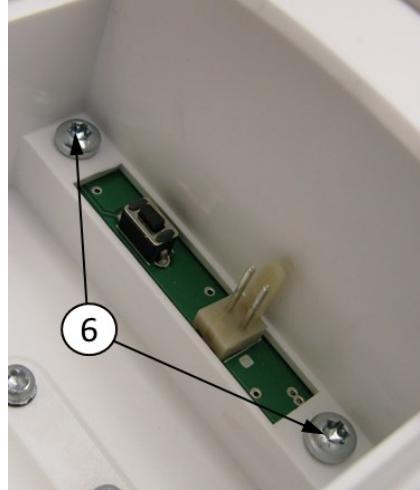


Fig. 59 Screws of the power supply board set – view from the battery side

5. Pull out the **Power supply boards set (9)** and unplug the **AC cord (12)** (Fig. 60).

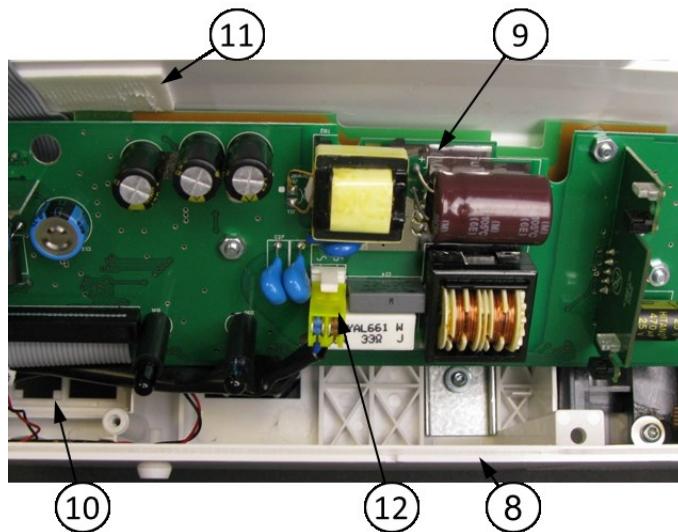


Fig. 60 Power supply board set connection with the Back case

13.13.2 Power supply board set installation ([video](#))

1. Connect the **AC cord plug (12)** and place the **Power supply boards set (9)** inside of the **Back case (8)** (Fig. 60).

Note!!!

Place the AC cord between the distance sleeves of the upper wall of the Back case as shown in Fig. 61. Before fastening the Power supply boards set, the Speaker set's and Buzzer's cables endings with plugs must be pulled out of the case!

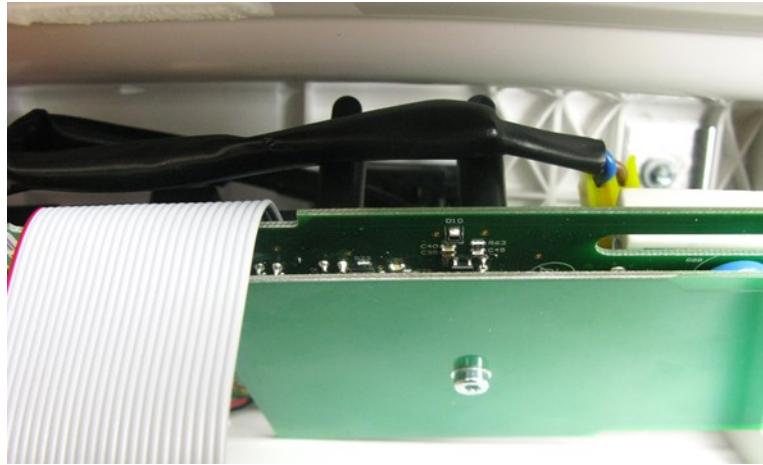


Fig. 61 Placing the AC cord

2. Using the **TA-41** torque screwdriver with the **TA-42** bit, screw three **3x10 screws for plastic (5)** together with **2,7x10x1 polyamide washers (4)** and two **3x6 screws for plastic (6)** located in the battery chamber (**Fig. 59**).
3. Stick the **IDE tape (7)** to the **Two-sided foam tape (11)**.
4. Connect the **Speaker set (1)**, the **Battery controller (2)** and the **Buzzer (3)** to respective sockets on the power supply boards set.

Note!!!

The Buzzer and Speaker cables place as shown in Fig. 57.

5. Assemble the **Syringe pump** as described in chapter **13.5** (p. 99).

13.14 BATTERY BOARD REPLACEMENT (M-030.9.2578.XX)

13.14.1 Battery board removal ([video](#))

1. Disassemble the **Syringe pump** as described in chapter **13.4** (p. 99).
2. Using the **TA-15** tweezers disconnect the **Battery controller tape (2)** from the socket in the **Power supply boards set (Fig. 57)**.
3. In the battery chamber in the **Back case (4)** unscrew two **2,5x6 screws for plastic (1)** with **1,5x1 o-rings (2)** by using **TB-2** torx screwdriver as shown in **Fig. 62**.

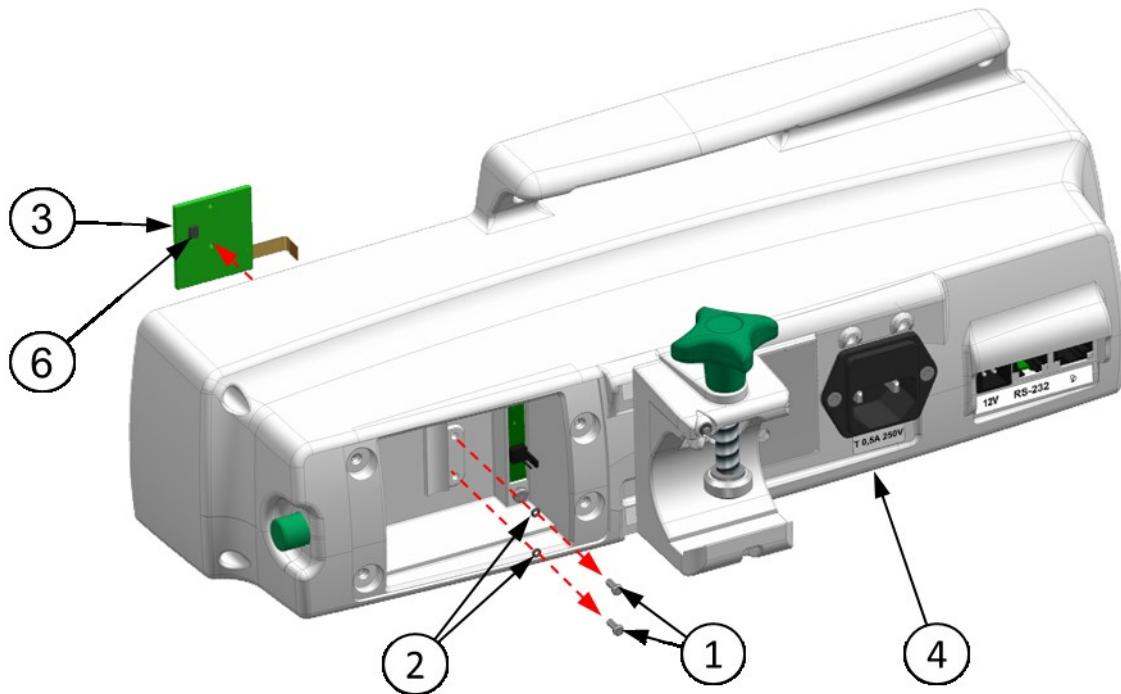


Fig. 62 Battery board removal/installation

4. Remove the **Battery board (3)** from the **Back case (4)**.
5. Clean the **TB-8** thermoconductive paste out of the **Battery controller recess (5)** showed in the **Fig. 63** and out of the **Temperature sensor (6)** showed in **Fig. 62**.

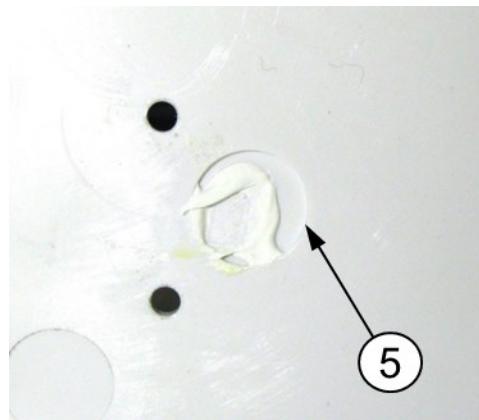


Fig. 63 Thermoconductive tape removal

13.14.2 Battery board installation ([video](#))

1. Apply a little of the **TB-8** thermoconductive paste in the **Battery controller recess (5)** as shown in **Fig. 64**.

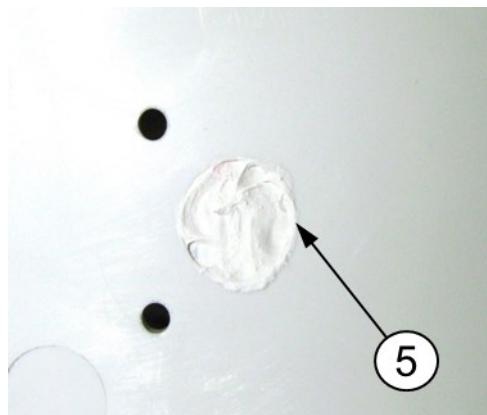


Fig. 64 The amount of the thermoconductive paste on the battery controller

2. Place the **Battery board (3)** in the **Back case (4)** and place the **Temperature sensor (6)** in the **Battery controller recess (5)** shown in **Fig. 63** opposite to the direction indicated by the red arrow in **Fig. 62**. Using the **TB2** screwdriver (**Fig. 65**) and protecting the **Battery board (3)** from falling out, screw two **2,5x6 screws for plastic (1)** together with **1,5x1 o-rings (2)** until O-rings get deformed as shown in **Fig. 65**.



Fig. 65 O-rings deformation

3. Connect the **Battery controller tape (2)** to the socket in the **Power supply boards set (Fig. 57)**.
4. Assemble the **Syringe pump** as described in chapter **13.5** (p. 99).

13.15 MICROSWITCHES FOIL (M-030.9.2589.XX)

13.15.1 Microswitches foil removal ([video](#))

1. Remove the **Drive mechanism** as described in the chapter **13.8.1** (p. 105).
2. Using the **TB-1** screwdriver unscrew four **3x8 screws for plastic (2)**.
3. Using the flat-nosed pliers **TB-5** remove the **Axle bearings clamp (3)** as shown in **Fig. 66**.
4. Remove the following parts: the **Microswitches case (4)** with the **Right microswitch button (5)**, **Left microswitch button (6)** and the **Buttons seal (7)**.

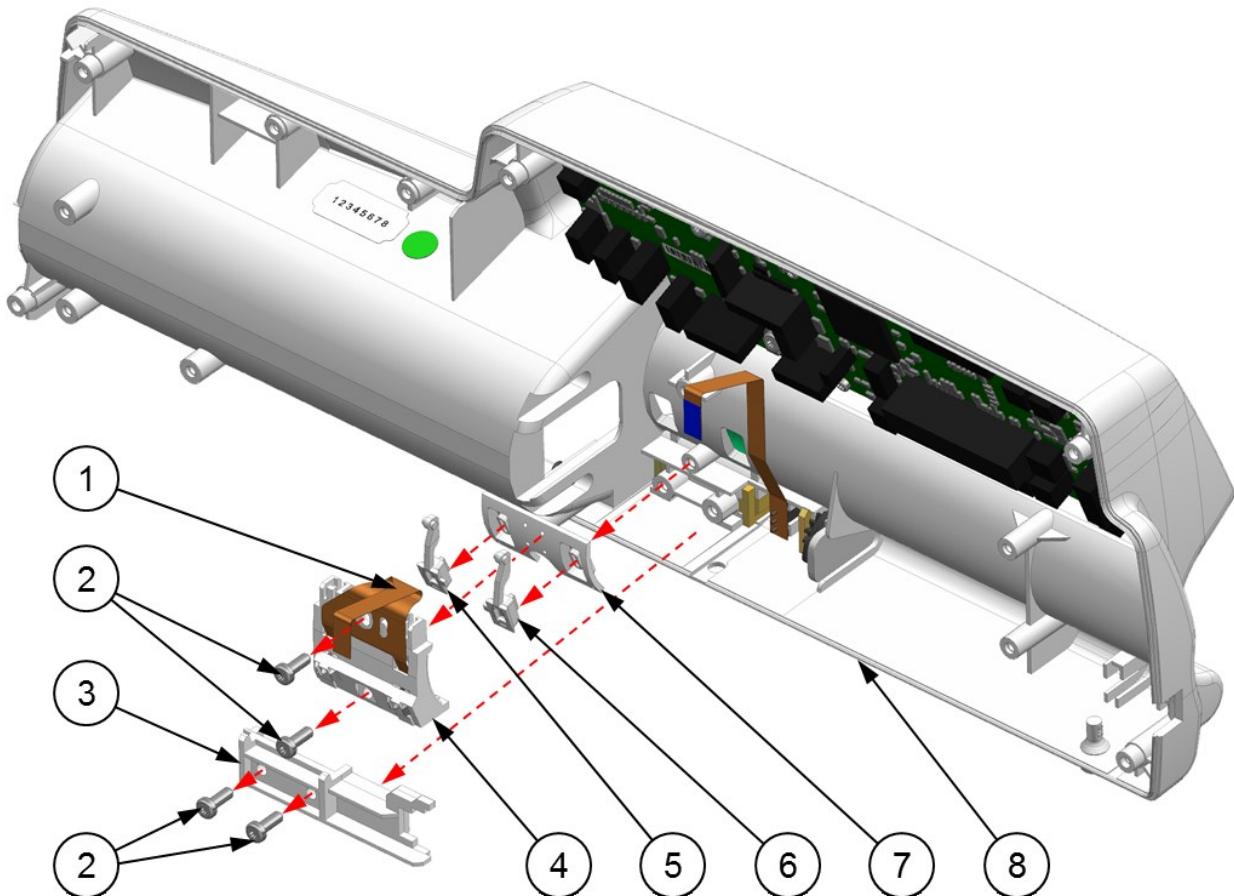


Fig. 66 Microswitches Foil removal/installation

5. From the **Microswitches case (4)** pull out the **Microswitches Foil (1)** according to the red arrow shown in the **Fig. 67**.



Fig. 67 Microswitches Foil disassembly from the Microswitches case

13.15.2 Microswitches foil installation ([video](#))

1. Insert the **Microswitches Foil (1)** to the **Microswitches case (4)** pull out the **Microswitches Foil (1)** opposite to the direction indicated by the red arrow in **Fig. 67**.
2. Insert the following parts to the **Microswitches case (4)**: the **Right microswitch button (5)**, **Left microswitch button (6)** and the **Buttons seal (7)** according to the orientation and red arrows directions from the **Fig. 68**.
3. The set assembled in the above point insert into the **Front case (8)** and using the screwdriver **TA-41** with the bit **TA-42** screw it with two **3x8 screws for plastic (2)** (**Fig. 66**).
4. Insert the **Axle bearings clamp (3)** screwing it with two **3x8 screws for plastic (2)** into the **Front case (8)** using the screwdriver **TA-41** with the bit **TA-42** (**Fig. 66**).
5. Install the **Drive mechanism** as described in the chapter **13.8.2** (p. 106).

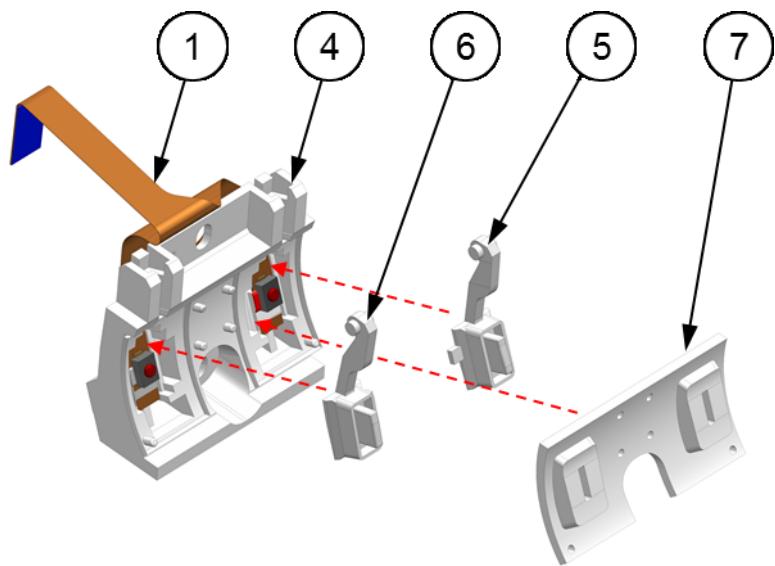


Fig. 68 Assembly of the syringe detection buttons

13.16 ROTATABLE POLE CLAMP SET REPLACEMENT (M-021.9.4061.XX)

13.16.1 Rotatable pole clamp set removal

1. Using a wrench TA-3 (6) unscrew the **Pole clamp screw** (5) as shown in Fig. 69.
2. Remove part **Rotatable pole clamp** (3) from part **Clamp base** (1) in the direction indicated by the red arrows in Fig. 69.

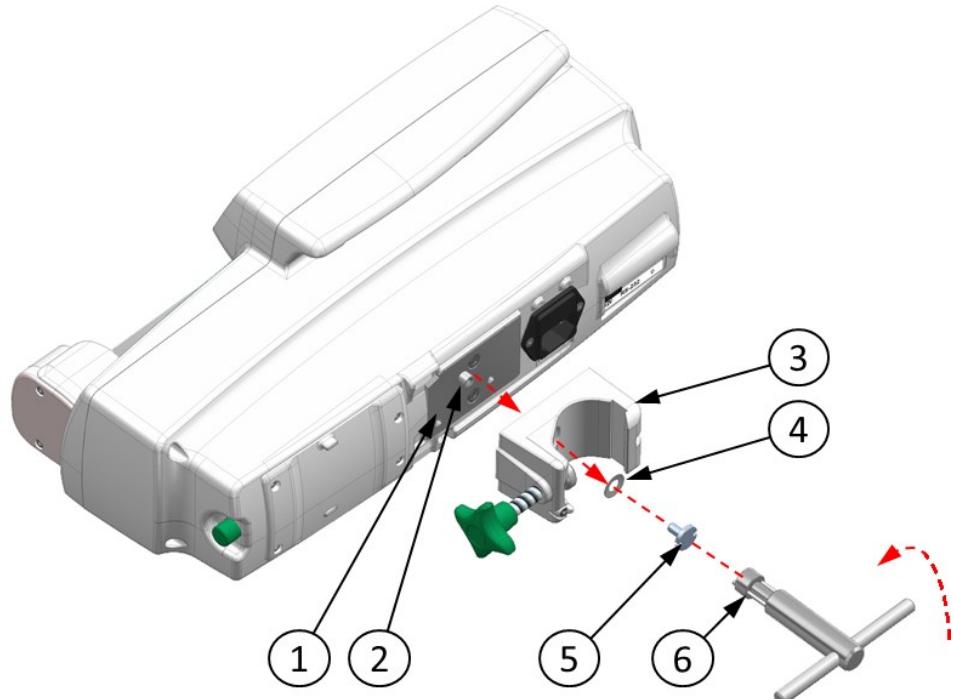


Fig. 69 Rotatable pole clamp removal/installation

13.16.2 Rotatable pole clamp set installation

1. Apply a small amount of thread adhesive TB-7 to the thread in the hole of part **Clamp base** (7) as shown in Fig. 70.

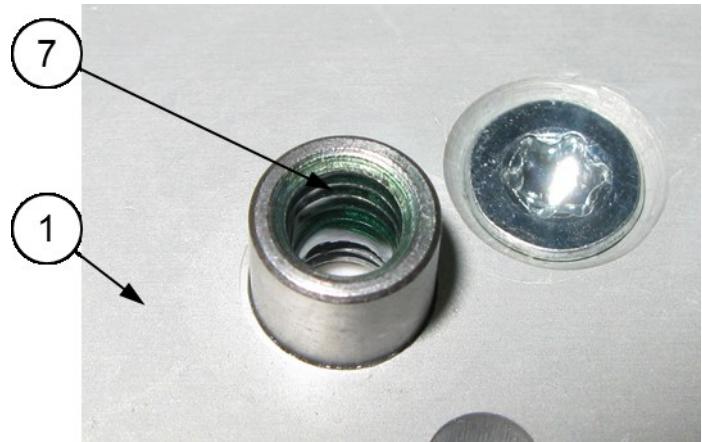
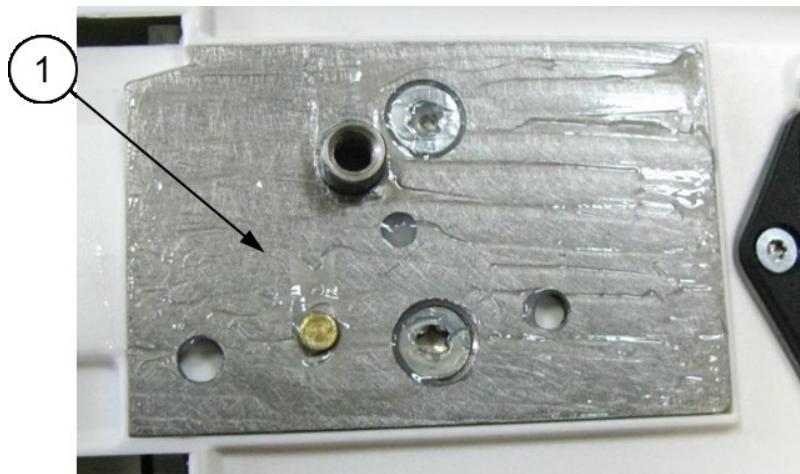


Fig. 70 Amount of thread adhesive TB-7

2. Apply a thin layer of the technical vaseline **TB-9** to the surface of **Clamp base (1)** which cooperates with the **Rotatable pole clamp (3)** as shown in **Fig. 71**.



3. Fig. 71 Proper layer of vaseline

4. Install the part **Rotatable pole clamp (3)** on the part **Clamp base (1)** against the direction marked with the **red arrows** shown in **Fig. 69**.
5. Using the wrench **TA-3 (6)** screw in the **Pole clamp screw (5)** together with **Plate spring (4)** by torque that allows it to be rotated comfortably (**Fig. 69**).

13.16.3 Pole clamp knob removal (M-001.1.0695.xx) ([video](#))

Note!!!

When replacing the Pole clamp knob **do not remove** the Rotatable pole clamp set from Back case.

1. Unscrew the part **Pole clamp screw (1)** from **Rotatable pole clamp (4)** opposite to the direction indicated by the red arrow in **Fig. 73**.

13.16.4 Pole clamp knob installation (M-001.1.0695.xx) ([video](#))

1. Screw the **Pole clamp screw (1)** in a distance of 14÷16 mm in the **Rotatable pole clamp (3)** as shown in **Fig. 72**.

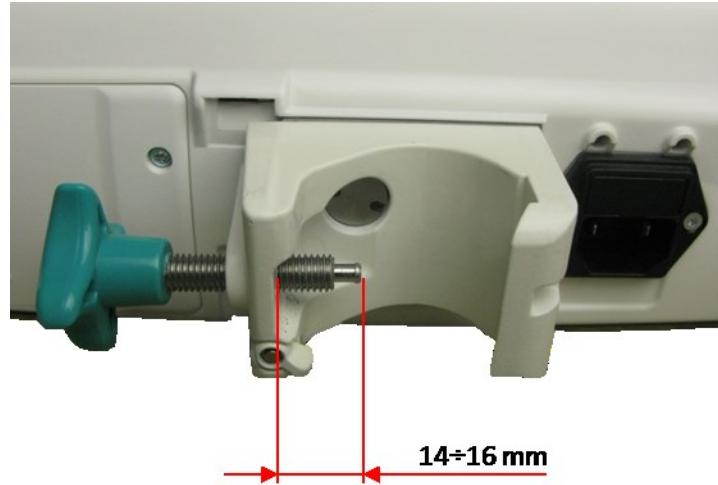


Fig. 72 Screwing the Pole clamp screw

2. Using the **TA-15** tweezers put the **4,3x12x1 Washer (2)** on the plug of part **Pole clamp screw (1)** (see Fig. 73).
3. Place the **TA-16 (5)** in the **Rotatable pole clamp (3)** as shown in Fig. 73.
4. Using the **TA-15** tweezers place and hold the **Pole clamp knob end (4)** on **Pole clamp screw (1)** as shown in Fig. 73.

Note!!!

Check the presence of **4,3x12x1 washer (2)**.

5. Tighten the **Pole clamp screw (1)** to **TA-16 (5)** until the **Pole clamp knob end (4)** snaps into the plug of part **Pole clamp screw (1)**. It is signalized by rapid decrease of torque value and proves that **Pole clamp knob end (4)** is properly fixed on **Pole clamp screw (1)**.

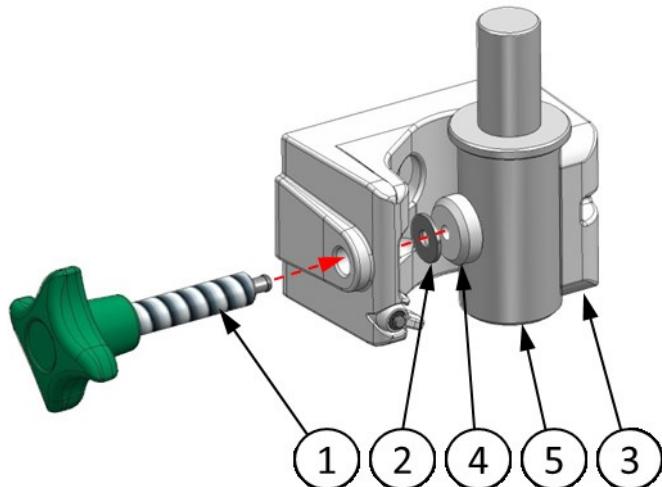


Fig. 73 Pole clamp screw assembly

13.17 BUZZER (MH93-YMS23AW80) AND SPEAKER (MH93-KWT2342F12LC) REPLACEMENT

13.17.1 Buzzer and Speaker removal

1. Remove the **Power Supply Board** as described in chapter **13.13.1** (p. 111).
2. Pull out the **Buzzer (1)** and **Speaker (2)** using the **TA-45** in the direction indicated by red arrow in Fig. 74 following the below guidelines:
 - to pull out the **Buzzer (1)** use **TA-45** to pull its housing as shown in Fig. 75;
 - to pull out the **Speaker (2)** use **TA-45** to pull the **Mounting plate (3)** as shown in Fig. 76.

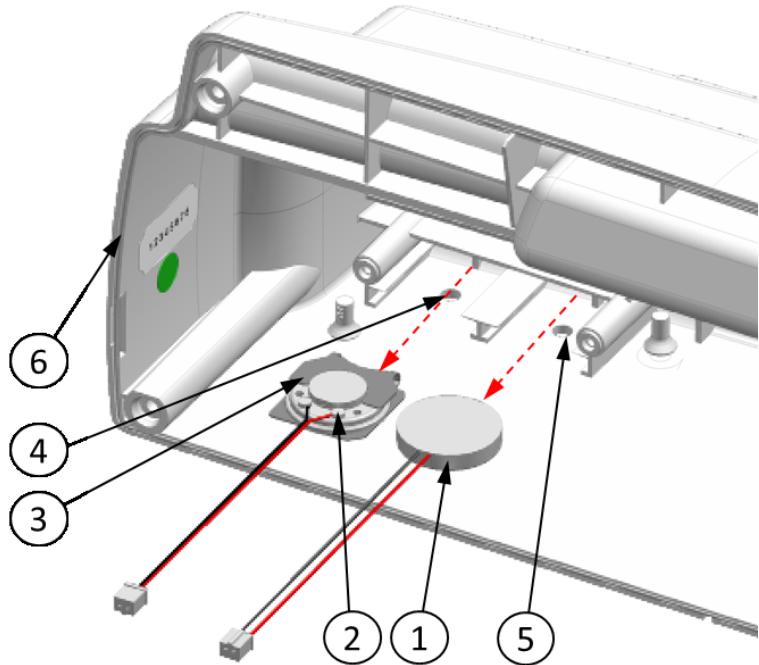


Fig. 74 Buzzer and Speaker removal/installation

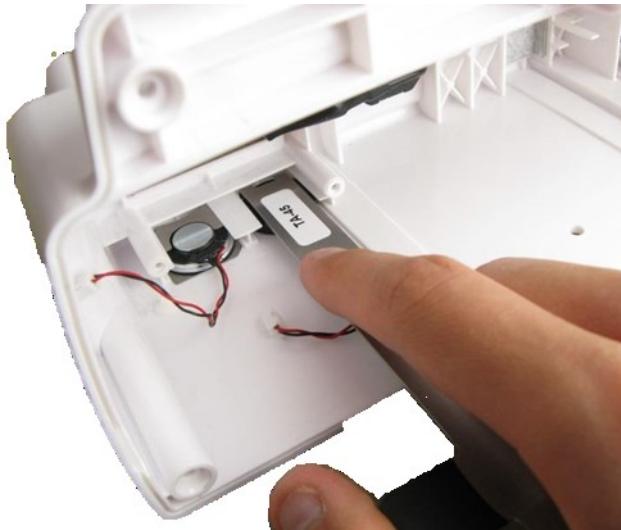


Fig. 75. Pulling out the Buzzer

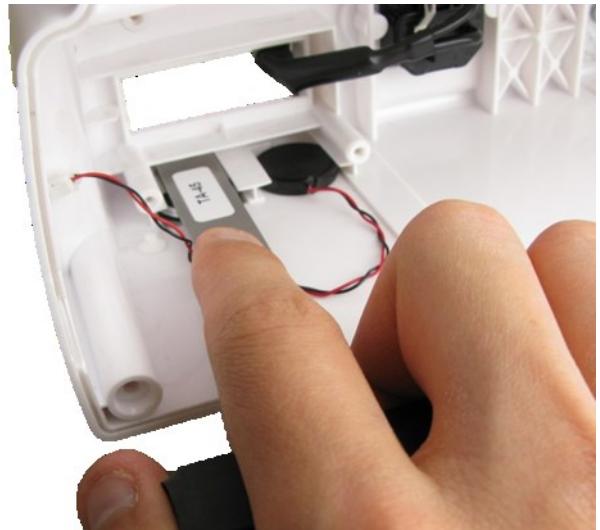


Fig. 76. Pulling out the Speaker

13.17.2 Buzzer and Speaker installation

1. Attach the **Mounting plate** (3) to the **Speaker** (2), then use the **TA-45** to push the **Speaker** (1) into the end of the socket (4) in the **Back case set** as shown in **Fig. 74**.
2. Using the **TA-45**, push **Buzzer** (1) and **Speaker** (2) into the end of the socket (5) in the **Back case set** opposite to the direction indicated by the red arrow in **Fig. 74** and following the below guidelines:
 - to push in the **Buzzer** (1) use **TA-45** to push its housing as shown in **Fig. 77**;
 - to push in the **Speaker** (2) use **TA-45** to push the **Mounting plate** (3) as shown in **Fig. 78**.

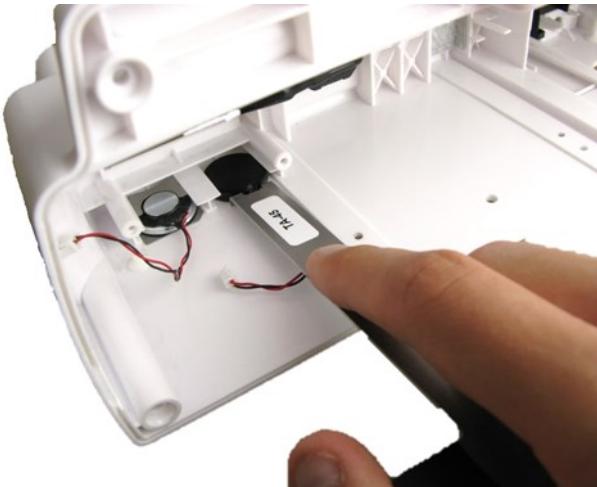


Fig. 77. Pushing in the Buzzer

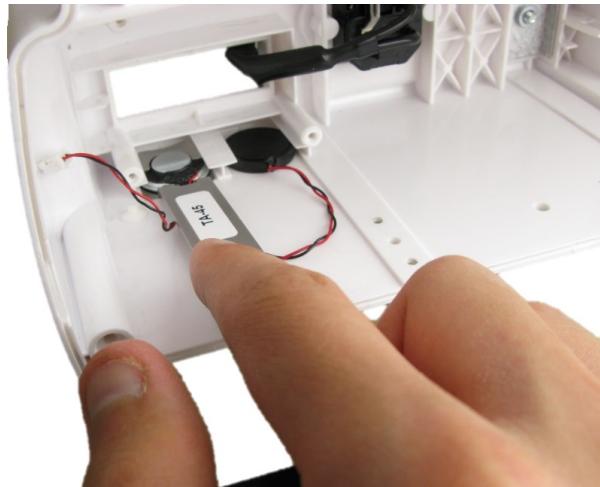


Fig. 78. Pushing in the Speaker

3. Install the **Power Supply Board** as described in chapter **13.13.2** (p. 112).

13.18 AC CORD REPLACEMENT (M-020.9.2642.XX)

13.18.1 AC cord removal

1. Remove the **Power Supply Board** as described in chapter **13.13.1** (p. 111).
2. Using a **TB-2** screwdriver, unscrew two **3x8 Screws for plastic** (1) as shown in Fig. 79.
3. Pull the **AC Cord** (2) out of the **Back case set**, paying attention to the **AC cord seal** (3) as shown in Fig. 79.

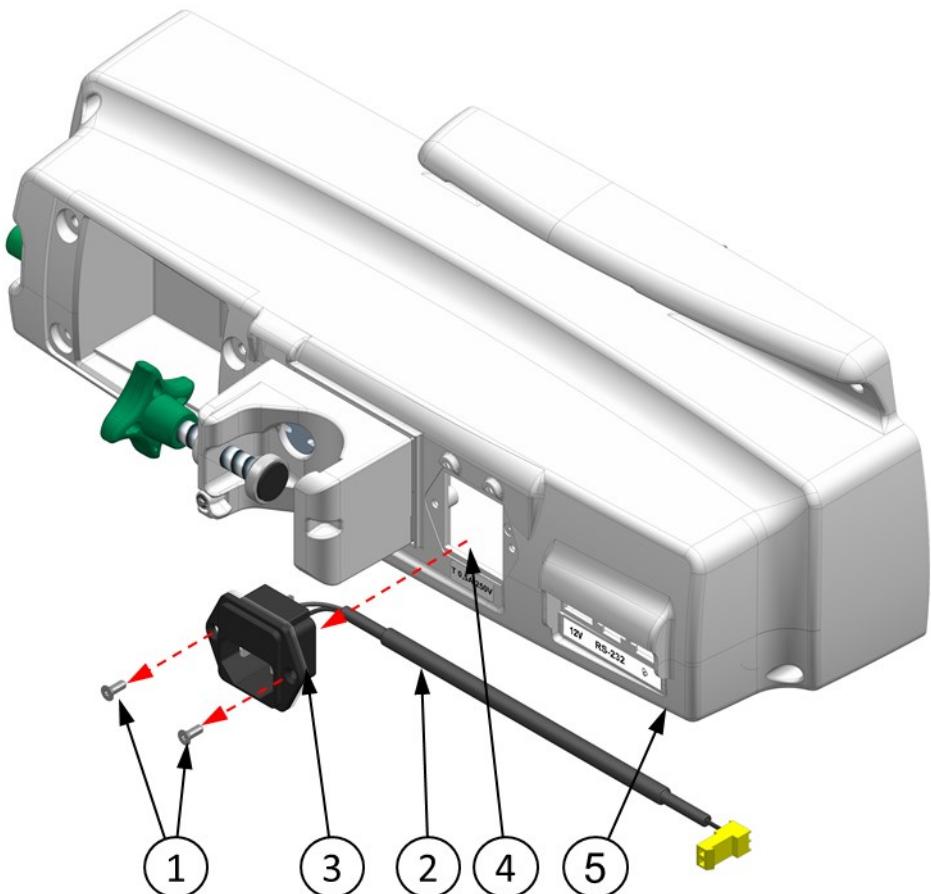


Fig. 79 AC cord removal/installation

13.18.2 AC cord installation

1. Insert the **AC cord gasket (3)** into the **AC cord slot** as shown in **Fig. 79**.
2. Insert the **AC cord plug** through the hole **(4)** in the **Back case set** then put the **AC Cord** into the cavity rounding the hole **(4)** in **Back case set**.
3. Using the torque screwdriver **TA-41** with **TA-43 bit** screw in two **3x8 screws for plastic (1)** as shown in **Fig. 79**.
4. Install the **Power Supply Board** as described in chapter **13.13.2** (p. 112).

13.19 BACK CASE SET REPLACEMENT (S-020.9.4073.XX, S-020.9.4075.XX)

13.19.1 Back case set disassembly ([video](#))

1. Remove the **Battery board** as described in the chapter **13.14.1** (p. 113).
2. Remove the **Rotatable pole clamp set** as described in the chapter **13.16.1** (p. 117).
3. Remove the **Buzzer** and **Speaker** as described in the chapter **13.17.1** (p. 119).
4. Remove the **AC cord** as described in the chapter **13.18.1** (p. 121).
5. Remove the **Sockets bezel (8)** from the **Back case (7)** by pressing with finger from the outside.
6. Using the **TB-2** screwdriver unscrew four **3x10 screws for plastic (1)** with **Metal washers 3,2x10x0,5 (2)** as shown in **Fig. 80**.
7. Press the **Latch button (3)**. Carefully remove the **Latch body (4)** with the **Metal latch (5)** as shown in **Fig. 80**.
8. Using the curved tweezers **TA-15** and pressing the **Latch button (3)** carefully remove the **Latch spring (6)** together with the **Latch button (3)** as shown in **Fig. 80**.

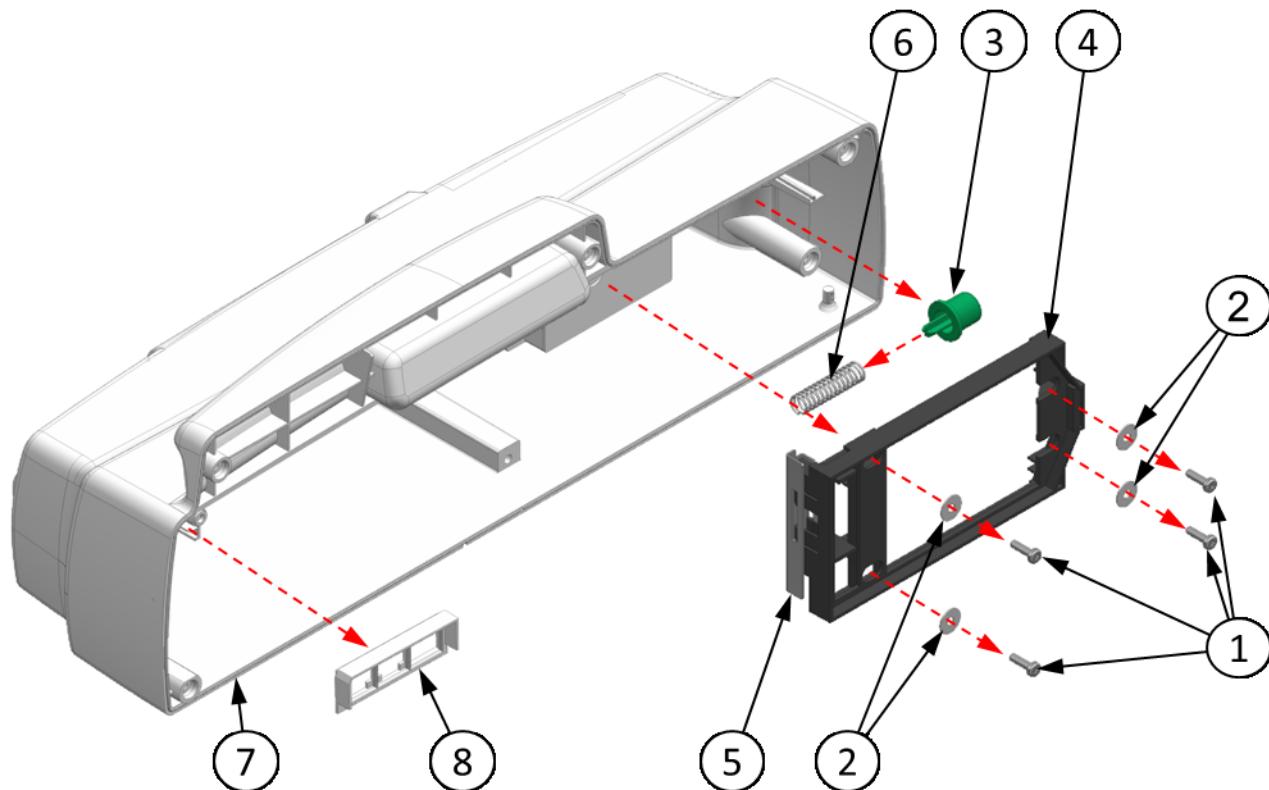


Fig. 80 Back case set removal/installation

13.19.2 Back case set assembly ([video](#))

1. Insert the **Sockets bezel (8)** into the **Back case (7)** opposite to the direction indicated by the red arrow in **Fig. 80**.
2. Using a paper tower soaked with the **TB-11** alcohol clean the lubricant from the **Latch body (4)** and the **Metal latch (5)**.
3. Using the curved tweezers **TA-15** insert the **Latch button (3)** in a **Back case (7)** hole. Next put the **Latch spring (6)** on the central pin of the **Latch button (3)** simultaneously pushing the spring until it leans against the wall of the **Back case (7)**. Perform the assembly opposite to the direction indicated by red arrow in **Fig. 80**.

4. Apply thin layer of the technical vaseline TB-9 on the **Latch body (4)** surface that slide on the **Metal washers 3,2x10x0,5 (2)**. Apply thin layer of the technical vaseline TB-9 on the **Metal latch (5)** surface that slide on the **Back case (7)**. Quantity of the vaseline is shown in the **Fig. 81**.

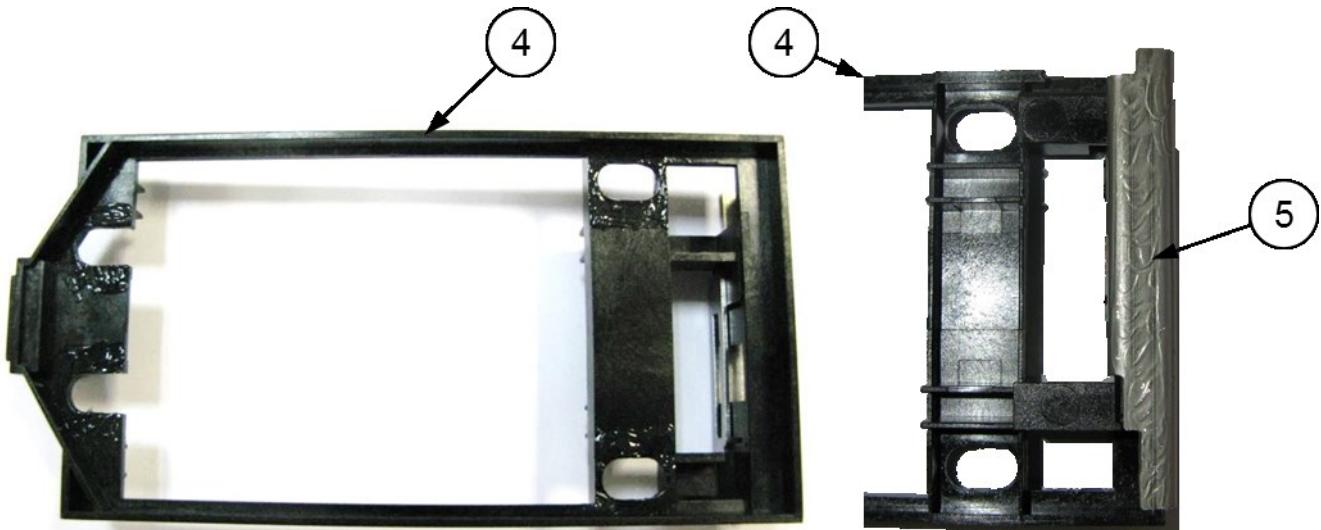


Fig. 81 Technical vaseline TB-9 application on the Latch body the Metal latch

5. Pressing the **Latch button (3)** carefully insert the **Latch body (4)** together with the **Metal latch (5)** into the **Back case (7)** in a way that the flange of the **Latch button (3)** slides into the grooves of **Latch body (4)**. Perform the assembly opposite to the direction indicated by red arrow in **Fig. 80**.
6. Using the **TA-41** with the bit **TA-42** screw four **3x10 screws for plastic (1)** with **Metal washers 3,2x10x0,5 (2)**. Perform the assembly opposite to the direction indicated by red arrow in **Fig. 80**.
7. Install the **AC cord** as described in the chapter **13.18.2** (p. 122).
8. Install the **Speaker** and the **Buzzer** as described in the chapter **13.17.2** (p. 120).
9. Install the **Rotatable pole clamp set** as described in the chapter **13.16.2** (p. 117).
10. Install the **Battery board** as described in the chapter **13.14.2** (p. 115).
11. Using a permanent marker write on the **S/N REF sticker** placed on the bottom of the **Back case (7)** the same serial number as on the old sticker and then protect it by sticking a transparent label onto it.

13.20 PCA COVER REPLACEMENT (M-020.1.0897.XX)

13.20.1 PCA cover removal ([video](#))

Note!!!

Before replacing the PCA cover, make sure that the PCA lock is open.

1. Disassemble the **Syringe pump** as described in chapter **13.4** (p. 99).
2. Place the **TB-5** torx screwdriver between a **Bearing PCA lock cover (1)** and a **Bearing PCA (3)** in the gap pointed by a reference arrowhead number **1** in the **Fig. 82**. Fold the **Cover (1)** back. Next by using the **TB-6** flat-nosed pliers pull the **Cover (1)** out as indicated on the **Fig. 83**.

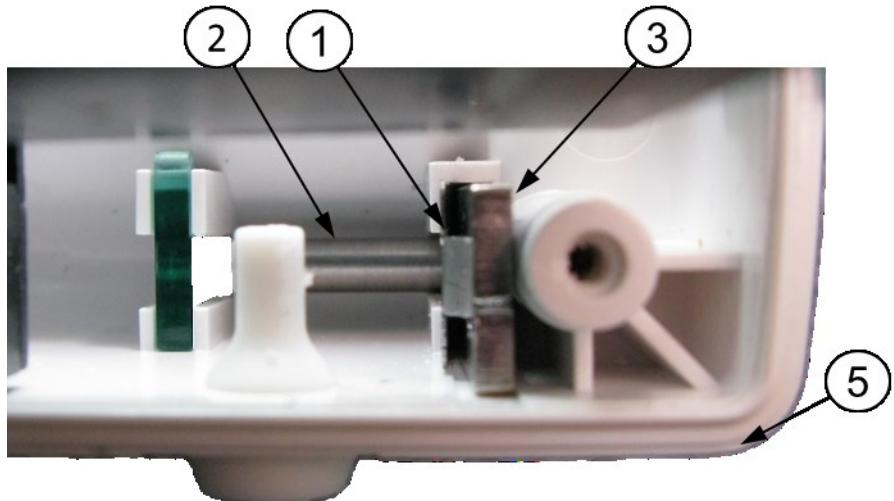


Fig. 82 Installed Left bolt cover PCA

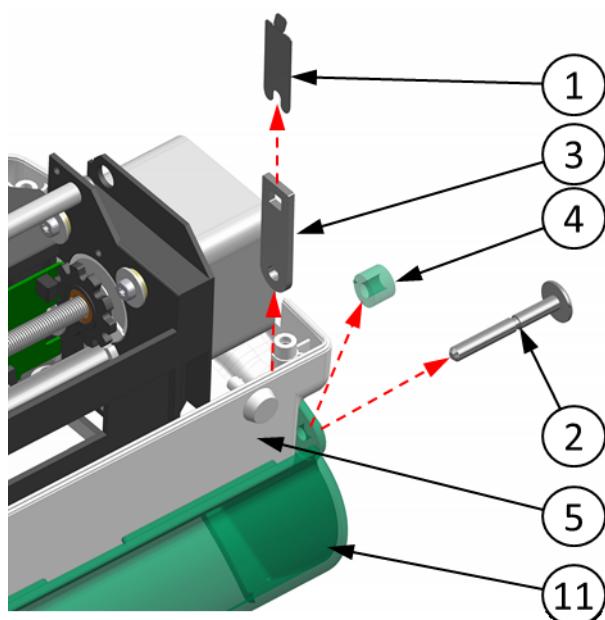


Fig. 83 Left bolt cover PCA removal/installation

3. By using the **TB-5** screwdriver pry and pull out the **Left bolt cover PCA (2)** from the **Front case (5)** in the direction pointed by a red arrow on the **Fig. 83**.
4. By using the **TA-15** curved tweezers pull out the **Bearing PCA (3)**.
5. Remove the **Sleeve PCA (4)** as shown in **Fig. 83**.
6. Move the **Pump stem end (8)** back from the **Front case (5)** wall according to p. 2 in the chapter **13.7.1** (p. 103).
7. By using the **TA-15** curved tweezers remove the **Circlip 3,2 (6)**.
8. By using the **TB-5** screwdriver pry and pull out the **Right bolt cover PCA (7)** as indicated on the **Fig. 84**.

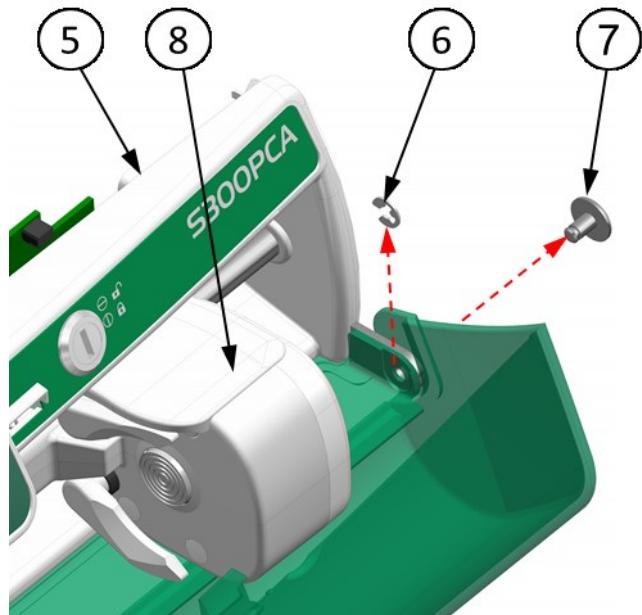


Fig. 84 Right bolt cover PCA removal/installation

9. Next to the **Syringe clamp** (9), hold the **TA-52 Technological distance for PCA cover** assembly (10) as indicated on the **Fig. 85**.

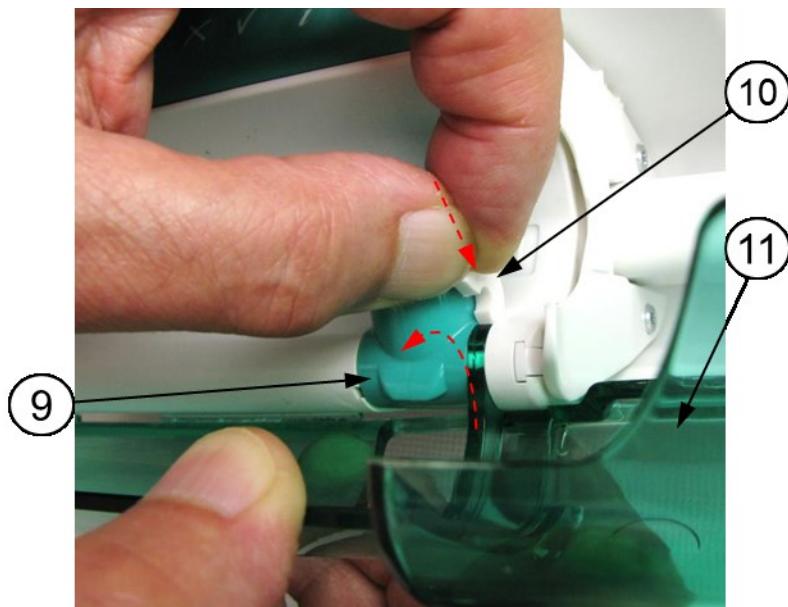


Fig. 85 PCA cover removal/installation

10. Pull towards himself/herself and disassemble the **PCA cover** (11), putting the **TA-52 Technological distance for PCA cover assembly** (10) in the free space as indicated on the **Fig. 85**.

13.20.2 PCA cover installation ([video](#))

1. Replace the **TA-52 technological distance for PCA cover assembly** (10) by the **PCA cover** (11) by making the movement opposite to the direction indicated by red arrows in **Fig. 85**.
2. Assemble the **Right bolt cover PCA** (7) and protect it by the **Circlip 3,2** (6). Perform the assembly opposite to the direction indicated by red arrow in **Fig. 84**.
3. Assemble the **Bearing PCA** (3) in the direction opposite towards the one pointed by red arrows on the **Fig. 83**.
4. Put the **Sleeve PCA** (4) between the **PCA cover** (11) and the **Front case** (5) and then assemble the **Left bolt cover PCA** (2). Perform the assembly opposite to the direction indicated by the red arrow in **Fig. 83**.
5. Protect the **Bearing PCA** (3) by pressing the **Cover bearing PCA lock** (1) to the position indicated on the **Fig. 82**.
6. Assemble the **Syringe pump** as described in chapter 13.5 (p. 99).

13.21 BOTTOM PCA COVER REPLACEMENT (M-020.1.0896.XX)

13.21.1 Bottom PCA cover removal

1. Disassemble the **Syringe pump** as described in chapter 13.4 (p. 99).
2. Open the **PCA cover (1)** and put the **Pump stem end (2)** off the **Front case (3)** wall according to p. 2 in chapter 13.7.1 (p. 103).
3. By using the **TA-15** curved tweezers disassemble the **Circlip 3,2 (6)** and remove the **Right bolt cover PCA (7)** as indicated on the **Fig. 84**.
4. By using the **TB-2** Torx screwdriver unscrew three **2,5x6 (4)** screws for plastic as indicated on the **Fig. 86**.

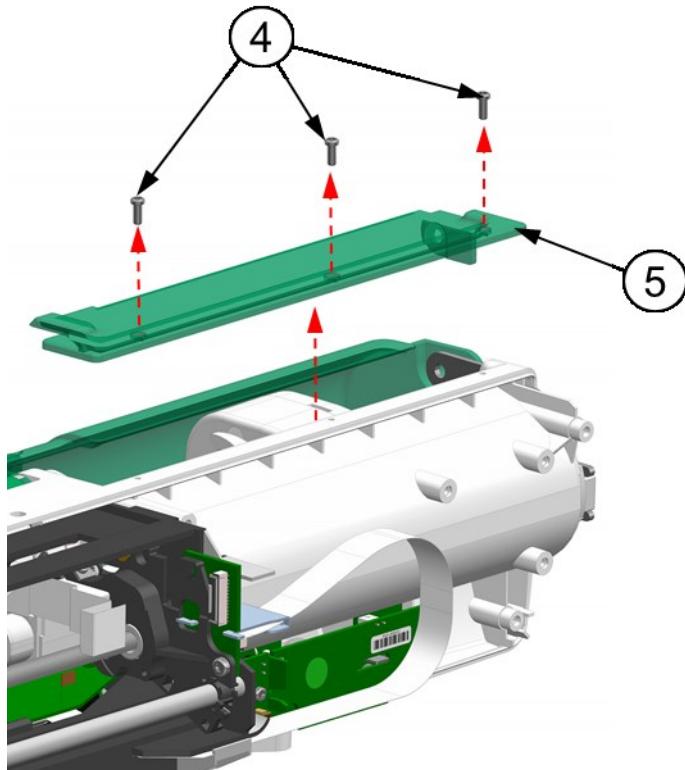


Fig. 86 Bottom PCA cover removal/installation

5. Disassemble the **Bottom PCA cover (5)** as indicated on the **Fig. 86**.

13.21.2 Bottom PCA cover installation

1. Assemble the **Bottom PCA cover (5)** with three **2,5x6 (4)** screws for plastic by using the **TB-2** Torx screwdriver. Perform the assembly opposite to the direction indicated by the red arrow in **Fig. 86**.
2. Assemble the **Right bolt cover PCA (7)** and protect it by the **Circlip 3,2 (6)**. Perform the assembly opposite to the direction indicated by the red arrow in **Fig. 84**.
3. Assemble of the **Syringe pump** as described in chapter 13.5 (p. 99).

13.22 PCA BOARD SET REPLACEMENT (M-030.9.2596.XX)

13.22.1 PCA board set removal

1. Disassemble of the **Syringe pump** accoring to chapter 13.4 (p. 99).
2. Disconnect the **TA-58 FFC 0,5x10x80 extension line (1)** from the **PCA board (2)** as indicated on the **Fig. 87**.
3. By using the **TB-1** screwdriver unscrew two **3x8 (3)** screws for plastic as indicated on the **Fig. 87**.
4. Disassemble the **PCA board (2)** from the **Front case (4)** as indicated on the **Fig. 87**.

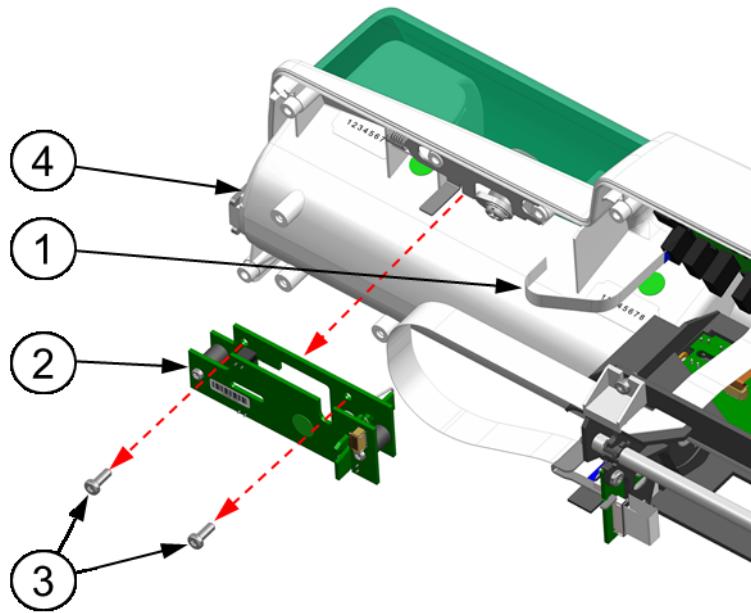


Fig. 87 PCA board removal/installation

13.22.2 PCA board set installation

1. Assemble the **PCA board** (2) by screwing to the **Front case** (4) two **3x8** (1) screws for plastic by the **TA-41** torque screwdriver with the **TA-42** replaceable shaft. Perform the assembly opposite to the direction indicated by the red arrow in **Fig. 87**.
2. Connect the **TA-58 0,5x10x80 FFC extension line** (1) to the **PCA board** (2). Details have been indicated on the **Fig. 87**.
3. Assemble the **Syringe pump** as described in **13.5** (p. 99).

13.23 PCA LOCK SET REPLACEMENT (S-020.9.4089.XX)

13.23.1 PCA lock set removal ([video](#))

1. Remove the **PCA board set** as described in chapter **13.22.1** (p. 126).
2. Remove the **PCA bolt cover** (12), **Bolt hook PCA** (11) and **PCA bolt cover spring** (13) as shown in **Fig. 88**.
3. Using the **TB-5** unscrew one **Screw M5** (3) and remove with **Toothed washer M5** (4) as shown in **Fig. 88**.
4. Remove the **Lock cam** (5) as shown in **Fig. 88**.
5. Using Flat-nosed pliers **TB-6** unscrew the **Lock nut** (6) as shown in **Fig. 88**.
6. Remove the **PCA lock** (9) as shown in **Fig. 88**.
7. Remove the **Lock housing** (7) as shown in **Fig. 88**.

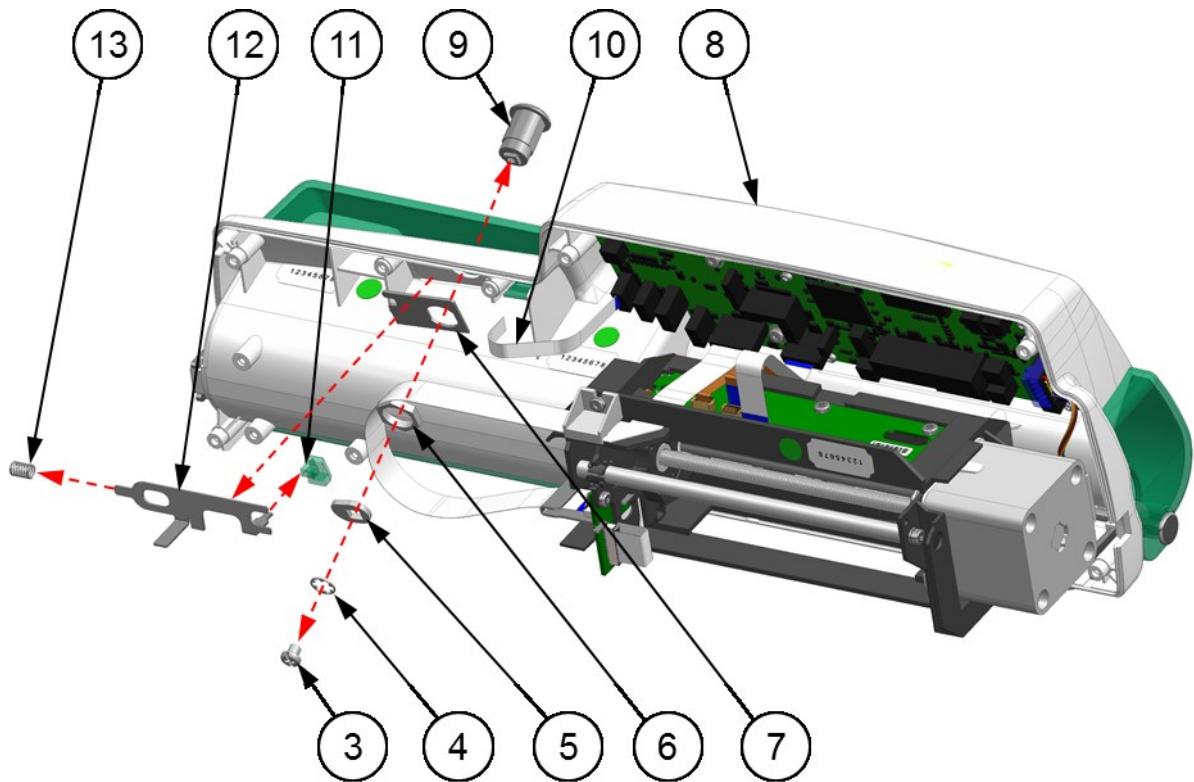


Fig. 88 PCA lock set removal/installation

13.23.2 PCA lock set installation ([video](#))

1. Mount the **Lock housing** (7) in the **Front case** (8) (Fig. 88). Perform the assembly opposite to the direction indicated by the red arrow in Fig. 88.
2. Insert the **PCA lock** (9) in a position, that the triangular mark on the housing of the **PCA lock** (9) is placed relatively to the **Front case** (8) as shown in Fig. 89. Perform the assembly opposite to the direction indicated by the red arrow in Fig. 88.

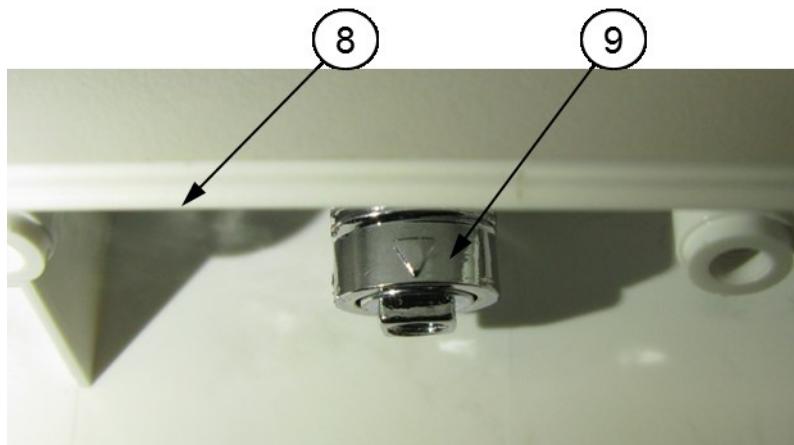


Fig. 89 PCA lock assembly position

3. Using Flat-nosed pliers TB-6 screw the **Lock nut** (6) as shown in Fig. 90 until mechanical resistance is felt.
4. Using the PCA lock key set the **PCA lock** (9) into one of two end positions – with the key slot set to the approximate vertical position.

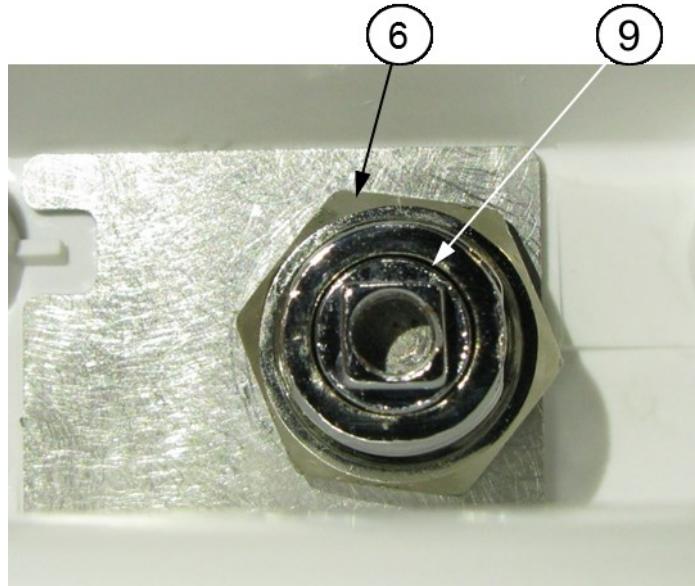


Fig. 90 PCA lock nut tightening

5. Using Flat-nosed pliers **TB-6** adjust the **PCA lock (9)** to a position with the key slot set to a vertical position (according to the mark printed on the **S300PCA Pump type sticker (14)** for the **Lock closed**) as shown in **Fig. 91**.

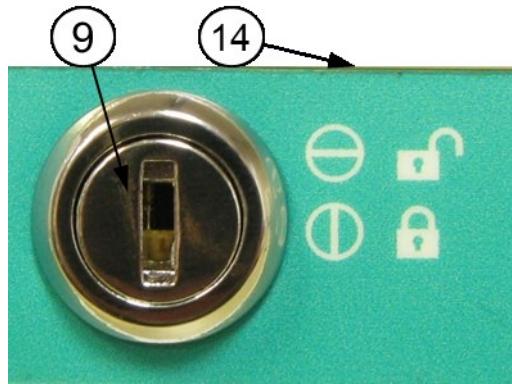


Fig. 91 The key slot set to a vertical position

6. Using a **Wooden toothpick** apply some quantity (Fig. 92) of the **Thread sealant TB-7** into the slot between the thread of the **PCA lock (9)** and the **Lock nut (6)** (Fig. 93).

Note!!!

Further assembly is allowed to do after at least of 1 hour!



Fig. 92 The Thread sealant TB-7 required for PCA lock and Nut installation

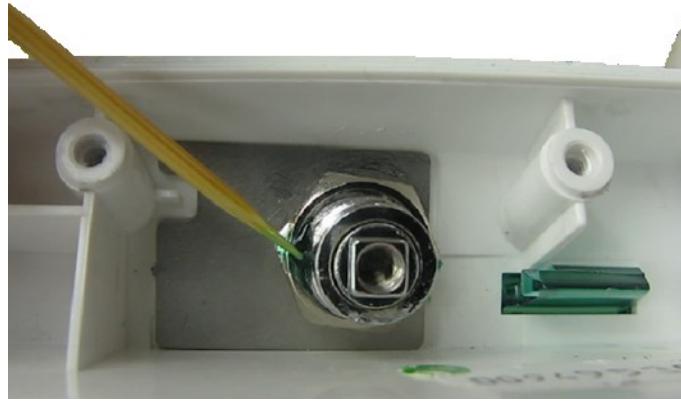


Fig. 93 The Thread sealant TB-7 application

7. Insert the **Lock cam (5)** of the rectangle end of the **PCA lock (9)** in a position shown in Fig. 94.



Fig. 94 The Lock cam installing position

8. Using the **TB-5** screw one **Screw M5 (3)** with the **Toothed washer M5 (4)** placed below the **Screw head** as shown in Fig. 95.

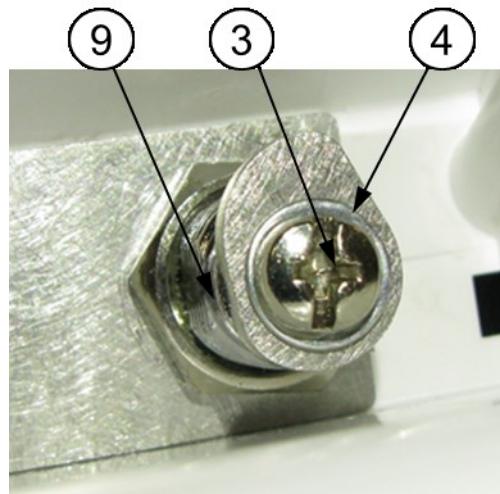


Fig. 95 The Lock cam installation

9. Apply some quantity of the **Technical vaseline TB-9** on the curved end of the **Lock cam (5)** as shown in Fig. 96.

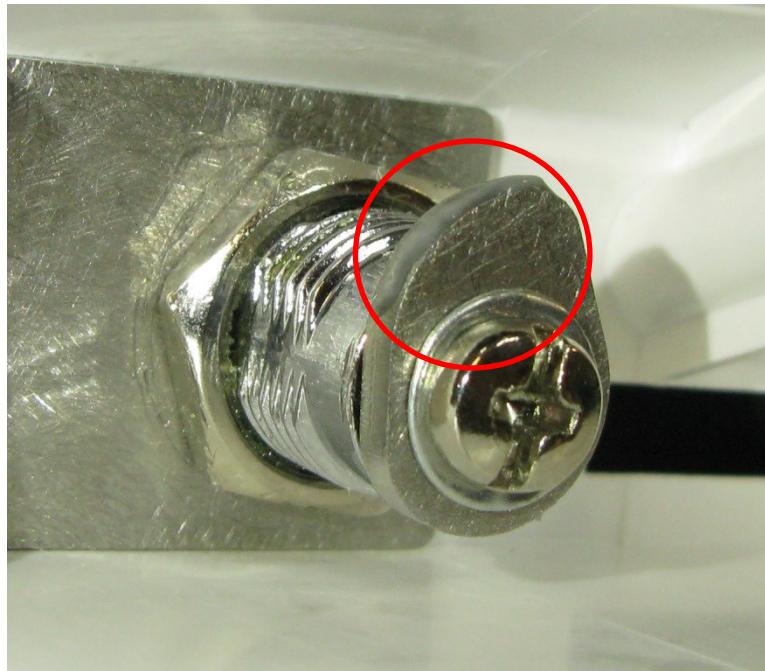


Fig. 96 Technical vaseline application on the curved end of the Lock cam

10. Mount the **Bolt hook PCA (11)** on the **PCA bolt cover (12)**.
11. Apply some quantity of the **TB-9** technical vaseline on the side surface of the **PCA bolt cover (12)** as shown in **Fig. 97.**

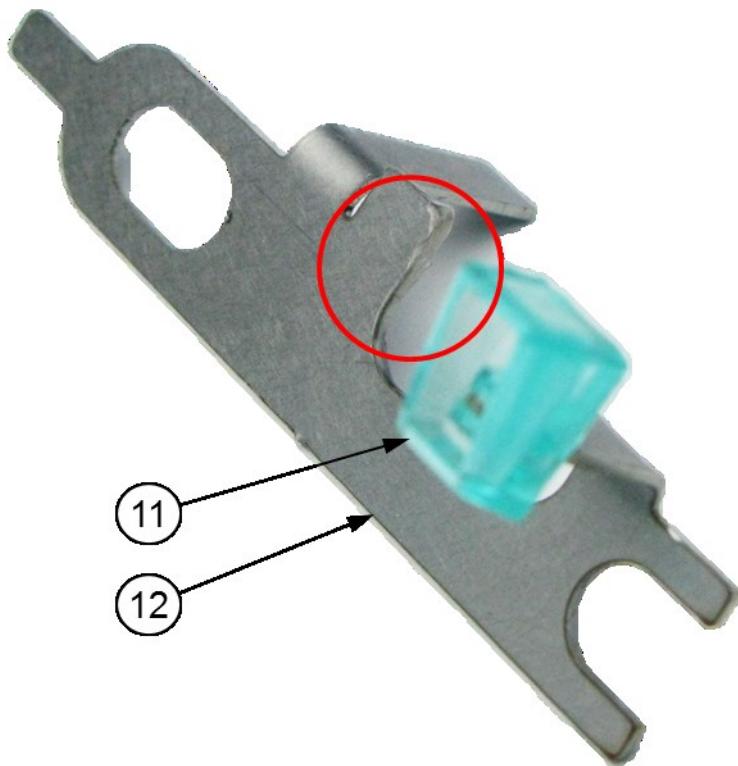


Fig. 97 Technical vaseline application on the side surface of the PCA bolt cover

12. On the **PCA bolt cover (12)** assembly the **PCA bolt cover spring (13)**. The assembled set insert into the cavity of the **Front case (8)** as shown in **Fig. 98.**

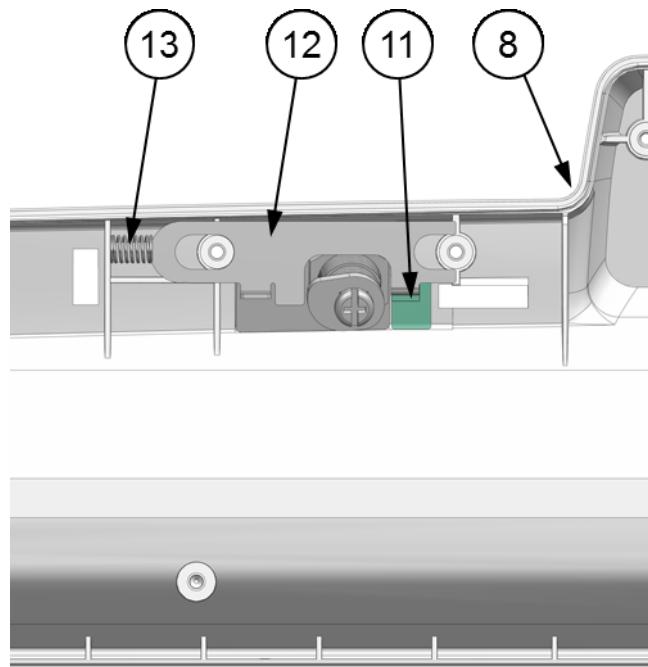


Fig. 98 The PCA bolt cover placement in the cavity of the Front case

13. Assembly the **PCA board set** as described in the chapter **13.22.2** (p. 126).

14 Actions to perform after part replacement

In the table below is listed the recommended minimum of actions to perform after part replacement. If the repairs were performed due to a scheduled service, perform **full technical safety check** of the pump according to chapter 10 (p. 30).

Table 12 List of actions to perform after part replacement.

No.	Replaced part	List of operations to perform after replacement
1	Battery package set (M-001.1.0344.xx)	<ol style="list-style-type: none"> Correctly set date and time (see chapter 4.5.6 (p. 21)). Select 3.6 New battery in the service menu (chapter 10.7.5 (p. 53)). Perform the Battery test (chapter 10.7.3 (p. 51)).
2	Front case set (S-020.9.4047.xx)	<ol style="list-style-type: none"> Perform: <ul style="list-style-type: none"> Exterior inspection ((chapter 10.3 (p. 32))). Note!!! Make sure that the pump type listed on the front case is consistent with the one listed on the S/N REF label 9, 11/Fig. 3 and the pump model set in (chapter 18.1). Perform calibrations: <ul style="list-style-type: none"> Touch panel calibration (chapter 11.1 (p. 55)). Syringe clamp calibration (chapter 11.5 (p. 61)). Arm position calibration (chapter 11.6 (p. 62)). Force sensor calibration (chapter 11.7 (p. 63)). SM1 motor torque calibration (chapter 11.8 (p. 64)). Perform tests: <ul style="list-style-type: none"> Basic tests (chapter 10.5 without the PCA tests (p. 38)). Functional tests (chapter 10.6 (p. 48)). Electrical safety test (chapter 10.8 (p. 53)). Perform steps after repair (chapter 15 (p. 136)).
3	Front case S300PCA set (S-020.9.4050.xx)	<ol style="list-style-type: none"> Perform: <ul style="list-style-type: none"> Exterior inspection ((chapter 10.3 (p. 32))). Note!!! Make sure that the pump type listed on the front case is consistent with the one listed on the S/N REF label 9, 11/Fig. 3 and the pump model set in (chapter 18.1). Perform calibrations: <ul style="list-style-type: none"> Touch panel calibration (chapter 11.1 (p. 55)). Syringe clamp calibration (chapter 11.5 (p. 61)). Arm position calibration (chapter 11.6 (p. 62)). Force sensor calibration (chapter 11.7 (p. 63)). SM1 motor torque calibration (chapter 11.8 (p. 64)). Perform tests: <ul style="list-style-type: none"> Basic tests (chapter 10.5 with the PCA tests (p. 38)). Functional tests (chapter 10.6 (p. 48)). Electrical safety test (chapter 10.8 (p. 53)). Perform steps after repair (chapter 15(p. 136)).
4	CPU S100 board with display (S-020.9.4062.xx)	<ol style="list-style-type: none"> Enter factory settings: <ul style="list-style-type: none"> Serial number consistent with the sticker on the case chapter 4.5.7 (p. 22). Production date enter the production date read from the pump before the CPU board replacement. If it is unavailable, enter the repair date (chapter 4.5.7 (p. 22)). Perform:
5	CPU S200 board with display (S-020.9.4063.xx)	
6	CPU S300 board with display	

	(S-020.9.4064.xx)	<ul style="list-style-type: none"> • Pump calibrations (chapter 11 (p. 55)). • Basic tests (chapter 10.5 without the PCA tests (p. 38)). • Functional tests (chapter 10.6 (p. 48)). <ol style="list-style-type: none"> 3. In the service menu see chapter 4.5 (p. 18) select "3. Battery --> 6. New battery" (chapter 10.7.5 (p. 53)). 4. Perform the Battery test (chapter 10.7.3 (p. 51)). 5. Perform steps after repair (chapter 15 (p. 136)). <p>Note!!! If the CPU board was replaced, before returning the pump to use, enter pump configuration according to the user's requirements.</p>
7	CPU S300PCA board with display (S-020.9.4065.xx)	<ol style="list-style-type: none"> 1. Enter factory settings: <ul style="list-style-type: none"> • Serial number consistent with the sticker on the case (chapter 4.5.7 (p. 22)). • Production date enter the production date read from the pump before the CPU board replacement. If it is unavailable, enter the repair date (chapter 4.5.7 (p. 22)). 2. Perform: <ul style="list-style-type: none"> • Pump calibrations (chapter 11 (p. 55)). • Basic tests (chapter 10.5 without the PCA tests(p. 38)). • Functional tests (chapter 10.6 (p. 48)). 3. In the service menu see (chapter 4.5 (p. 18) select "3. Battery --> 6. New battery " (chapter 10.7.5 (p. 53)). 4. Perform the Battery test (chapter 10.7.3 (p. 51)). 5. Perform steps after repair (chapter 15 (p. 136)). <p>Note!!! If the CPU board was replaced, before returning the pump to use, enter pump configuration according to the user's requirements.</p>
8	Drive mechanism Set (M-020.9.1076.xx)	<ol style="list-style-type: none"> 1. Perform calibrations: <ul style="list-style-type: none"> • Syringe clamp calibration (chapter 11.5 (p. 61)). • Arm position calibration (chapter 11.6 (p. 62)). • Force sensor calibration (chapter 11.7 (p. 63)). • SM1 motor torque calibration (chapter 11.8 (p. 64)). 2. Perform tests: <ul style="list-style-type: none"> • Basic tests (chapter 10.5 (p. 38)) without the PCA tests. • Functional tests (chapter 10.6 (p. 48)). 3. Perform steps after repair (chapter 15 (p. 136)).
9	Drive mechanism board (M-030.9.2587.xx)	<ol style="list-style-type: none"> 1. Perform calibrations: <ul style="list-style-type: none"> • Syringe clamp calibration (chapter 11.5 (p. 61)). • Arm position calibration (chapter 11.6 (p. 62)). 2. Perform tests: <ul style="list-style-type: none"> • Basic tests (chapter 10.5 (p. 38)) without the PCA tests. • Functional tests (chapter 10.6 (p. 48)). 3. Perform steps after repair (chapter 15 (p. 136)).
10	Guide board (M-030.9.2583.xx)	<ol style="list-style-type: none"> 1. Perform calibrations: <ul style="list-style-type: none"> • Arm position calibration (chapter 11.6 (p. 62)). 2. Perform tests: <ul style="list-style-type: none"> • Basic tests (chapter 10.5 (p. 38)) without the PCA tests. • Functional tests (chapter 10.6 (p. 48)).

		3. Perform steps after repair (chapter 15 (p. 136)).
11	Pump stem end (M-020.9.1085.xx)	<p>1. Perform calibrations:</p> <ul style="list-style-type: none"> • Arm position calibration (chapter 11.6 (p. 62)). • Force sensor calibration (chapter 11.7 (p. 63)). • SM1 motor torque calibration (chapter 11.8 (p. 64)). <p>2. Perform tests:</p> <ul style="list-style-type: none"> • Basic tests (chapter 10.5 (p. 38)) without the PCA tests. • Functional tests (chapter 10.6 (p. 48)). <p>3. Perform steps after repair (chapter 15 (p. 136)).</p>
12	Syringe flange clamp (M-020.1.0886.xx)	Perform exterior inspection (chapter 10.3 (p. 32)).
13	Back case Set (S-020.9.4073.xx)	<p>1. Using a permanent (indelible) marker, write down the pump's type and serial number on the S/N REF sticker. Copy the type and number from the sticker on the replaced case. If the sticker was destroyed, the serial number can be read from the pump (see chapter 4.5.7 (p. 22)).</p> <p>Note!!! The pump model and serial number listed on the S/N REF label must be consistent with the number saved in the pump and the pump type listed on the front case (12/Fig. 13).</p> <p>2. Perform exterior inspection (chapter 10.3 (p. 32)).</p> <p>3. Perform the electrical safety test (chapter 10.8 (p. 53)).</p> <p>4. Perform tests:</p> <ul style="list-style-type: none"> • Signalization and display test (chapter 10.5.1 (p. 39)). • Pump fixing in the docking station test (chapter 10.5.9 (p. 46)). <p>5. Perform the charger calibration (chapter 11.3 (p. 58)).</p> <p>6. Perform steps after repair (chapter 15 (p. 136)).</p>
14	Back case PCA Set (S-020.9.4075.xx)	<p>1. Using a permanent (indelible) marker, write down the pump's type and serial number on the S/N REF sticker. Copy the type and number from the sticker on the replaced case. If the sticker was destroyed, the serial number can be read from the pump (see chapter 4.5.7 (p. 22)).</p> <p>Note!!! The pump model and serial number listed on the S/N REF label must be consistent with the number saved in the pump and the pump type listed on the front case (12/Fig. 13).</p> <p>2. Perform exterior inspection (chapter 10.3 (p. 32)).</p> <p>3. Perform the electrical safety test (chapter 10.8 (p. 53)).</p> <p>4. Perform tests:</p> <ul style="list-style-type: none"> • Signalization and display test (chapter 10.5.1 (p. 39)). • Pump fixing in the docking station test (chapter 10.5.9 (p. 46)). • Patient's bolus button test (chapter 10.5.10 (p. 47)). <p>5. Perform the charger calibration (chapter 11.3 (p. 58)).</p> <p>6. Perform steps after repair (chapter 15 (p. 136)).</p>
15	Rotatable pole clamp Set (S-021.9.4061.xx)	1. Perform pole clamp inspection (chapter 10.3.2 (p. 36)).
16	Speaker (MH93-YMS23AW80)	<p>1. Perform the electrical safety test (chapter 10.8 (p. 53)).</p> <p>2. Perform tests:</p> <ul style="list-style-type: none"> • Signalization and display test (chapter 10.5.1 (p. 39)). • Pump fixing in the docking station test (chapter 10.5.9 (p. 46)). <p>3. Perform the charger calibration (chapter 11.3 (p. 58)).</p>
17	Buzzer (MH93-KWT2342F12LC)	<p>1. Perform the electrical safety test (chapter 10.8 (p. 53)).</p> <p>2. Perform calibrations:</p> <ul style="list-style-type: none"> • Battery calibration (chapter 11.2 (p. 56)). • Charger calibration (chapter 11.3 (p. 58)). • DC voltage calibration (chapter 11.4 (p. 60)). <p>3. Perform tests:</p>
18	Power supply board set (S-020.9.4087.xx)	<p>1. Perform the electrical safety test (chapter 10.8 (p. 53)).</p> <p>2. Perform calibrations:</p> <ul style="list-style-type: none"> • Battery calibration (chapter 11.2 (p. 56)). • Charger calibration (chapter 11.3 (p. 58)). • DC voltage calibration (chapter 11.4 (p. 60)). <p>3. Perform tests:</p>

		<ul style="list-style-type: none"> • Signalization and display test (chapter 10.5.1 (p. 39)). • Pump fixing in the docking station test (chapter 10.5.9 (p. 46)). <p>4. Perform steps after repair (chapter 15 (p. 136)).</p>
19	Battery controller board (M-030.9.2578.xx)	<p>1. Perform calibrations:</p> <ul style="list-style-type: none"> • Battery calibration (chapter 11.2 (p. 56)). • Charger calibration (chapter 11.3 (p. 58)). • DC voltage calibration (chapter 11.4 (p. 60)). <p>2. Perform steps after repair (chapter 15 (p. 136)).</p>
20	Patient's bolus button (M-004.9.0358.xx)	Perform the patient's bolus button test (chapter 10.5.10 (p. 47))
21	PCA cover (M-004.9.0358.xx)	<p>1. Perform inspection and tests:</p> <ul style="list-style-type: none"> • External appearance (chapter 10.3.1 (p. 32), Table 5 (p.). • PCA cover and lock test (chapter 10.5.11 (p. 47)). • Functional tests (chapter 10.6 (p. 48)).
22	Bottom PCA cover (M-020.1.0896.xx)	
23	PCA cover Set (S-020.9.4090.xx)	
24	PCA board Set (S-020.9.4090.xx)	<p>1. Perform inspection and tests:</p> <ul style="list-style-type: none"> • PCA cover and lock test (chapter 10.5.11 (p. 47)). • Functional tests (chapter 10.6 (p. 48))
25	PCA lock Set (S-020.9.4089.00)	
26	S100 Pump type sticker	<p>1. Perform:</p> <ul style="list-style-type: none"> • Exterior inspection (chapter 10.3.1 (p. 32)).
27	S200 Pump type sticker	
28	S300 Pump type sticker	
29	S300PCA Pump type sticker	

15 Final steps after pump repair/inspection

15.1 STEPS AFTER INSPECTION

1. If, during the inspection, pump settings such as:
 - **User configuration**
 - **Drug library**
 were modified, check if they are correct and inform the user about the change.
2. Set the pump's date and time – see chapter 4.5.6 (p. 21).
3. Fully charge the battery.
4. Set the date of next technical inspection – see chapter 4.5.4 (p. 20) and record it in the F1-IS-Sx00-01-EN-01 Technical Safety Check Report.

15.2 STEPS AFTER REPAIR

1. Perform technical safety check chapter 10 (p. 30) according to the scope of the repairs and inspection schedule.
2. Perform all steps after inspection chapter 15.1 (p. 136).
3. If any parts were replaced, send the filled F2-IS-Sx00-01-EN-01 Part replacement report to Medima (by e-mail or fax).

16 List of diagnostic parts

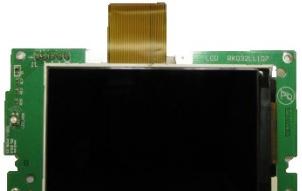
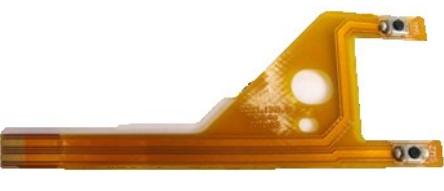
List of diagnostic parts SP-x (SP - Service Part) required for syringe pump service is shown in the table below.

Table 13 List of diagnostic parts

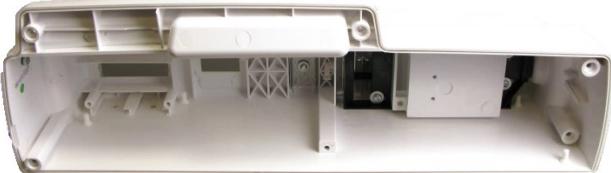
No.	Designation	Name	REF
1	SP-41A	Sx00 pump complete	Sx00 Pump-front
	SP-41B		Sx00 Pump-back
2 (*)	SP-42A	S300PCA pump complete	S300PCA Pump-front
	SP-42B		S300PCA Pump-back
3	SP-16	Battery package set	M-001.1.0344.xx
4 (*)	SP-23	Patient's bolus button	M-020.9.3896.xx
5	SP-27	Speaker	MH93-YMS23AW80
6	SP-28	Buzzer	MH93-KWT2342F12LC
7	SP-43	Batteryboard	M-030.9.2578.xx
8	SP-44	Power supply board set	S-030.9.2697.xx
9	SP-45	CPU board set	S-020.9.4062.xx
			S-020.9.4063.xx
			S-020.9.4064.xx
			S-020.9.4065.xx
10	SP-46	Drive mechanism direct board	M-030.9.4208.xx
11	SP-47	Drive mechanism board	M-030.9.2587.xx
12	SP-48	Pump stem end	M-020.9.1085.xx
13	SP-30	Display board	M-030.9.2409.xx

(*) Part required only for S300PCA pump repair

17 List of spare parts

Name	Product code	Piece	Pictorial photo
Battery package set	M-001.1.0344.xx	1	
Front case set	S-020.9.4011.xx	1	
Front case S300PCA set	S-020.9.4050.xx	1	
CPU S100 board set	S-020.9.4062.xx	1	
CPU S200 board set	S-020.9.4063.xx	1	
CPU S300 board set	S-020.9.4064.xx	1	
CPU S300PCA board set	S-020.9.4065.xx	1	
Display board	M-030.9.2409.xx	1	
Potentiometer	M-020.9.1029.xx	1	
Foil of microswitches	M-030.9.2589.xx	1	

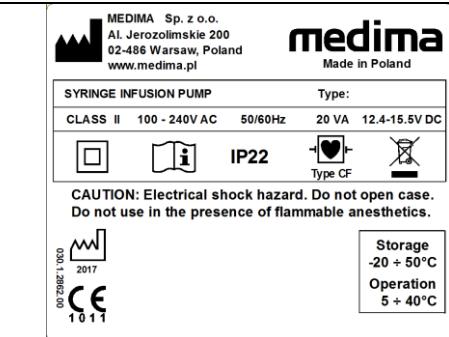
Name	Product code	Piece	Pictorial photo
Drive mechanism Set	M-020.9.1076.xx	1	
Drive mechanism board	M-030.9.2587.xx	1	
Drive mechanism direct board	M-030.9.4208.xx	1	
FFC ribbon 0.5x20x75	M-021.1.1754.xx	1	
FFC ribbon 0.5x24x300	M-020.1.0935.xx	1	
Pump stem end	M-020.9.1085.xx	1	
Syringe flange clamp	M-020.1.0886.xx	1	
Back case set	S-020.9.4073.xx	1	

Name	Product code	Piece	Pictorial photo
Back case PCA set	S-020.9.4075.xx	1	
AC cord	M-020.9.2642.xx	1	
Sockets bezel	M-020.1.0885.xx	1	
S-021.9.4061.xx-Rotatable pole clamp set	Rotatable pole clamp	M-020.9.3091.xx	
	Pole clamp screw	M-001.1.0463.xx	
	Disc spring 14x7.2x0.35		
Pole clamp knob	M-001.1.0695.xx	1	
Pole clamp knob end	S-020.9.4220.xx	1	

Name		Product code	Piece	Pictorial photo
Washer		4,2x12x1	1	
S-021.9.4068.xx-Magnetic holder Set	Magnetic holder	M-002.1.2305.xx	1	
	Magnetic cover	M-021.1.1676.xx	1	
	M3 Elastic washer	BN 762	1	
	M3 Nut		1	
	Speaker	MH93-YMS23AW80	1	
Buzzer		MH93-KWT2342F12LC	1	
IV Set holder		M-020.1.1628.xx	1	
Power supply board set		S-030.9.2607.xx	1	

Name	Product code	Piece	Pictorial photo
Battery board	M-030.9.2578.xx	1	
S-020.9.4076.xx-Accessories set	Screw for plastics 3x12	12	
	Screw for plastics 3x10	10	
	Screw for plastics 3x8	20	
	Screw for plastics 3x6	14	
	Screw for plastics 2.5x6	10	
	O-ring 1.5x1	4	
	O-ring 2.5x1	4	
	Screw M3x10	4	
	Screw M3x12	4	
	M3 nut	10	
	Washer 3.2x10x0.5	8	
	Polyamide washer 3.2x8x0.8	6	
	Polyamide washer 2.7x10x1	6	
	Opto cover	4	
Patient's bolus button	M-020.9.3896.xx	1	
PCA cover	M-020.1.0897.xx	1	
Bottom PCA cover	M-020.1.0896.xx	1	

Name	Product code	Piece	Pictorial photo
PCA board Set	M-030.9.2596.xx	1	
S-020.9.4090.xx-PCA cover set	Sleeve PCA	M-020.1.0895.xx	1 
	Bearing PCA	M-020.1.0894.xx	1 
	Right bolt cover PCA	M-020.1.0923.xx	1 
	Left bolt cover PCA	M-020.1.0922.xx	1 
	Cover bearing PCA	M-020.1.0920.xx	1 
	Right bolt cover PCA support	M-020.1.0924.xx	1 
	Cover bearing PCA lock	M-020.1.0921.xx	1 
S-020.9.4089.00-PCA lock set	PCA lock	KS90-ANF-362	1 
	Lock housing	M-020.1.0918.xx	1 
	Lock cam	M-020.1.0912.xx	1 
	PCA bolt cover	M-020.1.0913.xx	1 

Name		Product code	Piece	Pictorial photo
	Bolt hook PCA	M-020.1.0893.xx	1	
	PCA bolt cover spring	M-004.1.0330.xx	1	
S/N REF sticker	030.1.2862.xx	1		
S100 Pump type sticker	020.1.1296.xx	1		
S200 Pump type sticker	020.1.1297.xx	1		
S300 Pump type sticker	020.1.1298.xx	1		
S300 PCA Pump type sticker	020.1.0929.xx	1		

18 F1-IS-Sx00-01-EN-01 Technical Safety Check Report

Syringe pumps S100/S200/S300/S300PCA

Technical Safety Check Report should be filled out each time a technical safety check of the pump is performed.

18.1 PREPARATION OF THE FORM

Prepare a paper or electronic version of the form.

Before the tests and calibrations are performed, fill out the following fields:

- **Pump type** (see **Menu > Pump information > Identification > Pump type**),
- **Serial number** (see **Menu > Pump information > Identification > Serial number**),
- **MPU and PPU software version** (follow instructions in chapter 9.1 (p. 25)).

18.2 FILLING THE FORM DURING THE SERVICE PROCEDURE

During the service procedure, fill out the following fields:

- **Software upgrade**
If software upgrade is performed (see chapter 9.3 (p. 28)), afterwards, read the new **MPU** and **PPU** software version number (see chapter 9.3 (p. 28)) and enter it in the corresponding fields.
If the software was not upgraded, enter **NA**.
- **Battery replacement**
Fill the **Production lot number** field with the number of the battery production lot found on a label on the bottom side of the battery. If the battery was not replaced, enter **NA**.
- **Results** – fields for entering the results of the tests and calibrations described in the following sections:
 - **Exterior inspection**
 - **Basic tests**
 - **Functional tests**
 - **Battery tests**
 - **Electrical safety test**
 - **Pump calibration**

Depending on the result, enter the corresponding symbol, i.e.:

- **P** for positive result
- **N** for negative result
- **NA** if the test or calibration was not performed

In the **Electrical safety test** section of the form also fill out the fields for the results of measurements and calculations performed during the tests. A detailed description of the way that measurements and calculations should be performed can be found in the test procedure.

If a test or calibration was not performed, enter **NA** in the corresponding **Results** field.

- **Additional notes and small repairs** – in this section, enter additional information about pump condition and performed repairs.

18.3 CLOSING THE FORM

When the service activities are completed, enter a summary for the tests or calibrations performed within the section in the **Overall grade** field. The overall grade is positive (**P**) if all the result fields in this section contain the **P** symbol or the **NA** symbol; otherwise, the overall grade is negative (**N**).

In the **Final information** section, fill out the following fields:

- **I hereby declare that the device has passed technical tests and is suitable for further use** - the decision as to whether the pump is suitable for further use. If the **Overall grade** fields of all sections contain the **P** symbol, enter **YES**. Otherwise, enter **NO**.
- **Test performed by** - the date of the technical inspection and the signature of the person who performed it. The date of the technical inspection should be the same as the date in:
Menu -> 4. Maintenance date -> Last factory service –see chapter 4.5.4 (p. 20).
- **Date of the next technical safety check** - enter the date by which the next technical inspection of the pump should be performed. The date of the next technical inspection should be the same as the date in:
-> 4. Maintenance date -> Next factory service –see chapter 4.5.4 (p. 20).
- **Organizational unit** - the seal of the organization that performed the inspection.



Report no:

Technical Safety Check Report

Syringe pumps S100 / S200 / S300 / S300PCA

NOTE: All tests must be performed according to the description provided in the service manual.

Pump type		Pump type	
MPU software version		MPU software version	
Software upgrade (chapter 9 (p. 25))		MPU software version	PPU software version
Battery replacement		Production lot number	

Exterior inspection (chapter 10.3 (p. 32))	Result
	P/N/NA
External appearance (chapter 10.3.1 (p. 32))	
Pole clamp (chapter 10.3.2 (p. 36))	
Overall grade:	

Basic tests (chapter 10.5 (p. 38))	Result
	P/N/NA
Signalization and display test (chapter 10.5.1 (p. 39))	
Keyboard test (chapter 10.5.2 (p. 40))	
Touch panel test (chapter 10.5.3 (p. 40))	
Power supply test (chapter 10.5.4 (p. 41))	
Syringe clamp test (chapter 10.5.5 (p. 43))	
Gripper test (chapter 10.5.6 (p. 43))	
Syringe gripping test (chapter 10.5.7 (p. 44))	
Syringe diameter measuring test (chapter 10.5.8 (p. 45))	
Pump fixing in the docking station test (chapter 10.5.9 (p. 46))	
Patient's bolus button test (S300PCA only) (chapter 10.5.10 (p. 47))	
PCA cover and lock test (S300PCA only) (chapter 10.5.11 (p. 47))	
Overall grade:	

Functional tests (chapter 10.6 (p. 48))	Result
	P/N/NA
Syringe installation test (chapter 10.6.1 (p. 48))	
Infusion test (chapter 10.6.2 (p. 49))	
Occlusion alarm test (chapter 10.6.3 (p. 49))	
Overall grade:	

Battery tests (chapter 10.7 (p. 50))	Result
	P/N/NA
Battery capacity test (chapter 10.7.3 (p. 51))	
Overall grade:	

Electrical safety test (chapter 10.8 (p. 53))

(in accordance with EN 60601-1)

Test type	Requirement	Measurement result	Result
			P/N/NA
Measurement of insulation resistance (chapter 10.8.1 (p. 53))	4kV AC		
Measurement of leakage current in normal conditions (chapter 10.8.2)	60 – 100 µA AC		
Measurement of leakage current in the single fault condition (chapter	70 – 250 µA AC		
Overall grade:			
Measuring device type and S/N		Certificate validity date	

Pump calibration (chapter 11 (p. 55))

Result

P/N/NA

Touch panel calibration (chapter 11.1 (p. 55))	
Battery calibration (chapter 11.2 (p. 56))	
Charger calibration (chapter 11.3 (p. 58))	
DC voltage calibration (chapter 11.4 (p. 60))	
Syringe clamp calibration (chapter 11.5 (p. 61))	
Arm position calibration (chapter 11.6 (p. 62))	
Force sensor calibration (chapter 11.7 (p. 63))	
SM1 motor torque calibration (chapter 11.8 (p. 64))	
Overall grade P/N:	

Additional notes and small repairs

Final information

I hereby declare that the device has passed technical tests and is suitable for further use.

Test performed by:

Organizational unit:

.....

.....

Date Signature

Date of the next technical safety check:

19 F2-IS-Sx00-01-EN-01 Part replacement report

Syringe pumps S100 / S200 / S300 / S300PCA

The **part replacement report** should be prepared and filled when replacement of a part in the serviced pump is necessary.

19.1 PREPARATION OF THE FORM

Prepare a paper or electronic version of the form.

Before the tests and repairs are performed, fill out the following fields:

- **Date** – date of the replacement.
- **Previous S/N** – the pump's serial number before the repair.
- **New S/N** – the pump's new serial number after the repair.
- **Distributor name / Hospital name** – the pump's owner's information.

19.2 FILLING THE FORM DURING REPAIRS

If a part is replaced in the pump, the following information must be entered in the **Part replacement report**:

- **Part's catalogue number** - the part's number on the **List of spare parts** (see chapter 17 (p. 138))
- **Defective part's serial number** - the serial number of the defective part, read from the label.
- **New part's serial number** - the serial number of the new part, read from the label.
- **Notes** – additional information related to the replacement of the part.

19.3 CLOSING THE FORM

After finishing the repairs, fill out the following fields:

- **Parts replaced by** - the date of the technical inspection and the name of the person who replaced the parts.
- **Organizational unit** - the seal of the organization that replaced the part.



Report No.:

Part replacement report

Date:	Previous S/N:	New S/N ⁽¹⁾ :

Distributor name / Hospital name:

Notes:

Parts replaced by:	Organizational Unit:
.....
Date	Signature

(2) Enter NA, if the pump's S/N has not changed.

Memo:



Bear in mind that this manual may contain some typographical errors and incorrect information; therefore it is subject to correction. The corrections can be listed in the errata and included in the next issues of the manual. Due to evolution of standards, legal requirements and materials, characteristics included in this manual should be referred only to the devices mentioned in it. In order to obtain actual information about the products currently offered, please contact the manufacturer directly or the manufacturer's local representative. Copying the manual in whole or in part without permission of the manufacturer is prohibited.



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Medima Sp. z o. o.
Al. Jerozolimskie 200
02-486 Warsaw
Poland
Phone +48 22 313 22 60
+48 22 313 22 65
Fax. +48 22 313 22 69
e-mail: medima@medima.pl
website: www.medima.pl

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