

MEDICAL DEVICES

Volumat® Agilia

Technical Manual



Agilia
Intuitive Generation

**FRESENIUS
KABI**
caring for life

Revisions table

TM Volumat Agilia Eng ref CC3176
valid for pumps with serial numbers from 19830250 till...

Date	Revision	Chapter	Description
July 5th, 2007	0	All index "a"	Creation
Jan.15th, 2008	1	Index "b"	Insertion of Volumat MC
July 7th, 2008	2	Index "c"	Document only for Volumat Agilia
Sept. 15th, 2009	3	Index "d"	<ul style="list-style-type: none"> ■ New design ■ Spare parts catalogue removed from this document: a separate document is available. ■ 1.5.5 Update of the symbol of protection defibrillation
April 7th, 2013	4	Index "e"	<ul style="list-style-type: none"> ■ Spelling corrections. ■ Precautions to be taken for rate test are added.
Jan. 12th, 2015	5	Index "f"	The torque value to re-assemble the OCS clamp motor is added in the intervention procedure no 11.
Feb. 24th, 2017	6	Index "g"	<ul style="list-style-type: none"> ■ § 4.3 Training is added and a reference to it is mentioned in each intervention procedure (in § Maintenance level). ■ § 4.4.25 - Electrical safety test: standards are modified in the corresponding section and in the quality control certificate. ■ §4.7: update of the cleaning and disinfecting recommendations to match the IFU contents. ■ § 5.2: Error code "30" is updated. ■ Introduction of section 6 Intervention procedures is updated. ■ A "Z" is added in front of the tools references. ■ § 7.1.3 - Etal 2, Door: the value for door closed is modified to take into account the hall effect sensor magnet direction.

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1 Introduction

1.1 General introduction

Volumat Agilia is the volumetric pump of the **Agilia** range, our generation of intuitive and easy to learn infusion devices.

Thanks to its various programming modes, infusion modes, customisation capabilities and an extensive sets range, **Volumat Agilia** can be used in any units of the hospital: general wards, paediatrics, critical care, oncology....

Volumat Agilia can be:

- Used as a stand alone device thanks to the mounted "swinglock" clamp that allows its fixation on a rail or a pole.
- Stacked together with other **Agilia** devices thanks to its integrated locking system allowing three **Volumat Agilia** pumps to be stacked on top of one another to facilitate transportation. Easy to carry, **Volumat Agilia** is ideal for transporting patients.

The similar user interface across the entire **Agilia** range facilitates the acquisition of confidence in all the **Agilia** devices and reduces the time needed for training and maintenance.

Volumat Agilia can be programmed in three different modes:

- No drug name,
- Drug labelling,
- Vigilant Drug'Lib.

The drop detector is optional. **Volumat Agilia** has got a patented auto-test called "OCS test" (Occlusivity Check System) that checks the correct working order of the pump in association with its administration set, thus preventing any risk of free flow.

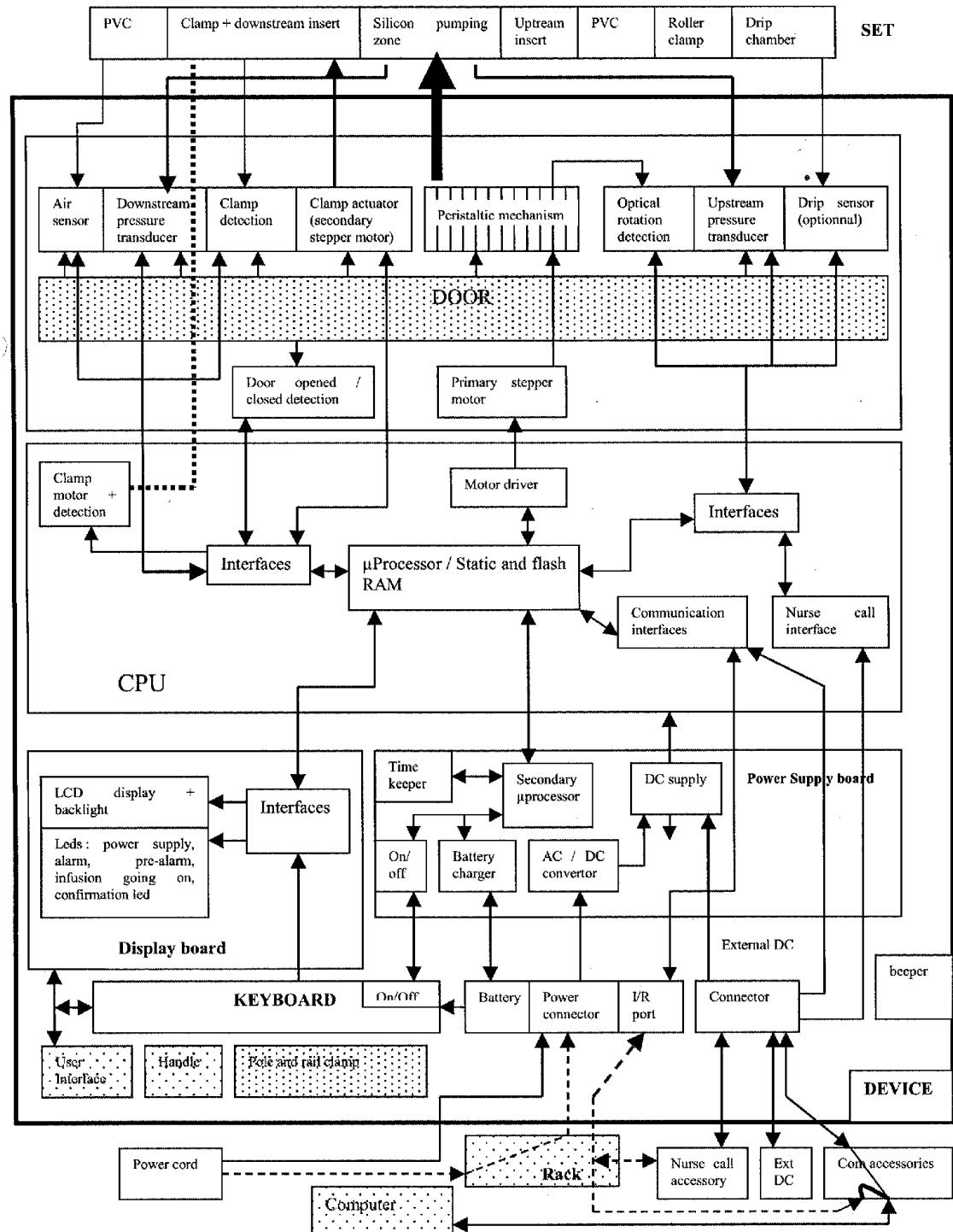
Volumat Agilia works with the **Volumat Lines**: these dedicated sets are equipped with a silicone pumping segment and a SafeClip that automatically clamps the line to avoid any risk of free-flow when the door is opened.

Volumat Agilia has its own control keyboard and a LCD screen. It has an internal battery which ensures a minimum battery life of 8 hours for a flow rate of 125ml/h.

Volumat Agilia has a range of flow rates from 1 to 1200mL/h in macro mode and from 0.1 to 100ml/h in micro mode.

Volumat Agilia is fitted with an infrared cell at the back. **Fresenius Kabi** also offers a **Link⁺ Agilia** rack system enabling several **Agilia** pumps to communicate to a communications system via the infrared cell and **Link⁺ Agilia**.

1.2 Operation diagram



1.3 Precautions for use

The  symbol visible on the device, indicates that the relevant Instructions For Use should be read thoroughly.

Volumat Agilia has been tested in accordance with the standards applicable to electromagnetic compatibility of the medical devices. Its immunity makes helps to ensure correct operation. The limitation of the radiation emitted avoids undesirable interference with other equipment such as EEG, ECG, etc. If a **Volumat Agilia** is placed near devices such as surgical equipment HF, X-rays, NMR, mobile phones or Wifi points, then minimal distances between equipment must be respected.

The device must not be used in the presence of inflammable anaesthetic agents due to a risk of explosion. It should always be used away from all risk areas.

The device could be disturbed by pressure or pressure variations, mechanical shocks, heat ignition sources, etc. Please contact our Technical Service, if you wish to use devices in specific conditions. The pump must be used in a horizontal and stable position to work correctly.

The physiological effects of medicine may be influenced by the characteristics of the device and the associated tubing (the constitution material is normally listed on the tubing packaging). Check that the prescriptions are compatible with the characteristics of the trumpet curves and with the occlusion alarm setting times in relation to the programmed flow rate.

The device uses a Lithium Ion rechargeable battery. Incorrect handling of a Lithium Ion battery by a non qualified personnel may cause leakage, heat, smoke, explosion or fire, which could result in deterioration of performance or failure. This may also damage the protection device installed in the battery pack, resulting in damage to the equipment or injury to the user.

Fresenius Kabi cannot, in any circumstances, be held responsible for any medical or other problem due to incorrect use of the device.

Kindly consult the Instructions For Use for more details.

Use conditions:

- Temperature: 5°C to 40°C / 41°F to 104°F.
- Humidity: 20% to 90%, no condensation.
- Atmospheric pressure: 700 hPa to 1060 hPa.

1.4 Operation safety

As soon as it is in operation, the device ensures continuous surveillance of its functions. Any internal fault or any procedural anomaly is immediately detected. Nevertheless, abnormal functioning of the device, without a defined cause, must always be brought to the attention of the qualified staff in your establishment or our Technical Service.

Volumat Agilia is equipped with an internal battery that ensures normal functioning during a mains power cut. In addition, 2 safety fuses protect the electrical mains concerned.

1.5 Technical characteristics

1.5.1 Electrical details

- Power supply: 100V - 240V~ / 50-60Hz with functional earth
- Max. consumption: 180mA
- Max. power: 15VA
- Fuse: T1AH 250V - 2xAT internal to power supply unit
- Battery: 7.2V - 2.2Ah. (LI-ion)
- External power supply: 9VDC. Power > 15W.
- Communication port and 11-30VDC power.

1.5.2 Electronic details

Volumat Agilia contains 5 electronic boards:

- Power supply board
- Mains board
- CPU board
- Display board
- Air detection board

1.5.3 Mechanical details

- Dimensions: H x W x D: 135 x 190 x 170mm
- Weight: ~ 2 Kg.

1.5.4 Material characteristics

	Components	Materials
1	Screw cap (2)	Polyamide
2	Nut bolt button	Polyamide
3	M8 moulded screws	Polyamide
4	Angle bracket	ABS
5	Battery door	ABS
6	Right and left flanges	Polycarbonate
7	Pumping block plate	Polyamide
8	Moulded cover over light guide	ABS
9	Light guide	Polycarbonate
10	Window	Polycarbonate
11	Moulded base	ABS
12	Base right tube guide	Polyamide 6
13	Base left tube guide	Polyamide 6
14	Cover central hook	Polyamide 6
15	Cover Right and left hook	Polyamide 6
16	Infrared window	Polycarbonate
17	Excentric bolt	POM
18	Bolt front case	POM
19	Bolt rear case	POM
20	Bolt button	POM
21	Bolt button pen	POM

Components		Materials
22	Air detector support	ABS
23	Door	ABS
24	Door plate	Polyarylamide
25	Moulded lever + hooks	Polyarylamide
26	Right and left door hinge	Polyamide 6
27	OCS fuse	Polyacetal
28	OCS unclamping finger	Polyamide
29	Mechanical spring cap	Polyamide
30	OCS detector cradle	Polyarylamide
31	Pumping block	Polyamide
32	Star motor ring	Polyacetal
33	Motor pulley	Polyamide
34	Cam shaft pulley	Polyamide
35	Belt idler pulley	Polyamide
36	Belt idler lever	Polyacetal
37	Rotation control disk	Polyamide
38	Pumping finger	PA6-12
39	Pumping bloc	Polyarylamide
40	Moulded cam shaft	PA66
41	Bearing motor support	Polyarylamide
42	Magnet support	ABS
43	Membrane	TF3 STE
44	Membrane frame	Polypropylene
45	Back foot	LSR
46	Front foot	LSR
47	RJ11 stopper	TPE EPTR
48	Connector stopper	TPE EPTR
49	Star motor shock absorber	Elastomere

1.5.5 Compliance to standards

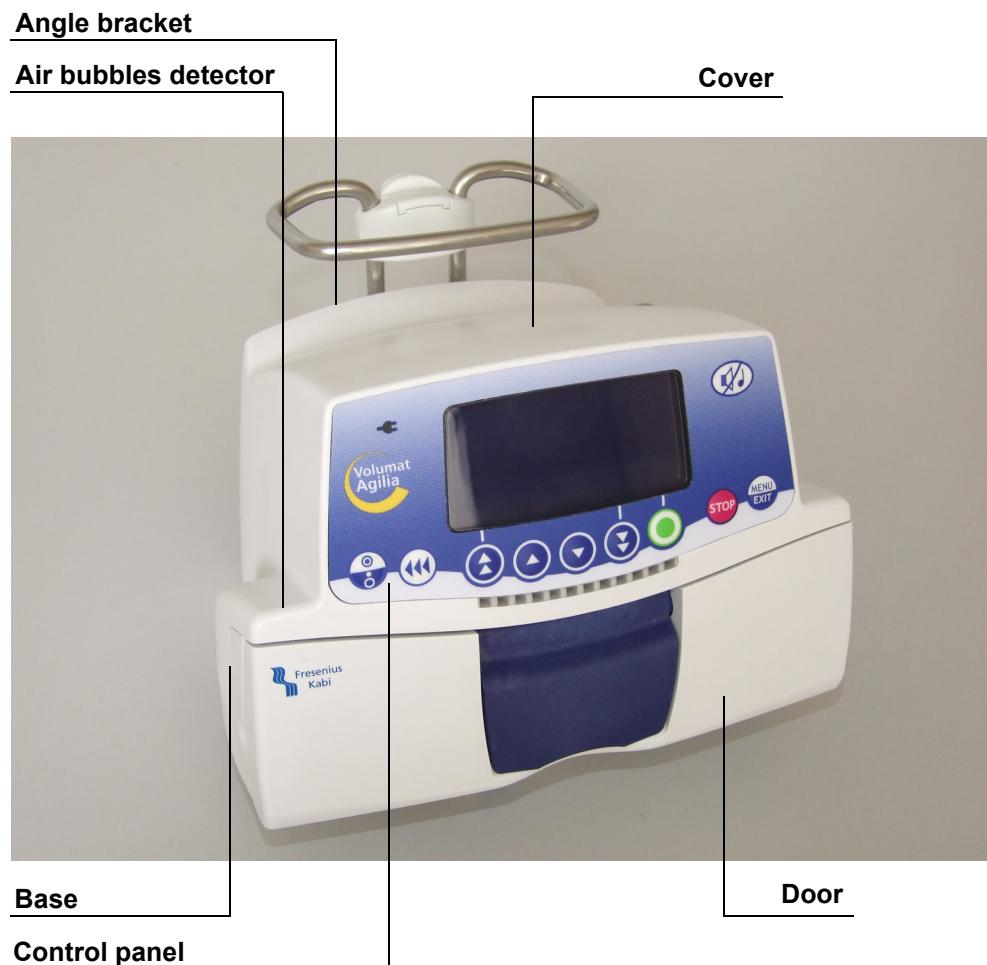
CE 0459	Compliant with the 93/42/CE Medical Directive.	IP22 Protection against splashing liquid. <input checked="" type="checkbox"/> Protection against leakage current: Defibrillation-proof type CF applied part. <input type="checkbox"/> Protection against electric shocks: class II. \pm Functional earth.
Safety of Electro Medical Equipement	Compliant with EN/IEC 60601-1 and EN/IEC 60601-2-24	
EMC (ElectroMagnetic Compatibility)	Compliant with EN/IEC 60601-1-2 and EN/IEC 60601-2-24	
	The functional earth is directly connected to the mains plug. It reduces the residual current which could cause interference to ECG or EEG devices.	



Detailed information concerning electromagnetic compatibility is available in the "Guidance and manufacturer's declaration on EMC" section of the Instructions For Use.

2 Description and operation

2.1 Physical description



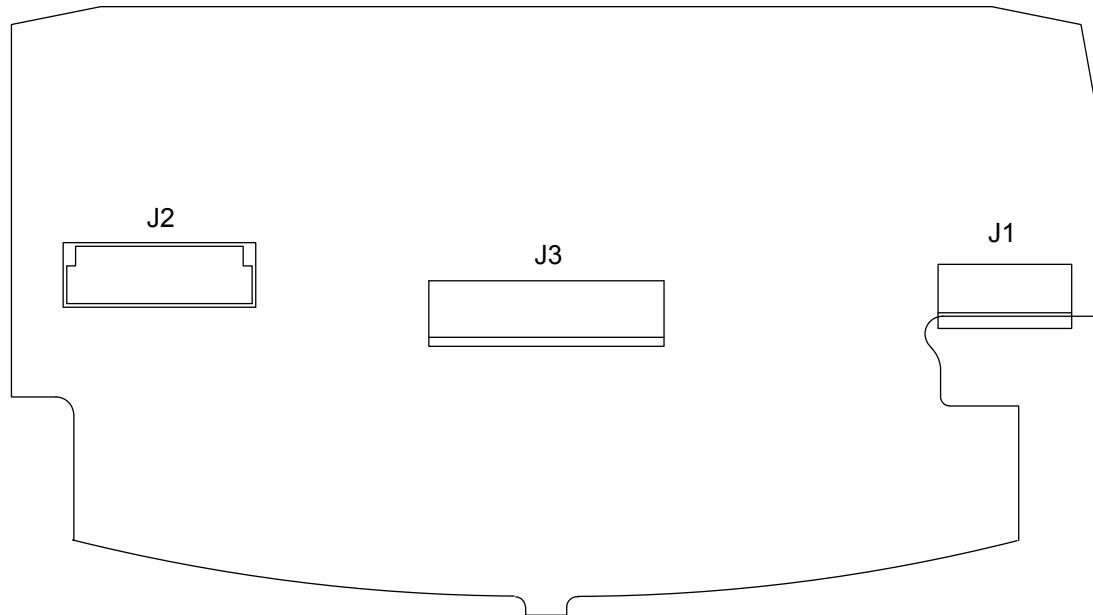
Volumat Agilia pump is made up of 3 main parts: an angle bracket, a cover and a base.

- The cover contains:
 - a display board.
- The base supports:
 - a CPU board,
 - an air bubble detector board,
 - an OCS system,
 - a pump motor mechanism,
 - an air bubble detection,
 - a clamp system.
- The angle bracket supports:
 - a power supply board,
 - a mains board,
 - a battery.

2.1.1 The display board

The display board is situated underneath the front of the command panel and contains all the essential parts for man-machine interaction:

- Keyboard
- Synoptics and control indicators
- LCD screen
- Buzzer



Display board

This board is connected to the other parts by means of connectors.

J1 connector to keyboard

Pin	Signal	Description
1	A_LED	Ground
2	COL0	Keyboard column 0
3	COL1	Keyboard column 1
4	COL2	Keyboard column 2
5	LIG0	Keyboard line 0
6	LIG1	Keyboard line 1
7	LIG2	Keyboard line 2
8	ON/OFF	Keyboard ON/OFF key
9	CTR	Keyboard control or line 3
10	GND	Ground

J2 connector to CPU board

Pin	Signal	Description
A1	GND	Ground
B1	VBAT	Battery power supply or "+10V mains"
A2	+3V3- PERM_PROT	Diagnostic signal (correct boards connection)
B2	-	Not connected

J2 connector to CPU board

Pin	Signal	Description
A3	GND	Ground
B3	+3V3	+3.3V power supply
A4	TON/OFF	Keyboard ON/OFF key
B4	MISO	SPI bus MISO signal
A5	GND	Ground
B5	MOSI	SPI bus MOSI signal
A6	GND	Ground
B6	CLK	SPI bus clock signal
A7	GND	Ground
B7	RESET/	Control signal
A8	RSLCD	Control signal (intended for LCD display)
B8	CSLCD/	Control signal
A9	CSLCD/	Control signal
B9	CD_BuZ_AFF	Buzzer command
A10	GND	Ground
B10	S_ANA_DOOR	Analogue signal sent by "DOOR" sensor
A11	+3V3	+3.3V power supply
B11	GND	Ground
A12	-	Not connected
B12	PRES_CARTES	Diagnostic signal (correct board connection)
A13	VBAT	Battery power supply or "+10Vmains"
B13	GND	Ground

J3 to display connector

Pin	Description
1	A_LED
2	C_LED
3	-
4	-
5	GND
6	MOSI
7	CLK
8	GND
9	GND
10	GND
11	GND
12	GND
13	GND
14	GND
15	GND
16	RSLCD
17	RESET/
18	CSLCD/
19	+3V3
20	GND

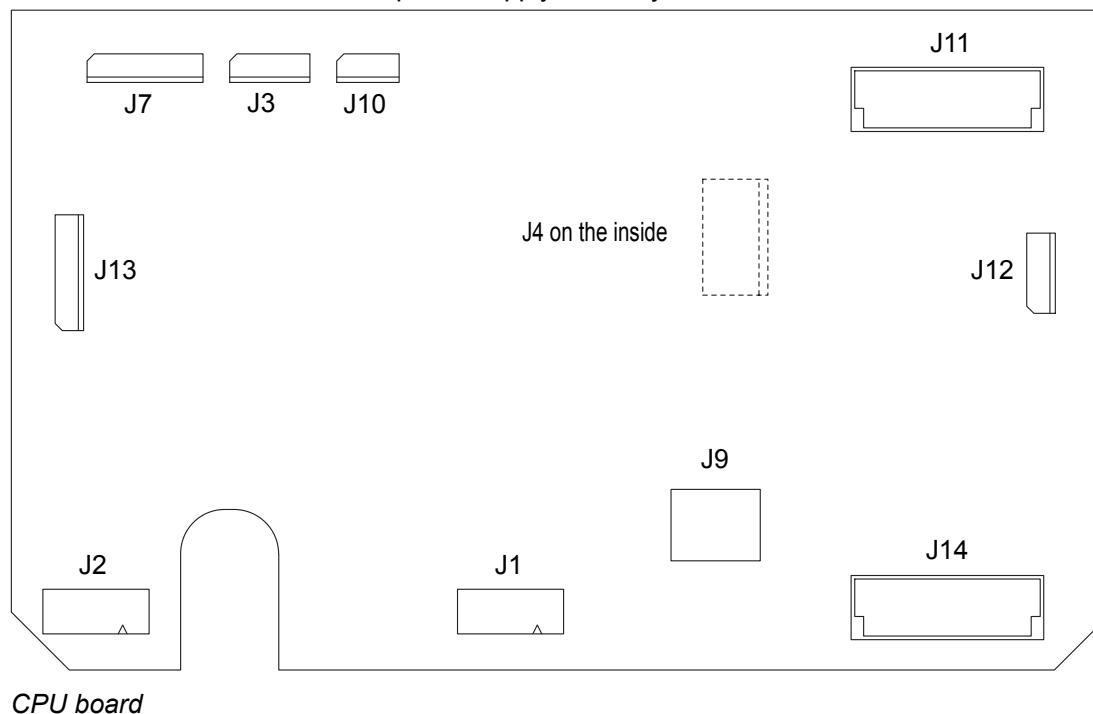
2.1.2 CPU board

The CPU board is made up of a main micro controller, FLASH and RAM memories and various analogue or power functions, namely:

- Two single step bipolar motor commands
- A power supply cut out - elevator type (BOOST)
- Adjustment of and acquisition from different sensors
- Different lines of communication (synchronous or non-synchronous serial link, optional Bluetooth connection).

The CPU board is connected to the display board by means of the J2 connector.

A ribbon cable connects it to the power supply board by means of the J14 connector.



J1 connector to pumping motor

Pin	Description	
1	+BOBINEA	+ motor A coil
2	-BOBINEA	- motor A coil
3	+BOBINEB	+ motor B coil
4	-BOBINEB	- motor B coil

J2 to OCS motor connector

Pin	Description	
1	+BOBINEA	+ motor A coil
2	-BOBINEA	- motor A coil
3	+BOBINEB	+ motor B coil
4	-BOBINEB	- motor B coil

J3 connector to downstream pressure sensor

Pin	Description	
1	GND	Ground
2	+3V3_PS	Power supply +3.3V filtered for pressure sensor
3	V+	+ Pressure sensor resistance bridge
4	GND	Ground
5	V-	- Pressure sensor resistance bridge
6	GND	Ground

J4 connector to upstream pressure sensor

Pin	Description	
1	GND	Ground
2	+3V3_PS	Power supply +3.3V filtered for pressure sensor
3	V+	+ Pressure sensor resistance bridge
4	GND	Ground
5	V-	- Pressure sensor resistance bridge
6	GND	Ground

J7 to CLAMP connector board

Pin	Description	
1	GND	Ground
2	MC_OPTO2/	Opto 2 status
3	MC_CD_OPTO	Opto 2 power supply
4	GND	Ground
5	MC_OPTO1/	Opto 1 status
6	MC_CD_OPTO	Opto 1 power supply
7	GND	Ground
8	/S_CLAMP	CLAMP opto status
9	/S_CD_CLAMP	CLAMP opto power supply
10	GND	Ground

J9 to JTAG connector (micro programming)

Pin	Description	
1	+3V3	+3.3V power supply
2	+3V3	+3.3V power supply
3	TCK	"Input" JTAG port signal
4	TDO	"Output" JTAG port signal
5	TRST/	"Input" JTAG port signal
6	TDI	"Input" JTAG port signal
7	MR/	"Input" JTAG port signal
8	GND	Ground
9	TMS	"Output" JTAG port signal
10	GND	Ground

J10 connector to opto motor

Pin	Description	
1	GND	Ground
2	MP_OPTO/	Motor opto rotation state
3	MP_CD_OPTO	Opto power supply
4	GND	Opto power supply return

J11 connector to display board

Pin	Description	
A1	GND	Ground
B1	VBAT	Battery power supply or + "10V mains"
A2	+3V3- PERM_PROT	Diagnostic signal (correct boards connection)
B2	-	Not connected
A3	GND	Ground
B3	+3V3	Power supply +3V3
A4	TON/OFF	Keyboard ON/OFF key
B4	MISO	SPI bus MISO signal
A5	GND	Ground
B5	MOSI	SPI bus MOSI signal
A6	GND	Ground
B6	CLK	SPI bus clock signal
A7	GND	Ground
B7	RESET/	Control signal
A8	RSLCD	Control signal (intended for LCD display)
B8	CSLCD/	Control signal
A9	CSLCD/	Control signal
B9	CD_BUZ_AFF	Buzzer command
A10	GND	Ground
B10	S_ANA_DOOR	Analogue signal sent by the "DOOR" sensor
A11	+3V3	Power supply +3.3V
B11	GND	Ground
A12	-	Not connected
B12	PRES_CARTES	Diagnostic signal (correct board connection)
A13	VBAT	Battery power supply or "+10V mains"
B13	GND	Ground

J12 connector to drop detector

Pin	Description	
1	GND	Ground
2	PULSE_goutte	Sensor return signal
3	GND	Ground
4	GND	Ground
5	CDLED_goutte	Sensor power supply
6	GND	Ground

J13 connector to air detector

Pin	Description	
1	GND	Ground
2	DA_ANA_AIR	Analogue signal sent by the air detector
3	GND	Ground
4	DA_DISCH	Air detector reset command
5	+3V3	+3.3V power supply
6	DA_GAIN	Air detector gain adjustment command
7	+3V3	+3.3V power supply
8	DA_SCL	I ² C bus clock signal between main micro controller and air detector
9	DA_SDA	I ² C bus data signal between main micro controller and air detector oscillator
10	GND	Ground

J14 connector to power supply board

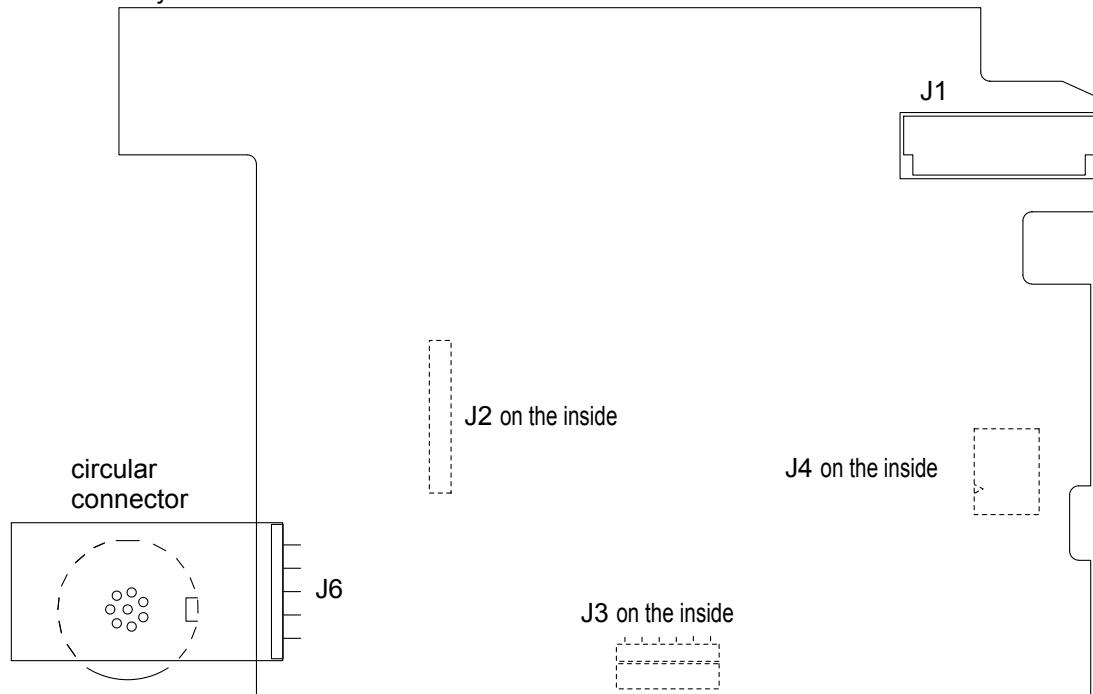
Pin	Description	
A1	GND	Ground
B1	VBAT	Battery power supply or "+10V mains"
A2	+3V3-PERM	Power supply +3.3V backup for date stamper
B2	-	Not connected
A3	GND	Ground
B3	+3V3	+3.3V power supply
A4	TON/OFF	Keyboard ON/OFF key
B4	GND	Ground
A5	SCL_ALIM	I ² C bus clock signal between main micro controller (CPU) and secondary (Power supply)
B5	SDA_ALIM	I ² C data signal between main micro controller (CPU) and (Power supply)
A6	GND	Ground
B6	RXIR	Infrared cell reception signal
A7	TXIR	Infrared cell emission signal
B7	GND	Ground
A8	SCK	Serial bus clock signal
B8	GND	Ground
A9	RXD	External plug data reception signal
B9	TXD	External plug data emission signal
A10	GND	Ground
B10	CD_BUZZ_ALIM	Buzzer command
A11	+3V3	+3.3V power supply
B11	GND	Ground
A12	-	Not connected
B12	PRES_CARTES	Diagnostic signal (good board connection)
A13	VBAT	Battery power supply or "+10V mains"
B13	GND	Ground

2.1.3 The power supply board

The power supply board is made up of a micro controller (ATmega48, as a secondary in relation to the one on the CPU board and in relation to its attributed functions) and the different analogue or power functions, namely:

- Management of the power supply for all the boards
- A battery charger
- An Infrared interface
- Different lines of communication (internal and external to the boards)
- A buzzer

The power supply board is situated on the angle bracket. It is used to supply power to the electronic unit from the 100V - 240VCA network or, externally, from 9VCC. It also charges a 2.2Ah battery.



Power supply board

This board is connected to the other parts by means of connectors.

J1 to CPU board connector

Pin	Description	
A1	GND	Ground
B1	VBAT	Battery power supply or "+9V mains"
A2	+3V3-PERM	Power supply +3.3V backed up for the time stamper
B2	-	Not connected
A3	GND	Ground
B3	+3V3	Power supply +3.3V
A4	TON/OFF	Keyboard ON/OFF key
B4	GND	Ground
A5	SCL_ALIM	Signal Clock of the bus I ² C clock signal between main (CPU) and secondary micro controller (Power supply)

J1 to CPU board connector

Pin	Description	
B5	SDA_ALIM	Signal Data of the I ² C bus data signal between main (CPU) and secondary (Power supply) micro controller
A6	GND	Ground
B6	RXIR	Infrared cell reception signal
A7	TXIR	Infrared cell emission signal
B7	GND	Ground
A8	SCK	Serial bus clock signal
B8	GND	Ground
A9	RXD	External plug data reception signal
B9	TXD	External plug data emission signal
A10	GND	Ground
B10	CD_BUZ_ALIM	Buzzer command
A11	+3V3	+3.3V power supply
B11	GND	Ground
A12	-	Not connected
B12	PRES_CARTES	Diagnostic signal (good board connection)
A13	VBAT	Battery power supply or "+9V mains"
B13	GND	Ground

J2 connector to mains connector

Pin	Signal	Description
1	Neutral	Mains power supply
2	Phase	Mains power supply
3	GND	Ground

J3 connector to secondary micro controller

Pin	Signal	Description
1	MISO	"Output" SPI programming signal
2	+3V3	+3.3V power supply
3	SCK	"Input" SPI programming signal
4	MOSI	"Input" SPI programming signal
5	/RST	"Input" SPI programming signal
6	GND	Ground

J4 connector to internal battery

Pin	Signal	Description
1	+BATTERIE	+Battery
2	ANA_CTN	+CTN
3	GND	Ground battery and CTN reference

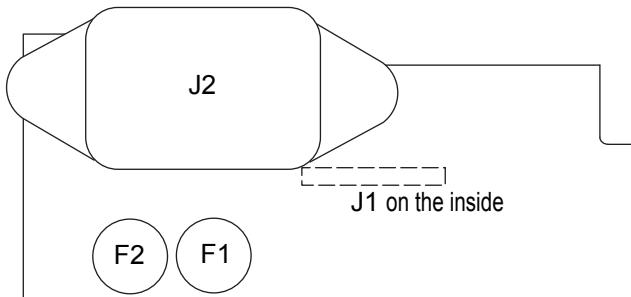
J5 connector to external plug

Pin	Signal	Description
1	SCK	Serial connection clock
2	TXD	Serial connection data emission
3	RXD	Serial connection data reception
4	+5V	Power supply accessories (supplied by the board)
5	GND	Ground
6	RELAIS	Relay command (open collector)
7	GND	Ground
8	+10V0	External power supply (supplied by the board)
9	GND	Ground
10	GND	Ground

2.1.4 The mains board

The mains board contains the mains plug, the ECG filter as well as F1 and F2 fuses.

It is the interface between the mains and the power supply board. The mains board is situated on the angle bracket. It enables the power supply board to be changed without the need for soldering.



Mains board

This board is connected to the other parts by means of connectors.

J1 connector to power supply board connector

Pin	Signal	Description
1	Neutral	Mains power supply
2	Phase	Mains power supply
3	GND	Ground

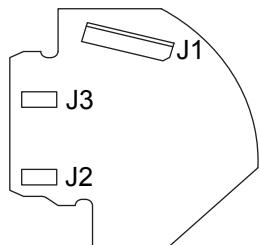
J2 connector to mains

Pin	Signal	Description
1	Neutral	Mains power supply
2	Phase	Mains power supply
3	GND	Functional earth

2.1.5 The air detection board

The air detection board is made up of an input amplifier and an output amplifier which are linked to the ceramic elements for reception and emission.

The air detection board is fixed to the base. It transmits the air bubbles volume in the administration set in the form of analogue data to the CPU board.



Air detection board

This board is connected to the other parts by means of connectors.

J1 to CPU board connector

Pin	Description	
1	GND	Ground
2	DA_ANA_AIR	Analogue signal sent by the air detector
3	GND	Ground
4	DA_DISCH	Air detector command reset
5	+3V3	+3.3V power supply
6	DA_GAIN	Air detector adjustment gain command
7	+3V3	+3.3V power supply
8	DA_SCL	I ² C bus clock signal between main micro controller and air detector oscillator
9	DA_SDA	I ² C bus data signal between main micro controller and the air detector oscillator
10	GND	Ground

J2 to ceramic elements for emission

J3 to ceramic elements for reception

2.2 Operational description

From an operational point of view, the **Volumat Agilia** pump is made up of 3 sub-assemblies:

- a sub-assembly to maintain and to check the correct positioning of the administration set.
- a motorisation sub-assembly.
- an external connection sub-assembly.

2.2.1 Administration set check and maintenance sub-assembly

The administration set is positioned along the front part panel held in place by the door.

The front part is equipped with four detection systems:

- A detector to check the position of the door (closed /open).
- A photoelectric cell to detect the presence of the administration set clamp.
- An ultra-sound detector to detect the presence of air bubbles in the administration set.
- Detection of the pressure is ensured by two piezo-resistant sensors allowing the pressure level control in the administration set.

2.2.2 Pumping sub-assembly

The pumping sub-assembly contains the peristaltic pumping mechanism.

The mechanism is made up of a camshaft that creates a wave-like movement in a bank of 12 "fingers". The displacement of these 'fingers' is controlled by the CPU board, while turning it displaces the liquid at the programmed flow rate.

The camshaft is driven by a stepper-motor and a reduction gearbox assembly via a toothed belt.

A photoelectric cell and a rotation palette, situated on the camshaft end, to control the motor/pumping system rotation.

2.2.3 External connections sub-assembly

Volumat Agilia has 2 plugs situated at the back of the angle bracket:

- a mains supply plug
- a 8 point Binder plug which, together with various specific **Fresenius Kabi** accessories, enables the following functionalities:
 - Continuous external power supply
 - Nurse call
 - Serial link.

An infrared cell is located at the back of the device. It permits information to be exchanged with the **Link⁺ Agilia**: the information can then be transmitted by dedicated communication cables.

3 Description of the menus

3.1 Options menu

The options menu enables the **Volumat Agilia** to be adapted to the specific needs of each ward. It accesses the menus that customise the infusion parameters.

Fresenius Kabi recommends the presence of its qualified staff, or a member of your Technical Department, who will assist you in implementing the configuration procedures you wish to select.

The options mode is activated by holding down the "Menu" key when the device is switched on.



The following options menu is displayed:

- User,
- Service,
- Maintenance.

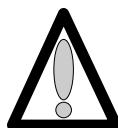
Each menu is made up of sub-menus.

The sub-menus can be accessed by using the "ENTER" key.



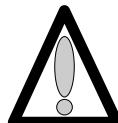
To access some of the sub-menus, you need to type in an access code. This code can be defined and/or de-activated in the Service mode. As long as the device is kept switched on, the code does not need to be keyed in again.

Main Menu	Key in code	Sub-menu	Sub-menu
User		User options menu	
Service	Code 0200	Service options menu	
Maintenance	Code XXXX	Test Maintenance options Calibration	Maintenance options test menu Maintenance options menu Calibration menu



Only the maintenance menu is described in this document.
 For more information concerning the other menus, kindly consult the Instructions For Use.

3.2 Calibration menu



The calibration menu is reserved for qualified staff only. Its access is protected by a code. To find out about the operating mode for the various calibrations, refer to the "Calibrations" section.

This menu enables the calibration of:

- **Etal 1**, Pressures,
- **Etal 2**, Door,
- **Etal 3**, Air sensor,
- **Etal 4**, Flow rate.

3.3 After-Sales Service test menu

The After-Sales Service test menu is reserved for qualified personnel. It enables a series of checks that can be carried out on the **Volumat Agilia** to confirm that it is operating correctly. (See section "Checks".)



The After-Sales Service tests can also be carried out more quickly and simply from a PC using our maintenance software (Contact our Technical Service for more details.)

The After-Sales Service test menu contains a series of tests or checks:

- **Test 1**, Identification,
- **Test 2**, Maintenance,
- **Test 3**, Maintenance messages,
- **Test 4**, Events,
- **Test 5**, Upstream pressure,
- **Test 6**, Downstream pressure,
- **Test 7**, Door,
- **Test 8**, Battery information,
- **Test 9**, Indication,
- **Test 10**, Keyboard,
- **Test 11**, Ageing test,
- **Test 12**, Battery life,
- **Test 13**, Battery test,
- **Test 14**, Air sensor
- **Test 15**, Clamp motor,
- **Test 16**, Flow rate,
- **Test 17**, Flow rate correction,
- **Test 18**, Occlusivity,
- **Test 19**, Clamp.

3.4 Maintenance options menu

Maintenance options menu allows to enter parameters for the 3 following options:

- **SAV 1**, Maintenance date,
- **SAV 2**, Initial set up,
- **SAV 3**, Data log event.

4 Preventive maintenance

4.1 Recommendations

The device can only be checked, serviced or repaired by **Fresenius Kabi** or by a certified and approved maintenance service. Any abnormal functioning of the pump must be brought to the attention of your in-house qualified technical personnel or our Technical Service.

Should you need to return the pump to our Technical Service, it should be cleaned, disinfected and very carefully packaged, preferably in its original packaging, before being sent.

For all information concerning the repair and use of the pump, kindly contact our Technical Service.

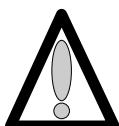
Fresenius Kabi is not liable for loss or damage to the pump during its transport to our Technical Service.

4.2 Maintenance schedule

4.2.1 Preventive maintenance

In order to maintain the pump's performance, a Preventive Maintenance inspection must be carried out every 3 years. This procedure, which includes changing the battery, replacing the membrane, should be carried out by a qualified technician.

Any abnormal functioning or failure must be reported to the qualified technical staff in your organisation or to our Technical Service. In these instances, the pump should not be used.



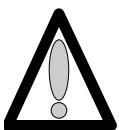
Important:
If these maintenance procedures are not observed, the pump's correct operation will be impaired.

4.2.2 Quality control

At the request of the health organisation, a quality check will be carried out every 12 months.

A quality check (not included in the guarantee) consists of different inspection procedures as defined in the pump's Technical Manual. Only a qualified technician may perform the quality check which must be performed using Fresenius Kabi software.

For more information, kindly contact our Technical Service.



Recycling of obsolete batteries and devices: Before disposal, remove battery from the device. Batteries and devices with this label must not be disposed of with the general waste. They must be collected separately and disposed of according to local regulations. For further information pertaining to waste processing regulation, contact your local Fresenius Kabi.



4.3 Training

For training, please contact **Fresenius Kabi**.

The Training levels, listed below, outline the specifics needed to maintain and preserve the device. They are defined below:

Level 1 is intended to the user for on-site maintenance, using the technical documentation of the device and specific tools.

- Mechanical and electrical knowledge.
- Biomedical structures knowledge.

This degree of maintenance does not need an extensive inventory.

Level 2 is intended to a technician specialized in maintenance performed through specific tools and procedures.

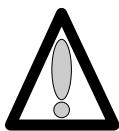
- Good mechanical and electronics knowledge.
- Two years experience minimum in a biomedical department.

Level 3 is intended to a technician specialized in repair performed in the maintenance department using specific tools, procedures as well as measurement and adjustment instruments. Complete check-up according to this manual of the device.

- Good mechanical and electrical knowledge.
- Good computer knowledge.
- More than two years experience minimum in a biomedical department.

4.4 Checks

A quality control certificate is available at the end of this section.



In order to ensure the smooth running of the checking procedure, recharge the battery for 16 hours beforehand.

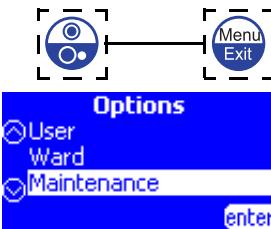
4.4.1 Accessing the tests

Keyboard description.

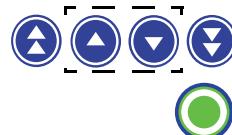
Key	Function
	ON switches on the pump. OFF switches it off when pressed for over three seconds.
	SILENCE ALARM
	STOP stops infusion.
	MENU/EXIT accesses the test mode. The selection keys scroll through the numbers and letters on the tenths, units and tens values and allow one to move to the next menu.
	OK validates your test selection or moves the cursor. enter starts up infusion. exit exits the screen and returns to the "previous" menu.
	Bolus or purge

Moving to the After-Sales Service test mode.

- Press "MENU/EXIT" key.
- Keep it pressed down and press "ON".
- When the "**Options**" main menu displays, release "MENU/EXIT" and "ON" keys.



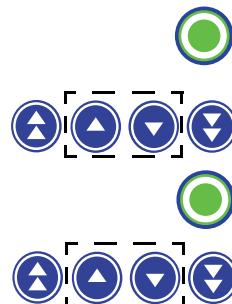
- Choose your "**Maintenance**" menu using the selection keys.
- Press "enter" to confirm.



- The "**Maintenance**" menu displays.
- Key in the code.



- Press "OK" to confirm.
- Choose the "**Test**" menu using the selection keys.
- Press "enter" to confirm.
 - Navigate through this sub-menu using the central selection keys.



You may exit the configuration mode at any time by pressing "MENU/EXIT"; this function cancels the modifications.



4.4.2 Visual check

Check the general appearance of the case and labels and check for shock impact damage.

4.4.3 Test 1, identification

This test displays:

- the device information screen,
- serial number
- screen,
- language information screen
- zone information screen
- boot information screen.

■ **Test 1**, press "enter".

- The main menu "**Identification**" displays.



■ Scroll through the information using the selection keys.

device information:

- ◆ device name
- ◆ version/revision and software production date
- ◆ device code and product serial number

serial numbers:

- ◆ CPU board serial number
- ◆ power supply board serial number

language information:

- ◆ language name, version and revision
- ◆ date the language file was created

zone information:

- ◆ zone parameter number, version and revision
- ◆ date the parameter file was created
- ◆ date of the last manual modification

boot information:

- ◆ boot version/revision
- ◆ boot creation date

■ Press "exit" to return to the "Tests" menu.



4.4.4 Test 2, Maintenance

This test displays:

- the running time since the last maintenance service in hours, days or months
- the date of the last maintenance service
- the total running time in hours, days or months and the number of cycles executed by the pumping unit.

■ **Test 2**, press "enter".

- The main "**Maintenance**" menu displays.
- Scroll through the information using the selection keys.
- Choose between the proposed options "Reset" or "Exit".

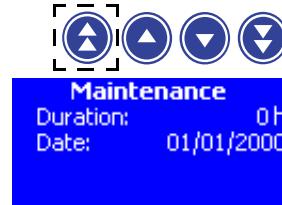


- "RAZ", using the left selection key.
The following "**Maintenance**" menu displays.

For this menu:

- Running time:**
 - ♦ the number of operating hours is reset to "0".
- Date:**
 - ♦ the date of the last maintenance is reset to the day's date.
- Total running time:**
 - ♦ the total running time since the beginning remains incremented.
- Total distance:**
 - ♦ the number of cycles executed since the start remains incremented.

- "Exit", leaves the screen and allows to return to the "**Test**" menu.



4.4.5 Test 3, Maintenance messages

This test displays information concerning the Technical Service interventions.

Test 3, press "enter".

- The "**Messages**" main menu displays.



- Scroll through the information from screen to screen using the selection keys.
- Press "exit" to return to the "**Test**" menu.



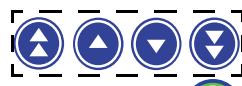
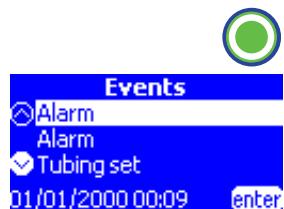
*It is necessary to use "Product maintenance software" to write messages in **Test 3**.*

4.4.6 Test 4, Events

This test displays the list of the alarms stamped with date and time.

Test 4, press "enter".

- The "**Events**" main menu displays.



- Scroll through the information from screen to screen using the selection keys.
- Press "enter" to display the alarm type.
- Press "MENU/EXIT" to return to the "**Test**" menu.



4.4.7 Test 5, Upstream pressure

This test displays:

- the upstream pressure value in mV,
- the calibration values of the different upstream pressures in mV,
- the date and calibration counter.

■ **Test 5**, select "enter".

- The "Upstream pressure" main menu displays.



■ Scroll through the information from screen to screen using the selection keys.

Conversion:

- ♦ Sensor value in mV
- ♦ Calibration door open in mV
- ♦ Calibration 0 mmHg in mV
- ♦ Sensor zero adjustment offset in LSB

Date:

Number:

- ♦ Date and number of calibration.

■ Select "exit" to return to the "**Test**" menu.



*Refer to section 7, "Calibration / Calibration procedure / **Etal 1** pressure", if one of the values is out of range.*

4.4.8 Test 6, Downstream pressure

This test displays:

- the downstream pressure value in mV,
- the calibration values for the different downstream pressures in mV,
- the date and calibration counter.

■ **Test 6**, press "enter".

- The main menu, "Downstream pressure" displays.



■ Scroll through the information from screen to screen, using the selection keys.

Conversion:

State:

- ♦ Sensor value mV,
- ♦ Door open calibration in mV,
- ♦ Calibration 0 mmHg in mV,
- ♦ Calibration 760 mmHg in mV,
- ♦ Sensor zero adjustment offset in LSB,



- Date:**
- Number:**
 - ◆ Date and number of calibrations.

- Select "exit" to return to the "**Test**" menu.



*Refer to section 7, "Calibration / Calibration procedure / **Etal 1** pressure", if one of the values is out of range.*



4.4.9 Test 7, Door

This test displays:
the door value in mV and its state, the calibration values in mV, the date and calibration counter.

- **Test 7**, press "enter".
- The main menu "**Door**" displays.



- Scroll through the information, from screen to screen, using the selection keys.
- Conversion**
- State**
 - ◆ Door open calibration value in mV,
 - ◆ Intermediary door calibration value in mV,
 - ◆ Door closed calibration value in mV.
- Date,**
- Number:**
 - ◆ Calibration date,
 - ◆ Number of calibrations,

- Select "exit" to return to the "**Test**" menu.



*Refer to section 7, "Calibration/Calibration procedure / **Etal 2** door, if one of the values is out of range.*

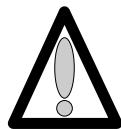
4.4.10 Test 8, battery information

This test displays:

- the battery running time displayed in hours, days and months
- the number of discharge cycles equivalent to the number of hours of battery use / 7h
- the start date for the battery running time counter; the battery voltage in mV and in 1/100 volts
- the battery temperature in mV and in 1/10 °C
- the current charge/discharge in LSB and mA.

■ **Test 8**, select "enter".

- The "**Battery info**" main menu displays.
- Choose between the "Clear" and "exit" options that appear.



Select "Clear" to reset to 0 after all battery replacements.

■ "Clear", using the left selection key



- The "**Battery Info**" menu displays.



Duration:

- ♦ the number of battery operating hours is reset to "0", resetting the number of cycles to "0".

Cycles:

- ♦ the number of cycles is reset to "0".

Start date:

- ♦ Only the total battery running time since the beginning remains incremented.

■ Scroll through the information, from screen to screen, using the selection keys.



Conversion:

Voltage:

- ♦ Voltage value at the battery terminals and conversion in mV.

Conversion:

Temperature:

- ♦ battery temperature value and conversion in mV.

Conversion:

Current:

- ♦ the value of the current consumed or on charge and its conversion in LSB.

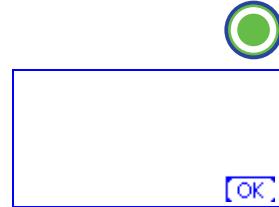
■ Press "exit" to return to the "**Test**" menu.



4.4.11 Test 9, Signalisation

This test checks that the indicator lights and buzzer are functioning correctly.

- **Test 9**, press "enter".
 - The main screen displays.
 - All LED and the mains LED are lit up.



- Press "OK" to start the test.
 - The "**Signalisation**" main menu displays.
 - ♦ Check that the LED, LCD and the two buzzer tones are functioning correctly.



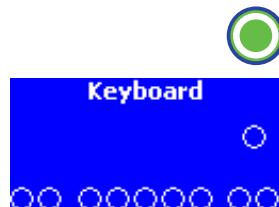
- "exit", exits the screen and returns to the "**Test**" menu for the entire duration of the test.



4.4.12 Test 10, Keyboard

This test checks that the keyboard is functioning correctly.

- **Test 10**, press "enter".
 - The "**Keyboard**" main menu displays.



- Press all the keys one by one, for example:
 - Press "Bolus/Purge"
 - ♦ the corresponding circle on the screen becomes dark.



- Press the "MENU/EXIT" key, for a long time to exit the screen and return to the "**Test**" menu for the entire duration of the test.

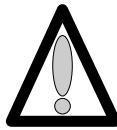


4.4.13 Test 11, Ageing test

This text checks the motor block/pumping system is functioning correctly as well as the pump occlusivity.

■ **Test 11**, press "enter".

- The main, "Ageing test" menu displays.



When the pump is fitted with a tube, open the administration set clamp by pressing the bolus key.



Ageing test
 Flowrate: 500 ml/h
 Mode Forward
 Step number: continuous
 OK



■ Select your submenu using the "OK" key.

- **Flow rate**: between 0.1 and 1200ml/h

Modify the value using the following selection keys:

- ♦ for the hundreds and tens, use the double arrows to increase or decrease
- ♦ for the units, increase or decrease using the single arrows.

- Press "OK" to validate and to move to the next step.



- **Mode**: Go forward or synchro or go forwards/backwards or backwards

Modify your choice using the single arrow selection keys.

- Press "OK" to confirm and move to the next step.



- **Steps numbers** or turns **number**:

Content or value lying between 1 and 9999

Modify the value using the single arrow selection keys

- Press "OK" to confirm and move to the next step.



- **Current**: high, low, auto or error.

Modify the value using the single arrow selection keys,

- Press "OK" to confirm and move to the next step.

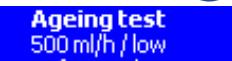


■ Press "OK" to confirm and start up the test.

- The "Ageing test" menu displays:

♦ The flow rate and current category for the motor command are displayed at the top of the screen.

♦ The number of steps decreases according to the actual change for the number of steps.



■ Press "exit" to return to the "Test" menu.



During the test, the rotation control is activated and the device set in error if a problem is detected.

In a test with a defined number of steps/cycles or using a synchro mode, the test ends when the requested position is reached.

4.4.14 Test 12, Battery life

This test displays:

- the amount of battery charge
- the date of the last automatic extinction
- the pump's battery running time before the pre-alarm and battery alarm were triggered
- the alarm's running time till the battery is off.

- **Test 12**, press "enter".
- The "**Battery life**" main menu displays.



- Scroll through the information, from screen to screen, using the selection keys.
 - **Charge**
 - **Auto extinction**
 - **Pre-alarm**
 - **Alarm**
 - **Cut-out**
- Press "exit" to return to the "**Test**" menu.

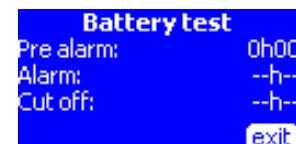


"Test 12" always displays information concerning the previous discharge. If the battery is replaced, all the parameters on test 8 must be reset to zero.

4.4.15 Test 13, Battery test

This test discharges the battery completely and measures the time taken for the alarms and pre-alarms to be triggered, as well as the duration of the power cut.

- **Test 13**, press "enter".
- If the pump is connected to the mains, the "**Battery test/Disconnect mains**" menu displays.



Carrying out the battery test does not require the presence of an operator to note the battery life.
 At the end of the battery life test, the device switches off.
 To read the battery life, connect the device to the mains power and select "test 12" :
 the battery life must be > 6h30.



Once the battery life has been obtained, test 13 accelerates the battery discharge. If the battery is changed, all the parameters for test 8 must be reset to zero.

4.4.16 Test 14, Air sensor

This test displays:

- the air detector value in mV,
- the calibration values in mV,
- the date and calibration counter.

■ **Test 14**, press "enter".

- The main "**Air sensor**" menu displays.



■ Scroll through the information, from screen to screen, using the selection keys.

- Conversion:**

State: water/air

- ♦ Air sensor value in mV
- ♦ Calibration without administration set in mV
- ♦ Calibration with administration set and air in mV
- ♦ Calibration with administration set and water in mV
- ♦ Frequency during calibration
- ♦ Frequency shift variance.

- Date:**

Number:

- ♦ Date and number of calibrations.

■ Press "exit" to return to the "**Test**"menu.



Refer to section 7, "Calibration / Calibration procedure / **Etal 3** calibration of the air detector", if the values are out of range.

4.4.17 Test 15, Clamp motor

This test checks the clamp motor is functioning correctly when carrying out displacement.

■ **Test 15**, press "enter".

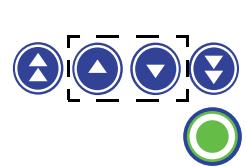
- The main "Clamp motor" menu displays.



■ Select your sub-menu using the "OK" key.

- **Mode**: declamping, continuous, go back, go forward or initialise.

Modify the choice using the selection keys.

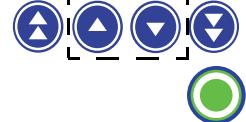


- Press "OK" to validate and move to the next step.

- **Steps numbers**: Auto or a value from 1 to 1000

Modify the value using the single arrow selection keys,

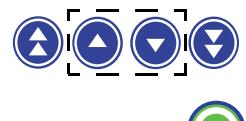
- Press "OK" to validate and move to the next step.



- **Frequency**: Auto or a value lying between 10 and 500 Hz

Modify the value using the single arrow selection keys.

■ Press "OK" to validate and start up the test.



- The "Clamp motor" menu displays:

♦ The displacement mode and the motor position for the motor command appear at the top of the screen.



♦ The number of steps decreases according to the actual change for the number of steps.



During the test, the rotation control is activated and the device set in error if a problem is detected.

In a test with a defined number of steps/cycles or using a "declamping" displacement mode, the test ends when the requested position is reached.

■ Press "exit" to return to the "Test" menu.



4.4.18 Test 16, Flow rate

This test checks the flow rate coefficient performed in the flow rate calibration procedure.
(Etal 4)

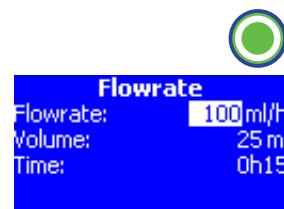
- Carry out a flow rate test that conforms to the EN-60-601-2-24 standard (see section 4.5 "Flow rate check").
- Check that the flow rate error lies between - 5% and +5%.



Before any flow rate test, carry out an infusion of 25 ml to warm up the administration set.

■ **Test 16**, press "enter".

- The "Flow rate" main menu displays:
The "default values" are:
 - ♦ Flow rate 100ml/h
 - ♦ Volume 25ml
 - ♦ Duration 0h15



The IS flow rate software dedicated to this procedure is available from Fresenius Kabi.

Any flow rate test using the "default values" menu with a minimum/maximum volume indication is facilitating the checking of the result obtained when this test is carried out with a scale or a test administration set.



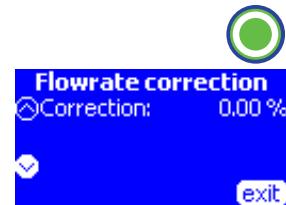
Refer to section 7, "Calibration/Calibration procedure / Etal 4 flow rate calibration", if the value is out of range.

4.4.19 Test 17, Flow rate correction

This test displays the flow rate corrective coefficient on the device, the date and calibration counter.

■ **Test 17**, press "enter".

- The main "**Flow rate correction**" menu displays.



■ Scroll through the information, from screen to screen, using the selection keys.

□ **Correction:**

- ◆ The device flow rate corrector coefficient is displayed as a percentage.

□ **Date:**

Number:

- ◆ Calibration date and number.

■ Press "exit" to return to the "**Test**" menu.



4.4.20 Test 18, Occlusivity

This test is dedicated exclusively to product development.

4.4.21 Test 19, Clamp

This test displays the presence or absence of the administration set clamp, and its position.

■ **Test 19**, press "enter".

- The main "**Clamp**" menu displays.



Clamp checking, test 19.

- Door open without administration set, check
 - Clamp: absent
 - Position: open.
- Insert the tube clamp in open position, check
 - Clamp: present
 - Position: open.
- Close the door with administration set, check
 - Clamp: present
 - Position: closed.
- Open the door, check
 - Clamp: present
 - Position: closed.

Check that the tube clamp is closed.

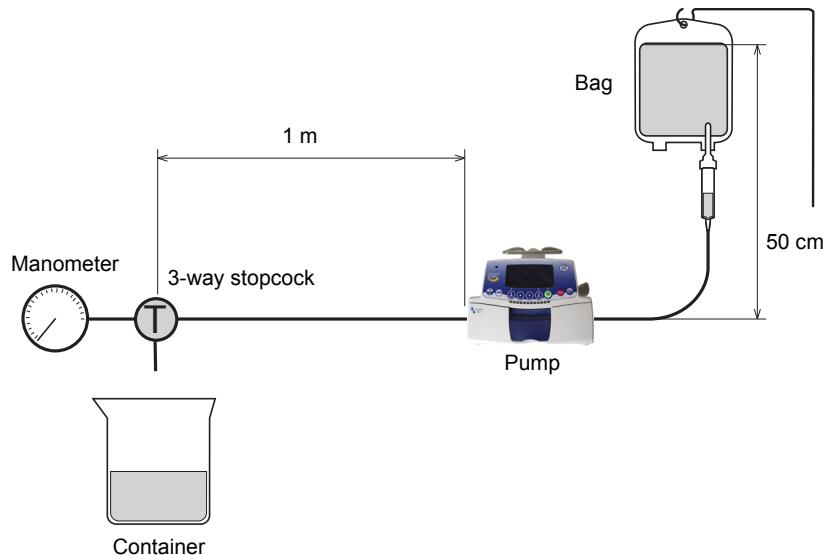
- Press "exit" to return to the "**Test**" menu.



4.4.22 Checking the presence limit alarm

To carry out this operation, exit the test mode and press "OFF".

- Carry out the following assembly:



- Press the "ON/OFF" key.

- Place the administration set on the device and close to the door.
- Place the manometer at the tube outlet.
- Select a flow rate of 125 ml/h.
- Adjust the pressure threshold to 750mmHg.
 - ♦ Open the 3-way stopcock to a container.
 - ♦ Start the infusion and leave it running for 30 seconds.
 - ♦ Position the 3-way stopcock on the manometer side.
 - ♦ Check that the alarm is triggered for a value of 1bar ± 0.15 bar.
- Stop the infusion cycle by pressing "STOP".



*When the value of the measured pressure, lies outside of the limit selected, recalibrate the pressure sensors (see "**Etal 1 Upstream and downstream pressure sensors calibration**").*

4.4.23 Mains/battery operation check

- To carry out this procedure, exit the test mode pressing the "OFF" key.



- Connect the device to the mains.

- Check the functioning of mains presence LED (plug-shaped indicator).



- Disconnect the device from the mains.

- Check that the mains indicator goes out.



4.4.24 Battery life check

- Carry out a complete battery recharge before proceeding with the test.
The duration of the charging procedure is:
 - < 6 h device switched off
 - < 20 h device functioning
(See test 12, Battery life)

- When the test has been carried out automatically, as described in test 13, the battery life must be greater than 6.30 hours.
- When the test is carried out in normal functioning mode, the battery life must be an average of 8h for a flow rate of 125ml/h.

4.4.25 Electrical test

Carry out the electrical test according to IEC 60601-1 or IEC 62353 standard.

For further information, please contact your Technical Service.

4.5 Maintenance options

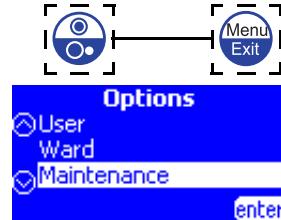
4.5.1 Access to test

Keyboard description.

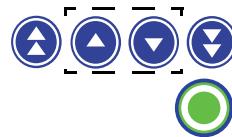
Key	Function
	ON , switches on the device. OFF stops the device by pressing for more than three seconds.
	MENU/EXIT , accesses the options menu.
	The selection keys are used to scroll through the numbers and letters on the tenths, units and tens and move to the next menu.
	OK , validates your choice or moves the cursor. enter , starts up infusion. exit , exits the screen and returns to the preceding menu

Moving to the **Maintenance** mode

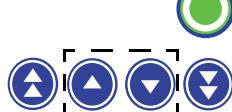
- Press "MENU/EXIT".
- Keep it pressed down while pressing "ON".
- When the "**Options**" main menu displays, deselect "MENU/EXIT" and "ON".



- Select "**Maintenance**" menu using the selection keys.
- Press "enter" to confirm.



- The "**Maintenance**" menu displays:
- Key in the code.
- Press "OK" to confirm.
- Choose the "**Maintenance options**" menu using the selection keys.
- Press "enter" to confirm.
 - You can browse through this sub-menu using the central selection keys.



You can exit the configuration mode at any time by pressing "MENU/EXIT". This function cancels the modifications.



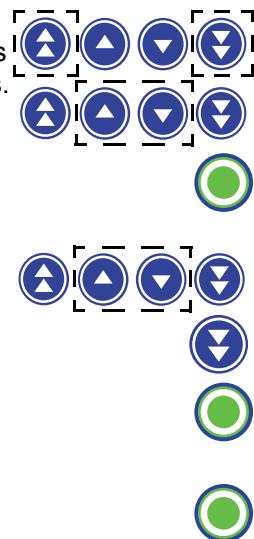
4.5.2 SAV 1, Maintenance date

This screen selects the date for the next maintenance.

- The "Maintenance date" main menu displays.



- Modify the day using the selection keys:
 - for the tens, increase and decrease using the double arrows
 - for the units, increase and decrease using the single arrows.
- Press "OK" to confirm and move to the next step.
- Modify the month using the selection keys:
 - increase and decrease using the single arrows,
 - ♦ press the "downward double arrow" for a Clear month.
- Press "OK" to confirm and move to the next step.
- Proceed as above to modify the year.
- Press "OK" to confirm.



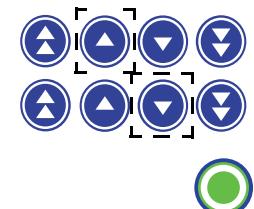
4.5.3 SAV 2, Initial set up

This screen activates the initial configuration when the device is next switched on.

- The "Initial set up" main menu displays.



- Modify your selection using "yes" or "no":
 - "YES", using a single left arrow.
 - "NO", using a single right arrow.
- Press "OK" to confirm.



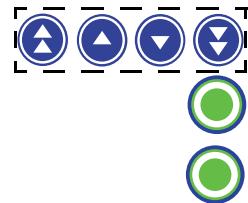
4.5.4 SAV 3, Data log event

This test displays the list of the alarms stamped with date and time (like **Test 4**).

- The "Data log event" main menu displays.



- Scroll through the information, from screen to screen, using the selection keys.
- Press "enter" to display the alarm type.
- Press "MENU/EXIT" to return to the "**Test**" menu.



4.5.5 Quality Control Certificate

Use this table to summarise the results obtained from the various tests.
 These tests can be carried out using a software dedicated to the **Agilia** devices.

Device type:	Code:	Device serial n°:
--------------	-------	-------------------

N°	Procedure	Value Obtained	Conformity	
			Yes	No
1	■ Check the general appearance of the case, label containing serial number and product code.			
2	■ OCS check: <input type="checkbox"/> Switch the device on. <input type="checkbox"/> Install an administration set filled with water. <input type="checkbox"/> Check OCS.			
3	■ Check the upstream pressure (without drip detector): ***** <input type="checkbox"/> Start a 100ml/h infusion without a drop detector. <input type="checkbox"/> Clamp the administration set between the drop chamber and the pump. <input type="checkbox"/> Check that the Upstream occlusion alarm is triggered before 30 seconds. <input type="checkbox"/> Unclamp the tube. <input type="checkbox"/> Press "silence alarme". <input type="checkbox"/> "Start" displays. Refer to section 7 "Calibration / Calibration procedure / E t R L 1 pressure calibration", if one of the values is out of range.			
4	■ Check the downstream pressure. <input type="checkbox"/> Install the water manometer at the administration set outlet. <input type="checkbox"/> Set the pressure threshold at 750mmHg. <input type="checkbox"/> Start infusion at 100ml/h. <input type="checkbox"/> Check that the Downstream occlusion alarm is triggered at 750mmHg \pm 125 (1bar \pm 0.15). Refer to section 7 "Calibration / Calibration procedure / E t R L 1 pressure calibration", if one of the values is out of range.			
5	■ Check the drop detector "if present".			
6	■ Check the air detector. <input type="checkbox"/> Start the test with at a flow rate of 500ml/h, <input type="checkbox"/> Create an air bubble in the administration set with a minimum length of 5 cm. <input type="checkbox"/> Check the presence of the air bubble alarm (sound and visual) when the air bubble passes through the air bubble detector. Refer to section 7, "Calibration / Calibration procedure / E t R L 3 calibration of the air detector", if the values are out of range.			
7	■ Display the running time and the last maintenance date, test 2 (in hours, days or months). *****			
8	■ Check the LCD screen, all light indicators and buzzer, test 9. **			
9	■ Check the keyboard, test 10. *****			

N°	Procedure	Value Obtained	Conformity	
			Yes	No
10	<ul style="list-style-type: none"> ■ Check the occlusivity, test 11. <ul style="list-style-type: none"> <input type="checkbox"/> Connect the water manometer at the administration set outlet. <input type="checkbox"/> Press the Bolus key to unclamp the administration set. <input type="checkbox"/> Start the test with at a flow rate of 500ml/h and confirm all other steps. <input type="checkbox"/> Check that no motor error is triggered and that the maximum pressure lies between 1.9 bar and 2.5 bar in maximum 45 seconds. 			
11	<ul style="list-style-type: none"> ■ Check the clamp motor, test 15. <ul style="list-style-type: none"> <input type="checkbox"/> Validate the clamping and unclamping. <input type="checkbox"/> Check for absence of motor alarm. 			
12	<ul style="list-style-type: none"> ■ Check the clamp, test 19. <ul style="list-style-type: none"> <input type="checkbox"/> Close the door without the administration set. <input type="checkbox"/> Check the message: <ul style="list-style-type: none"> ♦ clamp "absent", ♦ position "opened". <input type="checkbox"/> Insert the tube and close the door. <input type="checkbox"/> Check the message: <ul style="list-style-type: none"> ♦ clamp "present", ♦ position "closed". 			
13	<ul style="list-style-type: none"> ■ Check the flow rate. <p>Before any flow rate test, carry out an infusion of 25 ml to 'warm up' the administration set.</p> <ul style="list-style-type: none"> <input type="checkbox"/> Carry out a flow rate test in conformity with EN-60-601-2-24 standard. <input type="checkbox"/> Check that the flow rate error lies between - 5% and + 5%. <p>Refer to section 7, "Calibration / Calibration procedure / <i>E t d l 4</i> flow rate calibration", if the value is out of range.</p> 			
14	<ul style="list-style-type: none"> ■ Check the battery life, test 13: <ul style="list-style-type: none"> <input type="checkbox"/> Recharge the battery for 6 hours (device off). <input type="checkbox"/> Carry out the test according to test 13. <input type="checkbox"/> Note the battery running time information, test 12: ***** it should be > 6h30 			
15	<ul style="list-style-type: none"> ■ Carry out the electrical test according to the IEC 60601-1 or IEC 62353 standard 			

Name:	Date:	Visa:
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Observations:

4.6 Flow rate check

4.6.1 Measuring by computer

Measuring the flow rate using a computer requires **Fresenius Kabi IS Flow rate** software. For further information, contact our Technical Service.

The operating mode defined in this software follows the **infusion pump norm** protocol which is adapted to the user's software.



Use a new administration set [otherwise, make a hole in the filter of the administration set (if equipped with) and use this set for maximum 10 calibrations].

Do not recycle medical water.

Keep the container clean changing it as often as necessary.

Make sure the environmental temperature is between 18°C and 30°C.



*To acquire the IS flow rate software, contact the **Fresenius Kabi Customer service**.*

Equipment needed

- Scale connected to a micro-computer:

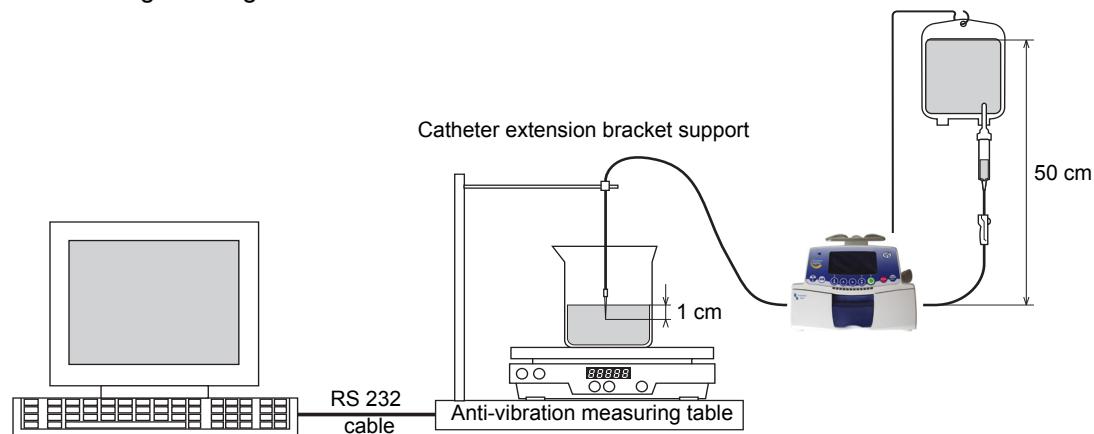
Flow rate value	Scale sensitivity
$x \leq 5\text{ml/h}$	1/10000th
$5\text{ml/h} < x \leq 30\text{ml/h}$	1/1000th
$x > 30\text{ml/h}$	1/100th

- Multi-scale acquisition programme
- Test tube or beaker with 1ml graduations
- Liquid: distilled water, oil.
- Catheter extension with Luer Lock end (length 100cm, internal diameter 2.5mm)
- Needle:

Flow rate value	Type of needle
$x \leq 30\text{ml/h}$	G26
$x > 30\text{ml/h}$	G18 or G21

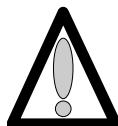
Installation

- Following the diagram below:



Observe the equipment horizontal installation plan.

- Fill the container with 600ml or more of distilled water.
- Connect an administration set with the container.
- Connect the canula with the distal end of the administration set.
- Fit the administration set on to the pump.
- Fill the administration set with water. Take care that no air is in the administration set before the measurement is started.
- Fill the test tube or the beaker with some water ensuring the canula is dipped in the water (> 1cm).
- Add several drops of oil to create a greasy film on the surface of the water. This way the user will avoid any measurement error due to evaporation of the water.
- Place the test tube or the beaker in the centre of the scale platform ensuring it is not in touch with the scale.
- Place the canula inside the test tube or the beaker ensuring that it is dipped in the water.



The infusion line (needle/catheter extension) must not rest on the scale/test tube unit.

- Press "ON" (device on mains power mode).
 - Prime the infusion line using the "BOLUS" key.
 - Check for the absence of air bubbles.



Operating mode



The software operates according to the operating mode described in the EN 60601-2-24 standard for infusion pumps.

- Start the acquisition programme for the scale.
- Enter the necessary programme data without confirming the flow rate.
- Adjust the device to the specific flow rate.
- Confirm the flow rate on the micro-computer to enable self-adjustment of the scale.
- Start infusion by pressing "VALIDATION", when **00.00** appears on the scale display.
- At the end of the specified time, note the error percentage displayed on the screen.



4.6.2 Measuring with a scale



Use a new administration set [otherwise, make a hole in the filter of the administration set (if equipped with) and use this set for maximum 10 calibrations].

Do not recycle medical water.

Keep the container clean changing it as often as necessary.

Make sure the environmental temperature is between 18°C and 30°C.

Equipment needed

- Chronometer
- Scale:

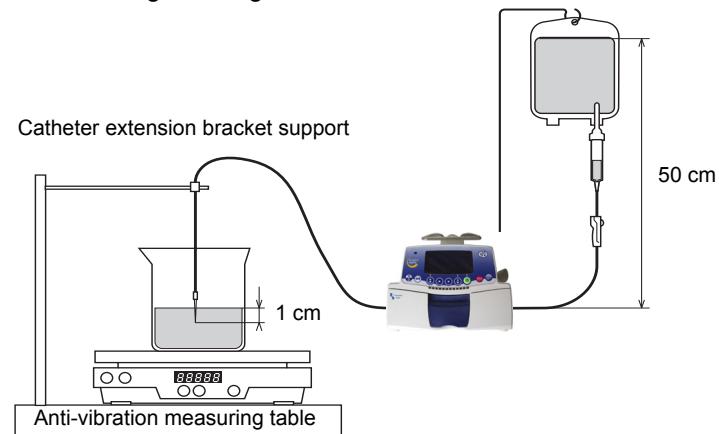
Flow rate value	Scale sensitivity
$x \leq 5\text{ml/h}$	1/10000th
$5\text{ml/h} < x \leq 30\text{ml/h}$	1/1000th
$x > 30\text{ml/h}$	1/100th

- Test tube or beaker with 1ml graduations.
- Liquid: distilled water, oil
- Catheter extension with Luer Lock end (length 100cm, internal diameter 2.5mm)
- Needle:

Flow rate value	Type of needle
$x < 30\text{ml/h}$	G26
$x > 30\text{ml/h}$	G18 or G21

Installation

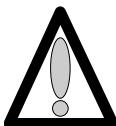
- Following the diagram below:



Observe the equipment horizontal installation plan.

- Fill the container with 600ml or more of distilled water.
- Connect an administration set with the container.
- Connect the canula with the distal end of the administration set.
- Fit the administration set on to the pump.
- Fill the administration set with water. Take care that no air is in the administration set before the measurement is started.

- Fill the test administration set or the beaker with some water ensuring the canula is dipped in the water (> 1cm).
- Add several drops of oil to create a greasy film on the surface of the water. This way the user will avoid any measurement error due to evaporation of the water.
- Place the test tube or the beaker in the centre of the scale platform ensuring it is not in touch with the scale.
- Place the canula inside the test tube or the beaker ensuring that it is dipped in the water.



The infusion line (needle/catheter extension) must not rest on the scale/test tube unit.

- Press "ON" (device on mains power mode).
 - Prime the infusion line using the "BOLUS" key.
 - Check for the absence of air bubbles.



Operating mode

- Carry out a flow rate selection.



For low flow rates (< 5ml/h), confirm or wait 1 hour for infusion to stabilise. For high flow rates, wait 10 to 30 minutes after the end of the infusion.

- Carry out the scale taring: **00.00** g.
- Start the infusion by pressing "VALIDATION", and start the chronometer (if necessary, note the chronometer value).
- After one hour, press "STOP" to stop the test.
- Note the value (in grams) of the "infused" liquid.
- Calculate the difference between the theoretical value and the real value.



1gram = 1ml.

- The error percentage is calculated according to the following formula:

$$\frac{(\text{Measured value} - \text{Theoretical value})}{\text{Theoretical value}} \times 100 = \text{Error percentage}$$

4.6.3 Measuring with a test tube



Use a new administration set [otherwise, make a hole in the filter of the administration set (if equipped with) and use this set for maximum 10 calibrations].

Do not recycle medical water.

Keep the container clean changing it as often as necessary.

Make sure the environmental temperature is between 18°C and 30°C.

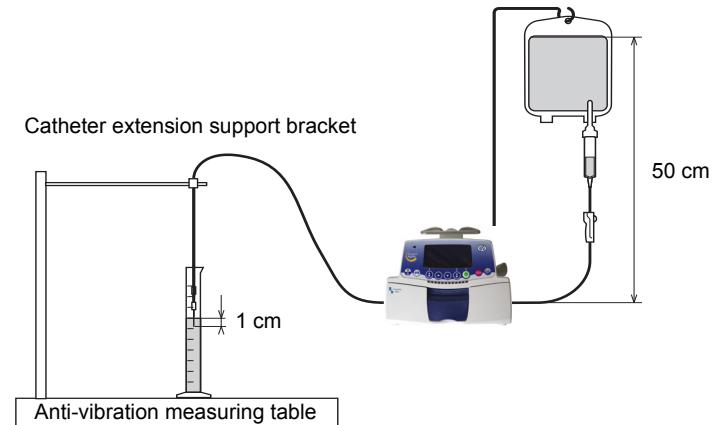
Material needed

- Chronometer
- Test tube or beaker with 1ml graduations
- Liquid: distilled water, oil
- Catheter extension with Luer Lock end (length 100cm, internal diameter 2.5cm)
- Needle:

Flow rate value	Type of needle
x < 30ml/h	G26
x > 30ml/h	G18 or G21

Installation

- Following the diagram below:



Observe the material horizontal installation plan.

- Fill the container with 600ml or more of distilled water.
- Connect a giving set with the container.
- Connect the canula with the distal end of the giving set.
- Fit the giving set on to the pump.
- Fill the giving set with water. Take care that no air is in the tube before the measurement is started.
- Fill the test tube or the beaker with some water ensuring the canula is dipped in the water (> 1cm).
- Add several drops of oil to create a greasy film on the surface of the water. This way the user will avoid any measurement error due to evaporation of the water.
- Place the canula inside the test tube or the beaker ensuring that it is dipped in the water.

Operating mode

- Carry out a flow rate selection.



For low flow rates (< 5ml/h), confirm and wait 1 hour for the infusion to stabilise. For higher flow rates, wait 10 to 30 minutes after the end of the infusion.

- Start the infusion by pressing "VALIDATION" and start the chronometer (if necessary, note the chronometer value).
- When the volume has been totally infused in the test tube, calculate the difference between the theoretical value and the real value:
Real flow rate = 50ml / time in hours
- The error percentage is calculated according to the following formula:

$$\frac{(\text{Measured value} - \text{Theoretical value})}{\text{Theoretical value}} \times 100 = \text{Error percentage}$$



4.7 Cleaning and disinfecting

Volumat Agilia is part of the patient's immediate environment. It is advisable to clean and disinfect the device's external surfaces regularly and especially before connecting a new patient and before any maintenance operation in order to protect patient and staff.

1. Prepare the detergent-disinfectant solution.
2. Disconnect the device from the power supply.
3. Moisten the disposable cloth with the detergent-disinfectant solution, carefully wring out the cloth. Repeat at each stage of the cleaning process.
4. Start by cleaning the bottom side of the device. Then carefully turn the device upside down without touching the mobile parts. Put down the device on a clean surface.
5. Continue the cleaning on sides of the device without wetting the sockets.
6. Clean the keyboard.
7. Complete the cleaning of the most exposed surfaces, the most critical zones and the mains cord.
8. Do not rinse, leave to dry.
9. Protect and keep the device clean before reuse.
10. Validate the maintenance protocol by simple bacteriological checking.
 - Do not place in an AUTOCLAVE or IMMERSE the device. Do not let liquids enter the device's casing.
 - DO NOT USE: TRICHLOROETHYLENE-DICHLOROETHYLENE - AMMONIA - AMMONIUM CHLORIDE - CHLORINE and AROMATIC HYDROCARBON - ETHYLENE DICHLORIDE-METHYLENE CHLORIDE - CETONE. These aggressive agents could damage the plastic parts and cause device malfunction.
 - Take care also with ALCOHOL BASED SPRAYS (20% - 40% alcohol). They lead to tarnishing and create small cracks in the plastic, and do not provide the necessary cleaning prior to disinfecting. Disinfecting SPRAYS may be used, in accordance with the manufacturer recommendation, from a distance of 30 cm of the device, avoid the accumulation of the product in liquid form.
 - Please contact the appropriate service, responsible for cleaning and disinfecting products, in your establishment for further details.

4.8 Storage

The device should be stored in a dry, cool place. In case of prolonged storage, the battery should be disconnected via the battery access flap situated underneath the device. This should be done by a qualified technician.

- Storage conditions and carrying:
 - Temperature: -10°C to +60°C / 14°F to 140°F.
 - Atmospheric pressure: 500hPa to 1060hPa.
 - Humidity: 10% to 90%, no condensation.

Fully recharge the battery before using the device to avoid any risks caused by micro power cuts in the mains supply and to ensure maximum autonomy.

4.9 Use of the internal battery

This device is provided with Li-Ion battery. When the device is disconnected from the mains, it automatically switches to battery mode.

Before starting for the first time, charge the battery for approx. 5 hours by connecting the power supply cord without using the device.

If possible, if not using device for an extended period (higher than 2 months), remove it from the device and store it in a place according to recommended use conditions. If not possible to remove battery or for a short period (lower than 2 months), it is recommended to charge the battery at least once a month, by leaving the device connected on mains power supply 8 hours at least (device OFF).

You can also recharge a Lithium-ion battery whenever convenient, without the full charge / discharge cycle necessary to get full capacity when fully charged.

In order to maximize the life time and the performances of the battery:

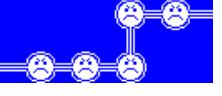
- Use and store in a cool place.
- In use, leave the device connected to mains power supply to maintain the charge of the battery and the maximum capacity when possible.

Lithium Ion rechargeable battery, handle with care !

- Do not incinerate or place near an open flame.
- Do not drop, crush, puncture, modify or disassemble battery.
- Do not use the battery that is severely scarred or deformed.
- Do not short terminals.
- Do not expose to high temperatures.
- Do not replace by a battery other than that specified by manufacturer.
- Do not charge or discharge otherwise than in the device.

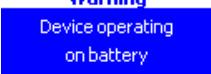
5 Troubleshooting

5.1 Breakdown guide

Displayed message	Meaning	Cause	Action
Door opened 	Door opened alarm	■ The Hall effect sensor detects that the door is open	■ Check that the magnet is present on the door ■ Calibrate the door sensor ■ Replace the door sensor
Install set 	Administration set position alarm	■ The pump does not detect the presence of the safety clamp	■ Check the position of the administration set and the clamp. Close the door. ■ Check the clamp detection opto and replace if necessary
	Administration set insertion alarm	■ Incorrect administration set position	■ Check the administration set position ■ Check that the magnet is present on the door ■ Calibrate the door sensor ■ Replace the door sensor
Install set 		■ At start-up: administration set not installed or door opened	■ Install the administration set and close the door
OCS Failure 	OCS test failure alarm	■ The pumping mechanism has not managed to raise the pressure in the line during the OCS test.	■ Check the administration set position ■ Check the pressure sensors calibration ■ Check the integrity of the membrane and replace it if necessary ■ Check the installation of the administration set and its integrity ■ Check the integrity of the door ■ If the problem persists, contact the Technical Service
Air alarm 	Air bubble alarm	■ The volume of air detected in the line exceeds the limit	■ Remove the air bubbles present by rebooting the administration set ■ Check the air bubble size setting ■ Calibrate the air detector ■ Replace the air detector
		■ Air bubble detected at start-up or in stop mode	■ Remove the air bubble by priming the administration set

Displayed message	Meaning	Cause	Action
	Flow rate flashing alarm	■ Flow rate has been modified but has not been confirmed	■ Check the flow rate and confirm with the OK key
	End of infusion pre-alarm	■ The remaining VTBI is less than 5% of the initially programmed VTBI or 5 minutes or 5 ml remain before the initially programmed VTBI is reached	■ Check if the volume remaining in the container corresponds to the remaining VTBI. If necessary, prepare a container for a new infusion sequence. If a drop detector is present, the end of infusion pre-alarm is deactivated and can be defined as an option.
	End of infusion alarm	■ VTBI delivered. KVO activated conforming with the configuration	■ Press Stop to define the new infusion parameters (if necessary).
	Drop detector alarm (if used with this accessory)	<ul style="list-style-type: none"> ■ The drop detector is not correctly positioned 	<ul style="list-style-type: none"> ■ Check the drop detector position ■ Check the integrity of the drop detector ■ Check the drop detector connection ■ Try the device using another drop detector ■ If the trouble keeps up, check the connection on the device ■ Replace the component if necessary
		<ul style="list-style-type: none"> ■ The drop detector has been connected then disconnected ■ The drop detector is disconnected when the pump is configured to function with it 	<ul style="list-style-type: none"> ■ Connect the drop detector to the pump and to the drip chamber
	Under flow rate alarm	■ Flow rate detected by the drop detector is lower than the set flow rate	<ul style="list-style-type: none"> ■ Check the container ■ Check the roller clamp ■ Check that liquid forms properly approx. 20 drops / ml

Displayed message	Meaning	Cause	Action
	Over flow rate alarm	<ul style="list-style-type: none"> ■ Flow rate detected by the drop detector is greater than the set flow rate 	<ul style="list-style-type: none"> ■ Check the administration set position ■ Check the drop detector position ■ Check the liquid volume in the drip chamber ■ Check the fluid temperature ■ Check that liquid forms properly approx. 20 drops / ml
	Uncontrolled flow rate alarm	<ul style="list-style-type: none"> ■ At the start or when stopped, free flow is detected by the drop detector 	<ul style="list-style-type: none"> ■ Check the drop detector and the administration set installations
	High flow rate warning	<ul style="list-style-type: none"> ■ Upper soft limit exceeded, conforming with the drug parameters set in the drug library 	<ul style="list-style-type: none"> ■ Check the liquid volume in the drip chamber ■ Check the fluid temperature ■ Check that liquid forms properly approx. 20 drops / ml
	Weak flow rate warning	<ul style="list-style-type: none"> ■ Lower soft limit exceeded, conforming with the drug parameters defined in the drug library 	<ul style="list-style-type: none"> ■ Check the liquid volume in the drip chamber ■ Check the fluid temperature ■ Check that liquid forms properly approx. 20 drops / ml
	Pressure increase warning	<ul style="list-style-type: none"> ■ In-line pressure rises. This warning can be selected as an option 	<ul style="list-style-type: none"> ■ Check whether the infusion line is occluded (clamp or 3-way stopcock closed, catheter blocked, line creased, etc.)
	Pressure drop warning	<ul style="list-style-type: none"> ■ Fall in pressure in the infusion line. This warning can be selected as an option 	<ul style="list-style-type: none"> ■ Check the downstream Luer lock connection and the integrity of the whole line
	Occlusion pre-alarm	<ul style="list-style-type: none"> ■ In-line pressure has reached 50 mmHg below the programmed threshold 	<ul style="list-style-type: none"> ■ Check the infusion line ■ Define the pressure threshold

Displayed message	Meaning	Cause	Action
	Upstream occlusion alarm	<ul style="list-style-type: none"> ■ The pressure level in the pumping system upstream line is too low ■ The container is empty ■ The roller clamp is closed ■ The air inlet stopper is closed (when used with a bottle) ■ Only if the drop detector is absent. The upstream line pressure is too weak 	<ul style="list-style-type: none"> ■ Check the container and the line ■ Check the roller clamp ■ Check that the administration set is not pinched ■ Check the height of the container ■ Check the air inlet stopper (when used with a bottle) ■ Calibrate the pressure sensors ■ Replace the upstream pressure sensor
	Downstream occlusion alarm	<ul style="list-style-type: none"> ■ The downstream pressure for the pumping system has exceeded the programmed pressure threshold 	<ul style="list-style-type: none"> ■ Check whether the infusion line is occluded ■ Check that the pressure threshold is set at an appropriate level ■ Calibrate the pressure sensors ■ Replace the downstream pressure system
	Battery pre-alarm	<ul style="list-style-type: none"> ■ Weak battery charge level 	<ul style="list-style-type: none"> ■ Connect the device to the mains
	Battery alarm	<ul style="list-style-type: none"> ■ Battery discharged (automatic switch off of the device in 5 minutes) 	<ul style="list-style-type: none"> ■ Immediately connect the device to the mains ■ Replace the battery if there is not enough life left
	Battery uncharged alarm	<ul style="list-style-type: none"> ■ Uncharged battery 	<ul style="list-style-type: none"> ■ Connect to mains power supply and wait till the battery is charged
	Mains disconnected warning	<ul style="list-style-type: none"> ■ Mains disconnection 	<ul style="list-style-type: none"> ■ Press on silence to stop the warning ■ Check that there is enough battery charge left for the expected duration of the infusion ■ If the disconnection location cannot be found: <ul style="list-style-type: none"> □ check the mains power supply connection
	Preventive maintenance requested	<ul style="list-style-type: none"> ■ Maintenance date reached 	<ul style="list-style-type: none"> ■ Carry out a complete check for the device and update the maintenance date (test 2)

Problem	Cause	Recommended action
Flow rate variance too great	■ A mechanical part of the pumping mechanism or the CPU board has been changed without the calibration of the infusion corrector coefficient being carried out	■ Carry out a flow rate test, calibrate the infusion corrector coefficient ■ Redo the test to ensure that the correction is right
Display default: segments, LED	■ LED and/or connectors defective	■ Check the general state of the display board ■ Check the contrast ■ Check the connectors ■ Replace the display board
The device switches off when it is disconnected from the mains	■ Battery is completely discharged	■ Check the battery connection ■ Charge the battery ■ Replace the battery
The mains indicator does not light up	■ Mains fuses are out of order	■ Replace the mains fuses ■ Check that the mains connector has been correctly connected ■ Replace the power supply board
Battery alarm while it has been correctly charged	■ Battery is completely discharged	■ Check the charging voltage ■ Replace the battery
The device switches on or off on its own	■ Defective keyboard ■ Defective CPU board	■ Check and replace the keyboard if necessary ■ Replace the CPU board and reconfigure completely
The keyboard keys do not work	■ Defective keyboard	■ Check and replace the keyboard if necessary
Mechanical elements are damaged	■ The pump has been dropped	■ Do not use the device. ■ Contact your biomedical department or our Technical Service.

5.2 Errors messages

Error Code	Description	Recommended action
Software and electronic command faults		
01	■ Rotation check	<ul style="list-style-type: none"> ■ Check correct functioning of the motor. ■ Check the flexible CI Opto and CPU board connection. ■ Check the correct functioning of the motor optical switch rotation. ■ Replace the CPU board. ■ Carry out a complete configuration using the maintenance software.
10	■ RAM	<ul style="list-style-type: none"> ■ Replace the CPU board. ■ Carry out a complete configuration using the maintenance software.
11	■ Flash	<ul style="list-style-type: none"> ■ Flash memory deleting or programming problem. ■ Replacing the CPU board. ■ Carry out a complete configuration using the maintenance software.
12	■ Resources	<ul style="list-style-type: none"> ■ Crc/16 problem. ■ Carry out a complete configuration for the device using the maintenance software. If the problem persists, replace the CPU board and carry out a complete configuration.
13	■ Version /secondary Crc16 µC check	<ul style="list-style-type: none"> ■ Secondary Crc/16 µC version is incorrect. ■ Carry out a complete configuration using the maintenance software.
14	■ Secondary µC starting up again.	<ul style="list-style-type: none"> ■ There is a problem of the secondary µC watch dog. ■ Replace the power supply board.
15	■ Secondary µC communication	<ul style="list-style-type: none"> ■ Check the state of the power supply/CPU board connection ribbon cable. ■ Replace the power supply board.
16	■ Disconnected battery	<ul style="list-style-type: none"> ■ Check the battery connection. ■ Check the battery charging voltage. ■ Replace the battery.
17	■ Battery charge	<ul style="list-style-type: none"> ■ Check the status of the battery. ■ Check the battery charge voltage. ■ Check the battery. ■ Replace the battery. ■ Replace the power supply board.
18	■ Mains presence	<ul style="list-style-type: none"> ■ Check the status of the mains fuses. ■ Replace the power supply board.

Error Code	Description	Recommended action
19	■ Battery temperature	■ Check the battery status. ■ Replace the battery.
20	■ 3.3 V missing of power supply	■ Check the status of the ribbon cable connection between power supply board and CPU board.
21	■ Secondary µC / coulometer power supply board communication	■ Contact the Technical Service.
22	■ Clamp opto switch	■ Check the opto functioning. ■ Check the status of the ribbon cable connection. ■ Replace the opto switch.
23	■ Clamp motor optical switch	■ Check the functionality of the clamp opto motor switch. ■ Check the flexible CI. ■ Replace faulty part(s).
24	■ Unclamping	■ Select test 15. ■ Check the status of the clamp motor. ■ Check the connector. ■ Replace the motor.
25	■ Door Hall effect sensor	■ Select test 7. ■ Check the "open or closed" door detection. ■ Check the Hall effect; change the Hall effect if necessary. ■ Perform a calibration of the door.
26	■ Board missing	■ Check the connection between the display board and the CPU board. ■ Check the connection between the power supply board and the CPU board. ■ Replace the faulty part(s).
27	■ LCD black-light missing	■ Check the connection between the display board and the Back light. ■ Replace the LCD display. ■ If the problem persists, replace the display board.
28	■ Keyboard	■ Check the keyboard test 10. ■ Replace the keyboard and check its functionality. ■ If the problem persists, replace the display board.
29	■ Analogue/digital converter	■ Replace the CPU board. ■ Carry out a complete configuration check using the maintenance software.

Error Code	Description	Recommended action
30	■ Date Time stamp	<ul style="list-style-type: none"> ■ Replace the CPU board, the Date Time stamp is integrated in the main Microcontroller. ■ Replace the power supply board, the time keeper is integrated in the secondary microcontroller. ■ Carry out a complete configuration of the CPU board using the maintenance software. For the power supply board, no configuration is needed.
31	■ Administration sets parameters	<ul style="list-style-type: none"> ■ Carry out a complete configuration using the maintenance software.
32	■ Default "language" loading configuration	<ul style="list-style-type: none"> ■ Carry out a complete configuration using the maintenance software.
33	■ Air detector	<ul style="list-style-type: none"> ■ Select test 14. ■ Check the status of the air detector using an administration set filled with water and air. ■ Calibrate the detector.
34	■ Infusion flow rate check	<ul style="list-style-type: none"> ■ Carry out a complete configuration using the maintenance software.
35	■ Motor period check	<ul style="list-style-type: none"> ■ Carry out a complete configuration using the maintenance software.
36	■ Motor rotation direction check	<ul style="list-style-type: none"> ■ Carry out a complete configuration using the maintenance software.
37	■ OFF key	<ul style="list-style-type: none"> ■ Carry out a complete configuration using the maintenance software. ■ Replace the power supply board to check the functionality of the secondary µC. ■ Replace the CPU board to check the functionality of the main µC. ■ Replace faulty parts.
38	■ OFF key locked	<ul style="list-style-type: none"> ■ Check the functionality of the keyboard OFF key. ■ Replace the keyboard if necessary. ■ Replace the power supply board and check the secondary µC functionality.
39	■ Impossible to switch off	<ul style="list-style-type: none"> ■ Replace the power supply board.
40	■ Drop detector	<ul style="list-style-type: none"> ■ Detector detection unstable. ■ Check the CPU board/detector connection. ■ Replace the CPU board ■ Carry out a complete configuration using the maintenance software.

Error Code	Description	Recommended action
41	■ Upstream pressure sensor out of range	<ul style="list-style-type: none"> ■ Select test 5. ■ Check the change in the state of the sensor by applying pressure to the sensor. ■ Check the connections. ■ Calibrate the upstream pressure sensor.
42	■ Downstream pressure sensor out of range	<ul style="list-style-type: none"> ■ Select test 6. ■ Check the change in state of the sensor by applying a pressure on the sensor. ■ Check the connections ■ Calibrate the downstream pressure sensor.
99	■ Activation of the watch dog	<ul style="list-style-type: none"> ■ Replace the power supply board to check the functionality of the secondary µC. ■ Replace the CPU board to check the functionality of the main µP. ■ Carry out a complete configuration, when replacing the CPU board, using the maintenance software.

6 Intervention procedures

This section lists all of the procedures of disassembly and reassembly.

Service shall be done by approved and qualified technicians who have been trained.

Use ONLY recommended accessories and options delivered with the device.

NO PART IS REPAIRABLE.

When replacing components, only use Fresenius Kabi spare parts.

Please refer to the "Spare parts catalogue" for ordering.



Any instrument or device used for maintenance must be regularly checked or re-calibrated according to its specifications and local regulations.

Procedure N°1: Battery and battery door

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.

Material needed:

- 1 Torx T-10 screwdriver
- 1 anti-static bracelet

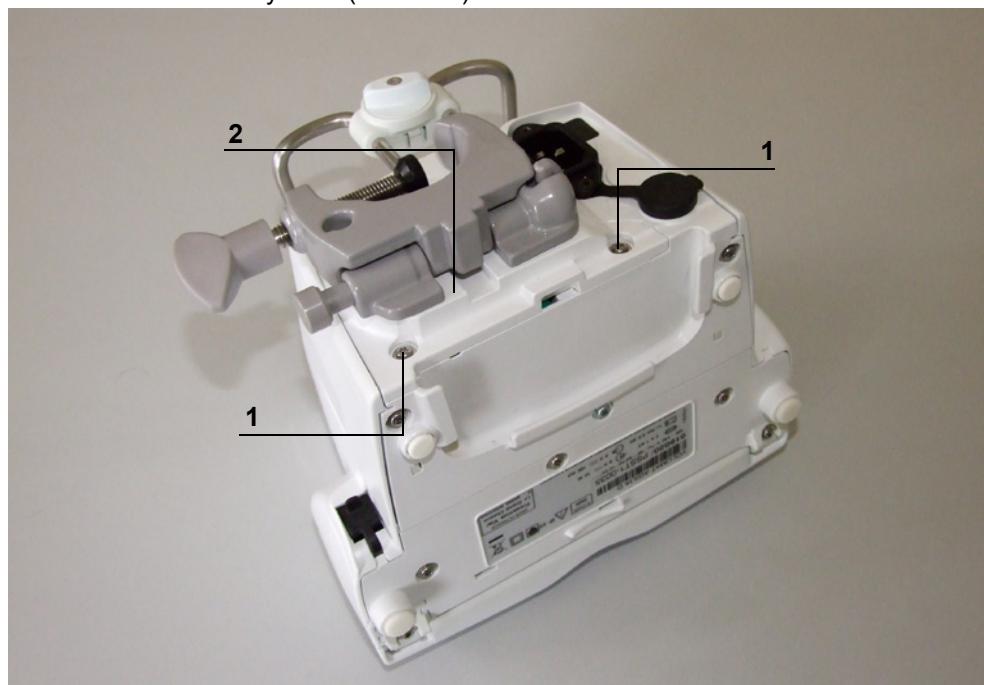
Maintenance level:

Level 3, specialist technician (see section “Training”, page 32).

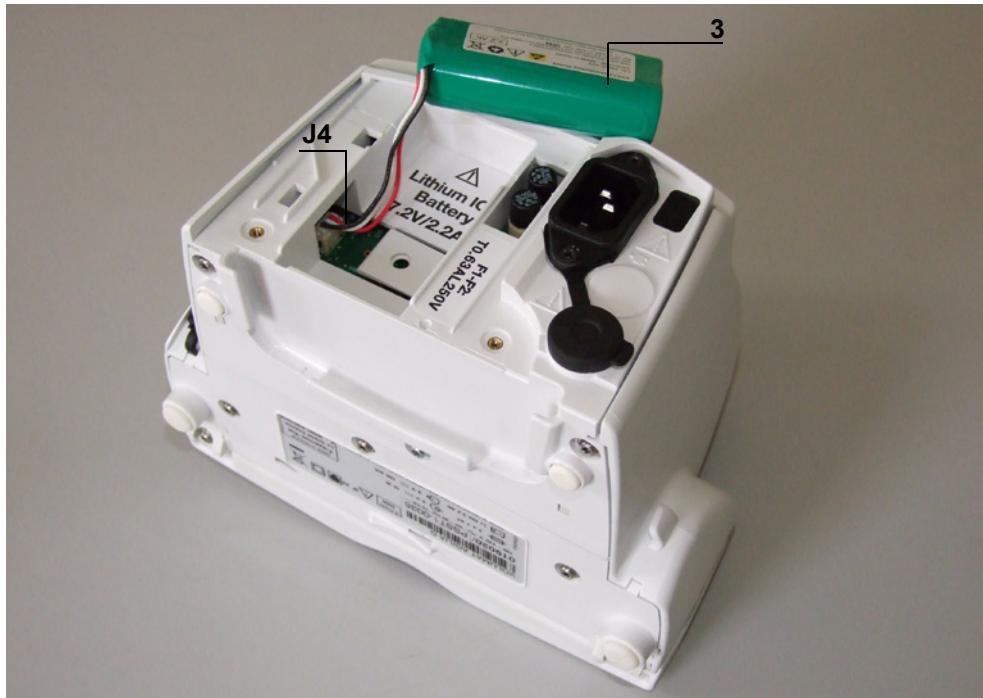
Procedure:

Dismantling

- Unscrew the 2 fixing screws (marker 1) holding the battery door in place.
- Remove the battery door (marker 2).



- Disconnect the J4 connector and remove the battery (marker 3).



Re-assembling

- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Carry out the regular servicing tests (see Quality Control Certificate).

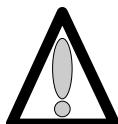
Procedure N°2: Upper case

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver
- 1 anti-static bracelet

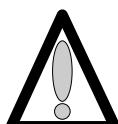
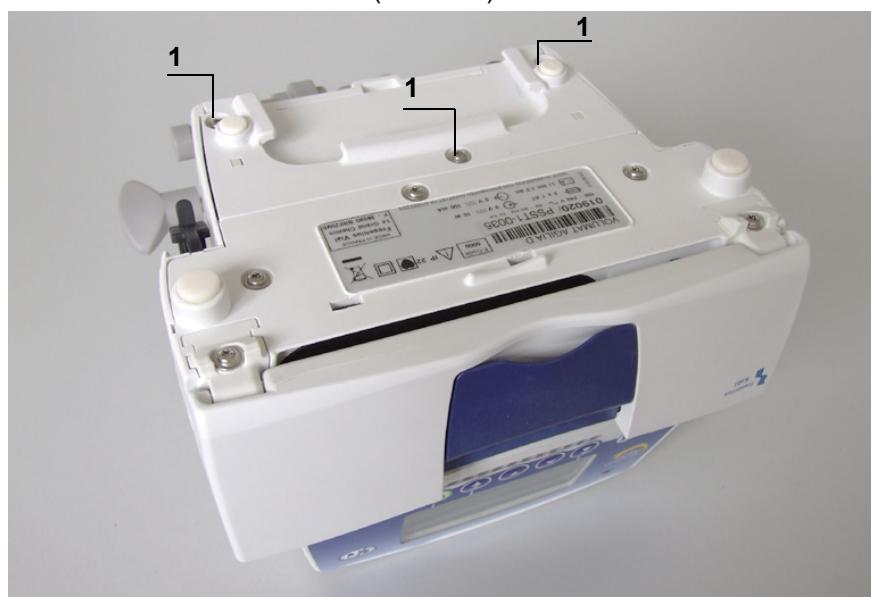
Maintenance level:

Level 3, specialist technician (see section "Training", page 32).

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them.



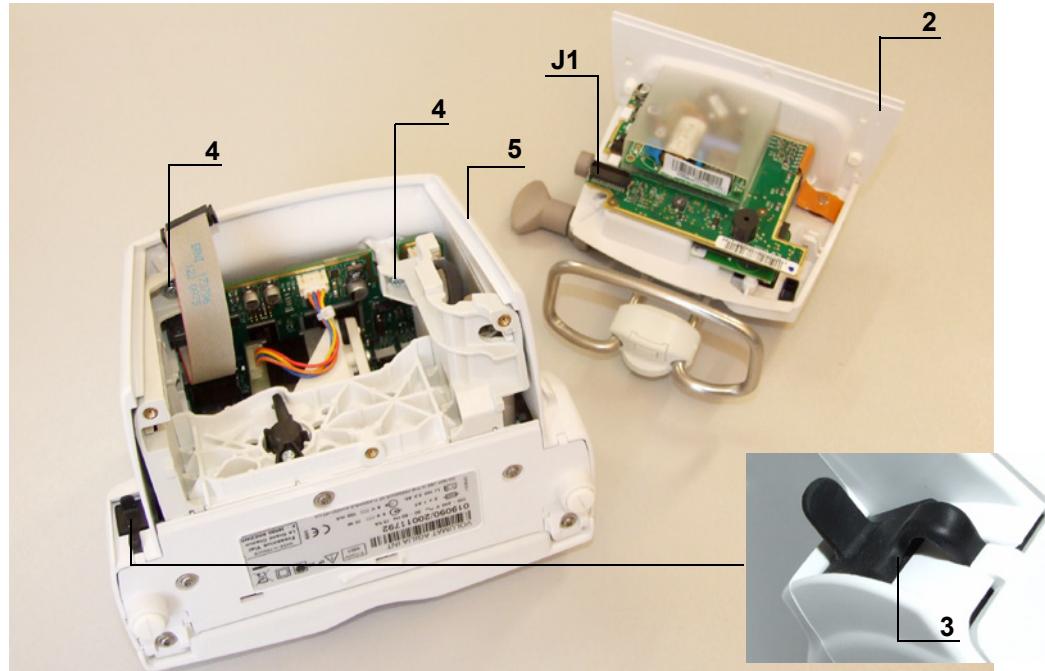
Do not touch the electronic boards with your hands.

Dismantling

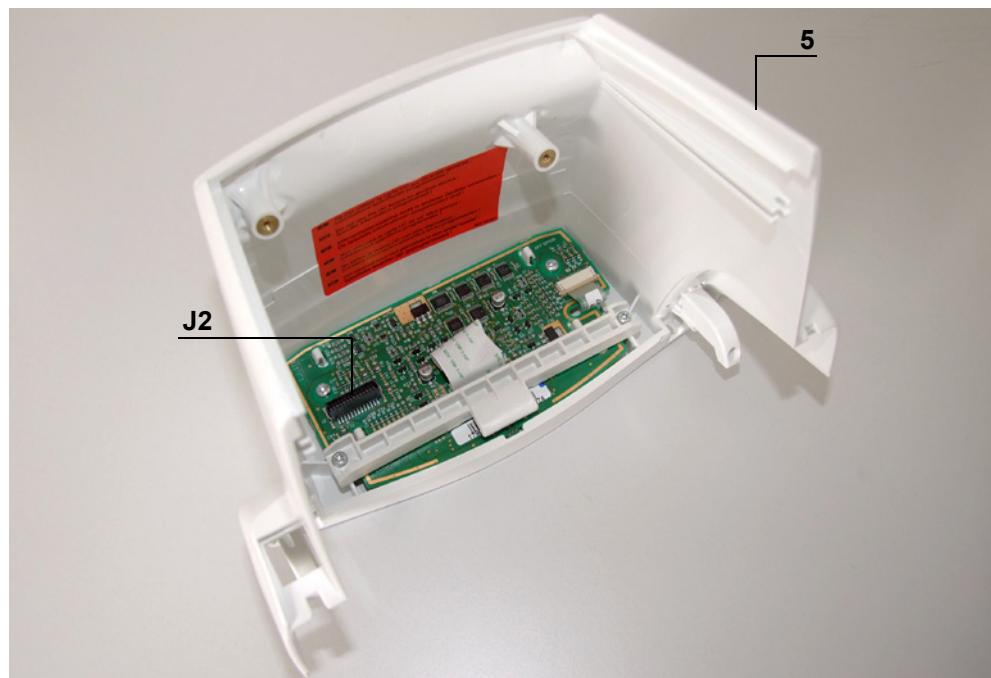


When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable connecting the CPU board to the power supply at J1.
- Pull out the RJ45 stopper (marker 3).
- Unscrew the 2 screws (marker 4) holding the upper case (marker 5) to the base.



- Remove the upper case (marker 5), being careful not to pull out the display board flat cable.
- Disconnect the flat cable connected to the CPU board from the display board at J2.



Re-assembling

- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Carry out the regular servicing tests (see Quality Control Certificate).

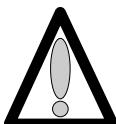
Procedure N°3: Display board

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver
- 1 anti-static bracelet

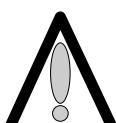
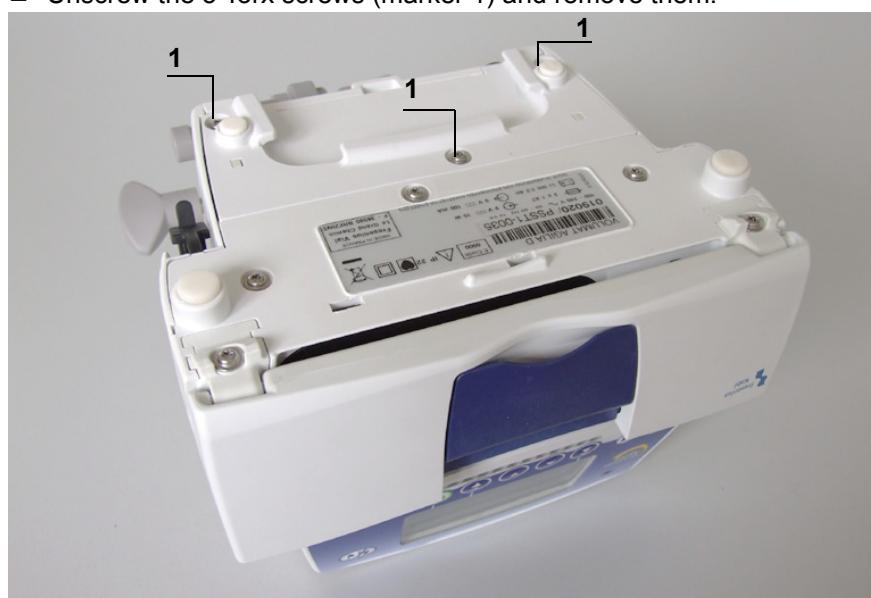
Maintenance level:

Level 3, specialist technician (see section “Training”, page 32).

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them.



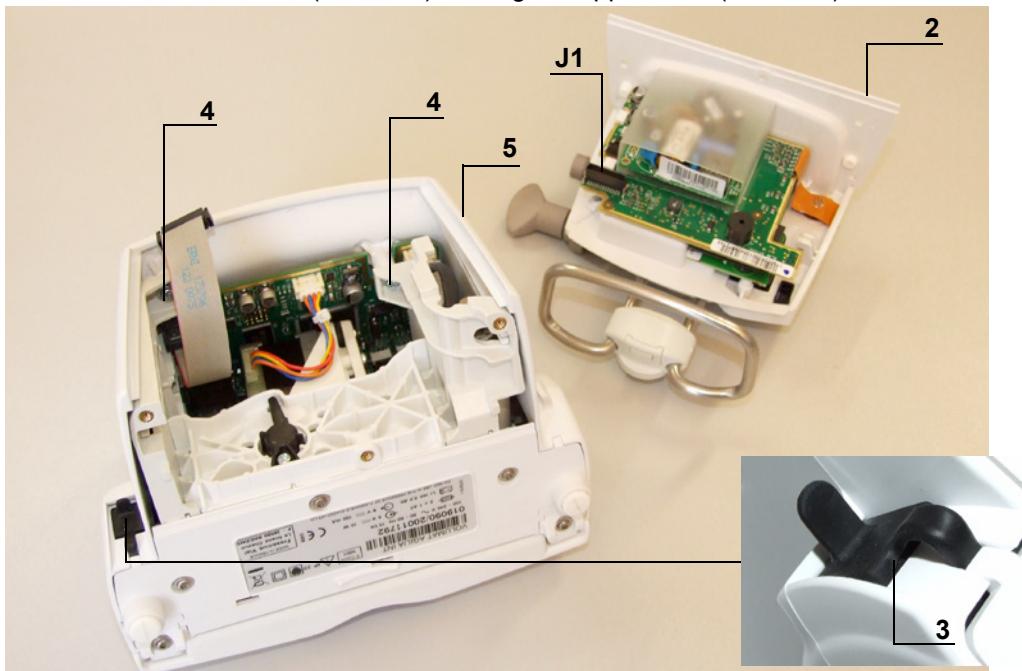
Do not touch the electronic boards with your hands.

Dismantling

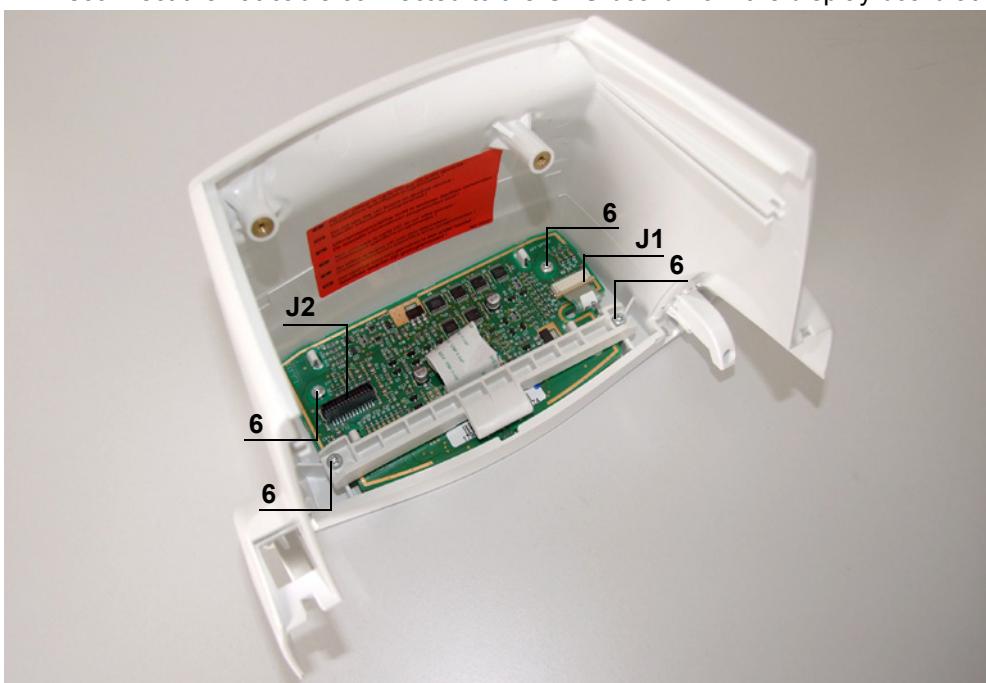


When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

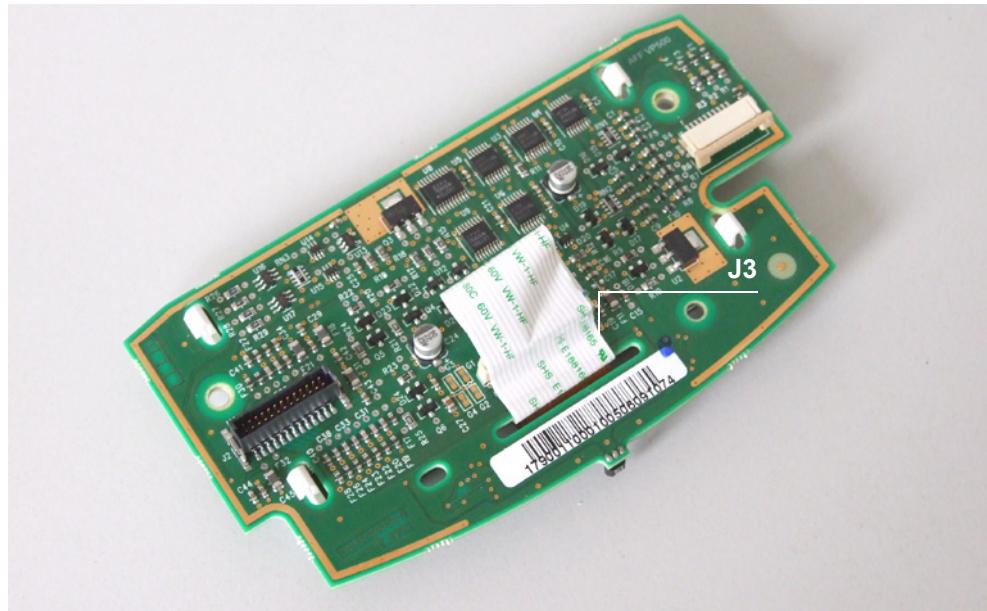
- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable connecting the CPU board to the power supply at J1.
- Pull out the RJ45 stopper (marker 3).
- Unscrew the 2 screws (marker 4) holding the upper case (marker 5) to the base.



- Remove the upper case (marker 5), being careful not to pull out the display board flat cable.
- Disconnect the flat cable connected to the CPU board from the display board at J2.



- Disconnect the keyboard/display board connection at (J1).
- Unscrew the 4 fixing screws (marker 6) holding the board to the upper cover.
- Remove the display board/display unit.
- Disconnect the display board /display connection at (J3).
- Unclip and separate the display board from the display.



Re-assembling

- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Carry out the regular servicing tests (see Quality Control Certificate).

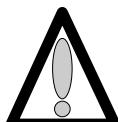
Procedure N°4: CPU board

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver
- 1 anti-static bracelet

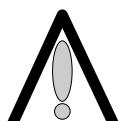
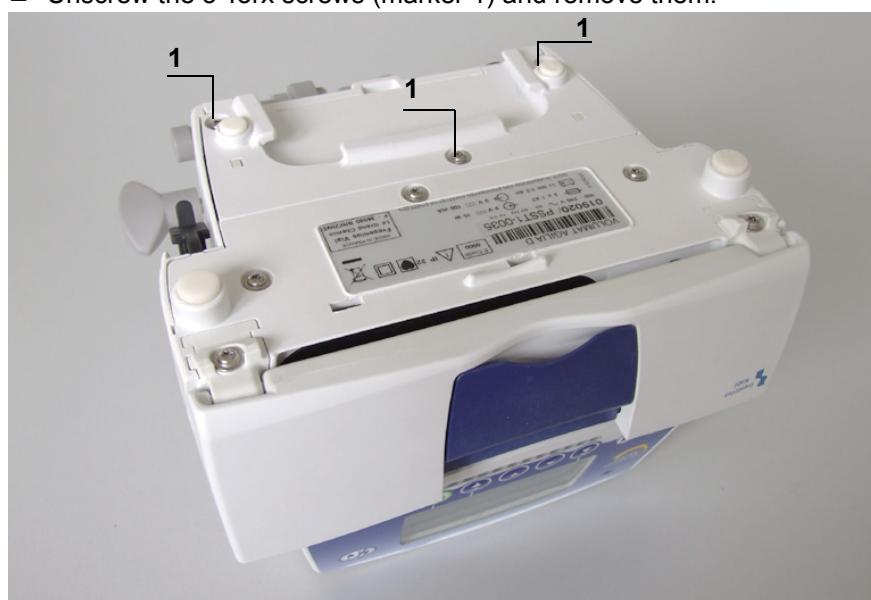
Maintenance level:

Level 3, specialist technician (see section “Training”, page 32).

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them.



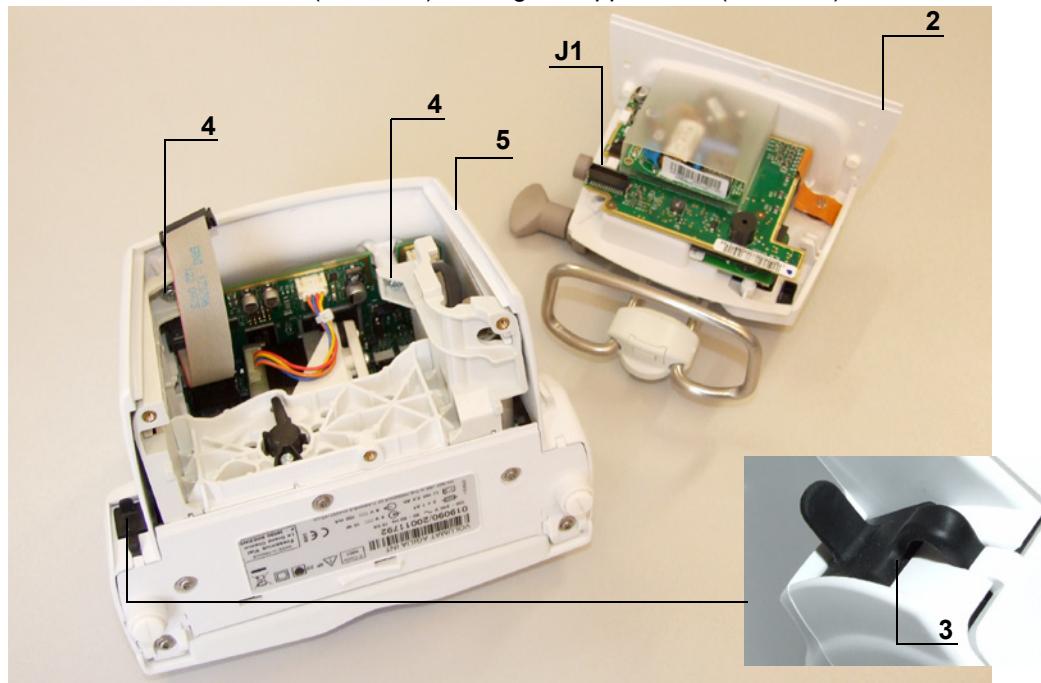
Do not touch the electronic boards with your hands.

Dismantling



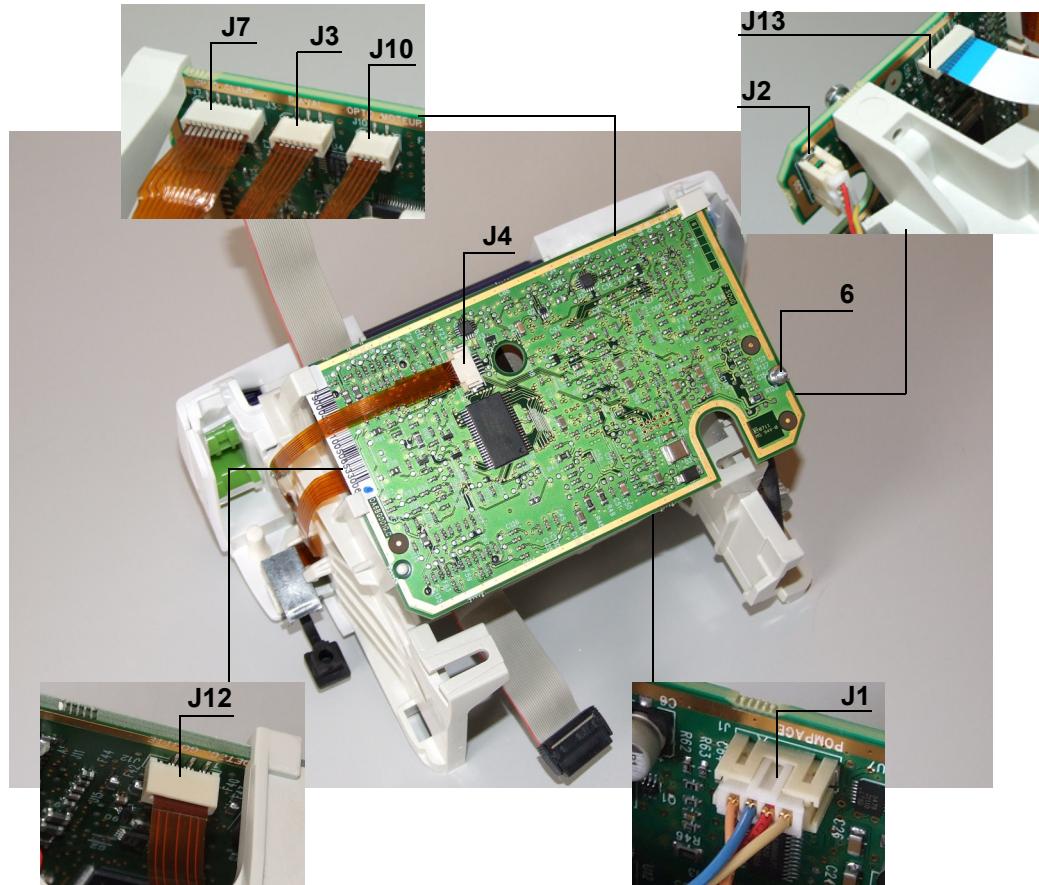
When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable connecting the CPU board to the power supply at J1.
- Pull out the RJ45 stopper (marker 3).
- Unscrew the 2 screws (marker 4) holding the upper case (marker 5) to the base.

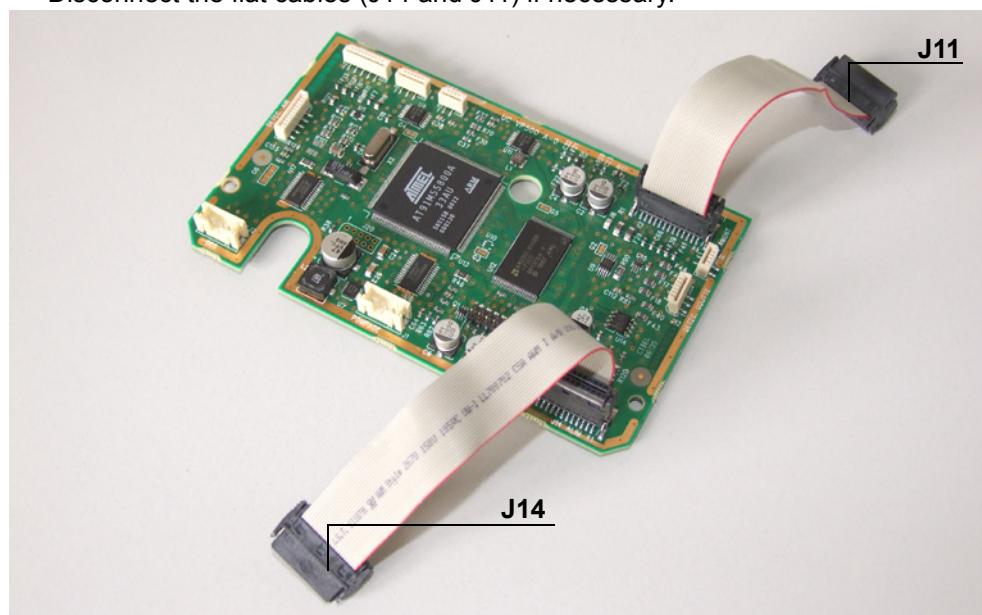


- Remove the upper case (marker 5), being careful not to pull out the display board flat cable.
- Disconnect the flat cable connecting the CPU board to the display board at J2.

- Disconnect the flat cables connected to the CPU board at:
 - J2 and J13
 - J7, J3 and J10
 - J4 and J12
 - J1
- Unscrew the fixing screws (marker 6) holding the CPU board to the flange.



- Remove the CPU board unit being careful not to pull out the flat cable on the inside.
- Disconnect the flat cables (J14 and J11) if necessary.



Re-assembling



*When replacing the CPU board, carry out a complete configuration of the device. Each **Volumat Agilia** has its own CPU board model. Be careful not to invert the different **Volumat Agilia** references. Order the one that corresponds to your device.*

- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Carry out the regular servicing tests (see Quality Control Certificate).

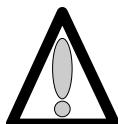
Procedure N°5: Power supply board

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver
- 1 14" wrench
- 1 anti-static bracelet

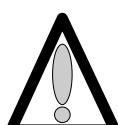
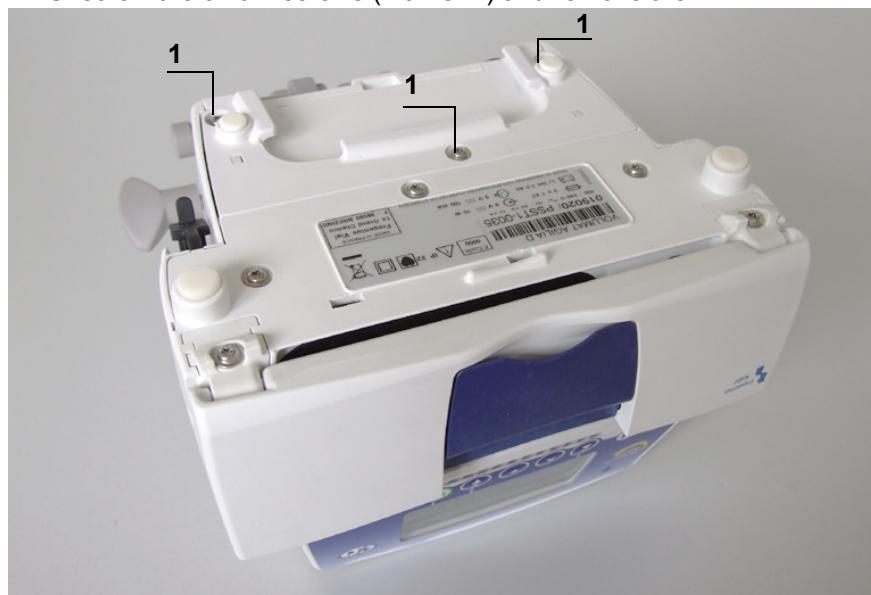
Maintenance level:

Level 3, specialist technician (see section “Training”, page 32).

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them.



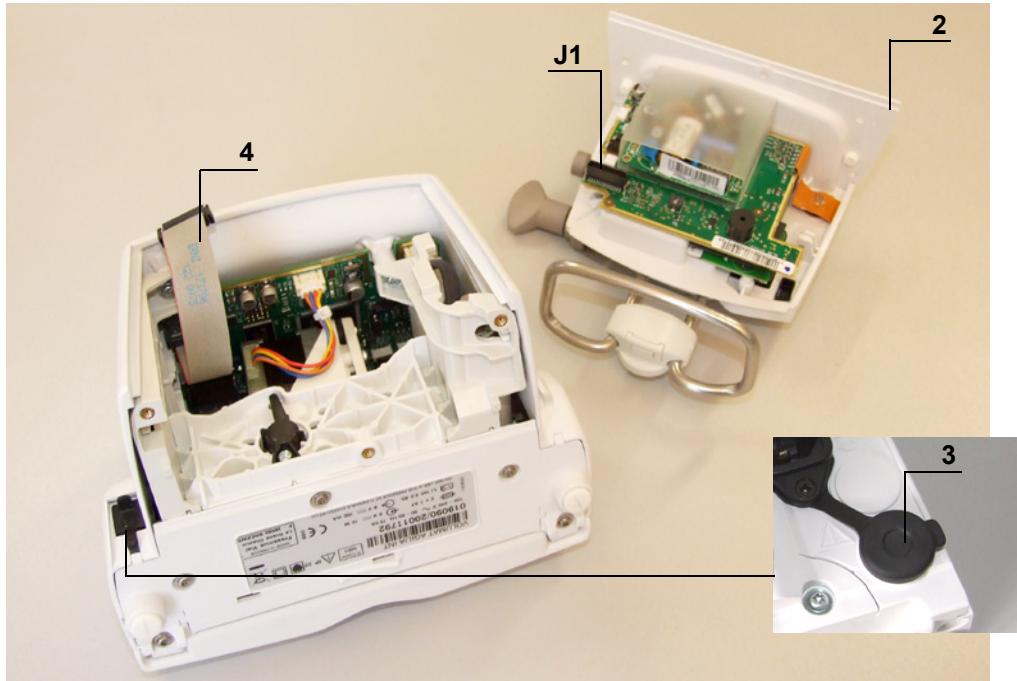
Do not touch the electronic boards with your hands.

Dismantling

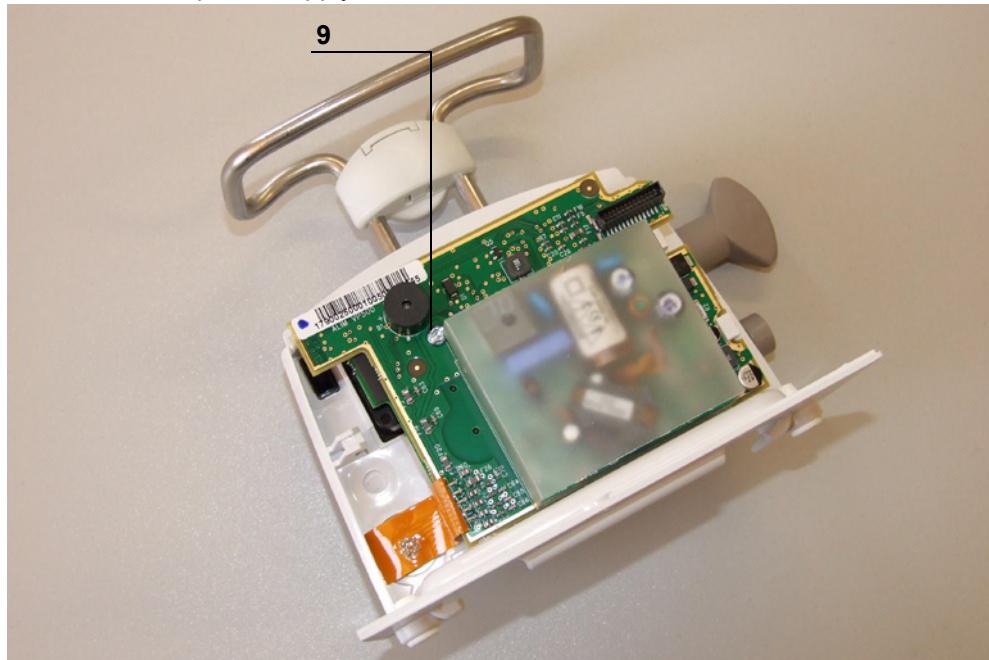


When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable (marker 4) connecting the CPU board to the power supply at J1.
- Lift the stopper and loosen the nut from the plug (marker 3).



- Unscrew the Torx screw (marker 9) from the holding board.
- Remove the power supply board.



Re-assembling

- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Carry out the regular servicing tests (see Quality Control Certificate).



Don't forget to set insulator between the power supply and the mains boards.

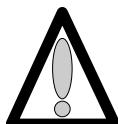
Procedure N°6: Base kit

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver
- 1 anti-static bracelet.

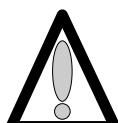
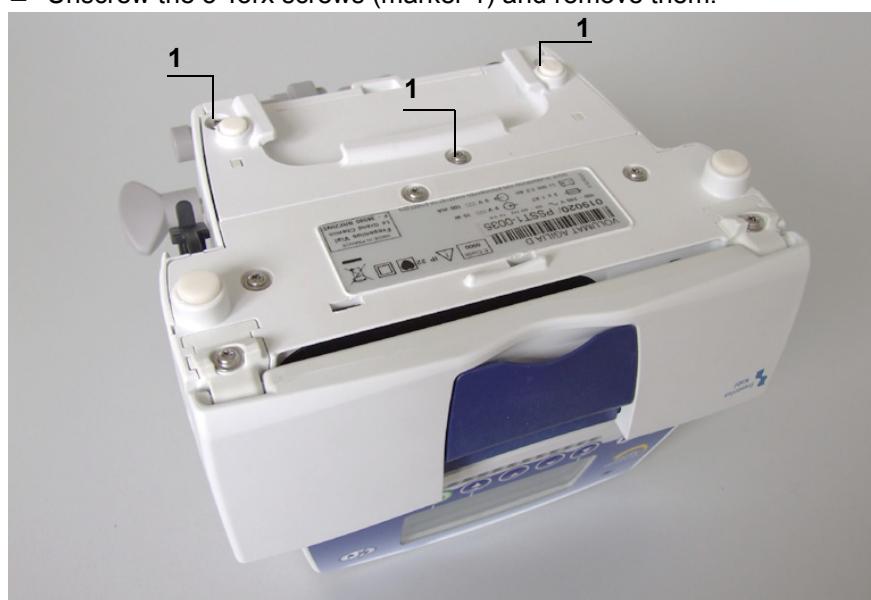
Maintenance level :

Level 3, specialist technician (see section “Training”, page 32).

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them.



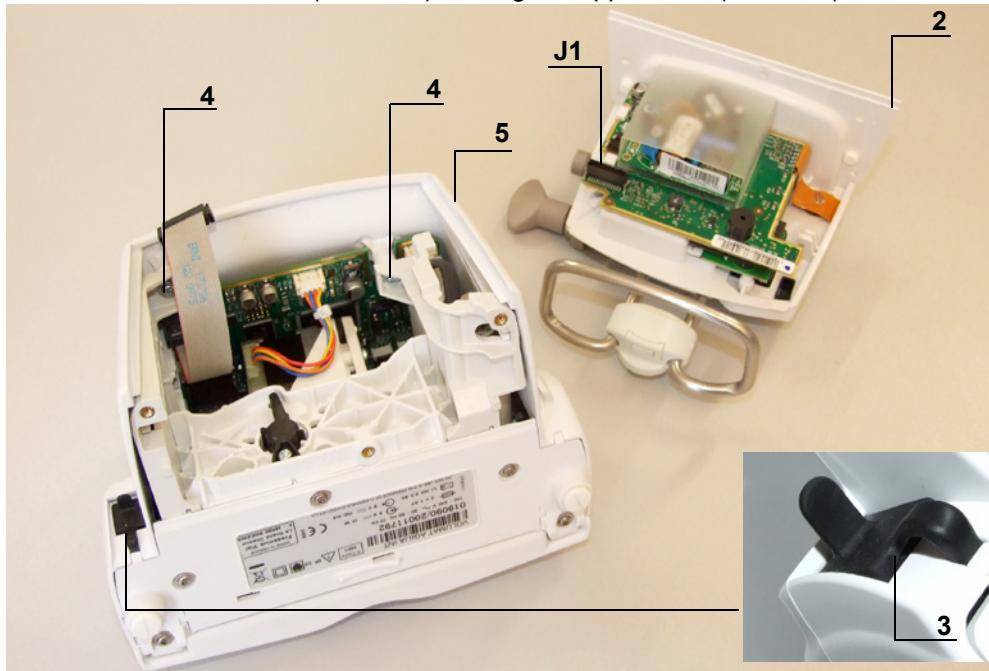
Do not touch the electronic boards with your hands.

Dismantling



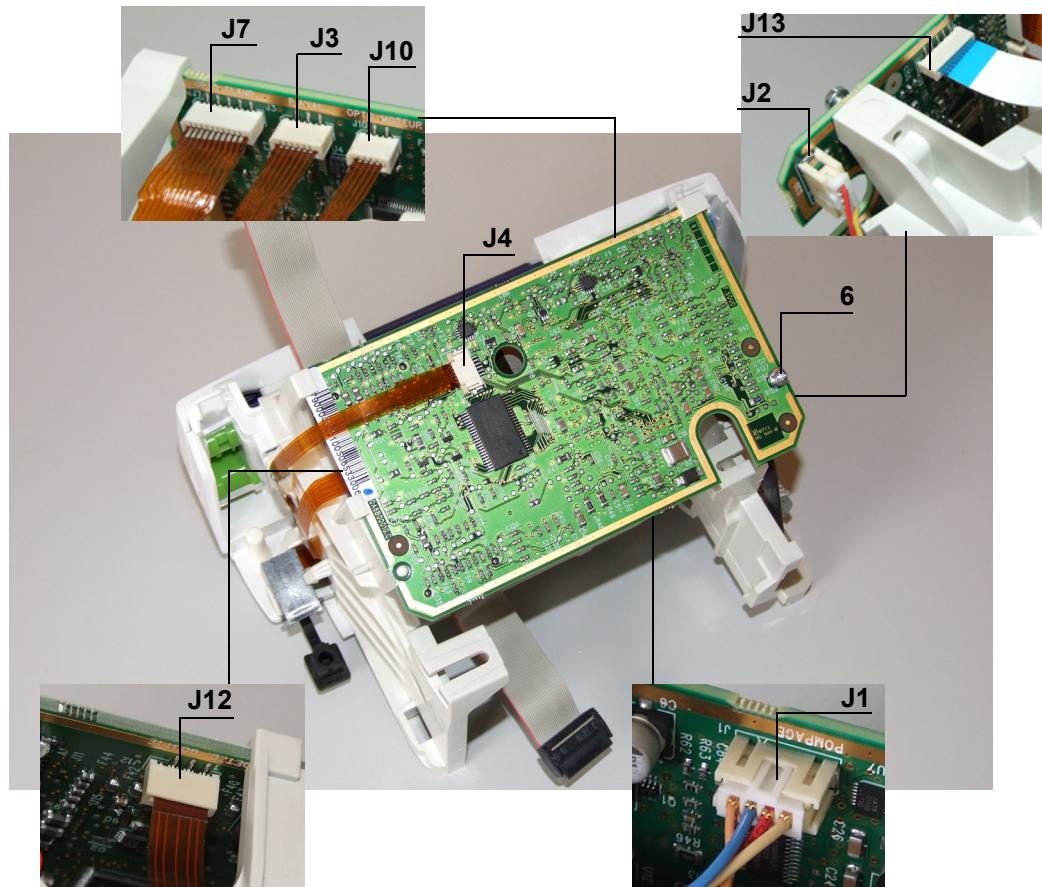
When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable connecting the CPU board to the power supply at J1.
- Remove the RJ45 stopper (marker 3).
- Unscrew the 2 screws (marker 4) holding the upper case (marker 5) to the base.



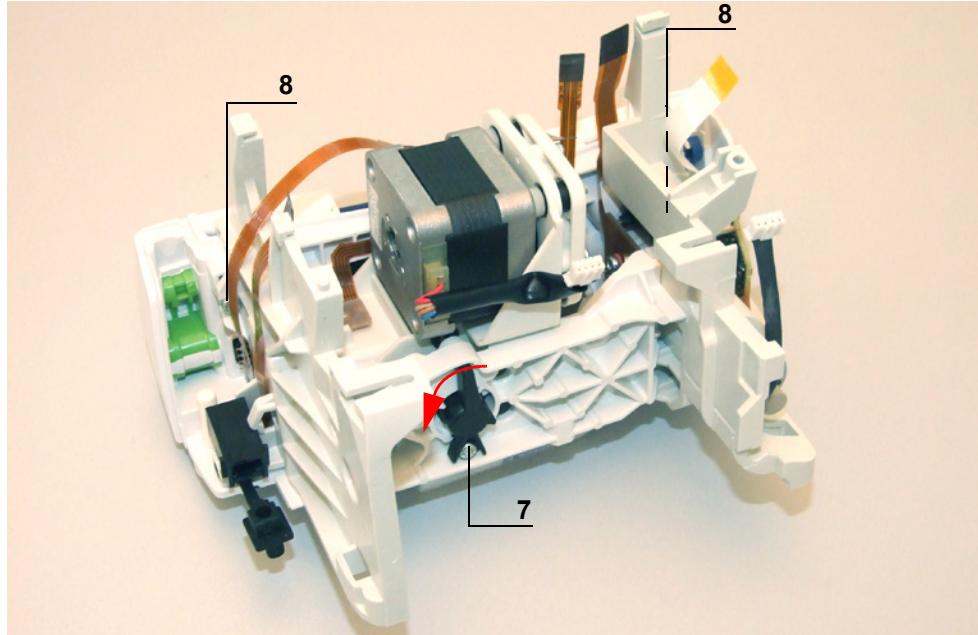
- Remove the upper case (marker 5), being careful not to pull out the display board flat cable.
- Disconnect the flat cable connecting the CPU board to the display board at J2.

- Disconnect the flat cables connected to the CPU board at:
 - J2 and J13
 - J7 and J3 and J10
 - J4 and J12
 - J1
- Unscrew the holding screws (marker 6) holding the CPU board to the flange.

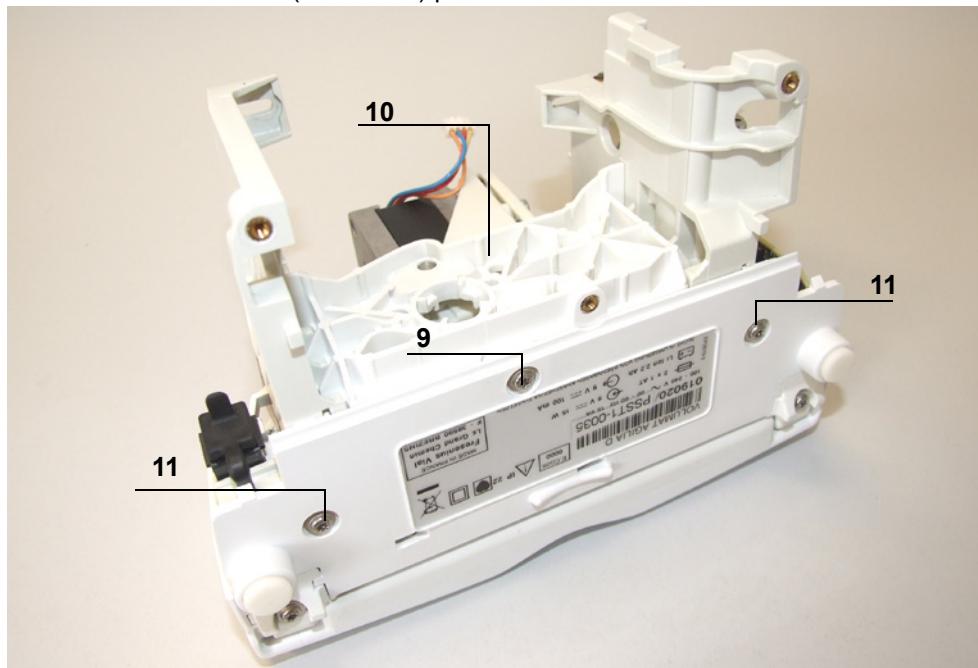


- Remove the CPU board.

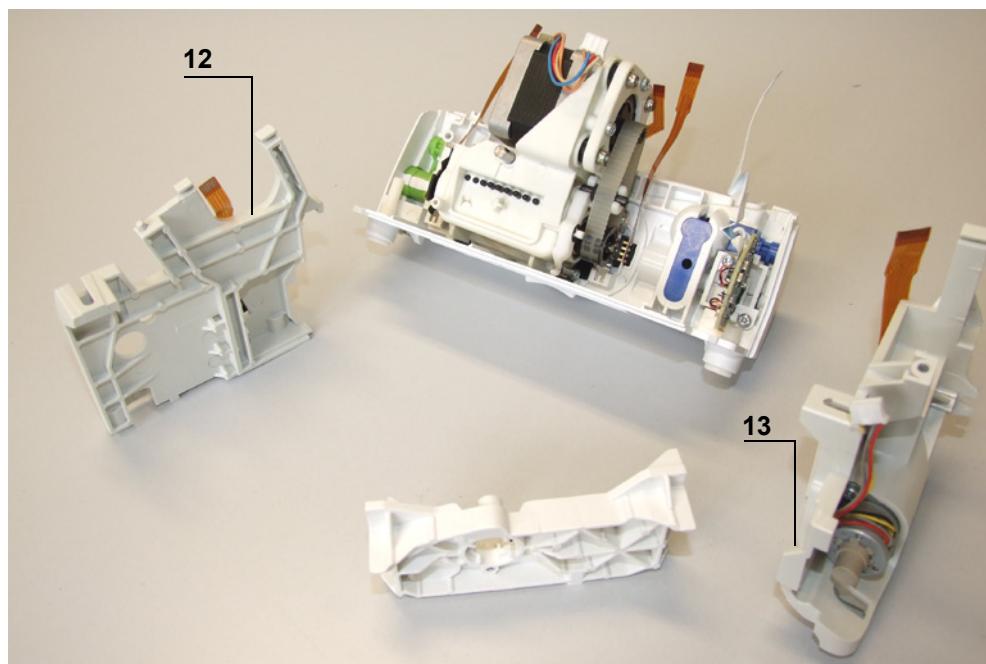
- Unscrew the button screw (marker 7) and pull it out.
 - Push the button and turn it to the left and remove it.
 - Remove the spring.
- Unscrew the 2 screws (marker 8) on either side of the right and left flanges being careful not to damage the air bubble board.



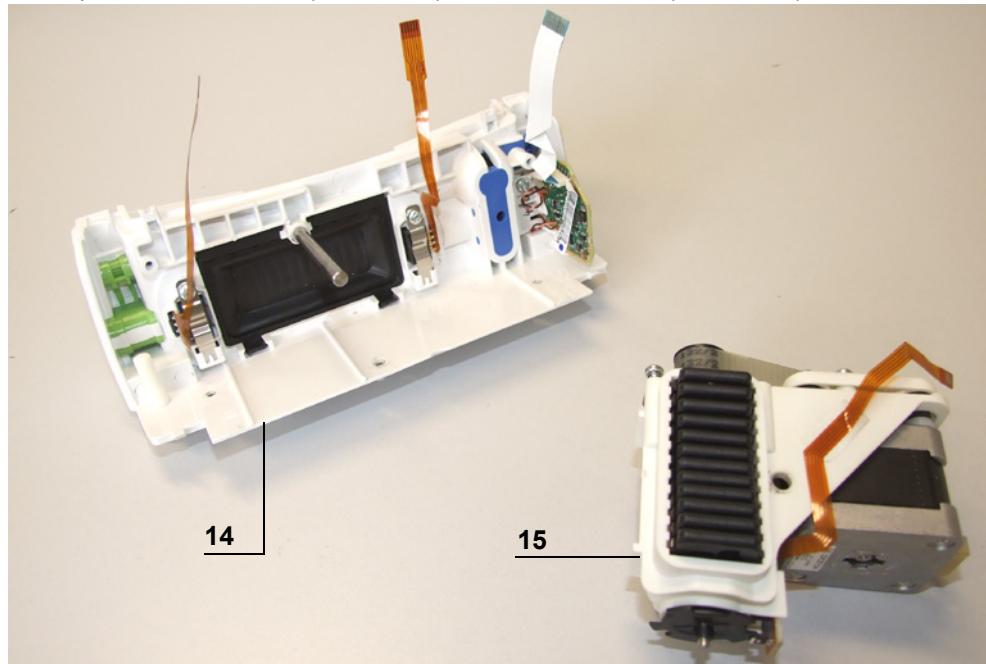
- Pivot the device on its front side.
- Unscrew the screw (marker 9) positioned under the base.
- Remove the pumping plate (marker 10).
- Unscrew the screws (marker 11) positioned under the base.



- Remove the left flange (marker 12).
- Take out the right flange (marker 13).



- Separate the base kit (marker 14) from the motor kit (marker 15).



Re-assembling

- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Carry out the regular servicing tests (see Quality Control Certificate).

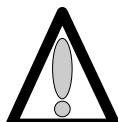
Procedure N°7: Air detector board

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver
- 1 anti-static bracelet

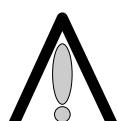
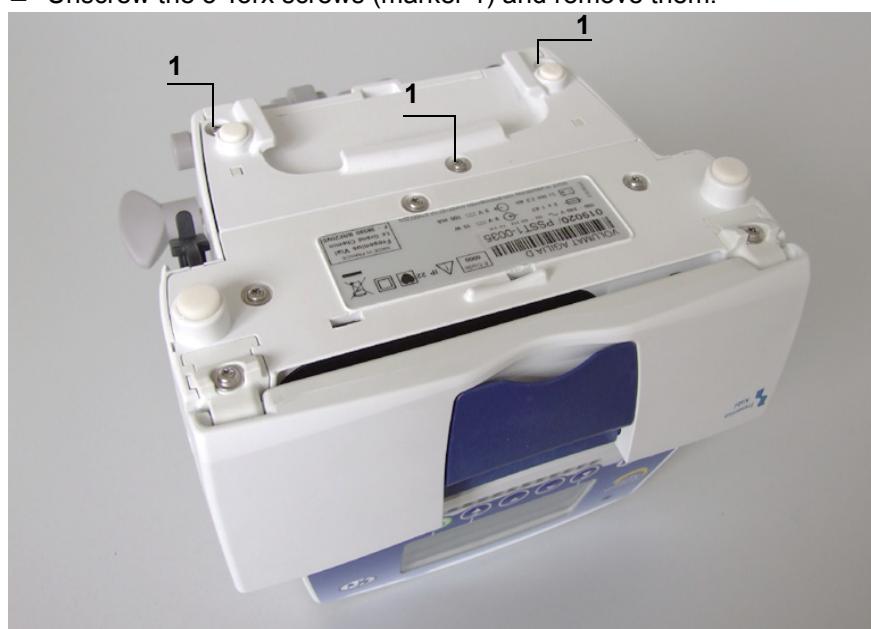
Maintenance level:

Level 3, specialist technician, (see section “Training”, page 32).

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them.



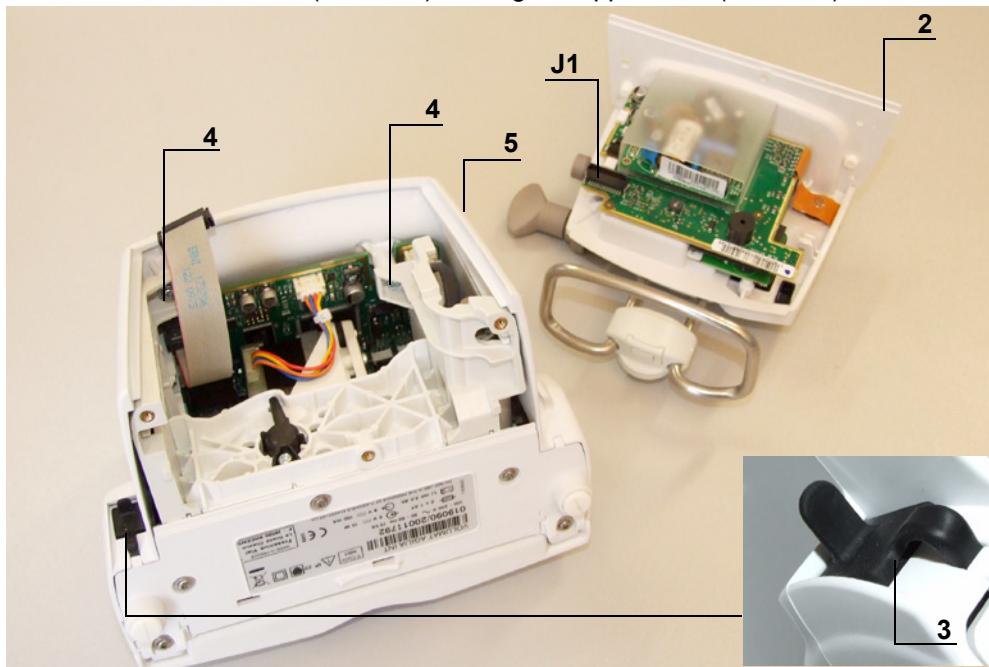
Do not touch the electronic boards with your hands.

Dismantling



When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

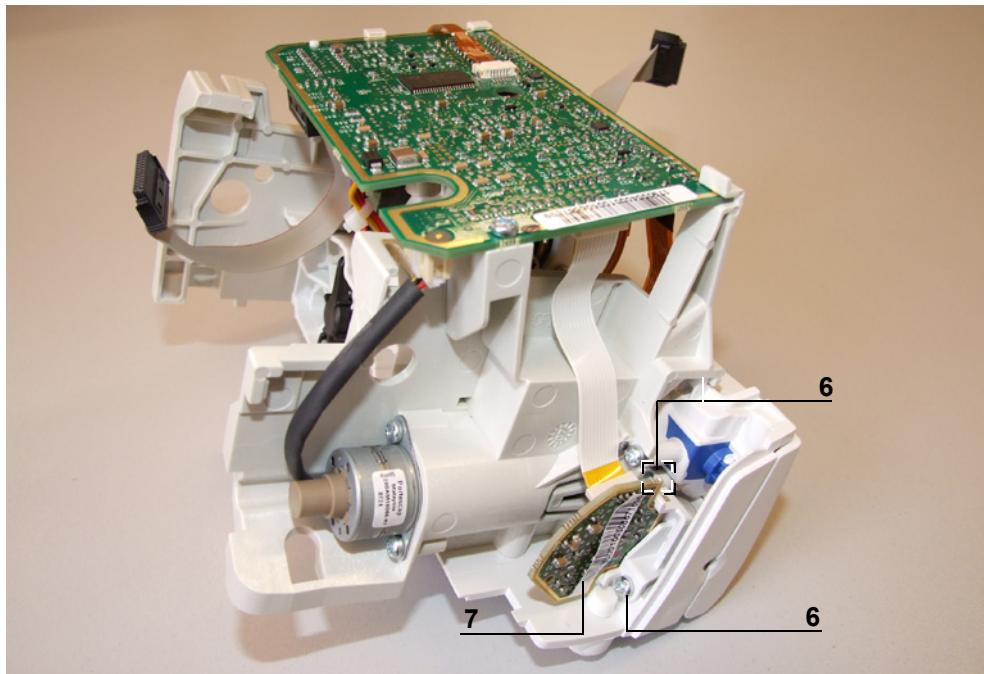
- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable connecting the CPU board to the power supply at J1.
- Remove the RJ45 stopper (marker 3).
- Unscrew the 2 screws (marker 4) holding the upper case (marker 5) to the base.



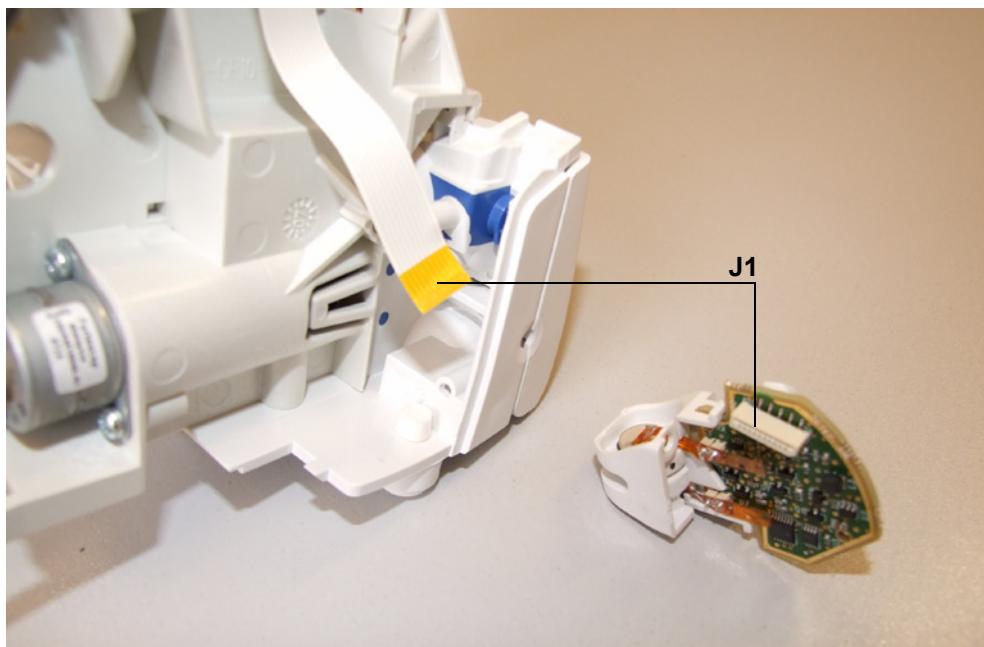
- Remove the upper case (marker 5), being careful not to pull out the display board flat cable.
- Disconnect the flat cable connecting the CPU board to the display board at J2.



- Unscrew the 2 screws (marker 6) of the air detector board (marker 7).



- Remove the board being careful not to pull out the flat cable.
- Disconnect the flat cable connected to the board at J1.



Re-assembling

- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Calibrate the air bubble detector.
- Carry out the regular servicing tests (see Quality Control Certificate).

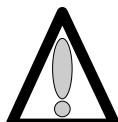
Procedure N°8: Pumping system

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver
- 1 anti-static bracelet.

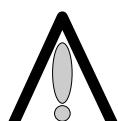
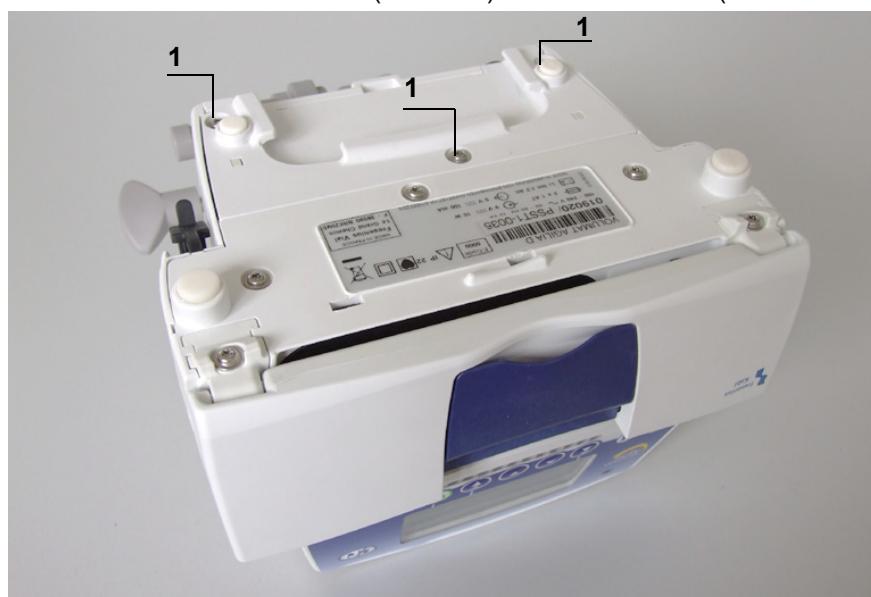
Maintenance level:

Level 3, specialist technician (see section "Training", page 32)

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them (3 under the angle bracket).



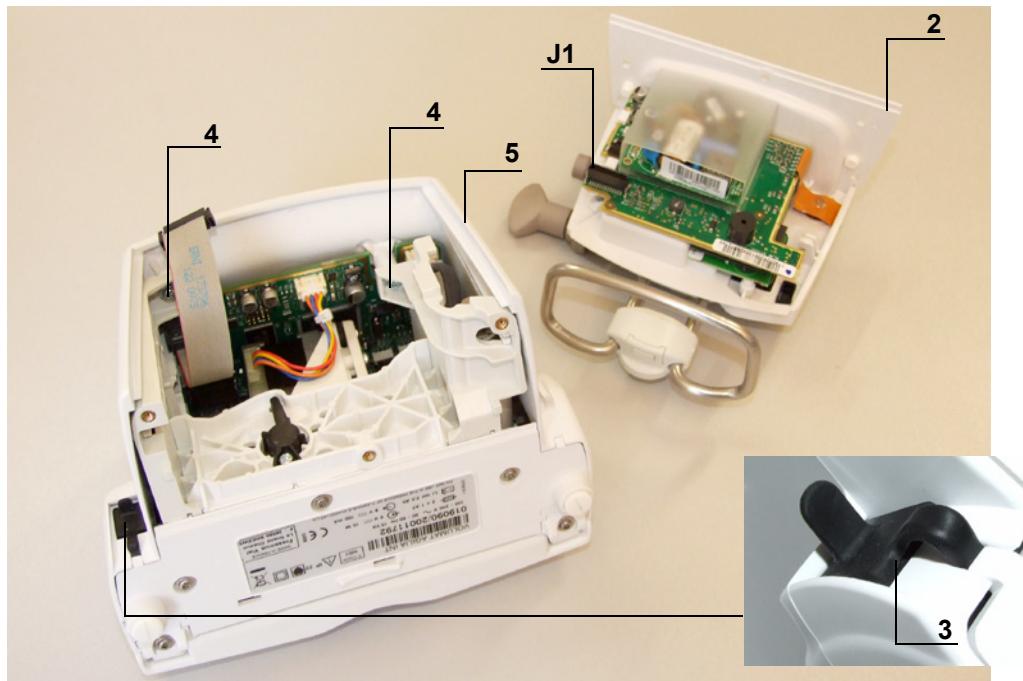
Do not touch the electronic boards with your hands.

Dismantling



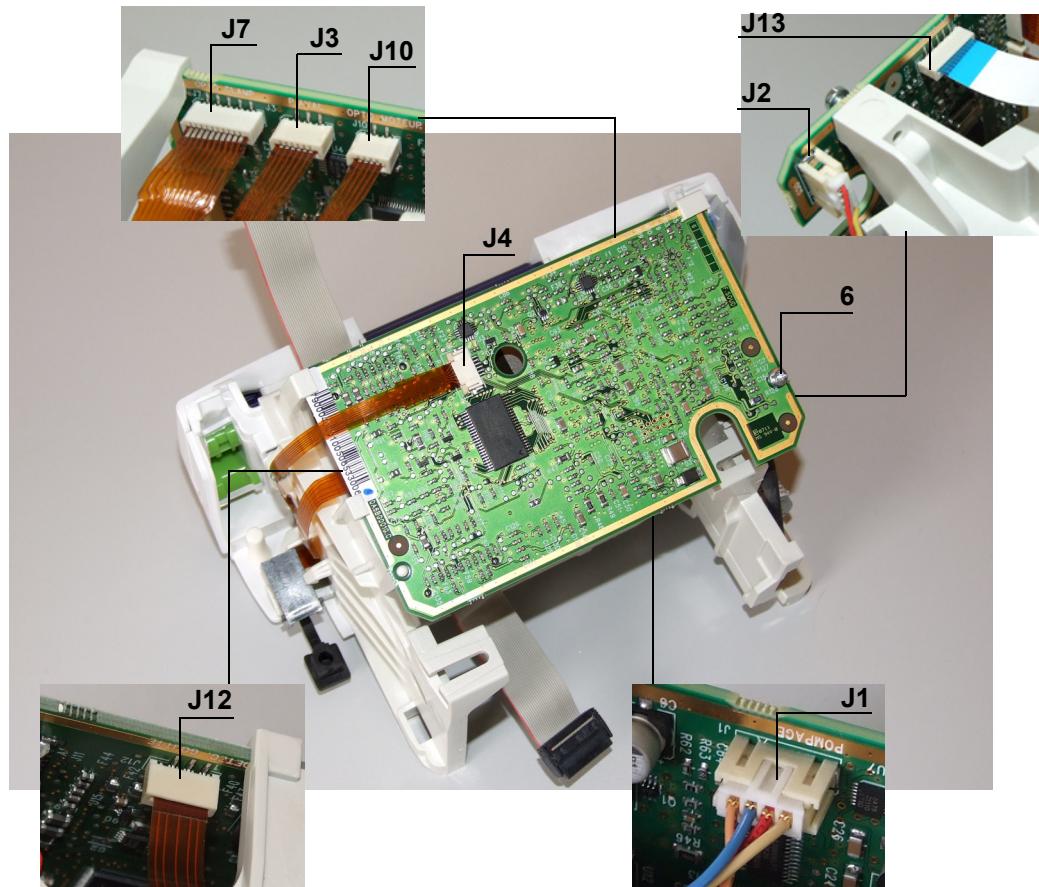
When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable connecting the CPU board to the power supply at J1.
- Remove the RJ45 stopper (marker 3).
- Unscrew the 2 screws (marker 4) holding the upper case (marker 5) to the base



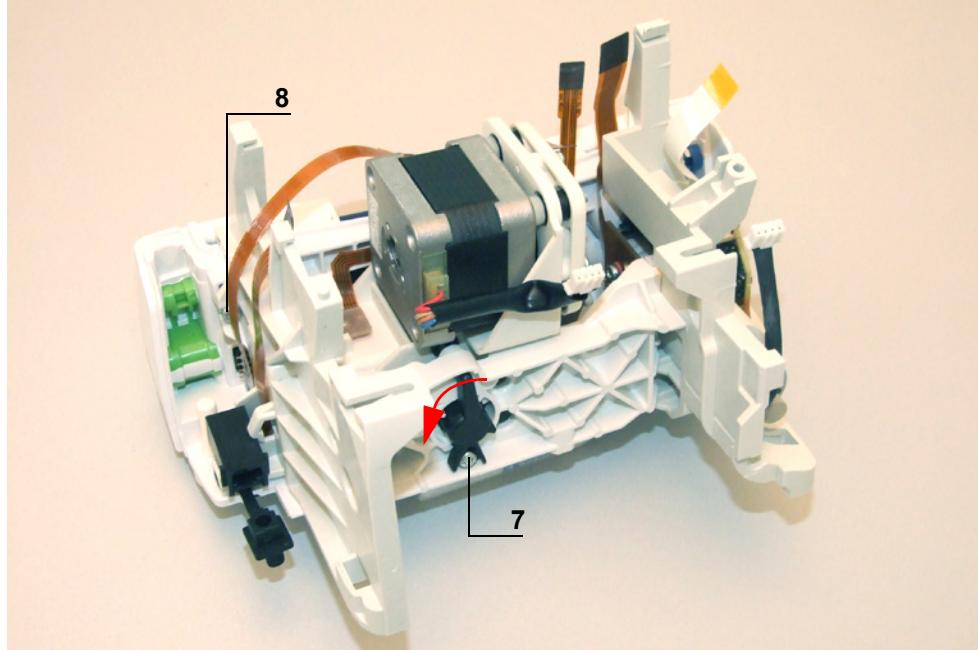
- Remove the upper case (marker 5), being careful not to pull out the display board flat cable.
- Disconnect the flat cable leading from the CPU board to the display board at J2.

- Disconnect the flat cable connected to the CPU board at:
 - J2 and J13
 - J7, J3 and J10
 - J4 and J12
 - J1
- Unscrew the holding screws (marker 6) holding the CPU to the flange.

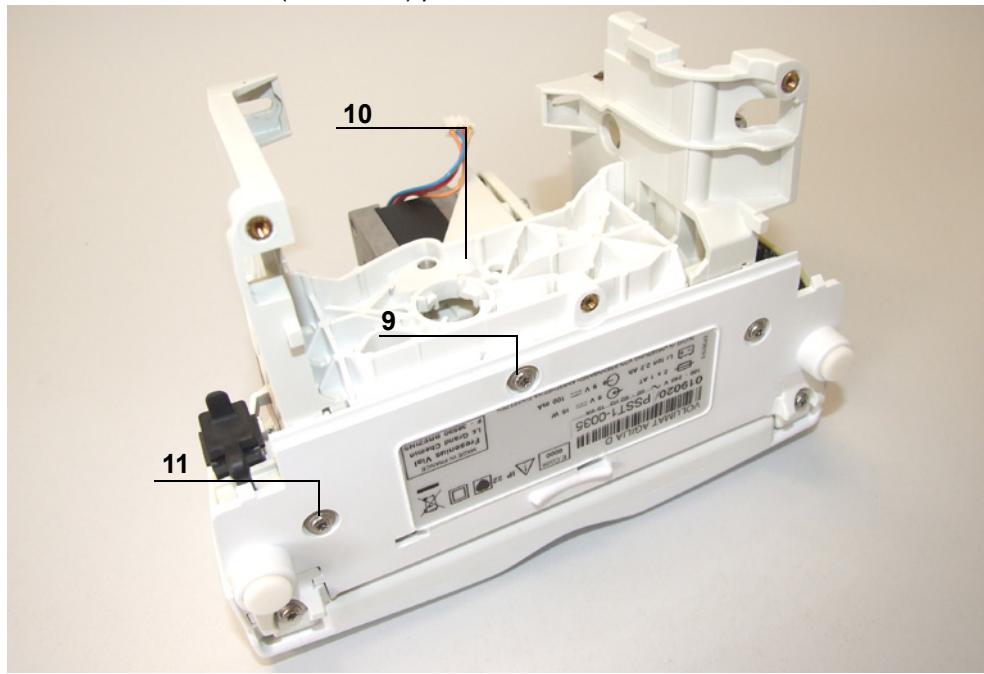


- Remove the whole CPU board being careful not to pull out the flat cable on the inside.

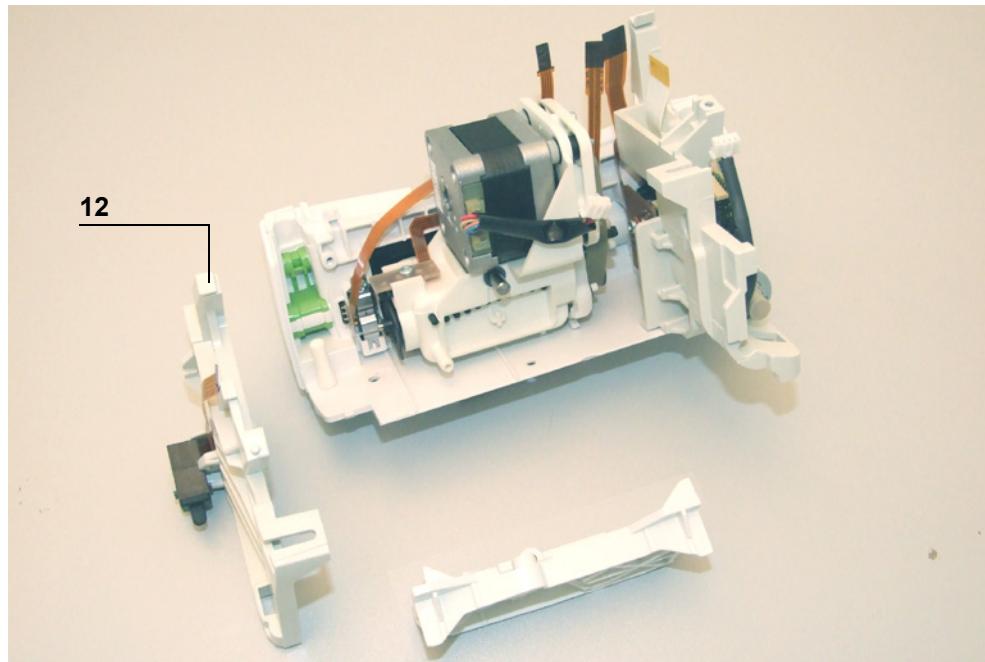
- Unscrew the button screw (marker 7) and pull it out.
 - Push the button and turn it to the left and remove it.
 - Pull out the spring.
- Unscrew the screw (marker 8) holding the left flange.



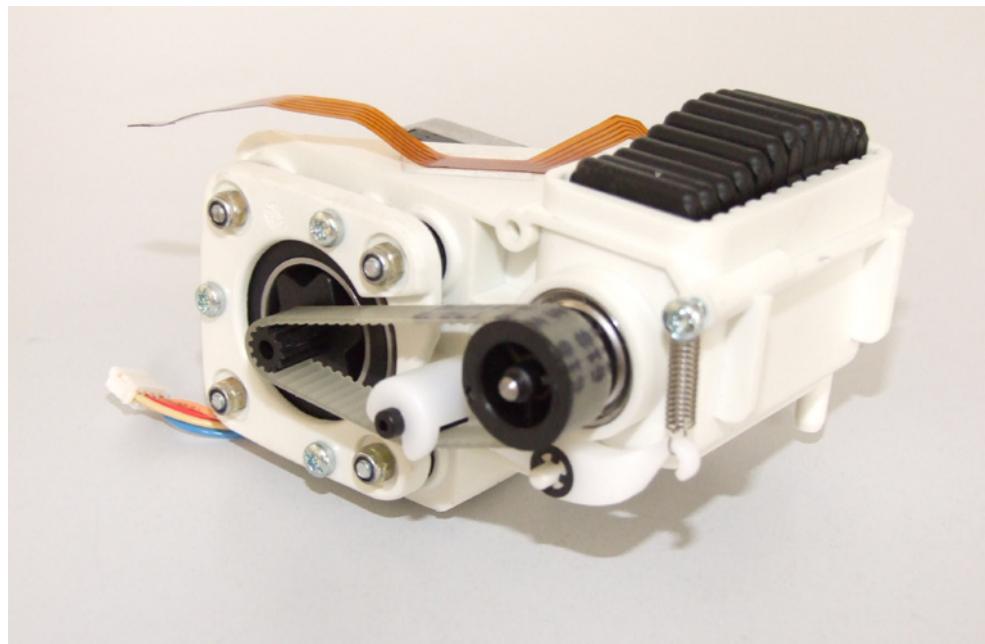
- Pivot the device on its front.
- Unscrew the Torx screw (marker 9) positioned under the base.
- Remove the pumping plate (marker 10).
- Unscrew the screw (marker 11) positioned under the base



- Remove the left flange (marker 12).



- Remove the pumping system.



Re-assembling

- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Carry out the regular servicing tests (see Quality Control Certificate).

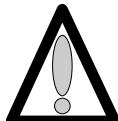
Procedure N°9: Motor

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver
- 1 anti-static bracelet
- 1 4" wrench
- 1 small cruciform screwdriver

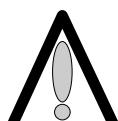
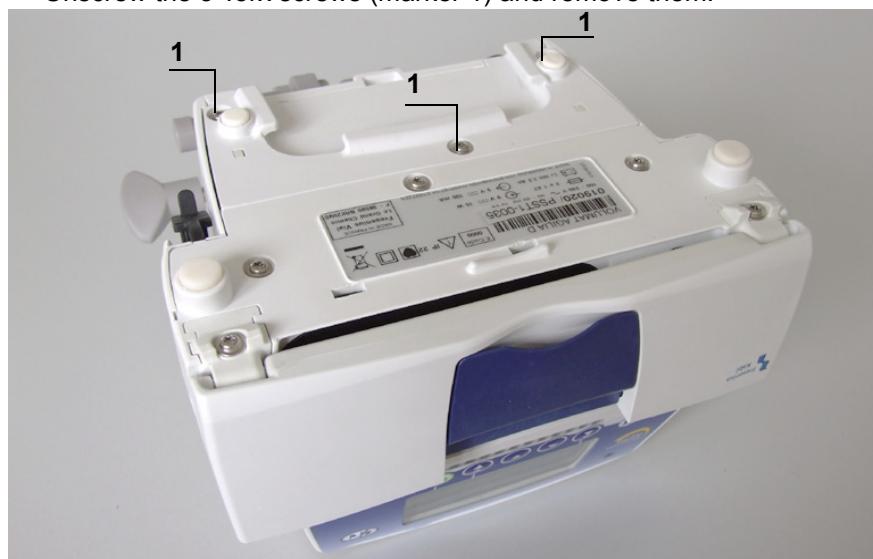
Maintenance level:

Level 3, specialist technician (see section “Training”, page 32).

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them.



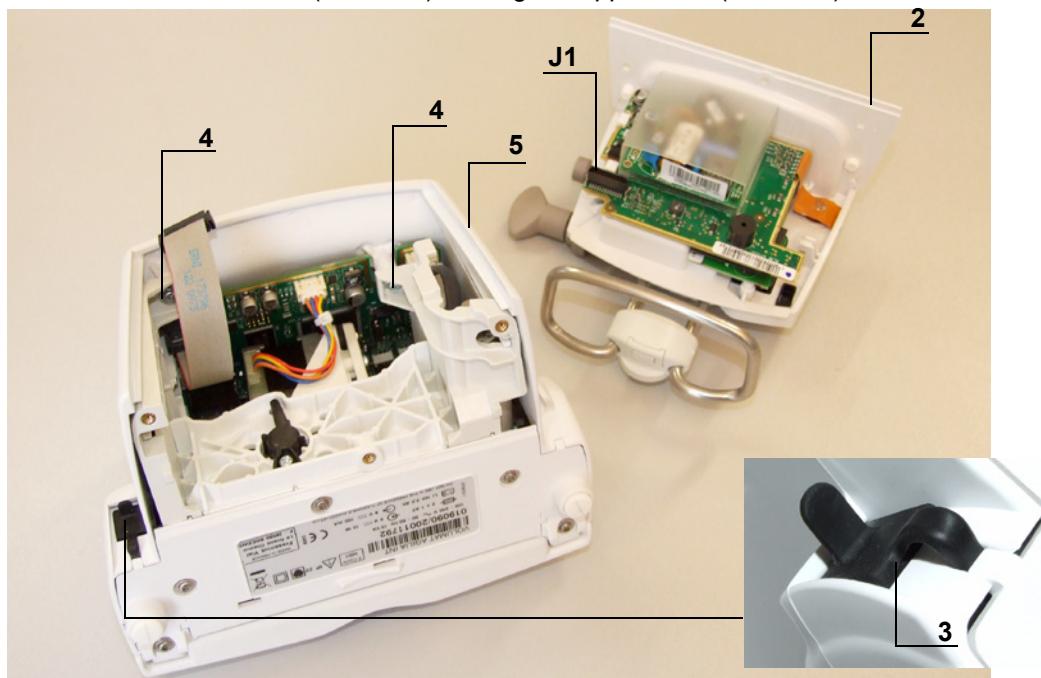
Do not touch the electronic boards with your hands.

Dismantling



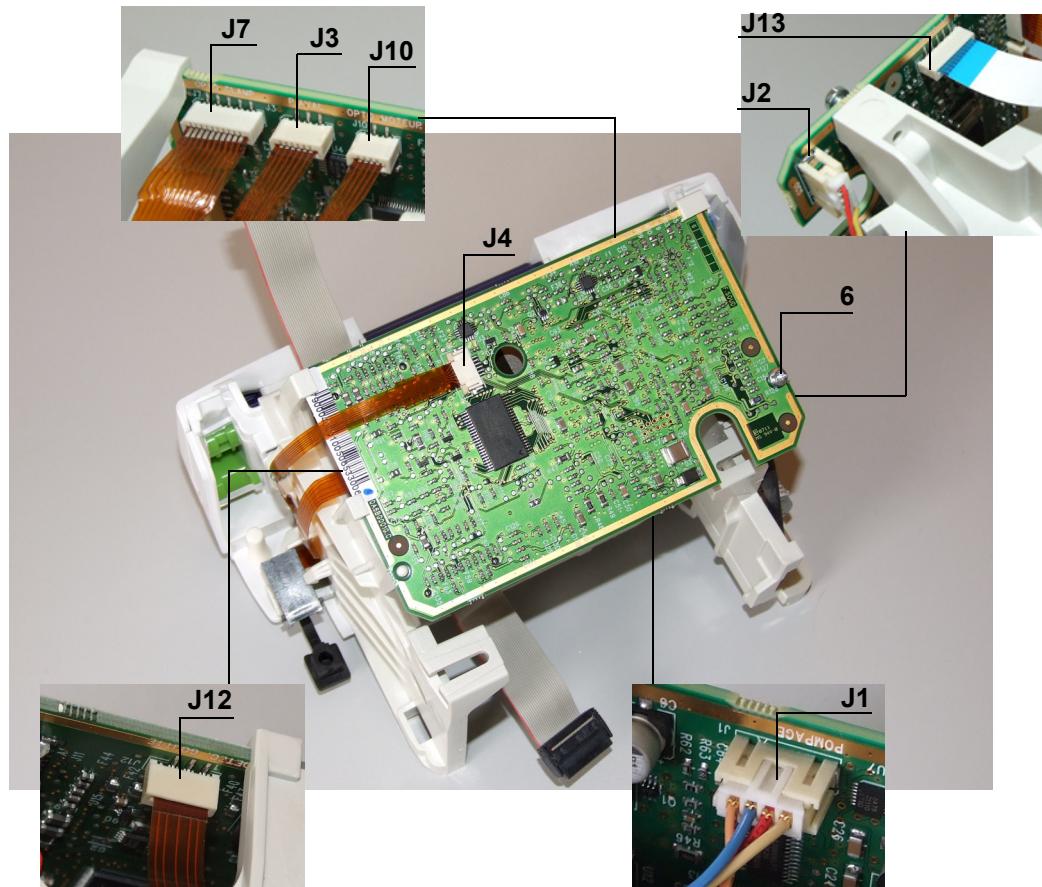
When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable connecting the CPU board to the power supply at J1.
- Remove the RJ45 stopper (marker 3).
- Unscrew the 2 screws (marker 4) holding the upper case (marker 5) to the base.



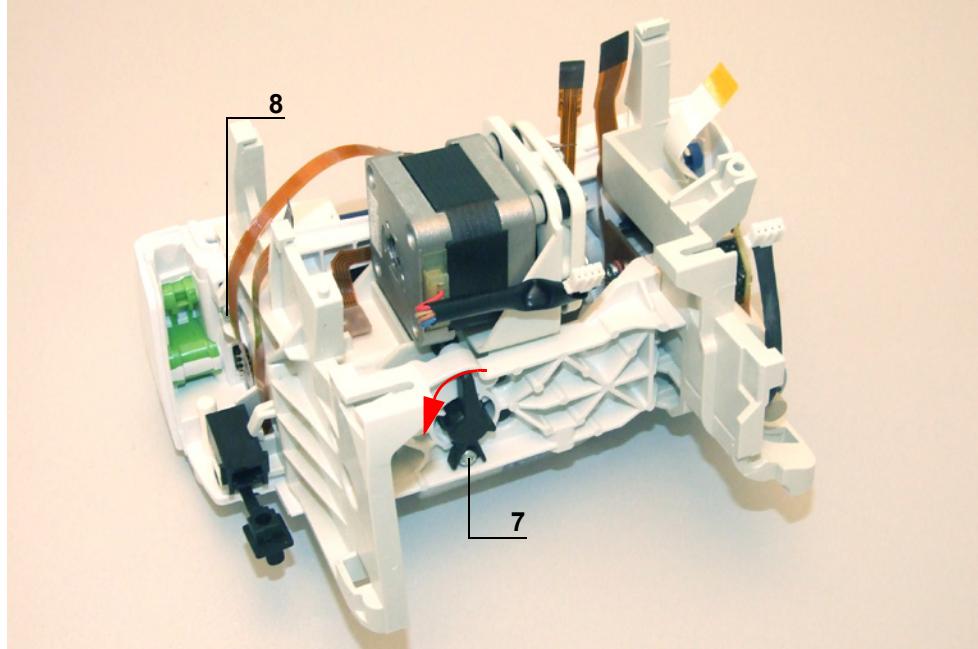
- Remove the upper case (marker 5), being careful not to pull out the display board flat cable.
- Disconnect the flat cable leading from the CPU board to the display board at J2.

- Disconnect the flat cables leading to the CPU board at:
 - J2 and J13
 - J7 and J3 and J10
 - J4 and J12
 - J1
- Unscrew the holding screws (marker 6) holding the CPU board to the flange.

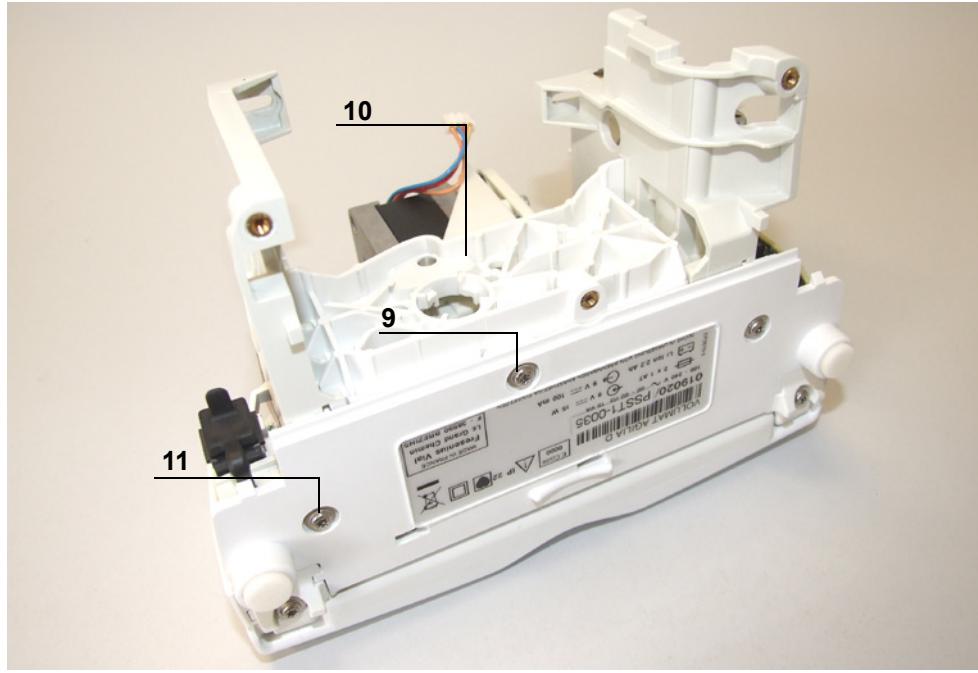


- Remove the whole CPU board being careful not to pull out the flat cable on the inside.

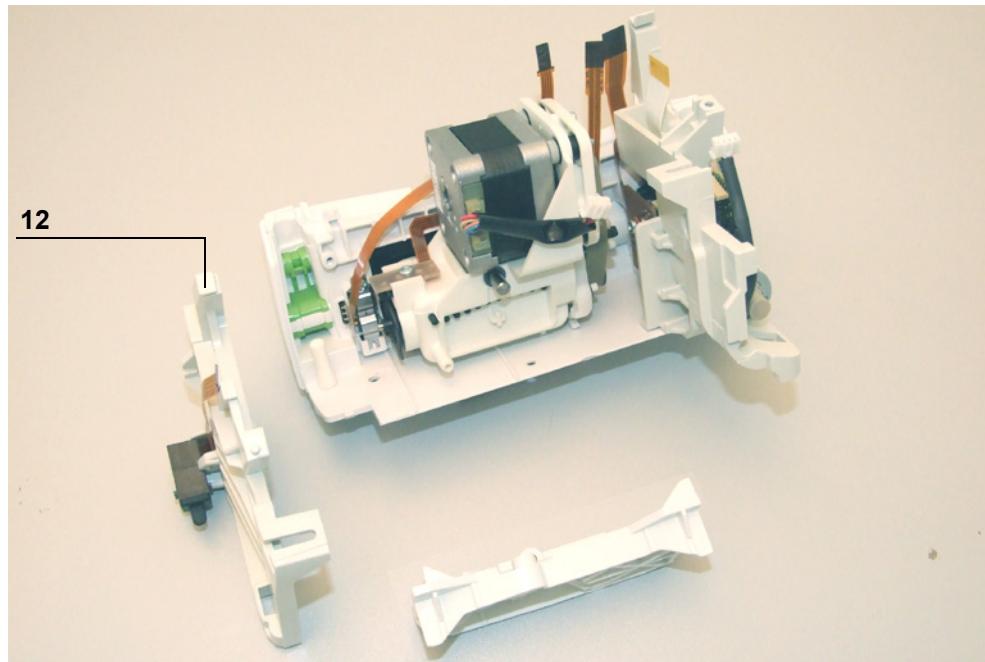
- Pivot the device on its front.
- Unscrew the button screw (marker 7) and pull it out.
 - Push the button and turn it to the left and remove it.
 - Pull out the spring.
- Unscrew the screw (marker 8) holding the left flange.



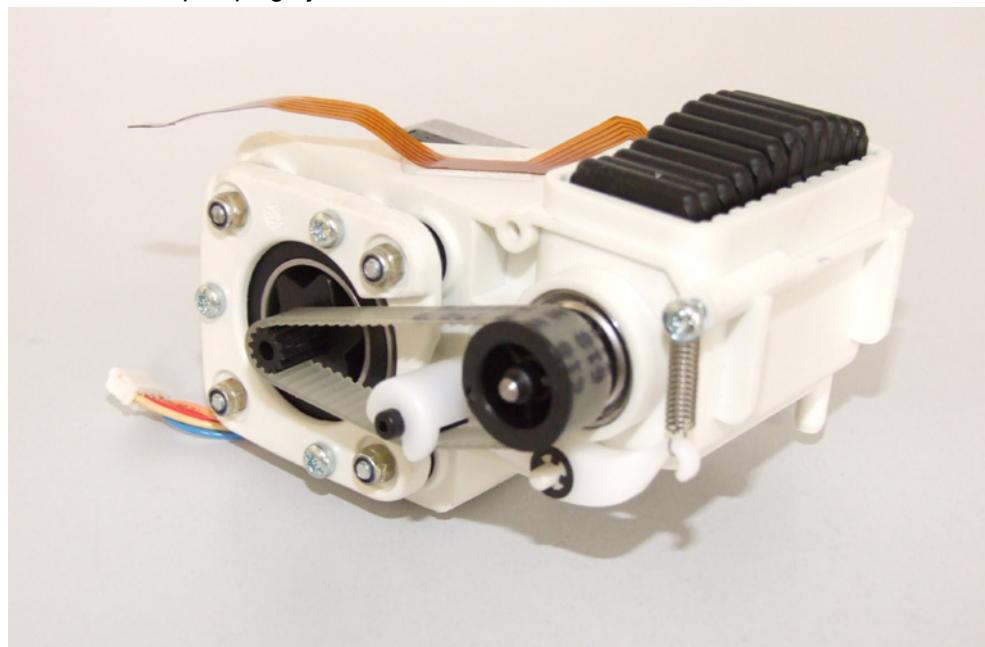
- Unscrew the Torx screw (marker 9) positioned under the base.
- Remove the pumping plate (marker 10).
- Unscrew the screw (marker 11) positioned under the base.



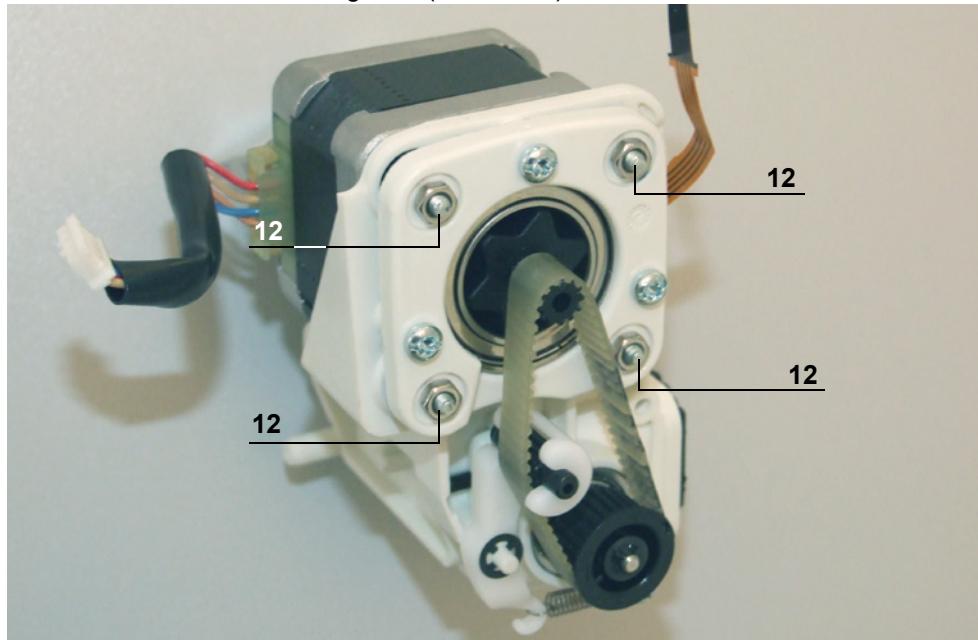
- Remove the left flange (marker 12).



- Pull out the pumping system.



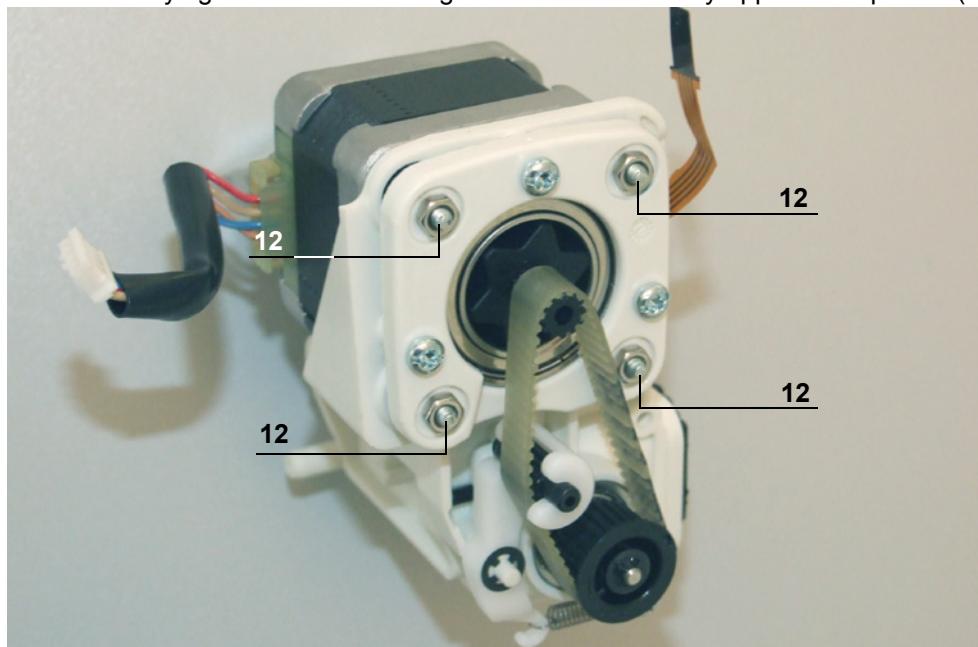
- Unscrew the 4 motor fixing nuts (marker 12).



- Pull out the 4 screws, and remove the motor with its silenblocks.

Re-assembling

- Put the motor in position, motor wires on the left side of the mechanical bloc using a weak loctite ref. 248 to fix the motor with its nuts.
- Moderately tighten the motor fixing nuts in a diametrically opposite sequence (marker 12).



- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Carry out the regular servicing tests (see Quality Control Certificate).

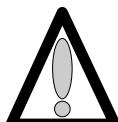
Procedure N°10: Pressure sensor

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver
- 1 anti-static bracelet

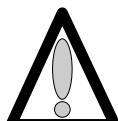
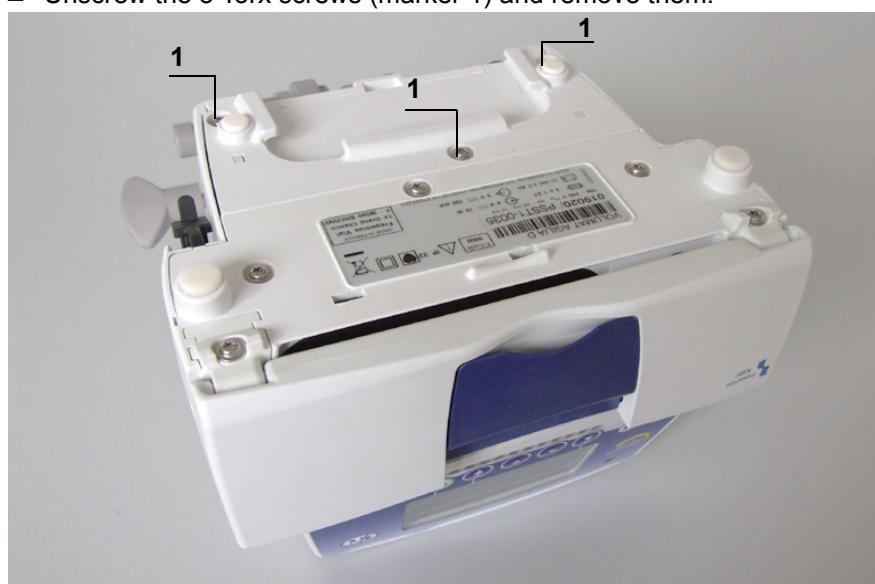
Maintenance level:

Level 3, specialist technician (see section "Training", page 32).

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them.



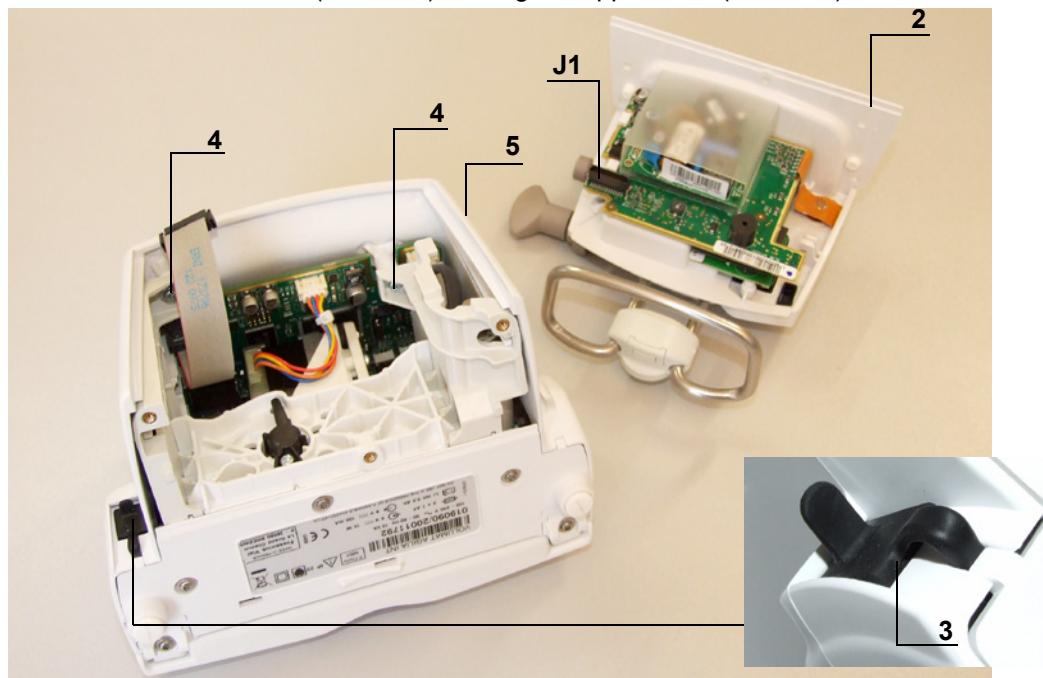
Do not touch the electronic boards with your hands.

Dismantling



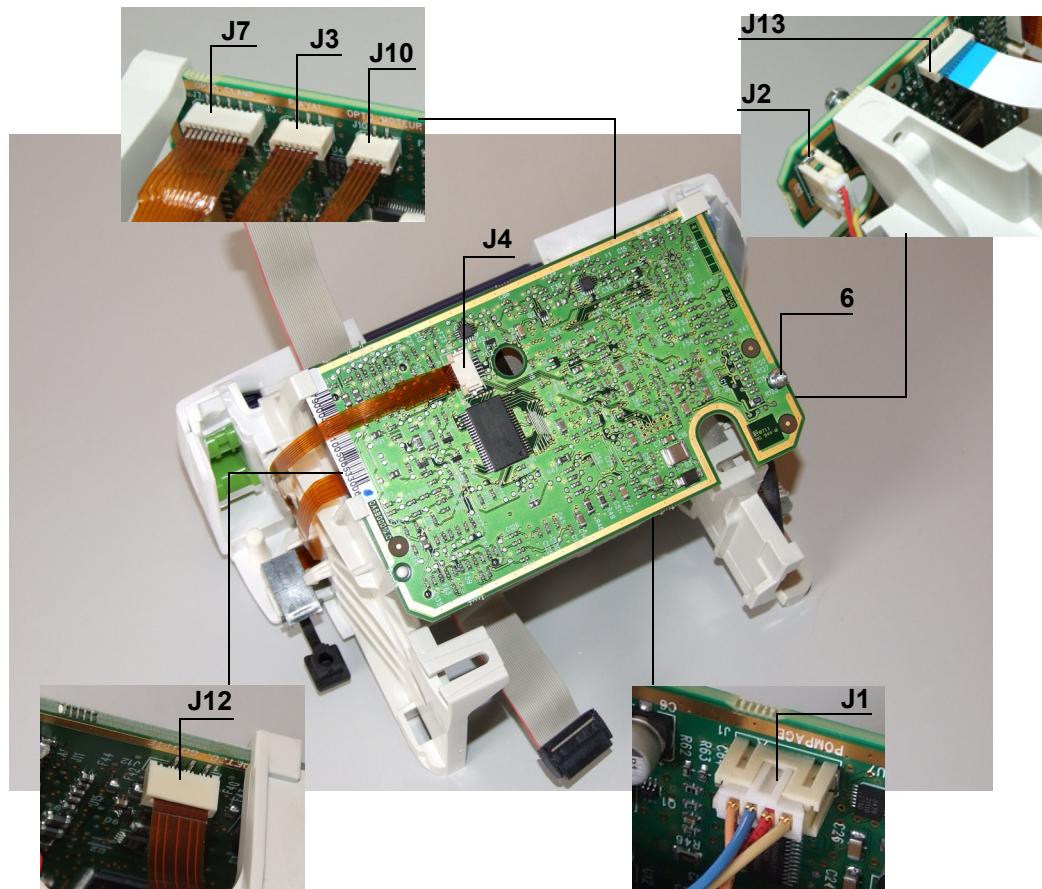
When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable connecting the CPU board to the power supply at J1.
- Remove the RJ45 stopper (marker 3).
- Unscrew the 2 screws (marker 4) holding the upper case (marker 5) to the base.



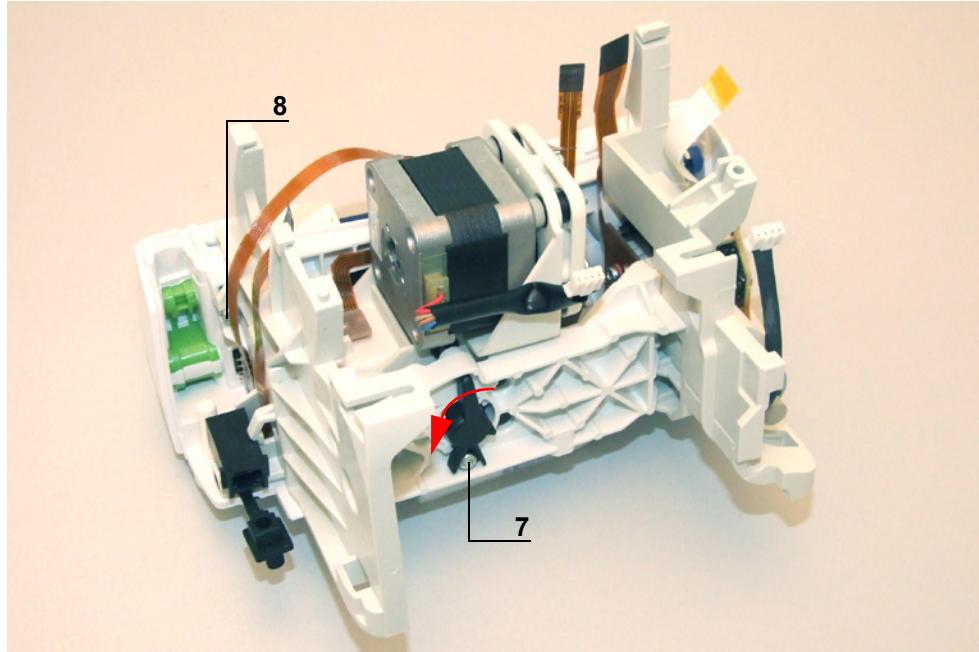
- Remove the upper case (marker 5), being careful not to pull out the display board flat cable.

- Disconnect the flat cable leading from the CPU board to the display board at J2.
- Disconnect the flat cables leading to the CPU board at:
 - J2 and J13
 - J7, J3 and J10
 - J4 and J12
 - J1
- Unscrew the holding screws (marker 6) holding the CPU board to the flange.

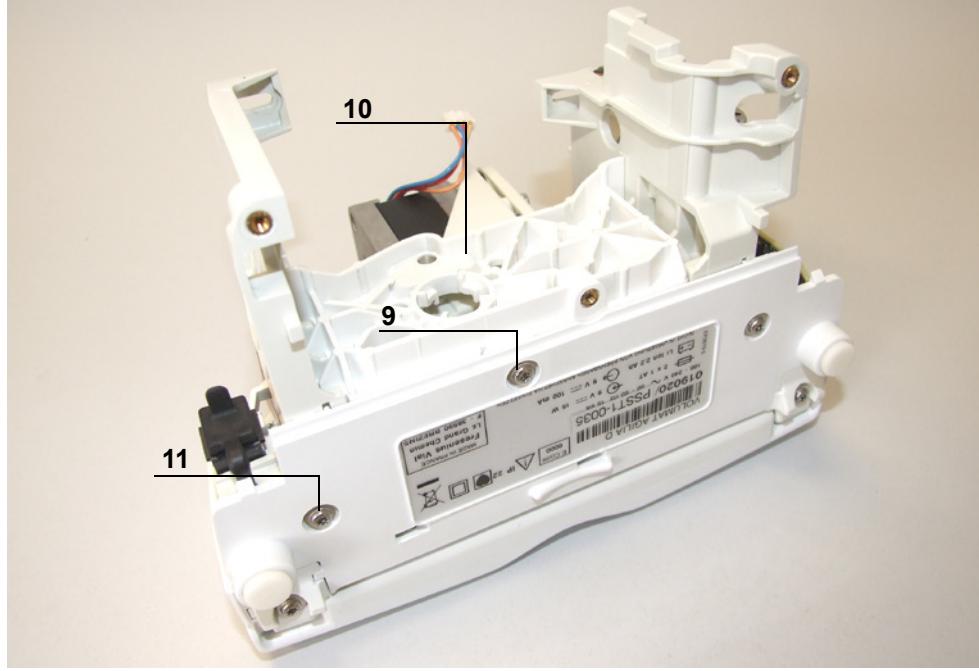


- Remove the whole CPU board being careful not to pull out the flat cable on the inside.

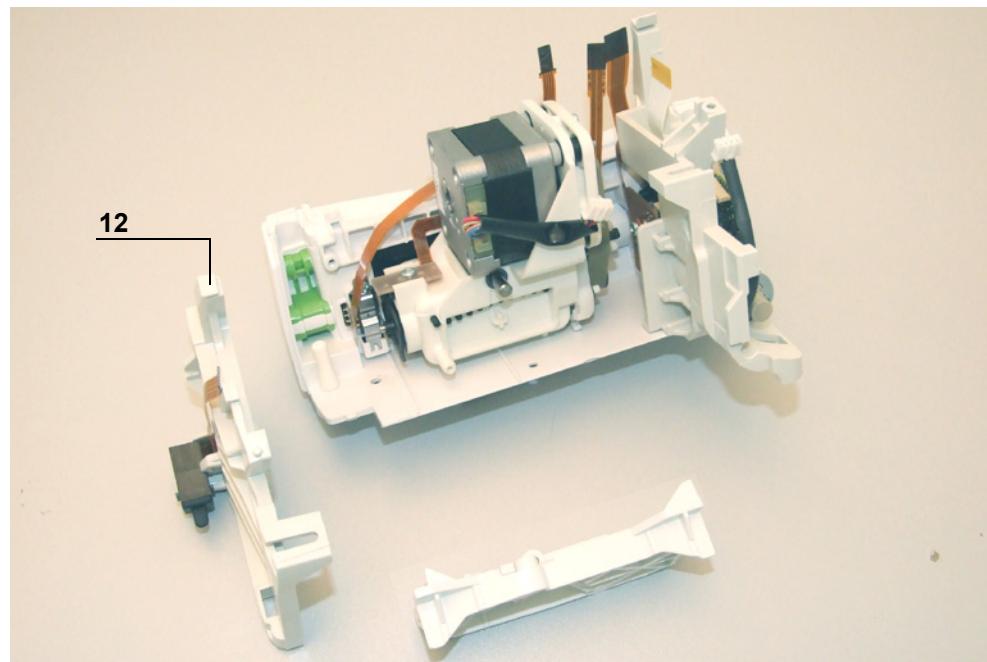
- Unscrew the button screw (marker 7) and pull it out.
 - Push the button and turn it to the left and remove it.
 - Pull out the spring.
- Unscrew the screw (marker 8) holding the left flange.



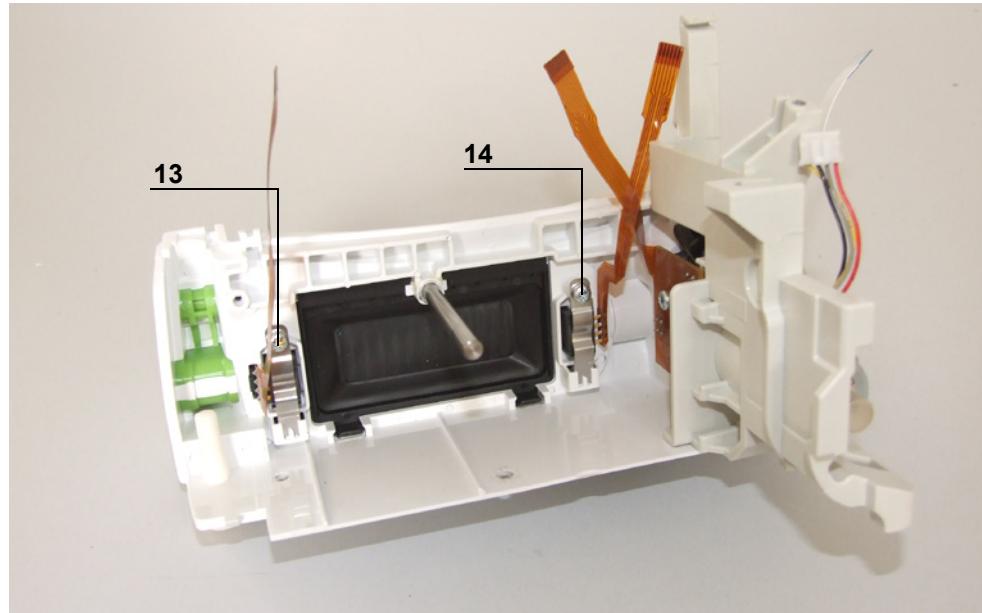
- Pivot the device on its front side.
- Unscrew the Torx screw (marker 9) positioned under the base.
- Remove the pumping plate (marker 10).
- Unscrew the screw (marker 11) positioned under the base.



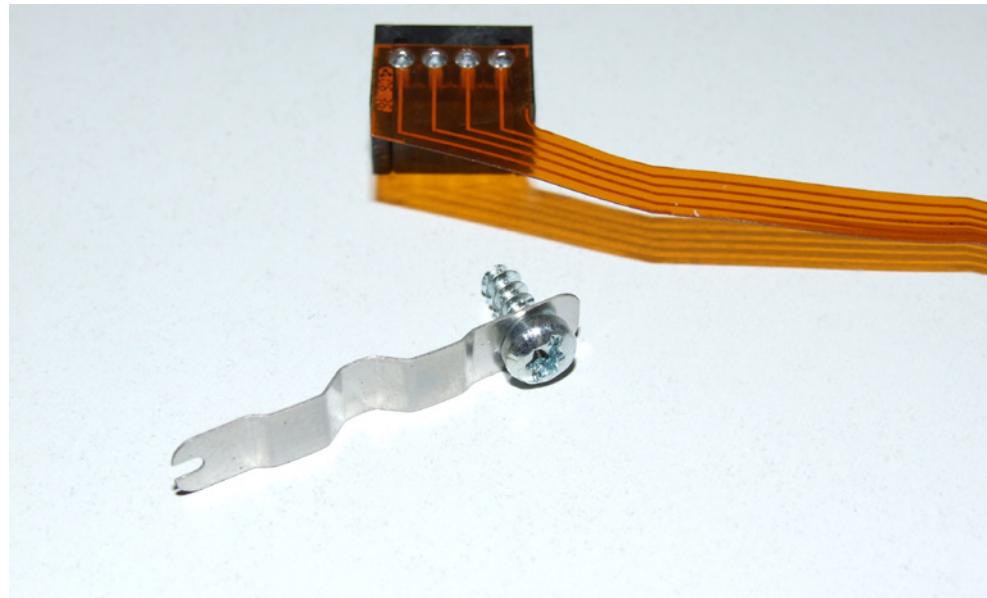
- Pull out the left flange (marker 12).
- Pull out the pumping system.



- Unscrew the 2 upstream sensor and downstream sensor screws (markers 13 and 14).



- Pull out the sensor.



Re-assembling

- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Calibrate the sensors.
- Carry out the regular servicing tests (see Quality Control Certificate).

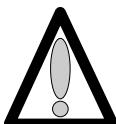
Procedure N°11: OCS clamp motor

Safety:

For safety reasons, the technician should not intervene when the device is connected to the mains voltage.

Disconnect the power supply cord from the mains.

Switch off the device.



Disconnect the battery before opening the device (see procedure n°1).

Material needed:

- 1 Torx T-10 screwdriver or electric screwdriver with a torque of 0.55 Nm
- 1 anti-static bracelet.
- 1 small flat screwdriver..

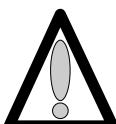
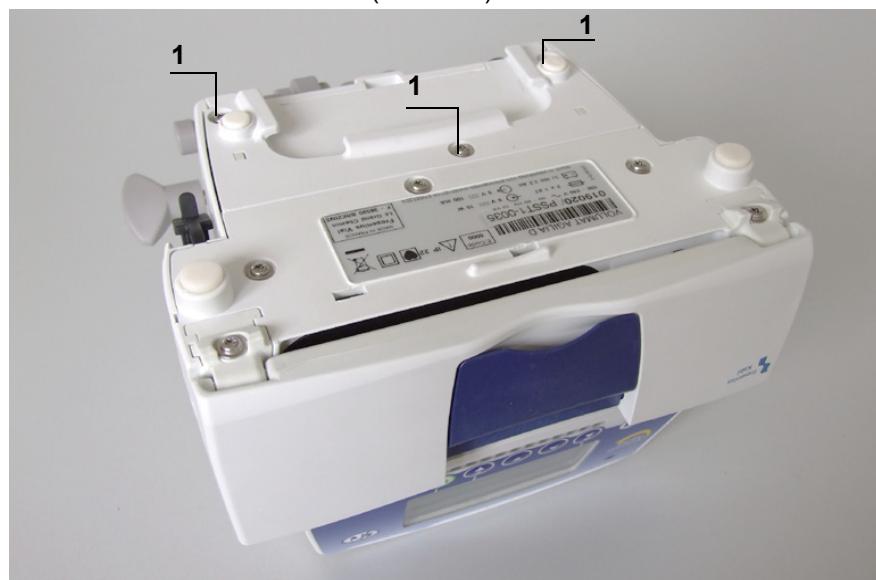
Maintenance level:

Level 3, specialist technician (see section “Training”, page 32).

Procedure:

Access

- Turn the device upside down.
- Unscrew the 3 Torx screws (marker 1) and remove them.



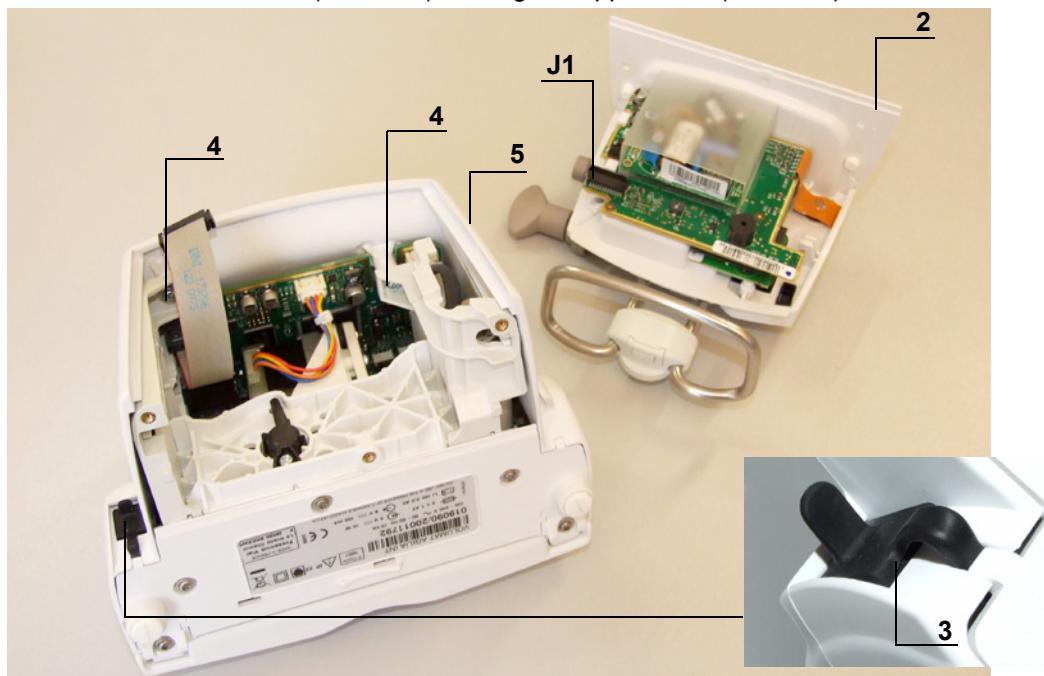
Do not touch the electronic boards with your hands.

Dismantling



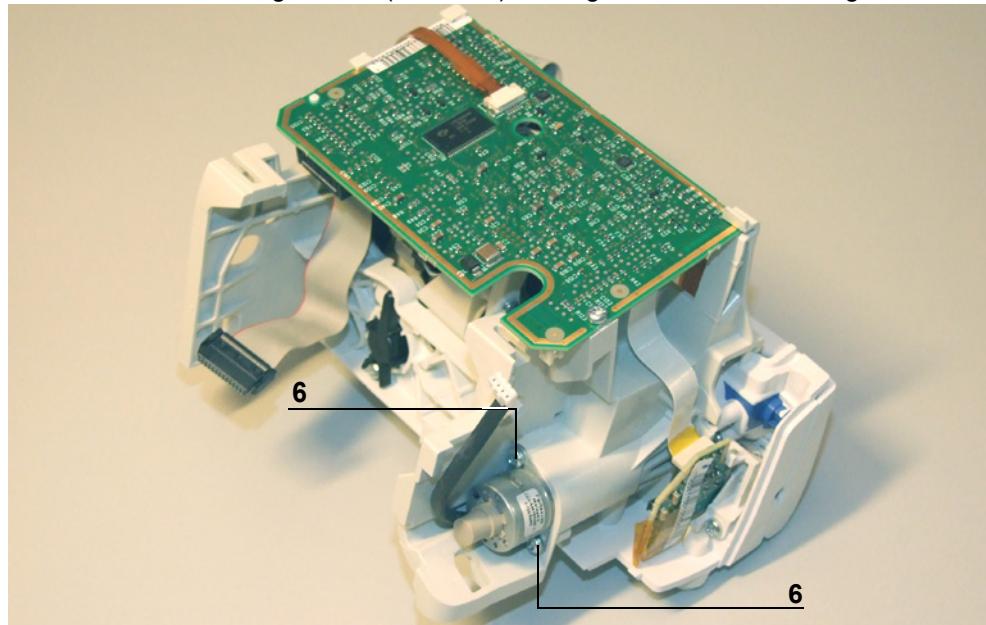
When working with electronic components, we recommend wearing an anti-static bracelet connected to earth and working on a foam anti-static mat.

- Remove the angle bracket (marker 2) being careful not to pull out the CPU board flat cable.
- Disconnect the flat cable connecting the CPU board to the power supply at J1.
- Remove the RJ45 stopper (marker 3).
- Unscrew the 2 screws (marker 4) holding the upper case (marker 5) to the base.



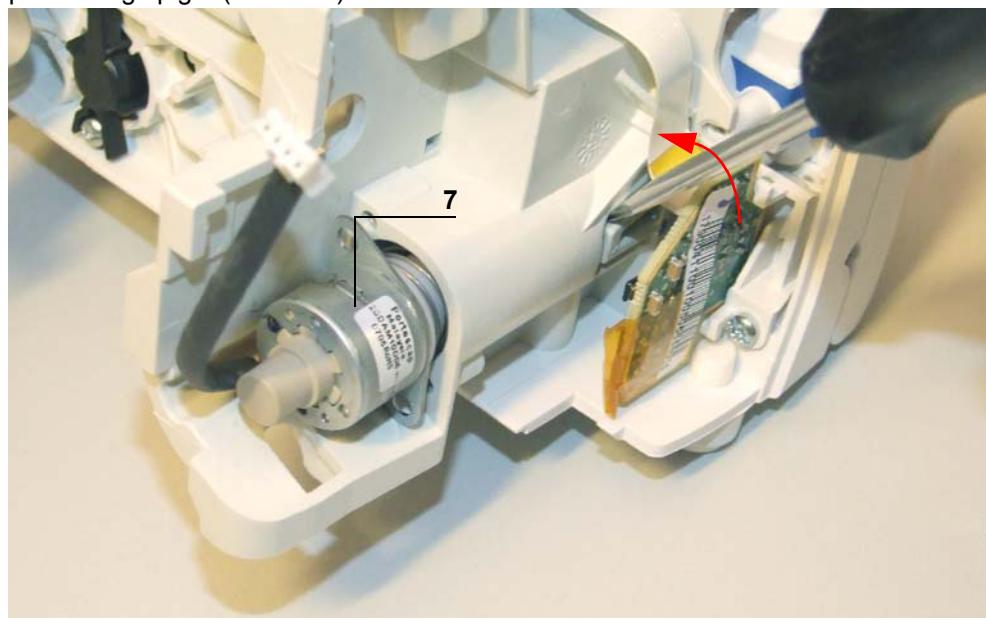
- Remove the upper case (marker 5) being careful not to pull out the display board flat cable.

- Unscrew the 2 fixing screws (marker 6) holding the motor to the flange.

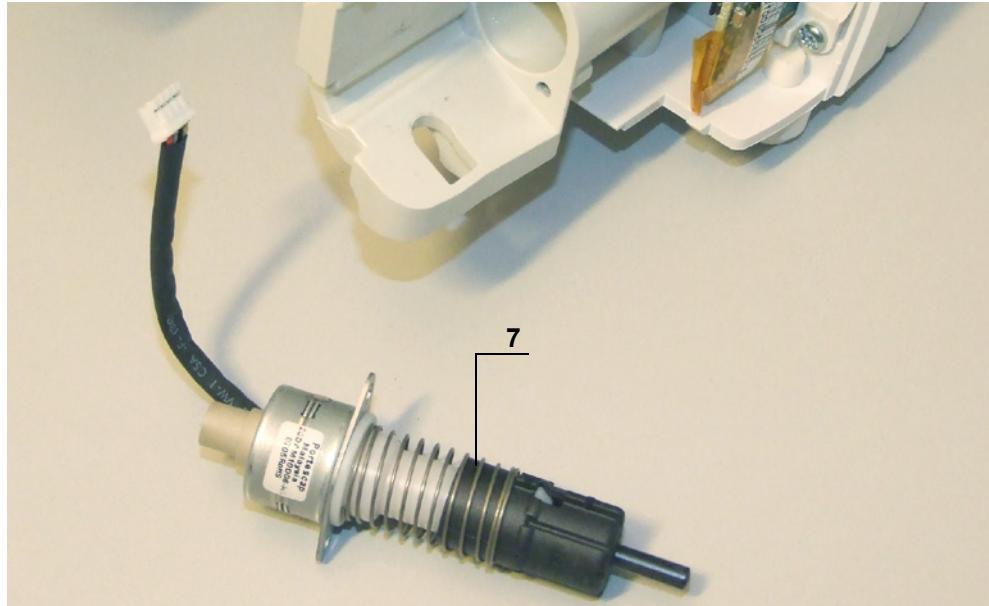


This procedure should be handled with care in order to avoid any damage of the air bubble detector board/flat cable when using a screw driver.

- Using a small flat screwdriver, apply a light pressure in order to disengage the motor positioning spigot (marker 7).



- Remove the motor (marker 7).

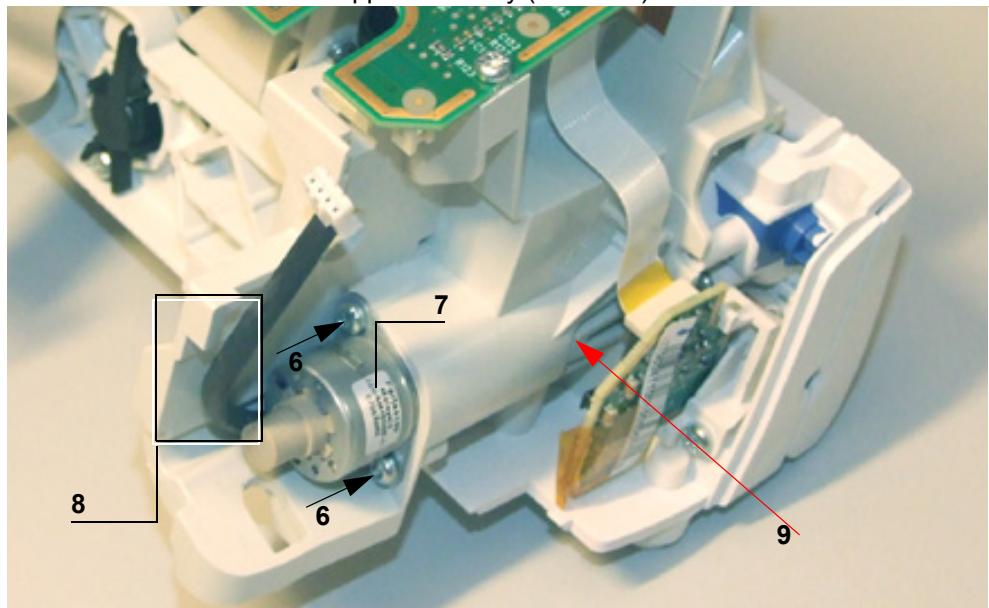


Re-assembling



Check the right position of the OCS motor fins when assembling the motor kit. The fins should be left side OCS optical sensor board.

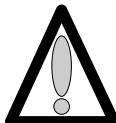
- Position the OCS motor into the flask, wires position as indicated by marker 8 (left side and at the bottom).
- Screw the 2 fixing screws (marker 6) holding the motor to the flask.
- Check that the motor is clipped correctly (marker 9).



- Carry out the dismantling procedure in reverse order to re-assemble the unit.
- Carry out the regular servicing tests (see Quality Control Certificate).

7 Calibrations

7.1 Calibrations procedure



The calibration menu is reserved for qualified staff only. Its access is protected by a secret code.

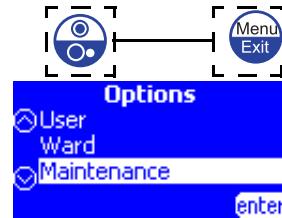
7.1.1 Access to the calibrations

Keyboard description

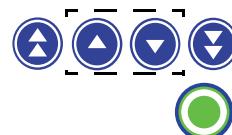
Key	Function
	ON switches on the device. OFF switches off the device when held down for more than three seconds.
	Menu/Exit accesses the calibrating mode.
	The selection keys scroll through the numbers and letters on the LCD screen using the tenths, units and tens values. Activate or de-activate the infusion menu.
	OK confirms the test selection or moves the cursor. start starts the infusion exit exits the screen and returns to the "Test" menu.

How to activate the "Calibration" configuration mode

- Press "**MENU/EXIT**".
- Keep it held down while pressing "**ON/OFF**".
- When the "**Options**" main menu displays, release "**MENU/EXIT**" and "**ON/OFF**" keys.



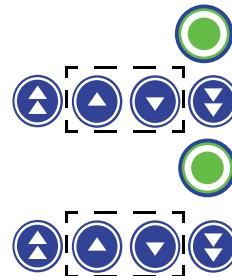
- Select your menu using the selection keys.
 Maintenance
- Press "enter" to confirm.



- The "**Maintenance**" menu displays.
- Key in your code.



- Press "OK" to confirm.
- Select the menu using the central selection keys.
 Calibration
- Press "enter" to confirm.
 Navigate through this sub-menu using the central selection keys.



*You may exit the configuration mode at any time by pressing "**MENU/EXIT**"; this function cancels the modifications.*



7.1.2 Etal 1, Pressures

Calibrating the pressures consists in calibrating the upstream and downstream pressures in several phases.

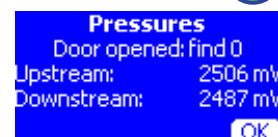


A new administration set must be used for this procedure.

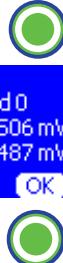
■ **Etal 1**, press "enter".

The main "**Pressures**" menu displays.

- Open the door and remove the administration set.

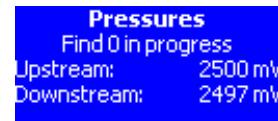


- Press "OK" to reset the search to zero.



■ The calibration values for upstream and downstream pressures appear in mV starting at 0.

- In "Pressures: door opened" phase.

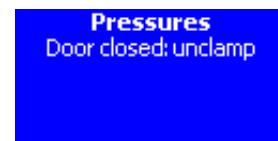


- Press "OK" to validate and move to the next step.



■ The "Pressures: door closed: unclamp" menu displays.

- Position the tube and close the door.



- Press "OK" to move to the next step.



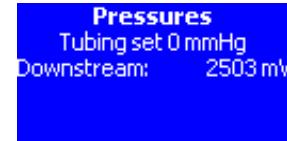
- ♦ Unclamping in progress.



- ♦ The motor starts positionning



■ The "Calibrating pressure" menu, 0mmHg with a tube appears in mV,
the manometer should indicate "0" mmHg (0 bar)



- Press "OK" to validate and move to the next step.



- The "pressure calibration" menu, 760mmHg with tube appears in mV.
 - Apply a pressure of 760mmHg (around 1bar) at the tube outlet.
 - Press "OK" to validate and move to the next step.



- The "Pressure calibration" menu, 0mmHg with tube appears in mV.
 - Decrease the pressure to 0mmHg (0bar).
 - Press "OK" to validate and move to the next step



- Press a second time to confirm and save the calibration values.



- If the values are out of the ranges, a message specify the non-conformity appears.
- Restart the calibration procedure.



7.1.3 Etal 2, Door

Calibrating the door consists of calibrating the door's Hall Effect sensor in several phases.

■ **Etal 2**, press "enter".

- The main "Door" menu displays.



- **Opened**: open the door.

- ♦ Press "OK" to validate and move to the next step.
 The value is read and recorded.
 It should lie between $1400 < X < 1800$ mV.

- **Intermediate**: place the calibration tool referenced Z067059 with the door in the intermediate position.



- ♦ Press "OK" to validate and move to the next step.
 The value is read and recorded.

- **Closed**: shut the door.



- ♦ Press "OK" to validate and move to the next step.
 The value is read and recorded.

This value should lie between $1500 < X < 2700$ mV in case the Hall Effect sensor magnet is mounted in the "south" direction or between $600 < X < 1500$ mV in case the Hall Effect sensor magnet is mounted in the "north" direction.

- Press again to confirm and save the calibration values.



- If the values are out of range, a message indicating the non-conformity appears: press "Exit".



- Restart the calibration procedure.

7.1.4 Etal 3, Air sensor

The air sensor calibration consists in calibrating the air detector board in several phases



A new administration set must be used for this procedure.

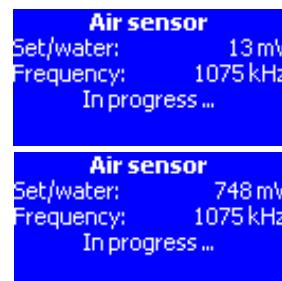
■ **Etal 3**, press "enter".

- The main menu "Air sensor" displays.
- Perform a flow rate measurement according to instructions described in paragraph "4.5 Flow rate check".
- Press "OK" to launch the resonance search.
- Wait the stop of resonance phase



■ Resonance frequency calibration phase with a tube and water:

- **Water tube**: the air detector value in mV.
- **Frequency**: current frequency value in KHz.
 - ◆ Water tube: the air detector value in mV. The value must lie between $600 < X < 2400$ mV.
 - ◆ Frequency: the resonance frequency for this phase.



- Press "OK" to validate and move to the next phase.

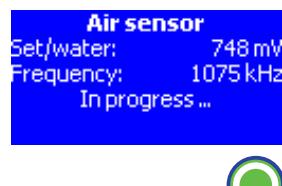
■ Resonance frequency calibration phase without a tube.

- Remove the pump tube and shut the door.
 - ◆ Without the tube: the air detector value in mV. The value must be $X < 300$ mV.
 - ◆ Frequency: the resonance frequency for this phase.
- Press "OK" to validate and move to the next phase.



■ Calibration resonance frequency, with tube and air

- Put a tube with air in place and close the door.
 - ◆ Air detector value in mV. The value must lie between $X < 300$ mV.
 - ◆ Frequency: resonance frequency for this phase.
- Press "OK" to validate and move to the next phase.



- Press "OK" again to confirm and save the calibration values.



- If the values are out of range, a message specifies the non conformity: press "Exit".



- Restart the calibration procedure.



7.1.5 Elal 4, Flow rate

The flow rate calibration consists in defining the device coefficient corrector to calibrate the pump.



A new administration set must be used for this procedure.

■ **Etal 4**, press "enter".

- The main menu "**Flow rate**" displays.
 - ◆ **Flow rate**: the infusion flow rate, 100ml/h, enables the speed of the motor rotation to be defined.
 - ◆ **Turns**: the number of motor cycles to execute 100.
- Perform a flow rate measurement according to instructions described in paragraph "4.5 Flow rate check".
- Press "OK" to validate and move to the next phase.

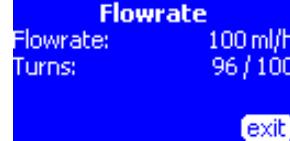


- "Unclamping" and "Motor clamp start-up" phase.



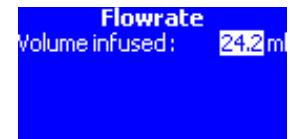
■ Coefficient corrector calibration.

- ◆ **Flow rate**: infusion flow rate, 100ml/h, enables the speed of the motor rotation to be defined.
- ◆ **Cycles**: number of motor cycles to execute 100.



exit

- Calibration in progress, wait till the end of the cycle.



- Press "OK" to validate and move to the next phase.

- The correction is displayed in %, it is calculated from the corrective coefficient programmed in the device.
The value of the corrective coefficient must lie between $80 < X < 110$.



- Press "OK" to save the flow rate correction.



8 Spare parts catalogue

Refer to the Volumat & Volumat MC Agilia spare parts catalogue.

Useful addresses

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