CODAN Syringe Pumps

A616S, A616S Plus
A616S *InCare,* A616S *TCI*

Service Manual

Version Mar 2022
For Firmware version 5.51

en

Table of Contents

Terms and Abbreviations

Item	Definition
A616S and variants	Including, CODAN A616S, A616S Plus, A616S *InCare*, and A616S *TCI* syringe pumps
ARGUS*service*	Windows-based service software for the configuration and maintenance of the CODAN ARGUS devices
COMMBOARD	Communication board
IV-Set	Infusion set (administration set)
KVO	Keep Vein Open
MED DB	Medication Database
MRI	Magnetic Resonance Imaging
PDMS	Patient Data Management System
R/T	Infusion Rate & Time
R/V	Infusion Rate & Volume
SM	Service Manual
SSC	Safety Standard Check
TIVA	Total Intravenous Anaesthesia
TPN	Total Parenteral Nutrition
UM/IFU	User Manual/Instructions For Use
VTBI	Volume To Be Infused

Preface

About the Manual

This Service Manual (SM) is for use, relevant to service personnel maintaining the CODAN A616S and variants. Download manuals, fact sheets, other documents and up-to-date information from www.codanargus.com.

Manufacturer

CODAN ARGUS AG
Oberneuhofstr. 10
CH-6340 Baar
Switzerland

www.codanargus.com
Technical Services:
support@codanargus.com

Sales and delivery:
codan@codanargus.com

General Remarks

Security and Safety

You must ensure the use of strong passwords, data protection, anti-virus software, protection against data theft and unauthorised data manipulation. Additionally, the use of an uninterruptible power supply is recommended. Service technicians are responsible for compliance with security and safety measures. For further information, contact your local distributor.

ARGUS*service* (SW version 6.04)

Throughout this SM, there are references to ARGUS*service*. Detailed information about how to connect and configure devices is fully described the ARGUS*service* UM. ARGUS*service* is designed for device FW from version 5.20 onwards.

System Information

If you contact CODAN ARGUS Technical Service Department by e-mail, provide the following information:

- Software release (SW-Rel.)
- Bootloader version (BL-Ver.)
- Device Serial Number (S/N).

The information can be found by entering the device configuration mode, or via ARGUS*service*.

How to Use the Manual

Keep this SM in a safe place and easily accessible at all times. Throughout this manual, special use cases for operating the device are explained using step by step instructions as follows:

➔ **How to …**

1 …

2 …

3 …

💧

Types and Explanation of Safety Notes

⚠WARNING **This is the safety note WARNING**

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION **This is the safety note CAUTION**

CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE **This is the safety note NOTICE**

NOTICE indicates possible device damage or an environmental problem can result if instructions are not followed.

This is an advice

The BULB symbol indicates special non-safety, non-risk advice that the user must pay attention to.

Safety Notices

It is mandatory that all users adhere to all safety notices throughout this SM.

Symbols

The symbol conventions, terms and abbreviations used throughout this manual are as follows:

➔ Start of an instruction	➤ Cross-reference
💧 End of an instruction	● List item

1 Introduction

1.1 Intended Use

The intended use of syringe pumps, CODAN A616S and variants is to deliver medications or fluids to adults, adolescents, paediatrics, and neonates who require continuous and precisely-controlled infusion rates delivered through clinically acceptable routes of administration.

These routes include but are not limited to:

- Intravenous
- Intra-arterial
- Subcutaneous
- Epidural.

Syringe pumps, CODAN A616S and variants, are intended for infusion therapies including but not limited to the following medications and fluids:

- Drugs such as cytostatic agents, anaesthetics
- Blood and Blood components
- Liquids for Total Parenteral Nutrition (TPN)
- Lipids
- Enteral fluids.

Syringe pumps, CODAN A616S and variants, are designed to be safe for continuous operation 24 hours per day. The device is intended to be used within a temperature range of between 5°C and 40°C.

1.2 Intended User

The intended users of syringe pumps, CODAN A616S and variants, are qualified healthcare professionals and service technicians in healthcare facilities which have been properly instructed and trained in the use of the pumps.

1.3 Contra-indication

Syringe pumps, CODAN A616S and variants, are not intended for:

- Home use or lay use
- Road or air ambulance (e.g. helicopter)
- Use in a hyperbaric chamber
- Use in an MRI environment
- Use with non-qualified syringes
- For use by an untrained healthcare professional or service technician.

1.4 System Interfaces

All syringe pump variants have interfaces that allow communication with an external IT system (PDMS), a nurse call system, and to the CODAN ARGUS*service* tool ARGUS*service*. The expected lifetime of the volumetric infusion pumps is 10 years.

1.5 Delivery Scope

Contained in the delivery package of the device are:

- A variant of the A616S syringe pump
- Combination clamp for attachment to infusion stand
- Mains power cable
- User manual.

Optional:

- Extended combination clamp for additional rail fixation

Accessories and spare parts for the A616S and variants of the syringe pumps are listed in a separate catalogue.

1.6 A616S Variant Matrix

The table below details the main options for each A616S variant. Not all features may be available/enabled on your device.

	A616S	A616S Plus	A616S *InCare*	A616S *TCI*
Standard Therapy Profiles	✓	✓	✓	✓
MED DB	✓[1]	✓[1]	✓[1]	✓[1]
TIVA	✓[1]	✓[1]	✓[1]	✓[1]
TCI	n/a	✓[2,3]	n/a	✓[3]
Connection to Docking Station	✓	✓[4]	✓	✓
Nurse Call	✓	✓	✓	✓
Ethernet (HL7 Protocol)	n/a	✓	n/a	n/a
Wi-Fi (HL7 Protocol)	n/a	✓[2]	n/a	n/a
Bluetooth (Patient ID scan)	n/a	✓	n/a	n/a

1. Medication database (MED DB file) required
2. Configurable
3. Night Mode not available in TCI infusion mode
4. Power only, no M docking station

2 Safety Notes

This section provides an overview of all safety notes. Failure to comply could lead to unexpected behaviour or a device malfunction which may risk user and patient safety.

⚠WARNING Safety Standard Check (SSC)

It is mandatory that SSC is performed regularly at intervals of 24 months or 10,000 operating hours.

⚠WARNING Qualified accessories, consumables and spare parts

Only operate the device with CODAN ARGUS AG qualified accessories and consumables. For maintenance and repair work, use only spare parts approved and supplied by CODAN ARGUS AG.

⚠WARNING Before maintenance or repair

Disconnect the device from the mains supply, and all interface connections before any maintenance or repairs are started. Failure to comply could lead to the electrical damage of the device or electrical shock, which may risk your safety.

⚠WARNING Using ARGUS*service*

ARGUS*service* must only be used by qualified technicians who have been trained by and are authorised by CODAN ARGUS AG.

⚠WARNING Safety Standard Check (SSC), maintenance and repair

The SSC, the maintenance and repair of devices must only be performed by qualified technicians who have been trained by and authorised by CODAN ARGUS AG.

⚠WARNING Disconnect the patient before device configuration

Never connect a device to, or attempt any configuration using ARGUS*service* while a patient is connected to the device.

⚠WARNING Firmware updates and patients

Ensure that the patient is disconnected from the device before starting a firmware update using ARGUS *service*.

⚠WARNING ARGUS*service* and patients

Never connect a device to, or attempt any configuration using ARGUS*service* while a patient is connected to the device. Failure to comply risks patient safety.

⚠WARNING Device check and firmware update

A qualified medical expert must check the device configuration after a firmware update to ensure that the device is configured, and suitable for patient use.

⚠WARNING Mandatory Safety Standard Check (SSC) after firmware update

It is mandatory that SSC is performed after a firmware update.

⚠WARNING Mandatory Safety Standard Check (SSC) after device repair

It is mandatory that SSC is performed after a device repair.

⚠WARNING Configuration process and technical errors

If the configuration process is terminated due to a technical error, restart the configuration process.

⚠WARNING Device configuration and mains supply

Connect the device to the mains supply before attempting to perform any device configuration, i.e. using ARGUS*service*. It is not possible to use ARGUS*service* without the device connected to the mains supply.

⚠WARNING **Firmware update and mains supply**

Connect the device to the mains supply before attempting to perform a firmware update, i.e. using ARGUS*service*. It is not possible to use ARGUS*service* without the device connected to the mains supply.

⚠WARNING **Specified syringe calibration parts**

Ensure that only the specified calibration parts for syringe calibration are used.

⚠WARNING **Specified pressure calibration parts**

Ensure that only the specified calibration parts for pressure calibration are used.

⚠WARNING **Nurse call connection and signalling**

Ensure that the device is connected, configured and fully functioning with the nurse call system throughout the hospital. Failure to comply could lead to unexpected, false and missed alarms which may risk patient safety.

⚠WARNING **Buzzer/speaker volume and ambient noise level**

Ensure that the volume of the buzzer/speaker is higher than the surrounding ambient noise level. Failure to comply could lead to a delayed reaction.

⚠WARNING **Defective devices**

Never use a device with visible defects, or suspected of having defects. Hand it over to your service technician.

⚠WARNING **Electrostatic discharge**

If electrostatic discharges ≥ 15 kV occur on the rear connectors of the device, the power supply may be damaged. If the device mains LED does not light up, disconnect the device from the mains immediately and investigate the cause of the problem. The device must only be used if the cause of the problem is found and resolved, else, continue investigating.

Initial investigation should focus on the following components, the Fuse, Primary cable, PSU and Mainboard.

⚠WARNING **Device battery packs**

The device must only be fitted, used with fully functioning battery packs that are supplied and approved by CODAN ARGUS AG.

⚠CAUTION **Distance between CODAN ARGUS Plus devices**

When used together, the distance between CODAN ARGUS A616S Plus devices (or A616S Plus and A71XV Plus devices) must be greater than 6 cm.

⚠CAUTION **EMC Performance**

Cables and accessories other than those specified or provided by the CODAN ARGUS AG may negatively affect EMC performance.

⚠CAUTION **Device cleaning**

Ensure that the device cleaning instructions are strictly followed. Failure to comply could lead to unexpected behaviour or a device malfunction which may risk patient safety.

NOTICE **Subject to change**

The information supplied in this manual is correct at the time of printing. We reserve the right to make changes without prior notice.

NOTICE **Device PIN code**

It is strongly recommended that the device PIN code is changed periodically, especially when taking delivery of the device.

3 Device Overview

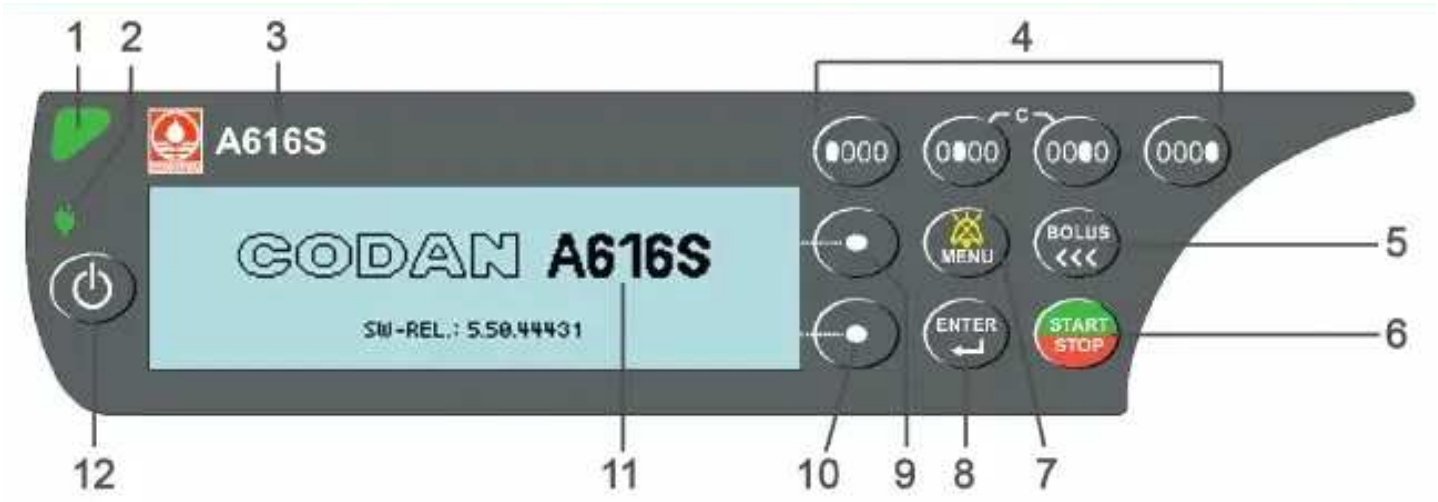
3.1 Key Features

The front view of the A616S Plus, A6161S *InCare*, and A616S *TCI* is the same as below; only the front panel for the A616S Plus is light blue, and dark blue for the A616S *TCI* variant. The front panel layout and key functionality are the same across all A616S variants.

1	Front Panel & User Interface (UI)	7	Clamp lever
2	Syringe barrel holder	8	Power connection
3	Syringe guide	9	Combination Clamp
4	Drive arm	10	Serial Interface (RS-232)
5	Piston clamp	11	Nurse call
6	Clutch lever	12	Ethernet port

3.2 Front Panel and User Interface (UI)

A keypress is confirmed by a short audible signal. The keypress audible signal is configurable using ARGUS*service*.



1	Status LED	7	MENU/MUTE key
2	Power supply LED	8	ENTER key
3	Device name	9	SELECT/CLEAR key
4	Numeric keys	10	INFO/EXIT key
5	BOLUS/BOLUS MENU key	11	User Interface
6	START/STOP key	12	ON/OFF key

4 Connectivity and Communications

⚠CAUTION **Distance between CODAN ARGUS Plus devices**

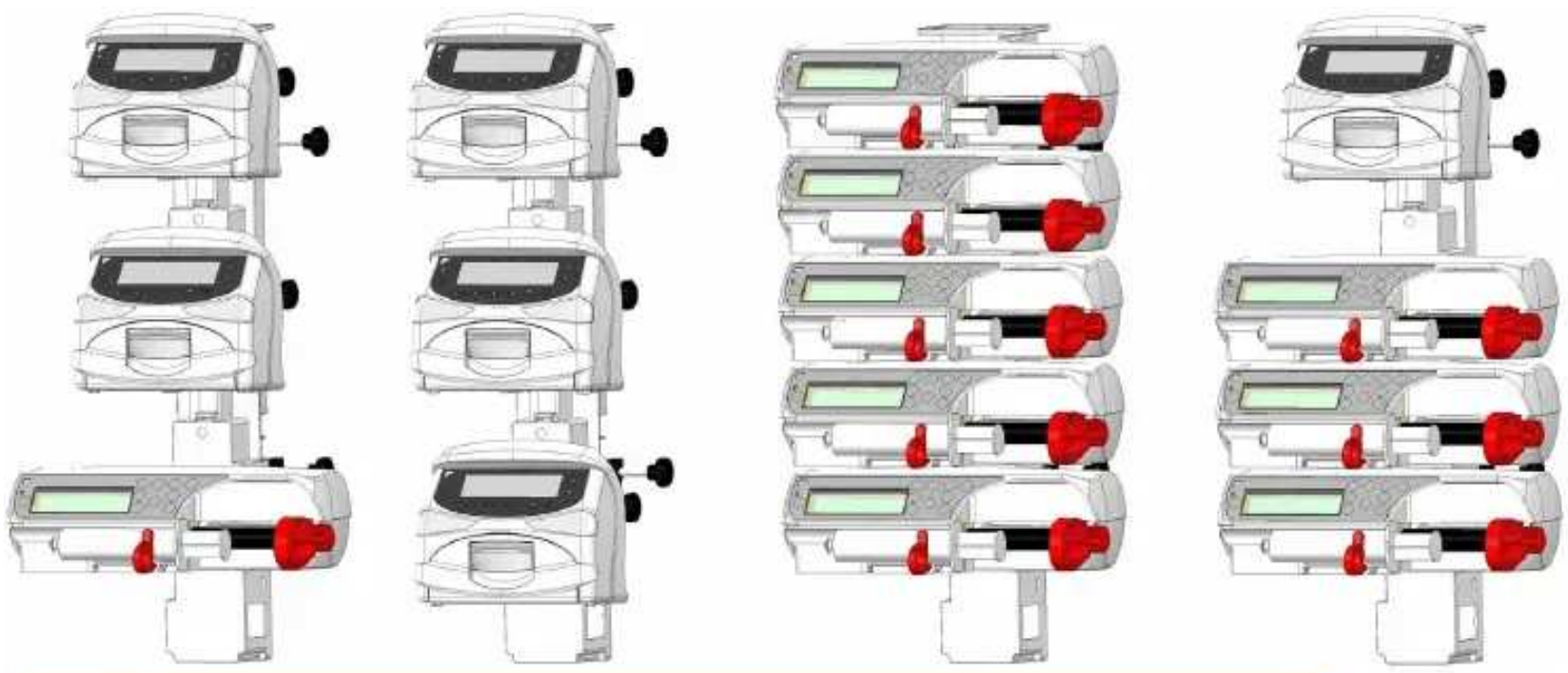
When used together, the distance between CODAN ARGUS A616S Plus devices (or A616S Plus and A71XV Plus devices) must be greater than 6 cm.

4.1 General

All A616S variants can be used in different combinations, stand-alone or mounted in a docking station. Depending on the variant, the method of connectivity and how each communicates with various hospital systems, i.e. nurse call, to a PDMS, or has support for ARGUS*service* is variant-specific.

At the rear of the A616S and A616S Plus there are a series of connections including a serial interface (RS-232), a nurse call port an Ethernet port, Wi-Fi and internally, Bluetooth (functional on the Plus variant only) each of which is described below. For device configuration, follow the instructions contained within the ARGUS*service* UM.

➤ See *3 Device Overview, page 9*



4.2 Serial Interface (RS-232)

4.2.1 General

The device has a serial interface for connection to CODAN ARGUS docking stations. The serial interface designed by CODAN ARGUS enables the communication with CODAN ARGUS docking stations. In such a case, the separation device, according to EN60601 1, is given by the docking station. It is prohibited to connect the interface cable to the serial interface of the device while it is connected to a patient.

4.2.2 Serial Communication Protocol

The following characteristics are valid for all ARGUS devices (syringe pumps, docking stations and PCs) which are intended to communicate with the device mentioned in this SM.

- Full-duplex RS-232, currently 4800 Baud for single pumps, 9600 Baud for docking stations (also on master/slave-link)
- Simple master (host/PC) – slave (device) communication (the host does polling)
- The host has to repeat the request if there is no valid response
- Uses a checksum (CRC8)
- Binary data transmission, thus no ASCII/text parsing
- Fast & direct communication with pumps on ARGUS docking station.

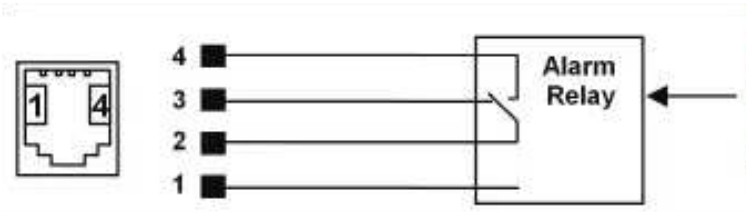
Contact your local distributor or CODAN ARGUS AG for the complete serial communication protocol description.

4.3 Nurse Call

⚠WARNING Nurse call connection and signalling

Ensure that the device is connected, configured (signalling) and fully functioning with the nurse call system throughout the hospital.

You can connect the device to the nurse call system. The connector is located at the rear of the device. The following figure illustrates the schematics of the nurse call connection and the connection plan of the RJ9 plug.



During an alarm or pre-alarm, nurse call becomes active (see the table below). After you muted the alarm or pre-alarm, the nurse call relay resets to the normal position.

This kind of function can be configured in 3 ways:

➤ See *7.1 Configuration Parameters, page 23*

Signal form	Setting	Value
Single-pulse alarm	Nurse call function	True
	Nurse call pause width	3,600 s
	Nurse call pulse width	Pulse duration
Pulse sequence alarm (with a reminder)	Nurse call function	True
	Nurse call pause width	Reminder time
	Nurse call pulse width	Pulse duration
Static alarm	Nurse call function	True
	Nurse call pause width	0 s
	Nurse call pulse width	3,600 s
Nurse call disabled	Nurse call function	False
	Nurse call pause width	Any
	Nurse call pulse width	Any

4.4 Ethernet Port and Wi-Fi

A communication board (COMMBOARD) is installed into the Plus variant to support a series of optional and standard device features.
The rear-mounted Ethernet port provides access to:

- Data transfer to hospital IT system (HL7/IHE)
- COMMBOARD configuration via ARGUS*service* (6.04)

The Wi-Fi provides access to:

- Data transfer to hospital IT system (HL7/IHE)

While the COMMBOARD is transparent to the user with no setup or interaction required; service technicians must use ARGUS*service* to configure the device options where necessary. To check the operational status of the COMMBOARD, i.e. all enabled COMMBOARD services are functioning correctly, follow the COMMBOARD Status check procedure in the device UM.

4.5 Bluetooth

Bluetooth is available on the A616S Plus variant only, Bluetooth connectivity enables the use of a barcode scanner for Patient ID scan.

5 Configuration Mode and Menus

⚠WARNING **Device check and firmware update**

A qualified medical expert must check the device configuration after a firmware update to ensure that the device is configured, and suitable for patient use.

⚠WARNING **Mandatory Safety Standard Check (SSC) after firmware update**

It is mandatory that SSC is performed after a firmware update.

NOTICE **Device PIN code**

It is strongly recommended that the device PIN code is changed periodically, especially when taking delivery of the device.

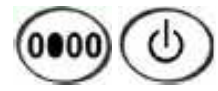
5.1 Configuration Mode

Configuration mode provides access to the device setting menu, a series of maintenance orientated menus, simple device tests, and information screens. No connection to ARGUS*service* is required.

After each change in the device configuration, a function check and a control measurement must be performed.

➔ **Configuration Mode – how to enter**

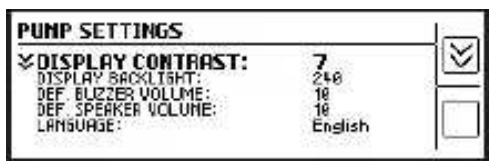
With the device switched off.



1 Press and hold the 2nd numeric key, then press the ON/OFF key.

2 Enter the 4-digit PIN code using the numeric keys when prompted.
3 Press ENTER.

The PUMP SETTINGS menu is displayed by default.



4 Pressing the MENU key provides access to a series of calibration, test and information menus. These menus are described later.

5.2 Pump Settings Menu

A series of self-explanatory device settings that can be accessed/configured through this menu, e.g. device language selection. To load a secondary language onto the device, you must use ARGUS*service*.

From the PUMP SETTING menu, you can configure some basic device parameters permanently and directly without using ARGUS*service*. Use the SELECT and ENTER keys to select and make changes, press EXIT to leave a sub-menu. Switch off the device to exit the PUMP SETTINGS menu/configuration mode.

The following settings are adjustable:

Setting	Default Value	Range/Unit	Description
DISPLAY CONTRAST	7	1 – 15	Display contrast
DISPLAY BACKLIGHT	240	0 – 255	Display backlight brightness
DEF. BUZZER VOLUME	10	1 – 10	Buzzer loudness. The volume cannot be turned off
DEF. SPEAKER VOLUME	10	1 – 10	Speaker loudness. The volume cannot be turned off
LANGUAGE	English	English or 2nd Language	Language selection of English or a secondary language for the user interface in normal mode.

6 Maintenance

⚠WARNING Electrostatic discharge

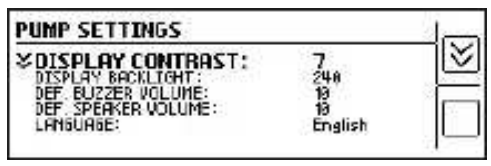
If electrostatic discharges ≥ 15 kV occur on the rear connectors of the device, the power supply may be damaged. If the device mains LED does not light up, disconnect the device from the mains immediately and investigate the cause of the problem. The device must only be used if the cause of the problem is found and resolved, else, continue investigating.

Initial investigation should focus on the following components, the Fuse, Primary cable, PSU and Mainboard.

6.1 Menu Overview

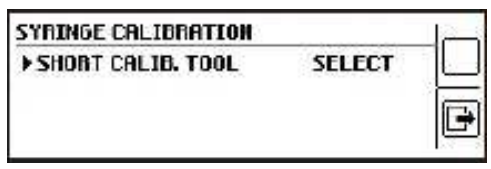
The following describes the available menus and their sequence of availability on pressing the MENU key in configuration mode. Press the MENU key repeatedly until the required menu is displayed.

PUMP SETTINGS



This menu provides a series of basic device configuration parameters that can be permanently set without the use of ARGUS*service*.

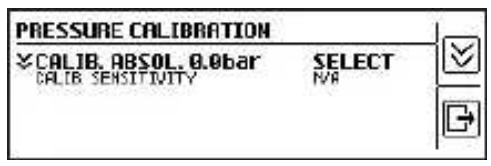
SYRINGE CALIBRATION



This menu and its submenus (Short & Long) allow you to calibrate the barrel, the clamp diameter and plunger position.

➤ See *6.2.2 Syringe Calibration, page 15*

PRESSURE CALIBRATION



This menu and its submenus (Short & Long) allow you to complete pressure measurements and pressure calibration.

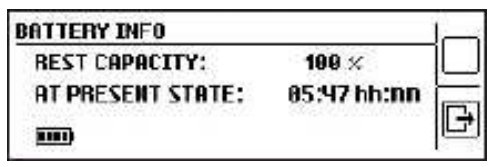
➤ See *6.2.3 Pressure Calibration, page 17*

KEYPAD & DISPLAY TEST

This menu provides access to the user interface test process.

➤ See *6.4 Keypad & Display Test, page 19*

BATTERY INFO

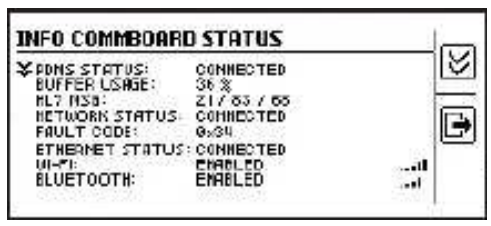


This menu provides information about the remaining battery capacity as a percentage and in hh:mm. If the specified times are no longer achievable, contact Technical Services.

INFO MED. DATABASE

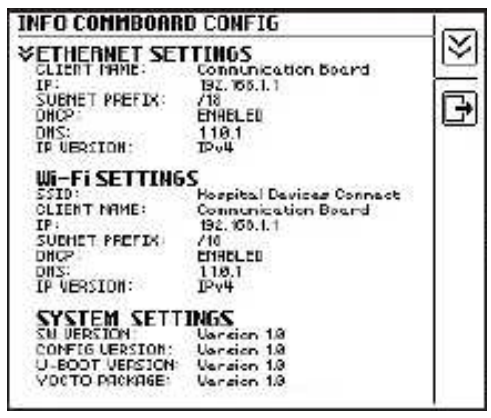
This menu provides information about the installed MED DB. This screen is not displayed if the device has no MED DB installed.

INFO COMMBOARD STATUS



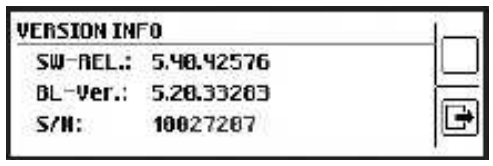
This menu provides live information about the current status of the COMMOARD. The menu is read-only.

INFO COMMBOARD CONFIG



This menu provides detailed information about the COMMBOARD configuration. The menu is read-only.

VERSION INFO
Row 1 FW Release with Version and Revision
Row 2 Bootloader Release with Version and Revision
Row 3 S/N of the device



6.2 Qualified Syringes, Import and Calibration

WARNING **Qualified accessories, consumables and spare parts**

Only operate the device with CODAN ARGUS AG qualified accessories and consumables. For maintenance and repair work, use only spare parts approved and supplied by CODAN ARGUS AG.

Syringe pumps, CODAN A616S and variants can be configured/used with a range of syringes from 10 ml to 60 ml. Unless otherwise specified by the customer, the device is calibrated by the manufacturer with the CODAN standard set. Other syringes must be calibrated separately. A list of qualified syringes is included with the product.

Connect the device to ARGUS*service* and follow the procedure detailed in the UM/on-screen to import (from the FW or syringe file) and configure a syringe. Imported syringes are enabled by default, but must be calibrated to the device. Syringe calibration is mandatory.

Qualified syringe calibration is a combination of a factory based calibration and syringe/pressure calibration. Follow the procedures below to complete syringe calibration.

➤ See the UM for ARGUS*service*

6.2.1 Factory Base Syringe Calibration

WARNING **Specified syringe calibration parts**

Ensure that only the specified calibration parts for syringe calibration are used.

The factory base calibration is part of the manufacturing process by CODAN ARGUS AG. You must repeat the process after the replacement of parts, e.g. mainboard, the complete syringe drive or parts of it, syringe barrel holder, potentiometer etc. also after being dropped or a substantial impact. We recommend checking the factory base calibration values during the SSC.

Remove any syringe before you start the calibration process. Spare parts, accessories and consumables for the device are listed in Spare Parts catalogue.

➤ **Syringe Calibration – how to**

1. Open the device but leave all the cables connected.
2. Enter the CONFIGURATION mode.

➤ See *5 Configuration Mode and Menus, page 12*

3. Press MENU to enter the CALIBRATION menu.
4. Press SELECTION to select SHORT CALIB. PART.
5. Press ENTER to get access to the different signal voltages.
   Do not press this key again as this will only be done during the final calibration with a closed device.
6. Ensure that the red syringe barrel holder is in a completely closed position. Adjust the white potentiometer to 360 mV ±40 mV (BARREL DIAM.). Tighten the set screw on the white cog wheel and verify the declared value again.
7. Completely pull out the syringe barrel holder. The signal of the barrel diameter must be between 2,600 and 3,180 mV. Repeat step 3 if this range is exceeded.
8. Push the syringe drive to the left. Adjust the black potentiometer on the drive unit to 300 mV ±10 mV (PLUNGER POS.). Tighten the set screw and verify the declared value again.
9. Push the syringe drive to the right. The signal of the plunger position must be between 2,900 and 3,000 mV. Repeat step 5 if this range is exceeded.
10. Remove the red cover of the driving head according to instruction:

➤ See *Red cover of the driving head – how to remove, page 29*

11. Check if the piston clamps are fully closed. Adjust the signal of the potentiometer to 460 mV ±50 mV (CLAMP DIAM.). Tighten the set screw and verify the declared value again.
12. Assemble the red driving unit again.
13. Ensure that the piston clamps are fully closed. Check if the clamp lever does not abut against the table. The signal of the CLAMP DIAM. must be 460 mV ±50 mV. Repeat steps 7 to 8 if this value is not reached.
14. Fully open the piston clamps. The signal of the CLAMP DIAM. must be between 2,400 and 3, 000 mV. Repeat steps 7 – 9 if this value is not reached.
15. Press EXIT to exit the CALIBRATION menu. Do not press the ENTER key.

16 Close the device and proceed with the final calibration.
Failure to observe the above-given value ranges may lead to a technical alarm when you start the device.

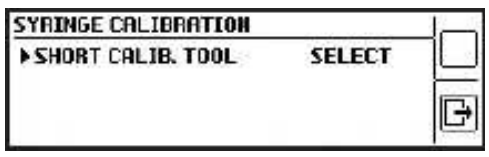
6.2.2 Syringe Calibration

⚠WARNING **Specified syringe calibration parts**
Ensure that only the specified calibration parts for syringe calibration are used.

The SYRINGE CALIBRATION menu has two submenus, LONG CALIB. TOOL and SHORT CALIB. TOOL. Use the submenus and the calibration tools to calibrate the barrel, the clamp diameter and plunger position.

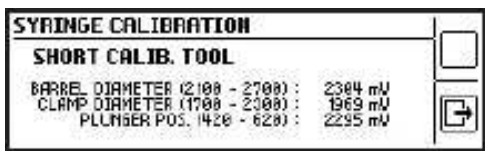
➔ **Calibration tool, short – how to use**

1 Press SELECTION to select SHORT CALIB. TOOL.
2 Press ENTER to confirm.



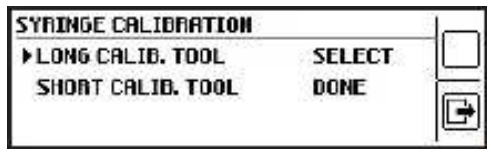
3 Insert the short calibration part (Ø 31, l = 60 mm).

4 Check whether the measured values are within the specified range. If not, repeat the factory base calibration.
➤ See *6.2.1 Factory Base Syringe Calibration, page 14*
5 Press ENTER to select and confirm calibration.



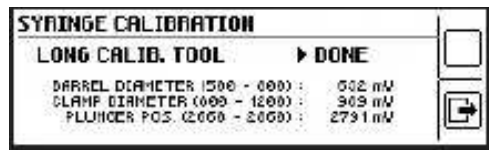
➔ **Calibration tool, long – how to use**

1 Press SELECTION to select LONG CALIB. TOOL.
2 Press ENTER to confirm.

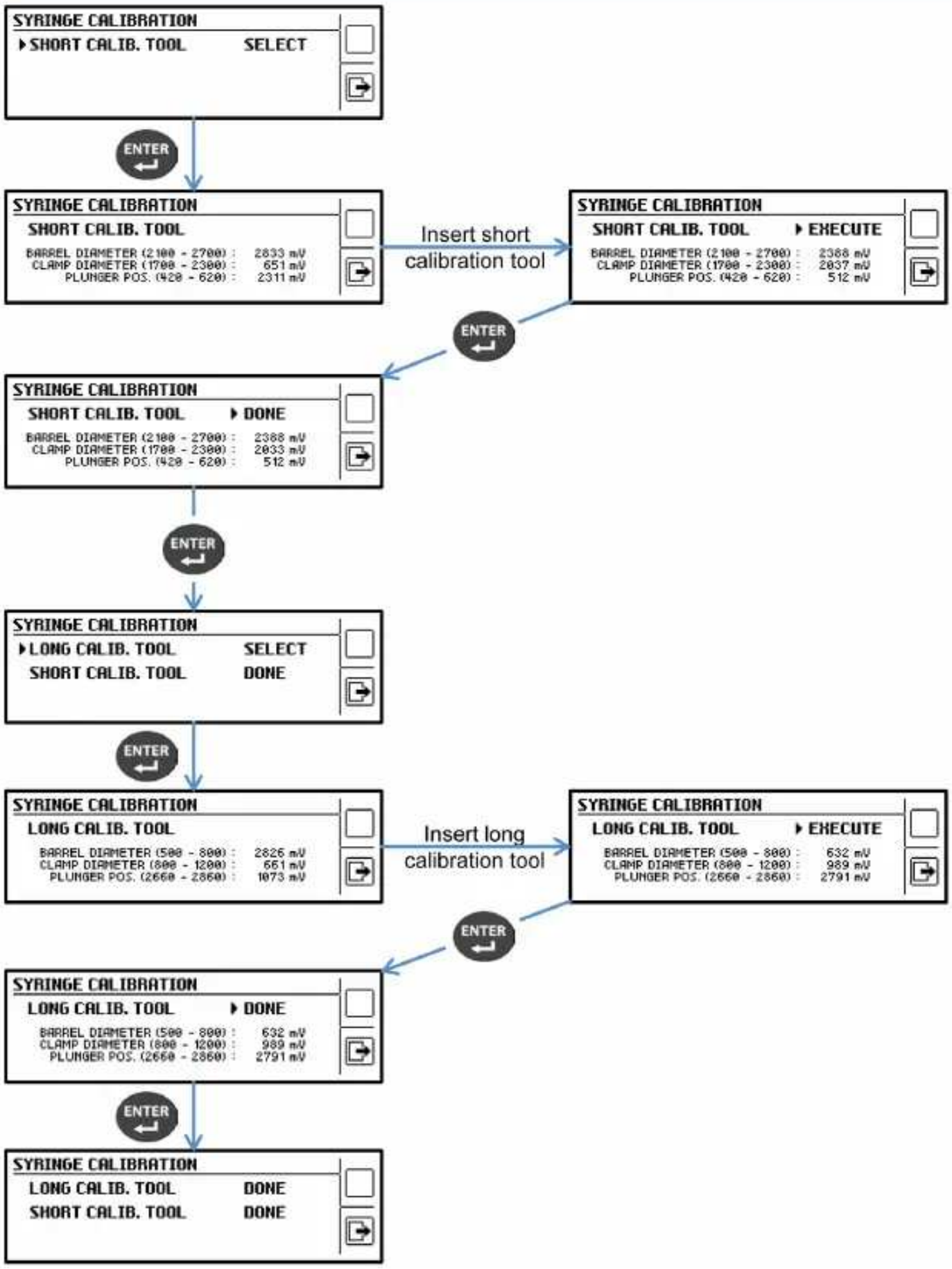


3 Insert the long calibration part (Ø 17, l = 160 mm).

4 Ensure that the piston clamps capture firmly without any gap between the drive unit and the calibration part.
5 Slightly press the calibration part against the drive unit.
6 Check whether the measured values are within the specified range. If not, repeat the factory base calibration.
➤ See *6.2.1 Factory Base Syringe Calibration, page 14*
7 Press ENTER to select and confirm calibration.



6.2.2.1 Workflow



6.2.3 Pressure Calibration

⚠WARNING **Specified pressure calibration parts**

Ensure that only the specified calibration parts for pressure calibration are used.

The PRESSURE CALIBRATION menu has two submenus:

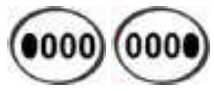
- For offset calibration (0 bar absolute pressure calibration by adjusting the digital potentiometer)
- For pressure sensitivity calibration by two landmarks at 0.2 and 1.2 bars to interpolate the pressure measurement.

Before you start pressure calibration, ensure that the device casing is closed and secure to ensure a stable force distribution.

➔ **0.0 bar, absolute – how to calibrate**

1 Press SELECTION to select CALIB. ABSOL. 0.0 BAR.
2 Ensure that syringes or calibration parts are not inserted. Position the driving head midway.
3 Press ENTER.
4 The pump automatically calibrates the ABSOL 0.0 bar. When the calibration is completed, ABSOL 0.0 bar DONE is displayed.
5 Press ENTER to finish the calibration.

➔ **Sensitivity – how to calibrate**

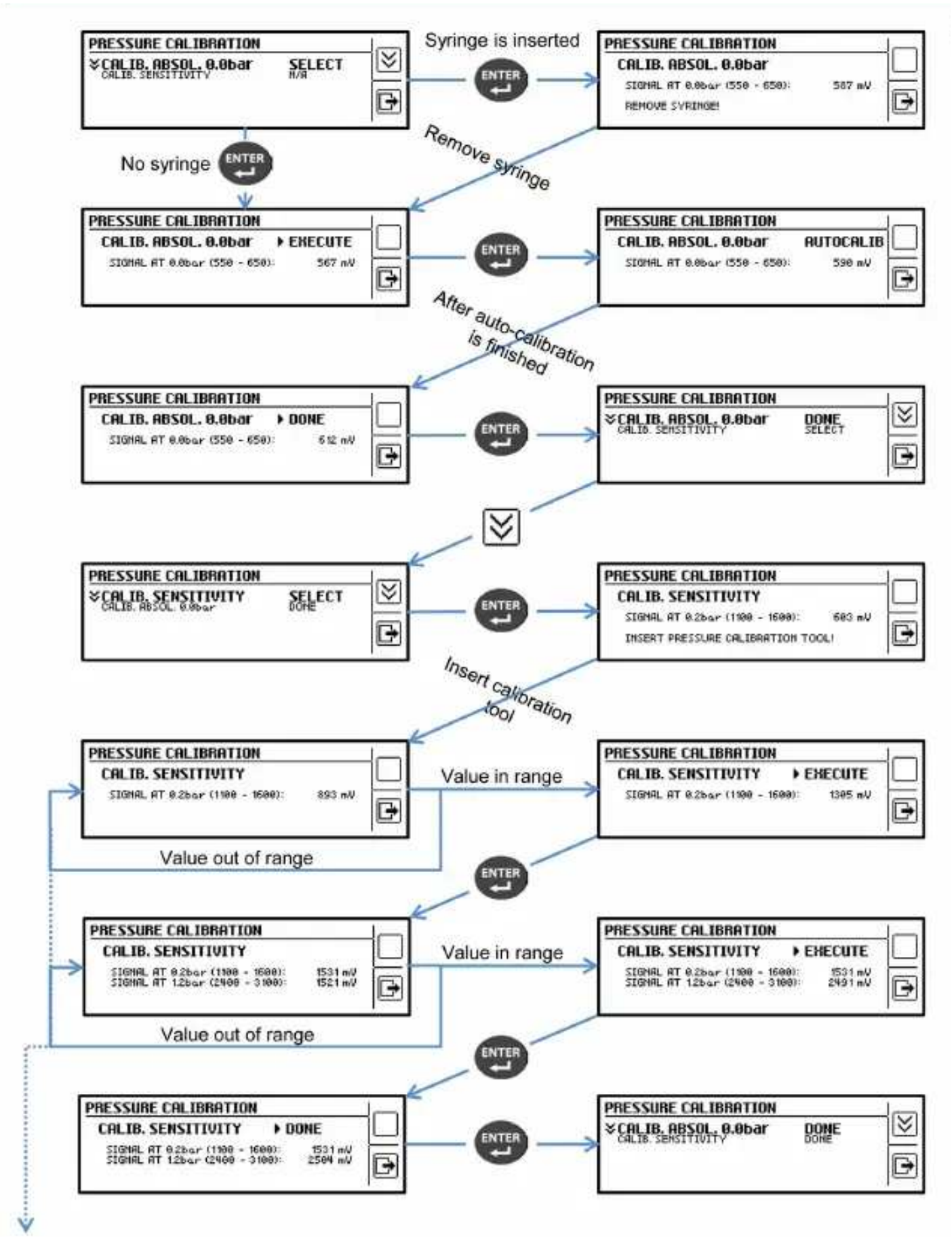


1 Press SELECTION to select CALIB. SENSITIVITY.
2 Insert the spring gauge for syringe pumps.
3 Press ENTER.
4 Press the 4th or the 1st numeric key to increase or decrease the delivery speed.
5 When 0.2 bar is reached, press the ENTER key.
6 When 1.2 bar is reached, press the ENTER key.
7 Press ENTER again.

➔ **Control measurement – how to execute**

1 Switch the device off and on again.
2 Control the pressure survey using a manometer:
   - Adjust the occlusion alarm limit to 1,000 mbar
   - Initiate the pressure build-up with 200 ml/h
   - Release an occlusion alarm at 1,000 mbar ±200 mbar.

6.2.3.1 Workflow



Calibrate using the numeric keys

Increase speed

Decrease speed

Stop

6.3 Pump Accuracy Measurement

Insert a 50 ml syringe, e.g. a CODAN Perfusion filled with distilled water. Purge the administration set and start to administer the water into a cup placed on a balance which has been zeroed. Check if the inserted syringe type and size matches the displayed syringe on the screen.

The device settings must be:

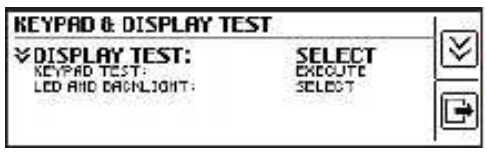
- Rate: 200 ml/h
- Volume: 20 ml.

The resulting net weight shall read 20 g ±2% (refers to a rate range from 1 to 1,500 ml/h).

6.4 Keypad & Display Test

This menu is for the verification of the correct function of the user interface, including keypad and display.

Select the tests one after the other and follow the instructions on display.



DISPLAY TEST	This test detects possible defective pixels. The check contains 2 steps. The correct function of the display is confirmed by a black display at the end.
KEYPAD TEST	This test verifies the correct function of all keys except the ON/OFF key. The ON/OFF key is automatically checked at every start-up of the device. The test is completed when you have pressed every key, and all check-marks are displayed.
LED AND BACKLIGHT	This test verifies all lights. The test is completed if all lights have shone as indicated on display.

6.5 Notifications

There are no associated notifications in configuration mode.

6.6 Technical Errors

⚠WARNING **Configuration process and technical errors**

If the configuration process is terminated due to a technical error, restart the configuration process.

Technical error messages remain displayed after the alarm audio signal is muted (muted using the ON/OFF key) and remains on-screen until the device is switched OFF and ON.

A technical error is indicated on the device by a continuous acoustic signal and/or a flashing red LED. During an error status, the error cause can be determined by the error code on the device screen:

An example of a TECHNICAL ERROR.

The 2nd line contains the FW version, module number, module revision and line number.

Technical errors – how to proceed in case of a technical error

1. Press ON/OFF to mute the audible alarm signal.
   An alarm message is displayed and remains until, the device is switched OFF and ON, or the cause of the alarm is resolved.
2. Press ON/OFF to switch the device off.
3. Press ON/OFF to restart the device. The device is now in normal mode.
4. If the same error message is displayed several times, investigate and clear the problem.

Recording (History/Event Log)

Important device events, including device switch ON/OFF, Therapy parameters, Alarms, Bolus setup etc. are recorded chronologically in the device history during operation. The entries are stored even if the device is switched off. In case of a power failure, the device keeps the historical events. When the maximum number of entries is reached, the oldest entry is overwritten. You can read out the history with ARGUS*service*.

The device supports a history file of up to 1,000 entries. Each entry is uniquely defined with an index according to the following rule:

• The index is a continuously increasing number, beginning with 0.

6.7 List of Technical Error Codes

Code Number	Message
48031	1. Calibrate device 2. Check cable between Mainboard and DMS module 3. Check cable between Mainboard and Drive module 4. Check Mainboard
48016	1. Calibrate device 2. Check cable between Mainboard and DMS module 3. Check Mainboard
48020 - 48023	1. Calibrate device 2. Check cable between Mainboard and Drive module 3. Check Drive module
48029, 48030 48032, 48042	1. Calibrate device 2. Check cable between Mainboard and Drive module 3. Check Mainboard 4. Check Drive module
48018, 48019	1. Calibrate device 2. Check Mainboard
8209 8336 – 8337 48044, 48045 4805	1. Check Battery 2. Check Mainboard
8255	1. Check Battery 2. Check Mainboard 3. Check Display module
8108	1. Check Battery 2. Check Mainboard 3. Check Power supply
48002	1. Check cable between Mainboard and Display module 2. Check Display module 3. Check Mainboard
48035 48046, 48047	1. Check cable between Mainboard and DMS module 2. Check DMS module 3. Check Mainboard
48033, 48034 48039, 48040 48043	1. Check cable between Mainboard and Drive module 2. Check Mainboard 3. Check Drive module
8245 - 8247	1. Check cable between Motor and Mainboard 2. Check Mainboard 3. Check Motor 4. Check Drive module and calibrate the device
48050	1. Check Mainboard 2. Check Battery 3. Check Display module 4. Check DMS module 5. Check Drive module
48048	1. Check Mainboard 2. Check Motor
8327	1. Check Mainboard 2. Check Power supply

Code Number	Message
48055	1. Check Power supply 2. Check Battery 3. Check Mainboard
8120, 8379	1. Flash the Device 2. Check Mainboard
48058, 48060	1. Temperature above valid range 2. Check Battery 3. Check Mainboard
48057, 48059	1. Temperature under a valid range 2. Check Mainboard
8106, 8109	Check Battery
8214	Check Coin Battery
8003	
8084	
8086, 8087	
8110, 8116	
8131	
8155	
8169, 8170	
8172, 8173	
8175	
8191	
8221	
8244	
8248 - 8250	Check Mainboard
8262, 8263	
8280	
8323	
8348	
48015	
48017	
48036	
48041	
48049	
48051 - 48053	
48056	
48061, 48062	
8165	Configuration error
8000 – 8081	
8004 – 8081	
8085	
8088 – 8105	
8118	
8124, 8125	
8147 – 8152	
8156 – 8163	
8166 – 8168	
8171	

Code Number	Message
8176 – 8180	
8187	
8192 – 8208	
8215 – 8220	
8222 – 8243	
8253, 8254	
8257, 8261	FW error: Contact CODAN ARGUS Technical Service
8264 – 8279	
8281 – 8322	
8324 – 8326	
8328 – 8334	
8338 – 8347	
8349 – 8378	
48000	
48004 – 48012	
48024 – 48027	
48038, 48064	
8174	Key pressed for too long or Keypad error
8184	MED DB error: Invalid medication flashed to the pump.
8185	Wrong Device Type

If the error is located in the FW, check if new FW version is available. Some technical errors give a hint in the history which hardware component is defective. In the table above, the possible components are in the order of probability as the error source. If you have found the defective component, first check the connections of the component. If the error occurs again, replace the components and check for errors. If the problem persists, inform/contact CODAN ARGUS Technical Services.

6.8 Battery Maintenance

⚠WARNING Device battery packs

The device must only be fitted, used with fully functioning battery packs that are supplied and approved by CODAN ARGUS AG.

6.8.1 Battery maintenance before first use

➔ **Battery maintenance – how to proceed before first use**

1. Complete the following steps to fully charge/condition the device internal battery pack for the first time.
2. Connect the device to the mains or a CODAN docking station until the battery is charged to 100%.
3. Disconnect/remove the mains supply to the device.
4. Operate the device via battery to deplete the battery until the BATTERY EMPTY alarm is displayed.
5. Reconnect the device to the mains or a CODAN docking station until the battery is charged to 100%.

You can activate/deactivate the message BATTERY MAINTENANCE IS DUE. If this message is displayed when the device is switched on, battery maintenance is required. The message is always displayed at startup until battery maintenance is complete.

➔ **Battery maintenance – how to proceed**

1. Carry out this procedure out at least quarterly, preferably monthly.
2. Connect the device to the mains or a CODAN docking station until the battery is charged to 100%.
3. Disconnect/remove the mains supply to the device.
4. Operate the device via battery to deplete the battery until the BATTERY EMPTY alarm is displayed.
5. Reconnect the device to the mains or a CODAN docking station until the battery is charged to 100%.

The battery charging system included in the device requires additional electronics (temperature and current sensors) to provide high current to accelerate charging time. Therefore, the battery must be obtained from CODAN ARGUS AG. The charging time also depends on the current device status (infusing rate, standby).

6.9 Coin Cell Battery

⚠WARNING Safety Standard Check (SSC), maintenance and repair

The SSC, the maintenance and repair of devices must only be performed by qualified technicians who have been trained by and authorised by CODAN ARGUS AG.

During normal use, the button cell battery lasts over 10 years. When the device is not used for an extended period and is not connected to mains, the battery may be emptied within a shorter time.

➤ See *Coin cell (mainboard) – how to replace, page 30*

7 Configuration

⚠WARNING ARGUS*service* and patients

Never connect a device to, or attempt any configuration using ARGUS*service* while a patient is connected to the device.

⚠WARNING Buzzer/speaker volume and ambient noise level

Ensure that the volume of the buzzer/speaker is higher than the surrounding ambient noise level. Failure to comply could lead to a delayed reaction.

To complete a Firmware (FW) update, language change, and device configuration changes other than those basic changes detailed in the maintenance chapter, you must be connected to ARGUS*service*. ARGUS*service* now has its own User Manual (UM). Always follow the instructions in the ARGUS*service* UM when connecting to ARGUS*service*, or carrying out any device updates/changes. The latest ARGUS*service* UM and FW updates are available from www.codanargus.com\Login. If you do not have access to the login area, follow the link to the one-time registration.

7.1 Configuration Parameters

Detailed below is an overview of all relevant settings accessible through the ARGUS *service,* configuration option.

Parameter	Value	Range	Unit	Description
Alarms				
Alarm Signal				
Interburst	2500	2500 - 15000	ms	Interburst interval
Pause	50	50 - 125	ms	Duration of pause
Pause no. 5	350	350 - 1300	ms	Duration of pause no. 5
Pulse	75	75 - 200	ms	Pulse length
Battery Maintenance				
Notification enabled	False	False/True		Enable battery maintenance notification
Note Signal				
Interburst	6000	2000 - 30000	ms	Interburst interval
Pause	250	150 - 1500	ms	Duration of pause
Pulse	150	100 - 000	ms	Pulse length
Nurse Call				
Function	False	False/True		Allows alarm transmissions
Pause width	2	0 - 3600	s	Pause width
Pulse width	1	0 - 3600	s	Pulse width
Reverse	False	False/True		Reverse alarm signals
Pre-alarm Signal				
Interburst	15000	15000 - 30000	ms	Alarm low priority interburst interval in ms
Pause	125	125 - 250	ms	Duration of pause
Pulse	125	125 - 250	ms	Pulse length
Standby				
Duration	2	1 - 60	min	Timeout for the unused device until alarm release
Standby alarm activation	deprecated	always afterKeypress afterInfusion deprecated...		always, afterKeypress, afterInfusion, deprecatedConfigParamAfterInfusionOnly, Selector for the action that is required before the standby alarm becomes active

Parameter	Value	Range	Unit	Description
Standby alarm only after an infusion	False	False/True		always, afterKeypress, afterInfusion, deprecatedConfigParamAfterInfusionOnly, Standby alarm is only triggered after the start of an infusion
Available Syringes				
List of syringes, factory default, or user-specific.				
Display				
General				
Brightness	240	0 - 255	Steps	Display backlight brightness
Contrast	7	1 - 15	Steps	Display contrast
Language for user interface	1	0 - 1		Selection of the display language
KVO				
General				
KVO function	True	False/True		KVO is active whenever an infusion is stopped (alarm conditions excluded) but not VTBI
Setting for high infusion rates	100	100 - 5000	µl/h	KVO rate for infusion rates above 3 ml/h
Setting for low infusion rates	100	100 - 3000	µl/h	KVO rate for infusion rates up to 3 ml/h
when VTBI was reached	False	False/True		KVO function is limited to VTBI (Volume to be infused) reached
Menu				
General				
Alarm Presets	True	False/True		This menu shows the current alarm presets
Automatic dimming inactivity time	60	1 - 3600	s	Period without pump/user activity (in seconds) after which the night mode is entered (the LEDs and backlight are automatically dimmed).
Automatic Purge	False	False/True		Access for the user to purge IV tubing automatically
Battery Info	True	False/True		Access for the user to check the remaining battery capacity
Bolus function	True	False/True		Access for the user to the bolus function
Fallback time from menu operation	60	5 - 60	s	Time to fall back from the menu to the main screen
Key Lock	False	False/True		Access for user to lock the keyboard using a pin
Key lock pin code	0	0 - 9999		4 digit pin code
Night Mode Enabled	False	False/True		Enables the night mode (menu) on the pump for automatic dimming
Pressure Setting	True	False/True		Access for the user to temporarily modify the occlusion level
Pressure unit settings	mbar	-	enum	mbar, mmHg, kpa, cmh2o, psi, Pressure unit to be displayed
Settings	True	False/True		mbar, mmHg, kpa, cmh2o, psi, Access for the user to temporarily modify the buzzer
Info Menu				
Accumulated Volume	False	False/True		Show accumulated volume info menu
Info Screen Commboard Status	True	False/True		Only when enabled. Show Info Screen Commboard Status
Operation Conditions				
Buzzer				
Sound at keypress	True	False/True		Buzzer signal at keypress
Sound at Start -Stop	atStartAndStop	-		atStartAndStop, noSound, Defines the buzzer sound at infusion start/stop.
Volume setting	10	1 - 10	Volume	atStartAndStop, noSound, Buzzer loudness

Parameter	Value	Range	Unit	Description
General				
Automatic bolus function	False	False/True		Option in addition to the manual bolus
Basic therapy enabled	True	False/True		Show or Hide the Basic Therapy option in the SEL. Therapy Profile screen
Fallback time to the infusion rate	15	5 - 120	s	Time to fall back within the main screen
Fluid balancing	False	False/True		Reset of the infused volume while VTBI remains unaffected
OFF key delayed	3	1 - 3	s	Adjustments of the response time
Purge max volume	2000	1000 - 5000	µl	Maximum volume of one single purge
Rate modification in Stop Mode	False	False/True		User is forced to stop infusion before a rate change
Therapy recall enabled	True	False/True		Show or Hide the Recall option in the SEL. Therapy Profile screen
Speaker				
Volume setting	10	1 - 10	volume	Speaker alarm loudness
Patient ID Mode				
Enable	Optional		enum	Disabled, Optional, Mandatory, Patient ID scan UI flow configuration. 'Optional' allows PID scanning to be skipped during therapy, whereas 'Mandatory' does not allow this.
Pre-Alarms				
Infusion Near End				
Enable	False	False/True		An announcement that the VTBI will be reached soon.
Reminder duration	120	1 - 120	s	Time until pre-alarm is repeated after its last clearance
Time before event	10	1 - 240	min	Time of the pre-alarm release
Low Battery				
Reminder duration	120	1 - 120	s	Time until pre-alarm is repeated after its last clearance
Syringe empty soon				
Reminder duration	120	1 - 120	s	Time until pre-alarm is repeated after its last clearance
Time before the event	3	1 - 120	min	Time of the pre-alarm release before the syringe is empty.
Pressure Control				
Automatic Pressure Reduction	True	False/True		Automatic activation of pressure reduction through the occlusion
Default Occlusion Alarm Limit in mbar	1000	50 - 1200	mBar	Default Occlusion Alarm Limit in mbar
Startup				
Splash Screen				
Text Department			Text	Department name to be displayed at the bottom of the splash screen
Syringe				
Auto-selection	False	False/True		Enables syringe auto-selection, means syringe is automatically selected based on detected syringe dimensions.
Limits				
10ml				
Bolus rate	300000	100 - 300000	µl/h	Bolus rate of the syringe with a volume of 10 ml in µl/h
Bolus volume	4000	100 - 10000	µl	Bolus max volume of the syringe with a volume of 10 ml in µl
Infusion rate	300000	100 - 300000	µl/h	Infusion rate of the syringe with a volume of 10 ml in µl/h

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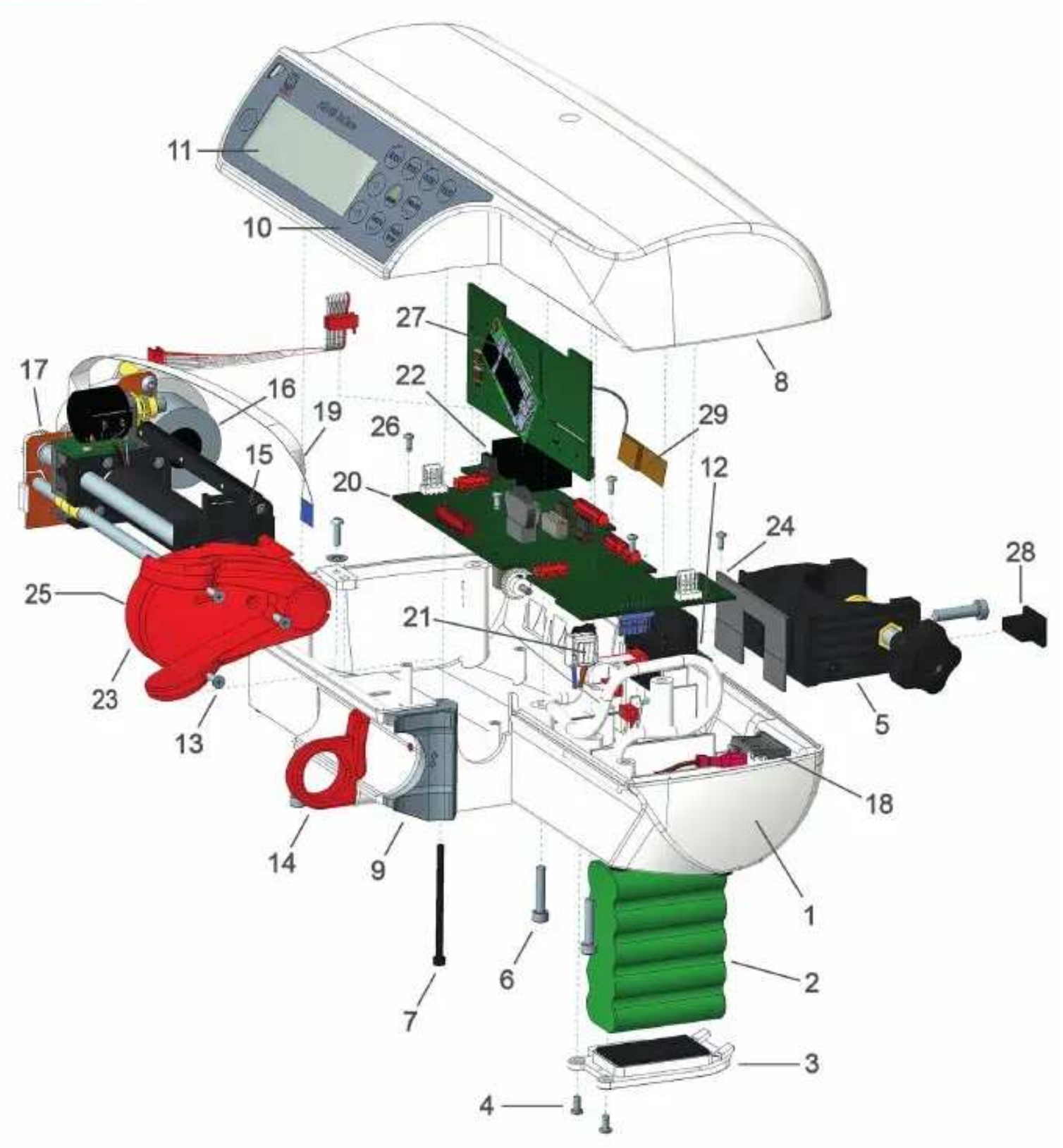
Parameter		Value	Range	Unit	Description
	Purge rate	300000	100 - 300000	µl/h	Purge rate of the syringe with a volume of 10 ml in µl/h
20ml					
	Bolus rate	500000	100 - 500000	µl/h	Bolus rate of the syringe with a volume of 20 ml in µl/h
	Bolus volume	10000	100 - 20000	µl	Bolus max volume of the syringe with a volume of 20 ml in µl
	Infusion rate	500000	100 - 500000	µl/h	Infusion rate of the syringe with a volume of 20 ml in µl/h
	Purge rate	500000	100 - 500000	µl/h	Purge rate of the syringe with a volume of 20 ml in µl/h
30ml					
	Bolus rate	500000	100 - 500000	µl/h	Bolus rate of the syringe with a volume of 30 ml in µl/h
	Bolus volume	10000	100 - 30000	µl	Bolus max volume of the syringe with a volume of 30 ml in µl
	Infusion rate	500000	100 - 500000	µl/h	Infusion rate of the syringe with a volume of 30 ml in µl/h
	Purge rate	500000	100 - 500000	µl/h	Purge rate of the syringe with a volume of 30 ml in µl/h
50ml					
	Bolus rate	1500000	100 - 1500000	µl/h	Bolus rate of the syringe with a volume of 50 ml in µl/h
	Bolus volume	20000	100 - 50000	µl	Bolus max volume of the syringe with a volume of 50 ml in µl
	Infusion rate	1500000	100 - 1500000	µl/h	Infusion rate of the syringe with a volume of 50 ml in µl/h
	Purge rate	1500000	100 - 1500000	µl/h	Purge rate of the syringe with a volume of 50 ml in µl/h
60ml					
	Bolus rate	1500000	100 - 1500000	µl/h	Bolus rate of the syringe with a volume of 60 ml in µl/h
	Bolus volume	20000	100 - 60000	µl	Bolus max volume of the syringe with a volume of 60 ml in µl
	Infusion rate	1500000	100 - 1500000	µl/h	Infusion rate of the syringe with a volume of 60 ml in µl/h
	Purge rate	1500000	100 - 1500000	µl/h	Purge rate of the syringe with a volume of 60 ml in µl/h
Properties					
	Schema version	1	0 - 65535		Defines the schema version of the set of syringe properties and meta-data
TCI					
Drugs					
Propofol					
	Decrement concentration	1000	100 - 15000	ng/ml	Decrement concentration for propofol
	Maximum drug concentration	20	10 - 20	mg/ml	Maximum drug concentration for propofol
	Minimum drug concentration	10	10 - 20	mg/ml	Minimum drug concentration for propofol
Remifentanil					
	Decrement concentration	1000	100 - 20000	pg/ml	Decrement concentration for remifentanil
	Maximum drug concentration	50	20 - 50	µg/ml	Maximum drug concentration for remifentanil
	Minimum drug concentration	20	20 - 50	µg/ml	Minimum drug concentration for remifentanil
Enable		True	False/True		Show TCI option
Models					
Minto					
	Effect mode	True	False/True		Enable effect mode for the Minto model for remifentanil
	Plasma mode	True	False/True		Enable plasma mode for the Minto model for remifentanil
Schnider					
	Effect mode	True	False/True		Enable effect mode for the Schnider model for propofol
	Plasma mode	True	False/True		Enable plasma mode for the Schnider model for propofol
User Permissions					
Definition 1					
	Name	Administrator			The user name
	Pin code**	XXXX	0 - 9999		Pin code of the user

* Parameter no longer editable, use the Standby alarm activation parameter.

** The device Pin code is set randomly for each client during production.

8 Replacement of Parts



1	Casing base	11	Display	21	Secondary cable
2	Battery pack	12	Edge board	22	Power supply
3	Battery cover	13	Screw M3x3	23	Driving head V3
4	Screw M3x2	14	Syringe holder	24	Seal for combination clamp
5	Combination clamp	15	Drive complete	25	Working lever x2 (attached to #23)
6	Screw M4x5	16	Motor	26	Screw M2.5x6
7	Screw M3x1	17	Sidewall with DMS	27	Communication board
8	Casing cover	18	Mains receptacle	28	Edge board rubber cap
9	Syringe guide	19	Flex cable V3	29	Communications board antenna (Wi-Fi)
10	Keypad/foil keyboard	20	Mainboard		

8.1 Repair Instructions

⚠WARNING Safety Standard Check (SSC), maintenance and repair

The SSC, the maintenance and repair of devices must only be performed by qualified technicians who have been trained by and authorised by CODAN ARGUS AG.

⚠WARNING Qualified accessories, consumables and spare parts

Only operate the device with CODAN ARGUS AG qualified accessories and consumables. For maintenance and repair work, use only spare parts approved and supplied by CODAN ARGUS AG.

⚠WARNING Before maintenance or repair

Disconnect the device from the mains supply, and all interface connections before any maintenance or repairs are started. Failure to comply could lead to the electrical damage of the device or electrical shock, which may risk your safety.

⚠WARNING Mandatory Safety Standard Check (SSC) after device repair

It is mandatory that SSC is performed after a device repair.

A complete SSC is mandatory after:

- The configuration of a new syringe
- Any repair which requires opening the housing.

Note: A factory base calibration may also be required.

➤ See *12 Safety Standard Check (SSC), page 35*

➔ **Casing – how to disassemble**

Note: The internal mains connectors under the transformer are not insulated.

1 Remove combination clamp at the rear side (#5).
2 Remove the screws on the casing base (5xM4 #6) and the screw at the grey syringe guide (1xM3 #7).
3 Place the casing cover (#8) behind the casing base (#1).
4 Continue with the required repair work.

➔ **Casing cover (including display, keypad, display board) – how to replace**

1 Remove pole clamp at the rear side.
2 Remove the screws on the casing base (5xM4 #6) and the screw at the grey syringe guide (1xM3 #7).
3 Place the casing cover (#8) behind the casing base (#1).
4 Afterwards, disconnect the flat cable of the casing cover
5 Replace the casing cover (#8)
6 For assembling repeat steps 4 to 1 (reverse order).
7 Perform an SSC.

➔ **Casing base – how to replace**

1 Remove the battery connector first and then all other cables of the mainboard (#20).
2 Completely remove the drive (#15).
3 Remove the mainboard (#20).
Remove the syringe drive.
4 Move the drive unit (#15) fully to the right and remove the fixing plate down at sidewall (#17) (kit: sidewall with DMS) of the drive.
5 Remove the plugs of the motor cable, the flex cable (#19) and the cable to the sidewall.
6 Remove the syringe drive (#15) out of the housing.
7 Remove the holder with the edge board (#12) and the battery cover (#3) from the old casing base.
8 Secure the holder with the edge board (#12) and the battery cover (#3) in the new casing base.
9 Perform an SSC.
10 Perform a factory base calibration.

Battery – how to replace

1 Switch off the device and disconnect the mains power cable.
2 Remove the screws (2xM3 #4) and open the battery cover (#3).
3 Replace the battery (#2)
4 Check all cable connections carefully.
The shrink-wrapped Printed Circuit Board (PCB) includes a temperature sensor.
5 Position it in the direction of the connector (avoid a positioning towards the transformer) and secure into position with the screws (2xM3).
6 Close the battery cover (#3) and secure the cover into position with screws (2xM3 #4).
7 Perform an SSC.

The battery pack of the device is equipped with a temperature and current sensors for an accelerated charging time with high current-flow. Therefore, use only battery packs provided by CODAN ARGUS AG. The charging time depends on the present intensity of use and the device status, e.g. run or stop mode, high or low infusion rate.

Red cover of the driving head – how to remove

1 Remove the 3 screws (3xM3 #13) on the cover (#23).
2 Important: manually open the beaks one third (or put a coin between the beaks) to disassemble the unit.
3 Then pull the cover (#23) with the levers (#25) out of the housing.
4 Continue with the required repair work.

Mainboard – how to replace

1 Remove the battery connector first and then all other cables of the mainboard.
2 Remove the drive (#15) completely before the replacement of the mainboard (#20).
3 Remove the screw on the fixing plate (1xM3). Remove the drive (#15).
4 Remove the screws on the mainboard (6xM2.5 #26). Remove the mainboard (#20).
5 Insert the new mainboard (#20). Secure into position with the screws (6xM2.5 #26).
6 Insert the drive (#15). Secure into position with the fixing plate and the screw (1xM3).
7 Ensure that the cogwheel on the potentiometer and the screw on the top side are unlocked.
8 Perform an SSC.

Syringe drive, complete – how to replace

1 First, remove the syringe drive. Move the drive unit (#15) fully to the right. Remove the screw (1xM3) on the fixing plate down at sidewall (#17) (kit: sidewall with DMS) of the drive. Remove the fixing plate.
2 Unplug the motor cable, the flex cable (#19) and the cable to the sidewall (#17).
3 Remove the syringe drive.
4 Insert the syringe drive (#15) in the casing base (#1).
5 Secure the syringe drive (#15) with the fixing plate and the screw (1xM3).
6 Plug the motor cable, the flex cable (#19) and the cable to the sidewall (#17) (kit: sidewall with DMS)
7 Perform an SSC.

Syringe holder – how to replace

1 Remove the battery (#2) connector first and unplug all cables of the mainboard (#20).
2 Completely remove the drive (#15)
3 Remove the mainboard (#20).
4 Change the syringe barrel holder by loosening the snap ring at the end of the gear.
5 Replace the syringe holder (#14).
6 Secure the syringe barrel holder with the snap ring.
7 Insert the mainboard (#20) and secure into position with the screws (6xM2.5 #26).
8 Perform an SSC.
9 Perform a factory base calibration.

Motor and gear – how to replace

1 Move the drive unit (#15) fully to the right and remove the fixing plate down at sidewall (#17) (kit: sidewall with DMS) of the drive.
2 Unplug the motor cable, the flex cable (#19) and the cable to the sidewall.
3 Remove the screws from the sidewall (2xM4).
4 Remove the syringe drive (#15) out of the housing.
5 Insert the new motor (#16) and secure it to the sidewall (#17) with the screws (2xM4).
6 Insert the syringe drive (#15) and secure into position.
7 Tighten the screws on the sidewall (2xM4 #17).
8 Plug the motor cable, the flex cable (#19) and the cable to the sidewall (#17) (kit: sidewall with DMS).
9 Perform an SSC.
10 Perform a factory base calibration.

Coin cell (mainboard) – how to replace

1 Locate and remove the coin cell by pushing it out with an insulated object. Be aware of the risk of short circuits.
2 Use a new coin cell qualified by CODAN ARGUS AG. See the Spare parts, Accessories and Consumables catalogue.
3 Switch the device on to re-initialise the real-time clock.
4 Switch the device off.
5 Switch the device on in configuration mode and use ARGUS*service* to set the date/clock. See the UM for ARGUS*service*
6 Perform an SSC.

Edge Board Rubber Cap – how to remove and replace

The rubber cap must be removed when connecting to ARGUS*service*, or a docking station.

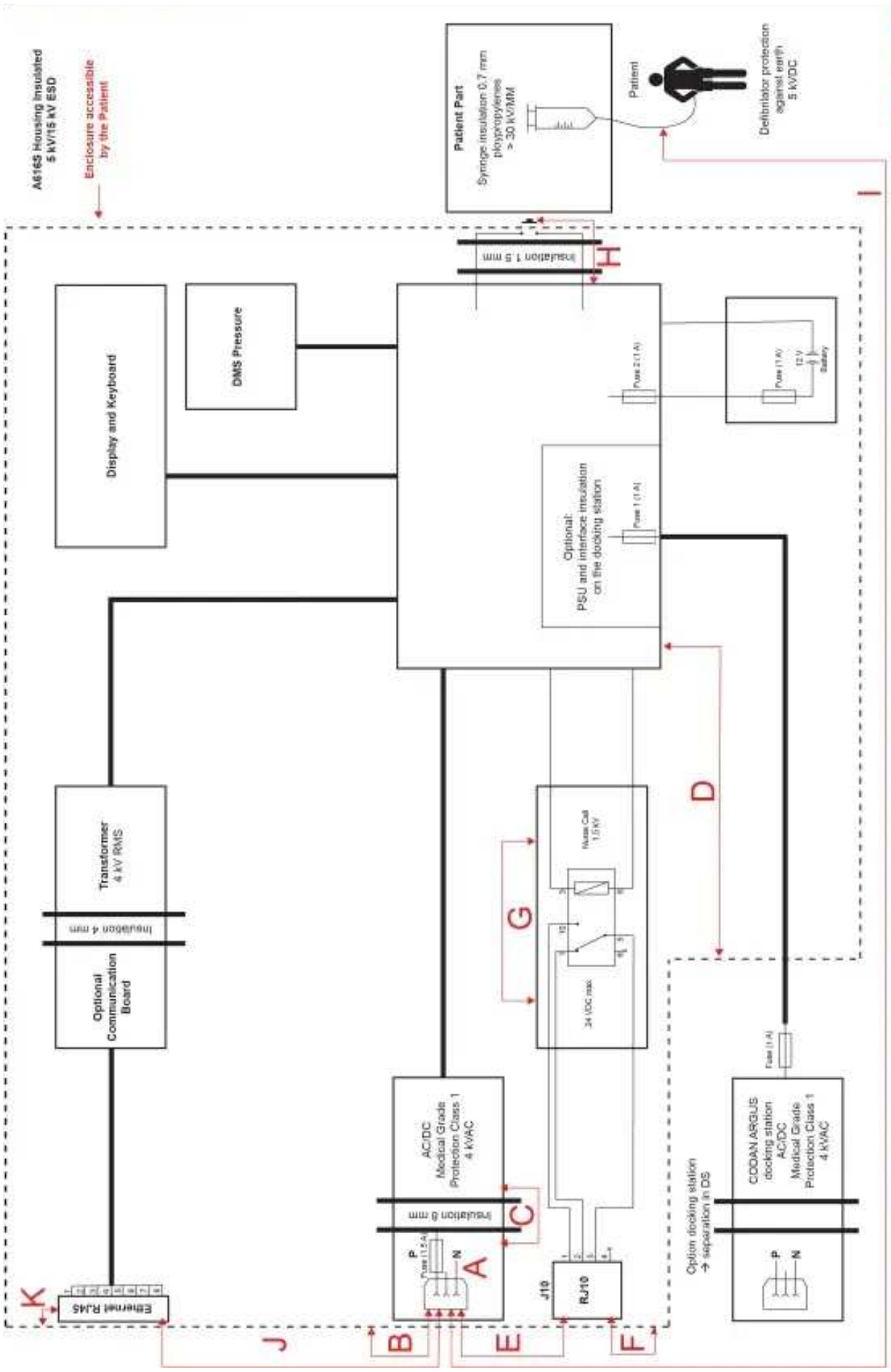
1 To remove the rubber cap (#28), carefully pull the rubber cap away from the edge board.
2 To replace the rubber cap (#28), orientate the cap correctly, then carefully push onto the edge board.

9 Isolation

⚠WARNING Electrostatic discharge

If electrostatic discharges ≥ 15 kV occur on the rear connectors of the device, the power supply may be damaged. If the device mains LED does not light up, disconnect the device from the mains immediately and investigate the cause of the problem. The device must only be used if the cause of the problem is found and resolved, else, continue investigating.

Initial investigation should focus on the following components, the Fuse, Primary cable, PSU and Mainboard.



ISOLATION

Pollution degree:			2					
Overvoltage category:			II					
Altitude:			≤ 3000 m					
Additional details on parts considered as applied parts:			☐ None		☒ Areas B,D (See Clause 4.6 for details)			
Area	**Number and type of Means of Protection:** MOOP, MOPP	**CTI**	**Working voltage** Vrms	Vpk	**Required creepage** (mm)	**Required clearance** (MM)	**Measured creepage** (mm)	**Measured clearance** (mm)	**Remarks**
A	1 MOOP	IIIb	240	340	2.5	2	4	4	
B	2 MOPP	IIIb	240	340	8	5	20	20	
C	2 MOPP	IIIb	240	340	8	5	8	8	
D	2 MOPP	IIIb	-	24dc	3.7	1.7	3.5	3	
E	2 MOOP	IIIb	240	340	5	4	220	210	SIP/SOP
F	1 MOPP	IIIb	240	340	4	2.5	4	4	SIP/SOP CF
G	1 MOOP	IIIb	240	340	2.5	2	4	4	
H	2 MOPP	IIIb	-	24dc	3.7	1.7	7.5	3.8	
I	2 MOPP	IIIb	240	340	8	5	Isol. tube	Isol. tube	
J	2 MOOP	IIIb	240	340	5	4	220	210	SIP/SOP
K	1 MOPP	IIIb	240	340	4	2.5	4	4	SIP/SOP CF

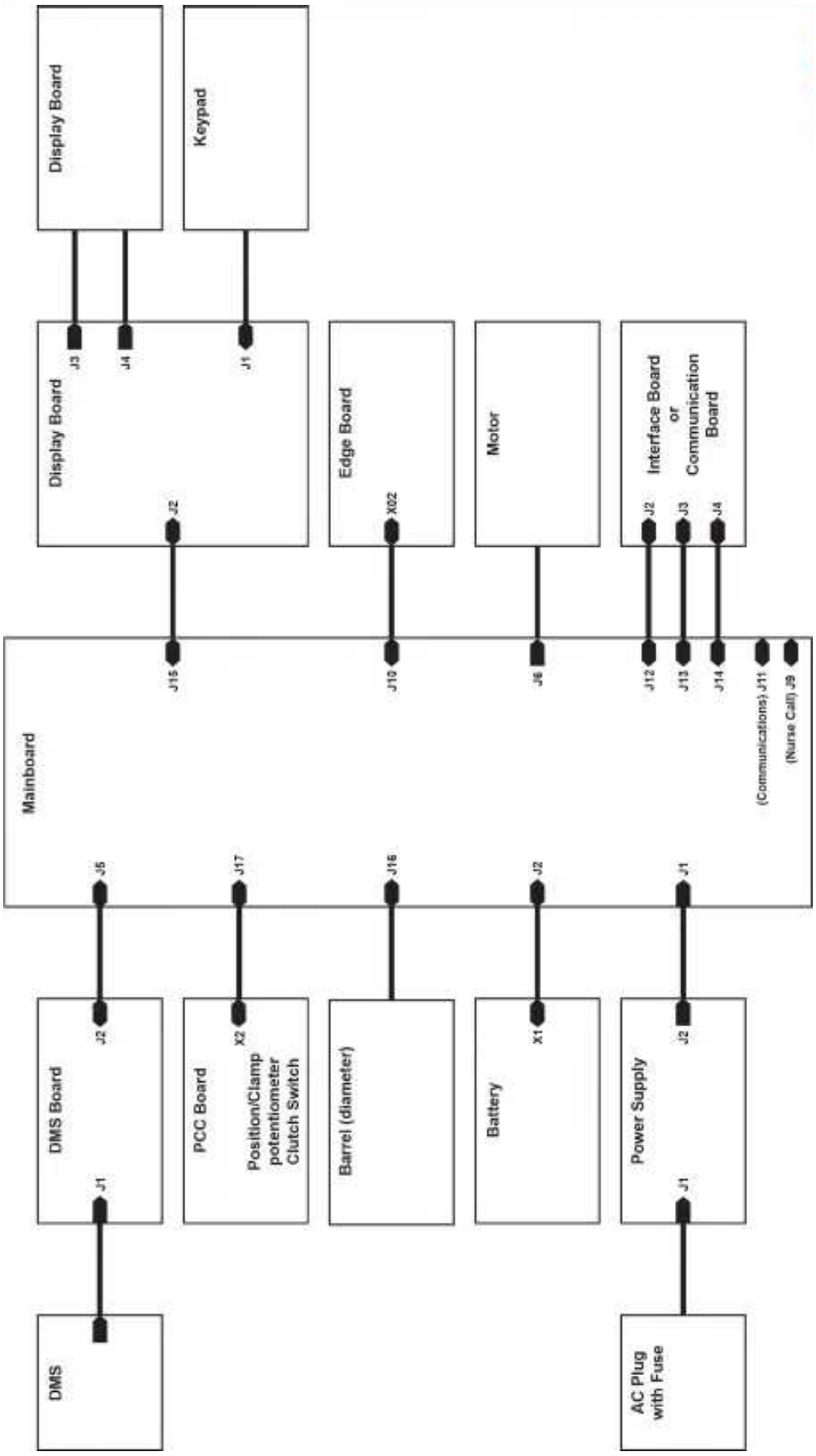
Edge is a charging connector of the docking station, protected by a rubber cap, and usually not accessible by the patient or operator.

10 Wiring Diagram

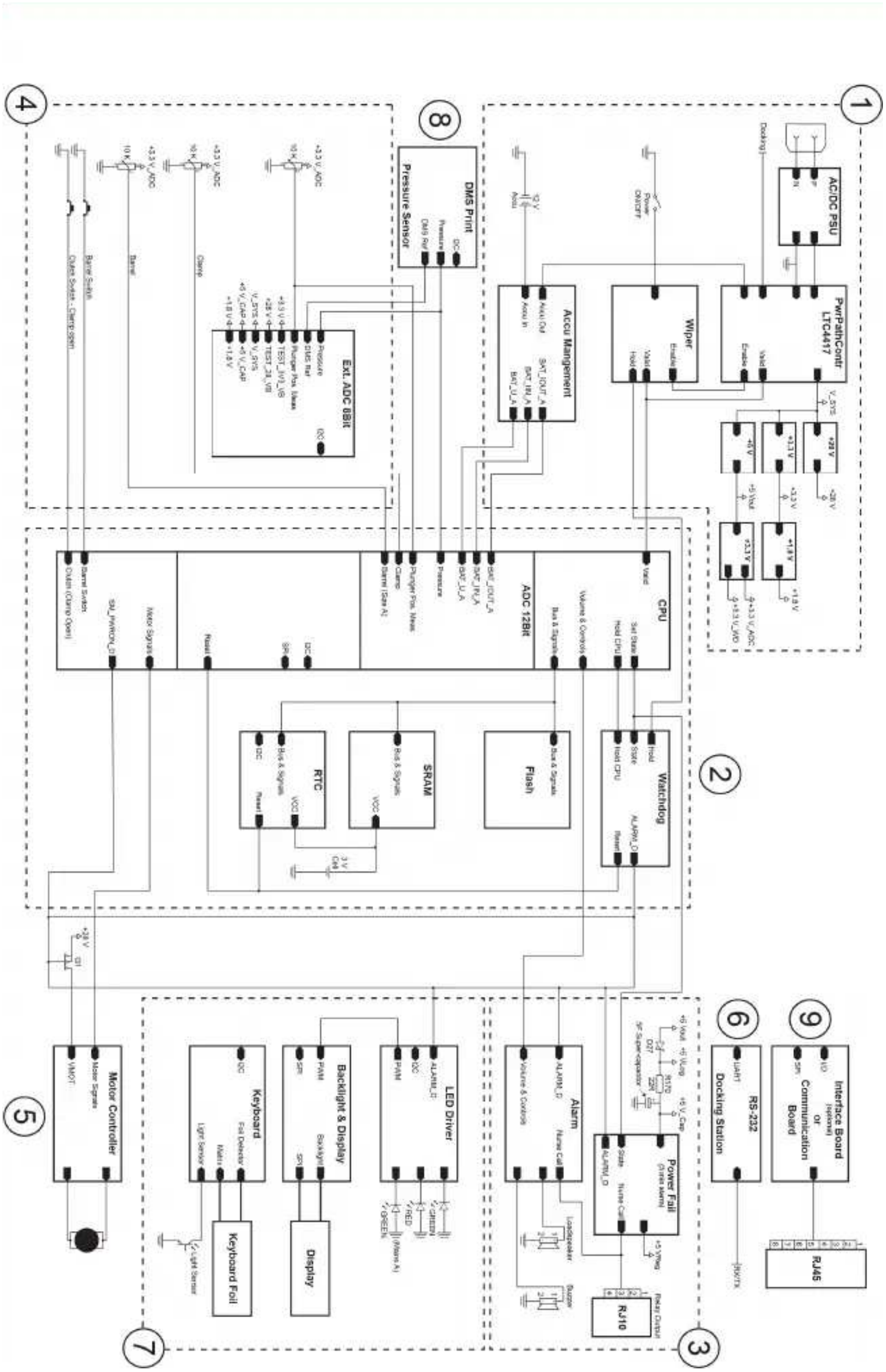
⚠WARNING Electrostatic discharge

If electrostatic discharges ≥ 15 kV occur on the rear connectors of the device, the power supply may be damaged. If the device mains LED does not light up, disconnect the device from the mains immediately and investigate the cause of the problem. The device must only be used if the cause of the problem is found and resolved, else, continue investigating.

Initial investigation should focus on the following components, the Fuse, Primary cable, PSU and Mainboard.



11 Block Diagram



Block diagram key:

1 Power supply and battery management
2 Digital part
3 Acoustic signals (buzzer, speaker) and power supply fail supervisor (super-capacitor)
4 Sensor module
5 Drive
6 Communication
7 Optical indication (display and LEDs) and keypad
8 DMS pressure sensor

12 Safety Standard Check (SSC)

➤ See *14 Safety Standard Check (SSC) Form, page 38*

WARNING **Safety Standard Check (SSC)**
It is mandatory that SSC is performed regularly at intervals of 24 months or 10,000 operating hours.

WARNING **Safety Standard Check (SSC), maintenance and repair**
The SSC, the maintenance and repair of devices must only be performed by qualified technicians who have been trained by and authorised by CODAN ARGUS AG.

WARNING **Qualified accessories, consumables and spare parts**
Only operate the device with CODAN ARGUS AG qualified accessories and consumables. For maintenance and repair work, use only spare parts approved and supplied by CODAN ARGUS AG.

WARNING **Using ARGUS*service***
ARGUS*service* must only be used by qualified technicians who have been trained by and are authorised by CODAN ARGUS AG.

WARNING **Before maintenance or repair**
Disconnect the device from the mains supply, and all interface connections before any maintenance or repairs are started. Failure to comply could lead to the electrical damage of the device or electrical shock, which may risk your safety.

➤ See *14 Safety Standard Check (SSC) Form, page 38*

12.1 Reminder PERFORM SAFETY CHECK

When an SSC is due, the reminder PERFORM SAFETY CHECK is displayed after you switched on the device.

A reminder is triggered if:
- S/N of the device is missing or invalid
- Service interval (months or operating hours) has expired, if not configured to zero
- Time and date are not set or invalid
- No coin cell battery installed on the mainboard
- Coin cell battery has a low voltage, replacement is required
- Faulty pressure or mechanical calibration.

You can find the exact reason for the reminder PERFORM SAFETY CHECK in the history file. Look for SSC in history.

12.2 Calibration

Check the calibration status using ARGUS*service*. Enter the CALIBRATION control and select the required Com-port for your device. Then the calibration status for the syringe and the pressure calibration is displayed.

12.2.1 Syringe Calibration Measurement

Use the same syringe calibration tools and proceed as described in

➤ *See 6.2.2 Syringe Calibration, page 15*

12.2.2 Pressure Calibration Measurement

The pressure calibration procedure always includes all of the following steps and is complete when the control measurement was successful. The previous values remain stored in premature termination of the calibration.

12.3 Battery Test

The battery of the device is equipped with a temperature and current sensors for an accelerated charging time with high current-flow. Therefore, only use batteries provided by CODAN ARGUS AG.

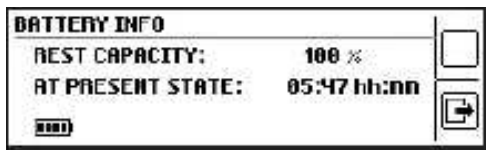
It is not permitted to reuse or to modify the built-in safety electronics. The charging time depends on the present intensity of use and the device status, e.g. run or stop mode, high or low infusion rate.

➔ **Battery – how to charge**

1 Discharge the battery at 5 ml/h until the device switches off. This is necessary to synchronise battery and FW.
2 Recharge the battery.
3 To execute the battery test discharge the fully charged battery at 5 ml/h.
4 Read out the measured time discharging the battery.
5 Compare the measured with the reference value of a new battery.
6 If necessary, repeat the charging/discharging until the specified runtime is reached.

➔ **Battery – how to check without ARGUS*service***

1 Fully charge the battery (100%)
2 Disconnect the device from the mains supply and start a stopwatch.
3 Fully discharge the battery by running at a rate of 5 ml/h for at least 6 hours.



4 Wait until the battery alarm is displayed and stop the stopwatch.
5 Read out the elapsed time.
6 Replace the battery if it does not reach the required capacity.

➤ See *Battery – how to charge, page 36*

7 Connect the device to mains for 7 hours to charge the battery.

12.4 Nurse Call Test

⚠WARNING Nurse call connection and signalling

Ensure that the device is connected, configured and fully functioning with the nurse call system throughout the hospital.

➔ **Nurse call test – how to proceed**

1 Switch on the device in normal mode.
2 Insert the syringe and the administration set in the device.
3 Check if the inserted syringe type and size matches the displayed syringe type and size.
4 Purge the administration set.
5 Start an infusion at a rate of 250 ml/h and a total volume of 30 ml.
6 Provoke the device into an alarm.
7 Verify that after the alarm, the relay switches the contact on the RJ9 plug. In this case the contact switches from Pin2/ Pin3 to Pin2/Pin4 and back (signal is depending on the configuration).

12.5 Electrical Safety Test

➔ **Electrical Safety Test – how to proceed**

1 Perform an electrical safety test according to IEC 62353

13 Cleaning and Care

⚠WARNING **Device cleaning and disinfection**

Avoid any liquid penetrating the device or the device plug. If a liquid is spilt over the device, the device must be immediately disconnected from the mains or removed from the docking station. The device must then be cleaned immediately and dried thoroughly.

13.1 Care of the Device

→ Care of the device – how to proceed

1. Disconnect the device from the mains supply and/or docking station before cleaning.
2. Remove all connecting cables.
3. Warnings must be observed for cleaning.
4. If there is any evidence of liquid inside/has entered the device, the device must be inspected before next use.
5. The device is unsuitable for sterilisation in autoclaves and must not be immersed in liquids.

13.1.1 Cleaning and Disinfection

⚠CAUTION **Device cleaning**

Ensure that the device cleaning instructions are strictly followed.

Keep the device and the accessories clean and dry. In order to maintain full functionality, we recommend cleaning the device regularly according to the product specifications. Do not use any abrasive cleaning agents. The following cleaning and disinfection points must be observed:

→ Cleaning and disinfection – how to proceed

1. Clean the device only by wiping with a damp cloth.
2. The use of lukewarm water is adequate.
3. Take care that the device connections are clean and dry to avoid electrical damage when connecting to a docking station or the mains supply.
4. For disinfection, use only agents containing diluted alcohol (isopropyl alcohol) up to a maximum concentration of 70%. Your in-house specialist department for hygiene can give information on suitable disinfectants.

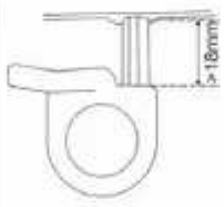
13.2 Storage and Transportation

→ Storage and transportation – how to proceed

1. Only store devices under clean, cool and dry conditions.
2. Ensure that you use appropriate packaging with sufficient protection against impacts for transportation. We recommend using the original packaging.
3. Fully charge the battery after at least 3 months to preserve full capacity. Otherwise, the battery may over-discharge and leak.

14 Safety Standard Check (SSC) Form

Device identification					
	CODAN A616S	❑		**CODAN A616S Plus**	❑
	CODAN A616S *InCare*	❑		**CODAN A616S *TCI***	❑
Serial no:			Hospital:		
Pump no:			Department:		
Used syringe:			Customer:		
The SSC has to be performed at least every 24 months or after 10 ,000 hours of operation. The check has been completed in accordance with the UM and SM.					

Test steps for the A616S, A616S Plus, A616S *InCare*, and A616S *TCI*				
1	Wear gloves to unpack, and immediately disinfect the device with one of the recommended disinfectants.		➤ See *13.1.1 Cleaning and Disinfection, page 37*	❑
2	Check the time and date		See ARGUS*service*: DATE & TIME	❑
3	Check the history file whether a technical error happened.		See ARGUS*service*: HISTORY No technical error occurred	❑
4	Visual check for damage, cleanness and completeness		Housing, labels, accessories, connectors, power cable, etc.	❑
			Completely pull out syringe holder (without the syringe)	❑
			Turn syringe holder to left/right position; verify the proper function of the mechanical stop; the distance from handhold 0 stop to duct stop must measure > 18 mm (otherwise the guidance duct is worn out)	❑
			Piston clamp closes completely (without the syringe)	❑
5	Switch on the device in configuration mode and note the FW version on the splash screen and compare the right device type.		FW version:	
			Is the device type identical to the pump?	❑
6	Check if an FW update is required.		Latest FW is available on CODAN ARGUS AG website (www.codanargus.com)	❑
7	Perform display, keypad, LED and backlight tests ➤ See *6.4 Keypad & Display Test, page 19*		Were all 3 tests successful?	❑
8	Switch the pump off and then on in normal mode. Check the acoustic signal and indication of the red status LED during the start-up procedure.		Acoustic signal is audible?	❑
			The red status LED lights up?	❑
9	Connect/disconnect the pump to/from the mains		The mains LED lights up only when connected to mains?	❑
10	Check switches and potentiometers.		Start to infuse and test general activity status by verifying alarm and buzzer functions plus a red blinking status lamp. Repeat this procedure until all the tests are done.	❑
			Press clutch lever down: verify alarm indicators, display picture and text information	❑
			Lift the syringe a little from the pushbutton switch: verify alarm indicators, display picture and text information	❑
			Press the clamp lever up: verify alarm indicators, display picture and text information	❑
			Pull the syringe holder: verify alarm indicators, display picture and text information	❑
11	Interfaces tests			
	Check the external connector NURSE CALL □ deactivated □ no control □ activates □ control alarm ➤ See *12.4 Nurse Call Test, page 36*		Relay contact switches	❑
	Check the interface to the docking station (connect the pump to the docking station).		The indicator for mains operation must light green The green status LED on the pump lights up.	❑

SAFETY STANDARD CHECK (SSC) FORM

12	Insert a 50 ml syringe	Verify whether the device runs smoothly at its maximum rate	❑
13	Check the factory base calibration values.	➤ See *6.2.1 Factory Base Syringe Calibration, page 14*	❑
14	Perform a syringe calibration.	➤ See *6.2.2 Syringe Calibration, page 15*	❑
15	Perform a pressure calibration.		❑
16	Check the occlusion alarm pressure.	Preset level: 1,000 mbar; measured level: ..... mbar	❑
17	Volume accuracy test	➤ See *6.3 Pump Accuracy Measurement, page 19*	
	Start therapy at a rate of 200 ml/h and a total of 20 ml.	Measured volume:	
18	Battery test		
	Charge battery of the running pump for at least 9 hours.	Mains power displayed.	❑
	Battery Check at a rate of 5 ml/h Run the battery test until the battery alarm occurs.	Battery symbol is displayed during the test.	❑
19	Electrical safety test		
	Perform an electrical safety test according to IEC 62353	➤ See *12.5 Electrical Safety Test, page 36*	❑
20	Inspection certificate Standard: IEC 62353		❑
21	Wear gloves to disinfect the device with one of the recommended disinfectants.	➤ See *13.1.1 Cleaning and Disinfection, page 37*	❑

The pump has passed the SSC and is safe for use		❑
Date:	Name:	Signature:

15 Repair Order Form

Purchase Order Pro forma Invoice Number:	
Customer Name:	
Address:	
Contact Person:	
Phone No:	

Device Identification:											
A717V		A717V Plus		ARGUS 707 V		ARGUS 708 V		ARGUS 717 V		ARGUS 718 V	
A718V		A718V Plus									
A616S		A616S Plus		A616S *InCare*		A616S *TCI*		ARGUS 606 S		ARGUS 600 S	
A300P		A500P		A600P		A300M		A500M		A600M	
A60P		A100P		A60M		A100M					
Accessory:											
Serial No:						Production Code:					

Detailed failure or problem description:

Excepted work/repair to be done:		
Repair		Description:
Warranty repair		
Replacement		
Other		

Date:	**Name:**	**Signature:**

CODAN Worldwide

CODAN is known internationally as a manufacturer and supplier of disposable medical transfer systems. CODAN Companies have more than 1500 employees around the world.

The name CODAN is synonymous with reliability, quality and precision based on the know-how and experience gained from more than 60 years of research and development. Company-owned production facilities and sales companies around the world are a guarantee for efficient production, a tight-knit sales network and a first-class service for customers in the healthcare sector.

CODAN Product range

- Infusion sets
- Transfusion sets
- Extension lines and manifold connectors
- Infusion and transfusion accessories
- Infusion filters and filter systems
- Neonatology/Paediatric products
- Withdrawal, preparation and administration systems
- CODAN CYTO®
- Chemoprotect® products
- Single use syringes
- Invasive blood pressure monitoring systems
- Infusion pumps
- Other CODAN Products

CODAN Companies

CODAN Medizinische Geräte GmbH & Co KG · Deutschland
CODAN pvb Critical Care GmbH · Deutschland
CODAN pvb Medical GmbH · Deutschland
CODAN PORTUGAL, S.A. · Portugal
CODAN 11, S.A. · Portugal
CODAN US Corporation · California · USA
CODAN Inc. · California · USA
CODAN NORGE AS · Norge
CODAN TRIPLUS AB · Sverige
CODAN Limited · Great Britain
CODAN FRANCE Sarl · France
CODAN Medical AG · Schweiz
CODAN ARGUS AG · Schweiz
CODAN BV · Nederland

CODAN s.r.l. · Italia
CODAN Medical GmbH · Österreich
CODAN Medical ApS · Danmark
CODAN DEHA ApS · Danmark

SIMPLIFIED EU DECLARATION OF CONFORMITY

Hereby, CODAN ARGUS AG (Baar) declares that the radio equipment type A616S Plus is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at www.codanargus.com

CE

EC REP CODAN pvb Critical Care GmbH
Römerstraße 18
85661 Forstinning
Germany

Manufacturer
CODAN ARGUS AG
Oberneuhofstrasse 10 · 6340 Baar, Switzerland
Tel. +41 (0) 41 785 09 44
www.codancompanies.com

The decisive connection

CE 0123

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