ENGINEERING
TOMORROW

Operating Guide

SonoCollect 111™

Data Concentrator for Smart Metering

1 General hints and conventions

1.1 About this document

This manual provides guidance and procedures for a fast and efficient installation and start-up of the units described in this manual. It is imperative to read and carefully follow the safety guidelines.

1.2 Legal bases

1.2.1 Copyright

1.2.2 Personnel qualifications

he use of the product described in this manual requires special personnel qualifications. All responsible persons have to familiarize themselves with the underlying legal standards to be applied, e. g.:

- Valid standards
- Handling of electronic devices

The Danfoss does not assume any liability whatsoever resulting from improper handling and damage incurred to both, Danfoss own and third-party products, by disregarding detailed information in this manual.

1.2.3 Technical condition of specified devices

The supplied components are equipped with hardware and software configurations, which meet the individual application requirements. Changes in hardware, software and firmware are permitted exclusively within the framework of the various alternatives that are documented in the specific manuals. The Danfoss will be exempted from any liability in case of changes in hardware or software as well as to non-compliant usage of components.

Please send your request for modified and new hardware or software configurations directly to the Danfoss.

1.3 Symbols

Danger: Always observe this information to protect persons from injury.

Warning: Always observe this information to prevent damage to the device.

Attention: Marginal conditions that must always be observed to ensure smooth and efficient operation

ESD (Electrostatic Discharge): Warning of damage to the components through electrostatic discharge. Observe the precautionary measure for handling components at risk of electrostatic discharge.

Note: Make important notes that are to be complied with so that a trouble-free and efficient device operation can be guaranteed.

Additional informations: References to additional literature, manuals, data sheets and internet pages.

1.4 Font conventions

Names of paths and data files are marked in italic-type. According to the system, Slashes or Backslashes are used. e. g.: D:\Data\

Menu items are marked in italic-type, bold letters, e. g.: ***Save***

Sub-menu items or navigation steps within a web browser are marked by using an arrow between two menu items or tabs, e. g.: ***File → New***

Pushbuttons or input fields are marked with bold letters, e. g.: **Input**

Keys are marked with bold capital letters within angle brackets, e. g.: **<F5>**

The print font for program codes is Courier, e. g.: `END_VAR`

Names of variables, designators and configuration fields are marked in italic-type, e. g.: Value

1.5 Number notation

Numbers a noted according to this table:

Number code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C Notation
Binary	'100'	in quotation marks
	'0110.0100'	nibbles separated with dot

Tabel 1: Numbering systems

1.6 Safety guidelines

- All power sources to the device must always be switched off before carrying out any installation, repair or maintenance work.
  Replace any defective or damaged device/module (e. g.: in the event of deformed contacts), as the functionality of the device in question can no longer be ensured on a long-term basis.
  The components are not resistant against materials having seeping and insulating properties. Belonging to this group of materials is: e. g. aerosols, silicones, triglycerides (found in some hand creams).
  If it cannot be ruled out that these materials appear in the component environment, then the components must be installed in an enclosure that is resistant against the above mentioned materials.
  Clean tools and materials are generally required to operate the device/module.
- Only use a soft, wet cloth for cleaning. Soapy water is allowed. Pay attention to ESD.
- Do not use solvents like alcohol, acetone etc. for cleaning.
- Do not use contact sprays, which could possibly impair the functioning of the contact area and may cause short circuits.
- Components, especially OEM modules, are designed for the mounting into electronic housings. Those devices shall not be touched when powered or while in actual operation. The valid standards and guidelines applicable for the installation of switch cabinets shall be adhered to.
- The devices are equipped with electronic components that may be destroyed by electrostatic when touched. It is necessary to provide good grounding to personnel, working environment and packing. Electroconductive parts and contacts should not be touched.

1.7 Scope

This manual describes the devices mentioned in the title, supplied by Danfoss.

1.8 Abbreviations

Abbreviation	Meaning
CSV	Character-Separated Values
DNS	Domain Name System
DI	Digital Input
DO	Digital Output
DIN	Deutsches Institut für Normung, German standardization body
DLDE	Direct Local Data Exchange (EN 62056-21, IEC 1107)
DLDERS	DLDE communication via RS-232 or RS-485
DLMS	Device Language Message Specification
I/O	In- / Output
ESD	ElectroStatic Discharge
FNN	Forum Netztechnik/Netzbetrieb, forum network technology / network operation (committee of VDE)
FTP	File-Transfer Protocol
HTTP	Hypertext Transfer Protocol
ID	Identification, Identifier
IP	Internet Protocol or IP address
LED	Light-Emitting Diode
M-Bus	Meter-Bus (EN 13757, part 2 - 3)
MAC	Medium Access Control or MAC address
MUC	Multi Utility Communication, MUC-Controller
OEM	Original Equipment Manufacturer
PEM	Privacy Enhanced Mail
PPP	Point-to-Point Protocol
PPPoE	Point-to-Point Protocol over Ethernet
RFC	Requests For Comments
RSSI	Received Signal Strength Indicator
RTC	Real Time Clock
RTOS	Real Time Operating System
S0	S0 interface (pulse interface, EN 62053-31)
SIM	Subscriber Identity Module
SML	Smart Message Language
SMTP	Simple Mail Transfer Protocol
SNTP	Simple Network Time Protocol
TCP	Transmission Control Protocol
TLS	Transport Layer Security
UTC	Coordinated Universal Time

VDE	Verband der Elektrotechnik Elektronik Informationstechnik e.V., association for electrical, electronic & information technologies
WAN	Wide Area Network
wM Bus	Wireless Meter-Bus (EN 13757, part 3 - 4)
XML	eXtensible Markup Language

Table 2: Abbreviations

2 General Information

The abbreviation MUC (Multi Utility Communication) stands for a communications module which automatically collects consumption data of the customer in the field of smart metering, sends this data over a wide area (WAN) connection to the utility, metering service company or meter operator, and also has a local interface for a client's PC.

The so-called MUC controller (also MUC) is a variant of such a communication module. It is separated from the meter and function as an interface for data transmission. The MUC is the central device for the implementation of smart metering. The advantage is that measurement and fast moving wide area communication are situated in different and separated units. These can be installed or replaced independently of each other.

The SonoCollect 111 is such a MUC controller and is compliant with the specifications of the FNN, version 1.0.

The device comes in a 3U enclosure (modules) and is intended for DIN rail mounting (DIN rail 35 mm).

2.1 Device variants

SonoCollect 111 is a modular controller. As a result, it is available in different variants and flexible to the needs of each property and customer.

Variant	Order number	M-Bus	wM-Bus 169 MHz	wM-Bus 433 MHz	wM-Bus 868 MHz	Ethernet	RS-232
SonoCollect 111 E-M-125	014U1602	X (125 UL)	-	-	-	X	-
SonoCollect 111 E-M-250	014U1604	X (250 UL)	-	-	-	X	-
SonoCollect 111 E-M-500	014U1606	X (500 UL)	-	-	-	X	-
SonoCollect 111 E-WM-500	014U1607	-	-	-	X	X	X
SonoCollect 111 E-WM-2-500	014U1608	-	-	X	X	X	X
Different frequency bands	On request	-	(X)	(X)	(X)	X	X

Table 3: Available variants

For the SonoCollect 111 E-WM-500 and SonoCollect 111 E-WM-2-500 frequency bands can be chosen from three bands at the time of order:

- 868 MHz
- 433 MHz
- 169 MHz

If no frequency bands are specified at the time of order, the SonoCollect 111 E-WM-500 variant will be shipped with the 868 MHz frequency band and the SonoCollect 111 E-WM-2-500 variant will be shipped with 868 MHz and 433 MHz frequency bands.

The RS 232 interface at the devices SonoCollect 111 E-WM-500 and SonoCollect 111 E-WM-2-500 can be used in combination with an external level converter to readout additional M-Bus meters. For example, a level converter is convenient for this use case.

2.2 Connectors

The various interfaces of the SonoCollect 111 are available on different sides of the device.
The following figures show the different device variants:

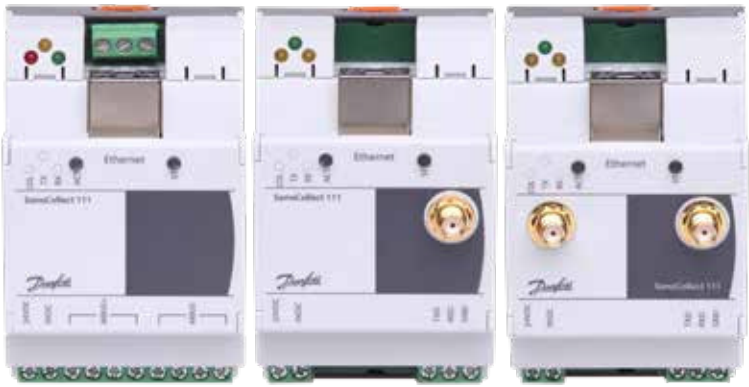


Figure 1: Device variants of the SonoCollect 111

The SonoCollect 111 is equipped with following connectors:

Connector	Marking	Pinning	Remark
Power supply	24VDC, GND / 0VDC	24VDC: positive power supply GND: negative power supply 0VDC: negative power supply	24 VDC (±5%), Screw clamp Cross sectional area 2,5 mm²
M-Bus connectors	MBUS+, MBUS-	MBUS+: positive bus line(s) MBUS-: negative bus line(s)	Screw clamp Cross sectional area 2,5 mm² MBUS+ and MBUS- are shorted each
Ethernet interface	Ethernet	1: TX+ 2: TX– 3: RX+ 4: 5: 6: RX– 7: 8:	According to TIA-568A/B 10/100 Base-TX
RS-232	TXD, RXD, GND	TXD: TX signal line RXD: RX signal line GND: Signal ground	According to EIA/TIA-232-F Interface does not support hardware handshaking (CTS/RTS)

Connector	Marking	Pinning	Remark
Wireless M-Bus antenna	OMS / OMS1	Inner: RF Outer: Reference ground	SMA, wM-Bus module 1
Wireless M-Bus antenna	OMS2	Inner: RF Outer: Reference ground	SMA, wM-Bus module 2

Table 4: Connectors and interfaces

2.3 State LEDs

Depending on the version, the SonoCollect 111 has up to 5 state LEDs. These indicate the following states:

LED	Color	Description
ACT (Active)	Off Green	Inactive, standby Readout of the M-Bus
ST (State)	Off Green Orange (flashing) Orange Red	No software started Main application running M-Bus scan Initialising Error

Table 5: State LEDs

In normal state, the LED State is green and the LED Active will blink green temporarily.

Depending on the variant the device comes with three additional LEDs on the upper edge of the housing. These LEDs signalize the operational state of the wired M-Bus or the wireless M-Bus respectively.

LED	Color	Description
COL	Red	Lights up when a collision has been detected on the M-Bus
TX	Yellow	Lights up when the M-Bus master is transmitting to the M-Bus
RX	Green	Lights up when data is received from M-Bus slaves

Table 6: State LEDs (Models equipped with wired M-Bus)

LED	Color	Description
RF1	Yellow	Lights up when data is received on interface OMS1
RF2	Yellow	Lights up when data is received on interface OMS 2
PWR	Green	Lights up when the device is powered
nc	Yellow	No function

Table 7: State LEDs (Models equipped with wireless M-Bus)

3 Bringing into service

The SonoCollect 111 boots automatically after connecting to the supply voltage. By default, following calls are made on system startup:

- Configuration of the network interface (Ethernet) via DHCP or static configuration
- Initial generation of SSL device keys (may need some time on first startup)

- Obtaining the system time via SNTP
- Start of system services
- Start of the main program

The main program provides the entire functionality, including the web interface of SonoCollect 111.

3.1 Network configuration and first steps

The SonoCollect 111 is fully configurable via the ethernet network interface. This must therefore be configured according to your network. If unsure, please ask your network administrator.

✓ The SonoCollect 111 is configured for having the static IP address 192.168.1.101 (subnet mask: 255.255.255.0, gateway: 192.168.1.254) per default.

The network settings can be configured via the website. There is the tab **General** (see section: 4.1) for configuration of these parameters.

➡ Website on the SonoCollect 111, i. e.: http://192.168.1.101/

The following webpage is shown at the webbrowser window (see section 3):

Figure 2: SonoCollect 111 website

If a direct connection using the pre-configured network configuration is not possible or you cannot connect for any other reason, it is recommended to use the Net discover tool, which can be obtained on request from our support team.

After installing and starting the tool, the main window comes up with all accessible devices in the local network. A right-click on an entry in the device list opens a context menu. There are functions like IP configuration, Web or FTP access. Some important features are described in detail in the subsequent sections.

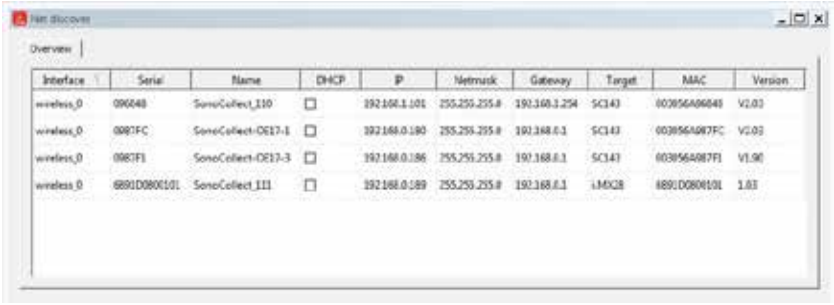


Figure 3: Main window of the Net discover tool displaying available devices

3.1.1 Network parameters

Using the command ***Net configuration*** in the context menu the network configuration (IP address, DHCP, etc.) of the device can be changed. The parameters shall be configured according to the current network. This data is then stored as a static configuration on the device.

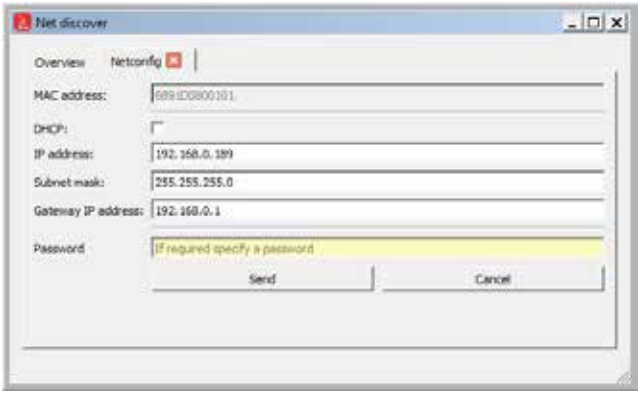


Figure 4: Network configuration with Net discover

The configuration is completed by pushing the button **Send**. The password of the admin user must be entered at the textbox **Password**.

If the automatic network configuration (DHCP) is selected, all parameters (IP address, Subnet mask, gateway, etc.) will be obtained from a DHCP server. The corresponding textboxes are disabled when using DHCP.

The assigned IP address can be determined from the DHCP server based on the unique MAC address of the SonoCollect 111. The MAC address of the device will be displayed at the column MAC at the main window of the Net discover tool.

If it is not possible to automatically configure your network (DHCP), the unit will choose a standard IP address (169.254.xxx.xxx) using IPv4 auto-configuration according to RFC3927.

- The default password is contained in section 4.6.
- Changing the network parameters of the SonoCollect 111 may restrict its accessibility. If the network parameters have been correctly set by an administrator, these shall not be changed.

3.1.2 Connectivity test (ping)

The ***Ping*** command in the context menu can be used for testing the connectivity.

The push button **Start** starts sending ICMP ping packets to the gateway's IP address. The push button **Stop** stops sending of these ICMP packets. The dialog can be closed by clicking on the push button **Done** or using the closing button at the register tab.

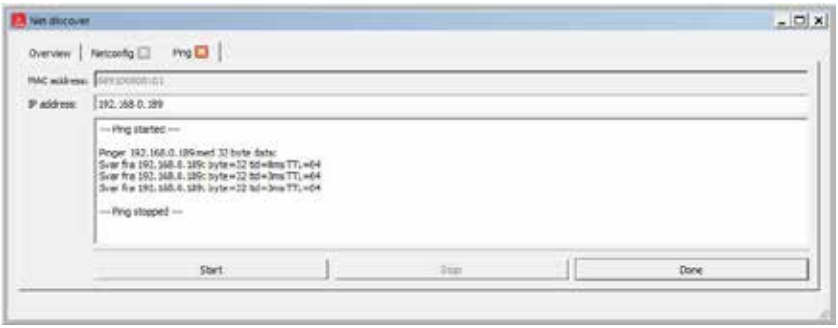


Figure 5: Output of the PING command at the Net discover tool

By using standard ICMP ping request packets, it is tested if the SonoCollect 111 is responding correctly:

Example output: Reply from 192.168.0.189: Bytes=32 Time<1ms TTL=64

3.1.3 Web access (HTTP)

The website of the device is opened in the browser via the ***WEB*** command in the context menu. This command refers directly to the configured default browser. That website can also be accessed directly with a browser by entering the address of the device. More information regarding the website of SonoCollect 111 can be found at section 3.

3.1.4 File access (FTP)

An encrypted FTP session is established with the tool WinSCP by using the context menu entries FTP and FTPS (default).

When using the context menu entry FTP, the WinSCP program will require entering a user name and a password. The context menu entry FTP (default) sets the username and password to the user admin's standard credentials. Using the second method ensures a quick and uncomplicated way to bring the SonoCollect 111 into service.

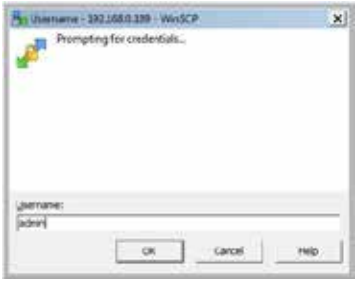


Figure 6: Entering the username at the FTPS log in

When connecting to the SonoCollect 111 via FTPS the first time, a warning dialog may be displayed. This dialog must be confirmed in order to continue to connect to the device. This is done by clicking on the push button **Yes**.

Figure 7: Confirming the device's certificate

After correct log in to the SonoCollect 111, the FTPS client program WinSCP will display a split main window which can be used to upload or download files to and from the device. By using a context menu, commands (for e.g. Copy, Rename or Edit) can by used to manipulate files. Drag & drop in combination with the Windows Explorer is also supported.

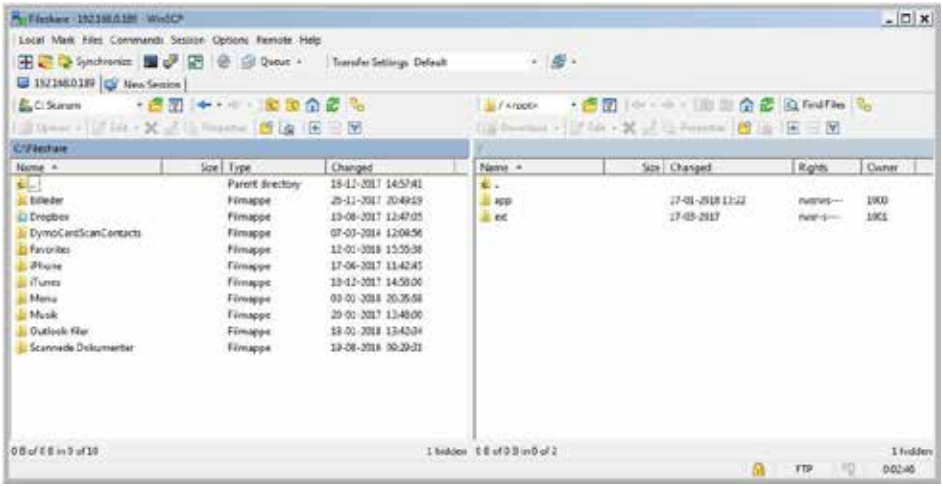


Figure 8: WinSCP main windows after correct log in

The standard log in credentials are contained in section 4.6.

Only trained personnel are allowed to change the files and the file system, since this may restrict the functionality of the device.

4 Configuration

The SonoCollect 111 is configured via its internal website. Alternatively, configuration can be done manually by using the configuration files (see section: 7.4)

The website allows reviewing and changing of device parameters, meter configuration and also services.

On delivery, the website automatically logs on with standard log-in data. If the standard user is already disabled at the configuration, correct login data must be entered.

In order to switch to another user, please select the logout button at the upper right.

The standard log-in details are shown in section 4.6.

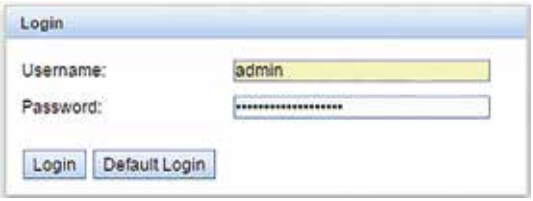


Figure 9: Login dialog

Users with write access should always log out after finishing the configuration, because no other user is allowed to have write access at the same time. If the connection stays active, no write access is available anymore.

4.1 Tab General

The tab ***General*** shows a general overview on the SonoCollect 111. Following values can be reviewed and changed:

Figure 10: Tab General

Field name	Meaning	Write access
Device name	Name of device (Correlates to CHIPtool)	yes
Serial number	Serial number of device	no
DHCP	Activates automatic network configuration	yes
IP address	IP address of device	yes
Subnet mask	Subnet mask of device	yes
Gateway address	Gateway address	yes
DNS IP	IP address of DNS server	yes
Free space log (kB)	Free storage space on the internal log memory of the controller	no
Free space Flash (kB)	Free storage space on the internal application memory of the controller	no
System date (local)	Current local system date	yes
System time (local)	Current local system time	yes
SNTP Server	Address of time server	yes

Table 8: Fields in tab General

The button **Save** finally saves the configuration. On **Reload** the last saved values are loaded and current changes get lost.

- Changing the network parameters of the SonoCollect 111 may restrict the accessibility. If the network parameters have been correctly set by an administrator, these shall not be changed.
- By storing the parameters via the button Save the SonoCollect 111 is automatically reinitialized.
- In SonoCollect 111 date and time are always processed as UTC time (without time zone shift). On the website, the browser converts these according to the local time zone of the computer. For example the Central European Time or Central European Summer Time is used in Central Europe. If the browser uses a different time zone, the time is displayed accordingly.

4.2 Tab Meter

The tab ***Meter*** displays a list of the connected meters and gives the user the ability to search for them.

The meter view displays the following information:

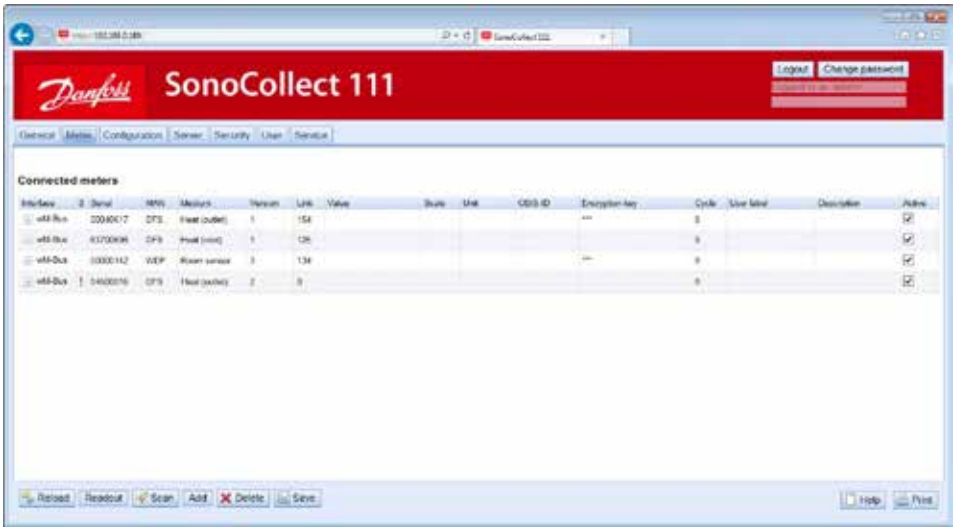


Figure 11: Tab Meter

Field name	Meaning	Write access
Interface	Interface of meter (M-Bus, wM-Bus, S0 or DLDE)	no
S (State)	Shows the status of a meter or the corresponding meter value. Exclamation mark: Unable to readout meter or meter value not up-to-date E: Meter or meter value has been edited (saving the configuration is necessary) A: Meter or meter value has been added (saving the configuration is necessary) Asterisk: Meter value list has been limited by configuration (see parameter *Maximum value count* at tab ***Configuration***)	no
Serial	Serial number of meter (number of meter)	no

MAN	Manufacturer of meter (abbreviation)	no
Medium	Medium of meter, according to column 2 of Table 17: Medium types in section 5.3.1	no
Version	Version number of meter	no
RSSI	Received Signal Strength Indicator (only wM-Bus)	no
Value	Meter reading or measurement value	only for S0
Scale	Scale factor (scientific notation)	only for S0
Unit	Unit, according to column 2 of Table 18: Units in section 5.3.1	only for S0
OBIS-ID	OBIS code formatted like X-X:X.X.X*X (X=0..255)	yes
Encryption key	Key for decrypting wM-Bus meters	yes
Cycle	Readout interval in seconds (entering 0 means using the general readout interval)	yes
User label	User specific description of meter value, included in export of CSV data, allows application specific mapping. – Valid characters are: A-Z, a-z, 0-9, !,§,$,%,&,/,(,),=,?,+ and * Comma is also allowed. Not allowed are: <,> und ". If CSV export is activated, the semicolon shall be avoided.	yes
Description	Description of meter value, according to column 2 of Table 17: Measurement types in section 5.3.1	yes
Active	Activates the transfer of meter or meter value to a server system or log file.	yes

Table 9: Fields in tab Meter

The meter configuration can be changed with the context menu using a right-click or by the buttons in the bottom area. Meters or meter values can be automatically searched for, created, deleted or changed according to the limitation of the used interface (M-Bus, wM-Bus etc.).

Meter entries or meter value entries can be selected by a single mouse click at the meter list. By pressing the **SHIFT**-key a range of entries can be selected. By pressing the **CTRL**-key multiple entries can be selected one for one.

On **Reload** the last saved values are loaded and current changes get lost. The meter values are updated accordingly.

Upon delivery the SonoCollect 111 contains an empty meter list. If meters are connected to the external interfaces of the SonoCollect 111, a scan can be started using the button **Scan**. The scan mode is configured in the tab ***Configuration***. For further information about the scan mode please have a look at section 5.1.1.

✔ Depending on the mode and number of connected meters, this process can take a long time.

The scan process cannot be interrupted. The meter configuration is applied immediately after scanning. Only additional changes must be saved manually. The meter list is additively expanded during the scan, already existing meters would not be deleted, even if these are not available anymore.

✔ Regarding M-Bus and wM-Bus meters, the arrangement of data in the table of tab Meter corresponds to the order of the data in the M-Bus or wM-Bus protocol. Thus, the meaning of the values can be compared directly with the data sheet of the meter.

- ✓ Timestamps transmitted within the M-Bus or wM-Bus protocol, are automatically assigned to the other meter values if possible. Therefore, some of these do not appear in the table. Using the configuration parameter MUC_SHOWTIMESTAMPSENTRIES for displaying of all timestamps can be manually enabled (see section: 7).
- ➡ Optionally there is a custom firmware version available which shows the time stamps in a human-readable format (year/month/day notation) at the meter list.
- ℹ Beginning with firmware version 1.20 the definition of some measurement types has been extended.
- ℹ Meter value descriptions that have been indicated as "Reserved" by firmware versions prior to version 1.20 will still be displayed as "Reserved" for compatibility reasons. For displaying the measurement types introduced in firmware version 1.20 the appropriate meter needs to be deleted from the meter list and re-created (for example: scan).

If there are any wM-Bus meters in the reception range of the SonoCollect 111 E-WM-500/ E-WM-2-500, these meters will be listed at the meter list. A scan will also add received meters to the list (see section: 5.1.2).

- ℹ If no scan or storing operation is in progress, currently unknown wM-Bus meters that are received are disabled by default. These have to be enabled manually for transmission to the communication server or log data. Unsaved wM-Bus meters get lost after a reboot.

Using button **Add** or the context menu entry **Add meter** one can add meters manually that are connected to interfaces that do not support automatic scanning. Please have a look at section 5.1.3 for further information.

For configuration of a meter or a meter value entry the edit dialog can be started by double-clicking at the appropriate entry in the meter list or by using the context menu entry **Edit**. The fields correspond to the columns in the meter list (see Table 8: Fields in tab General). According to the interface used some entries might be enabled or disabled.

It is possible to assign *User label* to meter entries or meter value entries to achieve an application-specific assignment of these values. It is also possible to assign a specific readout cycle to a meter entry using the parameter *Cycle*. The decryption key needed for encrypted wM-Bus meters can also be entered using this dialog.

The configuration can be completed by pressing the button **OK** or can be cancelled by pressing the button **Cancel**.

On activating or deactivating a meter its meter values are automatically enabled or disabled according to the hierarchy. If a meter is not active, it also gets activated by activating one of its meter values. It is possible to activate or deactivate multiple meter entries or meter value entries by selecting them and using the context menu entries **Activate** and **Deactivate**.

Using the button **Delete** or the same entry in the context menu deletes all selected meters and meter values. If wM-Bus meters are deleted and received again afterwards, these appear in the list again. This behavior can be disabled by deactivating **wM-Bus listen** in tab ***Configuration***.

- ✓ Deleting single meter values of an M-Bus or wM-Bus meter is not allowed.

Push the button **Save** for saving the meter list..

- ℹ On saving a modified configuration all meter data that has not been transferred via WAN interface yet gets lost. The CSV log data of the current day is deleted too, because the order of columns might have changed.

The button **Readout** triggers a read-out of connected meters regardless of the readout cycle. The sponta-

neous readout may take some time depending on the number of connected meters. Readout values are also written to the log file or transmitted to the server. The readout interval is unaffected by this process.

By storing the parameters via the button **Save** the SonoCollect 111 is automatically reinitialized

4.3 Tab Configuration

The tab ***Configuration*** allows configuring the meter interfaces of the SonoCollect 111. The following parameters are available:

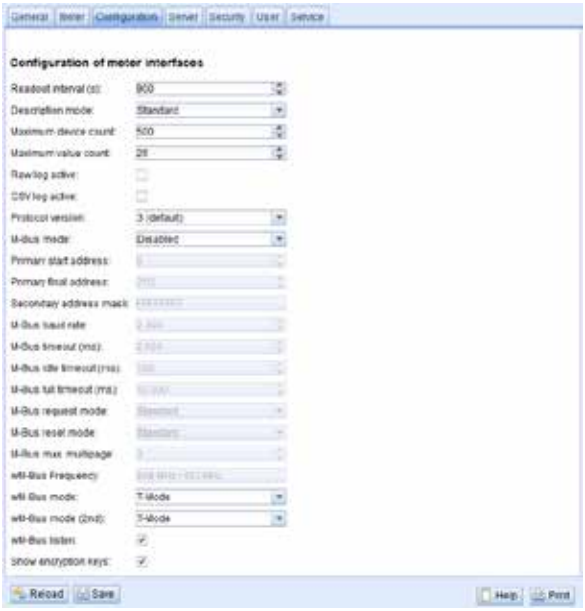


Figure 12: Tab Configuration

Field name	Meaning	Write access
Readout interval	Standard readout cycle of meters (in seconds). Value might be overwritten for each meter by parameter Cycle in tab Meter	yes

Description mode	Mode of displaying the meter value description on the website: - None: No display of description - Standard: Display of common value description - Extended: Extended display of value description (parameters will be displayed if they differ from 0): Notation: Description [Memory No.] <Tariff> {min|max|error} Example: Energy [2] <1> {max} - Extended with DIF/VIF: Extended display including DIF and VIF raw data Notation: Description [Memory No.] <Tariff> {Value Type} # XX XX XX … Example: Energy [2] <1> # 8C 11 04 - Extended with raw data: Extended display including the raw data of the complete meter value entry. Notation corresponds to Extended with DIF/VIF: Example: Energy [2] <1> # 8C 11 04 96 47 06 00 - DIF/VIF: Display of DIF/VIF raw data - Raw data: Displays the raw data of the complete meter value entry After changing this parameter, a read-out is needed to update the meter list and to display the relevant data.	yes
Maximum device count	Limitation of the number of meters to scan. (0: no limitation). Already configured meters are not limited by this parameter.	yes
Maximum value count	Limitation of the number of meter value entries to read during a read-out (0: no limitation).	yes
RAW log active	Activates the raw data log.	yes
CSV log active	M-Bus scan mode (secondary, reverse secondary or primary search)	yes
Protocol version	Protocol variants (CSV / XML) of the SonoCollect 111 WAN communication and log data (compatibility), see section: 5.3	yes
M-Bus mode	M-Bus scan mode (secondary, reverse secondary or primary search) and also deactivation of interface	yes
Primary start address	First address for primary search	yes
Primary final address	Last address for primary search	yes
Secondary address mask	Search mask for secondary search, 8 numerical characters; „F" defines a wildcard; missing characters will be filled up with leading zeros	yes
M-Bus baud rate	Baud rate for M-Bus communication (300 - 19200 baud)	yes
M-Bus timeout	M-Bus timeout until reception of first data (in ms)	yes
M-Bus idle timeout	M-Bus timeout until end of reception (in ms)	yes
M-Bus full timeout	M-Bus timeout (complete) for reception of a whole data packet (in ms)	yes
M-Bus request mode	Mode of the M-Bus readout (REQ_UD2): - Standard: Readout with REQ_UD2 - Extended 1: Readout with Get-All-Data (DIF/VIF 7F 7E) and REQ_UD2 - Extended 2: Readout with Get-All-Data (DIF 7F) and REQ_UD2	yes

M-Bus reset mode	Mode of the M-Bus Reset (before scan and readout): - None: no reset - Standard: Send SND_NKE to primary address of the meter or broadcast address when using secondary addressing - Extended 1: Send SND_NKE to primary address FD and SND_NKE to primary address of the meter or broadcast address when using secondary addressing - Extended 2: Send SND_NKE and an Application Reset to primary address FD and a SND_NKE to the primary address of the meter or to broadcast address when using secondary addressing.	yes
M-Bus max. multipage	Limits the count of multipage requests	yes
wM-Bus mode	wM-Bus communication mode (T or S mode) and also deactivation of OMS interface 1	yes
wM-Bus mode (2nd)	wM-Bus communication mode (T or S mode) and also deactivation of OMS interface 2	
wM-Bus listen	Activates recognition and visualization of new wM-Bus devices	yes
Show encryption keys	Encryption keys are shown as plain text	yes

Table 10: Fields in tab Configuration

The button **Save** finally saves the configuration. On **Reload** the last saved values are loaded and current changes get lost.

By storing the parameters via the button Save the SonoCollect 111 is automatically reinitialized.

4.4 Tab Server

The tab ***Server*** allows configuring the WAN interface (Wide Area Network) of SonoCollect 111. Following parameters are available:

Figure 13: Tab Server

Field name	Meaning	Write access
Mode	Mode of WAN interface, modes are: SMTP, XML (via TCP or TLS), FTP, WAN also can be deactivated	yes

Interval (min)	Transmission interval for WAN interface (in minutes)	yes
Address	Host address of remote station (e. g.: server)	yes
Port	Port number of remote station (e. g.: server), except for mode SMTP	yes
Directory	Server directory, except for mode SMTP	yes
Username	User name for a connection to a server, only for modes SMTP and FTP	yes
Password	Password for a connection to a server, only for modes SMTP and FTP	yes
Source address	Email sender address for mode SMTP	yes
Destination address	Email destination address for mode SMTP	no

Table 11: Fields in tab Server

Parameters get enabled or disabled according to the operating mode of the WAN interface.

The button **Save** finally saves the configuration. On **Reload** the last saved values are loaded and current changes get lost. The button **Test** allows the immediate transmission of data.

By storing the parameters via the button **Save** the SonoCollect 111 is automatically reinitialized.

4.5 Tab Security

The tab ***Security*** allows configuring the network services (FTP, Telnet) of SonoCollect 111. Following parameters are available:

Figure 14: Tab Security

Field name	Meaning	Write access
FTP server active	Activates the internal FTP server of SonoCollect 111, if deactivated, there is no FTP access available at all	yes
SSH server active	Activates the internal SSH server of the SonoCollect 111 (root access with admin credentials)	yes
Telnet server active	Activates the internal Telnet server of SonoCollect 111 (obsolete, is replaced by SSH)	no

Table 12: Fields in tab Security

The button ***Save*** finally saves the configuration. On ***Reload*** the last saved values are loaded and current changes get lost.

By storing the parameters via the button Save the SonoCollect 111 is automatically reinitialized.

4.6 Tab User

In the tab ***User***, different users can be managed and provided with specific access rights. The following users are pre-configured on delivery:

User name	Password	Remark
admin	admin	Administrator user with root access. Allows full access to all services of SonoCollect 111™ (HTTP, FTP, flash update, IP configuration).
web	web	Default user for the web interface - If there is a user with this name and password, the web interface automatically logs in with these credentials. Otherwise, the user is prompted to enter the credentials. This user has full access to the website of SonoCollect 111™ on delivery.
ftp	ftp	User for FTP access to the log directory B :/log/

Table 13: Predefined users on delivery

The existing configuration in the user table can be changed via the website:

Figure 15: Tab User

Field name	Meaning
Name	User name
Password	Password
Change Password	If active, user is allowed to change its password
Sessions	Number of open session with this user account
MaxSessions	Limit for the number of simultaneous user sessions (-1=unlimited)
Read General	Read access for tab General
Write General	Write access for tab General
Read Meter	Read access for tab Meter
Write Meter	Write access for tab Meter
Read Config	Read access for tab Configuration
Write Config	Write access for tab Configuration
Read Server	Read access for tab Server
Write Server	Write access for tab Server
Read Security	Read access for tab Security
Write Security	Write access for tab Security
Read Service	Read access for tab Service
Write Service	Write access for tab Service
FTP	User is allowed to access the FTP server (maximum 2 users)

Write User	Read/Write access for tab User

Table 14: Fields in tab User

The user configuration can be changed using the buttons at the bottom area or by using the context menu by right-clicking on the user's entry. With exception of the user admin, users can be created, edited or deleted.

User entries are selectable by mouse clicks. By pressing the **SHIFT** key it is possible to select a range of user entries and by pressing the **CTRL** key it is possible to select multiple user entries one by one.

By pressing the **Reload** button, all changes will be discarded and the last saved settings will be restored.

Having write access for a tab, will automatically provide read access to this tab.

The user admin cannot be changed or deleted via the general user configuration. Its password can only be changed via the button Change password by the logged in admin user itself.

On losing the administrator password, SonoCollect 111 can only be reset by a service engineer of Danfoss in-house, as file access is restricted. All the configuration data gets lost.

Only the user admin has full access to the file system of the SonoCollect 111 via FTPS. The second FTP user is only allowed to access /ext/log.

New users can be added by pressing the button **Add** or using the context menu by right-clicking on the user list.

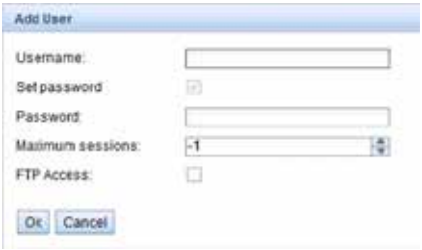


Figure 16: Input dialog for adding a user

Besides the username and the password of the new user it is possible to define how many login sessions in parallel are allowed for this user (-1 means no limit). In addition to the user *admin* one further user account can have FTP access to the SonoCollect 111. FTP access is then restricted to the log data of the SonoCollect 111 (directory */ext/log*). This property can only be set upon creation of a user account.

A separate FTP user (e. g.: ftp) makes it possible to retrieve all stored log data through a remote client (manual or automated) without affecting access to any other services or data of the SonoCollect 111.

An already created user can be edited by double-clicking on its user entry or by selecting the context menu entry **Edit**. The user edit dialog is equal to the user create dialog. To reset the password of a user the check-box **Set Password** needs to be selected. If this checkbox is not selected the password will not be changed or reset. It is not possible to display an already set password.

The configuration can be completed by pressing the button **Ok** or can be cancelled by pressing the button **Cancel**.

User access rights will be configured directly within the user list. If write access for a tab is granted to a certain user, this user will have read access to the tab automatically.

By pressing the button **Delete** or by clicking on the correspondent context menu entry a user entry with exception of the user *admin* can be deleted.

The button **Save** finally saves the user configuration.

4.7 Tab Service

The tab ***Service*** allows maintenance service and provides related information:

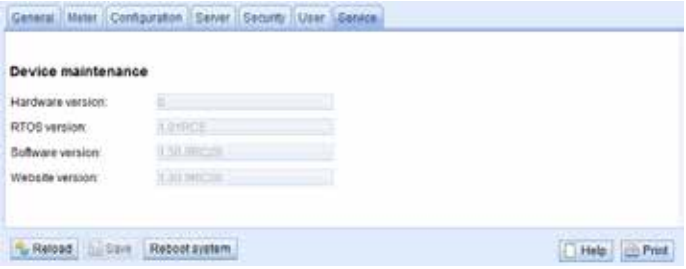


Figure 17 Tab Service

Field name	Meaning	Write access
Hardware version	Version of hardware	no
RTOS version	Version of operating system	no
Software version	Version of software	no
Website version	Version of website	no

Tabel 15: Field in tab Service

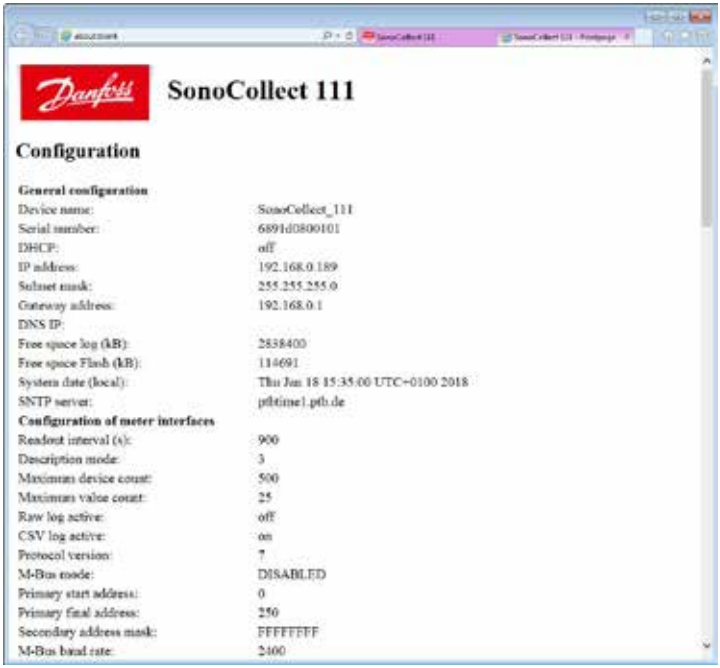
On **Reload** the values are updated.

The button **Reboot** restarts the SonoCollect 111. All internal processes are shut down and reinitialized after the reboot. Already cached meter data for WAN interface may be transmitted after the restart.

4.8 Print Page

For a print preview or for an export of the SonoCollect 111 configuration the print page can be used which is called by pressing the button **Print** (bottom right). According to the access rights the website is generating an additional view that contains all available configured parameters. The print page will be automatically closed (if not done already) by the logout of the user.

✔ The displayed meter list might be inserted into a spreadsheet application for further purposes.



SonoCollect 111

Configuration

General configuration	
Device name:	SonoCollect_111
Serial number:	6891d0800101
DHCP:	off
IP address:	192.168.0.189
Subnet mask:	255.255.255.0
Gateway address:	192.168.0.1
DNS IP:	
Free space log (kB):	2838400
Free space Flash (kB):	114691
System date (local):	Thu Jun 18 15:35:00 UTC+0100 2018
SNTP server:	ptbtime1.ptb.de
Configuration of meter interfaces	
Readout interval (s):	900
Description mode:	3
Maximum device count:	500
Maximum value count:	25
Raw log active:	off
CSV log active:	on
Protocol version:	7
M-Bus mode:	DISABLED
Primary start address:	0
Primary final address:	250
Secondary address mask:	FFFFFFFF
M-Bus baud rate:	2400

Figure 18: Print page of the SonoCollect 111

5 Acquisition and processing of meter data

The main task of SonoCollect 111 is the processing and transmission of meter data. For proper operation, following issues must be considered:

- The available meters must be configured correctly (meter configuration of SonoCollect 111). Required meters or meter values must be enabled by the checkbox Active.
- The WAN interface allows transmitting of collected meter data by SonoCollect 111 to a monitoring station.
- The control center or remote station is able to process the meter data (meter data format).

5.1 Meter configuration

Depending on the interface, meters are mounted to SonoCollect 111 via its website in different ways. Therefor the meter interfaces must be configured correctly (see section: 4.3).

➡ Meters using SML protocol on interfaces M-Bus, wM-Bus and DLDE are supported on request.

5.1.1 Scanning for meters (M-Bus)

Via the M- Bus interface it is possible to search for meters automatically. The meter's secondary or primary addresses are used for an iterative scan process. After the finishing the scan, all connected meters appear in the meter list.

The scan mode (primary or secondary) can be configured via the tab ***Configuration*** (see section: 4.3). The search process itself can be initiated from the tab ***Meters*** (see section: 4.2).

The M-Bus interface allows mixed configurations. It is possible to scan for primary addresses first and then scan for secondary addresses in a second run. New found meters are appended to the existing list. Meters found in both runs stay in list as-is and remain unchanged if already configured. If a meter is found for the first time during primary search, the primary address is used for all further requests. This applies also to secondary search and secondary addressing.

- The M-Bus supports the primary and secondary address for accessing the meter. Secondary addressing is recommended if the meters should be recognized and read out without additional configuration. However, the read-out process takes longer compared to primary addressing. If all meters are pre-configured with a unique primary address, it is recommended to use primary addressing. For a faster search process please adapt the limits for the primary addresses according to the expected values. The big advantage of primary addressing is that meters of exactly the same type and configuration (with an altered serial number) can be exchanged directly in the case of maintenance without adjusting the SonoCollect 111.
- Automated allocation of the primary addresses or setting of parameters/registers of meters by the SonoCollect 111 is available on request.

5.1.2 Automatic acquisition of meters (wM-Bus)

It is not possible to search for wM-Bus meters explicitly, because these are pushing data with their own cycle time. Therefore SonoCollect 111 listens all the time and appends all received meters to an internal list. This is similar to a search. The meters are displayed on the website after a search process or in accordance with update interval.

If no scan is in progress, currently unknown wM-Bus meters being received are saved temporary and are inactive by default. Only by manually activating and saving the configuration, meters are added and transferred via the configured WAN interface.

- Parameterization of the meters via a bidirectional connection is currently not supported.

5.1.3 Adding meters manually

Connected meters that cannot be automatically found by a scan (e. g.: DLDE or S0) must be added manually in the configuration by the **Add** button or the context menu entry **Add Meter** in the tab ***Meter***. If the configuration of specific meters is known, these meters can be added manually. It is also possible to pre-configure encryption keys for wM-Bus meters.

Figure 19: Adding a meter manually in tab Meter

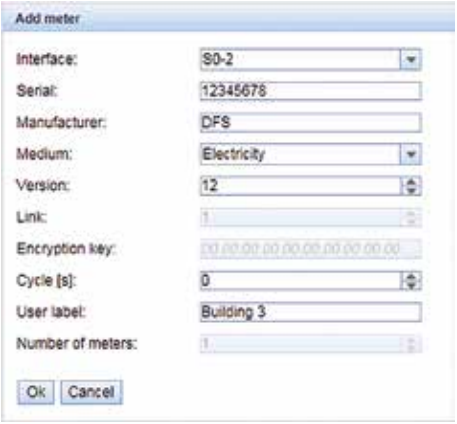


Figure 20: Input dialog for adding meters manually

All parameters correspond to the fields of the meter list at the tab Meter (see Table 8: Fields in tab General) whereas some fields are enabled or disabled according to the used interface. It is possible to set the serial number, the interface, the 3-letter manufacturer code (according to the DLMS User Association), the media and the version manually.

Additionally there is a parameter called **Number of meters** which makes it possible to add multiple meters at a time. When adding S0 impulse meters this parameter is set fixed to 1. The configuration can be completed by pressing the button **Ok** or can be cancelled by pressing the button **Cancel**.

After adding a meter to the meter list, it is possible to add one or multiple meter value entries according to the used interface (S0 or DLDE) using the context menu entry Add value:

Figure 21: Input dialog for manual configuration of meter values

All parameters correspond to the fields of the meter list at the tab ***Meter*** (see Table 8: Fields in tab General). Additionally there is a parameter **Number of values** available which makes it possible to add multiple meter values at a time. When configuring meter values of S0 impulse meters this parameter is set fixed to 1. The configuration can be completed by pressing the button **Ok** or can be cancelled by pressing the button **Cancel**.

5.1.4 Configure meters directly

Alternatively, meters can be inserted manually or automatically, directly into the meter configuration (see section: 7.4.2). The stored meter configuration can be downloaded and edited via FTP and also can be transferred to another SonoCollect 111.

5.2 Integration into supervisory or control system

There are versatile options for connecting the SonoCollect 111 to a control station or a supervisory system using the Ethernet interface.

Based on an IP connection data can be exchanged with a server (backend) via the Ethernet interface.

➡ The SonoCollect 111 can be configured to use PPPoE on request. So, it may establish a connection directly through a DSL modem.

5.2.1 Automatic Upload of CSV data via FTP/FTPS/SFTP

The most common way for connecting to a server is to use the FTP protocol. In the tab ***Server*** the mode *FTP Client Active or FTP Client Passive* has to be activated. Then the SonoCollect 111 transfers the files directly to a standard FTP server. The files are stored on the server in the configured directory.

Filename: <target path>/Meter_<timestamp>.csv
„Example: /SonoCollect_111/Meter_1372759627.csv“

The values in angle brackets denote fields according to the configured path and time stamp of transmission (UNIX time stamp).

The meter data itself is transmitted in CSV format, which is defined in section 5.3.2.

FTPS (FTP with TLS encryption) can be used by prepending the FTP server's hostname or IP address with the URL scheme (see RFC3986) *ftps://*

Example: *ftps://some.server.example.com.*

If an encrypted communication is used, the following certificate files must be transferred to the directory /app/ manually (see section: 7.3):

- Server certificate (RFC4945): ftp-cacert.pem
- Client certificate (RFC3280): ftp-clicert.pem
- Client key (RFC5958): ftp-clikey.pem

S/FTP (secure FTP over secure shell (SSH)) can be used by prepending the FTP server's hostname or IP address with the URL scheme (see RFC3986) *sftp://*

Example: *sftp://some.server.example.com*

No additonal client or server certificates are needed since all relevant keys are created at the time of the first bootup oft he device.

5.2.2 Downloading CSV data via FTP

It is also possible to exchange data with the SonoCollect 111 via the internal FTP server. Enable **CSV log active** in the tab ***Configuration***. An ordinary FTP client or a control center can access the SonoCollect 111 by using specific IP address and log-in data.

An FTPS connection (secured by TLS) can be established via the context menu of the Net discover tool (see section: 3.1.4).

An SFTP connection (secured by SSH) can be established via the context menu of the Net discover tool (see section: 3.1.4).

The standard log-in credentials can be found in section 4.6.

The data are stored in the following folder structure:

File name: */ext/log/<year>/<month>/Meter_<timestamp>.csv*

Example: */ext/Log/2013/07/Meter_20140207.csv*

The values in angle brackets correspond to the year, month and the time stamp (UNIX time stamp) at the time of the creating the log file (UTC time). The notation of the UNIX time stamp is defined as YYYYMMDD (Year/Month/Day).

Within this directory structure, the available log data can be downloaded and/or deleted..

For downloading log data, it is recommended to use the user ftp from the default user configuration, because it is configured for downloading the log data directly with specific access rights.

If the log data partition (directory /ext) is full, old log data gets deleted automatically.

This documentation refers to the protocol versions 3 and higher. In terms of previous formats (compatibility with existing systems), please contact our support.

5.2.3 XML Push connection

An external Web server or an application-specific system can be accessed by the SonoCollect 111 via a generic TCP connection. This connection can also be secured by an optional encryption. Choose either mode XML TCP or mode XML TLS in the tab ***Server*** for this purpose. If a path is defined in the parameter **Directory** (e. g.: /, /data), the XML data of the meters is transferred using HTTP headers. If the parameter is empty, plain XML data is transmitted via TCP. The XML format is described in section 5.3.3.

If an encrypted communication is used, the following certificate files must be transferred to the directory /app/ manually (see section: 7.3):

- Server certificate (RFC4945): cacert.pem
- Client certificate (RFC3280): clicert.pem
- Client key (RFC5958): clikey.pem

5.2.4 Email (SMTP)

The XML data can also be sent directly by email. Choose SMTP mode in the tab **Server**. The receiving email server (SMTP) might be configured to handle the data and possibly forward it to another destination address. The subject of the generated email is specified as follows:

Subject: SonoCollect 111 ID: <MUC-ID>, Timestamp: <time stamp> (<index>)
Example: SonoCollect 111 ID: 1234567, Timestamp: 1372759627 (2)

The values in angle brackets denote fields according to the serial number of SonoCollect 111 (MUC-ID), the time stamp at the beginning of the transmission (UNIX time stamp) and an index which marks multiple transmissions within an interval.

The XML data itself is transmitted within the content body of the email.

5.3 Format of meter data

The meter data can be transferred, among others, in XML format via a TCP connection or in CSV format via an FTP connection. For the FTP download CSV data can also be stored locally.

After updating the software of an older SonoCollect 111 (see section: 7.1) the protocol version stays the same and compatible until changing it on the website in the tab Configuration.

Transferring meter data via Modbus protocol is optionally available.

5.3.1 Predefined types for media, measurements and units

The medium types and units used within the meter data are pre-defined in the standard EN 13757-3. Following table shows the pre-defined values for the media ID:

Index	Description
0	Other
1	Oil
2	Electricity
3	Gas
4	Heat (outlet)
5	Steam
6	Hot water
7	Water
8	Heat cost allocator
9	Compressed air
10	Cooling load device (outlet)
11	Cooling load device (inlet)
12	Heat (inlet)
13	Heat (Cooling load meter)
14	Bus/System

Index	Description
15	Unknown medium
16 - 19	Reserved
20	Calorific value
21	Hot water
22	Cold water
23	Dual register (hot/cold) water meter
24	Pressure
25	A/D converter
26	Smoke detector
27	Room sensor
28	Gas detector
29 - 31	Reserved
32	Breaker (electricity)
33	Valve (gas or water)
34 - 36	Reserved
37	Customer unit
38 - 39	Reserved
40	Waste water
41	Waste
42	Carbon dioxide
43 - 48	Reserved
49	Communication controller
50	Unidirectional repeater
51	Bidirectional repeater
52 - 53	Reserved
54	Radio converter (system side)
55	Radio converter (meter side)
56 - 255	Reserved

Table 16: Medium types

Following table lists the predefined measurement types (descriptions of measurement value). In addition, own text-based measurement types can also be configured depending on the meter interface (indicated by index 31):

Index	Description
0	None
1	Error flags (Device type specific)
2	Digital output
3	Special supplier information
4	Credit
5	Debit
6	Volts

Index	Description
7	Ampere
8	Reserved
9	Energy
10	Volume
11	Mass
12	Operating time
13	On-time
14	Power
15	Volume flow
16	Volume flow ext
17	Mass flow
18	Return temperature
19	Flow temperature
20	Temperature difference
21	External temperature
22	Pressure
23	Timestamp
24	Time
25	Units for H.C.A.
26	Averaging duration
27	Actuality duration
28	Identification
29	Fabrication
30	Address
31	User specific description (text based)
32	Digital input
33	Software version
34	Access number
35	Device type
36	Manufacturer
37	Parameter set identification
38	Model / Version
39	Hardware version
40	Metrology (firmware) version
41	Customer location
42	Customer
43	Access code user
44	Access code operator
45	Access code system operator
46	Access code developer

Index	Description
47	Password
48	Error mask
49	Baud rate
50	Response delay time
51	Retry
52	Remote control (device specific)
53	First storagenum. for cyclic storage
54	Last storagenum. for cyclic storage
55	Size of storage block
56	Storage interval
57	Vendor specific data
58	Time point
59	Duration since last readout
60	Start of tariff
61	Duration of tariff
62	Period of tariff
63	No VIF
64	wM-Bus data container
65	Data transmit interval
66	Reset counter
67	Cumulation counter
68	Control signal
69	Day of week
70	Week number
71	Time point of day change
72	State of parameter activation
73	Duration since last cumulation
74	Operating time battery
75	Battery change
76	RSSI
77	Day light saving
78	Listening window management
79	Remaining battery life time
80	Stop counter
81	Vendor specific data container
82	Reactive energy
83	Reactive power
84	Relative humidity
85	Phase voltage to voltage
86	Phase voltage to current

Index	Description
87	Frequency
88	Cold/Warm Temperature limit
89	Cumulative count max. power
90	Remaining readout requests
91	Meter status byte
92	Apparent energy
93	Apparent power
94	Security key
95	Data frame
96 - 255	Reserved

Table 17: Measurement types

Following table lists the predefined units. In addition, own units can also be configured, depending on the meter interface:

Index	Unit	Description
0	None	None
1	Bin	Binary
2	Cur	Local currency unit
3	V	Volt
4	A	Ampere
5	Wh	Watt hour
6	J	Joule
7	m^3	Cubic meter
8	kg	Kilogram
9	s	Second
10	min	Minute
11	H	Hour
12	D	Day
13	W	Watt
14	J/h	Joule per hour
15	m^3/h	Cubic meter per hour
16	m^3/min	Cubic meter per minute
17	m^3/s	Cubic meter per second
18	kg/h	Kilogram per hour
19	degree C	Degree Celsius
20	K	Kelvin
21	Bar	Bar
22		Dimensionless
23 - 24	Res	Reserved
25	UTC	UTC

Index	Unit	Description
26	bd	Baud
27	bt	Bit time
28	mon	Month
29	y	Year
30		Day of week
31	dBm	dBm
32	Bin	Bin
33	Bin	Bin
34	kVARh	Kilo voltampere reactive hour
35	kVAR	Kilo voltampere reactive
36	cal	Calorie
37	%	Percent
38	Ft^3	Cubic feet
39	Degree	Degree
40	Hz	Hertz
41	kBTU	Kilo british thermal unit
42	mBTU/s	Milli british thermal unit per second
43	US gal	US gallon
44	US gal/s	US gallon per second
45	US gal/min	US gallon per minute
46	US gal/h	US gallon per hour
47	Degree F	Degree Fahrenheit
48 - 255	Res	Reserved

Table 18: Units

5.3.2 Format of CSV data

CSV data either is stored locally on the SonoCollect 111 by enabling **CSV log active** or transferred to an FTP server using the mode *FTP Client Active* or *FTP Client Passive* in the tab ***Server*** for the WAN interface. Different protocol versions can be configured in the tab ***Configuration*** using the parameter **Protocol version**.

The CSV data is formatted as follows:

Column name / header	Meaning
Meter:	
Index	Indexes the different devices/meters within a CSV file.
Timestamp	Unix time stamp (UTC) of SonoCollect 111 at readout of meter
Device-ID	ID of the meter, composed of manufacturer ID, serial number, version and medium type
Link	Primary address of the meter or RSSI value for wM-Bus meters
User	User specific description of the meter (configured in the tab Meter)
Meter value:	
IndexX	Indexes the different parameters/values of a device/meter.
ValueX	Meter value (directly read out from the meter)

Column name / header	Meaning
ScaleX	Scale factor in scientific notation (directly read out from the meter)
UnitX	Unit, according to column 2 of Table 19: Units in section 5.3.1 (directly read out from the meter)
DescriptionX	Descriptive term, according to column 2 of Table 18: Measurement types in section 5.3.1 (directly read out from the meter)
UserX	User specific description (configured in tab Meter)
TimestampX	Time stamp (directly read out from the meter or 0 if not available)
ObisidX	OBIS-ID (configured in tab Meter)

Table 19: Format of CSV data

The first row of the CSV data file contains the CSV header for protocol versions from version 2 on. The CSV header uses the column names of the table above. The following lines contain the data of one meter at a specific readout time.

The first of a row contain information regarding the meter like identification and the time of read-out. The other columns are added dynamically according to the configured meter and number of meter values. The meter values are inserted starting with index 0 (e. g.: *Value0*).

The following table shows the different protocol versions:

Column	Description	Ver. 0	Ver. 1	Ver. 2	Ver. 3	Ver. 4	Ver. 5	Ver. 6	Ver. 7
Index	Meter / device index							x	x
Timestamp	Time stamp of readout	x	x	x	x	x	x	x	x
DeviceId	Meter device ID (serial number)	x	x	x	x	x	x	x	x
Link	Primary address or RSSI value					x	x	x	x
User	User label of the meter (tab Meter)						x	x	x
IndexX	Meter value index.							x	x
ValueX	Numerical value of the acquired value	x	x	x	x	x	x	x	x
ScaleX	Scale factor of the acquired value	x	x	x	x	x	x	x	x
UnitX	Unit of the acquired value	x	x	x	x	x	x	x	x
DescriptionX	Description of the meter value	x	x	x	x	x	x	x	x
UserX	User label of the meter value (tab Meter)			x	x	x	x	x	x
TimestampX	Time stamp of the meter value			x	x	x	x	x	x
ObisIdX	OBIS-ID of the meter value		x	x	x	x	x	x	x

Table 20: Data contained in the different CSV protocol versions

An example of protocol version 3 is as shown:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Timestamp	DeviceId	Value0	Scale0	Unit0	Description0	User0	Timestamp0	ObisId0	Value1	Scale1	Unit1	Description1	User1
2	1449878417	DFS-00127550-02-04	129	1,00E+03	Wh	Energy	Label 2	1449878340	6-0:1.0.0*255	286	1,00E-02	m^3	Volume	
3	1449878421	DFS-00185550-02-12	111	1,00E+03	Wh	Energy		1449878340	6-0:1.0.0*255	244	1,00E-02	m^3	Volume	
4	1449879311	DFS-00127550-02-04	129	1,00E+03	Wh	Energy	Label 2	1449879240	6-0:1.0.0*255	289	1,00E-02	m^3	Volume	
5	1449879315	DFS-00185550-02-12	112	1,00E+03	Wh	Energy		1449879240	6-0:1.0.0*255	245	1,00E-02	m^3	Volume	
6	1449880211	DFS-00127550-02-04	130	1,00E+03	Wh	Energy	Label 2	1449880140	6-0:1.0.0*255	290	1,00E-02	m^3	Volume	
7	1449880215	DFS-00185550-02-12	112	1,00E+03	Wh	Energy		1449880140	6-0:1.0.0*255	247	1,00E-02	m^3	Volume	
8	1449881111	DFS-00127550-02-04	131	1,00E+03	Wh	Energy	Label 2	1449881040	6-0:1.0.0*255	292	1,00E-02	m^3	Volume	
9	1449881115	DFS-00185550-02-12	113	1,00E+03	Wh	Energy		1449881040	6-0:1.0.0*255	249	1,00E-02	m^3	Volume	
10	1449882012	DFS-00127550-02-04	132	1,00E+03	Wh	Energy	Label 2	1449881940	6-0:1.0.0*255	294	1,00E-02	m^3	Volume	
11	1449882015	DFS-00185550-02-12	114	1,00E+03	Wh	Energy		1449881940	6-0:1.0.0*255	251	1,00E-02	m^3	Volume	
12	1449882911	DFS-00127550-02-04	133	1,00E+03	Wh	Energy	Label 2	1449882840	6-0:1.0.0*255	296	1,00E-02	m^3	Volume	
13	1449882915	DFS-00185550-02-12	115	1,00E+03	Wh	Energy		1449882840	6-0:1.0.0*255	253	1,00E-02	m^3	Volume	
14	1449883811	DFS-00127550-02-04	134	1,00E+03	Wh	Energy	Label 2	1449883740	6-0:1.0.0*255	299	1,00E-02	m^3	Volume	
15	1449883815	DFS-00185550-02-12	116	1,00E+03	Wh	Energy		1449883740	6-0:1.0.0*255	255	1,00E-02	m^3	Volume	

Figure 22: Excerpt of a CSV file

5.3.3 Format of XML data

Meter data can be transmitted via an encrypted (mode XML TLS) or an unencrypted (mode XML TCP) WAN connection using XML format. Using the parameter **Protocol Version** at the tab ***Configuration*** it is possible to set a specific protocol version for transmission of the XML data.

The format is specified as follows:

Item	Attribute	Meaning
interface		Contains a complete data packet with at least one muc item
	MESSAGE_TYPE	Specifies type of packet: 1
muc		Contains the data for one SonoCollect 111 with its corresponding meter items
	MUC_ID	Hexadecimal representation of the ID of SonoCollect 111 (corresponds to the serial number shown on the website in tab General), using earlier protocol versions (see Table 22: Data in different XML protocol versions) this value is a decimal number (converted from HEX value)
	VERSION	Protocol version
	TIMESTAMP	UNIX time stamp (UTC) at transmission
meter		Contains at least one data item for each meter
	INTERFACE	1: S0 2: M-Bus 5: wM-Bus 6: DLDERS
	METER_ID	Serial number of meter
	USER	User specific description of the meter (configured at tab Meter)
data		Contains at least one entry item with at least one meter value, specified by attributes
	OBIS_ID	According to OBIS specification, configured via the website
	DESCRIPTION	According to column 2 of Table 17: Measurement types in section 5.3.1
	UNIT	According to column 2 of Table 18: Units in section 5.3.1
	SCALE	Scale factor, signed exponent to base 10 (scientific notation)
	MEDIUM	According to column 2 of Table 16: Medium types in section 5.3.1
	USER	Scale factor, signed exponent to base 10 (scientific notation)

Item	Attribute	Meaning
entry		Entry of meter data with time stamp (T) and one measurement value (VAL)
para-meter		Contains one parameter value
	NAME="T"	Associated value represents UNIX time stamp (UTC) of the measurement (if provided by the meter, otherwise system time of SonoCollect 111)
	NAME="T_MUC"	Associated value represents UNIX time stamp (UTC) of SonoCollect 111 at meter read out.
	NAME="VAL"	Associated value represents the measurement value defined in data item

Table 21: Format of XML data

If the entry Directory is configured for the WAN interface, the data is sent as an HTTP post request.

The following table shows the different protocol versions:

Item	Attribute	Ver. 0	Ver. 1	Ver. 2	Ver. 3	Ver. 4	Ver. 5	Ver. 6	Ver. 7
interface		x	x	x	x	x	x	x	x
	MESSAGE_TYPE	x	x	x	x	x	x	x	x
muc		x	x	x	x	x	x	x	x
	MUC_ID	Decimal	Decimal	HEX	HEX	HEX	HEX	HEX	HEX
	VERSION	1f1	1f2	1f3	1f4	1f5	1f6	1f7	1f8
	TIMESTAMP	x	x	x	x	x	x	x	x
meter		x	x	x	x	x	x	x	x
	INTERFACE	x	x	x	x	x	x	x	x
	METER_ID	x	x	x	x	x	x	x	x
	USER						x	x	x
data		x	x	x	x	x	x	x	x
	OBIS_ID	x	x	x	x	x	x	x	x
	DESCRIPTION	x	x	x	x	x	x	x	x
	UNIT	x	x	x	x	x	x	x	x
	SCALE	x	x	x	x	x	x	x	x
	MEDIUM	x	x	x	x	x	x	x	x
	MAN								x
	VER								x
	MED								x
	USER						x	x	x
entry		x	x	x	x	x	x	x	x
para-meter		x	x	x	x	x	x	x	x
	NAME="T"	x	x	x	x	x	x	x	x
	NAME="T_MUC"	x	x	x	x	x	x	x	x
	NAME="VAL"	x	x	x	x	x	x	x	x

Table 22: Data in different XML protocol versions

A XML packet according to protocol version 3 might be as follows:

```
<?xml version="1.0" encoding="utf-8"?>
<interface MESSAGE_TYPE="2">
    <muc MUC_ID="13fd0" VERSION="1f4" TIMESTAMP="1252004322">
        <meter METER_ID="92752244" INTERFACE="05">
            <data DESCRIPTION="VOLUME" UNIT="m^3" SCALE="1e-03"
MEDIUM="WATER" OBIS_ID="8-0:1.0.0*255">
                <entry>
                    <parameter NAME="T">1253000282</parameter>
                    <parameter NAME="T_MUC">1253000282</parameter>
                    <parameter NAME="VAL">2850427</parameter>
                </entry>
                <entry>
                    <parameter NAME="T">1253000482</parameter>
                    <parameter NAME="T_MUC">1253000482</parameter>
                    <parameter NAME="VAL">2850428</parameter>
                </entry>
            </data>
            <data ...>
            ...
            </data>
        </meter>
        <meter ...>
        ...
        </meter>
    </muc>
</interface>
```

6 Troubleshooting

In case the SonoCollect 111 does not work as described in this document, it is useful to locate the malfunction in order to resolve the issue and to recover the full functionality again.

6.1 Hardware errors

6.1.1 All LEDs remain off, the device does not respond

Turn off the power supply. Remove all cables and antennas except the power supply. Now switch on the power supply and check the voltage level of 90 to 260 VAC.

Make sure that no errors are caused on mains by the infrastructure, protection devices or circuit breakers. Possibly test the SonoCollect 111 under laboratory conditions.

6.1.2 The power LED flashes or blinks green

Turn off the power supply. Remove all cables and antennas except the power supply. Now switch on the power supply and check if the power LED will illuminate continuously.

No connect all the cables and antennas step by step and again check the power LED after each step.

If the error occurs related to connecting a specific cable, please check this in detail. For example, there might be a short circuit or overload at the external wiring. If necessary, please replace faulty cables.

6.2 Network error

6.2.1 No network connection

If there is no network connection to SonoCollect 111, first run a ping connection test (see section: 3.1.2).

If no ping reply is received and if SonoCollect 111 is connected via a larger network, test the SonoCollect 111 once more with a direct network connection to a PC. Depending on the remote network node, a cross-over cable must be used for a direct connection between the PC and SonoCollect 111.

Check the physical network connection between the PC and SonoCollect 111. Cables shall be properly connected and plugged in.

✔ Check, if the cable is plugged into connector Ethernet and not into connector Serial, as both are RJ-45.

At the network port of SonoCollect 111, the amber link LED should light continuously and the active LED should flash green sometimes. Please check also the corresponding LEDs on the remote terminal (PC, hub, etc.). If necessary, retry with other cables.

If all LEDs light correctly, please check if the SonoCollect 111 is shown at the Net discover tool (see section: 3.1). SonoCollect 111 must therefore be connected with the PC via a local area network.

If the desired SonoCollect 111 does not appear in the list (the serial number should match), please make sure that the communication is not suppressed by a firewall.

If the desired SonoCollect 111 appears in the list, please configure a unique IP address that is available on the local network (see section: 3.1.1). Please contact your network administrator.

Using a direct connection between the PC and network following example configuration can be used if there are no other devices connected to the network:

PC	
IP	192.168.1.102
Network mask	255.255.255.0

SonoCollect 111	
IP	192.168.1.101
Network mask	255.255.255.0

Table 23: Example for IP address configuration

6.2.2 SonoCollect 111 cannot be accessed via website or FTP

If it is not possible to access the SonoCollect 111 with your browser, you should perform a Ping connection test (see section: 3.1.2) first. You might also log in via FTP (see section: 3.1.4) for testing purposes. If there is no network communication with the SonoCollect 111 in general, please have a look at section 6.2.1.

If a particular web service is not available, please check passwords and also firewall settings on your PC or in your network.

If the website appears but it is not possible to log in, please check whether you can log in with *admin* credentials. Please clean up browser cache and reload the website (e. g.: <**F5**> or <**CTRL + F5**>).

6.2.3 User does not have write access to the website

Please check if the user is configured for having write access (configuration in tab ***User***).

Write access is only available for one user at a time. If other users are simultaneously logged on SonoCollect 111 (tab ***User***, column Sessions), log them out first or wait until they are logged out. Please check whether any other session is active, e. g. on another browser page (tab).

Maybe a previous user session was not closed or logged out properly. Please wait for the connection time-out of approximately 30 seconds and then log in again.

It is recommended to always terminate a user session with the logout button.

Please log in with *admin* credentials too, and check for write access.

6.2.4 The web session is terminated unexpectedly

If the web session with the SonoCollect 111 is terminated unexpectedly, this might be due to a connection timeout. In case of a poor connection to the SonoCollect 111 (e. g.: via GPRS) timeouts can occur. The time-out parameter can manually be configured by the parameters *WEBCOM_TIMEOUT* (see section: 7).

A timeout may also occur if SonoCollect 111 is currently busy, the collection and transmission of meter data takes priority over web communication.

6.2.5 FTPS login fails

If the FTPS login is not working or there are no files in the listing, login with the *admin* credentials first. Make sure that the administrator password is correct. You may check this by logging in as *admin* on the website.

If the login was successful (e. g.: no error in communication log) but no file listing occurs, please activate the FTPS passive mode in your FTPS client. Please make also sure that the additional built-up FTPS data connection for the file transfer or the file listing is not suppressed by an existing firewall.

6.3 Error in meter reading

6.3.1 M-Bus meters cannot be read out

Check the cable between SonoCollect 111 and the meter and replace faulty cables. If SonoCollect 111 is working, measure the M-Bus voltage (approximately 36 V) between the two M-Bus lines at SonoCollect 111 and also at the meter.

Make sure that the M-Bus interface (**M-Bus mode**) on the website in the tab ***Configuration*** is enabled and the meters support configured search mode (primary or secondary).

Try searching for meters gradually by limiting address space or using a search mask (e. g.: **Primary start address, Secondary address mask**).

Special M-Bus requests can be configured and activated with parameters:

- M-Bus request mode
- M-Bus reset mode

Also try an additional scan using other M-Bus baud rates (300, 2400 or 9600) or increased timeouts.

If possible, remove other meters to eliminate a possible source of error.

If available, connect another M-Bus meter and repeat the communication test with this meter in order to locate the source of error.

Using the internal configuration of the SonoCollect 111, changing the parameter MBUS_*MAXRETRY* allows to increase also the number of retries (see section: 7).

6.3.2 wM-Bus meters cannot be read out

Check the variant (Type) of the SonoCollect 111. For supporting the wM-Bus communication a "W" shall be included (e. g.: "SonoCollect 111 E-WM-500" or "SonoCollect 111 E-WM-2-500").

Make sure that the wM-Bus interface (**wM-Bus mode**) is activated in the tab ***Configuration*** on the website and the appropriate mode is chosen (*T Mode* or *S Mode*).

Test the communication link at a short distance. Position the meter in a distance of approximately 1 m to SonoCollect 111.

Check also the internal configuration of the meter (e. g.: transmission mode, transmission interval).

If the meter is displayed tab ***Meters*** without values, it might be necessary to enter an encryption key (*column Key*) for that meter.

If another wM-Bus meter is available in the meter list, you may perform the communication test with the faulty meter and a different communication mode again.

6.3.3 Not all meters can be found

Work with search masks or limit the address space to perform a gradual scan of the M-Bus.

Also perform a scan via primary address as well as via secondary address. Not every meter supports both methods.

If possible, remove other meters to eliminate a possible source of error.

If available, connect another M-Bus meter and repeat the communication test with this meter in order to locate the source of error.

Increase the parameter MBUS_MAXRETRY (see section: 7) located in the file */app/chip.ini* from the default value. Meters that do not respond to every request will be found easier using this setting. In some cases the scan mode SECONDARYSCANREVERSE might also help. Perform a new scan.

6.3.4 M-Bus meters are found but do not have any data on the website

Some meters use incorrect secondary addresses. This is why these meters are not addressable for meter readouts. The parameter *MBUS_SELECTMASK* (see section: 7) of the file */app/chip.ini* makes it possible to mask parts of the secondary address. These parts of the secondary address will be replaced by a wild card. Especially the version field (entry: `MBUS_SELECTMASK=4`) is a frequent cause of this problem.

Start a new scan of the M-Bus.

6.3.5 wM-Bus meters are found but do not have any data on the website

In most cases this happens, if meter data is encrypted and the encryption key entered in the SonoCollect 111 is not valid. Check if the meter uses encryption and if the encryption key in tab ***Meters*** is correct.

6.3.6 Scanning takes a lot of time

Under certain circumstances performing a scan on the M-Bus can take a very long time (>1h).

Work with search masks or limit the address space to perform a gradual scan of the M-Bus.

Decrease the value of the parameter *MBUS_MAXRETRY* located in the file /app/chip.ini (see section: 7).

Make use of another scan mode in the tab ***Configuration*** (see section: 4.3) or set the parameter *MBUS_SCANMODE* located in the file */app/chip.ini* (see section: 7). Especially the reversed secondary scan (*SECONDARYSCANREVERSE*) can be used to avoid this problem.

Start a new scan of the M-Bus.

6.3.7 The device restarts occasionally while performing a scan

The device is equipped with an internal watchdog for safety reasons which shall prevent a denial of service of the device. If a scan takes a very long time a reboot of the device could be triggered by the watchdog. If an M-Bus scan takes a very long time it is useful to increment the value of the parameter *WATCHDOG_SCAN* located in the file */app/chip.ini* (see section: 7).

Start a new scan of the M-Bus.

Under certain circumstances there can be lots of collision on the M-Bus, for example if all meters are responding at the same time. These collisions and the resulting high current draw of the M-Bus slaves can trigger a reboot of the device in some exceptional cases. Work with search masks or limit the address space to perform a gradual scan of the M-Bus. If possible, try to split the bus and scan each bus segment separately.

Start a new scan of the M-Bus.

6.4 Error in logging data or in transmitting meter data

6.4.1 Meter data is not logged

Check, whether drive */ext* of the SonoCollect 111 is accessible via FTP or logging is activated in tab ***Configuration***. The meter and the meter values shall also be checked in column *Active* in tab ***Meter***.

6.4.2 Meter data is not transmitted to the server

Make sure that the parameters for the network communications are set correctly.
If possible, check the network communication to the server or to a test server using a network analyzer such as Wireshark.

Check if data can be transferred to the FTP server using a standard FTP client or the tool wget (when using XML TCP). Also try to set the FTP mode to *FTP client (active)* or *FTP client (passive)* in the tab ***Server***.
If errors could not be resolved, contact our customer support.

7 Advanced Features

7.1 Firmware update

In order to provide new features to the SonoCollect 111, there is the possibility to perform a software update.
The update consists of 2 steps: In the first step a firmware image file will be uploaded to the SonoCollect 111 and in the second step the update will be started at the command line interface (CLI). To perform an update flawlessly, the integrity of the firmware update file must be ensured.

- The device configuration remains untouched during an firmware update.
- The current version of RTOS and SonoCollect 111 software can be found in the tab ***Service*** on the website (see section: 4.7).

7.1.1 Upload of a firmware image file

First, the firmware image file will be uploaded to the device by using FTPS. Establish an FTPS connection as user *admin* and copy the firmware image file to the directory */ext/Upd/*. Possible older firmware images need to be deleted from this directory before uploading any new firmware image file. After successful upload, the FTPS session can be closed.

- Only one firmware image file is allowed to reside in the directory */ext/Upd/*. Possible older firmware images need to be deleted prior uploading any new files.
- The standard password upon delivery is contained at section 4.6.

7.1.2 Performing the firmware update

After the firmware image file has been successfully uploaded to the SonoCollect 111 the update needs to be started using the command line interface (CLI). Open an SSH session to the command line interface as user *admin*.

The following command starts the firmware update process:

```
solcmd update-system
```

There will be numerous outputs during the firmware update process. The update process will be complete, if no additional outputs happen on the command line. Performing an update usually takes around 1 minute of time.

Once the update has been processed, a reboot of the SonoCollect 111 is necessary. Reboot the device using the command line interface (see section 7.2) or use the push button **Reboot** at the tab ***Service*** (see section4.7).

The following command reboots the device:

```
solcmd reboot-system
```

It is not allowed to reboot the device by interrupting the power to the device! The internal file system can be damaged which could cause the device to malfunction.

After rebooting the SonoCollect 111, browser cache should be cleaned up and the web page should be reloaded (i. e.: key <**F5**> or <**CTRL + F5**>).

7.2 Command line interface (CLI)

Some administrative tasks (for e.g. performing a firmware update) need access to the command line interface (CLI) of the device.

This can be easily done by using the Net discover tool by right-clicking on the desired device and choose option **SSH** from the context menu.

The OpenSource SSH client PuTTY will be started and establishes a secure connection to the device. The command line interface will be ready for usage after entering the password of the *admin* user account.

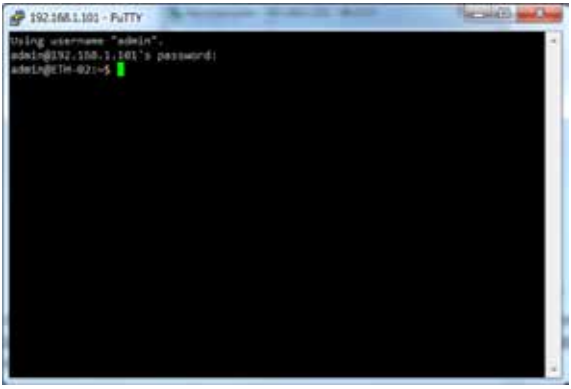


Figure 23: Command line interface after successful log in

An SSH session can be easily started using the context menu of the Net discover tool (see section 3.1).

The default password is contained in section 4.6.

It is also possible to use another standard SSH client instead of PuTTY.

Only trained personnel are allowed to access the console, since this may restrict the functionality of the device.

7.2.1 solcmd command reference

The different administrative tasks will be executed by the command line interface (CLI). To ensure system integrity and security all processes are controlled by the tool solcmd.

The tool solcmd expects a command as its first parameter.

Command	Description
format-partition-app	Formats the application partition.
format-partition-ext	Formats the log partition.
config-partitions	Resets all user permissions on partitions APP and EXT.
restart-eth0	Restarts the LAN network interface.
restart-server	Restarts all services (FTPS, SSH, Network discovery service)
regenerate-server-keys	Generates new device keys.
start-solapp	Starts the main application.
stop-solapp	Stops the main application.
update-rtc	Writes the system time to the hardware real time clock.
update-system	Performs a firmware update. The firmware image file needs to reside in the directory /ext/Upd/.
reboot-system	Reboots the device.

Table 24: solcmd command reference

7.3 Administrative FTP connection

Exchanging data and files with the SonoCollect 111 is directly possible via the internal FTPS server.
An ordinary FTPS client can access the SonoCollect 111 using the appropriate IP and log-in credentials.

An FTP connection can be established via the context menu of the Net discover tool (see section: 3.1.4).

The default password is contained in section 4.6.

After logging in with *admin* credentials, two directories are available: Directory */app* contains the system files and directory */ext* contains the log files and firmware update files.

The additional FTP user only has access to the directory */ext/Log/*.

Only trained personnel is allowed to change the files and the file system in other directories than / ext/log, since this may restrict the functionality of the device.

In the directory */ext/Log/*, available log data can be downloaded or deleted. If the storage capacity is exhausted, older log data is deleted automatically.

Configuration files can be directly changed, saved or restored in directoy */app* (see section: 7.4).

7.4 Configuration files

There are different configuration files located in directory /app that serves as configuration files of the device.

⚠ Only trained personnel is allowed to change the files and the file system of the SonoCollect 111, since this may restrict the functionality of the device.

⚠ For editing the configuration files please use an UTF8-capable editor otherwise there could be errors when using special characters. Since there is no byte order mark (BOM) included in the configuration file your editor might need to be manually set to UTF8.

➡ We recommend using the editor Notepad++
(see http://notepad-plus-plus.org/)

7.4.1 System configuration file

The file */app/chip.ini* is the main configuration file and contains the general system parameters.
The parameters are arranged in different groups. Parameters not explicitly configured in *chip.ini,* are set to their default values.

ℹ Manual changes to the file chip.ini don't take effect until restarting SonoCollect 111.

✓ The file chip.ini may be transferred to another SonoCollect 111 via FTPS with respect to the network configuration (e. g.: different IP address).

Parameter*	Meaning	Valid range	Standard*
Group [IP]			
ADDRESS	IP address of device	0.0.0.0 - 255.255.255.255	192.168.1.101
NETMASK	Subnet mask of device	0.0.0.0 - 255.255.255.255	255.255.255.0
GATEWAY	IP address of device	0.0.0.0 - 255.255.255.255	192.168.1.254
DHCP	Enabling DHCP look-up	0, 1	0
TCPIPMEM	Memory for the webserver in kB	60 -1000	280
Group [DEVICE]			
NAME	Name of device shown in CHIPtool	Text, max. 20 characters	SonoCollect_111
Group [CONFIG]			
FASTRESCAN_TIME	Update interval for temporary wM-Bus meter list (new incoming meters, in s)	1 - 4294967295	60
FTP_ENABLE	Enables FTP upload via WAN interface (Push)		0
FTP_FILEBASENAME	Base file name for FTP upload	Text, max. 40 characters	SonoCollect_111
FTP_IP	Address of remote FTP server	Text, max. 40 characters	Not set
FTP_LOCALIP	External local IP (used for FTP passive mode)	0.0.0.0 - 255.255.255.255	Internal IP
FTP_PASS	Password for remote FTP server	Text, max. 40 characters	Not set
FTP_PASSIVE	FTP passive mode	0, 1	1

Parameter*	Meaning	Valid range	Standard*
FTP_PATH	Directory of the remote FTP server for the log data	Text, max. 40 characters	Not set
FTP_PORT	Port of remote FTP server	0 - 65535	21
FTP_TIMEOUTSCALE	Scale factor for the FTP client timeout (a value of 2 doubles all timeouts)	1-20	1
FTP_USER	User name of remote FTP server	Text, max. 40 characters	Not set
MBUS_BAUDRATE	Baud rate for serial M-Bus communication		2400
MBUS_DATABITS	Data bits for serial M-Bus communication	7, 8	8
MBUS_DEBUGOUT	Enables output of raw data to STDOUT	0, 1	0
MBUS_DISABLEDE-CRYPTION	Disables the decryption of M-Bus messages (status field)	0, 1	0
MBUS_ENABLE	Enables M-Bus interface	0, 1	1
MBUS_FIRSTFCB-BIT_NEG	Starts the meter request with a specific value for the FCB bit (0: First FCB bit is set, 1: First FCB bit is not set)	0, 1	0
MBUS_FREEZESTOR-AGENUM	Storage number for meter data on Freeze command	0 - 4294967295	0
MBUS_FULLTIMEOUT	Maximum timeout for readout of a meter (in ms)	0 - 65535	10000
MBUS_IDLETIMEOUT	Idle timeout for detection of the end of a data transmission of a meter (in ms)	0 - 65535	100
MBUS_MAXMULTI-PAGE	Limits number of pages for multipage request	0 - 255	10
MBUS_ MAXPRIMAR-YADDRESS	Upper limit of address range for M-Bus primary scan	0 - 250	250
MBUS_MAXRETRY	Number of retries for an M-Bus or multipage request	0 - 255	3
MBUS_ MINPRIMARY-ADDRESS	Lower limit of address range for M-Bus primary scan	0 - 250	0
MBUS_PARITY	M -Bus parity: 0: no, 1: odd, 2: even, 3: mark, 4: space	0 - 4	2
MBUS_RAWLOGEN-ABLE	Enables raw data log to drive /ext	0, 1	0
MBUS_REQUEST-MODE	Defines request sequence for read-out	DEFAULT, EXT, ONLY, FREEZE	DEFAULT

Parameter*	Meaning	Valid range	Standard*
MBUS_RESETMODE	Reset mode: 0: NKE after select, 1: NKE prior to select 2: No reset 3: NKE sent to FD and FF prior communication 4: NKE sent to FD, Application Reset sent to FF and NKE sent to FF prior to communication	0 - 4	0
MBUS_SCANMODE	Scan mode for M-Bus	PRIMARYSCAN, SECONDARYSCAN, SECONDARYSCAN-ALLOC, SECONDARY-SCANREVERSE, SECONDARYSCAN-ALLOCREVERSE	SECONDARY-SCAN
MBUS_ SECMASK-MANUFACTURER	Predefined manufacturer ID for secondary scan	Exactly 4 characters, 0-9 each or 0xFFFF	0xFFFF
MBUS_SECMASK-MEDIUM	Predefined medium ID for secondary scan	Exactly 2 characters, 0-9 each or 0xFFFF	0xFF
MBUS_SECMASK-SERIAL	Mask for serial number of meters for secondary scan	Exactly 8 characters, 0-9 or 0xF each	0xFFFFFFFF
MBUS_SECMASK-VERSION	Predefined version number for secondary scan	Exactly 2 characters, 0-9 each or 0xFFFF	0xFF
MBUS_SELECTMASK	Disables parts of secondary address for exact selection, wildcards are used instead (set via bit mask): +1: Serial number +2: Manufacturer +4: Version +8: Medium	0 - 15,	0
MBUS_SMLENEABLE	Enables processing of SML protocol data within M-Bus frames	0, 1	0
MBUS_STOPBITS	Stop bits for serial M-Bus communication	1, 2	1
MBUS_TIMEOUT	Timeout for M-Bus (in ms)	0 - 65535	2000
MBUS_WAKEUP-ENABLE	Enables specific wake-up request	0, 1	0
METER_DELAY	Delays a readout N seconds once the read-out is due (in seconds).	0 - 4294967295	0
METER_ MAXALL-VALUECOUNT	Limits the total number of meter values (0: no limit)	0 - 65535	0
METER_ MAXDEVICE-COUNT	Limits the number of meters (0: no limit)	0 - 65535	80
METER_ MAXVALUE-COUNT	Limits the number of meter values per meter (0: no limit)	0 65535	25
METER_RETRY-DIVIDER	Set the divider for the try timeout (according to configured readout interval)	0 - 65535	0

Parameter*	Meaning	Valid range	Standard*
METER_STAT_CONFIG	Path for meter configuration file	Text, max. 40 characters	/app/device_handle.cfg
METER_TIME	Interval for meter read-out (in s), huge amount of data may arise on short cycle times and having many meters	10 - 4294967295	900
MUC_CONFIG_VER	Version of configuration file	1 - 5	5 (explicit)
MUC_CSVLOG_ENABLE	Enables logging CSV data to drive /ext	0, 1	0
MUC_LOG	Sets the level for output of system data to STDOUT	DEFAULT, NONE, ERRORONLY, ALL	DEFAULT
MUC_METER-DESCRIPTION ENABLEFLAGS	Enable flags for displaying the description field on the meter list Bit 0: Description Bit 1: Storage-Number, Tariff, Value Type Bit 2: DIF/VIF raw data Bit 3: Complete raw data of the value entry	0 - 16	1
MUC_PROTOCOL_VER	Protocol version for CSV and XML data	0 - 5	3
MUC_SCALEVALUES	Scales the meters values within CSV and XML files	0, 1	0
MUC_SETDEVICES	Enables writing data to meters (if supported)	S0, ALL, NONE	S0
MUC_ SHOWTIME-STAMPENTRIES	Explicit display of timestamps from the meter	0, 1	0
MUC_SHOWVENDOR-RAWDATA	Explicit enumeration of vendor-specific data as a meter value	0, 1	0
MUC_SHOWVENDOR-RAWDATAWEB	Display of binary data at the meter list (vendor-specific and data containers)	0, 1	0
MUC_USE_FREEZE	Enables using the Freeze command prior to meter read-out	0, 1	0
REPORT_DELAY	Delay before starting a new data report according to the configured report cycle time (in minutes)	0 - 4294967295	0
REPORT_RANDOM-DELAY	Additional random delay according to the configured report cycle interval (in min), Value 0: 12,5% random delay of report cycle interval	0 - 4294967295	0
REPORT_SIZELIMIT	Maximum file size of a report log file (in Byte)	1 - 4294967295	500000
REPORT_TIME	Interval for reporting data via WAN interface (in min)	1 - 4294967295	15
SHOW_KEYS	Enables displaying encryption keys on the website	0, 1	1

Parameter*	Meaning	Valid range	Standard*
SMTP_ENABLE	Enables using SMTP on WAN interface (email)	0, 1	0
SMTP_FROM-ADDRESS	Sender address of email for SMTP	Text, max. 40 characters	Not set
SMTP_IP	Address of SMTP server	Text, max. 40 characters	Not set
SMTP_PASSWORD	Password for SMTP server	Text, max. 40 characters	Not set
SMTP_SUBJECT-BASENAME	Base name for the email subject	Text, max. 40 characters	SonoCollect 111
SMTP_TIMEOUTS-CALE	Scale factor for the SMTP timeout parameters (a value of 2 doubles all timeouts)	1 20	1
SMTP_TOADDRESS	Receiver address of email for SMTP	Text, max. 40 characters	Not set
SMTP_USER	User name for SMTP server	Text, max. 40 characters	Not set
SNTP_ENABLE	Enables obtaining system time via SNTP	0, 1	1
SNTP_MAXTIMEOUT	Maximum timeout for time retrieval (explicit, in ms)	1- 4294967295	93600
SNTP_MINTIMEOUT	Minimum timeout for time retrieval (during data transport, in ms)	1- 4294967295	79200
SNTP_REQTIMEOUT	Timeout for the whole SNTP request (in ms)	1 - 65535	30000
SNTPIP	Address of time server (SNTP)	Text, max. 40 characters	ptbtime1. ptb.de
TLS_CLI_CERT_FILE	Path to client certificate (RFC3280)	Text, max. 40 characters	/app/clicert. pem
TLS_CLI_KEY_FILE	Path to client key (RFC 5958)	Text, max. 40 characters	/app/clikey. pem
TLS_DEBUGOUT	Debug output enable	0, 1	0
TLS_DISCONNECT-TIMEOUT	Socket timeout for termination of connections (in seconds)	1 - 1000	60
TLS_ENABLE	Activates the TLS interface		
TLS_IP	IP address of remote TLS server	Text, max. 40 characters	Not set
TLS_PORT	TCP port of remote TLS server	0 – 65535	443
TLS_ROOT_CERT_ FILE	Path to root certificate (RFC4945)	Text, max. 40 character	/app/cacert. pem
TLS_SITE	HTTP path for the HTTP request, if empty no HTTP header will be sent	Text, max. 40 characters	Not set
TLS_TIMEOUT	Timeout for a TLS request (in ms)	1- 65535	30000
WATCHDOG_IDLE	Timeout for watchdog during idle state (in s)	1 - 4294967295	120
WATCHDOG_ PROCESS	Timeout for watchdog during busy state (in s)	1 - 4294967295	900

Parameter*	Meaning	Valid range	Standard*
WATCHDOG_ READOUT	Timeout for watchdog during read-out (in s)	1- 4294967295	4 times the read-out cycle, at least: WATCHDOG_ PROCESS
WATCHDOG_SCAN	Timeout for watchdog during scan process (in s)	1- 4294967295	1800
WEBCOM_TIMEOUT	Timeout for a web session, user is logged out automatically after that period (in ms)	1 - 4294967295	30000
WMBUS_CACHESIZE	wM-Bus Cache size for saving received wM-Bus frames	1 - 500	500
WMBUS_CACHETIME-OUT	Retention time for received wM-Bus packets in queue (in s, 0: no timeout)	0 - 4294967295	0
WMBUS_DEBUGOUT	Enables output of raw data to syslog	0, 1	0
WMBUS_ENABLE	Enables wM-Bus interface	0, 1	1
WMBUS_MODE	Mode of wM-Bus interface	R2_OTHER_REQ, S2_REQ, T1_OTHER_REQ, T2_OTHER_REQ	T2_OTH-ER_REQ
WMBUS_RAWLOG-ENABLE	Enables raw data log to drive /ext	0, 1	0
WMBUS_SMLENE-BALE	Enables processing of SML data within wM-Bus frames	0, 1	0
WMBUS2_DEBUG-OUT	Enables output of raw data to syslog of 2nd wM-Bus interface	0, 1	0
WMBUS2_MODE	Mode of 2nd wM-Bus interface	R2_OTHER_REQ, S2_REQ, T1_OTHER_REQ, T2_OTHER_REQ	T2_OTH-ER_REQ
XMLTOTCP_DEBUG-OUT	Debug output of sent data	0, 1	0
XMLTOTCP_DISCON-NECTTIMEOUT	Socket timeout for termination of connections (in seconds)	1 - 1000	60
XMLTOTCP_ENABLE	Enables transferring XML data via TCP interface	0, 1	0
XMLTOTCP_IP	Address of remote TCP server (if empty, device acts as server)	Text, max. 40 characters	Not set
XMLTOTCP_PORT	Port of remote TCP server	0 - 65535	0
XMLTOTCP_SITE	Path for HTTP request, in case of an empty string no HTTP header is transmitted (pure TCP)	Text, max. 40 characters	Not set
XMLTOTCP_TIMEOUT	Timeout for TCP connection (in ms, 0: no timeout)	0 - 65535	0

**Names of configuration parameters or values are wrapped without a hyphen.*

Table 25: Parameters in file chip.ini

Additional parameters are provided by the RTOS. An overview can be found at: http://www.beck-ipc.com/files/api/scxxx/config.htm

7.4.2 Meter configuration file

Meter configuration is stored in file */app/device_handle.cfg*. If this file does not exist, it might be created or changed using the tab ***Meter*** on the website. wM-Bus meters that were detected during the normal operation will only be stored during a scanning process or by manually saving the configuration. Only entries which differ from the default values are stored (except entry version).

When changing the meter configuration, all files in folder /ext/tmp shall be deleted manually (if any).

The file device_handle.cfg must be saved as an UTF8 coded XML file.

Manual changes to the file device_handle.cfg don't take effect until restarting the SonoCollect 111.

The file device_handle.cfg may be transferred to another SonoCollect 111 via FTP.

The file uses XML format has following structure:

Parent element	Element	Meaning	Standard	Example
	root	Root element	-	-
root	version	Version of XML specification	-	0x06
root	meter	Parent element for each meter	-	-
meter	interface	Interface to meter		M-Bus
meter	serial	Serial number of meter, leading "0x"	0xFFFFFFFF	0x30101198
meter	manufacturer	Manufacturer of meter (abbreviation)	Not set	DFS
meter	version	Version of meter	Not set	0x01
meter	medium	Medium of meter, according to column 2 in Table 16: Medium types in section 5.3.1	Not set	Heat (outlet)
meter	primaryaddress	Primary address of meter (M-Bus or S0)	0	0x03
meter	addressmode	Used mode for addressing 0: Secondary 1: Primary	0	900
meter	readoutcycle	Specific read-out interval (in s)	0	900
meter	maxvaluecount	Limit for number of meter values	0	12
meter	encryptionkey	Encryption key for meter, e. g.: AES for wM-Bus	Not set, 0	0x82 0xB0 0x55 0x11 0x91 0xF5 0x1D 0x66 0xEF 0xCD 0xAB 0x89 0x67 0x45 0x23 0x01
meter	active	Enables logging of meter data or transmission via WAN interface	1	1
meter	rssi	Received Signal Strength Indicator at last reception (wM-Bus)	0	123
meter	register	Register assignment (e. g.: Modbus TCP)	0	250
meter	user	User specific text (according to column User label at tab Meter)	Not set	OG-1-Re

Parent element	Element	Meaning	Standard	Example
meter	value	Parent element for each value of the meter	-	-
value	description	Description of value, according to column 2 of Table 17: Measurement types in section 5.3.1	None	Energy
value	unit	Unit of value, according to column 2 of Table 18: Units in section 5.3.1	None	Wh
value	encodetype	Coding of value	NODATA	INT32
value	scale	Scale factor (scientific notation)	1e0	1e-3
value	valuetype	Type of value: instantaneous, maximum, minimum, errorgate	instantaneous,	instantaneous
value	storagenum	Storage number of value	0	2
value	tariff	Tariff information for value	0	3
value	confdata	Generic data, OBIS code for value (X-X:X-.X.X*X; X=0..255; according to column OBIS-ID in tab Meter)	Not set	0x01 0x00 0x01 0x08 0x00 0xFF
value	active	Enables logging of value data or transmission via WAN interface	1	1
value	register	Register assignment (e. g.: Modbus TCP)	0	250
value	user	User specific text (according to column User label in tab Meter)	Not set	OG-1-Re

Table 26: Structure of file device_handle.cfg

8 Application examples of the SonoCollect 111

The following section will refer to examples how to use the SonoCollect 111 in certain applications.

For using the SonoCollect 111 the network and meter interfaces need to be configured according to your application and your facility (see section: 3).

8.1 Local application without a control system

The SonoCollect 111 can be used for local acquisition of meter data.

No control system is needed for local acquisition of meter data. WAN- and GPRS-services can therefore be deactivated (tab ***Server***).

In this particular use case the SonoCollect 111 will be accessed by a PC on the same physical network segment. Actual meter values can be monitored using the tab ***Meters*** on the integrated website. CSV files can be accessed via FTP if CSV logging has been activated. A standard FTP client can be used to access the files via FTP (see section: 5.2.1).

User accounts with appropriate access rights can be configured to allow read-only access to the meter list (see section: 4.6).

8.2 Remote application without a control system

This use case corresponds to the one described in section 8.1. The main difference is up to the network infrastructure that is located between the PC and the SonoCollect 111 (e. g.: Internet). The PC and SonoCollect 111 are located within the same logical network instead of a physical one.

- ✓ Router and firewalls need to be configured in a way that access from an external network is allowed to your site-internal network. Please ask your network administrator on how to configure the routing, port forwarding, packet filters and firewalls for each service of the SonoCollect 111 (e. g.: FTP, HTTP and Telnet).

If the network has been configured correctly, access to the SonoCollect 111 is identical to the local application.

8.3 Remote application with email push

The SonoCollect 111 is able to send meter data to any email address configured. The meter data is formatted as XML data and can be easily processed by other systems (see section: 5.2.4).

- ✓ For sending emails with the SonoCollect 111, the site-internal network (e. g.: firewall, router) needs to be configured properly. Please ask your local network administrator.

8.4 Remote application with FTP upload

Instead of downloading the CSV data from the built-in FTP server of the SonoCollect 111 it is also possible that the SonoCollect 111 uploads these data on any remote FTP server autonomously. This enables easy accessing and processing of the meter data in an automated way (see section: 5.2.1).

- ✓ For uploading data via FTP, the site-internal network (e. g.: firewall, router) as well as the receiving FTP server need to be configured properly. Please ask your local network administrator.

8.5 Remote application with FTPS upload

Instead of uploading the CSV data with the insecure FTP protocol, it is also possible to upload this data on any TLS-enabled remote FTP server autonomously.

Client key and server certificate as well as the CA certificate are needed to be placed on the /app partition of the device to enable TLS-secured FTP connections.

- ℹ For further details on how to enable TLS-secured FTP connections please see section 5.2.1.
- ✓ For uploading data via FTPS, the site-internal network (e. g.: firewall, router) as well as the receiving FTPS server need to be configured properly. Please ask your local network administrator.

8.6 Remote application with XML/HTTP push

For direct connection of database systems the transmission of XML data over HTTP is a convenient method. Database servers are able to directly receive the data (see section 5.2.3).

- ✓ For transmitting data via XML/HTTP, the site-internal network (e. g.: firewall, router) as well as the receiving database server need to be configured properly. Please ask your local network administrator.

9 Technical data

9.1 General characteristics

9.1.1 Physical dimensions / Weight

The housing has following dimensions (without antenna):

- Width: 53 mm
- Height: 89 mm
- Depth: 61mm (without SMA antenna connectors)
- Weight: approx. 160 g

9.1.2 Installation

The device is intended for installation in a switch cabinet:

- Operating temperature: 0 – 50 °C
- Humidity: 10 – 95 %relH
- Protection class: IP20
- DIN rail mounting (DIN rail 35 mm)

9.2 Electrical characteristics

9.2.1 Power supply

The SonoCollect 111 needs an external DC power supply:

- Input voltage: 24 V(DC), +/- 5 %, screw clamps (≤2,5 mm^2)
- Power consumption: 2 W (idle state), max. 40 W (E-M-125/250/500)
- Safety: Reverse voltage protection, over voltage protection (transients)

9.2.2 Meter interfaces

There are various meter interfaces at the device (pin assignment according to section 0):

- M-Bus: Compliant to EN 13757-2, max. 125 unit loads (UL) for the SonoCollect 111 E-M-125, max. 250 unit loads (UL) for the SonoCollect 111 E-M-250, max. 500 unit loads (UL) for the SonoCollect 111 E-M-500, Uspace = 40 V, Umark = 24 V, screw clamps (≤2,5 mm^2)
- wM-BUS: Compliant to EN 13757-4, 169/433/868 MHz, modes S and T, integrated antenna

9.2.3 Communication interfaces

There are various communication interfaces at the device (pin assignment according to section 0):

- Ethernet: Compliant to IEEE 802.3, 10/100 Base TX, RJ45 connector

9.3 Further characteristics

9.3.1 Processing unit

There is a microprocessor within the device:

- Core: ARM9™ architecture, 454 MHz clock frequency
- Memory: 128 MB RAM, 4 GB internal eMMC flash memory
- Operating system: GNU/Linux
- Integrated RTC: Power reserve for up to 7 days

10 Disclaimer

Professional Use Only

This product is not subject to the UK PSTI regulation, as it is for supply to and use only by professionals with the necessary expertise and qualifications. Any misuse or improper handling may result in unintended consequences.

By purchasing or using this product, you acknowledge and accept the professional-use-only nature of its application. Danfoss does not assume any liability for damages, injuries, or adverse consequences ("damage") resulting from the incorrect or improper use of the product and you agree to indemnify Danfoss for any such damage resulting from your incorrect or improper use of the product.

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