

Operating Guide

SonoCollect 112

Data Concentrator for Smart Metering



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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

This manual, including all figures and illustrations, is copyright protected. Any further use of this manual by third parties that violate pertinent copyright provisions is prohibited. Reproduction, translation, electronic and photo technical filing/archiving (e. g.: photocopying) as well as any amendments require the written consent of Danfoss.

Non-observance will involve the right to assert damage claims.

Danfoss reserves the right to provide for any alterations or modifications that serve to increase the efficiency of technical progress. All rights arising from the granting of patents or from the legal protection of utility patents are owned by Danfoss. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

1.2.2 Personnel qualifications

The 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

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. Danfoss will be exempted from any liability in case of changes in hardware or software as well as to non-compliant usage of components.

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 information:** 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 are 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

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.


Installation of the components in a corresponding housing.


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)
DLDE RS	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
OMS	Open Metering System
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
SSL	Secure Socket Layer
TCP	Transmission Control Protocol
TLS	Transport Layer Security
UTC	Coordinated Universal Time
WAN	Wide Area Network
wM Bus	Wireless Meter-Bus (EN 13757, part 3 - 4)
XML	eXtensible Markup Language

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 network (WAN) connection to the utility, metering service company or meter operator, and also has a local interface for a client's PC.

SonoCollect 112 is a variant of such a communication module. It is separated from the meter and function as an interface for data transmission. SonoCollect 112 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.

SonoCollect 112 is compliant with the specifications of the FNN, version 1.0.

The device comes in a 4U enclosure (modules) and is intended for DIN rail mounting (DIN rail 35 mm).

2.1 Device variants

SonoCollect 112 is a modular controller. As a result, it is available in different variants and flexible to the needs of each property and customer.

Variant	Meter interfaces			Communication interfaces			Output	Order no.
	M Bus	wM Bus	S0	Ethernet	WAN	RS 485	Digital 24 V	
SonoCollect 112 E-WM-80	X	X	3	X	-	X	1	014U1603
SonoCollect 112 G-WM-80	X	X	3	X	X (LTE)	X	1	014U1605

Table 3: Available variants

The RS 485 interface can be used both, for the communication and for reading out meters.

2.2 Connectors

The various interfaces of the SonoCollect 112 are available on different sides of the device. The following figure shows the different device variants:



Figure 1a: SonoCollect 112 E-WM-80



Figure 1b: SonoCollect 112 G-WM-80

2.2 Connectors (continuous)

The SonoCollect 112 is equipped with following connectors:

Connector	Marking	Pinning	Remark
Power supply	N, L	N: neutral conductor L: phase conductor	230 VAC (90 - 260 VAC) 50 Hz
Ethernet interface	Ethernet	1: TX+ 2: TX- 3: RX+ 4: 5: 6: RX- 7: 8:	According to EIA/TIA-568A/B
RS 485	RS+, RS-	RS+: positive bus line RS-: negative bus line	Screw clamp Cross sectional area 2.5 mm ²
WAN antenna	WAN	Inner: RF Outer: reference ground	SMA only for GSM/4G version (G-WM-80)
Wireless M Bus antenna	OMS	Inner: RF Outer: reference ground	SMA
M Bus connector	MB+, MB-	MB+: positive bus line MB-: negative bus line	Screw clamp Cross sectional area 2.5 mm ²
S0 input	Sx+, Sx- (x = 1...3)	Sx+: impulse input Sx-: reference ground	Screw clamp Cross sectional area 2.5 mm ² Voltage range 24 VDC No galvanic isolation
Digital Output	DO+, Do-	DO+: output DO-: reference ground	Screw clamp Cross sectional area 2.5 mm ² 24 VDC, 100 mA No galvanic isolation

Table 4: Connectors and interfaces

2.3 State LEDs

Depending on the version, the SonoCollect 112 has up to 5 state LEDs. These indicate the following states:

LED	Color	Description
Power	green	Power supply active
ACT (Active)	off green	Idle state Reading out meters
ST (State)	off green orange (flashing) orange red	Software is not started Main program is running Scanning for meters Initialization is running Error
Mode*	off red (flashing) red yellow green	No connection Data connection initializing Low received field strength Average received field strength Good received field strength
Link*	off green yellow white	WAN module off WAN module on (no data connection) WAN module on + data connection (idle state) WAN module on + data connection (data transfer active)

*only available in variant with WAN

Table 5: State LEDs

In normal state, the LED State is green and the LED Active will blink green temporarily during the readout. The LED Mode shows the received signal strength of an active WAN connection during dial-in. The LED Link is yellow/white on an active WAN connection.

3 Bringing into service

The SonoCollect 112 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 112.

3.1 Network configuration and first steps

The SonoCollect 112 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 112 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.

For intuitive operation, a configuration website is available on the device, which can be called up via the IP of the SonoCollect 112 in a browser.

➡ Website on the SonoCollect 112, i.e.: <http://192.168.1.101/>

ℹ If several devices are used under the same IP (e.g. commissioning) or different software versions (e.g. update), you should always clear the cache of the browser (e.g. Ctrl+F5) to avoid an inconsistent version of the website.

The following webpage is shown at the web browser window (see section 4.1):

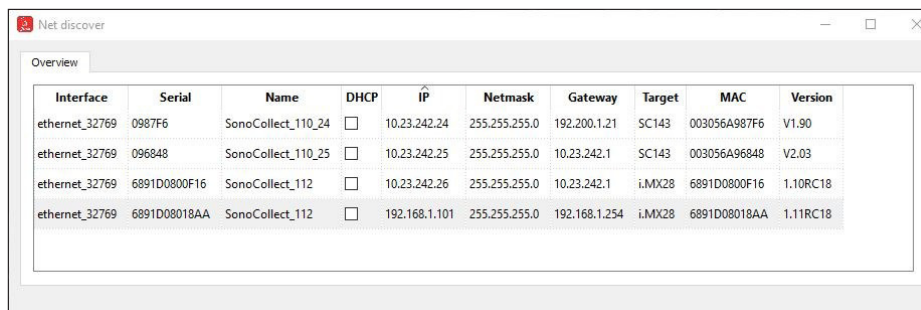


Figure 2

3.2 Net discover tool

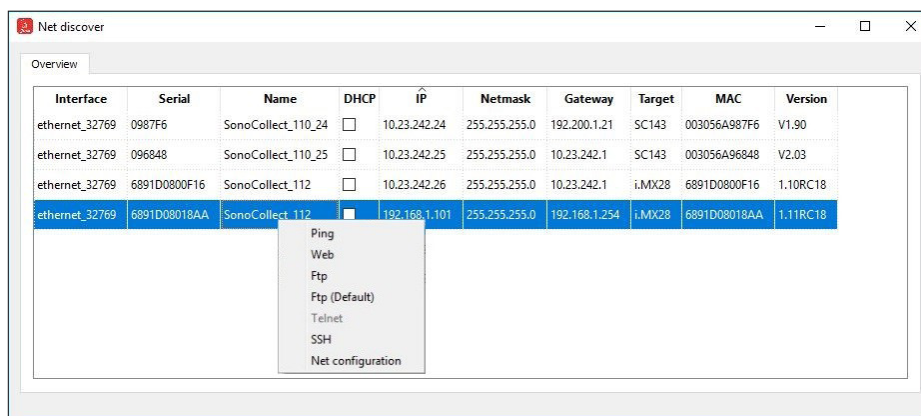
If it is not possible to establish a direct connection with the set network configuration or you cannot connect for any other reason, we recommend using the Net discover tool, which can be obtained on request from our support team.

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 FTPS access. Some important features are described in detail in the subsequent sections.



Interface	Serial	Name	DHCP	IP	Netmask	Gateway	Target	MAC	Version
ethernet_32769	0987F6	SonoCollect_110_24	<input type="checkbox"/>	10.23.242.24	255.255.255.0	192.200.1.21	SC143	003056A987F6	V1.90
ethernet_32769	096848	SonoCollect_110_25	<input type="checkbox"/>	10.23.242.25	255.255.255.0	10.23.242.1	SC143	003056A96848	V2.03
ethernet_32769	6891D0800F16	SonoCollect_112	<input type="checkbox"/>	10.23.242.26	255.255.255.0	10.23.242.1	i.MX28	6891D0800F16	1.10RC18
ethernet_32769	6891D08018AA	SonoCollect_112	<input type="checkbox"/>	192.168.1.101	255.255.255.0	192.168.1.254	i.MX28	6891D08018AA	1.11RC18

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



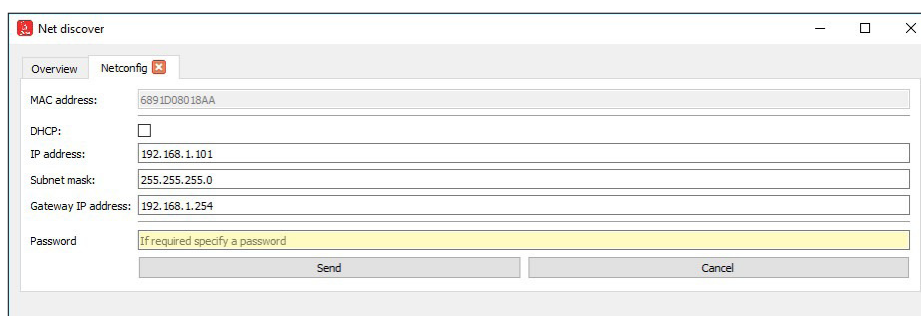
Interface	Serial	Name	DHCP	IP	Netmask	Gateway	Target	MAC	Version
ethernet_32769	0987F6	SonoCollect_110_24	<input type="checkbox"/>	10.23.242.24	255.255.255.0	192.200.1.21	SC143	003056A987F6	V1.90
ethernet_32769	096848	SonoCollect_110_25	<input type="checkbox"/>	10.23.242.25	255.255.255.0	10.23.242.1	SC143	003056A96848	V2.03
ethernet_32769	6891D0800F16	SonoCollect_112	<input type="checkbox"/>	10.23.242.26	255.255.255.0	10.23.242.1	i.MX28	6891D0800F16	1.10RC18
ethernet_32769	6891D08018AA	SonoCollect_112	<input type="checkbox"/>	192.168.1.101	255.255.255.0	192.168.1.254	i.MX28	6891D08018AA	1.11RC18

- Ping
- Web
- Ftp
- Ftp (Default)
- Telnet
- SSH
- Net configuration

Figure 4: Main window of the Net discover tool with right-click bar

3.2.1 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.



Netconfig

MAC address: 6891D08018AA

DHCP: ☐

IP address: 192.168.1.101

Subnet mask: 255.255.255.0

Gateway IP address: 192.168.1.254

Password: If required specify a password

Send Cancel

Figure 5: 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**.

3.2.1 Network parameters (continuous)

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 112. The MAC address of the device will be displayed at the column MAC at the main window of the Net discover tool and on the Web page in the tab General in the Serial number field.

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 SonoCollect 112 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 SonoCollect 112 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.

3.2.2 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.

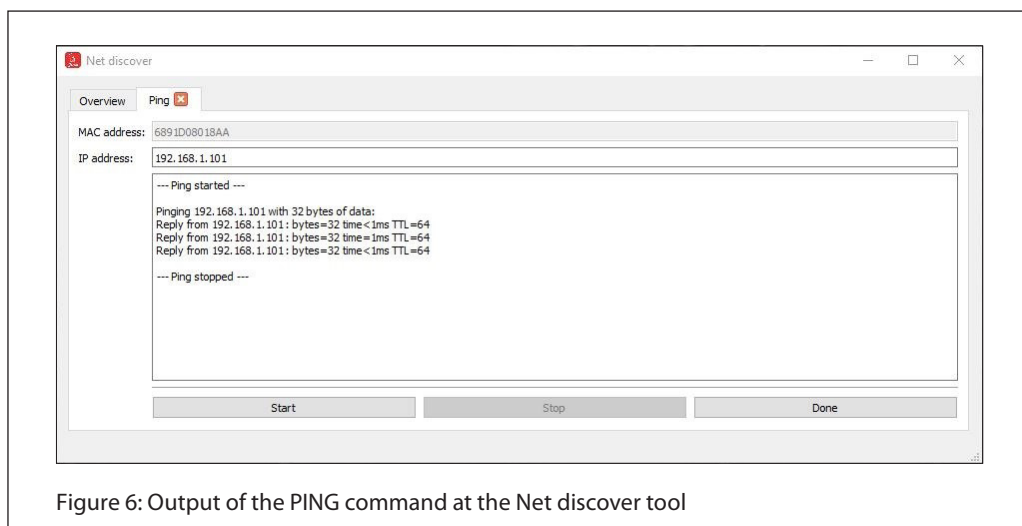


Figure 6: Output of the PING command at the Net discover tool

By using standard ICMP ping request packets, it is tested if the SonoCollect 112 is responding correctly:

Example output:

Reply from 192.168.1.101: Bytes=32 Time<1ms TTL=64

3.2.3 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 112 can be found at section 4.

3.2.4 File access (FTPS)

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

When using the context menu entry FTP, the WinSCP program will require entering a username and a password. The context menu entry FTP (default) uses the username and password to the user admin's standard credentials (see session 4.7). This ensures a quick and uncomplicated way to bring the SonoCollect 112 into service.

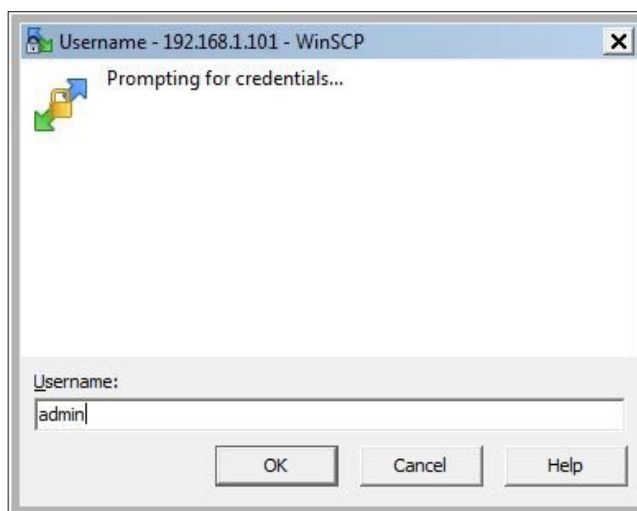


Figure 7: Entering the username at the FTPS log in

When connecting the PC workstation to the device for the first time, you may need to confirm the device certificate so that the correct encrypted connection can be established. This is done by clicking on the push button **Yes**.

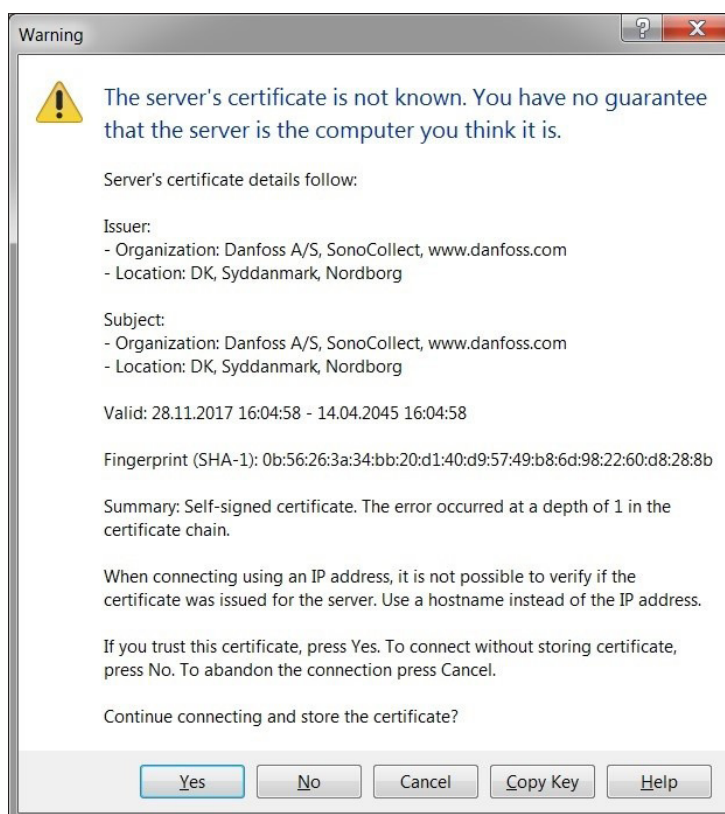


Figure 8: Confirming the device's certificate

3.2.4 File access (FTPS) (continuous)

After correct log in to the SonoCollect 112, 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 be used to manipulate files. Drag & drop in combination with the Windows Explorer is also supported.

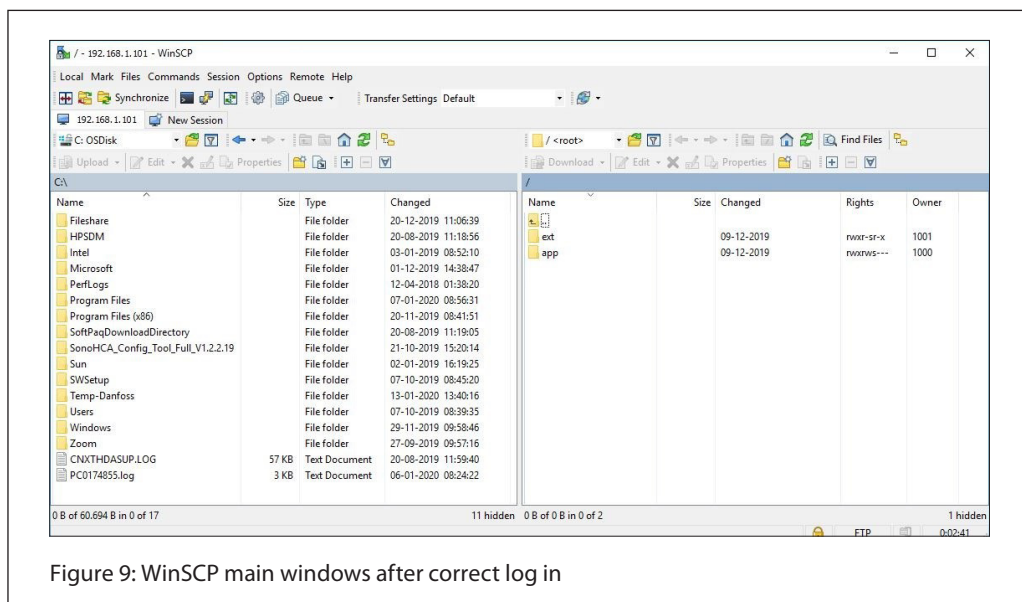




Figure 9: WinSCP main windows after correct log in


-  The standard log in credentials are contained in section 4.7.
-  Only trained personnel are allowed to change the files and the file system, since this may restrict the functionality of the device.

4 Configuration

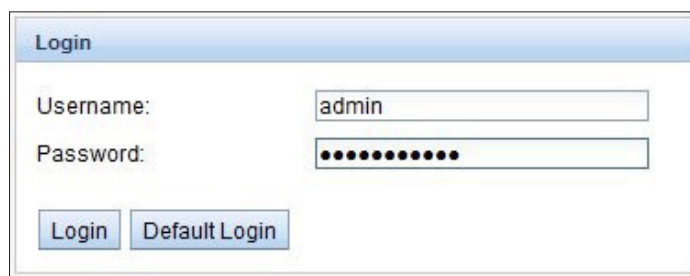
The SonoCollect 112 is configured via its internal web server with website. In net discover tool, you can right-click on the device with the selection "web". Alternatively, configuration can be done manually by using the configuration files (see section: 8)

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 (without entry password "web"). If the standard user "web" has been deactivated in 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 4.7.



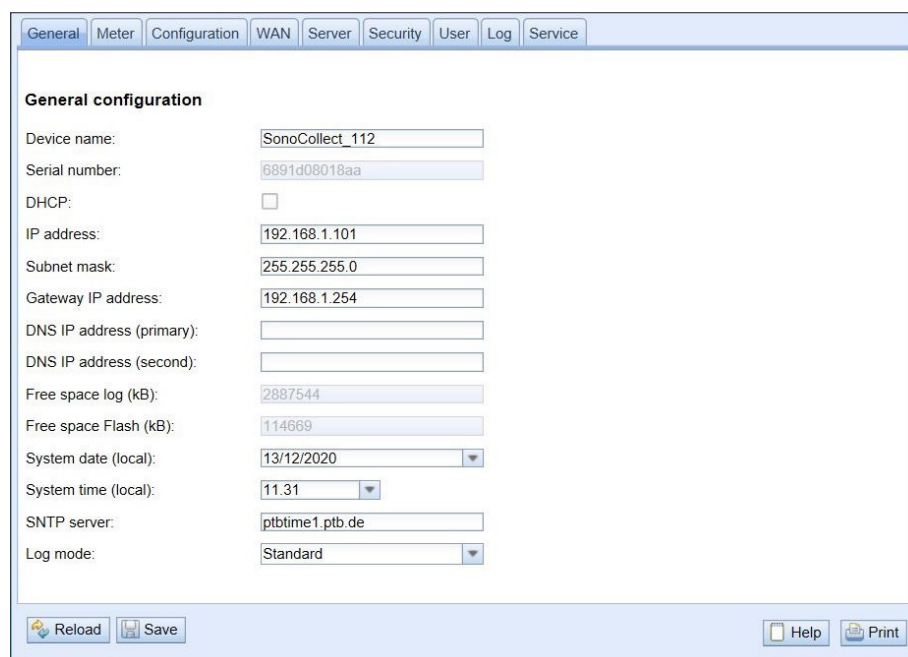
A login dialog box titled "Login". It contains two input fields: "Username:" with the text "admin" and "Password:" with masked characters (dots). Below the fields are two buttons: "Login" and "Default Login".

Figure 10: 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 112. Following values can be reviewed and changed:



A screenshot of the "General" configuration tab in the SonoCollect 112 web interface. The tab is titled "General configuration" and contains various fields for device information and settings. The fields are as follows:

Field	Value
Device name:	SonoCollect_112
Serial number:	6891d08018aa
DHCP:	<input type="checkbox"/>
IP address:	192.168.1.101
Subnet mask:	255.255.255.0
Gateway IP address:	192.168.1.254
DNS IP address (primary):	
DNS IP address (second):	
Free space log (kB):	2887544
Free space Flash (kB):	114669
System date (local):	13/12/2020
System time (local):	11.31
SNTP server:	ptbtime1.ptb.de
Log mode:	Standard

At the bottom of the tab, there are buttons for "Reload", "Save", "Help", and "Print".




Figure 11: Tab General

4.1 Tab General (continuous)

Field name	Meaning	Write access
Device name	Name of device (Correlates to Net discover tool)	yes
Serial number	Serial number of device (MAC address)	no
DHCP	Activates automatic network configuration	yes
IP address	IP address of device	yes
Subnet mask	Subnet mask of device	yes
Gateway IP address	IP address of standard gateway	yes (if not DHCP)
DNS IP address (primary)	IP address of primary DNS server	yes (if not DHCP)
DNS IP address (secondary)	IP address of secondary DNS server	yes (if not DHCP)
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

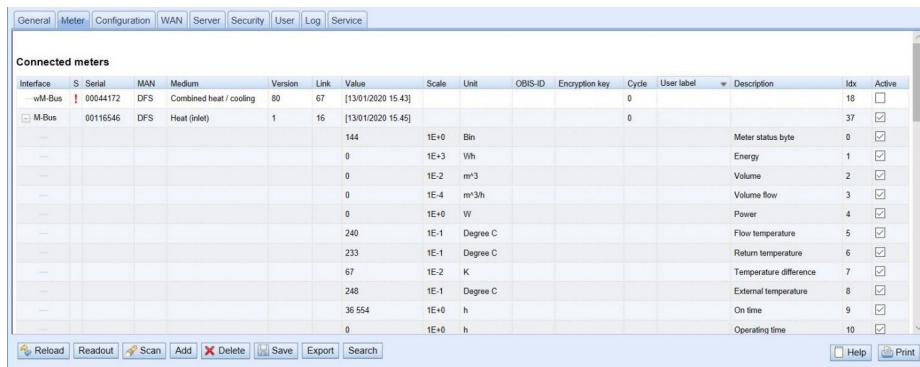
Table 6: Fields in tab General

The button **Save** finally saves the configuration. On **Reload** the last saved values are loaded and current changes get lost.
If the network configuration is changed, the SonoCollect 112 is available after saving under the new IP. All existing connections will be logged separately or logged in users will be logged out automatically.

-  Changing the network parameters of the SonoCollect 112 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 112 is automatically reinitialized.
-  In SonoCollect 112 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 an overview of the meters connected and gives the user the ability to automatically search for meters, manually add meters or configure existing meters:



Interface	S	Serial	MAN	Medium	Version	Link	Value	Scale	Unit	OBIS-ID	Encryption key	Cycle	User label	Description	Idx	Active
vM-Bus	!	00044172	DFS	Combined heat / cooling	80	67	[13/01/2020 15:43]					0			18	<input type="checkbox"/>
M-Bus		00116546	DFS	Heat (inlet)	1	16	[13/01/2020 15:45]					0			37	<input checked="" type="checkbox"/>
							144	1E+0	Bin					Meter status byte	0	<input checked="" type="checkbox"/>
							0	1E+3	Wh					Energy	1	<input checked="" type="checkbox"/>
							0	1E-2	m³					Volume	2	<input checked="" type="checkbox"/>
							0	1E-4	m³/h					Volume flow	3	<input checked="" type="checkbox"/>
							0	1E+0	W					Power	4	<input checked="" type="checkbox"/>
							240	1E-1	Degree C					Flow temperature	5	<input checked="" type="checkbox"/>
							233	1E-1	Degree C					Return temperature	6	<input checked="" type="checkbox"/>
							67	1E-2	K					Temperature difference	7	<input checked="" type="checkbox"/>
							248	1E-1	Degree C					External temperature	8	<input checked="" type="checkbox"/>
							36 554	1E+0	h					On time	9	<input checked="" type="checkbox"/>
							0	1E+0	h					Operating time	10	<input checked="" type="checkbox"/>

Figure 12: Tab Meter

4.2 Tab Meter (continuous)

Field name	Meaning
Interface	Interface of meter (M Bus, wM Bus, DLDE, S0 or System)
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)
Serial	Serial number of meter (number of meter)
MAN	Manufacturer of meter (abbreviation), DLMS Flag-ID
Medium	Medium of meter, according to column 2 of Table 19: Medium types in section 6.3.1
Version	Version number of meter
Link	Primary address of a counter (M-Bus) or receive field strength (RSSI) for wM bus
Value	Meter reading or measurement value
Scale	Scale factor (scientific notation)
Unit	Unit, according to column 2 of Table 21: Units in section 6.3.1
OBIS-ID	OBIS code formatted like X-X:X.X.X*X*X (X=0..255)
Encryption key	Key for decrypting wM Bus meters
Cycle	Readout interval in seconds (entering 0 means using the general readout interval)
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: <, > and ". If CSV export is activated, the semicolon shall be avoided.
Description	Description of meter value, according to column 2 of Table 20: Measurement types in section 6.3.1. The display of the memory number, tariff, value type and raw data can be configured via the parameter Description mode in the tab Configuration.
Idx	Index / position of the meter / meter value within the meter list
Active	Activates the transfer of meter or meter value to a server system or log file.

Table 7: 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 112 contains an empty meter list. If meters are connected to the external interfaces of the SonoCollect 112, 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 6.1.1.

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

The scan process can be cancelled with the button **Cancel**, whereby the already found meters are stored in the meter configuration. After the scan, the meter configuration is taken over immediately and only has to be saved again if there are additional changes. The existing meter list is additively extended during the scan; no already configured counters are deleted.

✓ 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. Alternatively, an assignment via the raw data of the counter values is possible (see parameter Description mode in the tab Configuration, see session: 4.3)

✓ 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 (chip.ini) for displaying of all timestamps can be manually enabled (see section: 8.4.1).

If there are any wM Bus meters in the reception range of the SonoCollect 112, these meters will be listed at the meter list. A scan will also add received meters to the list (see section: 6.1.2).

🔑 wM Bus meters that are newly received, are disabled by default. These meters have to be enabled and saved manually for transmission within 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 6.1.3 for further information.

4.2 Tab Meter (continuous)

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**.

For the transmission and logging of individual meters or meter values, these can be directly activated or deactivated via the checkbox in the Active column. According to the hierarchy, the meter values are automatically activated or deactivated when configuring a meter. In the same way, a non-active counter is automatically activated when one of its counter values is activated. 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.

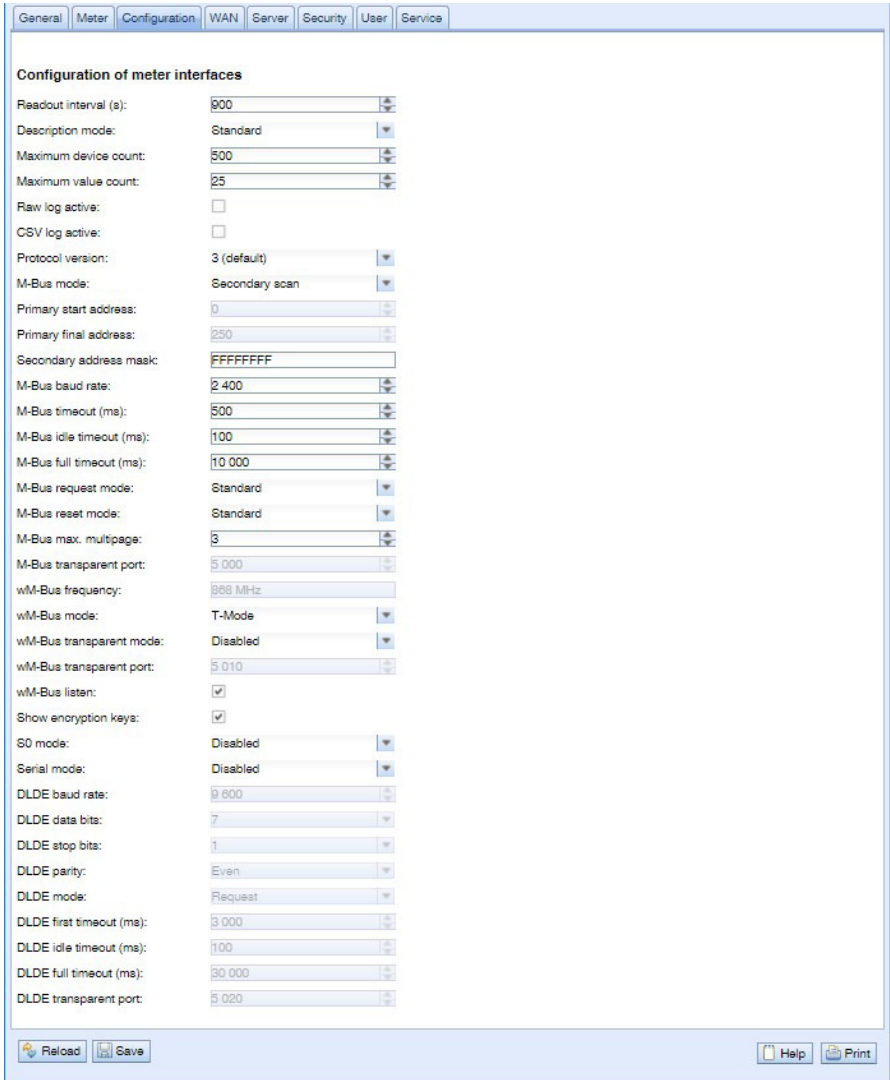
Push the button **Save** for saving the meter list.

 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 either the marked meters or all meters regardless of the readout cycle. This updates the meter list automatically and all unsaved changes are lost. The spontaneous 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.

4.3 Tab Configuration

The tab **Configuration** allows configuring the meter interfaces of the SonoCollect 112. The following parameters are available:



The screenshot displays the 'Configuration' tab of the SonoCollect 112 web interface. The tab is titled 'Configuration of meter interfaces'. It contains a list of settings for various communication protocols, including M-Bus and DLDE. The settings are organized into two columns. The left column lists the parameter names, and the right column shows the current values or selected options. At the bottom of the configuration area, there are buttons for 'Reload', 'Save', 'Help', and 'Print'.

Parameter	Value
Readout interval (s):	900
Description mode:	Standard
Maximum device count:	500
Maximum value count:	25
Raw log active:	<input type="checkbox"/>
CSV log active:	<input type="checkbox"/>
Protocol version:	3 (default)
M-Bus mode:	Secondary scan
Primary start address:	0
Primary final address:	250
Secondary address mask:	FFFFFFFF
M-Bus baud rate:	2 400
M-Bus timeout (ms):	500
M-Bus idle timeout (ms):	100
M-Bus full timeout (ms):	10 000
M-Bus request mode:	Standard
M-Bus reset mode:	Standard
M-Bus max. multipage:	3
M-Bus transparent port:	5 000
wM-Bus frequency:	868 MHz
wM-Bus mode:	T-Mode
wM-Bus transparent mode:	Disabled
wM-Bus transparent port:	5 010
wM-Bus listen:	<input checked="" type="checkbox"/>
Show encryption keys:	<input checked="" type="checkbox"/>
SO mode:	Disabled
Serial mode:	Disabled
DLDE baud rate:	9 600
DLDE data bits:	7
DLDE stop bits:	1
DLDE parity:	Even
DLDE mode:	Request
DLDE first timeout (ms):	3 000
DLDE idle timeout (ms):	100
DLDE full timeout (ms):	30 000
DLDE transparent port:	5 020

Buttons: Reload, Save, Help, Print

Figure 13: Tab Configuration

4.3 Tab Configuration (continuous)

Field name	Meaning
Readout interval (s)	Standard readout cycle of meters (in seconds). Value might be overwritten for each meter by parameter Cycle in tab Meter
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.
Maximum device count	Limitation of the number of meters to scan. (0: no limitation). Already configured meters are not limited by this parameter.
Maximum value count	Limitation of the number of meter value entries to read during a read-out (0: no limitation). Already configured meter value entries are not limited by this parameter.
RAW log active	Activates the raw data log.
CSV log active	Activates the CSV file log.
Protocol version	Protocol variants (CSV / XML) of the SonoCollect 112 WAN communication and log data (compatibility), see section: 6.3
M Bus mode	M Bus scan mode (secondary, reverse secondary or primary search, Transparent/TCP, Transparent/UDP) and also deactivation of interface
Primary start address	First address for primary search
Primary final address	Last address for primary search
Secondary address mask	Search mask for secondary search, 8 numerical characters; „F“ defines a wildcard; missing characters will be filled up with leading zeros
M Bus baud rate	Baud rate for M Bus communication (300-19200 baud)
M Bus timeout	M Bus timeout until reception of first data (in ms)
M Bus idle timeout	M Bus timeout until end of reception (in ms)
M Bus full timeout	M Bus timeout (complete) for reception of a whole data packet (in ms)
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
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.
M Bus max. multipage	Limits the count of multipage requests
M-Bus transparent port	Network port for the M-Bus transparent mode
wM-Bus frequency	Frequency band for the communication with wM-Bus meters
wM Bus mode	wM Bus communication mode (T, S, C or C/T mode) and also deactivation of OMS interface
wM Bus transparent mode	Select transparent mode for wM-Bus interface
wM-Bus transparent port	Network port for the wM-Bus transparent mode
wM Bus listen	Activates recognition and visualization of new wM Bus devices
Show encryption keys	Encryption keys are shown as plain text
S0 mode	Selection for absolute or relative pulse counting or deactivation of the interface
Serial mode	Operating mode of the serial interface (DLDE or Transparent / TCP or Transparent / UDP)
DLDE baud rate	Baud rate for serial interface in case of DLDE
DLDE data bits	Select data bits for serial interface in case of DLDE
DLDE stop bits	Select stop bits for serial interface in case of DLDE
DLDE parity	Select parity for serial interface in case of DLDE
DLDE mode	Select mode for serial interface in case of DLDE
DLDE first timeout	Timeout until the first data (in ms) for the serial DLDE communication is received
DLDE idle timeout	DLDE Waiting time for receiving the first data of the counter (in seconds). In push mode no data may be sent from the meter within this configured time (corresponds to the idle time)
DLDE full timeout	Maximum DLDE waiting time for reading a meter (in seconds)
DLDE transparent port	Network port for the DLDE transparent mode

Table 8: 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 112 is automatically reinitialized.

4.4 Tab WAN

The tab **WAN** allows configuring the WAN connection. The connection is automatically established temporarily on transmission of meter data through the WAN interface or left persistent corresponding to the parameter **Permanent**.

- ✓ For service and maintenance reasons, we recommend using the permanent mode for the WAN communication.

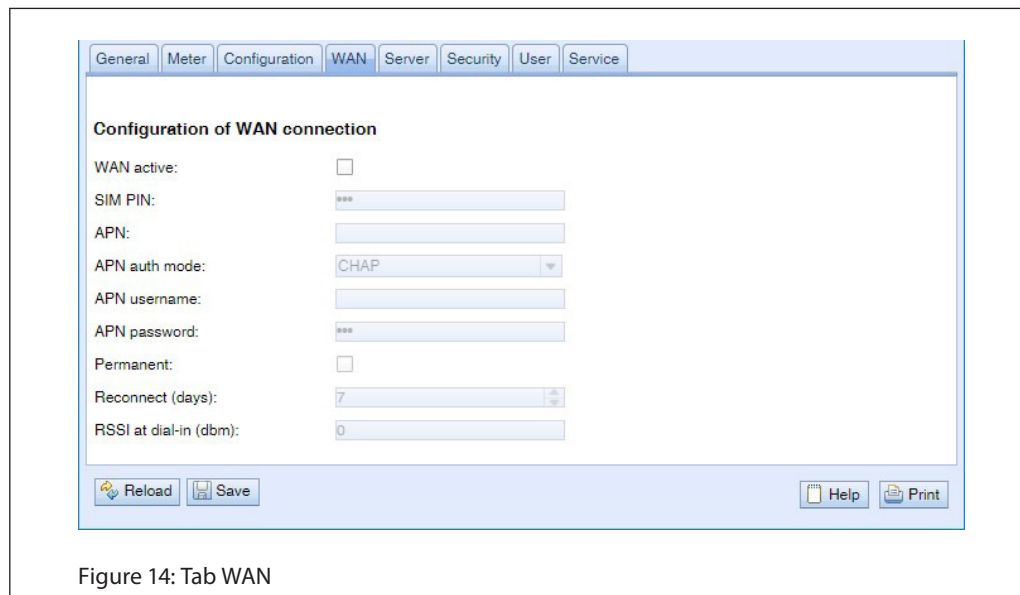


Figure 14: Tab WAN

Field name	Meaning	Write access
WAN active	Activate the WAN module	yes
SIM PIN	PIN number of the SIM card (if set)	yes
APN	The WAN access point name (APN)	yes
APN auth mode	Authentication mode (default CHAP)	yes
APN username	Username for authentication at the APN	yes
APN password	Password for authentication at the APN	yes
Permanent	Keep WAN connection persistent	yes
Reconnect	Reconnect interval (in days) of the WAN connection. The connection will be terminated, and the WAN modem module gets restarted at this interval.	yes
RSSI at dial-in	Received Signal Strength Indicator at dial-in in dBm (-113 to -51 dbm)	no

Table 9: Fields in tab WAN

The necessary parameters for WAN connection should be provided by the mobile service provider of your SIM card.

- ⓘ Please check whether the mobile phone contract includes the expected amount of data, otherwise increased costs or a blocking of the SIM card may follow.
- ⓘ Please check the parameters for correctness. The entry of incorrect parameters may lead to increased costs or a blocking of the SIM card.
- ⓘ If an invalid PIN is entered, it will be used only once per software startup. Thus, the remaining attempts for entering the PIN are not depleted and a new PIN can be entered via the website.
- ⚠ Changing the WAN configuration over an active GPRS connection is not recommended because the SonoCollect 112 may no longer be reachable by a modified or invalid 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 112 is automatically reinitialized. Any existing WAN connection is closed and reestablished.

4.5 Tab Server

The tab **Server** allows configuring the WAN interface (Wide Area Network) of SonoCollect 112. Following parameters are available:

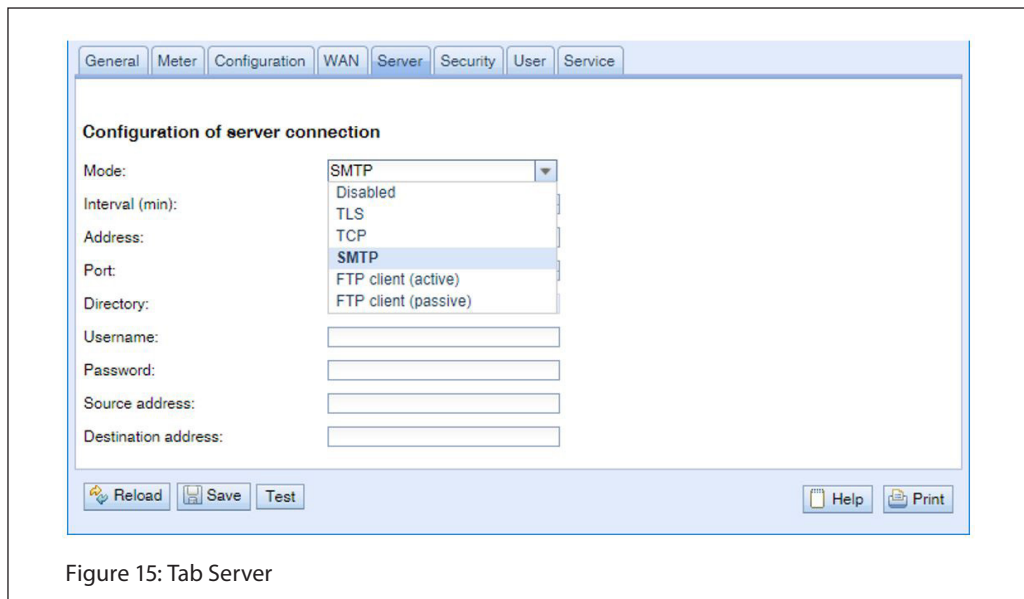


Figure 15: Tab Server

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	yes
Port	Port number of remote station	yes
Directory	Server directory, except for mode SMTP	yes
Username	Username for a connection to a server	yes
Password	Password for a connection to a server	yes
Source address	Email sender address	yes
Destination address	Email destination address	yes

Table 10: 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 the previously selected data.

 By storing the parameters via the button **Save** the SonoCollect 112 is automatically reinitialized.

4.6 Tab Security

The tab **Security** allows configuring the network services of SonoCollect 112. Following parameters are available:

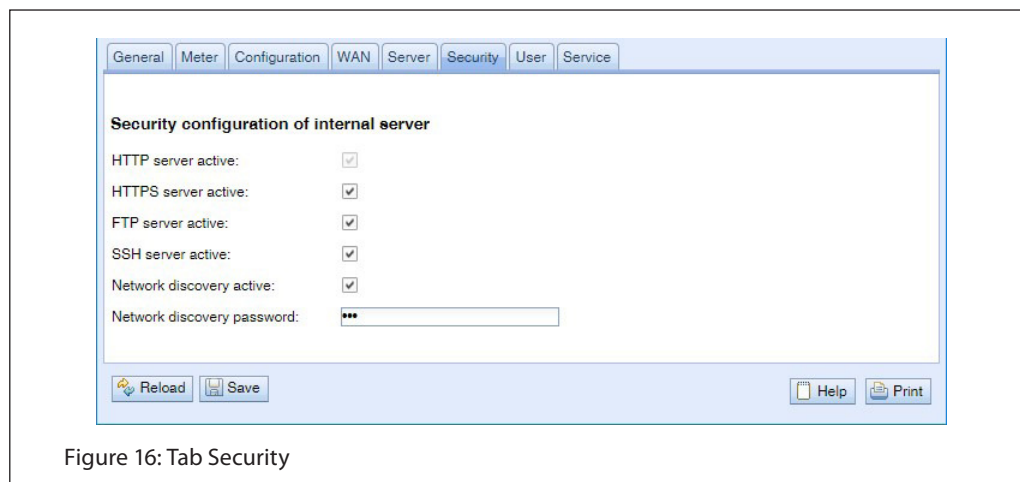



Figure 16: Tab Security

Field name	Meaning	Write access
HTTP server active	Enable HTTP server on the device (Activation and deactivation via HTTPS only)	yes
HTTPS server active	Enable HTTPS server on the device (Activation and deactivation via HTTP only)	yes
FTP server active	Enable FTP server on the device, if deactivated, FTP access on the SonoCollect 112 is not possible.	yes
SSH server active	Enable SSH server on the device (administrative access)	yes
Network discovery active	Enable network discovery, when deactivated, the SonoCollect 112 is no longer displayed in the tool Net discover tool.	yes
Network discovery password	Password for the network configuration via Net discover	yes

Table 11: 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 112 is automatically reinitialized.

4.7 Tab User

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

Username	Password	Remark
admin	admin	Administrator user with root access. Allows full access to all services of SonoCollect 112 (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 112 on delivery.
ftp	ftp	User for FTP access to the log directory B :/log/

Table 12: Predefined users on delivery

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

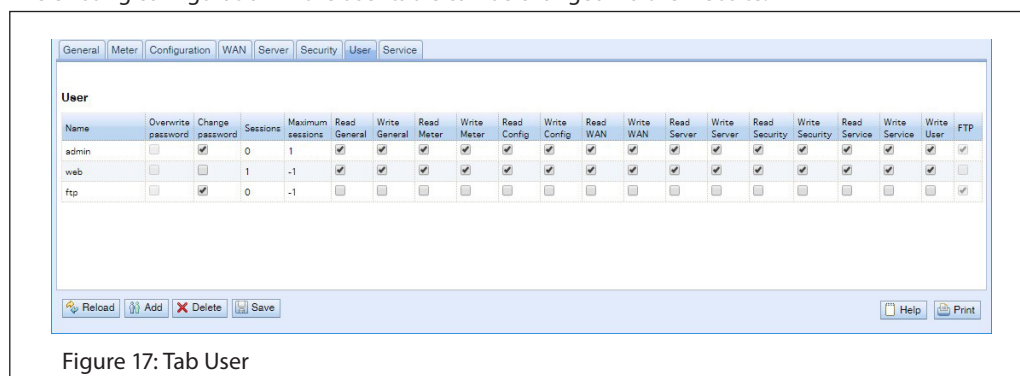


Figure 17: Tab User

4.7 Tab User (continuous)

Field name	Meaning
Name	Username
Overwrite Password	is set if a (new) password has been set for the user in the editing window
Change Password	If active, user is allowed to change its password
Sessions	Number of open sessions with this user account
Maximum Sessions	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
Write User	Read/Write access for tab User
FTP	User is allowed to access the FTP server (maximum 2 users)

Table 13: 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 112 can only be reset by a service engineer of Danfoss in-house, as file access is restricted. All the configuration data gets lost.
- ℹ Only the user admin has full access to the file system of the SonoCollect 112 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.


The screenshot shows a dialog box titled "Add User". It has the following fields and controls:

- Username:** A text input field.
- Set password:** A checkbox that is checked.
- Password:** A text input field.
- Maximum sessions:** A numeric input field with a spinner, currently set to -1.
- FTP Access:** A checkbox that is unchecked.
- Buttons:** "Ok" and "Cancel" buttons at the bottom.

Figure 18: Input dialog for adding a user

4.7 Tab User (continuous)

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 112. FTP access is then restricted to the log data of the SonoCollect 112 (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 112.

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 checkbox **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**.

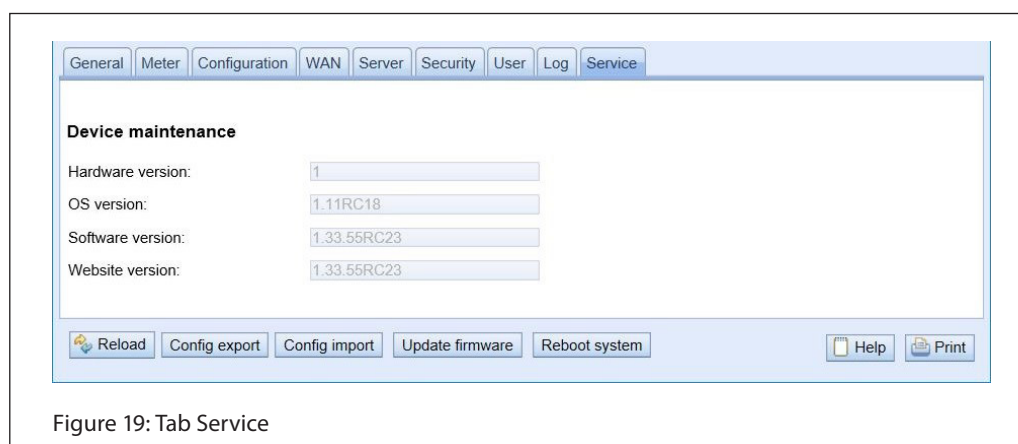
User access rights will be configured directly within the user list. If write access for a tab is granted to a certain user, this user will have read access to the tab automatically (read access).

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.

4.8 Tab Service

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



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

Table 14: Fields in tab Service

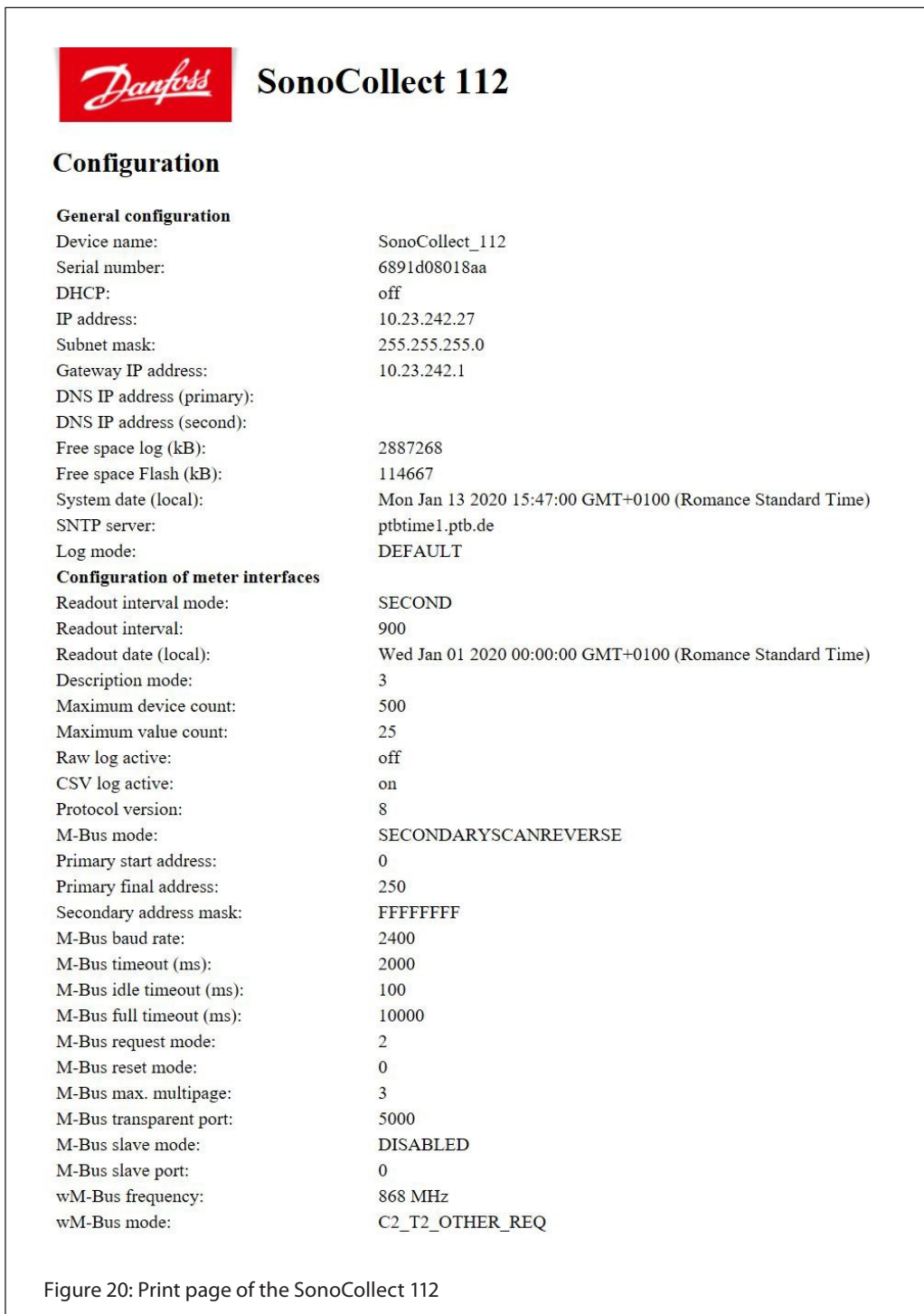
The values are updated with the button **Reload**.

The button **Reboot** restarts the SonoCollect 112. All internal processes are shut down and reinitialized after the reboot. Already cached meter data for WAN interface may be transmitted after the restart. Use this button if you want to adjust the configuration manually via FTP(S) or perform an update.

4.9 Print Page

For a print preview or for an export of the SonoCollect 112 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.



5 Specification of the Modbus TCP protocol (optional)

The Modbus protocol was originally developed by the company Modicon (now Schneider Electric) developed for the communication with their controllers. Data is transmitted in the terms of 16 Bit registers (integer format) or as status information in terms of data bytes. Over the years, the protocol has been continuously expanded. Modbus TCP is one kind of it.

➔ Modbus TCP is part of the standard IEC 61158

➔ A specification can be found here: www.modbus.org

The Modbus protocol is a single master protocol. This master controls the entire communication and monitors occurring timeouts (no response from the addressed device). The connected devices are only allowed to respond to requests by the master.

The SonoCollect 112 is a data concentrator with an optional Modbus extension. The SonoCollect 112 is a Modbus TCP server and therefore a Modbus TCP slave.

The Modbus communication requires an established TCP connection between a client (i.e.: PC or PLC) and the server (SonoCollect 112). The configured Modbus TCP port in the tab Server is used for the communication. This is configured to 502 by default (see section: 4.5).

✓ A specification can be found here: www.modbus.org

5.1 Function codes

Following functions codes are supported by the SonoCollect 112:

Code	Name	Description
0x01	Read Coil	Currently without any functionality
0x03	Read Holding Register	Reading of meter data, register layout see tables section 6.3.4 and 6.3.5
0x05	Write Single Coil	Currently without any functionality
0x06	Write Single Register	Currently without any functionality
0x10	Write Multiple Register	Currently without any functionality
0x0F	Force Multiple Coil	Currently without any functionality
0x2B	Read Device Identification	Reading of device data by MEI = 0x0E

Table 15: Function codes for Modbus TCP

Function codes marked as “Currently without any functionality” are replied with ILLEGAL DATA ADDRESS (0x02), other unsupported codes are replied with ILLEGAL FUNCTION (0x01).

If the function codes 0x2B is used along with MEI = 0x03, the device is responding with identification data. The values 0x01 und 0x02 are supported as Device ID code, allowing to retrieve basic (basic device identification) and regular (regular device identification) data. Following data is available in the identification data:

Object ID	Name	Data type	Example	Type
0x00	VendorName	String	Danfoss	Basic
0x01	ProductCode	String	1036	Basic
0x02	MajorMinorRevision	String	001	Basic
0x03	VendorUrl	String	www.danfoss.com	Regular
0x04	ProductName	String	SonoCollect 112	Regular
0x05	ModelName	String	Standard	Regular
0x06	UserApplicationName	String	Data concentrator	Regular

* Correlates with the configured device name at tab General

Table 16: Device identification

5.2 Data format

The arrangement of data in the Modbus registers corresponds to the usual structure. It uses the big-endian representation. Regarding the 16 Bit registers, the higher byte is sent first, then the lower byte thereafter.

Example: value: 0x1234 transmission: 0x12 first, 0x34 afterwards

If number and data ranges go beyond 16 Bits, representation is quite similar. Again, the most significant 16 Bit register is sent first and so it is addressed with the lowest register address.

Example: value: 0x12345678 transmission: 0x12 first, followed by 0x34, 0x56 and 0x78

For checking the data layout on the Modbus master side, it is possible to generate dummy data in the tab **Server** (see section 4.5). The following data will be represented via the Modbus interface according to the register layout described in section 6.3.4:

Address	Value	Description	Decoded value
0	0xD080	The last 32 bit of the device serial no., upper word	0xD080DC1
1	0x0DC1	The last 32 bit of the device serial no., lower word	
2	0x0002	Version of communication protocol used by the SonoCollect 112	1
3	0x0084	Firmware version of the SonoCollect 112	0x84 = 132: Version 1.32
4	0x5CE5	Timestamp of SonoCollect 112 system time, upper word	0x5CE5EAC = 1559054252: Wednesday, May 22nd 2019, 16:37:32 GMT+2
5	0x5EAC	Timestamp of SonoCollect 112 system time, lower word	
6	0x0000	Empty field	-
7	0x0100	Type field of register set in upper byte	0x01: Gateway entry
8	0x0000	Empty field	-
9	0x0000	Empty field	-
10	0x00BC	Serial No. of meter, upper word	0xBC614E = 12345678
11	0x614E	Serial No. of meter, lower word	
12	0x0443	3-letter manufacturer Code (see section 6.3.4)	0x0443: ABC
13	0x0102	Version (upper byte) and medium (lowerbyte) of the meter	0x0102: Version 1, medium 2 (electricity)
14	0x5CE5	Timestamp of the meter, upper word	0x5CE5EAC = 1559054252: Wednesday, May 22nd 2019, 16:37:32 GMT+2
15	0x5EAC	Timestamp of the meter, lower word	
16	0x0000	Empty field	-
17	0x0200	Type field of register set in upper byte	0x02: Meter entry
18	0x0000	Empty field	-
19	0x0000	Empty field	-
20	0x0000	Meter value (integer), highest word	0xBC614E = 12345678 Resultierender Zählerwert: 12345678 * 10 ⁴ = 1234.5678 Wh
21	0x0000	Meter value (integer)	
22	0x00BC	Meter value (integer)	
23	0x614E	Meter value (integer), lowest word	
24	0x449A	Meter value (float), upper word	0x449A522B = 1234.567800
25	0x522B	Mater value (float), lower word	
26	0xFFFC	Scaling factor (exponent to base 10)	0xFFFC = 4: factor = 10 ⁴
27	0x0005	Type field of register set in upper byte and unit of value in lower byte (see section 6.3.4)	0x00: Meter value entry 0x05: Wh
28	0x5CE5	Timestamp of meter value, upper word	0x519CBBB3 = 1559054252: Wednesday, May 22nd 2019, 16:37:32 GMT+2
29	0x5EAC	Timestamp of meter value, lower word	

Table 17: Dummy data


- ✓ The arrangement of the 32- and 64-bit values can be adjusted via the Modbus swap option in the Server tab (see section 4.5).
- ✓ The data arrangement of the dummy data (option Modbus test in the tab Server) is not affected by the possibly set options Modbus multi-slave and Modbus float-only.

5.3 Modbus multi-slave

If every single M Bus slave shall be available as a separate virtual Modbus slave with its individual Modbus address, the Modbus multi-slave feature at the tab Server needs to be enabled.

After enabling or disabling this functionality all Modbus registers addresses need to be re-assigned at the meter list. The column Register at the meter list shows the virtual Modbus slave address for meter entries and the Modbus register address for the value entries within that virtual Modbus slave.

By the use of the functions Allocate and Deallocate from the context menu in combination with multiple selection of all meters, all Modbus slave addresses, and Modbus register addresses can be assigned or deleted.

 After enabling or disabling the multi-slave feature all Modbus addresses need to be re-assigned at the meter list.

 Multiple selections by the use of the SHIFT- or CTRL-key is possible at the meter list.

5.4 Modbus multi-connection

The Modbus multi-connection feature allows up to 5 Modbus TCP connections to the SonoCollect 112 simultaneously.

You can, for example, tether a classic PLC, building control systems and a Modbus-enabled graphical display to the SonoCollect 112 at the same time without any interfering requests from these devices.

The configuration parameter MODBUS_MAXCONNECTIONS (see section 8) controls the maximum count of simultaneously Modbus TCP connections. If more connections are exceeding this limit, the oldest persisting Modbus TCP connection will be terminated by the gateway and the newly requested connection will be accepted.

 At the default configuration the SonoCollect 112 supports up to 5 parallel Modbus TCP connections.

6 Acquisition and processing of meter data

The main task of SonoCollect 112 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 112). Required meters or meter values must be enabled by the checkbox Active.
- The WAN interface allows transmitting of collected meter data by SonoCollect 112 to a monitoring station.
- The read-out meter data shall be transmitted from the device to a PLC or backend system via Modbus TCP.
- The control center or remote station is able to process the meter data (meter data format).

6.1 Meter configuration

Depending on the interface, meters are mounted to SonoCollect 112 via its website in different ways. Therefore 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.

6.1.1 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 Meter (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. Newfound 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. To change the readout, an already existing meter has to be deleted from the meter list and then be searched again with the preferred variant.

 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 112.

6.1.1 Scanning for meters (M Bus) (continuous)

➔ An automated allocation of the primary addresses (possible in the tab Configuration by selecting the transparent mode) or the setting of further parameters/registers of meters by the SonoCollect 112 is available on request.

6.1.2 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 112 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.

6.1.3 Adding meters manually

Connected meters that cannot be automatically found by a scan 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.

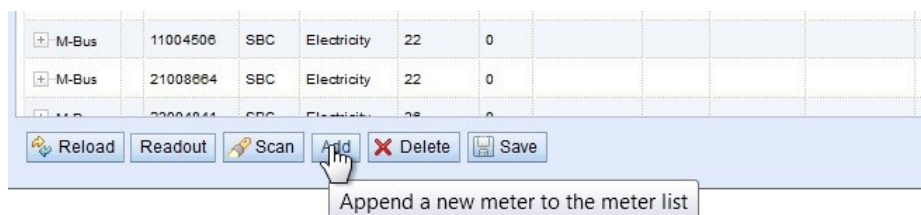


Figure 21: Adding a meter manually in tab Meter

Add meter

Interface:

S0-1

Serial:

12345678

Manufacturer:

SLV

Medium:

Electricity

Version:

12

Link:

0

Encryption key:

00 00 00 00 00 00 00 00 00 00

Cycle [s]:

0

User label:

Building 2

Number of meters:

1

Ok

Cancel

Figure 22: Input dialog for adding meters manually


6.1.3 Adding meters manually (continuous)

All parameters correspond to the fields of the meter list at the tab Meter (see Table 7: 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.

- ✓ If "-1" is entered as the primary address, the addressing is secondary.
- ✓ If a number 0...250 is entered as the primary address, the addressing is primary.
- ✓ The specified serial number is automatically overwritten when primary addressing is used

Additionally, there is a parameter called **Number of meters** which makes it possible to add multiple meters at a time. 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:



The figure shows a screenshot of a software dialog box titled "Add value". It contains several input fields for configuring a meter value. The fields and their values are: Interface (S0-1), Serial (12345678), Manufacturer (SLV), Medium (Electricity), Version (12), Set value (checked), Value (280,09), Scale (1e-4), Unit (kWh), OBIS-ID (A-B.C.D.E*F) (1-0:1.8.0*255), User label (Basement), Description (Energy), and Number of values (1). At the bottom of the dialog are "Ok" and "Cancel" buttons.

Figure 22: Input dialog for manual configuration of meter values

All parameters correspond to the fields of the meter list at the tab Meter (see Table 7: 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.

6.1.4 Direct editing of the meter list (manually)

Alternatively, meters can be inserted manually or automatically, directly into the meter configuration (see section: 8.4.2). The stored meter configuration can be downloaded and edited via FTP and also can be transferred to another SonoCollect 112.

6.2 Integration into supervisory or control system

There are versatile options for connecting the SonoCollect 112 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 112 can be configured to use PPPoE on request. So, it may establish a connection directly through a DSL modem.

6.2.1 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 112 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_112/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 6.3.2.


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: 8.3):
 - 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 additional client or server certificates are needed since all relevant keys are created at the time of the first bootup of the device.

6.2.2 Downloading CSV data via FTP

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 112 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_112/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 6.3.2.


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: 8.3):
 - 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 additional client or server certificates are needed since all relevant keys are created at the time of the first bootup of the device.

6.2.3 TCP connection

An external Web server or an application-specific system can be accessed by the SonoCollect 112 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 6.3.3.

- If an encrypted communication is used, the following certificate files must be transferred to the directory /app/ manually (see section: 8.3):
- Server certificate (RFC4945): cacert.pem
 - Client certificate (RFC3280): clicert.pem
 - Client key (RFC5958): clikey.pem

6.2.4 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 112 ID: <MUC-ID>, Timestamp: <time stamp> (<index>)
Example: SonoCollect 112 ID: 1234567, Timestamp: 1372759627 (2)

The values in angle brackets denote fields according to the serial number of SonoCollect 112 (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 serial number is displayed in hexadecimal format (corresponds to the serial number on the website in the General tab). For protocol versions smaller than 5, the representation is decimal (converted from BCD notation).

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

6.3 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 112 (see section: 8.1) 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. Please contact our support in terms of that.

6.3.1 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:

Name	Description
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
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

6.3.1 Predefined types for media, measurements and units (continuous)

Name	Description
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 18: 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):

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

6.3.1 Predefined types for media, measurements and units (continuous)

Name	Description
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
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
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 19: Measurement types

6.3.1 Predefined types for media, measurements and units (continuous)

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
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 20: Units

6.3.2 Format of CSV data

CSV data either is stored locally on the SonoCollect 112 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 112 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)
ScaleX	Scale factor in scientific notation (directly read out from the meter)
UnitX	Unit, according to column 2 of Table 21: Units in section 6.3.1 (directly read out from the meter)
DescriptionX	Descriptive term, according to column 2 of Table 20: Measurement types in section 6.3.1 (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 21: 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
Deviceld	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 22: Data contained in the different CSV protocol versions

An example of protocol version 7 is as shown:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Index	Timestamp	Deviceld	Link	User	Index0	Value0	Scale0	Unit0	Description0	User0	Timestamp0	Obisid0	Index1	Value1	Scale1	Unit1	Description1
2	0	1566431773	DPS-23010413-22-08	184	User Label 1.5	0	-92.000.000	1,00E+00	dBm	RSSI		1566435360		1	0x00	1,00E+00	Bin	Meter status byte
3	5	1566431963	DPS-23010413-22-08	176	User Label 2	0	-88.000.000	1,00E+00	dBm	RSSI		1566435540		1	0x00	1,00E+00	Bin	Meter status byte
4	10	1566431966	DPS-23010397-22-08	150	User Label 71	0	-75.000.000	1,00E+00	dBm	RSSI		1566435420		1	0x00	1,00E+00	Bin	Meter status byte
5	11	1566431963	DPS-23010397-22-08	125		0	-62.500.000	1,00E+00	dBm	RSSI		1566435480		1	0x00	1,00E+00	Bin	Meter status byte
6	17	1566432001	FLC-11991101-07-03	5	CLAS	0	0x00	1,00E+00	Bin	Meter status byte		0		1	4,029E+15	1,00E+00	None	Fabrication
7	20	1566431874	DPS-23010409-22-08	192	Entrance	0	-86.000.000	1,00E+00	dBm	RSSI		1566435360		1	0x00	1,00E+00	Bin	Meter status byte
8	0	1566432870	DPS-23010413-22-08	183	User Label 1.5	0	-91.500.000	1,00E+00	dBm	RSSI		1566436500		1	0x00	1,00E+00	Bin	Meter status byte
9	5	1566432796	DPS-23010413-22-08	176	User Label 2	0	-88.000.000	1,00E+00	dBm	RSSI		1566436380		1	0x00	1,00E+00	Bin	Meter status byte
10	10	1566432846	DPS-23010391-22-08	150	User Label 71	0	-75.000.000	1,00E+00	dBm	RSSI		1566436320		1	0x00	1,00E+00	Bin	Meter status byte
11	11	1566432754	DPS-23010397-22-08	128		0	-64.000.000	1,00E+00	dBm	RSSI		1566436320		1	0x00	1,00E+00	Bin	Meter status byte
12	17	1566432901	FLC-11991101-07-03	5	CLAS	0	0x00	1,00E+00	Bin	Meter status byte		0		1	4,029E+15	1,00E+00	None	Fabrication
13	20	1566432814	DPS-23010409-22-08	193	Entrance	0	-86.500.000	1,00E+00	dBm	RSSI		1566436320		1	0x00	1,00E+00	Bin	Meter status byte
14	0	1566437227	DPS-23010413-22-08	185	User Label 1.5	0	-92.500.000	1,00E+00	dBm	RSSI		1566437340		1	0x00	1,00E+00	Bin	Meter status byte

Figure 23: Excerpt of a CSV file

6.3.3 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 112 with its corresponding meter items
	MUC_ID	Hexadecimal representation of the ID of SonoCollect 112 (corresponds to the serial number shown on the website in tab General), using earlier protocol versions (see Table 25: 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 20: Measurement types in section 6.3.1
	UNIT	According to column 2 of Table 21: Units in section 6.3.1
	SCALE	Scale factor, signed exponent to base 10 (scientific notation)
	MEDIUM	According to column 2 of Table 19: Medium types in section 6.3.1
	USER	User specific description of the meter value (configured in tab Meter)
entry	-	Entry of meter data with time stamp (T) and one measurement value (VAL)
parameter	-	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 112)
	NAME="T_MUC"	Associated value represents UNIX time stamp (UTC) of SonoCollect 112 at meter read out.
	NAME="VAL"	Associated value represents the measurement value defined in data item

Table 23: 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
	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
parameter	-	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 24: Data in different XML protocol versions





6.3.3 Format of XML data (continuous)

An 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>
```

6.3.4 Modbus register layout

This chapter describes the Modbus register specification. The SonoCollect 112 uses a fixed address structure of 10 Modbus registers each.

-  Addresses for registers are enumerated starting with 0.
-  Data types using more than one register are encoded with the most significant word at the lowest address (MSB first)
-  The function code 0x03 (Read holding register) is used for reading the data.
-  Within the Modbus protocol, there is only data formatted as integer or float. Other data types used on M Bus (i. e.: BCD) are converted to integer values before transmission.

The first 10 Modbus register starting at address 0 are status registers of the SonoCollect 112 and are defined as follows:

Address	Name	Data length	Descriptions / notes
0 - 1	Serial number	32 Bit	Serial number of SonoCollect 112 as hexadecimal numbers
2	Protocol version	16 Bit	Protocol version for Modbus interface (value=1)
3	Version	16 Bit	Software version of the gateway (as integer)
4 - 5	Time stamp	32 Bit	Unix time stamp of last read-out, system time of the gateway shall be set correctly (manually or via SNTP)
6	Reserved	-	Reserved
7	Type field / reserved	16 Bit	Type field for register set in the upper Byte (value=1 for gateway entry), lower byte is reserved
8 - 9	Reserved	-	Reserved

Table 25: Modbus registers for the SonoCollect 112

6.3.4 Modbus register layout (continuous)

Each meter is characterized by 10 Modbus registers. Their offset has to be added to the starting register address for each meter. They are defined as follows:

Offset	Name	Data length	Descriptions / notes
0 - 1	Serial number	32 Bit	Serial number of meter as integer value (not as BCD), only decimal numbers are allowed
2	Manufacturer ID	16 Bit	Encoding of manufacturer by using different blocks of Bits: Bits 10 - 14: first character, Bits 5 - 9: second character and Bits 0 - 4: third character, the particular values point to the three letters, counting from "A" with value 1
3	Version / medium	16 Bit	Version of meter in the upper Byte and the medium ID in the lower Byte of the register according to Table 19: Medium types, it holds the index number
4 - 5	Time stamp	32 Bit	Unix time stamp of last meter read-out, system time of the gateway shall be set correctly (manually or via SNTP)
6	Reserved	-	Reserved
7	Type field / reserved	16 Bit	Type field for register set in the upper Byte (value=2 for meter entry), lower byte is reserved
8	Flags	16 Bit	Bit 0: Value 1: Meter could not be read, Value 0: Meter could be read correctly Bit1: Value1: Not all meter values are updated, Value 0: All meter values updated Bit 2-15: Reserved
9	Reserved	-	Reserved

Table 26: Modbus registers for a meter

Each meter value is characterized by 10 Modbus registers. Their offset has to be added to the starting register address for each meter value. They are defined as follows:

Offset	Name	Data length	Descriptions / notes
0 - 3	Meter value	64 Bit	Signed integer value (not scaled)
4 - 5	Meter value	32 Bit	Floating point value (scaled to unit in register 7), IEEE 754
6	Scale factor	16 Bit	Signed scale factor (exponent to the power of 10)
7	Type field / unit	16 Bit	Type field for register set in the upper Byte (value=0 for meter value entry), the lower byte encodes the unit according to Table 21: Units, it holds the index number
8 - 9	Time stamp	32 Bit	Unix time stamp transmitted by the meter, if there are no time stamps transmitted by the meter, this value is set to 0

Table 27: Modbus registers for a meter entry

The following figure shows an example for a configuration of Modbus addresses via the website:

Interface	S	Serial	MAN	Medium	Version	Link	Value	Scale	Unit	Cycle	User label	Description	Register
M-Bus		13414801	DFS	Heat (outlet)	2	254				0			0
---							0	1E+3	Wh			Energy	10
---							2	1E-2	m^3			Volume	20
---							41 314	1E+0	h			On time	0
---							13 414 801	1E+0	None			Fabrication	0
---							0	1E+3	Wh			Energy	30
---							0	1E+3	Wh			Energy	0
---							0	1E+3	Wh			Energy	40
---							0	1E+3	Wh			Energy	0

Figure 24: Modbus registers configured via the website

6.3.4 Modbus register layout (continuous)

Regarding this example, the following data is transmitted to the Modbus master:

Address	Value	Name	Decoded value
Gateway entry			
0 1	0x0002 0x993A	Serial number	0x0002993A
2	0x0001	Protocol version	1
3	0x006F	Version	Version = 0x006F = 111 → v1.11
4 5	0x519C 0xC16D	Time stamp	0x519CC16D = 1369227629 = Wednesday, 2013-05-22, 15:00:29 GMT+2
6	0x0000	Reserved	-
7	0x0100	Type field / reserved	Type = 1 → gateway entry
8 9	0x0000 0x0000	Reserved	-
Meter entry			
10 11	0x03F8 0x3CAA	Serial number	0x03F83CAA = 66600106
12	0x32A7	Manufacturer ID	0x32A7 = '0011.0010.1010.0111' 1st letter: '011.00' → 0x0C = 12 → L 2nd letter: '10.101' → 0x15 = 21 → U 3rd letter: '0.0111' → 0x07 = 7 → G
13	0x0204	Version / medium	Version = 2 Medium = 4 = Heat (outlet)
14 15	0x519C 0xC16D	Time stamp	0x519CC16D = 1369227629 = Wednesday, 2013-05-22, 15:00:29 GMT+2
16	0x0000	Reserved	-
17	0x0200	Type field / reserved	Type = 2 → meter entry
18 19	0x0000 0x0000	Reserved	-
Meter value entry			
20 21 22 23	0x0000 0x0000 0x0000 0x010B	Meter value (integer)	0x000000000000010B = 267 Resulting value: 267 * 10 ³ Wh
24 25	0x4882 0x5F00	Meter value (floating point)	0x48825F00 = 267000.000000 Wh
26	0x0003	Scale factor	Factor = 10 ³
27	0x0005	Type field / unit	Type = 0 → meter value entry Unit = 5 → Wh
28 29	0x519C 0xBBB3	Time stamp	0x519CBBB3 = 1369226163 = Wednesday, 2013-05-22, 14:36:03 GMT+2

Table 28: Example for data in Modbus registers

6.3.5 Reduced Modbus register layout

Using the configuration option Modbus float-only (see section 4.5) the SonoCollect 112 can be switched to a reduced Modbus register layout.

There are 2 Modbus registers (32 bit) available for a meter entry and each meter value entry.

The meter entry consists of the meter's serial number solely and is formatted as follows:

Offset	Name	Data length	Description / notes
0 - 1	Serial number	32 bit	Serial number of SonoCollect 112 as hexadecimal numbers

Table 29: Meter entry with reduced Modbus register layout

The meter value entry incorporates a floating-point value which has been calculated from the integer value if the meter does not deliver a floating-point value directly. The meter value is formatted as follows:

Offset	Name	Data length	Description / notes
0 - 1	Meter value	32 bit	Floating point counter value (scaled), IEEE 754

Table 30: Meter value entry with reduced Modbus register layout


- ✓ The byte order at the Modbus TCP protocol is always MSB (most significant byte) first.
- ✓ The word order at the Modbus TCP protocol is MSW (most significant word) first per default and can be changed to LSW (least significant word) first by setting the configuration option Modbus swap at the tab **Server** (see section 4.5).

7 Troubleshooting

In case the SonoCollect 112 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.

7.1 Hardware errors

7.1.1 All LEDs remain off, the device does not respond.

 **WARNING LIFE HAZARD:** Voltage supply testing must only be performed by trained personnel. 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 112 under laboratory conditions.

7.1.2 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. Now 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.

7.2 Network error

7.2.1 No network connection

Use our Net discover tool to check if the device is displayed. If there is no network connection to SonoCollect 112, first run a ping connection test (see section: 3.2.2). If no ping reply is received and if SonoCollect 112 is connected via a larger network, test the SonoCollect 112 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 112. Check the physical network connection between the PC and SonoCollect 112. Cables shall be properly connected and plugged in. At the network port of SonoCollect 112, 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 112 is shown at the Net discover tool (see section: 3.1). Therefore, SonoCollect 112 has to be connected to the PC via a local area network. If the desired SonoCollect 112 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 112 appears in the list, please configure a unique IP address that is available on the local network (see section: 3.1). 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	192.168.1.10
Network mask	255.255.255.0
SonoCollect 112	
IP	192.168.1.101
Network mask	255.255.255.0

Table 31: Example for IP address configuration

7.2.2 SonoCollect 112 cannot be accessed via website or FTP(S)

If it is not possible to access the SonoCollect 112 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 112 in general, please have a look at section 7.2.1.

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>).

7.2.3 User does not have write access to the website

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 112 (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 timeout of approximately 30 seconds and then log in again.

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

Log in with admin credentials too and check for write access.

7.2.4 The web session is terminated unexpectedly

If the web session with the SonoCollect 112 is terminated unexpectedly, this might be due to a connection timeout. In case of a poor connection to the SonoCollect 112 (e. g.: via GPRS) timeouts can occur. The timeout parameter can manually be configured by the parameters WEBCOM_TIMEOUT (see section: 8.4.1).

A timeout may also occur if SonoCollect 112 is currently busy, the collection and transmission of meter data takes priority over web communication.

7.2.5 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.

7.3 Error in meter reading

7.3.1 M Bus meters cannot be read out

Check the cable between SonoCollect 112 and the meter and replace faulty cables. If SonoCollect 112 is working, please measure the M Bus voltage (approximately 36 V) between the two M Bus lines at SonoCollect 112 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, please remove other meters to eliminate a possible source of error.

If available, please 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 112, changing the parameter MBUS_MAXRETRY allows to increase also the number of retries (see section: 8.4.1).

7.3.2 wM Bus meters cannot be read out

Check the type designation of the SonoCollect 112. It must contain a "W" to support the wM bus communication (eg: "SonoCollect 112 E-WM-80").

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 112.

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.

7.3.3 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: 8.4.1) 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.

7.3.4 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: 8.4.1) 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.

Check whether encryption is active in the meter and whether the entered key is correct. However, encryption is unusual with the M Bus. Check the setting especially of the **M-Bus reset mode**. Certain meters do not respond immediately after a Reset. Here, setting *None* can help.

Certain meters even suggest encryption, even though it does not exist. With the parameter MBUS_DISABLEDENCRYPTION = 1 (see section: 8.4.1) in the file */app/chip.ini* the attempt of the decryption can be deactivated.

Start a new scan of the M Bus.

7.3.5 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 112 is not valid. Check if the meter uses encryption and if the encryption key in tab **Meters** is correct.

7.3.6 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: 8.4.1).

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: 8.4.1). Especially the reversed secondary scan (SECONDARYSCANREVERSE) can be used to avoid this problem.

Start a new scan of the M Bus.

We recommend checking physical problems on the M-Bus. Faults or installation errors often lead to such a behavior.

7.3.7 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: 8.4.1).

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. Please 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.

7.4 Error in logging data or in transmitting meter data

7.4.1 Meter data is not logged

Check, whether drive `/ext` of the SonoCollect 112 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**.

7.4.2 Meter data is not transmitted to the server

Make sure that the parameters for the network communications are set correctly.

If possible, please 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). Please also try to set the FTP mode to FTP client (*active*) or FTP client (*passive*) in the tab **Server**.

8 Advanced Features

8.1 Firmware update

In order to provide new features to the SonoCollect 112, 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 112 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.

⚠ An update must ensure that the device is powered continuously.

✓ The device configuration remains untouched during a firmware update.

✓ The current version of RTOS and SonoCollect 112 software can be found in the tab **Service** on the website (see section: 4.8).

8.1.1 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.

ℹ The standard password upon delivery is contained at section 4.7.

8.1.2 Performing the firmware update

After the firmware image file has been successfully uploaded to the SonoCollect 112 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 112 is necessary. Reboot the device using the command line interface (see section 8.2) or use the push button **Reboot** at the tab **Service** (see section 4.8).

8.1.2 Performing the firmware update (continuous)

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.
- i After rebooting the SonoCollect 112, browser cache should be cleaned up and the web page should be reloaded (i. e.: key <F5> or <CTRL + F5>).

8.2 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.

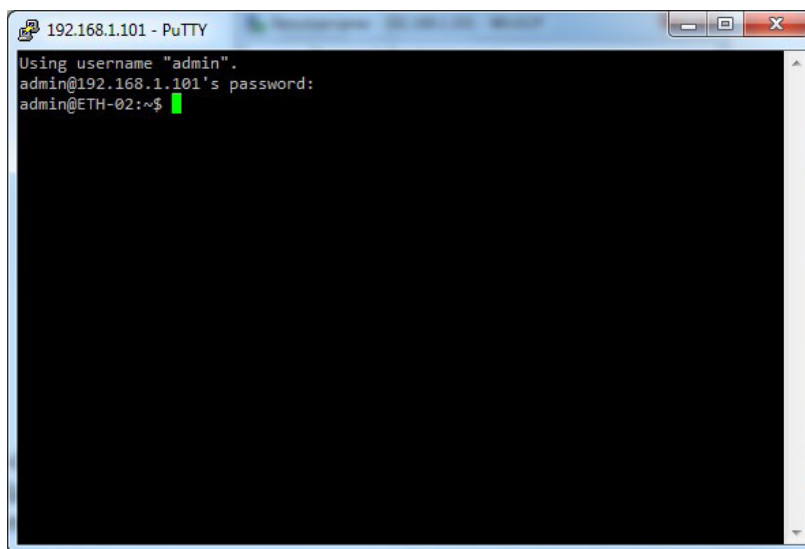


Figure 25: Command line interface after successful log in

- i An SSH session can be easily started using the context menu of the Net discover tool (see section 3.1)
- i The default password is contained in section 4.7.
- i 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.

8.2.1 Command reference of the tool "solcmd"


This tool can be accessed through solcmd help. 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	Format the application partition.
format-partition-ext	Format the log partition.
config-hostname	Update the system hostname configured in the chip.ini file.
config-partitions	Reset all user permissions on partitions APP and EXT.
config-timezone	Update the system time zone.
config-users	Update the system user and password.
manual-vpn	Start/connect a VPN connection in foreground to enable manual password input and extended testing.
restart-eth0	Restart the LAN network interface.
restart-server	Restart all services (FTPS, SSH, Network discovery service).
regenerate-server-keys	Generate new device keys.
start-ppp0	Start/connect a PPP dial-up connection.
start-solapp	Start the main application.
start-transparent-tty	Start all transparent uart/tty to TCP forwardings.
start-vpn	Start/connect a VPN connection.
stop-ppp0	Stop/disconnect a PPP dial-up connection.
stop-solapp	Stop the main application.
stop-transparent-tty	Stop all transparent uart/tty to TCP forwardings.
stop-vpn	Stop/disconnect a VPN connection.
update-rtc	Write the system time to the hardware real time clock.
update-system	Perform a firmware update. The firmware image file needs to reside in the directory /ext/Upd/.
reboot-system	Reboot the device.

8.3 Administrative FTP connection


Exchanging data and files with the SonoCollect 112 is directly possible via the internal FTPS server. An ordinary FTPS client can access the SonoCollect 112 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: 3.2).

 The default password is contained in section 4.7.

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 are allowed to change the files and the file system in the 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: 8.4).

8.4 Configuration files

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

 Only trained personnel are allowed to change the files and the file system of the SonoCollect 112, since this may restrict the functionality of the device.

 For editing the configuration files please use an UTF8-capable editor (not Microsoft Notepad). 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/>)

8.4.1 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.

Manual changes to the file `chip.ini` don't take effect until restarting SonoCollect 112.

The file `chip.ini` may be transferred to another SonoCollect 112 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 Net discover tool	Text, max. 20 characters	SonoCollect_112
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, 1	0
FTP_FILEBASENAME	Base file name for FTP upload	Text, max. 40 characters	SonoCollect_112
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
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	Username 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_DISABLEDECRYPTION	Disables the decryption of M Bus messages (status field)	0, 1	0
MBUS_ENABLE	Enables M Bus interface	0, 1	1
MBUS_FIRSTFCBBIT_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_FREEZESTORAGEENUM	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_MAXMULTIPAGE	Limits number of pages for multipage request	0 255	10
MBUS_MAXPRIMARYADDRESS	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_MINPRIMARYADDRESS	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_RAWLOGENABLE	Enables raw data log to drive /ext	0, 1	0

8.4.1 System configuration file (continuous)

Parameter*	Meaning	Valid range	Standard*
MBUS_REQUESTMODE	Defines request sequence for read-out	DEFAULT, EXT, ONLY, FREEZE	DEFAULT
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, SECONDARYSCANALLOC, SECONDARYSCANREVERSE, SECONDARYSCANALLOCREVERSE	SECONDARYSCAN
MBUS_SECMASKMANUFACTURER	Predefined manufacturer ID for secondary scan	Exactly 4 characters, 0-9 each or 0xFFFF	0xFFFF
MBUS_SECMASKMEDIUM	Predefined medium ID for secondary scan	Exactly 2 characters, 0-9 each or 0xFFFF	0xFF
MBUS_SECMASKSERIAL	Mask for serial number of meters for secondary scan	Exactly 8 characters, 0-9 or 0xF each	0xFFFFFFFF
MBUS_SECMASKVERSION	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,	14
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_WAKEUPENABLE	Enables specific wake-up request	0, 1	0
METER_DELAY	Delays a readout N seconds once the readout is due (in seconds).	0 - 4294967295	0
METER_MAXALLVALUECOUNT	Limits the total number of meter values (0: no limit)	0 65535	0
METER_MAXDEVICECOUNT	Limits the number of meters (0: no limit)	0 65535	80
METER_MAXVALUECOUNT	Limits the number of meter values per meter (0: no limit)	0 65535	25
METER_RETRYDIVIDER	Set the divider for the try timeout (according to configured readout interval)	0 - 65535	0
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	1 4294967295	900
MUC_CONFIG_VER	Version of configuration file	1 -5	-
MUC_CSVLOG_ENABLE	Enables logging CSV data to drive /ext	0, 1	0
MUC_METERDESCRIPTION ENABLEFLAGS	Enables 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_SHOWTIMESTAMPENTRIES	Explicit display of timestamps from the meter	0, 1	0
MUC_SHOWVENDORRAWDATA	Explicit enumeration of vendor-specific data as a meter value	0, 1	0
MUC_SHOWVENDORRAWDATAWEB	Display of binary data at the meter list (vendor-specific and data containers)	0, 1	0

8.4.1 System configuration file (continuous)

Parameter*	Meaning	Valid range	Standard*
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_RANDOMDELAY	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
SMTP_ENABLE	Enables using SMTP on WAN interface (email)	0, 1	0
SMTP_FROMADDRESS	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_SUBJECTBASENAME	Base name for the email subject	Text, max. 40 characters	
SMTP_TIMEOUTSCALE	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	Username 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
SNTP_IP	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_DISCONNECTTIMEOUT	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
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_CACHETIMEOUT	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, C/T, C	T1_OTHER_REQ

8.4.1 System configuration file (continuous)

Parameter*	Meaning	Valid range	Standard*
WMBUS_RAWLOGENABLE	Enables raw data log to drive /ext	0, 1	0
WMBUS_SMLENEBALE	Enables processing of SML data within wM Bus frames	0, 1	0
XMLTOTCP_DEBUGOUT	Debug output of sent data	0, 1	0
XMLTOTCP_DISCONNECTTIMEOUT	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 33: Parameters in file chip.ini

8.4.2 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.

ℹ Manual changes to the file `device_handle.cfg` do not take effect until restarting the SonoCollect 112. The device has to be restarted via the website, not by a voltage reset!

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 19: Medium types in section 6.3.1	Not set	Electricity
meter	primaryaddress	Primary address of meter (M Bus)	0	0x03
meter	addressmode	Used mode for addressing 0: Secondary, 1: Primary	0	0
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	rsi	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
meter	value	Parent element for each value of the meter	-	-
value	description	Description of value, according to column 2 of Table 20: Measurement types in section 6.3.1	None	Energy
value	unit	Unit of value, according to column 2 of Table 21: Units in section 6.3.1	None	Wh
value	encodetype	Coding of value	NODATA	INT32
value	scale	Scale factor (scientific notation)	1e0	1e-3

8.4.2 Meter configuration file (continuous)

Parent element	Element	Meaning	Standard	Example
value	valuetype	Type of value: instantaneous, maximum, minimum, errorstate	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 34: Structure of file device_handle.cfg

9 Application examples of the SonoCollect 112

The following section will refer to examples how to use the SonoCollect 112 in certain applications. For using the SonoCollect 112 the network and meter interfaces need to be configured according to your application and your facility (see section: 4).

9.1 Local application without a control system

The SonoCollect 112 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 112 will be accessed by a PC on the same physical network segment. Actual meter values can be monitored using the tab **Meter** 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 FTPS (see section: 6.2.2).

User accounts with appropriate access rights can be configured to allow read-only access to the meter list (see section: 4.7).

9.2 Remote application without a control system

This use case corresponds to the one described in section 9.1. The main difference is up to the network infrastructure that is located between the PC and the SonoCollect 112 (e. g.: Internet). The PC and SonoCollect 112 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 112 (e. g.: FTP, HTTP and SSH).

If the network has been configured correctly, access to the SonoCollect 112 is identical to the local application.

9.3 Remote application with email push

The SonoCollect 112 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: 6.2.4).

✓ For sending emails with the SonoCollect 112, the site-internal network (e. g.: firewall, router) needs to be configured properly. Ask your local network administrator.

9.4 Remote application with FTP upload

Instead of downloading the CSV data from the built-in FTP server of the SonoCollect 112 it is also possible that the SonoCollect 112 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: 6.2.1).

✓ 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. Ask your local network administrator.

9.5 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.

📘 For further details on how to enable TLS-secured FTP connections please see section 6.2.1.

✓ 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. Ask your local network administrator.

9.6 Remote application with TCP/HTTP push

For direct connection of database systems, the transmission of XML data over TCP or HTTP is a convenient method. Database servers are able to directly receive the data (see section 6.3.3).

- ✓ 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. Ask your local network administrator.

10 Technical data

10.1 General characteristics

The housing has following dimensions (without antenna):

10.1.1 Physical dimensions / Weight

- Width: 72 mm
- Height: 91 mm
- Depth: 62 mm (without SMA antenna connector(s))
- Weight: approx. 210 g or 220 g

10.1.2 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)

10.2 Electrical characteristics

The SonoCollect 112 is operated with an internal power supply (pin assignment according to section 2.2):

10.2.1 Power supply

- Input voltage: 90 – 260 V(AC), 50 – 60 Hz, screw clamps ($\leq 2,5 \text{ mm}^2$)
- Power consumption: 2 W (idle state), max. 10 W
- Safety: Reverse voltage protection, over voltage protection (transients)
- Inrush current: <40 A
- Galvanic Isolation between mains and meter interfaces: >3 kV

10.2.2 Meter interfaces

- M Bus: Compliant to EN 13757 2, max. 80 unit loads (UL), Uspace = 36 V, Umark = 24 V, screw clamps ($\leq 2,5 \text{ mm}^2$)
- wM Bus: Compliant to EN 13757 4, 868 MHz, modes S, T and C, SMA connector(s) for external antenna(s)
- S0: Compliant to EN 62053 31, U = 24 V, screw clamps ($\leq 2,5 \text{ mm}^2$)
- DLDERS: Compliant to EN 62056 21, configuration of mode and UART parameters according to section 8.4.1, depending on mode compliant to EIA 232 or EIA 485, RJ45 connector
- RS-485 interface

10.2.3 Communication interfaces

There are various communication interfaces at the device (pin assignment according to section 2.2):

- Ethernet: Compliant to IEEE 802.3, 10/100 Base TX, RJ45 connector incl. status LEDs
- Mobile communications: 4G modem, LTE Cat1, Baud 2,8,9

10.3 Further characteristics

10.3.1 Galvanic isolation

The Ethernet communication interface is separated from the meter interface and supply:

- Galvanic isolation: 1,000 V

10.3.2 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: Linux
- Integrated RTC: Power reserve for up to 7 day

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Heating Segment • heating.danfoss.com • +45 7488 2222 • E-Mail: heating@danfoss.com

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