Honeywell

Ultrasonic Flow Meter Series 6
Q.Sonic-plus

Manual
Operation and Maintenance

Contact

Honeywell Process Solutions
Elster GmbH (manufacturer)

Steinern Straße 19-21

55252 Mainz-Kastel/Germany

Phone:	+49 6134 605-0
Email:	**customerfirst@honeywell.com**
Support phone:	+49 6134 605 123
Support portal:	**process.honeywell.com/us/en/support/request-support**
Website:	**process.honeywell.com/us/en/site/elster-instromet**

Contents

Contents

1 General information

1.1 The enCore/enSuite concept

enCore is the name of an Elster product platform for advanced measurement devices. enCore devices are based on the same hardware components and software concepts. Both the hardware and software of enCore devices have a modular design; the configuration of the process board equipment is variable, just like the arrangement of software components. On one hand, the software components consist of basic functionalities which are provided by the `Basic System` with its **S**ystem **F**unction **B**locks (SFBs) and on the other hand it consists of application-related functionalities which provide the various **A**pplication **F**unction **B**locks (AFBs). Owing to this modular design principle, each device can be optimally adapted to individual requirements.

The Q.Sonic-plus belongs to the enCore device series of Ultrasonic Flow Meter Series 6. This series operates according to the transit time difference principle, i.e., they exploit, that ultrasonic pulses move faster in the flow direction than against the flow direction. Measuring path arrangements record velocity, performance, and other profile components.

The Ultrasonic Flow Meter Series 6 is also referred to as USM Series 6, UFM Series 6 or Q.Sonic Series 6.

enSuite is the configuration and analysis software for current Honeywell Elster© devices in the field of flow computer, data storage, gas quality analyzer and ultrasonic gas meter. It provides tools for configuration, parameterization, diagnosis, software downloads and other services. The software supports all activities that are required for commissioning and maintenance of these devices.

The concept and parameterization of single function blocks of the `Basic System`, such as the Time Service and user management, as well as the most important enSuite functions for the USM, such as the dashboard with Health Care Test, are described in the ⇨ UFM Series 6 "Configuration and analysis with enSuite" manual.

> ⓘ **Parameterization in enSuite**
>
> Please note that changes that you make to an offline parameter-zation in enSuite are only active in the device when you trigger the action **Transfer parameterization to device** and after the USM has been (automatically) restarted.

1.2   Relevant user documentations

Elster Gas Metering business provides the user documentations such as manuals, certificates, technical information for your UFM Series 6 meter in a ZIP file. The download information for this ZIP file is delivered with your device. Manuals referenced by this manual are included in this ZIP, such as UFM Series 6 "Safety Instructions" and "Configuration and analysis with enSuite".

Single documents are published in the Docuthek. The documents are updated regularly.

www.docuthek.com/
Use the device series or the device type as search term:
UFM Series 6 or **Q.Sonic-plus**

The enSuite installation manual is enclosed in the enSuite software pack-age. It is also available on the website.

process.honeywell.com/us/en/site/elster-instromet/support #software-downloads

1.3   About these Instructions

This manual is a complete guide to the operation and maintenance of a
Q.Sonic-plus.

This manual together with the ⇨ UFM Series 6 "Safety Instructions" and
⇨ "Wiring Instructions" provides essential information for safe use in compli-
ance with and insofar applicable:

- European Directives (e.g., ATEX, PED, EMC, MID)
- International IECEx standards
- North American FM Approvals standards
- Canadian CSA standards

This manual explains how to verify which certifications your flow meter
complies with, based on the labelling from the ultrasonic flow meter. The
manual also contains important instructions to prevent accidents and serious
damage before start-up, during operation, and to maintain trouble-free
operation in the safest possible way throughout the entire lifespan of the
device. Before using the product read this manual carefully, familiarize your-
self with the operation of the product, and strictly follow the instructions.

> ❗ **Keep printed manual in immediate vicinity of device**
>
> The manual "Operation and Maintenance" is an integral part of the
> product and supplied with the device in printed form.
>
> Keep printed manuals in the immediate vicinity of the USM for use
> by qualified personnel of the Notified Bodies as well as by
> installation, operating, maintenance and cleaning personnel at all
> times.

If you have any questions, or need further details on specific matters con-
cerning this product, please do not hesitate to contact one of our staff
members (⇨ Contact, p. 2).

1.4   Abbreviations

The following abbreviations may appear in this document:

AFB	**A**pplication **F**unction **B**lock
ATEX	**A**tmosphères **Ex**plosibles; European Directive 94/9/EC on equipment and protective systems intended for use in potentially explosive atmospheres New Directive (valid 20.04.2016): 2014/34/EU
CSA	**C**anadian **S**tandards **A**ssociation
DC	**D**irect **C**urrent
EC	**E**uropean **C**ommunity
EMC	**E**lectro**M**agnetic **C**ompatibility; European EMC Directive 2004/108/EC New directive (valid 20.04.2016): 2014/30/EU
HART	**H**ighway **A**ddressable **R**emote **T**ransducer
IECEx	**I**nternational **E**lectrotechnical **C**ommission System for Certification to Standards Relating to Equipment for use in **Ex**plosive Atmospheres
FM	**F**actory **M**utual Approvals
NMi	Nederlands Meet**i**nstituut
PED	**P**ressure **E**quipment **D**irective; European Directive 97/23/EC concerning pressure equipment New Directive (valid 19.07.2016): 2014/68/EU
PC	**P**ersonal **C**omputer
PCB	**P**rinted **C**ircuit **B**oard
SFB	**S**ystem **F**unction **B**lock
SPU	**S**ignal **P**rocessing **U**nit
UFM	**U**ltrasonic **F**low **M**eter
USM	**U**ltra**s**onic **F**low **M**eter

1.5   Event labels

Where	Label	Meaning
Logbook	<yellow font>	Message of a **Warning** type begins
Logbook	<yellow font>	Message of a **Warning** type ends
Logbook	<black font>	Signal of a **Note** type
Logbook	<yellow font>	Signal of a **Warning** type
Logbook	<red font>	Signal of an **Alarm** type
Error list	<black font>	Message or signal of a **Note** type
Error list	<yellow font>	Message or signal of a **Warning** type
Error list	<red font>	Message or signal of an **Alarm** type
enSuite		Message of a **Note** type
enSuite		Message of a **Warning** type
enSuite		Message of an **Alarm** type
enSuite		Signal of a **Note** type
enSuite		Signal of a **Warning** type
enSuite		Signal of an **Alarm** type

Table 1-1: Labeling events

1.6   Limitation of liability

This manual is based on the latest information available. It is provided subject to alterations. We reserve the right to change the construction and/or configuration of our products at any time without obligation to update previously shipped equipment.

The warranty provisions stipulated in the manufacturer's *Terms of Delivery* are applicable to the product. The manufacturer shall have no obligation, if:

- Repair or replacement of equipment or parts is required through normal wear and tear, or by necessity in whole or part by catastrophe, or the fault or negligence of the purchaser.

- The equipment, or parts, have been maintained or repaired by someone other than an authorized representative of the manufacturer, or have been modified in any manner without prior express written permission of the manufacturer.

- Non-original parts are used.

- Equipment is used improperly, incorrectly, carelessly, or not in line with its nature and/or purpose.

- Use of this product with unauthorized equipment or peripherals, including, but not necessarily limited to, cables, testing equipment, computers, voltage, etc.

The manufacturer is not responsible for the incidental or consequential damages resulting from the breach of any express or implied warranties, including damage to property, and to the extent permitted by law, damage for personal injury.

> **❗ Read the manual carefully!**
>
> Read through this Operation and Maintenance manual carefully before beginning any work.
>
> The manufacturer assumes no liability for loss and malfunctions that result from non-compliance with these instructions.

We reserve the right to make technical changes within the scope of improving performance characteristics and continuous development of the device.

Current warranty conditions in the General Terms and Conditions are available on our website:

process.honeywell.com/us/en/site/elster-instromet/about-us

2 Ultrasonic Flow Meter Series 6

2.1 General

The UFM Series 6 Q.Sonic-plus is a sophisticated, multi-path ultrasonic gas flow meter manufactured by Honeywell. It has been specifically designed for custody transfer measuring applications that demand a high degree of accuracy and reliability. It can be extended with an extra functionality whereby the flow meter has the possibility to convert the measured line volume to standardized volume, mass, or energy.

> ⚠️ **WARNING!**
>
> **Improper use of an UFM Series 6 may not only result in unreliable performance but may lead to hazardous situations.**
>
> Please refer to the type plates, located on the meter for the correct operating conditions. Never use the meter outside these limitations!

The Ultrasonic Flowmeter Series 6 contains 2 type plates:

- **Main plate**
  Provides information on mechanical design conditions as well as flow related information such as meter factor and range.
- **SPU type plate**
  Provides information on applicable hazardous area approval.

> 🛈 **Operate meter only within limits specified on the type plate!**
>
> Ensure the meter never operates outside the limits stated on the type plates. Any discrepancy between the type plates should be reported to Honeywell or your local agent immediately.
>
> ⇨

2.2   Applicable standards

The Ultrasonic Flow Meter Series 6 is manufactured to be in accordance with European Directives: ATEX, PED, EMC and optionally MID.

If the meter is ordered for use at a location where European Directives are NOT mandatory, the meter can alternatively be manufactured in compliance with IECEx, FM Approval or CSA certificate for use in hazardous areas.

Applicable standards for the optional integrated flow computer functionality are: AGA8-92 DC, SGERG-88, AGA-NX19 and ISO 6976.

2.3   Configuration

Several pairs of transducers are mounted in pairs on the flow cell of the UFM (wall mounted). Each pair of transducers represents one individual measuring path. There are two measuring path types on the Q.Sonic-plus:

- Axial: single bounce
- Swirl: double bounce

The Q.Sonic-plus is a 6-path ultrasonic flow meter (USM). The symmetrical path configuration with 4 double and 2 single reflection paths allows the measurement of swirls and turbulence, as well as asymmetries.
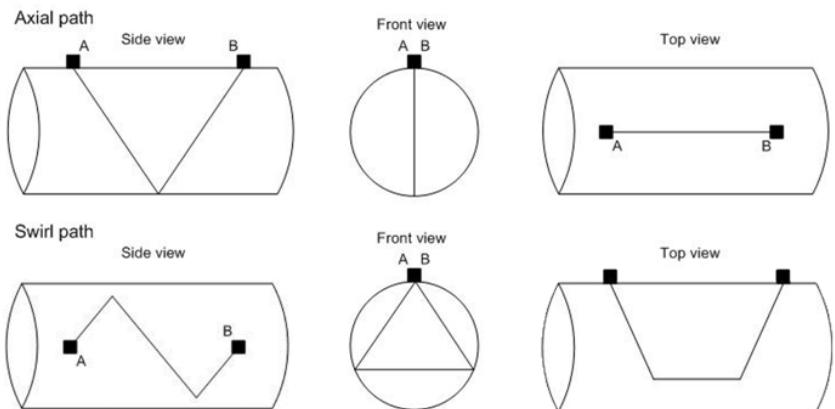
Fig. 2-1: Path types

Path configuration:

Front view	Rear view
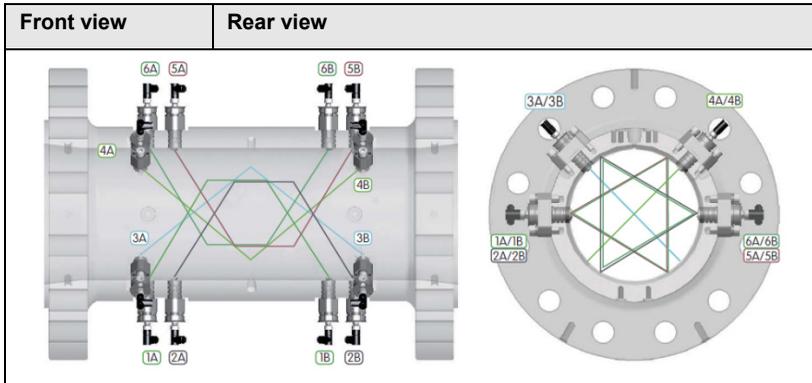
Fig. 2-2: Q.Sonic-plus – path layout

Path layout in detail:

Q.Sonic	No. of paths	Path 1	Path 2	Path 3	Path 4	Path 5	Path 6
plus	6	B1-CW	B1-CCW	A1	A2	B2-CW	B2-CCW

Table 2: Q.Sonic-plus path layout in detail

Legend:

> A : axial path;   B : swirl path;
> CW : clockwise; CCW : counterclockwise

Optionally, the meter can be equipped with pressure and temperature measurement.

2.4   Calibration

When using the UFM Series 6 Q.Sonic-plus in custody transfer applications, most countries demand (by law) a calibration from a certified calibration institute supervised by an inspector of weights and measures. Examples of facilities generally used for calibrations are Euroloop in Rotterdam (NL),

TransCanada Calibrations in Canada and PIGSAR GH45 or Open Grid European Dorsten (D).

If the Q.Sonic-plus meter must be in accordance with MID, extra restrictions should be considered.
⇨ 13.4 Calibration (p. 111)

3 Theory of operation

An ultrasonic flow meter is an inferential measurement device that consists of ultrasonic transducers that are typically located along a pipe's wall. The transducers are inserted into the piping using a gas tight mechanism. Ultrasonic pulses are alternately transmitted by one transducer and received by the other one.
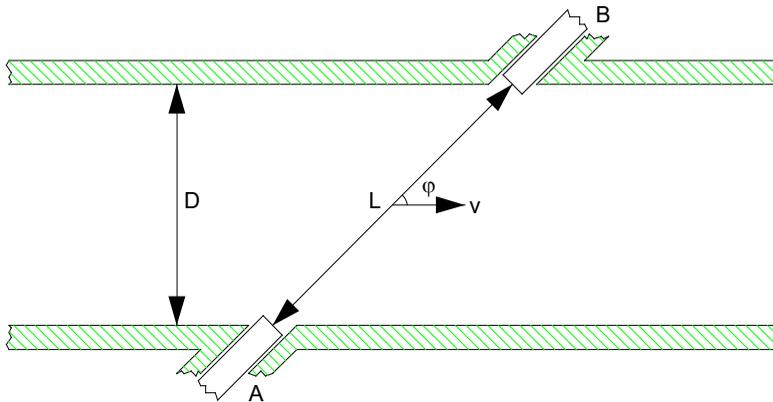
Fig. 3-1: Ultrasonic measuring line

This figure shows a simple geometry of two transducers, 'A' and 'B', at a sharp angle "φ" with respect to the axis of a straight cylindrical pipe with diameter "D". Please note: The Q.Sonic-plus flow meter employs reflection paths, where the acoustic pulses reflect one or more times off the pipe wall.

3.1 Flow velocity measurement

The acoustic pulses are crossing the pipe like a ferryman crossing a river. Without flow, they propagate with the same speed in both directions. If the gas in the pipe has a flow velocity different from zero, pulses travelling downstream with the flow will move faster, while those travelling upstream against the flow will move slower. Thus, the downstream travel times `tab`

will be shorter, while the upstream ones `tba` will be longer as compared when the gas is not moving. The equation below illustrates the computation:

$$VOG_{raw_n} = \frac{L_n}{2 \cdot \cos(\varphi_n)} \cdot \left(\frac{1}{tab_n} - \frac{1}{tba_n} \right)$$

where:

VOGraw$_n$	average uncorrected (raw) gas velocity.
L$_n$	straight-line length of the acoustic path between the two transducers
φ_n	angle between the gas flow and the ultrasonic signal
tab$_n$	downstream travel time of path n
tba$_n$	upstream travel time of path n

The raw gas velocity is corrected by a Reynolds flow profile correction. This correction is depending on the path type. Also, the contribution of the gas velocity of each path to the combined gas velocity is depending on the path type.

3.2   Correction after calibration

After flow calibration the meter can be adjusted either through an adjust factor or through linearization. How the meter is adjusted can be visualized at the display.

⇨ 6.1 Operation panel with touch areas (p.39)

3.3   Volume flow at line conditions

The volume flow at line conditions Q_{Line} is the (adjusted) profile-corrected gas velocity V_{Line} multiplied by the internal cross section A of the flow cell:

$$Q_{Line} = V_{Line} \cdot A \cdot t$$

$$= V_{Line} \cdot \frac{\pi \cdot D^2}{4} \cdot 3600 \left[\frac{m^3}{h} \right]$$

where:

Q_{Line}	volume flow at line conditions
V_{Line}	adjusted profile-corrected gas velocity
A	internal cross-section of the flow cell
D	internal diameter of the meter
t	time coefficient to go from seconds to hours

4 System description

4.1 Flow cell

The flow cell is the part of the UFM Series 6 that is mounted in the piping system. All components making the UFM Series 6 (SPU, transducers, type plates, temperature sensor, and optional pressure sensor) are mounted on the flow cell. Please refer to the following figure:
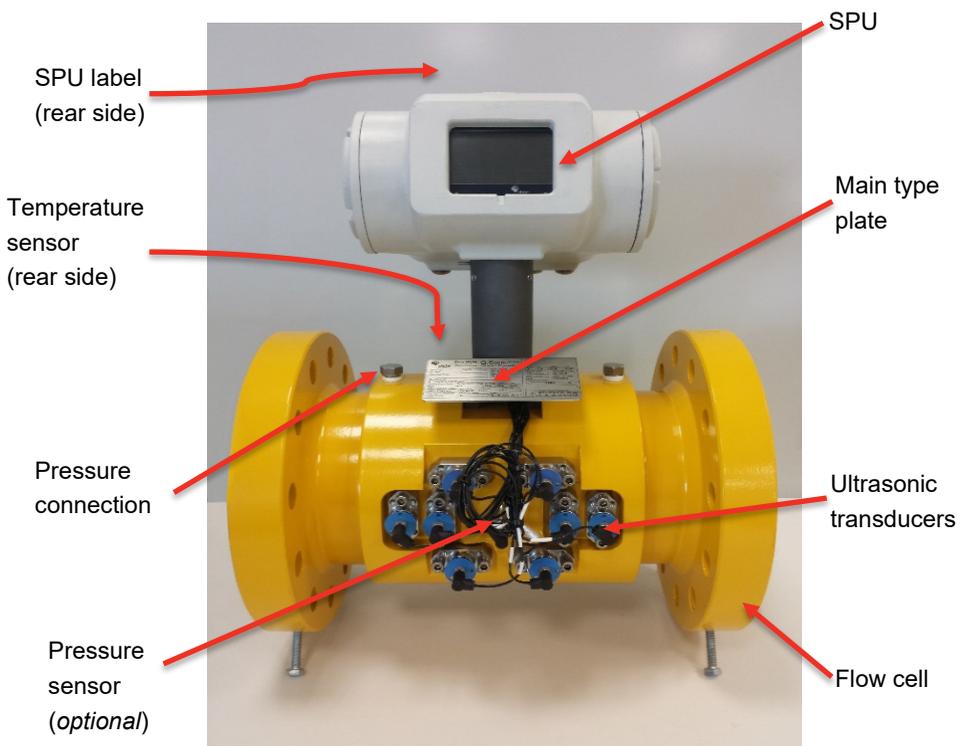
Fig. 4-1: Example of a Honeywell Ultrasonic Gas Flow Meter

4.2   Signal Processing Unit (SPU)

The SPU is mounted in an explosion proof housing. The box consists of two separate compartments: a main and a rear compartment.
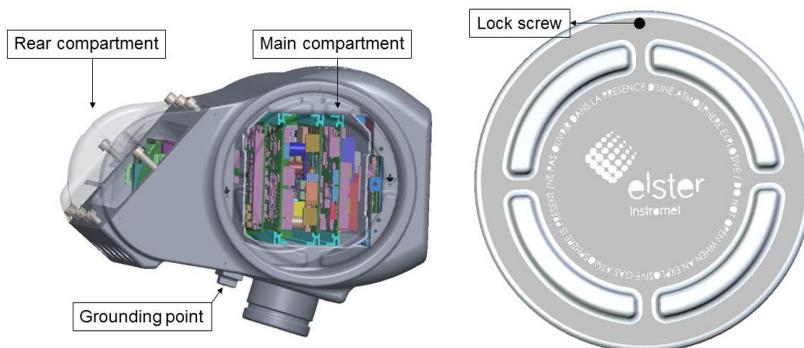
Fig. 4-2: SPU compartments and SPU cover

The main compartment can be opened from the side of the SPU and contains the main circuit boards. The main compartment also comprises intrinsically safe connections for the ultrasonic transducers and temperature and optional pressure sensors. All data processing from excitation of the transducers to calculating the flow rate is handled by the electronics in this compartment.

To prevent the box from opening by vibration, the covers on the side need to be firmly tightened and secured with the lock screw in the cover (⇨ Fig. 4-2). When closing the back compartment, ensure all screws are used.

A grounding point can be seen at the bottom of the SPU. As the meter is already internally grounded, it is not necessary to use this grounding for normal operation.

The rear compartment comprises of a field terminal board used for connecting the Ultrasonic Flow Meter Series 6 to the end user's applications. ⇨ 5.3 Wiring instructions (p.34)

> 📖 **UPS recommendation**
>
> In the event of a power failure, the UFM will shut down. There-
> fore, we recommend the use of an uninterruptible power supply
> (UPS).

4.3   Transducers

The ultrasonic signals required for the flow measurement are generated and received by ultrasonic transducers.

Piezoelectric transducers employ crystals or ceramics that are set into vibration when an alternating voltage is applied to the piezoelectric element. The vibrating element generates sound waves in the gas. Since the piezo-electric effect is reversible, the element will become electrically polarized and produce voltages related to the mechanical strain, when the crystal is distorted by the action of incident sound waves. Because the acoustic impedance of the gas is much smaller compared to the acoustic impedance of the piezoelectric element, and to maximize the acoustic efficiency, a matching layer is employed between the gas and the piezoelectric element.

The transducers used in the Ultrasonic Flow Meter Series 6 are type 'NG' (⇨ Fig. 4-3). Fig. 4-4 visualizes the NG transducer with the mounting bracket.

Fig. 4-3: NG transducer

Fig. 4-4: NG transducer with mounting bracket

4.4 Flow cell pressure sensor (*optional*)

As an optional feature the UFM can be equipped with a pressure sensor. This pressure sensor is used for:

- Reynolds flow profile correction
- Compensation of the flow cell expansion due to gas pressure.

> ⚠ **CAUTION!**
>
> **The pressure sensor is not used for volume conversion.**

4.5 Flow cell temperature sensor

The UFM is equipped with a temperature sensor. The temperature sensor is used for:

- The Reynolds flow profile correction
- Compensation of the flow cell expansion due to flow cell temperature

4.6 Labels and nameplates

Nameplates and labels are used to identify the product and to provide details on the specific product. Together with the product manual it specifies how the product is certified and designed.

Fig. 4-5: Main plate of a Q.Sonic-plus – example

- The main (type) plate provides information on mechanical design conditions as well as flow related information such as meter factor and range. If the UFM has been manufactured in accordance with the Measuring Instruments Directive (MID) the related certificate reference T10335 is mentioned in the top right corner of the main plate.

  ⇨ 13 MID requirements (p. 110)

- Refer to the type plate on the SPU for the applicable hazardous area approval. This could be according to ATEX, IECEx, FM or CSA.

  ⇨ For type plate examples refer to Fig. 4-6 to Fig. 4-9.

4.6.1 ATEX certified

The explosion proof housing has the following ATEX certification information:
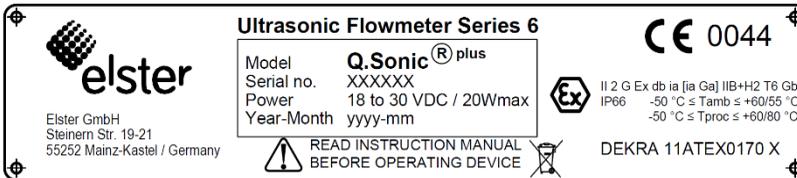
Fig. 4-6: ATEX label – example

- Classification: Ex II 2 G Ex db ia [ia Ga] IIB+H2 T6 Gb IP66
- Temperature ranges for ambient and process condition:

  -50 °C ≤ Tamb ≤ +60/55 °C
  -50 °C ≤ Tproc ≤ +60/80 °C

- ATEX markings: ⟨Ex⟩ II 2 G CE 0044
- 0044 is the Notified Body number of TÜV NORD CERT GmbH
- ATEX certificate reference: DEKRA 11ATEX0170 X

> **Warning**
>
> Read this "Operating and Maintenance" manual before operating the device.

4.6.2   IECEx certified

The explosion proof housing has the following IECEx certification information:
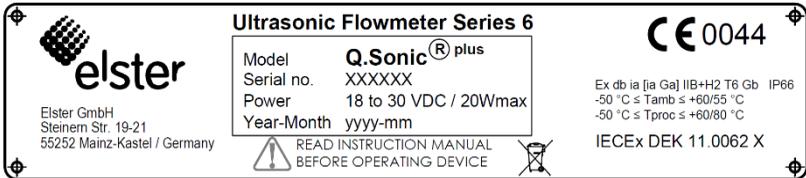
Fig. 4-7: IECEx label – example

- Classification: Ex db ia [ia Ga] IIB+H2 T6 Gb IP66
- Temperature ranges for ambient and process condition:

  -50 °C ≤ Tamb ≤ +60/55 °C
  -50 °C ≤ Tproc ≤ +60/80 °C

- IECEx certificate reference: IECEx DEK11.0062 X

> **Warning**
>
> Read this "Operating and Maintenance" before operating the device..

4.6.3   FM certified

The explosion proof housing has the following FM certification information:
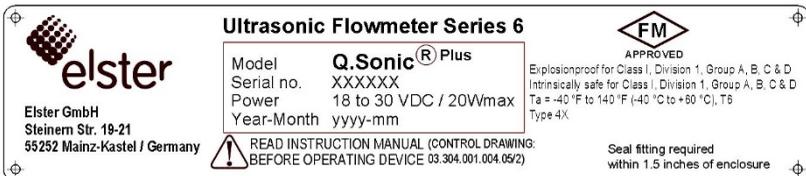
Fig. 4-8: FM label – example

- Explosion proof for Class I, Division 1, Group A, B, C and D
- Intrinsically safe for Class I, Division 1, Group A, B, C and D
- Ta = -40 °F to 140 °F (-40 °C to +60 °C), T6
- Type 4X
- "FM approved" mark
- Installation requirement: Seal fitting required within 1.5 inches of enclosure

> **ⓘ Warning**
>
> Read the instruction manual before operating the device (control drawing: 03.304.001.003.05/2).
>
> ⇨ UFM Series 6 "Safety Instructions" for the control drawing

4.6.4 CSA certified

The explosion proof housing has the following CSA certification information:
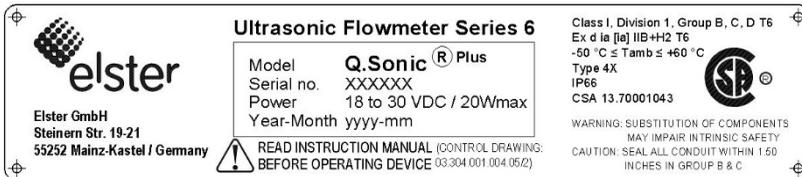
Fig. 4-9: CSA label – example

- Explosion proof for Class I, Division 1, Group B, C and D T6
- Ex d ia [ia] IIB + H2 T6
- −50 °C $\leq$ Tamb $\leq$ +60 °C
- Type 4X
- IP66
- CSA 13.70001043
- Installation requirement: Seal all conduit within 1.50 inches in group B & C

> ⊕ **Warnings**
>
> - Substitution of components may impair intrinsic safety.
>
> - Read the instruction manual before operating device (control drawing: 03.304.001.003.05/2).
>   ⇨ UFM Series 6 "Safety Instructions" for the control drawing

4.7   Sealing

This chapter describes the important sealing locations and sealing process as required by MID certificate T10335. Even if MID is not required it is advised to seal the UFM.

⇨ 13 MID requirements (p. 110)

4.7.1   Main plate

The following figure shows how the main plate is sealed to the flow cell:

Fig. 4-10: Seal on the main plate to the flow cell

4.7.2   SPU

The SPU in the main compartment of the flameproof certified box is sealed in 2 locations.

- By means of the PCB sealing bracket the SPU electronics is sealed to the flameproof certified box.
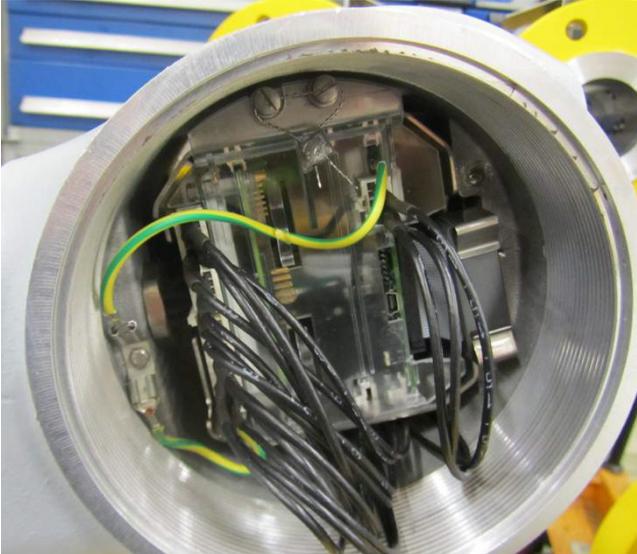
Fig. 4-11: PCB sealing bracket – example

- The meter should be protected from undesired changes in the software.
- Therefore, a hardware switch is placed on the main board. This hardware switch can be reached through an opening in the back panel. The hole in the back panel is protected with a plastic cap (⇨ Fig. 4-12).

  Meaning of the position of both pins on the switch:

  – both pins are *up*:
    The meter is sealed, and the parameter settings of the meter are locked from editing.

    – both pins are *down*:
The meter is unsealed, and parameter settings can be altered
with enSuite. Sealing of the switch itself should be done with
the screw socket on the protective cap.

-

Sealing switch on the mainboard is
accessible after removing the protective
cap.

Meter **unsealed**: both pins
down
(Towards the print board)
Meter **sealed**: both pins **up**
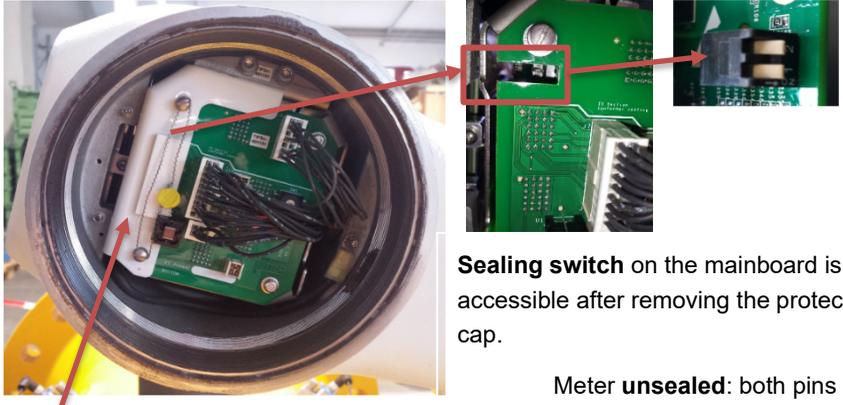
Backpanel with **Protective Cap**

(Screw sockets are used for sealing)

Fig. 4-12: Hardware protection on the main board

- In addition to the hardware protection, access to the meter software
  is secured by different user access levels and password protection.
  ⇨ 10 User rights / login (p. 97)

5 Installation and commissioning

5.1 Introduction

It is very important to check the shipment of your ultrasonic flow meter equipment. A visual inspection of surfaces and flanges should be performed. In case of damage, contact Honeywell immediately.

As well, please verify if all the necessary documentation is available. In addition to this "Operation and Maintenance" manual, you also require (at bare minimum) the ⇨ UFM Series 6 "Safety Instructions".
⇨ 1.2 Relevant user documentations (p. 9)

Also look at your project data to see if extra documentation is required and delivered. If documentation is missing, ⇨ Contact (p. 2) Honeywell or your local agent immediately.

5.2 Flow cell installation requirements

5.2.1 Installing a meter in the pipeline

The Ultrasonic Flow Meter Series 6 (including flow cell, transducers, and SPU) is shipped in a suitable box (e.g., wooden box, cardboard box).

> **ⓘ Use in legal metrology**
>
> For use in legal metrology following requirements must be taken into account:
>
> - For use according to MID, refer to the ⇨ 13.5 Installation requirements (p.111).
> - For FM Approved and CSA Certified UFMs also see their respective Control Drawings and particular installation remarks in the ⇨ UFM Series 6 "Safety Instructions".

> ⚠️ **WARNING!**
>
> **Risk of injury**
>
> The use of improper lifting equipment may result in serious personal injury to the operator or nearby personal or damage the Ultrasonic Flow Meter.
>
> ► Make sure the lifting equipment is certified, shows no damage or wear, and is suitable for the weight of the Ultrasonic Flow Meter Series 6.
> ► Always use the lifting lugs provided on the flow cell.
> ► Inspect eyebolts before each use and used according to the manufacturer's specification.

► Carefully disassemble the shipping box.
► Remove the transport straps from the flow cell.
► Use the lifting lugs provided on the flow cell to move the ultrasonic flow meter to the installation site.
► Install the meter according to the end user's company regulations and applicable local and national requirements.
► To ensure optimal performance of the UFM, comply with the up- and downstream spool requirements specified for your UFM (⇨ your order documentation).

5.2.2   Testing installation

Background

The flow cell is always hydrotested at the correct hydrotest pressure before the transducers are installed on the ultrasonic flow meter. Herewith, all welding of the flow cell is checked. When a Series 6 UFM is installed in a pipeline, it is no longer possible to hydrotest the pipeline. Water can be trapped between the housing and the transducers, causing the meter to have difficulties measuring.

Procedure

► Before pressurizing, check all pressure points on the meter.
If necessary, remove the cover caps to have a clear view of the entire
pressure point, particularly when an adapter is fitted on the meter body.

5.3   Wiring instructions

The correct wiring is described in detail in following documents:

⇨ UFM Series 6 "Wiring Instructions"

⇨ UFM Series 6 "Safety Instructions"

5.4   Create TLS certificate and publish it to enSuite

Since Basic System V03-39, MMS connections between an USM and
enSuite are secured via TLS. The USM authenticates itself to enSuite with a
self-signed certificate.

The devices are always delivered by Honeywell without a certificate. When
you switch on the device for the first time, a new certificate is automatically
created. This ensures that the certificate is not compromised.

To rule out the unlikely case that a third party (e.g., during transport) has
already created and compromised a certificate, we recommend deleting the
certificate (⇨ 5.4.2 Create a new TLS certificate, p. 35) and having it created
again during commissioning of the device. It is important that summer or
winter time (normal time) and the time zone of the USM are set.

5.4.1   Preparation: Check daylight saving time and time zone

Ensure that daylight saving time (standard time) and the time zone are set correctly on the USM.

Prerequisites:

- A connection between USM and enSuite is established.
- The user right **Change general system settings** is granted.

► Connect enSuite to the meter.
✓ When connecting for the first time, enSuite displays the information of the current certificate of the meter.
► Accept the certificate only temporarily.
► Call the action **Online parameterization**.
► In the parameter tree open the node:
   <device type> – 🗾 Basic System – 🕐 Time Service
► In section **General** select the **Time zone**.
► In section **Daylight saving** parameterize daylight saving.
► Click on the icon **Transfer changes to device**.

5.4.2   Create a new TLS certificate

► Authenticate yourself on the device in display 🗾 **System –** 👤 **Users**.
► Switch to display 🏠 **Home –** ℹ️ **Info – <device serial no.>**.
► Delete the existing certificate with **Delete certificate**.
✓ The certificate will only be permanently deleted on shutdown.
► Restart the device with the action **Reboot and create certificate**.
✓ On restart, the device generates a new certificate for MMS communication.

5.4.3 Validate the certificate information

► Open the certificate information on the device under:
ⓘ **Info – <device serial no.>**, **Certificate**
✓ The certificate is displayed on two pages:
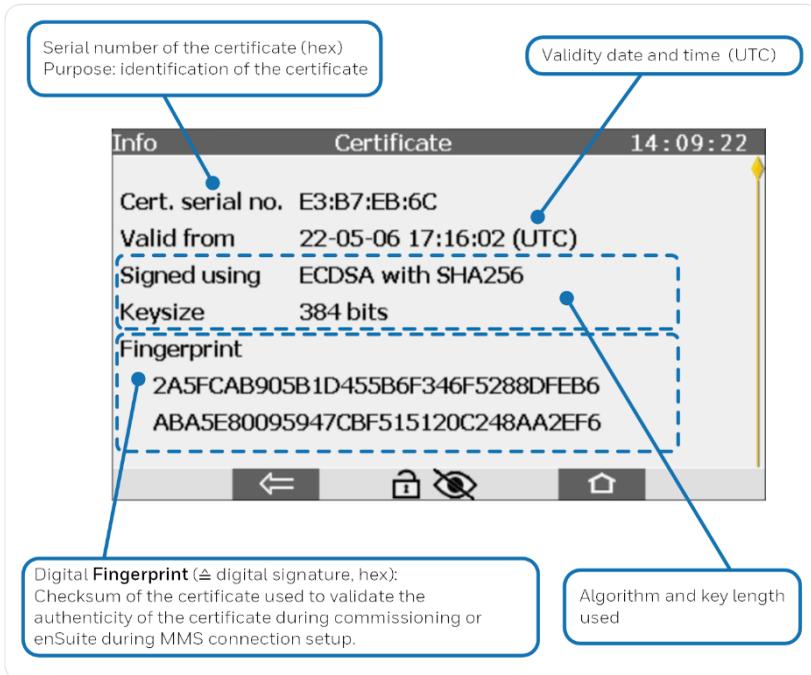
Fig. 8.2: Display **Certificate** first page – example
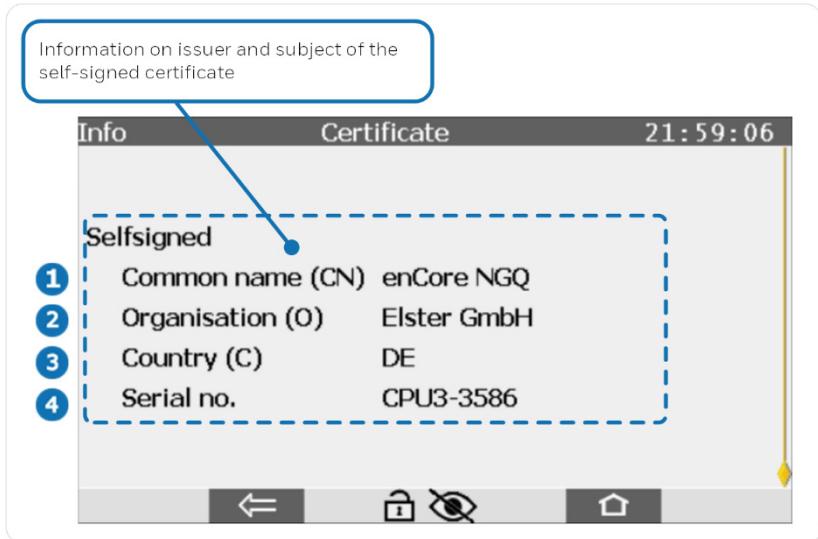
Fig. 8.2: Display **Certificate** second page – example

Naming convention according to X.500 standard and values for TLS certificates for enCore devices:

① CN = Common Name, here: enCore device type

② C = Country; here: DE - Germany

③ O = Organization; *here*: Elster GmbH

④ Serial number of enCore device

5.5   SPU configuration

When the meter is installed and correctly wired, it is advisable to read out the parameter settings of the meter. If the meter has been calibrated before, compare the parameter set-up with the one of the calibrations.
The parameter set-up can be readout with SonicExplorer (meter software up to V3.02) or enSuite.

In case you detect discrepancies, ⇨ Contact (p. 2) Honeywell or your local agent immediately.

⚠️ **WARNING!**

When opening the SPU (either main or rear compartment), obey the rules and regulations that apply to hazardous area operations.

5.6 Cold commissioning

During cold commissioning the meter is pressurized with a known gas composition at a known temperature and pressure, because in the case of atmospheric (low pressure) conditions, the UFM is not able to measure correctly.

A thorough functional test is performed by means of a PC and diagnostic software package (enSuite). Diagnostics and status per measuring path and the zero flow can be checked, assuming there is enough pressure in the meter. A technician of Honeywell will, verify measurements and check the system performance, if this has been agreed to.
⇨ Contact (p. 2) Honeywell or your local agent

5.7 Hot commissioning

The hot commissioning is in most cases the last test of the UFM and can be witnessed by a representative of the client and, if required, by an inspector of weights and measures for the official sealing. Under this condition there is process gas in the pipe and a flow test is being performed. The performance, AGC Levels/Limits and zero flow are checked again. If possible, the gas flow running through the UFM will be compared to another flow meter in the line. Most UFMs are calibrated gas flow meters, so the measured value is reliable without exception. Furthermore, the interaction with the flow computer can be tested.

6 Operation and navigation

This section describes how the UFM Series 6 can be operated through the interactive touch screen display on the meter.

6.1 Operation panel with touch areas

6.1.1 Overview
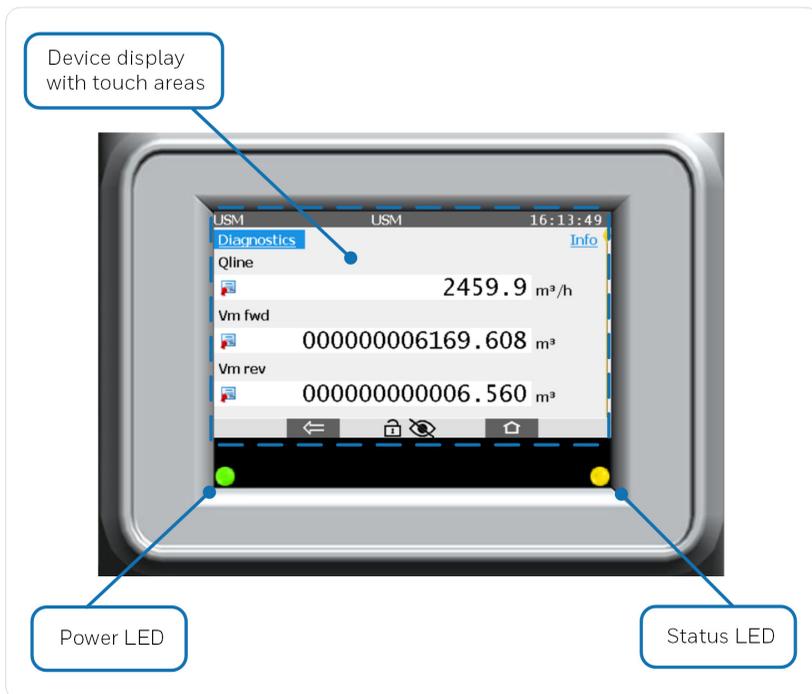
Fig. 6-1: Front panel – example

6.1.2   Power and status LED

2 LEDs provide an overall status indication of the meter.

Power LED

LED status	Description
Off	Power is off.
Green	Power is on.

Table 3: Power LED

Status LED

LED Status	Description
Off	Power is off or the device is running warning and error free.
Yellow, flashing	A warning is pending that does not affect the metrology relevant functionalities.
Yellow, permanently illuminated	At least one warning that does not affect the metrology relevant functionalities was pending but has already ended. The user needs to accept past warnings and errors at the operation panel before the color of the status LED turns back to off. ⇨ 9 Error list and audit trails (p. 91)
Red, flashing	An alarm is pending that affects the metrology relevant functionalities.
Red, permanently illuminated	At least one error that affects the metrology relevant functionalities was pending but has already ended. The user needs to accept past warnings and errors at the operation panel before the color of the status LED turns back to off. ⇨ 9 Error list and audit trails (p. 91)

Table 4: Status LED

6.1.3   Navigating with touch areas

The SPU contains an interactive touch screen display, showing the most important measurements and diagnostics (e.g., line flow, gas velocity, speed of sound, totalizers). It contains a touch screen with 7 touch areas. These touch areas will disappear when not in use and reappear with a touch of the screen in one of the 7 touch areas.
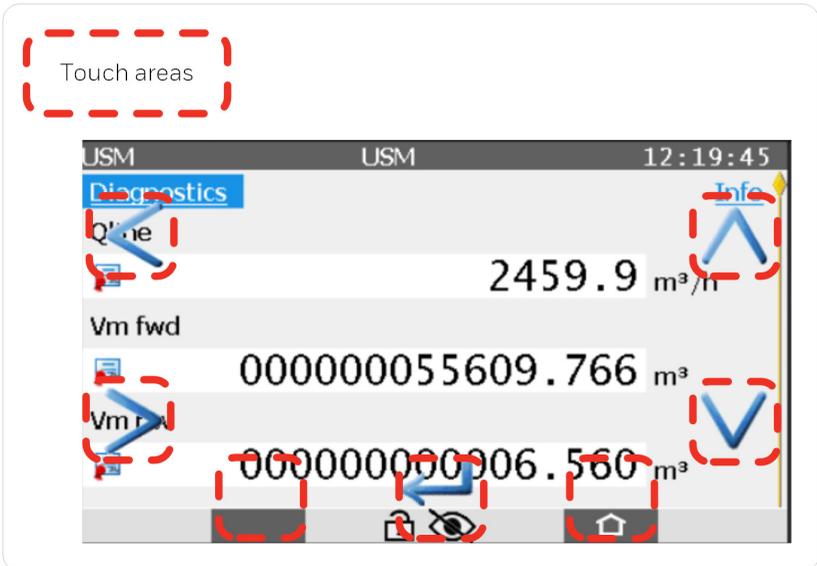
Fig. 6-2: Front panel with 7 touch areas

Virtual buttons	In short	Meaning
<	left	Navigates to the next element on the left or right.
>	right	Navigates to the next element on the right.
∧	up	Navigates to the next element up or moves the slider on the right up.
∨	down	Navigates to the next element down or moves the slider on the right down.
↵	enter	Opens a hyperlink, performs an action, or opens the keyboard for user input.

Table 6-5: Virtual touch areas and their meaning

Icons/ buttons	In short	Meaning
The following buttons are displayed depending on the context:		
⇐	back	Switch back to the calling display, i.e., the display that was previously opened.
⌂	home	Switch directly to the home display.
▤	basic	Switch directly to the basic display (startup display).
✓	ok	Confirms or cancels a user action that requires a confirmation, e.g., a time adjustment.
✗	cancel	

Table 6-6: Display icon and their meaning within the touch areas

View the front panel remote on your service PC

It is possible to access the local operation panel of a device remotely with your service PC, which allows you to interact with the device.

- In enSuite

  Call the action **Remote operation panel** in enSuite.

  ⇨ UFM Series 6 "Configuration and analysis with enSuite"

- In your browser (*meter firmware up to V 3.02 only*)

  Connect the Ethernet cable at the field terminal board (⇨ for help, refer to document: UFM Series 6 "Wiring Instructions") and type the following address in the internet browser on your service PC:

  http://xxx.xxx.xxx.xxx/frontpanel.html
  (where <xxx.xxx.xxx.xxx> represents the IP address of the meter)

6.1.3.1   Clarification: main, basic and home display

Main display is the name of the first display of an AFB or a functionality of the `Basic System`; it shows the most important results of this functionality. Depending on the AFB or functionality, further information is displayed in subordinate device displays.
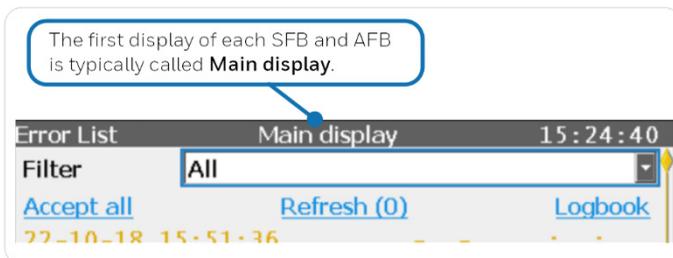
Fig. 6-3: The Main display ≙ 1st display of an AFB or SFB – example

The **basic display** (▤) is displayed immediately after the device is started. If no operation is performed during a preset time, the device switches back to the basic display automatically. By default, the basic display for the UFM Series 6 is the main display of the U S M A F B . (⇨ 6.2 The basic display, p. 45)

For some device types, it is parameterizable in enSuite which display is used as basic display.[1]

Home (⌂) is a special display and shows the software structure of the device. In enSuite you add further entries to the home display ⌂ in the parameter branch ▦ **Displays** on tab **Menu-editor – Home**.

Single software modules (like e.g., AFBs) and further selected functionalities, which shall be easily accessible (e.g., time or language setting), are repre-sented with small symbols in this display. The symbols are labelled with the name of the corresponding functionality. AFBs are labelled with their user-defined names, if parameterized – otherwise the default name is displayed.

---

[1] For more details ⇨online help: Press [F1] on node **Displays** in the device para-meterization tree.

6.1.4   Device display layout
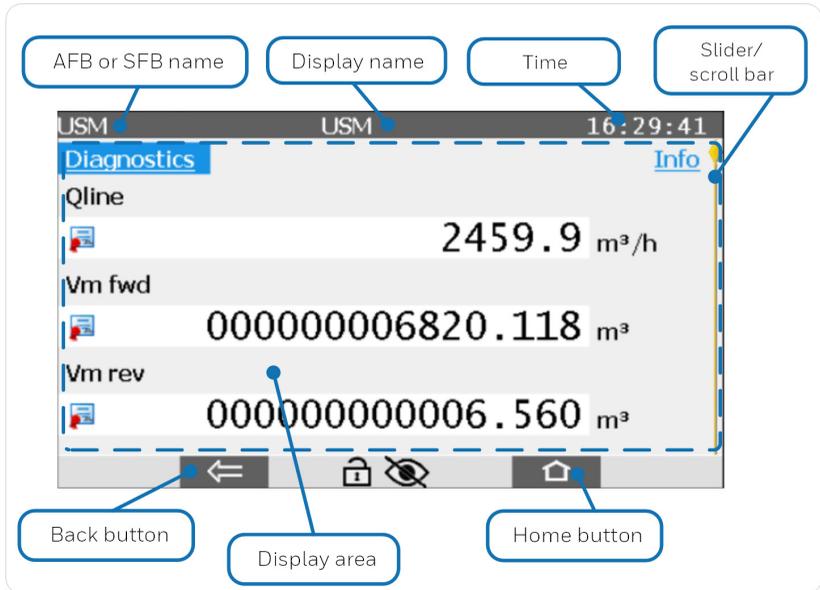
Fig. 6-4: Display layout – example **USM** display

6.2   The basic display (USM AFB)

The basic display (▤) is the main display of the USM AFB.
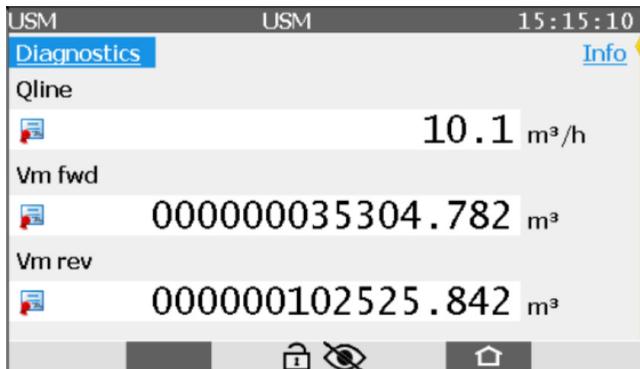
Fig. 6-5: Basic display – example

Basic display	
Qline	Volume flow at line conditions
Vm fwd	Volume at measurement conditions in forward (positive) direction
Vm rev	Volume at measurement conditions in reverse (negative) direction
Vline	Adjusted profile-corrected gas velocity (scroll down on the meter display to view this value)

Plus, hyperlinks for additional details:

- **Diagnostics**: Hyperlink to **Diagnostics** display
- **Info**: Hyperlink to **Info** display

6.3   The home display provides different functions

Call

🏠 Home
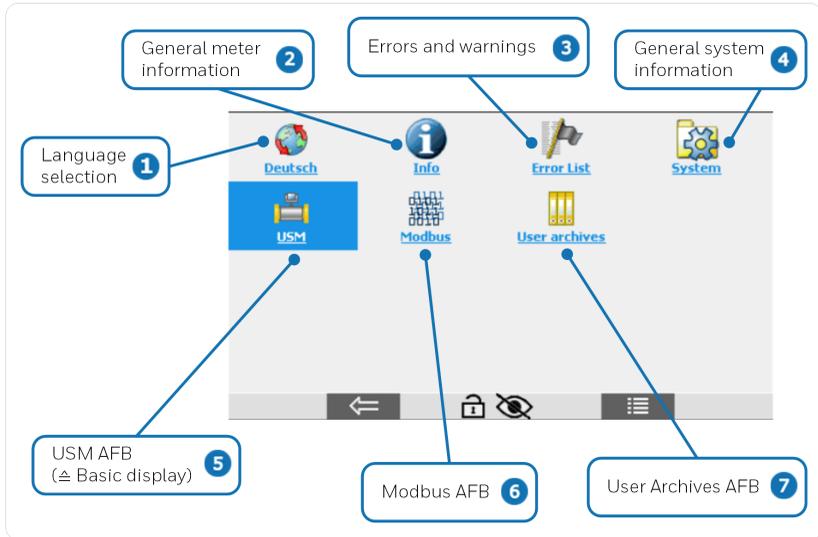
Fig. 6-6: Home display and Menu – example

The home display provides following modules:

❶   ⇨ 6.4 Switching the device language (p. 48)

❷   ⇨ 6.5 Display "Info" and its subdisplays (p. 48)

❸   ⇨ 6.6 Error List (p. 58)

❹   ⇨ 6.7 System – Time Service, Users, etc. (p. 59)

By default, the following AFBs are activated in the delivery state:

❺   ⇨ 6.8 USM AFB (p. 65)

❻   ⇨ 6.9 Modbus (p. 66)

❼   ⇨ 6.10 User archives AFB (p. 72)

6.4 Switching the device language

An enCore device supports two language settings. English is always available; in addition, you specify another language when ordering the device.
The language setting determines the language used as well as the date and time and number formats.
For example, if you select 🌐 **English** as a language, the date will be displayed in the format **YY-MM-DD** or **YYYY-MM-DD** and the time in the format **HH:mm:ss**.

🏠 Home **–** 🌐 **<Language>**

The language settings switch directly.

6.5 Display "Info" and its subdisplays

In this display general important information about the meter can be found.

🏠 Home – ℹ️ **Info**

Fig. 6-7: Display **Info** – example

The single sub displays are described in following sections.

At the bottom the status of the security switch is shown:

- **Security switch open**

- • **Security switch closed**
  In the case of devices which are used in the field of legal metrology, it is generally stipulated that the security switch is closed and sealed[2] during operation and can only be opened in the presence of an authorized person.

6.5.1   Display "<Device serial number>" to view basic device settings

Background

The display **<Serial number of the device>** shows important information of the device.

During system startup, the device compares its data with the so-called basic device settings. The basic device settings are stored in a configuration file that is available when the device is delivered and can be updated via the software configuration in enSuite.
If the device detects deviating data during the consistency check, these are shown in **red** in the display.

---

[2] A status cannot determine whether a security switch is sealed, this can only be identified on site directly on the device.

Call

🏠 Home **–** ℹ️ Info – **<Serial number of the device>**
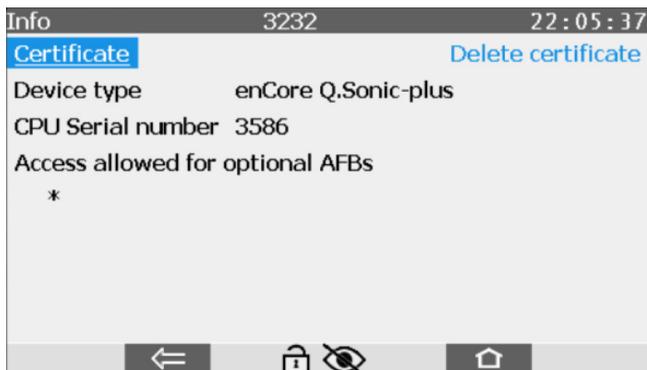
Fig. 6-8: Display **<serial number of the device>** – example

Display "<Serial number of the device>"	
Certificate	Hyperlink to view the certificate information for validation purposes. Typically used to check the validity of the certificate, when connecting enSuite to the enCore device. ⇨ UFM Series 6 "Configuration and analysis with enSuite"
Delete Certificate resp. **Reboot and create certificate**	Mark an existing certificate to be deleted after restart. After a certificate is marked to be deleted, the action for reboot can be performed and a new certificate is created on restart. ⇨ UFM Series 6 "Configuration and analysis with enSuite"
Device type	Device type (kernel of the firmware) of the enCore device, e.g., Q.Sonic-plus **in red**:
Cause	• Inconsistent data: Incorrect device type in the basic device settings

Display "<Serial number of the device>"	
CPU Serial number	Serial number of the CPU
Cause	**in red**: • inconsistent data: wrong CPU number in the basic device settings
Access allowed for optional AFBs *** or <variable list with AFBs>**	*optional* All chargeable AFBs that have already been purchased and activated in your device are displayed here – this section is only displayed if activated AFBs are available. An asterisk (*****) signals all chargeable AFBs are activated.
Access denied for optional AFBs **<variable list with AFBs>**	*optional* All chargeable AFBs that have been para-meterized but are not yet activated in your device are displayed here – the section is only displayed if such AFBs exist in the device.

[Mismatching basic device settings => manual]

This message is only displayed if inconsistent data has been detected.

> ❗ **Customs sign at system startup**
>
> In case the device detects inconsistencies, it starts in the so-called "improper configuration mode" and signals this with the customs sign.

Fig. 6-1: "Improper configuration mode"
with strongly limited range of functions

In this case, the display **<Serial number of the device>** is the first point to check, as it informs you which data is inconsistent.

Contact our support team (⇨ Contact, p. 2).

6.5.2   Display "Serial numbers"

Background

There are several serial numbers present in the device.

Call

🏠 Home **– ℹ️ Info – Serial numbers**

Fig. 6-9: Display **Serial Numbers** – example

Display "Serial numbers"	
Customer	serial number or name which can be chosen for easier meter identification
Type plate	serial number of the type plate used, e.g., ATEX, IECEx, FM or CSA certified ⇨ 4.6 Labels and nameplates (p. 25)
Meter body	meter serial number, typically also on meter body
Resource ticket	meter serial number stored in the resource ticket
CPU3 board	serial number of the CPU3 board, e.g., important in case of a CPU3 board replacement

6.5.3   Display "Device monitor"

Background

The **Device monitor** display shows information about the battery[3] and the current CPU and RAM load of the device.

Call

🏠 Home **–** ℹ️ **Info** – **Device monitor**

Info	Device monitor	10:39:41
Operating hours		65 h
Battery state of charge		22.00 %
Battery Normal voltage		2.97 V
Battery shut-down voltage		2.38 V
Battery replace date	70-01-01 00:00:00	
CPU load		54.79 %
RAM load		42.85 %
Reset battery status		

Fig. 6-10: Display **Device monitor**

Display "Device monitor"	
Operating hours	Actual operating time in hours since manufacture of device.
Battery state of charge **[Low battery charge state!]**	Remaining battery charge in percent The capacity calculation is linked to the threshold levels set in the parameters **Low runtime voltage** (default: 2.9V) and **Low shutdown voltage** (default: 2.3V) in enSuite **System** in section **Battery**.

---

[3] The battery is checked according to the parameterized **Check interval** (enSuite: **System**, section **Battery**).

Display "Device monitor"	
	If the battery capacity has fallen to below 20%, the message **Low battery charge state!** is displayed instead. Additionally, the warning "Battery low" is generated. ⇨ 6.6 Error List (p. 58)
Battery Normal voltage	voltage measured during meter operation
Battery shut-down voltage	voltage measured during meter shut down (voltage under load)
Battery replace date	After replacing a battery on the mainboard of the meter the battery status needs a reset. This updates the date and time and shows the actual charge level of the battery in %.
CPU load	Current load on the RAM in percent (*for information only*)
RAM load	Current load on the RAM in percent (*for information only*)
Reset battery status [**Resetting battery failed!**]	Action to reset the battery status Perform this action after changing the battery. Prerequisite: User is logged into the device with **User right to reset the battery**. The message **Resetting battery failed!** is only displayed in the event of an error. In this case, contact our support team (⇨ Contact, p. 2)

6.5.4   Display "Software status"

Background

This display lists all software modules with their versions and checksums.

⇨ 8 Verifying the software status (p. 90)

6.5.5 Display "Fiscal config" (for legal metrology)

Background

The **fiscal config** is a display designed for the specific control of the settings of all legally relevant parameters in the device against the official data book.

In this display the parameters are displayed hierarchically and grouped by functionalities. The structure of the display corresponds exactly to the structure in which the parameters are also presented in the data book. You can view a current data book at any time with enSuite based on the current parameterization.

Call

Home **–** 🛈 **Info** – **Fiscal config**

Fig. 6-11: Display **Fiscal config**

On the first level of the display, you can see the main functionality USM with the checksum over the corresponding parameters. With the hyperlink USM you branch to the subordinate parameter levels.

6.5.6   Display "Display test"

Background

Use this test function to check the device display of the Q.Sonic is working correctly.

Call

Home **–** 🛈 **Info** – **Display test**

During test mode, all pixels of the display are alternately black and white
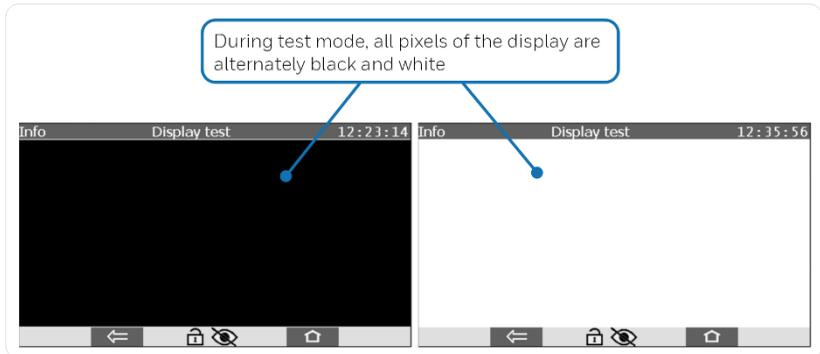
Stop the test with ⬅ back or 🏠 home.

6.5.7   Display "License info"

Background

License information about software components used in the enCore device.

Call

⬜ Home **–** ℹ️ **Info** – **License info**

Fig. 6-12: Display **License info**

6.6   Error List

Background

Here you can see a list of the most recent meter errors and warnings.

Call

⬜ Home **–** 📋 **Error List**

6.7   System – Time Service, Users, etc.

Background

The system display contains general system information.

Call

⌂ Home **–** 🖼 **System**
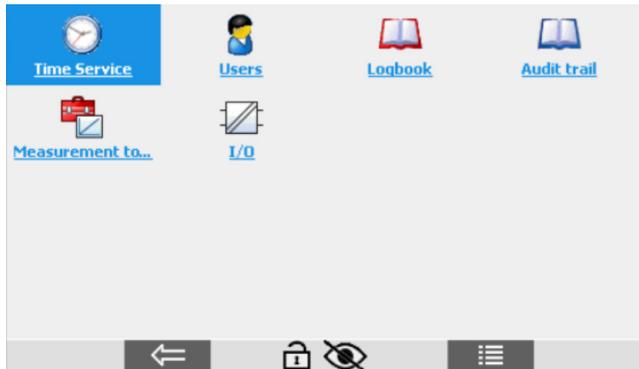
Fig. 6-13: Display **System** – example

Typically, **System** manages different Function Blocks, e.g., Measurement tools, I/O, Time Service. The following are described in more detail:

⇒   6.7.1 Time Service (p. 60)
setting date and time of the meter

⇒   10 User rights / login (p. 97)

logging in with appropriate user rights

⇒   6.7.2 Logbook (p 63)
viewing and filtering the list of the start and end of all messages (alarms and warnings)

⇒   6.7.3 Audit trail (p. 64)

6.7.1 Time Service

The `Time Service` is an SFB, which is used by all enCore devices. It manages the internal time within the device, hereinafter also referred to as system time. Its tasks include synchronizing and setting the system time (⇨ 16.1.1 Why does the Time Service distinguish between synchronization and setting the system time?, p. 119).
Updating the system time is the generic term for both the synchronization and the setting the system time.

6.7.1.1 Display "Main"

Call

Home – 🖥 **System** – 🕐 **Time Service**
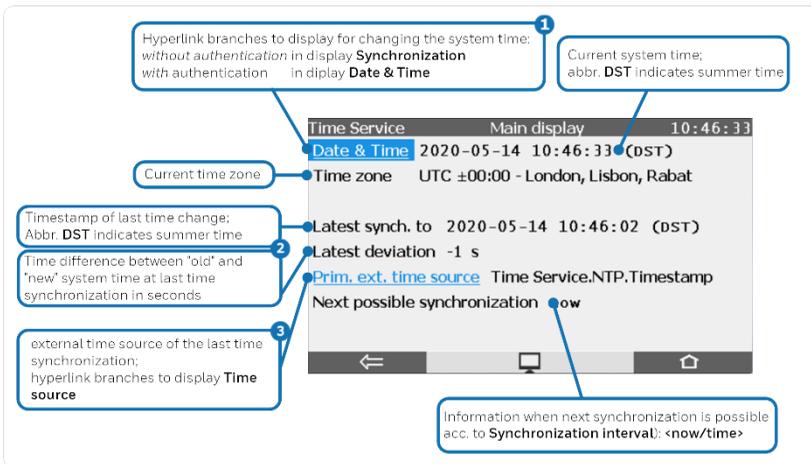
Fig. 6-2: Time Service Main display – example

① Prerequisite: user authentication with right **Update device time**

② A question mark **?** indicates that the system time has not yet been synchronized.

③ Only displayed if an external time source has been parameterized and used.
(Parameter **Prim. external time source** and **Sec. external time source**)

6.7.1.2   Display "Date & Time" – synchronizing the system time

Background

If no user is logged on to the device, or the logged in user does not have the right **Update device time**, you can synchronize the device time.

Call

   Home – 🗔 **System** – 🕐 **Time Service – Date & Time**
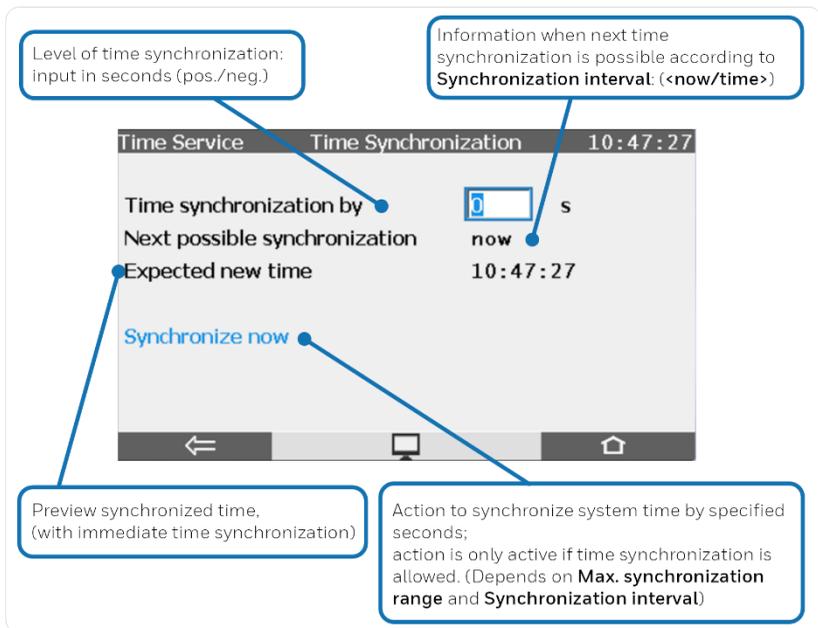
Fig. 6-3: Main display – example

6.7.1.3   Display "Date & Time" – setting date and time

Background

If you user is logged on to the device and is granted the right **Update device time**, you can set the date and time of the device.

Call

Home – 🖼 **System** – 🕐 **Time Service – Date & Time**
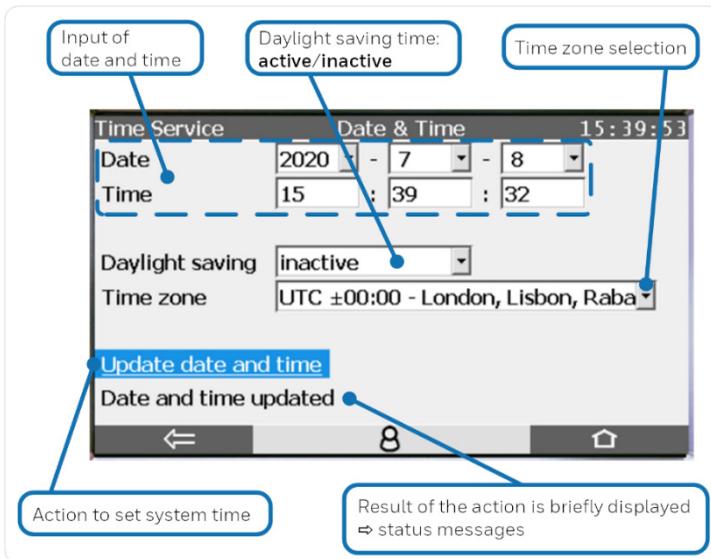
Fig. 6-4: Main display – example

6.7.2   Logbook

Call

🏠 Home – 🗔 **System** – 📖 **Logbook**

The logbook will log the start and end of all messages (alarms and warnings). It is similar to an archive; each entry is assigned a sequence number. It is part of the error list and can be filtered using the **Filter** drop-down list. (⇨ 1.5 Event labels, p. 12)
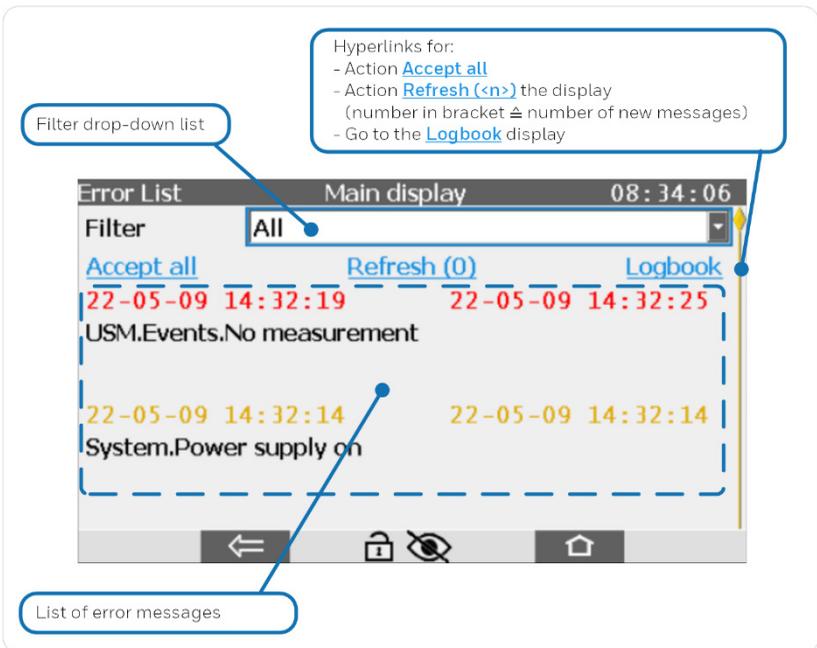
Fig. 6-5: **Error List**: **Logbook** display – example

6.7.3   Audit trail

Call

🏠 Home – ⚙️ System – 📖 Audit trail
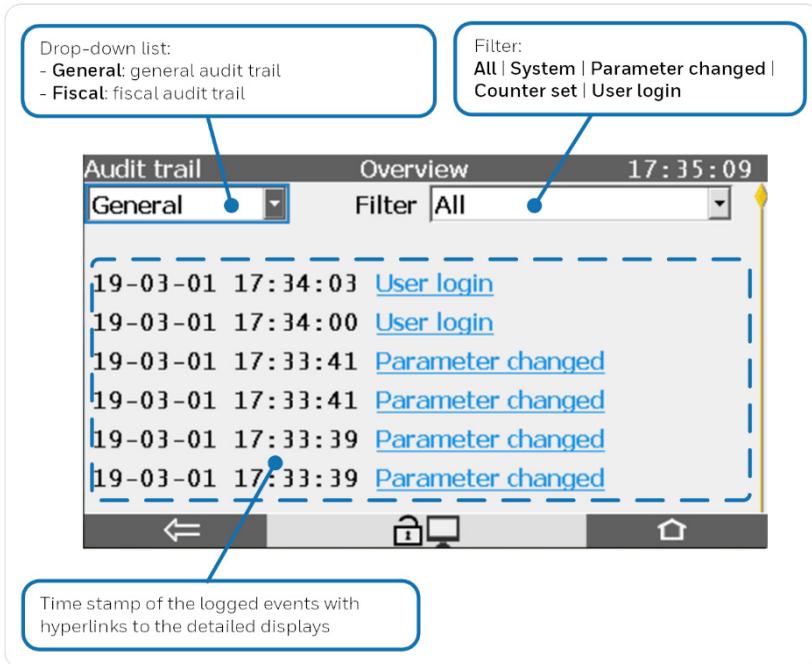
Fig. 6-6: Audit trail: Overview display – example

6.8   USM AFB

Background

Switches directly to the basic display, which typically is the Main display of the USM AFB.

Call

🏠 Home **–** 🖨 **USM**

⇨ 6.2 The basic display (p. 45)

6.9   Modbus AFB

6.9.1   Modbus display „Main"

Background

Opens the protocol display of the `Modbus AFB`.

⇨ UFM Series 6 "Modbus protocol"

Call

🏠 Home – ⊞ **Modbus**

Fig. 6-14: Main display of the `Modbus AFB` – example

① For Modbus slave or server, the dropdown list only contains the entry **Local device** (; for master or client the list contains all parameterized **Remote device**).

② The text **No filters selected** is displayed in case no filter from the display **Modbus filter** is active; otherwise, the selected filters are displayed instead.

③ If the register number does not exist or if no register is found due to the current filter selection, the AFB jumps to the nearest displayable register number.

> **Modbus register $\underline{00000}$ shows the meter type**
>
> Register **$\underline{00000}$** relates to the Flow Meter identification code. In ⇨ Fig. 6-14, the output of **68** equates to the meter type ID of the Q.Sonic-plus.
>
> ⇨ 15.1 Q.Sonic meter type IDs (p. 116)

For the descriptions of each value output and other information regarding Modbus protocol.
⇨ UFM Series 6 "Modbus Protocol"

6.9.2   Modbus display "Modbus filter"

Call

 Home **–** **Modbus** – **No filters selected**/**<filter>**
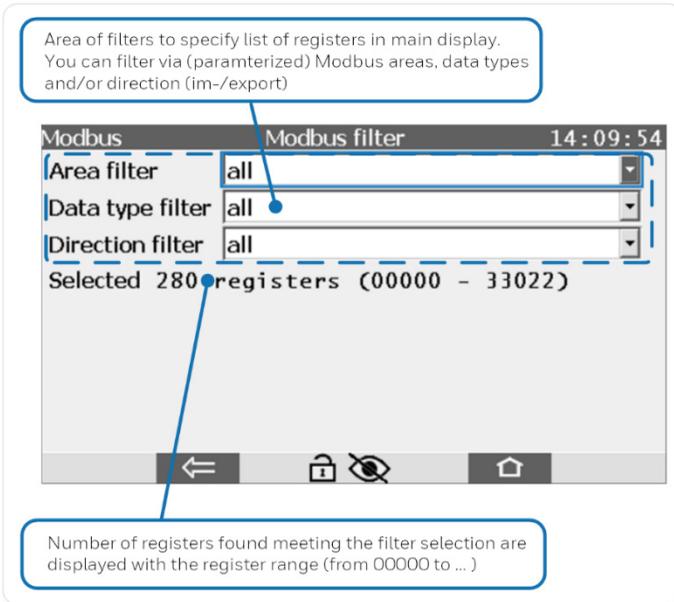
Fig. 6-15: M o d b u s   A F B , **Modbus filter** display – example

6.9.3   Modbus display "Diagnostic"

Background

This display provides diagnostic information of the selected area (not from function diagnostics `0x08`):

Call

⌂ Home – **▦ Modbus** – **TC**
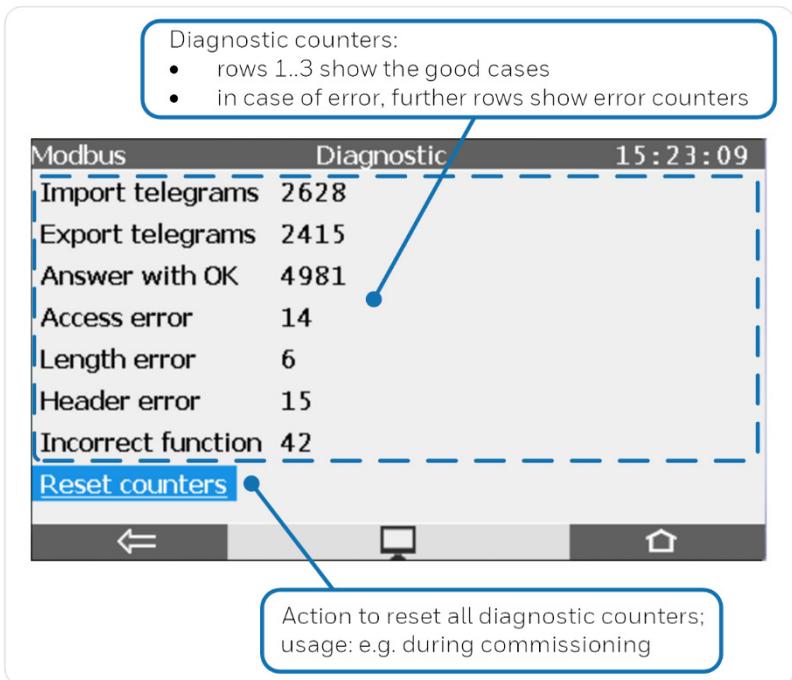
Fig. 6-16: M o d b u s   A F B , **Diagnostic** display – example

Error counters are only displayed, if they are not null (`0`), max. value is `999.999.999`. Following error counters are supported:

- **Access error**

  Accessing (read/write) protected register(s) while password is still locked.

- **Checksum error** (*slave only*)

  Received telegram(s) with wrong checksum.

- **Incorrect function**

  Request telegram with unsupported function

- **I-range error**

  For import data with range checking, the intended write value from telegram is outside the set range.

- **Header error** (*server only*)

  Total number of bytes specified in header is incorrect.

- **Length error**

  For writing into registers, the size of data received from telegram differs from the total size of Modbus registers to be written.

- **Register not found**

  Request telegram with unsupported function

- **Sending error** (*server only*)

  Internal data cannot be written due to program errors.

For simultaneous write area:

- **Access error**

  Register not in intended area

- **Length error**

  Data size for writing the value of a single register is not 16 bits.

- **Register not found**

  Incorrect register number, or the number of registers to be written differs from total number of registers in the area.

6.9.4   Modbus display "Modbus register"

Call

🏠 Home **–** ⠿ **Modbus** – **<reg.#>**
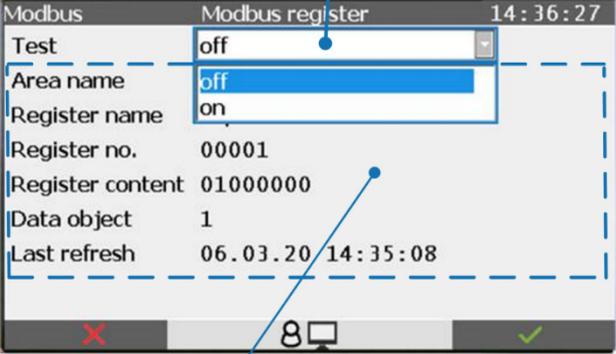
Fig. 6-17: M o d b u s   A F B , **Modbus register** display – example

❶   The test mode is available for all export registers except the data types
Export date and time, **Monoflop register** and **Sequence number** (*for
archive areas*).

❷   Register details

6.10 User archives AFB

Background

The User archives AFB archives values (e.g., measurements and counters) which are provided as export values by other AFB. An archive group creates a new archive entry each time a new value is available for one of the archive channels included in the group. The User archives AFB adds a time stamp and identification number to each archive entry.

In enSuite you can also parameterize an event-related and/or cyclic archiving, the Postprocessing AFB has to be used additionally for providing the cyclic or event-related values.

Call

🏠 Home **–** ░ **User archives**

To view the archive values, select the required **Group** and **Channel** and confirm with **Show values**.
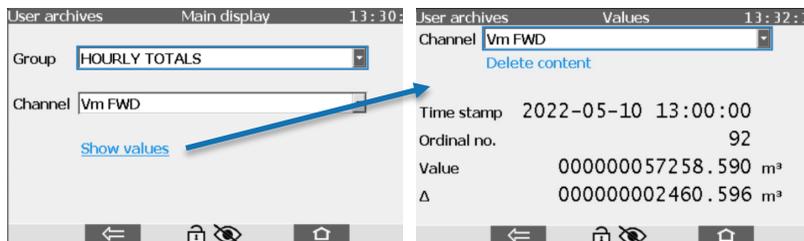
Fig. 6-18: Display **User archives** – example

6.11 Diagnostics

Background

The **Diagnostics** display allows to perform some easy firsthand diagnostics of the ultrasonic flow meter and its individual paths.

Call

⊞ Basic display, **Diagnostics**
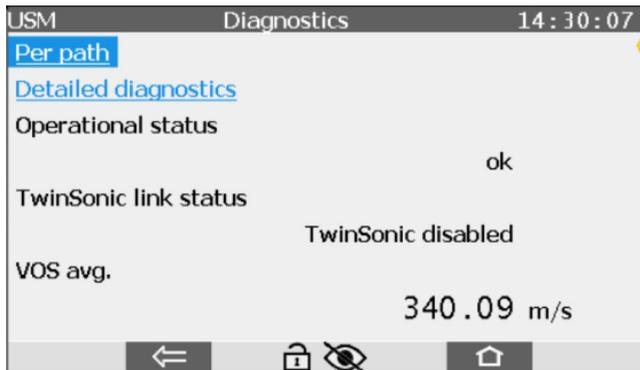
Fig. 6-19: Display **Diagnostics** – example

Display "Diagnostics"	
Per Path	Hyperlink opens display **Per Path** with details for each path. ⇨ 6.11.1 Per path (p. 75)
Detailed diagnostics	Hyperlink opens display **Per Diagnostic** with details regarding SNR, Gain, VOG Raw, VOS Raw, Profile Diagnostics, Performance, and Correction factors. ⇨ 6.11.2 Detailed diagnostic (p. 76)

Operational status	Possible status:
	• **ok** Everything is working properly. • **Reduced accuracy** There are some paths which are failing, nevertheless the measurement is still suitable for custody transfer. • **Non fiscal** There are some paths which are failing; measurement is no longer suitable for custody transfer. • **No measurement** All paths are failing. If the operational status is *not* **ok**, contact our support team (⇨ Contact, p. 2).
TwinSonic link status	(*always disabled*)
VOS avg.	Average measured Velocity of Sound of the gas.
Vme fwd	Total volume measured in forward direction, while the meter was in error mode
Vme rev	Total volume measured in reverse direction, while the meter was in error mode.
Pressure	With our optional pressure sensor, the live pressure can be given. If the meter is not equipped with the pressure sensor or it is not working, a pre-set value will be shown in red.
Temperature	With the optional temperature sensor, the live temperature can be given. If the meter is not equipped with the temperature sensor or it is not working, a pre-set value will be shown in red.
Density	This value is calculated from the option temperature and pressure sensor. If the meter is not equipped with the pressure and/or pressure sensor or they are not working, a pre-set value will be shown in red.
Viscosity	This value is calculated from the optional temperature and pressure sensor. If the meter is not equipped with the pressure and/or pressure sensor or they are not working, a pre-set value will be shown in red.
Internal temperature	This is the temperature measured in the SPU box on the mainboard. When the electronics are not equipped with the temperature sensor or it is not working, a pre-set value will be shown in red.

Table 7: Meter diagnostics

6.11.1   Per path

Background

The display **Per path** provides an overview of all paths and the current performance of each individual path can be checked.

Call

▦ Basic display, **Diagnostics**, **Per path**

Fig. 6-20: Display **Per Path**

For each path you can view further details like performance (%), diagnostic details, VOG and VOS of the selected path.

Fig. 6-21: Display **Per Path** – example

In case of a path in failure, you can see a detailed breakdown of the path diagnostics by selecting the highlighted **Diagnostic** result box.
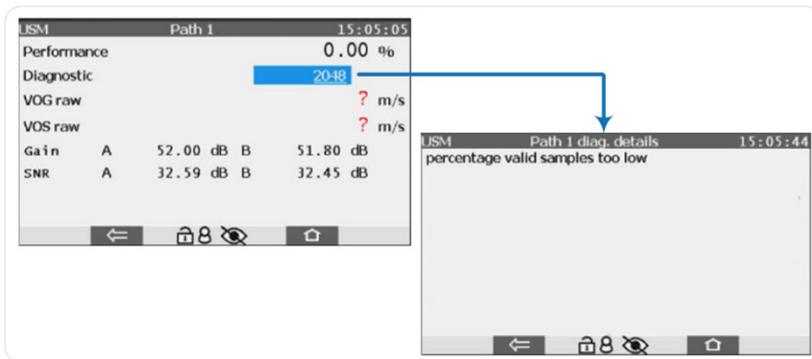
Fig. 6-22: Diagnostic details in case of path failure – example

6.11.2   Detailed diagnostics

Background

This display provides further diagnostic details**.**

Call

⊞ Basic display, **Diagnostics**, **Detailed diagnostics**
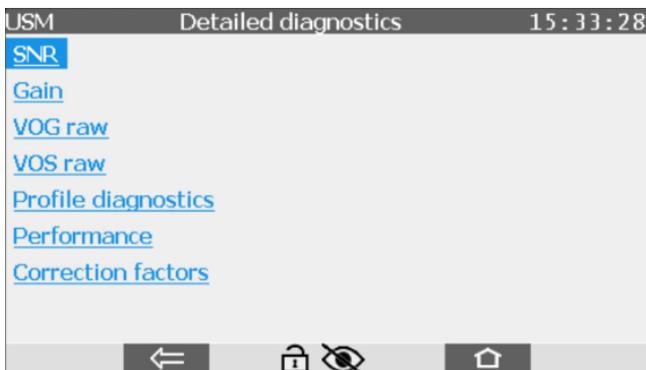
Fig. 6-23: Display **Detailed diagnostics**

6.11.2.1   SNR and Gain values

In these displays you check the live values for every transducer.

USM		Signal-to-noise ratio (SNR)			16:40:30		USM			Gain		16:42:17
Path 1	A	21.81 dB	B	17.94 dB			Path 1	A	54.39 dB	B	53.79 dB
Path 2	A	20.84 dB	B	16.09 dB			Path 2	A	38.00 dB	B	38.00 dB
Path 3	A	14.43 dB	B	13.99 dB			Path 3	A	36.20 dB	B	36.20 dB
Path 4	A	24.61 dB	B	23.34 dB			Path 4	A	39.80 dB	B	40.00 dB
Path 5	A	21.19 dB	B	21.46 dB			Path 5	A	40.40 dB	B	40.40 dB
Path 6	A	18.09 dB	B	17.34 dB			Path 6	A	36.60 dB	B	36.80 dB

6.11.2.2   VOG raw and VOS raw

These submenus display the raw Velocity of Gas and Velocity of Sound results.

USM	VOG raw	16:43:50		USM	VOS raw	16:45:29
Path 1		0.19 m/s		Path 1		344.37 m/s
Path 2		0.43 m/s		Path 2		344.60 m/s
Path 3		0.17 m/s		Path 3		344.49 m/s
Path 4		0.20 m/s		Path 4		344.41 m/s
Path 5		0.12 m/s		Path 5		344.49 m/s
Path 6		0.12 m/s		Path 6		344.42 m/s

6.11.2.3   Profile diagnostics

Profile diagnostics displays an array of useful calculations including, **Profile factor axial/swirl**, **Swirl angle**, **Asymmetry axial**, **Asymmetry horizontal**, **Reynolds path type A** and **Reynolds path type B**.

Fig. 6-24: Display **Profile diagnostics** – example

6.11.2.4   Performance

Here the performance of each individual path is displayed.

Fig. 6-25: Display **Performance** – example

6.11.2.5   Correction factors

This section provides an overview of all correction factors of the meter.

Fig. 6-26: Display **Correction factors** – example

Display "Correction factors"	
k-factor geometry \<path type\>, k-factor geometry diameter	These correction factors correct the size of the flow cell's body, based upon the measurements of the internal pressure and temperature sensors. The factor will only be considered if the meter is equipped with the pressure and temperature sensor and when this function is activated (enSuite in branch **\<USM AFB\> – Parameter –Correction**, parameter **Geometry Correction**: **on**)
	This is useful if the process conditions differ significantly from the conditions during the calibration process since both high pressure and high temperature results in an increase in the tube cross-section and a change in path lengths and angles.
	• **k factor geometry \<path type\>** determined correction factor of this path – if applicable
	• **k factor geometry diameter** correction factor for the inner diameter for the meter body at operation conditions
k factor linearization	When a meter is corrected after calibration through linearization, the adjust factor will be flow depending (interpolated between the calibration points). The meter can have a linearization for each flow direction. This factor shows the adjust factor calculated for the current operating flow (and direction).

k factor adjustment	This is the factor when a meter is corrected after calibration with one single adjust factor. There can be a different adjust factor for both flow directions.
	When operating around zero flow, it possible that this factor is constantly switching from positive adjust factor to negative adjust factor.
V offset correction	It is possible to put a fixed velocity offset in the meter. This will normally only be used on special projects. The standard for this factor is 0 m/s.

6.12 Info – Analog outputs, self-tests, internal software version

Background

The Info display provide general information about the electronics and its software with checksums.

Call

⊞ Basic display – **Info**
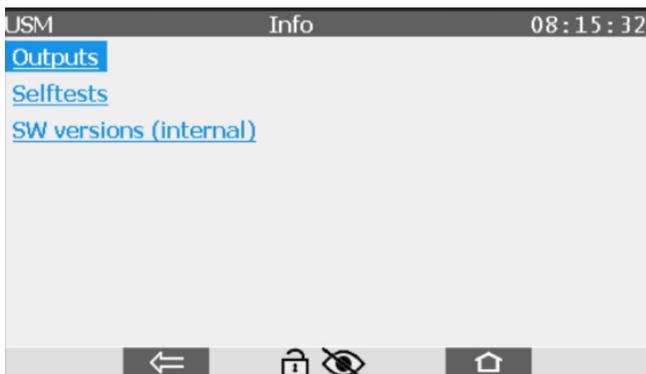
Fig. 6-27: Display **Info**

- **Outputs**

    Shows the results of the frequency and current outputs based on

the user's defined values (enSuite in branch **I/O – Analog & Digital**).

Fig. 6-28: Display **Analog Outputs**

- **Selftests**

  When you call this display, some important parts of the electronics will perform self-tests.

Fig. 6-29: Display **Selftests**

Possible values:

– **OK** – The test(s) passed.

– **FAIL** – If a FAIL is encountered, repeat the self-tests by calling this display again. If the tests continue to fail, contact our support team (⇨ Contact, p. 2).

– **?** – The self-test(s) have not started yet.

- **SW versions (internal)**
  In this display the flow board software components and their versions and checksums can be checked.
  ⇨ 8.2 Verifying checksums of the flow board components (p. 91)

7 Maintenance

The UFM contains no moving parts. The transducers are the only compo-
nents that are in contact with the gas medium. The materials used for the
transducers are resistant to the conditions that were clearly specified for the
measuring instrument. As a result, the transducers and the electronics are
virtually maintenance free.

However, Honeywell recommends inspection of the UFM at regular intervals,
for example weekly or monthly evaluations. In case of deterioration of the
meter, appropriate measures should be taken before a serious failure
occurs.

7.1 Collecting data

You can perform a quick health check of the meter via the ⇨ 6.2 The basic
display (p. 45) on the front panel. However, this only provides information
about the meter in the current state. For a more detailed indication of the
meter's condition, Honeywell recommends performing a trend analysis on
the meter's measured data (comparison of recent measured data with
results from a past period). enSuite is specially designed for this purpose.

⇨ UFM Series 6 "Configuration and analysis with enSuite"

It is a recommended engineering practice to record the measured data at
regular intervals.

7.2 Inspection of measured data

The following general rules provide a good basis for analyzing the measured
data.

7.2.1 Sample rate

The process of travel time measurement for all paths is repeated several
times per second. This number is called Sample Rate. Typically, this is a
stable value of about 20 with a variation of -1.

The sample rate is programmable to be anything between 1 and 100 Hz.
However, the actual sample rate may be lower than the programmed value

since, particularly with large size meters, the travel times of the ultrasonic pulses in the gas do not allow for the programmed sample rate. The UFM will then adjust the sample rate to the highest possible value. The highest possible sample rate is not necessarily the best setting for optimum performance. Although the sample rate is not critical, a value between 8 and 25 samples/second is recommended.

7.2.2   Performance

Performance is the pulse acceptance rate, expressed as a percentage for the pulses transmitted each second. Each transducer transmits several pulses each second. To be accepted as a valid received pulse by the signal processing system, each pulse must arrive within a small-time window, be of enough strength, and match a unique waveform signature. The percentage of accepted pulses is shown as an average value of all measuring paths, and for each individual path.

7.2.3   Velocity of Sound (VOS)

The Manual calculates the speed of sound in the gas, based on the measured travel times and the programmed spool piece geometry. This value may be compared to the (theoretically) expected value, for example as calculated using the AGA-10 equations of state. The difference between measured and expected values can be as little as 0.25 %, if gas composition, temperature, and pressure are precisely known.

7.2.4   Gas velocity (zero flow measurement)

When there is no flow through the meter, i.e., the block valve(s) are closed, the corrected gas velocity should randomly fluctuate between ±0.025 m/s and average very close to zero (0). During a sunny day the warm walls of the meter will cause small thermal convection currents to circulate inside the meter. The ultrasonic meter may measure these very slow currents as an increase in the random fluctuations.

7.2.5   Presentation of AGC levels and AGC limits

AGC limits and levels are presented in decibels (dB). The AGC ratio (AGC-limit / AGC-level) largely depends on the meter size and application (operating pressure, amount of CO_2, control valve nearby, etc.). A high AGC ratio is preferred.

The change of the AGC ratio over time is a very useful parameter to predict the performance of the meter in the future.

7.2.6   Swirl angle

If your meter is equipped with a swirl path, this value indicates the amount of swirl measured by an ultrasonic flow meter, expressed in degrees. A positive swirl angle indicates clockwise swirl, whilst a negative swirl angle indicates counterclockwise swirl. The meter operates reliably if the angle is between -20° and +20°. If the indicated swirl angle exceeds these values, please consult Honeywell for support.

7.3   Exchanging components

Different parts of the Ultrasonic Flow Meter Series 6 metering system such as transducers, electronic boards, etc. can easily be exchanged. The digital programmed pulse shape and pulse identification of the meter is always identical. Therefore, the electronic and transducer products need no adjustment. This means that re-programming or re-calibration of the meter after exchanging any identical part of the Ultrasonic Flow Meter Series 6 metering system is not necessary.

Spare parts of the Ultrasonic Flow Meter Series 6 metering system must be supplied by Honeywell. After exchanging parts of the Q.Sonic Series 6 metering system the present "calibration" sealing must be renewed.
⇨ 4.7 Sealing (p.29)

> ⓘ **Caution!**
>
> Before exchanging any components verify with your local metro-
> logy authority on proper procedures. It may be required that the
> operation needs to be witnessed by a representative of the local
> authority.

> ⚠ **WARNING!**
>
> **Exchanging of components should only be done with the
> same type and model; unless otherwise specified by
> Honeywell.**

7.3.1   Pressure sensors exchange

The meter may be equipped with an optional pressure sensor for internal
use (⇨4.4 Flow cell pressure sensor, p. 24). As the pressure sensors are
specially designed for the Ultrasonic Flow Meter Series 6, they may only be
exchanged with sensors from Honeywell.

> ⚠ **WARNING!**
>
> For the pressure sensor it is mandatory to *depressurize* the line
> before exchanging.

7.3.2   Temperature sensors exchange

The meter is equipped with a temperature sensor for internal use. As the
temperature sensors are specially designed for the Ultrasonic Flow Meter
Series 6, they may only be exchanged with sensors from Honeywell.
⇨ 4.5 Flow cell temperature sensor (p. 24)

As the temperature sensor only measures the flow cell temperature and is
not in contact with the gas in the pipe, exchanging can be done under
pressure.

7.3.3   Transducer exchange

Each transducer is a separate component of the Ultrasonic Flow Meter
Series 6 that can be exchanged independently. This can be done without
degradation of the measuring properties and accuracy (thus the calibration)
of the Ultrasonic Gas Flow Meter.

However, as the transducers are paired up during production, Honeywell
always recommends changing both transducers of an acoustic path, if
possible.

If the transducer cable is damaged, replace the cable harness.

> ⚠ **WARNING!**
>
> Obey the rules and regulations that apply to hazardous area
> operations and those with respect to custody transfer regulations
> (sealing).

> ⚠️ **WARNING!**
>
> Exchanging a transducer can take place when the line with the Ultrasonic Flow Meter Series 6 is *depressurized***:**
>
> - Refer to specific installation instructions delivered with the transducers:
>   ⇨ UFM Series 6 „Transducer Exchange at Atmospheric Conditions"
>
> Optionally, exchanging a transducer can be done when the Ultrasonic Flow Meter Series 6 is *pressurized***:**
>
> - A special tool is required for this: the 'Retraction tool NG Transducers'. Familiarize yourself with the documentation regarding this special tool:
>   ⇨ UFM Series 6 "Retraction tool NG transducers"
> - Before beginning this procedure verify if this is allowed by the safety standards set by your company and local safety regulations. If in doubt, DO NOT remove the transducers under pressure.

7.3.4   SPU exchange

Some parts of the SPU can be exchanged without issue, provided that the appropriate hardware and software versions are used. The product numbers can be found on the PCB and have the following structure `xxx-xxx-xxx-xxx`. The software version and its checksums can be checked via the front panel.
⇨ 6.1 Operation panel with touch areas (p. 39)

An SPU exchange will not affect the measuring characteristics and accuracy (and consequently the calibration) of the UFM. However, if the board is sealed after calibration, ⇨ Contact (p. 2) Honeywell or your local represent-tative before proceeding with the exchange.

When exchanging the SPU (or parts of the SPU), refer to the specific manual delivered with the component. Depending on the board, it could be one of the following documents:

⇨   UFM Series 6 "Exchanging PCB boards in TIP"

⇨   UFM Series 6 "Exchanging Boards at the Rear Compartment of the
     SPU"

8 Verifying the software status

It's possible to verify the software version with checksum for all components. This should be done by verifying the software versions and checksums, and by verifying the checksums of the flow board components.

8.1 Verifying software versions and checksums

Background

The checksums of the different software parts are checked cyclically. If a deviation of a checksum is detected, the checksum is displayed in red letters. If such a deviation affects the checksum of a legally relevant software part, an alarm is also triggered.

Call

🏠 Home **–** ℹ️ **Info – Software status**
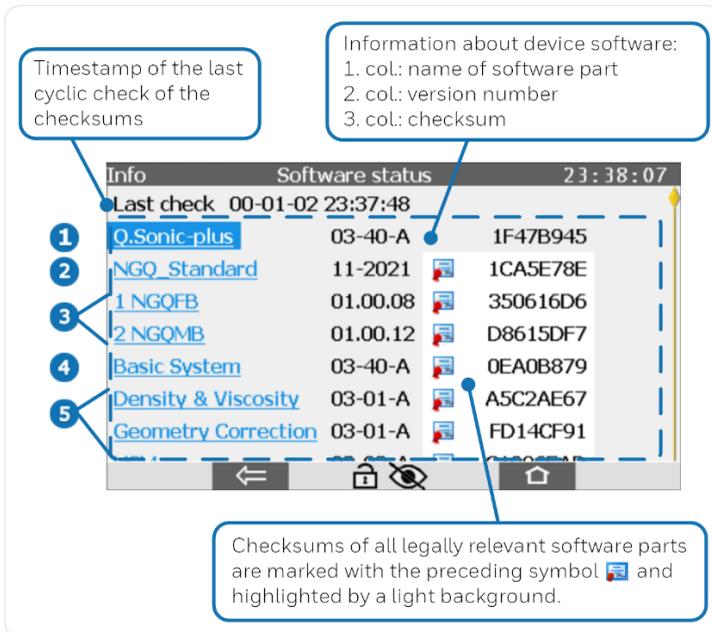
Fig. 8-1: Display **Software status** – example

①   Name, version, and checksum of the firmware

②   Name, version, and checksum of approval file

③   Name, version, and checksum of board software
(preceded by the number of the associated card slot)

④   Name, version, and checksum of the Basic System

⑤   Name, version, and checksum for each AFB available in the device

The names of the software parts are implemented as hyperlinks, which branch into subordinate displays with further information.

8.2   Verifying checksums of the flow board components

►   In the basic display ▤ open **Info** – **SW versions (internal)**.
✓   The flow board components are listed.

►   Choose the module you want to check, e.g., **DSP**.
✓   Module display.

Fig. 8-2: Display **DSP** with checksums of its software components – example

9 Error list and audit trails

9.1.1 Verifying errors and warnings

Background

The error list shows all the alarms and warnings which are either currently pending or have already ended but have not yet been accepted. The following terminology applies:

- *Alarms* are error messages which jeopardize the accuracy of the results of the (fiscal) functions. An alarm is generated, for example, in case of a flow board error

- *Warnings* are error messages which do not falsify the (fiscal) results but are important for monitoring the measurement, such as low accuracy.

As soon as an error of Alarm type or Warning type appears in the error list, the enCore device indicates this using either the red or yellow status LED on the front of the device.
⇨ Status LED (p. 40)

9.1.1.1   Opening and filtering the error list

►   Open the error list via home display 🏠 – 📋 **Error List**.

✓   The error list shows all the current warning or alarm messages.
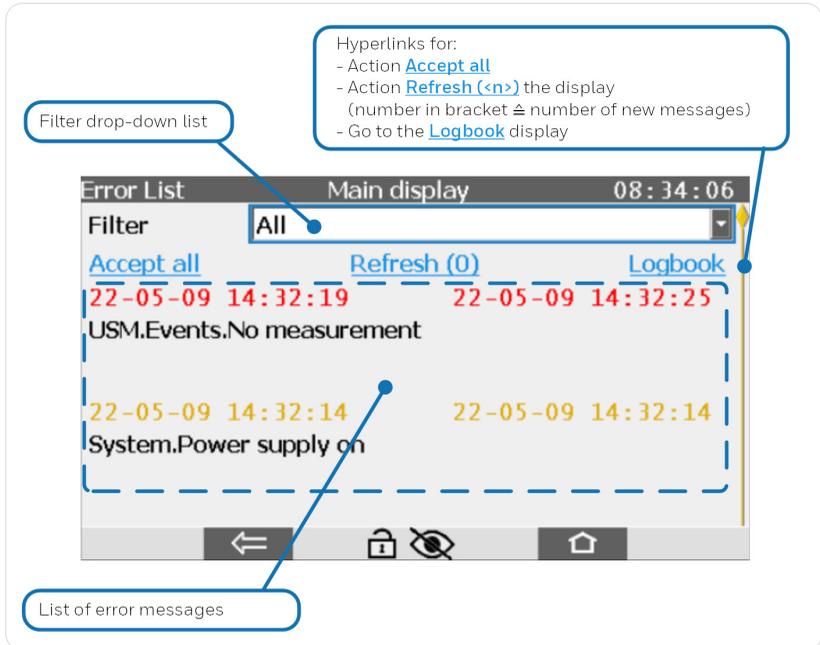
Fig. 9-1: Display **Error list** – example

In general:

- The error list is sorted in chronological order based on the time at which each the message was received, with the latest message being displayed first.

- Using the **Filter** drop-down list, this full list can be filtered so as, for example, to view all the messages for the **Audit Trail**.
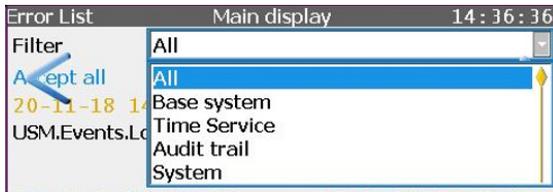
- Action **Accept all**
  This action accepts all the messages in the current filter selection which have ended; they will then disappear from the error list. Depending on the parameterization, a user may first have to log into the device to perform the **Accept all** action.

  ⇨ UFM Series 6 "Configuration and analysis with enSuite" for details on how to limit accepting errors.

- Action **Refresh (<n>)**
  While the error list is displayed, the *states* of errors which have already been displayed are updated continuously.
  New errors are not automatically added to the list, however. You can update the list manually using the **Refresh (<n>)** action. The number in brackets shows the number of new errors; **Refresh (<0>)** indicates the display is up to date.

- Hyperlink to the **Logbook** display
  ⇨ Logbook (S. 63)

- Time stamp for begin and end of a message
  The *begin* time stamp is shown on the left for each message and the *end* time stamp on the right (if the error has already ended). The time stamps for all alarms are displayed in red text and for all warnings in yellow text.
  A message is currently pending when an empty end timestamp is displayed, e.g. alarm is pending: __-__-__ __:__:__.

- Hyperlink **...**
  With a hyperlink **...** next to a message you will get more details about this message.

> **Naming convention of error messages**
>
> AFB messages follow the naming convention:
> **[<Group>.]< AFB name>.<message>**

9.1.2 General audit trail and fiscal audit trail

Background

In enCore devices, a distinction is made between the general audit trail and the fiscal audit trail. Both are log archives:

- General audit trail

  The audit trail is a fixed component of the `Basic System` and exists in every enCore device. All parameter changes and the following system events are logged here:

  – System messages

  – All parameter changes

  – User login and logout

  – Setting counters

  – All entries in the fiscal audit trail

  The audit trail has a depth of 1000 entries. As soon as the logbook is full and another event occurs, the oldest entry is overwritten by the latest entry using the FIFO (first-in-first-out) principle.

- Fiscal audit trail

  enCore devices which are used for legal metrology purposes also have a fiscal audit trail.

  All changes of parameters made while the security switch is closed, which are labeled with the 📖 symbol in the device parameterization, are logged here.

  The fiscal audit trail has a *maximum* storage capacity of 1000 entries. As soon as the fiscal audit trail is full, parameters with the relevant symbol can *no longer* be changed while the security switch is closed – the fiscal audit trail must first be cleared. This action can

only be performed by an authenticated user with the security switch open.

> **Parameterizing the audit trail in enSuite**
>
> In enSuite you can activate to Summarize entries for administrators and determine prewarning and warning limit for the fiscal audit trail.
>
> 🔧 **System**, section **Audit trail**
>
> | ▼ Audit trail | | | |
> |---|---|---|---|
> | Summarize entries for administrators | ☑ | | |
> | Prewarning limit fiscal audit trail | 85 | % | |
> | Warning limit for fiscal audit trail | <Not used> | % | |
>
> ⇨ Online help in enSuite

10 User rights / login

The user rights are implemented in the Ultrasonic Flow Meter Series 6. Access to the device with enSuite is only granted after user authentication.

10.1 User profiles: admin1, User1 and User2

By default, three user profiles are available:

- **admin** (*up to meter firmware V3.02*) /
  admin1 (*from meter firmware V03-40 or higher*)
  can modify all legally relevant and non-fiscal (operational) parameters
- **User1**
  can modify non-fiscal (operational) parameters
- **User2**
  has read access only

> **In delivery state the passwords of default users are blank!**
>
> For meter firmware version 03-40-A or higher the default passwords are set to blank, also for **admin1**.
>
> We highly recommend changing the default administrator password during commissioning of the meter. The password of other users should be changed on the first login.
>
> ⇨ 10.3 Change password (p. 101)

> **Administrator password (*meter firmware V 2.8 up to 2.11*)**
>
> For meter firmware version 2.8 up to 2.11 request an administrator password directly from Honeywell at:
>
> **mailto:Aftersales@Honeywell.com**

10.2 Perform changes and actions on the device

To make changes to the device, like updating date and time of the device or transferring a parameterization to the device, a user must first authenticate on the device locally or via the remote operation panel. After successful login, a session will be launched for this user, which is terminated when logging out. Throughout the session, the user can change the settings at system level according to granted rights. Changes in enSuite are only transferred to the device (and thus activated) after an explicit user confirmation.

⇨ UFM Series 6 "Configuration and analysis with enSuite" for details regarding user management

> **enCore devices support two modes for log-on to the device**
>
> You can use the parameter **Authorization mode** to control which information is required for logon.
>
> - By default, **<username>** and **<Password>** are required when logging on to the device.
>   (**Authorization mode**: **Password**)
>
> - For the case that the security switch is open, you can optionally parameterize a simplified logon, so that the <username> is sufficient when logging on to the device. This mode facilitates, e.g., the operating point check or commissioning, since the password is not required.
>   (**Authorization mode**: **Security switch**)
>
> For both modes, the user can only perform the changes and actions at the devices, to which the associated user profile is authorized.
>
> Make sure that this mode complies with the security guidelines in your company.

10.2.1 Log in to the device

Procedure

► Open the login dialog via the basic display 🛈 **System –** 👤 **User**.

> 📖 **Special case: Another user is already logged in**
>
> If a user is already logged in to the device (locally or remotely), the name of the user who is logged in will be shown.
>
> Refer to note ⇨ Mechanisms to terminate exclusive access (p. 100).

✓ The fields for the login with username and password will be shown, the field **User** is pre-assigned with the name of the last user to log in.
OR
In case the parameter **Authorization mode** has the value **Security switch** and the security switch is open, only the field **User name** is displayed.

► Change the login details if necessary.

► Log in to the device with **Login**.

✓ Following successful authentication, a session is started, in other words you will navigate through the device with the authorizations of the associated user profile until you log out.
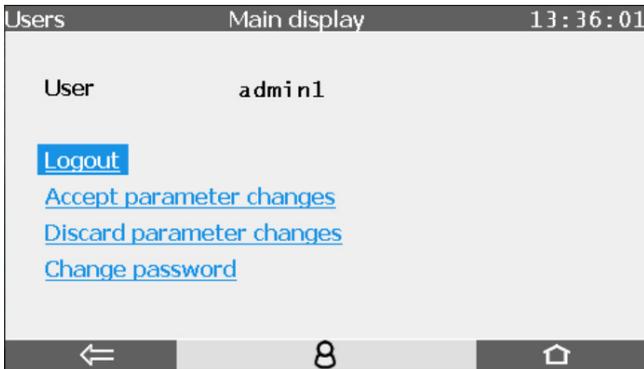
Fig. 10-1: Main display – User **admin1** is logged on (locally) [4]

10.2.2   Log out of the device

Background

Always log out of the device manually as soon as you have made the required changes. On the one hand, this prevents the device from unnecessarily being blocked for service activities of other users and on the other hand it prevents other users from using your session to make changes to the device with your user data.

Procedure

► Switch to the display 🛈 **System –** 👤 **User**.
► End your session with **Logout**.
▭ The session is over. Other users can log in to the device

> 📖 **Mechanisms to terminate exclusive access**
>
> The device has the following mechanisms to prevent the device accidentally being blocked for further service activities.
>
> • Parameter **Inactivity timeout**
>   If there is inactivity, a user is automatically logged out after a

---

[4] The actions **Accept parameter changes** and **Discard parameter changes** are not supported by the UFM Series 6, because parameters cannot be modified directly at the device.

parameterized timeout (*default* is **120 min**). Changes which
have been made but not accepted will be discarded.
The timeout takes effect for example if a user is logged in to
the device remotely and terminates enSuite without logging
out of the device beforehand.
(🐞 **User**, tab **Parameter**, parameter **Inactivity timeout**)

- Automatic logout after an action has been performed via
  enSuite
  If an action is performed in enSuite that requires a user to be
  logged in, the user is automatically logged out at the end of
  the action.
  For example, this can be after a parameterization, or a
  firmware change has been transferred to the device.

- Logout remote user manually
  For service activities on site, it is possible to manually log out
  a user who is remotely logged in to the device. Please note
  that the parameter changes made by the user who has been
  logged out will be discarded.
  (🖼 **System – 👤 User**, action **Logout remote user**).

- Closing enSuite or closing the connection to the device.

10.3 Change password on the device

Background

Default users and new users are created with an empty password. All users
are advised to change their passwords after successfully logging in to the
device for the first time.

Procedure

► Log in to the device under 🛈 **System – 👤 Users** with **<username>**
  and **<password resp. empty password>**.

► Click action **Change password**.
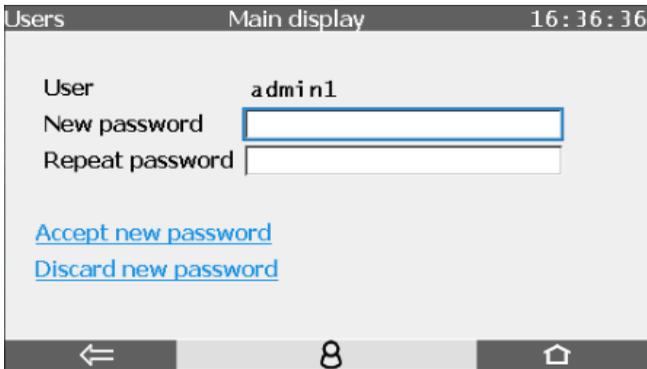
Fig. 10-2: Main display – Change password

► Hit the ⬅ enter key to show the keyboard – the field **New password** must have the focus.

► Enter and repeat the new password.

> 📖 **Permissible passwords**
>
> When choosing a new password, please note:
>
> - A password can be made up of 3 to 10 permissible characters – empty passwords (no characters) are also permitted.
> - No distinction is made between upper-case and lower-case letters.
> - All the letters from a through z (or A through Z) and the numbers 0 through 9 are permissible.
> - Special characters such as _ - . * [{ | # , \ are *not* permissible.

► Save the new password in the device with **Accept new password**.

▣ A short status message will be displayed briefly over the lower edge of the screen.
Red font indicates that the password was not able to be saved.

> **ⓘ Meter must be opened after loss of admin password!**
>
> Be aware that with meter firmware V03-40-A or higher no admin master password is managed by Honeywell. The user fully owns the admin password.
>
> In case of loss of the admin password, the meter must be opened to access the electronic boards in order to regain access as admin!
>
> Contact our support team (⇨ Contact, p. 2).

10.4 Enforce a strong password policy

There are different attacks on passwords today, so you should follow the best practices for managing your passwords. Here are some best practices:

- Always change default passwords.
- Choose strong passwords
- Use a combination of upper-case and lower-case letters, numbers, and special characters when assigning a password. In addition, protection increases with the password length. A strong password consists of at least 8 characters.
- Change passwords on a regular basis.
- Change passwords immediately in case someone has tried to attack the system.

> **📖 Document deviations of the best practices**
>
> If the system does not allow one of the best practices to be followed this should be documented. For example: maybe you do not allow the special character = in the password.

11 Security considerations for your network

enCore devices are used in modern accounting infrastructures and network control technology with the task of transmitting process information such as counters, measurements and messages to an accounting center or control station. Such a connection represents a significant security risk and therefore careful consideration must be given to the design.

11.1 How to report a vulnerability

A security vulnerability is defined as an error or weakness in the software that can be exploited to impair the operation or security of the parameterization or device software or to access sensitive data.

Honeywell investigates all reports of security vulnerabilities affecting Honeywell products and services. For details on Honeywell security policy, visit:

www.honeywell.com/us/en/product-security

To report a potential security vulnerability against any Honeywell product, please follow the instructions at:

www.honeywell.com/us/en/product-security#vulnerability-reporting

To view information on current malware threats please visit:

www.honeywell.com/us/en/news

OR

Contact your local Honeywell Process Solutions Customer Contact Center (CCC) or Elster Gas Technical Support team (⇨ Contact, p. 2).

11.2   Preventing unauthorized external access

To reduce the risk to your network, we highly recommend to include a firewall or some other mechanism to limit the network traffic between the (external) central accounting center resp. control station and the (internal) network for example of the gas measuring plant in a target manner. In addition, enCore devices should only be installed where access control is guaranteed, i.e., where protective measures are taken to prevent unauthorized persons from gaining physical access to the device.

Furthermore, we recommend to allow protocols and ports only that are actually used for data exchange with the external network, for example, by adding these to the white list of the firewall and allow data exchange with trusted participants only (⇨ 15.2 Supported data protocols, p. 116).

To avoid a (temporary) shutdown of the LAN interface due to an unintended packet overload, limit the packet rate to a value you expect during normal operation.
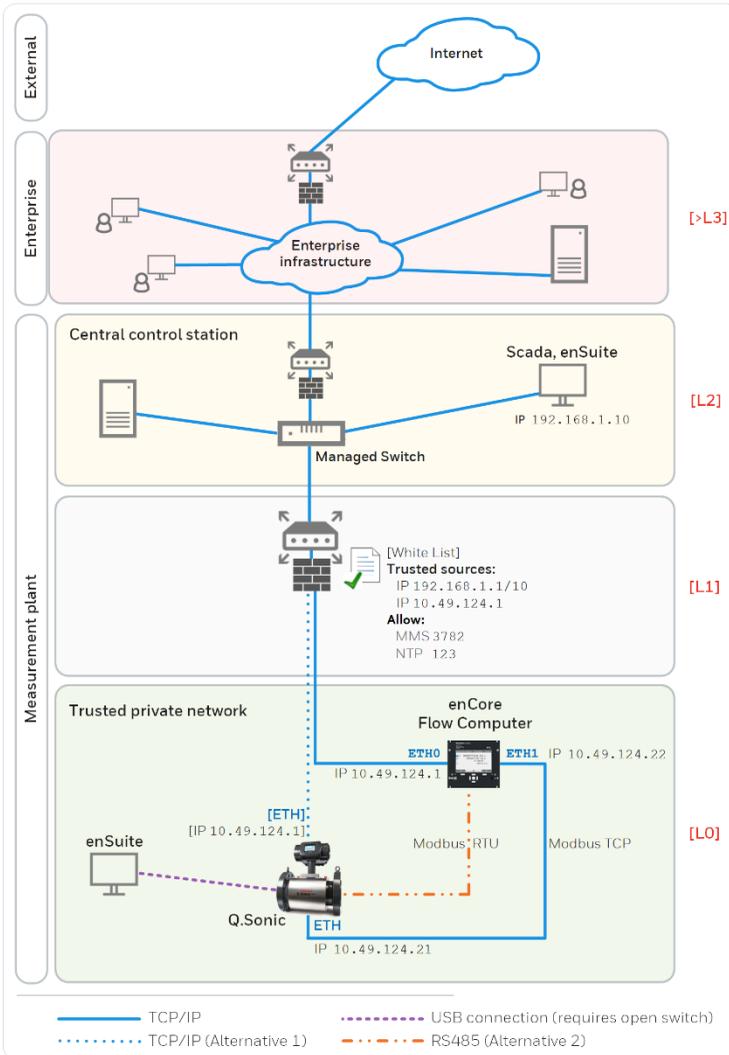
Fig. 8.2: Secure network topology using a VPN connection for metering data exchange – example with indication of security zones L0..L3 and higher according to IEC 62443

We recommend opening safety zone L0 only for zone L1 and not for zones L2, L3 and L4.

11.3 Data security for data at rest and in transit

11.3.1 Security for data at rest

enCore devices store all temporary or permanent data on the SD card. The data on the SD card is also called data at rest.

When discarding the device, you can easily and safely remove the stored data by removing the SD card.

11.3.2 Security for data in transit

Data in transit is the data that is transferred between an enCore device and, for example, a control station in a public or trusted network or between enCore device and enSuite, for example, when transferring data during parameterization of the device.

The communication between enCore device and enSuite is performed via MMS protocol, which is secured via TLS since firmware version 03-39. Other protocols – e.g., Modbus – transmit data partly in plain text. If possible, use the secure variant of a protocol. ()

> **Use encrypted VPN connection**
>
> We recommend using a VPN connection whenever you need a secure data connection, but no secure protocol is supported for data transmission.
>
> In a VPN, data is transferred between two or more participants in encrypted form. For this reason, a VPN connection is recommended, for example, for mobile access to an enCore device, access to the private network or for data communication via different systems.

> **Remote operation panel over insecure HTTP is no longer supported**
>
> Since `Basic System` V03-39 the insecure HTTP is no longer supported. Therefore, the remote operation panel can no longer be opened in the browser of a service computer.
>
> Instead, you access the remote operation panel of an enCore device in enSuite using the action of the same name. In this case, the connection is established via MMS and secured via TLS.

11.3.2.1   TLS certificate for MMS communication with enSuite

To prevent data from being read by other network users during MMS communication between the enCore device and enSuite, the data is transmitted in encrypted form only since `Basic System` V03-39. The encryption is performed using the TLS (Transport Layer Security) transmission protocol. The enCore device uses a self-signed certificate to authenticate itself to enSuite each time an MMS connection is established.

Normally, the certificate is created once when the enCore device is put into operation and announced to enSuite during the first MMS connection. However, it can be newly generated later.

⇨ 5.4 Create TLS certificate and publish it to enSuite (p. 34)

12 Shipping and storage

As the Ultrasonic Flow Meter Series 6 is a delicate instrument, care should be taken to carefully handle and store the flow meter in a proper way. Improper handling, shipping, or storing may void its warranty.

The Ultrasonic Flow Meter Series 6 should be stored in indoor conditions, with a low humidity (5% – 95% non-condensing); storage temperature should remain between -20 °C and +60 °C (long term storage temperature: between 0 °C – +60 °C).

⇨ UFM Series 6 "Shipping and Storage"

13 MID requirements

13.1 General

This chapter is only applicable when the Ultrasonic Flow Meter Series 6 Q.Sonic-plus needs to be in accordance with European Directive 2004/22/EC[5] on measuring instruments (MID) as stated in EC-type Examination Certificate T10335.

The Ultrasonic Flow Meter Series 6 can be used legally for fiscal metering based on European Directive 2004/22/EC5, Annex MI-002.

The Ultrasonic Flowmeter Series 6 Q.Sonic-plus is compliant with Environment Class M1 / E2.

13.2 EC declaration of conformity

Honeywell ultrasonic gas flow meters are manufactured in accordance with applicable directives, e.g.:

- Pressure Equipment Directive (PED)
- Equipment and Protective systems intended for use in potential Explosive Atmospheres (ATEX) Directive
- Electro Magnetic Compatibility (EMC) Directive
- Measuring Instruments Directive (MID)

In compliance with the applicable directives the meters are supplied with the CE mark and the EC Declaration of Conformity. This declaration is part of your flow meter documentation since it also contains important details of your flow meter (e.g., PED category, ATEX markings).

13.3 Sealing

A MID compliant meter shall be sealed.
⇨ 4.7 Sealing (p. 29)

---

[5] New European Directive valid from 20.04.2016: 2014/32/EU

13.4 Calibration

A MID compliant meter is accompanied by a copy of the EC Declaration of Conformity stating compliance with Measuring Instruments Directive 2004/22/EC[6] Annex MI-002, based on:

- EC-Type examination certificate T10335according to MID Annex B
- A certificate of conformity from a Notified Body according to MID Annex F.[6]

13.5 Installation requirements

Special attention needs to be taken so that the UFM Series 6 meter and its in- and outlet spools are mounted according to EC examination Certificate T10335 (last valid version).

Note that parameters stated in certificate T10335 may indicate a limit or limits of a range. The values and ranges applicable to your flow meter may be different.

UPS recommendation

In the event of a power failure, the UFM will shut down. There-fore, we recommend the use of an uninterruptible power supply (UPS).

---

[6] New European Directive valid from 20.04.2016: 2014/32/EU

14 Decommissioning and disposal

14.1 Preparations

14.1.1 Readout parameterization (*optional*)

If you want to save the parameterization during temporary shutdown or use it as a template for parameterization of another device, readout the parameterization as follows.

14.1.1.1 Readout parameterization in enSuite

Prerequisite:

- A connection between USM and enSuite is established.

► Select your device in the navigation window.
► From the context menu select the action **Readout parameterization**.
► Save the data with a suitable name.

14.1.2 Readout archives (*optional*)

To avoid data gaps in the archives as far as possible, read the archives from the enCore device immediately before taking it out of service.

14.1.2.1 Readout archives in enSuite

Prerequisite:

- A connection between USM and enSuite is established.

► Select your device in the navigation window.
► From the context menu select the action **Readout archives**.
► Save the archives with a suitable name.

14.2 Decommissioning and disassembly

> ⓘ   For safety reasons, the decommissioning of the enCore device
>   may only be performed by the service or appropriately trained
>   specialist personnel of the operator.

> ⚠   **WARNING!**
>
>   **Risk of explosion!**
>
>   **Do not open when an explosice atmosphee is present.**
>
>   If the device contains hazardous media e.g., toxic gases, they
>   must be removed before its dismantling. Prevent the release of
>   potentially pollutant or dangerous substances.

> ⚠   **ATTENTION!**
>
>   **Risk of short circuit!**
>
>   **The enCore device can be damaged if lines are connected
>   while the device is connected to the power supply.**
>
>   Always make sure the enCore device is free of voltage before
>   making any changes to device wiring or before connecting sensor,
>   supply, signal or data lines.

14.2.1.1   Taking the enCore device out of operation

► Disconnect the device from the power supply.
► Turn off all gas flows and depressurize all gas inlets.
► Prevent the unintentional opening of the shut-off valves by taking suit-
   able measures so that no danger can arise from further disassembly.
► In a non-explosive atmosphere, remove all connected gas lines, cables,
   and data lines.
► Dismantle the device mechanically.
► Open the device.
► On the CPU3 board open the SD card holder by sliding the cover down.
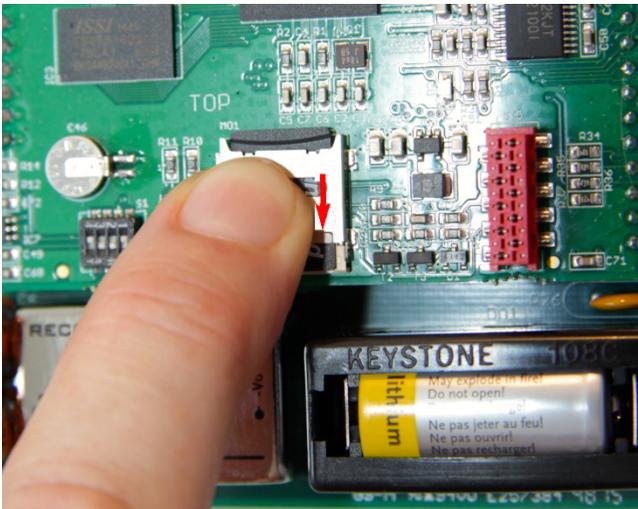
► Remove the SD card.
► *For final decommissioning*: To prevent data from being restored even
   after deletion, we recommend destroying the SD card.

14.3 Disposal

enCore devices fall under the WEEE directive and are marked with the
WEEE symbol ⚱. It is important to note that disused enCore devices must
be sent to an individual or collective take-back and disposal system. As the
EU member states have transposed the WEEE directive into national legis-
lation in different ways, the regulations for the return of disused equipment
vary.

Please ask your local Honeywell sales partner how the take-back of your
equipment is regulated.

Environmentally friendly disposal according to WEEE directive

The WEEE directive 2012/19/EU was issued by the European
Commission. WEEE stands for "Waste of Electrical and Electronic
Equipment". It aims to create a legal framework for sustainable
production and consumption of electrical and electronic equip-
ment through reuse, recycling, and other forms of recovery of
used electrical and electronic equipment. The proportion of such
devices in household waste should be reduced, raw materials
should be collected and sent for recycling.

15 Technical data

15.1 Q.Sonic meter type IDs

Meter	ID
CheckSonic	61
CheckSonic 2	62
CheckSonic^{VX} 3 path	70
CheckSonic^{VX} 6 path	71
Q.Sonic 3	63
Q.Sonic^{atom}	64

Meter	ID
Q.Sonic 5	65
Q.Sonic-plus	66
Q.Sonic-max8	68

15.2 Supported data protocols

15.2.1 Protocols at a glance

Communication	Supported data protocols
Ethernet	• HTTP (only up to Basic System V03-38) • MMS (secured via TLS) • Modbus TCP • NTP
serial (RS232, RS485)	• Modbus (ASCII, RTU) • UNIFORM

Table 1: Supported data protocols

> ❗ **Use secure version of a protocol!**
>
> Unencrypted protocols transmit data in plain text, such as Modbus. If possible, use the secure version of a protocol.
>
> Please take our recommendations in the following sections into account:
>
> ⇨ 11.2 Preventing unauthorized external access (p. 105)
>
> ⇨ 11.3 Data security for data at rest and in transit (p. 107)

15.2.2   Data protocols in detail

Protocol	Default port	Description
HTTP	80	Until B a s i c S y s t e m V03-38, **H**yper**T**ext **T**ransfer **P**rotocol enabled, e.g., access to an enCore device via the remote operation panel.
		Please note that HTTP is considered insecure today and is no longer supported since B a s i c S y s t e m V03-39!
MMS	102[7]	**M**anufacturing **M**essaging **S**pecification (acc. to ISO standard 9506) allows communication between enSuite and enCore devices, e.g., allows access to an enCore device via the remote operation panel.
		For reasons of data security, enCore devices since B a s i c S y s t e m V03-39 only support MMS connections that are secured via TLS (**T**ransport **L**ayer Security), i.e., the data is transmitted encrypted and the authentication of the enCore devices is ensured via a certificate.

---

[7] Typically, port 3782 is used instead of port 102 for secure communication. For reasons of downward compatibility, enCore devices use the standard port 102.

Protocol	Default port	Description
Modbus (ASCII, RTU)	–	Protocol for data exchange of user-defined registers between central control station and enCore device (Modbus AFB and intelligent protocols (GC, USM)) via a serial asynchronous point-to-point data connection via RS232C or a multipoint connection via RS422 or RS485.
Modbus TCP	25 465 (SSL/TLS) 587 (STARTTLS)	Protocol for data exchange of user-defined registers between central control station and enCore devices (Modbus AFB and intelligent protocols (GC, USM)) via a standard TCP/IP network.
NTP	123	**N**etwork **T**ime **P**rotocol for the time synchronization of enCore devices with an NTP time server.
UNIFORM	–	UNIFORM is a manufacturer-specific protocol for the connection of Q.Sonic ultrasonic gas meters (USM), originally developed for Series IV.

Table 15-1: Protocols and TCP standard ports for enCore devices

For unencrypted protocols, consider country-specific regulations!

Please note that with some protocols the data communication is unencrypted. This is the case, for example, with communication via Modbus.

Unencrypted data communication does not prevent an attacker from intercepting or modifying the communication. Consider the country-specific regulations. These may require manual verification of the data.

16 FAQ

16.1 Time Service

16.1.1 Why does the `Time Service` distinguish between synchronization and setting the system time?

Several processes in USM devices are reliant on a precise time basis, e.g., archive data are written at specific times.

There are therefore two fundamental requirements for the `Time Service`:

- The system time must correspond as accurately as possible to legal time.

  Since the internal device clock can drift a few seconds over the course of time, it must be possible to synchronize the system time with an external, more accurate, time source.

- A manipulation of data on account of the time adjustment must be prevented due to applicable fiscal requirements.

  The time stamp of the USM must be valid, i.e., the changing of the system time must not take place "undetected" to such a degree that, for example, billing-relevant consumption could be manipulated.

To fulfill these requirements, during a time adjustment with *external time sources* (**Prim. external time source**/**Sec. external time source**) the SFB distinguished between synchronization and the setting of the system time:

- Synchronization of the system time

  The `Time Service` interprets a time change as a synchronization if the system time deviates less from the new time of an external source than predicted by the parameterized time window (**Max. synchronization range**) and the system time is changed, for example, by less than ±20 seconds.

  Regular time synchronization ensures that the system time of the USM corresponds as accurately as possible to the external time

source. At the same time, from a fiscal perspective, time synchroni-
zation is non-critical and is therefore not recorded in the logbook.

- Setting the system time

  The `Time Service` interprets a time change as a setting of the
  system time if the system time deviates more from the new time of
  an external source than predicted by the parameterizable time
  window (**Max. synchronization range**) and the system time is
  changed, for example, by more than ±20 seconds.

  Setting the system time may, for example, be required following a
  battery failure or because of a change in time zone. Because data
  can be manipulated through such a change, the setting of the
  system time is considered critical and is always reported in the
  logbook.

With the help of the parameterization, you set the size of the time window
that is to be interpreted as a synchronization (**Max. synchronization range**).
To prevent multiple consecutive "undetected" time synchronizations from
resulting in a change in the time, you can only permit synchronization only
as the **Time update mode** within a certain **Synchronization interval** (for
example every 12 hours). Thus, no more than *one* synchronization can be
implemented within this synchronization interval; any further synchronization
attempts within this interval will be rejected. If the **Time update mode**
parameter has the value **Synch. and setting**, the time from the external time
source will always be applied.

With the **Synch. and setting (authentication req.)** setting, you can only
allow adjustment via the external time source if a user with the **Change
system time** user right is logged on to the device.

The parameterization is described in detail in ⇨ online help.

16.2 User roles in practice (exemplary)

Typically, three preconfigured users are required to operate an USM.
In this section, describes the corresponding standard roles and use cases as
examples and lists the minimum rights required.

> 📖 **Assign only minimal required rights**
>
> For Q.Sonic meters typically only three preconfigured users are used. (By default, users have read-only access to the USM.)

16.2.1.1   Possible roles

Role	Description
Service technician	(≙ administrator) Brings the device into operation or performs essential changes in the operating mode or repair measures. He/she performs maintenance work on the devices to ensure functionality. For example, gas specialist or qualified electrician of the energy supplier.
Authorized metrology expert[8]	Performs official testing of UFM Series VI for legal metrology. Can apply corrections to the meter.
Controller	Monitors the meter and reads out data. He/she is able to evaluate the plausibility of the UFM data and performs health care checks. In addition, he/she can possibly accept errors.[9] For example, trained personnel who has received basic training from Honeywell or the plant operator.
Honeywell technical support	Supports service technicians and controllers in their activities.

---

[8] Please note that the responsibilities and entitlements of a metrology expert are based on the applicable legal regulations and country-specific relevant standards and (may) vary from country to country. In the European Union, the legally relevant tasks are executed by designated notified bodies.

[9] Whether only errors which are no longer pending can be accepted or whether errors can always be accepted can be determined in the branch 📷 **Basic System – System**, **Error list** area in the parameter **Acceptance procedure**.
⇨ UFM Series 6 "Configuration and analysis with enSuite"

16.2.1.2   Example for use cases

⇨   Use case 1a:
   Service technician commissions the enCore device for use in legal
   metrology. (p. 123)

⇨   Use case 1b:
   Service technician commissions enCore device for operational use.
   (p. 124)

⇨   Use case 2:
   Authorized metrology expert performs legally relevant maintenance.
   (p. 125)

⇨   Use case 3:
   Controller monitors and reads out data from USM. (p. 126)

Use case 1a:
Service technician commissions the enCore device for use in legal metrology.

Main actor(s)

> (1) service technician authorized in legal metrology
> OR
> (2) service technician plus authorized metrology expert

Goals

> mount device
>
> configure device functions
>
> change firmware (legally relevant, operational)
>
> adapt parameterization to concrete measuring point
>
> open security switch
>
> ensure accuracy of legally relevant measurement
>
> seal security switch of enCore device

Minimum required rights

> at system level:
> all rights
>
> at parameter level:
> all rights to change SFBs and AFBs

User in enSuite

> **Admin1** (*no adaption necessary*)

Use case 1b:
Service technician commissions enCore device for operational use.

Main actor

service technician

Goals

mount device

configure device functions

change firmware (operational)

adapt parameterization to the concrete measuring point

Minimum required rights

at system level:

Modify displays, **Update device time**, **Reset battery state**, **Modify AFB configuration**, **Update non-fiscal firmware**, **Change general system settings**, **Calibrate HART transmitters**

at parameter level:

rights to change operational AFBs

User in enSuite

Admin1 (*no adaption necessary*)

OR

User1:

parameterize minimum required rights

Use case 2:
Authorized metrology expert performs legally relevant maintenance.

Main actor(s)

(1) authorized metrology expert
OR
(2) service technician authorized in legal metrology

Goals

open security switch

change firmware (legally relevant)

ensure accuracy of legally relevant measurement

delete legally relevant audit trail and archives

change legally relevant parameters according to the approval file

seal security switch of enCore device

Minimum required rights

at system level:
Erase fiscal audit trail/fiscal archives, **Update fiscal firmware**, **Update approval file**

at parameter level:
Right to change all parameters that are protected by security switch 🔒
according to the approval file.

User profiles in enSuite

Admin1 (*no adaption necessary*)

| Use case 3: |
| Controller monitors and reads out data from USM. |

Main actor

    controller

Goals

    readout archives from device

    readout parametrization from device

    perform health care tests

    view and accept error list

Minimum required rights

    at system level: (*none*)

    at parameter level: (*none*)

User in enSuite

    User1 (*no adaption necessary*)

    OR

    User2 (*no adaption necessary*)
    Default setting allows (read only) access.

17 Index

A

Abbreviations 11
AFBs
  chargeable 51
AGC levels 85
AGC limits 85
ATEX certified 26
Audit trail 59
Authorization mode
  Password 98
  Security switch 98

B

Basic display 43, 45

C

Calibration 16, 111
Chargeable AFBs 51
Checksums
  flow board components 91
  software 90
Cold commissioning 38
Configuration 15
consistency check 49
Correction factors 77, 79
CSA certified 28
Customs sign 51

D

Detailed diagnostics
  diagnostics 76
Diagnostics 73, 75, 76
  Performance 78
Display 'Diagnostics' 73
Display for USM AFB 65
Display of user archives 72
Display test 57

E

EC declaration of conformity 110
Error list 92
Error List 58
Error messages
  view 92
Euroloop 16
European Directive 2004/22/EC
  110
Event
  Labeling 12
Event labels
  enSuite 12
  Error list 12
  Logbook 12
Exchanging components 85

F

Flow Cell 21
Flow velocity measurement 18
FM certified 27
Front panel 41

G

Gas velocity (zero flow
  measurement) 84
General Terms and Conditions
  13
Geometry Correction
  k-factor 79

H

Home display 43, 47
Hot commissioning 38
hydrotest 33