Honeywell

Flow Computer
Device Series enCore FC
FC1, MC1

Manual
Basic System with SFBs

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Contents

1 About these instructions

The enCore FC manual has a modular design. You can find an overview of the enCore concept and the structure of the manual, safety and risk instructions, and text labeling in the "Operating Instructions" for the enCore FC.

This volume describes the basic functionality and operation of the Basic System with its SFBs. The Basic System is the basic module of the enCore device software and can be found in all enCore devices.

> **enSuite and the enCore FC device series**
>
> enSuite is the configuration and analysis software for Honeywell Elster devices in the field of flow computers, data loggers, gas analyzers and ultrasonic flow meters. enSuite offers tools for configuration, parameterization, diagnosis, software downloads as well as other service purposes, and supports all activities required for the commissioning and maintenance of these devices.
>
> This volume focuses on the enCore FC series. Under this name all enCore devices are summarized, which are used as industrial process computers for certain tasks in the gas and liquid measurement. These include, for example, the enCore MC1 signalling and monitoring unit and the enCore FC1 Flow Computer. Which functions a device supports in detail depends on its device type and is described in detail in the online help.

The significance of the individual parameters is extensively documented in the enSuite online help, which is why parameterization is only addressed as an example in this document. The examples used are mostly based on the device type FC1 in the device series enCore FC and may be somewhat different for your specific device. The instructions are based on the expert mode.

> **Accessing the online help**
>
> In enSuite you can access the general help via the menu item **Help –** 💿 **Show online help**. You can open context-sensitive help directly in the parametrization window from the desired branch by pressing **[F1]**.

This volume is aimed at specialists who are responsible for the following tasks after successful assembly of the device and installation of the current version of enSuite on the PC for service activities:

- Adaptation of the device parametrization to the measurement task
- Test of all data points and commissioning
- Other service activities

The figures in these instructions are used to demonstrate what is being explained, so they may vary depending on the configuration of the device and enSuite.

> **Saving documentation on service PCs**
>
> This volume of the enCore FC manual is provided in electronic form. We recommend that the document is saved on the PC intended to be used for service activities so that it can be accessed at any time.
>
> You can download all parts of the enCore FC manual in PDF format from our Docuthek document library. The documents are updated regularly.
>
>   **www.docuthek.com**

2 Overview of the Basic System

The Basic System is modular and is made up of various **S**ystem **F**unction **B**locks (SFBs). These provide basic functionality for the operation of enCore devices and administer, for example, the system resources, device time, I/O boards or coupling to other devices via digital protocols. The composition of the Basic System can vary by device type.

The Basic System can be divided into individual content areas, which are described in the following sections:

3　I/O boards

Detailed information...

- on the installation and retrofitting of the various process boards and connection diagrams for typical applications can be found in the ⇨ "Operating Instructions" of the enCore FC manual.
- on parameterization can be found in the ⇨ online help.

4   System settings

Various modules are grouped in **System**. Their tasks include monitoring the device resources and the software integrity and, for devices used for fiscal measurements, the fill level of the fiscal audit trail.

Some monitoring settings and actions in the event of an error can be parameterized in enSuite.

> 📖 **The parameters and export values are described in detail in the online help.**
>
> The parameters and export values relating to the system status of the enCore device are described in detail in the online help. They are only documented as examples in this section.

4.1   Monitoring the general system status

Background

The Basic System collects information relating to the system status of the enCore device. This includes information on the battery runtime and the current CPU and RAM load of the device.

The battery is required to retain the data when the voltage supply is switched off. To prevent a drained battery causing data loss, the device monitors the runtime and remaining capacity. The system provides an automatic signal as soon as the battery capacity has fallen to 20% of that of a new battery. (For details about replacement and disposal ⇨ Operating instructions).

enCore devices monitor the CPU load at all times. The more computing time is required to manage current processes, the higher the CPU load. With a high CPU load, the response time of the device display may increase, or problems may occur with MMS communication.

Information relating to the general system status are output in the **Device monitor** display. As an option, the device can generate a warning if the CPU load exceeds a parameterized warning limit.

Parameterizing a warning limit for the CPU load

To parameterize a warning limit for the CPU load, ...

►   ... open the context menu for the **CPU load warning limit** parameter and check the **Used** checkbox if it has the value **<Unused>**.

✓   You can now change the parameter.

►   Save a warning limit (in %) in the **CPU load warning limit** parameter.

▣   The warning 🚩 **CPU load high** will be displayed as soon as the CPU load is higher than the parameterized warning limit.

In addition, the enCore device may include a delay after the warning limit has been reached:

►   If the **CPU load warning delay** parameter has the value **<Unused>**, open its context menu and check the **Used** checkbox.

✓   You can now change the parameter.

►   If necessary, enter a time value in the **CPU load warning delay** parameter. The default value is 5 seconds.

▣   Only if the CPU load is higher than the parameterized warning limit for longer than the parameterized delay will the warning 🚩 **CPU load high** be displayed. This prevents flip-flopping messages if the CPU load fluctuates around the parameterized warning limit.

4.2   Error list

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, if a measurement required for flow conversion is outside the measuring range defined by alarm limits.

- *Warnings* are error messages which do not falsify the (fiscal) results but are important for monitoring the measurement, such as monitoring measured values based on parameterizable warning limits.

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[1] on the front of the device. The status LED shows the error state as follows (in sequence of priority):

LED status	Meaning
	The error list contains...
Red flashing	... at least one pending *alarm* which has not been accepted.
Yellow flashing	... at least one pending *warning* which has not been accepted.
Red, permanently lit	... at least one *alarm* which has already ended but has not yet been accepted.
Yellow, permanently lit	... at least one *warning* which has already ended but has not yet been accepted.

Table 4-1: Status LED indicates the type of error

In enSuite, you can decide in which conditions errors in the error list can be accepted.

Parameterizing the acceptance procedure in enSuite

► Open the 🔧 **System** branch of the parameterization.
► Select one of the following entries from the drop-down list in the **Error list** section in the **Parameters** tab:

- **Inactive errors can be accepted only**
  In this case, you can only accept errors when they are no longer pending. Once they have been accepted, the errors will be deleted from the list.

- **Errors can always be accepted**
  In this case, you can accept all errors, regardless of whether they

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[1] For further details about the status LED ⇨ Operating instructions for the enCore device series

are currently pending or not. In this case, too, all inactive errors will be deleted from the list. If errors are active when they are accepted, they will remain in the error list and will then be deleted from the list automatically when they end.

Only allowing errors to be accepted by selected user profiles

By default, errors can be accepted without logging in. Alternatively, you may allow only selected user profiles to accept them. In this case, you can also protect this action using the security switch.

To open this: **<Device> – Basic System –** 🧑 **Users**, **Special user rights** tab

⇨ 9.2.2 Rights at a system level (p. 110)

4.3 Checking integrity using the checksums

The enCore device monitors the integrity of its software during operation by recalculating the checksums for the various software modules and parts of the device parameterization in cycles and verifying these checksums against the setpoints. To ensure that the calculations and system functions are executed "just in time", it also monitors the system load and computing times.

Parameterizing general settings in enSuite

To parameterize some general monitoring settings and define what happens in the event of an error, ...

►   ... open the 🔧 **System** branch of the parameterization.

✓   The parameters for the integrity check are grouped in the **Parameters** tab in the **General** section and can be divided into the following sub-groups:

4.3.1   Monitoring scripts for intelligent measurement devices

Background

The enCore software contains scripts for the most common intelligent measurement devices (i.e., for certain ultrasonic gas meters and process gas chromatographs). A script is a piece of software which enables the relevant measurement device to be connected to the enCore device using a digital protocol (serial Modbus or TCP/IP). Among other things, every script contains the device type-specific details for Modbus communication and their evaluation (e.g., the register settings).

The enCore device monitors the checksums of the fiscal and non-fiscal code and parameterization in cycles. As an option, the enCore device may also include scripts to monitor the checksums.

Parameterizing script supervision mode in enSuite

To ensure that scripts are also used to monitor the checksums, ...

►   ... select one of the following settings for the **Script supervision mode** parameter:

•   **CRC error fiscal code**
As soon as a script causes a checksum error, the enCore device treats it as a CRC error in the fiscal code.

- **CRC error non-fiscal code**
  As soon as a script causes a checksum error, the enCore device treats it as a CRC error in the non-fiscal code.

- **Ignore changes to scripts** (*special case*)
  Select this entry in case Honeywell has adapted a script specifically to the needs of your system.

- **Ignore changes to scripts**. This will prevent the modified script causing a CRC error.

4.3.2   Defining behavior on runtime error

Background

While it is operating, the enCore device checks constantly that all the calculations are completed within the specified time. Exceeding this time is regarded as a *runtime error*. Runtime errors should not occur in normal operation and you therefore typically will not need to make any adjustments to the presets.

Parameterizing behavior on runtime error in enSuite (in exceptional cases only)

To define behavior for an emergency in which the enCore device identifies a runtime error, ...

► ... select one of the following settings for the **Behavior on runtime error** parameter:

- **Stop device immediately** (*default setting*)
  The device is stopped, thus stopping all calculations.

- **Reboot device**
  The enCore device attempts to return to a consistent state by rebooting itself.

  As an option, you can define a minimum runtime for the device in the **Minimal uptime** parameter before the device can be rebooted. This means: Even if the **Reboot device** option has been selected, the device would stop in the event of a runtime error (rather than

rebooting) if the minimal uptime after startup has not yet been reached.

In addition, you can limit the (maximum) number of (unsuccessful) reboot attempts that the enCore device can make in succession using the **Number of reboot attempts** parameter. Enter a value between **1** and **5**. If all the parameterized reboot attempts are unsuccessful, the device will stop. You can also disable the limit on the number of reboot attempts.

4.3.3   Monitoring the fiscal modules of the enCore device

Background

The enCore device checks the checksums of the legally relevant software modules, the parameterization and the approval file in cycles. You can define the behavior for each of these modules if the enCore device identifies a deviation and therefore a CRC error:

Parameterizing behavior in the event of a CRC error in the fiscal modules in enSuite

In the following parameters, you can decide whether the enCore device generates an alarm or a warning as soon as a CRC error is found in the relevant module:

► **Message on CRC error fiscal code**

▢ In the event of a CRC error in the fiscal code components, the device generates either the message 🚩 **CRC alarm fiscal code** or 🚩 **CRC warning fiscal code**.
   Depending on the parameterization, deviations in the scripts are also taken into account (⇨ parameter **Script supervision mode**, value **CRC error fiscal code**).

► **Message on CRC error fiscal parameterization**

▢ In the event of a CRC error in the fiscal parameterization, the device generates either the message 🚩 **CRC alarm fiscal parameterization** or 🚩 **CRC warning fiscal parameterization**.

► **Message on deviation from approval file**

If the safety mechanisms for the legally relevant parameters in the device parameterization are not identical with the selected approval file, it generates either the message 🚩 **Alarm deviation from approval file** (in this case, the flow conversion is also marked as in error) or 🚩 **Warning deviation from approval file**.

4.4   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[2]

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

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[2] ⇨ 9 User and rights management (p. 99)

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

► Open the 🔧 **System** branch of the parameterization.
✓ The parameters for the general audit trail and the fiscal audit trail are grouped in the **Parameters** tab in the **Audit trail** section.

To group parameter changes in the general audit trail into a single entry (of System type) if the changes are made by the administrator, ...

► ... select the **Summarize entries for administrators** checkbox. This parameter only applies to the general audit trail, not to the fiscal audit trail.

To prevent the fiscal audit trail being filled unnoticed, ...

► ... enter a **Prewarning limit fiscal audit trail** in percent.
► ... enter a **Warning limit for fiscal audit trail** in percent.
🔲 As soon as a prewarning and/or warning limit has been parameterized, the enCore device monitors the fill level of the fiscal audit trail. If one of the warning limits is exceeded, the relevant message 🚩 **Prewarning fiscal audit trail** or 🚩 **Warning fiscal audit trail** will begin.

4.5   Display and operation

The various modules for monitoring the enCore device each have different displays.

4.5.1   Displays at a glance

The following figure sketches the hierarchical structure and navigation through the `System` displays.
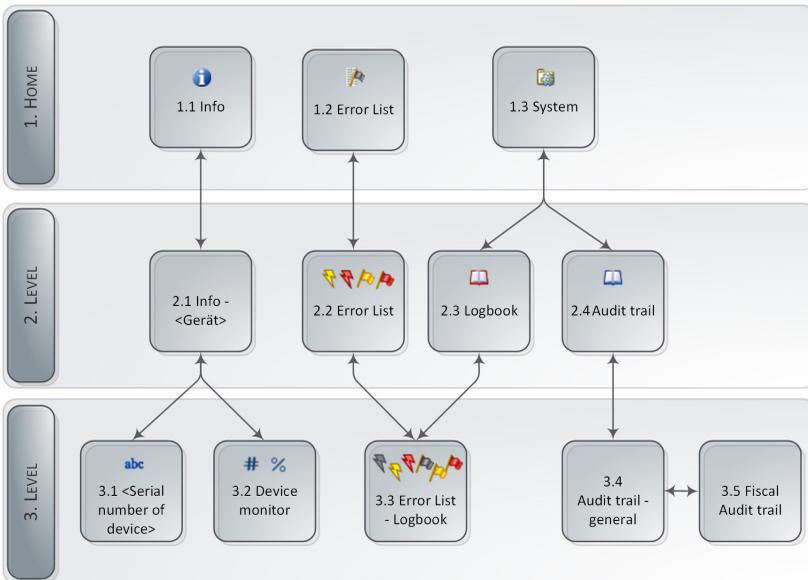
Fig. 4-1: Displays – hierarchical structure

4.5.2   <Serial number of the device>: View basic device settings

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

Call: Home display 🏠 – ⓘ **<Serial number of the device>**
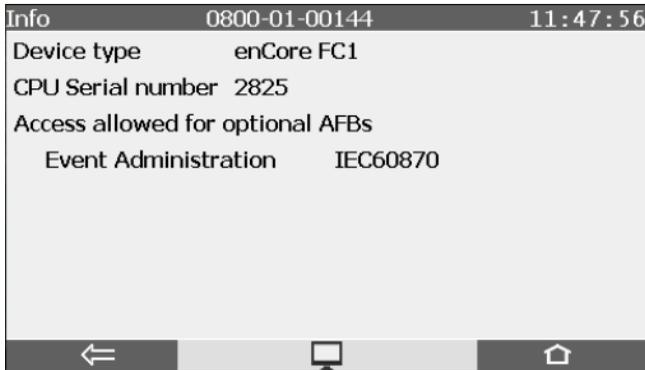
<div align="center">Fig. 4-2: <Serial number of the device> – Example</div>

When the system is started, 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.

3.1 <Serial number of the device>	
Device type	Device type (kernel of the firmware) of the enCore FC, e.g., enCore FC1
Cause	**in red**: • Inconsistent data: Incorrect device type in the basic device settings

3.1 <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 **<variable list with AFBs>**	All chargeable AFBs that have already been purchased and activated in your device are displayed here – the section is only displayed if activated AFBs are available.
Access denied for optional AFBs **<variable list with AFBs>**	All chargeable AFBs that have been para-meterized but 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. 4-3: "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.
>
> In this case, please contact our support directly.

4.5.3   Device monitor

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

To open this: Home display 🏠 **–** ℹ️ **Info – Device monitor**
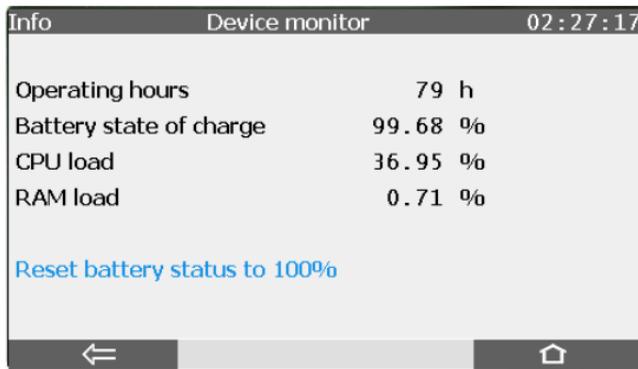
Fig. 4-4: Device monitor – example

1.1 Device monitor	
Operating hours	Actual operating time in hours since manufacture of device
Battery state of charge [**Battery low!**]	Remaining battery charge in percent The message "**Battery low!**" is only displayed if the battery capacity has fallen to below 20%.
CPU load [CPU load high!]	Current load on the CPU in percent The message "**CPU load high!**" is only displayed if a warning limit has been parameterized and has been reached – as an option, a time delay can also be taken into account**.**

1.1 Device monitor	
	(**CPU load warning limit/CPU load warning delay** parameter)
RAM load	Current load on the RAM in percent (for information only)
Reset battery status to 100% [Resetting battery failed!]	Action to reset the battery status to 100%, for example, after changing the battery – only active if a 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 ⇨ Technical Assistance Center (TAC)

4.5.4   Displays for error list, logbook and audit trail in detail

Error list

To open this:

- Home display 🏠 – 🪧 **Error list**
- On some device types, which are used for legal metrology purposes, you can go directly from the fiscal display to the error list.
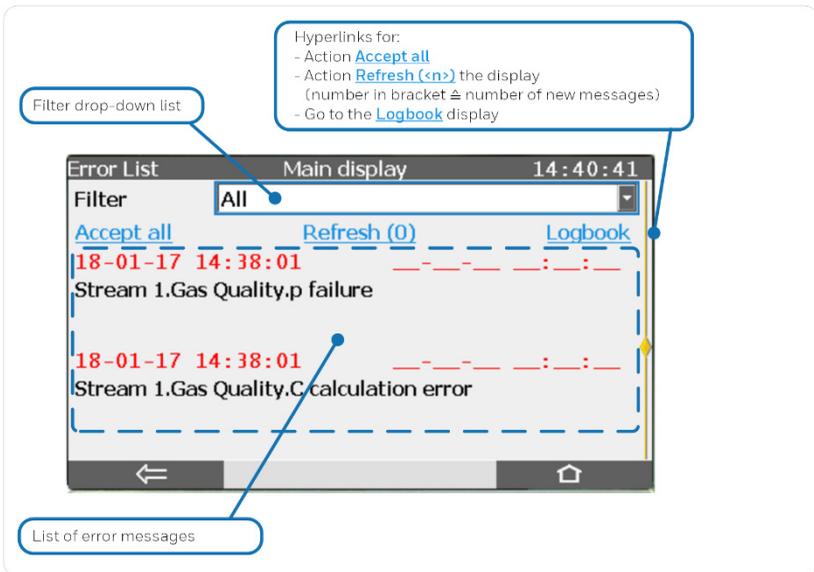
Fig. 4-5: Error list – example

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.

- If it contains more messages than can be shown on one screen, the scroll bar appears in the right margin. You can scroll through the error list using either the Up and Down navigation keys or by swiping vertically.

- Using the **Filter** drop-down list, this full list can be filtered so as, for example, to view all the messages for one stream.

- Action **Accept all**
  The **Accept all** action enables you to accept 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.

- 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, which means the display is up to date if a zero is displayed here, i.e., **Refresh (<0>)**.

- Time stamp for when the message begins and ends
  The *Begins* time stamp is shown on the left for each message and the *Ends* 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 current error can be identified by the fact that the *Ends* time stamp on the right has not yet been entered and instead, empty boxes are displayed (as in the above example).

- Hyperlink **...**
  If a hyperlink **…** is displayed next to the text of a message, you can use it to branch to another display. Here you will find further information to enable you to analyze the cause of the message in more detail.

Logbook

To open this:

- Home display 🏠 – 📝 **Error list**, hyperlink **Logbook**
- Home display 🏠 – 🖼 **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. Like the error list, the content of the list of displayed logbook entries can also be filtered using the **Filter** drop-down list.

The following figure shows an example for displaying the logbook with the **All** filter selected:
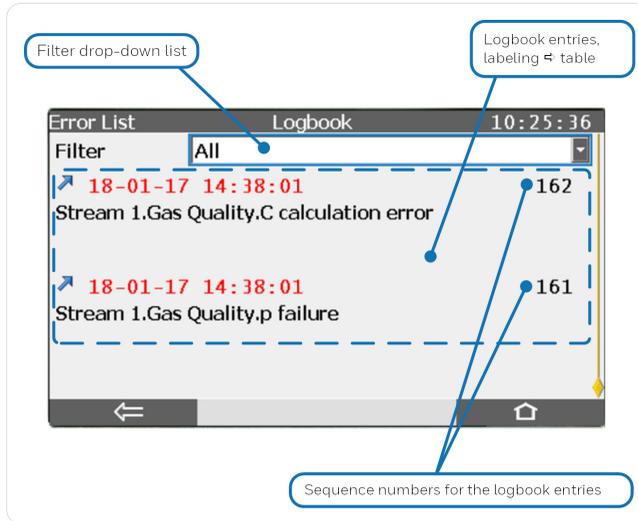
Fig. 4-6: Logbook – example

If it contains more messages than can be shown on one screen, the scroll bar appears in the right margin. You can scroll through the logbook using either the Up and Down navigation keys or by swiping vertically.

The various entries are labeled as follows in the display:

Labeling of the time stamp	Meaning
↗ <Red text>	A message of **Alarm** type begins
↘ <Red text>	A message of **Alarm** type ends
↗ <Yellow text>	A message of **Warning** type begins
↘ <Yellow text>	A message of **Warning** type ends

⚡ <Red text>	Signal [3] of **Alarm** type
⚡ <Yellow text>	Signal [3] of **Warning** type

Table 4-2: Labeling of entries in the logbook

General audit trail and fiscal audit trail

To open this: Home display 📷 – 🎛 **System – 📖 Audit trail**
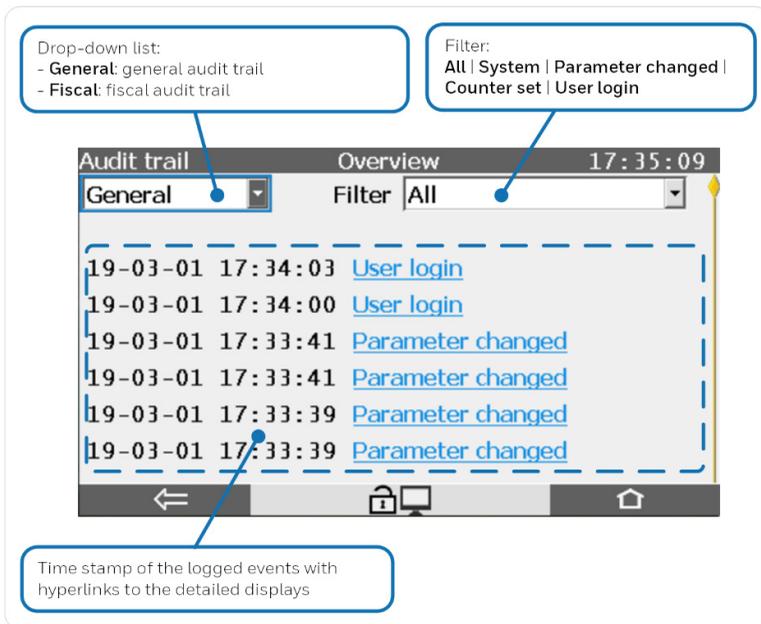
Fig. 4-7: Overview display – example

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[3] Signals are events which are only active for one computing cycle, and they therefore only appear once in the logbook and *not* when they begin and end.

Fiscal audit trail

The fiscal audit trail has the same structure as the general audit trail and is therefore not described in any further detail here.

For a detailed description, see ⇨ "Use in Legal Metrology" manual for the required device type.

5 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 (⇨ 10.2.1 Why does the Time Service distinguish between synchronization and setting the system time, p. 140). *Updating* the system time is the generic term for both the synchronization and the setting the system time.

In addition, it creates the time-related cyclical events (e.g., 🚩 **every hour**) that are used as an input signal by other internal device functions to perform time-controlled actions.

The `Time Service` manages the time display as a time stamp in (**C**oordinated **U**niversal **T**ime, or UTC for short). Time stamps contain the following information:

- the time in seconds since 1970-01-01 as UTC
- the local time zone (deviation from UTC in minutes)
- the local difference between daylight saving time and standard time (deviation in minutes)

The enCore device stores the system time on a battery-backed clock module, so the time display is still available even after the device has been switched off and back on again.

In most device displays, the current time is indicated in the top-right corner, except for the higher-level displays such as the home display.

> **Time stamp format in the display**
>
> The display format of time stamps depends on the language selected on the device. 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**.

The `Time Service` is sub-divided into the following functional areas:

5.1   Updating the system time

The system time in the enCore device can be updated in the following ways:

📖   **Setting the time with the protection of the security switch**

If the enCore device manages fiscal archives and thus the un-secured adjustment of the time could falsify fiscal values, it is reasonable or required to permit a manual setting of the system time via control panel or enSuite *only* if the security switch is open. Therefore, you put the access right **Update device time** in the user management under the protection of the 🔒 security switch.
⇨ 9 User and rights management (p. 99)

You can also set individual parameters of the `Time Service` in the **Rights** column to be under the protection of the 🔒 security switch or alternatively you can determine that changes to individual parameters must be logged in the 🔖 fiscal audit trail.

5.1.1   Synchronizing system time via operation panel

A change in the system time is regarded as synchronization if the difference between the old and the new system time does not exceed the para-meterized time window (**Max. synchronization range**). The parameter **Synchronization Interval** determines the time interval that has to pass after an executed synchronization before the next synchronization can be done. By default, you can synchronize the system time by ± 20 seconds every 12 hours without having the access right **Update device time**.

On the device, you can easily synchronize the system time by specifying the difference in seconds relative to the current system time. The `Time Service` continuously calculates the expected new system time, which you confirm specifically with the **Synchronize now** action. The action can only be executed if a synchronization is possible, that is, the specified difference is greater than zero (0) and the system time has not yet been synchronized within this synchronization interval.

Procedure on the enCore device

Prerequisite

- There is either no user logged on to the device, or the logged on user does not have the right **Update device time**.
  ⇨ 5.1.3 With enSuite "Update date and time" (action) (p. 35)

► If applicable, switch to the home display 🏠 of the enCore device.
► Open the display via 🗔 **System –** 🕐 **Time Service – Date & Time**.
🗔 In the display **Time Synchronization** you can synchronize the system time in seconds.
► In the edit field **Time synchronization by** enter the number of seconds the system time shall be changed. Positive and negative values are allowed.
  The edit field only accepts values within the parameterized synchro-nization window (**Max. synchronization range**).
► Based on the **Synchronization interval** the `Time Service` calculates the next possible point in time for a subsequent synchronization and displays the result in the line **Next possible synchronization**.

- If **now** is displayed you can synchronize the system time, hence, the **Synchronize now** action is active.
- ► In the line **Expected new time**, the **Time Service** continuously calculates the new system time.
- ► To adopt the **Expected new time** as the system time, click the action **Synchronize now**.
- The system time is synchronized by the specified value, in the example by 15 seconds.
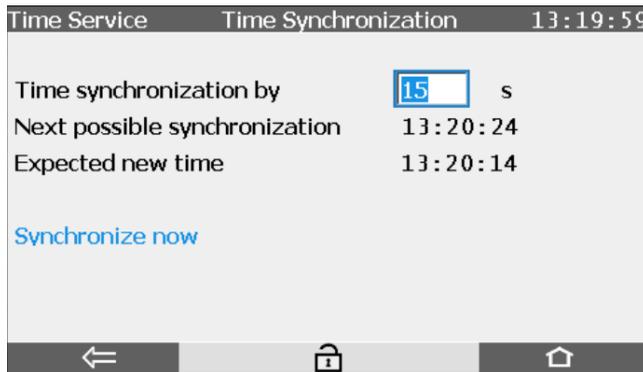
Fig. 5-1: Synchronized system time – example

5.1.2   "Update date and time" via operation panel

You can set the system time using the operation panel of the enCore device, either directly on the device or using the remote operation panel.

Prerequisite

- A user with the **Update device time** right is logged in to the device.
  - ⇨ 9 User and rights management (p. 99)

- ► If applicable, switch to the home display 🏠 of the enCore device.
- ► Open the desired display using 🗖 **System –** 🕐 **Time Service – Date & Time**.
- In the **Date & Time** display, you can set the **Date** and the **Time** in the drop-down menu:
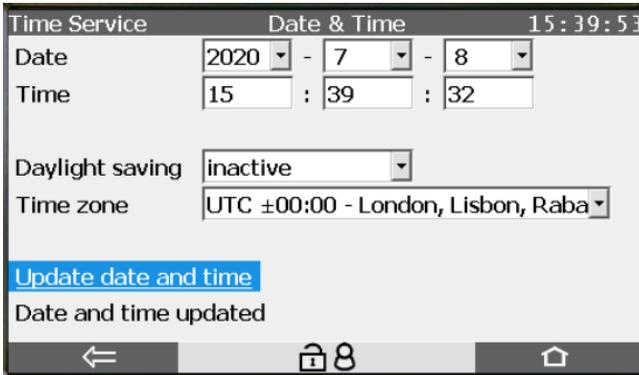
Fig. 5-2: **Date & Time** display

►   Set the current **Date** using the drop-down menu.

►   Set the current **Time** using the input fields.

The indication **Daylight saving** shows the current time setting of the device:

- **inactive**
  The system time is in standard time.

- **active**
  The system time is in daylight saving time.

►   If **Daylight saving** is displayed as a drop-down menu (and not as pure text), you can indicate whether the system time is daylight saving time or standard time directly on the enCore device.

> **Requirement for changing the daylight saving time manually**
>
> Switching the time from daylight saving time to standard time and vice versa is only possible in this display if the following setting is parameterized in enSuite:
>
> Parameter branch: 📷 **Basic System –** 🕐 **Time Service**, **Daylight saving** area
>
> - **Daylight saving** has the value **manual**

► Determine the **Time zone**.

    ► To accept the changes, click **<u>Update date and time</u>**.

🔲 A short status message will be displayed briefly over the lower edge of the screen. Red font indicates that the update has failed.

- **Date and time updated**
- **Update of date and time prohibited!**
- **Update of date and time failed!**

5.1.3 With enSuite "Update date and time" (action)

You can update the time within the device in enSuite using the enSuite action. As part of this, the updated time and date will be transferred directly to the enCore device without changing the parameterization.[4]
You can either synchronize the system time with the local PC time or set this manually. You can also switch the daylight-saving time settings in the associated enSuite dialog.

Prerequisites

- The user has the right to **Update device time**.

  ⇨ 9 User and rights management (p. 99)

- enSuite is connected to the enCore device via an active data connection.

  ⇨ enCore FC manual "Configuring the Device with enSuite"

► Click the **Update date and time** action in the lower area of the navigation window.
✓ The login dialog will open.
► Log in with the necessary user rights.
✓ Once you have logged in successfully, the **Update device's date and time** tab will open.

---

[4] You can only update the time zone, however, in the device parameterization.

To synchronize the system time of the device to the PC time...

► … enable the option **Use PC local time** – the current PC time will be shown in square brackets.

OR

To set the system time of the device yourself...

► … enable the option **Use specified date and time** – default.

✓ The date and time selection fields are pre-assigned using the system time of the enCore device at the point at which the user logged in; the date and time are not updated.

► To assign the date and time selection fields again with the updated local PC time, click **[Now]**.

► Change the date in the date field if necessary.

► Change the time in the time field if necessary.

If the local PC time or the time you have selected is in daylight saving time...

► … select the checkbox **Daylight savings time**.

► Clicking **[Update date and time]** transfers your settings to the enCore device.

▫ If the system time in the enCore device has been successful updated, the time display in the header of the device will be updated and then in the main display of the `Time Service` this update time will be displayed as the 🗓 **Latest update** value.

✓ If the date and time could *not* be set successfully, enSuite will display a warning and the cause of the error in the **Output**[5] window. The cause of the error may be, for example, that the user has been automatically logged out due to the **Inactivity timeout**.
    ⇨ 9 User and rights management (p. 99)

_____

[5] If the output window is not displayed in enSuite, you can open it via the menu **Window – Output** or the key combination **<Ctrl + 4>**.

5.1.4   Adjusting system time via external sources

When adjusting the time through external time sources, the enCore device fundamentally distinguishes between the synchronization and the setting of the system time.

⇨ 10.2.1 Why does the Time Service distinguish between synchronization and setting the system time? (p. 140)

Synchronization can either be carried out an unrestricted number of times or only once within a specific time interval (e.g., every 12 hours).

The enCore device distinguishes two error situations: the external sources are identified as in error or setting the time is not permitted. For both error situations, you determine whether the device generates an alarm or a warning or continues without generating a message.

Parameterizing time adjustment in enSuite

Prerequisites

- The connection to the external time sources is already enabled and configured in parameterization, for example NTP under **Time Service – NTP** or a Modbus time source in a Modbus AFB.
  ⇨ Parameterizing NTP in enSuite (p. 43)

- The desired parameterization is opened in the branch **<Device> – Basic System – Time Service**.

To assign the external time sources for the time adjustment...

► … import the time stamp export value of the preferred time source in the parameter **Prim. external time source**.

Example

> To update the time preferably by NTP, import the time stamp from the export branch Basic System – Time Service – NTP: enabled – Timestamp as the primary time source.

- As long as the primary time source is not in error, this source will be used for synchronization and setting the system time.
- ► In case of any errors, import a further time source in the parameter **Sec. external time source**.

Example

To update the time via Modbus in the case of an error in the primary time source, import the time stamp from the export branch 🗃️ **Basic System** – ▦ **Modbus** – **<Communication mode…>** – 🕒 **Register Areas.<Time import>.Register.Register <x.x>.Import Date and Time.Time** as a secondary time source.

📖ℹ️ **Incorrect configuration**

Ensure that an update to the time using an external time source is only carried out if the **Prim. external time source** is parameterized. If no time source is indicated there (incorrect parametrization), the parameter **Sec. external time source** will be ignored.

If only the **Sec. external time source** is parameterized, the message 🚩 **Configuration invalid** will be generated.

- If the primary source is in error, the enCore device will use the secondary time source to update the system time.
- ► In the parameter **Max. synchronization range** adapt the time window such that the enCore device is interpreted as a synchronization – *default* is ±**20** seconds.
- ✓ The device interprets changes to the time within this time window as a synchronization of the system time with the external time source and not as the setting of the system time.

To prevent several synchronizations being carried out one after the other in short succession...

► … use the parameter **Synchronization interval** to determine the minimum time that needs to have passed between two synchronizations – *default* is **720** minutes.

The system time will be synchronized a maximum of once within the indicated interval.
This parameter only has an effect in when it interacts with the parameter **Time update mode**, and only if this parameter only allows one synchronization of the system time (value **Synchronization only**).

► Where applicable, limit **Time update mode** in the drop-down menu to determine whether only the system time can only be synchronized or set:

- **Synchronization only** (*default*)
  The system time may only be synchronized (and only once within the **synchronization interval**), but it may not be set.

- **Synch. and setting**
  The system time may be set freely and as frequently as desired; the limitations in the parameters **Max. synchronization range** and **Synchronization interval** are not taken into account.

- **Synch. and setting (authentication req.)**
  Only if a user with the user right **Update device time** is logged on to the device, the system time can be set freely and as often as required, as with **Synch. and setting**.
  However, if no user with this right is authenticated on the device for setting the system time, the system time may be synchronized – as is the case with **Synchronization only** – in accordance with the restrictions of the **Max. synchronization range** and **synchronization interval** parameters.

Example

To enable just the synchronization of the system time and make this only once every 24 h by a maximum of ±15 seconds…

► … enter the value **15** (seconds) in the parameter **Max. synchronization range**.
► … enter the value **1440** (minutes) in the parameter **synchronization interval**.
► Select the entry **Synchronization only** from the drop-down menu **Time update mode**.
▣ The system time can only be synchronized once per 24 h by a maximum of ±15 seconds.
   The time cannot be set using an external source, however.

To determine the handling of errors for the *Setting[6]* of the system time…

► ... select the appropriate behavior from the drop-down menu **Error on refused time setting**:
   • **Alarm**
      The 🏳 **Alarm time setting** message will be generated.
   • **Warning** (*default*)
      The 🏳 **Warning time setting** message will be generated.
   • **None**
      No message is generated.

▣ If an error occurs while setting the time, the enCore device will report the following information:
   • the current system time
   • the time from the external source which was not taken over
   • the daylight saving time information if daylight saving is enabled

---

[6] This parameter does *not* affect the synchronization of the system time.

Depending on the handling of errors set in the parameter **Error on refused time setting**, the device generates an alarm, a warning or no message.

These ![alarm] alarm or ![warning] warning messages disappear as soon as either the time is successfully reset or the enCore device is switched off.

► Use the drop-down menu **Message on failure of ext. time source(s)** to determine the behavior if there are errors in all of the parameterized external time sources:

- **Alarm**
  The ![alarm] **Alarm ext. time source** message will be generated.

- **Warning** (*default*)
  The ![warning] **Warning ext. time source** message will be generated.

- **None**
  No message is generated.

The ![alarm] alarm or ![warning] warning messages disappear as soon as one of the parameterized external sources is not in error again or as soon as the enCore device is switched off.

Flow chart

Overview of the main functioning and interaction of the individual parameters:
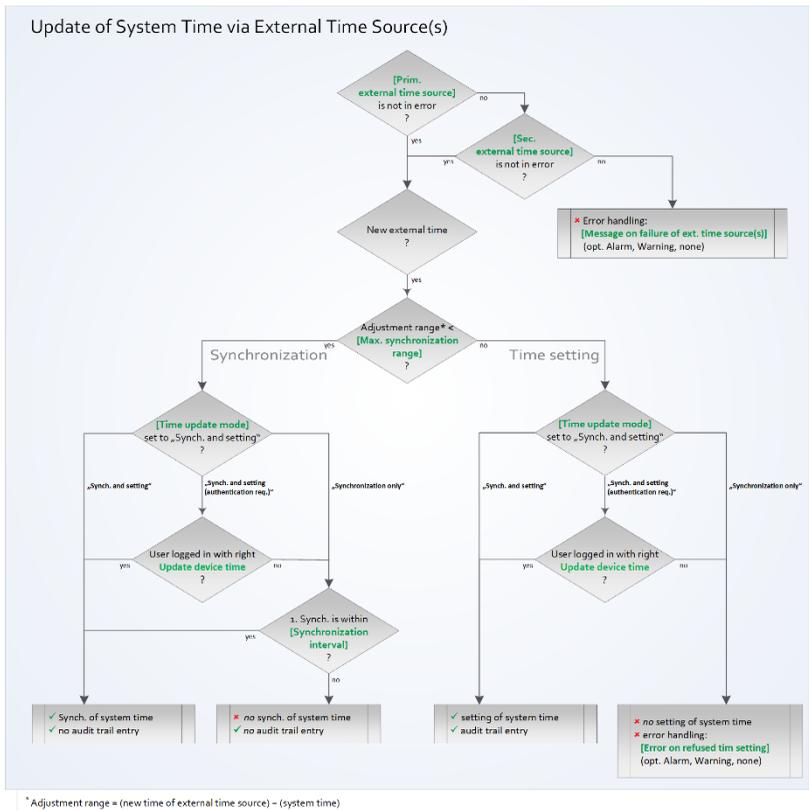
Fig. 5-3: Overview of the functioning and parameterization of the external time sources

Adjusting time via NTP

The system time can be adjusted against a highly accurate time server via the enCore device network via **N**etwork **T**ime **P**rotocol (NTP for short).

By default, the enCore device sends a query to an NTP server once within a set interval. If the NTP server does not answer within the specified timeout

period or has a stratum which is classified as not reliable (**Max. stratum**), the device can query two other NTP servers.

If none of the specified NTP servers responds, the enCore device generates either an alarm or a warning or continues without a message. If all NTP servers exceed the maximum permissible stratum, no message is generated.

Parameterizing NTP in enSuite

Prerequisite

- The desired parameterization is open in the branch **<Device> – 🖼 Basic System – 🕒 Time Service**.

To update the system time of an enCore device via NTP...

► … select the entry **enabled** on the **Parameter** tab in the **NTP** drop-down menu.

✓ The parameters for the NTP configuration are displayed.

► Enter up to three time sources in the following format in the parameters **Server 1** to **Server 3**:
<Name OR IP address of the server>[:<Port number>]
e.g., the DNS of the PTB: **ptbtime1.ptb.de**
Indication of the port number is optional – *default* is port **123**.

► Set the maximum allowable NTP time server stratum for **Server 1** to **Server 3** in parameter **Max. stratum**.
Allowed are values from 1 to 15, where 1 corresponds to a highly accurate stratum-1 server. The default value is 15 (that is, each server is accepted).

🖼 The enCore device accepts an NTP time server as a valid time source for time synchronization only if its stratum does not exceed the parameterized maximum stratum; otherwise, this time source is ignored.

► Enter the time interval during which the enCore device will try to request time information from the NTP servers in the parameter **Poll interval** – *default* is **1440** minutes (≙ 1 day).

To activate the time synchronization via a signal, ...

►   ... select in parameter **Trigger time synch.** the desired signal.

▣   The signal requests an additional spontaneous time synchronization from the NTP time server.

In general:

►   Enter the maximum response time for an NTP server in the parameter **Timeout** – *default* is **5** seconds.

▣   The enCore device tries to request the information from the NTP server within the time period indicated. If it does not respond within the timeout period, the enCore device attempts to query the second and then finally the third parameterized NTP server for the duration of the timeout.

►   Use the parameter **Max. poll attempts** to limit the maximum number of (unsuccessful) NTP queries that the enCore device performs one after the other - *default* is 3.

▣   If none of the parameterized servers responds (**Timeout** of all servers and **Max. poll attempts** exceeded), the parameter **Message on poll error** will be evaluated:

►   Using the **Message on poll error** drop-down menu, determine whether the enCore device generates a message if none of the parameterized NTP servers responds within the timeout or not:

- **Warning** (*default*)
  The 🏳 **warning** message is generated.

- **None**
  No message is generated.

▣   This 🏳 **warning** message disappears as soon as one of the parameterized NTP servers is accessible again or the enCore device is switched off.

✓   In the case of a successful time adjustment with one of the NTP time sources indicated, the export value 📅 **Timestamp** is updated with the NTP time stamp in the branch 🕓 **Time Service – NTP.enabled**.
In addition to this, the export value provides information about the 🕗 **Duration since latest polling** in the form of the amount of time that has passed since the last time polling.

> ⓘ **Use the NTP time stamp as an external time source**
>
> Ensure that the system time of the enCore device is only updated via NTP if you import the NTP export value 🗓 **Timestamp** into the Time Service, either as a **Prim. external time source** or as a **Sec. external time source**.
>
> ⇨ Parameterizing time adjustment in enSuite (p. 37)

▢   Time polling via NTP occurs in the following cases:

- upon start-up of the enCore device
- in the case of modified changed NTP server lists (**Server 1** to **Server 3**)
- cyclically according to the **Poll interval**
- in the case of manual call-up of the **Request time via NTP** action in display **NTP** device display.
- whenever the time synchronization is requested via a signal (**Trigger time synch.**)

5.2   Daylight saving

The time can be switched from standard time (≙ "winter time") to daylight saving time and vice versa in accordance with the regional rules of the European Union, the USA or Mexico (central zone), or on a user-defined basis in accordance with the POSIX standard for time zone information. Alternatively, you can change the time manually on the enCore device or via an external time source (**Prim. external time source**/**Sec. external time source**).

Parameterizing daylight saving in enSuite

► Open the branch 🕑 **Time Service**.
► On the **Parameter** tab, use the drop-down menu **Daylight saving** to determine the rules the switch should follow. Select the relevant entry:

- **manual**
  This enables you to change the time as follows:
    - at the operation panel of the enCore device
    - via the online parameterization
    - via an event message
    - via the daylight saving time information from an external time source

  With parameter **DST active** determine whether the change in time is manual or via a message.

- **predefined**
  The time is changed automatically based on the predefined rules for the **Region**.

- **user defined**
  The time is changed automatically based on a user-defined **Posix TZ string**. The notation complies with the POSIX standard for time zone information.

The POSIX standard for time zone information

You enter the time zone information in accordance with the POSIX standard in the TZ[7] string format. To make entry easier, it is sufficient for you to enter the rules for the daylight saving as enCore devices evaluate the user defined TZ string in this context based on the following syntax:

`[<NT><offset1>[<DST>[<offset2>],]<rule>`

Where:

- `<NT>`   is normal time
- `<offset1>` is time in the format: `HH[:mm[:ss]]`

---

[7] `TZ` stands for **T**ime **Z**one. The TZ string is defined as follows:
`<NT><offset1>[<DST>[<offset2>][,<rule>]]`

- `<DST>`   is daylight saving time
- `<offset2>` is time in the format: `HH[:mm[:ss]]`
- `,`   (separator)
- `<rule>`   The rule contains the information to calculate the start and end of daylight saving time. It has the following syntax:

  `<start date>[/<time>],<end date>[/<time>]`

  Where:

  - `<start date>[/<time>]`
    is the date and time (in normal time) of the changeover from normal time to daylight saving time
  - `<end date>[/<time>]`
    is the date and time (in daylight saving time) of the changeover from daylight saving time to normal time

5.3 Time-controlled actions

The enCore device provides time-related events of a 🚩 signal type. These events can be used as input signals for time-controlled actions in other SFBs or AFBs. This is so that you can automate recurring tasks and e.g., form new values cyclically with the `Postprocessing AFB`.

The enCore device generates time-related events based on the system time and the (parameterized) contract hour. The following export values are available:

- export values based on the system time in the export branch
  🗔 **Basic System –** or standard time 🕑 **Time Service – 📁 Timer events**:

  🚩 **Every second**

  🚩 **Every <2, 3, 5, 10, 15, 20, 30> seconds**

  🚩 **Every minute**

  🚩 **Every <2, 3, 5, 10, 15, 20, 30> minutes**

  🚩 **Every hour**

🦶 **Every <2, 3, 4, 6, 12> hours**

🦶 **Every day (at midnight)**

🦶 **Every Sunday (at midnight)**

🦶 **Every Monday (at midnight)**

🦶 **Every month (midnight on 1st)**

Special case: Trigger for a longer cycle duration is activated first

Event signals in a second rhythm are formed relative to a full minute and event signals in a minute rhythm are formed relative to a full hour.
For example:

- 🦶 **Every other minute**
  e.g., `12:02:00 … 12:04:00 … 12:06:00 …`, etc.

- 🦶 **Every 3 minutes**
  e.g., `12:03:00 … 12:06:00 … 12:09:00 …`, etc.

This means that immediately after the device is restarted and until a cyclic event signal is first triggered the time depends on the boot time and may be shorter than the associated cycle. This special case can only occur once immediately after the device is restarted.

Example
If the enCore device is switched on at `12:02:30` and the signals 🦶 **Every other minute** and 🦶 **Every 3 minutes** are used as triggers, at system time `12:03.00`, the signal 🦶 **Every 3 minutes** is formed and only subsequently at `12:04.00` is the signal 🦶 **Every other minute** formed.

- Export values based on the system time in the export branch
  🗂 **Basic System –** 🕐 **Time Service –** 📁 **Contract hour: <single contract/two contracts>**:

  (initial contract or single contract)

  # **Contract hour (numeric)**

🐾 **Every day (at contract hour)**

🐾 **Every Sunday (at contract hour)**

🐾 **Every Monday (at contract hour)**

🐾 **Every month (at contract hour on 1st)**

(second contract – optional)

\# Contract **hour 2 (numeric)**

🐾 **Every day (at 2nd contract hour)**

🐾 **Every Sunday (at 2nd contract hour)**

🐾 **Every Monday (at 2nd contract hour)**

🐾 **Every month (at 2nd contract hour on 1st)**

Parameterizing contract hour in enSuite

A gas day lasts `24 hours` and by default begins at `06:00`. If another contract hour is contractually agreed to, you can adjust the default. Optionally, the enCore device can manage a further contract with another contract hour.

To change the default...

► ... open the branch 🕐 **Time Service**.

► On the **Parameter** tab, select one of the following entries from the drop-down menu in the **Contract hour** area:

- **single contract –** *default*

- **two contracts**

✓ If you have selected **two contracts**, the parameter **Contract hour 2** will also be displayed.

► Select the time for the contract hour for the first or single contract from the drop-down menu **Contract hour** – *default* is **06:00**.

► Where applicable, select the time for the start of day for the second contract from the drop-down menu **Contract hour 2** – *default* is **08:00**.

▤ The enCore device provides various contract hour specific events in the export branch 🏢 **Basic System –** 🕐 **Time Service –** 📁 **Contract hour: <single contract/two contracts>**.

5.4   Display and operation

Depending on the parameterization, the `Time Service` has up to four standard displays: the main display showing the internal time in the device, the displays to set the date and time, a detailed view with information about the time source as well as an NTP overview (optional).

5.4.1   Overview of displays

The following figure shows the hierarchical structure and the navigation through the displays of the `Time Service`.

Depending on the user's authentication, the main display branches to the corresponding display to change the system time. The hyperlink **NTP overview is only displayed when time polling via NTP is enabled in the enCore device.**
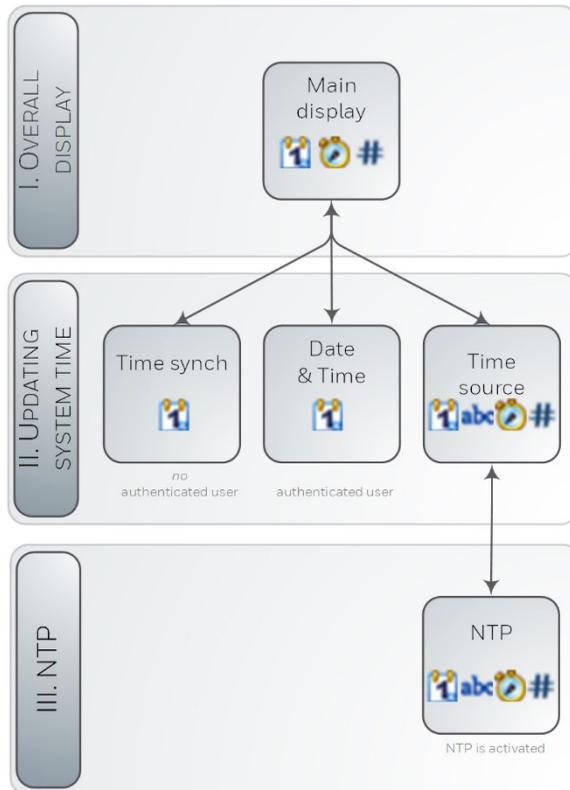
Fig. 5-4: Displays – hierarchical structure

5.4.2   Displays in detail

Display „Main"

The initial display of the `Time Service` is the **Main display**.

Access: **System –** **Time Service**

Fig. 5-5: Main display – example

Display „Synchronization"

Prerequisite

- No user with user right **Update device time** is logged on to the
  device.
  ⇨ 9.2.2 Rights at a system level (p. 110)
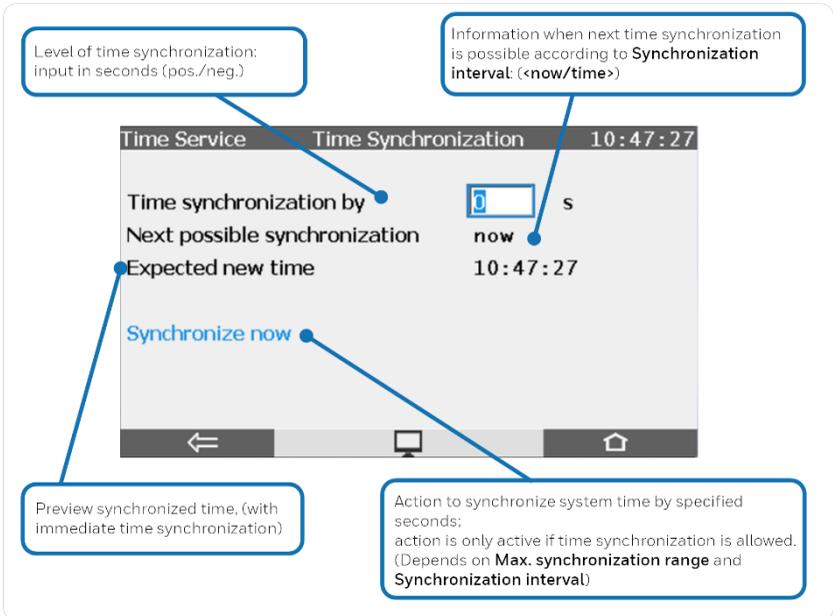
Fig. 5-6: Display **Time synchronization** – example

Display „Date & Time"

Prerequisite

- A user with user right **Update device time** is logged on to the device.
  ⇨ 9.2.2 Rights at a system level (p. 110)
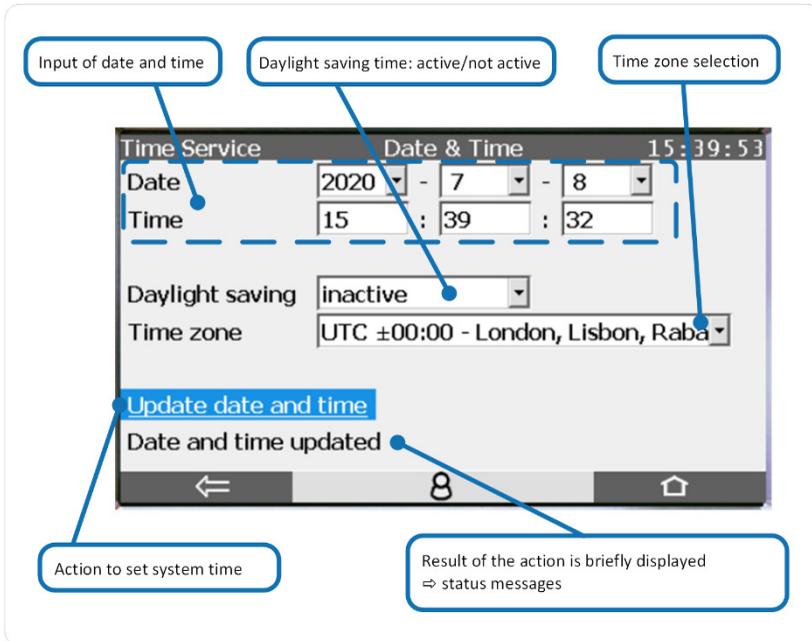
Fig. 5-7: Display **Date & Time** – example

Status messages and further details ⇨ 5.1.2"Update date and time" via operation panel (p. 33)

Display „Time source"

Fig. 5-8: Display **Time source** – example

Display „NTP"

Prerequisite

- The time request via NTP is parameterized.
  (**Basic System** – **Time Service**, parameter **NTP**)
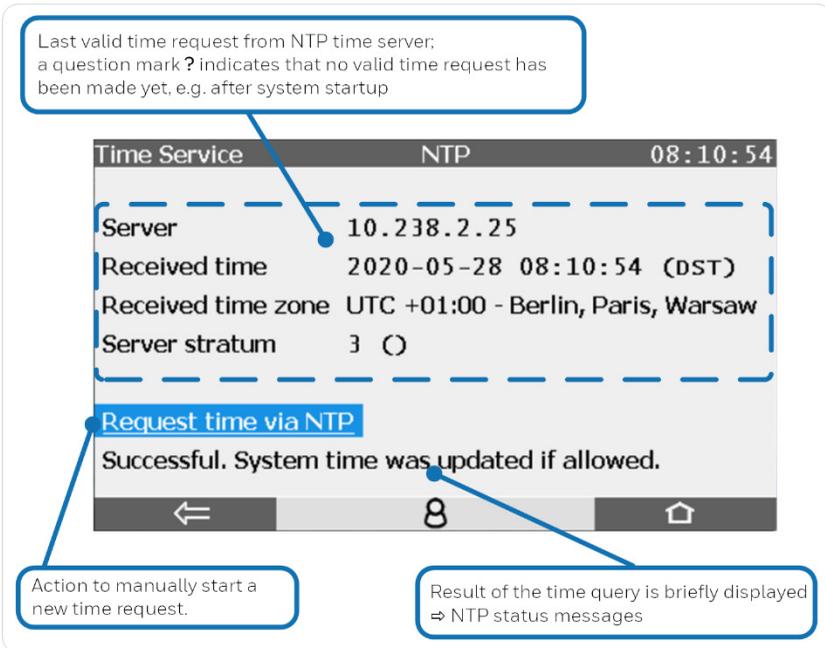
Fig. 5-9: Display **NTP** – example

Status messages with manual time synchronization via NTP

Messages in red font indicate that the NTP time request was not successful and inform about the type of error.

Status message	Description
Successful. Time was updated if allowed	The time was successfully requested of the NTP server, the system time might have been synchronized with the new time. ⇨ 5.1.4 Adjusting system time via external sources (p. 37)
No NTP server configured	The time request via NTP is activated (**NTP**: **active**), but no **Server 1..Server 3** is parameterized. Cause: • error in the parameterization
Name resolution error	The names of the NTP servers (**Server 1**..**Server 3**) could not be resolved via DNS. Possible causes: • The DNS server is not available, e.g., because the IP address of the **DNS server** in the network settings (CPU or ESER4) is not correctly parameterized. • The names of **Server 1..Server 3** are not correct.
Network error	Internal network error *In this case, contact our support team.*
Stratum exceeded	The maximum permitted NTP server stratum (**Max. stratum**) is exceeded by all parameterized **Server 1**..**Server 3**. Cause: • error in the parameterization

Status message	Description
Network timeout	The **Timeout** was exceeded in the time query of the **Server 1..Server 3**. Possible causes: • **Timeout** selected too low • network error

Table 5-1: Display **NTP overview** – status messages

6 Tools

6.1 Flow direction manager (Gas meter tools)

There are various AFBs that generate counters for flowed quantities or volumes – e.g., the `Flow Conversion AFB`.

If several flow directions are to be to be considered in a measuring system, a separate AFB of the respective type is used for each flow direction (FD), so that separate counters are available for each flow direction. "Flow directions" can be either physically different flow directions or logically distinguishable counters, e.g., filtered according to tariff times. The counters of such an AFB are only active if the corresponding parameterized activation message is pending.

To ensure that a unambiguous and error-free message is available for this purpose, there is the flow direction manager. Here you can define up to 10 FD groups. In a FD group, the flow direction information can be provided from up to four associated flow direction messages, or by a number or by a bitstring. The flow direction manager evaluates these messages and generates unambiguous messages for the activation of counters in subsequent AFBs – even if the input messages or values are erroneous or contradictory. This ensures that quantities are neither counted twice nor not at all.

6.2 Counter comparisons (Gas meter tools)

In many application cases, a "Counter type" measurement device is connected to the enCore device using two or three channels. A typical example is a turbine gas meter measuring the gas volume that has flowed, and which transmits the results via volume-proportional pulses with 2 redundantly arranged HF sensors to an enCore flow computer. A multi-channel connection allows for enhanced monitoring of the gas meter.

For the realization of this monitoring, the enCore software provides 2 various functionalities of a **Counter comparison** type, depending on whether both sensors generate HF signals (with high resolution), or whether one sensor generates HF signals and the other one LF signals (with low resolution). The

different refresh rates with HF and LF make various monitoring algorithms a requirement.

⇨ 10.4.3 What are the differences between the functions of the LF-HF and HF-HF counter comparison? (p. 158)

Furthermore, a comparison with the digitally transmitted results of an encoder index is also possible. An encoder index transmits its original counter values via the encoder protocol; the progression of such an index is comparable to the frequency of an LF counter with respect to the refresh frequency. Therefore, a counter comparison LF-HF is used for the comparison of an encoder index and a HF sensor.

Counter comparison Encoder-HF-HF

There are special applications where the gas meter includes both an encoder index and 2 additional HF sensors. If in such a case, should you intend to realize a counter comparison between all 3 sensors, you will first parameterize a HF-HF-comparison for the pulse generators and let enter the results in an LF-HF-comparison with the encoder index. Details regarding parameterization ⇨ 10.4.1 How to parameterize a counter comparison encoder-HF-HF? (p. 155).

Counter Comparison prior to Basic System V 3.23

The present description of the counter comparison function is applicable beginning with Basic System V `03.23`; starting with this version, the function provides more settings and diagnostic options (e.g., additional prewarning limits and messages).
If you want to parameterize an older software version, please see the online help in enSuite for details.

6.2.1 Counter comparison HF-HF

A counter comparison HF-HF uses 2 sensors with high resolution, i.e., the quality of the measurement results is approximately the same. As results, the counter comparison HF-HF provides an **Output counter** and an **Output flow rate**. These export values will be allocated to downstream functions for further processing, e.g., for `Flow Conversion AFB`.

The preferred sensor to be used in each case, – i.e., in the normal undisturbed case, for forming the output counter and the output flow rate – can be parameterized. To achieve optimum measurement accuracy, we recommend selecting the measurement values of the pulse sensor with the higher pulse value (cp) for the associated parameters **HF1 counter input (preferential)** as well as **HF1 flow rate (preferential)**.

As soon as one of the two HF sensors reaches or exceeds the parameterizable **Comparison amount**, a comparison will be performed and the deviation of both sensors determined. Subsequently, the comparison will restart.

In the parameterization, both a **Deviation prewarning limit** and a **Deviation warning limit** may be determined to realize 2-stage monitoring.

Stage 1:
If when reaching the **Comparison amount** it is determined that with the deviation between the two sensors the **Deviation prewarning limit** is exceeded, a prewarning is generated for the sensor which signaled the lower volume, apart from that, there are no further error responses.

Stage 2:
When exceeding the **Deviation warning limit**, there are the following error responses:

- A warning is generated for the sensor which signaled the lower volume.

- The export value **Output flow rate** is marked as erroneous. This way, downstream functions may appropriately respond to the error situation. (A `Flow conversion AFB`, e.g., generates an alarm if the input flow rate is erroneous.)

- If it is the parameterized preferred sensor that has a negative deviation that is too high, there will be a switch to the other HF sensor for

the export values **Output counter** and **Output flow rate**. The currently used sensor can be identified by whether the message 🚩 **HF1 used** or 🚩 **HF2 used** is pending.

A 🚩 **HF1 deviation warning** or 🚩 **HF2 deviation warning** ends, as soon as a subsequent comparison determines that the warning limit has not been exceeded. The warning also ends if you reset the comparison manually via the operation panel ➪ .

In order for the counter comparison not to be performed when the flow is very low, a **Switch-off limit** should be parameterized**.** The counter comparison will be stopped if both flow rate values are smaller than the parameterized **Switch-off limit**. In such a situation, the 🚩 **Monitoring stopped** message is generated. The counter comparison will only be restarted when at least one of the two flow values is greater than 1.5 × **Switch-off limit** for one minute. At this point, the message 🚩 **Monitoring stopped** ends.

The counter comparison cannot be performed if at least one of the input values **HF1 counter input**, **HF1 flow rate**, **HF2 counter input** or **HF2 flow rate** is marked as erroneous. In such a situation, the warning 🚩 **Monitoring off** is generated, additional detailed messages[8] will help diagnose the specific error case. The warnings will end if all inputs are error-free again. The comparison will be started anew.

---

[8] Warnings 🚩 **HF1 failure**, 🚩 **HF2 failure** (depending on which of both sensors is marked as being erroneous), collective message 🚩 **HF failure**

Parameterize HF-HF counter comparison (expert mode)

Prerequisite

- The connection of the two HF sensors is already parameterized under **Basic System – I/O** (ExMFE5 or MFE7 board).

► Open the branch 🖼 **Basic System –** 💼 **Tools**.
✓ The tab **Counter comparisons (HF-HF)** shows the already defined counter comparisons, provided they have been created already, e.g., in case of a FC1 parameterization created in normal mode.
► To create a new HF-HF counter comparison, click on the Add icon ➕.
✓ A new instance of the type **Counter comparison (HF-HF)** is created.

Parameterize the counter comparison according to your application and requirements:

► Select the physical quantity and unit for the counter and flow rate.
► Import the counter export value of the input channel to which the HF sensor with the higher pulse value[9] is connected to the parameter **HF1 counter input (preferential)**, e.g., for a HF sensor of a gas meter
   📍 Board 1.Z1+ Z1-.amount
► Import the associated flow export value to the parameter **HF1 flow rate (preferential)**, for the above example therefore
   📍 Board 1.Z1+ Z1-.Flow rate.
   Important: Counter input and flow rate must pertain to the same sensor and/or input channel!
► Import the counter export value and the associated flow rate export value of the second sensor to parameter **HF2 counter input** and **HF2 flow rate**. Also, valid in this instance: Counter input and flow rate must pertain to the same sensor and/or input channel!
► Determine a **Switch-off limit**, a **Comparison amount**, as well as a **Deviation prewarning limit** and **Deviation warning limit**.
✓ Note the following tips:

---

[9] We recommend to use the sensor with the higher pulse value (cp) as preferential sensor as it provides higher accuracy of measurement results.

- It makes sense to select the **Switch-off limit** based on the meter's lower measurement range limit, e.g., the Qmin/10 value. If the value zero (0) is parameterized here or the parameter is set to **Not used**, the comparison is not switched off in the event of low flow rates.

- It makes sense to select the **Comparison amount** dependent on the sensor's pulse value, e.g., the value 1000/pulse value. Example: If the sensor with the lower pulse value generates 1000 pulses per m^3, $1m^3$ is a sensible value for the comparison volume If, for the Comparison amount, the option **Not used** is selected or the value zero (0) is parameterized, no comparison will be performed.

- The **Deviation warning limit** should be selected depending on the **Comparison amount**, e.g., 5 % of the comparison amount.

  If, for the **Deviation warning limit**, the option **Not used** is selected or the value zero (0) is parameterized, no monitoring of a warning limit will be performed. In this case, each time the comparison amount is reached, there is the possibility of switching to the sensor that has signaled the higher flow rate; deviation does not play any role.

- It is expedient to select a lower **Deviation prewarning limit** than the warning limit. If the option **Not used** is selected or the value zero (0) is parameterized, no monitoring of a prewarning limit will be performed.

> 📖 **Parameterize HF-HF Counter Comparison in Normal Mode**
>
> If you edit a parameterization in normal mode, enSuite will facilitate your work enormously:
>
> In normal mode, you merely select the input channels on the board for the preferred and additional sensors, apart from that, only the parameter **Deviation warning limit** is visible and several additional influencing parameters – not visible to you – will automatically be set to default values. The input field for the **Deviation warning limit** also contains a recommended default value that is automatically calculated depending on other visible parameters. If you make changes to such influencing parameters, the preset value will be deleted; if you click on the **Preset value** button, the recommended default value will be recalculated and reentered. By fine tuning the **Deviation warning limit** value, you can adjust the counter comparison to be more or less sensitive.

6.2.2   Counter comparisons LF-HF

A counter comparison LF-HF is used if one of the sensors provides HF signals, the other on the contrary LF signals, or if it is an encoder index. Both a LF sensor and an encoder index have a lower refresh rate than a HF sensor, therefore a LF-HF counter comparison follows another algorithm than a HF-HF comparison.

The counter comparison LF-HF also provides an **Output counter** and an **Output flow rate** as results. These export values will be allocated to downstream functions for further processing, e.g., for a Flow Conversion AFB. In undisturbed normal operation, the HF sensor is automatically used for forming the output flow rate, since it provides a better measurement result due to the higher resolution.

Whichever sensor shall be used preferentially, i.e., in the event of normal undisturbed operation for forming the output counter, is thereby parameterizable. In a comparison between LF and HF pulses, the HF sensor should also be selected here. Only in case that an encoder index is functioning as an LF sensor, it may make sense to derive the output counter from the

encoder (LF) to achieve synchronization of the encoder index and the output counter.

An LF-HF counter comparison monitors the sensors with respect to the following aspects:

- Failure of a sensor
- Long term deviation of both sensors

Failure of a sensor

If a sensor has signaled a certain parameterizable amount, while during the same time period the other sensor indicates no progress, the inactive sensor is considered to have failed.

Long term deviation of both sensors

To monitor the long-term deviation of both sensors, there are comparison counters for the volumes that are signaled via both sensors. In addition, the deviation, which is the difference between both comparison counters, is calculated. There is a parameterizable prewarning limit as well as a warning limit for monitoring the deviation. This way, 2-stage monitoring with various errors responses may be achieved.

Stage 1
If the difference of the comparison counters exceeds the **Deviation pre-warning limit**, a prewarning is generated for the sensor with the lower amount, apart from that there are no further error responses.

Stage 2
When exceeding the **Warning limit deviation**, there are the following error responses:

- A warning is generated for the sensor which signaled the lower amount. The export value **Output flow rate** is marked as erroneous. This way, downstream functions may appropriately respond to the error situation. (A Flow conversion AFB, e.g., generates an alarm if the input flow is erroneous.)
- Depending on which sensor signals the lower amount, there will, if necessary, be a switch to the other sensor for the export values

Output counter and **Output flow rate**.
Recognizing the current sensor in use for the **Output counter** is possible by identifying the fact, whether the 🚩 **HF counter used** message or the 🚩 **LF counter used** message is pending. For the **Output flow rate**, there are the respective messages 🚩 **HF flow rate used** or 🚩 **LF flow rate used**.

If a 🚩 **Warning LF deviation** or 🚩 **Warning HF deviation** is generated, it will be active until you reset the comparison manually via the display menu. Instructions on how to do this are provided in a separate section.
⇨ 10.4.2 How to reset a counter comparison via the operation panel of the device? (p. 156)

Low long-term deviations between both sensors are systematic. Therefore, an automated function will always reset the long-term deviation if one of the two comparison counters has reached a specific amount (**Reset amount**) without the **Deviation warning limit** having been exceeded since the last time the comparison was started. When resetting, the **LF comparison counter**, the **HF comparison counter**, as well as the **Deviation** will be reset to the value zero (`0`), i.e., the comparison will start anew.

In order for the counter comparison not to be performed when the flow is very low, a **Switch-off limit** should be parameterized**.** The counter comparison will be stopped if both flow rate values are smaller than the parameterized **Switch-off limit**. In such a situation, the 🚩 **Monitoring stopped** message is generated. The counter comparison will only be started when at least one of the two flow values is greater than 1.5 × **switch-off limit** for one minute. At this point, also the message 🚩 **Monitoring stopped** ends.

The monitoring functions cannot be performed if at least one of the input values for **LF counter input**, **LF flow rate**, **HF counter input** or **HF flow rate** is identified as erroneous. In such a situation, the warning 🚩 **Monitoring off** is generated, additional detailed messages[10] will help diagnose the

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[10] Warnings 🚩 **LF sensor failure**, 🚩 **HF sensor failure** (depending on which sensor is erroneous), collective message 🚩 **sensor failure**

specific error case. The warnings end if all inputs are error-free again. The comparison will be started anew.

Parameterize LF-HF counter comparison (expert mode)

Prerequisite

- The connection of the two sensors (either LF sensor and HF sensor, or encoder and HF sensor) is already parameterized under **Basic System – I/O** (ExMFE5 or MFE7 board).

► Open the branch 🔲 **Basic System –** 🧰 **Tools**.
✓ The tab **Counter comparisons (HF-HF)** shows the pre-defined counter comparisons, provided they have been created already, e.g., in case of a FC1 parameterization created in normal mode (in this case a comparison between encoder index and HF sensor is pre-defined.
► To create a new LF-HF counter comparison, click on the Add icon ➕ .
✓ A new instance of the type **Counter comparisons (LF-HF)** is created.

Parameterize the counter comparison according to your application and requirements:

► Select the physical quantity and unit for the counter and flow rate.
► Import the counter export value of the LF sensor or the encoder index to the parameter **LF counter input**, e.g., for an encoder index 📍 **Encoder index 1.V Encoder**.
► Import the associated flow export value to the parameter **LF flow rate**, therefore the export value in the above example 🔵 **Encoder index 1.Q**. **Important**: Counter input and flow rate must pertain to the same sensor and/or input channel!
► Import the counter export value and the associated flow rate export value of the HF sensor to parameter **HF counter input** and **HF flow rate**. Also, valid in this instance: Counter input and flow rate must pertain to the same sensor and/or input channel!
► Determine a **Switch-off limit**, a **Deviation for sensor failure**, a **Reset amount**, as well as values for **Deviation prewarning limit** and **Deviation warning limit**.
✓ Note the following tips:

- It makes sense to select the **Switch-off limit** based on the meter's lower measurement range limit, e.g., the Qmin/10 value. If the value zero (0) is parameterized here or the parameter is set to **Not used**, the comparison is not switched off in the event of low flow rates.

- It makes sense to select the **Deviation for sensor failure** based on the meter's higher measurement range limit, Qmax, e.g., the value of 5% Qmax (in m³ in case that Qmax is stated in m³/h). If the value zero (0) is parameterized here or the parameter is set to **Not used**, monitoring is disabled.

- It makes sense to select the **Deviation warning limit** based on the meter's higher measurement range limit, Qmax, e.g., the value Qmax (in m³ in case that Qmax is stated in m³/h). If the value zero (0) is parameterized here or the parameter is set to **Not used**, monitoring is disabled.

- It is expedient to select a lower **Deviation prewarning limit** than the warning limit. If the option **Not used** is selected or the value zero (0) is parameterized, no monitoring of a pre-warning limit will be performed.

- It makes sense to select the **Reset amount** based on the meter's higher measurement range limit, Qmax, e.g., the value of 100 × Qmax (in m³ in the case that Qmax is stated in m³/h). Attention: If the value zero (0) is parameterized here or the parameter is set to **Not used**, no automatic reset is implemented (not recommended!).

► Select the input (i.e., in error-free operation) to be used preferentially for forming the output counter. In a comparison between LF and HF pulses, the HF sensor should be selected here. Only in case that an encoder index is functioning as an LF sensor, it may make sense to derive the output counter from the encoder (LF) to achieve synchronization of the encoder index and the output counter.

> 📖 **Parameterize LF-HF Counter Comparison in Normal Mode**
>
> If you edit a parameterization in normal mode, enSuite will facilitate your work enormously:
>
> In normal mode, simply select the LF sensor (or the encoder index) as well as the HF sensor in the tab **Stream <x> – Gas meter**. Apart from that, only the parameter **Deviation warning limit** is visible, several other influencing parameters – invisible to you – are automatically assigned standard values. The input field for the **Deviation warning limit** also contains a recommended default value that is automatically calculated depending on other visible parameters. If you make changes to such influencing parameters, the preset value will be deleted; if you click on the **Preset value** button, the recommended default value will be recalculated and reentered. By fine tuning the **Deviation warning limit** values, you can adjust the counter comparison to be more or less sensitive.

6.3   Absolute pressure calculations (Measurement tools)

Pressure transmitters usually measure either absolute or relative pressure. Many functions, such as the `Gas Quality AFB`, expect the absolute pressure as input value for their calculations. If only the relative pressure is measured, an absolute pressure calculation can be used so that the related absolute pressure is also available as input value for such functions.

A maximum of 12 absolute pressure calculations can be parameterized.

6.4   Density calculations (Measurement tools)

Density meters typically provide an output frequency from which the density measurement can be calculated. This calculation is carried out according to special algorithms which depend on the manufacturer/type of the measurement device.

The enCore input board MFE7 provides two frequency inputs (D2+, D3+) for the connection of such density meters. The enCore software supports certain density meters manufactured by Solartron and Sarasota.

Using the **Density calculations** tool, you can parameterize both the calculation of the density from the input frequency and a correction of the calculated density, depending on the manufacturer/type of the density meter.

The measurement of a density measurement device is influenced by pressure and temperature. Depending on the measurement device type used (example: Solartron 7835) there are correction equations which take this influence into account. The Density correction function applies the corresponding correction equation and calculates a corrected density ▦ ρc which is available for subsequent functions.

A maximum of 6 density calculations (including optional density correction) can be parameterized.

6.5   Average calculations (Measurement tools)

This function calculates the current arithmetic average value from 2 or 3 current measurements (no average value calculation over time) and monitors their deviation. The calculated average value is available as an export value and can be processed by subsequent functions. One possible application is to use the average value from several redundant measurements as the input value for one level of Preprocessing to define a replacement strategy.

A maximum of 30 average calculations can be parameterized, each with 2 or 3 measurements entering the calculation (selectable).

6.6   USM geometry correction (Measurement tools)

For ultrasonic gas meters that are connected to the encore device via pulse interface, a geometry correction can be carried out according to ISO CD 17089-1. Such a geometry correction requires the volume at operating conditions and/or the flow rate at operating conditions of the gas meter, pressure and temperature as well as some other parameters, e.g., for the geometry of the gas meter installation. Export values of this function are a

corrected volume 📍**Vcg USM**, a corrected flow rate 📍**Qcg USM** and the applied correction value #**Cfg**.

A maximum of 6 USM geometry corrections can be parameterized.

6.7   Min/max indicators (Measurement tools)

The Min/max indicators' functionality offers a simple tool for monitoring the change of a measurement over the course of time. For each min/max indicator, both minimum and maximum since last resetting of the assigned measurement are recorded. The display of the device shows the current value as well as minimum and maximum value (the latter two together with the corresponding time stamps).

A minimum or maximum value is not transferred to the min/max indicator as long as the input value is recognized as faulty and cannot be used. Exception: If the input value is marked with one of the error identifiers OOL, OUL or OOC[11], it is marked as faulty but the value itself can be used. If an extreme value occurs in such a situation, it is taken over into the min/max indicator, but the corresponding value is marked as faulty. The display shows such a min/max value in red text color.

Min/max indicators can be reset manually via operating panel and/or automatically each time when a parameterized event occurs (input of 🐦Event - signal type). A cyclic reset can be achieved by using a cyclical time event from the **Time service** here, for example 🐦 **Every day (at midnight)**

At the moment of resetting, both minimum and maximum are set to 0 and updated in the next calculation cycle.

A maximum of 32 min/max indicators can be parameterized.

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[11] OOL/OUL: The measurement violates a lower or upper alarm limit, respectively.

OOC: The measurement is a calculated value for which the calculation could not be carried out normally due to an error.

6.8   Preprocessings (Measurements tools)

A preprocessing for measurements is used to define a single- or multi-stage replacement strategy for measured input values in the event of faults. In this context, „single-stage" means a procedure with one measurement with a (fixed) substitute value; in the case of redundant measurements, up to 5 further measurements can be taken into account to achieve a "multi-stage" substitution strategy. In addition, monitoring for limit values is also possible.

Many types of measurement devices measure exactly one physical quantity; a single preprocessing is created for the substitution strategy for such a measurement value.

Apart from that, there are also measuring instruments such as PGCs which provide a complete set of measured values at the same time. In this case, it is important for a replacement strategy that all measurements come from one source. To achieve this, the preprocessing must be grouped for all corresponding measurements. The general principles for a preprocessing group are no different from those for a single preprocessing. But: If at least one erroneous measurement is detected in one level of preprocessing, not only the respective value but also the entire group is switched to another (same) level of preprocessing. This ensures that the result values for further processing always belong together, i. e. come from the same data source (e.g. from the same PGC).

In selected AFBs, such as the `Gas Quality AFB`, exactly one pre-processing group is provided for the measurement of the gas components; in the Basic System, you can define up to 4 preprocessing groups under **Tools – Preprocessing groups**.

For more information, especially on the parameterization of preprocessings, refer to the context-sensitive ⇨ online help in enSuite.

6.9   Display and operation

6.9.1   Display overview

The overview displays for Gas meter tools and Measurement tools can be reached from the ⬛ Home display (⬛System – 🏠 Gas meter tools or ⬛System – 📈 Measurement tools).
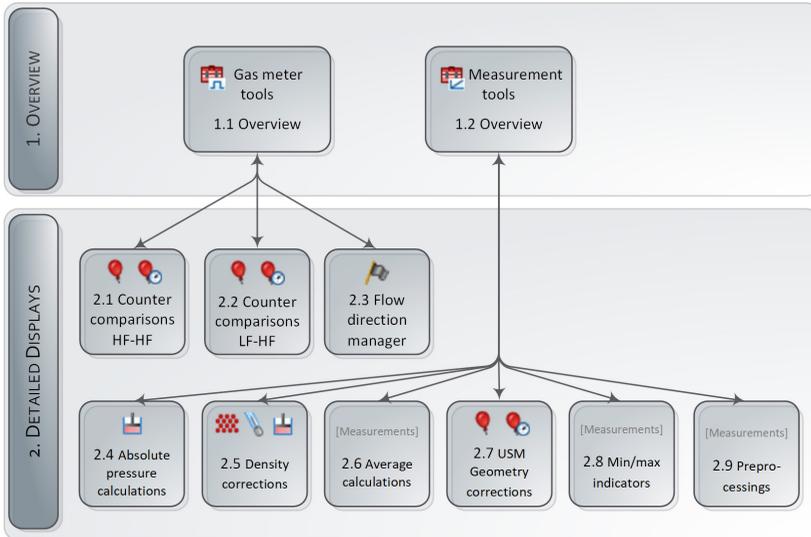
Fig. 6-1: Displays – hierarchical structure

6.9.2   Displays in detail - Tools for gas meters

The initial display for `Tools` specifically used for gas meters, is the
Overview display.

Access: 🗗 **System –** 🗗 **Gas meter tools.**

Fig. 6-2: Overview display–example

In a brief overview, this display provides information about which tools are
available for gas meters and states how many instances of this functionality
are currently parameterized. In the main view, navigate over the respective
hyperlinks to the associated detail displays, if available. In the example, a
Counter comparison HF-HF is parameterized.

Overview display in detail

Overview		
	found: ...	**Description with ⇨ [<Target view>]**
Counter comparison HF-HF	... <x/0>	HF-HF counter comparison (x ≙Number of parameterized HF-HF-Counter comparisons/0 ≙ none) ⇨ [**2.1 Counter comparisons HF-HF**]
Counter comparison LF-HF	... <x/0>	LF-HF counter comparison (x ≙Number of parameterized LF-HF-counter comparisons/0 ≙ none) ⇨ [**2.2 Counter comparisons LF-HF**]
Flow direction manager	... <xx/0>	Flow direction manager (x ≙Number of parameterized flow direction managers/0 ≙ none) ⇨ [**2.3 Flow direction manager**]

Display(s) Gas Meter Tools in Detail

2.1 Counter comparisons HF-HF	
Name <Name of counter comparison>	The selection list includes the (parameterized) names of the counter comparisons HF-HF. The detail display of the currently selected counter comparison is always shown. To jump to the detail display of another counter comparison, select the respective name from the list.
Reset	The text **Reset** is only a hyperlink, if you are logged-in as an appropriately authorized user. ⇨ 10.4.2 How to reset a counter comparison via the operation panel of the device? (p. 156).

2.1 Counter comparisons HF-HF	
<Status of monitoring>	The 2nd line of the display area shows the most important current status messages of the shown counter comparison. If none of the associated messages are pending, the respective space in the display will remain empty.
	Left side:
	Stopped: the message **Monitoring stopped** is shown
	Off: the message **Monitoring off** is shown
	Right side:
	HF1 failure or **HF2 failure,** **HF1 deviation warning** or **HF2 deviation warning,** **HF1 deviation prewarning** or **HF2 deviation prewarning**
	The associated message is pending. In case several of these messages are pending at the same time, the message with the highest priority is displayed (the above list is in descending order of priority).
Vm (HF<x>) **Qm (HF<x>)**	These lines display the **Output counter** and the **Output flow rate**, i.e., the primary results of the HF-HF counter comparator. The indication **HF<x>** shows you which encoder is currently used to form the respective value. (**HF1** indicates that the preferred encoder is used, **HF2** indicates the comparator encoder).
Dev.	Last calculated deviation. If this value exceeds the parameterized warning limit for the deviation, the value is depicted in color.
at	Time of the last calculation of the deviation.

2.2 Counter comparisons LF-HF	
Name \<Name of counter comparison\>	The selection list includes the (parameterized) names of the counter comparisons LF-HF. The detail display of the currently selected counter comparison is always shown. To jump to the detail display of another counter comparison, select the respective name from the list.
Reset	The text **Reset** is only a hyperlink if you are logged-in as an appropriately authorized user. ⇨ 10.4.2 How to reset a counter comparison via the operation panel of the device? (p. 156).
\<Status of monitoring\>	The 2nd line of the display area shows the most important current status messages of the shown counter comparison. If none of the associated messages are pending, the respective space in the display will remain empty. Left side: **Stopped**: the message **Monitoring stopped** is shown **Off**: the message **Monitoring off** is shown Right side: **LF failure** or **HF failure,** **LF deviation warning** or **HF deviation warning,** **LF deviation prewarning** or **HF deviation prewarning** The associated message is pending. In case several of these messages are pending at the same time, the message with the highest priority is displayed (the above list is in descending order of priority).
Vm - LF	These rows display the **LF comparison counter** and the **HF comparison counter**.
Vm - HF	
ΔVm	Difference between **LF comparison counter** and **HF comparison counter**. If this value exceeds the parameterized warning limit for the deviation, the value is depicted in color.

2.2 Counter comparisons LF-HF	
Vm (HF) or **Vm (LF)**	These rows display the **Output counter** and the **Output flow rate**, which is the primary results of the HF-HF counter comparison. The information **HF or LF** shows which sensor is currently being used for forming the respective value.
Qm (HF) or **Qm (LF)**	

2.3 Flow direction manager	
Name <Name of flow direction group>	The selection list includes the names of the flow direction groups that are configured in para-meterization. The detail display of the currently selected flow direction group is always shown. To jump to the detailed display of another flow direction group, select the corresponding name from the list.
FD1 active **…** **FD<x> active** (number of lines depends on number of flow directions)	The current status of the resulting messages for the group is displayed here (**FD<x> active = on** or **off**). The corresponding export values **FD<x> active** are used as activation messages in AFBs that form counters depending on flow direction.
Inputs contradictory	If there are several input messages in an FD group, exactly one input message should always signal an active flow direction. If a situation nevertheless occurs in which the input messages contradict each other (more than one "1" or all "0"), the previously active flow direction remains active and the warning **Inputs contradictory** is generated. If this message is pending, it is displayed in plain text in the last line. For more information, see the context-sensitive online help of enSuite.

6.9.3   Display of details – Additional tools

In addition to tools specifically intended for gas meter connections, there are also tools for measurements. The initial display for such `Tools` (e.g.,

Absolute pressure calculations, **Average calculations** or **Min/max indicators**) is the **Overview**.

Access: 🗔 **System –** 🖳 **Measurement tools).**

This display provides a brief overview of the tools being available for measurements and indicates how many instances of these functionalities are currently parameterized. From the main display, navigate to the corresponding hyperlinks in the corresponding detailed displays, if available. In the example, four min/max indicators are parameterized.

Overview display in detail

Overview		
	found: ...	**Description with ⇨ [<Target view>]**
Absolute pressure calculations	**...<x/0>**	(x ≜Number of parameterized absolute pressure calculations/ 0 ≜ none) ⇨ [**2.4 Absolute pressure calculations**]
Density calculations	**...<x/0>**	(x ≜Number of parameterized density corrections/0 ≜ none) ⇨ [**2.5 Density calculations**]
Average calculations	**... <x/0>**	(x ≜Number of parameterized average calculations/0 ≜ none) ⇨ [**2.6 Average calculations**]
Min/max indicators	**...<x/0>**	(x ≜Number of parameterized min/max indicators/0 ≜ none) ⇨ [**2.7 Min/max indicators**]
USM geometry correction	**...<x/0>**	(x ≜Number of parameterized USM geometry corrections/0 ≜ none) ⇨ [**2.8 USM geometry correction**]
Preprocessings	**...<x/0>**	(x ≜Number of parameterized preprocessings/0 ≜ none) ⇨ [**2.9 Preprocessings**]

Display(s) Measurements Tools in Detail

2.4 Absolute pressure calculations	
Name <Name of the Absolute pressure calculation>	The selection list contains the names of the absolute pressure calculations that are configured in parameterization. The detailed display of the currently selected absolute pressure calculation is displayed here. To jump to the detailed display of another absolute pressure calculation, select the corresponding name from the list.
p gauge	Gauge pressure, measured input value of the function
p baro	barometric pressure Depending on parameterization that is either a fixed value or a current measurement if the value is measured by a connected measurement device.
p abs	result of the absolute pressure calculation: `p abs = p gauge + p baro`

2.5 Density calculations	
Name <Name of the Density calculation>	The selection list contains the names of the defined density calculations that are configured in parameterization. The detailed display of the currently selected density calculation is displayed here. To jump to the detailed display of another density calculation, select the corresponding name from the list.
ρ	measured density, input value of the function
ρc	corrected density, result of the calculation
tρ	temperature entering the correction equation
pρ	absolute pressure entering the correction equation

2.6 Average calculations	
Name \<Name of the Average calculation\>	The selection list contains the names of the defined average calculations that are configured in parameterization. The detailed display of the currently selected average calculation is displayed here. To jump to the detailed display of another average calculation, select the corresponding name from the list.
Average	calculated arithmetic average of the input measurements
M1 out **M2 out** **M3 out** (if applicable)	1st, 2nd and (if applicable) 3rd measured value, which is included in the calculation of the mean value

2.7 Min/max indicators	
Name \<Name of the min/max indicator\>	The selection list contains the (parameterized) names of the min/max indicators. The detailed display of the currently selected min/max indicator is initially displayed. To jump to the detailed display of another min/max indicator, select the corresponding name from the list.
Measurement	Here you can see the current measurement.
Min. **Min. time**	Minimum measurement since last reset, with associated time stamp
Max. **Max. time**	Maximum measurement since last reset, with associated time stamp
Reset **Reset all**	The **Reset** and **Reset All** texts are only hyperlinks if you are logged on as an authorized user. To do so, you need the **Change General System Settings** right. ⇨ 9 User and rights management (S. 99) With **Reset** only the currently displayed min/max indicator is reset, by activating **Reset All** you can reset all defined min/max indicators at once.

2.8 USM geometry correction	
Name <Name of the USM geometry corrections>	The selection list contains the names of the USM geometry corrections that are configured in para-meterization. The detailed display of the currently selected USM geometry correction is displayed here. To jump to the detailed display of another min/max indicator, select the corresponding name from the list.
V USM	counter for volume at measurement conditions (uncorrected)
Q USM	USM flow rate (uncorrected)
V_{cg} USM	counter for corrected volume at measurement conditions
Q_{cg} USM	corrected USM flow rate
Cfg	applied correction factor

2.9 Preprocessings
Drop-down list **<[(G)] Name of the preprocessing>** **Level 1**   **<Measurement 1>**   [**A**] [<error identifier>] **Level 2**   if applicable: **<Measurement 2> [Status active]** **Level 3**   if applicable: **<Measurement 3>** **Level 4**   if applicable: **<Measurement 4>** **Level 5**   if applicable: **<Measurement 5>** **Level 6**   if applicable: **< Measurement 6>** **Level 7**   **<parameterized keypad value>**

7 Intelligent measurement devices

The SFB for intelligent measurement devices is part of the Basic System. It allows the connection, parameterization and management of all intelligent protocol-based measurement devices which are supported by enCore devices.

Which digital communications protocol is used depends on the device. For example, process gas chromatographs or ultrasonic gas meters are generally connected using the Modbus protocol while temperature and pressure transmitters use the HART protocol.

The digital interfaces on the enCore device required for connecting the intelligent measurement devices are defined in the Basic System for I/O (input/output). You can define here which input and output boards are used in your enCore device and save the communications settings for data exchange with other devices.

7.1 Connecting the measurement transmitter using the HART protocol

The HART protocol (**H**ighway **A**ddressable **R**emote **T**ransducer) uses the FSK (Frequency Shift Keying) standard to superimpose digital communication signals at a low level on the 4 ... 20 mA signal. This means that bidirectional field communication is possible.

Typically, pressure and temperature transmitters transfer their measurements to the enCore device using the HART protocol. In addition to the primary measurement, some measurement transmitters can also transfer up to 3 additional measurements.

HART technology is a master/slave protocol. A distinction is made between two communication modes:

- Multidrop mode
  The measurement device (slave) only sends data if it is requested by an enCore device (master). (Polling)

- Burst mode
  The measurement device (slave) sends its data to a master cyclically and without requests being required. (Pushing)

The configuration of the transmitter decides whether a transmitter communicates in multidrop or burst mode. The communication mode is automatically identified by the enCore device at protocol level; no parameterization in enSuite is required.

enCore devices support two input board types which provide input channels that can be used as a HART interface (≙ HART loop):

- ExMFE5:   `P+/P-`
- MFE7:   `A1+/A2-` and `A2+/A2-`

Which input channels are available depends in each case on the process boards installed in the enCore device. You can connect 1 ... 4 measurement devices for each HART loop. Of these, a maximum of 1 HART transmitter may be operated in burst mode.

Managing HART transmitters in enSuite

Requirement

- The required offline parameterization is opened in expert mode.

► Open the **<Device> –** 🖼 **Basic System –** ▨ **I/O** branch.
► Go to the **Parameters** tab.
► Ensure that the **Board <x>** slot where the board is fitted has been selected for the required input board (ExFME5 or MFE7).
  For example, with a FC1 standard configuration, MFE7 is fitted in slot 1 and therefore with a FC1 standard parameterization, the entry **Board 1** is set as default.
► Mark the folder with the selected board in the parameterization window – in the example, it is **Board 1: ExFME5**.
► To use a channel as the HART interface, select the entry **HART channel** depending on the board used for one of the following channels:

- MFE7:   Channel **A1+/A2-** or **A1+/A2-**
- ExFME5:   Channel **P+/P-**

✓   The parameterization window displays the sub-folder **<Channel>: HART loop <x>**.

Parameterize the general communications settings for this HART loop:

►   In sub-folder **<Channel>: HART loop <x>**, go to the **Parameters** tab.

►   Assign a meaningful name for this channel in the **Name** parameter. (*Optional*)

►   The **Power supply** only has to be defined for the MFE7:

   •   If this channel provides the power supply for the HART loop, select **On**. (*Default setting*)
        (Source mode)

   •   Select **Off** if a different device in the HART loop provides the power supply.
        (Drain mode)

►   Assign a meaningful name for this HART interface in the **Name** parameter in the **HART loop <x>** section. (*Optional*)

►   Set the **Device 1** ... **Device 4** parameter to **used** for each connected HART transmitter.
    Please note that a maximum of 1 HART transmitter may be operated in burst mode.

✓   A sub-folder **Device <x>: used** is displayed for each device in the parameterization window.

Parameterizing the settings for each device:

►   In sub-folder **Device <x>: Used**, go to the **Parameters** tab.

►   Assign a meaningful name for this HART transmitter in the **Name** parameter. (*Optional*)

(*Only for special cases such as maintenance work*)
To mark incoming values as invalid for further processing, ...

►   ... select the **Out of service** checkbox.

✓ The quality bit `OOS` (Out Of Service) will be added to the measurements from this HART transmitter for internal data processing and in multidrop mode, the transmitter will no longer be retrieved via the HART loop.

► Select the address of the HART transmitter identified in the HART loop in the **HART address** parameter. Addresses between **0 ... 15** may be used.

> 📖 **Meaning of the HART address**
>
> The HART address identifies a HART device in the HART loop. It must be unique.
> Ensure that the HART addresses of the transmitters are unique and are identical to the parameterization of the enCore device since otherwise HART communication will not work.
>
> Since Basic System version `03-25`, HART addresses between `0..15` are permitted regardless of communication mode (burst or multidrop). Up to version `03-24`, HART address zero (`0`) was reserved for the HART transmitter in burst mode.

> 📖 **Configure the HART addresses of HART transmitters first.**
>
> Please note that you should first configure the HART addresses of the HART transmitters before you connect them (with the voltage supply switched off) to the appropriate input channel of the enCore device.
>
> Since the enCore device requests all the parameterized HART addresses individually during its startup sequence, it cannot identify HART transmitters if their HART address is changed afterwards.

► Ensure that the entry **Used** has been selected for the **Primary variable** of the HART transmitter. (*Default setting*)

► If, in addition to the primary measurand, the HART transmitter also supplies other measurands, select the entry **Used** for each additional measurand in the **Second ... Fourth variable** parameters.

✓   The sub-folder **<x> variable: Used** is displayed for each measurand in the parameterization window.

Parameterize the settings for each variable (measurand):

► In sub-folder **<x> variable: Used**, go to the **Parameters** tab.
► Assign a meaningful name for this measurand, such as **p** for pressure in the **Name** parameter. (*Optional*)
► Select the quantity of the measurement in the **Physical quantity** parameter which the HART transmitter provides. These are typically the following quantities:

  • **Absolute pressure** (*default setting*)
    for the primary measurand of a HART pressure transmitter

  • **Temperature**
    for the primary measurand of a HART temperature transmitter

✓   The standard unit for the physical quantity is set as default in the **Phys. unit** parameter – for absolute pressure, for example, **bar ***.
✓   Adjust the unit if necessary.

To monitor the measuring range limits (*optional*), …

  ► … enter the limit values for this measurand in the **Lower meas. range limit** and/or **Upper meas. range limit** parameters.
    Note: The measuring range of a transmitter is normally specified on its type label.

To minimize measuring deviations using the adjustment function, ...

► ... enable the **Adjustment** section with **Used**.
    (For more details about the adjustment function, see ⇨ 10.1.3 How can the measuring deviation of a transmitter be minimized? (Adjustment function), p. 139)
► Set the **Measured value 1** and **Adjusted value 1** parameters as well as **Measured value 2** and **Adjusted value 2** parameters.
    Typically, value 1 is at the lower end of the range and value 2 is as high as possible in the range.

The following export values are available for further processing and can, for example, be used in the preprocessing of a Gas Quality AFB:

- **Measured value**
  Measurement supplied by the HART transmitter via the HART protocol.

- **Adjusted value** (*only with the adjustment function*)
  Measurement calculated from the **Measured value** by applying the adjustment.

► Repeat these steps for each additional measurand.

8 Unit Service

In each enCore device, many values are processed and provided as import and export values which represent physical quantities. The Unit Service SFB manages these physical quantities and their respective units in the device.

All physical quantities that are typically required in the enCore environment are already present in the Unit Service. The SI units and a number of non-SI units which are very common for these physical quantities are pre-defined (⇨ 11.1.1 Physical quantities and pre-defined sets of units, p. 161). If necessary, you can add your own units for each quantity.

Every physical quantity is allocated a precise unit or set of units in enSuite. Of these, one unit is defined as a default unit. A display format is preset for each combination of physical quantities and physical units. Default units and display formats can be parameterized.

In each parameterization, there are values for which you can select the desired physical unit in enSuite. There are also values for which the physical quantity must be indicated first. For example, in the case of a measurement via the input channel, the physical quantity depends on the type of measurement device connected. In other cases, the physical quantity is fixed but the unit may need to be adapted for the display or the further processing of the value. You can make the adjustments in enSuite, they cannot be processed on the device.

As soon as you change the unit for a value, this measurement or counter will be displayed the device in the amended unit. A measurement will automatically be calculated in the new unit and a counter will start counting again from the point the change is made in the new unit. However, the "old" counter value will not be converted to the new unit.

The pre-defined units of the Unit Service are based on the international unit system SI (Le Système International d'Unités) and the conventions and rules of the US National Institute of Standards and Technology (NIST)[12].

You can make the following adjustments in the Unit Service:

8.1   Changing default units

For each parameterization, a unit is pre-defined as the default unit in enSuite for each physical quantity. Features of default units are:

- The default units are identified in enSuite with an asterisk (*).

- The associated default unit is used as a pre-assigned value if you, for example, allocate a physical quantity to an input or output channel first.
  Alternatively, you can select another unit from the set of units for a physical quantity in a targeted manner for parameters or export values[13].

- If you change a default unit, the new default unit will automatically be updated in all of the parameterization for all of the values which use this default unit.

- A unit which is defined as a default unit is displayed twice in the set of units for the physical quantity to which it is allocated: once as a default unit and once as a "normal" unit. It is therefore possible to use the "normal" unit for individual parameters or export values and therefore avoid the unit being automatically adapted due to a change in default unit.

---

[12] Ambler Thomson, Barry N. Taylor: Guide for the Use of the International System of Units (SI). National Institute of Standards and Technology. NIST Special Publication 811, 2008 Edition, Gaithersburg 2008

[13] You can change units of parameters on the **Parameter** tabs and units of export values on the **Export value** tabs.

The unit which is used as a default unit for a physical quantity can be parameterized.

Changing default units in enSuite

► Open the branch ⬛ **Basic System – ⬛ Unit Service**.
✓ The tab **Parameter** lists all physical quantities in the area **Default units** which are typically used by enCore devices.
The column **Value** displays the default unit currently allocated to each physical quantity.
► To allocate a default unit to a physical quantity, mark the corresponding row.
✓ The drop-down menu in the **Value** column contains all pre-defined and user-defined units for this physical quantity.
► Select the desired unit.
✓ As soon as you save your change, the unit selected is set as the default unit across the entire parameterization for this physical quantity. Parameters which use this default unit automatically use this new default unit.
✓ There are two entries for this unit in the drop-down menus: there is one entry as the default unit **<Unit> *** and one as a "normal" unit **<Unit>**.

Example

The default unit for the physical quantity **temperature** is degrees Celsius (**°C**). To allocate the unit Fahrenheit as the default for temperature (**°F**)…

► … mark the **temperature** row.
► In the **Value** column, in the drop-down menu select the entry °**F**.
✓ As soon as you save the change, Fahrenheit (°**F**) is the default unit for temperature values.

8.2   Defining new units

If you need an additional unit not provided as a standard for a physical quantity, you can easily define this based on a pre-defined unit. A user-defined unit is useful for example if you...

- ... need various display formats or unit symbols for a unit. In this case, the value itself is not converted, just displayed in a different way.
- … want to use a unit based on a decadic factor – a single, ten, hundred times the value etc. – for counter values and for example want to derive the unit centimeters from the unit millimeters.

A user-defined unit is defined from a pre-defined unit by indicating a gradient and an optional offset. To do this, the gradient and offset for the linear conversion of a value in the pre-defined unit to the value in the user-defined unit must be determined.
The formula is as follows:

$$\text{value in userdefined unit} = \text{gradient} \times \text{value in predefined unit} + \text{Offset}$$

Creating a new unit in enSuite

► Open the branch 🗗 **Basic System –** 🢅 **Unit Service –** 🗒 **User-defined units**.

► Click the Add symbol ➕ on the **Parameter** tab.

✓ The area **Unit <x>** is added to the table.

To define a new unit, in the parameter...

► … **Name** enter a unique identifier – *default* is **Unit <x>**.

✓ In the area name, the name entered is displayed instead of the **<x>**: **Unit <Name>**

► … **Symbol** enter a unique symbol.

✓ After saving this, identify the user-defined unit with a **Name** and **Symbol**. They are displayed together in the drop-down menu in the format **<Name> (<Symbol>)** – in contrast to this, in the case of pre-defined units only the symbol is displayed.

► … **Physical quantity** enter the physical quantity for which you want to add a new unit.

► … **Derived from** enter the pre-defined unit from which the new unit is to be derived.

> **User-defined units cannot be derived from the default unit**
>
> Please note that you can only derive a user-defined unit from a "normal" pre-defined unit (**<Unit>**) but not from the default unit (**<Unit *>**). Since a default unit is always also available as a "normal" unit for a physical quantity, select this entry in this case.

► … **Gradient m** enter the factor by which the value in the pre-defined unit is to be multiplied to convert to the new unit.

► … **Offset n** enter the offset which is added during the conversion (optional).

► … **Format string** enter the representation format for the user-defined unit on the device.
The syntax of the format strings is described in detail ⇨ 8.3 Adjusting display formats of physical quantities (p. 95).

✓ In this parameterization, the new unit is available in the set of units for the physical quantity indicated.

Example

The units meter (**m**) and millimeter (**mm**) are pre-defined for the physical quantity **Length** as a standard.

► To define the unit centimeter (**cm**), parameterize the following values:

Name	Centimeter
Symbol	cm
Derived from	m
Gradient m	100
Offset n	0

✓ The new unit **Centimeter (cm)** is available in the set of units for the physical quantity.

> **Deleting a user-defined unit**
>
> You can delete user-defined units by marking the row **Area <Name>** and clicking the Remove symbol ❌.
>
> Please note that the user-defined unit will also be deleted even if it is being used in the parameterization. This will render the parameterization invalid; invalid references will be indicated in red font as usual so you can correct the references manually.

8.3 Adjusting display formats of physical quantities

Display formats determine how values of a physical quantity are displayed in the device in the associated unit. Display formats are defined for each combination of physical quantity/physical unit by means of so-called format strings. They enable decimal and exponential representation. The format for a decimal representation determines, for example, the number of places before and after the decimal point.

> **Notation on the exponential representation**
>
> In the exponential representation, each numerical value x is represented with two values, with the mantissa m and the exponent e:
>
> $$x = m \times 10e$$
>
> The mantissa m is a rational number. In the normal representation, the mantissa only has one significant figure before the decimal point. The exponent is a whole number.
>
> A number is displayed in the exponential representation on the device in the normal representation and in the format:
>
> **<m>E<e>**
>
> The exponent is displayed with at least two digits in the device. Where necessary a leading zero (0) is added.

> **Example**
>
> In a standardized exponential representation, the value
> `0.0000123456789` is `1.23456789x10-5` and is represented in
> the device as **1.23456789E-05**.

Display formats for pre-defined and user-defined units can be parameterized. You can easily determine the format string using graphical operation elements.[14]

⇨ Changing format strings with the help of control elements in enSuite (p. 96)

⇨ Examples of display formats (p. 98)

Changing format strings with the help of control elements in enSuite

You call the format string depending on whether you change a pre-defined or a user defined unit.

(1) To change the display format for a *pre-defined* unit...

► … open in branch ⊞ **Basic System –** ⅗c **Unit Service** the tab **Display formats**.

✓ Only pre-defined units are managed in this tab.

► Select the physical quantity from the drop-down menu for which you want to change the display format of a unit.

✓ The table lists all associated (pre-defined) units with format strings.

► Mark the row showing the desired unit.

---

[14] Alternatively, you can also manually adjust the format string.
⇨ 11.1.2 Syntax of format strings for the display (p. 174)

(2) To change the display format for a *user defined* unit...

► … open the branch 🔷 **Basic System –** ⚗c **Unit Service – User defined Units**.
► On tab **Parameter** select the user defined unit or add a new unit.
✓ Mark the **Format string**.

The further steps are the same for pre-defined and user defined units:

✓ The control elements will be displayed in the lower area of the tab so you can change the display format. The live values of the format strings are preset.

To display the value in *decimal notation* on the device…

► … select the checkbox **Decimal notation**.
► Adjust the representation of the figures before the decimal point:

  • To only show the significant figures before the decimal point, select **All significant digits**.

    This setting is typically used for measurements.

  • To limit the number of figures before the decimal point, select the maximum number **<1 to 12> digits before the decimal point**.

    – To add leading zeros, select the checkbox **Show leading zeros**.

    This setting is typically used for counters.

► Adjust the representation of decimal places:

  • To only show whole numbers, select the checkbox **No digits**.

  • To display a fixed number of figures after the decimal point, select the relevant checkbox and the desired number **<1 to 6> digits**. Filling zeros will be added where applicable.

To display the value in *exponential notation* on the device…

► … select the checkbox **Exponential notation (normalized)**.
► To display a fixed number of figures after the decimal point, select the desired number **<0 to 9> digit after decimal point**. Filling zeros will be added where applicable.

Regardless of the representation selected...

✓   … your changes will be implemented in the **Format string** column
     immediately as a format string.
►   If necessary, you can restore the pre-defined display format at a later
     point using **[Restore default]**.

Examples of display formats

For space reasons, the following abbreviations are used in the table: DBD
for digits before the decimal point, DAD for digits after the decimal point and
E for exponential representation:

Description	Format string	Example value	Display on the device
counter with 12 DBD and 3 DAD	000000000000.000	321.1234567	000000000321.123
counter as a whole number with 12 digits	000000000000.	321.1234567	000000000321
measurement with 3 DAD and all significant DBD	.000	321.1234567	321.123
value in E with 5 DAD	.00000E	0.00001234567890	1.23457E-05
Warning: The following format is not recommended because under certain circumstances the value cannot be shown.			
measurement with 3 DBD and 3 DAD	000.000	654321.123	###

Table 8-1: Display formats – examples

9 User and rights management

The user and rights management of enCore devices makes it possible to determine which changes users are able to make on the device in a very detailed manner. Rights are managed centrally via user profiles. Various users can be allocated to each profile. Since the users inherit the rights of their profile, changes to the rights of a user profile always automatically affect all users with this profile.

Changes on the device can only be carried out after the user has successfully logged in. Users can only make the changes their user profile entitles them to make. To ensure data consistency, only one user can be logged into the device at any one time. In addition to this, data which has been changed is only saved in the device when the user explicitly confirms the final acceptance of the data by means of an action. Each change made on the device is reported with an indication of the action, the user name and the date and time. Logins to and logouts from the device are also saved in the audit trail.

Read-only access to the device, however, does not require a user to log in, for example the reading of archives or the reading of the parameterization.

In addition to the rights for user profiles, devices can also be protected for use in legal metrology by means of security settings which comply with the approval. In this way, it is possible to ensure that fiscally relevant changes can either only be made when the security switch is open or are reported in the fiscal audit trail.

enCore devices distinguish rights at the parameter level and the system level:

- Rights at a parameter level
  Authorizations can be assigned in a very differentiated manned for individual parameters or parameter ranges of an application.
  For example, in Flow Conversion AFB when monitoring the input values of the gas meter, you can determine that only users with user profile 1 🧑 can change the value for the minor quantity limit in the device while the alarm limits can also be changed by users of user profiles 2 🧑 and 3 🧑.

- Rights at a system level
  These rights determine which system settings of the device can be changed. This includes changing the device time.

  ⇨ 9.2.2 Rights at a system level (p. 110)

User and access rights are saved per parameterization.

User and access rights only in the expert mode

User and access rights are managed in the expert mode. If you are editing a parameterization in the normal mode, you can view the associated user and access rights at any time by switching from normal mode to expert mode (**Tools**, checkbox **Expert mode** selected)

As administrator, you can change this too. Please note that you can only switch from expert mode back into normal mode if you only make changes to sections and parameters that are not marked with the symbol 🎓 expert lock.

User and rights management is sub-divided into the following areas:

⇨ 9.1 Managing user profiles and users (p. 101)

⇨ 9.2 Managing access rights (administrator only) (p. 104)

⇨ 9.3 Overview of user profiles and their authorizations (p. 115)

⇨ 9.4 Perform changes and actions on the device (p. 115)

⇨ 9.5 Display and operation (p. 131)

9.1   Managing user profiles and users

The enCore authorization concept is based on role-based access control. Up to six different roles can be created with six user profiles which are available in each parameterization. The rights are allocated by profile.

The following figure gives an initial overview of the user profiles; the user profiles and users are described in detail below:
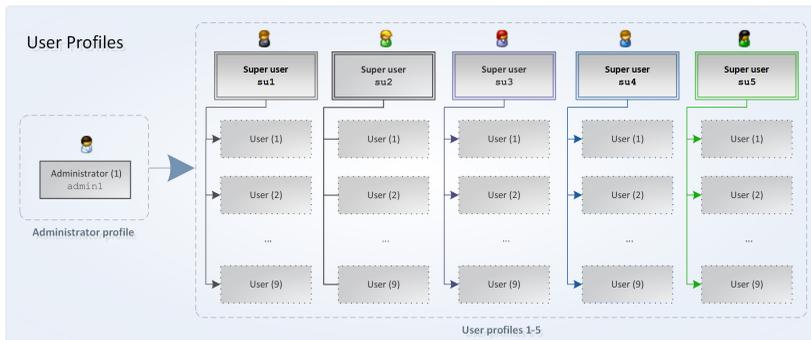
Fig. **9**-1: Overview of user profiles

The administrator profile (Administrator) allows full access to the device and management of the other user profiles. It is intended for setting and trans-ferring user management. By default, the rights and access management is not preset. User roles and passwords are assigned by the administrator.

The user profiles 1-5 consist of up to nine standard users plus one super user. Users inherit the authorizations of their profile. The five super users also have the right to manage the users in their own profile, in other words they can add users to their group, delete them from the group or change user names.

A user can only ever belong to one profile. Each user has login details made up of a user name and a password. It is possible to log in to the device locally or remotely via the network. The device checks the login details, in other words the user must be known in the parameterization of the device.

A unique symbol and a unique position are allocated to every profile in enSuite:
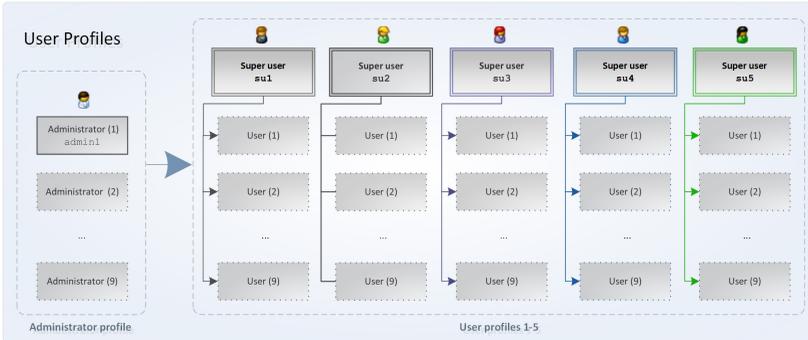
Fig. 9-2: User profiles with unique symbols and a fixed position

Standard login of standard users

There are super users in each parameterization. enSuite creates these users in a newly created parameterization with the following access names and an empty password in each case:

- Administrator: **admin1**
- Super user: **su1** to **su5**   ("**S**uper **U**ser")

These users are always present and cannot be deleted. The login details for the administrator and the super user can be changed.

Assign password at first login to the enCore device!

In delivery state, user passwords are not set for standard users. Even if you create a new user in enSuite, enSuite creates these users without a password.

We strongly recommend that each user changes his or her password at the first login to the device.

⇨ 9.4.1 Change password (p. 122)

Managing users in enSuite

Prerequisites

- The desired offline parameterization is open in expert mode.
- Only the administrator can manage super users of the user profile.

► Open the desired user profile in the branch 🔧 **Users – <Profile name>**, e.g., 🧑 **User profile 1**

✓ The tab **User list** lists all users of this profile with their role (**Super user** or **User**) and their name, e.g., **Super user su1**.

► Except for the administrator profile, in the field **Profile name,** you can enter a meaningful name for the user profile which, for example, describes the function of this profile, such as **Technician** or **Metrologist**.

✓ This name is used in node **Users.<Profil–name> profile**, e.g., 🧑 **Users.Technician profile**.

To add a new user...

► … click the Add symbol ➕.

► Enter a permissible user name into the **Create user** dialog, e.g., **JSmith**.

> 📖 **Permissible user names**
>
> When choosing a user name, please note:
>
> - It must be unambiguous in the parameterization, in other words it may not appear several times.
> - The name can be made up of 3 to 10 permissible characters.
> - 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.

✓ As soon as your entry is permissible, enSuite will activate the **[OK]** button.
► Confirm your entry with **[OK]**.
✓ The user is created with the login details **<User name>** and an empty password.
   ► Log on to the enCore device and assign a secure password.
     ⇨ 9.4.1 Change password (p. 122)

To delete a user[15]…

► ... mark the desired name in the list and click the Remove symbol ❌.
✓ The user will be removed from the list without confirmation.

To change the name of a user...

► ... mark the desired name in the list and click the Edit symbol […].
✓ In the **Edit user** dialog, a warning will appear that if you change the name the associated user password will be deleted.
► In the **User name** field, enter a permissible user name.
   ⇨ information on Permissible user names (p. 103)
✓ As soon as your entry is permissible, enSuite will activate the **[OK]** button.
► Confirm the name with **[OK]**.
✓ The changed name is displayed in the list. The old password is deleted.
   ► Log on to the enCore device and assign a secure password.
     ⇨ 9.4.1 Change password (p. 122)

9.2   Managing access rights (*administrator only*)

Access rights determine which parameters or system settings a user may or may not change on the device. The access rights are managed exclusively by the administrator in the expert mode.

---

[15] Please note that you can only delete users you have defined, not the standard users **<admin1>** and **<su1>** to **<su5>**.

Rights are assigned per user profile. In addition to this, changes to the device are protected by the following security settings:

- Protection of the security switch 🔒 (at a parameter and system level)

  Changes which are under the protection of the security switch in addition to a user profile can only be transferred to the device or changed on the device when the security switch is open. Country-specific regulations may specify that only an authorized group of people is permitted to open and close the security switch.
  This protection is the highest security setting on the device.

- Fiscal audit trail 📖 (*only* at a parameter level)

  As an alternative to the protection of the security switch, parameters can also be labeled fiscal audit trail 📖. Changes to these parameters are reported in the Fiscal Audit Trail. In this way, legally relevant parameters can be changed even when the security switch is closed provided the fiscal audit trail is not full (maximum of 1,000 entries).
  When the security switch is open, these changes are not logged in the fiscal audit trail.
  The fiscal audit trail 📖 setting is less strict than protection by the security switch.

📖 **Erasing the fiscal audit trail**

The fiscal audit trail can hold a total of 1,000 entries. As soon as the logbook is full, parameters which are labeled fiscal audit trail 📖 can only be changed again when the entries are removed using the action **Erase fiscal audit trail**.

A requirement for this is that the user has the **Erase fiscal audit trail/fiscal archives** right. This action should also be protected by the security switch.
⇨ 9.2.2 Rights at a system level (p. 110)

In the case of devices used in legal metrology, these additional security settings come from an approval file, which reflects the specifications of the notified body for the authorized use. The minimum fiscal requirements are

described in an approval file of this type. Furthermore, a standard approval file can be defined for a device, which is not part of the fiscal approval but merely sets out common security settings.

The administrator can add additional security settings in the parameterization. Please note that the administrators also has the right to parametrize the device below the minimum requirements set out in the approval file selected. As soon as changes of this type are transferred to the device, the device is *not approval-compliant* and may no longer be operated for the relevant fiscal use.

⇨ FAQ 10.3.2 How can I tell whether an enCore device is being operated in accordance with the approval? (p. 144)

Rights are managed in enSuite with the help of symbols. Wherever rights can be assigned at a parameter or system level, a toolbar is shown in the column **Rights** or **Authorization**.

The toolbar is divided into two and is made up of up to seven buttons:

- Buttons 1 through 5: Rights for user profiles

  Each button is allocated a unique symbol for user profiles 1 through 5.[16] The order corresponds to the position of the profiles in the user management.

- Buttons 6 through 7: fiscal security settings

  Button 6 is allocated to the symbol for the protection of the 🔒 security switch and button 7 to the symbol for the 📕 fiscal audit trail. Button 7 is only displayed at a parameter level.

In general, the following applies: Only when a symbol is enabled does the user profile have the corresponding right (buttons 1 through 5) or do these (fiscal) security settings apply (buttons 6 through 7).

---

[16] The administrator already has all rights which can be parameterized in enSuite, so there is no button for the administrator profile.

9.2.1   Rights at a parameter level

At a parameter level, only a reduced toolbar is displayed in enSuite as a standard in which the rights for the user profiles are faded out.

Managing rights in enSuite

Prerequisites

- The desired offline parameterization is open in expert mode.
- The user who is transferring the parameterization to the device has administrator rights.

First display the extended toolbar to assign the profile rights...

►   ... open the node **<Device>**.

✓   In the upper area of the tab **Configuration** the fields for virtual login[17] and the checkbox **Edit user rights** will be displayed.

✓   Only the administrator can edit user rights. If a user without administrator rights is already virtually logged in to enSuite, the checkbox **Edit user rights** will be inactive (grayed out) and will not be evaluated.

►   In this case, clear the checkbox **Use virtual login** or log in to enSuite virtually as administrator (standard login **admin1**).

✓   The checkbox **Edit user rights** can be changed.

►   Select the checkbox **Edit user rights**.

✓   In the entire parameterization, the extended toolbar for assigning rights will be displayed in the column **Rights** or **Authorization** and you can assign the rights for user profiles 1 through 5.

---

[17] ⇨ 10.3.5 How can I filter a parameterization in advance according to a certain user profile? (Virtual login) (p. 151).

> 📖   **Reducing the toolbar in the "Rights" column**
>
> To reduce the toolbar for the assignment of the profile rights to
> display only the security settings 🔒 and 🔖, open the node
> **<Device>** and clear the checkbox **Edit user rights**.

You can assign user rights in a targeted manner for individual parameters
and, depending on the context, also for whole areas or whole tabs. In doing
this, subordinate parameters inherit the corresponding right. You can only
disable inherited rights at the level at which these were set. This type of
inheritance does not work for legally relevant security settings.

To give a user profile the right to change certain parameters in a targeted
manner...

►   ...enable the desired button in the parameter row for the user profile or
    user profiles.

✓   The symbol(s) of the marked profiles are displayed, shown here using
    the example of user profile 1 👤 :

Fig. **9**-3: Changing rights for individual parameters – Example **Input 1**

🔲   The users of the profile with a symbol enabled in the toolbar can transfer
    a parameterization to the device by changing this parameter.

To give a user profile the right to change an entire area...

►   ... enable the desired button in the area row for the user profile or user
    profiles.

✓   All the parameters in this area inherit this setting, shown here using the
    example of user profile 2 👤 :

Fig. 9-4: Changing rights for an entire area – Example **FD group 1**

✓   The inherited right of a parameter can only be disabled at an area level
    not at a parameter level.

To give a user profile the right to change an entire tab...

►   ... enable the desired button on the tab for the user profile or user
    profiles.
✓   The setting will be adopted for the entire tab, shown here using the
    example of user profile 3 🔴:
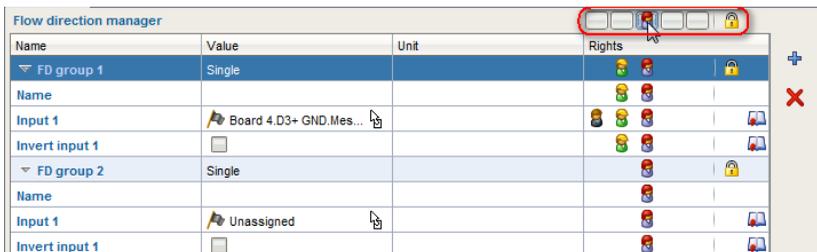
Fig. 9-5: Changing rights for an entire tab – Example **Flow direction manager**

✓   The inherited right for an area or parameter can in this case only be
    disabled at the tab level but not for individual areas or parameters.
▫   The parameterization with the changed user rights and security settings
    becomes effective as soon as it is transferred to the device.

Example

To give the individual profiles the right to change the following parameters in
a hypothetical example:

- User profile 1: **Q minor**, **Qmin alarm limit** and **Qmax alarm limit**

- User profiles 2 and 5: **Qmin alarm limit** and **Qmax alarm limit**

- User profile 3: **Q minor**

- User profile 4: none

► … enable the symbols for the individual profiles as follows:

Fig. 9-6: Rights – Example

🗒 A user can only transfer a parameterization to the device if they have the authorization for each of the parameters changed.
In addition to this, the following security settings apply:

- **Qmin alarm limit** can only be changed when the security switch is open.

- When the security switch is closed, **Q minor** and **Qmax alarm limit** can be changed if the changes are logged in the fiscal audit trail. This is only possible if the fiscal audit trail is not full.

9.2.2   Rights at a system level

Using the rights at a system level the administrator is able to determine in a differentiated manner which users changed which device settings or carried out which actions. These settings and actions can also be protected by the security switch.

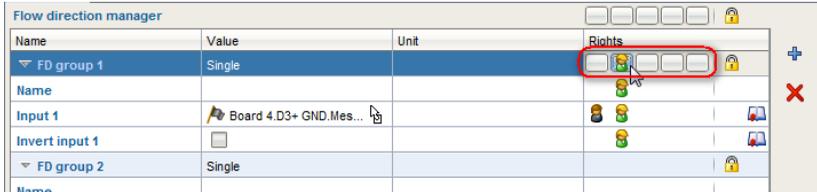**Managing rights in enSuite at a system level**

Prerequisites

- The desired offline parameterization is open in expert mode.

- The user who is transferring the parameterization to the device has administrator rights.

► Open the branch **<Device> – 🐾 Users**.
► Switch to the **Special user rights** tab.

✓ The following table lists all changes (actions) at a system level for which you can assign an authorization in enSuite.

Grant	Description
Accept errors without login[18] OR	The acceptance of the error list is possible without logging in (*default*).
Accept errors	Only authorized user profiles can accept the error list. This can also be protected by the security switch.
access on the device	📑 **Error list – Accept all**
Erase fiscal audit trail/fiscal archives	Two actions are summarized under this right: (1) Erasing the fiscal audit trail 🔔. The fiscal audit trail has a maximum depth of 1000 entries. As soon as the fiscal audit trail is full, no more parameter with the access right 🔒 can be changed if the security switch is closed – not until the fiscal audit trail has been deleted.
access in enSuite (navigation branch)	**My devices – <Device> – Erase fiscal audit trail** OR **My devices – <Device> – End of commissioning**[19]
access on the device	🗃 **System – 📖 Audit trail – Erase fiscal audit trail**
	(2) Clearing fiscal archives Fiscal archives are DSfG interval archives and DSfG data loggers (⇨ volume "DSfG AFB" of the enCore FC manual – *available for the German market only*). Non-fiscal archives are not affected by this right.
access in enSuite (navigation branch)	**My devices – <Device> – Clear archives in device** OR

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[18] Whether or not 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**.

[19] **End of commissioning** performs different actions to put the device in proper state right before commissioning. This way e.g., fiscal and non-fiscal archives, the audit trail and/or fiscal audit trail can be cleared.

	My devices – <Device> – End of commissioning [19]
Modify displays	Transferring parameterization with changed displays to the device. Pre-defined standard displays can be changed if they are not read-only; read-only displays are labeled with a lock 🔒. User-defined displays can also be created, edited or deleted.
access in enSuite	🎨 **Displays – <Folder> – [Folder –] <Display(s)>**
Update device time	Set internal system time in the device. ⇨ 10.2.1 Why does the Time Service distinguish between synchronization and setting the system time (p. 140)
access in enSuite (navigation branch)	**My devices – <Device>, Update date and time**
access on the device	🖼 **System –** 🕐 **Time Service – Date and time – [Update date and time –], Update date and time**
Reset battery state	Display of the battery state of charge on the enCore device, e.g., reset to 100% after changing the batteries.
access on the device	ℹ️ **Info – device monitor**, **Reset battery status to 100%**
Modify AFB configuration	Change the composition of AFBs
access in enSuite (parameter branch)	**<Device>, tab AFB configuration**
Update non-fiscal firmware	All non-fiscal firmware modules (the checkbox is cleared in the **Fiscal** column) can be updated or restored to their last status.
access in enSuite (navigation branch)	**My devices – <Device>, Action Firmware configuration, [Make changes to firmware] OR [Restore to state before the last update]** [20]

[20] Relates to all *non-fiscal* firmware modules, in other words modules for which the checkbox in the **Fiscal** column is *cleared*.

Update fiscal firmware	All fiscally approved firmware modules (the checkbox is selected in the **Fiscal** column) can also be updated or restored to their last status.
access in enSuite (navigation branch)	**My devices – <Device>**, Action **Firmware configuration**, **[Make changes to firmware]** OR **[Restore to state before the last update]**[20]
Update approval file	Select another approval file.
access in enSuite (navigation branch)	action **Firmware configuration**, column **Firmware module** value **approval**, in column **Current** select approval file, **[Make changes to firmware]**
Change general system settings	Various actions are summarized under this right:
access on the device	• delete TLS certificate resp. Reboot and create certificate 🛈 **Info – <device serial no.>**: **Delete certificate** resp. 🛈 **Info – <device serial no>**: **Reboot and create certificate**
access on the device	• enable/disable test mode for MFA8 boards[21,22] ⚙ 🔲 **System – I/O – <x>: MFA8**, **Test mode**: **On**/**Off**
access on the device	• enable/disable maintenance mode of the Flow Conversion AFB [21] **<Main display of the Flow Conversion AFB>**, **Maintenance mode**, **Maintenance mode**: **On**/**Off**
access on the device	• enable/disable the HART loop for test and service purposes[21] (*only* multidrop mode) ⚙ **System – Intelligent measurement devices**, **HART loop more…**, **Loop active**: **Yes**/**No**
access on the device	• LF-HF counter comparison: reset comparison counter and deviation ⚙ **System – Tools**, **counter comparison LF-HF more…**, **Reset**

Table **9**-1: Actions for further user rights

► To give a profile the right to perform an action, enable the corresponding profile symbol in the authorization column.
⇨ Managing rights in enSuite (p. 107)

✓ If necessary, you can also place an action under the protection of the security switch.

▣ The parameterization with the changed user rights and security settings becomes effective as soon as it is transferred to the device.

---

[21] The device will remain in this state until the mode is disabled, or the user logs out.

[22] You can assign test values to the individual output channels that are output instead of the original values using the test mode for MFA8 boards.

9.3   Overview of user profiles and their authorizations

The following table provides an overview of the various authorizations of the administrator profile and user profiles 1 through 5:

Right	Administrator profile	User profile 1–5	
	Admin.	`su1 - su5`	User
change own password	✔	✔	✔
manage users in own profile	✘	✔	✘
manage users in other profiles	✘	✘	✘
manage authorizations	✔	✘	✘
change (fiscal) security settings (🔒 or 🖼)	✔	✘	✘
changing parameters (≙ changes at a parameter level)	(✔)[23]	✘/(✔)[23, 24]	✘/(✔)[23, 24]
changing system settings (≙ changes at a system level)	(✔)[23]	✘/(✔)[23, 24]	✘/(✔)[23, 24]

Table 9-2: Overview of user profiles and their authorizations

9.4   Perform changes and actions on the device

A user must first log in to the device (locally or via the remote operation panel) before they can make changes or perform certain actions on the device. Once they have logged in successfully, a session will be launched for this user, which is only ended when the user logs out. Throughout the

---

[23] If the change is under the protection of the security switch, the change is only permitted when the security switch is *open*.

[24] Whether parameters or system settings can be changed by a (super) user of the user profiles 1 through 5 and if so which parameters or system settings is managed by the administrator.

session, the user can change the associated settings at a system level
according to their rights and save these in the device.

⇨ 9.2.2 Rights at a system level (p. 110)

> 📖 **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, **<User name>** 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.

Changes are only finally transferred to the device (in other words enabled for
the ongoing calculation processes) when the user explicitly confirms this. If a
user for example is automatically logged out of the device, changes that
have already been made will be discarded.

Changes to the device are always made in three steps:

⇨   Log in to the device (p. 117)

⇨   Perform changes or actions on the device (p. 119)

⇨   Log out of the device (p. 121)

Log in to the device

► 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.
>
> In this case, ready the ⇨ note Mechanisms to end exclusive access first (p. 121).

    The fields for the login, **User name** and **Password**, will be shown, the field **User name** 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.

> ⓘ **Warning! Your password entry is visible via the remote operation panel. (only up to Basic System 03-38)**
>
> Please note that your password entry will be visible to other users when they are accessing the device via the remote operation panel. The remote operation panel is a 1:1 reproduction of the device display, in other words each keyboard entry can be read live:
>
>
>
> Fig. 9-7: Remote operation panel active – The **a** key has been pushed
>
> The monitor symbol on the lower edge of the screen indicates that a user is currently accessing the device via the remote operation panel.
>
> Since Basic System `03-39`:
> As soon as a local user on the device opens the virtual keyboard for input with granted control, enSuite displays a lock screen.
> ⇨ "Configuring the Device with enSuite" of the FC manual

► 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.
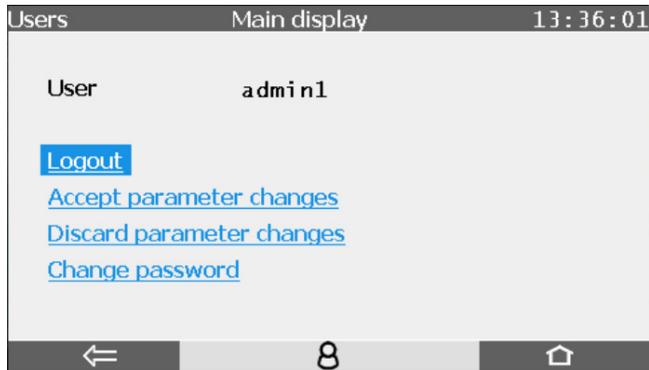
Fig. 9-8: Main display – User **admin1** is logged on (locally)

Perform changes or actions on the device

Prerequisite

- The user is logged in to the device.
  ⇨ Log in to the device (p. 117)

► During the session, you can perform the following actions in the main display of the user management regardless of whether you are accessing the device locally or via the remote operation panel:

- **Logout**
  Log out from the device manually, ending the session.
  ⇨ Log out of the device (p. 121)

- **Accept parameter changes**[25]
  Save changes to the parameters and enable these in the device.

- **Discard parameter changes**[25]
  Do *not* save changes to the parameters.

- **Change password**
  Change the user password.
  ⇨ 9.4.1 Change password (p. 122)

---

[25] ⇨ 10.3.6 Which conditions must be met to change parameters directly on the device? (p. 153)

◻ Depending on your authorization, as long as you are logged in certain parameters will be displayed as editable fields and the associated actions as accessible hyperlinks.

⇨ 9.2.2 Rights at a system level (p. 110)

In the example, the user has the **Update device time** right.
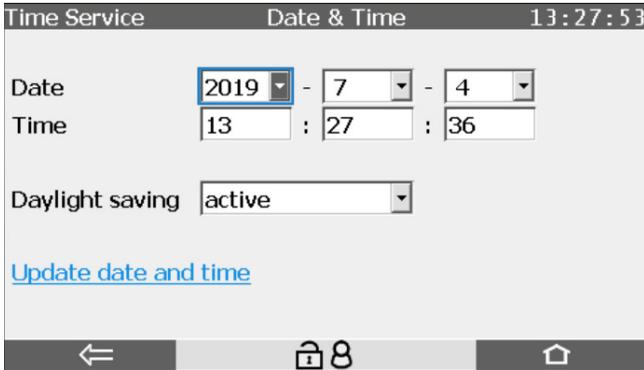
Fig. 9-9: Editable fields and action for the **Update device time** right – example

► Make the desired changes in the various displays.

► To save parameter changes in the device, switch back to the login display with 🛈 **System – 👤 User** and perform the action **Accept parameter changes**.

To accept other changes in the device, click the associated action, e.g., Update date and time.

Examples

(1) To change parameters which can be changed directly on the device via the display...

⇨ 10.3.7 How do I change parameters directly on the device using the example of a user-defined display? (p. 152)

(2) To change the date and time on the device...

⇨ 5.1.1 Synchronizing system time via operation panel (p. 32)

Log out of the device

Always log out of the device manually as soon as you have made the desired 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.

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

> 📖 **Mechanisms to end 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 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 ends enSuite without logging out of the device beforehand.
>   (👥 **User**, tab **Parameter**, parameter **Inactivity timeout**)
>
> - Automatic logout after an action has been carried out via enSuite
>   If an action is carried out 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.

9.4.1   Change password

enSuite always creates a new user with an empty password. All users can change their passwords after successfully logging in to the device.

Change password on the device

► Log in to the device under 🛈 **System –** 👥 **User** using the desired user name and password.
► Click the action **Change password**.
🖼 The fields for the new password will be displayed:
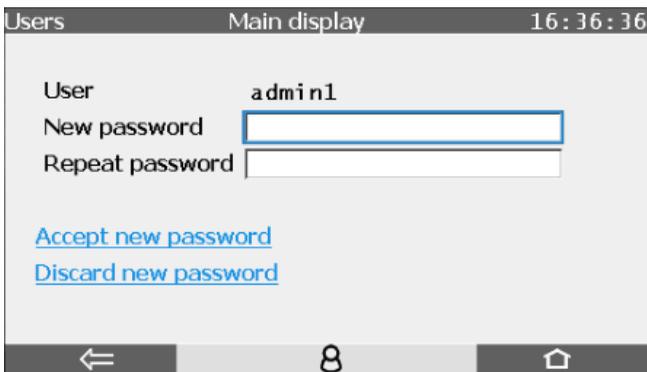
Fig. 9-10: Main display – Change password

► You can make the keyboard appear by clicking the field **New password**.
► Enter 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 (0 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.

► Enter the same password in the field **Repeat password**.
► To save the password in the device, click **Accept new password**.
🖥 The passwords entered will be checked to make sure they are identical and for length and permissible characters.
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.

9.4.2   User roles in practice (exemplary)

enCore devices support the possibility to define up to five user profiles, and to assign rights on system and parameter level very granularly for each of these profiles. This provides you with a powerful tool that allows you to realize a wide range of role concepts based on your own requirements.

In this section, we will limit ourselves to defining a few roles and use cases as examples and listing them with the minimum rights required.

Assign only minimal required rights

To ensure the security of your enCore device, you should always give the user profiles 1..5 only the minimum rights required to perform a task. (By default, users have read-only access to the enCore device.)

For example, if the task is to only adjust certain limits of a flow computer once in summer and once in winter, you should only give the user profile the rights to change exactly these limit values.

Possible roles

Role	Description
Service technician	($\triangleq$ administrator) brings the device into operation or carries out essential changes in the operating mode or repair measures. e.g., gas specialist or qualified electrician of the energy supplier
Authorized metrology expert[26]	carries out official testing when using a flow computer (FC1) or a monitoring controller (MC1) in legal metrology.
Technical staff	carries out maintenance work on the enCore devices to ensure the correctness of the data. e.g., gas specialist of the metering point operator

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[26] 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.

Role	Description
Controller	reads out the (non-sensitive) data of the device and is able to evaluate the plausibility of the (flow computer) data and carries out a rough consistency check. In addition, he can possibly accept errors. [27] e.g., trained personnel who has received basic training from Honeywell or the plant operator.
Honeywell technical support	supports service technicians, technical staff and controller in their activities

Example for use cases

⇨ Use case 1a:
    Service technician commissions enCore FC for use in legal
    metrology. (p. 126)

⇨ Use case 1b:
    Service technician commissions enCore FC for operational use.
    (p. 127

⇨ Use case 2:
    Authorized metrology expert carries out legally relevant
    maintenance. (p. 128)

⇨ Use case 3:
    Technical staff carries out operational maintenance work. (flow
    computer only) (p. 129)

⇨ Use case 4:
    Controller reads out non-sensitive data form enCore FC. (p. 130)

---

[27] 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**.
⇨ Parameterizing the acceptance procedure in enSuite (p. 13)

Use case 1a: **Service technician commissions enCore FC 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 profiles in enSuite

- − **Administrator profile** (*no adaption necessary*)

Use case 1b:
Service technician commissions enCore FC 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 profiles in enSuite

- **Administrator profile** (*no adaption necessary*)

OR

- **User profile 1..5**:
  parameterize minimum required rights

Use case 2:
Authorized metrology expert carries out 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

- **Administrator profile** (*no adaption necessary*)

OR

- **User profile 1..5**:
  parameterize minimum required rights

Use case 3:
Technical staff carries out operational maintenance work. (*flow computer only*)

Main actor

    technical staff

Goals

−   regularly change a fixed set of parameters of the flow conversion, e.g., adjust values of the gas quality table

−   change non-fiscal firmware

−   delete non-fiscal archives

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 the required set of parameters, e.g., gas quality values

User profiles in enSuite

−   **Administrator profile** (*no adaption necessary*)

OR

−   **User profile 1..5**
       parameterize minimum required rights

Use case 4:
Controller reads out non-sensitive data form enCore FC.

Main actor

   controller

Goals

   −   readout archives from device

   −   readout parametrization from device

   −   view and accept error list

Minimum required rights

   −   at system level: (*none*)

   −   at parameter level: (*none*)

User profiles in enSuite

   −   **User profile 1..5** (*no adaption necessary*)
       Default setting allows (read only) access.

9.5 Display and operation

The user management only has one pre-defined display (**Main display**) for logging in and out of the device as users and rights are managed in enSuite. After a successful local login, the actions to accept or discard the parameter changes and to log out are displayed. In addition to this, the user who is logged in can change their password.

Access: 🖼 **System – 👤 User**

Main display
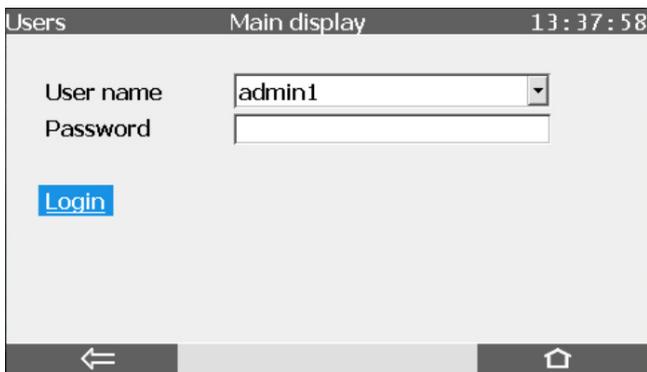
Fig. 9-11: **Main display** – Logging in to the device
(Status: no local or remote user logged in)

📖 Remote access to the enCore device via the remote operation panel is described in detail in the FC manual ⇨ "Configuring the Device with enSuite".

The main display – display view[28]:

Display view – Status: no user logged in to the device		
User name[29]	**<Name>**	If necessary, change the pre-assigned user name.
Password	**[******][30]**	if necessary, change the pre-assigned password
[Login]	Log in to the device with the user details. Switches to the ⇨ View for the remote user to log out (p. 133).	
[Remote operation panel active]	This warning is always shown when a user has access to the device's operation panel via remote connection and the remote user has enabled the local user to view the device. Otherwise, the local user sees a lock screen.	

Table 9-3: Login

---

[28] Since only *one* user can be logged in to the device exclusively at any one time, either the action **Login** will be displayed or the user name through which the network is logged in to the device, e.g., during the transfer of a parameterization to the device.

[29] The field **User name** is pre-assigned with the name of the last login.

[30] For security reasons, in the display each character in the password is replaced by an asterisk (*); the field can also be empty.

The main display: View for the remote user to log out

Logout view – Status: a remote user is logged in to the device		
Remote user	**\<Name\>**	Name of the user who is logged on to the device via the network and is currently performing an action.
[Logout remote user]		To perform service activities on the device on site, a local user can logout a remote user. Switches to the ⇨ display view (p. 132).
[Remote operation panel active]		This warning is always shown when a user has access to the device's operation panel via remote connection and the remote user has enabled the local user to view the device. Otherwise, the local user sees a lock screen

Table 9-4: Logout (remote user)

The main display: View for the local user to log out

Logout view		
User name	**\<Name\>**	Name of the user logged in locally
Logout		Logout the user from the device. Action switches to the ⇨ display view (p. 132).
Accept parameter changes		Save current parameter changes and enable them in the device.
Discard parameter changes		Discard current parameter changes.
Change password		Set a new password. Switches to the ⇨ View to change password (p. 134).
\<Status message\>, e.g., **New password accepted**		If applicable a status message will be displayed indicating whether an action has been successful or unsuccessful.

Table 9-5: Logout (local)

The main display: View to change password

Logout view	
User name	**<Name>** name of the user logged in locally
New password	Enter a new password.
Repeat password	Enter the new password again for security reasons.
Accept new password	The new password is valid as soon as it has been checked successfully. ⇨ Switches to the ⇨ View for the local user to log out (p. 133).
Discard new password	The entry is discarded, the original password is still valid. Switches to ⇨ View for the local user to log out (p. 133).
<Status message>, e.g., **Passwords do not match!**	If there is an error, a message will appear indicating the cause.

Table 9-6: Changing the password

10 FAQ

This section contains the most important settings and questions to help you with the tasks that occur on a regular basis.

10.1 I/O

10.1.1 Where can I find the MAC address in the device display?

Background

The MAC address (**M**edia **A**ccess **C**ontrol) is the unique hardware-bound address of a network component. In enCore devices, the CPU3 and ESER4 boards have a LAN interface, each of which has an individual MAC address. The CPU3 can be found in every device, and up to two ESER4 boards can be installed in a device. The device automatically reads all of the MAC addresses that are present. You can only view the addresses on the device and in enSuite in the Ethernet properties of the respective board ("read-only").

Procedure on the enCore device

To view the MAC address for the CPU3 or an ESER4 on the device...

▶ ... if applicable, switch to the home display 🏠 of the enCore device.
▶ Open 🗔 **System –** ▨ **I/O**.
▦ All the input and output boards in the device are listed.
▶ Click the desired network component (**CPU3** or **ESER4**).
▦ The name and the MAC address of the board are displayed in the display **Ethernet I/F** in the first row **Board**.
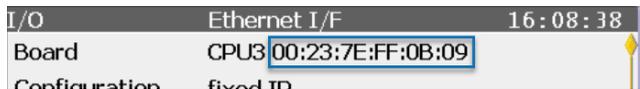
I/O	Ethernet I/F	16:08:38
Board	CPU3 00:23:7E:FF:0B:09	
Configuration	fixed IP	

Fig. 10-1: MAC address for a CPU3 – example

10.1.2   Which standard gateway(s) and DNS server sets the normal mode?

Background

For the data communication to function in the local network and into another network, consider the following rules when parameterizing standard gateway and DNS server.

In general

- Typically, a DNS server runs on the default gateway and typically has the IP address of the default gateway.

- Each enCore device has at least one LAN interface, which is provided by the CPU board (`ETH0`). For a device with a 1/3 width, additionally 1 ESER4 board (`ETH1`) can be installed, with 1/2 width, additionally 1 ESER4 boards providing one additional LAN interface each (`ETH1`, `ETH2`).[31]

- Only 1 (!) LAN interface of the enCore device can have a connection outside its own network segment (e.g., to the Internet). For this purpose, a gateway must be entered on this interface in its own network segment.

  This means you parameterize as standard gateway (and DNS server) ...

---

[31] `ETH0` is always the LAN interface of the CPU. The designations `ETH1` and `ETH2` depend on the jumper position `JP4` on the ESER4. The 1st ESER4 is jumpered as `ETH1`, the 2nd ESER4 as `ETH2`, whereby the 1st ESER4 is always installed directly next to the CPU (`board 4` at 1/3 housing width or `board 7` at 1/2 housing width) and the 2nd ESER4 next to the 1st ESER4 (`board 6` only at 1/2 housing width).

Background: For 1/2 housing width and 2 × ESER4 used, the `JP4` of the ESER4 with the lower bus address (`board 6` ~ correlates with bus address 6) needs to be set to the lower jumper position (`ETH1`) and of the ESER4 with the higher bus address (`board 7` ~ correlates with bus address 7) needs to be set to the higher jumper position (`ETH2`). This means that if you install a 2nd ESER4 board later, you must adjust the jumper position for JP4 on both boards accordingly.

–   ... only for the LAN interface, which manages the data
    communication into another network, a valid IP address of a
    standard gateway: `<x.x.x.x>`

–   ... for all LAN interfaces, which communicate exclusively within
    the local network (subnet), switch this functionality off with:
                        `0.0.0.0`

•   The enCore device queries the available LAN interfaces one after
    the other until it finds the first IP address of a standard gateway, the
    enCore device ignores all other standard gateways.

    The query sequence for several LAN interfaces is:
            `LAN` (CPU) ⇨ `LAN` (1st ESER4) ⇨ `LAN` (2nd ESER4)

Example

To use the LAN interface of the ESER4 in an enCore device with a 1/3 width
for communication with a center located in another local network,
parameterize the default gateway (and DNS server) ...

►   ... of the LAN interface of the CPU with the address `0.0.0.0` and

►   ... the LAN interface of the ESER4 with the IP address of the standard
    gateway used `<x.x.x.x>`.

✓   Note that in this case DHCP must not be activated for the LAN interface
    of the CPU, as this would result in the entry of an automatically detected
    gateway!

Network settings in normal mode

The normal mode maps certain standard constellations based on the above
rules. If you parameterize a LAN interface in normal mode, it may therefore
make further network settings. You can change these according to your
requirements.

I/O Configuration	Network settings and their meaning		
		LAN (CPU)	LAN (1st. ESER4)
Create new parameterization	Configuration:	**DHCP**	(*unavailable*)
Meaning	Standard gateway and DNS server of the LAN interface of the CPU are active and are determined automatically.		
add ESER4	Configuration: IP address: Network mask: Default gateway: DNS Server:	**fixed IP** **0.0.0.0** **0.0.0.0** **0.0.0.0** **0.0.0.0**	**DHCP**
Meaning	Standard gateway and DNS server of the LAN interface of the CPU are inactive and those of the ESER4 are determined automatically. If not the LAN interface of the ESER4 but instead the LAN interface of the CPU is supposed to provide the communication to a remote network, then parameterize the standard gateway and DNS server of the ESER4 with 0.0.0.0 and parameterize standard gateway and DNS Server of the LAN interface of the CPU or select DHCP.		
remove ESER4	Configuration:	**keep settings**	(*unavailable*)
Meaning	Removing the (last) ESER4 does not change the LAN settings of the CPU. If necessary, adjust the standard gateway and DNS server.		

Table 10-1: Network settings in normal mode – example
of an enCore device with 1/3 housing width

> 📖 **Standard gateway and DNS settings for two ESER4 cards**
>
> If standard gateway and DNS server are used on the second ESER4 board, you parameterize standard gateway and DNS server of this LAN interface and parameterize standard gateways and DNS servers of the CPU and the first ESER4 with: `0.0.0.0`

10.1.3   How can the measuring deviation of a transmitter be minimized? (Adjustment function)

The measurements from transmitters which are connected to enCore devices can undergo linear adjustment. A reference unit is used for the adjustment procedure, i.e., a more precise measurement device than the measurement transmitter. The measured value (displayed by the transmitter) and the adjusted value (displayed by the reference unit) are found for two adjustment points. This enables the measuring deviation of transmitters for evaluation in the enCore device to be minimized. As soon as you enable the adjustment function for a measurand, the calculated export value **Adjusted value** is available for further use.

The adjustment function uses two adjustment points for linear interpolation to calculate the adjusted value from the measured value. This means that in the event of a deviation being detected, a minor linear measurement adjustment can be achieved without having to recalibrate the transmitter.

The adjustment points are composed as follows:

- Adjustment point 1
  From the two parameters **Measured value 1** and the corresponding **Adjusted value 1**.

- Adjustment point 2
  From the two values **Measured value 2** and the corresponding **Adjusted value 2**.

The interpolation is carried out between these two adjustment points. All the values must be correctly and completely parameterized, otherwise interpolation is not possible. If the adjustment has been parameterized incorrectly

or incompletely, the export value **Adjusted value** will be labeled with `OOC`
(Out of Calculation).

10.2 Time Service

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

Several processes in enCore 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 enCore device 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 enCore device corresponds as accurately as possible to the external time source. At the same time, from a fiscal perspective,

time synchronization 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 ⇨ 5.1.4 Adjusting system time via external sources (p. 37).

10.3 User and rights management

10.3.1   How can I view a list of the (fiscally) secured parameters on the device?

Background

In enCore devices, which are used in the field of legal metrology, the approval defines which parameters are legally relevant and therefore need to be specially secured. Parameters of this type are either under the protection of the security switch 🔒 or changes to their values are reported in the fiscal audit trail 📖.

You can view the secured parameters and their values directly on the device. These parameters are listed for all legally relevant software components. In the FC1, for example, the Basic System and the Flow Conversion AFB and Gas Quality AFB are legally relevant AFBs.

Procedure on the enCore device

To list the secured parameters of the Basic System or a legally relevant AFB...

► ... if applicable, switch to the home display of the enCore device.
► Open ℹ️ **Info – Software status – <Basic System or name of the fiscal AFB>**.

Example

Open the display **Secured parameters** for the Flow Conversion AFB with ℹ️ **Info – Software status – Flow conversion**.

▢ In the display **Software info**, the hyperlink **Param. secured** with the calculated checksum is displayed across all secured parameters of the selected software component.

Fig. 10-2: Checksum across secured parameters of the
selected software component – example

Note: If there are no secured parameters, the text **Param. secured** is
not an active hyperlink and three hyphens are displayed instead of the
checksum: **–––**

► Switch to the **Secured parameters** display with **Param. secured**.

▣ In the **Secured parameters** display the following details are displayed
page by page for a legally relevant parameter – the order of the
parameters corresponds to the order of the parameters in enSuite.

- **Name**
  Long name: Parameter branch plus parameter name

- Depending on the parameter type or export value:

  – **Value** parameterized fixed value

  – **Reference** parameterized import value

  – **Unit** unit of the export value (*only for export values*)

► Use the navigation buttons (Up, Down) or the touch screen to scroll
through the list of parameters.
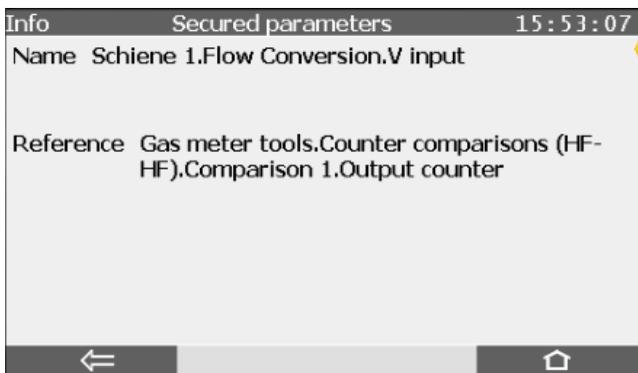
Fig. 10-3: View of the secured parameter **V input**
(Flow Conversion AFB) – example

10.3.2 How can I tell whether an enCore device is being operated in accordance with the approval?

Background

Based on the fiscal requirements of the device, the fiscal approval file defines which parameters are legally relevant and how they are secured (🔒 or 🔓). Approval files are signed and cannot be edited.

Honeywell sets the necessary approval file in the device during production. If the fiscal specifications change, Honeywell will provide an amended approval file which you can then transfer to the device with the firmware update.

To ensure that an enCore device can operate in accordance with the approval, each user of the device can check whether the access rights in the current parameterization meet the specifications in the approval file. If this is not the case, for example because the administrator has changed the security setting for a legally relevant parameter and transferred this to the device, the device may not be operated for fiscal uses. The result of this check is shown in the display **Software status**.

Procedure on the enCore device

To view the result of the check...

►   ... if applicable, switch to the home display of the enCore device.
►   Open 🛈 **Info – Software status**.
▢   Information about the code in the device and its checksums will be displayed.
       The third row shows the name, version and checksum of the approval file. The symbol 🗐 indicates that it is a fiscally relevant software component, the checksum of which is calculated based on the fiscal information.

Fig. 10-4: Information on the approval file in the third row – example

The device indicates whether or not the current parameterization meets the specifications of the approval file by means of the font color in which the name of the approval file is displayed:

- blue font
  The security settings of the parameters in the device meet the requirements of the approval file.

Fig. 10-5: The requirements of the approval file are met

- red font
  The security settings of the parameters in the device do *not* meet the requirements of the approval file.

Fig. 10-6: The requirements of the approval file are not met

> **Special case: The check result is not yet available after a restart**
>
> After a restart, the device starts to evaluate the approval file and calculate the checksums. This process can take a few seconds depending on the capacity of the system.
> In this special case, there is not yet a check result. The device will display the following information in the display **Software status** until the first check has been completed:
>
> - for **Last check** a question mark **?**
> - the placeholder **Approval file** in blue font
> - currently calculated checksums in yellow font.

Fig. 10-7: Ongoing (first) check after a restart

10.3.3 How can I ensure conformity with a fiscal approval?

Background

Approval files can either set minimum or precise requirements for the security settings of the parameters (properties of the file) depending on the applicable regulations.

If the approval file describes...

- the minimum requirements…
  … a parameterization is deemed to be compliant with the approval

file if it has *at least* the security settings specified in the approval file. In other words, the security settings may not be any more relaxed but can be stricter.

If the approval file sets out that a parameter must be protected by the fiscal audit trail as a minimum, this parameter can be set to be stricter under the protection of the security switch; parameters with no fiscal security settings can be set as under the protection of the security switch or the fiscal audit trail.

- the precise requirements…
  … a parameterization is deemed to be compliant with the approval file if it has *precisely* the security settings specified in the approval file. In other words, the security settings cannot be changed, even to make them stricter.

enSuite offers an option to accept the security settings for an approval directly for a parameterization. Regardless of the level of strictness, this then ensures that the security settings of the parameterization comply with the approval.

The simplest thing to do is to select the relevant approval file directly when creating a new parameterization. However, the approval file can also be transferred over at a later point in editing.

Procedure in enSuite

Prerequisite

- The name of the approval file is known.
  (⇨ display in the enCore device under 🛈 **Info – Software status**, in the third row the name of the approval file).

- The desired parameterization is open in the node **<Device>**.

► If necessary, switch to the **AFB configuration** tab.
► Select the approval file for the device from the drop-down menu **Select approval**.

> **Warning: "The approval requirements may be inconsistent"**
>
> Before enSuite transfers a parameterization to the device, it
> checks whether the approval requirements of the parameterization
> correspond to the requirements of the device. If this is not the
> case, enSuite generates a warning that the different approval
> requirements may be inconsistent.
>
> The approval file for the parameterization (tab **AFB
> configuration**, drop-down menu **Select approval**) and the
> approval file in the device that was transferred to the device with
> the firmware update are checked.

✓   enSuite checks whether the parameterization meets the (minimum or
    precise) requirements of the approval file selected.

- the security settings of the parameterization already comply with
  the approval
  In this case you do not need to do anything else.

- the security settings of the parameterization do not comply with the
  approval
  All parameters which do not comply are displayed in red font.

To meet the requirements of the approval file...

►   … click **[Make compliant]**.
✓   The result varies depending on whether the requirements of an approval
    file must be complied with as a minimum or precisely:

- in the case of precise requirements…
  … enSuite sets the security settings for the parameterization
  according to the requirements of the approval file 1:1 and removes
  all additional security settings.
  This means the security settings of the parameterization comply
  with the approval and no further steps are necessary.

- in the case of minimum requirements…
  … in the dialog displayed you can choose whether enSuite
  implements the parameterization requirements precisely or as a

minimum. In both cases, the security settings then comply with the approval file.

– If you select **[No]**, enSuite will implement the *minimal* requirements and ignore all additional security settings.

– If you select **[Yes]**, enSuite will implement the *precise* requirements and remove all additional security settings.

– If you select **[Cancel]** enSuite will not make any changes.

10.3.4 How can I determine the status of the security switch?

Background

The security switch on the enCore device can either be open or 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[32] during operation and can only be opened in the presence of an authorized person.

Procedure on the enCore device

To view the status of the security switch...

► ... switch to the home display if necessary.
► Open **Info**.
✓ The display **<Device type>** shows the status:

• **Security switch open**

• **Security switch closed**

---

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

10.3.5   How can I filter a parameterization in advance according to a certain user profile? (Virtual login)

Background

In offline parameterization enSuite opens a parameterization with administrator rights as a standard so all parameters are displayed and, due to the expanded authorizations of the administrator, are also editable. Even those parameters which can only be changed on the device when the security switch is open can be edited.

For the changes to a parameterization to be able to be successfully trans-ferred to a device (subsequently), the user who is logged in to the device must have access rights for *all* parameters which were previously changed in offline mode. If the parameterization has changed parameters which are under the protection of the security switch, the security switch must also be open. If this is not the case, the device will reject the transfer of the entire parameterization.

With virtual login, enSuite offers an option to filter a parameterization in advance by the authorizations of the desired user profile and the status of the security switch. In this way, you can ensure that a user is really entitled to transfer a changed parameterization successfully to a device.

In the virtual login, only a user name must be entered, a password only needs to be entered to transfer the data. In this way, you can also parameterize parameterizations for other user profiles in advance.

Procedure in enSuite

Prerequisite

- only for offline parameterization
  Online parameterization requires an explicit user login with the user name and password.

►   Open the parameterization in the node **<Device>**.
✓   In the upper area of the tab **Configuration** the fields for virtual login are displayed. The fields may be pre-assigned with the settings of the previous virtual login.

► Select the checkbox **Use virtual login**.
✓ The entry field for the user name can be edited.
► Enter a user name for the desired user profile and confirm your entry with **[Enter]** or **[Tab]**.
✓ When a user has successfully logged in, a green checkmark ✔ will be displayed behind this name field.
In addition to this, in the entire parameterization only the parameters for which the user who is logged in has authorization are editable; all other parameters are displayed in a gray font and are labeled as non-editable with the symbol 🚫.

To additionally block all parameters which are under the protection of the security switch for editing...

► … clear the checkbox Assume open security switch.
✓ In the entire parameterization only the parameters which may also be changed when the security switch is closed can be edited. All the others are shown in gray and marked as non-editable with the symbol 🚫.

To hide all the parameters that the user is not permitted to change due to a lack of access rights and the status of the security switch...

► ... select the checkbox **Show enabled parameters only**.
✓ The entire parameterization will no longer display all the parameters for which the user does not have authorization.

OR

To display all the parameters regardless of their access rights...

► ...clear the checkbox **Use virtual login**.
✓ The filter settings will be deleted.
In the parameterization, which is open, all of the parameters will be displayed and are editable.

10.3.6 Which conditions must be met to change parameters directly on the device?

In general, the following conditions must be met for an authenticated user to be able to make changes to a parameter on the device:

- The parameter is a constant.
- The user has the right to change this parameter.
- The parameter can be changed in the display.
  For user-defined displays in particular, this means that in the display editor...
  - … the parameter of the display has been added from the tab **Export values** as **<Device> – Parameter** (and not as **<Device> – Export value**).
  - … for this parameter, the checkbox **shown parameter may be edited on screen** is selected.
    This checkbox can only be selected for parameters in user-defined displays and, depending on the device type, in selected standard displays .
  - … the parameterization was transferred to the device by a user with the right **Modify displays**.

For a detailed example of use ⇨ 10.3.7 How do I change parameters directly on the device using the example of a user-defined display? (p. 152).

10.3.7 How do I change parameters directly on the device using the example of a user-defined display?

Background

This FAQ describes how you can change parameters on the device using the example of a gas vector and a user-defined display:

If you use a constant gas vector in the `Gas Quality AFB`, there is a possibility that an authenticated user will change the values of the gas components directly on the device if the real composition of the gas changes. A user can only change the parameters for which he has rights.

During a session, you can make all necessary parameter changes. These will only be transferred to the device when you confirm your changes. This ensures that all the values which have been changed are transferred over *at the same time*. This is particularly important if values which belong together are changed, as in the example of the proportions of the individual gas components in the composition of the gas. Otherwise, if the values are trans-ferred over sequentially, it is possible that values which are not consistent may temporarily be processed.

Alternatively, you can discard your changes. Please note that unconfirmed changes will also be discarded if you are logged out from the device, for example after the **Inactivity timeout**.

Procedure on the enCore device

Prerequisites

- The proportions of the gas components to be changed are set in the Gas Quality AFB as a constant – please note that import values cannot be changed on the device (enSuite **<Device> – [<Group> –] <Gas Quality AFB> – Gas components**)

- On the device, there is a display in which these parameters can be changed (using the example of the user-defined display **<Gas vector>** (⇨ figure below).

- The user has the rights to change the parameters.
  (enSuite **<Device> – [<Group> –] <Gas Quality AFB> – Gas components**, tab **Parameter**, column **Rights**)

► Log in to the device via the basic display using your user information – 🛈 **System –** 👤 **User**.

🖥 Your session will start once you have logged in successfully.

► Switch to the user-defined display **<Gas vector>**.

🖥 All gas components will be displayed as editable fields if they...

- ... can be changed on the device and

- ... the user has the right to change them.

Gas Quality	Gasvector	16:47:54
N2	10.4520	mol%
CO2	1.2900	mol%
CH4	83.4790	mol%
C2H6	3.7160	mol%
C3H8	0.6600	mol%
iso-C4H10	0.1310	mol%

Fig. 10-8: Editable gas components – example

► Change the values in the necessary fields. Clicking the desired field will show the keyboard.

🖫 The changes will remain for your entire session but are not yet enabled in the device.

To accept the changes permanently in the device...

► … switch to the logout view, e.g., via the basic display 🛈 **System – 🧑 User**.

► Click **Accept parameter changes**.

🖫 The new values will be enabled in the device. The Gas Quality AFB will perform its calculations based on the amended gas composition.

To discard all changes...

► … click **Discard parameter changes**.

🖫 All values which have been changed and have not yet been permanently saved in the device using the action **Accept parameter changes** will be deleted.

10.4 Tools

10.4.1 How to parameterize a counter comparison encoder-HF-HF?

There are special applications where the gas meter includes both an encoder index and 2 additional HF sensors. If in such a case, should you intend to realize a counter comparison between all 3 sensors, you will first parameterize a HF-HF-comparison for the pulse generator and let enter the results in an LF-HF-comparison with the encoder index.

Prerequisites

- The desired offline parameterization is open in expert mode.
- The connection of the encoder index as well as the two HF sensors is already parameterized under **Basic System – I/O** (ExMFE5 or MFE7 board).

► Parameterize a **Counter comparison HF-HF** for the two HF sensors, as described in ⇨ 6.2.1 Counter comparison HF-HF (from p. 63).

► In the branch 📷 **Basic system –** 💼 **Tools**, create a **Counter comparison LF-HF**. Parameterize this counter comparison according to ⇨ 6.2.2 Counter comparisons LF-HF (p. 68), however, with the following additional rule:

► In the parameters **HF counter input** and **HF flow rate**, import the export values **Output counter** and **Output flow rate** of the counter comparison HF-HF which was parameterized in the previous step; therefore, for example, **Counter comparisons (HF-HF).Comparison 1.Output counter** and **Counter comparisons (HF-HF).Comparison 1.Output flow rate**. Please take care that the two values belong to the same HF-HF counter comparison in the event that several are created in your parameterization.

✓ The counter comparison encoder HF-HF is parameterized by cascading a counter comparison HF-HF and a counter comparison LF (Encoder)-HF.

> **Parameterize Encoder HF-HF Counter Comparison in Normal Mode**
>
> If you edit a parameterization in normal mode, enSuite will facilitate your work enormously:
>
> It depends on the device type which input channels for the gas meter are predefined in normal mode in a newly created parameterization; generally, a 2-channel connection is preset. For a ZM1, for example, an encoder channel and a HF channel are defined by default.
>
> In the first step, under **Start (I/O configuration)**, correctly parameterize the 3-channel connection of the gas meter as per your application. Afterwards switch to the tab **Gas meter** of the associated stream and select the preferred sensor (encoder) here, the 2nd and 3rd. sensor (each HF). The input field for the **Deviation warning limit** also contains a recommended default value for the 2nd counter comparison. This value is automatically calculated depending on other visible parameters. If you make changes to such influencing parameters, the preset value will be deleted; if you click on the **Preset value** button, the recommended default value will be recalculated and reentered.
>
> For additional changes, you may switch to expert mode at any time.

10.4.2 How to reset a counter comparison via the operation panel of the device?

A manual resetting of the counter comparison is possible both for counter comparison type LF-HF as well as for counter comparison type HF-HF.

Resetting a counter comparison LF-HF

With a **Counter comparison LF-HF**, during the resetting process, the **LF comparison counter**, the **HF comparison counter**, as well as the **Deviation** will be reset to the value zero (0), i.e., the comparison will start anew. Furthermore, all error messages will end should any be pending at the time

of the reset.

In particular, the manual resetting is the only option with a **Counter comparison LF-HF** to reset a pending **<LF or HF> deviation warning** after resolving the cause of the failure. As long as a **<LF or HF> deviation warning** is pending, the export value **Output flow rate** is marked as erroneous, which means, for example, that a downstream `Flow conversion AFB` is in alarm status.

Resetting a counter comparison HF-HF

A **Counter comparison HF-HF** automatically starts completely new, as soon as one of the two sensors has exceeded the parameterized **Comparison amount**. If a 🏳 **HF1 deviation warning** or 🏳 **HF2 deviation warning** is pending, it will only end in this situation, however, if during a subsequent comparison, it is determined, that the warning limit is no longer exceeded. This also applies for the respective prewarnings.

In a manual resetting of the **Counter comparison HF-HF** via the control panel, not only the comparison is started anew, but also the pending warnings/prewarnings of the deviation monitoring will end.

Procedure on the device

To reset a counter comparison, proceed as follows:

► Log-in to the device; an additional prerequisite is, that you are authorized to **Change general system settings**.
   ⇨ 9 User and rights management (p. 47)

► Switch to the display 🖼 **System – 🏭 Gas meter tools.**

► In the overview, either activate the hyperlink **Counter comparisons HF-HF** or **Counter comparisons LF-HF**, depending on what type of counter comparison you want to reset.

► In the overview select the requested counter comparison via the selection box **Name**, if required.

► In the detail display, activate the hyperlink **Reset** on the right side of the 1st row of the display area.

✓ The counter comparison is reset.

10.4.3 What are the differences between the functions of the LF-HF and HF-HF counter comparison?

A LF-HF counter comparison runs (compared to a HF-HF counter comparison) over a longer period of time. This is also achieved in that the reset amount of a LF-HF comparison (in relation to the refresh rate of the HF sensor) is set substantially higher than the comparison amount in the HF-HF comparison.

For the LF-HF counter comparison, the difference between the two sensors is calculated continually and it is continually checked to see whether it exceeds a limit for the deviation. The automatic resetting and restarting of the comparison only takes place if one of the comparison counters exceeds the parameterized reset amount without a deviation warning being issued during the last comparison period. A pending deviation warning can only be reset manually via the control panel of the device.

For the HF-HF comparison, however, the difference calculation and the verification are performed each time a specific, relatively small comparison amount has flown through. The comparison will be restarted anew each time. A pending deviation warning ends automatically if a subsequent comparison is performed without exceeding the warning limit for monitoring.

10.5 Unit Service

10.5.1 How do I display a counter in the form $1234567.8 \times 100m^3$?

The SI unit for volume is cubic meters (m^3). The physical quantities volume counter (meas. cond.) and volume counter (base cond.) are available in enSuite to show volume-based counters.
Since the unit of 100 cubic meters (`100 m³`) is *not* defined for these quantities as a standard, in the first step set this is a user-defined unit for the desired volume counter. In the second step, determine which volume-based counters use the new unit.

Procedure in enSuite

To create a new user-defined unit, open...

► ... the branch 🗒 **Basic System – 🔣 Unit Service – 🗒 User-defined units**.
► Click the Add symbol 🔘 on the **Parameter** tab.
✓ The area **Unit <x>** is added to the table.
► To define the unit 100 cubic meters (**100 m³**) and along with it a display format of 7 digits before the decimal point and 1 digit after the decimal point, set, for example, the following values:

Name	**Volume counter**
Symbol	**100 m³**
Physical quantity	**Volume counter (base cond.)** **OR** **Volume counter (meas. cond.)**
Derived from	**m³** (do not derive from the default unit "m³ *")
Gradient m	**100**
Offset n	**0**
Format string	**0000000.0**

✓ The new unit **Volume counter (100 m³)** is available in the unit set for the selected physical quantity.
You can use the new unit as a default unit or in a targeted manner for selected volume-based counters.

To use the user-defined unit as a default unit for the selected physical quantity...

► … switch to the node 🔣 **Unit Service** on the tab **Parameters**.
► For the physical quantity for which you have defined the new unit, select the entry **Volume counter (100 m³)** from the drop-down menu.
✓ As soon as you save your changes, your user-defined unit will be the default unit for the selected volume counter.

To use the user-defined unit in a targeted manner for a selected counter...

▶   … switch to the desired branch and open the desired tab **Parameters** or
     Export values.
✓   You can allocate the new unit to parameters and export values with the
     same physical quantity.

Example

To provide the volume at measurement conditions as an export value for
other functions in the unit **Volume counter (100 m^3)** …

▶   … switch to the desired flow conversion, e.g., **<Device> – 🟩 Flow
     conversion**.
▶   Open the tab **Export values**.
▶   In the area **Measurement conditions**, for the export values **V$_b$**, **V$_b$S**
     and **V$_b$u** in the column **Unit**, select the entry **Volume counter (100 m^3)**
     from the drop-down menu.
🖳   These export values will be created in the new unit from the acceptance
     of the parameterization and displayed in the display with 7 digits before
     the decimal point and 1 digit after the decimal point.

---

11 Appendix

11.1 Nomenclature

11.1.1 Physical quantities and pre-defined sets of units

The following table lists all physical quantities with the allocated units and unit sets which are defined in enCore devices. The unit, which is used as the basis for the conversion of values into other units, is highlighted in bold in each case:

Sym.	Physical quantity	Unit	Character	Conversion factor [+ offset]
#	Number	–	–	–
📊	Compressibility	–	–	–
#	Counter	–	–	–
Δ#	Counter difference	–	–	–
dB	Level	Decibels	dB	–
⏱	Duration	Milliseconds	ms	1000
		Second	**s**	–
		Minute	min	1.6666666666667E-2
		Hour	h	2.7777777777778E-4
		Day	d	1.15740740740741E-5
📏	Length	**Meter**	**m**	–
		Millimeter	mm	1000
		Foot	ft	3.280839895013123
		Inch	in	3.93700787401575E1

	Area	**Square meter**	**m²**	–
		Square foot	ft²	1.076391041670972E1
		Square inch	in²	1.5500031000062E3
	Angle	**Degree**	°	–
	Volume counter (base cond.), Volume (meas. cond.)	**Cubic meter**	**m³**	–[33]
		Cubic hectometer	10^6 m³	–
		Liter	l	–
		Cubic foot	ft³	–
		Cubic hectofoot	10^6 ft³	–
		Cubic inch	in³	–
		Barrel	bbl	–
		Gallon	gal	–
	Volume (base cond.), Volume (meas. cond.)	**Cubic meter**	**m³**	–
		Cubic hectometer	10^6 m³	1E-6
		Liter	l	1000.0
		Cubic foot	ft³	3.53146667214886E1
		Cubic hectofoot	10^6 ft³	353146667214886E-5
		Cubic inch	in³	6.102374409473228E4
		Barrel	bbl	6.28981074385
		Gallon	gal	2.641720523581E2

---

[33] If the unit for a counter value is changed, this applies to the incrementing of the counter from the time of the change on. The value of the counter at the time of the change of the unit is not converted to the new unit.

🎈	specific volume	**Cubic meter per kilogram**	**m³/kg**	–
		Cubic foot per pound	ft³/lb	1.601846353E1
		Cubic centimeter	cm³/g	1000.0
🗑	Mass counter	Gram	g	–[34]
		Kilogram	**kg**	–
		Ton	t	–
		Pound	lb	–
🔺	Mass	Gram	g	1000.0
		Kilogram	**kg**	–
		Ton	t	1E−03
		Pound	lb	2.2046226218
🧪	Molar mass	**Grams per mol**	g/mol	–

---

[34] If the unit for a counter value is changed, this applies to the incrementing of the counter from the time of the change on. The value of the counter at the time of the change of the unit is not converted to the new unit.

🚀	Energy counter	**Kilowatt hour**	**kWh**	–[34]
		Joule	J	–
		Kilojoule	kJ	–
		Megajoule	MJ	–
		Gigajoule	GJ	–
		Calories	cal	–
		Kilocalories	kcal	–
		Megacalories	Mcal	–
		Gigacalories	Gcal	–
		British thermal unit	Btu	–
		Million British thermal unit	MMBtu	–
📊	Energy	**Kilowatt hour**	**kWh**	–
		Joule	J	3.6E6
		Kilojoule	kJ	3.6E3
		Megajoule	MJ	3.6
		Gigajoule	GJ	3.6E−03
		Calories	cal	8.59845227858985E5
		Kilocalories	kcal	8.59845227858985E2
		Megacalories	Mcal	8.59845227858985E−1
		Gigacalories	Gcal	8.59845227858985E-4
		British thermal unit	Btu	3.41214163312794E3
		Million British thermal unit	MMBtu	3.41214163312794E-3
🥧	Molar fraction	**Molar percentage**	**mol %**	–
		–	–	1E−2
%		**Percent**	**%**	**–**

	Percentage share	Per mill	‰	10
		Parts per million	ppm	1E4
		Parts per billion	ppb	1E7
	Absolute pressure	**Bar**	**bar**	**–**
		Millibar	mbar	1000
		Hectopascal	hPa	1000
		Kilopascal	kPa	100
		Megapascal	MPa	0.1
		Kilograms per square centimeter	kg/cm2	1.01971621297793
		Pounds per square inch	psi	1.450377377302168E1
	Relative pressure	**Bar**	**bar**	**–**
		Millibar	mbar	1000
		Hectopascal	hPa	1000
		Kilopascal	kPa	100
		Megapascal	MPa	0.1
		Kilograms per square centimeter	kg/cm^2	1.01971621297793
		Pounds per square inch	psi	1.450377377302168E1

	Differential pressure	**Bar**	**bar**	**1**
		Millibar	mbar	1000
		Hectopascal	hPa	1000
		Kilopascal	kPa	100
		Megapascal	Pa	1E5
		Kilograms per square centimeter	kg/cm^2	1.01971621297793
		Pound per square inch	psi	1.450377377302168E1
		Millimeter water column (4°C)	mm H$_2$O (4°C)	1.0197162129779E4
		Inch water column (4°C)	in H$_2$O (4°C)	4.0146307597556E2
	Temperature	**Degrees Celsius**	**°C**	**–**
		Degrees Fahrenheit	°F	1.8 (+ 32)
		Kelvin	K	1 (+ 273.15)
		Degrees Rankine	°Ra	1.8 (+ 491.67)
	Frequency	**Hertz**	**Hz**	–
	Current	**Milliampere**	**mA**	–
	Resistance	**Ohm**	**Ω**	–
	Voltage	**Volt**	**V**	–
		Millivolt	mV	1000
	Pulse value (volume)	**Number of pulses per cubic meter**	**1/m3**	–
		Number of pulses per 10^6 cubic meter	1/10^6 m^3	1E6
		Number of pulses per liter	1/l	1E-3

		Number of pulses per cubic foot	$1/ft^3$	2.8316846592E−2
		Number of pulses per 10^6 cubic foot	$1/10^6\ ft^3$	2.8316846592E4
		Number of pulses per cubic inch	$1/in^3$	1.6387064E−5
		Number of pulses per barrel	1/bbl	1.58987295599915E−1
		Number of pulses per gallon	1/gal	3.785411784000694E−3
	Pulse value (mass)	Number of pulses per gram	1/g	1E-3
		Number of pulses per kilogram	**1/kg**	**–**
		Number of pulses per ton	1/t	1E3
		Number of pulses per pound	1/lb	0.45359237017463226
	Pulse value (energy)	**Number of pulses per kilowatt hour**	**1/kWh**	**–**
		Number of pulses per megajoule	1/MJ	2.77777777777777778E−1
		Number of pulses per joule	1/J	2.77777777777777778E-7
		Number of pulses per kilojoule	1/kJ	2.77777777777777778E−4
		Number of pulses per gigajoule	1/GJ	2.77777777777777778E2
		Number of pulses per calorie	1/cal	1.163E-6
		Number of pulses per kilocalorie	1/kcal	1.163E−3

		Number of pulses per megacalorie	1/Mcal	1.163
		Number of pulses per gigacalorie	1/Gcal	1.163E3
		Number of pulses per British thermal unit	1/Btu	2.9307107E−4
		Number of pulses per Million British thermal unit	1/MMBtu	2.9307107E2
	Volume flow rate (base conditions), volume flow rate (meas. conditions)	10^6 cubic meters per day	10^6 m³/d	2.4E−5
		Cubic meters per day	m³/d	24.0
		10^6 cubic meters per hour	10^6 m³/h	1E-6
		Cubic meters per hour	m³/h	**–**
		Cubic meters per minute	m³/min	1.66666666666667E−2
		Cubic meters per second	m³/s	2.7777777777778E−4
		Liters per day	l/d	2.4E4
		Liters per hour	l/h	1000.0
		Liters per minute	l/min	1.66666666666667E1
		Liters per second	l/s	2.7777777777778E−1
		10^6 cubic feet per day	10^6 ft³/d	8.47552001315736E−4
		Cubic feet per day	ft³/d	8.47552001315736E2
		10^6 cubic feet per hour	10^6 ft³/h	3.5314666721489E−5
		Cubic feet per hour	ft³/h	3.5314666721489E1

		Cubic feet per minute	ft³/min	5.88577778691483E−1
		Cubic feet per second	ft³/s	9.8096296448579E−3
		Barrels per day	bbl/d	1.509554584904E2
		Barrels per hour	bbl/h	6.2898107704321
		Barrels per minute	bbl/min	1.04830179507201E−1
		Barrels per second	bbl/s	1.74716965845336E−3
		Gallons per day	gal/d	6.3401292565944E3
		Gallons per hour	gal/h	2.641720523581E2
		Gallons per minute	gal/min	4.40286753930167
		Gallons per second	gal/s	7.33811256550278E−2
	Mass flow rate	Kilograms per day	kg/d	24.0
		Kilograms per hour	**kg/h**	**−**
		Kilograms per minute	kg/min	1.666666666666667E−2
		Kilograms per second	kg/s	2.777777777777778E−4
		Tons per second	t/s	2.777777777777778E-7
		Tons per minute	t/min	1.666666666666667E-5
		Tons per hour	t/h	1E-3
		Tons per day	t/d	2.4E-2
		Pounds per day	lb/d	5.29109429232E1
		Pounds per hour	lb/h	2.2046226218
		Pounds per minute	lb/min	3.67437103633333E−2
		Pounds per second	lb/s	6.12395172722222E−4

		Kilopounds per second	klb/s	6.12395172722222E-7
		Kilopounds per minute	klb/min	3.67437103633333E-5
		Kilopounds per hour	klb/h	2.2046226218E−3
		Kilopounds per day	klb/d	5.29109429232E−2
	Energy flow rate	Kilowatt	kW	–
		Megajoules per hour	**MJ/h**	**3.6**
		Gigajoules per hour	GJ/h	3.6E-3
		Kilocalories per second	kcal/s	2.38845896627496E−1
		Kilocalories per hour	kcal/h	8.59845227858985E2
		Kilocalories per day	kcal/d	2.063628546861565E4
		Gigacalories per day	Gcal/d	2.063628546861565E−2
		British thermal units per second	Btu/s	9.47817120313317E−1
		British thermal units per hour	Btu/h	3.41214163312794E3
		British thermal units per day	Btu/d	8.189139919507056E4
		Million British thermal units per second	MMBtu/s	9,47817120313317E-7
		Million British thermal units per hour	MMBtu/h	3,41214163312794E-3

		Million British thermal units per day	MMBtu/d	8,189139919507056E-2
		Watt	W	1000
		Milliwatt	mW	1E6
🔥	Heating value (energy/volume)	**Kilowatt hours per cubic meter**	**kWh/m3**	**–**
		Joules per cubic meter	J/m^3	3.6E6
		Megajoules per cubic meter	MJ/m^3	3.6
		Gigajoules per cubic meter	GJ/m^3	3.6E-3
		Kilocalories per cubic meter	$kcal/m^3$	8.59845227858985E2
		Calories per cubic meter	cal/m^3	8.59845227858985E5
		British thermal units per cubic meter	Btu/m^3	3.412141635E3
		British thermal units per cubic foot	Btu/cft	9.6621091228471E1
		Million British thermal units per cubic meter	$MMBtu/m^3$	3.412141635E-3
		Million British thermal units per cubic foot	$MMBtu/\,ft^3$	9,6621091228471E-5
🔥	Heating value (energy/mass)	**Kilowatt hours per kilogram**	**kWh/kg**	**–**
		Megajoules per kilogram	MJ/kg	3.6
🔥		Kilojoules per mol	kJ/mol	3.6

		Heating value (energy/mol)	**Watt hours per mol**	Wh/mol	**–**
	Density	**Kilograms per cubic meter**	**kg/m3**	**–**
		Grams per cubic meter	g/m^3	1000
		Milligrams per cubic meter	mg/m^3	1E6
		Pounds per cubic meter	lb/m^3	2.204622621
		Pounds per cubic foot	lb/ft^3	6.24279605521099576E−2
		Pounds per cubic inch	lb/in^3	3.61272981477534E−5
	Relative density	–	–	–
	Velocity	**Meters per hour**	**m/h**	**–**
		Meters per minute	m/min	1.6666666666667E−2
		Meters per second	m/s	2.7777777777778E−4
		Feet per hour	ft/h	3.28084
		Feet per minute	ft/min	5.46806666666667E−2
		Feet per second	ft/s	9.1134444444444E−4
	Dynamic viscosity	**Pascal seconds**	**Pa s**	–
		Centipoise	cP	1000.0
		Pound force second per square foot	$lbf\ s/ft^2$	2.08854337883712E−2
		Pound force hour per square foot	$lbf\ h/ft^2$	5.80150938565868E−6
	Kinematic viscosity	**Square meters per second**	**m2/s**	**–**

		Square centimeters per second	cm^2/s	1E4
		Centistokes	cSt	1E6
		Square feet per second	ft^2/s	1.076391041670972E1
		Square inches per second	in^2/s	1.5500031000062E3
	Temperature coefficient	1/Kelvin	1/K	–
		1/Degrees Celsius	**1/°C**	**1**
		1/Fahrenheit	1/°F	0.555555555555556
	Joule-Thomson coefficient	**Kelvin/Pascal**	**K/Pa**	**–**

Table 11-1: Physical quantities and pre-defined sets of units

11.1.2 Syntax of format strings for the display

The display format of units is defined using format strings. The following table gives an overview of the syntax of the format strings.

	Format string	Description

Pre-decimal position	**0 …**
	000000000000
	(1 to 12 zeros)
		• The value is displayed with a fixed number of digits before the decimal point, if necessary leading zeros are added.
		• The number of zeros corresponds to the positions before the decimal separator.
		• If the value exceeds the number of pre-determined positions, the following applies:
		  – *in the case of counters*
		    The counter is displayed with part of the value cut off.
		  – *in the case of measurements*
		    Three hashes **###** will be displayed instead of the measurement.
		• This format is typically used for counters.

	Format string	Description
	<empty>	• Only significant figures are displayed. • If there are no significant figures, a zero (**0**) is output. • If the value exceeds the number of characters which can be displayed, three hashes **###** will be displayed instead of the value. • This format is typically used for measurements.
	#… **############** (1 to 12 hashes)	• Only significant figures are displayed. • The number of hashes corresponds to the maximum number of digits before the decimal point. • If the value has more significant figures than the parameterized number of hashes, three hashes **###** will be displayed instead of the value.
Decimal separator	Decimal point (**.**)	• placeholder for the decimal separator • The language set in the home display determines whether a comma (**,**) or a period (**.**) is displayed in the device as a decimal separator character.

Decimal places	**0** … **000000**
	(1 to 6 zeros)
		• The value is displayed with a fixed number of decimal places, if necessary filling zeros are added.
		• The number of zeros corresponds to the positions after the decimal separator.
		• If the value exceeds the number of pre-determined positions, the following applies:
		  – *in the case of counters*
		    The decimal places are displayed with part of the value cut off.
		  – *in the case of measurements*
		    The decimal places are displayed as rounded numbers.

	<empty>	• The value is displayed as a whole number.

	Format string	Description
Exponential representation (standardized)	**.E** … **.000000000E** (0 to 9 zeros)	• enSuite uses what is known as the standard representation of the exponential notation, in other words the mantissa only has one significant figure before the decimal separator. • The mantissa and exponent are calculated during the operation from the input value and displayed in the form `<Mantissa>E<Exponent>`. • The exponent is displayed with a minimum of two digits and where necessary a leading zero (`0`) is added. • The exponential notation is used for very large or very small values.

Table 11-2: Format string – syntax

11.1.3   Labeling events

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

Table 11-3: Labeling events

11.2 Warnings and alarms

The device manages the warning and alarm messages in the error list and reports them in the logbook. The warning and alarm messages which occur specifically varies depending on the functional blocks they contain and the parameterization of the device.

11.2.1 Error messages from the `Time Service`

The enCore device manages the warning and alarm messages from the `Time Service` in the error list and in the logbook under **Time Service**:

Identifier	Cause
🚩 `Configuration invalid`	Incorrect parameterization *Only* the **Sec. external time source** was para-meterized; the **Prim. external time source** however, is **unassigned**. ⇨ 5.1.4 Adjusting system time via external sources, (p. 37)

🚩 `Daylight saving.<Operating Mode>.Configuration invalid`	The change to daylight saving time was unsuccessful. The cause depends on the **Daylight saving** mode selected:
	• **manual**
	  − Type: **Import**
	    Either the imported message is erroneous or no import value is parameterized.
	  − Type: **Not used**
	• **user-defined**
	  The device was not able to evaluate the **Posix TZ string**.
	⇨ 5.2 Daylight saving (p. 45)

🚩 `Warning time setting`	The following conditions are met: • The system time must be set as it deviates from the external time by more than the **Max. synchronization range**. However, only synchronization and not the setting of the system time is permitted (**Time update mode** has the value **Synchronization only**). • The value **Warning** is parameterized for processing the **Error on refused time setting**. ⇨ 5.1.4 Adjusting system time via external sources (p. 37)

Identifier	Cause
🚩 `Alarm time setting`	The following conditions are met: • The system time deviates from the external time by more than the **Max. synchronization range**. However, only synchronization and not the setting of the system time is permitted, i.e., **Time update mode** has the value **Synchronization only**. • The value Alarm is parameterized for processing the Error on refused time setting. ⇨ 5.1.4 Adjusting system time via external sources (p. 37)
🚩 `Warning ext. time source`	The following conditions are met: • All of the parameterized external time sources (**Prim. external time source/Sec. external time source**) are labeled as in error. • In the case of an error, a warning is generated, in other words the parameter **Message on failure of ext. time source(s)** has the value **Warning**. ⇨ 5.1.4 Adjusting system time via external sources (p. 37)
🚩 `Alarm ext. time source`	The following conditions are met: • All of the parameterized external time sources (**Prim. external time source/Sec. external time source**) are labeled as in error. • In the case of an error, an alarm is generated, in other words the parameter **Message on failure of ext. time source(s)** has the value **Alarm**. ⇨ 5.1.4 Adjusting system time via external sources (p. 37)

Identifier	Cause
🚩 Warning	(Only in the case of NTP) The following conditions are met: • None of the parameterized NTP servers (**Server 1** to **Server 3**) is responding within the parameterized timeout. • **Max. poll attempts** of NTP requests were exceeded without a parameterized NTP server (**Server 1** to **Server 3**) responding. • In the case of an error, a warning is generated, in other words the parameter **Message on poll error** has the value **Warning**. ⇨ Adjusting time via NTP (p. 42)

Table 11-4: Time Service – Error messages

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