Honeywell

enCore Device Series

Gas Chromatograph EnCal 3000 proChain GC

Manual
Information for General Use

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Contents

1 About this document and device delivery

1.1 Aim / Scope

This document provides information to gas industry / process instrumentation professionals about the Honeywell ® EnCal 3000 proChain process gas chromatographs from the enCore series of instruments, hereafter referred to as **proChain GC** for short.

The instruments quantitatively measure components in a gaseous sample and are designed to operate in many hazardous areas. The **proChain GC** covers a wide operating temperature range, allowing the fully automated instrument to be placed near the gas sampling point or sample preparation. One of its main applications is the analysis of natural gas and natural gas-like gas mixtures to determine calorific value. For this purpose, the instrument uses the enSuite configuration and analysis software with the corresponding application-related functionalities. For further details on the software, see section

➪ 3 Software (Device operation with enSuite) (p. 141)

The manual explains the basic measuring instrument functions and describes installation, commissioning, operation, use and maintenance.

In addition to the general technical knowledge, this document enables safe and efficient handling of the proChain GC .

For this purpose, you must have a good command of the documentation language, or use another translation of this document. The safety instructions and warnings on the instrument are in English or French.

Depending on the field of activity, different basic knowledge is assumed. Notes on this can be found in the relevant sections. Definitions used in this document can be found in the glossary.

Compliance with all the safety information and instructions set out in this information is a requirement for safe working practice and correct handling of the device and for correct measurement and calculation results.

Furthermore, the directives, standards, local accident prevention regulations and general safety regulations which apply to the field of application of the device, must be obeyed.

If you have any questions, please contact our technical support ➪ 4.2 Technical support Flow Computers and Gas analyzers (p. 314)

1.1.1 Important notes to this document

Only the device and software versions specified on the cover sheet are considered in these instructions. **If supplied with the device, this information also applies to the device.** This document is also available online in PDF format for the duration of its validity and can be downloaded under:

https://docuthek.kromschroeder.com/documents.

If you have obtained this documentation in PDF format, e.g. after an update, you can use the SHA-1 checksum information to test the file integrity.

The SHA-1 information can be found in the comment field of the Docuthek or in brackets on the Elster-Instromet page.

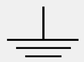
The device series and documentation are subject to change during further development, and are usually associated with a software update ➪ (p. 1). The above link then provides the successor version.

Honeywell recommends that all technical documentation is always kept to hand in the system. For a comprehensive overall understanding of the measuring system, it is essential to read the manual before starting work!

Essentially the same symbols are used both on the device and in the documents to ensure clarity.

Text preceded by a subsequent symbol must be observed.

Symbol	Meaning *Signification*
	This symbol indicates dangers and safety instructions that are very important. Texts marked in this way must be followed under all circumstances. DANGER! indicates an immediately dangerous situation. WARNING! and CAUTION! indicate a possibly dangerous situation. In case of disregard or if the corresponding precautionary measures are not taken, there is a risk of damage to health, environmental damage, damage to property and injuries or even death.
	This symbol warns of action errors when handling the device. PROHIBITION! indicates actions that you are not allowed to perform, unless the specified conditions and prerequisites are met, and you are qualified for the corresponding work.
	This symbol warns against damage and misuse of the device. NOTICE! indicates a potentially hazardous situation which may result in property damage and consequential can lead. Certain conditions must be met or a certain behavior is required to avoid this.
	This symbol indicates tips and recommendations. These are notes and information to facilitate work with the device.
	The symbol on the device is a reminder to comply with all the instructions and important information here in this document. The appropriate parts are marked with the other symbols in this table.

Symbol	Meaning *Signification*
	The symbol on the device denotes the connection for the functional earth (FE).
	This symbol on the device designates the equipotential bonding connection (PA) or the terminal for the electrical connection to the equipotential bonding system and earth.
U = 24 V ⎓	This information on the device means that the power supply is 24 V DC.
	In the interest of our environment, it is not permitted to dispose of the device with household waste within the EU! The symbol is a reminder. in accordance with the European WEEE directive.

NOTICE

Warning signs or warnings incomplete

General safety regulations and expert knowledge concerning the behavior in plants and the handling of gas are considered to be known and are therefore not completely reproduced. A lack of warning signs or information does not release you from your personal responsibility for safety!

The figures serve to show the explained facts. They may differ slightly from the actual design.

The definitions and terms used are largely known in the field of gas industry / process measurement technology. The glossary at the end of the manual provides an additional overview.

For a better distinction between gas and electrical lines in this documentation always the term "cable" is used for electrical lines.

To gain knowledge in the various fields, e.g. installation, operation and maintenance, it is sufficient to read the relevant section after the safety instructions. The relevant passages can be found quickly using the table of contents or the keyword index.

1.1.2 Abbreviations

Short form	Description
°C	Temperature (Celsius) = T_C = T_K – 273,15 = $^5/_9$ (T_F – 32)
°F	Temperature (Fahrenheit) = T_F = 1,8 T_C + 32 = 1,8 T_K – 459,67
AFB	Application function block (enSuite)
AMR	Advanced meter reading
ATEX	Atmosphère explosible (French for explosive atmospheres)
AWG	American Wire Gauge
bar	Pressure (Europ. unit) 1 bar = 0.1 MPa = 14.504 psi
BTU	British thermal unit 1 BTU = 0.0010543503 MJ
$C_{10}H_{22}$	Total decane
C_2+	Results summary (ethane + all higher hydrocarbons)
C_2H_6	Ethane
C_3H_8	Propane
C_6H_{14}	Hexane
C_7H_{16}	Total heptane
C_8H_{18}	Total octane
C_9H_{20}	Total nonane
CAL	Calibration gas inlet
CEC	Canadian Electrical Code
CH	Total of all hydrocarbons
CH_4	Methane
cm	Length 1 cm = 10 mm = 0.3937 in = 0.3937”
CO_2	Carbon dioxide
CPU	Central processing unit
CSA	(Canadian Standards Association) independent standards organization
CVDD	Calorific value determining device
d / rd	Relative density (density ratio of fuel and air)
DBB	Double block-and-bleed (valve block technology)
DC	Direct current
DHCP	Dynamic Host Configuration Protocol (Network setting)
DIN	Deutsches Institut für Normung e. V. (German Institute for Standardization)
DNS	Domain Name System (Network setting)
DST	daylight saving time
EMC / EMV	Electromagnetic compatibility (germ. term EMC)
EN	European standard

Short form	Description
EN/IEC 60079-14	Standard on explosive atmospheres
EPC	Electronic pressure control
F	Farad = 1/ Daraf = S–1 (electrotechnical units)
FE	Functional earth / functional ground
ftlb / ftlb	Pound-foot 1 ftlb = 1 ftlb = 1.355817948 Nm
GC	Gas chromatograph
GCM	Gas chromatography module
GF	Gas family
gr	Grains 1gr = 64.79891 mg
Hi/HiM/HiV	Net heating value / Lower heating value / Inferior calorific value (molar / based on mass / based on volume)
Hs/HsM/HsV	Gross heating value / Higher heating value / Superior calorific value (molar / based on mass / based on volume)
Hz	Frequency
iC_4H_{10}	Isobutane (i-butane)
iC_5H_{12}	Isopentane (i-pentane)
ID	Identification number (enSuite), for example gas cylinder number
IECEx:	(IECEx SYSTEM) International explosion-protection (Ex) rating
in or ″	length in inch (1 ″) 1 in = 1 ″ = 0.0254 m = 25.4 mm
IP	Internet protocol / Protection class
IR	Infrared
ISO	International Organization for Standardization
K	Temperature (Kelvin) = T_K = 5/9 (T_F + 459.67) = T_C + 273.15 (Δ 1K = Δ 1°C)
kg	Kilogram 1kg = 2.204623lb.
l	Liter 1l = 0.001m³ = 0.0353 cft= 0.0353 cu ft
lb	Pound 1lb = 0.4535923kg
LED	Light emitting diode
log	Logbook
LOD (LDL)	Limit of detection, or lower detection limit
LOQ	Limit of quantitation
m	Mass
M (Mm)	Molar mass (of the mixture)
m or mm	Length in SI unit (meter) 1 m = 1000 mm = 3.280840 ft = 39.37008 in (or ″)
m³	Cubic meter 1m³= 1000 l = 35.3147 cft = 35.3147 cu ft
MEMS	Micro-electro-mechanical system
mg	Milligram 1 mg = 0.0154323584 gr
MJ	Megajoule 1MJ = 948.45138280892 BTU

Short form	Description
MLC	Multi-level calibration (done by manufacturer)
MMS	Manufacturing Messaging Specification
MPa	Megapascal (pressure) 1 MPa = 10 bar = 145.04 psi
MPag	Gauge pressure in megapascals
MZ (MN)	Methane number
N	Newton Force (SI unit) $1N=1kg \cdot m \cdot s^{-2}$ = 0.224809 lbf
N_2	Nitrogen (gas component)
NC	Switch/output which is closed when de-energized (NC contact)
nC_4H_{10}	n-butane
nC_5H_{12}	n-pentane
nC_6H_{14}	n-hexane (C_6+)
NEC	National Electrical Code (USA)
neo-C_5H_{12}	Neopentane (2,2-Dimethylpropane)
NIST	US National Institute of Standards and Technology
Nm	Torque 1 Nm = 0.7375621494575465 ft lb
NO	Switch/output which is open when de-energized (NO contact)
NPT	National Pipe Thread (self-sealing (pipe) thread)
NTP	Network Time Protocol (Standard for clock synchronization in computers)
O_2	Oxygen
P1-11K	Calibration gas mixture
PA	Equipotential bonding connection
PC	Personal computer
PELV	Protective extra-low voltage
PG	Process gas/Measuring gas
PGC	Process gas chromatograph
ppm	Parts per million
Pressure (g)	Overpressure (g = gauge)
psi	Pressure (pound per square inch) 1psi = 0.068948 bar = 0.0068948 MPa
Rho	Density at base conditions
RS485	Interface standard for cable-based differential serial data transfer
S	Daraf = 1/ Farad = F−1
SAV	Safety shut-off valve
SELV	Safety extra-low voltage
SFB	System function block (enSuite)
sft^3/scft	Standard cubic foot 1cft = 0.028317 m^3 = 28.317 l
SI	International unit system SI (Le Système International d'Unités)
SLC	Single level calibration (Calibration automatic or by user)

Short form	Description
SSW	Security switch
TCD / WLD	Thermal conductivity detector (germ. Wärmeleitfähigkeitsdetektor)
TCP	Transmission Control Protocol (Internet)
TLS	Transport Layer Security transmission protocol
TP	Circuit board temperature (internal monitoring)
VDE	German Association for Electrical, Electronic & Information Technologies
VPN	Virtual Private Network
WEEE	Waste of Electrical and Electronic Equipment (directive of the EU)
Wi	Inferior Wobbe index / Net Wobbe index
Ws	Superior Wobbe index (Wobbe index superior) / Gross Wobbe index
YOC	Year of construction
Z	Compressibility factor
ρ (Rho)	Density at base conditions

1.2 Safety information and warning

The device complies with the relevant safety standards. The safety and warning notes listed here and on the device (in English or France) support proper handling.

Always observe all safety information in this manual and on the device. Also observe the technical specifications or the data sheet. Always contact Honeywell if you have any questions or are in doubt!

PROHIBITION

- **to operate the measuring device or parts involved in the measurement with damages**
- **operation with modified housing or unsuitable connections.**
- **Installation in a place where electrostatic charges may occur on non-conductive surfaces.**
- **storage and operation at ambient conditions /temperatures outside the temperature range specified on the device / data sheet.**
- **Use in corrosive atmospheres and in potentially explosive atmospheres not specified in the approvals**

The explosion protection is no longer given in these cases.

If it is found that the measuring equipment or other parts involved in the measurement are damaged, the system must be put out of operation, disconnect everything from the gas and electricity supplies and secure the parts to prevent them being used accidentally.

NOTICE

Changes or modifications to the device

In case of unauthorized modifications, the CE declaration loses its validity with immediate effect! A safety risk may arise!

Deviations from these specifications may only be made with the approval of Honeywell. If the device is at the limits of its operating temperature range, consider:

CAUTION

Hot or cold surfaces

Contact can cause burns and frostbite!

In case of doubt, the device should be operated via the remote operation panel.

1.2.1 Intended use

The intended use of this instrument is the gas analysis of natural gas or natural gas-like gas (all components gaseous). For this purpose, all information on the measuring device, its data sheet and in this manual must be observed, as well as the information on installation and maintenance. Handling the equipment requires the personnel to be able to recognize hazards and risks as well as to assess their own work. Particular attention must be paid to:

- Installation only allowed in measuring systems where access control is guaranteed, i.e. where protective measures are taken to prevent unauthorized persons from gaining physical access to the device. Radio interference is possible (device is class A equipment). It may be required, to carry out appropriate interference suppression measures.
- It must be ensured, e.g. by means of high-pressure reductions and safety devices, that maximum permissible device pressures are not exceeded in the installation, even in the event of a fault. The device and any connected vent line must always be in a safe condition. Inspection and maintenance work must be carried out properly.
- It must be ensured that no hazards like electric shock, earth potential shift or lightning strikes exist or can arise, for example by means of an appropriate electrical installation and lightning conductor.

Deviations from these specifications and the following information in this manual are considered **misuse**.

DANGER / WARNING OF MISUSE

Dangerous situations can arise!
Gas can escape and cause consequential damage.

The device protection can be impaired in the event of misuse - only use the device for its intended purpose in accordance with safety- and explosion-protection-rules !

The list of suitable gases and calibration gases can be found in the technical data and in the data sheet of the device. ⇨ 4.1.3 Technical range of suitable gases (p. 308). **For other gases, be sure to contact Honeywell before use.**

If you want to use the device together with devices from other manufacturers or third-party equipment, make sure that they are suitable components.

The corresponding components must have their own operating instructions which provide information on their suitability for joint operation.

1.2.2 Place of use environmental conditions and installation

DANGER Place of use unsuitable

Danger of explosion Risk of extraneous effects

The device may only be installed and used in the potentially dangerous zones specified on it. Access to the device by unauthorized persons must not be possible. Use in a potentially corrosive area only after consultation and approval by Honeywell.

DANGER Improper assembly and installation

Explosion hazard

The regulations in the relevant national and international standards (for example, IEC/EN 60079-14, installation of explosion-protection equipment) must be followed to the letter. Lightning protection is required.

There must not be any ground potential difference between the components of the measuring system distributed in the plant - this must be prevented, e.g. by a properly dimensioned equipotential bonding conductor.

The device housing and mounting base must be included in the grounding system or equipotential bonding system. The grounding connection on the device (together with other connections if necessary) must be used for this purpose.

NOTICE Extreme ambient temperatures

Damage to device and system, incorrect measurement results.

It must be ensured (e.g. by means of an air-conditioned housing) that the device is not exposed to inadmissible temperatures. Temperature range -40 °C (-40 °F) to +60 °C (+140 °F) (according safety approvals).

PROHIBITION

- **Expose the device to direct weather influences (sun, wind, water) without protection.**

Make sure that the device cannot be hit by a water jet (e.g. when cleaning the plant). Outdoors, protect the device from direct sunlight and rain, e.g. with a tin roof. In a windy environment with temperatures below freezing, a windbreak may be required.

1.2.3 Required knowledge of the personnel

Assembly, electrical installation, commissioning and decommissioning as well as inspection and maintenance work may only be carried out by qualified personnel.

The ability to recognize dangers and risks, to assess their own work and to avoid possible hazards must be absolutely present in the personnel employed.

Reference is made to the relevant technical regulations, e.g. Directive RL 99/92/EC (ATEX 137). Do not deviate from this rule in the area of application.

The qualified specialists must have expertise according to EN-IEC 60079-14 Annex A or have comparable knowledge below:

- General safety rules
- Care and use of appropriate safety equipment
- Regulations for electrical safety technology and explosion protection
- Work on electrical circuits for hazardous (explosive) areas
- Working with high pressures and aggressive and dangerous media
- Safety instructions and Warnings in this document

PROHIBITION

- **Handling of the device by persons whose ability to react is influenced, e.g. by drugs, alcohol or medication.**

1.2.4 Information and warnings on the device

All information on the device must be noted and obeyed in all circumstances!

Safety instructions and warnings are given in English or French.

> NOTICE
>
> **Language skills necessary**
>
> Language skills for understanding the safety and warning instructions and their meaning must be available!

The information is engraved on the device or noted on the main type plate or additional type plates and labels. See following example.

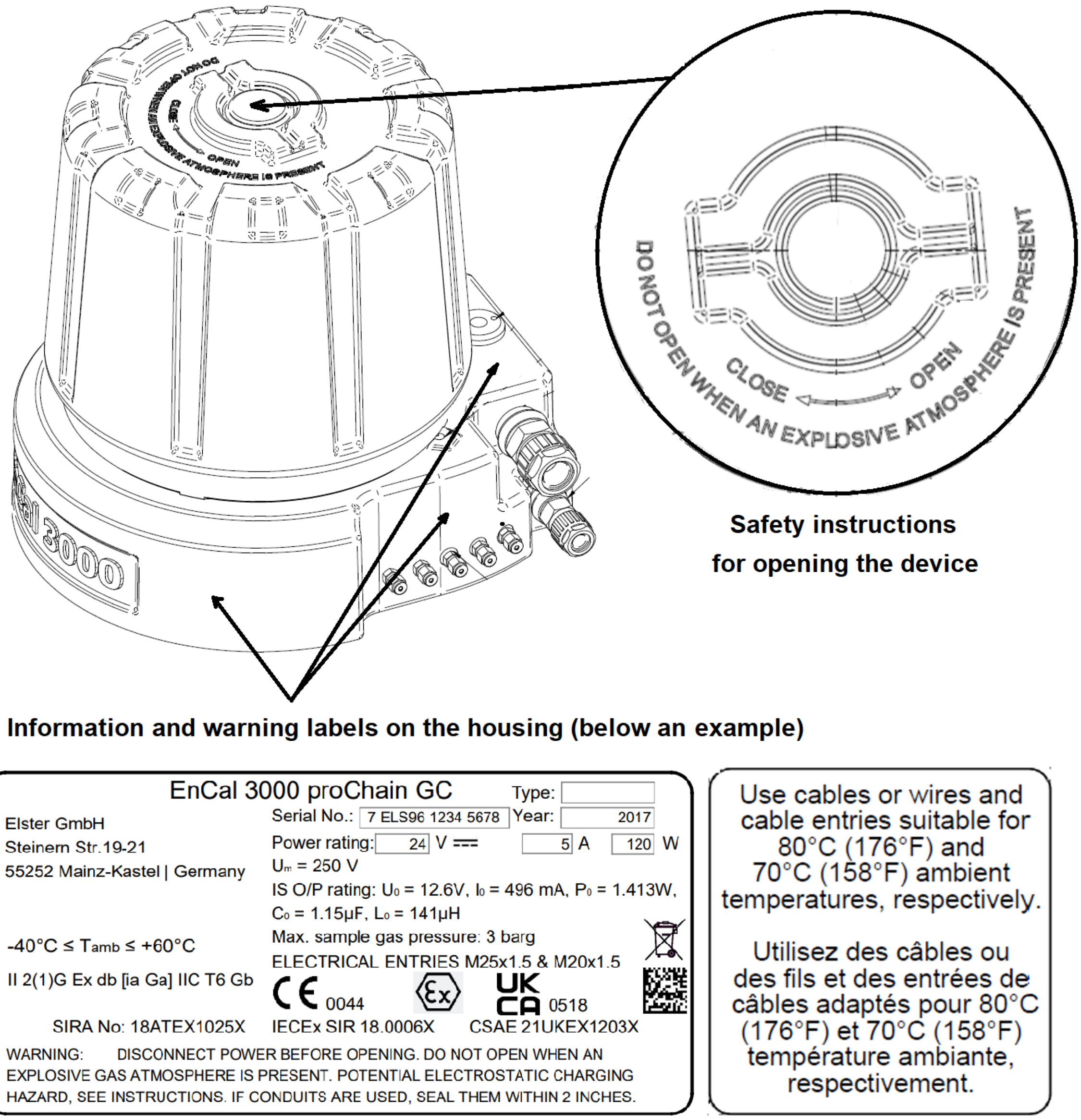


Fig. 1-1: Example warning and information on the housing

1.2.5 Safety information about gases and pressures

The measurement device requires various gases for operation and measurement with different hazard potentials. Supply all gases into the device and out again via fixed lines. Follow the hints in section ⇨ 2.6 Fluidic installation of the measuring device (p. 80)

DANGER

Explosion and poisoning

Gases can form an explosive mixture with air and be toxic. Damage to health to property and to environment can be the consequences of incorrect handling. Always ensure adequate ventilation when working on gas lines and protect against gases containing aggressive or toxic components. Observe the explosion protection regulations.

PROHIBITION

- **Connect gases which are potentially flammable or explosive without the presence of oxygen (for example, C_2H_2 acetylene) to the device.**
- **supply the device with any gas which contains more than 3.0 % vol. of oxygen.**
- **carrier gas pressure above 0.325 MPa(g) ± 0.025 MPa(g) ≙ 47.1 psi(g) ± 3.6 psi(g) ≙ 3.250 bar(g) ± 0.250 bar (g) (even in case of error)**
- **pressure for sample gas/calibration gas/verification gas above: 0.30 MPa(g) ≙ 43.5 psi(g) ≙ 3.0 bar(g) for ATEX / IECEx application (also in case of error)**
- **pressure for sample gas/calibration gas/verification gas above: 0.15 MPa(g) ≙ 21.7 psi(g) ≙ 1.5 bar(g) for cCSAus application (also in case of error)**
- **excess pressure at the outlet ports (also in case of error)**

Pressure regulator should contain a safety relief set at 0.4 MPa(g) ≙ 58.0 psi(g) ≙ 4 bar (g).

1.2.6 Handling explosion-protection devices

DANGER

Faulty handling repair or maintenance of the device.

Damage to health and property (explosion) possible

DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT

Before the device is switched on or switched back on, it must be ensured that all the gas connections are sealed and the grounding or protective conductor is correctly installed.

All covers, lids and hoods, which can be unscrewed to open the housing, must be protected against accidental opening by safety screws.

Contact the manufacturer for repair work which affects the explosion protection and the flameproof properties of the device.

Clean painted devices only with a damp cloth since otherwise electrostatic charging and therefore sparks are possible.

Maintenance must be carried out regularly according to the instructions in this manual.

Explosion- proof devices or housings are equipped with an element that serves to equalize pressure. If this breather called element has to be replaced, this may only be done by authorized personnel.

The breather is not part of the vent (waste) gas system and is in direct contact with the ambient atmosphere. It must not be closed or blocked. No gas escapes during normal operation.

Gas will only escape from the breather in the event of an error. If necessary take suitable precautions to discharge it. For example, for installations in a building, this may take the form of a line into a safe ventilation area or appropriate ventilation of the installation site.

The completely separate line can be connected via the internal thread of the breather (¼ " NPT). The following specifications must be observed for this line:

- The additional pressure drop which may be caused by the pipeline depends on fittings, bends and the material used. It must not allow the pressure inside the housing to rise above 10 kPa ≙1.45psi ≙100 mbar. If a straight smooth pipe is used with a minimum internal diameter of 8 mm ≙ 0.31496 inch and a suitable inlet pressure, lengths of around 40m ≙ 131ft are possible. If you wish to deviate from this specifications or in case of doubt, contact Honeywell.

The breather and the opening of the connected line, if used, must be protected by the operator against dirt, insects and rain, e.g. by a stainless steel insect screen. Protection against rain can be provided, for example, by having the end of the line point downward like a swan neck. This can also be achieved with a suitably bent short piece of pipe, which is screwed directly into the breather as a so-called Swan Neck. Details ⇨ 2.6.5 Connect a Swan Neck (option) (p. 89) Permanent atmospheric ventilation must be ensured.

PROHIBITION

- **Open the housing in the presence of an explosive gas atmosphere.**
- **Loosen the cable entries in the presence of an explosive gas atmosphere**
- **Connect the breather line with other lines**
- **Loosen or unscrew the breather in an explosive atmosphere**
- **Recommissioning procedure in an explosive gas atmosphere**

The operation and maintenance of explosion-proof devices may only be carried out by qualified personnel using explosion-proof, approved work equipment and measuring instruments. Work in potentially explosive atmospheres requires a license. You need a written operator’s license (fire service license certificate), for example, for the following:

- Transporting and/or using a PC or laptop through or in a potentially explosive atmosphere.
- Working on the open device when the operating voltage is live.(e.g. needed for test the device)
- Connecting the control and parameterization device or laptop e.g. via USB.

Follow the instructions set out below carefully and ensure that you have completed all the required safety steps before you work on the measuring unit or switch it on again. When you are working on the device, always switch it off before opening it! After opening, the voltage can be switched on again if necessary, with the operator's permission. Observe hints for ⇨ 2.4.5 Opening and closing proChain GC (p. 61) and the following sequence:

- Close all gas supplies.
- Switch off the supply voltage.
  (According the note on device: DISCONNECT POWER BEFORE OPENING)
  (Mark your work on the switched-off supply voltage and secure it against being switched on again!)
- Protect all open pipelines and connections from dirt.

1.2.7 Electrical safety information

CAUTION Health and equipment damage due to installation errors

The installation must comply with the local electrical and explosion protection standards (for example, DIN, EN, VDE, UL, etc.).

Compliance with standards and directives on the following topics is mandatory:

- Electrical equipment for potentially explosive gas atmospheres
- Operation of electrical systems
- Testing / maintaining electrical systems in potentially explosive gas atmospheres
- Erection of power installations with rated voltages below 1000 V – tests – initial tests
- German Ordinance on Industrial Safety and Health

Each device must be operated with its own voltage source. This must be protected externally by a fuse or circuit breaker.

The SELV system or the PELV system may be used. All electrically conductive parts (housing and, if available, mounting constructions) must be included in the earthing or potential equalisation. For this purpose, the potential equalization connection point (PA) of the device housing must be used in any case. Further connections may be required.The equipotential bonding connection point on the bottom of the device is identified by a sticker.

CAUTION
Health and equipment damage due to unsafe electrical supply

All connected devices have increased insulation against mains voltage. The 24 V DC power supply must have a safe electrical isolation point and be protected by a fuse or circuit breaker.

PROHIBITION

- **Operation without potential equalization / potential equalization line or grounding.**
- **Operation with earth potential displacement or earth potential difference in the parts of the measuring system e.g. between device and control room.**

For details see ➪ 2.5 Electrical installation (p. 64)

Disconnecting device and cables

The device does not have its own off switch and must be operated by the customer via a disconnecting device and current limiting device (or combination of both) to comply with ISO / IEC60079-14 and ISO / IEC61010-1.

An example of such a disconnecting device, which is not included in the scope of supply, is a C 5A circuit breaker, which must be installed near the proChain GC for reasons of explosion protection and electrical safety.

The disconnect device must meet the requirements of the installation site, must be capable of safely disconnecting at least 48 V DC, and must disconnect all power supply lines leading into the hazardous area. It thus contributes to the formation of the power-limited circuit.

DANGER / WARNING / CAUTION

Use of wrong equipment Installation errors

Health hazard Explosion hazard

The installation personnel must ensure that the wiring is protected from overloads and short-circuits and has the required over voltage and over current protection.

The cable shall be suitable for + 80°C ≙176°F.

Use cables or wires suitable for temperatures up to 80°C ≙176°F, they must be suitable for at least 10°C ≙ 18°F ≙ 10K above the maximum ambient temperature.

PROHIBITION

- **Operation without disconnection device**
- **Replacement of internal fuses without authorization**

Without a disconnect device, the unit no longer complies with ISO / IEC60079-14 and ISO / IEC61010-1. Replacement of internal fuses may only be performed by Honeywell authorized personnel.

Conduit systems and cable glands

In the housing of the device are four threaded holes for electrical inlets and outlets. Devices to use conform to cCSAus conditions are supplied with adapters for conduit systems. The conduit system, hubs, fittings, etc. needs a Type rating corresponding to the Type rating of the equipment. Cable glands could not be used in this case.

If the device is not used under cCSAus conditions the threaded holes can be fitted as required with blind plugs, adapters or cable glands. These screw-in parts must be suitable for the IIC Zone and need an explosion-protection certification.

DANGER / WARNING / CAUTION (Explosion hazard)

Use of non-certified or wrong parts (e.g. cable glands)

The device may only be connected using certified parts. These must comply with local explosion-protection regulations and be installed or replaced by authorized trained personnel. To comply with explosion-protection regulations, they must be installed and sealed as specified by the manufacturer of the part. The relevant regulations must be observed during this process.

The cable inlets (with sealing ring) must satisfy or exceed the IP rating (IP 66) and be suitable for temperatures up to 80°C ≙176°F, they must be suitable for at least 10°C ≙18°F ≙10K above the maximum ambient temperature.

NEC-compliant cable inlet equipment must be used in the USA. CEC-compliant cable inlet equipment must be used in Canada.

PROHIBITION

Use adapters several times in a row as well as use with blanking plugs

Only one adapter may be located between the cable gland and the device. Blanking plugs must fit directly into the device bore hole!

Further required properties:

- The cable gland must be sealed and must have explosion-protection certification II2G Ex db IIC T6 Gb.

Conduit system (conduit stop boxes as long as they are cast/sealed)

- Within 1 x D from the housing for ATEX and IECEx
- Within 5 cm (2")

1.3 Data safety information

1.3.1 Security considerations for your network

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

Reporting a security issue to Honeywell

As soon as you encounter a possible security gap of a Honeywell product, please report it directly to Honeywell.

➪ 4.7 How to report a security vulnerability (p. 316)

1.3.2 Enforce a strong password policy

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

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

Document deviations of the best practices

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

Assign passwords

enCore devices are delivered with standard users without password. We recommend to assign passwords for administrator and all main users during commissioning.

1.3.3 Preventing unauthorized external access

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

Furthermore, we recommend to allow protocols and ports only that are actually used for data exchange with the external network, for example, by adding these to the white list of the firewall and allow data exchange with trusted participants only (⇨ 4.1.5 Supported data protocols, p. 311).

To avoid a (temporary) shutdown of the LAN interface due to an unintended packet overload, limit the packet rate to a value you expect during normal operation.

For example:

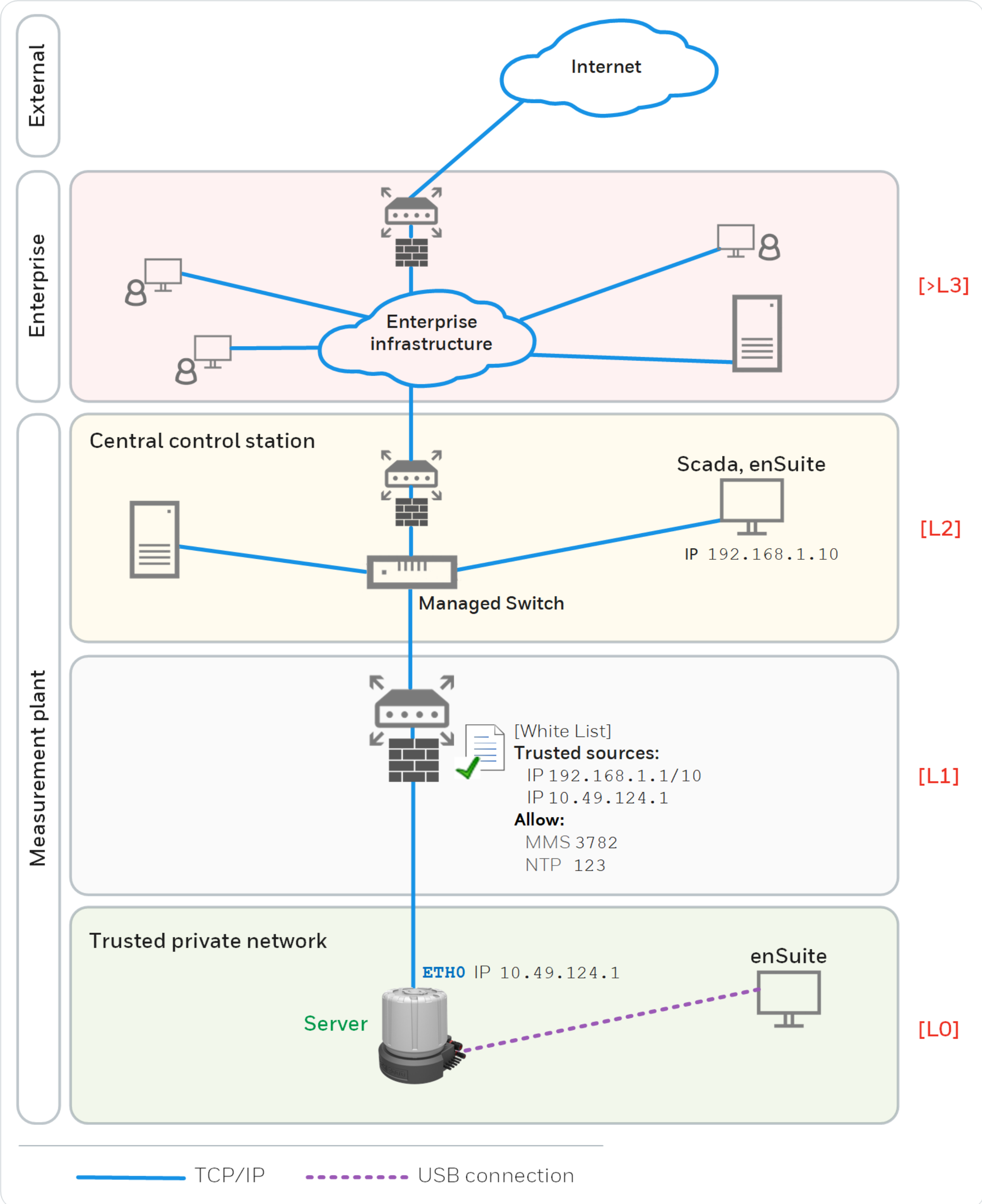


Fig. 1-2: Preventing unauthorized external access to enCore device – example with indication of security zones L0..L3 and higher according to IEC 62443

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

1.3.4 Security for data at rest and data in transit

Security for data at rest

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

To prevent unauthorized access to sensitive data, enCore devices have been storing this data in encrypted form on the SD card since Basic System V 03-39. Since this version, access to sensitive data (e.g., reading out the parameterization) is only possible after authentication with user name and password.

Up to Basic System V 03-38, sensitive data was stored on the SD card without encryption. Here it is even more important to protect the SD card against unauthorized removal and the device against unauthorized access!

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

➪ 1.3.3 Preventing unauthorized external access (p. 27)

Security for data in transit

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

The communication between enCore device and enSuite is carried out via MMS protocol, which is secured via TLS since Basic System V 03-39. Other protocols – e.g., Modbus – transmit data partly in plain text. If possible, use the secure variant of a protocol. (➪ 4.1.5 Supported data protocols, p. 311)

➪ 1.3.3 Preventing unauthorized external access (p. 27)

Use encrypted VPN connection

We recommend using a VPN connection whenever you need a secure data connection but no secure protocol is supported for data transmission.

In a VPN, data is transferred between two or more participants in encrypted form. For this reason, a VPN connection is recommended, for example, for mobile access to an enCore device, access to the private network or for data communication via different systems.

Remote operation panel over insecure HTTP is no longer supported

Since Basic System V 03-39 the unsecure HTTP is no longer supported. Therefore, the remote operation panel can no longer be opened in the browser of a service computer.

Instead, you access the remote operation panel of an enCore device in enSuite using the action of the same name. In this case, the connection is established via MMS and secured via TLS.

TLS certificate for MMS communication with enSuite

To prevent data from being read by other network users during MMS communication between the enCore device and enSuite, the data is transmitted in encrypted form only since Basic System V 03-39. The encryption is carried out using the TLS (Transport Layer Security) transmission protocol. The enCore device uses a self-signed certificate to authenticate itself to enSuite each time an MMS connection is established. Normally, the certificate is created once when the enCore device is put into operation and announced to enSuite during the first MMS connection. However, it can be newly generated later.

1.4 EnCal 3000 proChain GC after delivery and at the place of use

This section gives an overview of how to handle the device before, during and after installation at the place of use.

NOTICE

Improper device handling (storage/ transport/ assembly)

Malfunctions and damage of the device are possible!

Observe the notes in this document and on the device packaging.

Sequence of the required work:

1. Unpack the measurement device and any other components and check them for signs of damage and missing or incorrect parts.
2. Install the device in its position using the fastening materials provided ➪ 2.4 Mechanical installation proChain GC (p. 56) or storage the device properly again until its installation ➪ 1.4.1 Storing proChain GC (p. 32).
3. Connect the gas lines as well as the auxiliary and vent lines to the device and set the gas pressures, open the shut-off valves and check all lines for leaks. ➪ 2.6 Fluidic installation of the measuring device (p. 80).
4. Install the power supply and connect the communication cables. ➪ 2.5 Electrical installation (p. 64)
5. Install the ➪ 3 Software (Device operation with enSuite) (p. 141) on your computer/ laptop (parameterization device)

The installation sequence of the device is described in detail in in the hardware section.

1.4.1 Storing proChain GC

Prerequisite(s)

- The environmental specifications listed in the device data sheet are complied with.
- The packages are stored packed in closed, clean and dry rooms.
- Mechanical shocks (vibrations) do not occur during storage.

During storage, the device is not connected to the power supply. For this time, the battery ensures internal data retention.

- for storage times within one year, the device is (again / still) ready for use.
- for storage times between 1 and 3 years, the device is not ready for use again until the battery has been replaced.

NOTICE Fully discharged battery

Data will be lost if the battery is completely discharged during the storage period. Save important data on a PC before storage.

After three years, the battery is completely discharged. Contact our technical support if you want to store the device longer than three years.

1.4.2 Transporting proChain GC

> **PROHIBITION**
>
> - **Remove of transport guards and other safety devices, for example, for gas connections, before the device has been installed at its place of use and if dirt can still penetrate it.**

Prerequisite(s)

- Transport protection guards and protective devices, e.g. for gas connections, are attached to the instrument.

Steps

1. Transport the device to its place of use, avoiding extreme temperature fluctuations and the formation of condensation.
2. Check the device for condensation, if no condensation has occurred during transport the device can be used immediately. Otherwise, continue to the next step.
3. Slowly bring the device to room temperature.
4. Open the device ⇨ Opening proChain GC (p. 62) and let it dry for at least 12 hours. If necessary, contact Honeywell.

2 Hardware

The Hardware section is intended for trained personnel in the gas industry or process measurement technology and contains the explosion-relevant information. According to the definition, this personnel can assess the work assigned to them and identify possible dangers.

Based on this requirement, trained personnel are assumed to be familiar with general safety rules and these are therefore not reproduced in full in this document.

This section additional explains the basic functions of the measuring instrument and how to handle the EnCal 3000 proChain GC. In addition to general technical knowledge, the following information will enable safe and efficient use of the proChain GC.

> DANGER / WARNING / CAUTION
>
> **Work without observing the safety and explosion protection regulations**
>
> Risk of damage to health explosion is possible
>
> Any individual appointed to perform work on or with the proChain GC must read and be familiar with the content of this section prior to the work. In addition the summary of relevant safety and warning notices should be known
>
> Any unclear points and questions must be clarified before starting work!

2.1 proChain GC design and features

In its basic configuration, the measuring system consists of the **measuring unit** in an explosion-proof housing and a freely selectable **data processing unit**, for example a PC or laptop, to read and evaluate the measurements (e.g. in a control room).

The measuring unit is the actual **process gas chromatograph (PGC)** and is enclosed in an explosion-proof housing including the all analytical and electronic components required for autonomous automated operation. It conducts the analysis autonomously from a meteorological point of view and can be positioned close to the gas sample tap or sample conditioning system. Changes in ambient temperature have no significant influence under normal conditions the device does not need a temperature-controlled environment.

Depending on the application, up to 5 gas streams can be analyzed sequentially. To do so it uses the latest micro-electro-mechanical system components (MEMS) to determine very accurate analysis results. Compared to conventional gas chromatographs only approx. 2.9 l ≙0,102 cft carrier gas a day and 600 ml ≙0.0212 cft per calibration (1 Calibration /day) are needed. (Standard values per module and depending on application). Routine calibration could take place automatically and can be programmed by the user.

Based on the composition the analysis result is delivered in less than three minutes and includes the complete composition of any natural gas up to C6+ (standard), lower heating value, density and Wobbe index. In this way it makes the laboratory method of gas chromatography available on an industrial scale.

The **data processing unit** can be used for operating the device and serves also as a data logger within the system. It displays the operating stages of the measuring unit and is also used for configuration and data management.

The measurements are archived and can be transferred by the measuring unit via the outputs to the data processing system using the Modbus protocol (two Modbus ports) or a TCP/IP connection. Archives such as the log are managed internally. Signals and messages can be generated. Furthermore, it is possible to connect external signals and monitor contact closures in a control room, for example the low-pressure limit value of the calibration gas cylinder. The measuring unit and data processing unit use the "**enSuite**" PC software.

Both the hardware and the software of the system are modular, which means that the proChain GCconfiguration and programming may vary depending on the measuring task.

Overview key features of the proChain GC:

- Explosion protection to ATEX and IECEx (compact Ex-d version)
- IP 66 protection against dust and precipitation (suitable for offshore applications)
- Fully autonomous operation and featuring analytical MEMS components
- Integrated sampling system, automatic calibration and verification
- Maintenance work only required once a year
- High-speed analysis (C_6+ in less than three minutes), up to five streams possible
- Repeatability (with SLC) < 0.015% for all calculated properties at steady temperature (can be increased with MLC).
- Internal data logger, log and audit trail
- Standard temperature range: 0 °C (+32 °F) to +60 °C (+140 °F)optional expansion with internal heating up to -20 °C (-4 °F) with internal heating and external insulation up to -40 °C (-40 °F)
- EMC certification to EN 61000-6-2/4 (technical equipment)
- Vibration and impact test in accordance with OIML D11
- Maintenance work is only required once per year.

Further information see technical data sheet and the labels on the device.

2.1.1 Labels and information on the device

Information on the device must be noted and obeyed in all circumstances!

The layout and content or meaning of the labels and signs on the device can be seen in the following.

Metrological type plate (measuring ranges)

The details relating to the approved measuring range are given on a special label, the metrological type plate on the device base. All the listed measurements can be output. The information refers to the standard state which is also defined.

NMi		Metering ranges TC11244					
Ambient temp.		Gas temp.		Nature of gases	Cal Gas	Gas flow (l/h)	
Tmin	Tmax	Tmin	Tmax	burnable natural and natural-like gases		Qmin	Qmax
-25 °C	+55 °C	-25 °C	+75 °C		P1-11K	2	40
Accuracy (Class A to OIML R 140 Hs: ≤0.5 %, p: ≤0.5 %) with following component measurement ranges and cal.gas composition in [mol%]							
Cal gas	Component Formula	Min.	Max.	Cal gas	Component Formula	Min.	Max.
8	N2	0	20	0.5	i-C4H10	0	1
balance	CH4	65	100	0.5	n-C4H10	0	2
3	CO2	0	12.5	0.025	neo-C5H12	0	0.1
6.5	C2H6	0	11	0.1	i- / n-C5H12	0	0.3
2	C3H8	0	4.5	0.025	n-C6H14	0	0.3
Heating value: 28.0 to 46.5 MJ/m^3, Wobbe index: 31.7 to 54.7 MJ/m^3, Densitiy: 0.74 to 1.01 kg/m^3							
According to ISO 6976 at T_1=25 °C, T_2=0 °C and base pressure p_0=101.325 kPa							
Determination of the compressibility factor according to the selected standard ISO 6976							

Fig. 2-1: Measuring ranges

Furthermore, there is an uncertainty ≤0.25% and a repeatability ≤0.015% (relative standard deviation) for Hs and ρ. The drift of this values is ≤0.1 %.

Type labels

The type label will vary depending on the application and country of use for the device. The language and specified standards or regulations will be adjusted accordingly. The details on the placed label or labels always apply and are exclusively to the device.

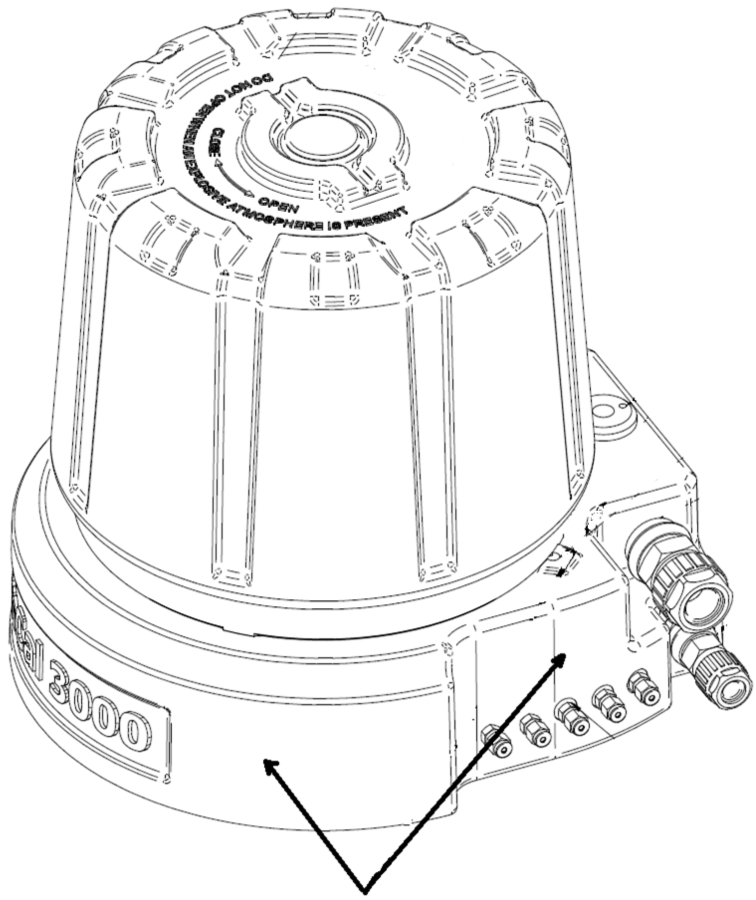
The main type label, containing the most important details, is located above the sample gas inlets on the right at the base.

In order to meet various approval conditions and if the main type label cannot provide sufficient space for all the details, the device can also be equipped with additional type labels which also affixed to the housing base.

These labels always contain the following data, possibly spread over multiple labels:

Data on the type label and additional type label
Manufacturer and manufacturer’s address with the address of the production site
Device type, type designation, serial number and year of manufacture MM/YYYY
2D matrix code and warning note to read the documentation
Gas inlet pressure range, ambient temperature range and enclosure
Voltage and power consumption
Approvals issued, approval number, CE mark with auditor number
Complied with or to be complied with environmental regulations such as WEEE or RoHS
Ex rating
Warning and connection instructions, in several languages, if necessary
Maximum sample gas pressure

The figure shows the positions of the type labels.



Possible positions of type plates

Fig. 2-2: Example positions of the labels

The following shows some examples of type labels :

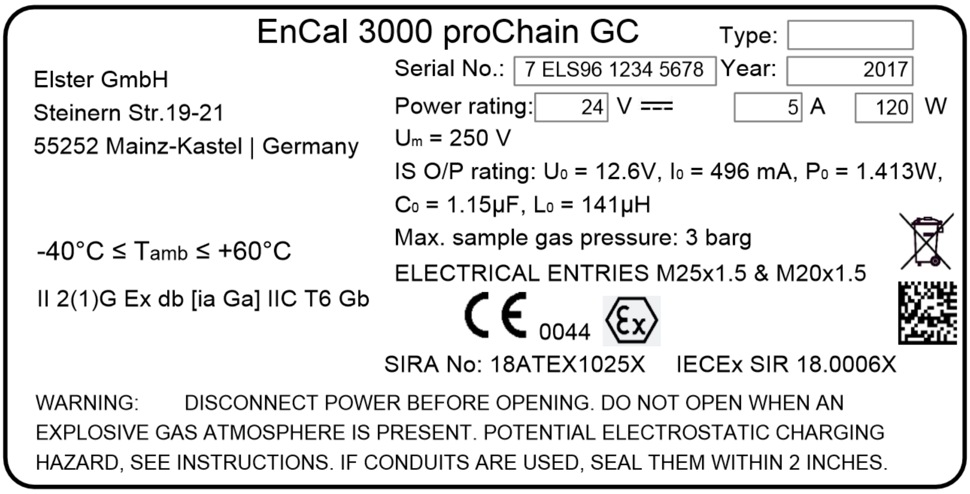


Fig. 2-3: Example type plate ATEX and IECEx

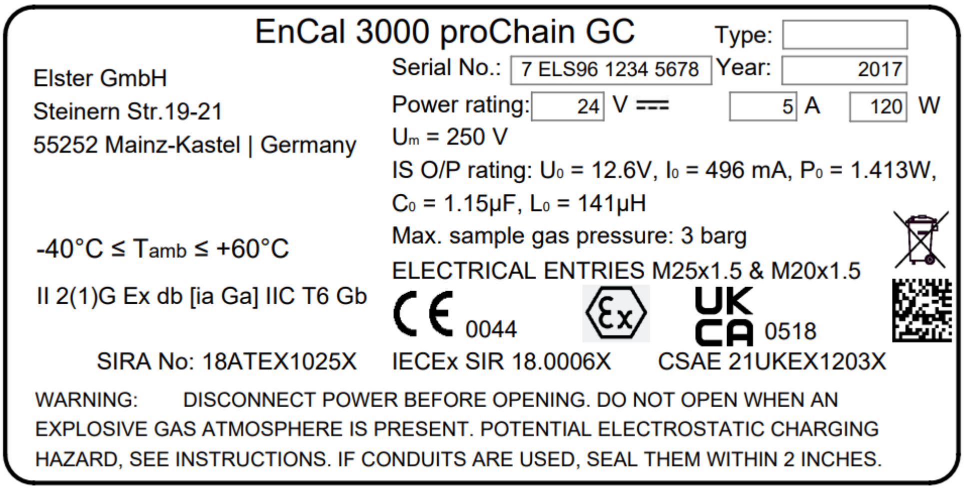


Fig. 2-4: Example type plate UKCA

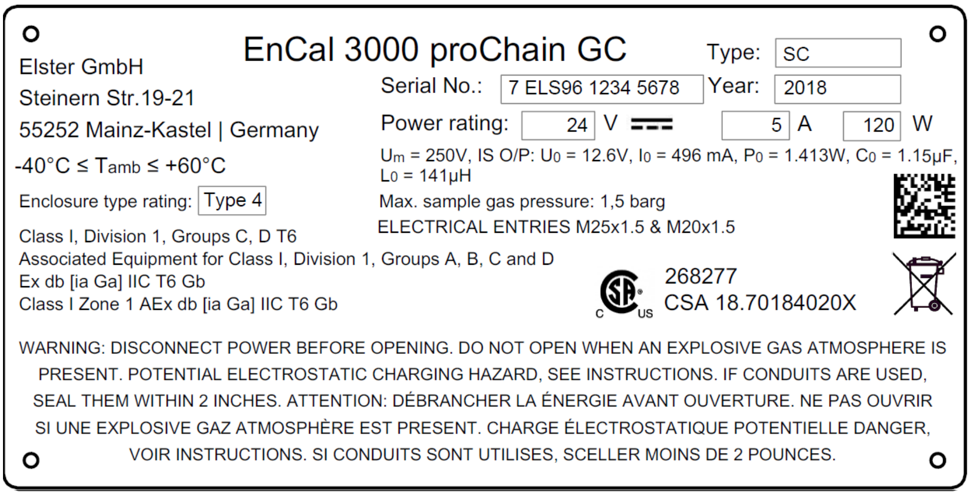


Fig. 2-5: Example type plate US /CA

7 = Gas (division)
ELS = Elster GmbH Mainz (manufacturer´s code)
96 = Production site MZ-Kastel
123... = 8 digits long individual serial number

Type Identification	
Option	Description
SC	Single channel, 1 instead of 2 analytical channels
HT	Heated, Additional housing heaters

Fig. 2-6: Description of the numeric key

Please note, the device is used by default with 24 V DC voltage at 5A

Um = 250V IS O/P rating: U0 = 12.6V, I0 = 496mA, P0 = 1.413W, C0 = 1.15µF,L0 = 141µH is the characteristic to the optional intrinsically safe display: This is only for information, if the display is used it is connected internal. No external power supply is needed.

The safety instructions for opening the device can be found on the top of the cover.

The gas inlets and outlets are also labelled ⇨ 2.6.1 Overview gas and vent connections (Fluidic interfaces) (p. 81)

2.1.2 Explanation of explosion protection markings

Icons / symbols	Meaning
Device Ex symbol	Designations around these symbols (on the nameplate) indicate the area of application taking explosion protection into account. Notified body, device group, device category, Ex zone, Ex class, type of protection, explosion group, temperature class and device protection level are indicated among other things.

Used Shorthand	Description / Explanation
0044	Ex marking for **Notified Body** Notified Bodies are state notified and supervised testing bodies. On behalf of the manufacturer, they inspect the conformity or compliance with corresponding standards and regulations for his products and/or his production.
II 2(1) G	Ex marking complete device suitable for ex- zone 1 and 2 (gases/vapors) **Ex zones** Potentially explosive areas are divided into zones according to the frequency and duration of occurrence of hazardous explosive atmospheres. The following applies to flammable gas-air mixtures: **Zone 0 / Division 1** is an area in which a hazardous explosive atmosphere is present continuously, for long periods or frequently. **Zone 1 / Division 1** is an area in which a hazardous explosive atmosphere may occasionally occur during normal operation. *(Division 1 comprises the combination of Zone 0 and Zone 1 areas)* **Zone 2 / Division 2** is an area in which a hazardous explosive atmosphere normally does not occur during normal operation, and if it does, it does occur only rarely and for a short period of time.
Ex db / AEx db	Principle and type of ex-protection (in this case flameproof enclosure) **Flameproof enclosure** By using **this protection principle and type of protection** parts that can ignite an explosive atmosphere are enclosed in a housing. The enclosure will withstand an internal explosion and prevent transmission to the atmosphere surrounding the enclosure.
[ia Ga]	Shorthand of **Intrinsic safety**, another protection principle. This is only used of some device parts. The protection principle works by limiting the energy.
IIC	Ex marking of **Explosion group** **Group I** contains equipment for mine workings endangered by firedamp. **Group II** for all other potentially explosive atmospheres. The classification is based on the equipment design and the hazardousness of the gases. It increases from explosion group II A to II C.
T6	Ex marking of **Temperature class** (in this case 85°C) The maximum surface temperature of the device must always be lower than the ignition temperature of the explosive mixture. The following temperature classes are specified: T1=450 °C (842 °F) T2=300 °C (572 °F) T3=200 °C (292 °F) T4=135 °C (275 °F) T5=100 °C (212 °F) T6= 85 °C (185 °F)
Gb	Ex marking of **Equipment protection level (EPL)** (in this case "high") Equipment for potentially explosive atmospheres where there is no risk of ignition during normal operation is classified in three levels of protection. These apply to gas (G) and dust (D) „Very high" protection level (**Ga or Da**) no danger of ignition in case of foreseeable or rare malfunctions „high" protection level (**Gb or Db**) no danger of ignition in the event of foreseeable faults or malfunctions „increased" protection level (**Gc or Dc**) Additional protective measures are taken to ensure that there is no danger of ignition in the event of foreseeable malfunctions of the device.

2.1.3 Design of the measurement point (system overview)

A typical measurement point consists of up to five sampling lines from the gas pipeline (s) to the measuring instrument, depending on the application. If necessary, a "**sample conditioning system**" must be installed and adjusted upstream of the sample gas inlet. If the pipeline pressure is higher than the maximum inlet pressure, the sample conditioning system must include a **safety pressure relief valve** to prevent sample pressure to the proChain GC from exceeding the maximum allowable limit (hint under . The system must maintain sample integrity by lowering sample pressure without causing condensation in the sample. It must also remove any solids or liquids before sending the low-pressure sample gas to the proChain GC.

It is recommended that sample transport lines to the proChain GC be heat-traced to maintain sample integrity and avoid condensation of water vapor or heavy HCs during low ambient temperatures. The streams of gas are measured in sequence. Gases which have passed through the device are fed into the vent gas.

The carrier gas (one each module possible) and calibration gas are generally supplied from gas cylinders with pressure reducers installed near the device, see section for pressure settings. These auxiliary gases are used to maintain operation and measurement accuracy. The gas supply will generally last for several years of operation. By using an optional changeover valve, the exchange of gas bottles is possible without interruption of operation. This option is shown on the helium cylinders in the next figure below.

All components and sample tubing (made of stainless steel) should be installed permanently. An additional heating is required for the use below the freezing point. The gases leaving the device must not cause any back-pressure in the exhaust system and must not interfere with each other. To enable this, the gas from the module vent(s) (MV) must always be discharged separately. The power supply and the communication cables must be connected and installed as usual in industrial environments. The following figures shows system layouts in simplified form, flowmeters can optionally be installed in the exhaust gas streams to obtain further status information of the device.

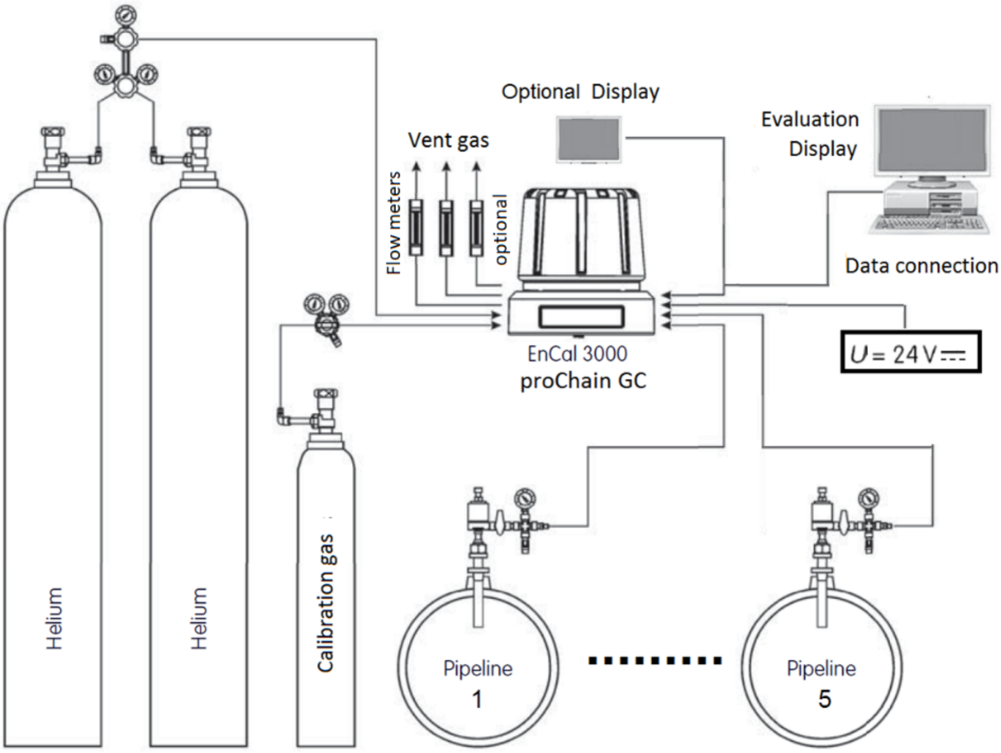


Fig. 2-7: Example system overview for standard application C6+

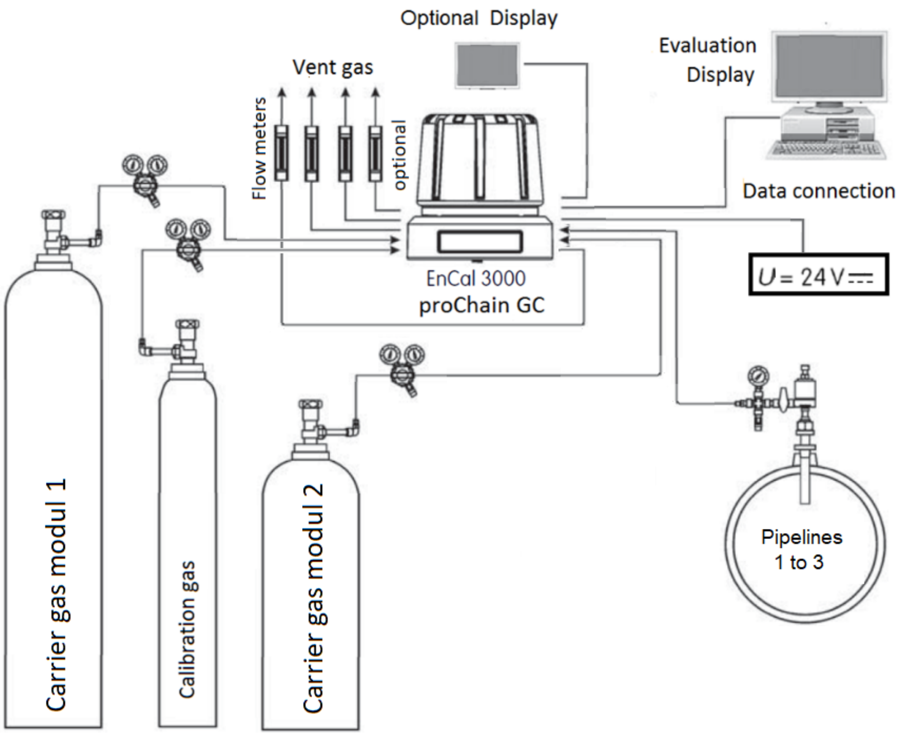


Fig. 2-8: Example system overview for two carrier gases and two module vents

2.2 The general measurement concept

The measurement concept is based on gas chromatography, an analytical method for analyzing gas mixtures, in other words, for measuring the concentration of the various components of a gas mixture.

For this purpose, a very small quantity of the sample gas to be analyzed is heated and inserted into a carrier gas stream by an injector. This carrier gas transports the sample through a very thin tube known as a “column”. Because of its internal structure, this tube acts as a separating medium and is therefore also known as a “separation column”.

The different properties of the individual components of the sample gas mean that they have different transit times through the column. As result the mixture is separated into its individual components.

At the outlet of the column, each component is measured by a detector. Based on the mole percentage of each individual component, every gas property can be calculated and displayed in a chromatogram. The following diagram shows this relationship.

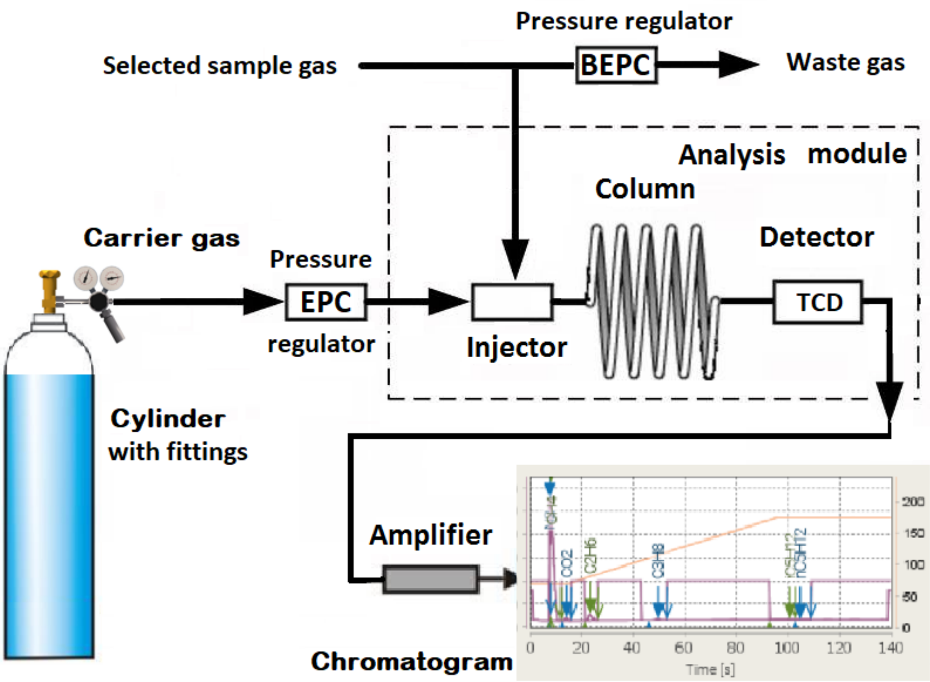


Fig. 2-9: The analytical principle

The individual parts of the analysis module and the design of the proChain GC is described in the following.

2.2.1 Housing with analytical modules

The chromatograph is supplied in an Ex-d housing with several special features offering space for up to two analytical modules. The explosion-proof aluminum housing essentially consists of a low base on to which a relatively high cover is screwed using an M270 thread. The mounting holes in the base at the rear (M8) and on the underside (M5) enable it to be secured.

The housing design allows it to be used in the most extreme conditions which are conceivable for natural gas applications. Only the cover must be removed for inspections, maintenance work and the electrical installation. **For safety reasons, this may only be done by trained personnel.** ⇨ 2.4.5 Opening and closing proChain GC (p. 61). As soon as the cover has been unscrewed and removed, almost all the internal components are directly accessible:

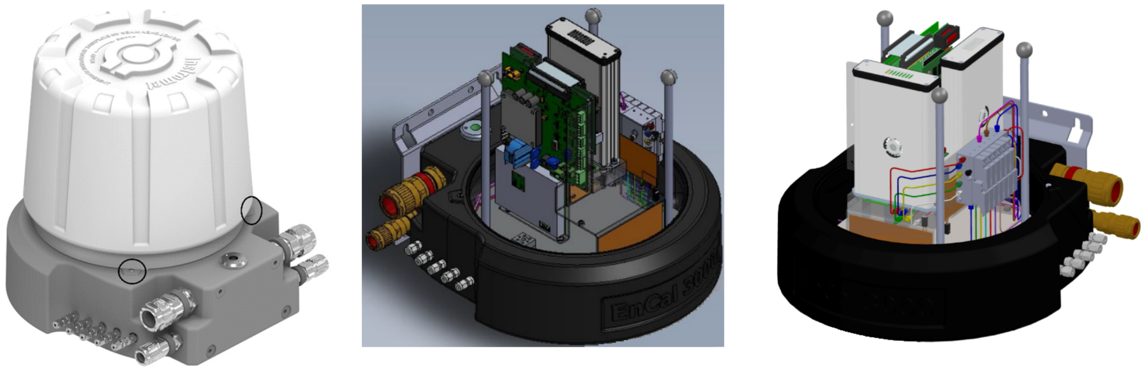


Fig. 2-10: Housing with and without the cover one and two modules

The open housing provides a view of the layout of the main components and internal parts. The frame is used to fasten the individual components. It enables all components on the mounting plate located on the base to be removed directly and individually. The housing contains all the electrical and electronic equipment such as:

- Printed circuit boards for processors, Ethernet, Modbus and digital I/O
- Fuses, switches, jumpers and DC-DC converter for multiple circuits
- Optional regulation of housing temperature and required heater foils
- GCM 1000 analytical module(s)
- Internal sample conditioning system and electronic pressure controllers

The components can be removed directly and individually by unscrewing / undoing screws. This layout allows the service technician to inspect and replace the components easily in the event of a malfunction.

2.2.2 Internal parts (analysis) and device design

In the open device, **the analytical module** with its separate housing called **GCM1000** is noticed first. The housing also contains the necessary electronics and cooling fans for the module. The number of modules, one or two, and their features or characteristics depend on the measurement task and vary.

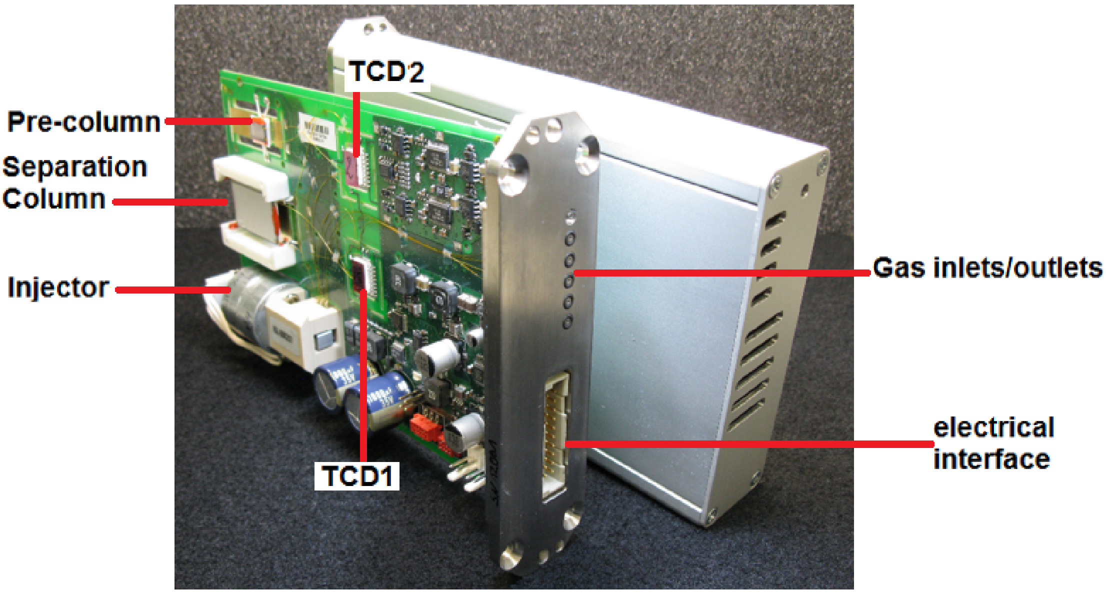


Fig. 2-11: GCM1000 internal board and housing

If two GCM1000 are used, they can work in parallel and each module is responsible for one part of the overall analysis.

Following components are the main parts of the GCM1000, they are inside the separat GCM housing and not visible for normal users:

The sample injector, simply **the injector**, injects a fix volume of sample gas into the carrier gas stream. The injection must precisely deliver the sample gas at a consistent volume, pressure, temperature, and flow rate. This is important to the repeatability of the analyses. MEMS technology is used for this purpose, in comparison with traditional fine mechanical technology, this injector achieves high-precision control of the injection volume and temperature.

The separation columns, or **columns**, used in the proChain GC are fabricated also in MEMS technology.

The inner coating or filler materials are known as the **"stationary phase"**. They are used as an adsorption layer for the gas molecules flowing through the column and ensure the actual separation of the components. Different types of column chips can be used depending on the expected gas composition or measurement task.

The thermal conductivity detector (TCD), **the detectors**, used in the proChain GC are manufactured in MEMS technology too and have a much lower volume than their predecessors. The circuit is designed as a so-called Wheatstone bridge.

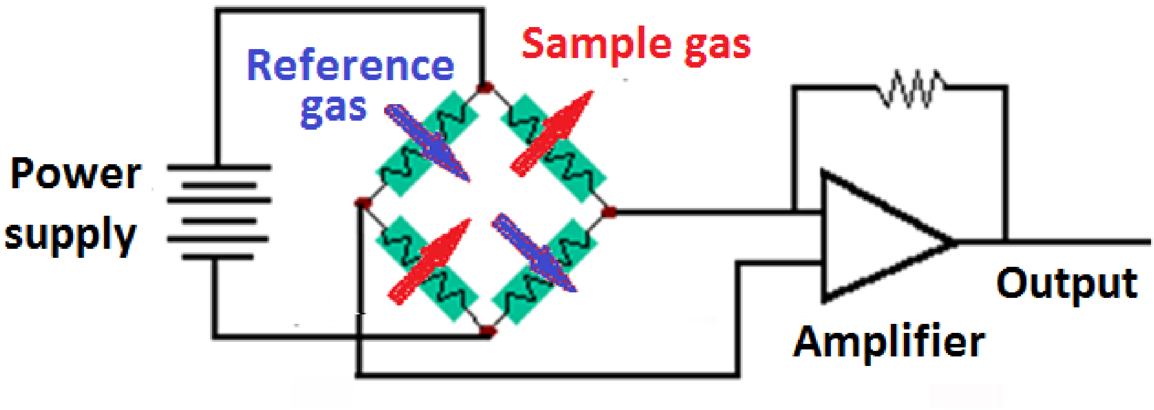


Fig. 2-12: Detector

Two fluidically independent cells for reference gas and sample gas are used. Temperature differences occur between the chip (approximate temperature +100 °C (+212 °F)) and the filament (temperature up to approx. +350 °C (+662 °F)), depending on the thermal conductivity of the gas, which result in the bridge losing its tuning and thus a change in the electrical circuit.

The internal sample conditioning system is another main component of the device. After passing through the inlet coupling (inlet filters), which are no substitute for a proper sample conditioning system and only filter out small particles to protect the device, the gas flows into the manifold.

Several valves are installed on the manifold, depending on the number of sample streams and modules, see following figure.

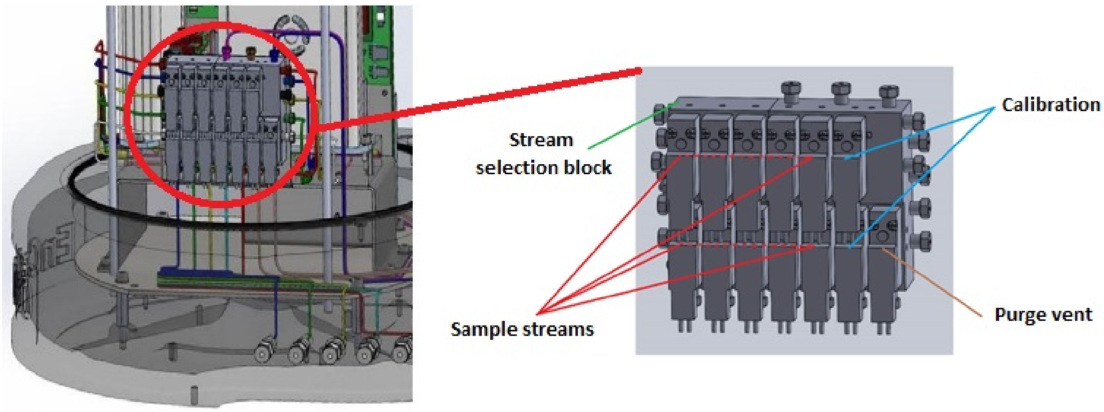


Fig. 2-13: Example internal sampling system (five streams) in the device

The internal sampling system has the following functions:

- Stream selection with “double-block-and-bleed function”
  (depending on the application up to five sample gas streams and one calibration gas stream)
- Supply of carrier gas (argon or helium) and sample gas / calibration gas to GCM1000 module(s)
- Connection of the vents or outlets (gas lines) of the GCM1000 module(s)
- Integrated bypass function (purge valve)

The sample bypass valve is a purge valve. The valves which are installed above each other directly to the left of the purge valve are used for calibration and are activated in pairs at the same time.

To the left of the valves for the calibration gas stream, there are one to five pairs which are used for the process gas streams. Depending on the configuration, the manifold may connect between two and six streams (maximum five sample gas streams plus one calibration gas stream). Not used positions on the manifold are blocked.

In the operating state, gas enters the lower valve and flows to the second, upper valve. The second valve guides the stream to a manifold line. When it is deactivated, the supply is blocked by the lower valve and the discharge is forwarded to the vent which discharges the gas into the opening (SBV).

The supply through the upper valve is also blocked and no pressure can build up between the valves. If one or both valves have a leak, the pressure will not rise above the line pressure since the gas is forwarded to the vent (SBV). It is not possible for it to mix with the stream. This circuit realizes the double-block-and-bleed function (DBB).

The discharge from all upper valves is combined via a manifold line. Depending on which stream is active, the deactivated valves and part of the line form a dead volume.

The discharge from the deactivated valves is released to a second vent which is blocked by the sample bypass valve. The internal sample bypass is therefore realized as follows:

The activation (opening) of the valve causes a flow from the activated stream through the upper, deactivated valves for the other streams and through the sample bypass valve into the vent gas. This means that all the second (upper) valves and the tubes and therefore also the dead volume are refreshed or purged. The flow, details in next section, which then becomes established is around 15 times higher than in normal operation due to the lower flow resistance of this stream.

At the same time, the flow through the analytical module(s) is reduced but not stopped. When the purge valve is closed (default condition), the flow through the analytical module(s) returns to normal and the purge time is over.

If a new stream is selected, the sample bypass valve is activated automatically. To adjust the opening time, the lengths of the tubing between the sampling points and the device and the pressure between the sampling points must be given. See also next section.

If the stream is changed during a measurement, flushing will start immediately after the injection while the analysis is running to prevent unnecessary waiting times. Remember that flushing and flush time also apply to the calibration gas. Lengthy, frequent flushing will empty the cylinder more quickly.

The following figure represents the normal operating case: stream 1 is measured. The DBB function is demonstrated using the example of the calibration gas (CAL). If the upper or lower valve is leaking, the gas (shown in pink) is always routed to the vent gas duct and to the SBV.

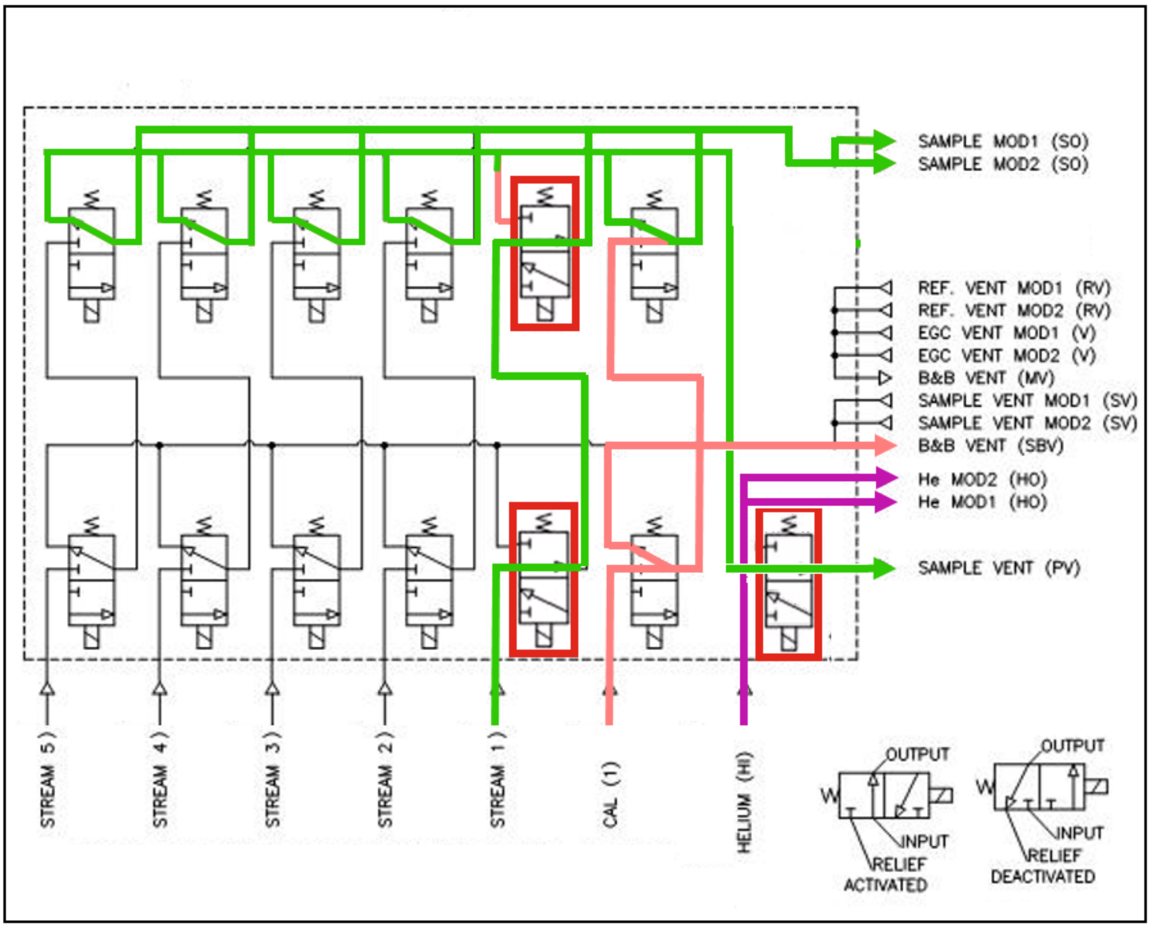


Fig. 2-14: Gas flow diagram, normal operation

The next figure shows the stream selection system in which calibration gas is now supplied to the GCM .

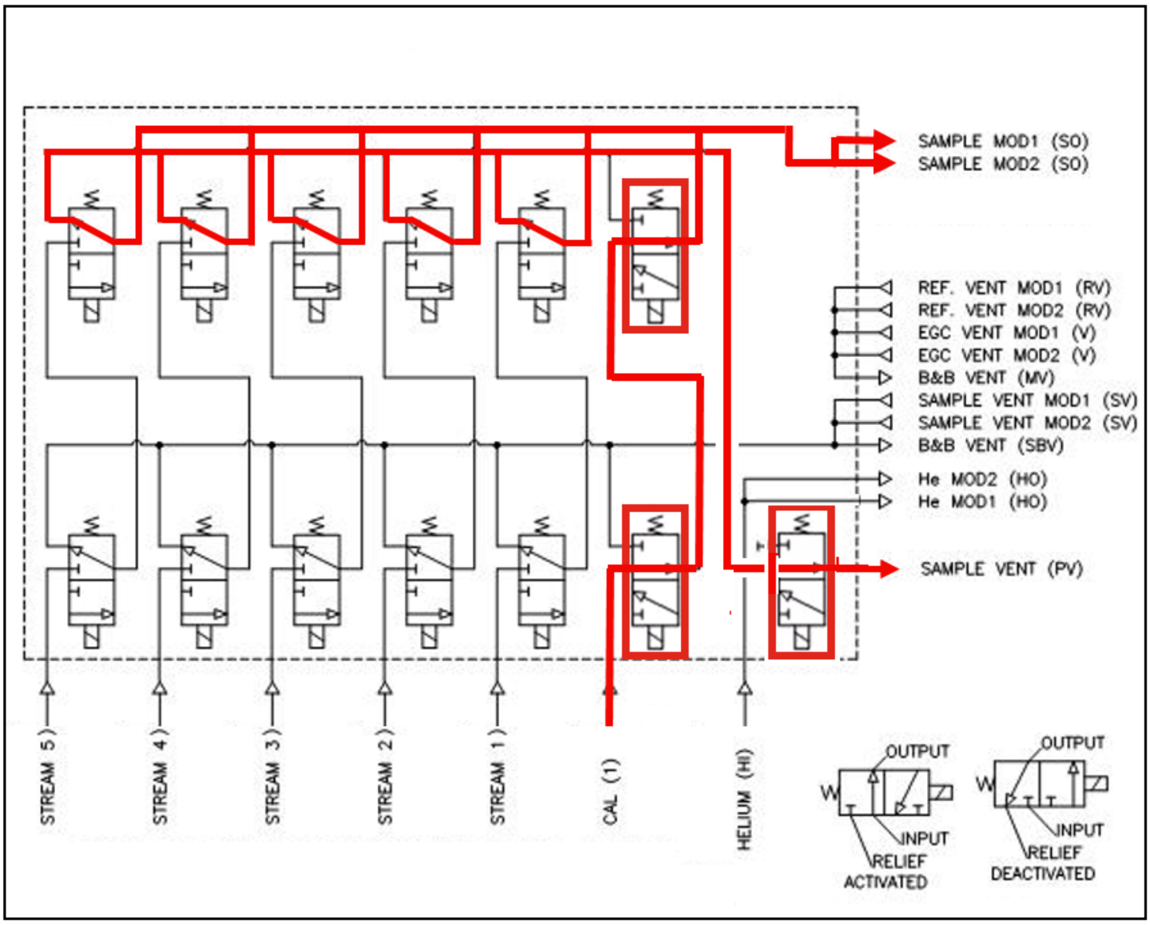


Fig. 2-15: Calibration gas flow diagram

After the carrier gas, sample gas and, if applicable, the calibration gas has entered the inlet filter flame arrester and selection system, they pass the electronic pressure control (EPC) where the gas pressure is adjusted before they reach the GCM, the core of the proChain GC.

2.2.3 Process bords (PCBs) in the EnCal 3000 proChain GC

The EnCal 3000 proChain GC contains following electronic boards to manage the measurement results and the communication.

There is a Terminal Board, a Base Board, a Processor Board (CPU3Core) and electronic (back) pressure regulation board(s).Additional passive module connection board(s) exist.

The intrinsically safe IS Display Board is an optional additional PCB.

The overview shows the main PCBs.

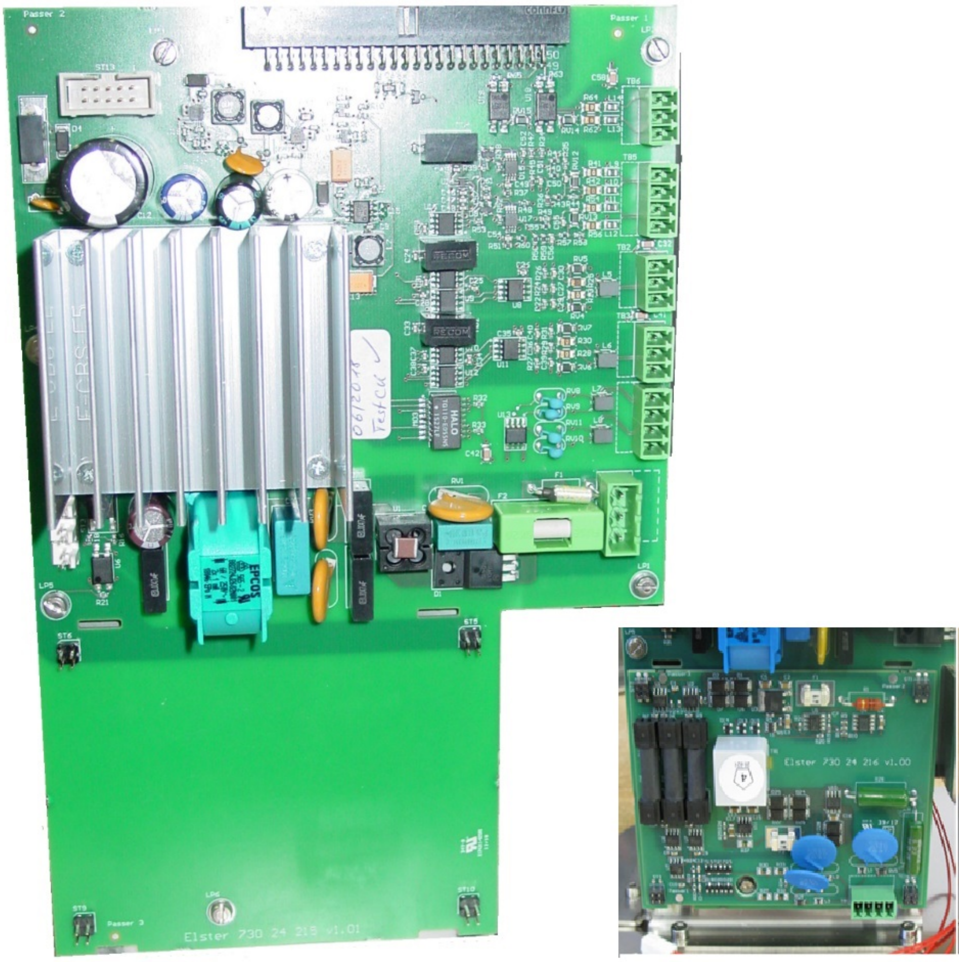


Fig. 2-16: Overview PCBs (left Terminal Board/ right optional IS Display Board

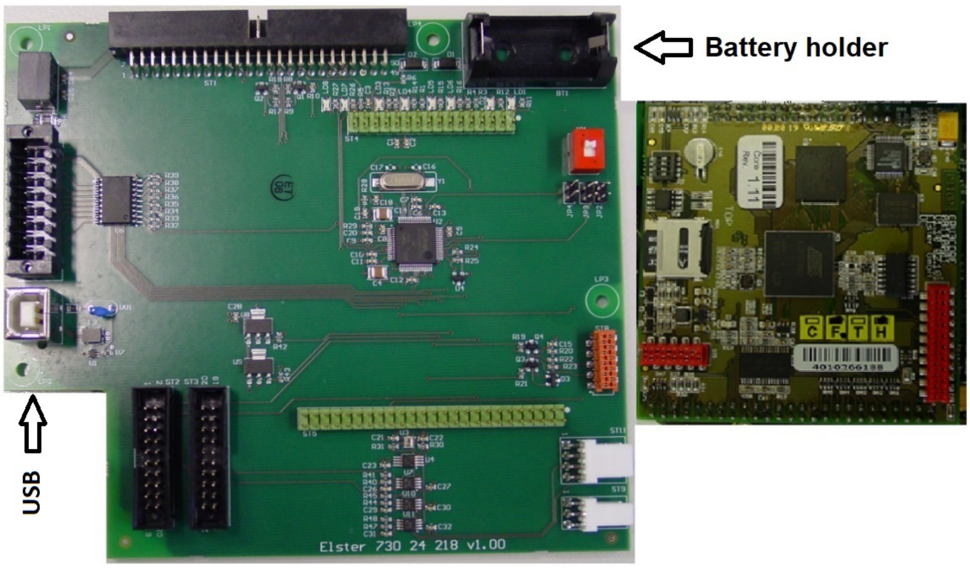


Fig. 2-17: Overview PCBs (left Base Board / right CPU 3 Board)

The PCBs carry the electronic components and are responsible for control, calculation, archiving, displaying as well as for the input and output of signals or data.

2.2.4 Procedure and results of the measurement

After passing the inlet coupling, even small particles have been filtered out and the gas flows into the manifold to which multiple valves are connected. These components build the internal sampling system with the following functions:

- Stream selection with “double-block-and-bleed” function (up to five sample gas streams/one calibration gas stream)
- Supply of the carrier gas and the sample gas for the GCM1000 module(s)
- Connection of the vent gas lines of the two modules
- Integrated bypass function (purge valve) for around 15 times higher flow than in normal operation (flow 20 – 30 Nl/h software selectable)

Depending on the configuration, the manifold may connect between two and six streams (including the calibration gas stream) for measurement. If a new stream is selected, the sample bypass valve is activated automatically for an adjustable time. The lengths of the tubing between the sampling points and the device and the pressure between the sampling points must be given due consideration in the adjustment.

If the stream is changed for the next measurement the flushing will start during the current measurement. This procedure is called “stream ahead flushing”. The flushing will automatically start immediately after the injection while the analysis is running to prevent unnecessary waiting times. The flushing time for the calibration gas can be adjusted separately. It is typically set to 60s to have a enough flushing and avoid too much calibration gas consumption.

After passing the manifold, the gas is forwarded (in parallel) to the downstream components. The last job of the manifold is then to transfer the gas to the vent, after it has passed through the analytical module(s).

After the carrier gas, sample gas and, if applicable, the calibration gas has passed through the sample conditioning and selection system, they must pass the electronic pressure controllers where the gas pressure is adjusted before they reach the GCM module, the core of the proChain GC.

Different processes are used for the carrier gas on the one hand and for the sample or calibration gas on the other hand

- The carrier gas pressure is actively regulated by an electronic pressure controller (EPC)
- The sample, or calibration, gas flow and pressure are controlled via a Backpressure EPC (BEPC or sort: BPC).

A combination of EPC and BPC pressure controllers is located before each GCM module.

The injector injects a fix volume of sample gas into the carrier gas stream. This package reaches the first separation column (pre-column). The light components pass the pre-column and flow into the second column (analytical column).

The light components are separated by the analytical column and measured by the first detector. In most cases, the analytical column is temperature programmed.

The heavier components are still in the pre-column. The flow direction of the carrier gas is reversed and the component are flushed back to the former inlet of the pre-column and measured by the second detector.

After this analytical run is completed, the columns are cooled to their starting temperatures by an active fan.

The differences of the thermal conductivity are detected in the TCD. It results in the peaks in the chromatogram. The chromatogram is now evaluated and analyzed. The figure below shows examples of a chromatogram. All the main gas components can therefore be directly recorded and processed.

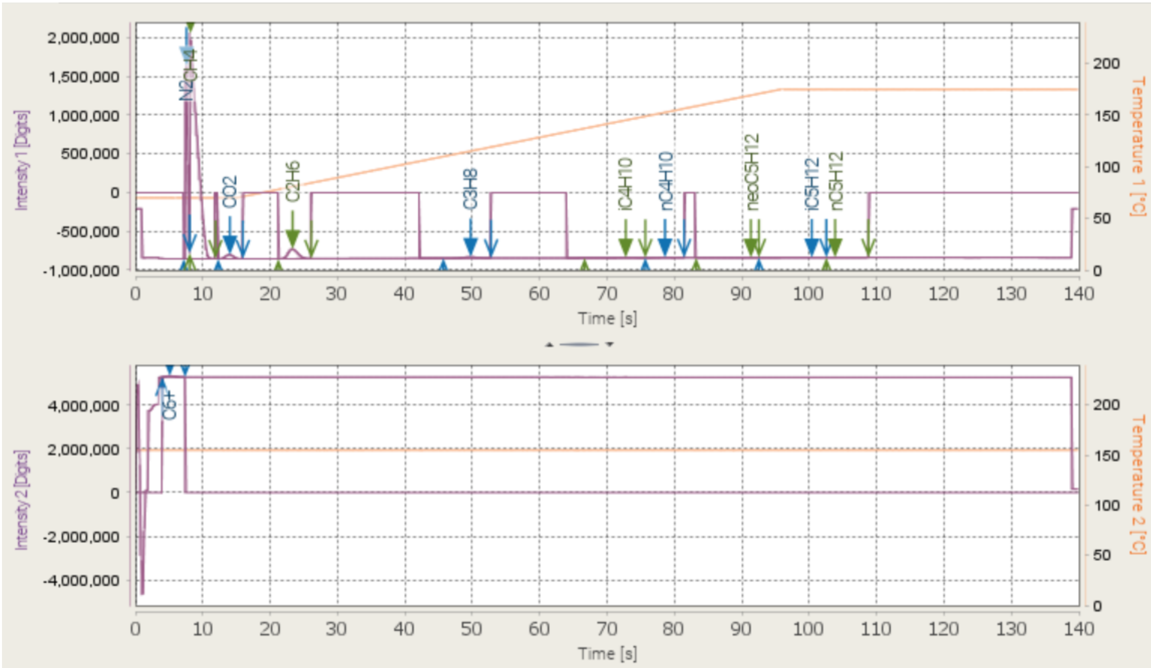


Fig. 2-18: Chromatograms

2.3 Optional add-ons

The proChain GC offers several options. If not ordered directly, these can also be installed subsequently. In addition to the pure extension of functions by a second analysis module, it is also possible to extend communication through an **external USB service interface** (only for ATEX / IECEx application) or a **local display**. Furthermore, the operating temperature range can be extended to below freezing point by an **additional heating system**.

NOTICE

Risk of short circuit and leaks

The device may damage and dangerous situations can occur

For safety reasons, optional additions should only be fitted by Honeywell or a trained specialist who has the needed information from the **INFORMATION FOR SERVICE USE** manual.

2.3.1 Housing heater (opt. for use below 0 °C (+32 °F))

For use in temperatures from 0 °C (+32 °F) down to -25 °C (-13 °F) the device can be fitted with an additional heating system .

If this option is required, the proChain GC is generally fitted with the required parts at the factory. If the heaters must be retrofitted, this must be done by personnel authorized by the manufacturer for safety reasons.

To protect the proChain against overheating, this function does not operate whenever the temperature inside the housing reaches of + 40 °C (+104 °F).

The heating function is adjusted and modified via the PC software enSuite. Please refer to ⇨ 3.4.2 Adjust settings of the housing heating system (p. 212) or to the online help for this software for further information.

2.3.2 Ext. USB connection (option for ATEX / IECEx application)

The use of the USB connection extends access to the device and is beneficial for communication. The screw-in USB port, offered by Honeywell, could used in an non explosive atmosphere under ATEX / IECEx conditions.

> You cannot use this option under cCSAus conditions because the certification of the USB bushing does not match that of the device.
>
> For screw-in USB connections not offered by Honeywell, note that they must be installed according to the manufacturer's safety instructions, that the certified explosion protection must match the device, and that local requirements must be met.

Fig. 2-19: USB connection

If this option should be retrofitted, this must be done by personnel authorized by the manufacturer for safety reasons.

For further details see:

➪ 2.8.1 Use of the ext. USB interface (ATEX / IECEx option) (p. 101)

2.3.3 Local display (option)

The proChain GC is designed for operation with the enSuite software. All functions, measured values and setpoints can be set and read via this software. The handling of enSuite is explained in more detail in section ➪ 3 Software (Device operation with enSuite) (p. 141)

Optional, it is possible to view the main data via a local display. If the device has already been ordered with this option, the display is already connected and ready for use.

If you want to retrofit the display, you will need the following components: Display (SAP No. 73024269), IS display board (SAP No. 73024216) with protective cover (SAP No. 73024221).

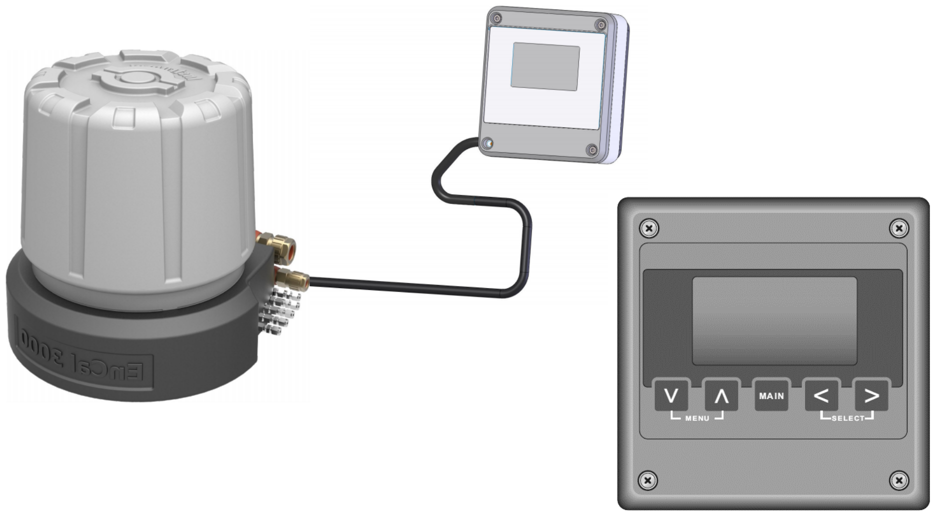


Fig. 2-20: Overview optional local display and front view with five keys

The illuminated intrinsically safe Honeywell Enraf display is constantly updated. The display is suitable for use in suitable for use in potentially explosive atmospheres and is connected to the device via an approx. 1.8 m (5.9 ft) long cable.

For further mechanical details see

➪ 2.4.3 Mounting distances local display (option) (p. 59)

Handling and operation of this option describes

➪ 2.8.2 Optional local display observation of device (p. 102)

Depending on local and national regulations, the display may only be used indoors.

2.4 Mechanical installation proChain GC

PROHIBITION

Carry out any of the work mentioned in this section if you do not have

- **the necessary instructions from the manufacturer or his representatives!**
- **the permission of the plant operator**

Select an installation height between 1.0 m (3.28 ft.) and 1.5 m (4.92 ft.) above the floor which is suitable for maintenance work.

There must be a minimum gap of 700 mm (2.30 ft.) above the base of the device and 100 mm (0.33 ft.) in front of the gas connections or a radius of 225 mm (0.74 ft.) around the center of the cover.

We recommend that you use larger gaps to make installation and maintenance work easier.

Prevent dirt and / or moisture from entering the device during work and possibly causing damage.

2.4.1 External dimensions of proChain GC

Please note all dimensions are given metric and in mm.
1 mm = 0.03937" NPT adapters are available for the threads

The relevant dimensions (raw dimensions) are highlighted in bold. Some of them will change depending on the types of fluidic and electrical couplings used.

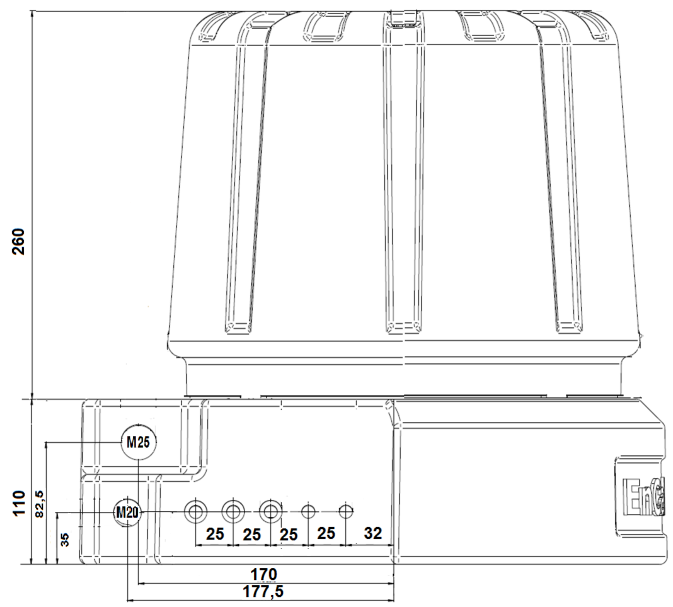


Fig. 2-21: Side view with dimensions (without couplings and connections)

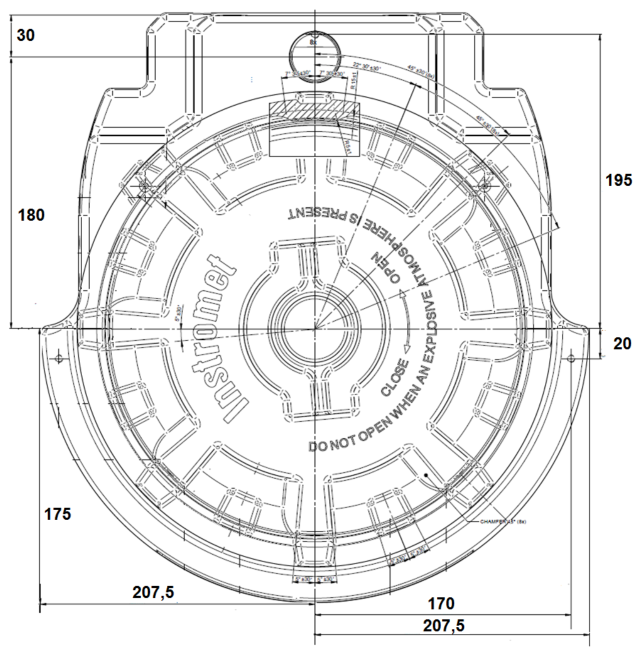


Fig. 2-22: Plan view with dimensions (without couplings and connections)

2.4.2 Mounting distances and installation options

There must be a minimum gap of 700 mm (2.30 ft.) above the base of the device and 100 mm (0.33 ft.) in front of the gas connections or a radius of 225 mm (0.74 ft.) around the center of the cover. We recommend that you use larger gaps to make installation and maintenance work easier. The following figure shows these requirements.

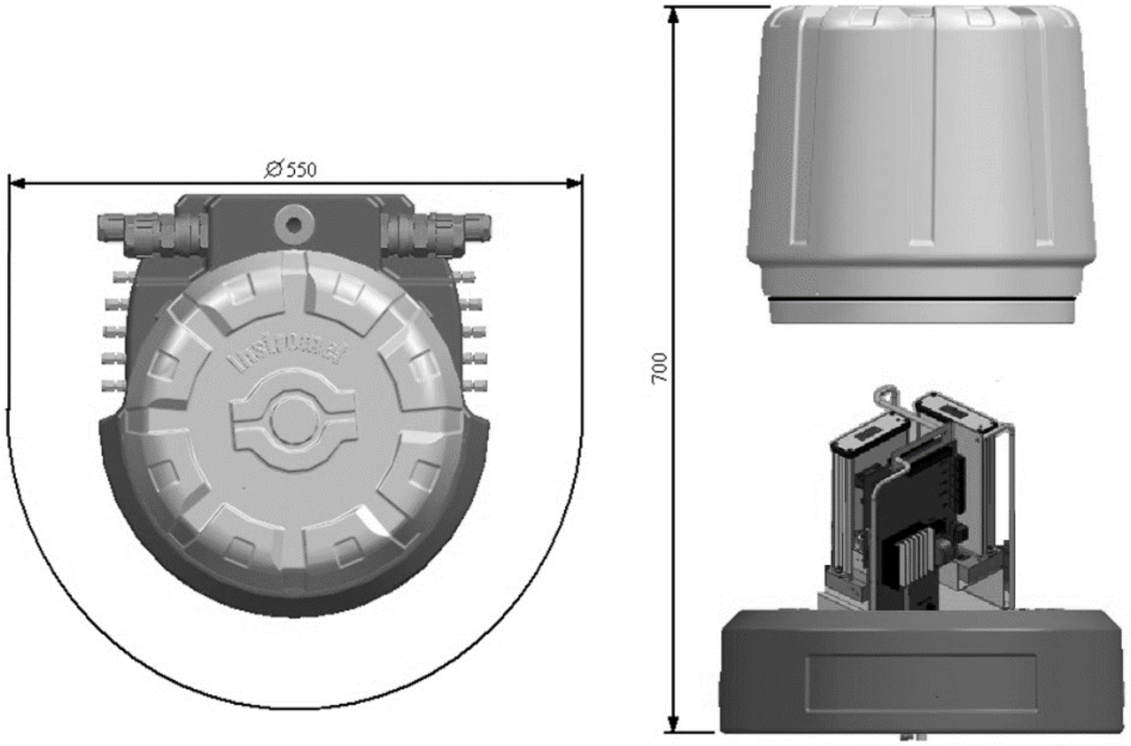


Fig. 2-23: Minimum installation gaps

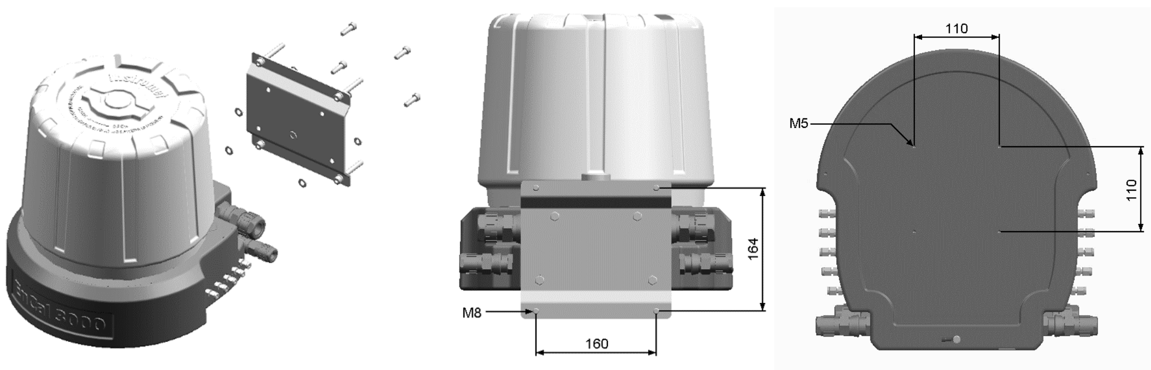


Fig. 2-24: : Installation options

> Note all dimensions are given metric and in mm. 1 mm = 0.03937"

2.4.3 Mounting distances local display (option)

The local display can be held in the hand for easy reading. It can be attached to a wall or rail near the device (cable length 1.8 m (5.9 ft)) via a two-part magnetic holder.

Fig. 2-25: Local display with magnetic holder as retrofit set

The part of the magnetic holder to be fixed is shown on the left in the above picture, its dimensions can be taken from the following drawing. Make sure that your mounting material (screws and dowels) are suitable for the surface and are flush with the holder.

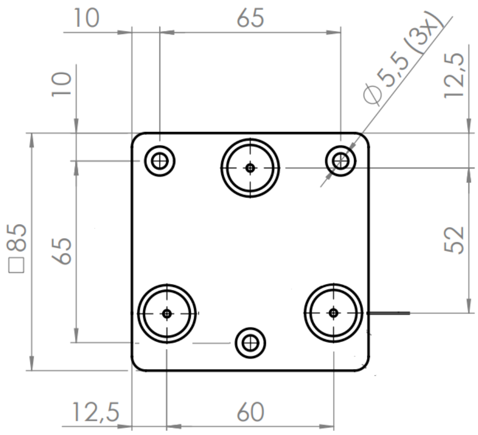


Fig. 2-26: Dimensions display holder

Please note all dimensions are given metric and in mm. 1 mm = 0.03937"

2.4.4 Place of use and installation

The measuring device should be installed as close as possible to the process gas sampling point in order to avoid long supply lines, since the volume and pressure of the line, in addition to the dead time of the measuring device itself, determine the timeliness of the measurement result.

The installation site must meet the safety conditions see

➪ 1.2.2 Place of use environmental conditions and installation (p. 17)

NOTICE

Extreme conditions at the installation site, e.g. outside buildings.

Incorrect measurements or device damage are possible !

Protect the device from direct sunlight and rain, e.g. by using a metal roof or an additional air-conditioned housing. Make sure that the device cannot be hit by a jet of water (e.g. when cleaning the system).

The meter weighs approximately. 29 kg ≙ 64 lb . Before mounting, make sure that the mounting surface has the sufficient stability.

The proChain GC must always be operated in a horizontal position, with the analytical module(s) and hood at the top.

The proChain GC can be installed on a flat vertical surface (wall/measuring board) or on a horizontal surface. All connections with the exception of the breater are left and right. To do this, use the mounting holes provided in the housing and, if necessary, additional mounting plates (as shown in the following section). For example, the measuring unit can be mounted to a horizontal surface using the four threaded blind holes in the base plate of the housing (not with the stainless steel nameplate supplied) with four screws. Use appropriate fasteners and counterparts (i.e., bolts and nuts or dowels) in each mounting hole.

The material to which the unit is attached must be able to withstand a combined vertical load of 1000 N at the attachment points, equivalent to a weight of approximately 100 kg.

DANGER Working in hazardous areas

Risk of damage to health, environment and plant

Obey the explosion-protection rules at all times when working with tools or on items in hazardous zones.

2.4.5 Opening and closing proChain GC

To perform the electrical installation and for subsequent maintenance work, the device has to be opened and closed again.

Securing the detachable parts for opening the housing

All parts that can be unscrewed to open the housing are protected against unintentional opening by locking screws.

> **To open / unscrew, screw the locking screws shown in the following figure into the basic housing**

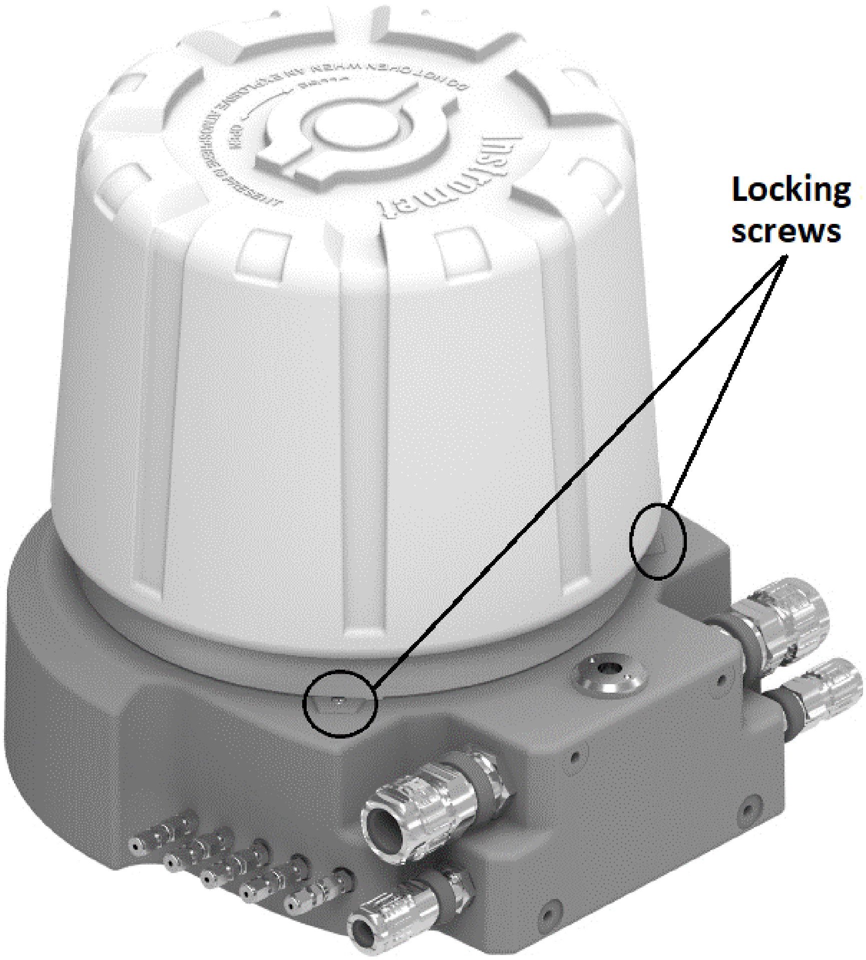


Fig. 2-27: Locking screws

> At the end of installation or maintenance, unscrew the locking screws tightly against the cover or hood which has been screwed back on.

Opening proChain GC

PROHIBITION

- OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT
- OPENING BEFORE DISCONNECTING THE POWER SUPPLY
- **Opening without the permission and consent of the system operator.**
- **Opening in the absence of conditions according to ISO / IEC61010-1*.**

* Controlled conditions according to the ISO / IEC61010-1 prevail, namely temperature +5 °C (+41 °F) to +40 °C (+104 °F); humidity up to 80% at +31 °C (+88 °F), linearly decreasing to 50% at +40 °C (+104 °F) (usually these are residential and office conditions). In case of doubts, contact Honeywell.

Prerequisite(s)

- Permission and consent from the system operator to open installed equipment is available in writing.
- Expolsive atmosphere is not present.
- Voltage is switched off.
- Conditions according to ISO / IEC61010-1 are given.
- An authorized person (calibration officer) is present if required by the regulations of your country, and the measurement task of the instrument.

Steps

1. Mark your work on the switched off supply voltage and secure it against being switched on again!
2. Monitor the environment for the presence of an explosive atmosphere, e.g., with a gas leak detector, continuously during the entire process.

DANGER

EXPLOSIVE ATMOSPHERE

Damage to health and property (explosion) possible

Stop work immediately if an explosive atmosphere occurs!

3. Screw in the locking screws ⇨ Securing the detachable parts for opening the housing (p. 61).
4. Unscrew and remove the cover counterclockwise without tools. If fhe cover cannot be turned, contact our technical support ⇨ 4.2 Technical support Flow Computers and Gas analyzers (p. 314)

The inside of the device is accessible.

Handle with care and caution as sensitive parts are contained here.

Prevent electrostatic discharge e.g. with ESD wrist strap according to EN 61340-5-1.

Closing the housing of proChain GC

Prerequisite(s)

- Work on the opened device has been completed.
- An authorized person (calibration officer) is present if the regulations of your country and the measuring task of the device require this.
- Device as well as sensor and signal lines are sealed according to the conditions of the applicable authorization, if necessary, e.g. when it is used within the scope of legal meteorology.

Steps

1. Screw in the cover clockwise to the stop, without tools.
2. Unscrew the locking screws to protect the cover from unintentional opening ⇨ Securing the detachable parts for opening the housing (p. 61)
3. Check the effectiveness of the locking screws, if movement of the secured parts is still possible, unscrew the screws further and check mobility again. If you are unsuccessful, contact our technical support. ⇨ 4.2 Technical support Flow Computers and Gas analyzers (p. 314)

When the device is properly closed, remove the work notice on the supply voltage Turn on the supply voltage and all gases to start operation.

2.5 Electrical installation

Before starting work, make sure that you observe the general safety rules. Also observe and follow the information in section ➪ 1.2 Safety information and warning (p. 15). Especially in potentially explosive atmospheres use a gas leak detector when working on the device and make sure that it is voltage-free (supply and signals) before any change of the wiring. It is essential that you follow the instructions.

> PROHIBITION
> **Carrying out the work described in the section without the required instructions by the manufacturer or his authorized representatives and the permission of the plant operator.**

The local / national installation guidelines (e.g. EN 60079-14) must be observed for all work. A functioning effective lightning protection must exist at the place of use and the device must be connected to the equipotential bonding or earth. An external switch-off device must be installed near the device by the system operator.

Above all, the following sections are important:

➪ 1.2.2 Place of use environmental conditions and installation (p. 17)

➪ 1.2.7 Electrical safety information (p. 23)

➪ Disconnecting device and cables (p. 24)

➪ Conduit systems and cable glands (p. 25)

> **DANGER Lost of explosion protection**
> **due to incorrect installation of the cable glands**
>
> The installation is relevant to explosion safety! Care must be taken to ensure safe and proper installation.

The manufacturer therefore only accepts responsibility for cable glands made by him or on his behalf.

> The device is protected against polarity reversal. The device will not work if the connections have been reversed.

2.5.1 Power supply and electric protection

The power supply must comply with section ⇨ 1.2.7 Electrical safety information (p. 23). Note the following in this context:

- The 24 V (DC) power supply must have reinforced insulation and be safely isolated from other mains. Fluctuations, including mains fluctuations: ± 15%.It must be possible to supply a rating of up to 120 W. Generated e.g. with Quint-PS-100-240AC / Quint-PS24DC / 24DC / 10 / Siemens PSU / Siemens logo or equivalent power supplies
- Only one device may be operated at a voltage supply.
- The overvoltage/current protection and electrical line protection must be ensured by the power supply. Suitable external safety devices must shut down a current of 8.3 A or over within 120 seconds, thus limiting the power supply.

The device has no user replaceable guards, it will not work if the internal protective equipment has tripped.

This protective equipment (thermal trips and electrical fuses) must be changed by authorized specialists.

If the internal guards have tripped, refer to

⇨ 2.9.4 Correct electrical faults (p. 110)

or contact

⇨ 4.2 Technical support Flow Computers and Gas analyzers (p. 314)

Check the input voltage, at the location of use, for accuracy and usability according to the following data:

- Voltage range: 24 V DC. Including mains fluctuations ± 15%, Power supply units with safe electrical isolation.
- An external safety device which shuts down within 120 seconds is installed. (The shut-down current is 200/Supply voltage. The tripping properties depend on the ambient temperature. This must be taken into account if the temperature is significantly higher than room temperature.)
- Rating of up to 120 W can be supplied.

2.5.2 Grounding

The proChain GC must be connected to the equipotential bonding system at the place of use and earthed, see section. For the potential equalization connection point (PA) use a connection on the base (see next figure). Take in mind:

- **When connecting the earthing cable, ensure that it has a permanent, stable electrical contact.**
- **When making the contact and selecting the fastening materials, avoid corrosion by different materials.**
- **Use an steel/stainless steel washer between aluminium enclosure and the conductor/cable lug and comply with the appropriate regulations, for example IEC/EN 60079-14.**

If other metal parts are connected to the device during the installation work, they must be expertly included in the earthing and the equipotential bonding system. Use the appropriate connections or install such connections.

The device will only operate correctly if all the system parts have the same earthing potential. Ensure that the same earthing potentials are always connected to each other.

The permissible conductor cross-section for grounding is at least 6 mm² ≙10 AWG (maximum 10 mm² ≙ 8 AWG) of the copper cable. The earthing cable can be connected at various points on the base, depending on the installation configuration. Generally, the bottom side is used with M5 threaded bolts, but the rear with M8 threaded bolts may also be used, see following figure.

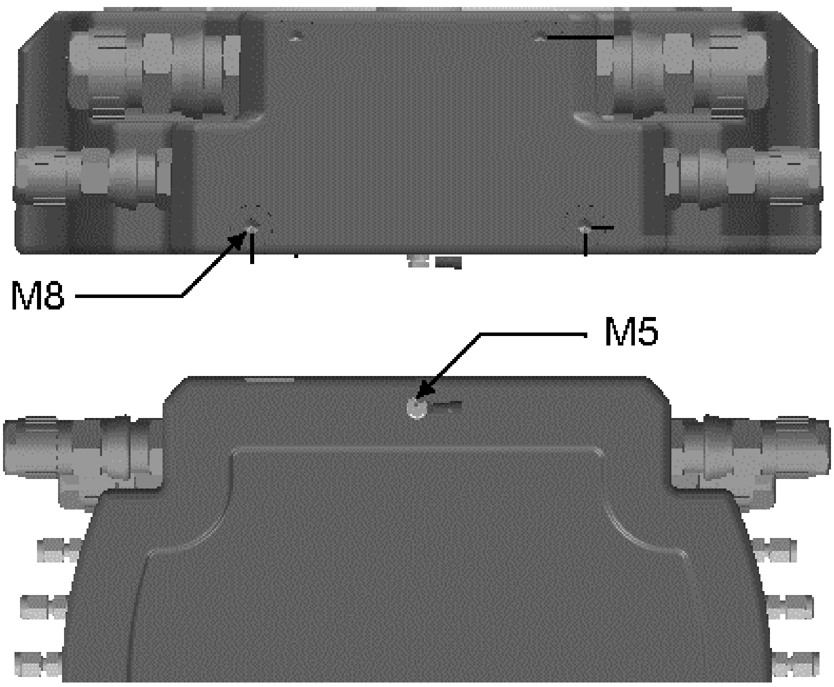


Fig. 2-28: Example of earthing points on the device

2.5.3 Cables (power supply / communication)

For the connection between the instrument and other instruments different control and signal cables are suitable, the choice depends on the requirements at the place of use.

> Cables and wires are standard products (not from the manufacturer) which are necessary to operate the device. It is recommended to disconnect the data cables from the power supply cable.

Generally, the connection cables can be routed to 2 separate locations without additional ex-rated junction boxes. The insulation must at least comply with flammability class 1. Use screened cables. The screen on the connection cable must be connected in compliance with local regulations.

> **DANGER**
>
> **Unsuitable cables**
>
> Dangerous situations can arise
>
> The temperature of the device may rise to 10°C ≙18°F ≙10K above the ambient temperature. Cables must be suitable for this increase in the local ambient conditions.

The connection terminals are suitable for conductor cross-sections from 0.25 mm^2 ≙24 AWG to 2.5 mm^2 ≙14 AWG. Signal cables require conductor cross-sections of ≥ 0.25 mm^2 ≙24 AWG. We recommend signal cables with a conductor-to-conductor capacity of less than 120pF/m ≙36.58 p S^{-1}/ft and an inductance of less than 0.7 µH/m ≙0.213 µΩs /ft.

The number of cores varies depending on the application, whereby the cores should be twisted into pairs and screened jointly. The maximum cable length depends on the type of signal and must not be exceeded. A cable type of category 5 (Cat 5) is recommended for data communication links via Ethernet.

Cables or cores are fed into the device via cable glands. See also the next section. The relevant installation guidelines must be obeyed for routing the cables!

2.5.4 Electrical entries

There are four threaded holes which pass completely through the device base (2x M20x1.5 and 2x M25x1.5) (see next figures). The threaded holes can be fitted with blind plugs, adapters or cable glands as required and according to local regulations. Optional they can fitted with the local display or the USB interface.

PROHIBITION

- **Use of cable glands under cCSAus conditions**

Devices to use conform to cCSAus conditions are supplied with adapters for conduit systems. The conduit system, hubs, fittings, etc. needs a Type rating corresponding to the Type rating of the equipment.

These screw-in parts must have the correct IP rating (at least IP 66) and suitable explosion-protection certification. To comply with the specified explosion-protection regulations, they must be installed and sealed in their function as securing parts as specified by the manufacturer of the cable glands.

Unused openings must be fitted with suitable certified blind plugs.

DANGER Unsuitable cable entries and cables

Dangerous situations can arise

The temperature on the proChain GC surface may rise to a temperature 10 °C / 18 °F above the ambient temperature (+70 °C / +158 °F). Make sure cable entries and cables are suitable for this increase under ambient conditions on site.

Use only suitable and approved cable inlet equipment. The cable inlets must satisfy or exceed the IP rating. NEC-compliant cable inlet equipment must be used in the USA. CEC-compliant cable inlet equipment must be used in Canada.

Most systems only require two cable glands, one for the data transfer cable and one for the power supply (24 V DC). Other cable inlets may be used for additional signal cables, the optional local display or the optional USB port.

The device can also be fitted with bespoke cable glands, for example with ½" NPT threads, using adapters. Please contact Honeywell for further details if you wish to change the standard equipment.

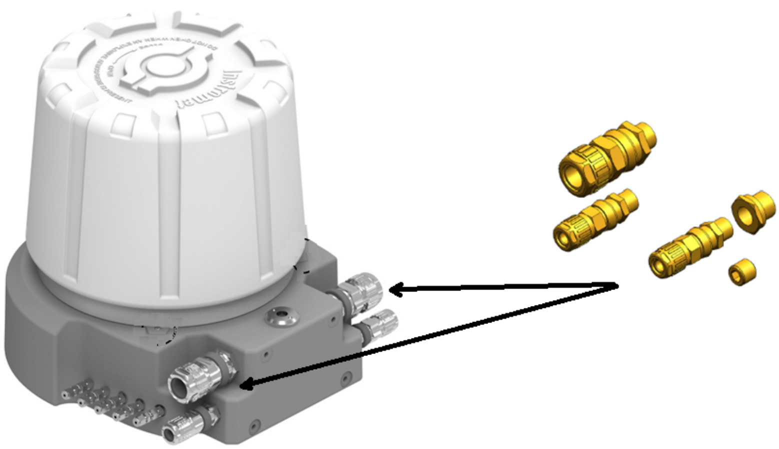


Fig. 2-29: Position of the cable end glands on the housing base

The next figure shows the number and position of cable glands (looking from the wall towards the device). The relevant installation guidelines must be obeyed for routing the cables.

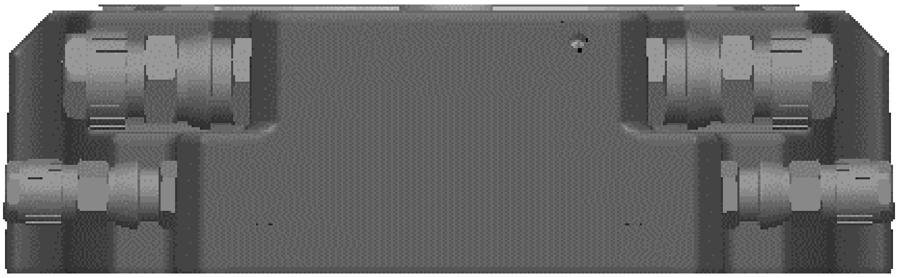


Fig. 2-30: Position of the cable glands (back view)

All the electrical connections can be directly connected to the device using cable glands. When selecting, you must comply with the manufacturer's instructions. The electrical inputs are sealed for reasons of explosion protection.

In the event of a replacement, the complete gland must be replaced.

The residual cable in the device must then be cut and can no longer be used. The replacement and extension of the electrical connections involve similar work to a new installation. Sealing rings and washers supplied must also be installed.

The manufacturer is only responsible for compliance with the listed regulations if the cable glands were made by him or on his behalf.

The M25 cable glands used as standard are suitable for reinforced cable with a diameter of 17 – 26 mm, while the M20 cable end glands can be used for reinforced cable with a diameter of 5,5 – 12 mm (small) or 12,5 – 20,5 mm (medium).

The following cable properties are required in order to comply with the explosion-protection regulations:

- Not sensitive to cold flow, impermeable to air and at least three meters long.
- The cable and cable gland are suitable for temperatures of +70 °C (+158 °F) and higher.

Other examples of suitable electrical inputs are cable junction boxes when sealed within 2" (~5 cm).

2.5.5 Outputs / inputs and electrical connection plan

The electrical interfaces (plug connectors) are located on the Terminal Board. They are electrically isolated. An exception are the optional add-ones **USB service interface** on the Base board and **local display** with its own IS Display board connection.

The following figure gives an overview :

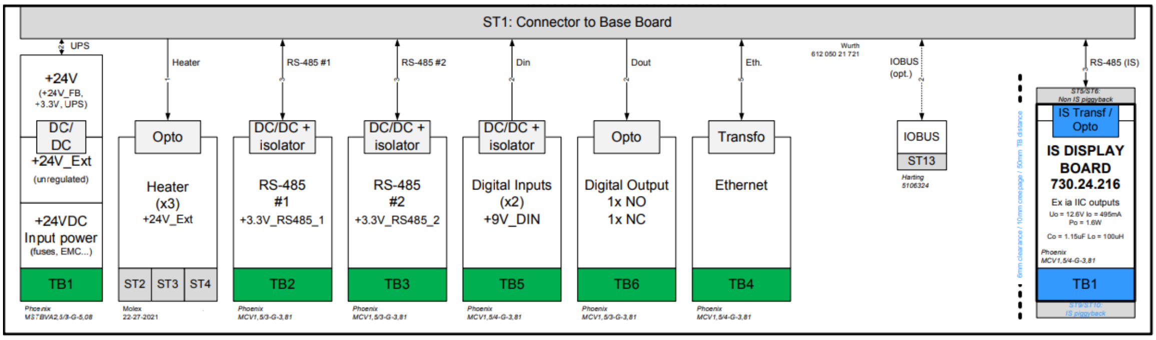


Fig. 2-31: Inputs and outputs (connection diagram section of Terminal Board)

The connection terminals on the Terminal Board in the interior are different for the voltage supply and signals. The shielded / screened cables must be connected and installed in compliance with the local / national installation guidelines and regulations (e.g. EN 60079-14).

Connector	Interface
TB1	Power supply (connection for the EMC adapter cable already connected)
TB2 /TB3	RS485 port 1/2 (electrical isolation), range: 500m ≙1640ft
TB4	Ethernet connection 10/100 Mbit/s; electrically isolated, range: 100m ≙ 328.084ft
TB5	Digital inputs 1 and 2 supplied by the device, max. 9 V (electrical isolation)
TB6	2 digital outputs (electrically isolated), common supply (semi-conductor circuit operates as a floating contact), max. 120 mA at 28.8 V (DC)

The electrical connection options are also shown in the following overview:

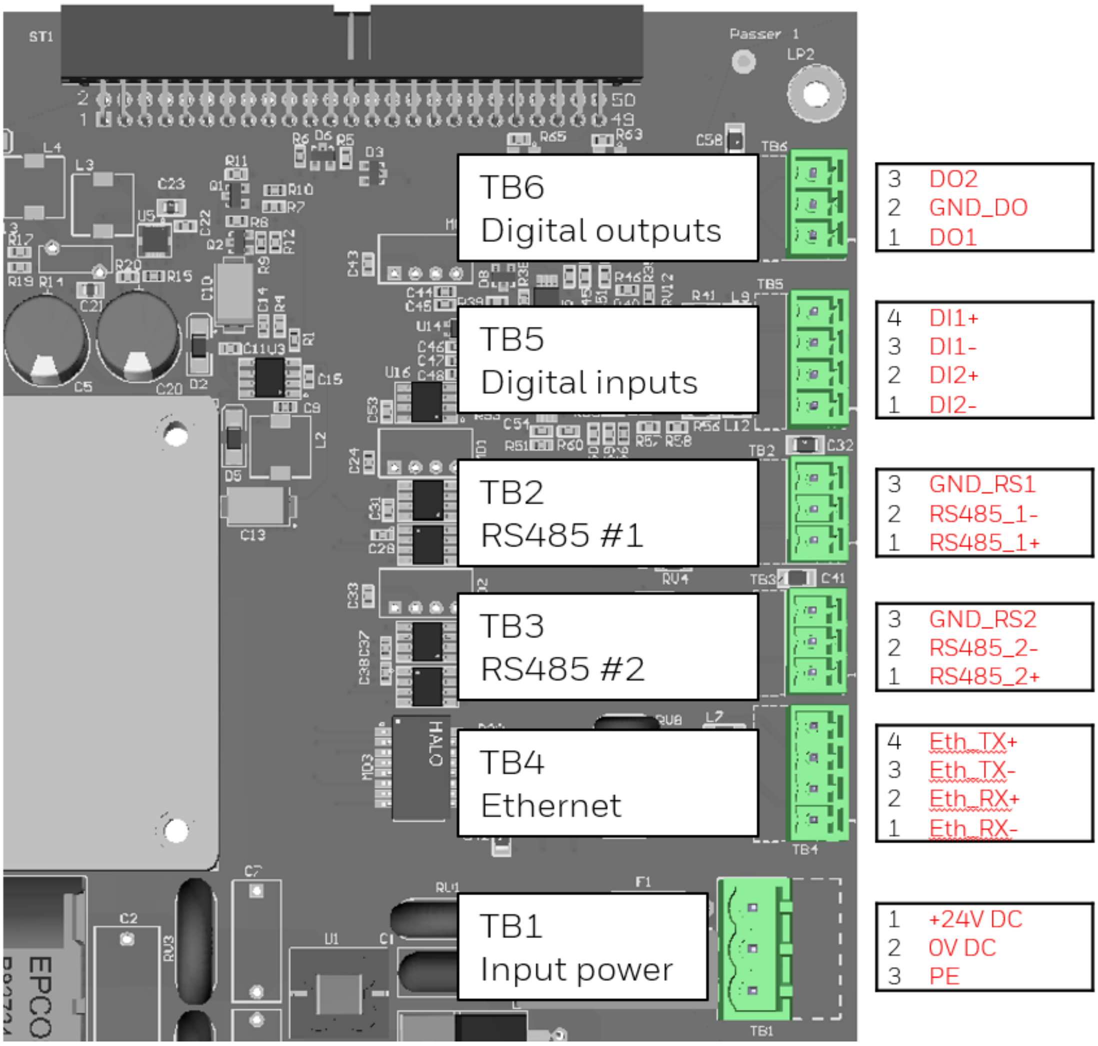


Fig. 2-32: Inputs and outputs (connection diagram section of Terminal Board)

Please note that the connection for the supply voltage (TB1) has been pre-assigned with an EMC adapter cable at the factory for EMC reasons.

The EMC adapter cable ends at a connection terminal on the base plate in front of the Terminal Board, see following figure.

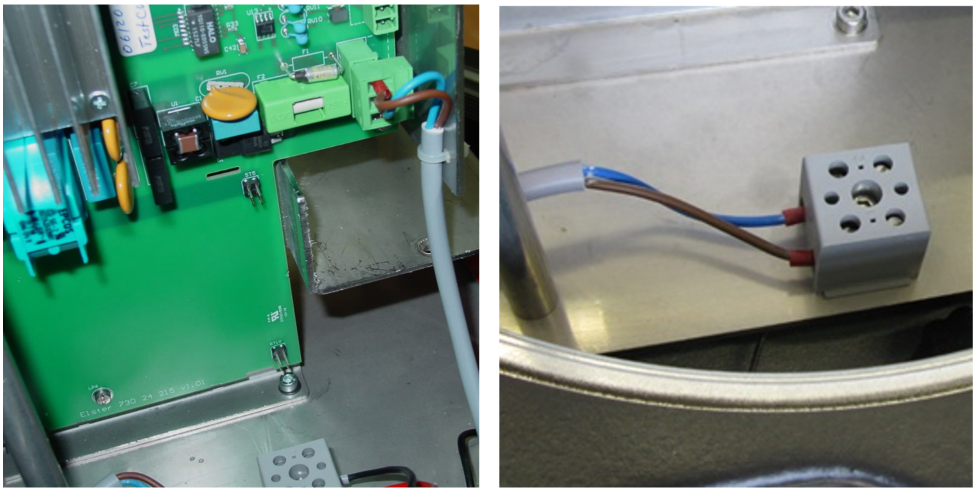


Fig. 2-33: Power connection position and details

The two wires of the power supply are screwed to this grey connection terminal. Figure 2.27 shows the already made connection with the EMC adapter cable. Use the opposite clamps and pay attention to the correct polarity Connect + 24V DC opposite the brown wire. Connect 0V DC opposite the blue wire

NOTICE

Installation errors

Errors in device supply and data transmission

Connect the cables and shields/screens in accordance with the explosion protection regulations! In practice, the shields are not connected in the explosion area, but only outside. Check for tightness of connectors! Screws of unused terminals must be tightened!

In the figure above you see the lower part of the Terminal Board on the left hand side an IS Display board for the local display can be plugged on.

2.5.6 Connection to other devices and system parts

The connection diagrams for sensors and devices to which the instrument can be connected are shown in example form in the following. This may require special parameterization in enSuite.

Detailed information on parameterization is available in section ⇨ 3.3 Notices about parameterization (p. 204) and the online help. Only the minimally required settings are shown below in keywords

Regarding wiring, shielding / screening and grounding, the general industrial rules as well as the local conditions and regulations, e.g. EN 60079-0 and EN 60079-14, apply taking explosion protection into account.

The shielding of the cable serves to create a space free of external fields. Cable shields can best be imagined as a continuation of the housing. In order to better dissipate any interference that may occur, it is recommended that the shield be contacted as frequently and extensively as possible.

The following options for attaching the screen to the connection cable are possible as long as they do not breach explosion protection regulations

Options	Description
Two-sided attachment	(It is extremely important and mandatory that there are no grounding potential differences between the end points of the shield.) Benefit:EMC-compliant connection is also effective against inductive coupling components Drawback: Compensating currents (ground loop formation), which flow through the screens should be prevented where possible and require appropriate action.
One-sided attachment	Benefit:Lower voltage with potential isolation in conjunction with low frequency signals No compensating currents and ground loop formation Drawback: Is only effective against capacitive couplings and only produces significant success if the screened circuit has no connection to the ground, at least on the cable side.

CAUTION Violation of explosion protection

Risk of explosion

In order to comply with the specified explosion protection level, the cable connection in the gland must always obey the gland manufacturer's specifications.The isolation or surge (lightning) protection on the cables must be installed by the user, depending on the situation of use.

Ethernet connection

> Ethernet can be used to connect to the device, access the remote control panel, retrieve information, send a new set of parameters to the device and start other device actions.
>
> It is best to have an Ethernet cable pulled to a location outside the hazardous area, ending in a plug for RJ-45: This way you or a service person can always connect a laptop to the device.

The connection is made using the terminals TB4-1 to TB4-4 on the proChain GC Terminal Board. The core colors depend on the standard used, normally EIA/TIA 568B. The twisted pairs must not be untwisted or regrouped. The polarity of the cores within the core pair is unimportant and the core pairs can even be swapped.

For cable type refer to section ➪ 2.5.3 Cables (power supply / communication) (p. 67) length 100m ≙328ft.

Core pair	Plug (pins)	Color EIA/TIA 568 B	Color EIA/TIA 568 A	Color IEC	Color REA	Color DIN 47.100	Terminal inside device
1	4 / 5	blue + white/blue	blue + white	white/+ blue	white+blue	white+brown	
2	3 / 6	white/green + green	white + orange	red+orange	turquoiseviolet	green+yellow	TB4-4 TB4-3
3	1 / 2	white/orange + orange	white +green	black+grey	white+orange	grey +pink	TB4-2 TB4-1
4	7 / 8	white/brown + brown	white +brown	yellow+brown	turquoise+violet	blue + red	

The following drawing is only designed to illustrate the screening using an example.

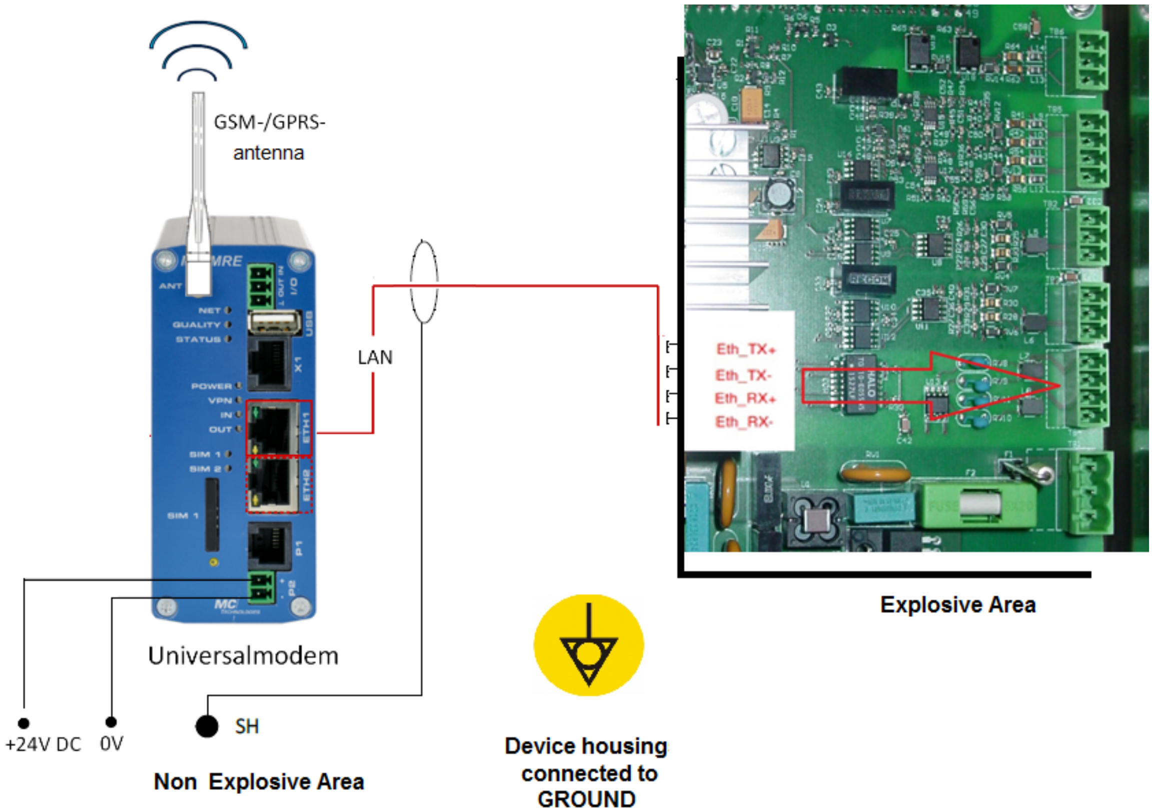


Fig. 2-34: Sample LAN/Ethernet connection (diagram)

Additional to the wiring, settings must be made before this interface can be used. See sections ➪ System display I/O (network settings / inputs/ outputs) (p. 270) or ➪ 3.2.1 SFB I/O (IP address network- and I/O-settings) (p. 165)

RS485 serial interface connection

Connections include, for example, other measurement devices, devices for final processing and evaluation, PLC systems, and so on. Cable type refer to section ➪ 2.5.3 Cables (power supply / communication) (p. 67).

There are 2 interfaces (TB2-terminals and TB3-terminals details see figure). The connection varies depending on the device (see dotted cable in the following example). The ground (0 V) is either connected directly to the device/system or connected to GND.

Pull-up / pull-down resistors should be installed at the cable end near the data evaluation unit to generate the neutral potential. A 470 Ω resistor must be connected between RSA and the positive supply voltage of the connected data evaluation unit. A further 470 Ω resistor must be connected between RSB and GND. For cable lengths over 200 m ≙656ft, additional bus connection resistors of 120 Ω each between RSA and RSB at the cable end at the data evaluation unit are recommended.

The following drawing is only designed to illustrate the screening using an example.

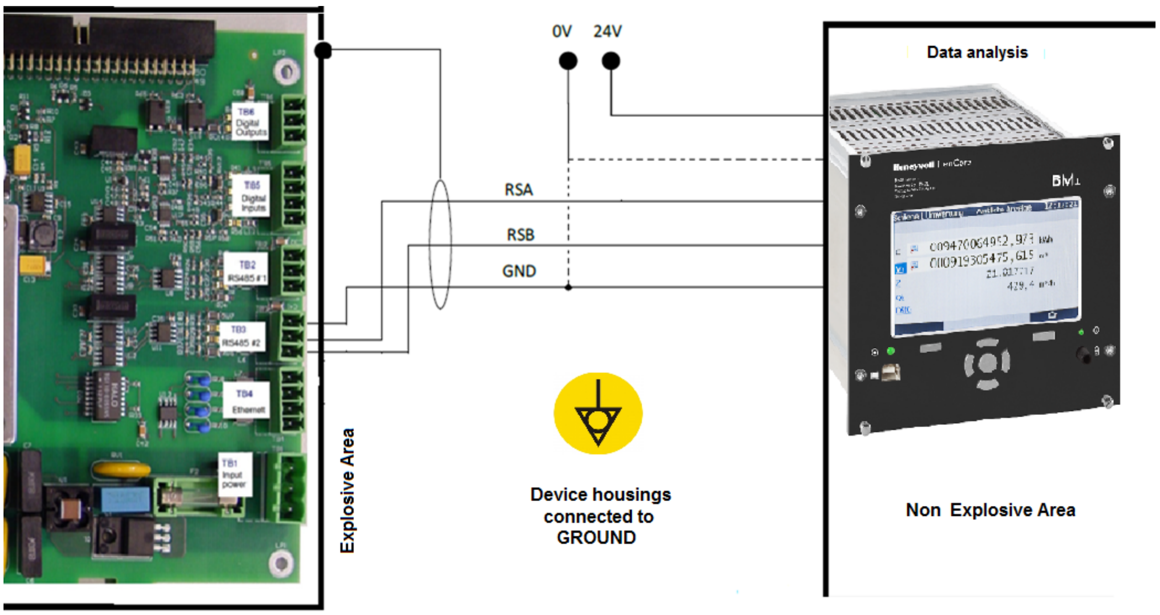


Fig. 2-35: Example of RS485 connection (diagram)

> In addition to the wiring, various enSuite settings are required before this interface can be used. Refer to section ➪ 3.2.1 SFB I/O (IP address network- and I/O-settings) (p. 165)

Digital inputs

There are two electrically isolated inputs supplied in the connection box (TB5-terminals 1 to 2 and TB5-terminals 3 to 4, details see figure). The maximum supply voltage is approx. 9 V.

For cable type refer to section ➪ 2.5.3 Cables (power supply / communication) (p. 67) The figure also shows the appropriate terminals on the Terminal Board The wiring in the drawing is only designed to illustrate the screening using an example.

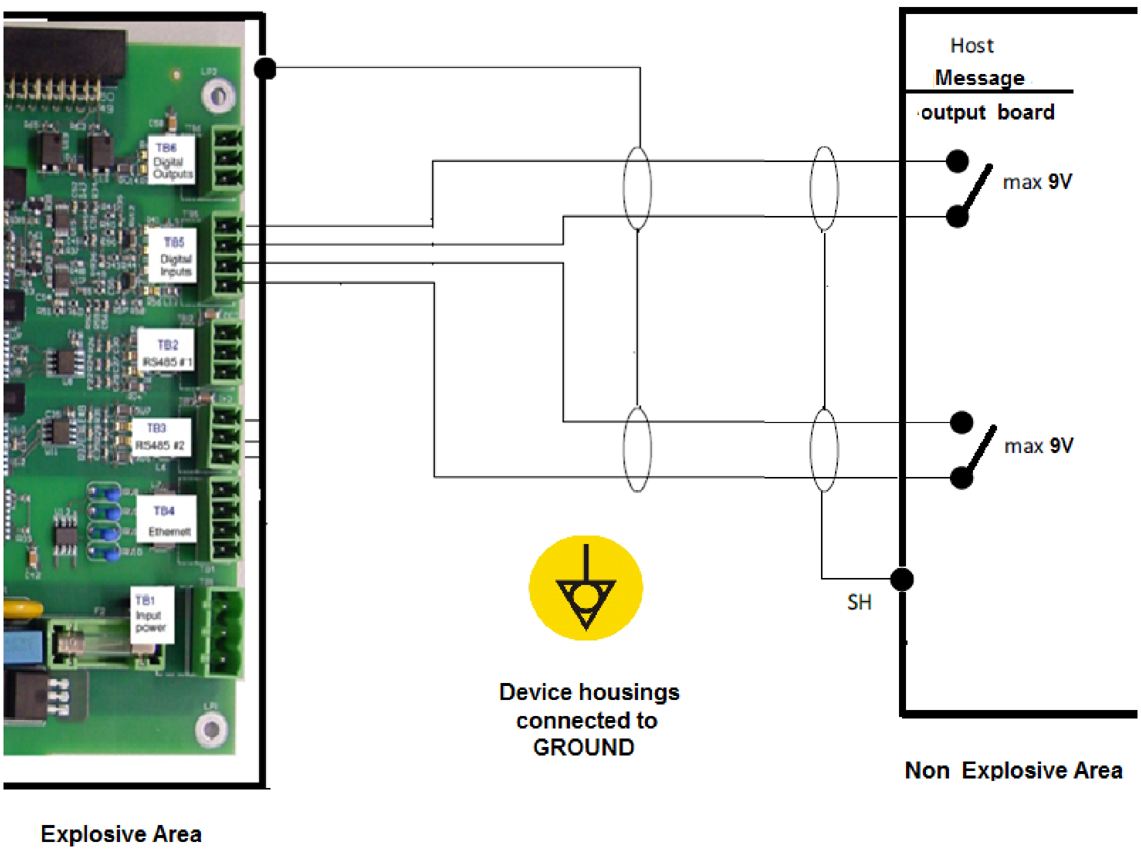


Fig. 2-36: Example connection of digital inputs

> In addition to the wiring, various enSuite settings are required before this interface can be used. See ➪ 3.2.1 SFB I/O (IP address network- and I/O-settings) (p. 165). Then, just make a connection to a potential-free contact. The state of these inputs can be observed on the display and via enSuite using “Live values” function.

Digital outputs

There are two digital outputs (electrically isolated passive output circuits) on the Terminal Board (TB6-terminals, details see figure).

The maximum load per channel is 28.8 V DC/120 mA. The maximum pulse rate is 25 Hz.

Cable type refer to section ➪ 2.5.3 Cables (power supply / communication) (p. 67) the maximum length is 250m ≙820ft. The figure also shows the appropriate terminals in the connection box. The wiring in the drawing is only designed to illustrate the screening using an example.

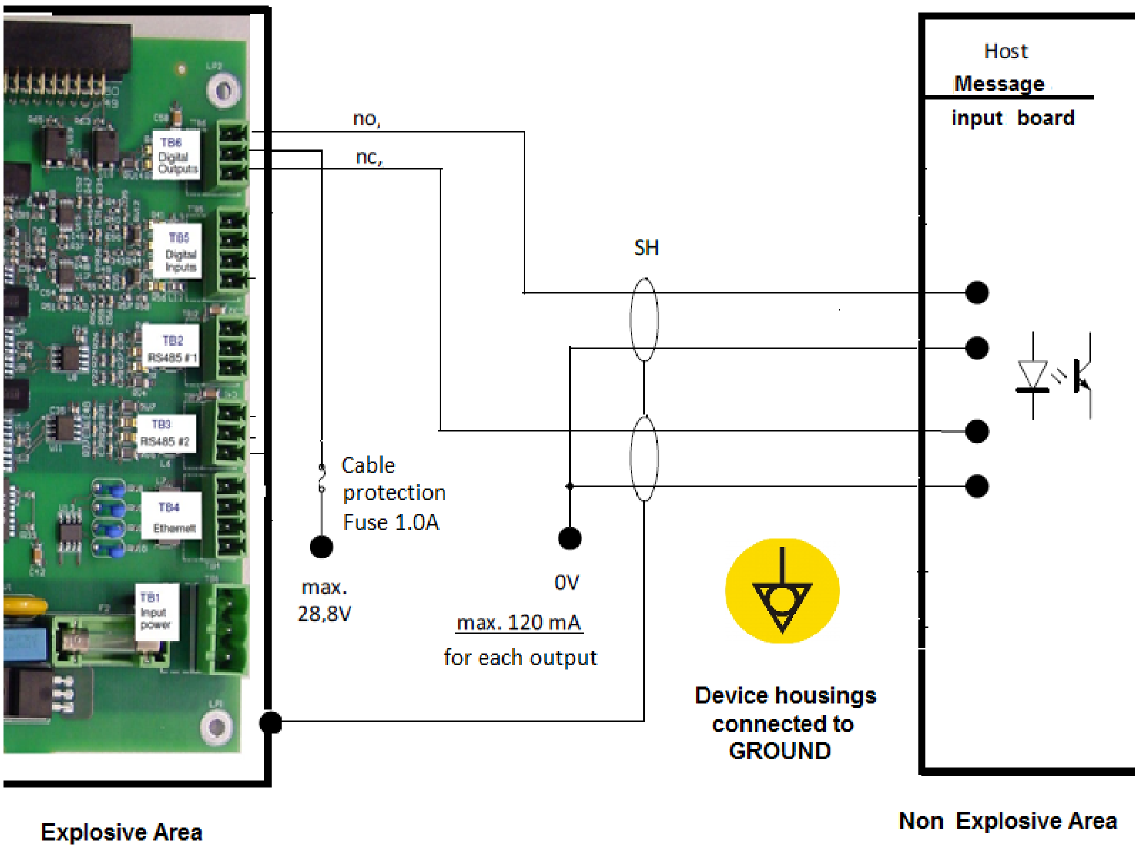


Fig. 2-37: Example connection of digital outputs

> These outputs act like a potential-free contact to a common point. This common point is usually used as common supply (usually +24 V). If configured that way and a channel is switched ON, the corresponding pin switches to +24 V. In addition to the wiring, various enSuite settings are required before this interface can be used. Refer to section ➪ 3.2.1 SFB I/O (IP address network- and I/O-settings) (p. 165).The state of these outputs can be observed and manually set by setting these outputs into "Test mode" on the display.

2.5.7 Electrical device test to verify correct installation

After completion of the electrical work, you should conduct a test to eliminate the possibility of errors, e.g. insulation faults in the supply voltage and communication.

> **PROHIBITION**
>
> - **to conduct the tests in a potentially explosive atmosphere.**
> - **to conduct the tests without the permission of the system operator**

The use of a multimeter is required to conduct the test. You should check the following points:

1. ➪ Opening proChain GC (p. 62) Conduct a visual inspection of the interior of the device. There must be no loose wires. All wires are connected as shown in the circuit diagram. Spare wires have been dealt with correctly and routed safely.
2. The supply voltage is 24 V DC. ± 15% is available after switching on the terminals on the Terminal Board.
3. The power supply capacity is sufficient for the maximum device requirement (see type plate).If necessary, connect a load resistor in parallel to achieve this value.
4. Cause a short- circuit and the supply voltage must be switched off within 120 seconds.
5. Check all switches and fuses outside the device. Is everything accessible and can everything be switched off and on?
6. Conduct resistance measurements to ensure that all the electrical connections have low resistance. Check the earthing as well.
7. Conduct resistance measurements to ensure that all the cables are adequately isolated from each other and to earth.

If you find any discrepancies or errors during the check, eliminate them and repeat the corresponding points of the installation procedure until all points are error-free and OK. This completes the installation work. Then close the device properly. ➪ Closing the housing of proChain GC (p. 63)

2.6 Fluidic installation of the measuring device

For all work described in the following, the recognized rules of technology for handling high purity gases and the piping plans drawn up and specified by the plant operator must be observed. Surfaces which come into contact with gas must be free of grease, oil, solvents and other impurities.

Avoid mixing compression fittings from different system suppliers. If this is not possible, check the compatibility of the systems before making the gas-technical device connection.

PROHIBITION

- **Carrying out the work described without he permission of the plant operator.**
- **Installations that make it possible to exceed the maximum pressure at the gas connections of the device.**

All gases must not be contaminated or adulterated when being transported from the source (pipeline or cylinder) to the measurement device.

Only use permanently connected, tight, clean stainless-steel gas lines. Fittings and pipe couplings with few dead spaces are to be preferred.

Route the gas pipelines to the instrument. Ensure that every pipeline and every gas route is fitted with the required safety, shut-off and pressure regulation equipment.

Shut-off valves and pressure regulators are not parts of the measuring device and are not included in the scope of delivery.

The piping and safety devices must be installed in accordance with the applicable general rules and the specifications in this manual.

When setting the pressures, observe section ⇨ 1.2.5 Safety information about gases and pressures (p. 20)

After completion of the entire installation, when all gas and waste gas lines have been connected and pressurized, a leak test must be performed.

Since the test cannot be carried out on all parts when the device is switched off, the leakage test for these parts must be carried out first or made up for when the instrument is running.

Please note the section ⇨ Check the tightness of the installation (p. 122)

2.6.1 Overview gas and vent connections (Fluidic interfaces)

This section provides an overview of all the gas connections and the breather. Depending on the application, several connection assignments are possible.

If a tubing is connected to the breather for it must be completely separated from all other gas lines and meet the specifications set out in section . Also note

The generally accepted rules of engineering for handling gases must be followed when carrying out the work described in the further course of this section. This means sample integrity and operational integrity. All gas tubing must be free of grease, oil, solvents and other impurities.

Please remember to provide only samples free of solids and liquids.

The gas inlets and outlets are marked on the device. See figures below.

Standard application “C6+”

The figure below provides an overview of all connections in standard application “C6+.

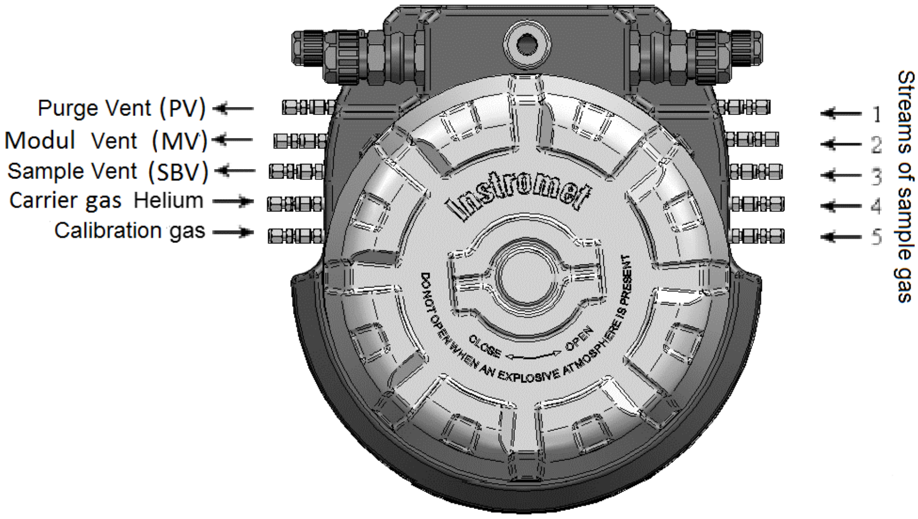


Fig. 2-38: Overview of gas connections (fluidic connections) standard application “C6+

Connection	Position on the proChain GC / Note
Breather with ¼" NPT connection thread for tube into save area	**Rear of the device** Used to equalize the pressure on explosion-proof housings.
Calibration gas cylinder with certificated gas (P1-11K) Maximum inlet pressure: ATEX/IECEx: 0.3MPa(g) ≙43.5psi(g) ≙3bar(g). cCSAus: 0.15 MPa(g) ≙21.75 psi(g) ≙1.5bar(g).	**Left-hand side, first connection** Used to maintain measurement accuracy.
Carrier gas cylinder with helium Typical inlet pressure 0.325 MPa(g) ≙47 psi(g) ≙3.25 bar(g).	**Left- hand side, second connection** Carrier gas is a required utility gas for transporting the measurement gas inside the device and performing chromatography.
Module vent (MV) Approximate flow rate is 0.12 l/h ≙0.0042 cft/h.	**Left-hand side, penultimate connection** The vent of measured sample and carrier gas, nearly purehelium is released at ambient pressure.
Purge vent (PV) Flow rate during purge is between 20 l/h ≙0.706 cft/h. and 30 l/h ≙01.059 cft/h.	**Left-hand side last connection** Purge of sample gas used to flush (bypass)
Sample and blocking vent (SBV) Approximate flow rate is 2 l/h ≙0.071 cft/h	**Left-hand side, third connection** The unmeasured sample gas is released at ambient pressure.
Sample gas streams 1 –5 Maximum inlet pressure ATEX/IECEx: 0.3MPa(g) ≙43.5psi(g) ≙3bar(g). cCSAus: 0.15 MPa(g) ≙21.7 psi(g) ≙1.5bar(g).	**Right-hand side** It is possible to measure up to five different gases in sequence. One inlet is standard.

Natural gas and hydrogen application “e-Gas”

The figure below provides an overview of all connections in e-Gas application

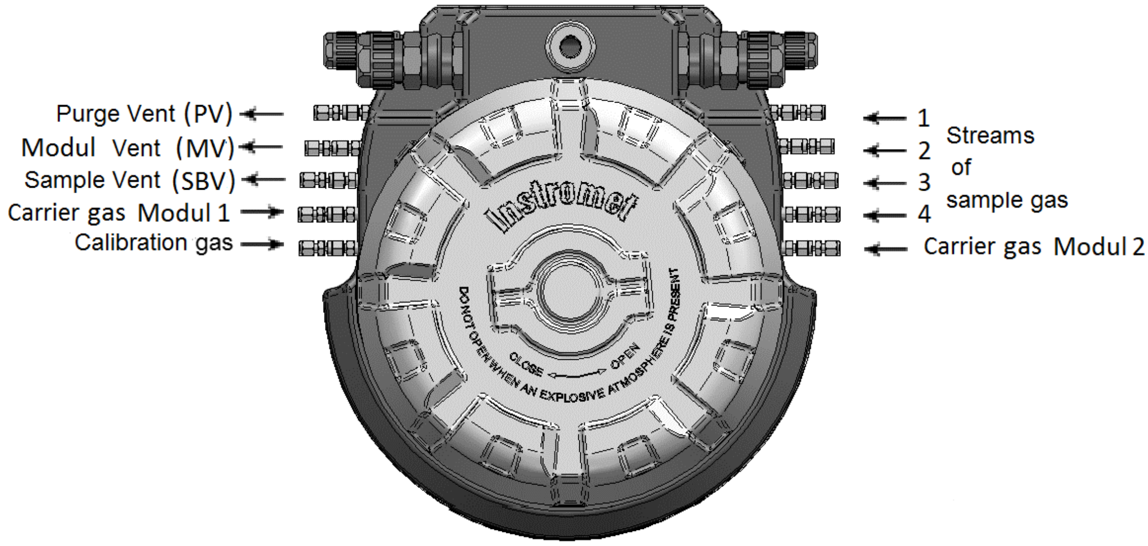


Fig. 2-39: Overview of gas connections (fluidic connections) e-Gas application

Connection	Position on the proChain GC / Note
Breather with ¼" NPT connection thread for tube into save area	**Rear of the device** Used to equalize the pressure on explosion-proof housings.
Calibration gas cylinder with certificated gas. Maximum inlet pressure: ATEX/IECEx: 0.3MPa(g) ≙43.5psi(g) ≙3bar(g). cCSAus: 0.15 MPa(g) ≙21.75 psi(g) ≙1.5bar(g).	**Left-hand side, first connection** Used to maintain measurement accuracy.
Carrier gas cylinders with helium (modul 1) and nitrogen (modul 2) Typical inlet pressure 0.325 MPa(g) ≙47 psi(g) ≙3.25 bar(g).	**Left- hand side, second connection, right-hand side, first connection** Carrier gas is a required utility gas for transporting the measurement gas inside the device and performing chromatography..
Module vent (MV) Approximate flow rate is 0.12 l/h ≙0.0042 cft/h.	**Left-hand side, penultimate connection** The vent of measured sample and carrier gas, nearly pure mixture of carrier gases is released at ambient pressure.
Purge vent (PV) Flow rate during purge is between 20 l/h ≙0.706 cft/h. and 30 l/h ≙01.059 cft/h.	**Left-hand side last connection** Purge of sample gas used to flush (bypass)
Sample and blocking vent (SBV) Approximate flow rate is 2 l/h ≙0.071 cft/h	**Left-hand side, third connection** The unmeasured sample gas is released at ambient pressure.
Sample gas streams 1 – 4 Maximum inlet pressure ATEX/IECEx: 0.3MPa(g) ≙43.5psi(g) ≙3bar(g). cCSAus: 0.15 MPa(g) ≙21.7 psi(g) ≙1.5bar(g).	**Right-hand side** It is possible to measure up to four different gases in sequence. One inlet is standard.

Gas from decomposition application “bio-Gas”

The figure below provides an overview of all connections in bio-Gas application (Gas mixture produced during the natural decomposition of organic material).

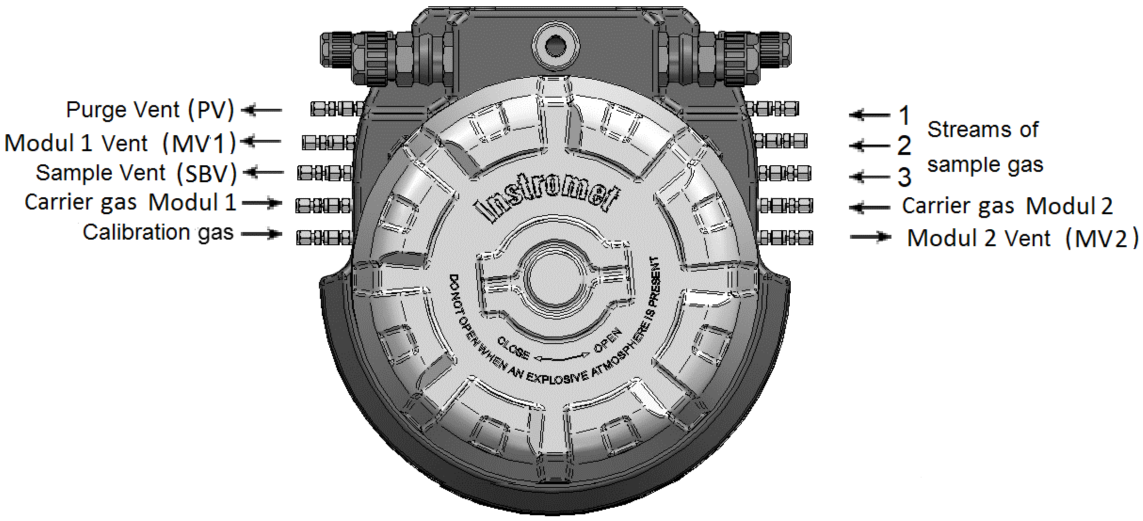


Fig. 2-40: Overview of gas connections (fluidic connections) bio-Gas application

Connection	Position on the proChain GC / Note
Breather with ¼" NPT connection thread for tube into save area	**Rear of the device** Used to equalize the pressure on explosion-proof housings.
Calibration gas cylinder with certificated gas. Maximum inlet pressure: ATEX/IECEx: 0.3MPa(g) ≙43.5psi(g) ≙3bar(g). cCSAus: 0.15 MPa(g) ≙21.75 psi(g) ≙1.5bar(g).	**Left-hand side, first connection** Used to maintain measurement accuracy.
Carrier gas cylinders with helium (modul 1) and helium or argon (modul 2) Typical inlet pressure 0.325 MPa(g) ≙47 psi(g) ≙3.25 bar(g).	**Left- and right.hand side, second connection,** Carrier gas is a required utility gas for transporting the measurement gas inside the device and performing chromatography.
Module vents (MV) Approximate flow rate is 0.12 l/h ≙0.0042 cft/h.	**Left-hand side, penultimate connection modul 1** **right-hand side, first connection modul 2** The vent of measured sample and carrier gas, nearly pure carrier gas is released at ambient pressure.
Purge vent (PV) Flow rate during purge is between 20 l/h ≙0.706 cft/h. and 30 l/h ≙01.059 cft/h.	**Left-hand side last connection** Purge of sample gas used to flush (bypass)
Sample and blocking vent (SBV) Approximate flow rate is 2 l/h ≙0.071 cft/h	**Left-hand side, third connection** The unmeasured sample gas is released at ambient pressure.
Sample gas streams 1 –3 Maximum inlet pressure ATEX/IECEx: 0.3MPa(g) ≙43.5psi(g) ≙3bar(g). cCSAus: 0.15 MPa(g) ≙21.7 psi(g) ≙1.5bar(g).	**Right-hand side** It is possible to measure up to three different gases in sequence. One inlet is standard.

2.6.2 Fluidic installation gas supply connections and breather

The proChain GC has multiple gas connections for various functions. They are always fitted by the manufacturer. In the standard version, they take the form shown in the figure below.

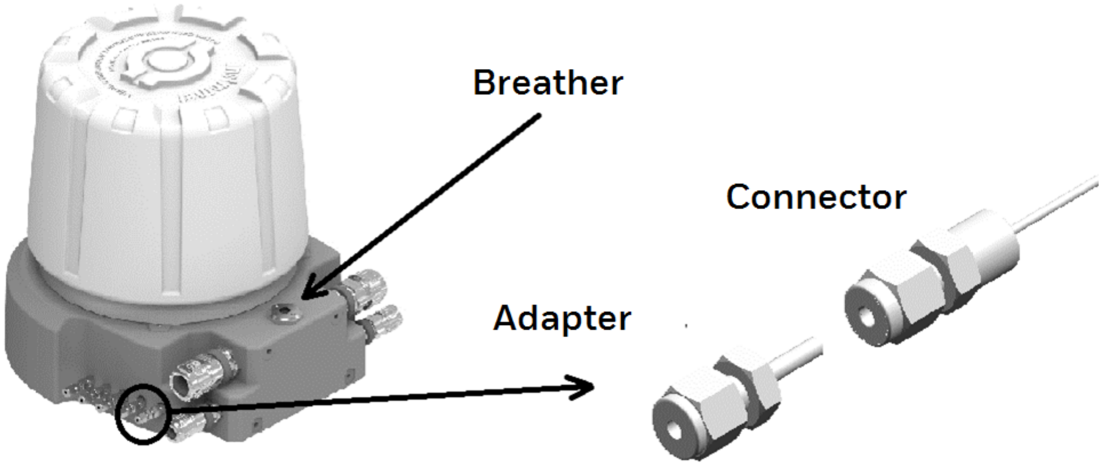


Fig. 2-41: Layout of the gas connections of the proChain GC

Each gas inlet / outlet consists of:

- Coupling/Connector (1/8" Swagelok fitting factory sealed that enters the housing) Attention: Be careful not to loosen this connection, it will be damaged!
- Adapter with 2µ filter (field replaceable tube only for inputs)

The adapter can be replaced without removing the hood from the gas chromatograph and is suitable for connecting a Swagelok pipe fitting (3 mm or 1/8"). It contains an interchangeable internal 2 µ filter for each gas inlet.

Inside the proChain GC, the gas connections are each soldered to a pipe which is used as a flame arrester. Sample and vent tubing outside the device should be made of seamless stainless steel tubing that is permanently connected. Supplied sample gases must comply with the inlet specification and be fully free of solids and liquids. The particle filters in the adapters are only designed to protect the device.

Always respect the following:

- The specified maximum pressure on the gas inlets must not be exceeded to prevent damage to the device and dangerous situations. This must be guaranteed by an external protection, which is not an integral part of the proChain GC. Refer to the information in section, when setting the maximum pressure.
- The required tubes and protection devices must be provided according to the general guidelines as well as the requirements in these Operating Instructions.

The breather

To comply with Ex regulations, explosion-proof devices or housings have an element what is known as breather, which serves to equalize the pressure between the interior of the device and the ambient area. It prevents the housing overpressure from rising to more than 100 mbar in the event of a complete gas rupture (all gas lines in the housing open). The position can be seen in the figure above.

> **PROHIBITION**
> - **UNSCREW THE BREATHER**
> - **CONNECT THE BREATHER'S TUBE TO OTHER TUBES**

The breather in the proChain GC is made of sintered metal. It must not be sealed or blocked, for example by water, condensation, ice, insects, dirt or the like, as otherwise the pressure equalization process will be adversely affected.

> **DANGER**
>
> **Blocked housing ventilation**
>
> Dangerous situations can occure
>
> Ensure permanent atmospheric ventilation of housig via the breather. In the case of outdoor installation, the breather may be protected

To protect the breather a "Swan Neck" can be used ➪ 2.6.5 Connect a Swan Neck (option) (p. 89) or a tube can be connected via the ¼"NPT thread. The specifications (min. int. diameter of 8 mm ≙0.31496 inch and max. lengths 40m ≙131ft) from section must be met in this case, IP 66 protection is achieved and a vent line flow rate of around 10.5 l/min is possible.

Always keep in mind:

> **DANGER**
>
> **Incorrect working in hazardous areas**
>
> Significant damage to health, the environment, the plant and the device that is not covered by the warranty can occur.
>
> Complete all Work around the fluidic installation (this section) in accordance with all national / local safety regulations as well as the following instructions.

2.6.3 Connect the process gas line

Prerequisite: The process gas from the process line (pipeline) is provided according to specification via the tapping equipment with temperature equalization system and pressure regulator.

Refer to ➪ 4.1.3 Technical range of suitable gases (p. 308)

For this purpose, additional shut-off devices, further pressure reductions, filter system, gas dryer, etc. were installed on site and provided in the pipeline.

Prepare the process gas sampling line connecting the device

1. Ensure that the shut-off valve in the process gas pipeline is closed! If there is a pressure regulator, it must be set to its lowest setting!(Pressure regulators and shut-off valves are not equipment parts and are not included in the delivery; make sure you use types that comply with the specifications and standards)
2. Check whether the pressure and other parameters are correct and connect the end of the line intended for the device connection to the vent gas properly using a hose.
3. Carefully open the shut-off valves to create a permitted gas flow above the operating conditions. Then flush for around 30 to 45 seconds to clean the pipeline system. For very long lines you must extend this time accordingly.
4. Close the line shut-off again. Set the process gas pressure to a valid value, do not exceed the maximum pressure! (The exact pressure will be set later).
5. The pipeline is now ready for connection to the device. Prevent the penetration of dirt and moisture if the connection is not made immediately.
6. Remove the protection (sealing stopper/ sealing screws) from the device inlet and connect the gas line for the process gas. Observe the information in section ➪ 2.6.1 Overview gas and vent connections (Fluidic interfaces) (p. 81)
7. Carefully open all the shut-off valves in the gas path so that the gas is present at the device inlet
8. Check the tightness of the process gas path from the source to the device. Refer to the section. ➪ Check the tightness of the installation (p. 122)

2.6.4 Connect the vent gas tubings

In regular measuring mode, the entire gas flows through the device and is discharged via the exhaust tubing to secure ventilation areas outside buildings. The gases from measurement and (if used) bypass must be drained **without back pressure** through exhaust tubings and routed to a safe area away from the device.

The gas drain connections must ventilate atmospherically and be protected against dirt or liquids. Never decrease their diameters!

Step	Work: Connect the vent tubes
1.	Connect the vent gas to the relevant outlets. Always discharge the gas from (MV) separate. Avoid back pressure formation and mutual interference in the exhaust system.
2.	Connect the tubing immediately after you have removed the sealing elements (blind plugs or screw plugs) from the gas outlets on the device.
3.*	It is not possible to conduct a leak test when the device is switched off. The vent gas line must be checked for leaks with a gas leak detector, calibrated with status or value display, during the flushing cycle. This test must be carried out immediately after the proChain GC is fully installed and starting operating.

*Usually step 3 cannot be performed at this stage of installation it is done during commissioning

> **DANGER**
>
> **Connections with the breather line**
>
> Gas could get into the device and cause dangerous situations
>
> The breather line is not part of the exhaust system and may never be connected to other lines.

Do not forget to check tightness ⇨ Check the tightness of the installation (p. 122)

2.6.5 Connect a Swan Neck (option)

Permanent atmospheric venting of the housing must be ensured, as described in section . One way of doing this and protecting the breater from dirt and rain is to use a Swan Neck, as shown in the following example.

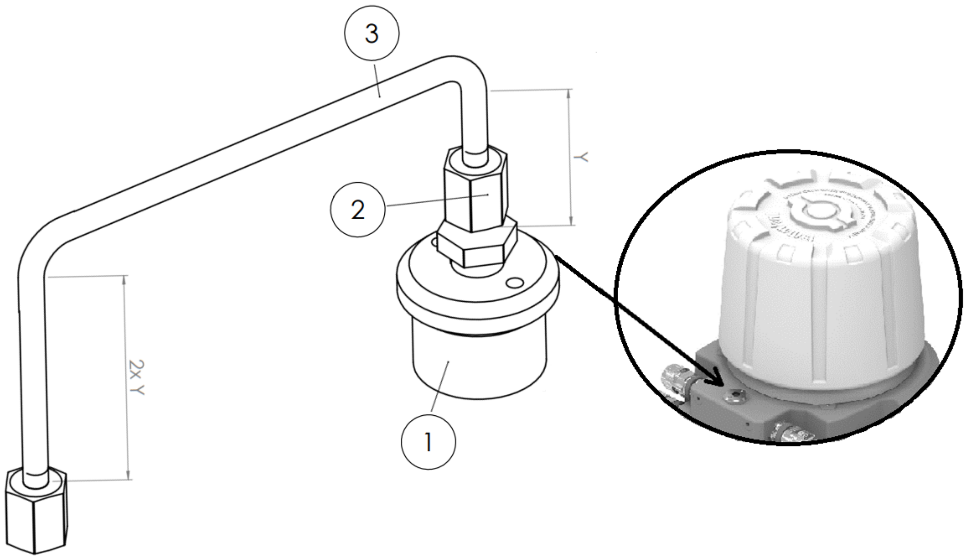


Fig. 2-42: Example of a Swan Neck

The Swan Neck is a suitably bent short stainless steel tube which is connected directly via the ¼"NPT thread of the breather (1). You can use several suitable fittings (2) to connect the bend tube.

The tube (3) shall be a piece of stainless steel pipe (with an inner diameter of 6 mm or ¼" to 8 mm (0.3149"), as used to discharge the gas escaping from the breather in the event of a fault.

As the example shows, the downward pointing length of the Swan Neck should be 2 times as long (2x Y) as the upward pointing tube length (Y).

> Use a standard tool such as a wrench to hand-tighten the connection of the swan neck to the breather. To ensure that the connection is tight enough to prevent water ingress, it must not be possible to loosen the connection without tools.

2.6.6 Connect/replace calibration-, carrier-, verification- gas cylinders

For proper operation of the instrument, regular automatic calibration / adjustment with a calibration gas is necessary. A gas bottle with, the calibration gas mixture P1-11K, must be connected to the instrument for this purpose. A gas cylinder with helium or argon as carrier gas is also required for operation. A suitable pressure reducer is required for this purpose, if not already available. Honeywell offers prefabricated panels with the high pressure reducers for this purpose.

Some situations make it necessary to connect additional gas cylinders, e.g. a verification measurement .

This work must be performed for both **fluidic installation** and **maintenance**. For further details see ➪ Connect/replace calibration-, carrier-, verification- gas cylinders (p. 132)

Check the tightness before use the gas cylinder ➪ Check the tightness of the installation (p. 122)

2.7 Commissioning and decommissioning

PROHIBITION

Carrying out the work described in the section without

- **the required instructions by the manufacturer or his authorized representatives.**
- **the permission of the plant operator.**

Refer allways to the regulations for explosion protection and the safety information, particularly for starting up the device in a potentially explosive atmosphere.

The commissioning procedure may only be carried out by qualified technician or field service personnel. Honeywell can provide training and commissioning services.

Before commissioning, make sure that Section ⇨ 1.2 Safety information and warning (p. 15) and sectionhave been observed and followed and that the instrument has been installed and connected in accordance with this document.

All newly delivered devices already have a factory parameterization. This default parameterization should usually be sufficient; if necessary, fine-tuning may be required in the field and some parameters may need to be adjusted via the software, such as the calibration gas properties.

If you are not familiar with the operation and software of the instrument, read the appropriate information in section

⇨ 3 Software (Device operation with enSuite) (p. 141)

2.7.1 Commissioning preparations and requirements

The following points must apply:

- The upstream sample handling and conditioning system must be operating properly, providing the correct pressure to the device, and at its operating temperature.
- A a process calibration gas cylinder is correctly connected. The composition of the gas mixture is programmed into the device.
- Delivery is less than 1 year ago, (battery charge above 20%). If you are unsure check according to hints in section ⇨ Info display (Device monitor) (p. 249) or have the battery replaced as a precaution.
- The device is installed and fully closed.
- There is no moisture condensation inside the device. If in doubt, remove the covers (see next section) and allow the appliance to dry for at least 12 hours; or contact Honeywell.
- Power supply and communications are carried out properly and is available.

Set date and time

First set the current date and time as well as the timezone of the location. Activate daylight saving time if applicable.

> **Information about the procedure**
> ➪ System display Time Service (System time and date) (p. 255)
> ➪ 3.2.3 Time service SFB settings and system time action (p. 169)

Set password for Administrator (admin1) and generate a new TLS certificate

Background

The access data is always checked in the device, i.e. the user must have been created in the device.

In the delivery state, user passwords for standard users are empty for all enCore devices, including **admin1**.

To increase security, we recommend creating passwords for **admin1** and all existing users during commissioning and implementing a role-based authorization concept.

> NOTICE
> **Lack of password protection**
> Access to the device is possible for unauthorized persons.
> Assign passwords for administrator and all main users during commissioning and create a role-based authorization concept.

The enCore device uses a self-signed TLS-certificate to authenticate itself to enSuite each time a connection is established. This certificate is created when the enCore device is put into operation.

Delete the TLS certificate on the enCore device (if already exist) and having the device generate a current one with administrator and user passwords set up.

> **Further details:**
> ➪ **Info display (Serial number and TLS certificate) (p. 246)**
> ➪ **System display Users (login, logout, password) (p. 262)**
> ➪ **3.2.5 User and rights management (p. 176)**

Adapting the factory parameterization

In the factory parameterization (default parameter set), usually only calibration gas properties, automatic calibration intervals and the purging / flushing times for the gases must be adjusted. For extreme ambient conditions, the setting for the auxiliary housing heater is still required.

Other parameters are normally left at their factory-set values and, if necessary, supplemented by customer-specific requirements.

To understand these parameters and to change their values if necessary, please refer to section ➪ 3 Software (Device operation with enSuite) (p. 141) as well as to ➪ enSuite online help (p. 145)

The hardware parameter guard (SSW)

You can (and must for fiscal use) protect settings which affect the measuring properties. This is done with the Security Switch (short: SSW) also called calibration switch. It ensures that fiscally relevant changes can only be made with the SSW opened or are logged in the audit trail.

To open or close the SSW, the device must be opened. Follow the procedure from ➪ Opening proChain GC (p. 62)

Always keep in mind:

- **never open the housing in the presence of an explosive gas atmosphere and with out the permission of manufacturer and system operator**
- **The inside of the device contains sensitive parts that can easily be damaged proceed with the appropriate care.**

Opening and closing the hardware parameter guard (SSW)

The SSW is the red switch on the Base Board near the battery next to the CPU3 board, see figure.

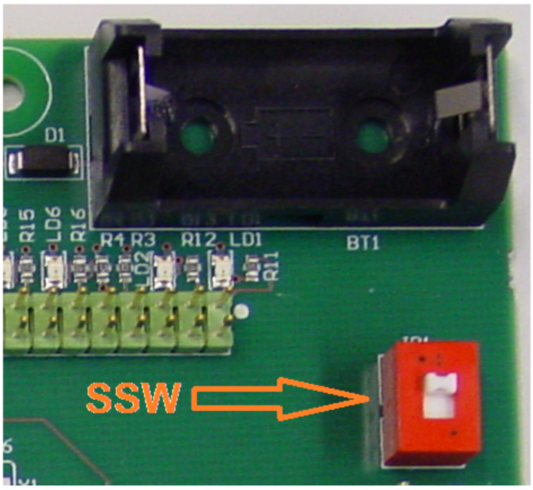


Fig. 2-43: Overview of SSW position (without battery and CPU board)

On delivery, the switch is in the open (position as shown in the figure). Change the status by moving the switch to its other position.

Be careful, the interior of the device contains sensitive parts. You can view the setting by using online parameterization or the remote operation panel. ➪ Viewing position of the security switch (p. 193). ➪ 3.6.5 The middle of the bottom status line (p. 237)

You can fit a seal direct to the SSW (jumper) or seal the entire housing to prevent or detect unauthorized access.

Additional conditions for fiscal metering

In the case of fiscal use, the conditions laid down in the relevant approval must be met. This is ensured by a file in the device that adjusts the settings. For final commissioning, the calibration switch or security switch (SSW) must be closed. You can attach a seal directly to the SSW (jumper) to prevent or detect unauthorized access.

> **Presence of an authorized person (calibration officer)**
>
> Within the scope of fiscal metering, depending on the regulations of your country, for the final commissioning the presence of an authorized person (calibration officer), who carries out officially protected work on gas-technical plants is required.

Details of the SSW are given in section ➪ The hardware parameter guard (SSW) (p. 94). For the approval file have a look into ➪ 3.2.6 Fiscal parameters and optional using of approval file (p. 194).

The applicable regulations on sealing the device must also be observed during fiscal operation. Make sure that you comply with these regulations.

2.7.2 Standard commissioning (application “C_6+”)

Complete all the commissioning work in the specified sequence to avoid possible damage and fault situations affecting the device.

Steps

1. Open the carrier gas cylinder setting: 0.325 MPa(g) ≙47 psi(g) ≙3.25 bar(g).
2. Open the calibration gas cylinder setting: For ATEX / IECEx: 0.3 MPa(g) ≙43.5 psi(g) ≙ 3bar(g). For cCSAus: 0.15 MPa(g) ≙21.7 psi(g) ≙1.5bar(g).
3. Open the process gas setting: For ATEX / IECEx: 0.3 MPa(g) ≙43.5 psi(g) ≙3bar(g). For cCSAus: 0.15 MPa(g) ≙21.7 psi(g) ≙1.5bar(g).
4. Switch on the power supply. After the proChain GC completes its boot sequence, you may connect it with the enSuite software. ⇨ 3.1.2 Data connection to the measuring device (p. 146)
5. Using the enSuite PC software, select **"Chromatograph"** and the **"Auto"** function. Follow the instructions in section ⇨ 3.7 Device operation (Chomatograph actions) (p. 282). The software performs the steps defined by the parameterization. (see ⇨ 3.3 Notices about parameterization (p. 204). If parameterized, the continuous measuring operation "**Automation**" is started directly. While reasonable analysis results may occur quickly, stable results can be expected after approximately one hour of operation.
6. Check for fault-free operation, e.g. with a measurement of a known gas. Change parameter “**Start on power up**” to **YES**, if wanted. (proChain GC performs an auto start e.g. in the case of power supply interruption). This concludes the standard commissioning procedure.

> The device will now operate with the default parameter set which enables it without any further changes to operate with low accuracy deviations.
>
> The default parameter set defines the starting behavior, calibrations, process gas sampling and the communications properties.
>
> The measured values are processed, and messaging, monitoring and logging tasks are also completed with the default settings.
>
> For change requests, see chapter ⇨ 3.3 Notices about parameterization (p. 204), or get in contact with the Honeywell.

The measuring system is used for various natural gases and measures samples of these gases at intervals of about three minutes. If the gas is not measured, it is discharged from the proChain GC via a vent gas line to create a continuous flow and the sample is taken from the current gas.

The device can be fitted with an optional additional heating system for use in temperatures below freezing. Further details of this option are provided in section ⇨ 2.3.1 Housing heater (opt. for use below 0 °C (+32 °F)) (p. 53).

Checking the device settings and signals

If you have completed the commissioning steps listed above and there are still errors or uncertainly measurement results. It may be necessary to adjust the flow of some gases or adjust some other settings. Since the default settings cannot know the site conditions, which may differ from the standard ones, it may be necessary to re-adjust the settings, for example the flush times, in some cases. This is also the case if the gas chromatograph was not supplied with the calibration gas in which case the calibration settings must be adjusted again.

> NOTICE
>
> **Operation with invalid default settings**
>
> Incorrect or inaccurate measurement results
>
> Flush times and the settings of the gas compositions from calibration gas must be checked and, if necessary, adjusted. ➪ 3.4.7 Adjust gas mixtures / limit values and select calculation (p. 222)

Adjust the settings and parameters using the procedure described in software section.

If errors are still active after you have made these changes, an extended (complete) check of the current device parameter set is required.

This can be done using the enSuite software, refer to ➪ 3 Software (Device operation with enSuite) (p. 141) . For example, you must check and adjust the bespoke alarm limits and settings for the sequence of sample gases and the calibration and protocol settings.

Parameterized output signals can be measured using suitable measuring equipment. The digital communication (Modbus, etc.) can be checked using suitable tools (for example a protocol analyzer).

2.7.3 Decommissioning and disposal

Decommissioning and disassembly

WARNING! Risk of explosion

DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT

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

NOTICE

Before making any changes to the wiring, it is essential to ensure that all cables are de-energized. The enCore device can be damaged if cables are removed while the power supply is switched on.

Improper removal of components may cause additional hardware damage, the device will not work any longer. Carry out the work with the appropriate level of care if you want to use the device again.

If the device contains hazardous media e, g. toxic gases, they must be removed before its dismantling. Prevent the release of potentially pollutant or dangerous substances.

To take the enCore device out of operation, proceed as follows:

1. Disconnect the device from the power supply.
2. Turn off all gas flows and depressurize all gas inlets.
3. Here, too, prevent the unintentional opening of the shut-off valves by taking suitable measures so that no danger can arise from further disassembly.
4. In a non-explosive atmosphere, remove all connected gas lines, cables and data lines.
5. Dismantle the device mechanically.

Next steps:

- In case of temporary decommissioning: ➪ 1.4.1 Storing proChain GC (p. 32) To do this, return the device to the condition in which it was transported.
- For final decommissioning open the device ➪ Opening proChain GC (p. 62), in the center of the unit, to the left of the GCM, you are looking directly at the CPU3 card with the SD card holder(as shown).

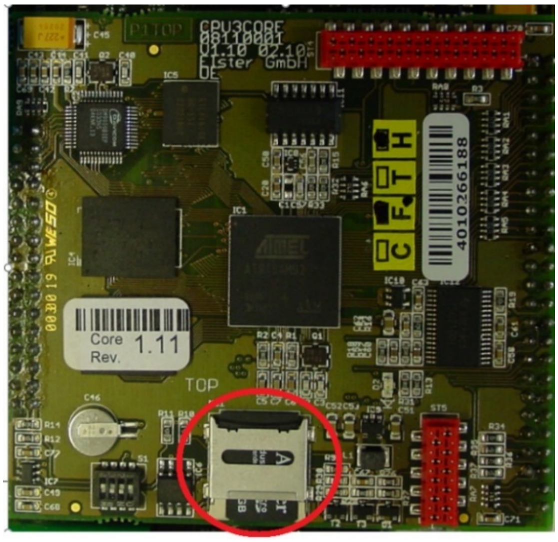


Fig. 2-44: Open SD card holder

- Open the SD card holder by sliding the cover down and remove the SD card to prevent unauthorized third parties from accessing the device's data. To prevent data from being recovered even after deletion, we recommend destroying the SD card.

> **NOTICE**
> Destroying the SD card means, the device will not work any longer.

- Remove the battery ➪ Remove of the battery (p. 135)

> **NOTICE**
> **Proper disposal of the battery**
> Please note that batteries are subject to hazardous waste treatment. Drop them off at a collection point or have them disposed of by a specialist company.

Disposal

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

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

Environmentally friendly disposal according to WEEE directive

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

NOTICE

Remove battery before shipping or disposing of the enCore device.

Note that batteries are subject to hazardous waste treatment. Remove them before shipping the enCore device and hand them in at a collection point or have them disposed of by a specialist company. ➪ Remove of the battery (p. 135)

2.8 Use of optional add-ons

The proChain GC offers several options that can also be installed subsequently. This section describes how to use these options. If you do not use optional extensions you can skip the section and continue with the next one.

2.8.1 Use of the ext. USB interface (ATEX / IECEx option)

Before using, the cap of the USB bushing, offered by Honeyell, must first be removed.

DO NOT REMOVE THE CAP AND DO NOT CONNECT THE USB WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT. FOR SAFE USE ONLY

After removing the cap an USB adapter (compare left image) must plugged in, see figures below.

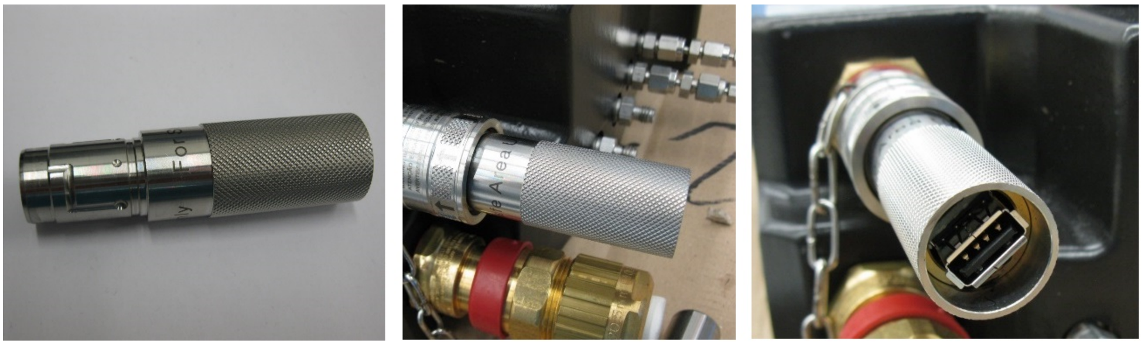


Fig. 2-45: Use of the USB service interface connection

A USB cable (male type A – male type A) can now plugged into the adapter.

The other side of the connecting cable can then be connected to the PC.

With the proChain switched on, you can connect to the proChain GC via USB using the configuration and analysis PC software enSuite.

2.8.2 Optional local display observation of device

Some device functions can be monitored locally by a Honeywell Local Display as an option to view the main data as an overview, see ⇨ 2.3.3 Local display (option) (p. 55)

This optional local display is not affected by connection or disconnection of enSuite, it will be refreshed constantly.

Navigation in the display

The following sections describe the menu using the Honeywell Local Display in general form based on examples. The figures below provide an initial overview of the structure. The figure below shows the standard version.

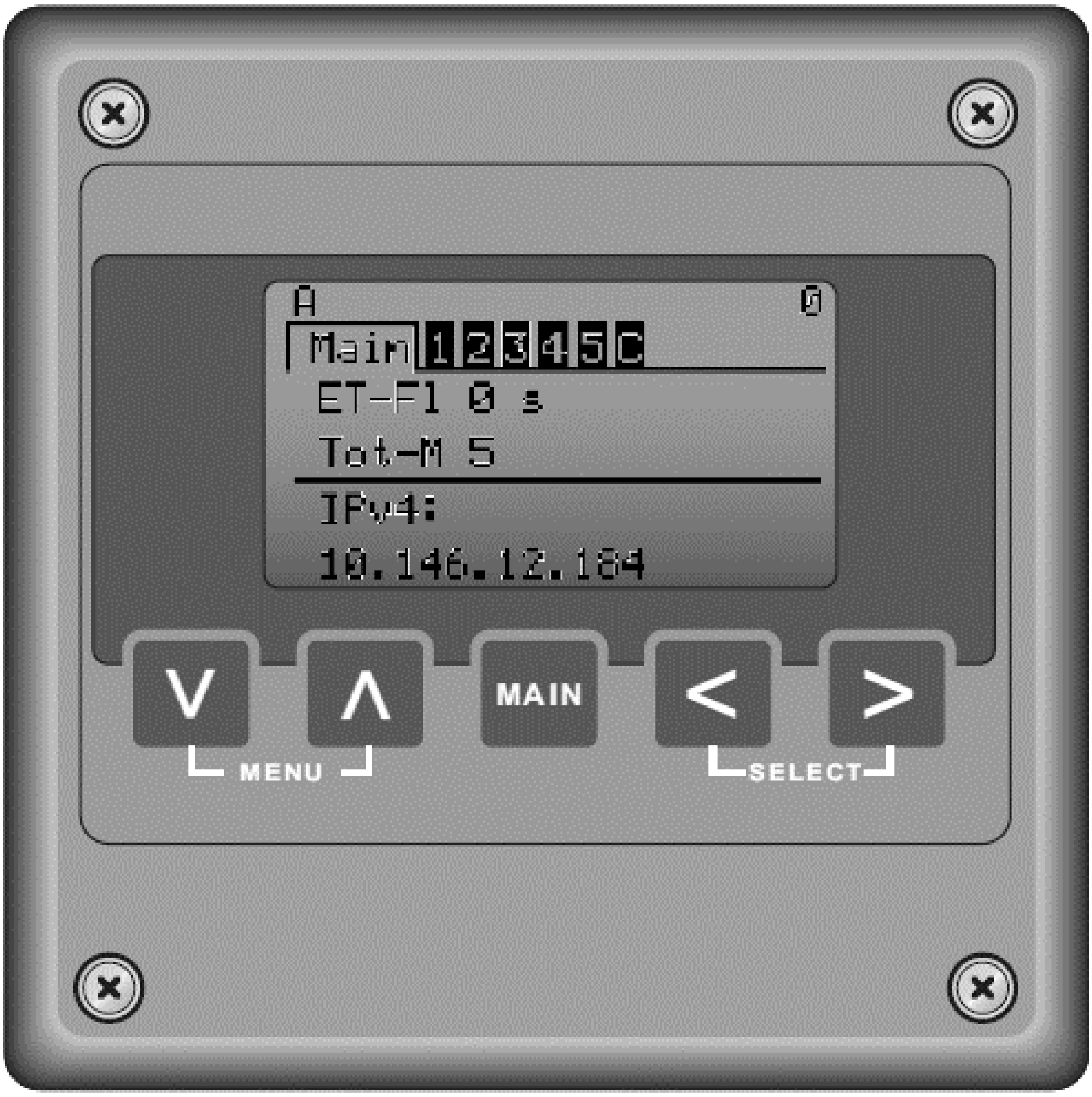


Fig. 2-46: Optional local display

There are five keys below the display (screen area). Pressing one of these keys activates the display, which switches itself off after a longer period of non-use. The display will appear in the position, that was last used. The following two characteristics provide information about this position.

- The second line gives an overview of all menus. The current (selected) menu is displayed highlighted a wider line, see examples for "Main", STR1" and Calibration"

Fig. 2-47: Current (selected) menu

- The black triangle shows the current (selected) point of the menu in the following examples IPv4 in menu Main and C3H8 in menu STR 1

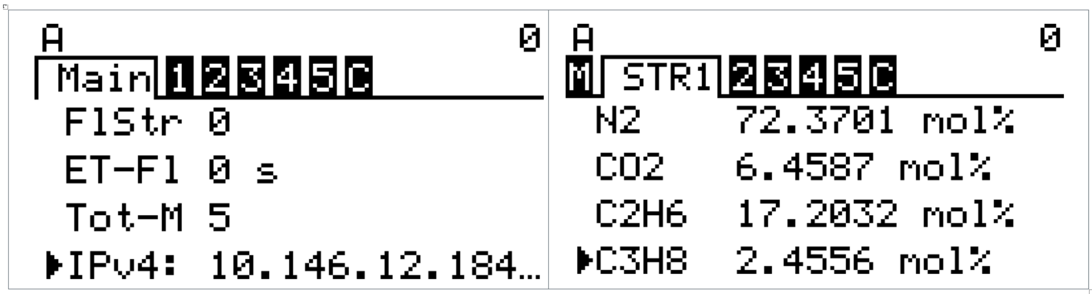


Fig. 2-48: Current (selected) point of the menu

The keys to change this position and view the desired values are located under the display area and have following functions:

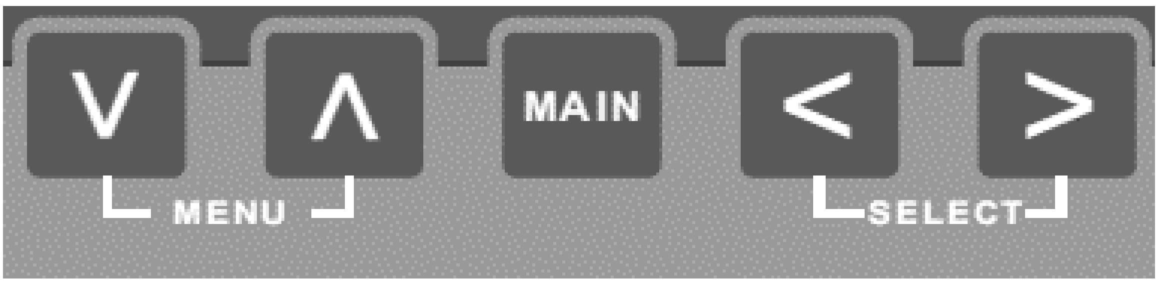


Fig. 2-49: TNavigation keys and Main

With the MENU keys, you scroll up and down in a menu. If the DOWN key is pressed again after the last entry, the list jumps back to the beginning. The last entry is also jumped to if the UP key is pressed in the topmost position.

With the SELECT keys, additional information for the current line can be displayed or the full information is shown because the line was too short for it. (use > for this function, < will return to the list)

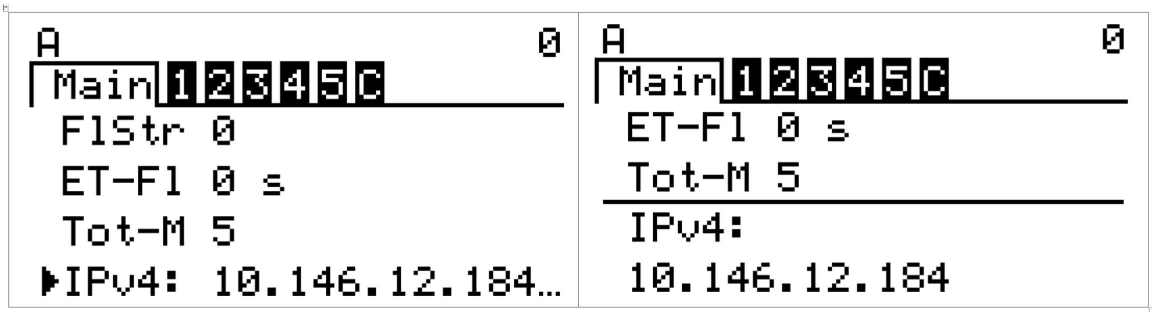


Fig. 2-50: Details of a menu point

If you are in the topmost position of a menu, as shown in the examples figure 3.70, you can use these keys to switch into another menu.

> **With a click on the MAIN key at the bottom center you return to the start of the display, no matter which position is displayed now.**

Display status line (first line)

The first line gives a rough overview of the device status. Alarms (A) or warnings (W) or both (if present) are displayed on the left, they are independent from the measured stream. If they do not exist or no longer guilty the place is empty. On the right the current measured stream is shown (0 for idle or no measurement, 6 for calibration running), see examples

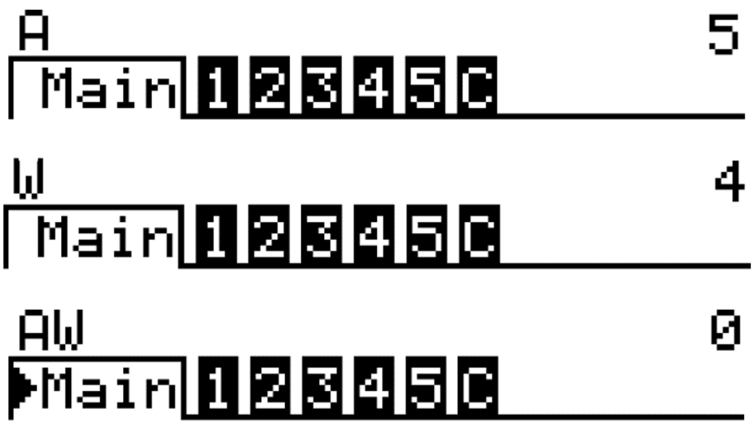


Fig. 2-51: Display status line (Alarms / Warnings)

> **The appearance of the display depends on the parameterization. The values displayed are only valid if the system is in analysis mode and has not suffered a fault. This means that no alarm or error messages are active (view log)**

Data / content of Main display

The main display is the start display of the device. This position can be reached by pressing the MAIN key. As the display only offers space for a few characters, abbreviations are used.

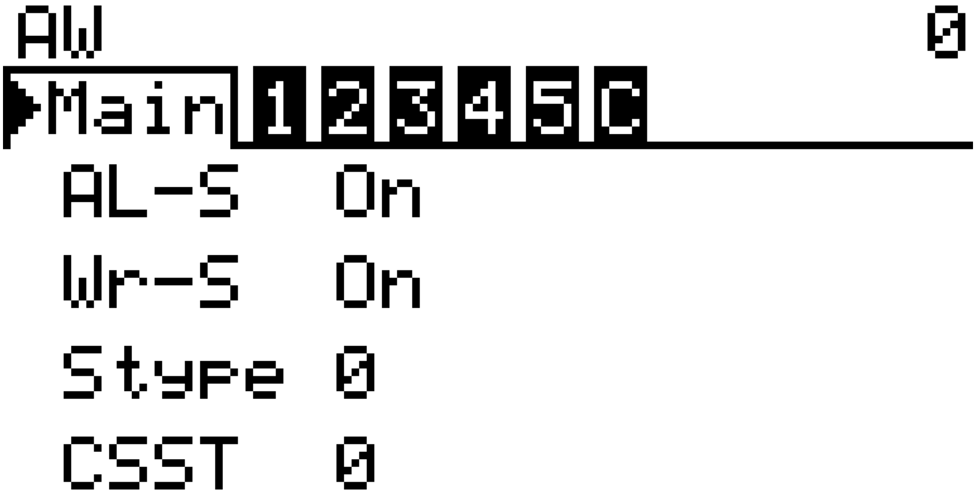


Fig. 2-52: Main display (Start display)

The following table explains the abbreviations and lists all values contained in the menu. Use the DOWN and UP button of MENU to scroll through the display.

Display text	Meaning
Main	Name of the menu
AL-S	Alarm (Alarms exist = On / No Alarms exist = off)
Stype	Sample Type (only numbers are displayed) 0 = Idle / 1 = Parameter Update / 2 = Auto / 3 = Calibration 4 = Verification / 5 = Single run /6 = Initialization
CSST	Sequence State (only numbers are displayed) 0 = Inactive / 1 = Flushing / 2 = Switching stream / 3 = Waiting for module ready 4 = Start Measurement / 5 = Measurement / 6 = Abort measurement 7 = Parameterization / 8 = Initialization /9 = Measurement & Flush next stream
CStr	Current stream (Gas of the input which is connected / measured in the module)
ETrun	Running Time (Time elapsed since the beginning of the measurement)
FlStr	Flushing stream (Gas path which is flushed for the next measurement 0 = no flushing in the moment)
ET-Fl	Elapsed flushing time
Tot-M	Total measurements (Number of all measurements independent of the stream)
IPv4	IP-Address of the device
SerNo	Serial number of the device

Data / content of display STR1-5 and Calibration

The displays for Stream 1-5 and calibration are build identical. The last measurement results for dry gas for the set reference state are displayed as standard. As the display only offers space for a few characters, abbreviations are used.

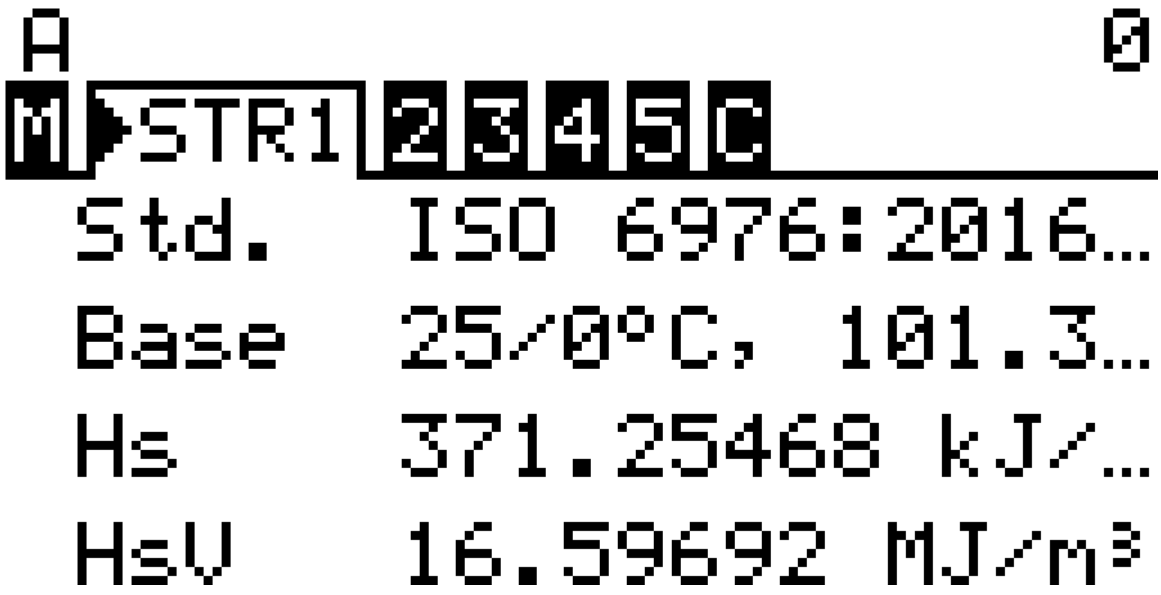


Fig. 2-53: Display of streams and calibration

The following table explains the abbreviations and lists all values contained in the menu. Use the DOWN and UP button of MENU to scroll through the display.

Display text	Meaning
STRx	Name of the menu (x= 1 to 5 and C = Calibration)
Std.	Calculation standard
Base	Base conditions selected for the calculation standard
Hs	Gross heating value / Higher heating value (molar)
HsV	Gross heating value / Higher heating value (based on volume)
HsM	Gross heating value / Higher heating value (based on mass)
Hi	Net heating value / Lower heating value (molar)
HiV	Net heating value / Lower heating value (based on volume)
HiM	Net heating value / Lower heating value (based on mass)
Z	Compressibility factor
Ws	Superior Wobbe index (Wobbe index superior) Gross Wobbe index
Wi	Inferior Wobbe index / Net Wobbe index
rd	(d) Relative density (of fuel and air)
ρ	(Rho) Density at base conditions
M	Molar mass
CH_4	Methane
N_2	Nitrogen
CO_2	Carbon dioxide

Display text	Meaning
C_2H_6	Ethane
C_3H_8	Propane
nC_4H_{10}	n-Butane
iC_4H_{10}	Isobutane (i-butane)
nC_5H_{12}	n-Pentane
iC_5H_{12}	Isopentane (i-pentane)
$neoC_5H_{12}$	Neopentane (2,2-Dimethylpropane)
nC_6H_{14}	n-Hexane (C6+)
C_7H_{16}	Heptane
C_8H_{18}	Octane
C_9H_{20}	Nonane
$C_{10}H_{22}$	Decane

2.9 Maintenance, cleaning and repair

In addition to the operational calibration (usually triggered by parameterization) a regular annual maintenance is required, to ensure long-term use.

The operator is responsible for ensuring that the installation and maintenance work described in this document is carried out correctly and that the device remains in technically perfect, safe condition throughout its period of operation. Honeywell will be happy to assist you with this work.

Maintenance consists of checking the entire system for the presence of any unusual damage that may have occurred since the time of installation and commissioning, and preventive checks such as checking the possible ranges of consumables.

PROHIBITION

Carry out any of the work mentioned in this section if you do not have.

- **the necessary instructions from the manufacturer or his authorized representatives.**
- **the permission of the plant operator.**

Honeywell recommends that the completed maintenance work and general operations are documented.

Cleaning and, if necessary, Honeywell service work or repairs are the resulting outcome of this maintenance.

2.9.1 Possible error events

These are messages or signals that are generated by different software parts (called AFB or SFB). All events are binary. They may or may not exist at a certain point in time. All possible display texts are listed under the respective AFBs or SFBs in the export value window of enSuite ⇨ 3 Software (Device operation with enSuite) (p. 141). Alarms are shown in red and warnings in yellow.

In the **export value window**, select a message or a signal e. g. currently displayed in the **Error List**. Press **F1** to get information about the event or further actions. Additional display texts can be generated. This is done in the **Postprocessing AFB** by changing the parameter set. Further information on parameterization and on the Postprocessing AFB see ⇨ 3.3 Notices about parameterization (p. 204)

2.9.2 Disturbances during normal operation (troubleshooting)

On the operation panel, in addition to the screen and the keys, there are two multicolored LEDs. On the basis of the display (color / flashing light), you can see whether the measuring device is working properly or whether there is or was a malfunction.

In this case, the fault list contains corresponding entries. As an aid to eliminating malfunctions, this section contains guidelines for troubleshooting. You can locate the cause of these malfunctions by checking the input and sensor values and, if necessary, correct them. Honeywell provides troubleshooting assistance.

Troubleshooting checklist

1. Check that the sample gas, calibration gas and the carrier gas are available at the correct pressure
2. Check that the vent gas line is not blocked.
3. Check the gas flow in the device (e.g. float / flow meter)
4. Check the supply voltage(24 VDC) and the housing groundingas well as the bootloader
5. Check the communication connections
6. Check the displays for red entries.

The following describes action to prevent some errors. It is essential to obey all the safety regulations when troubleshooting, particularly the following:

> **NOTICE**
>
> Opening of the device only with written operator's authorization under observance of all safety measures!
>
> Do not loosen cable entries in an explosive atmosphere!
>
> Loosening or unscrewing the breather element is prohibited!
>
> Only explosion-protected, approved work equipment is to be used!
>
> Work only in de-energized and depressurized condition, no explosive gas atmosphere may be present!
>
> Protect all open lines and connections against contamination / dirt!
>
> Before the device is switched on again, ensure that all the gas connections are sealed and the grounding or PE wire is correctly installed.

If you are not successful with the following methods, there is a defect which you can only rectify by replacing modules. Contact Honeywell to obtain the required parts or to arrange a service visit. ⇨ 4.2 Technical support Flow Computers and Gas analyzers (p. 314).

2.9.3 Correct the gas supply failures

Rectification of the errors under points 1 – 3 (gas supply error) e.g. abnormal loss of calibration or carrier gas. The following measures can be taken:

> **DANGER due to unusable gas leak detector**
>
> **Damage to health and property (explosion) possible**
>
> Use gas leak detectors that reliably indicate even the smallest leaking quantities of the gases used.

Steps

1. Complete a tightness test ⇨ Check the tightness of the installation (p. 122)
2. Set the regulators and valves to the required values..
3. Disconnect blocked lines from the switched-off device and flush the pipeline with non-flammable gas to remove any blockages and deposits not exceeding the maximum pressure.
4. Discharge the purge gas properly

2.9.4 Correct electrical faults

Rectification of the errors under point 4 (electrical supply and insulation errors, no enSuite connection possible).

Prerequisite(s)

- All all switchgear and fuses outside the device have been checked and are OK. Defective parts were replaced if necessary.
- The idling voltage (without connections) and supply voltage (with connected device) of the electrical supply has been checked and is OK (24V DC). Defective parts were replaced if necessary.
- Opening of the device is permitted by the plant operator.

Following tools and materials are available:

- Multimeter
- Service standard tools
- Some small cable ties
- Gas leak detector for flammable gases, calibrated with status or value display
- ESD wrist strap or similar device to prevent electrostatic discharge

Steps

Preparations for opening and opening the device:

1. Dee-energize the device (switch off power).
2. Make sure that there is no voltage, e.g. with a multimeter.
3. Turn off gas supply, block the device from all gases.
4. Monitor the environment for the presence of an explosive atmosphere, e.g., with a gas leak detector, continuously during the entire process.
5. Ensure there is no explosive atmosphere. Only then open the device.
   ➪ Opening proChain GC (p. 62)

> **DANGER EXPLOSIVE ATMOSPHERE**
>
> **Damage to health and property (explosion) possible**
>
> Stop work immediately if an explosive atmosphere occurs!

Examine the device.

1. Avoid electrostatic discharges, e.g. with an ESD wrist strap.
2. Disconnect the supply line connector from the circuit board.
3. Measure the electrical resistance of the cable connection between the device plug and the electrical supply. If there is no low-resistance electrical contact, reconnect the wires. If the contacts are OK, go to the next step.
4. Ensure there is still no explosive atmosphere. Only then switch power to the device and measure the incoming idling voltage of the supply cable at the removed plug.
5. Replace the cable **(power off before)** if the voltage is missing or significantly lower than the voltage of the electrical supply. If the power supply is OK, go to the next step.
6. **With power off**, plug the supply line connector back onto the circuit board.
7. Ensure there is still no explosive atmosphere. Only then switch power to the device and check if the error is still there. If so, contact Honeywell

Device closing

1. De-energize the device (switch off power).
2. Make sure that there is no voltage, e.g. with a multimeter.
3. Close the de-energized device. ➪ Closing the housing of proChain GC (p. 63)
4. After successful repair, supply the device with power again, to complete the work.

Replacing the fuse of the Terminal Board

A fuse (type 0477005MXP / 5 A / time lag) to protect the electrical components is also located on the Terminal Board. See overview drawing. If necessary, this can be replaced with an equivalent fuse.

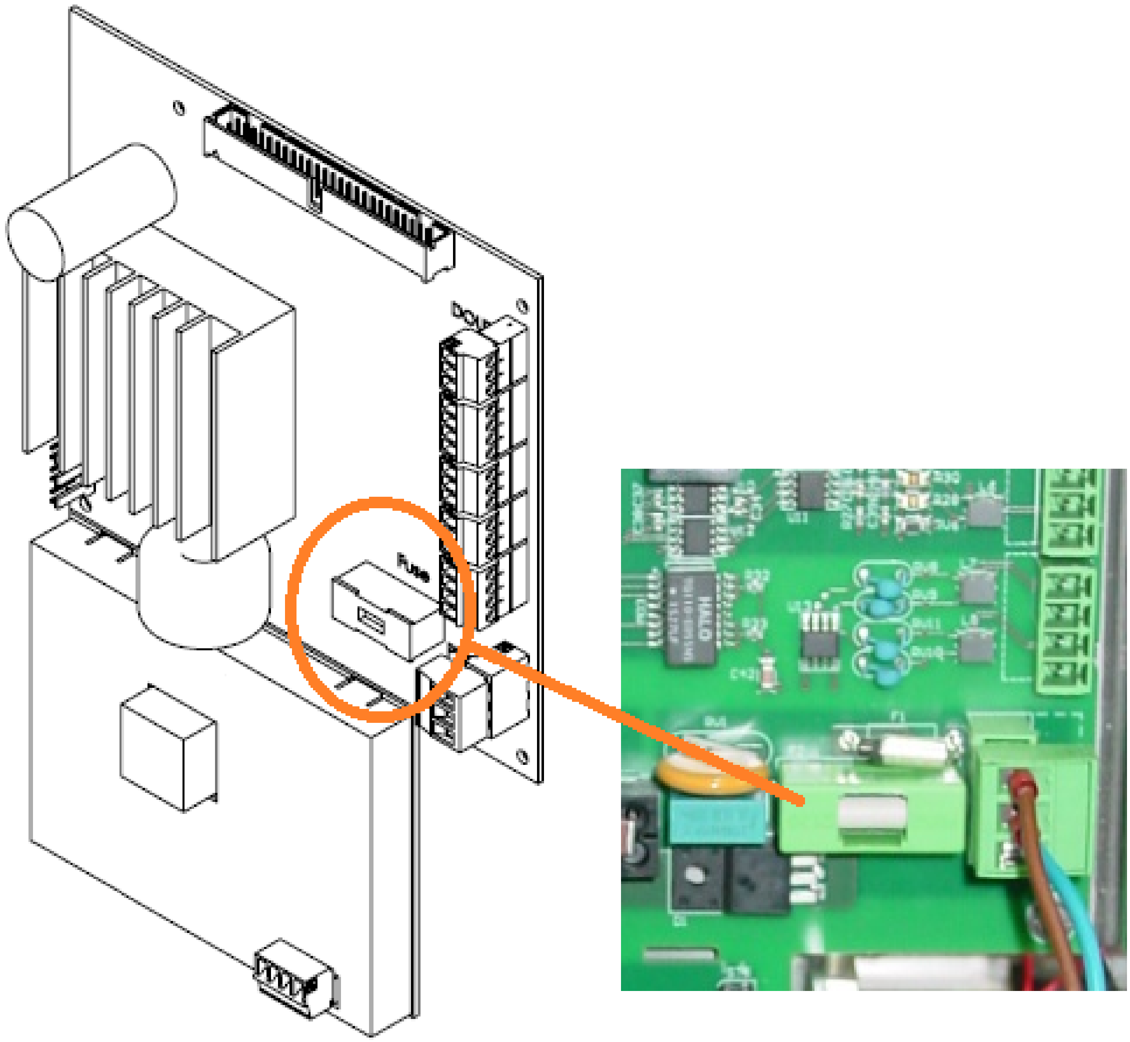


Fig. 2-54: Terminal Board fuse

Prerequisite(s)

- Opening of device is permitted by plant operator.
- Ambient conditions according to ISO / IEC61010-1
  (temperatures / humidity as in living and office spaces).

The following tools and materials are available:

- fuse type 0477005XP 5A
- Service standard tools
- Gas leak detector for flammable gases, calibrated with status or value display
- ESD wrist strap or similar device to prevent electrostatic discharge

Steps

Preparations for opening and opening the device:

1. Dee-energize the device (switch off power).
2. Make sure that there is no voltage, e.g. with a multimeter.
3. Turn off gas supply, block the device from all gases.
4. Monitor the environment for the presence of an explosive atmosphere, e.g., with a gas leak detector, continuously during the entire process.
5. Ensure there is no explosive atmosphere. Only then open the device.
   ⇨ Opening proChain GC (p. 62)

> **DANGER EXPLOSIVE ATMOSPHERE**
>
> **Damage to health and property (explosion) possible**
>
> Stop work immediately if an explosive atmosphere occurs!

Change fuse

1. Avoid electrostatic discharges, e.g. with an ESD wrist strap.
2. Open the cover and remove the blown fuse. See figure above
3. Insert the replacement fuse and put the cover back
4. Ensure there is still no explosive atmosphere. Only then switch power to the device.
5. If the internal LEDs do not light up, the thermal fuse has tripped. A service technician must replace the circuit board to eliminate all possible sources of error. If the boards have power (LEDs are on), proceed to the next step.

Device closing

1. De-energize the device (switch off power).
2. Make sure that there is no voltage, e.g. with a multimeter.
3. Close the gas-tight de-energized device. ⇨ Closing the housing of proChain GC (p. 63)
4. Switch power to the devive again to complete the work.

2.9.5 Correct communication errors

Rectification of the errors under point 8 (communication error)

The following action can be taken if an error occurs in the data communication. This may be a hardware error or a software error.

> Always use the latest enSuite version for your work to access all device versions. ⇨ (p. 1)

Action: Checking the communication (software)

- If changes have been made to the parameterization, undo them. Use the last saved functional parameterization. A complete check of the current device configuration can be performed with the enSuite software with an online connection.
- If the bus communication is not working, it may be the case that the device has been parameterized to too high an operating mode.If you have multiple devices on the bus, you must take the slowest subscriber into account when selecting the operating mode.
- Use the test function of the digital inputs and outputs
  Requirements: Use enSuite ⇨ 3.1 enSuite basis of use (p. 142)
  In- and outputs being tested are parametrized, the device is switched on, connected and ready for operation. You are logged in with the required rights. Navigate to the **I/O overview display**. Select **On** for the test mode of the appropriate hyperlink. Click on the hyperlink to go to the Board details sub-display. Select the communication you wish to test under **Channel** in Board details. See figure.

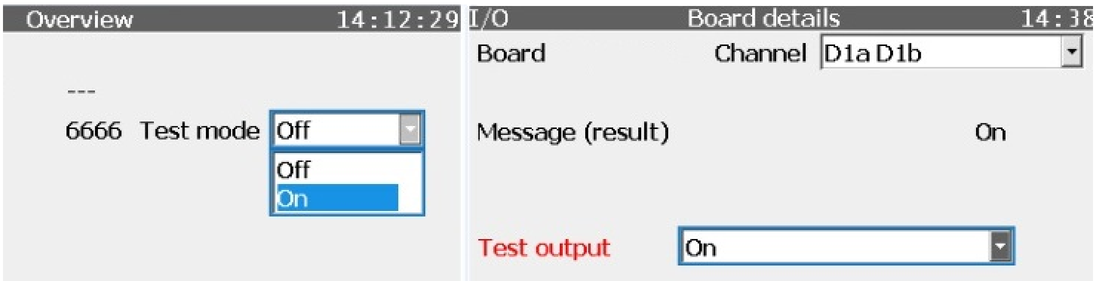


Fig. 2-55: Example I/O overview and Board details displays

The desired state is shown next to **Message (result)**. In the example,**On**.
You can change the states, regardless of the actual conditions, using **Test output**". Measure each output in both states (On/Off) to obtain a complete overview of the error situation. Use a measurement device to test whether a connection exists, will be created or has been interrupted between the switch signal cable and the return cable.
Do not forget to switch off test mode again.

Action: Checking the communication (hardware)

> NOTICE
>
> Carry out the following hardware check only in consideration of explosion protection, required housing opening may only take place if no explosive atmosphere is present.
>
> ➪ 2.4.5 Opening and closing proChain GC (p. 61)

- Check the communication cables for signs of damage. Check the “terminal to terminal” connection for each core.
- Checking the digital communication (Modbus etc.) can take place (e.g. as protocol analyzer). Use appropriate tools.
- Parameterized output signals can be measured with appropriate measuring instruments and checked in this way.
- Test the function of the digital outputs after switching off the device. The plugs of communication cables have been disconnected on the terminal board. Use a measurement device to test whether there is a connection between the switch signal terminals and the return cable. Except for output DO_1, the normally closed contact, no connections are permitted to be made.

Also note the information in section ➪ 2.5.6 Connection to other devices and system parts (p. 73)to get a better overview.

2.9.6 Resolving a "Protocol error" (message)

Background

Masters (serial) or clients (TCP/IP) monitor the communication via Modbus. They establish a transmission error if either the Modbus communication is interrupted or the data import or data export is not successful for at least one register. In this case, the AFB generates a message with the same name **Protocol error**. The message is displayed until all registers of this Modbus unit can be successfully imported or exported again.

Important parameters for error recognition include **Transaction timeout** (master) and **Error filter** (slave/server). In the case of **Transaction timeout** you determine a maximum time period for which a master waits for the answer from a slave before it generates a protocol error. In the case of the error filter, you specify for each slave/server the number of times the AFB tries to export or import a register (Round Robin method) before the master or client generates the message.

Possible causes and remedies

- The device is switched on, but is not reachable due to erroneous parameterization of the communication parameters.

▶ Ensure that the communication parameters in the **Basic System** and Modbus AFB are coordinated between the master and slave and/or client and server.

OR

[only Slave/Server]

- The error tolerance during data import or data export of a register is too low.
- On a test basis, increase the **Error filter** parameter under:
  Modbus – Communication mode: Master or client – Remote devices – <Remote device x>, tab **Parameter**, section **General**.

OR

[Master and slave]

- At least one register is incorrectly or not at all parameterized on one of the two sides.
- Use the operation panel of the enCore device in the display belonging to the Modbus AFB and check which registers are not regularly refreshed. On both sides, check for errors in the respective parameterization concerning these register numbers.

OR

[Master and slave]

- The cabling is defective or there is a cable breakage.
- Check the cabling and replace the damaged cable.

OR

[only master]

- The remote device (slave or server) processes the telegrams slower than expected.
- On a test basis, increase the **Transaction timeout** of the master under:
  Modbus – Communication mode: Master or client, tab **Parameter**, section **Interface**

2.9.7 Detect hardware errors

The following measures can be used to detect hardware faults. (Faults under point 9)

Checking the displays

If entries are shown in red letters in the displays, and you have excluded all other previously discussed error possibilities, there is most likely a hardware defect

Using "Live Data and Trending"

You can use "Live Data and Trending" in enSuite to check for changes in the raw data and to determine the timeliness of the values generated by the hardware. If the live data also does not show valid values, there is a hardware defect that you cannot fix without spare parts

Further action:

Please contact Honeywell for replacement of the corresponding component.

2.9.8 Eliminate start-up errors

Prerequisite:

A prohibition sign is shown on the display or in the **remote operation panel** the device is in emergency operation. Hints about the **remote operation panel** ➪ 3.6 The Remote operation panel actions (p. 232) a connection to the device is required.

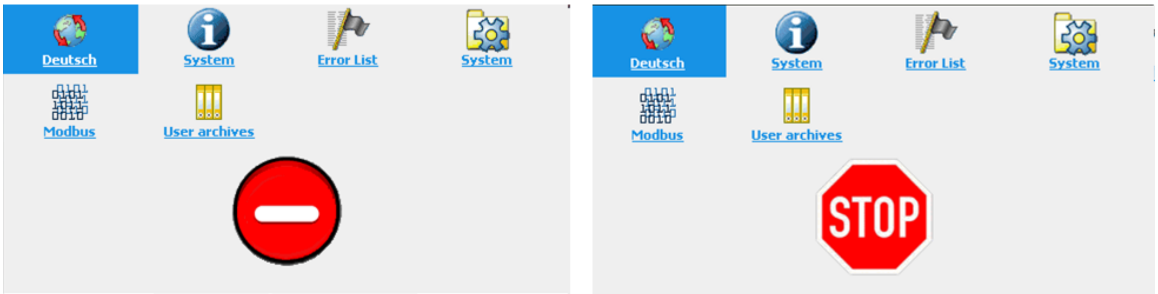


Fig. 2-56: Device not ready

Background

Examples of such errors are import of a faulty parameterization or internal connection errors. For example, after or during start-up, a one-way sign is displayed. and only the basic functions for error handling are active; all other functions are deactivated.

Procedure in case of errors caused by parameterization

- Transfer a correct parameterization to the device, e.g. the factory parameterization. ➪ Import parameter settings (Reset device) (p. 157)

Procedure in case of other errors

- Open the device (only if permission is available and prerequisites are met) ➪ 2.4.5 Opening and closing proChain GC (p. 61)
- Check all internal plug connections (all plugs are correctly seated on the sockets).
- If there are no connection errors, modules must be replaced Please contact Honeywell to order spare parts.

2.10 Maintenance and maintenance intervals at a glance

Using the list below and the other sections, check the possible ranges of consumables and the presence of any unusual damage that may have occurred since the time of installation and commissioning. Equipment cleaning and documentation of the work performed complete the maintenance.

> **DANGER**
>
> **Incorrect or non-performed maintenance work**
>
> Health and property damage as well as incorrect measurement results are possible
>
> The operator must regularly check all safety devices for operability, if necessary, also outside the maintenance interval. The provisions for explosion protection (e.g. per IEC EN 60079-14) must be observed.

Not all maintenance work, for example replacing the battery, can be carried out by the user. The following overview lists all possible maintenance work and intervals. This monitoring can also be performed more frequently in order to detect deviations at an early stage. If necessary, please arrange a service appointment.

- Visual inspection. Fill in the "First inspection" ⇨ First inspection (p. 138) form one month after commissioning.
- Close-up inspection(s) every twelve months. Document results (e.g. use "Service report template" ⇨ Template for documentation of the work performed (p. 140))
- Carrying out a test Meausements every twelve months. see ⇨ Repeatability test (p. 129)and ⇨ Accuracy test (p. 130)

Main areas for the annual inspection

- Check the gas connections using a tightness test with gas leak detector.
- Check the battery capacity (if replacement is necessary, it must be done as part of a service visit)
- Check the housing parts
- Check the external elements with tools (is everything secure)
- Monitor the vent / breather element
- Conduct a visual inspection of the connections (electrical / mechanical)
- Inspect the interior of the device
- Visual inspections / cylinder pressure (calibration gas and carrier gas)/ of inlet pressures /of flow rates. (compare pressure gauge /flow meter with values at start-up).
- Visual inspection / replace (if necessary) of gas inlet filters.
- Check the mechanical strength of the electrical grounding and test it for low resistance

Replacing the consumables (only possible during a service visit)

- Particle filter for process gases, depending on impurities, every 1 to 3 years
- Lithium cell battery, depending on use, as a precaution every 10 years

If you operate the device official (fiscal), please also observe the applicable regulations regarding sealing and closing off the housing before opening it. If you have any questions, please contact Honeywell.

2.10.1 Spare parts and repairs

For spare parts and repairs please write an email to our service.

PMT-Reparatur@Honeywell.com

Spare parts / consumables / additional materials

The list below shows the most important spare parts, consumables and accessories. The explanation follows in the next sections.

SAP-No	Name
3-875-414	Breather
600.24.030	O-ring (for Breather)
801.06.713	Filter Gasinlets 1/8”
799.05.041	Cable Gland M20 (5.5-12)
799.05.042	Cable Gland M20 (12.5-20.5)
799.05.043	Cable Gland M25 (17-26)
799.05.017	Plug M20 (for unused cable glands)
799.05.048	Plug M25 (for unused cable glands)
1.875.343 (1x) 040.08.020 (4x) 220.08.007 (8x) 210.08.000 (4x)	Wall mounting bracket (incl. mounting parts)
600.40.270	O-ring for Housing Cover
1.875.239	Stream Selection Block – base (w/o valves)
1.875.380	Stream Selection Block - extension (w/o valves)
102.49600022	Valve (for Stream Selection Block)
73024297	Module Manifold (incl. ferrules, nuts, bolts)
73025429	GCM1000 Natural gas C6+ calibrated
600.01.001	O-rings for GCM1000/EPC/BPC
73024215	Terminal Board
73023525	CPU3Core (board) incl. SD-card
73023755	Micro-SD-Card

SAP-No	Name
73024218	Base Board
4270033	Battery 1/2AA 3.6 V
73025542	Carrier EPC (EPC)
73025543	Sample EPC (BPC)
73024301	Cable Base - Terminal Board
73024302	Cable Base - Module Connection Board
73024303	Cable MCB - EPCs
73024217	Valve Connector Cable Full
73024470	Valve Connector Cable Halfstream (1-2 Streams)
73024344	Housing heater foil (2 foils needed)
2.875.491	Insulation Cab
73024308	USB (optional external service connection)
799.05.044	M25-M20 adapter (for USB connection)
73024101	M20 washer (for USB connection)
73024269	Display (with cable, cable gland, mounting parts)
73024221	Cover IS Display Board
73024216	IS Display Board

2.10.2 Inspection work in detail

Checking the battery charge

The battery of the device is mainly stressed when the voltage supply is permanently switched off or is switched off and on again more frequently. When the voltage supply is connected, the consumption of the battery can be neglected.

The battery must be replaced when the charge drops to less than 20%. In addition, the battery loses energy due to aging and must be replaced with a new one after 10 years at the latest.Check the battery charge on the info display (device monitor).

> **NOTICE Discharged battery**
>
> The device will no longer start correctly, Measurement data will be lost. Check battery charge at least once a year.

Procedure:

- On the device or the remote operation panel activate: Home- display – Info – Device monitor
- Read off the **Battery state of charge** and note the value in the maintenance report.

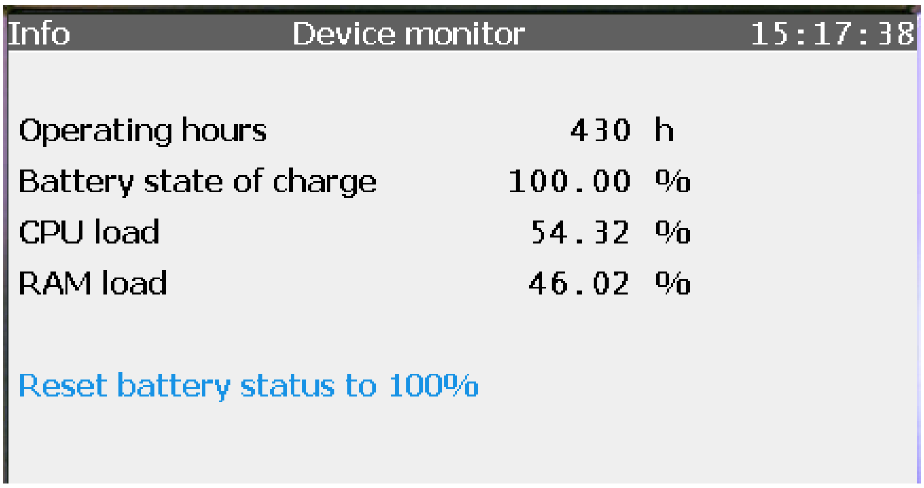


Fig. 2-57: Display Device Monitor

Result evaluation and further procedure:

- Charge > 50 % Battery can be used for another year.
- Charge < 50 % Check battery more frequently
- Charge < 20% Replace battery if necessary inform Honeywell for this purpose.

Check the tightness of the installation

> **DANGER**
>
> **Leaky gas installation**
>
> Leaks increase the risk of explosion and can cause serious damage to health and considerable damage to property.
>
> Do not work with leaking gas installations. Use a suitable gas leak detector to check all parts of the installation. Eliminate leaks immediately or shut off the affected area immediately.

Check the tightness before the device

Prerequisite(s)

- The valves in the device are closed (No power supply)

Following tools and materials are available:

- Gas leak detector for flammable gases, calibrated with status or value display

Steps

1. Apply gas and pressure to all inlet gas lines of the measuring device so that a gas volume is present in the lines.
2. Use a gas leak detector to check all parts of the installation up to the instrument for leaks. Also check the carrier gas lines. (Use a gas leak detector that can reliably detect the appropriate gas).
3. If gas leak detector shows leaks, Immediately shut off the affected parts of the gas line system and depressurize them. ⇨ Procedure in case of leaks (p. 123). Otherwise the check is finished.

Check the tightness downstream device

Prerequisite(s)

- The device is in operation and gas is flowing through it.

Following tools and materials are available:

- Gas leak detector for flammable gases, calibrated with status or value display

Steps

1. Use a suitable gas leak detector to check all parts of the installation behind the device (exhaust gas lines) for leaks.
2. If gas leak detector shows leaks, take the device out of operation immediately and shut off the affected parts of the gas pipe system. ⇨ Procedure in case of leaks (p. 123). Otherwise the check is finished.

Procedure in case of leaks

Steps

1. Immediately switch off the affected parts, depressurize and de-energize them.
2. Do not use the device elimination of leaks.
3. Eliminate / seal the leak!
4. Check the effectiveness of your measures! !
   Repeat ⇨ Check the tightness of the installation (p. 122)

Check cylinder pressure (visual check)

General

- Operation without calibration gas is possible, the results will be less accurate
- Operation without carrier gas is not possible

Prerequisite(s)

- Maintenance work is performed on the device.
- Planning for storage.

Steps

1. Read the cylinder pressure of the calibration gas and the carrier gas on the pressure gauge of the gas cylinder.
2. Note the result in the maintenance report or your planning documents.

Further procedure

- With a cylinder pressure of significantly more than 1.0 MPa(g) use until next maintenance is possible.
- With a cylinder pressure less than or around 1.0 MPa(g) the gas supply is not sufficient until the next maintenance. You can empty the cylinder to a minimum pressure of 0.5 MPa. Inform Honeywell if a new calibration gas mixture or carrier gas is required.

Check inlet pressures (visual check)

Valid pressure ranges

- Carrier gas inlet pressure is between
  0.3 MPa(g) ≙3 bar(g) and 0.35 MPa(g) ≙3.5bar(g)
- Process gas and calibration gas inlet pressures are between
  0.1 MPa(g) ≙1 bar(g) und 0.3 MPa(g)) ≙3 bar(g) for ATEX / IECEx use
  0.1 MPa(g) ≙1 bar(g) und 0.15 MPa(g)) ≙1,5 bar(g) for cCSAus use.

Prerequisite(s)

- Maintenance work is performed on the device.
- Pressure errors are displayed.

Steps

1. Read process gas inlet pressure (streams 1-5),calibration gas inlet pressure (stream 6) and carrier gas inlet pressure on pressure gauges.
2. Note result in the maintenance report or similar documents.

Further procedure

- If the pressure is inside the valid ranges the check is done,
  If the pressure is outside the valid ranges, use the control devices in the supply lines to bring it into a valid range.
- If the pressure cannot be adjusted to a valid range, disconnect the gas and power supplies and do not use the unit until repair is made. Contact Honeywell for a service call.

Checking flows (optical control)

> In some systems, variable area flow meters are installed in the gas streams. These are not absolutely necessary, since the flow rate is controlled by the pressure but the floats provide an additional means of control.

Prerequisite(s)

- Maintenance work is carried out on the device.
- Pressure errors are indicated.

Steps

1. Check the device for process gas pressure alarms. No process gas pressure alarm should be active.
2. Read off the flow rates at the floats
   (if present floats should indicate approx. 2 l/h).
3. Note the result in the maintenance report, execute further procedure if necessary.

Further procedure:

- Readjust the flow rates by changing the inlet pressure. If this is not possible with valid inlet pressure, check / replace filter at inlet to device.
- As long as the operating conditions are not in a valid range, disconnect the gas and voltage supply and do not use the device until it is repaired. Contact Honeywell for a service call or to order replacement parts.

Check housing parts (visual inspection)

General

> **NOTICE**
> **The housing may only be repaired by Honeywell. Explosion-proof equipment not repaired by the manufacture may be not used again**

Prerequisite(s)

- Maintenance work is performed on the device.
- Unusual changes at the place of use.

Steps

1. Check all housing parts (including built-in parts such as flow meter or additional parts such as local display) for damage and loose components.
2. Tighten loose parts if existing. Set unscrewing locks in function and note the result in the maintenance report or your documents.

Further procedure

- If all components are undamaged and bolts and fasteners are in proper condition the use until next maintenance is possible.
- If damaged parts present inform Honeywell, disconnect the gas and power supply and do not use the deviec until it has been repaired.

Check connections (visual check)

Prerequisite(s)

- Maintenance work is performed on the device.
- Unusual changes at the place of use.

Steps

1. Check connections (fluidic / electrical) to determine if they are undamaged, complete and free of corrosion..
2. Replace defective components and close unused openings, if existing! Observe the explosion protection rules!
3. Note result in maintenance report or your documents.

Further procedure

- If all components are undamaged, complete and free of corrosion the use until next maintenance is possible.

- If damaged parts present, you can not replace, inform Honeywell, disconnect the gas and power supply and do not use the device until it has been repaired.

Check breather(s) / device venting

Prerequisite(s)

- Maintenance work is performed on the device.
- Unusual changes at the place of use.

Steps

1. Check whether the openings on the breather and connected components, e.g. ventilation line or swan neck, are free of dirt and blockages.
2. Remove the dirt if existing!Do not pour or spray water or cleaning agent into the breather system!
3. Note result in maintenance report or your documents.

Further procedure

- If there is no contamination or if it has been successfully removed, the use until next maintenance is possible.

- If dirt is still present, a service call is required. Inform Honeywell. Do not carry out any further actions or work, do not use the device any longer until the breathing organ and / or the ventilation line are in perfect condition again.

Check device internally (visual inspection)

Prerequisite(s)

- Opening of the device is permitted by the plant operator.
- Maintenance work is carried out on the device.
- Unusual changes at the place of use.

Following tools and materials are available:

- Service standard tools
- Some small cable ties
- Gas leak detector for flammable gases, calibrated with status or value display
- ESD wrist strap or similar device to prevent electrostatic discharge

Steps

Preparations for opening and opening the device:

1. Dee-energize the device (switch off power).
2. Make sure that there is no voltage, e.g. with a multimeter.
3. Turn off gas supply, block the device from all gases.
4. Monitor the environment for the presence of an explosive atmosphere, e.g., with a gas leak detector, continuously during the entire process.
5. Ensure there is no explosive atmosphere. Only then open the device.
   ➪ Opening proChain GC (p. 62)

> ⚠ DANGER EXPLOSIVE ATMOSPHERE
>
> **Damage to health and property (explosion) possible**
>
> Stop work immediately if an explosive atmosphere occurs!

Check the device and close it again

1. Avoid electrostatic discharges, e.g. with an ESD wrist strap.
2. Check all components for damage and correct connections.
3. Re-tighten loose connections, if present, and note the result in the maintenance report or your documents.
4. Close the device again ➪ Closing the housing of proChain GC (p. 63)
5. If there is no corrosion or damage and all wires are firmly connected (again), supply the device with power, otherwise contact Honeywell for a service call and do not use the device until it has been repaired.

Test Measurements

After the parameterization has been optimized, there are still some steps to prepare for a calibration. After the calibration, has been completed, tests with the calibration gas are carried out.

Repeatability test

After completion of the calibration, a repeatability test is performed with the calibration gas. For this purpose, at least 20 consecutive measurements are performed on stream 6 (the calibration stream) and then the mean value and standard deviation **σ** are calculated for this series of measurements.

The (RSD)repeatability of the heating value H (`H= Heating Value average) should be better than 0.015 % (relative standard deviation). This is calculated with:

$$\mathbf{RSD\%\ of\ Heating\ value} = \frac{\bar{H}}{\sigma} \times 100\,\%$$

If the repeatability is poor, the integration of the individual components and the peak table should be checked. After modification a change, the calibration should also be re-peated. An example of the result of a repeatability test is as follows:

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Repeatability

Heating value [MJ/m3]

No	Timestamp	RunNumber			Res Cal-Str_HsV
1	14.7.21 11:22	73			39,787
2	14.7.21 11:25	74			39,796
3	14.7.21 11:28	75			39,795
4	14.7.21 11:30	76			39,794
5	14.7.21 11:34	77			39,795
6	14.7.21 11:36	78			39,790
7	14.7.21 11:40	79			39,799
8	14.7.21 11:42	80			39,798
9	14.7.21 11:45	81			39,801
10	14.7.21 11:48	82			39,792
11	14.7.21 11:51	83			39,796
12	14.7.21 11:54	84			39,796
13	14.7.21 11:57	85			39,792
14	14.7.21 12:00	86			39,797
15	14.7.21 12:03	87			39,795
16	14.7.21 12:06	88			39,792
17	14.7.21 12:09	89			39,799
18	14.7.21 12:12	90			39,800
19	14.7.21 12:15	91			39,799
20	14.7.21 12:18	92			39,799
				average	39,796
				std. dev.	0,0035
				rel. std. dev	0,0088 %
				limit	0,0250 %

Fig. 2-58: Example of the result of a repeatability test

Accuracy test

Two test gases with very different calorific values are used for this test. See the following table for an example of the composition of the test gases. Several measurements are made with each test gas (>5) and the accuracy is checked for the last 5 measurements (average of the last 5 measurements). The relative deviation for the calorific value should be less than 0.25% for both test gases. An example of this is as follows:

Honeywell
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Accuracy Test

No.	Component	calibration	Testgas 1			Testgas 2		
	Number of samples	3 samples	8 samples			8 samples		
				measurement			measurement	
		certificate	certificate	average	deviation	certificate	average	deviation
	Heating value [MJ/m3]	39,79019991	35,66543511	35,71019	0,0447575	44,010771	43,99235	-0,0184174
	relative deviation [%]				0,12549			-0,04185
	allowed rel. dev. [%]				0,25000			0,25000
	result				OK			OK
No.	**Component**	**certificate** [conc. %]	**certificate** [conc. %]	**average** [conc. %]	**deviation** [conc. %]	**certificate** [conc. %]	**average** [conc. %]	**deviation** [conc. %]
1	Nitrogen	8,03	10,99	10,90517	-0,08483	0,94530	0,95475	0,00945
2	Methane	79,2201	86,00895	86,08003	0,07108	85,01699	85,06415	0,04716
3	CO2	3	1,548	1,53673	-0,01127	1,43900	1,42653	-0,01247
4	Ethane	6,49	0,7533	0,77918	0,02588	8,99100	8,96161	-0,02939
7	Propane	2,01	0,3005	0,31078	0,01028	3,00600	3,00623	0,00023
8	i-Butane	0,501	0,1005	0,09731	-0,00319	0,20140	0,19676	-0,00464
9	n-Butane	0,502	0,09912	0,09737	-0,00175	0,19890	0,19553	-0,00337
10	neo-Pentane	0,0259	0,04889	0,04778	-0,00111	0,04806	0,04634	-0,00172
11	i-Pentane	0,099	0,05007	0,04811	-0,00196	0,05129	0,04891	-0,00238
12	n-Pentane	0,0986	0,05043	0,04787	-0,00256	0,05112	0,04845	-0,00267
13	n-Hexane	0,0234	0,05024	0,02980	-0,02044	0,05094	0,03045	-0,02049
14	n-Heptane	0	0	0,01490	0,01490	0,00000	0,01522	0,01522
15	n-Octane	0	0	0,00497	0,00497	0	0,00507	0,00507

Fig. 2-59: Example of the accuracy test

If the deviation for a test gas is greater than 0.25% for the calorific value, a check of the integration parameters and a new calibration are required.

After the test with the two test gases is complete, some test measurements are made with natural gas to check the fine tuning of the integration parameters, because the concentration of the components are much lower in most cases.

In most cases, only minor changes are required, and a new calibration is not necessary after these changes.

2.10.3 Repairs by exchange modules and consumables

The device has hardly any consumable and wear parts..

> For safety reasons, some work may only be carried out by the manufacturer or by persons authorized / trained by the manufacturer. Please make an appointment in good time, this is also a good opportunity to rectify any deviations that may have occurred during maintenance.

The device may only be opened by qualified personnel with the appropriate device knowledge and with the permission of the system operator. ➪ 2.4.5 Opening and closing proChain GC (p. 61)

ESD protection (e.g. according to EN 61340-5-1) must be provided when working on the device. Short circuits and electrostatic discharge can destroy the integrated circuits.

When used in legal metrology, the presence of a verification officer (or a representative) may also be required when opening the device.

If the required conditions cannot be established on site, the complete device must be dismantled closed.

Always remember :

- **DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE IS PRESENT**
- **Explosion-protected equipment that has not been repaired by the manufacturer may not be reused until it has been inspected by a recognized expert and again complies with the design documents.**
- **Flame arresters are not standard replacement parts and can only be replaced after consultation with Honeywell Technology Gas Quality**

Connect/replace calibration-, carrier-, verification- gas cylinders

For proper operation of the instrument, regular automatic calibration/adjustment with a calibration gas is necessary. Refer to section ⇨ 2.6 Fluidic installation of the measuring device (p. 80)

As soon as the outlet pressure of a gas cylinder can no longer be kept stable, it must be replaced. Depending on the regulator, this may occur at a pressure around 1.0 MPa (g). If the pressure is below 2 MPa, you should have a replacement cylinder ready. therefore monitor the cylinder pressure with e.g. a pressure gauge or contact manometer.

The recognized rules of technology for handling gases must be observed for all work as described. Surfaces that come into contact with gas must be free of grease, oil, solvents and other contaminants. Take steps to prevent dirt and/or moisture from reaching the unit during replacement.

> **DANGER**
>
> **Incorrect handling of gas cylinders**
>
> Serious damage to health and considerable damage to property can occur (explosion).
>
> Complete the following steps in accordance with national regulations on the basis of the information in this document.

Remove connected gas cylinder
1. Close the main valve on the gas cylinder.
2. Depressurize the connected gas pipeline.
3. Remove everything from the gas cylinder connector.
4. Close the connection thread on the valve with the screw cover (nut).
5. Place the protective cap onto the gas cylinder and screw it tightly.
6. Release the anti-tipping device and remove the gas cylinder.
7. Protect the connection thread for the remaining installation if a new gas cylinder is not to be connected immediately.

Connecting the gas cylinder (The cylinder fittings must include safety equipment.)
1. Secure the cylinder to prevent it from tipping over.
2. Unscrew the protective cap from the gas cylinder.
3. Make sure that the main valve on the bottle is closed. Only then remove the screw cover (dummy plug) from the valve connector
4. Make sure that the handwheel or the adjusting screw for the outlet pressure of the high pressure reducer* or cylinder pressure regulator* to be connected is closed. (* not automatically included in the scope of delivery, use only suitable standard-compliant types).
5. Connect the cylinder connector on the high pressure reducer or cylinder pressure regulator to the valve connector on the gas cylinder. Do not apply any oil or grease to the thread.
6. For accuracy reasons, now flush the pressure reduction as described in the next activity block.
7. After the flushing cycle, connect the outlet of the pressure reducer to the appropriate gas inlet on the device using a fixed pipeline. If this is not yet possible, seal the gas pipeline with a dummy plug so that you can continue with step 8 later.
8. Open the main valve of the gas cylinder. Set the outlet pressure of the high pressure regulator or cylinder pressure regulator / cylinder pressure reducer to the working pressure.Carrier gas: 0.325 MPa(g) ± 0.025 MPa(g) ≙47.1 psi(g) ± 3.6psi(g) ≙3.250 bar(g) ± 0.250 bar (g) Calibration gas/ Verification gas for ATEX / IECEx: 0.30 MPa(g) ≙43.5 psi(g) ≙3.0 bar(g) for cCSAus: 0.15 MPa(g) ≙21.7 psi(g) ≙1.5 bar(g).
9. check the tightness carefully! Perform leakage test for all connections. (See installation tightness check).

Manual flushing of the high pressure reducer
1. Make sure that steps 1 to 6 of the activity block "Connecting the gas bottle" have been carried out. and a gas flow can take place in the parts to be purged, for this purpose the gas line must be disconnected directly in front of the unit (gas bottle closed!). Ensure that the purging gas is discharged professionally and safely.
2. Slowly open the main valve on the gas cylinder.
3. Adjust the stream of gas and observe it e.g. by using a flow indicator. Do not exceed the maximum pressure levels.
4. Now close the main valve on the gas cylinder.
5. If the outlet pressure of the high pressure reducer or cylinder pressure regulator has fallen to almost 0 MPa, open the gas cylinder briefly and then close it again.
6. Repeat the procedure described in step 5 several times to ensure that there is no more air in the dead space of the regulator and the pipeline. Everything will be flushed after a total of 5 filling and emptying cycles.
7. After the purging procedure, immediately proceed to step 7 of the " Connect gas cylinder" activity block to prevent contamination.

Tips for sealing the leak

When leaks are detected, they need to be sealed. You have a few options to do this..

- Tighten the connections.
  In the course of time, connections may have loosened slightly. By retightening them, they can be resealed. For small sizes, be careful not to block the flow of the gas with this measure. Do not overtighten the thread.
- Replace the seals.
  You will need the appropriate replacement seals. Switch off the gas supply for this purpose, observe the explosion protection rules and the assembly instructions in the following section.

Replace an inlet filter

Prerequisite(s)

- Work is permitted by the plant operator.

Following tools and materials are available:

- Spare part: Filter Gas inlet, No. 801.06.712 (3 mm) / 801.06.713 (1/8”)
- Standard tools
- Gas leak detector for flammable gases, calibrated with status or value display

Steps

1. Close the main valve on the gas supply line and relieve the pressure in the supply line to the device.
2. When the residual gas has flowed through the device, switch off the electrical supply to the device.
3. Only disconnect the gas pipe from the device when the device is depressurized, and the ambient conditions are similar to the interior. Ensure that no gas escapes.
4. Disconnect the Swagelok pipe fittings from the filter and replace it with a new filter (see figure).

5. Refit the fittings and lines to the device.

Leak test:

1. Open the gas supply to the supply line.
2. Now use the gas leak detector to check carefully for leaks in all new or rebuild connections.
3. If leaks are present, they must be eliminated immediately. Switch off gases and depressurize device. Check or repeat the previous assembly work. If everything is tight, the device can continue with operations.

Remove of the battery

For long time storing or disposal the battery has to be removed. If the battery charge was too low according to the display, or a new board is delivered without battery, a replacement lithium battery must be inserted.

Prerequisite(s)

- Opening of device is permitted by plant operator.
- Ambient conditions according to ISO / IEC61010-1 (temperatures / humidity as in living and office spaces).
- The parameterization of the device was read out with enSuite, ➪ Read-out parameterization (p. 151)

The following tools and materials are available:

- Service standard tools
- Gas leak detector for flammable gases, calibrated with status or value display
- ESD wrist strap or similar device to prevent electrostatic discharge

Steps

Preparations for opening and opening the device:

1. Dee-energize the device (switch off power).
2. Make sure that there is no voltage, e.g. with a multimeter.
3. Turn off gas supply, block the device from all gases.
4. Monitor the environment for the presence of an explosive atmosphere, e.g., with a gas leak detector, continuously during the entire process.
5. Ensure there is no explosive atmosphere. Only then open the device.
   ➪ Opening proChain GC (p. 62)

> ⚠ DANGER EXPLOSIVE ATMOSPHERE
>
> **Damage to health and property (explosion) possible**
>
> Stop work immediately if an explosive atmosphere occurs!

Working on the battery holder:

1. Avoid electrostatic discharges, e.g. with an ESD wrist strap.
2. Gain access to the battery holder. Position, see description of the base board board ➪ 2.2.3 Process bords (PCBs) in the EnCal 3000 proChain GC (p. 49)
3. Remove the battery cover above the battery holder (not present on all boards). Use a small screwdriver to carefully loosen the tabs on the sides.

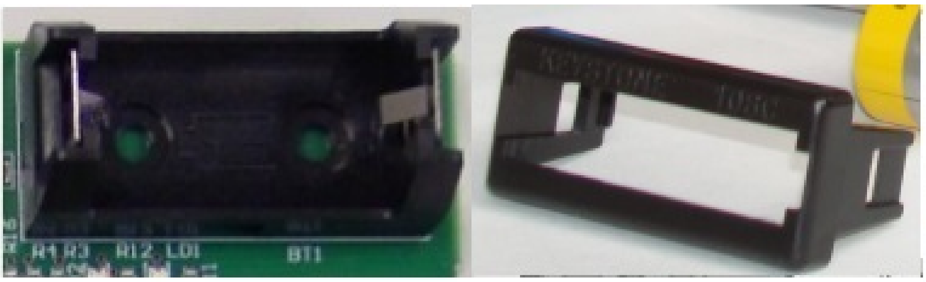


Fig. 2-60: Battery holder

4. Take off the battery cover and take out the old battery.

> Data retention is guaranteed by a capacitor for 15 minutes.

Further procedure after removing

- When the device is no longer in use, it can be stored for an unlimited period of time after assembly. Disposal is also now possible in accordance with local regulations.
- When the device is to be used further, **a service technician** must insert a new battery **EVE ER14250; 3.6 V** within 15 minutes. **The use of other types is prohibited.**

Replacing the memory card

All data of the device are stored on the SD card (flash memory card). This card is located on a separate board called CPU3 CORE. See marking on the figure. The mounting position depends on the device.

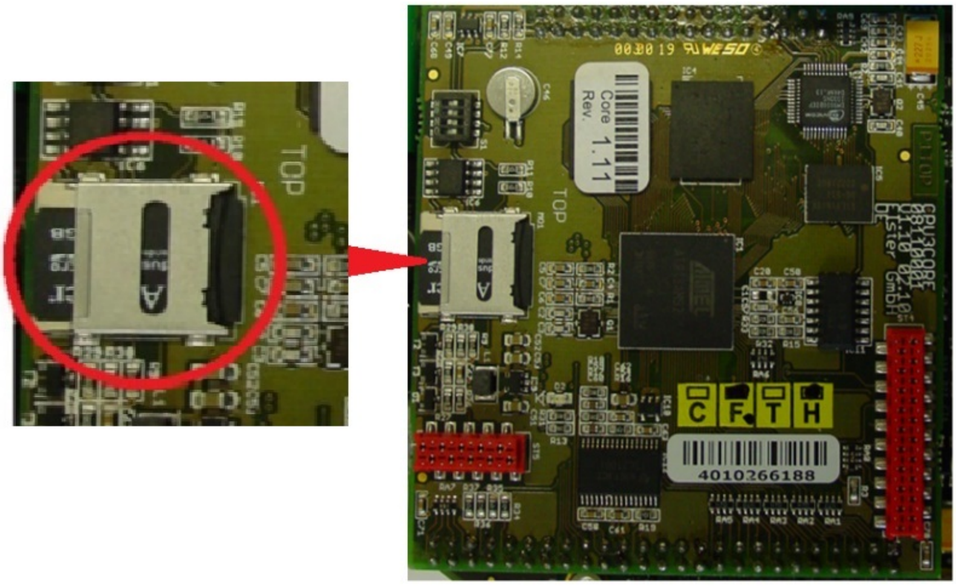


Fig. 2-61: CPU board with memory card

Prerequisite(s)

- Parameterizations, chromatograms and archives have been saved outside the device (in enSuite or on a PC)
- Device is de-energized and open. There is no explosive atmosphere. This is monitored e.g., with a gas leak detector, continuously during the entire process.
- The CPU3 CORE board, see figure above, can be accessed .
- You have a replacement card with the required software from Honeywell.
- You have a way to connect the card to your PC / laptop to make final adjustments. (in this case Honeywell will provide you with the necessary information and programs)
- ESD wrist strap or similar device to prevent electrostatic discharge.

Steps

1. Avoid electrostatic discharges, e.g. with an ESD wrist strap.
2. Open the holder by first pushing the cover to the edge and then folding it away to the front. Compare with the red border in the figure above.
3. Remove the SD card and insert the new one (if necessary after last adjustments)
4. Close the holder by folding the cover back again and then pushing it back to the initial position.

2.10.4 Cleaning of equipment

For cleaning, only use tools that will not accumulate static charge and generate sparks. Ideally, you could use a damp cloth. As a rule, a mild cleaning solution or a mild glass cleaner as used in the household can be used. Always note the following

PROHIBITION

- **Use of aids which can become statically charged and produce sparks.**
- **Pouring or spraying water or cleaning agents directly into the respiratory system or the vent line!**
- **Use of high-pressure cleaners or similar devices.**

2.10.5 Documentation of the work

Honeywell recommends that the completed maintenance work and general operations are documented. This documentation is in fact mandatory in some countries and at some institutions.

Below are templates to help you document the work performed. Copy the form, enter your results, and archive your findings with the other documentation of the device.

To ensure that the work performed during installation and commissioning and after modifications maintains its function over the long term, review the items on the ⇨ First inspection (p. 138) form **after one month** .

To document proper maintenance, you can use the ⇨ Template for documentation of the work performed (p. 140)

Naturally, you will also receive detailed documentation of the work if you have it completed by Honeywell service technicians. In this case, these documents need to be archived.

First inspection

To ensure that the work carried out during installation and start-up remains functional in the long term, check the following points after one month. Complete the form.

First inspection	Date of inspection ___. ___. 20____
Device _______________	Serial number: __________________ Software: _______________
Inspector/Company: ______________________________	Result yes / no
Gas connections, gas pipes and (if installed) flow meters have been checked with a suitable detector e.g. methane detector for sample gas or helium detector for carrier gas and are tight.	
Housing parts and paintwork are undamaged and firmly sealed.	
The breather (and the line) is free of dirt and blockages.	
Gas and electrical connections are undamaged and free of corrosion.	
No corrosion inside the device, all cores are securely connected, all housing openings sealed.	
All the gas lines and cables which belong to the measurement point are undamaged and free of corrosion.	
The ground connection is mechanically secure. There is a low resistance connection to the ground.	
The terminals on unused electrical connections are closed, there are no loose, unconnected wires in the device.	
The cylinder pressure of the calibration gas mixture is: ______	
The cylinder pressure of the carrier gas is: ______	
The inlet pressures are in the valid range: Process gas pressure: ______ Calibration gas pressure: _____ Carrier gas pressure: _____	
The battery charge is: _________ and is adequate.	
The device functions perfectly.	

Template for documentation of the work performed

Service Report	Number: ____________________	
Device ______________	Serial number: ________________ Software: ______________	
Date of service work: ___. ___. 20____	Inspector/Company: ____	Result Yes/No
Gas connections, gas pipes and (if installed) flow meters have been checked with a suitable detector e.g. methane detector for sample gas or helium detector for carrier gas and are tight.		
Housing parts and paintwork are undamaged and firmly sealed.		
The breather (and the line) is free of dirt and blockages.		
Gas and electrical connections are undamaged and free of corrosion.		
No corrosion inside the device, all cores are securely connected, all housing openings sealed.		
All the gas lines and cables which belong to the measurement point are undamaged and free of corrosion.		
The ground connection is mechanically secure. There is a low resistance connection to the ground.		
The terminals on unused electrical connections are closed, there are no loose, unconnected wires in the device.		
The cylinder pressure of the calibration gas mixture is higher than 1.0 MPa. ≙ 145 psi ≙ 10 bars. The pressure is: ________________		
The calibration gas cylinder was replaced. ***		
The cylinder pressure of the carrier gas is higher than 1.0 MPa. ≙ 145 psi ≙ 10 bars. The pressure is: ________________		
The carrier gas cylinder was replaced. ***		
The inlet pressures are in the valid range: Process gas pressure: ____________ Calibration gas pressure: ______________ Carrier gas pressure: ____________		
The particulate filters are OK, the flow rates are in the valid range. *		
Analytical components were replaced. **		
The battery charge is above 20% and is: ________________		
The battery (Li/SOCl2 ½ AA 3.6 V) was replaced. ***		

* If not, a pressure error will occur with valid inlet pressures and the filter must be replaced.

** Only required if measurement errors occur. Replacement part: ____________________

*** Must be carried out after 10 years or if the battery charge/pressure is low.

3 Software (Device operation with enSuite)

The PC software concept based on **the configuration and analysis software enSuite** offers you the possibility to carry out configurations, parameterizations or device settings and diagnostics with the aid of a computer.

This PC software is also used for monitoring, control or archiving purposes and supports all Honeywell enCore devices. The combination of computer and device allows the control of the device from flexible distances.

For devices without local enCore display enSuite is necessary to access the device, if a local enCorer display is available enSuite can be used in parallel and complementary. If you cannot use the default parameter set, without deviation, enSuite will also support you. You should change parameters before or during commissioning. One example of these discrepancies is the use of gas properties not stored in the device for the verification or calibration.

With enSuite you get a comprehensive overview of the device and its operating situation. Your PC can thus also be used as a parametrization device.

The following sections are primarily aimed at measurement technicians. In addition to the **online help** ⇨ enSuite online help (p. 145), they explain the operation (e.g. starting / stopping measurements), parametrization, calibration as well as data and results management of the measuring device with enSuite.

We assume here that the device is already properly installed mechanically and electrically as well as in terms of communication technology.

Always use the latest enSuite version for your work and get an overview with the help of the following information before accessing the device with enSuite.

Honeywell offers courses and training to help you learn how to use the meters and take advantage of all the individual capabilities the instrument offers. If you are interested, please contact Honeywell ⇨ 4.2 Technical support Flow Computers and Gas analyzers (p. 314)

3.1 enSuite basis of use

3.1.1 First steps to use enSuite

Install and uninstall enSuite

You can download the installation program from the Software Downloads section of the website:

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

This site also contains a file describing the installation procedure and the minimum system requirements. Complete the installation as specified on the website. Ensure that there are no special characters in the file path, otherwise it will not be possible to transfer files to a device.

> If enSuite is already installed on your computer (parameterization device), make sure that you have the current version. If this is not the case, reinstall enSuite and make sure that no data is overwritten during reinstallation.(create a backup copy or change the storage location).

> **No restart is required after completing the installation.**
> **The shortcut symbol shown here will appear on your desktop.**

If you no longer wish to use enSuite, uninstall it in the usual Windows way, but only if you no longer wish to access **any enCore device permanently**, as the uninstallation removes all enCore devices and data from your parameterization device (PC) at the same time.

You remove individual data in the **Navigation window** ⇨ Starting enSuite (p. 143) using **Delete** in context menu. After confirmation, the selected line and all subordinate entries are deleted.

Starting enSuite

Start enSuite either via the enSuite program symbol on the desktop or via the Start menu (Elster group of programs).

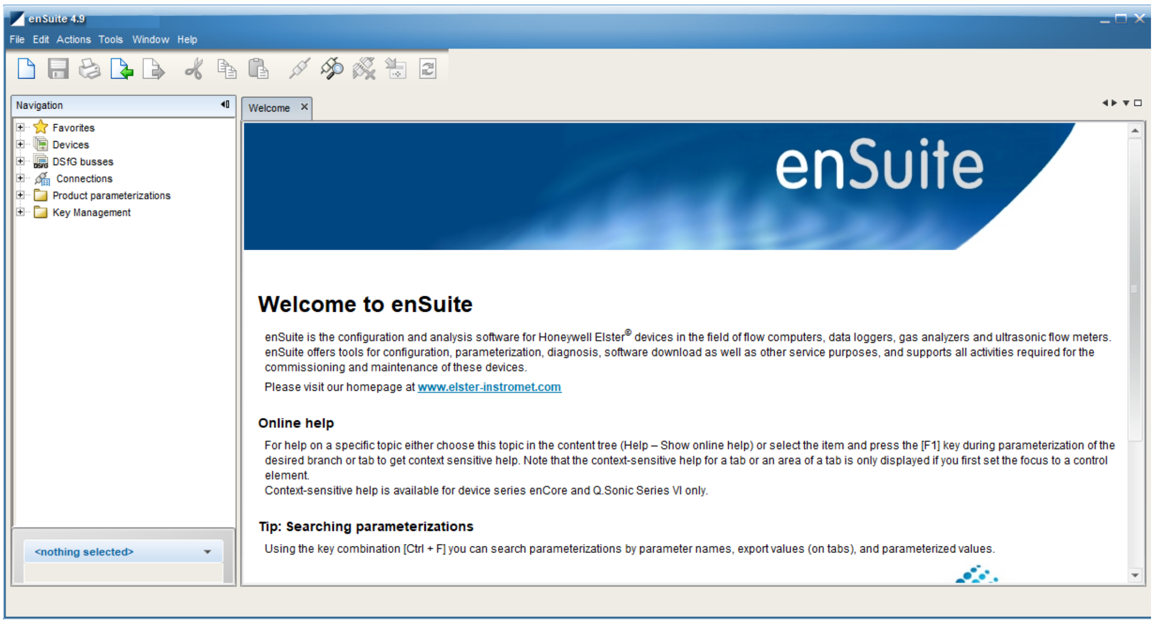


Fig. 3-1: Welcome window

The software's user interface will appear once it has been opened. At the top, there is the menu bar and below it is the button bar.

The language used by enSuite can be changed via the dialog shown in the following figure.

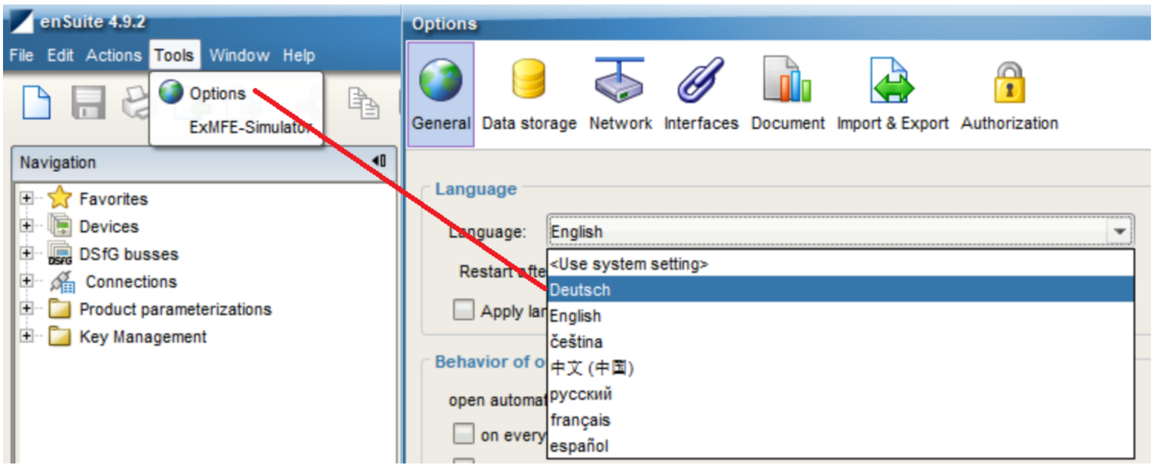


Fig. 3-2: Change language in enSuite

First open the dialog, then set the language you require using the drop-down menu. After confirmation your settings enSuite has to be restarted. A note and / or a link will be displayed the bottom right of the window.

The symbol reminds of the pending restart.

The rest of the interface is split into window areas. The communication is established using these input and output windows.

More information about the interface is provided in the online help.
⇨ enSuite online help **(p. 145)**

It is possible to detach some windows or window areas from enSuite and display them separately.

Open the context menu in the header or tab of the area you want to detach and select **"Float"** or **"Float Group"** or drag the item line to a free area of your desktop using **"Drag and Drop"**.

The individual windows can then be resized to a desired size. To do this, hold down the mouse button and drag the window edges or use the corresponding functions from the context menu.

Use **"Dock"** or **"Dock Group"** to reintegrate the window. Closing the window with **X** also removes the detachment.

“Reset windows” (location **menu bar** / **Window**)

EnSuite remembers the position of the windows from previous applications. This function enables you to restore the default state and to eliminate erroneous display behavior.

enSuite online help

Please use the online help to get an overview of the enSuite basic functions. You will find instructions on how to use the software and on basic settings as well as information on the parameters to be changed. The manual supplements the information if necessary.

> You can activate the general online help via the menu item Help – Show online help. Open the context-sensitive help (help on a specific topic) directly from the desired branch in the parameterization window with [F1]. A help text for the selected / current position appears.

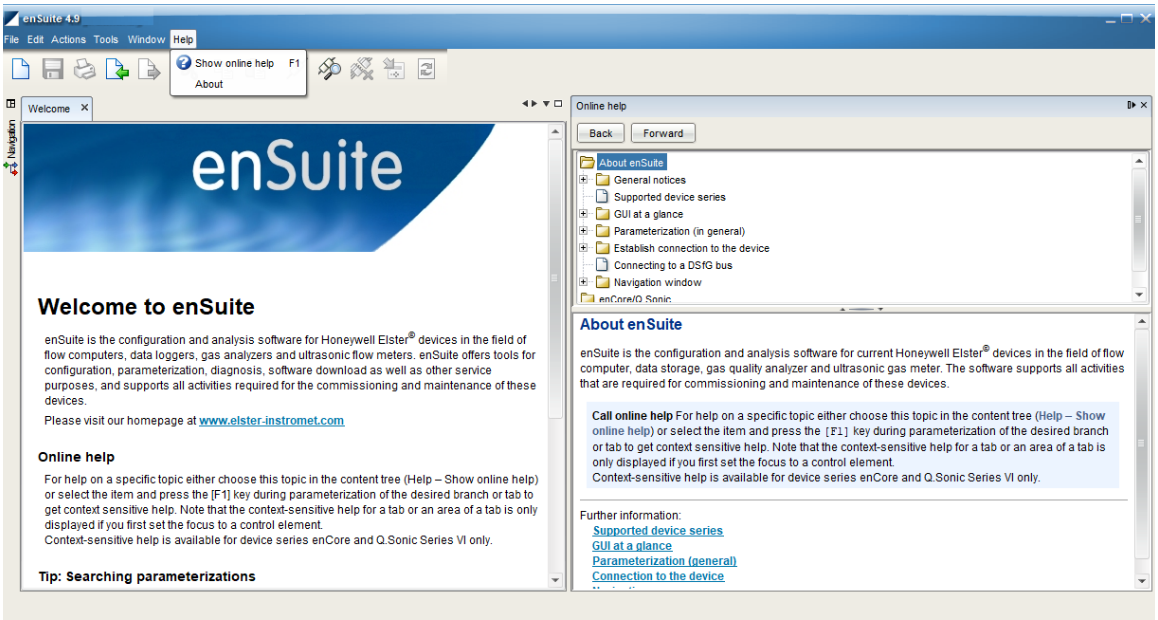


Fig. 3-3: enSuite online help window

> **Tip**
>
> For a first overview, go through the shown folder path of the general help starting at **About enSuite** up to **Navigation window**. Then go to **Supported device series** and branch to your device type for more details.

3.1.2 Data connection to the measuring device

Connection options

A data connection between computer and device can be established either directly via a USB cable or via TCP/IP computer network.

The communication between enCore device and enSuite is carried out via MMS and is secured via TLS since Basic System 03-39. The enCore device uses a self-signed certificate to authenticate itself to enSuite every time an MMS connection is established. The certificate is normally created once when the enCore device is put into operation and is announced to enSuite during the first MMS connection.

Notes for GQ-enCore devices

> **For installed devices, mainly use the TCP/IP data connection, since a device opening, unlike the USB connection, is not required and the PC can be located outside the hazardous area.**

> **Usually you cannot use the USB connection with installed GQ devices, since a device opening is required. For devices without a display, the network settings can be found and changed via this connection. Be sure to observe all safety regulations when use the USB connection with open housing.**

Connect the enCore device via TCP/IP

Prerequisites

- Device is mounted in an accessible computer network.
- cable type according to Category 5 (Cat 5)

Connect the service PC and enCore device with a CAT 5 cable (e.g. via a network). The network interface is located in the device. ➪ 2.5.5 Outputs / inputs and electrical connection plan (p. 70)

Connect enCore device locally via USB

Prerequisite

- USB cable type A to B (not included in delivery)

Connect the service PC and enCore device with the USB cable. The USB interface is located in the device on its boards. ➪ 2.2.3 Process bords (PCBs) in the EnCal 3000 proChain GC (p. 49) If your device is equipped with the optional screw-in USB port see ➪ 2.8.1 Use of the ext. USB interface (ATEX / IECEx option) (p. 101)

Since Windows 10, enSuite can communicate with the enCore device via USB without driver installation, use always current Software versions.

You may need to change the Windows USB energy saving settings for USB connections between notebooks and enCore devices if problems occur when connected, since in particular mobile devices are designed to use as little energy as possible.

Possible USB connection problems

Prerequisite You use a Windows notebook to establish a USB connection between enSuite and enCore device.

Problem As soon as the notebook wakes up from sleep mode, it may happen that Windows no longer recognizes the USB device correctly and cannot restore the USB connection between enSuite and enCore device.

Workaround As soon as you unplug the USB connection cable from the notebook and plug it in again, the USB hardware recognition under Windows starts. As soon as Windows recognizes the USB device, you can establish a connection between enSuite and the enCore device again. It is not necessary to restart the notebook.

Prerequisite You use computers before Windows 8 and computers with an old enSuite installation

ProblemConnection via USB is not possible.

WorkaroundDelete the old driver and install a current version (you will require administrator rights on your parameterization device). Open the Device Manager (the physical connection still exists between the devices). Uninstall the Elster enCore device. Look on the enSuite CD or in your Downloads folder for "**drivers\Zadig**"and start the application. **Install the WCID driver.**

Connect enCore device to Service PC

Select one of the following options in enSuite:

Symbol	Action	Description
	Search device (alternatively press the [F3] key)	Searches for all accessible devices and establishes the connection. All devices which were unknown up until now are entered in the enSuite database. This option is recommended for all initial connections established with one or more devices.
	Connect	Establishes the connection to a specific device. The device must be contained already in the enSuite database and selected in the navigation window under the Devices branch (identification via serial number).

In both cases, a dialog to select the connection path appears once the option is activated.

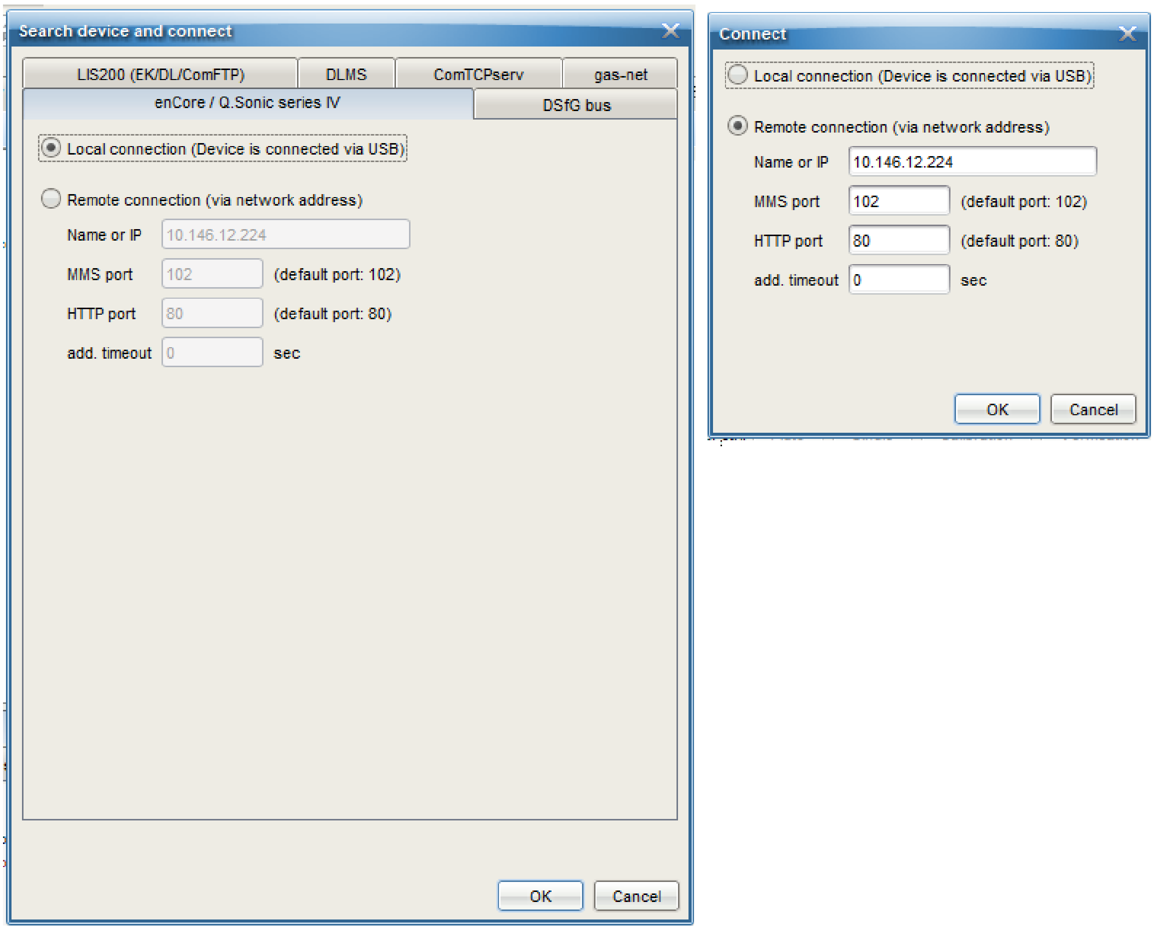


Fig. 3-4: Dialogs to select the connection – example

- To establish a USB connection, select **Local connection**; to establish a TCP-IP connection, select **Remote connection** – in this case, the network name or IP address of the enCore device is required, adjust the default ports if necessary.
- Confirm with **[OK]**.

Only in case the certificate is unknown to enSuite, it will be displayed for validation. This is the case the first time the device is connected, or the device authenticates itself with a new certificate.

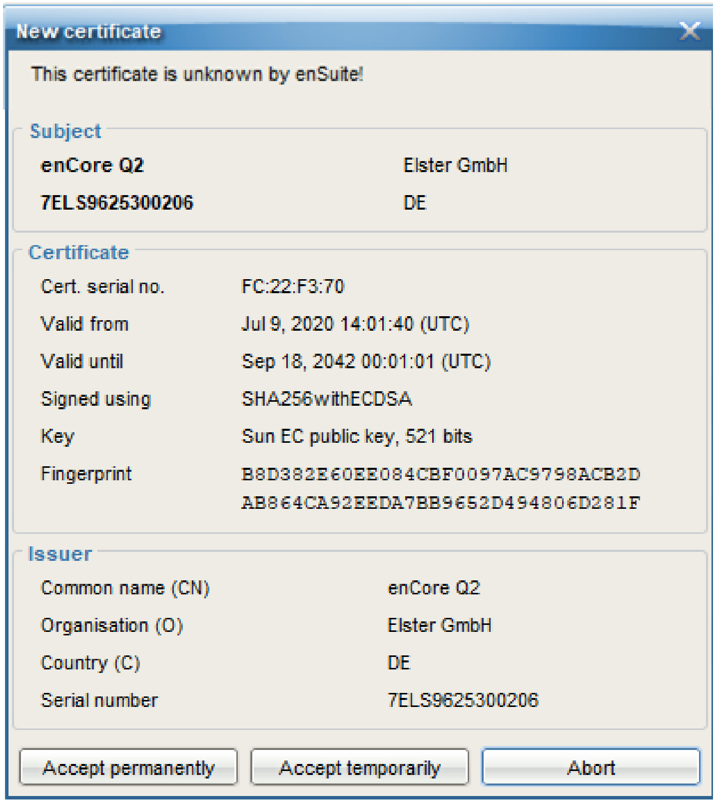


Fig. 3-5: Certificate is still unknown – example first connection establishment

Without a connection to the device, you have no way to compare the fingerprint. Therefore, check the information about the device in the section **Subject** of the dialog first . If the information is correct, the next step is to establish a **temporary connection** to the device. (⇨next action)

You now have the following options:

- If you trust the certificate (for example, because the fingerprint matches), select **[Accept permanently]**. In this case, enSuite saves the certificate. Each time a connection is established, enSuite compares the received certificate (in the background) with the saved one. As long as both certificates match, enSuite trusts this connection and establishes the connection. Only if the device's certificate changes, e.g. because a user has newly created the certificate, will enSuite display the new certificate information.
- If you are unsure whether you trust the connection (e.g. because you are not on-site), select **[Accept temporarily].** The current MMS connection will remain, but enSuite will not save the certificate. The next time a connection is established, a security query will appear again.
- If you do not trust the certificate, select **[Cancel]**. In this case, the MMS connection is interrupted.

As soon as the connection is established, you can readout and parameterize the device etc.

Compare the fingerprint of the certificate remotely

Since a temporary connection exists, call the **Remote operation panel** ⇨ 3.6 The Remote operation panel actions (p. 232) and open the certificate information via the basic display of the device:

Info – <device serial no.>, Certificate ⇨ Info display (Serial number and TLS certificate) (p. 246)

In enSuite, open the output window via **Window – Output**.Here all transferred certificates are linked with the time stamp of the transfer. Open the corresponding certificate with **Show certificate** and compare fingerprint and subject information of enSuite and (device) display with each other.

If both match, you can permanently save the certificate in enSuite by reconnecting to the device and **[Permanently accept]** the certificate.>

In the enSuite **navigation window**, all devices with serial numbers which are contained in the database are listed under the **Devices** branch.

Device ID

The individual devices are identified in the enSuite database via their serial numbers. In addition, it is possible to append an individual name to the serial number (highlight device, select **Properties** in the context menu and enter the name).

With respect to devices for which a connection has currently been requested but has not yet been established, the device symbol is marked under the **Devices** branch with a yellow dot .

The device symbol is then marked with a green dot during the data connection.

In addition, all devices for which a connection has been established during the current enSuite session are listed under the **Connections** branch. These entries are retained until enSuite is closed, even if the respective connection is disconnected.

Disconnecting the device

There are two further options available to disconnect data connections:

Symbol	Action	Description
	Disconnect from all devices (alternatively press the [F4] key)	Terminates all active connections.
	Disconnect	Terminates the connection to the device which is selected in the navigation window (identification via serial number).

3.1.3 Saving and managing the device setting

The following section explains how to read out and save and export the device parameterization, the software structure of the device and the import of saved parameterizations.

Read-out parameterization

NOTICE Data and function loss possible!

There is no automatic backup of the parameterization in enSuite!

Avoid data and function loss by reading out the parameterization after each change. Create a backup for emergencies by saving each parameterization read out and exporting it if necessary.

There must be an active data connection to the device ⇨ Connect enCore device to Service PC (p. 147) before the parametrization can be read-out from the device. If a connection exists, proceed as follows:

1. Highlight the device in question in the navigation window either under the Devices branch or under the Connections branch.
2. Select the action **Read out parameterization** in the lower section of the navigation window or open the context menu and select “**Readout parameterization**”.A dialog **"Save as"** will appear.

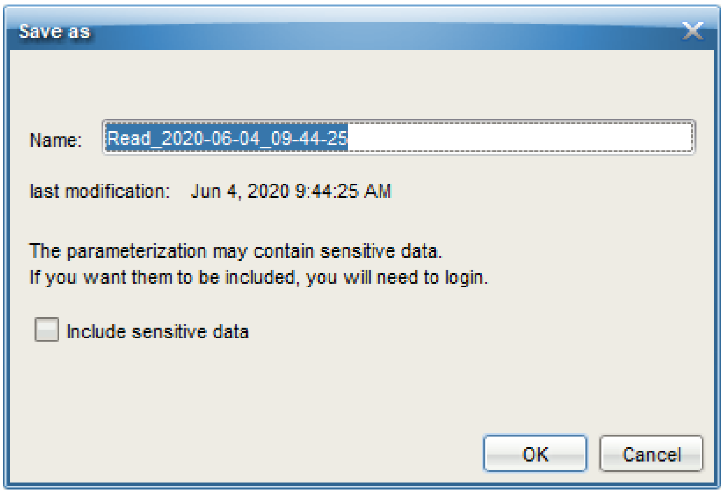


Fig. 3-6: Save as dialog

3. If necessary, you can now change the displayed name by overwriting it. Then press **[OK].**

For GQ devices it is not necessary to mark the check box because no sensitive data is transferred. If the check box is selected a login dialog will appear after pressing **[OK]** button.

Create a report of device settings and parameters (data book)

Prerequisite(s)

- Parameterization for report is read out and selected
  ➪ Read-out parameterization (p. 151)

Steps

1. From the context menu select the action: **Document...**
2. From the drop-down list **Document type** select select an entry, e.g., **Data book <device type>** or **Parameter list (no Modbus)**
3. From the drop-down list **Language** select the needed language

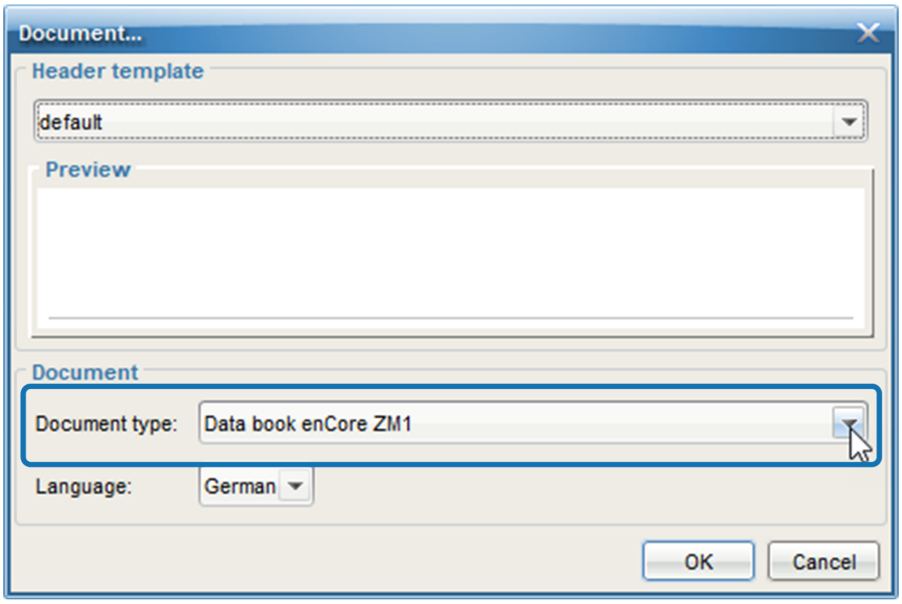


Fig. 3-7: Document current data book in enSuite – example

4. Confirm with **[OK]**. The data book is newly created on the basis of the parameterization.

After preforming the steps above, the printer symbol in the tool-bar has been activated. Click on it to get a hardcopy.

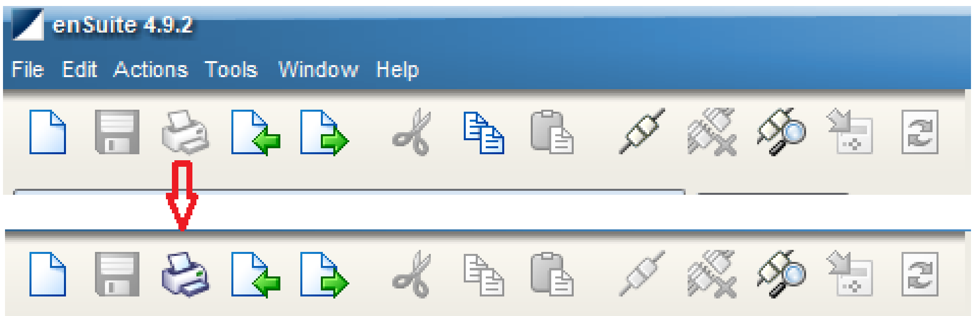


Fig. 3-8: Print a report

Software modules of the parameterization

proChain GC is based on a Honeywell product platform called **enCore**. Both the hardware and software have a modular design. The device software of each enCore product consists of the following:

- The Basic System is responsible for functionalities (such as the I/O coupling or connection to digital protocol interfaces) and is a key component of the software for all enCore devices. The Basic System that contains it's functionalities in blocks called **SFB**s (**System Function Blocks**).

and

- **Application Function Blocks** (**AFBs**) An AFB is a single application-specific functionality that can be added or removed via the parameterization. The AFB arrangement is variable; most AFBs can also be used several times. Which AFBs are necessary for a device or which AFBs can be used as an option depends on the individual device type.

The illustration shows this principle

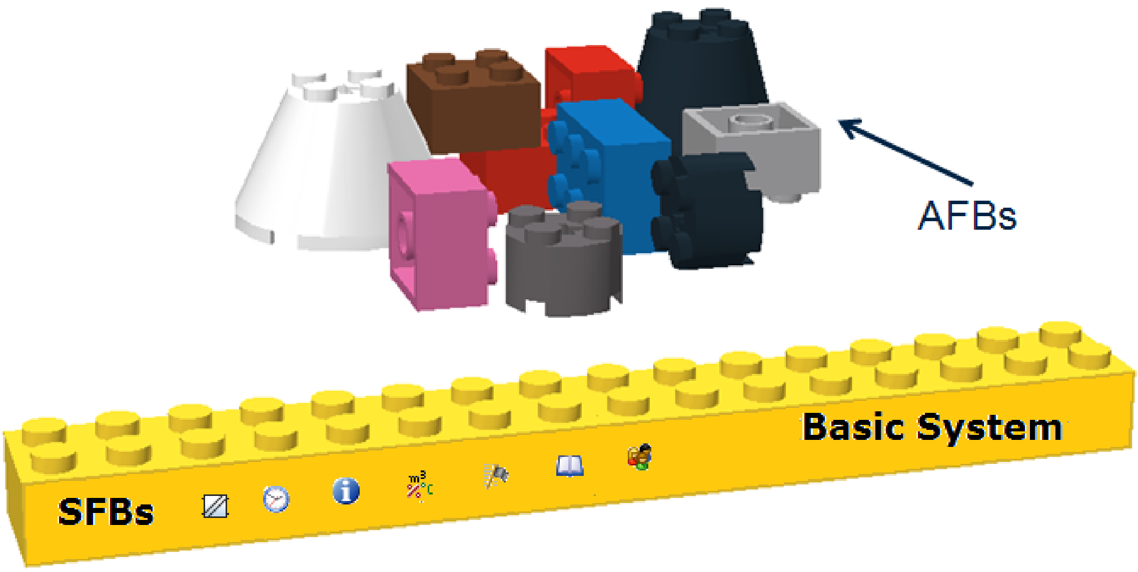


Fig. 3-9: enSuite blocks(basic system with SFBs and AFBs)

The proChain GC is always included the AFB for chromatographs called GC.

Viewing the parameterization of SFBs and AFBs

To establish which SFBs, AFBs and settings the device uses or with which ones it was delivered, read out the unchanged parameter set ⇨ Read-out parameterization (p. 151)

This is stored in **devices - <serial number/name> - parameterizations** branch of the **navigation window**, see the following example

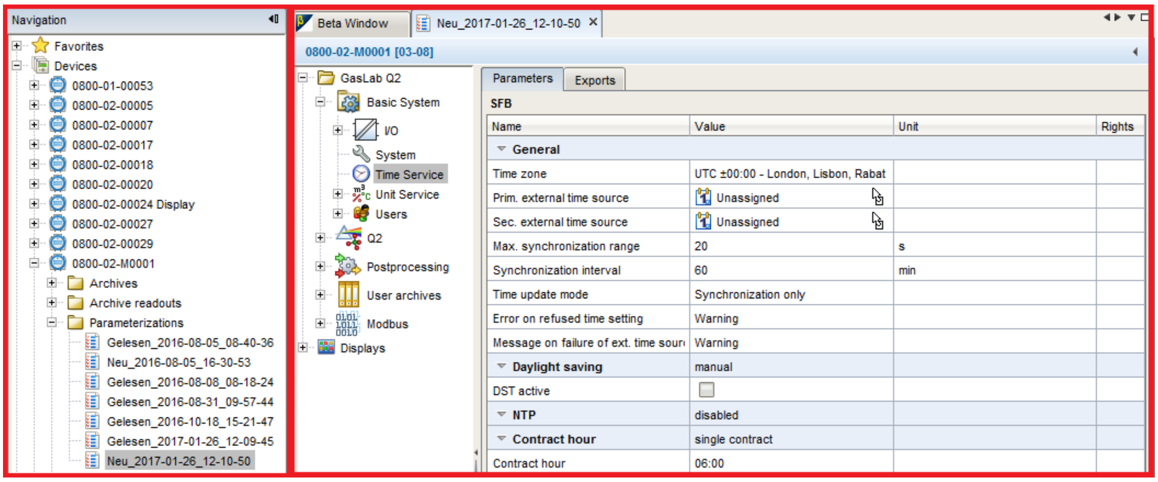


Fig. 3-10: Navigation window and parametrization window examables.

After double-clicking on the file, enSuite opens the **parameterization window** (left part in the example) and displays the parameterization. The tree structure is displayed next to the navigation window. The top level shows the device name; in the subordinate level you can see the Basic System and the AFBs. The individual parameters are displayed on the right side of the window after selecting an element in the tree. The **online help** provides further information about this window.

Several parameterization windows may also be opened in different tabs. You can distinguish them by way of the tab label – the parameterization name is stated here (saved name or identification of the device for new parameterizations and parameterizations which have not yet been saved).

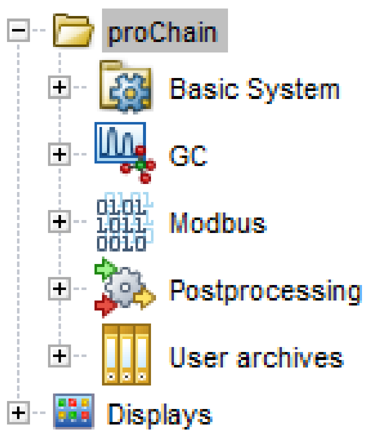


Fig. 3-11: Example of a device tree structure

The default parameterization is visible in the parameterization window when it is read out for the first time. The meaning of the individual software parts and parameters is explained in detail in the **online help**.

AFB configuration

You can see the current parameter structure tree on the left-hand part of the parameterization window. The root is for the device. The first sublevel consists of AFBs that are currently included. The Basic System is always included in the device software; however, AFBs may be grouped, added or deleted.

If the tree root (i.e. the device name) is highlighted, you will see all available AFBs for the device in the Configuration tab. Of each AFB, both the version and the number of instances already used in the parameterization are stated there.

Generally speaking, the AFB composition can be freely configured. Restrictions result from the resources already in use. Most AFBs can be used several times.

Here's how to edit the AFB composition:

To add an AFB, highlight it in the right-hand part of the window in the Configuration tab and click on Add AFB. Check the font color of the newly added AFB in the parameter window:

- font colororange The AFB does not conform to the approval. Click [Make compliant] again.
- font color blue The changes are compliant, but not yet saved.

To delete an AFB, highlight the AFB in the parameter tree and click in the context menu Delete AFB.

- If an AFB is deleted, it may happen that the parameterization is no longer valid. In this case, all parameter folders and parameters that contain invalid references to the deleted AFB are marked in red.

Saving, and exporting the parameter set

Enter a name for the file in the "**Save as**" dialog. The read parameterization is then stored under this name under the **Devices – <Serial Number/Name> – Parameterizations** branch. Change the suggested name, for example to “Default_parameters_YYYY-MM-DD” (always include the date so that you can identify the backup copy).

Check that the parameter set has been saved correctly in the **Navigation window**. A file must now exist with the selected name. See the following example:

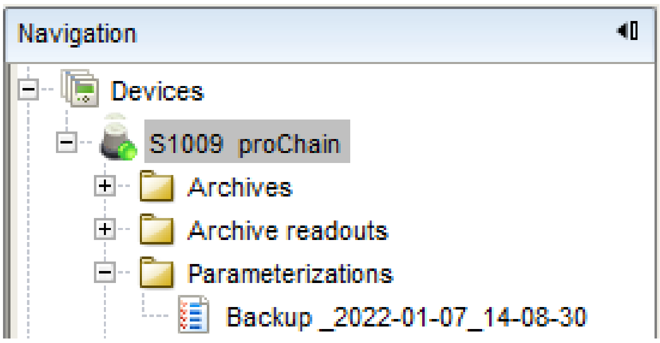


Fig. 3-12: Example of saved parameter set

After double-clicking on the file (Backup in the example), enSuite will open the parameterization window and show the parameter set. See the online help for more information about this window.

Certain parameters are set to defined values as default. You have now backed up these values. Do not make any more changes to this file which can be used as a restore and backup file in an emergency.

To become independent from your current enSuite installation, you can also export selected files using the icon in the enSuite window or the export function in the context menu. As in the example, click on the highlighted icon and follow the dialog boxes. Once the file(s) have been exported, they should be saved under a defined name as a backup copy on the PC hard disk or externally.

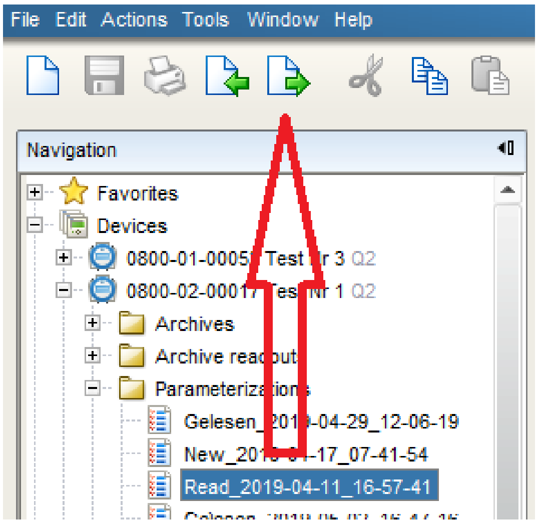


Fig. 3-13: Example of saved parameterization

NOTICE Data loss is possible!

Changes to parameterization already saved in enSuite are saved under the old name, i.e. the original file is overwritten!

For changes, always read out the current parameters from the device, do not change any parameterizations saved for documentation or as a backup.

Import parameter settings (Reset device)

Import selected files (backup's)

As usual under windows you drag your file (backup) and drop it in the upper part of the navigation window. You can also click on the icon above the red arrow (see next figure) and follow the dialog boxes. Once the file has been imported, it will appear in the navigation window under the parameter tree of the device, as in the example.

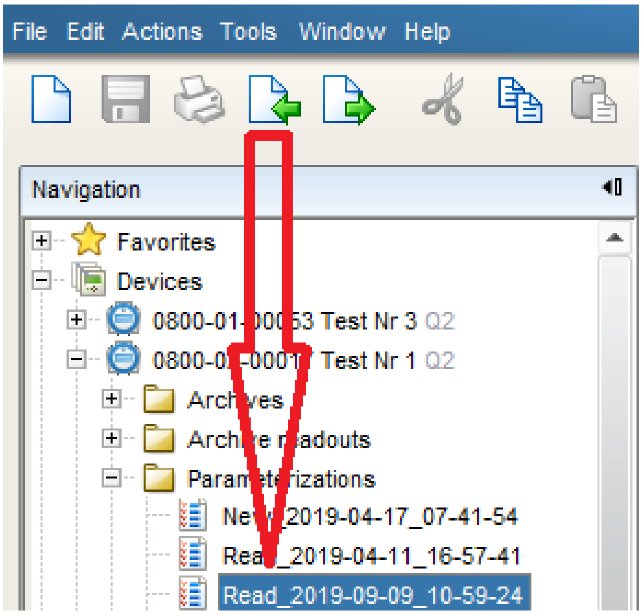


Fig. 3-14: Example data import

Note that imported data may no longer be up-to-date. For example calibration gas properties have to be adjusted or the version must be updated.

Reset device

If the device no longer produces acceptable results due to several incorrect settings, it may be necessary to restore an older parameter set or the factory settings. Requirements are

- All required data has been read out from the device and saved on an independent system (PC / parameterization device).
- A backup or an older parameterization is available on the PC or parameterization device.
- No software update has been performed since the data was created or the versions are still compatible.

This process should only be used when all other options have been exhausted, as the current settings in the device will be deleted. If you are in any doubt, contact Honeywell.

Steps to restore the device to its previous state

- **Connect to the device** ➪ 3.1.2 Data connection to the measuring device (p. 146)
- **Select the desired file** (delivery parameterization / backup), if it is not in your enSuite installation, you have to import it first, see above.
- **Transfer the "the backup"** into device. Use action **Transfer parameterization to device**

After transferring the data, the device restarts and works again with the settings from the backup file.

3.1.4 Update Downgrade and Bugfix-Software

As with all products, changes and additions to the proChain GC take place from time to time. Make sure that you keep the device up to date and use the appropriate version of the documentation. This increases data security and leads to better measurement results. You should therefore check from time to time whether the software used is still up to date.

> **To use the software (The terms firmware and software are used synonymously) according to this manual an update from version 03-39 to 03-40 is necessary. In contrast to the usual updates, extensive changes must also be made in the parameterization. We recommend to have this special update performed by Honeywell.**

If you want to update the device yourself observe the notes on the web page https://process.honeywell.com/us/en/site/elster-instromet/support and it's sub directory’s like **enSutie**, **enCor** and **Gas analyzers** .

Also have a look to following general information.

A software update for enCore devices

Since the device software consists of different modules, the software update works individually for each module. In special cases there may be a requirement to downgrade to older software modules. In this case, it is possible to exchange more recent versions for older ones.

enSuite ensures the compatibility of the software modules.

These software modules include the Basic System (with its SFBs), all available AFBs as well as the approval file for devices in legal metrology, which defines the official access rights.

Structure of the version information for software modules

The version information for software modules is structured as follows, for example:

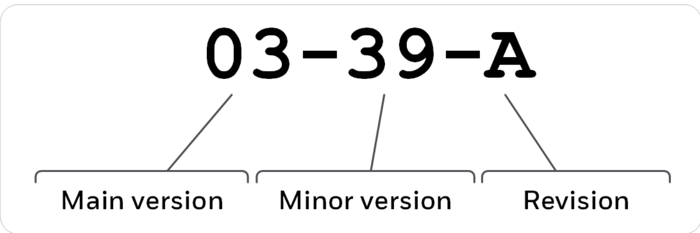


Fig. 3-15: Structure of version information – example V 03-39-A

- Main version (two-digit number)
  The main version changes only in case of major structural changes to the Basic System. It is the same for all software modules within a device.
- Minor version (two-digit number)
  The minor version is typically increased in new developments and indicates that the parameter structure has changed. It may vary between the modules.
- Revision (letter)
  The revision letter changes for small changes such as bug fixes. For AFBs, the revision is also adjusted as soon as the minor version of the Basic System is increased.

Steps in a nutshell

Perform all steps one after the other, if necessary:

Prerequisite(s)

Open security switch

➪ Opening and closing the hardware parameter guard (SSW) (p. 94)

Save existing data

➪ Readout archives in enSuite (p. 228)

➪ Read-out parameterization (p. 151)

Update with enSuite

➪ Update software modules (p. 160)

Adaptation and transfer of the update

➪ Transfer offline parameterization (p. 206)

➪ Check update (p. 163)

Eliminate errors if necessary

➪ Possible red text during software configuration (error) (p. 163)

Close security switch

➪ Opening and closing the hardware parameter guard (SSW) (p. 94)

Update software modules

Prerequisite(s)

- Data connection to the device exists.
- Required access rights are granted, if necessary the security switch is open.

▶ In the **Navigation** pane, highlight the device in either the **Devices** folder or the **Connections** folder.

▶ Select the action **Software configuration**.

✓ The **Configure software** window lists in a table (❶) all software modules that are currently contained in the device with version information in the **Current** column .
In addition, the column **Fiscal** informs whether a module is legally relevant.

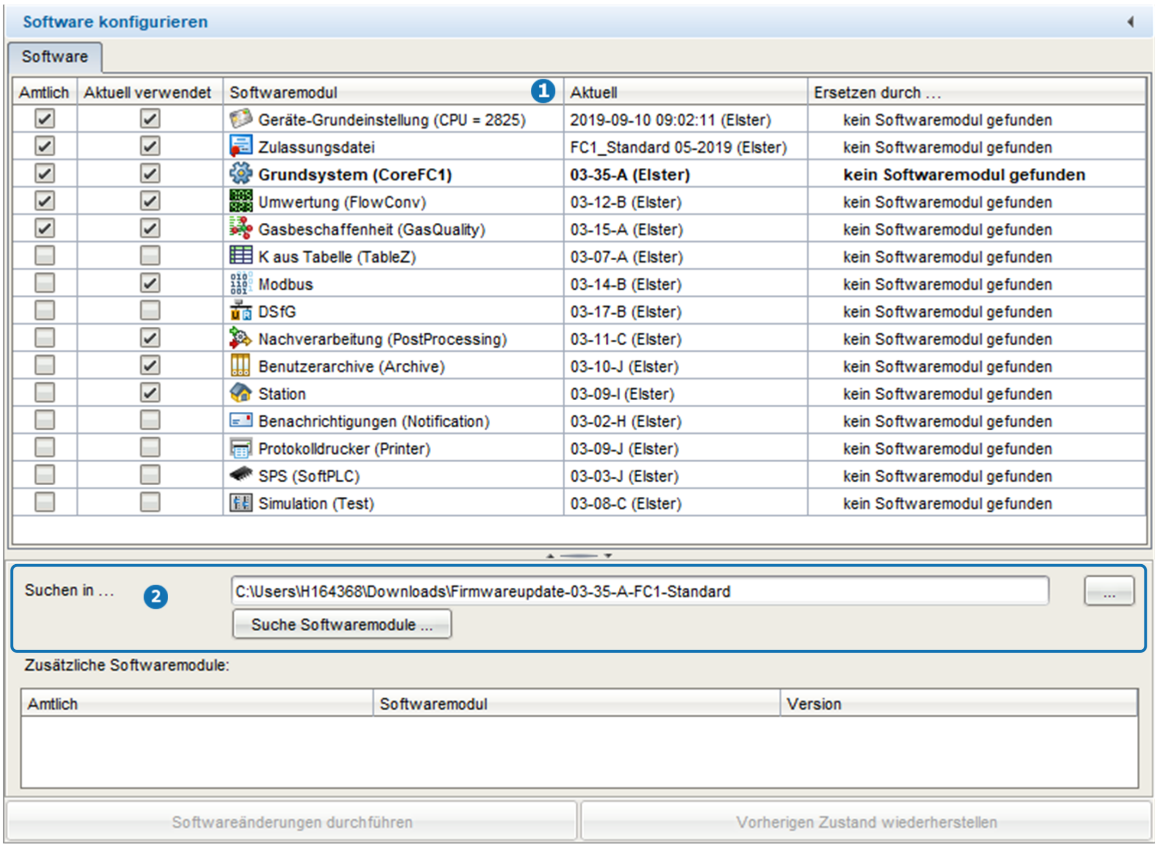


Fig. 3-16: Current software modules in the device (❶) – example FC1 V 03-35-A

To search for the current software (❷), ...

▶ ... under **Search in...** enter the directory with the unpacked software.

▶ Click on the button **[Search software modules...]**.

✓ The specified directory is searched for other software versions:

- In the **Replace by...** column, newer module versions are highlighted in bold and *green* and preselected for an update by default.
  The text **do not replace** is displayed if there is no newer version for a module.
- The **Additional software modules** (3) area displays modules that are not available in the device by default.

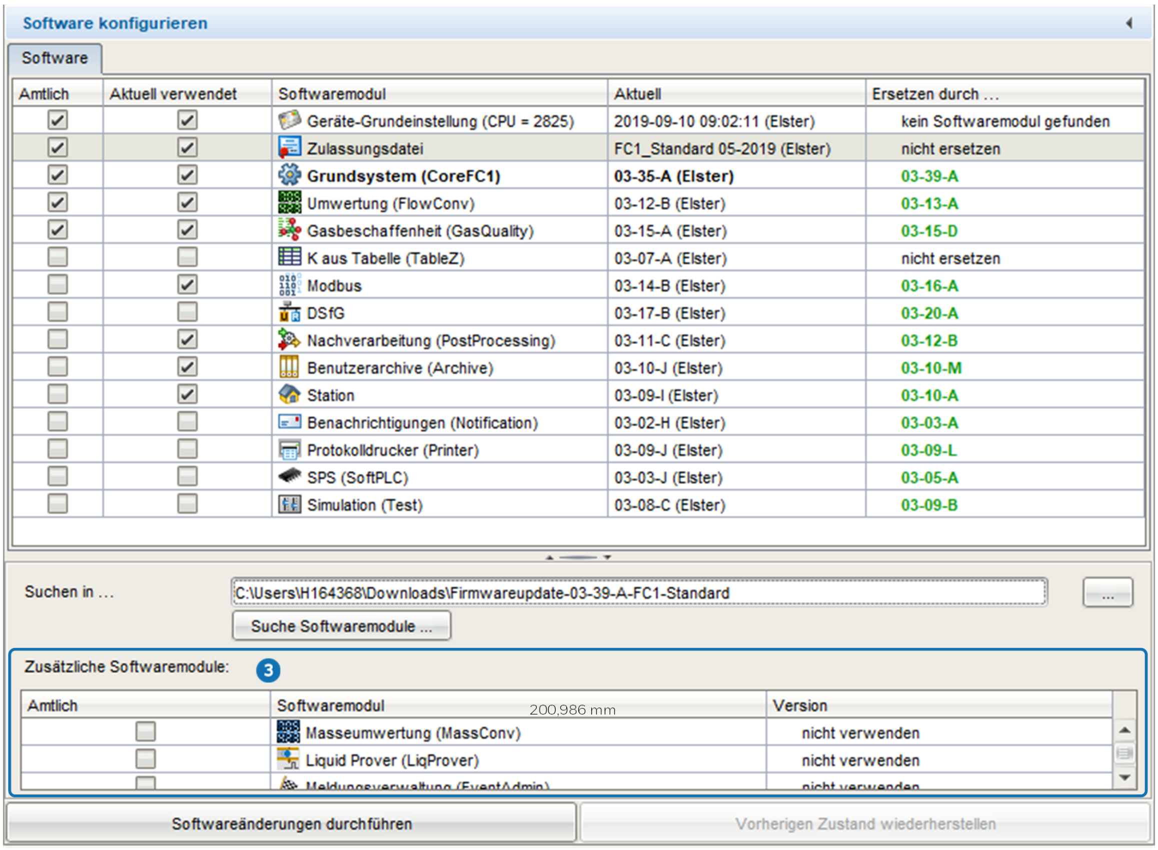


Fig. 3-17: Possibly newer versions in searched software – example FC1 V 03-39-A

▸ In columns **Replace by...** and **Version**, define one of the actions for each module:

- update **<version>**. (*default*)
- to keep a module version in the device, select the entry **do not replace**.
- to delete module version in the device, select the entry **remove**.

Explicitly select approval file

Note that approval files do not have a version, but are identified by their name. If a current approval with a new approval file must be taken into account, select it explicitly.

To transfer the selected software to the device, ...

▸ ... click on the button **[Perform software changes]**.

The status of the security switch is checked:

- The process is aborted if the security switch is closed and a change of the software configuration is prohibited in this case.
- The login dialog appears when...

- ... the security switch is open.
- ... the security switch is closed and the action is permitted with the security switch being closed.

- If the action is allowed, log in with username and password.
- ✓ If authentication is successful, enSuite lists the modified modules before transmission.
- To transfer the modified software to the device, confirm this dialog.
- After successful transmission, the device restarts automatically with an empty basic parameterization (without AFBs).
- If necessary, check on the device in the **Info - Software status** display whether the parameterization conforms to the approval file contained in the device.

Transfer offline parameterization

1. Establish the data connection to the appropriate device ⇨ 3.1.2 Data connection to the measuring device (p. 146)
2. Make sure that there are no other enSutie connections to this device.
3. Highlight the desired **device parameterization** in the data structure of the **navigation window**
4. Select the **Transfer parameterization to device** action (for example in the context menu).
5. Log in using the login dialog with your user name and password which appears.
   The parameter set will be transferred.

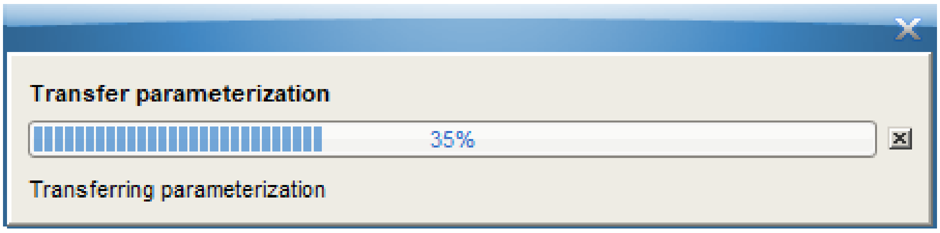


Fig. 3-18: Dialog transfer parameterization

There are typically a number of parameters which are protected by the security switch (SSW) (e.g. in order to meet the requirements of an approval).

If the new device parameterization is likely to bring about changes to such parameters, but the security switch is closed, then the message Device could not be parameterized appears following the transfer. The device does not restart; the old parameterization is still used.

If the parameters are not protected by the SSW or if this is open, the changes will be transferred, and the device will restart.

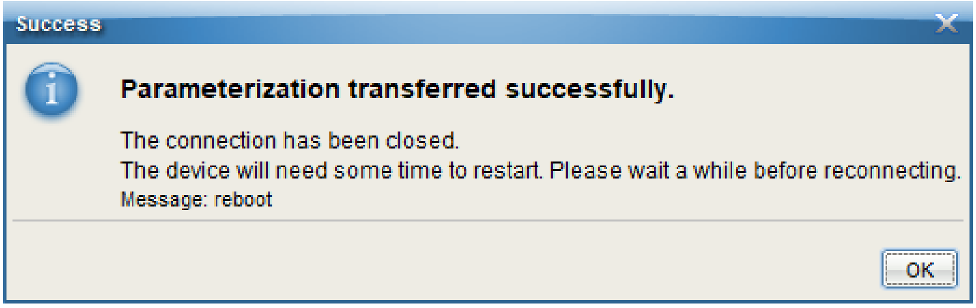


Fig. 3-19: Dialog parameterization transferred successfully

The restart will disconnect the device and the user will be logged out automatically.

The device will now operate using the transferred settings after you have re-enabled the required operating mode. These new settings will remain in use even after the device is switched off and on again.

Check update

You ensure that the desired software modules have been transferred to the device by comparing the version numbers in enSuite (**Configure software** window) with the version numbers of the device.

- Switch from the home display to the display **Info – Software status** – <**Basic System or name of legally relevant AFBs**>.
- Here (among other things) the Basic System and the used AFBs are listed with their version number.

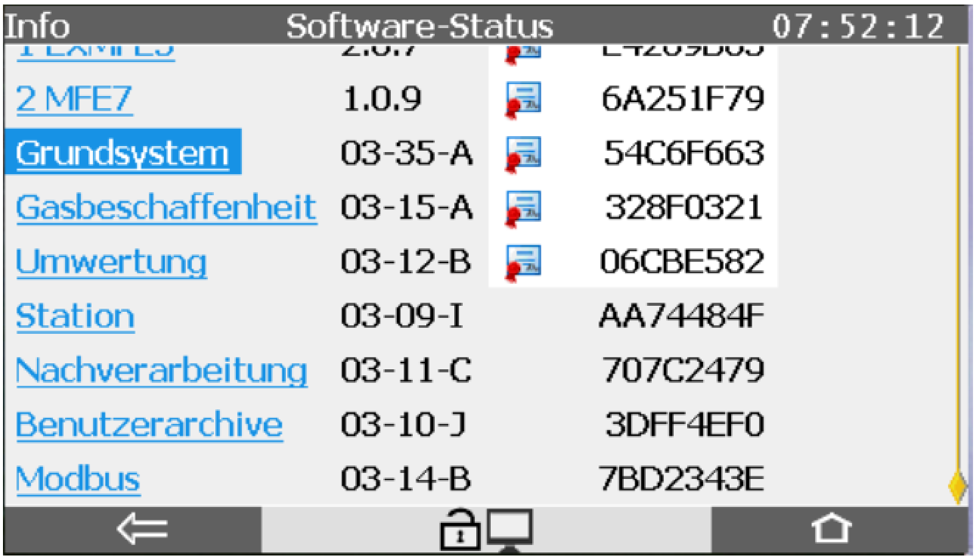


Fig. 3-20: Basic System and AFBs with version number – example

Possible red text during software configuration (error)

Situation: The function software configuration shows red entries in the software window

Cause: Depending on the scope of the updates, the enSuite settings have to be changed to allow all possible steps and to get only green entries.

Action: Change the enSuite settings, open tabs as shown

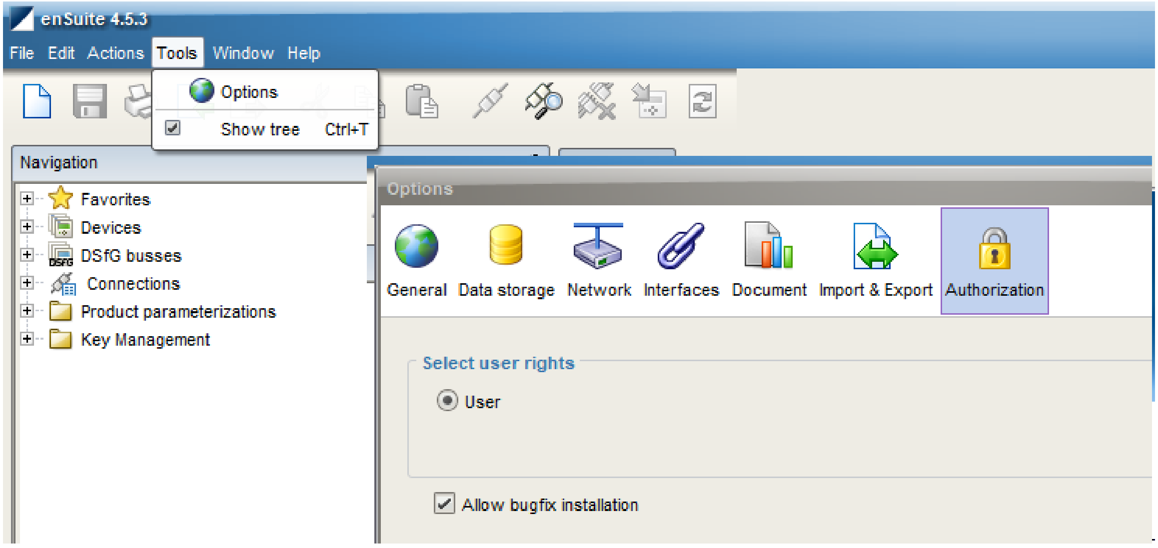


Fig. 3-21: Change of settings

Select tap "**Options**" select option "**Authorization**" set check box as shown.

Result: After reopening and repeat of the steps only green entries are shown

3.2 Changing basic (system) settings

The following section explains some SFB of the basic system and how to adjust their settings. An overview is given in the online help. Select **Basic system** in the parameter tree of the **parameterization window** and press **[F1].**

3.2.1 SFB I/O (IP address network- and I/O-settings)

The IP address and the input and output channels are part of the parameter set existing in the device. After reading out the parameterization ⇨ Read-out parameterization (p. 151), you can change the settings (offline) on the following page:

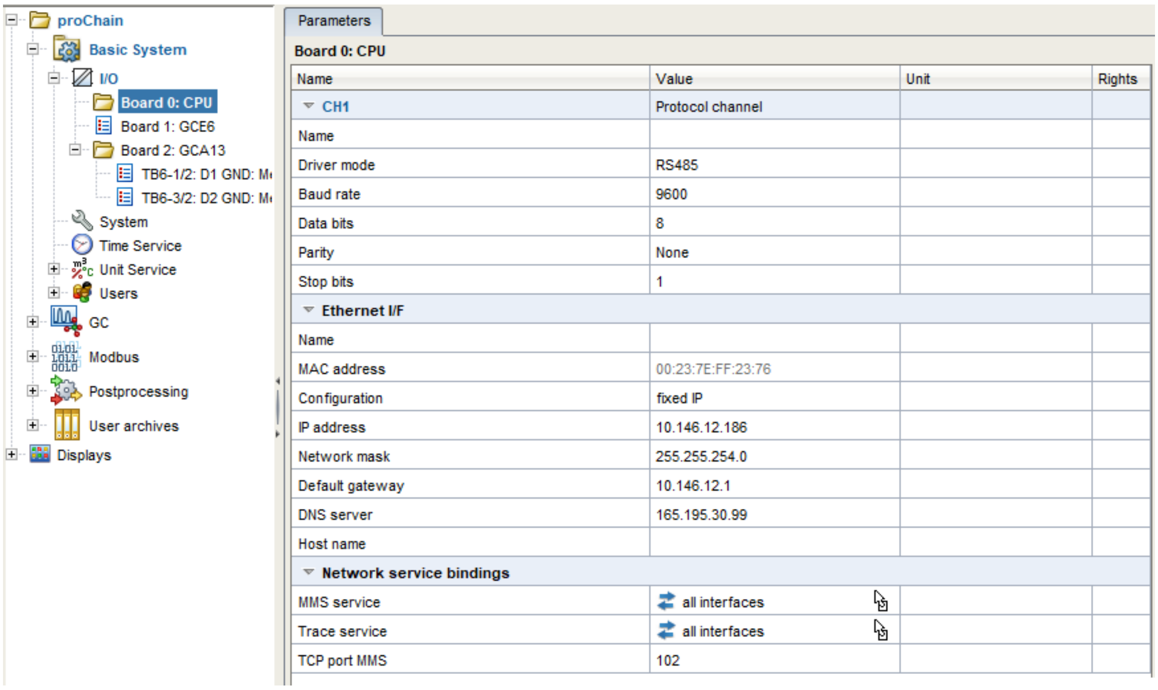


Fig. 3-22: I/O Settings in enSuite

NOTICE

Do not change the network settings without consulting the IT administration

Note all changes and show them on the device or its documents!

Change or activate the following I/O interfaces (the parameters open after clicking the folder) for communication and data exchange with other devices.

Refer to the information in the online help which contains more details required to define all the parameters for the following settings.

Ethernet settings

For data communication, connections via Ethernet are mainly used. Go to parameter branch: **proChain GC – Basic system – I/O – Board 0: CPU**. Fill in your changes, proceed like explained in the online help. Also note the information in section ⇨ Ethernet connection (p. 74)

Serial interface RS485

These connections include, for example, other measuring instruments, devices for final processing and evaluation, PLC systems, etc.

Parameters for serial interface are located on two places. For terminal TB2 go to parameter branch: **proChain GC – Basic system – I/O – Board 0: CPU.** On the **Parameters** tab set the type of **CH1** from **Unused** to **Protocol channel**. For terminal TB3 go to parameter branch: **proChain GC – Basic system – I/O – Board 1: GCE6.** On the **Parameters** tab set the vallues under **TB3-1/2/3**.

Refer to the information in the online help which contains the details required to define the other parameters. Also note the information in section ⇨ RS485 serial interface connection (p. 76)

Digital inputs

There are two electrically isolated inputs supplied by the device. Go to parameter branch: **proChain GC – Basic system – I/O – Input channels** and set the type from **Unused** to **Message input** or **LF pulse input**. Refer to the information in the online help which contains the details required to define the other parameters. Also note the information in section ⇨ Digital inputs (p. 77)

Digital outputs

There are two outputs outputs (electrically isolated passive output circuits). Go to parameter branch: **proChain GC – Basic system – I/O – Output channels** and set the type from **Unused** to the desired function offered in the pop-up menu e.g. **Message output** or **Pulse output**. Refer to the information in the online help which contains the details required to define the other parameters. Also note the information in section ⇨ Digital outputs (p. 78)

Possible error: Current output does not react.

Situation: After a parameterization, the outputs of the current outputs do not show the expected values.

Cause: The output condition has been set to "**Used**" but in the following line no Output condition is selected (See picture line with flag Unassigned)

Parameters | Exports

I1+ I- Current output

Name	Value	Unit	Rights
General			
Name			
Physical quantity	Absolute pressure		
Physical unit	bar *		
Output assignment	Q2.Sensor values.PI		
Filter mode	Not filtered		
Current range	4 to 20 mA		
Physical value at 0/4 mA	0.9	bar *	
Physical value at 20 mA	4.5	bar *	
Current value on error	0.0	mA *	
Output condition	Used		
Output condition	Unassigned		
Inverted			
Adjustment	Unused		

Fig. 3-23: Output condition Used / Unassingned

Action: Set the output condition completely or set the first line to:

Output condition	Unused		

Fig. 3-24: Output condition Unused

3.2.2 System settings

In node System you can parameterize basic system settings. The following Function Blocks are summarized here for enCore devices:

⇒ General system settings

⇒ Error List

⇒ Audit trail

⇒ Checksums

Parameters and export values are documented in detail in the online help. Select **System** in the expanded parameter tree of the **parameterization window** and press **[F1]**.

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**. The online help provides further information about the parameters and possible settings.

Defining acceptance procedure of the error list

In general, alarms and warnings remain in the fault list until they have gone and are considered acknowledged.The acceptance procedure of the **error list** is determined by two parameters:

- **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 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.

You parametrize the acceptance procedure in enSuite under Basic system – System on the Parameter tab.

By default, it is possible to accept errors without logging in. Alternatively, you can only allow accepting for selected user profiles. In this case, you can additionally place the action under the protection of the security switch.

Path: <Device> – Basic system – Users – Special user rights tab

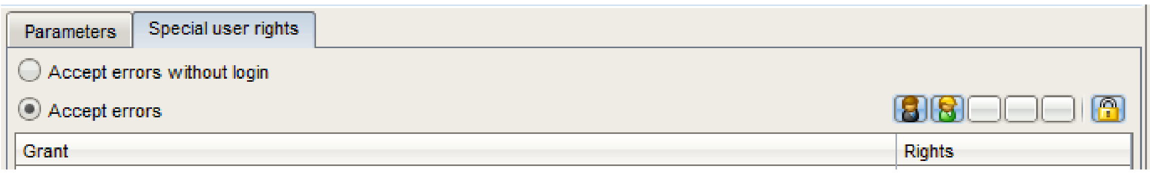


Fig. 3-25: Störungen quittieren Benutzerrechte

3.2.3 Time service SFB settings and system time action

Time Service is a System Function Block (SFB) of the Basic System. The following areas can be parameterized with the Time Service:

- General
- Daylight saving
- NTP
- Contract hour

Parameters and export values are documented in detail in the online help. Select **Time Service** in the expanded parameter tree of the **parameterization window** and press **[F1]**.

Time-related values and actions

Check or set the following settings:

Time zone local time zone of the device (relative to UTC)

Prim. external time source Sec. external time source

The device time can be changed directly on the device, via enSuite or via external time sources.

Max. Synchronization window maximum changeable difference of the system time

Synchronization interval Synchronization only possible within this time interval

Time update mode Synchronize system time only or also set

Error on refused time setting Behavior if takeover of external time rejected.

Message on failure or ext. time source(s)
Behavior if all parameterized external time sources are disturbed:

Daylight saving changeover from normal time (≙"winter time") to daylight saving time and vice versa.

NTP the enCore device can synchronize its system time via Network Time Protocol (short: NTP) against highly accurate time servers.

Contrakt hour Contractual times and duration of the gas day

Parameters and export values are documented in detail in the online help, press [F1].

In the export value window SFB provides time related events under **Basic system time service** time events. They can be used as input signal for time-controlled actions in other SFBs or AFBs.)

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.

Update date and time (system time action)

The system time is the combination of the device time and date. You can update it with the enSuite action "**Update date and time**" or on the operation panel ⇨ System display Time Service (System time and date) (p. 255)

The online help provides the necessary information. In the help window under **About enSuite >> Navigation >> Devices >> Device – actions >> Update date and time**.

3.2.4 Settings Unit service SFB and displays

In each device parameterization there are parameters describing physical quantities. The **Unit Service** is a System Function Block (SFB) of the basic system for managing these quantities. The predefined units are based on the International System of Units SI (Le Système International d'Unités) and the conventions and rules of the US National Institute of Standards and Technology (NIST) . You can make the following adjustments in the Units Service:

- Change standard units
- Define new units
- Adapt display formats of physical quantities

Select **Unit Service** in the expanded parameter tree of the **parameterization window** and press **[F1]**.

The node **Displays** contains all displays of an enCore device. Depending on the authorization, you can create displays and adapt them to your requirements. The online help provides the necessary information. Select **Displays** in the parameter tree of the **parameterization window** and press [F1].

Change default units

For each parameterization, one unit is predefined in enSuite as the default or standard unit for each physical quantity. Characteristics of standard units are:

- The default units are identified in enSuite with an asterisk (*). In selection lists there is a second entry for this unit as **"normal"** unit without 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 You can change units of parameters on the Parameter tabs and units of export values on the Export value tabs.
- If you change a standard unit, the new standard unit is automatically updated in the entire parameterization for all values that use this standard unit. Measured values are automatically calculated in the new unit.
  Attention. Limit or fixed values are not recalculated and must be adjusted manually.
- It is possible to use any unit , e.g. for individual parameters or export values, as a **"normal"** unit and thus exclude that this unit would be automatically adjusted due to a changed standard unit.

Which unit is used as standard unit for a physical quantity is parameterizable:

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.

Define 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:

Value in user-defined unit = Gradient × Value in predefined unit+Offset

> You can only derive user-defined unit from a "normal" predefined unit (<unit>), but not from the standard unit with*.(A standard unit is also always present as a "normal" unit).

Create a new unit in enSuite

- Open the Basic System - Units Service - User-defined units branch.
- On the **Parameters**tab, click the Add icon .
- The Unit <x> section is added to the table.

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

- ... **Name** a unique identifier - this will now be used instead of the number.
- ... **Symbol** specify a unique formula character. User-defined units are displayed together in the selection lists in the **<name> (<symbol>)** format - in the case of predefined units, however, only the symbol is displayed.
- ... **Physikal quantity** indicates the physical size for which you are adding the new unit.
- ... **Derived from** indicates the predefined unit from which the new unit is derived.
- ... **Gradient m** the factor by which the value in the predefined unit is multiplied for conversion to the new unit.
- ... **Offset n** the offset which will be added during the conversion (optional).
- ... **Format-String** Format string the display format of the user-defined unit in the displays ⇨ Display formats and format strings (p. 174)

Example

By default, the units meter (m) and millimeter (mm) are predefined in enSuite for the physical quantity length. To define the unit centimeter (cm), parameterize the following values:

Unit centimeter	
Name	Centimeter
Symbol	cm
Physikal quantity	Length
Derived from	m
Gradient m	100
Offset n	0

The new unit centimeter (cm) is available in the unit set of physical quantities.

Delete user-defined unit

You can delete user-defined units by selecting the Range **<Name>** line and clicking the Remove icon .

Note that a user-defined unit is also deleted if it is used in the parameterization. In this case, the parameterization becomes invalid; invalid references are displayed in red font color as usual, so that you can correct the references manually.

Display formats and format strings

Format strings are used to define the display format of units. You can easily define display formats for predefined and user-defined units using graphical controls (display format editor). Alternatively, you can adjust the format string manually.

To change the display format for a predefined unit, open the **Display formats** tab in the Basic system - Unit Service branch.

- Select the physical size from the drop-down list (first row) for which you want to adjust the display format of a unit. All related (predefined) units with format strings are listed in the table. Select the row with the desired unit.

To change the display format for a user-defined unit, open the branch Basic system - Unit service - User-defined units.

- On the Parameters tab, select the desired user-defined unit or add a new unit. Select the format string.

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

In the lower part of the tab, the controls are displayed to change the display format. The current values of the format string are preset. Change the format using the selection buttons and lists.

Regardless of the selected display format, your changes will be immediately implemented as a format string in the Format String column.

If required, you can restore the predefined display format at a later time with [**Restore default**].

Define basic display and edit display behavior

Normally the displays do not have to be edited. If you have the appropriate rights, you can do the following (In the parameter tree, select "Display" as shown below):

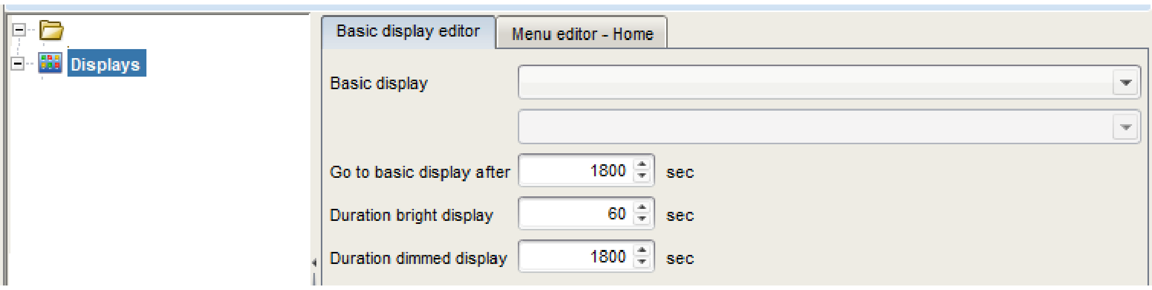


Fig. 3-26: Editing the display

On the right-hand side of the parameterization window, there are various settings and options available in the Basic display editor tab.

- Basic display
  Using the 2 selection menus you can define which display or sub-display the device shows first when it is switched on or restarted. You can define the AFB in the first selection menu. The second menu is to select any sub-displays.
- Go to basic display after
  Here you can define after what time the system quits the current display and returns to the basic display. Do not make this time too short since after a break in editing above this time, you will have to reopen the previous display, making your work more difficult.
- Duration bright display
  If a bright display is not used for a lengthy period, it will dim. You can define the time after which it will dim here.
- Duration dimmed display
  If a dimmed display is not used for a lengthy period, the screen will be shut down. You can define the time after which it will shut down here.

The device displays are also listed on the right-hand side of the parameterization window in the Menu editor – Home tab. If you have the appropriate rights, you can use the context menu and the symbols on the right-hand edge to make various changes to settings.

3.2.5 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 success-fully 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. Login to and logout 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 parameter level and rights at system level:

- Rights at a parameter level
  Authorizations can be assigned in a very differentiated manner for individual parameters or parameter ranges of an application. For example, changing alarm limits or units.
  ➪ Rights at a parameter level (p. 180)
- Rights at a system level
  These rights determine which system settings of the device can be changed. This includes changing the device time.
  ➪ Rights at a system level (p. 183)

User and access rights are saved per parameterization.

User and rights management is saved by parameterization and divided into the following areas:

➪ Managing user profiles (p. 177)

➪ Managing users in enSuite (p. 178)

➪ Managing access rights (administrator only) (p. 179)

➪ Overview of user profiles and their authorizations (p. 187)

➪ System display Users (login, logout, password) (p. 262)

➪ Perform parameter changes via displays (p. 263)

Managing user profiles

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:

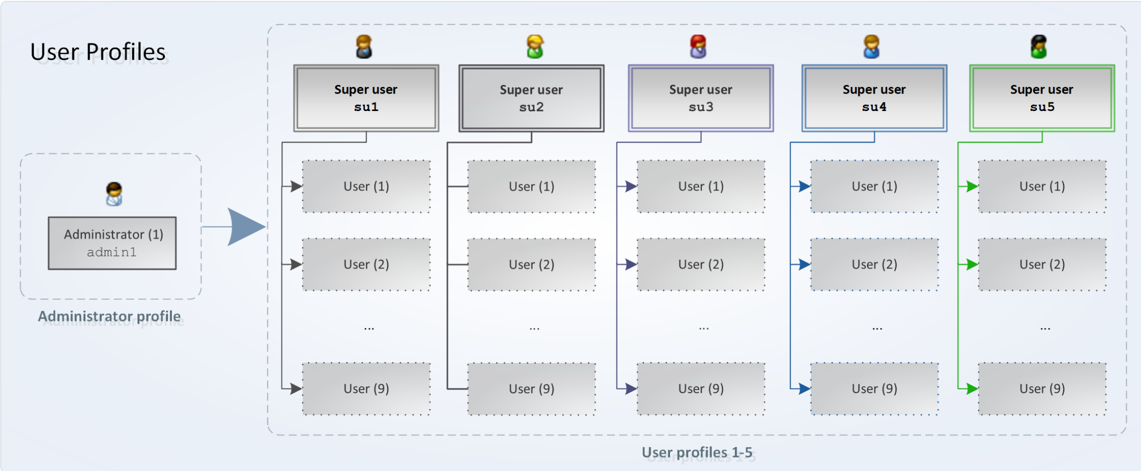


Fig. 3-27: Overview of user profiles

The administrator profile (Administrator) allows full access to the device and management of the other user profiles. It is intended for setting and transferring 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. Only the administrator can manage super users of the user profile.

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:

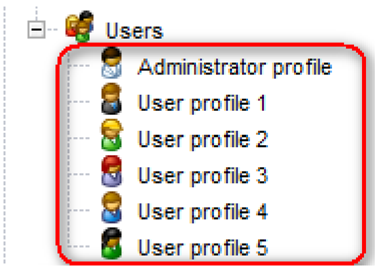


Fig. 3-28: User profiles with unique symbols and a fixed position

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** ("Super User")

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

NOTICE

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. ⇨ Change password (p. 266)

Managing users in enSuite

The branch **Users – <Profile name>**.e.g., **User profile 1** Tab **User list** lists all users of this profile. Except for the administrator profile, in field **Profile name** , you can enter a permissiblemeaningful 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.<Profile name> profile**.e.g., **Users.Technician profile**

Permissible user names

When choosing a user name, please note:

- The name can be made up of 3 to 10 permissible characters.
- It must be unambiguous in the parameterization, in other words it may not appear several times.
- No distinction is made between upper case and lower case letters.
- All the letters from a through a through z (or A through Z) and the numbers 0 through 9.
- Special characters such as e.g.,␣ - . * [{ | # , \ are not permissible.**Change the name of a user**
  (Refer also to ⇨ Change password (p. 266))

Add a new user (Refer also to ➪ Change password (p. 266))

1. In offline parameterization open the required user profile in branch **Users – <Profile name>**.e.g., **User profile 1** Tab **User list** lists all users of this profile .
2. Click the Add symbol
3. Enter a permissible user name into the **Create user** dialog. e.g.,PSchmidt. As soon as your entry is permissible, enSuite will activate the **[OK]** button.
4. Confirm your entry with **[OK]**.The user is created with the login details **<User name>** and an empty password.
5. Log on to the enCore device and assign a secure password.

Delete a user(**<admin1>** and **<su1>** through **<su5>** cant be deleted)

1. In offline parameterization open the required user profile in branch **Users – <Profile name>**.e.g., **User profile 1** Tab **User list** lists all users of this profile.
2. Mark the required name in the list and click the remove symbol .
   The user will be removed from the list without confirmation.

Change the name of a user (Refer also to ➪ Change password (p. 266))

1. In offline parameterization open the required user profile in branch **Users – <Profile name>**.e.g., **User profile 1** Tab **User list** lists all users of this profile
2. Mark the required 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.
3. In the **User name** field, enter a permissible user name. Soon as your entry is permissible, enSuite will activate the **[OK]** button. .
4. Confirm the name with **[OK]**. The changed name is displayed in the list. The old password is deleted.
5. Log on to the enCore device and assign a secure password.

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.

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.
➪ Rights at a system level (p. 183)

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.

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. [1] 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).

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.

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

Managing rights in enSuite

Prerequisite(s)

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

Steps in enSuite

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

▶ ... open node **<Device>**.

✓ In the upper area of tab **Configuration** the fields for virtual login and 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 checkbox **Use virtual login** or log in to enSuite virtually as administrator (standard login **admin1**).

✓ 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.

> **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 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.

Right to change certain parameter

To give a user profile the right to change certain parameter 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 :

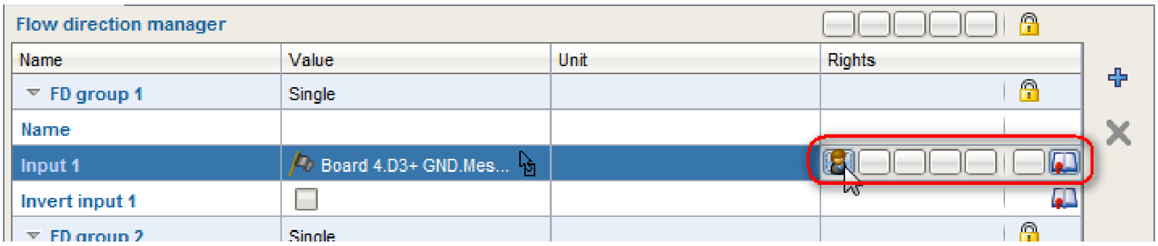


Fig. 3-29: Changing rights for individual parameters – example **Input 1**

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

Right to change entire area

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 :

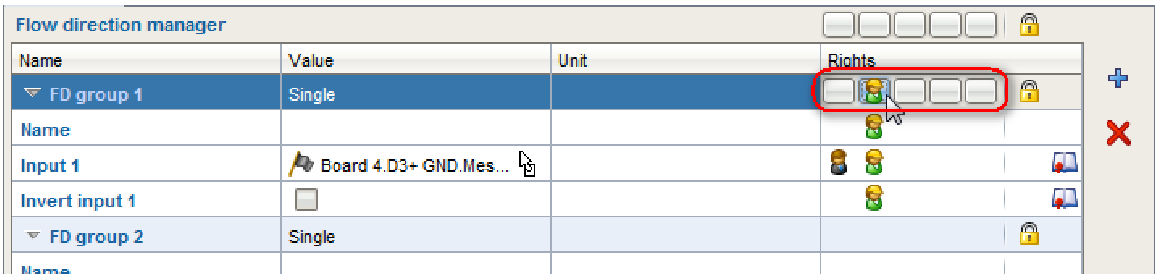


Fig. 3-30: Changing rights for an entire area –
example **FD group 1**

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

Right to change entire tab

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 :

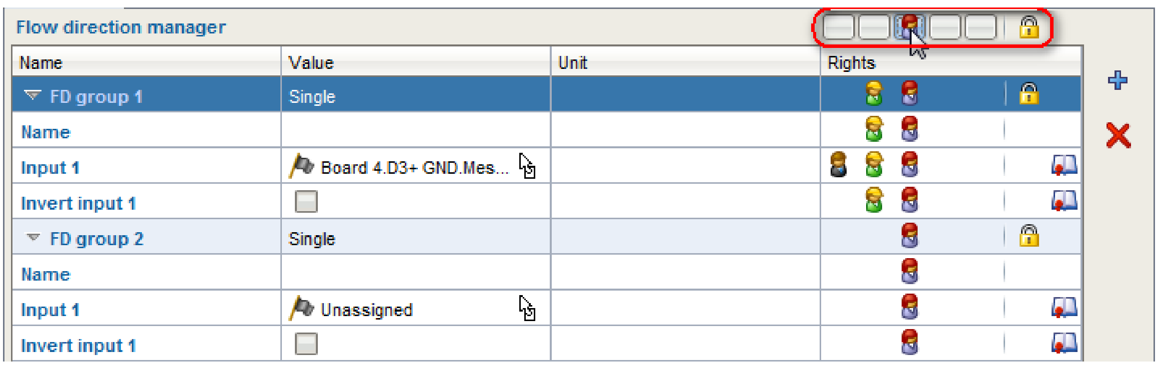


Fig. 3-31: Changing rights for an entire tab – example **Flow direction manager**

✓ 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.

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

Preparation(s)

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

▸ Switch to **<Device>** – **Users**, **Special user rights** tab.

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

Actions for special user rights

Action "Accept errors without login" [1]

The acceptance of the error list is possible without logging in. (*default*)

Access on the device

Error list – Accept all

Action "Accept errors" [2]

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

Action "Erase fiscal audit trail/fiscal archives"

Two actions are summarized under this right:

1 Whether or not only errors which are no longer pending can be accepted or whether errors can always be accepted can be determined in branch **Basic System – System**, section **Error list** with parameter **Acceptance procedure**.

2 Whether or not only errors which are no longer pending can be accepted or whether errors can always be accepted can be determined in branch **Basic System – System**, section **Error list** with parameter **Acceptance procedure**.

(1) Erasing the fiscal audit trail

The fiscal audit trail has a maximum depth of 1,000 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

Access on the device

System – <**Audit trail**>, select entry **Fiscal**, Erase fiscal audit trail

(2) Clearing fiscal archives (*DSfG AFB only*)

Action "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 (navigation branch)

Displays –**<Folder>** – [Folder –] **<Display(s)>**

Action "Update device time"

Set internal system time in the device.[1]

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

---

Action "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

Info –**device monitor**, Reset battery status to 100%

---

1 The Time Service distinguishes between synchronization and adjustment of the system time.
⇨ enCore manual Basic System with SFBs

Action "Modify AFB configuration"

Change composition of AFBs.

Access on the device

<Device>, tab **AFB configuration**

Action "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]** [1]

Action "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]**

Action "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]**

Action "Change general system settings"

Various actions are summarized under this right:

- delete TLS certificate resp. Reboot and create certificate
  Access on the device
  Info –<device serial no.>, `Delete certificate`
  OR
  Info –<device serial no.>, `Reboot and create certificate`
- enable/disable test mode for MFA8 boards
  Access on the device
  System – I/O –<x>, **MFA8**: **Test mode: On/Off**

---

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

- enable/disable maintenance mode of the Flow Conversion AFB
  Access on the device
  <Main display of Flow Conversion AFB>, **Maintenance mode**, **Maintenance mode**: **On/Off** [1]
- enable/disable the HART loop for test and service purposes (*only* multidrop mode)
  Access on the device
  System – **Intelligent measurement devices**, **HART loop** **more...**, **Loop active**: **Yes/No**
- LF-HF counter comparison: reset comparison counter and deviation
  Access on the device
  System – **Tools**, **counter comparison LF-HF** **more...**, **Reset**

▶ To give a profile the right to perform an action, enable the corresponding profile symbol in the authorization column.
➪ Managing rights in enSuite (p. 181)

✓ 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.

General parameters

▶ Open branch **<Device> – Basic System – Users**.

▶ Switch to **Parameter** tab.

✓ The following table lists the general parameters you can assign on this enSuite page.

Action: "Inactivity timeout"

Enter the time period after the expiry of which a user is automatically logged off from the enCore device due to inactivity – the standard value 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.

Action: "Authorization mode"

enCore devices support two modes for log-on to the device:

- *Password* (default)
  In this mode, the <user name> and <Password> are required when logging on to the device. This is the default log-on.

- *Security switch*
  In case the security switch is open, the <user name> is sufficient. This mode is intended for special cases only, e.g. it simplifies the maintenance operations and commissioning of the device since the password is not required.

Make sure that this mode complies with the security guidelines in your company.
For both modes, the user can only perform the changes and actions at the devices, to which the associated user profile is authorized.

1 DSfG AFBThe AFB is not available for every enCore device type.

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	Admin.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)	(✓) [1]	–/(✓) [1,.2]	–/(✓) [,1.2]
changing system settings (≙ changes at a system level)	(✓) [2]	–/(✓) [1,.2]	–/(✓) [1,.2]

Table 3-1: Overview of user profiles and their authorizations

Suggested permissions (GQ devices)

You should only ever assign user profiles 1-5 the minimum permissions required to perform a task. This role-based authorization concept is another tool for increasing data security. Six different roles can be implemented. The following table gives an example overview of a few roles and use cases of the permissions proposed by Honeywell:

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

2 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.

Administratorprofil **enSuite**	**Main actor(s):** Device owner / Station Operator
	Goals: System- / Device-Management
	all rights at system level and at parameter level exists (no adaption necessary)
	Use case: Creating and deleting users / assigning rights / assigning passwords
one of the User profiles 1–5 **enSuite**	**Main actor(s):** Honeywell Service Technician / Technical Support Service technician with additional qualification (authorized in legal metrology)
	Goals: Mount device / configure device functions / change software (legally relevant, operational) / adapt parameterization to measuring point / open and close security switch / ensure correctness of the official measurement / seal device
	required rights (administrator rights without user management) **All rights at system level / All rights at parameter level** **(Rights must be adjusted)**
	Use case: Service technician commissions the device in legal metrology or operationally or carries out essential changes to the operating mode or repair measures. Honeywell Technical Support supports service technicians, technical personnel and controllers in their activities
another one of User profiles 1–5 **enSuite**	**Main actor(s):** Honeywell Service partner / Metrologie-Expert with HONEYWELL Training
	Goals: Open and close security switch / erase fiscal audit trail/fiscal archives / change legally relevant parameters according to the approval file / change legally relevant software on the device / ensure correctness of the official measurement / seal device
	Minimum required rights (Rights must be adjusted) **rights at system level:** Change device system time / Reset battery status / Change AFB configuration / Change legally relevant and operational software / Change general system settings / Erase fiscal audit trail/fiscal archives / Change approval file. **rights at parameter level:** Right to change all parameters that are protected by security switch according to the approval file. / Change rights around operational AFBs
	Use case: Authorized metrology expert carries out legally relevant maintenance.
a third profile of the User profiles 1–5 **enSuite**	**Main actor(s):** Qualified personnel with HONEYWELL training e.g. electrician / gas specialist
	Goals: Goals: Regularly change a defined set of parameters, e.g. adjust values of the gas component table / change operational software / delete operational archives / perform calibrations / perform maintenance
	Minimum required rights (Rights must be adjusted) **rights at system level:** Change displays / Change device system time / Reset battery status / Change AFB configuration / Change operational software / Change general system settings **rights at parameter level:** rights to change the required set of parameters, z. e.g. gas quality values / gas composition
	Use case: Technical staff carries out operational maintenance work
Rest of the User profiles 1–5 **enSuite**	**Main actor(s):** User without HONEYWELL training e.g. Controller.
	Goals: readout archives / readout parametrization / view and accept error list
	no adjustment of rights necessary (default setting allows read-only access)
	Use case: Employee reads out non-sensitive data from the measuring device

Fig. 3-32: Proposed permissions

Login prompt and login status

For working on protected settings, a **login prompt** will automatically appear when you start the action. To log in, you will require a **user name** and **password** which the system operator, acting as the administrator, or the super user of the profile will have prepared for you.

Please request these data.

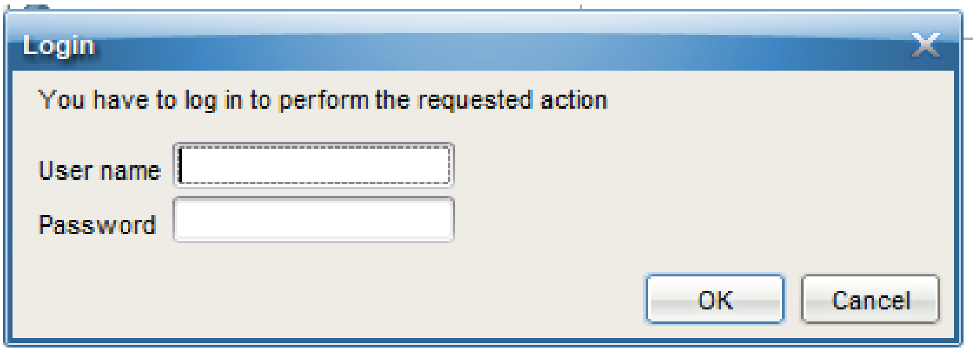


Fig. 3-33: Login dialog window

If you have the required authorization and the position of the calibration switch (SSW) allows editing, you can make the changes after logging in.

Check your login status

Click on the topmost folder in the parameter tree, select the tab as shown.

If a login is requited or possible e.g. for online parametrization you have the option to use "**Login**" button .

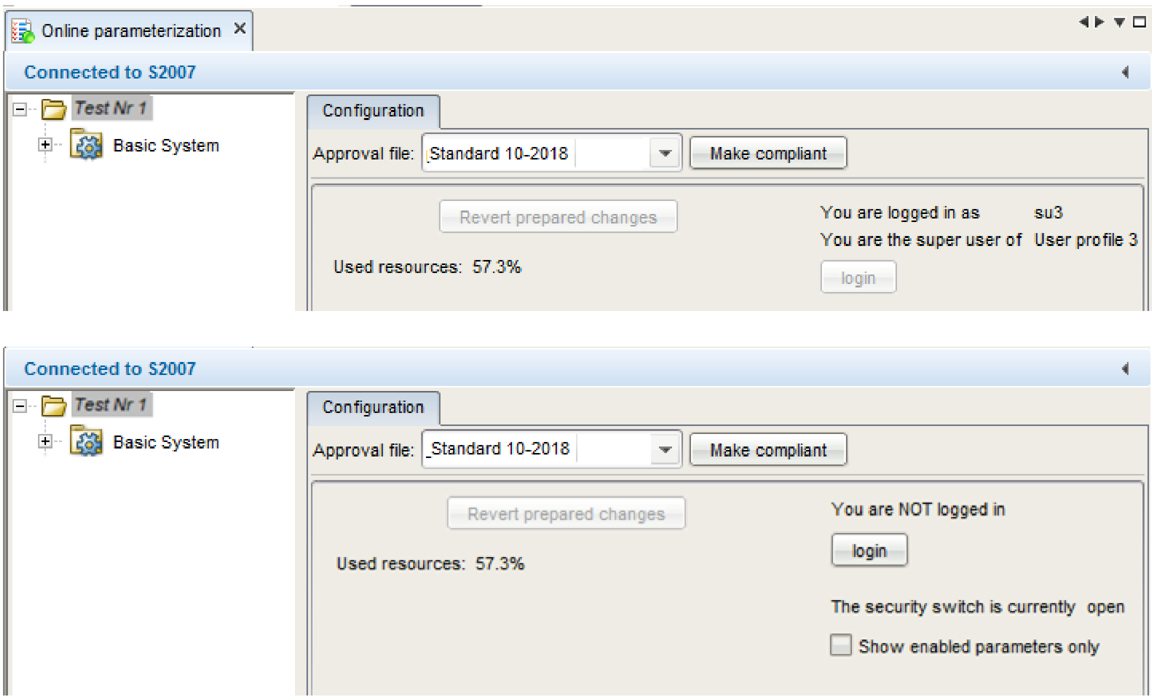


Fig. 3-34: Online parameterization login and logout

Log out by disconnecting the device or closing the function e.g. the online parameterization window.

Virtual login (restriction of editing options)

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 transferred 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 protection, 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.

Requirement:

- You have selected offline parametrization ⇨ 3.3.1 Offline parameterization (p. 205).
- The parameter set is open and the topmost folder (device) is marked. In the right-hand section of the window you will see the **"Configuration"** tab (withe possible selections shown)

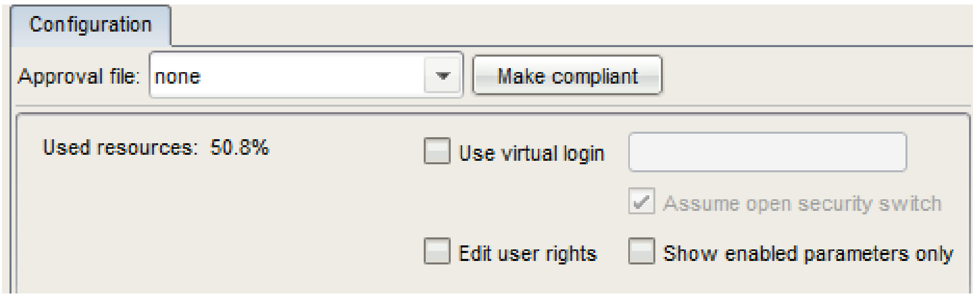


Fig. 3-35: Use virtual login

In the **Use virtual login** fild, 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. When a user has successfully logged in, a green check-mark will be displayed behind this name field.

Non-editable parameters are listed now in gray in the parameter lists and are labeled with the symbol . If you deactivate the option **Assume open security switch**, then all parameters under security switch protection can no longer be edited either.

By using the option **Show enabled parameters only**, you can achieve that any such parameters are not displayed at all.

To display all the parameters again regardless of their access rights, disable the checkbox **"Use virtual login"**. You will now see the existing setting options under Parameters.

Assigning or changing a password (online parameterization)

Connect to the device and select "Parameterize online". A login prompt will appear in which you must log in as the administrator or super user (for example, SU3). Click on **"OK"**.

You can only log in if no other login is active on the device.

The parameter set will be read after the login. Open the user management in the basic system and select the appropriate user.

Double-clicking on the user will open the following dialog box (see figure).

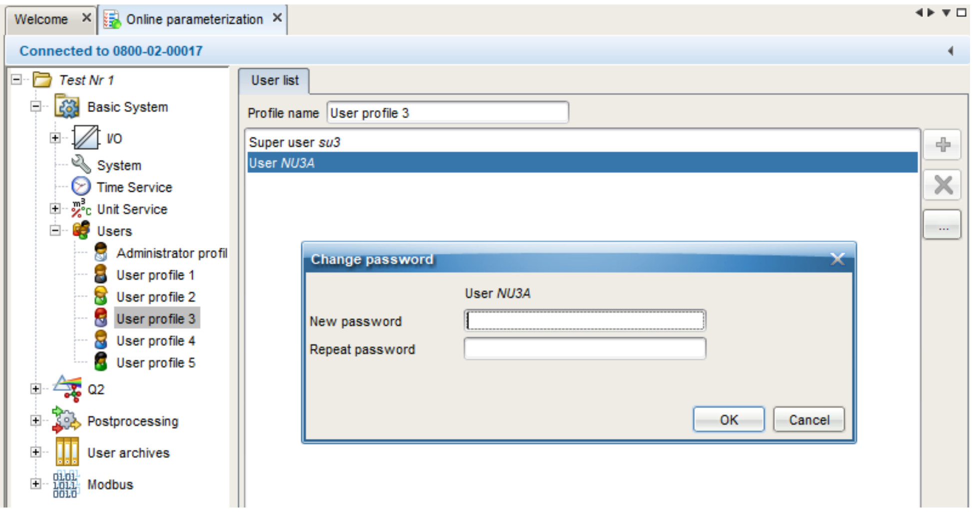


Fig. 3-36: Change password dialog (online parameterization)

Enter a legal password in both boxes in the dialog, obeying the instructions in the dialog. If your entry is valid, the [OK] button can be selected, and you can conclude your change by clicking on it. The new password is now active. After you have selected OK, you can break the connection.

> Assigning or changing own password could also be done with the help of the remote operation panel.
>
> See section System display (device) Users (Login/Logout/change password).

When carrying out any online work on the device, please note that an automatic logout will take place after a defined period of inactivity. (Further information about this inactivity timeout can be found in section .)

You will also be logged out when the connection to the device is disconnected e.g. by reboot.

Viewing position of the security switch

The security switch (calibration switch) can physically establish or interrupt electrical connections within the device and thus prevent changes in addition to password protection and access rights. On delivery and in “non-fiscal operation”, this connection is open. More information in section ⇨ The hardware parameter guard (SSW) (p. 94).

Also for this protection, which is not installed at delivery, the administrator must make the necessary settings, because some settings, as already mentioned, must be protected during official measurements.

Independently of the official measurements, the administrator has the possibility to put further device settings under this protection.

You can view the setting using online parameterization. After opening the online parameterization, the Configuration tab shows the current situation, see figure.

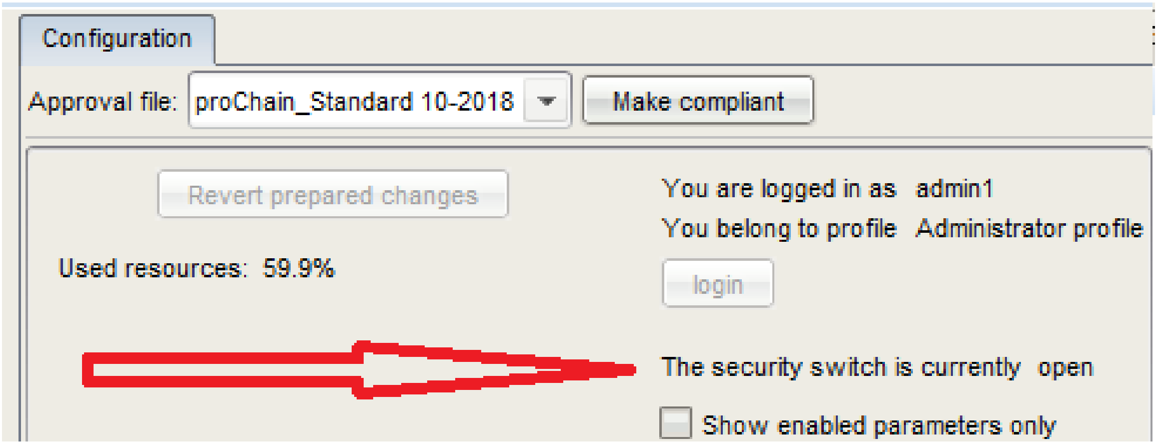


Fig. 3-37: View the SSW position

> When the switch is closed, the text "**The security switch is currently closed**" is displayed. More information the online help of enSuite.

3.2.6 Fiscal parameters and optional using of approval file

For devices, which are intended to be used in legal metrology, the approval specifies which parameters are legally relevant. The editing of such parameters must be specifically protected or logged.

> There are two different types of access rights for legally relevant parameters:
>
> Can only be changed if the sealable security switch is open
>
> Can also be changed if the security switch is closed, provided the fiscal audit trail is not yet full. The change is logged in the fiscal audit trail

If the device is operated in accordance with a valid approval, then the following conditions need to be met in the parameterization:

- The access rights for legally relevant parameters must be set in line with the approval.
- The software versions of the fiscal software components must comply with the approval.

In order to ensure compliance with these conditions, please proceed as follows:

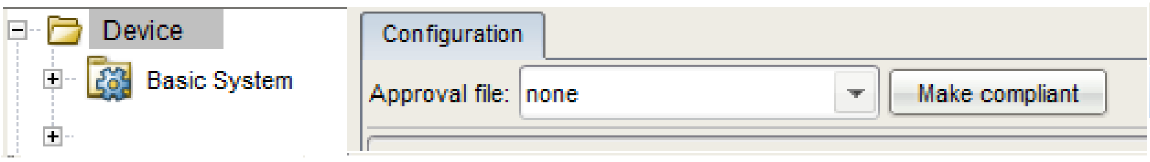


Fig. 3-38: Configuration – selecting the approval file

1. Select the approval to be applied in the Configuration tab, using the drop-down list.
   All parameters and parameter branches whose official access rights (i.e. or) deviate from the selected approval are now labeled in bold orange. A blue label indicates that official access rights have been newly added.
2. Now click on Make compliant. By doing this, the access rights for legally relevant parameters are set in line with the selected approval. The orange labeling is replaced by a blue one as the changes have not yet been saved.
3. Check the listing of AFBs in the Configuration tab. If an AFB is still labeled in bold orange here, then this means that a software version was selected here which does not comply with the approval.
   Select the correct version which is in line with the approval. (Versions in line with the approval are listed in black, and versions which are not in line with the approval are listed in orange. Versions that are not compatible with the current Basic System appear in red.)

Then click on the Make compliant button.

4. Save the parameterization . The blue labeling of parameters and parameter paths then disappears.

   This action does not make any changes to the values of parameters. After the changes are saved, all the colored markings will disappear. Transfer this compliant parameter set to your device to use it for fiscal measurements.

> Approval file within enSuite / the device
>
> There are various national approval files which define the fiscal parameters which must be monitored and the corresponding values in enSuite.
>
> There are also files which allow this protection mechanism to be used for non-fiscal operation as well.
>
> A special official approval file transferred and contained in the device's software determines which approval should apply fo the device. It is possible to replace the approval file in the device via software configuration (ð section)

During operation, the device checks whether the official access rights and the fiscal software component versions match the requirements of the approval file in the device. The selection in enSuite is used solely for support purposes during parameterization.

On the remote operation panel, you can see an identifying string for the approval file in the Info (system) display. If both the official access rights of the parameterization as well as the fiscal software component versions are in line with the approval file, then this text is black; the text is red in the event of any deviations.

Security switch and fiscal audit trail may also be used for devices that are not to be operated in accordance with an official approval. In such cases there are prepared unofficial "approval" files, including a file without any official access rights whatsoever.

All the AFBs available for the device will be listed in a table in the bottom section of the tab. They can be used with the appropriate rights to expand the Configuration AFB. See the online help for further information.

> **If this protection is disabled, "none" (see figure) will be displayed. after "Approval file".**

3.2.7 Live data and trending actions in enSuite

EnSuite offers the possibility to view live data and trends of the device. First you have to establish a connection to the device (See Establish connection to enCore device). After you are connected to the device, you can right-click on the "Live data and trending" entry in the lower part of the navigation window. The parameters will then be read out from the device and a new window will open in the middle of the screen. (see figure)

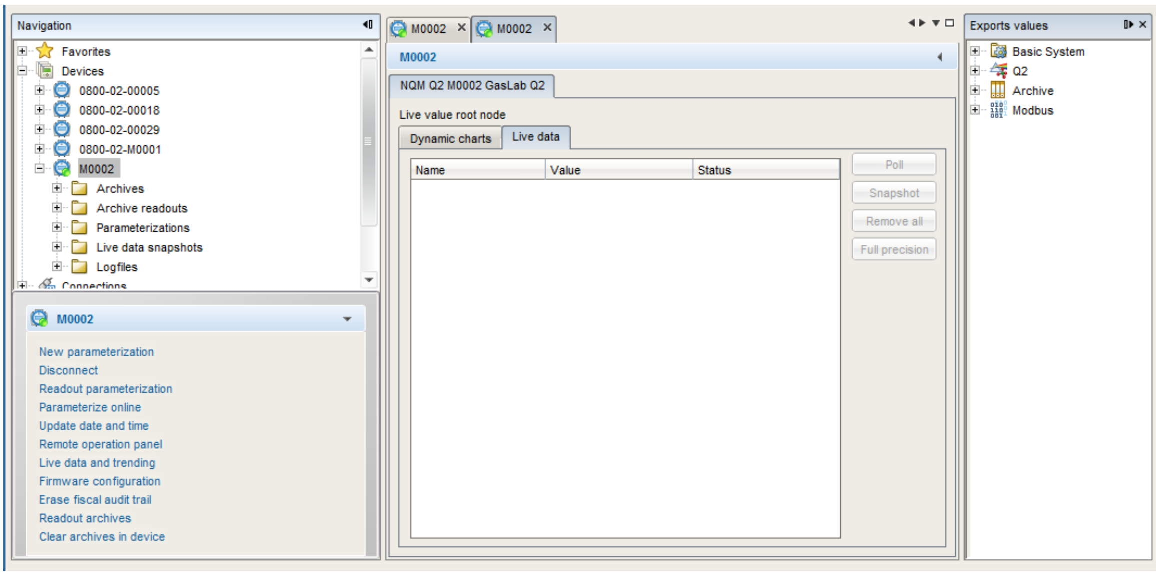


Fig. 3-39: Windows and tabs for "Live data and trending" function

There are 2 tabs in the window, "Dynamic charts" and "Live data". In the "Live data" tab, you can monitor lots of data simultaneously in number form. In the "Dynamic charts" tab, you can monitor the data in graphic form. There are only 2 physically different data items to observe since there is a maximum of 2 vertical axes. Several data items of the same type can be compared on each vertical axis, for example two temperatures (in °C).

Examples of the "Live data" tab application

There is a window with all the available values in the device (parameter tree) on the right-hand side. Simply navigate to the required value, hold it and drag it into the center window (see the following screen section)

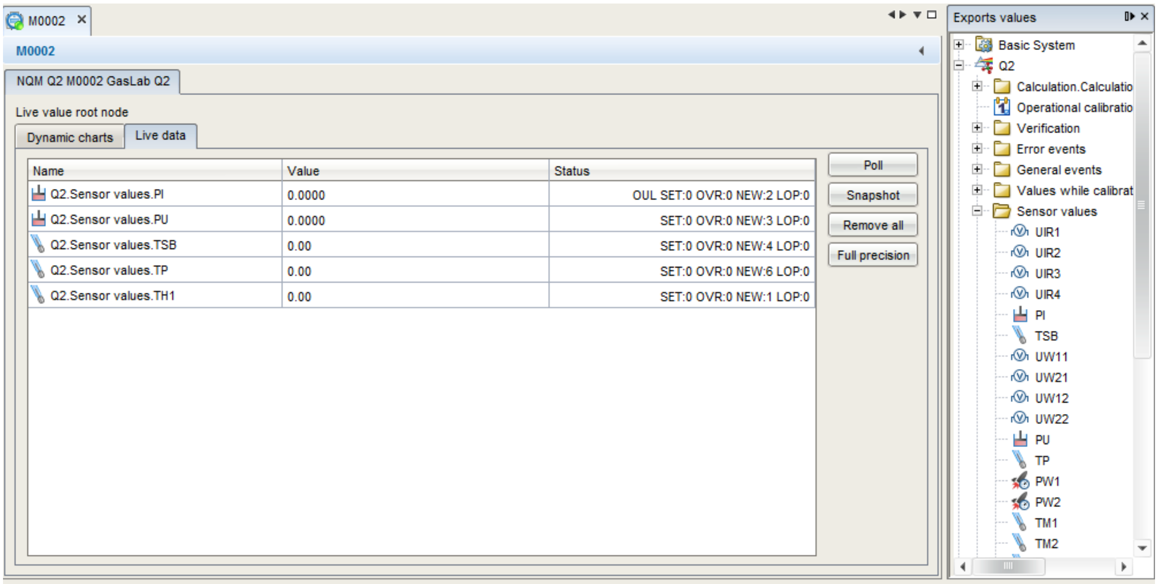


Fig. 3-40: Live data tab

If you wish to view a calculated value, for example the inferior calorific value, you can display all three different states of the gas (completely dry/completely wet/partly wet).

When you have dragged the required values from the right-hand window into the center, simply click on “Poll” and you will see values updated every second while the button changes to “Suspend”. If you click on “Snapshot”, the current value will be frozen and can be viewed in a new table sheet created at the same time.

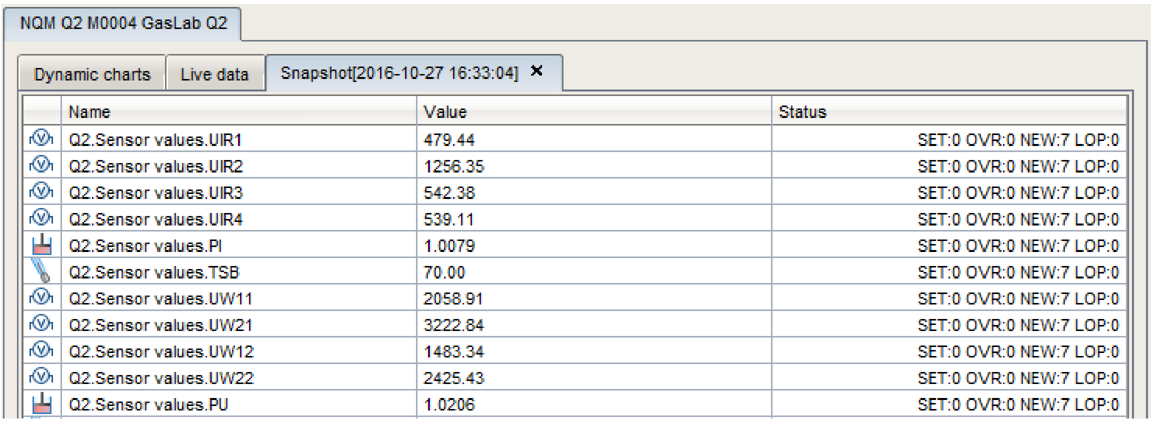


Fig. 3-41: Snapshot tab

If you click on **“Full precision”**, the display of the values will be extended to all the existing decimals. If you click on **“Remove all”**, the display window in the center will be cleared. Other examples include the following:

• Use as **“Device monitor**” to obtain information about the operating hours and battery charge and the CPU and RAM load. These data can be opened if the export values from “Device status” are used in the tab

• Use as “**Time Service display**” to provide information about the time setting and events and data linked to it. This information can be opened if the export values from “Time service” are used.

> **Details are given in the next sections.**

Examples of application tab "Dynamic charts"

Here you can select values which you wish to see in graphic form. To do so, drag the values from the right-hand window into the central area.

Please remember that these must be "Groups" (see above) if you want to display more than 2 values.

Once the required values have been positioned in the center window, click again on "**Poll**". The values will then be displayed in a line diagram.

The button will change to "**Suspend"** (as shown below) and **"freezes**" the graphs when it is clicked until fresh values are displayed by clicking on **"Poll"**.

Fig. 3-42: Tab "Dynamic chart"

You can clear the central section again by clicking on "Remove all" and display other values in graphic form. The number values form the Y-axis, while the recording time is shown as the X-axis.

Use “Live data tab” as Device monitor

Information about

- Operating hours
- Battery state of charge
- CPU load and Ram load

can be obtained if the system export values are used in the tab “Live data” as shown below.

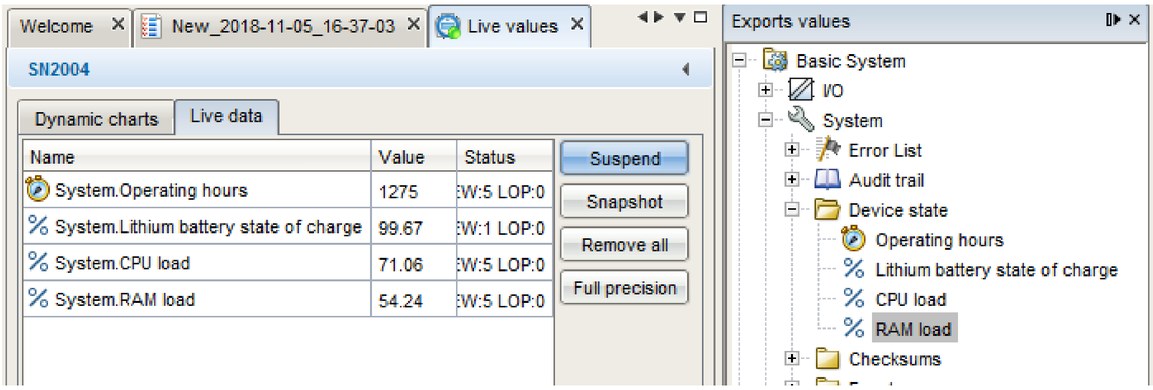


Fig. 3-43: System– Device monitor values

Operating hours:
Elapsed hours that the unit has been on and running since manufacture.

Battery state of charge: Remaining battery charge in percent.
(The battery is mainly used when the instrument is switched off. The message "Battery charge low!" is displayed when the battery capacity has dropped below 20%. The battery must then be replaced).

CPU load: Current utilization of the CPU in percent.
(Message "CPU load high!" can optionally be displayed if a warning limit has been parameterized).

RAM load: Current load of the main memory in percent. (for information only)

Use “Live data tab” to view Time Service data

Information around time setting, related events and data can be obtained, if the time service export values are used in the tab “Live data” as shown below.

Value	Meaning
Current time	System time
Latest update	Time stamp of the last time change.
Latest deviation	Deviation (in seconds) at the last time change
Latest external time source	Number of the external source for the last time synchronization
Daylight saving time	(DST) is the practice of advancing clocks during warmer months

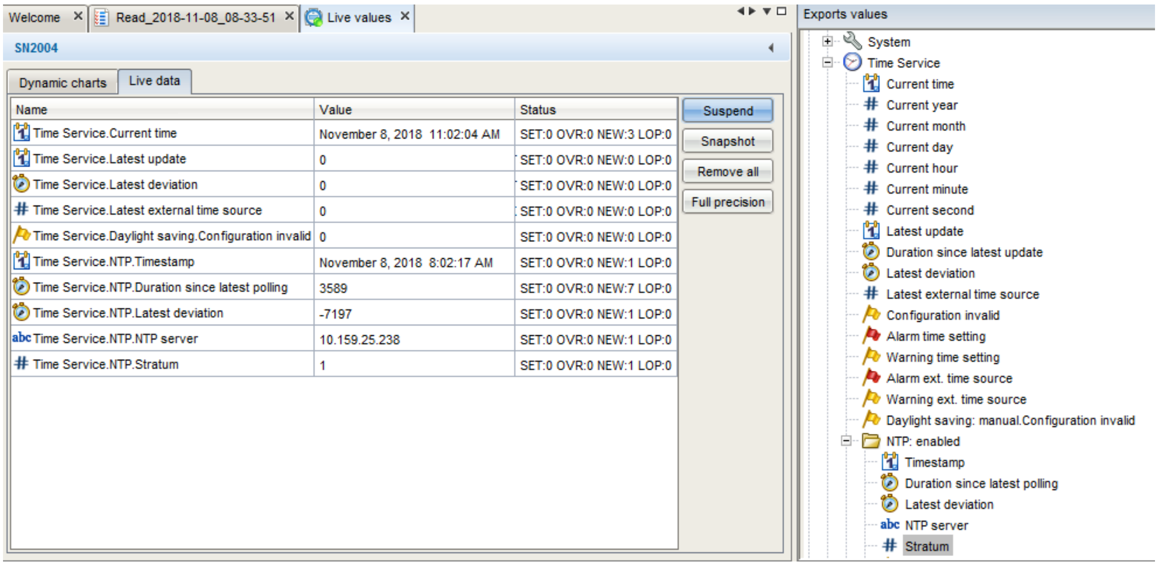


Fig. 3-44: Time service main data

The Time zone (geographical location) and the setting of DST could be viewed in the parameter settings of **Basic system**. See next figure.

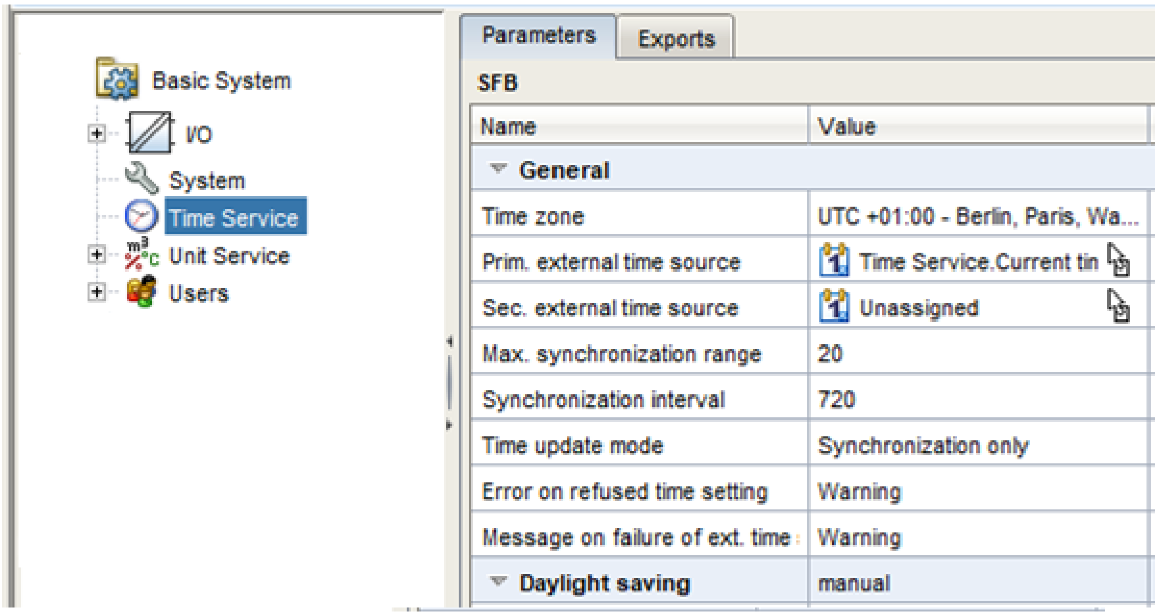


Fig. 3-45: Time zone (enSuite)

.

The Network Time Protocol (NTP) is a standard for clock synchronization in computer systems. It can be used if NTP synchronization has been activated in the device. Information about enabling and function see sections ➪ System display Time Service (System time and date) (p. 255) and ➪ 3.3 Notices about parameterization (p. 204). Following data can be viewed (information also in the online help available).

Time stamp: Latest update of the last time synchronization using NTP. If a synchronization has already been completed, the precise time of the synchronization can be read in the display (date, time and time zone).

Duration since latest polling: the deviation (in seconds) at the last time synchronization using NTP shows by how many seconds the internal time deviated from the standard time at the last synchronization.

NTP Server: name or IP address of the NTP server used for the last time synchronization, for example ptbtime1.ptb.de or de.pool.ntp.org or company servers as in the figure.

Stratum: stratum value of the NTP server used for the last time synchronization (number of computers up to the time reference in the NTP hierarchy).

Use "Live data tab" to view the Software status

In most enCore devices, a display called "Software status" shows information about the identification data of all the software parts in the device. The data comprise the name of the software parts, the version number and the checksum. These data can also be displayed using enSuite functions "Software configuration" and "Live data".

Use the "Software configuration" tab to display the software status.

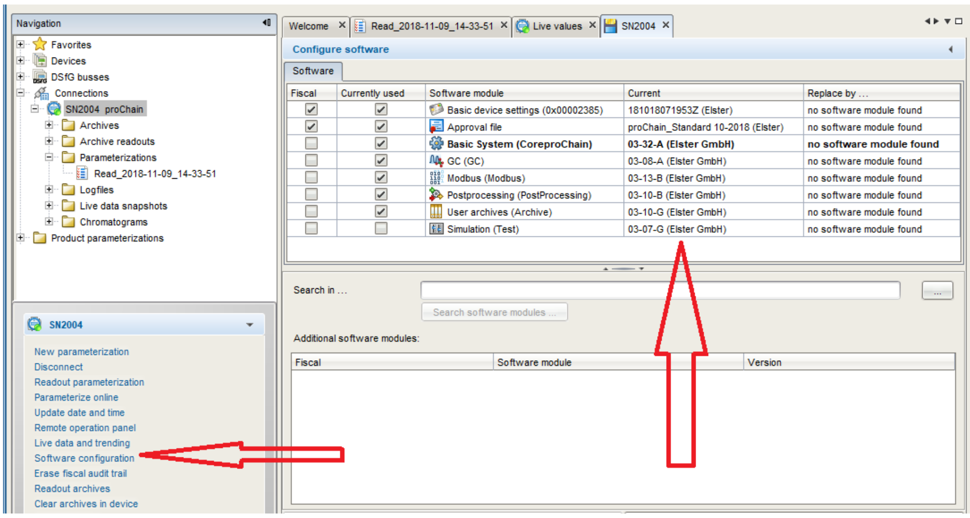


Fig. 3-46: Software configuration info

The software configuration lists the names of the main software parts in the column headed Software module. The next column Current contains the software version numbers of the components.

The second line of the tab shows the short name of an approval file. This file contains the definition of which parameters should be protected from changes so that the device can be operated to the customer's specification or approval. Further information ➪ 3.2.6 Fiscal parameters and optional using of approval file (p. 194).

Operation without an approval file is also possible. In this case, "none (Elster)" is displayed. If the device is operated with an approval file and a closed SSW, the appropriate parameters are protected to prevent them being changed.

Use the "Live data" tab to obtain information about the software checksum, third column of missing "Software status" display. To do so, drag the export values out of the checksum folder under "System" into the tab's table.

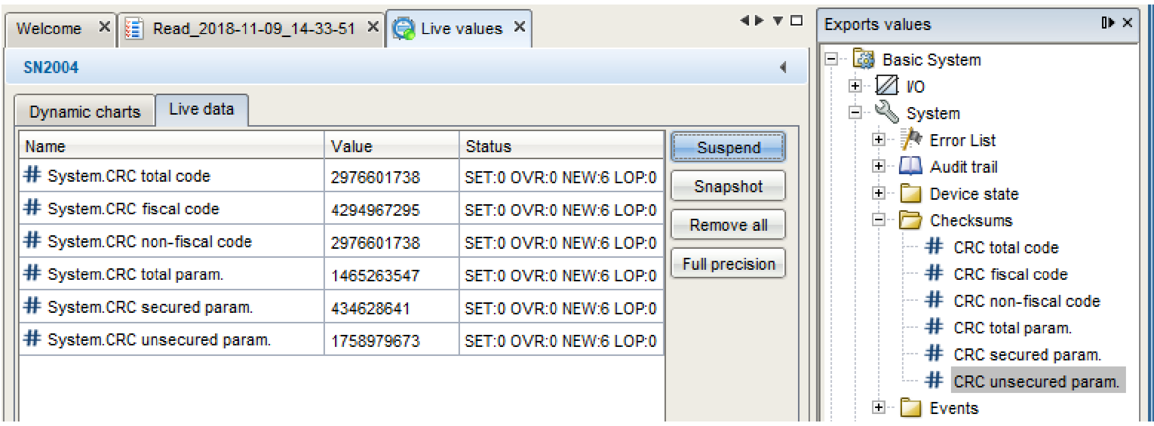


Fig. 3-47: Software checksum info

The above figure only shows examples.
If, for example, the device is not used for fiscal measurements, the "Secured parameters" display will not be supported.

The Value column contains the appropriate checksum (after clicking on Poll). During operation, the actual checksums are calculated and compared to the reference values.

If a checksum discrepancy is identified an error is generated. To check this, add the relevant points listed under Event additional in the live data tab.

3.3 Notices about parameterization

> **On delivery, the device will always have a default or factory parameter set (called device parameter set or device parmererization). This only must be adjusted if necessary. <u>Consider: Any change of this settings runs the potential risk of the device being set incorrectly!</u>**

Parameterizations differ in type and scope. They may only be suitable for one device or for one device series, and may be copied, shortened, extended or have their content changed.

The parameterization work can also be done in different ways, either directly in the device (online) or in advance on the PC (offline) with later transfer.

In the help window of enSuite **online help** you will find the folder **Parameterization (in general)** located under **About enSuite**. In this folder the subfolders and branches all essential terms and properties of the parameterization are explained.

Below you will find some additional hints:

- The user and rights management of enCore devices makes it possible to define in detail which changes users may make. This is the responsibility of the administrator, who in turn has unrestricted access to the device. ⇨ 3.2.5 User and rights management (p. 176)
- To reduce the risk of incorrect changes which may render the device useless, the administrator should block actions which are not required by other users during normal operation. For example, these include editing the approval file, Configuration AFB and both non-fiscal and fiscal software.
- You must always be logged in when making or transferring the changes and you are bound by the user management restrictions.
- Only parameter changes which the logged in user is permitted to make are possible. Parameters which cannot be edited are displayed in the parameter lists in grey and marked with the symbol, or in some cases will not be displayed depending on who is logged in.
- Select the parameter to be changed from the parameter tree. Activate the input field and press **[F1]** to get information about it.

3.3.1 Offline parameterization

There are two alternatives available:

- change an existing device parameterization
- create a new device parameterization

> **Original content will be lost by changing**
>
> Do not use any parameter sets stored in the archive or as a backup to make changes. Instead, always read a new parameter set.
>
> ➪ Read-out parameterization (p. 151)
>
> ➪ Saving, and exporting the parameter set (p. 155)

Requirements:

- The parameter file is opened and shown in the parameterization window.
- Restrictions of the user management and SSW position allow the transfer of the changed parameters

Offline parameterization takes place in the following steps:

Step	Content/Action
1.	Edit the device parameterization. ➪ 3.3.3 Editing parameterizations (p. 209) If you are using a new parameter set or a product parameter set from other devices, please consider that this is only a template and that all the relevant parameters must be adjusted on the device before the parameter set is transferred to the device in step 3. **If you fail to do this, the device may react in an undesirable manner.**
2.	Save the device parameterization .
3.	Transfer the changed parameter set to the device with the matching serial number.

Save offline parameterization

> **Only saved device parameterizations can be transferred, and only to the device with the matching serial number.**

When all the required changes have been made, save the parameterization .

After it has been saved, the symbol will turn gray and the lines will be displayed in black.

Transfer offline parameterization

1. Establish the data connection to the appropriate device ⇨ 3.1.2 Data connection to the measuring device (p. 146)
2. Make sure that there are no other enSutie connections to this device.
3. Highlight the desired **device parameterization** in the data structure of the **navigation window**
4. Select the **Transfer parameterization to device** action (for example in the context menu).
5. Log in using the login dialog with your user name and password which appears.
   The parameter set will be transferred.

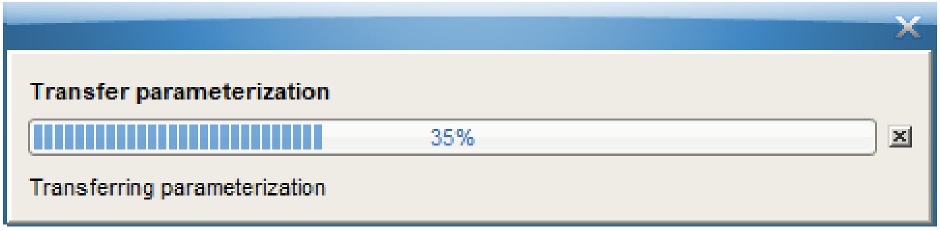


Fig. 3-48: Dialog transfer parameterization

There are typically a number of parameters which are protected by the security switch (SSW) (e.g. in order to meet the requirements of an approval).

If the new device parameterization is likely to bring about changes to such parameters, but the security switch is closed, then the message Device could not be parameterized appears following the transfer. The device does not restart; the old parameterization is still used.

If the parameters are not protected by the SSW or if this is open, the changes will be transferred, and the device will restart.

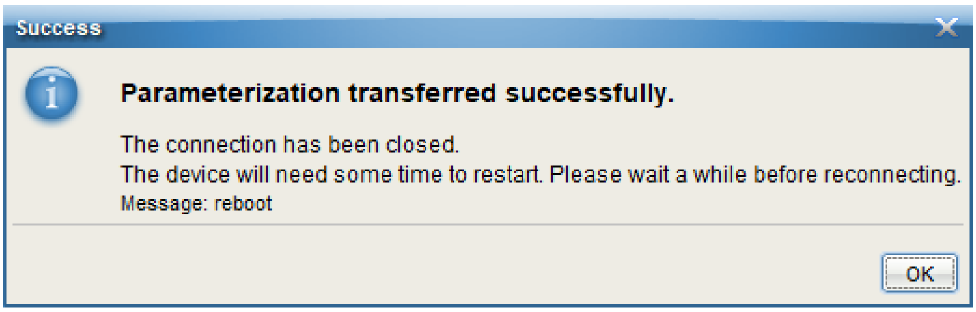


Fig. 3-49: Dialog parameterization transferred successfully

The restart will disconnect the device and the user will be logged out automatically.

The device will now operate using the transferred settings after you have re-enabled the required operating mode. These new settings will remain in use even after the device is switched off and on again.

Possible errors

EnSuite marks incorrect parameter settings in color and the transmission into the device is prevented in most cases.

Nevertheless, parameterizations can cause situations which do not produce the desired result and are not indicated by error information. The following shows examples and remedial measures.

Dialog disapears without reaction

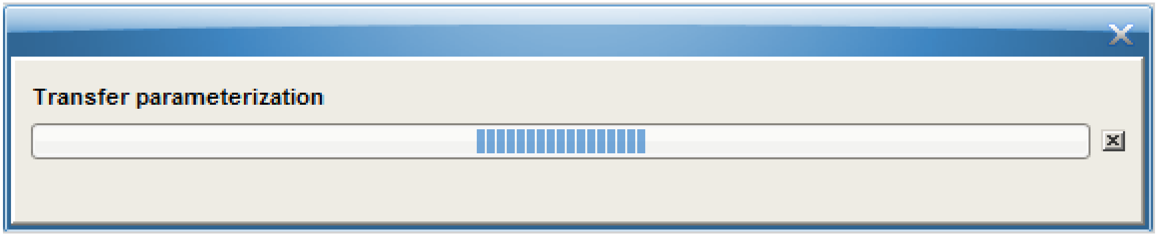


Fig. 3-50: Dialog Transfer parameterization

Situation: The dialog disappears without another message or confirmation. The device does not reboot.

Cause: The transmission path was interrupted or the transfer was too long.

Action: Check the transmission path (E.g., a slow W-LAN connection was selected)

Change the transmission path and retry the transmission (Use "wire"connection or use the USB port)

> **In order to ensure that a valide parameterization is in the device, read the parameterization again after a restart and compare this result with the saved version.**

Files are not transfered

Situation: The following error message appears

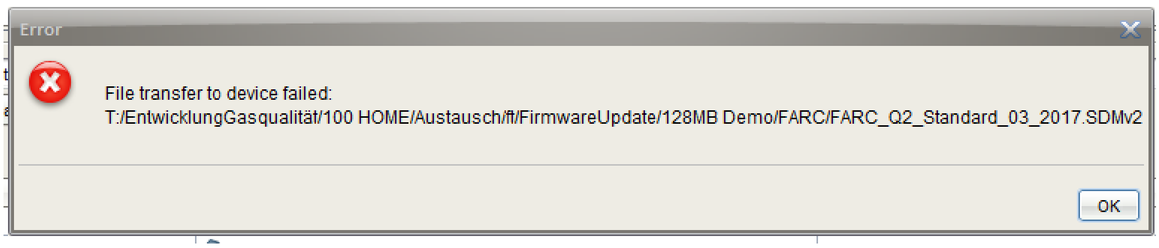


Fig. 3-51: Error data transfer

Cause: It is not possible to transfer files to a device (even parameter settings) If the file path contains umlauts (ä / ö / ü)

Action: Change the location of the data (e.g., copy data to the desktop)

3.3.2 Online parameterization

Online parameterization means that the content of certain parameters is changed directly during an existing data connection to the device. See ⇨ 3.1.2 Data connection to the measuring device (p. 146).

> No changes may be made to the AFB composition or the parameter structure.
>
> Parameters labeled as 🔒 cannot be changed, parameters labeled as may only be changed provided the fiscal audit trail is not full, if the security switch is closed
>
> Non-editable parameters are listed in gray in the parameter lists and are labeled with the symbol ⊘.

Changing device parameters in the connected device online
1. Establish the data connection to the device
2. Select the entry **Online parameterization** in the lower section of the navigation window.
3. Log in with your user name and password using the login dialog that appears.
4. The parameterization is read; the parameterization window then opens up for editing purposes. (The elements of the parameter tree will be displayed in black.)
5. Make the changes ⇨ 3.3.3 Editing parameterizations (p. 209) After entering the edited value, the edited parts of the parameter tree will be highlighted in green. This indicates that the parameter was edited but the change has not yet been transferred to the device. Any superordinate branches are also green at the same time.
6. Activate the Transfer parameterization to device button . Once the transfer is completed, the parameter label is then blue. This indicates that the transfer was completed but the edited parameterization has not yet been saved in enSuite.
7. Save the changed parameter set in enSuite. Use the diskette symbol . (Once they have been saved, the values will again be displayed in black.)
8. Log out by closing the online parameterization window.

3.3.3 Editing parameterizations

The parameter set also called parameterization is changed or edited in the **parameterization window**. In the **parameters tab**, the parameters of the individual parameter branches are listed in table format and offered for editing.

> Use **virtual login** to make editing safer, simpler and hide unnecessary parameters. ⇨ Virtual login (restriction of editing options) (p. 190)

The function blocks of the enCore software provide results (**Exports**) which can be further processed by other function blocks as an **import value**. In the **value window** the exports are identified by a symbol. This symbol shows at a glance to which physical quantity the value belongs.

In the help window of enSuite **online help** you will find the folder **GUI at glance** located under **About enSuite**. In this folder the subfolders and branches all essential information can be found.

> During editing, the program makes use of color-based signs in order to identify the status. If the parameter label is blue, this means that the parameter was edited but the change has not yet been saved. Any superordinate branches are also blue at the same time. A red parameter label indicates that changes have been made and the parameterization is not yet valid. The parameterization can be saved, but it cannot be transferred to a device.

Additional practical tips for editing parameterization:

- If you delete or make a major change to a value and the value is used in a different context, all the links to this value will be invalidated and will be automatically deleted. You will receive a message about this process so that it is obvious which links must be recreated.
- New functions or changed operating modes require additional parameters which are then made available for editing in a new subordinate branch. Example: Converting the operating mode of a board channel, e.g. for changing from "**not used**" to "**message input**".
- For certain parameters, it is also possible to select the option. Select always an option **Not used**, e.g. for unavailable input values.
- Parameterization of input channels
  Parameterize the measurement devices that are connected to the digital channels. The operating mode typically needs to be selected initially for the respective channel under **Basic System – I/O – <Board name> – <Channel name>**. The associated parameters can then be edited.
- Define protocol channels
  The CPU and or certain process boards provide digital protocol channels. These are intended for the connection of measurement devices via digital protocol or for communication via Modbus (in conjunction with the Modbus AFB). Only the basic communication parameters are specified when defining a protocol channel. You can then edit the associated parameters. Define protocol channels

- define Pre-processing operations
  in the **Postprocessing AFB**. Create messages or implement a strategy e.g.in the event of errors and/or for fixed substitute values. Change units ⇨ Change default units (p. 171) if necessary
- Assign the desired export value
  to each required input value of the **AFB** or **SFB**. This export value is typically provided by another SFB or AFB. You must take care to ensure that the source of the value is correct. The assignment of an export value to an import parameter only works if the physical quantity is matching. A stop sign ⊘ appears if any such assignment is not possible (e.g. because the physical quantity is not matching).
- Check or edit all options and constants. For certain constants, such usage can also be switched off via the context menu by choosing **Not used**.

3.4 Change settings of the GC AFB

The following section explains in combination with the **online help** how to adjust some settings in the **GC AFB**. An overview is given in the online help. Select **GC** in the parameter tree of the **parameterization window** and press **[F1].**

3.4.1 Overview of the GC AFB

> **Using the default parameter set and the commissioning settings, automation, calibration and verification will run without any additional intervention in the parameters**

The default parameter set covers most applications. Nevertheless, it may be necessary to adjust some parameters. This is done in the **GC AFB** and its underlying nodes, see example of parameter tree in the figure below.

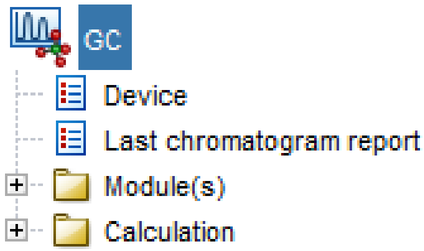


Fig. 3-52: Overview of GC AFB

On the right-hand side (on the parameterization window), you can see the settings used for the Code checksum (software check). The **Exports** values tab contains possible links for the AFB which can be used in other software parts. In general, it is not necessary to make any changes here.

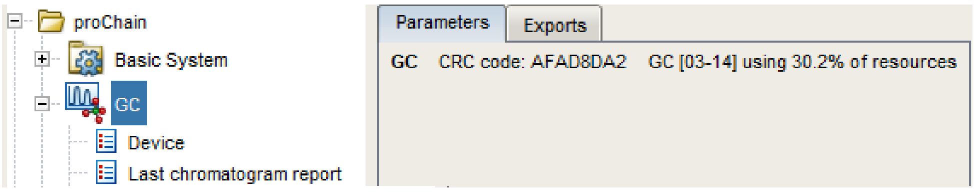


Fig. 3-53: GC Parameters

3.4.2 Adjust settings of the housing heating system

Under the node **Device**, the target temperature (setpoint) and the sensitivity (tolerance) for the optional housing heating can be defined. When this temperature is reached, the heating switches off within the selected tolerance range. Detailed information is available in the enSuite online help.

Check and adjust the heating parameters. The parameters can be modified using ➪ 3.3.2 Online parameterization (p. 208).

Recommended values are 20°C (68°F) as Housing heater setpoint (temperature inside the device) and 0.5°C (0.9°F) as Housing heater tolerance.

The start-up-phase of the device may take much more time, because the device must reach the target temperature before measurements can be performed.

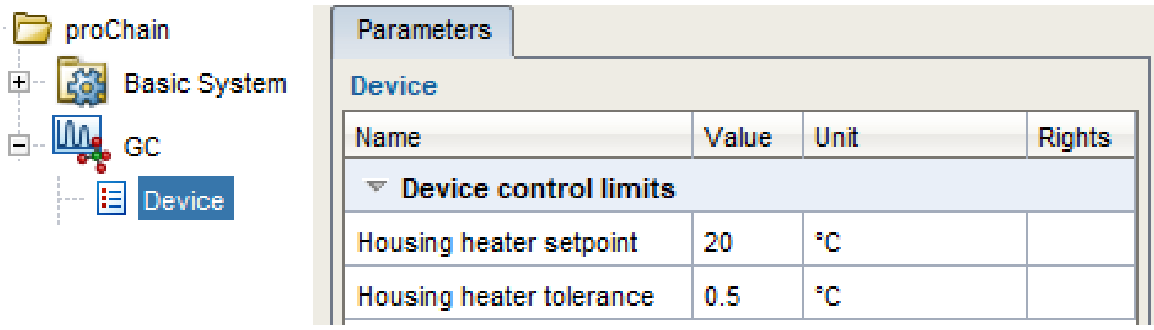


Fig. 3-54: Settings of the housing heating system

PROHIBITION

- Use with settings above 40°C (104°F)

3.4.3 Adjust settings of Last chromatogram report

The sum of all gas components must be 100%. This is achieved by a calculation called normalization. As basis serve the not normalized measured values whose maximum deviation is specified under the node **Last chromatogram report** tab **Parameters**.

If the limits are exceeded or not reached, the result may be incorrect, this is monitored by the parameters on this node.

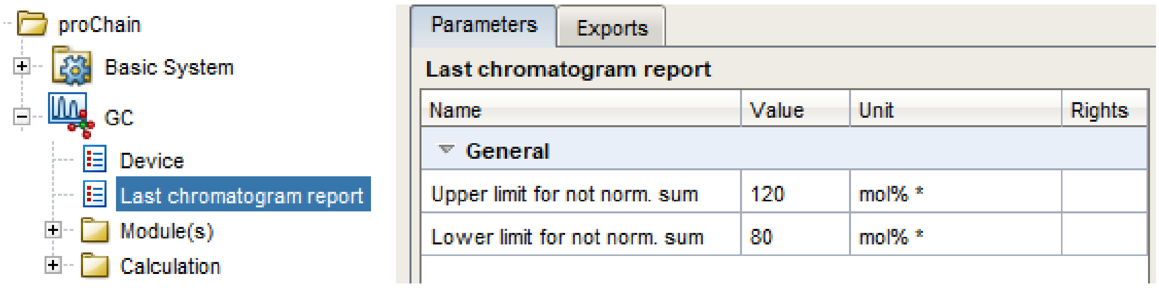


Fig. 3-55: GC AFB – Last chromatogram report sub-node

Exports This values could be monitored under **Last Results** ⇨ 3.7.10 View the last analysis in numerical values (p. 293) more information is given in the online help.

3.4.4 Module(s) overview

The Module(s) node folder contains two groups of parameters **Sequence** and **GCM 1 / GCM2)**. The node **"Sequence"** should be adjusted near the end of commissioning.

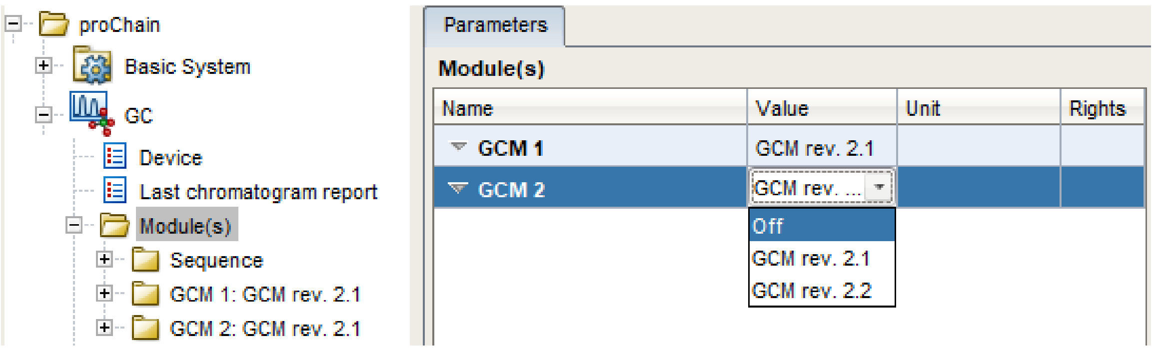


Fig. 3-56: GC AFB – Modules node, sub-nodes and settings

On the right-hand side (parameterization window), you can see and change the settings of the analytical modules GCM(s). As the figure shows you can switch of a module or change it's version. Up to two modules are possible.

The settings has to be made according to the hardware and are usually adjusted by at the factory or during service or commissioning by extra trained personal. No changes may be made here during normal operation.

If two modules are in use the nodes **GCM 1** and **GCM 2** have an identical design. The user generally does not have to make changes in this parameter lists.

3.4.5 Defining and changing sequence settings

This section describes adjustments made by users, if changes must be made to the automatic process after order placement and commissioning. This is carried out in the **“Sequence”** node and its sub-nodes.

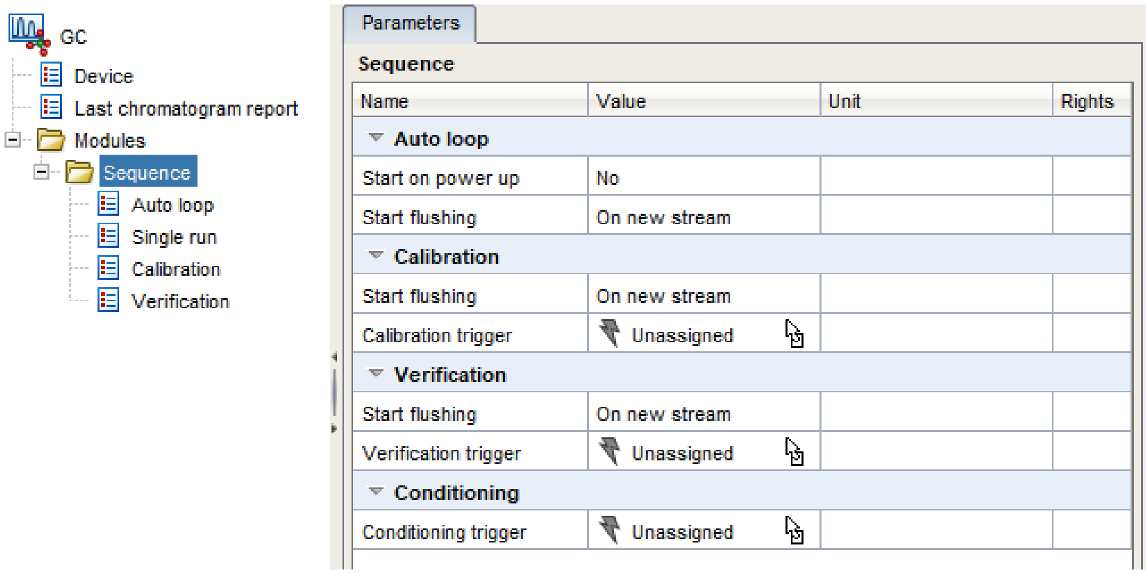


Fig. 3-57: Sequence node

“**Start on power up**” enables you to define what happens after the device is connected to the power supply. “**Yes**” enables the device to start immediately in automation mode, “**No**” means that the device will not start until it is activated by a user.

“**Start flushing**” enables you to flush the device **Before every measurement** or only if you change the stream “**On new stream**”.

The **trigger parameters** under **Calibration**, **Verification**and **Conditioning** starts this functions on an event basis, if the device runs in automation.

A range of options can be selected in the **Value column** using a drop-down menu. There is no entry in the **Unit column**. Instead of using the drop-down menu you can also drag and drop values from the **Export window** directly into the **Value column** of the function.

If you want to start a **Calibration** a **Verification** or **Conditioning** depending on date and time, (**system time**) a corresponding setting in the **Time service SFB** must be done before.

In addition, it is also possible to extend the events with corresponding settings in the **Postprocessing AFB**.

> Changing the time-controlled trigger (interval, day, time) of factory settings e.g. if the measurement is done using two redundant devices. Otherwise both devices perform its calibration at the same time and do not get new measurement results. It may be useful to start an automatic operational calibration at certain events e.g. after a reboot or when an input signal is triggered.

The “**Auto loop**” (below Sequence in parameter tree) essentially decides the automation sequence. It runs in an infinite loop. The user can permanently interrupt this loop manually with the "**Stop**" button see section.

The device can also interrupt the loop on an event basis using one of the triggers above. After the function e.g. calibration has been executed, the loop will be continued at the interrupted step.

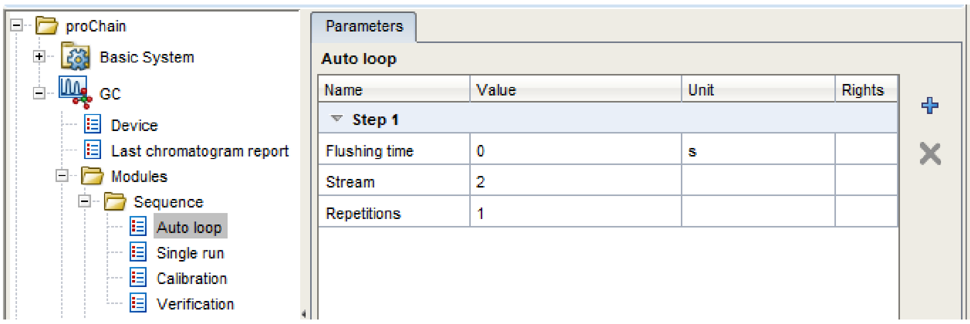


Fig. 3-58: Auto loop

Auto loop must have settings for **each stream** and according with the hardware (real number of streams). The **online help** explains the parameters in detail.

> **Flush time settings** Flushing ensures that the tubing and the Stream selection block are filled with the correct gas (fresh sample). If the device is analyzing one stream continuously, it is recommended to flush 10s before every measurement. After changing the stream, it is recommended to flush 60s.

On the **Single run** parameter tab page, you can define the **stream** on which you wish to conduct a single run after activate the button **Single**. For more details use the **online help**.

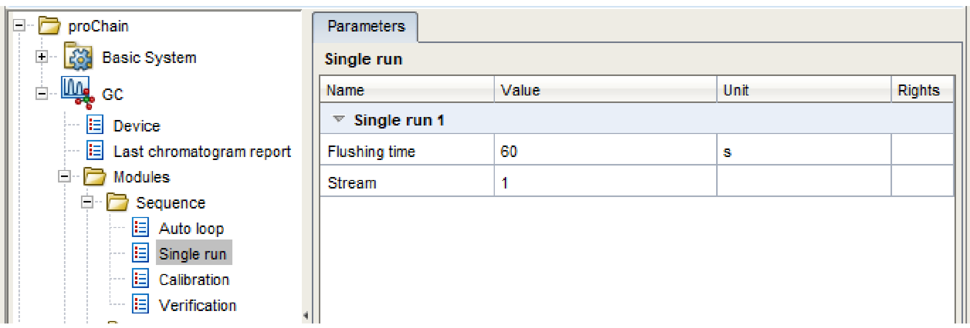


Fig. 3-59: Single run table

The **Calibration tab** contains the steps and type of runs used for calibration purposes at **Calibration stream**. The **online help** explains the parameters in detail.

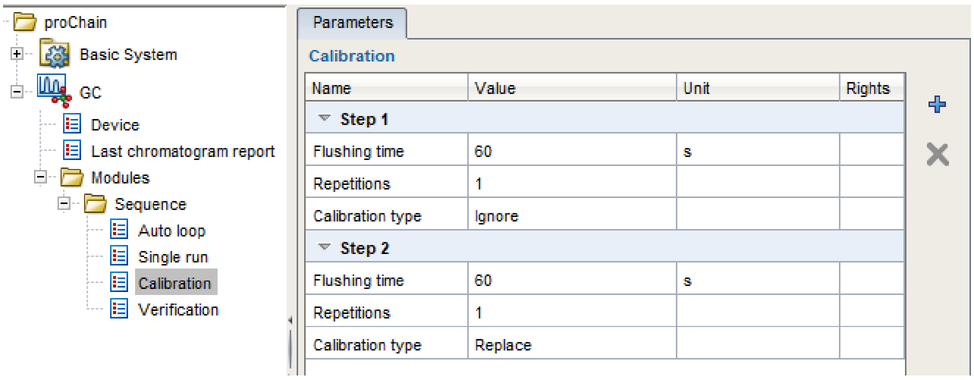


Fig. 3-60: Calibration (cycle)

If the calibration fails, an entry is generated in the log. The table process is repeated on the next planned event. The parameters from the last successful calibration remain in use. If this error occurs frequently and you cannot rectify it, contact Honeywell.

With "**Verification**" the measurement accuracy of the device can be checked. For this control purpose, a test gas with a known composition is measured and the results of the measurement compared to the original analysis.

For each verification gas you must set (**Flushing time**,**Stream** and **Repetitions**. The **online help** explains the parameters in detail. Frequency is depending on the settings under the sequence main node.

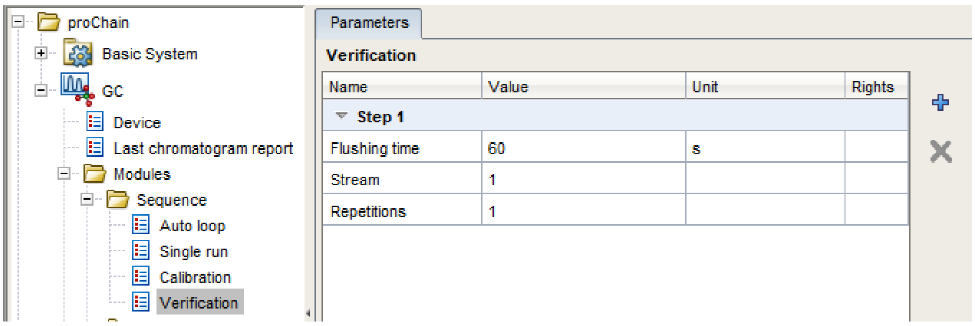


Fig. 3-61: Verification (cycle)

The easiest way to use this function is the use of calibration gas as verification gas. Then the stream could be the calibration gas inlet.

3.4.6 GCM 1/ GCM 2 nodes general (parameter tree)

This section describes settings which are normally completed when the proChain GC is ordered and during its commissioning.

If measurements are incorrect, these settings should be checked again to exclude wrong settings as the cause of the error.

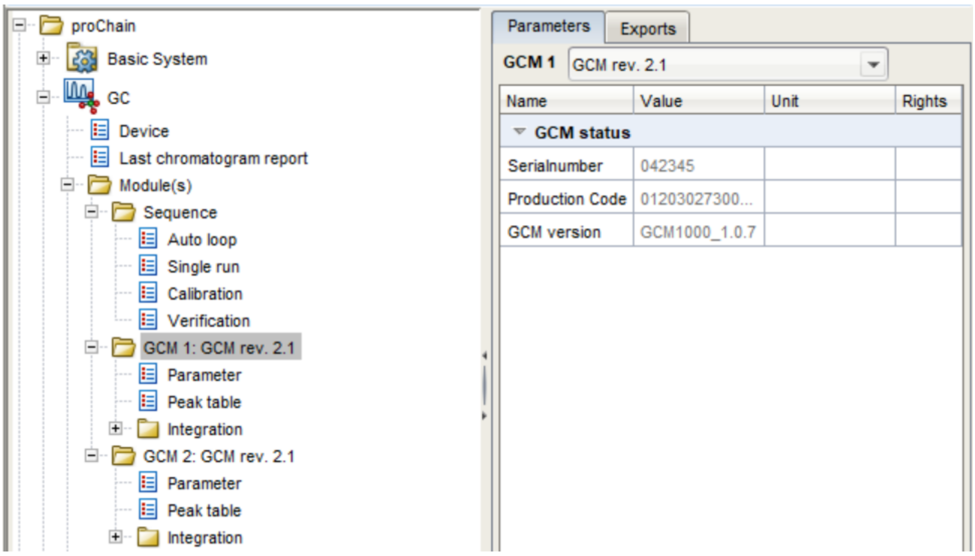


Fig. 3-62: GCM Parameter tree

The figure above shows, the GCM parameter tree. If two modules are used the GCM 1 und GCM 2 folders are identical and bearing the prarmeters for the corresponding analytical module.

On the right-hand side (on the parameterization window), you will find **Serialnumber**, **Production Code** and **GCM version**. This information, filled in automatically can provide indications of possible errors during service work.

In the topmost selection field you have again the possibility to switch of the module or change it's version. The settings must correspond to the real existing hardware. If you switch off a module it will disappear from the parameter tree. For switch on again go to **Modules** node in the parameter tree.

The Export values tab contains information about the module status and the pressure controlers before the GCM.

GCM-Parameter

The figure below shows, the topics of the settings stored under **GCM >Parameter**. The Parameters tab contains system settings such as measuring method, amplification, conditioning, sensor and injector temperature. The number of parameters depends on the version used, more details are given in the online help.

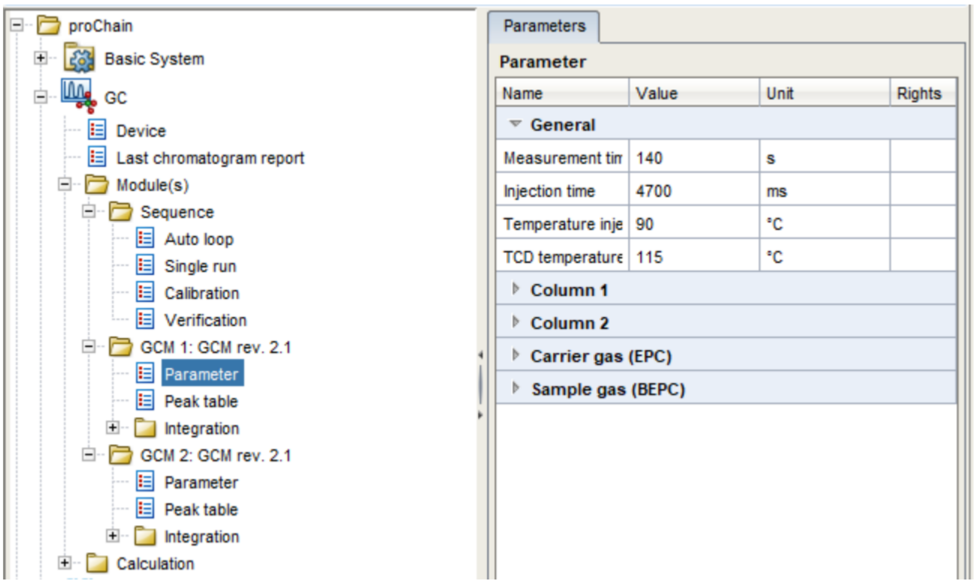


Fig. 3-63: GCM Parameter

Since normally **no changes must be made here**, these items are not described in this document. The instructions required for checking or changing the settings are available from Honeywell, if necessary.

Check EPC / BEPC parametrization

Check the values of the yellow marked parameters as indicated.

Use, for example, the online parameterization ➪ 3.3.2 Online parameterization (p. 208)) to view the parameterization tree analogously to the figure above.

Perform this also for GCM2 if this module is present and inform Honeywell Service if you find any discrepancies.

Parameters

Parameter

Name	Value	Unit	Rights
Carrier gas (EPC)			
Pressure set point	1300	mbar	
Control period	3000	ms	
P coefficient	70		
I coefficient	2		
D coefficient	300		
Min pressure (offset)	0	mbar	
Max pressure (full-scale)	3415	mbar	
Sample gas (BEPC)			
Pressure set point	450	mbar	
Control period	500	ms	
P coefficient	1		
I coefficient	15		
D coefficient	10		

Fig. 3-64: EPC and BEPC parameter

GCM - Peak table settings

The template setting of the parameters in the **Peak table** and the **integration node** are the starting point for each individual optimization. More information about the parameters are given in the **online help**.

Setting up and adjusting the parameters of the **Peak table** should only be performed by trained personnel. **Each Peak** (CH_4 in the example) contains a list of peak parameters, including the name of the component, retention time and tolerances, the system and various coefficients. A change of this parameters (not necessary in normal operation) has influence on the analysis results.

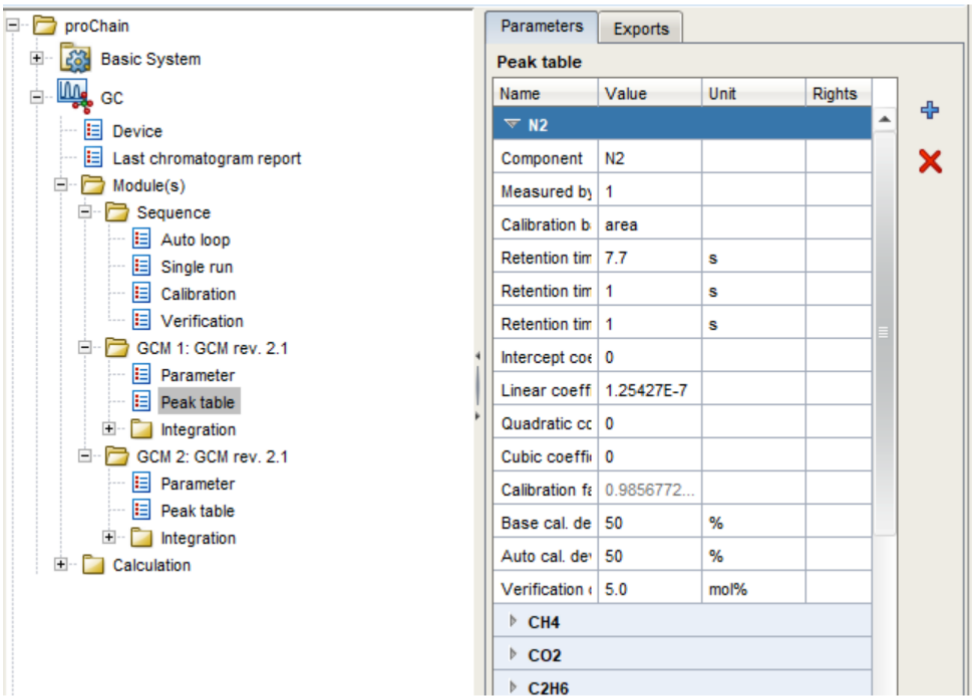


Fig. 3-65: GCM Peak table

GCM-Integration settings

An adjustment of this parameters is not necessary in normal operation. In exceptional cases only, trained personnel should do this.

The "**Integration**" node contains grouped parameters which are used for internal calculations. It is devided in **two Systems**. Each System can be divided into several sections. **Section** is the name of a time piece of the measurement in which these calculations are used for the peaks contained within it.

After changes, the remaining/new sections then must be adjusted. Sections can have a light overlap. But they should not exceed the measurement time.

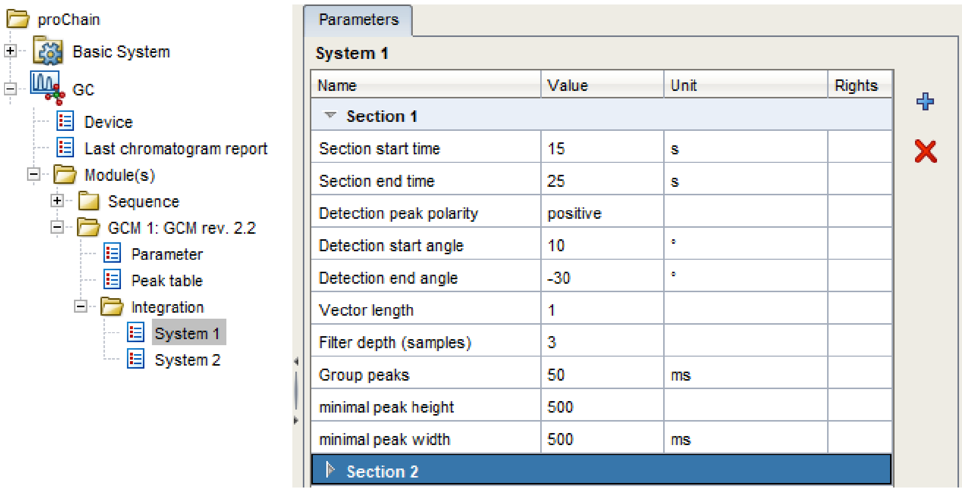


Fig. 3-66: Integration (Sections)

3.4.7 Adjust gas mixtures / limit values and select calculation

The sub-node **Calculation** contains settings for normalization and correction. It allows to include additional components in the final calculation and contains further settings around the calculation behavior.

> All settings should be specified during ordering and commissioning and usually do not need to be changed later. **The online help describes the parameters in detail**.

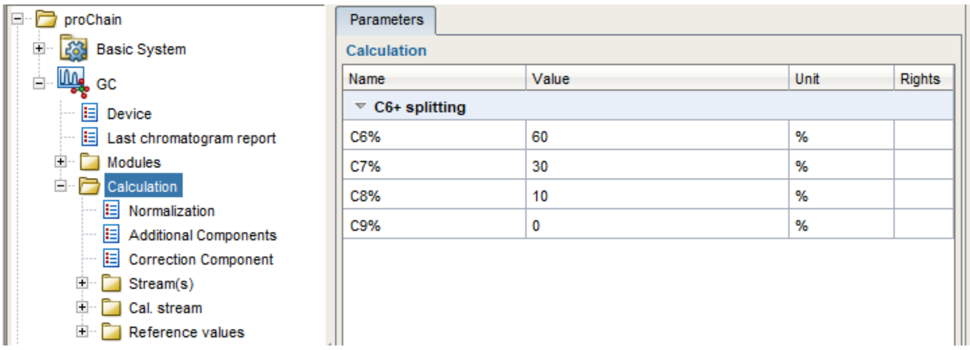


Fig. 3-67: Calculation

C6+ splitting (see figure above) shows how the device is modeling the sum peak of C6+ (splitting the sum peak into higher hydrocarbons) for further calculations.

Normalization is used to correct the sum of all component measurement results to 100%. Different procedures can be set, and several options can be selected. **Standard normalization** affects the value of all components to achieve a result of 100%. **Balance normalization** only corrects one component, which can be choose in a separate drop down menue.

Bridge allows you to select a Bridge component if some gas components are measured on both modules. Then both modules will aligned to each other and will have the same sensitivity level. See the following figure.

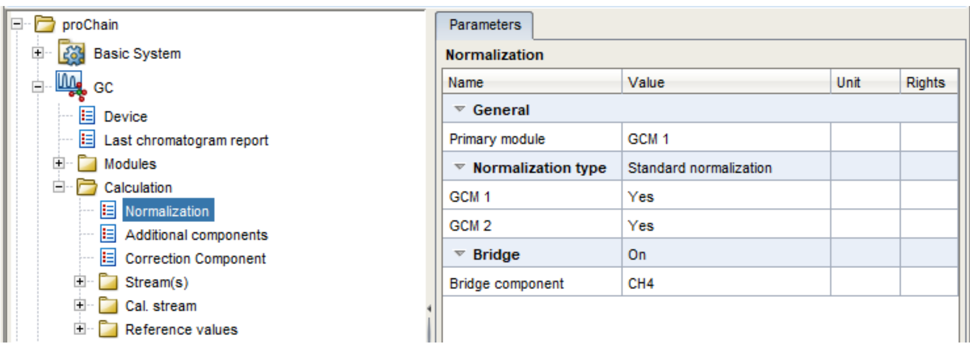


Fig. 3-68: Normalization

“Additional Components” allow gas components with known concentration to be included in the final result that have not been measured by the proChain GC. It also could be used to overwrite measured components with this specification. See following example:

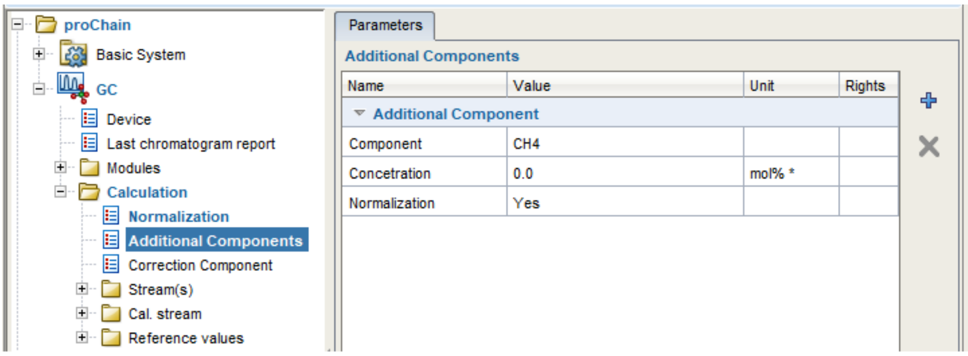


Fig. 3-69: Additional Components

“Correction Component” can be used to correct peak results that include foreign components. A Result Component is built from the Original Component (including the foreign component) minus the foreign component which is the Correction Component. In the further calculation the result component and correction component will replace the original component. With the Correction factor this result can be additional adjusted. See following example:

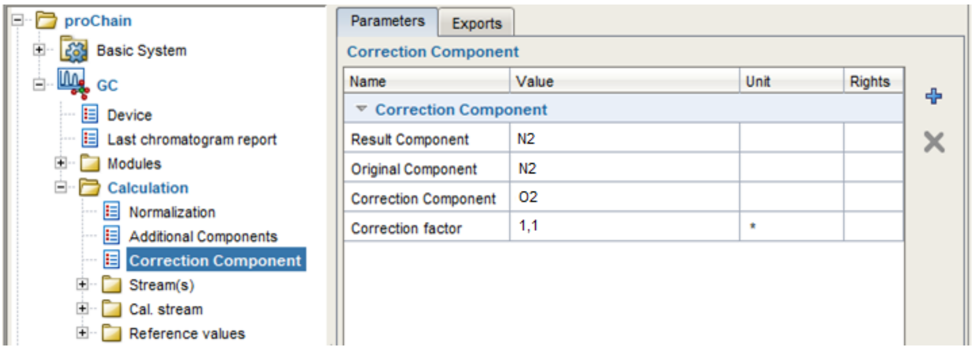


Fig. 3-70: Correction Component

The node **Stream(s)** allows the parameterization to be adapted to the existing streams in the device. This should already have been done during commissioning. Every listed stream produces a new node in the parameter tree.

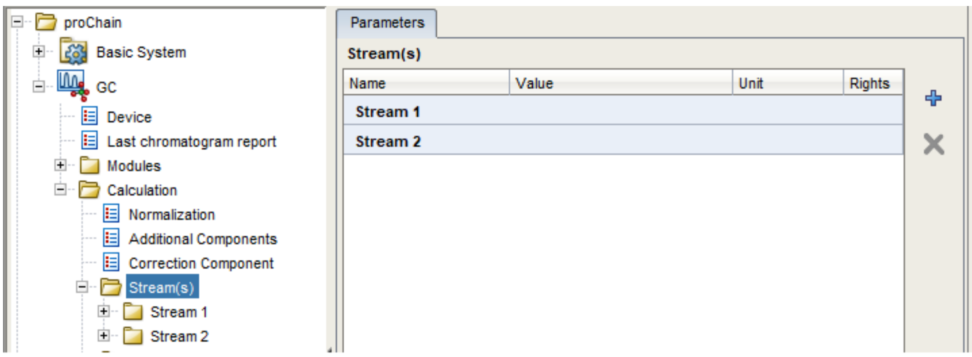


Fig. 3-71: Calculation Stream(s)

In addition to the measurement accuracy of the device, the result of the analysis is heavily dependent on the **calculation standard** used. Up to two standards can be used simultaneously for each stream (standard A is always active). If you set **Calculation standard B** to **On** (dropdown in the Value column, see below), a new table (identical to standard A) appears in the parameter tree.

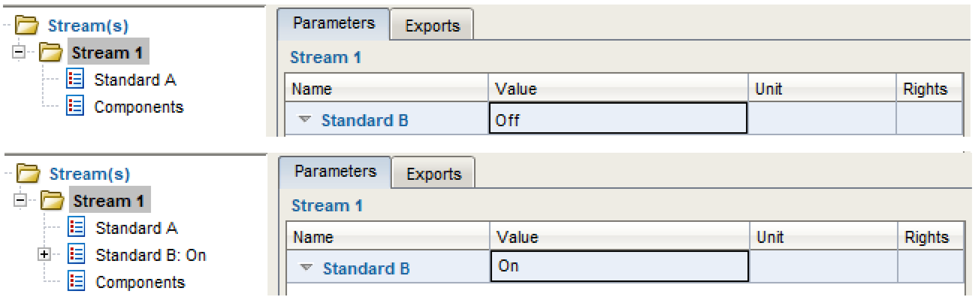


Fig. 3-72: Calculation stream standard B Off and On

You can choose between five calculation standards to ensure that the device complies with local requirements. You can adjust the calculation standard or standards individually for each generated stream and the calibration stream, see next example.

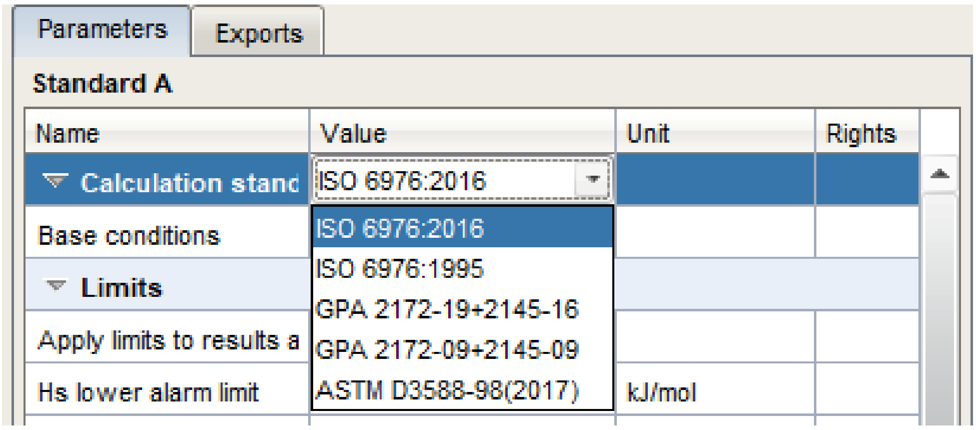


Fig. 3-73: Example selection of calculation standard

As shown in the figure above, you can change the standard by a dropdown menu in column Value. After it has been selected, the **Base conditions** of the standard can be viewed and if necessary, also adjusted by a dropdown menu in this cell of the coulumn.

Use the parameters below **Limits** to define the alarm limits for the corresponding values. If these values are exceeded or not reached, the device issues an error message.

Please check the default settings. Further information on the individual parameters can be found in the online help.

> **Adjust the entries on and select the unit required for your application only by agreement with the system operator or after consulting Honeywell. Ensure that all physically identical values also have the same units.**

You use the **Components tab** to define the **limits for each expected gas component**. These components must be generated. If they don't exist use the **+ symbol** on the right-hand edge. Then the limits can be set. See example in next figure.

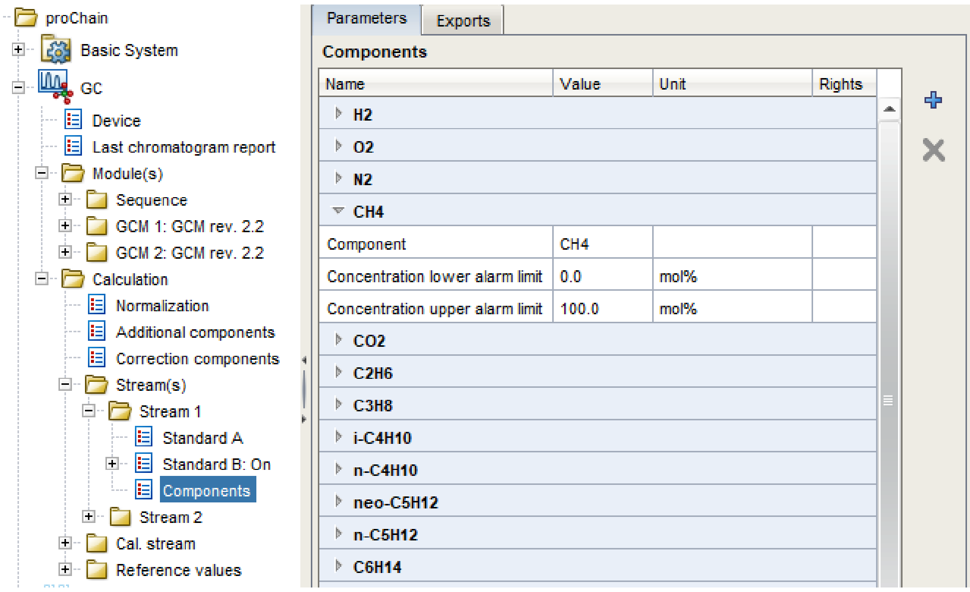


Fig. 3-74: Stream components limits

Like in the examples above you must adjust all existing streams. In normal cases this was already done during factory setup and commissioning. Further details in the online help.

The device, it checked and corrected by an automatic calibration system, therefore the **Cal.stream** (stream 6) is the permanent connection with a calibration gas. Requirement for calibration gas (P1-11K), see ➪ 4.1.3 Technical range of suitable gases (p. 308) . In addition with the calibration at the factory before delivery this ensures the measurement correctness.

Also the components of the gas used must be entered precisely as shown in the manufacturer's certificate of analysis. These **Reverence values** must be adjusted during the commissioning procedure and after changing the cylinder. Go to the following place of parameter tree for this purpose.

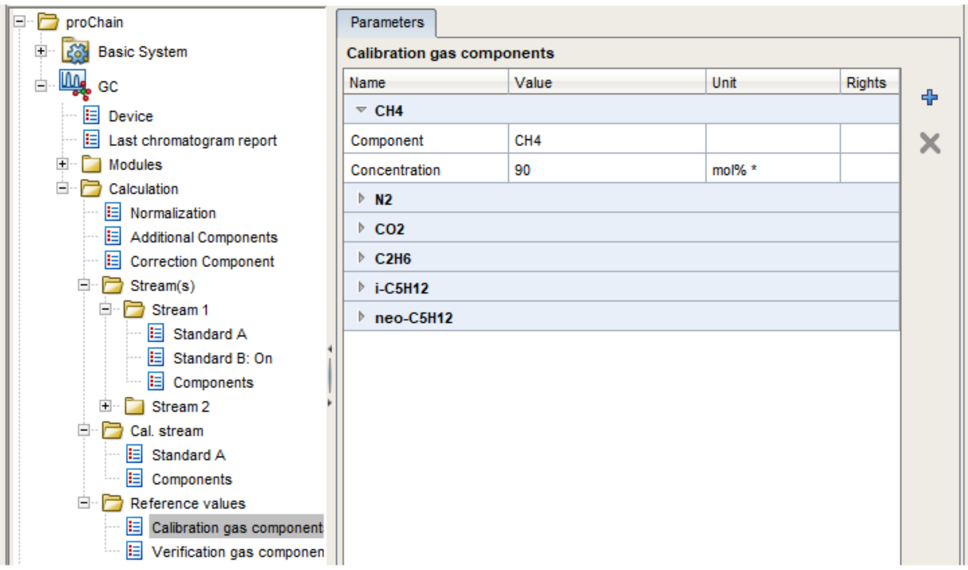


Fig. 3-75: Reference values (Calibration / Verification gas properties)

In the tables, **Calibration gas components** and **Verification gas components** you first create the components of the corresponding gas with **+ symbol** on the right-hand edge. Create an entry for all components specified in the manufacturer certificate of analysis.

> **The parameter Component contains the name of the gas component and is selectable by a dropdown list, which opens after a click into the column Value.**

Then open each entry with a click on the arrow and enter the concentration of the component according to the analysis certificate as shown in the example.

If calibration gas or verification gas is changed use the **X** to remove not used components from the list. Further information can be found in the **online help**.

3.5 Using enSuite functions and other AFBs

In normal operation, the device will operate autonomously. Nevertheless, there are situations which require contact to be established with the device. This may be the case, for example, if you wish to view or check the results live or export and archive data from the device memory before they are overwritten. The use of other AFBs is also a reason to get in contact with the device.

3.5.1 Working with archives and logs

Individual archives can be created via the parameterization in the AFB User archive. Further information see ⇨ enSuite online help **(p. 145)**

Three archives, used as logs, are always available, "**Audit trail (system)**", "**Audit trail (fiscal)**" and "**Logbook**". Whenever changes occur or events come and go, this information is written into one of them and stored as a history. The archives takes the form of a ring buffer with 1000 data records.

- The header contains a timestamp with the precise calendar time at which the entry was generated and an ascending ordinal (sequence) number for the log entry.
- The text body contains the text with information about the reason the entry was generated. This text depends on the cause and the settings in enSuite. It starts with the name of the SFB/AFB which caused the entry.

The Logbook

documents / saves events and protocol the device operation in this way. All the relevant data, like logins, logouts and password changes, new set of parameters, can be viewed in these archives. The archive content remains available in the event of a power failure or software update. When the logbook is full, the next entry will overwrite the oldest data record. The user cannot delete the entries.

The Audit trail

This protocol archive is part of the basic system and exists in all enCore device types. All the data in the audit trail is also saved in the log which means that the entire recorded history is visible in the latter. A distinction is made between "System /General" and "Fiscal". The Fiscal audit trail is primarily relevant for billing purposes. The terms "**official**", "**fiscal**" and "**legal metrology**" are used synonymously.

In the General section, the oldest entry will be overwritten.

The fiscal audit trail is only filled if the SSW is closed and an approval file is used which provides for the filling. After 1000 entries, no changes can be made to the legally relevant parameters unless the security switch (SSW) is open.

The archives can only be cleared / deleted if the user has the appropriate rights and the SSW is open.

The data can be read out, viewed, saved, backed up and exported using enSuite.

> **NOTICE**
>
> **Data will be overwritten**
>
> The operator must read the data and save it to external data media at suitable intervals. Only if this is done it will be possible to access the information in the logbooks if the data have been deleted or overwritten on the device. The archive can only be cleared / deleted if the user has the appropriate rights and the SSW is open.

Readout archives in enSuite

Prerequisite(s)

- A data connection to the device exists.

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

⇨ enCore manual Configuring the Device with enSuite

Archives after reading out

The archive will be saved in the path Devices – <Serial number/Name> – Archives or Archive reading cycles. See example:

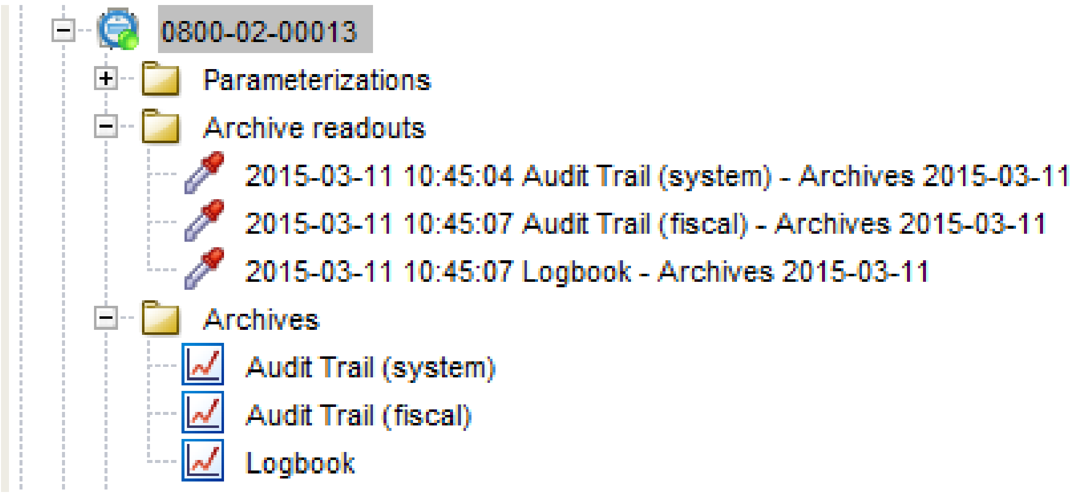


Fig. 3-76: Archives after reading out

Each time enSuite reads data, a reading cycle is generated – displaying exactly what was read – sorted by ordinal number. Then ⇨ Disconnecting the device (p. 150) if needed and view the data in a table.

To do this, select the archive, for example **Logbook**, and click on **Display archive** in the bottom section of the navigation window.

The archive window appears and shows the content of the selected archive in tabular and, possibly, graphic form. The ordinal number and the archive time are displayed on the left. The archived data is shown in the remainder of the line.

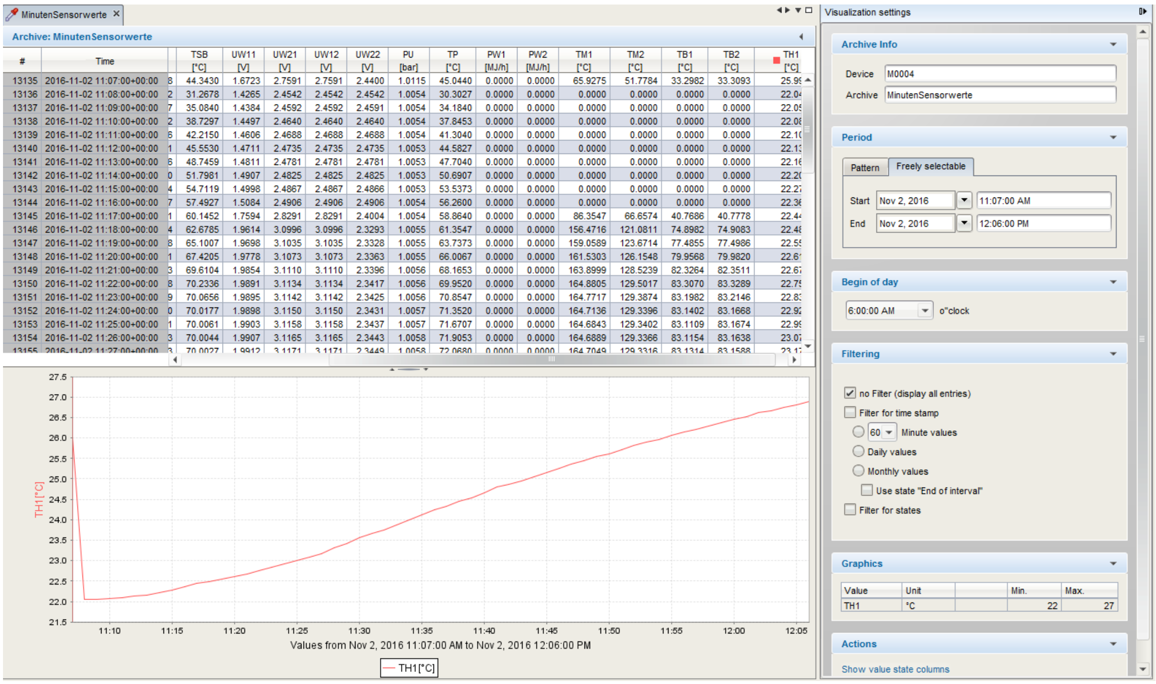


Fig. 3-77: enSuite Archive Window)

Use the “**scroll bar**” (if displayed) to view more archive entries. Depending on the type of data, a visualization window may also appear under the table. You can view selected data in graphic form in this window. The selection is made in the context menu by clicking on the header.

There is a clear link between the date and ordinal number; each entry has a time stamp.

Some events are abbreviated by letters and numbers.The letters stand for:
W = Warning A = Alarm H = Note

The numbers stand for:
0 = Message not present 1 = Message present 2 = Signal changed

#	Time	Data
17	2019-06-10 08:56:20+03:00	Q2.HSV.Substitute values used, W, 0
18	2019-06-10 09:12:10+03:00	Q2.General events.Service calibration, H, 1
19	2019-06-10 09:47:03+03:00	Q2.General events.Service calibration, H, 0
20	2019-06-10 10:13:48+03:00	Q2.General events.Operational calibration, H, 1
21	2019-06-10 10:22:29+03:00	Q2.General events.Calibration successful, H, 2
22	2019-06-10 10:23:32+03:00	Q2.General events.Operational calibration, H, 0
23	2019-06-10 10:40:55+03:00	Q2.General events.Verification, H, 1
24	2019-06-10 11:30:11+03:00	Q2.General events.Operational calibration, H, 1
25	2019-06-10 11:30:11+03:00	Q2.General events.Verification, H, 0
26	2019-06-10 11:30:16+03:00	Q2.Error events.Calibration gas pressure alert, A, 1

Fig. 3-78: Example Abbreviations

In the example (see marking) GasLab Q2 signals a successful calibration.

A window with settings for the visualization appears on the right-hand side. You can filter the display here and decide how the archive channels should be displayed. Once again, you can use the optional displayed **scroll bar"** to view all the options.

Using the same process as for parameterization, you can also export selected files using the symbols or the export function in the context menu to make yourself independent of your current enSuite installation.

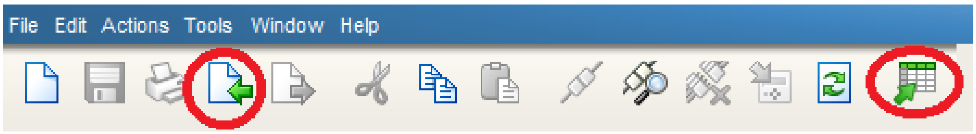


Fig. 3-79: enSuite export functions

> Further information on "**General audit trail** " and "**fiscal audit trail**" is available in the online help. Open the parameterization branch **<System>** . Press **[F1]** on the Parameters tab in **Parameters Audit trail** area.

3.5.2 Creating reports using enSuite

In addition to displaying the analysis results, the Postprocessing AFB and the User archives AFB can also be used to compile reports which can then be displayed, saved or transferred in the normal way on the device. enSuite once again provides users with a great deal of scope for designing the report to meet their requirements.

For example, an integration report which contains detailed information about the component analysis, for example shape, location, calculation and name of the various peaks, is conceivable. Details such as retention times can also be included in these reports. Since the scope depends on the application, the number of components and entries in the report can be adjusted accordingly.

Another example report, as used by many users, is an application report with the complete analysis data, the calculated data and stream information.

3.5.3 Displaying and reading analysis results

The analysis results can be displayed and read in different ways.

The Modbus AFB can be used to export and process the data. You can also use the User archives AFB to save the results in the device. These data can be read out and viewed or saved later to a PC.

The enSuite function “**Live data and trending**” can be used to analyze individual results in more detail and display them in graphic form.

Another way of displaying and reading the results is to use the enSuite functions in “**Chromatograph**”, see ⇨ 3.7 Device operation (Chomatograph actions) (p. 282) and ⇨ 3.8 Handling with chromatograms (p. 295). In addition to graphic displays, number values are also displayed in this case.

3.5.4 Working with the Modbus AFB

The Modbus AFB allows the Modbus parameters to be configured. It is used if TCP/IP has not been configured for data transfer or data exchange. The settings can be freely selected within wide ranges.

This enables you to adjust the device perfectly to the environment of your measuring equipment using standard parameter sets or to use the device as a replacement without changing the existing structure.

> **NOTICE**
>
> **Consider country-specific regulations!**
>
> Please note that Modbus communication is not encrypted. This does not prevent an attacker from intercepting or modifying the communication. Consider the country-specific regulations. These may require manual verification of the data.

> **The Modbus AFB has its own operating instructions which can be downloaded from the Docuthek www.docuthek.com**

Please note that Modbus mainly transmits numbers. For example, the operating mode and the operating step of the device are indicated as export values, by (Modbus numbers), since the plain text is not output here.

3.6 The Remote operation panel actions

The so-called remote operation panel refers to a function that enables the remote control of enCore devices with your service computer. The remote access can be done via Ethernet or USB connection.

Because the remote operation panel behaves like a real display on most enCore devices, opening, closing, or connecting / disconnecting the instrument does not change the login status.

3.6.1 Activate / deactivate remote operation panel

As soon as you are connected to a device (see ➪ Connect enCore device to Service PC (p. 147)), the entries in the lower left corner of the enSuite interface are activated. If you select the entry "**Remote operation panel**" there, a graphical control panel appears in the middle of the enSuite interface.

By mouse clicks operation is possible.

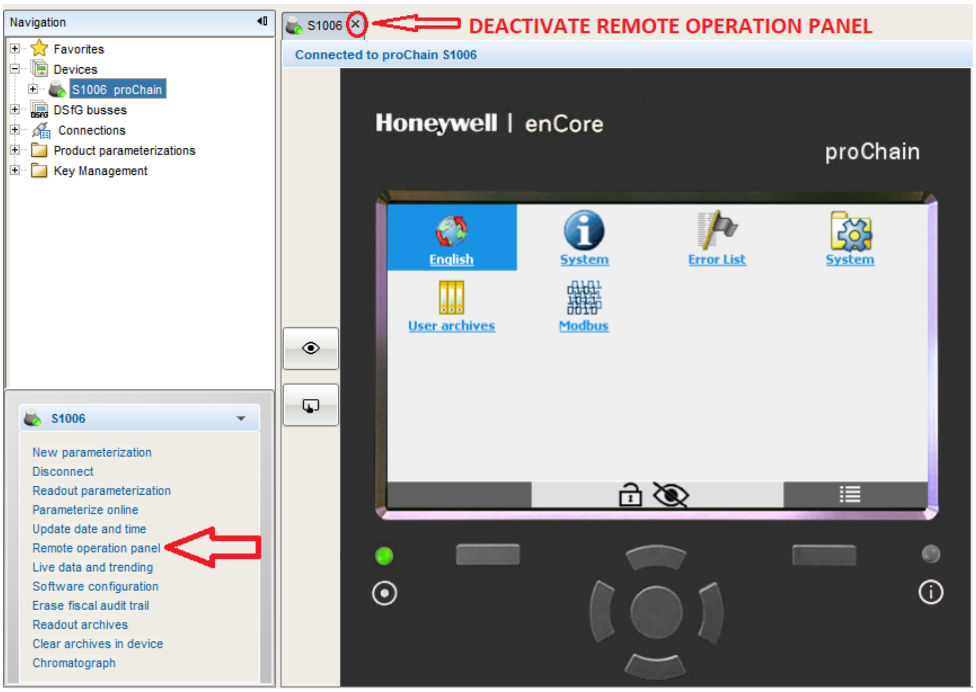


Fig. 3-80: View of the remote operation panel via enSuite

> **Tip:** Detach the window from the enSuite frame see ➪ **Starting enSuite (p. 143)** and have the remote operation panel displayed enlarged, which makes it easier to use.

Deactivating the pannel function

by closing the window with the **X** in the first line (shown in the figure above), by disconnecting the device ➪ Disconnecting the device (p. 150) or automatically after a few minutes without activity.

> If a user uses the remote operation panel, it cannot be opened by another user. If the remote operation panel is closed, it can be used in another enSuite connection.

Two toggle buttons **[Grant/Revoke local view]** and **[Grant/Revoke local control]** for changing the local conditions during remote access are displayed to the left of the figure. As the proChain does not have an operation panel, these buttons are not relevant and can remain in the default setting.

3.6.2 Different types of device displays

Main display is the name of the first display of an application or a functionality of the basic system; it shows the most important results of this functionality. Depending on the application or functionality, further information is displayed in subordinate device displays.

The **basic display** is displayed immediately after the device is started. If no operation is performed during a preset time, the device switches back to the **basic display** automatically. For some device types, it is parameterizable which display is used as basic display.
➪ 3 Software (Device operation with enSuite) (p. 141)

Home is a special display and shows the software structure of the device. In enSuite you add further entries to the home display .

Single software modules, which shall be easily accessible (e. g. error list or language setting), are represented with small symbols in this display. The symbols are labelled with the name of the corresponding functionality. A user-defined name, if parameterized, is possible– otherwise the default name is displayed..

Examples and structure of displays

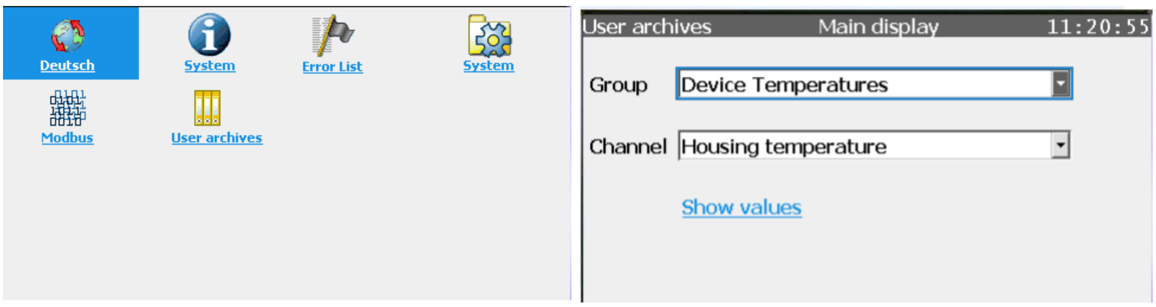


Fig. 3-81: Display **Home** and **Main** display

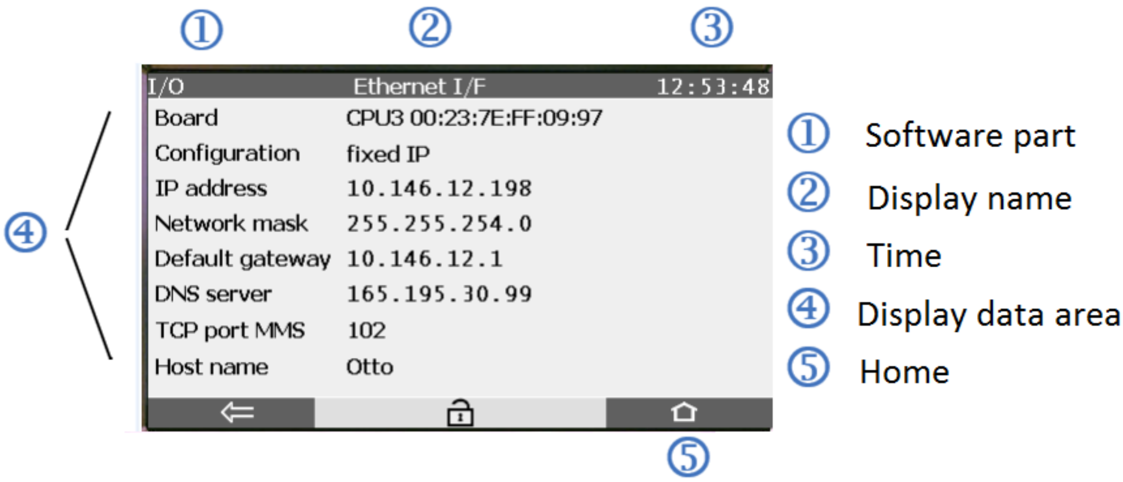


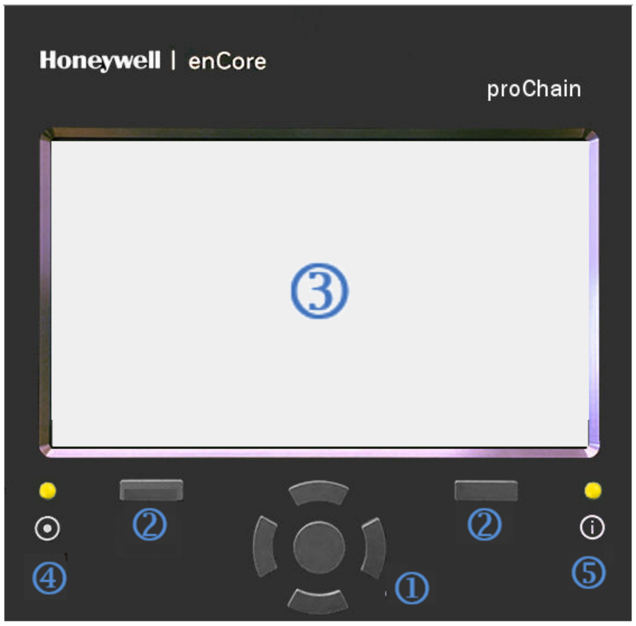
Fig. 3-82: Structure of a display

3.6.3 The operation panel and the navigation keys

proChain GC exception

Actions that are normally made by local touching the screen of enCore devices or the keys below can't be done, because there is no local operation panel on the proChain GC, only a virtual remote operation panel exist. But the handling is essentially the same as used in most of other enCore devices.

Operation panels generally used to display the measurements and to control the various operating modes, Since the proChain GC outputs its results via the chromatogram functions, the operation panel is only used for setting and checking the basic device functions, e.g. time, battery and software status. Result influencing (official) parameters cannot be changed. The configuration and analysis software enSuite with its extended functions is designed for this purpose.

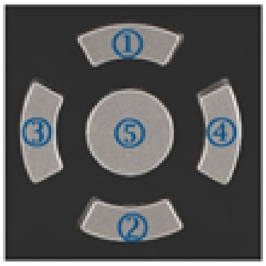


① Navigation keys
② Function keys
③ Display area
④ Power-LED
⑤ Status-LED

Fig. 3-83: Overview of the remote operation panel

The figure above provide an initial overview of the structure and the element of the remote operation panel. There are two function keys(2) below the display (screen area (3)). Clicking on one of these keys activates the function of the display button shown on the display above it. Alternative you can click directly in the screen area without using the keys.

The displayed navigation keys(1) (Up, Down, Left, Right, Enter, see next figure) are designed for navigating in the menus and displays. They are alternative and supplementary controls to clicking with the mouse in the screen area.



① Up
② Down
③ Left
④ Right
⑤ Enter

Fig. 3-84: Navigation keys and Enter

> **The remote operation panel is provided by enSuite.**
> **Navigation details are described later in this document.**

3.6.4 Navigation options

In general

Two buttons are displayed at the bottom of the touch screen. Depending on the context, you can use the symbols and or and , as well as or .

Function of the buttons	
	switches directly to the home display.
	switches directly to the basic display.
	switches back to the calling display, i. e. the display that was previously opened.
	accept user action
	discard user action

The basic display can always be reached with a maximum of two steps – either by pressing and successively, or by pressing , if this button is displayed directly.

If the buttons are marked with the check marks or , the device is waiting for a confirmation by the user. (e. g. previously using the Keypad).

Navigation options in the “Home” display

You open a folder by selecting and confrim its symbol in the display. After having activated the symbol of an application or any other selected functionality, the corresponding **main display** is shown or the function is exicuted.

Navigation options in other displays

Most device displays show measurement results, status information or settings.

When operating an enCore device, hyperlinks and actions are distinguished:

- Use **hyperlinks** to navigate through the device's displays
- Use **actions** to perform a specific functionality.

Both hyperlinks and actions are presented in the display with a **blue** font color and underlined. If the text is not underlined, the item cannot be selected.

Further items which can be selected on the display are drop-down lists and input boxes.

- A **drop-down list** can be identified by the triangle on the small grey box next to the value with everything being framed in blue when selected.
- Input boxes show their values in white boxes. When a value has been selected, it will be displayed with a blue background and there will be a blue border around the box.

You can select this the entries using the navigation keys or by clicking on them . To confirm or execute the selection with a blue background e.g. "Serial number" , you must click on Enter in the navigation keypad. Alternatively, you can click direct on the required item which is then executed immediately.

If a display contains more rows than can be displayed at once, a scroll bar is displayed. A small yellow diamond on the right-hand edge indicates your position in the content. Use the Up and Down keys to scroll.

The **Up and Down keys** enable also you to jump to the next selectable item, even if it is not in the visible section of the display.

3.6.5 The middle of the bottom status line

Additional information icons are displayed contextually in the middle of the bottom row. It is possible that not all or none are displayed.

Fig. 3-85: Possible icons in the middle of the status line of displays

For **fiscal measurements**, settings relevant for approval must be protected. For this purpose, conductor connections must be made inside the device via the security switch (SSW). If these are missing, this symbol (open padlock) is displayed, which then appears in every display. In **non-fiscal operation**, the connections can remain open. Since the housing must be opened to operate the security switch (SSW), special rules apply, see ⇨ The hardware parameter guard (SSW) (p. 94). You can also have a seal affixed to the switch its selve to verify unauthorized access. Contact Honeywell if necessary.

If the symbol is shown, somebody has logged in and is working with the device. Normally you are the logged in user, if not you should not carry out any further activities, so as not to disturb the work of the user who is logged in. If several people access the device, mutual agreement is always required.

These symbols provide information about the visualization settings and input conditions on device displays or the remote operation panel. Since the prochain GC does not have an enCore display, these symbols have no function here.

3.6.6 Entries and changes using the operation panel

Changes on the device are always made in the following steps:
- Log into the device
- Complete and confirm the changes on the device
- Log out of the device

Use the **Users main display** to log in, confirm and log out ⇨ System display Users (login, logout, password) (p. 262). The procedure for changing parameters is also described there.

Values which can be changed are displayed in white boxes. These are editable boxes. These editable boxes appear depending on the login status and user rights. Changes are not finally entered and saved to the device until the user has explicitly confirmed them. If the user has logged out beforehand or is logged out due to another event without confirming the changes, any changes that have been made will be discarded. Entries and changes can be made either using a drop-down list or the displayed keypad.

Changes using a drop-down list are shown in the following example.

A drop-down list can be identified by the small gray box with a triangle next to the value to be changed, in this example after month and day. The view will change when you click on it, in the example the year.

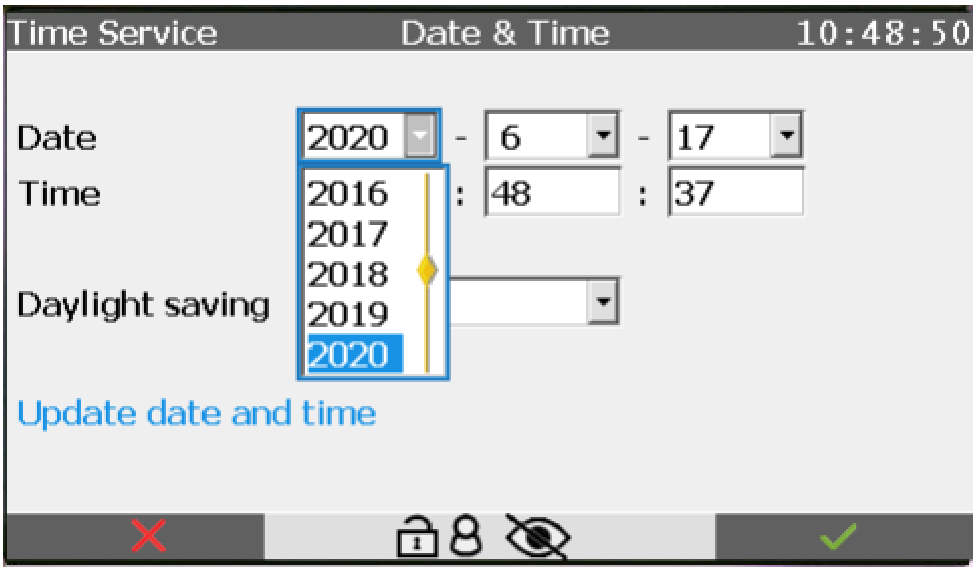


Fig. 3-86: Drop-down list open

The drop-down list is opened and displays the available values. The navigation keys enable you to select a value from the drop-down box. Your selection then has a blue background (in the example 2020).

After this user action, confirmation ✅ or discarding ❎ of the selection is requested, therefore the buttons at the bottom of the display area are marked with corresponding icons. See the figure above.

If you have confirmed the selection, you also must execute your change.

In the above example, this is the action Update date and time. which is then underlined.

Changes using a displayed keypad for entering letters and numbers.

You can identify an entry box by its white background. When the box has been selected, it will have a blue border and the content (if there is any) will have a blue background. In the following examples, the entry boxes for Password and Time can be seen. The view will change after you click on a box as shown below and the keypad will be displayed.

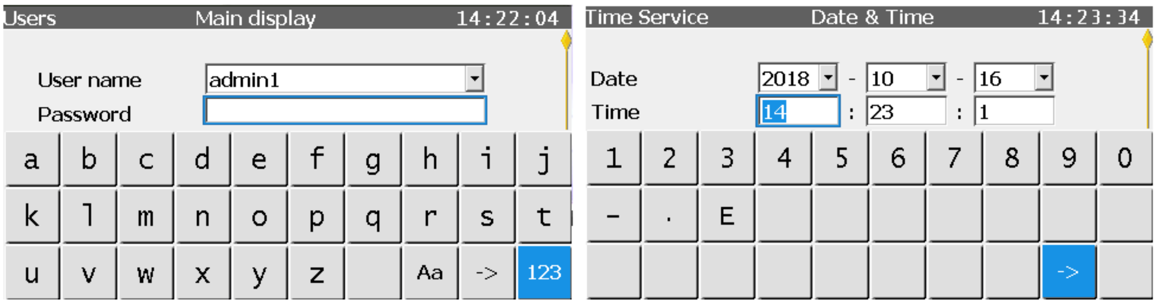


Fig. 3-87: Keypad displayed

Depending on the expected entry, a keypad which can be switched between letters and numbers (on the left in the example) or just a number pad (on the right in the example) will be displayed. You can switch between upper- and lower-case letters using the “Aa” key. You can switch between letters and numbers using the “123” or “ABC” key. If a special symbol must be entered, the “Aa” key will also appear on the number pad. When this is pressed, the special characters will be displayed and can be selected.

To select a key (button) in the box click on it or use the navigation keys. Your selection then has a blue background. The keypad will remain open and you can select and add another value in the box.

If all the values are already filled in, you can close the keypad using and keep all the entries in the box.

You can discard the entries using . The keypad will also close. When you leave entry mode, a consistency check is made to find whether a value has been entered which in this context is nonsensical or not allowed. If this is the case, the value is not saved and the previous one is retained or replaced by a substitute value.

If only individual characters are to be replaced, it is possible to jump to the end of the existing entry using the -> key and then supplement the entry.

At the same time, the key changes and shows the following symbol <- which allows individual characters to be deleted starting from the right.

If the entry requires a restart, this is indicated in the display with a link. The restart is then carried out immediately after you click on the link. If you log out without completing the restart, the changes will not be saved. An example of this is changing the IP address.

3.6.7 LEDs on the operation panel

Two multicolor LEDs are simulated under the actual screen. On the left the power LED and on the right the status LED. Their color and behavior (steady light or flashing light) indicate whether the measuring device is working properly or whether there is or was a malfunction.

If there is no supply voltage, the diodes are OFF. If the device is supplied with voltage, the power LED switches permanently to green. In the start-up phase and after the supply voltage has been restored, the status LED flashes green. If there are no entries in the fault list, it switches to green continuous light. A red or yellow status LED indicates that there are pending or unacknowledged faults. (The LED status is retained even after a re-start and is displayed again). The status LED indicates the fault status as follows (in order of priority):

Status LED	Explanation
Red flashing	The error list contains at least one pending alarm which has not been accepted.
Yellow flashing	The error list contains at least one pending warning which has not been accepted.
Red, permanently on	The error list contains at least one alarm which has already ended but has not yet been accepted.
Yellow, permanently on	The error list contains at least one warning which has already ended but has not yet been accepted.

3.6.8 The remote operation panel (displays and actions)

In contrast to other enCore devices, the proChain GC uses the operation panel displays mainly for status purposes. The measurement results are output via other enSuite functions and via chromatograms (see sections ⇨ 3.5 Using enSuite functions and other AFBs (p. 227) or ⇨ 3.7.10 View the last analysis in numerical values (p. 293)and ⇨ 3.8 Handling with chromatograms (p. 295)).

You can get to any display using the navigation methods explained in the previous section. In addition, device dialogs and confirmation prompts guide you through the displays. Progress displays provide information about the success and progress of actions.

> **The current time is shown in the top right-hand corner of most device displays.**

Changing display is generally done using a special display known as "**Home**". This is the main node for the device. This display is explained first of all as it provides a better understanding and a good overview. Starting from the "Home" display, various other displays are then presented and the details described.

Home display (overview)

“Home” is a special display that can show the structure of the device software. Individual software parts and selected other functions that should be easily accessible (e.g. switching the language) are displayed here in the form of small icons. These are marked with the name of the respective function.

> After start-up or power-up, the “Home” display can be accessed by using .

The number of displayed icons, which in turn may contain further branches, depends on the version used and the parameterization. The menu structure is like a tree, in other words, a subordinate menu option of a module may, in turn, include subordinate menu options and branch off to the side. The following figure shows an example of this main node.

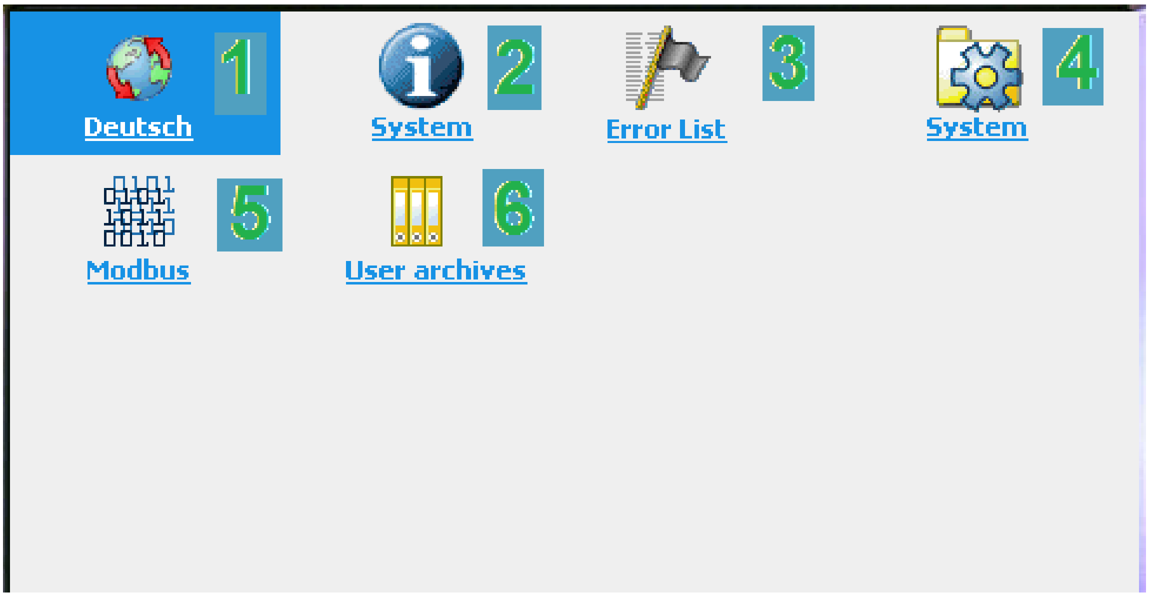


Fig. 3-88: "Home" display node (example)

If you have the required rights, you can change and supplement this display.

➪ Define basic display and edit display behavior (p. 175)

The following describes only the contents of the **“Home”** display that are usual on delivery.

Home display (Navigation options)

Selecting a symbol (clicking on it or using the navigation keys and Enter) in the Home display will open it to display the functions grouped in this folder. If only one function is assigned to this symbol, selecting it will immediately take you to the main display of this function.

The "Globe"enables you to change the language to the language stated below the symbol.

The displays behind "Info" provide an overview of "Serial number", "TLS-Certificate", "Device monitor", "Software status", "Display test" and "License info". The state of the security switch is also specified.

The "Error List – Main display" contains a complete list of all active errors and those which are no longer active (but have not been accepted).

The gear wheel symbol opens the System display, another node to the displays for the time service, user management, logbooks and I/O functions.

The "User archives" display enables you to select various archives and view them.

The "Modbus" display enables you to select various tabs and view them.

Home display (device language change)

Up to two languages are optional possible. English is always the second language. The devices will always start in the first language. Please notify Honeywell if you wish to change the first language installed in the device.

If English is selected as the first language, the device can only be operated in English.

The design of displays and menus, for example, date and time format, depends on the current parameter set and language.

If the language is changed, all the data in the device will be renamed or reformatted and displayed in the current language.

Carry out the following procedure to change the language:

In the "Home" display select the "Globe". The alternative language is shown below the symbol. Confirm your selection. The language has changed. The text beneath the "Globe" shows the previous language as the new alternative.

Home display showing start-up or system errors

What does the prohibitive sign mean after system start?

In very rare cases, it may happen that the device shows a prohibitive sign in the home display after parameterization and restart:

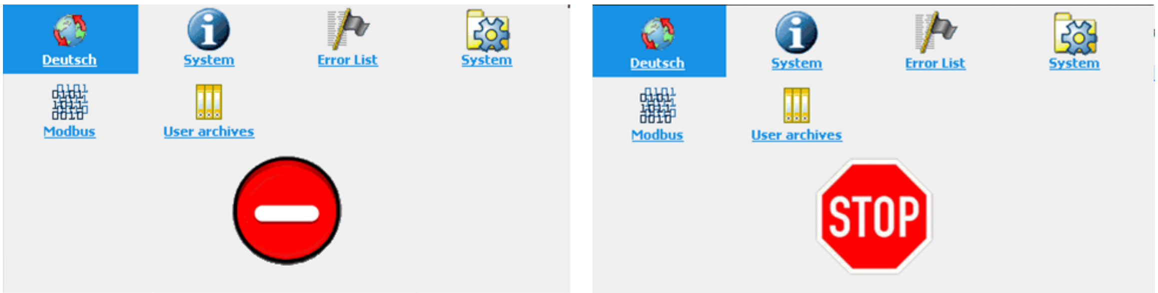


Fig. 3-89: Emergency mode – example

The prohibitive sign indicates that the device has started in emergency mode due to a system error that has been detected during re-start. In this case only basic functionalities for error handling are active; all the other functions are disabled.

Typically, this error is caused by an erroneous parameterization configuration and can be solved by transferring a correct parameterization to the device.

Please contact our technical support if you need assistance. (➪ 4.2 Technical support Flow Computers and Gas analyzers, p. 314)

What does the customs sign mean after system start?

In case the device detects inconsistencies, it starts in the so-called “improper configuration mode” and signals this with the customs sign.

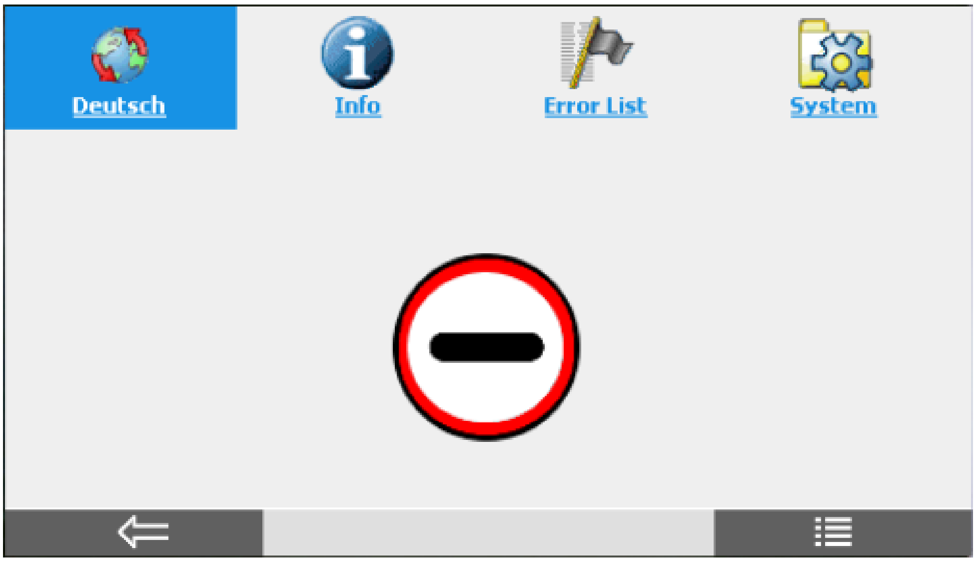


Fig. 3-90: “Improper configuration mode” with strongly limited range of functions

In this mode the device is in emergency operation:

- SFBs only run in the standard configuration.
- AFBs do not start.
- With enSuite, you can only create a new software parameterization or transfer another parameterization to the device.
- It is also possible to exchange the basic device settings via enSuite.

Viewing the causes in the device display

The device shows the detected inconsistencies in the display **Info - <serial number of the device>**.

▶ Switch directly to the device display with the button . The device display signals inconsistencies in red font:

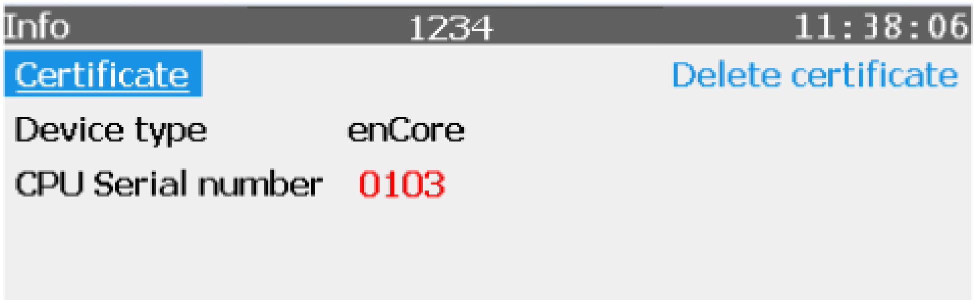


Fig. 3-91: In the example the CPU serial number does not match the basic device setting

Possible causes are:

- There is no device basic settings file in the device. In this case the serial number of the CPU is displayed in the title as follows: **CPU3-<CPU serial number>**
- The CPU serial number of the device does not match the CPU serial number of the basic device settings.
- The device type (kernel of the firmware) does not match the device type of the basic device settings.
- The verification of the signature of the device basic settings has failed.
- The parameterization uses a chargeable AFB, which is not activated.

Please contact our technical support if you need assistance. (➪ 4.2 Technical support Flow Computers and Gas analyzers, p. 314)

Info display (overview)

This symbol opens the following display:

The display shows the device's serial number (first line) and the status of the security switch (SSW). Furthermore, the display provides access to the listed functions:

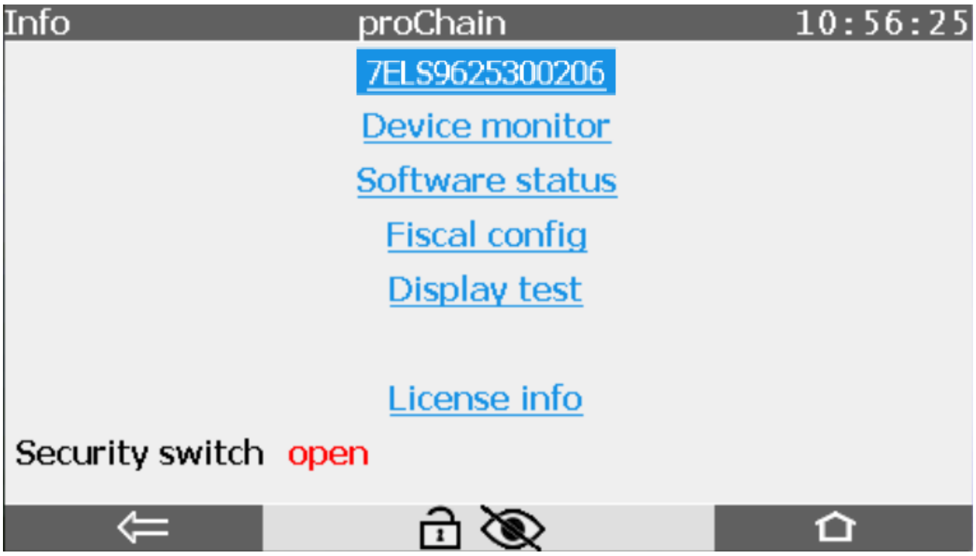


Fig. 3-92: Info (System) display

The function "Fiscal config" is not used in this device. The function "Display test"can only be used for devices with a fixed display and is not described further here. The other functions are described in the next sections.

The security switch (SSW) 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 during operation and can only be opened in the presence of an authorized person.

This protection prevents changes to the fiscal settings or main device settings and software downloads. Refer to ➪ The hardware parameter guard (SSW) (p. 94)

Info display (Serial number and TLS certificate)

After activate the serial-number-link the display **<Serial number of the device>** shows important information **Device type** and **CPU Serial number** as well as further links and functions.

> **When the system is started, the device compares its data with the so-called basic device settings. If it detects deviating data e.g. incorrect device type or wrong CPU number, during the consistency check, these are shown in red in the display.**

The link **Certificate** on the display enables to view the MMS certificate for secure data transmission. The display action **Delete certificate** allows the authorized user to delete the existing certificate and create a new one.

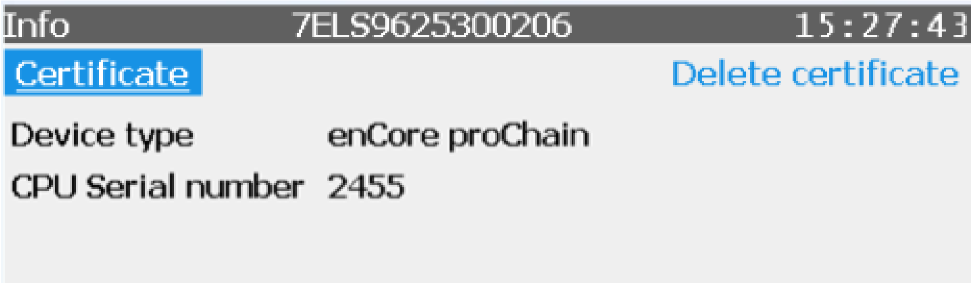


Fig. 3-93: Display serial number (example)

The certificate display shows the details of the used certificate for secure data transmission. Since the display is too long to be shown completely, use the small yellow diamond on the right-hand edge or scroll use the up and down arrows on the display.

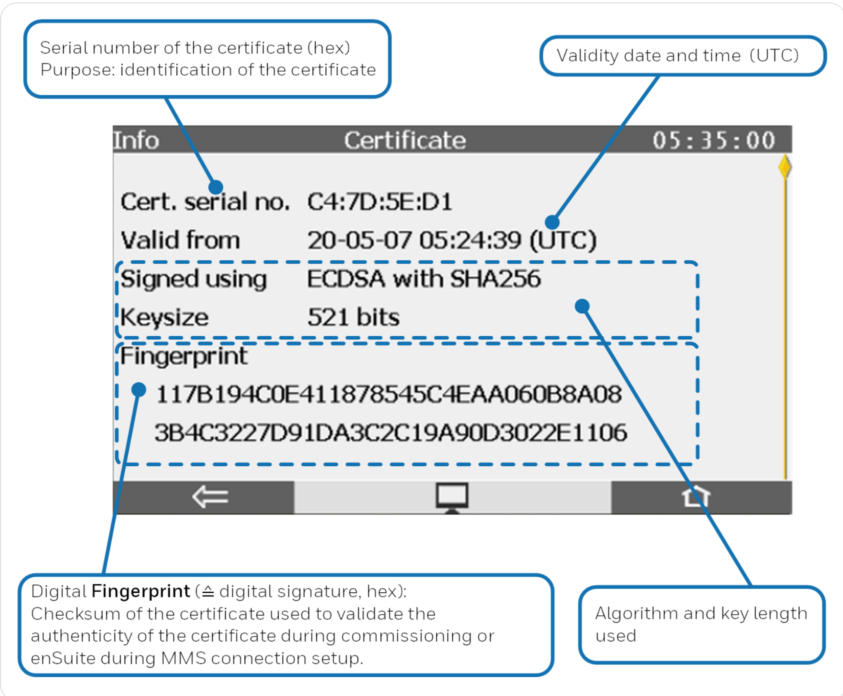


Fig. 3-94: Display **Certificate** with certificate information, top of page - example

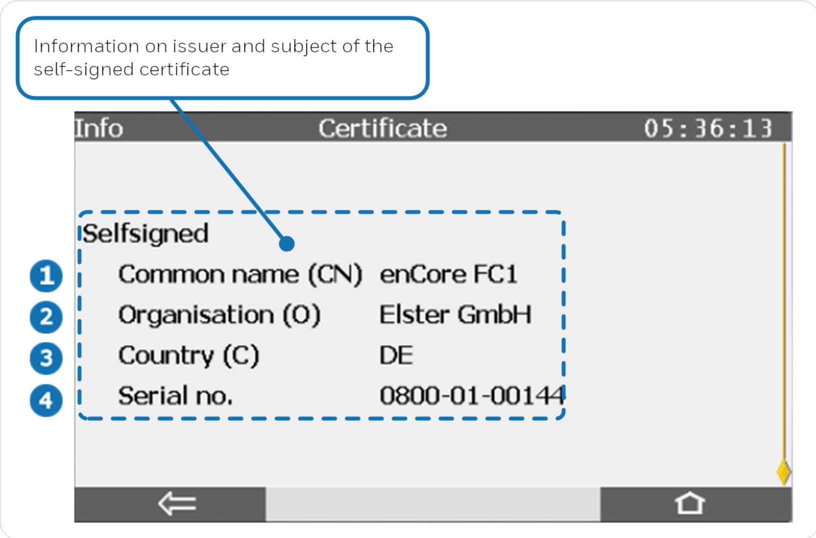


Fig. 3-95: Display **Certificate** with certificate information, end of page - example

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

1. CN = Common Name, *here*: enCore device type
2. C = Country; *here*: DE - Germany
3. O = Organization; *here*: Elster GmbH
4. Serial number of enCore device

To increase security, we recommend that a new TLS certificate always be created if the existing one was made under unknown conditions, e.g. on the transport route or in trial operation

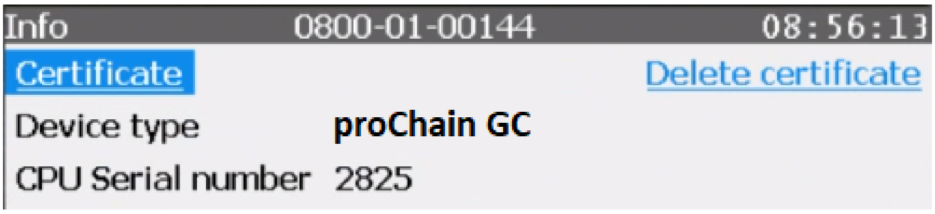
Change a TLS certificate and publish it to enSuite

Prerequisite(s)

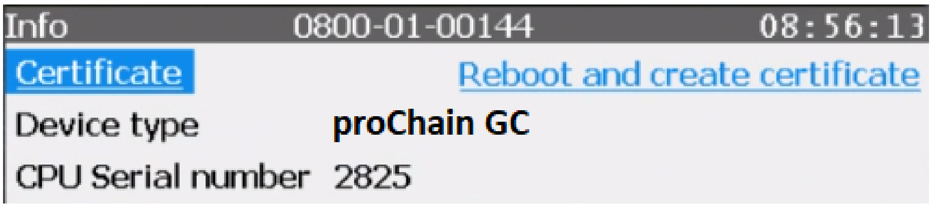
- The enCore device is preferably connected to enSuite ➪ 3.1.2 Data connection to the measuring device (p. 146)

Steps

1. Log in to the "**User Main Display**" on the device or on the remote operation panel **(Home >> System >> Users)**.See also ➪ System display Users (login, logout, password) (p. 262)
2. Go (via Home) to diplay **Info (System)** and activate the **device serial number**. You will see the 2nd page of the display as shown below.



3. Delete the existing certificate with the device action **Delete certificate**. The text of the action will change, see figure.



4. The certificate will only be permanently deleted on shutdown. Restart the device with the shown action **Reboot and create certificate**. On restart, the device generates a new certificate for MMS communication.

Info display (Device monitor)

The device monitor shows information about the operating hours and battery charge and about the CPU and RAM load. **Navigation: Home- display – Info – Device monitor**

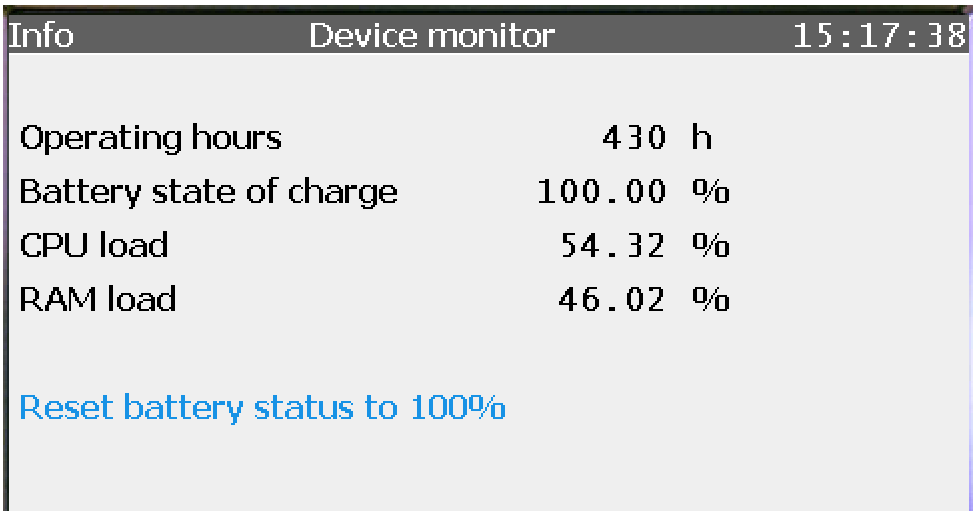


Fig. 3-96: System info – Device monitor display

Device monitor	
Operating hours	Elapsed hours that the unit has been on and running since manufacture.
Battery state of charge	Remaining battery charge in percent. (The battery is mainly used when the instrument is switched off. The message "Battery charge low!" is displayed when the battery capacity has dropped below 20%. The battery must then be replaced).
CPU load	Current utilization of the CPU in percent. (Message "CPU load high!" can optionally be displayed if a warning limit has been parameterized).
RAM load	Current load of the main memory in percent. (for information only)
Reset battery status to 100%	Action to reset the battery status to 100% after a battery change (action only active when logged in with the appropriate authorization. A service technician should perform this action to keep the device data up to date. In case of error, "Reset failed!" is displayed.)

Info display (Software Status)

Software status shows the identification data of all software parts in the device. The data consist of the name of the software parts, the version number and the checksum. In addition to the **"Last check"**, the topmost line contains the date of the readout for the following information.

The **first column** lists the names of the software parts. These names are selectable hyperlinks and take you to subordinate displays (component displays) containing information on the corresponding software part.

The **second column** contains the software version number of the components and the third column contains the relevant checksum. During operation, the actual checksums are calculated and compared to the reference values.

If an **entry (checksum) is marked red**, the last test failed, in other words, a discrepancy was identified. In this case, an error is generated. Information about checksum can be found in the glossary.

Fig. 3-97: System info – Software status display

The following shows examples of component displays. You will find the following information: Last check/Software part/Name/Version/Software/All parameters

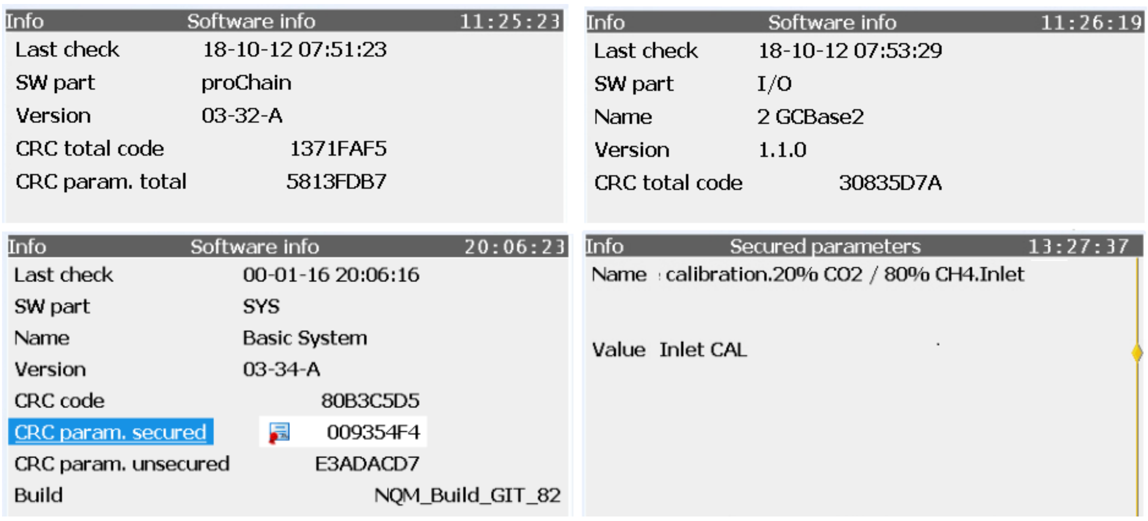


Fig. 3-98: System info – Software info display example

> Above only examples are shown. If the device is not used with an approval file, the “**Secured parameters**” display will not be available. Furthermore, some links can only be selected if there are no red entries. As the example shows, the component displays do not have a uniform structure.

The **“Software status”** display shows the short name of an **approval file** in second place on the list. This file contains the definition of which parameters are backed up before being changed so that the device can be operated in compliance with customer specifications or approvals.

Operation without an approval file is also possible. In this case, as in the example above, **NonFiscal** is displayed as the abbreviation. If the device is operated with an approval file and a closed SSW, the appropriate parameters are protected to prevent them being changed.

> If you wish or have to backup parameters with an approval file, refer to section ➪ The hardware parameter guard (SSW) (p. 94) and section ➪ 3.2.6 Fiscal parameters and optional using of approval file (p. 194). If necessary, contact Honeywell.

> If an approval file is used and both the official access rights of the parameterization as well as the fiscal software component versions are in line with the approval file, then this text is black; the text is red in the event of any deviations.
>
> If you activate the hyperlink of the Approval, a display is then evoked which contains detailed information on the approval.

If the device is operated with an approval file and a closed SSW, the appropriate parameters are protected to prevent them being changed.

Info display (License info)

The hyperlink on the overview leads to the following display with details of licenses, copyright and rights.

Fig. 3-99: System info – License info display

Error List – Main display (accept / quit error messages)

The device manages the warning and alarm messages in the error list (located on Home display) and reports them in the logbook. Which messages appear, depends on the parameterization of the device.

If the status LED is lit or flashing in red or yellow, there are entries in the error list. The list can be opened by clicking on this symbol in the home display.

The figure below shows an example of the error list and explains the display in detail.

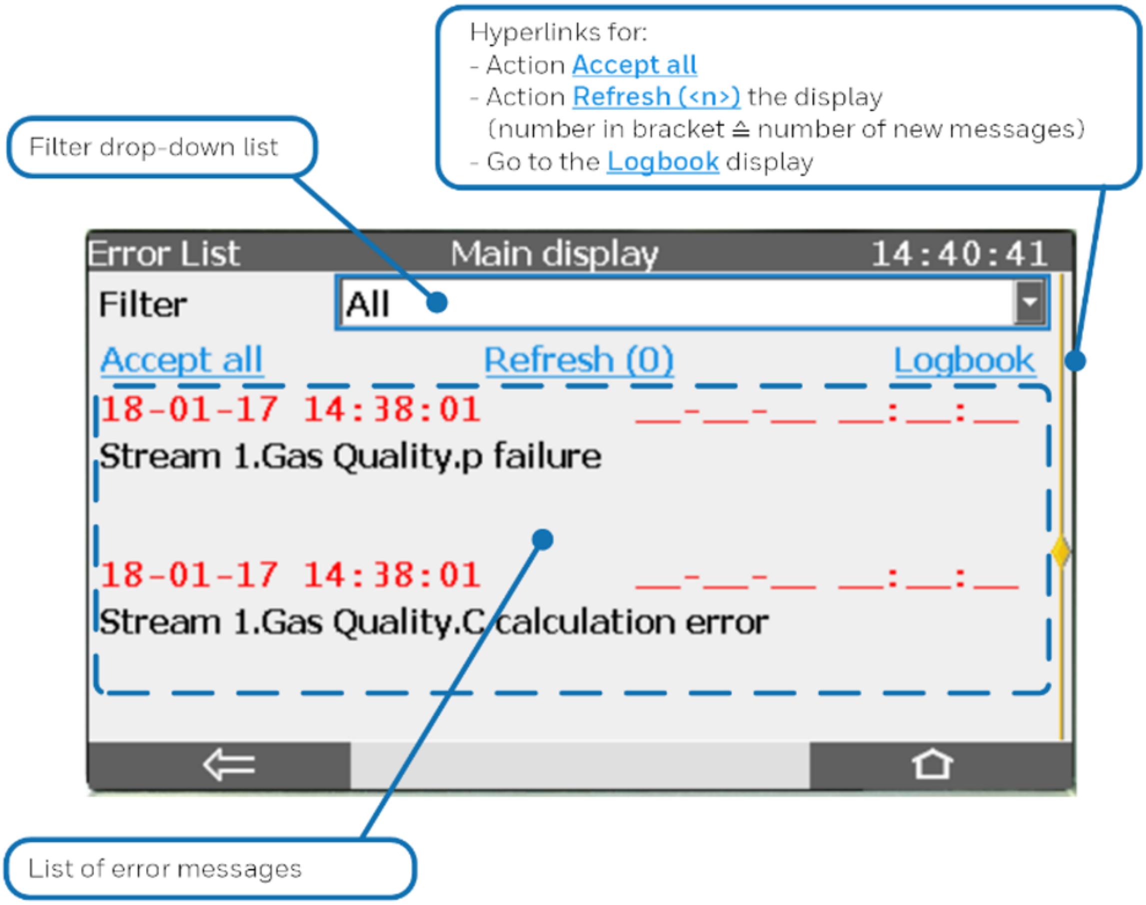


Fig. 3-100: Error list Main display

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.

• 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. 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>).

Hyperlink (Logbook) You can go straight to the logbook display from the error list display using the Logbook hyperlink.. Here you will find further information to enable you to analyze the cause of the message in more details. ⇨ System display (Logbook) (p. 267).

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).

Entries must be accepted, this is done list-wise and not individually. The action is defined in the parameter **Acceptance procedure**. This parameter checks if only errors, which are no longer currently pending, can be accepted or whether errors can always be accepted irrespective of whether they are currently pending or no longer pending.

Refer to the online help of ⇨ 3 Software (Device operation with enSuite) (p. 141) for details about the acceptance procedure. (branch **Basic System – System**, section **Error List**)

Step	Acceptance procedure clearing the error list
1.	Navigate to error list and open it.. (Activate: Home >>Errorlist).
(2.)	In order to accept messages of a specific software part from the list, open it by selecting the corresponding entry or **<Group>** from the drop-down list **Filter**.
3.	Select “Refresh” to update the list which had been frozen upon opening (number in brackets = number of new messages).
4.	Trigger the action Accept all. The selected list is accepted and updated according to the parameterized acceptance procedure.
(5.)	If required, repeat these steps for other lists.

After all the entries have been accepted, the system will be returned to error-free status. The status LED will be lit in green.

Honeywell provides assistance with troubleshooting work. **⇨ 4.2 Technical support Flow Computers and Gas analyzers (p. 314)**

System display (overview)

The system display, a node to additional displays, is opened by selecting this symbol.

You can go to the following sub-displays using this node:

- Tim Service ⇨ System display Time Service (System time and date) (p. 255)
- Users ⇨ System display Users (login, logout, password) (p. 262)
- Logbook ⇨ System display (Logbook) (p. 267),
- Audit trail ⇨ System display (Audit trail) (p. 268)
- I/O. ⇨ System display I/O (network settings / inputs/ outputs) (p. 270)

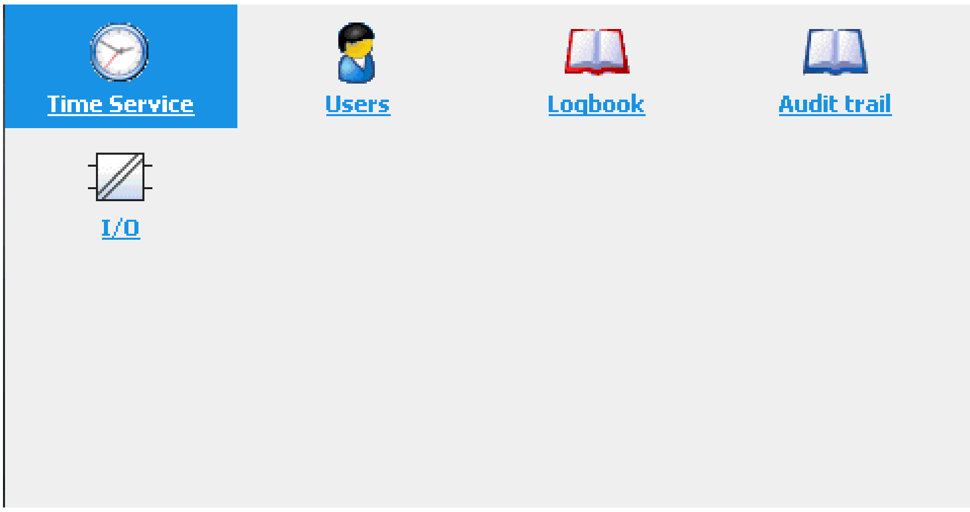


Fig. 3-101: System display

System display Time Service (System time and date)

Depending on the parameterization, the Time Service has up to four standard displays located behind this symbol. The **Main display** showing the internal time in the device, via links and actions it leads to the other possible and optional displays.

The following figure shows the hierarchical structure of the displays

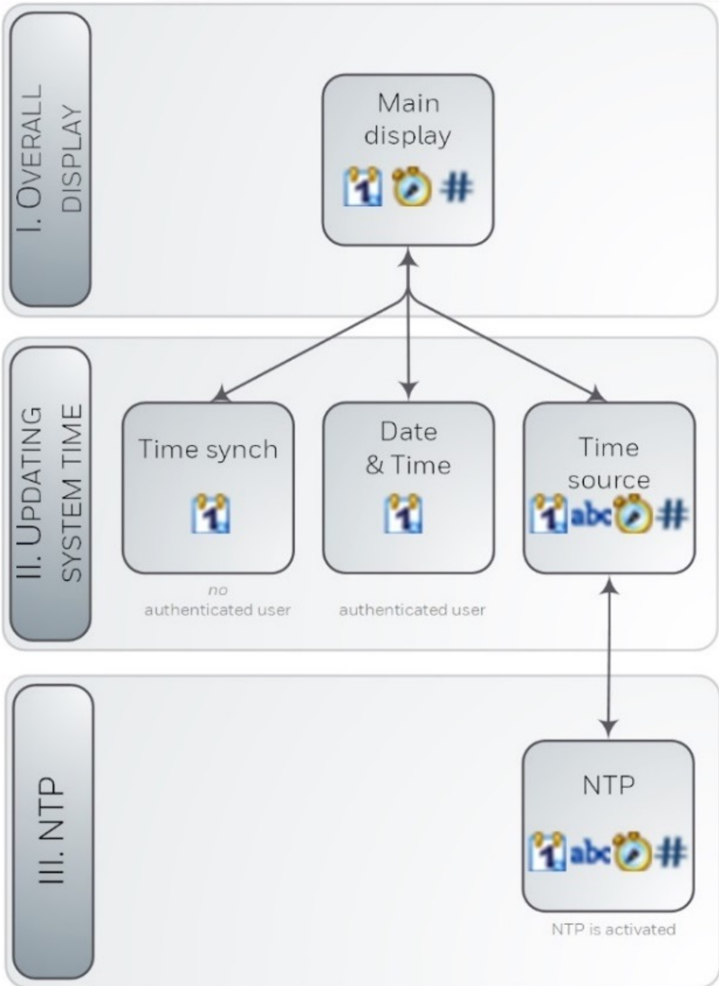


Fig. 3-102: Time Service display overview

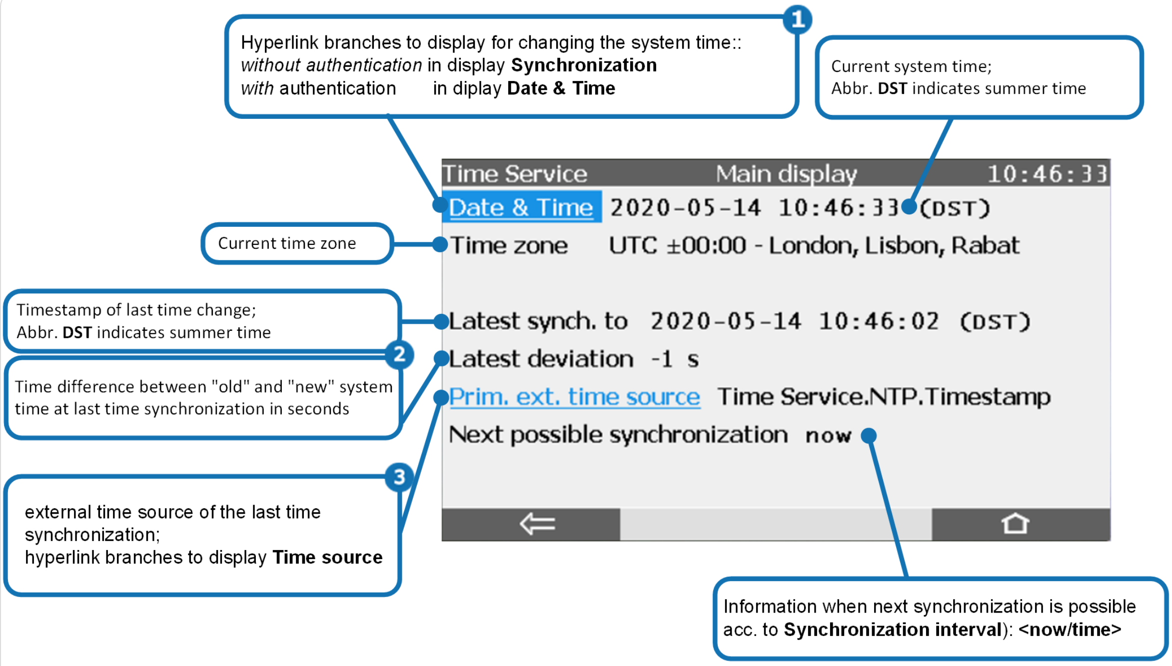
Depending on the user login ➪ System display Users (login, logout, password) (p. 262), the enSuite parameterization ➪ 3 Software (Device operation with enSuite) (p. 141) and the user's authentication, the main display branches to the corresponding display . The displays **Time soruce** and **NTP**are only shown when time polling via NTP is enabled.

The system time (permanent device-internal calendar with date and time) is saved on a battery-buffered clock block and available even after the device has been switched off and on again. Changing the system time is the generic term for both synchronization and for adjusting the date and time.

Time Service Main display

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

(Access: Home - System – Time Service)



1 Prerequisite: User authorization **Update device time**

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

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

Fig. 3-103: Time Service main display

The Time Service main display shows the date and time (also known as the system time). The abbreviation (DST) means daylight saving time and is only shown if the current time is in daylight saving time.

Furthermore, the following is also displayed:

Time zone:	Geographical location
Latest synch. to:	Time stamp of the last time change.
Latest deviation:	Deviation (in seconds) at the last time change
Prim.ext time sorce	only shown when time polling via NTP is enabled ➪ Display Time source and NTP (p. 260)
Next possible synchronization:	Point in time based on the Synchronization interval.

Synchronizing system time

For a user who is not logged in or a user who is logged in but is not entitled to change the device time, " **Time Service – Time Synchronization**" will open as the second display after **"Date & Time"** has been activated. **(System > Time Service > Date & Time)**

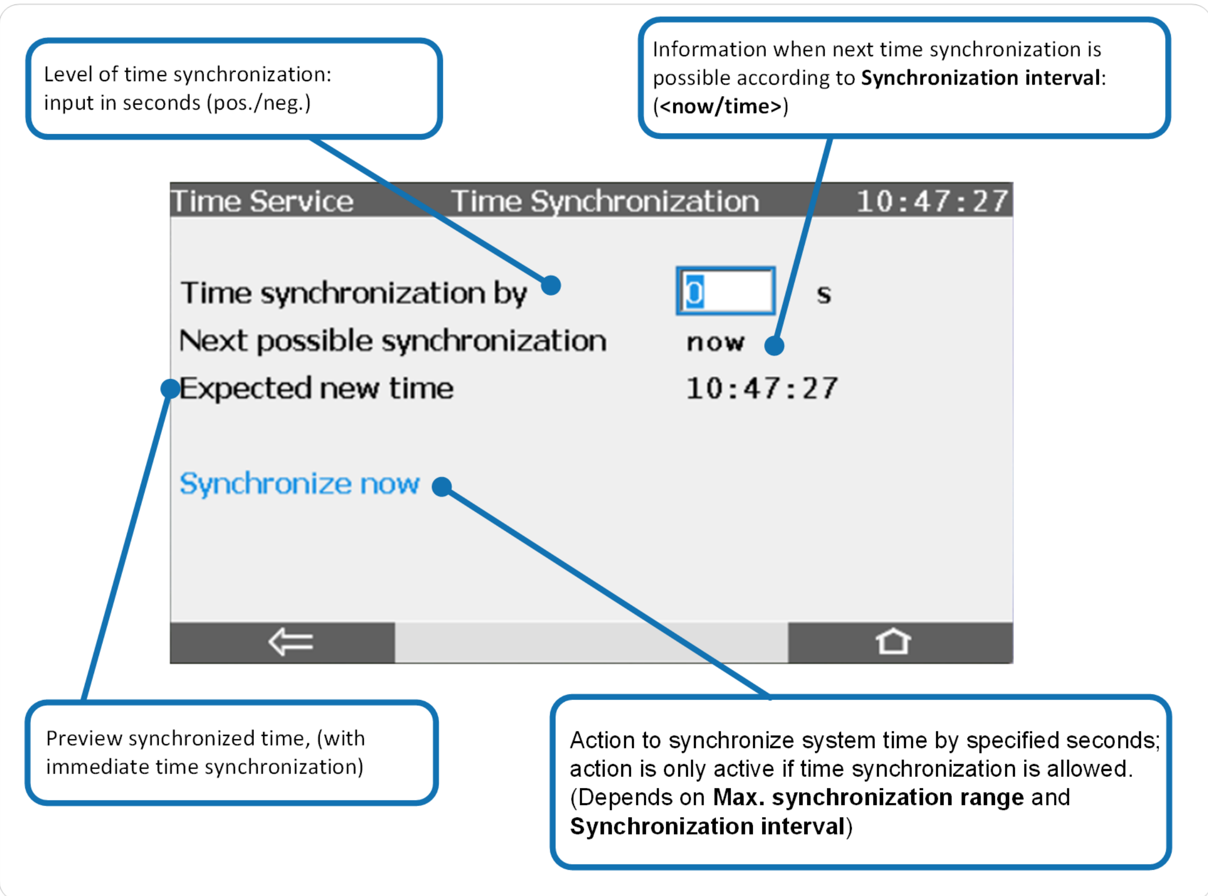


Fig. 3-104: Time Service – Time Synchronization display

The display shows following information:

- Time synchronization by: 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 parameterized time window (Max. synchronization range). Enter the seconds in the box by which the system time is to be changed. Both positive and negative values may be entered. The box will only accept values within the parameterized synchronization window .

- Next possible synchronization: Next possible time for another synchronization. The calculation is made after a synchronization based on the synchronization interval. The parameter Synchronization Interval determines the time interval that has to pass after an executed synchronization before the next synchronization can be done. If the entry is Now, you can synchronize the system time; otherwise, you must wait until the next specified time.
- Expected new time: The time service continuously calculates the new system time in this line. You can easily synchronize the system time by specifying the difference in seconds relative to the current system time.

- Synchronize now: This action (if available) specifically saves the new time as the system time. 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.

> **By default, you can synchronize the system time by ± 20 seconds every 12 hours without having the access right Update device time. Refer to** ⇨ 3 Software (Device operation with enSuite) (p. 141) **online Help (branch Basic System – Time Service) for information about the time service parameter setting.**

"Update date and time"

For a user who is logged in and entitled to change the device time, after **"Date & Time"** has been activated, the display with the same name will open as the second display.

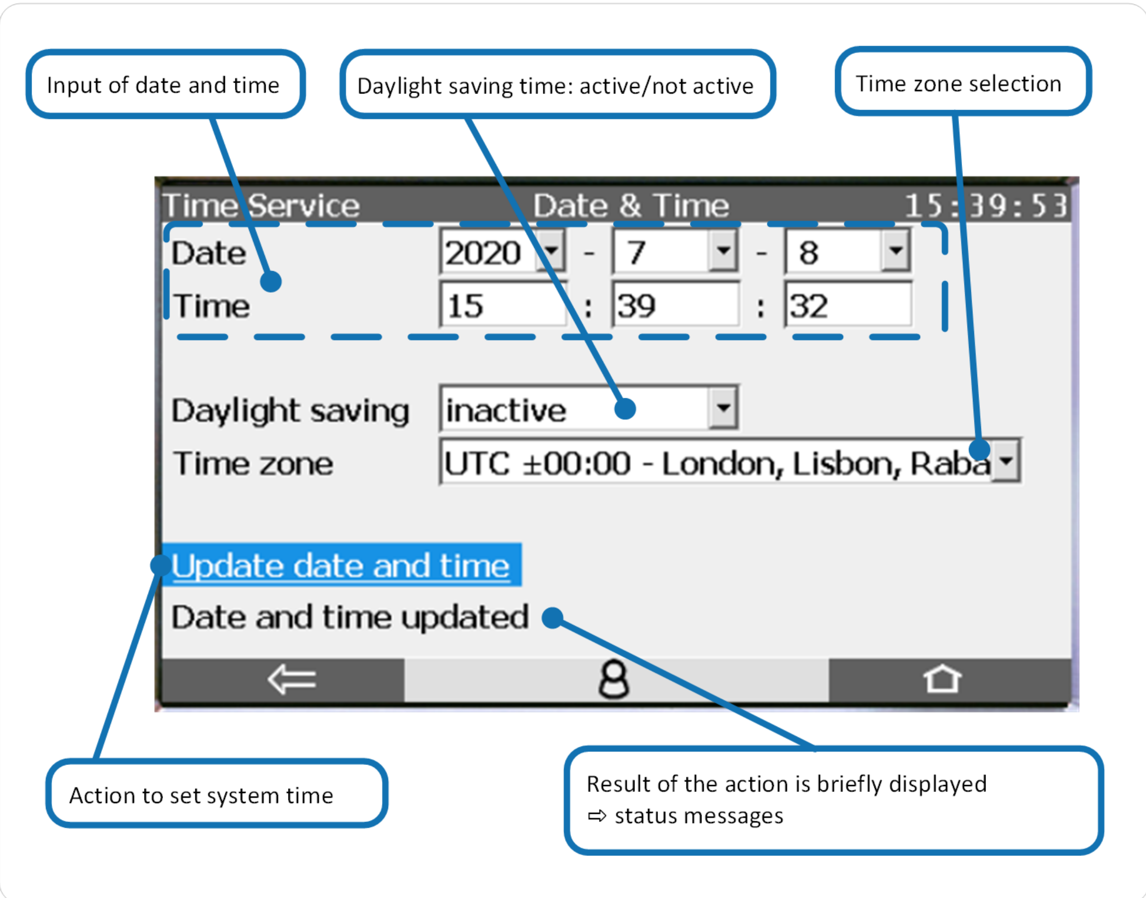


Fig. 3-105: Time Service display "Date & Time"

The system time can be adjusted in this display. You require the appropriate rights for this purpose and the security switch (SSW) must be in the setting specified in the parameter set.

Action: Setting the time and date

1. Log in and open **“Date & Time”** display.
   (System > time service > Date & Time)
2. Enter the current date and time using the drop-down menu and keypads.
3. If appropriate setting has been made in enSuite, click on the **Daylight saving box**. and choose between**Active** (device system time is daylight saving time) or**Inactive** (device’s system time is standard time). Automatic switchover between daylight saving time and standard time is not provided for in the default parameter set.
4. Click on the **Time zone box** and choose the local time zone (deviation from UTC in hh:mm)
5. When the entries have been made, execute Update date and time. Status messages (*Date and time updated / Update of date and time prohibited! / Update of date and time failed!*) are displayed briefly at the bottom of the screen. If the action fails, this is indicated by red text otherwise the new time setting is used.

> The date and time can also be changed using enSuite ➪ Update date and time (system time action) (p. 170)
>
> The **Daylight saving box** can only be used if the following setting is parameterized in enSuite (branch: Basic System – Time Service, Daylight saving area, Daylight saving has the value manual.

Display Time source and NTP

The following optional display is only available if parameterized in enSuite. **(Branch Basic System – Time Service, parameter NTP)**, see online help for more information. Then it will open after **Prim.ext time sorce** has been selected in the **Main** display and give information as shown in the figure.

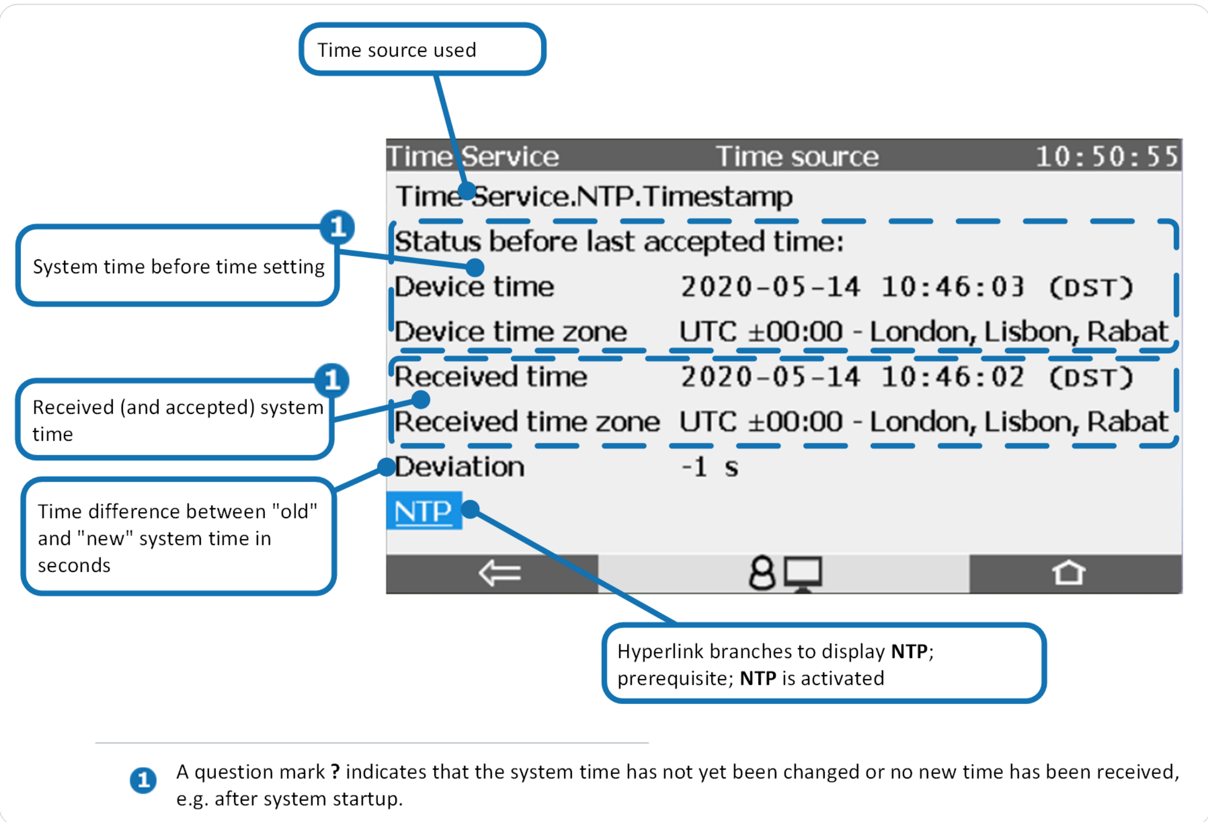


Fig. 3-106: Time Service –Time source

The final optional display entitled NTP will open after NTP has been selected in the **Time source** display.

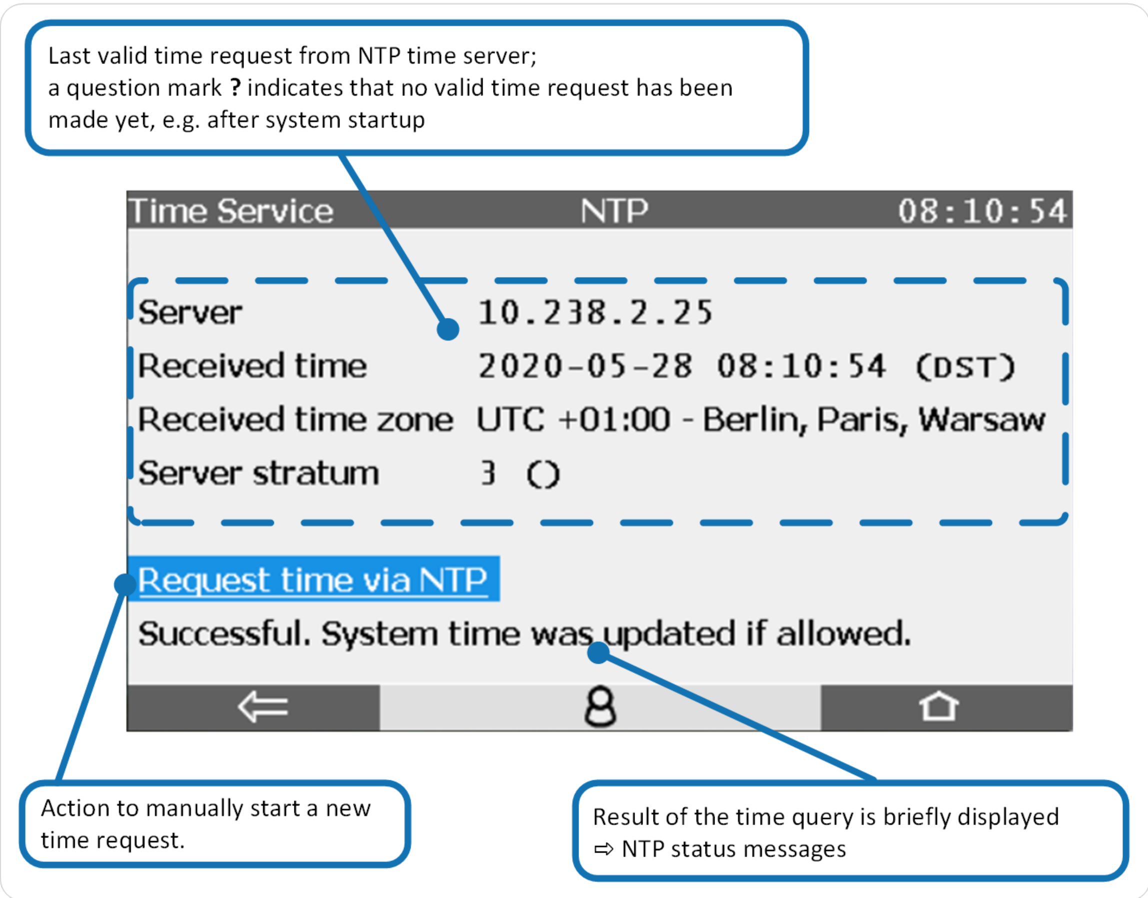


Fig. 3-107: Time Service – NTP overview display (optional)

This display provides the action Request time via NTP for manual time synchronization via NTP. Fruther information is given in the figure above.

Following status messages using manual time synchronization via NTP can occur. Messages in red font indicate that the NTP time request was not successful and inform about the type of error.

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.

No NTP server configured Error in the parameterization The time request via NTP is activated (NTP: active), but no Server 1..Server 3 is parameterized.

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 Error in the parameterization. The maximum permitted NTP server stratum (Max. stratum) is exceeded by all parameterized Server 1..Server 3.

Network timeout The Timeout was exceeded in the time query of the Server 1..Server 3. Possible causes:Timeout selected too low or network error.

System display Users (login, logout, password)

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.

Main display

Access: **Home** – **System** – **User**

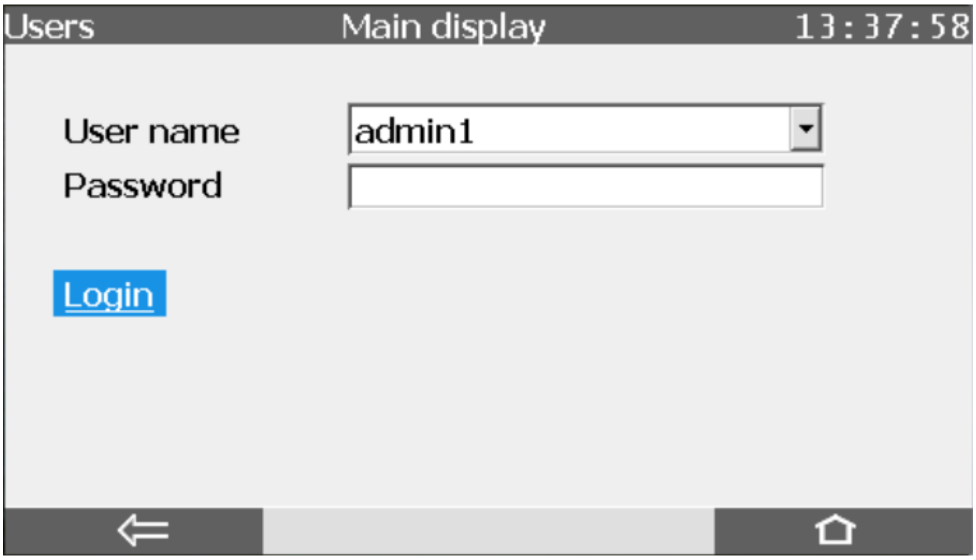


Fig. 3-108: Main display – Logging in to the device (Status:no user logged in)

Display view – status: no user logged in to the device	
User name	**<Name>** Field pre-assigned with the name of the last login. If necessary, change the pre-assigned user name.
Password	**[******]** For security reasons, in the display each character in the password is replaced by an asterisk (*); the field can also be empty.
Login	Action for log in to the device (user details set fields before) After this action the display changes the appearance ➪ Logout (p. 265)
Remote operation panel active	This warning at the bottom of the display (not shown in figure) is always on because there is no local display on the device.

Login

Access: Home – System – User

Only one user can be logged in to the device exclusively at any one time, either the action Login will be displayed on **Users Main display**or the user name through which the action is logged.

If **Login** is shown select your **User name** (if not already shown) fill in your **Password** and choose this action, if not , read special cases below.

After successful login, a session is started, and only terminated again when you log out or logged out by others. You can navigate through the device depending on your authorizations ⇨ 3.2.5 User and rights management (p. 176), you are able to change settings.

With the login the **Users Main display** changes its appearance and offers the possibility to logout ⇨ Logout (p. 265), to change parameters ⇨ Perform parameter changes via displays (p. 263) and the password ⇨ Change password (p. 266).

Special cases:

Another user is already logged in
The name of the user who is logged in will be shown, read the section ⇨ Mechanisms to end exclusive access (p. 264)

Authorization mode Security switch is used

Parameter **Authorization mode** has the value **Security switch** and the security switch is open, only the field **User name** is displayed. In this mode the password is not required. (By default, <User name> and <Password> are required.)
Parameter **Authorization mode** is set to **Password**) ⇨ Rights at a system level (p. 183)

Perform parameter changes via displays

Changes are always made in three steps and are only saved if the user explicitly confirms this. If a user is logged out before confirmation, changes already made are discarded.

1. **Login** ⇨ Login (p. 263)
2. **Perform changes and actions in the various displays.**
   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. To save parameter changes, switch back to the **Main display** (System User) and perform the action Accept parameter changes, to discard parameter changes, perform the action Discard parameter changes.
3. **Logout** ⇨ Logout (p. 265)

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**) ⇨ General parameters (p. 186)
- 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.

Logout

Access: **Home** – **System** – **User**

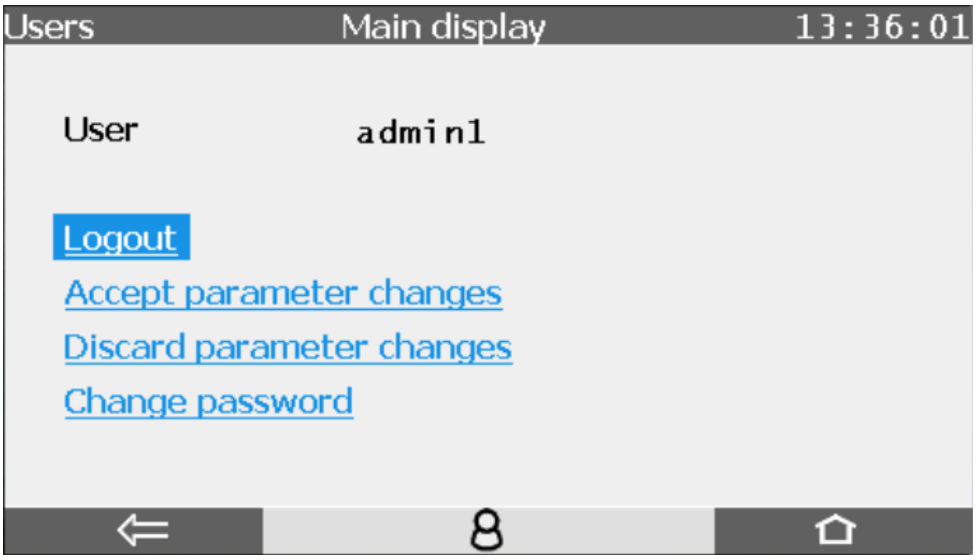


Fig. 3-109: Main display – User **admin1** is logged on

End your session with Logout. The session is over. Other users can log in to 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.

Logout view – lines in overview	
User name	**<Name>**Name of the user logged in
Logout	End the session and switches to ⇨ Login (p. 263)
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. Action switches to display ⇨ Change password (p. 266)
Remote operation panel active	This warning at the bottom of the display (not shown in figure) is always on because there is no local display on the device.

End the session of an user all ready logged in with **Logout remote user**.

In this case the **Logout view** is displayed instead of the **"Login view**"and contains following lines:

Logout view – Status: A user is logged in to the device e.g. via enSutie.	
Remote user	**<Name>**Name of the user who is logged on and is currently performing an action.
Logout remote user	End the session of this user and switches to ⇨ Login (p. 263). You discard all changes that the previous user has not saved yet.

Change password

All users can change their passwords on **Users Main display** after successfully logging in to the device. ⇨ Login (p. 263)

Click the action Change password. The fields for the new password will be displayed:

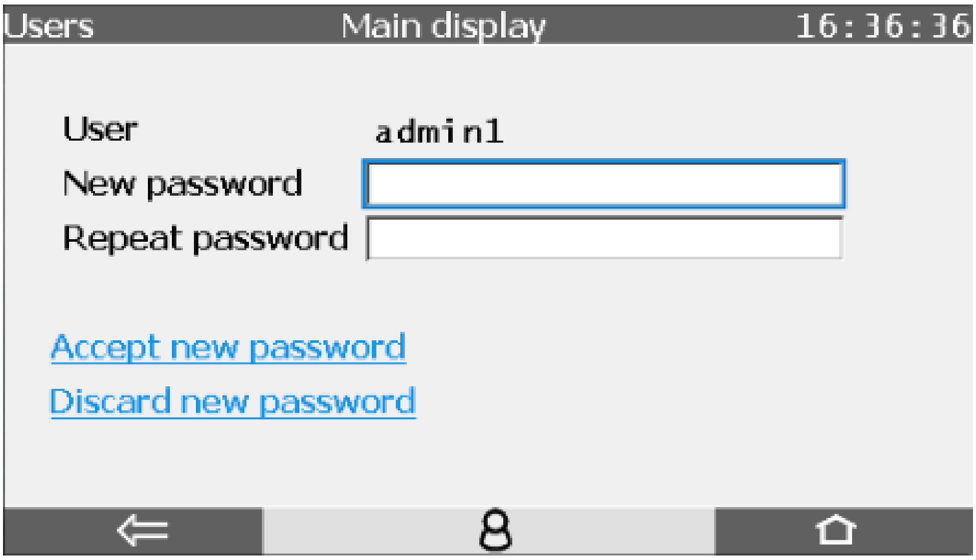


Fig. 3-110: Main display – change password

You can make the keyboard appear by clicking the field **New password**. Then enter new password. Enter the same password in field **Repeat password** and save it with selection of Accept new password.

A short status message will be displayed briefly over the lower edge of the screen. Red font indicates that the password was not able to be saved, e.g. the passwords are not identical or not permissible.

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.

System display (Logbook)

The **Logbook** located under **Home** **System** **Logbook** is one of two device logs in which events during operation are stored as history. It is similar to an archive; each entry is assigned an ordinal number. The entries which have been removed from the **error list** ⇨ Error List – Main display (accept / quit error messages) (p. 252) can be found here with the same labeling of the time stamp.

The second is the **Audit trail** ⇨ System display (Audit trail) (p. 268) whose data is also stored in the **Logbook**.

> The logbook (Logbook error list, see the figure below) documents / saves incidents and thus logs the device operation. It cannot be deleted and contains up to 1000 data records. When the logbook is full, the next entry overwrites the oldest record.

The logbook records the coming and going of all messages (alarms and warnings). Each entry is assigned an ordinal number. The header also contains a timestamp with the exact calendar time when the entry was created.

The body contains the text with the information why the entry was created and starts with the name of the software part that caused the entry.

Like the error list, the content of the list of displayed logbook entries can also be filtered using the Filter drop-down list. If there are more messages than can be displayed at once, the scroll bar appears at the right edge. The following figure shows an example for displaying the logbook with the All filter selected:

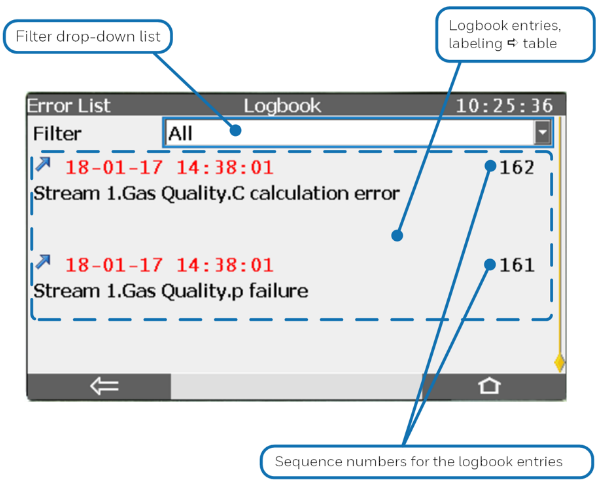


Table Labeling of entries in the logbook	
Labeling of the time stamp	**Meaning**
<Red text>	**Alarm** message begins
<Red text>	**Alarm** message ends
<Yellow text>	**Warning** message begins
<Yellow text>	**Warning** message ends
Signals only appear once in the logbook and *not* when they begin and end.	
<Red text>	Signal of **Alarm** type
<Yellow text>	Signal of **Warning** type

Fig. 3-111: Error List – Logbook display-example

Whenever changes occur or an event is included in or removed from the Error List main display, this information is recorded in the logbook

> **To analyze large archive sections, it is more practical to read the archives using enSuite. ⇨ 3.5.1 Working with archives and logs (p. 227)**

System display (Audit trail)

The **Audit trail** is one of two device logs in which events during operation are stored as history. It is located under **Home** **System** **Audit trail**. The content is also stored in the other log. ⇨ System display (Logbook) (p. 267).

> The audit trail distinguishes between "**General**" and "**fiscal**" because of the different type of archived data.

General audit trail and fiscal audit trail

To open this: Home display – **System** – **Audit trail**

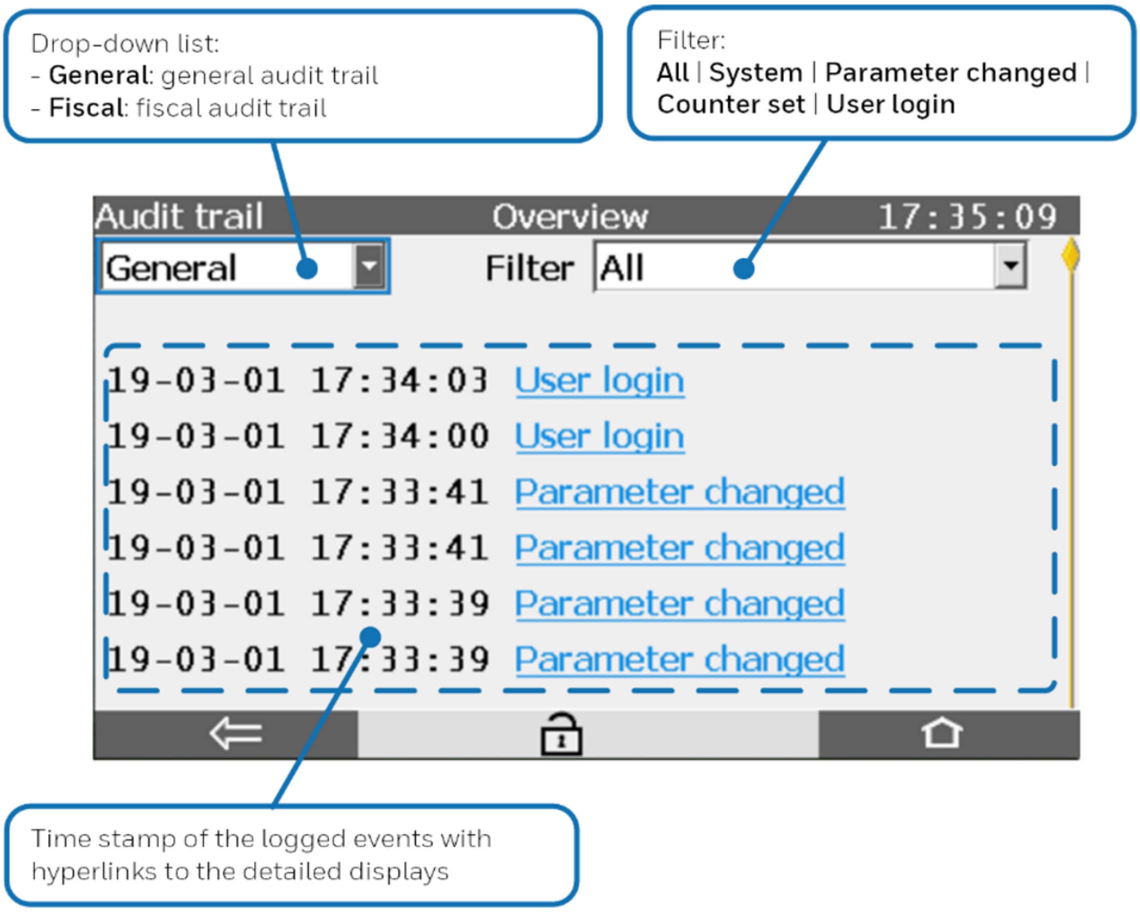


Fig. 3-112: Overview display – example

> **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 the enCore FC device series, you will find a detailed description in the ⇨ enCore manual Instructions for Use in Legal Metrology for the respective device type.

Audit trail entries

The audit trail has space for 1000 entries. **In the general section**, the oldest entry will be overwritten after 1000 entries have been created. If this space is occupied **in the fiscal section,** no changes can made to the legally relevant parameters without opening the security switch (SSW).

The events recorded in the audit trail can be displayed more clearly with a filter in the right selection list. Activate the hyperlink behind the entry whose details you would like to view The detail view for the entry appears.

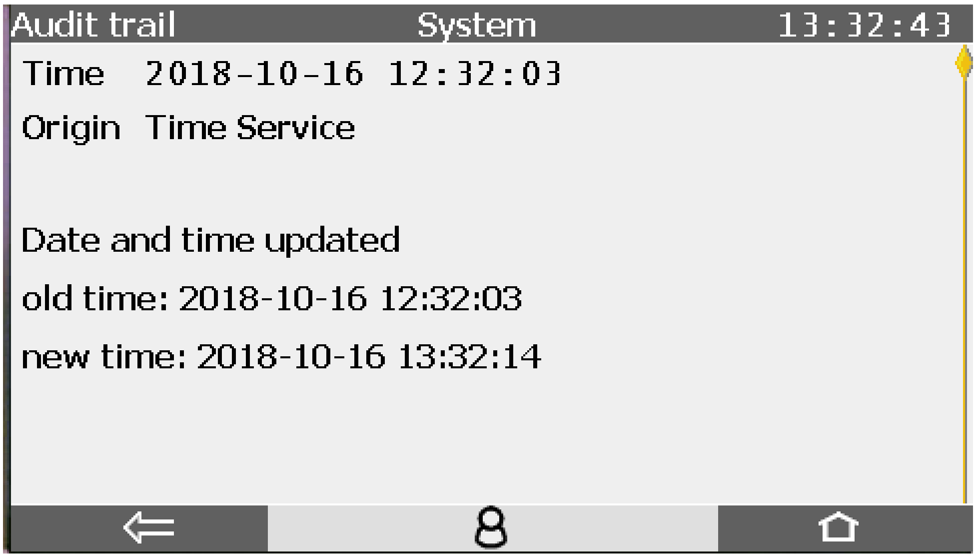


Fig. 3-113: Example of audit trail details

> The type and scope of the displayed data depends on the situation and the settings in enSuite. If the SSW is opened, the entries can be deleted using the now displayed action to create space for new changes.

System display I/O (network settings / inputs/ outputs)

The I/O – Overview display lists all the device parts available on inputs or outputs and enables the user to go to other sub-displays using hyperlinks.

The hyperlinks and test mode function appear depending on the parameter set. A login is required to use the functions. ⇨ System display Users (login, logout, password) (p. 262)

Fig. 3-114: I/O – Overview display

Using test mode, you can apply test values to individual output channels, which are used instead of the original values.

Hyperlink CPU3 is always available and enables the user to go to the Ethernet I/F display with the basic network settings.

Ethernet I/F display with the basic network settings

Location : Home display – System – I/O - CPU3

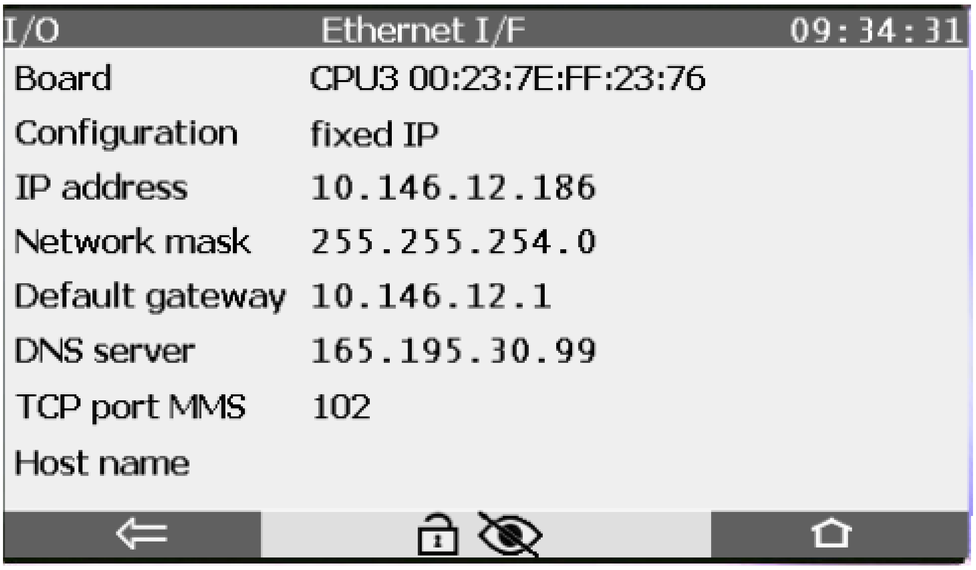


Fig. 3-115: I/O – Ethernet I/F display

As the example above shows, this display lists the internal board (CPU3) with its MAC address (00:23:7E:FF:23:76).

If a user with the appropriate authorization is logged in, the configuration (DHCP mode), IP address, network mask, default gateway, DNS server, TCP port MMS and host name can be changed. The number of entries which can be changed is also affected by the selected / pre-set settings.

> **If the user is not logged in or does not have the appropriate authorization, data can only be read in this display.**
>
> **The setting of the IP address and the basic network settings can made alternatively via enSuite ⇨ 3.2.1 SFB I/O (IP address network- and I/O-settings) (p. 165). The enSuite online hel explains the various settings in more details.**

A logged in user with the appropriate rights, get following view, see the figure below.

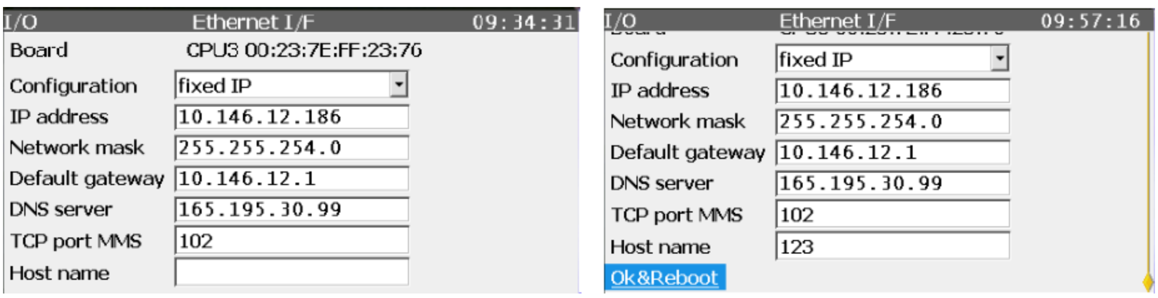


Fig. 3-116: I/O displays with options to make an entry and restart

PROHIBITION

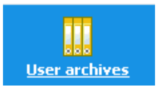
- **to change the settings of the Configuration (DHCP operation mode)**

Change basic network settings:

- Make a note of the settings to be able to undo your changes if necessary .
- Select the entry you want to change. If necessary, ask your system administrator which parameters are to be changed. (With the selection the keyboard is shown)
- Enter the values specified (by the system administrator) field by field using the keyboard that appears.
- To accept the changes, the device must be restarted with the then appearing action **[OK&Reboot]** (see figure).

The changed data will be used after the reboot. If you exit the display with  your changes will not be applied.

Display User archives



This symbol takes you to the main display of the User Archives AFB, which can be used by multiple devices, in other words, also by the proChain GC.

The following figures and explanations are only examples, further information and the actual set-up takes place using enSuite. ➪ 3 Software (Device operation with enSuite) (p. 141)

The main display contains two drop-down list boxes. Using these, you can select the archive group and then select the archive channel. All the parameterized user archives in the enCore device are available. After making your selection, you can go to a detailed display “Values” using the Show values link.

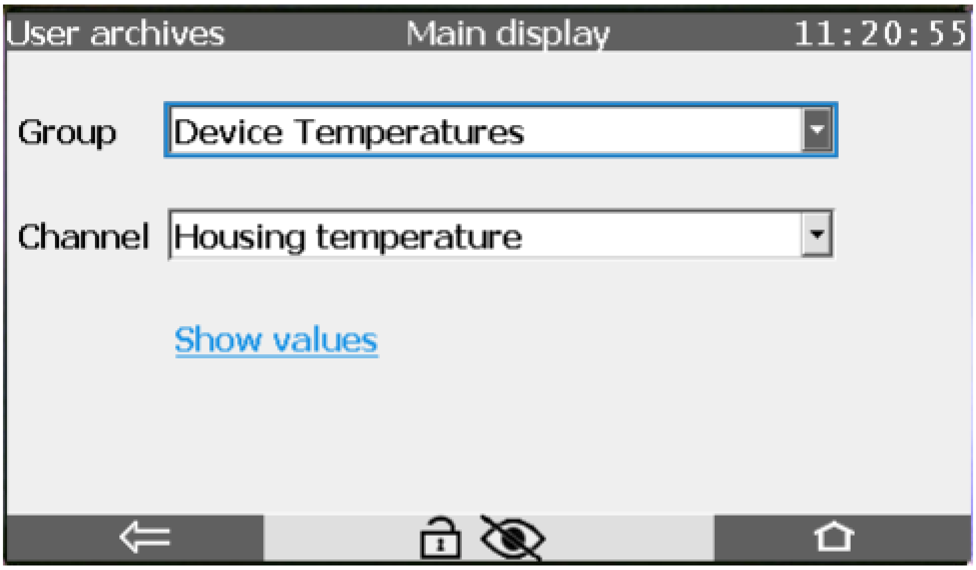


Fig. 3-117: User archives main display

The following functions and information are available in the displays:

- Channel (switch to other group channels)
- Delete content (not possible)
- Time stamp (date of archive entry)
- Ordinal no. (automatic identification number)
- Value (archived measurement or calculation result)

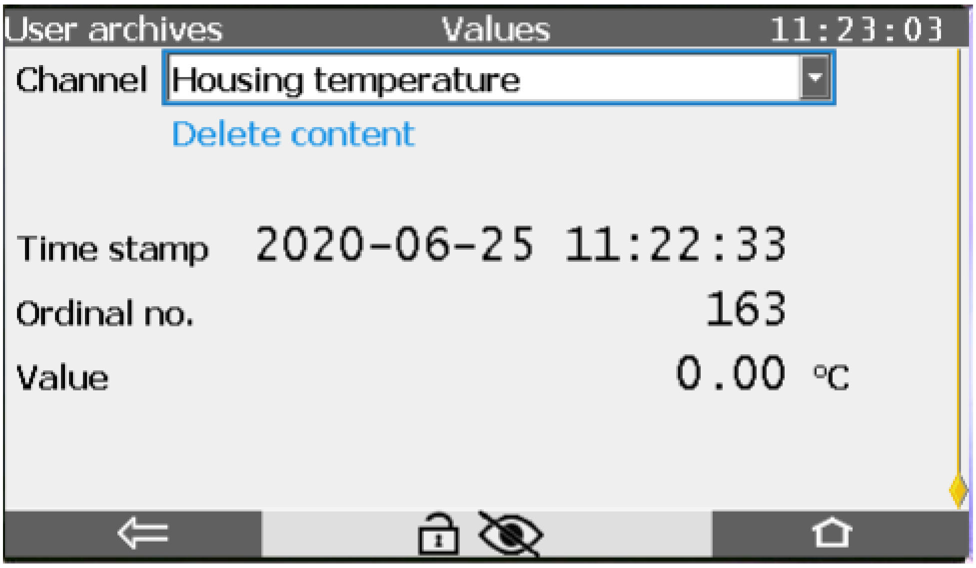


Fig. 3-118: Values sub-display

It is also possible to delete the content of the archive. A login with the appropriate rights is required for this.

The archive can be cleared if the Delete content link is underlined, see the two examples

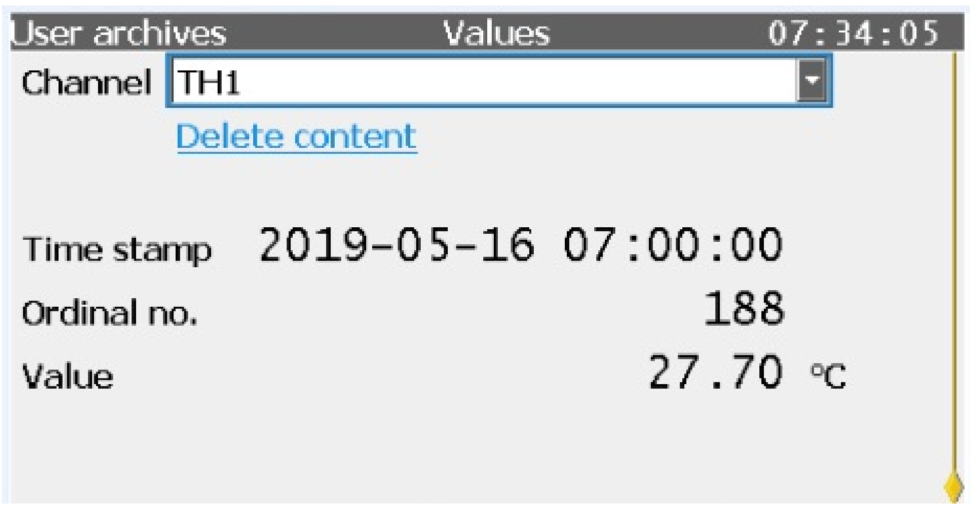
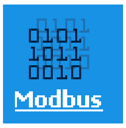


Fig. 3-119: Values sub-display (Delete content)

> **Documents for the enCore flow computer (⇨ www.docuthek.com) also contain information about this general data management**

Display Modbus



This symbol takes you to the main display of the Modbus AFB which can be used by most enCore devices and also by theproChain GC

The following figures and explanations are only examples, further information and the actual set-up takes place using ➪ 3 Software (Device operation with enSuite) (p. 141).

Displays at a glance

The following figure shows the hierarchical structure and the navigation through the displays of the Modbus AFB:

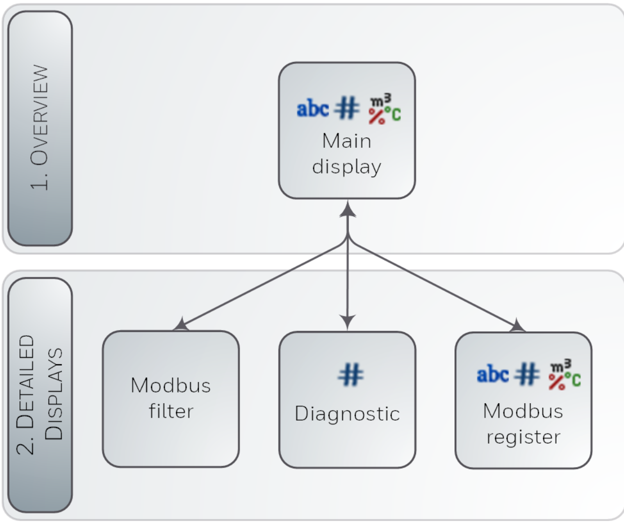


Fig. 3-120: Display – hierarchical structure

Displays in detail

The **Main display** of the Modbus AFB provides you with an overview of all (parameterized) Modbus areas of the enCore device and lists (in ascending order) all associated registers for the selected area. From here you can switch to a diagnostics display. Optionally, you can select filters to specify the results list and you can switch to a detailed display for each register.

"Main display"

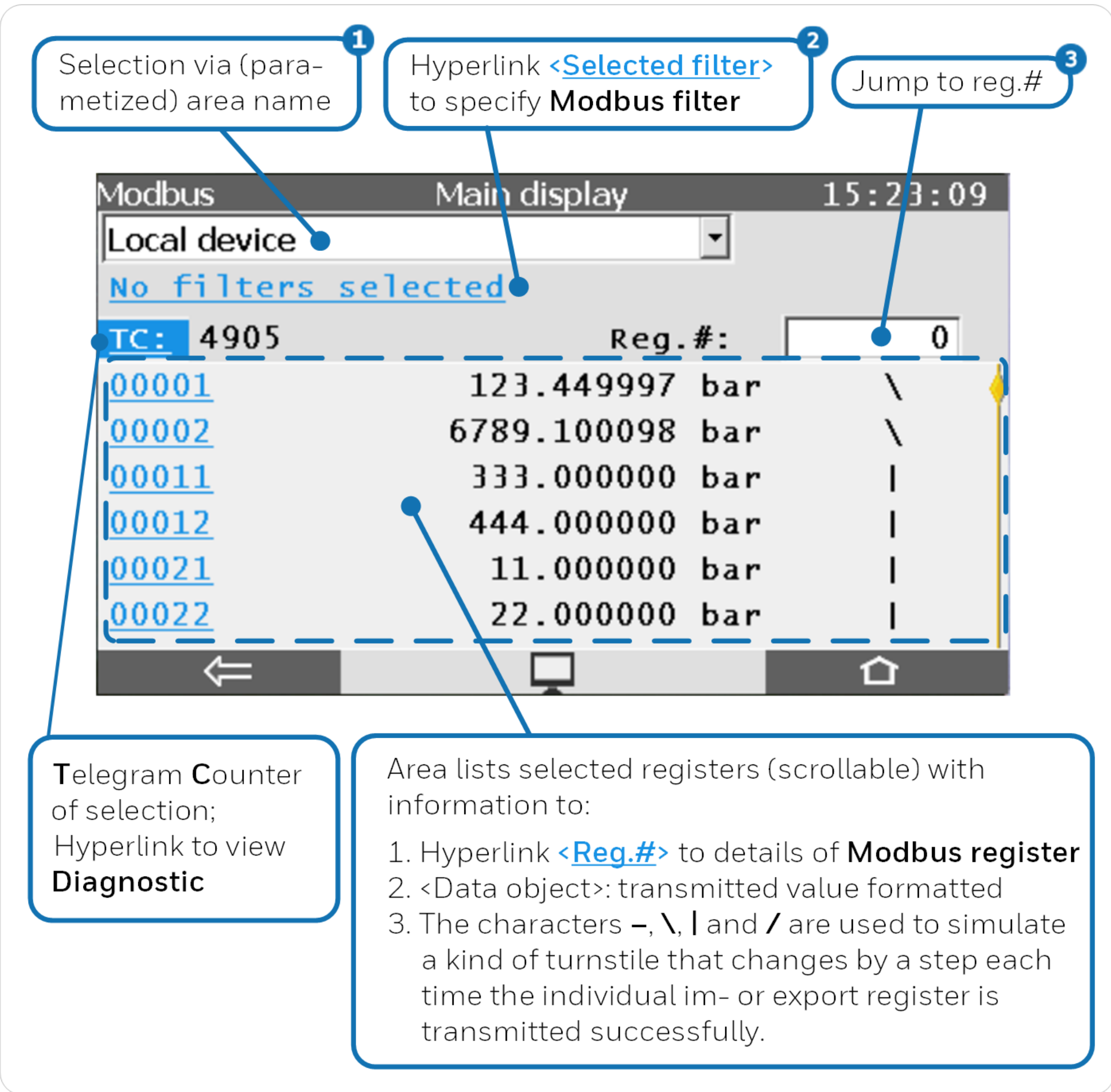


Fig. 3-121: Modbus **Main display** – example

1. For Modbus master or client the dropdown list contains all parameterized **Remote devices**; for slave or server only the entry **Local device** is available
2. The text **No filters selected** is displayed in case no filter from the display **Modbus filter** is active; otherwise the all selected filters are displayed instead.
3. If the register number does not exist or if no register is found due to the current filter selection, the AFB jumps to the nearest displayable register number.

Display "Modbus filter"

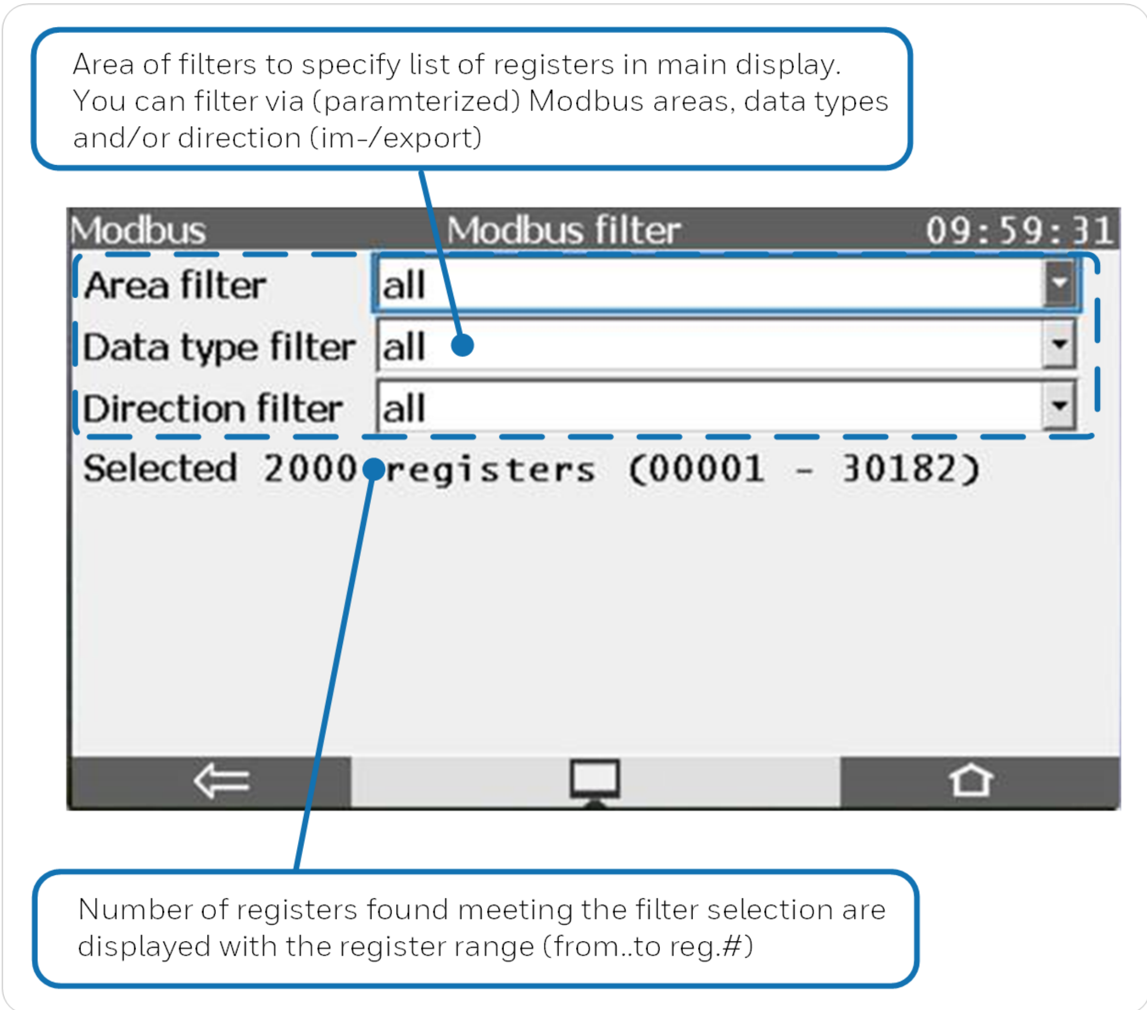


Fig. 3-122: Display **Modbus filter** – example

Display "Diagnostic"

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

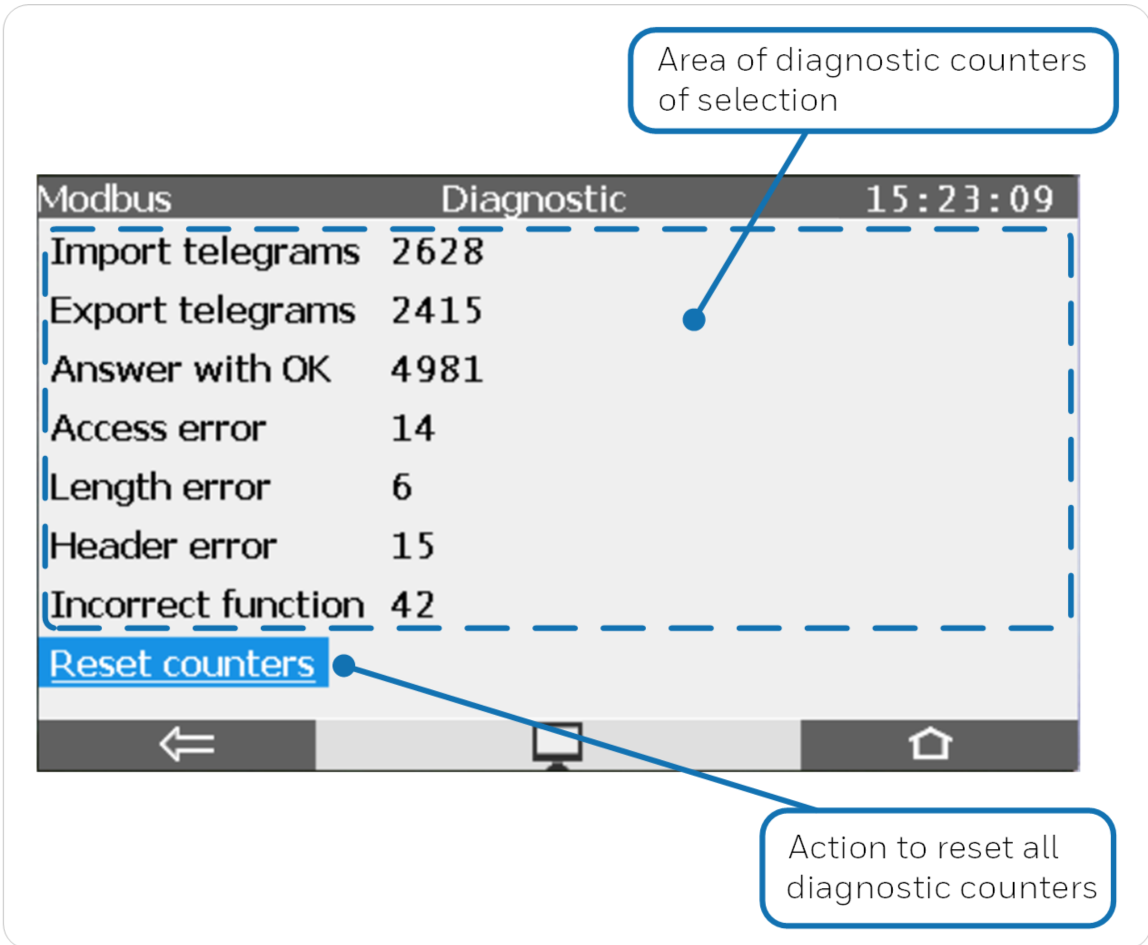


Fig. 3-123: Display **Diagnostic** – example

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

All Modbus types:

- **Access error**
  Accessing (read/write) protected registe(s) while password is still locked.
- **I-range error**
  For import data with range checking, the intended write value from telegram is outside the set range.
- **Length error**
  For writing into device registers, the size of data received from telegram differs from the total size of Modbus registers to be written.

Client and master:

- **Error responses**
  Received telegram(s) with error response
- **Checksum error** (*master only*)
  Received telegram(s) with wrong checksum

- **Header error**
  Telegram(s) with unexpected function or (*master only*) unexpected command
- **Reception timeout**
  Response time is up.
- **ID error** (*master only*)
  Received telegram(s) with wrong ID
- **Register not found**
  ACK telegram received but either total number of written registers or first register is not correct.
- **Sending error**
  Sending telegram failed.

Server and slave:

- **Access error**
  Write request for export register
- **Header error** (*server only*)
  Total number of bytes specified in header is incorrect.
- **Checksum error** (*slave only*)
  Received telegram(s) with wrong checksum
- **Incorrect function**
  Request telegram with unsupported function
- **Register not found**
  Requested register(s) not available
- **Sending error** (*server only*)
  Internal data cannot be written due to program errors.

For simultaneous write area:

- **Access error**
  Register not in intended area
- **Length error**
  Data size for writing the value of a single register is not 16 bits.
- **Register not found**
  Incorrect register number, or the number of registers to be written differs from total number of registers in the area.

Display "Modbus register"

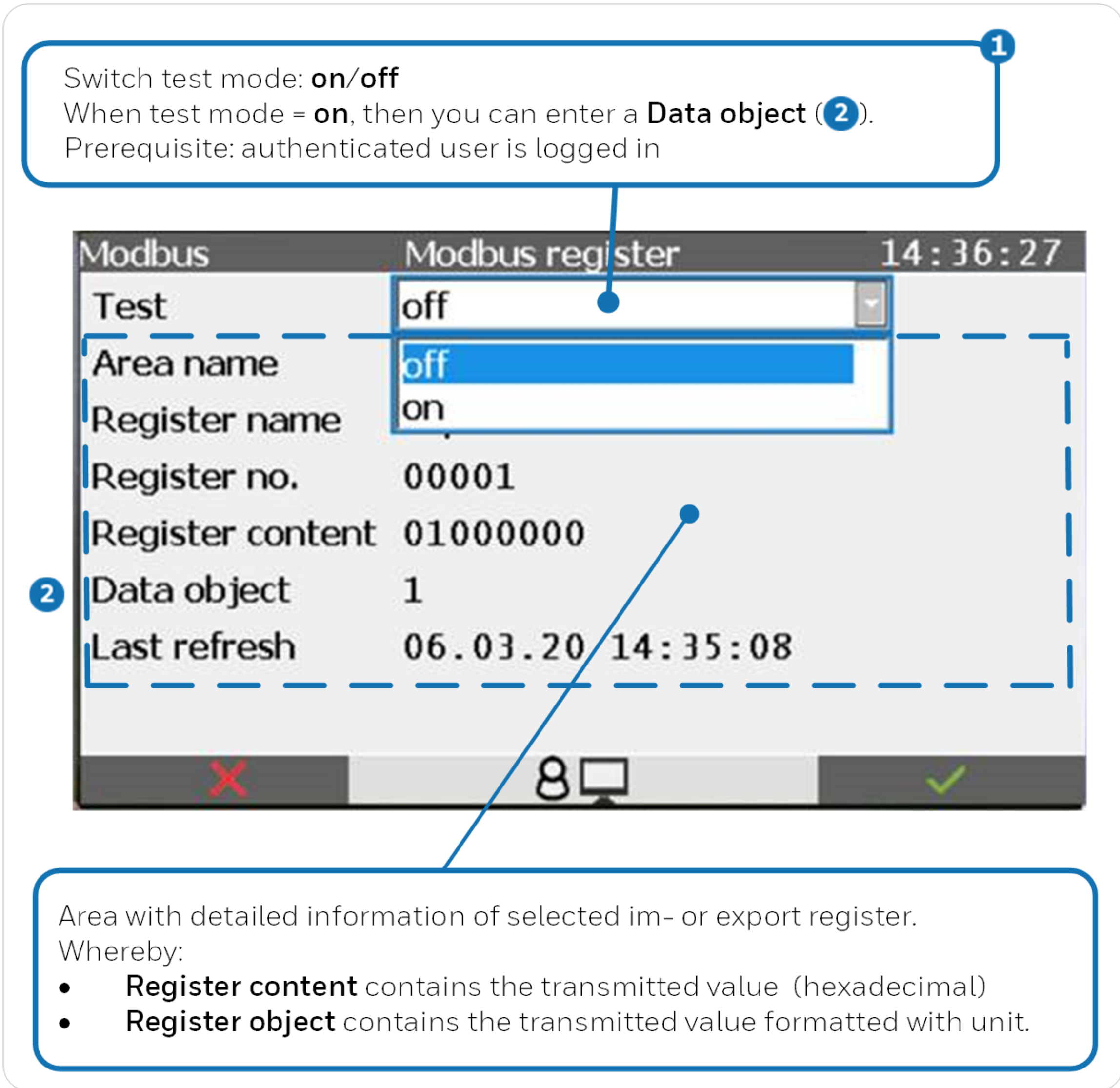


Fig. 3-124: Display **Modbus register** – example

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

Checking export registers on the device

With the AFB, it is possible to check individual export registers directly in the device display – apart from data types **Export date and time**, **Monoflop register** and **Sequence number** (*for archive areas*).

As soon as you log in to the device as a user with the user right **Change general system settings**[1] , you can activate or deactivate the test function.

[1] You can find the setting for the authorization in the parameterization under **<Device> – Basis System – Users – Special user rights**.

Steps in enSuite

Prerequisite(s)

- You are logged in as a user with the user right **Change general system settings**.

To activate the test of an export register, ...

- ... switch to the detailed display of the desired export register via **Modbus – Main display**.
- In the **Modbus register** display, the **Test** line is displayed as a drop down list.
- Select the entry **on** in the drop-down list.
- The test mode is active and the value for the **Data object** can be edited. The text **Data object** is displayed in red font color during the test mode.

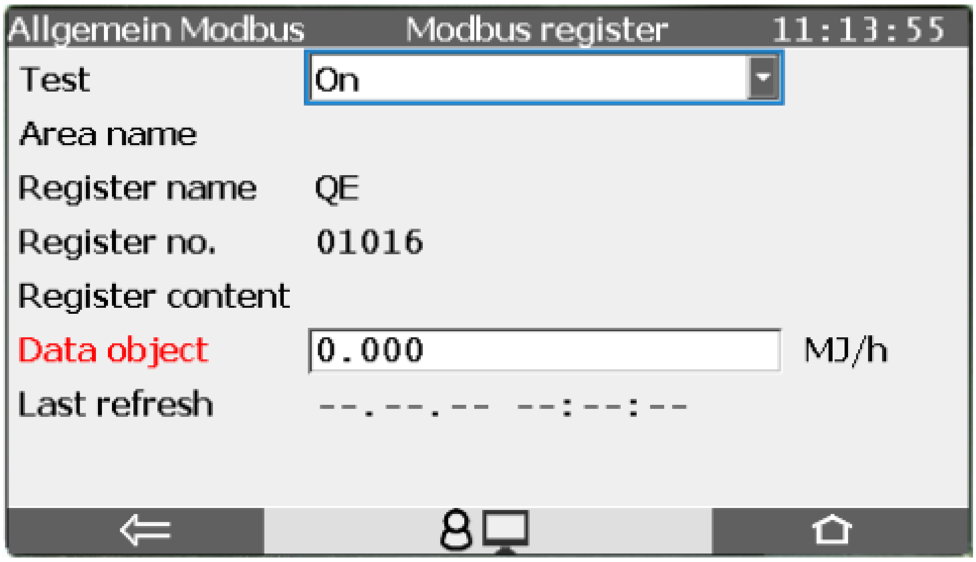


Fig. 3-125: Test function active for selected export register

- In the **Data object** field, enter the desired value that you want to simulate and confirm your entry with the button ✓ .
  The value ranges vary depending on the register type and assigned format.
- The specified value is provided via Modbus until you enter a new value or end the test function.

Exit of test function

The test function ends in the following cases:

- As soon as you navigate to another page in the display, for example, to simulate the value of another register.
- Logoff of the user, for example, due to the inactivity timeout.
- After a restart of the enCore device.

3.7 Device operation (Chomatograph actions)

The aim of the following sections is to familiarize you with the operation and operating modes of the device. **Active connection is needed.**

First, normal automated operation is presented, which delivers continuous results in the form of chromatograms (stored on the device) and associated values. Then operating instructions for the more complex operating modes and functions, e.g. calibration, are explained. Information about chromatograms see ➪ 3.8 Handling with chromatograms (p. 295)

The operation and operating modes of the device are controlled via the chomatograph actions of enSuite which become visible after the connection is established or can be displayed by activating **"Chromatograph"** in the lower part of the navigation window. You get the following view:

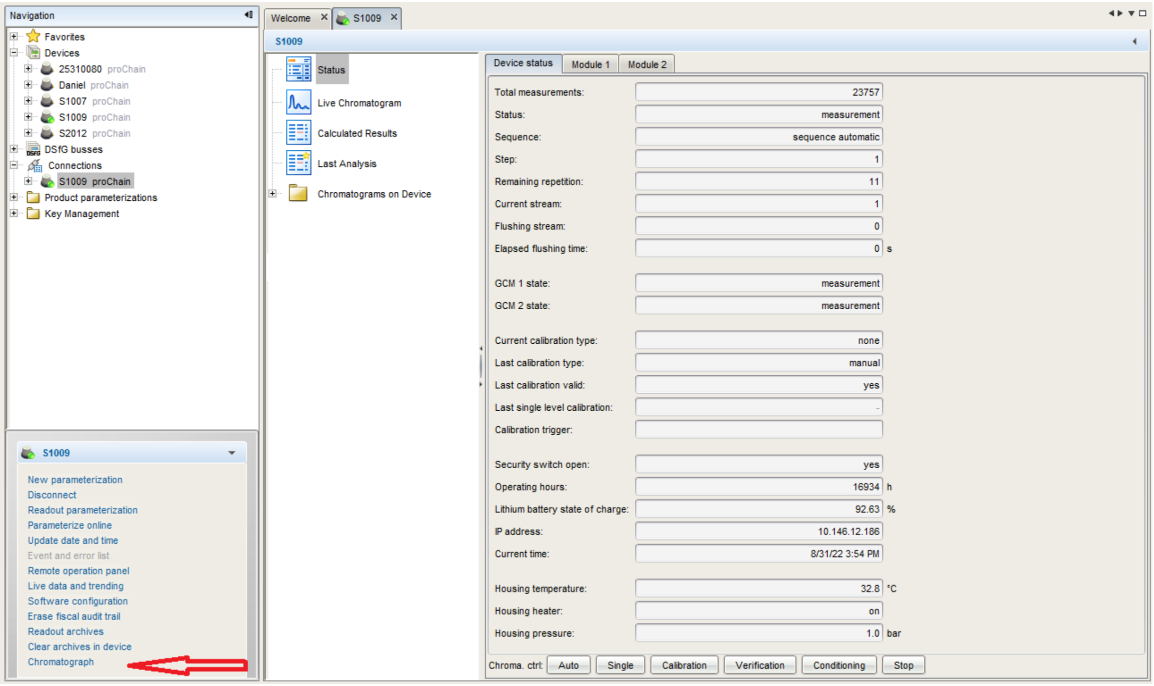


Fig. 3-126: Calling the control and chromatogram functions

The left part of the window opened by the activation contains the following elements, as shown in the figure above:

- **Status** for operating the device and displaying the device status and for additional details about the state of the device and module(s)
- **Live Chromatogram** for graphic observation of the current measurement.
- **Calculated Results** provides a list which can be used as application report.
- **Last Analysis** gives a list with meausred results of the last measurement.
- **Chromatograms on Device** node with saved chromatograms and results.

The right part of the window is used to display the element selected in the left part.

The display remains visible even after the connection is interrupted. Contents are no longer up to date and control is ineffective.

Always pay attention to the in device icon above the display and reconnect if necessary.

The next sections contain the details of the functions and entries.

3.7.1 The control functions

The control functions that operate the device are located in a control/command line at the bottom of the **Status** and **Live Chromatogram** display of the chromatograph actions, see next figure.

Fig. 3-127: Control and operating line

Use the table entries of the status display to check whether the device is already performing a measurement.
➪ 3.7.7 Viewing the current device status (p. 288)

If the device is not yet in operation (Sequence: idle), you can start automated measurements with **Auto** or a single measurement with **Single**.

Calibration allows you to perform a calibration manually.

With **Verification** you can check the performance of the gas chromatograph manually.

Use **Conditioning** to flush impurities from the MEMS column and optimize analytical performance. (not working in the moment for future use.)

You must be logged in for all these actions and the device status must be **Idle** before. A corresponding dialog gives you the opportunity to login. Further details in the following subsections.

The **"Stop"** button makes it possibility set the device to Idle if necessary. The currently state e.g. measurement, will be completed before the device enters the Idle state. This may take up to 140s or the time defined for measurement time in the GC parameter section.

3.7.2 Automation (normal operation mode)

Select **Auto** in the control/command line.

If you are not already logged in, a dialog box appears asking you to do so.

The measurements now run autonomously and continuously using the settings/parameters defined during the commissioning procedure on a recurring basis using a **Sequence table** in an infinite loop.

This table (see section ➪ 3.4 Change settings of the GC AFB (p. 211)) also governs the automatic calibration process, for instance.

A logged-in user can end the automation by clicking on **Stop**.

3.7.3 Single run (manual operation)

In addition to fully automatic measurements, it is also possible to complete just a single measurement, for example for test purposes.

This operating mode is called “Single run”. Short **Single**.

If the device is already working in the automated system, activate **Stop** first. In the device status **Idle**, you can immediately activate the **Single** action when logged in, otherwise the login prompt appears.

If you activate **Stop**" during the single run, the current run will be finished.

After the single run is completed without interruption and without errors, the device will return to **Idle** mode.

The measured values are now saved as **Last Analysis** and are available for further evaluation. You can now start further single runs or use **Auto** to put the device back into continuous operation.

3.7.4 Calibration (autoamatic / manual)

In order to perform a calibration, the calibration gas inlet must be connected to the calibration gas and the **calibration gas data must be valid**. See section ➪ 3.4.7 Adjust gas mixtures / limit values and select calculation (p. 222).

The calibration of the device must be repeated at regular intervals in order to maintain the measurement accuracy with the help of the calibration values found in the process. It takes a few minutes. During the entire calibration time, the last valid gas quality values are maintained via measured value outputs.

Automatic calibration

During normal operation mode **Auto** a trigger ensures that calibration is started without additional intervention at a certain time after completion of a measurement. This runs according to the factory and commissioning settings see section ➪ 3.4.5 Defining and changing sequence settings (p. 214).

After calibration is complete, sample gas is measured again. Measurement then simply continues automatically at the next step in the sequence table.

Manual calibration

In addition, if there are no physical errors in the instrument, you can start a calibration cycle manually at any time, for example after you have replaced the calibration gas cylinder.

- If the Chomatograph actions are not yet displayed activate **Chromatograph** in the lower part of the **enSuite navigation window**.
- Select **Status** and check the device status. This must be **Idle**, i.e. no other functions are running at the moment. If necessary, activate **Stop** at the control/command line and wait until the current run is finished.
- Click the **Calibration** button at the control/command line, when you are logged in. If you are not logged in, the login prompt appears, then log in and repeat.

The instrument carries out the calibration procedure set in the parameterization and returns to the **Idle** state. If you want to cancel press **Stop**.

In case of aborted or faulty calibrations, no changes are made, and the old calibration values remain in use.

If the calibration fails, contact Honeywell for further actions, for example to organize repair work.

3.7.5 Verification (manual operation)

In a verification run, the analysis properties are evaluated using a test gas with a known composition. The measurement results are compared with data from the manufacturer's certificate of analysis. The most practical method is to use the calibration gas as the test gas.

> Since in this special operating mode a test gas or the calibration gas replaces the sample gas, changes to the gas inputs may be necessary. In addition, the analysis data of the gas used must be stored accurately in order to detect deviations reliably. A change in the parameterization may also be necessary for this purpose.

For the next steps the device status must be **Idle**, this means the instrument does not perform any measurements. If necessary, activate **Stop**.

> **DANGER of Explosion**
>
> **Obey all safety instructions for working on gas connections!**
>
> **Conduct a leakage test in any case.**

- Adjust the parameterization and / or connect the sample gas input to the test gas.
- When using a test gas cylinder (with cylinder pressure reducer), open the cylinder and set the pressure to the value of the sample gas pressure. Note ➪ Connect/replace calibration-, carrier-, verification- gas cylinders (p. 132)
- Once the gas line connection has been established and the appropriate parameterization is in the device, you can activate "**Verification**" in the control/command line at the bottom of the **Status** display
- If you are not logged in, the login prompt appears, log in and click the button again. The device executes the sequence set in the parameterization and returns to the **idle** state. If you want to cancel, press **Stop**.
- If necessary, readjust the parameterization and / or the sample gas input for normal operation, then the automation can start again by a click on **Auto**.

After the complete run, according to the settings in section ➪ 3.4.5 Defining and changing sequence settings (p. 214), the measured values are saved under **Calculated Results** and are available for further evaluation.

For results that are not within the limits, a message is generated in the **Logbook** for each peak. Limit values are defined in the peak table.

Read out the logbook according to section ➪ 3.5.1 Working with archives and logs (p. 227) and check the result of the verification.

3.7.6 Conditioning (autoamatic / manual)

At each start or restart, the device performs a short automatic conditioning for all modules with the parameters set under **Conditioning time** and **Conditioning temperature** see **Column 1** and **Column 2** ⇨ GCM-Parameter (p. 218) for each module.

Depending on the settings in section ⇨ 3.4.5 Defining and changing sequence settings (p. 214). Conditioning can start automatically with the paramtriezed valules.

Additionally to this short automatic start up conditioning, you can start a **Manual conditioning** for a longer time. (This is only possible with version 03-40 or higher)

Prerequisite(s)

- The analysis performance of the columns has deteriorated noticeably
- No good separation between nitrogen and oxygen
- The base line is not clear.

Steps

1. Open online parameterization ⇨ 3.3.2 Online parameterization (p. 208)
2. Go to ⇨ GCM-Parameter (p. 218) **Column 1** and change **Conditioning time** as well as **Conditioning temperature**.
   In case of standard application "C6+" (one module) use 175°C / 2h.
   In case of natural gas and hydrogen application "e-Gas"
   use 175°C / 2h for moule 1 modul 2 need no changes.
   In case of decomposition application "bio-Gas"
   use 300°C / 2h for moule 1 and 160°C / 2h for module 2.
3. Activate the Transfer parameterization to device button .
4. Activate **"Chromatograph"** in the lower part of the **enSuite navigation window**.
5. Check the device status (see **Status**). The device status must be **"Idle"** this means no other functions are running in the moment. If necessary, activating **"Stop"** and wait until the current run is finished.
6. Activate the **"Conditioning"** button at the bottom of the **Status** window. Use the log-in prompt which appears, when not already logged in.

The instrument performs the conditioning and returns to the previous operating mode after this is done. If you want to cancel activate **"Stop"** during this operation.

Don't forget to set and transfer the original parameters back to the device after the conditioning is finish.

3.7.7 Viewing the current device status

Select **Status** in the chomatograph actions and you will see a table in the right part of the window. Depending on the number of modules used, some values are displayed on up to two additional tabs.

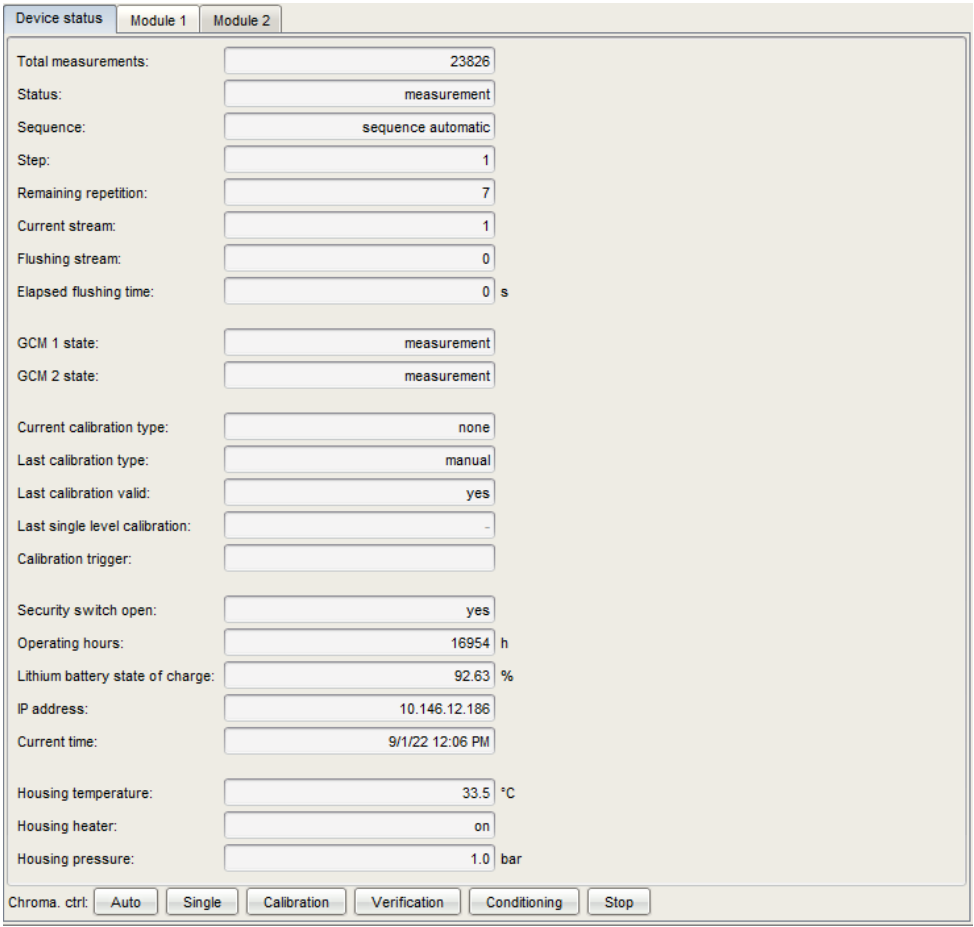


Fig. 3-128: Status table (working details and sensor values)

Total measurements
Number of all measurements that have been performed with this device so far.

Status (work step) and **Sequence** (operating mode)
gives an overview of the current working situation of the device, both individually and in combination.

Eleven work steps are possible, these are:

Inactive(0), Flushing(1), Switching stream analysis(2), Waiting for module ready(3), Start Measurement(4), Measurement(5), Abort Measurement(6), Parameterization(7), Initialization (8), Measurement& Flush next stream(9), Conditioning(10).

Nine operating modes are available, five of them are set by the user. These are the fo-lowing actions:

Auto(2), Single(5), Calibration(3), Verification(4) and Conditioning(8).

The remaining operating modes **Idle(0)**, **Parameter update(1)**, **Initalization(6)** and **Error (7)** are automatically assumed by the device depending on the situation.

When using Modbus, only the numbers in the brackets are transmitted.

A possible combination could be: **Status: Flushing / Sequence: Calibration**

Step:
Operations and work are performed in a sequence of one or more steps. e.g. calibraiton has two steps. The current step number is indicated here.

Remaining repetition:
Number of remaining repetitions for measuring the current stream.

Current stream:
Stream which is measured now.

Flushing stream:
Number of the stream which is flushed now or next.

Elapsed flushing time:
Time since start of flushing the stream mentioned in line above.

GCM state:
Analogous to status and sequence for the device, the status of the individual module is shown here

Current calibration type, **Last calibration type**, **Last calibration valid**, **Last singel level calibration** and **Calibration trigger** provide information about the calibration settings e.g. automatic or manual and history of the device calibration.

Security switch open, **Operating hours**,
Lithium battery state of charge, **IP address** and **Curent time**
provide information from a classic device monitor as it is used with other enCore devices

Housing temperature:
Display of sensor measured housing temperature

Housing heater:
Current status of the Heater (on / off)

Housing pressure:
Sensor measured housing pressure (usually ambient pressure)

A second and, in case of two modules, a third tab give additional information about the module(s). These tabs are identical in structureand contain the information shown in the figure.

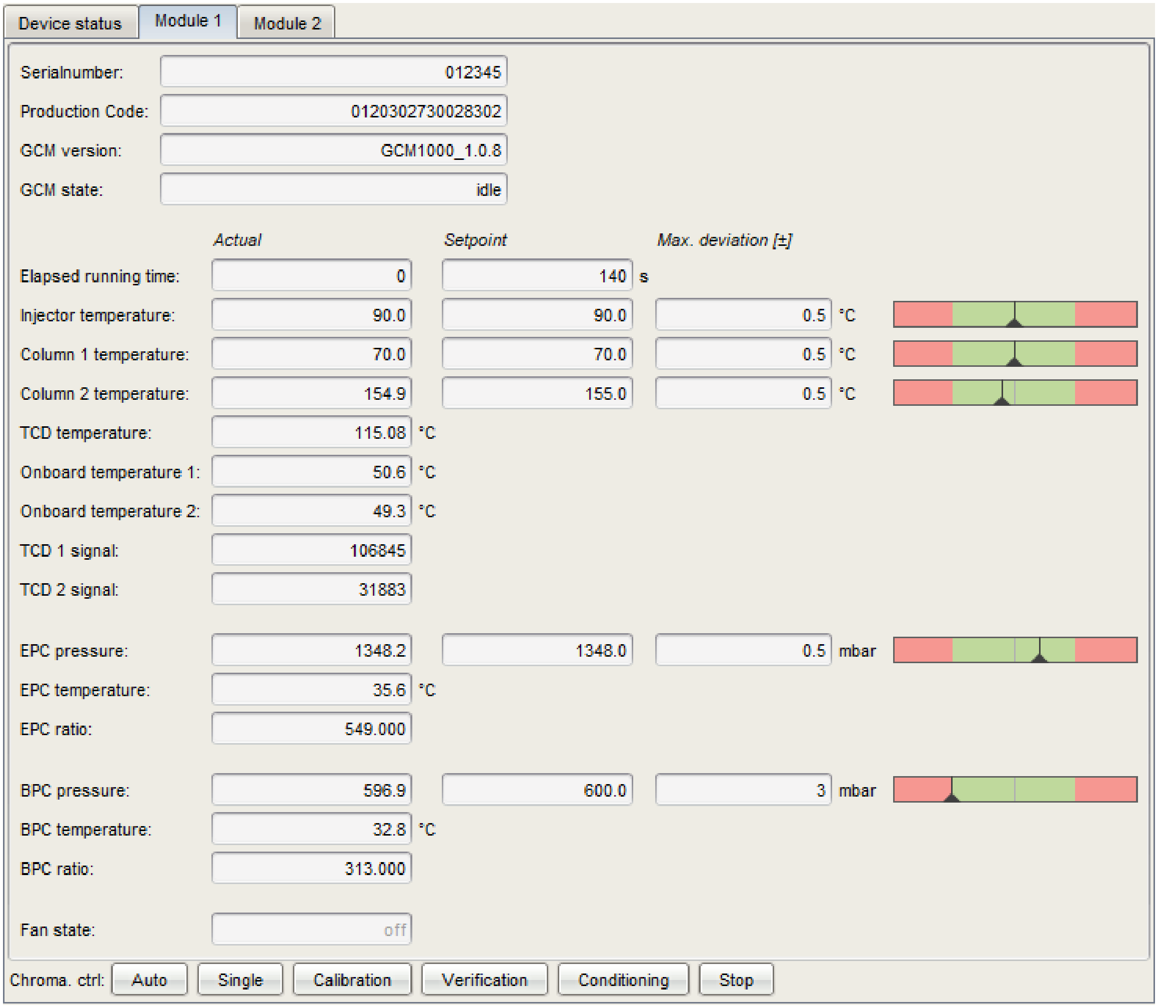


Fig. 3-129: Module status details

> **The colored scales behind some entries let you see directly if the corres-ponding value is in the intended (green) range.**

You can view some of these entries alternately e.g. with **Live Chromatogram** to better evaluate the graphs of the chromatogram and to get additional information.

3.7.8 Viewing a live chromatogram

After a click on node **"Live Chromatogram"** two chromatogram areas are displayed on the right side of the window. If two modules are used select tab **Chart Module 1** for the first module or **Chart Module 2** to view the measurement of the second module. If the instrument is already performing a measurement, the areas up to the "live point" are quickly filled with graphs, after which the result graphs are plotted in real time.

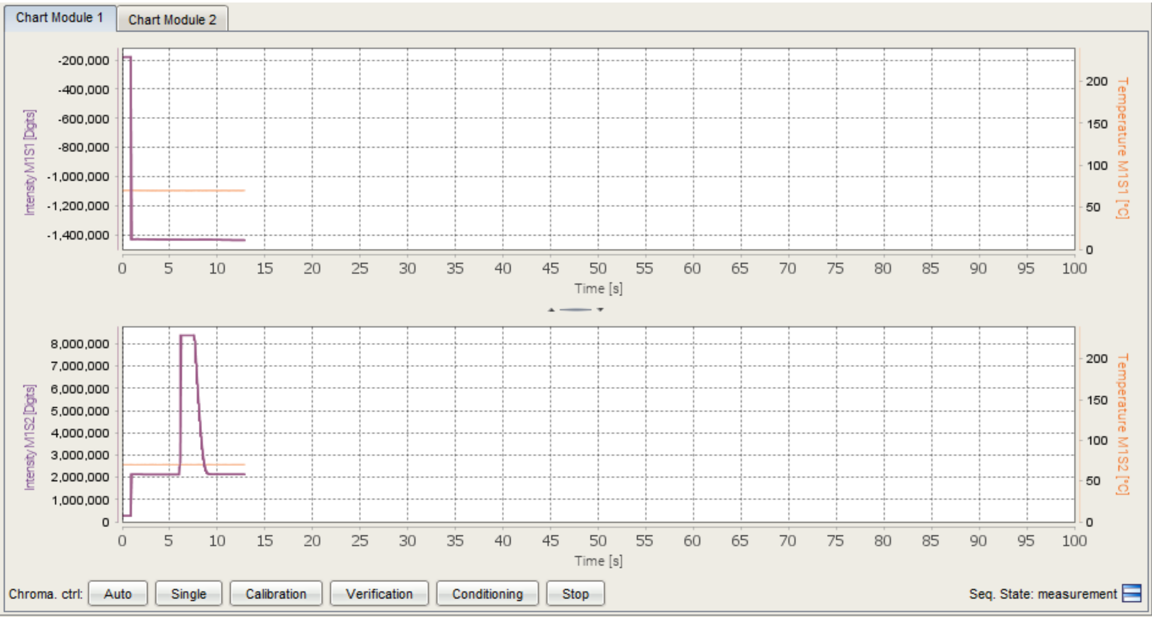


Fig. 3-130: Live data tab chromatograms

Values are displayed in graphic form as chromatograms in two drawing sections. Since each GCM1000 module consists of two systems (pre-column and main column with detectors), **a measurement always consists of both chromatograms**.

The purple graph shows the deflection of the detector (Y value). When combined with the time (X axis), we obtain the lines in the chromatogram known as **"peaks"**. The area under such a peak corresponds to the proportion of the gas component in the sample. The temperature at which the purple measurements were found is shown by the orange line to make the values easier to assess.

The **control functions** are displayed again under the chomatograms ⇨ 3.7.1 The control functions (p. 283), as well as the **sequence state**. After the measurement is finished, the result is saved in a file. This file can be displayed again as a chromatogram. Further information in section ⇨ 3.8 Handling with chromatograms (p. 295). If you have used the **ZOOM function** described in section ⇨ 3.8.5 Adjusting the view (zoom) (p. 300), you can reset the view of the chromatograms to the normal size with this button.

The evaluation (numerical values) of the chromatogram can also be viewed under **"Last Analysis"** if no new measurement has been completed.

Please note that regardless of the connected measuring paths (streams) and built-in modules, the current measurement is always displayed here, which must be assigned accordingly if necessary.

3.7.9 View Calculated Results (application report)

Calculated Results gives a list with used settings and calculated data as well as stream information. This report normally is used by the operator. Details are shown in the following figure.

Overview

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5	Cal. Stream	Unit
Measurement number	20245	20246	0	0	0	0	
Measurement time	2022-01-11T11:01:33Z	2022-01-11T11:04:31Z	-	-	-	-	
Any Error	no	no	no	no	no	no	
Total Peaks	9	9	0	0	0	0	
Unknown Peaks	0	0	0	0	0	0	
Calculation standard	ISO 6976:2016	ISO 6976:2016	ISO 6976:1995	ISO 6976:1995	ISO 6976:1995	ISO 6976:2016	
Base conditions	25/0°C, 101.325 kPa	25/0°C, 101.325 kPa	25/0°C, 101.325 kPa	25/0°C, 101.325 kPa	25/0°C, 101.325 kPa	25/0°C, 101.325 kPa	
Calculated results							
Hs	761.88141	915.11490	0.00000	0.00000	0.00000	0.00000	kJ/mol
HsV	34.07111	40.94314	0.00000	0.00000	0.00000	0.00000	MJ/m³
HsM	39.86204	51.58320	0.00000	0.00000	0.00000	0.00000	MJ/kg
Hi	687.17069	826.30178	0.00000	0.00000	0.00000	0.00000	kJ/mol
HiV	30.73007	36.96955	0.00000	0.00000	0.00000	0.00000	MJ/m³
HiM	35.95314	46.57698	0.00000	0.00000	0.00000	0.00000	MJ/kg
Zb	0.997659	0.997185	0.000000	0.000000	0.000000	0.000000	
Ws	41.90636	52.25787	0.00000	0.00000	0.00000	0.00000	MJ/m³
Wi	37.79699	47.18618	0.00000	0.00000	0.00000	0.00000	MJ/m³
rd	0.66102	0.61385	0.00000	0.00000	0.00000	0.00000	
ρ	0.85473	0.79373	0.00000	0.00000	0.00000	0.00000	kg/m³
M	19.1130	17.7406	0.0000	0.0000	0.0000	0.0000	g/mol
Components							
CH4	81.9969	90.4748	0.0000	0.0000	0.0000	0.0000 mol%	mol%
N2	12.0674	0.7941	0.0000	0.0000	0.0000	0.0000 mol%	mol%
CO2	4.4343	2.0161	0.0000	0.0000	0.0000	0.0000 mol%	mol%
C2H6	0.7501	6.1358	0.0000	0.0000	0.0000	0.0000 mol%	mol%
C3H8	0.3036	0.4775	0.0000	0.0000	0.0000	0.0000 mol%	mol%
n-C4H10	0.2013	0.0507	0.0000	0.0000	0.0000	0.0000 mol%	mol%
i-C4H10	0.1962	0.0445	0.0000	0.0000	0.0000	0.0000 mol%	mol%
n-C5H12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 mol%	mol%
i-C5H12	0.0502	0.0000	0.0000	0.0000	0.0000	0.0000 mol%	mol%
neo-C5H12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 mol%	mol%
C6H14	0.0000	0.0064	0.0000	0.0000	0.0000	0.0000 mol%	mol%
C7H16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 mol%	mol%
C8H18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 mol%	mol%
C9H20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 mol%	mol%
C10H22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 mol%	mol%
H2	0.0000	0.0000	-	-	-	-	mol%
O2	0.0000	0.0000	-	-	-	-	mol%

Fig. 3-131: Results (application report)

3.7.10 View the last analysis in numerical values

"Last Analysis" contains the last current measurement result, regardless of when the chromatogram function window was opened via enSuite.

Head- and Peak-Data are shown, the following figure gives an example.

You need a connection to the device ⇨ 3.1.2 Data connection to the measuring device (p. 146)

> With the settings selected in section ⇨ 3.3 Notices about parameterization (p. 204), you can change the display of the corresponding physical meaning for each peak.

Last Analysis

Stream: 1 | Total measurements: 23905
Measurement time: 9/1/22 4:48 PM | Sequence: sequence automatic
Not normalized sum: 98.6467 mol%

	N2	CH4	CO2	C2H6	C3H8	i-C4H10	n-C4H10	neo-C5H12	i-C5H12	n-C5H12	C6+
Module	1	1	1	1	1	1	1	1	1	1	1
Measured by system	1	1	1	1	1	1	1	1	1	1	2
Peak start	7.08	7.59	11.79	19.95	47.03	70.87	78.16	0.00	107.14	108.03	5.80
Measured retention time	7.46	7.69	13.50	22.23	50.22	74.73	80.92	0.00	107.79	108.53	7.11
Peak end	7.59	10.73	15.64	26.54	53.65	77.11	83.27	0.00	108.03	109.08	9.53
Peakgroup membership	0	0	0	0	0	0	0	0	0	0	0
Area	4815627	413355657	14808340	50337210	5609929	827819	812326	0	24386	29738	1324162
Concentration not normalized	0.6882	89.5121	1.9496	5.9218	0.4592	0.0518	0.0493	0.0000	0.0012	0.0014	0.0120
Concentration normalized	0.6977	90.7401	1.9764	6.0030	0.4655	0.0525	0.0500	0.0000	0.0013	0.0015	0.0121
Verification out of limit	no	no	no	no	no	no	no	no	no	no	no
Cal. limit exceeded	no	no	no	no	no	no	no	no	no	no	no
Calibration base	area	area	area	area	area	area	area	area	area	area	area
Retention time tolerance left	1.00	1.00	1.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	1.00
Retention time	7.40	7.70	13.00	22.50	49.70	74.40	80.70	95.00	105.50	110.00	7.50
Retention time tolerance right	1.00	1.00	2.00	3.00	3.00	3.00	3.00	4.00	3.00	3.00	3.00
Intercept coefficient	0.000	1.645	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Linear coefficient	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Quadratic coefficient	0.000	0.000	-0.000	0.000	0.000	0.000	0.000	-0.000	0.000	0.000	0.000
Cubic coefficient	-0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Calibration factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Base cal. deviation limit	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	100.00
Auto cal. deviation limit	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	100.00
Verification deviation limit	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000	5.0000

Fig. 3-132: Section of last analysis table

After this additional buffering, these values are stored in a file under the node **"Chromatograms on Device"**.

With enSuite, you can obtain (redraw) chromatograms from these files as often as you like at any time, regardless of the current measurement task of the instrument, and open them for further processing.

3.7.11 View stored chromatograms

Chromatograms on Device is a folder that contains the results files of previous measurements. Up to 2000 measurements can be saved. To view the stored chromatograms, open this folder in the **Chromatogragraph actions**.

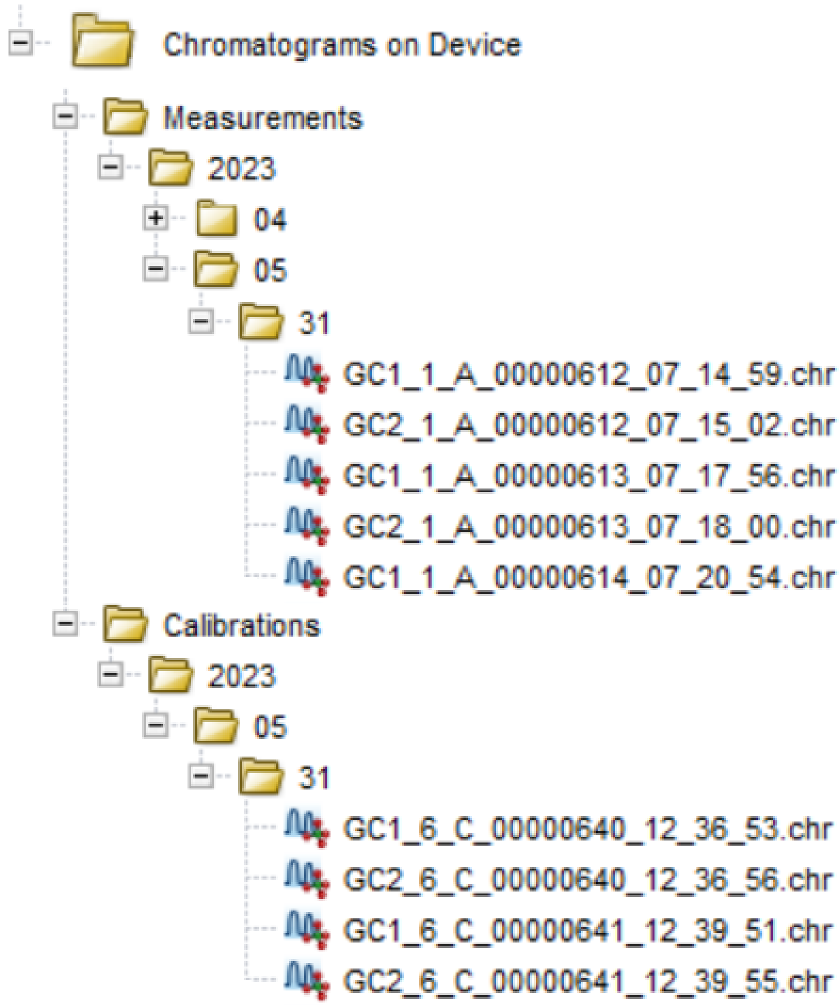


Fig. 3-133: Stored chromatograms in the device

The chromatograms of measurement and calibration are stored separately. Subfolders with years, months and days appear, see the figure above. In the day nodes you will find the files with the results.

The content at the time of function activation is displayed. If the data you are looking for is newer, use the **Refresh** function in the context menu or the **F5**. function key.

If you now click on the desired entry, you will get a view similar to the **Live Chromatogram** In contrast, this graphical display is immediately filled with the stored data and presents the evaluated results with labels.

3.8 Handling with chromatograms

3.8.1 Transfer stored chromatograms

> Chromatogram files are build on the device.
> After 2000 measurements the oldest files are overwritten.
> To save them and to be able to view the chromatograms without the device, we recommend a transfer to enSuite.

Prerequisite(s)

- A connection to the device exist
  and folder **Chromatograms on Device** is opened.

Steps

1. Select a node and choose **Save** in the context menu, to save the data like the parameter settings. (New sub nodes are created in the **Navigation window**)

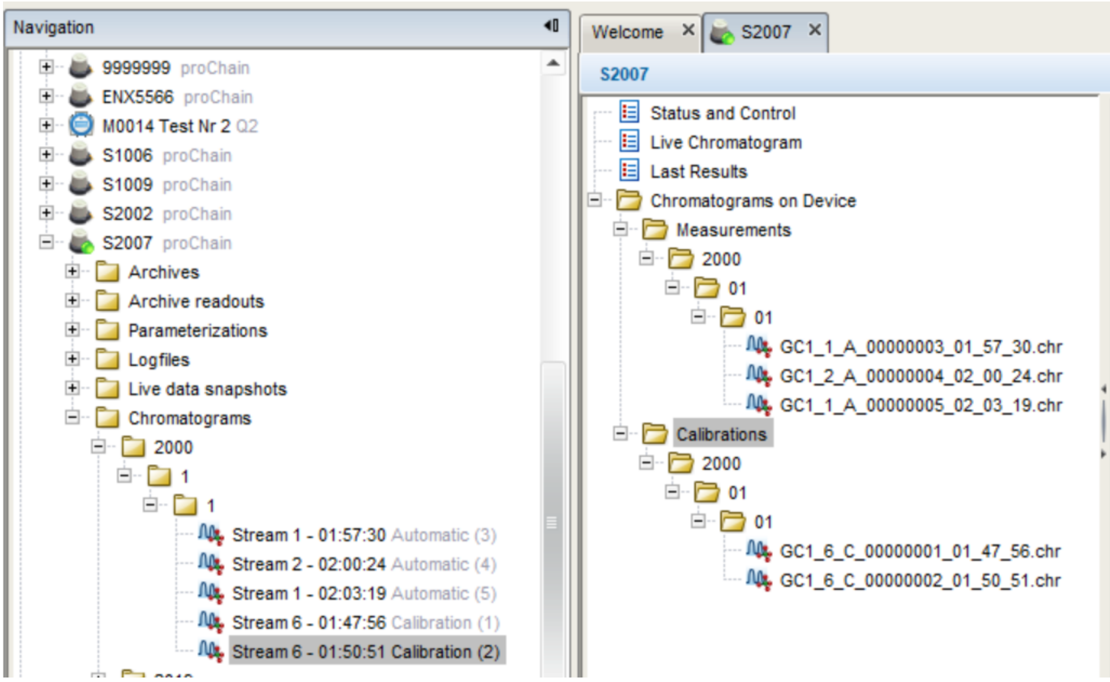


Fig. 3-134: Stored chromatograms in enSuite

2. (optional for export chromatogram files to the hard disk of the computer.)
   Click on the desired measurement, open the context menu and select **Export**.

The files stored in enSuite can be used in the same way as those stored in the device.

If you have done an **Export** to the hard disk of the computer the files should be saved under a defined name as a backup copy. This chromatogram files can be imported back into enSuite. This is done analogously to the parameterization import ➪ Import parameter settings (Reset device) (p. 157)

3.8.2 Identify stored chromatograms

The Chromatogram files have an identifier or can be assigned based on the following information (e.g. **GC1_ 6_ C_ 00000003_ 09_ 23_ 24**on device) or (e.g. **Stream1-07:27:19Automatic (23,783** in enSuite).

Examples on the device:

GCX_ - _ - = first three digits are used for GCM (X= 1 or 2 possible)
- - - _ 1 _ - = sample stream number (from 1 to 5 (6) is possible)

GC1_1_A = this is a chromatogram of an automated measurement (A)
GC1_2_S = this is a chromatogram of a single measurement (S)
GC1_6_C = this is a chromatogram of a calibration (C)
GC1_3_V = this is a chromatogram of a verification (V)
Measurement number and time* follow: _00000003_09_23_24

Examples in enSuite :

StreamX- = the stream of measuring gas

hh:mm:ss = measuring time *

Automatic = type of measurement (auto, single, calib. verification)

e.g.(12,123) = measurement number in brackets

*The time set on the device at which the chromatogram was saved is indicated.

3.8.3 Options for stored chromatograms

The context menu offers additional functions for the chromatogram files, depending on opening in **Chromatograms on device** or **Navigation window**.

Add to Overlay View opens the chromatogram for a comparative analysis and offers the possibility to optimize settings with the function **Recalculation**.
➪ 3.8.6 Overlaying chromatograms (maintenance) (p. 303)

Open Chromatogram opens the chromatogram in a new window,
alternatively you can double click on it.
➪ 3.8.4 Open stored chromatograms (p. 297)

Delete
enables you to remove no longer used chromatograms from enSuite storage.

The **Copy** option is future use and has currently no function.

3.8.4 Open stored chromatograms

With a click (or double click if saved in enSuite) on the desired measurement, it will be displayed as a chromatogram (in 2 areas) on the right side of the window.

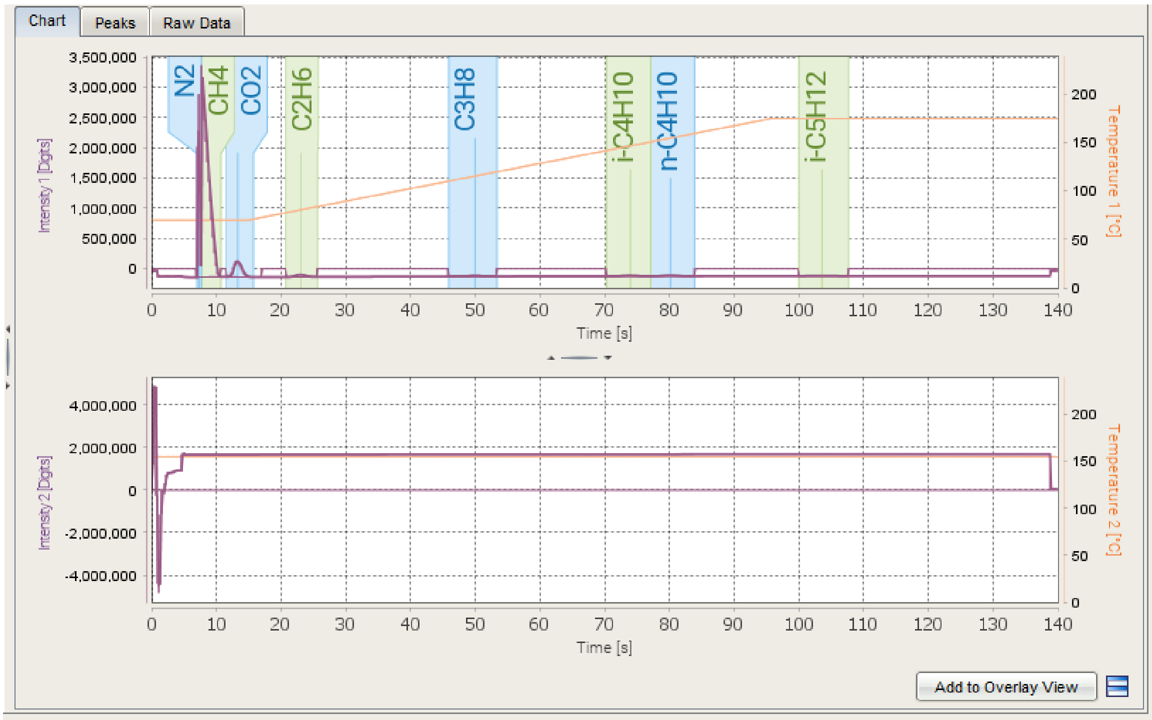


Fig. 3-135: Chromatogram example

In the lower right corner of the window two buttons **Add to Overlay View** and (**reset to normal size**) appear, further information in following sections.

In addition, the graphs are evaluated, and results are displayed graphically, see example.

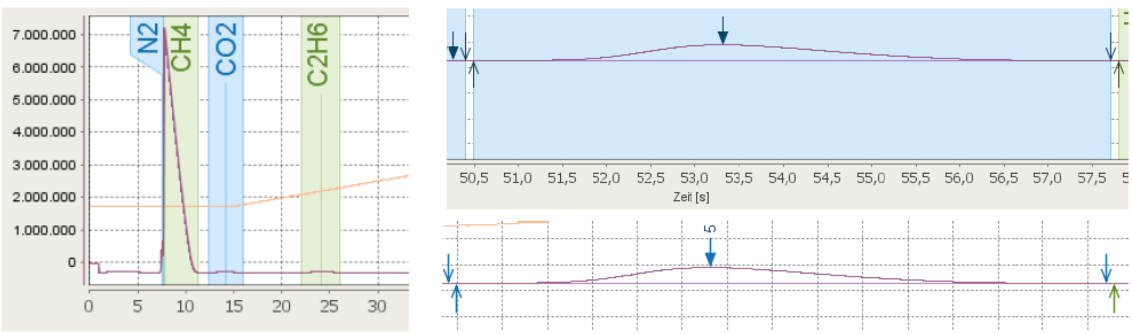


Fig. 3-136: Various peak views

Except for the labeling of the chromatogram area, the call from **Chormatograms on Device** or from **enSuite Navigation** does not differ from **Live Chromatograms**.

If you open the context menu in the chromatogram area, you can change the views under **Next Peak View Mode**. Alternatively press the letter **M**in the chromatogram area, see figure.

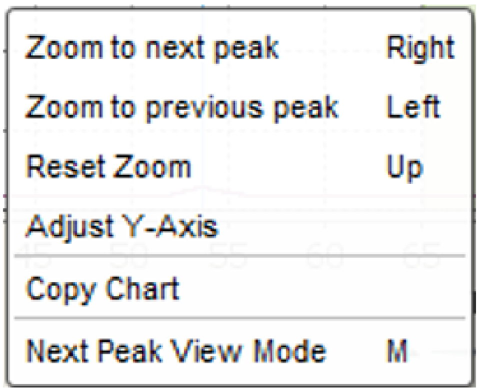
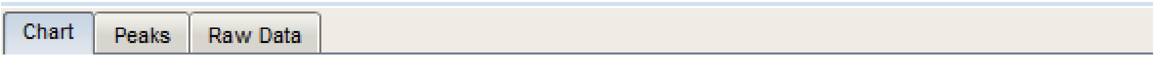


Fig. 3-137: Peak views and change of representation

Two further registers (**Peaks / Raw Data**) are also created. **Peaks** contains a list of all peak related calculated values. **Raw Data** includes the chromatogram data in text form. This list of abbreviationed values is not nessesary for normal operation and not described further on.



In case of calibration an additional special register (**Calibration Report**) is created. This register contains a list of calibration results.

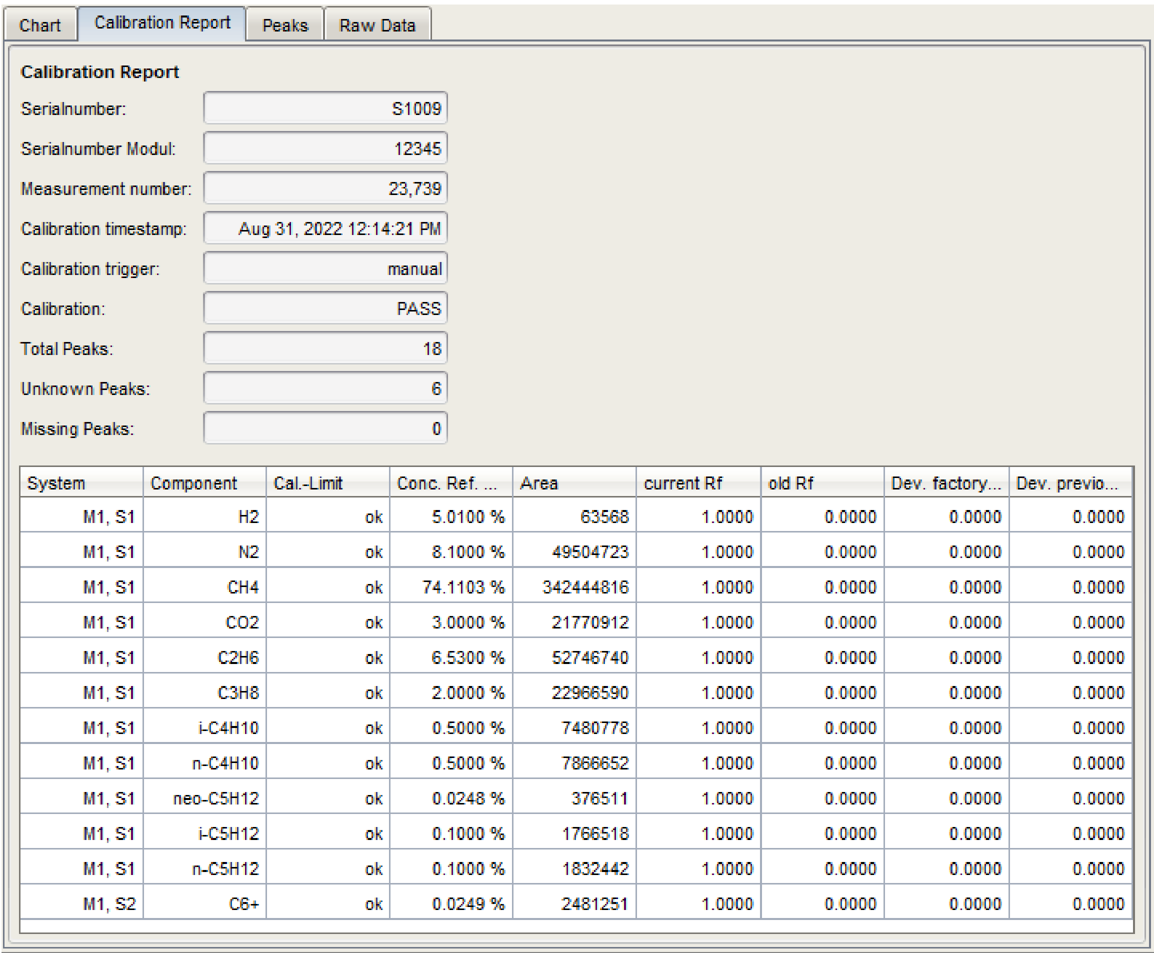


Chart | Calibration Report | Peaks | Raw Data

Calibration Report

Serialnumber:	S1009
Serialnumber Modul:	12345
Measurement number:	23,739
Calibration timestamp:	Aug 31, 2022 12:14:21 PM
Calibration trigger:	manual
Calibration:	PASS
Total Peaks:	18
Unknown Peaks:	6
Missing Peaks:	0

System	Component	Cal.-Limit	Conc. Ref. ...	Area	current Rf	old Rf	Dev. factory...	Dev. previo...
M1, S1	H2	ok	5.0100 %	63568	1.0000	0.0000	0.0000	0.0000
M1, S1	N2	ok	8.1000 %	49504723	1.0000	0.0000	0.0000	0.0000
M1, S1	CH4	ok	74.1103 %	342444816	1.0000	0.0000	0.0000	0.0000
M1, S1	CO2	ok	3.0000 %	21770912	1.0000	0.0000	0.0000	0.0000
M1, S1	C2H6	ok	6.5300 %	52746740	1.0000	0.0000	0.0000	0.0000
M1, S1	C3H8	ok	2.0000 %	22966590	1.0000	0.0000	0.0000	0.0000
M1, S1	i-C4H10	ok	0.5000 %	7480778	1.0000	0.0000	0.0000	0.0000
M1, S1	n-C4H10	ok	0.5000 %	7866652	1.0000	0.0000	0.0000	0.0000
M1, S1	neo-C5H12	ok	0.0248 %	376511	1.0000	0.0000	0.0000	0.0000
M1, S1	i-C5H12	ok	0.1000 %	1766518	1.0000	0.0000	0.0000	0.0000
M1, S1	n-C5H12	ok	0.1000 %	1832442	1.0000	0.0000	0.0000	0.0000
M1, S2	C6+	ok	0.0249 %	2481251	1.0000	0.0000	0.0000	0.0000

Fig. 3-138: Calibration Report (Pass)

If the calibration failed, as shown in following example the information can used to find out the reason. The figure shows the monitored details.

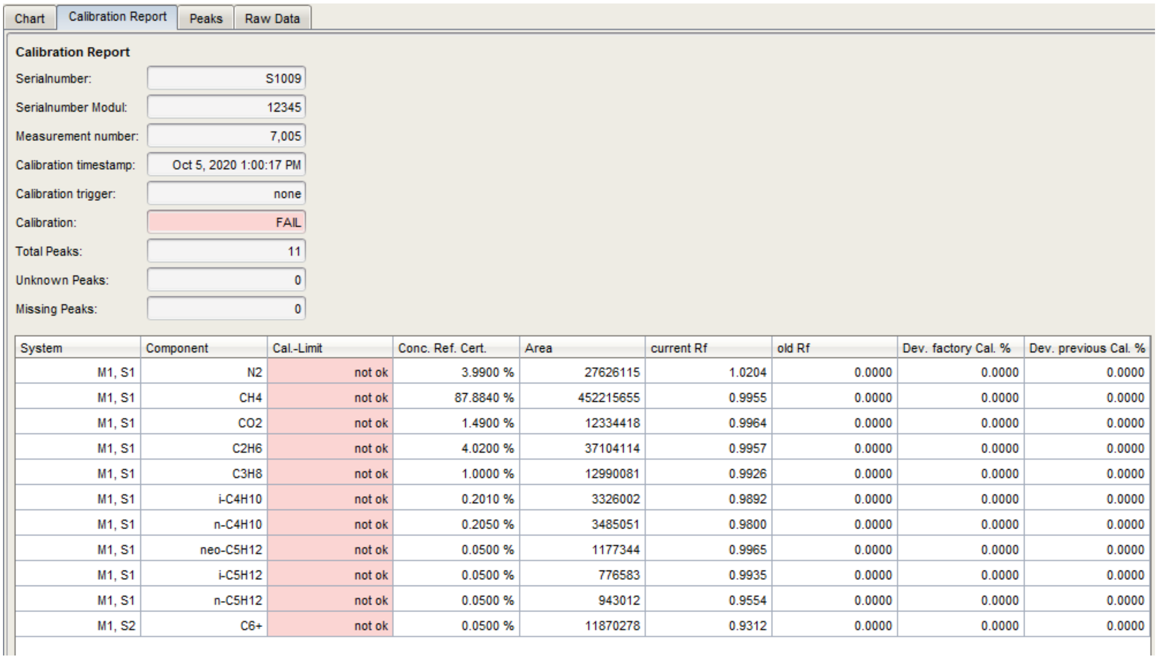


Chart | Calibration Report | Peaks | Raw Data

Calibration Report

Serialnumber:	S1009
Serialnumber Modul:	12345
Measurement number:	7,005
Calibration timestamp:	Oct 5, 2020 1:00:17 PM
Calibration trigger:	none
Calibration:	FAIL
Total Peaks:	11
Unknown Peaks:	0
Missing Peaks:	0

System	Component	Cal.-Limit	Conc. Ref. Cert.	Area	current Rf	old Rf	Dev. factory Cal. %	Dev. previous Cal. %
M1, S1	N2	not ok	3.9900 %	27626115	1.0204	0.0000	0.0000	0.0000
M1, S1	CH4	not ok	87.8840 %	452215655	0.9955	0.0000	0.0000	0.0000
M1, S1	CO2	not ok	1.4900 %	12334418	0.9964	0.0000	0.0000	0.0000
M1, S1	C2H6	not ok	4.0200 %	37104114	0.9957	0.0000	0.0000	0.0000
M1, S1	C3H8	not ok	1.0000 %	12990081	0.9926	0.0000	0.0000	0.0000
M1, S1	i-C4H10	not ok	0.2010 %	3326002	0.9892	0.0000	0.0000	0.0000
M1, S1	n-C4H10	not ok	0.2050 %	3485051	0.9800	0.0000	0.0000	0.0000
M1, S1	neo-C5H12	not ok	0.0500 %	1177344	0.9965	0.0000	0.0000	0.0000
M1, S1	i-C5H12	not ok	0.0500 %	776583	0.9935	0.0000	0.0000	0.0000
M1, S1	n-C5H12	not ok	0.0500 %	943012	0.9554	0.0000	0.0000	0.0000
M1, S2	C6+	not ok	0.0500 %	11870278	0.9312	0.0000	0.0000	0.0000

Fig. 3-139: Calibration Report (FAIL)

3.8.5 Adjusting the view (zoom)

Besides the peak views there are further options to change the view of the chromatograms. There are various procedures to choose from.

The view of a chromatogram can be enlarged **(ZOOM IN)**. You can enlarge any part by left clicking in the chromatogram section and drawing a rectangle over the desired area while holding the left mouse button. This will then be highlighted in color. To do this, start at the left corner above the section that you wish to enlarge. The figure below shows the change:

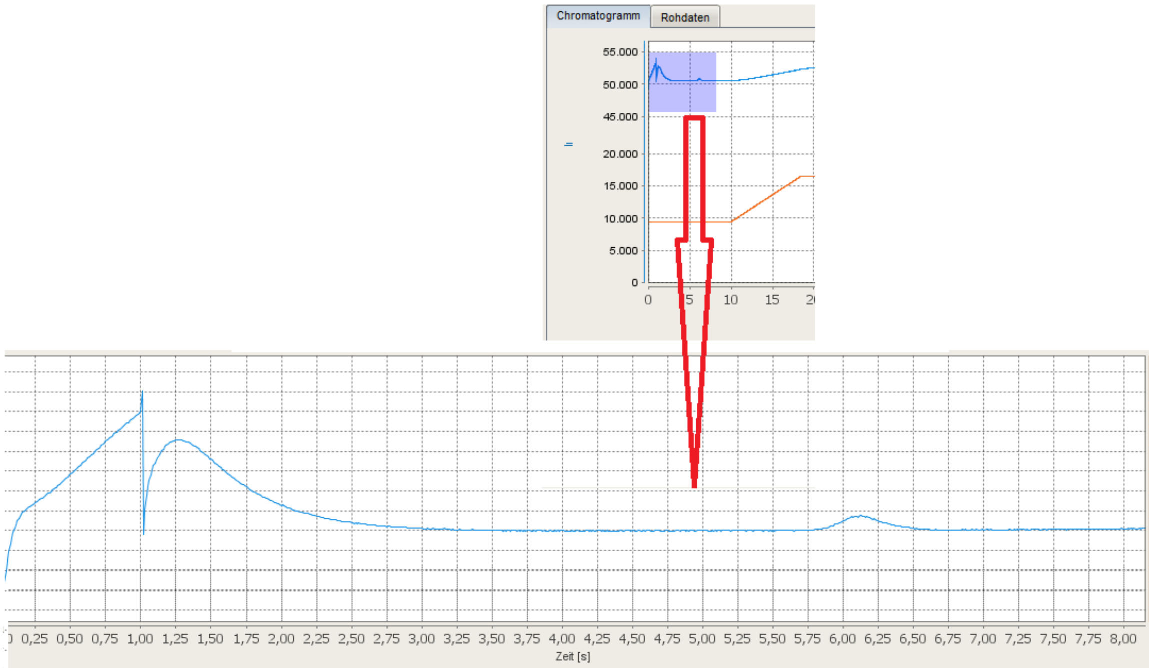


Fig. 3-140: Zoom example 1

The selected rectangle is then spread over the available area, adjusting the X and Y axes in the process. With **"Ctrl" + left mouse button**, you can move the selected section within the chromatogram.

You can also use the context menu above. With the selection **Zoom to next peak** the first peak is optimally enlarged. If you select it again, the second peak will be enlarged, etc. If you select **Zoom to previous peak**, you will return to the previous peaks step by step.

Use the context menu opened with the right mouse button in the chromatogram area and the **Reset zoom** entry to return to the reduced previous general view.

You can also restore the original view by clicking on the  symbol (at the bottom right in the chromatogram window).

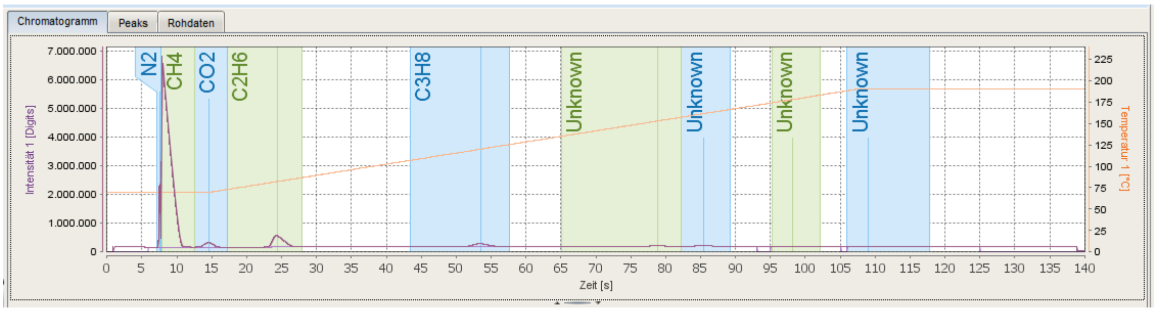


Fig. 3-141: Zoom example 2

If you press e.g. the cursor key <right> the first peak (in the example N_2) is enlarged. See the following figure.

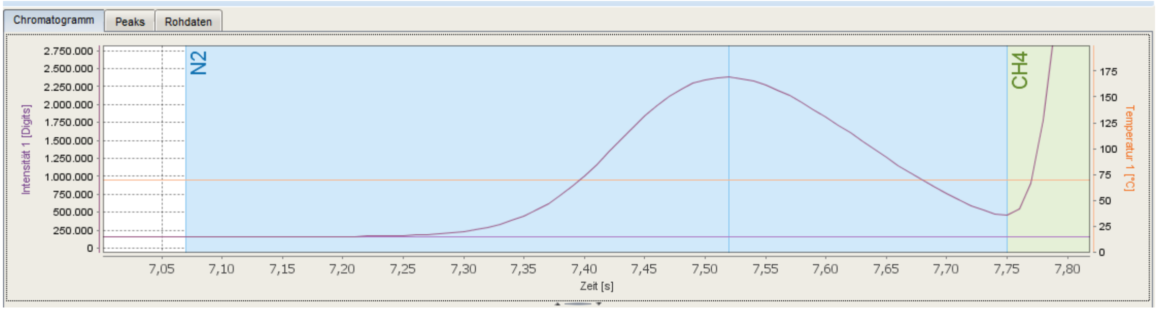


Fig. 3-142: Zoom example 3

Press this key again to display the next peak (same as when using the context menu), in the example CH_4.

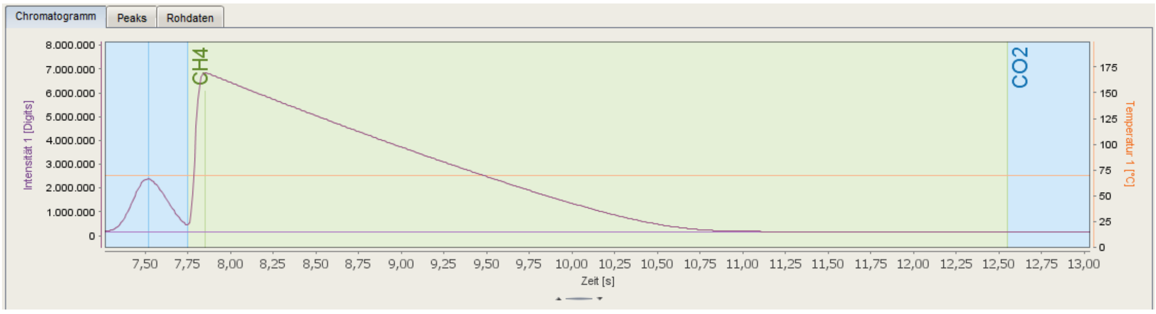


Fig. 3-143: Zoom example 4

With the cursor key <right> you continue to run through the chromatogram each time you press. Press the cursor key <left> the direction is changed, and you return to the previous peaks until you reach the first one again.

Use the cursor key <up> to cancel the magnification and return to the overall view in the same way as in the context menu use.

The course key <down> and the <Shift> key extend the display options compared to the context menu.

If you want to use the zoom functions again after completion, you can return to the last zoomed view with <down>.

If you press the <Shift> key in combination with a cursor key, you can increase or decrease the number of peaks displayed with each press. See examples:

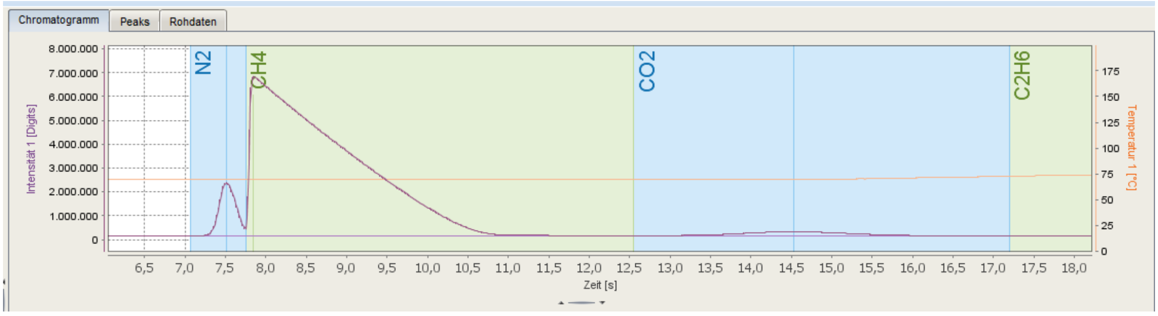


Fig. 3-144: Zoom example 5

(<Shift>+<right>) Number of peaks displayed increases.

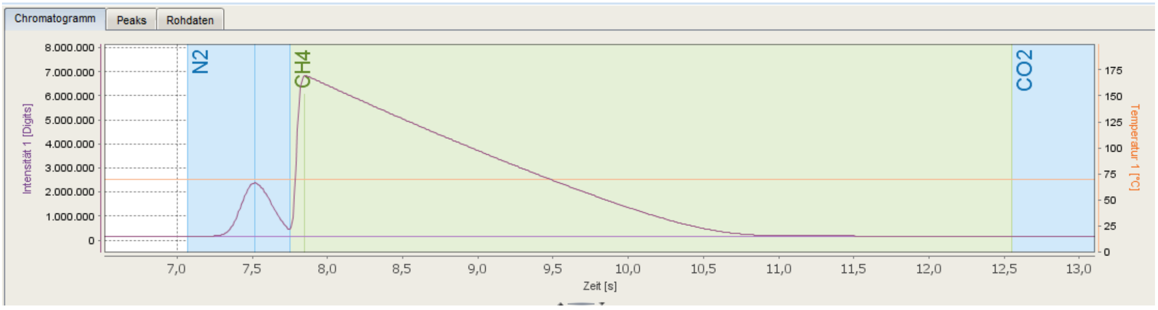


Fig. 3-145: Zoom example 6

(<Shift> +<left>) Number of peaks displayed decreases.

Another possibility for ZOOM IN and ZOOM OUT is the mouse wheel. When the wheel is turned, the contents are displayed up to extreme magnifications and reductions.

This method is not as comfortable as the previous ones and should only be used by experienced users.

3.8.6 Overlaying chromatograms (maintenance)

With this function, up to 20 stored chromatograms can be simultaneously loaded. This makes it easy to compare chromatograms and detect differences. Chromatograms can be selected (as mentioned before) by the context menu (right mouse button). Only the graphs (without integrated peaks and results) are displayed.

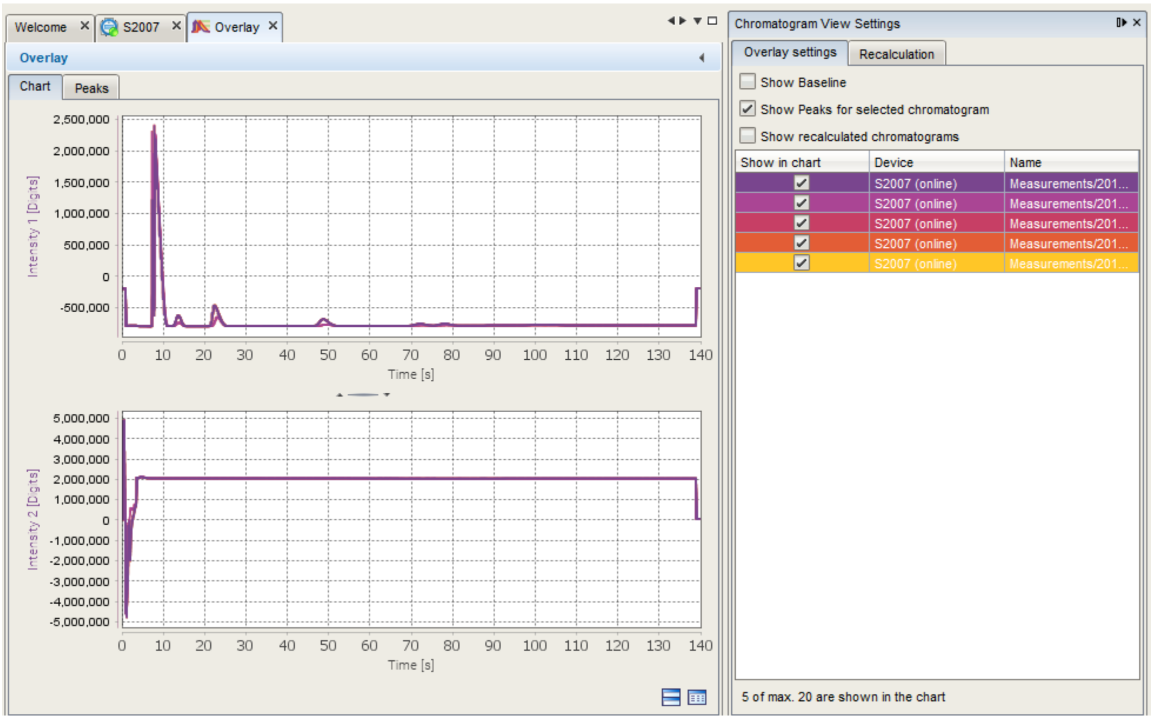


Fig. 3-146: Overlay View (Chart)

By setting check marks on tap **Overlay settings** on the right-hand side of the window, you can select desired view properties and define which chromatograms are to be displayed. If the window does not appear automatically after opening, you can open it with the symbol at the bottom right of the chromatogram display.

To compare numeric values and results use the tab **Peaks**. (See next figure)

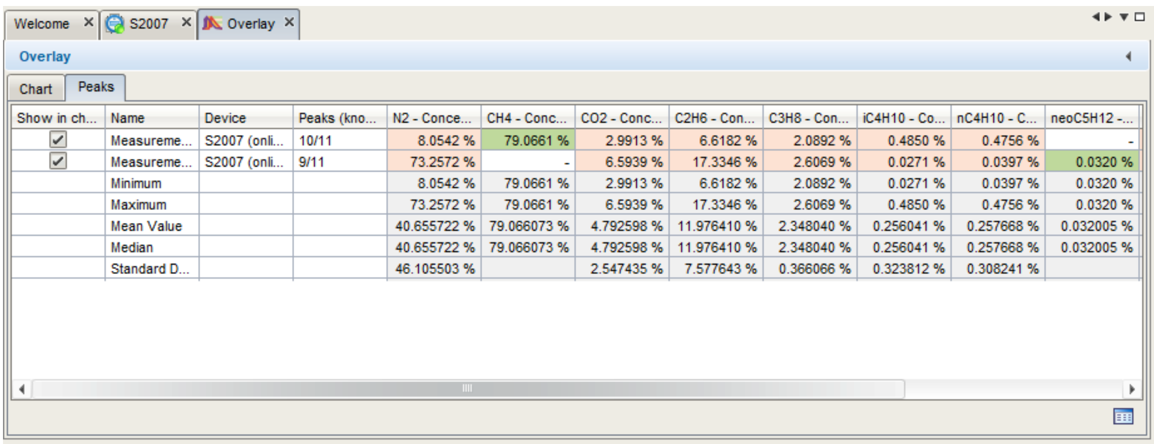


Fig. 3-147: Overlay View (Peaks)

You are able to open a **Peak Settings** window with the symbol at the bottom right, if it is not already displayed.

In this window, you can use radio buttons and check boxes to adjust and filter the displayed values of the list, shown in figure before, for evaluation.

The second tab of the window called **Recalculation** can be used to adjust and optimize the settings (peaks, integration...) of the device.

In this table, you will find all relevant parameters that you can change. The following figure shows a section of the table.

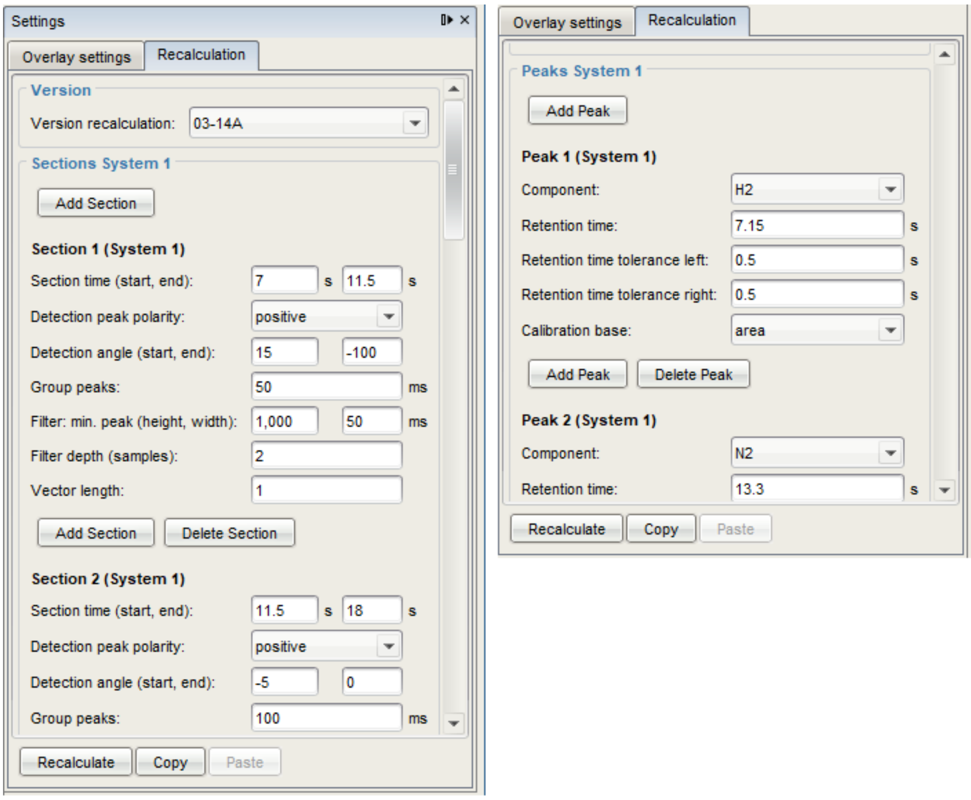


Fig. 3-148: Part of overlay View tab. Recalculation

A click on **Recalculate** accepts your changes in the selected chromatogram(s) as a trial. You can now check your changes by switching back to the **Overlay settings** table and selecting the **Show recalculated chromatograms**.

Transfer settings

If your changes are ok, then go back to tab **Recalculation** and press **Copy**.

Open the parameterization to be changed. Use a new read out for this purpose. Expand the parameter tree and mark and the GCM which contains the original values before re-calculation. If two GCM's are used, make sure that the data is not interchanged. Choose **Paste** in the context menue. See example.

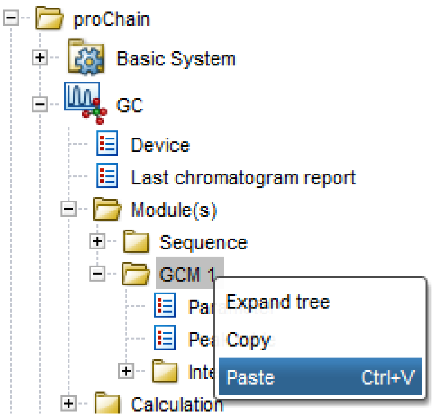
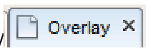


Fig. 3-149: Example take over recalculation settings

After saving and sending the parameterization to the device, the new settings are used. See also ➪ 3.4 Change settings of the GC AFB (p. 211)

You can also copy data from the parameterization to the recalculation. To do this, press **Copy** in the parameterization, like shown in the example. Then open **Overlay**, go to tab **Re-calculation** and press **Paste** to fill the fields with the values of the parameterization.

Leave this function by closing the window 

on its register.

The procedure described above is usually done during commissioning

3.8.7 Printing a chromatogram

If you have activated a chromatogram view and opened the context menu inside the chromatogram, the **Copy Chart** option will be available (see figure).

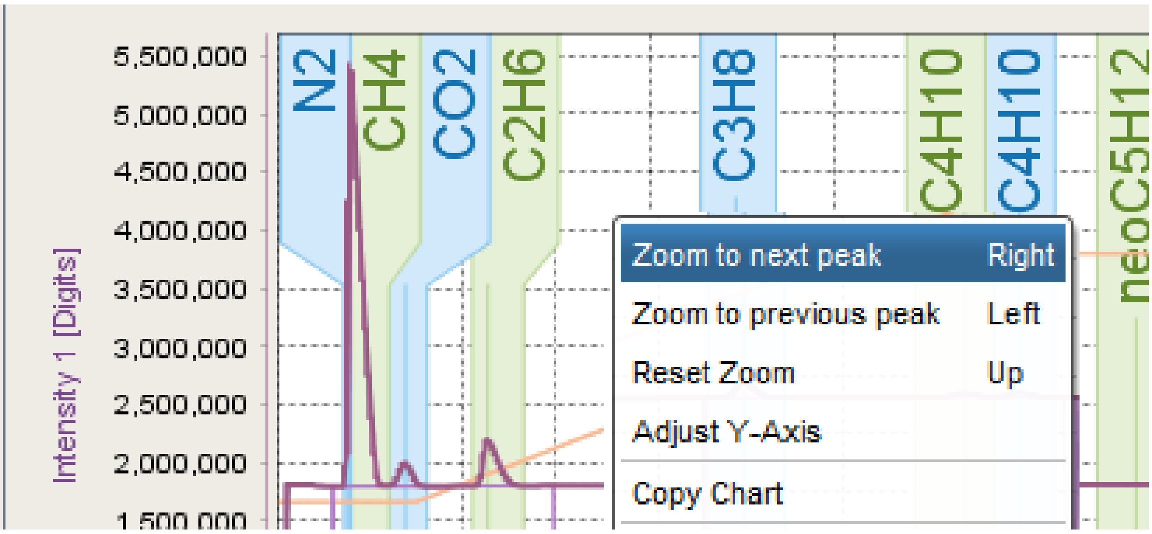


Fig. 3-150: Example "Copy Chart"

Selecting this option copies the chromatogram to the clipboard of the computer. Using the standard Windows functions, e.g. a right-click menu or the **Ctrl+V** keyboard shortcut, you can paste the content into corresponding programs and save it.

Now you can reopen or print the chromatogram in the format of the Windows application.

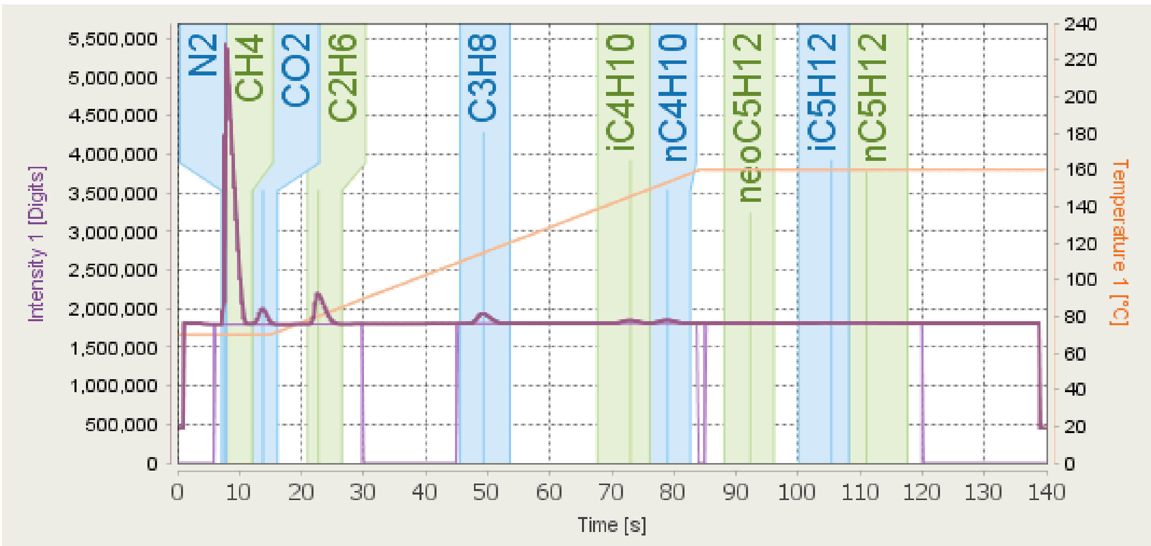


Fig. 3-151: Example chromatogram copy

> **Remember that only the selected chromatogram is copied, nothing else. Due to both chromatograms on the page belong to a complete measurement, you have to repeat the procedure for the other one.**

4 General notices

4.1 Technical data

4.1.1 Explosion protection data

Ex rating	
ATEX	II 2(1) G Ex db [ia Ga] IIC T6 Gb
IECEx	Ex db [ia Ga] IIC T6 Gb
cCSAus	Class I Division 1 Groups B, C, D T6 Associated Equipment for Class I, Division 1, Groups A, B, C and D Ex db [ia Ga] IIC T6 Gb, Class I Zone 1 AEx db [ia Ga] IIC T6 Gb

Pursuant to the standards:		
IECEx	IEC 60079-0 IEC 60079-1	2011 6th edition 2014-06 7th edition
ATEX:	EN 60079-0 EN 60079-1	2012 2014
cCSAus	2258 02 2258 82	

4.1.2 Measurands and accuracies

Information on measured variables and accuracies can be found in the data sheet of the device.
– ISO 6976, GPA 2172, or ASTM D3588

4.1.3 Technical range of suitable gases

The gases (like natural gas) must be technically free of dust, particles and liquids. Only use gases according to the following lists.

Gas temperature between -25°C≙13°F and +75°C≙167°F.

Concentrations outside these ranges and other components on request. In the following table the composition of the standard calibration gas P1-11K is also described.

Component name	Formula	Min. measuring range [mol%]	Max. measuring range [mol%]	Calibration Gas P1-11K [mol%]	Output
Nitrogen (N)	N_2	0.0	20	8.0	Yes
Methane	CH_4	60	100	79.25	Yes
Carbon di-oxide	CO_2	0.0	12	3	Yes
Ethane	C_2H_6	0.0	14	6.5	Yes
Propane	C_3H_8	0.0	6	2	Yes
i-Butane	i-C_4H_{10}	0.0	3	0.5	Yes
n-Butane	n-C_4H_{10}	0.0	3	0.5	Yes
neo-Pentane	neo-C_5H_{12}	0.0	0.1	0.025	Yes
i-Pentane	i-C_5H_{12}	0.0	0.3	0.1	Yes
n-Pentane	n-C_5H_{12}	0.0	0.3	0.1	Yes
Hexane plus	C_6+	0.0	0.3	0.025	Yes

Carrier gases	Ranges/Variables
Helium: Quality: 5.0 or better Argon: Quality: 5.0 or better Nitrogen: Quality: 5.0 or better	Supply pressure: = 0.325 MPa(g)± 0.025 MPa(g) ≙47 psi(g) ± 3.6 psi(g) ≙3.250 bar(g) ± 0.250 bar (g) (typical settings see ➪ 2.6.1 Overview gas and vent connections (Fluidic interfaces) (p. 81)) Flow rate: approx. 0.12 l/h ≙ 0.0042 cft/h per module(depending on application)
50 l gas cylinder (not always supplied from Honeywell) Option: 2 cylinders with autom. changeover syst.	Ensure that only suitable standard-compliant types are used if you do not source them from Honeywell. Cylinder pressure greater than 1.0 MPa(g) ≙ 10 bar(g) ≙ 145 psi(g) re-quired. At a pressure below 2 MPa ≙ 20 bar ≙ 290 psi keep a replacement cyl-inder available. Other accessories required: Connection lines and Pressure regulator with a safety relief (Set at 0.4 MPa(g) ≙4 bar(g) ≙58 psi(g))

Calibration gas (P1-11K)	Ranges/Variables
Reference gas with a Quality of 2.0 or better for all components and(max. 1% measurement un-certainty)	Rated supply pressure (Protection against pressure peaks needed) 0.1 to 0.3 MPa(g) ≙14.5 to 43.5 psi(g) ≙1.0 to 3.0 bar(g)

Calibration gas (P1-11K)	Ranges/Variables
The composition for this gas is mentioned in the table at the previous page and at the NMI nameplate. Other Compositions are possible depending on the expected sample gas and application	for ATEX / IECEx 0.1 to 0.15 MPa(g) ≙14.5 to 21.7 psi(g) ≙1.0 to 1.5 bar(g) for cCSAus Flow rate / Consumption (at atm. pressure). ± 600 ml/ Calibration (1 Calibration /day) ≙ ± 0.0212 cft/ Calibration (1 Calibration /day)
10 l gas cylinder (not always included in Honeywell package)	Ensure that only suitable standard-compliant types are used if you do not source them from Honeywell. Cylinder pressure greater than 1.0 MPa(g) ≙10 bar(g) ≙145 psi(g) required. At a pressure below 2 MPa ≙20 bar ≙290 psi keep a replacement cylinder available. Other accessories required: Pressure regulators and connection lines

4.1.4 Notes on device characteristics and operating conditions

Basic information about the device's properties and operating conditions can be found in the device's data sheet. Also note the following:

EnCal 3000proChain GC system	Values and/or comments
Place of use	Installation close to the sampling point up to Ex Zone 1 If installed outdoors, the device may have to be placed in an air-conditioned housing.
Breather line	Connection at breather element: 1/4” NPT
Installation	Wall mounting using a bracket or installation on a bench or platform
Dimensions	Base Ø 37 mm x height 37 cm (Ø 14" x height 14")
Weight:	29 kg ≙64 lb.
Installation gaps:	At least 300 mm to the left and right, at least 200 mm≙7.87 ′′ at the top and bottom (recommended 900 x 900 mm≙35.43 x 35.43 ′′)
Interval setting	1 x daily calibration
Gas connections	Inlets (up to 5 x process gas, 1 x carrier gas, 1 x calibration gas) Outlets (2 x process gas & gas measured) 1/8" Swagelok pipe fitting (standard equipment, others on request)
Sample gas consumption	approx. 2 l/h ≙0.071 cft/h per module
Gas management	Integrated double-block-and-bleed device
Electrical connections	e.g. following cable glands: Power supply and data transfer per M25 cable end gland for reinforced cable Ø 17 to 26 mm / M20 cable end gland (2) for reinforced cable Ø 5,5 to 12 mm or 12,5 – 20,5 mm Ext. sensor (optional) or

EnCal 3000proChain GC system	Values and/or comments
(Only by certified parts)	adapters from M20 thread to ½" NPT, for using imperial threads.
Maximum current/rating	(± 15% mains fluctuations) 5 A / 120 W (start-up peak and heated) (Heating time approx. 1 to 2 hours at -25°C (-13°F)) 16 W typical, 30 W max, 60 W peak (not heated)
Detection limit	for C_5: 50 ppm
Analysis output	Complete composition of natural gas up to C_6+ Heating value, density, Wobbe index
Ambient pressure	Atmospheric pressure
Operating system	Service PC: See download section
Software	EnSuite
File format	enSuite.csv/enSuite.par
Data logger	Integrated (interval adjustable) Archives/Calibration data/Parameterization/Logbooks
Data logging (Exceeds API 21.1)	local storage of last 100 days of all analytical data (analysis, events, alarms, averages, calibration data) in accordance with API Report 21.1. Last 2000 chromatograms are stored (ca. 4 days).
Data output	All data can be supplied in XML format.
Communication Speed:	345,600 Baud TCP/IP (serial)
EMC strength	to EN 61000-6-2 and EN 61000-6-4
Mechanical strength	Vibration and shock test to IEC 60068-2-31 and -64
Digital outputs:	2 for 24 V DC (common earth, electrically isolated) 1 NC contact (closed when de-energized, suitable for general alarms) 1 NO contact
Digital inputs:	2 (2 cores each, 9 V, electrically isolated) Separate power supply, for example process and calibration gas pressure monitoring

4.1.5 Supported data protocols

Protocols at a glance

Communication	Supported data protocols
Ethernet	– HTTP (*only up to Basic System V 03-38*) – MMS (secured via TLS) – Modbus TCP – NTP
serial (RS232, RS485)	– Modbus (ASCII, RTU) – UNIFORM

Use secure version of a protocol!

Unencrypted protocols transmit data in plain text, such as Modbus. If possible, use the secure version of a protocol.

Protocols in detail

For unencrypted protocols, consider country-specific regulations!

Please note that with some protocols the data communication is unencrypted. This is the case, for example, with communication via Modbus und IEC 60870-5-104.

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

HTTP

Default port: 80

Until Basic System 03-38, **H**yper**T**ext **T**ransfer **P**rotocol enabled e.g., access to an enCore device via the remote control panel.
Please note that HTTP is considered insecure today and is no longer supported since Basic System 03-39!

MMS

Default port: 102
Note: Typically, port 3782 is used instead of port 102 for secure communication. For reasons of downward compatibility, enCore devices use the standard port 102.

Manufacturing **M**essaging **S**pecification (according to ISO standard 9506) enables communication between enSuite and enCore devices, e.g., allows access to an enCore device via the remote control panel.
For reasons of data security, enCore devices since Basic System 03-39 only support MMS connections that are secured via TLS (**T**ransport **L**ayer **S**ecurity), i.e., the data is transmitted encrypted and the authentication of the enCore devices is ensured via a certificate.

Modbus (ASCII, RTU)

Default port: –

Protocol for data exchange of user-defined registers between central control station and enCore device (Modbus AFB and "intelligent protocols" (GC, USM)) via a serial asynchronous point- to- point data connection via RS232C or a multipoint connection via RS422 or RS485.

Modbus TCP

Default port: 502

Protocol for data exchange of user-defined registers between central control station and enCore devices (Modbus AFB and "intelligent protocols" (GC, USM)) via a standard TCP/IP network

NTP

Default port: 123

Network **T**ime **P**rotocol for the time synchronization of enCore devices with an NTP time server.

UNIFORM

Default port: –

UNIFORM is a manufacturer-specific protocol for the connection of Q.Sonic ultrasonic gas meters (USM), up to series IV.

4.1.6 Certificates and approvals

EU declaration of conformity

The EU declaration of conformity lists all European health, safety, and environmental protection standards whose requirements the product meets. It is enclosed as hardcopy with the delivery of the device.

The following provides an extract from the declaration. The complete declaration of conformity and associated documents can be downloaded in PDF format from our Docuthek (www.docuthek.com).

This declaration of conformity is valid for the following Directives:
Diese Konformitätserklärung gilt für folgende Richtlinien:

2014/30/EU (EMC)	**2014/34/EU (ATEX)**	**2011/65/EU (RoHS)**

The object of the declaration described above is in conformity with the relevant harmonization legislation from the European Union:
Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsrechtsvorschriften der Europäischen Union:

OIML-R140: 2007	EN 60079-0:2012/A11:2013 EN 60079-1:2014	EN 50581: 2012

Certificates and interventions by notified bodies:
Bescheinigungen und Maßnahmen durch notifizierte Stellen:

Test report NMi-1901745-01	Sira 18ATEX1025X EU-type examination *EU-Baumusterprüfung*	Not applicable *Entfällt*
NMi Certin BV 2600 AL Delft The Netherlands	CSA Group Netherlands B.V. Utrechtseweg 310, 6812 AR, Arnhem, Netherlands	

This declaration of conformity is valid for products labelled accordingly:
Diese Konformitätserklärung gilt für entsprechend gekennzeichnete Produkte:

CE	CE 0044 II 2(1)G Ex db [ia Ga] IIC T6 Gb	CE

The production is subject to the following surveillance procedures:
Die Herstellung unterliegt folgenden Überwachungsverfahren:

Directive Annex II *Richtlinie Anhang II*	Directive Annex IV+VII *Richtlinie Anhang IV+VII*	Directive Article 7 Richtlinie Artikel 7
	Notified Body 0044 TÜV NORD CERT GmbH D-30519 Hannover	

4.2 Technical support Flow Computers and Gas analyzers

Our support of Elster Gas is available for technical advice as well as repairs.

To find further information visit our support site of Elster Gas:

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

> **Use secure communication!**
>
> Use secure communication, such as email encryption, to send confidential data.

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

4.5 Copyright notice for the pressure sensor used

(License for EnCal 3000 proChain GC Baseboard Bosch Pressure sensor Lib)

****

* Copyright (C) 2015 – 2016 Bosch Sensortec GmbH

* File: bmp280.c

* Date: 2016/07/01

* Revision: 2.0.5 (pressure and temperature compensation code revision 1.1)

* Usage: Sensor Driver for BMP280 sensor

****

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4.6 Warranty Conditions

You will find our current warranty conditions in the General Terms and Conditions, for example, on our website:

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

4.7 How to report a security vulnerability

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

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

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

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

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

To view information on current malware threats please visit:

www.honeywell.com/us/en/news

OR

Contact your local Honeywell Process Solutions Customer Contact Center (CCC) or our technical support of Elster Gas.

4.8 Knowledge base articles on Honeywell Support Portal

Elster Gas provides problem-solving approaches and answers to frequently asked questions, as well as tips and tricks in short articles for various product series in our technical knowledge base.

process.honeywell.com/us/en/services-and-support/support-center/technical-support

The knowledge articles are constantly being expanded.

4.9 Overview additional manuals

The user documentation consists of the present manual. In case of use additional AFBs, the following AFB manuals are available.

> **!** Please note that safety instructions are contained exclusively in the present manual.

Additional Manuals	Q2	proChain
Basic System with SFBs	✓	✓
Gas Quality AFB	–	✓
Modbus AFB	✓	✓
Postprocessing AFB	✓	✓
Update of the Device Software	✓	✓
enSuite - Installation and Security Measures[1]	✓	✓

4.9.1 Download latest manuals on Docuthek

Elster Gas provides the user documentation such as manuals, certificates, data sheets, technical information for different device types (in different languages) on the Docuthek. The documents are regularly updated.

www.docuthek.com
Use the device type as search term, for example,
enCore FC1

Check PDF after download

Use SHA-1 checksum information to verify the file integrity of a PDF after download with an appropriate tool.

The target value of the SHA-1 checksum for a PDF can be found on our Docuthek in the details in section **Remarks**, or – if you have downloaded the PDF from Honeywell website – in brackets next to the download link.

Which manuals are relevant for previous product releases?

Only the latest manuals are available on the Docuthek. If you are using an older software version, you can look up these manuals for each version in the software history on the Honeywell website. The software history is available as a PDF file for product releases since 2020 in the download area of the respective device type

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

[1] The current installation instructions are available on the Elster-Instomet website in the **Software Downloads** section.
process.honeywell.com/us/en/site/elster-instromet/support#software-downloads

4.10 How to give feedback to user documentation

We are always interested in your comments, corrections or suggestions for improvement regarding the Elster Gas Flow Computers and Gasanalyzers documentation. Please send your feedback to our technical support of Elster Gas.

ElsterSupport@Honeywell.com

Use this email address to provide feedback, or to report errors and omissions in the documentation.

5 Index

6 Glossary

A

Administrator

Administrator is a person with unrestricted access to the device and responsible for setting and transferring user management to the device. The Administrator should therefore have the appropriate equipment know-ledge e.g. by participating in a training course. The station operator usually takes on this task.

Alarm

Error which jeopardizes the correctness of the results. Generated, for example, if a measurement is outside the defined measuring range. The start and end of an alarm are registered with time stamps in the asso-ciated logbook / error list.

Approval file

is an enSuite file which automatically defines which parameters should be especially protected. It contains approvals for specific countries or stand-ard-ized settings and relates to all relevant AFBs. An approval file must be used for fiscal purposes, otherwise its use is optional.

Audit trail

is a two-part log archive (parameter audit trail) which enables the user to conduct changes relevant to billing without opening the SSW. These changes are monitored and documented in the fiscal section. If the SSW is opened, data are only included in the general section.

Authorizied metrology expert

or Fiscal verification officer ia a person who has the ability and is author-ized, because of his or her technical training, knowledge and experience, to execute fiscally protected tasks in gas systems within the scope of legal metrology. A metrology expert is trained to work with fiscally protected devices and systems and is acquainted with the relevant standards and regulations that apply in specific countries.

B

Basic display

The basic display is displayed immediately after the device is started. If no operation is performed during a preset time, the device switches back to the basic display automatically. For some device types, it is parameter-izable which display is used as basic display.

Breather

is a screw-in part (flame arrester) designed to equalize the pressure on explosion-proof housings. This pressure equalization device is required during operation and must not be sealed.

C

C2+

means that all higher hydrocarbons are added to the ethane component.

Cable

To ensure greater differentiation between gas and electrical lines, electrical lines are always referred to as “cables” in the following.

Calibration gas

See Operational calibration gas. Also called operational calibration gas, is held in cylinder connected firmly to the device and is part of the measuring system. It is a mixture with fiscal established properties and is required for automatic and manual calibration.

Calibration officer

or representative is a person with country-specific authorization who may carry out officially protected work on gas systems which are to be used for fiscal measurements.

Carbon dioxide (CO2)

An acidic, non-flammable, colorless and odorless gas comprising a chemical compound of carbon and oxygen. The gas is also known as carbonic anhydride or colloquially carbonic acid.

Checksum

is a method to identify, display and check the software version. It is calculated by the device itself. Further information about this checking method used by enCore devices is provided in the manual entitled “enCore ZM1, MC1, FC1 – basic system with SFBs”.

Compressibility factor Z

The quotient from the actual (real) volume of a specified mass of gas at a specified pressure and temperature and its volume as calculated from the Ideal Gas Law (for the same pressure and temperature). The compressibility factor Z is generally dependent on the temperature, pressure and gas composition.

Conditioning

is a process used to flush impurities out of the MEMS column and maintain analytical performance. For this purpose, carrier gas is passed through the column, which is additional strongly heated.

CSA mark

The mark shows that the product has been certified by an accredited third-party lab (independent standards organization) and have met applicable standards as required by American law.

Current Run time

The current cycle time restarts with every injection of module (1).

Cycle time overrun

Warning or alarm will be raised, if “Last Run time” is longer than “cycle warning time limit”(e.g. 95s). The warning will disappear, if not valid anymore the alarm not. The user configurable value is in percentage of the total cycle time (default value 1% relative to total cycle time vor warning and 2% relative to total cycle time for alarm)

D

DBB technology

is a valve technology to seal gas streams. The connection of 2 solenoid valves in series, between which there is a vent, ensures that the system is safe even if the valves leak.

Density/Density at base conditions

is the quotient of the mass of a gas sample and its volume in specified pressure and temperature conditions or at base conditions, e.g. in kg/m^3. The density or density at base conditions is used to monitor the gas composition and energy content of fuel gases.

Display

is the generic term for all depictions and views on the computer and the optional screen.

E

enCore

(For short: enCore FC) A collection of various device types used as process computers. These include, for example, the volume conversion device enCore ZM1, the signaling and monitoring unit enCore MC1 and the flow computer enCore FC1. The proChain GC also uses this software package for data management.

enCore devices

enCore is the name of the product platform for representatives of a range of measuring devices based on similar modular hardware and software. Their configuration is variable. In addition to the GasLab Q2 and proChain GC, these include the volume conversion device enCore ZM1, the signaling and monitoring unit enCore MC1 and the flow computer enCore FC1.

enSuite
The configuration and analysis PC software for current Honeywell Elster devices in the field of flow computer, data storage, gas quality analyzer and ultrasonic gas meter. The software supports all activities that are required for commissioning and maintenance of these devices.

Error list
is used by the user to identify errors and reproduce the history of the error. The start and end of a message is entered into the error list with a time stamp and recorded in the logbook.

Event
or note is generated if a measurement violates a state defined by the user. The start is entered in the error list with a time stamp and logged in the logbook. Notes cannot be accepted and are automatically deleted from the error list after the cause of the note has ended.

Export value (enSuite)
The function blocks in the software supply results which can be processed by other function blocks. These results are known as export values.

F

Firmware
Firmware is software that is functionally fixed to device hardware components. It is embedded or stored in the device and cannot be replaced by the user.

Fiscal parameters
are marked with this symbol . They provide information about whether items can be edited when the SSW is locked.

Fiscal verification officer
See Authorizied metrology expert.

flow computer
(For short: enCore FC) A collection of various device types used as process computers. These include, for example, the volume conversion device enCore ZM1, the signaling and monitoring unit enCore MC1 and the flow computer enCore FC1. The proChain GC also uses this software package for data management.

G

Gas family

Classification of fuel gas types into groups based on their physical and combustion properties (families, abbreviated to GF) A distinction is made between 4 gas families. Gas families are classified in Germany in DVGW Code of Practice G 260; natural gas and gas similar to natural gas are members of the second gas family in this system.

Gas Quality Analyzers

are devices which automatically measure the superior calorific value of gases. The superior calorific value, density at base conditions and carbon dioxide content are calculated using the values from the sensors.

Gas saturation

Reflects the influence of water vapor on calorific value/heat value. Values for wet (saturated) gas or partly wet (partially saturated) gas are lower than those for dry (unsaturated) gas because the total volume consists of the components of hydrocarbons and water vapor. The instrument do not analyze water vapor. The determination of the actual water vapor content must, for example, be obtained from moisture or dew point measurements. The results are therefore calculated for three assumed standards (dry/wet /partly wet) of water vapor.

Ground loop

Grounding the devices may create ground loops since the cable screens create additional connections if they are connected to both sides. A ground loop is electric cabling closed to create a loop. In the event of low-frequency error currents, an undesirable voltage drop occurs in the signal path and an interference signal is added to the signal as a result of the impedance of the loop.

Grounding

Grounding is the general term used for the highly conductive connection to a reference potential, for example, to the earth which is also conductive. This device connection is used, among other things, to prevent incoming and outgoing interference as described in the EMC directives and allows various electrical devices and equipment to be operated with a joint reference potential.

H

Higher heating value Hs

A heat variable used to monitor the gas composition and energy content of fuel gases. The higher heating value can be specified in molar, mass or volume, for example in kWh/m^3.

Home

is a special display and shows the software structure of the device.

I

Inferior calorific value

also called net heating value or Lower heating value Hi (colloquially known as energy content or energy value) is a heat variable. In contrast to the Superior calorific value, the calorific value, all the combustion products are in gaseous which is why this value is lower than the superior calorific value. The value can refer to mole, mass or volume, for example in kWh/m^3.

Internal sampling system

A gas manifold which defines a gas route using valves. The gas channels in this metal block also enable DBB technology to be used.

L

Last Stream Update Time/Date

Information for the user when the stream last has received an update (new data)

Limit of detection LOD

or lower detection limit, LDL is the measured value up to which the measurand can just be reliably detected. Values below the detection limit are referred to as non-measurable or non-detectable in the sense of metrology.

Limit of quantitation (LOQ)

is the smallest concentration that can be quantitatively determined with a specified precision. Only above the limit of quantitation quantitative analytical results are given. The limit of quantitation always has a higher accuracy than the limit of detection

Location of use

See Place of Use. or of installation is the room or space where the device is placed. It must meet the specified requirements of the manufacturer, authorities, and operators.

Logbook

also known as the standard audit trail, is a log archive which can be used by all software parts and records every extraordinary situation, for example, errors in the measuring equipment.

Lower heating value Hi

(Colloquially energy content or energy value) is a heat variable. In contrast to the higher heating value, all the combustion products are in gaseous form. Therefore, the higher heating value is higher than the lower heating value. The lower heating value is quoted as a mass-related heating value, for example in kilojoules per kilogram in (kJ/kg) or as the heating value of the gas quantity over the measured volume, for example in building services engineering in kWh/m³.

M

MAC address

The MAC address (Media Access Control) is the unique hardware-bound address of a network component. In enCore devices, the CPU3 board has a LAN interface, each of which has an individual MAC address.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")

Main display

is the name of the first display of an AFB or a functionality of the basic system; it shows the most important results of this functionality. Depending on the AFB or functionality, further information is displayed in subordinate device displays.

Manufacturing Messaging Specification

MMS (pursuant to ISO 9506) allows communication between enSuite and enCore devices.

Message

is an event which applies to multiple evaluation cycles of the device. It may be reset by a user with the appropriate user rights.

Modbus protocol

Modbus TCP protocol for data exchange by user-defined registers between AMR and enCore devices using a standard TCP/IP network.

N

Network Time Protocol.

NTP for the high-precision time synchronization of enCore devices with an NTP time server.

Note

Generated if a measurement violates a state defined by the user. The start is logged in the logbook.

O

Operating mode

Different working states of the device during operation are known as operating modes.

Operational calibration gas

short called calibration gas, is kept in a cylinder permanently connected to the device and is an integral part of the instument. This is a mixture of two or more components e.g. methane and carbon dioxide with officially defined properties and is required for automatic calibration.

Ordinal number

or sequence number is an automatically assigned identification number for archived data. This is formed so that the very first archive entry has the number 1. The number is incremented by one for each subsequent entry.

P

PELV

PELV protective extra-low voltage systems which comply with DIN EN 60079-14: the power supply to generate PELVs must ensure that no short-circuit is possible between the primary voltage and the extra-low voltage and its connections. It has a safe electrical isolation point (safety isolation transformer) and complies with IEC 61558-2-6. The circuits are grounded. All bodies of electrical equipment must be connected to a common grounding (and equipotential bonding) system.

Pipeline

Pipeline is the 0.5 to >2 m diameter steel pipe. The instrument uses much smaller diameters. The production and installation of tubing is entirely different from pipelines.

Place of use

or installation site is the room or position at which the measurement device is located. It must satisfy the requirements defined by the manufacturers, authorities and operators.

Power-limited circuit

A power-limited circuit is a circuit separated from other circuits by at least BASIC INSULATION in which the direct voltage (U) is no greater than 60 V. The current which can occur in the circuit is limited by certain measures to a value of less than 200/U. These measures must interrupt the circuit within 120 seconds if this value is exceeded.

Process gas

is the gas which is to be analyzed or measured. It is supplied to the measuring equipment in normal operation and is also known as the operating sample gas

R

Reference potential

is a potential to which all other voltages are referred. The potential of a grounded point (ground potential) is used for this purpose and gives it a value of zero volts. Since ground connections, like all connections, have different resistances, voltage differences or potential differences may occur between grounded points and system parts. A correctly designed low resistance equipotential bonding cable between the system parts or devices can eliminate these ground potential differences.

Remote operation panel

The enSuite software offers the option of operating the device remotely from the PC during an existing data connection. Once the Remote operation panel action is called up, enSuite displays a operating panel on the computer screen. If a local display exist it is a copy of it, then, the display at the device may show a masked screen preventing the usual operation via keys or touch screen. The on-site user can disconnect the remote operation panel connection at any time and return to the usual device display. The device display shows information on how to do this.

S

Security switch (SSW)

(also known as the CAL switch) is a possible hardware isolator and part of the concept to limit user rights. Since a change requires the housing to be opened, this may only be done by trained personnel with the authorization of the manufacturer.

SELV

SELV safety extra-low voltage systems which comply with DIN EN 60079-14: The power supply to generate SELVs must ensure that no short-circuit is possible between the primary voltage and the extra-low voltage and its connections. It has a safe electrical isolation point (safety isolation transformer) and complies with IEC 61558-2-6. Live parts of circuits must not be grounded or connected to live parts or PE wires of other circuits. All bodies of electrical equipment cannot be grounded (for example, for electromagnetic compatibility). (Devices must be grounded even in a SELV system)

Separation column (stationary phase)

A capillary with a defined internal diameter and a defined length. It is clad internally with a material which separates the gas components over time. Traditionally, this component is known as a “column”. Current technology uses thin tubes on a coil or chips manufactured using MEMS technology.

Signal

is an event which is only output for a short time. Acceptance by the user is not required. Signals are also entered into the logbook.

Software

also called application software, is a collective term for programs that determine the function of a device. It can be exchanged or updated by the user.

Specialist

or professional is the designation for a trained person who, as a result of their technical training, possesses skills and experience and who is familiar with the relevant standards and regulations. Trained personnel can assess their work and identify potential dangers. Hardware work on the GasLab Q2 or proChain GC requires, among others, the expertise described in EN/IEC 60079-14, Annex A.

Start delay

Defines how long the start is delayed after the measuring conditions are reached.

Status LED

indicates whether an error, in other words, an alarm or a warning, is active or has been active.

Stream ahead flushing

A method to prevent unnecessary flushing waiting times, when a stream is changed.

Stream Info

Is a text message. It tells the user what the stream is doing e.g. Running / calibrating / verification / manual injection / flushing

Super user

shortened (su...) is one of five users who can create or delete further users in the own profile, all five are included in every parameterization and cannot be deleted. The administrator determines the rights of the su and its profile.

Superior calorific value

or Higher heating value Hs also called Upper Calorific value is a heat variable which, for example, is used to monitor the energy content of fuel gases. The superior calorific value is higher than the inferior calorific value. Not all the combustion products are in gaseous form. This value can be specified in molar, mass or volume, for example in kWh/m^3.

System time

is the combination of time and date shown on the device. Changing the system time is the generic term for both synchronizing and adjusting these values. Further information is provided in the manual entitled “enCore ZM1, MC1, FC1 – basic system with SFBs”.

T

Test gas

See Verification gas

Time stamp

are time details which relate to an event. They contain the time in seconds since 1 January 1970, the local time zone and the local time difference (additional deviation in minutes). The format for displaying time stamps depends on the language selected on the device, for example, YYYY-MM-DD hh:mm:ss or DD.MM.YYYY hh:mm:ss.

Time zone

Enables the geographic location of the device to be identified. (In Version 3-39 setting only in enSuite offline parameterization)

Total cycle time

Fixed time, after a new run will be started. It includes the measurement, cool down, …everything + spare time to assure that cool down time will be always within Total cycle time. This time assures that the device will measure every 3 minutes for example, independent of the cool down time which will be depending on ambient temperature.

Total cycle time (Last Run time)

measured time difference in seconds between the last two injections of module (1) and will change with each cycle. The total cycle time starts with the injection.

Trained personnel

See Specialist The designation for a person who, as a result of their technical training, possesses skills and experience and who is familiar with the relevant standards and regulations. Trained personnel can assess their work and identify possible dangers. Hardware work on the device requires, among others, the expertise described in EN/IEC 60079-14, Annex A.

U

Upper Calorific value

A thermodynamic parameter that is used, for example, to monitor the energy content of fuel gases. The upper calorific value is greater than the inferior calorific value (net heating value). Not all combustion products are gaseous.

User

is a person who belongs to a defined user profile (including super user) and operates or parameterizes the device. The user is identified by a user name and password.

User management

Subject to changes by the administrator. If used correctly, it guarantees, by means of passwords and access rights, that unauthorized changes are suppressed and authorized changes are permitted.

User profile

is a list of access rights for a group. A super user, for example, SU3, manages the profile with up to 9 other users.

V

Valve block

is a gas manifold which defines a gas route using valves. The gas channels in this metal block also enable DBB technology to be used.

Vent gas

also called waste or exhaust gas, is the gas flowing out of the measuring device after the measurement. The gas from the bypass is also part of the vent gas.

Verification gas

A test gas mixture with known properties which is supplied to the measurement device instead of the process gas for verification purposes.

Virtual private network

A virtual private network (VPN for short) is a closed logical network in which the participants are physically separated from one another and connected via an IP tunnel.

W

Warning (message or signal)

Error messages which do not falsify the results but are important for monitoring the measurement. The calculation is continued without falsification. If the cause no longer exists, it can be accepted on the operation panel and the entry thus removed from the error list.

WEEE Directive

The Waste Electrical and Electronic Equipment Directive dated 14 August 2018 is designed to prevent and reduce waste from electrical and electronic equipment, particularly in household waste. It defines minimum standards for handling end-of-life electrical and electronic devices in the EU and relates to all electrical and electronic devices used for private and commercial purposes. To achieve this aim, end-of-life electrical and electronic devices are collected separately and recycled to obtain raw materials.

Wobbe index Ws

Used to characterize the quality of fuel gases and is a calculated variable for monitoring and regulating the heat output. A distinction is made between a superior Wobbe index (Ws) and an inferior Wobbe index (Wi). The unit is J/m^3 or kWh/m^3, depending on the unit used for the superior and lower heating value.