USER GUIDE (SOFTWARE VERSION 1.4.1.12)

CoreSense M10

Multi-gas monitoring system

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CHAPTER 1

Introducing CoreSense M10 Software

Once your CoreSense M10 multi-gas monitoring system has been properly installed as explained in the CoreSense M10 installation guide, you can monitor the various gases found in your transformer. You can achieve this using the provided software. The following pages explain how to maximize your use of this software.

NOTICE

This user guide assumes that you are accessing the CoreSense M10 monitoring system remotely. Any explanations given for a different access scenario will be clearly indicated.

NOTICE—CYBERSECURITY

This product is designed to be connected to, and communicate information and data via a network interface. It is the user's sole responsibility to provide, and continuously ensure, a secure connection between the product and the user's network or any other network (as the case may be).

Users shall establish and maintain any and all appropriate measures (such as, but not limited to, the installation of firewalls, the application of authentication measures, the encryption of data, the installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized accesses, interferences, intrusions, leakages and/or theft of data or information.

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https://www.hitachienergy.com/offering/product-and-system/transformers/transformer-service/advanced-services-for-transformers/condition-monitoring/coresense-m10-multi-gas-dga-analyzer

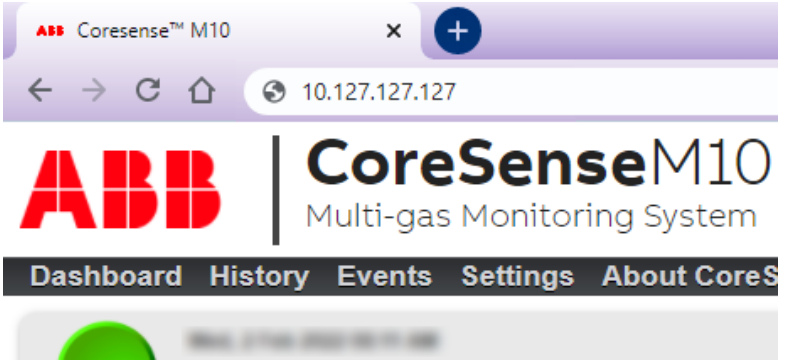
Logging In to Your System

You access your system via a web browser. The CoreSense M10 software supports the latest versions of commonly used web browsers. **Google Chrome and Microsoft Edge are strongly recommended**.

To access the system, simply point your browser to the address provided by your DHCP server (as indicated on the analyzer cabinet internal touchscreen) or by your network administrator.

When not using a DHCP server, the default IP address is 10.127.127.127.

Figure 1 Default Address in Web Browser



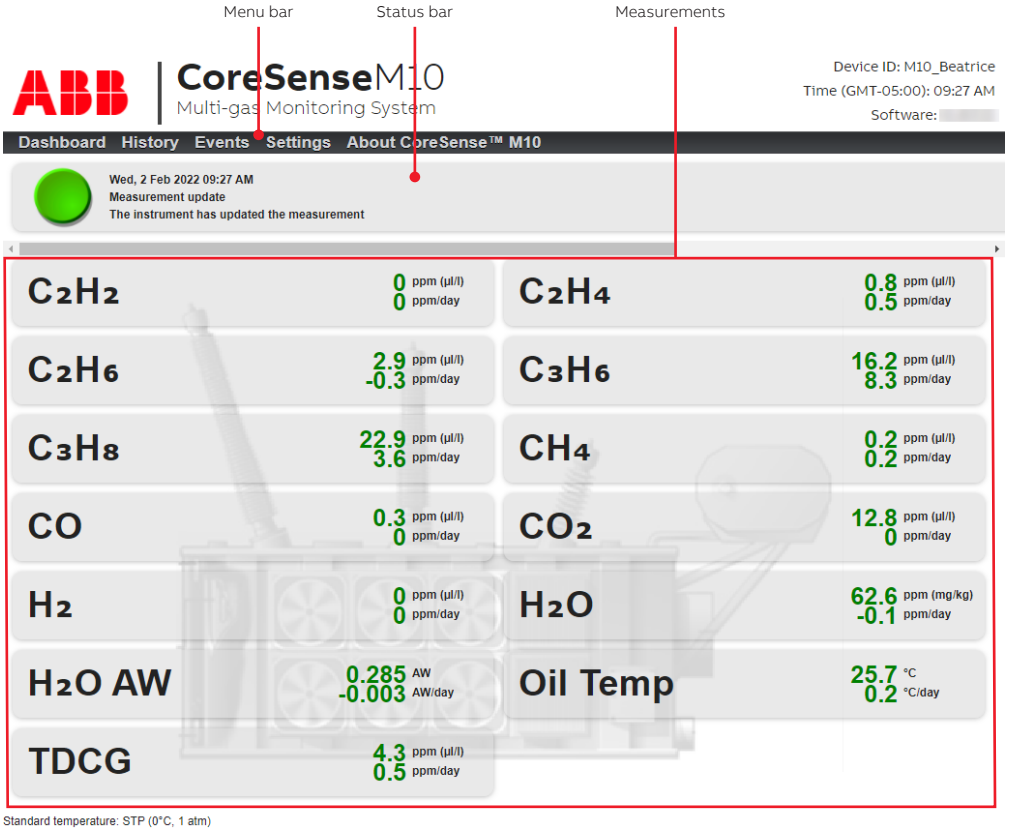
Introducing the Dashboard

When your browser connects to the address entered, the CoreSense M10 dashboard appears in the main window.

NOTICE

The interface that you see in Figure 2 below may be slightly different whether operators have administrative access to the system or not. For more information, see “Changing Passwords” on page 5

Figure 2 CoreSense M10 Dashboard



NOTICE

On first startup of a new CoreSense M10 instrument, allow up to 45 minutes for the first measurement points to appear on the dashboard.

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CHAPTER 2

Setting Up the Analyzer

Once you are in contact with the monitoring system, you can modify a few basic parameters, as explained in the following pages.

You access your system via a web browser. The CoreSense M10 software supports the latest versions of commonly used web browsers. **Google Chrome and Microsoft Edge are strongly recommended.**

Changing Passwords

With the CoreSense M10 system, parameters and functions are made available depending on the password used to access the system (rather than user names).

Upon connecting with the system for the first time, you were required to modify the original password, as explained in the CoreSense M10 installation guide. Also, for cybersecurity reasons, it is considered a best practice to change passwords regularly. Not doing so could expose your entire network to cyberattacks.

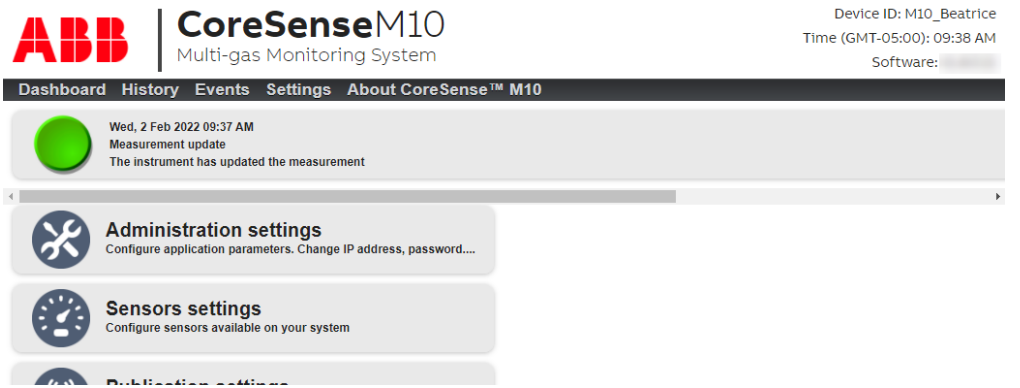
If you did not change the passwords as required during installation, the default operator and administrator passwords are still:

- Operator **Ack**
- Administrator **Admin**

To change passwords:

1 From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears.

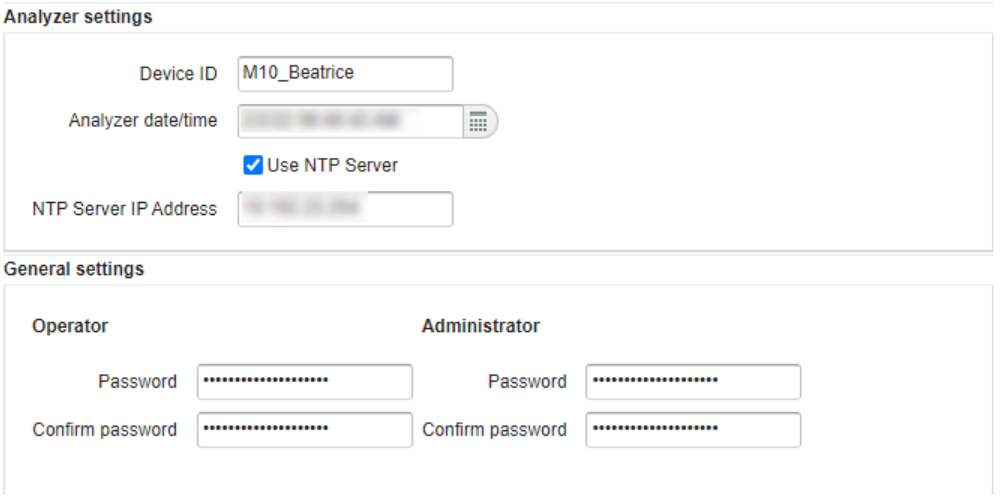
Figure 3 CoreSense M10 Settings Page



2 Click **Administration settings** and enter the administrator password. The Administration settings page appears.

3 In the **General Settings** section, change passwords for operators and/or administrators, as necessary (see Figure 4 on page 6).

Figure 4 Password Settings section



4 At the bottom of the page (depending on the size of your screen, you might have to scroll down), click **Apply** to save the password(s).

Activating the Sensor Head Thermal Pump

This step should have been performed during system installation and commissioning, so this is mostly a reminder of this critical procedure.

The CoreSense M10 sensor head is delivered with its thermal pump turned off. For configuration purposes, the sensor head can be powered when it does not contain any transformer fluid.

However, its thermal pump must be turned off. When installation is complete and the sensor head is in contact with transformer fluid, make sure to activate the thermal pump.

NOTICE

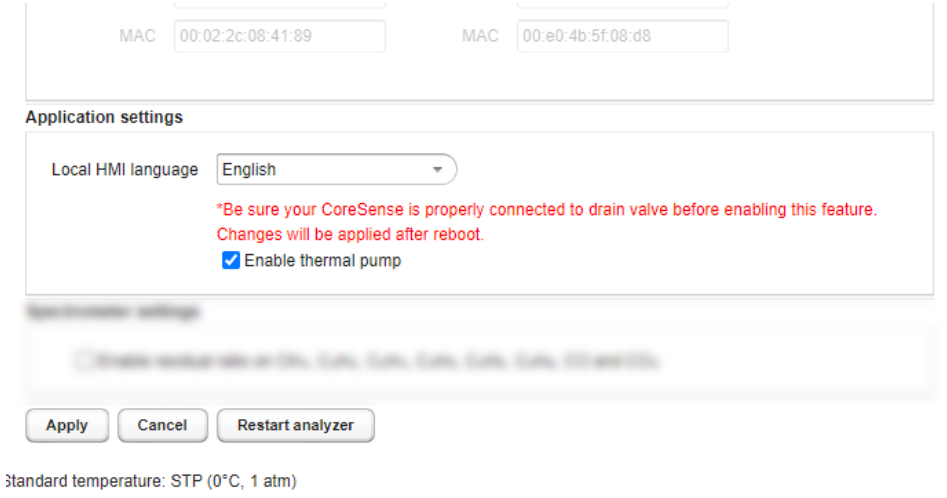
The thermal pump will fail *within minutes* if operated in air.

To activate the thermal pump:

1. From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears (see Figure 3).
2. Click **Administration settings** and enter your password (for more information on passwords, see “Changing Passwords” on page 5).
3. Scroll down to the **Application settings** section and check the **Enable thermal pump** box.

   When you check this box, a reminder appears, asking you to verify that the sensor head is properly connected to the transformer (i.e., in contact with oil).
4. At the bottom of the page, click **Apply** to confirm activation of the thermal pump.

Figure 5 Activating the Thermal Pump



Configuring Analyzer ID and Date/Time

To accurately report event times, you must configure time settings.

NOTICE

All **instrument** dates and times are stored in coordinated universal time (UTC). A properly configured browser will automatically translate those dates and times into local time for dashboard and event display.

Therefore, the computer connected to the CoreSense M10 shall be set to the **local timezone** for the following operations to be successful.

To properly configure time settings:

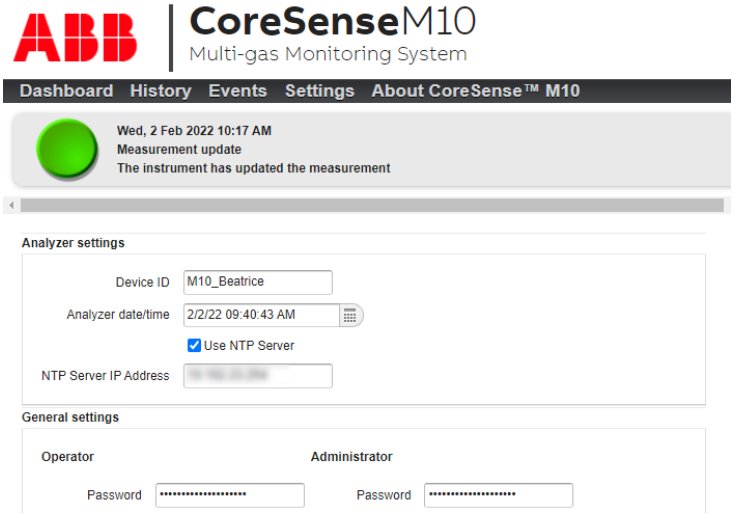
1 From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears.

2 Click **Administration settings**.

If asked, enter your password (for more information on passwords, see “Changing Passwords” on page 5).

The Administration settings page appears.

Figure 6 Configuring General Analyzer Settings



3 Enter an easily recognizable identifier in the **Device ID** field.

The name given here appears in the interface header, to simplify unit identification.

NOTICE

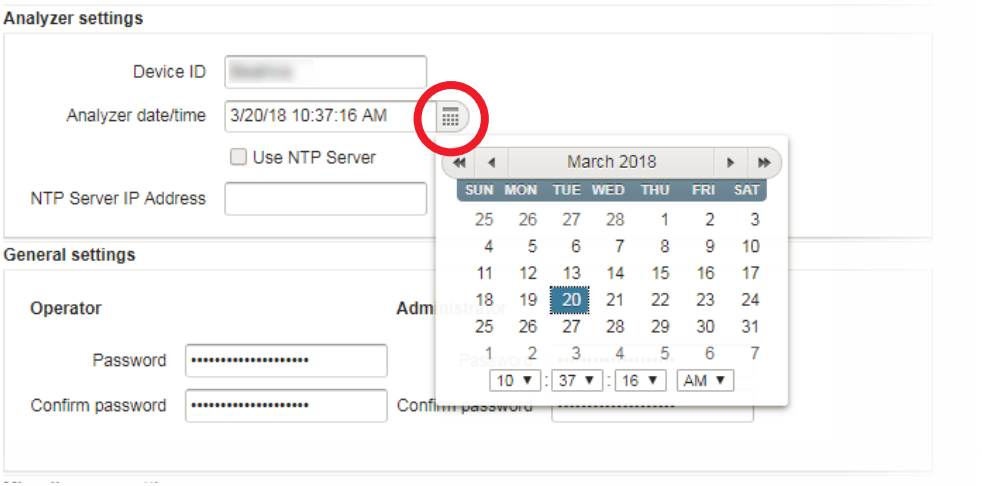
When naming your device, **DO NOT** use accents, spaces or special characters.

When suggested that you must restart the system, click **Cancel** and continue with the next step.

4 Set the time and date.

– Click the calendar icon to the right of the **Analyzer date/time** field and select the appropriate date and time for your monitoring system.

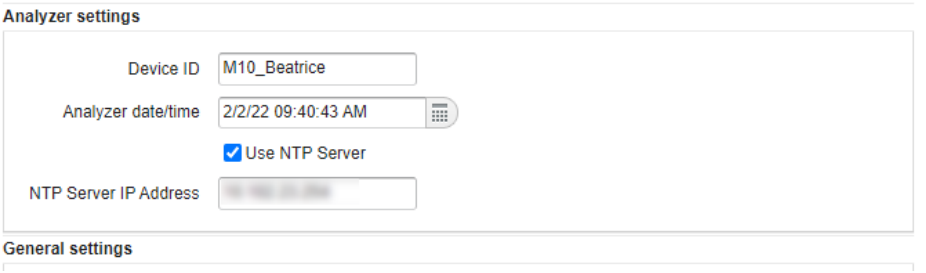
Figure 7 Setting Date and Time Manually



OR

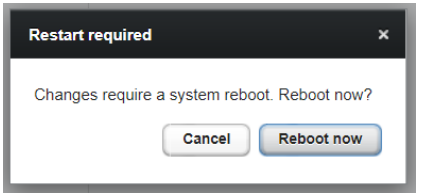
– Check the **Use NTP Server** box and enter a proper local Network Time Protocol server IP address in the field underneath. This function allows for continuous and accurate timekeeping within the monitoring system.

Figure 8 Setting Up NTP Server for Date/Time Management



5 At the bottom of the page click **Apply** to save the information that you just entered. A **Restart required** dialog box appears.

Figure 9 Restart required Dialog Box



6 Click **Reboot now**. The CoreSense M10 system reboots and the changes that you made are applied.

Configuring Ethernet Ports

The CoreSense M10 system cabinet comes with two Ethernet ports: SCADA and Service.

NOTICE

Although **SCADA** and **Service** ports look alike inside the cabinet, **do not** use the **Service** port nor change its parameters.

This port shall only be used by authorized service personnel. Any unauthorized modification to the settings of this port may render your system unusable.

Assigning IP Addresses (SCADA Port)

The SCADA port allows you to access the monitoring system web interface either locally or via a network.

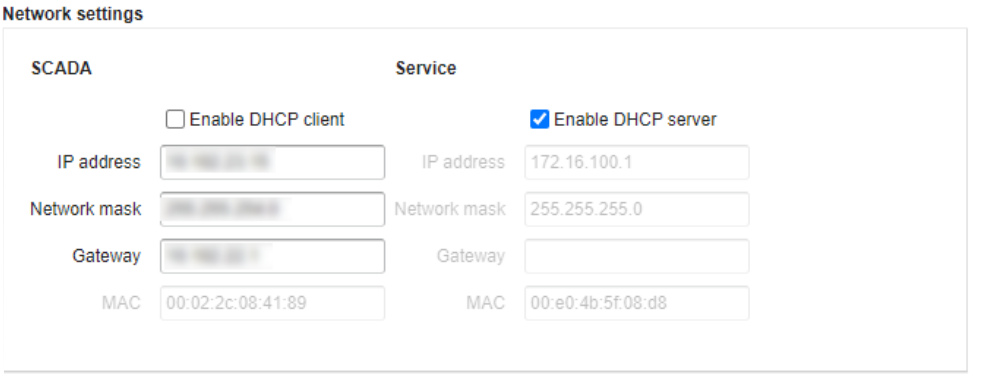
To do so, you need to configure valid network settings to your system:

1 From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears (see Figure 3).

2 Click **Administration settings** and enter your password if necessary (for more information on passwords, see “Changing Passwords” on page 5).

3 In the **Network settings** section, under **SCADA**, enter the appropriate network information (**IP Address, Network mask, Gateway**).

Figure 10 Setting Monitoring System Network Information



4 At the bottom of the page, click **Apply** to save the information that you just entered.

From now on, you can access the interface to your monitoring system by pointing your web browser to the IP address entered, whether you are accessing the system remotely over a network or directly at the system's location.

Enabling DHCP Client for SCADA Port

If IP addresses on your network are managed via a DHCP server, check the **Enable DHCP client** box and click **Restart analyzer** at the bottom of the page. Doing this deactivates the address fields (**IP Address, Network mask, Gateway**) and your system address will now be assigned by the DHCP server.

You can only find the IP address attributed to your system by the DHCP server by looking at the system touchscreen inside the cabinet.

Once you know this address, you can use it (and even bookmark it) in the address bar of your web browser to access the system's web page. This address also now appears in the **Administration** settings, under **Network settings**, in the **SCADA IP address** field.

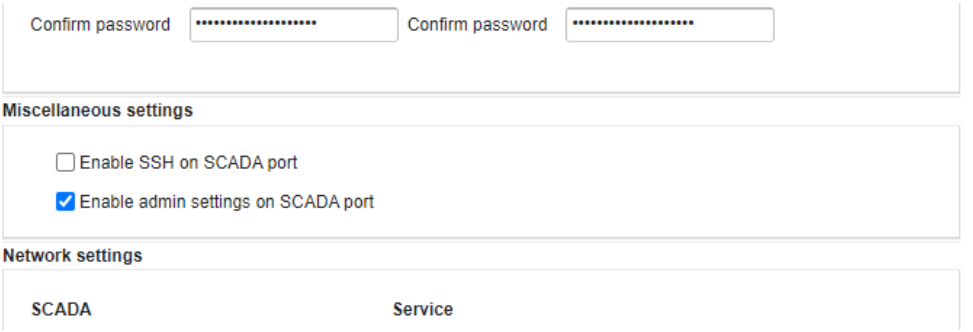
Enabling DHCP Server on Service Port

The network Service Port runs a DHCP server on new instruments or on any instrument following a Wipe Install. To enable or disable the DHCP server on the Service port, check or uncheck the **Enable DHCP server** box and click **Restart analyzer** at the bottom of the page. Doing this deactivates the address fields (**IP Address, Network mask, Gateway**) and your system address on the Service port will now be 172.16.100.1. Any device that connects to the Service port will receive an IP Address in the range 172.16.100.2 to 172.16.100.20.

Giving Access to Administrative Settings on SCADA Port

Activating this option will allow access to the administration settings menu when accessing the CoreSense M10 web page via the SCADA port. When the option is deactivated, the administration settings page is only accessible using a computer connected to the Service port. The access is enabled by default on the system.

Figure 11 Enabling Remote Access to ABB Level 2 Accredited Personnel



To enable/disable this feature:

1 From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears (see Figure 3).

2 Click **Administration settings** and enter your password if necessary (for more information on passwords, see “Changing Passwords” on page 5).

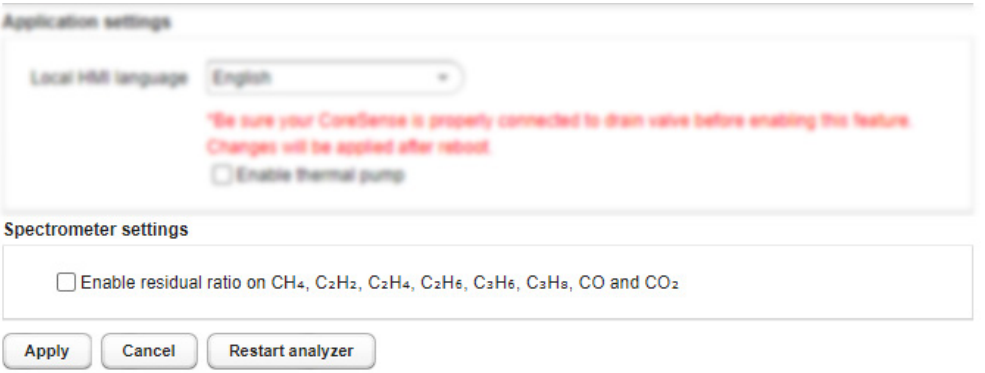
3 In the **Miscellaneous settings** section, check the **Enable admin settings on SCADA Port**.

4 At the bottom of the page, click **Apply** to save the information that you just entered.

Spectrometer Settings

Residual ratio could be used by the gas measurement algorithms. The function is **unchecked** by default for normal operation.

Figure 12 Spectrometer Settings



Setting Transformer Fluid Type

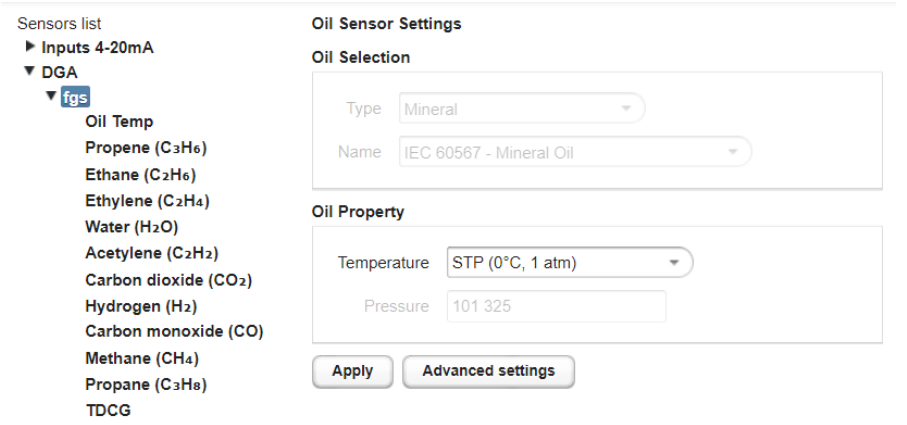
You need to set the fluid property temperature based on the standard used by your local transformer fluid analysis laboratory. The factory-set standard is STP and can be changed following these steps:

1 From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears (see Figure 3).

2 Click **Sensor settings** and, if requested, enter your password. The Sensor settings page appears,

3 Click **DGA** and **fgs.** The **Oil Sensor Settings** page is displayed.

Figure 13 Oil Sensor Settings



4 In the **Oil Property** section, select the appropriate setting.

5 Click **Apply**. The selected setting will be included in all relevant calculations.

NOTICE

The type of oil in your transformer has been configured at installation by a trained technical personnel. However, should you ever need to select another oil type, you can do so on this page.

By clicking **Advanced settings** (you will receive a warning when doing this), you activate the **Oil Selection** section where you can make the modification

- Oil type is factory set and shall not be changed.
- Use the drop-down menu **Name** to select the relevant oil standard to be used.

To disable the **Oil Selection** section, click **Basic settings**.

WARNING

Proper CoreSense M10 configuration shall be used according to transformer fluid:

CSM10-ST for use with mineral oil only
CSM10-NE for use with natural esters
CSM10-SE for use with synthetic esters
CSM10-SL for use with silicone fluid

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CHAPTER 3

Configuring Communication Protocols

If you are planning on connecting to the Ethernet or optical Ethernet port, contact your network administrator to confirm network settings and check port availability. Ethernet ports (SCADA and optical) can be configured either as DHCP clients or with static IP addresses. For more information on hardware connections and configuration, please refer to the CoreSense M10 Installation Guide.

You access your system via a web browser. The CoreSense M10 software supports the latest versions of commonly used web browsers. **Google Chrome and Microsoft Edge are strongly recommended.**

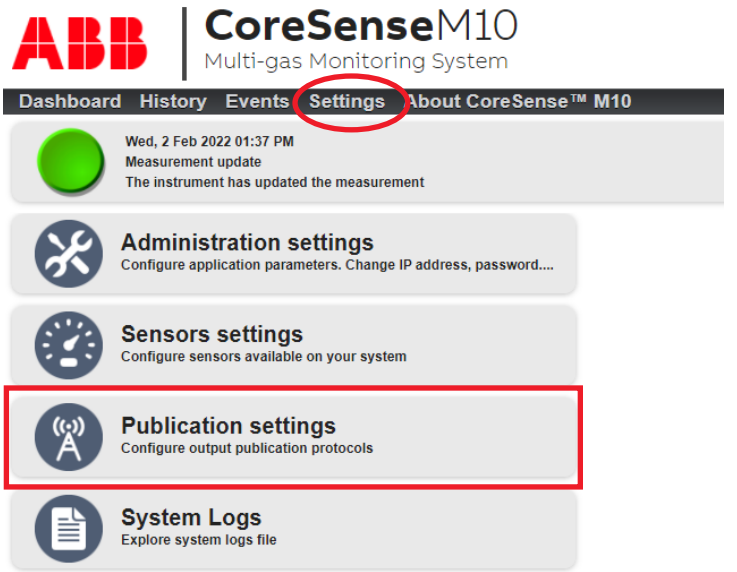
NOTICE

Do not use the **Service** port. The Service port shall only be used by authorized service personnel.

Any unauthorized modification to the settings of this port may render your system unusable.

To access these settings, click **Publication settings** from the Settings page. The Publication settings page allows you to configure the various communication protocols.

Figure 14 Publication settings on Settings Page



Any time you modify a configuration, you need to click **Apply** to confirm your modifications.

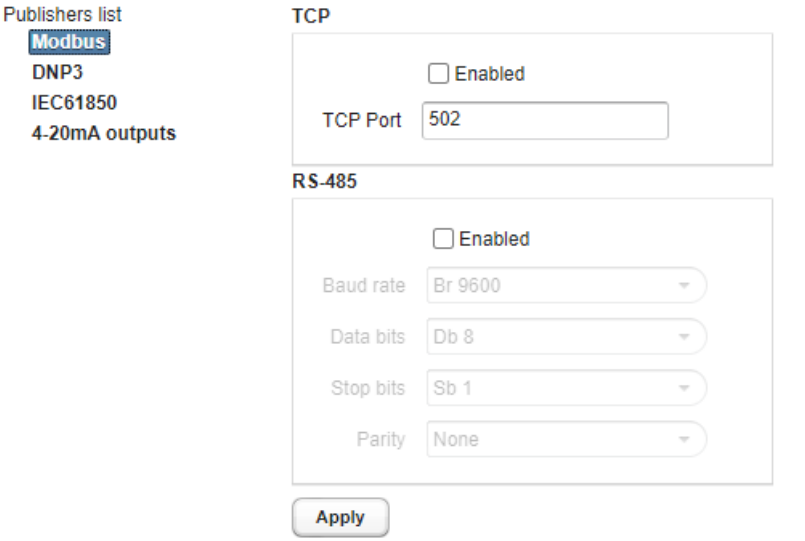
Modbus

The Modbus communication protocol is available on the RS-485 serial interface and the Ethernet SCADA and optical Ethernet ports. The figure below shows the default Modbus configuration. You can change it based on your system administrator's indications.

NOTICE

The Modbus slave ID is 1 **and cannot be changed**.

Figure 15 Default Modbus Parameters



You have more detailed information on the Modbus communication protocol used in appendix "Modbus" on page A53.

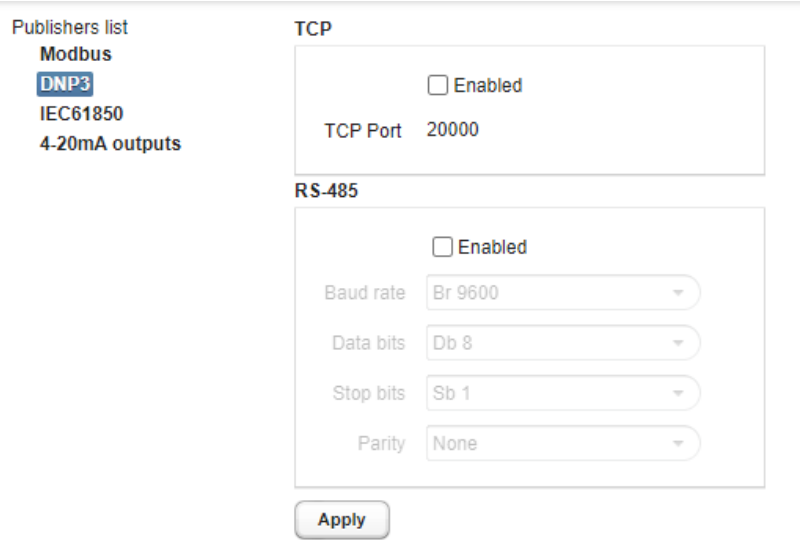
DNP3

The DNP3 communication protocol is available on the RS-485 serial interface and the Ethernet SCADA and optical Ethernet ports. The figure below shows the default DNP3 configuration. You can change it based on your system administrator's indications.

NOTICE

The DNP3 outstation ID is 1 **and cannot be changed.**

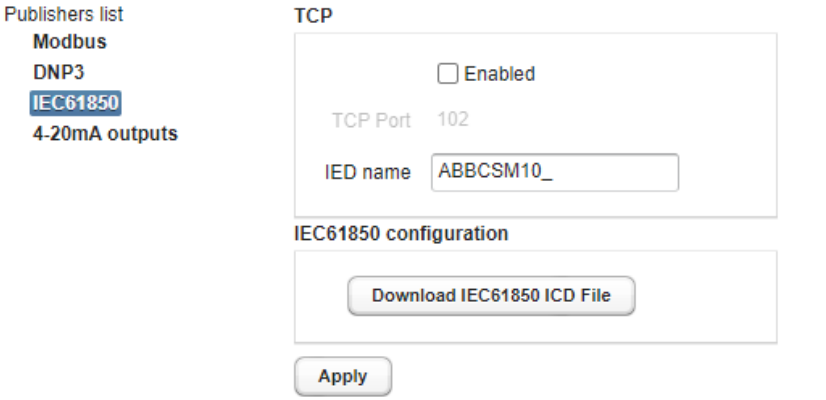
Figure 16 Default DNP3 Parameters



IEC 61850

The IEC 61850 communication protocol is available on the Ethernet TCP SCADA and optical Ethernet ports. The figure below shows the default IEC61850 configuration. You can change it based on your system administrator's indications.

Figure 17 Default IEC 61850 Parameters



See "IEC 61850" on page C63 for more detailed information on the IEC 61850 communication protocol used.

Downloading ICD Files

You can also download the ICD file associated with your IEC 61850 communication profile from your device for consultation or troubleshooting purposes.

To do so:

1. From the page shown on Figure 17, click **Download IEC61850 ICD File**. Your browser asks whether you want to save or open the generated file.
2. Click **Save** and, in the **Browse** window that appears, select a location for the file that you are about to save.

   The CoreSense M10 creates an **.icd** file in the directory that you chose.

NOTICE

The content of the file generated with this procedure is the complete ICD file.

4–20 mA Output Channels

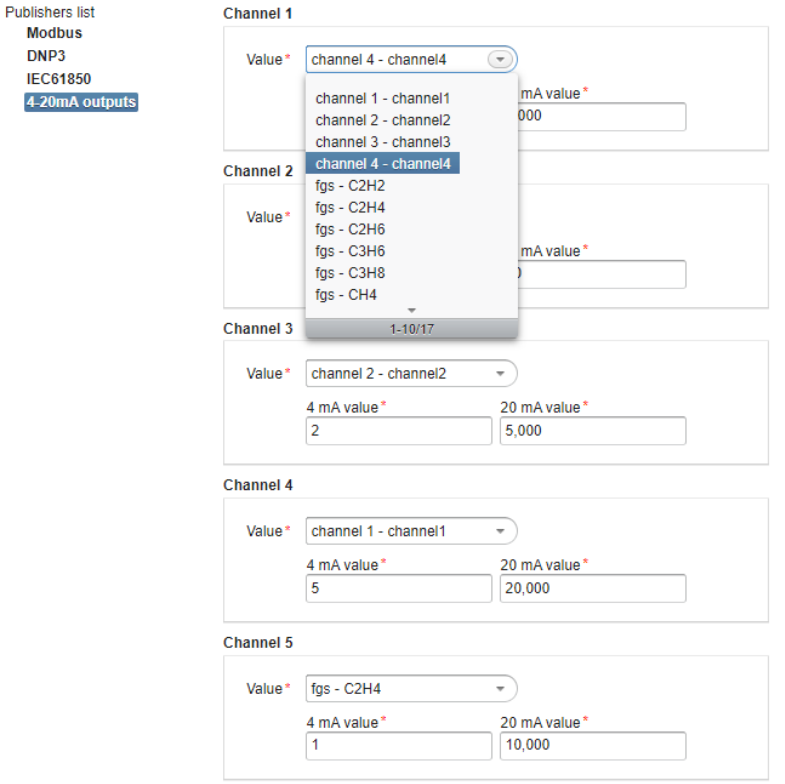
In the CoreSense M10, 4–20 mA outputs can be defined for up to eight gas sensors (channels 1 to 8). All channels can be configured the same way. In the following procedure, channel 1 is used as an example.

To configure the output for one gas sensor:

1 From the Publication settings page, click **o420** (for output 4–20; see Figure 18 on page 19).
On the page that appears, you can configure up to eight channels.

2 Under **Channel 1**, select the output that you want from the **Value** drop-down menu.
From the menu, you have access to the values of 10 gas sensors (fgs) and four channels.
The four channels correspond to the 4–20 mA inputs.

Figure 18 Selecting Output Channel Values



3 Enter the appropriate values in ppm in the **4 mA value** and **20 mA value** fields. For more information on the range of possible values, refer to the measurement specifications in the Installation Guide.
When you select a value in the Value drop-down list, default values appear in the **4 mA value** and **20 mA value** fields.

4 Repeat steps 2 and 3 for all required channels.

5 Scroll to the bottom of the page and click **Apply**. Values are set for the output channels that you selected.

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CHAPTER 4

Configuring 4–20 mA Input Channels

Data input channels that use the 4–20 mA standard are available if you need to integrate data coming from external devices (thermometers, flow meters, etc.). For each input channel that you enable, you need to configure certain settings, values, and thresholds. The following pages explain how to do that. To simplify understanding, we will use a thermometer as the device inputting values into the CoreSense M10.

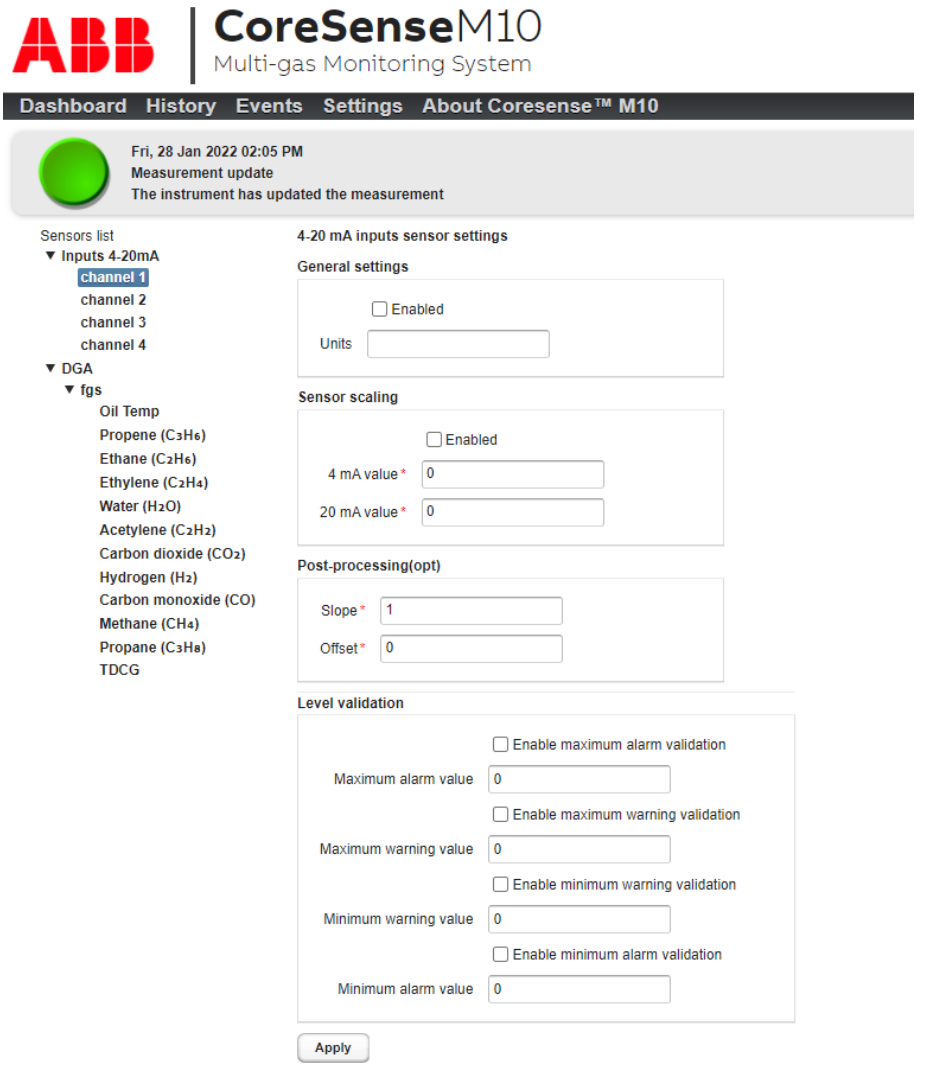
Configuring Basic Channel Settings

Each channel can be given a specific unit and be enabled or disabled as necessary.

To configure these settings:

1. From the CoreSense M10 dashboard, click **Settings**. The Settings page appears.
2. Click **Sensors settings** and enter your password when asked. The **Sensors Settings** page appears.
3. Click **Inputs 4–20 mA** and the channel that you want to use.
4. In the **Units** field, enter the unit of the property that you want to measure, e.g., °C, °F, K.
5. Check the **Enabled** box to activate this channel.
6. Click **Apply** at the bottom of the page to save your changes.

Figure 19 Selecting Input Channels



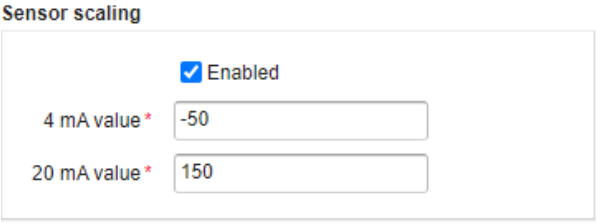
Setting Sensor Scaling

Since this input channel uses the 4–20 loop standard, it is necessary to set the values for the 4 mA and 20 mA currents. You enter these values in the **4 mA value** and **20 mA value** fields.

For example, a temperature sensor will output a signal from 4-mA to 20 mA for a corresponding temperature range of –50 °C to 150 °C.

You can enter such values in the **Sensor scaling** section.

Figure 20 Entering Sensor Scaling Values



Check the **Enabled** box below **Sensor scaling** to activate this function.

Click **Apply** at the bottom of the page to save your changes.

Setting Post-processing Channel Values

With the CoreSense M10, it is possible to add additive and/or multiplicative correction factors to raw sensor data. In CoreSense M10, multiplicative factors are known as slopes and additive factors, as offsets.

For example, a slope of 1.1 applied to a temperature of 100 degrees brings the raw sensor measurement to 110 degrees.

As for offsets, an offset of –5 applied to a temperature of 100 degrees brings the raw sensor measurement to 95 degrees.

You can enter such values in the **Post-processing (opt)** section.

Figure 21 Entering Post-processing Values

Click **Apply** at the bottom of the page to save your changes.

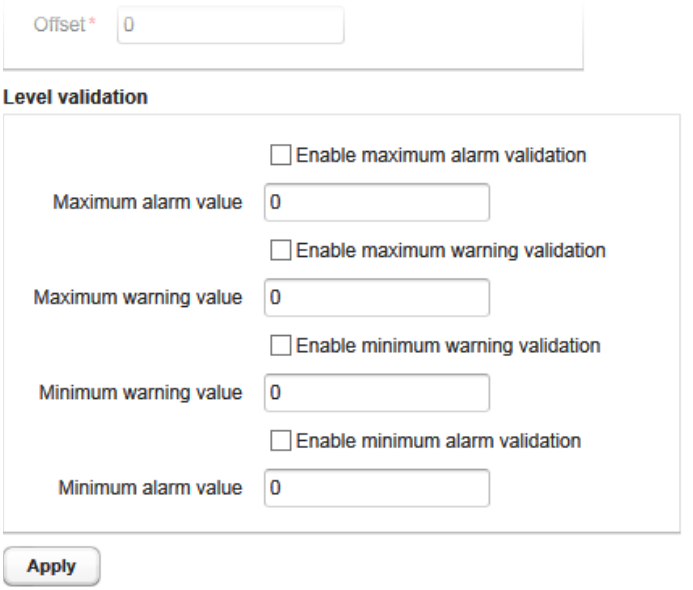
Setting Channel-level Alarms and Warnings

Each input channel supports two user-configurable thresholds for both alarms and warnings. It is your responsibility to define these thresholds and enter the appropriate values in the **Level validation** section.

When entering values for these thresholds, you must ensure that warning values, if ever attained, are attained before alarm values.

The following logical sequence should be applied:
Minimum alarm value < **Minimum warning value** < **Maximum warning value** < **Maximum alarm value**.

Figure 22 Entering Alarm and Warning Level Values



Click **Apply** at the bottom of the page to save your changes.

NOTICE

Only when a value is above its RoC trigger level will a rate-of-change warning or alarm condition be raised.

CHAPTER 5

Configuring Gas Sensors

Under normal circumstances, CoreSense M10 gas sensors need little to no fine-tuning.

At the factory, the CoreSense M10 is configured to report level warnings and alarms for the following measurement points: moisture (H_2O), hydrogen (H_2), methane (CH_4), acetylene (C_2H_2), ethylene (C_2H_4), ethane (C_2H_6), carbon monoxide (CO), carbon dioxide (CO_2), and total dissolved combustible gas (TDCG*). Warning and alarm threshold values, as indicated in the table below, are derived from Condition 3 (warnings) and Condition 4 (alarms) as defined in the IEEE Std C57.104-2019.

Table 1 shows values for transformer operating with mineral oil. See Appendix E for synthetic ester, natural ester or silicone fluids.

Table 1 Default Dissolved Gas Concentration Limits for Mineral Oil (µL/L [ppm])

Gas	Warning threshold	Alarm threshold	ROC Warning threshold	ROC Alarm threshold	Default state
Moisture (H_2O)	10	20	3	5	Enabled
Hydrogen (H_2)	80	200	25	50	Enabled
Methane (CH_4)	90	150	5	10	Enabled
Acetylene (C_2H_2)	2	7	1	3	Enabled
Ethylene (C_2H_4)	50	100	5	10	Enabled
Ethane (C_2H_6)	90	175	50	100	Enabled
Carbon monoxide (CO)	900	1100	35	70	Enabled
Carbon dioxide (CO_2)	9000	12,500	20	35	Enabled
TDCG*	n/a	n/a	n/a	n/a	**Disabled**
Propene (C_3H_6)	15	30	n/a	n/a	**Disabled**
Propane (C_3H_8)	n/a	n/a	n/a	n/a	**Disabled**

* TDCG is the sum of H_2, CH_4, C_2H_6, C_2H_4, C_2H_2 and CO, as per IEEE Std C57.104-2008.

NOTICE

Despite well-documented default values, it remains the user's responsibility to properly configure the CoreSense M10 monitoring system.

NOTICE

As illustrated later in the chapter, it is possible to configure rate-of-change (RoC) warning and alarm thresholds for each measurement point, and also to configure level alarms for oil temperature, propene (C_3H_6) and propane (C_3H_8).

None of these features are enabled by default.

Configuring Alarms and Warnings for Gas-level Events

The CoreSense M10 multi-gas monitoring system is delivered with preset gas-level event warnings and alarms. It is possible to modify these default presets. The system supports two user-configurable thresholds for level alarms and two additional user-configurable thresholds for rate-of-change alarms.

Level

Default warning and alarm thresholds can be modified. It is your responsibility to define warning and alarm thresholds suited to your transformer condition and application.

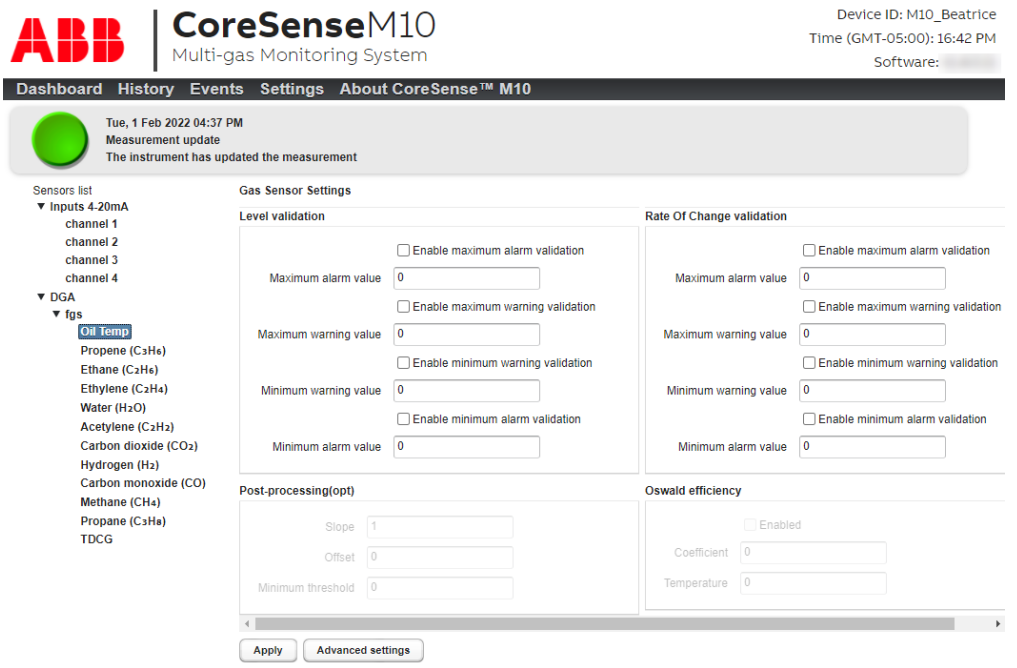
To configure these settings:

1 From the CoreSense M10 dashboard, click **Settings**. The Settings page appears.

2 Click **Sensors settings** and enter your password when asked. The **Gas Sensors Settings** page appears.

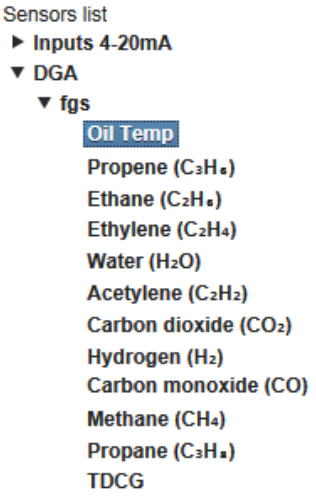
3 Click the arrows adjacent to **DGA** and **fgs**. A list of all sensor-measured values appears.

Figure 23 Entering Post-Processing Values



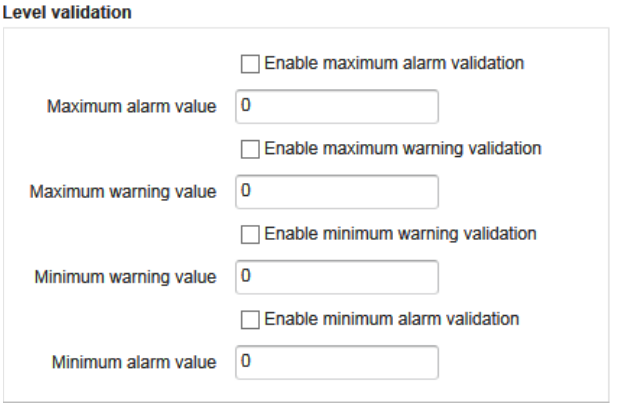
4 Select the value or gas whose events you want to configure (ten gases, oil temperature and TDCG [total dissolved combustible gas]).

Figure 24 Selecting a Value or Gas to Configure



5 Enter the appropriate values in the **Level validation** fields, and check the **Enable...** box for each relevant value to consider.

Figure 25 Entering Post-Processing Values



6 Click **Apply** to save the parameters that you just set.

Rate of Change (RoC)

The rate of change is evaluated over a period of 24 hours to determine whether a warning is issued or not. By default, RoCs are set at 0 for all gases. These default values can be modified to suit specific applications.

To avoid false alarms, a minimum level is configured for the rate-of-change alarm to be considered. Only when a gas is above the gas RoC trigger level will a rate-of-change warning or alarm condition be raised.

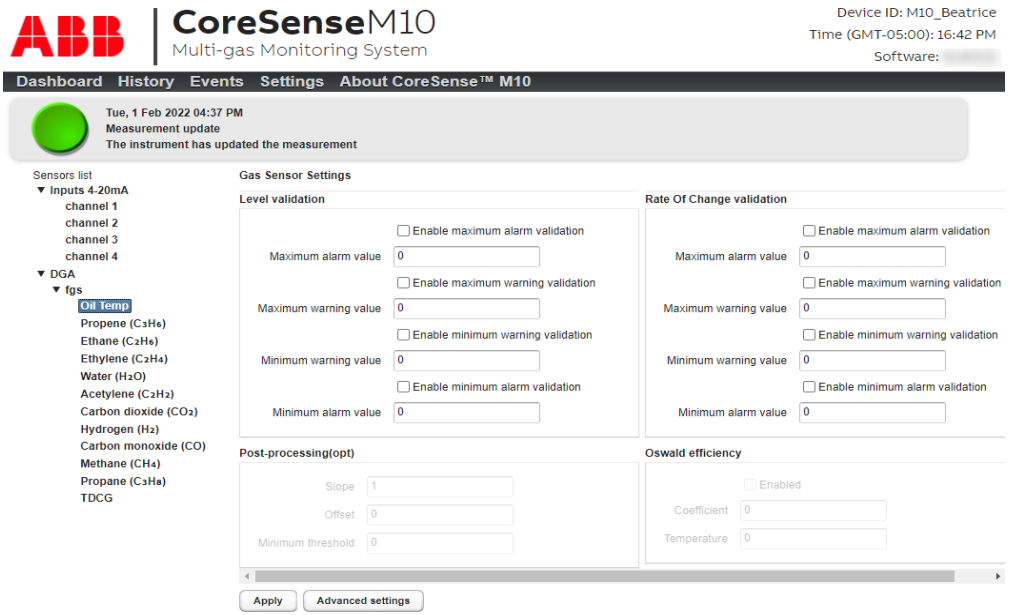
To configure these settings:

1 From the CoreSense M10 dashboard, click **Settings**. The Settings page appears.

2 Click **Sensor settings**. The Sensor settings page appears.

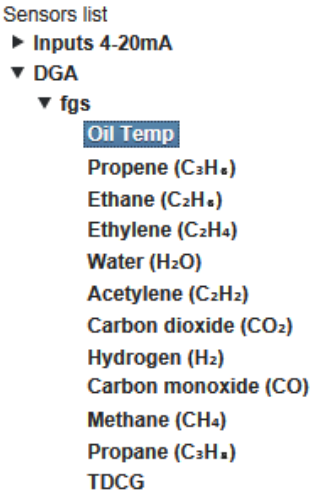
3 Click the arrows adjacent to **DGA** and **fgs**. A list of all sensor-measured values appears.

Figure 26 Entering Post-Processing Values



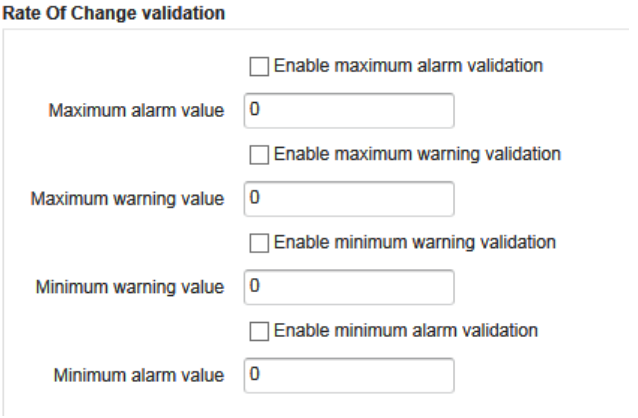
4 Select the value or gas whose events you want to configure (ten gases, oil temperature and TDCG [total dissolved combustible gas]).

Figure 27 Selecting a Value or Gas to Configure



5 Enter the appropriate values in the **Rate of Change validation** fields, and check the **Enable...** box for each relevant value to consider.

Figure 28 Entering post-processing values



6 Click **Apply** to save the parameters that you just set.

Setting Advanced Processing Parameters

CoreSense M10 allows you to apply certain advanced processing parameters depending on your situation. The procedures below briefly explain how to enable these processing parameters.

With the CoreSense M10, it is possible to add additive and/or multiplicative correction factors to raw sensor data. In CoreSense M10, multiplicative factors are known as **slopes** and additive factors, as **offsets**.

For example, a slope of 1.1 applied to a concentration value of 100 ppm brings the raw sensor measurement to 110 ppm.

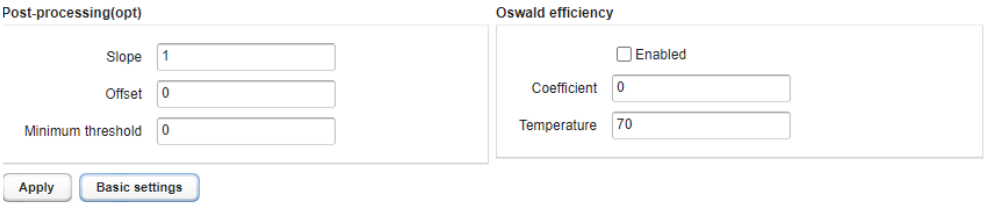
As for offsets, an offset of -5 applied to a concentration of 100 ppm brings raw sensor measurement to 95 ppm.

The **Minimum threshold** parameter is an advanced filtering function for each sensor. When activated any value lower than threshold value is set to 0. This corrected data is shown on the dashboard, history data and published protocols. The raw data is still available in the .csv file export. By default the minimum threshold is set to the minimum level of detection as per instrument specifications. The function can be deactivated by setting the value to zero (0).

To enter such values:

1. Click **Advanced settings** next to the **Apply** button. A confirmation dialog box appears.
2. Click **OK**. This activates the **Post-processing (opt)** and **Oswald efficiency** sections.
   The **Advanced settings** button becomes **Basic settings**.
3. Enter the relevant values **Post-processing (opt)** section.
4. Click **Apply** to save your changes.

Figure 29 Entering Advanced Processing Parameters



NOTICE

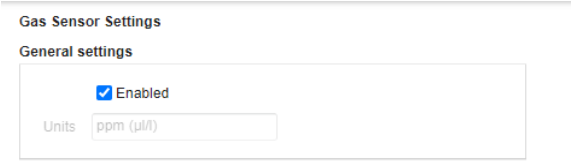
The **Oswald efficiency** coefficient is an advanced feature that must only be used with the help or in the presence of your service representatives. Modifying parameters in this section without any help could damage the system and render it unusable or, at the very least, unreliable.

Disabling Gas Sensor General Settings

Some values can be disabled from the **Gas Sensor Settings** page. Once the **Enabled** box is unchecked, the corresponding value is removed from the dashboard and stops being updated on the various protocols.

By default all sensor values are **Enabled**. Under normal operation the parameter shall remain **Enabled**.

Figure 30 Gas Sensor Enabled Checkbox



Selecting Total Dissolved Combustible Gas Specification

CoreSense M10 allows you to select one of two total dissolved combustible gas (TDCG) specifications: SGCC or IEEE/IEC.

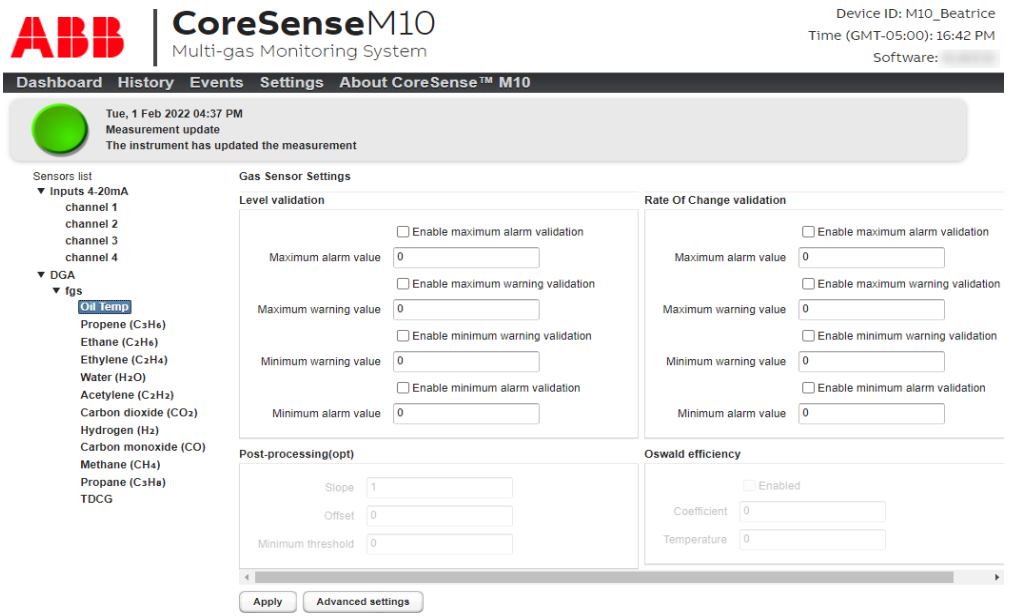
Table 2 TDCG Specification Gas Selection

SGCC	IEEE/IEC
Acetylene (C_2H_2)	Acetylene (C_2H_2)
Ethylene (C_2H_4)	Ethylene (C_2H_4)
Ethane (C_2H_6)	Ethane (C_2H_6)
Methane (CH_4)	Methane (CH_4)
	Carbon monoxyde (CO)
	Hydrogen (H_2)

To select a TDCG specification:

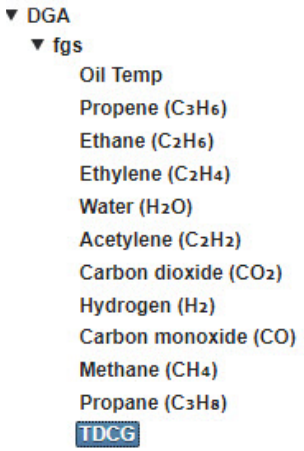
1. From the CoreSense M10 dashboard, click **Settings**. The Settings page appears.
2. Click **Sensor settings**. The Sensor settings page appears.
3. Click the arrows adjacent to **DGA** and **fgs**. A list of all sensor-measured values appears.

Figure 31 Entering Post-Processing Values



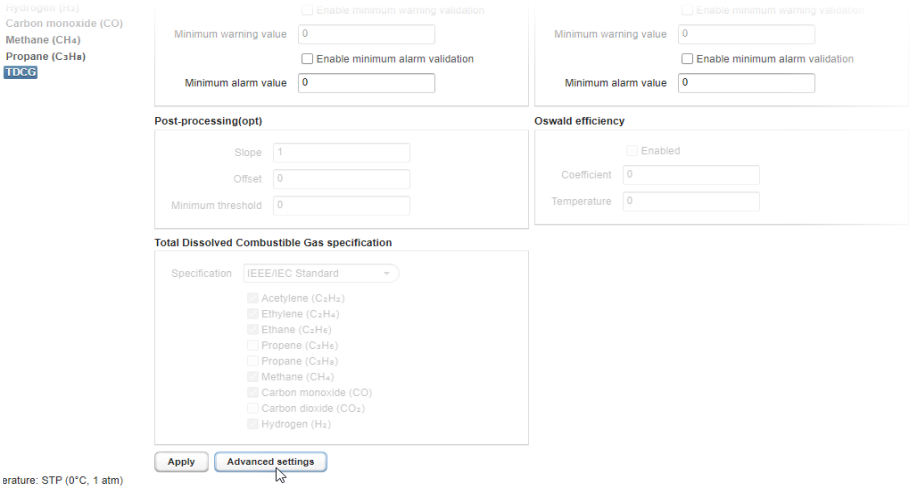
4 Select **TDCG**.

Figure 32 Selecting TDCG



5 Scroll to the bottom of the page, and click **Advanced settings**.

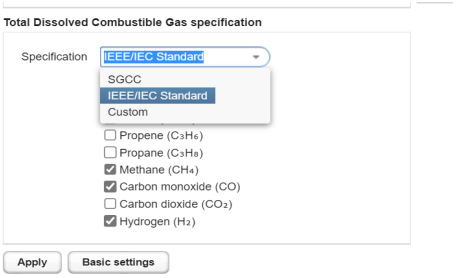
Figure 33 Clicking Advanced settings



The panel underneath **Total Dissolved Combustible Gas specification** becomes active.

6 From the **Specification** drop-down menu, select the specification that you need to use (**SGCC** or **IEEE/IEC**).

Figure 34 Selecting the TDCG specification



The gas selection underneath the **Specification** menu changes based on the specification selected

7 Click **Apply**. The TDCG specification is now active.

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CHAPTER 6

Managing Events

Events happen inside the system: configuration changes, status changes (warning to alarm, warning to normal, etc.), system errors and reboots, etc. These events can be recorded with the CoreSense M10. The following pages explain how to manage these events.

Acknowledging Events

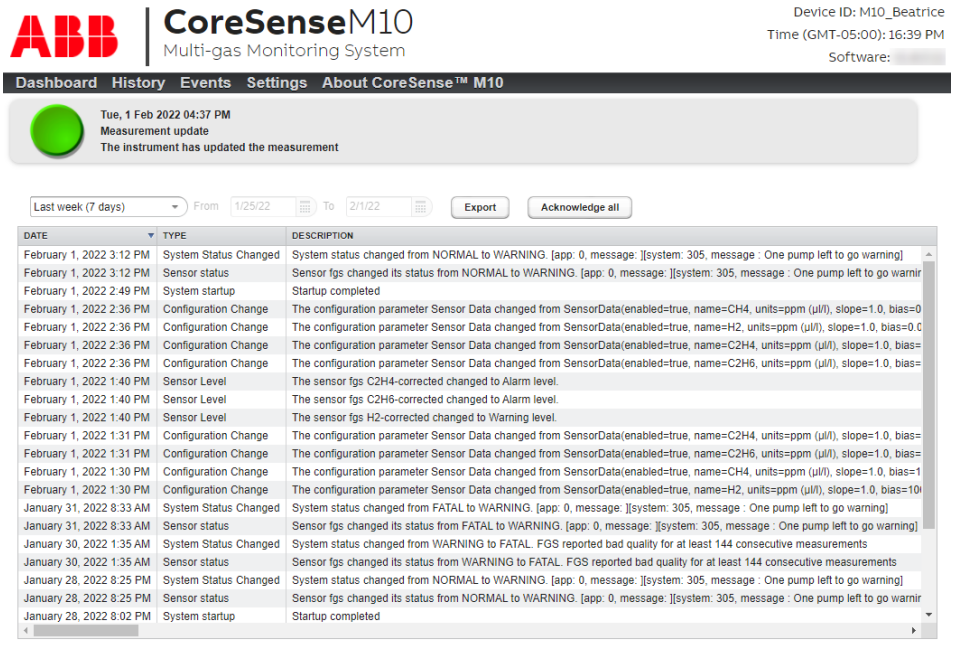
It is possible to acknowledge events for which actions have been taken. You can either acknowledge each event individually or all at once and you can do so while being connected remotely or when you are on site without a computer handy.

At Once

You can acknowledge all events at once locally via the CoreSense M10 touchscreen or remotely via the Web interface.

- To acknowledge all events via the touchscreen, click **Acknowledge all** on the **Events** page.

Figure 35 Events Page



To acknowledge all events remotely:

1 Click **Acknowledge all** on the **Events** page. The **Acknowledgment** dialog box appears.

Figure 36 Acknowledgment Dialog Box

2 Enter your name in the **Name** field and, if necessary, enter comments in the text box underneath.

3 Click **Acknowledge**. All events are acknowledged.

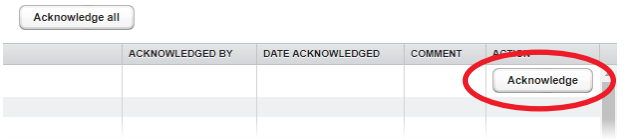
Individually

You can only acknowledge individual events remotely via the Web interface. When you log in remotely, **Acknowledge** buttons appear in the **ACTION** column of the **Events** page.

To acknowledge events individually:

1 From the **Events** page, click **Acknowledge** on the line of the event that you want to acknowledge.

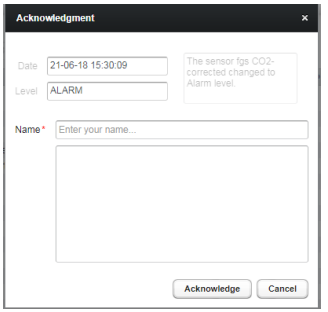
Figure 37 Acknowledge Button



2 Enter your password in the **Password** dialog box that appears.

3 In the **Acknowledgment** dialog box, where the selected event is identified (date and alarm level), enter your name in the Name field and, if necessary, enter comments in the text box underneath.

Figure 38 Acknowledgment Dialog Box



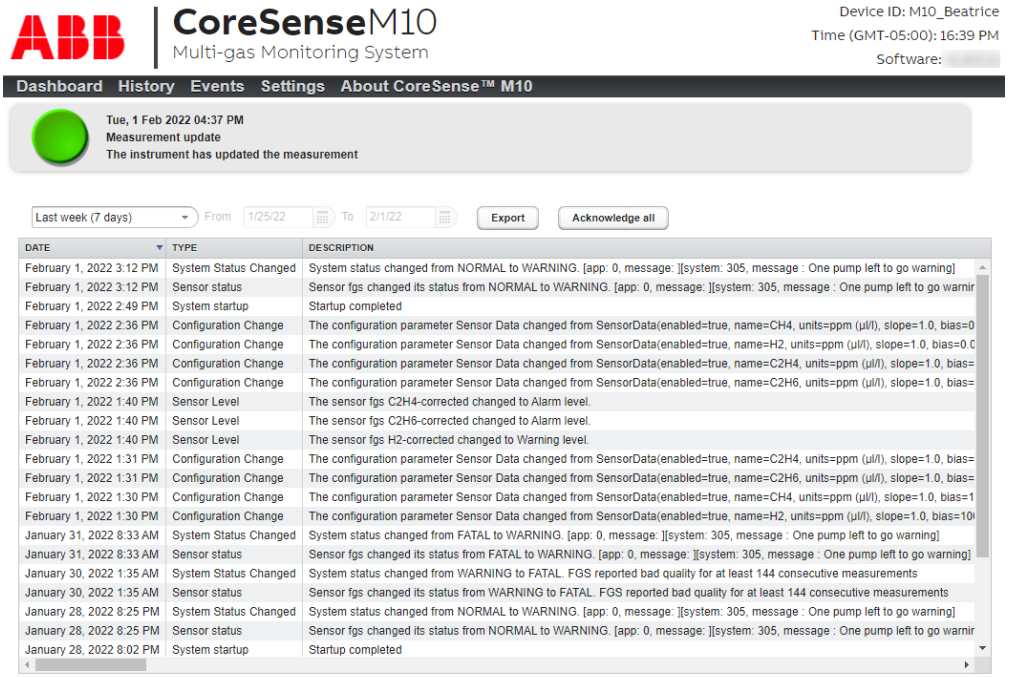
4 Click **Acknowledge**. The individual event selected is acknowledged.

Selecting a Specific Period

To select events that happened over the course of a specific period:

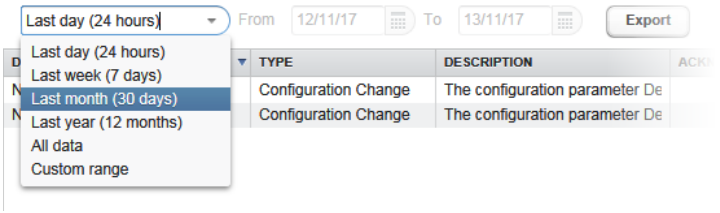
1 From the CoreSense M10 dashboard, click **Events** in the menu bar. The events table appears.

Figure 39 Events Page



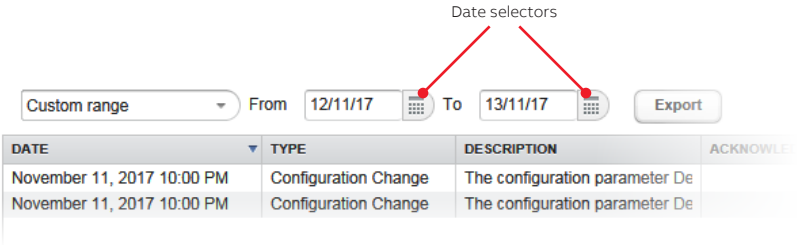
2 From the drop-down list above the **Date** column, you can select a predefined period. The event list underneath is updated to reflect the selected period.

Figure 40 Time Period Drop-down Menu



a If you selected **Custom range**, the adjacent **From** and **To** fields become active.

Figure 41 Selecting Period with Date Selectors



b For both the **From** and **To** fields, click the date selector on the right and select the beginning and end of the required period. The event table updates accordingly.

Exporting Events

You can export events from the CoreSense M10 software for analysis in another software, for example. Events are exported in a *.csv* file format.

NOTICE

DO NOT use accents, spaces or special characters when naming your device as this will make exported files unusable.

CoreSense M10 generates dates in the US format (month/day/year HH:MM AM/PM). Make sure that the regional format used on your computer is English (United States) before trying to work with CoreSense *.csv* files in Microsoft Excel.

To export an event table:

1 Select a period for the events that you want to export (see “Selecting a Specific Period” on page 37).

2 Click **Export** and select where you want to save the *.csv* file (options for saving files vary depending on your browser).

CHAPTER 7

Managing History Data

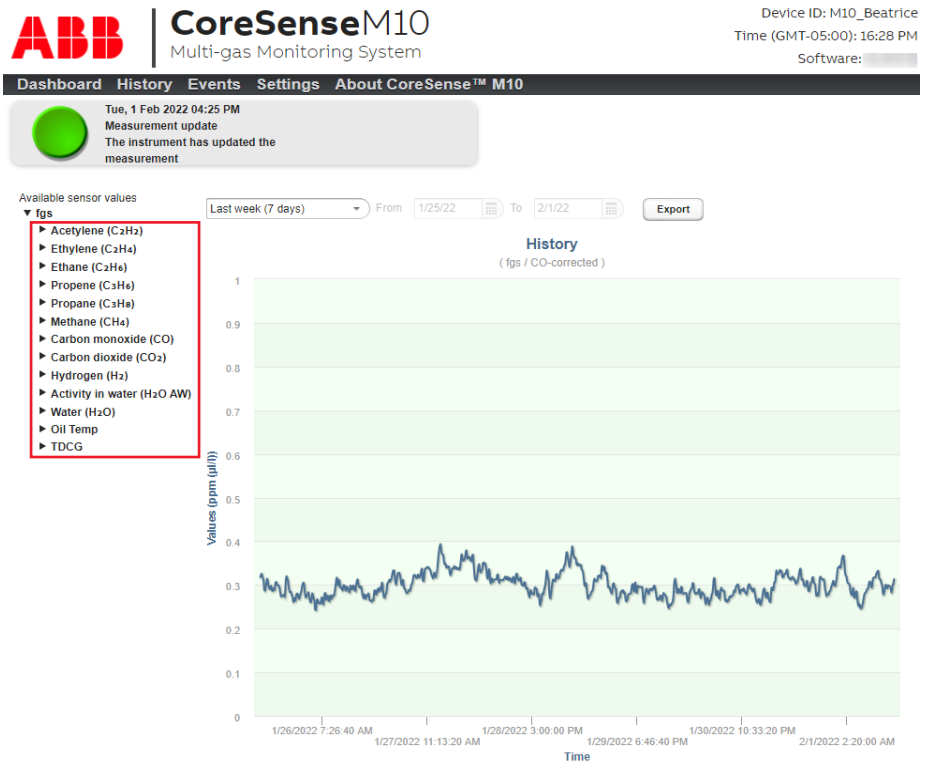
The CoreSense M10 analysis module applies a certain level of processing to raw data for analysis purposes. It also calculates the rate of change of this data. All this information can be retrieved and exported for further analysis with your favorite tool for dissolved gases software. This data can be displayed in the History page.

Selecting the Type of Data to Display

To select the type of history data to display:

1 From the CoreSense M10 dashboard, click **History** in the menu bar. The history page appears.

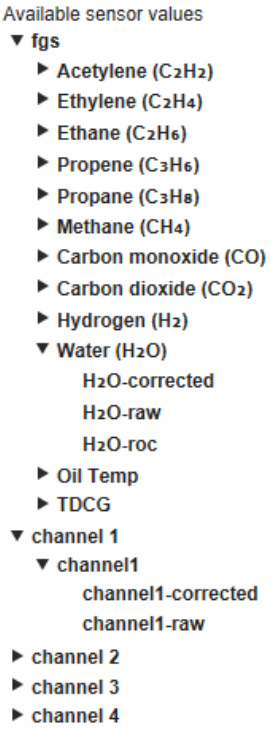
Figure 42 History Page with Expanded Gas List



2 Click the arrow next to the **fgs** (**F**TIR **g**as **s**ensor) or **channel** *x* (4–20 mA input) to display the list of gases or channel data whose history has been recorded.

3 Click the arrow next to a gas or channel whose history you want to display (see Figure 43). This opens up a list of available data for this specific gas or channel.

Figure 43 Available History Data



Three types of data are recorded continuously:

- Raw data (-raw) is data as recorded directly from the sensor, without any slope and offset value processing applied.
- Processed data (-corrected) is raw data to which slope and offset values have been applied.
- Rate of change (-roc) is the rate at which data changes over time; it is calculated over a 24-hour period (**only available for the fgs**).

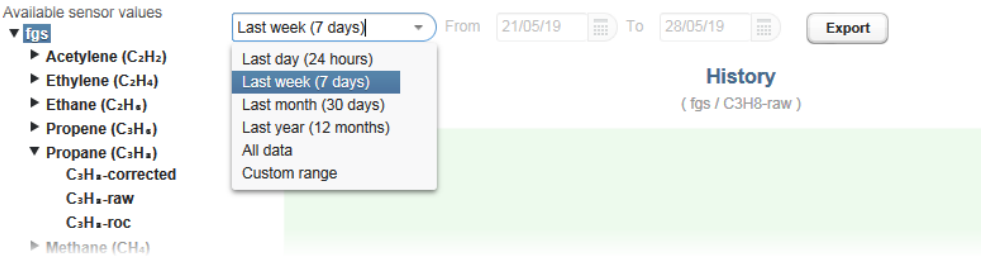
4 Select the data type that you wish to display. Once selected, the relevant data is displayed in the adjacent graph.

Selecting a Specific Period

Once you have selected the data type to display, you can select to display data for a specific period only.

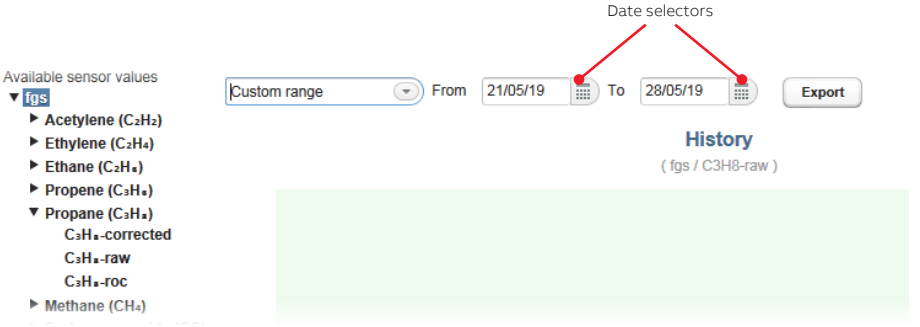
To do so, from the active drop-down list above the graph, select a predefined period. The history graph underneath is updated to reflect the selected period.

Figure 44 History Page Period Drop-down Menu



- If you selected **Custom range**, the adjacent **From** and **To** fields become active. For both fields, click the date selector on the right (see Figure 45) and select the beginning and end of the required period. The gas data graph updates accordingly.

Figure 45 Selecting Period with Date Selectors



Exporting History Files

You can export history files from the CoreSense M10 software for analysis using specialized software.

When exporting gas sensor (**fgs**) history, **all** gas values, oil temperatures and TDCGs are downloaded automatically for all 10 gases over the specified period. However, when exporting channel history files, **each** channel is exported independently.

History files are exported in a *.csv* file format.

NOTICE

If you used accents, spaces or special characters when naming your device, exported files will not work properly.

CoreSense M10 generates dates in the US format (month/day/year HH:MM AM/PM). Make sure that the regional format used on your computer is English (United States) before trying to work with CoreSense *.csv* files in Microsoft Excel.

To export a history file:

1. Select **fgs** (or any gas underneath) or the **channel** that you want to export.
2. Select a period for the history that you want to export (see "Selecting a Specific Period" on page 41).
3. Click **Export** and select where you want to save the file (saving options vary with each browser).

CHAPTER 8

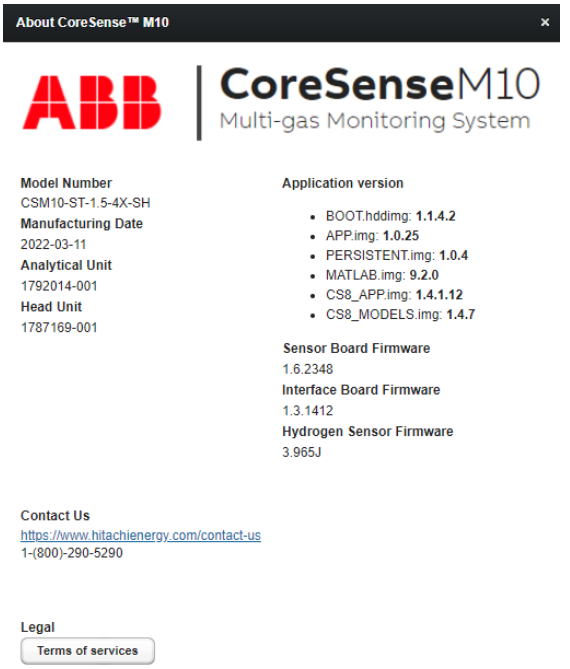
Troubleshooting

As usual with ABB products, reliability is of the essence. Troubleshooting might happen occasionally. Most of the time, service has to be performed by authorized service personnel. If such situations arise, you will need to contact after-sales service. When in contact with service personnel, you might be asked to provide certain information and provide remote access to your system. The following pages provide relevant details.

About Your CoreSense M10 Software

Whenever you need to contact the after-sales service for troubleshooting purposes, you can do so from the About CoreSense M10 menu. When you select this item from the menu bar, an **About CoreSense™ M10** box appears where you can obtain the various software versions on-board the analysis module as well as the email address to contact the after-sales service. This is also where you can access the terms of service.

Figure 46 About CoreSense M10 Box

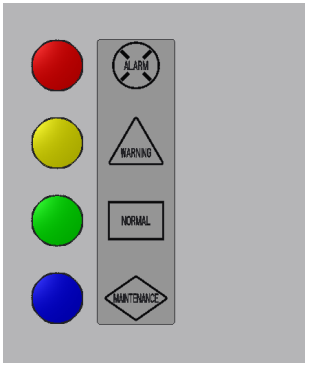


Diagnosing Problems

Most problems that could happen within the CoreSense M10 monitoring system will be recorded as events in the Events log. You will be informed of these problems either with alarms or by looking at the LEDs on the system cabinet or sensor head. The meaning of the various LEDs is explained below.

Understanding Analytical Unit LEDs

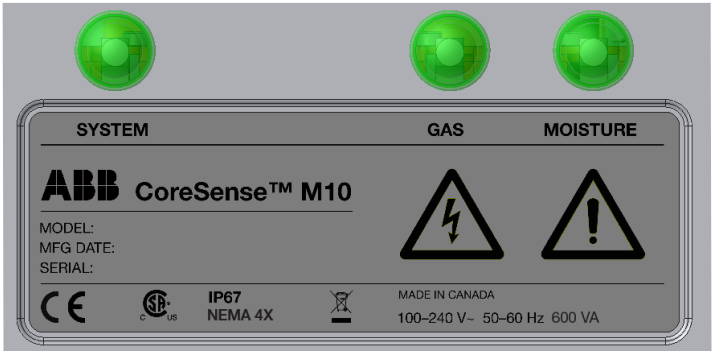
Figure 47 Analytical Unit Status LEDs



	Solid	Blinking
RED **ALARM**	An alarm threshold has been reached by any of the measured parameters.	N/A
YELLOW **WARNING**	A warning threshold has been reached by any of the measured parameters.	N/A
GREEN **NORMAL**	Normal operating conditions.	The analyzer is starting up.
BLUE **MAINTENANCE**	**Unit requires immediate maintenance.** User attention is required as the sensor is either operating outside its nominal specifications or experimenting a fault condition. Export and consult the event log and contact your local service representative (for information on exporting logs, see “Exporting System Logs” on page 47).	User attention is required as the last working pump or source is being used. An event is created accordingly, logs should be exported and a service call made (for more information, see “Exporting System Logs” on page 47). **NOTE:** The blinking blue LED can be lit at the same time as other LEDs, or when a measurement is missing for a certain period of time (90 minutes by default).

Understanding Sensor Head LEDs

Figure 48 Sensor Head Status LEDs



	System	Gas	Moisture
GREEN	The sensor is powered up and operating normally.	All gas levels and rate-of-change are below user-configured WARNING thresholds.	Both the moisture level AND the moisture 24-hour rate-of-change are below user-configured WARNING thresholds.
BLUE	**Unit requires immediate maintenance.** **Solid:** During system updates or when user attention is required as the sensor is either operating outside its nominal specifications or experimenting a fault condition. Export and consult the event log and contact your local service representative (for information on exporting logs, see “Exporting System Logs” on page 47). **Blinking:** User attention is required as the last working pump or source is being used. An event is created accordingly, logs should be exported and a service call made (for more information, see “Exporting System Logs” on page 47). **NOTE:** The blinking blue LED can be lit at the same time as other LEDs or when a measurement is missing for a certain period of time (90 minutes by default).	N/A	N/A

	System	Gas	Moisture
YELLOW  **WARNING**	**Solid:** While the cabinet is starting up. **Solid:** A warning threshold has been reached by any of the measured gases. It remains lit until the associated WARNING event has been acknowledged.	The last measured gas level OR 24-hour rate-of-change of at least one gas is above user-configured WARNING thresholds.	The last measured moisture level OR 24-hour rate-of-change are above user-configured WARNING thresholds.
RED  **ALARM**	An alarm threshold has been reached by any of the measured gases. It remains lit until the associated ALARM event has been acknowledged.	The last measured gas level OR 24-hour rate-of-change of at least one gas is above user-configured ALARM thresholds.	The last measured moisture level OR 24-hour rate-of-change are above user-configured ALARM thresholds.

Managing System Logs

The following procedures explain how to generate the system log files that after-sales service representatives might ask for.

Selecting a System Log

All system logs are saved in a predefined folder. They contain all sorts of information relevant to a trained service personnel.

To access and select a system log file:

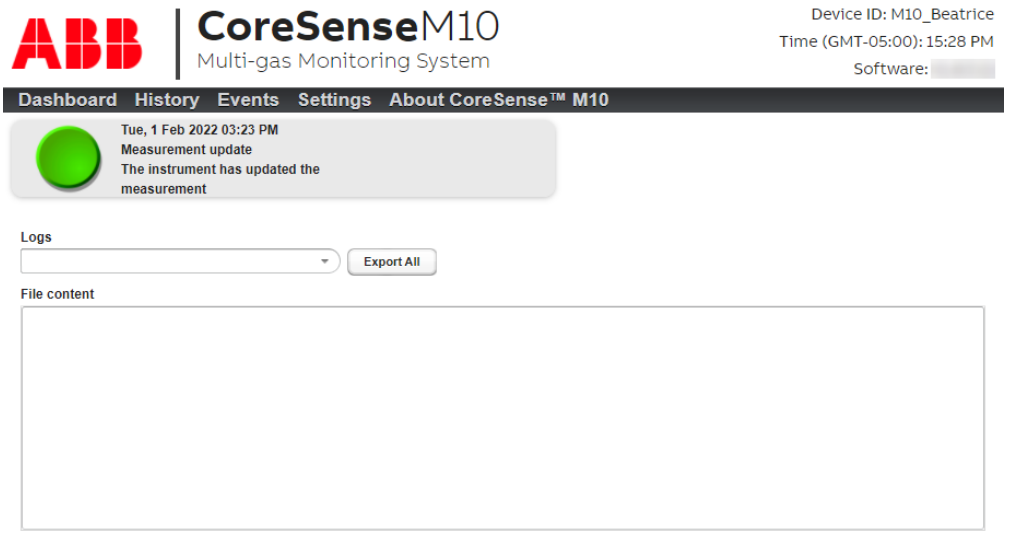
1 From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears.

2 Click **System Logs**.

If asked, enter your password. For more information on passwords, see “Changing Passwords” on page 5.

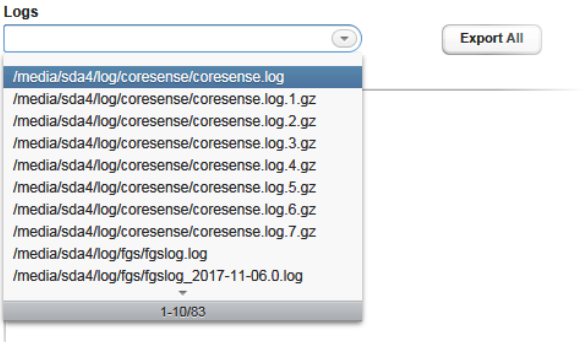
The system log page appears.

Figure 49 System Logs File



3 From the **Logs** drop-down menu, select the log to display (see Figure 50). The content of the log appears in the section under the **Logs** drop-down menu.

Figure 50 Selecting System Log File



Exporting System Logs

To export system logs, click **Export All** and select where you want to save the .zip file (saving options vary with each browser).

Managing SPC Files

The following procedures explain how to generate spectrum files that ABB applications support representatives might need to improve/fix technical problems with your system.

Selecting SPC Files

1 From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears.

2 Click **SPC files**.

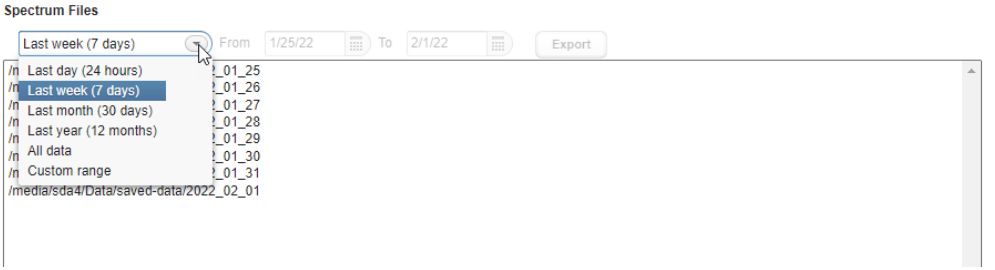
If asked, enter your password. For more information on passwords, see “Changing Passwords” on page 5.

The spectrum page appears.

Figure 51 Spectrum Page

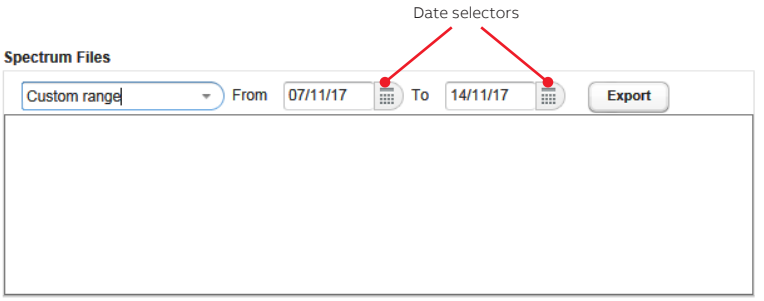
3 Select a predefined period from the drop-down list under **Spectrum files**. A list of spectra for the selected period appears in the box underneath.

Figure 52 Spectrum Page Period Drop-down Menu



- If you selected **Custom range**, the adjacent **From** and **To** fields become active. For both fields, click the date selector on the right (see Figure 53) and select the beginning and end of the required period. The list of spectrum files changes according to the period selected.

Figure 53 Spectrum Page Date Selectors



Exporting SPC Files

To export a spectrum file:

1 Select the spectrum to export (as explained on page 48).

2 Click **Export** and select where you want to save the .zip file (saving options vary with each browser).

Enabling Remote Access for Service

If contacting service for troubleshooting reasons, the service representative might ask to obtain access to your system.

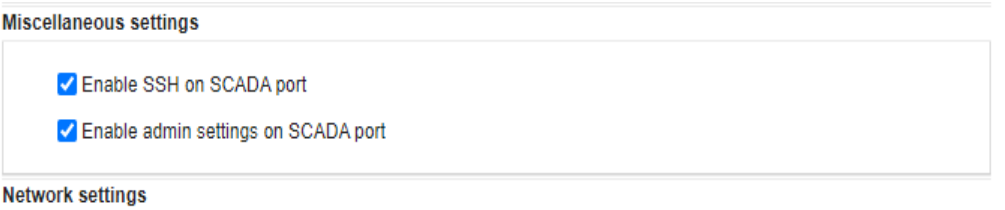
You can provide remote access to your system as follows:

1 From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears (see Figure 3).

2 Click **Administration settings** and enter your password if necessary (for more information on passwords, see “Changing Passwords” on page 5).

3 Scroll down to the **Miscellaneous settings** section and check **Enable SSH on SCADA port**

Figure 54 Enabling remote access to service personnel



4 At the bottom of the page, click **Apply** to confirm remote access to your system.

When you check this box, service personnel gain access to a special Diagnostics TCP port on your instrument for remote access to your system.

Installing Firmware Updates

At some point in the future, you might be asked by a service representative to update your system firmware. This can be done with a web browser (remotely or locally) or a USB key (locally).

Before performing any firmware update, it is **strongly recommended** to export your system logs (see page 47) and history files (see page 42).

Updating With a Web Browser (preferred method)

To update the firmware via a web browser:

1 Skip to step 2 if you are working remotely. Otherwise, open the CoreSense M10 cabinet and connect your laptop to an Ethernet communication port (SCADA or SERVICE) of the analytical unit with a straight RJ45 Ethernet cable.

2 Open your web browser and point it to the required IP address:

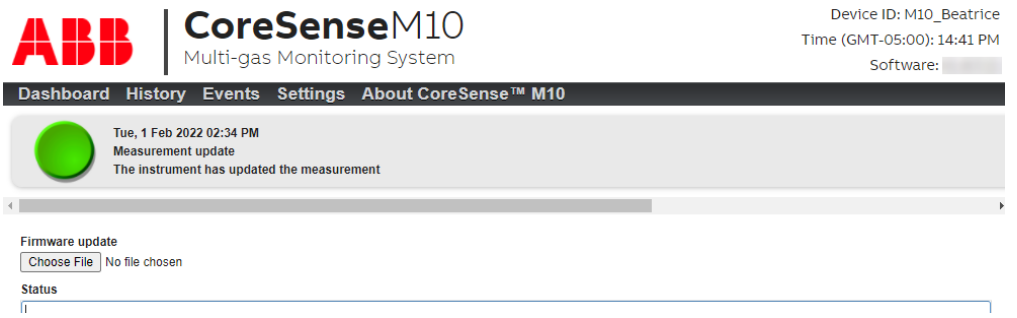
- if connected to the SCADA port: the static IP address (`http://10.127.127.127`) or the address indicated on the local HMI;
- if connected to the SERVICE port: `http://172.16.100.1` (or fix address set for this interface).

This address points to the CoreSense M10 dashboard.

3 From the CoreSense M10 dashboard (see Figure 2 on page 3), click **Settings**. The Settings page appears.

4 Click **Update firmware** and enter your password (if necessary). The firmware update page appears.

Figure 55 Firmware Update Page



5 Click **Choose File**.

6 In the **Open** window that appears, locate and select the firmware file (.zip) sent to you by the service representative.

7 Click **Open**. You return to the firmware update page. The name of the file that you selected appears next to the **Choose File** button and the **Update** button is now active.

8 Click **Update**.

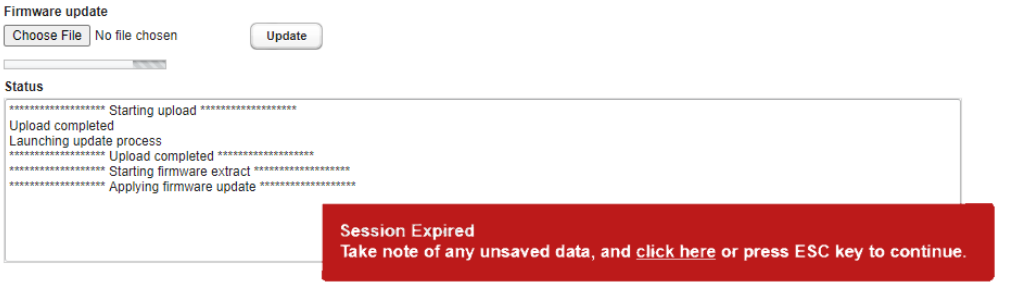
The file is uploaded to your system and the firmware update takes place.

NOTICE

Do not exit the browser during the firmware update process.

You need to wait for the **Session Expired** message before attempting to connect on the web page.

Figure 56 Firmware Update Page



Your system reboots once the firmware is updated. Multiple reboot sequences may be required depending on actions required on the CoreSense M10.

9 After the system has been automatically rebooted, return to the web page and click **About CoreSense™ M10** to make sure that the application version is the one given to you by your service representative.

Updating With a USB Key

NOTICE

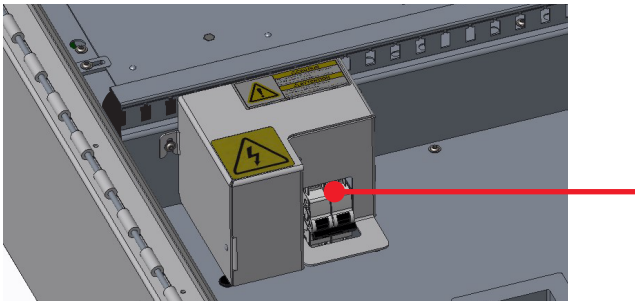
If the update process do not seem to work on your first try, try it again with a different brand of USB key or update remotely (see “Updating With a Web Browser (preferred method)” on page 50).

1 From your computer, extract the zip file sent to you by the service representative at the root level of a USB key.

2 Open the CoreSense M10 cabinet.

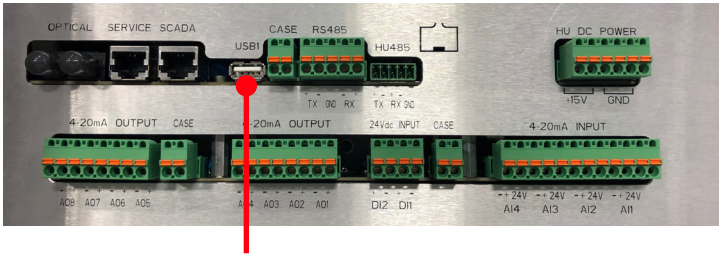
3 Shutdown the instrument using the main power switch.

Figure 57 Instrument Main Power Switch



4 Insert the USB key on the USB port of the CoreSense M10 cabinet.

Figure 58 Instrument USB Port



5 Turn on the instrument using the main power switch (see Figure 57). The update process will start automatically and take a few minutes.

Messages will appear on the local screen during the update process. Also, the instrument may reboot two or three times depending on the required updates for your system. The update process is complete once a message appears indicating to remove the USB key and reboot.

6 When this message appears, remove the USB key.

7 Power off the system for a few seconds and power it on again.

You may be asked to calibrate the screen by touching the four crosses displayed on the screen.

The system firmware is considered complete after this last step. Wait until the **Dashboard** page is displayed for at least 4 minutes (after the reboot, the **Dashboard** page might be empty for the first 20 minutes).

APPENDIX A

Modbus

The RS-485 and Modbus default settings can be modified using the web interface.

NOTICE

For best results it is recommended to configure the Modbus master with a timeout of 10000 ms and 5 retries.

Minimum delay between polls shall be at least 100 ms.

The Modbus slave ID is 1 **and cannot be changed**.

RS-485 Configuration

Baud rate	9600
Data Bits	8
Stop bits	1
Parity	None
Flow control	None (only none is supported)

TCP Configuration Port

Modbus TCP	502/tcp

Modbus Parameters

NOTICE

Only read-only holding registers are supported in this implementation.

The Modbus slave ID is 1 **and cannot be changed**.

Register	Modbus number	Parameter	Function	Datatype	DataRange
			Reserved		
0			Not supported		
1-10			Reserved		
			Info		
11-20	40011	Model number		ASCII string	
21-30	40021	Serial number		ASCII string	
31-40	40031	SW revision		ASCII string	
41-50	40041	System ID		ASCII string	
51	40051	Manufacturing date	high byte = month low byte = day	32-bit binary value	
52	40052		Year		
			System status		
53	40053	System status	see <Status> table	16-bit binary map	see <Status> table
54	40054	FGS status	Internal error	signed 16-bit binary number	ABB service
			Dissolved gas and moisture		
55	40055	Moisture status		16-bit binary map	see <Gas status> table
56	40056	Moisture (aw)	scaled by 1000	signed 16-bit binary number	
57	40057	Moisture (ppm)		signed 16-bit binary number	
58	40058	Moisture RoC (ppm/day)		signed 16-bit binary number	
59	40059	RESERVED–Moisture RoC (ppm/week)	return 0	signed 16-bit binary number	
60	40060	RESERVED–Moisture RoC (ppm/month)	return 0	signed 16-bit binary number	
61	40061	Hydrogen status		16-bit binary map	see <Gas status> table
62	40062	Hydrogen (ppm)		signed 16-bit binary number	
63	40063	Hydrogen RoC (ppm/day)		signed 16-bit binary number	

Register	Modbus number	Parameter	Function	Datatype	DataRange
64	40064	RESERVED–Hydrogen RoC (ppm/week)	return 0	signed 16-bit binary number	
65	40065	RESERVED–Hydrogen RoC (ppm/month)	return 0	signed 16-bit binary number	
66	40066	CO status		16-bit binary map	see <Gas status> table
67	40067	CO (ppm)		signed 16-bit binary number	
68	40068	CO RoC (ppm/day)		signed 16-bit binary number	
69	40069	RESERVED–CO RoC (ppm/week)	return 0	signed 16-bit binary number	
70	40070	RESERVED–CO RoC (ppm/month)	return 0	signed 16-bit binary number	
71	40071	CO_2 status		16-bit binary map	see <Gas status> table
72	40072	CO_2 (ppm)		signed 16-bit binary number	
73	40073	CO_2 RoC (ppm/day)		signed 16-bit binary number	
74	40074	RESERVED–CO_2 RoC (ppm/week)	return 0	signed 16-bit binary number	
75	40075	RESERVED–CO_2 RoC (ppm/month)	return 0	signed 16-bit binary number	
76	40076	CH_4 Status		16-bit binary map	see <Gas status> table
77	40077	CH_4 (ppm)		signed 16-bit binary number	
78	40078	CH_4 RoC (ppm/day)		signed 16-bit binary number	
79	40079	RESERVED–CH_4 RoC (ppm/week)	return 0	signed 16-bit binary number	
80	40080	RESERVED–CH_4 RoC (ppm/month)	return 0	signed 16-bit binary number	
81	40081	C_2H_2 Status		16-bit binary map	see <Gas status> table
82	40082	C_2H_2 (ppm)		signed 16-bit binary number	
83	40083	C_2H_2 RoC (ppm/day)		signed 16-bit binary number	
84	40084	RESERVED–C_2H_2 RoC (ppm/week)	return 0	signed 16-bit binary number	
85	40085	RESERVED–C_2H_2 RoC (ppm/month)	return 0	signed 16-bit binary number	
86	40086	C_2H_4 status		16-bit binary map	see <Gas status> table
87	40087	C_2H_4 (ppm)		signed 16-bit binary number	
88	40088	C_2H_4 RoC (ppm/day)		signed 16-bit binary number	
89	40089	RESERVED–C_2H_4 RoC (ppm/week)	return 0	signed 16-bit binary number	

Register	Modbus number	Parameter	Function	Datatype	DataRange
90	40090	RESERVED–C_2H_4 RoC (ppm/month)	return 0	signed 16-bit binary number	
91	40091	C_2H_6 status		16-bit binary map	see <Gas status> table
92	40092	C_2H_6 (ppm)		signed 16-bit binary number	
93	40093	C_2H_6 RoC (ppm/day)		signed 16-bit binary number	
94	40094	RESERVED–C_2H_6 RoC (ppm/week)	return 0	signed 16-bit binary number	
95	40095	RESERVED–C_2H_6 RoC (ppm/month)	return 0	signed 16-bit binary number	
96	40096	TDCG status		16-bit binary map	see <Gas status> table
97	40097	TDCG (ppm)		signed 16-bit binary number	
98	40098	TDCG RoC (ppm/day)		signed 16-bit binary number	
99	40099	RESERVED–TDCG RoC (ppm/week)	return 0	signed 16-bit binary number	
100	40100	RESERVED–TDCG RoC (ppm/month)	return 0	signed 16-bit binary number	
101	40101	C_3H_6 status		16-bit binary map	see <Gas status> table
102	40102	C_3H_6 (ppm)		signed 16-bit binary number	
103	40103	C_3H_6 RoC (ppm/day)		signed 16-bit binary number	
104	40104	RESERVED–C_3H_6 RoC (ppm/week)	return 0	signed 16-bit binary number	
105	40105	RESERVED–C_3H_6 RoC (ppm/month)	return 0	signed 16-bit binary number	
106	40106	C_3H_8 status		16-bit binary map	see <Gas status> table
107	40107	C_3H_8 (ppm)		signed 16-bit binary number	
108	40108	C_3H_8 RoC (ppm/day)		signed 16-bit binary number	
109	40109	RESERVED–C_3H_8 RoC (ppm/week)	return 0	signed 16-bit binary number	
110	40110	RESERVED–C_3H_8 RoC (ppm/month)	return 0	signed 16-bit binary number	
111	40111	Oil temperature status		16-bit binary map	see <Gas status> table
112	40112	Oil temperature (moisture sensor) (Celsius)		signed 16-bit binary number	
113	40113	Oil temperature RoC (ppm/day)		signed 16-bit binary number	
114	40114	RESERVED–Oil temp. RoC (ppm/week)	return 0	signed 16-bit binary number	

Register	Modbus number	Parameter	Function	Datatype	DataRange
115	40115	RESERVED–Oil temp. RoC (ppm/month)	return 0	signed 16-bit binary number	
			System IO		
200	40200	Oil temperature (Celsius)		signed 16-bit binary number	
201	40201	4–20 mA input 1	scaled by 100	signed 16-bit binary number	
202	40202	4–20 mA input 2	scaled by 100	signed 16-bit binary number	
203	40203	4–20 mA input 3	scaled by 100	signed 16-bit binary number	
204	40204	4–20 mA input 4	scaled by 100	signed 16-bit binary number	
205	40205	relay0 (maintenance, NO)		signed 16-bit binary number	
206	40206	relay1 (system, NO)		signed 16-bit binary number	
207	40207	relay2 (warning, NC)		signed 16-bit binary number	
208	40208	relay3 (alarm, NC)		signed 16-bit binary number	
			Misc		
300	40300	Registers update timestamp in second since 1/1/1970 (UTC)		unsigned 32-bit LSB portion	
301	40301			unsigned 32-bit MSB portion	

<Gas status>

Bit	Description
15	Reserved
14	Reserved
13	Reserved
12	Reserved
11	Reserved
10	Reserved
9	Reserved
8	Gas Month ROC CRITICAL
7	Gas Month ROC WARNING
6	Gas Week ROC CRITICAL
5	Gas Week ROC WARNING
4	Gas Day ROC CRITICAL
3	Gas Day ROC WARNING
2	Gas level CRITICAL
1	Gas level WARNING

<Status>

Value	Description
4	Sytem Error
3	Gas Alarm level
2	Gas warning level
1	System Healthy
0	Initializing

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APPENDIX B

DNP3

The CoreSense M10 DNP3 outstation implementation is compliant to level 1 and level 2. You can communicate with the sensor using a data link address = 1. DNP3 is available on the RS-485 serial interface or on the Ethernet interfaces.

NOTICE

For best results, it is recommended to configure the DNP3 master with a time out of 10000 ms and 5 retries.

Minimum delay between polls shall be at least 100 ms.

The DNP3 cold restart function is not supported for cybersecurity reasons.

The outstation ID is 1 and cannot be changed.

RS-485 Configuration

Baud rate	9600
Data Bits	8
Stop bits	1
Parity	None
Flow control	None (only none is supported)

TCP Configuration Port

DNP3	20.000

Pointmap[1] [2] [3] [4] [5]

Analog input		
Name	**Point index**	**Unit**
4–20 mA[6] input 1	10	mA
4–20 mA input 2	11	mA
4–20 mA input 3	12	mA
4–20 mA input 4	13	mA
CH4	23	ppm
CH4_Roc_Day	24	ppm/day
Reserved	25	–
Reserved	26	–
CO2	27	ppm
CO2_Roc_Day	28	ppm/day
Reserved	29	–
Reserved	30	–
CO	31	ppm
CO_Roc_Day	32	ppm/day
Reserved	33	–
Reserved	34	–
C2H2	35	ppm
C2H2_Roc_Day	36	ppm/day
Reserved	37	–
Reserved	38	–
C2H4	39	ppm
C2H4_Roc_Day	40	ppm/day
Reserved	41	–
Reserved	42	–
C2H6	43	ppm
C2H6_Roc_Day	44	ppm/day

Binary input	
Name	**Point index**
n/a	n/a
n/a	n/a
n/a	n/a
n/a	n/a
CH4_Lev_Warn	15
CH4_Lev_Crit	16
CH4_Roc_Warn	17
CH4_Roc_Crit	18
CO2_Lev_Warn	19
CO2_Lev_Crit	20
CO2_Roc_Warn	21
CO2_Roc_Crit	22
CO_Lev_Warn	23
CO_Lev_Crit	24
CO_Roc_Warn	25
CO_Roc_Crit	26
C2H2_Lev_Warn	27
C2H2_Lev_Crit	28
C2H2_Roc_Warn	29
C2H2_Roc_Crit	30
C2H4_Lev_Warn	31
C2H4_Lev_Crit	32
C2H4_Roc_Warn	33
C2H4_Roc_Crit	34
C2H6_Lev_Warn	35
C2H6_Lev_Crit	36

1 Event class is None

2 For binary inputs, name for state when value is zero = off.

3 For binary inputs, name for state when value is one = on.

4 Rate-of-change (RoC) is calculated on a 24-hour period.

5 For analog inputs, the multiplier is always 0.1 and the offset, 0.

6 4–20 mA inputs' function is scaled by 100

Analog input		
Name	**Point index**	**Unit**
Reserved	45	–
Reserved	46	–
C3H6	47	ppm
C3H6_Roc_Day	48	ppm/day
Reserved	49	–
Reserved	50	–
C3H8	51	ppm
C3H8_Roc_Day	52	ppm/day
Reserved	53	–
Reserved	54	–
Hydrogen	55	ppm
Hyd_Roc_Day	56	ppm/day
Reserved	57	–
Reserved	58	–
Moi_Aw	59	aw[1]
Moisture	60	ppm
Moi_Day	61	ppm/day
Reserved	62	–
Reserved	63	–
TDCG	64	ppm
TDCG_Roc_Day	65	ppm/day
Reserved	66	–
Reserved	67	–
Temp	68	Celcius
Temp_Roc_Day	69	Celcius/day
Reserved	70	–
Reserved	71	–

Binary input	
Name	**Point index**
C2H6_Roc_Warn	37
C2H6_Roc_Crit	38
C3H6_Lev_Warn	39
C3H6_Lev_Crit	40
C3H6_Roc_Warn	41
C3H6_Roc_Crit	42
C3H8_Lev_Warn	43
C3H8_Lev_Crit	44
C3H8_Roc_Warn	45
C3H8_Roc_Crit	46
Hyd_Lev_Warn	47
Hyd_Lev_Crit	48
Hyd_Roc_Warn	49
Hyd_Roc_Crit	50
Moi_Lev_Warn	51
Moi_Lev_Crit	52
Moi_Roc_Warn	53
Moi_Roc_Crit	54
TDCG_Lev_Warn	55
TDCG_Lev_Crit	56
TDCG_Roc_Warn	57
TDCG_Roc_Crit	58
Temp_Lev_Warn	59
Temp_Lev_Crit	60
Temp_Roc_Warn	61
Temp_Roc_Crit	62

1 Scaled by 1000

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APPENDIX C

IEC 61850

The CoreSense M10 implements an IEC 61850 MMS server over TCP/IP Ethernet that is compliant with edition 1 of the IEC 61850 standard.

PIXIT	Protocol Implementation eXtra Information for Testing
MICS	Model Implementation Conformance Statement
PICS	Protocol Implementation Conformance Statement
TICS	Technical Issues Implementation Conformance Statement
CoreSenseStrict.icd	ICD file which does not contain extended data attributes
CoreSenseExtended.icd	ICD file which contains extended data attributes

For your convenience, selected information is available in this appendix.

PIXIT

PIXIT for Association Model

ID	ED	Description	Value/Clarification	
As1	1	Maximum number of clients that can set-up an association simultaneously	2	
As2	1.2	TCP_KEEPALIVE value. The recommended range is 1..20 s	5 seconds	
As3	1,2	Lost connection detection time	5 sec (idle) + (5 sec * 5 retry) = 30 seconds	
As4	-	Authentication is not supported yet	NA	
As5	1,2	What association parameters are necessary for successful association	Transport selector	Y
			Session selector	Y
			Presentation selector	Y
			AP Title	N
			AE Qualifier	N
As6	1,2	If association parameters are necessary for association, describe the correct values e.g.	Transport selector	00 01
			Session selector	00 01
			Presentation selector	00 00 00 01
			AP Title	NA
			AE Qualifier	NA
As7	1,2	What is the maximum and minimum MMS PDU size	Max MMS PDU size	120000 bytes
			Min MMS PDU size	1200 bytes

ID	ED	Description	Value/Clarification
As8	1,2	What is the maximum start up time after a power supply interrupt	5 minutes
As9	1,2	Does this device function only as test equipment? (test equipment need not have a non-volatile configuration; but it cannot be part of the substation automation system)	No

PIXIT for Server Model

ID	ED	Description	Value/Clarification	
Sr1	1,2	Which analogue value (MX) quality bits are supported (can be set by server)	Validity:	
			Good	Y
			Invalid	Y
			Reserved	N
			Questionable	Y
			Overflow	N
			OutofRange	N
			BadReference	N
			Oscillatory	N
			Failure	Y
			OldData	N
			Inconsistent	N
			Inaccurate	N
			Source:	
			Process	Y
			Substituted	Y
			Test	N
			OperatorBlocked	N

ID	ED	Description	Value/Clarification	
Sr2	1,2	Which status value (ST) quality bits are supported (can be set by server)	**Validity:**	
			Good	Y
			Invalid	Y
			Reserved	N
			Questionable	Y
			Overflow	N
			BadReference	N
			Oscillatory	N
			Failure	Y
			OldData	N
			Inconsistent	N
			Inaccurate	N
			Source:	
			Process	Y
			Substituted	Y
			Test	N
			OperatorBlocked	N
Sr3	-	What is the maximum number of data object references in one GetDataValues request	Deprecated	
Sr4	-	What is the maximum number of data object references in one SetDataValues request	Deprecated	
Sr5	1	Which Mode values are supported	On	Y
			[On-]Blocked	N
			Test	N
			Test/Blocked	N
			Off	N

PIXIT for Data Set Model

ID	ED	Description	Value/Clarification
Ds1	1	What is the maximum number of data elements in one data set (compare ICD setting)	Only one non-configurable dataset containing all DO.
Ds2	1	How many persistent data sets can be created by one or more clients (this number includes predefined datasets)	Only one non-configurable dataset containing all DO. Data set creation is not supported.
Ds3	1	How many non-persistent data sets can be created by one or more clients	Data set creation is not supported.

PIXIT for Substitution Model

ID	ED	Description	Value/Clarification
Sb1	1	Are substituted values stored in volatile memory	Substitution is not supported.

PIXIT for Setting Group Control Model

ID	ED	Description	Value/Clarification
Sg1	1	What is the number of supported setting groups for each logical device	SG is not supported.
Sg2	1,2	What is the effect of when and how the non-volatile storage is updated (compare IEC 61850-8-1 $16.2.4)	SG is not supported.
Sg3	1	Can multiple clients edit the same setting group	SG is not supported.
Sg4	1	What happens if the association is lost while editing a setting group	SG is not supported.
Sg5	1	Is EditSG value 0 allowed	SG is not supported.
Sg6	2	When ResvTms is not present how long is an edit setting group locked	SG is not supported.

PIXIT for Reporting Model

ID	ED	Description	Value/Clarification	
Rp1	1	The supported trigger conditions are (compare PICS)	Integrity	Y
			Data change	Y
			Quality change	Y
			Data update	Y
			General interrogation	Y
Rp2	1	The supported optional fields are	Sequence-number	Y
			Report-time-stamp	Y
			Reason-for-inclusion	Y
			Data-set-name	Y
			Data-reference	Y
			Buffer-overflow	N
			EntryID	N
			Conf-rev	Y
			Segmentation	N
Rp3	1,2	Can the server send segmented reports	No	
Rp4	1,2	Mechanism on second internal data change notification of the same analogue data value within buffer period (Compare IEC 61850-7-2 $14.2.2.9)	Send report immediately	
Rp5	1	Multi-client URCB approach (compare IEC 61850-7-2:2003 $14.2.1)	Each URCB is visible to all clients	
Rp6	-	What is the format of EntryID	Deprecated	
Rp7	1,2	What is the buffer size for each BRCB or how many reports can be buffered	BRCB are not supported.	
Rp8	-	Pre-configured RCB attributes that are dynamic, compare SCL report settings	Deprecated	
Rp9	1	May the reported data set contain:	-structured data objects?	Y
			-data attributes?	Y
R10	1,2	What is the scan cycle for binary events Is this fixed, configurable	100 ms Fixed	

ID	ED	Description	Value/Clarification
RP11	1	Does the device support to preassign a RCB to a specific client in the SCL	SCL is not used as a configurable item in this device.
RP12	2	After restart of the server is the value of ConfRev restored from the original configuration or retained prior to restart	Restored from original configuration

PIXIT for Logging Model

ID	ED	Description	Value/Clarification
Lg1	1,2	What is the default value of LogEna (Compare IEC 61850-8-1 $17.3.3.2.1, the default value should be FALSE)	Logging not supported.
Lg2	-	What is the format of EntryID	Deprecated
Lg3	1,2	Are there are multiple Log Control Blocks that specify the Journaling of the same MMS NamedVariable and TrgOps and the Event Condition (Compare IEC 61850-8-1 $17.3.3.3.2)	Logging not supported.
Lg4	1	Preconfigured LCB attributes that cannot be changed online	Logging not supported.

PIXIT for GOOSE Publish Model

ID	ED	Description	Value/Clarification
Gp1	1,2	Can the test (Ed1) / simulation (Ed2) flag in the published GOOSE be set	GOOSE not supported.
Gp2	1	What is the behavior when the GOOSE publish configuration is incorrect	GOOSE not supported.
Gp3	1,2	Published FCD supported common data classes are	GOOSE not supported.
Gp4	1,2	What is the slow retransmission time Is it fixed or configurable	GOOSE not supported.
Gp5	1,2	What is the fastest retransmission time Is it fixed or configurable	GOOSE not supported.
Gp6	-	Can the GOOSE publish be turned on / off by using SetGoCBValues(GoEna)	Deprecated
Gp7	1,2	What is the initial GOOSE sqNum after restart	GOOSE not supported.
Gp8	1	May the GOOSE data set contain: • structured data objects (FCD) • timestamp data attributes	GOOSE not supported.

PIXIT for GOOSE Subscribe Model

ID	ED	Description	Value/Clarification	
Gs1	1,2	What elements of a subscribed GOOSE header are checked to decide the message is valid and the allData values are accepted? If yes, describe the conditions. Notes: • the VLAN tag may be removed by a Ethernet switch and shall not be checked • the simulation flag shall always be checked (Ed2) • the ndsCom shall always be checked (Ed2)	destination MAC address	NA
			APPID	NA
			gocbRef	NA
			timeAllowedtoLive	NA
			datSet	NA
			goID	NA
			t	NA
			stNum	NA
			sqNum	NA
			simulation / test	NA
			confRev	NA
			ndsCom	NA
			numDatSetEntries	NA
Gs2	1,2	When is a subscribed GOOSE marked as lost (TAL = time allowed to live value from the last received GOOSE message)	GOOSE not supported.	
Gs3	1,2	What is the behavior when one or more subscribed GOOSE messages isn't received or syntactically incorrect (missing GOOSE)	GOOSE not supported.	
Gs4	1,2	What is the behavior when a subscribed GOOSE message is out-of-order	GOOSE not supported.	
Gs5	1,2	What is the behavior when a subscribed GOOSE message is duplicated	GOOSE not supported.	
Gs6	1	Does the device subscribe to GOOSE messages with/ without the VLAN tag	GOOSE not supported.	
Gs7	1	May the GOOSE data set contain: • structured data objects (FCD) • timestamp data attributes	GOOSE not supported.	
Gs8	1,2	Subscribed FCD supported common data classes are	GOOSE not supported.	
Gs9	1,2	Are subscribed GOOSE with test=T (Ed1) / simulation=T (Ed2) accepted in test/simulation mode	GOOSE not supported.	

PIXIT for GOOSE Performance

ID	ED	Description	Value/Clarification
Gf1	1,2	Performance class	GOOSE not supported.
Gf2	1,2	GOOSE ping-pong processing method	GOOSE not supported.
Gf3	1,2	Application logic scan cycle (ms)	GOOSE not supported.
Gf4	1	Maximum number of data attributes in GOOSE dataset (value and quality has to be counted as separate attributes)	GOOSE not supported.

PIXIT for Control Model

ID	ED	Description	Value/Clarification	
Ct1	1	What control models are supported (compare PICS)	DOns	N
			SBOns	N
			DOes	N
			SBOes	N
Ct2	1,2	Is the control model fixed, configurable and/or dynamic	Fixed	
Ct3	-	Is TimeActivatedOperate supported (compare PICS or SCL)	Deprecated	
Ct4	1,2	Is “operate-many” supported (compare sboClass)	N	
Ct5	1	Will the DUT activate the control output when the test attribute is set in the SelectWithValue and/or Operate request (when N test procedure Ctl2 is applicable)	N	
Ct6	-	What are the conditions for the time (T) attribute in the SelectWithValue and/or Operate request	Deprecated	
Ct7	-	Is pulse configuration supported (compare pulseConfig)	Deprecated	
Ct8	1	What is the behavior of the DUT when the check conditions are set	Synchrocheck	N
			Interlock-check	N
		Is this behavior fixed, configurable, online changeable	Not applicable	

ID	ED	Description	Value/Clarification	
Ct9	1,2	Which additional cause diagnosis are supported	Unknown	N
			Not-supported	N
			Blocked-by-switching-hierarchy	N
			Select-failed	N
			Invalid-position	N
			Position-reached	N
			Parameter-change-in-execution	N
			Step-limit	N
			Blocked-by-Mode	N
			Blocked-by-process	N
			Blocked-by-interlocking	N
			Blocked-by-synchrocheck	N
			Command-already-in-execution	N
			Blocked-by-health	N
			1-of-n-control	N
			Abortion-by-cancel	N
			Time-limit-over	N
			Abortion-by-trip	N
			Object-not-selected	N
			Edition 2 specific values:	
			Object-already-selected	N
			No-access-authority	N
			Ended-with-overshoot	N
			Abortion-due-to-deviation	N
			Abortion-by-communication-loss	N
			Blocked-by-command	N
			None	N
			Inconsistent-parameters	N
			Locked-by-other-client	N
Ct10	1,2	How to force a “test-not-ok” respond with SelectWithValue request	Not applicable	
Ct11	1,2	How to force a “test-not-ok” respond with Select request	Not applicable	
Ct12	1,2	How to force a “test-not-ok” respond with Operate request	DOns	N
			SBOns	N
			DOes	N
			SBOes	N

ID	ED	Description	Value/Clarification	
Ct13	1,2	Which origin categories are supported	bay-control	N
			station-control	N
			remote-control	N
			automatic-bay	N
			automatic-station	N
			automatic-remote	N
			maintenance	N
			process	N
Ct14	1,2	What happens if the orCat value is not supported or invalid	DOns	N
			SBOns	N
			DOes	N
			SBOes	N
Ct15	1,2	Does the IED accept a SelectWithValue / Operate with the same control value as the current status value	DOns	N
			SBOns	N
			DOes	N
			SBOes	N
		Is this behavior configurable	Configurable	N
Ct16	1	Does the IED accept a select/operate on the same control object from 2 different clients at the same time	DOns	N
			SBOns	N
			DOes	N
			SBOes	N
Ct17	1	Does the IED accept a Select/SelectWithValue from the same client when the control object is already selected (Tissue #334)	SBOns	N
			SBOes	N
Ct18	1,2	Is for SBOes the internal validation performed during the SelectWithValue and/or Operate step	Not applicable	
Ct19	-	Can a control operation be blocked by Mod=Off or [On-]Blocked (Compare PIXIT-Sr5)	Deprecated	
Ct20	1,2	Does the IED support local / remote operation	Not applicable	
Ct21	1,2	Does the IED send an InformationReport with LastApplError as part of the Operate response- for control with normal security	SBOns	N
			DOns	N
Ct22	2	How to force a “parameter-change-in-execution”	SBOns	N
			SBOes	N
Ct23	1,2	Can a controllable object be forced to keep its old state e.g. Internal Controllable Objects may not be accessible to force this, whereas a switch like Circuit Breaker outside the DUT can?	Not applicable	
Ct24	1,2	When CDC=DPC is supported, is it possible to have DPC (Controllable Double Point) go to the intermediate state? (00)	Not applicable	
Ct25	1,2	Do any objects have Operate Timeout > 0	DOes	N
			SBOes	N

ID	ED	Description	Value/Clarification	
Ct26	2	Does the IED support control objects with external signals	DOns	N
			SBOns	N
			DOes	N
			SBOes	N
Ct27	2	Does the IED support DPC control objects with external signals	DOns	N
			SBOns	N
			DOes	N
			SBOes	N

PIXIT for Time Synchronization Model

ID	ED	Description	Value/Clarification	
Tm1	1	What time quality bits are supported (may be set by the IED)	LeapSecondsKnown	Y
			ClockFailure	Y
			ClockNotSynchronized	N
Tm2	1,2	Describe the behavior when the time server(s) ceases to respond What is the time server lost detection time	Relies on internal clock. It can take up to 1024 seconds to detect time server lost but the time server lost event is not reported	
Tm3	1,2	How long does it take to take over the new time from time server	Up to 1024 s. (17 min.).	
Tm4	1,2	When is the time quality bit “ClockFailure” set	When real-time clock fails that bit will be set.	
Tm5	1,2	When is the time quality bit “Clock not Synchronized” set	Not supported.	
Tm6	-	Is the timestamp of a binary event adjusted to the configured scan cycle	Deprecated.	
Tm7	1	Does the device support time zone and daylight saving	Time is UTC so no direct support for timezone and DST.	
Tm8	1,2	Which attributes of the SNTP response packet are validated	Leap indicator not equal to 3	N
			Mode is equal to SERVER	N
			OriginateTimestamp is equal to value sent by the SNTP client as Transmit Timestamp	N
			RX/TX timestamp fields are checked for reasonableness	N
			SNTP version 3 and/or 4	4
			other (describe)	NA
Tm9	1,2	Do the COMTRADE files have local time or UTC time and is this configurable	Not applicable.	

PIXIT for File Transfer Model

ID	ED	Description	Value/Clarification
Ft1	1	What is structure of files and directories Where are the COMTRADE files stored Are comtrade files zipped and what files are included in each zip file	File transfer not supported.
Ft2	1,2	Directory names are separated from the file name by	File transfer not supported.
Ft3	1	The maximum file name size including path (recommended 64 chars)	File transfer not supported.
Ft4	1,2	Are directory/file name case sensitive	File transfer not supported.
Ft5	1,2	Maximum file size for SetFile	File transfer not supported.
Ft6	1	Is the requested file path included in the MMS fileDirectory respond file name	File transfer not supported.
Ft7	1	Is the wild char supported MMS fileDirectory request	File transfer not supported.
Ft8	1,2	Is it allowed that 2 clients get a file at the same time	File transfer not supported.

PIXIT for Service Tracking Model

ID	ED	Description	Value/Clarification
Tr1	2	Which ACSI services are tracked by LTRK.GenTrk	Not applicable.

MICS

Logical Nodes List

The following table contains the list of logical nodes implemented in the device:

L: System Logical Nodes
LPHD (physical device information)
LLN0 (logical node zero)
G: Logical Nodes for Generic References
GGIO (generic process I/O)
S: Logical Nodes for Sensors and Monitoring
SIML (insulation medium supervision [liquid])

SIML–Insulation Medium Supervision (liquid)

The IEC 61850-7-4 SIML node was extended with data objects defined in technical report IEC 61850-90-4.

		SIML	
DO Name	**CDC**	**Explanation**	**M/O[1]**
LNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)	
Data Objects			
Common Logical Node Information			
Mod	INC	Mode	M
Beh	INS	Behavior	M
Health	INS	Health	M
NamPlt	LPL	Name plate	M
Measured Values			
H2O	MV	Relative saturation of moisture in insulating liquid (in %)	O
H2OTmp	MV	Temperature of insulating liquid at point of H_2O measurement	O
H2	MV	Measurement of hydrogen (in ppm)	O
H2Oppm	MV	Measurement of moisture (in ppm)	O
H2RoC	MV	Hydrogen rate of change (RoC in ppm/day)	O
MstRoC	MV	Moisture rate of change (RoC in ppm/day)	O
CH4	MV	Measurement of methane (in ppm)	O
CH4ROC	MV	Methane rate of change (RoC in ppm/day)	O
CO2	MV	Measurement of carbon dioxide (in ppm)	O
CO2ROC	MV	Carbon dioxide rate of change (RoC in ppm/day)	O
CO	MV	Measurement of carbon monoxide (in ppm)	O
COROC	MV	Carbon monoxide rate of change (RoC in ppm/day)	O
C2H2	MV	Measurement of acetylene (in ppm)	O

1 M: Mandatory, O: Optional

		SIML	
DO Name	**CDC**	**Explanation**	**M/O[1]**
C2H2ROC	MV	Acetylene rate of change (RoC in ppm/day)	O
C2H4	MV	Measurement of ethylene (in ppm)	O
C2H4ROC	MV	Ethylene rate of change (RoC in ppm/day)	O
C2H6	MV	Measurement of ethane (in ppm)	O
C2H6ROC	MV	Ethane rate of change (RoC in ppm/day)	O
C3H6	MV	Measurement of propene (in ppm)	O
C3H6ROC	MV	Propene rate of change (RoC in ppm/day)	O
C3H8	MV	Measurement of propane (in ppm)	O
C3H8ROC	MV	Propane rate of change (RoC in ppm/day)	O
TDCG	MV	Measurement of total dissolved combustible gas (TDCG in ppm)	O
TDCGROC	MV	Total dissolved combustible gas rate of change (RoC in ppm/day)	O
Status Information			
InsAlm	SPS	Insulation liquid critical (refill isolation medium)	M
H2Alm	SPS	Hydrogen alarm	O
MstAlm	SPS	Moisture sensor alarm	O
H2RoCAlm	SPS	Hydrogen rate of change alarm	O
H2ORoCAlm	SPS	Moisture rate of change alarm	O
H2Wrn	SPS	Hydrogen warning	O
MstWrn	SPS	Moisture sensor warning	O
H2RoCWrn	SPS	Hydrogen rate of change warning	O
MstRoCWrn	SPS	Moisture rate of change warning	O
CH4Alm	SPS	Methane alarm	O
CH4ROCAlm	SPS	Methane rate of change alarm	O
CH4Wrn	SPS	Methane warning	O
CH4ROCWrn	SPS	Methane rate of change warning	O
CO2Alm	SPS	Carbon dioxide alarm	O
CO2ROCAlm	SPS	Carbon dioxide rate of change alarm	O
CO2Wrn	SPS	Carbon dioxide warning	O
CO2ROCWrn	SPS	Carbon dioxide rate of change warning	O
COAlm	SPS	Carbon monoxide alarm	O
COROCAlm	SPS	Carbon monoxide rate of change alarm	O
COWrn	SPS	Carbon monoxide warning	O
COROCWrn	SPS	Carbon monoxide rate of change warning	O
C2H2Alm	SPS	Acetylene alarm	O
C2H2ROCAlm	SPS	Acetylene rate of change alarm	O
C2H2Wrn	SPS	Acetylene warning	O
C2H2ROCWrn	SPS	Acetylene rate of change warning	O
C2H4Alm	SPS	Ethylene alarm	O

		SIML	
DO Name	**CDC**	**Explanation**	**M/O[1]**
C2H4ROCAlm	SPS	Ethylene rate of change alarm	O
C2H4Wrn	SPS	Ethylene warning	O
C2H4ROCWrn	SPS	Ethylene rate of change warning	O
C2H6Alm	SPS	Ethane alarm	O
C2H6ROCAlm	SPS	Ethane rate of change alarm	O
C2H6Wrn	SPS	Ethane warning	O
C2H6ROCWrn	SPS	Ethane rate of change warning	O
C3H6Alm	SPS	Propene alarm	O
C3H6ROCAlm	SPS	Propene rate of change alarm	O
C3H6Wrn	SPS	Propene warning	O
C3H6ROCWrn	SPS	Propene rate of change warning	O
C3H8Alm	SPS	Propane alarm	O
C3H8ROCAlm	SPS	Propane rate of change alarm	O
C3H8Wrn	SPS	Propane warning	O
C3H8ROCWrn	SPS	Propane rate of change warning	O
TDCGAlm	SPS	Total dissolved combustible gas alarm	O
TDCGROCAlm	SPS	Total dissolved combustible gas rate of change alarm	O
TDCGWrn	SPS	Total dissolved combustible gas warning	O
TDCGROCWrn	SPS	Total dissolved combustible gas rate of change warning	O
Settings			
H2AlmSpt	ASG	Hydrogen alarm set point	O
MstAlmSpt	ASG	Moisture sensor alarm set point	O
H2RoCAlmSpt	ASG	Hydrogen rate of change alarm set point	O
MstRoCAlmSpt	ASG	Moisture rate of change alarm set point	O
H2WrnSpt	ASG	Hydrogen warning set point	O
MstWrnSpt	ASG	Moisture sensor warning set point	O
H2RoCWrnSpt	ASG	Hydrogen rate of change warning set point	O
MstRoCWrnSpt	ASG	Moisture rate of change warning set point	O
CH4AlmSpt	ASG	Methane alarm set point	O
CH4ROCAlmSpt	ASG	Methane rate of change alarm set point	O
CH4WrnSpt	ASG	Methane warning set point	O
CH4ROCWrnSpt	ASG	Methane rate of change warning set point	O
CO2AlmSpt	ASG	Carbon dioxide alarm set point	O
CO2ROCAlmSpt	ASG	Carbon dioxide rate of change alarm set point	O
CO2WrnSpt	ASG	Carbon dioxide warning set point	O
CO2ROCWrnSpt	ASG	Carbon dioxide rate of change warning set point	O
COAlmSpt	ASG	Carbon monoxide alarm set point	O
COROCAlmSpt	ASG	Carbon monoxide rate of change alarm set point	O

		SIML	
DO Name	**CDC**	**Explanation**	**M/O[1]**
COWrnSpt	ASG	Carbon monoxide warning set point	O
COROCWrnSp	ASG	Carbon monoxide rate of change warning set point	O
C2H2AlmSpt	ASG	Acetylene alarm set point	O
C2H2ROCAlmSp	ASG	Acetylene rate of change alarm set point	O
C2H2WrnSpt	ASG	Acetylene warning set point	O
C2H2ROCWrnSp	ASG	Acetylene rate of change warning set point	O
C2H4AlmSpt	ASG	Ethylene alarm set point	O
C2H4ROCAlmSp	ASG	Ethylene rate of change alarm set point	O
C2H4WrnSpt	ASG	Ethylene warning set point	O
C2H4ROCWrnSp	ASG	Ethylene rate of change warning set point	O
C2H6AlmSpt	ASG	Ethane alarm set point	O
C2H6ROCAlmSp	ASG	Ethane rate of change alarm set point	O
C2H6WrnSpt	ASG	Ethane warning set point	O
C2H6ROCWrnSp	ASG	Ethane rate of change warning set point	O
C3H6AlmSpt	ASG	Propene alarm set point	O
C3H6ROCAlmSp	ASG	Propene rate of change alarm set point	O
C3H6WrnSpt	ASG	Propene warning set point	O
C3H6ROCWrnSp	ASG	Propene rate of change warning set point	O
C3H8AlmSpt	ASG	Propane alarm set point	O
C3H8ROCAlmSp	ASG	Propane rate of change alarm set point	O
C3H8WrnSpt	ASG	Propane warning set point	O
C3H8ROCWrnSp	ASG	Propane rate of change warning set point	O
TDCGAlmSpt	ASG	Total dissolved combustible gas alarm set point	O
TDCGROCAlmSp	ASG	Total dissolved combustible gas rate of change alarm set point	O
TDCGWrnSpt	ASG	Total dissolved combustible gas warning set point	O
TDCGROCWrnSp	ASG	Total dissolved combustible gas rate of change warning set point	O

PICS

ACSI Basic Conformance Statement

The basic conformance statement is defined in the following table.

		Client/ Subscriber	Server/ Publisher	Value/ Comments
Client-Server Roles				
B11	Server side (of TWO-PARTY-APPLICATION-ASSOCIATION)		Y	
B12	Client side of (TWO-PARTY-APPLICATION-ASSOCIATION)		-	
SCSMs Supported				
B21	SCSM: IEC 61850-8-1 used		Y	
B22	SCSM: IEC 61850-9-1 used		N	Deprecated Ed2
B23	SCSM: IEC 61850-9-2 used		N	
B24	SCSM: other		N	
Generic Substation Event Model (GSE)				
B31	Publisher side		N	
B32	Subscriber side		-	
Transmission of Sampled Value Model (SVC)				
B41	Publisher side		N	
B42	Subscriber side		-	

- = not applicable
Y = supported
N or empty = not supported

ACSI Models Conformance Statement

The ACSI models conformance statement is defined below.

	Client/ Subscriber	Server/ Publisher	Value/ Comments
If Server side (B11) and/or Client side (B12) supported			
M1	Logical device	Y	
M2	Logical node	Y	
M3	Data	Y	
M4	Data set	Y	
M5	Substitution	N	
M6	Setting group control	N	

Y = service is supported
N or empty = service is not supported

	Client/ Subscriber	Server/ Publisher	Value/ Comments
	Reporting		
M7	Buffered report control	N	
M7.1	sequence-number	N	
M7.2	report-time-stamp	N	
M7.3	reason-for-inclusion	N	
M7.4	data-set-name	N	
M7.5	data-reference	N	
M7.6	buffer-overflow	N	
M7.7	entryID	N	
M7.8	BufTm	N	
M7.9	IntgPd	N	
M7.10	GI	N	
M7.11	conf-revision	N	
M8	Unbuffered report control	Y	
M8.1	sequence-number	Y	
M8.2	report-time-stamp	Y	
M8.3	reason-for-inclusion	Y	
M8.4	data-set-name	Y	
M8.5	data-reference	Y	
M8.6	BufTm	Y	
M8.7	IntgPd	Y	
M8.8	GI	Y	
M8.9	conf-revision	Y	
	Logging		
M9	Log control	N	
M9.1	IntgPd	N	
M10	Log	N	
M11	Control	Y	
M17	File Transfer	N	
M18	Application association	Y	
M19	GOOSE Control Block	N	
M20	Sampled Value Control Block	N	
If GSE (B31/32) is supported			
M12	GOOSE	N	
M13	GSSE	N	Deprecated in Edition 2

Y = service is supported

N or empty = service is not supported

	Client/ Subscriber	Server/ Publisher	Value/ Comments
If SVC (B41/42) is supported			
M14	Multicast SVC	N	
M15	Unicast SVC	N	
For all IEDs			
M16	Time	Y	Time source with required accuracy shall be available. Only Time Master are SNTP (Mode 4 response) time server. All other Client / Server devices require SNTP (Mode 3 request) clients
Y = service is supported N or empty = service is not supported			

ACSI Service Conformance Test

The ACSI service conformance statement is defined below (depending on the statements in ACSI Basic Conformance Statement and in ACSI Models Conformance Statement).

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
Server						
S1	1,2	GetServerDirectory (LOGICAL-DEVICE)	TP		Y	
Application Association						
S2	1,2	Associate			Y	
S3	1,2	Abort			Y	
S4	1,2	Release			Y	
Logical Device						
S5	1,2	GetLogicalDeviceDirectory	TP		Y	
Logical Node						
S6	1,2	GetLogicalNodeDirectory	TP		Y	
S7	1,2	GetAllDataValues	TP		Y	
Data						
S8	1,2	GetDataValues	TP		Y	
S9	1,2	SetDataValues	TP		Y	
S10	1,2	GetDataDirectory	TP		Y	
S11	1,2	GetDataDefinition	TP		Y	
Data Set						
S12	1,2	GetDataSetValues	TP		Y	
S13	1,2	SetDataSetValues	TP		N	
S14	1,2	CreateDataSet	TP		N	
S15	1,2	DeleteDataSet	TP		N	
S16	1,2	GetDataSetDirectory	TP		Y	

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
Substitution						
S17	1	SetDataValues	TP		N	
Setting Group Control						
S18	1,2	SelectActiveSG	TP		N	
S19	1,2	SelectEditSG	TP		N	
S20	1,2	SetSGValues	TP		N	
S21	1,2	ConfirmEditSGValues	TP		N	
S22	1,2	GetSGValues	TP		N	
S23	1,2	GetSGCBValues	TP		N	
Reporting						
Buffered Report Control Block (BRCB)						
S24	1,2	Report	TP		N	
S24-1	1,2	data-change (dchg)			N	
S24-2	1,2	quality-change (qchg)			N	
S24-3	1,2	data-update (dupd)			N	
S25	1,2	GetBRCBValues	TP		N	
S26	1,2	SetBRCBValues	TP		N	
Unbuffered Report Control Block (URCB)						
S27	1,2	Report	TP		Y	
S27-1	1,2	data-change (dchg)			Y	
S27-2	1,2	qchg-change (qchg)			Y	
S27-3	1,2	data-update (dupd)			Y	
S28	1,2	GetURCBValues	TP		Y	
S29	1,2	SetURCBValues	TP		Y	
Logging						
Log Control Block						
S30	1,2	GetLCBValues	TP		N	
S31	1,2	SetLCBValues	TP		N	
Log						
S32	1,2	QueryLogByTime	TP		N	
S33	1,2	QueryLogAfter	TP		N	
S34	1,2	GetLogStatusValues	TP		N	
Generic substation event model (GSE)						
GOOSE						
S35	1,2	SendGOOSEMessage	MC		N	
GOOSE-CONTROL-BLOCK						
S36	1,2	GetReference	TP		N	
S37	1,2	GetGOOSEElementNumber	TP		N	
S38	1,2	GetGoCBValues	TP		N	

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
S39	1,2	SetGoCBValues	TP		N	
GSSE						
S40	1	SendGSSEMessage	MC		N	Deprecated in Edition 2
GSSE-CONTROL-BLOCK						
S41	1	GetReference	TP		N	Deprecated in Edition 2
S42	1	GetGSSEElementNumber	TP		N	Deprecated in Edition 2
S43	1	GetGsCBValues	TP		N	Deprecated in Edition 2
S44	1	SetGsCBValues	TP		N	Deprecated in Edition 2
Transmission of Sampled Value Model (SVC)						
Multicast SVC						
S45	1,2	SendMSVMessage	MC		N	
Multicast Sampled Value Control Block						
S46	1,2	GetMSVCBValues	TP		N	
S47	1,2	SetMSVCBValues	TP		N	
Unicast SV						
S48	1,2	SendUSVMessage	TP		N	
Unicast Sampled Value Control Block						
S49	1,2	GetUSVCBValues	TP		N	
S50	1,2	SetUSVCBValues	TP		N	
Control						
S51	1,2	Select			N	
S52	1,2	SelectWithValue	TP		N	
S53	1,2	Cancel	TP		N	
S54	1,2	Operate	TP		N	
S55	1,2	Command-Termination	TP		N	
S56	1,2	TimeActivated-Operate	TP		N	
File Transfer						
S57	1,2	GetFile	TP		N	
S58	1,2	SetFile	TP		N	
S59	1,2	DeleteFile	TP		N	
S60	1,2	GetFileAttributeValues	TP		N	
S61	1,2	GetServerDirectory (FILE-SYSTEM)	TP		N	
Time						
T1	1,2	Time resolution of internal clock			2^{-9} seconds	Nearest negative power of 2^{-n} in seconds (number 0 .. 24)

	Ed.	Services	AA: TP/MC	Client (C)	Server (S)	Comments
T2	1,2	Time accuracy of internal clock			Unspecified	TL (ms) (low accuracy), T3 < 7) (only Ed2) T0 (ms) (<= 10 ms), 7 <= T3 < 9 T1 (µs) (<= 1 ms), 10 <= T3 < 13 T2 (µs) (<= 100 µs), 13 <= T3 < 15 T3 (µs) (<= 25 µs), 15 <= T3 < 18 T4 (µs) (<= 25 µs), 15 <= T3 < 18 T5 (µs) (<= 1 µs), T3 >= 20
T3	1,2	Supported TimeStamp resolution			2^{-24} seconds	Nearest value of 2^{-n} in seconds (number 0 to 24)

TICS Mandatory IntOp TISSUES

The table below gives an overview of the implemented IntOp Tissues.

NOTICE

- Tissue 49, 190, 191, 275 and 278 are part of tissue 453, all other technical tissues in the table are mandatory if applicable.
- Editorial tissues are marked as “NA”.
- Final proposal on tissue 45 is not defined yet

Part	TISSUE No.	Description	Impl. Y/NA
8-1	116	GetNameList with empty response?	Y
	165	Improper Error Response for GetDataSetValues	Y
	183	GetNameList error handling	Y
	246	Control negative response (SBOns) with LastApplError	NA
	545	Skip file directories with no files	NA
7-4	None		
7-3	28	Definition of APC	NA
	54	Point def xVal, not cVal	NA
	55	Ineut = Ires?	NA
	63	mag in CDC CMV	NA
	65	Deadband calculation of a Vector and trigger option	NA
	219	operTm in ACT	NA
	270	WYE and DEL rms values	NA
	1199	BCR	NA

Part	TISSUE No.	Description	Impl. Y/NA
7-2	30	control parameter T	NA
	31	Typo	NA
	32	Typo in syntax	NA
	35	Typo Syntax Control time	NA
	36	Syntax parameter DSet-Ref missing	NA
	37	Syntax GOOSE “T” type	NA
	39	Add DstAddr to GoCB	NA
	40	GOOSE Message “AppID” to “GoID”	NA
	41	GsCB “AppID” to “GsID”	NA
	42	SV timestamp: “EntryTime” to “TimeStamp”	NA
	43	Control “T” semantic	NA
	44	AddCause - Object not sel	NA
	45	Missing AddCauses	NA
	46	Synchro check cancel	NA
	47	“.” in LD Name?	Y
	49	BRCB TimeOfEntry (part of #453)	NA
	50	LNName start with number?	Y
	51	ARRAY [0..num] missing	NA
	52	Ambiguity GOOSE SqNum	NA
	53	Add DstAddr to GsCB, SV	NA
	151	Name constraint for control blocks etc.	Y
	166	DataRef attribute in Log	NA
	185	Logging - Integrity period	NA
	189	SV Format	NA
	190	BRCB: EntryId and TimeOfEntry (part of #453)	NA
	191	BRCB: Integrity and buffering reports (part of #453)	NA
	278	EntryId not valid for a server (part of #453)	NA
	333	Enabling of an incomplete GoCB	NA
	453	Combination of all reporting and logging tissues	NA
	1281	Trigger option GI is by default	NA
6	1	Syntax	Y
	5	tExtensionAttributeNameEnum is restricted	Y
	8	SIUnit enumeration for W	Y
	10	Base type for bitstring usage	Y
	17	DAI/SDI elements syntax	Y
	169	Ordering of enum differs from 7-3	NA
	245	Attribute RptId in SCL	NA
	529	Replace sev - Unknown by unknown	Y

APPENDIX D

Advanced Maintenance

NOTICE

The **Maintenance** page **must only be used** by ABB Level 2 accredited personnel or under the direct supervision of ABB Level 2 accredited personnel.

Unsupervised or unauthorized use of the **Maintenance** page could permanently damage the CoreSense M10 system, and even the power transformer that it monitors.

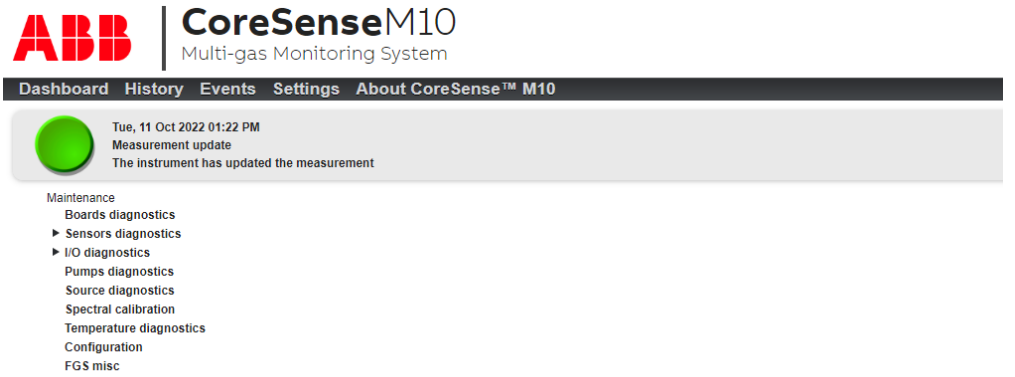
Accessing the Maintenance Page

Advanced maintenance is performed from the **Maintenance** page. The **Maintenance** page can only be accessed by users with administrator privileges. From the **Maintenance** page, you can gather the information needed to perform diagnostics, change certain operating parameters and manage system configuration files.

To access the page

1. From the CoreSense M10 dashboard, click **Settings**. The Settings page appears.
2. In the Settings page, click **Maintenance**.
3. If asked, enter your administrator password. The **Maintenance** page appears.

Figure 59 The Maintenance page



Gathering Diagnostic Data

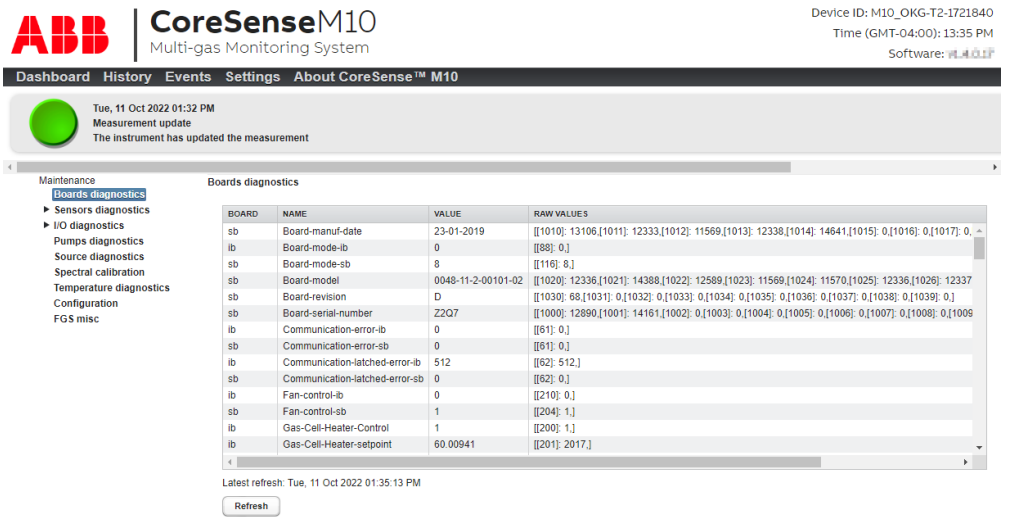
Depending on the problem to solve, you might need to gather data about specific subsystems such as the various sensors and boards.

In most of these data pages, you can refresh the displayed data by clicking the **Refresh** button located at the bottom of the page.

Board Data

To gather board data from the **Maintenance** page, click **Board diagnostics**. A table appears indicating the board IDs and name, as well as processed and raw values.

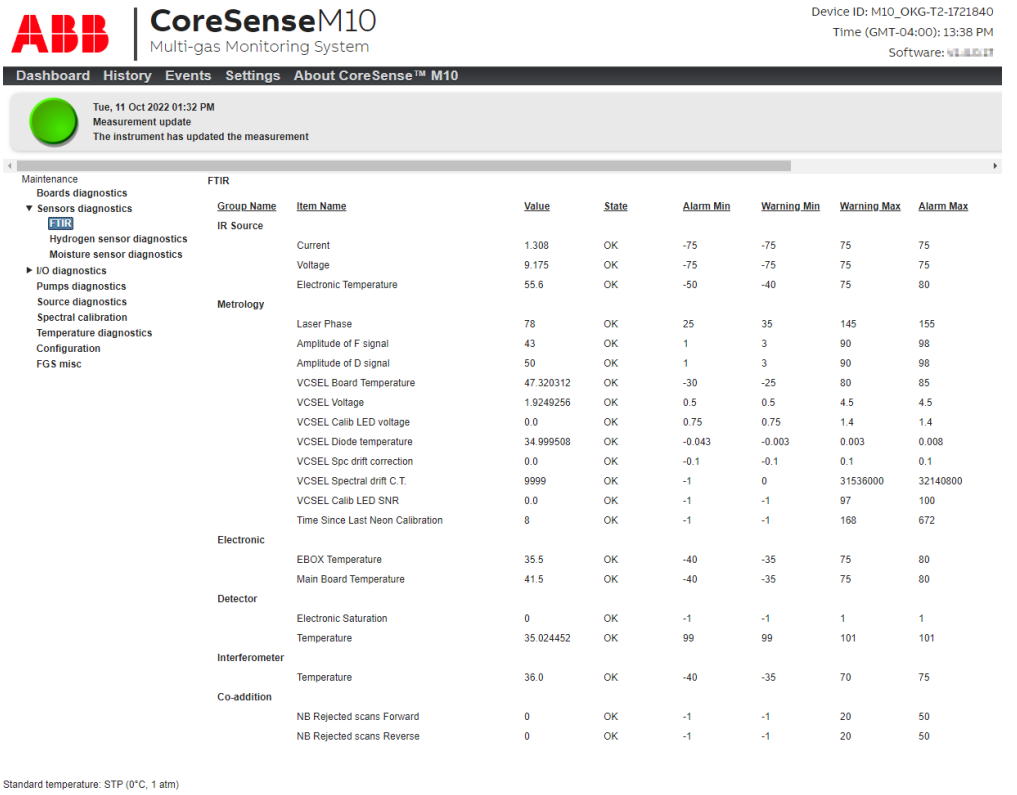
Figure 60 Board diagnostic data



FTIR Data

To gather FTIR diagnostic data from the **Maintenance** page, click **Sensors diagnostics> FTIR**. A table appears indicating various parameters and values.

Figure 61 FTIR diagnostics data



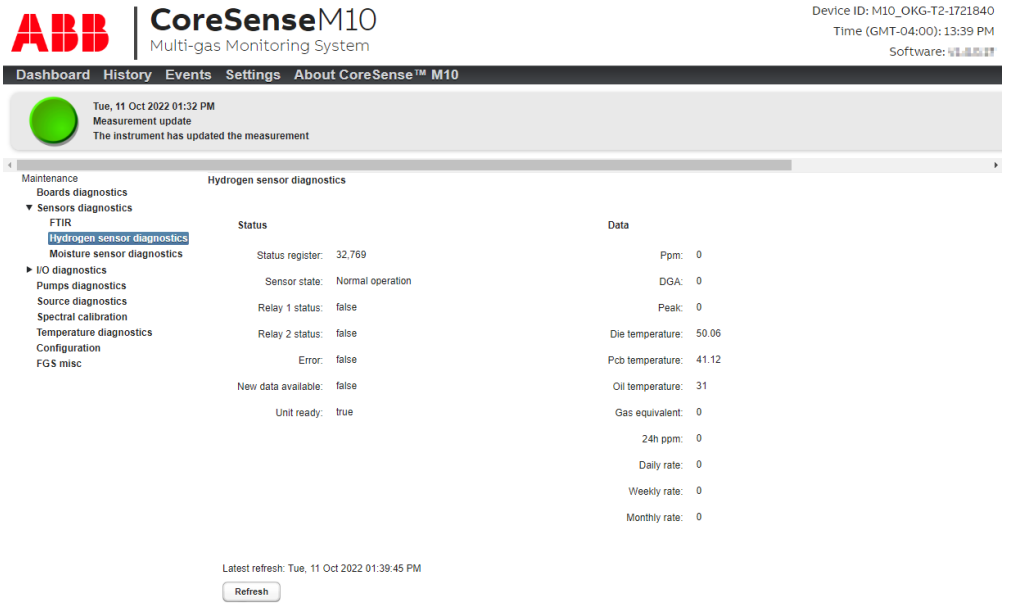
Group Name	Item Name	Value	State	Alarm Min	Warning Min	Warning Max	Alarm Max
IR Source							
	Current	1.308	OK	-75	-75	75	75
	Voltage	9.175	OK	-75	-75	75	75
	Electronic Temperature	55.6	OK	-50	-40	75	80
Metrology							
	Laser Phase	78	OK	25	35	145	155
	Amplitude of F signal	43	OK	1	3	90	98
	Amplitude of D signal	50	OK	1	3	90	98
	VCSEL Board Temperature	47.320312	OK	-30	-25	80	85
	VCSEL Voltage	1.9249256	OK	0.5	0.5	4.5	4.5
	VCSEL Calib LED voltage	0.0	OK	0.75	0.75	1.4	1.4
	VCSEL Diode temperature	34.999508	OK	-0.043	-0.003	0.003	0.008
	VCSEL Spc drift correction	0.0	OK	-0.1	-0.1	0.1	0.1
	VCSEL Spectral drift C.T.	9999	OK	-1	0	31536000	32140800
	VCSEL Calib LED SNR	0.0	OK	-1	-1	97	100
	Time Since Last Neon Calibration	8	OK	-1	-1	168	672
Electronic							
	EBOX Temperature	35.5	OK	-40	-35	75	80
	Main Board Temperature	41.5	OK	-40	-35	75	80
Detector							
	Electronic Saturation	0	OK	-1	-1	1	1
	Temperature	35.024452	OK	99	99	101	101
Interferometer							
	Temperature	36.0	OK	-40	-35	70	75
Co-addition							
	NB Rejected scans Forward	0	OK	-1	-1	20	50
	NB Rejected scans Reverse	0	OK	-1	-1	20	50

Standard temperature: STP (0°C, 1 atm)

Hydrogen Sensor Data

To gather hydrogen sensor data from the **Maintenance** page, click **Sensors diagnostics> Hydrogen sensor diagnostics**. A table appears indicating various sensor parameters and values.

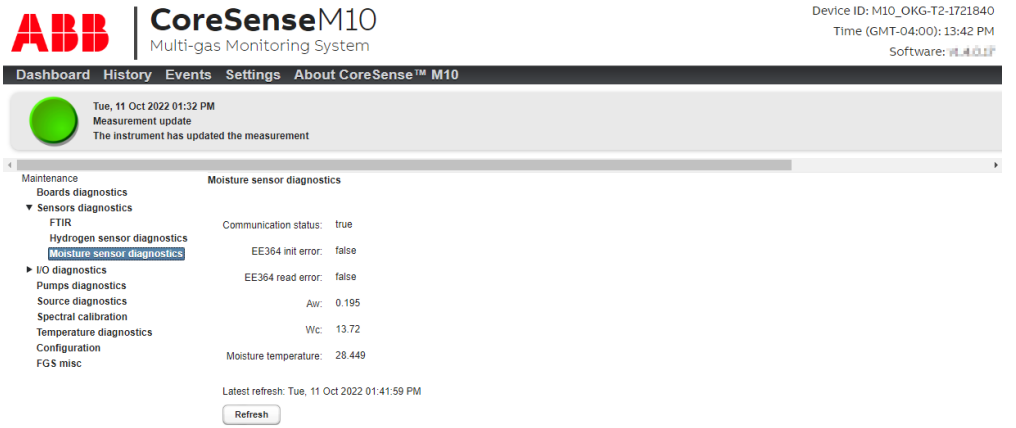
Figure 62 Hydrogen sensor diagnostic data



Moisture Sensor Data

To gather moisture sensor data from the **Maintenance** page, click **Sensors diagnostics> Moisture sensor diagnostics**. A table appears indicating various sensor parameters and values.

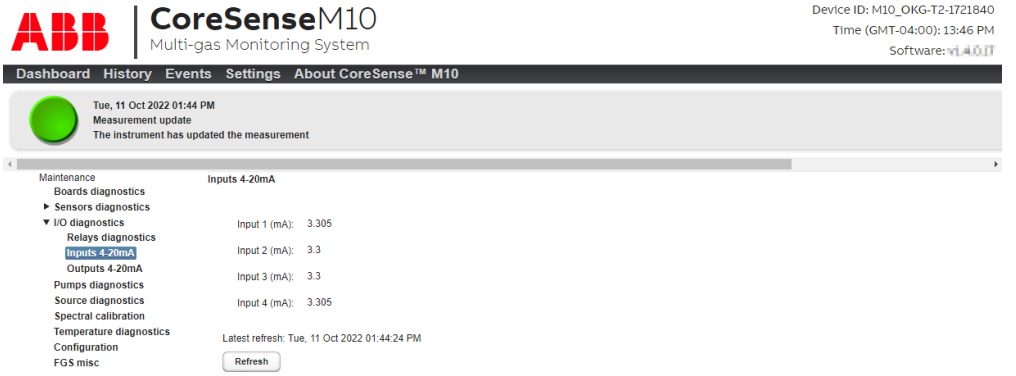
Figure 63 Moisture sensor diagnostic data



4–20 Inputs

To gather diagnostic data for the 4–20 mA inputs from the **Maintenance** page, click **I/O diagnostics> Inputs 4–20 mA**. A table appears indicating various parameters and values.

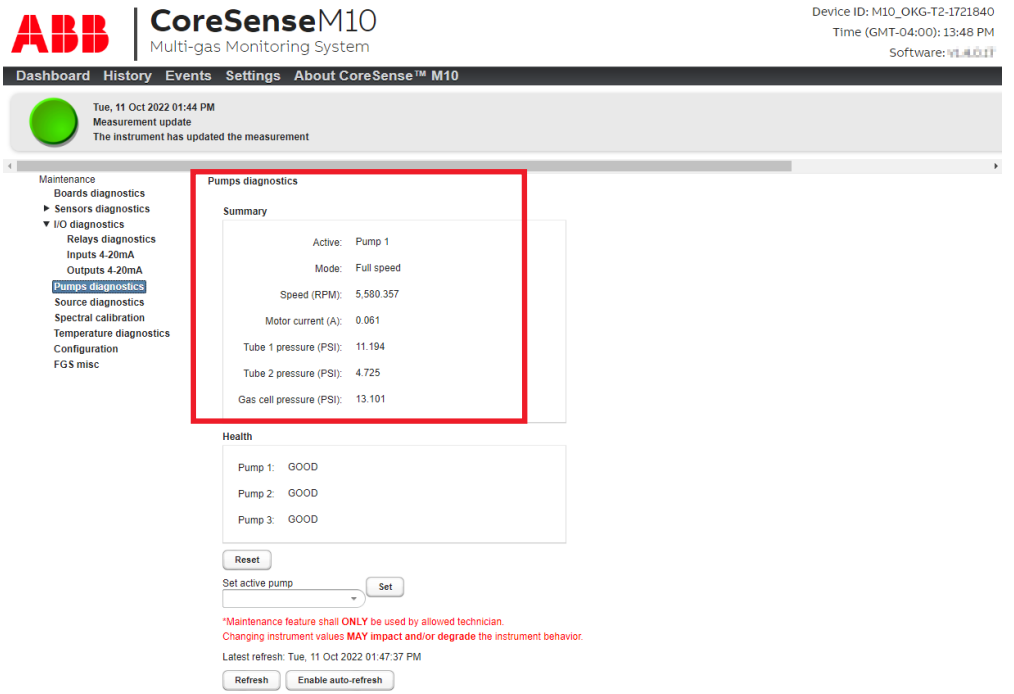
Figure 64 4–20 mA inputs diagnostic data



Pump Data

To gather diagnostic data for the system pumps from the **Maintenance** page, click **Pumps diagnostics**. A table appears in the top part of the page indicating various parameters and values.

Figure 65 Pumps diagnostics page



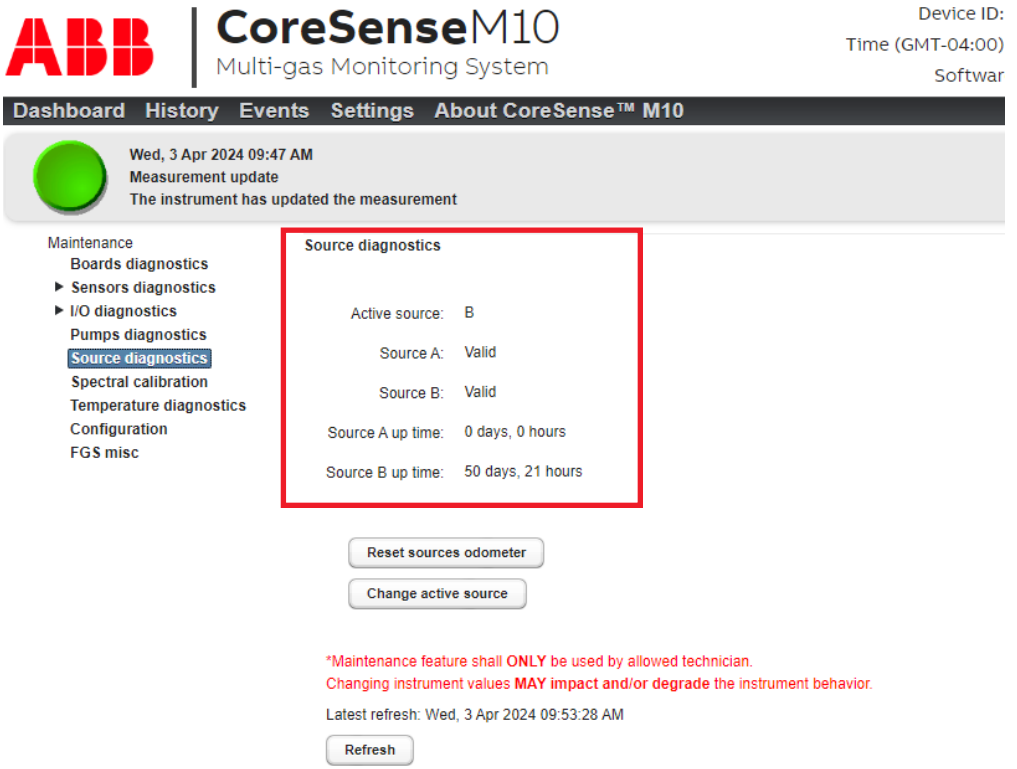
NOTICE

Use of the bottom part of this page is destined to testing system pumps. Pump testing is explained in more details on "Working on Pumps" on page D96.

Source Data

To gather diagnostic data for the system source from the **Maintenance** page, click **Source diagnostics**. A table appears in the top part of the page indicating various parameters and values.

Figure 66 Pumps diagnostics page



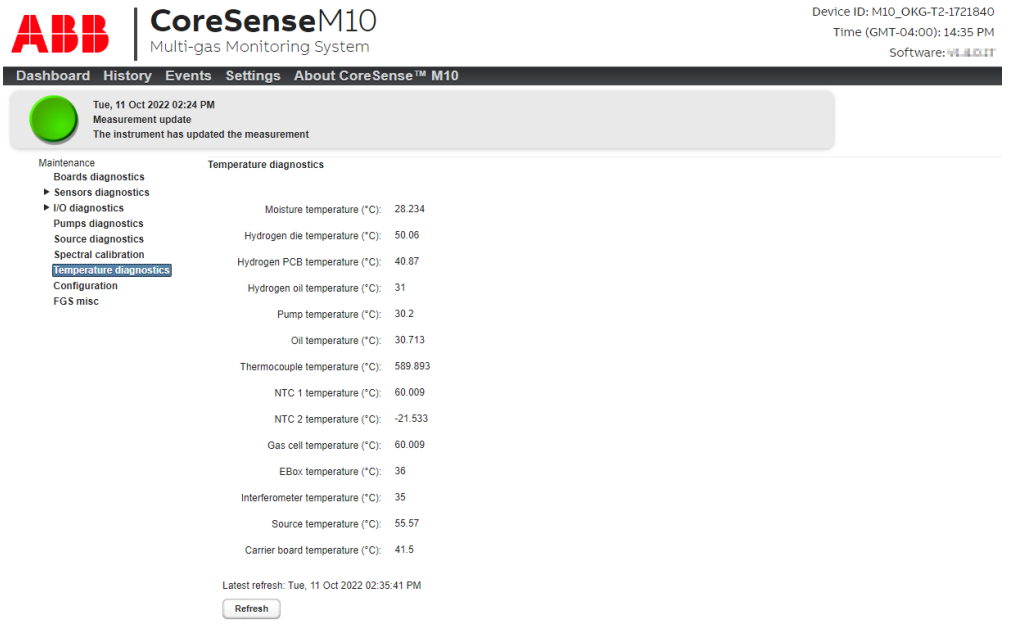
NOTICE

Use of the bottom part of this page is destined to testing and resetting various source parameters. Source testing is explained in more details on "Diagnosing System Sources" on page D98.

Temperature Data

To gather temperature data for diagnostic purposes, click **Temperature diagnostics** from the **Maintenance** page. A table appears indicating various temperature parameters and values.

Figure 67 Temperature diagnostic data



Performing a Spectral Calibration

NOTICE

Spectral calibration **must only be performed** by ABB Level 2 accredited personnel or under the direct supervision of ABB Level 2 accredited personnel.

The CoreSense M10 is comprised of a spectrometer that uses two infrared (IR) detectors (referred to as the reference channel and the sample channel). Both IR detectors must show identical results, hence the need to calibrate these detectors via a spectral calibration. Spectral calibrations use atmospheric water vapor as a calibration reference.

Spectral calibrations are required whenever the IR source module, a detector or the interferometer is replaced. Otherwise, there is no need to perform spectral calibrations.

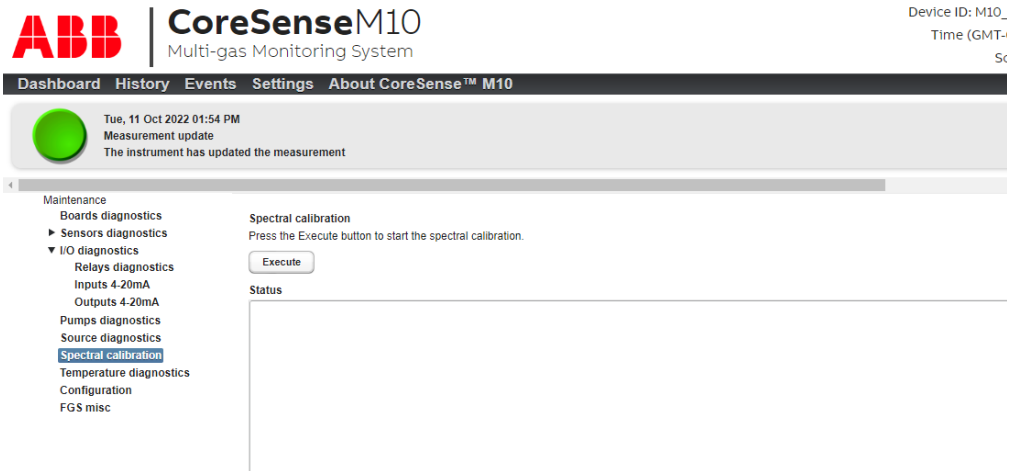
To perform a spectral calibration on your instrument:

1 Click **Spectral calibration** from the **Maintenance** page[1].

2 Click **Execute** to start the spectral calibration (the button becomes the **Abort** button).

1 Make sure that both sensors detect a signal before launching a spectral calibration. Otherwise, performing a spectral calibration will decalibrate the CoreSense M10.

Figure 68 Spectral Calibration



3 Enter your username when required and click **Submit**.

Calibration starts and progress is displayed in the **Status** box underneath (a spectral calibration takes between 5 and 15 minutes typically).

4 Once the spectral calibration succeeds, CoreSense M10 reboots automatically and returns to normal operating status.

If spectral calibration fails, CoreSense M10 will not reboot. In this situation:

a Click **Details**.

b Take a screenshot of the displayed information. You must send this screenshot when contacting the ABB FTIR support, which you *must do* after a spectral calibration failure.

c Close the **Details** dialog box.

d Click **Reboot now**.

NOTICE

Do not close the web interface before the calibration is completed and a message of **Reboot** appears.

Toggling Relays

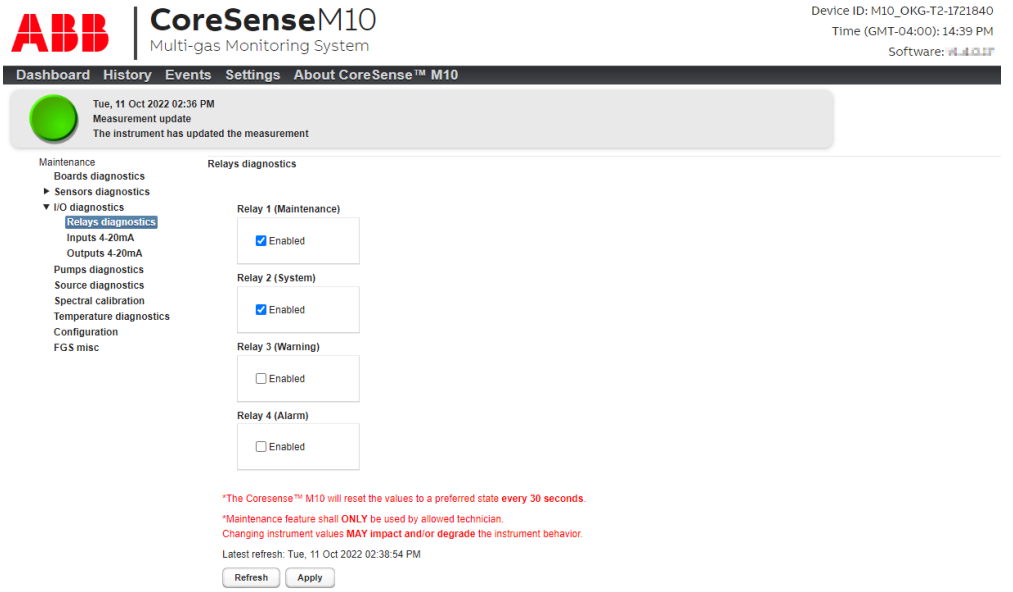
Sometimes, when performing maintenance or troubleshooting tasks, you need to enable or disable certain system relays.

To do so:

1 Click **I/O diagnostics> Relays diagnostics** from the **Maintenance** page. The **Relays diagnostics** page appears, indicating the state of the various relays.

2 Check or uncheck the boxes next to the relays that you want to enable or disable.

Figure 69 Relays diagnostics page



3 Click **Apply**. The state of the physical relays is modified to match the state given on the page.

NOTICE

The CoreSense M10 is designed to counteract undue external influences (e.g., electromagnetic interferences) by resetting relays to a preferred state every 30 seconds. If your testing of the relays exceeds 30 seconds, click **Refresh** to obtain the latest relay states before continuing on.

Modifying 4–20 mA Output Values

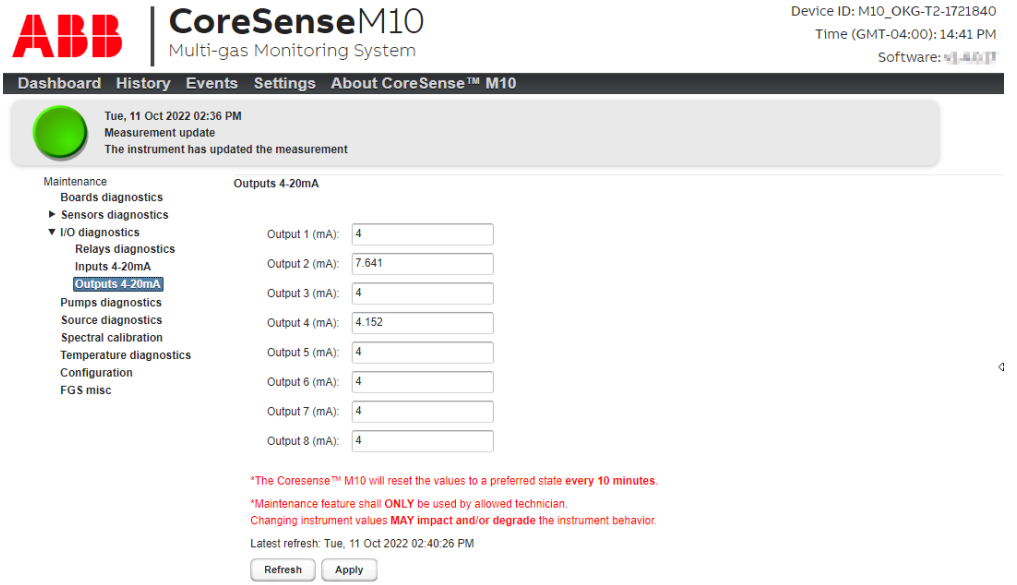
Sometimes, when performing maintenance or troubleshooting tasks, you need to modify certain electric output currents.

To do so:

1 Click **I/O diagnostics> Outputs 4–20 mA** from the **Maintenance** page. The **Outputs 4–20 mA** page appears, indicating the various current outputs.

2 Modify the indicated current outputs as required by your troubleshooting or maintenance task.

Figure 70 4–20 mA outputs page



3 Click **Apply**. The current outputs are modified as indicated.

NOTICE

The CoreSense M10 is designed to counteract undue external influences by resetting current outputs to a preferred state every 30 seconds. If your testing of the current outputs exceeds 30 seconds, click **Refresh** to obtain the latest relay states before continuing on.

Working on Pumps

When troubleshooting a CoreSense M10 system, you might have to perform tasks on the different pumps (resetting pump state, activating/deactivating a pump, etc.). The following pages explain how to perform these tasks.

Activating a Pump

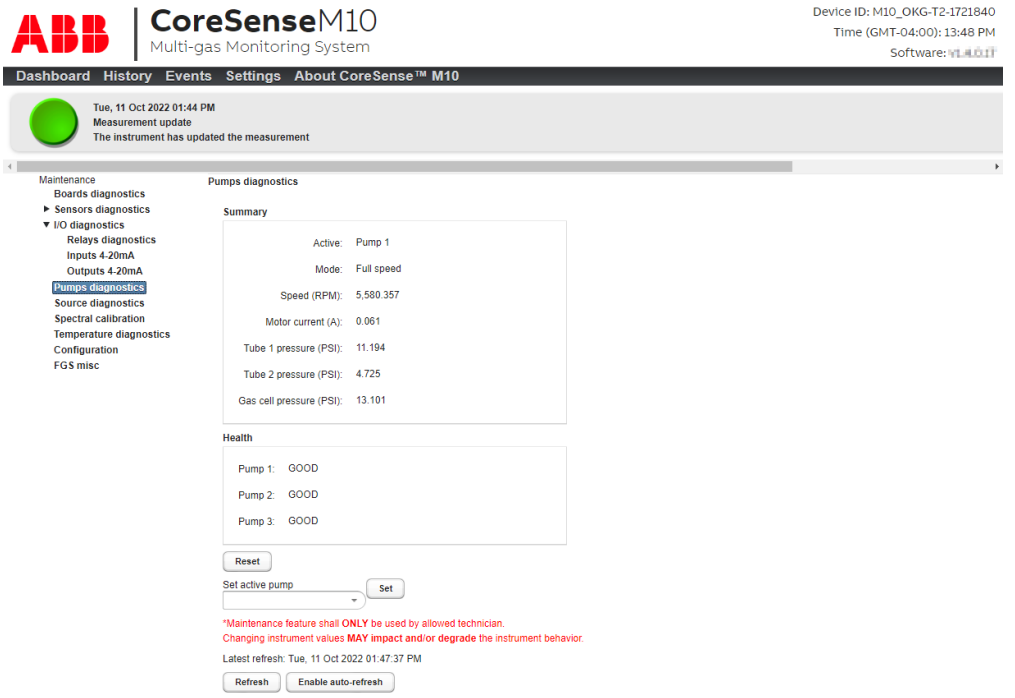
Sometimes, when performing maintenance or troubleshooting tasks, you need to activate or deactivate pumps over the course of a maintenance or troubleshooting session.

To do so:

1. Click **Pumps diagnostics** from the **Maintenance** page. The **Pumps diagnostics** page appears.
2. In the **Set active pump** drop-down menu, select the pump that you want to activate.
3. Click **Set**.

   The selected pump is activated, and all other pumps are deactivated.

Figure 71 The Pumps diagnostics page



Resetting the State of All Pumps

While the CoreSense M10 is in operation, *persistent files* are created for each pump, describing certain parameters and pump states. These files are designed to remain in the instrument. However, there are times when you might need to erase those files (e.g., after replacing a pump).

To do so:

1. Click **Pumps diagnostics** from the **Maintenance** page. The **Pumps diagnostics** page appears (see Figure 71 on page D96).
2. Click **Reset** above the **Set active pump** drop-down menu.

   The persistent files are deleted, allowing the system to use all pumps in a fresh state again.

NOTICE

Clicking the **Reset** button by mistake will delete the persistent files and recreate them based on the current instrument state.

Enabling Auto-refresh

The CoreSense M10 is designed so that the user has to click the **Refresh** button to obtain the system's latest operating state. However, when it comes to pump diagnostics and troubleshooting, a user will often need both hands while optimizing pump and connection behavior. That is why an auto-refresh function has been provided on the **Pumps diagnostics** page.

To activate the auto-refresh function:

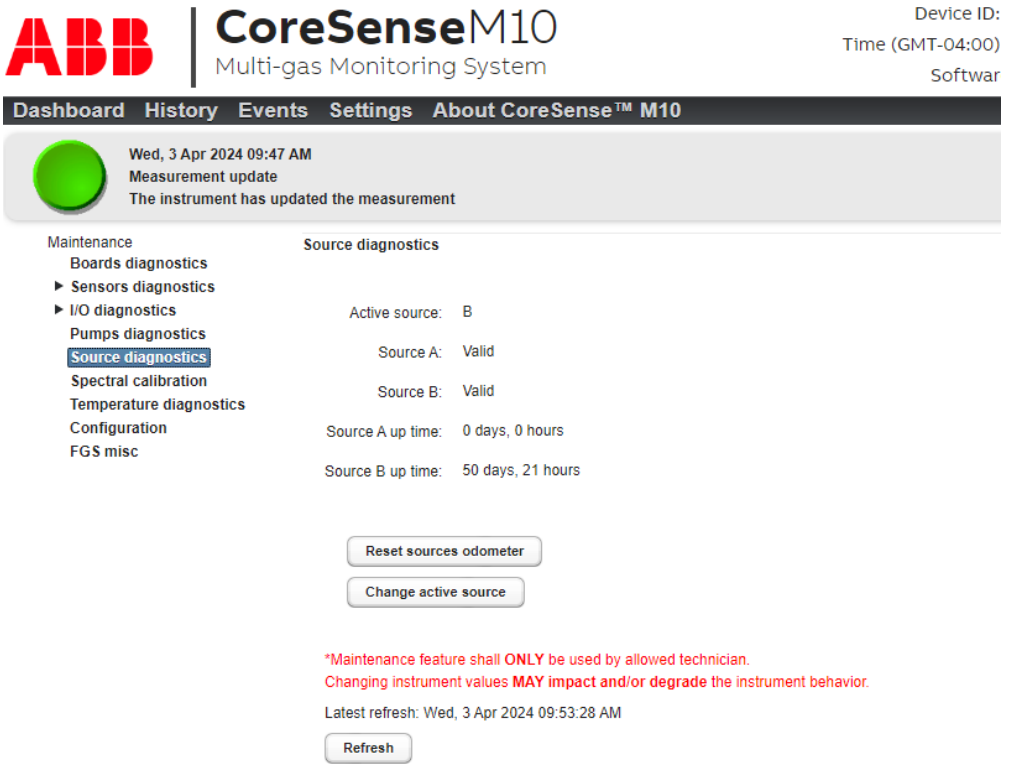
1. Click **Pumps diagnostics** from the **Maintenance** page. The **Pumps diagnostics** page appears (see Figure 71 on page D96).
2. Click **Enable auto-refresh.** The **Refresh** button becomes grayed out.

   The auto-refresh function will automatically refresh the pump states every 2 seconds until you click **Disable auto-refresh**.

Diagnosing System Sources

When diagnosing CoreSense M10 problems, system sources could be at fault. From the **Maintenance** page, there are certain actions that you can perform to achieve a diagnostic.

Figure 72 The Source diagnostics Page



Changing the Active Source

There are two sources in a CoreSense M10 system. To switch between active sources:

1. Click **Source diagnostics** from the **Maintenance** page. The **Source diagnostics** page appears (see Figure 72 above).
2. Click **Change active source**.
3. Click **Refresh** at the bottom of the page to make sure that the change has been properly executed.

Resetting Source Odometers

While CoreSense M10 is in operation, *persistent files* are created for each source, describing certain parameters and source states. These files are designed to remain in the instrument. However, there are times when you need to erase those files (e.g., after replacing a source).

To reset source odometers:

1 Click **Source diagnostics** from the **Maintenance** page. The **Source diagnostics** page appears (see Figure 72 on page D98).

2 Click **Reset odometers**.

The source persistent files are deleted, allowing the system to use all sources in a fresh state again.

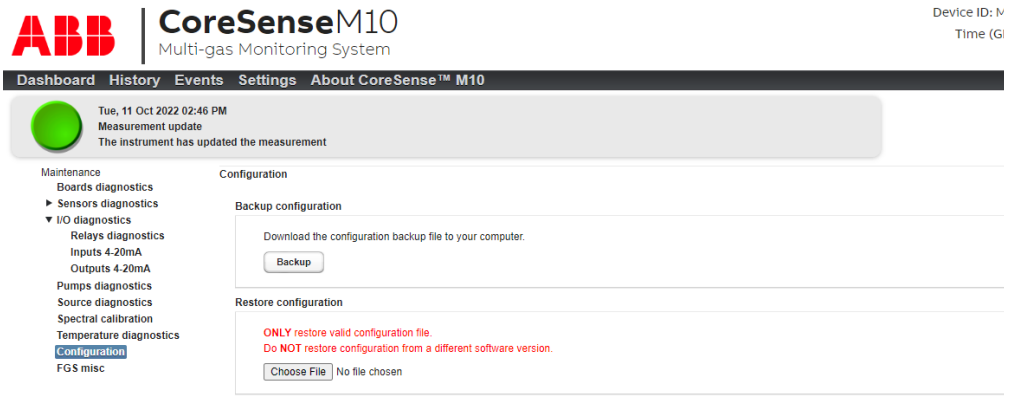
NOTICE

Clicking the **Reset odometers** button by mistake will delete the persistent files and recreate them based on the current instrument state.

Managing CoreSense M10 Configurations

Activation and backup of CoreSense M10 configurations are managed from the **Configuration** page on the **Maintenance** page.

Figure 73 The Configuration page



Backing Up the Current Configuration

Before performing any major maintenance operation on a CoreSense M10 system, you should back up your current system configuration.

To do so:

1 Click **Configuration** from the **Maintenance** page. The **Configuration** page appears (see Figure 73 above).

2 Click **Backup** in the **Backup configuration** section of the page. Your browser asks you where you want to save the backup file named **config_Coresense_M10.bin**. Browse to a location and click **Save**.

A backup of your configuration file is saved at the location of your choice.

Restoring a Configuration

After performing any major maintenance operation on a CoreSense M10 system, you should be able to restore a previously created backup your current system configuration if you need to.

To do so:

1 Click **Configuration** from the **Maintenance** page. The **Configuration** page appears (see Figure 73 above).

2 Click **Choose File** in the **Restore configuration** section of the page.

3 In the **Choose file to upload** window, browse to the location of a previously saved configuration file (.bin) and select the file that you need.

NOTICE

A .xml configuration file modified outside the system **must be** reencoded in UTF-8 before being uploaded. An improperly encoded configuration file could render the system inoperative.

You return to the **Configuration** page and the path to the selected file appears in the field next to the **Choose File** button. A **Restore** button also appears to the right of the **Choose File** button.

5 Click **Restore**. The configuration file is restored and the system restarts.

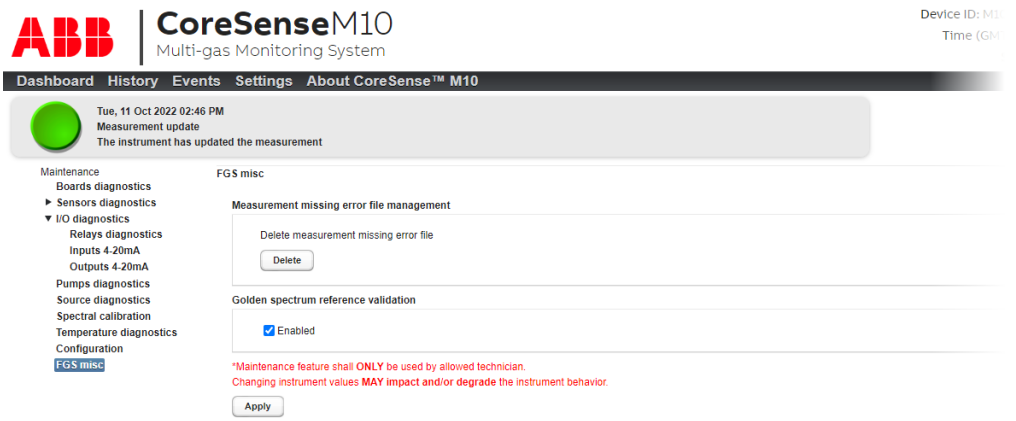
Fixing Remote Web Interface Display Problem

There are rare and minor situations where the CoreSense M10 remote Web interface will not display measurements even though these measurements are displayed on the analytical unit screen.

This problem can be fixed as such:

1 Click **FGS misc** from the **Maintenance** page. The **FGS misc** page appears (see Figure 74 below).

Figure 74 The FGS misc page



2 Click **Delete** in the **Measurement missing error file management** section.

Measurement values should now appear in the Measurement page.

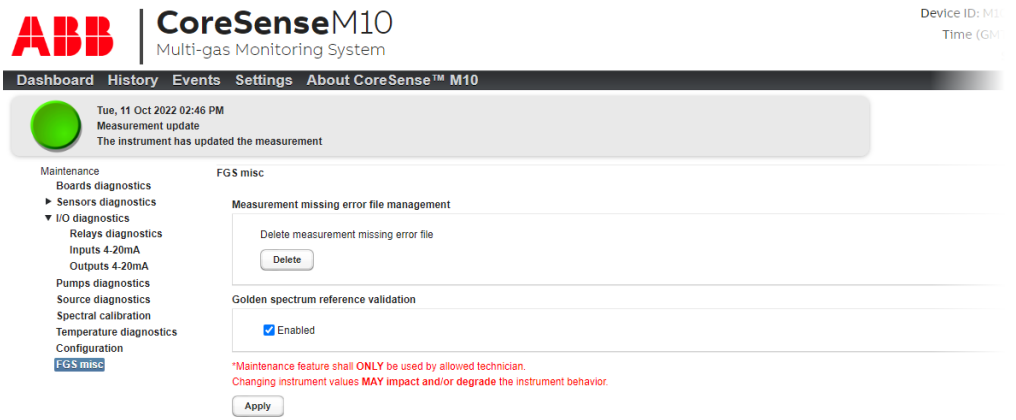
Toggling Validation of the Golden Reference Spectrum

There are times when you will need to change the validation status of the golden spectrum reference.

To do so:

1 Click **FGS misc** from the **Maintenance** page. The **FGS misc** page appears (see Figure 75 below).

Figure 75 The FGS misc page



2 Toggle the **Enabled** box in the **Golden spectrum reference validation** section to change the validation status.

3 Click **Apply**. From now on, the golden spectrum reference will be validated (or not, if you just so decided).

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APPENDIX E

Alternate Fluids Validation

Mineral Oil (IEEE Std C57.104-2019)

Table 3 Default dissolved gas concentration limits for Mineral Oil (µL/L [ppm])

Gas	Warning threshold	Alarm threshold	ROC Warning threshold	ROC Alarm threshold	Default state
Moisture (H_2O)	10	20	3	5	Enabled
Hydrogen (H_2)	80	200	25	50	Enabled
Methane (CH_4)	90	150	5	10	Enabled
Acetylene (C_2H_2)	2	7	1	3	Enabled
Ethylene (C_2H_4)	50	100	5	10	Enabled
Ethane (C_2H_6)	90	175	50	100	Enabled
Carbon monoxide (CO)	900	1100	35	70	Enabled
Carbon dioxide (CO_2)	9000	12500	20	35	Enabled
TDCG	n/a	n/a	n/a	n/a	**Disabled**
Propene (C_3H_6)	15	30	n/a	n/a	**Disabled**
Propane (C_3H_8)	n/a	n/a	n/a	n/a	**Disabled**

Synthetic Ester (IEEE Std C57.155-2014)

Table 4 Default dissolved gas concentration limits for Synthetic Ester (µL/L [ppm])

Gas	Warning threshold	Alarm threshold	ROC Warning threshold	ROC Alarm threshold	Default state
Moisture (H_2O)	400	600	25	50	Enabled
Hydrogen (H_2)	64	88	25	50	Enabled
Methane (CH_4)	104	144	25	40	Enabled
Acetylene (C_2H_2)	13	42	10	30	Enabled
Ethylene (C_2H_4)	150	230	25	50	Enabled
Ethane (C_2H_6)	124	474	20	100	Enabled
Carbon monoxide (CO)	1344	1541	350	700	Enabled
Carbon dioxide (CO_2)	1300	1500	350	700	Enabled
TDCG*	n/a	n/a	n/a	n/a	**Disabled**
Propene (C_3H_6)	25	50	n/a	n/a	Enabled
Propane (C_3H_8)	75	150	n/a	n/a	Enabled

Natural Ester (IEEE Std C57.155-2014)

Table 5 Default dissolved gas concentration limits for Natural Ester (µL/L [ppm])

Gas	Warning threshold	Alarm threshold	ROC Warning threshold	ROC Alarm threshold	Default state
Moisture (H_2O)	200	300	45	94	Enabled
Hydrogen (H_2)	112	171	25	50	Enabled
Methane (CH_4)	20	41	5	10	Enabled
Acetylene (C_2H_2)	1	3	1	3	Enabled
Ethylene (C_2H_4)	18	36	5	10	Enabled
Ethane (C_2H_6)	232	389	50	100	Enabled
Carbon monoxide (CO)	161	462	35	70	Enabled
Carbon dioxide (CO_2)	80	230	20	35	Enabled
TDCG*	n/a	n/a	n/a	n/a	**Disabled**
Propene (C_3H_6)	10	20	n/a	n/a	Enabled
Propane (C_3H_8)	20	40	n/a	n/a	Enabled

Silicon Fluid (IEEE Std C57.146-2005)

Table 6 Default dissolved gas concentration limits for Silicon Fluid (µL/L [ppm])

Gas	Warning threshold	Alarm threshold	ROC Warning threshold	ROC Alarm threshold	Default state
Moisture (H_2O)	70	105	15	30	Enabled
Hydrogen (H_2)	200	300	30	50	Enabled
Methane (CH_4)	100	150	15	25	Enabled
Acetylene (C_2H_2)	1	3	1	3	Enabled
Ethylene (C_2H_4)	30	45	5	10	Enabled
Ethane (C_2H_6)	30	45	5	10	Enabled
Carbon monoxide (CO)	3000	4500	430	640	Enabled
Carbon dioxide (CO_2)	30000	45000	4300	6400	Enabled
TDCG*	n/a	n/a	n/a	n/a	**Disabled**
Propene (C_3H_6)	n/a	n/a	n/a	n/a	**Disabled**
Propane (C_3H_8)	n/a	n/a	n/a	n/a	**Disabled**

Hitachi Energy Customer Center

Phone:
1-800-290-5290

www.hitachienergy.com/contact-us

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