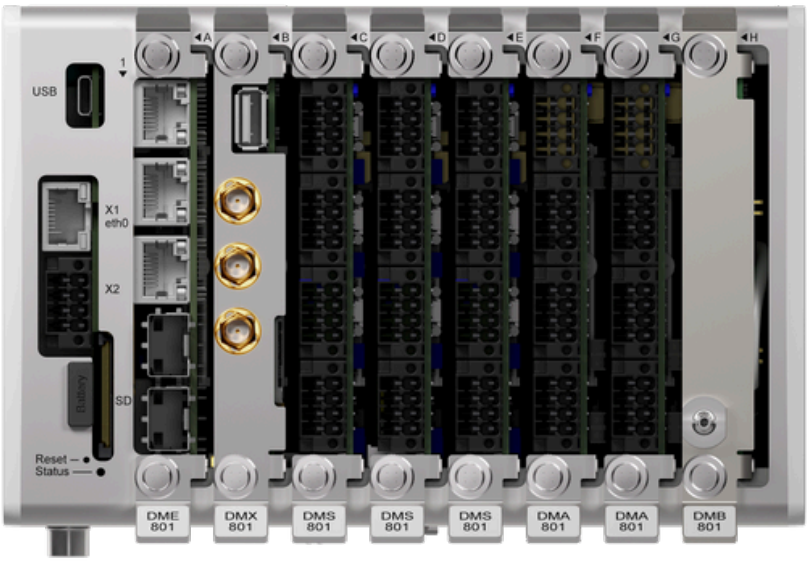
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USER GUIDE

# DMU801

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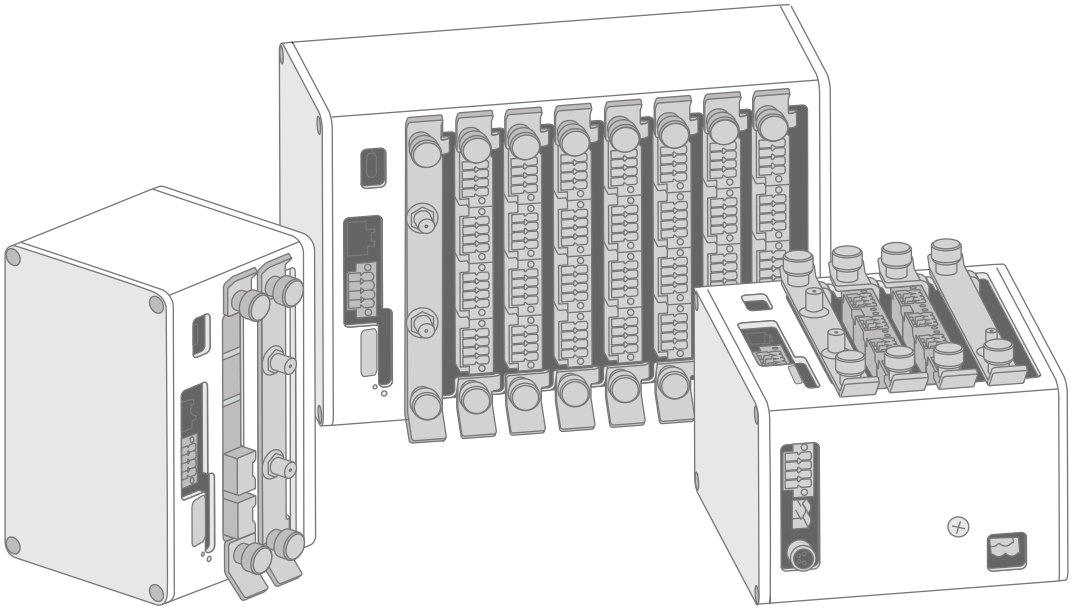


M212436EN-T

# User Guide

## Vaisala Data Management Unit

**DMU801**



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# 1. About this document

## 1.1 Version information

This document provides detailed information about installing, using, and maintaining Vaisala Data Management Unit DMU801.

Table 1 Document versions (English)

| Document code | Date | Description |
|---|---|---|
| M212436EN-T | September 2026 | The following changes have been made in Kaiku release 2.15:<br>• Modem management system has been updated. The **Modem** view in the Web UI has been improved, and all modem configuration tasks, including CHAP (Challenge-Handshake Authentication Protocol) configuration, can be done through the view.<br>• Managing certificates is now possible through the Web UI (**Settings > Certificates**). You can assign a signed certificate to the web server, to enable web browsers to make a secure connection to DMU801. More use cases will be supported in future releases.<br>• New stream-based architecture and components are available for applications. For monitoring data from stream components, there is a new **Stream console** view in the Web UI. |
| M212436EN-R | June 2026 | The following changes have been made in Kaiku release 2.14:<br>• Support for selectable pull-down and hardware filter capacitor included in DMA803 analog measurement module has been added. This helps with direct interfacing with certain wind sensors (such as potentiometer-type wind vanes) and eliminates the need for external adapters.<br>The following changes have been made in Kaiku release 2.13:<br>• Possibility to poll data through an HTTPS Reports API has been added. |
| M212436EN-P | December 2025 | The following features have been added in Kaiku release 2.13:<br>• The DMU801 firmware has been named Kaiku and Configuration Tool Kaiku Designer. |

## 1.2 Related manuals



For the latest versions of these documents, see docs.vaisala.com.

Table 2 Related manuals

| Document code | Name |
|---|---|
| M212429EN | Vaisala Data Management Unit DMU801 Quick Guide |



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| Document code | Name |
|---|---|
| M212430EN | Vaisala Data Management Unit DMU801 Plug-in Modules Installation Quick Guide |
| M212407EN | Vaisala Kaiku Designer User Guide |
| M213182EN | Vaisala Data Management Unit DMU801 ASCII Sensor Parser Developer Guide |
| M213275EN | Vaisala Data Management Unit DMU801 Analog Sensor Integration Guide |
| M213260EN | Vaisala Data Management Unit DMU801 Modbus RTU Sensor Integration Guide |
| M213266EN | Vaisala Data Management Unit DMU801 Time Synchronization Management Guide |
| M213151EN | Vaisala Kaiku Event Description |
| M213154EN | Vaisala Kaiku Device Management API Description |
| M213354EN | Vaisala Kaiku HTTPS Reports API Description |

Table 3 Downloads

| Code | Name | Download link |
|---|---|---|
| SW211572 | Latest firmware package | Kaiku firmware package |
| SW211573 | Latest Vaisala Kaiku Designer | Vaisala Kaiku Designer |
| DOC258453 | DMU801-related wiring diagrams | DMU801 wiring diagrams |

## 1.3 Documentation conventions

**WARNING!** Alerts you to a hazardous situation that, if not avoided, could result in death or serious injury.

**CAUTION!** Alerts you to a hazardous situation that, if not avoided, could result in minor or moderate injury.

**NOTICE!** Alerts you to a situation that, if not avoided, could result in the product to be damaged, or important data to be lost.

Highlights important information on using the product.



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# 2. Product overview

## 2.1 Introduction to DMU801

Vaisala Data Management Unit DMU801 is designed for acquiring and managing data flow from sensors in automatic weather stations. Its open design allows flexibility in sensor selection and data interfaces.

DMU801 is available in 3 sizes. It has a processor board and room for either 2, 4, or 8 optional plug-in modules. You can select the size of the base unit according to your expansion needs and complement it with additional plug-in modules.

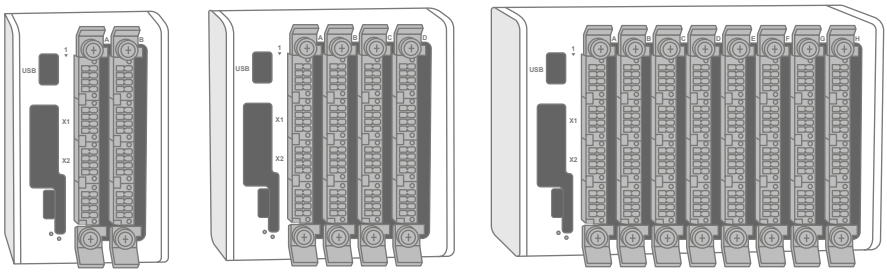


Figure 1 3 sizes of DMU801

DMU801 has the following user interfaces:

- Kaiku Designer is for creating and modifying applications.
- Kaiku Web UI is for maintenance, configuration, and troubleshooting tasks. It allows controlling the system both remotely and locally.

**More information**

▸ User interfaces (page 24)

## 2.2 DMU801 solution

DMU801 is designed for meteorological applications. In meteorological applications, the measurement certainty and software configurability are important, and DMU801 is designed to fulfill these requirements.

Analog measurements are optimized for resistive platinum (Pt100) temperature sensors, low voltages from thermopile sensors, and potentiometer and frequency measurements over a wide temperature range with high accuracy. Measurement parameters are fully configurable.

Serial interfaces support all interfaces used in meteorological sensors.

For modern communication networks, DMU801 has excellent cyber security, which prevents unauthorized access and actions. Remote monitoring and maintenance capabilities enable easy maintenance of large networks.

**More information**

- Data security (page 27)

## 2.3 Product and part names

Table 4 Product and part names

| Item | Name |
|---|---|
| DMU801 | Vaisala Data Management Unit |
| DMA801<br>DMA802<br>DMA803 | Vaisala Analog Measurement Module |
| DMS801<br>DMS802 | Vaisala Serial Module |
| DME801 | Vaisala Ethernet Switch Module |
| DMX801 | Vaisala Modem Carrier Module |
| DMB801 | Vaisala Barometer Module |
| BMU801 | Vaisala Battery Management Unit |
| Vaisala Kaiku | Operating system and software platform running on DMU801 |
| Kaiku Web UI | Web user interface for service connection between computer and DMU801 |
| Kaiku Designer | Vaisala software for designing and modifying the application |

## 2.4 Safety

This product fulfills the relevant requirements of electrical safety.

Consult local authorities and electricity professionals on decisions that relate to grounding, safe installation, and power supply.

The assembler is responsible for the safety of the system into which the device is integrated.

If the product is used in a manner not specified by Vaisala, the protection provided by the product may be impaired. Follow the instructions.



**WARNING!** Follow local and state legislation and regulations on occupational safety.



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**WARNING! Electricity hazard**
Lightning strikes and lightning-induced current surges can result in injury or death and damage the device or system. Ground the device or system properly, including any remote units, and install lightning protection.



**WARNING! Electricity hazard**
Lightning strikes can result in injury or death. Do not perform installation or maintenance procedures when there is a risk of thunderstorm or lightning in the area.



**WARNING! Electricity hazard**
Failure to provide proper grounding can result in injury or death from electric shock and can severely damage the product. Ground the product and verify the grounding periodically.



**WARNING! Electricity hazard**
A long cable between units (sensors, transmitters, power supplies, and displays) can cause a lethal lightning-induced current surge. Always ground the enclosure to a suitable grounded location with a short, low-resistance cable.



**WARNING! Electricity hazard**
Replacing components when the system is powered up can result in injury. Always disconnect all power sources before servicing the system.



**CAUTION! Electricity hazard**
Handling energized wires can cause electric shock. Prepare or connect only de-energized wires.



**NOTICE!** Modification of the product can damage the product. Do not modify the product or substitute parts unless instructed to do so. Improper modification voids your warranty.



**NOTICE!** Incorrect wiring can cause damage and prevent or limit operation. Do not damage or change the wiring.



Failure to comply with the warnings and cautions in these instructions violates safety standards of design, manufacture, and intended use of the product. Vaisala assumes no liability for the failure to comply with these requirements.

### 2.4.1 ESD protection

Electrostatic discharge (ESD) can damage electronic circuits. Vaisala products are adequately protected against ESD for their intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects in the equipment housing.

To avoid delivering high static voltages to the product:

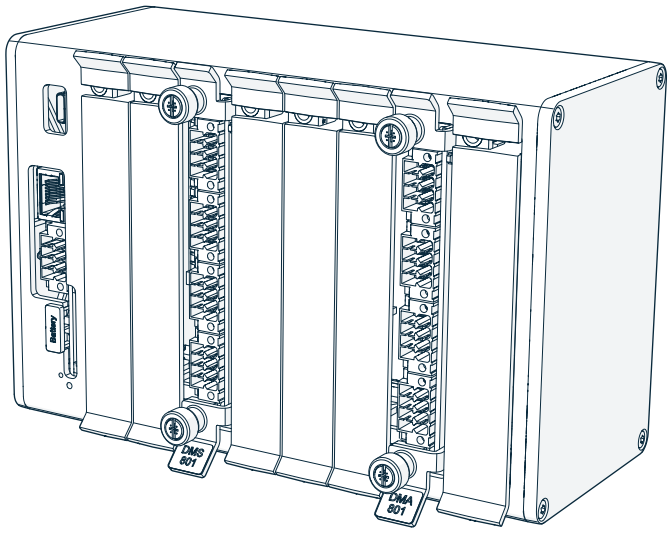
- Handle ESD-sensitive components on a properly grounded and protected ESD workbench or by grounding yourself to the equipment chassis with a wrist strap and a resistive connection cord.
- If you are unable to take either precaution, touch a conductive part of the equipment chassis with your other hand before touching ESD-sensitive components.
- Hold component boards by the edges and avoid touching component contacts.



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# 3. Structure and components

## 3.1 Vaisala Data Management Unit DMU801




DMU801 collects and processes data from the sensors as defined in the application. To process the observation data, DMU801 performs advanced algorithm calculations. In addition, DMU801 validates sensor data accuracy using preconfigured criteria before sending the data forward. DMU801 also manages internal diagnostics of the system and reports the system status through a configurable reporting interface.

The sensors are connected to DMU801 through plug-in modules. DMU801 controls the power of the sensors and provides heating power through a separate connector.

DMU801 has an embedded web server through which observation data, sensor status, and many DMU801 maintenance functions can be managed. Information can be viewed and managed through a browser-based graphical user interface, the Kaiku Web UI.

DMU801 has an 8 GB internal eMMc Flash memory, of which 4 GB can be used for data logging. The logging capability can be extended with an external SD memory card. The data is logged in daily files, which makes it easy to locate any particular data set for further analysis. DMU801 supports SD cards of up to 32 GB.

**More information**

- DMU801 specifications (page 115)

## 3.1.1 DMU801 base unit connectors and indicators

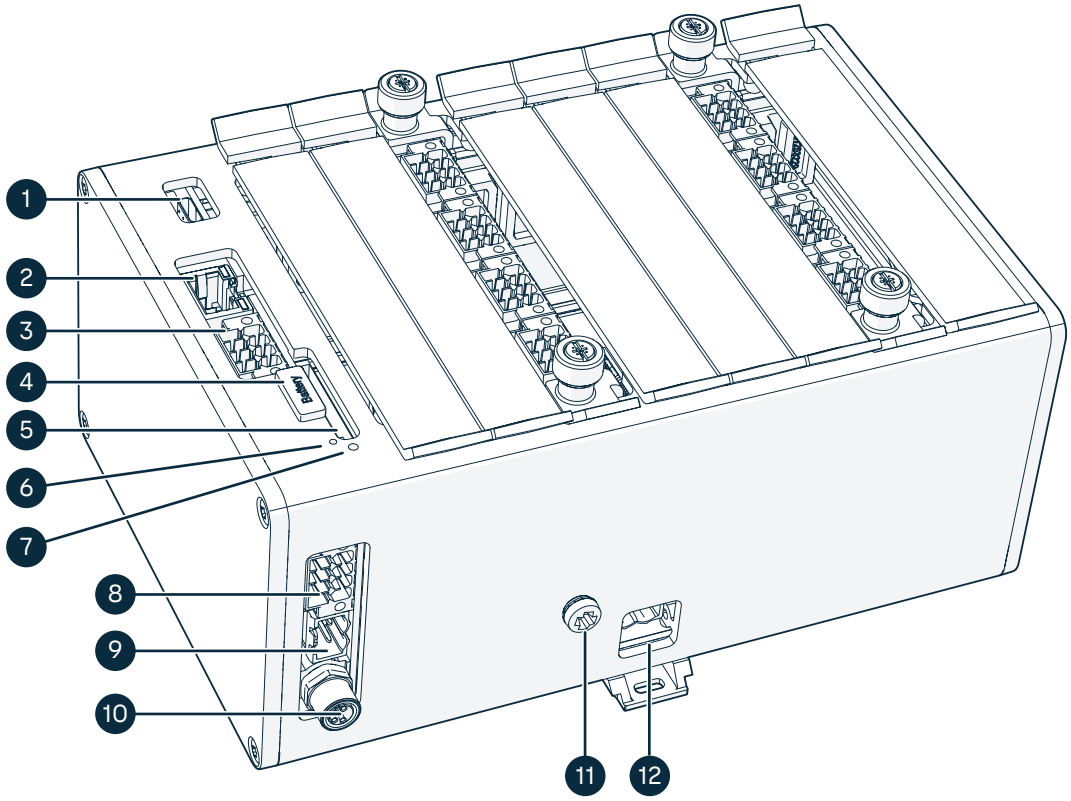



Table 5 DMU801 base unit connectors

| Number in figure | Port | Purpose | DMU801 connector | Connector name in application |
|---|---|---|---|---|
| 1 | USB-C | Service port. IP address: *https://192.168.10.2* | **USB** | – |
| 2 | Ethernet 10/100 Mbps Base-T [1) 2)] | Ethernet interface. IP address: configurable (default: *192.168.2.2*) | **X1 eth0** | **ETH_X1** |
| 3 | 2-wire RS-485 [2)] | RS-485 interface for sensor or telemetry device inside the weather station enclosure | **X2** | **COM_X2** |
| | 3.3 V logic level GPIO pins, pulse count capable | Connection for switch or counter measurement | **X2** | **GPIO_X2.1** |
| | 3.3 V logic level GPIO pins, pulse count capable | Connection for switch or counter measurement | **X2** | **GPIO_X2.2** |
| 4 | Battery | Lithium battery | **Battery** | – |
| 5 | SD card | Memory card, max. 32 GB | **SD** | – |

| Number in figure | Port | Purpose | DMU801 connector | Connector name in application |
|---|---|---|---|---|
| 6 | Reset button | Restart and restore factory settings | **Reset** | – |
| 7 | Status LED | Indication of DMU801 operation mode | **Status** | – |
| 8 | RS-232 / 2-wire RS-485 / SDI-12 multiprotocol serial [2) 3)] | Serial interface for sensor or telemetry device inside the weather station enclosure | **X3** | **COM_X3** |
| | 3.3 V logic level GPIO pins, pulse count capable | Connection for switch or counter measurement | **X3** | **GPIO_X3.1** |
| | 3.3 V logic level GPIO pins, pulse count capable | Connection for switch or counter measurement | **X3** | **GPIO_X3.2** |
| 9 | 8–32 V DC input power, 24 V DC nominal | Input power | **X4** | **PWR_X4** |
| 10 | 2-wire RS-485 [2)] | Internal RS-485 connection (reserved for Battery Management Unit BMU801) | **X5** | **COM_X5** |
| 11 | Grounding point | Equipment grounding | – | – |
| 12 | 24 V DC heating power | Heating power input connection for sensors connected to plug-in units | **X6** | **HEAT_X6** |

1) *Ethernet connection is disabled by default (can be configured in the Web UI).*
2) *External surge protection is recommended if connected devices are outside the weather station enclosure.*
3) *SDI-12 support in future releases.*

**More information**

- Surge protection for sensor interfaces (page 73)
- DMU801 base unit pins (page 134)

## 3.1.2 Powering

DMU801 operates with external power supply connected to connector **X4**. The operating voltage is 8–32 V DC. Heating power connection (connector **X6**) is provided for optional heating of the sensors connected to DMU801 plug-in units.

DMU801 also contains a lithium real-time clock battery to keep the system clock running during power outages.

DMU801 can receive power through a USB connection, too, but with limited functionality. For example, the sensors connected to plug-in modules do not get power. Also, if DMU801 has Modem Carrier Module DMX801 and/or Ethernet Module DME801, it is not possible to use USB powering. DMU801 application handling, firmware updating, and corresponding functions are available. However, depending on the host that feeds power to the USB bus and the application, it may happen that USB power supply is not sufficient for normally available functions, either. If the status LED blinks red occasionally and DMU801 does not respond, you need to connect the power supply.

DMU801 does not have a separate power switch. To power off DMU801, unplug the USB-C cable (if connected) and switch off the power supply.

**More information**

- Connecting power to DMU801 (page 29)

## 3.1.3 Data storage

The internal memory of DMU801 enables storing a large amount of data locally. You can also use an external SD memory card to store data. DMU801 supports SD cards of up to 32 GB.

Observation data can be stored in the internal memory or SD card. In the internal memory it is possible to store at least 12 months of 1-minute data for each parameter. System diagnostic data and station parameters are stored in the internal memory.

Observation data contains the observation values, their metadata, and timestamps. You can set the logging interval, data storage duration, and the file size limit in the application with Kaiku Designer. Data can be stored for a defined number of days, for example 90 days, or as long as possible. As long as possible means as long as there is space in the DMU801 internal memory or SD memory card, or as long as the defined file size limit is met, whichever comes first.

The logging interval can be set in 1-second intervals, starting from a minimum of 1 second. The period, over which statistical calculations are performed on the logged data, is also adjustable in 1-second intervals, starting at 1 second. To prevent overloading DMU801 processing capabilities, it is recommended to limit the statistical period to a maximum of 24 hours (86 400 seconds). For longer statistical period calculations, it is recommended to calculate statistics based on aggregated values from shorter statistical periods.

**NOTICE!** Avoid logging a very high number of data points very frequently. If the total number of data points in all logs combined exceeds 50 million, the CPU load increases remarkably, which impacts the overall performance of the system.
For example, set the logging interval to 1 minute instead of 1 second.

If the available space in the SD card or DMU801 internal memory, the file size limit, or the data retention limit is met, the oldest data log files are deleted to make room for the most recent ones.

**More information**

- Inserting external memory card (page 78)
- Downloading measurement logs (page 82)
- Downloading diagnostic data (page 101)
- Downloading event logs (page 102)

### 3.1.4 Data reporting interfaces

DMU801 has several data reporting interfaces for sending the observation data messages. Data reporting settings define how and in which format you want DMU801 to send the messages.

The settings are specified in the application. You can edit the application for data reporting (communication options, report formats) with Kaiku Designer.

The following communication interfaces are available for data reporting:

- Serial ports (RS-232 and RS-485)
- TCP socket
- HTTPS client
- SFTP/FTP
- HTTPS Reports API for data polling

The following report formats are available:

- Text report with Kaiku Designer report editor
- SMSAWS data message
- Dynamically formatting reports and binary reports by writing custom Python function to generate the report contents

## 3.2 DMU801 plug-in modules

DMU801 houses the plug-in modules that provide connections to the sensors. To safeguard the system and sensors from external power surges, analog and serial modules (DMA80X and DMS80X) have internal surge protection.

For Ethernet Switch Module (DME801), Vaisala recommends external surge protection when devices connected to it are located outside the weather station enclosure.

All the printed circuit boards (PCB) in the modules have conformal coating for better humidity resistance.

Table 6 DMU801 plug-in module types

| Plug-in module type | Purpose |
|---|---|
| Serial Modules DMS801 and DMS802 | Provide ports for sensors with serial interface. |
| Analog Measurement Modules DMA801, DMA802, and DMA803 | Add analog channels and convert the analog data into digital format. |
| Ethernet Switch Module DME801 | Adds Ethernet connections. |
| Modem Carrier Module DMX801 | Allows connecting a mPCIe card modem to DMU801. |
| Barometer Module DMB801 | Includes a Class A calibrated barometer. |

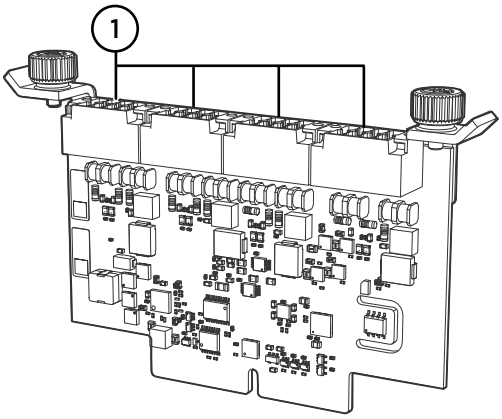
The number and type of plug-in modules in the installation depend on the application. Typically, DMU801 is delivered with plug-in modules installed but the modules are also available as spare parts and can be plugged in later to expand the selection of sensor interfaces. The plug-in modules have handles for easy installation.

The sensor cables are connected to the plug-in modules with lockable spring-cage connectors.

**More information**

- Analog Measurement Modules DMA801, DMA802, and DMA803 (page 19)
- Serial Modules DMS801 and DMS802 (page 21)
- Ethernet Switch Module DME801 (page 22)
- Barometer Module DMB801 (page 23)
- Modem Carrier Module DMX801 (page 23)
- Installing DMU801 plug-in modules (page 86)

## 3.2.1 Analog Measurement Modules DMA801, DMA802, and DMA803




1 Analog input (4 pcs)

Many sensors for measuring temperature, pressure, and solar radiation have analog interfaces. DMA801, DMA802, and DMA803 analog measurement modules provide analog channels and convert the analog data into digital format for DMU801.

The analog inputs support Pt100, Pt1000, NTC thermistor, and voltage-out sensors such as pyranometers.

Each analog measurement module includes:

- 4 differential analog channels
- 2 additional single-ended high voltage channels
- 2 counter/frequency measurement channels

DMA803 has additional onboard circuitry for direct interfacing with certain wind sensors (such as potentiometer-type wind vanes with High-Z gap). For more information, see DMU801 Analog Sensor Integration Guide (M213275EN).

With DMA801, the frequency measurement is done by the DMU801 base unit. This means that even if you have several DMA801 modules, you can use only 2 of the counter/frequency measurement channels in the modules. The channels must be different: use frequency/counter input of port 1 in one DMA801 module and frequency/counter input of port 2 in another DMA801 module.

Depending on the size of DMU801, it is possible to add up to 8 analog measurement modules to DMU801.

**More information**

- Calibrating analog measurement modules (page 94)
- DMA801 specifications (page 118)
- DMA802 specifications (page 121)
- DMA803 specifications (page 123)

### 3.2.1.1 Adapter Module DCA420

DCA420 is a current loop input adapter module designed to support 4–20 mA current loop measurement in DMA801/DMA802/DMA803 analog measurement modules. DCA420 contains a stable 100.00 Ω precision resistor.

DCA420 is delivered with the connector attached.

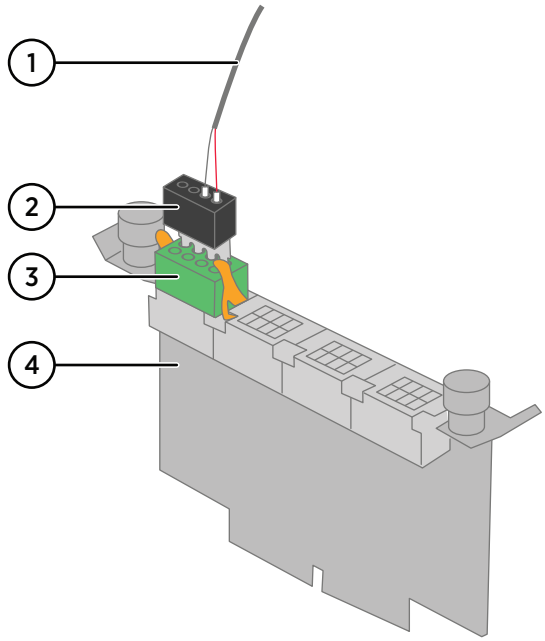



Figure 2 DCA420 installation

1 Wiring from 4–20 mA sensor
2 DCA420
3 Connector
4 DMA801, DMA802, or DMA803

## 3.2.2 Serial Modules DMS801 and DMS802

DMS801 and DMS802 serial modules extend the number of serial ports in DMU801. Each module provides interfaces for 4 additional sensors. Depending on the size of your DMU801, it is possible to add up to 8 serial modules to the system.

Table 7 DMS801 and DMS802 ports

| Plug-in module | Port | Description |
|---|---|---|
| DMS801 | RS-485 port (× 3) | Isolated |
| | Multipurpose port (× 1) | Support for 2-wire RS-485, RS-232, and SDI-12 connections. |
| DMS802 | RS-232 port (× 2) | Standard |
| | Multipurpose port (× 1) | Support for 2-wire RS-485 and RS-232 connections. |
| | Multipurpose port (× 1) | Support for 2-wire RS-485, RS-232, and SDI-12 connections. |

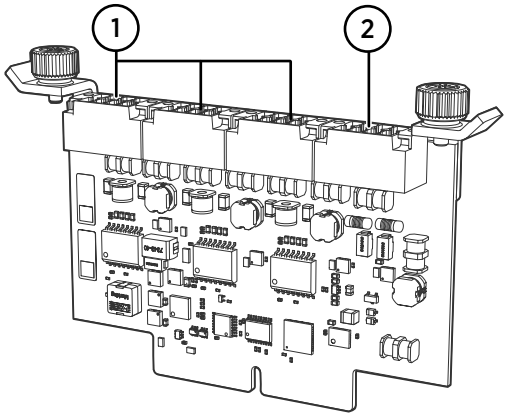



Figure 3 Serial Module DMS801

1 Isolated RS-485 port (3 pcs)
2 Multipurpose port

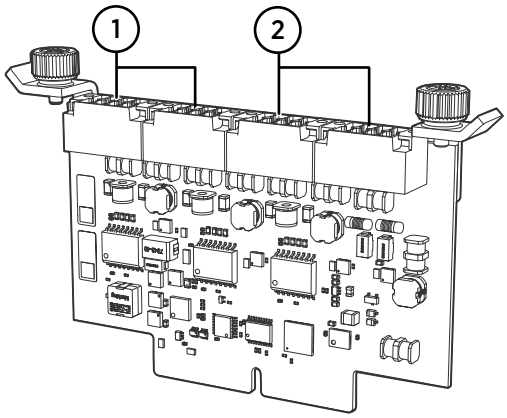


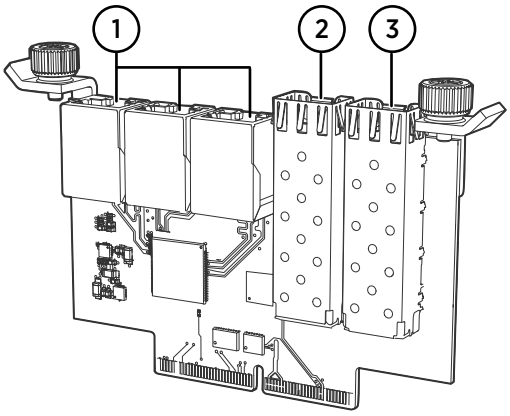

Figure 4 Serial Module DMS802

1 Standard RS-232 port (2 pcs)
2 Multipurpose port (2 pcs)

**More information**

- DMS801 specifications (page 126)
- DMS802 specifications (page 127)

## 3.2.3 Ethernet Switch Module DME801




1 Gigabit copper port (3 pcs)
2 SFP module slot (default)
3 SFP module slot (not all firmware versions support this slot)

DME801 adds 5 Ethernet connections to DMU801. Its 1 Gb Ethernet connectors include 3 copper ports and 2 slots for fiber optic SFP module.

DMU801 base unit has an Ethernet interface (port **X1 eth0**), too. If you need an additional Ethernet connection, use DME801.

**More information**

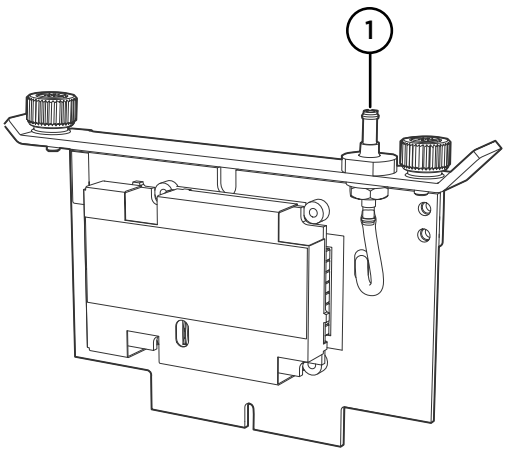
- Configuring Ethernet connection (page 35)
- DME801 Ethernet port LED modes (page 98)
- DME801 specifications (page 128)

## 3.2.4 Barometer Module DMB801

DMB801 is a barometer carrier for BARO-1 barometer module.

DMB801 uses the capacitive Vaisala BAROCAP sensor and features barometric pressure measurement for DMU801 calculation and additional pressure calculations (QFF, QFE, and QNH). The module includes a self-diagnostics feature.

The observation range of DMB801 module is 500–1100 hPa and its accuracy is ±0.15 hPa.



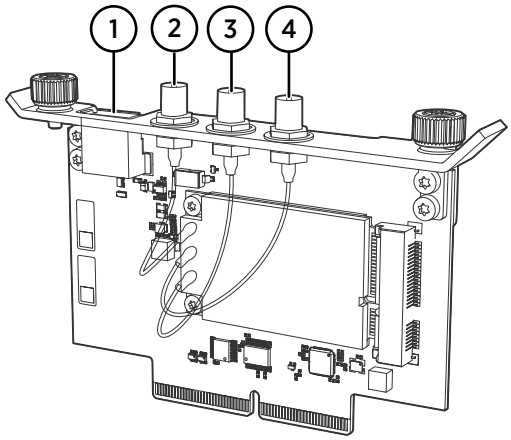

1 Barometer pressure port

**More information**

- DMB801 specifications (page 129)

## 3.2.5 Modem Carrier Module DMX801

DMX801 modem carrier module provides an interface for connecting a cellular modem to DMU801 data management unit. DMX801 supports standard mini Peripheral Component Interconnect express (mPCIe) card modems and low-power LTE Cat 4 modem modules. DMX801 can be used as a SIM card carrier for any compatible 2FF (mini) card. It can also act as an interface for external modem using USB connection.




1 USB-A port
2 Main antenna
3 GNSS
4 Diversity antenna

**More information**

- Preparing integrated modem module (page 37)
- Configuring cellular modem settings (page 38)
- DMX801 specifications (page 130)

# 3.3 User interfaces

DMU801 has the following user interfaces:

- Kaiku Designer is for creating and modifying applications.
- Kaiku Web UI is for maintenance, configuration, and troubleshooting tasks. It allows controlling the system both remotely and locally.

For using Kaiku Designer, you need a computer with Windows operating system.

**More information**

- Kaiku Designer (page 24)
- Kaiku Web User Interface (page 26)

## 3.3.1 Kaiku Designer

Kaiku Designer is a visual tool for creating and modifying applications. Kaiku Designer allows specifying the incoming and outgoing data connections, definitions for sensor and component connections, performed calculations, and outgoing reports, and displays a visualization of the data flow with colored nodes.

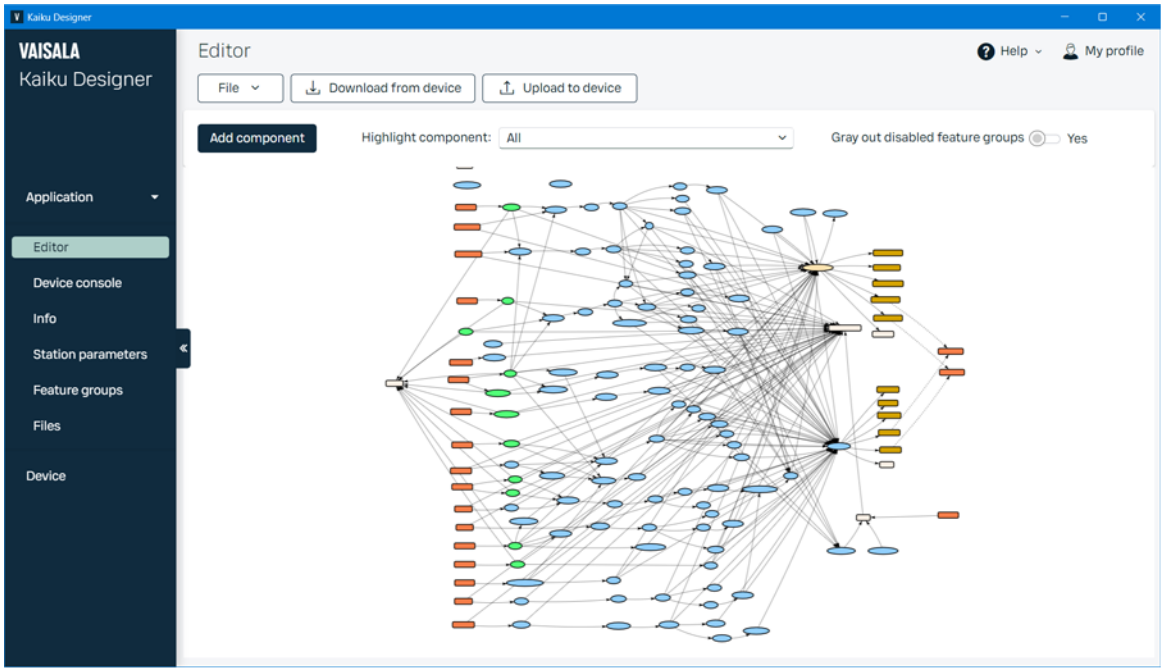



Figure 5 Kaiku Designer

Kaiku Designer comes with a library of basic calculations that can be extended with existing Python modules. You can also write custom Python calculation functions with the tool.

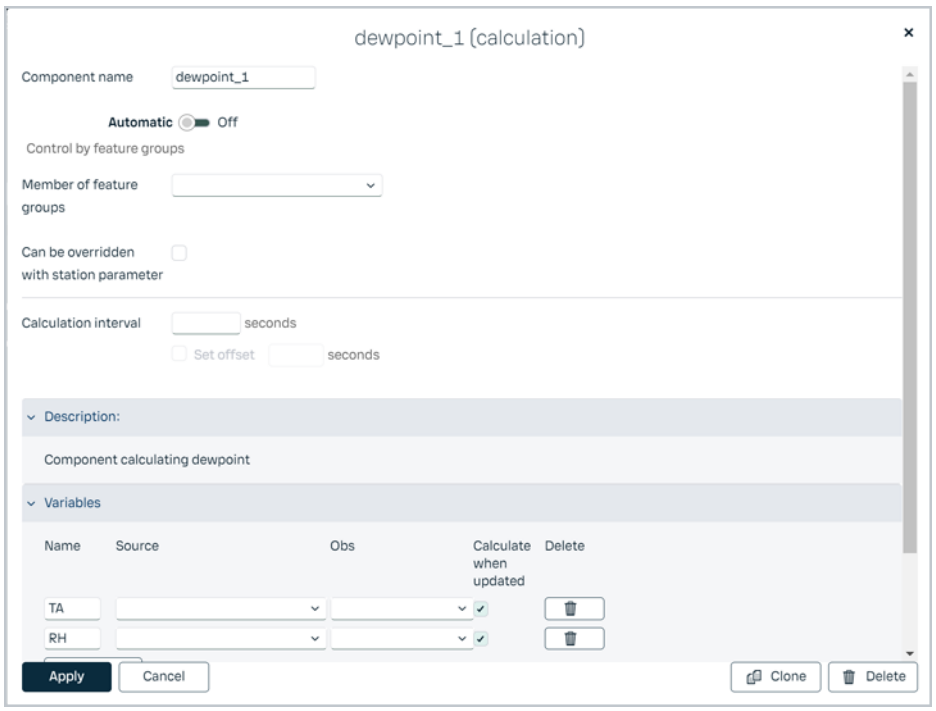


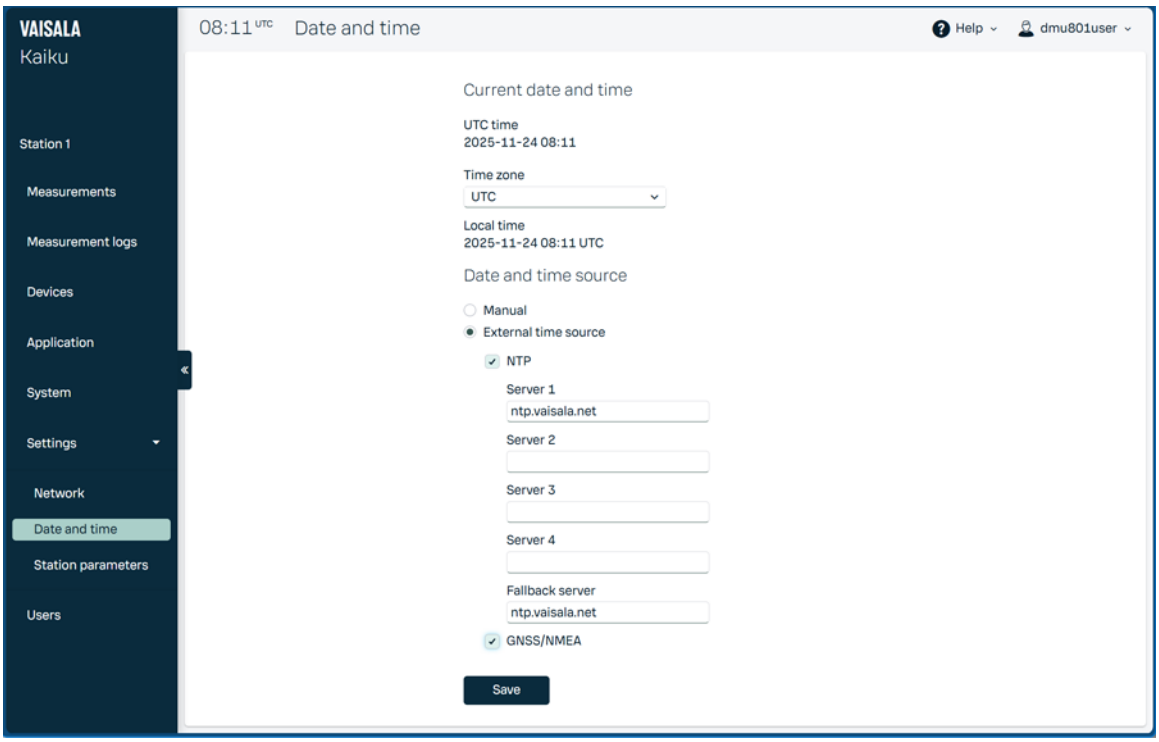

Figure 6 Calculation component example

You can upload the resulting application directly from Kaiku Designer to DMU801 over USB or TCP/IP connection.

**More information**

- Installing Kaiku Designer (page 32)

## 3.3.2 Kaiku Web User Interface




The Kaiku Web UI is available through a web browser. It has been tested with the latest versions of Microsoft Edge, Mozilla Firefox, and Google Chrome at the time of publishing this document.

You can use the Web UI for maintenance tasks, such as restarting the station, updating the software, and viewing and downloading log files.

The Web UI allows setting station-specific parameters such as date and time. In addition, you can view real-time measurement data from the sensors.

User management is also handled in the Web UI.

**More information**

- Logging in to Web UI (page 100)

# 3.4 Kaiku APIs

The following APIs are available for Kaiku (DMU801):

- Kaiku Device Management API
- Kaiku HTTPS Reports API

## 3.4.1 Kaiku Device Management API

With Kaiku Device Management API, you can perform device management operations for individual or several DMU801 units at the same time using applicable management software.

The Device Management API is a collection of several HTTP (Web) APIs:

- Device API for obtaining device, firmware, and hardware information, restarting the device, and performing factory reset
- Firmware API for updating firmware
- Backup and restore API for taking a backup and doing a full or selective restore from the backup

For more information, see Kaiku Device Management API Description (M213154EN).

## 3.4.2 Kaiku HTTPS Reports API

With Kaiku HTTPS Reports API, you can poll weather observations and reports from Kaiku (DMU801). With the API you can list, fetch, delete, and wait for reports. The API uses a buffered report architecture where reports are stored in the memory with monotonically increasing serial numbers. This enables client-side management of report delivery and processing.

For more information, see Kaiku HTTPS Reports API Description (M213354EN) .

# 3.5 Data security

Data security mechanisms protect data from security threats and unauthorized access. DMU801 and Kaiku are secure by design and have a number of built-in security features. This helps to protect also other devices that are in the same network from unauthorized access and tampering of data.

The software tools, Kaiku Designer and Web UI, provide a safe and easy interface to the system.

Kaiku runs on embedded Linux operating system allowing various security features, which include, for example, secure communication protocols for data collection interfaces and secure boot to make sure that only software signed and published by Vaisala is run on the device. Regular firmware updates are provided to keep the components up-to-date on the operational device.

Table 8 Kaiku security features

| Feature | Description |
|---|---|
| **System integrity** | |
| Device identity | Ensures unique identity of each device when communicating with cloud, improving the security of data flow. |
| Secure boot | Only Vaisala-signed software can be installed, and the running image cannot be altered. Enables software copy protection. |
| Controlled software execution environment | Software verification and installation control to ensure predictable and secure software behavior. |
| **Secure interfaces** | |
| Secure network protocols | Provide secure data transfer over public networks. Prevent unauthorized access to other devices in the same network. |
| Secure communication interfaces | Communication using industry-standard encryption protocols. |
| Firewall | Preconfigured, dynamic firewall protection. |
| **Systematic user management** | |
| Device activation code | Unique code for each device. The user must enter code and create maintenance account to the device prior to accessing the Web UI.<br>No hardcoded passwords. |
| User roles | Provides access to authorized users only through access control. |
| Privacy protection | Secure authentication and storage for credentials. |
| Password limitations | Requirement for strong password. |
| **Software update capability** | |
| Secure software lifecycle | Continuous security improvements and patches. |
| Remote software update capability | Efficient update process, easy to keep devices up to date. |
| Verified update contents | Encrypted and signed firmware installation packages. |

The listed security features make the system secure, provided the user takes the following safety precautions:

- System setup and connection to network as instructed in user documentation
- Secure handling of passwords
- Use of strong passwords
- Distribution of credentials to a limited number of users

**More information**

‣ Configuring firewall rules (page 47)



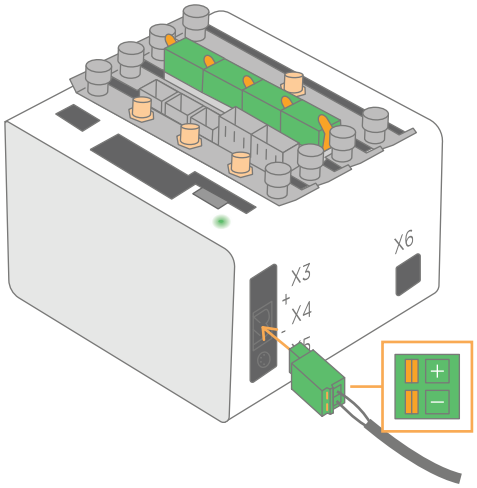
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# 4. Activating DMU801

## 4.1 Connecting power to DMU801

1. To power up, connect a power cable to the DMU801 connector **X4**.

   Connector **X6** is for sensor heating power.




2. Wait for DMU801 to power up. It can take up to 1 minute.

> Always connect the power supply before the USB-C cable, if both are connected. If you connect the USB-C cable first, the voltage supply for plug-in module **Vsupply** pins may remain off even after the power supply is connected.

> DMU801 can receive power through a mere USB connection, too, but with limited functionality.
> Do not use USB powering if you have DME801 or DMX801 plug-in modules included in your DMU801. Also, USB connection as the only power source does not power sensors connected through the plug-in modules (**Vsupply** pins).

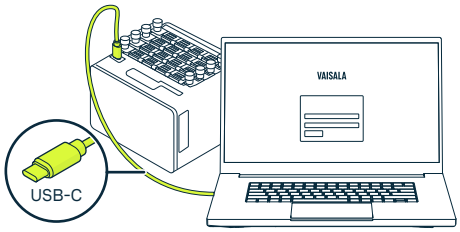
**More information**

- Powering (page 16)

# 4.2 Activating DMU801

1. Connect DMU801 to your computer with a USB-C cable.

   Use the USB-C cable provided by Vaisala. If you use your own cable, make sure that the cable is shielded.




2. Open a web browser and go to the Web UI address:

   *`https://192.168.10.2`*.

3. Web browsers do not trust a self-signed certificate. If you are logging in for the first time, the browser indicates that the connection is untrusted or insecure. Ignore the warning and continue to the site.

After activation, you can use the **Certificates** view in the Web UI to manage custom certificates and avoid future browser warnings.



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4. Type the device activation code in the **Activation code** field.

   The device activation code is delivered with DMU801. The code is unique for each DMU801. Check that the serial number in the device activation code sticker matches the serial number of your DMU801.




**NOTICE!** Store the device activation code in a safe place. You have to re-enter the code after a factory reset. If you forget or do not know the device activation code, contact Vaisala.

5. Select **Activate**.
6. After entering the correct device activation code, you are prompted to create an administrator user account. Create a username and password for the **Administrator** user, confirm the password, and select **Create**.

**NOTICE!** Store the username and password in a safe place. If you forget your username or password, you have to reset DMU801 to factory default settings.

   The **Administrator** user account is created, and the Web UI main view opens.

### More information

- Managing user accounts (page 49)

# 5. Creating and uploading application

## 5.1 Creating or editing application

The application is the source that tells DMU801 what to measure, log, calculate, and report.

If you need to edit the application, you can download the application from your DMU801, edit it with Kaiku Designer, and upload it back to DMU801.

With Kaiku Designer, you can also create applications from scratch or modify the possibly provided example application according to your needs.

For more information, see Kaiku Designer User Guide (M212407EN).

**More information**

- Uploading application to DMU801 through Web UI (page 33)

## 5.2 Installing Kaiku Designer



For using Kaiku Designer, you need a computer with Windows operating system.

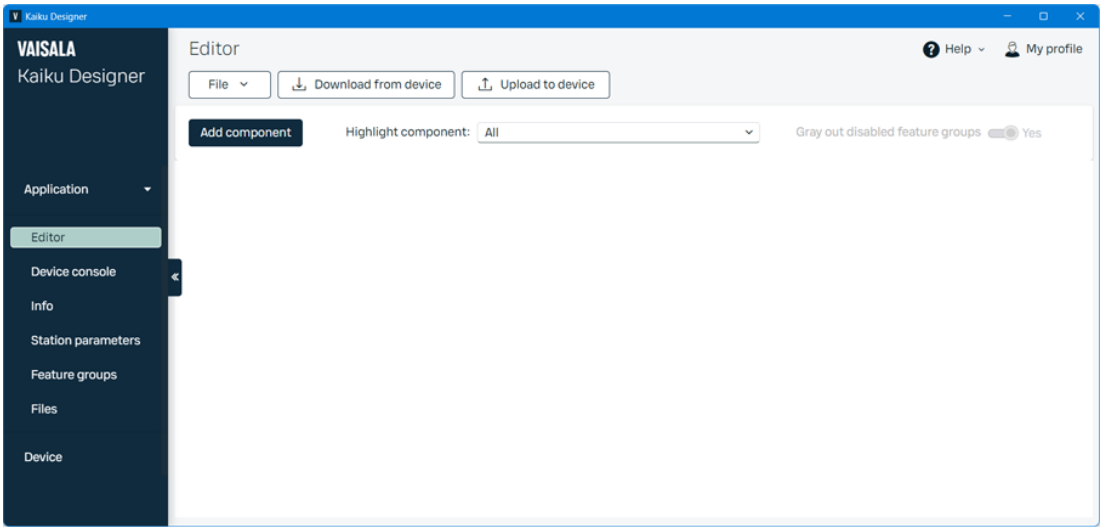
Vaisala recommends using the latest version of Kaiku Designer. You can download the latest version from Vaisala product documentation portal docs.vaisala.com.

1. Go to Vaisala Kaiku Designer or use the search, and download the installation file on your computer.
2. Extract the ZIP file.



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3. To open Kaiku Designer, double-click the *KaikuDesigner.exe* file.




For more information on Kaiku Designer, see Kaiku Designer User Guide (M212407EN).

**More information**

- Kaiku Designer (page 24)

## 5.3 Uploading application to DMU801 through Web UI

If you have ordered DMU801 with a ready-made application, the application is uploaded to DMU801 already at the factory.

When copying an application from one DMU801 to another, follow the backup and restore procedure in the Web UI **System > Operations** view. Station parameter values configured through the Web UI are device-specific and are not included in the application package.

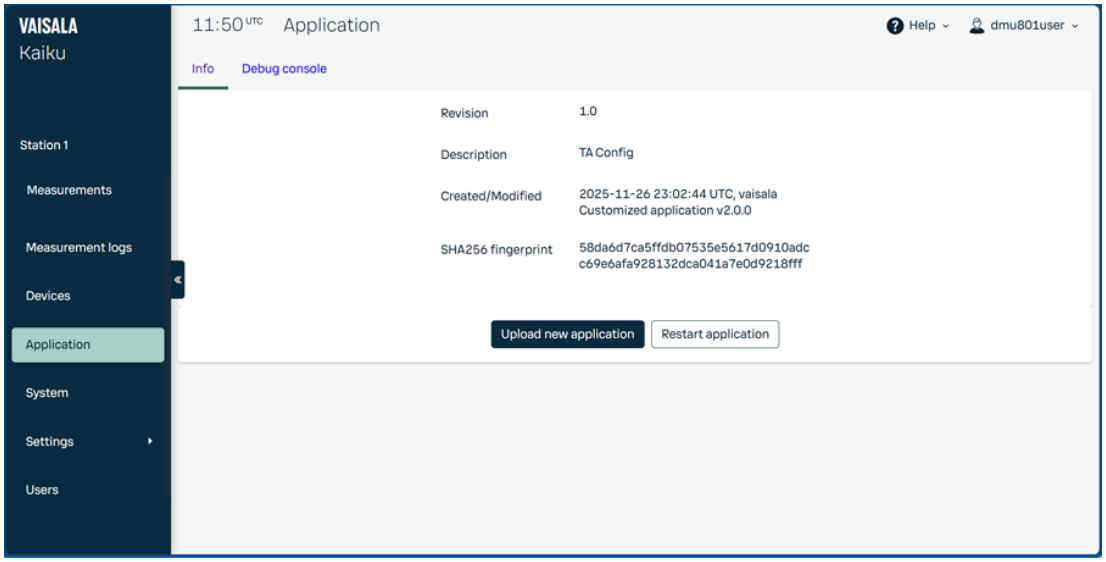
1. Log in to the Web UI as an **Administrator**.
2. Go to **Application > Info**.



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3. Select **Upload new application**, locate the application (*.zip*) in your computer, and open it to upload it to DMU801.

   There is no need to extract the ZIP file.




The application is automatically taken into use after uploading.

### More information

- Creating or editing application (page 32)

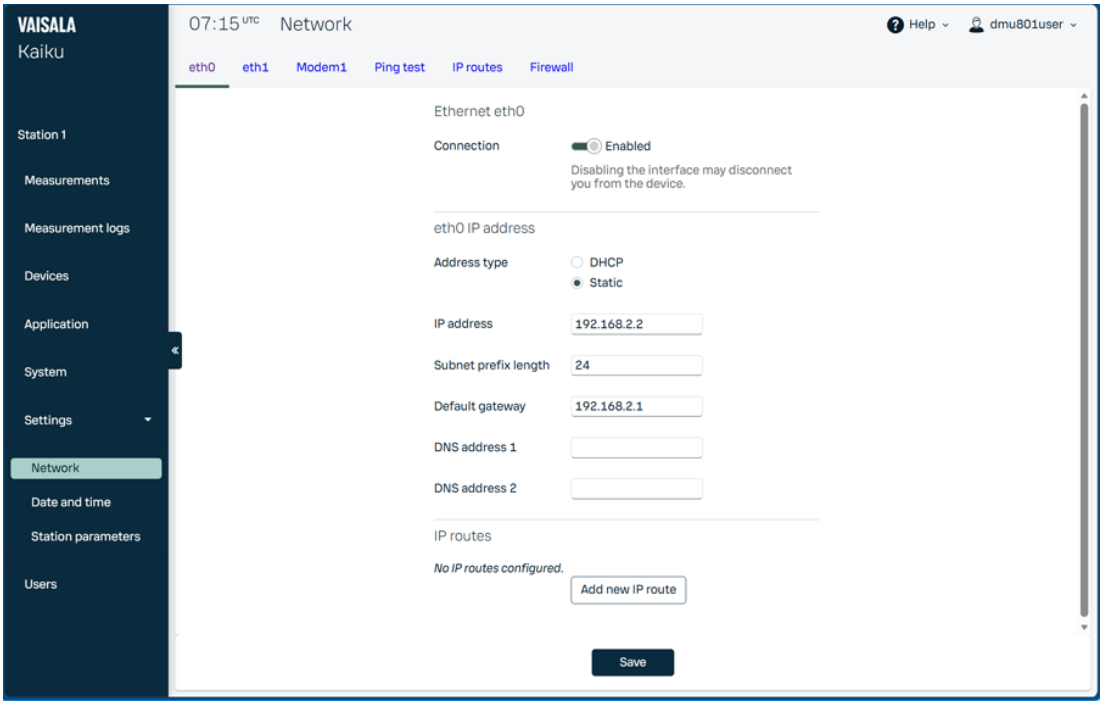
# 6. Configuring communication and time settings

## 6.1 Configuring Ethernet connection

Configure Ethernet connection to be able to connect to DMU801 over Ethernet.

Make sure that you are not connected to DMU801 through the same connection that you are configuring. For example, if you are configuring the **eth0** connection, make sure that you are connected to DMU801 through USB-C cable, **eth1**, or modem.

1. In the Web UI, go to **Settings > Network**.



2. In the **eth0** tab, set the following:

**Connection**
Select **Enabled**.

**Address type**
- Select **DHCP** if the network assigns network settings automatically, and refresh your web browser.
- Select **Static** to configure network settings manually.

If you selected **Static**, fill in the rest of the fields with information provided by your local network administrator.

**IP address**
Set a suitable IP address according to the used network (default = **192.168.2.2**).

**Subnet prefix length**
Give the number of network bits. For example:
- 255.255.255.0 = **24** (default)
- 255.255.255.224 = **27**

**Default gateway**
Default = **192.168.2.1**.

**DNS address 1**
IP address of the primary DNS server.

**DNS address 2**
IP address of the secondary DNS server.

3. If you want to set another IP route for the network interface, select **Add new IP route**, and set the following:

   **Destination network IP address**
   Destination network or device address.

   **Subnet prefix length**
   Number of network bits in **Destination network IP address**.

   **Gateway**
   Gateway address for connecting to the destination network or device.

   **Route metric**
   Route metric value according to which the routing decisions are made. If 2 or more active network interfaces that have routing entries with equal subnet length define access to the destination network, the one with the lower route metric value will be used.




4. To save the changes, select **Save**.

In the Web UI, the **eth1** tab is for configuring the Ethernet settings for Ethernet Switch Module DME801. If you have DME801 in your application, set the values in **eth1** similarly to **eth0**.

**More information**

- Ethernet Switch Module DME801 (page 22)
- IP routing (page 41)

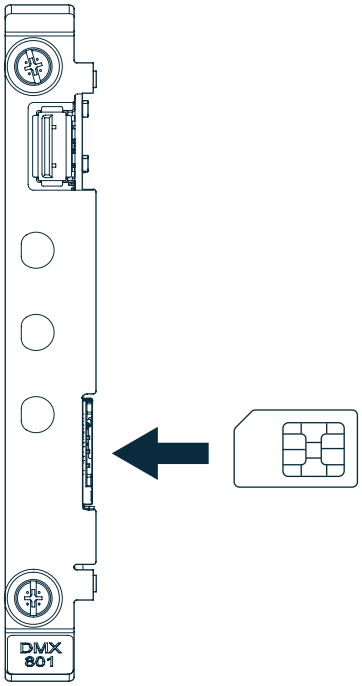
# 6.2 Preparing integrated modem module

Before setting up the cellular modem, obtain a SIM card.
The correct size for the card is Standard SIM (25 × 15 mm) (0.98 × 0.59 in).

To protect the SIM from unauthorized use, use a PIN code. To set a PIN code, insert the SIM card to a mobile phone and use the phone to set the PIN. Write it down in a safe place for future reference.

If you have a Modem Carrier Module DMX801 that contains an integrated modem module in your system, it may have the SIM card already in place. If the SIM card is not inserted, follow the steps below.

1. If DMU801 is inside a weather station enclosure, make sure that the weather station is powered off.
2. Hold your SIM card so that the cut-off corner points up and the golden contact area of the card is on the left side.
3. Insert the card in its slot in DMX801, pushing it all the way in.




**More information**

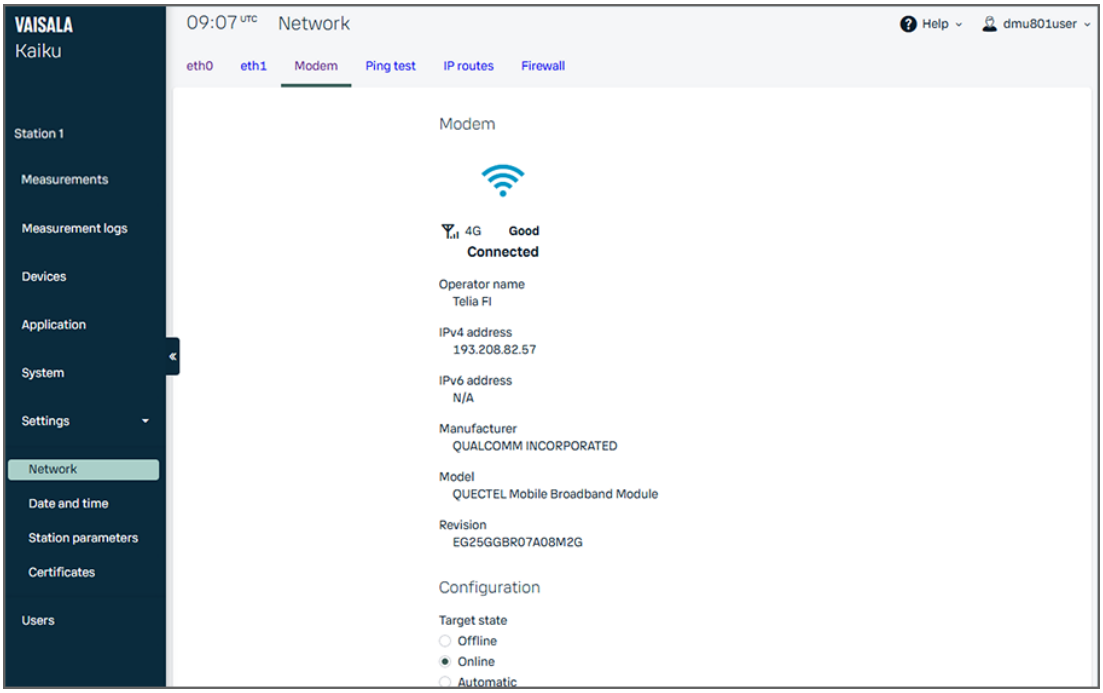
- Modem Carrier Module DMX801 (page 23)

# 6.3 Configuring cellular modem settings

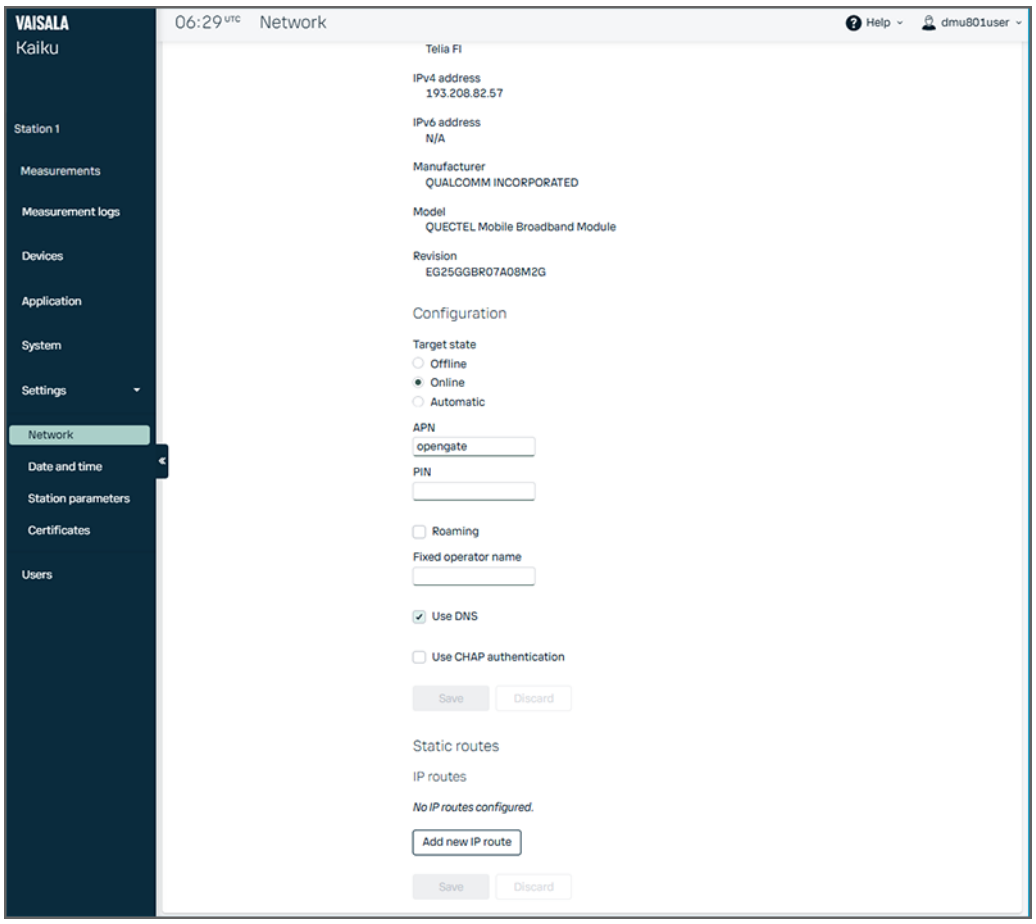
To be able to use a modem connection, you must have Modem Carrier Module DMX801 installed in DMU801. Before starting, make sure that the modem has a SIM card installed.

Configure modem settings to enable cellular connectivity for DMU801.

1. In the Web UI, go to **Settings > Network**.



2. In the **Modem** tab, set the following:




**Target state**

Select how the modem connection is controlled.

- **Offline**: The modem is always offline.
- **Online**: The modem is always online.
- **Automatic** (recommended): The modem is online by default. You can change the state with the **Connect** and **Disconnect** buttons. The **Automatic** state also enables automatic connection management by a Kaiku application, if the functionality is implemented in the application.

If you select the **Offline** state or the **Disconnect** button, you may not be able to restore the connection remotely.

**APN**

Type the Access Point Name (APN) as specified by your cellular network provider, for example `Internet`.

**PIN**

Type the PIN code of the SIM card.

**Roaming**

Check to enable data roaming.

**Fixed operator name**
Specify the network operator to connect to. Leave blank to let the modem choose the best available network automatically.

**Use DNS**
Use the DNS servers provided by your cellular network provider. When unchecked, DNS servers from the Ethernet connection are used instead.

**Use CHAP authentication**
Check to enable authentication of the modem connection using CHAP (Challenge-Handshake Authentication Protocol), if required by your network provider.

**CHAP username**
Type the CHAP username assigned to you by your network provider.

**CHAP password**
Type the CHAP password assigned to you by your network provider.

3. If you want to set another IP route for the network interface, select **Add new IP route**, and set the following:

   **Destination network IP address**
   Type the destination network or device address.

   **Subnet prefix length**
   Type the number of network bits in **Destination network IP address**.

   **Route metric**
   Type the route metric value according to which the routing decisions are made. If 2 or more active network interfaces that have routing entries with equal subnet length define access to the destination network, the one with the lower route metric value will be used.

4. To save the changes, select **Save**.

**More information**

- Modem Carrier Module DMX801 (page 23)
- IP routing (page 41)

# 6.4 IP routing

IP routing allows you to define the routing rules for outgoing IP packets based on the destination IP address. IP routing rules are primarily needed when DMU801 has to connect to multiple networks through more than one network interface. You can specify which network interface DMU801 uses to communicate to a certain network or device.

Set the IP routing rules for the DMU801 network interfaces in the Web UI. A network interface can have any number of IP routing rules, or none at all.

Add new IP routes in the settings of each network interface:

- **eth0** for Ethernet interface in DMU801
- **eth1** for Ethernet interface in DME801 Ethernet Switch Module

- **Modem** for modem in DMX801 Modem Carrier Module

> Changing the IP routes remotely may cause you to lose access to DMU801 over the used network.

To view the routing table, select **Settings > Network > IP routes**. The routing table is a summary of all configured rules, including the default ones.

**More information**

- Configuring Ethernet connection (page 35)
- Configuring cellular modem settings (page 38)

## 6.4.1 IP routing example

The following example shows how to configure DMU801 to use the Ethernet interface **eth0** for communicating to private subnet `172.24.84.0/24`.

Without the routing rule, DMU801 attempts to communicate to the network through the modem interface, which will fail.

> You can only add an IP route for an interface with a static IP address.

To create a new route:

1. In the Web UI, go to **Settings > Network**.
2. In **eth0**, select **Add new IP route**.

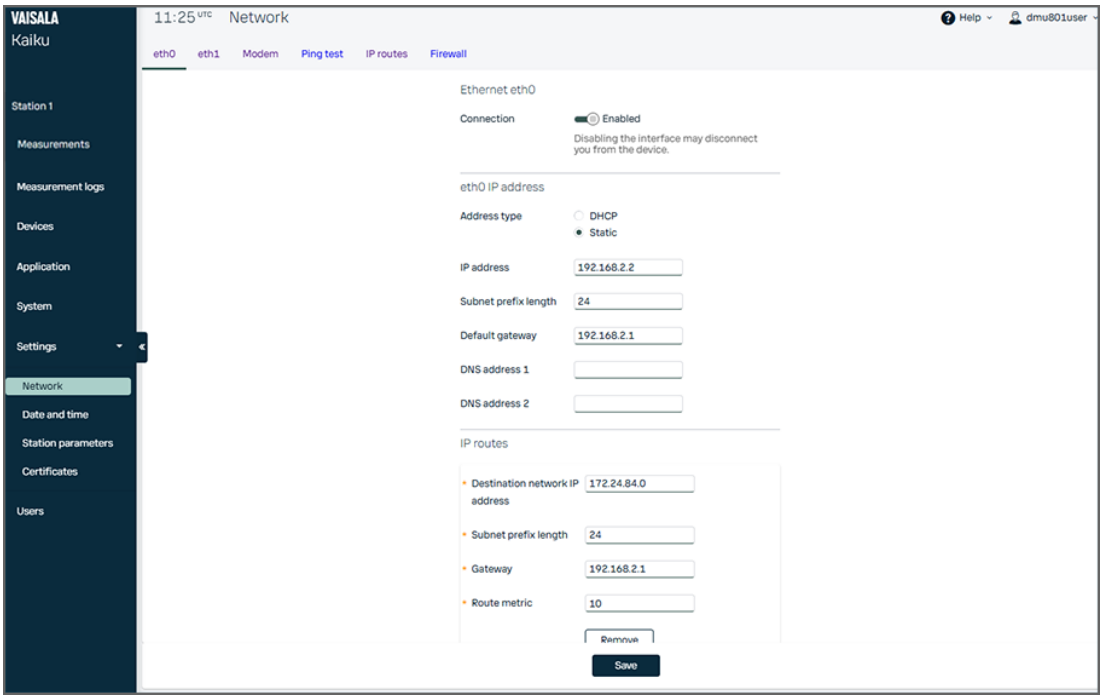
3. Set the following:

**Destination network IP address**
Destination network or device address.

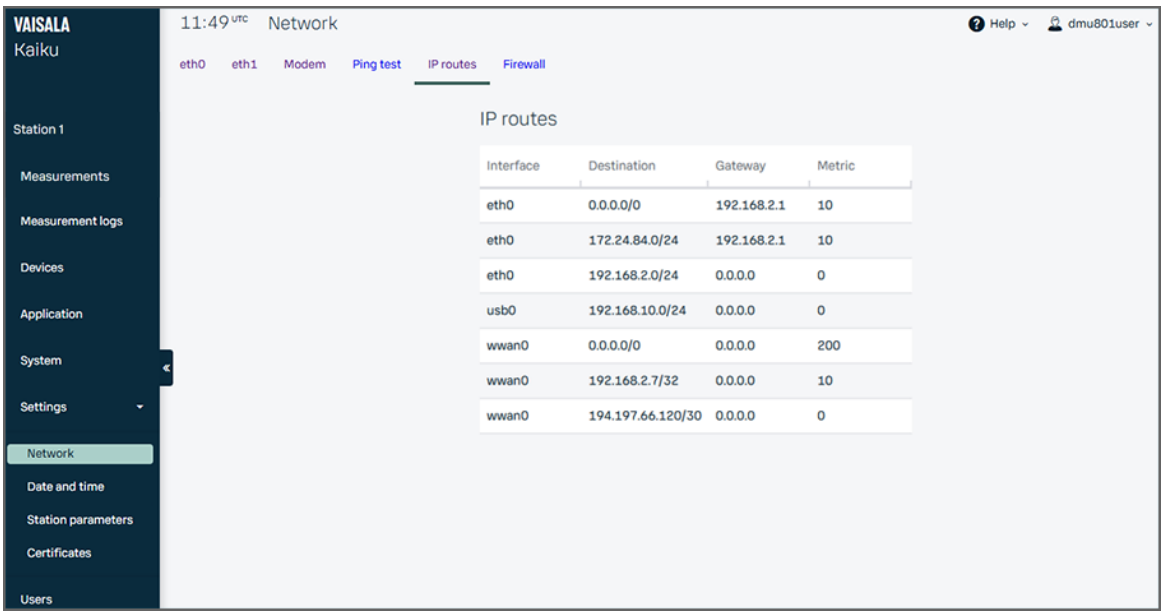
**Subnet prefix length**
Number of network bits in **Destination network IP address**.

**Gateway**
Gateway address for connecting to the destination network or device.

**Route metric**
Route metric value according to which the routing decisions are made. If 2 or more active network interfaces that have routing entries with equal subnet length define access to the destination network, the one with the lower route metric value will be used.



You can see a table of the created IP routing rules in **Settings > Network > IP routes**.




*1) In the table, wwan0 = modem.*

# 6.5 Verifying network connection

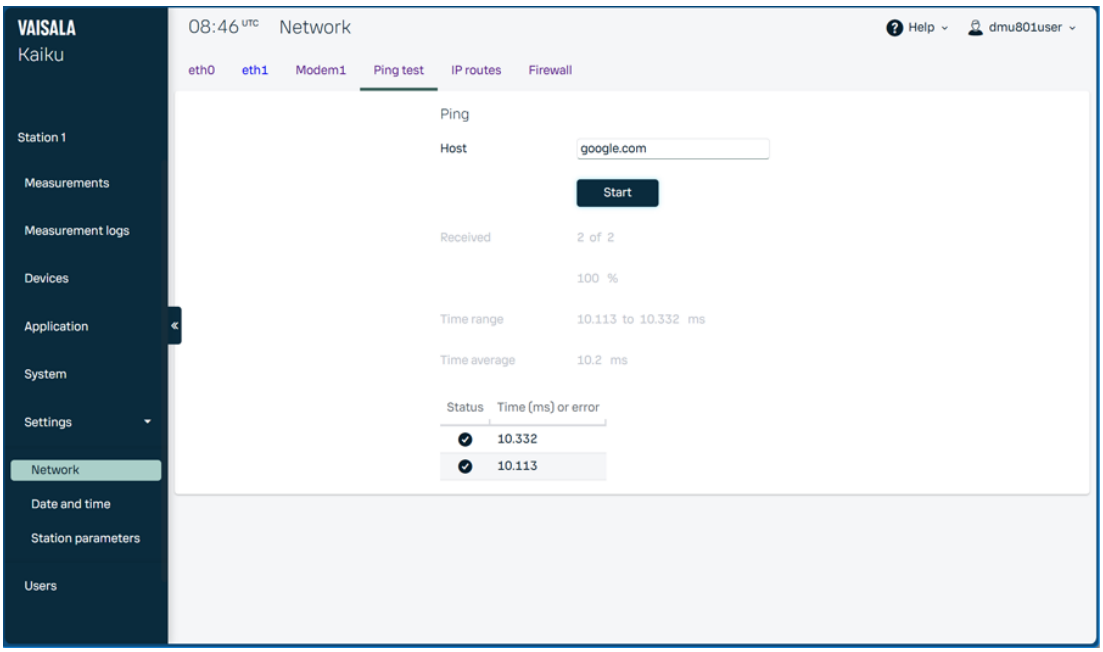
You can check the network connection and speed in the Web UI.

1. In the Web UI, go to **Settings > Network > Ping test**.



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2. In **Host**, write any web address or IP address, and select **Start**.




   The ping results are shown.

3. To stop pinging the connection, select **Stop**.

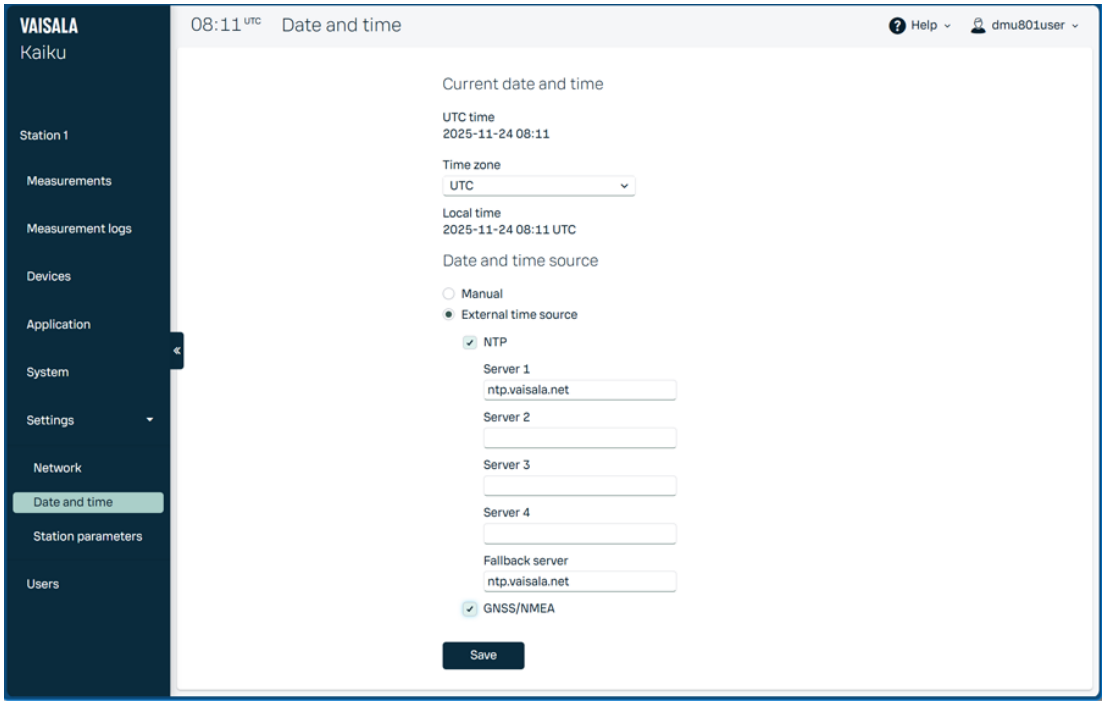
# 6.6 Setting time

Network Time Protocol (NTP) is used to set system clocks accurately to the current time. NTP makes sure that all observations have the correct timestamp.

You can also use GNSS (Global Navigation Satellite System) signals for time synchronization. To be able to use GNSS signals, you must have an external GNSS device in your system and an application that includes a GNSS device component.

Vaisala recommends using both NTP (if the system is connected to the Internet) and GNSS signals (if you have an external GNSS device in the system), when possible. If Internet connectivity is not available and you have no GNSS device, you can set the system time manually.

1. In the Web UI, go to **Settings > Date and time**.




2. In **Time zone**, select your local time zone or UTC time.

   If you select the local time zone, the system calculates the UTC time from the time zone information.
   The time zone setting does not affect observation data, which is always recorded and stored in UTC time. However, certain wall-clock-based events, such as precipitation sum reset, can optionally use local time.

3. In **Date and time source**, select one of the following:

   - **Manual** (if the system is not connected to the Internet)
     Set the local date and time.
   - **External time source** (if the system is connected to the Internet or you have a GNSS device in your system)

4. If you selected **External time source**, select one or both of the following options:

   - **NTP** (if the system is connected to the Internet)
     Type the address of the NTP servers that you want to use.
   - **GNSS/NMEA** (if you want to use GNSS signals for time synchronization)

5. To save the changes, select **Save**.

You are logged out of the Web UI. Logout does not happen if you select **NTP** and the resulting time does not differ considerably from the current system time.

For more information, see DMU801 Time Synchronization Management Guide (M213266EN).



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# 6.7 Configuring firewall rules

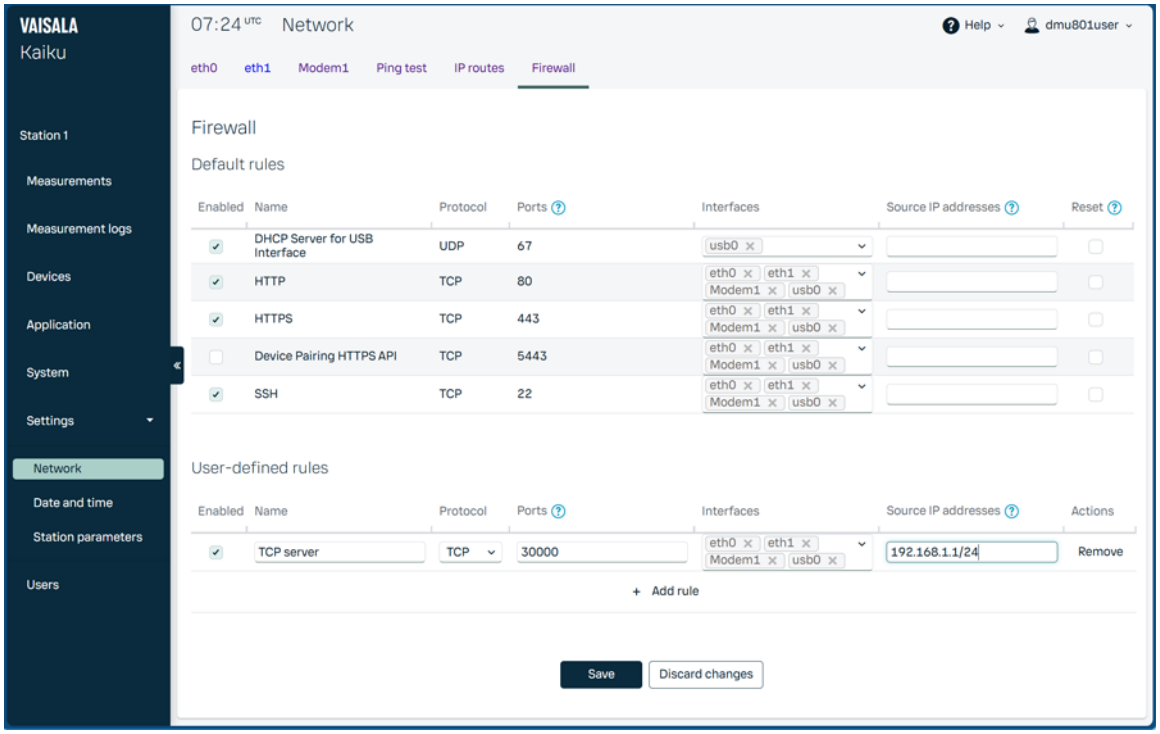
Kaiku has a dynamic firewall that allows incoming traffic only to specified ports, and optionally from selected remote IP addresses. Default firewall rules define the allowed ports for incoming connections. You can edit the default rules and also configure the ports and source IP addresses by setting your own rules.

You can:

- Open or close ports in the firewall for services running in the system
- Restrict network interfaces through which the services can be accessed
- Restrict IP subnets/hosts through which the services can be accessed

To access the Web UI, you must have HTTPS enabled in the default rules.

Traffic through HTTP is redirected to the HTTPS port.




1. In the Web UI, go to **Settings > Network > Firewall**.

   **Default rules** show the default set of rules configured for the device.

2. To add your own firewall rule under **User-defined rules**, select **Add rule** and set the following:

   **Enabled**
   Enable or disable the rule.

   **Name**
   Give a name for the rule.

   **Protocol**
   Select the protocol.

   **Ports**
   Type the ports to which access is allowed when this rule is enabled.

   **Interfaces**
   Select the network interfaces through which traffic is allowed when this rule is enabled.

   **Source IP addresses**
   Type the IP addresses from which connection is allowed when this rule is enabled. If left empty, any source IP address is allowed.

3. To save the changes, select **Save**.



For default rules, you can edit all other parameters except **Name**, **Protocol**, and **Ports**. If you have edited a default rule and want to revert to the original default values, select **Reset** and **Save**.

# 7. Managing user accounts

## 7.1 Managing user accounts

To be able to use the Web UI and Kaiku Designer, you need a user account. User accounts are managed in the Web UI.

Only users with the **Administrator** role can add, edit, or delete user accounts.

An administrator account is created in the initial login, after DMU801 has been activated with the device activation code. There can be several **Administrator** users.

**More information**

- Activating DMU801 (page 30)
- User roles (page 49)
- Adding new user accounts (page 50)
- Editing user accounts (page 52)
- Changing administrator password (page 52)

## 7.2 User roles

User management is handled through user roles with different levels of access rights.

**NOTICE!** For security reasons, passwords cannot be retrieved from the system. If you forget your username or password, you have to reset DMU801 to factory default settings.

Table 9 User roles and access rights

| User role | Purpose |
|---|---|
| **Administrator** | • View observations, metadata, system status, and settings<br>• Modify station and network settings<br>• Perform maintenance tasks<br>• Manage users<br>• Manage certificates<br>• Update firmware and application<br>• Back up and restore application |
| **Operator** | • View observations, metadata, system status, and settings<br>• Modify station and network settings<br>• Perform maintenance tasks<br>• Back up application |
| **Viewer** | • View observations, metadata, system status, and settings |

| User role | Purpose |
| --- | --- |
| **API access** | Machine-to-machine account for device management functions [1)] |

1) *For the available functions, see Kaiku Device Management API Description (M213154EN).*

## 7.3 Adding new user accounts

1. Log in to the Web UI as an **Administrator**, and select **Users**.

2. Select **Add new user**, and set the following:

**Username**

Username for the user.

The acceptable characters are:

- Small letters a–z
- Capital letters A–Z
- Numbers 0–9
- Unicode characters 0x00A1-0xFFFF
- Following characters:
  - @ (at symbol)
  - = (equal sign)
  - . (period)
  - , (comma)
  - + (plus sign)
  - – (minus sign)
  - _ (underscore character)

**First name**

First name of the user (optional).

**Last name**

Last name of the user (optional).

**Role**

The role of the user.

**New password**

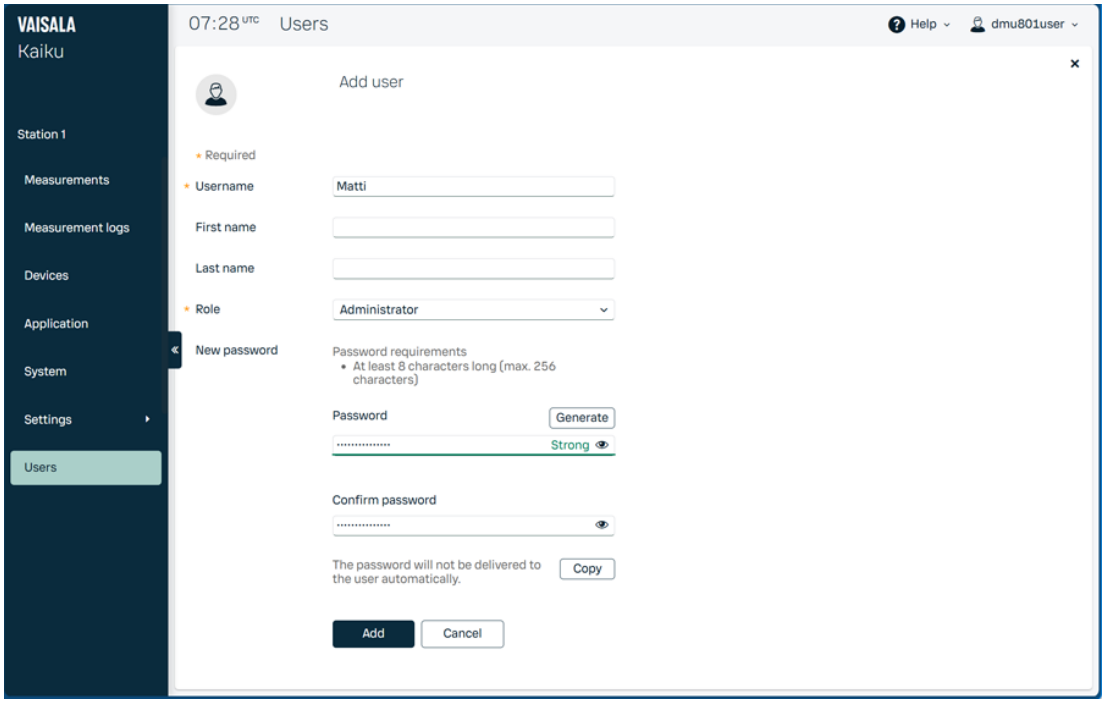
The user's password.

To use an automatically generated password, select **Generate password**.

**Confirm password**

Confirm the password.

To copy the password and send it to the user, select **Copy**.




3. To add the user account, select **Add**.

## 7.4 Editing user accounts

1. Log in to the Web UI as an **Administrator**, and select **Users**.
2. From the list of usernames, select the user you want to edit.
3. Make the changes.

If you delete your account and no other accounts exist, you need to activate DMU801 with the device activation code before you can access the Web UI again.

If you are an **Administrator** user, you can change your own password also in your own user view on the top right corner of the Web UI.

4. To save the changes, select **Save**.

## 7.5 Changing administrator password

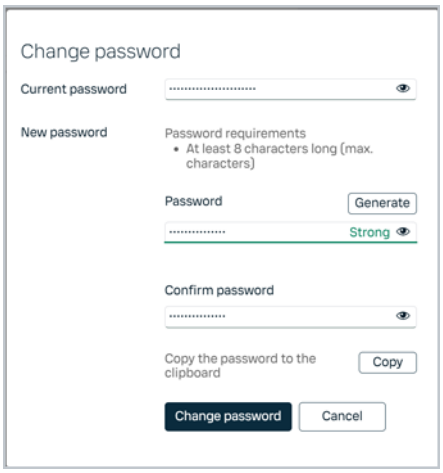
If you are an **Administrator** user, you can change your own password by selecting your username on the top right corner of the Web UI.



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1. In the Web UI, select your username and **Change password**.
2. Type your password in the **Current password** field.
3. Type the new password in the **New password** field.

   You can see an indication of the password strength as you type.




4. Confirm the password.
5. To save the changes, select **Change password**.

# 8. Managing station parameters

## 8.1 Station parameters

Station parameters are application-specific parameters that identify the application and control many different options. The station parameters include, for example:

- Site information, such as name and location
- Sensor connection settings, such as port
- Installation-specific parameters, such as surface type
- Data reporting connection settings
- Parameters for calculation algorithms

Station parameters and their default values are defined in the application. You can edit the application with Kaiku Designer. Once the application is uploaded to DMU801, you can view the station parameters in the Web UI and edit the values for individual stations as needed.

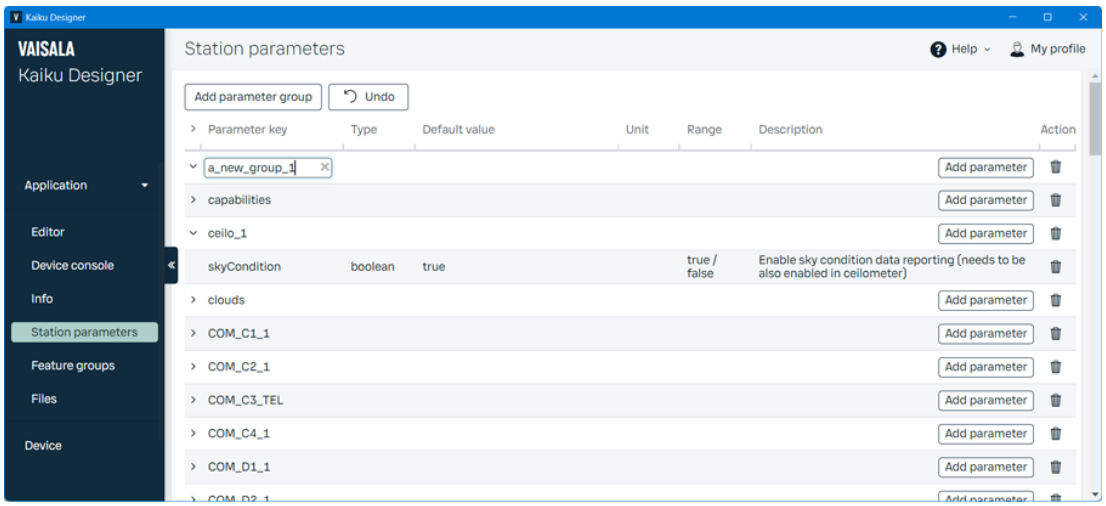
## 8.2 Creating station parameters

When you add a new component in the application, the related station parameters are typically created automatically for that component.

In addition, you can create application-specific station parameters with Kaiku Designer.

To create a new station parameter:

1. In Kaiku Designer, go to **Station parameters**.




2. Decide the parameter group to which you want to add a new station parameter. If there is no suitable group available, create a new group by selecting the **Add parameter group** button.

3. Under the correct parameter group, select **Add parameter**.
4. Set the following values. Each field becomes editable when you hover your mouse over the field and select it.

**Parameter key**
Type the name of the parameter. The parameter key will consist of the parameter group name and the parameter name. For example, the parameter key for parameter `altitude` is `site.altitude` (belongs to parameter group `site`).

**Type**
Select the parameter type (**boolean**, **number**, **string**, **password**). The type determines how the parameter is used.



If you select **password** as the parameter type, the value is encrypted and shown with asterisk characters (*) in the Web UI. In addition, you cannot set a default value for the parameter but you must always give the value in the Web UI.

**Default value**
Give a default value for the parameter.

**Unit**
If the parameter is numeric, select a measure unit for it.

**Range**
For number, string, or password type of parameter, define one of the following (a new window opens when you select **Range**):
- Minimum and maximum value
- Alternatives (not available for **password** )

For boolean type of parameters, the range is always **true/false**.

**Description**
Give a short description for the parameter.

## 8.3 Editing station parameters in Web UI

You can edit the values of station parameters in the Web UI.



Do not edit the values of station parameters in the **capabilities** and **development** parameter groups, unless specifically instructed. They are set correctly at the factory.

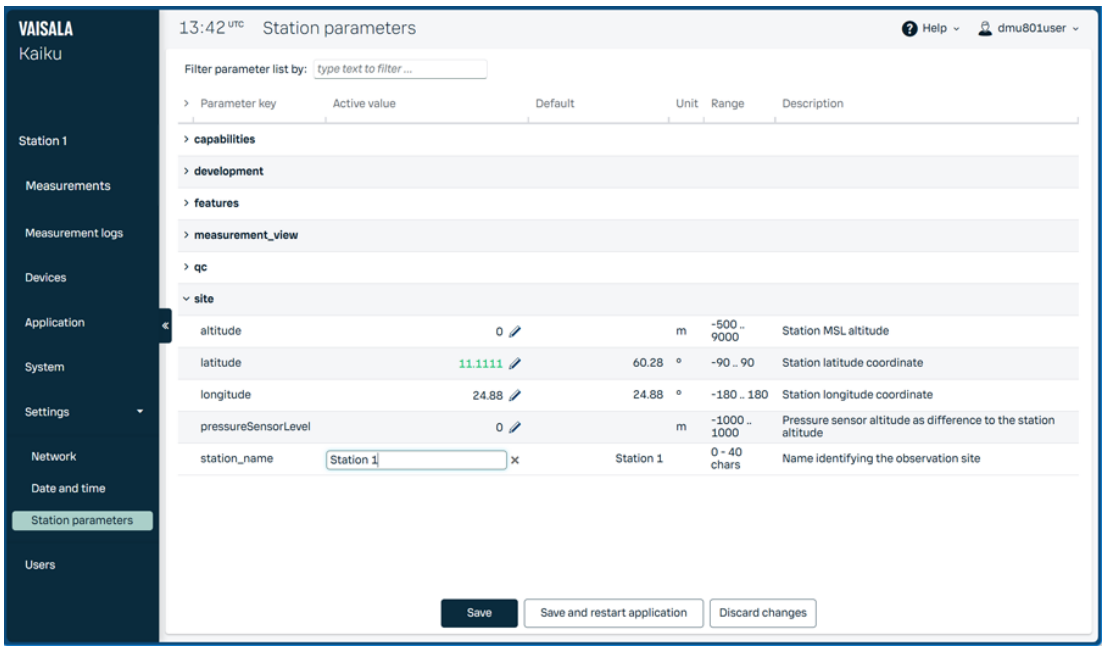
1. In the Web UI, go to **Settings > Station parameters**.

   The **Station parameters** view shows a list of all parameters and their values. The parameters are organized in groups according to their intended use.

   The **Range** column shows:
   - The allowed minimum and maximum number of characters for textual parameters
   - The allowed minimum and maximum values for numerical parameters

2. To find the parameter you want to edit, use the filter function and type search text in the **Filter parameter list by** field.
3. Locate the parameter you want to edit on the list, and select the pen icon next to the **Active value** field.

   The field becomes editable.




4. Type the new value in the field and select **Save** or **Save and restart application**.

   How the changes are applied depends on the application. When in doubt, select **Save and restart application**.

To restore the default value of a parameter, select the pen icon and then the cross icon next to the parameter.

# 9. Managing certificates

## 9.1 Certification management

In the **Certificates** view you can configure endpoint (local) TLS certificates that DMU801 uses. TLS certificates allow computers to trust each other through certificate-based authentication. When configured correctly, certificate-based authentication protects against man-in-the-middle type of attacks.

With a properly configured certificate, a web browser can make a secure connection to DMU801, without any warnings about untrusted certificates. For this to work, the endpoint certificates (like the one used by DMU801's web server) must be signed by a certificate authority (CA) that the browser trusts. The CA can be either a well-known public CA or an internal CA managed by your own organization. If you use an internal CA, you need to configure the browser (or other such tools) to trust the internal CA.

## 9.2 Assigning web server certificate

For a secure and trusted connection between a web browser and DMU801, assign a signed certificate to the web server.

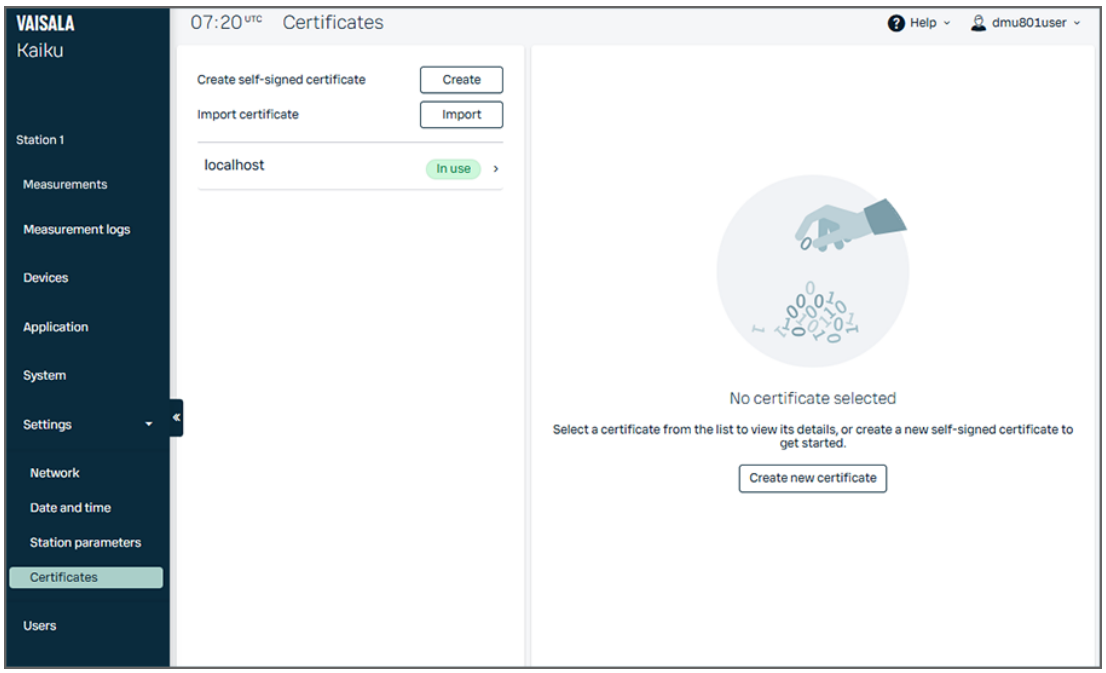
Perform the following procedures in the order presented:

1. Creating self-signed certificate (page 57)
2. Generating CSR (Certificate Signing Request) (page 59)
3. Importing signed certificate (page 60)
4. Assigning certificate to service (page 60)

### 9.2.1 Creating self-signed certificate

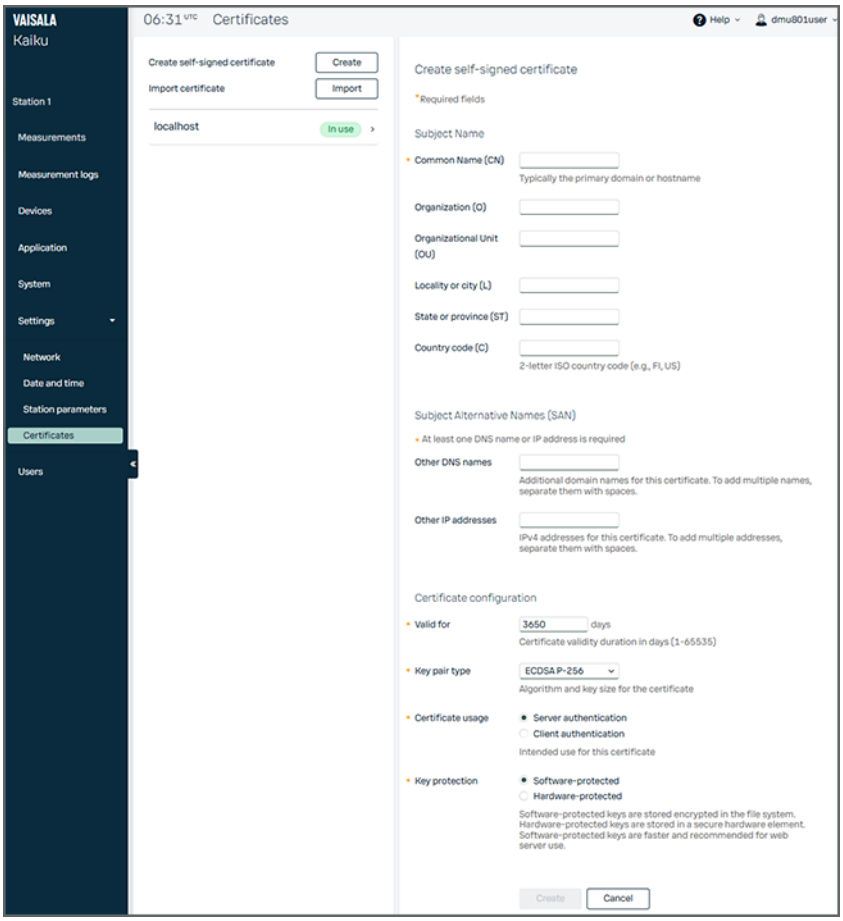
1. Log in to the Web UI as an **Administrator**.

2. Go to **Settings > Certificates**, and select **Create**.



3. Under **Subject Name**, set the following:

   **Common Name (CN)**
   Type the hostname or device name that identifies what the certificate is for.




4. For other fields under **Subject Name**, set the optional metadata.
5. Under **Subject Alternative Names (SAN)**, in **Other DNS names** or **Other IP addresses**, type all DNS names or IP addresses that can be used to access DMU801.
6. Under **Certificate configuration**, use the default values for other fields, and set the following:

   **Valid for**
   Type the number of days for which the certificate is valid, according to your organization policy.

7. Select **Create**.

   The certificate is created and appears on the list of certificates.

## 9.2.2 Generating CSR (Certificate Signing Request)

Generate a CSR (Certificate Signing Request) and send it to a certificate authority.

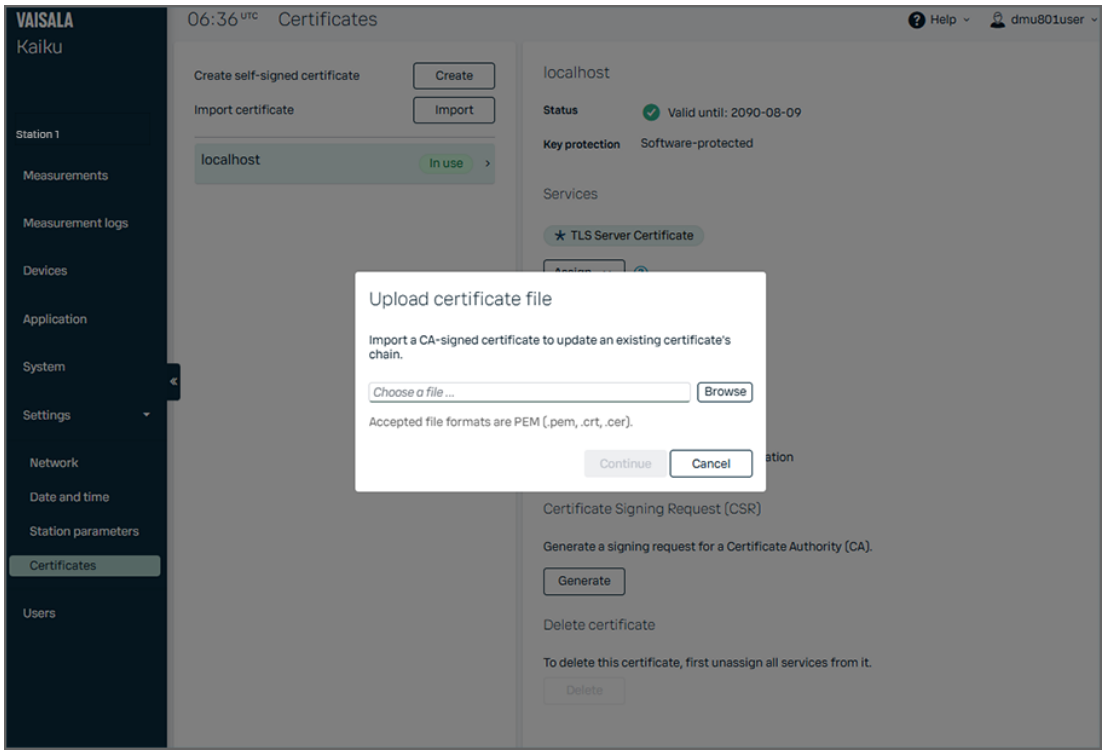
1. In the **Certificates** view, select the certificate.
2. Under **Certificate Signing Request (CSR)**, select **Generate**.
3. Copy the CSR and send it to a certificate authority (CA) to be signed.

> If you use an internal CA managed by your organization, you may need to configure the browser (or other such tools) to trust the internal CA.

## 9.2.3 Importing signed certificate

When you have received the signed certificate from the certificate authority, import it to the system.

1. In the **Certificates** view, select **Import**.
2. Browse to the folder where the certificate file is stored and select the certificate file.




3. Select **Continue** and **Update**.

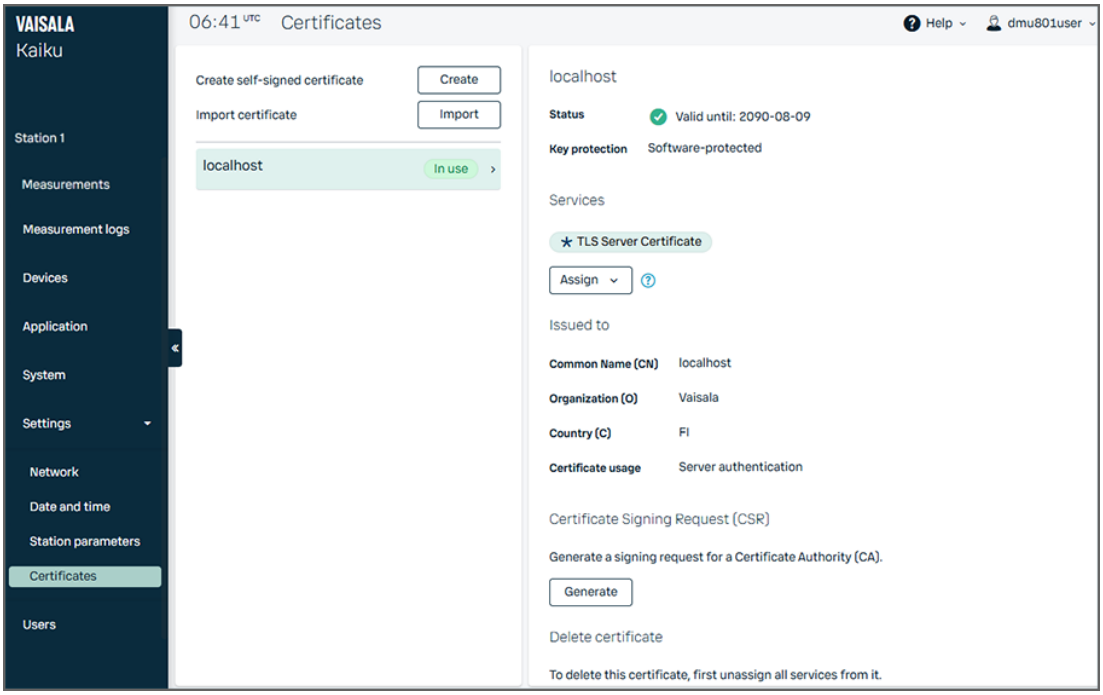
   The signed certificate is imported to the system.

## 9.2.4 Assigning certificate to service

1. In the **Certificates** view, select the certificate.

2. From the **Assign** drop-down menu under **Services**, select the service you want to assign the certificate to. For the web server, select **TLS Server Certificate**.

   The service appears as a tag under **Services** in the certificate details. On the list of certificates, the certificate is marked as **In use**.




3. To take the changes into use, restart DMU801 in **System > Restart**.

When authorized users access the Web UI, web browsers no longer warn about an untrusted site.

# 10. Installation

## 10.1 Mounting DMU801 into enclosure

In weather stations, DMU801 is located inside an enclosure, mounted on a DIN rail. DMU801 is typically preinstalled inside the enclosure at the factory. You can also install DMU801 into the enclosure on site.

The correct DIN rail type for DMU801 mounting is IEC/EN 60715 (35 mm).

**NOTICE!** In outdoor installations, always mount DMU801 inside a weatherproof enclosure.

Reserve some extra space around DMU801 for connectors and cables. For example, sensor connectors require a minimum of 20 mm (0.8 in) additional space from the DMU801 frame.

1. Disconnect power from the station.

2. Insert DMU801 onto the DIN rail inside the enclosure and snap it into place.

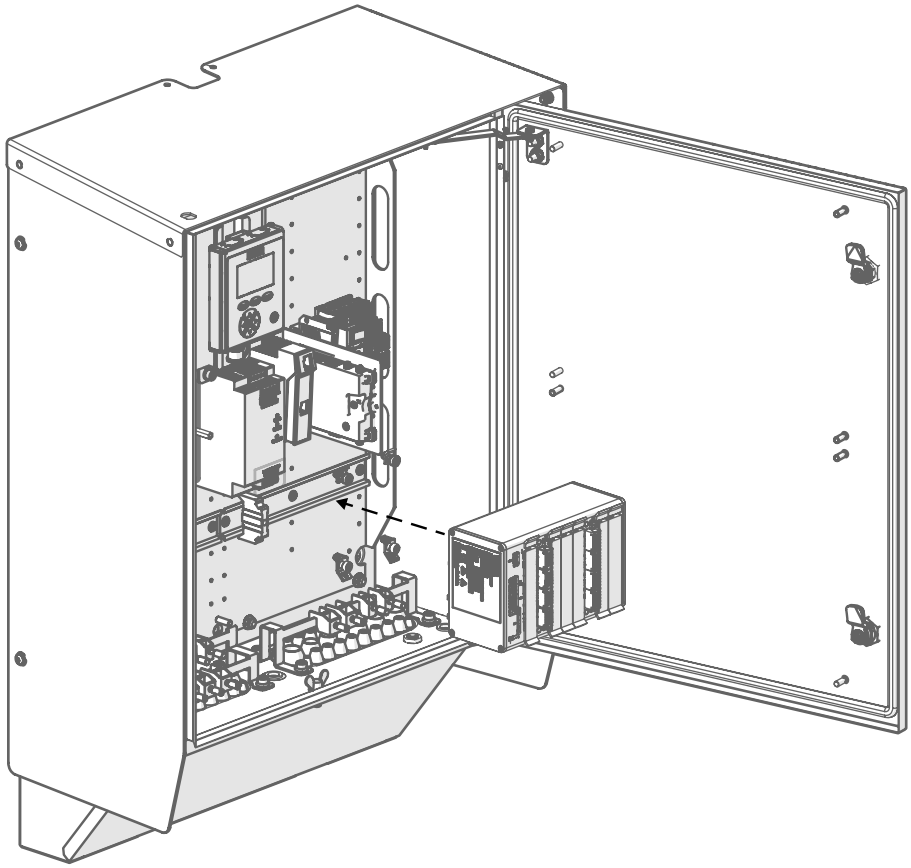


Figure 7 Mounting DMU801 into Vaisala AWS810 enclosure

**More information**

- Replacing DMU801 (page 90)

# 10.2 Grounding DMU801

Inside a weather station enclosure, DMU801 is grounded to the enclosure DIN rail. In addition, it has a separate grounding point at the bottom for extra grounding. Vaisala highly recommends using extra grounding, especially in areas with high risk of thunderstorm or lightning activity.

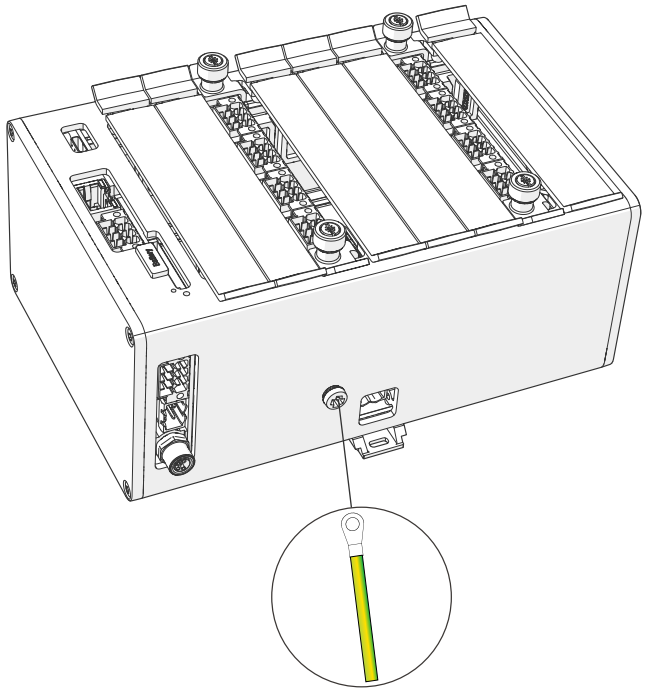
- Crosshead screwdriver
- 10-mm socket wrench

You need a separate grounding cable to ground DMU801 from the grounding point (the cable is not included in the DMU801 delivery).

Vaisala recommends using a grounding cable with the following specifications:

- Conductor cross-sectional area: 6 $mm^2$
- As short as possible

1. Connect the grounding cable to the DMU801 grounding point.



2. Attach the other end of the cable to a suitable grounded location, such as the enclosure frame.
3. To ensure good grounding contact, make sure that the connections are tight.

## 10.3 Cutting sensor cables

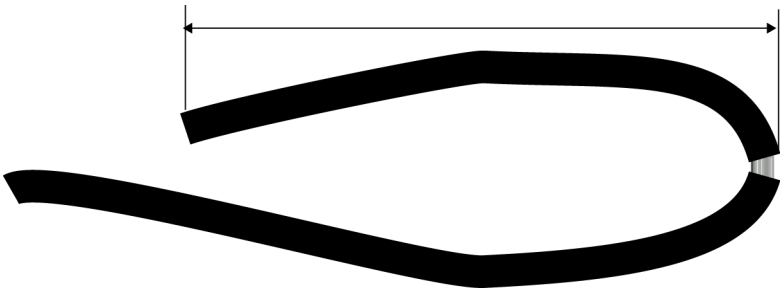
- Cable strippers
- Cable cutters

**WARNING! Electricity hazard**
Handling energized wires can cause electric shock. Prepare or connect only de-energized wires.

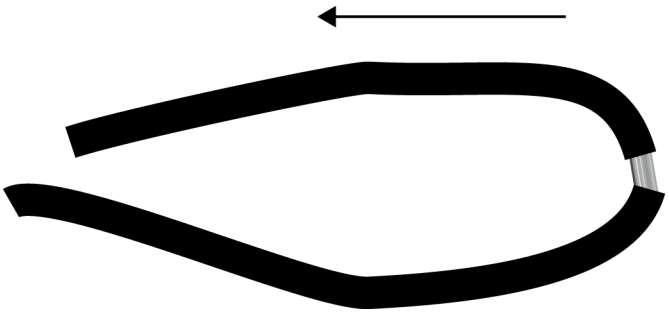
Prepare the cables one at a time.

1. Take a cut cable into one hand and bend it. The correct bending distance from the cable end depends on the dimensions of the weather station enclosure where DMU801 is installed in.
2. Cut the cable jacket carefully at the top point.

   To reach the cut around the cable, release, rotate, and bend the cable a few times.

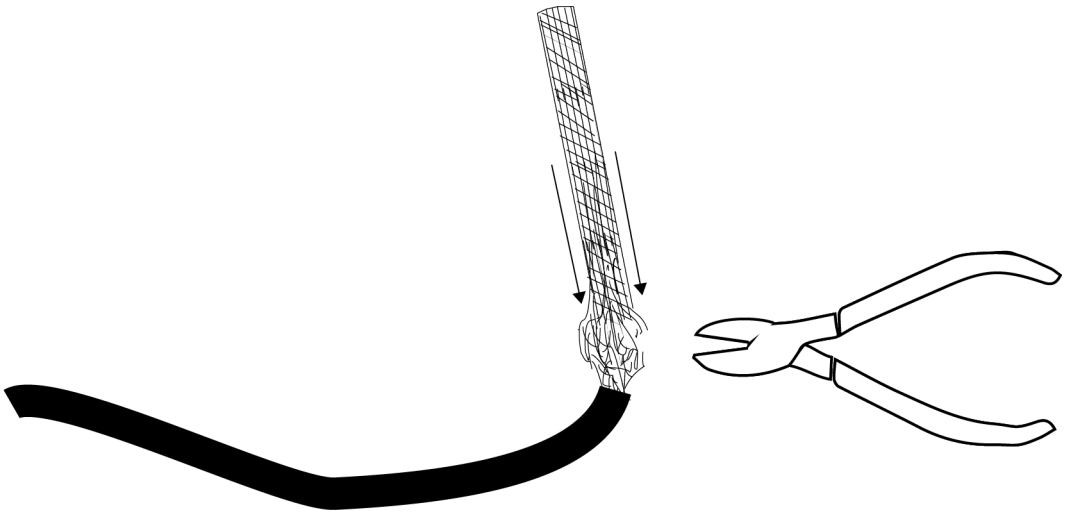


3. Take a firm hold of the cable jacket and slide the cut part along the braided cable shield to remove it.



If removing the cable jacket proves to be difficult, cut it into shorter bits.

4. Shorten the exposed braided cable shield.
   a. To detach the shield from the wiring, push the exposed cable shield towards the remaining cable jacket.
   b. Cut the shield carefully leaving approximately 2.5 cm (1 in) of the shield visible.
   c. Pull off the cut part.



5. Fold the shield back over the cable jacket, and wrap metal foil tape with conductive adhesive around it.



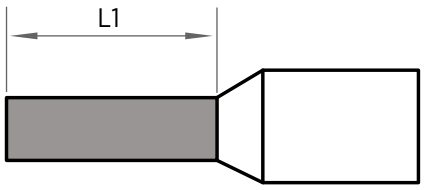
## 10.4 Adding wire-end ferrules

- Cable strippers
- Crimping tool

**WARNING! Electricity hazard**
Handling energized wires can cause electric shock. Prepare or connect only de-energized wires.

Use the ferrules that are included in the delivery, or, if you use other ferrules, note the following:

- Select ferrules that are suitable for the wires. For example, ferrules with cross-section 0.5 $mm^2$ go with wire size 0.5 $mm^2$ and smaller.
- For 0.5 $mm^2$ and 0.75 $mm^2$ ferrules, select 10 mm contact length (L1).
- For ferrules < 0.5 $mm^2$, you can use 8 mm or 10 mm contact length (L1) versions.



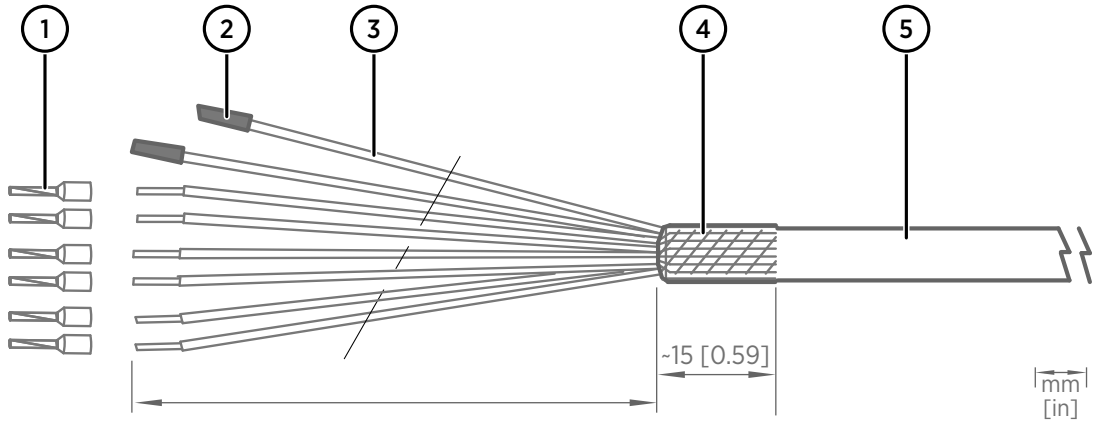

The correct contact length is important so that the wire stays firmly in the connector.

1. Strip the wires that are going to be connected.

   Strip a piece that is 1–2 mm (0.04–0.08 in) longer than the ferrule L1.
   For details on the wiring, see:
   - Wiring diagrams
   - Pin reference cards (provided with document DMU801 Plug-in Modules Installation Quick Guide (M212430EN))

2. Crimp the ferrules to the wires.

Use a professional crimping tool and press hard enough to make sure that the ferrule holds fast.




1 Ferrule (10 mm / 0.39 in)
Ferrule
2 Unused wires covered with a shrinkable tube or electrical tape
3 Cut the wires (the correct length depends on the installation setup)
4 Cable shield folded over cable jacket
5 Cable

3. Cut unused wires to different lengths and tie them together with electrical tape.

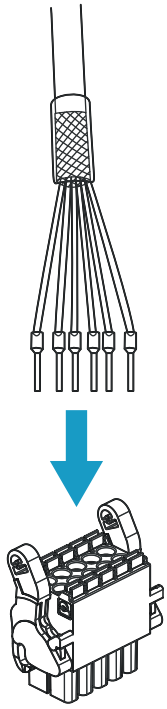
**NOTICE!** If exposed wires come in contact with the shield, ground, or each other, they can interfere with signals from other sensors on the same line. Cut unused wires to different lengths and insulate them with electrical tape. Avoid cutting the wires too short.

## 10.5 Connecting sensor wires

- Pliers

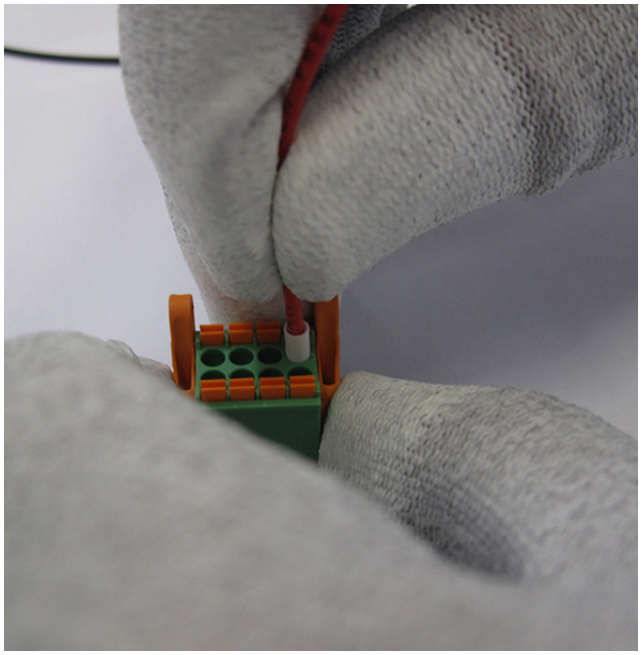
**WARNING! Electricity hazard**
Handling energized wires can cause electric shock. Prepare or connect only de-energized wires.

**NOTICE!** Incorrect wiring can cause damage and prevent or limit operation. Do not damage or change the wiring.

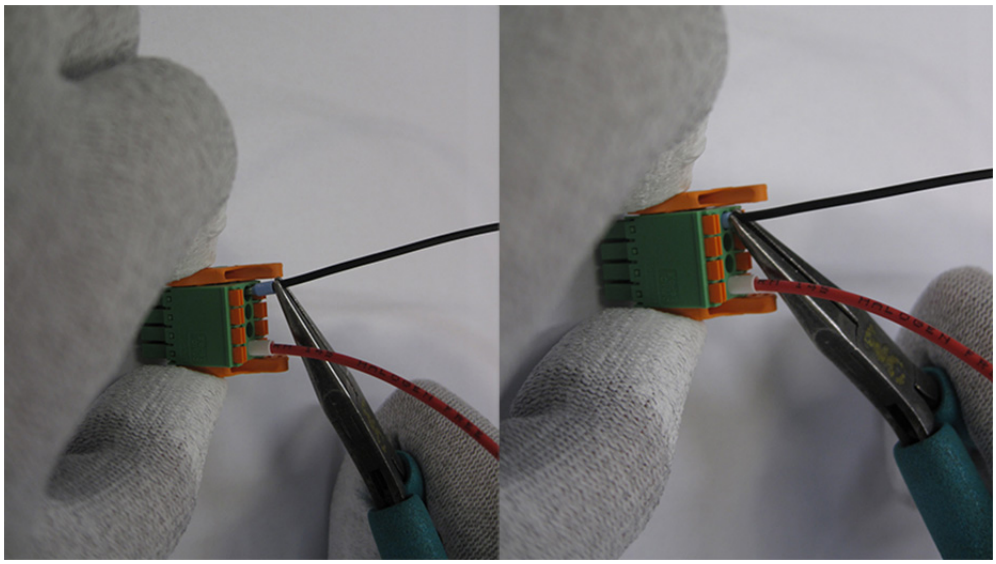


For details on the wiring, see the wiring diagrams. You can also use the pin reference cards (provided with document DMU801 Plug-in Modules Installation Quick Guide (M212430EN)) to check the correct pins.

1. Push the ferruled wires to the correct pins in the connector.



With smaller wires (< 0.5 $mm^2$), use pliers.

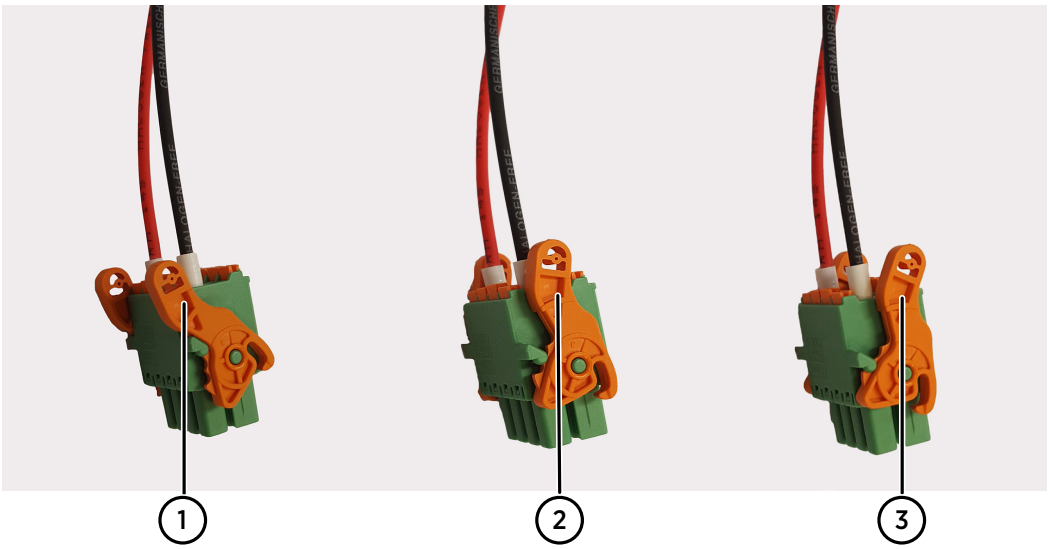


## 10.6 Connecting sensor cables

- Flat head screwdriver (optional)

**NOTICE!** Too much strain on the connector may cause the cable to fall off, damage the cable or connector, or make the cable or connector susceptible to water leakage. Connect the cable properly.

1. Turn the 2 orange lock levers of the connector to the open or middle position.




1 Open
2 Middle
3 Locked

2. Insert the connector in the correct port in the DMU801 plug-in module.

3. Push the connector to the bottom of the port.

**NOTICE!** Make sure that the lock levers are in the open or middle position. Pushing the connector in place with the lock levers in locked position damages the lock levers.



4. Verify that both lock levers have turned to the locked position, or turn them manually.

> Do not use force. If the lock levers do not turn to the locked position easily, it means that the connector is not properly in place.



## 10.6.1 Surge protection for sensor interfaces

Analog and serial plug-in modules (DMA and DMS) have internal surge protection (up to 3 kA) to protect the analog and serial interfaces.

> DMU801 base unit serial connectors **X2**, **X3**, and **X5** do not have strong surge protection. Vaisala recommends external surge protection when using DMU801 base unit serial ports for connecting sensors or other devices that are located outside the weather station enclosure. If the connected device is inside the enclosure, no extra surge protection is needed.

**More information**

- DMU801 base unit connectors and indicators (page 15)

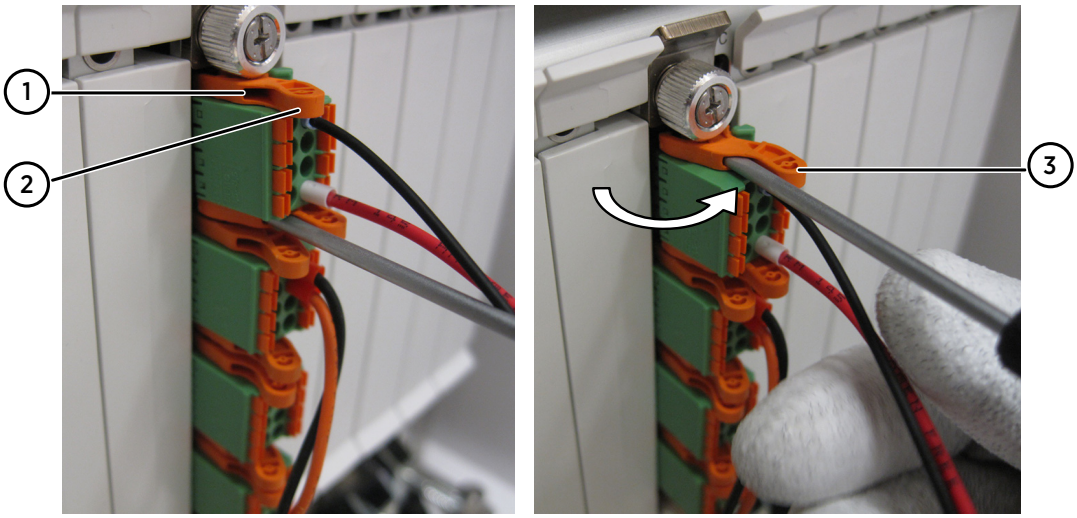
## 10.6.2 Removing sensor connectors

- (Optional) Flat head screwdriver, maximum size 2.5 mm (0.1 in)

1. Turn the lock levers to the middle position one by one. You can use your fingers or a flat head screwdriver.

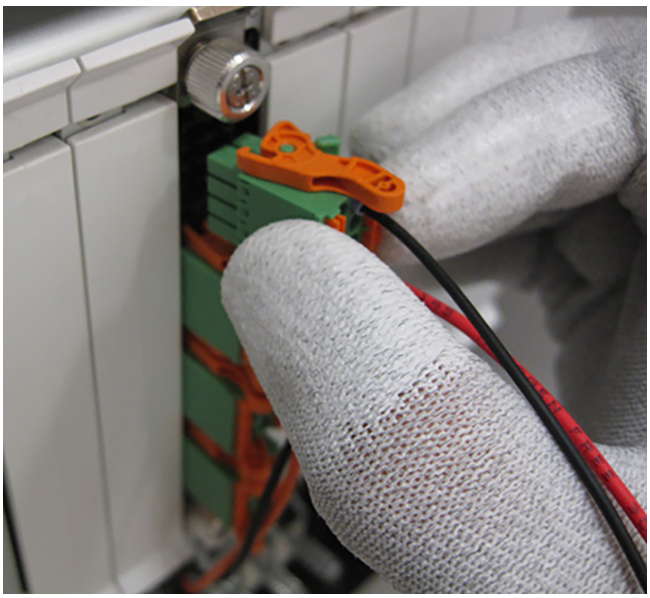
Using a screwdriver may be helpful especially in tight spaces.

**NOTICE!** Do not pull from the wires or try to remove the connector without first turning the lock levers to the middle position.
Do not turn the lock levers by force.

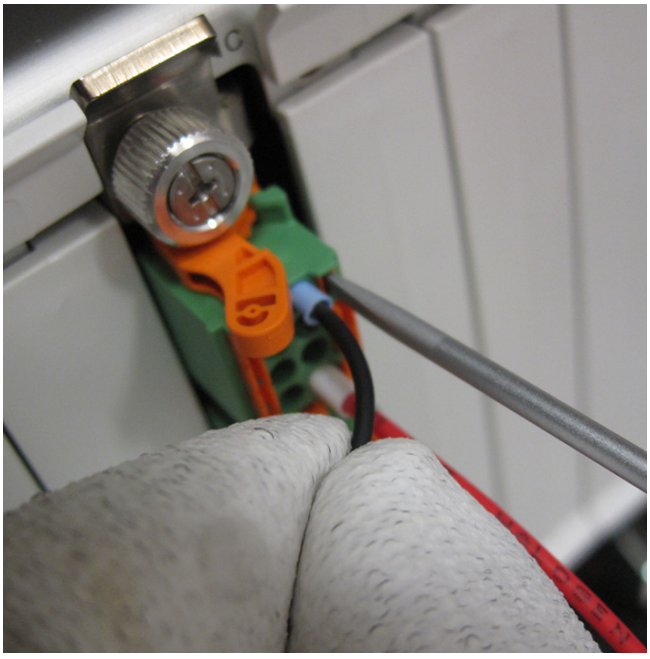



1 Slot for screwdriver
2 Lock lever locked
3 Lock lever in the middle position

2. Remove the connector with your fingers.



If you need to remove a wire from the connector, push the release button next to the wire with a flat head screwdriver and pull the wire out of the connector. The easiest way to remove a wire from the connector is to do it while the connector is attached to the plug-in module.



# 10.7 Grounding sensor cables



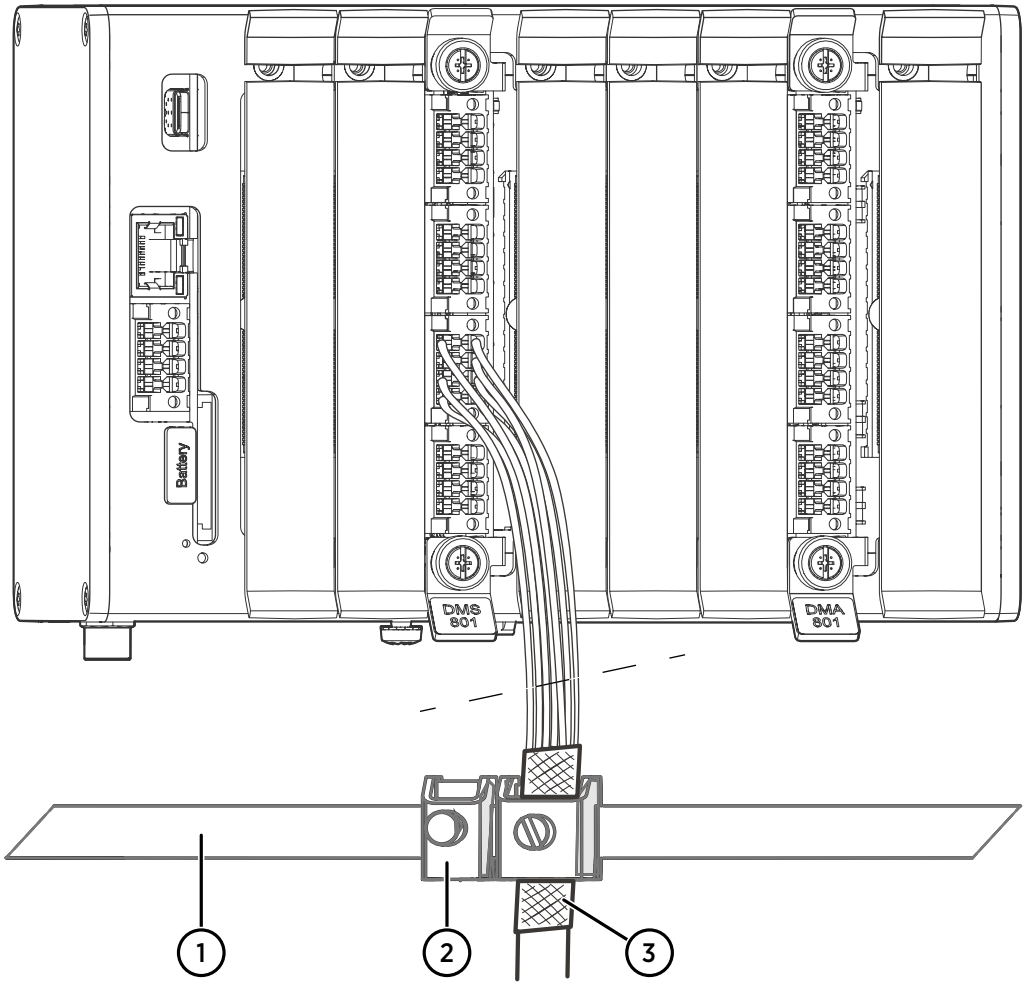
- Flat head screwdriver (optional)



**WARNING! Electricity hazard**
Failure to provide proper grounding can result in injury or death from electric shock and can severely damage the product. Ground the product and verify the grounding periodically.

1. For strain relief and grounding, secure the sensor cable to the grounding rail for sensor cables with a cable clamp. Make sure that the cable shield or the metal foil around the cable shield touches the grounding rail.

   This step shows an example of how sensor cables are grounded in a Vaisala automatic weather station. If DMU801 is installed elsewhere, ground the sensor cables in a way that is suitable for that setup.




1 Grounding rail for sensor cables
2 Cable clamp
3 Cable shield or metal foil

2. Tighten the clamp gently using your fingers or a flat head screwdriver.
3. Mark the end of each cable with a label (provided in a separate plastic bag).

# 10.8 Inserting external memory card

You can use an external SD memory card to increase the memory space. DMU801 supports SD cards up to 32 GB.

Vaisala has tested and verified the use of SD card type SDHC 32 GB with DMU801. If you use some other card, consider the following specifications:

Table 10 SD card specifications

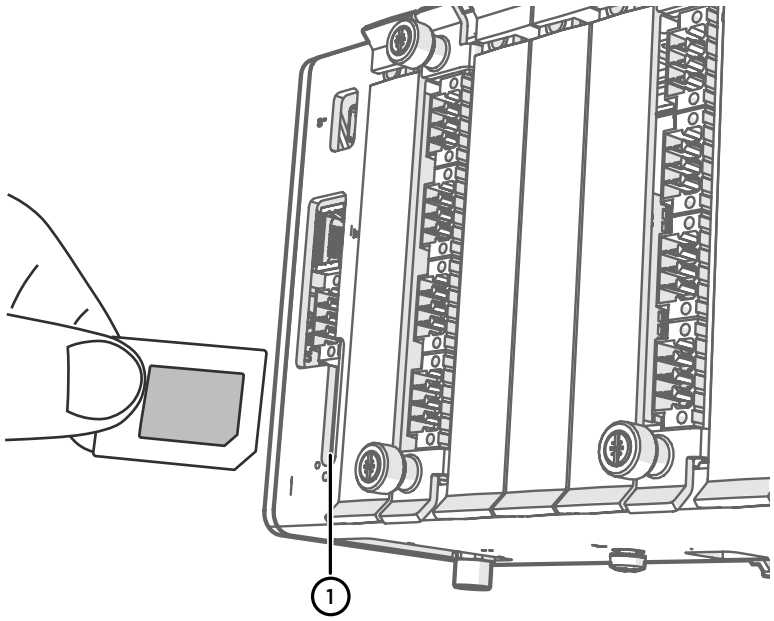
| Property | Value |
|---|---|
| Card type | SDHC or SDXC |
| Speed class | UHS-I |
| Temperature range | −40 … +85 °C (−40 … +185 °F) [1] |
| Memory cell technology | pSLC or SLC [2] |

1) *Depends on the installation location and application. For some locations, a more limited range may be acceptable. For outdoor installations, wide temperature range cards are strongly recommended, especially if they are used as logging memory and left in the station for a long time.*
2) *Recommended for maximum reliability, especially if the SD card is used as logging memory.*

Make sure that the SD memory card has file system FAT32. If not, format the card to FAT32 with your computer.

To use the SD memory card, insert it into DMU801.

1. Hold the memory card so that the colored text label points towards the body of DMU801 and the edge with a cut-off corner faces downwards.




1 **SD** card slot

2. Insert the card in the **SD** card slot and push it in.

When you insert a new memory card into DMU801, the software checks that the card is ready for use.

**More information**

- Data storage (page 17)

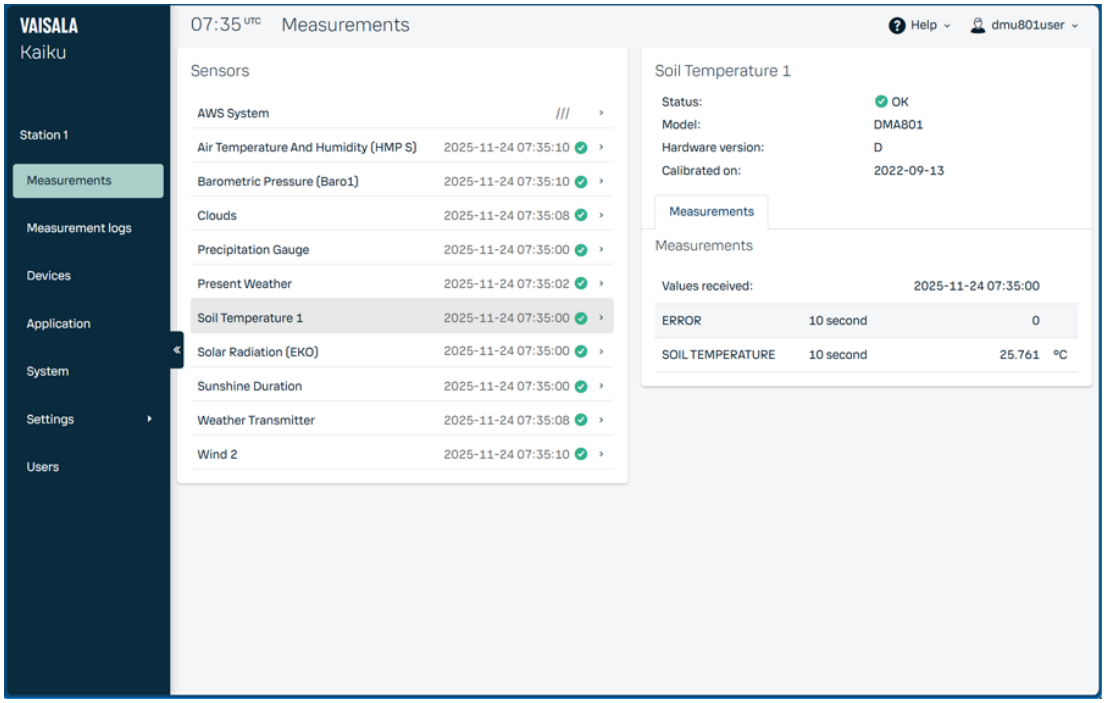
# 11. Verification

## 11.1 Viewing measurement data

You can view real-time measurement data from the sensors in the Web UI.

1. In the Web UI, go to **Measurements**.

   The **Measurements** view lists all the sensors that are connected to the system. Depending on the sensor, you can view the status of the sensor, observation data received from the sensor, and some metadata, such as the latest calibration date or serial number.



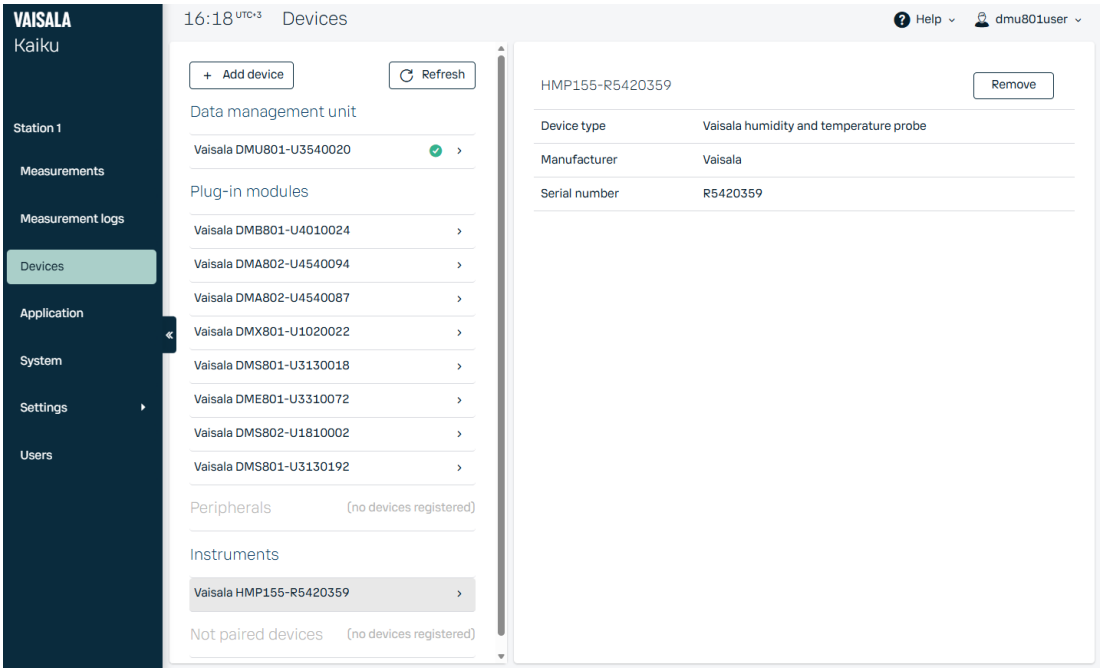

In **Measurements**, you can also complete maintenance tasks, such as calibration, for certain sensors.

## 11.2 Viewing connected devices

The **Devices** view shows the metadata, such as serial number, of DMU801 and the connected plug-in modules.

If you are using a Vaisala cloud service, the connected instruments and other devices are also listed in the view.

1. In the Web UI, go to **Devices**.




The devices are listed under appropriate categories.

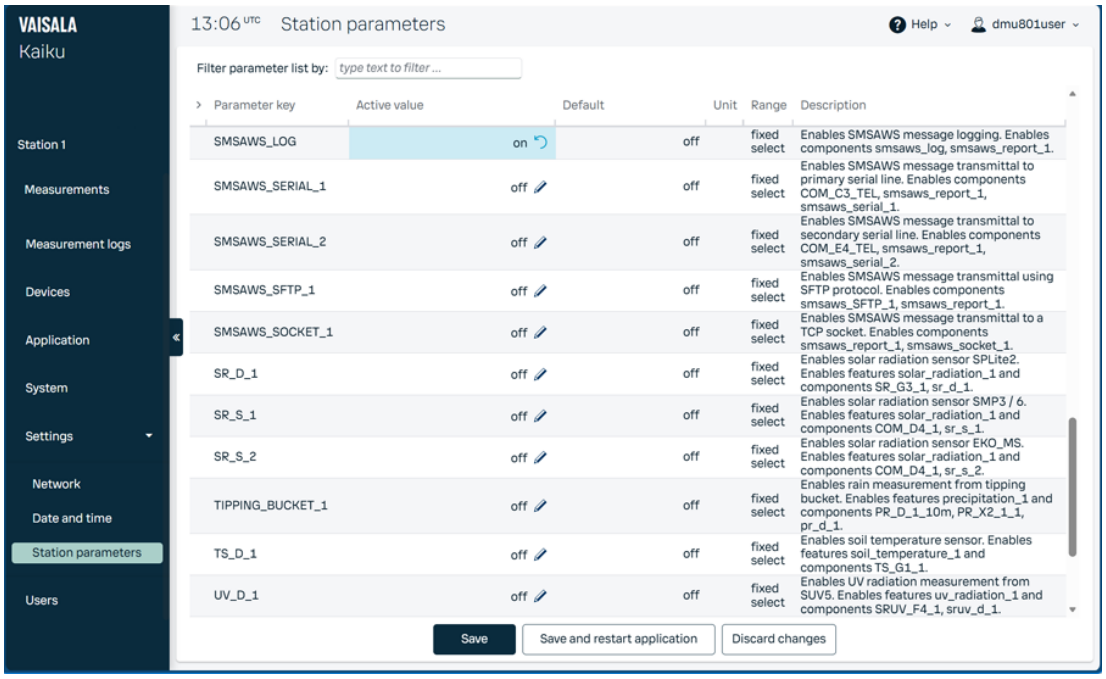
A **Remove** button is available for devices listed under **Instruments**. When you disconnect an instrument from DMU801, for example, replace it with a new one, select the **Remove** button to delete the instrument also from the DMU801 device registry. This means that the instrument is no longer visible in the Vaisala cloud, either.

# 12. Data logging

## 12.1 Downloading measurement logs

You can download measurement log files from the Web UI. The measurement log file options and their settings that are displayed in the Web UI are defined in the application.

1. In the Web UI, go to **Settings > Station parameters**.
2. Under the parameter group **features**, set the **Active value** of the desired log message format to **on**.




3. To save the changes and take them into use, select **Save and restart application**.

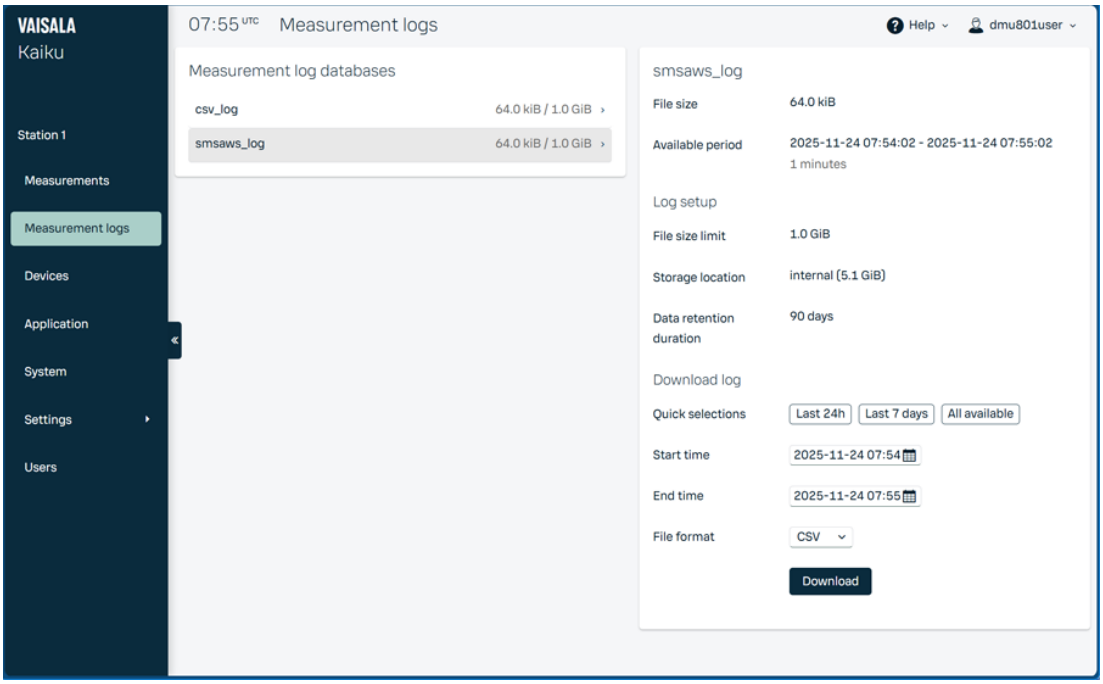
   When the application has restarted, refresh the browser to make the changes visible.



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4. Go to **Measurement logs** and select the log file you want to download.

   The Web UI shows the log file information, such as storage location (internal memory or SD card), file size, and the duration of the data storing period.




5. In **Download log**, use the quick selection buttons to define the log period or select the start time and end time.
6. Select the file format (CSV or JSON) and **Download**.

### More information

- Data storage (page 17)

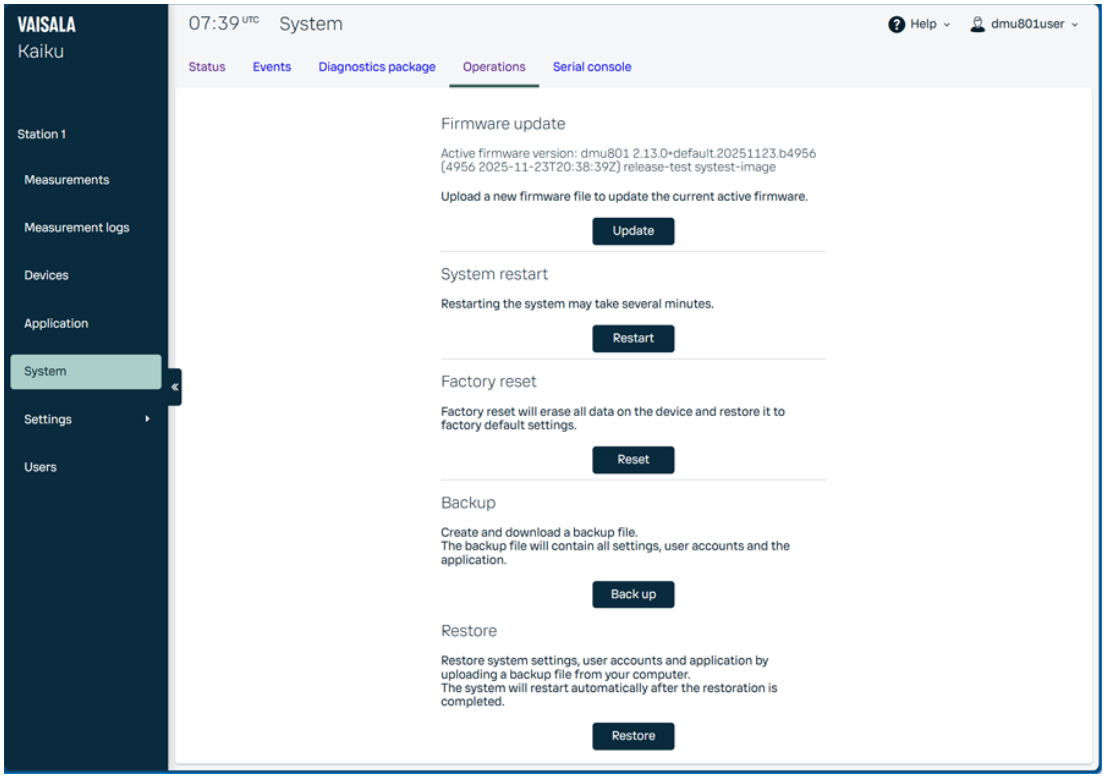
# 13. Backing up and restoring application and system settings

You can create a backup file of the current application and settings, save the file on your computer, and restore the application later.

In addition to the application, the backup file contains the system settings and user accounts.

Password-type station parameter values are encrypted. These values can only be restored correctly to the same device where you took the backup from.
If you upload the backup file to another device, you have to set the values again.

1. In the Web UI, go to **System > Operations**.




2. To create the backup file, select **Back up**.

   The backup file is saved on your computer.

3. To restore system settings, user accounts, and application:
   a. Log in to the Web UI as an **Administrator**.

      The restore function is available only for administrator users.

   b. Select **Restore** and the backup file from your computer.
   c. Select **Upload** and again **Restore**.

   The file is uploaded to DMU801 and the system restarts.



You can download and save the current application also through Kaiku Designer. For more information, see Kaiku Designer User Guide (M212407EN).



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# 14. Maintenance

## 14.1 Installing DMU801 plug-in modules

Crosshead PH1 screwdriver (optional)

Follow these instructions if you are installing plug-in modules to DMU801 for the first time or adding new modules to an existing system.

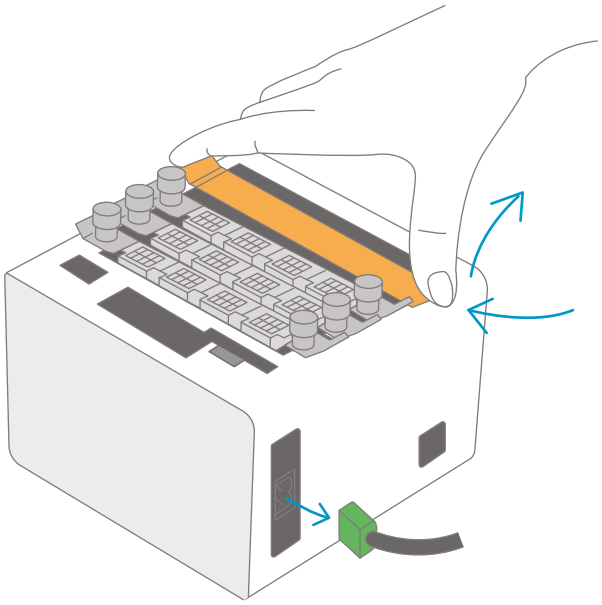
Before you start, make sure that:

- DMU801 is powered off.
- The weather station is powered off, if DMU801 is inside a weather station enclosure.

The plug-in module locations in DMU801 slots must be in accordance with the application. If you insert a module into a wrong slot, the module does not break but it may function incorrectly.

The example figures illustrate a 4-slot DMU801. The same instructions apply to all DMU801 sizes.

1. Remove cover plates from the DMU801 slots where you are going to install the new plug-in modules.

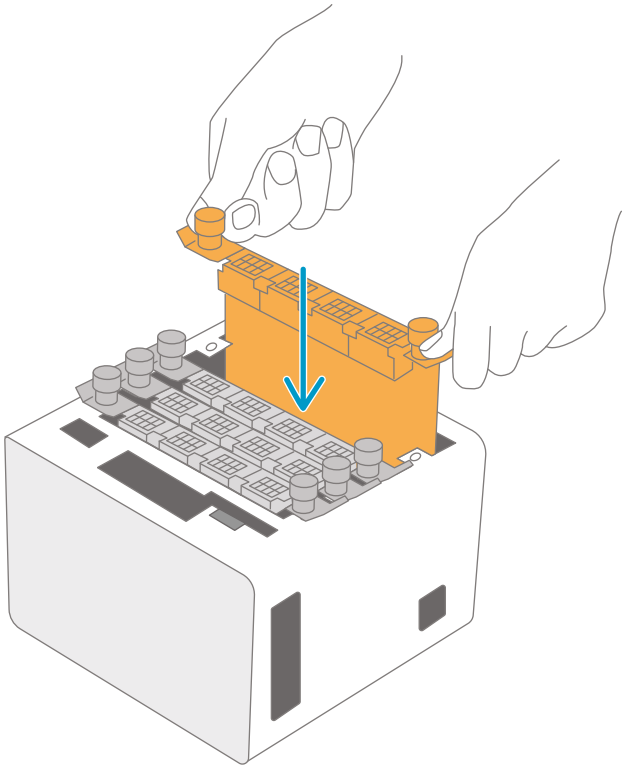


2. Place the plug-in modules in the DMU801 slots.

Place the plug-in modules in the DMU801 slots as defined in the application. You can check the correct order by opening the application in Kaiku Designer. Alternatively, you can first install the plug-in modules and then create or update the application to match the installation.

- Place Ethernet Switch Module (DME801), if used, in slot **A** in DMU801.
- Only 1 Barometer Module (DMB801) is allowed per DMU801.
- Place DMB801, if used, in the first free slot on the right in DMU801. The optimal location for DMB801 is the rightmost slot.
- Place Modem Carrier Module (DMX801) in the first free slot on the left in DMU801.

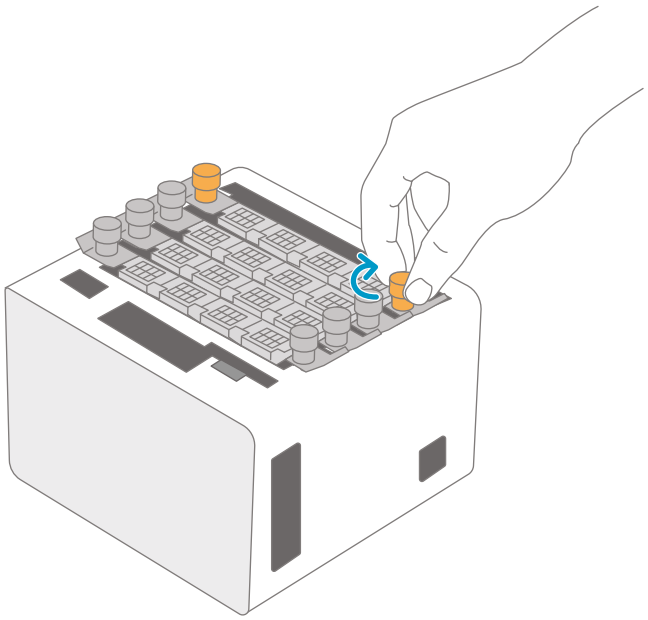
3. Make sure that the module is well aligned in its proper position. Gently press the module down until the handles contact the frame. Do not use force.



4. Tighten the finger screws by hand or, alternatively, use a crosshead PH1 screwdriver.

   The maximum torque is 1.0 Nm. Note that if you use a tool and tighten to over 0.8 Nm, it may be difficult to remove the screws with fingers only.

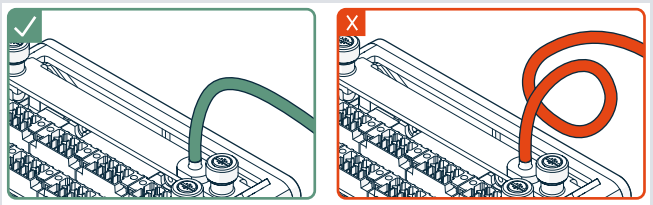
   If the screws do not tighten properly, check that the module is pressed all the way down.



5. Connect the sensors to the new plug-in modules.

   You can use the pin reference cards provided with document DMU801 Plug-in Modules Installation Quick Guide (M212430EN) to help with wiring.

   When you connect a pressure hose to the DMB801 pressure port, keep the hose as straight as possible. Avoid bending the hose and make sure that there are no loops.



6. Power up DMU801 by connecting the power cable to connector **X4**.
7. Connect DMU801 to your computer and add the new plug-in module connections to the application with Kaiku Designer (if not done already).
8. Check that the sensor connections are working, and the data reports show data from each sensor.

   Plug-in modules have LEDs that blink green once a minute to indicate that the modules are functional.

**More information**

- DMU801 plug-in modules (page 18)

## 14.2 Replacing DMU801

If you need to replace DMU801 installed in an automatic weather station enclosure, follow the steps below.



Flat head screwdriver

1. Take a backup of the application by downloading it through Kaiku Designer.

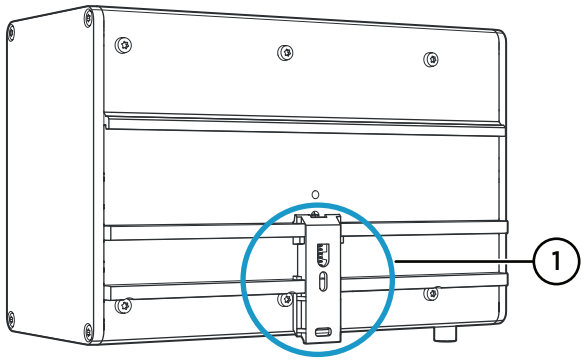
   For instructions, see Kaiku Designer User Guide (M212407EN).
2. Disconnect power from the station.
3. Remove all cabling from DMU801.

   To have more slack in the wiring, you may need to cut the cable ties holding the wires.

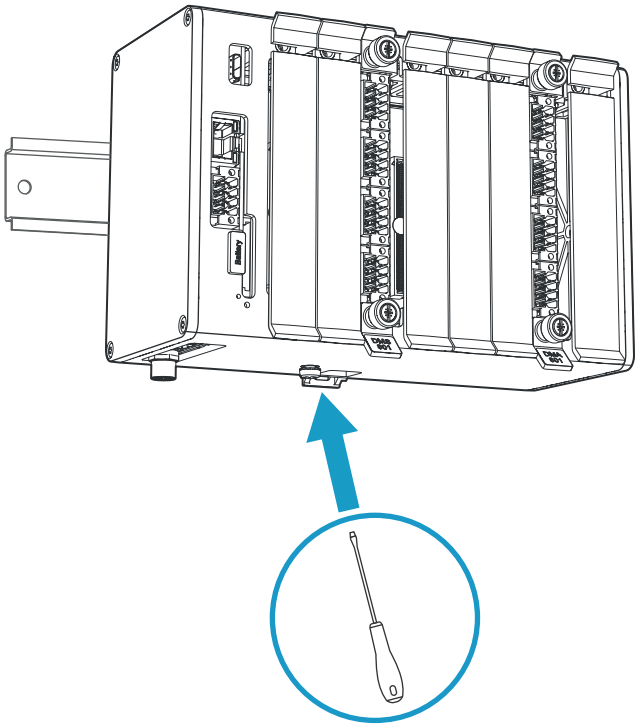


**NOTICE!** To avoid damaging the wiring, be careful when cutting the cable ties.

4. To remove DMU801 from the DIN rail, slide down the locking piece with a flat head screwdriver, and lift DMU801.




1 Locking piece on the back of DMU801



5. Remove the plug-in modules from DMU801 by pulling from the module edges.

**NOTICE!** When removing or inserting the modules, be careful not to bend the connector pins.

6. Insert the plug-in modules in the new DMU801, in the same slots.

   Use either the same plug-in modules you removed or, if you are replacing plug-in modules at the same time, insert the new plug-in modules in the new DMU801.
   It is also possible that the new DMU801 spare part has spare plug-in modules already in place.

7. Insert the new DMU801 on the DIN rail and snap it into place.
8. Connect the cables to the new DMU801.
9. Use new cable ties to reattach the cables to the backplate.
10. Power up the station. This may take a while.
11. Upload the application backup file to the new DMU801 through Kaiku Designer or Web UI.
12. To verify that the plug-in modules are functional, check that data reports show data from each sensor.

**More information**

- Mounting DMU801 into enclosure (page 62)

## 14.3 Replacing DMU801 lithium RTC battery

**WARNING! Chemical hazard**
This product contains a coin or button cell battery. If the battery is swallowed, it can cause severe internal burns in only 2 hours and can lead to death.
Keep new and used batteries away from children. If the battery compartment does not close securely, stop using the product and keep it away from children.
If you suspect that the battery may have been swallowed or placed inside any part of the body, seek immediate medical attention.

DMU801 contains a lithium real-time clock (RTC) battery to keep the system clock running during power outages. The battery type is CR1225/BR1225, which lasts for a minimum of 5 years if DMU801 is powered down. When DMU801 is operating normally, the battery lasts longer.

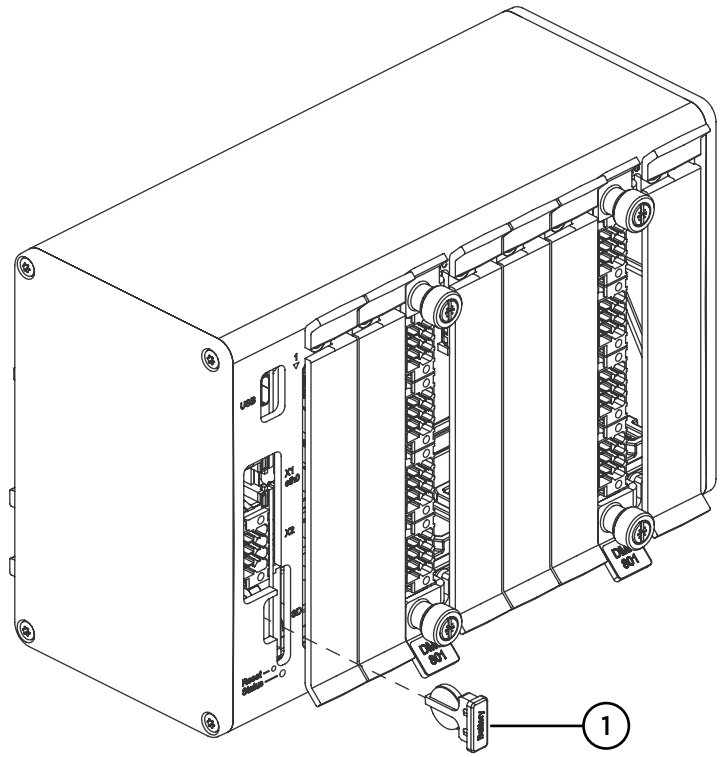
Replace the battery before it runs out. If the battery is empty when DMU801 is powered down, the application date and time are lost when DMU801 is powered up again. When DMU801 is operating normally (and the battery is not used), Vaisala recommends replacing the battery every 15 years, or when the expected date of expiration determined by the battery manufacturer is reached.



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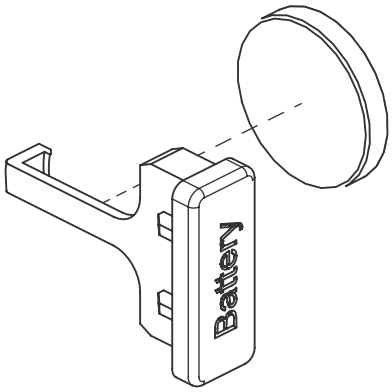
Vaisala recommends using a Panasonic, Varta, or Renata battery.

1. Remove the battery holder including the battery by pulling the battery cover out with fingers.



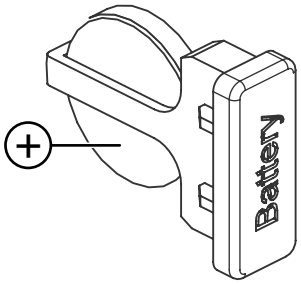

1 Battery cover

2. Remove the battery from the battery holder.



3. Insert the new battery in the holder.

> Place the battery text (+) side facing towards the holder.




4. Insert the battery cover including the new battery back in DMU801.

## 14.4 Calibrating analog measurement modules

The Analog Measurement Modules DMA80X are calibrated at the factory. The modules have excellent long-term stability, and typically no adjustments are needed. However, Vaisala recommends regular calibration to ensure measurement accuracy.

For basic validation, perform field calibration regularly, for example once a year, with a calibrated multimeter or a calibrated reference sensor, and a voltage and resistance simulator. If you suspect any change based on the field calibration, send the plug-in module to Vaisala for calibration. Replace it with a calibrated spare module, or wait until Vaisala sends the module back from calibration.

1. Remove DMA80X from DMU801.
2. Send the plug-in module to Vaisala for calibration.
3. Check the operation of the calibrated plug-in module.
   a. Install the calibrated plug-in module into DMU801.
   b. Connect the sensors.
   c. Check that the sensor connections are working, and the data reports show data.

**More information**

- Analog Measurement Modules DMA801, DMA802, and DMA803 (page 19)
- Installing DMU801 plug-in modules (page 86)



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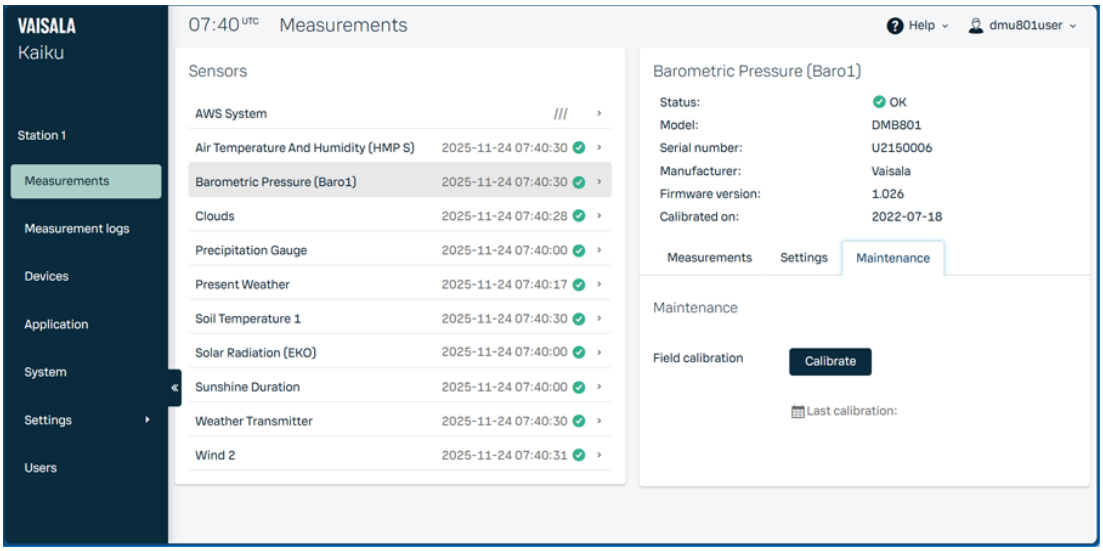
# 14.5 Calibrating DMB801

Calibrating DMB801 is a demanding, high-precision task that requires proper facilities. Vaisala recommends that you send the sensor to Vaisala for calibration.

DMB801 contains pressure module BARO-1. You can perform a 1-point field check of the pressure module using the Web UI.

- Laptop computer and access to the Web UI
- Traveling standard barometer (for example, Vaisala PTB330TS)
- USB-C cable (included in the delivery)

1. Connect DMU801 to your computer with a USB-C cable.
2. Open a web browser, log in to the Web UI, and go to **Measurements**.
3. Under **Sensors**, select **Barometric Pressure (Baro1)** (or other name given to the component).
4. In **Maintenance**, select **Calibrate**.



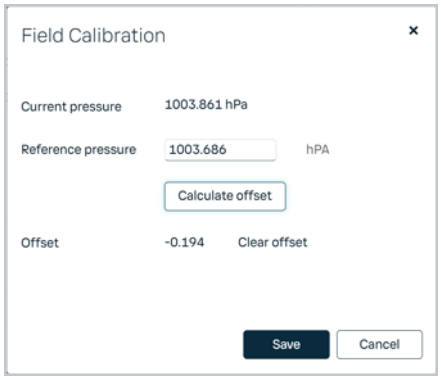

The **Field Calibration** window opens.

5. Lift the reference barometer to the same height as DMU801.

Make sure that the wind does not interfere with the reading of the reference barometer.

6. Read the reference barometer reading.

7. If the reference reading differs from the pressure module measurement with more than 0.2 hPa, type this reference reading in **Reference pressure**.
8. Select **Calculate offset**.




   The offset (measured value − reference reading) is shown.
9. To save the changes, select **Save**.
10. Repeat the calibration if necessary.

If you later want to check the latest offset value, you can always do it in **Maintenance > Calibrate > Offset**.

# 15. Troubleshooting

## 15.1 Troubleshooting checklist

When troubleshooting, check the questions listed in Technical support (page 132) before contacting Vaisala technical support.

## 15.2 Determining DMU801 operation mode

You can follow the DMU801 operation mode from the status LED on the DMU801 front panel.

Table 11 DMU801 status LED indications

| LED color/behavior | State | Actions |
|---|---|---|
| Green, steady | DMU801 is functioning normally.<br>The application is running. There are no active errors. | – |
| Green, blinking | DMU801 is starting up. [1)]<br>DMU801 has powered up or reset. The application is not yet running. | – |
| | DMU801 is shutting down.<br>DMU801 is in shutdown mode and not available. | |
| Green, blinking × 3 | Factory reset acknowledgment.<br>When the LED blinks 3 times in green, you have pressed the **Reset** button long enough (approximately 10 s). Release the button to reset DMU801 to factory settings. | – |
| Red, steady | Startup error occurred. DMU801 is not operational. | 1. If you have plug-in modules installed in DMU801, remove the modules one by one to see if one of them causes the fault. Replace the faulty plug-in module.<br>2. If removing the plug-in modules does not help, replace DMU801. |

*1) When you connect power to DMU801, the status LED first blinks once in red.*

The Ethernet port **X1 eth0** has 2 status LEDs (green and yellow).

Table 12 **X1 eth0** port status LED indications

| LED color/behavior | State |
|---|---|
| Blank, both LEDs | No Ethernet link |
| Green LED, steady | Ethernet link is on |
| Green LED, blinking | Data transfer ongoing through the port |
| Yellow LED, steady | 100 Mbps (megabits per second) link |
| No yellow LED on | 10 Mbps link |

For example, if the green LED is blinking and the yellow LED is not on, data transfer is ongoing through the port at the speed of 10 Mbps.

DMU801 plug-in modules have their own status LEDs. The LEDs blink green once a minute to indicate that the modules are functional.

## 15.2.1 DME801 Ethernet port LED modes

The 3 copper ports of Ethernet Switch Module DME801 each have 2 LEDs (green and yellow) to indicate the status of the port.

Table 13 DME801 copper port status LED indications

| LED color/behavior | State |
|---|---|
| Blank, both LEDs | No Ethernet link |
| Green LED, steady | 1 Gbps (gigabits per second) link |
| Green LED, blinking | Data transfer ongoing through the port with 1 Gbps speed |
| Yellow LED, steady | 100 Mbps (megabits per second) link |
| Yellow LED, blinking | Data transfer ongoing through the port with 100 Mbps speed |
| Both LEDs, steady | 10 Mbps link |

| LED color/behavior | State |
|---|---|
| Both LEDs, blinking  | Data transfer ongoing through the port with 10 Mbps speed |

**More information**

- Ethernet Switch Module DME801 (page 22)

# 15.3 Troubleshooting DMU801



- USB-C cable and a laptop computer

If you have a problem with using DMU801, check the following table. If the problem you have is not listed, or if the proposed solution does not fix the problem, contact Vaisala technical support.

Table 14 DMU801 problem situations and their remedies

| Problem | Probable cause | Actions |
|---|---|---|
| You do not get enough voltage for sensors from serial or analog port **Vsupply** pins. | DMU801 has not been able to initialize sensor powering.<br>If you first connect DMU801 to a computer with a USB-C cable, and only after that connect power supply to the connector **X4**, then voltage given in serial/analog port **Vsupply** pins is 7 V, which is insufficient for most sensors. | Connect the power supply to the DMU801 connector **X4** first, then connect the USB-C cable between DMU801 and the computer. This way, **Vsupply** voltage in serial/AD ports is 12 V. |
| You cannot connect your computer to DMU801. | You have not accepted a self-signed certificate in the web browser. | When first connecting a computer to DMU801, you must connect to the Web UI and accept the security warning. |
| The application does not start. One or multiple `ImportErrors` are reported in the **Device console** view of Kaiku Designer. | Possible syntax errors in the script. | See **Device console** for errors and fix the syntax accordingly. |
| | The DMU801 firmware version is not compatible with the Kaiku Designer (Configuration Tool) version. | Use a Kaiku Designer version that is compatible with the firmware version. Contact Vaisala to get the compatible versions, or download the latest version from docs.vaisala.com. |

| Problem | Probable cause | Actions |
|---|---|---|
| Logging in to the Web UI fails. | You have forgotten your Web UI password. | Restore factory default settings and reconnect to the Web UI. When you reconnect, you will be prompted to give the device activation code and create new users and passwords.<br><br>**NOTICE!** Erasing network settings means that you may not be able to connect to DMU801 remotely. |
| Login view is not shown after a restart. | Web browser may have to be refreshed after restarting DMU801. | Refresh your web browser. |
| Data is not stored to the memory card. | Memory card is not properly inserted. | Remove and reinsert the memory card. |
| | Memory card is not selected as data storage. | Update the application with Kaiku Designer to use the memory card as data storage. |
| | Memory card is corrupted. | Replace the memory card. |
| | Memory card is not correctly formatted. | Format the memory card to FAT32 file system with your computer. |
| | Memory card is full. | Replace the memory card. |

## 15.4 Logging in to Web UI

The Web UI has been tested with the latest versions of Microsoft Edge, Mozilla Firefox, and Google Chrome at the time of publishing this document.

**NOTICE!** For security reasons, passwords cannot be retrieved from the system. If you forget your username or password, you have to reset DMU801 to factory default settings.

1. Make sure that DMU801 is connected to your computer with a USB-C cable.

   Use the USB-C cable provided by Vaisala. If you use your own cable, make sure that the cable is shielded.

2. Open a web browser and go to the Web UI address:

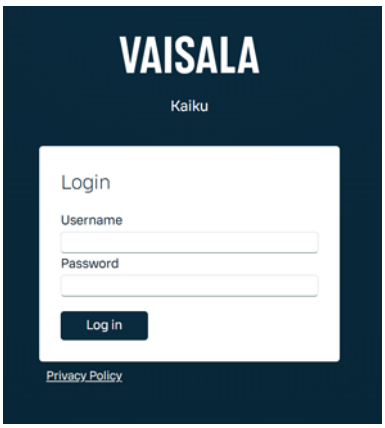
   `https://192.168.10.2` (local connection)
   For Ethernet connection, use IP address `https://192.168.2.2` (default), or other address if it has been configured as the network address.

3. Web browsers do not trust a self-signed certificate. If you are logging in for the first time, the browser indicates that the connection is untrusted or insecure. Ignore the warning and continue to the site.



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4. On the **Log in** page, type the username and password in the fields.




5. Select **Log in**.

**More information**

- Kaiku Web User Interface (page 26)

### 15.4.1 Logging in to Web UI remotely

For remote connection, the weather station must have a public, static IP address or be connected to a private access point.

1. Connect your browser to the public IP address or address provided by the access point.
2. Follow the login instructions in Logging in to Web UI (page 100).

## 15.5 Downloading diagnostic data

You can download a diagnostic data package from the Web UI. The package includes data log files that are useful for troubleshooting purposes. Also the station parameters are included in the diagnostics package.

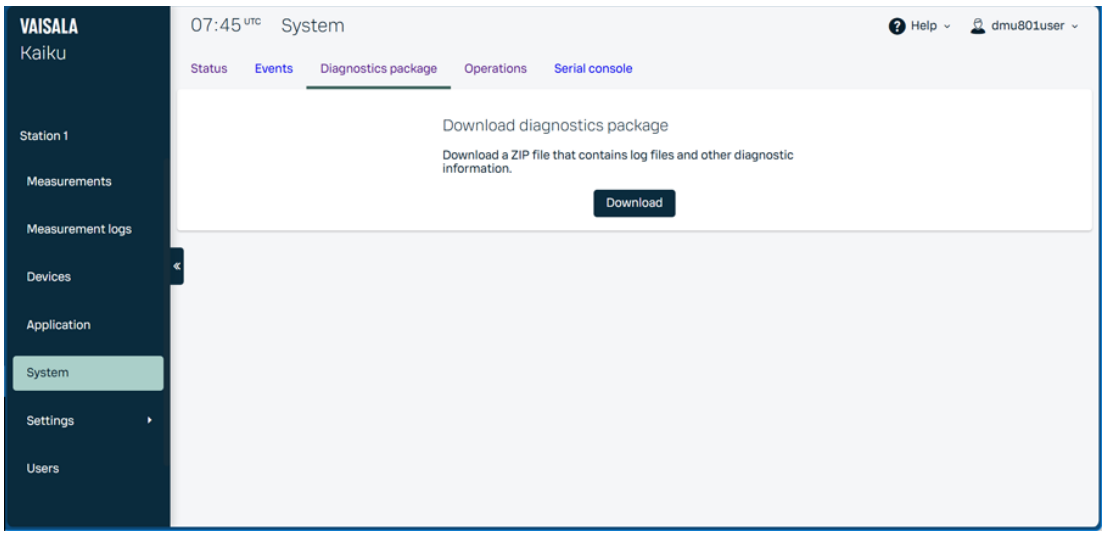
If you encounter an error situation and need to contact Vaisala technical support, provide the diagnostics package to help with troubleshooting.

1. In the Web UI, go to **System > Diagnostics package**.



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2. On the **Diagnostics package** page, select **Download**.




3. Extract the ZIP file on your computer.

**More information**

- Data storage (page 17)

# 15.6 Downloading event logs

You can download event log files from the Web UI. In addition to the events, the log file includes details, such as severity of the event and the device from which the event originated (DMU801 or a sensor connected to DMU801). The events are timestamped according to the time setting selected in the Web UI (local time or UTC time). The available events are application-specific.

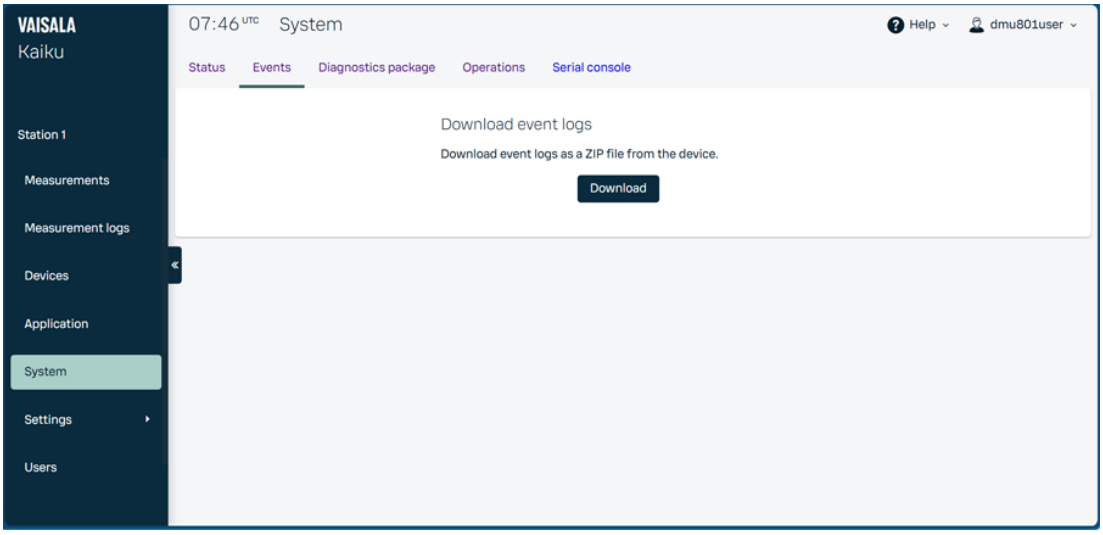
The event log files include the following information:

| Field | Description | Example |
|---|---|---|
| Timestamp | Time of event creation. | `2024-09-16T22:24:00.939852+00:00` |
| Severity | Message severity:<br>• `ALARM`<br>• `CRITICAL`<br>• `ERROR`<br>• `WARNING`<br>• `INFORMATIONAL` | `INFORMATIONAL` |
| Message | Free-form event message. | `Station parameters updated by user "dmu801user"` |
| Code | Event code of form `vrn:dev:event:<code>`. | `vrn:dev:event:gecko.web.stationParameterUpdate` |

| Field | Description | Example |
|---|---|---|
| Device | Device URN identifying the device which the event is related to. | `urn:dev:ops:16961-DMU801-U0650006` |
| Reported by device | Device URN identifying the device that reported the event. | `urn:dev:ops:16961-DMU801-U0650006` |
| Boot ID | Unique identifier for each device restart. | – |
| Custom data | Custom data of the event as a JSON object. | `username=dmu801user\| updatedStationParameters=site.station_name` |

For more information, see Kaiku Event Description (M213151EN).

1. In the Web UI, go to **System > Events**.
2. On the **Events** page, select **Download**.




3. Extract the ZIP file on your computer.

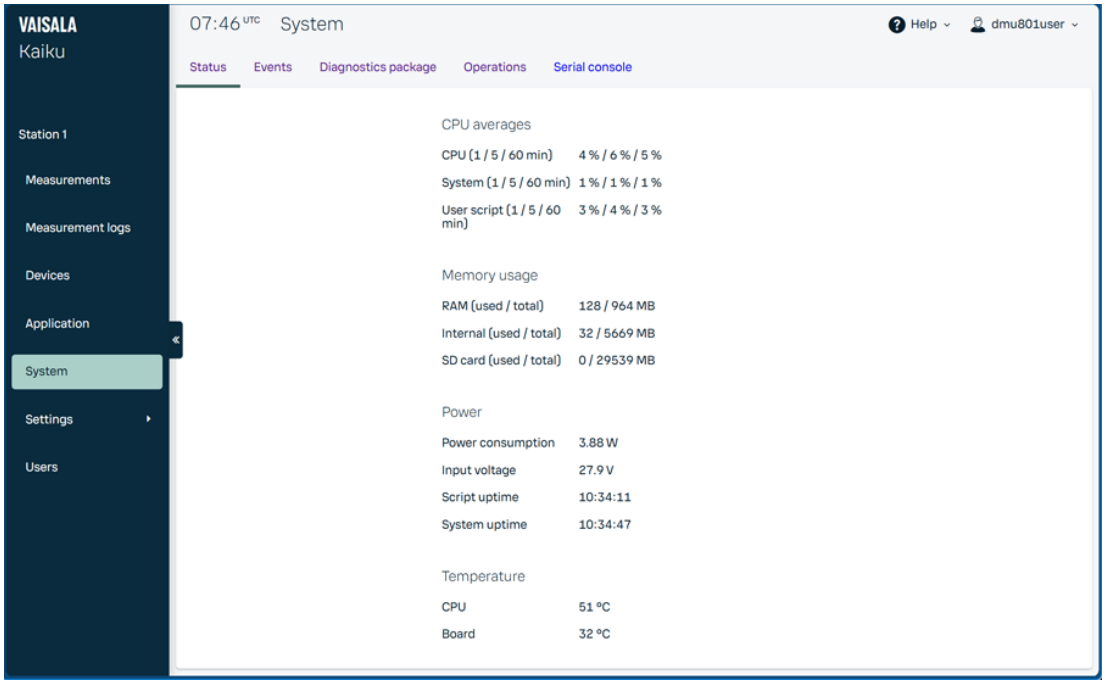
**More information**

- Data storage (page 17)

# 15.7 Viewing system status

You can view the system status from the Web UI.

1. In the Web UI, go to **System > Status**.




## 15.8 Using console views

In the Web UI **Serial console** view you can see observation data from sensors connected to DMU801 through serial connection.

In the **Stream console** view you can see data from stream components.

The data can be used for debugging, and you can also issue commands to the sensors and components.

1. In the Web UI, go to **System** and select **Serial console** or **Stream console**.
2. In **Serial port** or **Component**, select the port or component from which you want to view data.

   The terminal window starts showing data polled from the selected port or component.
3. To save the data on your computer, select **Save**.

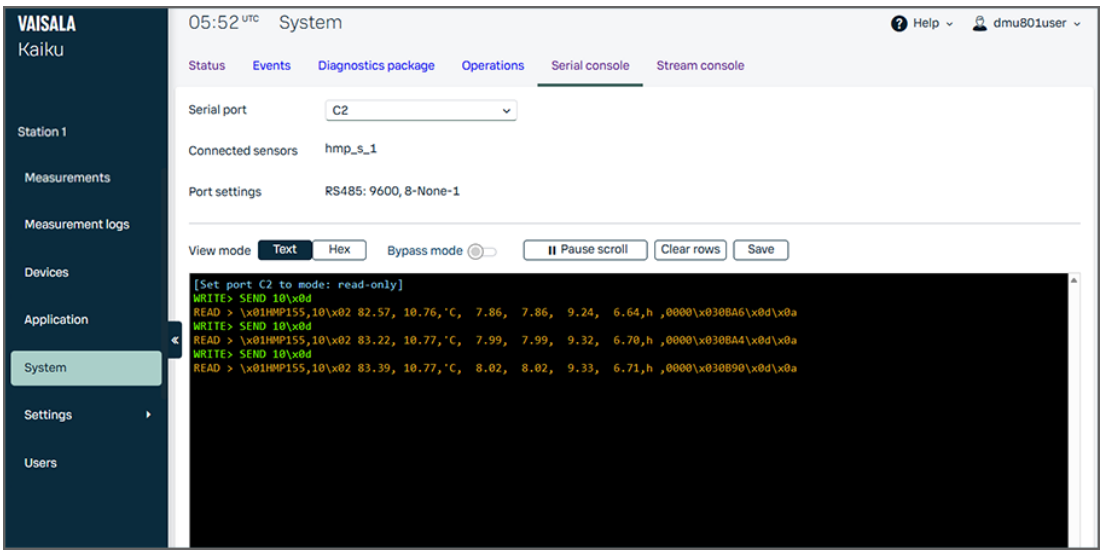


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4. To start the write mode and to be able to give commands, select **Bypass mode**.

   The data is no longer printed in the terminal window. You can type commands in the text input field.

When **Bypass mode** is enabled, the selected sensor or component is controlled by the user. The sensor or component is in the service mode and no valid data is received.



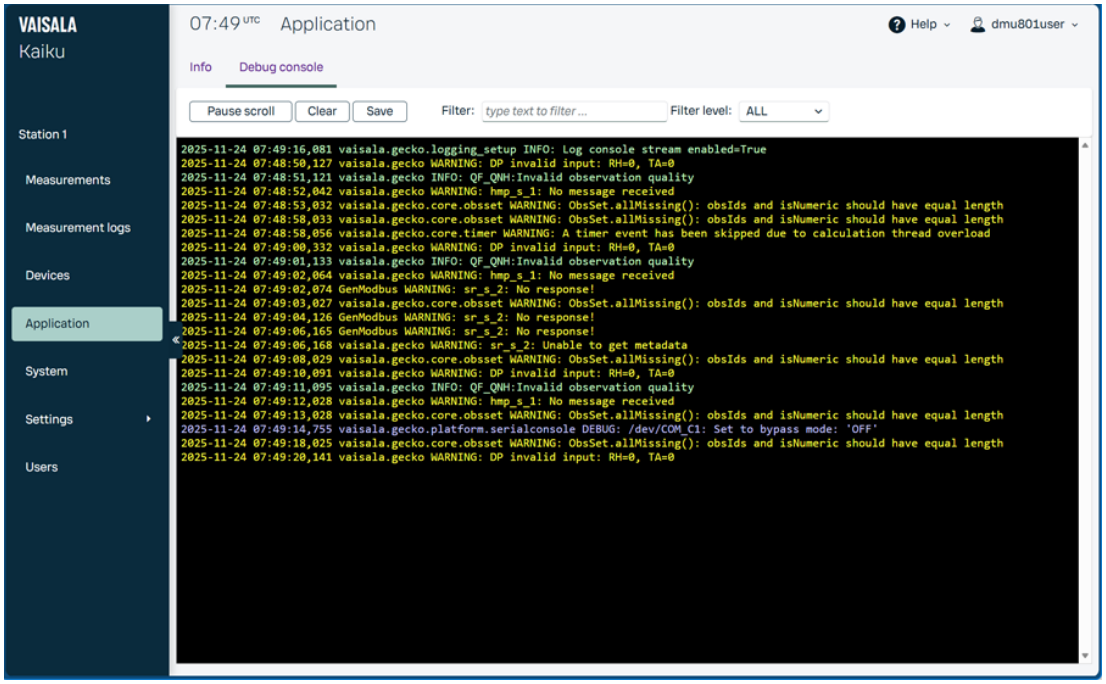

# 15.9 Viewing application data

You can use the application data for validating and debugging the application. The **Debug console** view in the Web UI displays data about the application uploaded to DMU801. You can see the log, make sure that data is received from the sensors, and view possible errors.

For example, after uploading a new application to DMU801, it may be useful to verify that the application is operational, observation data from the connected sensors is shown, and there are no errors in the application.

A similar **Device console** view is also available in Kaiku Designer.

1. In the Web UI, go to **Application > Debug console**.



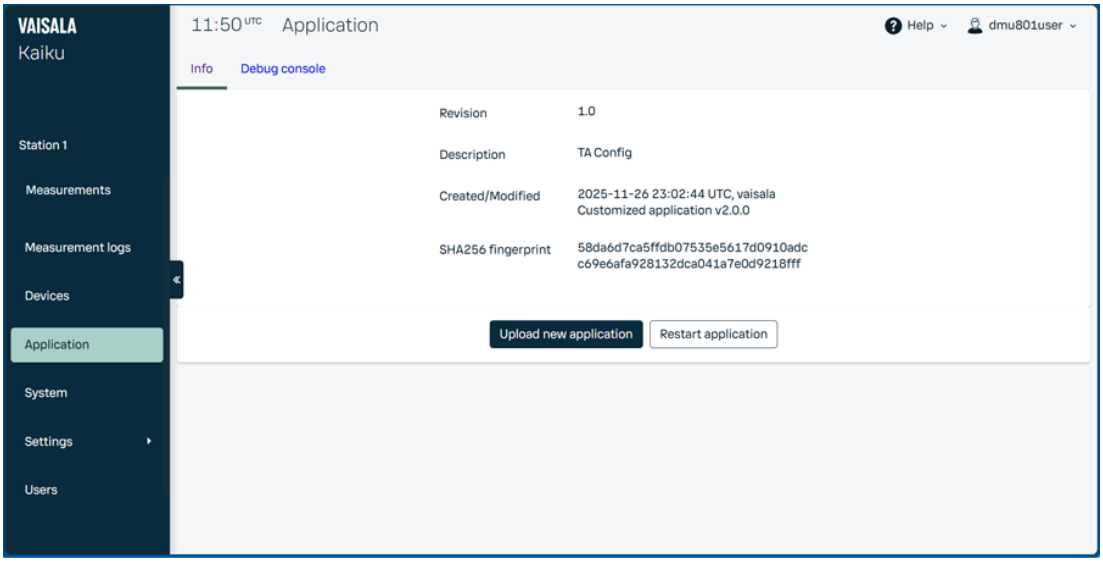

   The application log data is printed in the terminal window.

2. To filter the data:
   - Select **Filter level** to sort the logs according to the defined categories.
   - Type the filter text in the **Filter** field.

# 15.10 Viewing application metadata

In the Web UI, you can view information about the currently running application. The information also includes a unique digital fingerprint of the application, which allows you to compare the application with another one and check if the application has been modified.

1. In the Web UI, go to **Application > Info**, and view the application metadata.




**Revision**
Revision of the application.

**Description**
Description of the application or the latest changes.

**Created/Modified**
Application creation date, Kaiku Designer version, and the name of the creator or modifier.

**SHA256 fingerprint**
Digital fingerprint calculated for the application.

## 15.11 Using external termination resistor on RS-485 line

Normally, the RS-485 line does not need external termination resistors. DMU801 serial plug-in modules have built-in resistors to reduce signal reflections.

| Serial module | Port | Termination type |
|---|---|---|
| DMS801 | 1–3 | Built-in AC termination (120 Ω resistor in series with 1 nF capacitor) |
| DMS801 and DMS802 | 4 | Software-controllable 120 Ω termination |

In addition, the RS-485 transceivers have fail-safe functionality and controlled transmit slew rate to eliminate the need for external resistors in most cases.

However, in case of a communication issue on the RS-485 line, you can try to fix it as follows:

- Add a 120 Ω external resistor at the end of the line (in DMS801 ports **1–3**).

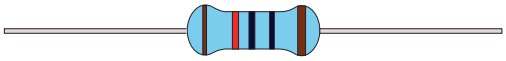
- Switch on the software-controllable termination using Kaiku Designer (in DMS801/ DMS802 port **4**). For instructions, see Kaiku Designer User Guide (M212407EN).

The communication problem may be caused by signal reflections if there is an extra long sensor cable or high-speed slew rate at the sensor end.

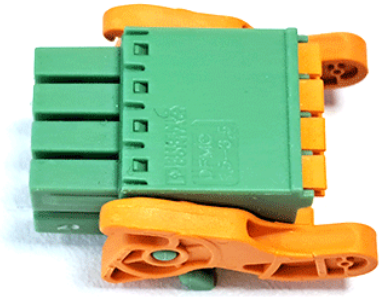
## 15.11.1 Installing 120 Ω termination resistor

- Side cutters

A few pieces of termination resistors are included in the weather station delivery.



1. Bend the other end of the resistor wire as shown in the following figure.



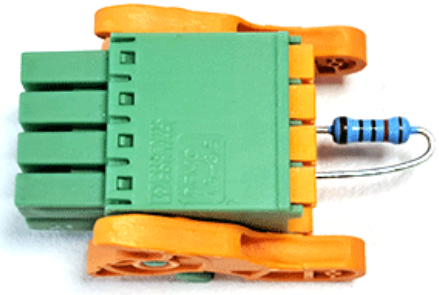


2. Cut the other end of the wire to the same length.

3. Insert the resistor ends in the spring-cage connector, between pins 2 and 3 (or 6 and 7), in ports 1–3 of Serial Module DMS801. It does not matter which end goes to which pin.

> If both pin pairs 2 and 3, and 6 and 7 are already used for sensor wiring, add external splicing connector to add the resistor.

4. Push the resistor ends to the bottom of the connector.



**More information**

- DMU801 spare parts and accessories (page 146)

## 15.12 Restoring factory default settings

You can restore DMU801 to factory settings, for example in the following cases:

- You have forgotten your administrator username or password to the Web UI.
- You want to remove the application and all settings, for example, when replacing DMU801 with a device that has been in use earlier.

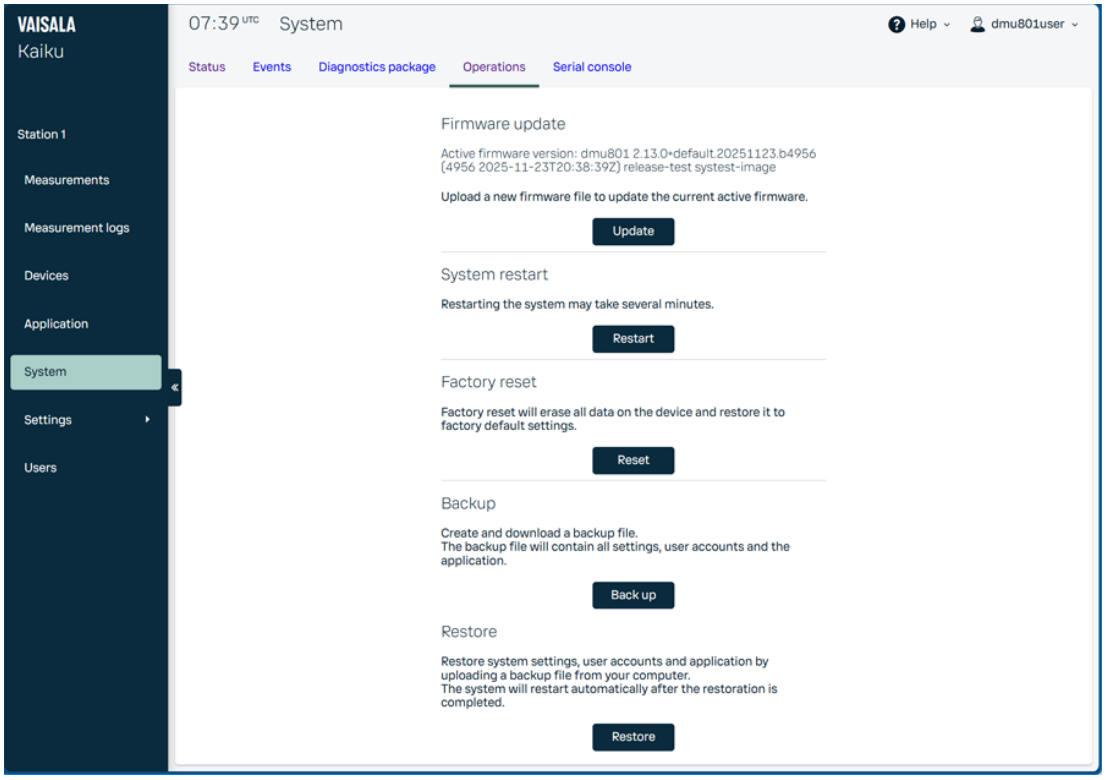
In factory reset, all data on the device will be lost, including observations, application, and settings.

> After restoring the factory default settings, you need to activate DMU801 with the device activation code and create new users when you connect to the Web UI the next time.

### 15.12.1 Restoring factory default settings through Web UI

> **NOTICE!** Erasing network settings means that you may not be able to connect to DMU801 remotely.

1. Log in to the Web UI as an **Administrator**.
2. Take a backup of the current application.
3. Go to **System > Operations**.
4. Under **Factory reset**, select **Reset**.




The reset takes up to 1 minute.

5. After the reset, log in to the Web UI, give the device activation code, and create a new user account.
6. Import the backup file through the Web UI. If you do not have a backup, configure all the settings again.

## 15.12.2 Restoring factory default settings with Reset button

- Small pin or similar

Pressing the **Reset** button briefly reboots DMU801.
Pressing and holding the **Reset** button down for 10 seconds resets DMU801. All device settings are reverted back to factory settings. After the factory reset, you need to reconfigure the settings. You can restore the settings by importing the backup file to DMU801.

1. Unplug the USB-C cable (if connected).
2. Press and hold down the **Reset** button in the DMU801 front panel with a small pin for 10 seconds.

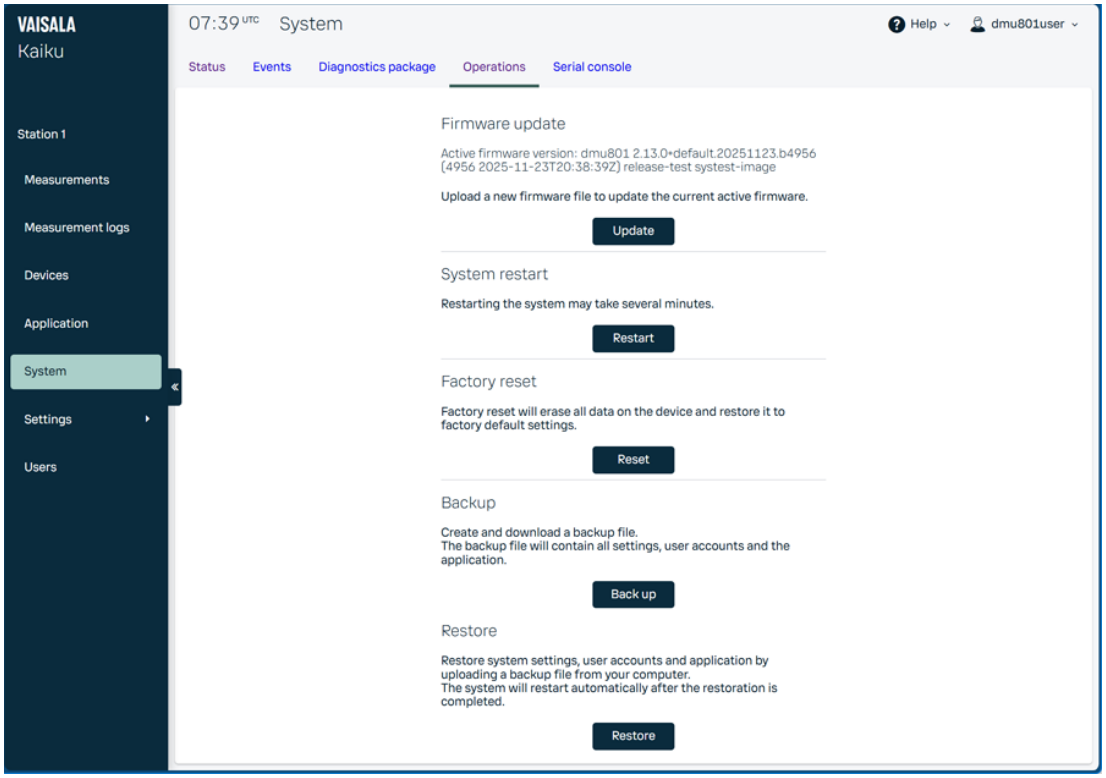
   The reset takes up to 1 minute.
3. After the reset, log in to the Web UI, give the device activation code, and create a new user account.
4. If you have a backup file, import it through the Web UI. If you do not have a backup, configure all the settings again.

## 15.13 Restarting system remotely

When the application is not operating properly, restarting the system may help.

Do not restart DMU801 or the system while uploading firmware, exporting or importing settings, or calibrating sensors.

1. In the Web UI, go to **System > Operations**.




2. Under **System restart**, select **Restart**.
3. When the **Log in** page is shown, log in again.

During a system restart DMU801 turns the sensor power off and on for the sensors powered through the DMU801 **Vsupply** pins. This causes a reset for some of the sensors.

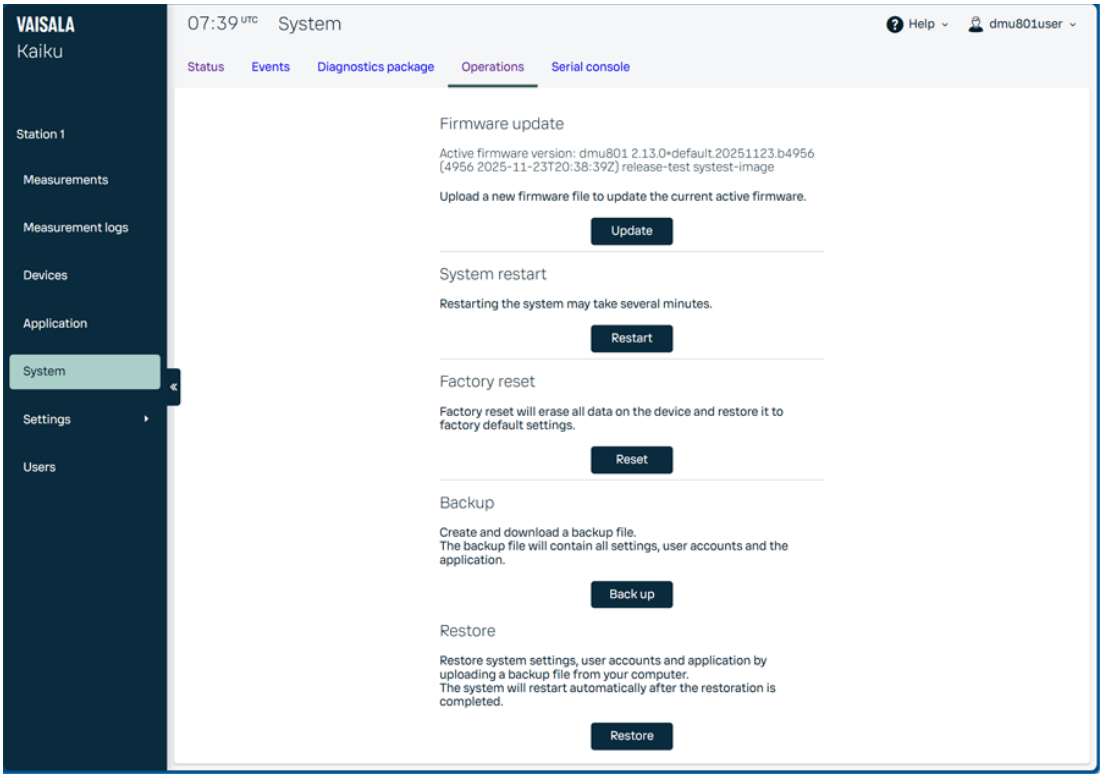
# 16. Upgrades

## 16.1 Updating firmware

To make sure that the system components stay up to date, Vaisala provides regular firmware updates to DMU801. You can download the latest firmware version from Vaisala product documentation portal: Kaiku firmware package.

1. Save the update file on your computer.
2. Log in to the Web UI as an **Administrator**.
3. Go to **System > Operations**, and under **Firmware update**, check the current firmware version.

   You can also see the current firmware version in **Help > About**.
4. To upload a new firmware version, select **Update**.




5. In the **Firmware update** window, select **Browse**, locate the new file, and select **Upload**.

   The filename ends with `.firmware`.

Once the firmware is updated, DMU801 restarts, and you are directed to the **Log in** page.

Wait at least 5 minutes after updating the firmware before switching off power from DMU801.

### More information

- Powering (page 16)

# 17. Technical data

## 17.1 DMU801 specifications

### Table 15 DMU801 operating environment

| Property | Description/Value |
|---|---|
| Operating temperature [1)] | −40 … +85 °C (−40 … +185 °F) |
| Extended operating temperature (available on request) | −60 … +85 °C (−76 … +185 °F) |
| Storage temperature | −60 … +85 °C (−76 … +185 °F) |
| Operating humidity | 0–100 %RH, non-condensing |

*1) Operating temperature of some of the DMU801 plug-in modules may be different. See the plug-in module datasheets.*

### Table 16 DMU801 powering specifications

| Property | Description/Value |
|---|---|
| Operating voltage | 8–32 V DC (maximum 10 A) |
| Power consumption, typical | 500 mW |
| Heating voltage | 24 V DC nominal |
| Maximum input current for heating | 12 A |
| Mating connectors (power/heating input) | 2 × Phoenix Contact FKCN 2,5/2-ST-5,08 (included) |

### Table 17 DMU801 processing system

| Property | Description/Value |
|---|---|
| Processor | ARM Cortex A9, 800 MHz |
| Memory | 1 GB DDR3L RAM, 8 GB eMMC Flash |
| External memory | SD card up to 32 GB [1)] |
| Operating system | Linux |
| Communications protocol | IPv4 and IPv6 |
| **Real-time clock (standard)** | |
| Accuracy | Better than 20 s/month |
| Backup battery | CR1225/BR1225 |
| Backup time | Minimum 5 years |

*1) SD card available as an accessory.*

## Table 18 DMU801 compliance

| Property | Description/Value | |
|---|---|---|
| EU directives and regulations | EMC Directive (2014/30/EU)<br>RoHS Directive (2011/65/EU) as amended by 2015/863 | |
| EMC immunity | EN 61326-1, industrial environment [1)] | |
| EMC emissions | CISPR 32 / EN 55032, Class B<br>FCC part 15 B, Class B<br>CAN ICES-3(B)/NMB-3(B) | |
| Cybersecurity | Developed in accordance with ISO/IEC 27001 and IEC 62443-4-1 for secure product development practices | |
| Compliance marks | CE, China RoHS, FCC, ICES, RCM, UKCA | |
| **Test** | **Applied standard** | **Description/Value** |
| Maritime | IEC 60945 | – |
| Vibration (sinusoidal) | IEC 60068-2-6 | 5–13.2 Hz, 1 mm (0.04 in) amplitude<br>13.2–200 Hz, 0.7 g |
| Rough handling | IEC 60068-2-31 | Drop height 100 cm (39.37 in) |
| Shock | IEC 60068-2-27 | 15 g, 11 ms, saw-tooth |
| Dry heat | IEC 60068-2-2 | +85 °C (+185 °F) |
| Damp heat | IEC 60068-2-78 | +40 °C (+104 °F), 95 %RH |
| Cold | IEC 60068-2-1 | −60 °C (−76 °F) |

1) *Modem Carrier Module DMX801 complies with EN 61326-1 basic level. Ethernet connection in DMU801 base unit (**eth0**) requires external surge protection to comply with EN 61326-1 industrial environment level.*

## Table 19 DMU801 inputs and outputs

| Property | Description/Value |
|---|---|
| **Ethernet** | |
| Ports | **eth0** on CPU, additional ports with plug-in modules |
| Supported standard | IEEE 802.3u |
| Physical layer | Base-T |
| Data rate | 10/100 Mbps |
| Connectors | RJ45 with link LEDs |
| Data transmission | Full/Half-duplex with auto-negotiation |
| **USB** | |
| Ports | 1 |
| Supported standard | USB 2.0 |

| Property | Description/Value |
|---|---|
| Signaling | High speed |
| Connectors | USB-C |
| **Serial** | |
| Ports | • 1 × RS-232 / RS-485 / SDI-12 port<br>• 2 × RS-485 ports<br>• Additional ports with plug-in modules |
| Supported bit rate | 1200–115 200 bps |
| Power output | 5 × software controllable power output pins |
| Signals | • RS-232: RXD, TXD<br>• RS-485: D+/D− |
| Digital I/O | 4 × 3.3 V logic level GPIO pins, pulse count capable |
| Mating connectors | • 2 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included)<br>• 1 × M8 4-pin male |
| **Note:** 4-wire RS-485/RS-422 is supported by using 2 × 2-wire RS-485. | |
| **TCP/IP** | |
| Supported protocols | DHCP, DNS, NTP, ARP, ICMP Echo, TCP/IP, SSH, UDP, DTLS, HTTPS [1)] |

*1) The list is subject to change.*

## Table 20 DMU801 communication options

| Property | Description/Value |
|---|---|
| Wireless communication | LTE Cat 4 cellular modem (with UMTS/HSPA+ and GSM/GPRS/EDGE support) |
| Landline communication | RS-232, RS-485, LAN |
| Ethernet communication | HTTPS, TCP socket, SFTP, FTP, MQTT client |
| Communication protocols | Modbus TCP<br>ASCII (SMSAWS, CSV, customized format) |
| Satellite communication | Vaisala GOES DCP Transmitter QST102-3 |
| Local maintenance connection | USB-C, browser-based Web UI |

## Table 21 DMU801 mechanical specifications

| Property | Description/Value |
|---|---|
| Weight | 2-slot unit: 0.35 kg (0.77 lb)<br>4-slot unit: 0.48 kg (1.06 lb)<br>8-slot unit: 0.71 kg (1.57 lb) |

| Property | Description/Value |
|---|---|
| Mounting | DIN rail 35 mm (1.4 in) |
| **Dimensions (H × W × D)** [1] | |
| 2 slots | 120 × 77 × 84 mm (4.72 × 3.03 × 3.31 in) |
| 4 slots | 120 × 113 × 84 mm (4.72 × 4.45 × 3.31 in) |
| 8 slots | 120 × 185 × 84 mm (4.72 × 7.28 × 3.31 in) |
| **Materials** | |
| Screws, washers | Stainless steel AISI 316 |
| DIN rail locking piece | Stainless steel AISI 630 |
| Frame profile | Aluminum EN AW-6060 T6 |
| End covers | Plastic PC/ABS |

1) *Reserve some extra space for connectors and cables. For example, sensor connectors require a minimum of 20 mm (0.8 in) additional space from the DMU801 frame.*

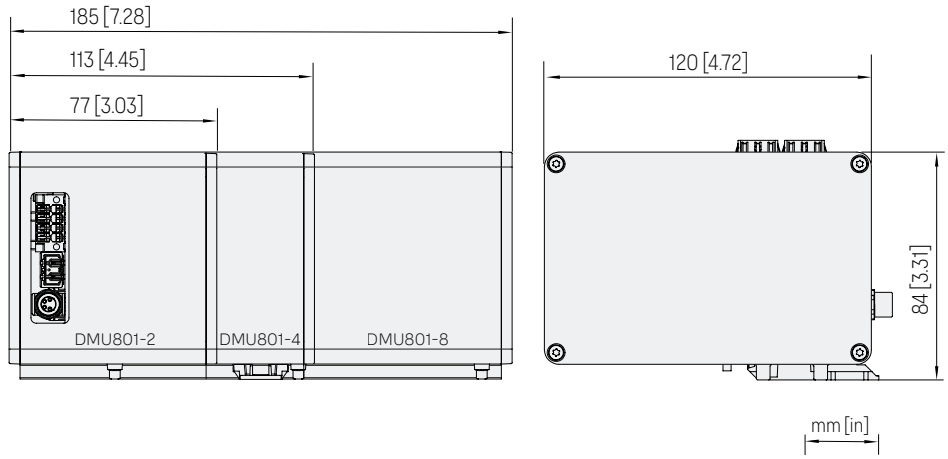



Figure 8 DMU801 dimensions (all sizes)

**More information**

- Vaisala Data Management Unit DMU801 (page 14)

# 17.2 DMA801 specifications

Table 22 DMA801 accuracy specifications

| Property | Description/Value |
|---|---|
| **Temperature measurement (Pt100 sensor)** [1] [2] | |

| Property | Description/Value |
|---|---|
| Measurement range | −60 … +85 °C (−76 … +185 °F) |
| Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F) | < ±0.04 °C |
| Typical error at 0 °C (+32 °F) [3] | < ±0.01 °C |
| **Temperature measurement (Pt1000 sensor)** [1] [2] | |
| Measurement range | −60 … +85 °C (−76 … +185 °F) |
| Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F) | < ±0.35 °C |
| Typical error at 0 °C (+32 °F) [3] | < ±0.2 °C |
| **NTC thermistor** [2] | |
| Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F) | |
| 1–360 kΩ | ±0.14 % |
| 360 kΩ – 1.5 MΩ | ±0.7 % |
| **Voltage measurement** | |
| Uncertainty over temperature range −40 … +70 °C (−40 … +158 °F): | |
| ±2.5 V range | < 0.05 % of reading ±1.85 µV |
| ±1.25 V range | < 0.04 % of reading ±2.3 µV |
| ±620 mV range | < 0.04 % of reading ±0.9 µV |
| ±310 mV range | < 0.04 % of reading ±0.75 µV |
| ±156 mV range | < 0.04 % of reading ±0.8 µV |
| ±78 mV range | < 0.04 % of reading ±1.25 µV |
| ±39 mV range | < 0.04 % of reading ±0.8 µV |
| Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F): | |
| ±2.5 V range | < 0.05 % of reading ±1.85 µV |
| ±1.25 V range | < 0.04 % of reading ±2.3 µV |
| ±620 mV range | < 0.04 % of reading ±0.9 µV |
| ±310 mV range | < 0.04 % of reading ±0.85 µV |
| ±156 mV range | < 0.04 % of reading ±1.2 µV |
| ±78 mV range | < 0.05 % of reading ±1.25 µV |
| ±39 mV range | < 0.06 % of reading ±0.95 µV |
| Common mode range | +2.5 V / −0.9 V |
| **Voltage measurement 0–30 V** | |
| Uncertainty over temperature range −60 … +50 °C (−76 … +122 °F) | ±0.3 % of reading ±3 mV, typical |

| Property | Description/Value |
|---|---|
| Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F) | ±1.2 % of reading ±3 mV, typical |
| Input impedance | > 900 kΩ |
| Maximum measurable voltage | 32.765 V |
| **Frequency measurement** | |
| Measurement range | 0–10 000 Hz |
| Uncertainty over temperature range −60 … +85 °C (−76 … +158 °F): | |
| 3–100 Hz | < 0.04 % of reading |
| 100–1000 Hz | < 0.082 % of reading |
| 1000–10 000 Hz | < 0.82 % of reading |

1) *Verified by measuring ±20 °C from ambient temperature, while ambient temperature spreads across the entire range.*
2) *Confidence level k=2.*
3) *Verified with DMU801 at 0 °C (+32 °F).*

## Table 23 DMA801 inputs and outputs

| Property | Description/Value |
|---|---|
| Inputs | • 4 × differential analog inputs<br>• 2 × 0–30 V single-ended measurement channels<br>• 2 × frequency/counter measurement channels |
| Mating connectors | 4 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included) |
| Power output | Each port has a separate, software-controllable power output pin and a separate excitation pin |
| Heating output | Each port has separate heating power supply pins |
| A/D conversion | Low noise 24-bit A/D converter with internal diagnostics |

## Table 24 DMA801 powering specifications

| Property | Description/Value |
|---|---|
| Sensor supply voltage | 3–26 V, software controllable |
| Current limit | 0.7 A, −25 % … +20 % per port |
| Sensor heating current limit | 2 A per plug-in module |

## Table 25 DMA801 mechanical specifications

| Property | Description/Value |
|---|---|
| Dimensions (H x D) | 123 × 79 mm (4.84 × 3.11 in) |

| Property | Description/Value |
|---|---|
| Distance between 2 plug-in module slots in DMU801 frame | 18 mm (0.71 in) |
| Weight | 64 g (2.26 oz) |
| Material | UL-rated fire-resistive FR4 |
| Handles | Stainless steel |
| Coating | Conformally coated against humidity |

**More information**

- Analog Measurement Modules DMA801, DMA802, and DMA803 (page 19)

# 17.3 DMA802 specifications

Table 26 DMA802 accuracy specifications

| Property | Description/Value |
|---|---|
| **Temperature measurement (Pt100 sensor)** [1) 2)] | |
| Measurement range | −60 ... +85 °C (−76 ... +185 °F) |
| Uncertainty over temperature range −60 ... +85 °C (−76 ... +185 °F) | < ±0.04 °C |
| Typical error at 0 °C (+32 °F) [3)] | < ±0.01 °C |
| **Temperature measurement (Pt1000 sensor)** [1) 2)] | |
| Measurement range | −60 ... +85 °C (−76 ... +185 °F) |
| Uncertainty over temperature range −60 ... +85 °C (−76 ... +185 °F) | < ±0.35 °C |
| Typical error at 0 °C (+32 °F) [3)] | < ±0.2 °C |
| **NTC thermistor** [2)] | |
| Uncertainty over temperature range −60 ... +85 °C (−76 ... +185 °F) | |
| 1–360 kΩ | ±0.14 % |
| 360 kΩ – 1.5 MΩ | ±0.7 % |
| **Voltage measurement** | |
| Uncertainty over temperature range −40 ... +70 °C (−40 ... +158 °F): | |
| ±2.5 V range | < 0.05 % of reading ±1.85 µV |
| ±1.25 V range | < 0.04 % of reading ±2.3 µV |
| ±620 mV range | < 0.04 % of reading ±0.9 µV |
| ±310 mV range | < 0.04 % of reading ±0.75 µV |

| Property | Description/Value |
|---|---|
| ±156 mV range | < 0.04 % of reading ±0.8 µV |
| ±78 mV range | < 0.04 % of reading ±1.25 µV |
| ±39 mV range | < 0.04 % of reading ±0.8 µV |
| Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F): | |
| ±2.5 V range | < 0.05 % of reading ±1.85 µV |
| ±1.25 V range | < 0.04 % of reading ±2.3 µV |
| ±620 mV range | < 0.04 % of reading ±0.9 µV |
| ±310 mV range | < 0.04 % of reading ±0.85 µV |
| ±156 mV range | < 0.04 % of reading ±1.2 µV |
| ±78 mV range | < 0.05 % of reading ±1.25 µV |
| ±39 mV range | < 0.06 % of reading ±0.95 µV |
| Common mode range | +2.5 V / −0.9 V |
| **Voltage measurement 0–30 V** | |
| Uncertainty over temperature range −60 … +50 °C (−76 … +122 °F) | ±0.3 % of reading ±3 mV, typical |
| Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F) | ±1.2 % of reading ±3 mV, typical |
| Input impedance | > 900 kΩ |
| Maximum measurable voltage | 32.765 V |
| **Frequency measurement** [4] | |
| Measurement range | 0–10 000 Hz |
| Uncertainty over temperature range −60 … +85 °C (−76 … +158 °F): | |
| 3–100 Hz | < 0.025 % of reading |
| 100–1000 Hz | < 0.082 % of reading |
| 1000–10 000 Hz | < 0.82 % of reading |

1) *Verified by measuring ±20 °C from ambient temperature, while ambient temperature spreads across the entire range.*
2) *Confidence level k=2.*
3) *Verified with DMU801 at 0 °C (+32 °F).*
4) *The given values are the maximum uncertainty percentages of single measurements. Average calculation gives better results.*

## Table 27 DMA802 inputs and outputs

| Property | Description/Value |
|---|---|
| Inputs | • 4 × differential analog inputs<br>• 2 × 0–30 V single-ended measurement channels<br>• 2 × frequency/counter measurement channels |
| Mating connectors | 4 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included) |

| Property | Description/Value |
|---|---|
| Power output | Each port has a separate, software-controllable power output pin and a separate excitation pin |
| Heating output | Each port has separate heating power supply pins |
| A/D conversion | Low noise 24-bit A/D converter with internal diagnostics |

Table 28 DMA802 powering specifications

| Property | Description/Value |
|---|---|
| Sensor supply voltage | 3–26 V, software-controllable |
| Current limit | 1.26 A, ±20 % per port |
| Sensor heating current limit | 2 A per plug-in module |

Table 29 DMA802 mechanical specifications

| Property | Description/Value |
|---|---|
| Dimensions (H x D) | 123 × 79 mm (4.84 × 3.11 in) |
| Distance between 2 plug-in module slots in DMU801 frame | 18 mm (0.71 in) |
| Weight | 64 g (2.26 oz) |
| Material | UL-rated fire-resistive FR4 |
| Handles | Stainless steel |
| Coating | Conformally coated against humidity |

**More information**

- Analog Measurement Modules DMA801, DMA802, and DMA803 (page 19)

# 17.4 DMA803 specifications

Table 30 DMA803 accuracy specifications

| Property | Description/Value |
|---|---|
| **Temperature measurement (Pt100 sensor)** [1) 2)] | |
| Measurement range | −60 … +85 °C (−76 … +185 °F) |
| Uncertainty over temperature range −40 … +60 °C (−40 … +140 °F) | < ±0.03 °C |
| Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F) | < ±0.04 °C |

| Property | Description/Value |
|---|---|
| Typical error at 0 °C (+32 °F) [3] | < ±0.01 °C |
| Long-term stability | 1.7 mK / year, typical |
| **Temperature measurement (Pt1000 sensor)** [1] [2] | |
| Measurement range | −60 ... +85 °C (−76 ... +185 °F) |
| Uncertainty over temperature range −60 ... +85 °C (−76 ... +185 °F) | < ±0.35 °C |
| Typical error at 0 °C (+32 °F) [3] | < ±0.2 °C |
| Long-term stability | 1.7 mK / year, typical |
| **NTC thermistor** [2] | |
| Uncertainty over temperature range −60 ... +85 °C (−76 ... +185 °F) | |
| 1–360 kΩ | ±0.14 % |
| 360 kΩ – 1.5 MΩ | ±0.7 % |
| **Voltage measurement** | |
| Uncertainty over temperature range −40 ... +70 °C (−40 ... +158 °F): | |
| ±2.5 V range | < 0.05 % of reading ±1.85 µV |
| ±1.25 V range | < 0.04 % of reading ±2.3 µV |
| ±620 mV range | < 0.04 % of reading ±0.9 µV |
| ±310 mV range | < 0.04 % of reading ±0.75 µV |
| ±156 mV range | < 0.04 % of reading ±0.8 µV |
| ±78 mV range | < 0.04 % of reading ±1.25 µV |
| ±39 mV range | < 0.04 % of reading ±0.8 µV |
| Uncertainty over temperature range −60 ... +85 °C (−76 ... +185 °F): | |
| ±2.5 V range | < 0.05 % of reading ±1.85 µV |
| ±1.25 V range | < 0.04 % of reading ±2.3 µV |
| ±620 mV range | < 0.04 % of reading ±0.9 µV |
| ±310 mV range | < 0.04 % of reading ±0.85 µV |
| ±156 mV range | < 0.04 % of reading ±1.2 µV |
| ±78 mV range | < 0.05 % of reading ±1.25 µV |
| ±39 mV range | < 0.06 % of reading ±0.95 µV |
| Common mode range | +2.5 V / −0.9 V |
| **Voltage measurement 0–30 V** | |
| Uncertainty over temperature range −60 ... +50 °C (−76 ... +122 °F) | ±0.3 % of reading ±3 mV, typical |

| Property | Description/Value |
|---|---|
| Uncertainty over temperature range −60 … +85 °C (−76 … +185 °F) | ±1.2 % of reading ±3 mV, typical |
| Input impedance | > 900 kΩ |
| Maximum measurable voltage | 32.765 V |
| **Frequency measurement** [4] | |
| Measurement range | 0–10 000 Hz |
| Uncertainty over temperature range −60 … +85 °C (−76 … +158 °F): | |
| 3–100 Hz | < 0.025 % of reading |
| 100–1000 Hz | < 0.082 % of reading |
| 1000–10 000 Hz | < 0.82 % of reading |

1) *Verified by measuring ±20 °C from ambient temperature, while ambient temperature spreads across the entire range.*
2) *Confidence level k=2.*
3) *Verified with DMU801 at 0 °C (+32 °F).*
4) *The given values are the maximum uncertainty percentages of single measurements. Average calculation gives better results.*

## Table 31 DMA803 inputs and outputs

| Property | Description/Value |
|---|---|
| Inputs | • 4 × differential analog inputs<br>• 2 × 0–30 V single-ended measurement channels<br>• 2 × frequency/counter measurement channels |
| Mating connectors | 4 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included) |
| Power output | Each port has a separate, software-controllable power output pin and a separate excitation pin |
| Heating output | Each port has separate heating power supply pins |
| A/D conversion | Low noise 24-bit A/D converter with internal diagnostics |

## Table 32 DMA803 powering specifications

| Property | Description/Value |
|---|---|
| Sensor supply voltage | 3–26 V, software-controllable |
| Current limit | 1.26 A, ±20 % per port |
| Sensor heating current limit | 2 A per plug-in module |

## Table 33 DMA803 mechanical specifications

| Property | Description/Value |
|---|---|
| Dimensions (H x D) | 123 × 79 mm (4.84 × 3.11 in) |

| Property | Description/Value |
|---|---|
| Distance between 2 plug-in module slots in DMU801 frame | 18 mm (0.71 in) |
| Weight | 64 g (2.26 oz) |
| Material | UL-rated fire-resistive FR4 |
| Handles | Stainless steel |
| Coating | Conformally coated against humidity |

**More information**

‣ Analog Measurement Modules DMA801, DMA802, and DMA803 (page 19)

# 17.5 DMS801 specifications

Table 34 DMS801 inputs and outputs

| Property | Description/Value |
|---|---|
| Ports | • 3 × serial ports for isolated RS-485<br>• 1 × multipurpose serial port supporting 2-wire RS-485, RS-232, and SDI-12 |
| Mating connectors | 4 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included) |
| Supported bit rate | 1200–115 200 bps |
| Power output | Each serial port has a separate, software controllable power output pin |
| Heating output | Each serial port has separate heating power supply pins |
| Signals, RS-232 | RXD, TXD, GND |
| Signals, RS-485 serial | D+/D− |
| Signals, RS-485 serial, isolated | D+/D− |
| **Note:** 4-wire RS-485/RS-422 is supported by using 2 × 2-wire RS-485. | |

Table 35 DMS801 powering specifications

| Property | Description/Value |
|---|---|
| Sensor supply voltage | 3–26 V, software controllable |
| Current limit | 1.4 A, −25 % … +20 % per port |
| Sensor heating current limit | 2 A per plug-in module |

Table 36 DMS801 mechanical specifications

| Property | Description/Value |
|---|---|
| Dimensions (H x D) | 123 × 79 mm (4.84 × 3.11 in) |
| Distance between 2 plug-in module slots in DMU801 frame | 18 mm (0.71 in) |
| Weight | 68 g (2.4 oz) |
| Material | UL-rated fire-resistive FR4 |
| Handles | Stainless steel |
| Coating | Conformally coated against humidity |

**More information**

- Serial Modules DMS801 and DMS802 (page 21)

# 17.6 DMS802 specifications

Table 37 DMS802 inputs and outputs

| Property | Description/Value |
|---|---|
| Ports | • 2 × standard RS-232 serial ports<br>• 1 × multipurpose serial port supporting 2-wire RS-485 and RS-232<br>• 1 × multipurpose serial port supporting 2-wire RS-485, RS-232, and SDI-12 |
| Mating connectors | 4 × Phoenix Contact DFMC 1,5/4-ST-3,5-LR (included) |
| Supported bit rate | 1200–115 200 bps |
| Power output | Each serial port has a separate, software controllable power output pin |
| Heating output | Each serial port has separate heating power supply pins |
| Signals, RS-232 | RXD, TXD, GND |
| Signals, RS-485 serial | D+/D– |
| **Note:** 4-wire RS-485/RS-422 is supported by using 2 × 2-wire RS-485. | |

Table 38 DMS802 powering specifications

| Property | Description/Value |
|---|---|
| Sensor supply voltage | 3–26 V, software controllable |
| Current limit | 1.4 A, –25 % … +20 % per port |
| Sensor heating current limit | 2 A per plug-in module |

Table 39 DMS802 mechanical specifications

| Property | Description/Value |
|---|---|
| Dimensions (H x D) | 123 × 79 mm (4.84 × 3.11 in) |
| Distance between 2 plug-in module slots in DMU801 frame | 18 mm (0.71 in) |
| Weight | 65 g (2.3 oz) |
| Material | UL-rated fire-resistive FR4 |
| Handles | Stainless steel |
| Coating | Conformally coated against humidity |

**More information**

- Serial Modules DMS801 and DMS802 (page 21)

# 17.7 DME801 specifications

Table 40 DME801 inputs and outputs

| Property | Description/Value |
|---|---|
| Ports | • 3 × copper ports, RJ45 connectors<br>• 2 × SFP module slots [1)] |
| Supported standard | IEEE 802.3 |
| Physical layer, copper ports | Base-T |
| Data rate | 10/100/1000 Mbps |
| Data transmission | Full/Half-duplex with auto-negotiation |

*1) Support for the second SFP module will be available in the future releases.*

Table 41 DME801 mechanical specifications

| Property | Description/Value |
|---|---|
| Dimensions (H × D) | 123 × 79 mm (4.84 × 3.11 in) |
| Distance between 2 plug-in module slots in DMU801 frame | 18 mm (0.71 in) |
| Weight | 65 g (2.3 oz) |
| Material | UL-rated fire-resistive FR4 |
| Handles | Stainless steel |



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| Property | Description/Value |
|---|---|
| Coating | Conformally coated against humidity |

**More information**

- Ethernet Switch Module DME801 (page 22)

# 17.8 DMB801 specifications

Table 42 BARO-1 specifications

| Property | Description/Value |
|---|---|
| Sensor type | Vaisala BAROCAP® (silicon capacitive) |
| Observation range | 500–1100 hPa |
| Resolution | 0.01 hPa |
| Operating temperature | −40 … +60 °C (−40 … +140 °F) |

Table 43 DMB801 measurement performance

| Property | Description/Value |
|---|---|
| Pressure range | 500–1100 hPa |
| Accuracy | Class A |
| Linearity [1)] | ±0.05 hPa |
| Hysteresis [1)] | ±0.03 hPa |
| Repeatability [1)] | ±0.03 hPa |
| Calibration uncertainty [2)] | ±0.07 hPa |
| Accuracy at +20 °C (+68 °F) [3)] | ±0.10 hPa |
| Total accuracy at −40 … +60 °C (−40 … +140 °F) | ±0.15 hPa |
| Temperature dependence [4)] | ±0.10 hPa |
| Long-term stability | ±0.10 hPa/year |
| Response time | 1 s |

1) *Defined as ±2 standard deviation limits of endpoint non-linearity, hysteresis error, or repeatability error.*
2) *Defined as ± 2 standard deviation limits of inaccuracy of the working standard including traceability to NIST.*
3) *Defined as the root sum of the squares (RSS) of endpoint non-linearity, hysteresis error, repeatability error and calibration uncertainty at room temperature.*
4) *Defined as ±2 standard deviation limits of temperature dependence over the operating temperature range.*

Table 44 DMB801 mechanical specifications

| Property | Description/Value |
|---|---|
| Dimensions (H × D) | 123 × 79 mm (4.84 × 3.11 in) |
| Distance between 2 plug-in module slots in DMU801 frame | 18 mm (0.71 in) |
| Weight | 88 g (3.1 oz) |
| Material | UL-rated fire-resistive FR4 |
| Handles | Stainless steel |
| Coating | Conformally coated against humidity |

**More information**

- Barometer Module DMB801 (page 23)

# 17.9 DMX801 specifications

Table 45 DMX801 inputs and outputs

| Property | Description/Value |
|---|---|
| Main antenna | SMA female connector |
| Antenna diversity | SMA female connector |
| GPS antenna | SMA female connector |
| **USB connection** | |
| Supported standard | 2.0 |
| Connector | USB-A |

Table 46 mPCIe card specifications

| Property | Description/Value |
|---|---|
| Type | Full-Mini Card |
| Dimensions (L × D × W) | 56 × 30 × 5 mm (2.20 × 1.18 × 0.20 in) |
| Max. (peak) current consumption | 2.75 A |
| Supported voltage | +3.3 V |

### Table 47 Supported modem modules

| Property | Description/Value |
|---|---|
| Model | Quectel EG25-G LTE Cat4 Mini PCIe [1)] |

*1) For more information, see the manufacturer documentation.*

### Table 48 DMX801 mechanical specifications

| Property | Description/Value |
|---|---|
| Dimensions (H × D) | 123 × 79 mm (4.84 × 3.11 in) |
| Distance between 2 plug-in module slots in DMU801 frame | 18 mm (0.71 in) |
| Weight, no modem included | 64 g (2.26 oz) |
| Weight with EG25-G mPCIe modem, 3 × antenna connectors, and SIM card | 86 g (3.03 oz) |
| Materials | UL-rated fire-resistive FR4 |
| Handles | Stainless steel |
| Coating | Conformally coated against humidity |

**More information**

- Modem Carrier Module DMX801 (page 23)

# 18. Vaisala services

## 18.1 Service centers

Vaisala offers comprehensive customer care throughout the life cycle of our products. Our service centers offer maintenance, calibration, upgrade, and repair services. All the services are provided worldwide with fast deliveries. For more information, go to vaisala.com/services.

The services are available from:

- Vaisala Online Store, store.vaisala.com
- Vaisala Services, helpdesk@vaisala.com

The provided services vary product by product.

## 18.2 Technical support



You can contact Vaisala technical support at vaisala.my.site.com/myvaisala or helpdesk@vaisala.com. You can find all our support channels at vaisala.com/support.
When contacting technical support, provide the following as applicable:

- Product name, model, and serial number
- Software/Firmware version
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information
- Diagnostics package for the application

If applicable, also provide the following details:

- What failed (what worked / did not work)?
- Where did it fail (location and environment)?
- When did it fail (date, immediately / after a while / periodically / randomly)?
- How many failed (only one defect / other same or similar defects / several failures in one unit)?
- What was done when the failure was noticed?
- What was connected to the product and to which connectors?
- What is the input power source type, voltage, and what else (such as lighting, heaters, and motors) was connected to the same power output?
- Are all parts connected and grounded properly? Take a photo to help the troubleshooting.

## 18.3 Warranty

For warranty terms and conditions and the warranty claim process, see vaisala.com/warranty.



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Note that warranty coverage may not apply if the product is damaged due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. See the applicable supply contract or Conditions of Sale for details of the warranty for each product.



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# Appendix A. DMU801 base unit pins

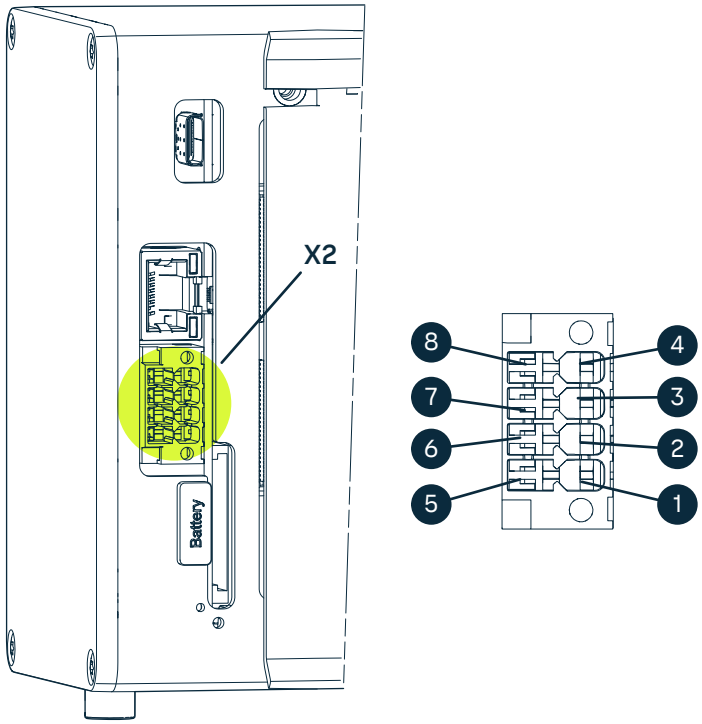
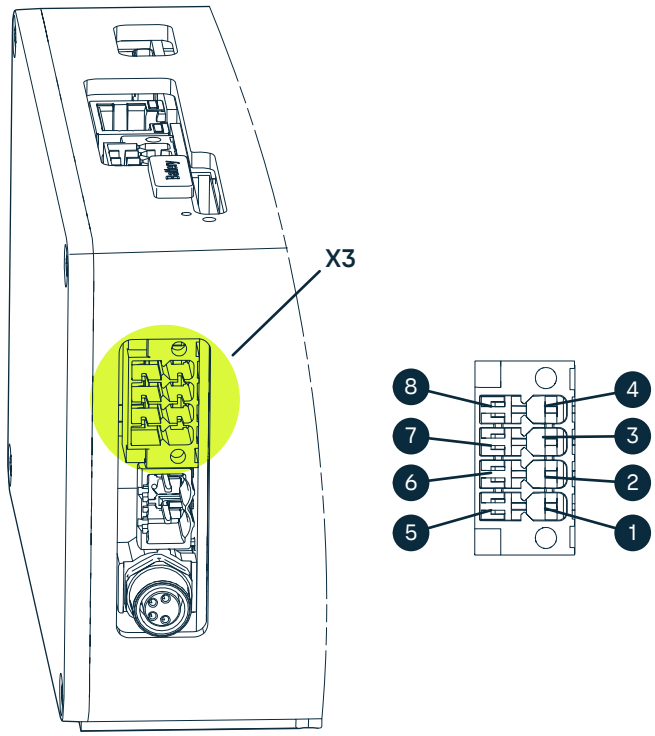



Figure 9 DMU801 serial connector **X2** pins

1 Vsupply
2 GPIO_X2.1
3 GPIO_X2.2
4 GND
5 Vsupply
6 D+
7 D−
8 GND




*1) SDI-12 support in future releases.*

Figure 10 DMU801 serial connector **X3** pins

1 Vsupply
2 GPIO_X3.1
3 GPIO_X3.2
4 GND
5 Vsupply
6 D+/TxD
7 D−/RxD/SDI-12 [1)]
8 GND

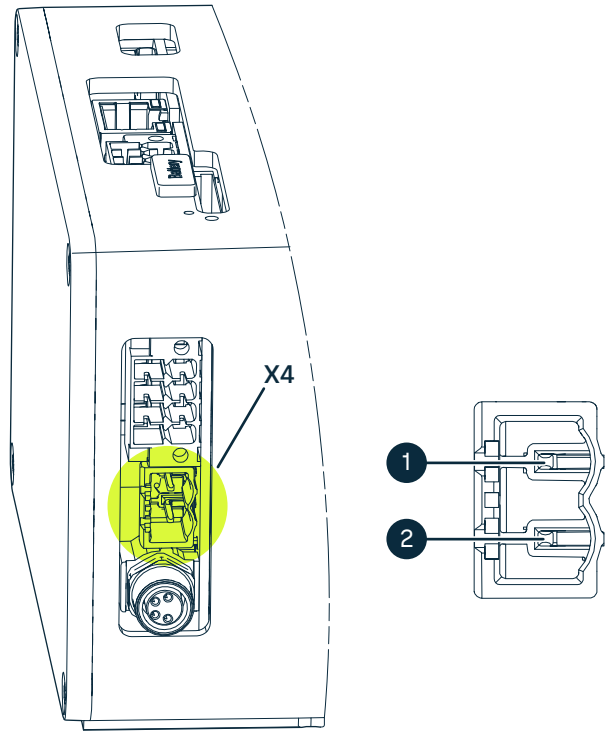



Figure 11 DMU801 power input connector **X4** pins

1 Power (+)
2 GND (−)

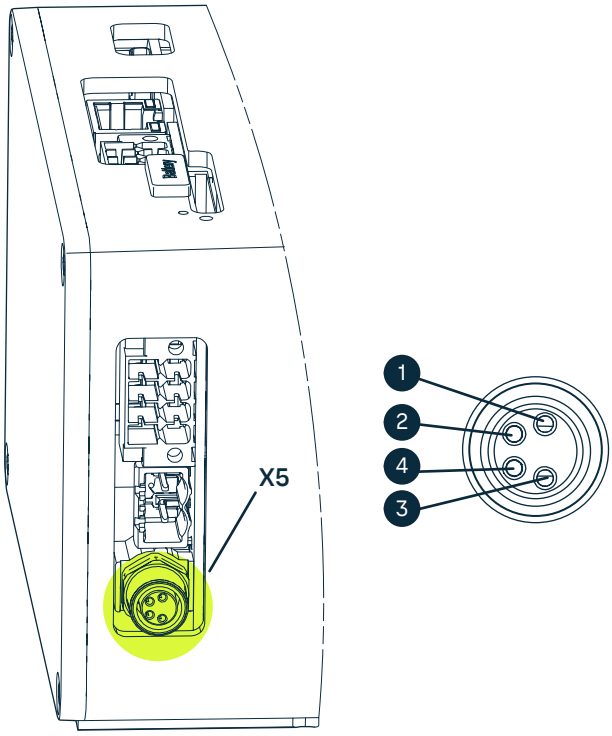



Figure 12 DMU801 serial connector **X5** pins

1 Power
2 D–
3 GND
4 D+

**More information**

- DMU801 base unit connectors and indicators (page 15)

# Appendix B. DMU801 plug-in module pins

The plug-in module slots are marked with letters and ports with numbers in Kaiku Designer.

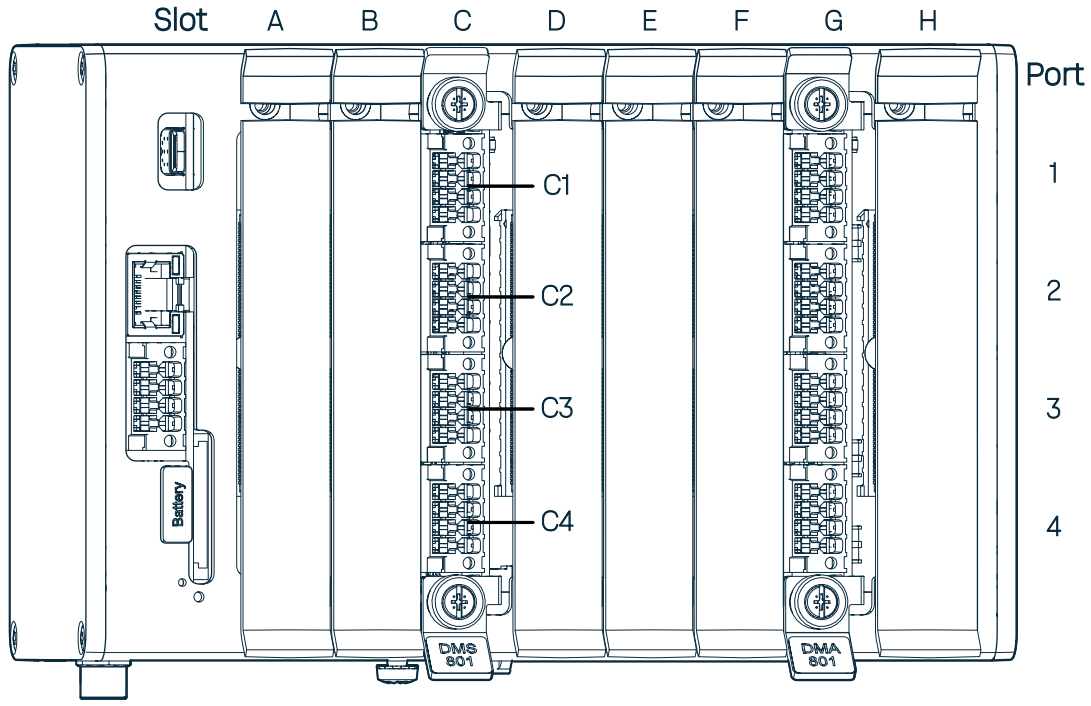
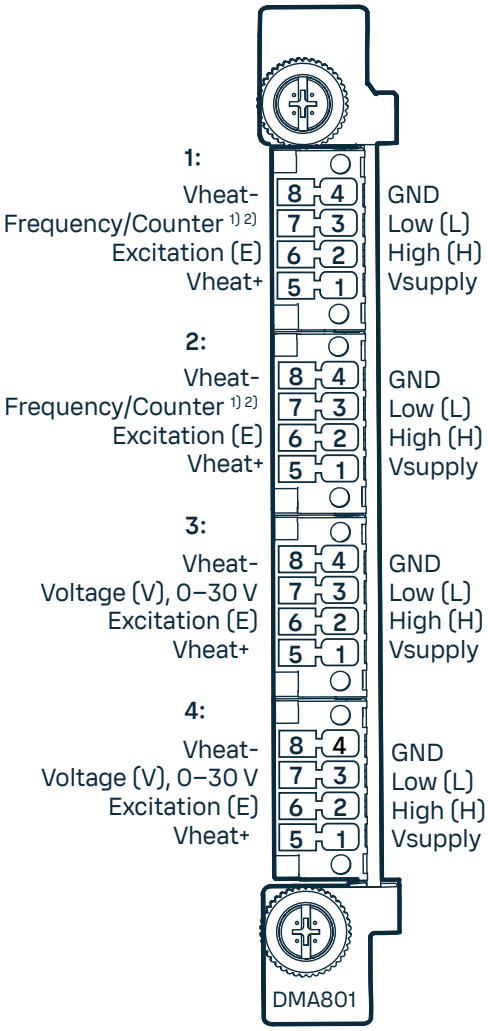



Figure 13 Plug-in module connector numbers




1) *DMA801 plug-in modules installed in DMU801 support a maximum of 2 frequency measurements. Even if you have several DMA801 plug-in modules, you can still use only 2 of the frequency/counter measurement channels in the modules. The channels must be different: use frequency/counter input of port **1** in one DMA801 module and frequency/counter input of port **2** in another DMA801 module.*
2) *Counter measurement in DMA801 is unavailable in DMU801 firmware versions 2.1.0–2.3.0. Frequency measurement in DMA801 is unavailable in DMU801 firmware versions 2.1.0–2.9.0.*

Figure 14 DMA801 pins

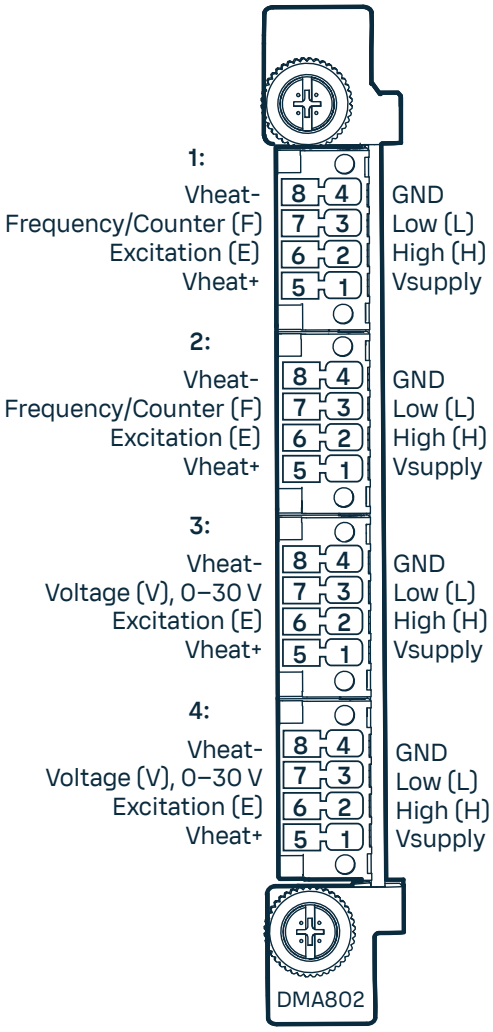



Figure 15 DMA802 pins

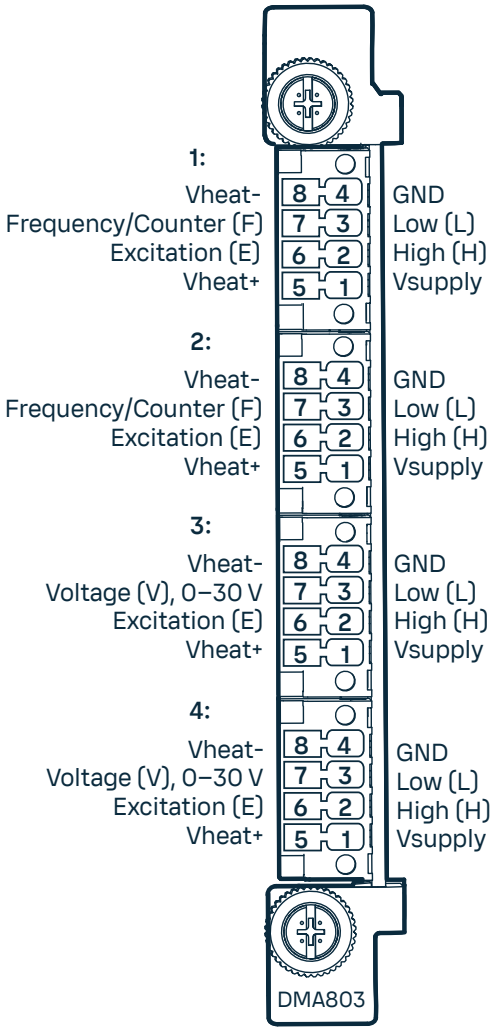



Figure 16 DMA803 pins

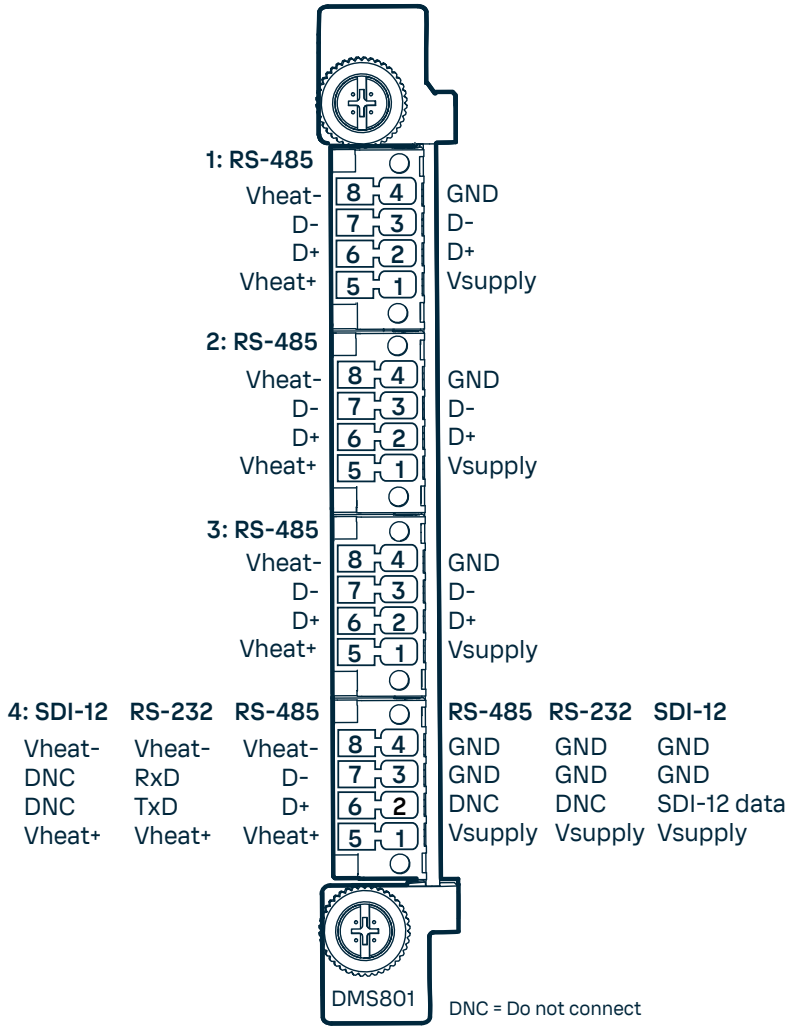



Figure 17 DMS801 pins

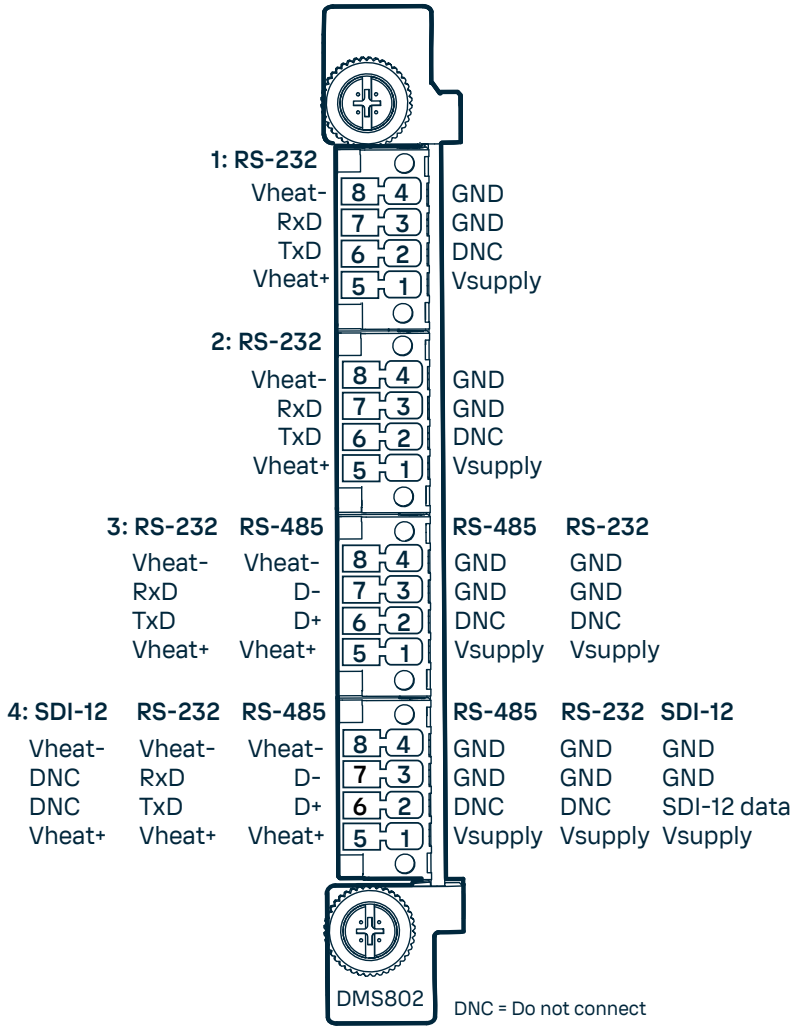



Figure 18 DMS802 pins

# Appendix C. Regulatory statements

## C.1 FCC/ISED regulatory notices

### Modification statement

Vaisala Oyj has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

*Vaisala Oyj n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.*

### Interference statement

This device complies with Part 15 of the FCC Rules and Innovation, Science and Economic Development Canada (ISED) licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

*Le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada (ISDE) applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

### Wireless notice

**Wireless notice** chapter applies to DMU801 devices that include Modem Carrier Module DMX801.
Approval IDs are attached to the modem module inside DMX801.

This equipment complies with FCC and ISED radiation exposure limits set forth for an uncontrolled environment. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

*Cet appareil est conforme aux limites d'exposition aux rayonnements de l'ISDE pour un environnement non contrôlé. L'antenne doit être installée de façon à garder une distance minimale de 20 centimètres entre la source de rayonnements et votre corps. L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.*

## FCC Class B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

*Cet appareil numérique de classe B est conforme à la norme canadienne NMB-003.*

# Appendix D. DMU801 spare parts and accessories

## Table 49 DMU801 spare parts

| Spare part | Order code |
|---|---|
| DMU801-2 | A1NNNNNNNNANN1NNN [1)] |
| DMU801-4 | A2NNNNNNNNANN2NNN [1)] |
| DMU801-8 | A3NNNNNNNNANN3NNN [1)] |
| Analog Measurement Module DMA801 | DMA801SP |
| Analog Measurement Module DMA802 | DMA802SP |
| Analog Measurement Module DMA803 | DMA803SP |
| Barometer Module DMB801 | DMB801SP |
| Serial Module DMS801 | DMS801SP |
| Serial Module DMS802 | DMS802SP |
| Ethernet Switch Module DME801 | DME801SP |
| Modem Carrier Module DMX801 with 4G modem | DMX801-4GSP |
| DMU801 connector set | 262822SP |
| Plug-in module connector set | 262861SP |
| Insulated connector ferrule (100 pcs) | 237754SP |
| 120 Ω termination resistor (10 pcs) | 240940SP |
| Current loop input adapter | DCA420SP |
| Battery holder (10 pcs) | DRW256364SP |

1) *With DMU801 configuration code you can define the DMU801 you want to order. You can select, for example, the number and type of plug-in modules to be included. For details and access to the order form, contact Vaisala.*

## Table 50 DMU801 accessories

| Accessory | Order code |
|---|---|
| SD memory card | SD32GSP |
| Plug-in module slot cover set | 284039SP |



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# Appendix E. Recycling instructions

These recycling instructions guide you on the end-of-life treatment of this Vaisala product. As waste regulations and infrastructure vary in each country, these instructions only indicate the different components to be separated and common ways to handle them. Always follow local requirements when disposing of the product. Vaisala encourages to use the best available recycling practices to minimize related environmental impacts.



Vaisala is committed to meeting the requirements of the EU Waste Electrical and Electronic Equipment (WEEE) Directive. This directive aims to minimize the impact of electrical and electronic goods on the environment, by increasing reuse and recycling, and reducing the amount of WEEE going to landfill. This symbol indicates that the product should be collected separately from other waste streams and treated appropriately.

If applicable, Vaisala recommends removing the battery unit before recycling the rest of the device as typical electronic waste. The battery unit can be recycled separately in accordance with local waste management practices and regulations. Integrated small sized batteries are typically left in place and removed by professionals at the recycling facilities.



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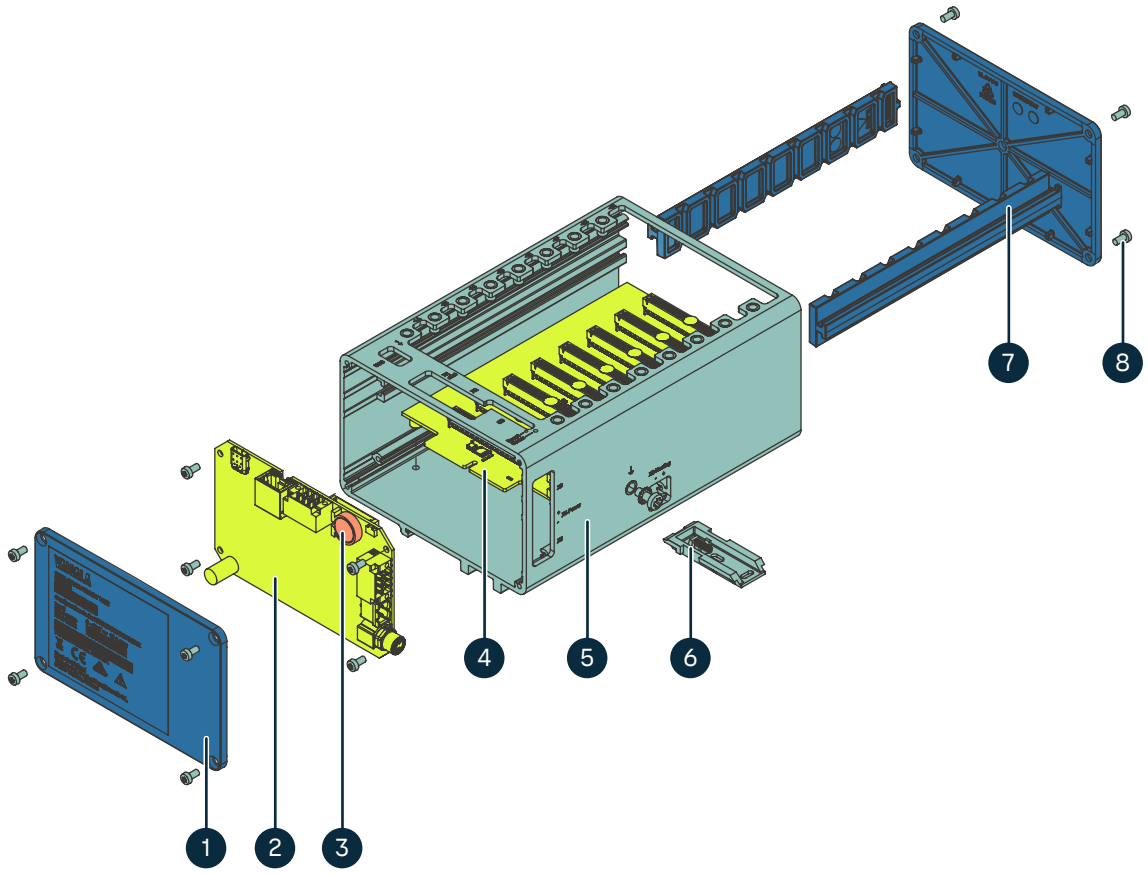



Figure 19 DMU801 parts for recycling

Table 51 DMU801 materials

| Recycling | Part | Description | Material |
|---|---|---|---|
| Battery waste | 3 | Battery, lithium 3 V 48 mAh CR1225 | Various |
| Electrical and electronic waste | 2 | Component board | Various |
| | 4 | Base board | Various |
| Metal waste | 5 | Frame | Aluminum |
| | 6 | Locking piece | Stainless steel |
| | 8 | Screws and washers | Stainless steel |
| Plastic waste | 1 | End cover | PC + ABS = Cycoloy® |
| | 7 | Plug-in module guide part | PC + ABS = Cycoloy® |

# Open-source software (OSS)

For licenses for the open-source software (OSS) used in this product, see the product user interface.

You may request a copy of certain open-source code as required by certain applicable OSS licenses by sending an email to opensourcesw@vaisala.com with the following subject line: *OSS source code request*.

# Security support

Vaisala provides security and software support for this product for 5 years from the date of purchase. During this period, Vaisala will:

- Monitor for and evaluate reported vulnerabilities
- Provide security updates or mitigation guidance as needed

If you believe that you have discovered a security vulnerability in this product, please contact us at security@vaisala.com.

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