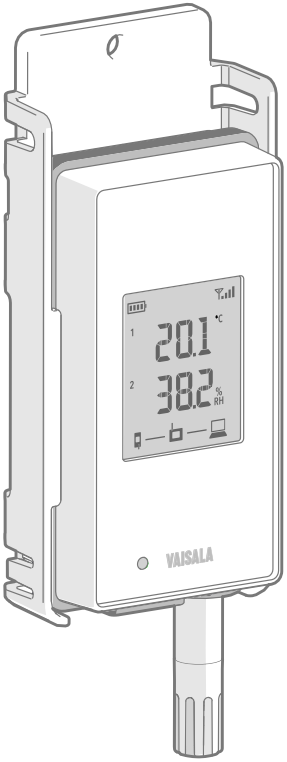
M211861EN-J

User Guide

Vaisala VaiNet Wireless Data Logger

RFL100



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1. About this document

1.1 Version information

This document provides instructions for installing, using, and maintaining Vaisala VaiNet Wireless Data Logger RFL100.

Table 1 Document versions (English)

Document code	Date	Description
M211861EN-J	October 2023	Updated for RFL100 firmware version 1.8.0 with support for VaiNet segments feature. Note that RFL100 devices with earlier firmware versions cannot join VaiNet network segments B–D, only segment A. Updated sections: • RFL100 overview (page 12) • Setting up RFL100 (page 29) • Problem situations (page 73) Added sections: • RFL100 models and radio compatibility (page 13) • VaiNet segments explained (page 26) • How RFL100 joins a VaiNet network (page 26) • Moving RFL100 to a different VaiNet segment (page 50)
M211861EN-H	March 2023	Added 500 MHz model. Updated sections: • Probe support accessory (page 41) • Service port (page 23) • Downloading data using service port (page 76) • Updating RFL100 firmware (page 70) • RFL100 technical specification (page 79)
M211861EN-G	October 2021	Added 922 MHz model. Updated sections: • RFL100 technical specification (page 79) • Accessories and spare parts (page 82)

1.2 Related manuals

Table 2 Related manuals

Document code	Name
M211822EN	Vaisala RFL100 VaiNet Wireless Data Logger Quick Guide
M211821EN	Vaisala AP10 VaiNet Wireless Access Point Quick Guide

Document code	Name
M211860EN	Vaisala AP10 VaiNet Wireless Access Point User Guide
M211799EN	Vaisala GMP251 Carbon Dioxide Probe User Guide
M211060EN	Vaisala HMP60 and HMP110 Series Humidity and Temperature Probes User Guide
M212315EN	Vaisala viewLinc Enterprise Server 5.1 User Guide

1.3 Documentation conventions

WARNING! Warning alerts you to a serious hazard. If you do not read and follow instructions carefully at this point, there is a risk of injury or even death.

CAUTION! Caution warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.

Highlights important information on using the product.

Gives information for using the product more efficiently.

Lists tools needed to perform the task.

Indicates that you need to take some notes during the task.

1.4 Trademarks

Vaisala®, CARBOCAP®, and HUMICAP® are registered trademarks of Vaisala Oyj.

2. Product overview

2.1 RFL100 overview

Vaisala RFL100 data logger is a wireless, battery powered data logger. It supports several types of Vaisala probes for measurement of humidity, temperature, and carbon dioxide (CO_2). RFL100 is intended as a data collection point in a Vaisala viewLinc Monitoring System.

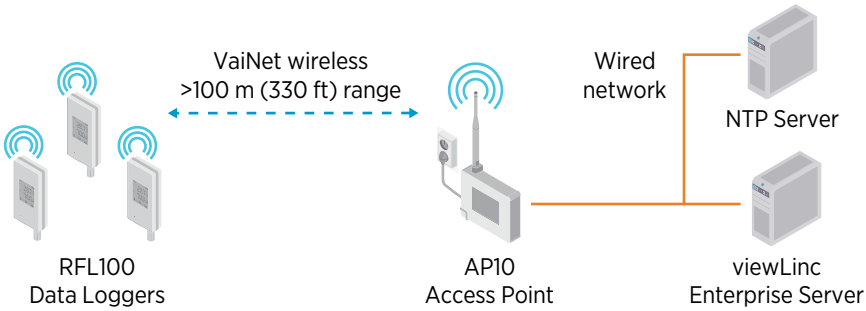


Figure 1 Connecting RFL100 to the viewLinc Monitoring System

The wireless connection of RFL100 requires a Vaisala AP10 access point. A single AP10 can connect up to 32 loggers to the viewLinc Monitoring System. In a typical indoor space, install the AP10 within 100 meters (328 ft) of the RFL100. In an open space with line-of-sight and no interfering structures, the range can be over 500 m (1640 ft).

RFL100 is optimized for low power operation. It reads the probe once a minute, and transmits measurement data to the access point every 4 minutes. Because the radio link is not continuous, remote management actions and system joining status may take some time to be updated on the display of the data logger.

Before you start installing RFL100 data loggers, install viewLinc Enterprise Server and one or more AP10 access points within range of RFL100. This way RFL100 can immediately join your system.
For more information on viewLinc Monitoring System installation, see the *viewLinc Setup Guide* and *viewLinc User Guide* for your viewLinc Enterprise Server version.

More information

- RFL100 technical specification (page 79)

2.1.1 Probe interface

The interface between RFL100 and the detachable probes is digital. RFL100 reads the measurement results from the probe(s) and stores them in its own memory using the following resolution:

- RH is stored with resolution of 0.1 %RH
- T is stored with resolution of 0.05 K
- CO_2 is stored with resolution of 100 ppm (0.01 %)

Storing the measurement samples using these optimized resolutions allows smaller storage size and faster transfer speed. The same resolutions are used when the samples are sent and stored to viewLinc Enterprise Server.

Local display of RFL100 shows the latest temperature measurements using one decimal place. This does not affect the internal resolution of temperature measurement in any way.

Logged temperature data is limited to range −40 ... +60 °C (−40 ... +140 °F) when a CO_2 measurement probe is connected.

The probes contain their own identifying information (such as serial number) and information about the latest calibration (calibration date and information text string). RFL100 makes this information available to viewLinc. If a probe is replaced or the calibration information is changed, the information in viewLinc is automatically updated.

2.2 RFL100 models and radio compatibility

There are several models of the RFL100 data logger. The models differ from each other by the implementation of the wireless connection and its operating frequency band. Only use a model that is approved for use in your country. You can verify the model and operating frequency of the RFL100 from its type label.

The RFL100 can only connect to an AP10 access point if its wireless model is compatible. For example, the AP10E model that operates on the 868 MHz frequency band will only connect 868 MHz models of the RFL100 data logger.

2.3 Probe options

Probe	Description [1)]	Installation notes
HMP110, HMP110T, and HMP110REF 	**Humidity and temperature** probe for measurement in demanding conditions. Robust stainless steel construction. Temperature-only version HMP110T available. Plastic grid filter provides the fastest response time. For added protection, select the membrane filter, the PTFE filter, or the stainless steel sintered filter. Measurement temperature range −40 ... +80 °C (−40 ... +176 °F).	Suitable for measurement inside chambers, incubators, fridges, and freezers. Versatile mounting options using accessories. Must be connected to RFL100 using a cable. A constant output probe version HMP110REF is also available for validating installations. The constant output version does not measure – instead, it outputs unchanging humidity and temperature values.
HMP115 and HMP115T 	**Humidity and temperature** probe for general purpose measurement. Temperature-only version HMP115T available. Plastic grid filter provides the fastest response time. For added protection, select the membrane filter or the PTFE filter. Measurement temperature range −40 ... +60 °C (−40 ... +140 °F).	Ideal choice for ambient measurement. Can be integrated with the RFL100 housing or connected using a cable.
TMP115 	**Temperature** probe for measurement in a wide range of conditions. Available as 50 cm (1 ft 7.7 in) and 3 m (9.8 ft) long versions. Length includes the probe body and sensor tip. Measurement temperature range −196 ... +90 °C (−320 ... +194 °F). Operating temperature range of the probe body is −40 ... +60 °C (−40 ... +140 °F).	Suitable for measurement inside chambers, fridges, and freezers. Can be integrated with the RFL100 housing or connected using a cable. Sensor tip withstands immersion in glycol and liquid nitrogen. Use the thermal dampener block accessory (item code 236310SP) to add thermal mass to the sensor tip.

Probe	Description [1)]	Installation notes
GMP251 	**Carbon dioxide** probe for %-level measurements. Designed for use in demanding applications such as life science incubators. Measurement temperature range −40 ... +60 °C (−40 ... +140 °F). When ordered with the RFL100 data logger, the probe is delivered with a mounting kit that includes a probe holder designed for use with GMP251 and the other supported probes. The kit also includes a magnetic holder for the Probe Splitter M8/M12 accessory.	Must be connected using the Probe Splitter M8/M12 accessory. Any one of the other supported probes can be connected at the same time in the M8 connector of the probe splitter. Requires use of external power supply due to power consumption. Data logger batteries provide a backup in case the external power is not available. Logged temperature data is limited to range −40 ... +60 °C (−40 ... +140 °F) when GMP251 is connected.

1) See probe datasheets for detailed probe specifications.

2.4 RFL100 parts

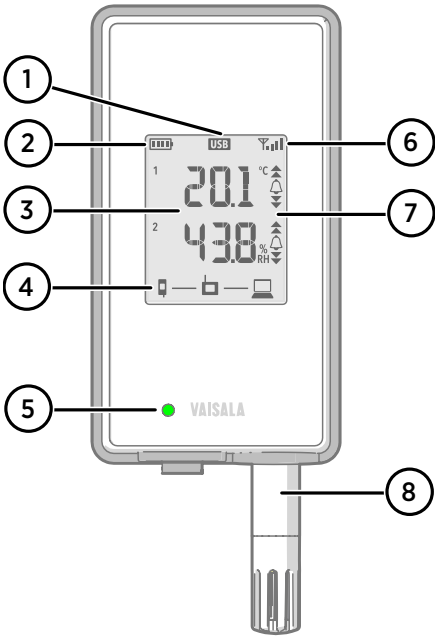


Figure 2 Front and display

1 Service port connection indicator
2 Battery level indicator
3 Currently measured values
4 Connection indicators
5 Status LED. Blinks green for normal operation, red for error or alarm.
6 Signal strength of access point connection
7 Alarm indicators. Alarms are configured in viewLinc Enterprise Server software.
8 Detachable probe, or extension cable

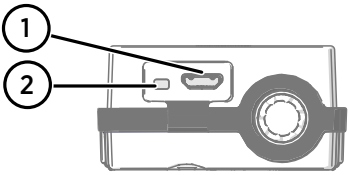


Figure 3 Under the silicone plug

1 Service port (micro-USB). If using external power supply, connect it here.
2 **Info** button. Push to enable info mode for 1 hour, and again to end the info mode. Info mode cycles through information screens, and also enables faster wireless scanning.

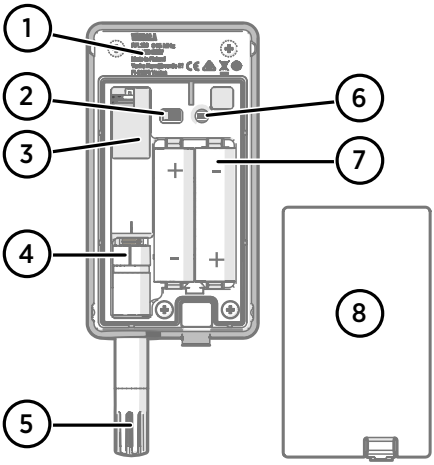


Figure 4 Rear and inside

1 Type label
2 On/off switch
3 Clock battery
4 Probe orientation mark. When connecting the probe, line up the markings on the probe and above the connector before pushing the probe to the connector.
5 Humidity and/or temperature sensors under the filter
6 **Release** button. Push to release RFL100 from its current viewLinc system, and allow it to connect to any viewLinc system.
7 Main batteries. Use only non-rechargeable, AA size, 1.5 V alkaline (LR6) or lithium (FR6) batteries.
8 Battery cover

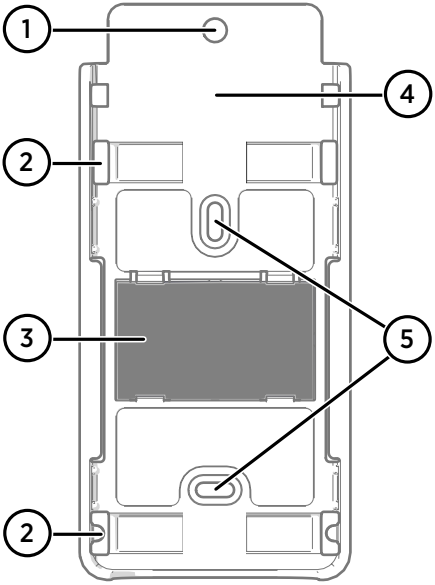


Figure 5 Mounting bracket

1 6 mm (0.23 in) hole for hook mounting
2 Holes for mounting with cable ties
3 Strong magnet (in magnetic mounting bracket only). **Handle with care.**
4 Suitable area for attaching labels
5 3.80 mm (0.15 in) holes for screw mounting

2.5 RFL100 batteries

Main batteries

RFL100 data logger is powered by 2 AA size primary (non-rechargeable) batteries with 1.5 V nominal voltage. Starting the data logger always requires that compatible batteries with sufficient voltage are in place, even if external power is supplied through the service port.

When replacing batteries, always use new batteries, not partially discharged ones. Minimum battery voltage for operation is 2.15 V in series.

Compatible battery types are:

- 1.5 V alkaline batteries, designation IEC-LR6, ANSI 15A. Standard choice for most humidity and temperature measurement applications.
- 1.5 V lithium batteries, designation IEC-FR14505 (FR6), ANSI 15-LF. Typically higher capacity and better in cold temperatures. Recommended for CO_2 measurement as lithium batteries provide a longer battery backup time if external power becomes unavailable.

CAUTION! Do not use batteries with a nominal voltage higher than 1.5 V.

Use of rechargeable batteries is not recommended. RFL100 will not charge batteries even if the service port is connected to a power supply.

Clock battery

RFL100 also has a separate 3 V lithium battery (type CR1/3N button cell) to keep the real-time clock powered when the device is switched off. This battery is good for 10 years, and should only be replaced if the data logger display shows the low clock battery error code **Err 200**.

2.5.1 Battery level indicator

Battery level indicator displays an estimate of the capacity remaining in the main batteries of the data logger. It is based on typical behavior of alkaline batteries in this application.

Table 3 Battery level indicator

Symbol on display	Description
	Full batteries.
	One quarter of battery capacity used.
	Half of the battery capacity used.

Symbol on display	Description
	Low battery alarm is activated by viewLinc at this level. Remaining battery capacity is typically enough for 2 ... 4 weeks of non-CO_2 measurement operation. Replace batteries.
	Battery voltage is too low to support radio communication. Data logging continues locally until battery voltage is too low. The last bar of the battery symbol is flashing and error code **Err 103** is shown on the display. Replace batteries immediately.
	Battery voltage is too low for operation. Data logging is stopped. Only the empty battery symbol is shown on the display. Replace batteries to resume normal operation.

2.6 Connection indicators

Table 4 Symbols

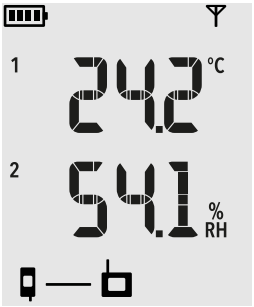
Symbol	Description	Symbol	Description
	Data logger		Connection OK
	Access point		Connection currently unavailable
	viewLinc Enterprise Server		

Table 5 Connection states

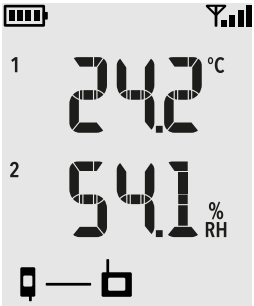
Symbols on display	Description
	Data logger is searching for an access point.
	Data logger has failed to find an access point that is in installation mode. viewLinc server icon is not shown, as the data logger has not been accepted to a viewLinc system yet.
	The data logger has failed to connect to an access point that belongs to its own network.
	Data logger is successfully connected to an access point, but there is no connection between the access point and viewLinc server. Data logger has not been accepted to a viewLinc system yet.

Symbols on display	Description
	Data logger is successfully connected to an access point, but there is no connection between the access point and viewLinc server. Data logger has been accepted to a viewLinc system.
	Data logger is successfully connected to an access point, and connection between the access point and viewLinc server is also OK. The viewLinc symbol is flashing to indicate that the data logger is waiting to be accepted to the viewLinc system as a new device.
	Data logger is successfully connected to an access point, and connection between the access point and viewLinc server is also OK. Data logger has been accepted to the viewLinc system.

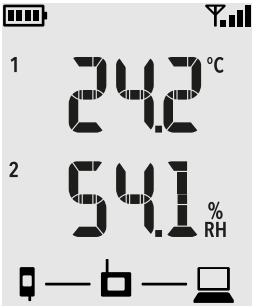
2.6.1 Connection examples



Looking for an access point to join: Line between data logger and access point symbols is blinking, and signal strength indicator shows no bars.



Connected to an access point but viewLinc Enterprise Server not discovered yet: Signal strength indicator shows the strength of the access point connection.



Full connectivity: Data logger has discovered a viewLinc Enterprise Server and is connected to it through the access point. You can now log in to the viewLinc Enterprise Server and accept the device to the system.

2.7 Signal strength indicator

Signal strength indicator shows the strength of the signal from the currently connected access point. The indicator is updated when the data logger communicates with the access point, once every 4 minutes.

Table 6 Signal strength indicator

Symbol on display	Description
	No indicator. Radio temporarily shut down between access point connection attempts.
	Antenna symbol but no signal bars. Radio is on but data logger is not currently connected to an access point.
	Antenna symbol with 1–4 signal bars. Data logger is connected to an access point. The bars indicate the signal strength of the latest received message.

Any signal strength level is fine as long as the data logger stays continuously connected. A communication break will cause viewLinc Enterprise Server to trigger a **device communication alarm** for the affected device. If a data logger is causing repeated communication alarms, it does not have a reliable access point connection. Consider relocating or adding an access point to provide a better signal.

2.8 Alarm indicators

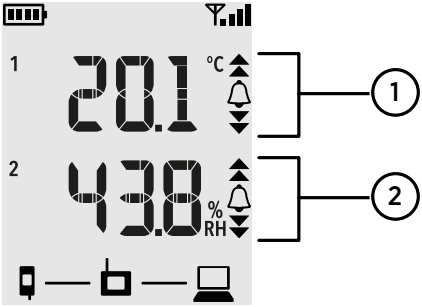


Figure 6 Alarm indicators on RFL100 display

1 Alarm indicators for channel 1
2 Alarm indicators for channel 2

Table 7 Alarm symbols

Symbol on display	Description
	High-high threshold alarm active.
	High threshold alarm active.
	Alarm bell symbol that is always shown when any threshold alarm is active on this channel.
	Low threshold alarm active.
	Low-low threshold alarm active.

RFL100 can show active threshold alarms on its local display. When a threshold alarm is active on RFL100, the appropriate alarm indicators will be shown on the display. Additionally, the LED will flash red for high-high and low-low threshold alarms.

Threshold alarms cannot be configured locally on the RFL100 itself; they are configured using viewLinc Enterprise Server software. When applying a threshold alarm template to a Location, you can choose to show the alarms on the data logger that is linked to the location. To show the alarms, enable the **Send to device** setting, and then enable **Alarm on Device** for each threshold that you want to generate an alarm on the RFL100.

On the RFL100, only one set of thresholds can be active at a time for one channel. The latest set that is pushed to the device replaces the previous one. The **Send to device** setting of any previously sent threshold alarm is automatically set to **No**.

RFL100 does not implement the **Alarm Delay** and **Alarm off margin** settings of viewLinc threshold alarms. Local alarm status on RFL100 changes as soon as the measured values cross the thresholds.

2.8.1 Alarm examples

Figure 7 RFL100 with high alarm active on channel 1

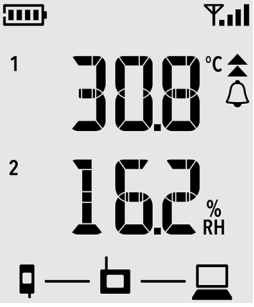


Figure 8 RFL100 with high-high alarm active on channel 1

2.9 Service port

The service port of the data logger provides a local interface for performing service actions that cannot be done over the air, such as updating the device firmware. The service actions are based on file transfer using Media Transfer Protocol (MTP), so no special software is needed. The service port connector is a standard micro-USB connector.

The service port can be used to supply operating power to the data logger. Use a power supply that fulfills the requirements listed in Table 20 (page 82).

Batteries with a sufficient voltage must always be in place inside the data logger when the data logger is started, even when supplying external power through the service port.

CAUTION! When using an external power supply, the main batteries will be drained very slowly. As alkaline batteries may leak when left in place for a long time, always use compatible 1.5 V lithium batteries instead of alkaline batteries when using an external power supply.

2.9.1 Files and folders in USB filesystem

Following files and folders are present in the USB filesystem of the data logger. Vaisala support may request files from the data logger to help with solving your support request.

Except for the *\Data\Update* folder that is used to load the firmware update file, the filesystem is read-only.

Table 8 Files and folders in USB filesystem

Path and file	Content
\Data\Licenses.zip	Contains the licenses and notices for open source software used in this product.
\Data\Configuration\Diagnostics.txt	Summary of error code activations.
\Data\Configuration\Parameters.json	Configuration parameters of the data logger.
\Data\Configuration\State.json	Current time and state flags of the data logger.
\Data\Configuration\Version.json	Product code and firmware version of the data logger.
\Data\Log\EventLog.txt	Event history for the data logger.
\Data\Log\Log_1h.txt	Measurement data from the past hour.
\Data\Log\Log_24h.txt	Measurement data from the past 24 hours.
\Data\Log\Log_30d.txt	Measurement data from the past 30 days.
\Data\Update	Folder for firmware update. Copy the firmware update file here to start the update.

2.10 Data transfer in a VaiNet network

VaiNet protocol and VaiNet devices are designed for power-efficient operation. To save energy and reduce signal overlap, VaiNet network transfers data at set intervals. This may be apparent to the user as longer data transfer times before the data is available in the viewLinc Enterprise Server.

Intermittent radio connections

Access points take turns communicating in a 2-minute cycle, and connected data loggers send their measurement data to their connected access point every 4 minutes. This introduces the following scenarios:

- Data loggers that are not currently connected (new devices, or devices that have fallen out of radio contact) scan for available access points for a complete cycle before they can decide what is the optimal access point for them. Connection attempts typically take at least a couple of minutes. Additionally, some joining scenarios may take multiple attempts. For example, when filling a single access point up to its full capacity of 32 data loggers, it may take an hour for the last data logger to successfully connect to the access point.
- Access points request missing data and issue management commands to data loggers within their communication window. Transferring a full month's worth of measurement data from 32 data loggers using 1 access point takes several hours.

Data logger scanning interval

Scanning for available access points consumes power. To prevent repeated scanning from draining their batteries, RFL100 data loggers that are not connected to an external power supply shut down their radio temporarily if they cannot connect to an access point. They will resume scanning after a waiting interval that gets progressively longer if they keep failing to find an access point. The maximum interval is 8 hours and 30 minutes.

This means that when access points become available after an outage, it may take several hours for data loggers to discover them. This is why you should always keep your access points powered up, and why you should start your network installation by installing the viewLinc Enterprise Server and access points first.

You can manually wake up the radio of an RFL100 data logger by pressing its **Info** button. The button is located next to the service port under the silicone plug.

More information

- Info mode (page 46)

2.11 How RFL100 joins a VaiNet network

1. When you switch on an RFL100 data logger that is not connected to a VaiNet network, it turns on its radio and scans for VaiNet access points that are in **installation mode** and have **available capacity**. This means you must first install the necessary access point(s) and make sure they are in installation mode.

   RFL100 will turn off its radio and try again later if there are no access points that meet the criteria. This can add a long joining delay as the retry interval becomes longer with repeated attempts, up to a maximum of 8 h 30 min.

2. After determining there is at least 1 access point that can be joined, the RFL100 connects to the access point with the **best signal strength**.
   This initial connection also determines the **VaiNet segment** of the RFL100, as the segment of its first connecting access point becomes its home segment. A data logger will not leave its home segment unless it is released from the network.

   Support for VaiNet network segments was added in AP10 access point firmware version 5.0.0. If your access points are using an earlier firmware version, your VaiNet network does not have segments.
   RFL100 data loggers with firmware earlier than 1.8.0 can only join access points in the default A segment, and cannot join segments B–D.

3. The connected RFL100 comes up in the connected viewLinc system as a new device. No measurement data is transferred and stored until the RFL100 is **accepted** into the system by a viewLinc administrator. If the RFL100 has been previously accepted and is now joining again, this step is skipped.
4. If the RFL100 is rejected, it clears its VaiNet home segment information and starts the joining process from the beginning by scanning for access points to join.

2.12 VaiNet segments explained

The VaiNet segmentation feature splits the local VaiNet radio network into segments. Each segment can have up to 8 access points, 1 for each VaiNet channel. Up to 4 segments can be created, identified using letters A–D.

Segmentation provides significant benefits for the building of larger VaiNet networks:

- Overlapping radio transmissions have been significantly reduced as each segment has a different timing offset for its VaiNet radio communication.
- The access point switching behavior of data loggers is more controlled. Data loggers only connect to access points of their home segment, and ignore the other segments.

Segment configuration is done on the access point using the web interface or the local touch interface. Starting with AP10 access point firmware version 5.0.0, there is a new **VaiNet segment** configuration parameter. This new setting is part of the VaiNet radio settings. The setting is mandatory, so every VaiNet network has at least one segment. The segment and channel combination of each access point must be unique on the site.

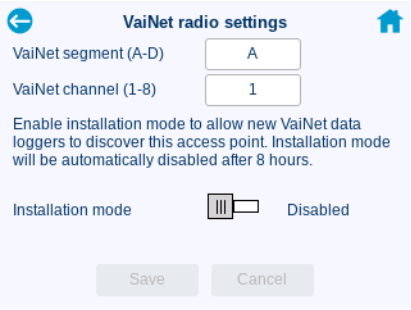


Figure 9 VaiNet segment setting in the AP10 touch interface

Data loggers do not have a configurable segment setting, as their segment is automatically determined by the access point they use to join the system. When a data logger connects to an access point that is in installation mode, the segment of its connecting access point becomes its **home segment**. A data logger will not leave its home segment unless it is remotely released from the network or its physical **Release** button is pressed. For example, if a data logger is connected to access point B1 (VaiNet segment B, channel 1), it will only connect to other access points in the B segment if it loses its current access point connection.

If the segment setting of an access point is changed, all data loggers that are currently connected to it will lose their connection. They will automatically attempt to reconnect to any remaining access point in their home segment. They will not be transferred to the new segment of the access point.

To make sure all data loggers are assigned to the planned segment, the installation of data loggers in a large system should proceed one segment at a time.

For guidance in designing and installing a large system, see Guidelines for Large VaiNet Systems (M212596EN).

2.13 Safety

WARNING! Read the product documentation carefully before installing or operating the product. If you encounter the following marking during installation or operation, consult product documentation to find out the nature of the potential hazards and any actions which have to be taken to avoid them:

CAUTION! The optional magnetic mounting bracket of the RFL100 has a strong magnet. Handle it with care and keep it away from devices that are sensitive to magnetic fields (for example, pacemakers, magnetic cards, and mechanical watches.)

2.14 ESD protection

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

Avoid touching component contacts or connectors when working with the device.

3. Installation

3.1 Installation safety specification

Table 9 RFL100 installation safety specification

Property	Specification
Operating environment	Indoor use
For use in wet locations	No
Operating humidity	0–100 %RH, non-condensing
Operating altitude	Max. 2000 m (6500 ft)
IP rating	IP54: Limited protection against dust. Protected from water splashes from any direction.
IP rating with external power supply	IP20: Protected against solid foreign objects of 12.5 mm Ø and greater.
Pollution degree	2
Frequency band	See type label on device
Batteries	2 × AA sized, 1.5 V (LR6 or FR6)
Supply voltage from external power supply	5 V DC
Power consumption	Max. 1 W
Operating temperature [1)]	
with alkaline batteries	+2 ... +60 °C (+35.6 ... +140 °F)
with lithium batteries	−20 ... +60 °C (−4 ... +140 °F)
with external power supply	0 ... +60 °C (+32 ... +140 °F)

1) *Verify operating temperature specification when using batteries and power supplies not supplied by Vaisala.*

3.2 Setting up RFL100

Start the installation of RFL100 by performing the appropriate setup procedure:

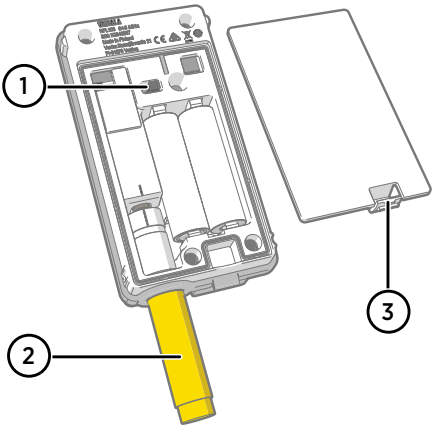
- If you are connecting 1 humidity or temperature probe, see Setup with 1 humidity or temperature probe (page 30).
- If you are connecting 2 temperature probes using the probe splitter accessory, see Setup with 2 temperature probes (page 32).
- If you are connecting a carbon dioxide (CO_2) probe, see Setup with CO_2 probe (page 35).

If you are unfamiliar with the way RFL100 data loggers join the VaiNet system, see How RFL100 joins a VaiNet network (page 26).

If you are installing data loggers into a system that takes advantage of VaiNet network segmentation, see Guidelines for Large VaiNet Systems (M212596EN) for important compatibility information and additional setup guidance.

CAUTION! viewLinc Enterprise Server version 5.0 or higher is required for connecting RFL100 data loggers. Setup instructions include additional firmware and hardware requirements for using RFL100 with 2 temperature probes, or a CO_2 probe. Make sure the components of your viewLinc Monitoring System are updated to the required levels.

3.2.1 Setup with 1 humidity or temperature probe



1 Power switch.
2 Transport protection cap (remove after installation)
3 Latch of the battery cover.

1. If any cable is connected to the service port of the data logger, disconnect it.
2. Open the battery cover of the data logger.
3. Make sure the power switch is in the **Off** position.
4. If a probe is not already connected to the data logger, connect it now:
   - To connect a probe directly to the data logger, first align the orientation mark on the probe with the line above the probe connector. Then push the probe in all the way, do not rotate.
   - To connect a probe using an extension cable, use an accessory cable that has been designed for RFL100. Insert the cable connector in the same way as a probe, and then connect the probe to the cable. Note that HMP110 and HMP110T probes must always be connected using a cable as they do not mechanically lock into the data logger when the battery cover is closed.

5. Move the power switch to the **On** position.
6. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe (or extension cable) in and try again.
7. Look at the display and wait for the data logger to start up. Then verify the status:
   - Data logger shows the word **NEW** on each affected channel when it detects that a probe has been changed [1]. The text is shown for a few seconds, after which the display shows the measurement reading(s).

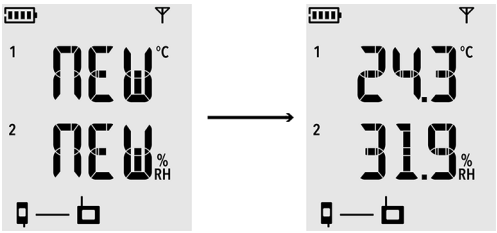
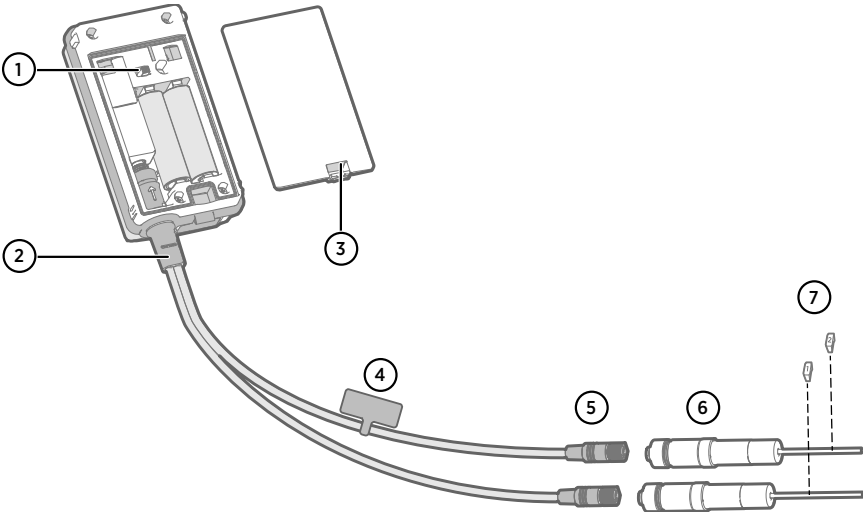


Figure 10 Detection of a new RH + T probe

   - If dashes "- - -" are shown instead of measurement readings, check that the probe is properly connected. It is possible to disconnect the probe or cable by pulling it with the battery cover open.
   - Battery indicator should show full batteries .
   - There should be no error codes shown. If there are, see Error codes (page 74).

1) *This feature is included in RFL100 firmware version 1.2.0 and newer.*

3.2.2 Setup with 2 temperature probes



1 Power switch
2 Probe splitter
3 Latch of the battery cover
4 Instruction label with short version of this setup instruction
5 Probe connectors of the probe splitter
6 Temperature probes
7 Numbering labels for TMP115 probes (included in the probe mounting accessories)

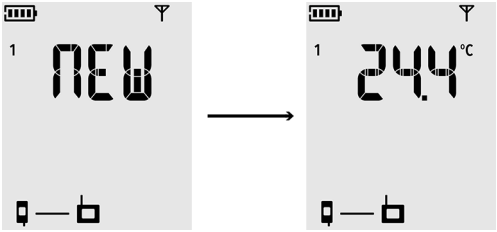
- 2 temperature-only probes of following models: HMP110T, HMP115T and TMP115 (any combination)
- Probe splitter M8 (Vaisala item code CBL210834)
- Optional: probe extension cable(s)

CAUTION! To support operation with 2 temperature probes, the RFL100 data logger must have firmware version 1.2.0 or higher. Additionally, make sure the following components of your viewLinc Monitoring System are updated to at least the following firmware and software levels:

- AP10 firmware version 3.0
- viewLinc 5.0.2

CAUTION! You must follow the procedure below to set up RFL100 with the probe splitter. The procedure includes steps to label the probes to make it easy to identify the channel assignment later. You can also use the info mode of the RFL100 to check which probe serial number is connected to which channel.

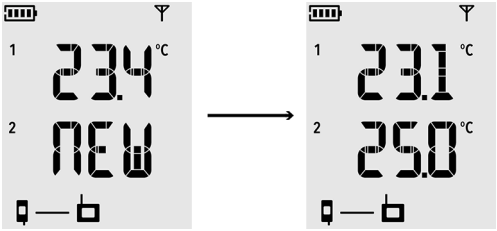
1. If any cable is connected to the service port of the data logger, disconnect it.
2. Open the battery cover of the data logger.
3. Make sure the power switch is in the **Off** position.
4. If the probe splitter is not yet connected to the data logger, connect it:
   a. If a probe or cable is currently connected to the probe connector, pull it straight out without rotating it.
   b. Align the orientation mark on the probe splitter with the line above the probe connector. Push the probe splitter straight in all the way, do not rotate.
5. Connect the first temperature probe to the probe splitter, using an extension cable if necessary. The first connected probe will be assigned to channel 1.
6. Move the power switch to the **On** position.
7. Look at the display and wait for the data logger to start up. You should see the word **NEW** on channel 1 for a few seconds, after which it is replaced by the temperature reading.



8. Attach a label with number 1 to the probe you just connected.

   If you are using TMP115 probes, use the included probe labels. Connect the label to the thin cable between the probe body and the sensor tip.
9. Move the power switch to the **Off** position.
10. Connect the second temperature probe to the probe splitter, using an extension cable if necessary.
11. Move the power switch to the **On** position.

12. Look at the display and wait for the data logger to start up. You should see the word **NEW** on channel 2 for a few seconds, after which it is replaced by the temperature reading.



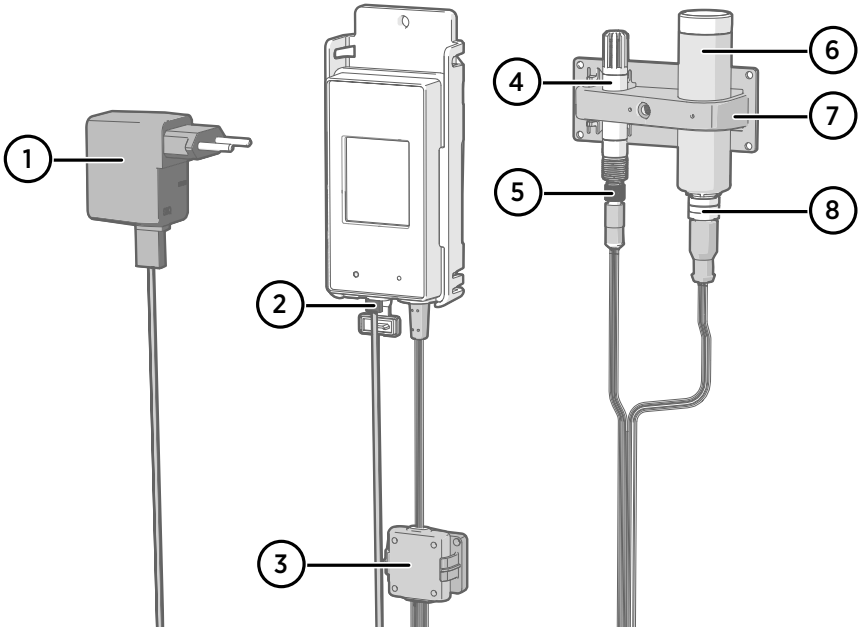
13. Attach a label with number 2 to the probe you just connected.
14. Look at the display:
    - If dashes "- - -" are shown instead of measurement readings, check that the probe and probe splitter are properly connected. It is possible to disconnect the probe splitter accidentally by pulling it with the battery cover open.
    - Battery indicator should show full batteries.
    - There should be no error codes shown. If there are, see Error codes (page 74).
15. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe splitter in and try again.

Once the data logger has been set up for 2 temperature probes using the probe splitter, it requires a factory reset before it can be set up for one-probe mode or operation with a CO_2 probe.

More information

- Info mode (page 46)

3.2.3 Setup with CO_2 probe



1 DC power supply with micro-USB connector
2 Power supply connection to service port
3 Electronics housing of the Probe Splitter M8/M12 accessory and its magnetic holder
4 Humidity or temperature probe
5 M8 connector of the probe splitter
6 GMP251 CO_2 probe
7 Probe support accessory
8 M12 connector of the probe splitter

- GMP251 CO_2 probe
- Probe splitter M8/M12 (item code CBL211050)
- DC power supply with micro-USB connector
- Optional: any supported humidity or temperature probe
- Optional: probe extension cable(s)

CAUTION! To support operation with a CO_2 probe, the RFL100 data logger must have firmware version 1.4.0 or higher, and must be manufactured after July 2021. Additionally, make sure all AP10 access points at the location of use have firmware version 4.0.0.

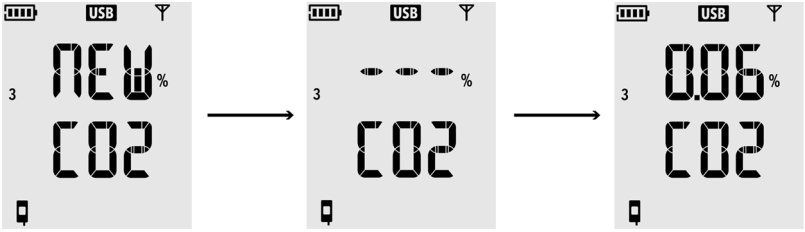
External power supply is a requirement for operating the data logger with a CO_2 probe. Batteries are used as a backup power source if the external power fails. Lithium batteries are recommended as they provide a longer backup time, but even with lithium batteries the operation time is limited in CO_2 mode (typically at least 12 hours). The data logger will show the error code **Err 106** if it operates in CO_2 mode without a power supply.

1. If any cable is connected to the service port of the data logger, disconnect it.
2. Open the battery cover of the data logger.
3. Make sure the power switch is in the **Off** position.
4. Verify that the data logger has lithium batteries (type FR6) inserted. Replace the batteries if necessary.
5. If the probe splitter M8/M12 is not yet connected to the data logger, connect it now:
   a. If a probe or cable is currently connected to the probe connector, pull it straight out without rotating it.
   b. Align the orientation mark on the probe splitter with the line above the probe connector. Push the probe splitter straight in all the way, do not rotate.

   You can also use a probe extension cable between the data logger and the probe splitter.

6. Connect the CO_2 probe to the M12 connector of the probe splitter, using a suitable extension cable if necessary.
7. Optional: connect the temperature or humidity probe to the M8 connector of the probe splitter, using a suitable extension cable if necessary. If you do not connect a probe to the M8 connector, make sure the connector is not inserted inside an incubator, for example.
8. Connect the micro-USB connector of the power supply to the service port of the data logger, and connect the power supply to a wall socket.
9. Move the power switch to the **On** position.

10. Look at the display and wait for the data logger to start up. The word **NEW** is shown for channels where a new probe has been connected. Note that the CO_2 probe is always connected on channel 3.



CO_2 measurement shows dashes "- - -" while waiting for the CO_2 probe to warm up. If dashes are not replaced by measurement readings within 30 seconds, check that the probe(s) and probe splitter are properly connected. It is possible to disconnect the probe splitter accidentally by pulling it with the battery cover open.

11. Check that:
    - Battery indicator shows full batteries .
    - There are no error codes shown. If there are, see Error codes (page 74).
12. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe splitter in and try again.

Once the data logger has been set up in CO_2 probe mode, it requires a factory reset to allow it to be set up for non-CO_2 operation.

3.3 Mounting RFL100

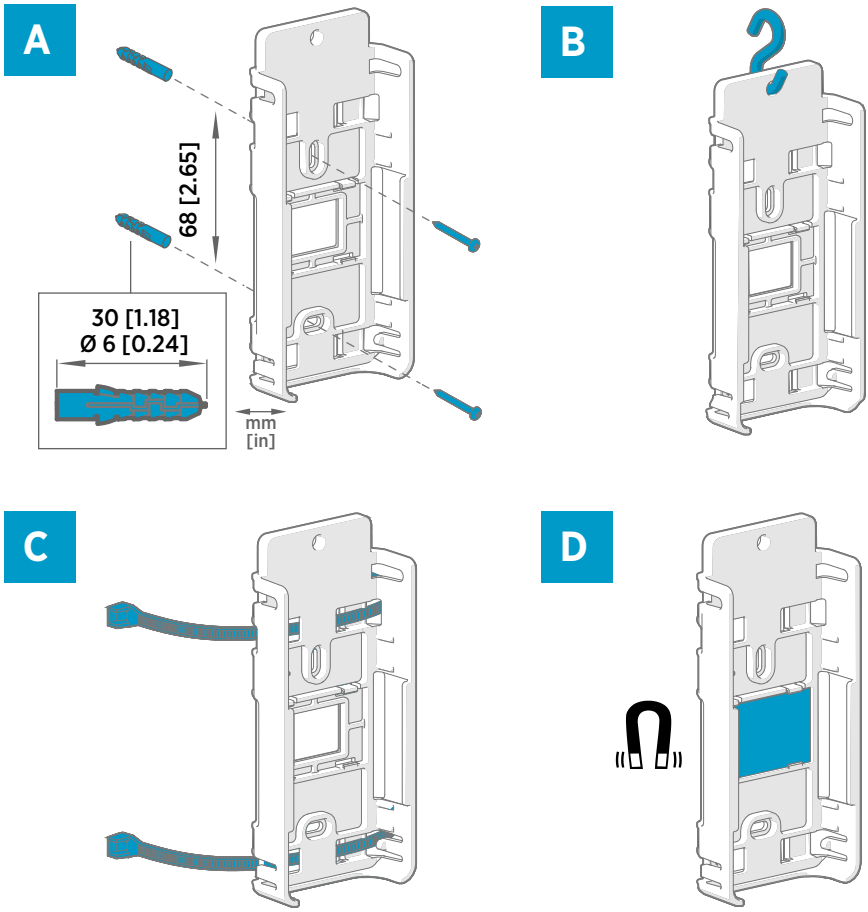


Figure 11 RFL100 mounting methods

A Mounting with screws. Screws and wall plugs are included with the data logger.
B Mounting with a hook (hook not included)
C Mounting with cable ties. Cable ties are included with the data logger.
D Magnetic mounting (with optional magnetic mounting bracket)

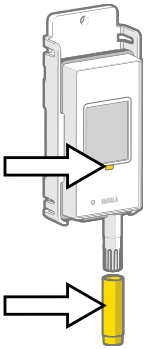
1. Select a suitable mounting location. A good location is easily accessible, protected from water and condensation, and remains within the operating temperature range of RFL100:
   - +2 … +60 °C (+35.6 … +140 °F) with alkaline batteries
   - −20 … +60 °C (−4 … +140 °F) with lithium batteries

   If you need to measure a wider temperature range, use a HMP110 or TMP115 probe and connect it using an extension cable. This way you can leave the data logger in an environment that is suitable to its specification.

2. Attach the mounting bracket using one of the mounting methods shown in Figure 11 (page 38). Orient the bracket vertically so that the probe or extension cable points down after installation. Do not attach RFL100 without the mounting bracket.

   CAUTION! If you are mounting the data logger higher than 2 m (6 ft) or in a location where it would pose a hazard if dropped, ensure the mounting bracket is securely fixed with screws or cable ties.

3. Slide the logger into the mounting bracket from the top, with the probe or cable pointing downward.
4. Peel off the protective film from the display and remove the yellow transport protection cap from the probe.



5. If the probe(s) are connected using an extension cable or a probe splitter, mount the probes in the desired measurement locations and secure the cable(s) using the included accessories.
6. Recommended: Apply location labels to the mounting bracket and RFL100 according to your installation plan and company policy.

3.4 Mounting probes

3.4.1 Probe holder ASM213382

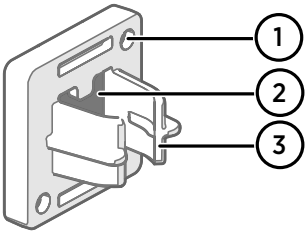


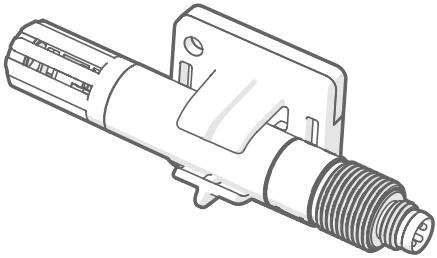
Figure 12 Probe holder ASM213382

1 Holes for attaching the holder with screws (screws not included)
2 Magnet
3 Probe attachment

The probe holder is a versatile mounting accessory for securing Ø 12 mm diameter cable mounted probes.

One probe holder is included in the RFL100 data logger package for each applicable cable mounted probe. Additional probe holders are available as an accessory (Vaisala item ASM213382SP, includes 5 probe holders).

Figure 13 HMP110 probe in the probe holder



To attach the probe, simply press the body of the probe into the probe attachment. HMP115 and TMP115 probes have a groove that locks the probe in the holder when it is centered in the probe attachment.

3.4.2 Probe support accessory

When the data logger is purchased with a GMP251 CO_2 measurement probe, a CO_2 probe mounting kit (Vaisala item ASM214253SP) is included. The kit includes a versatile probe support accessory that has attachments for GMP251, a Ø 12 mm probe, and the sensor tip of the TMP115 probe. It also provides sufficient separation between the probes to prevent the mild heating effect of the GMP251 from affecting the measurement of the other probe. For this reason, it is best not to attach the GMP251 to a second probe using a cable tie, for example.

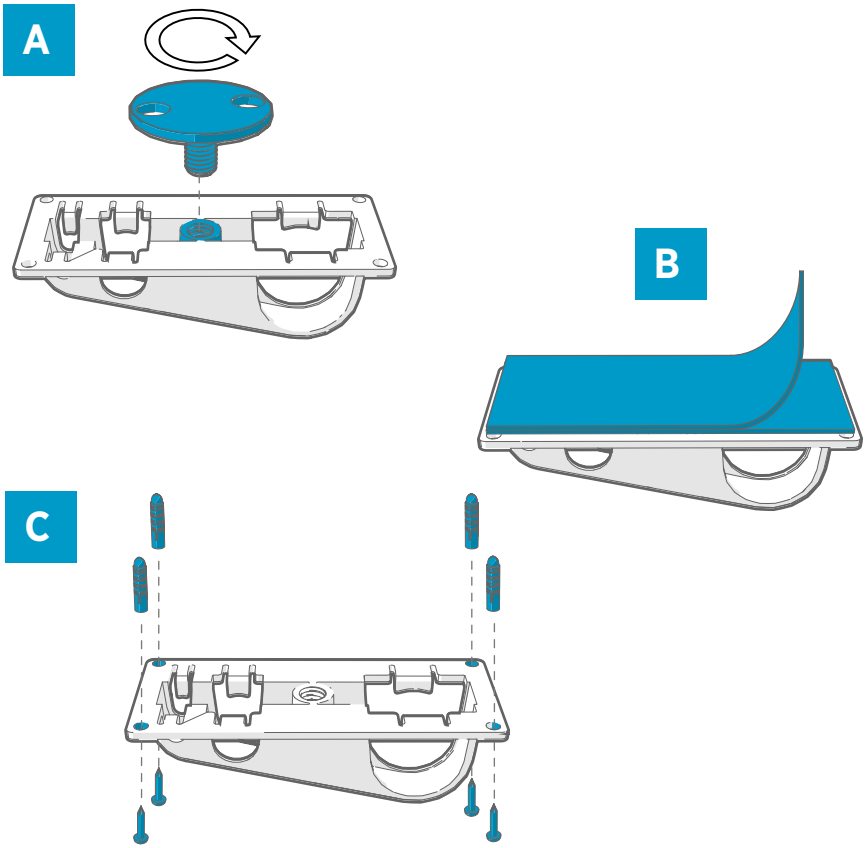


Figure 14 Probe support accessory mounting options

A Mounting through a hole using the screw-on attachment part.
B Mounting using a reusable fastener strip. Clean the attachment surfaces using the included cleaning pad before applying the strip.
C Mounting with screws and wall plugs.

3.4.3 Mounting HMP110 probes

HMP110 is a robust stainless steel probe for humidity and temperature measurement in demanding conditions. Suitable for measurement inside chambers, fridges, and freezers in temperature range -40 ... +80 °C (-40 ... +176 °F). Must be connected using a cable, as the probe is not designed to be integrated with RFL100 housing. Probe diameter 12 mm (0.47 in).

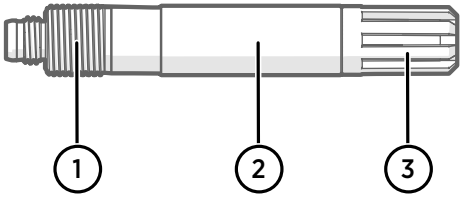


Figure 15 HMP110 probe

1 M12×1 thread for through-wall installation using mounting nuts.
2 Attach from this area using probe holder ASM213382 or cable tie.
3 Sensor protection filter. Do not attach from this area.

3.4.4 Mounting HMP115 probes

HMP115 is a general purpose humidity and temperature measurement probe. It is designed to be integrated with the RFL100 housing for minimum footprint, but can be connected using a cable as well. Operating temperature range −40 ... +60 °C (−40 ... +140 °F).

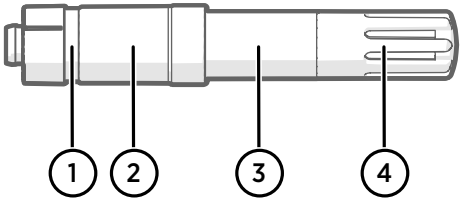


Figure 16 HMP115 probe

1 If using a probe holder, align it to this groove.
2 Plastic sleeve that locks the probe in place when integrated with RFL100. Diameter 14 mm (0.55 in) at this point.
3 Attach from this area if using a cable tie. Diameter 12 mm (0.47 in) at this point.
4 Sensor protection filter. Do not attach from this area.

3.4.5 Mounting TMP115 probes

TMP115 is a wide-range temperature-only probe for measurement in extreme conditions. The probe body can be integrated with RFL100 or connected using a cable. The sensor tip is permanently connected to the probe body with a thin cable. Available as 50 cm (1 ft 7.7 in) and 3 m (9.8 ft) long versions.

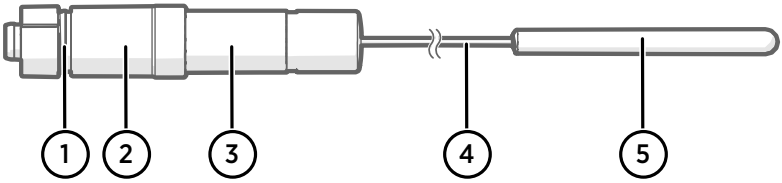


Figure 17 TMP115 probe

1 If using a probe holder, align it to this groove.
2 Plastic sleeve that locks the probe body in place when integrated with RFL100. Diameter 14 mm (0.55 in) at this point.
3 Probe body with measurement electronics. Attach from this area if using a cable tie. Diameter 12 mm (0.47 in) at this point. Operating temperature range −40 … +60 °C (−40 … +140 °F).
4 Sensor cable. Do not cut or bend into a tight loop. Numbering labels included with the probe splitter accessory are designed to be attached to this cable.
5 Sensor tip, diameter 4.8 mm (0.19 in). Secure using a cable tie or insert into thermal dampener block for added thermal mass. Insert into the probe support accessory when using together with a CO_2 probe. Operating temperature range −196 … +90 °C (−320.8 … +194 °F).

CAUTION! The operating temperature range of the sensor tip is much wider than that of the probe body. Leave the probe body outside the measured environment if possible, and avoid inserting it in environments that are outside its operating range.

When working with equipment in extremely cold temperatures, use appropriate personal protective equipment such as thermally insulated gloves and clothing. Wear protective eyewear if working with coolants such as liquid nitrogen, and observe safe handling and storage precautions.

3.4.6 Mounting GMP251 probes

GMP251 is a robust carbon dioxide (CO_2) measurement probe for use in demanding applications such as life science incubators. Operating temperature range −40 ... +60 °C (−40 ... +140 °F).

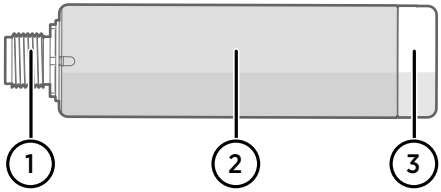


Figure 18 GMP251 probe

1 M12 5-pin male connector. Must be connected to the M12 connector of the Probe Splitter M8/M12 accessory.
2 Ø 25 mm probe body.
2 Sensor protection filter. Do not attach from this area.

4. Operation

4.1 Probe detection

Probe detection of RFL100 has been changed to accommodate 2 probe operation. In firmware version 1.2.0 and later, the data logger detects and validates the connected probe(s) only at startup. If any unsupported probes or probe combinations are detected, or if both probes have been replaced simultaneously when 2 temperature probes are in use, an error is shown. The only way to recover is to turn off the data logger and correct the problem.

After the probe detection is successfully completed, the data logger starts its normal operation. The detected and validated probe(s) must remain the same until the data logger is turned off again. If a probe is disconnected while the data logger remains powered on, a connection error will be shown. Reconnecting the same, correctly detected probe without turning off the data logger is supported.

Remember the following when operating and maintaining the data logger:

- Changing a probe to a different one always requires the data logger to be turned off.
- When a CO_2 probe and another probe are connected using the Probe Splitter M8/M12 accessory, both probes can be replaced at the same time.
- When 2 temperature probes are connected using the Probe Splitter M8 accessory, the probes must be replaced one at a time according to the replacement procedure.

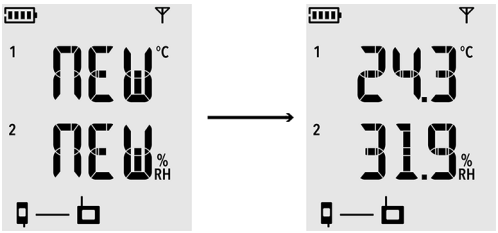


Figure 19 Detection of a new RH + T probe shown on display

More information

- Probe replacement (page 54)
- Changing RFL100 clock battery (page 70)
- Error codes (page 74)

4.2 Info mode

RFL100 data logger has a small button next to the service port. Pressing this button enables **Info mode** for 1 hour, after which the mode is automatically disabled. Pressing the button again disables the mode immediately.

In the Info mode:

- Display and LED are turned on if they have been turned off remotely.
- Data logger starts radio scanning immediately if it has shut down to save power.
- After showing the current measurement results and possible error codes, the data logger shows the text **INFO ON** and the following additional information:
  - If the data logger is connected to an access point:
    - Signal strength indicator is updated faster, approximately every 30 seconds.
    - The currently connected VaiNet channel is shown, alternating with measurement results and firmware version.
  - Firmware version of the data logger.
  - Serial number(s) of probe(s) detected at startup, shown in three separate segments.
    - If 1 probe is used, the letters **SN** are shown before the number.
    - If 2 probes are used, the letters **SN1** and **SN2** are shown before the numbers. SN1 is always the probe that provides the measurement for channel 1. SN2 is either the second T probe that provides the measurement for channel 2, or the CO_2 probe that provides the measurement for channel 3.

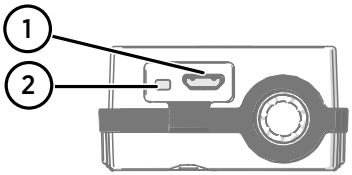
After all information has been shown, the same sequence is repeated until Info mode is disabled or 1 hour has passed.

4.2.1 When to use Info mode

Info mode can be very useful when you can physically access the data logger. The following are the main use cases:

1. Wake up the data logger from radio power save without restarting it.
2. Determine the signal quality of the current access point connection. When the data logger is connected to an access point, you can move the data logger around and monitor the signal strength indicator that updates every 30 seconds in Info mode. Note that the connection quality is shown only for the current access point connection.
3. Check the access point where the data logger is currently connected. You can determine this from the channel number if you know the channel assignments of the access points.
4. Verify serial numbers and channel assignments when 2 temperature probes are connected using the probe splitter M8 accessory.
5. Check the firmware version of the data logger without restarting it.

4.2.2 Turning on info mode



1 Service port (micro-USB)
2 Info button

1. Open the plug that covers the service port.
2. Push the small button next to the service port using a pen or a small screwdriver.
3. Verify from the display that the text **INFO ON** appears briefly.
4. Close the plug over the service port.

4.3 Remote management

After an RFL100 data logger has been accepted to a viewLinc Monitoring System, it can be remotely managed using viewLinc Enterprise Server software. Remote management operations can be performed directly from the **Sites Manager > Hosts and Devices** tree.

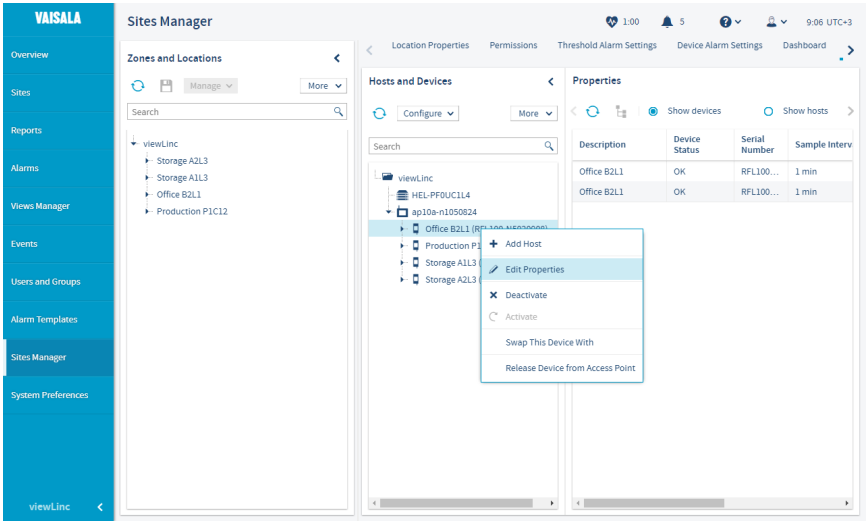


Figure 20 RFL100 remote management using viewLinc Enterprise Server

Select **Configure > Edit Properties** to access the remotely configurable settings.

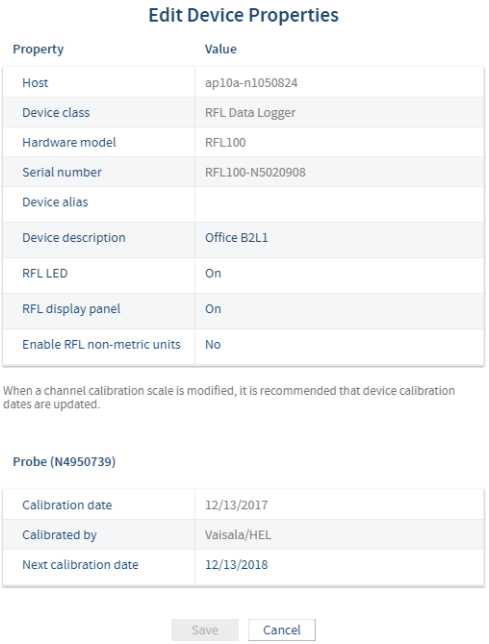


Figure 21 RFL100 device properties in viewLinc

Local alarms on the RFL100 are also managed remotely, but in a different way. See Alarm indicators (page 22).

viewLinc automatically issues calibration reminder notifications at 3 months and 1 month before to the due date, and again on the due date. These reminders are not shown locally on the data logger.

4.4 Releasing RFL100 from viewLinc Monitoring System

After RFL100 data logger has been accepted to a viewLinc Monitoring System by a viewLinc Enterprise Server administrator, it will not connect to any other system unless first released from its current system. There are 2 ways to release the data logger:

- Locally by pressing its **Release** button
- Remotely from viewLinc Enterprise Server software

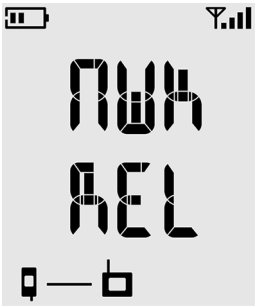
Measurement and data logging is not affected by the release procedure. Existing data will remain unaffected on the data logger. All remotely managed RFL100 settings will be reset to defaults: threshold alarm indicators will be cleared, and display and LED will turn on if they have been remotely turned off.

After RFL100 is released, it will be ready to join any compatible viewLinc Monitoring System after a delay of 4–6 minutes. The connecting access point must be in installation mode.

4.4.1 Releasing using release button

- Pen or a small screwdriver

1. Remove the data logger from the mounting bracket.
2. Open the battery cover of the data logger.
3. Press the **Release** button using a pen or a small screwdriver.
4. Verify from the display that the text **NWK REL** appears briefly, and that the connection icon that denotes the viewLinc Enterprise Server disappears.



5. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe (or extension cable) in and try again.
6. Insert the data logger back in the mounting bracket.

4.4.2 Releasing remotely using viewLinc

1. Log in to the viewLinc Enterprise Server with a user account that has the right to manage devices.
2. Select **Sites Manager > Hosts and Devices**.
3. Select the data logger you want to release from the **Hosts and Devices** tree.
4. Select **Configure > Release Device from Access Point**.

5. Select **Release** to confirm.

4.5 Moving RFL100 to a different VaiNet segment

It may be necessary to change the segment of an RFL100 data logger to conform to your device installation plan, improve connectivity, or make room in a full segment. As long as there is no need to relocate devices physically, the move can be done remotely using the **Sites Manager** view of viewLinc Enterprise Server.

1. Log in to the viewLinc Enterprise Server as an administrator.
2. Navigate to **Sites Manager > Hosts and Devices**.
3. Enable installation mode on at least one access point that belongs to the target segment. Right-click on the access point in the device list of **Hosts and Devices** tab and select **Edit Properties**.

   The access point should have free connection capacity (currently connecting less than the maximum 32 data loggers) and it should be in range of the data logger that you want to connect to the target segment.
4. Make sure installation mode is not enabled on any access point that is not assigned to the target segment.

   Installation mode is automatically disabled after 8 hours.

5. Locate the data logger you want to move to the segment from the device list. Right-click it and select **Release Device from Access Point**.

   It will take some minutes for the release command to be delivered to the data logger, after which it will automatically start to listen for access points that are in installation mode. The data logger will rejoin the system through the new segment without having to be accepted again by the viewLinc administrator.
6. Wait for the rejoining to be completed, and verify from the device list that the data logger is now connected to an access point in the target segment.

4.6 Vaisala Insight software

Figure 22 HMP115 probe in Insight software

Vaisala Insight software is compatible with probes used by RFL100 data logger. With Insight software, you can:

- See probe information and status
- See real-time measurement
- Calibrate and adjust the probe
- Configure probe settings
- Monitor and record 2 measurement parameters up to 48 hours

Vaisala Insight PC software is available in English and Japanese, and it operates on Windows 10 operating systems or newer. One product specific USB cable (type A connector) per connected probe is needed.

Vaisala Insight software is available for download at www.vaisala.com/insight.

More information

- Adjusting measurement using Insight software (page 68)

4.6.1 Connecting probes to Insight software

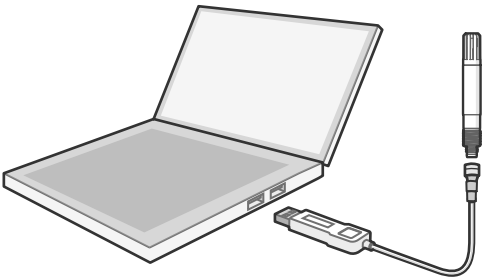


Figure 23 Connecting a HMP110 probe to insight

- Computer with a Microsoft Windows® operating system (64-bit version) and Vaisala Insight PC software installed
- USB connection adapter for the probe:
  - For GMP251 probe: Indigo USB Adapter (item code USB2) or USB connection cable (item code 242659)
  - For other supported probes: USB connection cable (item code 219690)

1. Disconnect the probe from the data logger.
2. Open the Insight software on your PC.
3. Connect the USB adapter to a free USB port on the PC or USB hub.
4. Connect the probe to the USB cable.
5. Wait for the Insight software to detect the probe.

More information

- Probe replacement (page 54)

5. Maintenance

5.1 Cleaning RFL100

- Lint-free cloth
- Isopropyl alcohol (70 %)

Do not spray anything directly on the RFL100, since that may deposit impurities on the sensor.

1. Remove the data logger from the mounting bracket.
2. Moisten some lint-free cloth with isopropyl alcohol (70 %).
3. Wipe the data logger and the mounting bracket.
4. Check the filter on the probe. If the filter becomes contaminated, it is very likely to affect the humidity measurement since residue on the filter will retain some moisture. If the filter is dirty, replace it with a new one. See Changing the probe filter (page 53).
5. Insert the data logger back in the mounting bracket.

5.2 Changing the probe filter

- New filter for the probe

Filter on the probe should be replaced when it is damaged or dirty. You can change the probe filter without disconnecting the probe from the data logger.

CAUTION! Sensors are easily damaged when the filter is not in place. Handle the probe carefully.

1. Turn the filter counter-clockwise to loosen it.
2. Remove the filter from the probe. Be careful not to touch the sensors with the filter.
3. Install a new filter on the probe, and tighten it so it is finger-tight. Make sure the filter sits straight and meets the thread properly.

More information

- Accessories and spare parts (page 82)

5.3 Probe replacement

Separate procedures for probe replacement are provided for different scenarios:

- Replacing a single humidity or temperature probe (page 55)
- Replacing probes when 2 temperature probes are connected (page 57)
- Replacing probes when a CO 2 probe is connected (page 57)
- Replacing probe(s) with a different type (page 58)

More information

- Probe detection (page 45)
- Error codes (page 74)

5.3.1 Probe replacement and viewLinc alarms

If the data logger is connected to a viewLinc Enterprise Server, probe replacements activate the appropriate alarms in viewLinc.

Probe Changed alarms

These alarms are always activated to notify the administrator that a probe has been changed. The alarm has to be acknowledged by the administrator.

RFL100 data logger communicates changed probe information automatically to viewLinc Enterprise Server. This information includes the serial number and calibration information stored in the probes. Stored data points are automatically associated with the correct probe.

Missing Historical Data alarms

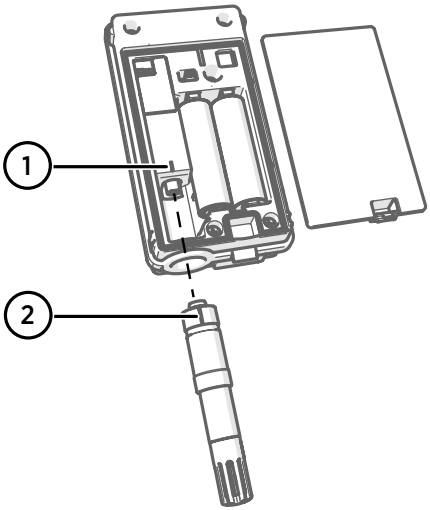
These alarms are activated for Locations that are linked to channels of the data logger when viewLinc notices that realtime data is not being received. The alarms will be cleared when the data logger reconnects and viewLinc retrieves any data that was locally stored on the data logger during the connection break.

If you need to avoid any interruption to monitoring, use the **Swap Device** feature of viewLinc Enterprise Server to link another device to the monitored Location for the duration of probe replacement. See *viewLinc User Guide*.

CAUTION! If you replace the probe with a different model that does not have the same measurement channels (for example, replacing RH+T probe with a T-only probe), unlink the channels from the old probe(s) in viewLinc Enterprise Server before you start. Always unlink the channels before changing between 1 and 2 probe operation.

5.3.2 Replacing a single humidity or temperature probe

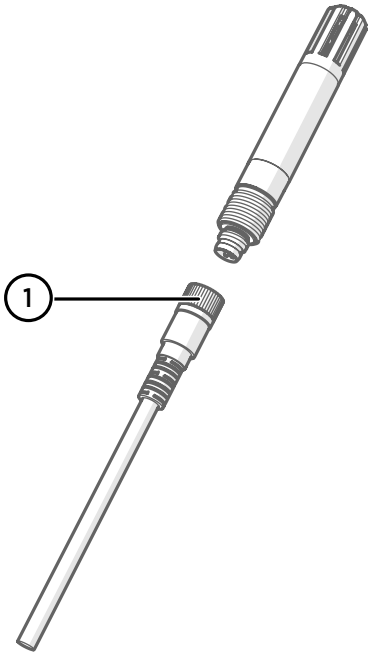
1. Remove the data logger from the mounting bracket.
2. Open the battery cover of the data logger.
3. Move the power switch to the **Off** position.
4. To replace a fixed probe (directly connected to RFL100 without a cable):



1 Orientation mark on data logger
2 Orientation mark on probe

   a. Grip the old probe from above the filter and hold the data logger with your other hand. Pull the probe straight out of the data logger. Do not rotate the probe.
   b. Align the orientation mark on the new probe with the line above the probe connector. Push the probe straight in all the way, do not rotate.

5. To replace a cabled probe:



1 Locking ring on probe cable or probe splitter

   a. Loosen the locking ring of the connector at the end of the probe cable, and pull the old probe away from the connector.
   b. Connect the new probe and tighten the locking ring.
6. Move the power switch to the **On** position.
7. Look at the display and wait for the data logger to start up.

   Data logger shows the word **NEW** on each affected channel when it detects that a probe has been changed [1)]. The text is shown for a few seconds, after which the display shows the measurement reading(s). Verify that the display shows measurement readings instead of dashes or error codes.
8. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe (or extension cable) in and try again.
9. Insert the data logger back in the mounting bracket.

1) *This feature is included in RFL100 firmware version 1.20 and newer.*

5.3.3 Replacing probes when 2 temperature probes are connected

You can replace one or both of the probes by following the procedure below. Only temperature probes can be connected when the Probe Splitter M8 accessory is used.

1. Remove the data logger from the mounting bracket.
2. Open the battery cover of the data logger.
3. Move the power switch to the **Off** position.
4. Replace the first probe:
    a. Loosen the locking ring of the connector at the end of the probe cable or probe splitter, and pull the old probe away from the connector.
    b. Connect the new probe and tighten the locking ring.
    c. Remove the numbering label from the old probe and apply it to the new probe.
5. Move the power switch to the **On** position.
6. Look at the display and wait for the data logger to start up. Data logger shows the word **NEW** on the channel that was affected by the probe change for a few seconds, after which it is replaced by the temperature reading. Verify that the display shows measurement readings instead of dashes or error codes.
7. To replace the second probe, repeat the steps starting from step 3.
8. Optional: Press the info button on the data logger (under the silicone plug, next to the service port) and verify the channel assignment of the probes using the Info mode.
9. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe (or extension cable) in and try again.
10. Insert the data logger back in the mounting bracket.

5.3.4 Replacing probes when a CO_2 probe is connected

1. Disconnect the power supply from the service port of the data logger.
2. Remove the data logger from the mounting bracket.
3. Open the battery cover of the data logger.
4. Move the power switch to the **Off** position.
5. To replace the CO_2 probe:
    a. Loosen the locking ring of the M12 connector on the probe splitter, and pull the old probe away from the connector.
    b. Connect the new CO_2 probe and tighten the locking ring.
6. If a second probe is connected to the M8 connector on the probe splitter and you want to replace it, do so at this point. In CO_2 mode, the data logger allows both probes to be replaced at the same time.
7. Move the power switch to the **On** position.

8. Look at the display and wait for the data logger to start up. Data logger shows the word **NEW** on the channels that were affected by the probe changes for a few seconds. Wait for 30 seconds for the CO_2 probe to warm up, and verify that the display shows measurement readings instead of dashes or error codes.
9. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe (or extension cable) in and try again.
10. Insert the data logger back in the mounting bracket.
11. Reconnect the power supply to the service port of the data logger.

5.3.5 Replacing probe(s) with a different type

If a single humidity or temperature probe is connected, you can simply turn off the data logger, remove the probe, and follow the appropriate setup procedure to connect the new type of probe:

- Setup with 1 humidity or temperature probe (page 30)
- Setup with 2 temperature probes (page 32)
- Setup with CO_2 probe (page 35)

The following cases require that you perform a **factory reset** on the data logger before attempting to replace the probes:

- The data logger is currently set up with 2 temperature probes using the Probe Splitter M8 accessory, and you want to connect a probe that is not temperature-only.
- The data logger has a CO_2 probe connected using the Probe Splitter M8/M12 accessory, and you want to stop using a CO_2 probe.

More information

- Performing a factory reset (page 77)

5.4 Calibration and adjustment

If you think the device is not measuring correctly, calibration and adjustment is not the first thing to do. Check the following first:

- Make sure nothing is interfering with the measurement: heat sources, temperature differences, or condensation.
- Check that there is no moisture on the probe. If the sensor has become wet, wait for it to dry.
- Always wait for the measurement to stabilize.

Calibration means comparing the measurement output of the device to a known reference, such as a known environment in a calibration chamber or the output of a reference instrument. Correcting the reading of the device so that it measures accurately is referred to as **adjustment**.

Sensors and measurement electronics used by the data logger are fully contained in the replaceable probe. This allows the probe to be calibrated, adjusted, and replaced as needed. Probe serial number and calibration information (calibration date and information text string) are stored in the probe. If the probe is replaced or the calibration information in the probe is updated, RFL100 automatically sends the new information to viewLinc.

The calibration frequency depends on the application and your compliance requirements. Vaisala recommends having the probe calibrated and adjusted once a year by Vaisala Calibration and Repair Services. See www.vaisala.com/calibration.

Generic procedures for on-site calibration and adjustment are provided in this guide:

- To verify the measurement accuracy of the probe without disconnecting it from the data logger, compare its readings with a calibrated reference instrument. Doing this at the installation location of the data logger is referred to as a field check. See Field checking using a reference instrument (page 60).
- To calibrate and adjust the probe using a Vaisala handheld meter and humidity and temperature references, see RH and T calibration and adjustment using HM40 (page 61) and RH and T calibration and adjustment using MI70 (page 66).
- To calibrate and adjust the probe and change its stored calibration information using a computer, connect the probe to Vaisala Insight software. See Adjusting measurement using Insight software (page 68).

5.4.1 Calibration and adjustment environments

Measurement probes can be **calibrated** in any environment that is within their operating range. For example, output from TMP115 probe can be checked and compared at any temperature in range -196 ... +90 °C (-320.8 ... +194 °F). However, probes should only be **adjusted** in conditions where they have good accuracy. Refer to the accuracy specification of the probe you intend to adjust. Probes will not accept the adjustment if the adjustment points are unsuitable.

Because stabilization of temperature and humidity takes time, you should expect the adjustment procedure to take at least 30 minutes for each adjustment point.

When working with equipment in extremely cold temperatures, use appropriate personal protective equipment such as thermally insulated gloves and clothing. Wear protective eyewear if working with coolants such as liquid nitrogen, and observe safe handling and storage precautions.

More information

- RFL100 technical specification (page 79)

5.4.2 Adjustment points and requirements

For adjustment points and requirements of the GMP251 CO_2 probe, see GMP251 User Guide (M211799EN).

Table 10 Measurement adjustments of RFL100-compatible RH and T probes

Adjustment	HMP110	HMP110T	HMP115	HMP115T	TMP115
1-point RH adjustment	✓		✓		
2-point RH adjustment	✓		✓		
1-point T adjustment	✓	✓	✓	✓	✓
2-point T adjustment	✓	✓	✓	✓	✓

2-point RH and T adjustments have the following requirements:

- When adjusting RH, the first point requires a < 50 %RH humidity reference, and the second point must be > 50 %RH. The difference between the references must be at least 30 %RH.
- When adjusting T, the difference between the 2 references must be at least 30 °C (54 °F).

When comparison against a calibrated reference indicates that adjustment of humidity measurement is necessary, Vaisala recommends adjusting in 2 points, 11 %RH and 75 %RH. These humidities can be produced using LiCl and NaCl salt chambers of the Vaisala HMK15 Humidity Calibrator.
Adjustment of temperature measurement is typically not necessary.

5.4.3 Field checking using a reference instrument

You can perform a field check of the RFL100 using any humidity and temperature measurement instrument with a display. Typically field checking is done with a recently calibrated portable instrument.

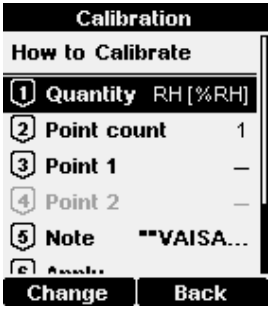
1. Place the probe of the reference instrument (or the entire instrument) in the same environment as the probe of the RFL100. The environment should be as stable as possible.
2. Wait for 30 minutes for humidity and temperature to stabilize. Verify that measurements are no longer changing at the end of the stabilization period.
3. Record the readings from both instruments.

5.4.4 RH and T calibration and adjustment using HM40

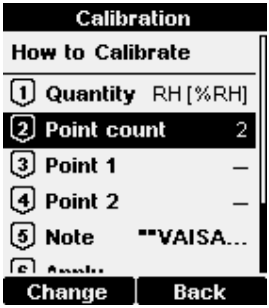
- Vaisala HM40 Handheld Meter
- Connection cable for HM40 Handheld Meter (Vaisala item HMT120Z300)
- Reference environments for the desired calibration and adjustment points
- RFL100 data logger with the probe to be calibrated

You can calibrate and adjust RH and T measurement probes of your RFL100 data logger in 1 or 2 points using the HM40 handheld meter.

1. Disconnect the probe from the data logger.
2. Connect the probe to HM40 using the connection cable.
3. Turn on HM40 and check that measurements from the probe are displayed on the screen.
4. Select **Menu > Settings > Time & Date** and verify that the current time and date are set correctly on the HM40. Correct them if needed. The current date will be automatically set as the calibration date of the probe when adjustment is applied in step 13.
5. Select **Menu > Calibration**.
6. Select the parameter to be calibrated at menu item **[1] Quantity**.

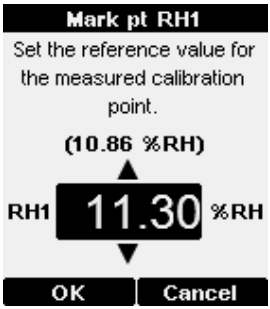


7. Select number of calibration points at menu item **[2] Point count**.

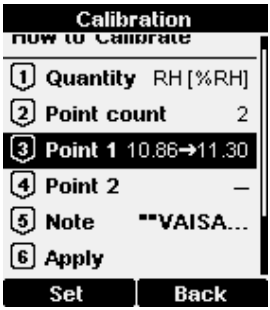


8. Place the probe in the first reference environment (first calibration point). Wait 20 – 40 minutes for the reading to stabilize.

9. Select **[3] Point 1 > Set**. The meter now shows the currently measured value of the selected parameter. Set the reference value using the arrow buttons and select **OK**.

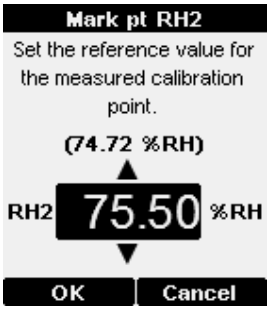


Correction to measurement at point 1 is now shown in the text for menu item **[3] Point 1**. If you are only doing a 1-point calibration, skip to step 12.

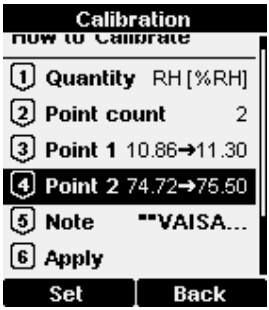


10. Place the probe in the second reference environment (second calibration point). Wait 20 – 40 minutes for the reading to stabilize.

11. Select **[4] Point 2 > Set** The meter now shows the currently measured value of the selected parameter. Set the reference value using the arrow buttons and select **OK**.

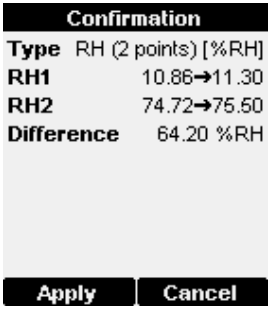


Correction to measurement at point 2 is now shown in the text for the menu item **[4] Point 2**.



12. Select **[5] Note** to edit the calibration info text that will be stored in the probe when the adjustment is applied in step 13. Edit the text using the select button and arrow keys. When done, select the **OK** character in the bottom right corner. To exit without changing the text, select **Cancel**.

13. Select **[6] Apply** to view the calibration result. Verify the corrections in the confirmation screen and select **Apply** to apply the adjustment to the probe, or **Cancel** to exit without applying the adjustment.



14. Disconnect the probe from the HM40.
15. Connect the probe to the data logger.

More information

- Probe replacement (page 54)

5.4.5 RH and T calibration and adjustment using MI70

- Vaisala MI70 Measurement Indicator
- Connection cable for MI70 Measurement Indicator (Vaisala item 219980SP)
- Reference environments for the desired calibration and adjustment points
- RFL100 data logger with the probe to be calibrated

Optional:

- MI70-compatible reference probe and connection cable

You can calibrate and adjust the probe of your RFL100 data logger in 1 or 2 points using the MI70 indicator. You can also do the 1-point calibration so that you compare the reading of the probe to any MI70-compatible Vaisala probe that provides the same measurement parameter.

1. Disconnect the probe from the data logger.
2. Connect the probe to be calibrated to port I of the MI70 measurement indicator using the connection cable.
3. If you want to calibrate by comparing to the reading of a reference probe, connect it to port II of the MI70 indicator.
4. Turn on the MI70 indicator.
5. Start the adjustment sequence from **Main menu > Functions > Adjustments**.

   If you have 2 probes connected, make sure to start the adjustment sequence for probe **I**.
6. MI70 notifies you that automatic power off is disabled during adjustment mode, select **OK** to acknowledge.
7. Select **RH** or **T** parameter for adjustment and select **OK**. This procedure assumes you are adjusting relative humidity, but the same principles apply for temperature adjustment.
8. Insert the probe to be calibrated in the reference environment. If you are calibrating relative humidity using 2 reference environments, use the dry reference first. If you have a reference probe, insert that in the same environment.

   If you are comparing against the reading of a reference probe, you can also use the ambient condition as the reference environment, as long as its conditions are stable.
9. Wait for the measurement to stabilize. You can follow the stabilization from the **GRAPH** display. Select **ADJUST** when the reading is stabilized in the reference.
10. To perform the adjustment using 1 reference environment (1-point adjustment), perform these steps:
    a. Select **1-point adjustment > SELECT > OK**.
    b. When the measurement is stable, select **READY**.
    c. Give the reference RH value by using the arrow buttons and select **OK**.
    d. To confirm the adjustment, select **YES**. If you select **NO**, you return to the adjustment mode display and no changes are made.
    e. Continue from step 13.

11. To perform the adjustment using 2 reference environments (2-point adjustment), perform these steps:
    a. Select **2-point adjustment > SELECT > OK**.
    b. When the measurement is stable, select **READY**.
    c. Give the reference RH value by using the arrow buttons and select **OK**.
    d. Insert the probe to be calibrated in the second reference environment.
    e. When the measurement is stable, select **READY**.
    f. Give the reference RH value by using the arrow buttons and select **OK**.
    g. To confirm the adjustment, select **YES**. If you select **NO**, you return to the adjustment mode display and no changes are made.
    h. Continue from step 13.
12. To perform the adjustment using a reference probe, perform these steps:
    a. Select **To same as RH[II]**.
    b. To confirm the adjustment, select **YES**. If you select **NO**, you return to the adjustment mode display and no changes are made.
13. Calibration and adjustment is now completed. Select **BACK** to exit the adjustment mode and **EXIT** to return to the basic display.
14. Disconnect the calibrated probe from the MI70 indicator.
15. Reconnect the probe to the data logger.

More information

- Probe replacement (page 54)

5.4.6 CO2 calibration and adjustment using MI70

Calibration and adjustment of GMP251 CO_2 probe using MI70 Indicator is described in the GMP251 User Guide (M211799EN). In addition to the calibration and adjustment procedure, note the sections describing the compensation features and calibration accessories of GMP251. Their proper use is important for achieving an accurate calibration.

5.4.7 Adjusting measurement using Insight software

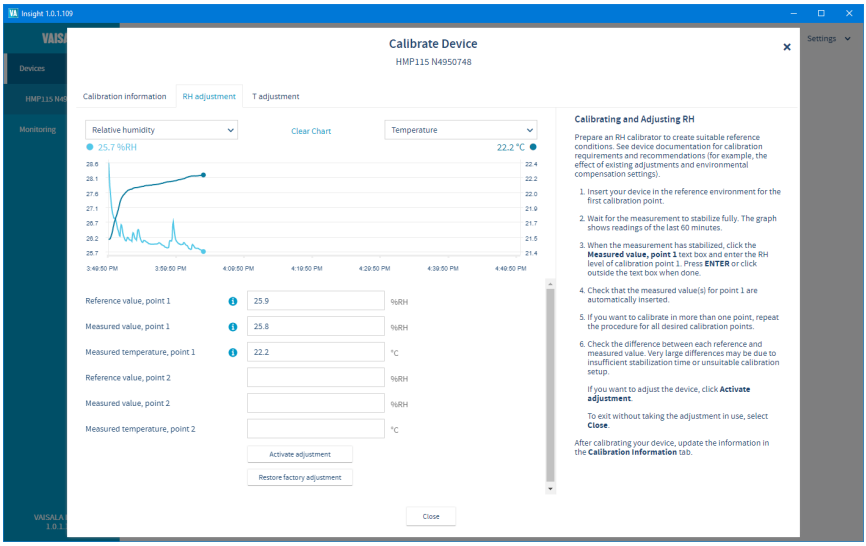


Figure 24 Adjusting relative humidity measurement in Insight

- Computer with Windows operating system and Vaisala Insight software installed
- USB connection adapter for the probe:
  - For GMP251 probe: Indigo USB Adapter (item code USB2) or USB connection cable (item code 242659)
  - For other supported probes: USB connection cable (item code 219690)
- Reference environments for the desired calibration and adjustment points

This procedure can be used to adjust the humidity or temperature measurement of the probe. If you want to adjust both, adjust temperature measurement first, then repeat the procedure for humidity.

1. Disconnect the probe from the data logger.
2. Connect the probe to Insight. See Connecting probes to Insight software (page 52).
3. Select > **Calibrate > Yes** to switch the probe to calibration mode.

   In calibration mode, the device will not use functions that may interfere with calibration and adjustment.
4. Select the type of adjustment to perform: **RH adjustment**, **T adjustment**, or **CO_2 adjustment**.

5. Define the needed adjustment for the first adjustment point:
   a. Insert the probe head in the reference environment for the first adjustment point.
   b. Wait for the measurement to stabilize fully.
   c. Click the **Reference value, point 1** text box and enter the reference value of the adjustment point. Press **ENTER** or click outside the text box when done.
   d. The probe automatically enters the measured values for the adjustment point.
6. If you want to adjust in more than one point, repeat step 5 for all desired adjustment points.
7. Select **Activate adjustment > Yes** to store the adjustment in the probe.
8. Check the message that appears at the top of the screen. If the message indicates that the adjustment is activated successfully, your adjustment is stored in the probe.
9. Select the **Calibration information** tab and update the content of the **Calibration date** and **Calibration text** fields.
10. Select **Close > Yes** to exit the calibration mode.
11. Disconnect the probe from the USB adapter.
12. Connect the probe to the data logger.

More information

- Vaisala Insight software (page 51)
- Probe replacement (page 54)

5.5 Changing RFL100 batteries

- 2 pcs of new AA size 1.5 V batteries: alkaline (type LR6) or lithium (type FR6)

1. Remove the data logger from the mounting bracket.
2. Open the battery cover of the data logger.
3. Move the power switch to the **Off** position.
4. Remove the old AA size batteries from the data logger.
5. Check the battery orientation markings on the data logger and insert the new batteries in the correct orientation.
6. Move the power switch to the **On** position.
7. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe (or extension cable) in and try again.
8. Insert the data logger back in the mounting bracket.

5.6 Changing RFL100 clock battery

- New 3 V lithium battery (type CR1/3N button cell)
- Small flat-head screwdriver

1. Open the battery cover of the data logger.
2. Use a small flat-head screwdriver to lift the top part of the small plastic cover marked **Clock battery (CR1/3N)**, and slide the cover upward until it comes loose.
3. Use the small screwdriver to lift the old clock battery from the battery socket.
4. Take the new clock battery and verify the + and - markings of the battery itself and the clock battery socket. Insert the new clock battery in the clock battery socket.
5. Replace the clock battery cover.
6. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe (or extension cable) in and try again.

5.7 Updating RFL100 firmware

For general principles of VaiNet device firmware updates, firmware compatibility information, and instructions on how to minimize the impact to your viewLinc system, see Updating VaiNet device firmware in a viewLinc system Technical Note (M212867EN) available at docs.vaisala.com.
If a release notes document is included with the firmware update file, read it before starting for information on any important changes and possible compatibility requirements.

Required:
- Computer with a free USB port and an operating system that supports the Media Transfer Protocol (MTP). For example, Windows® 7 and newer.
- USB connection cable (USB 2.0 type A - micro-B, Vaisala cable 244961). You can also use a generic cable that has all pins connected (not just power).
- RFL100 firmware update file (.fw) and release notes document from Vaisala.

CAUTION! Updating RFL100 firmware erases the recorded data on the device. Before updating, verify from the viewLinc Enterprise Server that up-to-date data from this device is available. You can also copy the data from the device for local storage; see Downloading data using service port (page 76).

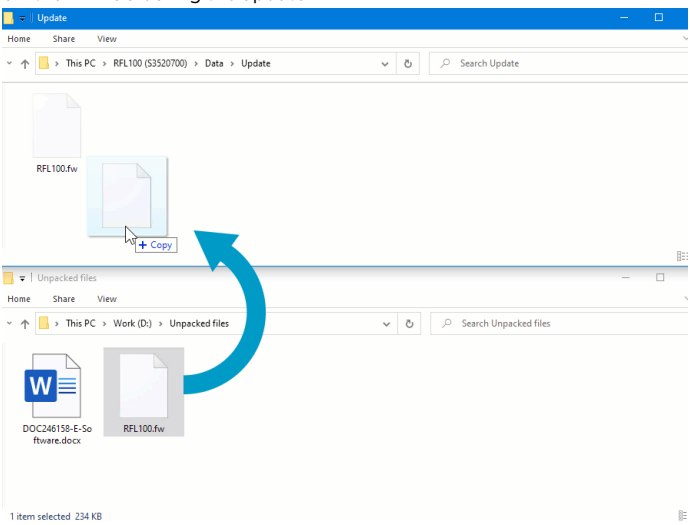
Updating the firmware will not affect the data logger's status in the Vaisala viewLinc Monitoring System. If the device was accepted in the system before the update, it will remain accepted.

1. To check if an update is necessary, verify the current firmware version of the RFL100 before starting.

   The current firmware version is shown briefly when you turn the RFL100 on, and also during info mode. If the firmware version you have downloaded is newer than the installed version, continue with the update.
2. If the firmware update file and release notes document are in a zip package, unzip it into a temporary directory.
3. If the RFL100 is switched off, switch it on.
4. Open the plug that covers the service port and connect the USB cable between your computer and the service port of the RFL100.

   After the computer detects the RFL100 and installs the appropriate driver, it is available for file transfer.
5. Copy the firmware update file (file name ending in ***.fw***) into the ***\Data\Update*** folder on the RFL100. For example, if your computer has a Windows operating system, you can simply drag the file into the correct folder (drag and drop) or use the copy and paste functions. Select to overwrite the old file when prompted.

   If the file is valid, RFL100 begins the update automatically. Do not unplug the cable or turn off the RFL100 during the update.



6. Monitor the update progress on the display of the RFL100. When the update is done, you will see **UPD OK** message on the display, after which the RFL100 restarts with the new firmware.

7. Disconnect the USB cable and close the plug over the service port.

6. Troubleshooting

6.1 Problem situations

Table 11 Troubleshooting table

Problem	Possible cause	Solution
You are adding a new RFL100 data logger to the system but it is not coming up as a **New Device** in viewLinc.	RFL100 is not in range of an AP10 that has **installation mode** turned on, and capacity to add more data loggers (maximum 32 for each AP10).	Turn on installation mode in an AP10 that is within 100 m (approx. 330 ft) of the data logger, and has capacity to add more data loggers.
	RFL100 is connected to an AP10 that is not connected to viewLinc.	Verify the following: • AP10 is connected to the network and has an IP address. • AP10 is configured to connect to the correct viewLinc Enterprise Server. • viewLinc connection of the AP10 is OK.
	You are connecting the RFL100 to VaiNet segment B, C, or D, but it has an older firmware version and can only connect to the default segment A.	Update the firmware of the RFL100 to at least version 1.8.0. See Updating RFL100 firmware (page 70).
	RFL100 has been previously accepted to a different viewLinc system.	Press the **Release** button of the RFL100 and verify that the message **NWK REL** appears on screen. The RFL100 is now ready to join any AP10 that is in installation mode.
	RFL100 has joined a different viewLinc system that is within VaiNet range.	
	RFL100 has joined an AP10 but has not been accepted to the viewLinc system. The AP10 is no longer in range, but RFL100 cannot change to a different access point as it is pending to be accepted to the system.	
Display shows 1 or more error codes.	Various causes.	Check meaning of the error code(s) and proceed accordingly. See Error codes (page 74).

Problem	Possible cause	Solution
Data logger shows dashes "- - -" instead of a CO_2 reading at start-up.	Start-up delay of the CO_2 probe.	This is normal. Wait for the CO_2 reading to appear.
RFL100 turns off by itself.	Display and LED of the RFL100 have been turned off remotely using viewLinc Enterprise Server. All other functions of the data logger remain active.	You can change the setting from the **Hosts and Devices** tree in viewLinc Enterprise Server. If you are connecting the RFL100 to a new viewLinc Monitoring System and you want the display and LED back on again, press the **Release** button of the RFL100 and verify that the message **NWK REL** appears on screen.
	Main batteries are empty.	Replace the main batteries. See Changing RFL100 batteries (page 69).

6.2 Error codes

Table 12 RFL100 error codes

Error code	Cause	Recommended action
Err 100	User parameter bank checksum failure.	Power cycle the data logger. If the error persists, contact Vaisala.
Err 101	Factory parameter bank checksum failure.	
Err 102	Real-time clock of the data logger has lost accurate time.	Restore the wireless connection to an AP10 access point. RFL100 will synchronize its clock with the time from the access point.
Err 103	Main battery voltage is critically low. When this error appears, the data logger will soon stop radio communication to conserve energy. It will continue to record measurement data in the local memory as long as possible.	Replace the main batteries of the data logger.
	External power supply is connected but the power switch of the data logger is in the **Off** position.	Move the power switch to the **On** position. Note that it will take some time for the error to clear if the data logger remains continuously powered.

Error code	Cause	Recommended action
Err 104	Incorrect factory configuration parameters.	Power cycle the data logger. If the error persists, contact Vaisala.
Err 105	Real-time clock hardware error.	
Err 106	Data logger is operating in CO_2 mode without external power.	Connect an external power supply to the service port of the data logger to avoid draining the batteries.
Err 110	If using 1 probe with the data logger: • No probe connected at startup • Incompatible probe detected • Trying to switch from 2-probe mode to1-probe mode without performing a factory reset	1. Verify that a compatible probe is connected to the data logger. 2. Power cycle the data logger to re-detect the probe. 3. If the error persists, it is likely that the data logger has been set up in 2-probe mode. Perform the factory reset procedure to allow 1-probe use again, then power cycle the logger to re-detect the probe.
	If using 2 temperature probes with the probe splitter: • No probes connected at startup • Two probes connected at same time without following proper setup or probe swap procedure • Data logger is in 2-probe mode but 1 probe is missing • Unsupported probe combination • At least 1 incompatible probe detected	1. Verify that that probe splitter and 2 supported temperature-only probes are connected to the data logger. 2. If you reconnected any probes, power cycle the data logger to re-detect the probe(s). 3. If the error persists, perform the 2-probe setup again.
Err 200	Real-time clock battery voltage is low.	Replace the clock battery.
Err 202	Communication failure with at least 1 probe that was detected at startup.	1. Check that the probe(s) are connected properly. 2. If you reconnected any probes, wait 1 minute for the display to update and verify that the error is gone. 3. If the error persists, power cycle the data logger to re-detect the probe(s).
Err 203	Probe error. Can be caused by probe damage or a wet humidity sensor.	Inspect the probe and replace it if necessary. If the error has been caused by a wet humidity sensor, wait for it to dry out.
Err 204	Real-time clock temperature compensation problem.	If error code **Err 200** is also active, replace the clock battery. If the error persists, contact Vaisala.

More information

- Probe detection (page 45)
- Probe replacement (page 54)
- Changing RFL100 clock battery (page 70)

6.3 Verifying operation of RFL100

1. Open the battery cover of the data logger.
2. Move the power switch to the **On** position.
3. Look at the display and verify that:
   - Battery indicator shows full batteries .
   - Display shows measurement readings instead of dashes or error codes.

   If measurement readings are not shown after a few seconds, check that the probe is properly connected. It is possible to disconnect the probe by pulling on the probe with the battery cover open.
4. Move the power switch to the **Off** position.
5. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe (or extension cable) in and try again.

6.4 Downloading data using service port

- Computer with a free USB port and an operating system that supports the Media Transfer Protocol (MTP). For example, Windows® 7 and newer.
- USB connection cable (USB 2.0 type A - micro-B, Vaisala cable 244961). You can also use a generic cable that has all pins connected (not just power).

In normal operation measurement data is automatically transferred to the viewLinc server. If there is a break in communication with the viewLinc server, the RFL100 will record data locally, and the data will be automatically backfilled when communication is restored. This means that local data download is mostly an optional convenience, and only really necessary in exceptional cases. For example, a communication break longer than 30 days would fill the local memory of the RFL100, and cause data to be lost unless it was locally downloaded.

The local data files are text files that can be viewed with any text editor. The data can also be imported to a spreadsheet program such as Microsoft Excel using the tab-separated values (TSV) import option. The data cannot be manually loaded to viewLinc, it must be stored as a separate file.

1. Open the plug that covers the service port.

2. Connect the USB cable between your computer and the service port of the RFL100 data logger.

   When the computer detects the RFL100, it is available for file transfer.
3. Navigate to the *\Data\Log* folder on the RFL100.
4. Copy the following files from the folder to retrieve the data:

File name	Content
Log_1h.txt	Measurement data from the past hour.
Log_24h.txt	Measurement data from the past 24 hours.
Log_30d.txt	Measurement data from the past 30 days.

5. Disconnect the USB cable and close the plug over the service port.

6.5 Performing a factory reset

- Pen or a small flat head screwdriver

Factory reset clears all user settings on the data logger much in the same way as pressing the **Release** button. Additionally, factory reset restores some lower level settings that are not user changeable. Factory reset will not clear existing data on the data logger.

You may need the factory reset in the following cases:

- If the data logger has been set up with 2 temperature probes (using the probe splitter accessory), you need to perform the factory reset before you can perform the setup in 1 probe mode.
- Factory reset can be done in an attempt to recover from serious operating errors that prevent normal startup or operation. This is not typically necessary, and should only be done in cases where it is advised by troubleshooting instructions or Vaisala Support.

1. Open the battery cover of the data logger.
2. Move the power switch to the **Off** position.
3. Hold down the **Release** button using a pen or a small flat-head screwdriver, and move the power switch to the **On** position. Keep holding down the **Release** button during start-up until you see the text **FCT RST** on the display. If you do not see the text appear, turn the data logger off and try again.
4. After a successful factory reset, the data logger will continue operating normally. To make sure factory settings are in use, move the power switch to the **Off** position, wait for a few seconds, and turn it back to **On** position. Verify from the display that the data logger starts up normally.
5. Close the battery cover of the data logger. **Push the latch down until you hear a click.** If the cover does not close easily, push the probe (or extension cable) in and try again.

After the factory reset, RFL100 will be ready to join any compatible viewLinc Monitoring System after a delay of 4 ... 6 minutes. The connecting access point must be in installation mode.

7. Technical data

7.1 RFL100 technical specification

See probe datasheets for technical specifications of supported measurement probes.

Table 13 RFL100 wireless

Property	Specification
Networking standards	Vaisala VaiNet
Modulation	Chirp spread spectrum modulation
Output power	≤ 13 dBm (≤ 20 mW)
Antenna	Internal
Typical range (indoors)	At least 100 m (approx. 330 ft)
Range with line-of-sight	Over 500 m (1640 ft)
Frequency bands	500 MHz, 868 MHz, 915 MHz, 920 MHz, and 922 MHz

Table 14 RFL100 memory

Property	Specification
Sample capacity	30 days (43200 samples per channel)
Memory type	Non-volatile EEPROM
Memory mode	Ring buffer (FIFO)
Sampling rate	One sample / channel / minute (non-changeable)

Table 15 RFL100 operating environment

Property	Description/Value
Storage temperature	−40 ... +60 °C (−40 ... +140 °F)
Operating humidity	0–100 %RH, non-condensing
IP rating	IP54: Limited protection against dust. Protected from water splashes from any direction.

Property	Description/Value
IP rating with external power supply	IP20: Protected against solid foreign objects of 12.5 mm Ø and greater.
Operating temperature [1)]	
with alkaline batteries	+2 ... +60 °C (+35.6 ... +140 °F)
with lithium batteries	−20 ... +60 °C (−4 ... +140 °F)
with external power supply	0 ... +60 °C (+32 ... +140 °F)

1) *Verify operating temperature specification when using third party batteries and power supplies.*

Table 16 RFL100 general

Property	Specification
Compatible probes	GMP251, HMP110, HMP110T, HMP115, HMP115T, TMP115
Batteries	2 × AA sized, 1.5 V (LR6 or FR6)
Clock battery	CR 1/3N (3 V lithium button cell)
Internal clock accuracy	±30 s/month Synchronizes with Network Time Protocol (NTP) server
Operation time on battery power at 20 °C (68 °F)	
RH and T measurement in any probe combination	18 months
CO_2 measurement	Typically 12 hours with lithium batteries

Table 17 RFL100 compatibility requirements

Item	Required minimum version(s)
viewLinc version	viewLinc Enterprise Server 5.0
Dual T probe support using Probe Splitter M8 accessory	• RFL100 firmware 1.2.0 • AP10 firmware 3.0 • viewLinc Enterprise Server 5.0.2
CO_2 measurement using Probe Splitter M8/M12 accessory and external power	• RFL100 firmware 1.4.0 • RFL100 hardware manufactured after July 2021 • AP10 firmware 4.0 and hardware revision G • viewLinc Enterprise Server 5.1

Table 18 RFL100 compliance

Property	Description/Value
Electromagnetic compatibility (EMC)	IEC/EN 61326-1, industrial environment
Electrical safety	IEC/EN 61010-1
500 MHz model	
Radio standards and approvals	China MIIT 工业和信息化部公告 2019 年第 52号
Compliance marks	China RoHS
868 MHz model	
EU directives and regulations	RoHS Directive (2011/65/EU) amended by 2015/863 Radio Equipment Directive, RED (2014/53/EU)
Radio standards and approvals	ETSI EN 300 220-2 ETSI EN 301 489-1 ICASA No: TA 2020-7761 IMDA No: DB105576 TRA No: 67584/18 Serbia: И005 21
Compliance marks	AAA, CE, ICASA, UKCA
915 MHz model	
Radio standards and approvals	Anatel ID: 04761-19-12322 AS/NZS 4268 FCC ID: 2AO39-RFL100A IC ID: 23830-RFL100A NOM ID: 1901C00493
Compliance marks	ANATEL, NOM, NYCE, RCM
920 MHz model	
Radio standards and approvals	MIC ID: 012-200007
Compliance marks	GITEKI
922 MHz model	
Radio standards and approvals	NCC ID: CCAP21LP1240T3
Compliance marks	NCC

Table 19 RFL100 mechanical specifications

Property	Specification
Housing color	White
Mounting methods	Screws, cable ties, hook, or magnetic mounting bracket (optional accessory)
Probe interface	4-pin female M8 connector
Service port	USB 2.0 with micro-USB connector
Dimensions (H × W × D) with HMP115 probe	
Without mounting bracket	158 × 62 × 31 mm (6.22 × 2.4 × 1.22 in)
With mounting bracket	186 × 68 × 36.5 mm (7.32 × 2.68 × 1.44 in)
Weight	
With batteries (2 pcs alkaline) and HMP115 probe	190 g (6.7 oz)
With batteries (2 pcs alkaline), HMP115 probe, and magnetic mounting bracket	254 g (8.96 oz)
Materials	
Housing	PC/ABS blend
Display window	PMMA (acrylic)
Sealings	TPE

Table 20 Requirements for external power supply

Property	Specification
Output voltage	5 V DC
Output power	Min. 1 W
Output connector	Micro-USB
Certifications and approvals	• Certified to IEC 62368-1 • Approved for use in your country

7.2 Accessories and spare parts

For probe-specific accessories and spare parts, see probe datasheets and user guides.

Table 21 RFL100 accessories

Accessory	Item code
Probe cable for RFL100, 1.5 m	CBL210555-1M5SP
Probe cable for RFL100, 3 m	CBL210555-3MSP
Probe cable for RFL100, 10 m	CBL210555-10MSP
Flat cable for RFL100, 3 m	CBL210647SP
Probe holder (5 pcs) for Ø 12 mm probes	ASM213382SP
CO_2 probe mounting kit	ASM214253SP
Probe splitter M8 (for connecting two T probes)	CBL210834SP
Probe splitter M8/M12 (for connecting a CO_2 probe)	CBL211050SP
1 m high-temperature cable M12 (for CO_2 probe) [1)]	271038SP
1 m high-temperature cable M8 (for RH/T probe in CO_2 applications) [1)]	271039SP
Universal power supply (100–240 V AC / 5 V DC) with micro-USB connector	ASM214178SP

1) *High-temperature cables are extensions for the probe splitter M8/M12 in CO_2 applications. They tolerate –20 ... +180 °C (–4 ... +356 °F) temperatures and can remain inside an incubator during a typical heat sterilization cycle. Due to heat conduction, leave half of the cable in ambient temperature when installed.*

Table 22 RFL100 spare parts

Description	Item code
RFL100 mounting bracket (5 pcs)	DRW244769SP
RFL100 magnetic mounting bracket (5 pcs)	ASM211527SP
RFL100 battery cover (5 pcs)	DRW244766SP
RFL100 and AP10 mounting kit	245679SP
Probes	
HMP110 probe	HMP110 order form, code: Z00B0C1A0
HMP110T probe	HMP110 order form, code: Z0B01A0
HMP115 probe	HMP115 order form
HMP115T probe	HMP115T order form
TMP115 probe	TMP115 order form
GMP251 probe	GMP251 order form, code: B1B0C0N1

7.3 Dimension drawings

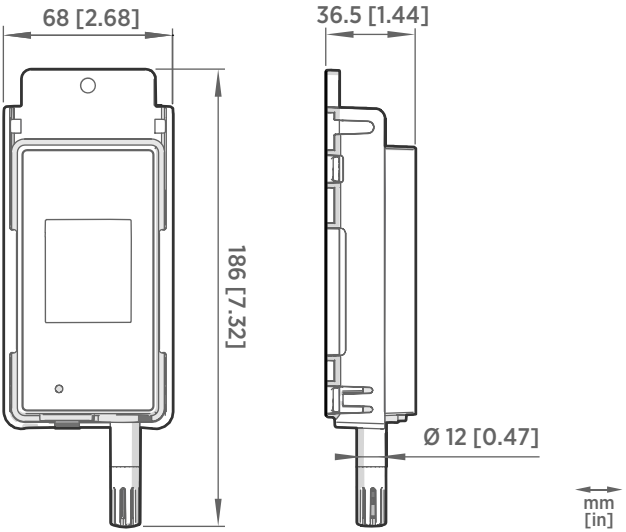


Figure 25 RFL100 dimensions with mounting bracket

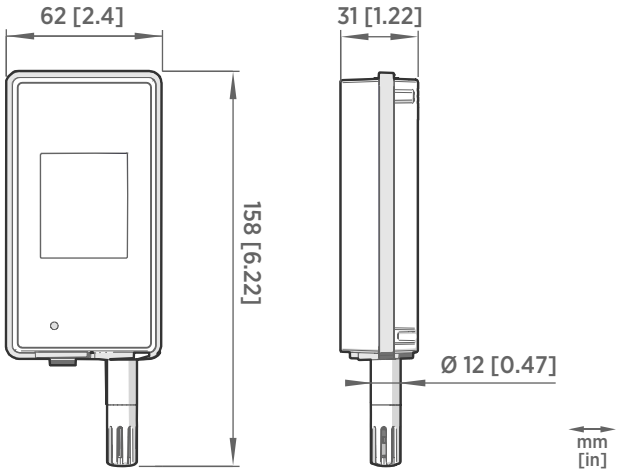


Figure 26 RFL100 dimensions without mounting bracket

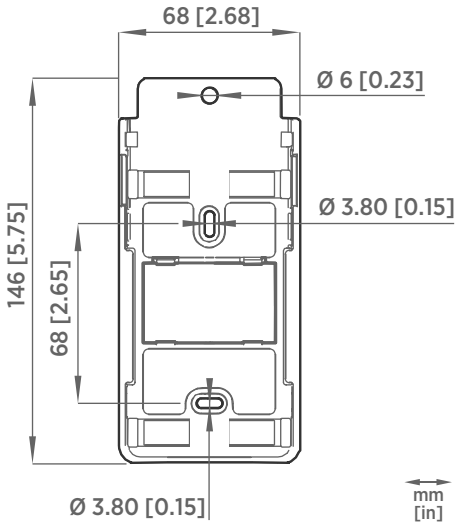


Figure 27 RFL100 mounting bracket dimensions

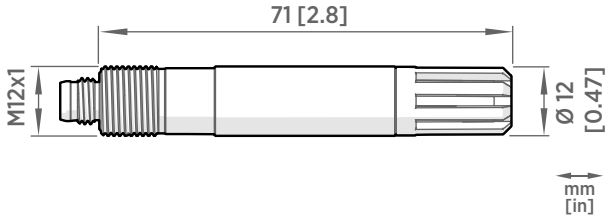


Figure 28 HMP110 probe dimensions

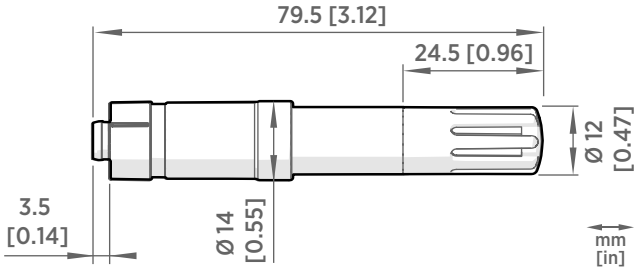


Figure 29 HMP115 probe dimensions

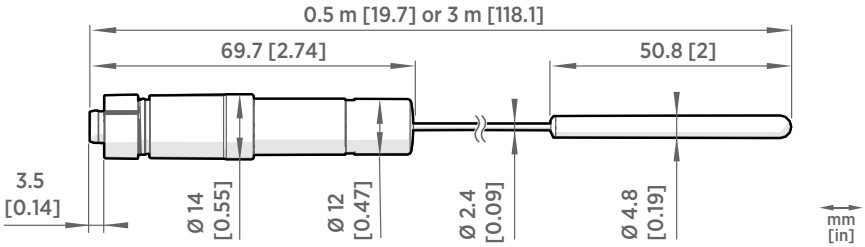


Figure 30 TMP115 probe dimensions

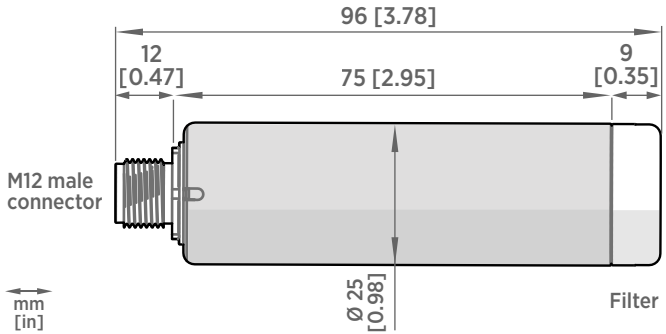


Figure 31 GMP251 probe dimensions

Maintenance and calibration services

Vaisala offers comprehensive customer care throughout the life cycle of our measurement instruments and systems. Our factory services are provided worldwide with fast deliveries. For more information, see www.vaisala.com/calibration.

- Vaisala Online Store at store.vaisala.com is available for most countries. You can browse the offering by product model and order the right accessories, spare parts, or maintenance and calibration services.
- To contact your local maintenance and calibration expert, see www.vaisala.com/contactus.

Technical support

Contact Vaisala technical support at helpdesk@vaisala.com. Provide at least the following supporting information 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 on the problem

For more information, see www.vaisala.com/support.

Warranty

For standard warranty terms and conditions, see www.vaisala.com/warranty.
Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

Recycling

When preparing to recycle the data logger, open the battery cover and remove the main batteries and the clock battery.

Recycle all applicable material according to local regulations.

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Visit docs.vaisala.com for product documentation updates and translations.

www.vaisala.com