Instruction Manual

Multichannel User Interface
MI

VAISALA

General safety considerations

Always power off the Multichannel user interface MI before accessing the modules behind the display. Vaisala recommends the installation of an external power switch.

⚠ **Warning!** If this device is used against manufacturer's instructions, user safety may be compromised.

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.

Technical support

Contact Vaisala technical support at helpdesk@vaisala.com. Provide at least the following supporting information:
- Product name, model, and serial number
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information of the problem

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

Disposal

When wishing to dispose of an obsolete instrument or any parts of an instrument, please observe local and national regulations and requirements for the disposal of electrical and electronic equipment.

Symbols and terms used in this manual:

⚠ This indicates a **warning**. It provides safety precaution information needed to avoid injury while operating the refractometer system.

ⓘ This indicates that something is **important** for the operation of the refractometer system.

Note. Notes contain additional information and hints.

This product manual is delivered to the end user with a Vaisala K-PATENTS® product. Information in this manual is subject to change without notice. When the manual is changed, a revised copy is published at *http://www.kpatents.com/*

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MI instruction manual

1 Description

The Multichannel user interface MI is an industrial computer designed to add function-ality to the PR-43 refractometers. The MI sends and receives data and it can also be used to control the process.

The Multichannel user interface MI connects with up to 4 Vaisala K-PATENTS® PR-43 refractometers. With module cards, it can also be used to add external inputs and outputs (e.g. relays and mA outputs) to your refractometer system.

The MI is operated by the touch-screen display. The stainless steel enclosure gives a good environmental protection and allows also outdoor installations, especially with the included rain cover. The outer door is easy to open by one hand and the handle can be modified for padlock to prevent unauthorized access. The module cards can be reached by opening the inner door. The MI has IP66 rating when the outer door is open if the inner door (display panel) is fixed. With outer door closed the rating is IP67.
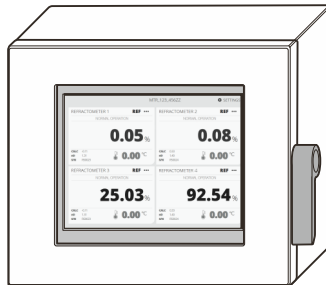
Figure 1.1   Multichannel user interface MI

2 Mounting

The Multichannel user interface MI can be mounted on a wall with wall mounting or on a table with a table stand. The mounting location should be easily accessible. If mounted outdoors, the MI has to be protected from rain and direct sunlight.
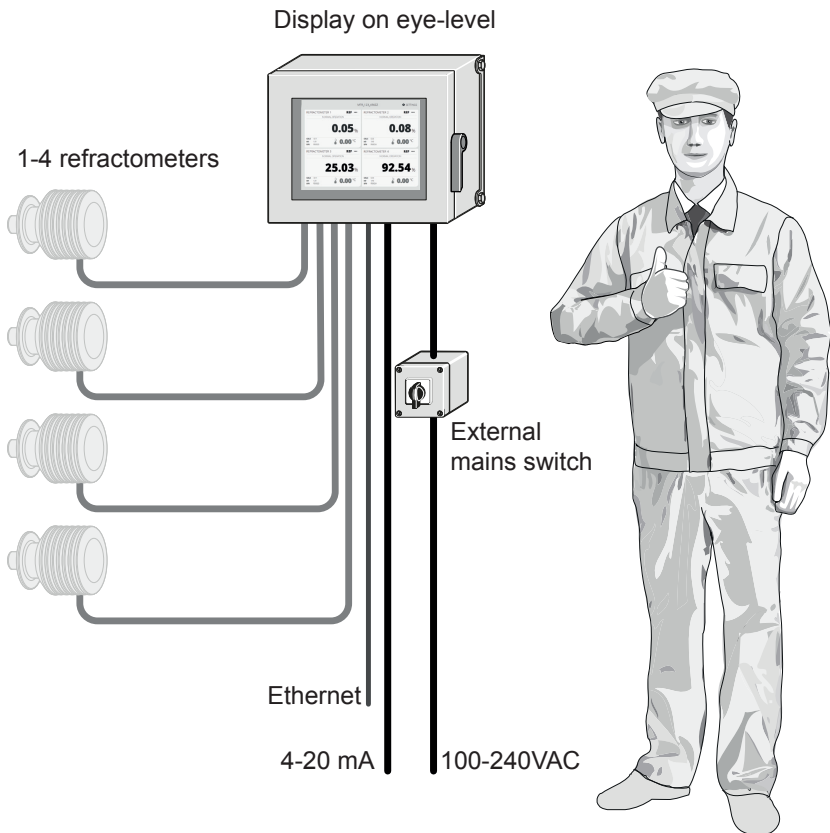
Figure 2.1   Mounting guide
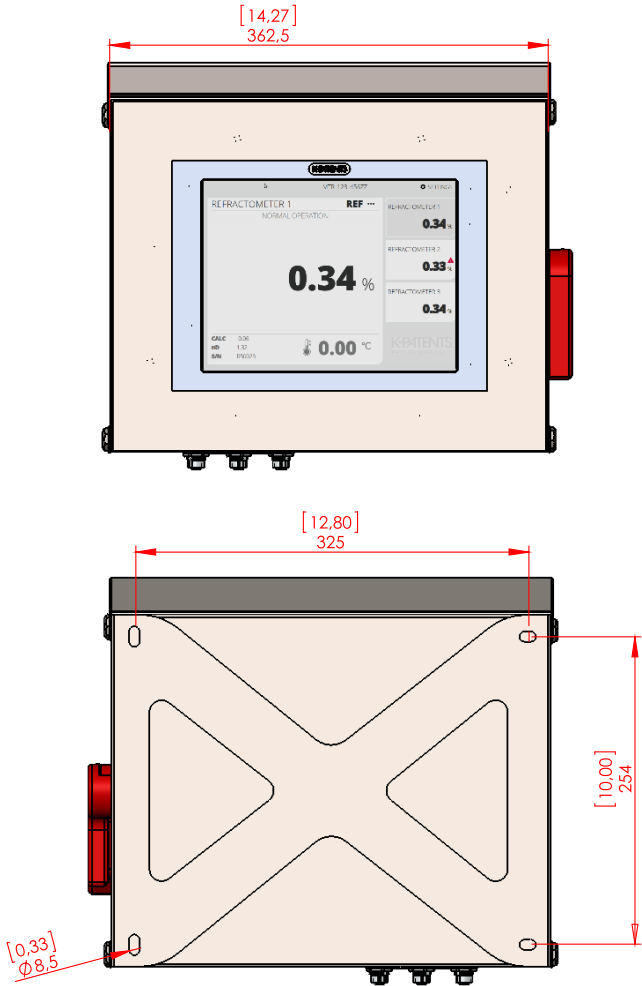
Figure 2.2   Enclosure dimensions
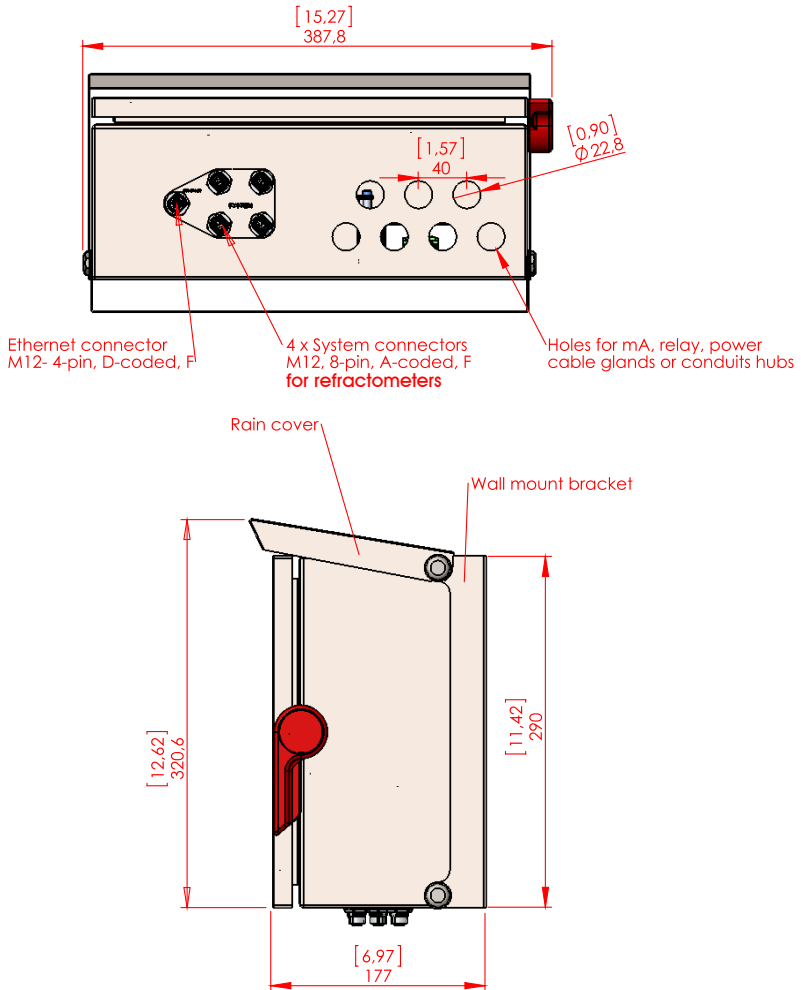
Figure 2.3   Enclosure dimensions
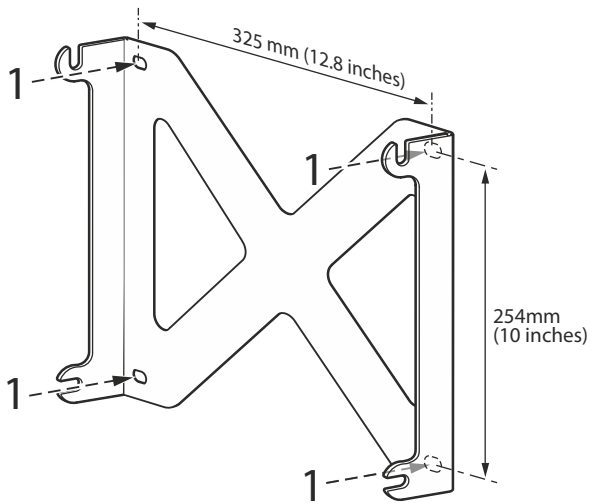
1. Bracket screwed to wall by 4 screws.

Screw hole dimensions 325x254mm

Figure 2.4   Mounting the wall bracket
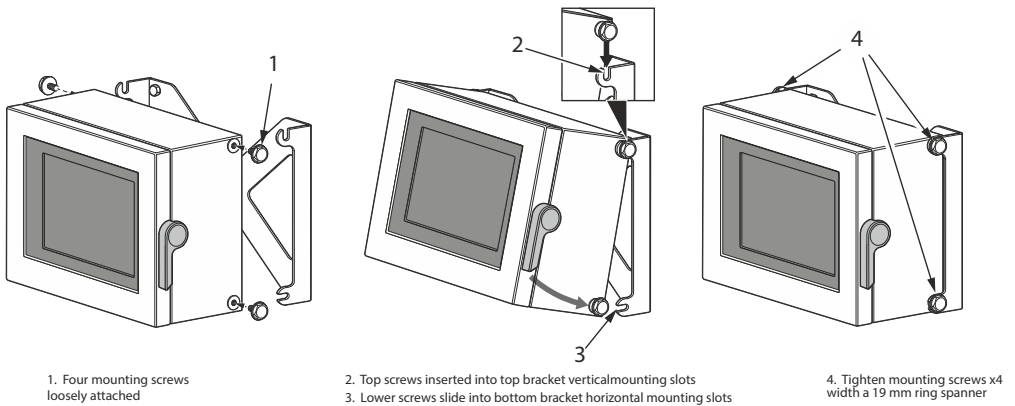
1. Four mounting screws
loosely attached

2. Top screws inserted into top bracket verticalmounting slots
3. Lower screws slide into bottom bracket horizontal mounting slots

4. Tighten mounting screws x4
width a 19 mm ring spanner

Figure 2.5   Mounting the MI onto the wall bracket

Note: Be careful when mounting, the MI weighs 13 kilos (28.5 lbs).

> ⚠ **Important:** Do not drill mounting holes in the enclosure as that will affect the protection class of the enclosure and damage the electronics.

The MI is shipped with a rain cover. Vaisala recommends that it is installed even indoors to protect the top of the door from dust and dirt.

1. Screw out top attaching screws to allow clearance for rain cover to slot in place

2. Retighten screws
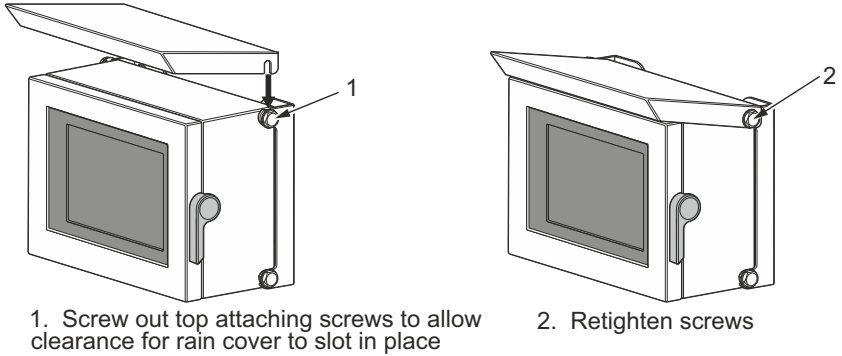
Figure 2.6   Mounting the rain cover

The table stand is very simple to mount.
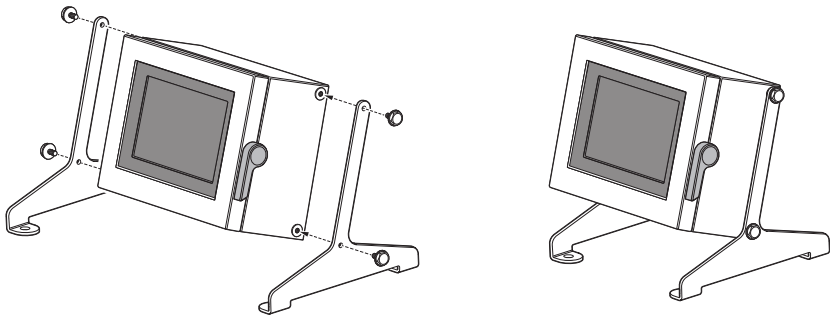
Figure 2.7   Table stand

The MI door handle can be modified to make space for a padlock to prevent unauthorized access.
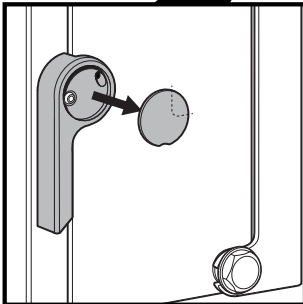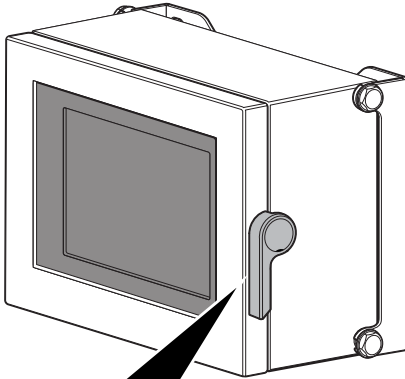
Remove handle center cover
and remove segment indicated
by break-line on the back of cover
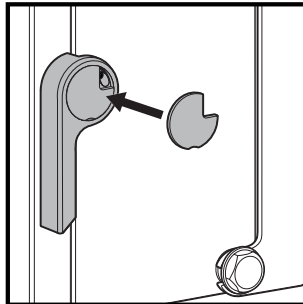
Replace center cover once
indicated segment has been
removed, making sure the opening
aligns with the channel for the padlock shackle
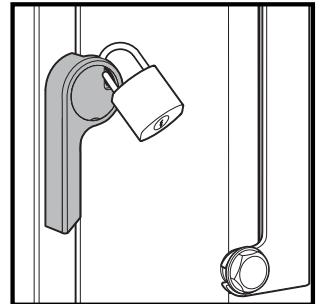
Figure 2.8 Locking the MI

3 Connections
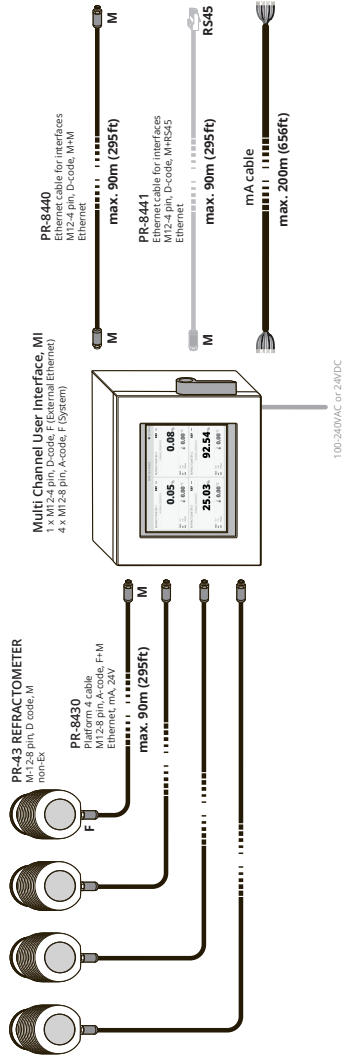
Figure 3.1   Multichannel user interface connections

3.1 Connecting the power cable

⚠ **Warning!** Make sure there is no power in your cable. Then open the enclosure and the inner door. You need a TX25 screwdriver to open the inner door retaining screws.

1. Push door gently
2. Lift handle 45 deg up
3. Open the door
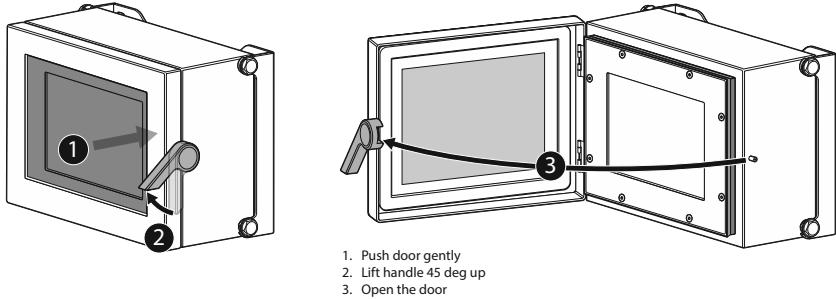
Figure 3.2   Opening the enclosure

Remove inner door retaining screws
and open inner door
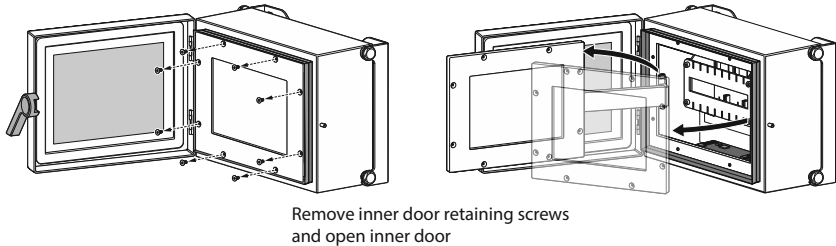
Figure 3.3   Opening the inner door

Unscrew one of the cable glands and push the power cable through. Connect the power cable to the power terminals at lower right of the motherboard (see below). Screw on the cable gland. Close the inner door and turn power on.

3.1.1   Power terminals for AC power

The primary AC power is connected to a separate terminal strip 1/2/3 in the lower right-hand corner of the motherboard. The three terminals are marked 1.L, 2.N and 3⏚ (protective earth). The power terminal 3/⏚ is directly connected to the exposed metal parts of the MI. Wiring to the terminals shall be 1.5mm^2 minimum. The protective fuse in the building system shall comply with the local requirements.
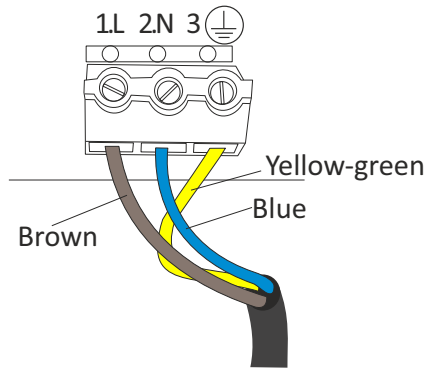
Figure 3.4   AC power terminals on the motherboard

3.1.2   Power terminals for DC power

The DC power is connected to a terminal stripe in the lower right-hand corner of the motherboard. The three terminals are marked 1+, 2- and 3⏚ (protective earth). The power terminal ⏚ is directly connected to the exposed metal parts of the MI. The 24V DC power to this terminal stripe shall be supplied from a secondary circuit which is double or reinforced insulated from the mains supply within the limits for a limited-energy circuit (maximum 200 VA/U) according to the IEC 61010-1.

3.1.3   External mains switch
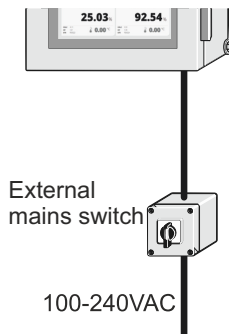
Figure 3.5   Installing external main switch

Important: The MI does not have a built-in power switch. The system is always powered when connected to a power source. Vaisala recommends mounting an external mains switch to control the MI's power supply (Figure 3.5). The external power switch should be easy to access. It is also recommended to use a 10A/230V circuit breaker for power supply.
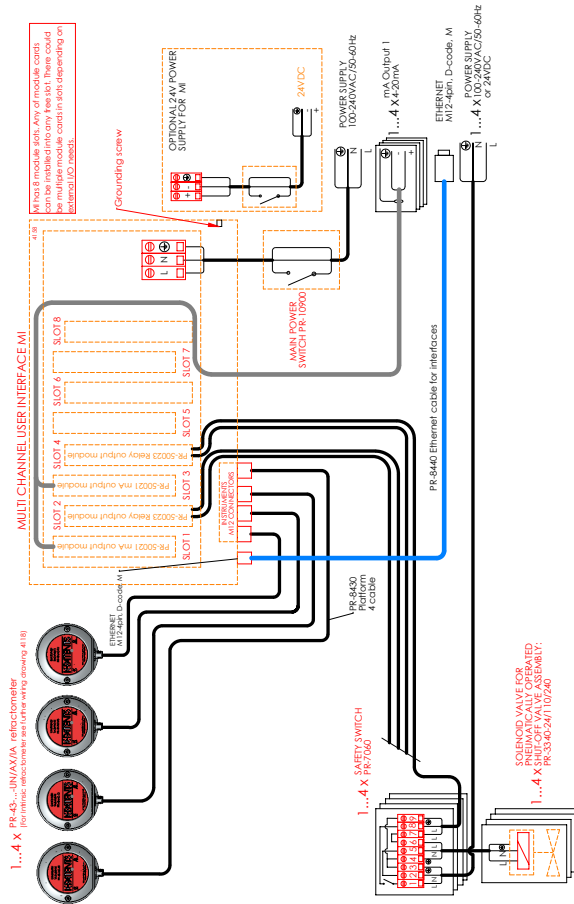
Figure 3.6   Multichannel user interface wiring

3.2 Refractometer cable connections

The refractometers are connected to the MI with a M12 male-female 8 pins A-coded cable PR-8430, maximum length 90 m. The refractometer connectors are located underneath the MI enclosure as a group of four. Refractometer connections can be made while the MI is powered. A refractometer can be connected to any of the four connectors.

3.3 Ethernet cable connection

The leftmost connector underneath the MI is for ethernet output. It is for a M12 male 4-pins D-coded cable. The cable can be connected while the MI is powered.

If you wish to connect the MI with e.g. a laptop, you can purchase Interconnecting cable PR-8330 with a M12-4 pin connector in one end and a RJ-45 connector in the other end.

3.4 Module cards

For the installation of the module cards, see Chapter 6 "Module cards".

3.5 Connections for external control of Recipe app

Item	Component	Part number	Supplied by	QTY
1	PR-43 Refractometer		Vaisala	1-4
2	Platform 4 cable	PR-8430	Vaisala	1-4
3	Multichannel User Interface MI		Vaisala	1
4	Main power switch	PR-10900	Vaisala	1
5	mA-output cable		Customer	1
6	GPIO selection cable		Customer	1
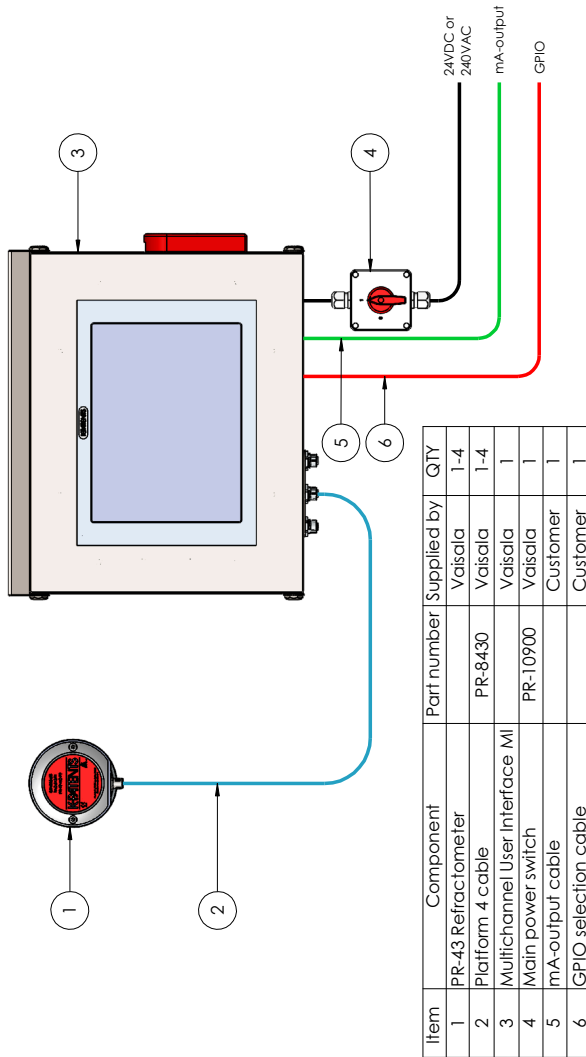
Figure 3.7   Recipe app controlled via GPIO (SYS-605)

Item	Component	Part number	Supplied by	QTY
1	PR-43 Refractometer		Vaisala	1-4
2	Platform 4 cable	PR-8430	Vaisala	1-4
3	Multichannel User Interface MI		Vaisala	1
4	Main power switch	PR-10900	Vaisala	1
5	mA-output cable		Customer	1
6	Ethernet cable	PR-8330	Vaisala	1
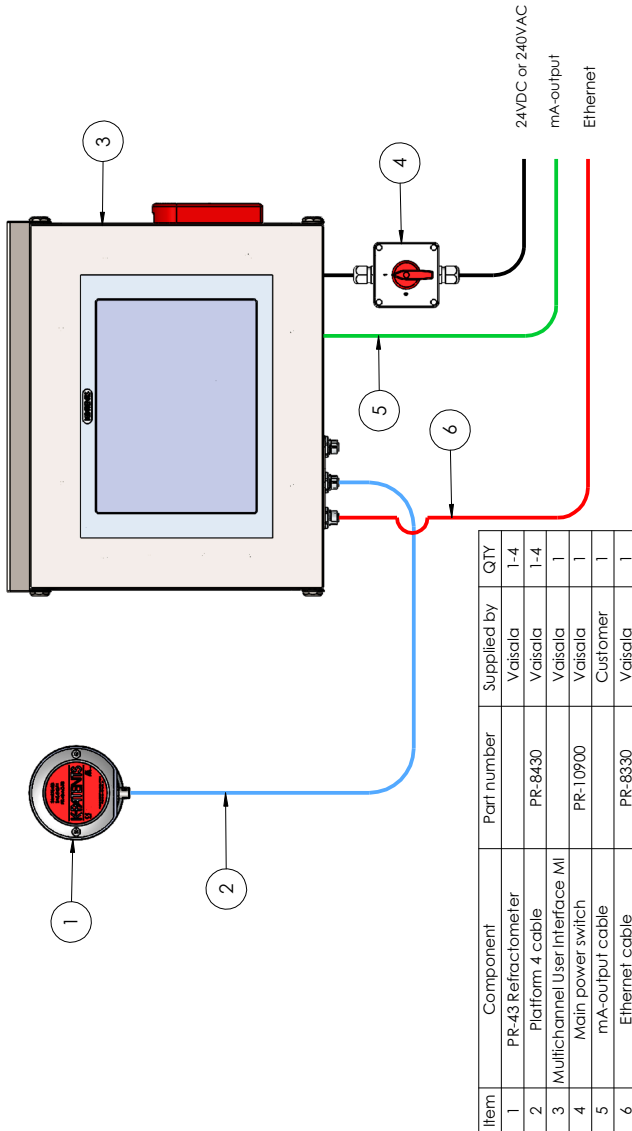
Figure 3.8   Recipe app controlled via Modbus/TCP or Ethernet/IP

4 Use

Power up the Multichannel user interface MI. A startup display with a progress bar is shown for approximately one minute, then the Main display appears.

The MI is operated by tapping the touch screen. To get access to the MI touch screen, open the enclosure door.

Note: If you find that the touch screen is difficult to use with fingers, try tapping it with e.g. the blunt end of a pen or use a fingernail instead of the whole fingertip. The screen works even when you are wearing gloves.

4.1 Main display

The main view can show up to four application windows at the same time. You can access measurement data and system settings via the Main display.
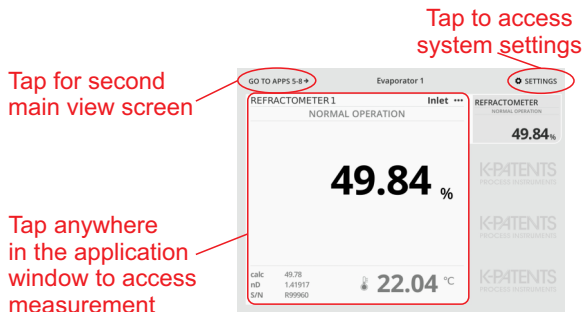
Figure 4.1   Accessing measurement and system settings via Main display

The Main display setup is controlled via *Settings > General*. Display mode and display language are chosen in drop-down menus, tap the little triangle to see the whole menu.

If you only have one application (usually a single refractometer), *One maximized* will make the most of the display. *Dual vertical* allows you to see two application, *Quadrant* and *One on top* shows up to of four applications at the same time. **Note:** If you have three applications and choose *One maximized*, you'll only see one application, but the other two will continue to run in the background.
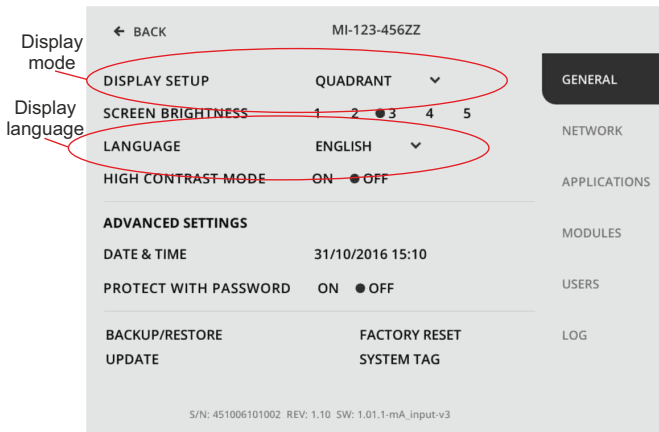
Figure 4.2   Selecting display mode and display language
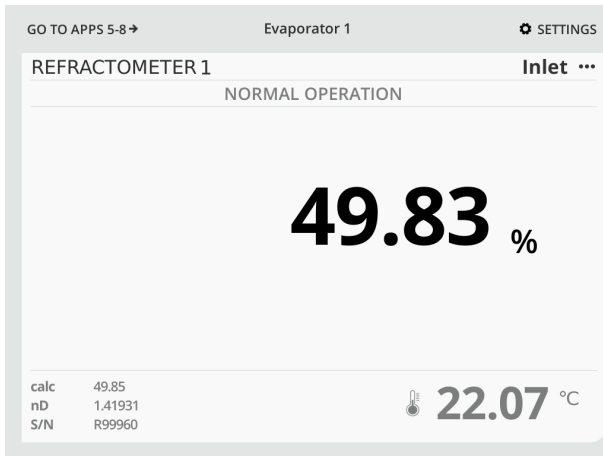
Figure 4.3   Setting "One maximized"
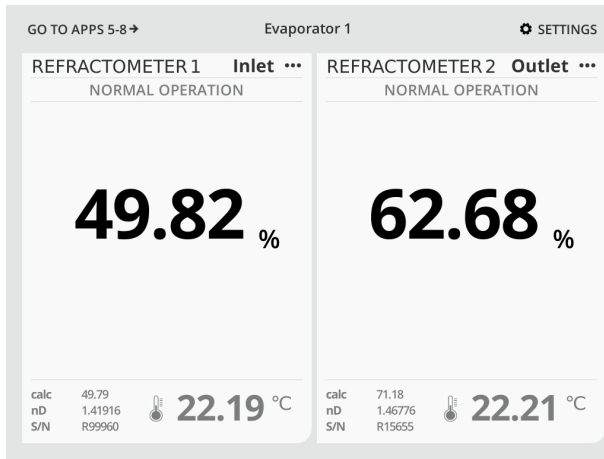
Figure 4.4   Setting "Dual horizontal"
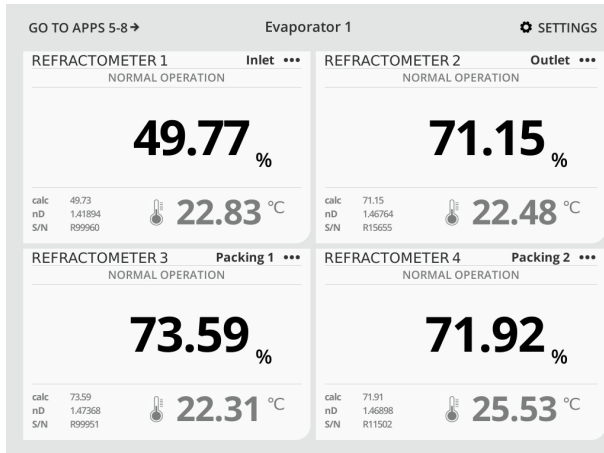
Figure 4.5   Setting "Quadrant"
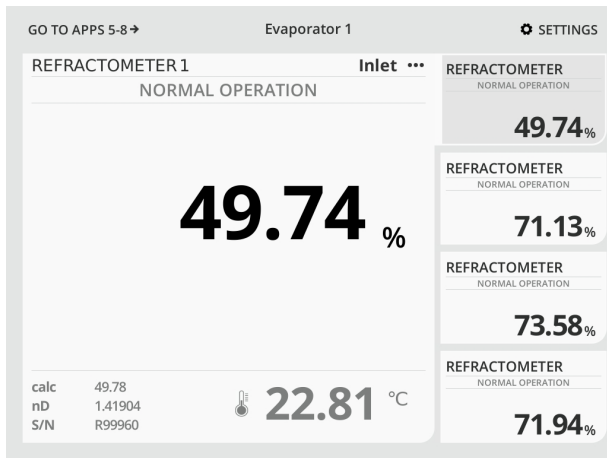
Figure 4.6   Setting "One on top"

Note: If the MI is left with a different display, e.g. Calibration, it will automatically go back to the Main display after a timeout.

Note: You can adjust Refractometer app to show concentration only, temperature only or both concentration and temperature. To change this setting, tap on the application window (see Figure 4.1) and choose *Calibration* (You may need to enter your password to get access to Calibration display). Then select the preferable display mode.
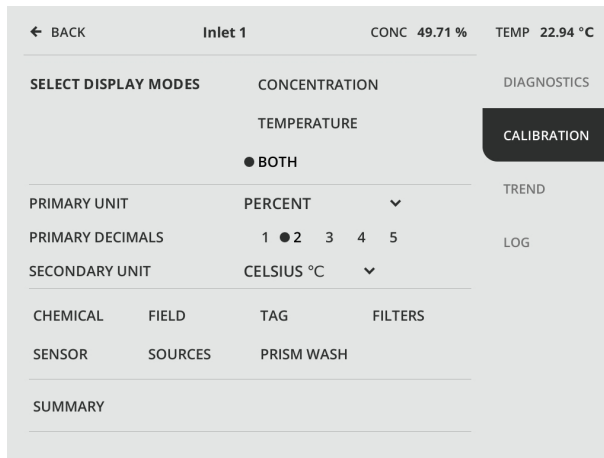
Figure 4.7   Calibration display

4.2 Activating and removing apps

The Main display may be empty even when one or several refractometers are connected to the MI. This means that one or several applications must be activated. Go to *Settings > Applications*, tap on the empty application slot and select the app type and source for that slot. After choosing settings for the app, tap *Done* to exit the setup.

Figure 4.8   Empty main display in quadrant mode
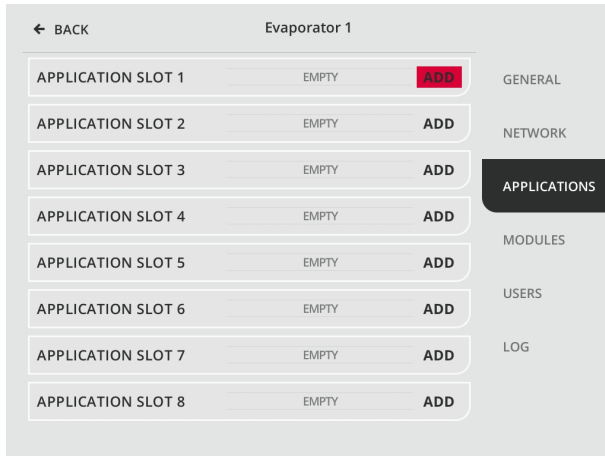
Figure 4.9   Selecting an empty application slot to activate the app
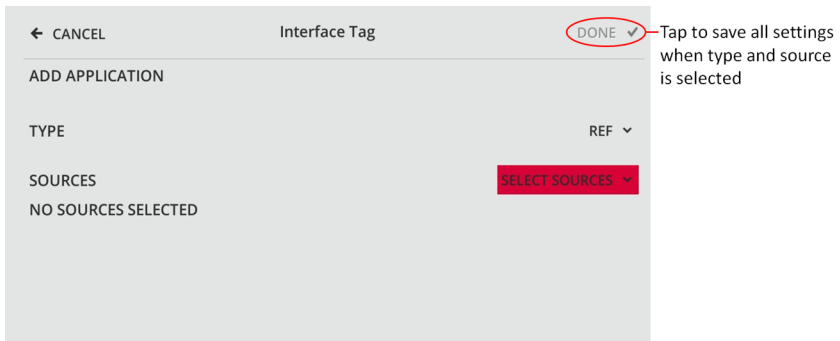
Figure 4.10   Selecting a source to activate the
app, here application type *Ref* is already selected

The empty application slot may contain an earlier app configuration. In that case a dialog will open during app activation and the earlier app configuration can be re-enabled.
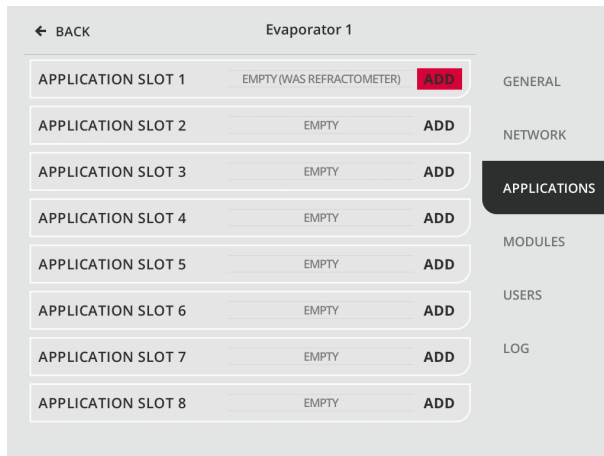
Figure 4.11   Selecting an empty application slot
that contains old Refractometer app configuration
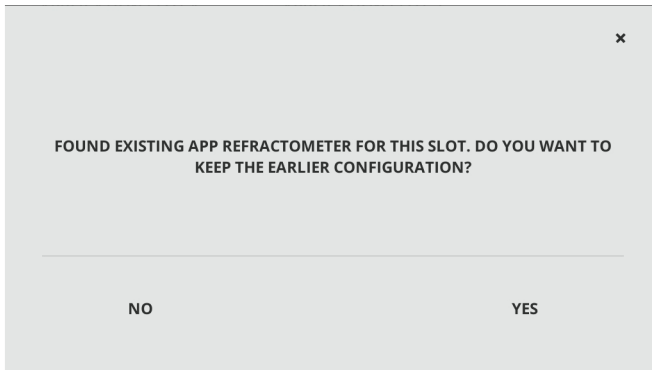
Figure 4.12   The earlier app configuration can be re-enabled

If necessary the app can also be removed. Go to *Settings > Applications* and tap *Remove* on the application slot. Accept the removal by tapping *Ok*. App's configuration will be saved until another kind of application is added to the same slot.
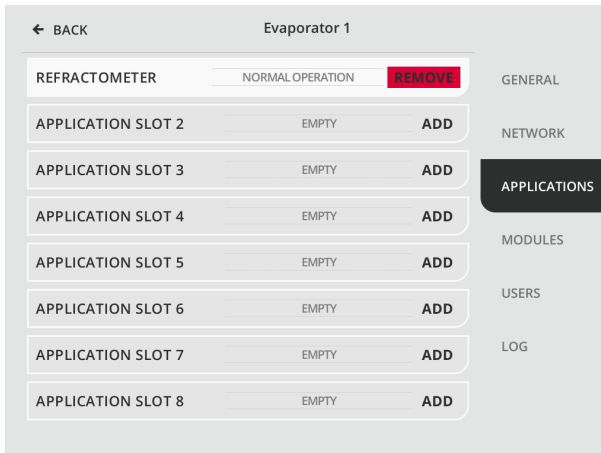
Figure 4.13   If necessary, an app can also be removed

4.3 Managing users and passwords

Some functions and settings, e.g. calibration, require a user to log in. Most functions in the settings, including user management, are only available to the master user. **The master user password (pin code) is printed on the delivery data sheet** shipped with the MI.

Note: Controlling and switching recipes in Recipe app (see section 5.3) is not protected by user passwords.

Go to *Settings > Users* to manage users. Vaisala recommends that a user name and a password is set separately for each user who needs to have frequent access to the restricted functions.
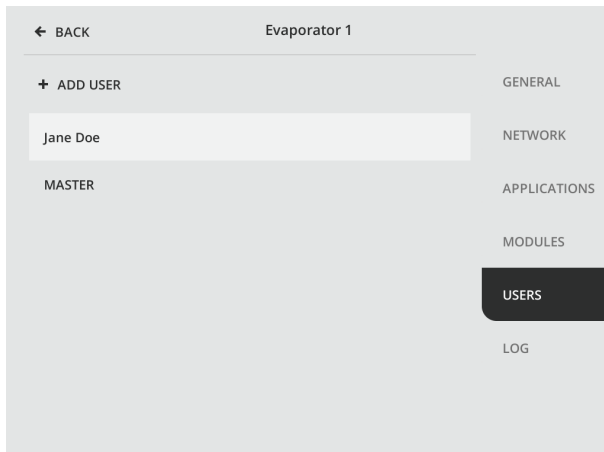
Figure 4.14   The Users display

Tap *+ Add User* to add users. Tap *Set name* to get access to the keyboard, then type the username and tap *OK*.
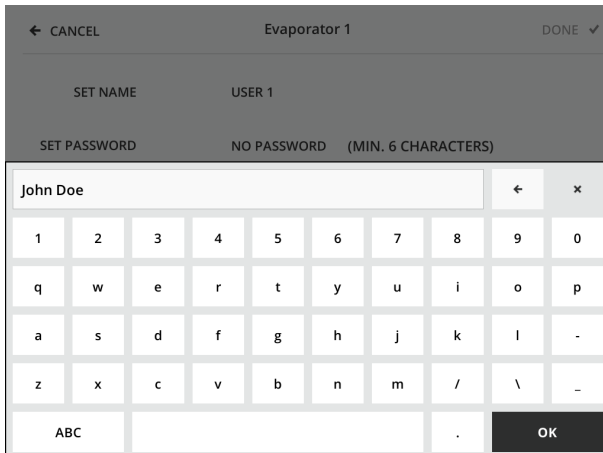
Figure 4.15   Writing a username

Note: If you have entered a username, you *must* enter a password, too, you cannot leave the password field empty.
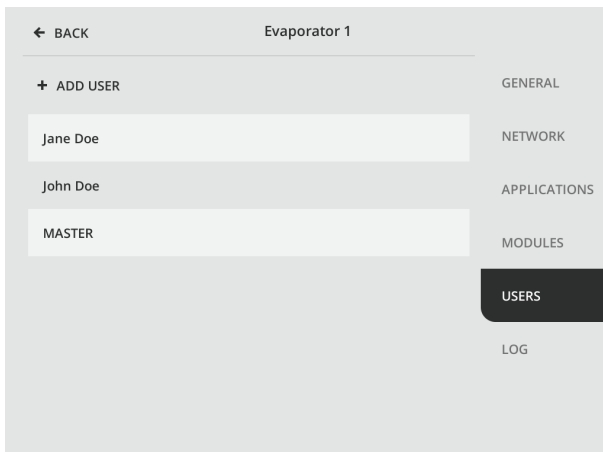
Figure 4.16   New user added to the list

To remove a user, go to *Users* and tap the name of the user you want to remove, then tap *Remove user*.

Note: The MI can store up to 38 users.

4.4 System log

To access a system log, go to *Settings > Log*. The system log lists status changes of the system like booting up, adding an app and changing module card settings. The system log is also accessed via http connection. Use the IP address found in the MI *Settings > Network* menu, under *Ethernet* section. On the MI web page select *files > system > log*.
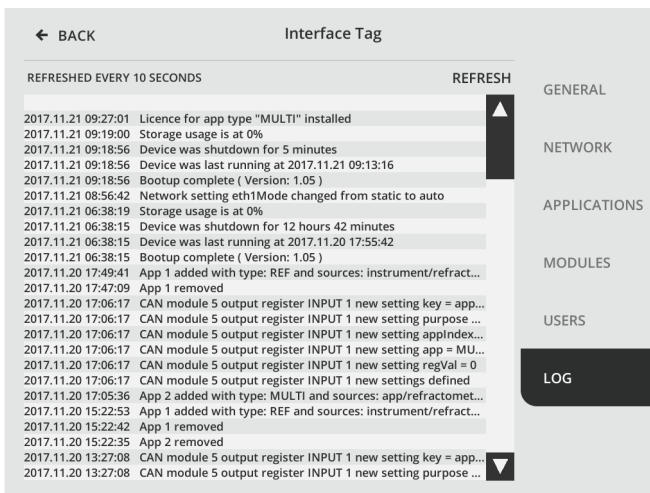
Figure 4.17   System log

4.5 Ethernet connections

4.5.1   MI ethernet connection

The MI has a built-in web server with a home page. The MI home page allows you to browse files or upload an update or a license file. To access the MI web page use IP address found under the title *Ethernet* in the *Settings > Network* menu.

The default IP address mode setting for the MI is *Auto*. In this mode the MI gets the IP address from an external DHCP server. If that fails the IP address will fall back to a static IP setting. Alternatively *IP address mode: Static* configures the MI to use a static IP address only. After choosing settings for the network, tap *Apply* to save all settings.

After factory reset the default IP address of the MI is 192.168.1.11.

← BACK	Interface Tag		
INSTRUMENT			GENERAL
CURRENT IP ADDRESS		192.168.143.11	
IP ADDRESS MODE	STATIC	DYNAMIC ● AUTO	NETWORK
SET STATIC IP ADDRESS		192.168.143.11	
SET SUBNET MASK		255.255.255.0	
SET FIRST SENSOR IP ADDRESS		192.168.143.20	APPLICATIONS
START BOOTP SERVER		YES NO ● AUTO	
			MODULES
ETHERNET			
CURRENT IP ADDRESS		172.16.21.166	USERS — MI web page IP address
IP ADDRESS MODE	STATIC	DYNAMIC ● AUTO	
SET STATIC IP ADDRESS		193.168.1.11	LOG
SET SUBNET MASK		255.255.255.0	
SET DEFAULT GATEWAY		0.0.0.0	
REMOTE UNIT IP ADDRESS			

Figure 4.18   To access the MI web page use IP address found in the *Settings > Network* menu
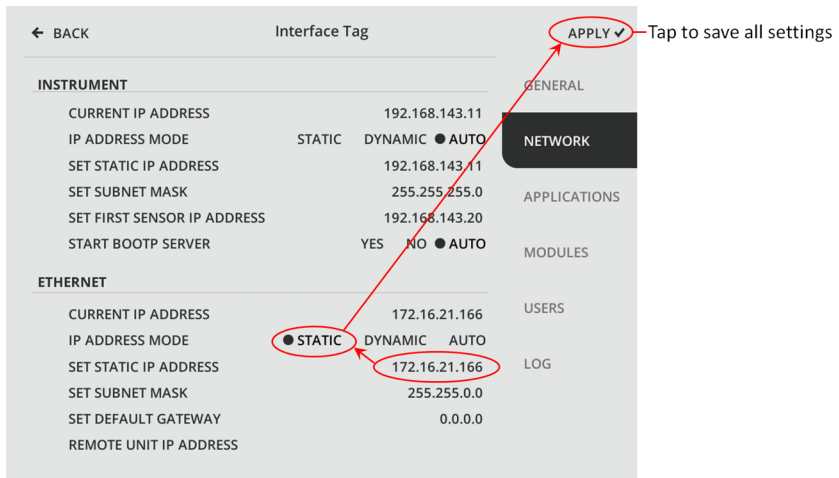
Figure 4.19   Steps to configure a static IP address for an MI

4.5.2   Refractometer connection

Refractometer's connection to the MI is configured under the title *Instrument* in the
Settings > Network menu. By default the refractometer's IP address is configured via
BOOTP server running on the MI. To reconnect a refractometer you can just replug its
cable to the MI – the IP address is configured automatically. Refractometer connections
can be made while the MI is powered.

4.5.3   Modbus/TCP connection

The MI has a built-in Modbus/TCP server that provides measurement data for con-
nected clients. Clients can connect and read the Modbus registers by using function
code 3. Each active MI app updates its registers that depend on app type. The registers
are listed on tables 4.1 and 4.2.

NAME	ADDRESS	TYPE	FUNCTION
Status	n032	32-BYTE STRING	Refractometer status message
Conc	n050	FLOAT	Final concentration value
Temp	n052	FLOAT	Process temperature
Calc	n054	FLOAT	Calculated concentration value
nD	n056	FLOAT	Calculated refractive index value
S/N	n098	32-BYTE STRING	Refractometer serial number
Ext wash	1n000	4-BYTE INT	External wash request input

Table 4.1   Modbus registers of a Refractometer
app. Register address n is the appslot number

External wash request includes a state machine to prevent continuous wash triggering that would wear out the sensor, so there must be a resetting value (zero) between each wash triggering values (ones).

NAME	ADDRESS	TYPE	FUNCTION
Status	n032	32-BYTE STRING	Refractometer status message
Conc	n050	FLOAT	Final concentration value
Temp	n052	FLOAT	Process temperature
Calc	n054	FLOAT	Calculated concentration value
nD	n056	FLOAT	Calculated refractive index value
S/N	n098	32-BYTE STRING	Refractometer serial number
Recipe ID	1n200	4-BYTE INT	Recipe identification number input

Table 4.2   Modbus registers of a Recipe app.
Register address n is the appslot number

Note: It is recommended to avoid overloading the MI with very frequent Modbus requests. The shortest recommended interval between Modbus requests is 100 ms.

4.5.4 Ethernet/IP connection

The MI implements an Ethernet/IP adapter that provides measurement data for connected scanners. Currently active MI app configuration determines the available

measurement data and the Ethernet/IP connection parameters. Connection can be set up easily with the Windows PC tool "Vaisala MI/CI EDS Generator" that generates EDS files based on the requested MI app configuration. The tool is available at https://www.kpatents.com/support/document-downloads/software-for-connectivity-and-communications. When using the tool, select the apps that are configured for each appslot on MI, then press "GENERATE EDS FILE" and choose name and location for the new EDS file.
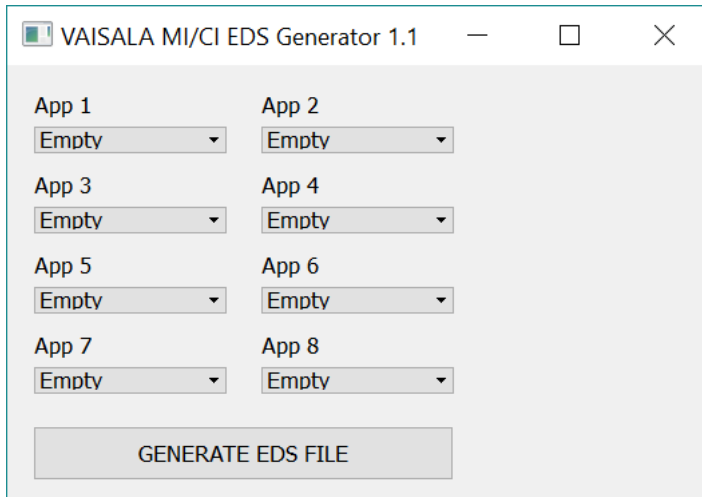
Figure 4.20   EDS File Generator

The data content of the O->T and T->O instances is a combination of individual app data contents. See the following tables for data content of individual apps.

NAME	BYTES	TYPE	FUNCTION
Conc	0-3	REAL	Final concentration value
Temp	4-7	REAL	Process temperature
Calc	8-11	REAL	Calculated concentration value
nD	12-15	REAL	Calculated refractive index value
S/N	16-27	STRING	Refractometer serial number
Status	28-59	STRING	Refractometer status message

Table 4.3   The 60-byte data of the Refractometer app. Recipe app has an identical set of output data

NAME	BYTES	TYPE	FUNCTION
ExtWash	0-1	INT	External wash request input

Table 4.4   The 2-byte input data of the Refractometer app

NAME	BYTES	TYPE	FUNCTION
RecipeID	0-1	INT	Recipe identification number input

Table 4.5   The 2-byte input data of the Recipe app

The connection can be set up manually with the following parameters:

Port: 0xAF12 (44818)

O->T:
- instance number: 119
- data size: sum of configured app's input data sizes, see the tables above.
- real time format: modeless
- packet rate: 1000 ms

T->O:
- instance number: 109
- data size: sum of configured app's output data sizes, see the tables above.
- real time format: modeless
- packet rate: 1000 ms
- connection type: point to point

5 Apps

Apps are small programs that give you different types of measurement data and functionality. Vaisala is constantly developing new apps for the measurement, but some are installed by default.

5.1 Shared functionality

While different applications work differently, there are some functions that are similar to all applications.

5.1.1 Application trend

An MI app can display graphically one or two of its variables over selectable time period. To access an app trend, tap application window on the main view and tap *Trend*. Save the trend by tapping *Save*. Saved trend can be accessed via http connection. Use the IP address found in the MI *Settings > Network* menu, under *Ethernet* section. On the MI web page select *files > trend > yearMonthDate-time_appType_slotNumber.csv*.

Note: Only apps running on the first four app slots can display the graphical trend. MI supports four apps on one main view screen and there are two main view screens that can be switched, see figure 4.1.
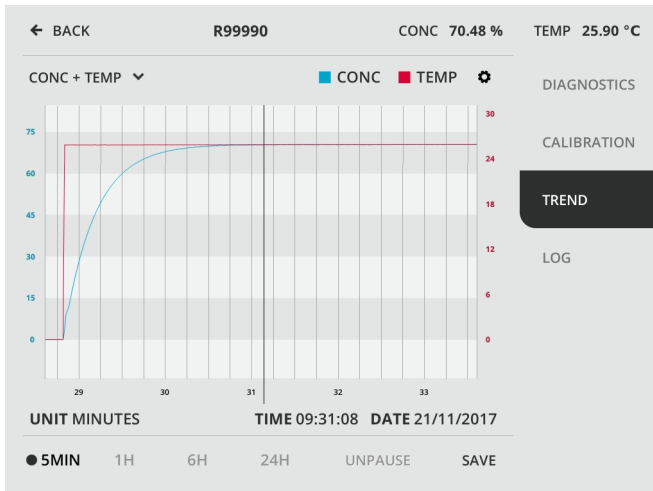
Figure 5.1   MI app trend display
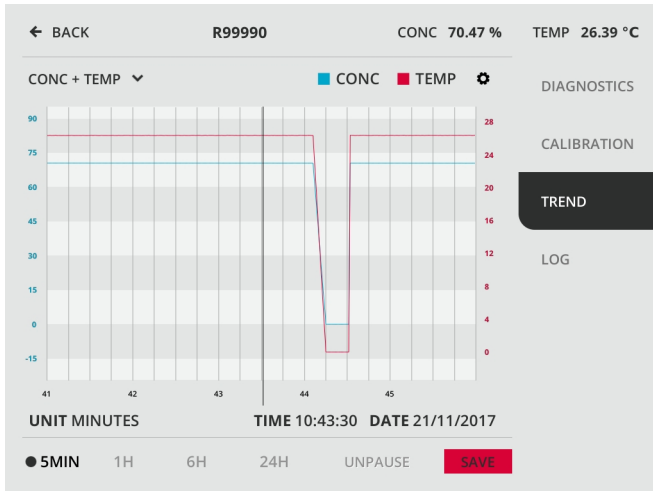
Figure 5.2   Saving app trend
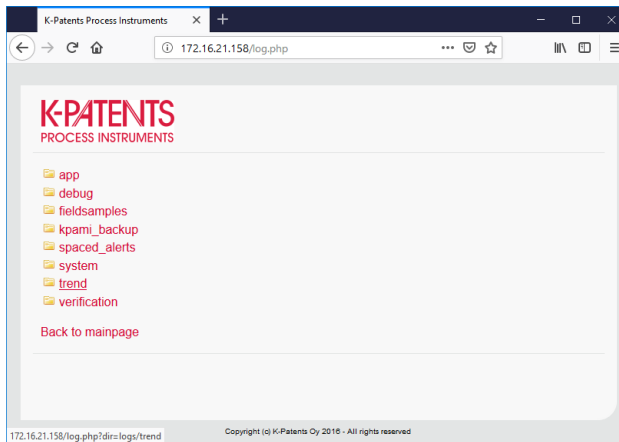
Figure 5.3   To access saved app trends, select *files > trend* on the MI web page
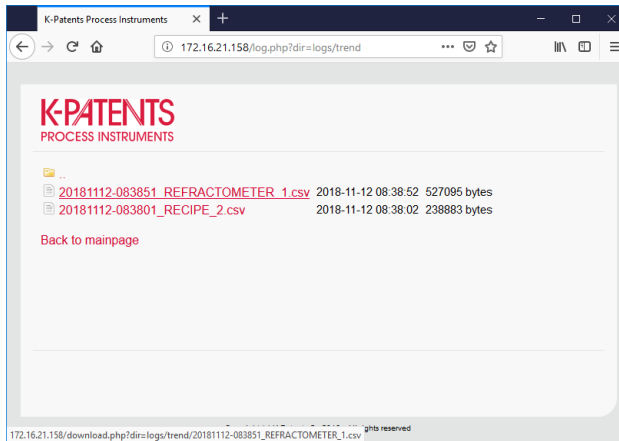
Figure 5.4   Select the trend to be viewed/downloaded

5.1.2 Application log

The app log lists status changes and possible error messages of apps in an app slot. To access an app log, tap application window on the main view and tap *Log*. The app log is

addressed by the app slot number and lists status changes and possible error messages of apps in that slot. App logs are also accessed via http connection. Use the IP address found in the MI *Settings > Network* menu, under *Ethernet* section. On the MI web page select *files > app > slotNumber > log*.
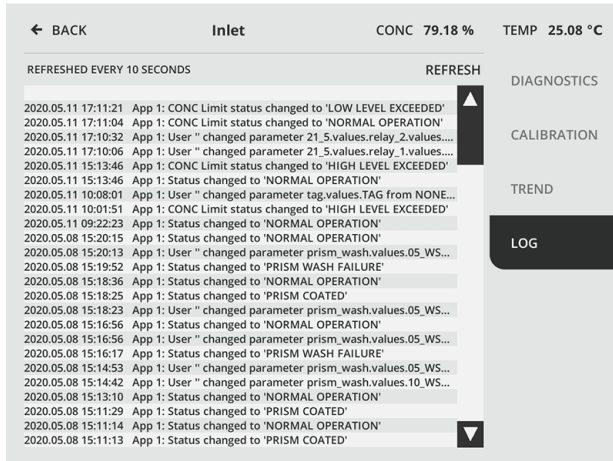
Figure 5.5   App log
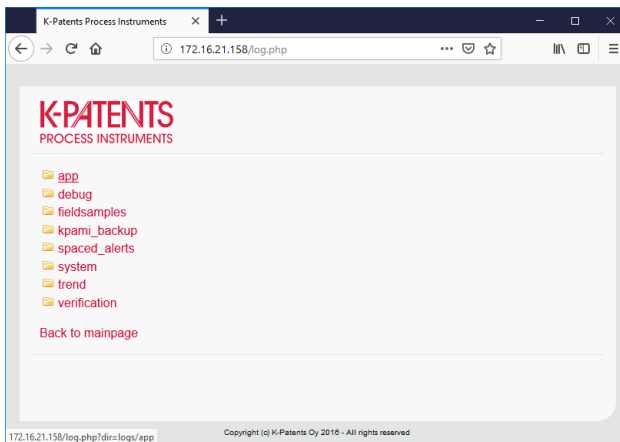
Figure 5.6   On the MI web page select *files > app*
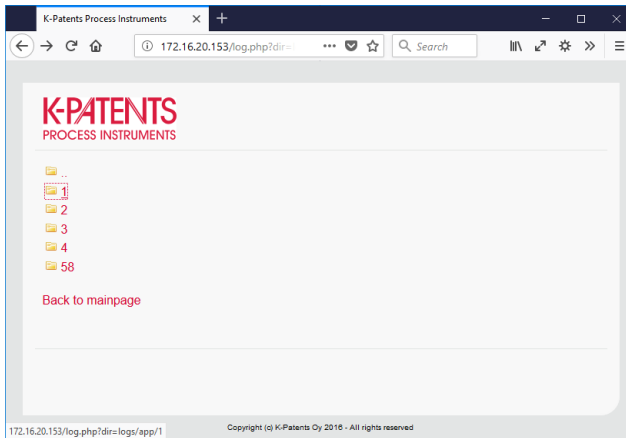
Figure 5.7   On the MI web page select *files > app > slot number*
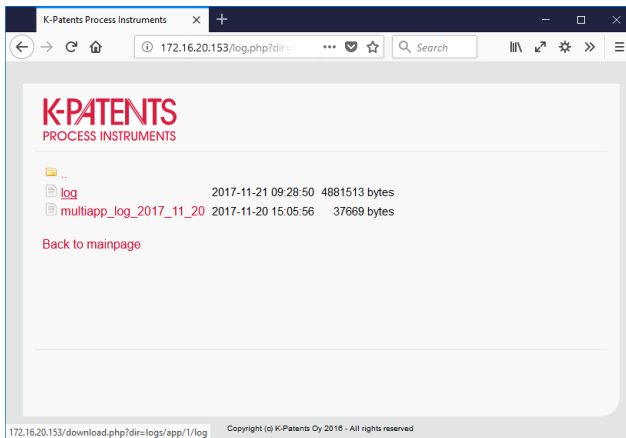
Figure 5.8   On the MI web page select *files > app > slot number > log*

5.2 Refractometer app

Refractometer app is included in your delivery. It gives you basic information about the process, e.g. concentration and temperature.

5.2.1   Diagnostics display

Tap the application window to access the Diagnostics display. In the top part of the
window you see the optical and slope curves. By default both optical image and slope
are shown, but you can tap on the texts *OPTICAL* and *SLOPE* to turn these on and off.
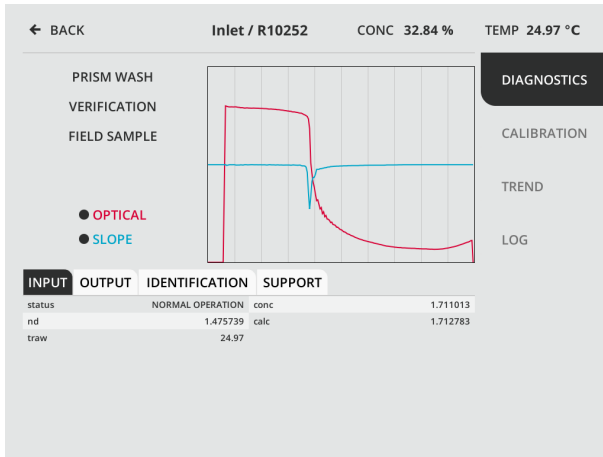
Figure 5.9   Diagnostics display

The tabs in the lower part of the display contain detailed information about the mea-
surement. Tap the name of the tab to see the contents. *Input* tab shows the values
as sent by the refractometer. *Output* tab shows the results of the calculations by MI.
Identification tab contains various identification information and e.g. software version
information. *Support* tab is a summary of the information in the other tabs and other
information needed by technical support for troubleshooting.
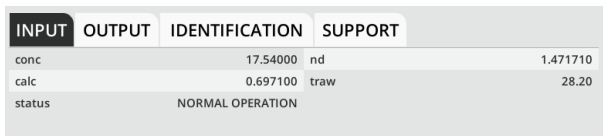
Figure 5.10   Input tab

INPUT	**OUTPUT**	IDENTIFICATION	SUPPORT		
S/N		R10252	Conc		17.542763
Temp		28.549999	CALC		0.697410
nD		1.471588	status		NORMAL OPERATION

Figure 5.11   Output tab

INPUT	OUTPUT	**IDENTIFICATION**	SUPPORT		
ipaddr		192.168.143.20	sensorserial		R10252
sprocserial		S00363	sensorversion		2.06
maserial		F00185	maversion		0.03
mac		00:0d:6e:01:01:6b			

Figure 5.12   Identification tab

INPUT	OUTPUT	IDENTIFICATION	**SUPPORT**		
Conc		17.540886	Temp		27.280001
nD		1.471573	status		NORMAL OPERATION
sensorserial		R10252	ipaddr		192.168.143.20
sprocserial		S00363	sensorversion		2.06
traw		27.28	rhsens		29.0
qf		155.957031	ccd		38.527
led		14.13	MI Temp		36.500

Figure 5.13   Support tab

5.2.2   Viewing and adjusting parameters

To view the parameters, go to the Calibration display and tap on *Summary*. Note that the summary extends to a second page, a small arrow on the top right will take you to the second (and third) page.

To adjust the parameters, go to the Calibration display, then choose appropriate parameter set, eg. Field. In the list, tap the parameter you want to change, type the new numbers with the number pad and approve the change by tapping *DONE*. **Note:** The parameter lists for Chemical and Field do not fit on the screen. Swipe down or use the scroll bar on the right to view the bottommost parameters.
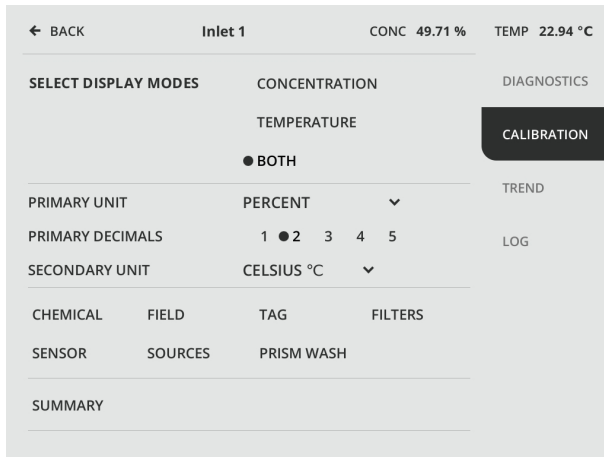
Figure 5.14   Calibration display

The settings in the upper part of the Calibration display are different types of lists that sets parameters for showing the measurement data, e.g. measurement unit. In the lower part of the window, the words are links to the given settings, e.g. by tapping on *Field* you get access to the field calibration parameters. If you want to see all the parameters, tap *Summary*.

| ← BACK | Inlet 1 | CONC 71.86 % | TEMP 25.22 °C |

CALIBRATION SUMMARY 1/2   →

CHEMICAL AND FIELD		FIELD CALIBRATION PARAMETERS		PRISM WASH	
		F 00	0	PRECONDITION SECS	0
CHEMICAL CURVE PARAMETERS		F 01	0	WASH SECS	3
NAME	Brix	F 02	0	RECOVERY SECS	20
WATERLINE-BASED	1	F 10	0	INTERVAL MINS	20
C 00	0	F 11	0	WASH CHECK MODE	0
C 01	0	F 12	0	WASH INHIB...EMP ENABLE	0
C 02	0	F 20	0	WASH INHIBIT TEMP VALUE	0
C 03	0	F 21	0	WASH VERIFY nD LIMIT	1.35
C 10	138.645	F 22	0	WASH VERIFY...TA nD LIMIT	0
C 11	0.133622	TEMPBIAS	0	WASH FAILU...RANCE MINS	0
C 12	-0.000618	C 0	0	MEASUREME...RING WASH	1
C 13	0	T 0	20	TEMPERATUR...URING WASH	0
C 20	-63.6827			EMPTY PIPE CHECK	1
C 21	-0.13722	**FILTERS**			
C 22	0.000855	DAMPING TYPE EXPONENTIAL		**SENSOR**	
C 23	0	DAMPING TIME	15		
C 30	21.3353	ALLOWED SLEW RATE	2	SENSOR mA	
C 31	0	SKIP COUNT SECS	5	DEFAULT	0
C 32	0			MAX	100
C 33	0			MIN	0

Figure 5.15   First page of calibration summary
(tap the little arrow in top right to see page 2)

| ← BACK | Inlet 1 | CONC 71.88 % | TEMP 25.25 °C |

←   **CALIBRATION SUMMARY 2/2**

SENSOR nD	
A 0	28503
A 1	-9488
A 2	-1085
A 3	110

TAG	
TAG	Inlet 1

Figure 5.16   Second page of calibration summary
(tap the little arrow in top left to go back to page 1)

5.2.3 Refractometer verification

An offline refractometer can be verified with standard refractive index liquids, available from Vaisala. Depending on the refractometer model, a sample holder may be needed. Go to the Diagnostics display (see Figure 5.9) and choose *Verification*. If you are not familiar with the verification procedure, tap the question mark on the Verification display for additional instructions.
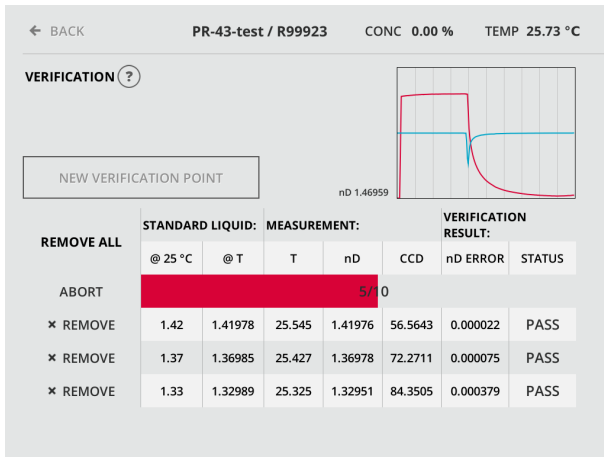
Figure 5.17   Verification in process
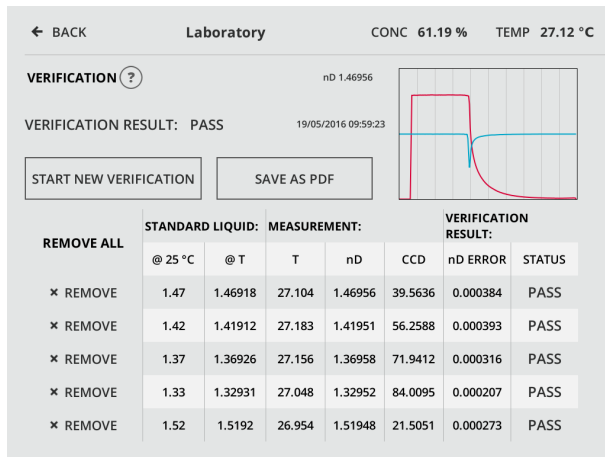
Figure 5.18   Finished verification

Once you have finished the verification process, you can save the verification results as pdf. The pdf is stored in the MI memory and it can be downloaded over the ethernet connection. Each pdf report gets a unique name and thus you can have several verification pdfs in the MI at the same time.
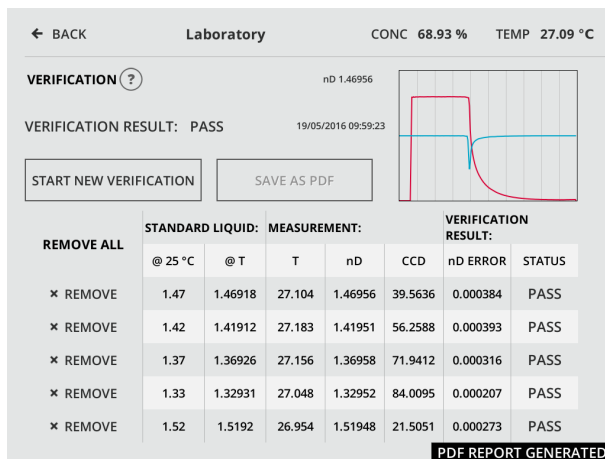
Figure 5.19   Pdf saved

5.2.4   Collecting field sample points

You can use the field sample functionality to acquire data points for Vaisala K-PATENTS®
field calibration service. Go to the Diagnostics display (see Figure 5.9) and tap *Field
sample*. Tap *Collect field point* to start collecting field samples and then tap *Save file* to
save the collected field points. These can be accessed via http connection. Use the IP
address found in the MI *Settings > Network* menu, under Ethernet section. On the MI
web page select *files > fieldsamples > FieldSamples_SlotNumber*.
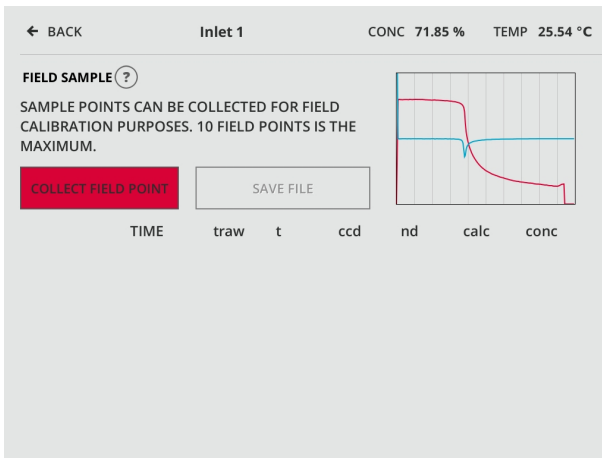
Figure 5.20   Start collecting field samples by tapping *Collect field point*
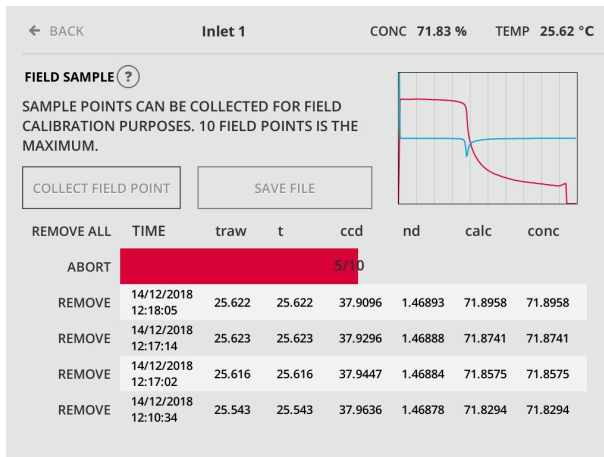
Figure 5.21   Field sampling in process
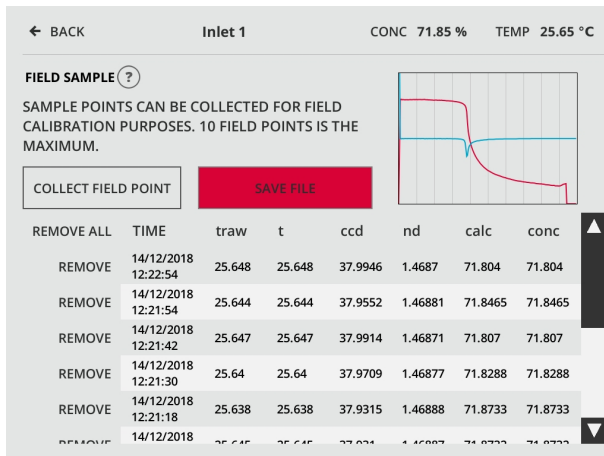
Figure 5.22   Save collected field points by tapping *Save file*

5.3 Recipe app

Recipe app provides a convenient way to control and switch different chemical curves. Each Recipe app can provide up to 32 different recipes. Switching a recipe in Recipe app means switching the chemical curve that is used in calculations. Each process medium has its specific chemical curve and by switching it the same processing line can be used to manufacture a variety of products.

5.3.1 Requirements

Using Recipe app requires a Refractometer app, which provides refractive index nD and temperature as a source data to the connected Recipe app. A licence is required to enable Recipe app. New Multichannel user interface MI:s are shipped with Recipe app licence installed. Old MI:s require software update to version 1.07 or newer and licence installation to enable Recipe app. Recipe app licences are granted free of charge to older MI:s.

5.3.2 Activating Recipe app

To activate Recipe app go to *Settings > Applications*, tap on a free application slot and select *Recipe*. Select a correct source Refractometer app with *Select sources*. The available Refractometer apps are listed based on their location in MI application slots. If no Refractometer app is listed in *Select sources*, then activate a Refractometer app *Ref* first.

5.3.3 Creating a new recipe

MI is provided with a Brix chemical curve as an example recipe for Recipe apps. A new Recipe app has the example recipe activated by default. A new recipe is instantly created when the example recipe is renamed. To rename a recipe go to *Recipe app > Calibration > Chemical* and select *Name*. The new recipe is a copy of the old recipe with the new name.

5.3.4 Modifying a recipe

A recipe can be modified e.g. by adjusting a field calibration parameter to offset the measurement result according to recipes requirements. To adjust the field parameters

of an active recipe go to *Recipe app > Calibration > Field*. In the list, tap the parameter you want to change, type the new numbers with the number pad and approve the change by tapping DONE. Note: The parameter lists for *Chemical* and *Field* do not fully fit on the screen. Swipe down or use the scroll bar on the right to view the bottommost parameters.

All recipes that are present in MI are visible and usable to all Recipe apps. If a specific recipe is modified in some Recipe app, the modification propagates also to the other Recipe app using the same recipe.

5.3.5 Selecting recipe switching mode

Recipes in the Recipe app can be switched manually, via General I/O module inputs (Switch input), via Modbus/TCP or via Ethernet/IP. To select the switching mode, tap the application window to access *Diagnostics* display. Then tap *Remote control* and then select the recipe switching mode.
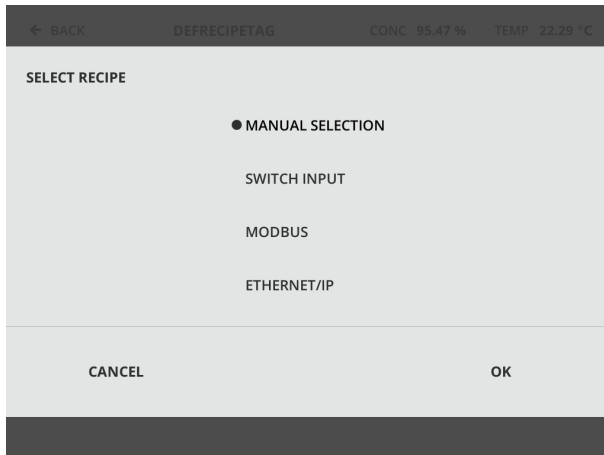
Figure 5.23   Selecting how to switch recipes in the Recipe app

5.3.5.1 *Switching recipe manually*

To switch recipe manually, tap the application window to access *Diagnostics* display. Then tap *Change recipe*, select the recipe by tapping its name and accept by tapping *OK*.
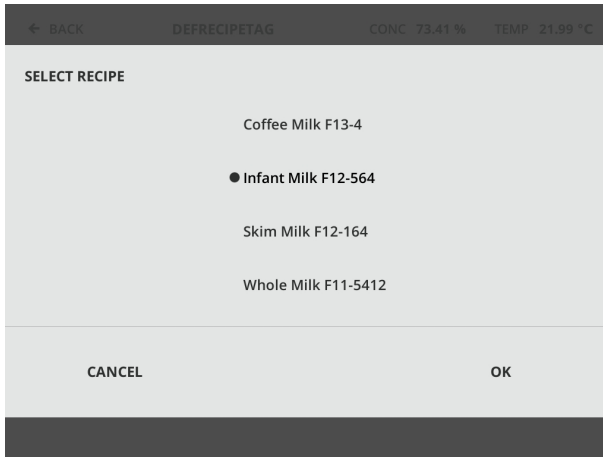
Figure 5.24 Switching recipe manually

5.3.5.2 Recipe identification numbers for remote control

A recipe is activated remotely, when a remote signal corresponds to a recipe identification number. To set the identification number go to *Recipe App > Calibration > Remote control*, tap a recipe name and select the identification number for that recipe. The identification number can have a value between 0 - 31. Different Recipe apps have independent values for their recipe identification numbers and they need to be set in each Recipe app that uses remote control functionality.
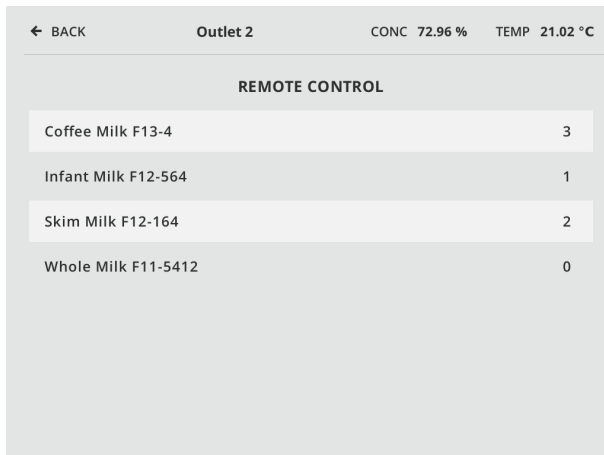
Figure 5.25 Recipe identification numbers for remote control
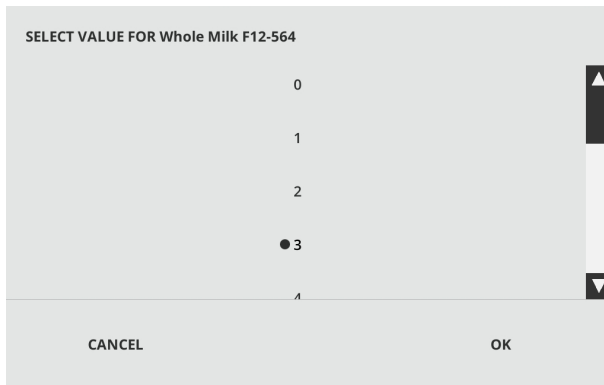
Figure 5.26 Setting an identification number for a recipe

5.3.5.3 Switching recipe via General I/O module inputs

A recipe is activated via General I/O module inputs, when the inputs form a binary number that corresponds to a recipe identification number. The recipe switching mode *Switch input* must be selected, see figure 5.23. To configure General I/O module, go

to *Settings > Modules*, tap the appropriate General I/O module to select it and then *View module* to access module configuration. Set the wanted inputs to control the Recipe app, which has a number according to the appslot it is running on. Set the purpose of inputs to implement a binary number with different multipliers for different bits. Four digital inputs associated to a single Recipe app enable 2^4 different binary number combinations that can address 16 different recipes. After choosing the settings for inputs, tap *Done* to save changes and exit the setup.

5.3.5.4 Switching recipe via Modbus/TCP

In Modbus mode the recipe is switched by writing the recipe identification number to a Modbus register `Recipe ID`, see table 4.2 in section 4.5.3. The recipe switching mode *Modbus* must be selected, see figure 5.23.

5.3.5.5 Switching recipe via Ethernet/IP

In Ethernet/IP mode the recipe is switched by writing the recipe identification number to an Ethernet/IP object `RecipeID`, see table 4.5 in section 4.5.4. The recipe switching mode *Ethernet/IP* must be selected, see figure 5.23.

5.3.6 Using Recipe app to make unit conversions

Recipe apps can perform unit conversions so that measurement results can be displayed in two or more units simultaneously. Unit conversions enable familiar readings like numeric values and engineering units, and comparing the measurement values to laboratory results gets easier.

5.3.6.1 Creating a recipe for unit conversion

A properly configured recipe is needed for each unit conversion. Create a new recipe for each new unit to be displayed. For clarity it is recommended to name the new recipe according to the unit. To implement the unit conversion, adjust a field calibration parameter *F 10* by setting its value to $(M - 1)$ where M is the conversion multiplier. See section 5.3.3 "Creating a new recipe" and section 5.3.4 "Modifying a recipe".

5.3.6.2   Displaying several unit conversions simultaneously

To display several unit conversions simultaneously, run each unit conversion recipe in its own Recipe app. If necessary, activate new Recipe apps, see section 5.3.2 "Activating Recipe app". Connect the new Recipe apps to the same source Refractometer app to perform unit conversions of a single measurement. To change the primary unit marking on the Recipe app display, go to *Recipe app > Calibration* and tap the little triangle of drop-down menu *Primary unit*.
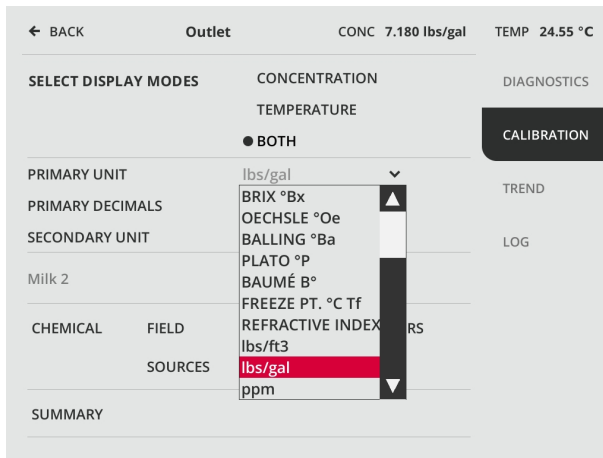
Figure 5.27   Changing the primary unit marking on the Recipe app display

5.3.7   Configuring mA output for Recipe app

If no mA output is configured for Recipe app, app status in Recipe app main view will blink between current status and message "mA output not configured". This will prevent false or omitted configuration of mA output. To configure mA output module, go to *Settings > Modules*, tap the appropriate mA output module to select it and then *View module* to access module configuration. Set the wanted output(s) for Recipe app, which has a number according to the appslot it is running on. Set the purpose of output(s), see section 6.4.1. After choosing the settings for outputs, tap *Done* to save changes and exit the setup.

GO TO APPS 5-8 ➜	Milk Line 2	⚙ SETTINGS

RECIPE 2   **Outlet** ⋯

MA OUTPUT NOT CONFIGURED

Whole Milk F11-5412

75.38 %

calc	73.38	
nD	1.47287	🌡 **24.09** °C
S/N	R99951	
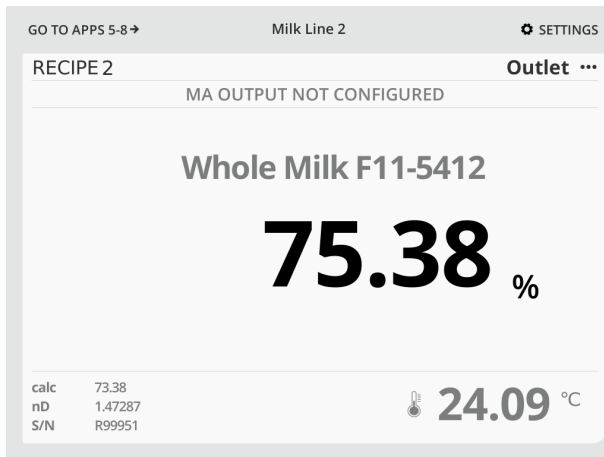
Figure 5.28   Blinking app status message when no mA output is configured

← BACK	Interface Tag	DONE ✔

MA OUTPUT SLOT 1   TEST ➜

SERIAL	49	SW	1	uA 1	-
TYPE	3	CC (uA)	30824	uA 2	-
HARDWARE	0.1	CL (uA)	80000		-
SOFTWARE	1.2	OC	0		-

REGISTER	APPLICATION	PURPOSE		
OUTPUT 1	RECIPE 2 ⌄	CONC ⌄	PARAMS	CLEAR
OUTPUT 2	(SELECT ONE) ⌄			

CALC
CONC
TEMP
nD
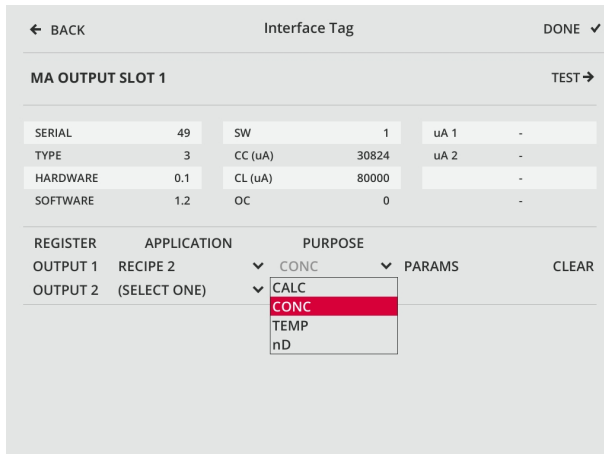
Figure 5.29   Configuring mA output for Recipe app

6 Module cards

A module card adds functions to the MI, e.g. a relay module card contains two relays that can be used as wash relays or alarm relays. There are eight module card slots inside an MI. Each Multichannel User Interface MI is shipped with one **relay module card** with 2 independent relays and one **mA output module card** with two independent 4-20 mA outputs as a standard. These are already installed in the MI. In addition to the relay module card and the mA output module card, there is a general input/output module card with 8 digital inputs/outputs. These module cards have the capability to be used in any combination as well as added and removed as needed.

6.1 Installation

To install a module card, **turn off MI power first**. Then open the enclosure, remove the display screws and fold the display to the side (see Figure 6.1). Unscrew and remove the module card cover to get access to the card slots. Insert the module card in an available card slot. To make adding cards easier, start from the left. Vaisala recommends for safety reasons that relay modules are mounted in slots 2, 4, 6 and 8 (connector downwards). This way the relay power wiring is as short as possible. Other module cards may be mounted in any slot.

Important: A relay module card may have an external power source. Make sure that also this external power source connected to a relay module is OFF before installing or removing module cards.

Important: In some circumstances when switching off MI, I/Os of General I/O module are undefined and may go to HIGH state. See Section 6.5 for more information.

Remove inner door screws
(TX25 screwdriver needed)

Open the inner door
and move it to the side

Open the four screws holding
the module card holder
and remove the holder

Insert the module card(s) and
replace the module card holder
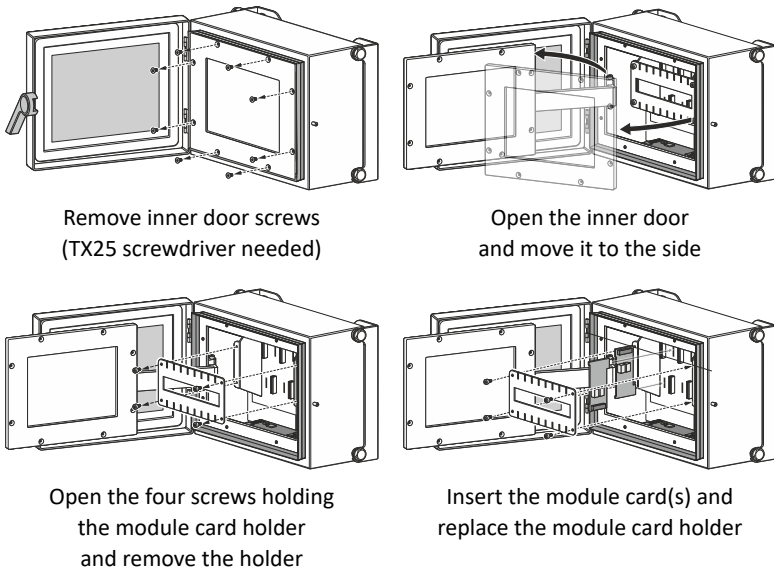
Figure 6.1   Installing module cards

To make the connections, first remove the removable connector from the module card. Bring the module connection cable to the MI and put it through the cable gland/conduit hub (1). Then connect wires to the screw terminals on the removable connector (2), see the module-specific sections for further information. Finally reconnect the removable connector to the module card (3).

MI-010
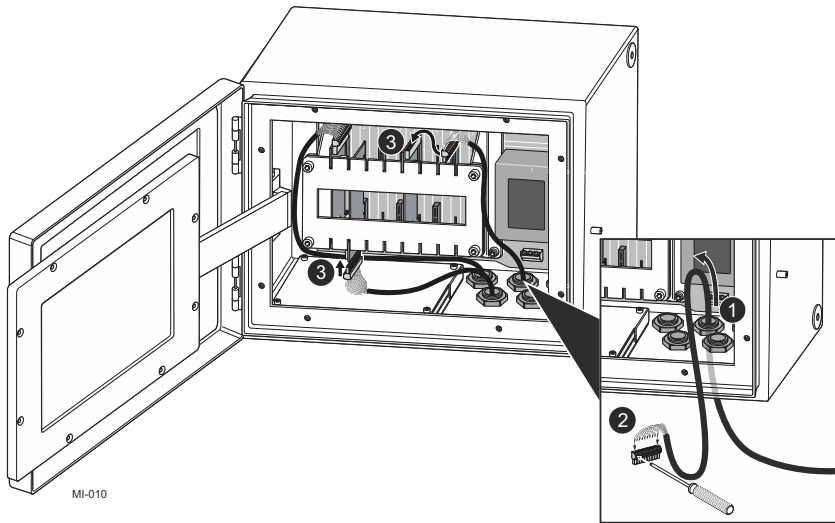
Figure 6.2   Connecting module connection cable to module card

6.2 Configuration

The MI automatically finds the installed module card(s). To configure a module card, go to *Settings > Modules*, tap the appropriate module card to select it and then VIEW MODULE to access module configuration. The selected module card is marked with a border.

Note: There are two types of EMPTY slots: grey slots do not have module card, striped slots are turned off (see Figures 6.3 and 6.4 on next page) and there may or may not be a module card in that slot. If there is a module card, it will be automatically recognized when the module slot is turned on by selecting the module and then tapping the TURN ON command.
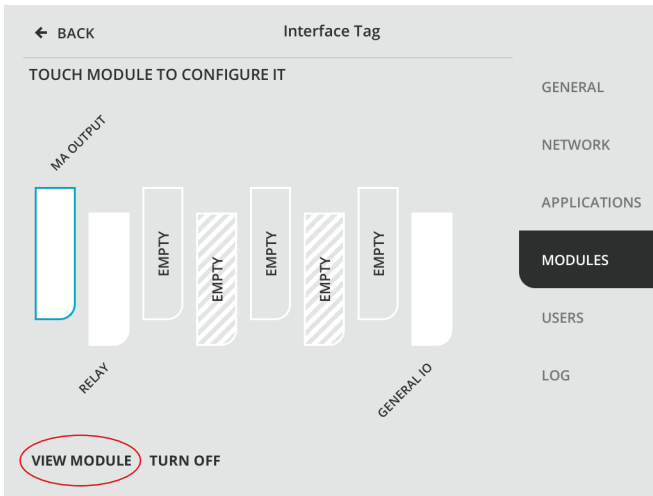
Figure 6.3   Selecting a module card and viewing module card information
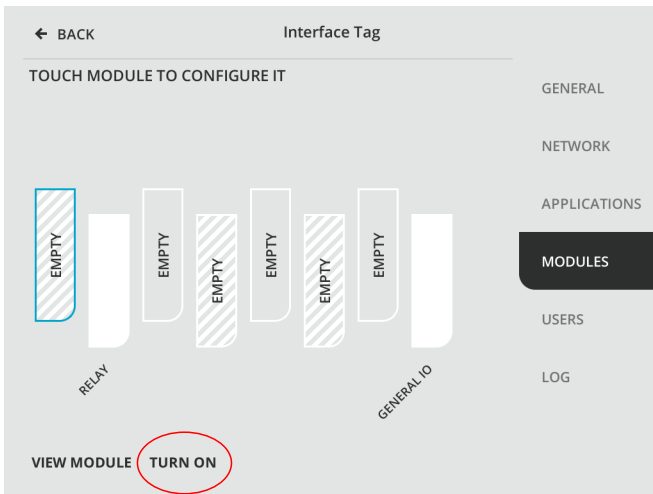
Figure 6.4   Selecting a turned-off module
card slot (slot 1 in this case) and turning it on

6.3 Relay module card PR-50023

The PR-50023 relay module card adds two relays to the Multichannel user interface MI. The relays can be configured independently to any connected refractometer. The relays can be used e.g. for controlling prism wash.

Specifications	
Relays per module	2
Voltage and current rating	Max. 250V/3A
Connection	Screw connection with tension sleeve
Connector	Phoenix 1900824 – MC 1,5/ 7-ST1-5,08
Contact type	Dry contact
Normal relay state	NO
Conductor cross section	0.14-1.5 mm^2 (28-16 AWG)
Stripping length	7 mm (¼")
Tightening torque	0.25 Nm (0.18 lbf.ft)
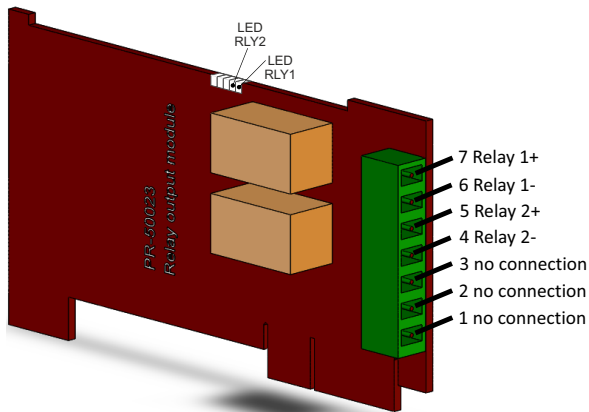
Figure 6.5   Relay connections

6.3.1 Configuring relays

On the relay display, first select the application the relay is used for, then select the function. After the function is chosen, you get access to those relay parameters that apply to this function.
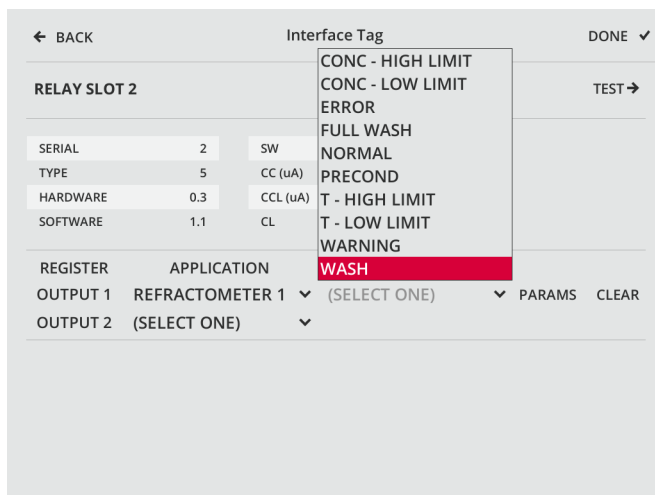
Figure 6.6   Configuring a relay

Note: Even though the relays can be configured independently, it is recommended that if you e.g. set precondition and wash parameters for a certain refractometer, you set those in the same relay module card.

Important: When you have chosen the settings for the relays, tap DONE to save changes and exit the relay setup.

Parameters LIMIT and HYSTERESIS are used to switch the relay based on concentration or temperature measurement values by the functions CONC - HIGH LIMIT, CONC - LOW LIMIT, T - HIGH LIMIT and T - LOW LIMIT. The relay closes on high limit when the measured value exceeds HIGH LIMIT + HYSTERESIS. The relay opens on high limit when the measured value goes below HIGH LIMIT - HYSTERESIS. Alternatively, the relay closes on low limit when the measured value goes below LOW LIMIT - HYSTERESIS. The relay opens on low limit when the measured value exceeds LOW LIMIT + HYSTERESIS.
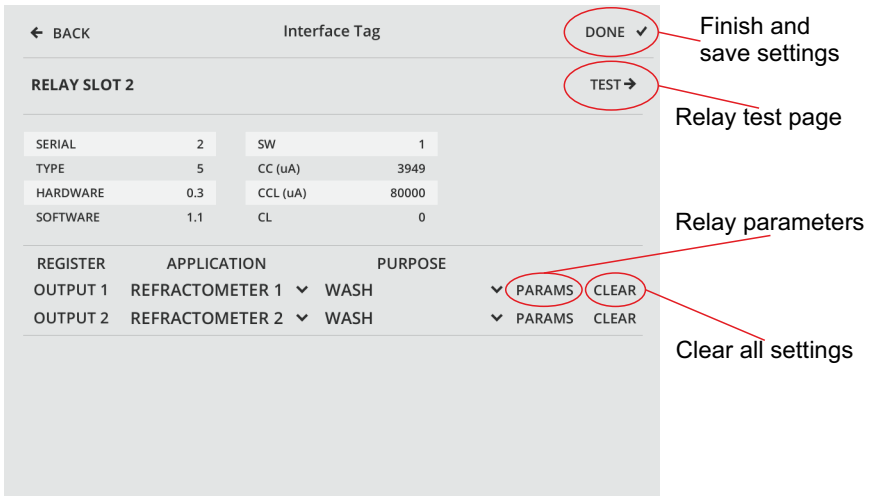
Figure 6.7   Accessing relay functions
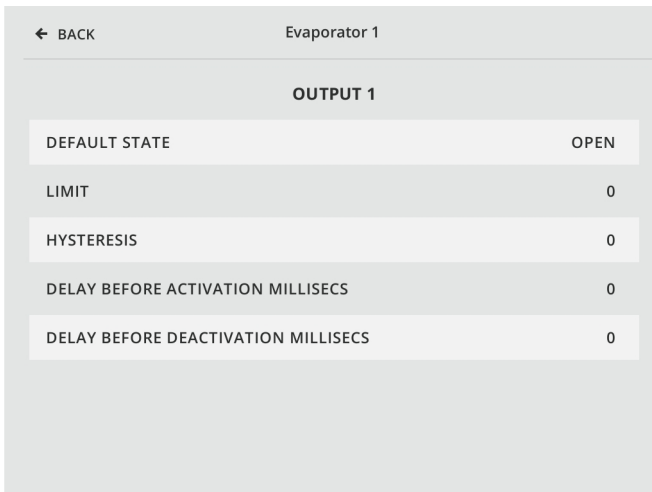
Figure 6.8   Relay module parameters

6.3.2   Notification of limit exceeding

When one of the limit functions CONC - HIGH LIMIT, CONC - LOW LIMIT, T - HIGH LIMIT
or T - LOW LIMIT is selected for the relay module and Refractometer app's measure-
ment result exceeds the configured relay parameter LIMIT, a blinking notification is dis-
played, see figure 6.9. If both concentration and temperature limits are exceeded si-
multaneously, only the concentration related notification is displayed. If there is any
error or warning on the refractometer itself, the limit exceeding notification is not dis-
played. Limit exceeding is always recorded to Refractometer app's application log, see
section 5.1.2.
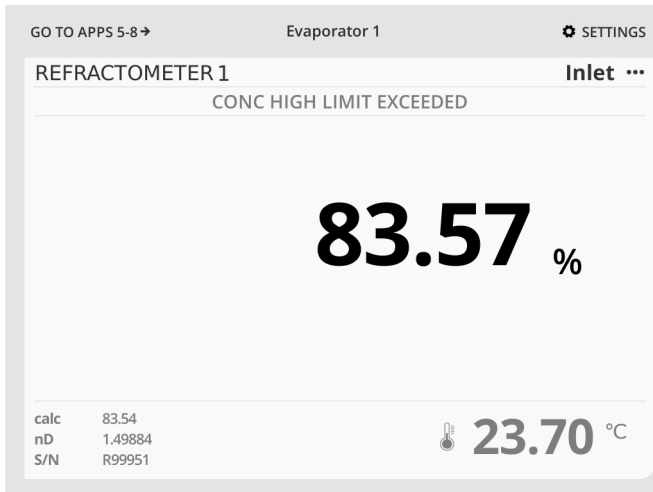
Figure 6.9   Blinking app status message when relay limit is exceeded

6.4   mA output module PR-50021

The mA output module card adds mA outputs to Multichannel user interface MI. On
the module card there are two independent 4-20 mA current sources. Both current
outputs are configurable independently to indicate for example process concentration
or temperature or other diagnostic data of any connected refractometer. A mA output
has traceable calibration, accuracy is ±0.02 mA.

Maximum load (compliance) is 1000 Ohm. There is a place inside the Multichannel user interface MI where the cable shield can be connected for grounding.

Cable specifications	
Conductor cross section	0.14-1.5 mm^2 (28-16 AWG)
Tightening torque	0.25 Nm (0.18 lbf.ft)

10 mA out 1+
9 mA out 1-
8 no connection
7 no connection
6 mA out 2+
5 mA out 2-
4 no connection
3 no connection
2 Frame ground
1 Frame ground
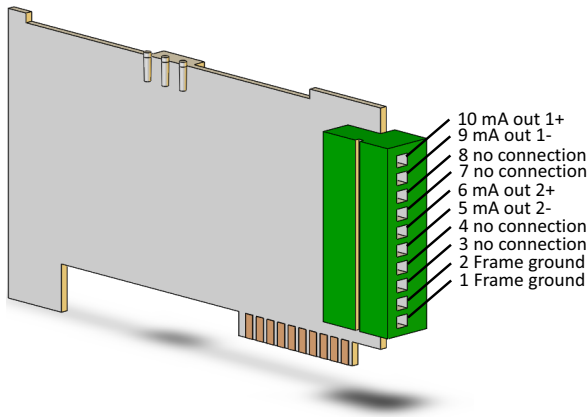
Figure 6.10 mA output pinout

The mA outputs are compliant to Namur NE43. NAMUR NE 43 uses the 3.8 to 20.5 mA signal range for measurement information, with values ≥21 mA or ≤3.6 mA to indicate diagnostic failures (see Figure 6.11). With that information, it is easier to detect a failure condition on a refractometer, for example, it clearly tells you if you have an empty pipe.
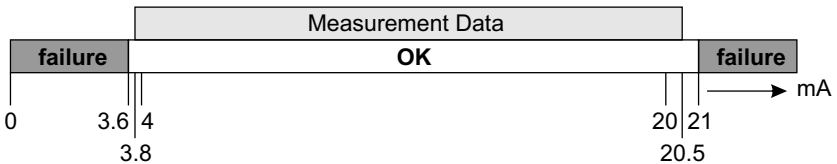
Figure 6.11 Default mA output values

Certain malfunctions cause the mA measurements to return to mA default output value, see Table 6.1 below. Factory setting for default output value is 3.4 mA.

Message	Returns to default mA	
	Conc	Temp
Short-circuit	X	X
No optical image	X	
Temp measurement fault	X	X
No sample	X	
Prism coated	X	
No connection	X	X

Table 6.1   Messages causing mA output value to return to default output

6.4.1 Configuring mA outputs

First select the application for an output, then set function. There are five possible functions, CALC, CONC, QF, TEMP and ND. After you've chosen a function, you can set the parameters for that function.

- CALC is the calculated concentration value without field calibration adjustment
- CONC is the final concentration value including field calibration adjustment
- QF is the quality factor measuring the image sharpness, available for Refractometer app
- TEMP is the process temperature
- ND is the refractive index value n_D from the sensor

| ← BACK | Interface Tag | DONE ✔ | Finish by tapping here to save settings |
| **MA OUTPUT SLOT 1** | | TEST → | Tap for output test page |

SERIAL	12	SW	1
TYPE	3	CC (uA)	30965
HARDWARE	0.1	CCL (uA)	80000
SOFTWARE	1.2	CL	0

REGISTER	APPLICATION	PURPOSE		
OUTPUT 1	REFRACTOMETER 1 ⌄	CONC ⌄	PARAMS	CLEAR
OUTPUT 2	(SELECT ONE) ⌄			

Output parameters

Clears all settings for this output
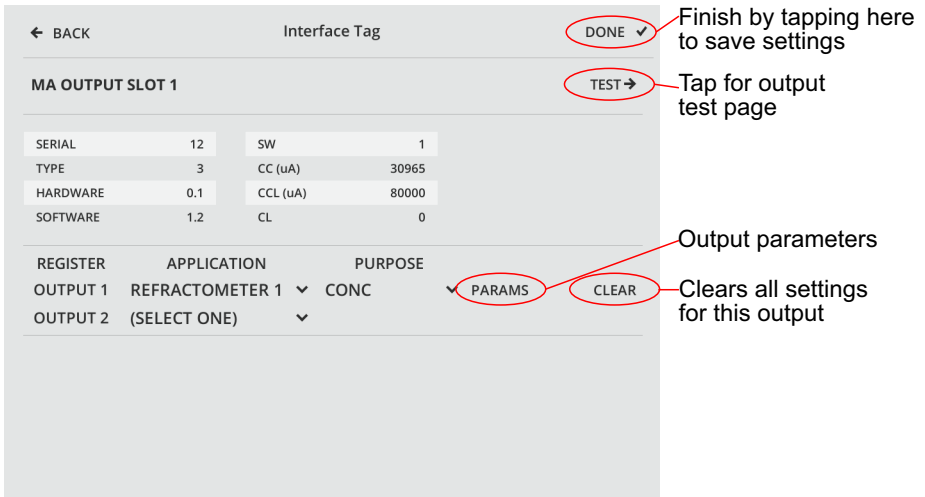
Figure 6.12   mA output settings

Important: When you have chosen the settings for the outputs, tap DONE to save changes and exit.

6.5 General I/O module PR-50024

The General I/O module card adds digital inputs and outputs to Multichannel user interface MI. The module card provides 8 input/output channels.

The input and output terminals are galvanically isolated according to
• UL 2500 V rms (UL1577)
• CSA 800 V rms (1131V peak) maximum working voltage - basic insulation
• CSA 400 V rms (566V peak) maximum working voltage - reinforced insulation
• VDE Reinforced insulation 560V peak
• TüV Reinforced insulation 400V rms maximum working voltage

Cable specifications	
Conductor cross section	0.14-1.5 mm^2 (28-16 AWG)
Tightening torque, max.	0.25 Nm (0.18 lbf.ft)

Voltage reference:

IO voltage can be selected with a jumper in the module. IO voltage options are internal 5V, internal 24V and external voltage.

Important: The default jumper setting on PR-50024 makes I/O to work with 5 VDC.

When external voltage is selected, a voltage of 3-30 VDC must be provided between V_IO and GND pin.

Warning! When external power supply is connected to General I/O module terminals **and** power to MI or module is disconnected, I/O states are undefined and may go to HIGH state.

When internal voltage is selected, voltage reference for switch input can be taken from V_IO and GND pins.

Electrical characteristics:

EXTERNAL IO VOLTAGE SUPPLY	
External IO voltage input range (VIO)	3-30 VDC
Absolute minimum external IO voltage input	0 VDC
Absolute maximum external IO voltage input	36 VDC
OUTPUTS	
Maximum combined* supply current when using internal 24V	20 mA
Maximum combined* supply current when using internal 5V	100 mA
Maximum individual channel supply current when using external IO voltage	1 A
Maximum combined* supply current when using external IO voltage	2 A
IO output voltage (voltage drop) when using external IO voltage	VIN - 0.15 VDC @ 5 VDC VIN - 0.20 VDC @ 24 VDC
INPUTS	
Input type	Sinking
Logical 0: voltage range	0.0.-0.7 VDC
Logical 1: voltage range	1.0-30 VDC
Input impedance	10 kohm
Absolute maximum input voltage	36 VDC

* current limit shared with all 8 channels

6.5.1   Connecting inputs/outputs

Terminal no.	Description	Function
1	Digital input/output	In/Out 1
2	Digital input/output	In/Out 2
3	Digital input/output	In/Out 3
4	Digital input/output	In/Out 4
5	Digital input/output	In/Out 5
6	Digital input/output	In/Out 6
7	Digital input/output	In/Out 7
8	Digital input/output	In/Out 8
9	Ground for outputs	GND
10	IO voltage input/output	V_IO
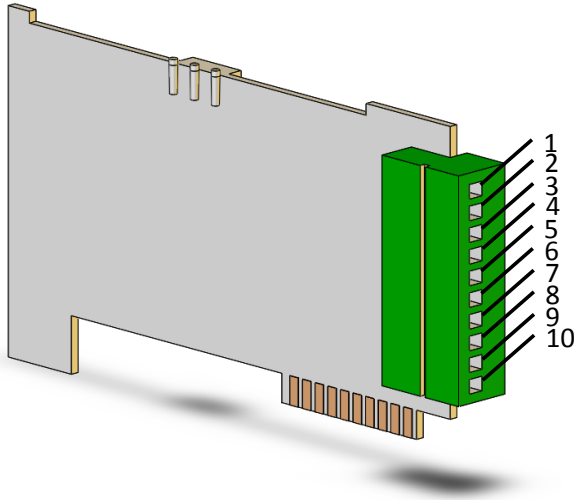
Figure 6.13   I/O module pinout

Digital outputs:
Digital output voltages are selected with jumper. GND (pin 9) is used for ground. See Figure 6.14 for connections.

Digital inputs:
Digital inputs can be used as switch inputs or controlled by external signal. Switch input configuration is shown in Figure 6.15. When an external signal is used, an external power supply is connected between input pin and GND (pin 9) as seen in Figure 6.16.
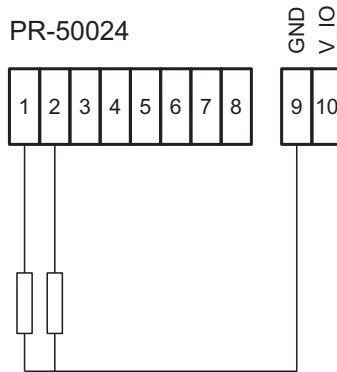
Figure 6.14   Channels 1 and 2 configured as output
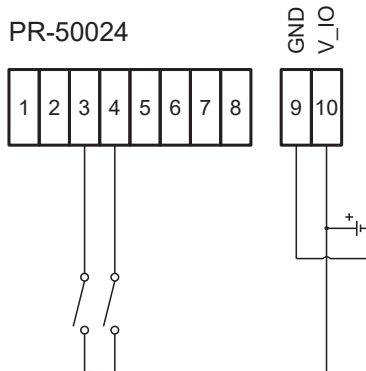
Figure 6.15   Channels 3 and 4 configured as input and connected as switch input
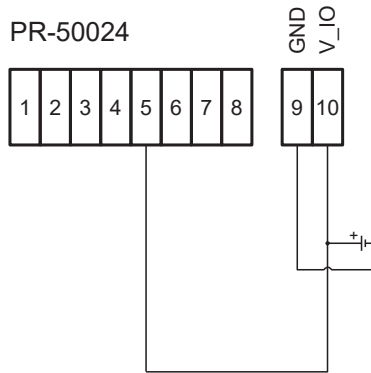
Figure 6.16   Channel 5 configured as input from external power supply

6.5.2   Configuring the general I/O module card

To configure the inputs and outputs, select the module card in the module view. Select the application to which the input/output is connected and then choose the desired function from a list.

The digital outputs can be configured for

- Concentration - high limit
- Concentration - low limit
- Error
- Full wash (precondition, wash, recovery)
- Normal
- Precondition
- Temperature - high limit
- Temperature - low limit
- Warning
- Wash

The digital inputs can be configured for

- External hold
- External wash
- External wash stop

Figure 6.17   General I/O module card configuration

Parameters LIMIT and HYSTERESIS are used to switch the digital output based on concentration or temperature measurement values by the functions CONC - HIGH LIMIT, CONC - LOW LIMIT, T - HIGH LIMIT and T - LOW LIMIT. Switching on high limit activates when the measured value exceeds HIGH LIMIT + HYSTERESIS. The output switches off on high limit when the measured value goes below HIGH LIMIT - HYSTERESIS. Respectively, switching on low limit activates when the measured value goes below LOW LIMIT - HYSTERESIS. The output switches off on low limit when the measured value exceeds LOW LIMIT + HYSTERESIS.

Important: When you have chosen the settings for the inputs or outputs, tap DONE to save changes and exit the setup.

6.5.2.1   Using the general I/O module to trigger prism wash

Prism wash can be started by configuring the general input for external wash request. To activate the wash system a relay must be configured to be a wash relay. Select the wash function on the relay display, see figure 6.6. To configure the general input, select the function "IN: EXT WASH" on the I/O module display.
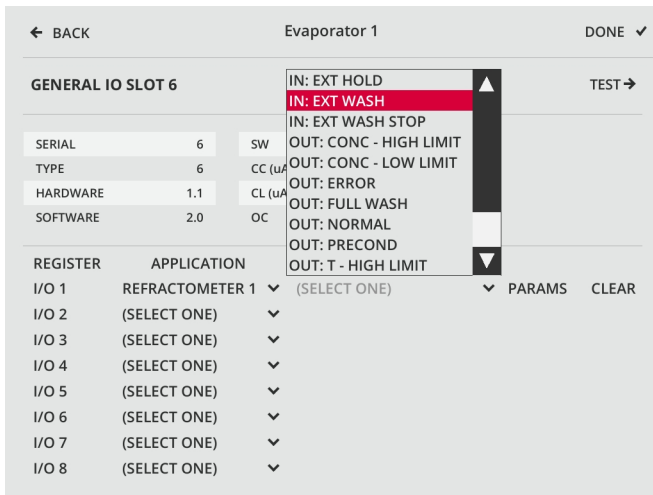
Figure 6.18   Selecting the function "IN: EXT
WASH" to configure external wash request

7 Prism wash

In some applications the process flow does not keep the prism clean because flow ve-
locity is not enough to keep the prism clean, or the process medium is sticky. In these
applications the prism can be automatically cleaned by installing a wash system (see
the refractometer manual).

7.1 Configuring prism wash

The prism wash settings for different refractometers are independent of each other.
The wash system is active if a relay has been configured to be a wash relay (see Sec-
tion 6.3.1) and the wash time is not zero. An automatic wash function can be configured
so that all refractometers connected to MI have different wash parameters. The wash
parameters can be configured at Refractometer app -> Configuration -> Wash.

7.1.1 Wash cycle

The wash logic is shown in Figure 7.2 as a flow diagram. The automatic prism wash cycle
(Figure 7.1) consists of three phases: *precondition*, *wash* and *recovery*. The optional
preconditioning function is used to e.g. blow out the condensate from the washing
line before washing. After the preconditioning there is a one-second pause to avoid
having both precondition and wash relays active at the same time.

The wash cycle is initiated when the wash interval has elapsed. The wash can also
be started by configuring a general input for external wash (Section 6.5.2) or manually
from the user interface at Refractometer app -> Calibration menu. The order of priority
for these wash triggers is

1. manual wash
2. external wash request
3. wash interval timer

The wash relay is closed for the wash time specified in the wash settings.

After the wash phase is completed, a recovery time is spent. During the wash cycle (pre-
condition, wash, recovery) the measurement result is in hold unless otherwise speci-
fied.
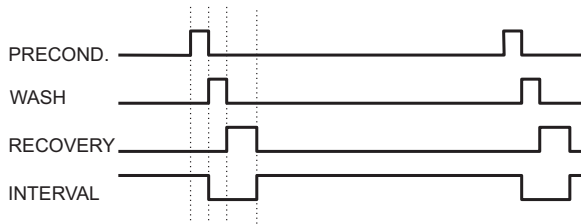
Figure 7.1   The automatic prism wash cycle

Preventing automatic wash:

The precondition and wash relays are never activated by the automatic wash control:

–   If diagnostic message is NO SAMPLE as this indicates a clean prism in an empty process line. The diagnostic message is WASH STOP/NO SAMPLE.
–   If a wash stop is present, indicating e.g. that there is no process flow. The diagnostic message is EXTERNAL WASH STOP.
–   If the process temperature limit is activated and the temperature falls below the limit, indicating that the process is not running. The diagnostic message is LOW TEMP WASH STOP.
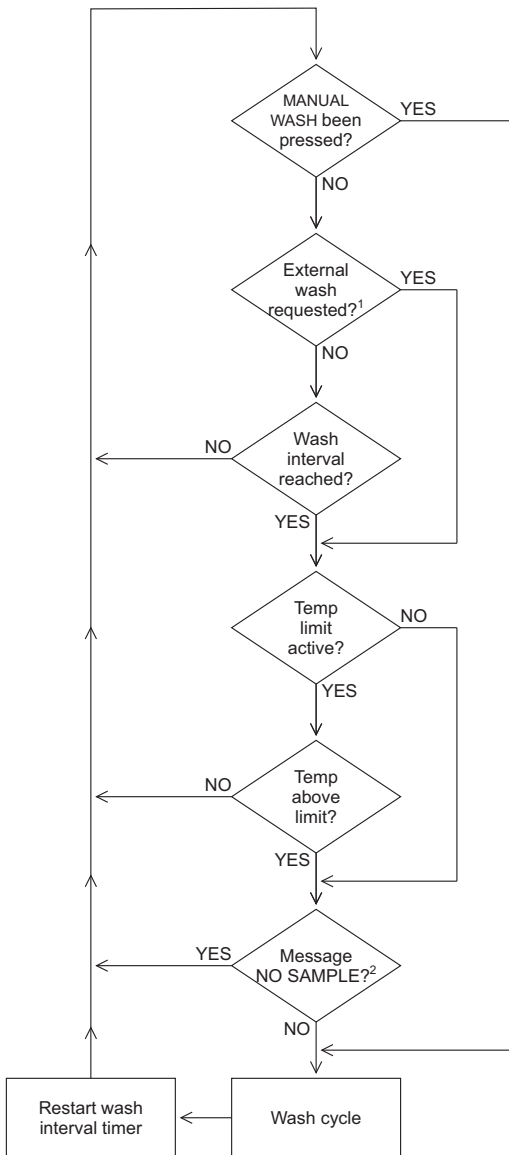
NOTES

1. External wash is triggered at the general input. If the input is held logical high, only one wash cycle is carried out.

2. The wash is inhibited if there is no sample, no refractometer or the refractometer cannot measure correctly.

Figure 7.2   Wash logic
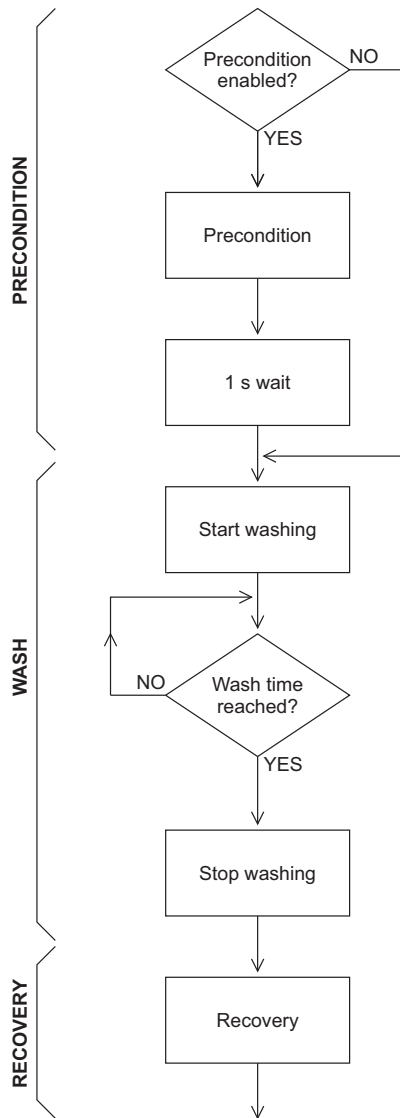
Figure 7.3   Wash cycle

7.1.2   Setting prism wash parameters

To set prism wash parameters for a given refractometer, first select the Refractometer app, then select Calibration and then Prism wash. This menu contains the alternatives (factory settings are given in parentheses):

1. Precondition secs 0-60 s (0)
2. Recovery secs 0-120 s (20)
3. Wash secs 0-30 s (3)
4. Empty pipe check (enabled)
5. Wash check mode (disabled)
6. Wash verify delta nD limit 0.0-0.5 (0.0)
7. Wash inhibit temp enable (disabled)
8. Interval mins 0-1440 min (20)
9. Wash inhibit temp value 0-200 C (0)
10. Wash verify nD limit 1.15-1.80 (1.35)
11. Wash failure tolerance mins 0-1440 (0)
12. Measurement hold during wash (enabled)
13. Temperature hold during wash (disabled)

The prism wash cycle: The timing of the wash cycle is controlled by the WASH INTERVAL, PRECONDITION TIME, WASH TIME and RECOVERY TIME settings. If the WASH INTERVAL is set to zero, the wash can only be initiated by using the manual wash (PRISM WASH on Diagnostics menu) or general input module configured for external wash.

If the PRECONDITION TIME is zero (or there is no relay configured for preconditioning), the preconditioning phase is skipped. If the WASH TIME is zero (or there is no relay for wash), the wash functionality is completely disabled.

The recommended wash times and wash medium pressures are given in the refractometer manual.

Wash check mode, standard: The prism wash check monitors automatically that the prism wash really has an effect on the prism. In the WASH CHECK mode, prism wash is accepted if the refractive index n_D either falls below wash verify n_D limit (default 1.35) at NORMAL OPERATION or NO SAMPLE occurs. This is the indication of a successful wash with water or steam.If the wash is not accepted, the diagnostic message PRISM WASH WARNING will appear. If no wash is accepted during wash tolerance time, the message

becomes PRISM WASH FAILURE. Both messages and the wash tolerance counter are re-set by a successful wash.The **Wash check mode, automatic wash cut** differs from the standard mode by stopping the wash 2 seconds after the n_D falls below the limit.

To stop the measurement for the duration of the prism wash, choose MEASUREMENT HOLD DURING WASH and in that menu activate the hold function. The CONC reading and mA output are held in the value they had immediately before starting the wash cycle. You can also stop **temperature measurement for the duration of the wash** by setting TEMPERATURE HOLD DURING WASH.

To set a low temperature limit, choose WASH INHIBIT TEMPERATURE ENABLE, enable it (fac-tory setting is disabled) and then set the temperature with WASH INHIBIT TEMP VALUE. The temperature is in the units that is chosen from the Calibration menu as the secondary unit.

The empty pipe check prevents washing if message is NO SAMPLE, i.e. there's no process liquid in the pipe. To deactivate (or activate) the empty pipe check, choose EMPTY PIPE CHECK and then the appropriate menu command.

To change the wash nD limit, select WASH VERIFY ND LIMIT to set the n_D to be used by the wash check functionality.

If you have set a **wash verify delta nD limit**, a temporary wash verify limit is calculated in the beginning of wash: $n_{D\ limit} = n_{D\ current} - \Delta n_D$. This temporary limit is compared to actual wash verify nD limit parameter, and the higher of these values takes precedence.

To set wash tolerance time, select WASH FAILURE TOLERANCE to set the time during which a wash has to be accepted. If no wash is accepted during wash tolerance time, the mes-sage becomes PRISM WASH FAILURE. The wash tolerance counter is reset by a successful wash.

8 Specifications

Figure 8.1 MI nameplates

MI specifications

Display:	xga 1024 x 768 pixels, touch screen
Power:	AC input 100-240 VAC, ±10%, 50/60 Hz, 60 VA, optional 24 VDC
Overvoltage category:	OVC II
Refractometer connectivity:	1-4 refractometers can be connected to the MI. Refractometers independent of each other: own parameter sets and usable in different applications.
Ethernet connection:	10/100 Mbit/s, data acquisition over UDP/IP Protocol
Modules:	1-8 modules for added connectivity
Apps:	1-4 apps
Protection class:	Enclosure IP66/67. Type 4X.
Installation:	Indoor/outdoor, max. 50°C (122°F), min. 0°C (32°F), must be protected from rain and direct sunlight.During installation highest relative humidity of ambient air 80%. Highest altitude 2000 m above sea level.
Weight:	12.9 kg (28.5 lbs)
Regulatory compliance:	Safety: IEC 61010-1:2010/EN 61010-1:2010, CSA certified to CSA-C.22.2 No. 61010.1-12, UL 61010-1:2012 Electromagnetic compatibility: IEC 61326-1:2012/EN 61326-1:2013.
Optional modules	
Relay Module:	2 signal relays 150V/3A
mA Output Module:	2 x 4-10mA, max. load 1000 Ohm, galvanic isolation 1000VDC
Regulatory compliance	Safety: IEC 61010-1:2010/EN 61010-1:2010, CSA certified to CSA-C.22.2 No. 61010.1-12, UL 61010-1:2012 Electromagnetic compatibility: IEC 61326-1:2012/EN 61326-1:2013

8.1 Model code

MULTICHANNEL USER INTERFACE

Model and description	Model
MI = Multichannel user interface, stainless steel enclosure with wall mount. Connectivity for up to 4 refractometers with Ethernet output, included 1 x mA output module card (2 x 4–20 mA), 1 x Relay module card (2 relays, 250 V/3A)	MI
Cable connection for power	
-U = ½inch NPT type conduit hubs	-U
-M = M20x1.5 metric cable glands	-M
Electrical classification	
-UN = Unclassified area, General Purpose, Ordinary location	-UN
Power supply	
-AC = Power supply 100–240 VAC 50/60 Hz	-AC
-DC = Power supply 24 V DC	-DC
Module cards for MI (0-8 modules selectable in total, one or several)	
-MO1 = 1 x mA output module card, for 2 x mA output (included in standard delivery)	-MO1
-MO2 = 2 x mA output module card, for 4 x mA output	-MO2
-MO3 = 3 x mA output module card, for 6 x mA output	-MO3
-MO4 = 4 x mA output module card, for 8 x mA output	-MO4
-RM1 = 1 x Relay module card, for 2 x relay output (included in standard delivery)	-RM1
-RM2 = 2 x Relay module card, for 4 x relay output	-RM2
-RM3 = 3 x Relay module card, for 6 x relay output	-RM3
-GO1 = 1 x General I/O module card, 4 x digital input, 4 x digital output	-GO1
-GO2 = 2 x General I/O module card, 8 x digital input, 8 x digital output	-GO2

8.2 Parts

ITEM	PART NUMBER	DESCRIPTION	QTY.
1	2886,2887	MI enclosure	1
2	PR-50021	mA- Output module	1
3	2890	MI door latch	1
4	2893	MI bracket nut	4
5	PR-50019-AC/-DC	MI mother board	1
6	3616	MI card support left	1
7	2917	MI card support right	1
8	2918	MI module card band	1
9	2921	MI door handle cover	1
10	3520	MI door hindge short	1
11	3519	MI door hindge middle	1
12	3666	MI door assembly	1
13	DIN 965/ISO14581 TX A2- M5x25	Hex. Socket Screw	8
14	DIN7985 TX A2 - M4x6	Hex. Socket Screw	4
15	DIN7985 TX A2 - M6x60	Hex. Socket Screw	2
16	DIN7985/ISO14583 TX A2 - M5x10	Hex. Socket Screw	4
17	3434	MI Ethernet switch (with FPM o-rings and M16 nuts)	1
18	3522	MI door hindge	1
19	3523	MI door hindge enclosure	1
20	3598	MI door foam gasket	1
21	DIN7985/ISO14583 TX A2 - M3x6	Hex. Socket Screw	4
22	PR-50023	Relay Output module for MI	2
23	3556	MI Switch cover	1
24	DIN 7985 TX A2- M4x10	Hex. Socket Screw	1
25	3676	Koriolulevy M4 A2	1
26	DIN 965/ISO14581 TX A2-M4x10	Hex. socket screw	2
27	3686	MI connector plate	1
28	3015	MI wall mount bracket	1
29	DIN7985/ISO14583 TX A2 - M6x10	Hex. Socket Screw	2
30	2898	Rain cover	1
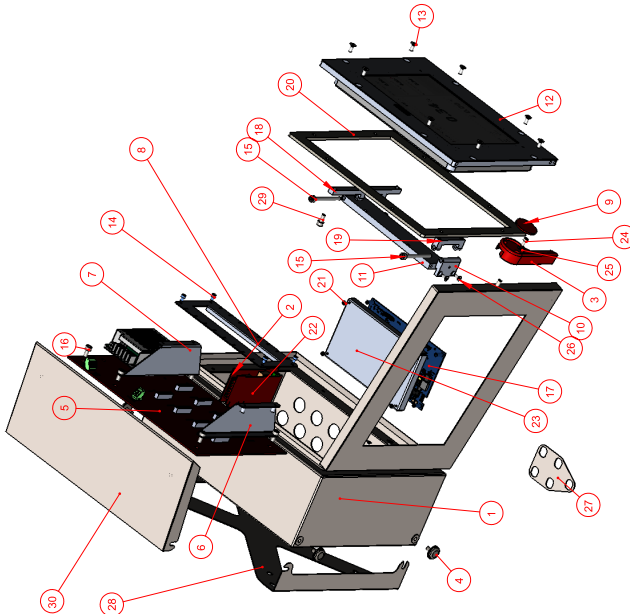
A EU declaration of conformity

VAISALA

2019-09-01B/JAMO   1 (1)

EU DECLARATION OF CONFORMITY

Manufacturer: Vaisala Oyj

Mail address: P.O. Box 26, FI-00421 Helsinki, Finland
Street Address: Vanha Nurmijärventie 21, Vantaa, Finland

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Object of the declaration:

K-Patents Multichannel User Interface MI

The object of the declaration described above is in conformity with Directives:

RoHS Directive (2011/65/EU)

EMC Directive (2014/30/EU)

Low Voltage Directive (2014/35/EU)

The conformity is declared using the following standards:

EN 50581:2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

EN 61000-3-2:2006 + A1:2009 + A2:2009 Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions

EN 61000-3-3:2013 Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements

EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use – EMC requirements – intended for use in industrial locations

Signed for and on behalf of Vaisala Oyj, in Vantaa, on 1st September 2019

Jukka Lyömiö
Standards and Approvals Manager

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C Command selection tree for Refractometer application

```
┌─────────────┐
│ Main screen │
└──────┬──────┘
       │
       ▼
┌────────────┐  ┌──────────────┐  ┌──────────────────┐  ┌──────────────────┐
│ REFR. APP  │─▶│ DIAGNOSTICS  │─▶│ PRISM WASH       │  │ CONCENTRATION    │
└────────────┘  └──────────────┘  ├──────────────────┤  ├──────────────────┤
                                  │ VERIFICATION     │  │ TEMPERATURE      │
                                  ├──────────────────┤  ├──────────────────┤
                                  │ FIELD SAMPLE     │  │ BOTH             │
                                  ├──────────────────┤  └──────────────────┘
                                  │ INPUT            │
                                  ├──────────────────┤
                                  │ OUTPUT           │
                                  ├──────────────────┤
                                  │ IDENTIFICATION   │
                                  ├──────────────────┤
                                  │ SUPPORT          │
                                  └──────────────────┘

                ┌──────────────┐  ┌──────────────────┐  ┌──────────────────┐
                │ CALIBRATION  │─▶│ SELECT DISPLAY   │─▶│ CONCENTRATION    │
                └──────────────┘  │ MODES            │  ├──────────────────┤
                                  ├──────────────────┤  │ TEMPERATURE      │
                                  │ PRIMARY UNIT     │  ├──────────────────┤
                                  ├──────────────────┤  │ BOTH             │
                                  │ PRIMARY DECIMALS │  └──────────────────┘
                                  ├──────────────────┤
                                  │ SECONDARY UNIT   │─▶┌──────────────────┐
                                  ├──────────────────┤  │ CELSIUS          │
                                  │ CHEMICAL         │  ├──────────────────┤
                                  ├──────────────────┤  │ FAHRENHEIT       │
                                  │ FIELD            │  └──────────────────┘
                                  ├──────────────────┤
                                  │ TAG              │
                                  ├──────────────────┤
                                  │ SENSOR           │
                                  ├──────────────────┤
                                  │ SOURCES          │
                                  ├──────────────────┤
                                  │ PRISM WASH       │
                                  ├──────────────────┤
                                  │ SUMMARY          │
                                  └──────────────────┘

                ┌──────────────┐
                │ TREND        │
                └──────────────┘
                ┌──────────────┐  ┌──────────────────┐
                │ LOG          │─▶│ CLEAR            │
                └──────────────┘  └──────────────────┘
```
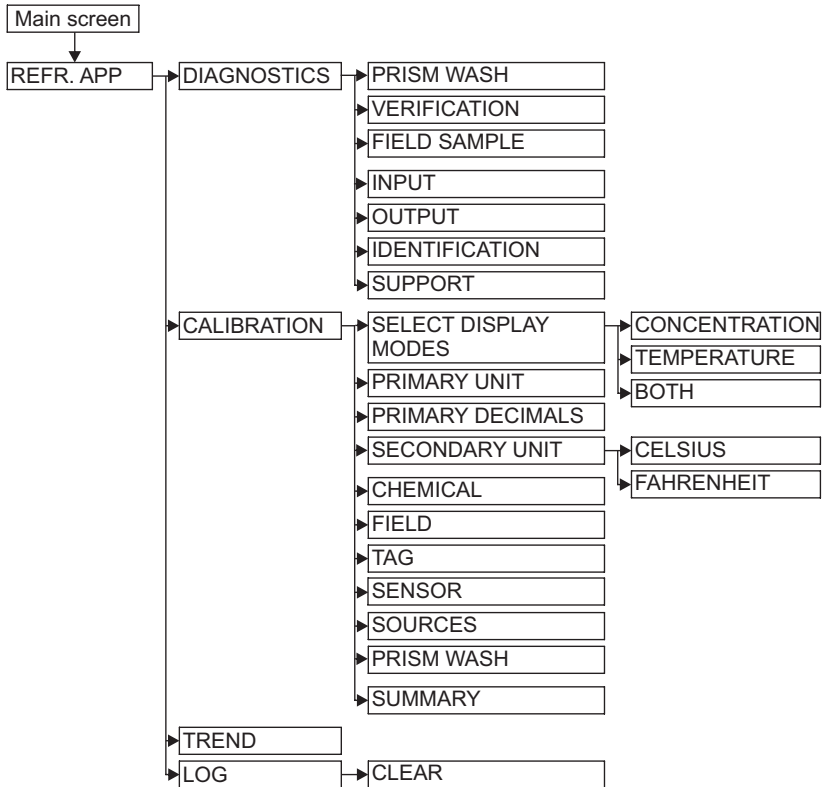
D Command selection tree for settings

Main screen

SETTINGS → GENERAL → DISPLAY SETUP → QUADRANT
- SCREEN BRIGHTNESS → ONE ON TOP
- LANGUAGE → DUAL VERTICAL
- HIGH CONTRAST MODE → ONE MAXIMIZED

Master user login required (IP address can be viewed without login)

- DATE & TIME
- PROTECT WITH PASSWORD
- BACKUP/RESTORE
- FACTORY RESET
- UPDATE
- SYSTEM TAG

NETWORK →

Refractometer
- CURRENT IP ADDRESS
- IP ADDRESS MODE → STATIC
- SET STATIC IP ADDRESS → DYNAMIC
- SET SUBNET MASK → AUTO
- SET FIRST SENSOR IP ADDRESS
- START BOOTP SERVER → YES
  - → NO
  - → AUTO

Ethernet
- CURRENT IP ADDRESS
- IP ADDRESS MODE → STATIC
- SET STATIC IP ADDRESS → DYNAMIC
- SET SUBNET MASK → AUTO
- SET DEFAULT GATEWAY

- APPLICATIONS → APP SLOT X (1-8) → ADD
- MODULES → MODULE SLOT X (1-8) → REMOVE
- USERS → ADD USER → SET NAME
- LOG → CLEAR → SET PASSWORD

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