Nokeval

m a d e   t o   m e a s u r e

PM20A chassis

Manual

Table of contents

Introduction

PM10 is a modular panel-installed meter and controller family for industrial use. PM20A is one type of chassis in this family. It is a 96x96 mm panel meter chassis consisting of an enclosure, motherboards, and a display. Various types of input and output cards can be fitted inside.

This manual covers the PM20A chassis. Please supplement this manual with the *PM10 system manual* and a manual for each card type used.

PM20A uses the FreeRTOS real-time operating system V8.0.1. The FreeRTOS source code is available from Nokeval support on request.

Assembling a new PM20A

This chapter may be skipped if the device is ordered pre-built.

The PM20A internals consist of two motherboards, support structures, the display board and the optional cards:
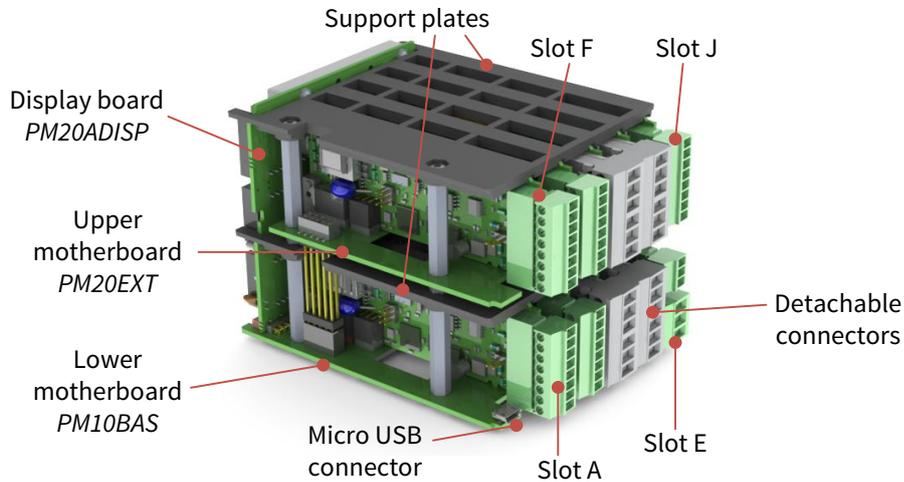
To access the internals, pull off all the detachable connector blocks. Then do one of following:

- Push the front bezel off. Place your fingers on the left or the right side of the bezel and push. It may be quite tight. Then slide the internals out. This is possible only when the device is not installed in a panel.

- Unscrew the four small Phillips screws in the back plate. Pull the internals out.

If you need to add/remove/set up cards in the upper floor, remove the two screws holding the upper support plate and then the plate itself.

If you need to add/remove/set up cards in the lower floor, remove the two screws at the bottom of the lower motherboard. Then carefully lift the upper motherboard until it disengages and then slide it off the display board.
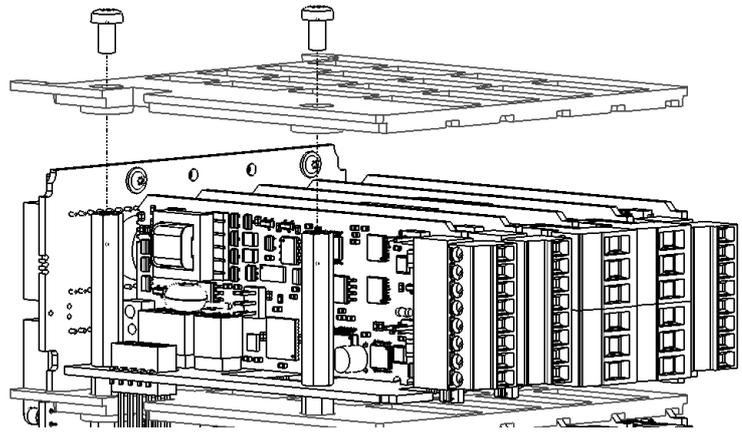
At reassembly, do the opposite, carefully guiding the pin connector to its counterpart.
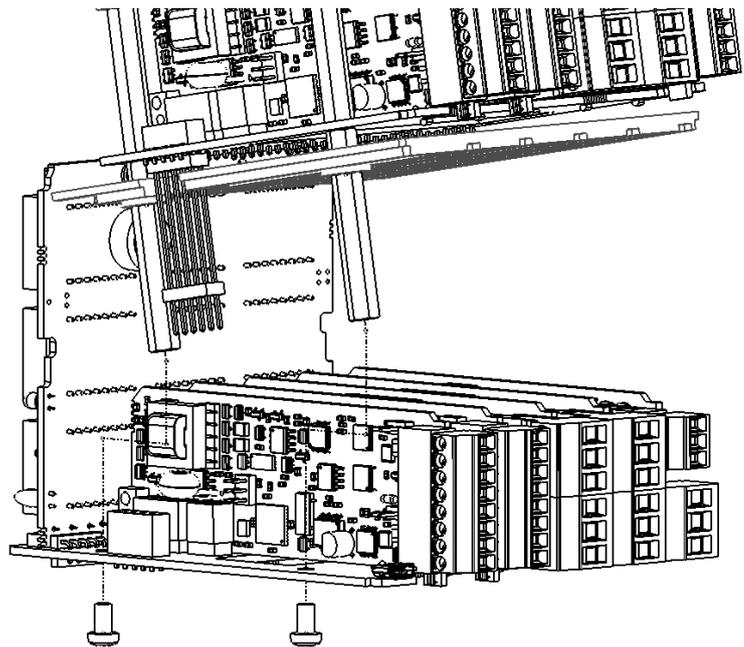
Use ESD precautions – at least touch an earthed object before touching the cards. Avoid touching the components on the cards, although it may be impossible.

Set the jumpers of the cards as described in the manuals of each card.

Insert the desired cards. The cards can be of any type and placed freely, except:

- Use only one power supply card. Place it always in slot E – the back plate has a different opening.
- Do not place a relay card in slot A to keep hazardous voltages away from the USB connector.

When purchasing separate cards, they are accompanied with connector diagram labels. Attach the labels on the top of the enclosure for the upper floor cards and on the bottom of the enclosure for the lower floor cards.

Snap the appropriate back plate opening covers off by fingers or by a flat-bladed screwdriver.

Slide the motherboard and the cards in the enclosure guiding the cards in the grooves and refit the front panel or the back plate.

Mounting in a panel

Prepare a panel cut-out per IEC 61554: width and height 92.0…92.8 mm.

Place the gasket around the PM20A body.

Slide the device in the opening and fasten with two clamps, either on the sides or on top and bottom.

The backside of the device may have hazardous voltages in the terminals. If this is the case, the backside must not be accessible without tools. Also tie the wires so that if a wire comes loose, it can't contact the other connectors.
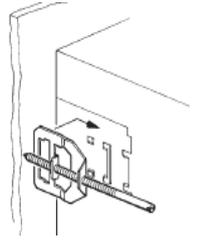
Configuration menu overview

The configuration menu items of the display are explained in the relevant chapters. This is just a quick overview. The other cards have menus of their own, not covered by this manual.

Display	Trunk	Defining the contents of the display.	Page 8.
	Auto fill		
	Page1		
	Page2		
	Scan	Controlling how several pages alternate on the display.	Page 13.
	Colors	Selecting colors for the display.	Page 14.
	Dimmer	Controlling the display brightness externally.	Page 15.
Setpoints		Allowing the operator to adjust some values easily, e.g. alarm levels.	Page 18.
Indicators		Defining the operation of the small indicator lamps above the display.	Page 16.
Attention		Using the bright red attention light.	Page 17.
Tables		Linearization tables.	PM10 system manual.
Totalizers		Totalizers for accumulating flow.	PM10 system manual.
Funcs		Multi-purpose functions.	PM10 system manual.
Program		Elo program for advanced functionality.	PM10 system manual.
General		Password for the display.	Page 17.
Agents		Controlling the settings dynamically.	PM10 system manual.

Using the display

Indicators
Can be used to indicate alarms, digital input states, and which page is currently displayed.

Fault indicator
Indicates that there is something wrong.

Tag
Gives a hint what the accompanying reading is. Can be 1-3 letters or digits.

Attention light
Bright red light for getting attention when something happens.

Reading
A variable value, e.g. input or function value.

Ambient light sensor
Convenient input for testing purposes. Can be used to dim the display.

Keys
For configuring the device, and for controlling its functions.

Display contents and pages

The display has three equivalent rows, each consisting of six 11-segment digits. The contents of the rows are configurable. In practice, every row can contain one of the following options:

• A tag	INPUtS
• A reading	23,4
• A tag and a reading	P1 234
• Two readings	23 67
• Nothing	

A *tag*, meaning some fixed text or numbers, can be used to clarify the contents of the display. Each row can have a tag of its own. The top row is sometimes used as a title without a reading.

As this device may have more inputs (and other values) than fits on the display, it is possible to define several *pages*, each having different tags and readings. The user may switch different pages to the display using the ▼ and ▲ keys, or the device can be configured to scan the pages automatically.

In a newly built device, the display may be blank, as nothing has been configured. The display reading may come from various sources not limited to the inputs. The display contents may be configured manually or automatically.

Automatically configuring the display contents

In most cases, the task of defining the display (page) contents may be left to PM20A. It will automatically query the input cards and place their readings on the display, beginning from slot A inputs. Since the inputs that are switched off are not included, configure the inputs first according to the input card manuals.

Warning! This will override any manual configurations done in the Page menus.

To start the *Auto fill*, do **one** of the following:

- Connect to the display (Master) with Mekuwin. Navigate to Display ▶ Auto fill and click Execute.
- Switch the device off, hold the ◀ and ▶ keys pressed, and switch the power on. "Autofill" is displayed for a moment.
- Use the Quick configuration menu on the front panel:
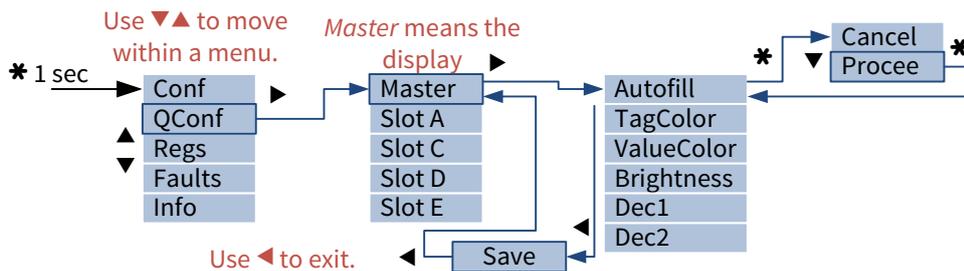
The display is now ready for use! Push the ▼ and ▲ keys to move among the pages.

The Auto fill may be re-run at any time. Its operation may be tuned with the following settings under the Display ▶ Auto fill configuration menu:

Layout	How the display is filled with tags and values. See options below.
Tag	How the tag is formed: - Retain: Preserve the previous tag. - None: Remove the tags. - Index: Sequential numbers 1, 2, 3… This is the factory default. - Letter: A letter A, B, C… - SlotReg: A combination of the card slot (A, B…E) and the number of the register on the card, e.g. A1, A2, B1, B2.
Dec	The number of decimals to show. Each reading will get the same number of decimals, but they may later be adjusted individually under each page settings.

Auto fill provides several layout options:

Layout setting	Description	Example
Title+Val	The top row has a tag. The middle row has a reading. The bottom row is blank. This is a "compatibility mode" with Nokeval 538-8 panel meter.	
Title+2Val	The middle and bottom rows have a reading. The top row has a tag consisting of two channel numbers separated by a dash. Each reading has six digits to use.	
3Val	Each row has a tag and a reading. The readings can be up to five digits long on channels 1-9 and four digits after that.	

Title+4Val	The middle and bottom rows have two readings each. Top row has a tag consisting of the first and last channel numbers separated by a dash. Each reading should have up to three digits.	*5-8* *45 44* *39 43*
6Val	Every row has two readings, maximally utilizing the display. If several pages are used, the indicators above the display can be used to indicate which page is being displayed as there is no room for tags.	*45 44* *39 43* *0 00*

Manually configuring the display contents

Open a configuration connection to Master, either with Mekuwin or on the front panel.
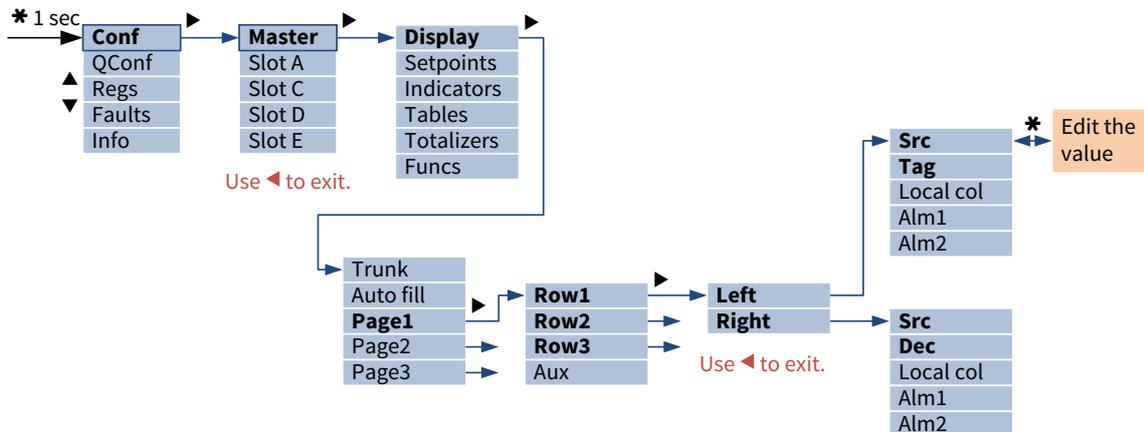
Set *Trunk* according to the amount of pages needed. (The word trunk refers to a tree trunk. The pages are arranged vertically as the user may move among them with the ▼▲ keys. The tree may contain branches, as demonstrated in "Having auxiliary pages" on page 20.) After setting Trunk, the corresponding number of Page submenus will be revealed.

Each Page submenu has three submenus, one for each display row. These menus are further divided into Left and Right submenus.

Configure the left side of a row in the Left submenu. Unless individual colors and alarms are needed, set just Src, Tag, and Dec.

Src	If you want a reading on the left side of the row (in addition to another reading on the right side), select the reading source here, typically one register of an input card. If you don't want two readings per row, set this to None.
Tag	If you want some fixed text or numbers on the row, write it here. It will appear beginning from the left edge of the display. The right side of the row may or may not have a reading. Set blank if desired.
	If you want to ensure a gap between the tag and the reading, place a space after the tag.
	If the tag is longer than the display, the display will scroll.
	You can't set a tag if there is a left side reading selected with the Src setting.
Dec	Set the number of decimals to show in the reading. A negative setting will round the corresponding number of last digits to zero. Affects floating point numbers only. This setting is hidden when Src is set to None.
	Examples of 123.4567 on various Dec settings:

Dec	Display
3	123.457
2	123.46
1	123.5
0	123
-1	120
-2	100

Configure the right side of the row:

Src	If you want a reading on the right side of the row, select the reading source here, typically one register of an input card. If you don't a reading, set this to None.
Dec	Set the number of decimals to show in the reading. A negative setting will round the corresponding number of last digits to zero. Affects floating point numbers only. This setting is hidden when Src is set to None.

Examples of 123.4567 on various Dec settings:

Dec	Display
3	123.457
2	123.46
1	123.5
0	123
-1	120
-2	100	

Typical usage scenarios of a row and the settings to accomplish it:

Scenario	Example	Left config	Right config
A tag	*INPUTS*	Src=None Tag=Inputs (example)	Src=None
A reading	*23.4*	Src=None Tag=None	Src=some register
A tag and a reading	*P1 23.4*	Src=None Tag=P1 (example)	Src=some register
Two readings	*23 67*	Src=some register	Src=another register
Nothing		Src=None Tag=blank	Src=None

Making the display to scan the pages

Scanning means that PM20A automatically displays each page for a moment, then advances to the next.
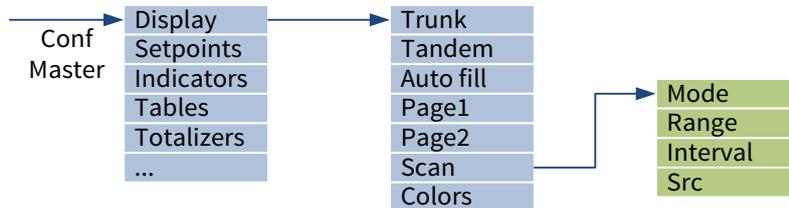
Use the following settings under the Display ▶ Scan menu:

| Mode	- Manual: User may move with ▼ and ▲ keys (factory default). - Auto: The pages will be automatically scanned. - Alarming: Like Auto, but the scanning is temporarily stopped if any of the registers configured under the Alarm submenus are active in the Page configuration. - External: The page to be displayed is controlled by some register.
Range	The number of pages to scan. The scanning is also limited by the Trunk setting; the lesser one will define the range.
Interval	The interval in seconds between changing to the next page in Auto and Alarming modes.
Src	The source controlling the page in External mode. Hidden otherwise.

Even in the Auto and Alarming modes, the user may use the ▼ and ▲ keys to move. After eight seconds, or by pressing simultaneously ▼+▲, the scanning will continue.

Configuring the colors globally

For minimum effort, use "global" colors. Then every tag shares the same color. Every left side reading shares the same color. As does every right side reading. To use global colors:

1. Go to the Display/Colors menu.
2. Go to the LeftValue menu, then to Normal menu. Adjust Hue and Brightness as explained below.
3. Do the same for the Tag and RightValue menus.
4. In each Row menu (under Display/PageX) set the Local color settings to No. The row will then obey the global colors. By default, they are already set to No. If you used Auto fill, it did this for you.
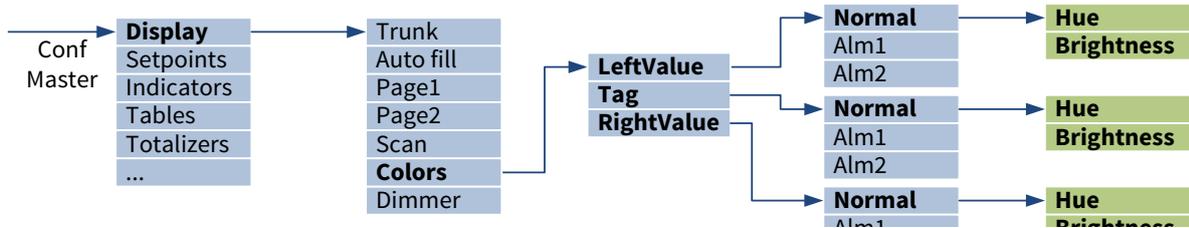
Each color is defined by two settings:

Hue	0 = red, 30 = orange, 60 = yellow, 100 = green. Any intermediate value may be used.
Brightness	0 = almost invisible, 100 = maximum brightness.

Configuring the colors individually

It is possible to override the global colors where needed. Set *Local color* to Yes in any Left or Right menu under any Display/Page/Row menu. A new submenu will appear: *Color*. It contains the Hue and Brightness settings explained above.
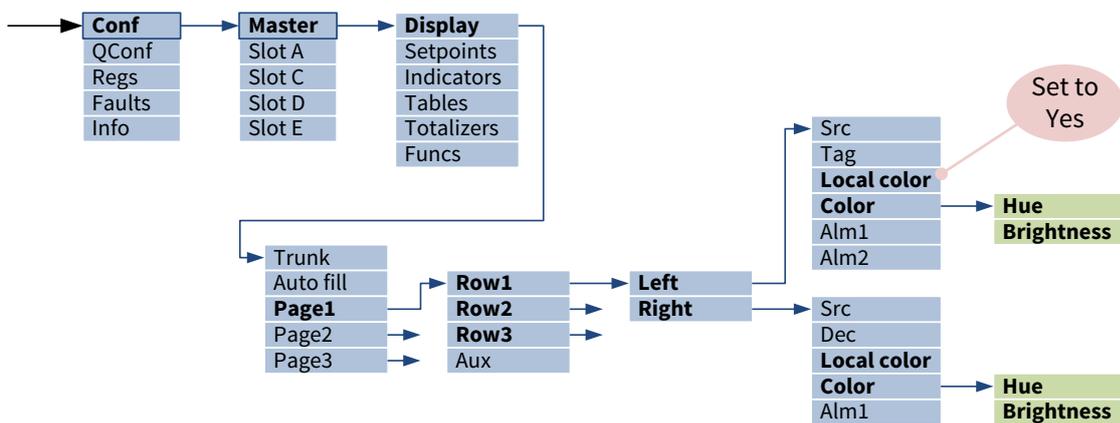
Making a color to change at an event

PM20A can change the display colors to get user attention e.g. when an alarm is triggered.

Each reading (and tag) can have two alternative colors in addition to the normal color, e.g. for a warning and an actual alarm, or for lower and upper alarms.

To use:

1. Prepare a rule for the color change i.e. some register that changes its value when the color should change. Typically this can is an alarm comparator on a relay card. You may also use one Function for this purpose (use Greater or Less function, see PM10 system manual).
2. Go to the Alm1 submenu under the relevant Page/Row/Left or Page/Row/Right menu.
3. Set Src to refer to the rule prepared in step 1. E.g. to Slot D/Alm1 or This/Func1.
4. If the Local color setting is Yes, define the alarm color with Hue and Brightness. Otherwise the color defined under Display/Colors/X/Alm1 will be used as the alarm color.
5. If you want another rule, do the same tricks for Alm2 submenu.
6. If you want the reading (or tag) to blink at alarm, set Blink to Yes in the same menu where the color is defined (locally or globally).

If both Alm1/Src and Alm2/Src are alarming, Alm2 will win.

Using a dimmer

PM20A allows controlling the display brightness from various sources, typically from an external potentiometer or control voltage, but it is also possible to use a setpoint for this. To use the dimmer:

1. Prepare the controlling signal. Some examples:
   a. Set up an analog input in a PM10UNI2A card and scale it to 0-100.
   b. Use the analog input in the PM10POW24SA card; it will measure raw volts. Use a Table or a Function to convert the reading to 0-100.
   c. Set up a Setpoint as described on page 18. Use lower limit 5 or so to prevent total darkness, and upper limit 100.
   d. Use the front panel Ambient light sensor (page 21). Set up a Table to shape its output to optimal dimmer response.
2. Go to the display card configuration menu, then to Display menu.
3. Set the Dimmer setting to refer to the controlling signal, e.g. Slot A/In1 or This/Setp1 or This/Table1.

To disable the dimmer, set the setting to None.

The dimmer will adjust the whole display. If you need to control the brightness or color of a single item, you may use Agents (see PM10 system manual).

Configuring the page indicators

As said in "Display contents and pages" on page 8, the leftmost indicators can be used to indicate which page is being displayed. It is possible to assign up to 5 leftmost indicators to this task.

When a single indicator is not enough to express the page number, PM20A will use multiple indicators together. The user obtains the page number by summing the number values next to the indicators. E.g. 4+5 = 9.

If the page number is too high to be expressed with the channel indicators, all of them will be off.

Select the number of channel indicators with the *Indicators/Channel indicators* setting. Value 0 disables them all.

Configuring and using the fault indicator

The PM10 display is continuously querying the other cards if they have any problems. If any of them reports any problems or faults, the Fault indicator will be on.

When this happens, use the Fault viewer to see the problem description as guided on page 28.

It is possible to adjust the sensitivity of the fault indicator. It can also be released for other use. This is controlled with the Indicators ▶ Fault indicator setting, that have the following options:

Off	The Fault indicator is not used. Can be used for other purposes with the Ind8 menu.
Suspicion	The fault indicator is on if any card reports a suspicion of a problem.
Warning	The fault indicator is on if any card reports a warning or a suspicion. A warning means everything is working, but problems are foreseeable. This is the factory default.
Failure	A failure means that the device has detected a problem that could possibly be fixed by the user, like a sensor fault.
Fault	A fault means that the device has detected a problem in itself, possibly needing service.
System	A system fault is something that compromises the operation of the whole device, e.g. power supply overload.

Using the indicators for other purposes

The indicators that are not used as channel indicators nor as a fault indicator, can be configured to indicate various events. To configure an indicator:

1. Under Indicators menu, there is a submenu for each indicator, e.g. Ind6. The leftmost indicator is Ind1 and the rightmost is Ind8.
2. Set the Count setting to match the number of "reasons" why the indicator can be on.
3. For each Src, select a source, e.g. an alarm or an alarm group. If any of the sources is on, the indicator will be on.

Selecting the color for the indicators

The color for the indicators is selected in the Indicators/Color menu. Hue and brightness are explained on page 14. It is not possible to have individual colors for each indicator.

Attention light

The front panel has a bright red light for gathering attention. The location of the light is marked in the picture on page 7. The light is controlled by one or more registers. When active, the light will blink to get maximum attention.

Conf Master	→	Display
		Setpoints
		Indicators
		Attention → Count
		Tables Src1
		Totalizers Src2
		... Src3
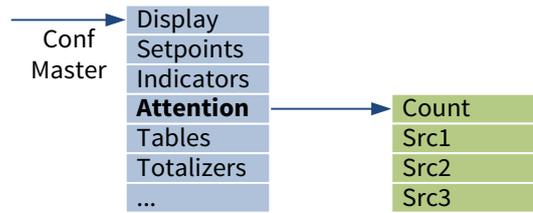
To use the attention light:

1. Go to the configuration menu, Attention submenu.
2. Set Count to the amount of source registers, i.e. the number of "reasons" why the light would be active. Up to four reasons can be used.
3. Corresponding amount of Src settings will be revealed. Set each of them to point to some register, e.g. an alarm on a relay card.

To draw attention when there is some fault recognized by PM20A, set one of the Src settings to the AnyFault register (page 21).

Protecting the configuration with a password

It is possible to prevent unauthorized persons from adjusting the settings in the configuration (and quick configuration) menu. To do so:

1. Go to the General submenu.
2. Set Conf code. It is a series of six keypresses ◄▼▲► (viewed on the front panel) or a series of numbers 1 to 4, e.g. 112234. In Mekuwin, it is possible to enter six letters; they will be converted to numbers. The password can't be ◄◄◄◄◄◄ = 333333.
3. When anyone tries to enter the configuration menu, he must enter the correct password.

The correspondence between the numbers (Mekuwin) and the keys (front panel):

1	▲
2	▼
3	◄
4	►

This password applies to the display card only. The other cards may provide a password protection of their own.

If the display password is forgotten, it must be reset as follows:

1. Power off the device.
2. Keep ◄ pressed down.
3. Switch on the power.
4. CCLEAR is displayed shortly. Now release the key and enter the menu.

Allowing the user to interact: The setpoints

The setpoints turn the "output" nature of the display to "input" from the user. The user may use the keys to adjust the setpoint values, affecting the operation of PM20A in various ways. The setpoints in this context are not directly related to alarms or controllers. They are merely something the user may easily adjust. They do nothing more by themselves, but provide the value for the other functions.

PM20A provides different types of setpoints for different uses.

- Event setpoint is "on" while the user keeps the ✱ key pressed. It can be used to tare, reset an alarm hold, and similar momentous activities.
- Boolean setpoint can be toggled "on" and "off" with the ✱ key. It can be used to start and stop some activity.
- Float setpoint is a user-adjustable floating point number with configurable limits. The setpoint can adjust an alarm level, controller set value, affect the operation of an Elo program, etc.
- ListIndex setpoint allows the user to select one item from a configurable list. The setpoint output is the index of the selection, beginning from 0.
- FloatList setpoint allows the user to select one number from a configurable list. The setpoint output is the numerical value of the selected item.
- StringList setpoint allows the user to select one string (a word) from a configurable list. The setpoint output is the selected string.

To configure a setpoint, open the Setpoints menu, and then one of the Setp submenus, e.g. Setp1. Configure it:

Type	See the explanations above.
Min **Max**	The limits for the Float setpoint.
List	The user-selectable options for the list type setpoints. Enter the options separated by linefeeds (enter key).
Preserve	If Yes, the value of the setpoint is retained when the device is powered off.
Startup	The value of the setpoint after power-up. If Preserve=Yes, this does not affect, except if the stored value gets corrupted. For a boolean setpoint, the value should be 0 or 1. For any of the list setpoints, the value should be the 0-based index of the item.
Value	This is the value of the setpoint. With the float setpoint, the value can also be set here.

The setpoint needs to be "made visible" in some of the display pages. Under the Display menu, select one of the Page submenus (increase the Trunk setting to get more pages if necessary) and configure:

Tag	Some letters to describe the purpose of the setpoint. E.g. SV.
Src	Select Reg > Master > Setp1 (or which setpoint you did configure). In Tandem mode, only the right half (Src) may have a setpoint, not the left half (LSrc).
Dec	For a float setpoint, this defines the resolution along with the number of decimals to show. Do not select unnecessarily many numbers, as it makes it slow to adjust the value. For the other setpoints, this setting does not matter.

If it is not acceptable that anyone can adjust the setpoints, set a password in Setpoints ▶ Code. The user must enter it before adjusting a setpoint. Once entered, the setpoints are unlocked for 60 seconds.

The setpoint is ready for use. Move to the newly configured page on the display. Push ✱ and the following should happen:

- With an event setpoint, an ✱ is displayed as far as the ✱ key is being pushed.
- With a boolean setpoint, the displayed value toggles between ✱ (on) and – (off).
- With a float setpoint, the value begins to blink. Adjust the value with the ▼▲ keys. The speed accelerates if the keys are held pressed. When the desired value is reached, push ✱. The value stops blinking and the ▼▲ keys can be used to move among the pages again.
- With any of the list setpoints, the value begins to blink. Select the desired option with ▼▲ keys and push ✱.

If there are several setpoints on a display page, push ✱ repeatedly until the desired setpoint is blinking. Don't place other setpoints on a page that has an event or a boolean setpoint.

The value of the setpoint is available in the Setp1…Setp8 registers on the master card.
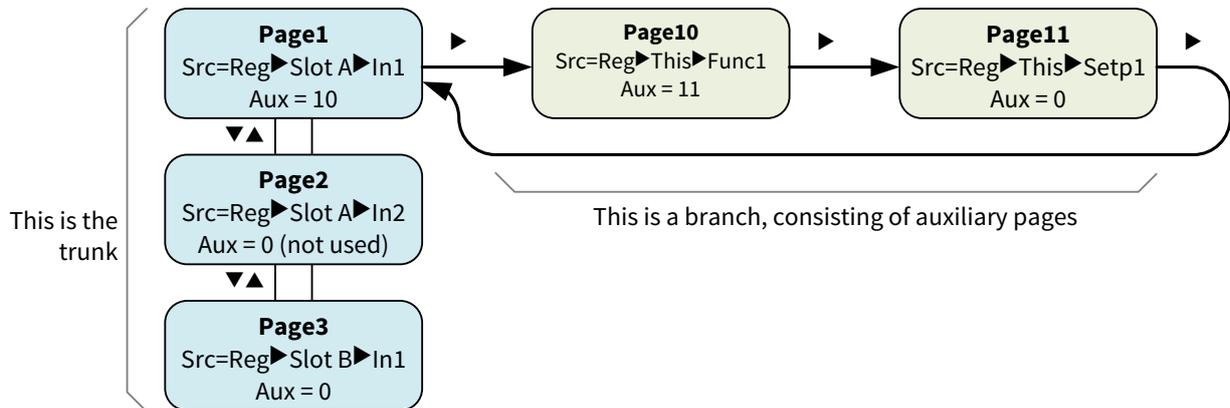
Having auxiliary pages

The trunk pages are arranged vertically – the user may move between them with the ▼▲ keys. Sometimes it may be convenient to have a horizontal motion too. E.g. when viewing a page that contains an input reading, the user might want to see its peak hold value, or adjust an alarm level or a controller set value. These can be accomplished with auxiliary pages. The user pushes ▶ to move an auxiliary page associated with the original page. The Aux setting on each page is used to define to which page to go if the user pushes ▶. If Aux is 0, there are no (further) auxiliary pages, and the user will return to the trunk. If the user will not touch the keys in one minute, the trunk page will be displayed.

The PM20A display has 18 configurable pages. Some of the first pages (e.g. pages 1 to 4) are used in the trunk, but the rest are free to be used as auxiliary pages.

To set up an auxiliary page (an example):

1. In one of the trunk pages, say Page1, set Aux=10 (or any unused page outside the trunk).
2. Configure the Page10 to contain a peak hold value. Set its Src to a function that is configured as a peak hold. Enter a short description, e.g. "PK" in the Tag.
3. To chain another auxiliary page, set Aux=11 in page 20.
4. Configure the Page11 to contain a setpoint (configured elsewhere). Src=Reg ▶ This ▶ Setp1. Configure an alarm to use this setpoint as its externally controlled level (ExtLevel).

When in one of the auxiliary pages, the channel indicators (if used) will blink and indicate the corresponding trunk page. In the example above, the channel indicator 1 will blink when the user is in the branch.

Ambient light sensor

The front panel includes a coarse non-calibrated ambient light sensor. The result is available in the *Amblight* register. The reading varies from 0 to 100.

The light sensor may be used as a temporary input when testing the PM10 functions. The reading may be affected by covering the sensor with a finger.

It is possible to control the display brightness according to the ambient light. Configure the Dimmer setting to follow a Table, and the table to follow Amblight, and set suitable table points to generate values 0 to 100.

Temperature sensor

The display board has a temperature sensor. It is not accurate, especially as it is inside the enclosure near heat-generating components. But it may be used for demo purposes and very coarse temperature measurement like an overheating alarm. Its output, in °C, is available in the *Temperature* register.

AnyFault register

The display board continuously queries all the cards (including the display itself) if they have any problems. This serves two purposes:

1. The Fault indicator is light if problems are found.
2. The *AnyFault* register contain the result as well as a truth value (no/yes). It can be used to control a relay or a digital output for simple remote monitoring.

Configuring the device using the front panel

The device can be configured with the Mekuwin software, or using the front panel display and keys. This chapter instructs the latter.

Each PM10 card, including the display card, is an independent "device" performing its tasks. Consequently, each card has a configuration menu of its own.

Actually each card has two configuration menus. The full configuration menu (Conf) contains all the setting and unleashes all the power of the card. For reduced complexity, each card has also a *Quick configuration menu* (QConf) that provides the most basic settings only. If you want a panel meter that measures a couple of inputs, displays the readings and retransmits the values with an analog signal, you can set them up using the quick configuration menu. Both menus are operated similarly, just select either Conf or QConf on the menu. The contents of the quick configuration menus are described in the *PM20A quick manual*.

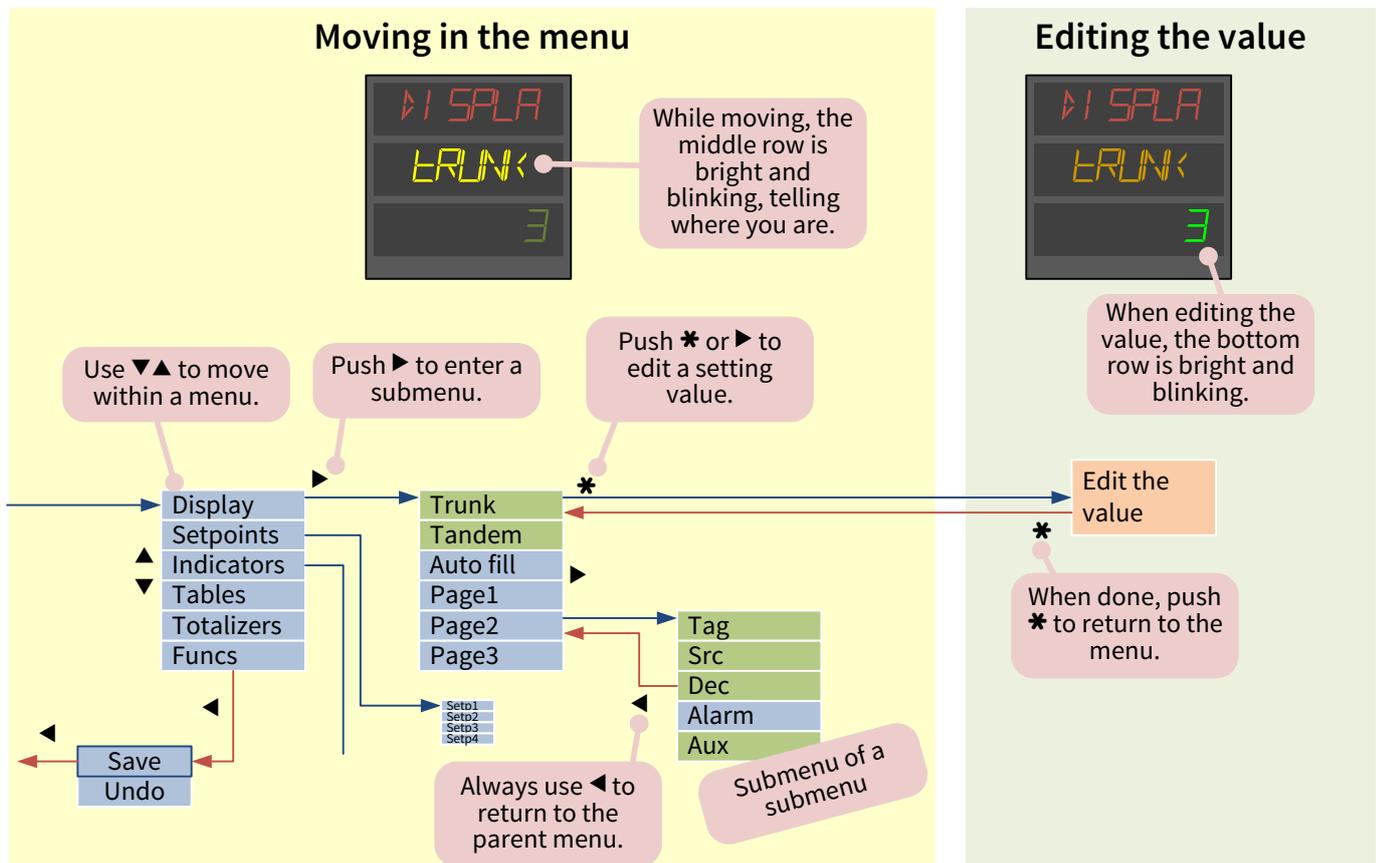## Beginning a configuration session
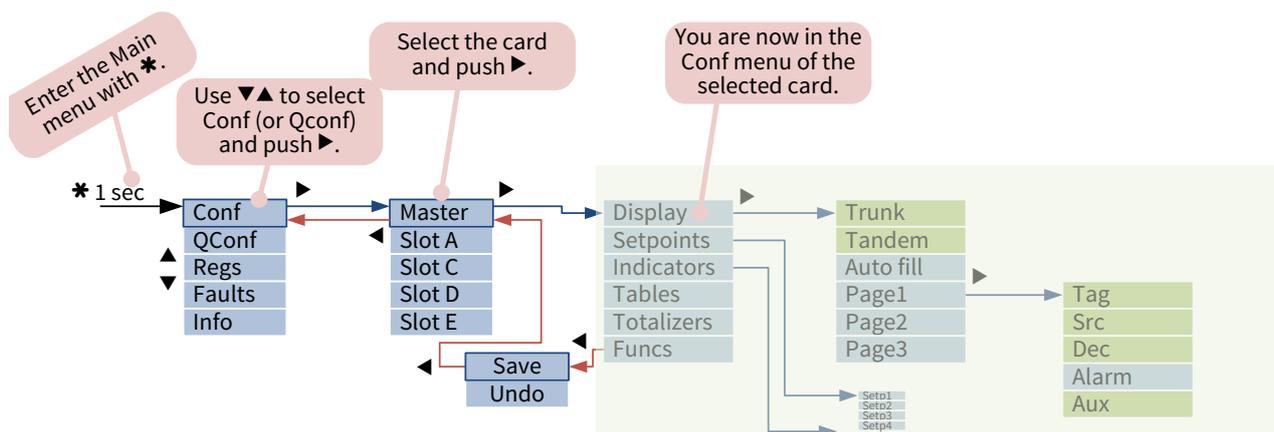
Navigating in the menu

The graph shows the truncated menu of the display (Master) as an example. The manual of each card depicts the menu structure of that card. The display rows are used as follows:

- The top row has the name of the menu where you are.
- The middle row has the menu item name that is being viewed or edited.
- The bottom row has the value of the item.

Moving in the menu

While moving, the middle row is bright and blinking, telling where you are.

Editing the value

When editing the value, the bottom row is bright and blinking.

Use ▼▲ to move within a menu.

Push ▶ to enter a submenu.

Push ✱ or ▶ to edit a setting value.

Display	→	Trunk
Setpoints		Tandem
Indicators		Auto fill
Tables		Page1
Totalizers		Page2
Funcs		Page3

✱ → Edit the value

When done, push ✱ to return to the menu.

| Tag |
| Src |
| Dec |
| Alarm |
| Aux |

Submenu of a submenu

| Setp1 |
| Setp2 |
| Setp3 |
| Setp4 |

Always use ◀ to return to the parent menu.

| Save |
| Undo |

Editing a value

The configuration menus contain different types of settings, each being edited differently as detailed below. Common practices:

- Use ▼ and ▲ to edit the value.
- Use ◀ and ▶ to move the cursor.
- Long-press ✱ to see a pop-up menu, that provides additional options.
- Exit with ✱.

Type	Examples	How to edit
On/Off or Yes/No	Tandem setting in the display	Use ▼ and ▲ to select. Exit with ✱.
List	Sensor selection	Use ▼ and ▲ to select. Exit with ✱.
Integer	Number of decimals to show Serial bus address	Use ▼ to decrease and ▲ to increase. Keep pressed for acceleration. Advanced: Use ◀ and ▶ to move the cursor. Long-press ✱ for a pop-up menu. Min = the smallest allowed value. Max = the largest allowed value. Zero = zero value. Exit with ✱.
Floating point (decimal) number	Input and output scalings	Use ▼ to decrease and ▲ to increase the number at the cursor. Keep pressed for acceleration. Use ◀ and ▶ to move the cursor. Push the cursor against the edges of the display to reveal more digits if necessary. Long-press ✱ for a pop-up menu. Zero = reset the value to 0. Negate = toggle the sign. Exit with ✱.

Page 23 - Configuring the device using the front panel

| Type	Examples	How to edit
Reference	The source of an analog output The source of the reading of a display page	The references are explained below this table.
Text (string)	Display tag Setpoint lists	Use ◀ and ▶ to move the cursor. Push against the edges to scroll. Use ▼ and ▲ to edit a character. If lost, long-press ✱ and select N to get capital N, a good starting point for any letter. To truncate the string (discard the end including the cursor location), long-press ✱ and select End. To insert a linefeed, as required when entering the setpoint lists, long-press ✱ and select Linefeed. The linefeed is displayed as ↵ in the editor. The left edge of the middle row of the display indicates the location of the cursor as a number. 1 means you are editing the first character. The middle row has also the character code in hexadecimal, e.g. 41 corresponds to capital A.
Password (code)	Configuration password	To set: Push ✱. The cursor blinks. Push six times the arrow keys to enter the password. The password can't be ◀◀◀◀◀. To disable: Push ✱ twice. The bottom row says *Off*.

Editing a reference

The references are used to link the different, autonomous blocks of the system together. E.g. for an analog output, the source must be configured, as the output may follow various sources (called registers) from any of the cards. Similarly, the display contents are configured to come from somewhere. These are done with a reference to an output register of some card. The reference consists of three parts: 1) Whether the reference is active or not. 2) The card, or slot, producing the referred register. 3) The register within the selected card.
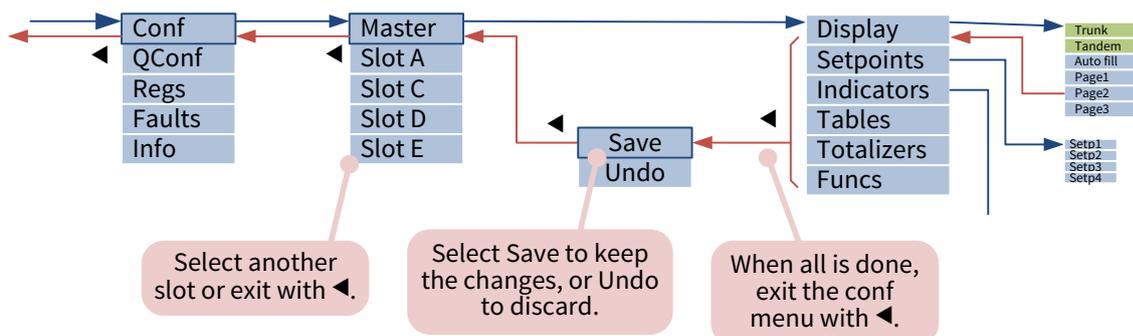
To select a reference:
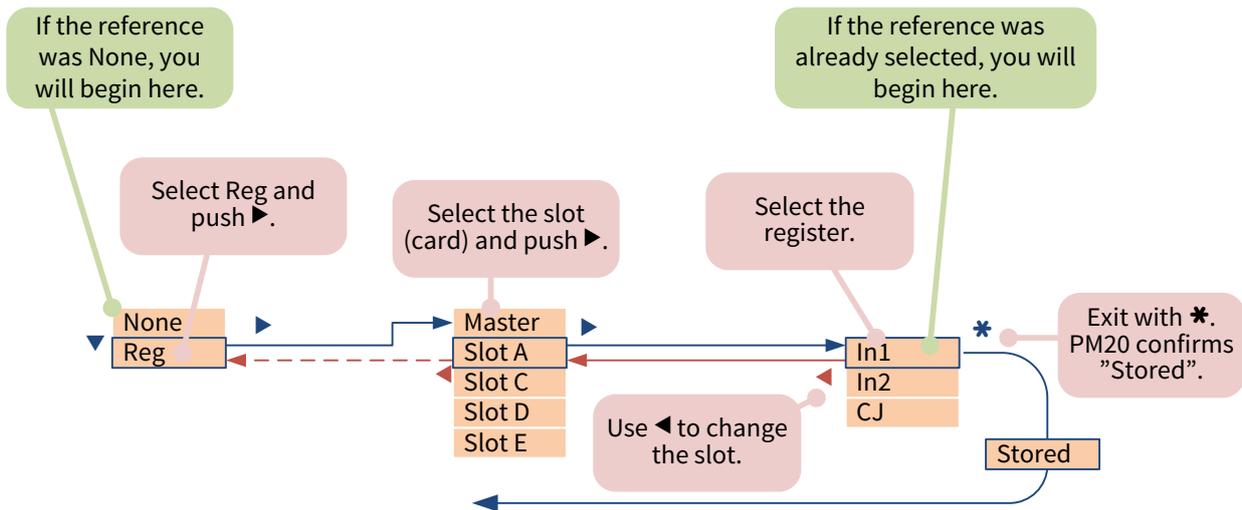
Sometimes it is necessary to *"switch off"* a reference. E.g. an unused analog output is disabled by selecting None as its source. A display page containing a tag only is achieved by setting Src to None. To switch off a reference, push ◄ twice and select None (picture below), or long-press ✱ and select None.
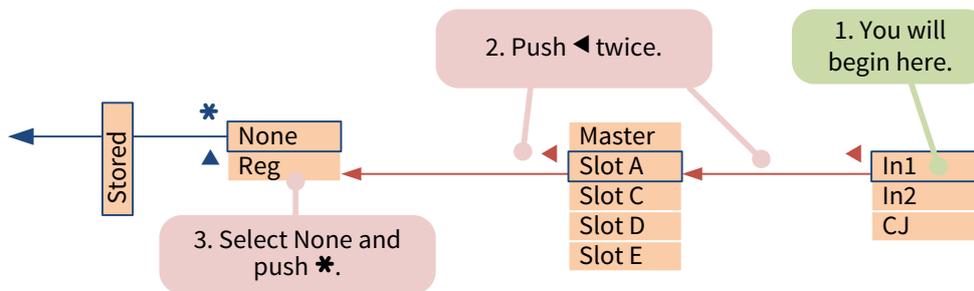
Ending the configuration session

Using the USB port

A micro USB port is available at the back of PM20A. It can be used for configuring the device with the Nokeval Mekuwin configuration software. The information below applies to PM20ADISP firmware V1.0.

When connected to a computer, PM20A appears as a virtual COM port, accepting Modbus RTU commands. Technically the port is connected to the display card (Master).

To prepare the port for configuration purposes on a Windows computer:

1. Obtain the PM10 USB driver from Nokeval web site, under Support > Software and drivers. Unzip it to some temporary folder.
2. Plug in PM20A. Windows tries to find a driver from Windows Update but fails.
3. Open the Device Manager (e.g. press Windows+R and type devmgmt.msc).
4. Locate PM10, with a yellow exclamation mark.
5. Right-click PM10 and select Update driver.
6. Point to the directory where the unzipped driver is.
7. Accept the warning. The downloaded driver is just a simple text file; the actual driver usbser.sys is included in Windows already.
8. Check that there is a PM10ADISP Virtual port under the Ports branch of the Device manager.

Then:

1. Launch Mekuwin (available for free at www.nokeval.com).
2. Select the virtual port.
3. Select ModbusRTU protocol, and address 1. (The parity and baud rate should not matter, but use 115200 and 8E1 if having issues.)
4. Use the Master, A, B… E buttons to open a configuration session for each card.

Functions, tables, Elo…

For processing the input signals and to allow tuning the device for many tasks, the display card provides the following configurable operational blocks:

- Functions take one or more inputs and do some simple operation on them, like subtracting two inputs.
- Tables allow entering several points to form a curve to shape a non-linear input to linear or other similar tasks.
- Totalizers cumulate the input value, allowing to calculate the mass of substance flown based on a flow measurement.
- Elo is a minimalist programming language allowing conditional execution, calculation, and timing.
- Agents allow linking some of the configuration settings to the functional blocks, varying them without using the configuration menu.

These blocks are common to many PM10 family cards. That's why they are explained in the PM10 system manual.

Maintenance

The device doesn't need regular maintenance. The analog input and output cards can be recalibrated, when maximum accuracy is desired.

Now and then check that the fault indicator ⚠ is not on.

The enclosure, including the front panel, may be cleaned with a moist cloth. Use mild soap water or isopropyl alcohol. Never allow water to go inside.

Troubleshooting

Problems

Problem: The Fault indicator is on (the rightmost indicator ⚠).
Solution: Use the Fault viewer as described on page 29.

Problem: The configuration menu can't be entered with ✱.
Solution: The display page may contain an Event setpoint. Try ✱+▲.

Problem: The display is blank.
Solution: Enter the configuration menu or the quick configuration menu. Check that there is at least one display page defined (under Master ▶ Display) that has a tag or a reading. Check that the color settings under Master ▶ Display ▶ Colors ▶ Normal are valid (brightness is >10).

Problem: Now and then the display dims for a moment.
Solution: There are short dips or interruptions in the supply voltage. Enhance the quality of the supply.

Seeing information about the cards

To see what kind of cards have been installed and their serial numbers and firmware versions, use the Info viewer:

1. Long-press ✱ key until a menu appears. (If not, try ▲ and ✱ together.)
2. Select *Info* with ▼▲ and push ▶ or ✱.
3. The top row has a word "Info" plus a letter indicating which card (slot) is being examined. * means the display card. Use ◀ and ▶ to change the card.
4. The middle row indicates the type of information to be shown. The options are listed below. Use ▼ and ▲ to change.
5. The bottom row displays the information, e.g. card type.
6. To exit, push ✱ and you are back in the main menu.

The information available:

- Type: Card type, e.g. PM10UNI2A.
- Ver: Firmware version, e.g. V1.0.
- SN: Serial number, e.g. P091201
- Descr: Short description of the purpose of the card, e.g. Dual analog input.

Viewing fault messages

To see if any card has detected a problem, use the Fault viewer:

1. Long-press ✱ key until a menu appears. (If not, try ▲ and ✱ together.)
2. Select *Faults* with ▼▲ and push ▶ or ✱.
3. The bottom row may have a message, accompanied with a letter indicating the card slot. E.g. "A Sensor 1 break" means that the card in the slot A reports a sensor problem.
4. Use ▼▲ to see if there are more messages.
5. Exit with ◀ ◀.

Some common fault messages:

- Source unavailable: some card can't get the value from the linked source. E.g. if an analog output in slot B has been configured to use slot C as its source and there is no card in slot C, this message will appear.
- Sensor fault or overrange: an analog or sensor input is exceeding its range or the sensor is found to be faulty or incorrectly connected.
- Conf corrupted: the checksum of the configuration data stored in a non-volatile memory does not match. Check all significant settings on that card and exit by saving. If the problem reappears later, the non-volatile memory has failed and needs to be replaced.
- Cal corrupted: the factory calibration data has been found to be corrupted. It is best to send the card to be checked and recalibrated.

Viewing the registers

The cards provide their readings and other values for the other cards. These "outputs" are called registers. The principle is explained in detail in the PM10 system manual. For troubleshooting, it is possible to view all the registers:

1. Long-press ✱ key until a menu appears. (If not, try ▲ and ✱ together.)
2. Select *Regs* with ▼▲ and push ▶ or ✱.
3. Select the card (slot) to view with ▼▲ and push ▶ or ✱.
4. Select a register with ▼▲; its name appears on the middle row.
5. View the value on the bottom row.
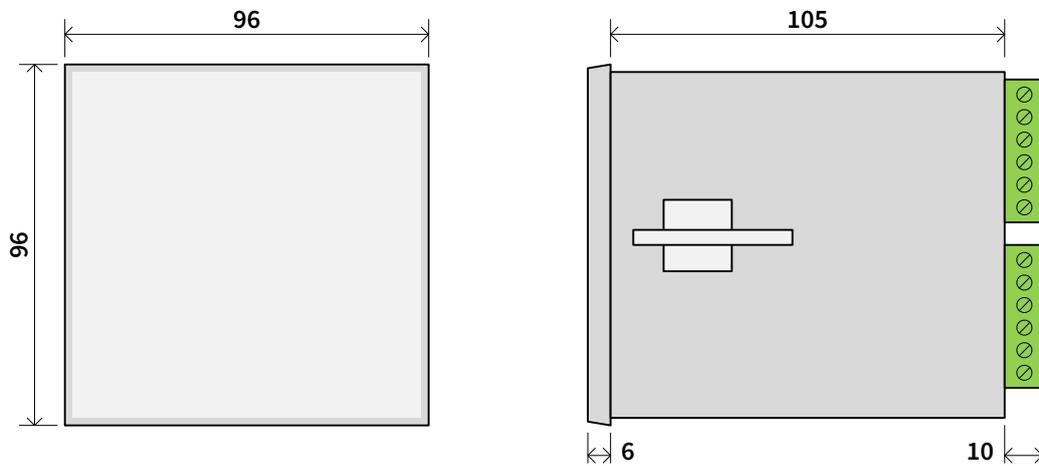6. To exit, push ◀.

Specifications

Environmental

Storage temperature	-40…+70 °C
Operating temperature	-30…+70 °C
Humidity, front panel	0…100 %RH
Humidity, rear	5…90 %RH non-condensing
Pollution degree, rear	2
Altitude	0…2000 m when hazardous voltages involved, unlimited otherwise
Protection, front panel	IP 65
Protection, rear	IP 20

Dimensions and weight

Panel opening	IEC 61554 (92.0 +0.8 -0.0 mm each side)
Digit height	14 mm
Weight	300 g without the optional cards

Warnings

The device must not be disposed with household waste. Observe local regulations concerning electronic waste recycling.

Manufacturer

Nokeval Oy
Rounionkatu 107
FI-37150 Nokia
Finland

Tel +358 3 342 4800 (Mo-Fr 8:30-16:00 EET)
WWW http://www.nokeval.com/
Email sales@nokeval.com,
support@nokeval.com