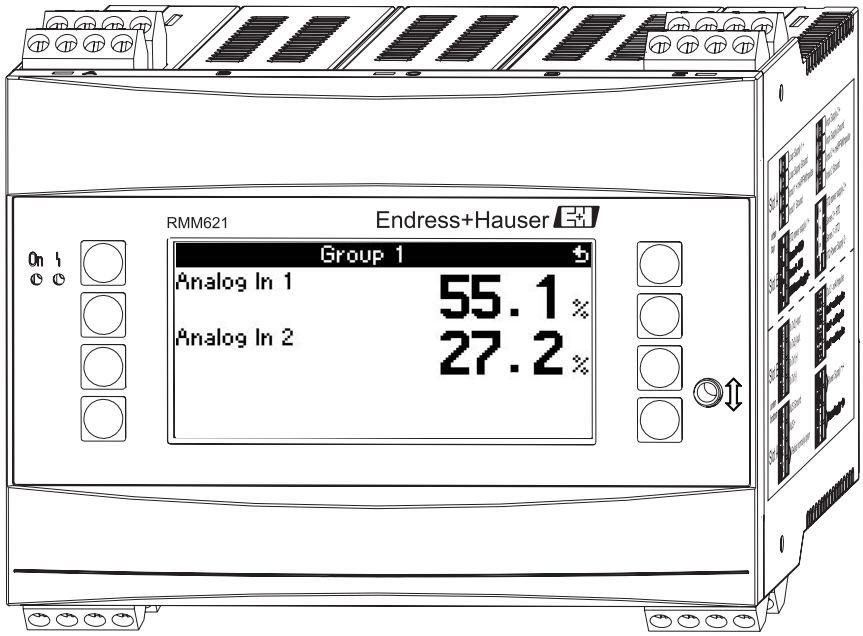
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

RMM621

Application Manager



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Endress+Hauser
People for Process Automation

Brief operating instructions

For quick and easy commissioning:

Safety instructions	→ 6
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Wiring	→ 11
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Display and operating elements	→ 23
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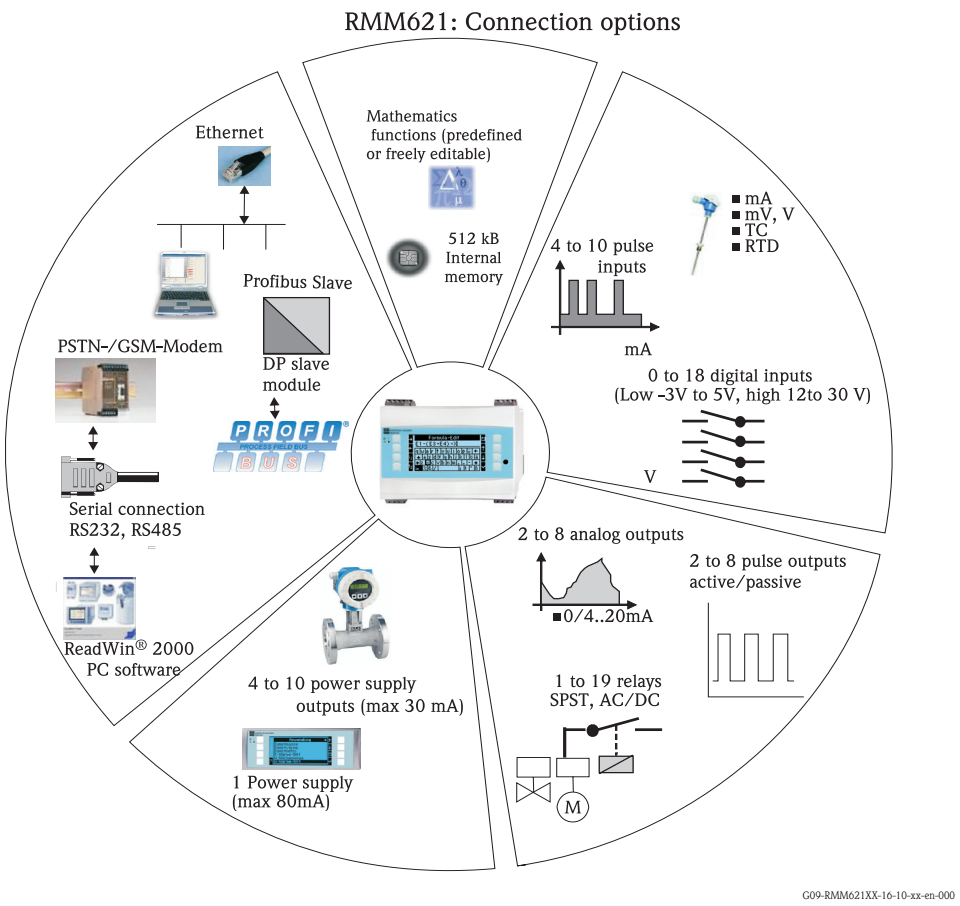
Commissioning	→ 30
Quick start via the navigator to device configuration for standard operation. Device configuration – explanation and use of all configurable device functions with the associated value ranges and settings. Application example – configuration of the device.	

Applications for the Application Manager



The device makes it possible to solve process measuring technology tasks with regard to the following:

- Data logging
- Telecontrol via various communication protocols and methods
- Control
- Presentation of scaled measured values (multichannel display)
- Calculations of mathematical and/or physical formulae, whose input values are delivered by connected sensors

The multichannel concept allows the simultaneous measurement and calculation of several applications.
A wide range of different types of sensors can be connected to the device, e.g. sensors for

- Flow
- Level
- Pressure
- Temperature
- Speeds
- Analytics.

Table of contents

1 Safety instructions

Safe operation of the Application Manager is only guaranteed if these Operating Instructions have been read and the safety instructions have been observed.

1.1 Designated use

The Application Manager is a device for calculating physical variables made available by connected sensors. Stored formulae and also formulae which can be defined freely can be used for calculation. These formulae which can be entered freely can be edited either directly at the device or also on a PC (using ReadWin). The input values and calculated values can be stored in the device and evaluated at a later time either at the device or by means of an external system. There are various ways of establishing the connection to this external system: RS232/485, connection via Ethernet, OPC or Mod-Bus.

- The device is seen as accessory equipment and may not be installed in hazardous areas.
- The manufacturer does not accept liability for damage caused by improper or non-designated use. The device may not be converted or modified in any way.
- The device is designed for use in industrial environments and may only be operated in an installed state.

1.2 Installation, commissioning and operation

This device has been safely built with state-of-the-art technology and meets the applicable requirements and EU Directives. The device can be a source of application-related danger if used improperly or other than intended. Installation, wiring, commissioning and maintenance of the device must only be carried out by trained technical personnel. Technical personnel must have read and understood these Operating Instructions and must adhere to them. The information in the electrical wiring diagrams (see Section 4 'Wiring') must be observed closely.

1.3 Operational safety

Technical improvement
The manufacturer reserves the right to adapt technical details to the most up-to-date technical developments without any special announcement. Contact your local sales center for information about the current state of and possible extensions to the Operating Instructions.

1.4 Return

For a return, e.g. in case of repair, the device must be sent in protective packaging. The original packaging offers the best protection. Repairs must only be carried out by your supplier's service organization.

Note!
When sending for repair, please enclose a note with a description of the error and the application.

1.5 Notes on safety conventions and icons

The safety instructions in these Operating Instructions are labeled with the following safety icons and symbols:

Warning!
This symbol draws attention to activities or procedures that can lead to injuries to persons, to a safety risk or to destruction of the device if not carried out properly.

Caution!
This symbol draws attention to activities or procedures that can lead to defective operation or to destruction of the device if not carried out properly.

Note!
This symbol draws attention to activities or procedures that have an indirect effect on operation, or can trigger an unforeseen device reaction if not carried out properly.

2 Identification

2.1 Device designation

2.1.1 Nameplate

The correct device?
Please compare the order code on the nameplate of the device to the code on the delivery note.

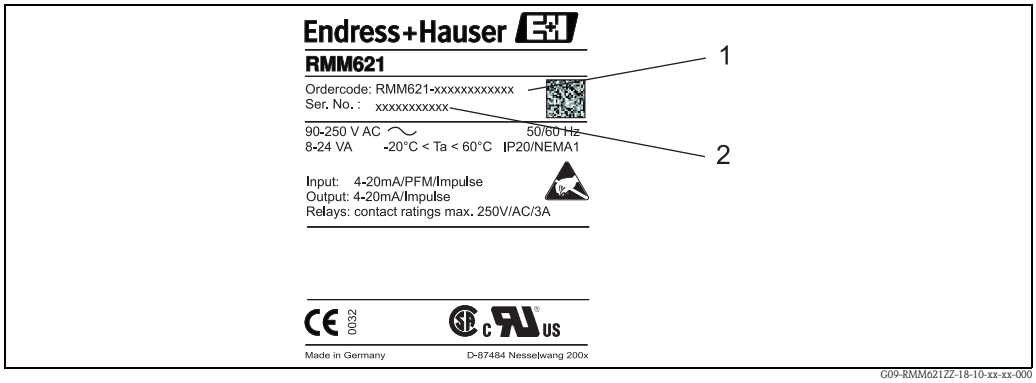


Fig. 1: RMM621 nameplate

1) Order code
2) Serial number

2.2 Scope of delivery

The scope of delivery of the device comprises:

- Application Manager for top-hat rail mounting
- Brief Operating Instructions in numerous languages in paper form
- Operating Instructions on CD-ROM
- Delivery note
- CD-ROM with PC configuration software and interface cable RS232 (optional)
- Remote display for panel mounting (optional)
- Extension cards (optional)

Note!
Please note the device accessories in Section 9 'Accessories'.

2.3 Certificates and approvals

CE mark, declaration of conformity

The device has been constructed and tested to state-of-the-art operational safety standards and left the factory in perfect condition as regards technical safety.
The device meets the relevant standards and directives as per IEC 61010 "Safety requirements for electrical equipment for measurement, control and laboratory use".
Thus, the device described in these Operating Instructions meets the legal requirements of the EU Directives. The manufacturer confirms successful testing of the device by affixing to it the CE mark.

3 Installation

3.1 Installation conditions

The permitted ambient temperature (see "Technical Data" Section) must be observed when installing and operating. The device must be protected against the effects of heat.

Caution!
When using extension cards, venting with an air current of at least 0.5 m/s is necessary.

3.1.1 Dimensions

Observe the device length of 135 mm (5.31 in) (corresponds to 8TE). More dimensions can be found in the "Technical Data" Section.

3.1.2 Mounting location

Top-hat rail mounting as per IEC 60715 in the cabinet. The mounting location must be free from vibrations.

3.1.3 Orientation

No restrictions.

3.2 Installation instructions

Snap the housing onto the top-hat rail by first hanging the device on the top-hat rail and then pressing it down gently until it engages (see Fig. 2, items 1 and 2).

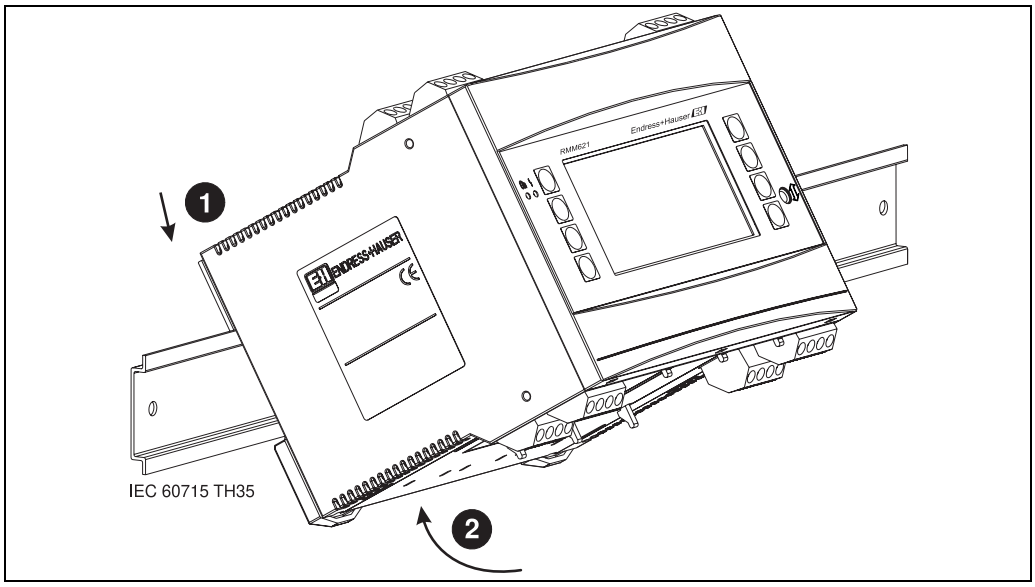


Fig. 2: Mounting device on top-hat rail

3.2.1 Installing extension cards

Caution!
When using extension cards, venting with an air current of at least 0.5 m/s is necessary.

You can equip the device with various extension cards. A maximum of three slots are available in the device for this. The slots for the extension cards are marked with B, C and D (→ Fig. 3) on the device.

1. Make sure that the device is not connected to the power supply when installing and removing an extension card.
2. Remove the blanking cover from the slot (B, C or D) of the basic unit by pressing together the catches on the bottom of the device (see Fig. 3, item 2), while at the same time pressing in the catch on the rear of the housing (e.g. with a screwdriver) (see Fig. 3, item 1). Now you can pull the blanking cover up out of the basic unit.
3. Insert the extension card into the basic unit from above. The extension card is not correctly installed until the catches on the bottom and rear of the device (see Fig. 3, items 1 and 2) lock into place. Ensure that the input terminals of the extension card are on top and the connection terminals are pointing to the front, as with the basic unit.
4. The device automatically recognizes the new extension card once the device has been correctly wired and has been commissioned (see 'Commissioning' Section).

Note!
If you remove an extension card and do not replace it with another card, you must seal the empty slot with a blanking cover.

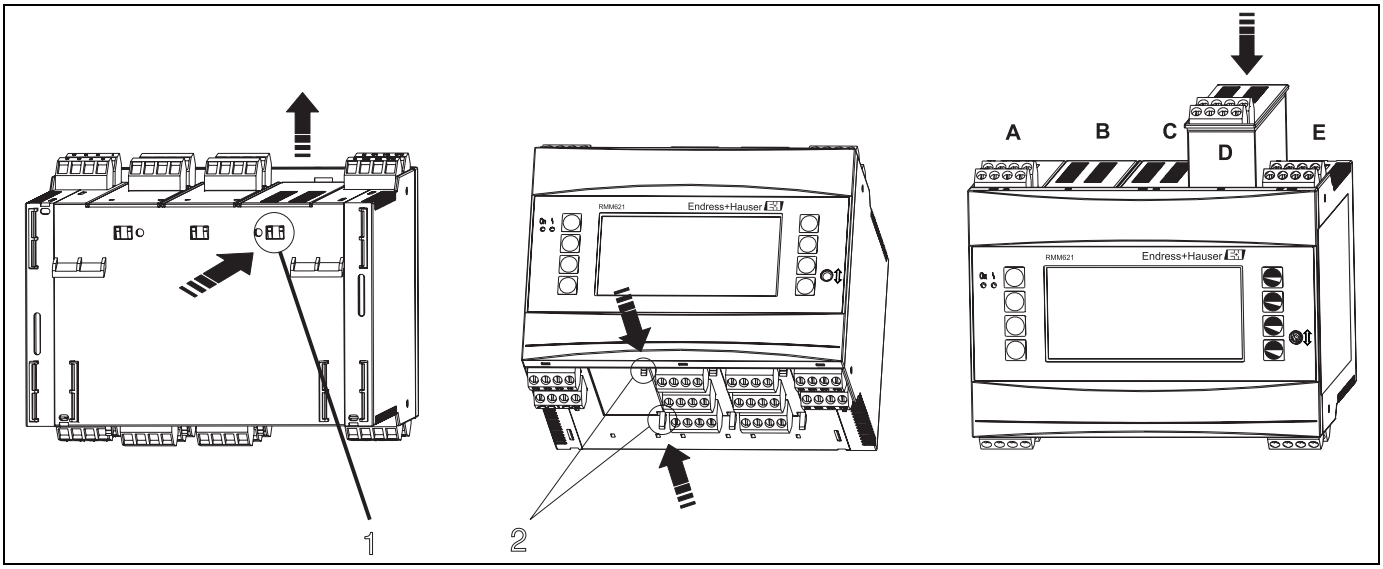


Fig. 3: Installing an extension card (example)

Item 1: catch on the rear of the device
Item 2: catches on the bottom of the device
Items A - E: identifier for slot assignment

3.3 Post-installation check

When using extension cards, ensure that the cards are sitting correctly in the device slots.

4 Wiring

4.1 Quick wiring guide

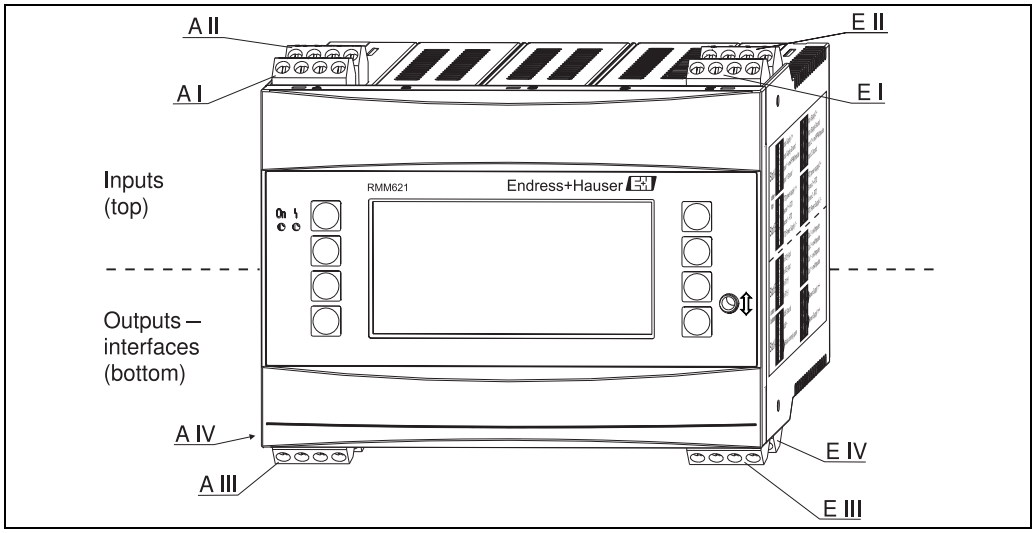


Fig. 4: Slot assignment (basic unit)

Terminal assignment

Terminal (item no.)	Terminal assignment	Slot	Input
10	+ 0/4 to 20 mA/PFM/pulse input 1	A top, front (**A I**)	Current/PFM/pulse input 1
11	Ground for 0/4 to 20 mA/PFM/pulse input		
81	Sensor power supply ground 1		
82	24 V sensor power supply 1		
110	+ 0/4 to 20 mA/PFM/pulse input 2	A top, rear (**A II**)	Current/PFM/pulse input 2
11	Ground for 0/4 to 20 mA/PFM/pulse input		
81	Sensor power supply ground 2		
83	24 V sensor power supply 2		
10	+ 0/4 to 20 mA/PFM/pulse input 1	E top, front (**E I**)	Current/PFM/pulse input 1
11	Ground for 0/4 to 20 mA/PFM/pulse input		
81	Sensor power supply ground 1		
82	24 V sensor power supply 1		
110	+ 0/4 to 20 mA/PFM/pulse input 2	E top, rear (**E II**)	Current/PFM/pulse input 2
11	Ground for 0/4 to 20 mA/PFM/pulse input		
81	Sensor power supply ground 2		
83	24 V sensor power supply 2		
Terminal (item no.)	**Terminal assignment**	**Slot**	**Output - interface**
101	- RxTx 1	E bottom, front (**E III**)	RS485
102	+ RxTx 1		
103	- RxTx 2		RS485 (optional)
104	+ RxTx 2		

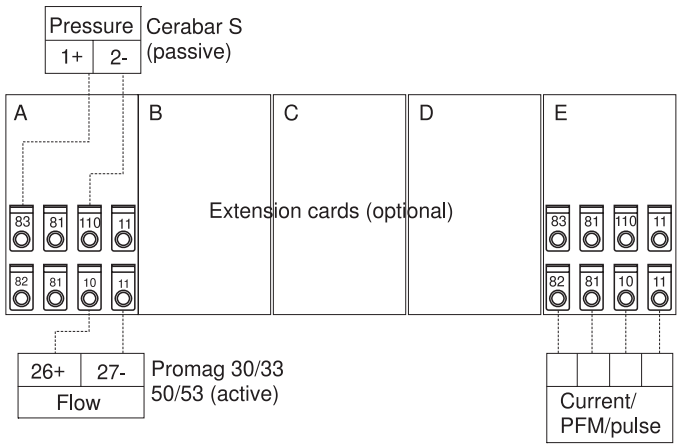
Terminal (item no.)	Terminal assignment	Slot	Input
131	+ 0/4 to 20 mA/pulse output 1	E bottom, rear (**E IV**)	Current/pulse output 1
132	- 0/4 to 20 mA/pulse output 1		
133	+ 0/4 to 20 mA/pulse output 2		Current/pulse output 2 Note! Ethernet, if the Ethernet option has been ordered.
134	- 0/4 to 20 mA/pulse output 2		
52	Relay Common (COM)	A bottom, front (**A III**)	Relay 1
53	Relay Normally Open (NO)		
91	Sensor power supply ground		Additional sensor power supply
92	+ 24 V sensor power supply		
L/L+	L for AC L+ for DC	A bottom, rear (**A IV**) Power supply	
N/L-	N for AC L- for DC		

Note!
The inputs in the same slot are not galvanically isolated. There is a separation voltage of 500 V between the aforementioned inputs and outputs in various slots. Terminals with the same second digit are jumpered internally (Terminals 11 and 81).

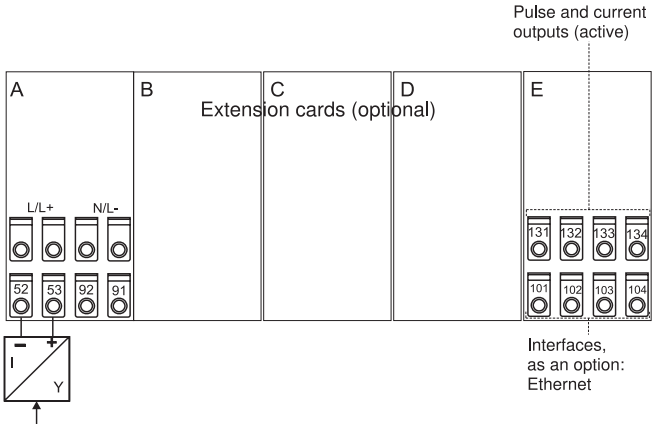
4.2 Connecting the measuring unit

Caution!
Do not install or wire the device when it is connected to the power supply. Not conforming with this can lead to the destruction of electronic components.

Connection overview, top (inputs)



Connection overview, bottom (outputs, interfaces)



4.2.1 Power supply connection

Caution!
- Before wiring the device, ensure that the supply voltage corresponds to the specification on the nameplate.
- For the 90 to 250 V AC version (power supply connection), a switch marked as a separator, as well as an overvoltage organ (rated current = 10 A), must be fitted in the supply line near the device (easy to reach).

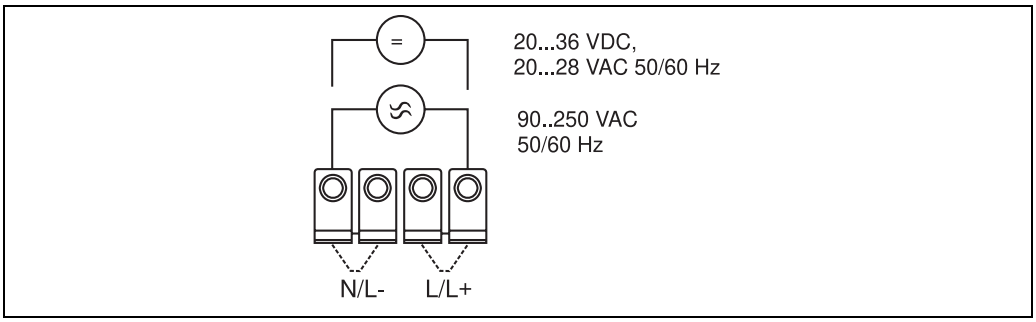


Fig. 5: Power supply connection

4.2.2 Connecting external sensors

Note!
Active and passive sensors with analog, PFM or pulse signal can be connected to the device.

Active sensors

Connection method for an active sensor (i.e. external power supply).

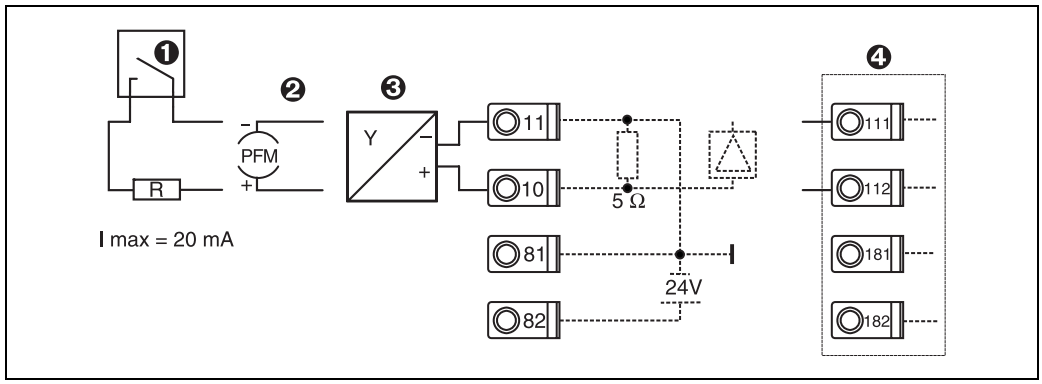


Fig. 6: Connecting an active sensor, e.g. to input 1 (Slot A I).

Item 1: pulse signal
Item 2: PFM signal
Item 3: 2-wire transmitter (4 to 20 mA)
Item 4: active sensor connection, e.g. optional Universal extension card in slot B (slot B I, → Fig. 12)

Passive sensors

Connection method for sensors which are supplied with power by means of the sensor power supply integrated in the device.

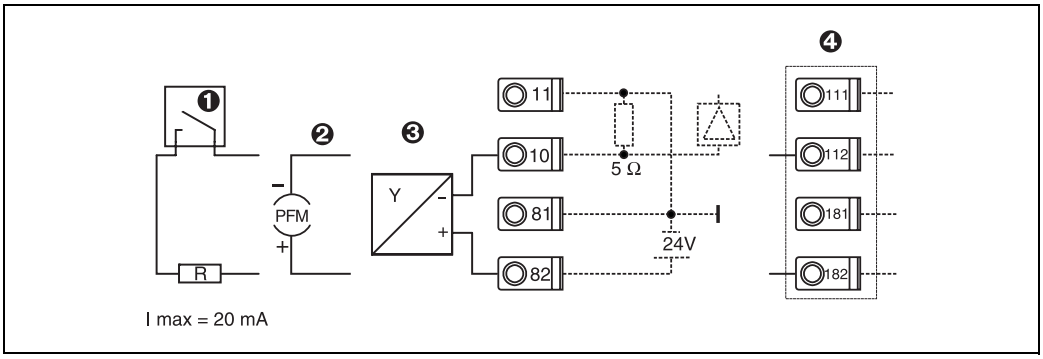


Fig. 7: Connecting a passive sensor, e.g. to input 1 (slot A I).

Item 1: pulse signal
Item 2: PFM signal
Item 3: 2-wire transmitter (4-20 mA)
Item 4: passive sensor connection, e.g. optional Universal extension card in slot B (slot B I, → Fig. 12)

Temperature sensors

Connection for Pt100, Pt500 and Pt1000

Note!
RTD temperature sensors can only be connected if an appropriate option card is installed. The basic version of the device does not have any temperature inputs.
Terminals 116 and 117 must be jumpered when connecting 3-wire sensors (see Fig. 8).

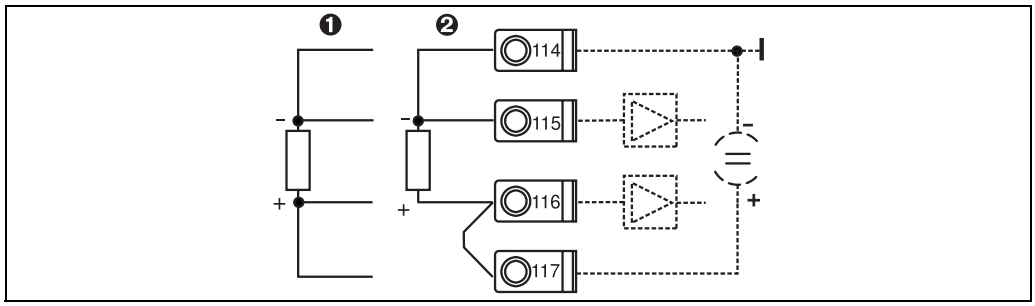


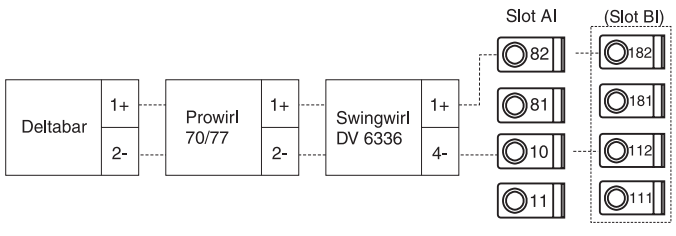
Fig. 8: Temperature sensor connection, optional temperature extension card e.g. in slot B (slot B I)

Item 1: 4-wire input
Item 2: 3-wire input

E+H-specific devices

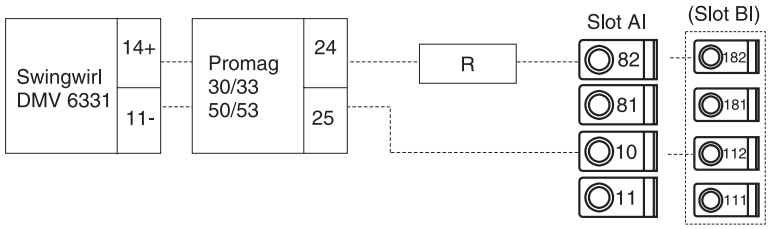
Flow sensors with PFM output

Note!
Set the Prowirl measuring device to PFM output (→ FU 20: ON, PF)

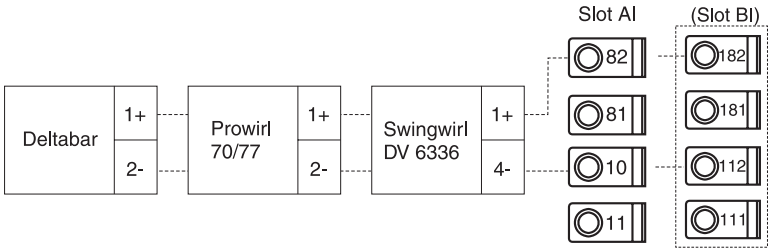


Flow sensor with open collector output

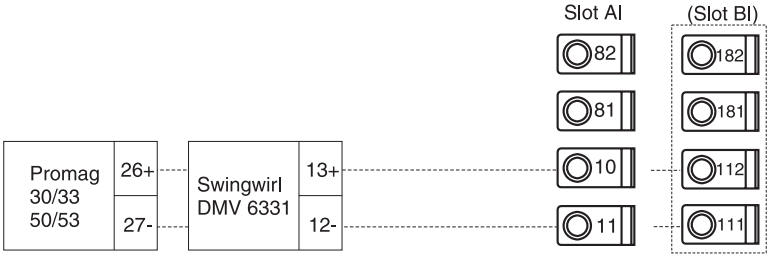
Note!
Select an appropriate dropping resistor R, so that I_{max} = 20 mA is not exceeded.



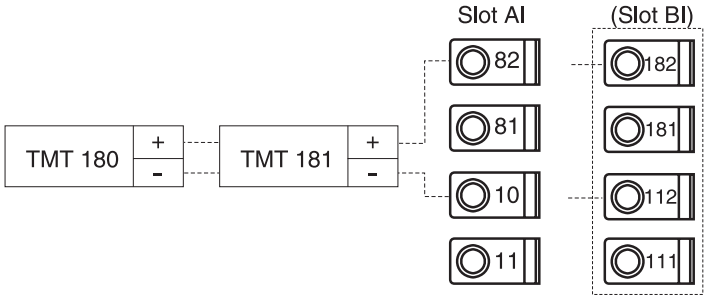
Flow sensor with passive current output (4 to 20 mA)



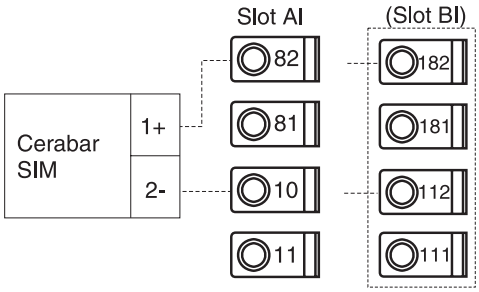
Flow sensor with active current output (0/4 to 20 mA)



Temperature sensor via temperature head-mounted transmitter (4 to 20 mA)



Pressure sensor with passive current output (4 to 20 mA)



4.2.3 Connection of outputs

The device has two galvanically isolated outputs (or Ethernet connection), which can be configured as an analog output or active pulse output. In addition, an output for connecting a relay and transmitter power supply are available. The number of outputs increases accordingly when the extension cards are installed (see 'Extension card connection').

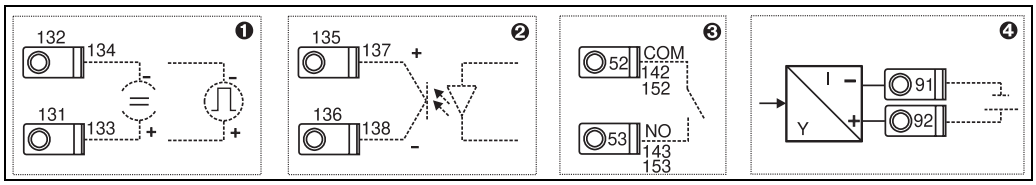


Fig. 9: Connection of outputs

Item 1: pulse and current outputs (active)
Item 2: passive pulse output (open collector)
Item 3: relay output (NO), e.g. slot A III (slot BIII, CIII, DIII on optional extension card)
Item 4: transmitter power supply (transmitter power supply unit) output

Interface connection

- **RS232 connection:** The RS232 is contacted by means of the interface cable and the jack socket on the front of the housing.
- **RS485 connection**
- **Optional: additional RS485 interface**
- **Plug-in terminals 103/104:** The interface is only active as long as the front RS232 interface is free.
- **PROFIBUS connection:** Optional connection of Application Manager to PROFIBUS DP via the serial RS485 interface with the external module HMS AnyBus Communicator for Profibus (see 'Accessories').
- **Optional: Ethernet connection**

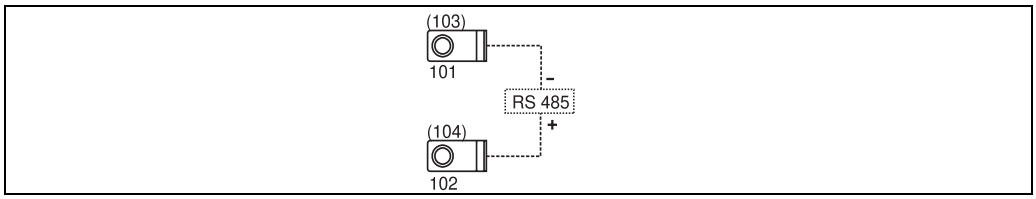


Fig. 10: Interface connection

4.2.4 Ethernet option

Ethernet connection

An IEEE 802.3-compatible connection is available on a shielded RJ45 plug connector on the device underside as the network connection. This can be used to connect the device to devices in the office environment with a hub or switch. The office equipment standard EN 60950 must be taken into consideration for safe distances between equipment. The assignment corresponds to an MDI-interface (AT&T258) conforming to standards so that a shielded 1:1 cable with a maximum length of 100 meters (328 ft) can be used here. The Ethernet interface is designed as a 10 and 100-BASE-T. Direct connection to a PC is possible with a crossover cable. Half-duplex and full-duplex data transmission is supported.

Note!
If the RMM621 has an Ethernet interface, no analog outputs are available on the base unit (Slot E)!

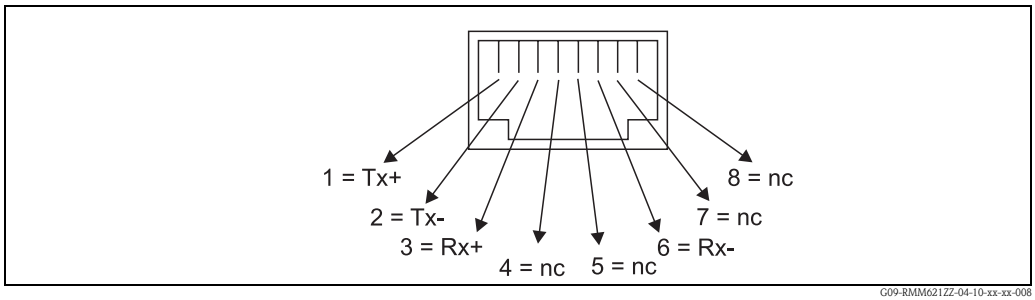


Fig. 11: RJ45 socket (assignment AT&T256)

Meaning of the LEDs

Two light-emitting diodes are located under the Ethernet connection (on the device underside) which indicate the status of the Ethernet interface.

- **Yellow LED**: link signal; is lit when the device is connected to a network. If this LED is not lit, communication is not possible.
- **Green LED**: Tx/Rx; flashes irregularly when the device is sending or receiving data. Otherwise it is lit constantly.

4.2.5 Extension card connection

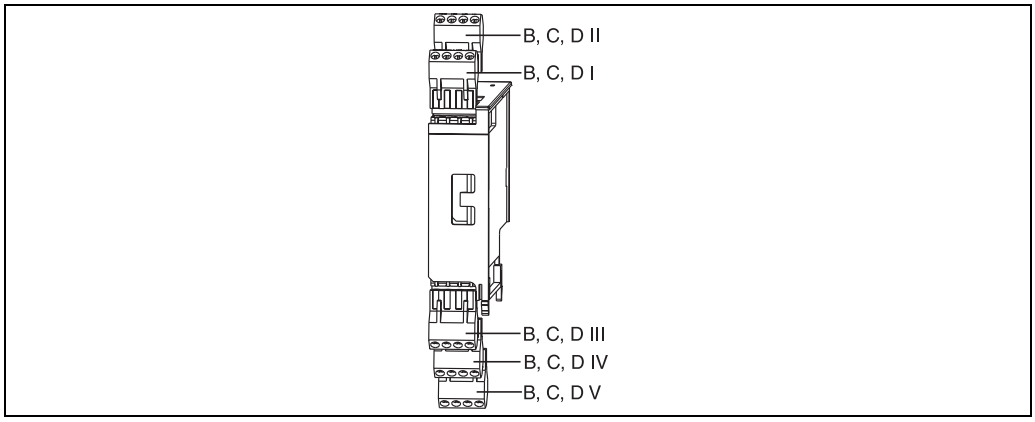


Fig. 12: Extension card with terminals

Terminal assignment of Universal extension card (RMM621A-UA); with intrinsically safe inputs (RMM621A-UB)

Terminal (item no.)	Terminal assignment	Slot	Input and output
182	24 V sensor power supply 1	B, C, D top, front (**B I, C I, D I**)	Current/PFM/pulse input 1
181	Sensor power supply ground 1		
112	+ 0/4 to 20 mA/PFM/pulse input 1		
111	Ground for 0/4 to 20 mA/PFM/pulse input		
183	24 V sensor power supply 2	B, C, D top, rear (**B II, C II, D II**)	Current/PFM/pulse input 2
181	Sensor power supply ground 2		
113	+ 0/4 to 20 mA/PFM/pulse input 2		
111	Ground for 0/4 to 20 mA/PFM/pulse input		
142	Relay 1 Common (COM)	B, C, D bottom, front (**B III, C III, D III**)	Relay 1
143	Relay 1 Normally Open (NO)		
152	Relay 2 Common (COM)		Relay 2
153	Relay 2 Normally Open (NO)		
131	+ 0/4 to 20 mA/pulse output 1	B, C, D bottom, center (**B IV, C IV, D IV**)	Current/pulse output 1 active
132	- 0/4 to 20 mA/pulse output 1		
133	+ 0/4 to 20 mA/pulse output 2		Current/pulse output 2 active
134	- 0/4 to 20 mA/pulse output 2		
135	+ pulse output 3 (open collector)	B, C, D bottom, rear (**B V, C V, D V**)	Passive pulse output
136	- pulse output 3		
137	+ pulse output 4 (open collector)		Passive pulse output
138	- pulse output 4		

Terminal assignment of temperature extension card (RMM621A-TA); with intrinsically safe inputs (RMM621A-TB)

Terminal (item no.)	Terminal assignment	Slot	Input and output
117	+ RTD power supply 1	B, C, D top, front (**B I, C I, D I**)	RTD input 1
116	+ RTD sensor 1		
115	- RTD sensor 1		
114	- RTD power supply 1		
121	+ RTD power supply 2	B, C, D top, rear (**B II, C II, D II**)	RTD input 2
120	+ RTD sensor 2		
119	- RTD sensor 2		
118	- RTD power supply 2		
142	Relay 1 Common (COM)	B, C, D bottom, front (**B III, C III, D III**)	Relay 1
143	Relay 1 Normally Open (NO)		
152	Relay 2 Common (COM)		Relay 2
153	Relay 2 Normally Open (NO)		
131	+ 0/4 to 20 mA/pulse output 1	B, C, D bottom, center (**B IV, C IV, D IV**)	Current/pulse output 1 active
132	- 0/4 to 20 mA/pulse output 1		
133	+ 0/4 to 20 mA/pulse output 2		Current/pulse output 2 active
134	- 0/4 to 20 mA/pulse output 2		

Terminal (item no.)	Terminal assignment	Slot	Input and output
135	+ pulse output 3 (open collector)	B, C, D bottom, rear (**B V, C V, D V**)	Passive pulse output
136	- pulse output 3		
137	+ pulse output 4 (open collector)		Passive pulse output
138	- pulse output 4		

Terminal assignment of U-I-TC extension card (RMM621A-CA); with intrinsically safe inputs (RMM621A-CB)

Terminal (item no.)	Terminal assignment	Slot	Input and output
127	-10 to +10 V Input 1	B, C, D top, front (**B I, C I, D I**)	U-I-TC Input 1
125	-1 to +1 V, TC Input 1		
123	0 to 20 mA Input 1		
122	Signal ground Input 1		
227	-10 to +10 V Input 2	B, C, D top, rear (**B II, C II, D II**)	U-I-TC Input 2
225	-1 to +1 V, TC Input 2		
223	0 to 20 mA Input 2		
222	Signal ground Input 2		
142	Relay 1 Common (COM)	B, C, D bottom, front (**B III, C III, D III**)	Relay 1
143	Relay 1 Normally Open (NO)		
152	Relay 2 Common (COM)		Relay 2
153	Relay 2 Normally Open (NO)		
131	+ 0/4 to 20 mA/pulse output 1	B, C, D bottom, center (**B IV, C IV, D IV**)	Current/pulse output 1 active
132	- 0/4 to 20 mA/pulse output 1		
133	+ 0/4 to 20 mA/pulse output 2		Current/pulse output 2 active
134	- 0/4 to 20 mA/pulse output 2		
135	+ pulse output 3 (open collector)	B, C, D bottom, rear (**B V, C V, D V**)	Passive pulse output
136	- pulse output 3		
137	+ pulse output 4 (open collector)		Passive pulse output
138	- pulse output 4		

Terminal assignment of Digital extension card (RMM621A-DA); with intrinsically safe inputs (RMM621A-DB)

Terminal (item no.)	Terminal assignment	Slot	Input and output
81	E1	B, C, D top, front (**B I, C I, D I**)	Digital inputs E1 to 3
83	E2		
85	E3		
82	Signal ground E1 to 3		
91	E4	B, C, D top, rear (**B II, C II, D II**)	Digital inputs E4 to 6
93	E5		
95	E6		
92	Signal ground E4 to 6		
142	Relay 1 Common (COM)	B, C, D bottom, front (**B III, C III, D III**)	Relay 1
143	Relay 1 Normally Open (NO)		
152	Relay 2 Common (COM)		Relay 2
153	Relay 2 Normally Open (NO)		
145	Relay 3 Common (COM)	B, C, D bottom, center (**B IV, C IV, D IV**)	Relay 3
146	Relay 3 Normally Open (NO)		
155	Relay 4 Common (COM)		Relay 4
156	Relay 4 Normally Open (NO)		
242	Relay 5 Common (COM)	B, C, D bottom, rear (**B V, C V, D V**)	Relay 5
243	Relay 5 Normally Open (NO)		
252	Relay 6 Common (COM)		Relay 6
253	Relay 6 Normally Open (NO)		

Note!
The current/PFM/pulse inputs or the RTD inputs in the same slot are not galvanically isolated. There is a separation voltage of 500 V between the aforementioned inputs and outputs in various slots. Terminals with the same second digit are jumpered internally. (Terminals 111 and 181)

4.2.6 Connecting remote display/operating unit

Functional description

The remote display is an innovative addition to the powerful RMx621 top-hat rail devices. The user has the opportunity to optimally install the arithmetic unit to suit the installation and mount the display and operating unit in a user-friendly way at easily accessible locations. The display can be connected to both a top-hat rail device without, as well as a top-hat rail device with, an installed display/operating unit. A 4-pin cable is supplied to connect the remote display with the basic unit; other components are not necessary.

Note!
Only one display/operating element can be attached to a top-hat rail device and vice versa (point-to-point).

Installation/dimensions

Mounting instructions:
- The mounting location must be free from vibrations.
- The permitted ambient temperature during operation is -20 to +60°C.
- Protect the device against the effects of heat.

Procedure for panel mounting:
1. Provide a panel cutout of 138+1.0 x 68+0.7 mm (as per DIN 43700), the installation depth is 45 mm.
2. Push the device with the sealing ring through the panel cutout from the front.
3. Hold the device horizontal and, applying uniform pressure, push the securing frame over the rear of the housing against the panel until the retaining clips engage. Make sure the securing frame is seated symmetrically.

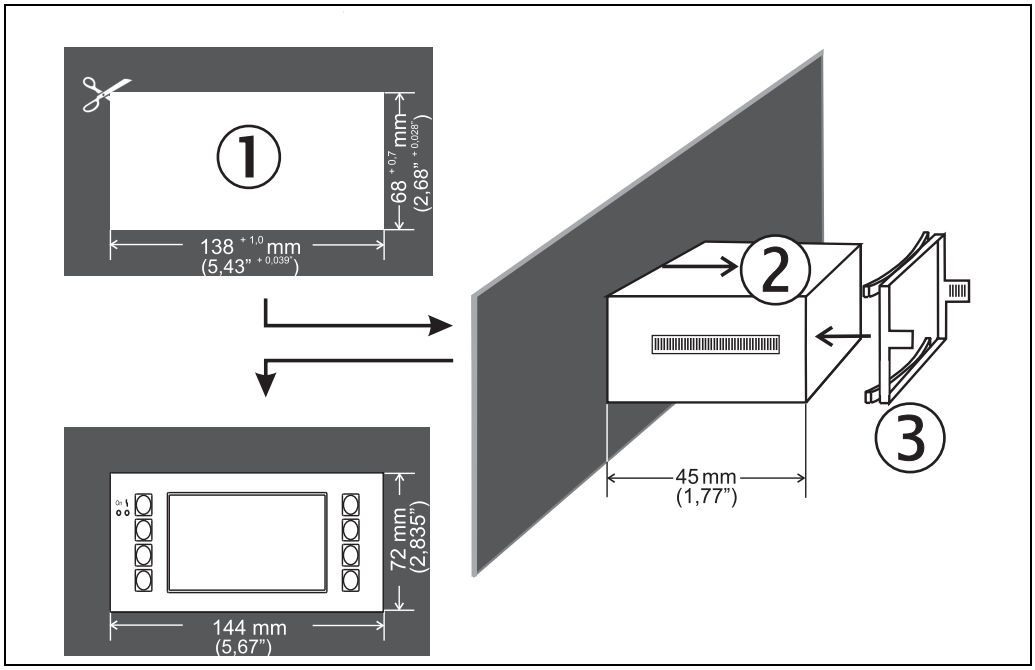


Fig. 13: Panel mounting

Wiring

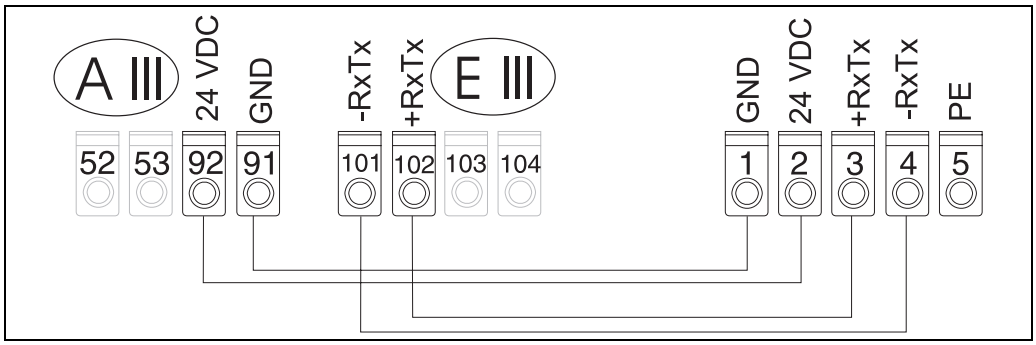


Fig. 14: Terminal plan of remote display/operating unit

The remote display/operating unit is connected directly to the basic unit with the cable supplied.

4.3 Post-connection check

After completing the device's electrical installation, carry out the following checks:

Device status and specifications	**Notes**
Is the device or cable damaged (visual inspection)?	–
Electrical connection	**Notes**
Does the supply voltage match the information on the nameplate?	90 to 250 V AC (50/60 Hz) 20 to 36 V DC 20 to 28 V AC (50/60 Hz)
Are all of the terminals firmly engaged in their correct slots? Is the coding on the individual terminals correct?	–
Are the mounted cables relieved of tension?	–
Are the power supply and signal cables connected correctly?	See wiring diagram in the Operating Instructions. ✎ Note! The wiring diagram for the standard design is also provided on the device itself.
Are all of the screw terminals well-tightened?	–

5 Operation

5.1 Display and operating elements

Note!
Depending on the application and version, the Application Manager offers a wide range of configuration options and software functions. Help text is available for nearly every operating item to assist when programming the device. This help text can be called up by pressing the "?" button. (The help text can be called up in every menu).
Please note that the configuration options described below refer to a basic unit (without extension cards).

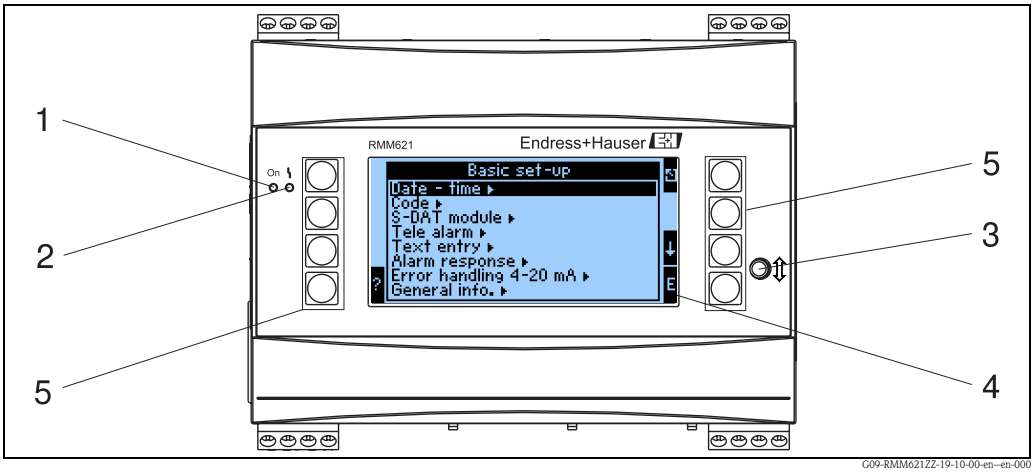


Fig. 15: Display and operating elements

Item 1:operating display: LED green, lights up when supply voltage applied.
Item 2:fault indicator: LED red, operating status as per NAMUR NE 44
Item 3:serial interface connection: jack socket for PC connection for device configuration and measured value read-out with the PC software
Item 4: display 160x80 dot-matrix display with dialog text for configuring as well as measured value, limit value and fault message display. Should a fault occur, the background lighting changes from blue to red. The size of the characters displayed depends on the number of measured values to be displayed (see Section 6.3.3 'Display configuration').
Item 5:input keys; eight soft keys which have different functions, depending on the menu item. The current function of the keys is indicated on the display. Only the keys which are required in the operating menu in question are assigned with functions or can be used.

5.1.1 Display

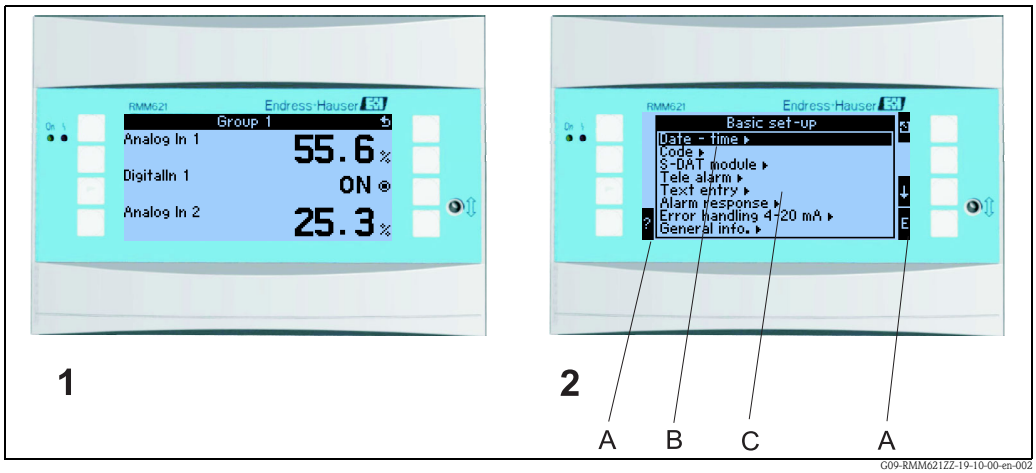


Fig. 16: Display of the Application Manager

Item: 1:measured value display
Item 2:Display of configuration menu item
- *A: Row of key icons*
- *B: Current configuration menu*
- *C: Configuration menu activated for selection (highlighted in black).*

5.1.2 Key icons

Key icon	Function
E	Change to submenus and select operating items. Edit and confirm configured values.
⎋	Exit the current editing mask or the menu item currently active without saving any changes.
↑	Move the cursor up a line or a character.
↓	Move the cursor down a line or a character.
→	Move the cursor a character to the right.
←	Move the cursor a character to the left.
?	If Help text is available on an operating item, this is indicated with the question mark. The Help is called up by actuating this function key.
R	Resets the counter
i	Displays additional information
ij/IJ	Key field for upper case/lower case (only with Palm), see Fig. 16
1/2	Key field for numerical entries (only with Palm), see Fig. 16
F_x	This key can be used to display the various available functions in the formula editor.

5.2 Local operation

5.2.1 Entering text

There are two ways of entering text in the operating items (see: **Setup → Basic setup→ Text input**):

a) Standard: individual characters (letters, numbers, etc.) in the text field are defined by scrolling through the entire row of characters with the up/down cursor until the desired character is displayed.
b) Palm: a visual key field appears for entering text. The characters on this keyboard are selected with the cursors. (see "Setup → Basic setup")

Using the Palm keyboard

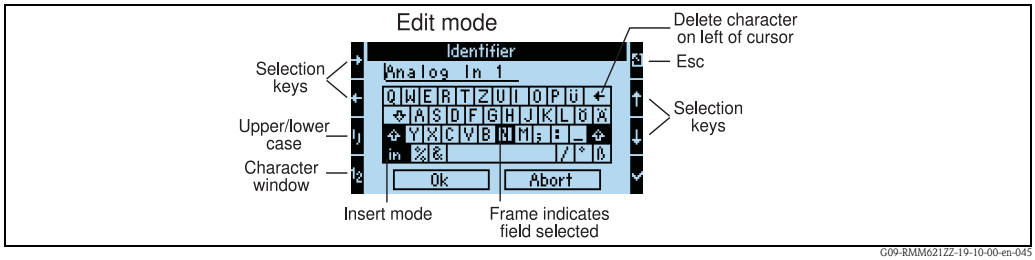


Fig. 17: Example: editing an identifier with the Palm keyboard

1. Using the cursor keys, move the cursor to the position where you wish to enter a character. If a character should be deleted, place the cursor to the right of the character to be deleted, select the "Delete character to the left of cursor" key and confirm with the tick sign.
2. Use the ij/IJ and ½ key to select upper/lower case or numerals.
3. Use the cursors to select the key required and use the tick sign to confirm. If you want to delete text, select the key in the top right.
4. Edit other characters in this way until the desired text has been entered.
5. Select "OK" and confirm with the tick sign to accept the entry. Select "Cancel" and confirm with the tick sign to discard the entries.

Notes
- Special key functions:
  "in" key: change to overwrite mode
  "←∀ key (top right): delete character to the left of the cursor

5.2.2 Lock configuration

The entire configuration can be protected against unintentional access by means of a four-digit code. This code is assigned in the submenu: **Basic setup → Code**. All the parameters remain visible. If the value of a parameter should be changed, you are first asked for the user code.

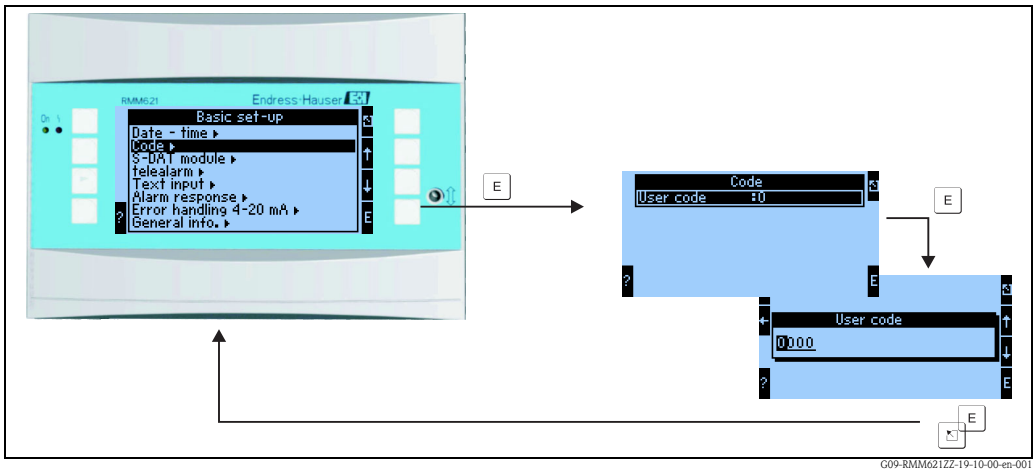


Fig. 18: Configuring the user code

5.2.3 Operating example

A detailed description of onsite operation with an application as an example can be found in Section 6.4 'User-specific applications'.

5.3 Error message display

Quick overview of the error concept

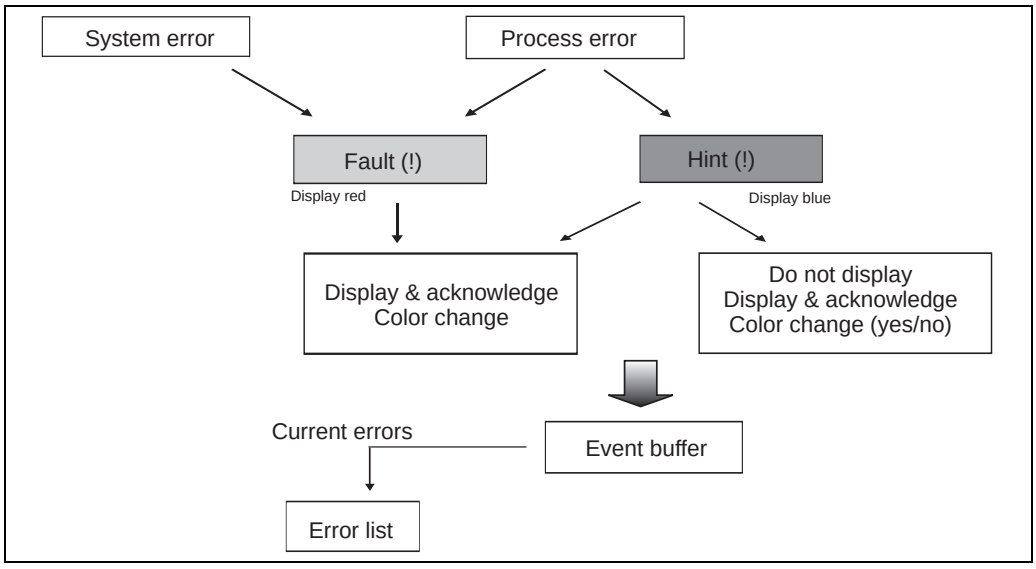


Fig. 19: Procedure when a system or process error occurs

The device differentiates between two types of errors:

- **System error:** this group comprises all the device errors, e.g. communication errors, hardware errors, etc. System errors are always signaled by fault messages.
- **Process error:** this group comprises all application error, e.g. "range overshoot", including limit value alarms, etc.

For process errors, you can configure how the device reacts in the event of an error, i.e. whether a fault message or a notice message is displayed. On leaving the factory, all process errors are preset as notice messages with a color change.

Fault messages

A fault is signaled by the display changing color from blue to red and by an **exclamation mark (!)** along the top edge of the display. The error is displayed as plain text. The fault is acknowledged by actuating any key. Via the Navigator menu, you can get to the diagnosis and the Setup to rectify the error if necessary. When a fault message occurs, it is possible to stop the affected counters or to allow them to continue running. This can be set by the user. The input signals behave as per their configured failsafe mode (see Section 6.3.3 'Main menu - Setup'). Only once all faults have been rectified does the device resume normal operation and the color changes from red to blue.

Notice messages

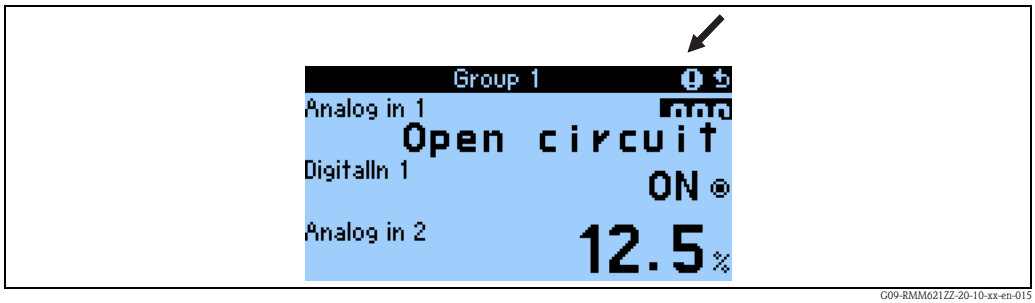


Fig. 20: Display of notice messages

A notice is signaled by an **exclamation mark (!)** in the display. It can also be signaled (as an option) by a color change and by displaying an alarm on the display. The exclamation mark is along the top edge of the display. In addition, some errors are signaled by an icon beside the corresponding measured values. Notices do not have any affect on the operation and counters but rather merely indicate that a certain event has arisen (e.g. range has been overshot).
Faults also result in an **exclamation mark (!)** in the display: If the error message window has been acknowledged by the user with OK, the **exclamation mark (!)** still remains in the header until the reason for the fault is rectified.

Icons appear along the top edge of the display next to the display parameter affected by the error which has occurred.	
	Signal overshooting (e.g. x > 20.5 mA) or undershooting (e.g. x < 3.8 mA)
	Error: fault or notice pending; → error list

Configuring the error type for process errors

Process errors are defined as notice messages in the factory setting. You can change the alarm response of process errors, i.e. process errors are indicated by a fault message.

1. Configure as **Setup ➔ Basic setup ➔ Alarm response ➔ Random**
2. Individual alarm responses for the inputs can then be defined in the device menu for inputs, applications and outputs.

The following process errors can be configured:
- Inputs:
  Open circuit, sensor signal range violation
- Outputs:
  Range violation

Event buffer

Navigator ➔ Diagnosis ➔ Event buffer
In the event buffer, the last 100 events, i.e. fault messages, notices, limit values, power failure etc. are recorded in chronological order with the time of occurrence and counter reading.

Error list

Navigator ➔ Diagnosis ➔ Error list
The error list provides assistance in quickly localizing current device errors. Up to ten alarms are listed in the error list in chronological order. In contrast to the event buffer, only the errors currently pending are displayed, i.e. rectified errors are cleared from the list.

5.4 Communication

In all devices and device versions, the parameters can be configured, altered and read out via the standard interface with the aid of PC operating software and an interface cable (see 'Accessories' Section). This is recommended in particular if extensive settings are to be made (e.g. when commissioning). There is the additional option of reading out all the process and display values via the RS485 interface with an external PROFIBUS module (HMS AnyBus Communicator for PROFIBUS-DP) (see 'Accessories' Section). In addition, you can also communicate with the device via modem (landline and mobile network). The device can be configured in combination with the PC operating software. If an alarm occurs, this can be sent to a cellular phone via text message, for example, or a counter reading can be communicated.

Note!
Detailed information for configuring the device using the PC operating software can be found in the accompanying Operating Instructions which are also located on the data carrier.

5.4.1 Communication via Ethernet (TCP/IP)

Every device that is equipped with an internal Ethernet interface can be integrated into a PC network (TCP/IP Ethernet).
The device(s) can be accessed from any PC in the network using the PC software supplied.
The system parameters "IP address", "Subnetmask" and "Gateway" are entered directly at the device or via ReadWin® 2000 and serial communication. Changes to the system parameters are not activated until the SETUP menu has been exited and the settings have been adopted. Only then does the device work with the new settings.

Note!
Multiple clients (PC) cannot communicate with a server (device) at one time. If a second client (PC) tries to establish a connection, an error message is output.

Ethernet commissioning

The system parameters have to be configured in the device "Setup - Communication - Ethernet" before a connection can be established via the PC network.

Note!
Your network administrator can provide you with the system parameters.

The following system parameters have to be configured:

1. IP address
2. Subnet mask
3. Gateway

Note!
This menu only appears if the device is fitted with an internal Ethernet interface.

5.4.2 Communication in the network using the PC software supplied

Once the device has been configured and connected to the PC network, a connection can be established to a PC in the network.

The following steps are needed for this:

1. Install the PC software supplied on the PC via which communication should take place.
2. A new device now has to be created in the database. After entering the device description, select how the device settings should be transmitted. Select Ethernet (TCP/IP) in this case.
3. Now enter the IP address. The port address is 8000.

   Note!
   The device address set at the device and the release code must also be configured correctly here.
4. Click "Next" to confirm your entry and start transmission with OK.
   The connection is now established and the device is saved in the device database.

6 Commissioning

6.1 Function check

Make sure that all post-connection checks have been carried out before you commission your device:
- See Section 3.3 'Post-installation check'
- Checklist Section 4.3 'Post-connection check'

6.2 Switching on the measuring device

6.2.1 Basic unit

Once the operating voltage is applied, the green LED (= device operating) lights up if no fault is present.
- When the device is first commissioned, the prompt "Please set up device" appears on the display. Program the device as per description → Section 6.3.
- When commissioning a device already configured or preset, measuring is immediately started as per the settings. The values of the display group currently set appear on the display. By pressing any key, you get to the navigator (quick start) and from there back to the Setup (see Section 6.3).

6.2.2 Extension cards

When the operating voltage is applied, the device automatically recognizes the installed and wired extension cards. You can now follow the prompt to configure the new connections or perform the configuration at a later date.

6.2.3 Remote operating unit

Once the supply voltage has been applied and after a short initialization period, the remote display/ operating unit automatically starts communication to the connected basic unit. By means of an auto-detect function, the display detects the baud rate and device address set at the basic unit.

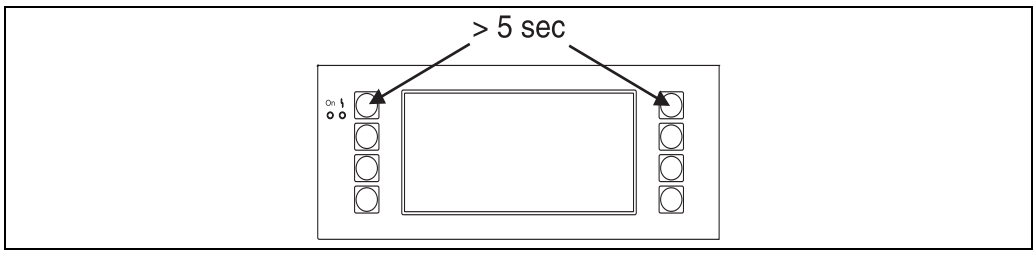


Fig. 21: Start Setup menu

You can get to the Setup menu of the display/operating unit by pressing the left and right top key at the same time for 5 seconds. Here, the baudrate as well as the contrast and display viewing angle can be configured. Press ESC to exit the Setup menu of the display/operating unit and to get to the display window and the Main menu to configure the device.

Note!
The Setup menu for configuring the basic settings of the display/operating unit is only available in English.

Error messages

After switching on or configuring the device, the message **"Communication problem"** appears briefly on the remote display/operating unit until a stable connection has been established.

If this error message is displayed during ongoing operation, please check the wiring.

6.3 Device configuration

This section describes all the configurable device parameters with the associated value ranges and factory settings (default values).
Please note that the parameters available for selection, e.g. the number of terminals, depend on the device version (see 'Extension cards' section).

Function matrix

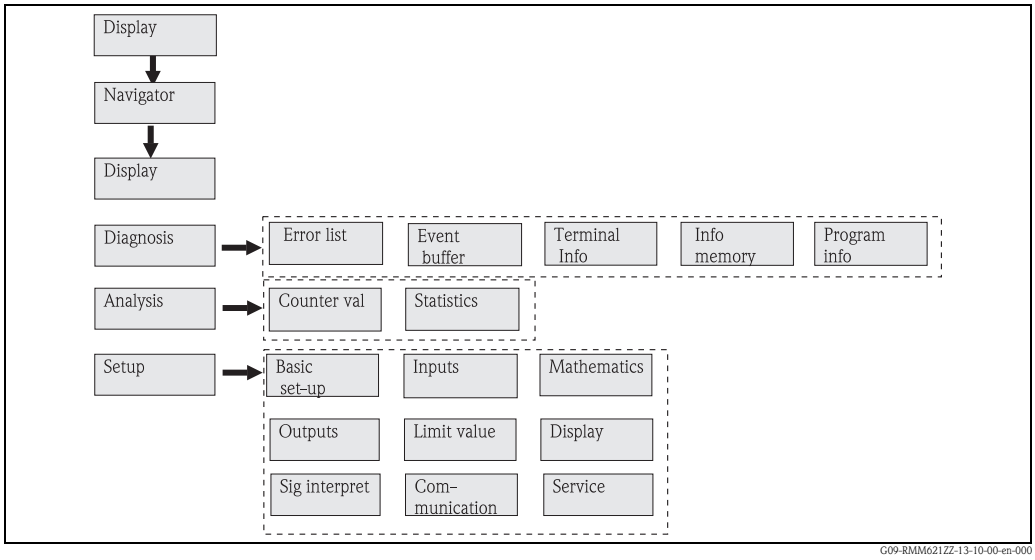


Fig. 22: Function matrix (extract) for onsite Application Manager configuration.

6.3.1 Navigator (quick start)

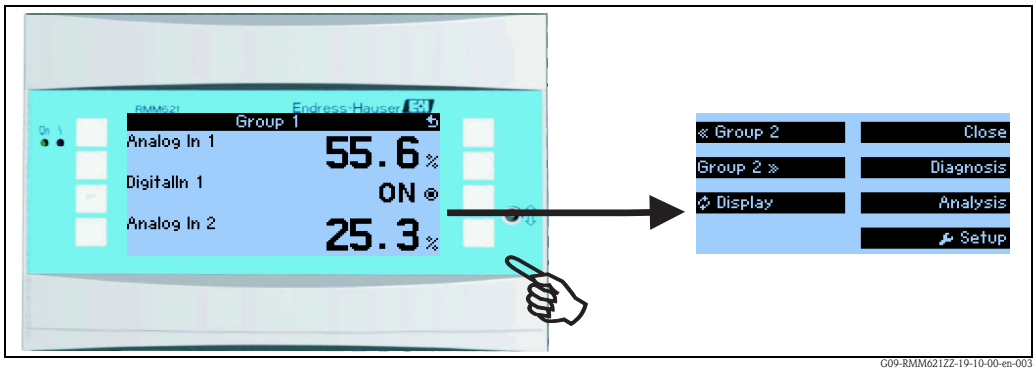


Fig. 23: Quick start to configuration via the Navigator menu of the Application Manager.

In the operating mode of the Application Manager (measured value displayed), the operating window "**Navigator**" opens up by pressing any key: the Navigator menu offers quick access to important information and parameters. Pressing one of the keys available takes you directly to the following items:

Function (menu item)	Description
Display	For selecting individual groups with display values.
Close	Exit the Navigator menu.
Diagnosis	Quickly locate current device errors; error list, event buffer, terminal info, memory info, prog. info. (→ Page 33)
Evaluations	Counter readings and statistics. (→ Page 33)
Setup	Main menu for configuring the device. (→ Page 35)

The contents of the group with display values can only be defined in the **Setup ➔ Display** menu. A group comprises a maximum of eight process variables which are displayed in a window in the display.
The settings for the display functionalities, e.g. contrast, scrolling display, special groups with display values, etc. are also made in the **Setup ➔ Display** menu.

Note!
When commissioning, the prompt "**Please set up device**" is displayed. Confirming this message takes you to the Navigator menu. Select '**Setup**' here to get to the main menu.
A device already configured is in the display mode as standard. The device changes to the Navigator menu as soon as one of the eight operating keys is pressed. From here, you get to the Main menu via '**Setup**'.

Note!
If you continue navigating through the Main menu, the message "**If you change the application, the respective counters will be reset**" is displayed. Confirming this message takes you to the Main menu.

6.3.2 Navigator - Diagnosis

The Diagnosis menu is used to analyze the device functionality, such as locating device malfunctions.

Function (menu item)	Description
Error list	List of the current pending errors. Entries are deleted when the errors are rectified.
Event buffer	List of all events saved
Terminal-Info	Overview of the assignment of all the terminals
Memory information	Indicates how long the memory in the device will last in total. If the memory is not read out during this time, data are overwritten and thus lost.
Program-Info	Overview of the device data: program name and version, serial number, order code, Com. date and Com. time

6.3.3 Navigator - Analysis

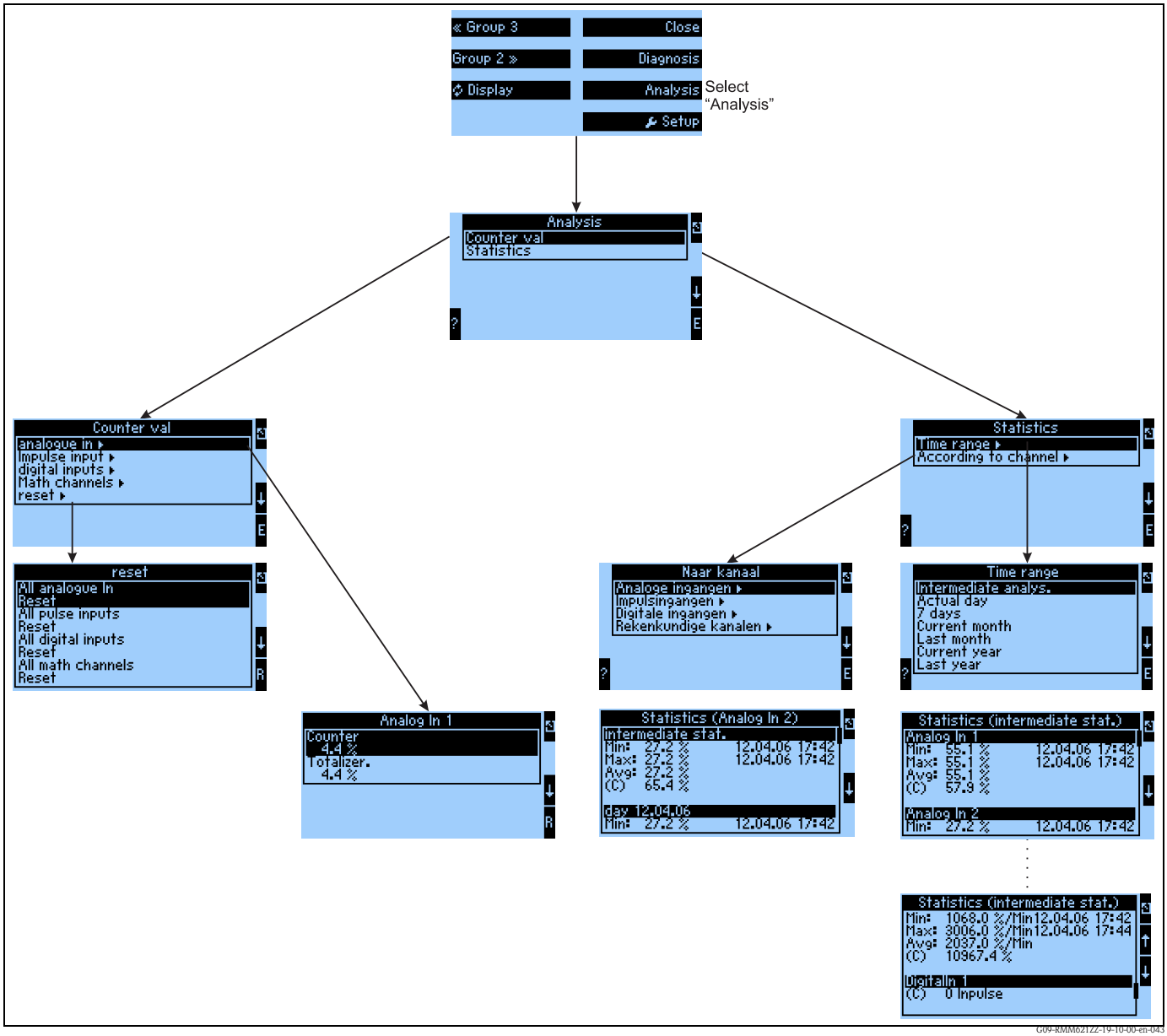


Fig. 24: Configuration of the RMM621 statistics

The evaluation can be called up from the Navigator.
This is divided into the display of the counter readings and into the statistics functions.

Counter readings

The input counters, which have been configured in the individual inputs to Integration, are output here.
This output is useful when, for example, the counter readings of all analog inputs are to be checked, or when a certain type of counter is to be reset, while other counters are to remain unaffected.

Statistics

In this menu, evaluation is performed based on an individual input or channel, or on a period of time (all inputs and all channels during the defined period of time).
Here, the intermediate evaluation is the period of time that has been configured in the "**Sig intr-pret→Interm. stat**" menu item, e.g. if evaluation is to be performed hourly, based on one hour.
This type of evaluation is useful when evaluation is to be performed based on time.
The evaluation according to channel is used of an individual channel is to be evaluated in detail, e.g. when monitoring a flowrate.

6.3.4 Navigator - Setup

The Setup menu is used for configuring the device.
Menu items displayed in bold indicate functions that have submenus.
Parameters displayed in bold indicate default values.

Setup ➔ Basic setup

Function (menu item)	Parameter setting	Description
Date-Time		
Date	**DD.MM.YY** DD.MM.YY	For configuring the current date (country-specific). ✎ Note! Important for summertime/wintertime changeover
Time	SS:MM	Current time for the real time clock of the device.
Summertime/normal time changeover		
Changeover	Off - Manual - **Auto.**	Kind of time changeover.
Region	**Europe** - USA	Displays the changeover date from normal time (NT) to summertime (ST) and vice versa. This function depends on the region selected.
NT→ST ST→NT - Date - Time	**31.03** (Europe) 07.04 (USA) **27.10** (Europe) 27.10 (USA) 02:00	Takes into consideration the summertime/normal time changeover in Europe and USA at different times. This can only be selected if summertime/normal time changeover is not set to 'Off'. Time of changeover. This can only be selected if summertime/normal time changeover is not set to 'Off'.
Code		
User	0000 - 9999	Device operation is only enabled once the previously defined code has been entered.
S-DAT module		
Op. data		
End setup	Automatic On request	Saves the settings automatically when you exit the setup or confirm a prompt/question.
Save	Press the E-key	Write counter readings and operating data to the S-DAT module.
Date	Editing field for entering the date	Date of last save
Time	Editing field for entering the time	Time of last save
Read in	Press the E-key	Transfer counter readings and operating data from the module to the device
Counter readings		
Date	Editing field for entering the date	
Time	Editing field for entering the time	
Read in	Press the E-key	Transfer counter readings from the module to the device
S-DAT data	Prog.-name - Prog.-ver. CPU No.	Program name, program version and CPU number of the S-DAT module.

Function (menu item)	Parameter setting	Description
Telealarm		
Active	Active **Not active**	Telealarm activated / not activated: If activated, then enabled (in the appropriate operating positions) messages are transmitted via telealarm to the specified receiver
Modem	**Modem (tone dialing)** Modem (pulse dialing) GSM terminal	Landline modem has been connected either in tone dialing method or in pulse dialing method, or a GSM modem is connected
Interface	**RS232** RS485 (1) RS485 (2)	Which interface of the RMM621 the modem is connected to, a 2nd RS485 is optionally available regardless of the device configuration
Exchange line seizure	0 to 999 **Not active**	If the modem is connected to an extension of a telephone system, then the digit for the exchange line seizure, e.g. 0, is entered here. ✎ Note! Only available for landline modem.
GSM PIN	0000 to 9999	Input field for the GSM Personal Identification Number (PIN), which belongs to the SIM-card of the GSM modem used
SMS Service-No.	20-digit service number	If a GSM modem is connected to the RMM621, then an SMS message can be sent directly via the SMS Service Center. The service number has to be obtained from your mobile network provider and entered here (e.g. +491722270333 for Vodafone). Configuration example, see Section 6 ✎ Note! Only available for GSM terminal.
Pause betw. calls	0 to 999	Time the device waits between two calls
Select all nos.	Yes **No**	**Yes**: All the configured telephone numbers are selected in succession when an event occurs. **No**: No further telephone numbers are selected after a successful call.
SMS error on relay	**Unused** List of available relays	If a relay has been selected, it outputs a pulse if all attempts at transmitting an SMS were unsuccessful.
Receiver 1		
SMS receiver	**none** PC Software Cellular phone D1 (D) D2 (D) E-plus (D)	Should the SMS be sent to a receiver with mobile network number or should the SMS be forwarded to the receiver via a service exchange
Telephone number	12-digit telephone number	Telephone number to which a telealarm message should be sent.
Number of attempts	1-9	Number of attempts until the system switches to the next specified receiver
Receiver 2		
SMS receiver	**none** PC Software Cellular phone D1 (D) D2 (D) E-plus (D)	Should the SMS be sent to a receiver with mobile network number or should the SMS be forwarded to the receiver via a service exchange
Telephone number	12-digit telephone number	Telephone number to which a telealarm message should be sent.
Number of attempts	1-9	Number of attempts until the system switches to the next specified receiver
Receiver 3		
SMS receiver	**none** PC Software Cellular phone D1 (D) D2 (D) E-plus (D)	Should the SMS be sent to a receiver with mobile network number or should the SMS be forwarded to the receiver via a service exchange
Telephone number	12-digit telephone number	Telephone number to which a telealarm message should be sent.
Number of attempts	1-9	Number of attempts until the system switches to the next specified receiver

Function (menu item)		Parameter setting	Description
Text input			
	Text input	Standard **Palm**	Selects the way of entering text: ■ Standard: Per parameter item, runs up or down the row of characters until the desired character appears. ■ Palm: The desired character can be selected from the visual key field with the cursors.
Alarm response			
	Category	**Factory setting** Random	Alarm response when process errors occur. As per the factory setting, all process errors are signaled by a warning message. By selecting "Random", additional operating items appear in the inputs and the application to assign a different fault category (fault message) to the individual process errors (see Section 5.3 'Error message display').
Failsafe mode 4-20 mA			
	As per Namur	**No** Yes	■ No: no Namur failsafe mode is used. The error limits are freely adjustable. ■ Yes: the device responds to an error as per the Namur standard: > 21mA: cable open circuit 20.5 mA < x < 21 mA: range violation < 3.6 mA: cable open circuit 3.6 mA < x < 3.8 mA: range violation
Gen. info			
	Unit ID		Assigns a device name (max. 12 characters long).
	Tag number		Assigns a TAG number, as in wiring diagrams for example (max. 12 characters long).
	Prog. name		Name which is saved in the PC operating software along with all the settings.
	SW version		Software version of your device.
	SW options		Information as to which extension cards are installed.
	CPU No.:		The CPU number of the device is used as an identifier. It is saved with all the parameters.
	Series No.:		This is the serial number of the device.
	Order code:		Order code of the device: first delivery status

Setup ➔ Inputs

Note!
Depending on the version, there are 4 (basic device, always available) to 10 (device extended with 3 analog or U-I-TC cards) current, PFM and pulse inputs available in the Application Manager for recording sensor signals.
The number of possible digital inputs is dependent on the number of extension cards used: there are 6 additional digital inputs available per extension card used.
If voltage signals (also thermocouple) are to be processed, then the device has to be extended with a U-I-TC card; an RTD card ("Temperature" card) has to be used for RTD signals.

Analog inputs

Function (menu item)	Parameter setting	Description
AnalogIn 1 to 10		Configuration of individual analog inputs
Identifier	**AnalogIn x**	Name of the analog input (max. 12 characters).
Signal	**Select** 4-20 mA 0-20 mA 0-100 mV 0-1 V 0-5 V 0-10 V +/- 1 V +/-10 V Type B Type J Type K Type L (IEC) Type L (G) Type N Type R Type S Type T Type U Type D Type C PT 100 PT 100 (J) Pt 100 (G) PT 500 PT 500 (J) Pt 500 (G) PT 1000 PT 1000 (J) Pt 1000 (G)	Selects the signal of the analog input.
Terminals	**None** A-10; A-110; B/C/D-112; B/C/D-113; E-10; E-110	Defines the terminal to which the analog signal in question is connected. It is possible to use one sensor for several applications. For this, in the application in question, select the terminal where the transmitter is located (multiple selection possible).
Type of connection	2-wire 3-wire 4-wire	Note! Only visible if the "PTxxxx" signal type is selected.
Curve	**Linear** Quadratic	Select the curve of the flow transmitter used. Note! Not visible for temperature input.

Function (menu item)	Parameter setting	Description
Unit		Free text, manual entry of a unit ✎ Note! Only visible if signal type = current or voltage is selected, not visible for TC or PTxxxx For TC or PTxxxx: Choice of ■ °C ■ K ■ °F
Start value	-999999.9 to 999999.99	Start value for the beginning of the measuring interval ✎ Note! Can only be selected for the current/voltage signal type.
End value	-999999.9 to 999999.99	End value for the end of the measuring interval ✎ Note! Can only be selected for the current/voltage signal type.
Offset	-9999.99 to 9999.99	Shifts the zero point of the response curve. This function is used to adjust sensors. ✎ Note! This can only be selected for the 0/4 to 20 mA signal.
Signal damping	0 to 99 s	Time constant of the first order low pass for the input signal. This function is used to reduce display fluctuations in the event of severely fluctuating signals.
Format	9 **9.9** 9.99 9.999	Number of places after the decimal point ✎ Note! Only visible if the "Random" system unit has been selected.
Storing data	**Yes** No	Storage of the input value in the nonvolatile memory of the device
Temperature correction		✎ Note! Only visible if a TC-type has been selected as the type of input.
Comparison temp.	**Internal** Constant	For selecting the internal comparison measurement point or a constant default value.
Fixed temp.	-999999.9 to 999999.99	✎ Note! Can only be selected if "Comparison temperature = constant" has been selected
Integration		✎ Note! Not visible if a TC-type or Pt-type has been selected as the type of input.
Time base	**Off** s (second) min (minute) h (hour) d (day)	Evaluation of the input signal for the integration - The integrated value is calculated depending on the selected value: e.g. if an input is evaluated /min, then the measured input signal is scaled and integrated accordingly
Factor	-999999.9 to 999999.99	
Unit	(**%**)	Free text, manual entry of a unit, initial setting "%"
Format	9 **9.9** 9.99 9.999	Presentation format (decimal places) on the display of the device and when transferring on the serial interface
curr. counter value	-999999.9 to 999999.99	

Function (menu item)	Parameter setting	Description
Alarm response		
Hint response	**Last measured value** Constant	Hint response: Response of the output in the event of a fault in the value that is to be output, or specification of the value, with which the system continues calculation in an alarm condition.
Hint value	-999999.9 to 999999.99	✎ Note! Only visible if "Constant" has been selected for the response in the event of a hint.
Range violation		
Alarm type	**Fault** Notice	Fault message, counter stop, color change (red) and message in plain text.
Color change	Yes **No**	Select whether the alarm should be signaled by a color change from blue to red. ✎ Note! Only active if the 'Notice' alarm type has been selected.
Fault text	Do not display **Display+acknowledge** SMS disp.+ackn.+SMS	Select whether in the event of an error an alarm should be shown to describe the error, which is hidden (acknowledged) by pressing a button or/and whether an SMS should be sent to the telealarm receiver. ✎ Note! Only active if the 'Notice' alarm type has been selected.
Open circuit		
Alarm type	**Fault** Notice	Define individually for this input which alarms should be displayed when errors occur: range violation (as per NAMUR43 or freely selectable limits) or circuit break. ✎ Note! Only active if the **Random** option has been selected in the 'Alarm response' menu item in **Setup → Basic setup**.
Color change	Yes **No**	Select whether the alarm should be signaled by a color change from blue to red. ✎ Note! Only active if the 'Notice' alarm type has been selected.
Display text	Do not display **Display+acknowledge** SMS disp.+ackn.+SMS	Select whether in the event of an error an alarm should be shown to describe the error, which is hidden (acknowledged) by pressing a button or/and whether an SMS should be sent to the telealarm receiver. ✎ Note! Only active if the 'Notice' alarm type has been selected.

PFM/pulse inputs

Function (menu item)	Parameter setting	Description
Pulse 1 to 10		
Identifier	**Pulse 1 to 10**	Name of the PFM/pulse sensor (max. 12 characters).
Signal	**Pulse** PFM	Is the input signal interpreted as a PFM or as a pulse signal
Terminals	**None** A-10; A-110; B/C/D-112; B/C/D-113; E-10; E-110; B/C/D-81, B/C/D-91	Defines the terminal to which the PFM/pulse signal in question is connected. It is possible to use one sensor for several applications. For this, in the application in question, select the terminal where the transmitter is located (multiple selection possible). ✎ Note! If a digital card is used the quick inputs on the digital card can also be used as pulse inputs. Depending on the digital card slot, the terminals B,C,D-81 and B,C,D-91 are then also possible.
Unit		Free text, manual entry of unit for the measured value. This is used for the measured value display. If integration is active, the time base is appended to the unit in the display (e.g. unit "l", time base "h" ➔ display "l/h")
Pulse value	0.0001 to 999999.9	Evaluation of an input pulse, i.e. how a pulse is evaluated, e.g. pulse value = 0.1 m^3: therefore corresponds to a pulse of 0.1 m^3; this is also calculated when the value is integrated.
Time base	s (second) **min** (minute) h (hour) d (day)	Evaluation of the input signal for the integration - The integrated value is calculated depending on the selected value: e.g. if an input is evaluated /min, then the measured input signal is scaled and integrated accordingly
Offset	**0.0**	Configuring the offset value in % (-999999.9 to +999999.9)
Format	9 **9.9** 9.99 9.999	Presentation format (decimal places) on the display of the device and when transferring on the serial interface
Storing data	**Yes** No	Storage of the input value in the nonvolatile memory of the device
Integration		
Factor	**1.0**	Configuring the factor (-999999.9 to 999999.99)
Unit	**%**	Free text, manual entry of unit for integration. This unit is used for the counter and totalizer of the pulse input.
Format	9 **9.9** 9.99 9.999	Presentation format (decimal places) on the display of the device and when transferring on the serial interface
curr. counter value	-999999.9 to 999999.99	Current counter value: counter reading of the associated counter, resettable/changeable

Function (menu item)	Parameter setting	Description
Alarm response		
Hint response	**Last measured value** Constant	Hint response: Response of the output in the event of a fault in the value that is to be output, or specification of the value, with which the system continues calculation in an alarm condition.
Hint value	-999999.9 to 999999.99	✎ Note! Only visible if "Constant" has been selected for the response in the event of a hint.
Range violation		Define individually for this input which alarms should be displayed when errors occur: range violation (as per NAMUR43 or freely selectable limits). ✎ Note! Only active if **Random** has been selected in the 'Alarm response' menu item in **Setup → Basic setup**.
Alarm type	Fault **Notice**	Fault message, counter stop, color change (red) and message in plain text.
Color change	**Yes** No	Select whether the alarm should be signaled by a color change from blue to red. ✎ Note! Only active if the 'Notice' alarm type has been selected.
Fault text	**Do not display** Display+acknowledge SMS disp.+ackn.+SMS	Select whether in the event of an error an alarm should be shown to describe the error, which is hidden (acknowledged) by pressing a button or/and whether an SMS should be sent to the telealarm receiver. ✎ Note! Only active if the 'Notice' alarm type has been selected.

Digital inputs

Note!
This menu is only visible if a digital card is installed in the device.

Function (menu item)	Parameter setting	Description
DigitalIn 1 to 18		
Identifier	**DigitalIn 1 to 18**	Name of the digital input, e.g. 'Pump on' (max. 12 characters).
Terminals	**None** B/C/D-81; B/C/D-83; B/C/D-85; B/C/D-91; B/C/D-93; B/C/D-95	Defines the terminal for connecting the digital signal.
Function	**None** On/Off message Display group Synch. time Set time Limit value monitoring active Counter start/stop Reset counter Counter Operating time	Function of the considered digital input ■ On/Off message: when the status is changed, a defined message should be output on the screen / entered in the event buffer ■ Display group: should a display group, which is to be defined, be output ■ Synch. time: synchronization of the time when a flank occurs: the seconds of the time are set to 0 – if the time value is currently in the range of 0-29, then the seconds time is reset (minutes value stays the same), otherwise the minutes value is increased by 1 ■ Set time: when a flank occurs, the value of the internal clock is changed to the specified value. The date is retained if the internal clock is < 1/2 period fast, otherwise the date is increased by 1, if necessary. (If the date is to be changed in the meantime) ■ Limit value monitoring Active: should the limit values of the entire device be deactivated? ■ Counter start/stop: should the counters including totalizers be stopped? ■ Reset counter: should the counters including totalizers be reset? ■ Counter: count pulses. ■ Operating time: count the time the input is active.
Active level	Active Low **Active High**	What should be reacted to?
Active flank	**Low→High** High→Low Both	When should the reaction take place (which change in status is reacted to)
Designation of statuses		
-Low	Text (**off**)	Text that is output when the digital input is at low
-High	Text (**on**)	Text that is output when the digital input is at high
Messages		
-Low➞High	Text	Text that is output when the digital input switches from low to high
-High➞Low	Text	Text that is output when the digital input switches from high to low
Display group	Group 1 ... Group 10	Selection of the group that is to be displayed. Note! Only visible if "Display group" has been selected for the function.
Set time	(**00:00**)	Time in hh:mm format) Note! Only visible if "Set time" has been selected for the function.
Counter	**Select** List of the counters available in the device	Note! Only visible if "Counter start/stop" or "Reset counter" has been selected for the function.
Storing data	Yes **No**	Storage of the input value in the nonvolatile memory of the device. Note! Only visible if "Pulse counter" or "Operating time" has been selected for the function.

Setup ➔ Mathematics

Up to 20 different mathematical calculations can be calculated simultaneously. The configuration of an application is possible without restricting the applications available up to now in the operating status. Please note that when you have successfully configured a new application or changed the settings of an already existing application, the data are not accepted until the user enables the application at the end (question before exiting the setup).

Function (menu item)	Parameter setting	Description
Maths 1 to 20		
Identifier	**Maths 1 to 20**	Name of the mathematics channel, e.g. 'Dens. range' (max. 12 characters).
Formula	**None** Linearization f=(g(y1)*a)?(y2*b)+c f = g(y1:y2)*b+c Formula editor	Individual channels can be mathematically linked to each other and calculated with functions (g) / factors (a or b) / constants (c). The mathematics channels calculated in this way are treated as "true" analog inputs, regardless of whether they are connected conventionally or via PROFIBUS (limit values, display, etc.). The formula is: f = (g(y1)*a) ? (y2*b) + c to apply functions or to calculate two channels together. Use the formula f = g(y1:y2)*b + c to form the mean value or the sum for the channels y1 to y2.
'g' function	**None** lg (decade log) ln (natural log) exp (e to the power of y1) abs (absolute value) sqrt (square root) square (x to the power of 2) sin cos tan asin acos atan	✎ Note! Visible if "f()" has been selected for the formula. The corresponding placeholder in the f() function is occupied with the respective item.
"y1" signal	**None** Maths signal source (list of all available input signals and counters)	Channel, which is to be linked to another ("y2"). ✎ Note! Mathematics channels are cascadable.
"a" factor	-99999.99 to +99999.99 (**1.00**)	Factor, with which the "y1" signal is multiplied. Factory setting: "1".
Link "?"	**+** - * / Modulo	Mathematic operator for linking the channels.
"y2" signal	**None** Maths signal source (list of all available input signals and counters)	Second signal, "y2", which is to be linked with the first one ("y1").
"b" factor	-99999.99 to +99999.99 (**1.00**)	Factor, with which the "y2" signal or g(y1:y2) is to be multiplied. Factory setting: "1".
"c" constant	-99999.99 to +99999.99 (**0.00**)	Constant, which is added to the result of the combination of the two signals "y1" and "y2". Factory setting: "0". Entry in the technical (or physical) unit of the mathematics channel.
Signal	**Select** List of all configured analog inputs	Signal source for the mathematics channel ✎ Note! Only visible if "Linearization" has been selected for the formula.
Formula editor		Opens the formula editor, in which you can create your own calculation formulae (see Section 7 "Formula editor"). ✎ Note! Only visible if "Formula editor" has been selected for the formula.

Function (menu item)	Parameter setting	Description
Result is	Logic operation **Scalable value** Counter Operating time	If this parameter is selected, this has an effect on the display in the measured value display and the further utilization of the channel. Logic operation: the result is a digital status. Scalable value: the result can be processed further like an analog input for example. ✎ Note! Not visible if "Linearization" has been selected for the formula.
Unit	(**%**)	Free text, manual entry of a unit
Format	9 **9.9** 9.99 9.999	Presentation format (decimal places) on the display of the device and when transferring on the serial interface
Storing data	Yes **No**	Should the measured value of the mathematics channel be stored or not?
Integration		
Time base	Off s (second) **min** (minute) h (hour) d (day)	Integration reference
Factor	-999999.9 to 999999.99 (**1.0**)	Integration factor, which is used to calculate the integrated value, e.g. if the input signal has been entered as l/min, then conversion is necessary, i.e. the factor is then applied with 1/60
Unit	(**%**)	Free text used for the display.
Format	9 **9.9** 9.99 9.999	Output format in the measured value display
curr. counter value	-999999.9 to 999999.99 (**0.0**)	Contains the counter reading, it changes
Linearization		
Number of pnts	2-32	Number of points in the table.
Unit	Text	Free text used for the display.
Format	9 **9.9** 9.99 9.999	Output format in the measured value display
Edit table		
X-value	-999999.9 to 999999.99	1st value in the table
Y-value	-999999.9 to 999999.99	Corresponding 2nd value in the table

Setup ➔ Outputs

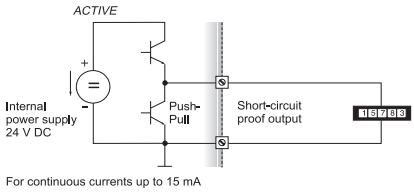
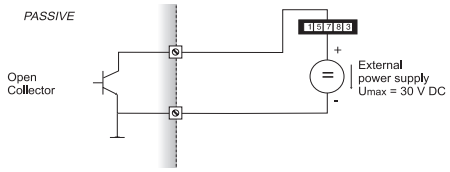
Analog outputs

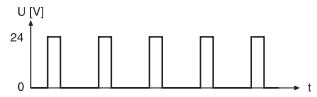
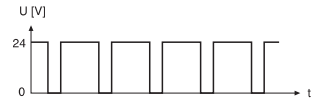
Please note that these outputs can be used as both analog and pulse outputs; the desired signal type can be selected for each setting. Depending on the version (extension cards), 0 (for Ethernet option) to 8 outputs are available.

Function (menu item)	Parameter setting	Description
Analog outp. 1 to 8		
Identifier	Analog outp. 1 to 8	An identifier can be given to the analog output in question for a better overview (max. 12 characters).
Terminals	B/C/D/E-131, B/C/D/E-133 **None**	Defines the terminal at which the analog signal should be output.
Sig. source	List of the values that can be output as an analog signal (inputs, calculated values) **Select**	Setting as to which calculated or measured variable should be output at the analog output. The number of signal sources depends on the number of configured applications and inputs.
Current range	**4 to 20 mA** 0 to 20 mA	Specifies the mode of operation of the analog output.
Start value	-999999 to 999999 **0.0**	Smallest output value of the analog output.
End value	-999999 to 999999 **100**	Largest output value of the analog output.
Time constant	0 to 99 s (**0 s**)	Time constant of the first order low pass for the input signal. This helps prevent severe fluctuations of the output signal.
Simulation	**Off** 0 3.6 4 10 12 20 21	The function of the current output is simulated. Simulation is active if the setting is not 'off'. Simulation ends as soon as you leave this item.
Alarm response		
Fault response	**Last value** Constant	Defines the behavior of the output in the event of a fault, e.g. if a sensor in the measurement fails.
Fault value	-999999 to 999999 (**0.0**)	Fixed value which should be output at the analog output in the event of a fault. ✎ Note! Only for the fault response setting ➞ "Constant" can be selected.
Range violation		
Alarm type	**Fault** Notice	Depending on the configuration of the fault ('fault message, counter stop, color change (red) and message in plain text) or notice ('here the user can determine the response of the device according to his requirements), the device reacts to exceptional behavior of this output
Color change	**Yes** No	✎ Note! Only visible if "Notice" has been selected for the alarm type.
Fault text	Do not display **Display+acknowledge** SMS disp.+ackn.+SMS	✎ Note! Only visible if "Notice" has been selected for the alarm type.

Pulse outputs

The pulse output function can be configured with active, passive output or relay. Depending on the version, 1 to 8 pulse outputs are available.

Function (menu item)	Parameter setting	Description
Pulse 1 to 8		
Identifier	Pulse 1 to 8	An identifier can be assigned to the pulse output in question for a better overview (max. 12 characters).
Signal	**Select** Relay DO active DO passive	Assign the pulse output. **Relay:** The pulses are output on a relay. (The frequency is max. 5Hz) **DO active:** Active voltage pulses are output. Power is supplied from the device. **DO passive:** Passive open collectors are available in this operating mode. Power must be supplied externally.  For continuous currents up to 15 mA  For continuous currents up to 25 mA Note! "DO passive" can only be selected when extension cards are used.
Terminals	A-52, B/C/D/E-131, B/C/D/E-133, B/C/D-135, B/C/D-137, B/C/D-142, B/C/D-152, B/C/D-145, B/C/D-155, B/C/D-242, B/C/D-252 **None**	Defines the terminal at which pulses should be output.
Sig. source	**Select** List of signals that can be output	Setting as to which variable should be output at the pulse output.

Function (menu item)	Parameter setting	Description
Pulse		
-type	Negative **Positive**	*POSITIVE pulses*  *NEGATIVE pulses*  PASSIVE-NEGATIVE *PASSIVE-POSITIVE* ACTIVE-NEGATIVE ACTIVE-POSITIVE Note! Pulse unit depends on the signal source selected.
-value	0.001 to 10000.0 (**1.0**)	Setting as to which value a pulse corresponds to (unit/pulse). Note! The max. possible output frequency is 12.5 Hz. The suitable pulse value can be determined as follows: $\text{Pulse value} > \frac{\text{Estimated max. flow (end value)}}{\text{Desired max. output frequency}}$
-width	User-def. **Dynamic (max. 100 ms)**	The pulse width limits the max. possible output frequency of the pulse output.
-value	0.04 to 1000.00 ms	Configuration of the pulse width suiting the external totalizer. The maximum permitted pulse width can be calculated as follows: $\text{Pulse width} < \frac{1}{2 \times \text{max. output frequency [Hz]}}$ Note! Only visible if "User-def." has been selected for **-width**.
Simulation	Off 1.0 Hz 5.0 Hz 10.0 Hz 50.0 Hz 100.0 Hz 200.0 Hz 500.0 Hz 1 kHz 2 kHz	The function of the pulse output is simulated with this setting. Simulation is active if the setting is not "off". Simulation ends if you leave this item. Note! The values indicated for the simulation apply for DO active and DO passive. Relays can only be controlled with the values 1.0 Hz and 5.0 Hz.

Digital outputs

The digital output function can be configured with active, passive output or relay. Depending on the version, 1 to 6 digital outputs are available.

Function (menu item)		Parameter setting	Description
	Dig.Out 1 to 6		
	Identifier	Dig.Out 1 to 6	An identifier can be assigned to the digital output in question for a better overview (max. 12 characters).
	Type	**Active** Passive	✎ Note! Not visible until a terminal has been selected.
	Active level	Active Low **Active High**	✎ Note! Not visible until a terminal has been selected.
	Terminals	**None** A-52, B/C/D-131, B/C/D-133, B/C/D-135, B/C/D-137, B/C/D-142, B/C/D-152	Defines the terminal at which pulses should be output.

Relay

Depending on the version, 1 to 19 relays are available in the device for limit value functions.

Function (menu item)		Parameter setting	Description
Relay 1 to 19			
	Identifier	Relay 1 to 19	An identifier can be assigned to the relay in question for a better overview (max. 12 characters).
	Op. mode	**Normally closed contact** Normally open contact	Is the relay operated as a normally closed contact or as a normally open contact when not activated
	Terminals	A-52, B/C/D-142, B/C/D-152, B/C/D-145, B/C/D-155, B/C/D-242, B/C/D-252 **None**	Defines the terminal of the set point selected.

Setup ➔ Limit values

30 limit values for limit functions are available in the device.

Function (menu item)	Parameter setting	Description
Limit value 1 to 30		
Identifier	Limit value 1 to 30	An identifier can be assigned to the set point in question for a better overview (max. 12 characters).
Output to	**Select** List of configured relays and digital outputs Display	Where should the limit function be output?
Type	**Min+Alarm** Max+Alarm Grad.+Alarm Alarm Min Max Gradient Unit failure	Definition of the event which should activate the set point. ■ Min+Alarm Minimum safety, event report if the limit value is undershot with simultaneous monitoring of the signal source as per NAMUR NE43 (or freely selectable limits). ■ Max+Alarm Maximum safety, event report if the limit value is overshot with simultaneous monitoring of the signal source as per NAMUR NE43 (or freely selectable limits). ■ Grad.+Alarm Gradient analysis, event report when set signal change is overshot per time unit of the signal source with simultaneous signal source monitoring to NAMUR NE43. ■ Alarm Monitoring of the signal source as per NAMUR NE43 (or freely selectable limits), no limit function. ■ Min Event report when set point is undershot without taking NAMUR NE43 into consideration. ■ Max Event report when set point is overshot without taking NAMUR NE43 into consideration. ■ Gradient Gradient analysis, event report when set signal change is overshot per time unit of the signal source without taking NAMUR NE43 into account. ■ Unit failure Relay (output) switches if a device fault is present (fault message).
Sig. source	**Select** List of values that can be monitored	Signal sources for the selected set point. ✎ Note! The number of signal sources depends on the number of configured mathematics channels, counters and inputs.
Swit. point	-99999 to 99999 (**0.00**)	For specifying the threshold ✎ Note! Only visible if "Min+Alarm", "Max+Alarm", "Min" or "Max" has been selected for **Type**.
Hysteresis	-99999 to 99999 (**0.00**)	Specify set point switch-back threshold to suppress set point bounce. ✎ Note! Only visible if "Min+Alarm", "Max+Alarm", "Min" or "Max" has been selected for **Type**.
Time delay	0 to 99 s (**0 s**)	How long does the limit value have to be present before a reaction takes place. ✎ Note! Only visible if "Min+Alarm", "Max+Alarm", "Min" or "Max" has been selected for **Type**.
Gradient		
delta -x	-19999 to 99999 (**0.00%**)	Value of signal change for gradient analysis (inclination function). ✎ Note! Only visible if "Grad.+Alarm" or "Gradient" has been selected for **Type**.

Function (menu item)		Parameter setting	Description
	delta -t	0 to 99 s (**0 s**)	Time interval for the signal change of the gradient analysis. ✎ Note! Only visible if "Grad.+Alarm" or "Gradient" has been selected for **Type**.
	Res. value	-19999 to 99999 (**0.00%**)	Switch-back threshold for gradient analysis. ✎ Note! Only visible if "Grad.+Alarm" or "Gradient" has been selected for **Type**.
	Notification text		
	LV off→on		You can write a message for when the limit value (set point) is overshot. Depending on the setting, this appears in the event buffer and the display (see 'Lim. display') ✎ Note! Only visible if "Min+Alarm", "Max+Alarm", "Grad.+Alarm", "Alarm" or "Device error" has been selected for the type.
	LV on→off		You can write a message for when the limit value (set point) is undershot. Depending on the setting, this appears in the event buffer and the display (see 'Lim. display') ✎ Note! Only visible if "Min+Alarm", "Max+Alarm", "Grad.+Alarm", "Alarm" or "Device error" has been selected for the type.
	Notification text	**Not display** disp.+ackn. SMS disp.+ackn.+SMS	Definition of the way of reporting the limit value. **Not display:** Limit value violation or violated limit value undershooting is recorded in the event buffer. **disp.+ackn.:** Entered in the event buffer and shown on the display. The message does not disappear until it is acknowledged with a key. ✎ Note! Only visible if "Min+Alarm", "Max+Alarm", "Grad.+Alarm", "Alarm" or "Device error" has been selected for the type.
	Telealarm	**Inactive** with priority	✎ Note! Only visible if "Min+Alarm", "Max+Alarm", "Grad.+Alarm", "Alarm" or "Device error" has been selected for the type.
	SMS receiver	**All** Receiver 1 Receiver 2 Receiver 3	✎ Note! Only visible if "Min+Alarm", "Max+Alarm", "Grad.+Alarm", "Alarm" or "Device error" has been selected for the type.

Setup ➔ Display

The device display can be freely configured. Up to ten groups, each with 1 to 8 freely definable process values, can be displayed individually or alternately.

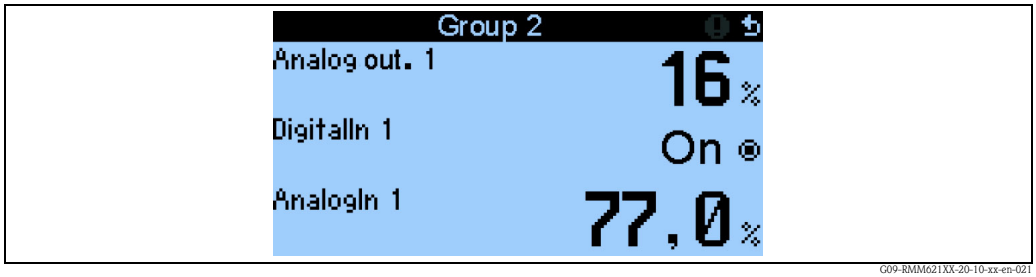


Fig. 25: Display with 3 values

When displaying one to three values in a group, all are displayed with a name and associated physical unit.
When four values or more are displayed, then only the respective identifier, the values and the physical unit are displayed.

Note!
In Setup "**Display**", the display functionality is configured. In "**Navigator**" then select which group(s) appear(s) with process values on the display.

Function (menu item)	Parameter setting	Description
Groups		
Group 1 to 10		Combine process values to groups here for showing on the display
Identifier	Free text	A name (max. 12 characters) can be given to the groups for a better overview.
Display	**Count** Bargraph horz.[1] Bargraph vert.[1] Line display[2]	Note! [1] Only available if "1 value" or "2 values" has been selected for **Display mask**. [2] Only available if "1 value" has been selected for **Display mask**.
Display mask	**Select** 1 value ... 8 values	Here, set the number of process values which should be displayed beside one another in a window (as a group). The way the value is displayed depends on the number of selected values. The more values in a group, the smaller the display.
Signal type 1	**All** Analog inputs Pulse inputs Digital inputs Mathematics channels Relay Miscellaneous	The display values can be selected from 4 categories (types).
Value type 1	**All** Measured values Statuses Counter Totalizer Miscellaneous	Selection criterion for output in the measured value display: the displayed values can be selected from 8 categories (types).
Value 1 to 8	**Select** List of all available process values	Selects which process values should be displayed.

Function (menu item)	Parameter setting	Description
Scrolling display		Alternating display of individual groups on the display.
Swit. time	0 to 99 **0**	Seconds until the next group is displayed.
Group 1 to 10	**Yes** No	Select the groups that should be displayed alternately. The alternating display is activated in the "**Navigator**" / "**Display**" (see 6.3.1).
Display		
No. of sums	Counter mode **Exponential**	Sum display **Counter mode:** sums are displayed with max. 10 positions up to overflow. **Exponential:** exponential display is used for large values.
Contrast		
Main device	2 to 63 **46**	For configuring the display contrast. This setting has an immediate affect. The contrast value is not saved until the setup is exited.

Setup ➔ Signal evaluation

Function (menu item)	Parameter setting	Description
Int. evaluation	**No** 1 min 2 min 3 min 4 min 5 min 10 min 15 min 30 min 1 h 2 h 3 h 4 h 6 h 8 h 12 h	Determines at the time intervals specified here the Min., Max., Mean values (applies to the entire device) for those channels whose storage has been set to "Yes"
Day	No **Yes**	Determines once a day the Min., Max., Mean values (applies to the entire device) for those channels whose storage has been set to "Yes"
Month	No **Yes**	Determines once a month the Min., Max., Mean values (applies to the entire device) for those channels whose storage has been set to "Yes"
Year	No **Yes**	Determines once a year the Min., Max., Mean values (applies to the entire device) for those channels whose storage has been set to "Yes"
Synch. time	00:00	✎ Note! Only available if intermediate evaluation is activated and daily or monthly or totalizer/ yearly counter is set to yes.
Reset	No Int. evaluation Daily counter Monthly counter Totalizer/Yearly counter All counters	✎ Note! Only available if intermediate evaluation is activated and daily or monthly or totalizer/ yearly counter is set to yes.
Memory information		Indicates how long the memory in the device will last in total. If the memory is not read out during this time, data are overwritten and thus lost.

Setup ➔ Communication

An RS232 interface at the front and an RS485-interface at terminals 101/102 can be selected as standard. In addition, all process values can be read out via the PROFIBUS DP protocol.

Function (menu item)	Parameter setting	Description
Unit adr.	0 to 99 **01**	
RS485 (1)		
Baudrate	9600, 19200, 38400 **57600**	Baudrate for the RS485 interface
RS232		
Baudrate	9600, 19200, 38400 **57600**	Baudrate for the RS232 interface
PROFIBUS-DP		
Number	0 to 48 **0**	Number of values which should be read out via the PROFIBUS-DP protocol (max. 48 values).
Adr. 0...4	e.g. density x	Assigns the values to be read out to the addresses.
Adr. 5...9 to Adr. 235...239	e.g. temp. diff. x	48 values can be read out via an address. Addresses in bytes (0…4, … 235…239) in numerical order.
RS485 (2)		
Use	**RS485**	
Baudrate	9600 19200 38400 **57600**	Baudrate for the RS485 interface ✎ Note! Only available if "RS485" has been selected for "Use"
Ethernet		
MAC	xx-xx-xx-xx-xx-xx	Configuring the unique MAC address (HW address, specified by E+H Preset)
IP	192.168.100.5	IP address, specified by network administrator
Subnet mask	255.255.255.0	Enter the subnet mask (you can obtain this from your network administrator). The subnet mask must be entered if the device is intended to establish connections into another partial network. Specify the subnet mask of the partial network, in which the device is located (e.g. 255.255.255.000). Please note: the class of network is determined by the IP address. This results in a default subnet mask (e.g. 255.255.000.000 for a Class B network).
Gateway	000.000.000.000	Enter the gateway (you can obtain this from the network administrator). Enter the address of the gateway here if connections into other networks are to be established. ✎ Note! Changes to the system parameters are not activated until the SETUP menu has been exited and the settings have been adopted. Only then does the device work with the changed settings.

✎ Note!
A detailed description about integrating the device into a PROFIBUS system can be found in the Operating Instructions of the accessory (see Section 9 'Accessories'): **PROFIBUS interface module HMS AnyBus Communicator for PROFIBUS**

Setup ➔ Service

Service menu: **Setup (all parameters) ➔ Service**.

Function (menu item)	Parameter setting	Description
Preset	No	Resetting the device to the delivery status with the factory default settings. You have to enter the service code to reset the settings. ✎ Note! This resets all the parameters you configured.
Counter stop	**Yes** No	Should the counters (all counters) be stopped? Yes/No
Reset oper. hours	Yes **No**	If a reset terminal is defined and the Reset oper. hours operating item is set to "Yes", then all operation hour counters are also to be reset to 0 when the reset terminal flank is changed from Low->High. This then always applies when a flank is changed. If Reset oper. hours is set to "No", then the operation hour counters remain at their value when a flank is changed.
Reset terminal	**None** List of the available digital inputs	Reset terminal; the counters can be reset via a digital signal. To do this, an available digital input must be selected
Counter ✎ Note! This menu item is only visible if a channel with a counter is active.		
Analog inputs		
Analog input 1 to 8		
Sum x	-999999.9 to 999999.9	The "Integration = Yes" operating item can be used to determine per channel whether the current values are to be integrated. These integrated values can then be displayed in the service level in an overview. When doing so, the resettable counters (comparable with the trip-distance counters of a car) are displayed.
Total sum x	-999999.9 to 999999.9	The "Integration = Yes" operating item can be used to determine per channel whether the current values are to be integrated. These integrated values can then be displayed in the service level in an overview. The total sums correspond to the mileometer of a car.
Pulse inputs		
Pulse input 1 to 10		
Sum x	-999999.9 to 999999.9	The "Integration = Yes" operating item can be used to determine per channel whether the current values are to be integrated. These integrated values can then be displayed in the service level in an overview. When doing so, the resettable counters (comparable with the trip-distance counters of a car) are displayed.
Total sum x	-999999.9 to 999999.9	The "Integration = Yes" operating item can be used to determine per channel whether the current values are to be integrated. These integrated values can then be displayed in the service level in an overview. The total sums correspond to the mileometer of a car.
Mathematics channels		
Mathematics channel 1 to 20		
Sum x	-999999.9 to 999999.9	The "Integration = Yes" operating item can be used to determine per channel whether the current values are to be integrated. These integrated values can then be displayed in the service level in an overview. When doing so, the resettable counters (comparable with the trip-distance counters of a car) are displayed.
Total sum x	-999999.9 to 999999.9	The "Integration = Yes" operating item can be used to determine per channel whether the current values are to be integrated. These integrated values can then be displayed in the service level in an overview. The total sums correspond to the mileometer of a car.

6.4 User-specific applications

6.4.1 Application examples

Display

When you press any key, you can select a group with display values or display all groups with automatic alternating display. If a fault occurs, the display changes color (blue/red). See Section 5.3 'Error message display' for information on how to eliminate the error.

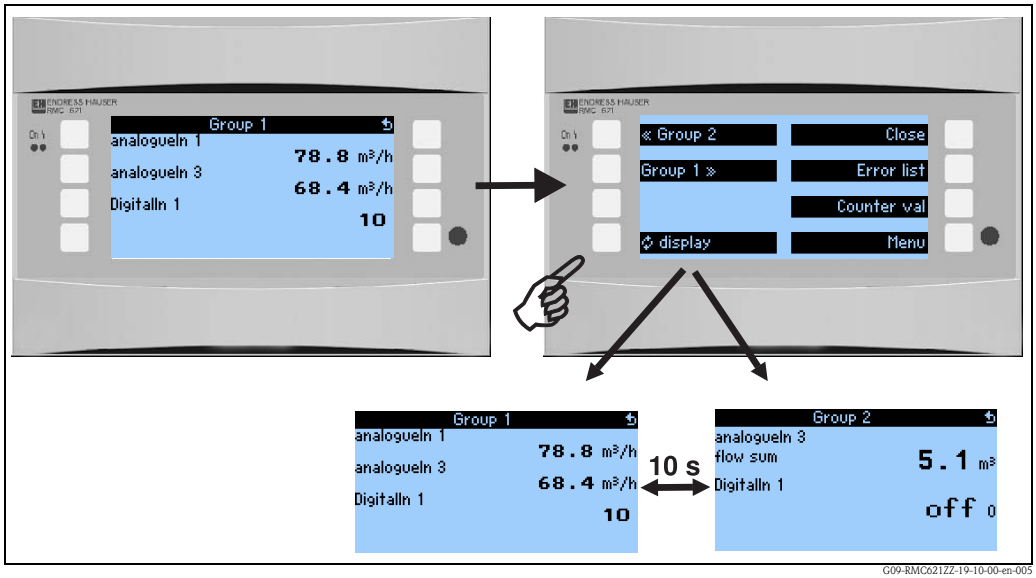


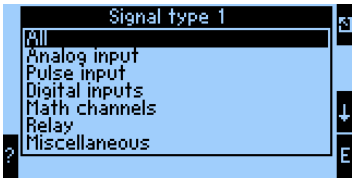
Fig. 26: Automatic changing of various display groups (alternating display)

If a value is displayed, then there are the following display possibilities:
- Count
- Bargraph horizontal
- Bargraph vertical
- Line display

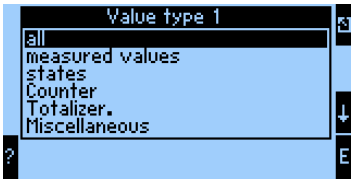
If 2 values are to be displayed, then you can choose between
- Count
- Bargraph horizontal
- Bargraph vertical

If 3 or more values are displayed, only counts (and statuses, e.g. circuit break) are displayed

To facilitate greater transparency, the display is configured in
Navigator → Setup → Display → Groups → Group X in 3 steps per value:
1. Selection of the signal type



2. Selection of the value type



3. The actual value can then be selected based on the preselections made above.

Note!
For better clarity, groups can be given their own identifier, so that the user can identify e.g. the measuring point to which the displayed values are assigned, for example "Tank East" or "Density Input".

Up to 10 display groups can be set up, which can each comprise up to 8 values. This means that you can map up to 80 measured values in one display cycle (i.e. in the specified alternation).

Different possibilities for measured value display and their configuration

Navigator ➔ Setup ➔ Display ➔ Groups ➔ Group X

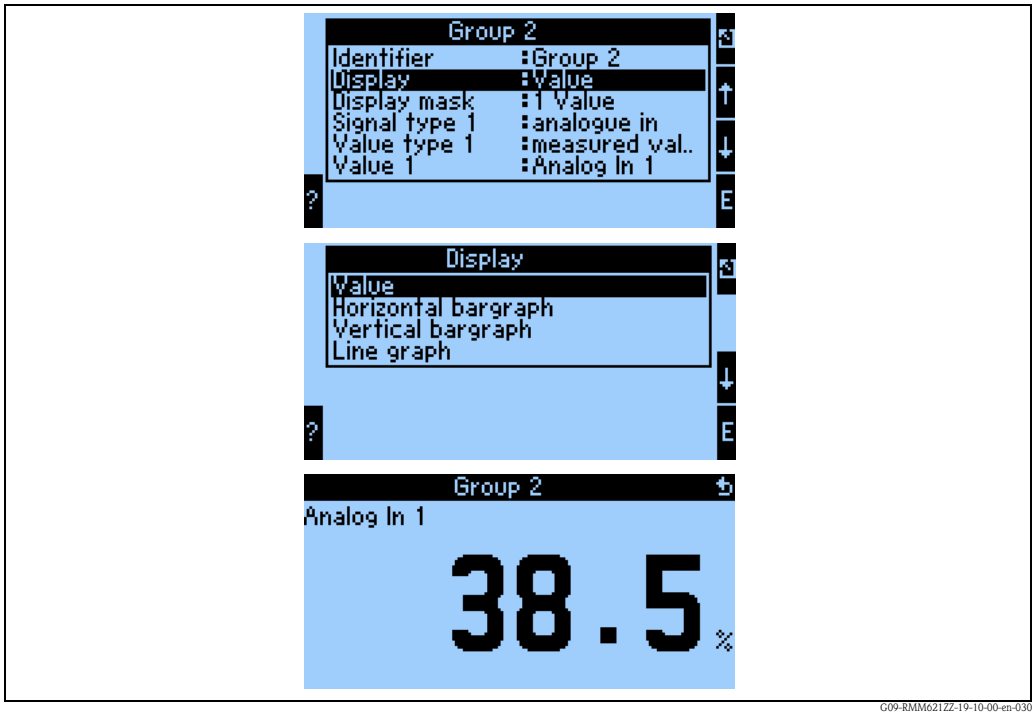


Fig. 27: Display of a measured value

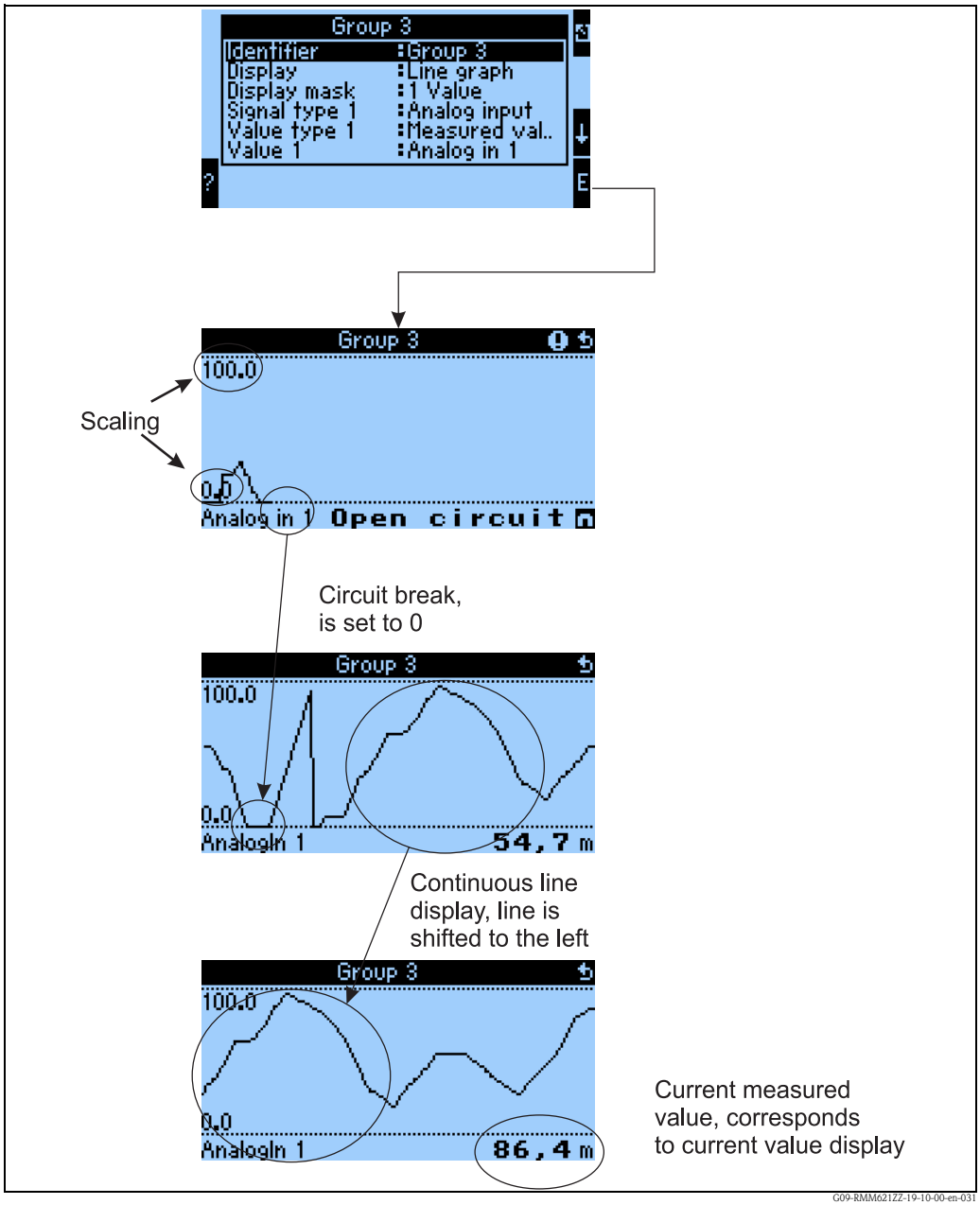


Fig. 28: Line display of a measured value

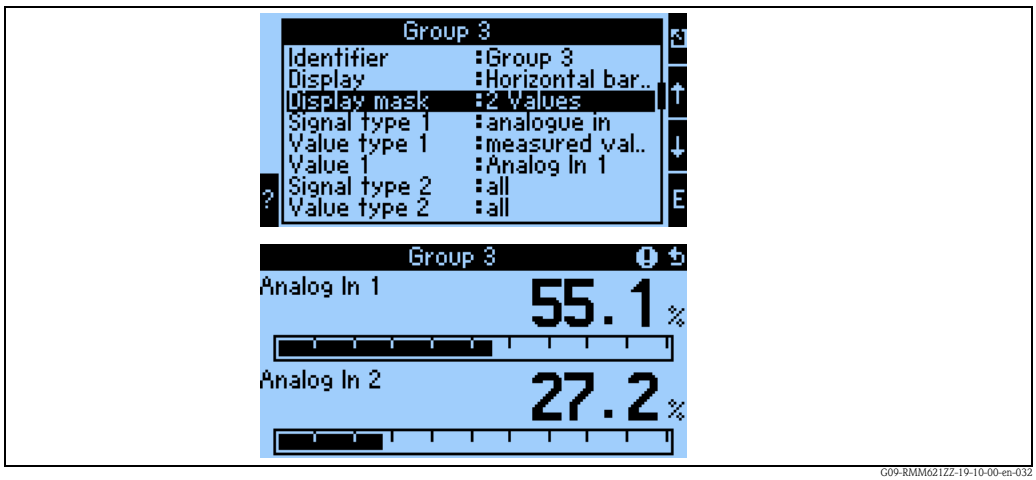


Fig. 29: Count + horizontal bargraph display

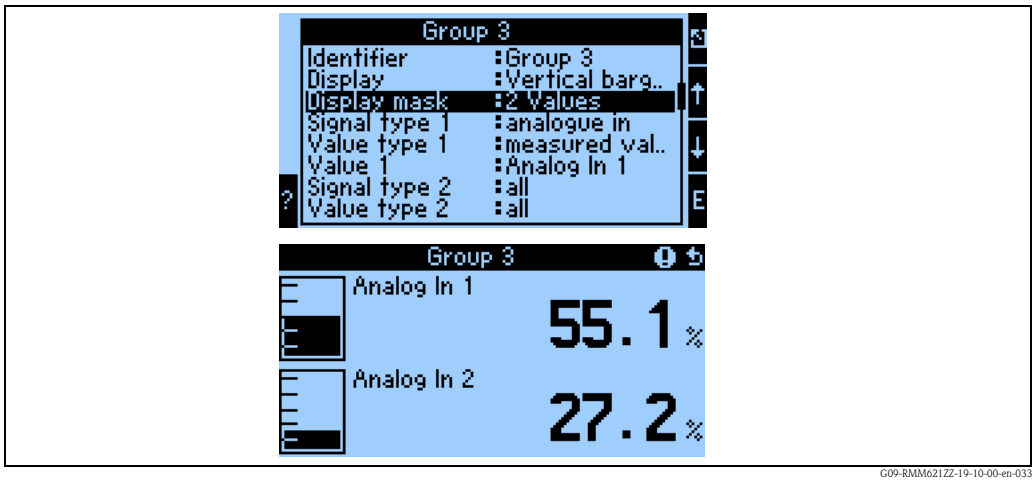


Fig. 30: Count + vertical bargraph display

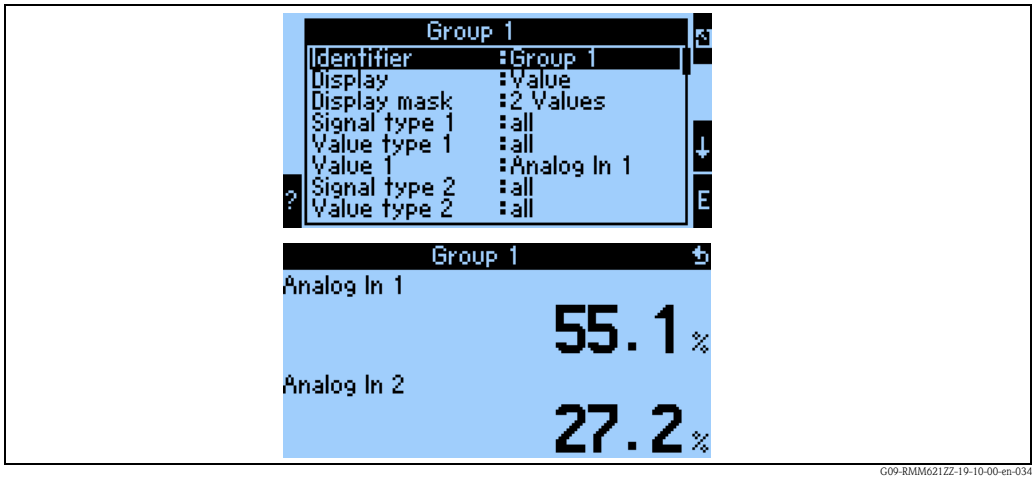


Fig. 31: Purely count display

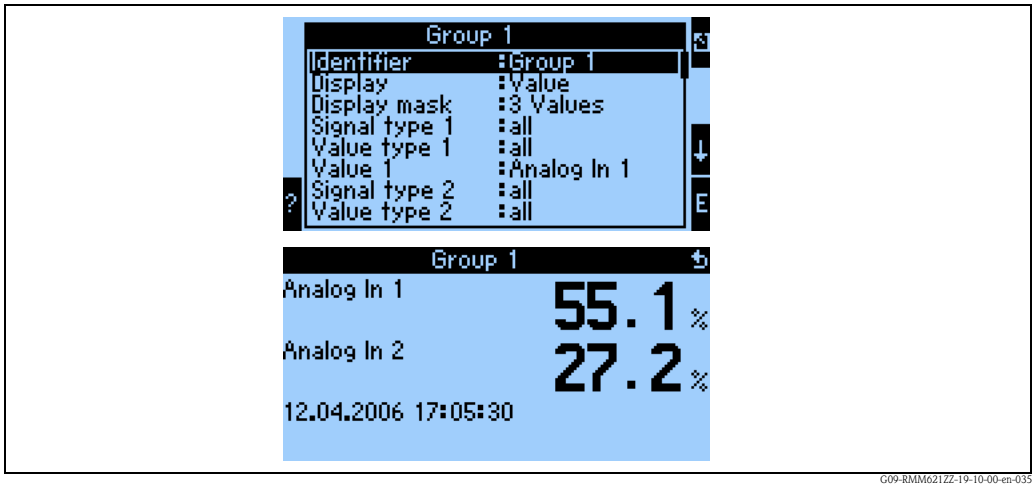


Fig. 32: Display of three measured values, only count display possible

Inputs

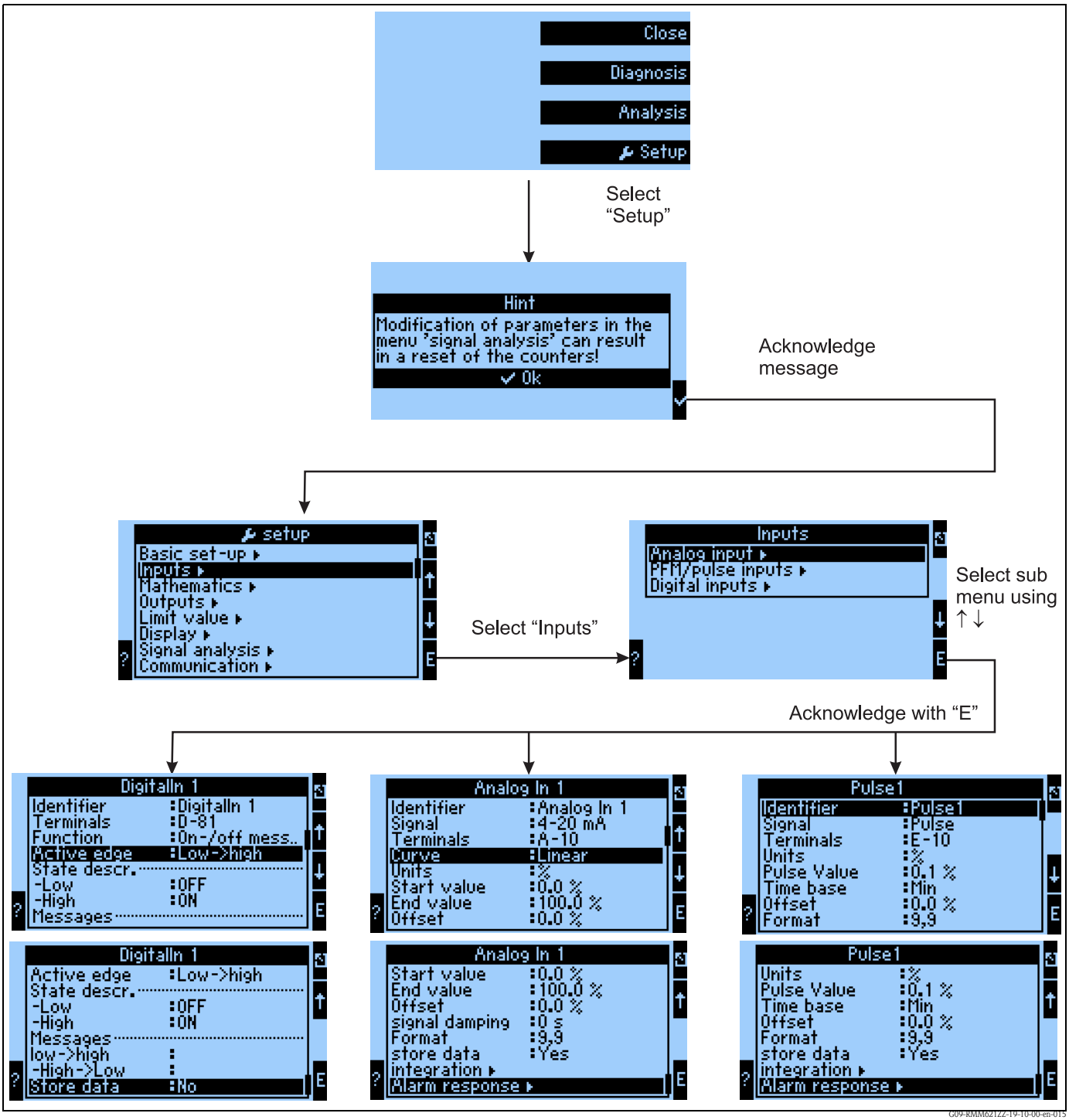


Fig. 33: Configuration of the inputs: Overview

Configuration of the analog input

- Selection of the signal type of the terminal to which the sensor is connected
- Terminal: select A10(+) and connect transmitter (passive) to terminal A10(-)/A82(+)
- Characteristic curve: Linear: should the characteristic curve of the sensor be assumed as linear or as quadratic (relevant above all for flow sensors)
- Unit: free text entry, is used for the display of the measured value
- Start/end value: at 0/4 to 20mA: entry of the scaling, upper and lower limits of the physical value range
- Offset: constant value, which is taken into consideration for each measured value

- Signal damping: entry of the time constants for the integrated low-pass filter; this filters out undesired, high-frequency interferences.
- Store data: measured values are stored and are available for reading out by means of PC software
- Integration: configuration of the integration, is this is required
- Alarm response: how should the analog input react to a current value > 20.5 mA and < 21 mA (range violation) as with a current value > 21 mA

Configuration of the digital input

- Terminal = selection of the terminal that is to be used for the digital input
- Function: which task is assigned to the digital input – what should be brought about at the device by the digital input? e.g. synchronization of the time (for more details, see parameter table)
- Active flank (optional: active level): initiates the low ➔ high, or high ➔ low flank function in the device (optional high level or low level)
- Description of High stat.: On – displayed text in the measured value display (display group) when digital input is set to High
- Description of Low stat.: Off – displayed text in the measured value display (display group) when digital input is set to Low
- Event text –Low ➔ High: text that is to be output when a rising flank occurs
- Event text – High ➔ Low: text that is to be output when a falling flank occurs
- Save data: Only visible if "Counter" or "Operating time" was selected for the **function**.

Configuration of the pulse input

- Selection of the signal type of the terminal to which the sensor is connected
- Terminal: select A10(+) and connect transmitter to terminal A10(-)/A83(+)
- Unit: free text entry, is used for the display of the measured value
- Pulse value: how much of the evaluated variable corresponds to a pulse
- Time basis: time reference of the signal, e.g. for flow: 1 pulse corresponds to 10 l/sec
- Offset: constant value, which is taken into consideration for each measured value
- Format: display format in the measured value display
- Store data: measured values are stored and are available for reading out by means of ReadWin
- Integration: configuration of the integration, is this is required
- Alarm response: how should the pulse input react to too high an input frequency.

Outputs

Analog outputs (Navigator ➔ Setup ➔ Outputs)

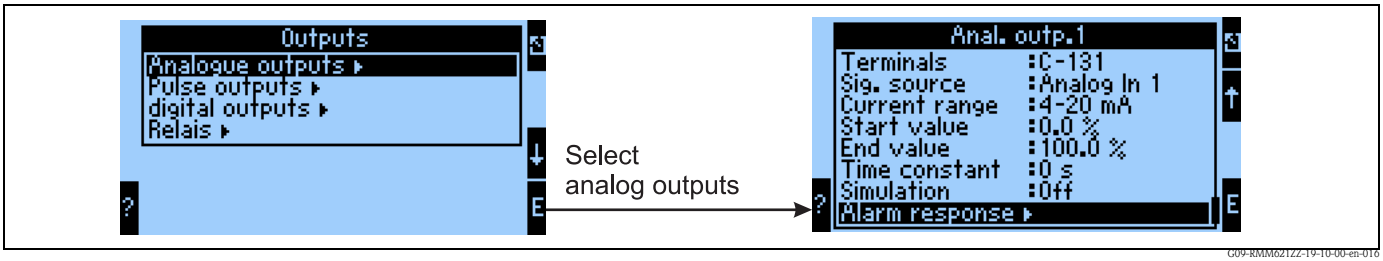


Fig. 34: Configuration of the analog output

- Terminal at which the analog signal is to be output (selection possibilities dependent on the device configuration)
- Signal source: the input / mathematics channel that is to be output
- Current range: 0 to 20mA or 4 to 20mA
- Start/end value: scaling of the current value that is to be output
- Time constant: used for filtering high-frequency interference signals
- Simulation: Off = output is not operated in simulation mode, otherwise it is possible, as long as the device is used in simulation mode, for a constant current value to be output, e.g. for testing another connected device (recorder, etc.)
- Alarm response: how should the device respond in the event of an error (range overshooting, etc.)

Pulse outputs (Navigator ➔ Setup ➔ Outputs)

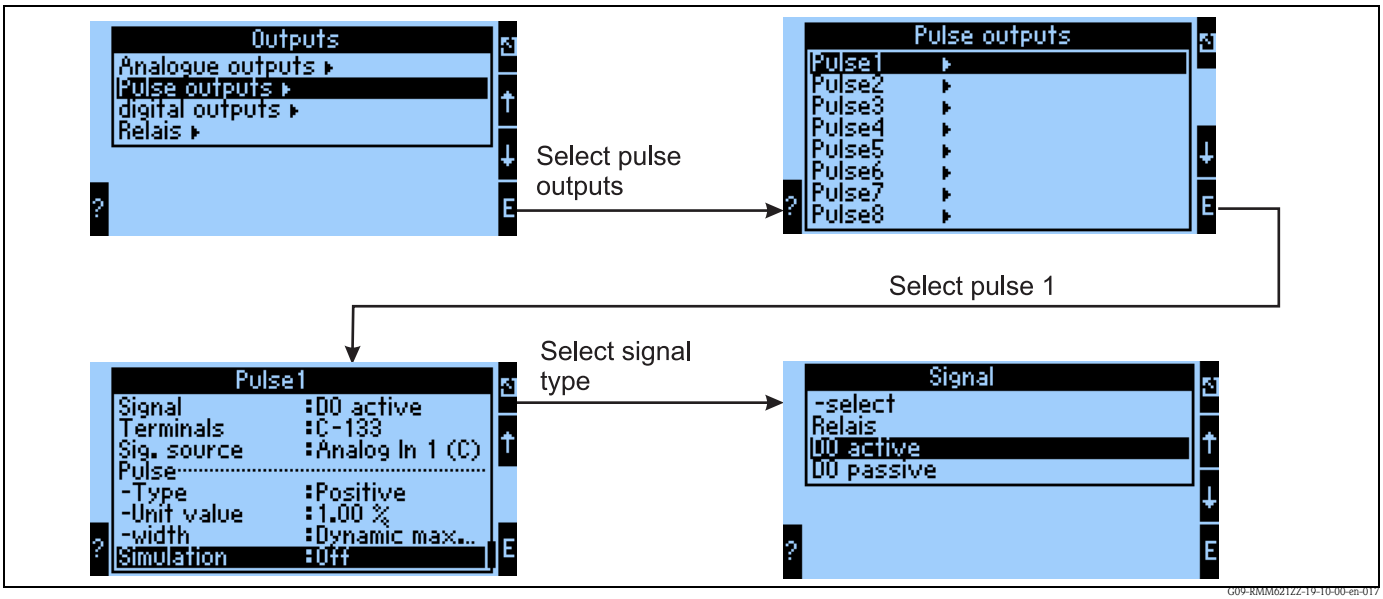


Fig. 35: Configuration of the pulse outputs

- Signal type: how should the signal be output? Relay: max. 5 switching operations per sec., digital output active or passive
- Terminal at which the digital signal is to be output (selection possibilities dependent on the device configuration)
- Signal source: which signal should be output as a pulse – reference to an integrated input (e.g: flow) or a counter
- Pulse type: positive/negative
- Pulse value: if, for example, a pulse is output per 10 liters, then "10" has to be set at this operating item

- Pulse width: dynamic max. 100 ms: the pulse width is adapted to the update time of 250 ms; if, for example, 3 pulses are to be output per update time, then the pulse is approx. 40 ms high and 40 ms low
- Simulation: Off = output is not operated in simulation mode, otherwise it is possible, as long as the device is used in simulation mode, for a constant pulse value to be output, e.g. for testing another connected device (recorder, etc.)

Digital outputs (Navigator ➔ Setup ➔ Outputs)

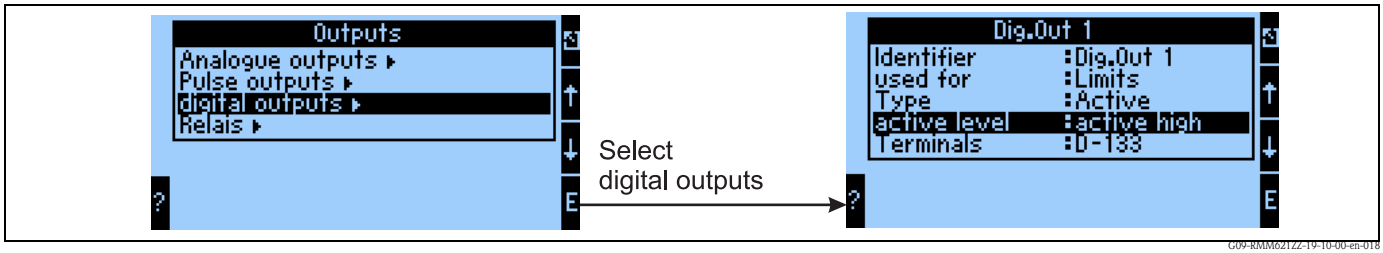


Fig. 36: Configuration of the digital outputs

- Selection of the output type (how should the device be used, e.g. as control outlet for a pump, as limit value, etc.)
- Output to: relay (e.g. if a pump is to be switched via a relay)

Relay

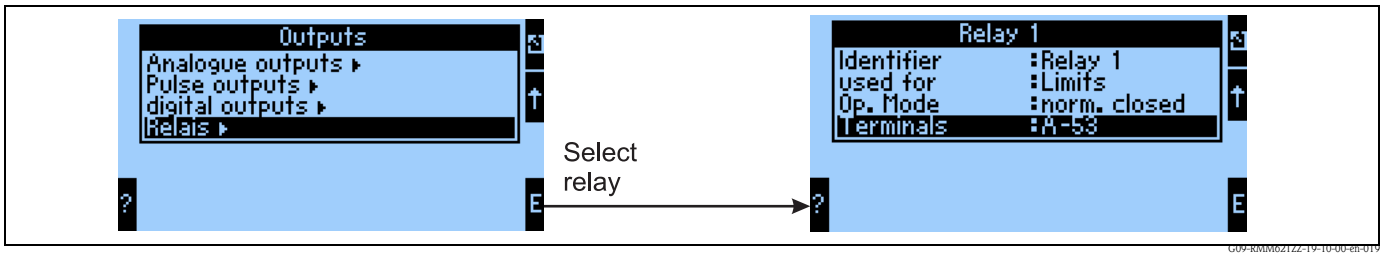


Fig. 37: Configuration of the relays

Limit values

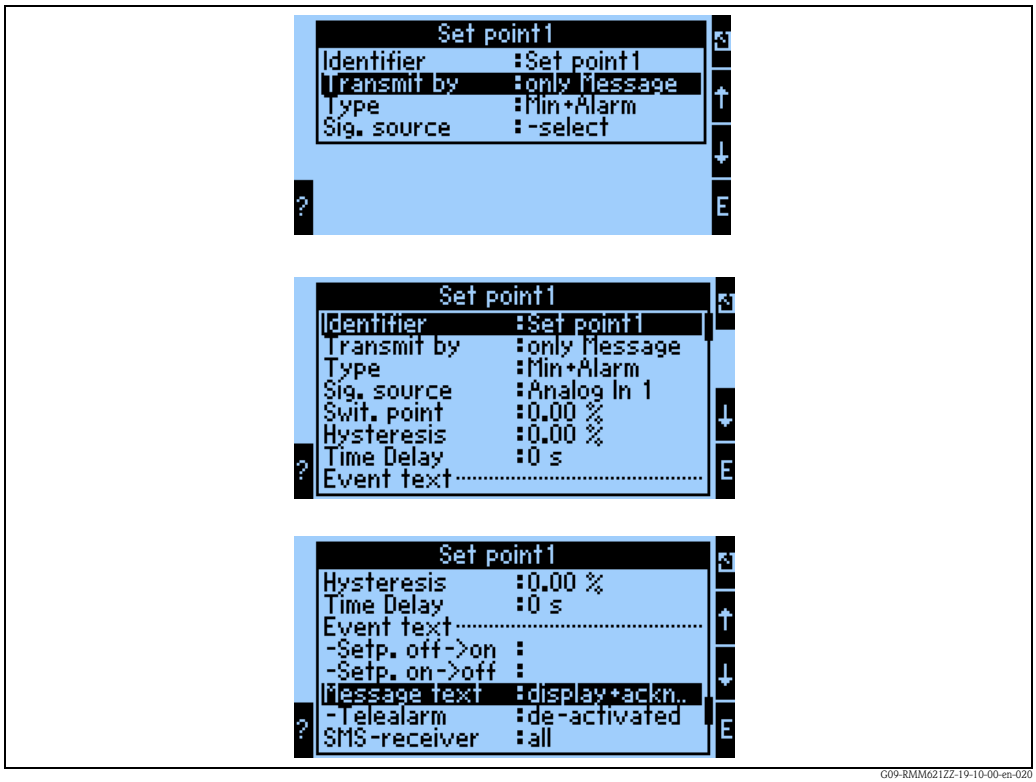


Fig. 38: Configuration of the limit values

- Output to: only on the display (purely message display, no issuing on an output)
- Type: the limit value is set when the minimum is undershot and when an alarm occurs
- Signal source: link to the signal that is to be monitored
- Switch point: when should the limit value be set (scaled value)
- Time del.: after what length of time, in which the limit value has been violated for a sustained length of time, should the limit value be set
- LV off/on: text that is displayed in the respective status in the measured value display of the device
- LV off➔on / on➔off: text that is output in a message box when the respective change in status takes place (if no text has been entered, then no message box is displayed)
- Notification text: if a message box appears, the user is prompted to acknowledge it. (Alternatively, a telealarm (send SMS) can be configured here)

Mathematics channels

Linearization

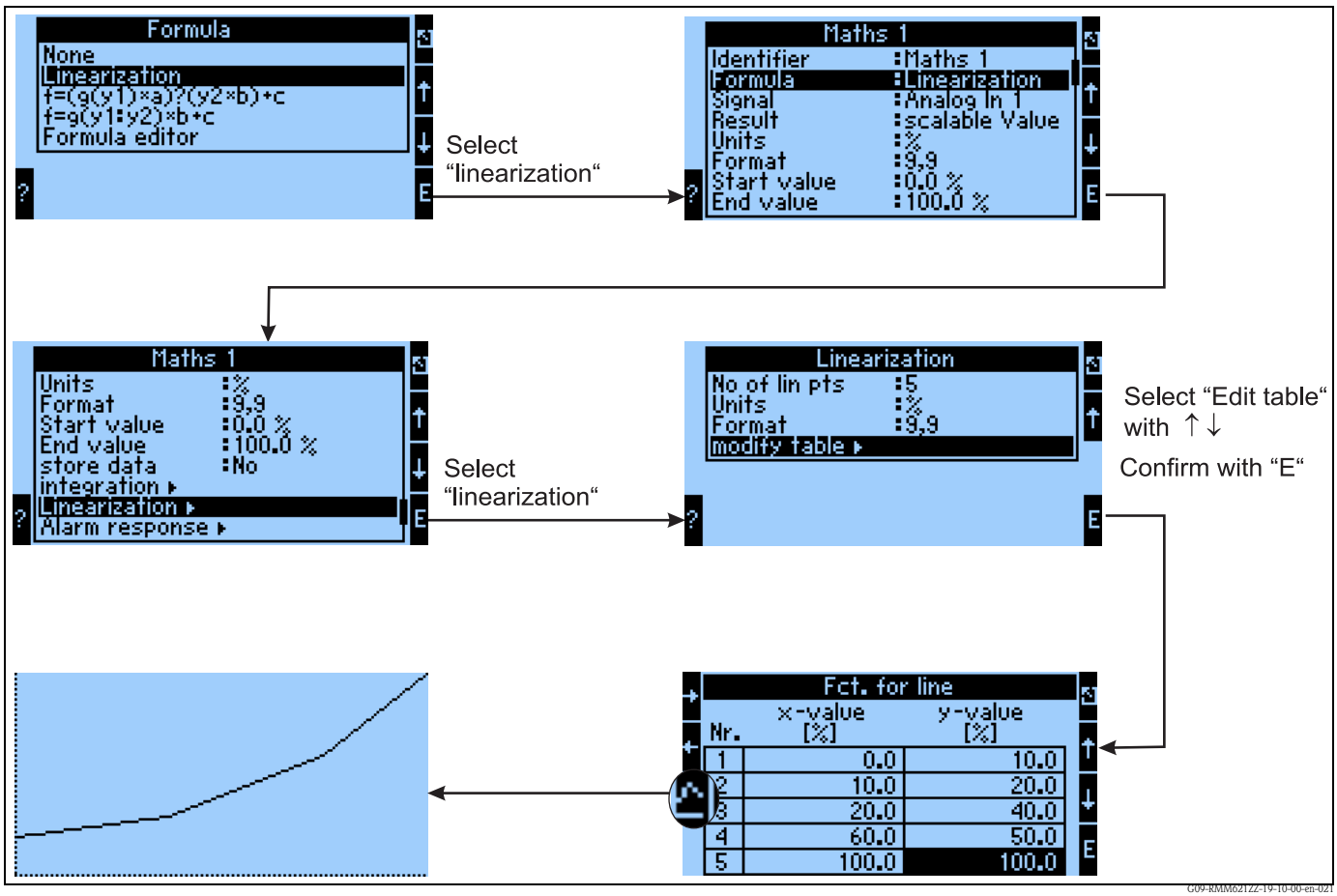


Fig. 39: Configuration of the linearization

When linearization is performed, any channel (input, mathematics) is applied as the x-value of the 2-dimensional matrix that is to be used.
The linearization takes place in the corresponding submenu; the table can be entered here. Please observe that the same values must not be entered for the x-value; this is pointed out by an error message.
The y-value represents the linearization output value.
It is also possible to display the entered table graphically.

Formula editor

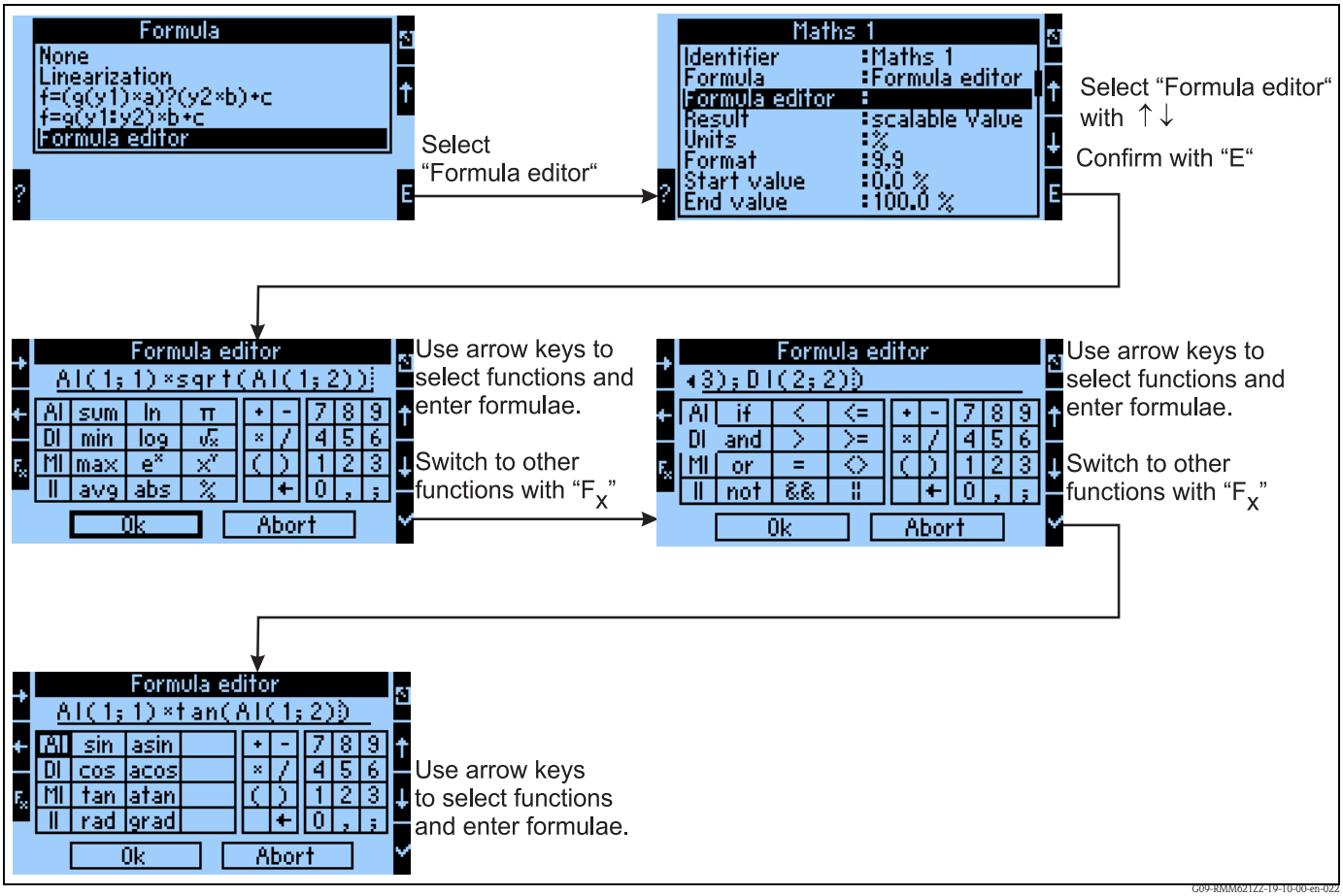


Fig. 40: Use of the formula editor

With the formula editor (only visible if the device has been ordered with the "Extended mathematics package" option), the RMM621 process computer can be used to calculate any mathematical equations. The following arithmetic / logic (Boolean)/ trigonometric functions can be used:

Arithmetic functions
- sum (calculates the sum of the specified channels)
- min (determines the smallest of the specified channels)
- Max (determines the largest of the specified channels)
- avg (determines the mean value of the specified channels)
- ln
- log
- e^x
- abs (determines the absolute value of the value of a channel (other mathematics channel / analog input, -3.4 ? 3.4)
- pi
- √
- x^y
- %

Logic functions
- if
- and
- or
- not (inversion of the specified digital signal)
- Logic relational operators for 2 inputs (<, >,=, <=>=, <> corresponds to unequal)
- && ≙ within a logic equation AND
- || ≙ within a logic equation OR

Trigonometric functions
- sin
- cos
- tan
- rad
- asin
- acos
- atan
- degrees

Predefined formulae

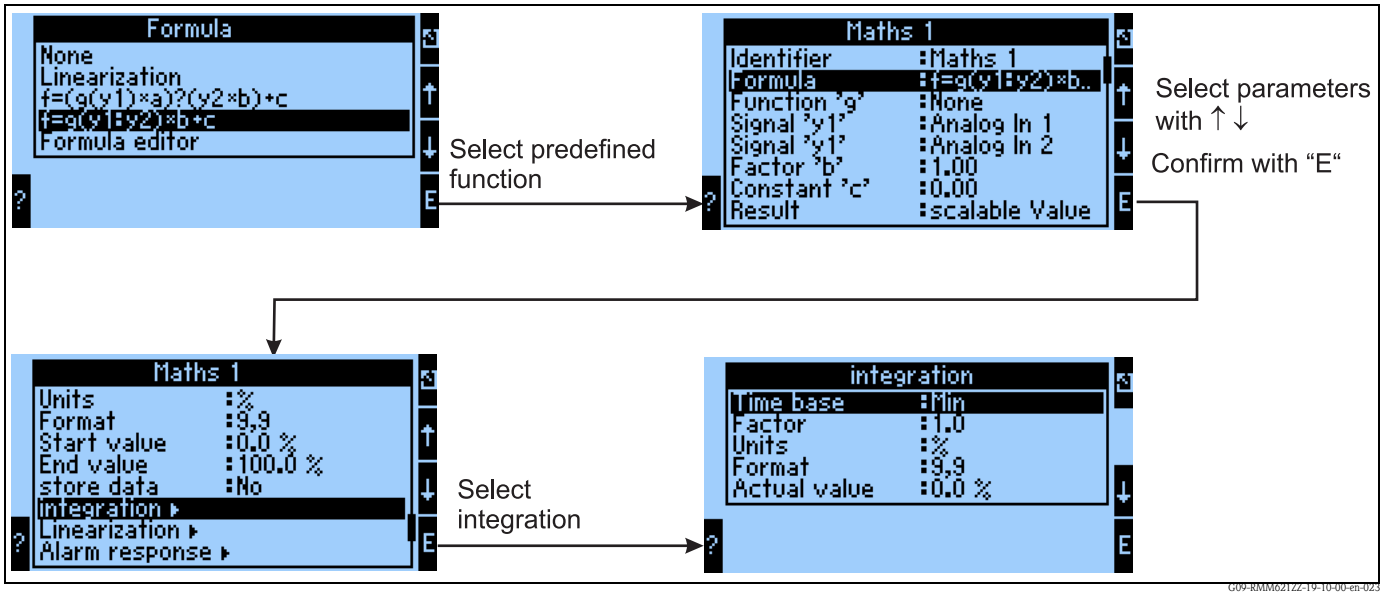


*Fig. 41: Using the predefined formula f = g(y1:y2)*b+c*

f = g(y1:y2)*b+c
In the selection of g(), functions such as
- Total
- Mean value
- Min
- Max

are available.
If, for example, sum is selected, then the signals from y1 to y2 are added up. In the example, therefore, this is Analog1+Analog2
The result is multiplied by the constant b, then constant c is added.

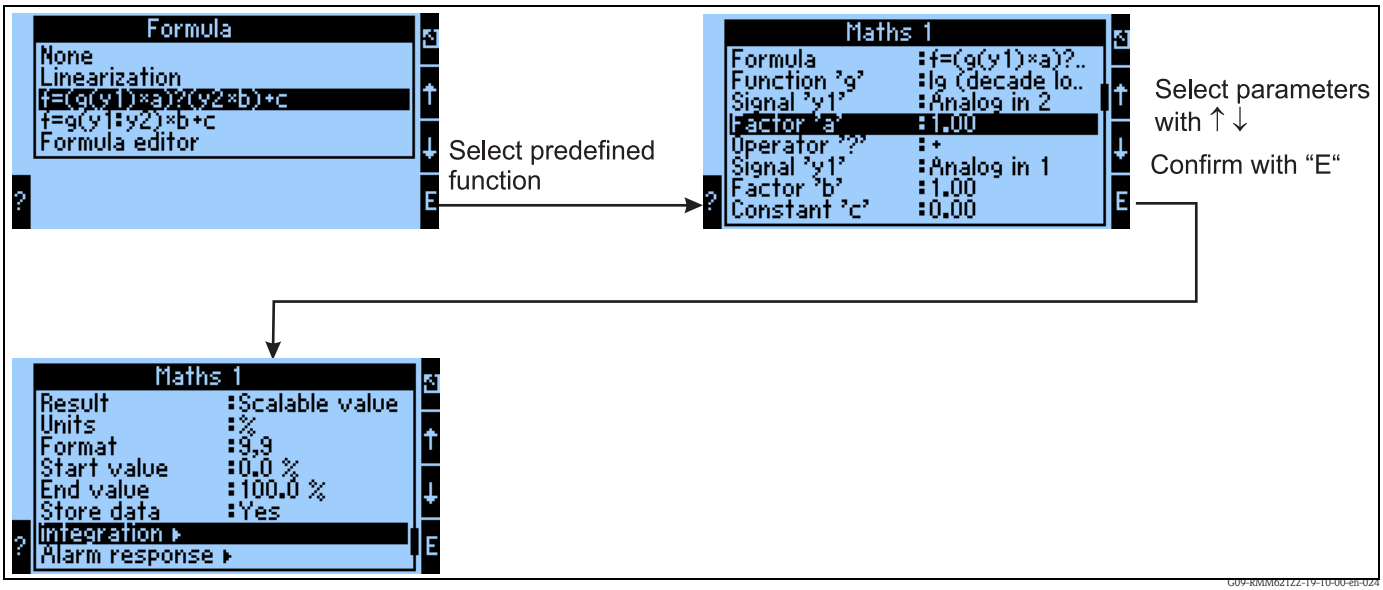


*Fig. 42: Using the predefined formula f = (g(y1)*a)?(y2*b)+c*

f = (g(y1)*a)?(y2*b)+c
In the selection of g(), the functions
- lg (decade logarithm of y1)
- ln (natural logarithm of y1)
- exp → e ^y1
- abs → Absolute value of y1, e.g. -3.4 corresponds to absolute 3.4
- sqrt → Square root of y1
- quad → y1^2
- sin
- cos
- tan
- asin
- acos
- atan

are available.
If, for example, the decade logarithm is selected, then it is calculated from y1 and multiplied by the constant a.
For the "?" link, the following options are available:
- +
- -
- *
- /
- Modulo → Division and continued use of the remainder that is not whole-numbered, e.g. 3Mod2=1

Then the constant c is added to the previously calculated result.

Storage

The RMM621 has 3 different storage media for storing values:
- Flash memory (permanently built in to the device) – storage according to the specified storage interval
- S-Dat module (removable) – storage takes place 1x/hour
- FRAM (permanently built into the device) – storage every second

	Op. data	Continuous counters (statistics) Min./Max./Mean value	Event buffer	Default values (statistics) Min./Max./Mean value of the last interval
FRAM (permanently built in)		✓		
Flash memory (permanently built in)	✓		✓	✓
S-Dat module (removable)	✓	✓		

The "Store data" option can be activated for analog inputs, pulse inputs, digital inputs and mathematics channels. This enables you to specify that values are stored for the respective input / channel (see the following table).
In addition, the integrated value can be stored for analog inputs and mathematics channels, i.e. the measured current values are integrated and stored in the device along with the Min./Max./Mean value.
These values can then be read out in the Navigator via the "Evaluations" menu according to "Counter readings" and "Statistics" (Min./Max./Mean values and current counter and preliminary counter directly at the device, archived values with ReadWin® 2000).
In the "Signal evaluation" menu item, interval-based intermediate evaluations, daily, monthly, yearly evaluations can then be activated:
- Intermediate evaluation: here you can configure at what interval the values are to be stored (no=no intermediate evaluation, 1, 2, 3, 4, 5, 10, 15, 30 min, 1, 2, 3, 4, 6, 8, 12h)
- Day: no, yes: daily values of the counters
- Month: no, yes: monthly values of the counters
- Year: no, yes: yearly values of the counters
- Synch. time: hh:mm: daily evaluation at the time of synchronization (applies to intermediate evaluation, day, month, year)
- Reset: yes / no: when this operating item is selected, all counters are reset.
- Memory info: Indicates how long the memory in the device will last in total. If the memory is not read out during this time, data are overwritten and thus lost.

			Display in measured value display	Display in statistics					
				Min./ Max./ Mean value for the last 7 days	Daily counter for the last 7 days	Min./ Max./ Mean value curr./last month	Counter curr./last month	Min./ Max./ Mean value curr./last year	Counter curr./last year
Identifier	**Signals**	**Number**		**7 days**	**7 days**	**2**	**2**	**2**	**2**
Analog inputs		**10**							
	scaled		X	X		X		X	
	Counter		X		X		X		X
	Totalizer		X						
Pulse inputs		**10**							
	scaled		X	X		X		X	
	Counter		X		X		X		X
	Totalizer		X						
Digital inputs		**18**							
	Status		X						
	Oper. hours		X		X		X		X
	Total oper. hours		X						
	Shift frequency		X		X		X		X
	Total shift frequency		X						
Mathematics channels		**20**							
	Status		X						
	Calculated value		X	X		X		X	
	Counter		X		X		X		X
	Totalizer		X						
Relays 1-19		**19**							
	Status		X						
Digital output		**6**							
	Status		X						
Miscellaneous			**4**						

			Display in measured value display	Display in statistics					
				Min./ Max./ Mean value for the last 7 days	Daily counter for the last 7 days	Min./ Max./ Mean value curr./last month	Counter curr./last month	Min./ Max./ Mean value curr./last year	Counter curr./last year
Identifier	**Signals**	**Number**		**7 days**	**7 days**	**2**	**2**	**2**	**2**
	Date		X						
	Time		X						
	Date+Time		X						

Signal evaluation

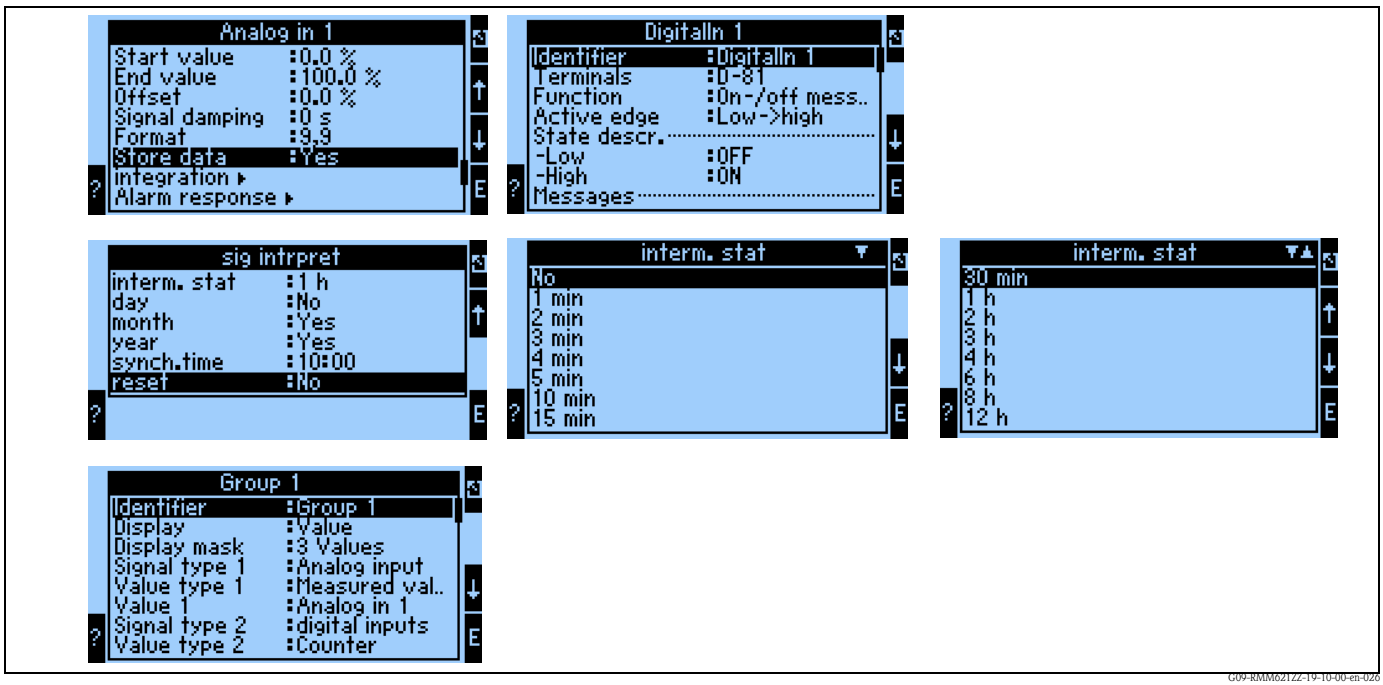


Fig. 43: Configuration of the signal evaluation

Counter evaluation:

Yes: storage of the counter readings as per stored interval

Signal evaluation:

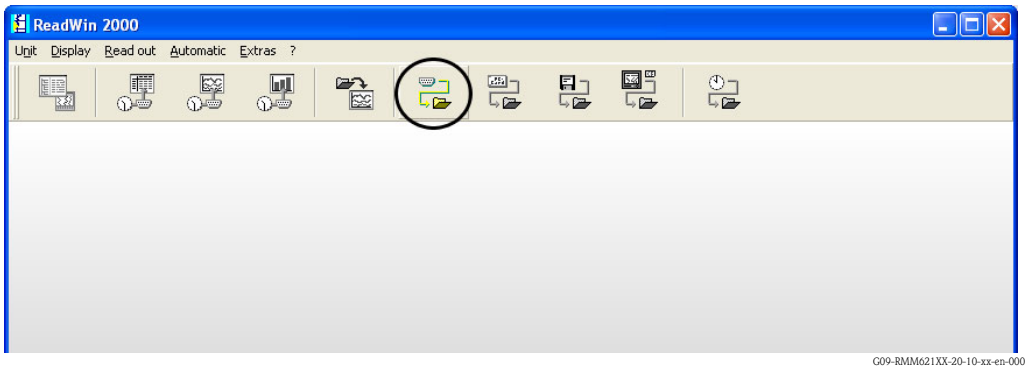
Setting, which specifies how the signals are to be evaluated:
- Intermediate evaluation: here you can specify at what interval the values are to be stored (no=no intermediate evaluation, 1, 2, 3, 4, 5, 10, 15, 30 min, 1, 2, 3, 4, 6, 8, 12h)
- Day: no, yes
- Month: no, yes
- Year: no, yes
- Synch. time: hh:mm: daily evaluation at the time of synchronization (applies to intermediate evaluation, day, month, year)
- Reset: no, intermediate evaluation, day, month, year, all counters are reset when ENTER is actuated

- Memory info: Indicates how long the memory in the device will last in total. If the memory is not read out during this time, data are overwritten and thus lost.

With ReadWin® 2000:

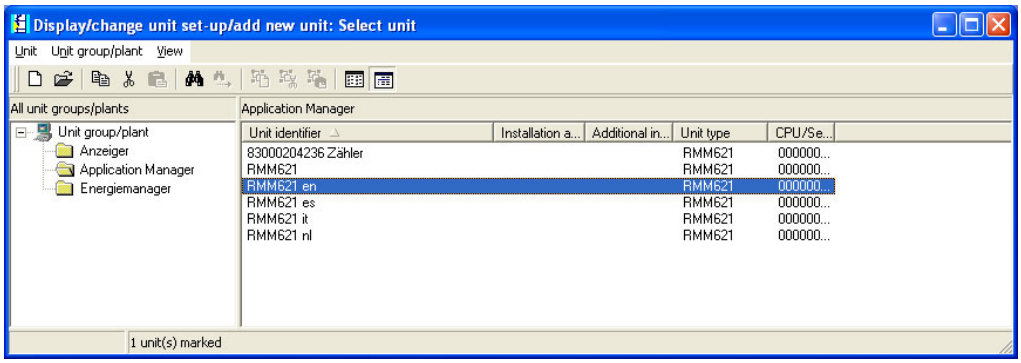
Read out measured values per interface/modem

Step 1: Start action



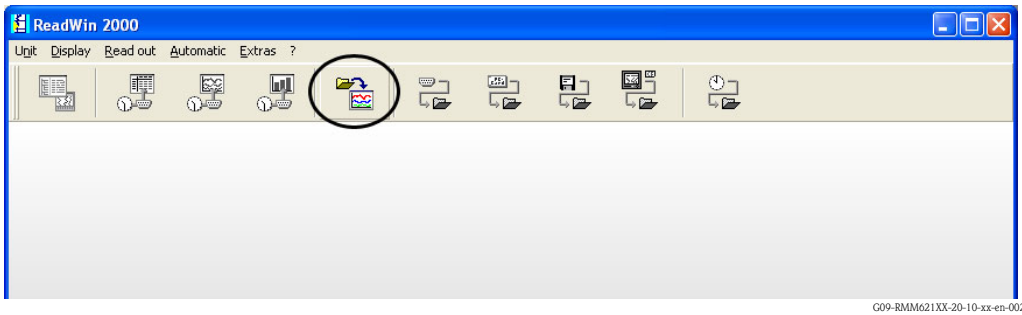
G09-RMM621XX-20-10-xx-en-000

Step 2: selection of the configuration, whose archived measured values are to be read out



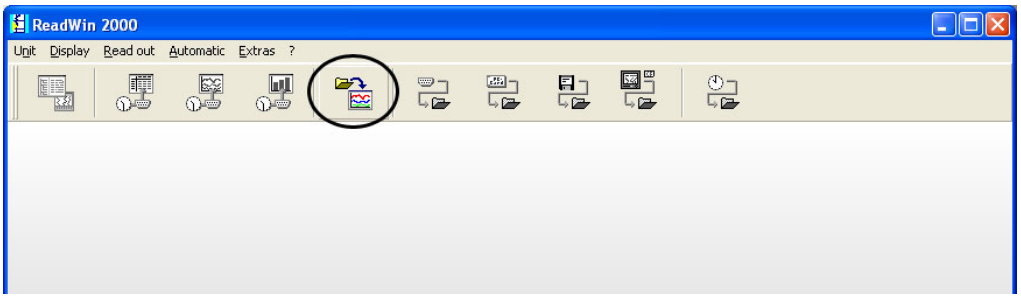
G09-RMM621XX-20-10-xx-en-001

Step 3: display read-out measured values

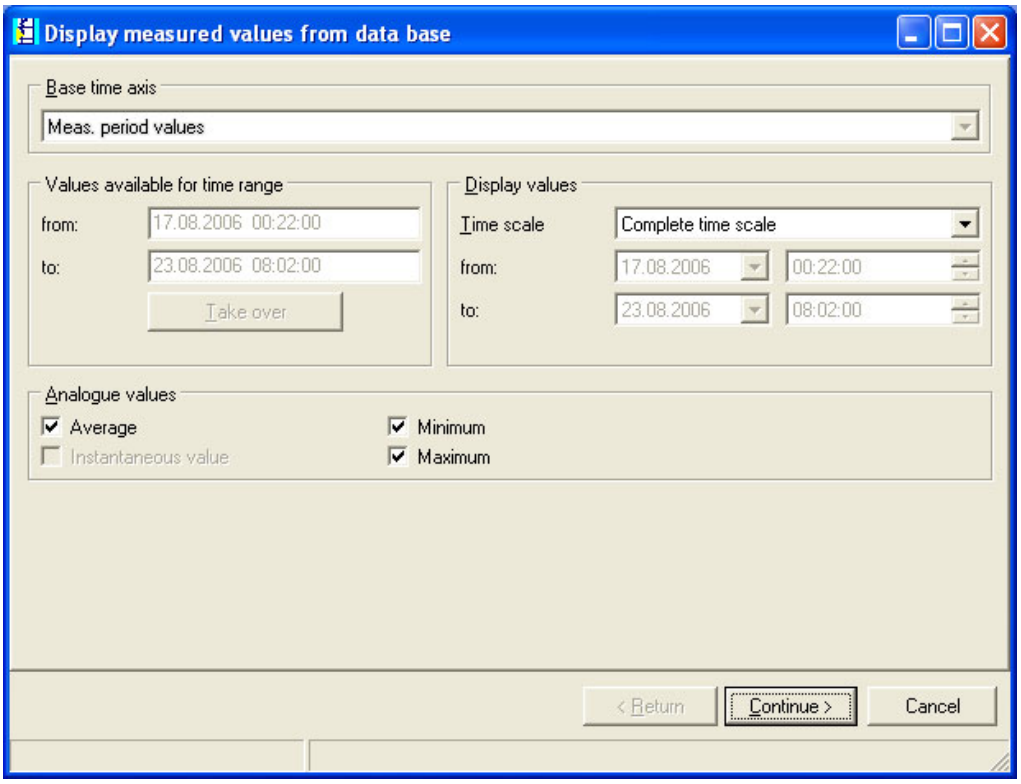


G09-RMM621XX-20-10-xx-en-002

Step 4: configuration of the output and selection of the desired values

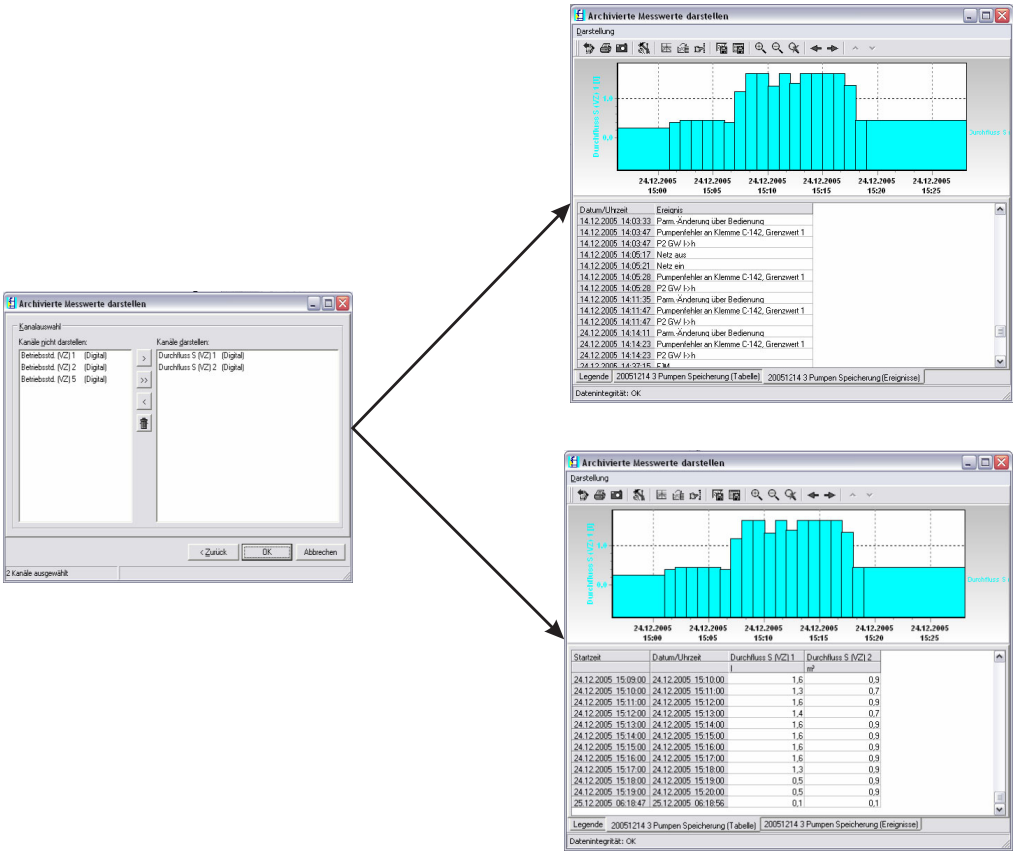


G09-RMM621XX-20-10-xx-en-002



G09-RMM621XX-20-10-xx-en-004

Step 5: display of the read-out values as bargraph, measured value table and the accumulated events



G09-RMM621XX-20-10-xx-en-008

Telealarm configuration

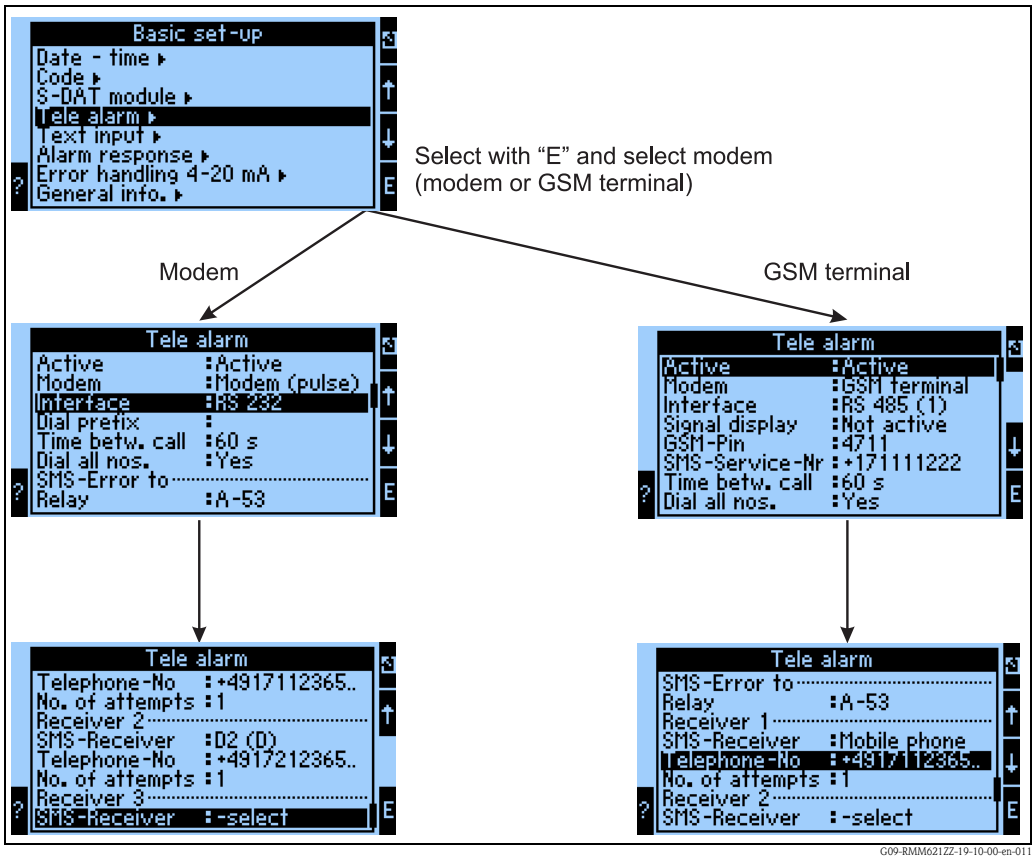


Fig. 44: Telealarm configuration at the RMM621 onsite

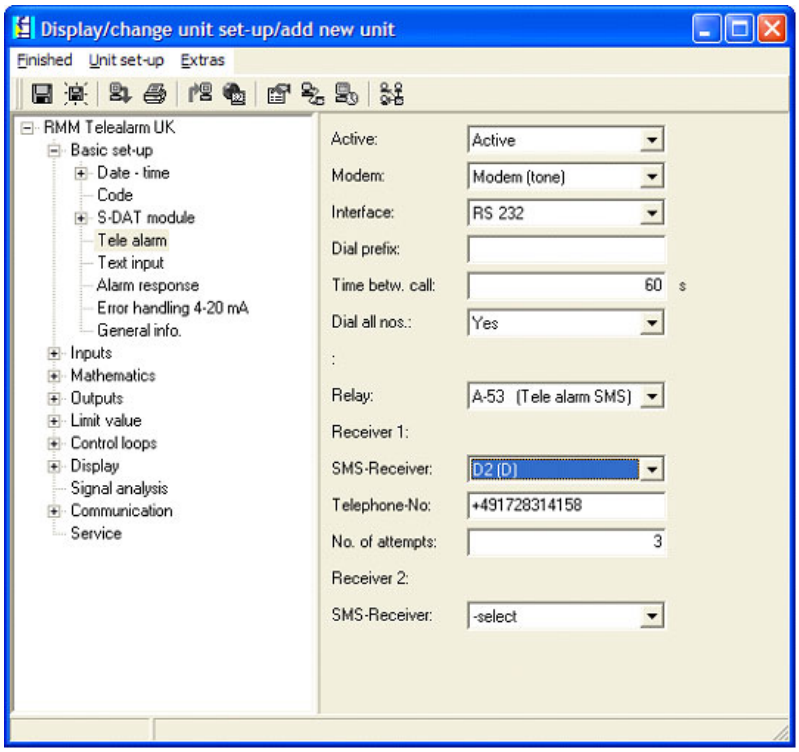
The "Telealarm" function is used for forwarding alarms, e.g. to a cellular phone or to a PC; this function is configured in the basic setup. For example, the following are configured here:

- Which modem type
  - – GSM terminal,
  - – Modem (pulse dialing method) or
  - – Modem (tone dialing method)

  is used,
- Which interface with which baudrate is used
- Whether exchange line seizure is necessary (not for GSM)
- Signal dis.: display of the signal strength - above all for testing in the event of transmission difficulties (only for GSM)
- SMS Service No.: number of the SMS gateway of the mobile network operator (only for GSM)
- Pause: a defined waiting time is maintained between 2 transmission attempts
- Should all numbers defined in the sequence be dialed? i.e. if it was not possible to reach the first defined number, then the second number is used, etc.
- SMS-Err.terminal: if it was not possible to transfer an SMS correctly to the modem, then a relay can be switched to activate an external system to display the problem.
- Receiver 1: cellular phone or PC software (for GSM), or D1 (D) or cellular phone (for modem)
- Telephone no. 1: "+"country code, followed by the telephone number of the desired participant
- Number of attempts before the next participant is to be dialed.

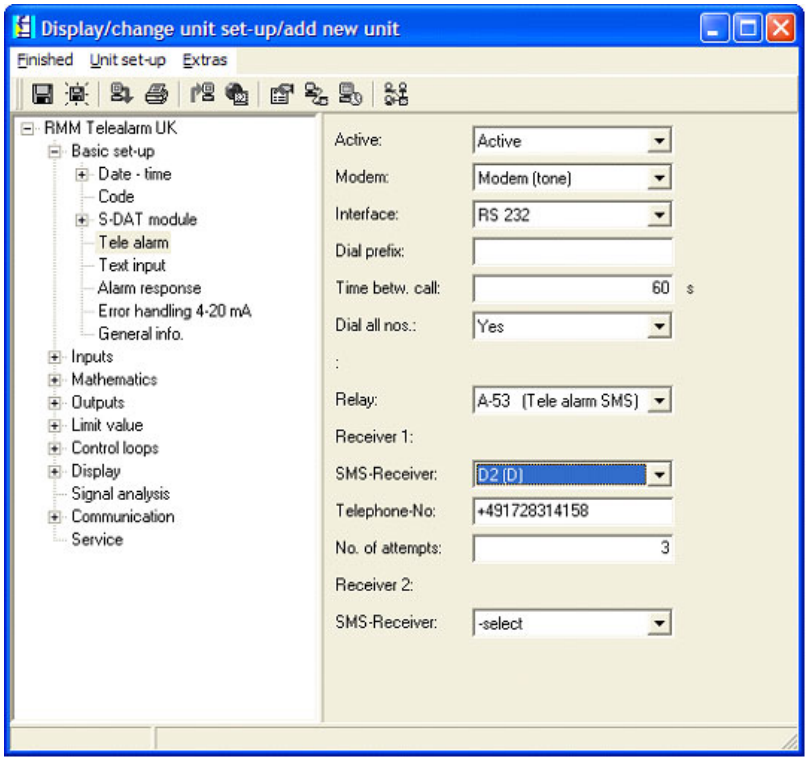
The same configuration using ReadWin® 2000 is displayed below; the individual steps correspond to those of the "Telealarm configuration: at RMM621 on site" (see Fig. 44)

Telealarm configuration in ReadWin® 2000



G09-RMM621XX-20-10-xx-en-018

Fig. 45: Configuration of Telealarm for modem with tone dialing in ReadWin® 2000



G09-RMM621XX-20-10-xx-en-019

Fig. 46: Configuration of Telealarm for modem with pulse dialing in ReadWin® 2000

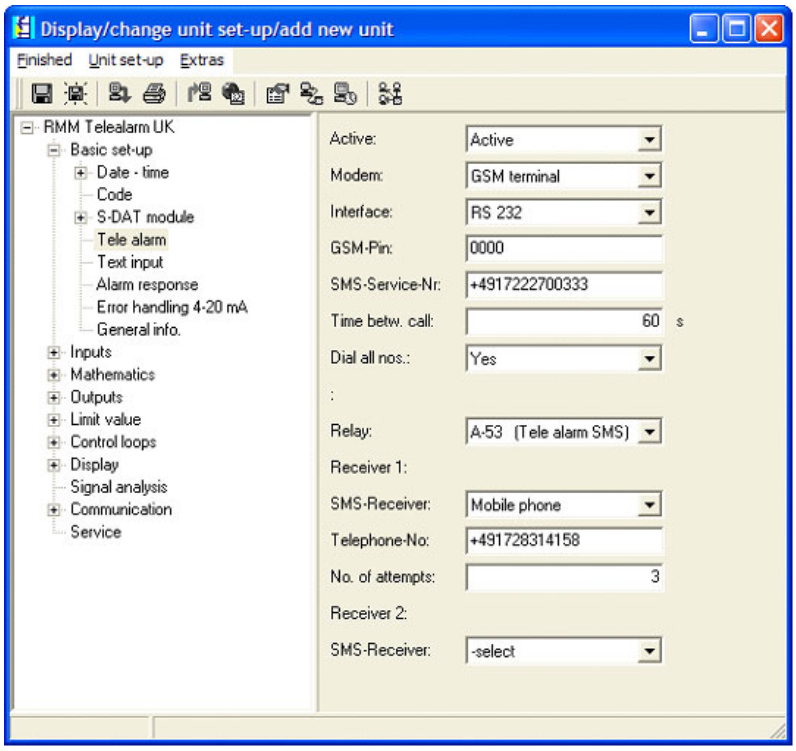


Fig. 47: Configuration of Telealarm for GSM terminal in ReadWin® 2000

The following illustrations describe how the connection is established:

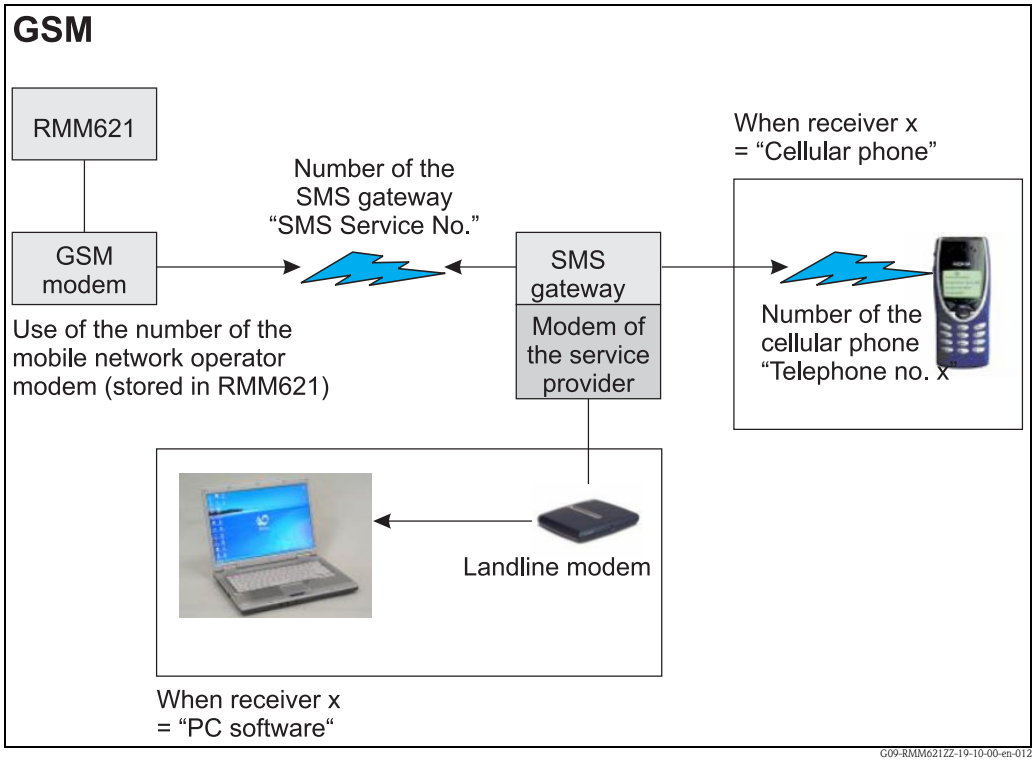


Fig. 48: Communication with cellular phone (SMS) via GSM modem (at RMM621) and SMS gateway, or modem of the service provider

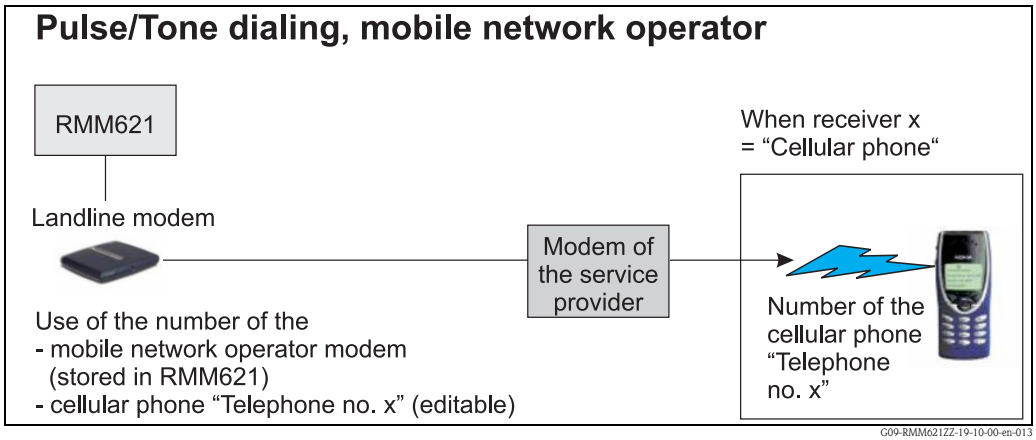


Fig. 49: Communication with cellular phone (SMS) via modem of the service provider

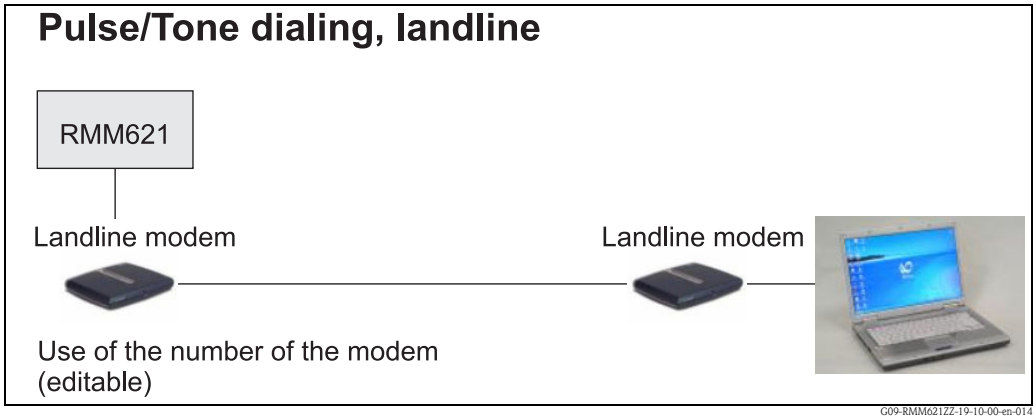


Fig. 50: Communication with PC (e.g. ReadWin® 2000)

Communication

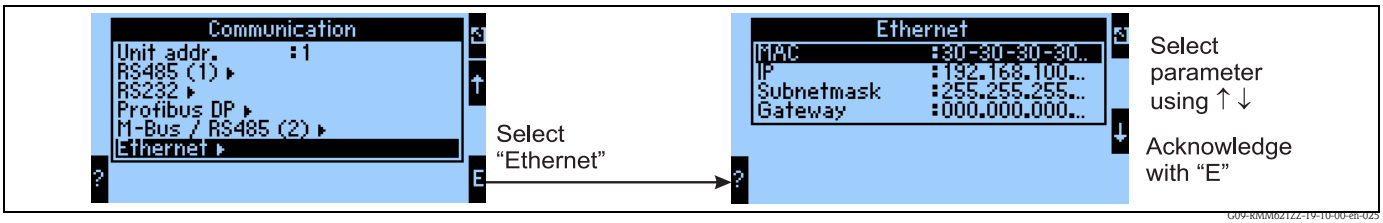


Fig. 51: Configuration of the Ethernet interface

- Configuration of the MAC address: is already permanently stored in the delivery status of the device, cannot be changed, is uniquely assigned to the device
- IP address: configuration of the IP address – is usually issued by the system administrator of the local network
- Subnet mask: Enter the subnet mask (you can obtain this from your network administrator). The subnet mask must be entered if the device is intended to establish connections into another partial network. Specify the subnet mask of the partial network, in which the device is located (e.g. 255.255.255.000). Please note: the class of network is determined by the IP address. This results in a default subnet mask (e.g. 255.255.000.000 for a Class B network).
- Gateway: Enter the gateway (you can obtain this from the network administrator). Enter the address of the gateway here if connections into other networks are to be established.

7 Formula editor

7.1 General information

- The formula can consist of "analog" and "digital" parts. The operators and functions described below are available.
- Mathematics channels can be cascaded one below the other, i.e. the result of the first calculation can continue to be used for the next calculation. However, it is only possible to use the calculated values of a "previous" channel (e.g. maths channel 3 can access the results of maths channels 1 and 2, but not maths channels 4 to 8).
- The formula entered can be max. 250 characters long.

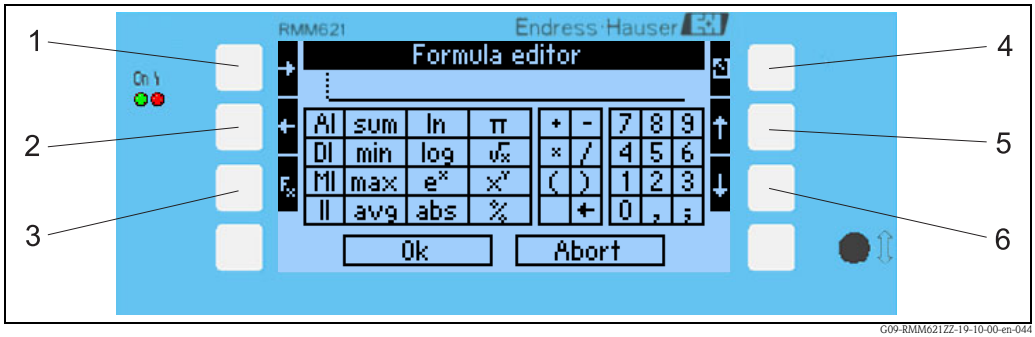


Fig. 52: RMM621 Formula Editor

1) Move cursor to the right
2) Move cursor to the left
3) Switch between the available mathematics functions
4) Back to the menu of the mathematics channel
5) Move cursor upwards
6) Move cursor downwards

7.1.1 The formula editor in the PC operating software

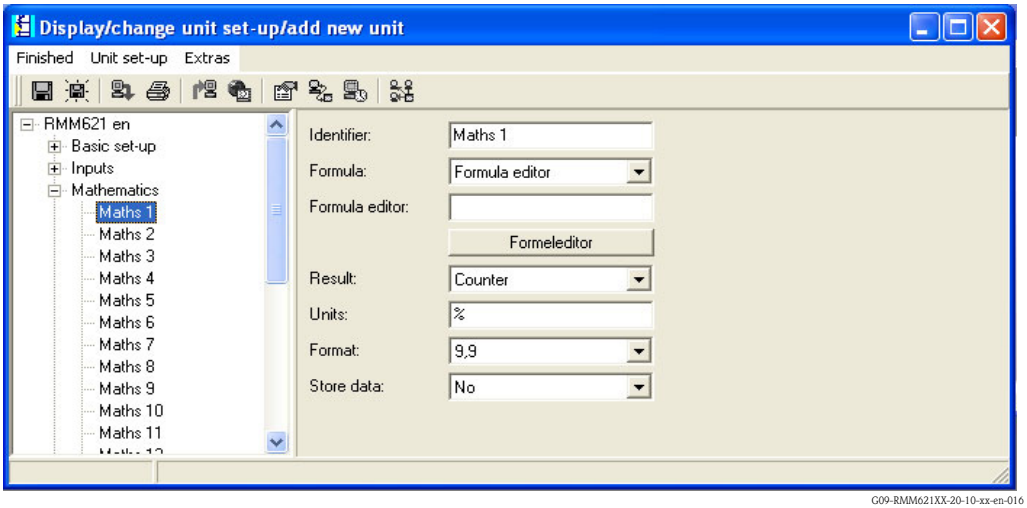


Fig. 53: Call the formula editor in the PC operating software

If the entry "Formula editor" was selected in the Formula menu item, a row appears with the formula currently used. If the field is empty, no formula has yet been defined for the mathematics channel. The button for opening the formula editor appears beneath this row. Clicking this button opens the following window.

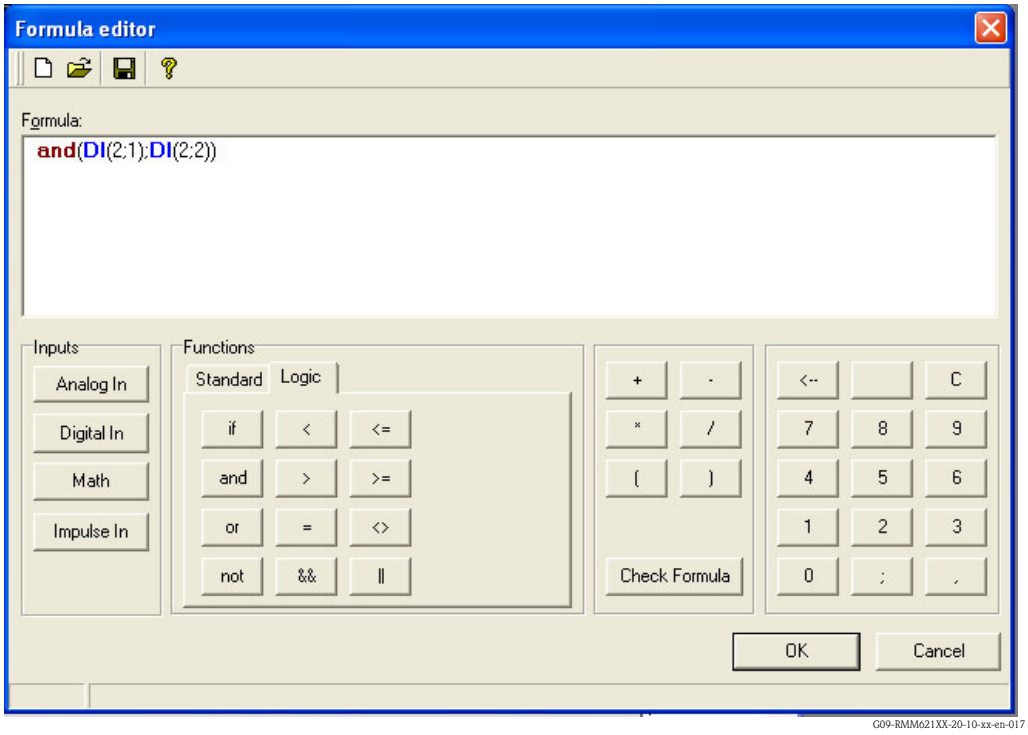


Fig. 54: Formula editor in the PC operating software

A formula with up to 250 characters can be created with the aid of this editor. Once the formula is ready, the Test Formula function can be used to check whether the formula entered is correct. If this test is positive, the editor can be exited with OK and the formula entered is accepted.

7.2 Inputs

Inputs are described within the formula using the following syntax:
Type of input (signal type ; channel number)

Types of input:

Type	Description
AI	Analog inputs
DI	Digital inputs (*)
MI	Mathematics channels
II	Pulse inputs (*)

(*): The "Application Manager" differentiates between digital inputs and pulse inputs. These inputs are combined in other devices.

Note!
If the scaling for an input has been changed and if this input is then used in the formula editor, an error message "" can occur.
Proceed as follows here:
- First configure the inputs
- Then exit the Setup (=> the inputs are configured as per the setting)
- Then start Setup again and enter the formula.

Note!
The available types are device-dependent (i.e. not available for all devices) or dependent on the device options.

Signal type:

Type	Description
1	Current value (measured value)
2	Status
3	Counter/operating time

Note!
The available signal types are device-dependent, i.e. not available for all devices.

Channel number: Analog channel 1 = 1, Analog channel 2 = 2, Digital channel 1 = 1, …

Examples:
DI(2;4) → status of digital channel 4
AI(1;1) → the current value of analog channel 1

7.3 Priority of operators/functions

The formulae are processed according to the universally valid mathematical rules:
- Brackets first
- Powers have precedence over multiplications
- Point has precedence over dash
- Calculate from left to right.

7.4 Operators

7.4.1 Arithmetic operators

Operator	Function
+	Addition
-	Subtraction / negative algebraic sign
*	Multiplication
/	Division
%	Modulo (remainder of the division x/y) see also "mod" function
^	x to the power of y

7.4.2 Relational operators

Operator	Function
>	greater than
>=	greater than or equal to
<	less than
<=	less than or equal to
=	equal to
<>	unequal to

7.4.3 Linking operators

Function	Syntax	Description	Example
||	Value1 || Value2	logic "or" (see also "or" function)	DI(2;1) || DI(2;2)
&&	Value1 && Value2	logic "and" (see also "and" function)	DI(2;1) && DI(2;2)

7.5 Functions

7.5.1 Standard functions

Function	Syntax	Description	Example
ln	ln(number)	Returns the natural logarithm of a number. Natural logarithms have the constant e (2.71828182845904) as their basis. For values ≤ 0, the result is undefined. The device continues to work with 0.	ln (86) = 4.454347
log	log(number)	Calculates the logarithm of the argument to a basis of 10. For values ≤ 0, the result is undefined. The device continues to work with 0.	log (10) = 1
exp	exp(number)	Exponentiates the basis e with the number specified as the argument. The constant e is the basis of the natural logarithm and has the value 2.71828182845904.	exp (2.00) = 7.389056
abs	abs(number)	Returns the absolute value of a number. The absolute value of a number is the number without its algebraic sign.	abs (-1.23) = 1.23
pi	pi()	Delivers the value of the number PI (3.14159265358979323846264)	
sqrt	sqrt(number)	sqrt calculates the positive square root of the "number" argument. For negative values, the result is undefined. The device continues to work with 0.	sqrt (4) = 2
mod	mod(number;divisor)	Returns the remainder of a division. The result has the same algebraic sign as the divisor. If the divisor has the value 0, the result is undefined. The device continues to work with 0.	mod (5; 2) = 1
x^y	pow(number;power)	Returns an exponentiated number as the result.	pow (2, 3) = 2^3 = 8

7.5.2 Trigonometric functions

Function	Syntax	Description	Examples
rad	rad(number)	Conversion of degrees to radians	rad (270) = 4.712389
degrees	degrees(number)	Conversion of radians to degrees	degrees (pi()) = 180

The following functions expect an angle in radians as the argument. If the angle is specified in degrees, it has to be converted to radians by multiplying it by pi()/180. Alternatively, the "rad" function can also be used.

Function	Syntax	Description	Examples
sin	sin(number)	Returns the sinus of a number.	sin(pi()) → Sinus of pi radians sin(30*pi()/180) → Sinus of 30 degrees (0.5)
cos	cos(number)	Returns the cosine of a number.	cos(1.047) = 0.500171
tan	tan(number)	Returns the tangent of a number.	tan(0.785) = 0.99920

The following functions output the returned angle in radians with a value between -pi/2 and pi/2. If the result is to be expressed in degrees, the respective result must be multiplied by 180/pi() or the "degrees" function must be used.

Function	Syntax	Description	Examples
asin	asin(number)	Returns the arc sine or reversed sinus of a number (inverse function). The arc sine expects a real argument in a range of -1 to +1. When values outside of this range are used, the device continues to work with 0.	arcsin(-0.5) = -0.5236 arcsin(-0.5)*180/pi() = -30°
acos	acos(number)	Delivers the arc cosine or reversed cosine of a number (inverse function. Arc cosine expects a real argument in a range of -1 to +1. When values outside of this range are used, the device continues to work with 0.	arccos(-0.5) = 2.094395
atan	atan(number)	Returns the arc tangent or reversed tangent of a number. (inverse function)	atan (1) = 0.785398

7.5.3 Logic functions

Function	Syntax	Description	Example
if	if(Check; Then_Value; Otherwise_Value)	Check is any value or expression, the result can be TRUE or FALSE. This argument can adopt any relational calculating operator. Then_Value is the value that is returned when the check is TRUE. Otherwise_Value is the value that is returned when the check is FALSE.	if(x>10;1;0) If the value x is greater than 10, the function returns 1; otherwise 0.
or	or(true1;true2)	Returns TRUE if an argument is TRUE. Returns FALSE if all arguments are FALSE. ✎ Note! see also Operator "||";	or(2>1;3>2) = true or(2<1;3>2) = true or(2<1;3<2) = false
and	and(true1;true2)	Returns TRUE if both arguments are TRUE. If one of the arguments is FALSE, this function returns the value FALSE. ✎ Note! see also Operator "&&"	and(2>1;3>2) = true and(2<1;3<2) =false
not	not(logical value)	Inverts the value of an argument. NOT can be used prevent a value from matching a certain value.	not(false) = true

7.5.4 Range functions

The XX in the following functions stands for one of the types of input described under Section 7.2 "Inputs". Range functions can only ever be executed via a type of input.

Function	Syntax	Description	Example
sumXX	sumXX(Type;From; To)	Adds up the values for the specified range of the input signals. Type: Signal type (see Inputs) From: channel number from which adding up is to begin ;(0 = Channel 1) To: channel number up to which adding up is to be performed (0 = Channel 1)	sumXX (1;2;5) = sum of all current values from channel 2 to 5
avgXX	avgXX(Type;From;To)	Calculates the mean value for the specified range of the input signals.	avgXX(1;1;6)
minXX	minXX(Type;From;To)	Delivers the smallest value for the specified range of the input signals.	minXX(1;1;6)
maxXX	maxXX(Type;From; To)	Delivers the largest value for the specified range of the input signals.	maxXX (1;1;6)

7.6 Decimal point

Both the decimal comma and the decimal point can be used in the formula editor. Symbols indicating thousands are not supported.

7.7 Inspecting the validity of a formula / Failsafe mode

Before the entered formula is used, its validity is checked. A formula is invalid, for example, if:
- The channels used are not switched on or they are in the wrong operating mode (is not checked during entry because the user may switch on the channel later)
- It contains invalid characters/formulae/functions/operators
- Syntax errors (e.g. wrong number of parameters) occur in the formulae
- Invalid brackets are set (number of open brackets <> number of closed brackets)
- Division is performed by zero

■ A channel refers to itself (infinite recursion)

Invalid formulae are switched off when the setup is adopted or the device is started.

7.7.1 Unrecognizable errors

Where possible, errors in the formula are reported directly during entry. However, due to the possible complexity of the formula entered (e.g. multiple connected formulae, which access different input variables via "if" condition), it is not possible to detect all errors.

7.8 Examples

Formula	Description
AI(1;1)+AI(1;2)	Analog channel 1 + Analog channel 2
avgAI(1;1;4)	Mean values of all analog channels 1 to 4
if(DI(2;1);AI(1;1)+AI(1;2);AI(1;1)+AI(1;3))	If digital input 1 is "on", analog channel 1 + analog channel 2 is calculated. Otherwise, analog channel 1 + analog channel 3 is calculated

8 Maintenance

The device does not require any special maintenance and servicing work.

9 Accessories

Identifier	Order code
PC configuration software ReadWin® 2000 and serial configuration cable with 3.5 mm jack plug.	RMM621A-VK
Remote display for panel mounting 144 x 72 x 43 mm	RMM621A-AA
Protective housing IP 66 for top-hat rail devices	52010132
Profibus Interface	RMM621A-P1
Digital extension card Inputs: 2 x digital up to 20 kHz, 4x digital up to 2 Hz Outputs: 6 x SPST relays	RMM621A-DA
U-I-TC extension card Inputs: 2 x U, I, TC Outputs: 2 x 0/4 up to 20 mA/pulse, 2 x digital, 2 x SPST relays	RMM621A-MA
Temperature extension card Inputs: 2 x Pt100/500/1000 Outputs: 2 x 0/4 up to 20 mA/pulse, 2 x digital, 2 x relays	RMM621A-TA
Power extension card Inputs: 2 x 0/4 up to 20 mA/PFM/pulse with transmitter power supply unit Outputs: 2 x 0/4 up to 20 mA/pulse, 2 x digital, 2 x relays	RMM621A-UA

10 Troubleshooting

10.1 Troubleshooting instructions

Always begin troubleshooting using the following checklists if faults occur after commissioning or during operation. Different questions will guide you to the cause of the error and will suggest appropriate remedial action.

10.2 System error messages

System error messages	Cause	Remedy
"Calibration data Error Slot %c"	Calibration data set at the factory faulty/cannot be read.	Remove card and insert it again (➔ Section 3.2.1 Installing extension cards). Contact E+H Service if error message appears again.

Ring memory error messages	Cause	Remedy
"Error reading curr. read item"	Event buffer faulty, read error	Please contact E+H Service, reset of the ring memory necessary
"Error reading curr. write item"	Event buffer faulty, write error	
"Error reading curr. oldest value"		

General errors in inputs/outputs	Cause	Remedy
"Terminal not assigned!"	An unassigned terminal is to be displayed in the diagnosis menu.	Please only select terminals that are being used.
"Circuit break:Slot, terminal"	Input current at current input smaller than 3.6 mA (with setting 4 to 20 mA) or larger than 21 mA. ■ Incorrect wiring ■ Sensor malfunction ■ Incorrectly configured end value for flow transmitter	■ Check sensor configuration. ■ Check function of the sensor. ■ Check end value of the connected flow meter. ■ Check wiring.
"Range violation; Circuit break ok:Slot, terminal"	3.6 mA < x < 3.8 mA (with setting 4 to 20 mA) or 20.5 mA < x < 21 mA ■ Incorrect wiring ■ Sensor malfunction ■ Incorrectly configured end value for flow transmitter	■ Check sensor configuration. ■ Check function of the sensor. ■ Check end value of the connected flow meter. ■ Check wiring.
"Pulse buffer overflow"	Too many pulses accumulated so the pulse counter overflows: pulses lost.	Increase pulse factor
"Range violation: Slot, terminal"	3.6 mA < x < 3.8 mA (with setting 4 to 20 mA) or 20.5 mA < x < 21 mA ■ Incorrect wiring ■ Sensor malfunction ■ Incorrectly configured end value for flow transmitter	■ Check sensor configuration. ■ Check function of the sensor. ■ Check end value of the connected flow meter. ■ Check wiring.
"Signal range violation Slot, terminal"	Current output signal below 3.6 mA or above 21 mA.	■ Check whether the current output is scaled correctly. ■ Change the start and/or end value of the scaling

S-Dat module	Cause	Remedy
"Error when writing the counter readings and/or operating data to the S-DAT module!"	Error when reading data into or out of the S-Dat module	Detach S-Dat module and attach it again. If necessary, contact your local E+H Service organization.
"No S-DAT module present or no data present in the S-DAT module!"	Error when reading data into or out of the S-Dat module	Detach S-Dat module and attach it again. If necessary, contact your local E+H Service organization.
"S-DAT module comes from another device. Adopt the data anyway?"	Error when reading data into or out of the S-Dat module	Detach S-Dat module and attach it again. If necessary, contact your local E+H Service organization.
"Error reading the operating data from the S-DAT module!"	Error when reading data into or out of the S-Dat module	Detach S-Dat module and attach it again. If necessary, contact your local E+H Service organization.
"Error reading the counter readings from the S-DAT module!"	Error when reading data into or out of the S-Dat module	Detach S-Dat module and attach it again. If necessary, contact your local E+H Service organization.

10.3 Process error messages

Error messages during setup	Cause	Remedy
"Invalid date!"	Date entered is incorrect	Correction of the values entered
"Invalid time!"	Time entered is wrong	Correction of the values entered
"Start and end value must not be the same!"	The same value has been entered for the upper and lower limits of the scaling of an input/output	Please check the values of your scaling of inputs/outputs: have the same values been entered in the start/end value editing field? If this is the case, please correct the values.
"Text must contain min. 1 character!"	A text field has not been edited.	Please check your text fields: have texts been entered at all relevant positions? For example, has an error message been entered for a configured telealarm? If this is not the case, then the specified error message is output.
"Delta t must lie between 0 and 60 s!"	When specifying the gradient, an incorrect time Δt has been entered.	Enter the value according to the value limits.
"It was not possible to read out the operating data. The standard values will be used."	The stored operating data cannot be read because format is different.	Reconfigure the device because the format the software is expecting does not match the actual present format. If the error also occurs after reconfiguration, please contact E+H Service.
"No values defined for the display. Configure via Setup ➔ Display ➔ Group	In a display group that is to be shown, no value has been specified that is to be output.	Please check your display groups: are correct values entered in all groups that are to be displayed? If, for example, a value is to be output for analog input 1 but it is not configured, then this error message appears. Another reason could be that no integration has been specified for analog input 1 but an associated counter value is to be displayed.

Table entry	Cause	Remedy
"Table contains double values in the 1st column. Please correct the value or delete the line."	Faulty table (e.g. for the linearization)	Please check the values of your linearization table: are double values contained in the first column? If this is the case, then please correct one of the two values, or delete all of them that are contained a number of times in the table except for one line.

Table entry	Cause	Remedy
"Maximum number of lines reached. No more lines can be added."	An attempt has been made to enter more lines into a table than is intended for the table	Please check whether all cells that have been entered so far are necessary; remove redundant lines, for example, if ■ Line 1: 4mA —> 0m ■ Line 2: 8mA —> 10m ■ Line 3: 12mA —> 20m Then the line with the 8mA as input signal can be omitted because the RMM621 automatically calculates the pair of values 8mA —> 10 due to the contained interpolation of intermediate values. This enables you to save on a line in the table and use it for another pair of values.
"Minimum number of lines (2) reached. No more lines can be deleted."	An attempt has been made to reduce the number of lines in a table to less than 2.	Since the RMM621 can no longer perform the interpolation of intermediate values correctly when the number of lines < 2, this error message is output. Please refrain from deleting any more lines. Since there is no point in having a table with less than 2 lines, deactivate the table, so that the functions associated with it are no longer executed.

Error messages of the formula editor	Cause	Remedy
"Error in formula"	General error in a mathematical formula	Please check the formulae that you have entered using the formula editor. When doing so, please observe the guidelines described in the Section on Configuration of the mathematics channels.
"'From' channel must be less than or equal to the 'To' channel"	The parameters of a function are not correctly specified	If, for example, the sum of several analog channels is calculated, then the first channel identifier must be < the last channel identifier: **Incorrect:** SUM(AI5; AI1) **Correct:** SUM(AI1; AI5) ➔ this maps the sum of the analog inputs AI1, AI2, AI3, AI4, AI5
Standard functions cannot be deleted!	The formula stored in the device contains standard functions that cannot be deleted	Please check the formula that you have edited
Invalid number of parameters!	An invalid number of parameters has been used in the formula	Please check the number of parameters in your formula
Insufficient memory!	The memory of the device is not enough for the desired function	Check your formula to see whether it can be optimized (e.g. by factoring out) to reduce the required memory space
Too many parameters!	Too many parameters have been entered for the function.	Check the number of parameters that are transferred to a function, e.g. a decade logarithm can only contain one parameter
Invalid operator!	An operator has been specified, which is not permitted in the function	Please check that your formula is correct
Formula buffer has been destroyed!	The formula entered has been destroyed / is no longer correct	Restart the device and reenter the formula, if necessary. If the error occurs again, then please contact E+H Service
Size estimate of the memory: insufficient memory!	The length of the formula/table or the quantity of the data that is to be saved exceeds the memory capacity of the device	Please check your formula (max. length: 255 characters/formula), the size of the tables used (for max. size, see list of operating parameters) and the number of values to be saved: is reduction/optimization possible, e.g. is a longer memory interval possible?

Error messages of the formula editor	Cause	Remedy
Missing operand	No operand has been specified in the stored formulae.	Please add the operand.
Number of opening and closing brackets is not equal!	Too few / too many brackets have been closed in a formula	Check your formulae: does the number of opened brackets match the number of closed brackets? If necessary, correct the brackets in the equation
Error in the syntax of the formula!	Syntax error in the formula entered	Please check your formula: for example, is there another summand after a "+", have the correct parameters been used?
Error in the function!	General error in the function	Please check your formula.
Too few parameters!	Too few parameters have been entered for the function.	Check the number of parameters that are transferred to a function, e.g. a decade logarithm must only contain one parameter
Division by 0!	A value = 0 was the result for a denominator in an equation.	Check the configured error handling: if, for example, a constant value is to be used for further calculation in the event of a circuit break of an input whose value is contained in the denominator of a division, then please set it to a value not equal to 0.

Telealarm error messages	Cause	Remedy
"SMS sent successfully"	Not an error message. Is only entered in the event list in event of OK.	
"'SMS could not be sent to all configured recipients"	The SMS-Service-Center/SMS recipient could not be reached, e.g. because an incorrect number is/ was set.	Please check the telephone number configured and contact your Service Provider where necessary.

10.4 Spare parts

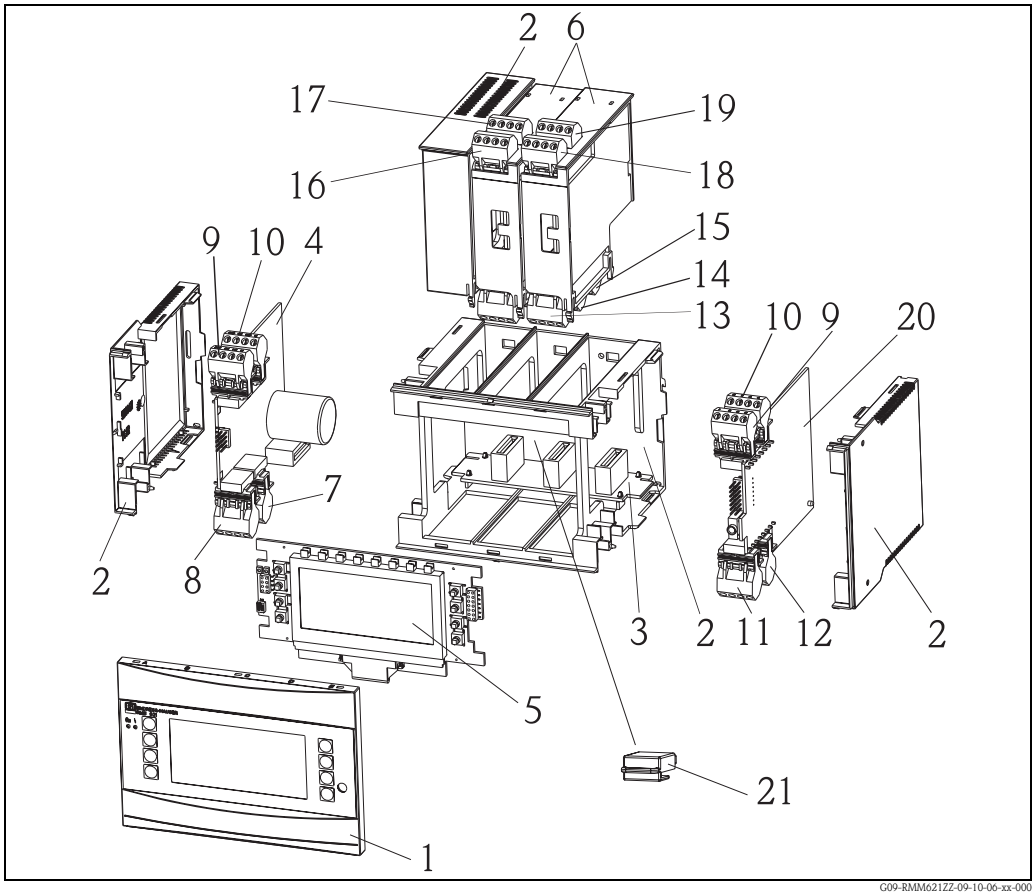


Fig. 55: RMM621 spare parts

Item No..	Identifier	Description	Order number
1	Front	Front cover for version without display	RMM621X-HA
		Front cover for version with display	RMM621X-HB
2	Housing	Housing cpl.without front+3x dummy plug-in+3x plug-in frame for board	RMM621X-HC
3	Bus board	Bus board	RMM621X-BA
4	Power unit	Power unit 90-253VAC	RMM621X-NA
		Power unit 20-36VDC/20-28VAC	RMM621X-NB
		Power unit 90-253VAC/ATEX version	RMM621X-NC
		Power unit 20-36VDC/20-28VAC/ATEX version	RMM621X-ND
5	Display	Display cpl. non Ex	RMM621X-DA
		Front board, version without display, non Ex	RMM621X-DB
		Display + front cover, non Ex	RMM621X-DC
		Display + front cover, neutral, non Ex	RMM621X-DD
		Display cpl. Ex	RMM621X-DE
		Front board, version without display, Ex	RMM621X-DF
		Display + front cover, Ex	RMM621X-DG
		Display + front cover, neutral, Ex	RMM621X-DH

Item No..	Identifier	Description	Order number
6	Extension cards	Extension card temperature (Pt100/Pt500/Pt1000) cpl. incl. terminals+fixing frame	RMM621A-TA
		Extension card temp. ATEX approved (Pt100/500/1000) cpl. incl. terminals	RMM621A-TB
		Extension card universal (PFM/pulse/analog/loop power) cpl. incl. terminals +fixing frame	RMM621A-UA
		Extension card univ. ATEX approved (PFM/pulse/analog/loop power) cpl. incl. terminals	RMM621A-UB
		Extension card 2x U,I,TC, outp. 2x0/4-20mA/pul., 2xdig., 2x rel. SPST	RMM621A-CA
		Extension card 2xU, I, TC, 2x U,I,TC ATEX, outp. 2x0/4mA/pul., 2xdig., 2x rel. SPST	RMM621A-CB
		Extension card digital, 6x dig. in, 6x rel. out, cpl. incl. terminals + fixing frame	RMM621A-DA
		Extension card dig., ATEX approved, 6x dig. in, 6x rel. out, cpl. incl. terminals	RMM621A-DB
7	Supply terminal	Plug-in supply terminal, 4-pin	51000780
8	Relay terminal / loop power	Plug-in terminal, 4-pin SMSTB2,5 91/92/53/52 Relay terminal / loop power	51004062
9, 10	Analog terminal	Plug-in terminal, 4-pin SMSTB2,5 82/81/10/11 Analog terminal 1 (PFM/pulse/analog/loop power)	51004063
		Plug-in terminal, Ex, 4-pin SMSTB2,5 82/81/10/11 Analog terminal 1 (PFM/pulse/analog/loop power)	51005957
		Plug-in terminal, 4-pin SMSTB2,5 83/81/110/11 Analog terminal 2 (PFM/pulse/analog/loop power)	51004064
		Plug-in terminal, 4-pin Ex 83/81/110/11 Analog terminal 2 (PFM/pulse/analog/loop power)	51005954
11	Terminal RS485	Plug-in terminal, 4-pin SMSTB2,5 104 to 101 Terminal RS485	51004065
12	Output terminal	Plug-in terminal, 4-pin SMSTB2,5 134 to 131 Output terminal (analog/pulse)	51004066
13	Relay terminal/ extension card	Plug-in terminal, RMx621 relay	51004912
14, 15	Extension card / output terminal	Plug-in terminal RMX621 dig./open collector	51004911
		Plug-in terminal, 4-pin SMSTB2,5 134 to 131 Output terminal (analog/pulse)	51004066
		Plug-in terminal, 4p RMM621 dig. outp. I	51010524
		Plug-in terminal, 4p RMM621 dig. outp. II	51010525
		Plug-in terminal, 4p RMM621 dig. outp. III	51010519

Item No..	Identifier	Description	Order number
16, 17, 18, 19	Extension card / input terminal	Plug-in terminal RMx621, input 1, RTD (Pt100/Pt500/Pt1000)	51004907
		Plug-in terminal, Ex, RMx621, input 1, RTD (Pt100/Pt500/Pt1000)	51005958
		Plug-in terminal RMx621, input 2, RTD (Pt100/Pt500/Pt1000)	51004908
		Plug-in terminal, Ex, RMx621, input 2, RTD (Pt100/Pt500/Pt1000)	51005960
		Plug-in terminal RMx621, input 1,4-20mA PFM, pulse, loop power	51004910
		Plug-in terminal, Ex, RMx621, input 1,4-20mA PFM, pulse, loop power	51005959
		Plug-in terminal RMx621, input 2,4-20mA PFM, pulse, loop power	51004909
		Plug-in terminal, Ex, RMx621, input 2,4-20mA PFM, pulse, loop power	51005953
		Plug-in terminal, 4p RMM621 dig. inp. blue	51010521
		Plug-in terminal, 4p RMM621 dig. inp. gray	51010520
		Plug-in terminal, 4p RMM621 inp. II blue	51010523
		Plug-in terminal, 4p RMM621 inp. II gray	51010522
		Plug-in terminal, 4p RMM621 UITC I blue	71005489
		Plug-in terminal, 4p RMM621 UITC I gray	71005487
		Plug-in terminal, 4p RMM621 UITC II blue	71005492
		Plug-in terminal, 4p RMM621 UITC II gray	71005491

Item No. 20	CPU board	RMM621C-

	Version:	
	A	Non-hazardous area
	B	ATEX approvals
	C	FM ASI I, II, III/1/ABCDEFG
	D	CSA (Ex ia) I, II, III/1/ABCDEFG

		Operating language:	
		A	German
		B	English
		C	French
		D	Italian
		E	Spanish
		F	Dutch

			Device software:	
			AA	Mathematics
			AB	Mathematics + telealarm
			YY	Special version, to specify

RMM621C-				⇐ Order code (part 1)

				Communication:	
				1	1x RS232+1x RS485
				5	1xRS232+2xRS485
				A	1x RS232+1x RS485+Ethernet Conversion to Ethernet only possible following consultation with E+H
				E	1xRS232+2xRS485+Ethernet Conversion to Ethernet only possible following consultation with E+H

					Version:	
					A	Standard

RMM621C-						⇐ Order code (complete)

Item No. 21	S-Dat module	RMM621S-
	Software	
	1	Standard software
		Version
		A	Standard version
RMM621S-	1	A	⇐ Order code

10.5 Return

For a return, e.g. in case of repair, the device must be sent in protective packaging. The original packaging offers the best protection. Repairs must only be carried out by your supplier's service organization. An overview of the service network can be found on the address page of these Operating Instructions.

Note!
When sending for repair, please enclose a note with a description of the error and the application.

10.6 Disposal

The device contains electronic components and must, therefore, be disposed of as electronic waste in the event of disposal. Please also observe local regulations governing disposal.

11 Technical data

11.0.1 Input

Measured variable	Voltage (analog and digital input), current (analog input), PFM, pulse
Input signal	Any measured variables (e.g. flow, level, pressure, temperature, density), implemented as analog signal

Measuring range

Measured variable	Input		
Current	■ 0/4 to 20 mA +10% overreach ■ Max. input current 150 mA ■ Input impedance < 10 Ω ■ Accuracy 0.1% of full scale value ■ Temperature drift 0.04% / K (0.022%/ °F) ■ Signal damping low filter 1st order, filter constant adjustable 0 to 99 s ■ Resolution 13 bit		
Current (U-I-TC card)	■ 0/4 to 20 mA +10% overreach ■ Max. input current 80 mA ■ Input impedance = 10 Ω ■ Accuracy 0.1% of full scale value ■ Temperature drift 0.01%/ K (0.0056%/ °F)		
PFM	■ Frequency range 0.01 Hz to 18 kHz ■ Signal level – low: 2 to 7 mA; – high: 13 to 19 mA ■ Measurement method: period length/frequency measurement ■ Accuracy 0.01% of measured value ■ Temperature drift 0.01% over entire temperature range		
Pulse	■ Frequency range 0.01 Hz to 18 kHz ■ Signal level 2 to 7 mA low; 13 to 19 mA high with approx. 1.3 kΩ dropping resistor at max. 24 V voltage level		
Voltage (digital input)	■ Voltage level – low: -3 to 5 V – high: 12 to 30V (as per DIN 19240) ■ Input current typically 3 mA with overload and reverse polarity protection ■ Sampling frequency: 4 x 4 Hz (terminal 83, 85, 93, 95) ■ 2 x 20kHz (terminal 81, 91)		
Voltage (analog input)	■ Voltage: 0 to 10 V, 0 to 5 V, ±10 V, inaccuracy ±0.1% of measuring range, input impedance > 400 kΩ ■ Voltage: 0 to 100 mV, 0 to 1 V, ±1 V; measured error ±0.1% of measuring range, input impedance > 1 MΩ ■ Temperature drift: 0.01% / K (0.0056% / °F)		
Resistance thermometer (RTD) as per ITS 90	Identifier	Measuring range	Accuracy (4-wire connection)
	Pt100	-200 to 800 °C (-328 to 1472 °F)	0.03% of full scale value
	Pt500	-200 to 250 °C (-328 to 482 °F)	0.1% of full scale value
	Pt1000	-200 to 250 °C (-328 to 482 °F)	0.08% of full scale value
	■ Type of connection: 3-wire or 4-wire system ■ Measuring current 500 µA ■ Resolution 16 Bit ■ Temperature drift 0.01%/ K (0.0056%/ °F)		

Measured variable	Input		
Thermocouples (TC)	Type	Measuring range	Accuracy
	J (Fe-CuNi), IEC 584	-210 to 999.9 °C (-346 to 1832 °F)	± (0.15% oMR +0.5 K) as of -100 °C ± (0.15% oMR +0.9 °F) as of -148 °F
	K (NiCr-Ni), IEC 584	-200 to 1372 °C (-328 to 2502 °F)	± (0.15% oMR +0.5 K) as of -130 °C ± (0.15% oMR +0.9 °F) as of -202 °F
	T (Cu-CuNi), IEC 584	-270 to 400 °C (-454 to 752 °F)	± (0.15% oMR +0.5 K) as of -200 °C ± (0.15% oMR +0.9 °F) as of -328 °F
	N (NiCrSi-NiSi), IEC 584	-270 to 1300 °C (-454 to 1386 °F)	± (0.15% oMR +0.5 K) as of -100 °C ± (0.15% oMR +0.9 °F) as of -148 °F
	B (Pt30Rh-Pt6Rh), IEC 584	0 to 1820 °C (32 to 3308 °F)	± (0.15% oMR +1.5 K) as of 600 °C ± (0.15% oMR +2.7 °F) as of 1112 °F
	D (W3Re/W25Re), ASTME 998	0 to 2315 °C (32 to 4199 °F)	± (0.15% oMR +1.5 K) as of 500 °C ± (0.15% oMR +2.7 °F) as of 932 °F
	C (W5Re/W26Re), ASTME 998	0 to 2315 °C (32 to 4199 °F)	± (0.15% oMR +1.5 K) as of 500 °C ± (0.15% oMR +2.7 °F) as of 932 °F
	L (Fe-CuNi), DIN 43710, GOST	-200 to 900 °C (-346 to 1652 °F)	± (0.15% oMR +0.5 K) as of -100 °C ± (0.15% oMR +0.9 °F) as of -148 °F
	U (Cu-CuNi), DIN 43710	-200 to 600 °C (-328 to 1112 °F)	± (0.15% oMR +0.5 K) as of -100 °C ± (0.15% oMR +0.9 °F) as of -148 °F
	S (Pt10Rh-Pt), IEC 584	0 to 1768 °C (32 to 3214 °F)	± (0.15% oMR +3.5 K) for 0 to 100 °C ± (0.15% oMR +1.5 K) for 100 to 1768 °C ± (0.15% oMR +6.3 °F) for 0 to 212 °F ± (0.15% oMR +2.7 °F) for 212 to 3214 °F
	R (Pt13Rh-Pt), IEC 584	-50 to 1768 °C (-58 to 3214 °F)	± (0.15% oMR +3.5 K) for 0 to 100 °C ± (0.15% oMR +1.5 K) for 100 to 1768 °C ± (0.15% oMR +6.3 °F) for 0 to 212 °F ± (0.15% oMR +2.7 °F) for 212 to 3214 °F
	Internal temperature compensation error: ≤ 3 °C (5.4 °F) Temperature drift: 0.01% / K (0.0056% / °F)		

Galvanic isolation

The inputs are galvanically isolated between the individual extension cards and the basic unit (see also 'Galvanic isolation' under Output.)

Note!
With digital inputs, every pair of terminals is galvanically isolated from each other.

11.0.2 Output

Output signal

Current, pulse, transmitter power supply (TPS) and switching output

Galvanic isolation

Basic unit:

Connection with terminal designation	Power supply (L/N)	Input 1/2 0/4 to 20 mA/ PFM/pulse (10/11) or (110/11)	Input 1/2 TPS unit (82/81) or (83/81)	Output 1/2 0 to 20 mA/pulse (132/131) or (134/133)	Interface RS232/485 housing front or (102/101)	TPS unit, external (92/91)	Digital input (94/95/96)
Power supply		2.3 kV	2.3 kV	2.3 kV	2.3 kV	2.3 kV	2.3 kV
Input 1/2 0/4-20 mA/PFM/pulse	2.3 kV			500 V	500 V	500 V	500 V
Input 1/2 TPS unit	2.3 kV			500 V	500 V	500 V	500 V
Output 1/2 0-20 mA/pulse	2.3 kV	500 V	500 V		500 V	500 V	500 V

Connection with terminal designation	Power supply (L/N)	Input 1/2 0/4 to 20 mA/ PFM/pulse (10/11) or (110/11)	Input 1/2 TPS unit (82/81) or (83/81)	Output 1/2 0 to 20 mA/pulse (132/131) or (134/133)	Interface RS232/485 housing front or (102/101)	TPS unit, external (92/91)	Digital input (94/95/96)
Interface RS232/RS485	2.3 kV	500 V	500 V	500 V		500 V	500 V
TPS unit, external	2.3 kV	500 V	500 V	500 V	500 V		500 V
Digital input (81/83/85 and 91/93/95)	2.3 kV	500 V	500 V	500 V	500 V	500 V	500 V
Input 1/2 U/I/TC	2.3 kV	500 V	500 V	500 V	500 V	500 V	500 V

Note!
The specified insulation voltage is the AC testing voltage U_{eff}, which is applied between the connections.
Basis for assessment: IEC 61010-1, protection class II, overvoltage category II

11.0.3 Output variable current - pulse

Current

- 0/4 to 20 mA +10% overreach, invertible
- Max. loop current 22 mA (short-circuit current)
- Load max. 750 Ω at 20 mA
- Accuracy 0.1% of full scale value
- Temperature drift: 0.1% / 10 K (0.056% / 10°F) Ambient temperature
- Output ripple < 10 mV at 500 Ω for frequencies < 50 kHz
- Resolution 13 bit
- Error signals 3.6 mA or 21 mA limit adjustable as per NAMUR NE43

Pulse

Basic unit:
- Frequency range up to 12.5 kHz
- Voltage level 0 to 1 V low, 12 to 28 V high
- Load min. 1 kΩ
- Pulse width 0.04 to 1000 ms

Extension cards (digital passive, open collector):
- Frequency range up to 12.5 kHz
- $I_{max.}$ = 200 mA
- $U_{max.}$ = 24 V ± 15%
- $U_{low/max.}$ = 1.3 V at 200 mA
- Pulse width 0.04 to 1000 ms

Number

Number:
- 2 x 0/4 to 20 mA/pulse (in basic unit)
- with Ethernet option: no output present in the basic device

Max. number:
- 10 x 0/4 to 20 mA/pulse (depends on the number of extension cards)
- 6 x digital passive (depends on the number of extension cards)

Signal sources

All available multifunctional inputs (current, PFM or pulse inputs) and results can be freely allocated to the outputs.

11.0.4 Switching output

Function

Limit relay switches in the operating modes: minimum/maximum safety, gradient

Switch behavior

Binary, switches when the limit value is reached (potential-free NO contact)

Relay switching capacity	Max. 250 V AC, 3 A / 30 V DC, 3 A
	Note! A mixture of low voltage and extra-low voltage is not permitted for the relays of the extension cards.
Switching frequency	Max. 5 Hz
Threshold	freely programmable
Hysteresis	0 to 99%
Sig. source	All available inputs and calculated variables can be allocated freely to the switching outputs.
No of output states	> 100,000
Scan rate	250 ms
Number	1 (in the basic unit) Max. number: 19 (depends on the number and type of extension cards)

11.0.5 Transmitter power supply and external power supply

- Transmitter power supply unit (TPS), terminals 81/82 or 81/83 (optional power extension cards 181/182 or 181/183):
  Max. output voltage 24 V DC ± 15%
  Impedance < 345 Ω
  Max. loop current 22 mA (at U_{out} > 16 V)
- RMM621 Technical Data:
  HART® communication is not impaired
  Number: 4 TPS in the basic device
  Max. number: 10 (depends on the number and type of extension cards)
- Additional power supply (e.g. external display), terminals 91/92:
  Supply voltage 24 V DC ± 5%
  Current max. 80 mA, short-circuit proof
  Number 1
  Source resistance < 10 Ω

11.0.6 Power supply

Supply voltage	■ Low voltage power unit: 90 to 250 V AC 50/60 Hz ■ Extra-low voltage power unit: 20 to 36 V DC or 20 to 28 V AC 50/60 Hz
Power consumption	8 to 38 VA (depending on version and wiring)
Connection data interface	**RS232** ■ Connection: jack socket 3.5 mm, front ■ Transmission protocol: ReadWin® 2000 ■ Transmission rate: max. 57,600 baud **RS485** ■ Connection: plug-in terminals 101/102 (in the basic unit) ■ Transmission protocol: (serial: ReadWin® 2000; parallel: open standard) ■ Transmission rate: max. 57,600 baud

Optional: additional RS485 interface
- Connection: plug-in terminals 103/104
- Transmission protocol and transmission rate as standard interface RS485

Optional: Ethernet interface
Ethernet interface 10/100BaseT, connector type RJ45, connection via shielded cable, issuing of IP address via Setup menu in the device. Connection by means of interface with devices in office environment.
Safety distances: office device standard IEC 60950-1 must be taken into consideration.
Connection to a PC: possible by means of "crossover" cable.

Note!
If the RMM621 has an Ethernet interface, no analog outputs are available on the base unit (Slot E)!

11.0.7 Performance characteristics

Reference operating conditions
- Power supply 230 V AC ± 10%; 50 Hz ± 0.5 Hz
- Warm-up period > 30 min
- Ambient temperature 25 °C ± 5 °C (77 °F ± 9 °F)
- Air humidity 39% ± 10% r. h.

11.0.8 Installation conditions

Installation instructions

Mounting location

In cabinet on top-hat rail IEC 60715

Caution!
When using extension cards, venting with an air current of at least 0.5 m/s is necessary.

Orientation

No restrictions

11.0.9 Environment

Ambient temperature range: -20 to 50 °C (-4 to 122 °F)

Storage temperature: -30 to 70 °C (-22 to 158 °F)

Climate class: as per IEC 60 654-1 Class B2 / EN 1434 Class 'C' (no condensation permitted)

Electr. safety: as per IEC 61010-1: environment < 2000 m (6560 ft) height above sea level

Degree of protection
- Basic unit: IP 20
- Remote operating and display unit: Front IP 65

Electromagnetic compatibility

Interference emission

IEC 61326 Class A

Interference immunity
- Power failure: 20 ms, no influence
- Starting current limitation: $I_{max}/I_n \leq 50\%$ (T50% ≤ 50 ms)
- Electromagnetic fields: 10 V/m as per IEC 61000-4-3
- Conducted HF: 0.15 to 80 MHz, 10 V as per IEC 61000-4-3

- Electrostatic discharge: 6 kV contact, indirect as per IEC 61000-4-2
  - Burst (power supply): 2 kV as per IEC 61000-4-4
  - Burst (signal): 1 kV/2 kV as per IEC 61000-4-4
  - Surge (power supply AC): 1 kV/2 kV as per IEC 61000-4-5
  - Surge (power supply DC): 1 kV/2 kV as per IEC 61000-4-5
  - Surge (signal): 500 V/1 kV as per IEC 61000-4-5

11.0.10 Mechanical construction

Design, dimensions

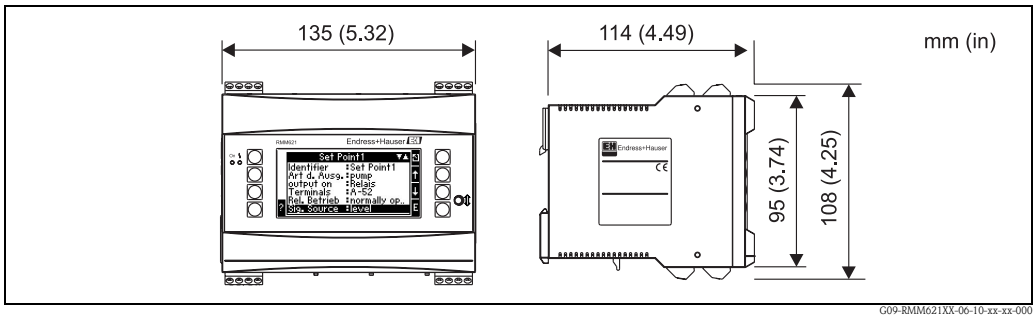


Fig. 56: Housing for top-hat rail as per IEC 60715

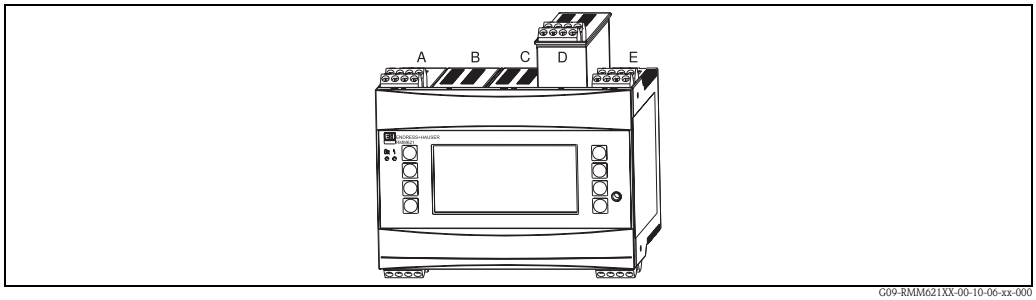


Fig. 57: Device with extension cards (available optionally or as accessory)
– Slots A and E are integral components of the basic device
– Slots B, C and D can be expanded with extension cards

Weight

- Basic device: 500 g (17.6 oz) (in maximum configuration with extension cards)
- Remote operating unit: 300 g (10.6 oz)

Material

Housing: polycarbonate plastic, UL 94V0

Terminals

Coded, pluggable screw terminals; clamping area 1.5 mm^2 (16 AWG) solid, 1.0 mm^2 (18 AWG) flexible with ferrules (applies to all connections).

11.0.11 Display and operating elements

Display elements

- Display (optional):
  160 x 80 DOT-Matrix LCD with blue background lighting, color change to red in event of error (configurable)
- LED status display:
  Operation: 1 x green (2 mm (0.08"))
  Fault message: 1 x red (2 mm (0.08"))
- Operating and display unit (optional or as accessory):

An operating and display unit can be additionally connected to the device in the panel mounting housing (dimensions WxHxD = 144 x 72 x 43 mm (5.67" x 2.83" x 1.69")). The connection to the integrated RS484 interface is made using the connecting cable (l = 3 m (9.8 ft)), which is included in the accessories kit. Parallel operation of the operating and display unit with a device-internal display in the RMM621 is possible.

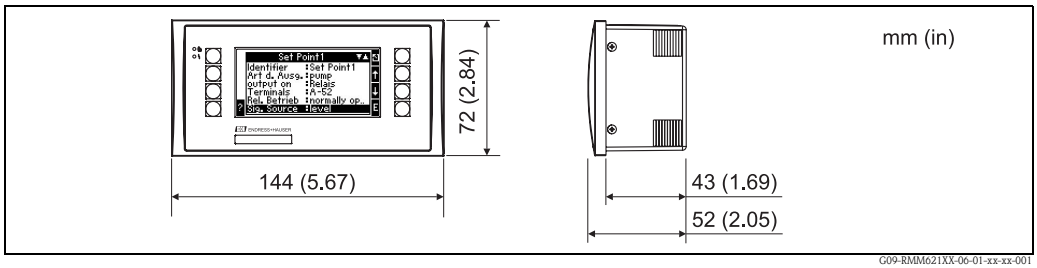


Fig. 58: Operating and display unit for panel mounting (available optionally or as accessory)

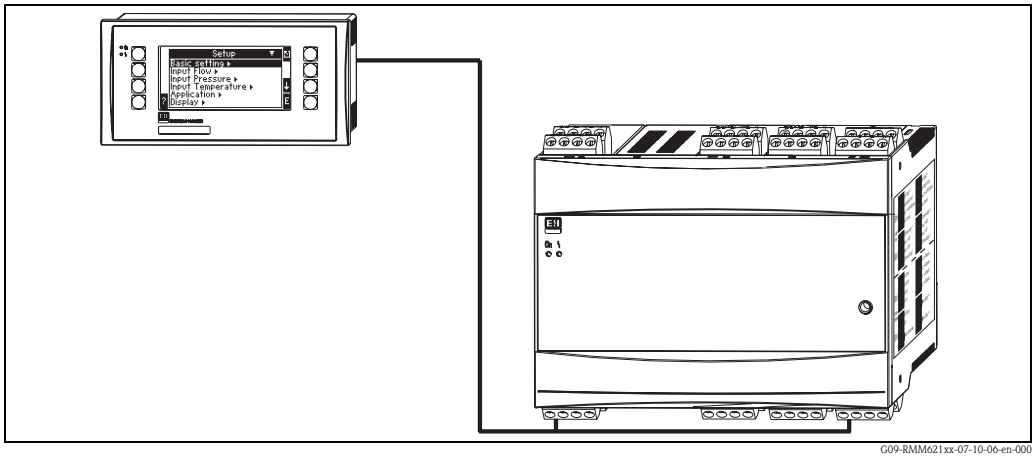


Fig. 59: Operating and display unit in panel mounting housing

Operating elements	Eight front-panel soft keys interact with the display (key functions are shown on the display).
Remote operation	RS232 interface (jack socket on front panel 3.5 mm (0.14 in)): configuration via PC with ReadWin® 2000 PC operating software. RS485 interface
Real time clock	■ Deviation: 30 min per year ■ Power reserve: 14 days

11.0.12 Certificates and approvals

CE mark	The measuring system meets the legal requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
Ex approval	Information about currently available Ex versions (ATEX, FM, CSA, etc.) can be supplied by your E+H Sales Center on request. All explosion protection data are given in a separate documentation which is available upon request.
Other standards and guidelines	■ IEC 60529: Degrees of protection through housing (IP code)

- IEC 61010:
  Protection measures for electrical equipment for measurement, control, regulation and laboratory procedures
- EN 61326 (IEC 1326):
  Electromagnetic compatibility (EMC requirements)
- NAMUR NE21, NE43
  Association for Standards for Control and Regulation in the Chemical Industry

11.0.13 Documentation

- Technical Information RMM621 Application Manager (TI124R/09/en)
- System components brochure (FA016K/09/en)

12 Appendix

12.1 List of abbreviations

Abbreviation	Meaning
… temp.	…temperature
curr.	current
Gen.	General
Ch. Speed	Change speed
disp.+ackn.	Display and acknowledge
C	Counter
Event mess.	Event message
Unit adr.	Unit address
Unit ID	Device designation
High stat.	High status
horz.	horizontal
Circuit br. det.	Circuit break detection
Low stat.	Low status
No.	Number
Prog.	Program
Res. value	Reset value
Pnts	Points
TC	Totalizer
Resp.	Response
vert.	vertical
Time del.	Time delay
betw. calls	between calls
Int. evaluation	Intermediate evaluation

12.2 Applications

12.2.1 Level measurement

Applications

The level in a tank can be determined with the aid of a differential pressure, the density of the medium (ρ) and the gravity constant (g=9.81). This calculation can be performed with a wide range of media.

Measured variables

Measuring pressure at the tank base and tank cover.

Display/formula for calculation

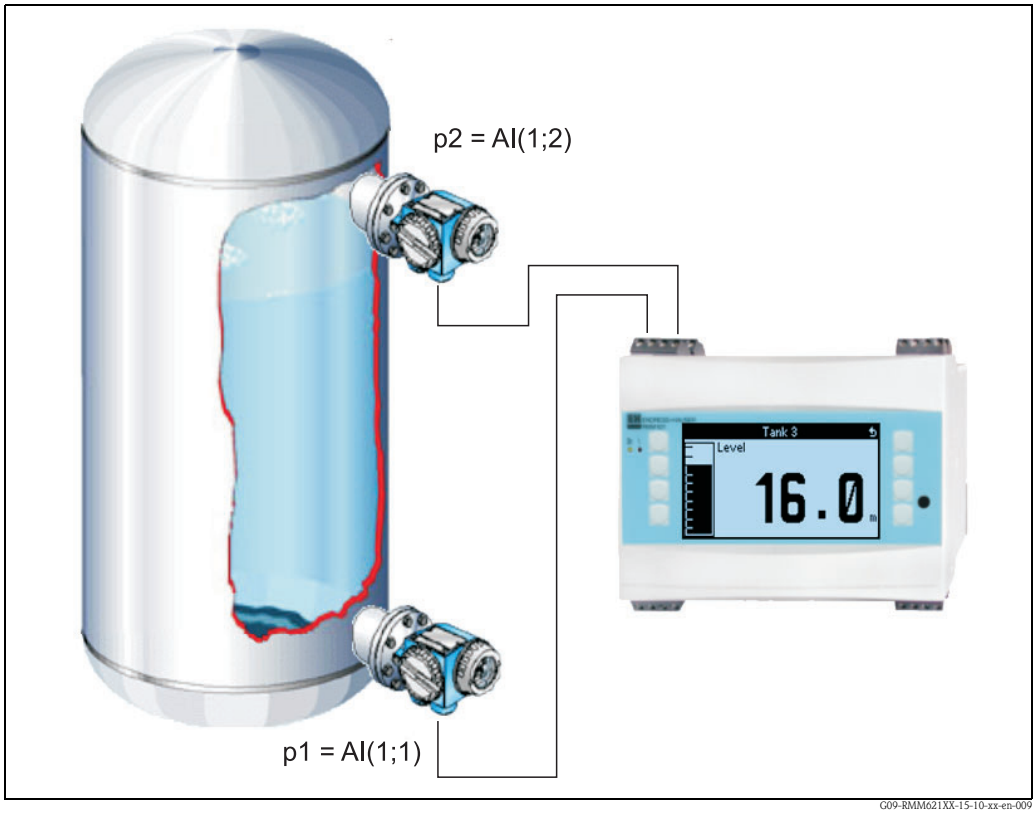


Fig. 60: Level measurement via differential pressure

Formula	h = (p1-p2)/ρ*g
Formula in the editor	(AI(1;1)-AI(1;2))/2.31*9.81

p1 Pressure at the tank base
p2 Pressure at the tank cover
ρ Density
g Gravity constant

Input variables

- Pressure (p1) at the base
- Pressure (p2) in the cover

Calculated variables

- Level (h) in the tank

Outputs

All output variables can be output as analog or pulse outputs. In addition, relay outputs are available for limit value violation. The number of outputs depends on the device version.

Miscellaneous

Up to five such applications can be implemented with one device. Three extension cards with the corresponding inputs are required for this purpose.
Monitoring, visualizing and analyzing levels increase the security in the process.

12.2.2 Controlling motors (logic functions)

Application

The drive of a feed screw, for example, can be controlled with the logic functions. Additional status signals taken into account (e.g. manual-automatic switch).

Display/formula for calculation

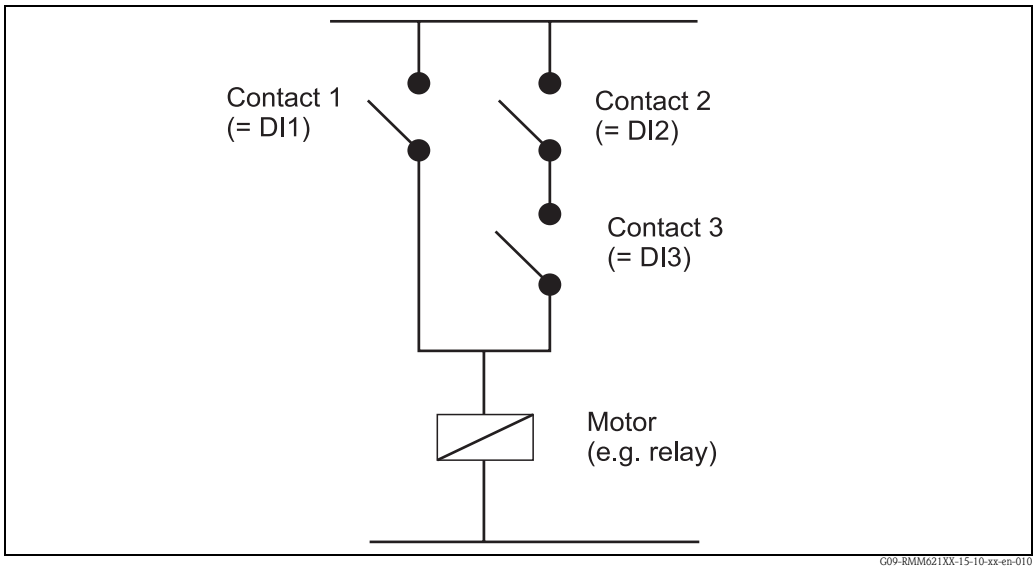


Fig. 61: Sequence control

Formula	$Motor_{on}$ = Contact 1 OR (contact 2 AND contact 3)
Formula in the editor	or(DI(2;1);and(DI(2;2);DI(2;3)))
	Contact 1 must be closed or contact 2 and contact 3 must be closed at the same time for the motor to start.

Input variables

- Digital input for automatic/manual mode (DI1)
- Digital inputs for automatic mode (DI2 and DI3)

Output variables/display on device

The status of the digital inputs and of the motor can be shown on the display.

Outputs

The adjuster or motor can be activated by means of an active, passive digital output or a relay.

12.2.3 Energy from biogas

Applications

Energy generated from biogas for heating purposes or to generate electrical energy, for example.
The standard volume is calculated from the operating volume, the pressure and the temperature.
The combustion energy is calculated from the standard volume and the heating value.
The heating value of the biogas (methane content) is determined with a gas chromatograph and transmitted to RMM621.
The current values and the totals (counter) of the standard volume and the combustion energy are displayed.

Measured variables

Measuring the operating volume flow, the pressure and the temperature. In addition, the heating value of the biogas is determined via the gas chromatograph.

Display/formula for calculation

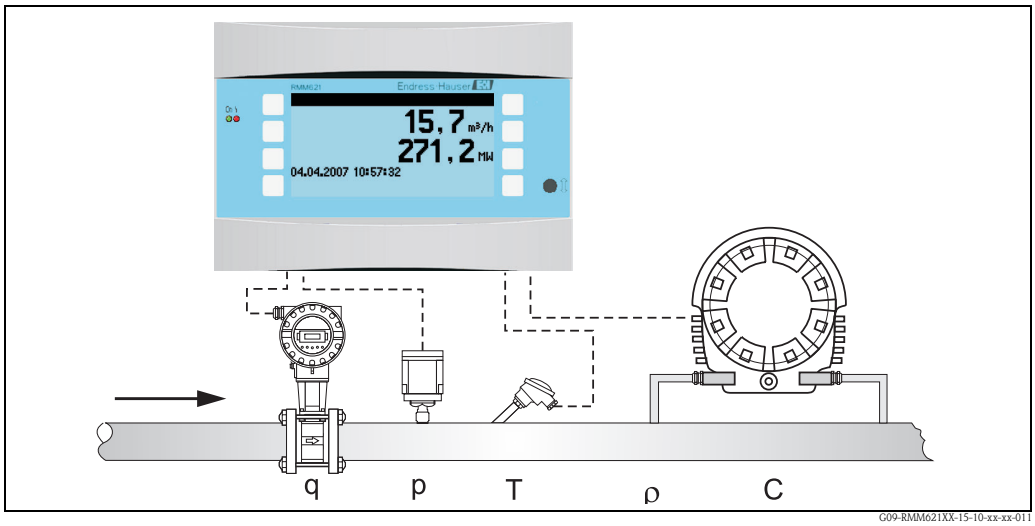


Fig. 62: Application: energy from biogas

Formula	Mathematics channel 1: standard volume flow calculated (ideal gas law) **$q_{ref} = q*(p/1.013)*(273.15/(273.15+T))$** Mathematics channel 2: combustion energy calculated **$E = q_{ref}*C/3600$**
Formula in the editor	(Standard volume) II(1;1)*AI(1;1)/1.013*273.15/(273.15+AI(1;2)) (Combustion energy) MI(1;1)*AI(1;3)/3600

q_{ref}	Standard volume (Nm^3/h)
q	Operating volume (m^3/h)
p	Pressure (bar)
T	Temperature (°C)
C	Heating value (MJ/Nm^3)
E	Energy (thermal power) (MW)

Reference conditions: 0 °C; 1.013 bar

Input variables

- Operating volume (q)
- Pressure (p)
- Temperature (T)
- Heating value (C)

Calculated variables

Gas standard volume flow, combustion energy (thermal power)

Output variables/display on device

- Gas standard volume flow, combustion energy
- Totalizer: standard volume, energy (enthalpy)

Outputs

All output variables can output analog or pulse outputs. In addition, relay outputs are available for limit value violation. The number of outputs depends on the device version.

Other functions

- Configurable alarm response, i.e. the function of the counters and outputs in the event of an error (e.g. cable open circuit) can be defined individually
- When operating a combined heat and power plant, approx. 2/3 are converted to thermal energy and 1/3 to electrical energy. To show these values on the display, multiply the calculated energy in a mathematics channel by 1/3 or 2/3.

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