Operation Manual

Impeller sensor
1,5 - 250 l/h

series 01-03

Impeller sensor
1,5 - 400 l/h

series R2

Impeller sensor
30 - 1000 l/h

series R4

Impeller sensor
30 - 5000 l/h

series 04-05

Impeller sensor
300 - 6000 l/h

series DN

Oval wheel sensor
2 - 80 l/h

series OV

Wall-mounted
display

EXTERN

CUSTOMIZED

IMA mini COMFORT & ANALOG & PRO

Content:

1.0 Short description

The IMA COMFORT (pulse measuring evaluation unit) has been developed especially for the proportional dosing of liquids and is characterised by flow rate display (various display units can be selected), a deletable totaliser, an adjustable contact distance, two freely adjustable limits, two freely assignable SSR relays and NPN outputs, two freely assignable digital inputs, and an automatic calibration menu (of course, K-factor can also be entered). The IMA COMFORT also offers the option to be used as a pre-selection counter. A special highlight of this variant is that the display changes its colour, indicating to the user that the current flow volume deviates from the set limits.
In addition to the functions of the IMA COMFORT the IMA ANALOG variant features an additional analogue output (3-conductor technology). Assignment of the lower and upper analogue value to the flow volumes is flexible and not dependent on the flow volume limit values.

The IMA PRO variant provides additional inputs and outputs:

- a 2nd. sensor can be connected to digital input 1
- analogue input for measuring voltages (0-24V_{DC}) and currents (0-24mA_{DC})
- SD card interface

The IMA PRO2 and IMA PRO3 variants provide a temperature measurement input (PT100) and a real-time clock with battery buffering.

The future IMA PRO1 variant will provide a flow regulator option.

The IMA PRO2 variant has an integrated data logger function. This allows incoming data to be recorded on SD card. The recording interval is adjustable.

The IMA PRO3 variant includes all functions, except for the regulator function.

2.0 Safety notes

2.1 General information

To guarantee safe operation, the IMA must only be operated as specified in the operation manual. When using the appliance, the legal and safety regulations applicable to the respective case of application have to be complied with in addition. This also applies by analogy to the use of any accessories.

2.2 Use as intended

The devices of the IMA series are used to monitor the continuous flow rates of low-viscosity liquids. Any other use is regarded as use not as intended.
Provided it is not stated otherwise, specified K factors relate to H_2O at 21 °C.
In the case of IMA operation involving the incidence of impact loads (e.g. scheduled operation) in particular, this should be discussed and checked with our technical personnel first.
The devices of the IMA series must not be used as the sole means of averting dangerous conditions at a machine or system. Machines and systems have to be designed in such a way that fault conditions may not result in any situation which poses a danger to personnel.

2.3 Qualified personnel

The devices of the IMA series must only be installed by qualified personnel capable of using the devices properly. Qualified personnel are persons who are familiar with the installation, assembly, commissioning and operation of the devices and who have qualifications appropriate to their work.

2.4 Resistance to chemical agents

Please check the resistance of the materials specified to the chemicals that you are using.

3.0 Assembly

3.1 Process connection

The following requirements have to be met, otherwise the flow meter and/or the plant may be damaged:

- An appropriate process connection has to be provided by the client
- Check the connection size
- Check the screwing-in depth
- Use suitable sealants (liquid sealant will damage the flow meter if it gets into the measuring chamber)
- Seal properly

3.2 Ambient conditions

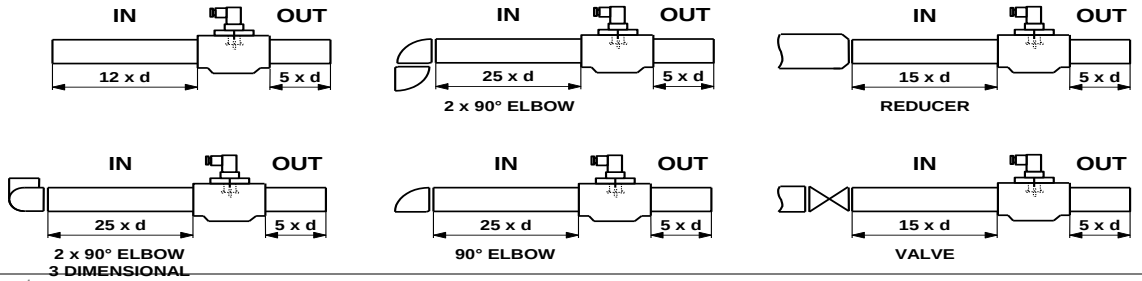
The following criteria have to be met, otherwise the flow meter and/or the plant may be damaged:

- The flow meter must not be used as a supporting part of pipes.
- The medium must not carry solid bodies. Ferromagnetic particles will aggregate at the magnets and impair the function.
- Check the compatibility of anti-corrosion and anti-freezing agents prior to use.
- Resistance of the materials specified to the chemicals you are using must be guaranteed

3.3 Mechanical installation of the IMA unit

The following requirements have to be met, otherwise the function of the flow meter may be impaired or the measuring results may be distorted:

- External magnetic fields have an effect on the flow meter. Keep sufficient distance from magnetic fields (e.g. electric motors).
- Pipes, process connections or holders made of ferromagnetic material influence the magnetic field of the flow meter. Keep a minimum distance of 100 mm from such materials (e.g. steel).
- Ensure ventilation of the device.
- Any changes to the cross-section, branches or bends in the pipes, affect the accuracy of the measurement. Apply the following settling sections (excerpt from DIN 1952) (d = nominal pipe width)



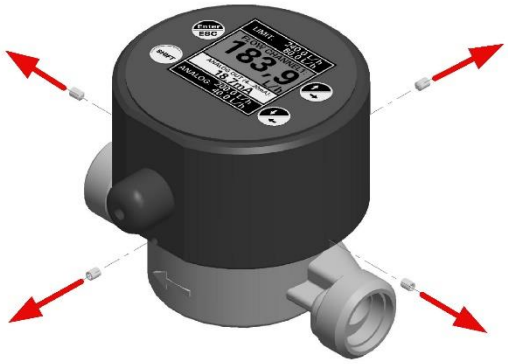
3.4 Electrical installation of the IMA

3.4.1 Opening the IMA

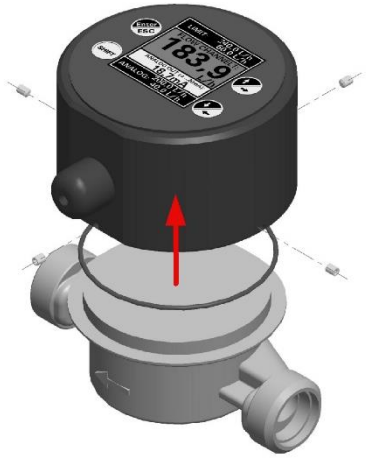
To electrically connect the IMA, first detach the evaluation unit from the flow meter/ from the wall mounting plate.
To do this, proceed as follows:

1. Switch the device from powered state!

2. Unscrew the four threaded pins



3. Pull the evaluation unit off upward

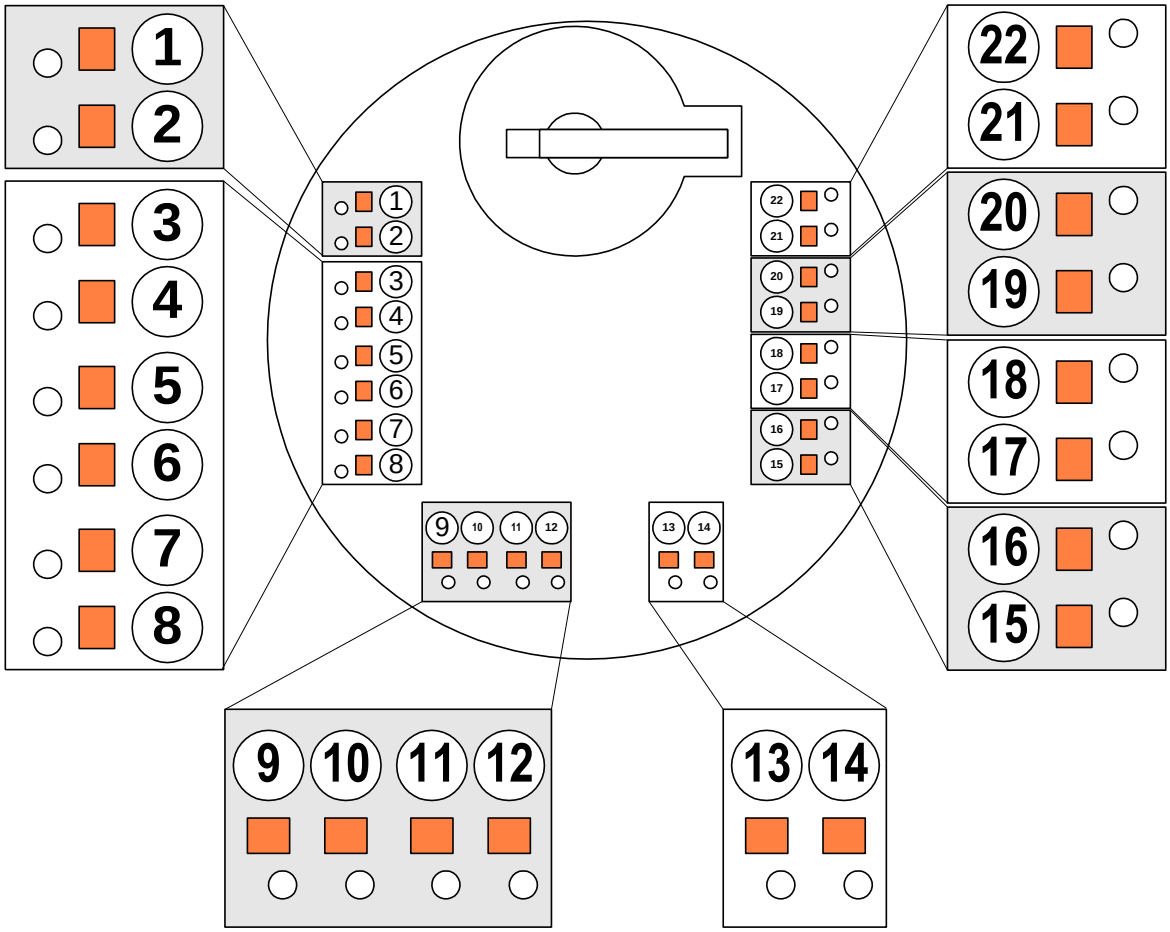


4. Undo the plugged connection to the flow meter (see 3.4.2)

3.4.2 Electrical installation of the IMA

Supply voltage: V_{IN}=24 VDC ± 50 % regulated I_{max} < 100mA

Digital output SSR: Design: SSR, SPDT contact (solid-state relay)
Contact: 30 V_{DC}, max.0.2 A



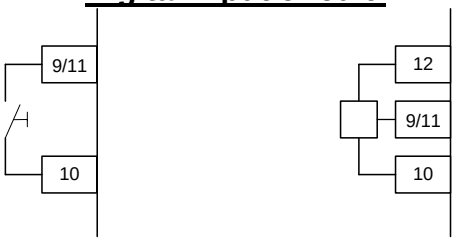
CAUTION!

On no account apply a voltage or power higher than the maximum connection values specified. Non-compliance may result in destruction of the device. Danger of fire!

Terminal	Assignment	IMA COMFORT	IMA ANALOG	IMA PRO1	IMA PRO2	IMA PRO3
1	GND (for analogue output)		x	x		x
2	Analogue output		x	x		x
3	Temperature measurement input				x	x
4	GND (for temperature)				x	x
5	Sensor input 1 (reserve)	x	x	x	x	x
6	Sensor input 1	x	x	x	x	x
7	GND (for sensor input 1)	x	x	x	x	x
8	V_{OUT-SI} (sensor input 1 supply)	x	x	x	x	x
9	Digital input 2	x	x	x	x	x
10	GND (for digital inputs)	x	x	x	x	x
11	Digital input 1	x	x	x	x	x
12	V_{OUT-DI} (for digital inputs)	x	x	x	x	x
13	GND (for IMA)	x	x	x	x	x
14	V_{IN} (for IMA)	x	x	x	x	x
15	LSS 2 (low-side switch)	x	x	x	x	x
16	LSS 1 (low-side switch)	x	x	x	x	x
17	SSR 2 - B	x	x	x	x	x
18	SSR 2 - A	x	x	x	x	x
19	SSR 1 - B	x	x	x	x	x
20	SSR 1 - A	x	x	x	x	x
21	GND (for analogue input)			x		x

22	Analogue input			x		x

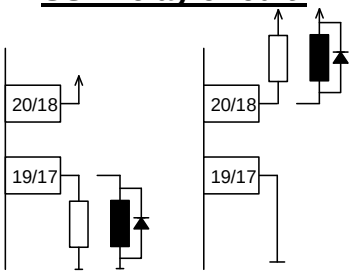
Digital input circuit:



external button / switch

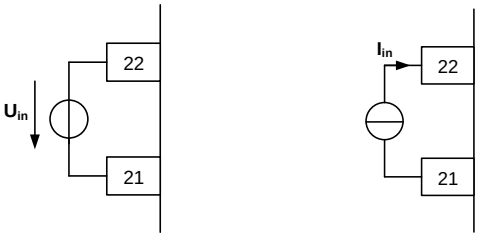
external sensor (NPN output)

SSR relay circuit:



Resistive or inductive load

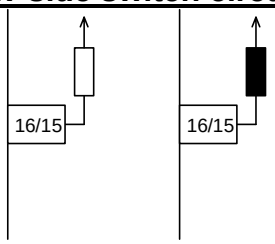
Analogue input circuit:



Voltage

Current

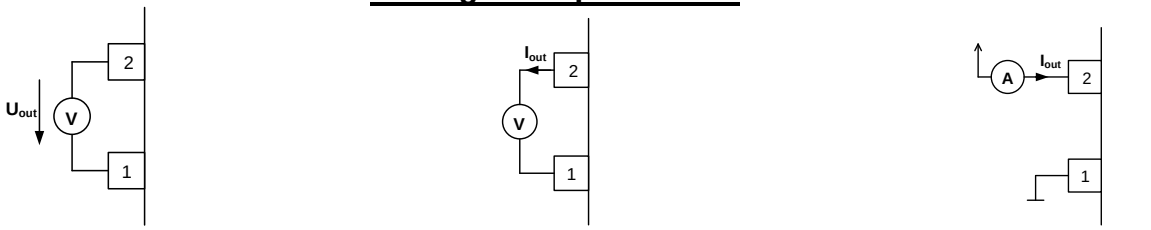
Low-side switch circuit:



Resistive

Inductive

Analogue output circuit:



Voltage

Current (source)

Current (sink)

*for CWC ANALOG / C
not assigned for

3.4.3 Closing the IMA

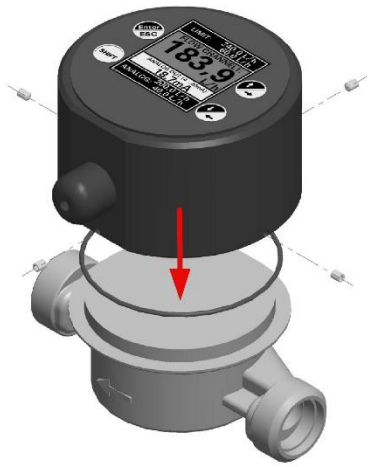
To operate the IMA, the evaluation unit must be mounted to the flow meter / wall mounting plate first. To do this, proceed as follows:

1. Switch the device from powered state!

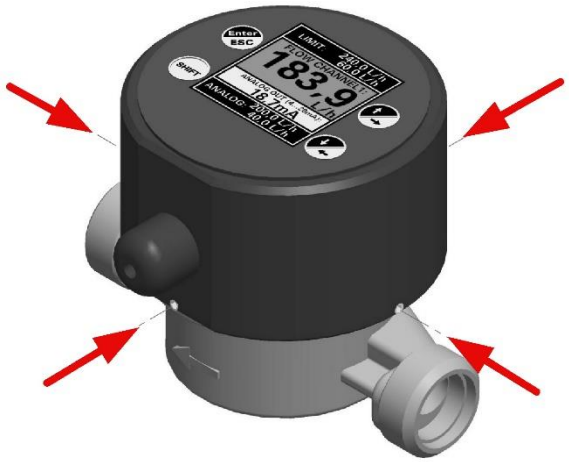
2. Place the O-ring in the IMA housing

3. Establish the plugged connection to the flow meter (see 3.4.2)

4. “Press” the evaluation unit onto the flow meter (do not squeeze the connecting cable!)

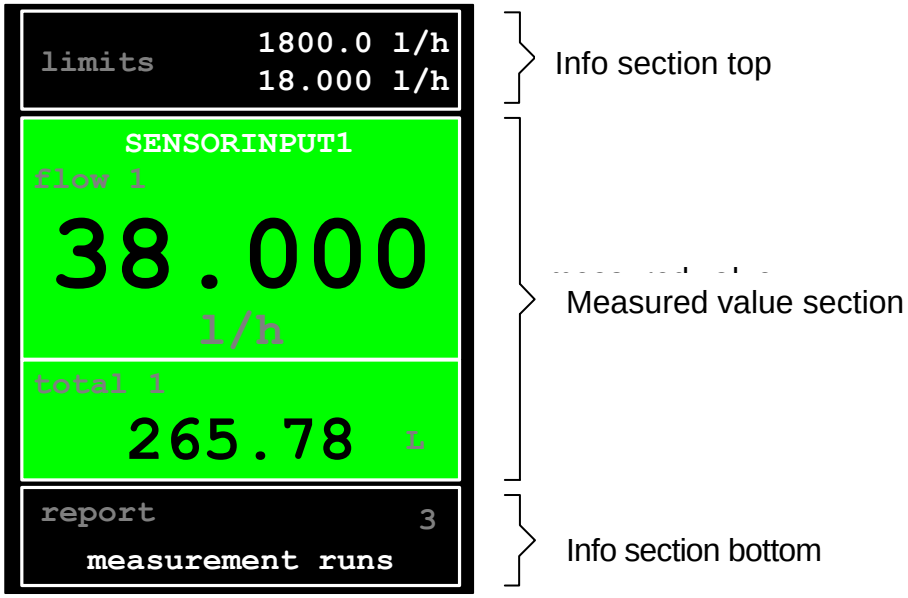


5. Screw the four threaded pins in



4.0 The display - flow rate indication

The display of the IMA is divided into three sections:



The measured value section is divided into two. The larger field shows the current value e.g. SE1 flow rate and the smaller lower field shows the subsequent value, e.g. SE1 total amount.

Info section top:

IMA COMFORT – PRO3 → Display of parameters dependent on current measured value section.
For example: Flow rate display -> Limits, analogue output value -> Range limits, …

Measured value section:

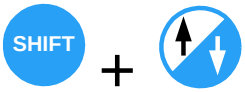
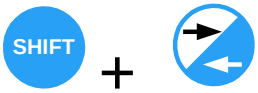
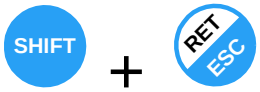
IMA COMFORT – PRO3 → Display of the current flow rate, the totaliser value, the remaining quantity on pre-selection counter, according to selection and function activity
The “graphic display” function is also shown.

Info section bottom:

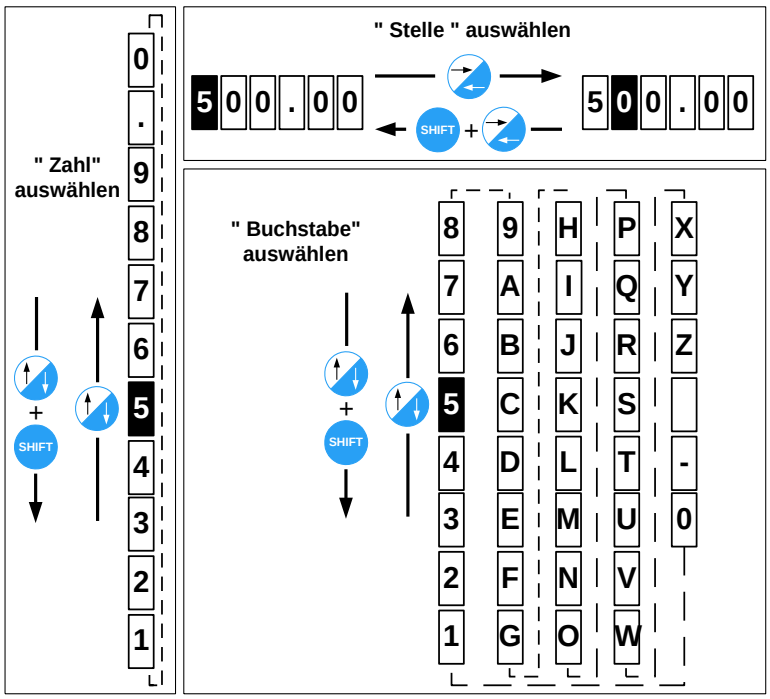
IMA COMFORT – PRO3 → Display of status messages

5.0 The control buttons

	= Enter	- Confirmation of a menu or sub-menu - confirmation of an entry - Keeping it pressed (until information is displayed) ends flow rate display and opens the main menu
	= Up	- Go one menu item up in a menu - During input of a value, increment the current position by 1. - During the flow display, switch between values in the measured value section e.g. flow rate on the totaliser
	= Right	- During input of a value, shift the current position to the right.
	= SHIFT	- Activate the second level of buttons (integrated LED is lit when the SHIFT button is activated). The SHIFT function is deactivated whenever a button is pressed.

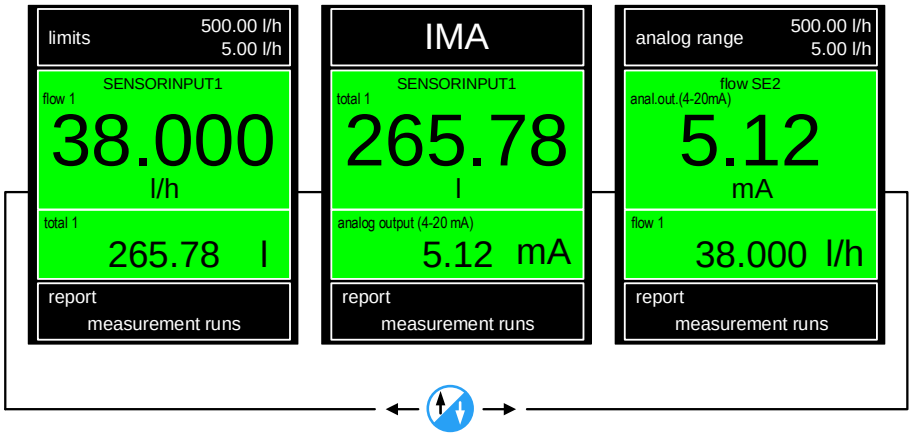
	= Down	- Go one menu item down in a menu - During input of a value, decrement the current position by 1.
	= Left	- During input of a value, shift the current position to the left.
	= ESC	- Abort to go one menu level back without saving

6.0 Inputting numbers and letters



Set numbers, points and letters using the up or down keys. Then select the next position to be edited using the Right or Left buttons. Repeat this procedure until all positions are completed. Confirm your entry with the Enter button.
If more than one point is set when entering figures, the lower value will be used.

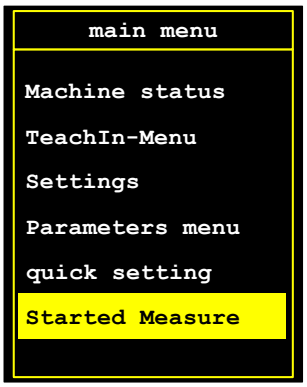
7.0 The flow rate indication



When the Up button is activated during an active measurement, the display changes between the displayable measured values in the measured value section.

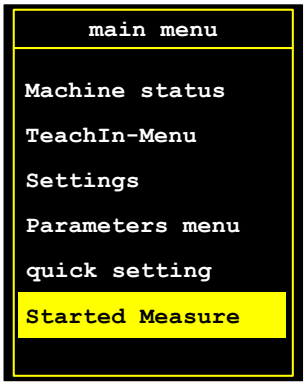
Keeping the Enter button pressed longer during an active measurement, stops the measurement.
A message appears on the display.
The main menu is then called up.

8.0 The Main menu



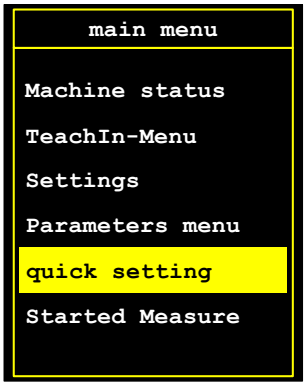
In all IMA variants the Main menu is divided into six sub-menus. To open a menu, select the menu using the Up and Down buttons and press Enter.

9.0 Starting a measurement



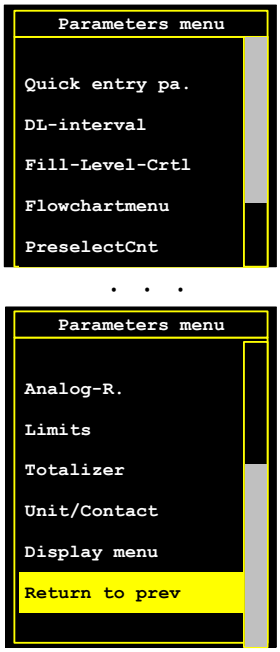
Press the Enter button to exit the Main menu and start the measurement.

10.0 Quick entry of parameters



Quick entry of parameters is to enable the user to select the most used or favourite parameter directly from the Main menu. Depending on the variant of the IMA, the favourite may be selected from a large number of parameters (see item 11.7). When the quick entry parameter is selected with the Enter button, the associated menu is opened.

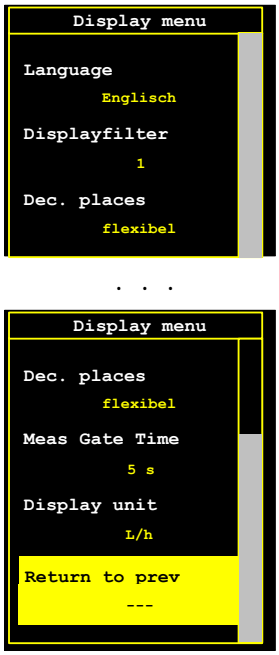
11.0 Parameters menu



In the Parameters menu, all entries are made that are required for display, monitoring and output. A different number of items are available depending on the IMA variant.

Back to Main menu via “Level back”.

11.1 Display menu

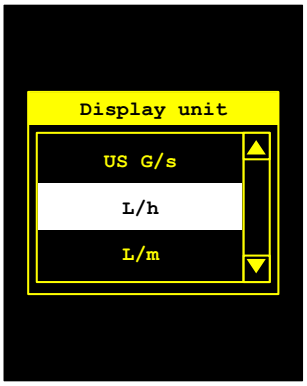


In the Display menu, all settings are configured that concern the flow rate display. Depending on the IMA variants, up to five sub-menus are available

11.1.1 Return to prev

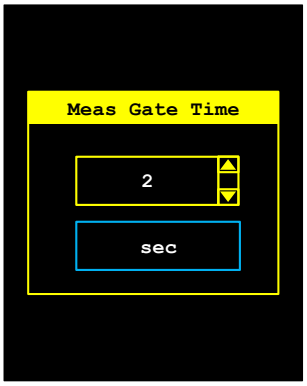
(Level back) Back to Parameters menu.

11.1.2 Display unit



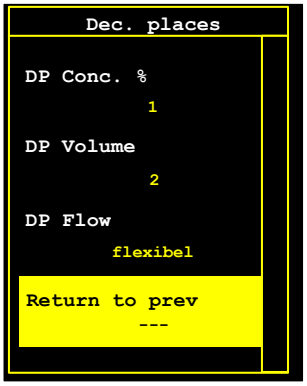
Available units are millilitres (ml), litres (l), US gallons (US gal), British gallons (UK gal) and cubic metres (m^3) with the respective time units second (s), minute (m) and hour (h). The volume unit selected here is used automatically for all inputs relating to volume or volume/time units. All values entered in a different unit are converted to the newly selected unit.

11.1.3 Measurement gate time



The measurement gate time in seconds can be selected in the range 1 to 120 seconds. The measurement gate time corresponds to the flow rate display update time. Therefore, it is also used to “smooth” the display value e.g. in the case of pulsating volume flows.

11.1.4 Decimal places (sub-menu)



In this sub-menu the decimal places (DP) of the different values are configured in the measurement screen. Depending on the version, the number of decimal places can be selected for the flow, volume and concentration display values.
1, 2 or 3 decimal places are flexibly available.
In this case, flexibly means that the comma is placed depending on the size of the display value.

11.1.4.1 Return to prev

(Level back) Back to Parameters menu.

11.1.4.2 DP Flow

Selection of the number of decimal places to be shown for values such as flow, limits etc. in the measurement screen.

11.1.4.3 DP Volume

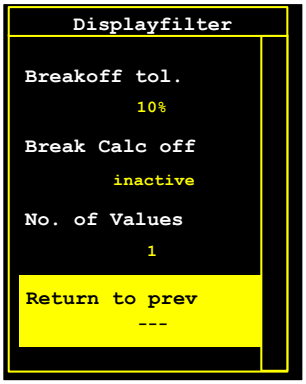
Selection of the number of decimal places to be shown for values such as volume, e.g. the totaliser, in the measurement screen. It is only available when the totaliser is activated.

11.1.4.4 DP Concentration %

Selection of the number of decimal places to be shown for values such as percentages, e.g. of concentrations, in the measurement screen. It is only available if the device has channel maths.

Note: It is recommended that for Concentration only one decimal place is used, otherwise the display value keeps changing.

11.1.5 Display filter (sub-menu)



In this sub-menu a display filter can be configured, so the displayed value is more stable. The average value is created from x values and is displayed accordingly.
The creation of an average value can be set so that if there are huge jumps in measurement values, these jumps are not blurred and are shown instantly. The display appears at the frequency of the set measurement gate time!

11.1.5.1 Return to prev

Back to Display menu.

11.1.5.2 Number of measurement values

1 to 10 measurement values can be selected and are stored in a ring memory, the average value and therefore the displayed value are then calculated from these.

11.1.5.3 Calculation abort

Activates or deactivates the abort of measurement value jumps.
If calculation abort is activated, measurements outside the abort tolerance are identified as jumps and are instantly displayed. Creation of the average value then starts again.

11.1.5.4 Abort tolerance

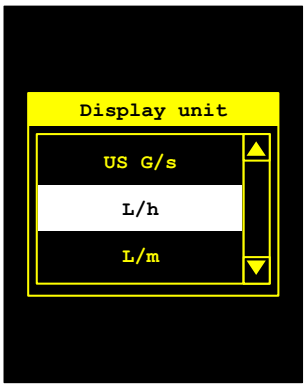
A tolerance can be selected from a table. When the deviation of a new measurement is greater than the Average value +/- Abort tolerance, a jump is identified.
Abort tolerances available in percent:
- 10% - 20% - 40% - 50% - 70% - 90% -

11.1.6 Language

Selection of the language in which the display text is to be displayed. If another language is selected, this is used as standard immediately after selection.

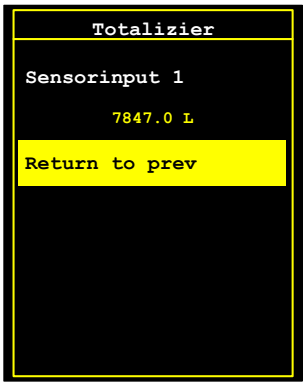
At the moment, German, English and Russian are available.

11.2 Unit/contact



The Unit/contact menu item is provided especially for quantity-based dosing. Depending on the contact distance setting, a signal is output here that relates to the measured quantity. For example, the value 0.4 means that a contact is output every 400 mL (when L was selected as the unit (see 11.1 Display menu - Display unit).
The following are available:
0.01 – 0.02 – 0.04 – 0.05 – 0.06 – 0.08 – 0.1 – 0.2 – 0.4 – 0.5 – 0.6 – 0.8 – 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10 – 20 – 30 – 40 – 50 – 60 – 70 – 90 – 100 – 200 – 500 – 1000

11.3 Totalizer

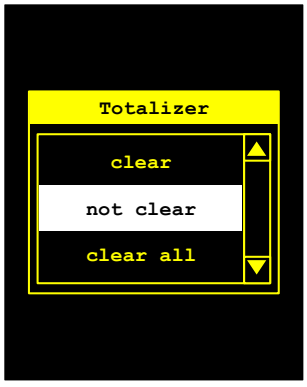


Depending on the IMA variant, the various totalizers and their counts are displayed. Depending on the design, the totalizer of Sensor input 1, Sensor input 2 and the Channel maths are listed.

11.3.1 Return to prev

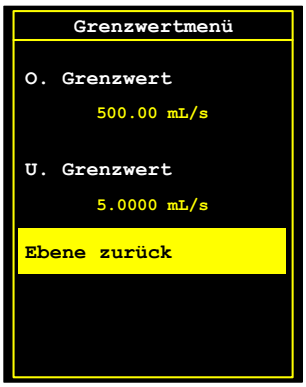
All settings are saved and the Parameters menu is returned to.

11.3.2 Sensor input 1 …



If the cursor is on “Sensor input1 …” when Enter is pressed, the “delete/do not delete/ delete all” counts selection appears (the last one only with IMA$_{PRO}$ with 2nd. sensor input 1). Make the required selection and confirm with Enter. The totalizer(s) will be saved and you are returned to the Totalizer menu.

11.4 Limit values



Note: Available from IMA COMFORT onwards

The current settings for the upper and lower limit value are displayed. See also 15.1 Limit monitoring
The upper and lower limit values are used to signal critical flow rates visually by the display colour turning from green to red (green = flow within the limits, red = flow outside the limits). Also, the limit values or non-compliance with these values can be assigned to the various outputs. This enables this information to be transmitted to higher-level control systems.

11.4.1 Return to prev

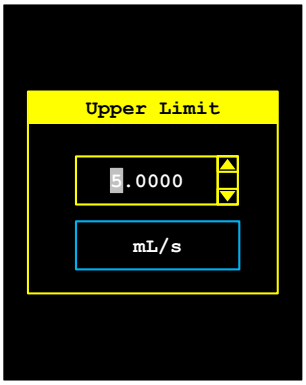
Back to Parameters menu.

11.4.2 Lower limit value

The lower limit value is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

Note: The upper and lower limit values are automatically exchanged if the upper limit value is lower than the lower limit value.

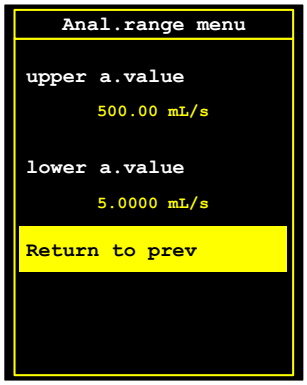
11.4.3 Upper limit value



The upper limit value is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

Note: The upper and lower limit values are automatically exchanged if the upper limit value is lower than the lower limit value.

11.5 Analogue range



Note: Available in IMA ANALOG, IMA PRO1 and IMA PRO3

The current settings for the upper and lower analogue values are displayed.

The analogue value is used to transmit the currently measured flow rate to higher- or lower-level control systems/circuits or a data recorder for logging.

11.5.1 Return to prev

Back to Parameters menu.

11.5.2 Lower analogue value

The lower analogue value is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

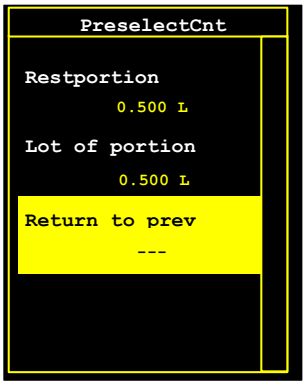
Note: The upper and lower analogue values are automatically exchanged if the upper analogue value is lower than the lower analogue value.

11.5.3 Upper analogue value

The upper analogue value is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

Note: The upper and lower analogue values are automatically exchanged if the upper analogue value is lower than the lower analogue value.

11.6 Pre-selectioncounter



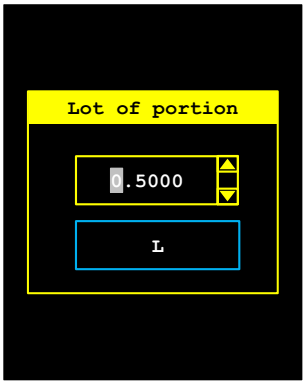
Note: Available in IMA COMFORT, IMA ANALOG, IMA PRO2 and IMA PRO3

Important: To operate the IMA as a pre-selection counter, "Pre-selection counter" needs to be activated under Settings - Sensor input 1 - Application (see item 12.1.1)

11.6.1 Return to prev

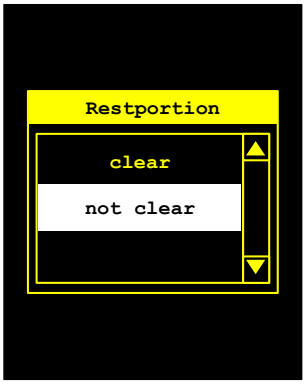
Back to Parameters menu.

11.6.2 Pre-selected quantity



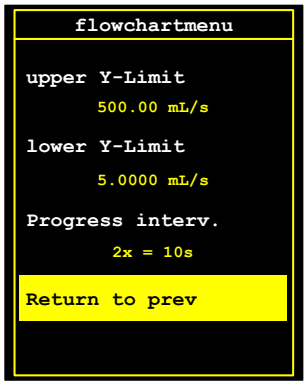
Under "Preselected quantity" the quantity to be dosed is entered in the selected unit.
The menu for entering the pre-selected quantity is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

11.6.3 Remaining quantity



The remaining quantity is displayed here. This deviates from the pre-selected quantity if there is an abort during portioning and the remaining quantity is active (see Settings – Pre-selection counter).
Pressing the Enter button opens the "delete/do not delete" count selection. Make the required selection and confirm with the Enter button. It is saved and the Pre-selection counter menu is returned to.

11.7 Graphic progress menu



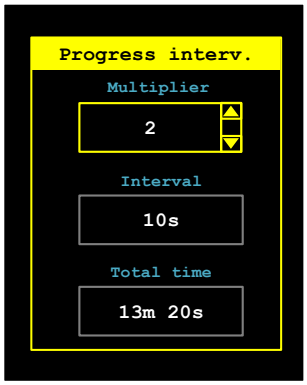
Note: Available from IMA COMFORT onwards

The graphic progress display is configured in the graphic progress menu. The graphic progress display is an illustration of a graphic bar display relating to time.

11.7.1 Return to prev

Back to Parameters menu.

11.7.2 Progress interval



Setting the multiplicator (1 - 999) to set the interval duration in seconds. The interval duration is the product of the multiplicator and the set measurement gate time.
In addition to the calculated interval, the entire period is shown.
As a maximum of 80 measured values are shown, the entire time is the product of the interval and 80.

11.7.3 Lower Y-value

Entry of the lower Y-value for the Y-axis in the selected unit.
The menu for entering the lower Y-value is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

11.7.4 Upper Y-value

Entry of the upper Y-value for the Y-axis in the selected unit.
The menu for entering the upper Y-value is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

11.8 Level monitoring

Note: Optionally available from IMA PRO onwards

See also 15.2 Level monitoring

11.8.1 Return to prev

Back to Parameters menu.

11.8.2 Change container

The internal counter for the level monitoring is set to 100% and therefore to the value for the total fill volume by pressing the Enter button.

Tip: Alternatively, digital input is possible via a button/key switch that can be configured as “Change container”, so this task can be performed without having to open the menu.

11.8.3 Lev1 tank empty

Under “Lev1 tank empty”, it is possible to enter from which quantity in the selected unit the container is considered to be “empty”.
The menu for entering the “Lev1 container empty” is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

11.8.4 Lev2 pre-alarm

Under “Lev2 pre-alarm” the desired quantity can be entered in the selected unit, from which a pre-alarm should be output to prepare for the container change or in the case of low use for an order to be created.

The menu for entering the “Lev2 pre-alarm” is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

11.8.5 Lev3 agitator

Under “Lev3 agitator” the desired quantity is entered in the selected unit from which an agitator in the container, for e.g., should be blocked.

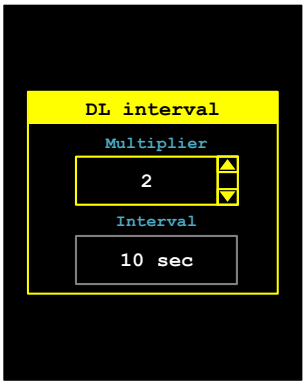
The menu for entering the “Lev3 agitator” is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

11.8.6 Total fill volume

Under Total fill volume, the desired total volume of the used container is entered in the selected unit.

The menu for entering the total fill volume is opened by pressing the Enter button. Enter the desired value as described in 6.0 and confirm it with the Enter button.

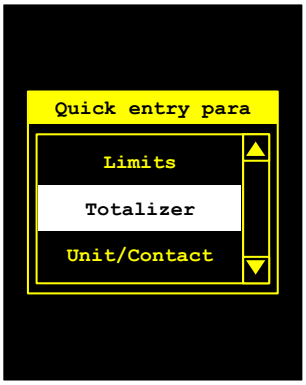
11.9 Data logger interval



Note: Available in IMA PRO2 and IMA PRO3

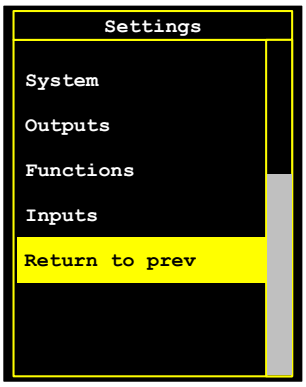
Setting the multiplicator (1 - 240) in order define the interval duration for the data logger in seconds. The interval duration is the result of the product of the multiplicator and the set measurement gate time and is displayed in a separate field.

11.10 Quick entry of parameters



Pressing the Enter button opens a selection menu that lists all the parameters that are available as quick entry parameters depending on the variant of the IMA. Select the required parameters and confirm with the Enter button. This function immediately appears in second place in the Main menu (see 10.0 Quick entry of parameters).

12.0 Settings



Four categories are defined for all settings to be made on the IMA: Inputs, functions, outputs and system.

12.1 Inputs

Depending on the IMA variant, a maximum of two sensor inputs and digital inputs are available respectively. From the IMA PRO onwards there is also an analogue input and a temperature measurement input.

12.1.1 Return to prev

Back to Settings.

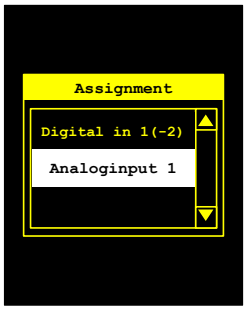
12.1.2 Sensor input 1 (or Sensor input 2)

The associated seven- or eight-item sub-menu for the selected sensor input opens when the Enter button is pressed.
(Left image: Sensor input 1, middle image: Sensor input 2 with Digital input assignment and right image: Sensor input 2 with Analogue input 1 assignment)

12.1.2.1 Return to prev

Back to Inputs

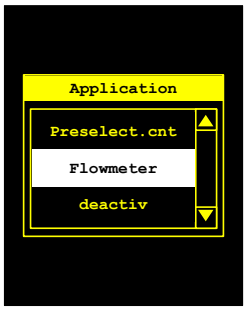
12.1.2.2 Assignment



Note: Only available for Sensor input 2

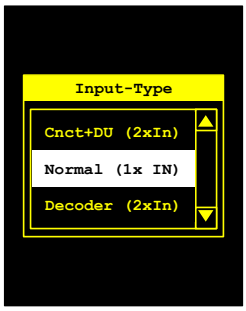
Sensor input 2 can be assigned to Digital input 1 or Analogue input 1. If Analogue input 1 is selected, the menu changes and the menu item Analogue input mode is displayed instead of Input type. This way analogue sensors or analogue feedback from pumps can be used as the sensor signal.

12.1.2.3 Application



The options available are Flow meter and Pre-selection counter. The flow meter application is used to monitor, evaluate and visualise the flow rate. The pre-selection counter application is used to meter out the selected quantity of a liquid. Of course, the flow rate monitoring and the analogue value output are active during the process.

12.1.2.4 Input type



Note: For Sensor input 1 and Sensor input 2 when assignment = Digital input 1(-2)

The following three options are available for the input type depending on the pulse registration device installed in the flow sensor at the factory:

Input type	Description
Normal (1xIN)	Pulse recording by means of a Hall-effect probe (standard). One digital input is required.
Count+U/D (2x IN)	Pulse recording by means of a coded Hall-effect probe for forward and backward counting. Two digital inputs are required.
Decoder (2x IN)	Pulse recording by means of an incremental encoder. Two digital inputs are required.

12.1.2.5 Analogue input mode

Note: Only for Sensor input 2 when assignment = Analogue input 1

The following measuring ranges are available as analogue sensor input:

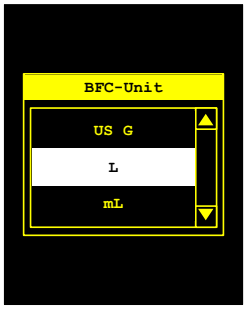
Mode	Description
Measuring range (0-10V)	Voltage measurement in the range 0 – 10 V_{DC}
Measuring range (0-20mA)	Voltage measurement in the range 0 – 20mA_{DC}
Measuring range (4-20mA)	Voltage measurement in the range 4 – 20mA_{DC}

12.1.2.6 Calculation basis

K-factor and measured data records can be selected under Calculation basis (Basis for Calculation = BFC).

Calculation basis	Description
K-factor	The IMA uses the K-factor entered over the entire flow rate range.
Measured data	The IMA uses multiple K-factors depending on the flow rates that are stored in a table.

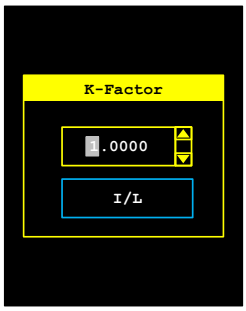
12.1.2.7 BFC unit



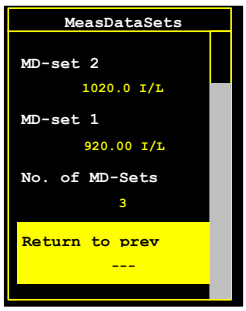
Under BFC unit, the quantity unit is specified to which all K-factors entered are referred. If the BFC unit is changed, all K-factors entered are automatically converted to the new unit.

The following units are available:
- Millilitres – Litres – US gallons – British gallons – Cubic metres –

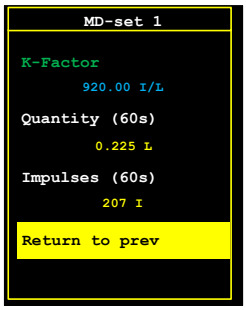
12.1.2.8 Measured data



If “K-factor” or “Measured data” has been selected under Calculation basis, after confirming with Enter, an input window is displayed where the K-factor or measured data can be entered as described in 6.0. K-factor or measured data may also be entered directly in the Settings menu (see item 13.0).
For the K-factor only the code of the flow sensor needs to be entered in Pulse per BFC unit.

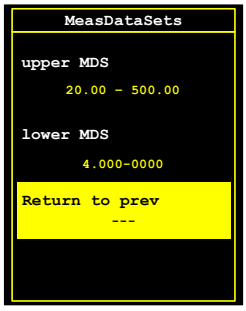


Multiple entries are required for the measured data sets. A selection menu is opened initially where the number of measured data sets (2-5) and the individual measured data sets are available for selection.



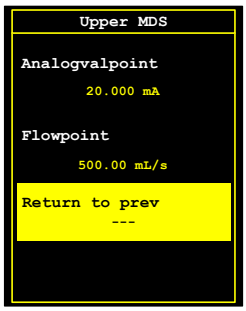
When the measured data set is selected and confirmed with Enter, a selection screen is opened. The pulse and quantity (calculated at 60s) can be entered here. The resulting K-factor is displayed.

Note: The conversion to 60 seconds is important for the data, as the calibration data is also stored and displayed accordingly. If the data is not converted, this can lead to serious calculation errors.



If the Analogue input 1 was assigned as the signal source, the corresponding values can be assigned to the upper and lower measured data set (MDS).

Note: Only for Sensor input 2 when assignment = Analogue input 1

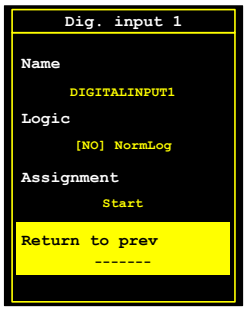


Example image: 20 mA corresponds to 500 ml/s and 4 mA to 0m l/s. Enter the analogue value and flow items as described in 6.0.

12.1.2.9 Name

You can enter a name for the sensor input as described in 6.0. During a measurement, the selected name is displayed in the topmost line of the measured value section.

12.1.3 Digital input 1 (or Digital input 2)



The associated four-time sub-menu for the selected digital input opens when the Enter button is pressed.

12.1.3.1 Return to prev

Back to Inputs

12.1.3.2 Assignment

All available assignments are listed here depending on the IMA design:

Assignment	Description
switched off	Digital input is not active
Start	The measuring process can be started externally in parallel with entry via buttons
Stop	The measuring process can be stopped externally in parallel with entry via buttons
Start Stop	The measuring process can be started externally and stopped again in parallel with entry via buttons
Measurement active	Feedback signal from a control whether the message is activated from this side. (still in the development stage)
Button lock	The buttons of the IMA are locked and only the flow rate display changeover is active.
Container change	The internal counter for the level monitoring is set to 100% and therefore to the value for the total fill volume.

Note: When “Button lock” is selected and the digital input is not connected, no entries can be made at the IMA!

12.1.3.3 Logic

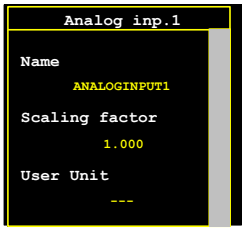
You can select between normal and inverted logic:

Logic	Description
[NO] Normal logic	IMA detects changes from low to high level
[NC] Inverted logic	IMA detects changes from high to low level

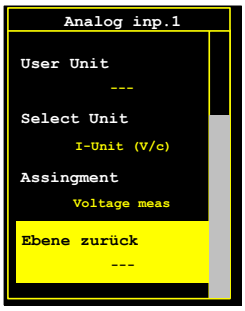
12.1.3.4 Name

You can enter a name for the digital input as described in 6.0. The selected name is used only to make assignment easier and is displayed in this menu only.

12.1.4 Analogue input 1



. . .



Note: Available in all IMA PRO

Note: The menu cannot be opened, if Analogue input 1 is assigned to Sensor input 2 (see 12.1.1)

The associated six-item sub-menu for the analogue input opens when the Enter button is pressed.

12.1.4.1 Return to prev

Back to Inputs

12.1.4.2 Measurement type

List of all available measurement types:

Measurement type	Description
switched off	Analogue input is not active
Voltage measurement	The analogue input is switched into voltage measuring mode and measures DC voltage in the range 0 – 24V)
Voltage measurement	The analogue input is switched into voltage measuring mode and measures DC voltage in the range 0 – 24mA)

12.1.4.3 Unit selection

Menu for selection of the unit in which the measured values of the analogue input are to be displayed

Unit	Description
SI unit (V/C)	The measured values are shown in Volt (V) or Milliampere (mA) depending on the measurement type.
User unit	The measured value is still converted and displayed in the entered unit. To do this, the following menu options, user unit and scaling factor, must be set.

12.1.4.4 User unit

Enter a unit of up to three characters as described in 6.0. This is shown for all analogue input measured value displays. An example of this, would be the connection of a pressure sensor to the analogue input. As the user unit “bar” would be entered and as the scaling factor the factor for the V or mA conversion in bar.

12.1.4.5 Scaling factor

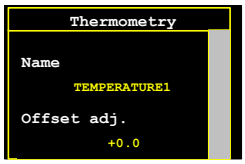
The scaling factor is used for conversion or adjustment of the measured value of the analogue input to another display value.
For example, a connected temperature sensor (0-10V) can have its temperature converted and displayed.

Pressing the Enter button opens the input screen for the scaling factor. Enter the desired value as described in 6.0 and confirm it with the Enter button.

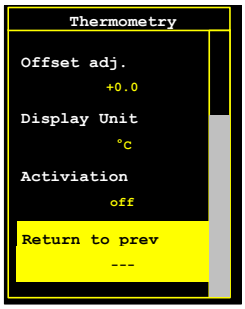
12.1.4.6 Name

You can enter a name for the analogue input as described in 6.0. The selected name is used only to make assignment easier and is displayed in this menu only.

12.1.5 Temperature measurement input



. . .



Note: Available in IMA PRO2 and IMA PRO3

The associated five-item sub-menu for the temperature measurement input opens when the Enter button is pressed. A PT100 is used as the temperature sensor in the two-wire procedure.

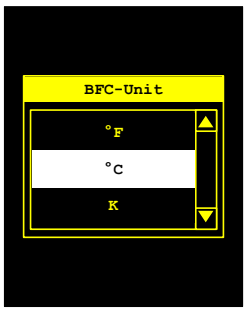
12.1.5.1 Return to prev

Back to Inputs

12.1.5.2 Activation

Pressing the Enter button opens a selection menu where the temperature measurement input can be switched on or off.

12.1.5.3 Display unit



The temperature measuring unit the measured temperature values are to be converted to, can be specified for the IMA in BFC unit

The following are available:
- °C (degree Celsius) – °F (degree Fahreneinheit) – K (Kelvin) –

12.1.5.4 Offset correction

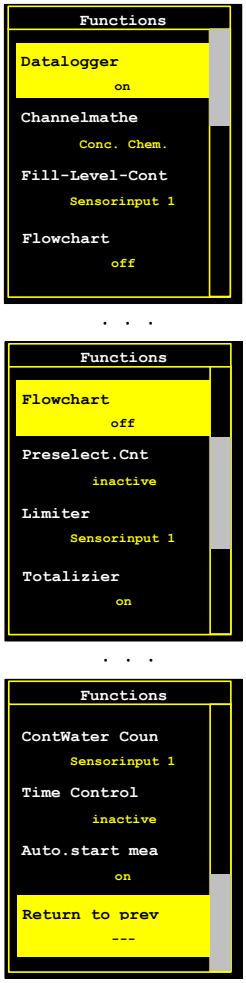
In many areas of application, it is necessary to shift the offset of the measured temperature in order to adapt local/structural conditions. This option allows the offset value to be set in the selected unit using the Up and/or Down buttons.

Display value = Measured value + Offset

12.1.5.5 Name

Allows you to enter a name for the temperature measurement input as described in 6.0. The selected name is used only to make assignment easier and is displayed in this menu only.

12.2 Functions



Up to eleven different functions can be selected depending on the IMA variant.
Select the function you want to set using the Up and Down buttons and open with the Enter button. Only if the selected function is switched on, can you proceed to the next menu following activation.
A function may be inactive:

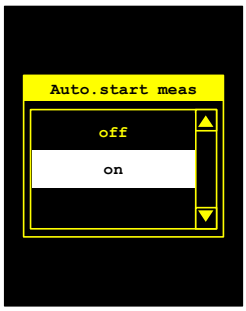
- if this is not available yet
- if the IMA variant does not include it
- if other influences are blocking the function (e.g. for the pre-selection counter function, the relevant pre-selection counter application has not been assigned to a sensor input).

In this case an error message appears for two seconds on the display.

12.2.1 Return to prev

Back to Settings.

12.2.2 Auto.Start measurement

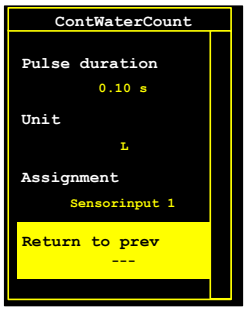


Pressing the Enter button opens a menu in which the “automatic start measurement” function can be switched on/off. If the “Auto. Start” function is active, the IMA starts the active measurement process immediately when the supply voltage is applied. If the “Auto. Start” function is not active, the IMA starts when the supply voltage is applied in the Main menu.

12.2.3 Time control

Note: “Time control” is still in development at the moment.

12.2.4 Contact water meter

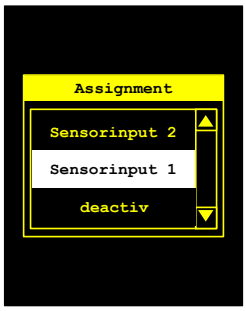


Pressing the Enter button opens the relevant sub-menu where the contact water counter can be assigned to a sensor input, or the function can be switched off.

12.2.4.1 Return to prev

Back to Functions

12.2.4.2 Assignment



In this selection menu the signal source for the graphic flow display can be selected. The following options are available: “switched off”, “Sensor input 1”, “Sensor input 2” and “Channel maths” according to unit variant and sensor input assignments.

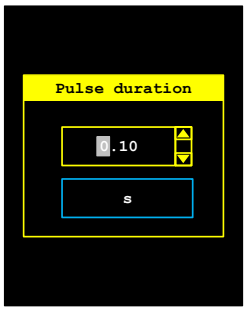
12.2.4.3 Unit

Under “Unit”, the quantity unit is specified for the IMA which will be applied to all parameters entered for contact water counter.

Note: If the unit is changed, the selected measurement is not included in the conversion.

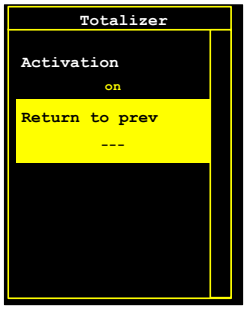
The following units are available:
- Litres – US gallons – British gallons – Cubic metres –

12.2.4.4 Pulse duration



If a digital output is configured as “CWC pulse” under 12.3.1, it may be necessary to change the pulse duration of this signal. This menu option allows the duration in seconds (glide ratio) to be set. The standard value is 0.1 seconds.

12.2.5 Totalizer

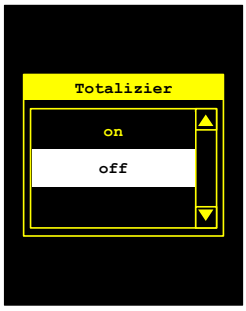


Pressing the Enter button opens a sub-menu in which the totalizer can be switched on or off.

12.2.5.1 Return to prev

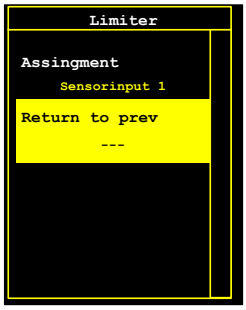
Back to Functions

12.2.5.2 Activation



Pressing the Enter button opens the selection where the totalizer function can be switched on or off.

12.2.6 Limit monitoring



Pressing the Enter button opens a menu where the limit monitoring is assigned a channel, or the function can be switched off. See also 15.1 Limit monitoring.

12.2.6.1 Return to prev

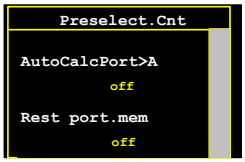
Back to Functions.

12.2.6.2 Assignment

In this associated menu the signal source for the limit monitoring can be selected. Depending on the unit variant and input assignments, the following selection options are available:

Assignment	Description
switched off	Limit monitoring is not active.
Sensor input 1	The limit monitoring monitors the flow of Sensor input 1. The unit for the lower or higher limit is the display unit specified in parameters.
Sensor input 2	The limit monitoring monitors the flow of Sensor input 2. The unit for the lower or higher limit is the display unit specified in parameters.
Channel maths	The limit monitoring monitors the flow or concentration of the channel maths. The unit for the lower or higher limit is the display unit specified in parameters, or is specified in percent.
Analogue input	The limit monitoring monitors the input values of the analogue input. The unit for the lower or upper limit corresponds with the unit selected in the menu Settings – Inputs – Analogue input 1 – Unit selection
Temperature	The limit monitoring monitors the input values of the temperature measurement input. The unit for the lower or upper limit corresponds with the unit selected in the menu 12.1.5 Temperature measurement input – Display unit.

12.2.7 Pre-selection counter



. . .

By pressing Enter the pre-selection menu opens where the pre-selection counter is configured. The following can be set: ready message, duration of the ready pulse, a remaining quantity record and specification of the pre-selection counter quantity through the analogue input 1.

12.2.7.1 Return to prev

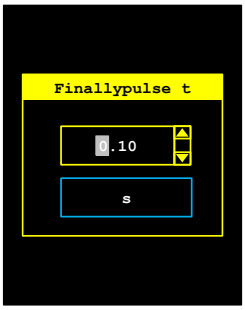
Back to Functions

12.2.7.2 Ready message

After completion of the filling process, the IMA can display a message before the device goes back to the Main menu, or in the case of locking, into a waiting screen.
The following can be selected here:

Ready message	Description
no message	no message is displayed.
2-sec message	a message is displayed for two seconds.
message until button	a message is displayed until a button is pressed.

12.2.7.3 Ready pulse length

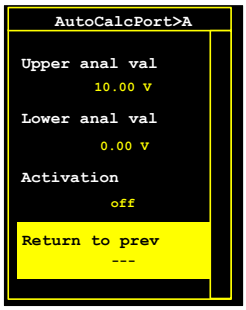


If a digital output is configured as “Preselection ready” under 12.3.1, it may be necessary to change the pulse duration of this signal. This menu option allows the duration in seconds (glide ratio) to be set. The standard value is 0.1 seconds.

12.2.7.4 Remaining quantity record

When the remaining quantity record is activated, the remaining quantity is recorded after a message abort and is processed at the next start.
The remaining quantity record can be displayed and deleted in the parameters in 11.6 Pre-selection.

12.2.7.5 Auto.calc.quantity -> AI



Note: Available in all IMA PRO

This sub-menu leads into the settings menu for the automatic calculation of the pre-selection quantity by specification via analogue input 1. The calculation is between zero and the pre-selection counter quantity in the selected unit. The upper analogue value corresponds with the pre-selection counter quantity and the lower analogue value = 0.

12.2.7.5.1 Return to prev

Back to Pre-selection counter menu.

12.2.7.5.2 Activation

Pressing the Enter button opens a selection menu where the Auto.calc.quantity -> AI function can be switched on or off.

12.2.7.5.3 Lower analogue value

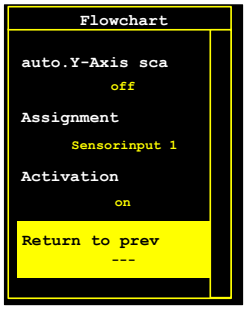
Under “lower analogue value”, the lower analogue value can be entered or measured in the unit set.
Press the Enter button to open the sub-menu for entry or calibration of the lower analogue value. Make the entry as described in 6.0 and confirm with the Enter button.

12.2.7.5.4 Upper analogue value

In “upper analogue value”, the upper analogue value can be entered or measured in the unit set.

Press the Enter button to open the sub-menu for entry or measurement of the lower analogue value.
Make the entry as described in 6.0 and confirm with the Enter button.

12.2.8 Graphic flow display

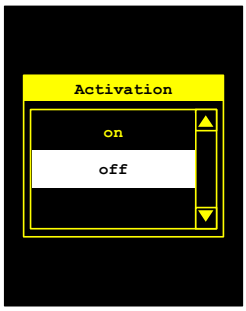


Press the Enter button to open a menu where the graphic flow display can be switched on or off and assigned to a sensor input.

12.2.8.1 Return to prev

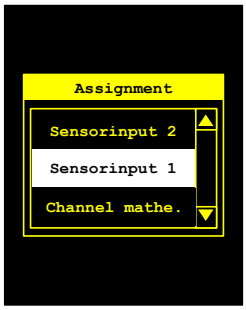
Back to Functions.

12.2.8.2 Activation



Pressing the Enter button opens a selection menu where the graphic flow display can be switched on or off.

12.2.8.3 Assignment



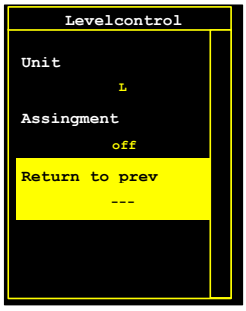
In this selection menu the signal source for the graphic flow display can be selected. The following options are available: Sensor input 1, Sensor input 2 and Channel maths depending on the unit variant.

12.2.8.4 Auto.Y-axis scale

Selection menu for switching the automatic Y-axis scaling on or off.

Note: This function is still in development and is not available yet.

12.2.9 Level monitoring



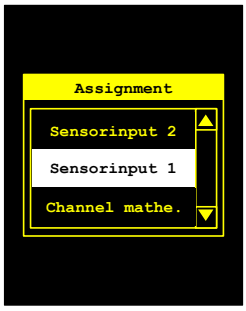
Note: Optionally available in all IMA PRO

Pressing the Enter button opens a menu where the level monitoring can be assigned to a sensor input and default values can be specified for a measurement unit. See also 15.2 Level monitoring.

12.2.9.1 Return to prev

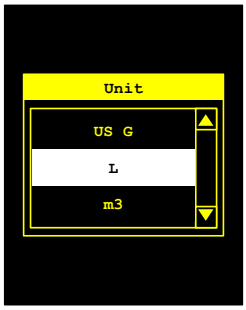
Back to Functions.

12.2.9.2 Assignment



In this selection menu the signal source for the level monitoring can be selected. The following options are available: switched off, Sensor input 1, Sensor input 2 and Channel maths, depending on device variant and settings.

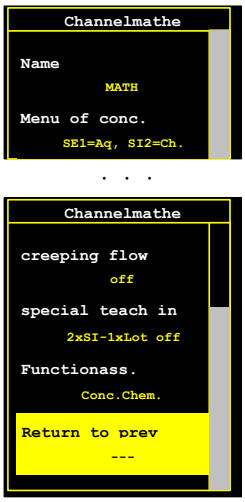
12.2.9.3 Unit



Under Unit, the quantity unit is specified for the IMA which will be applied to all parameters entered for level monitoring. If the BFC unit is changed, all level monitoring values entered are automatically converted to the new unit.

The following units are available:
- Litres – US gallons – British gallons – Cubic metres –

12.2.10 Channel maths



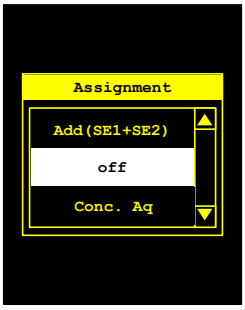
Note: Optionally available in all IMA PRO

Pressing the Enter button opens the menu where the channel maths function can be set. The result of the calculations is assigned to the channel maths “sensor” and can be displayed and also monitored.

12.2.10.1 Return to prev

Back to Functions.

12.2.10.2 Function assignment



The current measured values are used for the calculation of the mathematical functions.

The following mathematical functions are available with two selectable sensor inputs:

Function	Description
switched off	Channel maths is deactivated
Add (SE1+SE2)	Both sensor inputs are added together and the result is assigned to the channel maths. Channel maths = Sensor input 1 + Sensor input 2
Sub (SE1-SE2)	Sensor input 2 is deducted from sensor input 1 and the result is assigned to the channel maths. Channel maths = Sensor input 1 - Sensor input 2
Sub (SE2-SE1)	Sensor input 1 is deducted from Sensor input 2 and the result assigned to the channel maths. Channel maths = Sensor input 2 - Sensor input 1
Chemical concentration	Calculation of the chemical concentration in a solution quantity (see also Concentration menu)

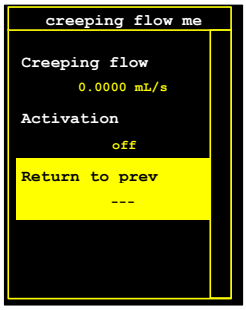
H2O concentration	Calculation of the H2O concentration in a solution quantity (see also Concentration menu)

12.2.10.3 Special measuring

The following special measuring methods are available to determine the measuring data or the K-factor:

Function	Description
switched off	No special measuring method active.
2x sensor, 1x quantity	Both sensors are measured at the same time using this method. It must be ensured that the same quantity flows through both sensors. This is entered after the measuring process.
Measure SE1, Auto SE2	With this method Sensor input 1 is first measured as normal, afterwards a comparison measuring run starts, where Sensor input 1 is used as a reference to calculate the quantity. It must be ensured that the same quantity flows through both sensors.
2x sensor, 2x quantity	Both sensors are measured at the same time using this method. It must me ensured that both liquid quantities flowing through the sensors are collected. After the measuring process, the quantity from Sensor input 1 and then the quantity from Sensor input 2 are entered.

12.2.10.4 Leak flow volume menu



Note: Can only be opened if the function assignment Sub(SE1 – SE2) or Sub(SE2 – SE1) has been selected.

In order to eliminate negative or positive small quantities and minimum quantities (leak flow volumes) that can occur due to physical and hydraulic conditions in the case of subtractions. If the measured value falls below the entered leak flow volume, these shortfalls are eliminated and set to zero.

12.2.10.4.1 Return to prev

Back to Channel maths.

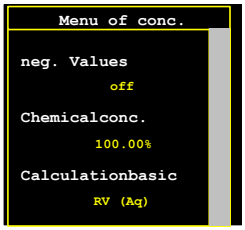
12.2.10.4.2 Activation

Pressing the Enter button opens a selection menu where the leak volume flow elimination can be switched on or off.

12.2.10.4.3 Leak flow volume

Pressing the Enter button opens the sub-menu for entering the threshold quantity for elimination of the leak flow volume in the selected unit. Make the entry as described in 6.0 and confirm with the Enter button.

12.2.10.5 Concentration menu



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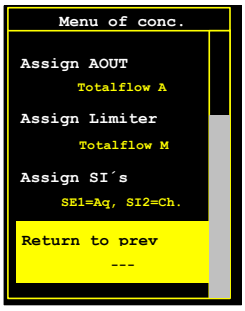


Note: Can only be opened if the function assignment Chemical concentration or Water concentration have been selected (see 12.2.10 Channel maths - Function assignment).

In order to be able to display a chemical substance or water, the IMA always needs both flow rates, the water supply (we base this on mixtures with water), the volume of the chemical substance and / or the volume of the solution (mixture quantity). The third volume is calculated from the two and is assigned to the channel maths.

12.2.10.5.1 Return to prev

Back to Channel maths.

12.2.10.5.2 SE assignment

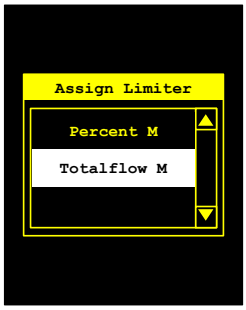
The IMA needs both flow rates to calculate the concentration. In this case both sensor inputs SE1 and SE2 must be assigned. As the local conditions are very variable, the assignment options are numerous.

The following assignments are available:

Assignment	Description
SE1=H2O, SE2=Chem	The water supply is assigned to Sensor input 1, the chemical addition is assigned to Sensor input 2. The solution set is calculated in the Channel maths.
SE1=H2O, SE2=Sol	The water supply is assigned to Sensor input 1, solution set is assigned to Sensor input 2. The chemical quantity is calculated in the channel maths.

SE1=Chem, SE2=H2O	The chemical addition is assigned to Sensor input 1, the water supply is assigned to Sensor input 2. The solution set is calculated in the Channel maths.
SE1=Chem, SE2=Sol	The chemical addition is assigned to Sensor input 1, the solution set is assigned to Sensor input 2. The water supply is calculated in the channel maths.
SE1=Sol, SE2=H2O	The solution set is assigned to Sensor input 1, the water supply is assigned to Sensor input 2. The chemical addition is calculated in the channel maths.
SE1=Sol, SE2=Chem	The solution set is assigned to Sensor input 1, the chemical addition is assigned to Sensor input 2. The water supply is calculated in the channel maths.

12.2.10.5.3 Limit assignment



Pressing the Enter button opens a selection menu where the limit monitoring is indicated, and possibly what needs to be monitored (depending on assignment in Limit monitoring 12.2.5).

Limit assignment	Description
Total flow (maths)	The calculated quantity is monitored (depending on assignment). The limit values are entered in the selected unit.
Percent (maths)	The calculated concentration is monitored. The limit values are entered in percent.

12.2.10.5.4 AOUT assignment

Pressing the Enter button opens a selection menu where the analogue output is indicated, and if necessary, the definition for the output (depending on assignment in analogue output 12.3.2). The following items are available:

AOUT assignment	Description
Total flow (maths)	The calculated quantity is output (depending on assignment). The range limits are entered in the selected unit.
Percent (maths)	The calculated concentration is output. The range limits are entered in percent.

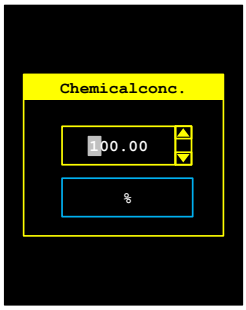
12.2.10.5.5 Calculation reference

Pressing the Enter button opens a selection menu where the mathematical basis for the concentration calculation can be selected.

Calculation reference	Description
SS – Solution	The solution set is used as the calculation basis (100%).
RV – H2O	The water volume is used as the calculation basis (100%).

Tip: If RV-H2O is selected, in the case of the Concentration function assignment, the result is always 100%

12.2.10.5.6 Chemical concentration



Pressing the Enter button opens the sub-menu where the chemical concentration can be entered in percent. If the proportion of the chemical in the solution set is to be displayed, 100% should be entered, if the resulting concentration is to be displayed, the concentration of the chemical substance used should be entered (safety data sheet / label …).
Make the entry as described in 6.0 and confirm with the Enter button.

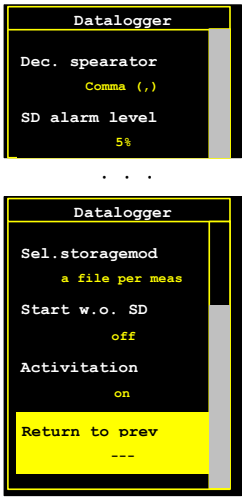
12.2.10.5.7 Negative values

Pressing the Enter button opens a selection menu for the activation and deactivation of negative results.

12.2.10.5.8 Name

You can enter a name for the temperature measurement input as described in 6.0. During a measurement, the selected name is displayed in the topmost line of the measured value section.

12.2.11 Data logger



Pressing the enter key opens the menu where the data logger can be switched on or off. In addition, in this menu a new measurement can be started with data recording without SD card (saved to internal memory) and save mode and decimal separators can be preset for the measured values in the file.

12.2.11.1 Return to prev

Back to Functions.

12.2.11.2 Activation

Pressing the Enter button opens a selection menu where the data logger can be switched on or off. If the data logger is activated, apart from the measurement data, changes etc. are also logged in a separate file.

12.2.11.3 Measurement start without SD

Pressing the Enter key opens a selection menu where it can be specified whether a measurement is started without an SD card inserted. If it is switched on, the measurement data is saved in the internal memory.
The following options are available:

Selection	Description
switched off	The measurement and data saving may only be started if the SD card has sufficient storage capacity.
switched on	The measurement and data saving are saved in any case, if there is sufficient storage on the SD card inserted or in the internal memory.

Tip: Do not forget to copy the data from the internal memory to the SD card. This is possible via the menu options Settings – System – Internal memory

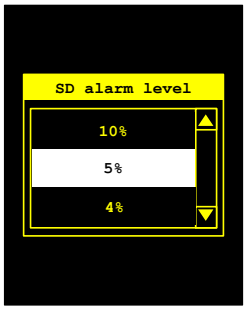
Note: The storage capacity can be requested under Settings – System – SD Card – Information. The same applies for the internal memory under Settings – System – Internal memory – Information.

12.2.11.4 Memory mode selection

Pressing the Enter button opens a selection menu where it can be specified where the system should store data.

Memory mode	Description
A large file	All data is saved in a large file that is constantly reopened. An empty line followed by the measuring data header is written between the individual measurements.
File for each measurement	Each time a measurement is started, a new file is generated and this is filled until the measurement is ended / aborted.

12.2.11.5 SD card alarm value



In this menu a percentage threshold can be selected for the monitoring of free storage capacity on an SD card. The SD card can be assigned a digital output (see digital output 12.3.1 Assignment = SD card alarm) to indicate the free storage capacity falling below the percent threshold.

Adjustable SD card alarm values in percent:

- 0% - 1% - 2% - 3% - 4% - 5% - 10% - 15% - 20% - 25% -

12.2.11.6 Decimal separators

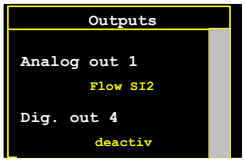
Pressing the Enter button opens a selection menu where the decimal separator for saved measurements is defined.
The following can be selected:

Comma (,) → The comma is used as the decimal separator e.g. 12,34
Point (.) → A point is used as the decimal separator e.g. 12.34

Tip: Use the comma as the separator in German speaking areas, as spreadsheet programs such as for e.g. Microsoft Excel are usually country-specific and the

comma is used. Otherwise the decimal separator will have to be changed in all measurements.

12.3 Outputs



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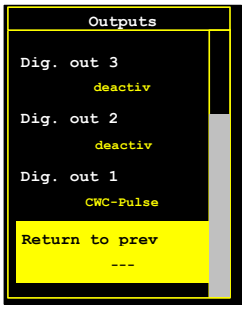
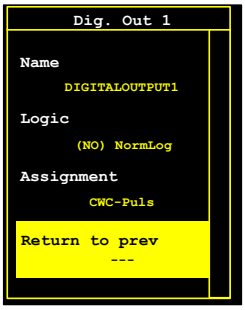


Depending on the IMA variant, two relay outputs are physically implemented as solid-state relays, (digital output 1 & 2), two NPN outputs (digital output 3 & 4) and an analogue output are available.

12.3.1 Return to prev

All changes are saved and the Settings menu is returned to.

12.3.2 Dig. output 1 (SSR1) … Dig. output 4 (LSS2)



The associated three-item sub-menu for the selected digital output opens when the Enter button is pressed. Various functions can be assigned to the selected output to enable communication of the IMA with e.g. higher-level control systems.

12.3.2.1 Return to prev

Back to Outputs.

12.3.2.2 Assignment

In this sub-menu, only one of the functions listed below can be assigned to the output selected:

Note: The availability of the specified functions may vary depending on the respective IMA variant

Assignment	Description
switched off	The digital output is deactivated and does not function.
Frequency SE1	Sensor input 1 is assigned to the digital output. The input frequency is set to 1:1 on the output.
Measuring time	The digital output becomes active if a measurement is started, and passive again if the measurement is ended. If the application is pre-selection counter, the digital output is active until the pre-selected quantity is processed.
Alarm window	The digital output becomes active when the value being monitored is outside (below/above) the set limits.
Lower limit value	The digital output becomes active when the value being monitored is below the lower limit.
Upper limit value	The digital output becomes active when the value being monitored is above the upper set limit.
CWC pulse	The digital output triggers a pulse (time adjustable) when the set unit/contact value is run via the assigned sensor.
Pre-selection ready	The digital output triggers a ready pulse (time adjustable) when the pre-selection value has been processed.
Lev1 container empty	The digital output becomes active as soon as the container empty parameter has fallen below the level monitoring.
Lev2 pre-alarm	The digital output becomes active as soon as the pre-alarm parameter has fallen below the level monitoring.
Lev3 agitator	The digital output becomes active as soon as the agitator parameter has fallen below the level monitoring.
SD card alarm	The digital output becomes active, when the free storage capacity of the SD card inserted falls below the set alarm value.
Fault detector	The digital output becomes active when an error has occurred during a measurement. The digital output only becomes passive again after the error is acknowledged.
Frequency SE2	Sensor input 2 is assigned to the digital output. The input frequency is set to 1:1 on the output.

12.3.2.3 Logic

You can select between normal and inverted logic here.

Output	Logic	Switch-on phase			Off	Measurement running																Rest phase
		Switching on	Until settings loaded from the EEPROM	After settings loaded		Frequency SE1	Measuring time	Alarm window				Lower limit value				Upper limit value				CWC pulse		Menu active
								f = 0	f < LL	f >= LL, f <= UL	f > UL	f = 0	f < LL	f >= LL, f <= UL	f > UL	f = 0	f < LL	f >= LL, f <= UL	f > UL	Imp < set value	Imp = set value	
SSR	Normal	open	open	open	open	SE1-Freq	closed	closed	closed	open	closed	closed	closed	open	open	open	open	open	closed	open	pulse closed	open
SSR	Inverted	open	open	closed	open	SE1-Freq	open	open	open	closed	open	open	open	closed	closed	closed	closed	closed	open	closed	Pulse open	closed
LSS	Normal	off	short pulse	off	off	SE1-Freq	on	on	on	off	on	on	on	off	off	off	off	off	on	off	Pulse on	off
LSS	Inverted	off	short pulse	on	off	SE1-Freq	off	off	off	on	off	off	off	on	on	on	on	on	off	on	Pulse off	on

Comments

SSR

open	The SSR is not controlled and thus the contact is open
closed	The SSR is controlled and thus the contact is closed

LSS

off	The LSS is not controlled (blocked)
on	The LSS is controlled (conductive)
short pulse	The LSS is controlled for a short time (ms range) during the initialisation phase

f = 0

No pulse is applied to the sensor input

f < LL

The sensor flow rate measured is lower than the lower limit value set

f >= LL, f <= UL

The measured sensor flow rate is equal to or higher than the lower limit value and equal to or lower than the upper limit value

f > UL

The sensor flow rate measured is higher than the upper limit value

Imp < set value

The sensor flow rate measured has not yet reached the set quantity

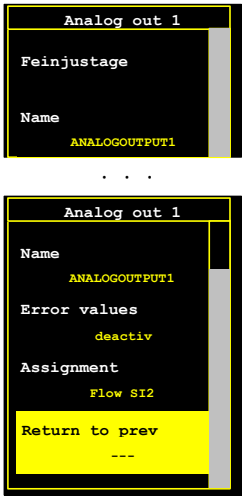
Imp = set value

The sensor flow rate measured has reached the set quantity and a pulse is output
The pulse length corresponds to the set pulse length (see menu: Settings - Functions - Contact water counter - Pulse length)

12.3.2.4 Name

You can enter a name for the output as described in 6.0. The selected name is used only to make assignment easier and is displayed in this menu only.

12.3.3 Analogue output 1



The associated six-item sub-menu for the selected analogue output opens when the Enter button is pressed. Please see the article code to find out the output type installed in your IMA.

12.3.3.1 Return to prev

Back to Inputs.

12.3.3.2 Assignment

In this sub-menu, only one of the functions listed below can be assigned to the analogue output 1:

Note: The availability of the specified functions may vary depending on the respective IMA variant

Assignment	Description
switched off	The analogue output is switched off and does not function.
Flow SE1	The analogue output is assigned to the flow of sensor input 1.
Container level	The analogue output is assigned to level monitoring. The upper value indicates a full container. (e.g. 20mA = 50L)
Flow SE2	The analogue output is assigned to the flow of sensor input 2.
Maths flow	The analogue output is assigned to the flow or concentration of the channel maths.
Temperature	The analogue output is assigned to the measured value of the temperature measurement input.
Analogue input	The analogue output is assigned to the input value of analogue input 1.

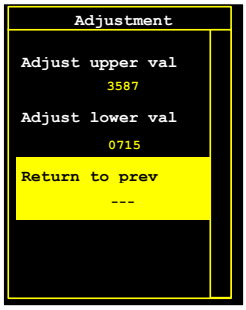
12.3.3.4 Error values

The “Error value” function can be activated or deactivated in this menu. If the error value is active, internal errors of the IMA are output with a higher output current (approx. 24 mA) or a higher output voltage (approx. 12 V).

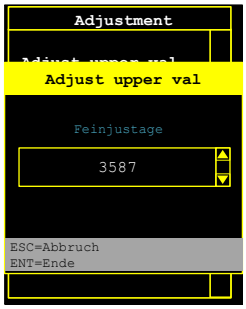
12.3.3.5 Name

You can enter a name for the analogue output as described in 6.0. The selected name is used only to make assignment easier and is displayed in this menu only.

12.3.3.6 Fine adjustment

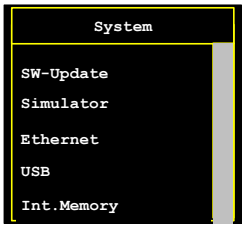


In this sub-menu the lower and upper analogue output value can be adapted to the respective system, if there are discrepancies with the factory setting. The value that requires changing is selected and confirmed with the Enter button.



The value is output at the analogue output and can now be changed using the Up and Down buttons.
The procedure is completed by pressing Enter, the new value is saved and you are returned to the selection menu.

12.4 System



Pressing the Enter key takes you to the system menu where system settings and input/output simulation can be configured

Note: The number of menu options available may vary depending on the respective IMA variant

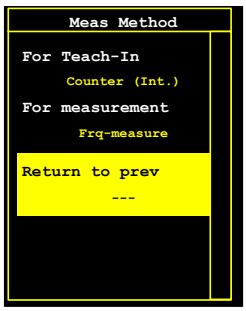
Return to prev:

All changes are saved and the Settings menu is returned to.

12.4.1 Device name

Here a name can be entered e.g. “INDUSTRIAL WATER” for the complete IMA as described in 6.0. The selected name is used only to make assignment easier and is displayed in this menu only.

12.4.2 Measurement procedure

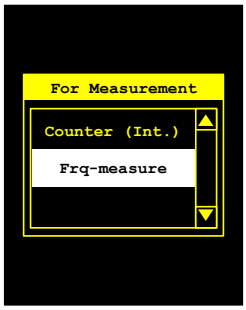


The associated three-item sub-menu opens when the measurement procedure option is selected by pressing the Enter button. This menu allows the selection of the measurement procedure for determining the flow data for the actual measurement and also for the measuring, independently of each other.

12.4.2.1 Return to prev

Back to System.

12.4.2.2 for measurement



Pressing the Enter button opens a selection menu where the measuring procedure for measurement can be selected.

The measuring procedures available are meter (interrupt) and frequency measurement.

Selection	Description
Counter (interrupt)	For this measurement procedure, the flanks of the input signal are incremented via an interrupt request (interrupt) and offset with the measurement gate time.
Frequency measurement	For this measurement procedure, the time between the flanks of an input signal are measured, totalled and an average value generated. The measurement value is the result of this. The advantage is higher accuracy in the case of lower input frequencies. Although there is a dependency on the measurement gate time.

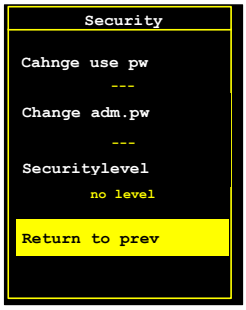
12.4.2.3 for calibration

Pressing the Enter button opens a selection menu where the measuring procedure for calibration can be selected.

The measuring procedures available are meter (interrupt) and frequency measurement.

Tip: As the frequency measurement measuring procedure is linked to the time factor, we recommend that this is only used for calibration if the IMA also controls the pump / magnetic valve (set the assignment of this output to measurement time), as this could lead to serious inaccuracies in some cases.

12.4.3 Security



In the Security menu the security level can be selected and the Administrator and User password changed. By default the administrator password is 9999 and the user password 1111.

Note: After a set time (5 minutes) without any keys being pressed, the approval is cancelled and the relevant password must be entered again after selecting a protected menu.

12.4.3.1 Return to prev

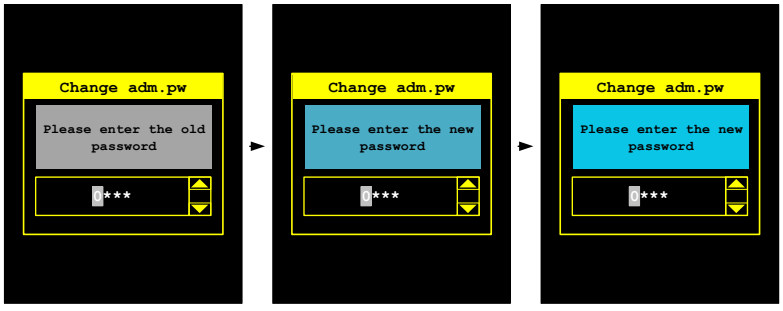
Back to System.

12.4.3.2 Security level

The following security levels are currently available:

Security level	Description
No level	The Main menu is easily accessed and all settings and parameters can be changed.
Low level	The Main menu is easily accessed. All other settings and parameters can be changed apart from the settings menu and the calibration menu (administrator password).
Medium level	The Main menu is easily accessed. The parameters menu is protected by the user password and both settings and calibration menus are protected by the administrator password.
High level	The Main menu is password- protected and can only be unlocked using the Administrator password. Thus all settings and parameters are protected from unintentional changes.

12.4.3.3 Change Administrator and User password



Allows the Administrator password or User password to be changed. First the old password is requested, then the new password must be entered correctly twice in succession.

If both the new passwords are the same, it is then saved as the new password and is valid from this point.
If there is any discrepancy between the new passwords, the system issues an error message.

12.4.4 Real-time clock

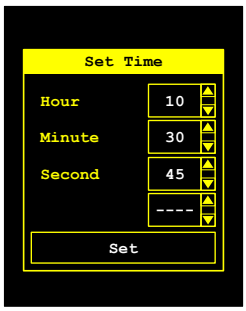
Note: Available in all IMA PRO

The associated five-item sub-menu opens when the real-time clock item is selected by pressing the Enter button. In this menu the time, data and summer/winter time can be set.

12.4.4.1 Return to prev

Back to System.

12.4.4.2 Time setting

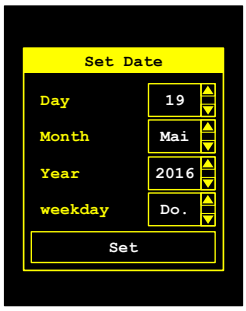


In this sub-menu the current time of the battery-buffered real-time clock can be set in the sequence Hour – Minute – Second – Set.

The values are set using the Up and Down buttons (see 5.0) and by confirming with the Enter button. It is possible to jump between the individual items using the Right and Left buttons without confirmation.

When the “Set” field is confirmed with the Enter button, the set time is transferred to the real-time clock and continues to run from this point. Then back to the Real-time clock menu.

12.4.4.3 Date setting



In this sub-menu the current date of the battery-buffered real-time clock can be set in the sequence Day – Month– Year – Weekday - Set.

The values are set using the Up and Down buttons (see 5.0) and by confirming with the Enter button. It is possible to jump between the individual items using the Right and Left buttons without confirmation.

When the “Set” field is confirmed with the Enter button, the set date is transferred to the real-time clock and continues to run from this point.
When a new date is identified, the summer/winter time request opens. Then back to the Real-time clock menu.

12.4.4.4 Summer/winter time

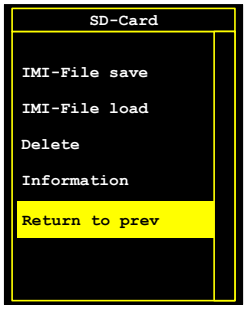
You can select between summer and winter time here. The time is automatically changed if there is any adjustment.

Date/time format:

The following date/time formats are available:

Date/time format	Description
Europe	Date format: Day . Month . Year Time format: Hour (0-24): Minute: Second
English	Date format: Day . Month . Year Time format: Hour (0-12): Minute: Second AM/PM
American	Date format: Month / Day / Year Time format: Hour (0-12): Minute: Second AM/PM
Asia	Date format: Year – Month – Day Time format: Hour (0-24): Minute: Second
Standard representation	Date format: Year – Month – Day Time format: Hour (0-24): Minute: Second

12.4.5 SD card



Note: Available in all IMA PRO

Pressing the Enter button opens a menu where SD card requests can be made relating to the deletion of files and the loading or saving of IMI files (IMA configuration files).

12.4.5.1 Return to prev

Back to System.

12.4.5.2 Information

The following information about the inserted SD card is shown:

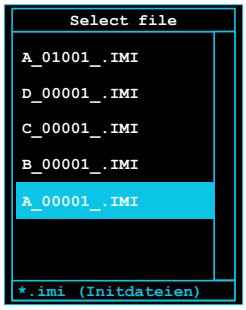
SD card info	Description
Total capacity	The total storage capacity of the inserted SD card is shown in kbyte (1024 byte)
Free capacity	Shows the free storage capacity in kbyte (1024 byte).
Free in percent	Shows the free storage capacity in percent. Used for the monitoring of free storage capacity (data logger).
Total directories	Shows the number of directories.
Total files	Shows the total number of files.
Number of MeasLogFiles	Shows the number of available data logger files (CSV files). The semicolon (;) is used as the separator.
Number of SysLogFiles	Shows the number of available system log files (IMA_SYS.LOG). The number is usually 1.
Number of init files	Shows the number of available IMA configuration files. (IMI files). These files enable offline exchange between the PC program for configuration and the IMA itself.

12.4.5.3 Delete

Menu option for deleting files on the inserted SD card. The following selection options are available:

Delete	Description
Do not delete	Ends the selection without initiating any action. No files are deleted.
Delete MeasLogFiles	Deletes all MeasLogFiles (CSV files) on the inserted SD card.
Delete all files	Deletes all files (*.*) on the inserted SD card.

12.4.5.4 Load IMI files



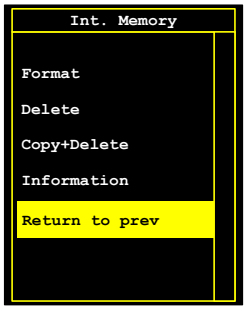
In this menu option a small file selection window is provided after pressing the Enter button, where a new configuration file can be selected and loaded for the IMA.
Using the Up and down buttons it is possible to select the configuration file for loading. This is loaded and applied as the current configuration by pressing Enter.
After loading you are returned to the SD car menu.
Pressing ESC cancels this and you are returned to the SD card menu with no actions executed.

12.4.5.5 Save IMI files

To save the current configuration a configuration file must be selected for overwriting, or a new file name must be entered. In this menu option a small file selection window is provided by pressing the Enter button.
A configuration file can be selected by using the Up and Down buttons and applied by pressing Enter. A message then follows to check if the file should be overwritten. If Yes = Enter button confirms the current configuration in the file will be overwritten. After saving you are returned to the SD card menu.

If a selected file name needs to be changed or a new name entered, press the ESC key when the cursor bar is on the relevant file. Make an entry or change as described in 6.0.
Pressing the Enter button completes the entry and the current configuration is saved.
You are then returned to the SD card menu.

12.4.6 Internal storage



Note: Available in all IMA PRO

Pressing Enter opens a menu where information about the deletion, copying and formatting of files from the internal storage medium can be requested.

12.4.6.1 Return to prev

Back to System.

12.4.6.2 Information

The following information about the internal storage medium can be requested:

SD card info	Description
Total capacity	The total storage capacity of the internal storage medium is shown in kbyte (1024 byte).
Free capacity	Shows the free storage capacity in kbyte (1024 byte).
Free in percent	Shows the free storage capacity in percent. Used for the monitoring of free storage capacity (data logger).
Total directories	Shows the number of directories.
Total files	Shows the total number of files.
Number of MeasLogFiles	Shows the number of available data logger files (CSV files). The semicolon (;) is used as the separator.
Number of SysLogFiles	Shows the number of available system log files (IMA_SYS.LOG). The number is usually 1.
Number of init files	Shows the number of available IMA configuration files. (IMI files). These files enable offline exchange between the PC program for configuration and the IMA itself.

12.4.6.3 Copying & deleting

Note: The menu can only be opened if files are available on the internal storage.

Menu option for copying and subsequent deletion of the selected file on the internal storage medium. Copying to the inserted SD card.

In this menu option a small file selection window is provided for the selection of a file from the internal storage and copying/deleting it. Pressing the Enter button opens the selection window. The file is selected using the Up and Down keys and by pressing Enter this is copied to the SD card and then deleted in the internal storage. Then you are returned to the internal storage menu.
Pressing ESC cancels this and you are returned to the SD card menu with no actions executed.

12.4.6.4 Delete

The following selection options are available for the deletion of files in the internal storage:

Delete	Description
Do not delete	Ends the selection without initiating any action. No files are deleted.
Delete MeasLogFiles	Deletes all MeasLogFiles (CSV files) on the inserted SD card.
Delete all files	Deletes all files (*.*) on the inserted SD card.

12.4.6.5 Formatting

For a file system to be created on the internal storage, this must first be formatted (via the Formatting menu option).
In order to format the internal storage the “format” selection must be confirmed. The internal storage is then formatted.
As the procedure does not last long, a special screen showing the progress is only displayed briefly.
After formatting you are returned to the internal storage menu.

12.4.7 USB

Note: Available in all IMA PRO

Note: This function is still in development and is not available yet.

12.4.8 Ethernet

Note: Only available in IMA PRO3

Note: This function is still in development and is not available yet.

12.4.9 Simulator

Using the simulator the wiring and input/ output functions of the connected IMA can be tested and checked within the operating environment. The following listed options can be selected using the Up and Down buttons and the outputs can be set for the outputs using the Right and Left buttons. Confirming the “Level back” option with the Enter button opens the system menu

All the options are listed and described in the following:

Simulation	Description
Sensorinput1	Displays the current frequency of Sensor input 1 in hertz.
Sensorinput2	Displays the current frequency of Sensor input 2 in hertz. When “not active” is displayed the sensor input is not available.
Digitalinput1	Displays the current status of digital input 1. In addition to the two states “switched on” and “switched off”, the “not active” state can also be displayed if the input is not available or is assigned as sensor input 2.
Digitalinput2	Displays the current status of digital input 2. In addition to the two states “switched on” and “switched off”, the “not active” state can also be displayed if the input is not available or is assigned as sensor input 2.
Digitaloutput1	Display and change in state of the digital output 1 (SSR1). The state is changed using the Right / Left buttons. When “not active” is displayed, the output is not available.
Digitaloutput2	Display and change in state of the digital output 2 (SSR2). The state is changed using the Right / Left buttons. When “not active” is displayed, the output is not available.
Digitaloutput3	Display and change in state of the digital output 3 (LSS1). The state is changed using the Right / Left buttons. When “not active” is displayed, the output is not available.
Digitaloutput4	Display and change in state of the digital output 4 (LSS2). The state is changed using the Right / Left buttons. When “not active” is displayed, the output is not available.
Analogoutput1	Display and change in value of the output of analogue output 1, depending on output type (0 or 4 up to 20mA or 0 – 10V). The value is changed using the Right / Left buttons in increments of 1. When “not active” is displayed, the output is not available.
Sensortemperature	Display of the current voltage value of the temperature measurement input. Only the measured voltage is displayed in volts. When “not active” is displayed, the temperature measurement input is not available.

12.4.10 Software update (bootloader)

Note: This function is available in all IMA PRO versions

A new version of the IMA application software can be imported using the software update function. To do this, the new software version (file: IMA_Prog.bin) must be available on the inserted SD card. The memory is programmed via the integrated bootloader.
The information is then provided that the integrated bootloader will be called up for the programming of the storage. A warning then follows with a request which by confirming/pressing the Enter button, immediately restarts the IMA. The bootloader responds. All the other buttons abort the process.

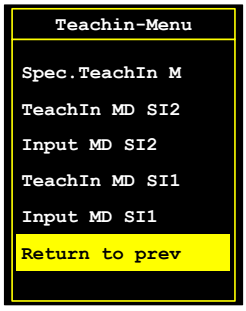
The bootloader menu is completely in English, to minimise the storage requirement for the bootloader and reserve as much storage as possible for the application software.

Menu item	Description
Start app	The application is started when this menu option is selected. If the application memory is empty, the menu will be displayed again following an error message.
Import new app	New application software is imported using this menu option, with the following sequence of functions: - Export of the current application memory into the “IMA_PrUp.bin” file. - Deletion of the application memory - Import of the new application software from the “IMA_Prog.bin” file on the SD card.
Restore prev. app	Old application software is restored using this menu option, with the following sequence of functions: - Deletion of the application memory - Restore of the “old” application software from the “IMA_PrUp.bin” file on the SD card. If the file is not available, the menu will be displayed again following an error message.

Note: The data memory is not changed by the bootloader functions.

Note: The bootloader can be started immediately when the device is started, by pressing both arrow buttons on the right side of the display at the same time.

13.0 Calibration menu



This menu is used to determine the K-factor of a connected flow meter. Depending on the calculation basis (K-factor or measured data records) assigned to the sensor input (see item 12.1), two different masks - for calibration or entry - are displayed in the Settings menu.

For “K-factor” calculation basis, see 13.1 The Calibration menu if calculation basis is K-factor and “Measured data” calculation basis, see 13.2 The Settings menu if calculation basis is measured data.

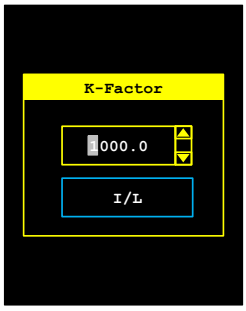
13.1 The Calibration menu if calculation basis is K-factor

Warum steht da nix?

13.1.1 Return to prev

Back to Main menu.

13.1.2 MD entry for SE1



If the K-factor of the flow meter is specified in the data sheet or another source, this can be entered directly as described in 6.0. The unit of the K-factor is always in the unit pulse/BFC. Setting of the calculation unit BFC (see 12.1.1).

13.1.3 MD calibration for SE1

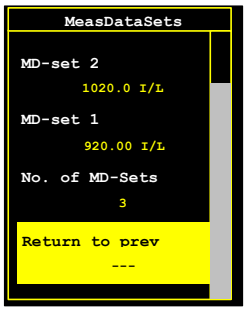
In this menu, the K-factor of the flow meter is determined automatically by the IMA. Please follow this procedure:

1. Put a measuring cup under the outlet.
2. Start the measurement with the Enter button.
3. Open or activate the valve / ball cock or pump (not necessary if valve / ball cock or pump is controlled by the IMA).
4. The IMA records the pulses and the time.
   Important! Measure litre flow for at least 120 seconds.
5. Close or deactivate the valve / ball cock or pump (not necessary if valve / ball cock or pump is controlled by the IMA).
6. End the measurement with the Enter button.
7. Enter the gauged litre amount as described in 6.0. (The quantity is always entered in the set BFC unit (see 12.1.1).

Important: If no pulse is registered after about 180 seconds after the start of measurement, the IMA will automatically stop the calibration process.

Important: The number of pulses indicated by the IMA during the calibration process is double the actual number because the rising and falling flanks of the pulse are always recorded.

13.2 The Settings menu if calculation basis is measured data



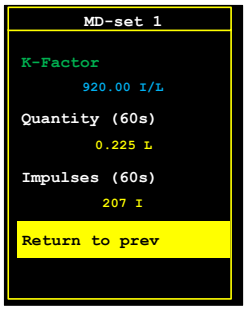
Up to five measured data records can be stored in Measured data. This is used whenever the flow meter is operated in a non-linear area. To this end, different K-factors are assigned to up to five different flow rate areas (or determined).

Irrespective of whether the measured data is entered or determined, a sub-menu opens after selection of the Calibration or MD entry for SE2 options, and then pressing the Enter button. In the sub-menu, the measured data record to be edited can be selected and the number of data records can be entered.

13.2.1 Return to prev

Back to Calibration menu.

13.2.2 Measured data entry for SE1



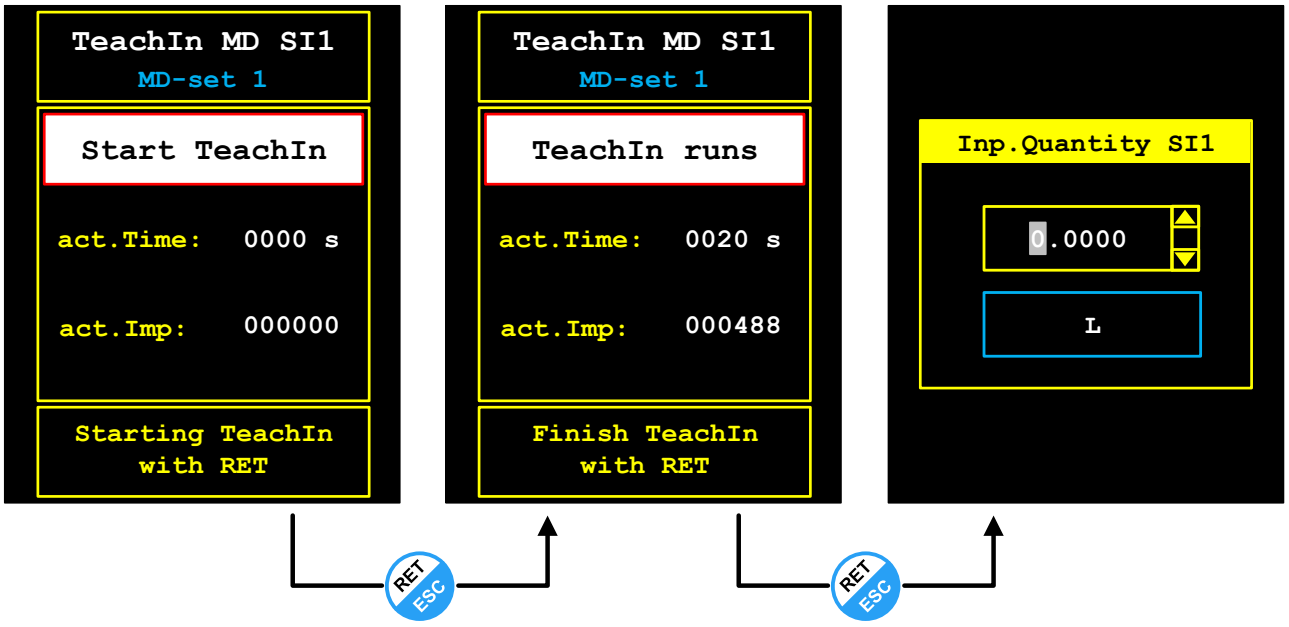
In order to save the K-factor and associated flow rate in the IMA at 60s, the rate and pulses determined for the respective measured data record are entered. The quantity unit corresponds to the BFC unit selected (see item 12.1.1).

13.2.3 Measured data calibration for SE1

In this menu, the flow rate and the K-factor for the measured data record selected are determined automatically by the IMA. Please follow this procedure:

1. Put a measuring cup under the outlet.
2. Start the measurement with the Enter button.
3. Open or activate the valve / ball cock or pump (not necessary if valve / ball cock or pump is controlled by the IMA).
4. The IMA records the pulses and the time.
   Important! Measure litre flow for at least 120 seconds.
5. Close or deactivate the valve / ball cock or pump (not necessary if valve / ball cock or pump is controlled by the IMA).
6. End the measurement with the Enter button.
7. Enter the quantity measured in litres as described in 6.0 (the quantity is always entered in the set BFC unit (see 12.1.1).

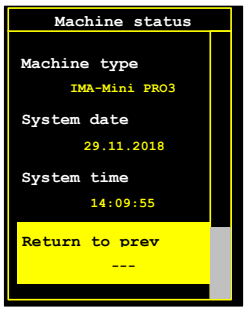
Important: If no pulse is registered after about 180 seconds after the start of the measurement, the IMA will automatically stop the calibration process.



Important: The number of pulses indicated during the calibration process is double the actual number because the rising and falling flanks are recorded.

Tip: It is best to determine the quantity with accurate high-resolution scales or an easily readable calibration container. The more accurately the quantity is determined and entered, the more accurate the subsequently displayed measured values will be.

14.0 Device status

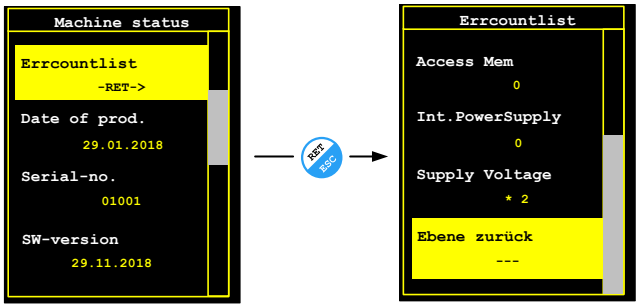


Device data relevant to maintenance and support is displayed here. Exit the Device status menu by selecting “Level back” and then pressing the Enter button. Also, the Error counter menu can be called up where errors that have occurred can be counted and confirmed.

Note: The number of menu options available may vary depending on the respective IMA variant

Status	Description
Level back	Back to Main menu
System time	Current system time of the real-time clock
System date	Current system date of the real-time clock
Device type	Display of the device variant e.g. IMA Mini PRO3
Device IO HWB	Display of the implemented IO hardware board
Software version	Display of current firmware version
Software date	Display of current firmware date
Serial number	Display of the device serial number
Production date	Display of the production date
Error counter list	Sub-menu for handling errors that have occurred in the device
Internal counter 1	Non-deletable totaliser for sensor input 1
Internal counter 2	Non-deletable totaliser for sensor input 2
Internal counter ARI	Non-deletable totaliser for channel maths

14.1 Error counter list



In this menu, all recorded internal error sources occurring during the measuring process or processes, are listed and their counter status displayed.
The errors themselves can also be acknowledged, so the error flag (see digital outputs 12.3.1) is reset.

When an error has not yet been acknowledged, a start(*) is shown in front of the error source text.

To follow is a list of the error sources recorded by the system:

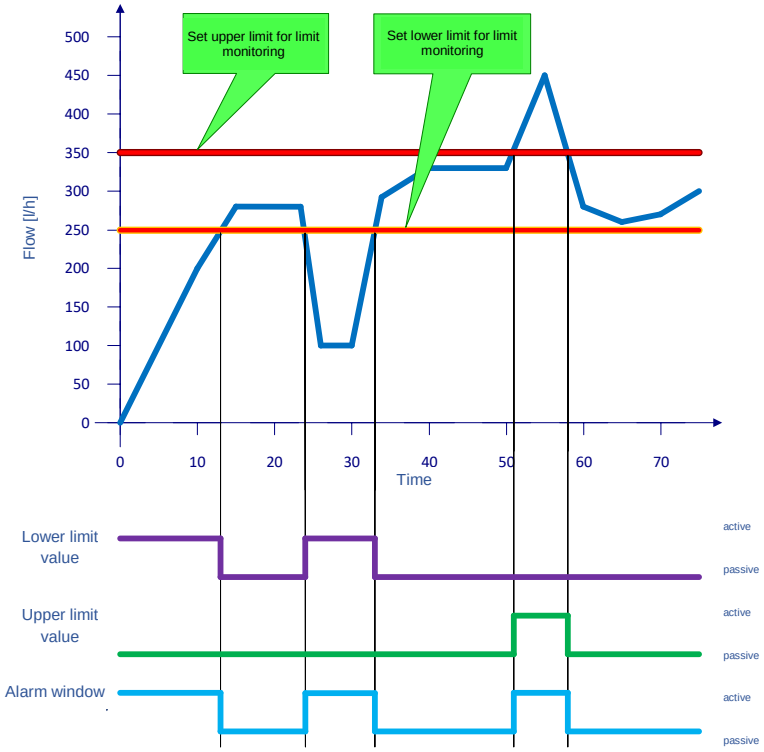
Error source	Description
Level back	Back
Ext. supply voltage	The external supply voltage was lower than 15V
Int. voltage generation	Problem with the internal voltage generation (3.0V/5.0V)
Cache	Memory errors not intercepted by the data logger routines
General HW errors	Not further defined hardware errors
General SW errors	Not further defined software errors
Watchdog	Watchdog timer was triggered

Confirming individual error sources with the Enter button, activates the following selection:

Selection	Description
Do not delete	Ends without executing an action
Delete	Current counter reading is set to zero
Acknowledge error	Acknowledges the error (star is removed)
Acknowledge&delete	Acknowledges the error and deletes the counter reading
Delete all	Deletes all counter readings at once

15.0 Explanations

15.1 Limit monitoring



The limit monitoring monitors a measurement assigned to it (e.g. flow, concentration, temperature) and checks whether it is inside or outside a set lower and upper limit. The result can be seen on the display as a change in the background colour of the measurement display (colour change), but can also be assigned to digital outputs.

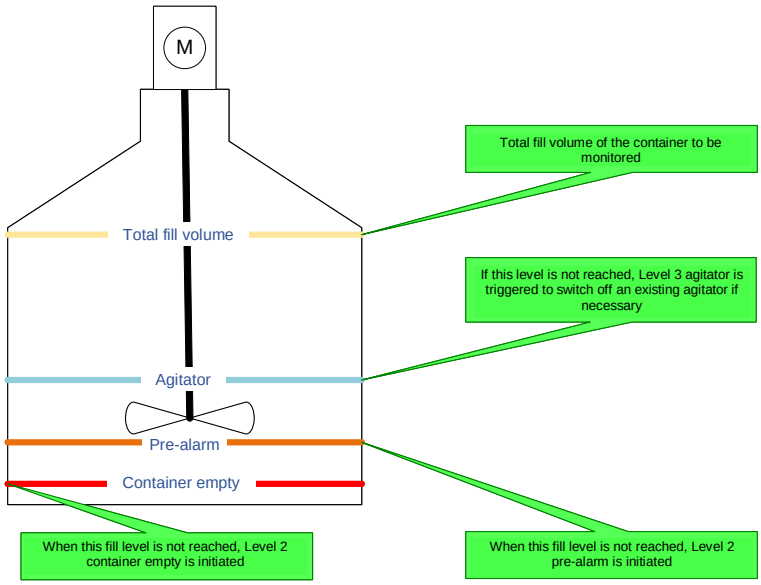
Example (relating to the diagram):

A water pipe with a flow sensor, connected to sensor input 1, with an average flow of 300 litres per hour, is monitored.

The lower limit is set to 250 l/h, so in the event of a leak an uncontrolled water leak can be prevented (Settings – Functions – Limit monitoring -> Assignment to sensor input 1; Parameters – Limits – lower limit to 250 l/h). Relay 1 (SSR1) thus controls another relay (as a power amplifier) and this controls a red warning signal light (Setting – Outputs – Dig.output 1 (SSR1 -> Assignment to “lower limit”).

Digital output 2 should pass a signal to a control if the flow exceeds 350 l/h (Parameters – Limits – upper limit – 350 l/h; Settings – Outputs – Dig.output 2 (SSR2) – Assignment to “upper limit”).

15.2 Level monitoring



The fill level of a container/tank can be monitored using the level monitoring. Requirements for this are a flow sensor in the sample line and accurate refilling of the container.
The extracted flow rate is counted and is subtracted from the total fill level. The more accurate the flow measurement is, the more accurate the level monitoring. In addition, 3 levels can also be monitored and a display message is triggered.
The result can also be assigned to the digital outputs.

Example (relating to the diagram):
A tank with 50 litres total fill volume is monitored. At 20 litres a motor-off signal should be set for the agitator control and at 5 litres a signal lamp switched on to indicate container is empty.
We are basing this on a calibrated IMA system (Sensor input 1).
First the level monitoring must be activated and this function assigned to sensor input 1 (Settings – Functions – Level monitoring – Assignment to sensor input 1). The unit must be set to litres in this example.
Then assign both outputs. The monitor-off signal is controlled by a relay output (Digital output 1 (SSR1)) and the signal lamp (LED 2W) is switched with an NPN output (Digit ouput 3 (LSS1)). In Settings – Outputs – Dig.output 1(SSR1) – set Assignment to "Lev3 agitator" and in Dig.output 3(LSS1) – Assignment to "Lev1 container empty".
In the Parameters menu – Level monitoring set the total fill volume to 50 litres, Lev3 agitator to 20 litres and Lev1 container empty to 5 litres.

Important: It is very important after refilling the container under Parameters – Level monitoring, to select the "Change container" option so the system sets the start value back to the total fill volume again.

16.0 FAQ

16.1 No flow rate indication

1. No flow
   → Check the medium is actually flowing
2. Flow rate lower than the measuring range
   → use a flow meter with another measuring range
3. Incorrectly installed or connected
   → correct assembly
4. Soiling
   → Clean the flow meter according to the sensor installation instructions
5. Defective electronics
   → Remove the failure root cause (e.g. short circuit, overload)
   → Replace the flow meter
6. Device defective
   → Send the flow meter in for repair

16.2 Measured flow rate is not equal to actual flow rate

1. Impeller soiled
   → Clean the flow meter as described in section

2. K-factor incorrect
   → Change K-factor or carry out automatic calibration

3. Device defective
   → Send the flow meter in for repair/calibration

16.3 No contact output

1. Electrical connection
   → Check correct connection of the flow meter
2. High contact distance selected (if flow rate is very low)
   → Choose smaller distance
3. Device defective
   → Send the flow meter in for repair/calibration

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