Operating instructions

supplement

for

U-PACE Electronics

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2. Note

2.1 General

Before unpacking and commissioning the device, the operating instructions and the “General Safety Instructions” document must be read and followed carefully. The general safety instructions, the operating instructions, the data sheet as well as approvals and further information can be downloaded via the QR code on the device or under the respective product on www.kobold.com.

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the device should be used only when the entire machine fulfils the EU machinery directive.

2.2 Validity and version of the operating instructions

Due to technical changes, the device documentation available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form.

2.3 Hazard warnings

The following instructions are intended to ensure your personal safety and to prevent damage to the product described or connected devices. Safety instructions and warnings to prevent danger to the life and health of users or maintenance personnel, or to prevent damage to property, are highlighted in this documentation using the symbols defined here. *The symbols and terms used have the following meaning in the documentation itself:*

Symbol	Explanation	Symbol	Explanation
Note	Is important information about the product, the handling of the product or the respective part of the documentation to which particular attention should be drawn.	Caution	Means that minor personal injury or minor property damage may occur if proper precautions are not taken.

Symbol	Explanation	Symbol	Explanation
Warning	Indicates that serious personal injury or substantial property damage may occur if proper precautions are not taken.	Danger	Means that death can occur if proper precautions are not taken.
Warning	Attention: Hot surface!	Warning	Warning: Dangerous electrical voltage

Note	Opening the screw ring of the U-PACE electronics (options C3/C3T/C3T0) will void the guarantee.

- The electronic display can be rotated in 90° steps via software. See chapter 5.3 of the U-PACE operating instructions.

Note	The device is delivered from the factory with a screen protector. This protective film can affect the function of the optical buttons. The screen protector must therefore be removed before use! The screw ring does **not** need to be opened for this. If the film is removed after commissioning, the supply voltage must be briefly switched off again. This will carry out an automatic key calibration.

2.4 Overview of the device functionality

Note	Depending on the installed device firmware, the U-PACE electronics (options C3/C3T/C3T0) may have different functionalities. The functional extensions are shown in the following table.

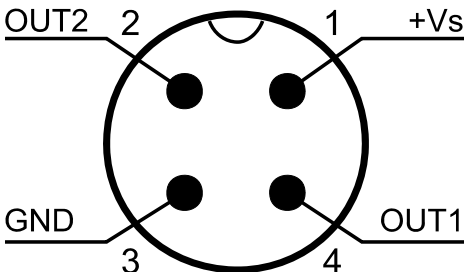
Function extension	Available from firmware version
-	REV220905
Sensitivity of the optical keys adjustable in 3 levels Counter overflow at 10E9 liters	REV230707

The installed software version is displayed after starting the device below the manufacturer logo in the form REVxxxxxx for approx. 2 sec.

3. Electrical connection

3.1 Pin assignment

3.1.1 External connection with electrical connector M12x1 4-pin

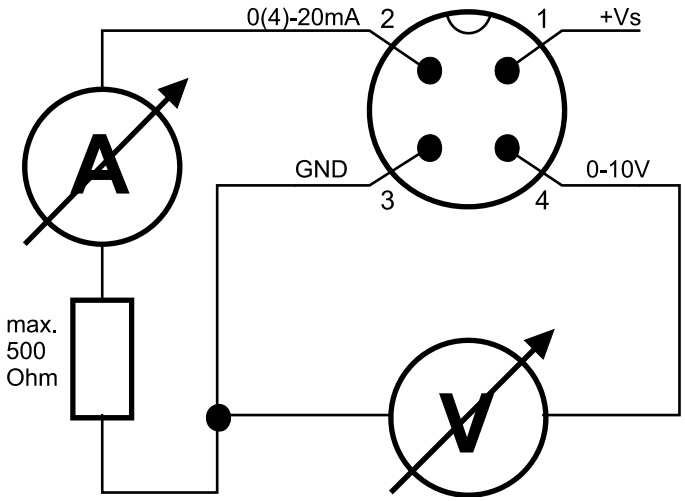


NOTE Note	In principle, the cable can be shortened by the user on the transmitter side and connected to the transmitter again after appropriate assembly.

NOTE Note	A customer extension of the connection cable is not recommended because of the necessary continuous shielding and leads to malfunction of the device. The cable permanently connected to the sensor must not be disassembled.

3.2 Connection example outputs:

OUT2: analogue output 4-20 mA
OUT1: analogue output 0-10 V



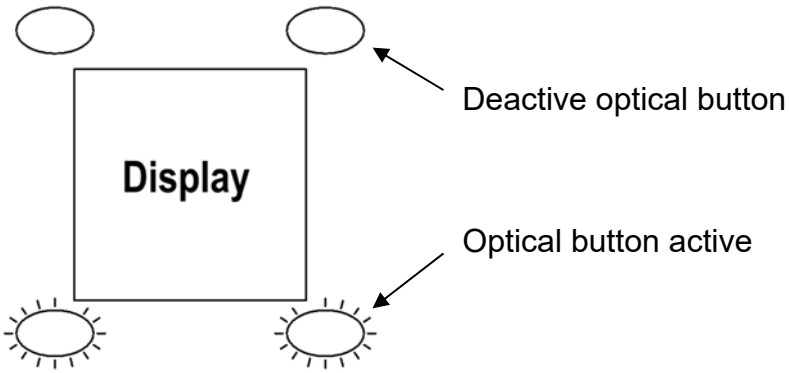
Configurable output functions:

Out 1	Out 2
analogue output 4-20 mA	analogue output 4-20 mA
analogue output 0-20 mA	analogue output 0-20 mA
analogue output 2-10 V	analogue output 2-10 V
analogue output 0-10 V	analogue output 0-10 V
alarm output	alarm output
pulse output	pulse output
frequency output	frequency output
communication mode KofiCom	
communication mode IO Link	
control input	
control input dosing function	dosing output

4. Operation and menu structure

4.1 General

4.1.1 Operation of the optical buttons



An optical button is located at each corner of the TFT display. The operability of the respective buttons is signaled by blue backlighting; therefore, non-backlit buttons are disabled and cannot be operated. To operate the keys, the finger must be placed on the key-dome and raised again. The orange background of the button symbols is briefly displayed in blue as visual feedback for a detected key press.

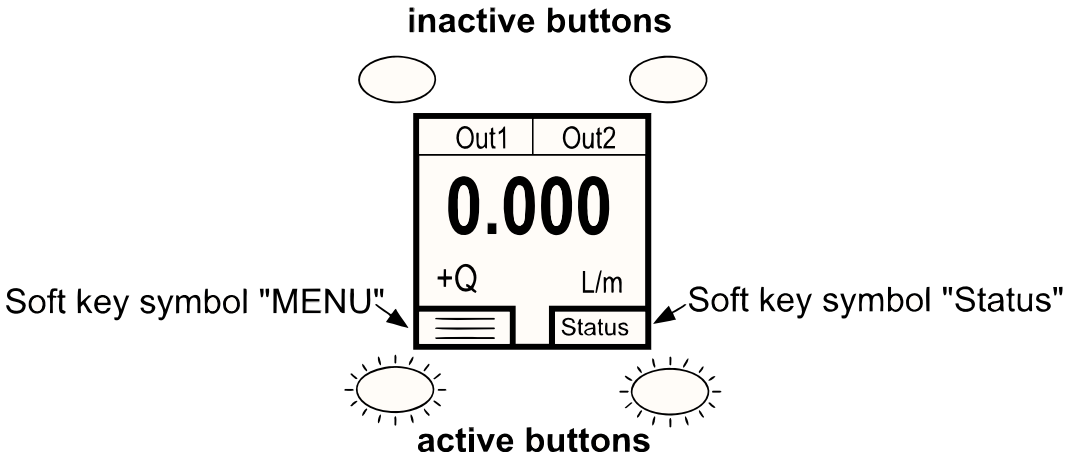
To avoid accidental operation in measuring mode, the operator must hold down the menu button for 3-5 seconds to activate the function. If the menu button is held down for more than 3 seconds, the blue backlighting will begin to flash to alert the user to release the button.

The operation of the optical buttons can also be done with gloves or other optically reflective objects. Suitable types of gloves are: cotton and textile gloves, light leather gloves, hygiene gloves made of latex and lightly rubberized work gloves. Black-coated work gloves of all kinds are not suitable. Light dirt on the surface usually does not interfere with the key function.

4.1.2 Function of the control buttons

The function of each control key can be recognized by the respective symbol displayed in the corners of the TFT display.

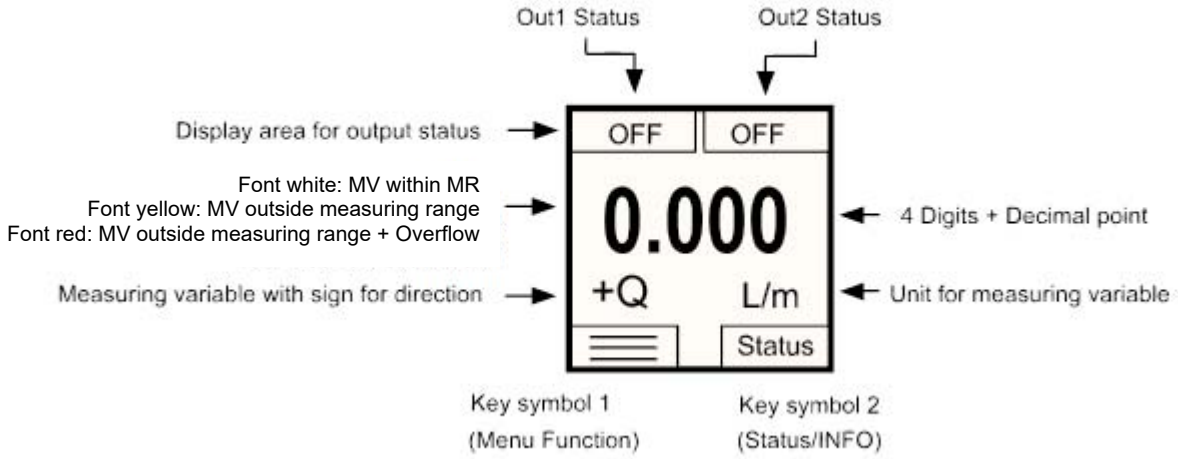
key symbol	designation	function	
		Measuring mode	menu mode
	menu mode	Activate menu mode hold **3-5 sec.**	-
	info display	opens the info menu	-
	down	-	Scroll down menu / decrease numeric value when entering numeric value
	up	-	Menu scroll up / Increase the number value for numeric value input
	forward	-	Menu level lower / forward (last menu level: Save value)
	backward	-	Menu function: menu level higher / back (last step: exit menu)



4.2 Measuring mode

After applying the supply voltage, the device starts in measuring mode. In this mode, the measured values of the respective measuring variables are continuously recorded; the current instantaneous flow values, temperature values[1)] and the volume counter readings are cyclically calculated and displayed according to the type of display.
In addition to the main display, the states and configuration of the outputs are shown in the display. If the corresponding output is configured as an alarm output, the status is also displayed with a green or red background color. If the background color is green, the set threshold value is exceeded; if it is red, the current value is still under threshold.

Measurement Mode Display Layout 'Single'



The measurement variables are represented by their corresponding symbols:

Menu entry	Mesuring variables Symbol	Description
Flow	Q	Flow rate
Volume	AC	Accumulated totalizer
Temperature[1)]	T	Medium temperature
Part volume	PT	Partial totalizer

[1)] Only available for devices with temperature sensor

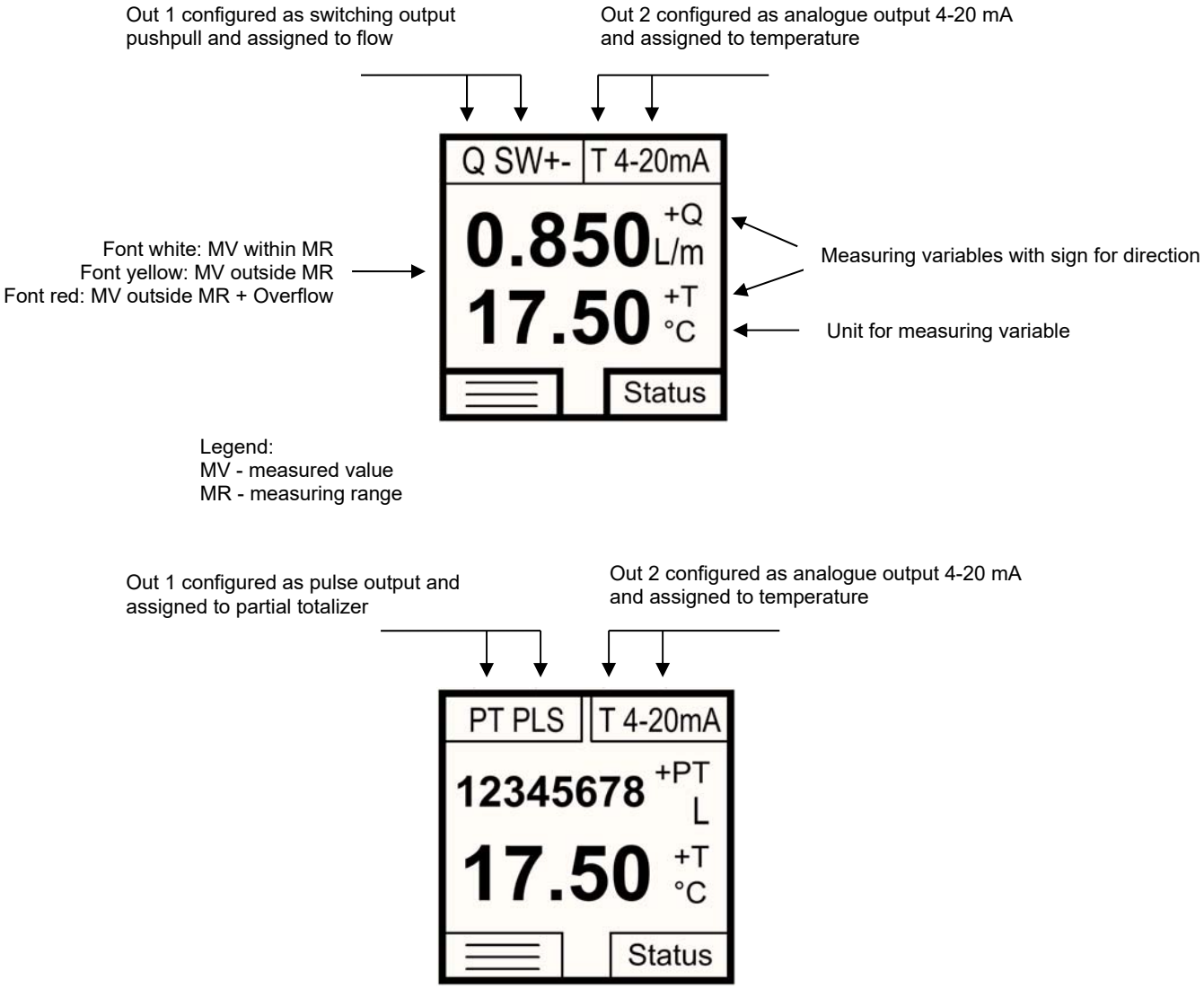
The outputs and their status are shown on the display as follows:

Output function OUT1/2	Symbol	Representation
disable	**OFF**	
Analog output 4-20mA	**4-20mA**	
Analog output 0-20mA	**0-20mA**	
Analog output 0-10V	**0-10V**	
Analog output 2-10V	**2-10V**	
Alarm output PushPull	**SW+-**	Background grey/green
Alarm output PNP	**SW+**	Background grey/green
Alarm output NPN	**SW-**	Background grey/green
Pulse output	**PLS**	
Frequency output	**FRQ**	
Communication mode KofiCom (only OUT1)	**KofiCom**	Use only for factory service
Communication mode IO-Link (only OUT1)	**IO-Link**	
Control input	**X CTL**	"X" symbol of the selected measuring variable

The measured variables flow, temperature[1)] and volume counter can in principle be assigned to each output function. The assignment of the respective output is indicated by the display of the symbol of the measuring variable. The representation of the assignment is independent of the set display layout (single, dual).

[1)] Only available for devices with temperature sensor

Measurement Mode Display Layout 'Dual'



4.2.1 Display area of the flow meters

The number of digits displayed on the volume counter display (partial and total volumetric counters) is limited to max. 8 digits. The partial and total volumetric meters therefore have a smaller font size than the flow and temperature display[1)]. If the 8-digit display range of the meter is exceeded, this is indicated by the display of 8 minus characters (--------). In this case, the meter reading can no longer be read. The user now has the option of bringing the counter reading back into the display area by changing the volume counter unit.

[1)] Only available for devices with temperature sensor

4.3 Menu Mode

In menu mode, all device parameters can be set. The individual parameters are arranged in menu groups by function. While the menu mode is activated, the signal processing and the outputs are still active in the background. However, all display parameters and outputs are updated after exiting the menu mode or in the measuring mode.
Note: The menu mode will exit automatically after a certain time without using the buttons, if the parameter “Menu Timeout” is set not equal to “0”.

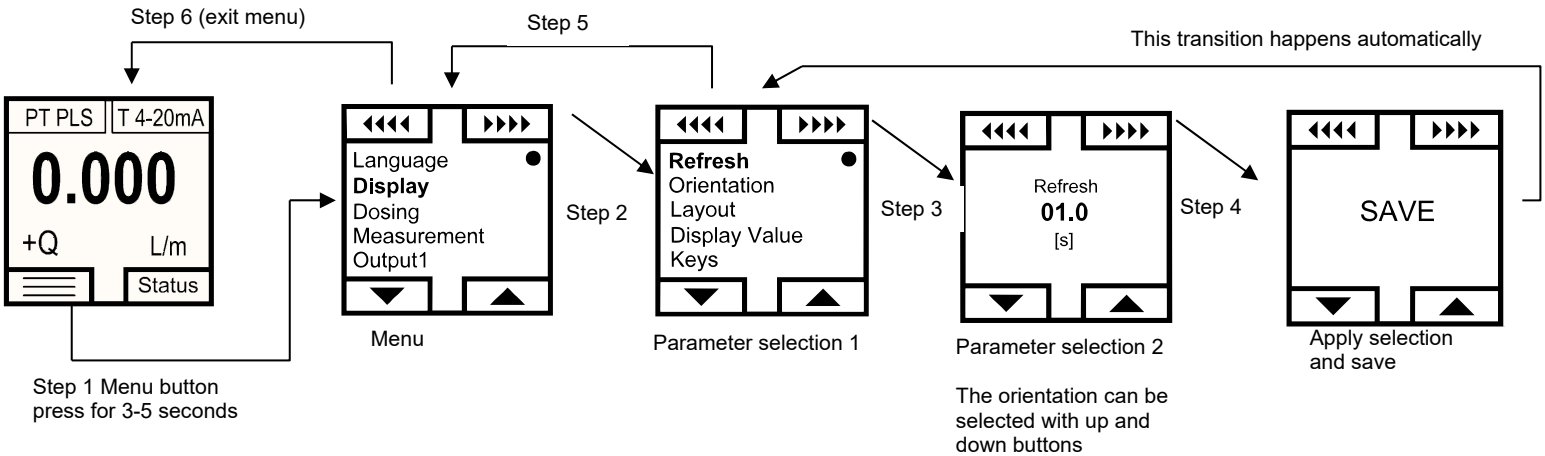
4.3.1 Parameter setting

4.3.1.1 List Selection

Parameters with predefined selection values are defined by means of list selection. The currently selected menu item is displayed in orange text. The selection can be moved with the ▲ ▼ keys, the key ▶▶ is used to accept the selection.

To activate the menu mode, press the button ☰ for 3-5 seconds. The parameters are divided into main groups and subgroups.

The buttons ▲ ▼ are used to select the main groups. In the main menu not all menu groups can be shown on the display at the same time, the list of individual menu items then scrolls up or down when the selection has reached the top or bottom. To choose the selection, the key ▶▶ is pressed and the device jumps to the corresponding submenu or parameter setting level. For selecting of predefined parameter values ▲ and ▼ are used. After changing the value of the parameter and confirming with ▶▶ the parameter is saved, and returns to the higher menu level. To return to the main menu or to exit the menu mode, press ◀◀ (repeatedly).



4.3.1.2 Numerical value input

When setting parameters with a numerical value, the assigned unit is always displayed below the input field in square brackets in the input function. The maximum size and the number of decimal places is fixed and cannot be changed. After calling the input function, first the left, outer digit is displayed in orange. This position can now be adjusted either with the keys ▲ ▼ in the value from 0 to 9. By pressing the key ▶▶, the entry point moves to the right and the next digit can be changed. By pressing the key ◀◀, the editing point can be moved to the left again. If the editing point is on the far right, the set value is saved by pressing the key ▶▶ again and switched to the higher-level menu function.

5. Device configuration

5.1 Sequence of device parameterization

The measurement device is pre-configured in factory. Changing the parameters "Measuring range" and "Sensor constant" or "K factor" is therefore not permitted. The adjustment of these parameters is only possible on the part of Kobold-factory. In the event of subsequent changes to volume or throughput units, the dependent parameters are converted and adjusted accordingly. However, the limit parameters of the switching outputs must always be checked and adjusted manually when adjusting volume or throughput units - these are not automatically converted.

An accidental change of the parameterization can be revised by the function "Reset factory setting" in the menu Userservice / Reset.

5.2 Language

In this menu item the menu language can be changed in English, German, French or Spanish (standard: English).

Parameter table **language**

Sublevel	**parameter level**	**Sub-para-meter level 1**	**Sub-para-meter level 2**	**Sub-para-meter level 3**	**Description**	**Value range / value list**	***Factory setting LPM version***	***Factory setting GPM version***
English					Selects English as the menu language		*English*	
Deutsch					Selects German as the menu language			
Francais					Selects French as the menu language			
Espanol					Selects Spanish as the menu language			

5.3 Display

5.3.1 Refresh

Parameter "Refresh" defines the time interval within which the measuring variables are displayed. The "Refreshrate" can be increased in steps of 0.5 sec. to 10 sec. An increase in the refresh rate time causes an increased "filtering" of the display value.

5.3.2 Orientation

With the menu item "Orientation" the display can be rotated either clockwise or counterclockwise in 90 ° increments. As the display rotates, both the display contents and the function of the 4 control buttons are turned.

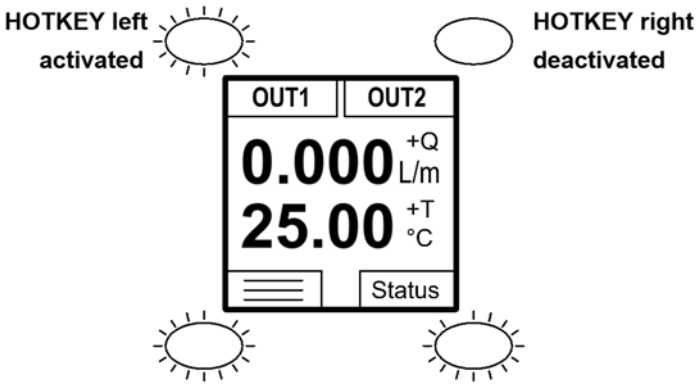
5.3.3 Layout

This parameter can be used to configure the display to either show one measurement variable or two measurement variables.

5.3.4 Display value

With the aid of this parameter, the measurement variables provided by the transmitter can be displayed. Depending on the 'Layout' display, either one or two measuring variables can be displayed.

5.3.5 Keys HOTKEYs



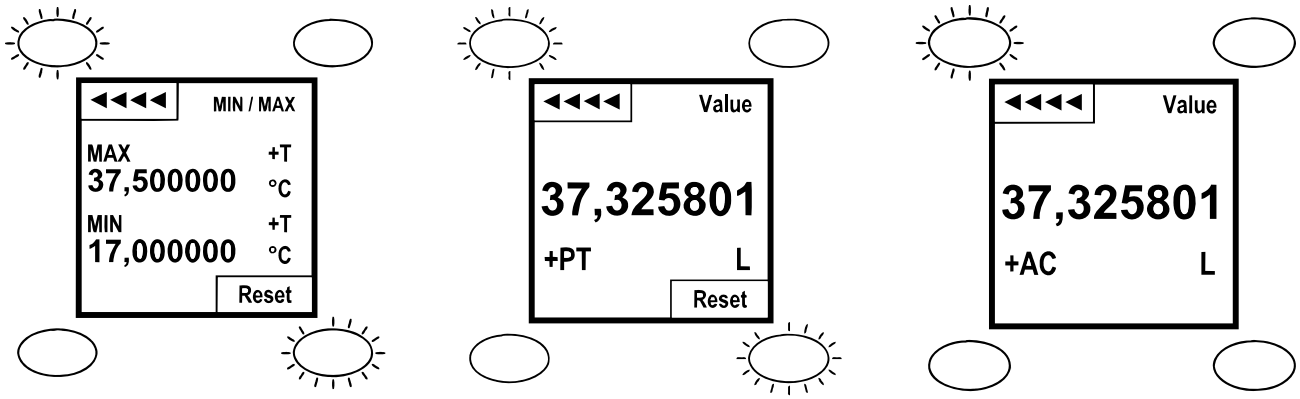
Two independent user keys are available, which can be individually assigned with different display functions. The 2 user keys are available in measurement mode top right and left. If the buttons are activated, they are backlit in blue and the programmed function can be executed by touching.

The following functions are available:

reading	MIN/MAX / Reset	Value display / Reset
flow	Yes / Yes	Yes / No
Temperature[1)]	Yes / Yes	Yes / No
Partial quantity counter	Not available	Yes / Yes
Totalizer	Not available	Yes / No

[1)] Only available for devices with temperature sensor

The called hotkey function remains permanently activated and can only be left by pressing the key ⏭. A direct reset function is available for the MIN / MAX measured value function and the partial quantity counter.



5.3.6 Key sensitivity

The sensitivity of the keys can be adjusted by setting the key sensitivity. The default setting "Low" is the optimal one when using the device with a finger. When operating with gloves, it is essential to select the "High" setting. Since the button function works via light reflection, the gloves must not be darker than medium gray.

5.3.7 Menu Timeout

The menu timeout time defines the time after which the menu function is automatically exited without pressing a key. In the setting "0 s" this function is deactivated and the menu function can only be left by hand by pressing the back key several times.

Parameter table **Display**

Sublevel	Parameter level	Sub-parameter level 1	Sub-parameter level 2	Sub-parameter level 3	Description	Value range/ value list	*Factory setting LPM version*	*Factory setting GPM version*
Refresh	*value input*				Sets the display refresh rate	*0.5-10 sec*	*0.5 sec*	
Orientation	*rotate CW*				Rotates the display 90 ° clockwise		*Landscape*	
	rotate CCW				Rotates the display 90 ° counterclockwise			
Layout	Single				Shows a measured value in the display area		*Double*	
	Double				Shows two measured value in the display area			
display value	Upper display	*list selec-tion*			Sets the reading for the upper display	*Flow, volume, temperature, part volume*	*Flow*	
	Lower display				Sets the reading for the lower display		*Temperature*[1)]	
Keys	Hotkeys	left	*Flow*	*List selection*	Sets the reading and function for the left hotkey	*Off, Value, Min / Max*	*Off*	
			Volume					
			Tem-perature					
			Part volume					
		right	*Flow*	*List selection*	Sets the reading and function for the right hotkey	*Off, Value, Min / Max*		
			Volume					
			Tem-perature					
			Part volume					
	sensitivity	*list selec-tion*			Sets the sensitivity for the optical buttons	*Low*/medium/ high	*Low*	
Menu Timeout	*value input*				Defines the time after which the setting menu is automatically exited without pressing a key (0 = deactivated)	*0.5 to 60 s*	*15 s*	

5.4 Measurement

The menu “Measurement” lists the measurement variables, which the sensor provides.

- Flow
- Volume (total volume counter)
- Temperature[1)]
- Part volume

Each measurement variable is still divided into its own submenu. In the submenu, all parameters relating to the respective measuring variables can be adjusted.

[1)] Only available for devices with temperature sensor

5.4.1 Flow

5.4.1.1 Unit

The displayed unit for the flow measurement can be selected from various predefined standard units. It is also possible to define a user-defined unit ("user"), here the "user unit" must be in LPM (liters / min.) be programmed:
e.g. Unit User = 100 LPM, if Q = 500 LPM then the display shows 5 users.

5.4.1.2 Filter function

The measured value filter filters the display value and most electrical output signals (analog outputs / frequency outputs / switching outputs).
A separately adjustable filter is available for each measured value (flow and temperature[1)]). In the factory setting, the standard filter with low filtering and active step detector is activated. Volume counters and pulse outputs are generally not filtered.
There are 3 different filter types available, so that a suitable filter functionality is available for as many applications as possible. The time base of the filter function is approx. 20 ms.

Filter type	Filter factor [n]	Step detector	Description
Standard	1 - 250	Yes	Rolling filter type, the size of the filter factor determines the number of temporarily stored and used averaging values. $MV_{AVG} = \frac{MV_0 + MV_{-1} + \cdots MV_{-n}}{n}$
IIR		No	With this filter type, depending on the filter factor, part of the last measured value average is added to the current average value. The filter corresponds to a digital low-pass filter of the 1st order with an infinite step response. The filter effect achieved is not linear to the parameter filter factor. A high filter effect is only achieved with filter values> 200. $MV_{AVG} = b * MV_0 + (1 - b) * MV_{AVG-1}$ with $b = \frac{251 - filter\ factor}{250}$
Exp. smoothing		No	The filter type works on the principle of exponential smoothing. The step response has an exponential course. The filter factor is proportional to the response time t_{90} of the step response. This enables the greatest filter effect to be achieved. $t_{90} \sim filter\ factor * 75ms$ $MV_{AVG} = \frac{MV_{AVG-1} * (n-1) + MV_0}{n}$
with: MV_{AVG} = filtered measured value, MV_{AVG-1} = last filtered measured value, MV_0= current measured value MV_{0-1}= last measured value			

[1)] Only available for devices with temperature sensor

Application areas of the filter types

Standard	Standard filter with step detector with fast response time with real changes in measured values. This filter type has a max. time lag of filter factor * 20 ms **This filter smoothes slight to medium fluctuations in measurement values without the disadvantage of increasing the response time in flow monitoring applications.**
IIR	Simple digital filter with lag, no step detector **This filter can be used for slight to medium pulsating fluctuations in measured values. With strong filtering, there is a correspondingly long lag of the filtered measured value in case of real measured value changes. Not suitable for flow monitoring applications with a large filter factor.**
Exp. Smoothing	Simple smoothing filter with lag, no step detector **This filter can be used for strong pulsating fluctuations in measured values. With strong filtering, there is a long lag of the filtered measured value with real measured value changes.** **The lag can be determined via the filter factor to:** t_{90} ~ filter factor * 75ms **Not suitable for flow monitoring applications with a large filter factor.**

Step detector (only available with standard filter)

The step detector integrated in the standard filter can detect the tendency of a real change in the measured value and temporarily bridge the filter function after detection of a step in the measured value in order to minimize the step response time. A step (sudden change) in the measured value can be detected both with increasing and with falling measured value. The step detector is set by the step threshold (*JD threshold*) and an interference suppression factor (*JD-ConfFactor*). The behavior at the beginning of the measuring range can be made “interference suppressed” with the parameter *0-ConfFactor**.

* Parameter "0-ConfFactor" only available up to software version 251028

JD Threshold	The value of the step threshold is normalized according to the span of the measuring range, the default value 0.1 means 10% of the full scale value.
JD ConfFactor	Defines the factor by which the step threshold must be exceeded in succession without interruption before the step detector actually becomes active. If the end value of the interference suppression counter is not reached, it will be reset. However, if the final value of the counter is reached, the step detector is active and all filter buffers are overwritten with the current measured value.

0-ConfFactor* If the measured values are at the start of the measuring range, below which the measured values are set to 0, the zero measured value suppression function may become active. The parameter *0-ConfFactor* defines a counter value, how often the measurement range start value must fall short of in succession and without interruption before the measurement value is actually set to "0". This function serves to stabilize the measured value in the area of the start of the measuring range. Like the step detector, this function works in both directions, i. e. from measuring range => 0 and from 0 => measuring range.
* Parameter "0-ConfFactor" only available up to software version 251028

Notes for applications with pulsating flows:
If flow pumps generate pulsating flow (e.g. peristaltic pumps or diaphragm pumps), the following instructions must be observed:
- The pulsation flow peaks must always be within the measuring range of the device
- If possible, install a pulsation damper
- The pulsation frequency of the pump should not be close to the 50 Hz frequency or its divider (25 Hz, 12.5 Hz, 6.25 Hz etc.), otherwise cyclical measurement fluctuations may occur.
- The measured value display (and the electrical analog and frequency outputs) can be most effectively dampened using the filter function “exp. Smoothing”

5.4.1.3 Separation

The parameter Separation sets the flow rate below which the measured value is set to "0". If this function is active, the flow value "0" is shown in blue colour in the display. If the parameter value is set smaller than the start of the measuring range (see technical data), the display value and all signal outputs assigned to it remain at "0" as long as the measured value does not exceed the start of the measuring range.
With mechanical measuring principles or measuring systems with a higher measuring range start value, measurement function may also be possible below the measuring range start by reducing the “separation” (cutoff) parameter. (See Technical Data) In this case, **the measurement accuracy is no longer guaranteed!**
For devices with bidirectional measuring function, this parameter also works bidirectionally.
This means that if the separation (cutoff) parameter is set to 1 L/min, for example, the measured value "0" is output as long as the flow rate is in the range -1 L/min…+1 L/min.

5.4.1.4 Simulation mode

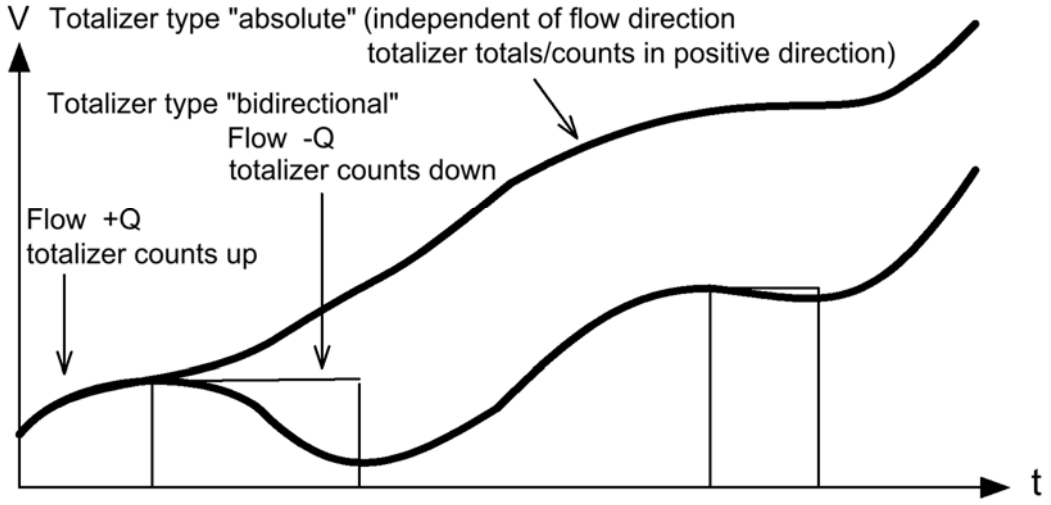
See section 5.4.5

5.4.2 Volume

5.4.2.1 Counter type

Absolute:
Regardless of the flow direction, the calculated partial volume is added to the counters.
Bidirectional:
Depending on the flow direction, the calculated partial volume is added or subtracted to the counters. If the measured flow value is negative, the volume value goes down from measurement to measurement (possibly into the negative range). For devices that do not have bidirectional measurement, the bidirectional counting mode behaves like the absolute counting mode.

Volume measurement by different totalizer types



5.4.2.2 Unit of the total volume counter

The parameter "Unit" determines the volume unit of the total volume counter. The listed volume units are available. When changing the volume unit, the current counter reading is converted to the new volume unit.
It is also possible to define a user-specific unit “User”. Here the "user unit" must be programmed in liters: e.g. unit "User" = 100 L, if the internal volume value reaches 500 L, then 5 "User" is shown on the display.

5.4.2.3 Flow Meter Overflow

If the volume counter exceeds the value of 15E6 liters, it is reset to 0 L. From software version REV230707, this overflow value is 10E9 liters. The volume meter reading can be shown on the display up to the overflow value if the volume unit is set to "m^3".

5.4.3 Temperature[1)]

5.4.3.1 Temperature Unit

The displayed unit for the temperature measurement can be selected from various default units. It is also possible to define a user-defined unit ("user"), in which case the "user unit" must be programmed in °C.
e. g. Unit “user” = 50 °C, if T = 50 °C then the display shows 1 user.

5.4.3.2 Simulation function

See section 5.4.5

5.4.3.3 Accuracy of Temperature Measurement

The accuracy of temperature measurement depends on various physical factors, such as:

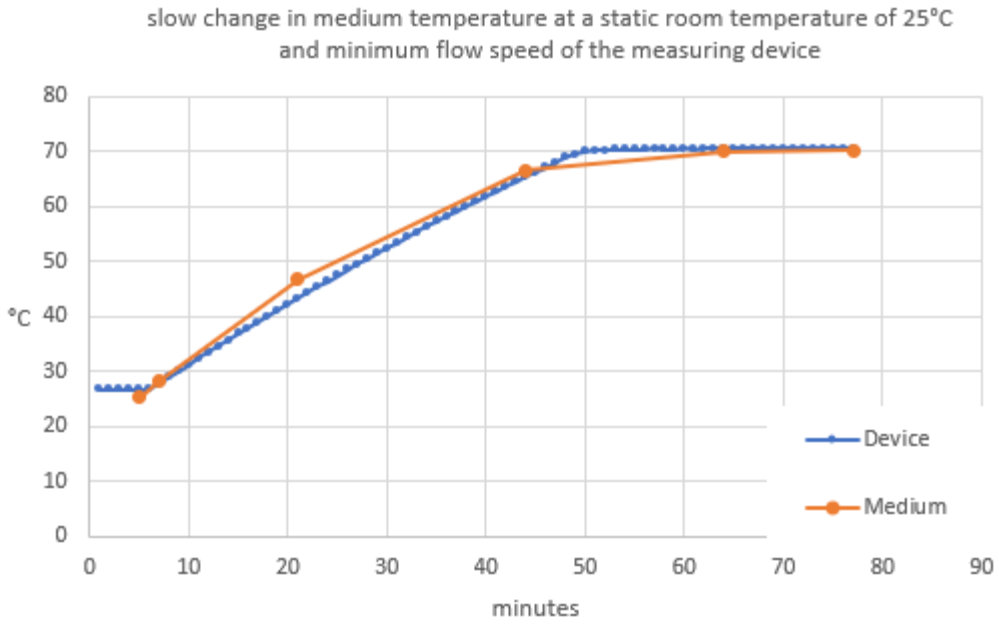
- Type of measuring device
- Ambient temperature
- System design
- Flow speed

It should be noted that the guaranteed accuracy of each measuring device from the U-PACE family refers to a fully temperature-controlled measuring system.

This means that the accuracy is only achieved when the flowing medium has heated or cooled all system components to the final temperature, in which it is installed. With large temperature fluctuations, this temperature control process takes longer than with small, gradual temperature changes.

Example 1: Slow Temperature Change

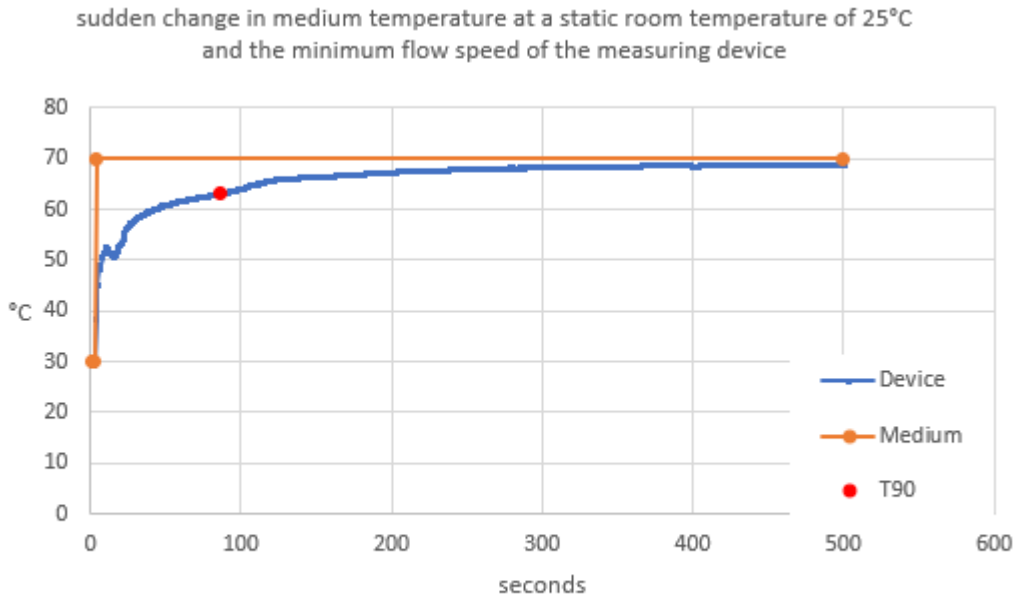
If the temperature is increased slowly, the temperature measurement of the measuring device will remain within the specified tolerances throughout the entire measurement process.



[1)] Only available for devices with temperature sensor

Example 2: Rapid temperature change

The faster and greater the temperature jump, the greater the temperature gradient between the medium, the system and the ambient temperature.



To ensure accurate temperature readings, the measuring device must be heated or cooled against the ambient temperature gradient. Only when the entire system has reached a stable operating temperature, the measurement errors caused by the ambient temperature gradient are eliminated.

Due to the exponential behavior of temperature control processes, a T90 temperature is often specified as a measure of measurement accuracy. However, reaching this T90 temperature, or the exact temperature value, depends on the final installation situation at the user's site and therefore cannot be universally defined.

For illustration, here is the same measurement setup as in Example 1, but now with an extreme temperature jump directly at the flow meter, with the medium and the entire system already pre-tempered:

Depending on the measurement task, either the integrated function of the U-PACE measuring devices or an additional, application-specific temperature sensor can be used for temperature measurement.

5.4.4 Part Volume

5.4.4.1 Counter type

Absolute:
Regardless of the flow direction, the calculated partial volume is added to the counters.

Bidirectional:
Depending on the flow direction, the calculated partial volume is added or subtracted to the counters. If the measured flow value is negative, the volume value goes down from measurement to measurement (possibly into the negative range).

5.4.4.2 Flow Meter Overflow

If the volume counter exceeds the value of 15E6 liters, it is reset to 0 L. From software version REV230707, this overflow value is 10E9 liters. The volume meter reading can be shown on the display up to the overflow value if the volume unit is set to "m^3".

5.4.4.3 Unit of the part volume counter

The parameter "unit" defines the volume unit of all volume meters. The listed volume units are available. When changing the volume unit, the current counter readings are converted to the new volume unit.
It is also possible to define a user-specific unit “User”. Here the "user unit" must be programmed in liters: e.g. unit "User" = 100 L, if the internal volume value reaches 500 L, then 5 "User" is shown on the display.

5.4.4.4 Memory reset

In this menu, the part quantity counter can be reset.

5.4.4.5 Simulation function

See section 5.4.5

5.4.5 Simulation function

With the simulation function, all available measured values can be simulated independently of each other for a limited time. The simulated measured values have full effect on the displays and outputs. It should be noted that the display's update time directly affects the displayed simulation value.

Each simulation started is automatically stopped after the time set in the "Sim Auto Stop Time" (user service) parameter (1 to 30 min) or after the programmed intervals have expired.
The following measured values can be simulated:
Volume flow, temperature[1)] and part quantity counter

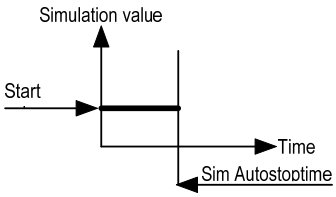
[1)] Only available for devices with temperature sensor

The simulation starts as soon as it is activated. The application of the set parameters to the simulation only occurs after confirmation of the respective entries in the simulation menu. Confirmation of the entries is achieved by repeatedly

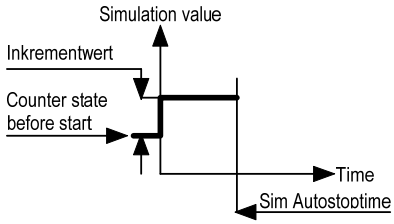
clicking the upper right button, moving the cursor past the last displayed value, and exiting the input screen to the right.

Three different simulation types are available for every purpose:

a.) “Static” mode

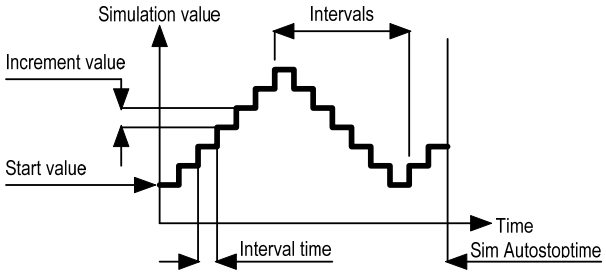


In the "Static" mode, a constant value is output for the measured values flow and temperature[1)]. The simulation ends after the set simulation time.



In the "static" simulation for the part quantity counter, the counter is only changed once by the set "increment value" after the start.

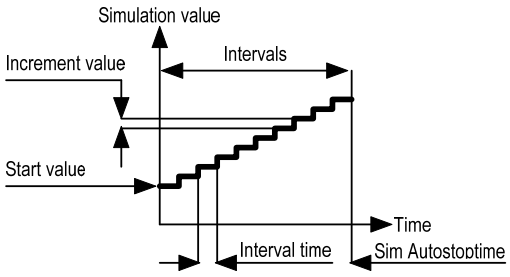
b.) „Triangle“ mode



In "Triangle" mode, the simulation value increases continuously in the increment of the parameter "Increment value" and in the interval "Interval time" with the "Start value". After the amount of the parameter "intervals", the simulation value decreases again in the same way, in order to increase again. This process is repeated continuously until the set time "Sim Auto Stop Time" has expired and the simulation ends.

When simulating the subset counter, note that, the submenu counter must be in bidirectional mode to achieve the expected effect.

c.) "Monotonic" mode



In "Monotonic" mode, the simulation value increases continuously in the step size of the parameter "Increment value" and in the interval "Interval time" with the "Start value". After the amount of "Intervals" or the expiration of "Sim Auto Stop Time", the simulation ends.

[1)] Only available for devices with temperature sensor

Parameter table **Measuring**

Sublevel	Para-meter level	Subpara-meter level 1	Sub-para-meter level 2	Sub-para-meter level 3	Description	Value range/ value list	*Factory setting LPM version*	*Factory setting GPM version*
Flow	Unit	*List selection*			Sets the flow unit	*L/m, L/h, m3/h, galUS/m, galUS/h, galUK/m, galUK/h, L/s, mL/s, User*	*L/m*	*gals/m*
	Filter	*Type*	*List selection*		See description	*Default / IIR / exp. smoothing*	*standard*	
		Filter factor	*Value input*			*1-250*	*25*	
		JD threshold				*0.05 – 1.00 [xFs]*	*0.1*	
		*JD-ConfFactor**				*1-25*	*1*	
		0-ConfFactor				*1-25*	*1*	
	sepa-ration	*value input*			Sets the value for the low flow cutoff	*0 ≤ **Value** ≤ End of MR*	*Range start*	
	Simula-tion mode	See table *Simulation mode*						
Volume	Counter Type	*absolute/ bidirectional*			Sets the counting mode		*absolute*	
	Unit	*List selection*			Sets the volume unit	*ml, L, m3, galUS, galUK, User*	*L*	*L*
Tem-perature[1)]	Unit	*List selection*			Sets the temperature unit	*°C, °F, User*	*°C*	*°C*
	Filter	*Type*	*List selection*		See description	*Default / IIR / exp. smoothing*	*standard*	
		Filter factor	*Value input*			*1-250*	*1*	
		JD threshold				*0.05 – 1.00 [xFs]*	0.1	
		*JD-ConfFactor**				*1-25*	1	
		0-ConfFactor				*1-25*	1	
	Simula-tions-modus	See table *Simulation mode*						
Part volume	Counter Type	*absolute/ bidirectional*			Sets the counting mode		*absolute*	
	Unit	*List selection*			Sets the volume unit	*ml, L, m3, galUS, galUK, User*	*L*	*galUs*
	memory reset	Yes/No			Sets the counter value to "0"			
	Simula-tion mode	See table *Simulation mode*						

* Parameter "0-ConfFactor" only available up to software version 251028

[1)] Only available for devices with temperature sensor

Table Simulation Mode:

Sublevel	Parameter level	Sub-parameter level 1	Sub-parameter level 2	Description	Value range/ value list
measurement				Select the measurement to be simulated: The measurement volume cannot be simulated!	
	Simulation mode	activation	deactivated	Exits simulation mode: All simulation settings become invisible.	
			activated	Start the simulation: All parameters for setting the simulation become visible.	
		Mode	static	Permanent output of the set value	
			Triangle	Alternating between a set number of additions followed by the same number of subtractions of the set increment	
			monoton	Continuous addition of the set increment	
		Value		Starting value of the simulation**	-99999,99...99999,99 [Unit of the measured variable]
		Increment value*		Value to be added***	-99999,99...99999,99 [Unit of the measured variable]
		Intervals*		Repetition rate of the increment	1...65000
		Interval time*		Time interval between two increments	10...50000 [ms]

* Visibility depends on the selected simulation mode
** Not available for partial volumes; the current partial volume level is used
*** For partial volumes and "static" simulation mode: The value is added once to the current partial volume level.

5.5 Dosing function

see section 7

5.6 Outputs

The U-PACE electronic (options C3/C3T/C3T0) provides a total of 2 outputs that are freely configurable. The configuration of the outputs (output 1 and output 2) is done via a wizard function. The wizard function guides the user step by step through all necessary settings.

Steps:

- Select output
- Selection of the source or the measurement variable to be output (Flow, Volume, Temperature[1)], Part volume)
- Selection of an output type (4-20 mA, 0-20 mA, 0-10 V, 2-10 V, alarm, pulse, frequency output, IO-Link, control input)
- Setting the output (scaling, thresholds)
- Save the configuration

The different output types are optimized for different types of applications. The following table contains the application recommendations for the different output types. If the outputs are not used according to the recommendations, measurement deviations can occur and the desired functionality is not achieved.

Application	Output type			
	Analog output (all variants)	Frequency output	Pulse output	Alarm output
Telemetry device	✓	✓		
Limit monitoring				✓
Window monitoring				✓
External dosage			✓	
External volumetric count			✓	

Application table output types

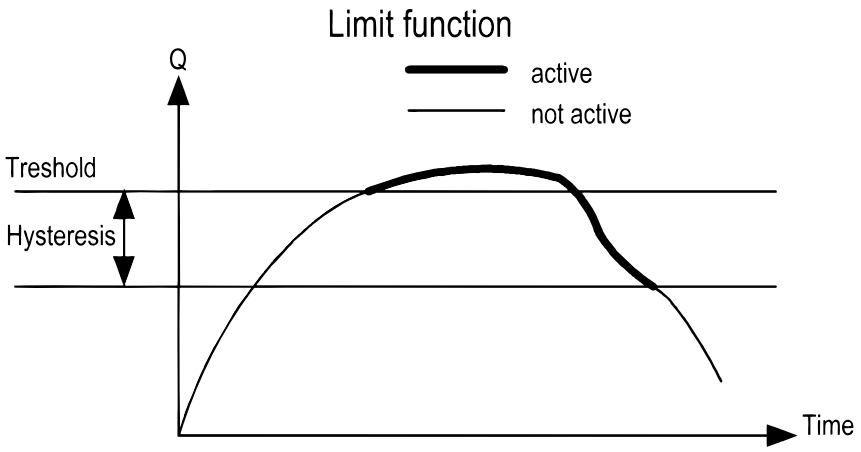
5.6.1 Alarm output

The alarm outputs can be parameterized with a limit value function or a window function.

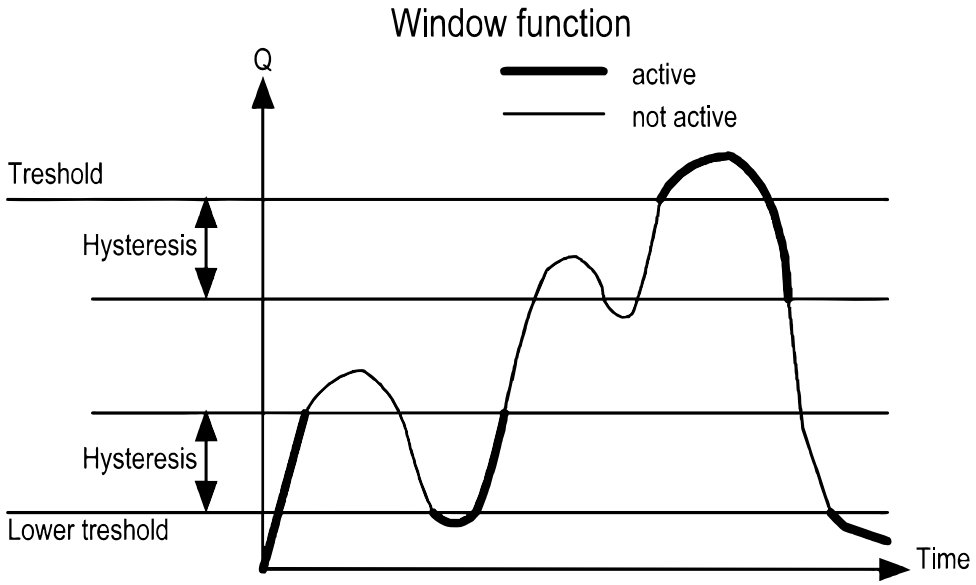
5.6.1.1 Function

The parameter *"Function"* defines the basic function. Limit value function and window function are available.
Limit value function: The switching output is **active** if the current flow rate value is above the switching threshold. It remains **active** until the measured value has fallen below the switching threshold minus the hysteresis.

[1)] Only available for devices with temperature sensor



Window function: The switching output is **active** if the current flow measured value is outside a window, which is formed by the *"switching threshold"* and the *"lower threshold"*. The monitored window decreases in each case by the amount of the *"hysteresis"*. If the switching output is to be **active** within the window, the parameter *"switching function"* must be changed from N/O to N/C.



5.6.1.2 Output type

The parameter *"Output type"* defines the function of the transistor output. NPN, PNP or PP (push-pull) output types are available. The push-pull type combines NPN and PNP and is therefore the best choice for most circuits. All outputs are short circuit and overload protected. In all output types NPN, PNP or PP, a HIGH signal is generated at the output when the switching threshold is exceeded and the switching function is set to "N.O.". An inverted behavior can be created if the switching function is set to "N.C." (see section 5.6.1.3).

5.6.1.3 Switching function

The *"switching function"* defines the mode of operation of the outputs. In the default setting "normally open", the output becomes active (switched) when the measured value exceeds the switching threshold. This feature is also referred to as N.O.
In the *"Normally closed"* setting, the output below the switching threshold is already active and is deactivated when the measured value exceeds the switching threshold. This function is also referred to as N.C.

5.6.1.4 Threshold

Threshold for limit value function and upper window point for window function.

5.6.1.5 Lower threshold

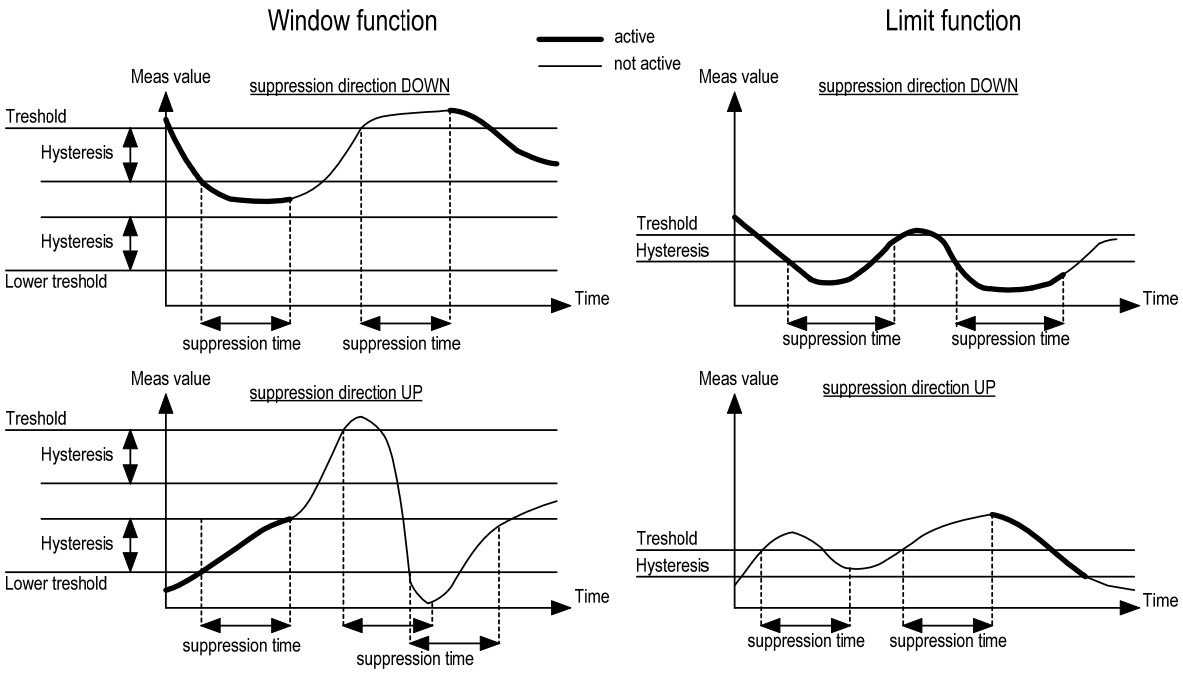
The "lower threshold" defines the lower limit when using the window function. When using the limit value function, this parameter remains ineffective.
The switching thresholds can be set both positive and negative.

5.6.1.6 Hysteresis

The appropriate setting of the "hysteresis" parameter ensures that the switching outputs do not switch on and off continuously when the current measured value fluctuates around the switching threshold. The hysteresis value should therefore always be greater than the real measured value fluctuations. As a result, a targeted suppression can be achieved.

5.6.1.7 Filter factor (delay)

Further suppression of the switching outputs of fluctuating measuring signals can be achieved by setting the parameter "Filter factor". If this parameter is selected greater than 0, the switching of the output will be delayed accordingly. The "Supp direction" parameter determines whether the deceleration is to be effective when the switching threshold is exceeded or not reached (alternatively in both directions). "High" means that the delay is active when the measured value exceeds the switching threshold, "Down" means corresponding effect when the switching threshold is undershot.
The measured value must stay continuously below or above the switching threshold with the count of [SUPPRESSIONFACTOR] before the switching output will be activated. With this function sporadic limit value overruns can be safely suppressed.
According to the value of the parameter "filter factor", the response time of the output generally increases.



Examples of the effect of the switching delay for window and limit function

5.6.2 Analogue outputs

NOTE Note	The end values of the analogue outputs (20 mA/10 V) are factory set to full scale of the respective measuring range. If this setting is changed manually, this parameter must be verified and, if necessary, adjusted each time the source for the respective output (flow rate or temperature[1)]) is changed.

NOTE Note	For devices with bidirectional measurement functionality, the analog outputs can be adjusted across the entire bidirectional measuring range, as long as the default value of "Start Value < End Value" is observed. The "Cutoff" flow parameter from the Measurement menu influences the output of the analog value around the zero point. Since the "Cutoff" parameter outputs a "0" when the set limit is exceeded, regardless of the flow rate, the output value of the analog output will jump to the corresponding, configured "0" value of the output and will not leave it again until the activated "Cutoff" range is exited.

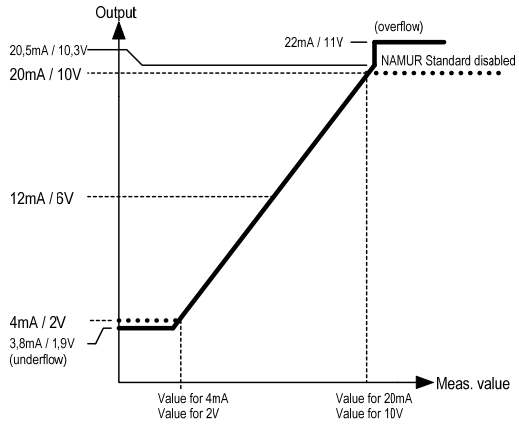
5.6.2.1 Current output 0(4)-20 mA

The current output gives a measured variable (flow or temperature[1)]) in scaled form as a 0 (4) -20 mA current signal.
The current output is scaled via the "Value 20 mA "and" Value 4 mA "(with current output 0-20 mA "Value 0 mA"). By default, the "Value 20 mA" parameter is set to the value for the end of the measuring range, but can be parameterized as desired within the measuring range, but always bigger than the measuring range start value. The parameters "Value 4 mA" / "Value 0 mA" define the measured values for the starting current value, which may also be set freely in the measuring range.
Note 1: If the value is set smaller than the end of the measuring range, the accuracy of the output voltage value is reduced.
Note 2: The burden on the current output must not exceed 500 Ω.

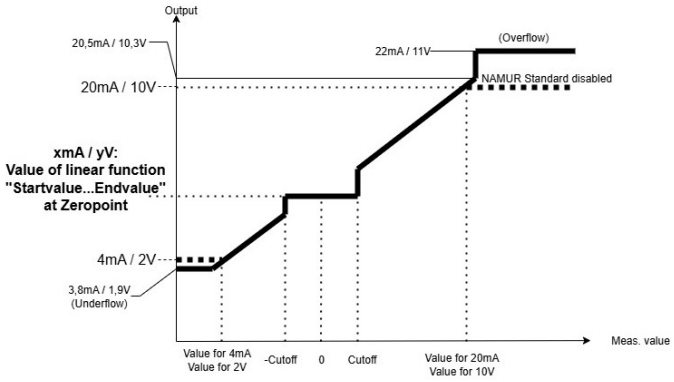
5.6.2.2 Voltage output 0-10 V / 2-10 V

The voltage output outputs a measurement variable (flow or temperature[1)]) in scaled form as a 0-10 V / 2-10 V voltage signal.
The scaling of the voltage output is done via the parameter "Value 10 V "and "Value 0 V". By default, the "Value 10 V" parameter is set to the value for the end of the measuring range, but can be parameterized as desired within the measuring range, but must always be bigger than the measuring range start value.
The parameters "Value 0 V" and "Value 2 V" define the measured values for the start voltage value, which may also be freely set in the measuring range.

Note 1: If the value is set smaller than the end of the measuring range, the resolution and accuracy of the output voltage value are reduced.

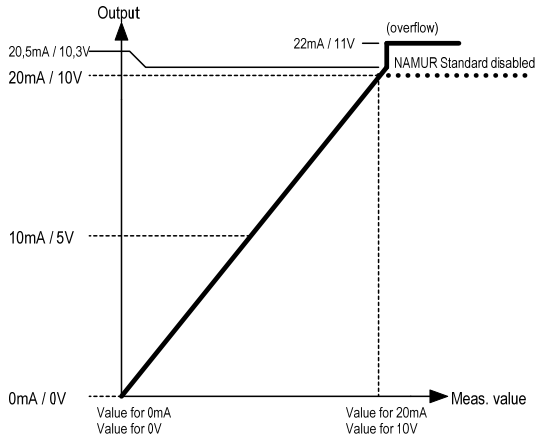


Output behaviour 4-20 mA and 2-10 V

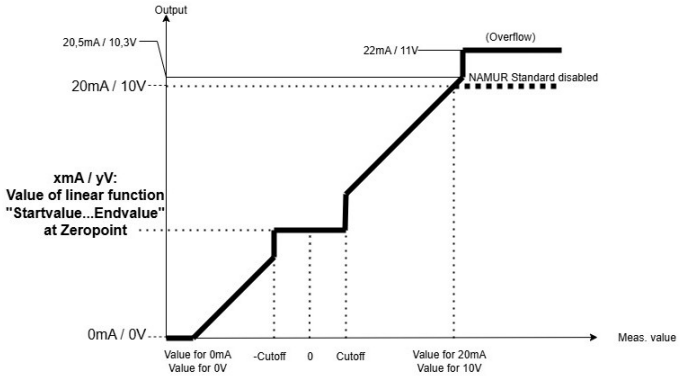


Output behaviour 4-20 mA and 2-10 V in bidirectional measuring systems

[1)] Only available for devices with temperature sensor



Output behaviour 0-20 mA and 0-10 V



Output behaviour 0-20 mA and 0-10 V in bidirectional measuring systems

5.6.2.3 Activation of behaviour according to NAMUR recommendation NE43

For all analog**ue** outputs (current and voltage), the output behavio**u**r can be activated according to NAMUR recommendation NE43. When the function is activated, e.g. the linear output of the 4 to 20 mA signals to 3.8 to 20.5 mA. Above 20.5 mA, the current value jumps to approx. 22 mA to signalise a measuring range overshoot. Current output values between 3.8 and 4.0 mA indicate that the measuring range is undershot. The output of approximately 3.6 mA signals a device or process fault (e.g., empty tube signalling).

5.6.3 Pulse output

The U-PACE electronics (options CT/C3T/C3T0) provides a scalable pulse output. When the pulse output is activated, the cyclically incoming volume is available as a pulse train at the output. The pulse width of the pulse output is constant and can be set in a range of 1 ms up to 20000 ms. The pulse output is updated in a cycle of 20 ms. At the beginning of each update, it is determined how much volume has been accumulated during the previous update period. According to this amount and the set pulse volume, the corresponding amount of pulses is available as a pulse train at the output.

NOTE Note	The pulse signal is not suitable for determining the volume flow with an external frequency measurement.

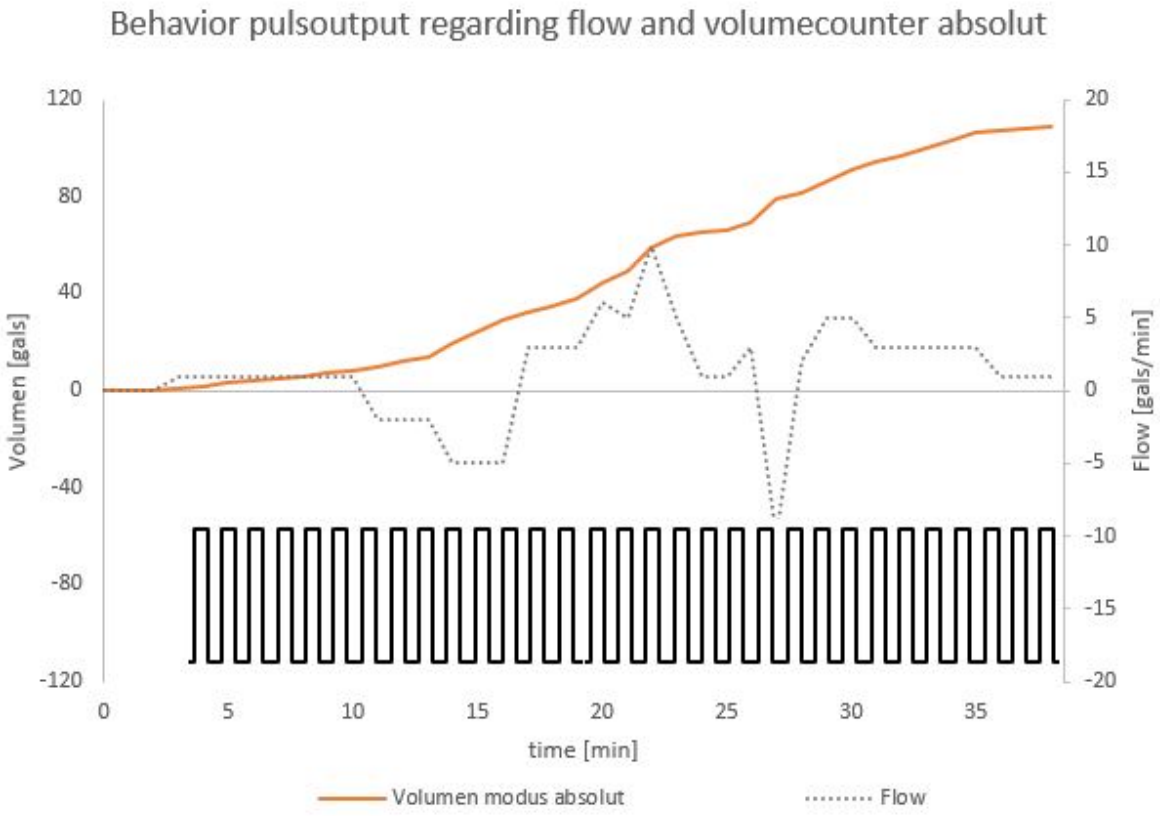
NOTE Note	The reaction time of the pulse output is directly dependent on the flow parameter "separation" (cutoff). The shortest reaction time is reached if this parameter is set to the value "0.0" (factory setting: start of measuring range).

The electrical output type of the pulse output is push-pull, therefore HIGH and LOW are actively switched through at the output.

The HIGH level corresponds to the voltage level of the applied supply voltage. The LOW level corresponds to zero potential.

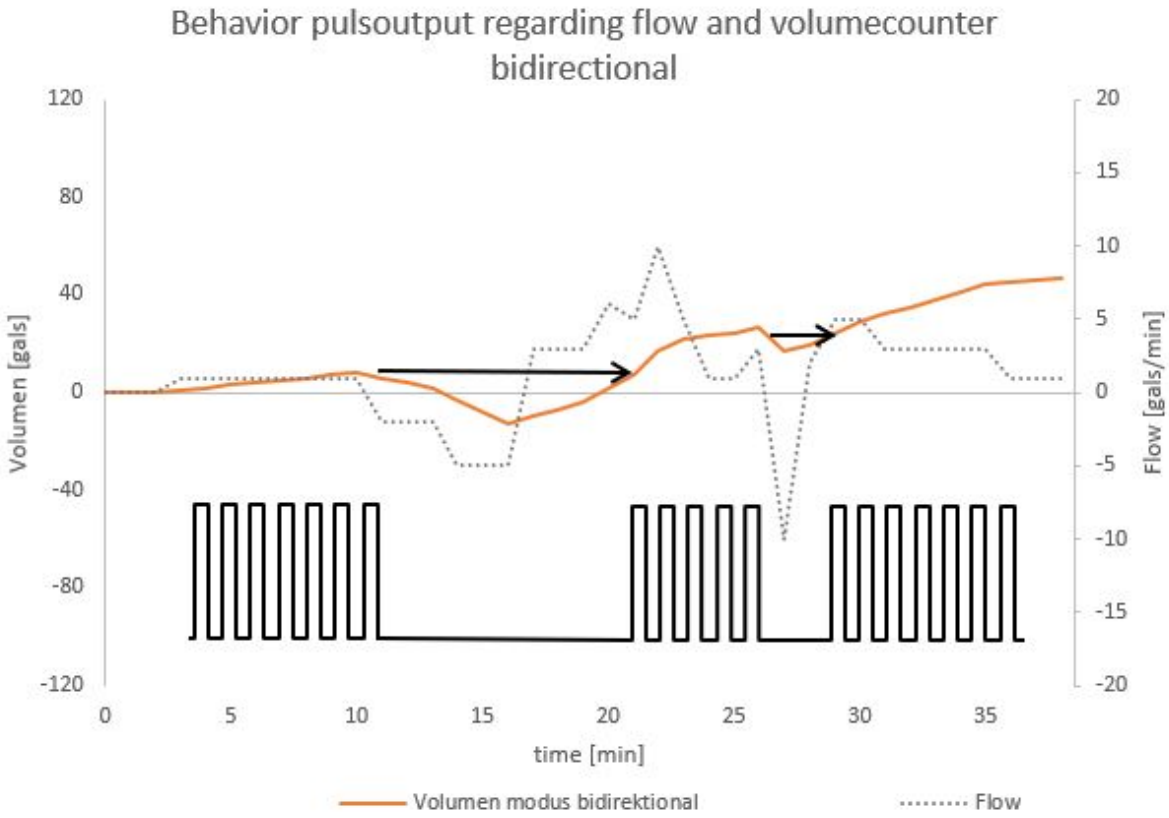
Partial volume counter in absolute mode:
If the partial volume meter is configured as "absolute", the following applies in relation to the flow direction:

- The absolute value of the accumulated partial volume is continuously recorded; regardless of the flow direction, the partial volume counter steadily increases.
- Pulses are continuously output according to the absolute value of the flow rate.



Partial volume counter in bidirectional mode:
If the partial volume meter is configured as "bidirectional", the following applies in relation to the flow direction:

- The actual value of the collected partial volume is continuously recorded. Depending on the flow direction, this leads to an increase (positive flow) or decrease (negative flow) of the partial volume counter.
- Pulses are only output if the following conditions are met simultaneously:
  1. Flow direction positive
  2. Current partial volume meter reading ≥ partial volume meter reading before negative flow



Behavior on OVERFLOW:
If the volumetric flow measurement is in the OVERFLOW range, the pulse output is switched off and a constant HIGH level is applied to the output.

5.6.3.1 Pulse volume

The parameter "Pulse Volume" defines the volume to be represented by a pulse. The unit is set via the parameter "Volume Unit" (see 5.6.3.2 Volume Unit).

Example 1: Setting a pulse volume

In the pulse measurement menu, first define the desired pulse unit and then enter the desired pulse volume.
Desired setting: Pulse volume 3 l:

1. Select pulse unit “l” = liters
2. Set pulse quantity to “3”.

Desired pulse volume setting: 20 ml

Option 1:

1. Select pulse unit “l” = liters
2. Set pulse quantity to “0.02”

Option 2:

1. Select pulse unit “ml” = milliliters
2. Set pulse quantity to “20”

Example 2: How many pulses can I expect with a set pulse volume?

Option 1: Relatively large pulse volume
Desired pulse volume at the output: 2 liters ↔ 1 pulse is output to the pulse output every 2 liters.

Pulse quantity = Flow rate / Pulse volume

Flow rate 10 l/min: Pulse quantity = 10 l/min / 2 l = 5 pulses/minute

Variant 2: Relatively small pulse volume
Desired pulse volume at the output: 2 ml ↔ 1 pulse is output to the pulse output every 2 ml

Pulse quantity = Flow rate / Pulse volume

Flow rate 10 l/min: Pulse quantity = 10 l/min / 0.002 l = 5000 pulses/minute

5.6.3.2 Pulse unit

The Pulse Unit parameter defines the unit of the set pulse volume. It is also possible to set a "User Unit" (see 5.4.1.1 Unit).

Example 1:

Unit "l" = liter
Pulse volume = 10
Meaning: 1 pulse ≙ 10 liters of accumulated volume since the last pulse

Example 2:

Unit “ml” = milliliter
Pulse volume = 10
Meaning: 1 pulse ≙ 10 ml of accumulated volume since the last pulse

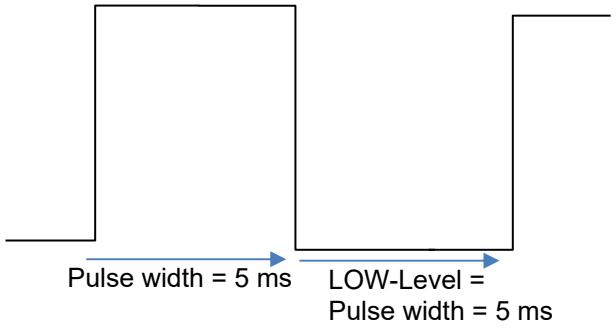
5.6.3.3 Pulse width

The pulse width parameter defines the duration of the HIGH level of a pulse. It is adjustable within the range of 1 to 20,000 ms. Before the next HIGH level can be transmitted, a LOW level of the same pulse width must be awaited.

Example:
Pulse width = 5 ms

Meaning:

Duration of HIGH level = 5 ms
Duration of LOW level = 5 ms
Interval between 2 HIGH levels = 10 ms



5.6.3.4 Application of the pulse output

The conversion of the set parameters to the output signal only takes place after confirmation of the respective entries in the pulse measurement menu. Confirmation of the pulse width and pulse volume is achieved by repeatedly pressing the upper right button to exit the value entry display beyond the last displayed digit.
The pulse output always outputs only whole pulses after each update time of approximately 20 ms. This means that only whole divisors of the pulse volume are delivered. As a result, a residual volume can remain in the device's memory, which is only output with the next pulse. This causes a time delay in the pulse sequence, which prevents its use as an indirect frequency signal.
The pulse output always delivers the entire accumulated volume as a pulse sequence throughout the entire measurement period. If the pulse volume and pulse width parameters are set unfavorably, this can lead to a significant overrun of the pulse output after the flow stops.
To prevent lag, the possible settings of these two parameters must be calculated in advance.
Theoretical limit of pulse width for a given pulse volume:

$$\text{Pulse width} < \frac{60000 * \text{Pulse volume}}{\text{Flow} * 2}$$

Theoretical limit of pulse volume for a given pulse width:

$$\text{Pulse volume} < \frac{\text{Flow} * 2 * \text{Pulse width}}{60000}$$

The following are calculation examples for the theoretical limit. To ensure that the pulses do not continue to run, it is recommended to minimize the calculated value independently and appropriately. This should compensate for the indifference caused by residual volume in the volume buffer and runtime differences in the update time.

Example 1: Pulse volume is given, maximum possible pulse width is to be determined

Required information:

- Flow rate [l/min] = maximum expected flow rate in application, to be output without pulse overrun
- Pulse volume [l]
- Time constant = conversion l/min to l/ms = 1*60*1000=60000
  - If the unit is different, this time constant can also be calculated and replaced independently.

- Formula: Pulse width $< \frac{60000 * \text{Pulse volume}}{\text{Flow} * 2}$

Example values:

- Flow = 300 l/min
- Pulse volume = 2l

  - Maximum pulse width $< \frac{\text{Pulse volume } [l]}{\text{Flow } [l/min] * 2}$

$$< \frac{\text{Pulse volume } [l]}{\text{Flow } [l/60000\ ms] * 2}$$

$$< \frac{60000 \text{ ms} * 2 \text{ l}}{300 \text{ l} * 2}$$

$$< 200 \text{ ms}$$

Considerations regarding the formula:

1. How many pulses does my maximum flow rate generate?
   Pulsmenge = Durchfluss/Pulsvolumen = 300/2 = 150 Pulse/min
2. How much time is available for these pulses: Time constant in ms, since the pulse width must be entered in ms = 60000
3. What is the maximum possible pulse width?
   (Time constant/pulse quantity)/2 = (60000/150)/2 = 200ms
   a. Why /2: Because of the time the LOW level takes up!
4. Summary: Pulse width = (time constant/pulse volume)/2 = (time constant/(flow/pulse volume))/2 = (time constant*pulse volume)/(flow*2)

Example 2: Pulse width is given, maximum possible pulse volume is to be determined.

Required information:

- Flow rate [l/min] = maximum expected flow rate in application, to be output without pulse overrun
- Pulse width [ms]
- Time constant = conversion l/min to l/ms = 1*60*1000=60000
  - If the unit is different, this time constant can also be calculated and replaced independently.

- Formula: Pulse volume $< \frac{\text{Flow} * 2 * \text{Pulse width}}{60000}$

Example values:

- Flow = 300 l/min
- Pulse width = 1000 ms

- Maximum pulse volume < Flow rate [l/min]*2*pulse width

< Flow [l/60000 ms]*2*pulse width

$$< \frac{300\ \text{l} * 2 * 1000\ \text{ms}}{60000\ \text{ms}}$$

< 10 l

Considerations regarding the formula:

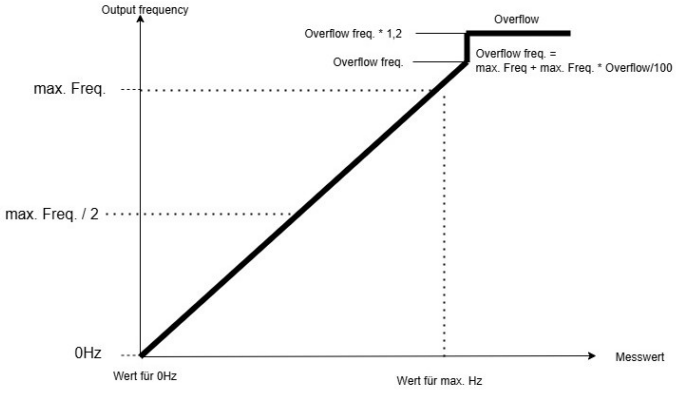
1. How long will 1 pulse last?
   Pulse duration = High+Low = 2* Pulse width = 2*1000ms = 2000 ms
2. How much time is available for these pulses: Time constant in ms, since the pulse width is given in ms, but the flow rate in l/min = 60000
3. What is the maximum possible number of pulses:
   Time constant/pulse duration = 60000 ms/2000 ms = 30 pulses can be emitted in that time.
4. What is the maximum possible pulse volume?
   Pulse volume = flow rate/pulse quantity = 300/30 = 10 l
5. Summary:
   Pulse volume = Flow rate/Pulse quantity =
   Flow rate / (Time constant/Pulse duration) =
   (Flow rate * Pulse duration) / Time constant =
   (Flow rate * 2 * Pulse width) / Time constant

5.6.1 Frequency output

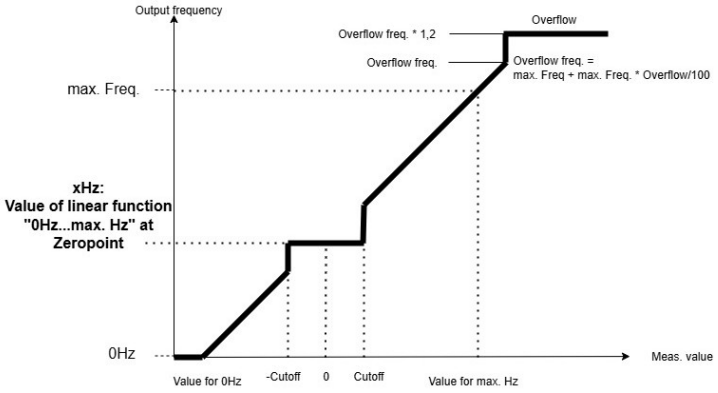
The U-PACE electronics (options CT/C3T/C3T0) provides a scalable frequency output. When this output is activated, the measurement variable (flow or temperature[1)]) associated with the frequency output is output proportionally as a frequency with a 1: 1 pulse / pause duration. The output frequency at the end of the measuring range can be set (parameter "maximum frequency"). With the two parameters "Value for 0 Hz" and "Value for max Hz", the frequency output in the measuring range can be freely scaled.

Behavior on OVERFLOW:

If the measured value is in the overflow range, a constant frequency is output.



Output behaviour Frequency output



Output behaviour Frequency output in bidirectional measuring systems

NOTE Note	The end values of the frequency outputs are factory set to full scale of the respective measuring range. If this setting is changed manually, this parameter must be verified and, if necessary, adjusted each time the source for the respective output (flow rate or temperature[1)]) is changed.

NOTE Note	For devices with bidirectional measurement functionality, the frequency output can be adjusted across the entire bidirectional measuring range, as long as the default value of "Start Value < End Value" is observed. The "Cutoff" flow parameter from the Measurement menu influences the output of the "Flow" frequency output around the zero point. Since the "Cutoff" parameter outputs a "0" when the set limit is exceeded, regardless of the flow rate, the output value of the "Flow" frequency output will jump to the corresponding configured "0" value of the output and will not leave it again until the activated "Cutoff" range is exited.

[1)] Only available for devices with temperature sensor

5.6.2 Control input

Output 1 can be configured as a control input. This can reset the MIN / MAX memory or the partial quantity counter depending on the assigned measurement variable.

Function	Measurement variable	Control pulse duration
MIN/MAX Reset	Flow, temperature[1)]	0.5s < t_{high} < 4s
Part volume counter reset	Part volume counter	0.5s < t_{high} < 4s

[1)] Only available for devices with temperature sensor

Parameter table **Output 1/2 – Flow**

Sub-parameter level 1	Sub-parameter level 2	Sub-parameter level 3	Description	Value range / value list	*Factory setting LPM version*	*Factory setting GPM version*
disabled			*Output deactivated*		*IO-Link*	
Alarm output	Function	*List selection*	Sets the basic function	*Limit function / window function*	*Limit function*	
	Output		Sets the electr. Output	*NPN/PNP/PP*	*NPN*	
	switching function		Set the log. switching function	*NO/NC*	*NO*	
	threshold	*Value input*	Sets the switching threshold	*MB start ≤ value ≤ Full scale*	*1*	
	lower threshold		Sets the lower threshold for window function	*Value threshold ≤ value ≤ MB start*	*1*	
	hysteresis		Defines the switching hysteresis	*0 ≤ **value** ≤ (MB end – MB start)*	*1*	
	filter factor		Factor for the switching delay x100 ms	*0x ≤ **value** ≤ 60x*	*0*	
	direction		Defines the effective direction of the switching delay	*Up / Down / Both*	*Down*	
4-20 mA	NAMUR Standard		Activates the behaviour according to NAMUR NE43	*activated / deactivated*	*deactivated*	
	Value 4 mA		Measured value for 4 mA output	*MB-start ≤ **value** ≤ Wert 20 mA*	*0*	
	Value 20 mA		Measured value for 20 mA output	*Value 4 mA ≤ **value** ≤ Full scale*	*Full scale*	
0-20 mA	NAMUR Standard		Activates the behaviour according to NAMUR NE43	*activated / deactivated*	*deactivated*	
	Value 0 mA		Measured value for 0 mA output	*MB start ≤ **value** ≤ value 20 mA*	*0*	
	Value 20 mA		Measured value for 20 mA output	*Value for 0 mA ≤ **value** ≤ Full scale*	*Full scale*	
2-10 V	NAMUR Standard		Activates the behaviour according to NAMUR NE43	*activated / deactivated*	*deactivated*	
	Value 2 V		Measured value for 2 V output	*MB start ≤ value ≤ value 10 V*	*0*	
	Value 10 V		Measured value for 10 V output	*Value for 2 V ≤ **value** ≤ Full scale*	*Full scale*	
0-10 V	NAMUR Standard		Activates the behaviour according to NAMUR NE43	*activated / deactivated*	*deactivated*	
	Value 0 V		Measured value for 0 V output	*MB start ≤ value ≤ value 10 V*	*0*	
	Value 10 V		Measured value for 10 V output	*Value for 0 V ≤ **value** ≤ Full scale*	*Full scale*	

Sub-parameter level 1	Sub-parameter level 2	Sub-parameter level 3	Description	Value range / value list	*Factory setting LPM version*	*Factory setting GPM version*
Frequency output	*max. frequency*	*Value input*	Frequency output at "value at max. Hz"	*50-1000 Hz*	*500 Hz*	
	overflow		Overflow value in % of the value "max.frequency"	*1-100 [%]*	*1%*	
	Value at 0 Hz		Value at 0 Hz	*MB start ≤ **value** ≤ value at max. Hz*	*0*	
	Value at max. Hz		Value at "maximum frequency"	*Value for 0 Hz <**value** ≤ Full scale*	*Full scale*	
Control input (only output 1)			Control function for MIN / MAX memory reset	*OFF, memory reset*	*Aus*	
KofiCom	*Factory calibration mode on output 1*					
IO-Link	*This mode activates the IO-Link function on output 1(standard factory setting)*					

Parameter table **Output 1/2 – Volume**

Sub-parameter level 1	Sub-parameter level 2	Sub-parameter level 3	Description	Value range / value list	*Factory setting LPM version*	*Factory setting GPM version*
disabled			*Output deactivated*		*disabled*	
Pulse output	Pulse unit	*List selection*	Sets the Pulse Volume for Pulse Volume	*ml, L, m3, galUS, galUK, User*	*L*	*galUs*
	Pulse volume	*value input*	Sets the value for the pulse volume	*0.001-999*	*1*	
	Pulse width		Sets the pulse width	1-20.000	1 ms	
KofiCom	*Factory calibration mode on output 1*					
IO-Link	*This mode activates the IO-Link function on output 1*					

Parameter table **Output 1/2 – Temperature**[1)]

Sub-parameter level 1	Sub-parameter level 2	Sub-parameter level 3	Description	Value range / value list	*Factory setting LPM version*	*Factory setting GPM version*
disabled			*Output deactivated*		*disabled*	
Alarm output	Function	*List selection*	Sets the basic function	*Limit function / window function*	*Limit function*	
	Output		Sets the electr. Output	*NPN/PNP/PP*	*NPN*	
	Switching function		Sets the log. switching function	*NO/NC*	*NO*	
	Threshold	*Value input*	Sets the switching threshold	*MB start ≤ **value** ≤ Full scale*	*1*	
	lower threshold		Sets the lower threshold for window function	*Value threshold ≤ value ≤ MB start*	*1*	
	Hysteresis		Defines the switching hysteresis	*0 ≤ **value** ≤ (MB end – MB start)*	*1*	
	Filter factor		Factor for the switching delay x100 ms	*0x ≤ **value** ≤ 60x*	*0*	
	Direction		Defines the effective direction of the switching delay	*Up / Down / Both*	*Down*	
4-20 mA	NAMUR Standard		Activates the behaviour according to NAMUR NE43	*activated / deactivated*	*deactivated*	
	Value 4 mA		Measured value for 4 mA output	*MB start ≤ **value** ≤ value 20 mA*	*0*	
	Value 20 mA		Measured value for 20 mA output	*Value 4 mA ≤ **value** ≤ Full scale*	*Full scale*	
0-20 mA	NAMUR Standard		Activates the behaviour according to NAMUR NE43	*activated / deactivated*	*deactivated*	
	Value 0 mA		Measured value for 0 mA output	*MB start ≤ **value** ≤ value 20 mA*	*0*	
	Value 20 mA		Measured value for 20 mA output	*Value 0 mA ≤ **value** ≤ Full scale*	*Full scale*	
2-10 V	NAMUR Standard		Activates the behaviour according to NAMUR NE43	*activated / deactivated*	*deactivated*	
	Value 2 V		Measured value for 2 V output	*MB start ≤ value ≤ value 10 V*	*0*	
	Value 10 V		Measured value for 10 V output	*Value 2 V ≤ **value** ≤ Full scale*	*Full scale*	
0-10 V	NAMUR Standard		Activates the behaviour according to NAMUR NE43	*activated / deactivated*	*deactivated*	
	Value 0 V		Measured value for 0 V output	*MB start ≤ value ≤ value 10 V*	*0*	
	Value 10 V		Measured value for 10 V output	*Value 0 V ≤ **value** ≤ Full scale*	*Full scale*	

[1)] Only available for devices with temperature sensor

Continuation Parameter table **Output 1/2 – Temperature**[1)]

Sub-parameter level 1	**Sub-parameter level 2**	**Sub-parameter level 3**	**Description**	**Value range / value list**	***Factory setting LPM version***	***Factory setting GPM version***
Frequency output	*max. frequency*	*Value input*	Frequency output at "value at max. Hz"	*50-1000 Hz*	*500 Hz*	
	Overflow		Overflow value in % of the “value at max. frequency"	*1-100 [%]*	*1%*	
	Value at 0 Hz		Value at 0 Hz	*MB start ≤* ***value*** *≤ value for max. Hz*	*0*	
	Value at max. Hz		Value at "max. frequency"	*Value for 0 Hz <****value*** *≤ Full scale*	*Full scale*	
Control input (only OUT1)			Control function for MIN / MAX memory reset	*OFF, memory reset*	*OFF*	
KofiCom (only OUT1)	*Factory calibration mode on output 1*					
IO-Link (only OUT1)	*This mode activates the IO-Link function on output 1*					

[1)] Only available for devices with temperature sensor

Parameter table **Output 1/2 – Part volume**

Sub-parameter level 1	Sub-parameter level 2	Sub-parameter level 3	Description	Value range / value list	*Factory setting LPM version*	*Factory setting GPM version*
Disabled			*Output deactivated*		*disabled*	
Pulse output	Pulse unit	*List selection*	Sets the Pulse Volume for Pulse Volume	*ml, L, m3, galUS, galUK, User*	*L*	*galUs*
	Pulse volume	*Value input*	Sets the value for the pulse volume	*0-999*	*1*	
	Pulse width		Sets the pulse width	1-20.000	1 ms	
Control input (only Out1)			Control function for counter reset	*OFF, memory reset*	*Off*	
KofiCom (only OUT1)	*Factory calibration mode on output 1*					
IO-Link (only OUT1)	*This mode activates the IO-Link function on output 1*					

5.7 User service

The user service provides the user with a reset function and password setting. Together with the activation of a user password, therefore, the menu access for the user on the part of a master user can be blocked.

5.7.1 User service / change password

In the factory setting the user password is set to "00000", the user functions are thus freely accessible. If the user password is changed to other than "00000", the password prompt becomes active the next time the user menu is entered. If the set password is no longer known, a master password can be requested from KOBOLD.

5.7.2 User service / factory setting

By activating this function, the user can reset the device to the factory settings. Any user settings will then be lost and the device will be back in delivery condition.

Parameter table **User menu**

Sublevel	Parameter level	Description	Value range / value list	*Factory setting LPM version*	*Factory setting GPM version*
Password	value input	Protects the user service menu by password prompting if the password is not "00000"	*00000-99999*	*00000*	
Factory reset	Yes / No	Resets the device to factory settings			
Menu lock	unlocked / closed	*With "locked", the menu access only takes place via the password prompt*	unlocked / closed	*unlocked*	
Sim Autostop	Value input	*Sets the time for how long the simulation mode remains active*	*1 - 31 min.*	*10 min.*	

5.8 Service / Factory service

The factory service function is password protected and not accessible to the user.

5.9 Info

5.9.1 General

This info option displays the measuring ranges of the device for flow and temperature[1)].

5.9.2 Version

This info option displays the hardware and software version of the device.

Parameter table **Info**

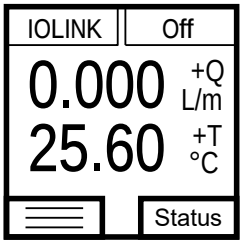
Menu level	Sublevel	Description
Info	General	Displays the measuring ranges of the device
	Version	Displays the hardware and software version
	Manual	Displays the QR code to download the instruction manual

[1)] Only available for devices with temperature sensor

5.10 Device default settings

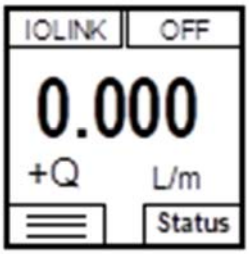
Measuring devices with temperature sensors are set and delivered from the factory with the following configuration:

Display - Dual
Upper display - Flow
Lower display - Temperature
Out 1: IO-Link
Out 2: deactivated



Measuring devices without a temperature sensor are set and delivered from the factory with the following configuration:

Display – Single
Anzeigewert - Flow
Ausgang 1: IO-Link
Ausgang 2: OFF / deaktivated



Different factory setting for output 2 for DON-…CT:
Pulse output partial quantity counter

6. Device Status

The color of the displayed measurement provides you with information for quickly classifying the incoming value.

Color of displayed measurement value	Meaning
Red	Measurement value exceeds overflow value
Yellow	Measurement value is between the end of the measuring range and the overflow value
White	Measurement value is positive and lies between the cutoff and the positive end of the measuring range
Magenta*	**Measurement value is negative** and lies between the cutoff and the negative end of the measuring range
Blue	Measurement value is below the cutoff value and is hard-set to 0

*Available for devices with software version newer than R251028 (Menu: Info → Version; Format: “R”YYMMDD)

For further information about the device status messages shown on the display, please refer to the product-specific user manual.

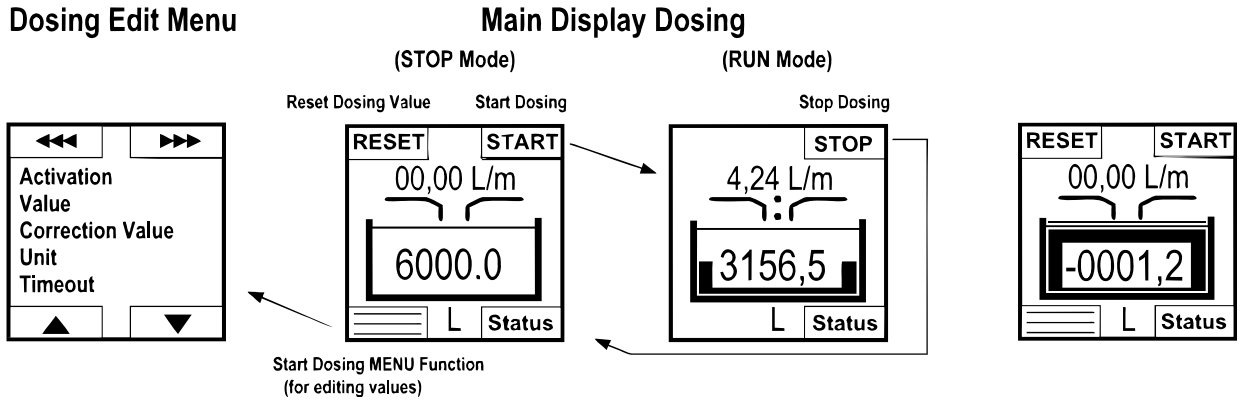
7. Dosing function

The standard U-PACE electronics (options CT/C3T/C3T0) provides a simple dosing function. This can be permanently activated or deactivated in the settings menu under the menu item "dosing". If the dosing function is activated, fixed functions are assigned to the 2 outputs which cannot be changed as long as the dosing function is activated:

OUT2 (Pin 2): Dosing output in push pull configuration
OUT1 (Pin 4): Control input for START/STOP/RESET function

NOTE Note	When the control input is used, then OUT1 (connection pin 4) must be always polarised, either to the 24 Vdc or to the GND (pin 3). When using a mechanical button that switches the supply voltage to the control input, a 10 kOhm pull-down resistor is recommended. The control input must not be left open!

If the dosing function is deactivated, both outputs are switched to OFF (deactivated) by default, but can then be freely configured again.



In the main display of the dosing function, the quantity to be dosed in a preselectable unit and the current flow value are displayed on the one hand. The progress of the dosing process is additionally represented by a graphic animation in which the container shown fills in percent and also overfill is shown.

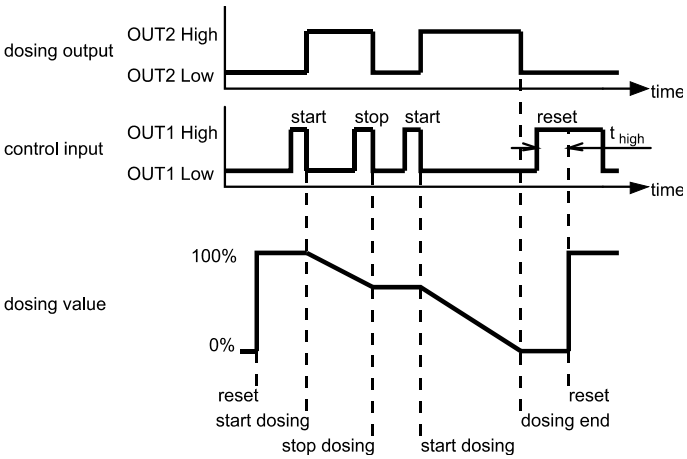
Softkey buttons: All softkey buttons in dosing mode must be held down by the user for at least 2 seconds and then released again for the corresponding function to be triggered. This is to avoid accidental operation.
Control input: Connection OUT1 can be used as a control input for the functions Start / Stop / Reset when the dosing function is activated.

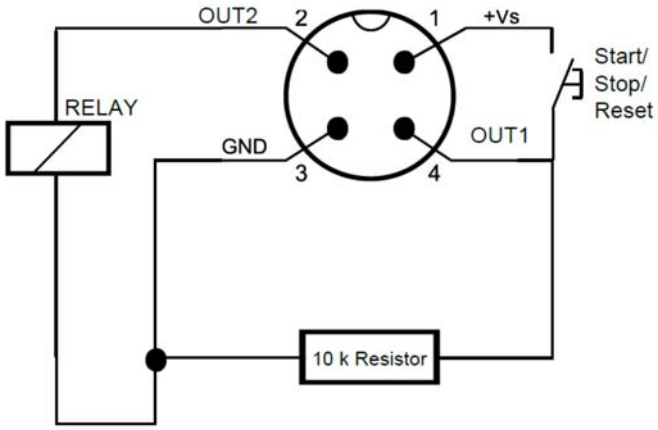
Function	Conditions	Control pulsetime
START	Stop Modus	0.5 s < t_{high} < 4 s
STOP	Run Modus	0.5 s < t_{high} < 4 s
RESET	Stop Modus	t_{high} > 5 s

START of dosing:
Dosing can be started either by triggering the "START" softkey or by applying a high pulse to the control input.
After the START function has been triggered, the dosing output is switched to active (High) and the dosing counter is counted down in the standard direction when flow is present.
If the dosing process is stopped incompletely by hand, it can be restarted by the START function.

STOP of dosing
If the dosing process is started, it can be stopped or interrupted by the STOP function. Resumption of dosing to reach the total dosing quantity is possible by START.
Like the START function, the STOP function can be remotely controlled by the control input.

RESETTING the dosing value
If the dosing process is finished or stopped, the dosing quantity can be reset to the default value by the function RESET.
This function can also be triggered at the control input.





Description of dosing parameters

Dosing quantity "Value"
Parameter "Value" determines the dosing volume. The volume unit is specified in the "Unit" parameter.
The maximum size is limited to 9999.9 (one digit after the decimal point). The absolute quantity can be extended or restricted by a suitable choice of dosing unit.

Dosing unit "Unit"
Parameter "Unit" defines the dosing volume unit. The choices are: mL, L, m^3, galUS, galUK, barrel, user

Dosing correction value "Correction value"
The "Correction value" parameter can be used to correct a system-related, constant "incorrect dosing" without having to change the actual dosing quantity. The correction value can be both positive and negative. If the system doses a smaller volume than intended, the correction value must be positive, but negative for a larger real volume. e.g.
Dosing quantity = 10 L
Correction value = -1 L
In this case, the metering counter will count from 10 L to '0', but will stop at 1 L because the quantity to be metered is 9 L calculated on the basis of the correction value of -1 L.
With a correction value of +1 L, the dosing counter will stop counting at -1 L, because the dosing amount is calculated to be 11 L.
10 - (- 1 L) = 11 L
The adjustable value of the correction value must always be:
(Value + Correction Value)> 0
If this condition is not met, this will be indicated by a warning message and the correction value will be preset to the value - (Value-0.1).

Dosing parameter "Timeout"
During the dosing process, the presence of a flow value not equal to 0 is constantly monitored. For this purpose, the parameter "Timeout" is used to set the time after which the status message "Time Out" is triggered.
The timeout value can be set between 0.5 sec and 10 sec.

Parameter table **Dosing**

Sublevel	Parameter level	Subpara-meter level 1	Subpara-meter level 2	Subpara-meter level 3	Description	Value range / value list	*Factory setting LPM version*	*Factory setting GPM version*
Activation	disabled				Dosing function deactivated		*disabled*	
	activated	*Activation*			Dosing function activated			
		Value	*Value input*			*0 ≤ Value ≤ 9999.99 [unit]*	*0*	
		Correction value	*Value input*			*-999.99 ≤ Value ≤ +999.99 [unit]*	*0*	
		Unit	*List selection*			*ml, L, m3, galUS, galUK, User*	*L*	*galUs*
		Time out	*Value input*			*0.5 - 10 sec*	*0.5 sec.*	

8. Disposal

See “General Safety Instructions” - via the QR code on the device or via www.kobold.com