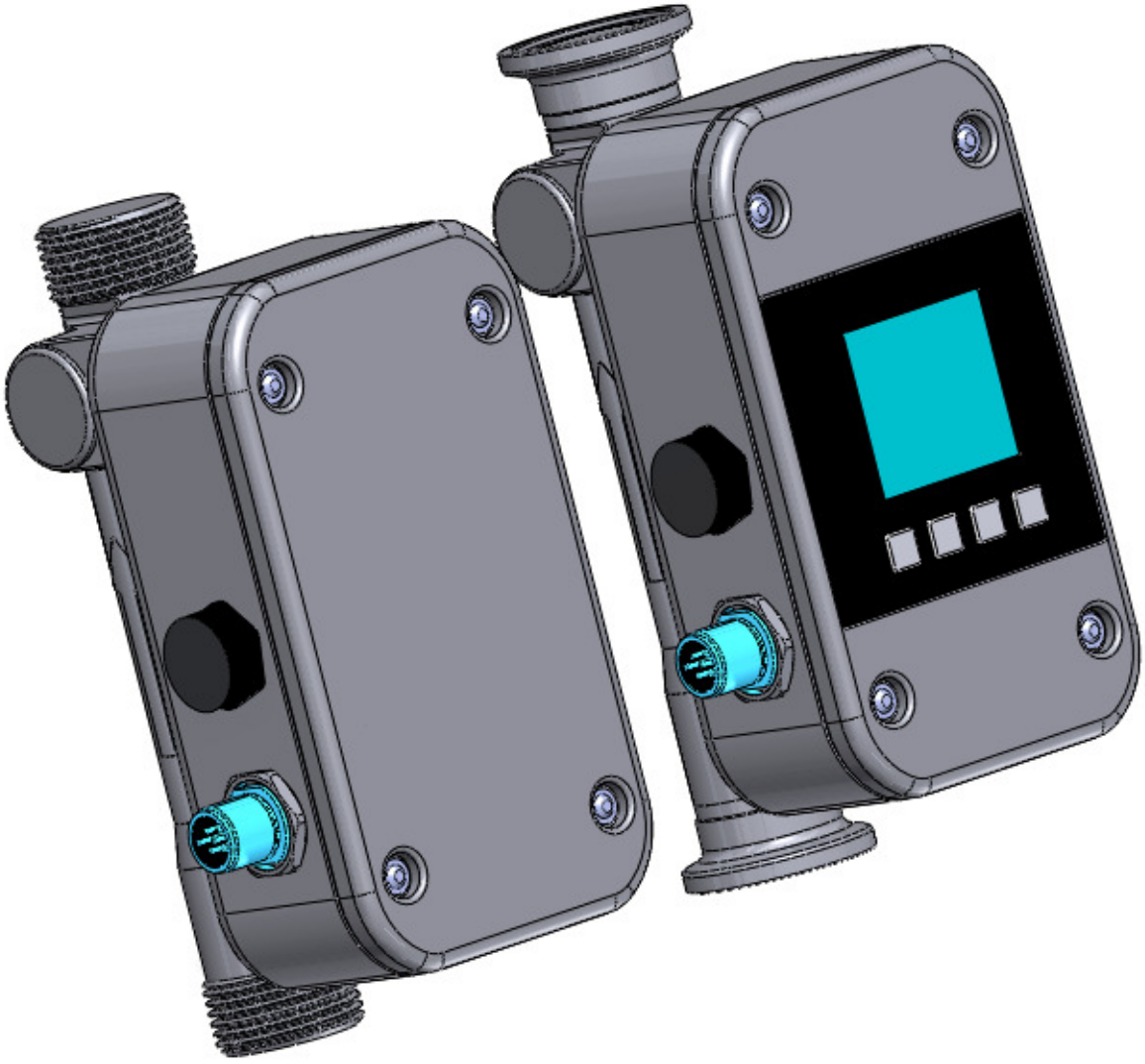
BA 008E/FM44i/06.12

Valid starting from
Hardware V 2.1
Software V 1.28

Flowmax® 44i

Ultrasonic flow metering / dosing device

Operating manual



MIB GmbH
Messtechnik & Industrieberatung

General safety instructions

Please always observe the following safety instructions!

Please pay attention to the safety instructions with the following pictograms and signal words in these operating instructions:

IMPORTANT! IMPORTANT! Indicates situations or cases which, if not avoided, could result damage or failure on the used equipment.

WARNING! WARNING! Indicates general hazardous situations or cases which, if not avoided, could result in serious injury.

NOTICE! NOTICE! Is used to lead users to helpful information not related to personal injury.

Intended use

- The flowmeter Flowmax 44i may only be used for measuring the flow of pure, homogeneous liquids.
- The volume flowmeter Flowmax 44i is manufactured and designed according to the current industry standard EN 61010 (corresponds to VDE 0411 “Safety specifications for electrical measurement, control and laboratory devices”).
- The manufacturer cannot be held liable for any damage from inappropriate or unintended use. Conversions and/or changes to the flowmeter may only be made according to these operating instructions.

Personnel for installation, commissioning and operation

WARNING!

- **Assembly, electrical installation, commissioning and maintenance of the flowmeter must be carried out by qualified, trained personnel. The qualified personnel must read and understand these operating instructions and must follow all appropriate instructions.**
- **The installer has to ensure that the flowmeter is correctly connected according to the electrical connection diagrams.**

Technological progress

The manufacturer reserves the right to revise, alter, or modify the flowmeter to the most current technology without special prior notice. Further information about the latest updates and potential additions to these operating instructions are available from MIB.

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1. Planning information

1.1 Areas of application

The flow measurement device Flowmax 44i is well suited for measuring dynamic flow in pipes and tubes. This flowmeter is suitable for liquids only. It is used for:

- Chemicals supply for controlling, logistics, monitoring
- Filling machines in food industries
- Cooling systems, logistics, monitoring
- Process equipment for control and monitoring of formulas
- Valve control for continuous release of liquid volumes
- Supply with de-ionized water
- Very dynamic liquid processes with dosing times of below 1 second

It has the following features and benefits:

- No movable parts, therefore no wear
- High repeatability
- Easy to clean
- Safe operation
- Compact design
- Integrated detection of empty conduits
- Integrated dosing function with pre-set and adjustable amounts
- Chemical resistant
- Integrated display with keypad

1.2 Measuring principle

It usually takes more energy to swim against the flow than with the flow. The ultrasonic flow measurement is based on the phase-difference approach.
Two sensors that are located opposite from each other alternatively transmitting and receiving ultrasonic signals. With medium at standstill both sensors receive the transmitted ultrasonic signals in the same phase, i.e. without phase difference. With medium flowing there is a phase shift. It differs when measured in direction of the flow than when measured against the direction of the flow. This phase difference is directly proportional to the flow rate. The flow rate and the known diameter of the pipe are used to determine the flow volume.

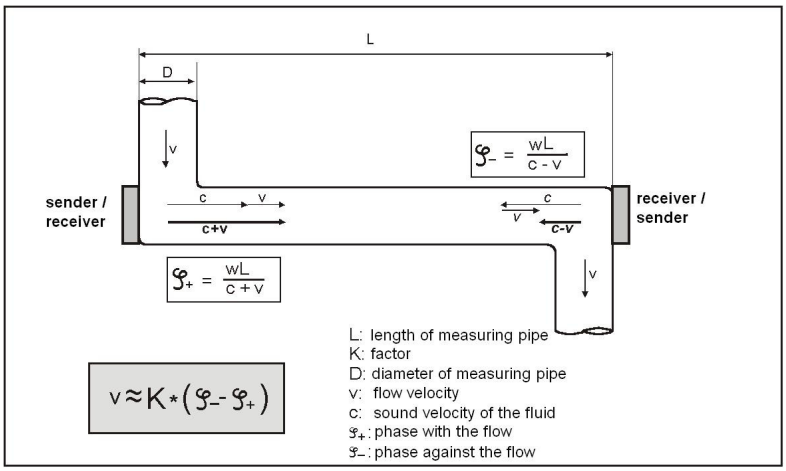


Fig. 1: Presentation of the principle of ultrasonic flow measuring

1.3 Operational safety

Comprehensive self-tests ensure highest possible safety.

The protection class is IP 67.

Flowmax 44i meets the general EMC immunity requirements according to CE, EN 50081-2, and EN 50082-2.

When referring to low voltage Flowmax 44i meets the safety requirements according to EN 60601-1.

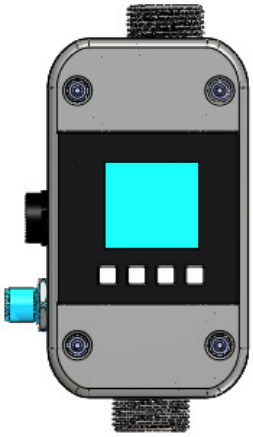
2. Assembly and installation

2.1 Installation instructions

NOTICE!

The housing of Flowmax 44i is labeled with an arrow symbolizing the direction of the flow. The flowmeter must be installed in direction of the flow.

TOP -> outlet



DOWN -> inlet

Fig. 2: Installation position of Flowmax 44i

For fastest possible bubble detection it is important to keep the pipe distance from tank to Flowmax 44i as short as possible. Accurate measurement can only be assured, if the pipe is completely filled and the liquid does not outgas.

Notwithstanding it may be advantageous for dosing applications to install the Flowmax 44i as close as possible to the dosing valve, since soft pipes increases the cross-section depending on the system pressure. This may lead to repeatable differences.

NOTICE!

Insure that no cavitations dissolve from the measured liquid. Depending on the measured liquid it can be helpful to have enough back pressure on the outlet of Flowmax 44i to avoid cavitations. Insure all mechanical connections are tight. Absolutely avoid usage of Teflon tape for sealing!

Particles present in the flow stream may result in measuring errors.

When using pumps, Flowmax 44i must be installed in flow direction on the pressure side. Note the maximum pressure specification of the Flowmax 44i.

For correct volume flow measurements straight and unobstructed inflow and outflow distances have to be observed. Starting from the connection thread these have to be at least:

Nominal diameter	DN10 3/8”	DN15 1/2”	DN20 3/4”	DN25 1”
Inflow distance	10cm 3,94”	30cm 11,81”	40cm 15,75”	40cm 15,75”
Outflow distance	0cm 0”	5cm 1,97”	10cm 3,94”	20cm 7,87”

IMPORTANT!

Always make sure that the maximum torque of the nuts for the hydraulic connections is not overtightened. We commend to use the delivered seals and a maximum torque depending on the diameter:

Nominal diameter	DN10 3/8”	DN15 1/2"	DN20 3/4"	DN25 1”
Inch thread, torque:	2Nm 1.5 ft-lbs	3Nm 2.2 ft-lbs	4Nm 3.0 ft-lbs	6Nm 4.4 ft-lbs

IMPORTANT!

Due to the material characteristics of PSU Flowmax has a limited resistance against UV rays. Do not mount in direct sunlight.

2.2 Assembly of the flowmeter

The flowmeter is mounted into a pipe system by using the mechanical connection. For best measuring performance Flowmax 44i should be mounted vertically into the pipe. It is not recommended to install the flowmeter after a dosing-valve. The flowmeter can run empty. To avoid getting bubbles in the liquid, Flowmax 44i should be installed on the pressure side of the pump.

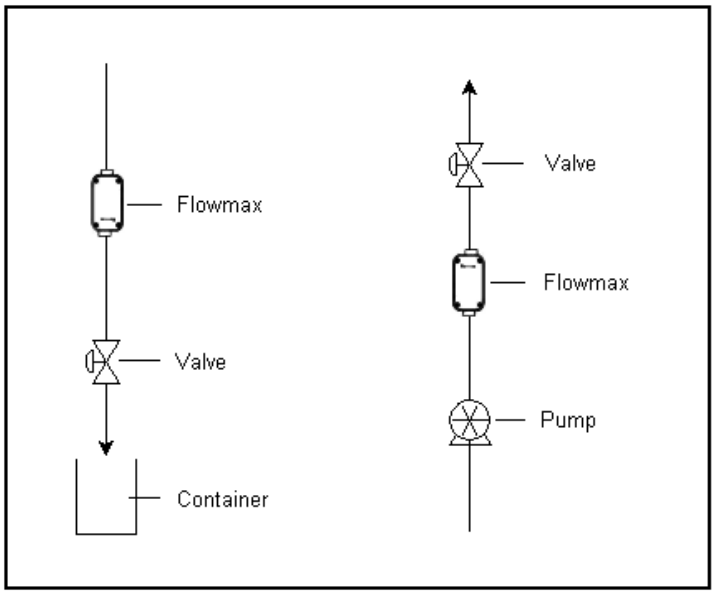


Fig. 3: Mounting examples for Flowmax 44i

If it is not possible to mount the flowmeter vertically, then mount the instrument in a location where the pipe will be filled at all times. The best measuring result is reached, when bubbles are unable to get into the Flowmax 44i.

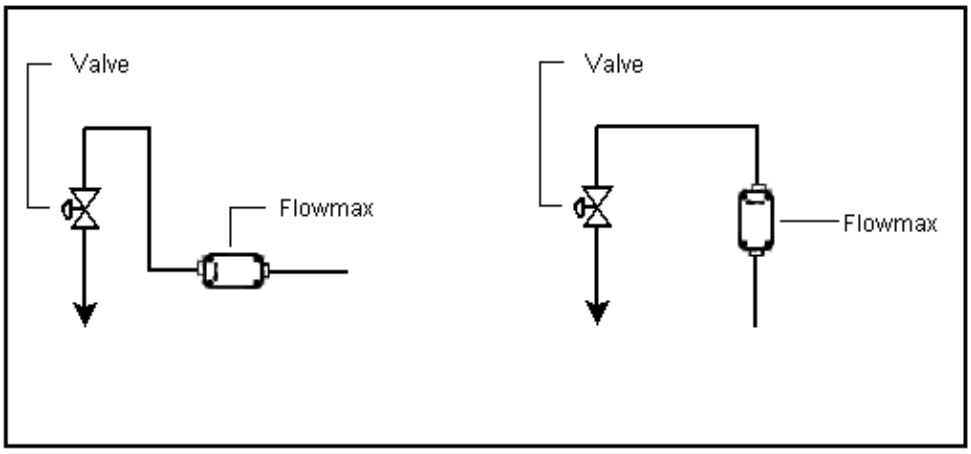


Fig. 4: Mounting possibilities

For applications with a “clean design“ meaning that it is necessary to completely drain the pipe system, we recommend mounting the flowmeter in the vertical position. If the flowmeter is mounted horizontally the internal geometry of the instrument will result in stagnate liquid.

Vibrations or mechanical forces may decrease measuring accuracy.
It is possible to fix the flowmeter additionally with two clamps against vibrations or movements. Use the clamps as seen in the figure below at the inlet and outlet connections of Flowmax 44i.

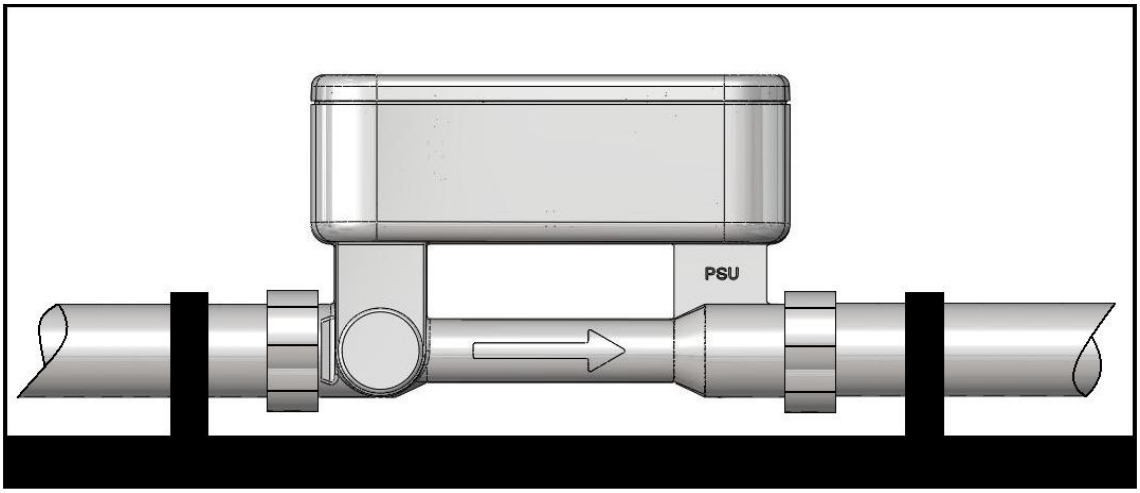


Fig. 5: Mounting the Flowmax 44i

IMPORTANT!

Flowmax must be installed without mechanical force on the existing pipe system, otherwise the flowmeter may be damaged. Pay attention to the axial channel offset of 5mm when mounting the flowmeter (For details see chapter 5.1 Dimensions and weight on page 22 / letter F).

Applications with hot liquids:

IMPORTANT!

When Flowmax 44i is used in applications with liquid temperatures higher than 60°C and mounted horizontal it is recommend to install the electronic housing away from the heat source. Heat rises away from the electronic housing and minimizes damage to electronic parts. When Flowmax is mounted vertically, heat damage is not an issue.

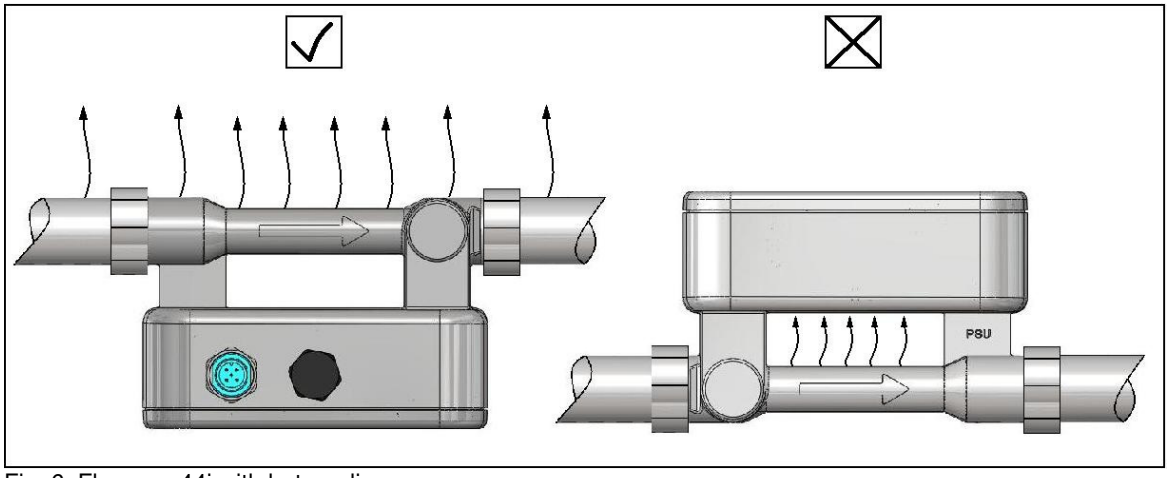


Fig. 6: Flowmax 44i with hot media

2.3 Electrical wiring

The flowmeter must not be installed, wired or disassembled with live power (operating voltage) present. Disconnect or shutdown all power before working on the flowmeter.

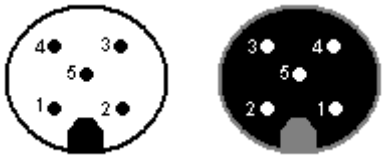


Fig. 7: Pin code: Connection plug / socket for 5-pin version

Connector cable pin configuration defined by manufacturer.
The outlets may be re-programmed for specific applications.

Pin	Function	Description
1	L+	Voltage supply: 18...30 VDC
2	Pulse output Q1 alternative: 1. Empty-pipe output 2. Dosing output 3. Limit-control output 4. Negative flow	Digital Output Q1 Freely adjustable ranging from 0.1 to 3000 ml/pulse in 0.1 ml/pulse steps, npn-Transistor, max. load 30V/100mA. Configurable output of 0V or 24V when pipe is empty. Configurable output of 0V or 24V via dosing-menu by FlowSoft. Configurable output of 0V or 24V when reaching upper or lower limit Configurable output of 0V or 24V when liquid flows in negative direction
3	GND	Ground: 0 V
4	Communication	Communication interface
5	Analog output QA	4....20mA; 0....20mA Example: 0l/min => 4mA 36l/min => 20mA Alert => 3.5mA (4-20mA, depending on the configured limits)

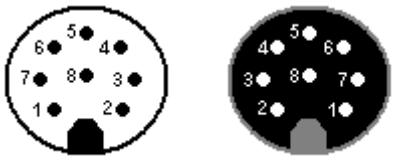


Fig. 8: Pin code: Connection plug / socket for 8-pin version

Connector cable pin configuration defined by manufacturer.
The outlets may be re-programmed for specific applications.

Pin	Function	Description
1	L+	Voltage supply: 18...30 VDC
2	Pulse output Q1 alternative: 1. Empty pipe output 2. Dosing output 3. Limit control output 4. Negative flow	Digital output Q1 Freely adjustable ranging from 0.1 to 3000 ml/pulse in 0.1 ml/pulse steps, npn-Transistor, max. load 30V/100mA. Configurable output of 0V or 24V when pipe is empty. Configurable output of 0V or 24V via dosing-menu by FlowSoft. Configurable output of 0V or 24V when reaching upper or lower limit Configurable output of 0V or 24V when liquid flows in negative direction.
3	GND	Ground: 0 V
4	Digital output Q2 Functions: 1. Empty pipe output 2. Dosing output 3. Pulse output 4. Limit control output 5. Negative flow	Digital output Q2 Configurable npn- or pnp-Transistor, max. Load 30V/ 100mA. Configurable output of 0V or 24V when pipe is empty. Configurable output of 0V or 24V via dosing menu of FlowSoft. Freely adjustable ranging from 0.1 to 3000 ml/pulse in 0.1 ml/pulse steps. Configurable output of 0V or 24V when flow reaches upper or lower limit. Configurable output of 0V or 24V when liquid flows in negative direction.
5	Analog output QA	4....20mA; 0....20mA Example: 0l/min => 4mA 36l/min => 20mA Alert => 3.5mA (4-20mA, depending on the configured limits)
6	Communication	Communication interface
8	Shielding	EMC safety
7	Digital input I1 1. Dosing output 2. Set offset 3. Reset counter 4. Creeping flow off	Digital input I1 Starts the dosage by a rising edge of 24V. The Offset is set by a rising edge of 24V. Reset of the counter by a rising edge of 24V. Creeping suppression is deactivated as long as there are 24V at the input.

Attention: Only operate the flowmeter Flowmax44i within the operating limits stipulated on the product label and the operating manual / data sheet. Use outside these conditions lead to overloads which cause permanent damage.

IMPORTANT!

3. Commissioning

Note:
While commissioning run the Basic Trim (FlowSoft Medium) with filled pipe. Repeat this action until amplifier stage and receiving amplitude reach a steady value.

NOTICE!

3.1 Operation

If Flowmax 44i is used as volume flowmeter for water or water-like liquids it will not require on-site calibration. Parameters for water are calibrated at the factory. Notwithstanding the Flowmax 44i may also be supplied with customized settings. The coordination must be done at time of purchase order.

If necessary, e.g. if viscosity and/or speed of sound deviate significantly from water, the pre-set parameters can be adjusted with the help of the hardware interface and the FlowSoft service software. This is always necessary when using Flowmax 44i as a dosing device according to section 3.2 Dosing function on page 19. This requires a display or the “USB to RS485-Converter Sonic”.

NOTICE!

The following parameters may be changed to settings suitable for the individual conditions: for 5-pin version

- Digital output Q1, function and behavior
- Analog output QA, function and behavior
- Flow range, for which shall apply 4...20 mA
- Pulse value
- Creeping suppression
- Optimization of measurement curve with up to 8 interpolation values (medium matrix)

The following parameters may be changed to settings suitable for the individual conditions: for 8-pin version

- Digital output Q1, function and behavior
- Digital output Q2, function and behavior
- Digital input I1, function and behavior
- Analog output QA, function and behavior
- Flow range, for which shall apply 4...20 mA
- Pulse value
- Creeping suppression
- Optimization of measurement curve with up to 8 interpolation values (medium matrix)

For others, see FlowSoft operating instructions

3.2 Functionalities of flowmeter and default settings

Display and user menu

Flowmax 44i is equipped with a display to visualize actual measurement values and change parameters of the flowmeter. Navigation and changes are done by the four keys on the keypad.

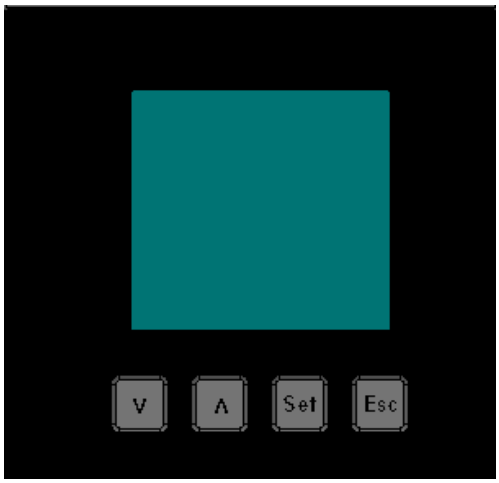


Fig. 9: Operating with the key pad

When the “Set” key is pressed the device switches into the Main Menu. Different menu options can be selected by using the two arrow keys.
To enter e.g. analog limits “Analog output – Upper limit” use the arrow keys to change values and press “Set” to confirm. To switch back to the last menu level press the “Esc” key. As soon as the operator tries to change values a password will be required. Password protection is used to ensure just authorized personal is able to change values or configurations. The default password for Flowmax 44i is **41414**. The password can be changed with FlowSoft. The user level will remain active for 5 minutes after the last press on any button.

Note:
Not all functions of Flowmax 44i can be changed in the user menu display. To configure more parameters FlowSoft and an “USBtoRS485-Converter Sonic” is needed.

NOTICE!

Note:
Functions marked with asterisk (*) are only available for the Flowmax 8-pin version. Flowmax 44i without user display supports the same functions as the display-version. To change configurations at Flowmax 44i without user display requires an “USBtoRS485-Converter Sonic” and “FlowSoft”.

NOTICE!

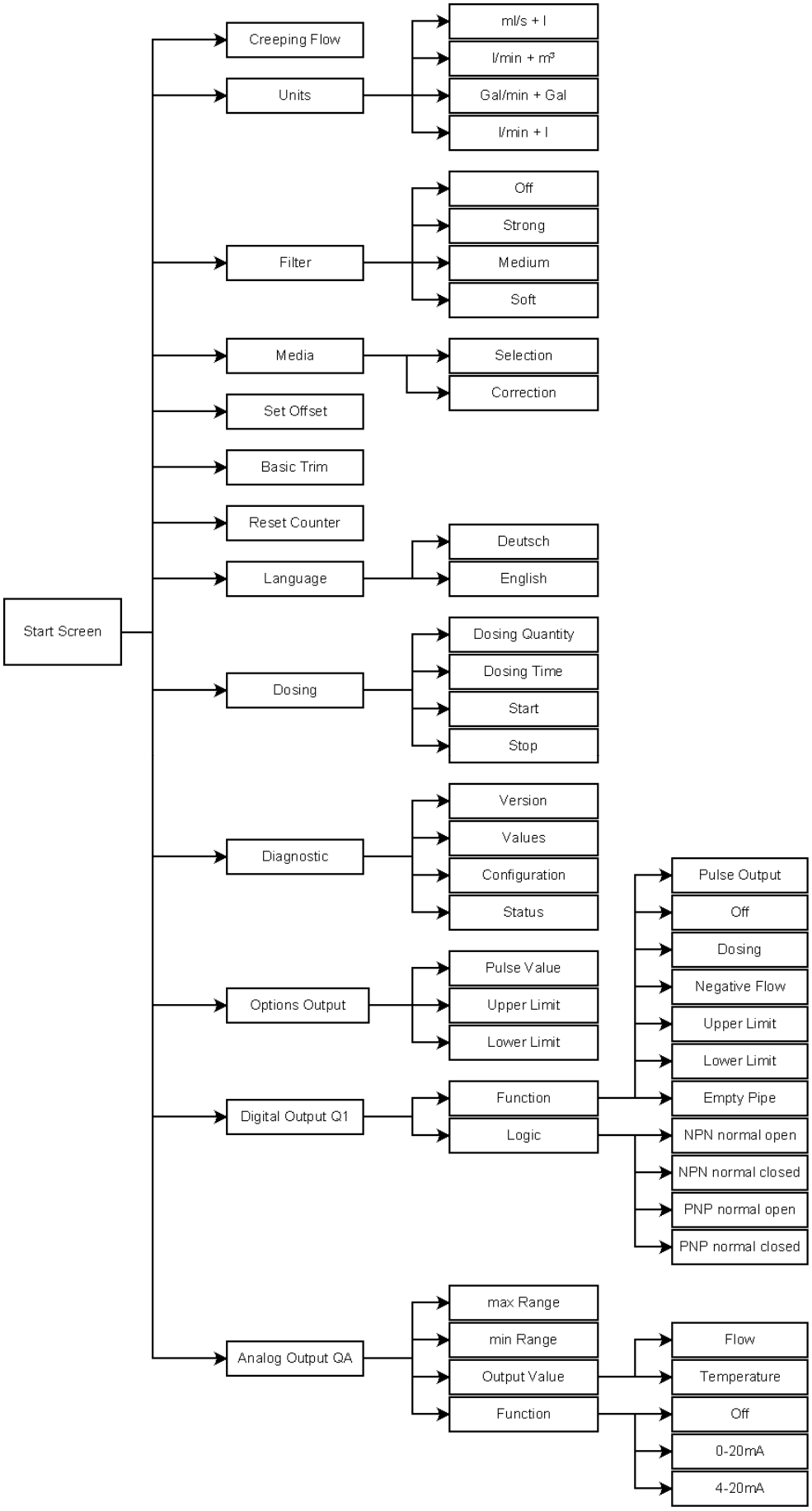


Fig. 10: Menu organization for 5-pin version

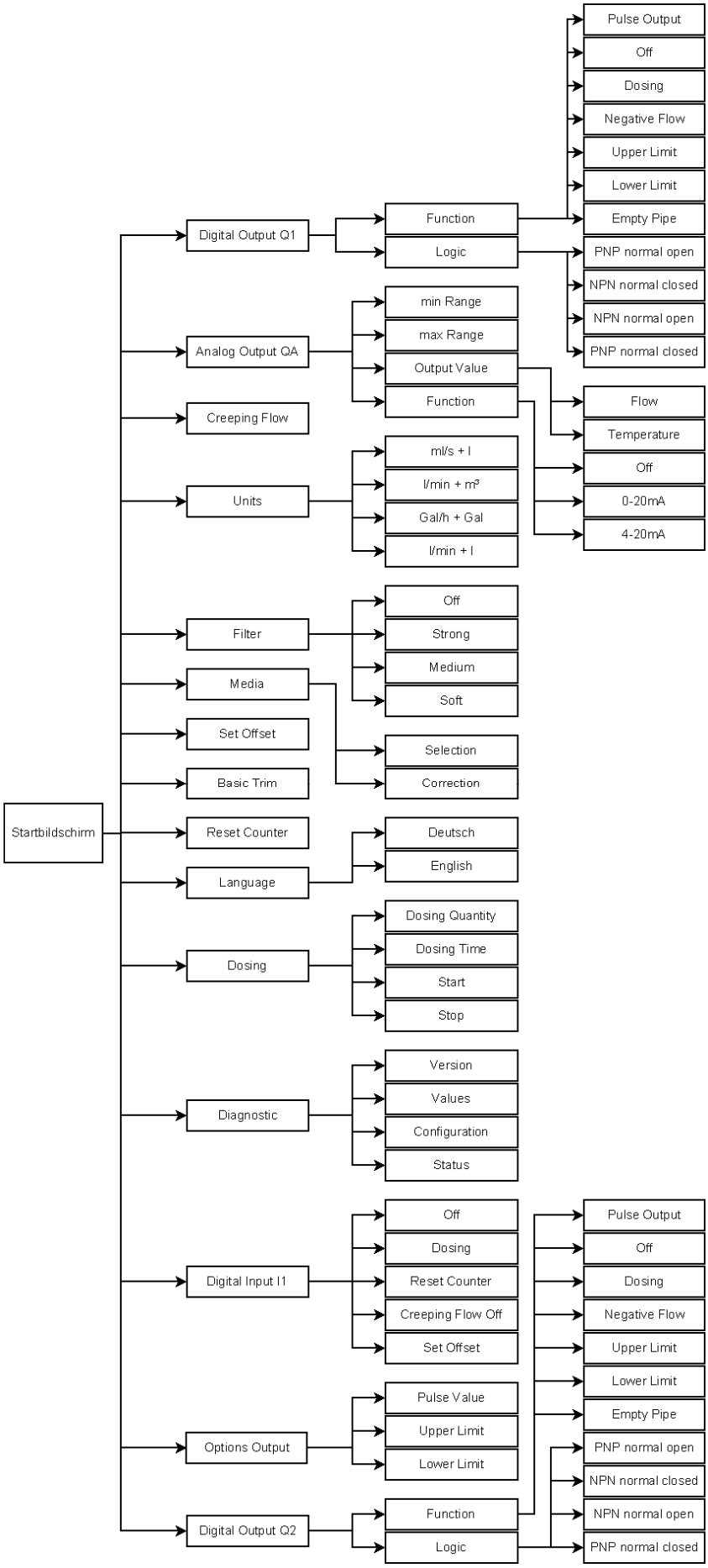


Fig. 11: Menu organization for 8-pin version

Set Offset

In the sub menu “Set Offset” it is possible to set the actual offset of the flowmeter. This function should just be used when Flowmax 44i is completely filled with liquid and there is no flow.

A small offset change e.g. caused by variable temperatures is automatically done by the flowmeter. It is also possible to set the offset via the configurable digital inputs.

Language

The language of the display can be changed. Available languages are English and German.

Filter

The function ”Filter“ averages the analog output signal. Possible settings: Soft, Medium, Strong, Off

The analog output signal reacts faster to signal changes when average determination is soft. Whereas the output signal reacts slower when average determination is strong.

Units

Flowmax 44i is able to show actual flow or the volume in different units. Following units can be selected:
ml/s + l , Gal/min +Gal , l/min + l , l/min + m^3.

The first letters correspond the unit of the flow value. The letters after the + correspond the unit of the volume value.

Reset Counter

The volume counter of Flowmax 44i can be reset. Note, accidentally erased counter values are permanently lost. After reset the counter works normally.

Basic Trim

NOTICE!

This function insures that the flowmeter is conforming to the media specific characteristics. By executing this function Flowmax 44i runs a self-diagnostic function which optimizes all important parameters. This process lasts approximately 1 minute.

To make sure the basic trim is correctly done the flowmeter has to be filled with liquid without a flow.

When there is an error detected while performing the basic trim function, the display shows “Error”. After successfully finishing the basic trim, the display shows “Done”.

Creeping suppression

The creeping suppression excludes flow measurements that result from convection in a narrow band around zero, even with a closed valve. At the factory, the creeping suppression is set at a standard value in relation to the cross-section of the flowmeter.

There are higher tolerances below the standard default settings, see also section 5.2, measurement errors!

The creeping suppression works with a hysteresis of - 25%.

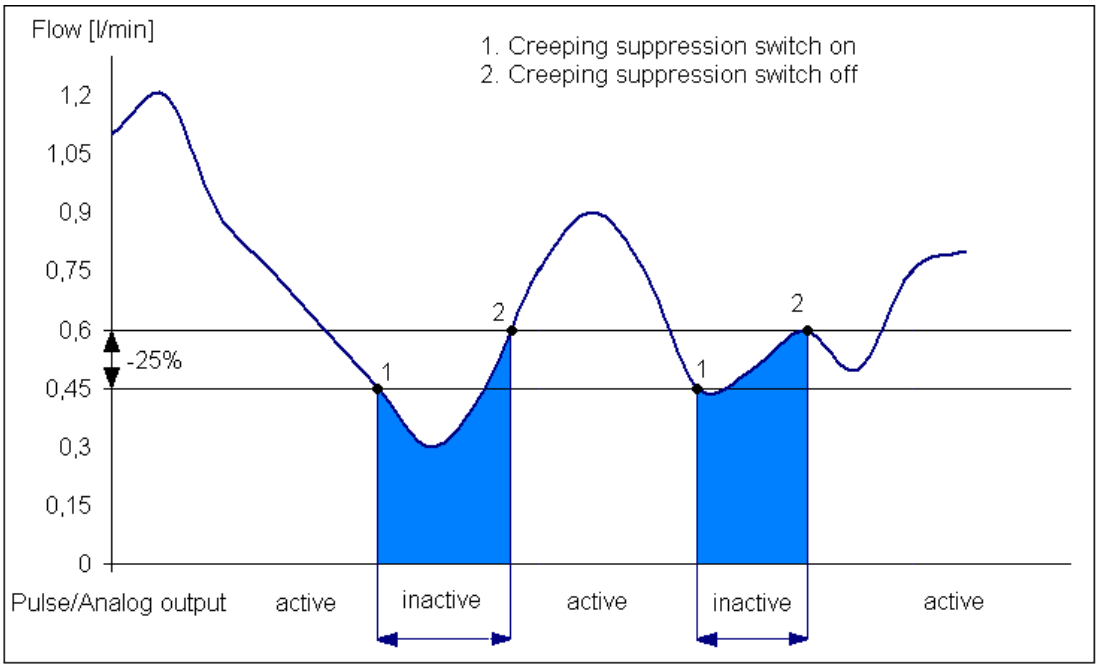


Fig. 12: Function of the creeping suppression illustrated with 0.6 l/min

Example: Creeping suppression = 0.6 l/min
If the flow rate is lower than 0.45 l/min the pulse output/analog output becomes inactive. If the flow rate exceeds 0.6 l/min a pulse is output again and added to the totalizer. Similarly, a value is transmitted to the analog output again.

Setting range: 0.0...20 l/min, in 0.006 l/min steps
Default settings: 0.3 l/min for DN10 / 3/8”
0.9 l/min for DN15 / 1/2"
3.5 l/min for DN20 / 3/4”
5.0 l/min for DN25 / 1”

Diagnostic

The sub menu “Diagnostic“ shows the software/hardware version and other helpful values for analysis. Knowing about the actual values or the instrument´s present status makes it easy to review the measurement by the manufacturer.

NOTICE!

Analog output

The analog output is available as current output 4-20mA or 0-20mA. This is selected with the purchase order. As a standard it comes with current output 4-20mA. It can also be switched off by using the device menu or FlowSoft operating software.

The current output ranges from 0 to 22.6mA measuring the flow rate or the condition of the flow measurement.

The values here signify for 4-20mA configuration:

- 20 mA the upper limit of the relevant measurement
- 4 mA the lower limit of the relevant measurement
- 3.5 mA empty pipe

Upper and lower limit parameters can be set within the type-specific measurement of the device. By default zero flow is set at 4 mA and the maximum flow is set at 20 mA. For detailed information see section 5.2 Technical specifications.

Set point ranges: 0-20mA, 4-20mA, off
Output value: Flow, Temperature

IMPORTANT!

When current output is used, the load must not be higher than 500Ohm. A higher load prevents the device from providing the maximum current of 22mA.

Pulse value

This section determines the output settings for pulsed outputs.

Choose configuration such as to neither exceed the maximum output frequency of the Flowmax 44i (10kHz) nor the maximum input frequency of the control.

Example: 2.0 ml/Pulse

This means: a pulse is emitted every 2.0 ml.
Setting range: 0.1...3000.0 ml/Pulse, in 0.1 ml/Pulse steps
Default setting: 1.0 ml/Pulse

Dosing

By choosing the dosing function via the user display in the manual mode dosing is configurable. The Volume “Dosing Batch“ and the “Dosing Time“ are freely adjustable. When the “Dosing Time“ is set to zero the timer control is inactive. A dosage can be started and stopped with the menu function keys “Start“ and “Stop“.

Setting range “Dosing Batch”: 0 – 3500 Liters
Setting range “Dosing Time” 0 –30000 Seconds
Default setting “Dosing Batch”: 0 Liters
Default setting “Dosing Time”: 3 Seconds

Digital output Q1

Digital output Q1 may be used as pulse output, empty pipe detection, for switching dosing valve or limit control. By using FlowSoft or the Display the user can switch between npn and pnp-transistor logic. In case of inductive load a diode has to be connected parallel to the coil. For detailed information see section 5.2 Technical specifications.

Flowmax 44i npn-out connected to a counter

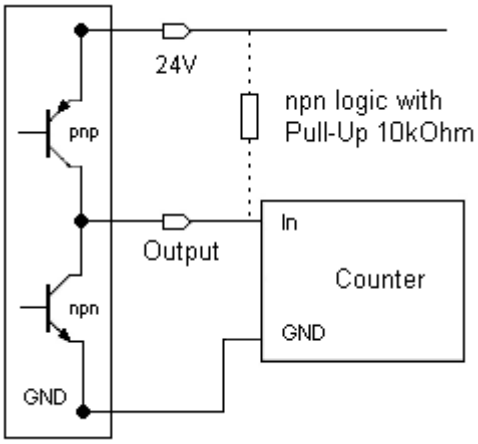


Fig. 13: Connecting output Q1 to external counter

Setting area: off, pulse output, empty pipe, dosing output, lower limit, upper limit, negative flow

Digital output Q2 *

Digital output Q2 may be used as pulse output, empty pipe detection, for switching dosing valve, limit control or flow direction control. See chapter 2.3 table connection plug 8-pins.

The npn or pnp logic can be selected. When the output is connected to an inductive load a diode has to be installed parallel to the load. For detailed information see section 5.2 Technical specifications.

Flowmax 44i pnp-out connected to a relay

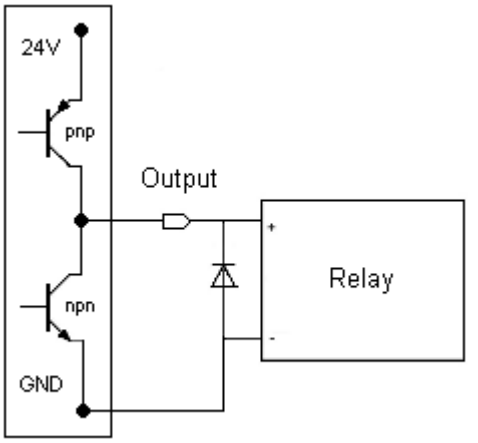


Fig. 14: Connecting output Q2 to relay

Setting area: off, pulse output, empty pipe, dosing output, lower limit, upper limit, negative flow

Dosing function

Dosing can be determined in different ways:

1. Flowmax 44i as dosing device (dosing control via Flowmax 44i)

Flowmax 44i controls the complete dosing function. The dosing quantity (e.g. 400 ml) is pre-set in the Flowmax 44i via the digital interface (RS485) with the operating software or by using the user menu of the display. Dosing starts, as soon as line digital input is wired to 24 V, e.g. via a pushbutton. Flowmax 44i will open the dosing valve via the output configured for it. When the pre-set dosing quantity is reached, the dosing valve is closed via the above output. The dosing procedure can also be started and stopped by using the dosing user menu. The second output can be used independently for signaling empty pipe, limit control or flow direction.

2. Flowmax 44i as dosing device (dosing control via FlowSoft)

Flowmax 44i controls the complete dosing function. The dosing quantity (e.g. 400 ml) is pre-set in the Flowmax 44i via the digital interface (RS485) with the operating software “FlowSoft”. Dosing starts via the dosing-menu in the operating software. Flowmax 44i will now open the dosing valve via the output configured for it. When the pre-set dosing quantity is reached, the dosing valve is closed via the above output.

3. Flowmax 44i as flowmeter (dosing control via dosing equipment)

The dosing equipment controls the entire dosing function. The dosing quantity is fixed in the dosing equipment control during commissioning by pre-selecting the meter pulses. Dosing starts, when the relevant pushbutton of the dosing equipment is pushed. The control will now open the dosing valve. From now on Flowmax 44i will send a voltage pulse to the control for each volume unit that has flown through (e.g. per 1ml). When the pre-selected pulse quantity is reached, the control closes the dosing valve. In this case, output 1 is used to send out pulses.

WARNING!

The customer has to provide an emergency stop and an overfilling stop to prevent hazardous situations. Both functions must perform safety shut down of pumps and closing of valves.

Media

Flowmax 44i dispose of a medium matrix with up to 8 interpolation values. Different media can be managed in the sub menu “Media”. By using the sub menu point “Correction” it is possible to correct the measures flow in percent.

Digital input I1 *

Flowmax 44i has a digital input that is programmable to following functions: dosing input, set offset, creeping suppression inactive and reset counter. In order to start a dosing process, 24V DC power is required. The status of the dosing parameters is modified with the user display or FlowSoft service software via the “USB to RS485 Converter Sonic”.

Dosing input is locked so that re-start is not possible during a running dosing process. After changing configurations via FlowSoft a restart of the device is needed to activate the function.

Not all of the following functions are adjustable via the user display. See chapter 3.2 Fig. 10 and Fig. 11: Menu organization.

3.3 Overview of default settings

Function	Default settings
Digital output Q1	Pulse output
Digital output Q2 *	Empty pipe output
Digital input I1 *	No function assigned
Current output QA	Flow as 4-20mA signal
Pulse value	1 ml/Pulse
Creeping suppression	0.3 l/min 0.9 l/min 3.5 l/min 5.0 l/min

3.4 General Information

Please check the following before powering the flowmeter for the first time:

IMPORTANT!

- Check the electrical connections and cable allocations.
- Check the installation position of the flowmeter. Are the direction of the arrow on the housing/name plate and the actual flow direction in the pipe congruent?
- Is the measurement pipe completely filled with fluid?
- Check the back pressure in the system.

When everything has been checked, switch on power. After 15 minutes with power running the measuring device reaches the maximum accuracy.

Now, Flowmax 44i is operational!

4. Exchange of measuring device

- **Switch off power before disconnecting the electrical connections!**

- Please note that after replacing the flowmeter

a) the programming of the previous flowmeter should be saved and copied on the new flowmeter
b) when using the dosing function, set a quantity

If the device requires a configuration change, the FlowSoft programming software and a “USBtoRS485-Converter Sonic” as well as a PC are required (see section 6. Accessories).

Repair, hazardous substances

Before sending the flowmeter Flowmax 44i to MIB for repair, the following precautions must be taken:

- **Clean all process chemicals from the device. Fully rinse the flow path. Please pay close attention to the process fittings. All media must be removed before returning. This is particularly important, if the medium to be measured is health hazardous.**

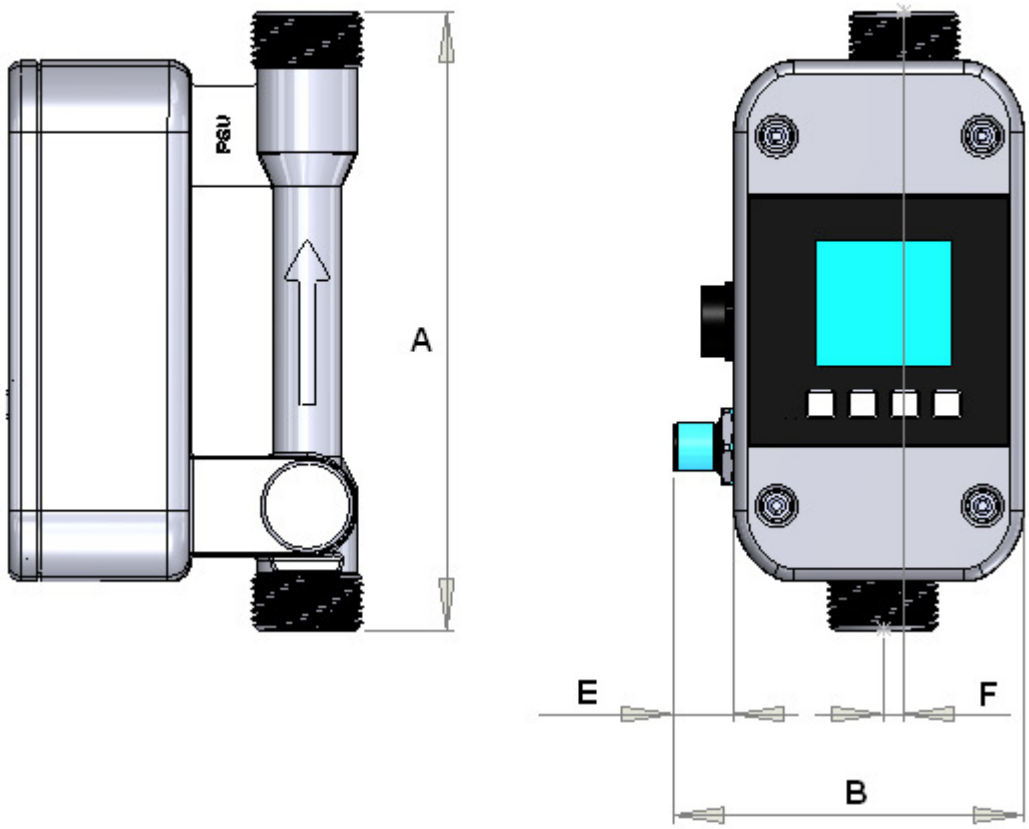
Devices judged by MIB to be insufficiently cleand will be returned to sender. No inspection of device will be done until proper cleaning is completed by user.

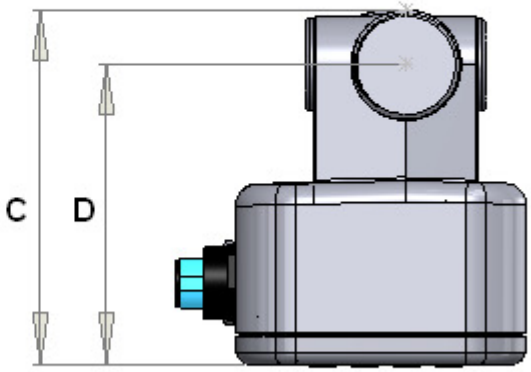
- **With the flowmeter send a detailed report describing the failure, the application and the physical-chemical properties of the medium parameters. (e.g. a decontamination declaration).**

In order to be able to process your repair order quickly and smoothly it is important that you provide a technical contact person including phone and fax number as well as e-mail address.

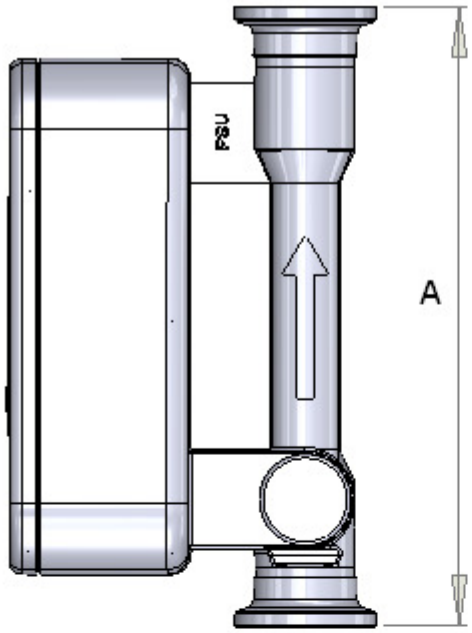
5. Technical specifications

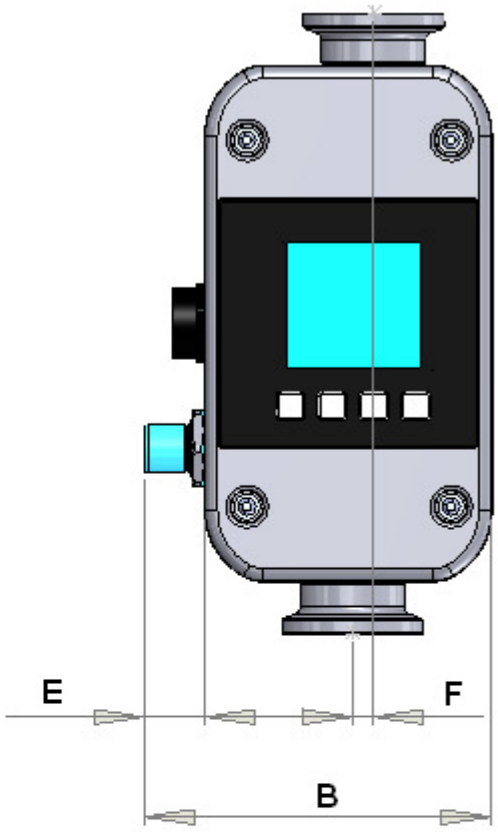
5.1 Dimensions and weight

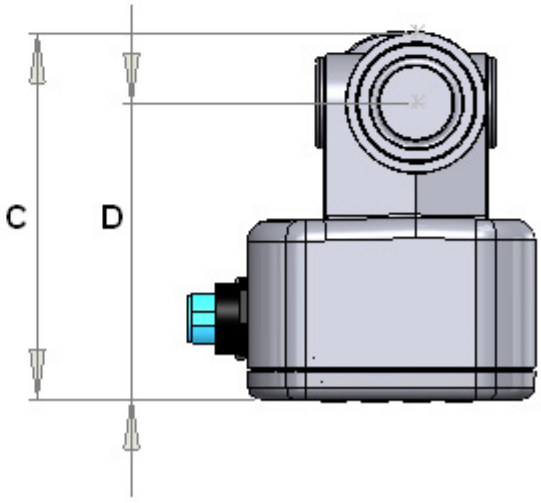




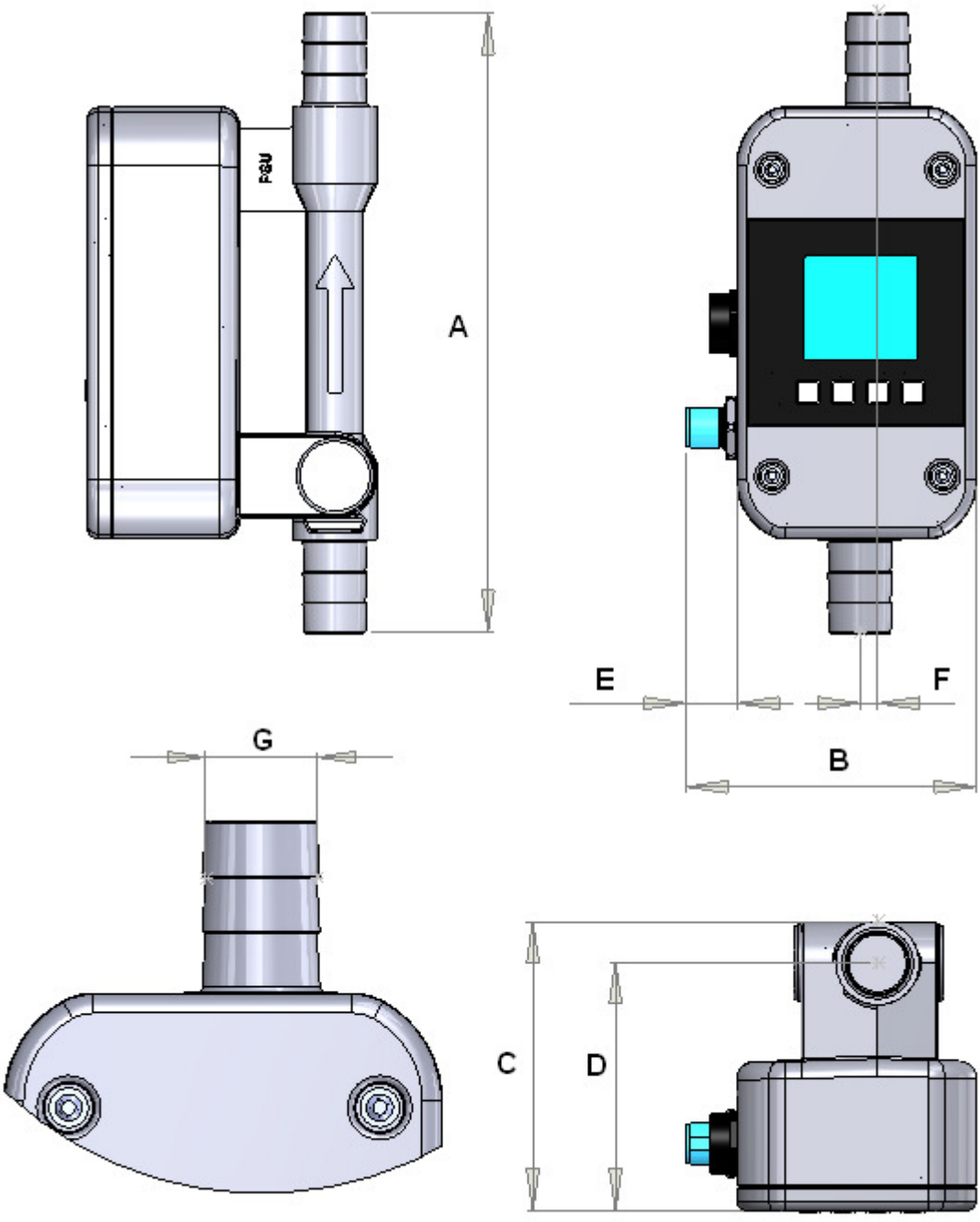
Nominal diameter	Connection	Lengths A [mm]	Widths B [mm]	Height C [mm]	Height axis D [mm]	Plug E [mm]	Parting line F [mm]	Weight [g]
DN10 ⅜“	½ G,NPT	147,0	84,0	83,0	70,5	15,0	5,0	332
DN15 ½“	¾ G,NPT	147,0	84,0	84,5	71,1	15,0	5,0	344
DN20 ¾“	1 G,NPT	160,0	84,0	94,2	77,6	15,0	5,0	414
DN25 1“	1 ¼ G,NPT	168,0	84,0	98,5	77,6	15,0	5,0	454







Nominal diameter	Connection	Lengths A [mm]	Widths B [mm]	Height C [mm]	Height axis D [mm]	Plug E [mm]	Parting line F [mm]	Weight [g]
DN10 ⅜"	11864-Clamp	147,0	84,0	83,0	70,5	15,0	5,0	339
DN15 ½"	11864-Clamp	147,0	84,0	84,5	71,1	15,0	5,0	347
DN20 ¾"	11864-Clamp	160,0	84,0	94,2	77,6	15,0	5,0	429
DN25 1"	11864-Clamp	168,0	84,0	98,5	77,6	15,0	5,0	469



Zoom on nozzle

Nominal diameter	Connection	Lengths A [mm]	Widths B [mm]	Height C [mm]	Axis height D [mm]	Plug E [mm]	Parting line F [mm]	Nozzle G [mm]	Weight [g]
DN10 ⅜"	Tube	160,0	84,0	83,0	70,5	15,0	5,0	12,0	332
DN15 ½"	Tube	178,0	84,0	84,5	71,1	15,0	5,0	18,0	344
DN20 ¾"	Tube	197,0	84,0	94,2	77,6	15,0	5,0	24,0	414

5.2 Technical specifications

Housing

Nominal diameters	DN10 - 3/8”, DN15 - 1/2", DN20- 3/4”, DN25- 1”
Connection	inch thread G, inch threat NPT, clamp connection DIN1864-3, tube nozzle
Medium temperature	0...+80°C
Protection class	IP 67
Pressure nominal	16 Bar / 232Psi for DN10 – 3/8” and DN15 1/2" 10 Bar / 145Psi for DN20 – 3/4" and DN25 – 1”
Material	all parts in contact with medium made of PSU (Polysulfone) Electronics housing made of PSU (Polysulfone)

Electronics

Power supply	18...30V DC
Power input	at 24V DC = 3.6W
Connection	Plug 5 pins, option plug 8 pins
Ambient temperature	0....+60°C
Storage temperature	0....+70°C
Current output	0/4...20 mA Lower- and upper limit adjustable, Ground connected to supply ground Error Signal according to NAMUR NE43
Digital output O1 /2	via transistor npn- and pnp-logic max. 30V/100mA output voltage according to DIN 19240: ≤5V means LOW ≥12V means HIGH Short cut resistant Frequency 0....10kHz
Data interface	Data interface for parameterize
Measuring deviation	± 1% of reading ± 3mm/s (± 6mm/s for DN10 – 3/8”) Reference conditions (VDE/VDI 2642)
Measuring range	0.3 – 21 l/min for DN10 – 3/8” 0.9 – 36 l/min for DN15 – 1/2" 3.5 – 60 l/min for DN20 – 3/4" 5.0 – 240 l/min for DN25 – 1”
Repeatability	0.5%

The measuring system Flowmax 44i complies with the EMC requirements EN 50081 parts 1/2 as well as EN 50082 parts 1/2. It is in conformity with the requirements of the EC directives and has the CE label.

Digital output

General

All outputs switch over to high resistance when the supply is smaller than 18V. When overload or short circuit is detected the digital outputs are switched off after 100µs for a period of 2s. When time is up the outputs get applied again.

Empty pipe output

	Empty pipe	Device filled
NPN opener	High resistatnt	0V
NPN shutter	0V	High resistatnt
PNP opener	High resistatnt	24V
PNP shutter	24V	High resistatnt

Pulse output

	Empty pipe	Filled, no flow	Filled, flow
NPN opener	0V	0V	0V Pulse
NPN shutter	0V	0V	0V Pulse
PNP opener	Hish resistant	Hish resistant	24V Pulse
PNP shutter	Hish resistant	Hish resistant	24V Pulse

Lower limit output

	Below lower limit	Between the limits	Above upper limit
NPN opener	High resistant	High resistant	0V
NPN shutter	0V	0V	High resistant
PNP opener	High resistant	High resistant	24V
PNP shutter	24V	24V	High resistant

Higher limit output

	Below lower limit	Between the limits	Above upper limit
NPN opener	0V	High resistant	High resistant
NPN shutter	Hochohmig	0V	0V
PNP opener	24V	High resistant	High resistant
PNP shutter	High resistant	24V	24V

Dosing output

	Startup of device	While dosing	Before/after dosing
NPN opener	High resistant	High resistant	0V
NPN shutter	High resistant	0V	High resistant
PNP opener	High resistant	High resistant	24V
PNP shutter	High resistant	24V	High resistant

When using the dosing function the output should not be configured as opener!

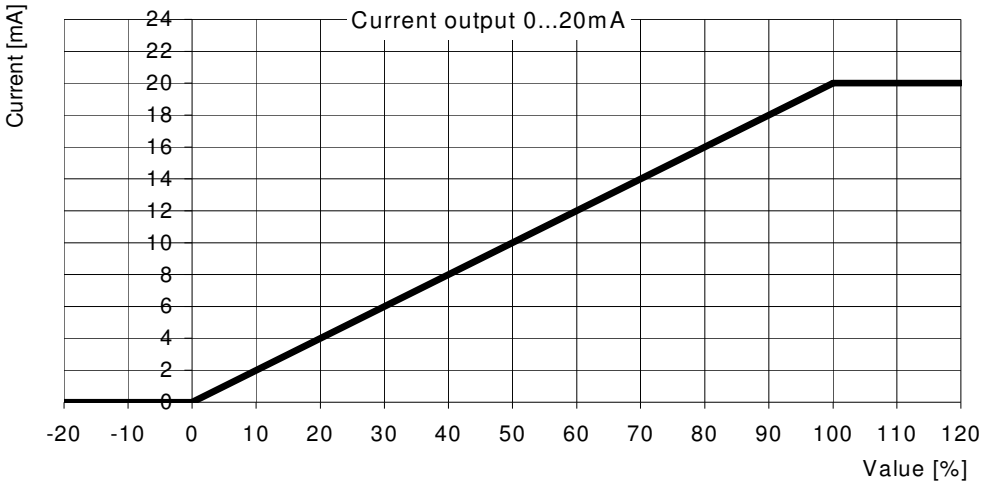
NOTICE!

After restart and till the end of a dosing process the valve would be open.

Characteristic curve analog output

0 - 20mA

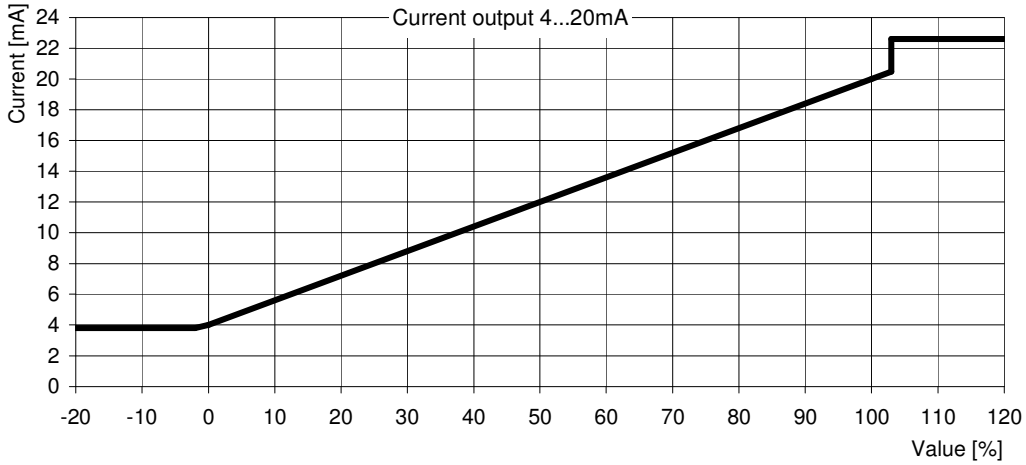
For the following graphic "min Range" is used for 0% and "max Range" is used for 100%.



Value	Current [mA]
Smaller 0%	0
0% (min Range)	0
Between 0% und 100%	Linear interpolation from 0 to 20 mA
100% (max Range)	20
Bigger 100%	20

4 - 20mA

For the following graphic "min Range" is used for 0% and "max Range" is used for 100%.



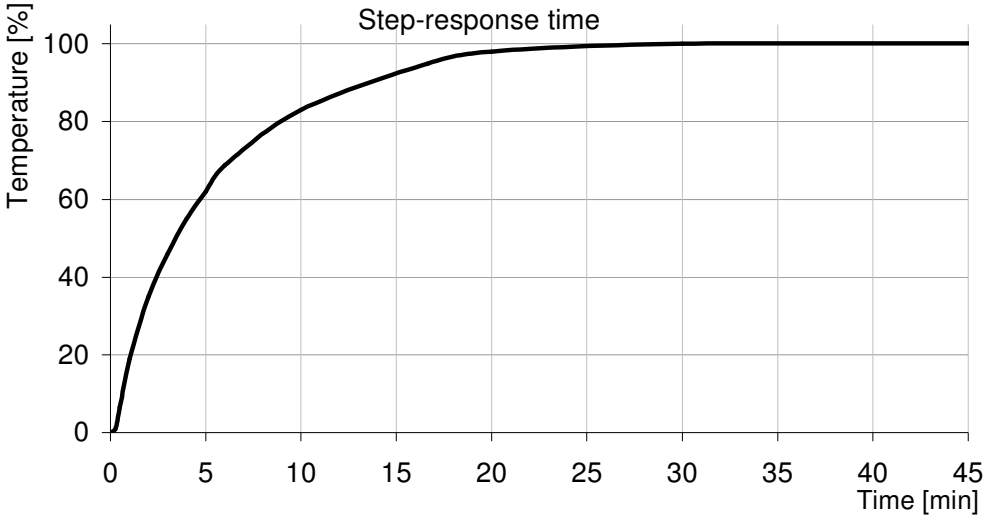
Value	Current [mA]
Empty pipe	3.5
Smaller -1.2%	3.8
Between	Linear interpolation from 3.8 to 4mA
0% (min Range)	4
Between 0% und 100%	Linear interpolation from 4 to 20mA
100% (max Range)	20
Between 100% und 103%	Linear interpolation from 20 to 20.5mA
Bigger 103%	22.6

Behavior of the thermocouple

The integrated thermocouple has no direct contact to the liquid and is used to calculate the expansion of the housing. The environment temperature greatly influences the actual temperature of the thermocouple. The response time of temperature changes relates to the mounting position of the thermocouple inside the housing.

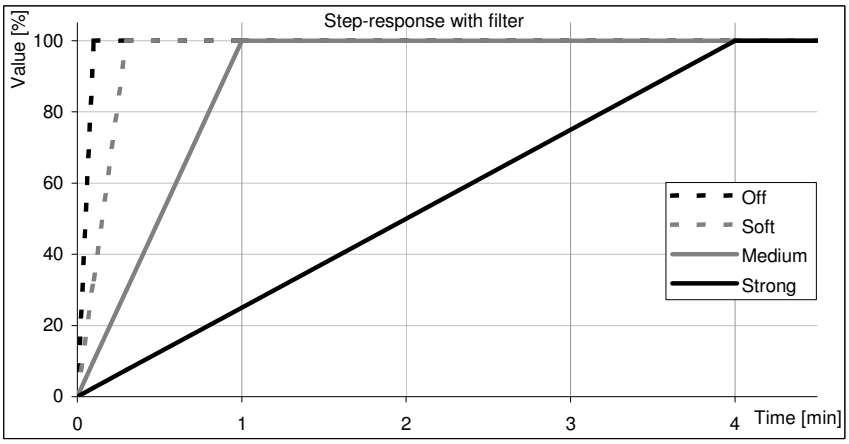
Step-response time

Step-response time after a significant temperature change. (Filter „Off“)



Filter configurations for thermocouple

Filter	100%
Off	1s
Soft	16s
Medium	1min
Strong	4min



Influence of the environment temperature

In the table below some examples of the temperature influence are shown.

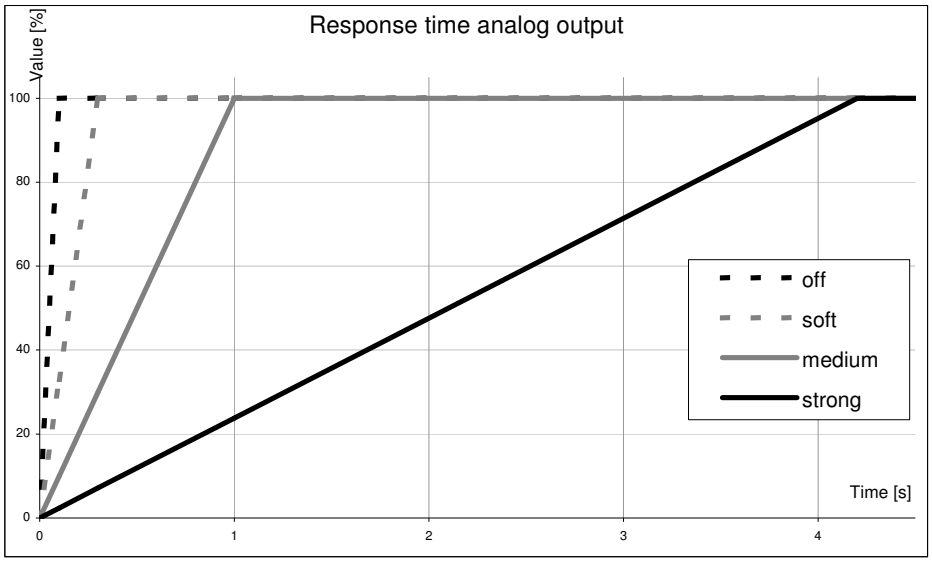
Liquid temp.	x	0.7	+	Envrionment temp.	x	0.3	=	Measured temp.
°C				°C				°C
40	x	0.7	+	20	x	0.3	=	34
40	x	0.7	+	30	x	0.3	=	37
40	x	0.7	+	40	x	0.3	=	40
60	x	0.7	+	20	x	0.3	=	48

In case of an error

In case of a short circuit of the thermocouple –50°C are shown.

In case of a cable brake between thermocouple and electronic –30°C are shown.

Filter options for analog output



Filter	100%
off	16ms
soft	0.3s
medium	1s
strong	4.2s

Digital input

When input setting is changed a device restart is required. After restart the changes are activated.

Available input functions:

	Set offset	**Creeping flow off**	**Dosing**	**Reset counter**	**off**
0V	-	-	-	-	-
24V	Rising edge: 0->24V Set offset	State: Switch creeping flow off	Positive Flanke: 0->24V Dosierungstart	State: 0->24V Counter is reset	-

only use when there is cirrently no flow

The input functions “Set Offset“ shall only be used when there is no flow through the meter. If an offset trim is done while liquid flows a measuring deviation will occur until the trim is done correctly.

Possible error text Flowmax 44i*

Display text	Description	Behavior
Empty Pipe	When “Empty Pipe” is detected no flow measurement.	Display flashing + text
Low Voltage	When supply voltage is less than 18V the outputs are inactive.	Display flashing + text
Short Circuit	When over load of the digital outputs is detected (>100mA), outputs are inactive.	Only text
Lower Limit	When the flow is less than an adjustable limit and the output is configured for limit control.	Only text
Upper Limit	When the flow is more than an adjustable limit and the output is configured for limit control.	Only text
Sonic Speed	Actual sonic speed out of specified value. Run basic trim!	Only text

6. Accessories

Flowview 100i
Evaluation and management unit for up to 10 ultrasonic volume flowmeter Flowmax 44i. Flowview 100i is based on a compact SPS-control with integrated touch screen.
Ordercode 908765

Flowmax connection socket
To supply and connect Flowmax 44i to an external control unit.
Ordercode 507321 (Socket 5 pins)
Ordercode 800845 (Socket 8 pins)

USB-to-RS485-Converter Sonic
Interface converter from USB to RS485 with spring terminal connection for quick-connection of Flowmax 44i and **FlowSoft** / **part 1**, PC software for configuration of ultrasonic volume flowmeter Flowmax 44i
Ordercode 908726

7. Shipment

Basically the device Flowmax 44i is delivered without additional material like connection socket or cable. We recommend ordering a connection socket (Ordercode 507321) to supply the measuring device.

8. Order code

The available functions of a Flowmax 44i device are defined by the ordered version. The order code provides important information about: connections, functions, pipe diameter, material and user display. The combination of the described information is defined by the following part number.

Diameter / Measuring range

FM44i D10 -	10 mm / Measuring range 0.3 - 21 l/min
FM44i D15 -	15 mm / Measuring range 0.9 - 36 l/min
FM44i D20 -	20 mm / Measuring range 3.5 - 60 l/min
FM44i D25 -	25 mm / Measuring range 5 - 240 l/min

Hydraulic connection

A	Inch thread (incl. 2 Pcs. EPDM-sealing)
B	Aseptic Clamp BKS 11864 A
C	Tri-Clamp (only DN 15)
D	Tube nozzle (not DN 25)
E	NPT thread
9	other

Housing material

A	PSU, black (standard)
9	other

Outputs

A	Pulse output, RS 485 interface; 5-pin plug
B	Pulse output, alarm output, communication interface; 5-pin plug
C	0/4-20 mA current output, pulse output, communication interface; 5-pin plug
D	0/4-20 mA current output, pulse output, alarm output, digital input, communication interface; 8-pin plug
9	other

Display

B	without display (blind cover)
D	incl. Display
9	other

Calibration

1	Standard 3-points
3	Special calibration Low Flow
9	other

Approval

A	Version without ATEX approval
9	other

FM44i -							= Order code

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