BAMOFLONIC

Ultrasonic flow metering / dosing device

INSTRUCTIONS MANUAL

General safety instructions

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

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

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

NOTICE —> Used to lead users to helpful information not related to personal injury.

Intended use

· The flowmeter BAMOFLONIC may only be used for measuring the flow of pure, homogeneous liquids.

· The volume flowmeter BAMOFLONIC 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

· **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.**

WARNING

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1. Planning information

1.1 Areas of application

The flow measurement device BAMOFLONIC 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.

$$\varphi_- = \frac{wL}{c-v}$$

$$\varphi_+ = \frac{wL}{c+v}$$
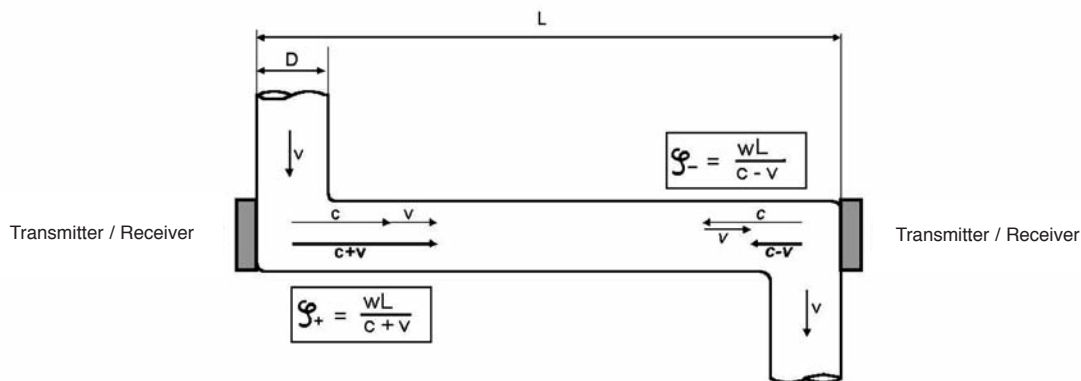
$$v \approx K * (\varphi_- - \varphi_+)$$

L: Length of measuring pipe
K: Factor
D: Diameter of measuring pipe
v: Flow velocity
c: Sound velocity of the fluid
φ_+ : Phase with the flow
φ_- : Phase against the flow

Fig. 1: Principle of ultrasonic flow measuring

1.3 Operational safety

Comprehensive self-tests ensure highest possible safety. The protection class is IP 67.

BAMOFLONIC meets the general EMC immunity requirements according to CE, EN 50081-2, and EN 50082-2.
When referring to low voltage BAMOFLONIC meets the safety requirements according to EN 60601-1.

# 2. Assembly and installation

2.1 Installation instructions

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

<div style="color:white;background:blue">NOTICE</div>

For fastest possible bubble detection it is important to keep the pipe distance from tank to BAMOFLONIC 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 BAMOFLONIC 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.

TOP –> Outlet
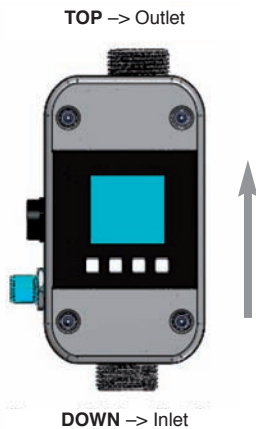
Insure that no cavitations dissolve from the measured liquid. Depending on the measured liquid it can be helpful to have enough back pressure on the outlet of BAMOFLONIC to avoid cavitations. Insure all mechanical connections are tight.

Absolutely avoid usage of Teflon tape for sealing!

NOTICE

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

DOWN –> Inlet

Fig. 2: Installation position of BAMOFLONIC

When using pumps, BAMOFLONIC must be installed in flow direction on the pressure side.
Note the maximum pressure specification of the BAMOFLONIC. For correct volume flow measurements straight and unobstructed **inflow and outflow distances have to be observed.**

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IMPORTANT

Starting from the connection thread these have to be at least:

Nominal diameter	DN10	DN15	DN20	DN25
Inflow distance	10cm	30cm	40cm	40cm
Outflow distance	0cm	5cm	10cm	20cm

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	DN15	DN20	DN25
Torque:	2 Nm	3 Nm	4 Nm	6 Nm

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

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IMPORTANT

2.2 Assembly of the flowmeter

The flowmeter is mounted into a pipe system by using the mechanical connection. **For best measuring performance the BAMOFLONIC 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, the BAMOFLONIC should be installed on the pressure side of the pump.
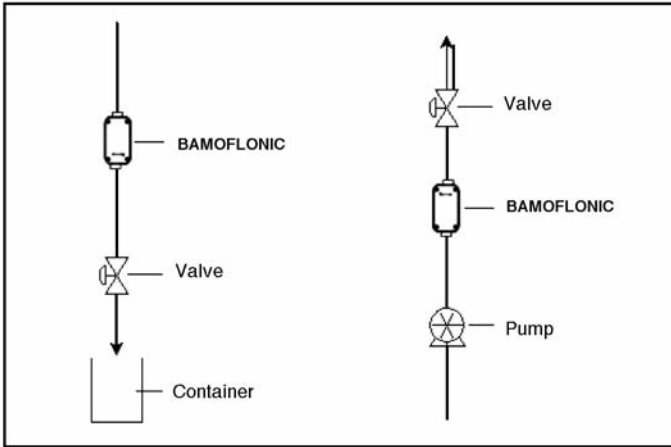
Fig. 3: Mounting examples of BAMOFLONIC

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 BAMOFLONIC.
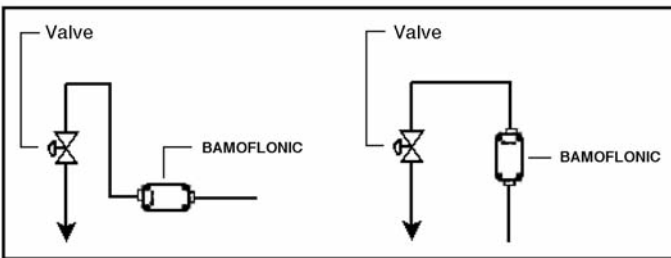

Fig. 4: Mounting possibilities of BAMOFLONIC

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 BAMOFLONIC.
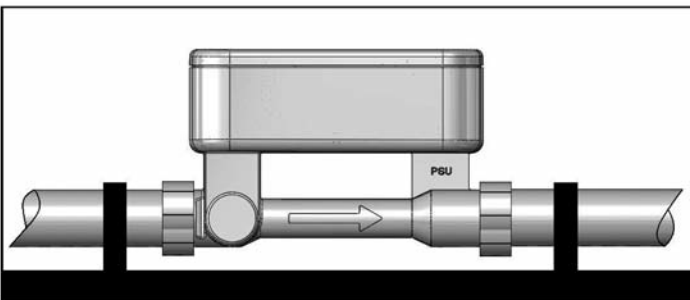

Fig. 5: Mounting of the BAMOFLONIC

The BAMOFLONIC 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 § 5.1).*

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IMPORTANT

Applications with hot liquids > 60°C:

When BAMOFLONIC 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 BAMOFLONIC is mounted vertically, heat damage is not an issue.

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IMPORTANT

Fig. 6: Mounting with hot liquids > 60° C

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: 5-Pin connection plug   /   Socket for 5-pin

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 V DC
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 Alarm => 3.5mA (4-20mA, depending on the configured limits)

**Only operate the flowmeter BAMOFLONIC 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.**

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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.

3.1 Operation

If the BAMOFLONIC 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 BAMOFLONIC 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 preset parameters can be adjusted with the help of the hardware interface and the FlowSoft service software.
This is always necessary when using BAMOFLONIC as a dosing device according to section Dosing function.
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:

- 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)

3.2 Functionalities and default settings

Display and user menu:

The BAMOFLONIC 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.
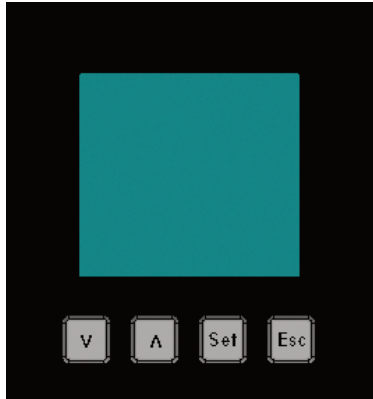

Fig. 8: Operating with the key pad

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 the BAMOFLONIC 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 BAMOFLONIC 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 not available. BAMOFLONIC without user display supports the same functions as the display version.
To change configurations at BAMOFLONIC without user display requires an *"USBtoRS485-Converter Sonic"* and *"FlowSoft"*.
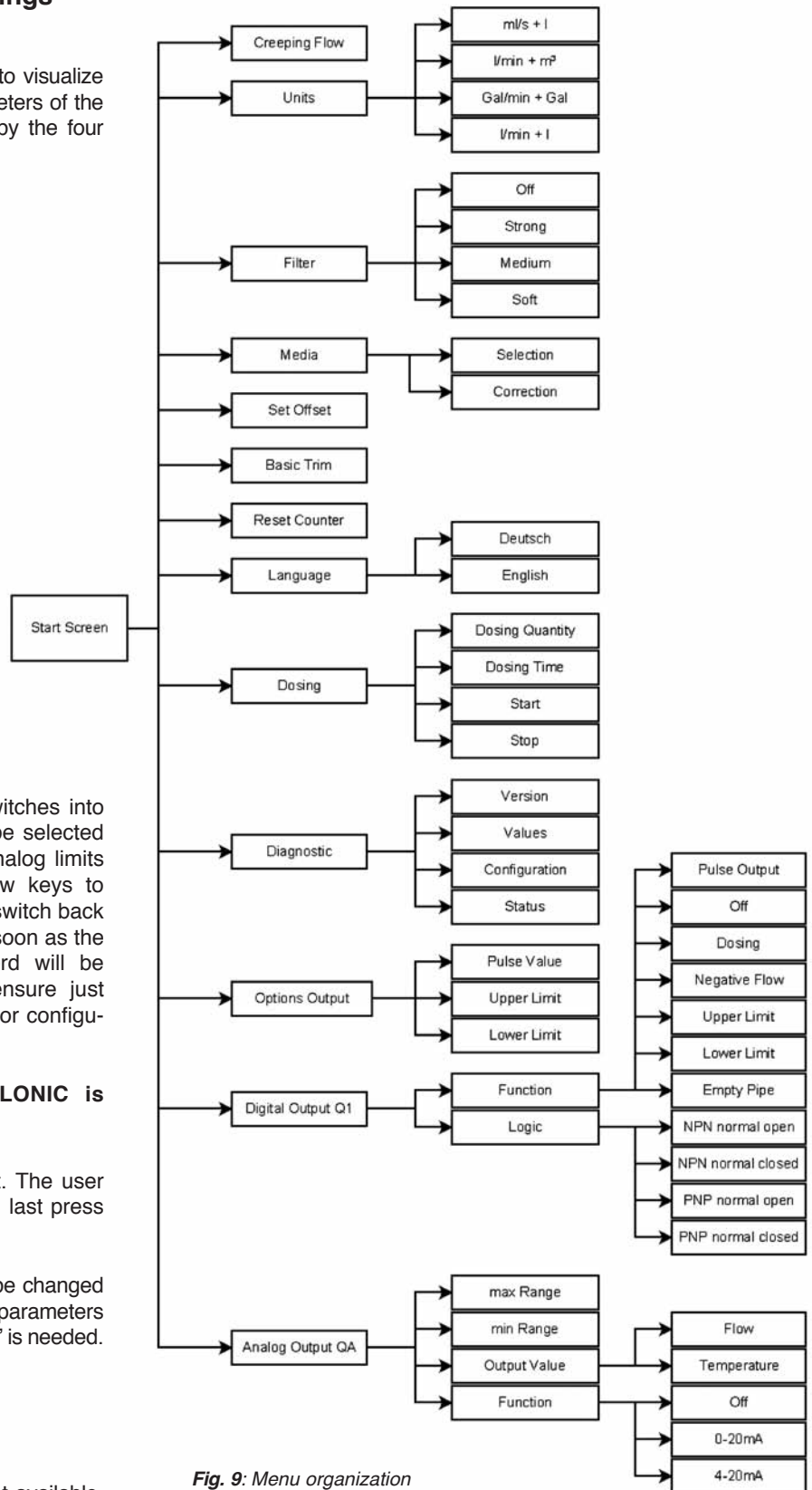
> **NOTICE**

Fig. 9: Menu organization

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 the BAMOFLONIC 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 flow

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

The BAMOFLONIC 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 + m³.
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 BAMOFLONIC can be reset.
Note, accidentally erased counter values are permanently lost. After reset the counter works normally.

Basic Trim

This function insures that the flowmeter is conforming to the media specific characteristics. By executing this function the BAMOFLONIC 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.

Fig. 10: Function of the creeping suppression (illustrated with 0.6 l/min)
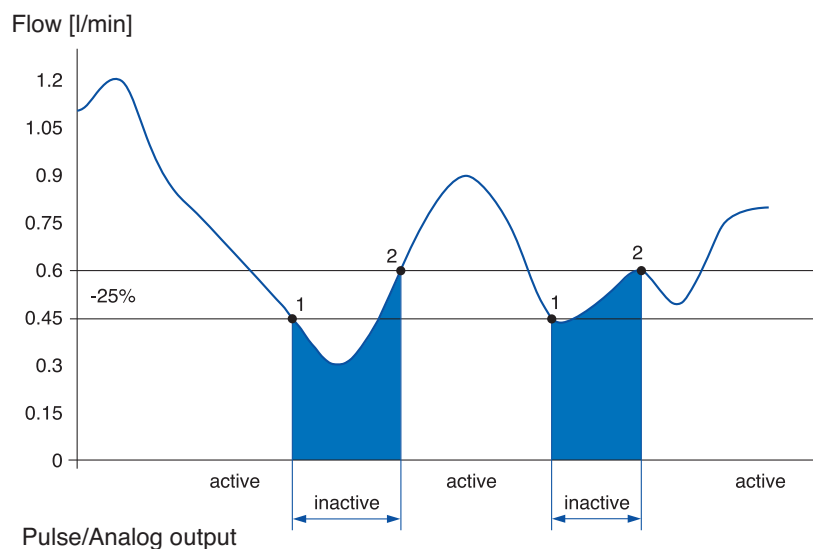
The creeping suppression works with a hysteresis of - 25%.

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.

Plages disponibles:

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. 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:

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

For detailed information see **§ 5.2**.

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 the BAMOFLONIC (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 **§ 5.2**.
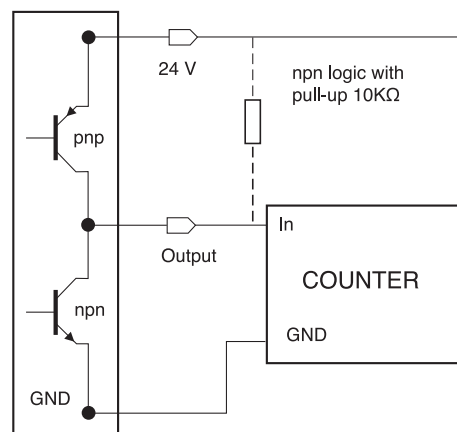
npn-out connected to a counter

Fig. 11 *: Connecting output Q1 to external counter*

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

Dosing function

Dosing can be determined in different ways:

a) BAMOFLONIC as dosing device (dosing control via BAMOFLONIC)

BAMOFLONIC controls the complete dosing function. The dosing quantity (e.g. 400 ml) is pre-set in the BAMOFLONIC 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. BAMOFLONIC 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.

b) BAMOFLONIC as dosing device (dosing control via FlowSoft)

BAMOFLONIC controls the complete dosing function. The dosing quantity (e.g. 400 ml) is pre-set in the BAMOFLONIC via the digital interface (RS485) with the operating software "FlowSoft". Dosing starts via the dosing-menu in the operating software. BAMOFLONIC 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.

c) BAMOFLONIC 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 BAMOFLONIC 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.

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.

⚠️ **WARNING**

Media

BAMOFLONIC 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.

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:

· 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.

i **IMPORTANT**

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

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

⚠️ **WARNING**

Repair, hazardous substances

<u>Before sending the BAMOFLONIC for repair, the following precautions must be taken:</u>

· **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.

⚠️ **WARNING**

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

· **Attach a detailed report describing the failure, the application and the physical-chemical properties**
  of the medium parameters,
  and the decontamination certificate (see last page).

5. Technical specifications

5.1 Dimensions and weight
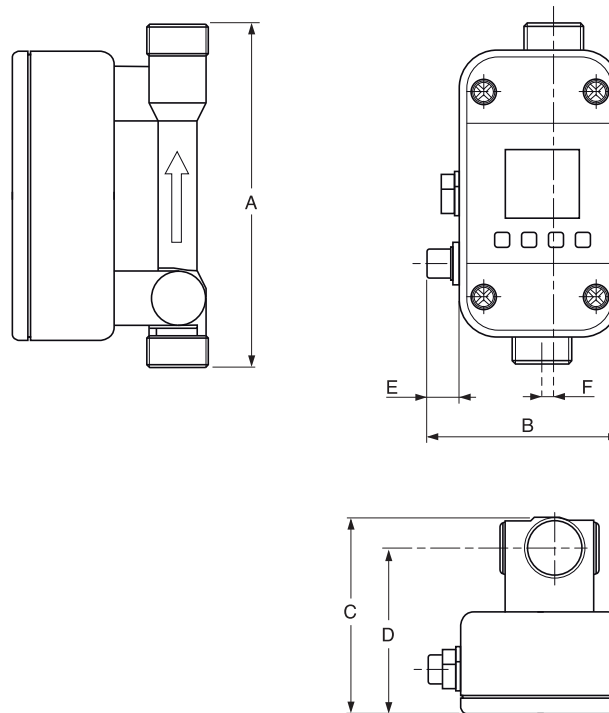
DN	Connection	A /mm	B /mm	C /mm	D /mm	E /mm	F /mm	Weight /g
DN10	½ G or NPT	147.0	84.0	83.0	70.5	15.0	5.0	332
DN15	¾ G or NPT	147.0	84.0	84.5	71.1	15.0	5.0	344
DN20	1 G or NPT	160.0	84.0	94.2	77.6	15.0	5.0	414
DN25	1 ¼ G or NPT	168.0	84.0	98.5	77.6	15.0	5.0	454
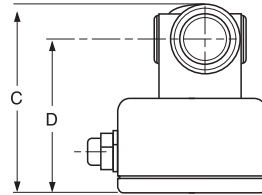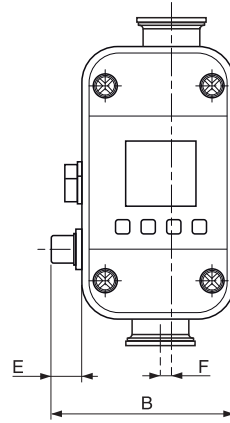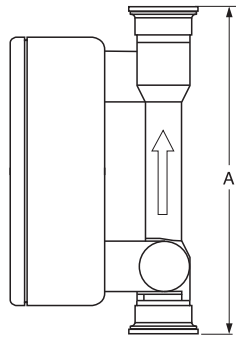
DN	Connection	A /mm	B /mm	C /mm	D /mm	E /mm	F /mm	Weight /g
DN10 ⅜"	DIN 11864-3	147.0	84.0	83.0	70.5	15.0	5.0	339
DN15 ½"	DIN 11864-3	147.0	84.0	84.5	71.1	15.0	5.0	347
DN20 ¾"	DIN 11864-3	160.0	84.0	94.2	77.6	15.0	5.0	429
DN25 1"	DIN 11864-3	168.0	84.0	98.5	77.6	15.0	5.0	469
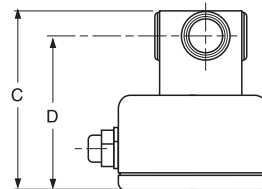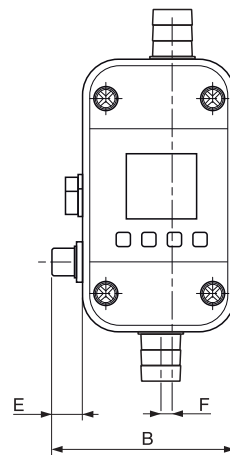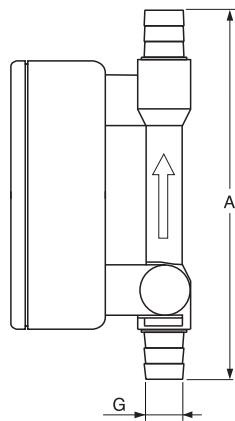
DN	Connection	A /mm	B /mm	C /mm	D /mm	E /mm	F /mm	G	Weight /g
DN10 ⅜"	Tube	160.0	84.0	83.0	70.5	15.0	5.0	12.0	332
DN15 ½"	Tube	178.0	84.0	84.5	71.1	15.0	5.0	18.0	344
DN20 ¾"	Tube	197.0	84.0	94.2	77.6	15.0	5.0	24.0	414

5.2 Specifications

Nominal diameters:	DN10 - 3/8", DN15 - 1/2", DN20- 3/4", DN25 - 1"
Connections:	BSP or NPT thread, Clamp connection DIN 11864-3, Tube nozzle
Medium temperature:	0...+80 °C
Protection class:	IP 67
Nominal pressure:	16 bar / 232 Psi for DN10 – 3/8" and DN15 – 1/2"
	10 bar / 145 Psi for DN20 – 3/4" and DN25 – 1"
Material:	All parts in contact with medium made of PSU (Polysulfone), Electronics housing made of PSU (Polysulfone)
Power supply:	18...30V DC
Power input:	at 24V DC = 3.6W
Connection:	M12, Plug 5 pins
Display:	Alphanumeric back lighted
Temperature:	Ambient –> 0...+60°C / Storage –> 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:	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
Accuracy:	Standard: ±2% of reading and ±3 mm/s
	OPTION: ±1% of reading and ±3 mm/s, ±6 mm /s for DN10 – 3/8" (according to VDI / VDE 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 BAMOFLONIC 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

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 resistant	0 V
NPN shutter	0 V	High resistant
PNP opener	High resistant	24 V
PNP shutter	24 V	High resistant

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

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

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

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

When using the dosing function the output should not be configured as opener.
After restart and till the end of a dosing process the valve would be open.

NOTICE

Characteristic curve analog output

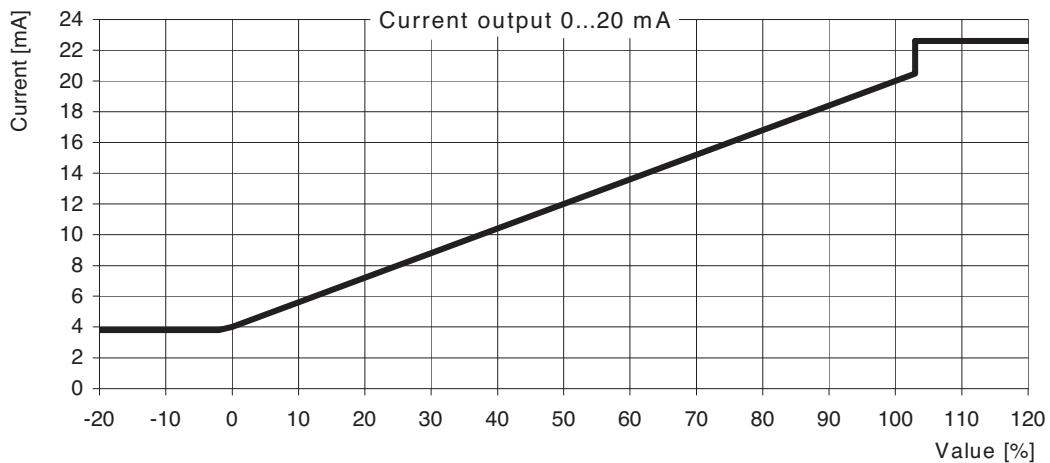For the following graphic "min Range" is used for 0% and "max Range" is used for 100%.

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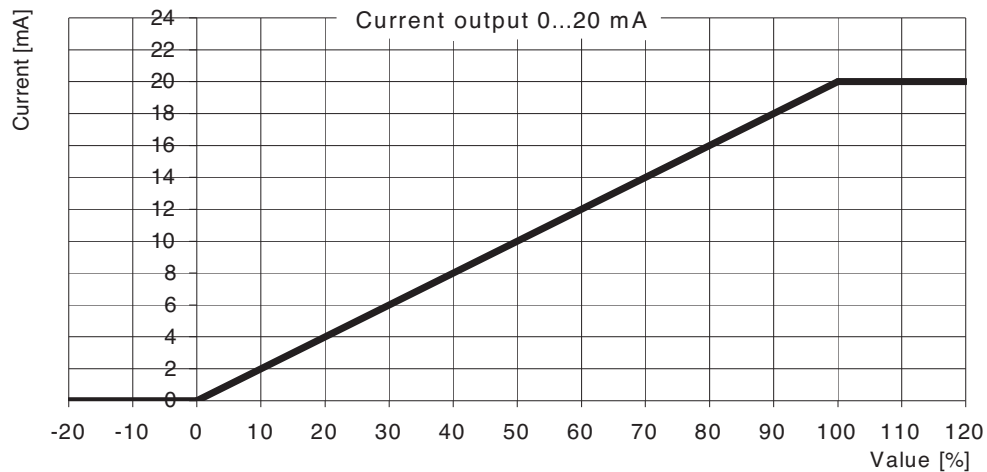
Value	Current [mA]
Smaller 0%	0
0% (min Range)	0
Between 0% and 100%	Linear interpolation from 0 to 20mA
100% (max Range)	20
Bigger 100%	20

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

4 - 20mA

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% and 100%	Linear interpolation from 4 to 20mA
100% (max range)	20
Between100% and 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.

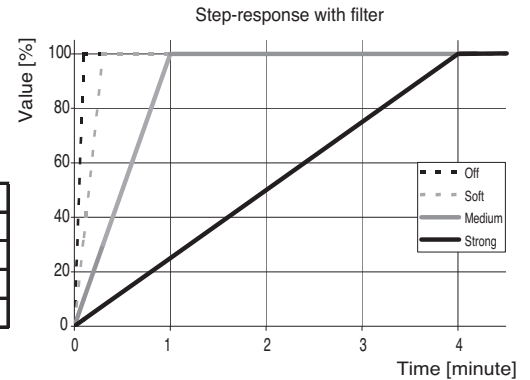Step-response time after a significant temperature change. (Filter „Off") ⟶

Step response time
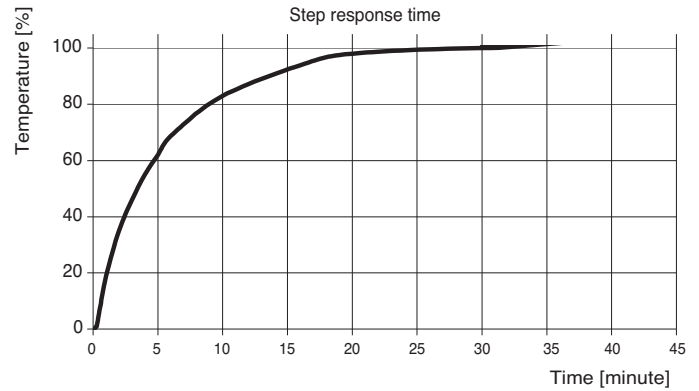
Influence of the environment temperature

Some examples:

| Liquid T° x 0.7 + environ. T° x 0.3 = measured T°			
40°C x 0.7	+ 20 °C x 0.3	= 34°C	
40°C x 0.7	+ 30 °C x 0.3	= 37°C	
40°C x 0.7	+ 40 °C x 0.3	= 40°C	
60°C x 0.7	+ 20 °C x 0.3	= 48°C	

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 configurations for thermocouple

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

Step-response with filter

Filter options for analog output

Configuration

Filter	100%
Off	16ms
Soft	0.3s
Medium	1s
Strong	4.2s

Response time analog output
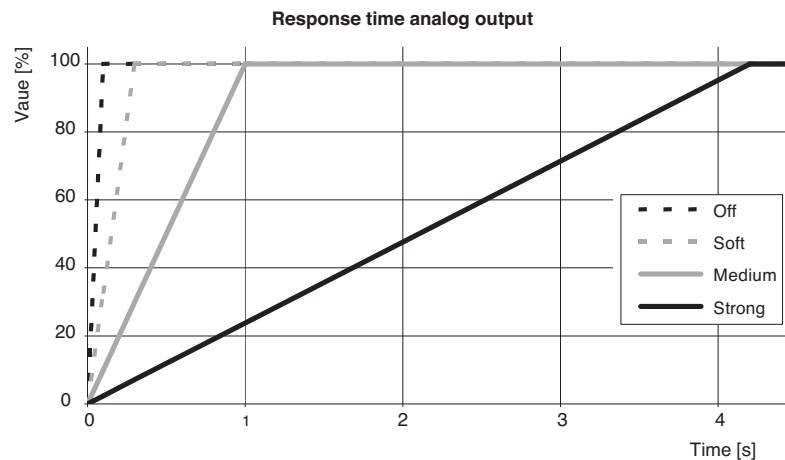
Possible error of BAMOFLONIC

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

RETURNED EQUIPMENT HANDLING FORM

SENDER

Contact person: …………………………………………………………………

Company: …………………………………………………………………

Your reference: …………………………………………………………………

Date: …………………………………………………………………

Please, return your equipment to:
BAMO MESURES SAS
22, rue de la Voie des bans
Z.I de la gare
95100 ARGENTEUIL
FRANCE
Phone: +33 130 258 320
Fax Nr: +33 134 101 605

EQUIPMENT DESCRIPTION, OPERATING CONDITIONS / MALFUNCTION DESCRIPTION

Type of device: ……………………………………………………………   **Serial number:** ……………………………………………………………………………

EQUIPMENT HISTORY

☐ The equipment operates correctly

☐ Was delivered damaged

☐ Malfunction during the start up

☐ Damaged during installation

☐ Operating since:……………………(period/time)

☐ Previous maintenance already done by BAMO

INFORMATIONS FROM BAMO (DO NOT FILL THE BLANK)

Customer Account: SAV Ref.:

P.O. Nr.:   Date:

Delivery note:

Delivery date:

Invoice Nr.:

REASON OF RETURN, OBSERVATIONS / DESCRIPTION OF FAULT / MALFUNCTION:

DECLARATION OF DECONTAMINATION

Denomination

	Corrosive	Flammable materials	Irritant Harmful	Toxic	Biological hazard	Other *	Harmless

Process medium: ………………………………………………

☐ ☐ ☐ ☐ ☐ ☐ ☐

Cleaning material: ………………………………………………

☐ ☐ ☐ ☐ ☐ ☐ ☐

* Please specify the type of the risk!……………………………………………………………..

Legal directives :
According to legal obligations and for our staff safety and workshop protection, it is necessary to send with the equipment this certificate to declare the decontaminating procedures have been applied before shipment.
Your responsibility will apply in case of non-respect of proper operations.

DECLARATION: I hereby declare that the returned equipment has been carefully cleaned and disinfected. It remains free of residues of harmful / toxic substances.

Name, Dept.:   Signature:
STAMP: Date: