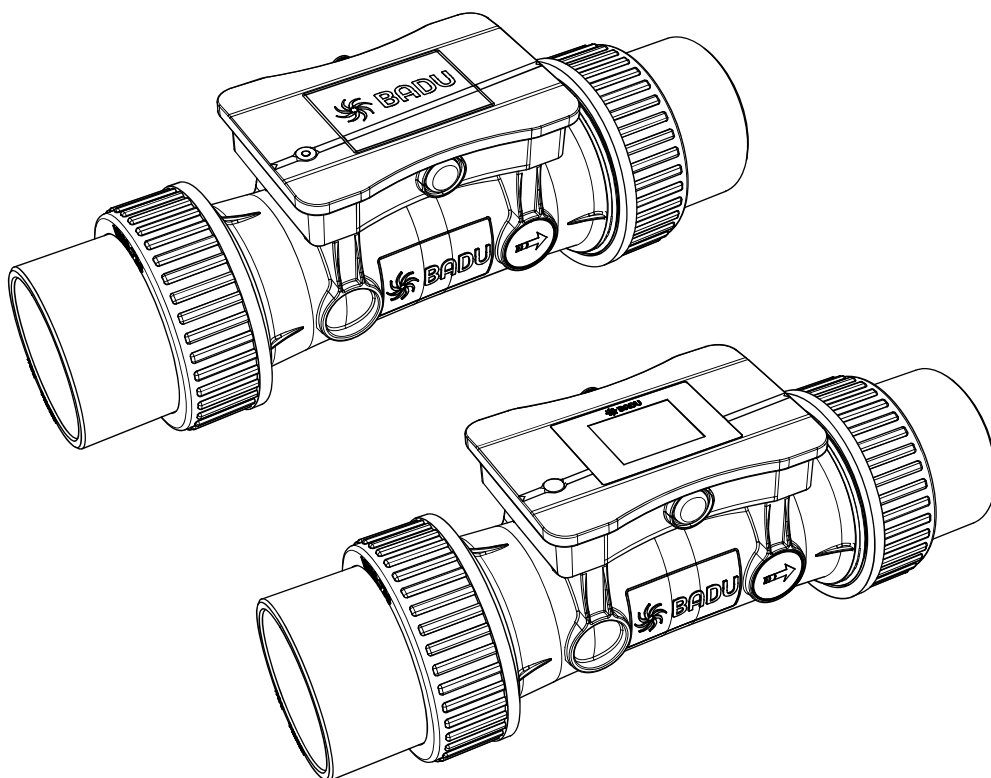




EN Operation Manual

BADU® FlowSonic
BADU® FlowSonic+





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UKCA: Comply Express Ltd, Unit C2 Coalport House, Stafford Park 1, Telford, TF3 3BD, UK

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Glossary

Transducer

Ultrasonic transducer, transducer, sensor

Volume flow, flow rate

Flow rate per timespan

1 About this document

1.1 Using this manual

This manual is a component of the pump/unit. The pump/unit was manufactured and tested according to the generally accepted rules of technology. However, if the pump/unit is used incorrectly, not serviced enough or tampered with, danger to life and limb or material damage could result.

- ➔ Read the manual carefully before use.
- ➔ Keep the manual during the service life of the product.
- ➔ Provide access to the manual for operating and service personnel at all times.
- ➔ Pass the manual on to any future owners or operators of the product.

1.2 Target group

This manual is aimed both at qualified specialists and the end customer. Descriptions aimed only at qualified specialists are indicated accordingly (qualified specialist). This indication applies to the whole point. All other points are universally valid.

1.3 Other applicable documents

- Packing list

1.3.1 Symbols and means of representation

Warnings are used in this manual to warn you of personal injury.

- ➔ Always read and observe warnings.

DANGER

Danger for people.
Non-observance results in death or serious injury.

WARNING

Danger for people.
Non-observance can result in death or serious injury.

CAUTION

Danger for people.
Non-observance can result in light to moderate injury.

NOTICE

Notes to prevent material damage, for better understanding or to optimise the workflow.

Important information and technical notes are specially marked to explain correct operation.

Symbol	Meaning
➔	Instructions for a one-step action.
1. 2.	Directions for a multi-step action. ➔ Observe the order of the steps.

2 Safety

2.1 Intended use

The ultrasonic flow meter measures the flow rate and temperature (BADU FlowSonic+) of conductive and non-conductive liquid media. It is installed in pipes.

Observing the following information is vital for intended use:

- This manual

The pump/unit may only be operated within the application limits, as specified in this manual.

The device can be used commercially.

Any other use or use exceeding this is **not** an intended use and must first be authorised by the manufacturer/supplier.

2.2 Personnel qualification

This unit can be used by **children** aged 8 and over as well as by persons with limited physical, sensory or mental capacity or by people with a lack of experience or knowledge, provided that they are supervised or have been instructed in the safe use of the unit and understand the resulting dangers.

Children may not play with the unit. Cleaning and **user maintenance** may not be carried out by **children** without supervision.

- ➔ Ensure that the following work is only performed by trained professionals with the following qualifications:
 - For work on the electric system: electricians.
- ➔ Ensure that the following requirements are fulfilled:
 - Personnel who do not yet have the appropriate qualifications must receive the required training before being allowed to work on the system.
 - The personnel's responsibilities, for example working on the product, electric equipment or hydraulic systems, are set based on their qualifications and the job description.
 - The personnel have read this manual and understand the necessary working steps.

2.3 Safety regulations

The operator of the system is responsible for the adherence to all relevant statutory regulations and guidelines.

- ➔ Observe the following regulations when using the pump/unit:
 - This manual
 - Warning and information signs on the product
 - Other applicable documents
 - The valid national regulations for accident prevention
 - The internal occupational, operational and safety regulations of the operator

2.4 Structural modifications and spare parts

Alterations or modifications can affect operational safety.

- ➔ Never modify or alter the unit without the manufacturer's permission.
- ➔ Only use original spare parts and accessories authorised by the manufacturer.

2.5 Signs

- ➔ Ensure that all the signs on the complete unit remain legible.

2.6 Residual risk

2.6.1 Electrical energy

There is an increased risk of electric shock when working on the electrical system due to the humid environment.

Electrical protective earth conductors which were not installed correctly can also result in electric shocks, for example due to oxidation or cable breakage.

- ➔ Observe VDE and utility company regulations.
- ➔ Build swimming pools and their protection according to DIN VDE 0100-702.
- ➔ Before working on the electrical system, take the following measures:
 - Disconnect system from the power supply.
 - Attach a warning sign: "Do not switch on! The system is being worked on."
 - Ensure that the system is free of voltage.
- ➔ Check the electrical system regularly to ensure it is in proper working condition.

2.6.2 Hazardous substances

Hazardous substances as a medium can lead to abrasive and corrosive damage to parts in contact with the medium. The medium can escape and therefore pose a fire hazard and a health risk.

- ➔ Calibrate and systematically check the resistance of the parts in contact with the medium and the permissible ambient conditions.

2.6.3 Hot surfaces

Risk of injury from hot surfaces on the equipment.

- ➔ Allow the equipment and system to cool down.
- ➔ Install contact protection if necessary.
- ➔ Observe the alignment of the electronics housing.

2.6.4 Mechanical stress

Mechanical stress on the equipment and connections can lead to leaks.

- ➔ Do not subject the equipment and connections to mechanical stress.
- ➔ Check the tightness of the connections regularly.

2.7 Faults

- ➔ In case of a fault, immediately switch the pump off and remove it from operation.
- ➔ Have all faults repaired immediately.

2.8 Preventing material damage**2.8.1 Leakage and pipe breakage**

Vibrations and thermal expansion can cause pipes to break.

- ➔ Install the unit in a manner which reduces structure-borne and airborne noise transmission. When doing so, observe relevant regulations.

If the pipe forces are exceeded, leaks can occur at the screwed connection or the pump itself.

- ➔ Do not use the unit as a fixed point for the pipe line.
- ➔ Connect pipes free of load and mount them elastically. Install compensators if necessary.
- ➔ In the event of leakage, the system may not be operated and must be disconnected from the mains.

3 Description

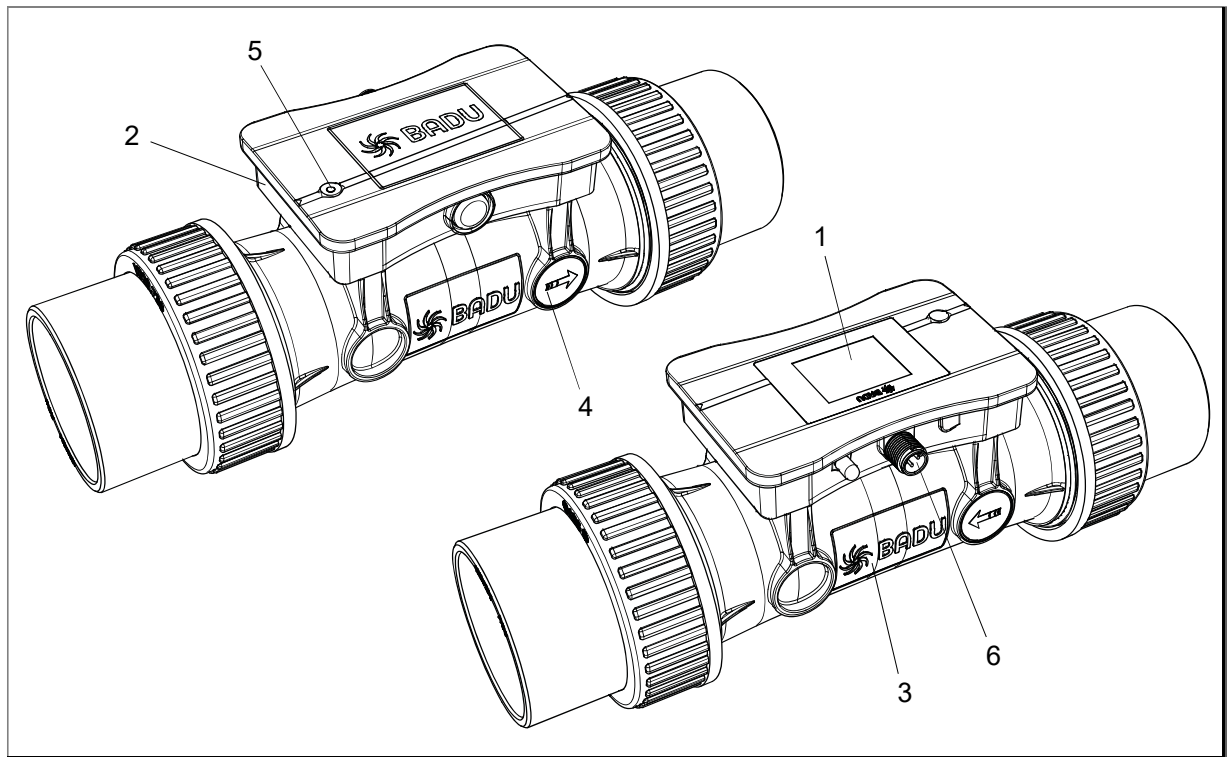


Fig. 1

1	Display view (BADU FlowSonic+)	4	Transducer
2	Electronics housing	5	Equipment status LED (BADU FlowSonic)
3	Measuring tube	6	M12 plug connector (4-pin)

3.1 Function

The transducers positioned opposite each other in the measuring tube are both sensors and receivers, i.e., they convert electrical energy into sound waves and the sound waves into electrical energy. The electronics supply the equipment with power, convert the raw signals into standard signals for communication with further systems (PLC, recorder, display device, etc.) and provide interfaces for displaying the measured values.

3.1.1 Functional principle

The flow meter works according to the transit time method. The two transit times t_1 and t_2 , which the sound requires from transducer A to transducer B and vice versa, are measured. The direction of flow is indicated by an arrow.

The transit time difference Δt is directly proportional to the flow velocity of the medium.

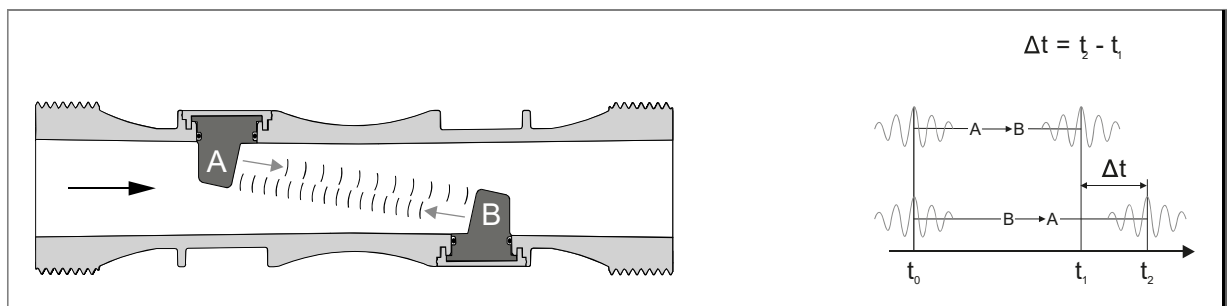


Fig. 2

3.2 Name plate

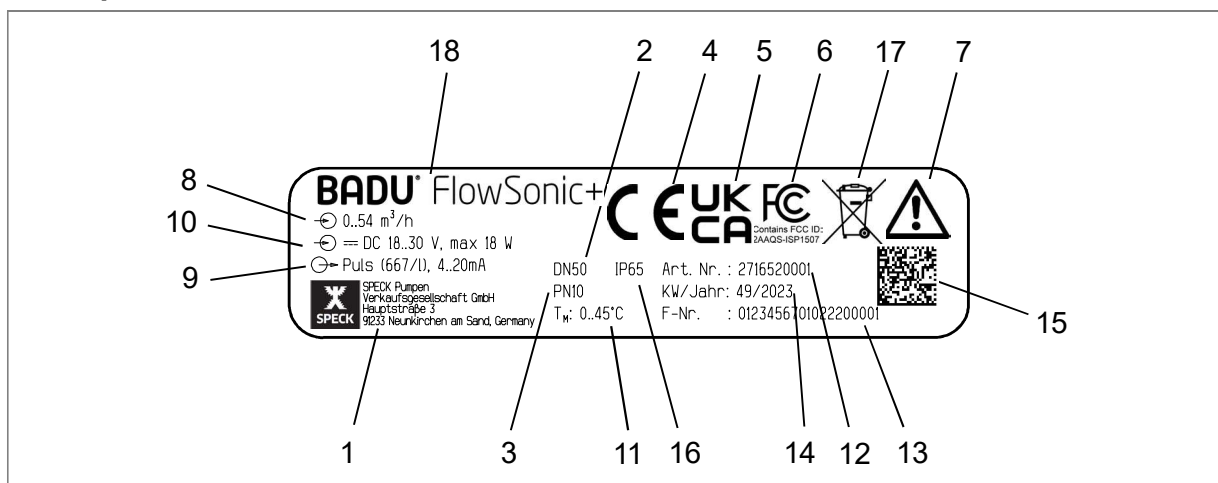


Fig. 3

1	Manufacturer and address	10	Power supply
2	Nominal diameter	11	Temperature of medium
3	Nominal pressure stage	12	Product number
4	CE Declaration of Conformity	13	Production number
5	UK Declaration of Conformity	14	Year of manufacture
6	FCC approval	15	Production number as DMC code
7	Observe the equipment documentation	16	Protection class
8	Measuring range	17	Recycling
9	Output signal	18	Type designation

4 Transport and intermediate storage

4.1 Transport

- ➔ Check the delivery conditions:
 - Check the packaging for transport damage.
 - Determine damages, document them with photographs and contact the distributor.

4.2 Storage

NOTICE

Damage or loss of individual parts!

- ➔ Do not open the original packaging until installation or keep individual parts in the original packaging until installation.
-

4.3 Returns

- ➔ Drain the device completely.
- ➔ Rinse and clean the device with clear water.
- ➔ Pack the device in a box and send it to the specialist retailer or manufacturer.

5 Installation

5.1 Installation

5.1.1 Place of installation

Prerequisites:

- Protect against electromagnetic interference.
- Protect against UV radiation.
- Protect from the weather when used outdoors.

5.1.2 Inlet and outlet sections

In order to stabilise the flow in the pipe, at least the specified inlet and outlet sections are required.

➔ Ensure a swirl-free flow.

For greater accuracy, the inlet and outlet sections can be lengthened.

DN = Nominal pipe diameter

→ = Flow direction

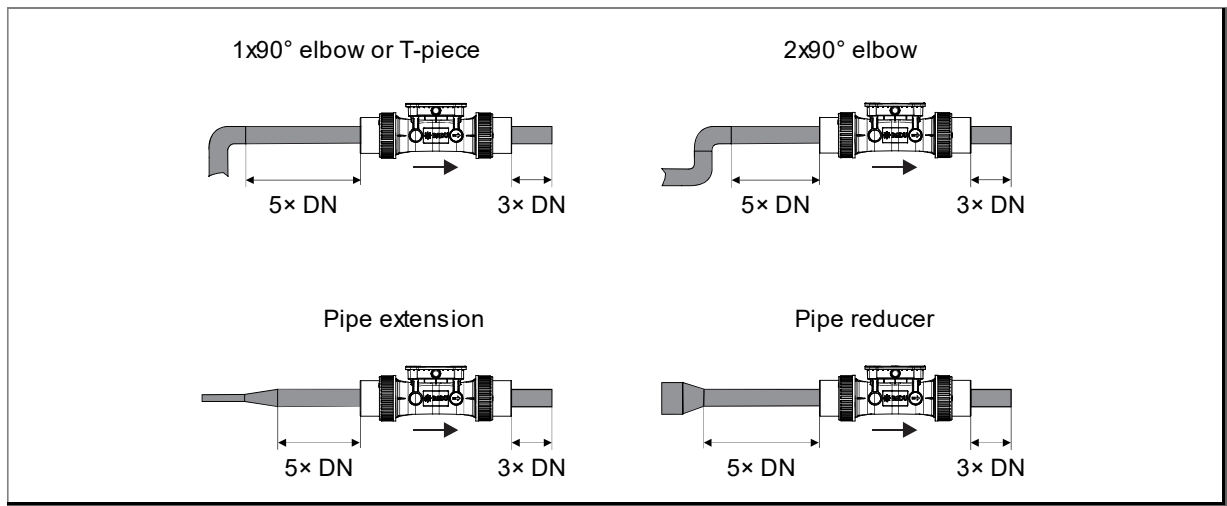


Fig. 4

5.1.3 Installation position

→ = Flow direction

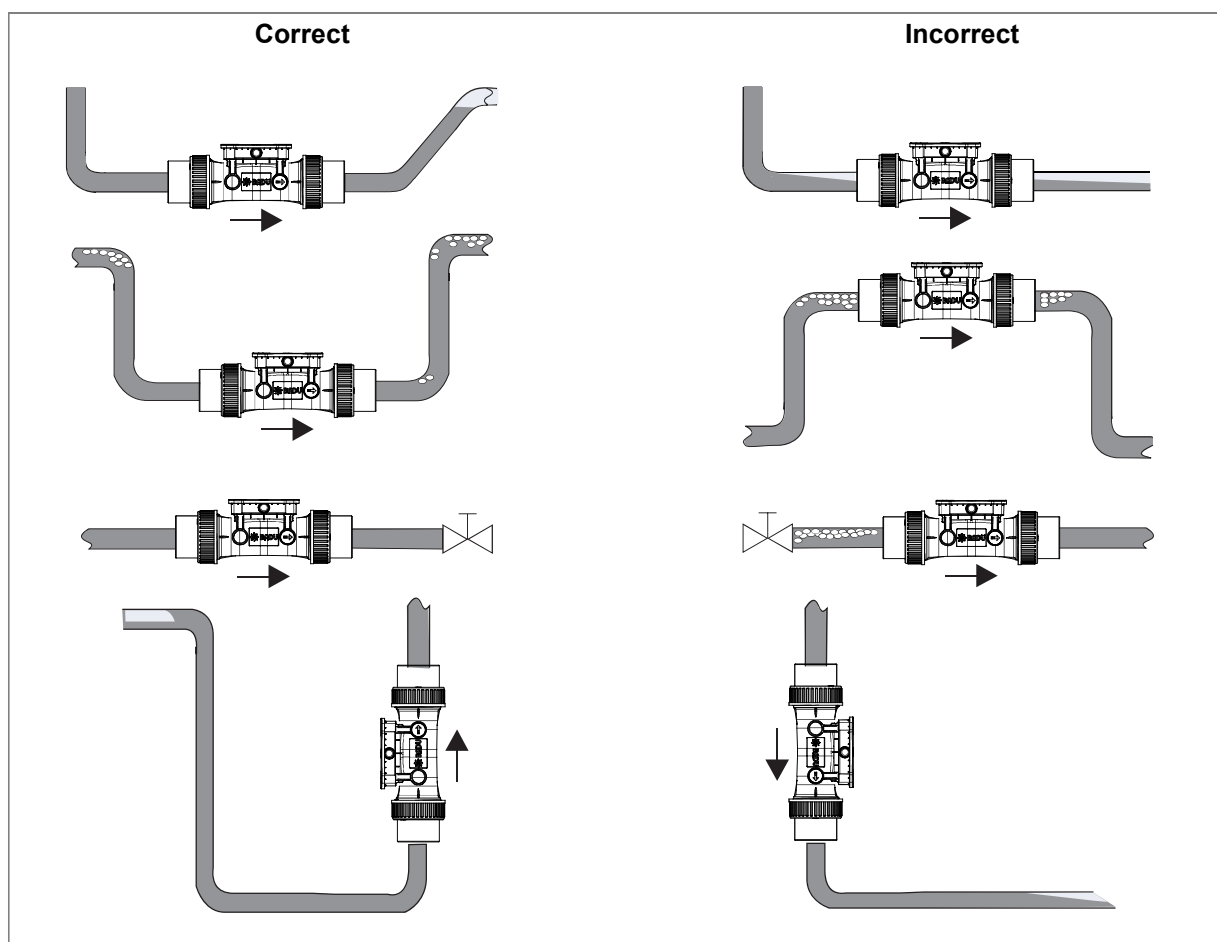


Fig. 5

5.1.4 Avoid mechanical stresses

Prerequisites:

- The centre axes of both pipe ends are aligned before installation in the pipe.
- The pipe ends are aligned parallel and at an angle to each other.
- The installation length of 200 mm is adhered to.

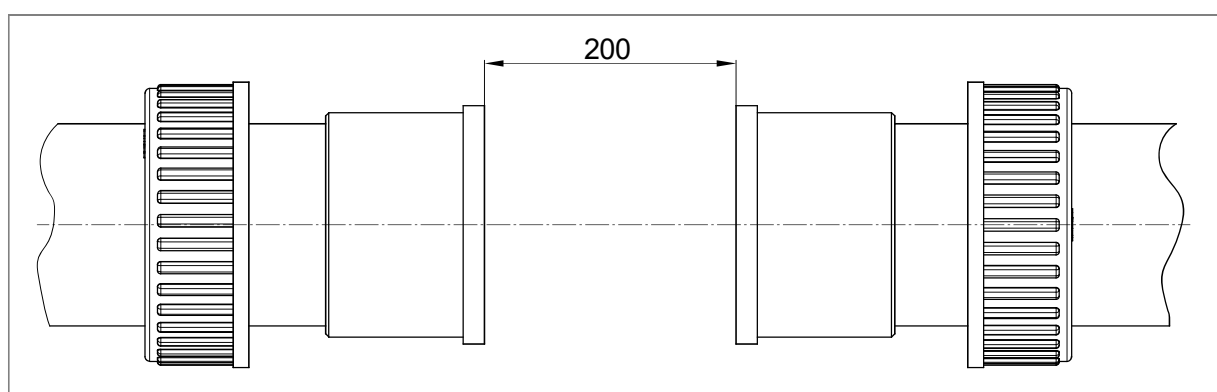


Fig. 6

5.1.5 Flow direction

The positive flow direction is labelled on the transducer covers on both sides of the equipment and, depending on the application, must be observed during installation.

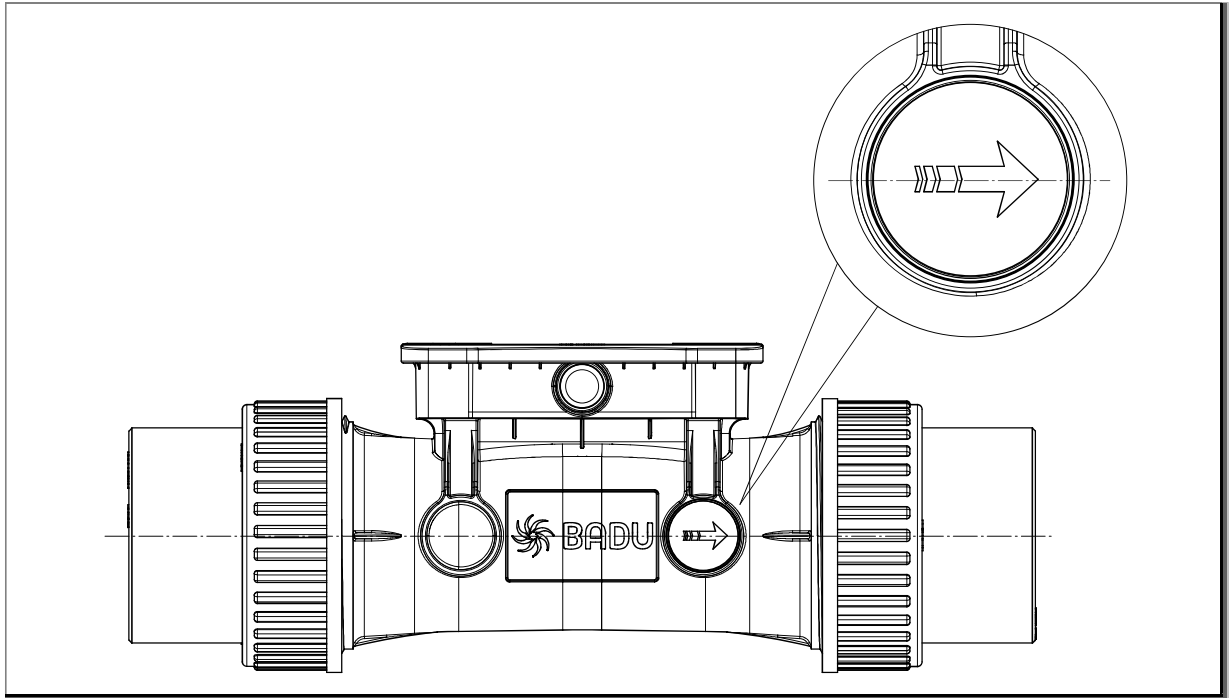


Fig. 1

5.2 Equipment installation

Prerequisites:

- The system is de-energised and secured against reactivation.
- No medium flows in the system.
- The pipes are drained and purged with water.
- The pipes are ready for installation. The union nut and the collar bushing are attached to the pipes.

1. Insert both O-rings into the collar bushing.

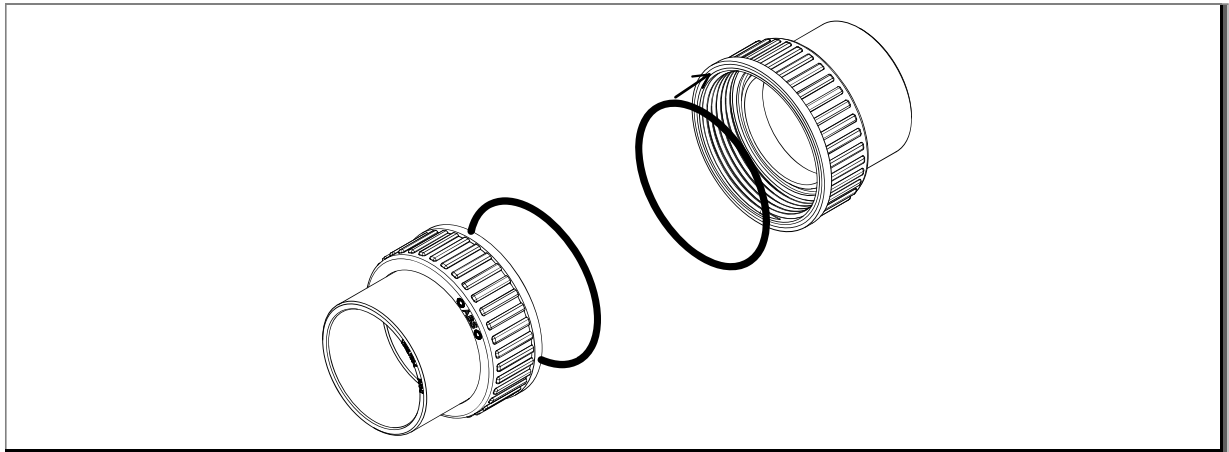


Fig. 7

2. Fit the BADU FlowSonic between the two collar bushings. Ensure that the O-ring is fitted correctly.

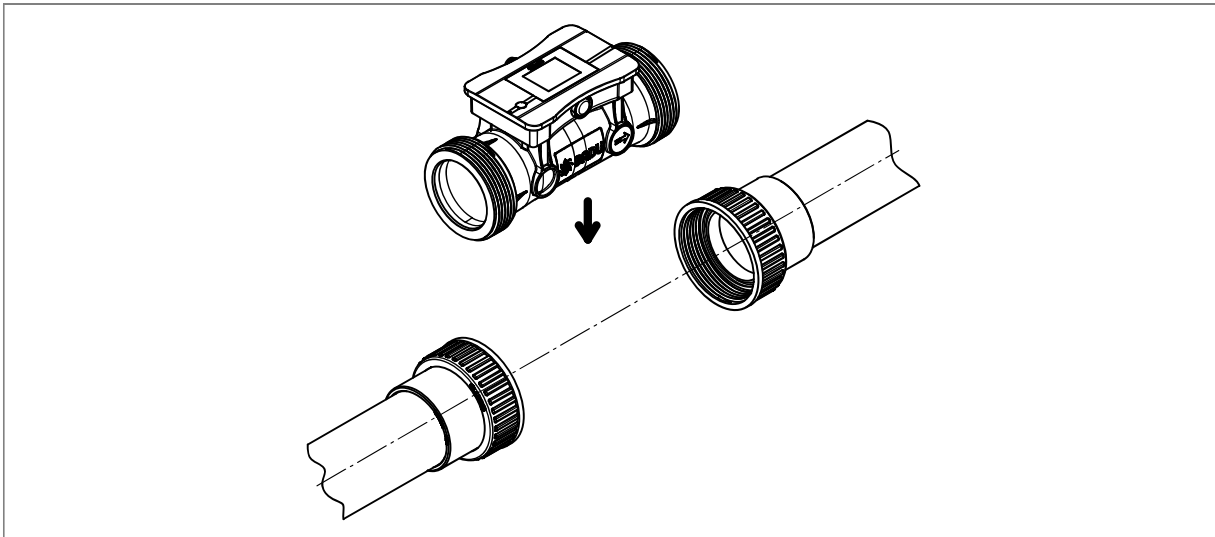


Fig. 8

3. Screw the two union nuts to the BADU FlowSonic. Only tighten by hand.

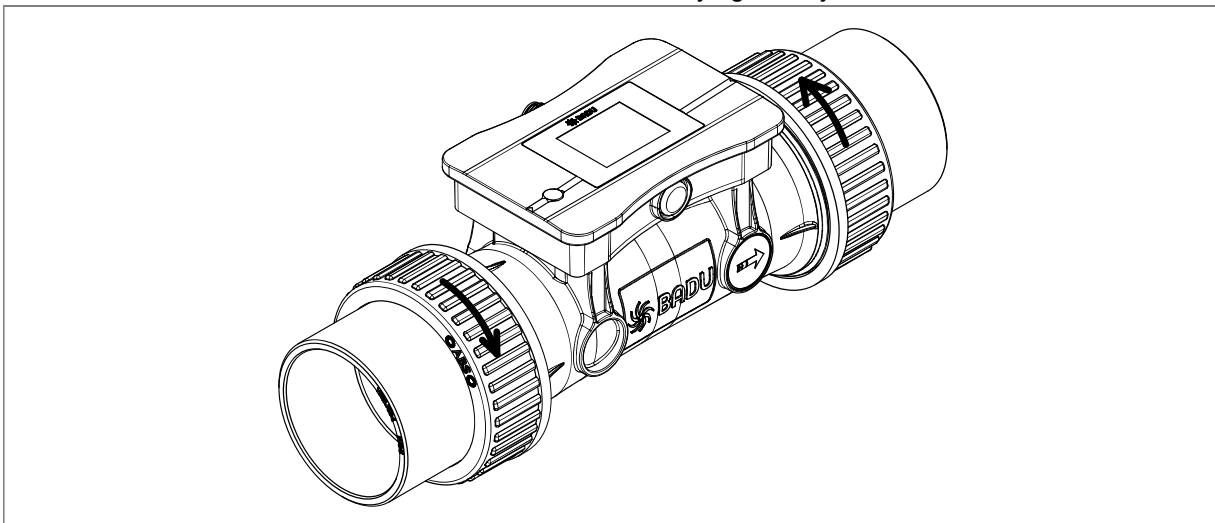


Fig. 9

4. Switch on the system, fill the pipes with medium and check the connections for leaks.

5.3 De-installation

Prerequisites:

- The system is de-energised and secured against reactivation.
 - No medium flows in the system.
 - The pipes are drained and purged with water.
 - A clean and dry place is prepared.
1. Loosen the union nut of the connection cable on the M12 plug connector of the equipment by hand.
 2. Pull the connection cable out of the plug connector and put it aside.
 3. Loosen the union nuts on the equipment and slide them backwards.
 4. Carefully remove the equipment from the system.
 5. Place the equipment in a clean and dry place.

5.4 Electrical connection

5.4.1 Pins

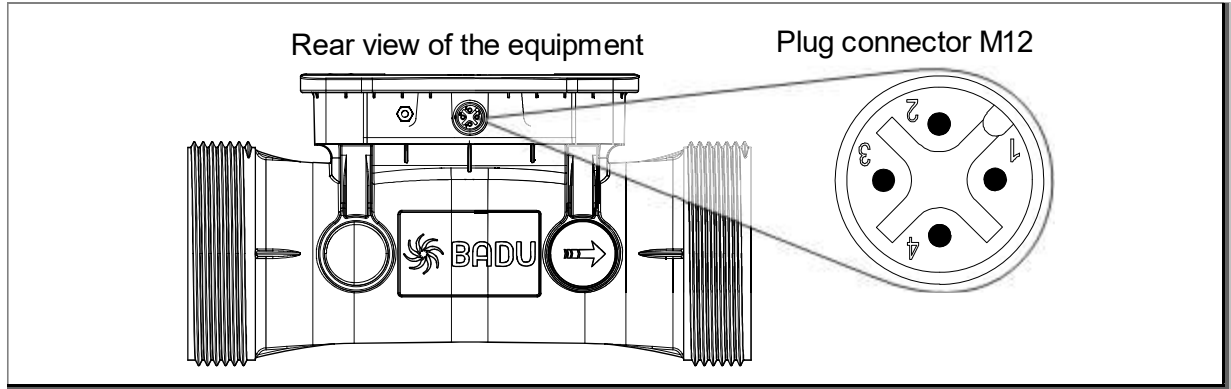


Fig. 10

5.4.2 Pin assignment

I/O pin 1 is assigned to the **digital output (pulse)**

I/O pin 2 is assigned to the **analogue output (current)**

Connection and colour assignment

Connection type	Plug connector	Colour ¹⁾	
Power supply V+ (DC 24 V)	1	Brown (BN)	
I/O pin 2	2	White (WH)	
GND	3	Blue (BU)	
I/O pin 1	4	Black (BK)	

¹⁾ The colour assignment is only valid for A-coded standard cables

5.5 Wiring diagram

Prerequisites:

- An unused current output is connected to GND.
- An unused voltage output is open.

5.5.1 Digital inputs (BADU FlowSonic+)

PLC level: logical "0" < 7 V, logical "1" >15 V

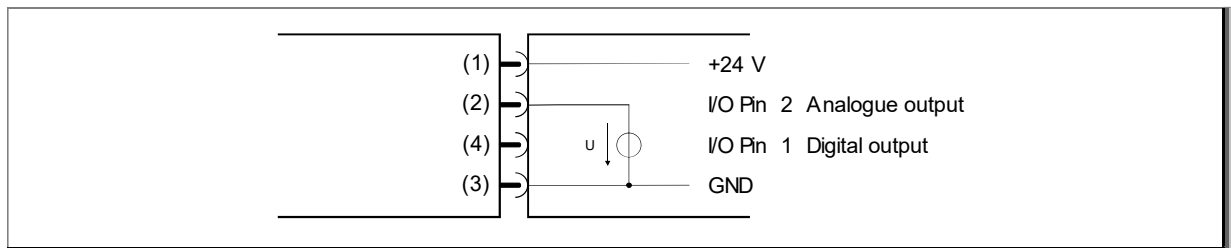


Fig. 11

5.5.2 Analogue outputs

Current output 4 to 20 mA

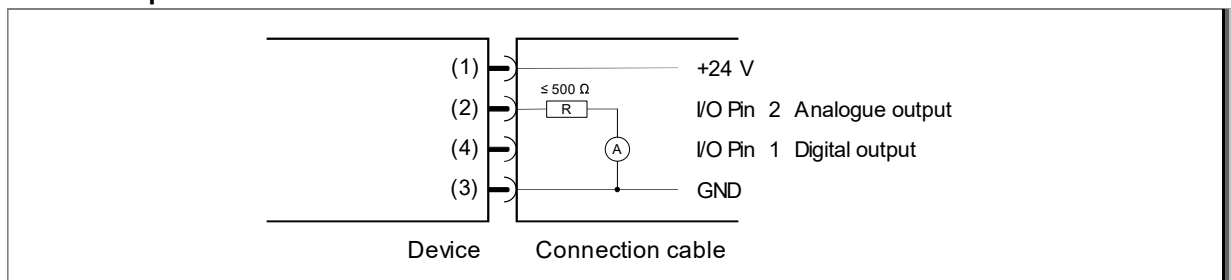


Fig. 12

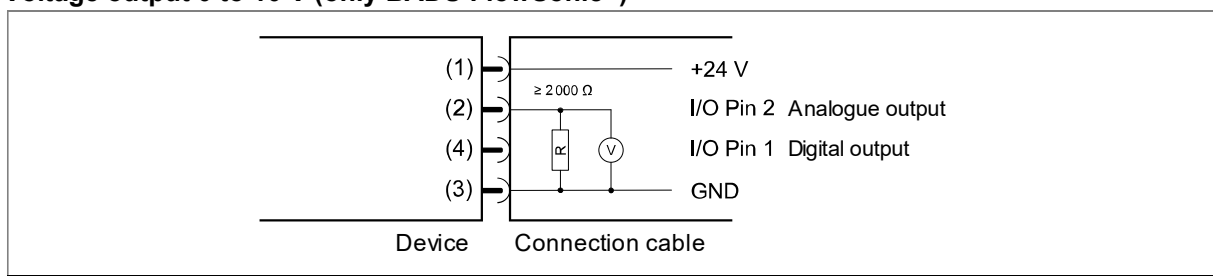
Voltage output 0 to 10 V (only BADU FlowSonic+)

Fig. 13

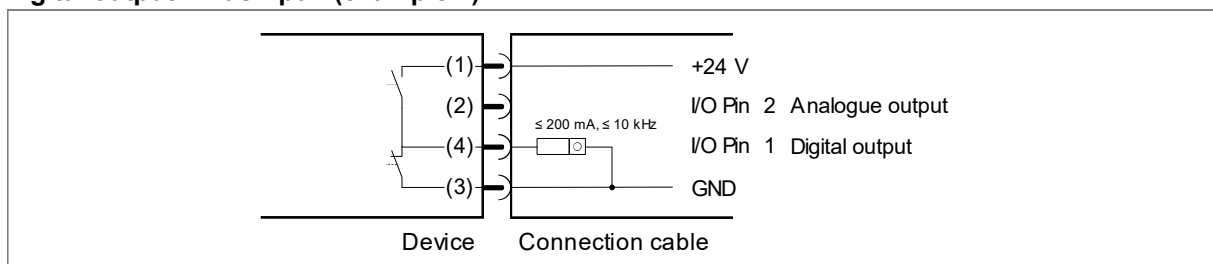
5.5.3 Digital outputs**Digital output – Push-pull (example 1)**

Fig. 14

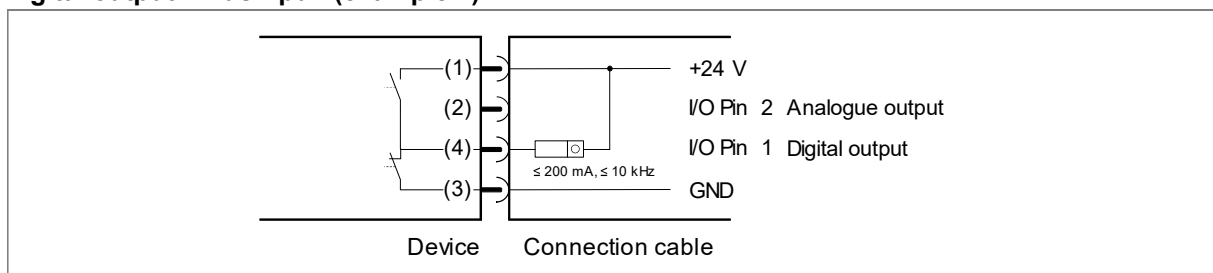
Digital output – Push-pull (example 2)

Fig. 15

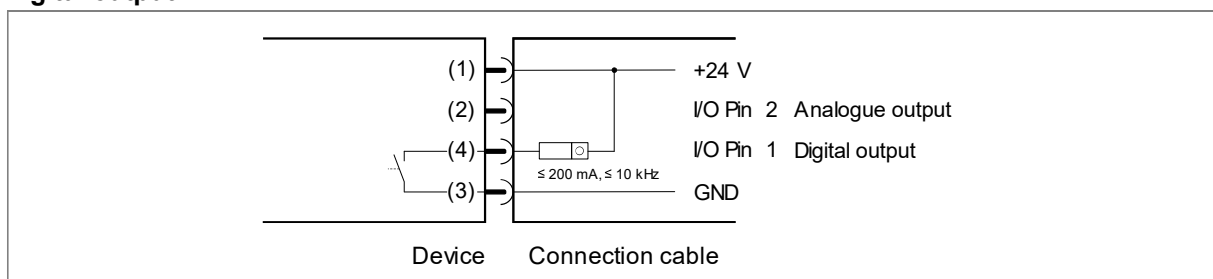
Digital output – NPN

Fig. 16

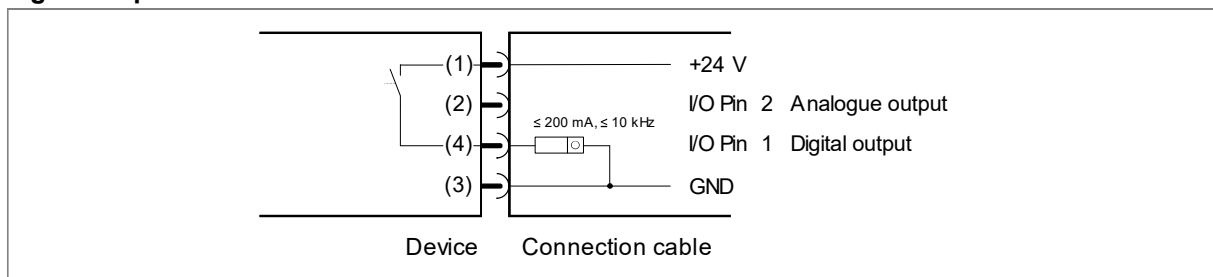
Digital output – PNP

Fig. 17

5.6 Equipment connection

Prerequisites:

- The system is de-energised and secured against reactivation.
- The power supply and signal processing connections are professionally prepared.
- The connection cable is heat-resistant in accordance with the process.
- The connection cable is not placed in the vicinity of high-voltage or high-frequency cables or is kept at a minimum distance of 30 cm.

1. Insert the connection cable into the plug connector (M12).

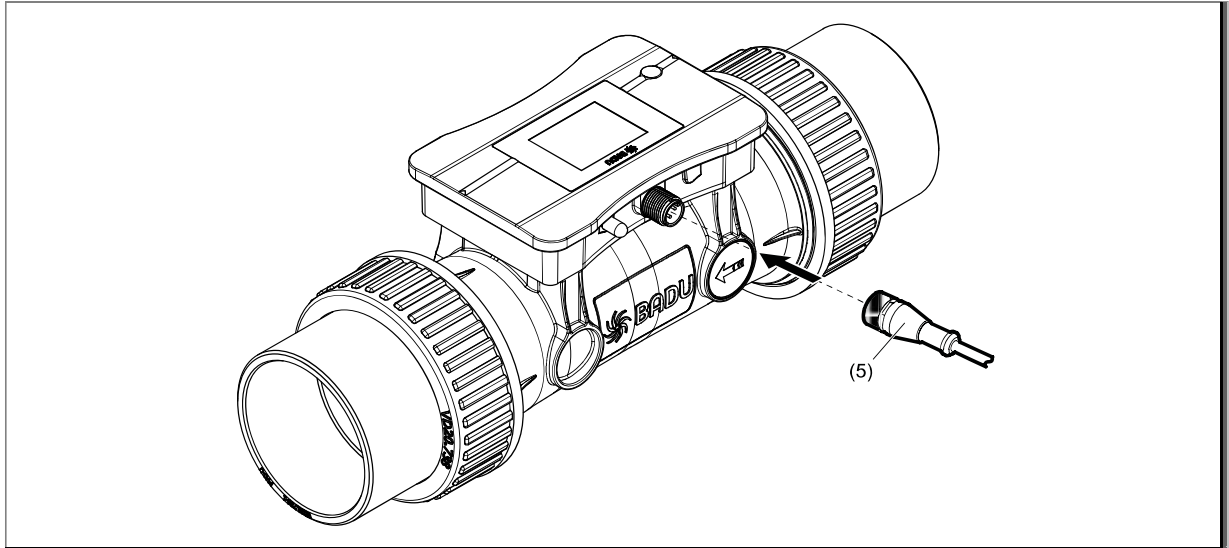


Fig. 18

2. Screw the union nut of the connection cable onto the plug connector.
➔ Observe a tightening torque of 0.4 Nm.

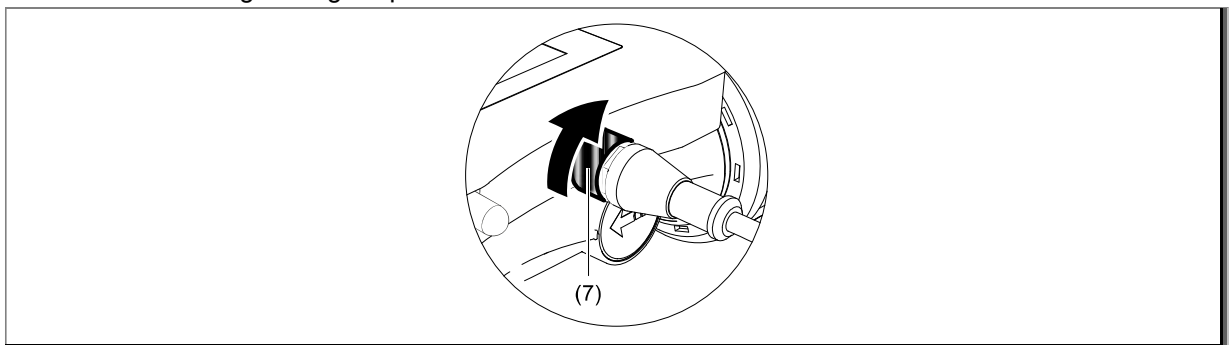


Fig. 19

3. Connect the connection cable to the signal-processing equipment and the power supply.
4. Place the connection cable so that it is protected against mechanical stress.
5. The equipment is ready for operation as soon as the power supply is established.

NOTICE

The connection cable of the BADU FlowSonic is open-ended.
The connection cable of the BADU FlowSonic+ has a mains plug.

6 Operation

6.1 BADU FlowSonic

6.1.1 Equipment status LED

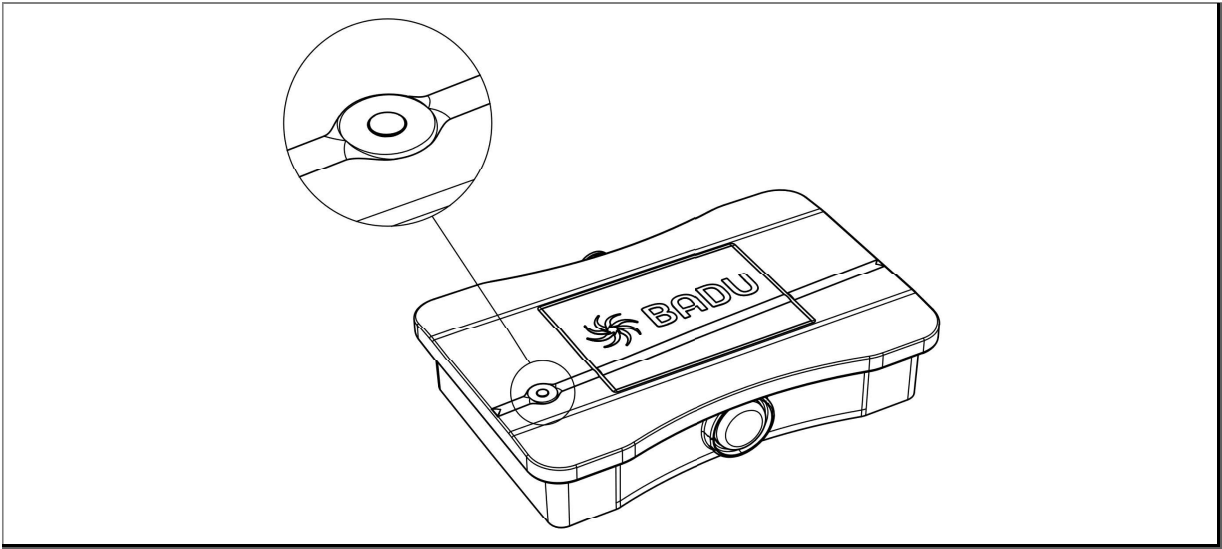


Fig. 20

Pos.	Description
1	Displays the equipment status (0, 2, 4) in accordance with NAMUR classification NE107: • Illuminated green (0) = normal operation • Illuminated yellow = function check • Flashing yellow (2) = out of specification • Flashing red (4) = fault/failure

6.2 BADU FlowSonic+

6.2.1 Start-up display

The start-up display appears as soon as the power supply is connected to the equipment. The start-up display switches to the process display after about five seconds.

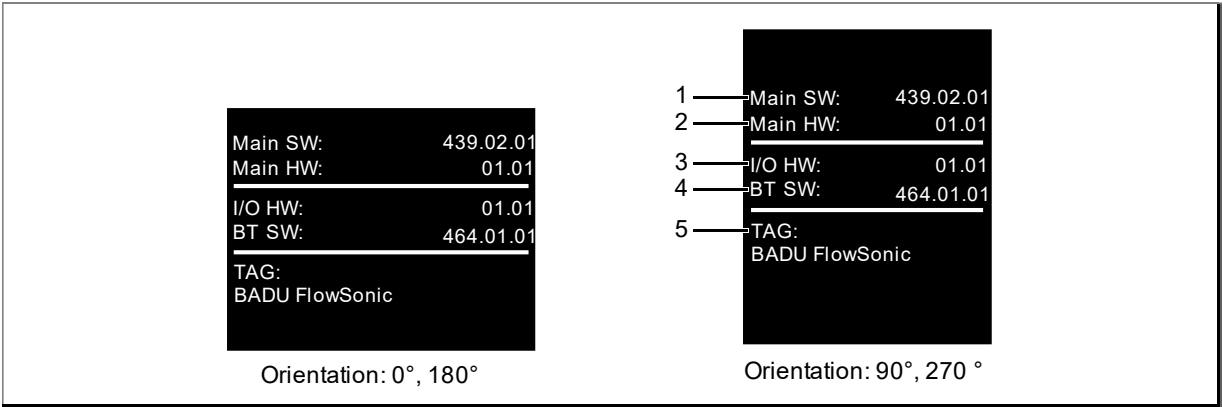


Fig. 21

Pos.	Designation	Description
1	Start-up display	Indicates the equipment's software version.
2, 3		Indicates the equipment's hardware version.
4		Indicates the software version of the Bluetooth module.
5		Indicates the equipment TAG (application-specific label).

6.2.2 Process display

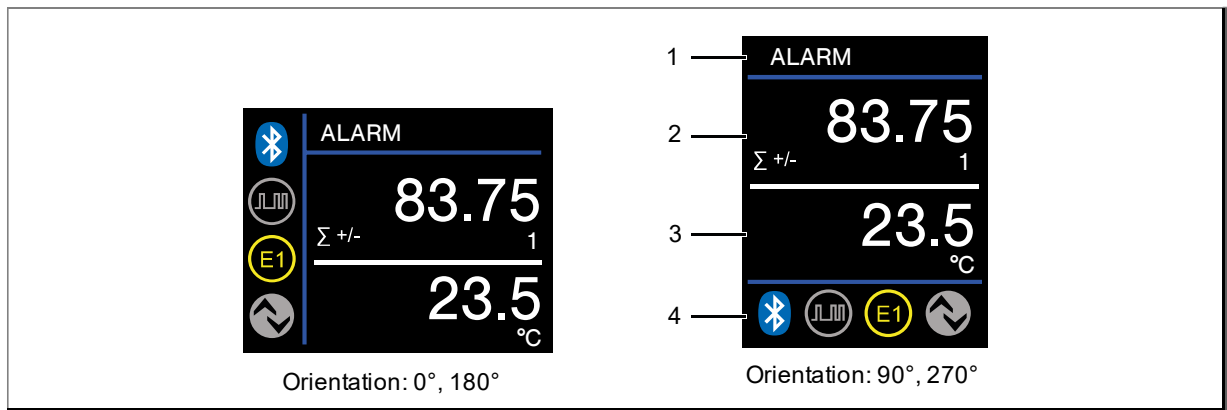


Fig. 22

Pos.	Designation	Description
1	Status bar	Indicates information on the equipment status.
2, 3	Process value display 1, Process value display 2	Indicate the following values and messages: - Both configured process values (actual values) - The system units of the process values - The totalisers with totaliser function - The filling or residual volume with batch function - Fault messages
4	Symbol bar	Indicates: - The configuration and status of I/O pin 1 (digital output) and I/O pin 2 (analogue output) - The configuration and status of the interface connections

Status bar



Fig. 23

Pos.	Symbol, display	Description
1	ALARM	Indicates a device fault or a warning.
	BATCH	Indicates an active batch process.
	SIM	Indicates an input that is in simulation mode.

Process value display 1, Process value display 2

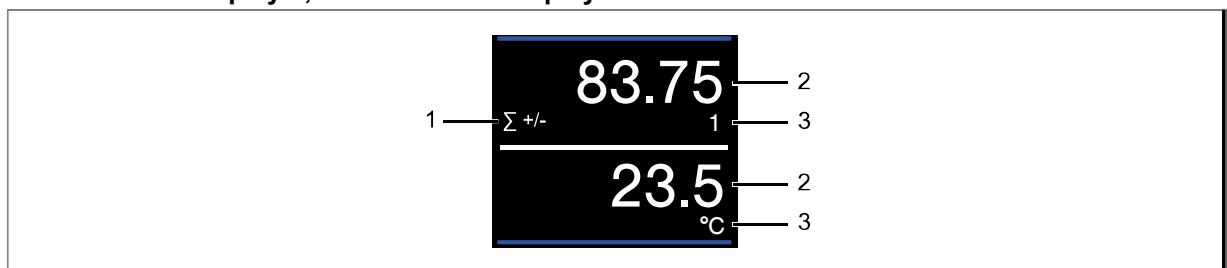


Fig. 24

Totaliser, carry-over totaliser

Only appears if the process value display is configured accordingly.

Pos.	Symbol, display	Description
1	Σ -	Indicates the negative counting mode of the totaliser.
	Σ +	Indicates the positive counting mode of the totaliser.
	Σ +/-	Indicates the balanced counting mode of the totaliser.

Batch

Only appears if the process value display is configured accordingly.

Pos.	Symbol, display	Description
1		Indicates the filling volume.
		Indicates the residual volume.

Process value (5 digits)

If the process value exceeds the 5-digit display range, the number of decimal places of the process value is reduced.

Pos.	Symbol, display	Description
2	12345	Indicates the positive process value.
	-12345	Indicates the negative process value.

System unit

Pos.	Symbol, display	Description
3	l/s, m3/h, ft3/min, l/min, ft3/h, usgal/min, impgal/min, l/h, cm3/s, usgal/h, impgal/h, °C, °F, mbar, bar, psi, m/s, %, l, usgal, impgal, m3, ft3	Indicates the configured system unit of the process value.

Symbol bars

			
1	2	3	4

Interface connection

Pos.	Symbol, display	Description
1		Interface connection: Bluetooth Status: Inactive
		Interface connection: Bluetooth Flashing status: Wait for connection to be established. Permanent status: Active
4		Interface connection: IO Link Status: Inactive
		Interface connection: RS485/digiLine Status: Inactive

I/O pin 1

Shows the configuration, function and status of I/O pin 1 of the equipment.

Pos.	Symbol, display	Description
2		Configuration: Analogue output
		Configuration: Digital output Function: Switching output, pulse output Status: Inactive (switching output)
		Configuration: Digital output Function: Switching output Status: Active

I/O pin 2

Shows the configuration, function and status of I/O pin 2 of the equipment.

Pos.	Symbol, display	Description
3		Configuration: Analogue output
		Configuration: Digital output Function: Switching output Status: Inactive
		Configuration: Digital output Function: Switching output Status: Active
		Configuration: Digital input Status: Inactive
		Configuration: Digital input Status: Active

6.3 Interfaces (BADU FlowSonic+)

6.3.1 Bluetooth

The smartCONNECT app enables the configuration and parametrisation of the equipment using an end device. Configuration data and equipment information are transmitted via Bluetooth. The Bluetooth radio module of the equipment is permanently active during initial commissioning.

The app is available to download free of charge from the usual app stores.

7 Bluetooth configuration (BADU FlowSonic+)

The parameter lists are based on the operating menu of the JUMO smartCONNECT app. The table headings locate the respective parameters in the operating menu of the app.

Factory settings are shown in **bold** in the following tables.

Sensor – Display

Parameters	Value	Description
Language	German, English , French, Spanish	Language of the equipment texts of the process display.
Process value 1, Process value 2	flow rate, temperature , no signal, pressure, sound velocity, signal strength, filling volume, residual volume, totaliser 1 volume, totaliser 1 volume carry-over, totaliser 2 volume, totaliser 2 volume carry-over	Output values of the parameters (can be configured independently of each other).
Brightness	0 to 15 (8)	Brightness of the process display backlighting.
Rotation	0° , 90°, 180°, 270°	Alignment of the process display.

Sensor

Parameters	Value	Description
Application-specific label	BADU FlowSonic+	TAG designation (text input with max. 32 characters possible).
Bluetooth mode	Active , Restricted (via NFC)	Status of the Bluetooth connection.
Factory settings	Inactive , Reset	Resets the equipment to factory settings.

Bluetooth mode

The Bluetooth radio module of the equipment is permanently active during initial commissioning and can be deactivated via the **Restricted** value (via **NFC**). In this mode, an NFC tag temporarily activates the Bluetooth radio module and starts automatic connection between the equipment and the end device. To do so, touch the equipment's NFC tag near the TFT display with the end device.

System units

Parameters	Value	Description
Flow rate	m³/h , l/s, l/min, l/h, cm³/s, ft³/min, ft³/h, usgal/min, usgal/h, imp.gal/min, imp.gal/h	System unit for these parameters.
Volume	l , cm³, m³, ft³, usgal, imp.gal	
Pressure	bar , mbar, psi	
Totaliser	l , cm³, m³, ft³, usgal, imp.gal	
Temperature	°C , °F	Unit for this parameter in the process value display
		The output signal is always output in °C regardless of this setting.

Input/Output 1

Parameters	Value	Description
I/O pin 1	digital output , analogue output	Parameter function.

Input/Output 1 > Analogue output 1

Parameters	Value	Description
Function	current output , inactive, voltage output	Parameter function. Parameter I/O pin 1 must be configured as analogue output value.
Output signal	Flow rate , temperature, pressure	Output signal of the parameter.
Start of scaling	Input range: -99999 to 99999 (0.000)	Process value for the current output (4 mA) or the voltage output (0 V).
End of scaling	Input range: -99999 to 99999 (maximum measuring range of the equipment)	Process value for the current output (20 mA) or the voltage output (10 V).
Fault behaviour	Low , High, Frozen, Replacement value	Output signal in the event of a fault: Low: 3.4 mA or 0 V High: 22 mA or 11 V Frozen: last valid value Replacement value: specified replacement value
Replacement value	Input range: 0.000 to 22.00 mA (3.400)	Fault behaviour parameter must be configured as a replacement value. Input range: 3.4 to 22 mA (current output) 0 to 11 V (voltage output)

Input/Output 1 > Digital output 1

Parameters	Value	Description
Function	pulse output , inactive, switching output,	Parameter function. Parameter I/O pin 1 must be configured as digital output value.

Input/Output 1 > Digital output 1 > Switching output

Parameters	Value	Description
Output signal	Limit value switch , batch active, Batch fault, equipment fault	Parameter function. Parameter I/O pin 1 must be configured as digital output value. Parameter Function of digital output 1 must be configured as Switching output value.
Inversion	Off , On	Inverts the output signal.
Output signal type	push-pull p-switching, n-switching,	Parameter function.
Limit value monitoring function	Inactive , Hysteresis function normally open (NO), Hysteresis function normally closed (NC), window function normally open (NO), window function normally closed (NC)	Parameter function. Inactive: Function of the switching output inactive.
Limit value monitoring signal	Flow rate , temperature, pressure	Process value signal of limit value monitoring
Switching point/window high	Input range: -99999 to 99999 (75.00)	Process value of the limit value monitoring signal.
Switch-back point/window low	Input range: -99999 to 99999 (50.00)	
Switch-on delay	Input range: 0.000 to 100.0	–
Switch-off delay	Input range: 0.000 to 100.0	
Fault behaviour	Inactive , Active, Frozen	Behaviour of the output signal in the event of a fault.

Fault behaviour

Value **Inactive**: If the parameter **Function** of digital output 1 was configured as the **Switching output** value, a process value fault sets the **Switching output** value to **Inactive**.

Value **Frozen**: If the parameter **Function** of digital output 1 was configured as the **Switching output** value, a process value fault has no effect on the configuration of the **Switching output** value.

Input/Output 1 > Digital output 1 > Pulse output

Parameters	Value	Description
Output signal type	push-pull , p-switching, n-switching,	Parameter function. Parameter I/O pin 1 must be configured as digital output value. Parameter Function of digital output 1 must be configured as Pulse output value.
Pulse per unit	Input range: 1 to 100000 (Output value for nominal diameter)	Output value in pulses per volume unit (system unit of the Volume parameter).

Input/Output 2

Parameters	Value	Description
I/O pin 2	Analogue output , digital output, digital input	Parameter function.

Input/Output 2 > Analogue output 2

Parameters	Value	Description
Function	current output , inactive, voltage output	Parameter function. Parameter I/O pin 2 must be configured as analogue output value.
Output signal	Flow rate , temperature, pressure	Output signal of the parameter.
Start of scaling	Input range: -99999 to 99999 (0.000)	Process value for the current output (4 mA) or the voltage output (0 V).
End of scaling	Input range: -99999 to 99999 (maximum measuring range of the equipment)	Process value for the current output (20 mA) or the voltage output (10 V).
Fault behaviour	Low , High, Frozen, Replacement value	Output signal in the event of a fault: Low: 3.4 mA or 0 V High: 22 mA or 11 V Frozen: last valid value Replacement value: Input value of the parameter Replacement value
Replacement value	Input range: 0.000 to 22.00 (3.400)	Fault behaviour parameter must be configured as a replacement value . Input range: 3.4 to 22 mA (current output) 0 to 11 V (voltage output)

Input/Output 2 > Digital output 2

Parameters	Value	Description
Function	switching output , inactive	Parameter function. Parameter I/O pin 2 must be configured as digital output value.

Input/Output 2 > Digital output 2 > Switching output

Parameters	Value	Description
Output signal	Limit value switch , batch active, batch fault, equipment fault	Parameter function. Parameter I/O pin 2 must be configured as digital output value. Parameter Function of digital output 2 must be configured as Switching output value.
Inversion	Off , On	Inverts the output signal.
Output signal type	push-pull , p-switching, n-switching	Parameter function.
Limit value monitoring function	hysteresis function normally open (NO) , inactive, hysteresis function normally closed (NC), window function normally open (NO), window function normally closed (NC)	Parameter function. Inactive: Function of the switching output inactive.
Limit value monitoring signal	Flow rate , temperature, pressure	Process value signal of limit value monitoring
Switching point/window high	Input range: -99999 to 99999 (75.00)	Process value of the limit value monitoring signal.
Switch-back point/window low	Input range: -99999 to 99999 (50.00)	
Switch-on delay	Input range: 0.000 to 100.0	—
Switch-off delay	Input range: 0.000 to 100.0	
Fault behaviour	Inactive , Active, Frozen	Behaviour of the output signal in the event of a fault.

Fault behaviour

Value **Inactive**: If the parameter **Function** of digital output 2 was configured as the **Switching output** value, a process value fault sets this value to **Inactive**.

Value **Frozen**: If the parameter **Function** of digital output 1 was configured as the **Switching output** value, a process value fault has no effect on the configuration of this value.

Input/Output 2 > Digital output

Parameters	Value	Description
Function	Inactive , Reset all totalisers, Start/Stop batch, Measurement suppression	Function of the parameter for signalling at the digital input.
Inversion	Off , On	Inverts the input signal.

Measured variables > Flow rate

Parameters	Value	Description
Filter time constant	Input range: 0000 to 25.00 (0.450)	Optimisation of the measured value update. The greater the value of the filter time constant, the slower the change in the measured value on the output side. Response time t_{90} with factory setting: ≤ 2 s.
Creep quantity limit value	Input range: 0.000 to 10.00 (0.050)	Input value in % of the maximum measuring range of the nominal diameter (DN) of the equipment. No process value is output below the limit value.
Creep quantity hysteresis	Input range: 0.000 to 50.00 (10.00)	Input value in % of the creep quantity. Defines the hysteresis of the creep quantity.
Inversion	Off , On	Inverts the flow signal, e.g. if the equipment was installed in the negative flow direction.
Characteristic curve	Standard , User-defined 1 to 9	Standard: Water User-defined 1 to 9: not defined

Measured variables > Flow rate > Fine adjustment

Parameters	Value	Description
Function	Off , On	Parameter function
Initial ACTUAL value	Input range: -99999 to 99999 (0.000)	Input value for fine adjustment. Alternatively: Parameter Adopt ACTUAL initial value
ACTUAL end value	Input range: -99999 to 99999 (100.0)	Input value for fine adjustment. Alternatively: Parameter Adopt ACTUAL end value
Initial TARGET value	Input range: -99999 to 99999 (0.000)	Input value for fine adjustment.
TARGET end value	Input range: -99999 to 99999 (100.0)	
Accept initial value	ACTUAL Inactive , accept ACTUAL initial value	Move to ACTUAL initial value and accept the measured flow value with Accept ACTUAL initial value . Alternatively: Parameter ACTUAL initial value
Accept ACTUAL end value	Inactive , accept ACTUAL end value	Move to ACTUAL end value and accept the measured flow value with Accept ACTUAL end value . Alternatively: Parameter ACTUAL end value

Measured variables > Temperature

Parameters	Value	Description
Filter time constant	Input range: 0.000 to 25.00 (1.000)	Optimisation of the measured value update. The greater the value of the filter time constant, the slower the change in the measured value on the output side.
Offset	Input range: -10.00 to 10.00 (0.000)	Offset correction for zero point adjustment.

Measured variables > Pressure

Parameters	Value	Description
Filter time constant	Input range: 0.000 to 25.00 (1.000)	Optimisation of the measured value update. The greater the value of the filter time constant, the slower the change in the measured value on the output side.
Offset	Input range: -10000 to 10000 (0.000)	Offset correction for zero point adjustment.

Totaliser

Parameters	Value	Description
Counting mode Totaliser 1	Positive , Negative, Balanced	Integrate the flow rate components depending on the counting modes. Positive: only positive flow components. Negative: only negative flow components. Balanced: positive and negative flow components.
Counting mode Totaliser 2	Balanced , Positive, Negative	
Reset all totalisers	Inactive , Reset	All totalisers and carry-overs are reset.

Batch

Parameters	Value	Description
Volume	Input range: 0000 to 99999 (100.0)	Input value of the volume to be filled in the system unit of the totaliser.
Max. batch time	Input range: 0 to 9999	If the input value is exceeded, the batch is cancelled.

Simulation > Flow rate

Parameters	Value	Description
Simulation	Off , On	Parameter function.
Value	Input range: -99999 to 99999 (0.000)	Input value for the simulation.

Simulation > Temperature

Parameters	Value	Description
Simulation	Off , On	Parameter function.
Value	Input range: -99999 to 99999 (0.000)	Input value for the simulation.

Simulation > Pressure

Parameters	Pressure	Description
Simulation	Off , On	Parameter function.
Value	Input range: -99999 to 99999 (0.000)	Input value for the simulation.

8 Troubleshooting

8.1 BADU FlowSonic

8.1.1 Fault messages

Fault messages in accordance with NAMUR classification NE 107 are indicated by the equipment status LED flashing yellow or red.

Symbol	Designation
Equipment status LED Flashing yellow (f = 1 Hz, t _{on} /T= 0.5)	Out of specification (S)

Message	Cause	Remedy
Out of specification	The measuring range has been exceeded.	Observe the measuring range.
Overload on C/Q or DO	The switching outputs are overloaded.	Check the connection and load of the switching outputs.
Analogue output fault	The load on the analogue output is too high.	Observe the specified values for the load of the analogue output.
Max. pulse rate exceeded	The maximum output frequency of the pulse output has been exceeded.	Check the configuration of the pulse output.
Empty tube	The measuring tube is empty.	Fill the measuring tube or the system.
Bubbles detected	Bubbles were detected in the system.	Bleed the system.

Symbol	Designation
Equipment status LED Flashing red (f = 1 Hz, t _{on} /T= 0.5)	Fault/Failure (F)

Message	Cause	Remedy
Internal fault (TDC comm.)	Defective equipment.	Contact the manufacturer.
Flow invalid	Too many bubbles in the system.	Bleed the system.
	Defective sensor.	Contact the manufacturer.

Symbol	Designation
Equipment status LED Flashing red (f = 1 Hz, t _{on} /T= 0.5)	Fault/Failure (F)

Message	Cause	Remedy
Corrupted configuration.	The configuration data in the EEDROM is corrupted.	Transfer the configuration data to the equipment again.
Equipment not calibrated.	The equipment is not calibrated.	Contact the manufacturer.
	Defective equipment.	

8.2 BADU FlowSonic+

8.2.1 Process value error

Process value errors are displayed flashing instead of the process value. Process value errors are supplemented with error messages in accordance with NAMUR classification NE 107 using symbols and a two-line message (alternating with the process display).

Error message	Cause	Remedy
-----	No process value signal configured.	Configure a process value signal.
	The process value signal is faulty.	When rebooting the equipment: Wait for initialisation (max. 15 s) When rebooting the equipment with activated batch function: Execute batch.
+++++	Defective temperature sensor.	Contact the manufacturer.
<<<<<	The measuring range was undershot.	Operate the equipment within the device specifications.
>>>>>	The measuring range has been exceeded.	Operate the equipment within the device specifications.

8.2.2 Fault messages according to NAMUR

Fault messages in accordance with NAMUR classification NE 107 are indicated by symbols and a two-line message (alternating with the process display).

Symbol	Designation
	Fault/Failure

Message	Cause	Remedy
Internal fault (TDC comm.)	Defective equipment.	Contact the manufacturer.
Flow invalid	Too many bubbles in the system.	Bleed the system.
	Defective sensor.	Contact the manufacturer.
Temperature invalid	The measuring range has been exceeded/undercut.	Observe the measuring range.
	Defective sensor.	Contact the manufacturer.
Corrupted configuration	The configuration data in the EEPROM is corrupted.	Transfer the configuration data to the equipment again.
Equipment not calibrated	The equipment is not calibrated.	Contact the manufacturer.
	Defective equipment.	

Symbol	Designation
	Function check

Message	Cause	Remedy
Simulation active	Simulation mode is active.	Deactivate simulation mode. Alternatively: Reboot the equipment.

Symbol	Designation	
	Out of specification	

Message	Cause	Remedy
Flow invalid	The measuring range has been exceeded.	Observe the measuring range.
Temperature invalid	The measuring range has been exceeded/undercut.	Observe the measuring range.
Pressure invalid	The measuring range has been exceeded/undercut.	Observe the measuring range.
Undervoltage	Insufficient power supply to the equipment.	Check the power supply to the equipment.
Overload on C/Q or DO	The switching outputs are overloaded.	Check the connection and load of the switching outputs.
Analogue output fault	The load on the analogue output is too high.	Observe the specified values for the load of the analogue output.
Max. pulse rate exceeded	The maximum output frequency of the pulse output has been exceeded.	Check the configuration of the pulse output.
Empty tube	The measuring section is empty.	Fill the measuring section or the system.
Bubbles detected	Bubbles were detected in the system.	Bleed the system.

8.2.3 Fault message outside NAMUR

Fault messages outside NAMUR classification NE 107 are indicated by symbols and a two-line message (alternating with the process display).

Symbol	Designation	
	Caution	

Message	Cause	Remedy
Batch error	The maximum batch time was exceeded.	Check the filling volume of the batch and restart the process.
	A measurement error occurred during the batch.	Check the process for measurement errors and restart the process.

9 Maintenance

9.1 Cleaning the housing

The housing can remain installed for cleaning.

➔ Clean the equipment with a cloth moistened with water

9.2 Clean parts in contact with the medium and replace the O-ring

Prerequisites:

- The equipment was removed from the system.
- The workstation for cleaning the parts is prepared

NOTICE

Do not damage the grooves for the O-ring of the flanged bushings when removing the O-rings.

1. Remove the O-rings from the grooves.
2. Thoroughly rinse all parts that come into contact with the medium with water.
3. Check the O-ring and replace if damaged.
4. Insert the O-rings into the grooves.
5. Install the equipment in the pipe.

9.3 Decontamination

Prerequisites:

- Install the equipment.
- Have a suitable cleaning agent ready.
- Prepare the cleaning area for rinsing and neutralising all parts in accordance with the safety data sheet for the hazardous substance.

NOTICE

Do not damage the grooves for the O-ring of the flanged bushings when removing the O-rings.

NOTICE

When selecting cleaning agents, ensure that they are compatible with the materials of the components and do not cause any damage.

1. Uninstall the equipment by loosening the union nuts.
2. Remove both O-rings from the collar bushings.
3. Thoroughly rinse and neutralise all parts that come into contact with the medium with a suitable cleaning agent.
4. Ensure that the equipment is disposed of correctly. See point on page .

If the equipment will be reused after cleaning:

1. Check O-rings for damage and replace with new ones if necessary.
2. Insert O-rings into the two collar bushings.
3. Insert the equipment into the pipe and tighten the union nuts.

10 Disposal

- ➔ Collect harmful media and dispose of it according to the regulations.
- ➔ At the end of its service life, the pump/unit or individual components must be disposed of correctly. Disposal in the household waste is not permitted!
- ➔ Dispose of the packaging materials in the household waste in accordance with the local regulations.

11 Technical data

11.1 Technical data

Maximum water temperature	45 °C
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11.2 Electrical safety

Requirements	EN 61010-1:2010 + A1:2019/AC:2019 The equipment must be supplied with a circuit that fulfils the requirements for "energy-limited circuits".
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11.3 Electrical data BADU FlowSonic

Power supply Current consumption Operation with analogue output Operation with digital output Power consumption Operation with analogue output Operation with digital output Protection class	DC 18 to 30 V SELV, PELV, Class 2 ≤ 50 mA ≤ 300 mA ≤ 1.5 W ≤ 9 W DIN EN 61140, Class III (Safety extra-low voltage)
Electrical connection Pins Equipment Connection cable	 M12 plug connector M12 plug connector, open-ended cable
M12 plug connector Design	IEC 61076-2-101 4-pin, shielded
Connection cable Cable cross-section Design Cable length Temperature resistance	≥ AWG 23 4-wire, copper, shielded ≤ 20 m ≥ 80 °C

11.4 Electrical data BADU FlowSonic+

Power supply Current consumption Power consumption Protection class	DC 18 to 30 V SELV, PELV, Class 2 ≤ 100 mA, with switching outputs ≤ 600 mA ≤ 10 W DIN EN 61140, Class III (Safety extra-low voltage)
Electrical connection Pins Equipment Connection cable	 M12 plug connector M12 plug connector, cable with plug-in power supply unit
M12 plug connector Design	IEC 61076-2-101 4-pin, shielded
Connection cable Cable cross-section IO Link operation Circuit outputs Design Cable length Temperature resistance	 ≥ AWG 28 ≥ AWG 21 4-wire, copper, shielded ≤ 20 m ≥ 80 °C
Earthing cable Cable cross-section Design Temperature resistance	1.5 mm ² 1-wire, copper ≥ 80 °C

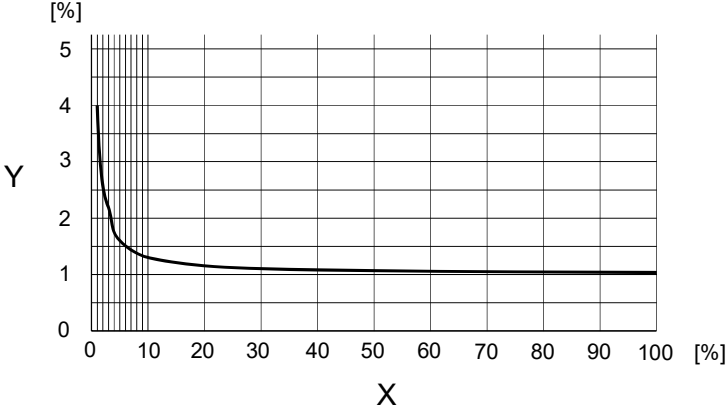
11.5 Inputs

11.5.1 Measured variables

Reference conditions

Measuring medium	Water
Temperature of medium	23 °C ± 5 K
Ambient temperature	23 °C ± 5 K
Pressure of medium	1 to 4 bar
Measuring tube	Horizontal installation, compliance with the required inlet and outlet distances

Flow rate

Max measurement range:	54 m³/h
Accuracy Pulse output Current output Voltage output Reproducibility Temperature drift Response time	$\leq \pm 1.0 \%$ of the measured value $\pm 0.03 \%$ of the max. measuring range As pulse output, plus $\leq \pm 0.1 \%$ of 16 mA As pulse output, plus $\leq \pm 0.1 \%$ of 10 V $\leq \pm 0.5 \%$ of the measured value $\pm 0.03 \%$ of the max measuring range $\leq \pm 0.05 \%$ of the measured value per 10 K temperature change (at -20 to +80 °C) $t_{90} \leq 2 \text{ s}$
X = max. measuring range Y = deviation from measured value $\pm$	BADU FlowSonic+ 

Temperature

Measuring range	-40 to +125°C
Accuracy	$\pm 2 \text{ K}$

11.5.2 Digital inputs (BADU FlowSonic+)

Function	Reset totalisers, Start/Stop batch, Measurement suppression
Type	Logic input (external voltage source)
Switching voltage V_{DI}	DC $-30 \text{ V} \leq V_{DI} \leq +30 \text{ V}$
Contact	Against reverse polarity and voltage peaks
Internal resistance	$> 100 \text{ k}\Omega$
Switching thresholds	PLC level: logical "0" $< 7 \text{ V}$, logical "1" $> 15 \text{ V}$

11.6 Outputs

11.6.1 Analogue outputs

Current output Function	BADU FlowSonic Output of the process value, output of a fault message signal and display via equipment status LED
Signal range	BADU FlowSonic+ Output of the process values flow rate or temperature, output of a fault message signal
Signal limits	4 to 20 mA
Error message	3.8 to 20.5 mA
Temperature influence	3.4 or 22 mA
Burden	75 ppm/K
Burden influence	$\leq 500 \Omega$
	$\leq \pm 0.02 \% \text{ per } 100 \Omega$
Voltage output Function	BADU FlowSonic Output of the process value, output of a fault message signal and display via equipment status LED
Signal range	BADU FlowSonic+ Output of the process values flow rate or temperature, output of a fault message signal
Signal limits	DC 0 to 10 V
Error message	DC 0 to 10.3 V
Temperature influence	DC 0 or 11 V
Load	75 ppm/K
Load influence	$\geq 700 \Omega$ (BADU FlowSonic); $\geq 2000 \Omega$ (BADU FlowSonic+)
	$\leq \pm 15 \text{ mV}$

11.6.2 Digital outputs

Type	Transistor output as switching output (BADU FlowSonic+) or pulse output (I/O pin 1 only)
Contactor	Against reverse polarity, short circuit and overload
Output signal	Push-pull, PNP, NPN
Current carrying capacity	$\leq 200 \text{ mA}$
Voltage drop	$\leq 2 \text{ V}$ (BADU FlowSonic); $\leq 3 \text{ V}$ (BADU FlowSonic+)
Switching output (BADU FlowSonic+ only) Function	Limit value monitoring
Input signal	Flow, temperature or pressure (optional)
Output signal	Limit value switch, batch active, batch fault, equipment fault
Switch-on and switch-off delay	0 to 100 s
Limit value function	Hysteresis (NO/NC contact), window (NO/NC contact), switch-on and switch-off delay
Switching point	Configurable
Pulse output Function	Output of the process value flow rate
Pulse rate	0 to 10 kHz
Duty cycle	50 %
Output value for nominal diameter DN 50	667 pulses per litre (l)

11.7 Interfaces (BADU FlowSonic+)

11.7.1 Bluetooth

Functions	Equipment configuration, transfer of configuration data and equipment information, display of process values
Communication	Via end device with app
Authentication	Via Bluetooth radio module and NFC tag
Connection status (configurable)	
Permanent	Active
Temporary	Restricted (via NFC)
Range	10 m
Radio frequency	
Bluetooth radio module	2.45 GHz
NFC tag	13.56 MHz
Max. transmission power	
Bluetooth radio module	0 dBm
NFC tag	-
App	
System requirements	iOS device from iPhone 7 (recommended) with iOS 13 Android device Android 8.0 or higher

11.8 Display

Type	TFT display
Size	
Display area	35.04 × 28.03 mm
Diagonal screen	1.77"
Resolution	128 × 160 RGB
Brightness	16 levels (configurable)
Rotation	0°, 90°, 180°, 270° (configurable)

11.9 Environmental influences

Permissible ambient temperature	DIN 60068-2-1, DIN 60068-2-2
At medium temperature $\leq 45\text{ °C}$	-20 to +60°C
Permissible storage temperature	-20 to +60°C
Climatic conditions Climate class Temperature range Relative humidity	DIN EN 60721-3-1, DIN EN 60721-3-3, DIN EN 60068-2-78 3K6 -20 to +55°C $\leq 100\%$ – Condensation on the outer casing of the equipment
Protection type	DIN EN 60529, EN 50102 IP65, IP67
Electromagnetic compatibility (EMC) Interference emission Interference immunity	DIN EN 61326-1, DIN EN 61326-2-3 Class B* Industry requirements
BADU FlowSonic+ only Oscillation resistance Vibration resistance Shock resistance	DIN EN 60068-2-6, DIN EN 60068-2-27 5 g at 10 to 2000 Hz 20 g above 11 ms
BADU FlowSonic only Oscillation Deflection Acceleration	DIN EN 60068-2-6 0.35 mm at 10 to 2000 Hz 50 m/s ² at 10 to 2000 Hz
BADU FlowSonic only Shock Peak acceleration Shock duration	DIN EN 60068-2-27 200 m/s ² 11 ms
Pressure Equipment Directive	2014/68/EU

* The product is suitable for industrial, domestic and small commercial use.

11.10 Mechanical properties

11.10.1 Materials

Housing	PA66-GF25
Display cover	PMMA
Components in contact with medium Measuring tube Transducer Seals, transducer	PP PEEK EPDM

11.10.2 Nominal pressure

Nominal pressure stage DN 50	PN 10
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11.11 Measuring media

Type of medium	Conductive or non-conductive liquids
Viscosity	$\leq 100\text{ mPas}$
Foreign matter content Solids Gases	$\leq 5\text{ Vol-}\%$ $\leq 1\text{ Vol-}\%$
Temperature of medium Temperature range	0 to +45°C

11.12 Dimensional drawing

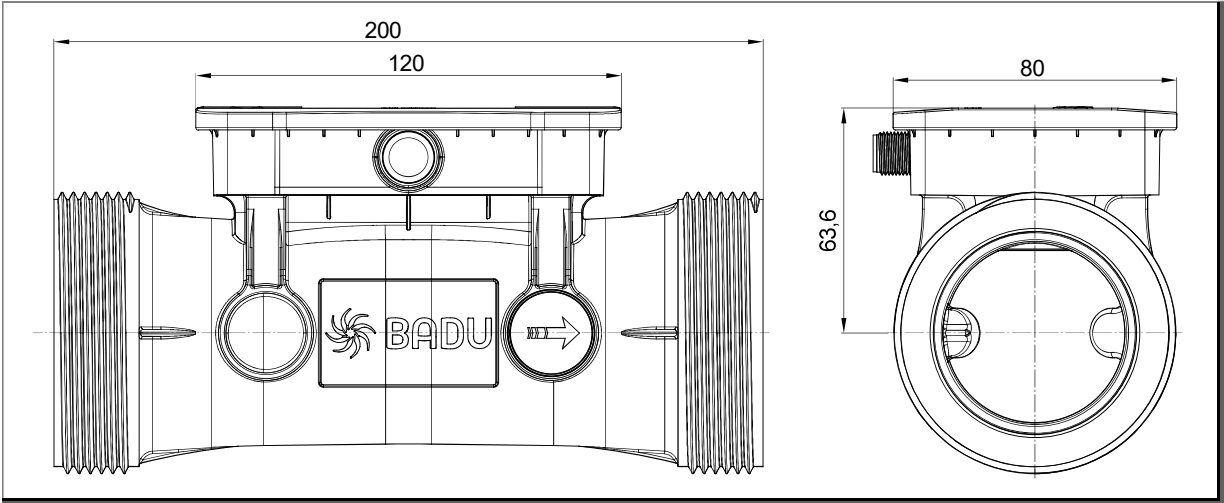


Fig. 25

UKCA Declaration of Conformity

Herewith we declare that the pump unit

BADU FlowSonic

Applied standard in particular:

EN 61326-1:2013

EN 61326-2-3:2013

UKCA Authorised Representative

Comply Express Ltd
Unit C2 Coalport House
Stafford Park 1
Telford, TF3 3BD
UK



i.V. Sebastian Watolla
Technical director



Armin Herger
Managing Director

UKCA Declaration of Conformity

Herewith we declare that the pump unit

BADU FlowSonic+

Applied standard in particular:

EN 61326-1:2013

EN 61326-2-3:2013

EN 61010-1:2010+A1:2019/AC:2019

EN 62479:2010

EN 300 328:V2.2.2

EN 300 330:V2.1.1

UKCA Authorised Representative

Comply Express Ltd
Unit C2 Coalport House
Stafford Park 1
Telford, TF3 3BD
UK



i.V. Sebastian Watolla
Technical director



Armin Herger
Managing Director

EG-Konformitätserklärung

EC declaration of conformity | Déclaration CE de conformité | EG-verklaring van overeenstemming | Dichiarazione CE di conformità | Declaración de conformidad

Hiermit erklären wir, dass das Pumpenaggregat/Maschine

Hereby we declare that the pump unit | Par la présente, nous déclarons que l'agrégat moteur-pompe | Hiermee verklaren wij, dat het pompaggregat | Con la presente si dichiara, che la il gruppo pompa/la macchina | Por la presente declaramos que la unidad de bomba

Baureihe

Series | Série | Serie | Serie | Serie

BADU FlowSonic

folgenden einschlägigen Bestimmungen entspricht:

is in accordance with the following standards: | correspond aux dispositions pertinentes suivantes: | in de door ons geleverde uitvoering voldoet aan de eisen van de in het vervolg genoemde bepalingen: | è conforme alle sequenti disposizioni pertinenti: | cumple las siguientes disposiciones pertinentes:

EMV-Richtlinie 2014/30/EU

EMC-Machine directive 2014/30/EU | Directives CE sur la compatibilité électromagnétique 2014/30/UE | Richtlijn 2014/30/EU | Direttiva di compatibilità elettromagnetica 2014/30/EU | directiva 2014/30/UE

EG-Richtlinie 2011/65/EG (RoHS)

Directive 2011/65/EC (RoHS) | Directive CE 2011/65 (RoHS) | EG-Richtlijn 2011/65/EG (RoHS) | Direttiva 2011/65/CE (RoHS) | CE-Directiva 2011/65/EG (limitación de utilización de determinados productos peligrosos en aparatos eléctricos y electrónicos y electrónicos)

Angewendete harmonisierte Normen, insbesondere

According to the provisions of the harmonized standard for pumps in particular | Normes harmonisées appliquées, notamment | Gebruikte geharmoniseerde normen, in het bijzonder | Norme armonizzate applicate in particolare | Normas armonizadas aplicadas, especialmente

EN 61326-1:2013

EN 61326-2-3:2013



i.V. Sebastian Watolla

Techn. Leiter | Technical director | Directeur technique | Technisch directeur | Direttore tecnico | Director técnico



Armin Herger

Geschäftsführer | Managing Director | Gérant | Bedrijfsleider | Amministratore | Gerente

91233 Neunkirchen am Sand, 15.01.2025

SPECK 

SPECK Pumpen Verkaufsgesellschaft GmbH
Hauptstraße 3, 91233 Neunkirchen am Sand, Germany

EG-Konformitätserklärung

EC declaration of conformity | Déclaration CE de conformité | EG-verklaring van overeenstemming | Dichiarazione CE di conformità | Declaración de conformidad

Hiermit erklären wir, dass das Pumpenaggregat/Maschine

Hereby we declare that the pump unit | Par la présente, nous déclarons que l'agrégat moteur-pompe | Hiermee verklaren wij, dat het pompaggregat | Con la presente si dichiara, che la il gruppo pompa/la macchina | Por la presente declaramos que la unidad de bomba

Baureihe

Series | Série | Serie | Serie | Serie

BADU FlowSonic+

folgenden einschlägigen Bestimmungen entspricht:

is in accordance with the following standards: | correspond aux dispositions pertinentes suivantes: | in de door ons geleverde uitvoering voldoet aan de eisen van de in het vervolg genoemde bepalingen: | è conforme alle sequenti disposizioni pertinenti: | cumple las siguientes disposiciones pertinentes:

EG-Richtlinie 2011/65/EG (RoHS)

Directive 2011/65/EC (RoHS) | Directive CE 2011/65 (RoHS) | EG-Richtlijn 2011/65/EG (RoHS) | Direttiva 2011/65/CE (RoHS) | CE-Directiva 2011/65/EG (limitación de utilización de determinados productos peligrosos en aparatos eléctricos y electrónicos y electrónicos)

Funkanlagen-Richtlinie 1999/5/EG

Radio system directive 1999/5/EC | Directive Équipements hertziens 1999/5/CE | Richtlijn 1999/5/EG betreffende radioapparatuur en telecommunicatie-eindapparatuur | Direttiva sulle apparecchiature radio 1999/5/CE | Directiva de equipos radioeléctricos 1999/5/CE

Angewendete harmonisierte Normen, insbesondere

According to the provisions of the harmonized standard for pumps in particular | Normes harmonisées appliquées, notamment | Gebruikte geharmoniseerde normen, in het bijzonder | Norme armonizzate applicate in particolare | Normas armonizadas aplicadas, especialmente

EN 61326-1:2013

EN 61326-2-3:2013

EN 61010-1:2010+A1:2019/AC:2019

EN 62479:2010

EN 300 328:V2.2.2

EN 300 330:V2.1.1



i.V. Sebastian Watolla

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Technisch directeur | Direttore tecnico | Director técnico



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91233 Neunkirchen am Sand, 15.01.2025

SPECK 

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 Pollet Pool Group