User manual

Your success counts

B-Smart

FLOWRATE INDICATOR / TOTALIZER

Signal input:	***pulse, NAMUR or coil flow meter signal***
Signal outputs:	***analog reflecting flowrate and scaled pulse reflecting total***

CE UKCA

B-Series - Basic indicators for ordinary locations
More info: www.fluidwell.com/bseries.

TABLE OF CONTENTS

1 ABOUT THIS MANUAL

1.1 HOW TO USE THIS MANUAL

This operation manual is divided into two main parts:

- The daily use of the B-Smart is described in **Section 4: Operation [»8]**. These instructions are meant for users / operators.
- All subsequent sections and appendices are meant for electricians/technicians. These provide a detailed description of all software settings and hardware installation guidance.

Always follow the instructions in this manual, especially the safety information. For additional information, please contact your supplier.

1.2 USE OF PICTOGRAMS

A hazardous situation may occur if the unit is not used for the purpose it was designed for or is used incorrectly. The following pictograms inform you of important information:

A warning indicates a hazardous situation that could cause injury or death.

A caution indicates a condition that could cause:

- moderate/minor personal injury or equipment damage.
- incorrect functioning of the unit or connected instruments.

A note informs you of important information.

1.3 WARRANTY AND TECHNICAL SUPPORT

For warranty and technical support on your Fluidwell products, visit our internet site www.fluidwell.com or contact us at support@fluidwell.com.

1.4 MODEL REFERENCE

Hardware version:	03.32.xx
Software version:	03.06.xx
Document version:	FW_B-SMART_M_v2501-01_EN
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2 SAFETY

2.1 PERSONAL SAFETY

- Risk of electric shock: Only open the unit if all leads are free of potential electrical energy.
- Immediately inform the person responsible for the installation if you disagree with the safety precautions or if you detect errors or danger.

2.2 END-USER RESPONSIBILITIES

- Installation, use, and servicing of the unit must be done by trained and authorized technicians.
- This unit is not designed for use in life support appliances, devices, or systems where malfunction of the product could result in personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.
- Check all connections, settings and technical specifications of all peripheral devices supplied with the unit.
- The unit must be installed in accordance with the EMC (Electro Magnetic Compatibility) guidelines.
- The local labor and safety laws, and regulations must be adhered to.
- Modifying the unit without prior written consent from the manufacturer will result in the immediate termination of product liability and warranty period.
- The manufacturer accepts no responsibility whatsoever if the safety information and instructions in this manual are not observed.

2.3 POTENTIAL EQUIPMENT DAMAGE

- Before installing the unit, check the mains voltage and information on the manufacturer's label for product configuration.
- Electro Static Discharge (ESD) causes irreparable damage to electronics. When installing or opening the unit, the technician should first discharge him- or herself by touching a well-grounded object.
- Never touch the electronic components without properly grounded tools.
- Never expose the unit to conditions that may exceed the enclosure classifications as indicated by the manufacturer's label and in the chapter **Section 6.1: Installation / environmental conditions [»17]**.

2.4 DISPOSAL OF ELECTRONIC WASTE

At the end of its life this product should be disposed of according to the (inter)national regulations regarding waste electronic equipment. If a battery is installed in this product, it should be disposed of separately. The separate collection and recycling of your waste equipment will help to conserve natural resources and ensure that it is recycled in a manner that protects the environment.

3 INTRODUCTION

3.1 SYSTEM DESCRIPTION

The flow rate indicator / totalizer model B-Smart is a microprocessor-driven instrument designed to show the current flow rate, resettable total, non-resettable accumulated total, and to transmit flow rate and totals.

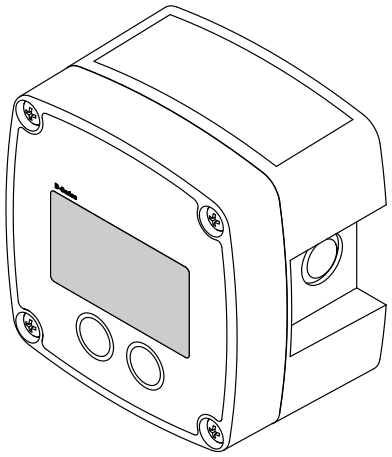


Fig. 1: The B-Smart

This manual describes the daily use, configuration and installation of the B-Smart with pulse input from a flow meter.

The following figure shows the B-Smart used in a typical installation.

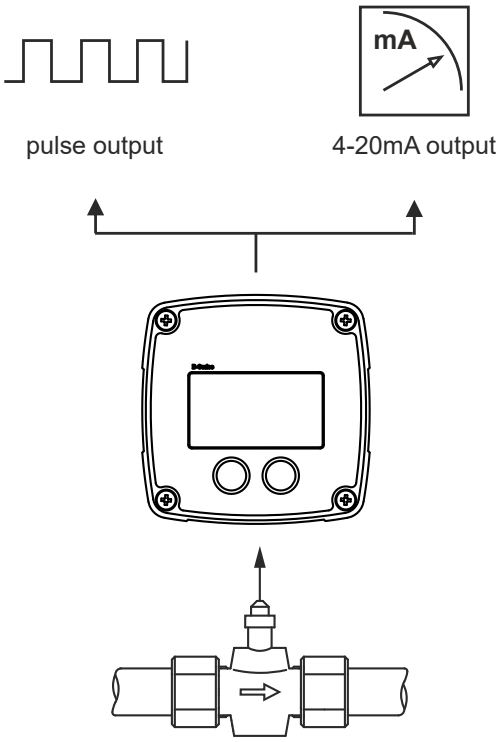


Fig. 2: Typical application

3.2 PRODUCT FEATURES

General characteristics

- User friendliness: easy two button operation
- Good readings in full sunlight and darkness through bright backlight
- Mounting flexibility through compact and durable IP65 enclosure for field, wall or meter mounting
- Ability to process most common pulse signals

- Multiple power supply options, including battery and 10-30 V
- Configurable pulse and analog signal outputs.

Configuration

The B-Smart can be used for many types of application and has a SETUP mode to allow for configuring it to your requirements. See **Section 5: Configuration [»10]** for further information.

All settings are stored in an EEPROM memory so they will not be lost if there is a power failure.

Input

- One flow meter with a passive or active pulse, NAMUR or coil signal output
- Several options are available for powering the sensor.

Output

- One configurable pulse output to transmit pulses representing the passing of a pre-set quantity.
- One configurable 4-20 mA analog output representing the actual flow rate.

Backlight

A backlight is standard available (externally powered only).

3.3 INSTALLATION EXAMPLE

Following parts can be recognized in below installation example.

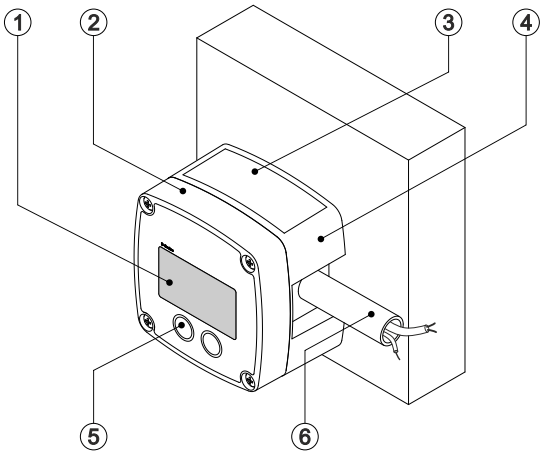


Fig. 3: Installation example B-Smart

1. Display	3. Label	5. Keys
2. Front cover	4. Back cover	6. Cable entry

4 OPERATION

CAUTION

This product may only be operated by authorized and trained personnel who have read and understood this manual, particularly **Section 2: Safety [»5]**.

4.1 INTRODUCTION

This chapter describes the daily use and operation of the B-Smart. For this, the B-Smart is equipped with a control panel that provides the operator with various functions, information and operating modes.

4.1.1 OPERATING MODES

The following operating mode are available:

- **OPERATOR**-mode
  This is the default mode of operation and mode indicator RUN is shown on the display. This mode is available for all operators and gives access to the other modes. The available functions and rights depend on the type of unit and configured settings. The unit will always return to this mode when there is no user interaction for some time in any of the other modes.
- **SETUP**-mode
  This mode allows to review all configuration settings using a SETUP-menu. The mode indicator SET-UP is shown on the display and access can be restricted via a password. After selecting a configuration item, it can be changed using the PROGRAM-mode.
- **PROGRAM**-mode
  This mode is used to change settings in the SETUP-menu, enter values in OPERATOR-mode or enter a password. When a setting is being changed, this is indicated by the mode indicator PROG on the display.

The following paragraphs describe the modes of operation in more detail. SETUP-mode and PROGRAM-mode are described in **Section 5: Configuration [»10]**.

4.2 CONTROL PANEL

The control panel is located on the front side of the B-Series.

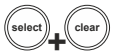
- A Liquid Cristal Display (LCD) to show process values and various other information.
- Two keys (SELECT, CLEAR) to control the unit during operation.

Functions of the keys in Operator Mode

SELECT-key
This key is used to

- Select the displayed information
- Gain access to the SETUP-mode.

CLEAR-key
This key is used to clear the value of total.



SELECT + CLEAR keys simultaneously
Press both keys simultaneously to program and save new values or settings.

4.2.1 DISPLAY

In the B-Smart, all inputs and outputs are continuously processed in the background. The relevant process information is then displayed on a selection of screens when the product is in OPERATOR-mode.

The display contains one line with larger digits and one line with smaller characters below that. The top line displays key process information, while the bottom line usually displays additional information or system messages. Also, measurement unit and symbols to indicate operating mode, function, and status may be displayed.

Normally, the display is updated once per second. By pressing any key, the display switches to refreshing the information 8 times per second. After 30 seconds of key inactivity, the display returns to the standard refresh rate.

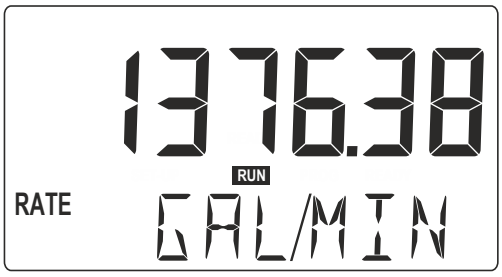


Fig. 4: Example of display information during process

4.3 DISPLAYED INFORMATION

By pressing the SELECT-key, the operator may scroll through a succession of screens showing various process values. The following table shows the available screens.

Selected display	Displayed information
MAIN SCREEN	Flow rate
SCREEN 1	Total (possibility to reset Total)
SCREEN 2	Accumulated Total

4.3.1 FLOW RATE

The main screen shows the actual flow rate. The configured unit of measurement is indicated on the bottom line of the display.
The value is show according to the configuration settings. When the flow rate is too high to display, “- - - - - -“ is shown.

4.3.2 TOTALIZED FLOW AND ACCUMULATED TOTAL

A resettable Total and non-resettable Accumulated Total are available. Both totalizers count up to 9,999,999 before rolling over to 0. The unit and number of decimals are displayed according to the configuration settings for Total.

4.3.3 CLEAR TOTAL

The value for Total can be cleared and reset to zero. To do so, press CLEAR while Total is shown (SCREEN 1). The flashing text "CLEAR – NO YES" is displayed. When CLEAR is pressed for a second time, Total is reset to zero. To avoid re-initialization at this stage, press the SELECT key or wait for 20 seconds.
Re-initialization of Total DOES NOT influence the Accumulated Total.

4.4 OPERATOR ALARMS

4.4.1 LOW BATTERY

When the battery voltage drops. When the battery voltage becomes too low, the text “LOW bAT” will be displayed, an indication that the operation becomes less reliable. Install a fresh battery as soon as possible when this indication comes on, to keep a reliable operation.

See **Section 7.3: Battery replacement [»25]** for further information.

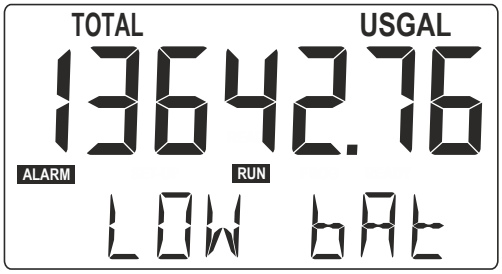


Fig. 5: Example of low-battery alarm

4.4.2 ALARM

When “ALARM” is displayed, press SELECT to display the alarm code. Consult **Section B: Troubleshooting [»29]** for more information.

5 CONFIGURATION

5.1 INTRODUCTION

This chapter describes how technicians can use configuration settings to configure the B-Smart for optimal functionality. Configuration is done in SETUP mode, using the front keys.

Also, the B-Smart can be configured by PC with our Remote Configuration Tool. Besides the possibility to configuring the unit, this solution offers up- and download and printing of all settings. The Remote Configuration Tool software package can be downloaded free of charge from our website at www.fluidwell.com/software, and installed on a Microsoft® Windows® PC. The package also contains a quick-start manual with detailed instructions to successfully connect the PC and your B-Series.

Connection between the service port of the B-Smart and the PC is made by using a special cable (to be ordered separately). For more info see **Section 6.5.5: Service port [»24]**.

5.2 CONFIGURING USING SETUP MODE

For an overview of Operating modes, see **Section 4.1.1: Operating modes [»8]**.

CAUTION

Changing settings may influence current operation

In SETUP mode the unit remains fully operational. Make sure the product is not being used for any application when changing settings.

5.2.1 ENTERING SETUP MODE

1. Press the SELECT-key for 7 seconds. During this, the symbol SET-UP will be flashing. You may be prompted to enter a password.
2. The SET-UP indicator is now activated on the display and the RUN indicator is deactivated.

5.2.2 NAVIGATING THE SETUP MENU

The SETUP menu contains several menu groups, which each contain various menu items. Each menu item has a unique number which is displayed at the bottom of the display. Additionally, each menu item is expressed with a keyword.
The menu number is a combination of two figures separated by a dot:

- the first figure indicates the selected menu group (e.g. 1. TOTAL).
- the second figure indicates the menu item (e.g. 1.1 UNIT).

The following image shows the layout of the menu structure:

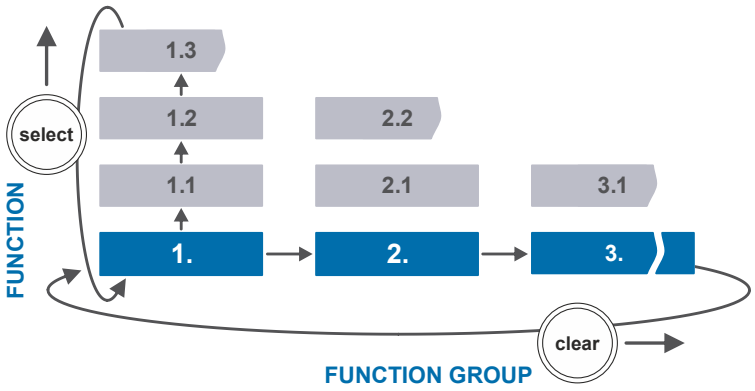


Fig. 6: SETUP menu layout and navigation

Navigate the SETUP menu with the following functions:

select

SELECT-key
This key selects the next function in the list (e.g. 1. → 1.1. → 1.2. → 1.... → 1.)
When the top of the list is reached, it will return to the function group selection level.

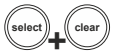
CLEAR-key
When only a function group is indicated in the display (one digit), this key scrolls through the function groups (1. → 2. → 3.)
When a function group is entered (two digits in display), this key is used to select the previous function in the list (e.g. 1.2 → 1.1 → 1). When the bottom of the list is reached, it will return to the function group selection.

5.2.3 CHANGING CONFIGURATION SETTINGS

A menu item either contains a value (a number with optionally a decimal point and sign, e.g. -123.45) or a selection list (e.g. L – m^3 - USGAL). After a menu item is selected in the SETUP menu, a new value can be programmed by performing the following steps. During the programming sequence, the PROG indicator is shown on the display.

When programming new values, changes will only be set after both keys have been pressed simultaneously to confirm the new value (Step 3)!

Step 1: Start the programming sequence



SELECT + CLEAR
When a menu item is selected in the SETUP menu, pressing both keys simultaneously starts the programming sequence.

Step 2a: Change a value

SELECT
This key is used to increment the selected digit or to select the next position of the decimal point.

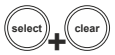
CLEAR
This key is used to select the next digit or to select the previous position of the decimal point.

Step 2b: Change the selection in a list

SELECT
This key is used to select the next item in the list (e.g. L → m^3 → USGAL).
At the end of the list, the selection will wrap around to the first selection.

CLEAR
This key is used to select the previous item in the list (e.g. USGAL → m^3 → L).
At the bottom of the list, the selection will wrap around to the last selection.

Step 3: Finish the programming sequence



SELECT + CLEAR
During the programming sequence, pressing the keys simultaneously confirms the new value and returns to SETUP mode. To cancel the operation, wait for 20 seconds: the programming sequence is cancelled and the former value is reinstated.

5.2.4 RETURNING TO OPERATOR MODE

When all configuration settings are set correctly, return to OPERATOR mode by pressing the SELECT-key for three seconds, or do not press any key for 2 minutes to return automatically. The RUN indicator is now activated on the display and the PROG indicator is deactivated.

5.3 SETUP MENU OVERVIEW

1	TOTAL		DEFAULT
1.1	UNIT	L - m3 - kg - lb - GAL - USGAL - bbl - no unit	L
1.2	DECIMALS	0 - 3	0
1.3	K-FACTOR	0.000010 - 9,999,999	1
1.4	DECIMALS K-FACTOR	0 - 6	0

2	RATE		DEFAULT
2.1	UNIT	mL - L - m3 - g - kg - ton - GAL - bbl - lb - cf - no unit	L
2.2	TIME	sec - min - hour - day	min
2.3	DECIMALS	0 - 3	0
2.4	K-FACTOR	0.000010 - 9,999,999	1
2.5	DECIMALS K-FACTOR	0 - 6	0
2.6	PULSES	1 - 99	10
2.6	FILTER	1 - 99	1

3	METER		DEFAULT
3.1	SIGNAL	coil - reed - NPN - PNP - Namur	coil

4	A-OUT		DEFAULT
4.1	OUTPUT	enable - disable	disable
4.2	RATE-MIN	0.000 - 9,999,999	0
4.3	RATE-MAX	0.000 - 9,999,999	99,999
4.4	TUNE-MIN	0000 - 9999	Factory set
4.5	TUNE-MAX	0000 - 9999	Factory set

5	D-OUT		DEFAULT
5.1	MODE	off - long - inter - short	off
5.2	DECIMALS	0 - 3	0
5.3	AMOUNT	0.000 - 9,999,999	0

6	OTHER		DEFAULT
6.1	MODEL	fixed	BASIC71
6.2	SOFTWARE VERSION	fixed	03.06.xx
6.3	SERIAL NUMBER	fixed	xxxxxxx
6.4	PIN	0000 - 9999	0000
6.5	BACKLIGHT	off - on	off

5.4 SETUP MENU EXPLANATIONS

5.4.1 MENU 1: TOTAL

Settings for total and flow rate are independent of each other. In this way, different settings like units of measurement can be used for each.

Calculating the K-factor for Total and Flow rate

The K-factor is used to convert the flow meter pulse frequency to a quantity. Two examples are given.

Example 1

- The flow meter generates 2.4813 pulses per liter.
- The Total will be displayed using cubic meters (m3; **1.1: TOTAL > UNIT**).
- A cubic meter equals 1000 liters, thus the flow meter generates 2,481.3 pulses per m3.
- Enter the K-factor as 248130 at **1.3: TOTAL > K-FACTOR** and 2 at **1.4: TOTAL > DECIMALS K-FACTOR**.

Example 2

- The flow meter generates 6.5231 pulses per gallon.

- The Total will be displayed using gallons (**1.1: TOTAL > UNIT**).
- Enter the K-factor as 652310 at **1.3: TOTAL > K-FACTOR** and 5 at **1.4: TOTAL > DECIMALS K-FACTOR**.

1	TOTAL	
	NOTE	*Changing the measurement unit will have consequences for operator and setup values. Please note that the K-factor should be checked also. Recalculation is not done automatically.*
1.1	UNIT	Determines the measurement unit for (accumulated) total, which is also used in configuration of the scaled pulse output. The following units can be selected: L - m3 - kg - lb - GAL - USGAL - bbl - no unit
1.2	DECIMALS	Determines for Total and Accumulated Total the number of decimals. The following can be selected: 0 - 3
1.3	K-FACTOR	This value is used to convert the flow meter pulse signals into a Total. The K-Factor is based on the number of pulses generated by the flow meter per measurement unit selected in **1.1: TOTAL > UNIT**. NOTE *Accuracy of the measurement system depends on the accuracy of the K-factor.* Examples are given above.
1.4	DECIMALS K-FACTOR	This setting determines the number of decimals for the K-factor (**1.3: TOTAL > K-FACTOR**). The following can be selected: 0 - 6 Please note that this setting influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits set for Unit (**1.2: TOTAL > DECIMALS**).

5.4.2 MENU 2: RATE

CAUTION Rate settings also apply to the Analog Output settings.

2	RATE	
	NOTE	*Changing the measurement unit will have consequences for operator and setup values. Please note that the K-factor should be checked also. Recalculation is not done automatically.*
2.1	UNIT	Determines the measurement unit for the flow rate. The following can be selected: mL - L - m3 - g - kg - ton - GAL - bbl - lb - cf - no unit
2.2	TIME	The flow rate can be calculated in units per second (SEC), minute (MIN), hour (HR) or day (DAY).
2.3	DECIMALS	Determines the number of decimals for the flowrate. The following can be selected: 0 - 3
2.4	K-FACTOR	The K-factor is used to convert the flow meter pulse signals to a flowrate unit. The K-factor is based on the number of pulses generated by the flow meter per measurement unit selected in **2.1: RATE > UNIT**. NOTE *Accuracy of the measurement system depends on the accuracy of the K-factor.* Examples are given above.

2	RATE				
2.5	DECIMALS K-FACTOR	This setting determines the number of decimals for the K-factor (**2.4: RATE > K-FACTOR**). The following can be selected: 0 - 6 Please note that this parameter influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for flow rate (**2.3: RATE > DECIMALS**).			
2.6	PULSES	The flowrate is calculated by measuring the time between a number of pulses, for example 10. This allows for irregular, pulsing or quickly varying pulse rates to be smoothed out resulting in a steady flowrate indication. Increasing the number of pulses (1->99) results in a more stable reading, but also increases the time before new flowrate information becomes available. Setting the number of pulses below 5 is only advised for installations where the incoming pulse frequency has very little variation.			
2.6	FILTER	When variations of the flowrate on the display over a longer period of time are not wanted, the filter setting can be used to stabilize the flowrate reading. The filter principal is based on three input values: the filter level (1-99), the last calculated flowrate, and the last average value. The higher the filter level, the longer it takes to reach the final value (see table below). Setting the filter level to 1 disables the filter. NOTE *The analog output uses the calculated flow rate after the filter has been applied. This means that both the display and the analog output will be updated with the rate set by the filter.*			
	RESPONSE TIME ON STEP CHANGE OF INPUT VALUE (IN % OF END VALUE)				
	Filter value	50%	75%	90%	99%
	01	filter disabled	filter disabled	filter disabled	filter disabled
	02	0.1 sec	0.3 sec	0.5 sec	0.9 sec
	03	0.3 sec	0.5 sec	0.8 sec	1.5 sec
	05	0.5 sec	0.9 sec	1.4 sec	2.6 sec
	10	0.9 sec	1.8 sec	2.8 sec	6 sec
	20	1.8 sec	3.5 sec	6 sec	11 sec
	30	2.6 sec	5 sec	9 sec	17 sec
	50	4.4 sec	9 sec	14 sec	29 sec
	75	7 sec	13 sec	22 sec	43 sec
	99	9 sec	17 sec	28 sec	57 sec

5.4.3 MENU 3: METER

3	METER				
3.1	SIGNAL	Selects the type of input sensor pickup / signal. The B-Smart can process several types of input signal.			
	FLOW METER SELECTION CHARACTERISTICS				
	TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ / mV pp	REMARKS
	NPN	NPN input	100 kΩ pull-up	max. 6 kHz	Open collector
	REED	Reed-switch input	1 MΩ pull-up	max. 120 Hz	
	PNP	PNP input	47 kΩ pull-down	max. 6 kHz	
	NAMUR	NAMUR input	820 Ω pull-down	max. 4 kHz	External power required
	COIL	Coil input	-	min. 30 mV pp	

5.4.4 MENU 4: A-OUT

An analog 4-20 mA signal is generated according to the flowrate. The settings for flow rate (SETUP **2: RATE**) influence the analog output directly and should be configured first. The relationship between rate and analog output is set with the following functions.

4	**A-OUT**	
4.1	OUTPUT NOTE	To minimize power consumption and save battery life, the analog output can be disabled. With this variable set to DISABLE, current will be fixed at less than 3.4 mA. The following can be selected: enable - disable *While powering up the loop, the initial current is approximately 3.3 mA. It may take some seconds before the analog output is stable.*
4.2	RATE-MIN NOTE	This setting sets the flow rate value at which the analog output should generate 4 mA. Often this will be 0. The unit, time and decimals are according to SETUP **2: RATE**. *The analog output value can be programmed "upside down". If desired, enter the high flow rate value here.*
4.3	RATE-MAX NOTE	This setting sets the flow rate value at which the analog output should generate 20 mA. Often this will be set to the maximum flow level. The unit, time and decimals are according to **2: RATE**. *The analog output value can be programmed "upside down". If desired, enter the low flow rate value here. For example, entering 0 will cause an output current of 20 mA at zero flow.*
4.4	TUNE-MIN WARNING	The initial minimum analog output value is 4 mA. However, this value might differ slightly due to external influences such as temperature for example. The 4 mA value can be tuned precisely with this setting. **Before tuning the signal, make sure the analog output is not being used for any application!** After pressing SELECT+CLEAR simultaneously, the current will be about 4 mA. The current can be increased / decreased by pressing one of the keys. The new value will become active after pressing SELECT+CLEAR again.
4.5	TUNE-MAX WARNING	The initial maximum analog output value is 20 mA. However, this value might differ slightly due to external influences such as temperature for example. The 20 mA value can be tuned precisely with this setting. **Before tuning the signal, make sure the analog output is not being used for any application!** After pressing SELECT+CLEAR simultaneously, the current will be about 20 mA. The current can be increased / decreased by pressing one of the keys. The new value will become active after pressing SELECT+CLEAR again.

5.4.5 MENU 5 D-OUT

NOTE *The digital transistor output has a maximum frequency of 100 Hz.*

5	**D-OUT**	
5.1	MODE	Sets pulse output length. The following choices are available: • **Off**: output is switched off • **Long**: pulse length is 100 ms (max. 5 Hz) • **Inter**: pulse length is 15 ms (max. 33 Hz) • **Short**: pulse length is 5 ms (max. 100 Hz).

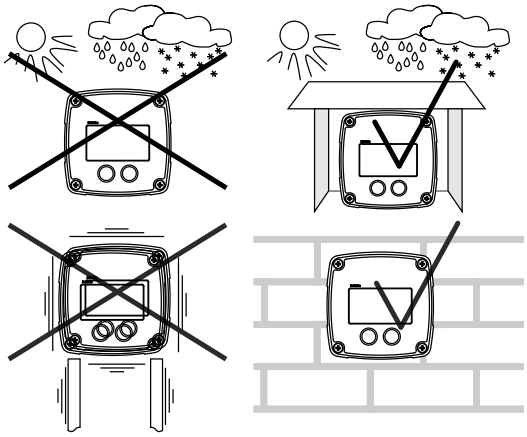
5	D-OUT	
5.2	DECIMALS	Sets the position of the decimal point for **5.3: D-OUT > AMOUNT**. The following can be selected: 0 - 3 *If the output frequency goes out of range, an internal buffer will store the excess pulses. As soon as the input frequency falls, the buffered pulses will be processed. However, the buffer might overflow and loose input if the number of pulses stored is too high. It is advised to minimize the chance of buffer overflow by choosing settings carefully.*
5.3	AMOUNT	One pulse is generated for every X-quantity measured. For example, if 100 pulses per unit are required, enter 1 for **5.3: D-OUT > AMOUNT** and 2 for **5.2: D-OUT > DECIMALS**. This sets the value of 1 pulse per 0.01 unit measured.

5.4.6 MENU 6: OTHER

6	OTHER	
6.1	MODEL	Provides important information on your product. This information may be required for maintenance or support.
6.2	SOFTWARE VERSION	
6.3	SERIAL NUMBER	
6.4	PIN	All SETUP values can be password protected. A four-digit PIN (password) can be programmed, for example 1234. To disable password protection, enter four zeros (0000).
6.5	BACKLIGHT	Switches backlight on or off. For backlight on, external power is needed.

6 INSTALLATION

6.1 INSTALLATION / ENVIRONMENTAL CONDITIONS



Take the relevant IP classification of the enclosure into account (see identification plate). Even an enclosure rated for IP67 / NEMA Type 4X should NEVER be exposed to strongly varying (weather) conditions.

When used in very cold environment or varying climatic conditions, take the necessary precautions against moisture inside the instrument case.

Mount the B-Smart onto a solid structure to avoid vibrations.

Relative humidity	< 90% RH
Outdoor use	Suitable for outdoor use
IP and NEMA rating	IP65. NEMA Type 4X
Supply voltage fluctuation	+/- 10% unless stated otherwise
Means of protection	Class II
Over-voltage category	II
Pollution degree	2 (internal environment), 3 (external environment)
Ambient	-20 °C to +60 °C, -4 °F to +140 °F
Altitude	up to 2000 meters (6600 feet)

6.2 IDENTIFICATION

Identification label

To identify your device, all products have a waterproof identification label placed on the outside of the unit.

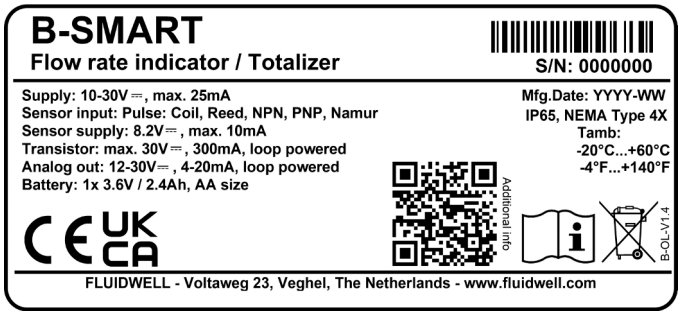


Fig. 7: Example of external label with general data

Installation label

An installation label is located at the inside of the enclosure, showing additional installation details.

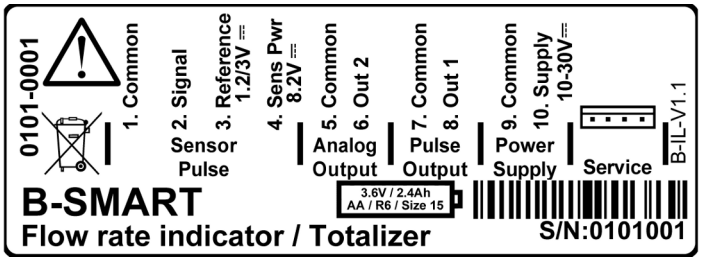


Fig. 8: Example of internal label with installation information

Serial number and year of production

The serial number can be reviewed on the identification label, the installation label, or in SETUP **6.3: OTHER > SERIAL NUMBER**. The production date is shown on the label and is also indicated by the first 4 digits of the serial number, representing year and week number (YYWW).

6.3 MECHANICAL INSTALLATION

6.3.1 MECHANICAL DIMENSIONS

Enclosure dimensions

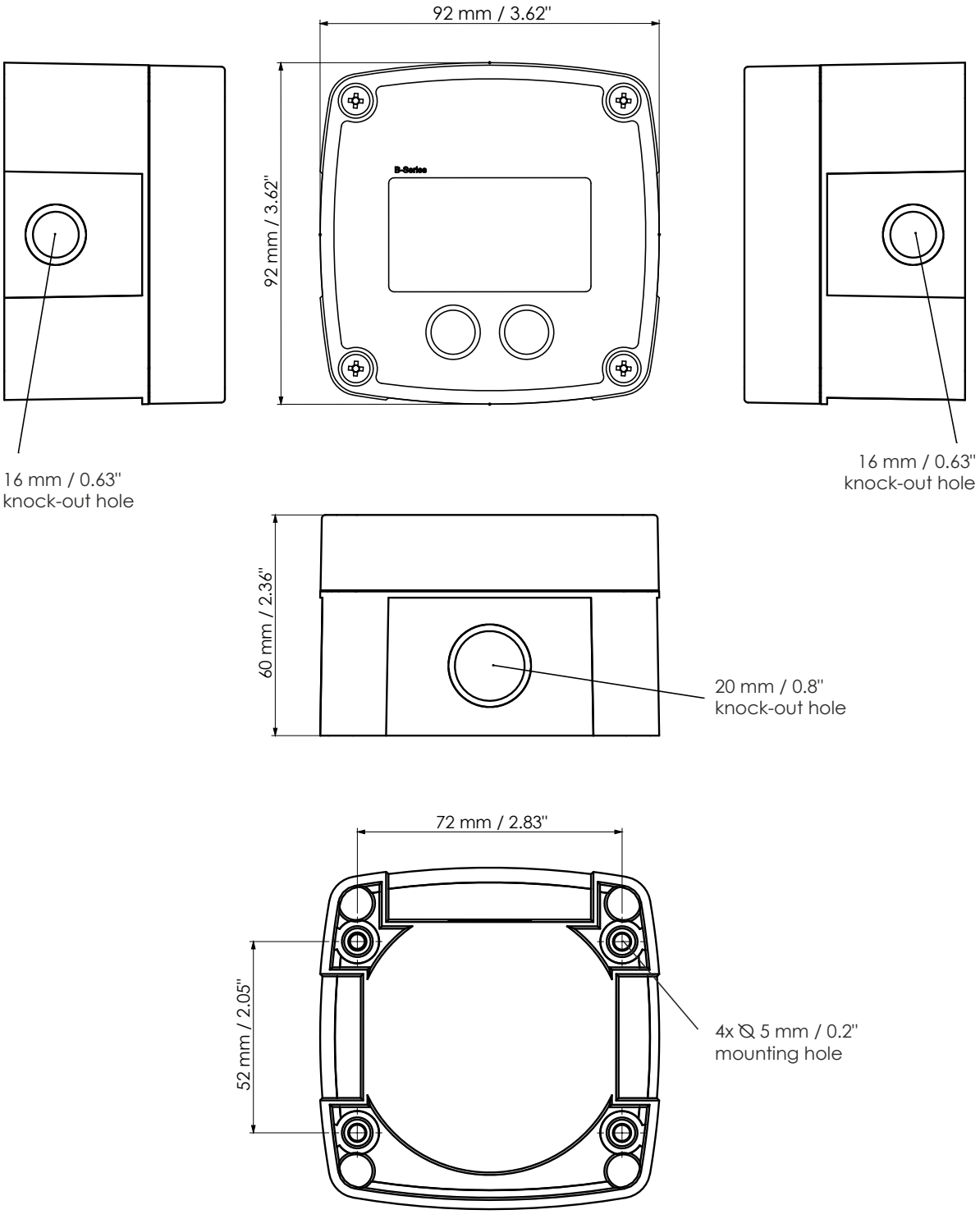


Fig. 9: Dimensions

6.3.2 MOUNTING

Wall mounting

The enclosure can be wall mounted with screws using the four available mounting holes. The holes are accessible after removal of the front cover.

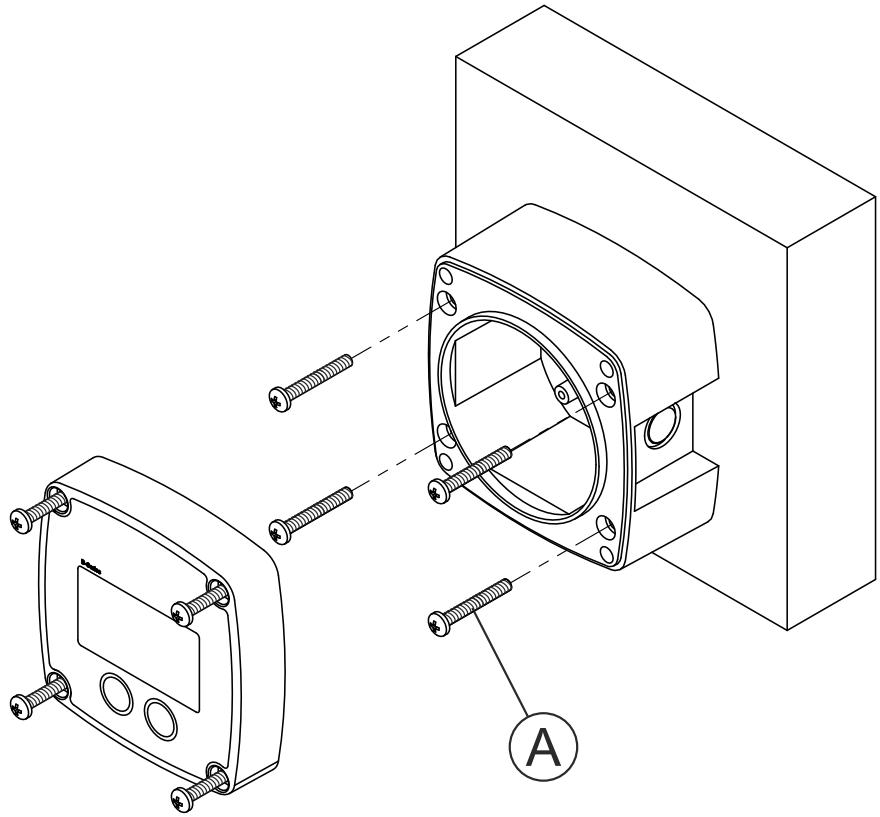


Fig. 10: Installation - Wall mount

A: 4x screw / bolt

- Head diameter: 6-8 mm / 0.24”- 0.31”
- Shaft diameter: max. 5 mm / 0.2”
- Shaft length: min. 50 mm / 2”
- Use applicable wall plugs

Note: the rear part may be rotated in 90° steps, enabling cable entry from each direction.

Sensor mounting

The enclosure can be mounted on a sensor by using the mounting hole at the bottom and a lock nut.

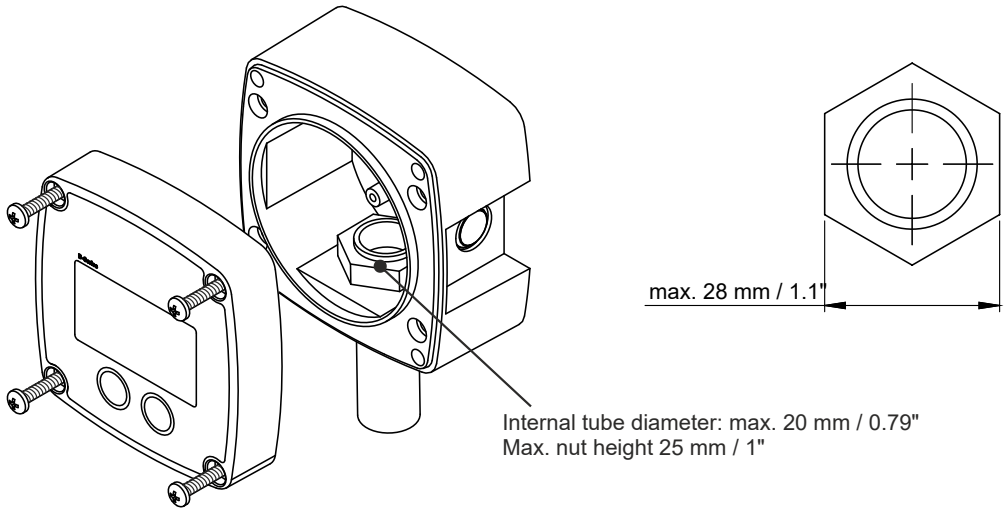


Fig. 11: Installation - Sensor mount

6.4 ELECTRICAL INSTALLATION

First consult the table with limiting environmental conditions and safety parameters in **Section 6.1: Installation / environmental conditions [»17]**.

WARNING

- The installation must comply with (inter)national requirements and local ordinances. Within the United States all field wiring must conform to the National Electrical Code, NFPA 70. Within Canada all field wiring must conform to the Canadian Electrical Code.
- The B-Smart must be installed in accordance with EMC guidelines (Electro Magnetic Compatibility)

CAUTION

- Electro static discharge can inflict irreparable damage to electronics! Before installing or opening the product, always first discharge yourself by touching a well-grounded object.

- For all wire entries, use cable glands with effective IP65 (or better) seals.
- For opened and unused cable entries, fit blind plugs with effective IP65 (or better) seals.
- Use effective screened cable for input / output signals and provide grounding of its screen to the '⊥' terminal (for isolated signals use the corresponding '-' terminal), or at the external device, whichever is appropriate to the application. Do not create ground loops!

6.4.1 ELECTRICAL SAFETY

General remarks

- In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be installed in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment. Furthermore, a protective over-current device with a maximum rating of 0.5 A (e.g. fuse or circuit breaker) must be inserted in the positive supply line.
- The external power supply must be an approved ELV source, insulated form AC mains by double / reinforced insulation per IEC 61010-1. All other inputs and outputs shall at least be reinforced insulated from mains.

6.4.2 SENSOR SUPPLY

Terminal 3: Reference voltage 1.2 – 3.2 V DC

Terminal 3 provides a reference voltage of 3.2 V DC (coil signals 1.2 V) which functions as a limited supply voltage for the signal output of the flow meter.

NOTE

This voltage may not be used to power the sensor electronics, converters etc., as it will not provide adequate sustained power! All energy used by the flow meter pick-up will directly influence battery life. It is strongly advised to use a zero power pick-up such as a coil or reed switch when operating without external power. It is possible to use some low power NPN or PNP output signals, but battery life will be significantly reduced.

Terminal 4: Sensor supply 8.2 V DC

Terminal 4 offers a supply derived from the supply input (Terminal 10). The output voltage of Terminal 4 is fixed to 8.2 V DC.

NOTE

The 8.2 V DC sensor supply requires an external supply to be connected. Maximum output current is 10 mA.

6.5 TERMINAL CONNECTORS

The following terminal connectors are available on the B-Smart.

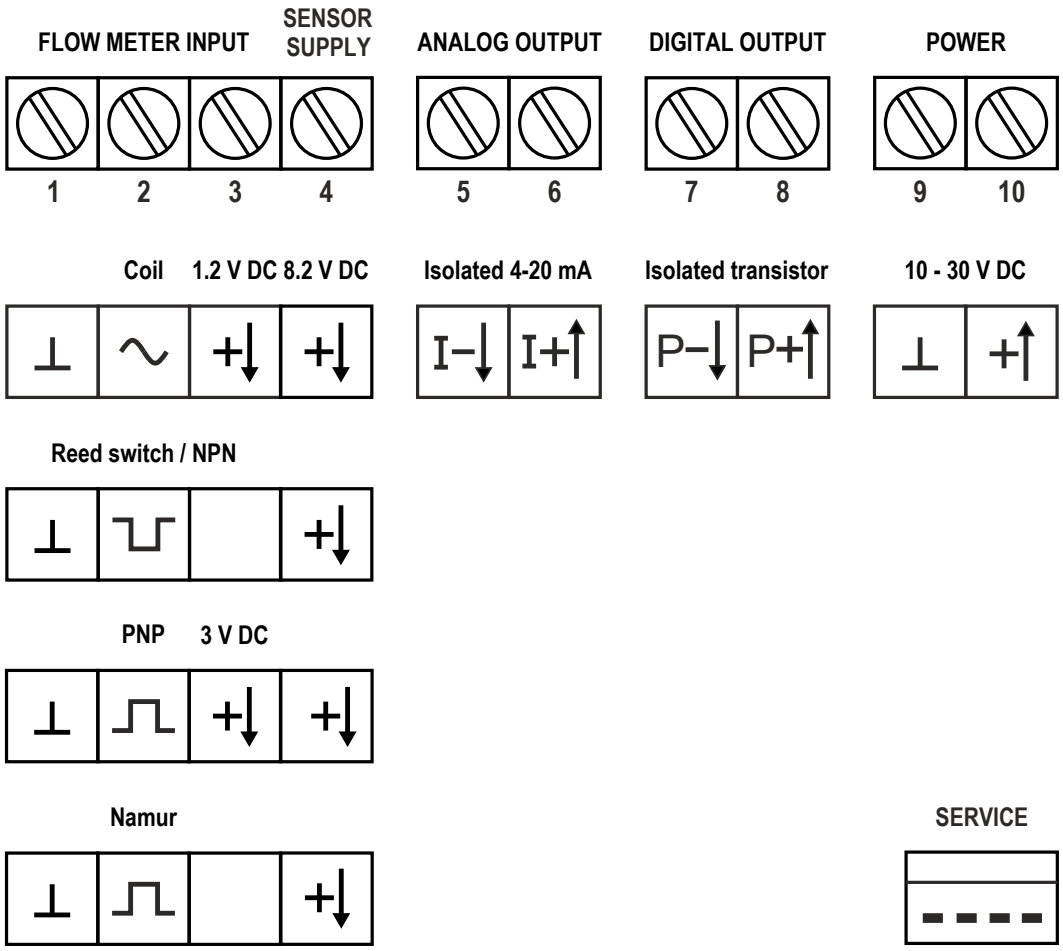


Fig. 12: Terminal connectors - overview

6.5.1 TERMINALS 1-4: FLOW METER INPUT

Two basic types of flow meter signals can be connected to the unit: pulse or sine wave (coil). The screen of the signal wire must be connected to the common ground terminal (unless earthed at the sensor itself).
The sensor output should match with the selected flow meter input signal at SETUP **Section : SETUP menu overview [»12]**. See **Menu 3: Meter [»14]** for more information.

Sine wave signal (Coil)

The B-Smart is suitable for use with flow meters with a coil output signal. The minimum sensitivity level is 30 mV pp.

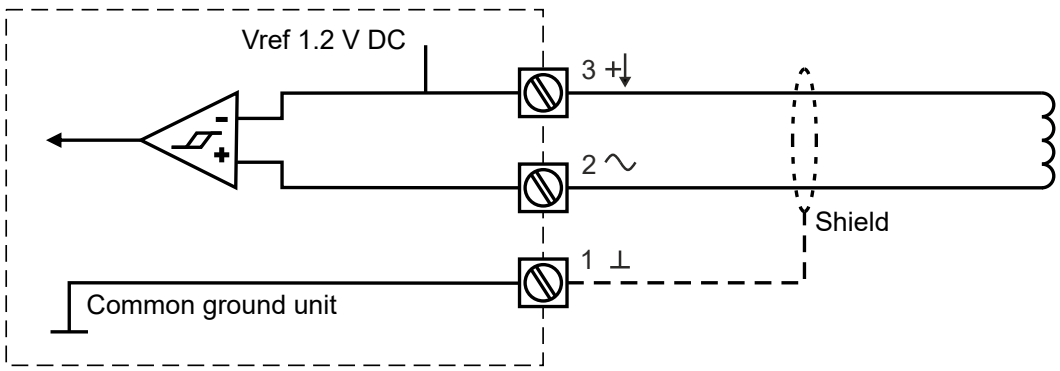


Fig. 13: Terminals 1 - 3: Coil signal input

Pulse signal NPN

The B-Smart is suitable for use with flow meters with an NPN output signal. For reliable pulse detection, the signal should be above 1.4 V or below 1.0 V under all circumstances. It is advised to use a sensor which is normally open, and is closed only for a short period. In that way, less power will be consumed.

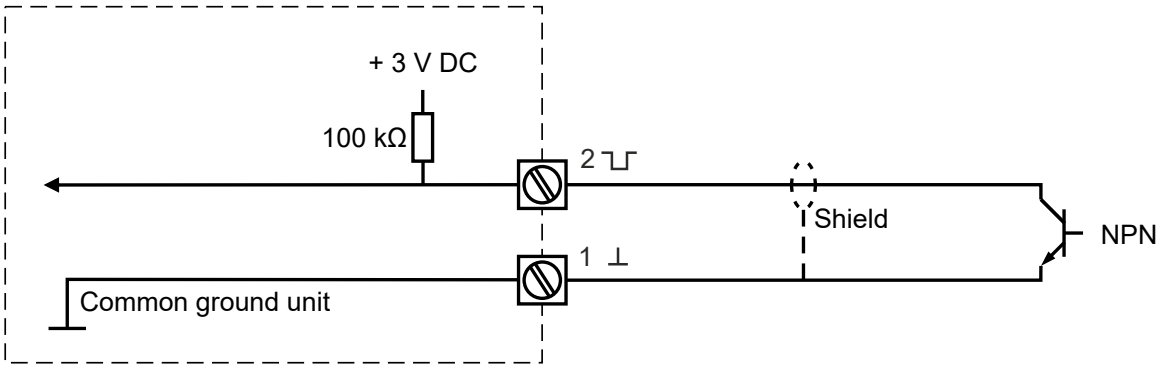


Fig. 14: Terminals 1 - 2: NPN signal input

Pulse signal PNP

The B-Smart is suitable for use with flow meters with a PNP output signal. 3.0 V DC is offered on terminal 3, which has to be switched by the sensor to terminal 2. Terminal 4 offers a 8.2 V DC when external power is supplied to the unit.
For reliable pulse detection, the signal should be above 1.4 V or below 1.0 V under all circumstances. It is advised to use a sensor which is normally open, and is closed only for a short period. In that way, less power will be consumed.
For active signals, the maximum voltage is 30 V DC.

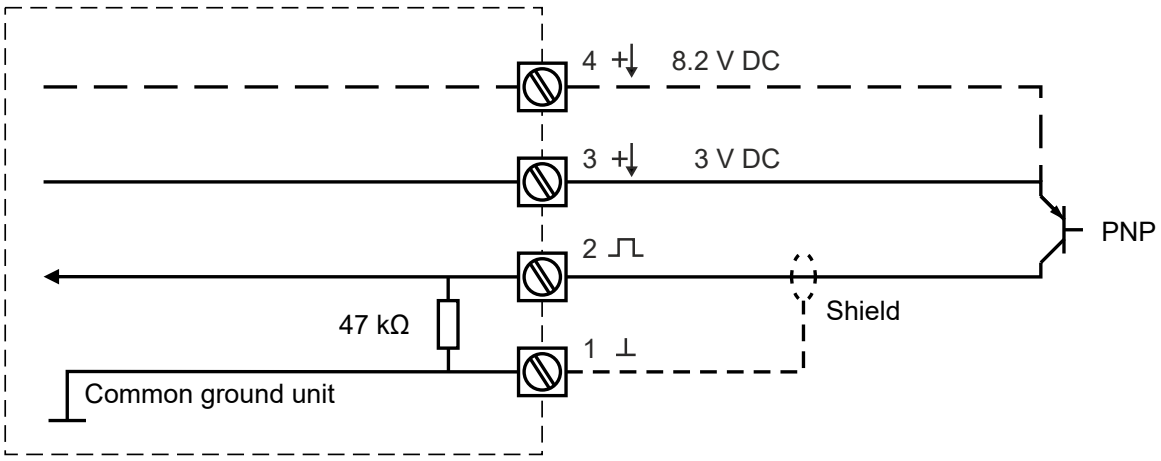


Fig. 15: Terminals 1 – 3 or 4: PNP signal input

Reed switch

The B-Smart is suitable for use with flow meters with a reed switch. The maximum contact resistance of the closed switch is 10 kΩ.

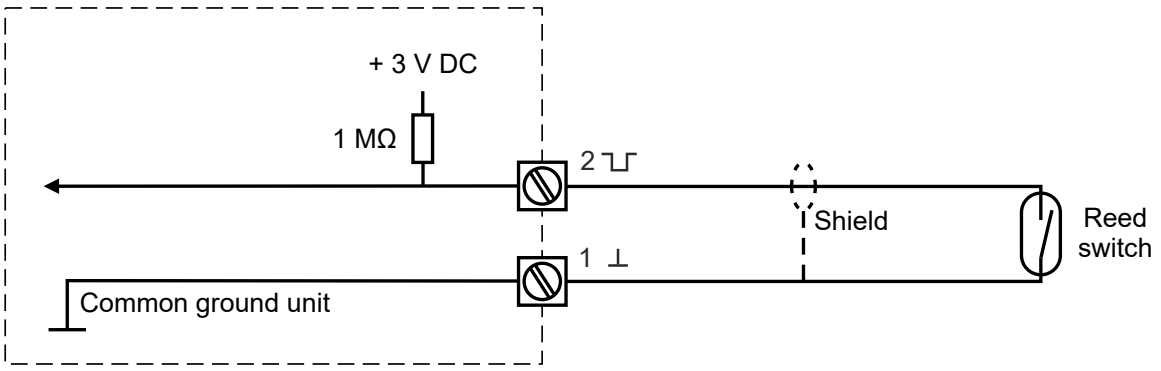


Fig. 16: Terminals 1 - 2: NPN signal input

Namur signal

The B-Smart is suitable for use with flow meters with a Namur signal. The sensor may be powered via the 8.2 V DC sensor supply at terminal 4, or may be powered externally.

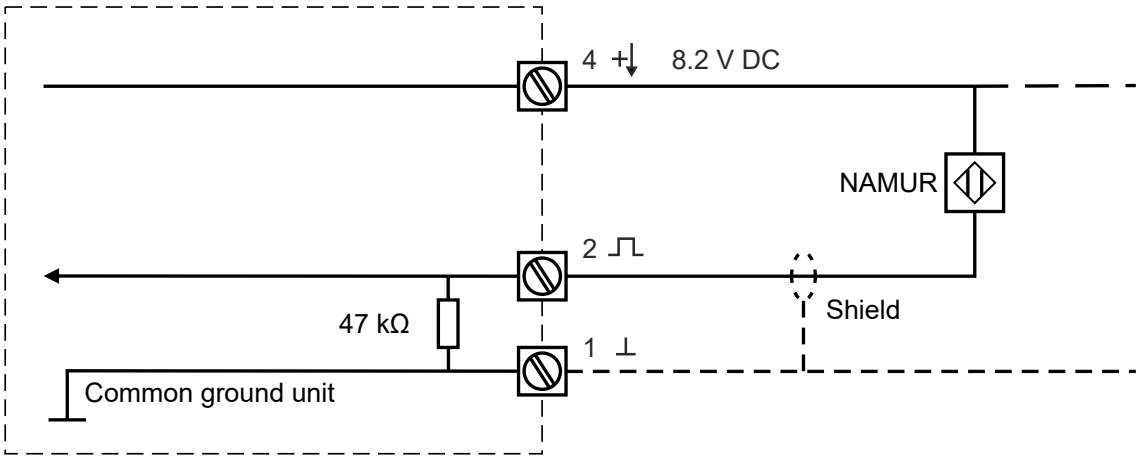


Fig. 17: Terminals 1 – 2 (4): Namur signal input

6.5.2 TERMINALS 5-6: ANALOG OUTPUT

Functionality of the analog output is programmed in the configuration menu **4: A-OUT**. See **Menu 4: A-out [»15]** for more details.

The isolated analog output generates a 4 – 20 mA output signal, proportional to the measured flow rate. The B-Smart may be powered from the analog circuit (backlight will not be available). When this output is disabled, a constant current of 3.3 mA is generated.

The output requires an external power supply (12-30 V DC) to function, with a maximum driving capacity of 600 Ω @ 24 V DC (24-12 V / 20 mA). The output is not isolated from internal electronics.

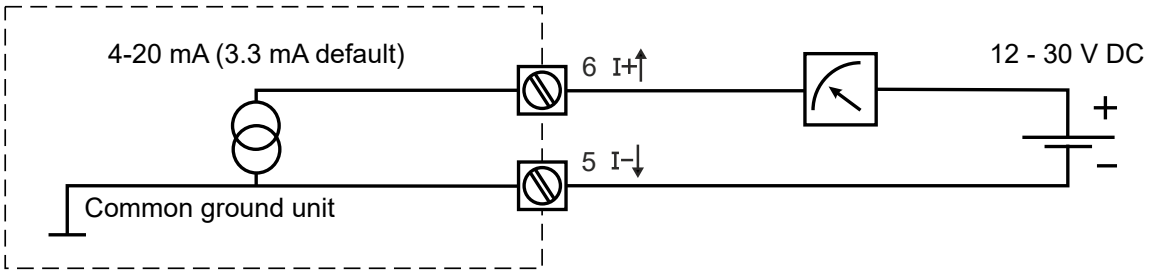


Fig. 18: Terminal connections - 4-20 mA analog output

6.5.3 TERMINALS 7-8: DIGITAL OUTPUT

Functionality of the digital output is programmed in the configuration menu **5: D-OUT**. See **Menu 5 D-out [»15]** for more details.

The passive transistor output is available with a maximum pulse frequency of 100 Hz, and a maximum driving capacity of 300 mA @ 30 V DC.

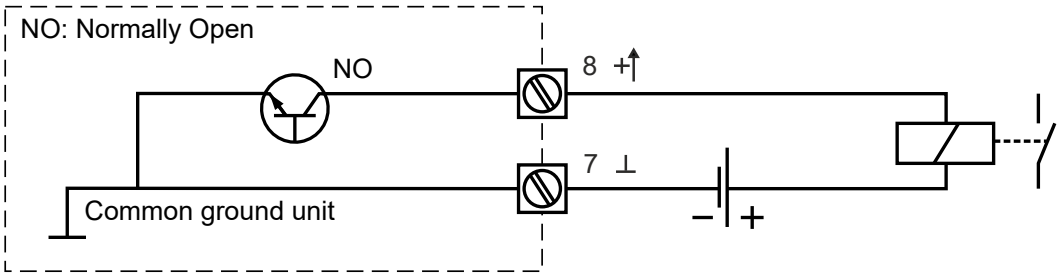


Fig. 19: Terminal connections - Transistor output

6.5.4 TERMINALS 9-10: POWER SUPPLY

Connect an external power supply (10-30 V DC) to terminals 9 and 10. Maximum current will be 25 mA. When power is supplied, the internal battery will not be used, and 8.2 V DC sensor supply becomes available at terminal 4. Also, the backlight may be used.

Please note that all common ground terminals are connected inside the B-Smart.

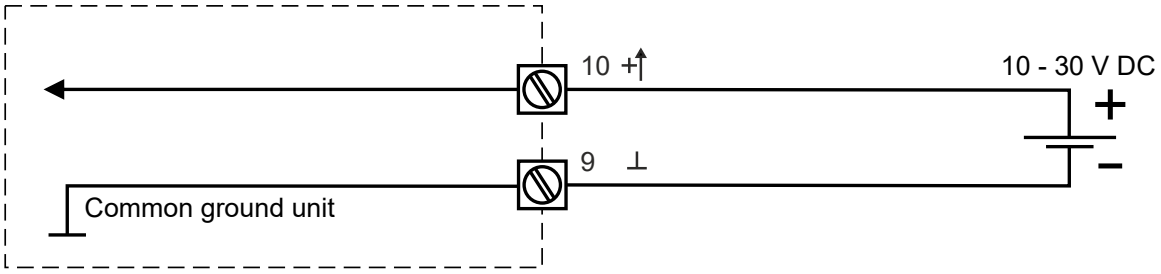


Fig. 20: Terminals 9-10: Power supply.

6.5.5 SERVICE PORT

A service port enabling configuration of the B-Smart via an external device such as a laptop is available. Connection to the port should be made with a special communications cable, available through our website or your supplier (accessory ACE02).

The service port is not to be connected permanently

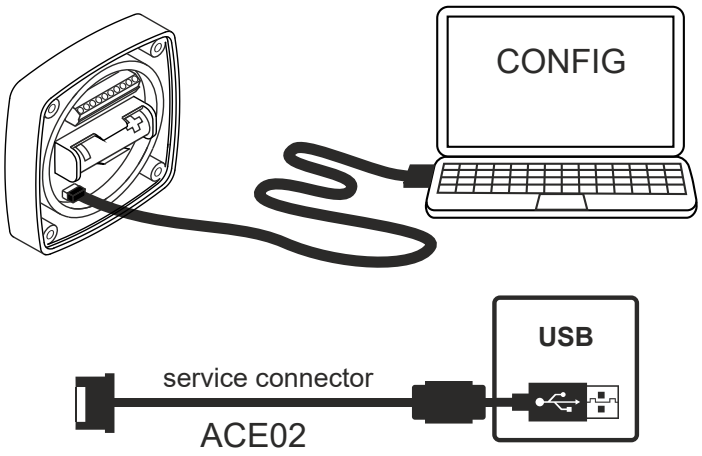


Fig. 21: Terminal connection - Service port

7 MAINTENANCE

7.1 GENERAL DIRECTIONS

The B-Smart does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the users responsibility to take all precautions to dehumidify the B-Smart in such a way that no condensation will occur, for example by placing a dry silica gel sachet in the casing. For further instructions, please refer to the information which came with your silica gel sachet.

Check periodically

- Condition of casing, cable glands and front panel
- Input/output wiring: reliability and aging
- Process accuracy: because of wear and tear, re-calibration might be indicated
- Battery status indication

Clean the casing with soapy water. Do not use any aggressive solvents.

Battery life

Battery life is influenced by

- Low temperatures - due to battery chemistry available power will be less at low temperatures
- Type of input signal – NPN and PNP consume more power than coil input
- High input frequency.
- Use of analog output
- Pulse output frequency and length.

It is strongly advised to use only necessary functions and disable functions not in use.

7.2 INSTRUCTIONS FOR REPAIR

This product cannot be repaired by the user. Repairs may only be done by the manufacturer or its authorized agent.

Repair policy

If you have any problem with your product and wish to have it repaired, please follow this procedure:

1. Obtain a Return Material Authorization (RMA) from your supplier or distributor. Together with the RMA, you need to complete a repair form to submit detailed information about the problem.
2. Send the product, within 30 days after authorization was obtained, to the address provided with the RMA. The RMA number must be indicated on the documents accompanying your physical return.

If the product falls under the warranty conditions, the product will be repaired or exchanged and returned within three weeks. Otherwise, you will receive a repair cost estimate.

7.3 BATTERY REPLACEMENT

Battery specification

Primary, non-rechargeable, Lithium-Metal Thionyl Chloride ($Li/SOCl_2$), 3.6 V, 2.4 Ah, AA size. (IEC-R6, ANSI size 15).

7.3.1 SAFETY INSTRUCTIONS

- Handle the battery with the utmost care to prevent a short circuit and damage. A mistreated battery can become unsafe. Unsafe batteries can cause serious injury.
  Do not recharge, crush, disassemble, incinerate, heat above its rated temperature or expose the contents to water.
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.

7.3.2 BATTERY REPLACEMENT PROCEDURE

Exchange the battery as follows:

1. Open the B-series. See **Section 6.3: Mechanical installation [»18]** for more information.
2. Hold the cover (1) and carefully remove the battery (2) from its holder (3). Please note that the holder can be made of plastic (as drawn) or of two metal clips.
3. In case of a plastic battery holder: inspect for signs of damage.
4. Place the new battery in the holder without forcing it. Take note of the polarity!
5. Check that the display comes on.
6. Close the B-series by screwing the front cover back to the back cover.

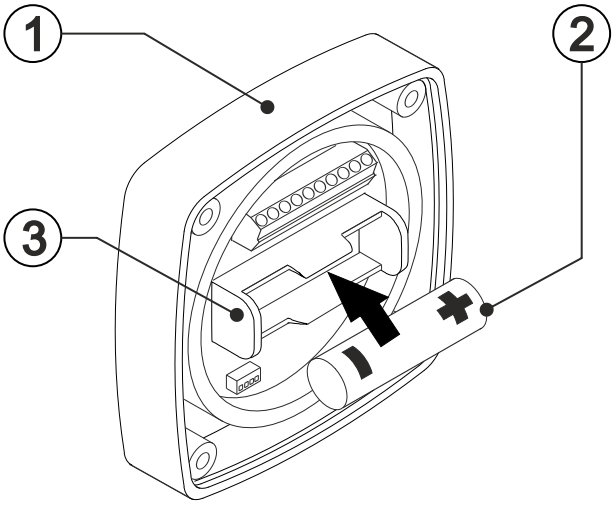


Fig. 22: Battery replacement procedure

7.3.3 DISPOSAL OF BATTERIES

Dispose of batteries in accordance with the (inter)national, the manufacturer's and the plant owner's standards and regulations.

- Batteries pose an environmental hazard.
- Do not dispose of as general waste or incinerate.
- Return used batteries to a recycling point.

APPENDIX A - TECHNICAL SPECIFICATION

A.1 GENERAL

DISPLAY	
Type	High intensity reflective numeric and alphanumeric LCD with bright backlight, UV-resistant
Note	*Backlight not available when battery or loop powered*
Digits	7 with height 12 mm (0.47”) and 11 with height 7 mm (0.28”). Various symbols and measuring units.
Dimensions	54 x 29 mm (2.13” x 1.14”)
Refresh rate	8/s when keys pressed. 30 seconds after last keypress: 1/s.

ENCLOSURE	
Material	GRP (Glass Reinforced Plastic) wall / field mount enclosure with EPDM gasket. UV stabilized and flame retardant material.
Control keys	Industrial type microswitches. UV resistant polyester keypad.
Rating	IP65, NEMA type 4X
Dimensions	92 x 92 x 60 mm (3.62” x 3.62” x 2.36”) (W x H x D)
Weight	200 g / 0.44 lbs
Cable entries	Knock-out type 2 x 16 mm / 0.63” 1 x 20 mm / 0.79”
Note	*The back cover may be rotated in steps of 90°*

OPERATING TEMPERATURE	
Ambient	-20°C to +60°C (-4°F to +140°F)

POWER REQUIREMENTS	
External power supply	10 – 30 V DC. Max power consumption 25 mA.
Note	*External power will also supply backlight and 8.2 V DC sensor supply*
Battery	Primary, non-rechargeable, lithium metal thionyl chloride ($Li/SOCl_2$), 3.6 V / 2.4 Ah. AA size (IEC-R6, ANSI size 15). Life up to 2 years, depending on settings.
Note	*Replace battery with identical specification*
Loop power	Loop powered via analog output, 12 – 30 V DC

SENSOR EXCITATION	
Standard	3 V DC reference voltage for pulse signals. 1.2 V DC for coil pick-up. Max 100 µA.
Note	*Standard sensor exitation is only suitable for sensors with very low power consumption like coils (sine wave) and reed switches.*
With external supply	8.2 V DC, max 10 mA

TERMINAL CONNECTIONS	
Type	Fixed terminal strip. Wire max 1.5 mm^2

DATA PROTECTION	
Type	FRAM backup of all settings. Backup of running totals every minute. Data retention at least 10 years.
Password	Configuration settings can be password protected

DIRECTIVES AND STANDARDS		
EMC	EN/BS 61000-6-2 EN/BS 61326-1	EN/BS 61000-6-3 FCC 47 CFR part 15
RoHS	EN/BS 50581	EN/BS IEC 63000
IP & TYPE	EN/BS 60529	NEMA 250
Note	*See the applicable Declaration of Conformity or product certificate for specific revisions and publication dates of applicable standards.*	

A.2 INPUT

FLOW METER	
Signal type	Coil / sine wave 30 mVpp, NPN, PNP, reed switch, NAMUR.
Frequency	Max. 6 kHz, but depends on signal type.
K-factor	0.000010 - 9,999,999 with variable decimal position

A.3 OUTPUT

PULSE OUTPUT	
Function	Scaled pulse output, transmitting accumulated total.
Type	One passive transistor output (NPN), not isolated. Max load 300 mA @ 30 V, 25°C
Frequency	User selectable, maximum values: 100 Hz @ pulse length 5 ms 33 Hz @ pulse length 15 ms 5 Hz @ pulse length 100 ms

ANALOG OUTPUT	
Function	Transmitting flow rate
Type	4-20 mA, not isolated. Unit may be loop powered
Supply voltage	12 V (lift-off) – 30 V DC
Maximum load	600 Ω @ 24 V DC (24 V – 12 V / 20 mA)
Accuracy	10 bit. Error 0.5% @ 20°C (Typical 45 ppm/°C).

A.4 OPERATIONAL

OPERATOR FUNCTIONS	
Displayed information	• Flow rate • Total • Accumulated total • Measuring unit
Reset Total	Total can be reset to zero

(ACCUMULATED) TOTAL	
Digits	7 digits
Unit	L - m3 - kg - lb - GAL - USGAL - bbl - no unit
Decimals	0 - 3

FLOW RATE	
Digits	7 digits
Unit	mL - L - m3 - g - kg - ton - GAL - bbl - lb - cf - no unit
Unit divisor	sec - min - hour - day
Decimals	0 - 3

APPENDIX B - TROUBLESHOOTING

Table 1 lists and describes how to troubleshoot problems that can occur when installing or operating theB-Smart.

Table 2 lists internal alarm codes and conditions signaled by a blinking ALARM flag on the display (ALARM). Press a key several times to display the 4-digit error code shown in Table 2.

Table 1: Install and configuration errors

Observation	Possible cause	Check
Flow detected too low or too high	Wrong signal selection in SETUP menu	**3.1: METER > SIGNAL**
	Unit or Time unit not matching flow	**2.1: RATE > UNIT** **2.2: RATE > TIME** **2.3: RATE > DECIMALS**
	K-factor setting wrong	**2.4: RATE > K-FACTOR** **2.5: RATE > DECIMALS K-FACTOR**
	Sensor power supply not sufficient	**Section 6.4.2: Sensor supply [»20]**
	Electrical connections wrong	**Section 6.5: Terminal connectors [»21]**
	Ground loops	Wiring of ground and screening
	Sensor not working properly	Sensor
Total is counting too slow or too fast	Unit not matching flow	**1.1: TOTAL > UNIT** **1.2: TOTAL > DECIMALS**
	K-factor setting wrong	**1.3: TOTAL > K-FACTOR** **1.4: TOTAL > DECIMALS K-FACTOR**
No analog output	Function disabled	**4.1: A-OUT > OUTPUT**
	Offset or max signal not matching process	**4.2: A-OUT > RATE-MIN** **4.3: A-OUT > RATE-MAX**
	Output not correctly tuned	**4.4: A-OUT > TUNE-MIN** **4.5: A-OUT > TUNE-MAX**
No pulse output	Function disabled or pulse length not matching external device	**5.1: D-OUT > MODE**
	Triggering quantity not set correctly	**5.3: D-OUT > AMOUNT** **5.2: D-OUT > DECIMALS**
SETUP- mode unavailable	Password setting	Enter correct password
	Password unknown	Call your supplier

Table 2: Internal alarms

Alarm	Explanation
0001	Display error
0002	Data storage error
0004	Initialization error

When multiple alarms occur, the error code shown is the sum of the error codes as given below. For example 0003 is a combination of error code 0001 and 0002.

An ALARM condition will in most cases be handled internally. If all programmed and measured values appear to be correct, intervention by the Operator is not necessary.
If an ALARM occurs more often or stays active for a longer period, please contact your supplier.

APPENDIX C - LEGAL INFORMATION

C.1 DECLARATIONS OF CONFORMITY

EU Declaration of Conformity

Fluidwell B–Series indicators Veghel, February 2022

We, Fluidwell BV, declare under our sole responsibility that the B–Series indicators are designed and will operate conform the following applicable European Directives and Harmonised Standards, when installed and operated according to the related manuals:

EMC Directive	2014/30/EU	EN 61000–6–2:2005; EN 61000–6–3: 2007 /A1:2011; EN 61326–1:2013
RoHS Directive	2011/65/EU (incl. current amendments)	EN 50581:2012 EN IEC 63000:2018

Last two digits of the year in which the CE marking was affixed: 16.

I. Meij, Manager Technology

Fluidwell BV – *P.O.Box 6, 5460 AA, Veghel, The Netherlands – Voltaweg 23, 5466 AZ, Veghel, The Netherlands*
Fluidwell BV is ISO9001 certified by DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, The Netherlands.

UKCA Declaration of Conformity

Fluidwell B–Series indicators Veghel, February 2022

We, Fluidwell BV, declare under our sole responsibility that the B–Series indicators are designed and will operate conform the following applicable UK Legislation and Standards, when installed and operated according to the related manuals:

Electromagnetic Compatibility Regulations 2016	BS 61000–6–2:2005; BS 61000–6–3: 2007 /A1:2011; BS 61326–1:2013
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (incl. current amendments)	BS EN 50581:2012 BS EN IEC 63000:2018

Last two digits of the year in which the UKCA marking was affixed: 22.

I. Meij, Manager Technology

Fluidwell BV – *P.O.Box 6, 5460 AA, Veghel, The Netherlands – Voltaweg 23, 5466 AZ, Veghel, The Netherlands*
Fluidwell BV is ISO9001 certified by DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, The Netherlands.

LIST OF CONFIGURATION SETTINGS				
SETTING		DEFAULT	DATE:	DATE:
1	**TOTAL**			
1.1	UNIT	L		
1.2	DECIMALS	0		
1.3	K-FACTOR	1		
1.4	DECIMALS K-FACTOR	0		
2	**RATE**			
2.1	UNIT	L		
2.2	TIME	min		
2.3	DECIMALS	0		
2.4	K-FACTOR	1		
2.5	DECIMALS K-FACTOR	0		
2.6	PULSES	10		
2.6	FILTER	1		
3	**METER**			
3.1	SIGNAL	coil		
4	**A-OUT**			
4.1	OUTPUT	disable		
4.2	RATE-MIN	0		
4.3	RATE-MAX	99,999		
4.4	TUNE-MIN	Factory set		
4.5	TUNE-MAX	Factory set		
5	**D-OUT**			
5.1	MODE	off		
5.2	DECIMALS	0		
5.3	AMOUNT	0		
6	**OTHER**			
6.1	MODEL	BASIC71		
6.2	SOFTWARE VERSION	03.06.xx		
6.3	SERIAL NUMBER	xxxxxxx		
6.4	PIN	0000		
6.5	BACKLIGHT	off		

Your success counts

Fluidwell bv
P.O. Box 6
5460 AA Veghel
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Voltaweg 23
5466 AZ Veghel
the Netherlands

Website: www.fluidwell.com
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