Battery manometer type BAP 2

Technical specification, installation and connection

Certificate No.:

FTZU 19 ATEX 0040X

Type approval mark:

TSK
173/16 – 018

Version 3.1

This instruction manual is valid for manometers of the third generation BAP 2 with battery power supply. The manometer can be equipped with a record, which creates it´s organic part. The manual specify the way of operation and at the same time it includes other basic information.

1. Terminology

The industrial battery manometers of the third generation BAP 2 are designed for measuring, digital display of instant value of overpressure, underpressure or absolute pressure of the measured medium in closed measuring systems or eventually level of liquid in tanks, cisterns and so on. For archiving of measured pressure value they can be equipped with a recorder – datalogger. Their sturdy construction predetermines them for use at container pressure tests, water pipes and pipelines.

2. Generally

*Use and principle of BAP 2 operation

In general, the manometer BAP 2 is a battery equipment which enables display and recording of the measured pressure value or liquid level. Together with instantaneous measured pressure value or level there is also relevant selected unit displayed in standard display mode and analogue imaging of the pressure - bargraph. In graphical display mode is shape of the pressure progress in set time period depicted in a column graph. Required pressure unit can be selected by user, while the unit is automatically recalculated. In case of liquid level measurement it is necessary together with this unit to enter also the density of the measured liquid. The sturdy construction of the manometer and possibility to increase the coverage as an option allows to use it also in adverse weather conditions.

It is possible to set all basic functions of the manometer with buttons on the front panel of the device. In case of the manometers equipped with the datalogger it is possible to control all parameters needed for record function and to set them also with superordinate program designated for PC. Communication with the manometer and reading out the stored data is possible with wireless communication, USB, or another serial interface. It is possible to see recorded data also by means of push buttons on manometer front side. There is also possibility to switch to the graphic display, switch the datalogger sampling on or off, to set display contrast, number of decimal points, filtration, to make calibration, to select physical unit on the display, to change access password, to set interval of automatic manometer switch off or backlight illumination of the display. The manometer can be switched on continually and illumination of the display can be also switched on continually. In this way you can set all datalogger functions, to check the filling of the recording memory, delete the memory, set parameters of the serial line and also to see information of the manometer software.

After setting of the pressure sampling time the manometer can be switched off, while measurement and recording of the measured data into the memory is uninterrupted. If the manometer is in switch on mode and datalogger sampling is switch on too, this is indicated in multifunctional part of the display with the notice „Rec“ or it´s blinking.

If you want to stop measuring and recording of the measured data into the memory you can set it with the buttons or by means of the PC software, to set the sampling interval to 0, or switch of the sampling with mode for quick switch off – see the instruction manual.

By means of the PC software you can set all the functions of the datalogger, transfer the samples from the memory to PC, their archiving and graphic visual presentation. The program enables also export of the data to XLS format or ASCI code for their subsequent processing with corresponding database program. The PC software is supplied as an optional accessory.

In case of a sensor malfunction, if the measured pressure will exceed the manometer range or another failure condition, there will be notice **„ Extreme“** on the display.

LED diodes 1 to 4 on the front panel are dedicated for indication of wireless communication mode if the manometer is equipped with this, connection of the power adaptor or communication line or, as the case may be, indication of charging and end of charging of the internal battery, if this type of the power is selected.

Construction of BAP 2

The manometer is built in a sturdy metal case made of aluminium alloy or stainless steel. It is connected into the measuring system by mean of process connection.

The manometer is battery / accumulator powered. The batteries are located under the back housing of the manometer. It is possible to connect rechargeable accumulator.

In technical design of Ex version, power supply is possible only by means of primary battery cells or approved accumulator. The case of the manometer must be connected to earth and aluminium case you need to protect before mechanical sparking as a result of friction or bang.

The manometers in Ex version rendition comply with requirements of standards EN IEC 60079-0:2018 and EN 60079-11:2012 and EU directive 2014/34/EU.

Communication with the manometer, if it is equipped with this – optional accessories, is possible through serial communication USB, RS 485, RS 232, or wireless through Bluetooth, XBee, LoRaWAN, Beacon, NB-IoT, Sigfox, WiFi or another type of communication. The communication connector is located on the side of the device.

Power supply possibilities of BAP 2

The manometer is powered by internal batteries / accumulators. They are located under the back cover of the manometer, or detachable rechargeable accumulator. **In design Ex version power supply is possible only by means of primary battery cells or approved type accumulator.**
Power supply by means of internal cells is possible. You can use simple, no-rechargeable batteries type AA, or D, which are located under the back cover and they can be changed by the user. You can also use internal rechargeable accumulator, which can´t be changed by the user. If it recommended to use non-rechargeable lithium D size battery for LoRaWAN, NB-IoT, Sigfox, XBee (802.14.5 / ZigBee), WiFi and Bluetooth Beacon communication.

Recharging of the internal accumulator is possible through connector K1. Power supply is possible also with removable accumulator set BP-1, in which case this can be recharged in external charger. For changing the set BP-1 you will need no tools.

Power supply form is possible to choose in table no. 1.

3. Technical parameters of BAP 2

Type of measurement	abs. pressure, overpressure, underpressure, level of liquid – hydrostatic pressure of the liquid
Display	alphanumeric display
Version	standard, or Ex, other after agreement
Range of measured pressures	0 to 2,5 kPa … 60 MPa
Possibility to change the range – selection of the range	up to 1 : 10
Temperature of the measured medium	- 40 °C to + 125 °C
Accuracy of pressure measurement	
0,08 % of the range	only for ranges ≥ than 25 kPa
0,1 % of the range	only for ranges ≥ than 25 kPa
0,25 % of the range	
0,4 % of the range	

** Combined error which include non-linearity, hysteresis and reproducibility.*

Additional error by temperature influence – thermal compensation	
standard	< 0,03 %/10 °C in range 0 to + 60 °C
extended	< 0,03 %/10 °C in range - 20 to + 60 °C
Long term stability	< 0,15 % of the range/year
Electric parameters	

Power supply

3 x internal monocell type AA – Selection 1 according to table no.1
Internal rechargeable accumulator – Selection 2 according to table no.1
Removable rechargeable accumulator – Selection 3 according to table no.1
Internal non-rechargeable lithium battery (D size) - Selection 4 according to table no. 1
Mains adaptor (optional accessories)

Power supply for Ex version

Power supply for Ex version with potential explosive atmosphere – Ex, there can be used only approved kinds and types of primary battery cells and accumulators:

- **Version N1 - Spark safety: II 1G Ex ia IIB T4 Ga**
  Primary cells: Energizer AAA Power Seal Technology LR03 1,5V
  Duracell AAA Long Leasing Power LR03 1,5 V

- **Version N2 - Spark safety: II 1G Ex ia IIB T3 Ga**
  Primary cells: AA Energizer E91-LR6-AM3-1,5V
  AA VARTA LONGLIFE Power

- **Version N3 - Spark safety: II 1G Ex ia IIB T4 Ga**
  Accumulators: Accumulator set BP-1

Record parameters:		
Number of records		up to 432 000
Sampling period		0,25 s to 72 hour
Communication:		
Wireless communication		Bluetooth, LoRaWAN, NB-IoT, Sigfox, WiFi, XBee, Beacon
Serial communication		RS 485, RS 232, or Mini USB, other after agreement
Process connection		M20x1,5; G½; G¼ Other after agreement
Case material	standard	aluminium alloy
	option	DIN 1.4301; AISI 304
Front panel material		polypropylene
Material of pressure connection		DIN 1.4301; AISI 304 Other after agreement
Sealing material		FPM – Viton
Isolation resistance		R_{IZ} > 2 M Ohm
Covering in conformity with standard STN EN 60 529		
	standard	IP 44
	option	IP 65
Basic dimensions of the manometer		figure no. 1 a 2
Weight of the manometer		cca. 0.5 / 1 kg

4. Marking

Data on type label

- Mark of the manufacturer and origin of the product
- Type marking
- Communication
- Range of measurement
- Accuracy of measurement
- Serial number
- Protection covering
- For version BAP 2...N to potentially explosive atmosphere:
    - **Spark safety**
        - **For N1**  **II 1G Ex ia IIB T4 Ga**
        - **For N2**  **II 1G Ex ia IIB T3 Ga**
        - **For N3**  **II 1G Ex ia IIB T4 Ga**
    - Certificate No.: **FTZU 19 ATEX 0040X**
    - Mark **CE**$_{1026}$

5. Ordering

Purchase order should include these data

- Number and date of the order
- Address of the orderer (including ID number and VAT number)
- Bank information
- Specification according to the ordering table, number of units, required delivery time
- Way of transport
- Possible requirement on option after agreement

6. Packing, transport and delivery

The manometers BAP 2 are packed in cardboard boxes. Internal parts of every delivered manometer are technical specifications and certificate of warranty.

TABLE NO. 1. SPECIFICATION OF TECHNICAL PARAMETERS AND REQUIREMENTS

CODE	DESCRTIPTION	
BAP 2	Battery – operated manometer Ø 100 mm with metal membrane sensor	
	BACKLIGHT	
B	White	
	MEASURING RANGE	**OVERLOAD CAPACITY /MAX. PRESSURE/**
0250 0600	0…2,5 kPa, 0…6 kPa	50 kPa
1000 1600	0…10 kPa, 0…16 kPa	50 kPa
2500 4000	0…25 kPa, 0…40 kPa	100 kPa
6000 1001	0…60 kPa, 0…100 kPa	200 kPa
2501 4001 6001	0…250 kPa, 0…400 kPa, 0…600 kPa	1,4 MPa
1002 1602	0…1 MPa, 0…1,6 MPa	3,4 MPa
2502 4002	0…2,5 MPa, 0…4 MPa	34,0 MPa
6002 1003 1603	0…6 MPa, 0…10 MPa, 0…16 MPa	34,0 MPa
2503 4003 6003	0…25 MPa , 0…40 MPa, 0…60 MPa	70,0 MPa
	The range for liquid level measurement is indicated as pressure where 1m = 10 kPa **Example: measurement range 0 to 2,5 m has code 2500**	
XXXX	Other range	
	TYPE OF MEASUREMENT	
A	Absolute pressure	
G	Over pressure	
H	Liquid level * for other liquids as water it is necessary to define specific density	
P	Underpressure or underpressure / overpressure	
	POWER SUPPLY	
1	Internal batteries / not rechargeable – primary monocells	
2	Internal rechargeable batteries – secondary monocells	
3	Removable rechargeable accumulator – battery pack BP-1	
4	Internal non-rechargeable lithium battery (D size)	
	TYPE OF CONSTRUCTION	
S	Standard version to the BNV environment	
N1	**Version to Ex – Spark safety: II 1G Ex ia IIB T4 Ga** Operating temperature - 20 °C to + 55 °C	
N2	**Version to Ex - Spark safety: II 1G Ex ia IIB T3 Ga** Operating temperature - 10 °C to + 50 °C	
N3	**Version to Ex - Spark safety: II 1G Ex ia IIB T4 Ga** Operating temperature 0 °C to + 50 °C	
NC	**Version to Ex – Spark safety II 3G Ex ic**	
NA	**Version to Ex – Spark safety II 3G Ex nA**	
X	others	
	OUTPUT SIGNAL	
Q0	Without output signal	
50	Wireless communication XBee	**Not for N1, N2 and N3**
60	Wireless communication Bluetooth	
61	Wireless communication LoRaWAN	**Not for N1, N2 and N3**
62	Wireless communication NB-IoT	**Not for N1, N2 and N3**
63	Wireless communication Sigfox	**Not for N1, N2 and N3**
64	Wireless communication WiFi	**Not for N1, N2 and N3**
65	Wireless communication Beacon	**Not for N1, N2 and N3**
80	RS-485	Max. transmission rate 115 kBd
90	USB mini	
XX	Other output	

CONTINUATION OF THE TABLE NO. 1 IS ON NEXT PAGE

CONTINUATION OF THE TABLE NO. 1

	PROCESS CONNECTION – CONNECTION THREAD		
M	Thread M20x1,5		
G	Thread G½"		
F	Thread G1/4		
X	Other connection, other thread		
	OPERATING TEMPERATURE		
0	Standard	0…+ 60°C	calibration at 22 °C
1	Extend	- 20…+ 60°C	Calibration at 22 °C
	ACCURACY		
E	Selection 0,08 % of the range		only for ranges ≥ 25 kPa
W	Selection 0,1 % of the range		only for ranges ≥ 25 kPa
V	Selection 0,25 % of the range		
S	Standard 0,4 % of the range		
	MEMORY		
Q0	Without memory – without recording		
32	32 megabit		
	RECOMMENDED ACCESSORIES		
QQ	Without accessories		
NA	Power supply adaptor / battery charger		
KK	Communication cable		
PC	Service program for PC		
BP	Detachable rechargeable accumulator – battery pack		
	SPECIAL REQUIREMENTS		
Q0	Without special requirements		
03	Calibration protocol of the manometer		
05	Protection covering IP65 in compliance with STN EN 60 529		
08	Version made of stainless steel		
11	Protection housing for the manometer		
XX	others		

X to XXXX – specify in order

Example: BAP 2 B 1002 A 1 S 60 M 0 S 32 NA PC 03

Digital manometer BAP 2, white backlight, range 1 MPa, absolute pressure, internal rechargeable batteries, standard version, Bluetooth output connecting thread M20x1,5; operating temperature 0 to 60 °C, accuracy 0,4 % of the range, power supply unit, service program, assessment of calibration.

7. Installation

The manometer is screwed on with appropriate wrench No. 27 into the inner thread at the measured pace, corresponding with the thread of the manometer. Tightness of the connection must be ensured by appropriate gasket – this is not object of the delivery. The body of the manometer is not allowed to use for screwing the unit on.

If it recommended to use non-rechargeable lithium D size batteries for LoRaWAN, NB-IoT, Sigfox, XBee (802.14.5 / ZigBee), WiFi and Bluetooth Beacon communication type transducers (selection 4 in table 1) or internal rechargeable accumulator (selection 2 in table 1) or wired DC power source.

You can switch off the manometer after setting the pressure sampling, whereas measuring and recording of the measured data into the memory will not be interrupted. In case the manometer is on and the measured pressure is on the display, the datalogger switch on in standard display mode

is indicated with the notice „Rec“. In graphic display mode the writing into the memory is indicated always at saving the data shortly by the notice „Saved!“.

If you want to interrupt measuring and recording of the measured data into the memory, you need to set the sampling interval to 0, with the buttons or with the software for PC, or to switch off the sampling with the quick switch off mode – see operational manual.

The notice „Extreme“ on the display serves for indication of the input sensor defective condition or for exceeding of the input range set by the manufacturer.

In standard display mode there is together with instantaneous value of the measured pressure or liquid level also corresponding selected unit and analogue depiction of the pressure - bargraph. In graphical display mode there is depicted together with pressure progress on the bargraph also instantaneous pressure value, minimal and maximal pressure in time interval displayed. If it is not possible to display required pressure value together with the physical unit at the same time the number of decimal points will be automatically set to maximum possible. If you want to display required number of decimal points, you need to select another unit of the pressure.

Manometers BAP 2…N (into the environment with potentially explosive atmosphere) can be used only in compliance with specifications and regulations valid for this environment and with conformity declaration issued by the company BD Sensors Ltd., whereas the case of the manometer must be connected with earth and aluminium alloy case must be protected from mechanical spark formation caused by friction or collision.

The temperature of the surroundings is specified:

For version N1	- 20 °C to + 55 °C
For version N2	- 10 °C to + 50 °C
For version N3	0 °C to + 50 °C

For version to the surroundings with potentially explosive atmosphere – Ex it is possible to use only approved kinds and types of primary cells and accumulators:

- **Version N1 - Spark safety: II 1G Ex ia IIB T4 Ga**
  Power supply – primary cells: Energizer AAA Power Seal Technology LR03 1,5V
  Duracell AAA Long Leasing Power LR03 1,5 V
- **Version N2 - Spark safety: II 1G Ex ia IIB T3 Ga**
  Power supply – primary cells: AA Energizer E91-LR6-AM3-1,5V
  AA VARTA LONGLIFE Power
- **Version N3 - Spark safety: II 1G Ex ia IIB T4 Ga**
  Power supply - accumulators: accumulator set BP-1

If the manometer will work in condition where the possibility of pressure strokes is, manufacturer recommends to protect the manometers with a damping device of pressure strokes, for instance type **TTR – MERET**.

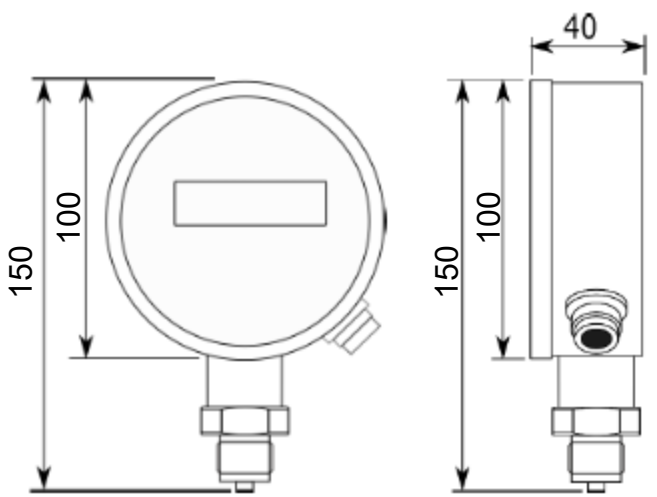
Meaning of LED diodes located on the front panel

LED 1	blue	the wireless communication switched on if the manometer is equipped with this
LED 2	orange	connection of the power adaptor or communication cable
LED 3	green	end of the internal accumulator charging, if the manometer is equipped with this

LED 4	red	charging of the internal accumulator, if the manometer is equipped with this

Connection of the connector K1:

No. pin	Connection of the serial line connector		
	RS-485	RS-232	Mini USB
1	+U (max. 5 V)	+U (max. 5 V)	Vcc
2	0 V	0 V	D-
3	A	Rx	D+
4	B		GND
5	not connected		



Picture No. 1 Basic dimensions of the manometer – internal batteries

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