BAMOSONIC N-DIS

USER MANUAL

Ultrasonic level transmitter (2-wire)
BAMOSONIC

23-07-2018   M-597.06-EN-AB

597-06 /1

SUMMARY

Ultrasonic level transmitter (2-wire)
BAMOSONIC

23-07-2018 M-597.06-EN-AB

597-06 /2

1. DESCRIPTION

Application

BAMOSONIC, ultrasonic level transmitters, are instruments of excellence for level measurements of liquids.
The measurement technology is based on the non-contact ultrasonic method. It suits applications where, for any reason, a direct physical contact with the liquid is not allowed.
Examples: Corrosion by the fluid of wet parts (chemicals), contamination (wasted water), deposits on measuring instruments, etc.

Principle

Ultrasonic level measurement is based on the principle of measuring the time required for the ultrasound waves to make a round trip between sensor and liquid surface.
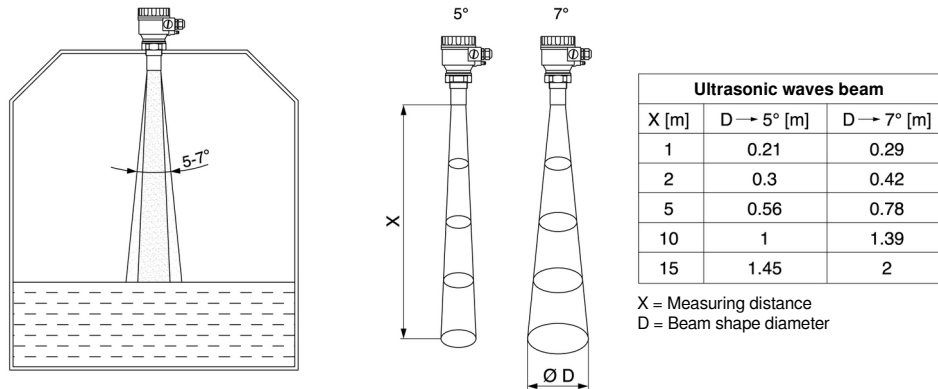The sensor emits ultrasonic waves (pulses) and receives the reflected waves.
The electronic device processes the reflected pulses; it calculates the distance corresponding to the travel time between the liquid surface and the sensor.

Ultrasonic beam

The beam is restricted to a solid angle of 5° or 7° according the model.
The narrow beam angle ensures a reliable measurement in silos, even with close walls or protruding objects. As a result of this narrow angle, the emitted ultrasonic waves are focused for a deep penetration through gases, vapours and foams.

Ultrasonic waves beam		
X [m]	D → 5° [m]	D → 7° [m]
1	0.21	0.29
2	0.3	0.42
5	0.56	0.78
10	1	1.39
15	1.45	2

X = Measuring distance
D = Beam shape diameter

Blind area

Blind area is a common feature to all ultrasonic level transmitters.
It is specified as "measuring distance min." on the table of technical features.

Measuring distance min. (Xm) depends of device design, for which a dead zone is assigned in factory. This distance may be extended on site in order to avoid effects of disturbing echoes due to the proximity of objects (protuberances).

Measuring distance max. (XM) is the greatest distance (by construction) which can be measured by the unit under ideal conditions. The real measuring distance (H) max. of the application cannot be greater than XM.

2. CODE NUMBERS AND REFERENCES

Code	597 220	597 202	597 205	597 222	597 223
Reference BAMOSONIC-N-xx-xx	PP-4m	PP-6m	PP-8m	PVDF-4m	PVDF-6m
Transducer nose material	PP	PP	PP	PVDF	PVDF
Measuring distance max.*	4 m	6 m	8 m	4 m	6 m
Measuring distance min.*	0,2 m	0,25 m	0,35 m	0,2 m	0,25 m
Beam solid angle	6°	5°	7°	6°	5°
Fitting	1 ½"	2"	2"	1 ½"	2"
OPTION: Programming & Display module, BAMOSONIC DIS-N					
Code	597 200				
On site display	LCD; 6 digits; Icons & Bar Graph				

* Distance from bottom-end of transducer nose

Ultrasonic level transmitter
(2-wire)
BAMOSONIC
23-07-2018   M-597.06-EN-AB

597-06 /3

3.   TECHNICAL FEATURES

Transducer nose materials	PP (Polypropylene) or PVDF (Polyvinylidene fluoride)
Head housing	PBT, glass fiber reinforced
Operating liquid temperature	-30 ... +90 °C
Ambient temperature	-25 ... +70 °C
Operating pressure	0.5 ... 3 bar (Absolute)
	For pressure below 1 bar Absolute, contact us.
Seals	EPDM for PP models; FPM for PVDF models
Protection	Transducer nose: IP68 - Head housing: IP67
Accuracy	± 0.2 % of reading; ± 0.05 % of F.S.
	Under optimal circumstances and stabilised temperature of transducer
Resolution	Depending of distance range; < 2 m: 1 mm; 2 ... 5 m: 2 mm; 5 ... 8 m: 5 mm
Angle	Between 5° and 7°
Power supply	12 ... 36 V DC / 48 ... 720 mW
Output signal	Analogue: 4 ... 20 mA (3.9 ... 20.5 mA), $R_{max} = (U_t - 11.4\ V)/(0.02\ Ohm)$; galvanic insulation.
Electrical connections	Two M20 x 1.5; Cable Ø6 ... 12 mm
	Two ½" NPT cable glands
	Wire cross section: 1.5 mm² max.
Electrical protection	Class III

4.   DIMENSIONS

4.1   Accessories

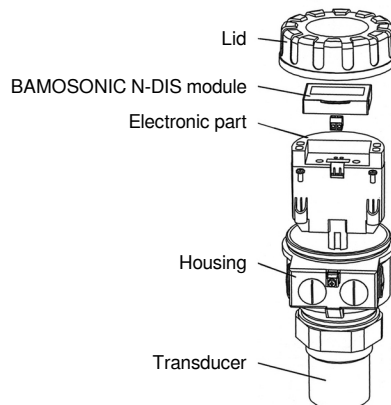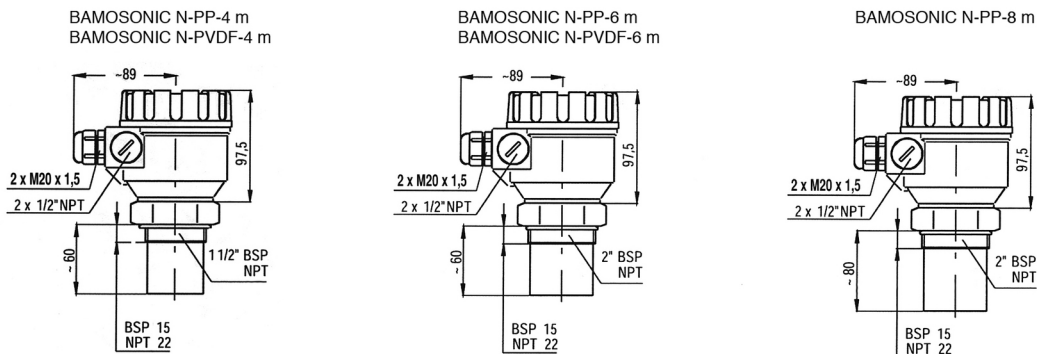Two cable glands M20x1.5; Setting-Display Module NDIS (option) - Instructions manual

4.2   Maintenance

BAMOSONIC series do not require a specific maintenance; However, a cleaning of the transducer nose (with care and precautions) can be carried out during maintenance routine.
This cleaning operation must be carried out gently, without scratching or pressing the surface of the transducer.
Repairs during or after the warranty period are carried out exclusively by the manufacturer.
The equipment sent back for repair must be cleaned and/or disinfected by the user before shipment.

BAMOSONIC N-PP-4 m
BAMOSONIC N-PVDF-4 m

BAMOSONIC N-PP-6 m
BAMOSONIC N-PVDF-6 m

BAMOSONIC N-PP-8 m

Lid
BAMOSONIC N-DIS module
Electronic part
Housing
Transducer

Ultrasonic level transmitter
(2-wire)
BAMOSONIC
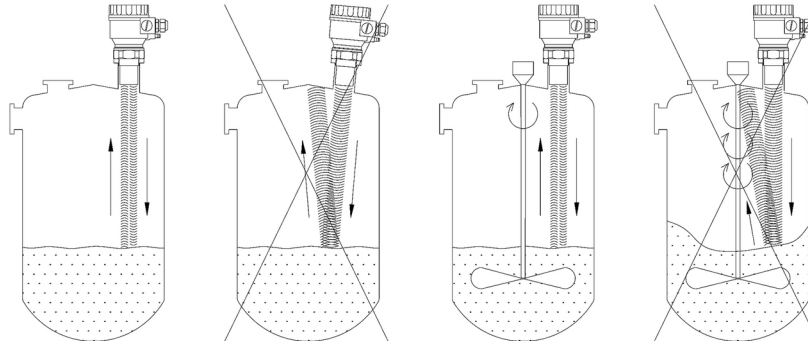23-07-2018   M-597.06-EN-AB
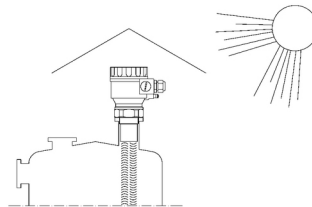
597-06/4

5. MOUNTING

5.1 Liquid level measurement

POSITION AND SENSOR ALIGNMENT
The optimal position of BAMOSONIC is, when the radius r = (0.3 … 0.5) R
Bottom end surface of sensor must be parallel to the liquid surface (within ± 2 - 3°).
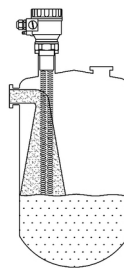

TEMPERATURE
Make sure that the transmitter will be protected against overheating by direct sunshine.

OBSTACLES
Make sure that filling flows (vortex, turbulences) or objects (pipes, scales, stirrers, temperature probes etc.) cannot disturb the beam.

MOUNTING ON TOP OF A TANK

FOAM
Foaming on the liquid surface can affect the echo signal and make it impossible to measure the level.
Find the area whithout foam, otherwise a tranquilization tube may be installed.
This area should be as far as possible from flowing liquid.

WIND
Intensive air (gas) movements in the vicinity of the ultrasonic beam must be avoided.
A strong current can "blow" the ultra sounds.

FUMES / STEAM

For closed tanks containing chemicals or other liquids, which create fume/ gases above the liquid surface, can originate a significative reduction of the nominal measuring range.

This can occur for instance for outdoor tanks exposed to the sun.

5.2 Open channel flow measurement

• For an optimal accuracy, install the unit as close as possible to the maximum fluid level (see the table "Measurement Min. scale).
• Fit the device according to resquested location from Venturi or Weir channel.
• For measurement accuracy the distances from restrictions are mandatory (Report to manual of the flow-meter).
• Despite of the most careful installation, the accuracy of flow measurement will be lower than specified accuracy on the measurement of distance.

It is determined by the features of the open channel or weir.

5.3 Electrical connexions

• Remove the lid to access to the display module (when there is one) and to terminals.

Suggested cable: 0.5 ... 1.5 mm².

• Connect the instrument to Earth: ground screw terminal inside or outside the housing.

The unit may be damaged by electrostatic surge.

Connector to receive the display module BAMOSONIC N-DIS
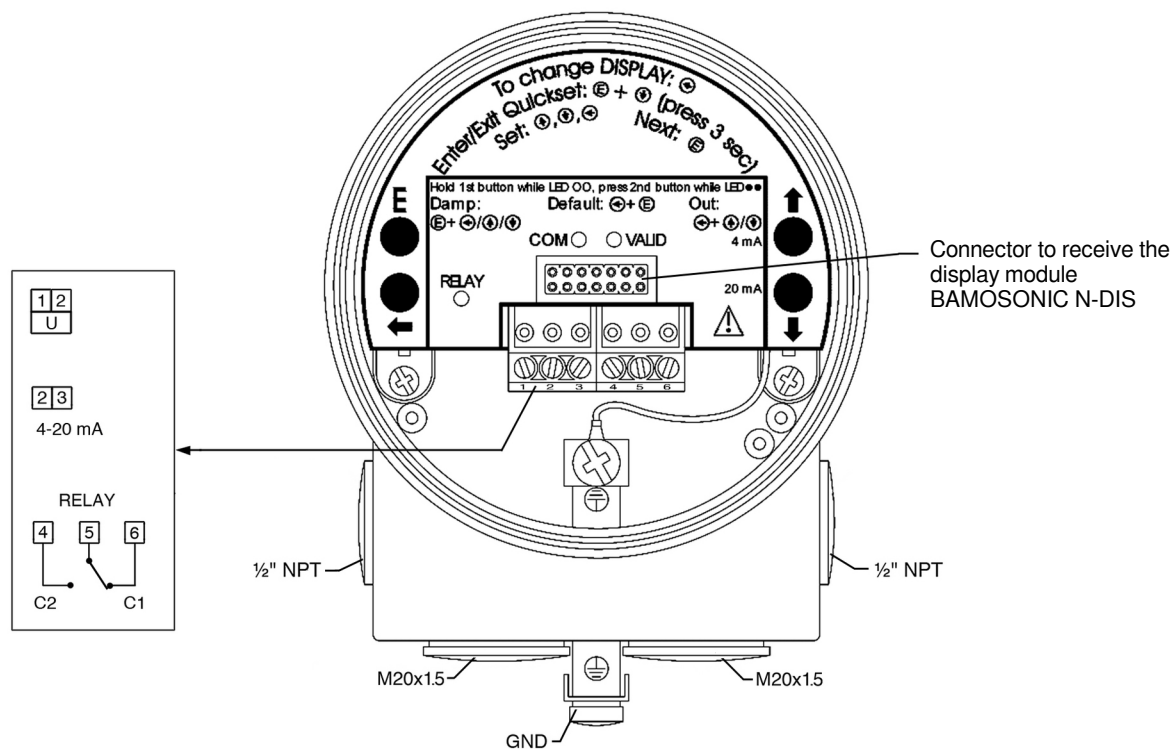
5.4 Loop test points

After removing the lid (and the Display Module if there is any) the actual loop current can be measured with an accuracy of 0.5% by connecting a voltmeter (in the range of 200 mV) to the points indicated on the drawing (terminals 1 & 2).

6. SETTINGS

The device can be set up by two ways:

• Set up without NDIS Module
Levels (liquid heights) assigned to the 4-20 mA output, errors signal through the analogue signal and dampers can be set up.

• Set up with the NDIS Module
All parameters are available, such as measurement settings, optimization, 32-point linearization, tank dimensions (11 models) and 21 open channel models (Venturi & Weir).
BAMOSONIC is fully operating without the display module NDIS.
The NDIS is only needed for setting and/or displaying the measurement values.
The last modifications will be effective after returning to the measurement mode.
The unit will measure during setting in accordance with the previous parameters.
If the transmitter is left in setting mode by mistake, it will automatically return to Measurement mode after 30 minutes and will operate with the parameters entered during the last completed set up.

BAMOSONIC is supplied with the default settings.
- Current output, display: level
- Current output and bargraph directly proportional to level height
- 4 mA: assigned to the minimum level 0%
- 20 mA: assigned to the maximum level 100%
- Error signal: through the current loop, hold last value
- Damper: 60 seconds

6.1 Setting without display module

Set up is only possible when device is set for Level Measurement mode (default) and receives a valid echo ("VALID" LED is lit on).
The following settings are avalable without display module:

- Assigned the requested value to output 4 mA (e.g. Level Min. / Distance Max.)
- Assigned the requested value to output 20 mA (e.g. Level Max. / Distance Min.)
- Error indication by the current output (or Hold last value or 3.6 mA or 22 mA)
- Damper (10, 30 or 60 s)
- Reset to the factory default set up

Note: Current output can also be assigned in reverse mode.
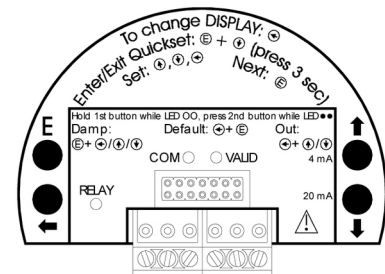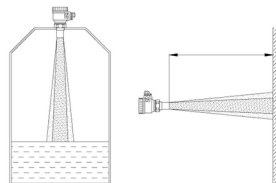*4 mA = 100% (Full tank), 20 mA = 0% (Empty tank)*
To set up, use the keys (see the tables) and check status of LEDs.

●	Lit on
◌	Blinking
○	Off
○ ◌	Flashing intermittently
–	*To not consider*

Assignment of 4 mA, (Tank volume Min.: 0 %)
Locate the device at a distance from the target, corresponding to the required volume Min.
Use the level of the tank, or fix a target at requested distance (for example to a wall).

Step	Action	LEDs status according the action	
1	Checking for a valid ECHO	– ●	= Valid Echo signal, transmitter ready for set up.
2	Press and hold the key NEXT "←"	○ ○	= To start the set up
3	Press and hold the key UP "↑"	● ●	= Distance assigned to 4 mA
4	Release the keys	○ ○	= End of set up

BAMO INTERNATIONAL
22, Rue de la Voie des Bans · Z.I. de la gare · 95100 ARGENTEUIL
Tel +33 (0)1 30 25 83 20 Web www.bamo.eu
Fax +33 (0)1 34 10 16 05 E-mail export@bamo.fr

Ultrasonic level transmitter (2-wire)
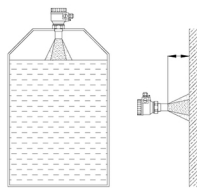**BAMOSONIC**
23-07-2018   M-597.06-EN-AB

597-06/7

Assignment of 20 mA, (Tank volume Max.: 100 %)
Locate the device at a distance from the target, corresponding to the required volume Max.
Use the level of the tank, or fix a target at requested distance (for example to a wal)l.

Step	Action	Status of LED, according the action	
1	Checking for a valid echo	– ●	= Valid echo, programming available
2	Press and hold the NEXT key " ← "	○ ○	= Start of set up
3	Press and hold the DOWN key " ↓ "	● ●	= Distance assigned to 20 mA
4	Release the keys	○ ○	= End of set up

Error signal: through the current output (Checking for a valid echo, as above)
Following this setting, the value for error will be 3.8 or 22 mA, or it will be held at the last value, until the error disappears.

Step	Action	Status of LED, according the action	
1	Press and hold the UP key " ↑ "	○ ○	= Programming mode available
2	Press and hold the DOWN key " ↓ "	● ●	= Hold last value
	or ENTER key " E "		= 3,6 mA
	or NEXT key " ← "		= 22 mA
3	Release the keys	○ ○	= End of set up

Damper: time setting (Check for a valid echo, as above)

Step	Action	Status of LED, according the action	
1	Press and hold the ENTER key " E "	○ ○	= Ready for set up
2	Press and hold the NEXT key " ← "	● ●	= 10 s
	or UP key " ↑ "		= 30 s
	or DOWN key " ↓ "		= 60 s
3	Release the keys	○ ○	= End of set up

RESET (Returns to default configuration)

Step	Action	Status of LED, according the action	
1	Press and hold the NEXT key " ← "	○ ○	= Programming mode is available
2	Press and hold the ENTER key " E "	● ●	= Reset in progress

LED indications table for set up mistakes

Action	Status of LED = Error signal	CORRECTIVE ACTION
During programming	○ ○ = blinking 2 times = no echo signal	Find a valid echo signal
During programming	○ ○ = blinking 3 times = Access denied (Active code access)	With the display unit NDIS
During programming	○ ○ = blinking 4 times = The device is not in Level Measurement Mode	With display unit NDIS

Ultrasonic level transmitter (2-wire)
BAMOSONIC
23-07-2018   M-597.06-EN-AB

597-06 /8

6.2   Set up the BAMOSONIC with the module NDIS

BAMOSONIC should be adjusted to the process by setting the parameters.
Display module NDIS may be used to display the values when setting as well as measurements when operating.
Display module NDIS supports two distinct set up modes, each representing the setting complexity required by end-user.
- **Quick setting**
- **Full Parameter Access**

Quick setting
Recommended as a simple and fast set up :
- Engineering unit (Metric or US)
- Measuring distance Max.
- Assignment of level Min. to 4 mA
- Assignment of level Max. to 20 mA
- Error signal by current output:
- Damper

Full Parameter Access
To all features of device, such as:
- Measurement settings
- Output signals
- Optimization of measurement
- 11 Memorized tank shapes for volume calculation
- Pre-set parameters for Venturi and Weir
- 32-point linearization
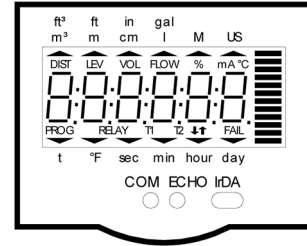
6.2.1 Set up the interface of NDIS module

Symbols in use on the LCD:

DIST	Measuring mode: DISTANCE
LEV	Measuring mode: LEVEL
VOL	Measuring mode: VOLUME
FLOW	Flow-meter mode: Open channel
PROG	Instrument set up mode
T1	TOT1 volume Totalizer, on flow-meter (reset available)
T2	TOT2 volume Totalizer, on flow-meter
FAIL	Errors on measurement/ fault
↑ ↓	Next or previous menu
	Bar Graph assigned to the current output or to echo strength.

Symbols used on the front desk:

M	Metric system
US	US system

LEDs:

COM	Digital communication: HART
ECHO	Valid echo signal

6.2.2 Set up BAMOSONIC with module NDIS

Settings are performed by pressing one or 2 keys at a time (simultaneously).
Pressing 1 key

(E)	Press the key ENTER (E) to save address parameters and to reach "Values" parameters or to return to adress parameters.
←	Press this key to move the blinking sign to the left
↑	Press the UP key to increase value of the blinking digit.
↓	Press the DOWN key to decrease the value of the blinking digit.

Pressing 2 keys simultaneously
Press the two keys simultaneously to access the requested menu.

- Enter into, or, quit setting mode

(E) ↓	Quick setting
(E) ←	Full Parameter Access

**Ultrasonic level transmitter
(2-wire)
BAMOSONIC**

23-07-2018   M-597.06-EN-AB

- Basic steps while parameter address is blinking

← ↑	Cancel all modifications
	"CANCEL" is displayed
← ↓	Return to default values
	LOAD is displayed
↓ ↑	Default values

- Basic steps while parameter value is blinking

← ↑	Cancel all modifications, return to parameter address
	Immediate cancellation
← ↓	Display default values
↓ ↑	Present parameter values

Function: " GET LEVEL "

This specific function is used only in level and distance measurement modes by pressing simultaneously the keys UP " ↑ " and DOWN " ↓ ".

Notes:
If parameter value is not available while parameter address is still blinking after pressing the key ENTER (E)
- The parameter is read-out type
- The password prevents the modification
If the modification of the parameter value is not accepted, the parameter value will blink after pressing the key ENTER (E)
- The modified value is either out of range
- Or the code is not valid for this parameter

6.2.3 LCD Display and indication on the module NDIS
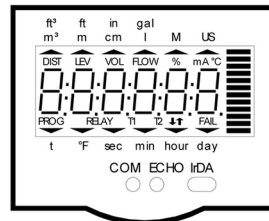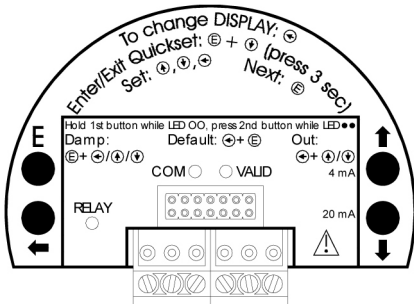
LEDs indications:

| ECHO | LED is lit on when measurement signal is valid. |
| COM | For HART protocole version (Option) |

LCD display on module NDIS
Indications are dependent of measurement mode
Engineering units (°C, °F, mA) will be displayed on the screen

DIST	DISTANCE
LEV	LEVEL
VOL	VOLUME
FLOW	FLOW RATE
T1/T2	TOTALIZERS
FAIL	ERROR (blinking)

To scroll on the displays, press repeatidly the key: NEXT " ← "

Following process parameters may be displayed

Volume / Flow rate	If set up
Level	If set up
Distance	If set up
Alarm indication	The event "FAIL" is blinking

Press the key NEXT " ← " to see next menus; Confirm with the key ENTER (E)

Temperature is displayed when pressing the key UP " ↑ "

Output current value may be displayed by pressing the key DOWN " ↓ "

INTERNATIONAL

22, Rue de la Voie des Bans · Z.I. de la gare · 95100 ARGENTEUIL
Tel +33 (0)1 30 25 83 20 Web www.bamo.eu
Fax +33 (0)1 34 10 16 05 E-mail export@bamo.fr

Ultrasonic level transmitter (2-wire)
BAMOSONIC

23-07-2018   M-597.06-EN-AB

597-06/10

6.2.4 Quick setting

"QUICK SET" menu is recommended as a simple and fast way to start up BAMOSONIC.
It includes 6 screens to set up a simplified operating programme. Access to the other parameters can be modified in the "Full Parameter Access Mode".
QUICKSET appears also on the front panel of module NDIS.

Action	Function
ENTER (E) + DOWN (press > 3 s)	To enter in QUICKSET mode or to end it
UP, DOWN, NEXT	Increase/ decrease the digit value or move blinking digit (to the left)
UP + DOWN	"GET LEVEL" to display present measured level
ENTER (E)	To save settings and go to next menu
NEXT + UP	Abort the change and return to the previous value
NEXT + DOWN	Display of default values of the selected parameter

Below the display and the action to follow:

AP : xxyy **Parameters of your application**
xx= select "EU" (European) for metric system, or, "US" for US engineering units (press keys UP " ↑ " and DOWN " ↓ ")
yy= display is "Li" for liquids
DEFAULT: " EU "
Setting this parameter will result in loading the default options of engineering units.

H : xxxx **H = xxxx - Measuring distance Max.**
Distance between transducer front and tank bottom.

Manually: Set the value; Use the keys UP / DOWN / NEXT keys and save by pressing key ENTER (E).
Automatically: Use the "GET LEVEL" function (only if If the LED VALID is lit on) with keys UP / DOWN, to obtain present measured value of level in the tank or in direction to a fixed surface at equal distance, then save by pressing ENTER (E).
DEFAULT: Measuring distance max. [m], see the table "Technical features".

4 : xxxx **4 mA xxxx**
Level value assigned to 4 mA current output

Manually: Set level value (keys UP / DOWN / NEXT keys) then save by pressing ENTER (E).
Automatically: Use the "GET LEVEL" function (only if If the LED VALID is lit on) with keys UP / DOWN, to obtain present measured value of level in the tank or in direction to a fixed surface at equal distance, then save by pressing ENTER (E).
DEFAULT: 0 m (0%, Empty tank)

20 : xxxx **20 mA xxxx**

Level value assigned to 20 mA current output
Manually: Set level value (Use the keys UP / DOWN / NEXT keys) and save by pressing ENTER (E).
Automatically: Use the "GET LEVEL" function (only if If the LED VALID is lit on) with keys UP / DOWN, to obtain present measured value of level in the tank or in direction to a fixed surface at equal distance, then save by pressing ENTER (E).
DEFAULT: Level Max. (100%, Full tank) = (measured distance) minus (dead band), see table "Technical features".

Er : xxxx **Error indications on the current output**
Select "HOLD", "3.8 mA" or "22 mA" (keys UP / DOWN), then save (E)
DEFAULT: "HOLD" (last value)

dt : xxxx **Damper**
Set required damping time (keys UP / DOWN), then save by pressing ENTER (E).
DEFAULT: 60 s for liquids, 300 s for solids.

NOTE: Current output signal can also be set up in reverse mode: 4 mA= 100% (Full tank), 20 mA= 0% (Empty tank)