BASI

CONTROL & MEASUREMENT

PROGRAMMABLE BARGRAPH INDICATOR

BBI250

OPERATION MANUAL

Please read this Operation Manual before mounting and operating!
Save the Manual for future references!

BBI250 is a programmable process indicator with an input for various linear current, voltage, or resistive signals, a fully programmable tri-color LED bargraph that allows setting the color of each dot, 'dot' or 'bar' display mode as well as customized scale, and a bright 3-digit LED display. The device may be also equipped with up to 2 programmable relays providing ON/OFF control / alarm with or without pulse mode.

Mounting

♦ Place BBI250 into a 42x90 mm panel cut-out.
♦ Tighten it into place using the enclosed mounting brackets.

Electro-Magnetic Interference (EMI) Issues

⚠ **Important note:**

A built-in RC noise suppression circuit may be connected in parallel with relay contacts. Full AC voltage isolation may NOT be provided when relay contacts are open. Small AC current (≈ 1.5 mA at 230 VAC) may still flow through the RC circuit!

♦ All signal wires must be shielded. They must not be packaged together with power cables!
♦ Never lay the signal wires close to inductive or capacitive noise sources, such as relays, contactors, motors, etc.!
♦ All shields have to be grounded ONLY at one end, as closer as possible to the indicator terminals!
♦ Avoid sharing supply lines with powerful consumers, especially with inductive loads, switched on and off.
♦ To stop unwelcome interference signals entering through the power supply lines, use shielded 1:1 isolation transformer!
♦ Shunt all switched (not only those switched by the indicator) inductive consumers with special suppression networks: RC group and varistor - for AC loads, or diode - for DC loads.
♦ If the indicator operates in a very powerful EMI area, it has to be mounted inside a grounded metal shielding box!
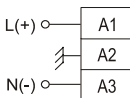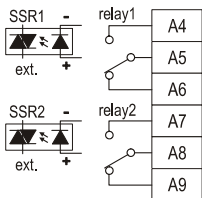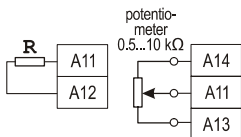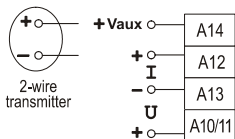
Important notes:

- *Power supply must be turned off during mounting and wiring!*
- *With voltage input, use terminal A10 for range 0...10 V, and A11 – for other.*
- *Connecting a potentiometer requires excitation voltage of 5 V, 10 mA (see '**Specifications**').*

Input signal wiring

Connect the input with regard to its type (see '**Specifications**') through the respective terminals on the device back.

Voltage transmitters should be powered ONLY by external source!

Output wiring

Connect the outputs with regard to their types (see '**Specifications**') via the respective terminals.

Power supply wiring

Connect the right power supply voltage for your device (see '**Specifications**') through the respective terminals.

Parameter Programming

*Some parameters are accessible only when the respective functionality is installed. (see '**Specifications**').*

Device parameters

BBI250 is a programmable device whose service behavior is determined by a set of parameters. All the parameters, along with their names, symbols, and value ranges, are given in Table 1.

Parameter	Symbol	Description
Parameters of Level L3		
Input Type	inP	Type of the input signal in case of programmable input
Point Position	Pnt	Display decimal point position
Input Low	iLo	Display value at low limit of the input range
Input High	ihi	Display value at high limit of the input range
Input Correction	icr	Constant to be added to the measured input value
Gradient	Grd	Maximum admissible input change for 120 ms sampling period
Filter Time	$F.t$	Relative time constant of the input filter
Filter Band	$F.b$	Zone around the measured value, within which the filter is active
SP Limit Low	SPL	Set-point low limit
SP Limit High	SPh	Set-point high limit
Bargraph Low	bLo	Display value at low limit of the bargraph range
Bargraph High	bhi	Display value at high limit of the bargraph range
Bargraph Color	bcL	Color of the bargraph LEDs
Bargraph Mode	bFr	Bargraph display mode
Parameters of Level L2		
Direction 1	$dr.1$	Control action direction of output **K1**
+Differential 1	$Pd.1$	Relay switching differential over set point for output **K1**
-Differential 1	$nd.1$	Relay switching differential under set point for output **K1**
Time On 1	$tn.1$	ON duration of pulsed output **K1**
Time Off 1	$tF.1$	OFF duration of pulsed output **K1**
Hold On 1	$hn.1$	Holds the output **K1** reaction when being activated
Hold Off 1	$hF.1$	Holds the output **K1** reaction when being deactivated
The same 7 parameters, but with index 2 - for output **K2**		
Parameters of Level L1		
Set Point 1	$SP.1$	Set-point value of output **K1**
Set Point 2	$SP.2$	Set-point value of output **K2**
Access-Control Parameter (parameter of Hidden level)		
Access Control Level	AcL	Controls the access to device parameters

* *With potentiometric input, after wiring the device and setting desired values to* **Input Low** *and* **Input High**, **Input High** *value differ, to adjust the device to display PV correctly, set new* **Input High** *value as calculated*

Input High$_{new}$ = **Input Low** + (**Input High** - **Input Low**)^2 / (PV(100%) - **Input Low**)

** *When* **Bargraph Low** = **Bargraph High**, *the bargraph is off; with* **Bargraph Low** < **Bargraph High**, *the pointer goes down within* **Bargraph High** ... **Bargraph Low**.

Table 1

Value	Unit	Notes
$u.10$, $u.5$, $r.0$, $r.4$	-	$u.10$ (0...10 V), $u.5$ (0...5 V; potentiometer 0.5...10 kΩ), $r.0$ (0...20 mA), $r.4$ (4...20 mA)
0, 0.0, 0.00	-	when indicating values with the input-signal measurement unit (**ISU**)
-199 ... 999	ISU	
-199 ... 999	ISU	*
-199 ... 999	ISU	display offset value
0 ... 999	ISU	used for input peak filtration; value '0' cancels the filtration
0 ... 999	-	This parameter and the following one define a low-pass input filter.
0 ... M	ISU	**M** = 25% of input range
-199 ... 999	ISU	These parameters keep the set points in safe limits, preserving them from random changes.
-199 ... 999	ISU	**
-199 ... 999	ISU	
green, yellow, red	-	see 'Setting color'
bAr, dot	-	'**bar**' - all LEDs underneath the pointer light together with it, '**dot**' - only the pointer lights
coo, hEA	-	'**coo**ling' - activates over set point, '**hea**ting' - activates under set point
0 ... 999	ISU	less than (high range limit - **Set Point 1**)
0 ... 999	ISU	less than (**Set Point 1** - low range limit)
0 ... 999	sec.	pulse duration; value '0' disables pulse mode
0 ... 999	sec.	pause duration; value '0' disables pulse mode
0 ... 999	sec.	Value '0' disables hold mode.
-199 ... 999	ISU	within operating range limits **Input Low** ... **Input High**, considering **SP Limit Low(High)**, **Input Correction**, and **+/-Differential 1(2)**
FuL, $L1$, no	-	FuL (full access), $L1$ (access only to parameters of level L1), no (no access)

check the PV(100%) value when potentiometer slide is positioned at 100%. If PV(100%) value and by the formula:

the bargraph pointer goes up within the **Bargraph Low** ... **Bargraph High** *range, while in the opposite case,*

●＊ - Changing
Point Position *value*
reflects on the real value
of all parameters
with ISU!

E.g.: changing
Point Position *value*
from (0) to (0.0)
would change
a Set-point value
of 100 to 10.0!!!

Setting numerical parameter value

♦ Enter parameter value adjustment mode (see '**Program Levels**').

♦ The whole part of the value together with the left zeroes appears on the display, and the rightmost digit blinks.

♦ To select another digit, press ◆.

♦ The 3 rightmost digits can accept values from *0* to *9*, and the leftmost digit can also accept the values **–** and **-|**.

♦ To increase or decrease the blinking digit value, use respectively ⊼ or ⊻.

♦ Confirm the adjusted value by pressing simultaneously ◆ + ⊼ or ◆ + ⊻.

♦ If the new value has not been confirmed and no key has been pressed for a certain period of time, value adjustment automatically ceases, and the parameter retains its initial value.

Setting symbolic parameter value

♦ In parameter value adjustment mode, use ⊼ or ⊻ to change the value, and to confirm, press ◆ + ⊼ or ◆ + ⊻.

♦ If the new value has not been confirmed and no key has been pressed for a certain period of time, value adjustment automatically ceases, and the parameter retains its initial value.

Setting color

♦ Enter **Bargraph Color** parameter value adjustment mode.

♦ Each of the bargraph LEDs lights in its designated color, and the lowermost blinks.

♦ To select other LED, use ◆.

♦ To change the LED color, use ⊼ or ⊻.

♦ To cease the adjustment, press ◆ + ⊼ or ◆ + ⊻ or just wait awhile.

Programming order

♦ Set full access to device parameters.
♦ Adjust the parameters.
♦ If needed, restrict the access again
by adjusting the **Access Control Level** parameter.

Access control (Hidden level)

♦ Hold $\boxed{\wedge}$ depressed while turning
the power supply on and until $A.c.L$ appears.
♦ Set access level according to Table 1.

Basic level

At power-on, TI250 enters Basic level.
At this level, the device shows on the display
the measured input value (PV) with a resolution,
according to the **Point Position** parameter,
and on the bargraph – the relative position of PV
within the programmed range of the bargraph.

♦ If the whole part of PV cannot be entirely
displayed, the unit generates blinking
'overflow' messages (oL or $-oL$, depending
on PV sign). If PV is out of the bargraph
programmed range, the corresponding
endmost LED of the bargraph blinks.
♦ If PV is out of the device physical operating
range, blinking symbolic messages –
$L \_ \_J$ (under-range) or $\Gamma \bar{\ } \bar{\ } \bar{\ }$ (over-range) –
appear on the display, and the respective
endmost LED of the bargraph blinks.
♦ Upon entering Basic level, BBI250 may display
the in_i message, indicating that some time
is necessary for filter initialization.
In such case, the bargraph goes off.
♦ The noi message may appear as a result of
the peak filter operation (see '**Input filtration**').
In such case, the bargraph goes off.

Set-point adjustment (Level L1)

♦ To enter **Set Point 1** adjustment mode, press
and hold $\boxed{\wedge}$ until $SP.1$ appears on the display.
Release the key to view the set-point value.
♦ To enter **Set Point 2** adjustment mode, follow
the same procedure, but start with the $\boxed{\vee}$ key.

⚠ *A PV around
the lower limit
of the bargraph
programmed range
does not visualize on it.*
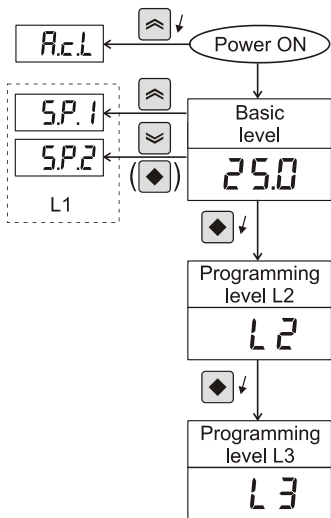
Programming (Levels L2 and L3)

♦ Enter from Basic level by pressing and holding $\boxed{\blacklozenge}$.

♦ To access and adjust the parameters from level L2, release the key while $L\,2$ is displayed. To enter level L3, release the key when $L\,3$ appears on the display.

♦ Choose a parameter using $\boxed{\approx}$ or $\boxed{\vee}$.

♦ To enter parameter value adjustment mode, press $\boxed{\blacklozenge}$.

♦ If no key has been pressed for a while, the device automatically returns to Basic level, storing all confirmed changes.

♦ For quick exiting and saving, use key combination $\boxed{\approx}$ + $\boxed{\blacklozenge}$, $\boxed{\vee}$ + $\boxed{\blacklozenge}$, or $\boxed{\approx}$ + $\boxed{\vee}$.

Output Control

Alarm output operation

♦ The alarm outputs operate according to the control algorithm parameters.
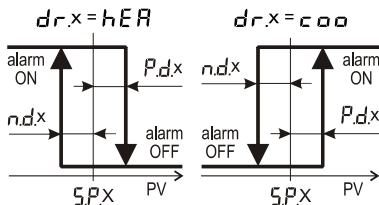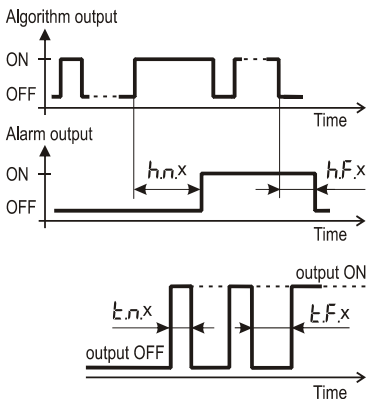
♦ When an error is detected (see '**Error messaging**'), the outputs deactivate and restore after all discrepancies have been resolved and programming exited.

ON/OFF control algorithm

The static characteristic of an alarm relay controlled by an ON/OFF algorithm is shown on the left drawing.

Algorithm output

ON
OFF
Time

Alarm output

ON
OFF
$h.n.x$ $h.F.x$
Time

Output hold

For eliminating undesirable output switches, additional parameters (**Hold On** and **Hold Off**) are assigned to hold the output reaction for certain period of time.

output ON
$t.n.x$ $t.F.x$
output OFF
Time

Output pulse mode

When an output is activated by the control algorithm, it can either stay ON or pulse depending on **Time On** and **Time Off** parameter values.

Error Messaging

Message	Parameters	Error type
FAL	all	incorrect memory
$E.\ 1$	Grd	out of range
$E.\ 2, E.\ 3$	$F.t, F.b$	out of range
$E.\ 4, E.\ 5$	SPL, SPh	out of input range *
$E.\ 6$	SPL, SPh	$SPL > SPh$
$E.11, E.21$	$t.n.1, t.n.2$	out of range
$E.12, E.22$	$t.F.1, t.F.2$	out of range
$E.13, E.23$	$h.n.1, h.n.2$	out of range
$E.14, E.24$	$h.F.1, h.F.2$	out of range
$E.15, E.25$	$P.d.1, P.d.2$	out of range
$E.16, E.26$	$n.d.1, n.d.2$	out of range
$E.17, E.27$	$SP.1, SP.2$	outside $SPL ... SPh$
$E.18, E.28$	$SPx - n.dx$	under input range *
$E.19, E.29$	$SPx + P.dx$	over input range *

* Within range limits **Input Low** ... **Input High** considering **Input Correction**.

♦ In some cases, BBI250 finds discrepancies in parameter values that must be resolved before operating at Basic level.

♦ The device indicates such kind of problems by displaying error messages as given on the left.

♦ If FAL appears on the display, try debugging by turning the power off/on.

♦ If the problem persists, press and hold ◆ to restore the default (factory) settings.

Peak filter

This filter is intended for eliminating pulse spikes (peaks), which can appear in the input signal, in the following way:

♦ BBI250 measures the input signal value every 120 ms (sample time).

♦ The measured values are compared subsequently. The filter checks the difference between the last 2 samples. If it does not exceed **Gradient** value, the device accepts the signal as *normal*.

♦ If the last measured value differs from the previous one by more than the **Gradient** value, the filter output is held until the device determines a presence of a *normal* signal. It is possible only if the input signal has not been changed with more than the **Gradient** value for 4 subsequent samples.

♦ If the device has not determined a *normal* signal for 20 subsequent samples, по⌐ appears on the display (see 'Basic level').

Low-pass filter

This first-order filter acts ONLY within a certain band around filter output value. This has been designed to cut periodic noises outside the communication signal spectrum.

♦ Filter operation is defined by two parameters:
Filter Time (defines filter time constant) and **Filter Band** (defines filter active band around filter output value).

♦ If the newly measured value differs from the filter output by more than **Filter Band**, the filter resets with a new initial output value (newly measured value).

$C\epsilon$

The undersigned hereby declares,
on behalf of BASI.,
that this device has been manufactured
in compliance with standards
EN 61000, EN 61010, and EN 61326,
and meets the requirements of Directives
2004/108/EC, 2006/95/EC, and 2011/65/EU.

Bengt Steèn, CEO
BASI Instrument AB.

Waste Disposal

Do not dispose of electronic devices together with household waste material!

If disposed of within European Union,
this product should be treated
and recycled in accordance with the laws
of your jurisdiction implementing
the WEEE Directive 2002/96
on the Waste Electrical and Electronic
Equipment.

Input	☐ programmable,
	☐ on request (see device label)
Outputs:	up to 2
Electromechanical relay	5A/250VAC with NO/NC contact
SSR	1A/250VAC
MOS gate	0.1A/60V, optically isolated
Output for external SSR	5...24 VDC, 30 mA
- K1	☐ relay, ☐ SSR, ☐ MOS gate, ☐ for ext. SSR
- K2	☐ relay, ☐ SSR, ☐ MOS gate, ☐ for ext. SSR
Power Supply	☐ 230 VAC, ☐ 90…250 V,
	☐ 24 VDC, ☐ 12...24 V,
	☐ ....
Excitation Voltage (Vaux)	☐ 10...30 V, 30 mA, ☐ 5 VDC, 10 mA, stabilized,
	☐ ....
Consumption	less than 10 VA
Measurement Error	$\leq \pm$ 0.3% from span
Temperature Drift	$\leq \pm$ 0,02% from span for 1 °C
Ambient Temperature / Humidity	-10…65 °C / 0…85% RH, non-condensing
Protection Class: front / terminals	☐ IP65, ☐ IP54 / IP20

Warranty and Support

……………………….
serial number

……………………….
manufacturing date

QC check mark ……….…(passed)
(stamp)

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QD-8.2.4-WC

Warranty
BASI warrants this product
to be free from defects in materials
and workmanship for 2 years. If your unit
is found to be defective within that time,
we will promptly repair or replace it.
This warranty does not cover accidental
damage, wear or tear, or consequential
or incidental loss. This warranty
does not cover any defects caused
by wrong transportation, storage, installation,
or operating (see '**Specifications**').

Technical support
In the unlikely event that you encounter
a problem with your BASI device,
please call your local dealer or contact
directly our support team.