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SMART ISOLATED CONDUCTIVITY TRANSMITTER

BCOT751

OPERATION MANUAL

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

Overview

BCOT751 is a smart isolated conductivity transmitter with automatic temperature compensation.
The device is fully programmable with all its parameters accessible by PC via its communication interface.

Mounting and Wiring

Mounting

BCOT751 can be easily mounted on every 35 mm rail conforming to EN50022.

Wiring

- Connect a conductivity cell to terminals 5 and 6(7) and a temperature compensation sensor to terminals 7(6) and 8.

Terminals 6 and 7 are internally connected.

- Get the analog output signal from terminals 2(+) and 4(-).
- Wire the relay output via terminals 3 and 4.
- Connect the right power supply voltage (see '**Specifications**') via terminals 1(+) and 4(-).
- In order to minimize measuring errors, make sure the connecting screws are tightened enough.

Communicating

- Install standard FTDI Cable Driver on your PC.
- Connect BCOT751 to the PC via communication cable model K12U.
- Use an applicable terminal application (e.g. HyperTerminal) and follow the requirements of the described protocol to communicate with the device.

Programming

Device parameters

BCOT751 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 programming

BCOT751 is to be programmed through the communication interface.

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

✸ - *Changing* **Point Position** *value reflects on the real value of all parameters with the conductivity measurement unit.*

E.g.: changing **Point Position** *value from* 0 *to* 1 *would change a set-point value of 100 to 10.0.*

Parameter	Symbol	Description
Input Parameters		
Temperature Value	t.v	Measured temperature
Default Temperature	t.def	Default temperature
Temperature Unit	t.unit	Temperature measurement unit
Temperature Coefficient	t.cor	Temperature compensation coefficient
Temperature Compensation	t.comp	Temperature compensation method
Temperature Sensor	t.sens	Type of sensor connected to the device temperature input
Conductivity Value	c.v	Measured conductivity
Conductivity Unit	c.unit	Conductivity measurement unit
Point Position	c.pnt	Decimal point position
Filter Band	f.b	Zone around the measured value, within which the filter is active
Filter Time	f.t	Relative time constant of the input filter
Cell Constant	const	Cell constant
Wire Resistance	c.cabr	Resistance of the connection wires
Output Parameters		
Output Configuration	o.conf	Analog output signal type
Analog Output Link	o.lnk	Defines input linked to the analog output
Low Limit	o.lo	Input value at low limit of the analog output range
High Limit	o.hi	Input value at high limit of the analog output range
Output Value	o.v	Relative value of the analog output
Output On Error	o.er	Analog output state in case of an error
Hold Time On Error	er.t	Duration of output-reaction hold in case of an error
Relay Output Link	r.lnk	Defines input linked to the relay output
Set Point	r.s.p	Set-point value of the relay output
Hysteresis	r.his	Relay output switching hysteresis
Direction	r.dir	Alarm action direction of the relay output
Calibration Parameter		
Calibration Mode	cal	Defines the method of calibration
System Error	error	

(1) Depending on **Relay Output Link** value
(2) Depending on **Analog Output Link** value
(3) Depending on **Temperature Unit** value

Table 1

Value	Unit	Point	Notes
000.0…100.0 032.0…212.0 (3)	t.unit	1	
			used when **Temperature Compensation** = fixed
c, f	-	-	c (Celsius), f (Fahrenheit)
0.000…9.999 0.000…5.555 (3)	%/t.unit	3	
sens, fixed, off	-	-	sens (using measured temperature), fixed (using **Default Temperature**), off (no compensation)
Pt100, pt1000, ntc1k	-	-	Pt100 (Pt100), pt1000 (Pt1000), ntc1k (NTC 1k)
	c.unit	c.pnt	
mS.cm, uS.cm	-	-	mS.cm (mS/cm), uS.cm (µS/cm)
0, 1, 2, 3	-	-	
0…**M**	c.unit	c.pnt	**M** = 5***Cell Constant** (mS/cm) = 5000***Cell Constant** (µS/cm)
0…999	0.1/s	0	
0.008000…25.00000	1/cm	5, 6	
00.00…99.99	Ω	3	used for long wire resistance compensation
i.0.20, i.4.20, u.0.10, u.2.10	-	-	i.0.20 (0…20 mA), i.4.20 (4…20 mA), u.0.10 (0…10 V), u.2.10 (2…10 V)
cond, temp	-	-	cond (conductivity input), temp (temperature input)
0000…9999	c.unit t.unit (1)	c.pnt 1 (1)	
0000…9999	-	0	
under, over	-	-	under (under range), over (over range)
000.0…10.0	s	1	applies both to the analog and the relay output
cond, temp	-	-	cond (conductivity input), temp (temperature input)
0000…9999	c.unit t.unit (2)	c.pnt 1 (2)	
heat, cool	-	-	heat (activates under set point), cool (activates over set point)
no, c.set, c.cal	-	-	no (calibration off), c.set (calibration by setting cell constant), c.cal (calibration by adjusting measured value)
0…41	-	-	see '**Errors**'

Notes:

- *BCOT751 adds 3 spaces in the beginning of the response.*
- *BCOT751 returns decimal point even when the value is integer.*
- *#13 (CR) is byte 0x0D; #10 (LF) is byte 0x0A.*

Protocol examples:

PC or other device:	BCOT751 response:
reading filter time	
`f.t#13#10`	`f.t 0015.#13#10`
writing filter time of 30	
`f.t 30#13#10`	`f.t 0030.#13#10`
reading measured conductivity	
`c.v#13#10`	`c.v 027.5#13#10`

Protocol architecture

- The protocol is based on UART protocol with:
  - Baud Rate - 9600 bps;
  - Data bits - 8;
  - Parity Control - Even;
  - Stop bit - 1.
- ASCII protocol is used for communicating, and the information is exchanged in frames.
- Each frame consists of 1, or 2 words separated by byte 32 (SPACE), and ends with bytes 13 (CR) and 10 (LF). The first word in the frame denotes the parameter 'Symbol' as taken from Table 1 and the second word (if needed) is the parameter 'Value', both spelled with only small Latin letters (except for **Conductivity Unit** value), digits, dots, and/or the '-' sign.

Reading from a device

- If the frame consists of only 1 word, it is recognized as a command for reading.
- The device responds to it by returning the same word and its value, according to Table 1.

Writing in a device

- If the frame consists of 2 words, it is recognized as a command for writing.
- With writing, transferred are the same 2 words that would have been received at the respective command for reading from the device (except for the `reset` command).

`invalid command.`	command not recognized
`parity error.`	parity error detected
`not a number.`	attempt to write symbols for numerical parameter
`point error.`	value resolution greater than parameter's one
`out of range.`	value out of range
`read only.`	parameter is read-only
`can't save.`	problem with writing in non-volatile memory

Other device responses

- BCOT751 responses in case of incorrect protocol use are given on the left.
- When **Error Info** value is `-1`, the device substitutes any command for `error` reading (see '**Errors**').

Reset

To reset the device, send command `reset`.

Errors

Value	Parameters	Error type
`-1`	all	incorrect memory
`0`	all	no error
`1`	**Cell Constant**	out of range
`2`	**Filter Time**	out of range
`3`	**Filter Band**	out of range
`4`	**Temperature Coefficient**	out of range
`5`	**Default Temperature**	out of range
`11`	**Hysteresis**	out of range *
`12`	**Set Point - Hysteresis**	under range *
`13`	**Set Point + Hysteresis**	over range *
`21`	**Hysteresis**	out of range **
`22`	**Set Point - Hysteresis**	under range **
`23`	**Set Point + Hysteresis**	over range **
`31`	**Hold Time On Error**	out of range
`41`	**Wire Resistance**	out of range

* with **Relay Output Link** = `temp`
** with **Relay Output Link** = `cond`

- Writing in the device may incur discrepancies in parameter values that must be resolved before further operation.
- To check for an error, send command `error`.
- In case of value `-1`, try resetting by sending command `reset`.
- If the problem persists, send command `error 0` to restore the default (factory) settings.

Temperature Compensation

- To use the current measured temperature for temperature compensation, set parameter **Temperature Compensation** to `sens` (`t.comp sens#13#10`).
- For manual temperature compensation, using the value of the parameter **Default Temperature**, set parameter **Temperature Compensation** to `fixed` (`t.comp fixed#13#10`).

Set a **Default Temperature** *value as close as possible to the operating temperature value.*

- To turn off temperature compensation, set parameter **Temperature Compensation** to `off` (`t.comp off#13#10`).

Input Filtration

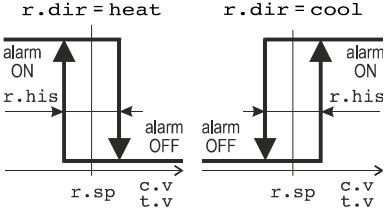
Low-pass filter

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).

Output operation

- The analog output operates according to the values of parameters **Low Limit**, **High Limit**, and **Output Value**.
- The alarm relay output operates according to the control algorithm parameters - **Set Point**, **Direction**, and **Hysteresis**.
- When an error is detected, the relay output deactivates and the analog output is held for a certain time, defined by the parameter **Hold Time On Error**.
- The analog output signal in case of an error depends on the value of parameter **Output On Error**.



ON/OFF control algorithm

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

Calibration by setting cell constant

- To use this method, set parameter **Calibration Mode** to `c.set` (`cal c.set#13#10`).
- Assign the precise cell constant value, taken from the certificate provided with your sensor or from the sensor label, to the parameter **Cell Constant** (`const x.xxxxxx#13#10`).

Calibration by adjusting measured value

- To use this method, set parameter **Calibration Mode** to `c.cal` (`cal c.cal#13#10`).
- To take temperature compensation into account, select the desired compensation method via parameter **Temperature Compensation**.
- Place the conductivity cell into calibration solution and wait for the measured value to stabilize (`c.v#13#10`).
- Assign the calibration solution's conductivity value to the **Conductivity Value** parameter (`c.v xx.xx#13#10`).

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 Directive 2012/19/EU on waste electrical and electronic equipment (WEEE).

Specifications

Conductivity Input Signal	0.1 µS/cm … 100 mS/cm
Cell Constant	0.008…25 cm^{-1}
Temperature Input	Pt100, Pt1000, or NTC 1k, programmable
Temperature Compensation	0.0...10.0 %/°C
Output Signal	0(4)...20 mA or 0(2)...10 V, programmable
Admissible Current Load	max. 500 Ω at 20 mA
Admissible Voltage Load	max. 2 kΩ at 10 V
Relay Output	MOS gate 0.1mA/60V, optically isolated
Serial Interface	☐ K12U compatible
Power Supply	24 VDC ± 20%, max. 100 mA
Input Isolation	1500 VAC for 1 min
Total Measurement Error	± 2% from span
Temperature Drift	± 0.06% from span for 1 °C
Ambient Temperature / Humidity	-20…85 °C / 0…85% RH, non-condensing
Protection Class	IP20

Warranty and Support

……
article number

……
serial number

……
manufacturing date

QC check mark ……(passed)
(stamp)

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Warranty

BASI Instrument AB 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.