

# Digital Readout

**Type: BC-A01**

**- angular measurement**



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**Note:**

Before you proceed to operate the digital readout, acquaint yourself thoroughly with this manual.  
Warranty claims caused by improper operation cannot be accepted.

## 1. Basic features and safety

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BC-A01 is a digital readout designed especially for angular measurements. It processes signals from incremental encoders providing TTL phase shifted A/B signals.

**Standard features:**

- 6-digit LED display + sign
- height of the digits 14 mm
- counting direction setting
- absolute / incremental measurement
- angular value can be displayed in decinal form or in the form of angular degrees, minutes and seconds (max. 5 seconds)
- resetting, presetting the initial measurement value
- mirroring, 1/2 value calculation (halving)
- checking of an unknown encoder resolution
- encoder resolution setting
- encoder linear correction setting
- reference point setting / customer reference point setting
- possibility to lock any of the digital readout buttons
- measured values and parameters retained in memory after switching off

**Optional features:**

- external analog/digital input
- relay control outputs of slowing-down points

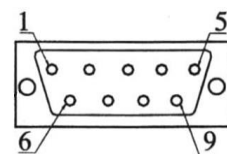
**Safety**

The BC-A01 digital readout is powered from the mains power adapter connected to the power supply 230 V / 50 Hz. During installation and operation keep common principles valid for operation of electrical devices. The mains adapter remains connected to the mains power even after switching the power switch on the rear panel off.

## 2. Technical specifications

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Power supply	standard: mains adapter 9 V DC - connectors: No.: 1&6 (0V) and 5&9 (+9V) - there is supplied standard power adapter for 220V / 50 Hz optionally: 24 V - connectors: No.: 2 (0V) and 5 (+24V) - DC
Current	150mA
Operating temperature	+10...+40 °C
Measurement range:	0 ~ 999,999° or +/- 999°, 59 min, 55 sec 0 ~ 359,999° or +/- 359°, 59 min, 55 sec
Resolution:	0.001° /3.6 sec. or 5 sec
Measurement velocity:	reciprocal resolution – 6 rev./min. at resolution 0.001°
Circle division:	6 ~ 360000



### 3. Digital readout setting

#### Connection

Connect the power supply and the encoder to the connectors located on the rear panel of the digital readout. Turn the unit on using the power switch located on the rear panel of the digital readout.

*The following tables describe individual digits on the display for setting the readout functions:*

During power on press and hold a button or buttons to invoke the setting mode.

After finishing a setting confirm the set parameters by pressing the MODE button. Switch the readout off and on again. The readout starts to operate with a new setting.

If you do not want to change the setting, switch the readout off to finish the setting mode.

Meaning of the displayed digits in the setting mode:

1 – function is active

0 – function is blocked

ABS button – moves the active (blinking) position to the left

INC button – changes value of the digit on the active position (values 0 / 1)

#### 3.1 Digital readout constants

During power on press and hold the ABS button.

	Readout constants					
Displayed positions:	SIGN	HALF	NiE	MIRROR	360°	TEST

SIGN - counting direction selection (sign)

HALF - ½ value calculation (halving)

NiE - zero pulse from the encoder (reference point)

MIRROR - displayed value mirroring

360° - one circle measurement

TEST - checking of an unknown encoder resolution (the readout will be automatically switched to resolution 1)

#### 3.2 Button locking

During power on press and hold the MODE button.

	Button locking			Not used buttons		
Displayed positions:	MODE	ABS	INC	XXX	XXX	XXX

MODE 0 = MODE button locking

ABS 0 = ABS button locking

INC 0 = INC button locking

### 3.3 Enabling the slowing-down points, cycle

During power on press and hold the ABS and MODE buttons simultaneously.

	Input			Output		
Displayed positions:	XXX	XXX	XXX	XXX	CUT	SLOW

- CUT - after reaching the target value, the pre-defined value is set again (repeating the cycle)
- SLOW - enabling the slowing-down points

### The following functions can be set by numerical values on the display:

- ABS button – moves the active (blinking) position to the left
- INC button – increasing value of the digit on the active position (values 0 up to 9)

### 3.4 Reference point setting

During power on press and hold the INC button.

	Primary reference point					
Value:	0-9	0-9	0-9	0-9	0-9	0-9

1) **Movable (working, customer) reference point** – this reference point (coordinate value in a given point) is automatically referenced by the readout to the reference point, which is positioned on the encoder. Thanks to this memorized reference point it is possible to return back to the original absolute scale of measurement after switching the power supply off and on again. In fact, the digital readout can be used as an absolute measurement system even if incremental encoder are used.

The movable reference point is indicated during moving the encoder through the scale reference point (the **NiE** function indicating the reference point must be enabled).

2) **Fixed reference point (zero point, not obligatory)** – this reference point is fixed by the user (eg. absolute angular zero value etc.)

The fixed reference point is indicated after switching the readout on, during moving the encoder through the reference point, when the MODE button is pressed simultaneously (the **NiE** function indicating the reference point must be enabled). The readout displays an angle related to this reference point (eg. related to the absolute zero value).

### 3.5 Slowing-down points setting

During power on press and hold the INC and MODE buttons simultaneously.

			1 <sup>st</sup> s-d p.	2 <sup>nd</sup> s-d p.	3 <sup>th</sup> s-d p.	Target
Value:	0	0	0-9	0-9	0-9	0-9

The values stand for distances before the target

- 1<sup>st</sup> s-d p. - 1<sup>st</sup> slowing-down point (0-9 degrees before target)
- 2<sup>nd</sup> s-d p. - 2<sup>nd</sup> slowing-down point (0-9 tens of degree before target)
- 3<sup>th</sup> s-d p. - 3<sup>th</sup> slowing-down point (0-9 hundredths before target)
- Target - coincidence (0-9 thousandth before target)

**3.6 Digital readout resolution setting according to the connected encoder**

During power on press and hold the ABS and INC buttons simultaneously.

<b>Digital readout resolution according to the connected encoder</b>						
Value:	0	0-6	0-9	0-9	0-9	0-9

Method of coefficient setting according to the applied encoder:

- 1) in the test mode measure number of pulses within the specified angle (eg. 15708 pulses / 90°)
- 2) enter number of pulses into the following formula:  
 Coefficient = 360000 / number of pulses for 360°  
 Round the coefficient to an integer value.  
 Max. number of pulses = 65535

*Example:* Encoder coefficient calculation for circle diameter 100 mm; 5 micron resolution encoder is used.

$$\text{Coefficient} = 360000 / 15708 \times 4$$

$$\text{Coefficient} = 5.73 = \mathbf{5} \text{ or } \mathbf{6}$$

Further, angular correction setting of the encoder must be performed to display the angular value accurately.

**3.7 Angular correction setting**

During power on press and hold the MODE, ABS and INC buttons simultaneously.

<b>Angular correction setting</b>						
Value:	0	0	0-9	0-9	0-9	0-9

$$\text{Value} = (360000 - (\text{number of pulses for } 360^\circ * \text{resolution coefficient of the readout})) * 2^{16} / (\text{number of pulses for } 360^\circ * \text{resolution coefficient of the readout})$$

or

$$\text{Value} = (360000 - (360000 + \text{number of pulses making deviation for } 360^\circ)) * 2^{16} / (360000 + \text{number of pulses making deviation for } 360^\circ)$$

Max. = 9999

*Example 1:* Example of calculation for circle diameter 100 mm  
 Number of pulses for 90° = 15708 (62 832 / 360°)  
 For angular correction calculation a rounded down coefficient will be used = 5 (entered into the readout)

$$\text{Value} = (360\ 000 - (62832 * 5)) * 2^{16} / (62832 * 5)$$

$$\text{Value} = 9563$$

*Example 2:* Example of calculation for circle diameter 100 mm  
 Number of pulses for 90° = 15708 (62 832 / 360°)  
 For angular correction calculation a rounded up coefficient will be used = 6 (entered into the readout)

$$\text{Value} = (360\ 000 - (62832 * 6)) * 2^{16} / (62832 * 6)$$

$$\text{Value} = -2954$$

**Example 3:** Example of calculation for circle diameter 100 mm  
When using the coefficient value = 5, 45 840 pulses remain to 360°  
Coefficient value = 6 was entered into the readout.

Value =  $(360\,000 - (360\,000 - 45\,840)) * 2^{16} / (360\,000 - 45\,840)$   
Value = 9563

**Example 4:** Example of calculation for circle diameter 100 mm  
When using the coefficient value = 6, there are 16 992 spare pulses for 360°  
Coefficient value = 6 was entered into the readout.

Value =  $(360\,000 - (360\,000 - (-16\,992))) * 2^{16} / (360\,000 - (-16\,992))$   
Value = - 2954

## **4. Digital readout operation**

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### **4.1 MODE button**

- Press this button shortly to select decimal display or degrees-minutes-seconds display.  
(the degrees-minutes-seconds display is indicated by the luminous LED over the MODE button)

### **4.2 ABS button**

- Press this button shortly to select absolute scale of measurement  
(it is indicated by the luminous LED over the ABS button)
- Press this button long to switch the readout to the mode of presetting a value of the absolute scale  
(presetting of the absolute scale is possible in the display mode of decimal angular values)

ABS button – moves the active (blinking) position to the left  
INC button – increases value of the digit on the active position (values 0 up to 9)  
MODE button – confirms the set value and returns to the measurement mode

### **4.3 INC button**

- Press the button to clear the display and to select incremental scale of measurement  
(it is indicated by the luminous LED over the INC button)
- Press this button long when the function HALF active to halve the displayed value.

## 5. Troubleshooting

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### 5.1 Not able to switch the digital readout on

Check power inlet and the mains adapter.

### 5.2 Measured values are not correct

- 1) Check correct connection between the readout and the encoder.
- 2) Check if velocity of the movement is not too high.
- 3) Check correct installation of the encoder.
- 4) Check correct setting of the readout resolution.
- 5) Check correct setting of the correction factor.

### 5.3 The display is shining without indicating any values

Check the set value of the encoder resolution. When 0, the readout does not indicate any values!

## 6. Maintenance, repair, disposal

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### *Cleaning and maintenance*

The casing of the readout may be cleaned with a soft cloth. Do not use any solvents.

The electronic system of the readout does not require any maintenance.

### *Repairs*

Let the faulty readout repair at the supplier or in an authorized service point only. Unauthorized repairs lead to cancellation of warranty.

### *Disposal*

Worn-out electronic device should be sent to a collection point in accordance with regulations valid for worn-out electric and electronic equipments.