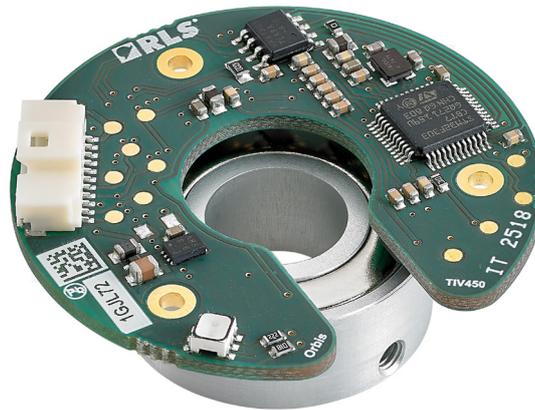


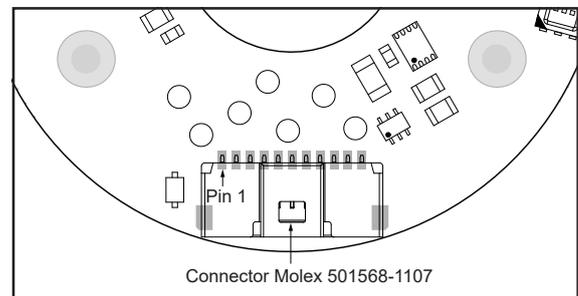
# Orbis™ battery backup multiturn (BBM) absolute rotary encoder



- Multiturn counter powered by battery
- Extended temperature range
- Reduced accuracy thermal drift

## Technical specifications

<b>Resolution</b>	14 bit
<b>Accuracy</b>	±0.25° (optimal installation)
<b>Accuracy thermal drift</b>	±0.003°/°C
<b>Operating temperature</b>	-40 °C to +105 °C
<b>Installation tolerances</b>	
Axial ( $\Delta Z$ ) displacement (ride height)	3.5 mm nominal ±0.5 mm



## Electrical data

<b>Main supply voltage</b>	4.5 V to 5.5 V (at the connector)
<b>Current consumption</b>	70 mA typical (no output load)
<b>Battery supply voltage (<math>V_{BAT}</math>)</b>	3.15 V to 4.1 V (at the connector)*
<b>Battery monitoring error threshold voltage</b>	3.05 V
<b>Battery monitoring warning threshold voltage</b>	3.15 V
<b>Supply current from battery (with main supply disconnected)</b>	30 $\mu$ A typ. (Speed <8000 RPM) at $V_{BAT} = 3.5$ V
<b>Supply current from battery (with main supply connected)</b>	4 $\mu$ A

\* Do not use Orbis BBM without an external battery connected. If only the battery power supply is connected, communication with encoder is not possible and LED will be turned off. To establish communication, the encoder must be connected to the main power supply.

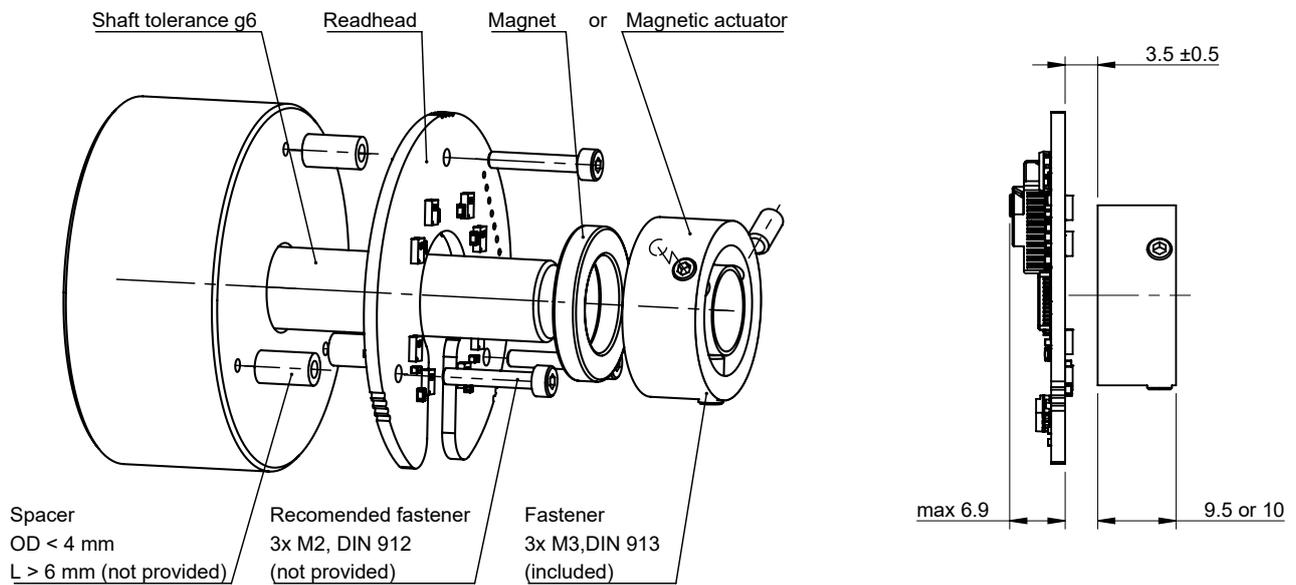
## Pinout

Pin	Signal
1	5 V Supply
2	$V_{BAT}$
3	GND
4	
5	-
6	-
7	MA+
8	MA-
9	Cable Shield
10	SLO+
11	SLO-

For other specifications please see the document BRD01 at [www.rls.si/orbis](http://www.rls.si/orbis).

### Installation drawing

Dimensions and tolerance in mm.



\* Readhead should only be mounted on the golden plated surfaces around the mounting holes.

### Installation procedure

1. Install Orbis encoder readhead and magnetic actuator according to mechanical tolerances specification in document BRD01 at [www.rls.si/orbis](http://www.rls.si/orbis).
2. Connect main power supply and battery power supply. At this point, red LED should be blinking. The rotation speed should not be high during power-up of the encoder and when setting the multiturn counter.
3. Apply the multiturn counter twice in order to set the correct value (see section "Using Orbis BBM with Encosight Software" or Orbis BiSS-C register access Application note, section Multiturn counter which can be downloaded from [www.rls.si/orbis](http://www.rls.si/orbis)). Please wait at least 0.5 s between the first and the second multiturn counter value input. Green LED should be blinking.

### Battery replacement

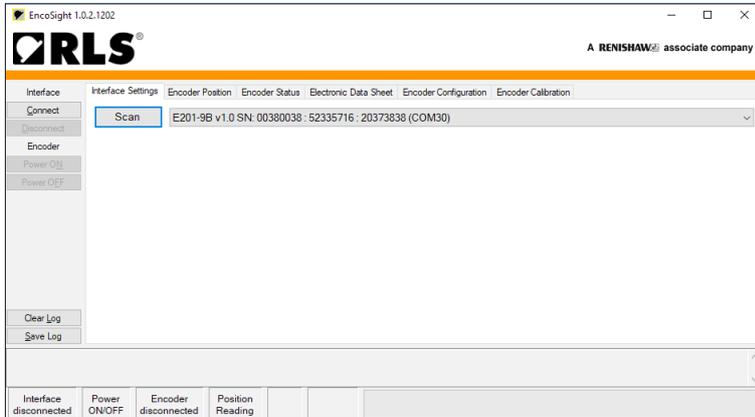
Follow the installation procedure and:

- Have the second battery connected to the encoder before disconnecting the first.
- Remember the multiturn counter value and set the multiturn based on this information after new battery is connected. Please follow the third paragraph of Installation procedure described above. Battery Error / Warning is cleared when the multiturn counter is set.

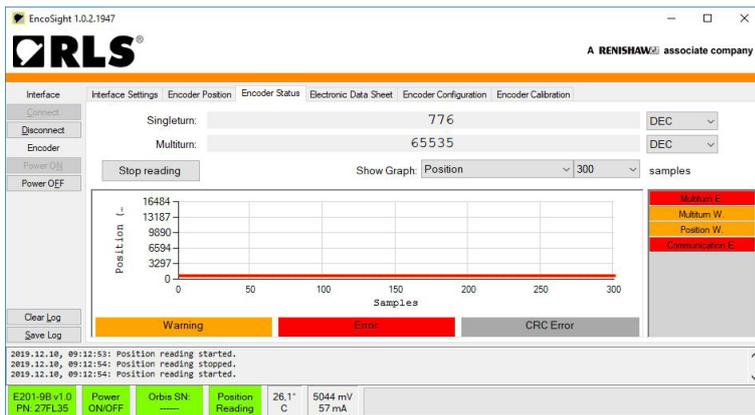
## Using Orbis BBM with Encosight Software

### Procedure:

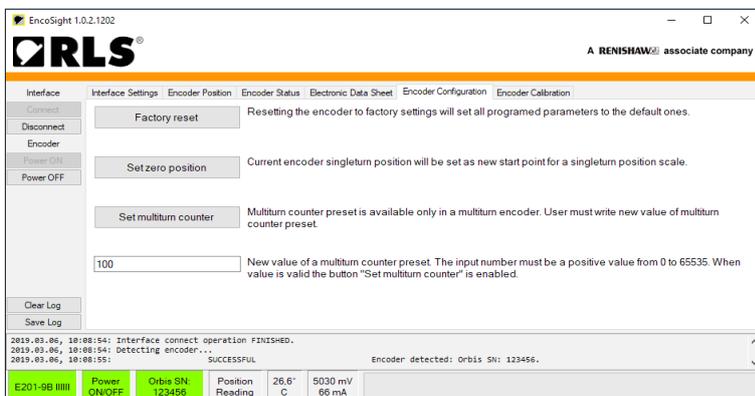
1. Connect E201-9B BiSS-C interface to the host computer with USB cable.
2. Connect Orbis BBM encoder to E201-9B BiSS-C interface with a DB-9 connector cable.
3. Open Encosight program. You should be welcomed by the following screen:



4. Software should automatically find E201-9B hardware and display it in the drop-down list. Click "Connect". The encoder should now be connected and its serial number should appear on the bottom label. If you go to the "Encoder Status" tab, you will find errors and warnings as shown below.



5. Go to the "Encoder Configuration" tab. Write the desired value between 0 to 65535 for the multiturn counter and then press the "Set multiturn counter" button **twice**. If this was successful, the encoder error should now be cleared and green LED indicates that it is now ready for normal operation.
6. You can display the singleturn and multiturn position of the encoder in the "Encoder Status" tab. You can also test the behaviour of the encoder without main supply by pressing the "Power OFF" button. This switches off the main power supply. In that case the LED light is turned off but the encoder still counts the rotations and updates the multiturn counter value. Singleturn position and reading values from the encoder is available only when the main power supply is turned on.



7. When disconnecting E201-9B interface, make sure the battery remains connected to Orbis BBM encoder at all times. If the battery is disconnected, the multiturn error will reappear.

### Prerequisites:

- Latest version of Encosight Software (available for download at [E201-9B website](#))
- [E201-9B USB Encoder Interface](#)

### Multiturn status bit definitions

Multiturn status is accessible on BiSS Direct access registers on address 0x53 as one status byte. Definition of each bit can be found in table below:

Name	Bit	Description	Details	Solution
COMM_ERR	0	Communication error	Error in the internal encoder communication. This could be caused by physical damage to the communication lines or an irregular initialization process. Red LED. Position is invalid.	Check for any EMI around the readhead, reset Orbis encoder and cycle main power.
POS_ERR	1	General position error	General positioning errors can be the result of the following situations: <ul style="list-style-type: none"> <li>• Insufficient presence of a magnetic field</li> <li>• Unexplained position change</li> <li>• Unexplained configuration change</li> <li>• Error in the initialization procedure</li> <li>• Temporarily insufficient power supply was detected</li> </ul> Red LED. Position is invalid.	Check that Orbis is installed within the mechanical installation tolerances and that the readhead is not mechanically damaged. Cycle main power to the encoder and apply the multiturn counter value. *
BAT_ERR	2	Battery supply error **	The battery voltage is below the minimum level. This bit is latching; once set, it can only be cleared by applying a new multiturn counter value.  The color of the LED depends on the situation in which the battery voltage level is detected: red if insufficient battery voltage was detected at encoder power-up, or yellow if insufficient battery voltage is detected during the regular encoder status check.	Change the battery and write a new multiturn counter value.
BAT_WNG	3	Battery supply warning **	The battery voltage is near the minimum level.  Orange LED. Position is valid.	Procedure for battery replacement: <ol style="list-style-type: none"> <li>1. Leave Orbis powered on</li> <li>2. Store current multiturn counter value</li> <li>3. Remove battery</li> <li>4. Insert new battery</li> <li>5. Apply stored multiturn counter value to Orbis *</li> </ol> Alternative: <ol style="list-style-type: none"> <li>1. Connect the new battery in parallel to the old battery</li> <li>2. Remove the old battery quickly</li> </ol>
Reserved	4	-	-	-
POS_WNG	5	General error at regular status checking	The multiturn value is checked at regular intervals. An error was detected during this check. See POS_ERR. Position is still valid, but not on the next power on.  Orange LED. Position is valid.	Check that Orbis is within the mechanical installation tolerances and that the readhead is not mechanically damaged. Apply the multiturn counter value. *
COMM_WNG	6	Communication warning	Communication error occurred during the regular status check.	Check for any EMI around the readhead, reset Orbis encoder and cycle main power.
SYS_ERR	7	System error	Incorrect sensor version.	Contact <a href="#">RLS sales</a> .

\* Enter the multiturn counter value between 0 to 65535 twice in order to set the correct value. Please wait at least 0.5 s between the first and the second multiturn counter value input.

\*\* Disconnected battery or low battery voltage is monitored every 10 seconds.

## Battery selection guide

The battery capacity should be selected according to the expected total encoder off-time and supply current from the battery (see table on [Page 1](#)). The battery consumption is independent of the rotation speed.

Duration time (approximate)	Battery capacity	Battery size
2 years	0.55 Ah	Coin
3.8 years	1.0 Ah	1/10 D
4.5 years	1.2 Ah	1/2 AA
9 years	2.5 Ah	AA
13 years	3.5 Ah	A

NOTE: Duration times of the batteries are based on preliminary calculations.

## Battery error status definitions

	Operating voltage / Condition	MT status (BiSS direct access register: 0x53)	Detailed status (BiSS direct access registers: 0x4A-0x4B)	Error/Warning	LED	Measures
1	BAT: 3.15 V–4.1 V, normal operation	0	0	No error/warning	Green	-
2	BAT: 3.05 V–3.15 V, normal operation	0x08 (BAT_WNG)	0x108 (MT warning)	Warning	Orange	Check battery
3	BAT: <3.05 V, normal operation	0x0C (BAT_WNG + BAT_ERR)	0x108 (MT warning)	Warning	Orange	Check battery
4	BAT: 3.05 V–3.15 V, after power cycle	0x0e (BAT_WNG)	0x108 (MT warning)	Warning	Orange	Check battery
5	BAT: <3.05 V, after power cycle	0x0e (BAT_ERR + BAT_WNG + POS_ERR)	0x308 (MT error)	Error	Red	Check battery Error clearance : setting MT counter

Communication interface:

Only BiSS-C communication is supported.

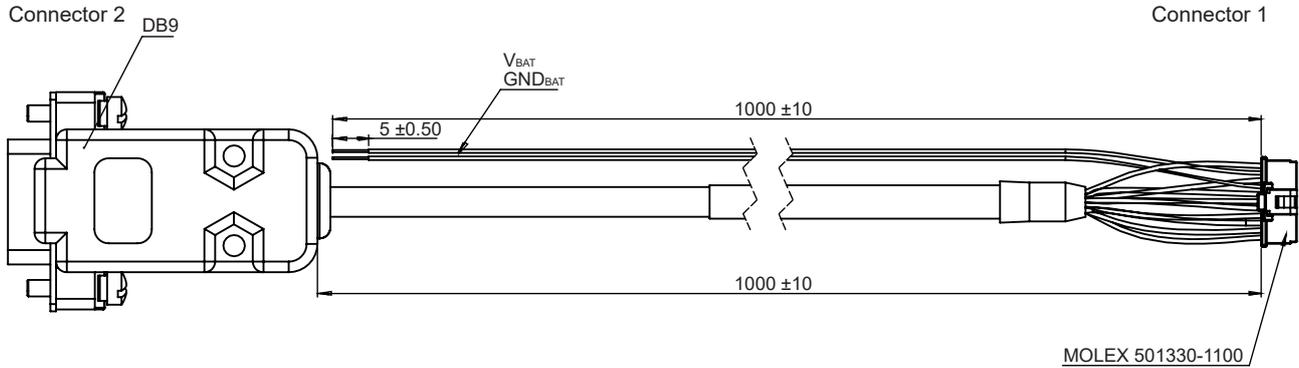
Data sheet  
**BRD08\_02**

**Accessories**

Cables with crimped connectors

Part number	Length	Connector 1	Connector 2	Notes
<b>ACC035</b>	1.0 m	Molex 501330-1100 and 501334-0000	Flying leads	Single-shielded
<b>ACC036</b>			DSUB-9 M	

Dimensions and tolerances are in mm.



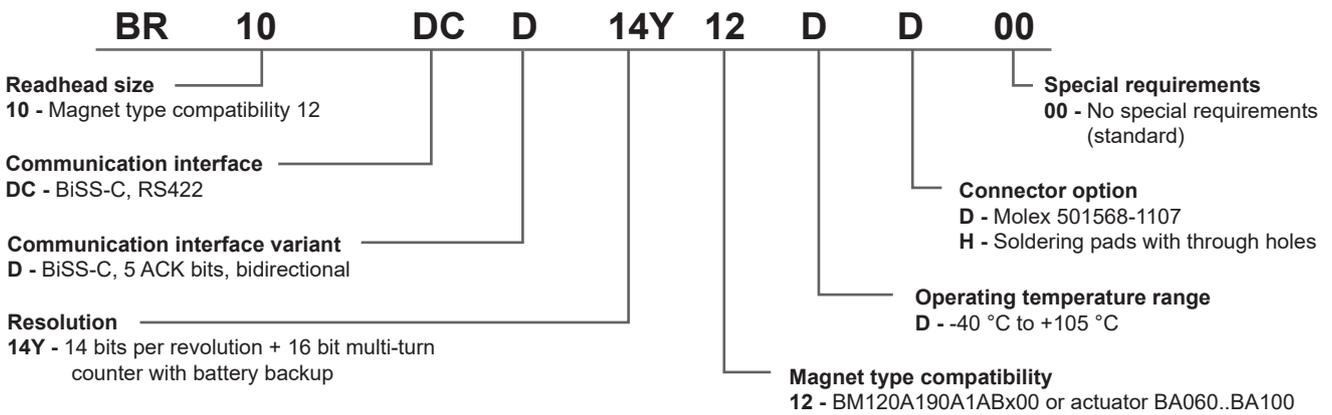
Connector 1 pin	Connector 2 pin	Wire color (flying lead)	BISS-C
1	5	Brown	5 V supply
2	External wire (violet)	Pink (flying lead) or Violet (external wire)	$V_{BAT}$
3	9	White	0 V (GND)
4	External wire (grey)	Grey	
5	-	-	-
6	-	-	-
7	2	Red	MA+
8	3	Blue	MA-
9	1	Cable shield	Cable shield
10	6	Green	SLO+
11	7	Yellow	SLO-

**Cable specifications**

<b>Part numbers</b>	ACC035, ACC036	
<b>Cable specifications</b>	LI12YC12Y	
<b>Configuration</b>	4 × 2 × 0.14 mm <sup>2</sup>	
<b>Sheath colour</b>	Grey (RAL7032)	
<b>Rated voltage</b>	250 V	
<b>Temperature range</b>	Operating -30 °C to +125 °C Storage -40 °C to +130 °C	Not valid for cables with DSUB-9 M connector.
<b>Environmental conformation</b>	RoHS conform 73/23/EWG-Guideline CE conform Halogen free	
<b>Chemical resistance</b>	Largely resistant to acids, bases and usual oils. Free from lacquer damaging substances and silicone.	

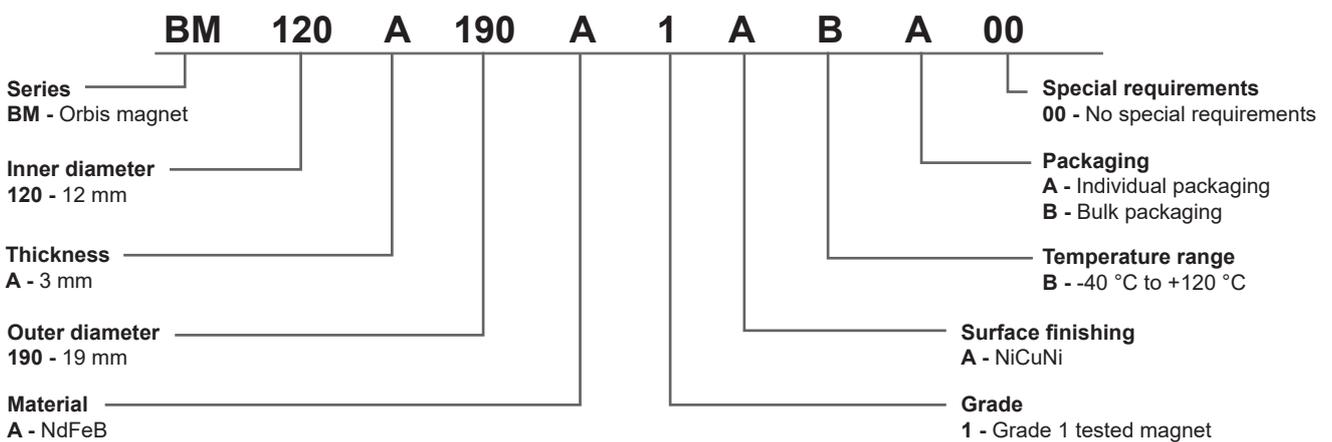
ACC036 can be used for direct connection to E201-9B USB encoder interface.

### Readhead part numbering



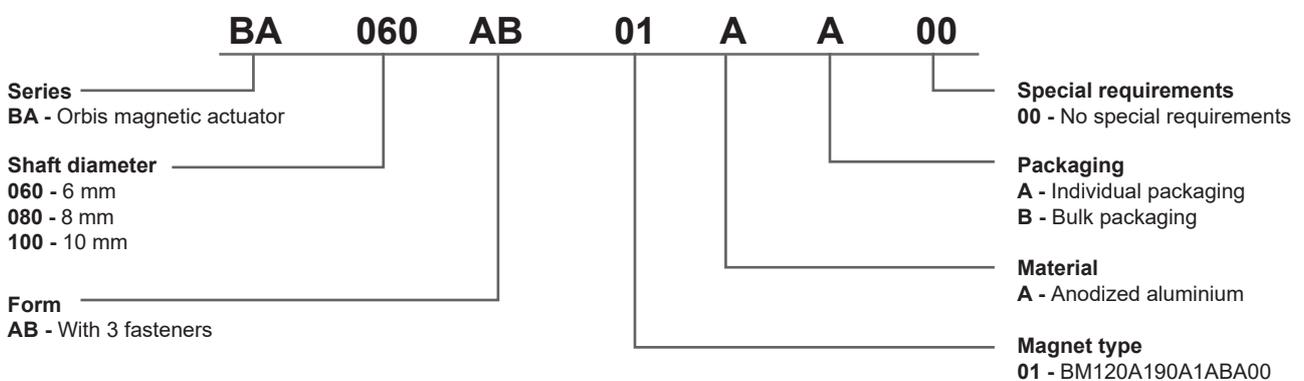
Series	Readhead size	Communication interface	Communication interface variant	Resolution	Magnet type compatibility	Operating temp. range	Connector option	Special requirements
BR	10	DC	D	14Y	12	D	D / H	00

### Magnet part numbering



Series	Inner diameter	Thickness	Outer diameter	Material	Grade	Surface finishing	Temperature range	Packaging	Special requirements
BM	120	A	190	A	1	A	B	A / B	00

### Magnetic actuator part numbering



Series	Shaft Size	Form	Magnet type	Material	Packaging	Special requirements
BA	060 / 080 / 100	AB	01	A	A / B	00

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## Document issues

Issue	Date	Page	Corrections made
1	12. 12. 2019	-	New document
2	11. 6. 2020	1, 5	Battery supply voltage amended
		2	Installation procedure amended
		3	Procedure of using Orbis BBM with Encosight software amended
		4	Multiturn status bit definitions amended
		7	Readhead part numbering amended

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