

Orbis

Battery Backup Multiturn (BBM) True Absolute Rotary Encoder

Orbis™ Battery Backup Multiturn is an absolute rotary encoder with a battery-powered multiturn counter that allows the encoder to count shaft rotations even when the main power supply is unavailable.

BATTERY
BACKUP
MULTITURN

EASY
INSTALLATION

HIGH SPEED



Features and benefits

- ▶ True absolute
- ▶ 14 bit resolution
- ▶ Battery powered multiturn
- ▶ Built-in self-diagnostics
- ▶ Self-calibration after installation
- ▶ Integrated status LED
- ▶ BiSS C communication interface
- ▶ Easy installation
- ▶ Reduced accuracy thermal drift



GIMBALS



AGVs



MOTOR FEEDBACK
AND COMMUTATION



ROBOTIC JOINTS

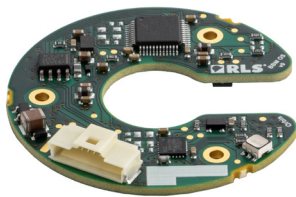


AGRICULTURAL
AUTOMATION

General information

The encoder consists of a diametrically magnetized permanent ring magnet and a printed circuit board. The geometrical arrangement of RLS' proprietary Hall sensors on the PCB enables the generation of one period of sine and cosine signals per mechanical magnetic revolution. In addition, it also allows cancelation of the third harmonic component.

An adaptive filtering function provides high resolution at low rotation speeds and low angular phase delay at high rotational speeds. Orbis also has an additional built-in self-calibration algorithm that improves the accuracy of the encoder after installation.



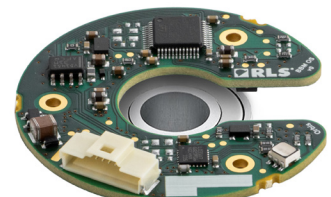
Orbis readhead

+



Permanent magnet

=



Orbis system

Choose your Orbis system

Orbis BR10 system



For installations on shaft diameters up to 15 mm.

Orbis BR20 system



For installation on shaft diameters up to 22 mm.

Orbis BR30 system



For installation on shaft diameters up to 30 mm.

Storage and handling

Storage temperature



With connector
-40 °C to +105 °C

Without connector
+15 °C to +30 °C (before soldering)
-40 °C to +105 °C (after wires are soldered)

Operating temperature



-40 °C to +105 °C

Humidity



With connector
Up to 70 % non- condensing

Without connector
Up to 10 % (before soldering)
Up to 70 % non-condensing (after wires are soldered)



Readhead is ESD sensitive - handle with care.

Do not touch electronic circuit, wires or sensor area without proper ESD protection or outside of ESD controlled environment.

Packaging

Less than 20 products are packed individually in an antistatic box. If the order quantity is 20 systems and larger, the parts are packed in antistatic plastic trays. Magnets and readheads are packed separately.

Operational conditions

Chemical resistance

RLS products are often used in industrial applications and exposed to chemicals that can affect their internal and external components. While our products are designed to be resistant to many harsh chemicals and environments, long-term resistance will depend on exposure, temperature, and concentration. Most chemicals our products are exposed to are not in continuous contact. Therefore, a material that might not be resistant when submerged in a chemical will last indefinitely when wiped down by that same chemical once a day.

For further information or to confirm compatibility with a chemical in your environment, [contact RLS](#).

External magnetic field

The operating principle of any magnetic encoder is to sense changes in the magnetic field of the magnetic actuator. External magnetic fields generated by permanent magnets, electric motors, coils, magnetic brakes, etc. can affect the operation of the encoder. The accuracy of Orbis is degraded in the presence of magnetic field in radial and axial direction. Axial component is less critical.

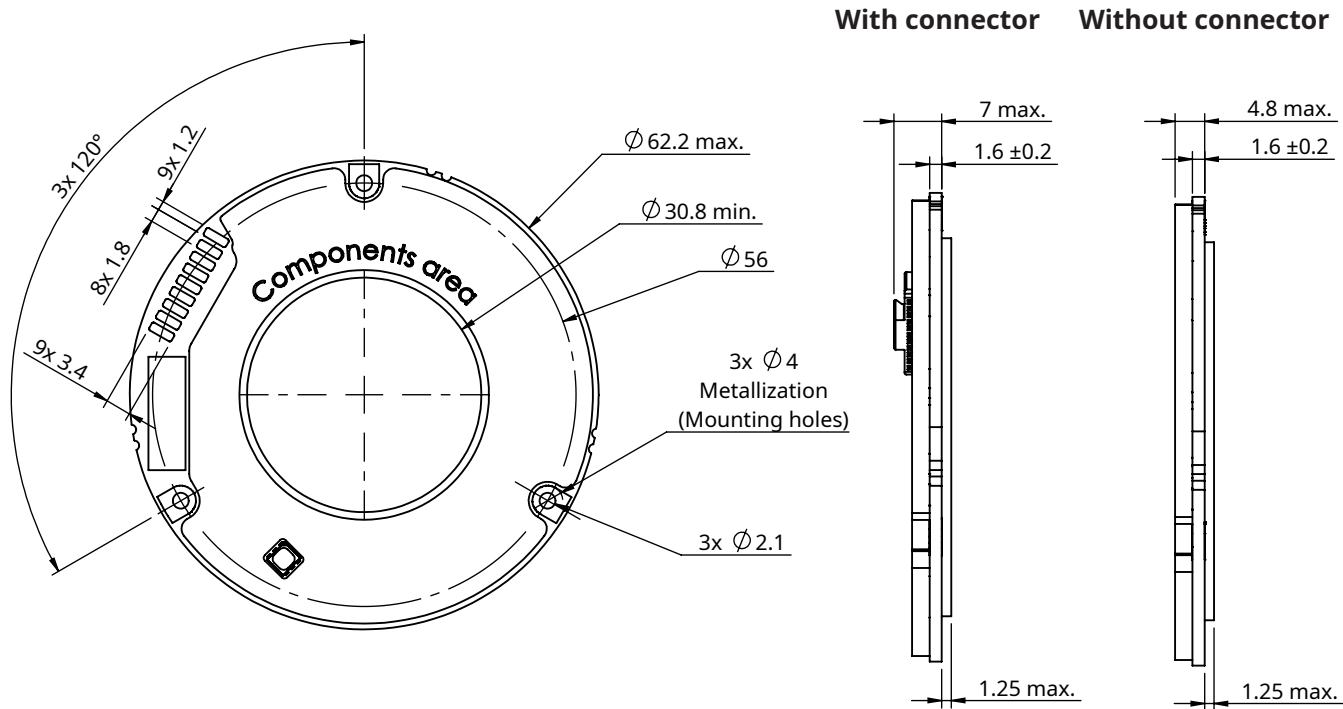
Overspeed

Conditions for correct multiturn operation with battery backup at an operating speed of >900 rpm when the main power supply (V_{dd}) is switched off:

- The operating speed must be reduced to less than 900 rpm within 1 minute.
- The position will be valid at a speed higher than 900 rpm within 1 minute or until the speed is 0 rpm.
- If the speed is 0 rpm before 1 minute has elapsed, it is not allowed to increase speed over 900 rpm.

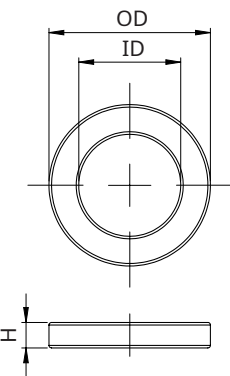
Do not switch on the main power supply (V_{dd}) at an operating speed of more than 900 rpm.

BR30 readhead



BM magnets and magnetic actuators

Permanent magnet

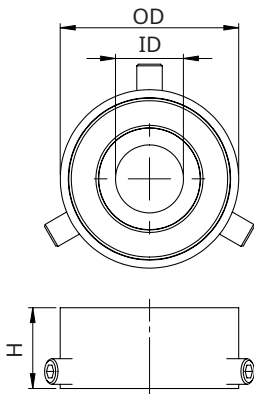


Available magnets:

ID	OD	H
12	19	3
22*	32	4
30	44	4

ID and OD tolerance is ± 0.05 .
*ID tolerance for 22 mm magnet is ± 0.08 .

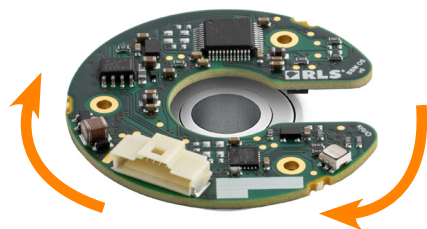
Magnetic actuator (magnet included)



Available actuators:

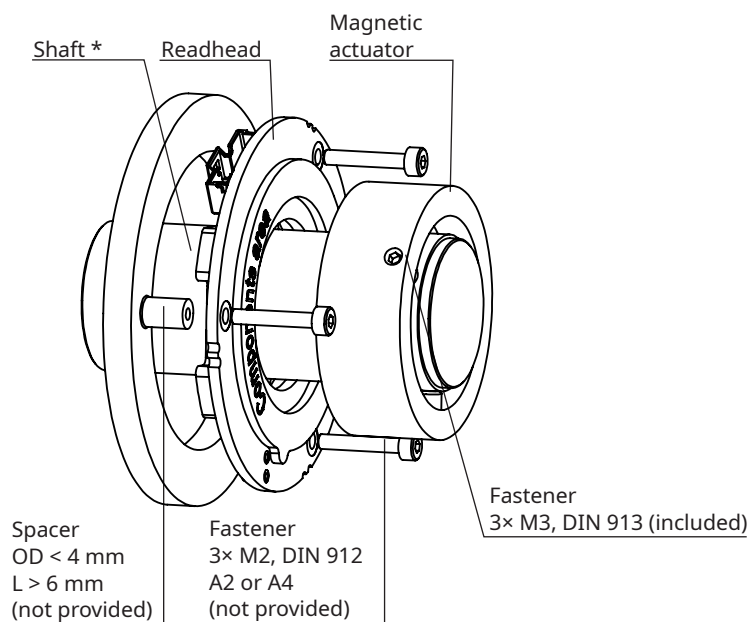
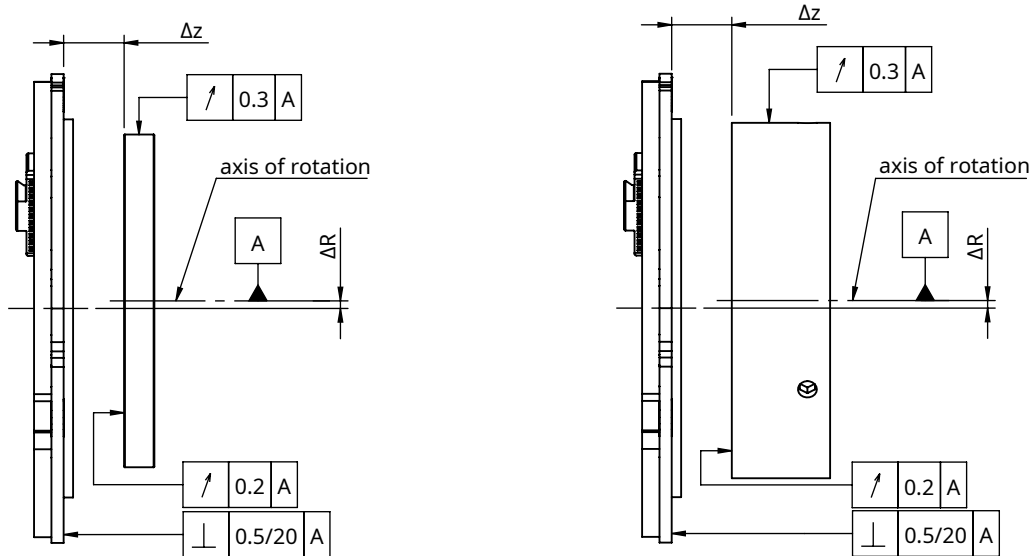
ID	OD	H
6	21	9.5
8	21	9.5
10	22	9.5
20	34	12
24	47	13

ID tolerances are H7.



Position increases for clockwise (CW) rotation of magnet.

Installation drawing



* Recommended shaft tolerance for application with magnetic actuator is g6.

Readhead should only be mounted on the gold plated surfaces around the mounting holes. **See Installation instructions.**

For recommended tightening torques, refer to the document TTD01 available at **RLS Media center**.

Specifications in this data sheet apply to magnet mounting with non-ferrous shafts. If ferrous shafts are used, the encoder specifications may change. In this case, the use of actuators is recommended, as the magnet should not be in direct contact with ferrous material.

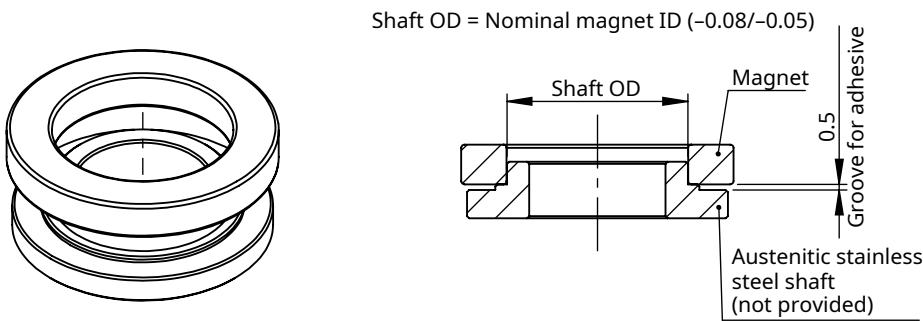
Installation instructions

1. Install Orbis encoder readhead and magnetic actuator according to mechanical tolerances specification.
2. Connect main power supply (V_{dd}) and battery power supply (V_{bat}). At this point, red LED should be blinking. Setting of new multiturn counter value must be performed only when the encoder's readhead and magnet are stationary.
3. Apply the multiturn counter **twice** in order to set the correct value (refer to the chapter E201-9B at the document **E201D01** or the chapter Multiturn counter at the application note **BRD05**). Please wait at least 0.5 s between the first and second multiturn counter value input. After the successful multiturn value input, the LED is blinking green.

Magnet installation

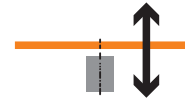
Adhesive mounting uses materials such as industrial adhesives, epoxy resins, or adhesive tapes to join components. Before starting the assembly, always refer to the adhesive manufacturer's instructions. These include critical details such as surface preparation, application method, curing time, and environmental conditions (temperature, pressure, humidity). If no specific instructions are provided, you may follow the standard procedure below as a general guideline:

1. Clean both the shaft and the magnet contact surfaces with alcohol. The surfaces must be clean, dry and free of dust, oil and grease.
2. Apply the Loctite EA 9514 adhesive evenly around the entire perimeter of the magnet to ensure even bonding and alignment.
3. Cure at a maximum of 130 °C for 45 minutes.

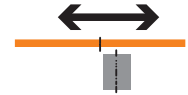


Installation tolerances

Axial (ΔZ) displacement (ride height)*	Magnet with 12 mm ID	3.5 mm $\pm$ 0.5 mm
	Magnet with 22 mm ID	5.5 mm $\pm$ 0.5 mm
	Magnet with 30 mm ID	3.5 mm $\pm$ 0.5 mm



**Radial (ΔR) displacement
of the sensor** Max. 0.5 mm



— - Readhead ■ - Magnet

* See [Installation drawing](#).

Precise magnet and readhead installation is key to achieve good overall accuracy.

Specifications in this data sheet apply to magnet mounting with non-ferrous shafts. If ferrous shafts are used, the encoder specifications may change. In this case, the use of actuators is recommended, as the magnet should not be in direct contact with ferrous material.

Axial position adjustment (ride height)

Any non-magnetic and non-conductive tool can be used to mechanically check for correct ride height adjustment. The integrated LED can be used as a rough indicator. When the correct ride height is achieved, the LED will be green and should not change colour as the magnet rotates.

Self-calibration after installation

The self-calibration function eliminates eccentricity-related errors, which are a dominant contributor to the accuracy of the encoder and are caused by the eccentric mounting of the magnet. This function eliminates the error of one sine wave per revolution. The self-calibration function can be triggered by the user via selected communication interfaces or via using the corresponding USB encoder interface.

For details, refer to the description of the selected communication interface. After self-calibration, the multiturn error will be set and you need to set a new multiturn counter twice.

Requirements:

- Free mechanical rotation for one full revolution (360°).
- No error is present.
- Default self-calibration timeout is set to 10s.
- Speed up to 600 rpm.
- Clockwise/counter-clockwise rotation is supported.
- Suitable communication interface (BiSS C) or adapter that allows the function to be triggered.

Technical specifications

System data

Resolution		14 bit
Repeatability		±2 LSB (counts, unidirectional)
Maximum speed	On battery	See chapter <u>Overspeed</u>
	Main supply connected	12,000 rpm
Encoder speed		25 kHz bandwidth, 50 kHz sampling rate, up to 44 kHz refresh rate
Accuracy		±0.25° (BR10), ±0.3° (BR20), ± 0.5° (BR30)
Accuracy thermal drift		±0.003° /°C
Digital hysteresis		±2 LSB (counts)

Electrical data

Supply voltage		4.5 V to 5.5 V (at readhead)
Set-up time after power up		< 200 ms
Current consumption (main supply V _{dd})		Typ. 60 mA (no output load)
Connector options		Molex 501568-1107 or soldering pads
Battery supply voltage (V _{BAT})		3.15 V to 5 V (at readhead)*
Battery voltage	Out of specification	< 3.05 V
	Near specification limit	3.05–3.15 V
Supply current	On battery	Typ. 21 µA at velocity = 0 Typ. 66 µA at 0 < velocity < 850 rpm Typ. 800 µA at velocity > 900 rpm**
	Main supply connected	Typ. 140 nA at V _{BAT} = 3.3 V Typ. 280 nA at V _{BAT} = 5 V
Maximum output load		±100 mA at 5 V
ESD protection		HBM, Class 2, ±2 kV (valid only on RS422 signals on connector; do not touch other components)

* 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 switched off. To establish communication, the encoder must be connected to the main power supply.

** See chapter **Overspeed**.

Mechanical data

Mass	Readhead	5.3 g
	Magnetic actuator (inner diameter)	6 mm: 6.0 g; 8 mm: 5.5 g; 10 mm: 5.7 g; 20 mm: 25 g; 25 mm: 48 g
	Magnet (inner diameter)	12 mm: 3.8 g; 22 mm: 12.7 g; 30 mm: 16.8 g
Magnet material	Magnetic actuator	Anodised aluminium
	Magnet (12 mm, 22 mm)	NdFeB with Ni-Cu-Ni protective layer
	Magnet (30 mm)	NdFeB + epoxy resin

Environmental data

Temperature	Operating	-40 °C to +105 °C
	Storage	-40 °C to +105 °C*
Humidity		0 % to 70 % non-condensing*
External magnetic field		Max. ± 10 mT (DC) on top side of readhead. External magnetic field decreases accuracy of encoder.
Shock		100 G (6 ms, standard EN 60068-2-27:2009)
Vibration		40 G (55 Hz – 2000 Hz, standard EN 60068-2-6:2008)

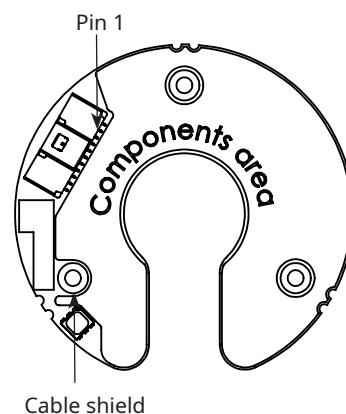
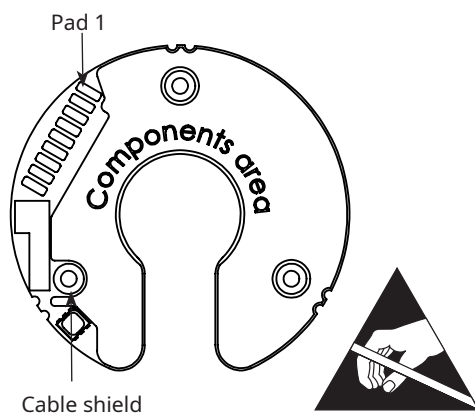
* For limitations see chapter **Storage and Handling**.

Electrical connections

Pinout

Pad	BiSS C
1	V _{dd}
2	V _{bat}
3	GND
4	GND
5	MA+
6	MA-
7	Cable shield
8	SLO+
9	SLO-

Pin	BiSS C
1	V _{dd}
2	V _{bat}
3	GND
4	GND
5	-
6	-
7	MA+
8	MA-
9	Cable shield
10	SLO+
11	SLO-



System integration / Shield connection

The mounting surfaces of the PCB are not connected to signal ground. To achieve EMC compliance, the encoder system must be correctly integrated. Particular attention must be paid to the shielding arrangements. The mounting surfaces of the encoder and the cable shield must be connected to chassis with a good and reliable connection. Special care must be taken to ensure that the cable shield only touches the gold mounting surface. See the Installation instructions.

Status indicator LED

The LED provides visual feedback of warning and error condition and is used for set-up and diagnostic. Flashing LED indicates that encoder is powered but communication has not been established. When communication is running at minimum of 5 readings per second LED is constantly lit.

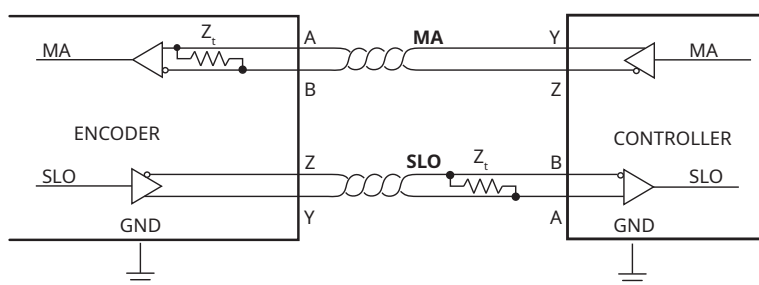
LED		Status
	Green	Normal operation; position data is valid.
	Orange	Warning; position is valid, but the resolution and/or accuracy might be out of specification. Some operating conditions are outside limits. See detailed status.
	Red	Error; position data is not valid. It might also indicate that multiturn counter will be invalid in case lost of V_{dd} (status »multiturn warning«).
	Slow flashing	Communication has not been established. Position was not requested within last 200 ms. Color of flashing – see above.
	No light	No power supply.
	Continuously fast flashing red	System error during start-up or operation.
	3 sec. fast flashing	Self-calibration results – refer to the document BRD05 (Orbis BiSS C register access) available at RLS Media center .

BiSS C interface

Encoder position in up to 14 bit natural binary code and encoder status are available via the BiSS C protocol. The position data is left aligned and followed by two status bits (active low) followed by CRC (inverted).

BiSS C is implemented for point-to-point operation, multiple slaves are not supported. Communication is bidirectional, the readhead is user programmable. Additional data can be read from the readhead.

Electrical connection

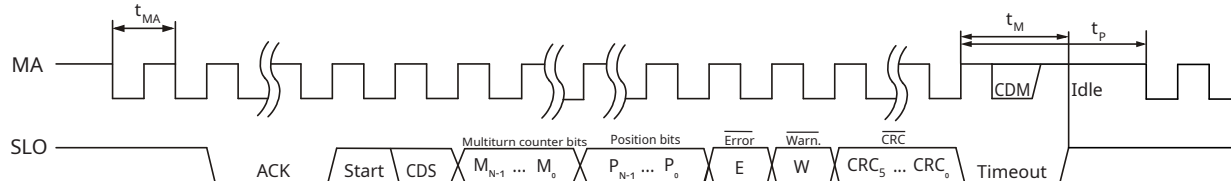


The signal MA is Master Clock with a maximum frequency of 5 MHz and SLO is Slave Out, whose data is transmitted on the rising edges on the line MA. The MA and SLO lines are 5 V RS422 compatible differential pairs. The RC termination on the MA line is built into the encoder. If the total cable length exceeds 5 m, termination on the controller is required. The nominal impedance of the cable should be 120 Ω .

Output protection

Excessive output current and power dissipation caused by faults or bus conflicts are prevented by two mechanisms. A foldback current limit at the output stage provides immediate protection against short circuits. In addition, a thermal shutdown circuit forces the driver outputs into a high-impedance state, if the chip temperature becomes too high.

BiSS C timing diagram



Data package description

Data	Length (N)	Description
$M_{N-1} - M_0$	16 bits	Multiturn counter value (length 0 when single turn option is selected)
$P_{N-1} - P_0$	14 bits	Absolute position inside one revolution
E	1 bit	Error status bit; inverted
W	1 bit	Warning status bit; inverted
$CRC_5 - CRC_0$	6 bits	Cyclic redundancy check; polynomial 0x43; inverted

Communication parameters

Parameter	Symbol	Min	Typ	Max
MA period	t_{MA}	200 ns		2.5 μ s
MA frequency	$f_{MA} = 1/t_{MA}$	110 kHz		5 MHz
ACK length	ACK		13 bits	
Transfer timeout	t_M		13 μ s	
Pause time	t_P	$t_M + 1 \mu$ s		
Latency				10 μ s
Mechanical bandwidth*				25 kHz
Mechanical sample rate				50 kHz
Maximum request rate				40 kHz (singleturn)

* Orbis samples at 50 kHz, so mechanical changes faster than 25 kHz cannot be detected at the output (Nyquist theorem).
If the position request comes faster than the sampling frequency, the encoder recalculates the position at the time of the request based on the current rotational velocity.

If number of clocks from MA is less than specified, SLO within timeout is not necessarily in low state.

First valid frame is expected after encoder set-up time.

The request cycle starts with MA in idle state (MA is high). Its first falling edge initiates communication. The encoder responds by setting SLO to low on the second rising edge on the MA line and generating the ACK signal (Acknowledge). When the encoder is ready for the next request cycle, it indicates this to the master by setting SLO to high. The absolute position and the CRC data are available in binary format and are initially transmitted in MSB format.

Encoder data packet structure

Multiturn counter		
Bit	Status	Description
b37 : b22	Multiturn counter	
b21 : b8	Encoder position	MSB first
b7	Error	If low, the position data is not valid.
b6	Warning	If low, the position data is valid, but some operating conditions are close to limits.
b5 : b0	Inverted CRC, calculated by using 0x43 polynomial	

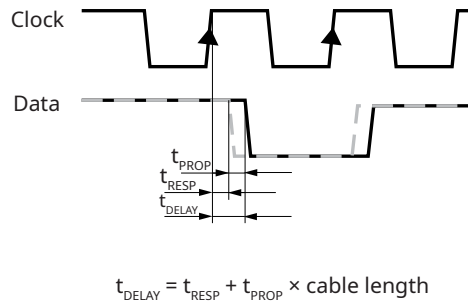
When error is active (error bit is low) singleturn position data (b21 : b8) is replaced by detailed status bits (b13 : b0). For the complete detailed status see BiSS C register. Please refer to [Detailed status bits](#). In case of only active warning, position data is valid.

Cable length compensation

The readhead needs 60 ns to respond to incoming clocks (t_{RESP}). The change on the Data signal is delayed by 60 ns after the rising edge on the Clock line. An additional delay is caused by the time the signal takes to propagate through the cable to the readhead and back (t_{PROP}). This delay is typically 14 ns per 1 meter cable. The total cable length from the encoder to the receiver must be considered.

The total delay (t_{DELAY}) is calculated as in the formula below.

A proper implementation of BiSS C Master should automatically measure t_{DELAY} and adjust the internal timing to compensate for it. BiSS C Master without compensation for cable delay will work even with short wiring (up to 1 meter at 5 MHz clock frequency).



Encoder programming

Encoder supports register access which allows setting zero position, running self-calibration function, configuring the encoder, reading signal level indicator, temperature, detailed status bits and electronic datasheet.

See application note APP06 available at [RLS media center](#).

Multiturn status register (address 0x5D)

Multiturn status is accessible on BiSS C Direct access registers on address 0x5D as one status byte. Definition of each bit can be found in table below:

Multiturn status description		
Bit	Status	Description
b7	Warning	Battery supply warning. The battery voltage is near the minimum level and multiturn warning is set in detailed status. LED is orange. Position is valid. Change the battery.
b6	Reserved	
b5	Reserved	
b4	Error	Battery supply error. The battery voltage is below the minimum level. Change the battery. The status depends on the situation in which the battery voltage level is detected: • If insufficient battery voltage was detected at encoder power-up, multiturn error will be set in detailed status and LED will be red. Replace the battery and write the new multiturn counter twice. • If insufficient battery voltage is detected during the regular encoder status check (V_{dd} is present), warning will be set and LED will be orange. Change the battery without disconnecting V_{dd}.
b3	Error	General error. Red LED. Position is invalid. Error in the initialization procedure was detected. Check that Orbis is installed within the mechanical installation tolerances and that the readhead is not mechanically damaged. Cycle both main and battery power supply and apply the multiturn counter value twice.
b2	Reserved	
b1	Error	Battery multiturn not valid. The status depends on the situation in which it is detected: • If detected at encoder power-up, multiturn error will be set in detailed status and LED will be red. Possible causes are overspeed or empty battery when V_{dd} was absent. Write the new multiturn counter twice. • If detected during the regular encoder status check (V_{dd} is present), warning will be set and LED will be orange, multiturn is still valid but must be updated before power cycle otherwise error will be set. Check the mechanical installation tolerances and that the readhead is not mechanically damaged. Write multiturn counter twice.
b0	Error	Overspeed. The speed was too high when main power was absent. Apply the multiturn counter value twice.

Multiturn and zero position (offset) should be performed only when the encoder's readhead and magnet are stationary.

Encoder status (address 0x4A–0x4D) Persistent detailed status (address 0x58–0x5B)

Detailed status		
Bit	Status	Description
b15	Warning	Multiturn warning. Multiturn is valid but will not be valid after power cycle. See multiturn status register.
b14	Warning	Temperature out of range. The readhead temperature is out of specified range.
b13	Warning	Signal amplitude low. The distance between the readhead and the magnet is too large.
b12	Warning	Signal amplitude too high. The readhead is too close to the magnet or an external magnetic field is present. There is also a possibility that magnet is touching encoder head. It is strongly recommended that user checks the encoder mounting immediately after this warning gets set.
b11	Warning	Multiturn is valid and will also be valid after power cycle, however the limit of reliable operation is being approached. See multiturn status register.
b10	Warning	Rotational speed exceeds the limit.
b9	Error	Multiturn error. Multiturn is not valid. It is caused by any other status that has error in Error/warning column. Check multiturn status register on BBM.
b8	Error	Acceleration error. The position data changed unexpectedly or too fast. A stray magnetic field is present or metal particles are present between the readhead and the magnet.
b7	Reserved	
b6	Error	Signal lost. The readhead is out of alignment with the magnet or the magnet is damaged.
b5	Error	Signal amplitude too high. External magnetic field is present.
b4	Error	System error. Malfunction inside the circuitry. To reset the System error bit try to cycle the power supply on both battery and main supply. If the issue persists, contact RLS.
b3	Reserved	
b2	Reserved	
b1	Error	Internal communication error. Check environment for EMI. To reset the error bit cycle the power supply on both battery and main supply. If the issue persists, contact RLS.
b0	Reserved	

Register Persistent detailed status (address 0x58–0x5B) accumulates all the status bits that were active during encoder operation, in every internal encoder cycle, even if communication is not active.

Format of the data is same as standard Detailed status register.

Clearing the Persistent status register is performed by writing value 0xCD into Key register (0x48), immediately followed by writing value ASCII 'b' (0x62) into Command register (0x49).

Battery selection guide

The battery capacity should be selected according to the expected total encoder off-time and supply current from the battery (see chapter [Technical specifications](#)).

Battery capacity	Battery duration time at 0 rpm (approx.)	Battery duration time at 500 rpm (approx.)
0.55 Ah	3 years	1 year
1.0 Ah	5.4 years	1.9 years
1.2 Ah	6.5 years	2.25 years
2.5 Ah	13.6 years	4.5 years
3.5 Ah	19 years	6.5 years

Valid only at 23 °C when main power supply (V_{dd}) is disconnected.

Battery replacement procedure

1. Leave Orbis powered on.
2. Remove battery.
3. Connect new battery.

Replacing the battery with power off will result in loss of the multturn position.

Battery error status definition

Battery error status is accessible on BiSS C Direct access registers on address 0x5E -0x5F status byte. Definition of each bit can be found in the table below.

Operating voltage/ Conditions	Multiturn status (BiSS C direct access register 0x5D)	Detailed status (BiSS C direct access registers 0x4A–0x4B)	Error/warning	Measures
BAT: 3.15 V–5 V, normal operation	0	0	No error/warning	–
BAT: 3.15 V–3.05 V, normal operation, with main power supply (V_{dd}) on	b7 (Battery supply warning)	b11 (multiturn warning)	Warning	Check / replace battery
BAT: < 3.05 V, normal operation, with main power supply (V_{dd}) on	b7 (Battery supply warning) b4 (Battery supply error)	b15 (multiturn warning)	Warning	Check / replace battery
BAT: < 3.05 V, after power cycle	b7 (Battery supply warning) b4 (Battery supply error)	b9 (multiturn error)	Error	Check battery, check clearance, setting multiturn counter

Part numbering

Readhead

	BR	10	DC	B	14Y	12	D	D	10
Series									
BR - Orbis board-level readhead									
Size									
10 - 16 mm through hole									
20 - 22 mm through hole									
30 - 30 mm through hole									
Communication interface									
DC - BiSS C, RS422									
Communication interface variant									
B - BiSS C, 13 ACK bits, bidirectional									
Resolution									
14Y - 14 bits per revolution + 16 bit multitrack counter with battery backup									
Magnet type compatibility									
12 - BM120A190A1ABx00 or actuator BA060..BA100 (BR10)									
22 - BM220C320AxABx00 or actuator BA200AB03AA00 (BR20)									
30 - BM300C440BxBBA00 or actuator BA240AB03AA00 (BR30)									
Operating temperature range									
D - -40 °C to +105 °C									
Connector option									
D - Molex 501568-1107, 11-pin locking connector									
P - Soldering pads									
Special requirements									
10 - Standard									

Not all part number combinations are valid. Refer to the table of available combinations below.

Table of available combinations

Series	Readhead size	Communication interface	Communication interface variant	Resolution	Magnet type compatibility	Operating temperature range	Connector option	Special requirements
BR	10	DC	B	14Y	12	D	D / P	10
	20				22			
	30				30			

Magnet

BM 220 C 320 A 1 A B A 00

Series

BM - Orbis magnet

Inner diameter

120 - 12 mm

220 - 22 mm

300 - 30 mm

Thickness

A - 3 mm

C - 4 mm

Outer diameter

190 - 19 mm

320 - 32 mm

440 - 44 mm

Material

A - NdFeB

B - NdFeB + plastic resin

Grade

1 - Grade 1 tested magnet

Surface finishing

A - NiCuNi

B - None

Temperature range

B - -40 °C to 120 °C

Packaging

A - Standard packaging

Special requirements

00 - Standard

Not all part number combinations are valid. Refer to the table of available combinations below.

Table of available combinations

Series	Inner diameter	Thickness	Outer diameter	Material	Grade	Surface finishing	Temperature range	Packaging	Special requirements
BM	120	A	190	A	1	A	B	A	00
	220	C	320			B			
	300		440	B					

Magnetic actuator

	BA	060	AB	01	A	A	00
Series							
BA - Orbis magnetic actuator							
Shaft diameter							
060 - 6 mm							
080 - 8 mm							
100 - 10 mm							
200 - 20 mm							
240 - 24 mm							
Form							
AB - With 3 fasteners							
Magnet type							
01 - BM120A190A1ABA00							
03 - BM220C320A1ABA00							
06 - BM300C440B1BBA00							
Material							
A - Anodized aluminium							
Packaging							
A - Standard packaging							
Special requirements							
00 - No special requirements							

Not all part number combinations are valid. Refer to the table of available combinations below.

Table of available combinations

Series	Shaft diameter	Form	Magnet type	Material	Packaging	Special requirements
BA	060	AB	01	A	A	00
	080					
	100					
	200		03			
	240		06			

Accessories



Cable assembly, 1 m

ACC035

ACC068

See chapter **Cable assemblies**.



Cable assembly, 1 m

ACC036

ACC069

See chapter **Cable assemblies**.



USB interface (for BiSS C communication interface)

E201-9B



Magnet viewer

MM0001

Cable assemblies

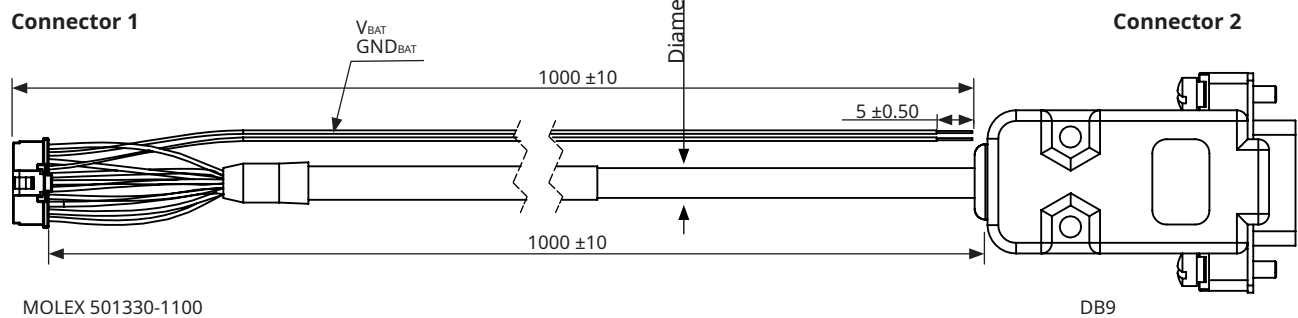
Cable specifications

Part numbers	ACC035, ACC036	ACC068, ACC069
Connector 1	Molex 501330-1100 and 501334-0000	Molex 501330-1100 and 501334-0000
Connector 2	ACC035: Flying leads ACC036: DSUB-9M	ACC068: Flying leads ACC069: DSUB-9M
Wire diameter	5 mm	6.2 mm
Length	1.0 m	1.0 m
Cable specifications	LI12YC12Y (single-shielded)	LiYCY (TP) (single-shielded)
Configuration	$4 \times 2 \times 0.14 \text{ mm}^2$	$4 \times 2 \times 0.14 \text{ mm}^2$
Rated voltage	250 V	350 V
Temperature range	Operating $-30 \text{ }^{\circ}\text{C}$ to $+100 \text{ }^{\circ}\text{C}$ Storage $-40 \text{ }^{\circ}\text{C}$ to $+105 \text{ }^{\circ}\text{C}$ Not valid for cables with DSUB-9 M connector.	Operating $-40 \text{ }^{\circ}\text{C}$ to $+75 \text{ }^{\circ}\text{C}$ (fixed) $-5 \text{ }^{\circ}\text{C}$ to $+70 \text{ }^{\circ}\text{C}$ (bending) Storage $-40 \text{ }^{\circ}\text{C}$ to $+80 \text{ }^{\circ}\text{C}$
Environmental conformation	RoHS conform 73/23/EWG-Guideline CE conform Halogen free	RoHS and REACH compliant Flame-retardant according IEC 60332-1-2 Approvals based on VDE 0812 Classification ETIM 5.0 Class-ID: EC000104

Cables with crimped connectors
ACC036 and ACC069 can be used for direct connection to **E201-9B** USB encoder interface.
ACC035 and ACC036 may be discontinued in future.

Dimensions

Dimensions and tolerances are in mm.



Connector 1 pin	Connector 2 pin		
Pin number		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-

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Document issues

Issue	Date	Page	Description
1	24. 11. 2025	General	New document
2	13. 4. 2026	4, 5	Dimensions drawing amended, note added to actuators

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