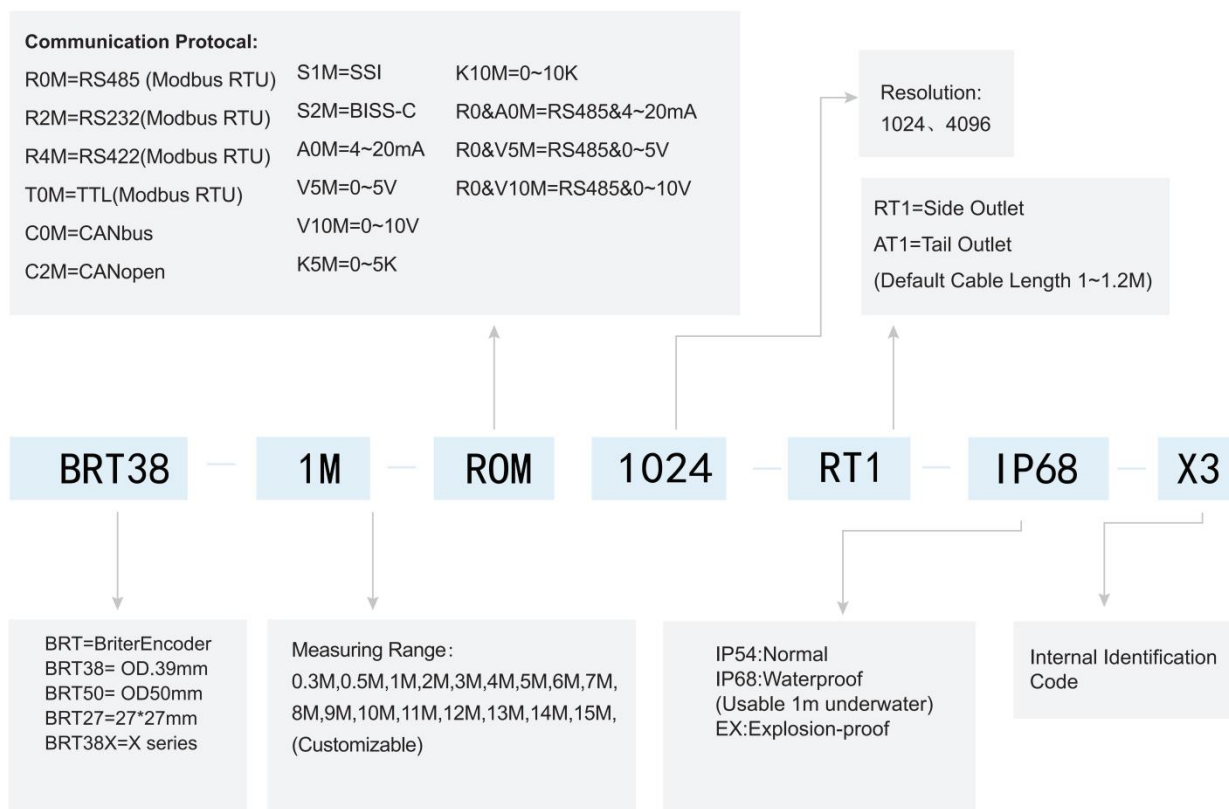


Briterencoder Linear Wire Displacement Sensor

BISS Protocol User Manual V202407

1. Product Model Description



Model description:

- 1.Structural form of the encoder: e.g., BRT38 indicates an outer diameter of 38mm.
- 2.Measuring range: e.g., 1M indicates a measuring stroke range of 0 - 1000mm.
- 3.Communication interface: e.g., R0M indicates an electrical interface of RS485 and the communication protocol is Modbus RTU.
- 4.Resolution: e.g., 1024 means that the internal encoder and the winding wheel feed back 1024 data when rotating one circle. For a 1 - meter stroke, referring to the corresponding table parameters, if the diameter of the internal winding wheel is 100mm, it means that the encoder feeds back 1024 data when moving 100mm. The minimum displacement resolution: $100\text{mm} / 1024 = 0.098\text{mm}$. That is, the displacement resolution of 1024 is 0.098mm.
- 5.Inventory: Some randomly combined models may be out of stock. Please consult in advance to ensure that the selected model is available.

2. Wiring Definition and connection

Red wire	Power Supply	DC 5V~24V
Black wire	0V (GND)	-
Green wire	CLOCK+	-
Brown wire	CLOCK-	-
White wire	DATA+	-
Grey wire	DATA-	-
Yellow wire	Function line	<ol style="list-style-type: none"> 1. It serves for encoder zero position setting. 2. During normal encoder operation, keep the yellow wire suspended and disconnected.
Orange wire	Function line	<ol style="list-style-type: none"> 1. 1.It serves for encoder setting direction and midpoint. 2. During normal encoder operation, keep the yellow wire suspended and disconnected.

Three simple ways to set absolute encoder to zero position?

- ✧ Method 1. Connect yellow wire to ground (black wire) more than 100mS. After set zero, please separate the yellow and black wire.
- ✧ Method 2. After right connected the wires according to the wiring definition. send set zero position command according to the user manual.
- ✧ Method 3. Use the upper computer provided by our company (BriterEncoder).

How to set directions of encoder rotation?

- ✧ Step 1: After power off, connect the orange wire to the black wire.
- ✧ Step 2: Power on and hold for two minutes.
- ✧ Step 3: Power off, then separate the orange wire from the black wire. The rotary encoder has now switched direction.

How to set midpoint of encoder?

Setting the absolute encoder to the midpoint position. Connect the orange wire to ground (black wire) for more than 100 milliseconds. After setting, please separate the orange and black wires.

3. Product Parameters

Measuring Range	Interface	Pull Rope Tension	Multicircle data bit	Resolution 4096PPR	Winding wheel diameter(mm)
0~650mm	BRT27 Series	3.5N	5-bit (24-turn)	0.0146mm	60mm
500mm	BRT38 Series	3~4N		0.0244mm	100mm
1000mm		2.5N		0.0244mm	100mm
2000mm		3~4N		0.0366mm	150mm
3000mm		5~6N		0.0488mm	200mm
4000mm		7~8N		0.061mm	250mm
5000mm		8~9N		0.061mm	250mm
6000mm		9~10N	0.0549mm	225mm	
7000mm		7-bit (100-turn)	0.0549mm	225mm	
8000mm		5-bit (32-turn)	8~9N	0.0830mm	340mm
9000mm			9~10N	0.0830mm	340mm
10000mm	0.0830mm		340mm		
11M~15M	20~25N		0.0854mm	350mm	
16M~20M	25~30N	0.0854mm	350mm		

500mm	BRT38X Series	2N	5-bit (24-turn)	0.031mm	130mm
1000mm				0.031mm	130mm
2000mm		3N		0.043mm	180mm
3000mm		6N		0.056mm	230mm
4000mm		4~5N		0.073mm	300mm
5000mm		9N		0.093mm	385mm
 BRT27		 BRT38		 BRT38X	
Service times	>5million times		Working temp.	-40~+85°C	
Code Format	Binary (default), Gray code		Drawstring diameter	0.8mm	
Max. Working Speed	1m/s		Pull rope material	steel wire, outer nylon coating	
Protection Grade	IP54, IP68waterproof, Explosion proof		Cable Length	1-1.2meters	
Working voltage	5~24V		Electrical life	> 100000 h	
Working current	100mA		Node number	1-255 (default1)	
Kernel refresh cycle	50uS		Electrical life	> 100000 h	
Body Material	Aluminum alloy housing with anti-static surface, tainless steel puller, IP68-rated encoder in stainless iron.		Linearity Accuracy	±0.1% of Full Scale	
Clock Frequency	100 kHz - 5 MHz				

4. How to calculate the displacement length

Firstly, it is necessary to determine the inner wheel perimeter and resolution of the sensor you purchased; When using, the position values feedback by the sensor before and after pull the rope are X2 and X1.

Method 1: For the rope sensor you purchased with a range of Part No. BRT38-0.5M with 500mm and a resolution of 4096ppr, referring to the corresponding wheel diameter of 100mm in the table, the displacement calculation formula is:
 $Length = (X2 - X1) * 100 / 4096 \text{ mm.}$

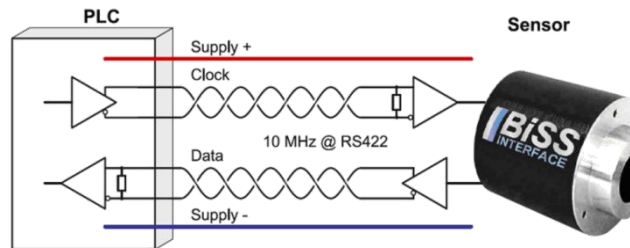
Part No.	Measuring Range	Interface	Linear accuracy	Resolution 1024PPR	Resolution 4096PPR	Winding wheel diameter(m m)
BRT38-0.5M	500mm	Biss	±0.1%	0.098mm	0.0244mm	100

Method 2: For the rope sensor you purchased with a range of Part No. BRT38-0.5M with 500mm and a resolution of 4096ppr, according to the table, the actual resolution is 0.0244mm, so the displacement calculation formula is: $Length = (X2 - X1) * 0.0244 \text{ mm.}$

Note: When X1 displays a large value, it is caused by the principle of multi-turn absolute encoder used in the draw-wire displacement sensor. Therefore, moving backward from the zero position results in a large numerical value. To address this situation, simply preset the initial value of X1 to 1000 (this can be modified via the PC software or by sending a command), which can effectively solve the problem.

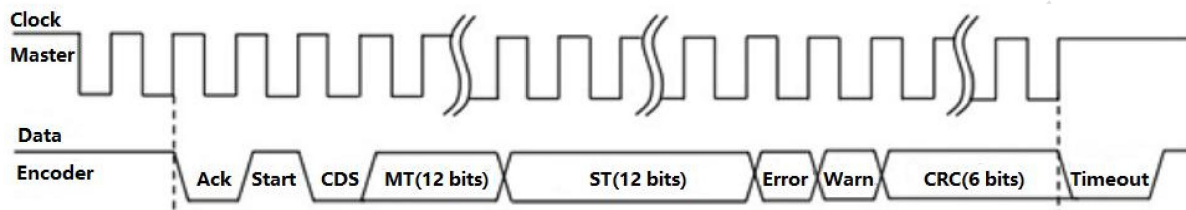
5. BISS-C communication protocol

BISS communication protocol is a full duplex synchronous serial bus communication protocol designed specifically to meet real-time, bidirectional, and high-speed sensor communication, and is compatible with industry standard SSI bus protocol in hardware. Its typical application is to achieve communication between servo drivers and encoders in the field of motion control. The current version of the BISS communication protocol is BISS-C. The BISS protocol can generally be decoded through hardware or software. Hardware decoding requires the main station to have a decoding chip of the BISS protocol, and software decoding can read data through the processor IO port to simulate the clock (providing stm32 reading routines).



BISS Networking diagram

The BISS communication frame is as follows: the controller sends out a drive signal, the encoder sends out a data signal, and completing one BISS communication frame indicates that the controller has received one frame of data.



Timing Description

Byte	Identification name	Description	Default value	Data length
N+10	Ack	Encoder preparation data	0	1bit
N+9	Start	Ready to start sending data	1	1bit
N+8	CDS	1 bit low level after Start	0	1bit
N+7	AP	Data, high bit before low bit after	/	M+N bit
7	Error	error	1	1bit
6	Warn	warning	1	1bit
0~5	CRC	CRC verification data	/	6bit
	Timeout	Data remains at a low level and ends this communication after being pulled up	/	20us

On the first rising edge of the Clock, the encoder is in a latched state, and on the second rising edge, the encoder pulls the Data down to respond to the Master's communication (Ack). Subsequently, the Data is pulled up, indicating that the encoder data is ready (Start). After Start, the encoder will send a 1-bit CDS signal ('0'). The subsequent number of turns and single turn values are sequentially issued (with the high bit in front), and the encoder data is followed by 1 bit error bit, 1 bit warning bit, and 6 bits check bit. After the data transmission is completed, the data remains at a low level of less than 10us, which is called a timeout period. This signal is maintained until the Data is pulled up, indicating that the current frame communication has ended and the next frame communication can begin.

6. Precautions and warranty

- Encoders belong to precision instruments. Please handle them with care and use them with care, especially do not knock, hit, or forcefully pull the encoder shaft.
- The encoder and mechanical connection should use flexible connectors or elastic brackets to avoid hard damage caused by non concentric rigid connections.
- Although the encoder itself does not lose the number of turns in interference environments, it can cause interference to the data during transmission. Therefore, when there is a motor or strong electromagnetic interference environment in the system, an isolated power supply should be used to power the encoder. And when there's external extended communication lines, it is best to use double shielded cables.
- The encoder casing and shielding wire should be well grounded to prevent damage to the encoder circuit caused by lightning strikes or high-voltage static electricity
- The product is guaranteed for one year free of charge when used correctly.

- When exceed the warranty period, or the product is damaged due to improper use, the product can be sent back to the original factory for repair (only raw material cost is required when repair).

7. Sensor Indicator Lights Description

1. Default indication status: Status light flashing (flashing color varies by model), indicating normal power supply to the encoder;

2. Other work status indications:

(1) - Biss reading encoder data status: Cyan light flashes quickly at 0.5s intervals;

(2) - Yellow wire power-on reset, yellow wire zero-point setting status: Orange light flashes quickly at 0.5s intervals;

(3) - Orange wire power-on direction switch, orange wire midpoint setting status: Purple light flashes quickly at 0.5s intervals;

(4) - Normal working status upon power-on: Stop 4s, flash slowly 3 times at 1s intervals, stop 2s, flash slowly 3 times at 1s intervals, stop 2s, flash slowly 3 times at 1s intervals, where the combination of three flashes forms a quaternary number that can be converted into the corresponding multi-turn number and single-turn accuracy digits of the encoder, the last flash color defines the output mode, 1 for Biss.

Table 1 Color and Numerical Value Definitions

Color	Blue	Cyan	Orange	Purple	Green	Red
Value	0	1	2	3	4	5

8. Contact us and technology support

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Technical documentation

Detailed version of the instruction manual;

PC software;

2D drawings and 3D model files;

Additional Video Tutorials;

For more details, please visit our website:

www.briterencoder.com.



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