Briterencoder Linear Wire Displacement Sensor

BRT38X Series SSI Interface User Manual V202407

1. Product Model Description

Communication Protocal:

R0M=RS485 (Modbus RTU)
R2M=RS232(Modbus RTU)
R4M=RS422(Modbus RTU)
T0M=TTL(Modbus RTU)
C0M=CANbus
C2M=CANopen

S1M=SSI
S2M=BISS-C
A0M=4~20mA
V5M=0~5V
V10M=0~10V
K5M=0~5K

K10M=0~10K
R0&A0M=RS485&4~20mA
R0&V5M=RS485&0~5V
R0&V10M=RS485&0~10V

Resolution:
1024、4096

RT1=Side Outlet
AT1=Tail Outlet
(Default Cable Length 1~1.2M)

BRT38X	1M	ROM	1024	RT1	IP68

BRT=BriterEncoder
BRT38= OD.39mm
BRT50= OD50mm
BRT27=27*27mm
BRT38X=X series

Measuring range:0.3M、0.5M、1M、2M、3M、4M、5M、6M、7M、8M、9M、10M、11M、12M、13M、14M、15M、(Customizable)

IP54:Normal
IP68:Waterproof
(Usable 1m underwater)
EX:Explosion-proof

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: 100mm / 1024 = 0.098mm. 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.

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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	1. It serves for encoder zero position setting. 2. During normal encoder operation, keep the yellow wire suspended and disconnected.
Orange wire	Function line	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	Linear accuracy	Resolution 1024PPR	Resolution 4096PPR	Winding wheel diameter(mm)
500mm	SSI	±0.1%	0.126mm	0.031mm	130
1000mm		±0.1%	0.126mm	0.031mm	130
2000mm		±0.1%	0.175mm	0.043mm.	180
3000mm		±0.1%	0.224mm	0.056mm	230
4000mm		±0.1%	0.292mm	0.073mm	300
5000mm		±0.1%	0.375mm	0.093mm	385
Service times	>5million times		Working temp.	-40~+85°C	
Pull Tension	2~3N		Working current	100mA	
Max. Working Speed	1m/s		Pull rope material	Stranded steel wire	

Protection Grade	IP54, IP68 Waterproof, Explosion proof	Output Code	Binary(default), Gray Code
Cable Length	1-1.2meters(Customizable)	Drawstring Diameter	0.6mm
Clock Frequency	50K-2M	Working voltage	5~24V
Body material	Aluminum alloy (anti-static), stainless steel head; IP68/ex-proof encoder in stainless steel.		

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 mm.

Part No.	Measuring Range	Interface	Linear accuracy	Resolution 1024PPR	Resolution 4096PPR	Winding wheel diameter(mm)
BRT38-0.5M	500mm	RS485	±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 mm.

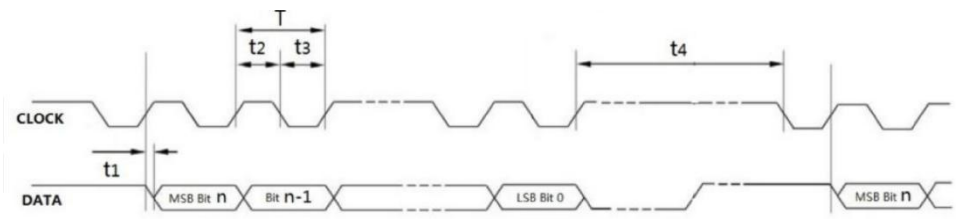
Note: When X1 displays a large value, it is caused by the principle of multi-turn absolute encoder used in the draw-wire displacement sensor. Therefore, moving backward from the zero position results in a large numerical value.
To address this situation, simply preset the initial value of X1 to 1000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

5. SSI communication protocol

SSI communication protocol, abbreviated as Synchronous Serial Interface, uses RS422 as the physical interface and is divided into two parts: clock pulse and data. The receiving device sends a series of clock pulses to the encoder, and the encoder outputs encoder values bit by bit based on the number of clock pulse bits, including angle position, calibration signal, or encoder working status, upon receiving synchronization of the clock pulses. SSI is a widely used position sensor.

The SSI interface encoder only requires two signals: clock and data, which are independent of the encoder's accuracy. The data reading speed of the encoder depends on the clock frequency given by the host, and the encoder emits real-time data based on the clock pulses given by the host. In order to enhance anti-interference ability and long-distance transmission, the SSI interface adopts RS422 level, a pair of differential clock signals, and a pair of differential data signals.

Suitable for motion controllers, PLCs with SSI interfaces, or for simulating SSI host acquisition through a microcontroller.



As shown in the above figure, the absolute position value of the encoder is emitted by the host's clock signal, starting from the binary high bit (MSB) and outputting a serial signal synchronized with the clock signal. The clock is emitted from the host device and outputs N pulses in the total number of bits of the encoder. When the signal is not transmitted, both the clock and data bits are high. At the first falling edge of the clock signal, the current value begins to be stored. From the rising edge of the clock signal, the data signal begins to be transmitted, and one clock pulse synchronizes one bit of data.

T=500ns ~ 10us;

t2=t3=1/2T;

t1 < 1us;

t4 > 20us。

6. Precautions and warranty

● The displacement sensor of the pull rope is installed in a fixed position, and when the pull head is pulled out, it is strictly prohibited to let go and allow the pull rope to retract instantly.
● Movement needs to be kept unobstructed, and the cable should be pulled out vertically during installation.
● Non technical personnel are strictly prohibited from disassembling. If necessary, please disassemble and reassemble under the guidance of technical personnel;
● When installing the stainless steel ropes, attention should be paid to angle control. If necessary, pulleys can be added appropriately to change direction to ensure measurement accuracy and the service life of the steel rope, and to avoid friction between the wire and the outlet.
● Please confirm the power is turned off when wiring, and be aware that incorrect wiring may cause the encoder main board to burn out.
● 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. 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, 0 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.**