Multi-turns Absolute Rotary Encoder User Manual

For RS485(Modbus RTU) Interface

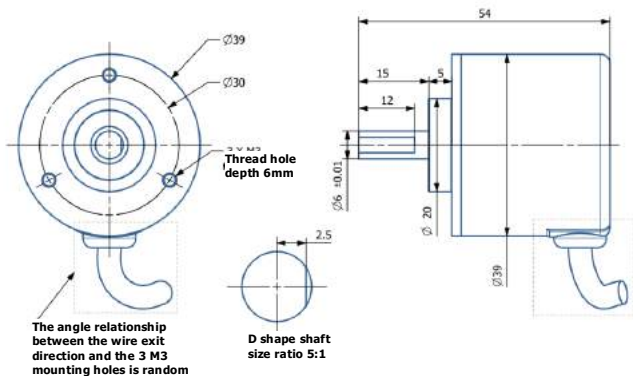深圳布瑞特科技有限公司
BriterEncoder.com

▮▮▮ Product Advantages

● RS485 digital communication signal output, the digital output signal has multi-turn value and single-turn absolute value.

● Adopt standard ModBus-RTU communication protocol, support Kingview, Intouch, FIX, synall and other popular software, and can realize data communication with equipment and systems of international famous brands such as AB, Siemens, Schneider, and GE.

● Full-scale true multi-turn encoder composed of precision reduction gears, no battery needed, power-break memory; any position within the range is unique, even if there is interference or movement after power break, the number of turns will not be lost .

● The resolution of an multi-turns encoder is 10bit(1024P/R) or 12bit(4096P/R). and the number of turns (Memorable range) are 24turns, 50turns, 99turns, 150turns, 1287turns, 4968turns, 19872turns, and a resolution of 0.35 degrees can be achieved within the range. The number of turns refers to the range of power break memory, when exceeding the range, the memory starts from the beginning.

● All parameters can be set through the RS485 communication of the computer, and the zero point can be set at any position. Therefore, when the encoder is installed, the device can be left at any position, and the connecting shaft can be fixed without considering the rotation position of the encoder. After power-on, it can be automatically corrected by performing a zero-setting operation at the external lead or through RS485 communication.

● It is especially suitable for tower cranes, mining cranes, construction lifts, machine tools, 3D printers, automatic assembly lines, industrial robots, printing machinery, packaging machinery, logistics machinery, mobile advertising screen slides and other equipment height, stroke,
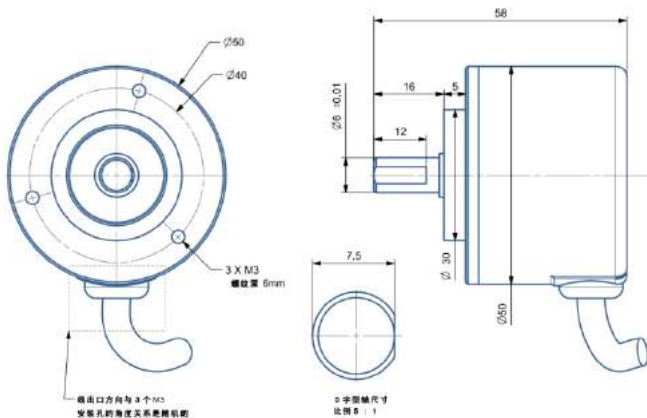
■■■ Electrical Characteristics

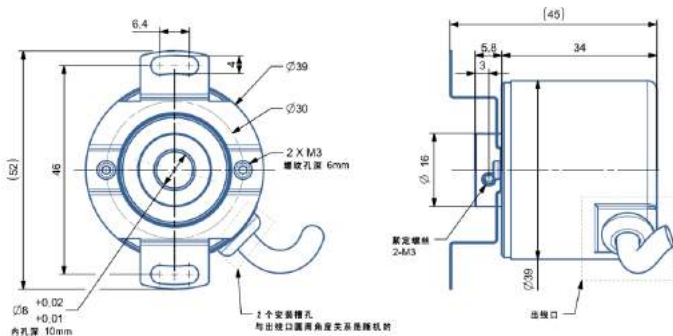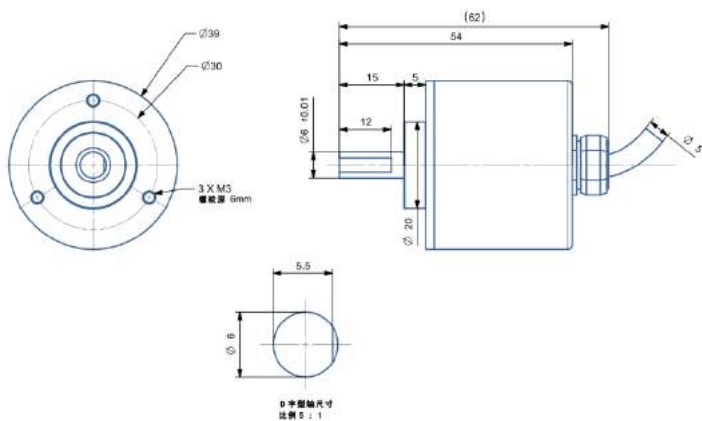| Electrical Parameters				
Working Voltage	5V, 24V(9~30V)	Baud rate		9600~115200(default 9600)
Working Current	100mA	Station address		1~127（default 1）
Linearity	0.1%	TCP		Refer to the Attachment
Kernel refresh cycle	50uS	Electrical life		> 100000 h
Mechanical parameters				
Shell/ flange material		Zinc-nickel coated steel/ Aerospace aluminum		
Shaft material		Stainless steel		
Bearing material		Bearing steel		
Maximum load of the Shaft		Axial 20 N, Radial 80 N		
Maximum mechanical speed		1000RPM		
Starting torque		0.006Nm		
Weight		150 g（include 1.2meter shielded wire）		
Environment Parameters				
Operating temperature		-40 ~ + 85℃		
Storage temperature		-40 ~ + 85 ℃		
Humidity		98 % (No condensation)		
Standard Waterproof Level		Shell: IP54; Shaft，Bearing: IP65		
Highest Waterproof Level		IP67/IP68 waterproof for the entire body		
Wiring Methods				
Red	Positive power supply （5V、9~30V）	Please pay attention to the voltage value on the encoder label before power on.		
Black	Ground（GND）			
Yellow	（ZR）	1. When the zero-setting wire is grounded for more than 100ms, the encoder position value returns to zero. 2. Restore the factory setting function: after power off, connect the yellow wire to ground (black wire). Power on again, hold for 2 minutes, it can be reset after 2 minutes, and separate the two wires after reset.		
Green	RS485B			
White	RS485A			

Mechanical Size

Thread hole depth 6mm

The angle relationship between the wire exit direction and the 3 M3 mounting holes is random

D shape shaft size ratio 5:1

Drawing 1: 6mm solid shaft, IP54

3 X M3 螺纹束 6mm
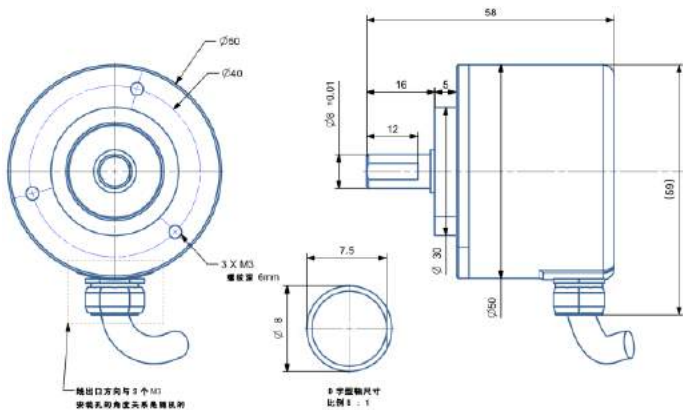
线出口方向与 3 个 M3 安装孔的角度关系更随机的

D 半圆轴尺寸 比例 5：1
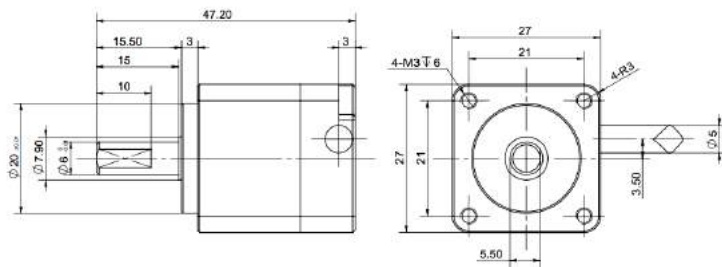
Drawing 2: 8mm solid shaft, IP54

Drawing 3: 8mm blind hole, IP54

Drawing 4: 6mm solid shaft, IP67 waterproof encoder

Drawing 5: 8mm solid shaft, IP67 waterproof encoder

Drawing 6: 6mm solid shaft, IP68 waterproof encoder

Precautions for installation and use

● The encoder is a precision instrument. Please handle it with care and use it carefully, especially for the encoder shaft, please do not knock, hit or pull hard.

● Flexible connectors or elastic supports should be used for the connection between the encoder and the machine, and the rigid damage caused by the non-concentricity of the rigid connection should be avoided.

● Encoder waterproof grade IP54, IP67 two optional, such as the choice of IP54 encoder, shaft protection grade is IP65, should avoid shaft upward installation or soaking in water, otherwise, please use waterproof shield and other measures; IP67 waterproof encoder was tested in one-meter depth of water for 48 hours. Please rest assured to use in outdoor conditions.

● Although the encoder itself will not lose the number of turns in the interference environment, it will cause interference to the data in the transmission process, so when there is a motor in the system or a very strong electromagnetic interference environment, the encoder power supply should use an isolated power supply and external extension It is best to use double-shielded cables and other measures for the communication wire.

● The outer shell of the encoder shell and shielded cable should be well grounded to prevent damage to the encoder circuit due to lightning strikes or high-voltage static electricity!

● Except for the above zero-setting (yellow wire) allows grounding, any other signal wires of the encoder are forbidden to be short-circuited with each other. After power-on, avoid accidentally touching the signal wires, otherwise it may cause permanent damage to the circuit!

Product warranty and disclaimer

● 1. The product is guaranteed for one year free of charge when used correctly.

● 2. 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).

Contact Us

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Encoder RS485 TCP (Standard MODBUS-RTU)

This encoder uses MODBUS-RTU (National Standard GB/T19582-2008) TCP for communication, supports one master station to control multiple slave stations, and 127 slave station addresses can be configured through the built-in host computer. The master station can be a single-chip computer, PLC or PC, etc.

1.1 Communication parameters

The default configuration of the serial port at the factory, the baud rate is 9600bps by default, the data bit is 8, no parity, and the stop bit is 1. The baud rate can be configured in the range of 9600~115200bps, and the encoder default communication address (station number) is 1.

1.2 MODBUS-RTU Frame format

This encoder supports 0x03 (read holding register), 0x06 (write a single register) function codes of MODBUS。

1.2.1 0x03 Read holding register

Host send :

Byte	1	2	3	4	5	6	7	8
Content	ADR	0x03	Start register high byte	Start register low byte	High byte of register number	Low byte of register number	CRC High byte	CRC low byte

The 1st byte ADR : Slave address code (1 ~ 127)

The 2nd byte 0x03 : Read register value function code

The 3rd、4th. byte : Start address of the register to be read

The 5th、6th. byte : Number of registers to be read

The 7th、8th. byte : CRC16 checksum from byte 1 to 6

Return from station :

Byte	1	2	3	4、5	6、7		M-1、M	M+1	M+2
Content	ADR	0x03	Total byte	Register data 1	Register data 2	.....	Register data M	CRC High byte	CRC Low byte

The 1st byte ADR : Slave address code (1 ~ 127)

The 2nd byte 0x03 : Return to read function code

The 3rd byte :   The total number of bytes from 4 to M (including 4 and M)

The 4th. ~ M byte :   Register data

The M + 1、M+2byte :   CRC16 checksum from byte 1 to M

1.2.2 0x06 Write a single register

Host send :

Byte	1	2	3	4	5	6	7	8
content	ADR	0x06	Start register high byte	Start register low byte	High byte of register number	Low byte of register number	CRC High Byte	CRC Low byte

When the slave station receives correctly, the slave station sends back :

Byte	1	2	3	4	5	6	7	8
Content	ADR	0x06	Register high byte	Register low byte	High byte of register number	Low byte of register number	CRC high byte	CRC low byte

1.2.3 0x10 Write multiple registers

Byte	1	2	3	4	5	6	7
Content	ADR	0x10	Start register high byte	Start register low byte	High byte of register number	Low byte of register number	Total number of data bytes

Byte	8、9	10、11	N、N+1	N+2	N+3		
Content	Register data 1	Register data 2	Register data M	CRC high byte	CRC low byte		

When the slave station is received correctly, the slave station is sent back :

Byte	1	2	3	4	5	6	7	8
Content	ADR	0x10	Register high byte	Register low byte	High byte of register number	Low byte of register number	CRC high byte	CRC low byte

When an error is received from the slave station, the slave station is sent back :

Byte	1	2	3	4	5
Content	ADR	0x83	Exception code	CRC high byte	CRC low byte

1.3 Register definition

1.3.1 Encoder register

Register address	description	Value ranges	Support function code	Remarks
0x0000~0x0001	Encoder value	0~0xFFFFFFFF (0~4294967295)	0x03	/
0x0002	Encoder number of turns	0~0xFFFF (0~65535)	0x03	/
0x0003	Encoder singe turn value	0~0xFFFF (0~65535)	0x03	/
0x0004	Encoder address	1~127	0x06	Communication address
0x0005	Baud rate	0x0000~0x0004	0x06	0x00：9600 0x01：19200 0x02：38400 0x03：57600 0x04：115200
0x0006	Encoder mode	0x0000~0x0001	0x06	0x00：Query mode 0x01：automatic backhaul
0x0007	Automatic return time	0~65535(ms)	0x06	default：50mS
Note: once the automatic return time is set to less than 20 milliseconds, the encoder will not be able to set other parameters, use with caution!				
0x0008	Encoder reset zero mark	0x0001	0x06	Write 0x0001 , the encoder takes the current position as the zero point
0x0009	Encoder value increasing direction	0x0000~0x0001	0x06	0x00：clockwise 0x01：counterclockwise
0x000B~0x00C	Set the current value of the encoder	0~0xFFFFFFFF (0~4294967295)	0x10	Set the current position value of the encoder
0x000E	Set the encoder's midpoint	0x0001	0x06	Write 0x0001 , the encoder takes the current position as the mid-point
0x000F	set the current turn value to 5 turns	0x0001	0x06	Write 0x0001 , Set the encoder to 5 turns with the current position value.

1.4 Example of Encoder communication

1.4.1 Read encoder value
Tx:01 03 00 00 00 02 (C4 0B)
Rx:01 03 04 00 01 76 3B (CC 40)
Note: The CRC check digit is in the brackets, the return data of the encoder value is 00 01 76 3B (decimal: 95803)

1.4.2 Read encoder circle value + single circle value
Tx:01 03 00 02 00 02 (65 CB)
Rx:01 03 04 00 08 02 7A (FB 72)
Note: The CRC check digit is in the brackets, the return data of the encoder circle value is 00 08 (decimal: 8 circle)

The return data of the encoder single-turn value is 02 7A (decimal: 634)

1.4.3 Read encoder number of turns
Tx:01 03 00 02 00 01 (25 CA)
Rx:01 03 04 00 08 (59 83)
Note: The CRC check digit is in the brackets, the return data of the encoder circle value is 00 08 (decimal: 8 circle)

1.4.4 Read encoder single-turn value
Tx:01 03 00 03 00 01 (74 0A)
Rx:01 03 04 02 7A (D8 C6)
Note: The CRC check digit is in the brackets, the return data of the encoder single-turn value is 02 7A (decimal: 634)

1.4.5 Set the encoder address
Tx:01 06 00 04 00 02 (49 CA)
Rx:01 06 00 04 00 02 (49 CA)
Note: The CRC check digit is in the brackets, and the set address is 02 (HEX:0x0002)

1.4.6 Set the encoder baud rate
Tx:01 06 00 05 00 02 (18 0A)
Rx:01 06 00 05 00 02 (18 0A)
Note: The CRC check digit is in the brackets, and the set baud rate is 38400 (0x02)

1.4.7 set encoder data mode.
Tx: 01 06 00 06 00 01 (A8 0B).
Rx: 01 06 00 06 00 01 (A8 0B).
Note: CRC check bits are in parentheses, and the current encoder data mode is set to automatic backhaul (default query).

1.4.8 set encoder automatic return time (milliseconds).
Tx: 01 06 00 07 00 64 (39 E0).
Rx: 01 06 00 07 00 64 (39 E0).
Note: the CRC check bit is in parentheses, and the automatic return time is set to 100ms (HEX:0x0064).
Note: once the automatic return time is set to less than 20 milliseconds, the encoder will not be able to set other parameters, use with caution!

1.4.9 set encoder zero.
Tx:01 06 00 08 00 01 (C9 C8).
Rx:01 06 00 08 00 01 (C9 C8).

Note: the CRC check bit is in parentheses, and the current point of the current encoder is set to the origin.

1.4.10 set the encoder value increment direction.

Tx:01 06 00 09 00 01 (98 08).
Rx:01 06 00 09 00 01 (98 08).
Note: the CRC check bit is in parentheses, set the current encoder counterclockwise value to increase (default clockwise).

1.4.11 set the midpoint of the encoder.

Tx:01 06 00 0E 00 01 (29 C9).
Rx:01 06 00 0E 00 01 (29 C9).
Note: the CRC check bit is in parentheses, and the current point of the current encoder is set to the midpoint.

1.4.12 set the encoder 5 circle value.

Tx:01 06 00 0F 00 01 (78 09).
Rx:01 06 00 0F 00 01 (78 09).
Note: the CRC check bit is in parentheses, and the current point of the current encoder is set to 5 circles.

1.4.13 set the current position value of the encoder.

Tx:01 1000 0B 00 02 04 00 00 30 39 (66 0E).
Rx:01 1000 0B 00 02 (300A).
Note: the parenthesis is the CRC check bit, and the position set is 12345 (HEX:0x00003039).

1.5 CRC check function Code reference

```
unsigned int Crc_Count(unsigned char pbuf[],unsigned char num)
{
        int i,j; unsigned int wcrc=0xffff;
        for(i=0;i<num;i++)
        {
                wcrc^=(unsigned int)(pbuf[i]);
                for (j=0;j<8;j++)
                {
                        if(wcrc&0x0001)
                        {
                                wcrc>>=1; wcrc^=0xa001;

                        }
                        else
                                wcrc>>=1;
                }
        }
        return wcrc;
```

```
    }
```

1.6 BriterEncoder software interface