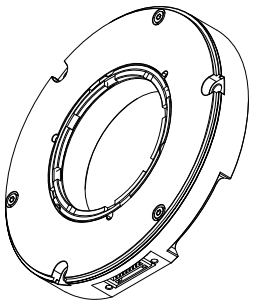
1. PM82 Multi-turn Absolute Photoelectric Bearingless Encoder (Through Shaft)

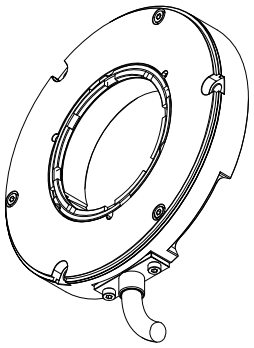
1.1 Introduction：

PM82 features a unique large-aperture through-the-shaft concentric locking device and a bearingless, ultra-thin design.
It is a high-precision, multi-turn absolute photoelectric encoder that can output 24Bits of single-turn position information, expandable to 32Bits, and can read to 24Bits of multi-turn position information.
The product boasts a compact structure, high integration, and simple installation, making it suitable for applications with limited space.

PM82-E



PM82-J



1.2 Feature：

- External diameter Ø82mm,Thickness 12.5mm, Hollow shaft up to Ø40mm;
- Concentric shaft ring locking installation structure;
- Adopt non-contact photoelectric reflective principle;
- Interface: BiSS_C or SSI;
- Accuracy: ±80";
- Max resolution is 24Bits, can be expanded up to 32Bits;
- Support multi-turn data recording under the condition of no power lost, the maximum recording is 24Bits.

1.3 Application：

Servo motor, robot and other industrial automations.

1.4 Connection：

Radial socket (8P SM08B-GHS-TB).
Radial cable (Standard 1m).

1.5 Protection：

＜IP20

1.6 Weight：

About 150g

2. Model Selection Guide

2.1 Model composition (select parameters)

PM82-	E	40	B	2416	R			- 000
Product model series	Interface: E=Radial socket (SM08B-GHS-TB) J=Radial cable	Hollow shaft: 30=Ø30mm 32=Ø32mm 38=Ø38mm 38.1=Ø38.1mm 40=Ø40mm	Communication: B=BISS C (Binary) S=SSI (Binary) G=SSI (Gray)	Resolution Single-turn: 17=17Bit 19=19Bit 20=20Bit 22=22Bit 24=24Bit Single-turn + Multi-turn 16Bit: 1716=17+16Bit 1916=19+16Bit 2016=20+16Bit 2216=22+16Bit 2416=24+16Bit Customized products are subject to negotiation.	Electrical interface: R=RS-485	Supply voltage: Blank=DC5V H=DC8-30V	Special requirement: Blank=❶	Customer No.

Special requirement：

❶. IP=50；cable length 1M，if need to change the length C+number，max 10M(indicated by C10).

3. Basic Specification

3.1 Resolution

Single-turn(ST)		Multi-turn(MT)	
17Bits 2^{17}(0～+131071)	Under 24Bits as standard, expandable up to Max 32Bits	16Bits 2^{16}(65536 turn)	16Bits is the standard product, others can be customized, Max 24Bits
19Bits 2^{19}(0～+524287)		16Bits 2^{16}(65536 turn)	
20Bits 2^{20}(0～+1048575)		16Bits 2^{16}(65536 turn)	
22Bits 2^{22}(0～+4194303)		16Bits 2^{16}(65536 turn)	
24Bits 2^{24}(0～+16777215)		16Bits 2^{16}(65536 turn)	

3.2 Specification

Name	Parameter	Remark
Scanning principle	Photoelectric	
Accuracy	±80″	
Response speed	Normal action: 6000min^{-1}	
RMS position signal noise	±2 @18 Bits/r	
Communication	BiSS_C (Binary)	Pls refer to BiSS_C standards
	SSI (Binary / Gray code)	Pls refer to SSI standards
Communication clock frequency	≤10 MHz(BiSS) or ≤5 MHz(SSI)	
Max resolution	24 Bits expandable up to Max 32 Bits	For frame infomation,please refer to P9 & P10 (data frammes)
Starting time	Typical value: 13 ms	
Absolute position sampling period	≤75 ns	
Allowable speed	≤32200 r/min	Restricted by mechanical speed limit
Electrical connection	Radial socket & cable connection	Pls refer to page 6、7
Cable	Twisted-paired cable	
Cable length	200mm - 10000mm	
Internal single-turn position update rate	15000kHz	Access rate is limited by communication frequency
Internal multi-turn position update rate	11.5kHz	
Temperature alarm limit value	-20℃～115℃	

3.3 Mechanical specification

Name	Parameter	Remark
Mechanical Connection	Ring locking with shaft	
Diameter of shaft	Ø30mm、Ø32mm、Ø38mm、Ø38.1mm、Ø40mm (through hole)	Pls refer to page 5 for dimensions
Shaft material	Stainless steel	
Shell material	Aluminium alloy	
Weight	About 150g	

3.4 Environmental specification

Name	Parameter
Environmental temperature	Operating：－20～115℃
	Storage：－25～+115℃
Environmental humidity	Operating and storage:35～85%RH (Noncondensing)
Vibration	Amplitude 1.52mm ,5～55HZ,2h for X,Y,Z direction individually
Shock	980m/s² 11ms three times for X,Y,Z direction individually
Protection grade	＜IP20

4. Electrical Characteristic

4.1 Absolute maximum rating

Symbol	Instructions	Minimum	Maximum	Unit
Vcc	Supply Voltage	-0.3	+6.0	V
V_{BAT}	Backup Voltage	-0.3	+6.0	V
T_{STG}	Storage Temperature	-25	+115	° C
T_J	Junction Temperature	-30	+115	° C

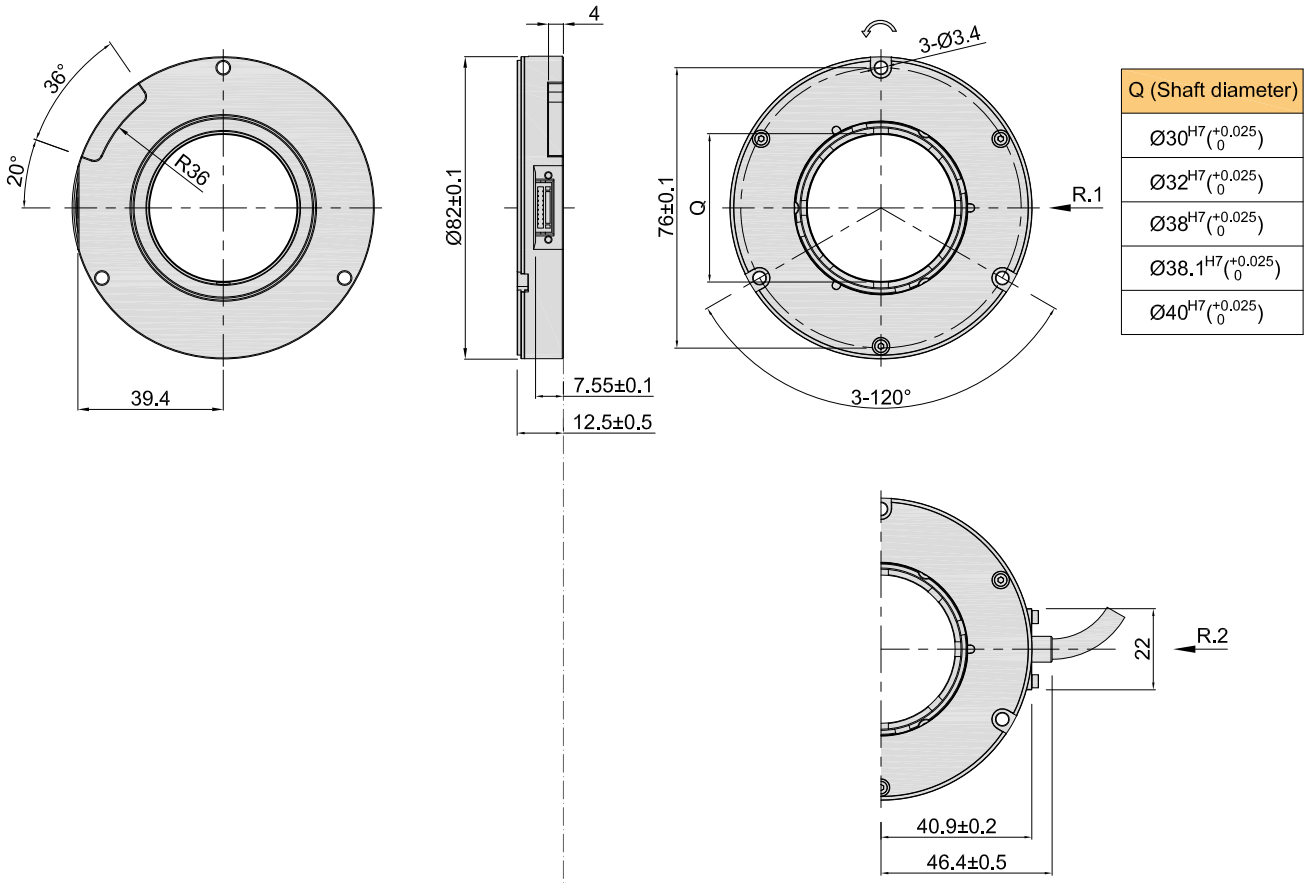
4.2 Electrical specification

Symbol	Instructions	Minimum	Typical value	Maximum	Unit
Vcc	Supply Voltage DC5V	4.75	5.0	5.5	V
	Supply Voltage DC8-30V	7.75	30	32	V
I_{DD}	Supply Current	-	-	120	mA
V_{BAT}	Backup Voltage ❶	3.0	3.6	4.2	V
$I_{(BAT)}$	Backup Current	-	-	35	uA
f_{BISS}❷	BISS Communication clock frequency	-	-	10	MHz
	SSI Communication clock frequency	-	-	5.0	MHz
Ta	Operating temperature	-20		+115	° C

❶ For the power supply sequence of multi-turn absolute encoders, be sure to power on the system after the battery has been powered up.
❷ Pls refer to BiSS_C and SSI standards.

5. Basic Dimension

5.1 Dimension

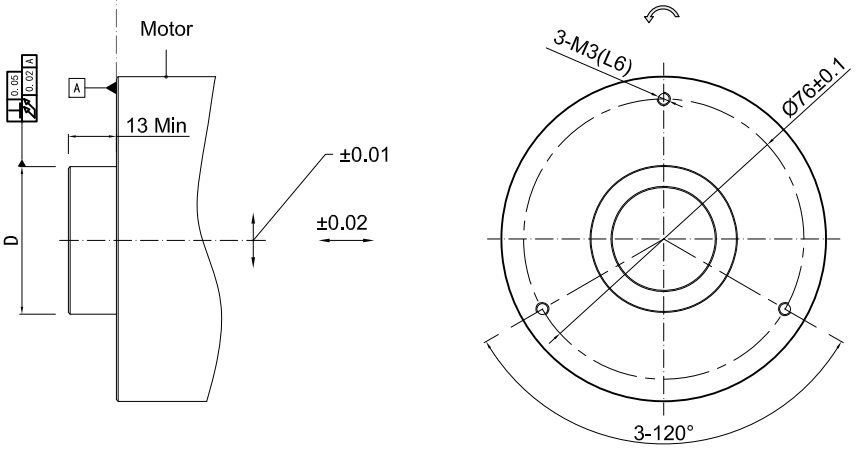


Q (Shaft diameter)
$Ø30^{H7}_{(0}^{+0.025})$
$Ø32^{H7}_{(0}^{+0.025})$
$Ø38^{H7}_{(0}^{+0.025})$
$Ø38.1^{H7}_{(0}^{+0.025})$
$Ø40^{H7}_{(0}^{+0.025})$

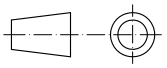
5. 2 Installation shaft specification

Mounting screws
Inner hexagon bolt +flat washer Specification: M3*15 Material: stainless steel Quantity: 3

D(Motor shaft)
$Ø30_{g6}(^{-0.009}_{-0.025})$
$Ø32_{g6}(^{-0.009}_{-0.025})$
$Ø38_{g6}(^{-0.009}_{-0.025})$
$Ø38.1_{g6}(^{-0.009}_{-0.025})$
$Ø40_{g6}(^{-0.009}_{-0.025})$



Unit: mm



= Shaft rotation direction of the signal output
R. 1 = Radial socket (8P SM08B-GHS-TB)
R. 2 = Cable connection (standard length 1000)

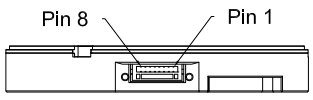
6. Interface Definition

6.1 Function and definition of socket pin (Radial socket)

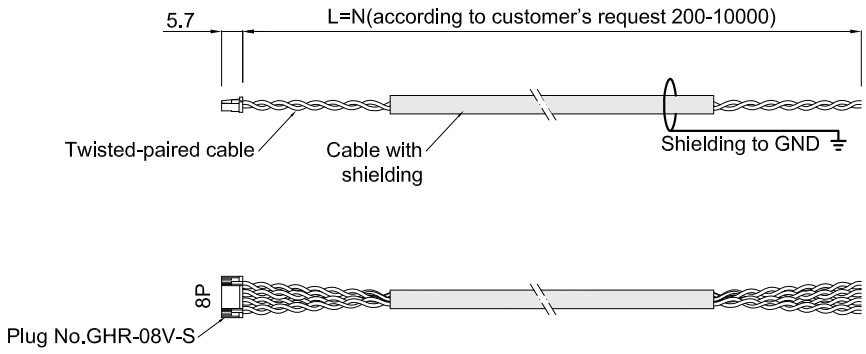
Socket Pin No.	Signal				Function	Twisted-paired cable
	BISS_C ST	BISS_C MT	SSI ST	SSI MT		
Pin 1	Up	Up	Up	Up	Power positive	
Pin 2	Un	Un	Un	Un	Power negative	
Pin 3	SL-	SL-	DATA-	DATA-	Data signal	
Pin 4	SL+	SL+	DATA+	DATA+	Data signal	
Pin 5	MA-	MA-	CLOCK-	CLOCK-	Clock signal	
Pin 6	MA+	MA+	CLOCK+	CLOCK+	Clock signal	
Pin 7	-	Vbat	-	Vbat	Backup power supply	
Pin 8	-	0V	-	0V	0V	

6.2 Pin assignment

Socket No: SM08B-GHS-TB



Plug+Shielding cable (order additionally)

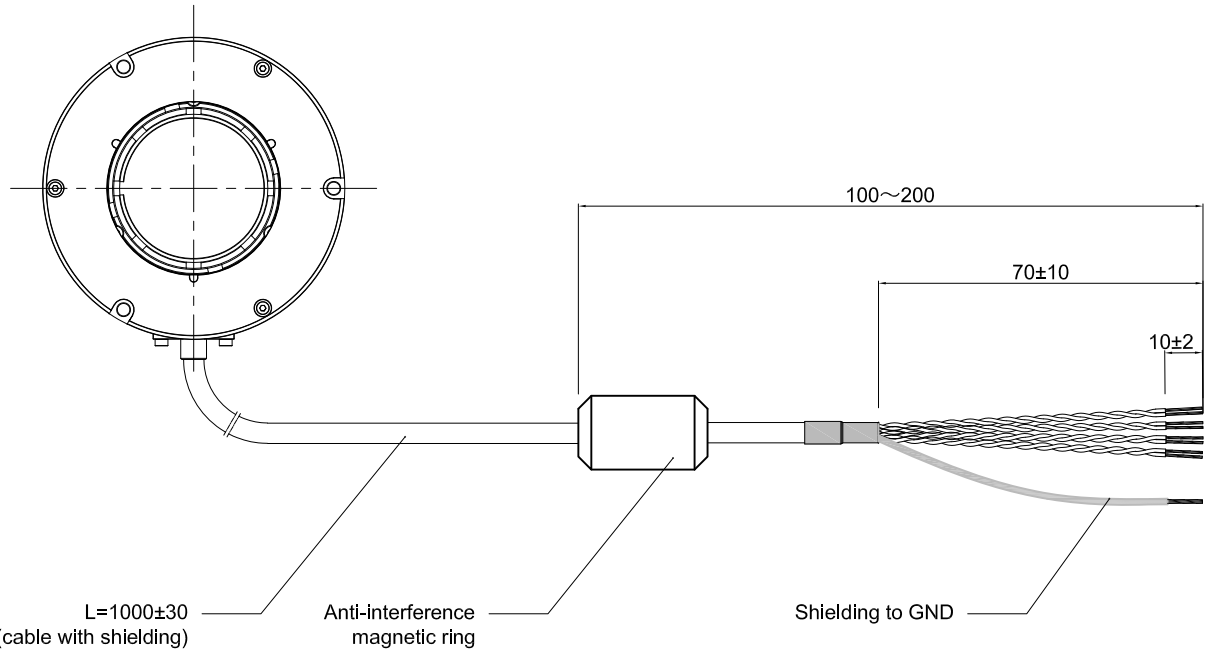


Unit: mm

6. 3 Function and color definition (Radial cable)

Wire Color	Signal				Function	Twisted-paired cable
	BISS_C ST	BISS_C MT	SSI ST	SSI MT		
Red	Up	Up	Up	Up	Power positive	
Black	Un	Un	Un	Un	Power negative	
White	SL-	SL-	DATA-	DATA-	Data signal	
White/black	SL+	SL+	DATA+	DATA+	Data signal	
Green	MA-	MA-	CLOCK-	CLOCK-	Clock signal	
Green/black	MA+	MA+	CLOCK+	CLOCK+	Clock signal	
Yellow	-	Vbat	-	Vbat	Backup power supply	
Yellow/black	-	0V	-	0V	0V	

6.4 Cable connection schematic



Unit: mm

7 Electrical Connection

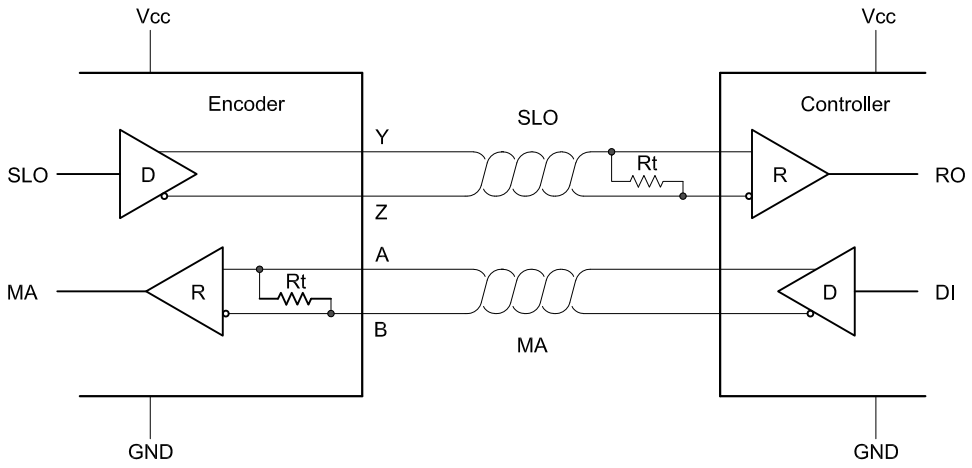


Figure 1: Point-to-point configuration

Note: Both the MA and SLQ lines are differential twisted-paired cable transmission, compatible with RS422.
The terminal resistor of the MA transmission line has been integrated inside the encoder.

8. Communication Format

8.1 BiSS_C communication

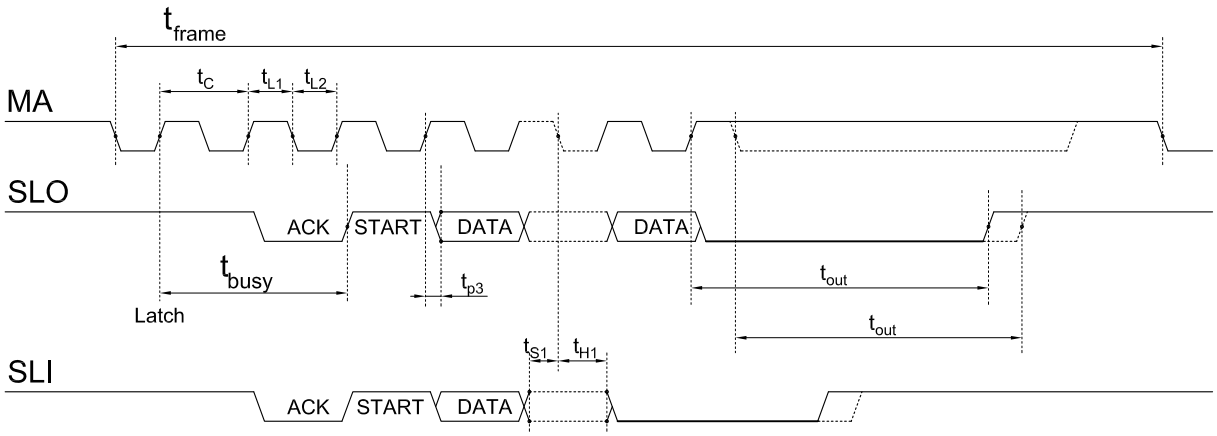


Figure 2: BiSS-C Timing

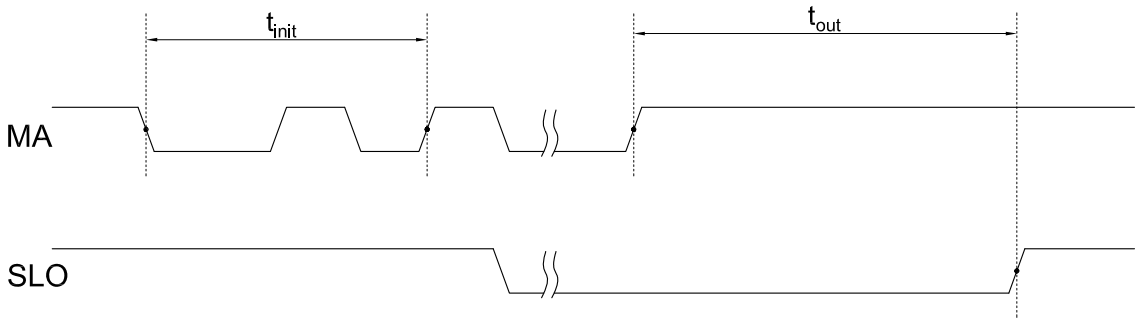


Figure 3: BiSS-C (SSI) Slave Timeout Sequence

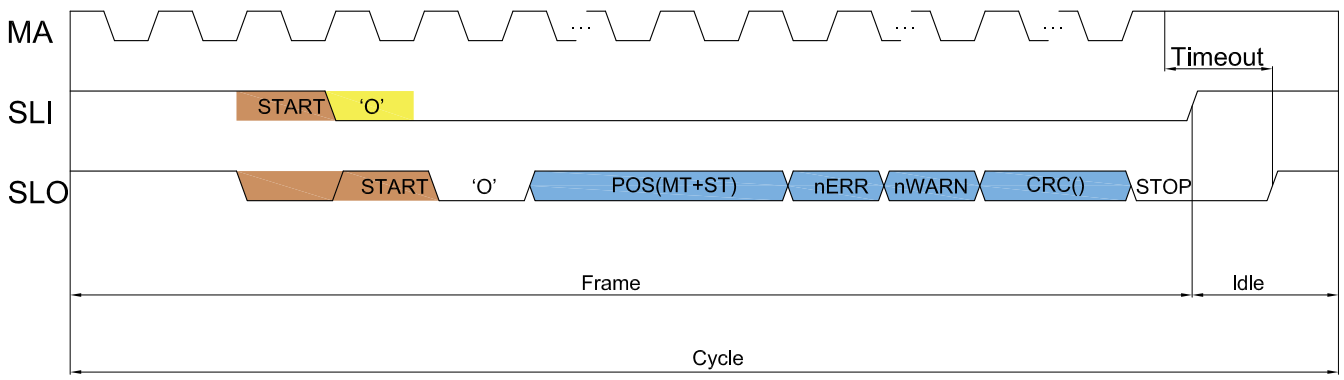


Figure 4: BiSS-C Frame Structure

8. 2 SSI communication

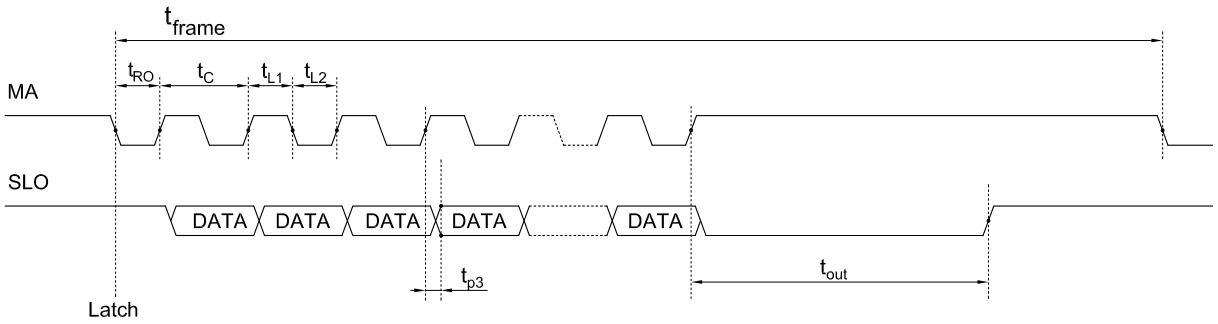


Figure 5: SSI Timing

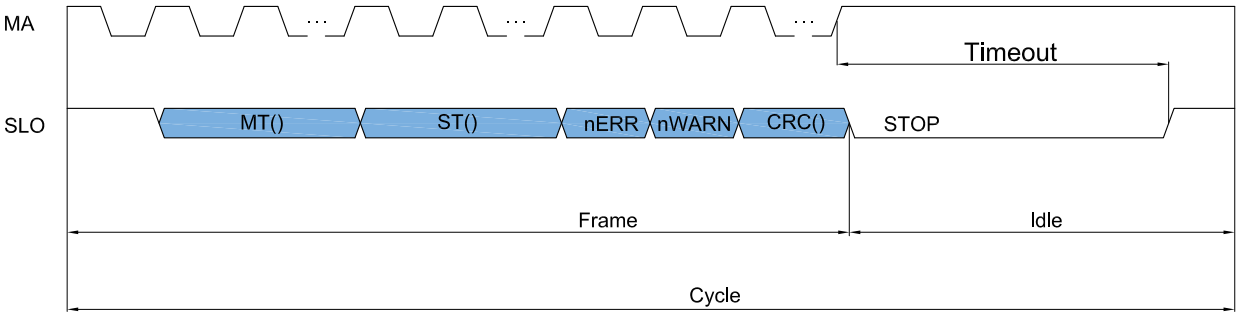


Figure 6: SSI Frame Structure

The frame is composed of frame structure and data to be transmitted. The sequence of data transmission first is MSB, error bit and alarm bit are low effective, cyclic redundancy check transmitted inverted. The specific data composition is shown in the below table:

Bits No.	Data	Instructions
[55:32]	MT[23:0]	Recording the accumulative number of the encoder running after power on
[31:8]	ST[23:0]	Current data of absolute location
[7]	nERR	Error output, active low
[6]	nWARN	Warning output, active low
[5:0]	CRC[5:0]	Check bit CRC polynomial of 0x43 with a starting value of 0 (output at flip level)

9. Installation Steps

Figure 1
a. Place the encoder (3) directly on the motor shaft and gently push it onto the motor platform.
b. Screw in the three M3*15 mounting bolts (4), but do not tighten them too much. Wait until the shaft sleeve and the motor shaft are tightened before tightening these three bolts.

Note: The matching tolerance of the encoder shaft sleeve and the motor shaft. (Please refer to P5)

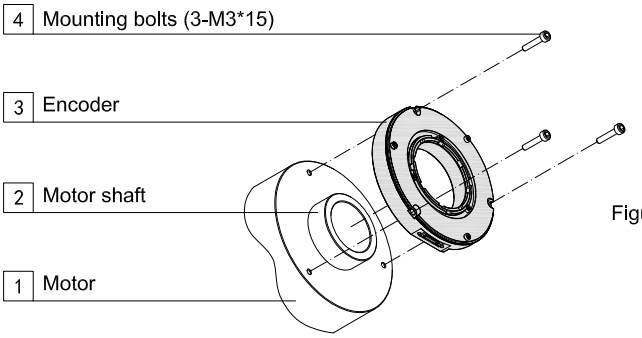


Figure 1

Figure 2
a. Insert the wrench (A) into the slot on the encoder shaft sleeve and tighten the lock nut with the wrench (B). At this time, the encoder shaft sleeve and motor shaft should be tightened and locked. (The recommended tightening force is 18-22N.m)
b. Then tighten the three M3*15 mounting bolts (4).

Note: To prevent the lock nut from loosening during use, which will cause the encoder shaft and the motor shaft to move and slip, apply thread glue to the thread surface of the lock nut before tightening.

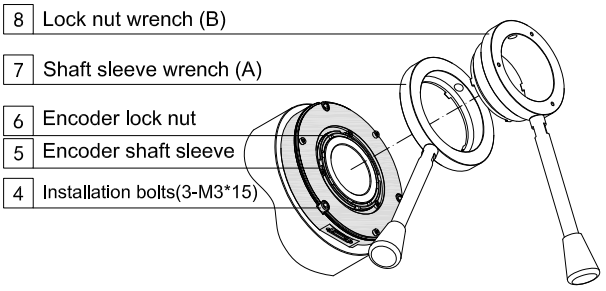


Figure 2

Figure 3
a. Remove the (9) sleeve fixing bolts. These three bolts can be screwed onto the wrench (B) and will be used next time when removing the encoder.
b. Remove the (10) positioning plate fixing bolts. These three bolts will be reinstalled after the positioning plate (B side) is flipped over to (A side), as shown in Figure 4 and 5.

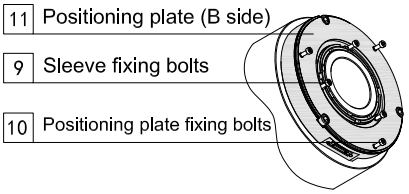


Figure 3

Figure 4
Remove the positioning plate, flip it from the B side to the A side, and then reinstall it.

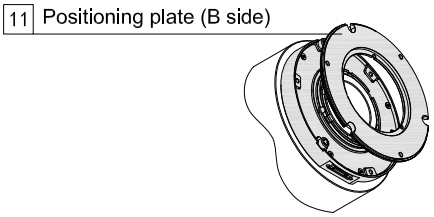


Figure 4

Figure 5
After the positioning plate is flipped over to the A side, tighten the (10) positioning plate fixing bolts and tighten them.

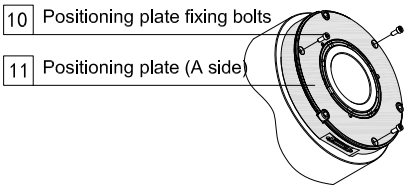


Figure 5

Figure 6
This figure shows the encoder after installation.

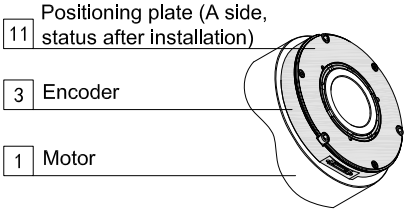


Figure 6

10. Caution

10.1 Caution for operation

- The working temperature shall not exceed the storage temperature.
- The working humidity shall not exceed the storage humidity.
- Do not use where the temperature changes dramatically and have fog.
- Do not close to corrosive and flammable gas.
- Keep away from dust,salt and metal powder.
- Keep away from places where you will use water, oil, or medicine.
- Undue vibration and shock will impact the encoder.

10.2 Caution for installation

- Electrical components should not be subjected to excessive pressure, etc., and electrostatic assessment of the installation environment should be conducted.
- Do not close the cable of the motor power to the encoder.
- The FG wire of the motor and mechanical device should be grounded.
- The shielding wire must be effectively grounded since the shielding is not connected to the encoder.

10.3 Caution for wiring

- Use the encoder under the specified supply voltage. Please note that the supply voltage range may drop due to the wiring length.
- Do not put the encoder wiring and other power lines through the same duct, and do not use them by bundling in parallel.
- Please use twisted pair wires for the signal and power wires of encoder.
- Please do not apply excessive force to the cable of encoder, or it will may be damaged.

fang@shhxgd.com Tel: 86-21-54613487