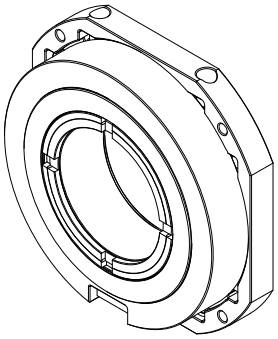
1. MPN80 Multi-turn Absolute Encoder (Through Shaft)

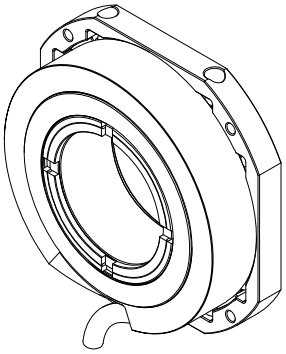
1.1 Introduction：

MPN80 has a unique shaft concentric locking ultra-thin structure and and installation method that combines a flange and a flexible board. It is a high-precision multi-turn absolute photoelectric encoder that can output 24Bits of single-turn position information and can be expanded up to 32Bits, and read multi-turn position information up to 24Bits. The product has compact structure, high integration, simple installation, and is suitable for application scenarios with limited space.

MPN80-E



MPN80-S



1.2 Feature：

- External diameter Ø80mm (Mounting flange diameter Ø94mm), Thickness 25mm, 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 24 Bits.

1.3 Application：

Servo motor, robot and other industrial automations.

1.4 Connection：

Radial socket (8P SM08B-GHS-TB).
Radial cable (length 1000mm).

1.5 Protection：

IP50

1.6 Weight：

about 360g

2. Model Selection Guide

2.1 Model composition (select parameters)

MPN80-	E	40	B	2416	R			-	000
Product model series	Interface Radial socket: E=SM08B-GHS-TB Cable connection: S=Cable	Hollow shaft: 30=Ø30mm 32=Ø32mm 38=Ø38mm 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 Other resolutions can be customized	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℃～95℃	

3.3 Mechanical specification

Name	Parameter	Remark
Mechanical Connection	Ring locking with shaft, flexible spring plate fixed connection	
Diameter of shaft	Ø30mm、Ø32mm、Ø38mm、Ø40mm (through hole)	Pls refer to page 5 for dimensions
Shaft material	Stainless steel	
Starting Torque	Less than 60×10^{-3} N·m	
Inertia Moment	Less than 80×10^{-6} kg·m²	
Shaft load	Radial 30N; Axial 20N	
Allowed speed	≤3000 rpm	
Shell material	Aluminium alloy	
Weight	About 360g	

3.4 Environmental specification

Name	Parameter
Environmental temperature	Operating：－20～95℃
	Storage：－25～+95℃
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	IP50

4. Electrical Characteristics

4.1 Absolute maximum ratings

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	-40	+95	° C
T_J	Junction Temperature	-50	+125	° C

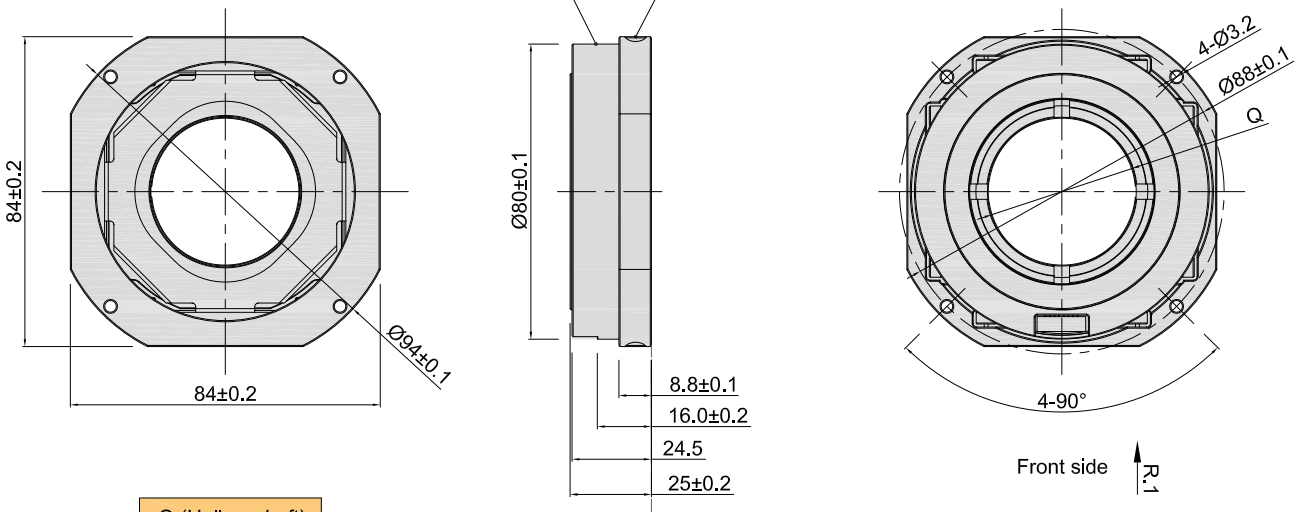
4.2 Electrical specification

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	-40		+95	° 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.

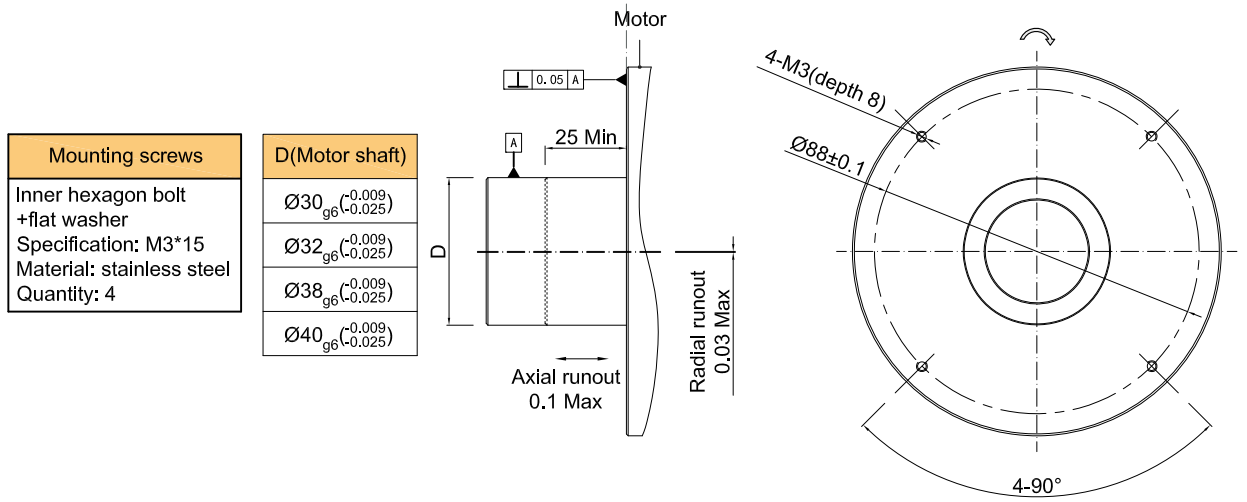
5. Basic Dimension

5.1 Dimension



Q (Hollow shaft)
$Ø30^{H7}_{(0}^{+0.025})$
$Ø32^{H7}_{(0}^{+0.025})$
$Ø38^{H7}_{(0}^{+0.025})$
$Ø40^{H7}_{(0}^{+0.025})$

5. 2 Installation shaft specification



Mounting screws
Inner hexagon bolt +flat washer Specification: M3*15 Material: stainless steel Quantity: 4

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

Unit: mm

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

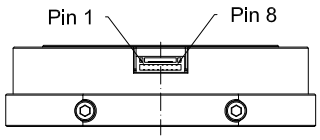
6. Interface Definition

6.1 Function and definition of socket pin (Radial socket)

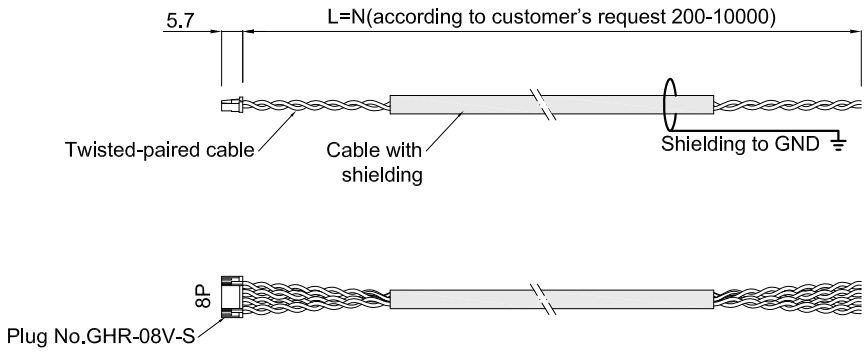
Pin No.	Signal				Function	Twisted-paired cable
	BISS_C ST	BISS_C MT	SSI ST	SSI MT		
Pin 1	Up	Up	Up	Up	Power positive	
Pin 2	Un	Un	Un	Un	Power negative	
Pin 3	SL-	SL-	DATA-	DATA-	Data signal	
Pin 4	SL+	SL+	DATA+	DATA+	Data signal	
Pin 5	MA-	MA-	CLOCK-	CLOCK-	Clock signal	
Pin 6	MA+	MA+	CLOCK+	CLOCK+	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)

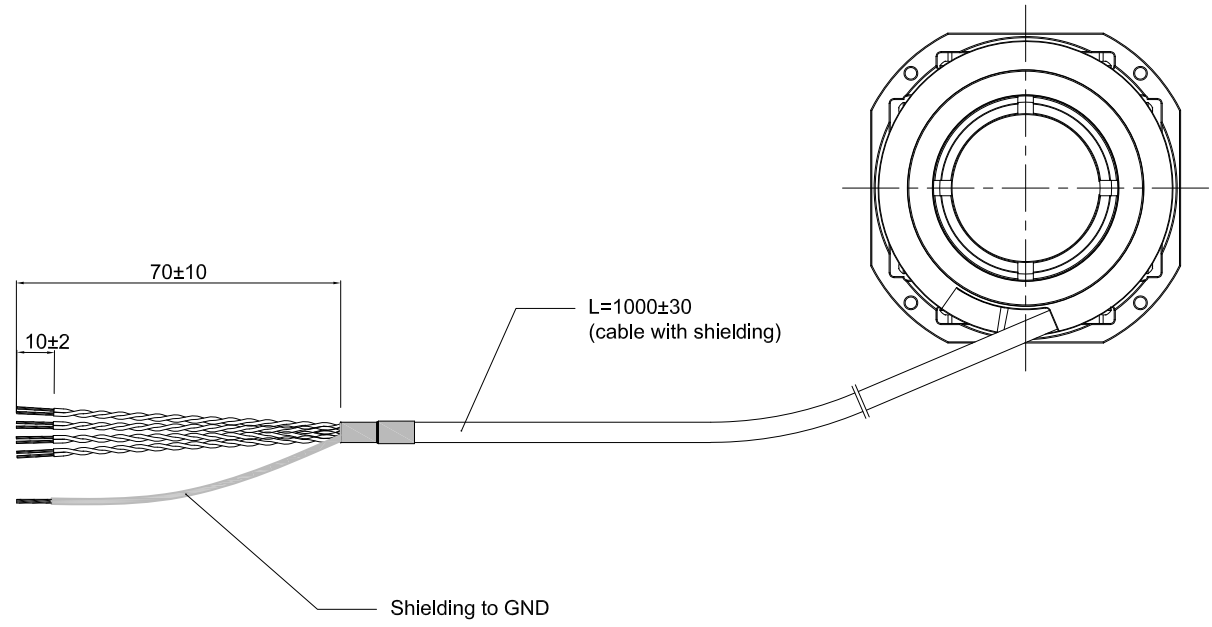


Unit: mm

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

6. 5 Electrical connection

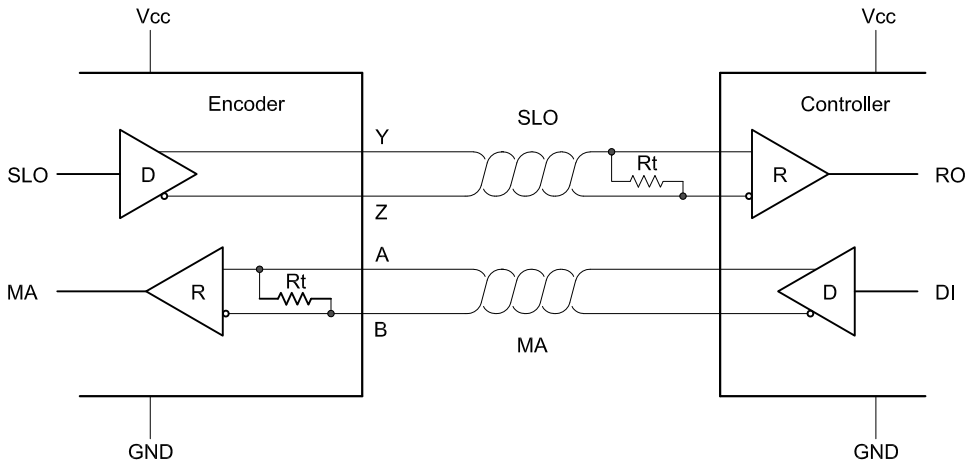


Figure 1: Point-to-point configuration

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.

6. 6 BiSS_C Communication

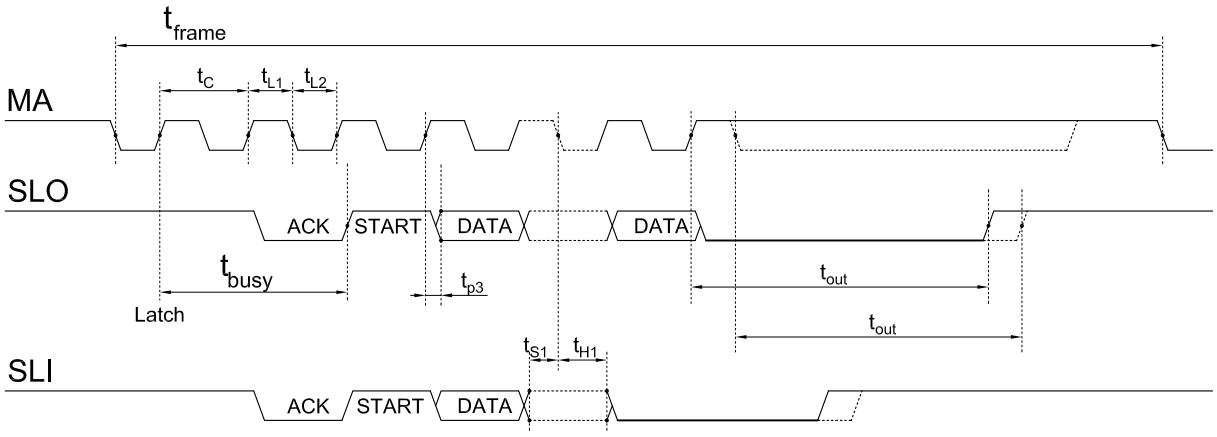


Figure 2: BiSS-C Timing

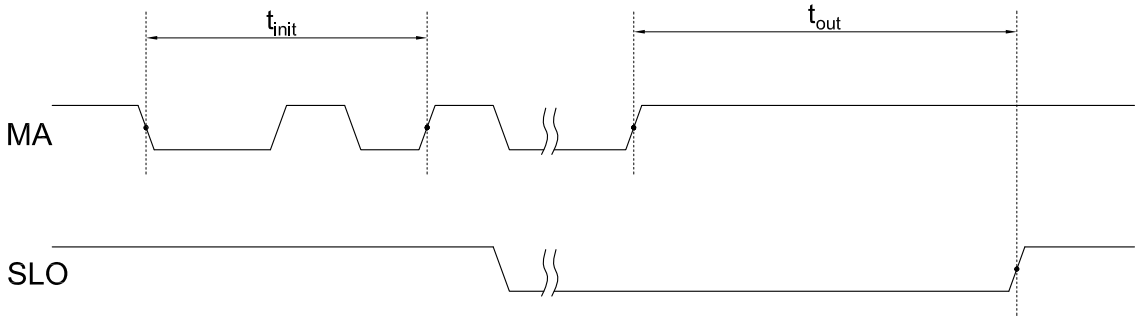


Figure 3: BiSS-C (SSI) Slave Timeout Sequence

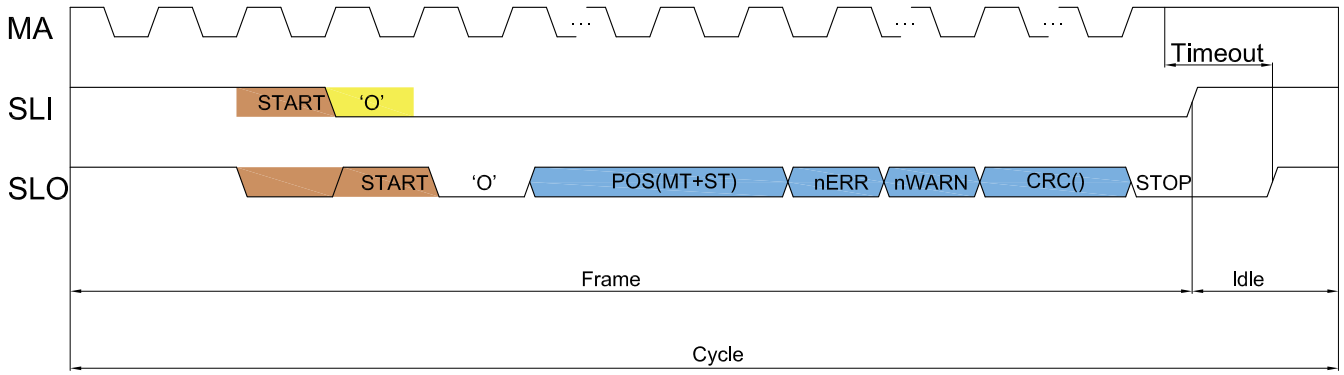


Figure 4: BiSS Frame Structure

6. 7 SSI Communication

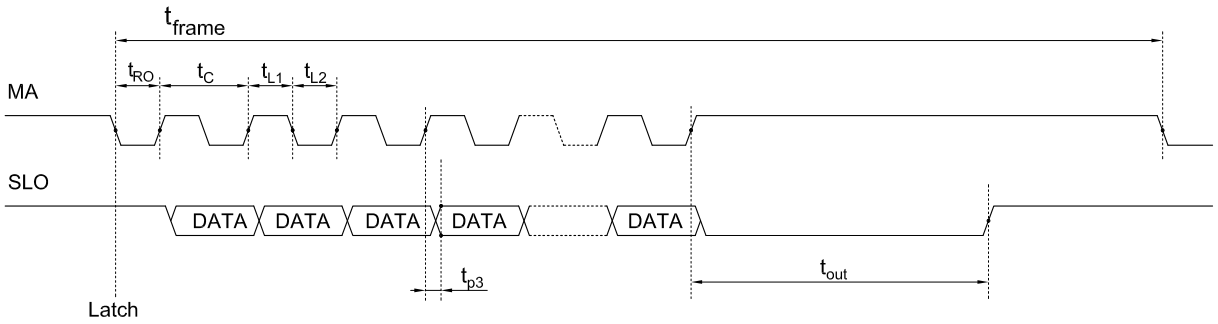


Figure 5: SSI Timing

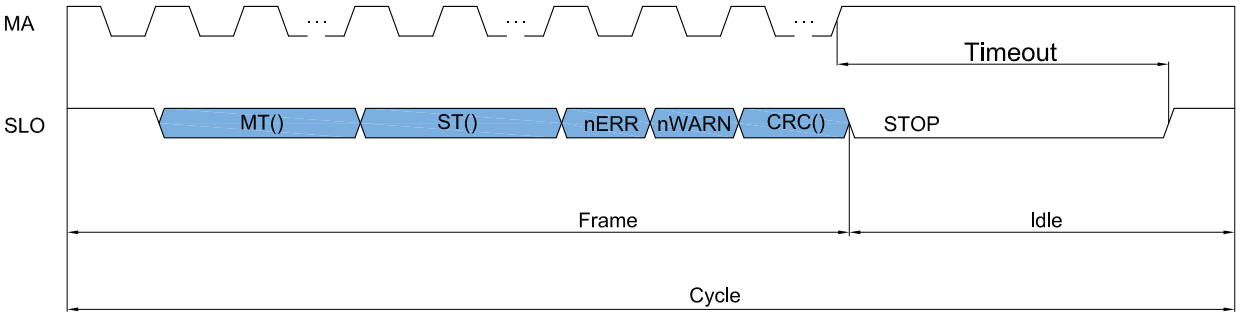


Figure 6: SSI Frame Structure

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)

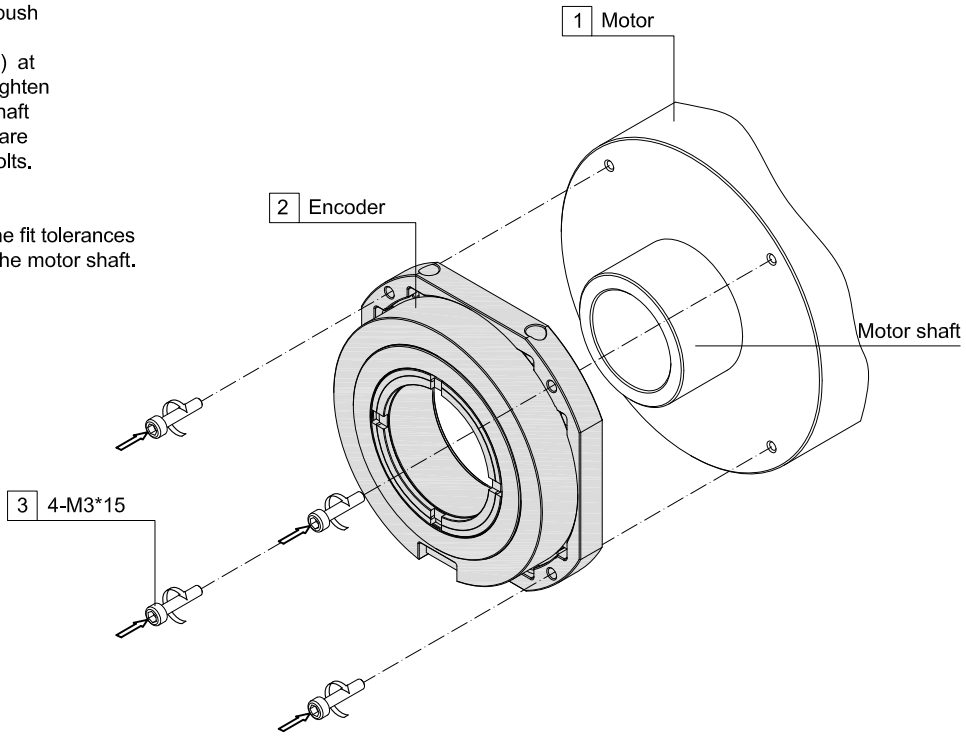
7. Installation Steps

First Step

a. Put the encoder(2) directly on the motor shaft and gently push it to the motor.

b. Tighten four M3*15 bolts (3) at the same time, but do not tighten them too tightly.when the shaft sleeve and the motor shaft are tightened, fasten the four bolts.

Note: Please refer to page 5 for the fit tolerances of the encoder sleeve and the motor shaft.

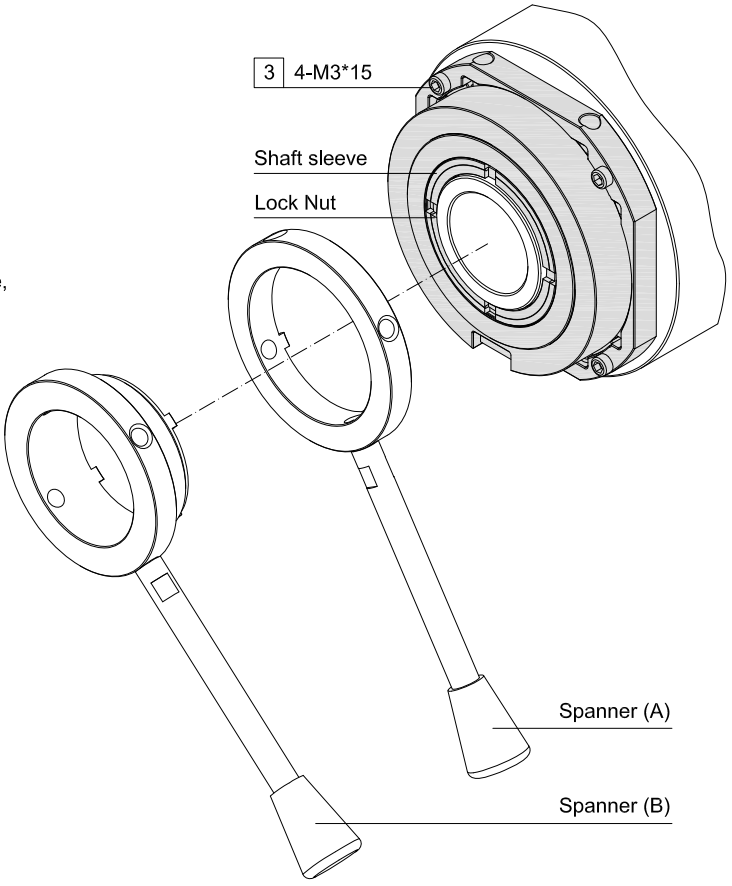


Second Step

Fix the spanner (A) on the slot of the encoder shaft sleeve, tighten the lock nut with the spanner (B). (the recommended tightening force is 15-20 N.m), and then tighten the four M3*15 lock bolts (3).

Note:

To avoid loosening of the lock nut during use, which can cause displacement and slippage between the encoder shaft and motor shaft, it is necessary to apply thread adhesive to the threaded surface of the lock nut during installation and then tighten it.



8. Caution

8.1 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.

8.2 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.

8.3 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.

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