1．PM57 Multi-turn Absolute Photoelectric Bearingless Encoder (Through Shaft)

1.1 Introduction：
PM57 features an ultra-thin, bearingless through-shaft concentric locking
design, allowing for installation without additional tools.
It is a high-precision multi-turn absolute photoelectric encoder that outputs
24 Bit single-turn position information, expadable up to 32 Bit, and can
read multi-turn position information up to 24 Bit.
The product has a compact structure, high integration, and simple install-
ation, making it suitable for applications with limited space.

PM57-E

1.2 Feature：
 • External diameter Ø57mm,Thickness is only 10mm,
   Hollow shaft up to Ø24mm;
 • Concentric shaft ring locking installation structure;
 • Adopt non-contact photoelectric reflective principle;
 • Interface：BiSS_C or SSI;
 • Accuracy：±100″；
 • 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.

PM57-J

1.3 Application：
Servo motor, robot and other industrial automations.

1.4 Connection：
 • Radial socket (8P SM08B-GHS-TB).
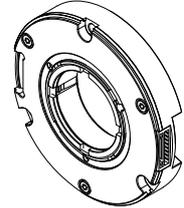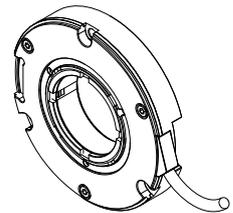 • Radial cable (Standard 1m).
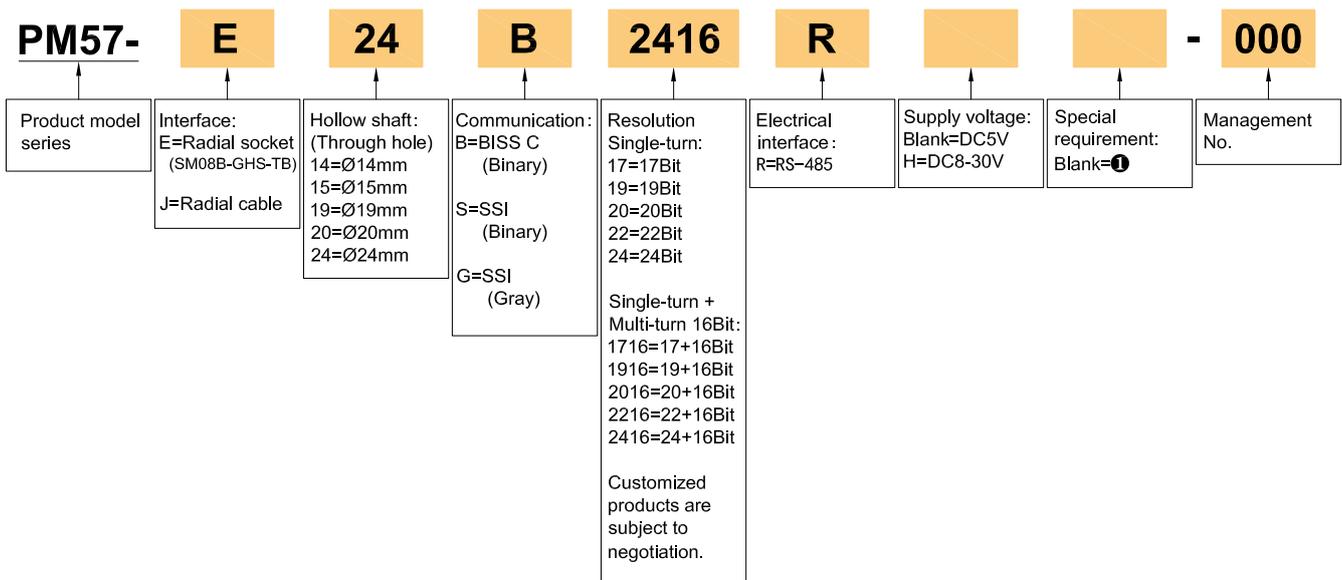
1.5 Protection：
＜IP20

1.6 Weight：
About 110g

2．Model Selection Guide

2.1 Model composition (select parameters)

PM57-	E	24	B	2416	R			- 000

| Product model series | Interface: E=Radial socket (SM08B-GHS-TB) J=Radial cable | Hollow shaft: (Through hole) 14=Ø14mm 15=Ø15mm 19=Ø19mm 20=Ø20mm 24=Ø24mm | 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 | Management No. |

Special requirement：
❶.IP＜20；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	$2^{17}(0\sim+131071)$	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	$2^{19}(0\sim+524287)$		16Bits	2^{16}(65536 turn)	
20Bits	$2^{20}(0\sim+1048575)$		16Bits	2^{16}(65536 turn)	
22Bits	$2^{22}(0\sim+4194303)$		16Bits	2^{16}(65536 turn)	
24Bits	$2^{24}(0\sim+16777215)$		16Bits	2^{16}(65536 turn)	

3.2 Specification parameter

Name	Parameter	Remark
Scanning principle	Photoelectric	
Accuracy	±100″	
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 or radial cable	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	-40℃～95℃	

3.3 Mechanical specification

Name	Parameter	Remark
Mechanical Connection	Ring locking with shaft	
Diameter of shaft	Ø14mm、Ø15mm、Ø19mm、Ø20mm、Ø24mm（through hole）	Pls refer to page 5 for dimensions
Shaft material	Stainless steel	
Shell material	Aluminium alloy	
Weight	About 110g	

3.4 Environmental parameter

Name	Parameter
Environmental temperature	Operating：－40～95℃
	Storage：－40～+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 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	-40	+95	°C
T$_J$	Junction Temperature	-40	+95	°C

4.2 Electrical parameter

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.
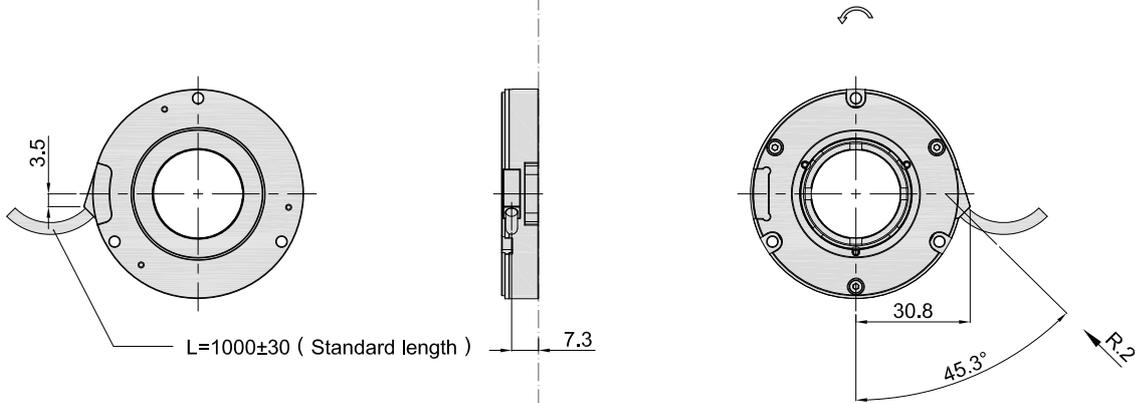❷ Pls refer to BiSS_C and SSI standards.
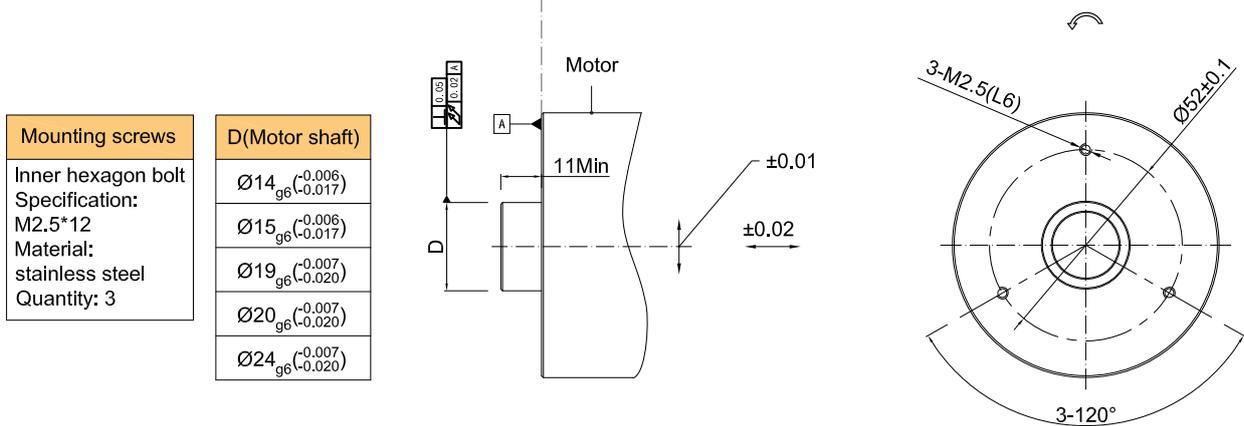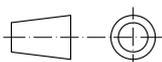
5. Basic Dimension

5.1 PM57-E (Dimension)

10±0.2

34°

R24

Ø57±0.05

3.6

2.8

5.0

3-Ø2.8

Ø52±0.1

Q

R.1

3-120°

Q (Hollow shaft)
Ø14^{H7}($^{+0.018}_{0}$)
Ø15^{H7}($^{+0.018}_{0}$)
Ø19^{H7}($^{+0.021}_{0}$)
Ø20^{H7}($^{+0.021}_{0}$)
Ø24^{H7}($^{+0.021}_{0}$)
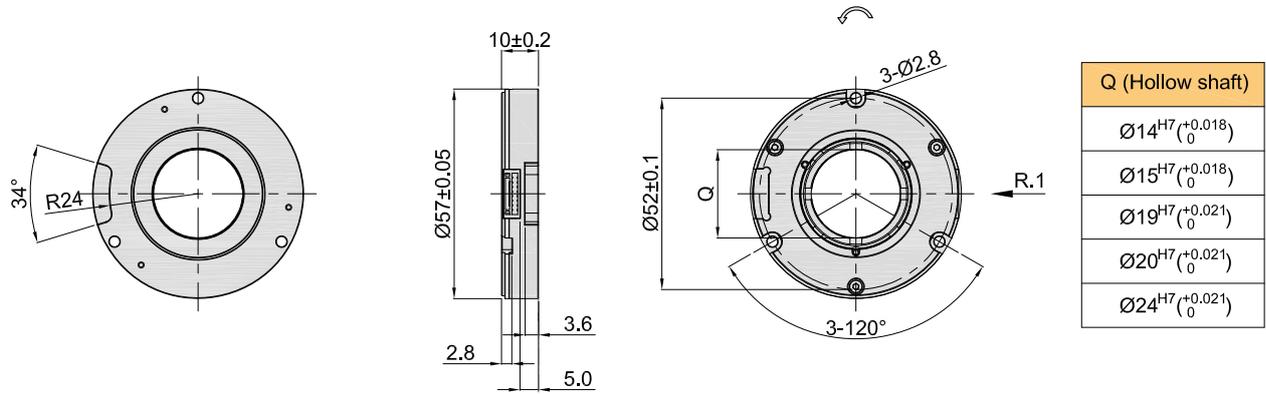
5.2 PM57-J (other parameters are the same as PM57-E)

3.5

L=1000±30 (Standard length)

7.3

30.8

45.3°

R.2

5.3 Installation shaft specification

Mounting screws	D(Motor shaft)
Inner hexagon bolt Specification: M2.5*12 Material: stainless steel Quantity: 3	Ø14$_{g6}$($^{-0.006}_{-0.017}$)
	Ø15$_{g6}$($^{-0.006}_{-0.017}$)
	Ø19$_{g6}$($^{-0.007}_{-0.020}$)
	Ø20$_{g6}$($^{-0.007}_{-0.020}$)
	Ø24$_{g6}$($^{-0.007}_{-0.020}$)

0.05

0.02 A

A

Motor

11Min

D

±0.01

±0.02

3-M2.5(L6)

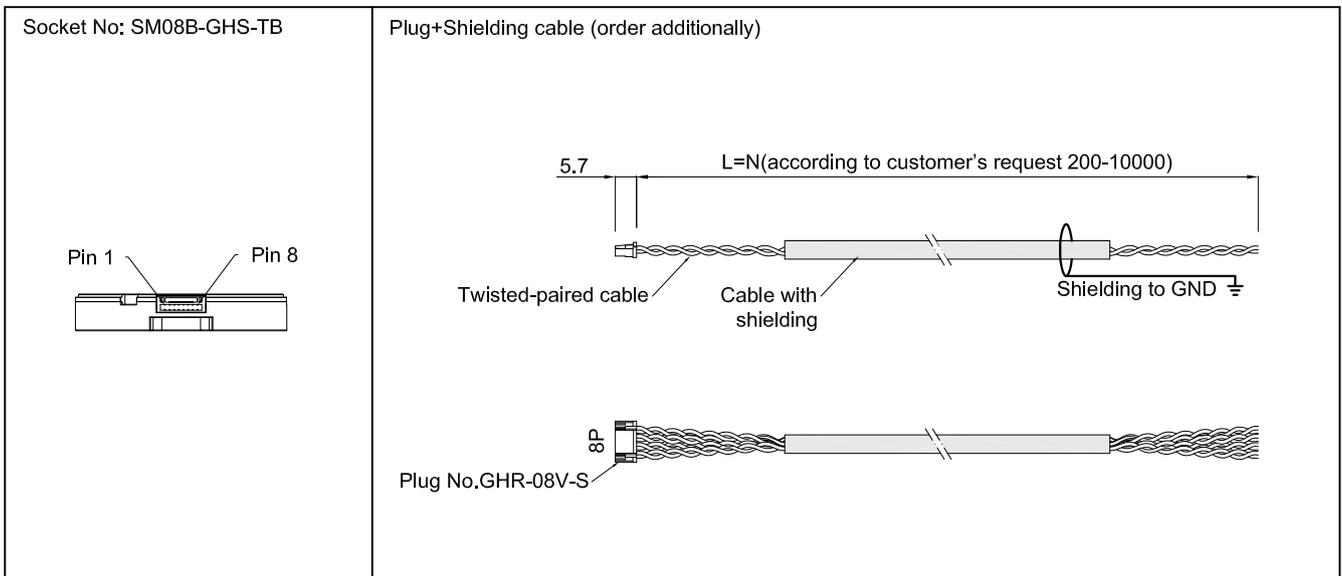Ø52±0.1

3-120°

Unit: mm

$\frown$ = 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

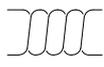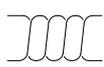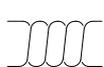6.1 Function and definition of socket pin (Radial socket)

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	
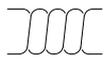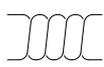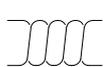
6.2 Socket definition

Socket No: SM08B-GHS-TB	Plug+Shielding cable (order additionally)
Pin 1 Pin 8	5.7 L=N(according to customer's request 200-10000) Twisted-paired cable Cable with shielding Shielding to GND 8P Plug No.GHR-08V-S

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

100～200

70±10

10±2

L=1000±30
(cable with shielding)

Anti-interference
magnetic ring

Shielding to GND
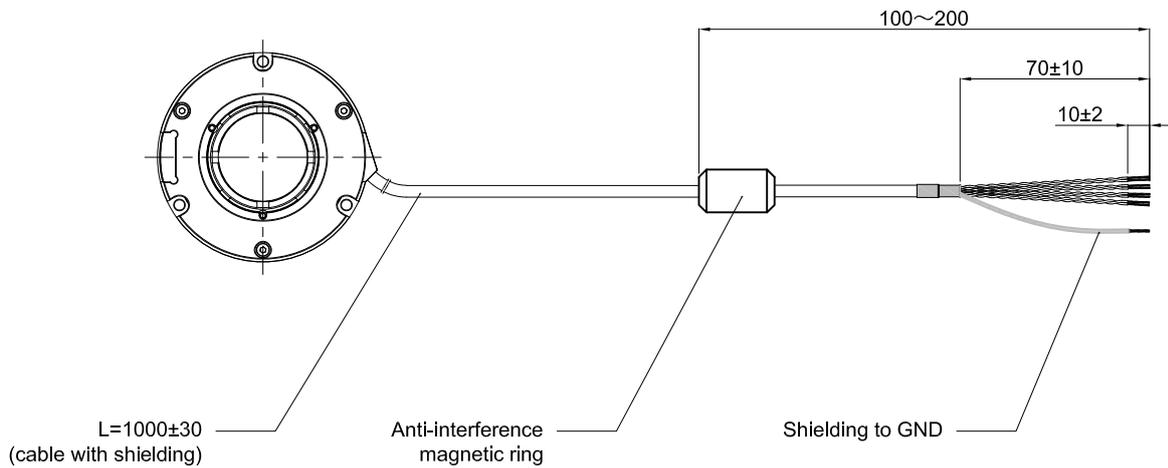
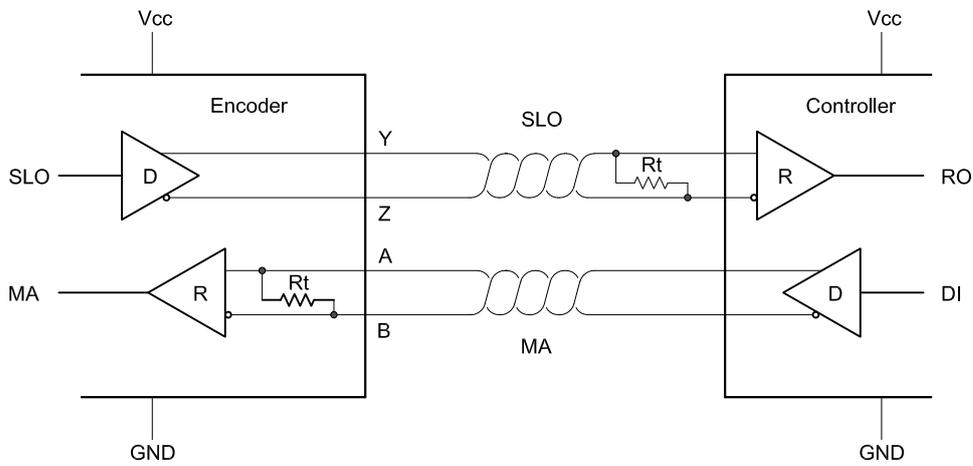Unit: mm

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.

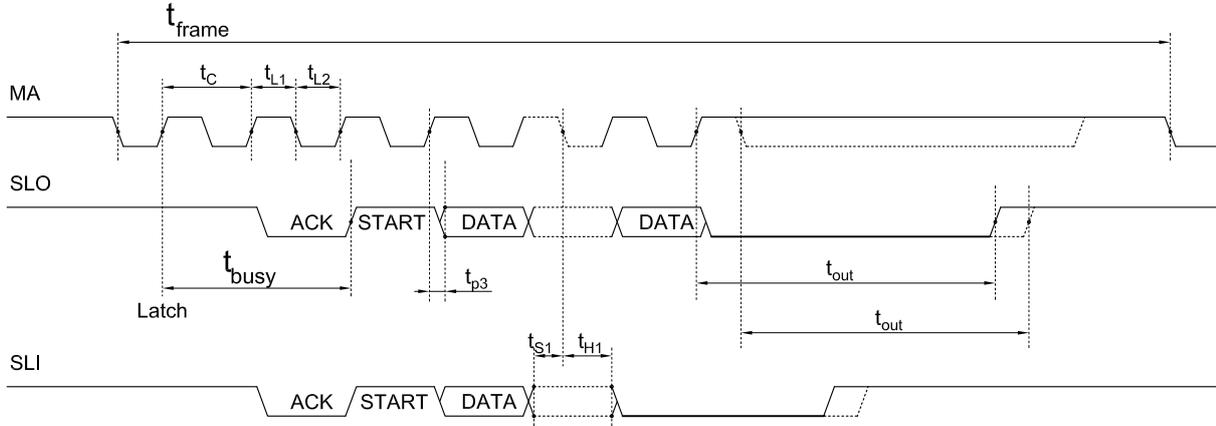# 8. Communication Format
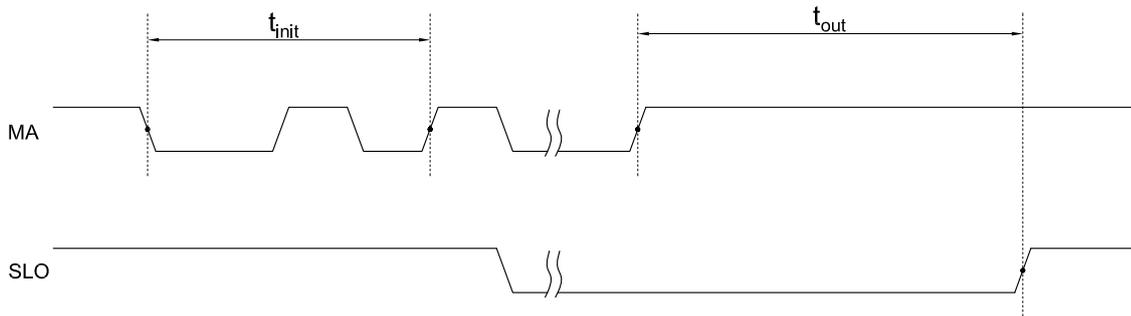
8.1 BiSS_C communication

Figure 2: BiSS-C Timing
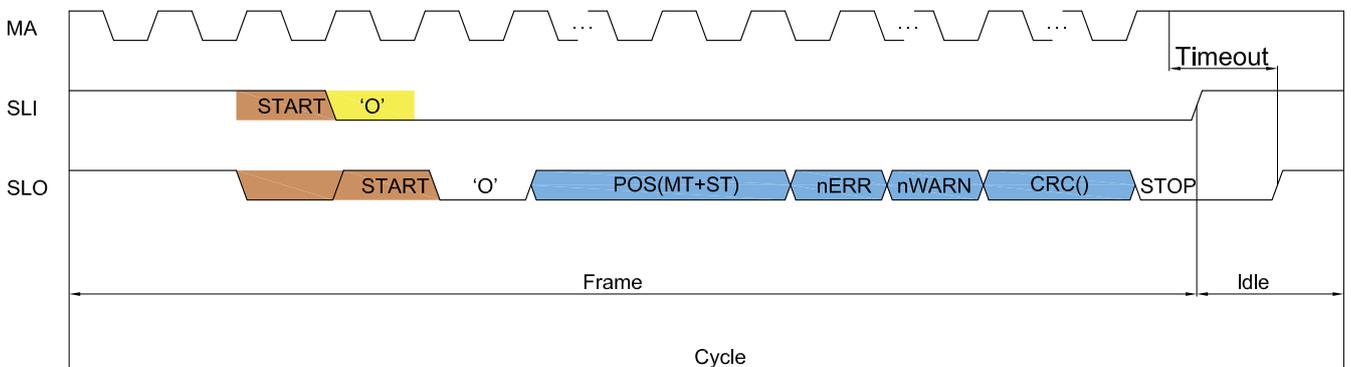
Figure 3: BiSS-C (SSI) Slave Timeout Sequence

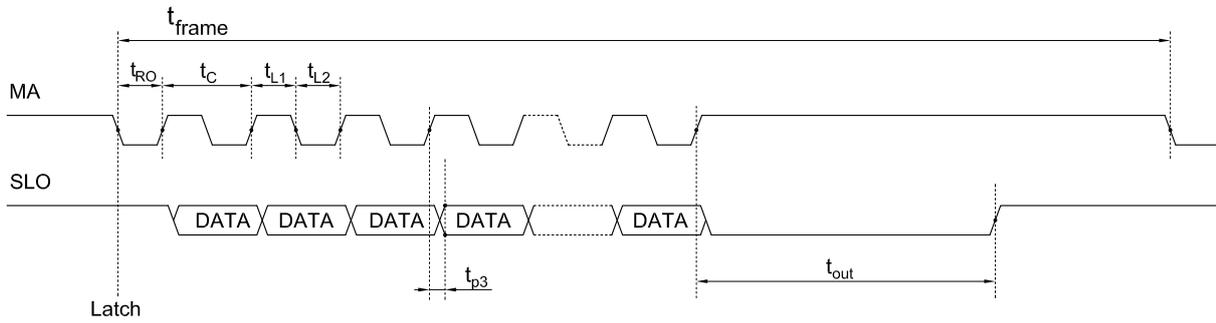Figure 4: BiSS-C Frame Structure

8.2 SSI communication
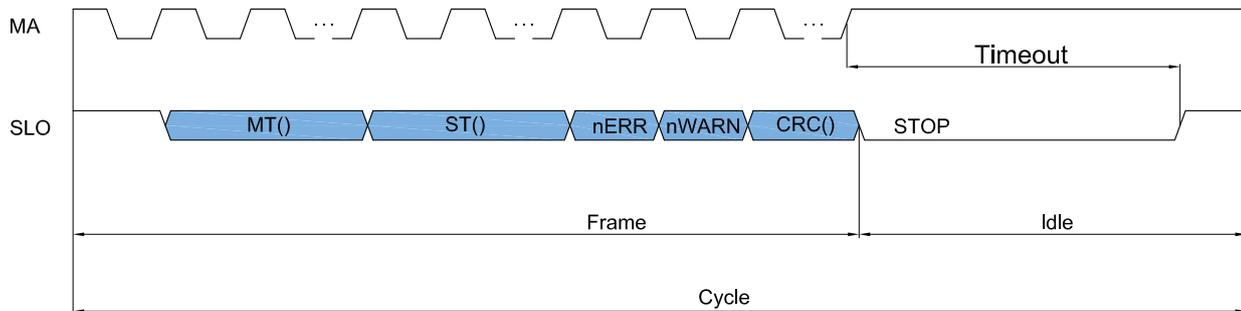

Figure 5: SSI Timing

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 M2.5*12 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
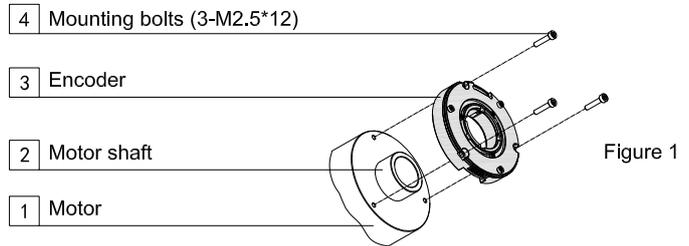   shaft sleeve and the motor shaft.
      (Please refer to P5)

4	Mounting bolts (3-M2.5*12)
3	Encoder
2	Motor shaft
1	Motor

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 13-16N.m)
b. Then tighten the three M2.5*12 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
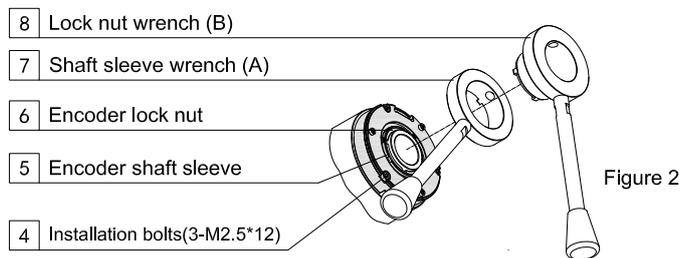   to the thread surface of the lock nut before
      tightening.

8	Lock nut wrench (B)
7	Shaft sleeve wrench (A)
6	Encoder lock nut
5	Encoder shaft sleeve
4	Installation bolts(3-M2.5*12)

Figure 2

Figure 3
a. Remove the (9) shaft sleeve fixing bolts.
   Discard these three bolts but keep them well for
   future use when disassembling the encoder.
b. Remove the positioning plate fixing bolts (10).
   These three bolts should be reinstalled when
   the positioning plate is flipped from side (B)
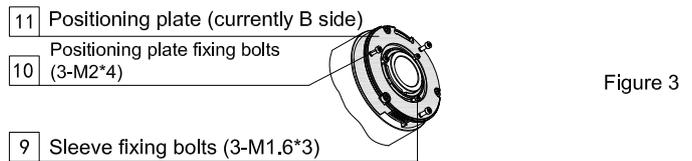   to side (A). refer to P4 and P5.

11	Positioning plate (currently B side)
10	Positioning plate fixing bolts (3-M2*4)
9	Sleeve fixing bolts (3-M1.6*3)

Figure 3

Figure 4
   Take out the positioning plate, flip it from the B side
   to the A side, and then reinstall it.
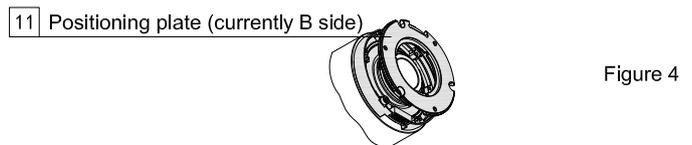
| 11 | Positioning plate (currently B side) |

Figure 4

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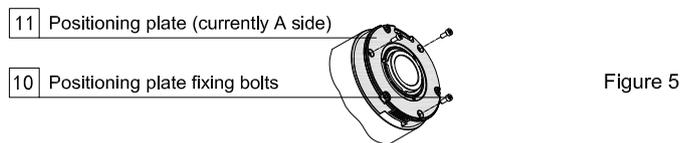   screw on and lock the positioning plate fixing bolts (10).

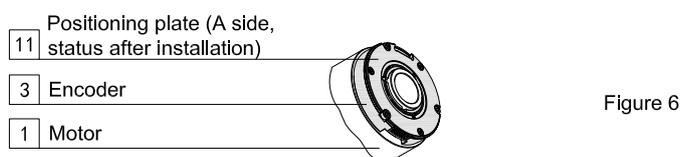| 11 | Positioning plate (currently A side) |
| 10 | Positioning plate fixing bolts |

Figure 5

Figure 6
   This figure shows the encoder after installation.

11	Positioning plate (A side, status after installation)
3	Encoder
1	Motor

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.

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fang@shhxgd.com   Tel: 86-21-54613487   We reserve the final interpretation right of this specifications,subject to change without notice.