## 1. MPB55 Multi-turn Absolute encoder (Through shaft)

1.1 Introduction：
MPB55 is a mechanical flexible mounting flate design,
high precision absolute optical encoder, capable of outputting
24Bits of single-turn position information and reading up
to 24Bits of multi-turn position information.
The product is compact, highly integrated and easy to
install, which can solve the installation problems of
users in limited space.

MPB55-E
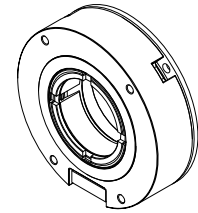
1.2 Feature：
- External diameter Ø55mm,Thickness 16mm,
  Hollow shaft up to Ø24mm;
- Concentric shaft ring locking and unique flexible spring plate mounting structure；
- Adopt non-contact photoelectric reflective principle;
- Interface：BiSS_C or SSI;
- Accuracy：±80" ;
- Resolution up to 24Bits (expanded up to 32Bits);
- Support multi-turn data recording under the condition of no power lost,
  the maximum recording is 24 Bits.

MPB55-J
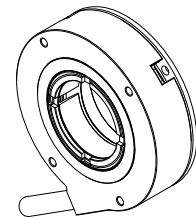
1.3 Application：
Servo motor, robot and other industrial automations.

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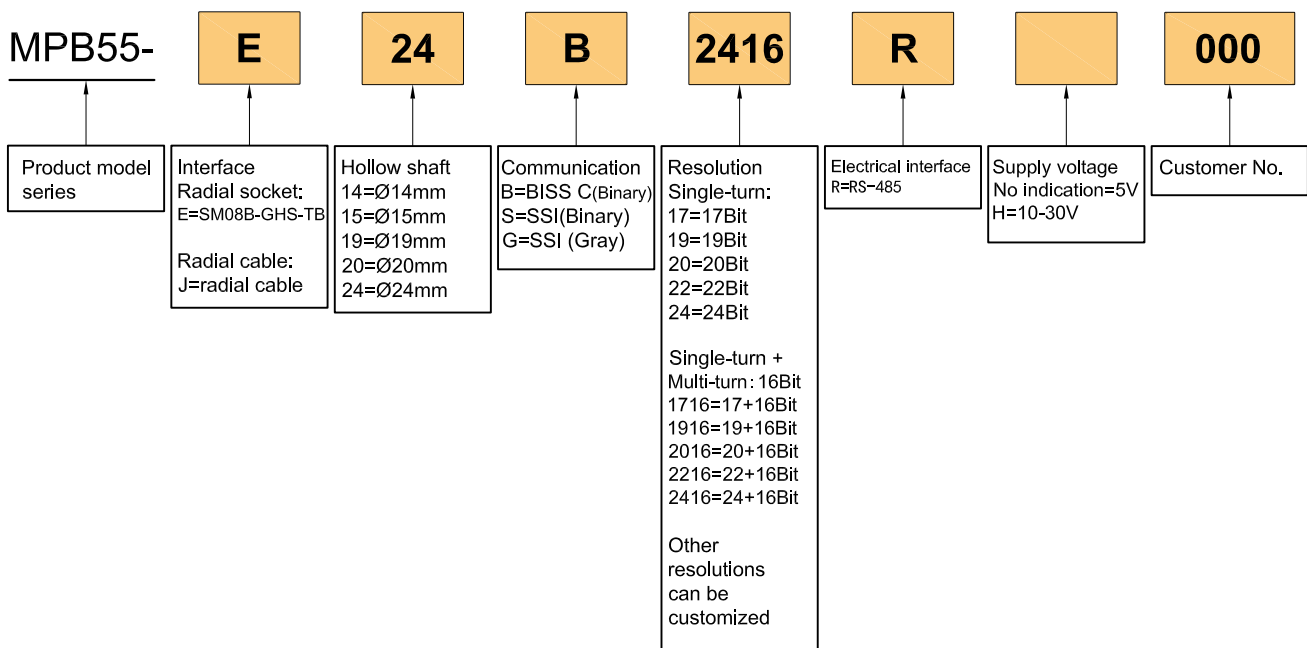Radial cable (length 1000mm).

1.5 Protection：
IP50

1.6 Weight：
about 150g

2. Model guide

Model form (filled required parameters in the box as following)

MPB55- | E | 24 | B | 2416 | R | [ ] | 000

| Product model series | Interface Radial socket: E=SM08B-GHS-TB Radial cable: J=radial cable | Hollow shaft 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 Other resolutions can be customized | Electrical interface R=RS-485 | Supply voltage No indication=5V H=10-30V | Customer No. |

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 Parameter

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 & Radial cable	
Cable	Twisted-paired cable	Pls refer to page 6、7
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 with motor platform	
Diameter of shaft	Ø14mm、Ø15mm、Ø19mm、Ø20mm、Ø24mm（through）	Pls refer to page 5 for dimensions
Shaft material	Stainless steel	
Starting Torque	less than $9.8×10^{-3}$ N·m	
Inertia Moment	less than $6.5×10^{-6}$ kg·m²	
Shaft load	Radial 20N; Axial 10N	
Allowed speed	≤4000 rpm	
Shell material	Aluminium alloy	
Weight	about 150g	

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	-20	+95	°C
T$_J$	Junction Temperature	-	150	°C

4.2 Recommended electrical parameter

Symbol	Instruction	Minimum	Typical value	Maximum	Unit
Vcc	Supply Voltage	4.75	5.0	5.5	V
I$_{DD}$	Supply Current	-	-	120	mA
V$_{BAT}$	Backup Voltage ①	3.0	3.6	4.2	V
I$_{(BAT)}$	Backup Current	-	-	35	uA
f$_{BISS}$②	BISS Communication clock frequency	-	-	10	MHz
	SSI Communication clock frequency	-	-	5.0	MHz
Ta	Operating temperature	-20	-	+95	°C

① For the power supply sequence of multi-turn absolute encoders, be sure to power on the system
after the battery has been powered up.
② Pls refer to BiSS_C and SSI standards.
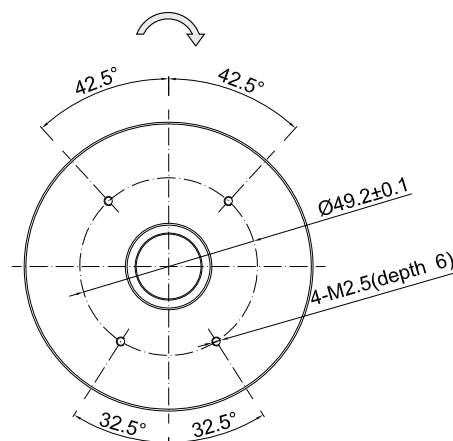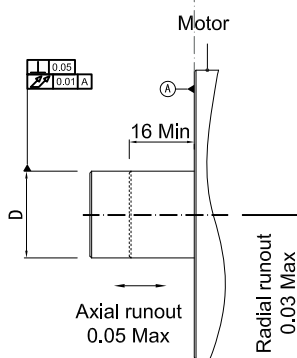
5. Basic dimensions

24±0.2

Ø55±0.2

6.7

16±0.2

42.5°   42.5°

Q

Ø49.2±0.1

4-Ø2.8

32.5°   32.5°

Front side

R.1

Q

32°

34

R.2
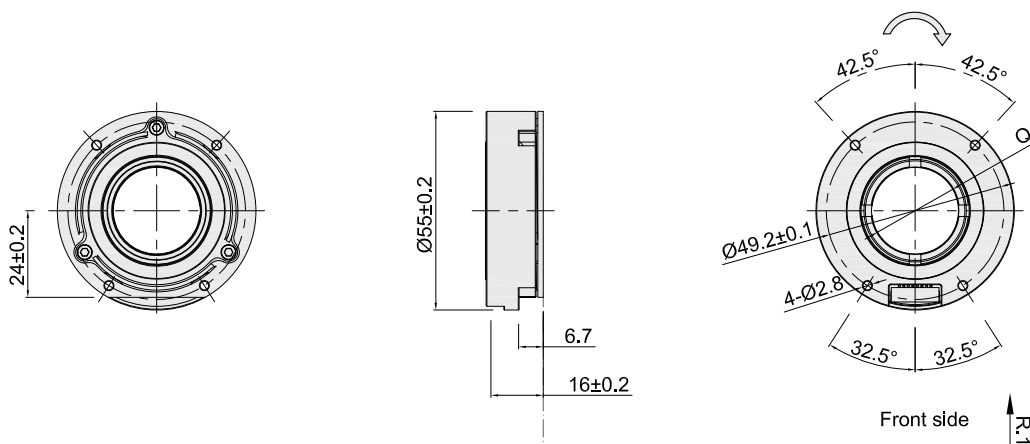
Q (Hollow shaft)
$Ø14^{H7}(^{+0.018}_{0})$
$Ø15^{H7}(^{+0.018}_{0})$
$Ø19^{H7}(^{+0.021}_{0})$
$Ø20^{H7}(^{+0.021}_{0})$
$Ø24^{H7}(^{+0.021}_{0})$

6. Specification for mounting shaft

Mounting screws	D(Motor shaft)
Inner hexagon bolt Specification: M2.5*5 Material: stainless steel Quantity: 4	$Ø14_{g6}(^{-0.006}_{-0.017})$
	$Ø15_{g6}(^{-0.006}_{-0.017})$
	$Ø19_{g6}(^{-0.007}_{-0.020})$
	$Ø20_{g6}(^{-0.007}_{-0.020})$
	$Ø24_{g6}(^{-0.007}_{-0.020})$

Motor

0.05
0.01 A

A

16 Min

D

Axial runout
0.05 Max

Radial runout
0.03 Max

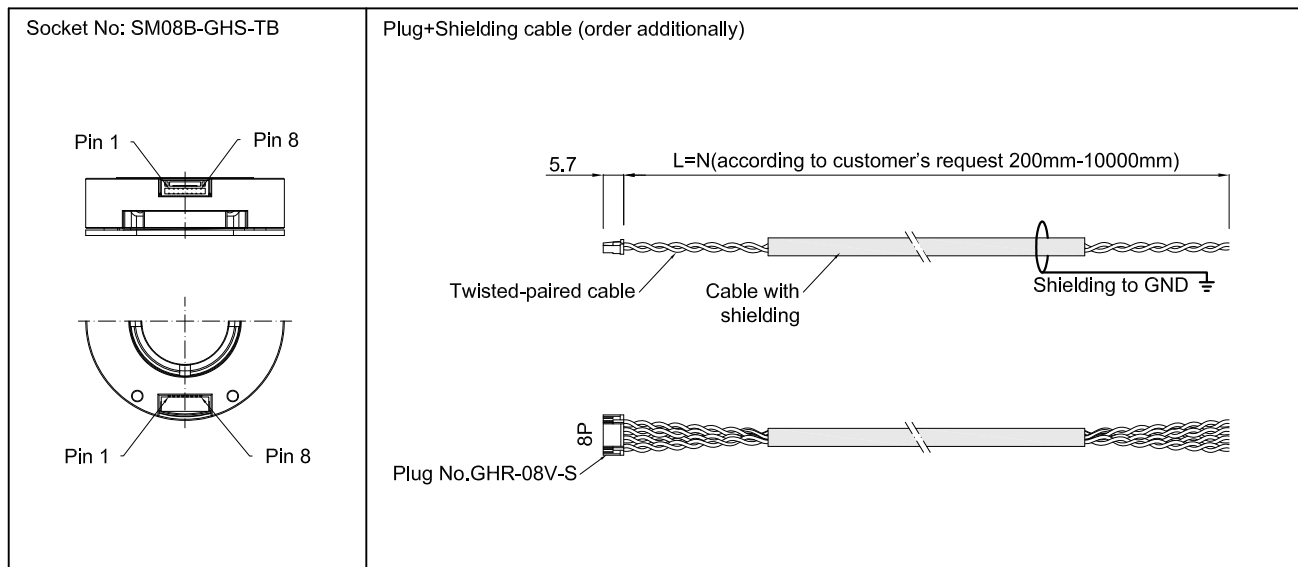42.5°   42.5°

Ø49.2±0.1

4-M2.5(depth 6)

32.5°   32.5°

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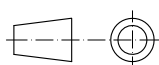
= Shaft rotation direction of the signal output
R.1 = Radial socket(8P SM08B-GHS-TB)
R.2 = Radial cable (standard length 1000)

7. Interface Definition

7.1 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	

7.2 Socket definition

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

Unit: mm

7.3 Function and wire 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	

7.4 Radial cable schematic

70±10

10±2

L=1000±30
(Cable with shielding)

32°

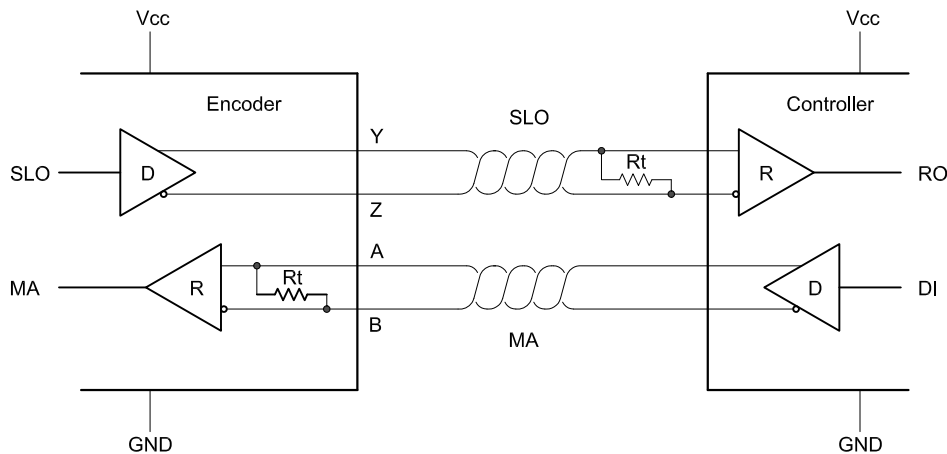Shielding to GND
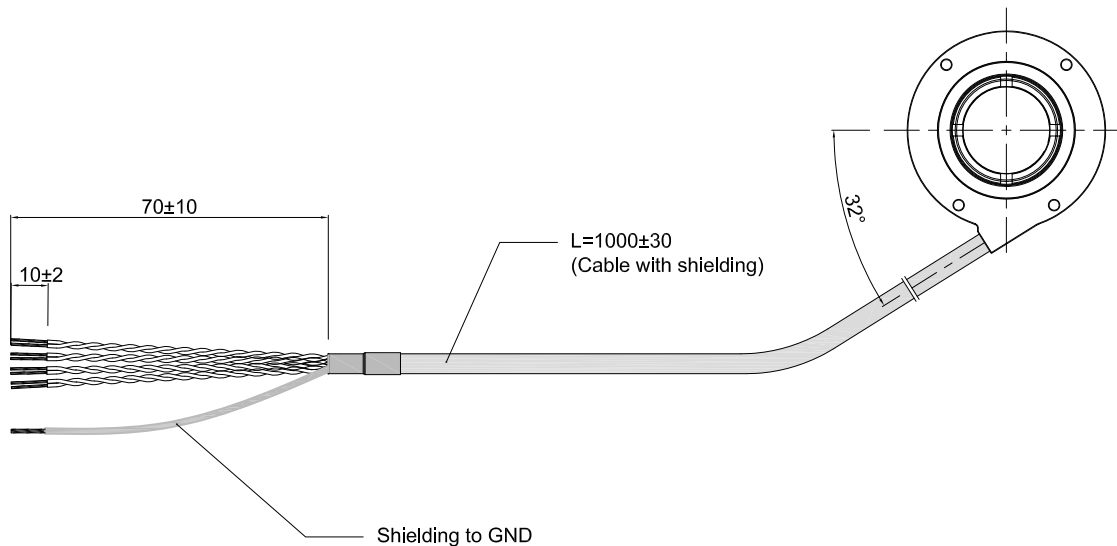
Unit: mm

7.5 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.
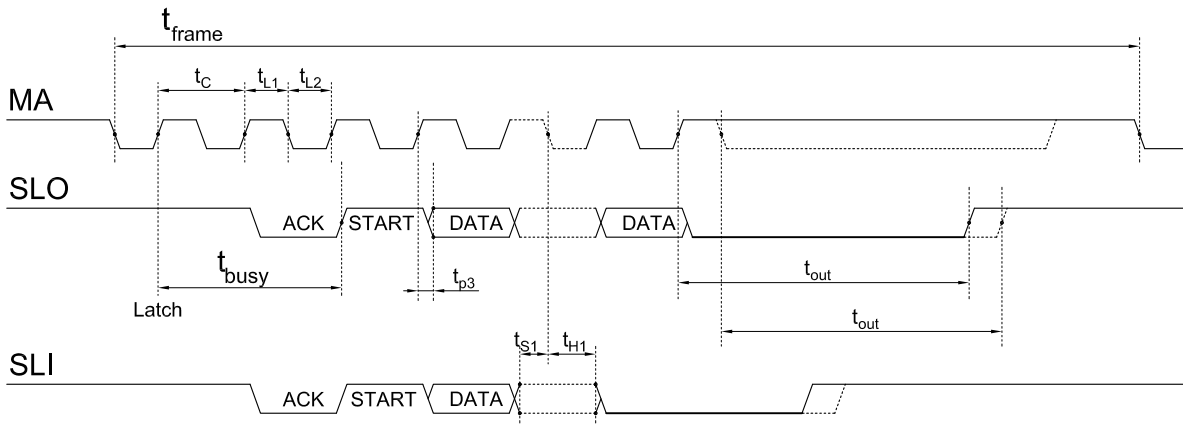
7.6 BiSS_C Communication
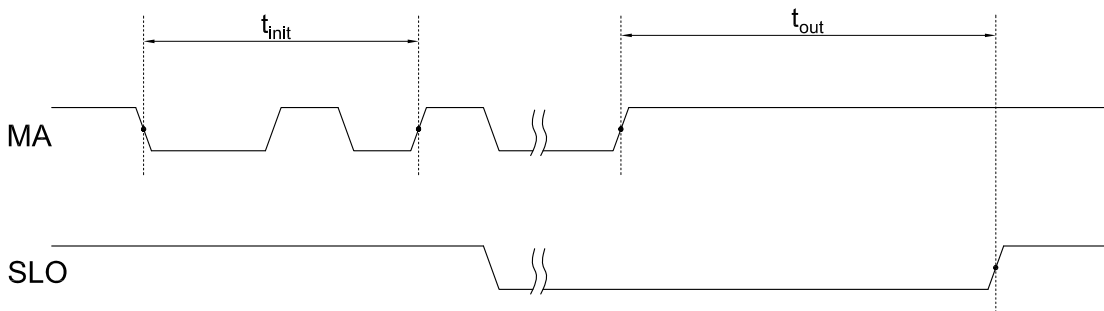

Figure 2: BiSS-C Timing

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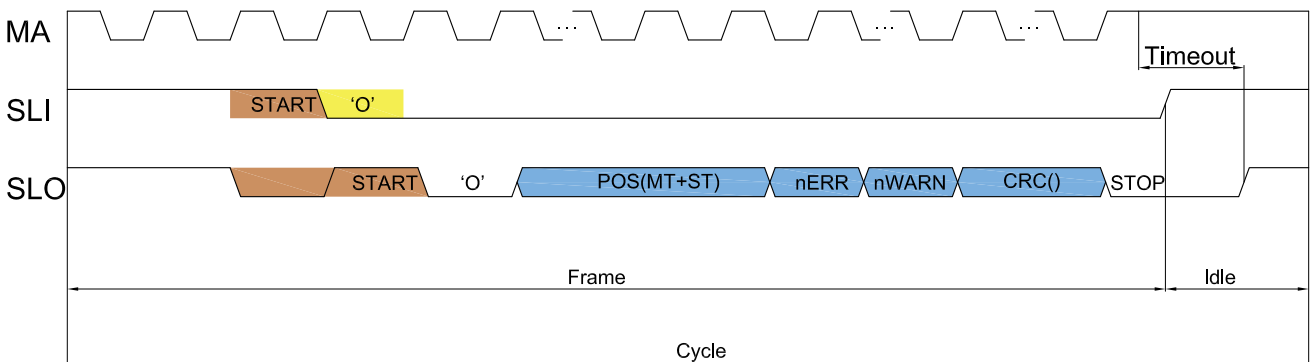

Figure 4: BiSS Frame Structure
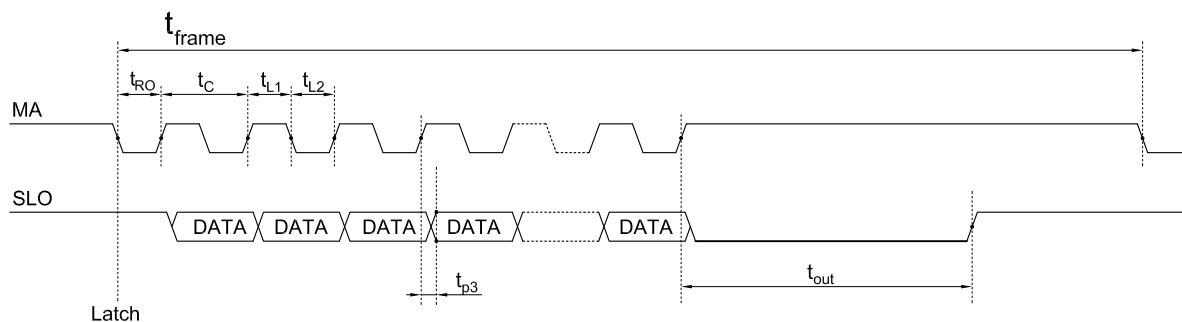
7.7 SSI Communication
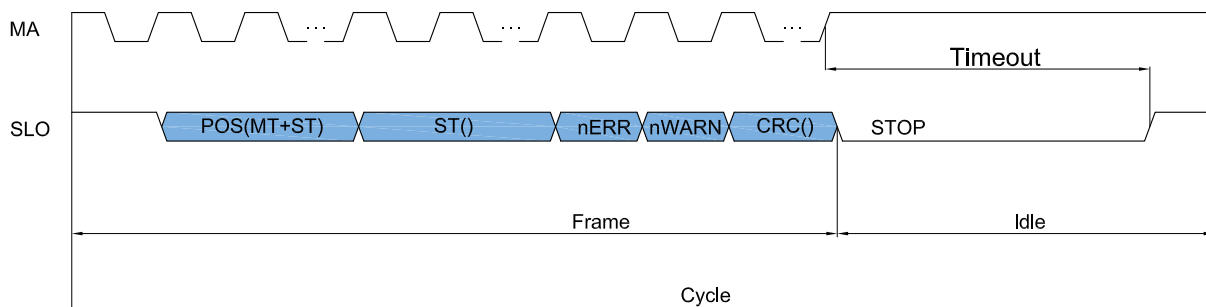

Figure 5: SSI Timing

Figure 6: SSI Frame Structure

The frame is composed of frame structure and data to be transmitted. The sequence of dsta 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, including directivity
[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)

8. Installation Steps

First Step
  a. Put the encoder(2) directly on
     the motor shaft and gently push
     it to the motor.
  b. Insert the Allen wrench into the four
     guide holes of the encoder and screw
     in and tighten the four M2.5*5 bolts (3)
     (thread adhesive is required).

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

1 Motor

Motor shaft

2 Encoder

4 Hexagonal wrench

4-M2.5*5 3
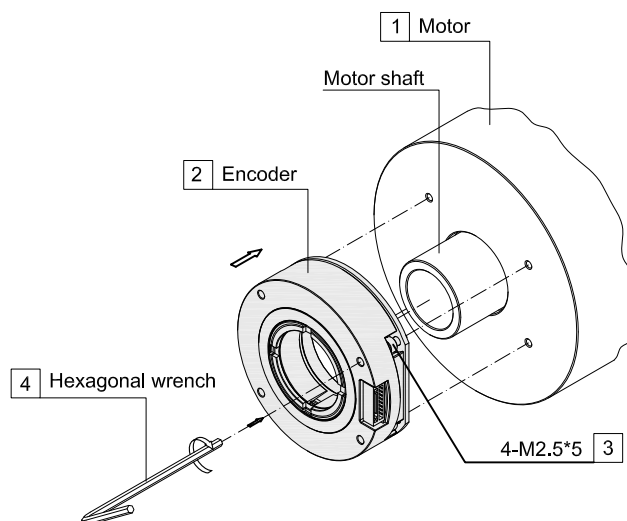
Second Step
Snap the wrench (A) onto the slot of the encoder
bushing by hand, then tighten the nut with the wrench
  (B) (recommended tightening force is 13-16N.m)

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.

Shaft sleeve

Lock Nut

Spanner (A)

Spanner (B)
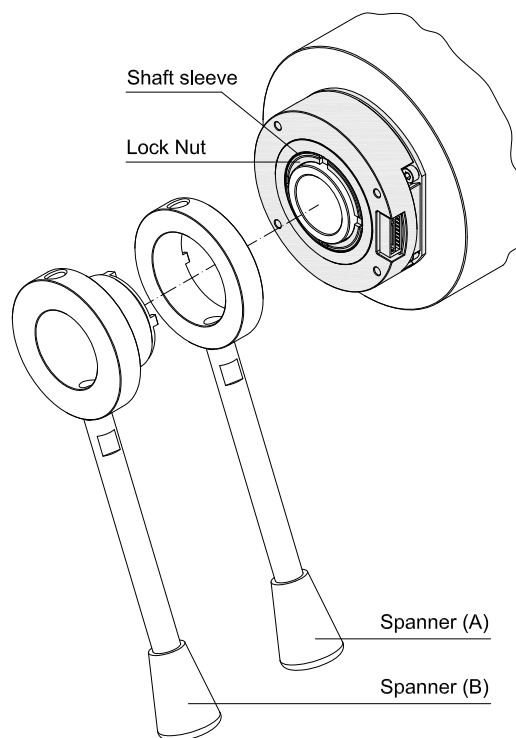
9. Caution

9.1 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.

9.2 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.

9.3 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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