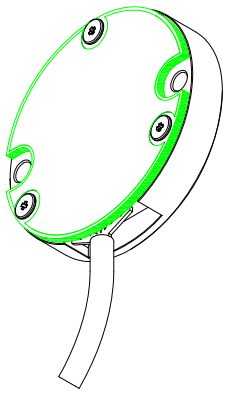
1. ZM35 Multi-turn Absolute Bearing-less Encoder (Blind shaft)

1.1 Introduction:

ZM35 is a bearing-less ultra-thin blind shaft miniaturized design, high-precision multi-turn absolute photoelectric encoder, capable of outputting 24Bits of single-turn position information, which can be expanded to 32Bits, and reading multi-turn position information of up to 24Bits, suitable for structures with space height restrictions.

ZM35-J



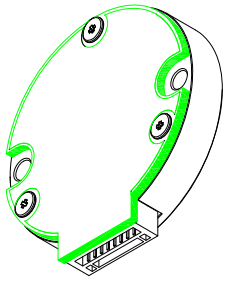
1.2 Feature:

- External diameter Ø35mm、thickness 11.8mm、diameter of shaft Ø6mm.
- Compact and sturdy structure.
- Adopt non-contact photoelectric reflection principle.
- Interface: BiSS_C or SSI.
- Accuracy: ±80".
- Single-turn resolution of 24Bits is expandable up to maximum 32Bits.
- Support multi-turn data recording without power failure, the maximum recording is 24 Bits.

1.3 Application:

Servo motor,robot and other industrial automations.

ZM35-C



1.4 Connection:

Cable connection (length 0.5M)
Socket connection

1.5 Protection:

None

1.6 Weight:

about 80g

2. Model Selection Guide

2. 1 Model composition (select parameters)

ZM35-	J	6	B	2416	R			-	000
Product model series	Connection: J=Cable connection C=Radial socket	Diameter of shaft: (Blind hole) 6=Ø6mm	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. No protection grade；cable length 0.5M，if need to change the length C+number，max 5M(indicated by C5).

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 P10 & P11 (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	Cable connection & socket connection	Pls refer to page 7 & 8
Cable	Differential twisted-paired cable	
Cable length	200mm - 5000mm	
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	No bearing	
Diameter of shaft	Ø6mm(Blind shaft)	Pls refer to page 5 for dimensions
Shaft material	Stainless steel	
Allowed speed	≤6000 rpm	
Shell material	Aluminium alloy	
Weight	about 80g	

3.4 Environmental parameter

Name	Parameter
Environmental temperature	Operaing：－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	490m/s² 11ms three times for X,Y,Z direction individually
Protection	None

4. Electrical Characteristic

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

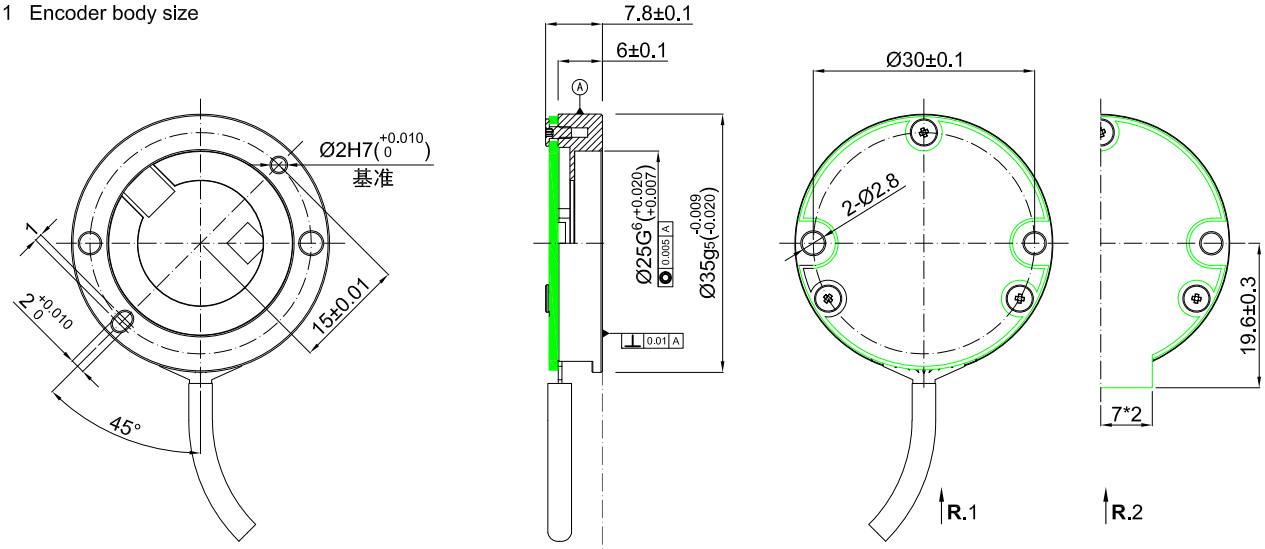
4.2 Electrical specification

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
Up_{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

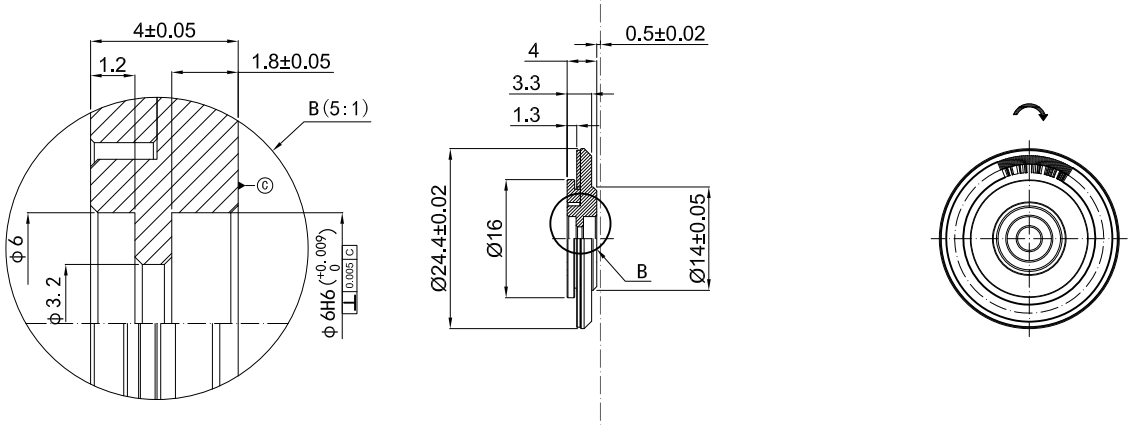
❶ For the power supply sequence of multi-turn absolute encoders, be sure to power on the system after the battery has been powered up.
❷ Pls refer to BiSS_C and SSI standards.

5. Basic Dimension

5.1 Encoder body size



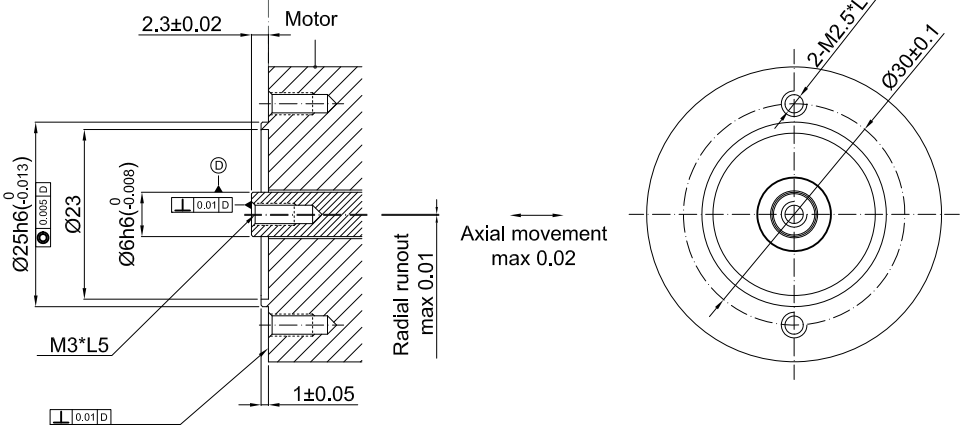
5.2 Code disk size



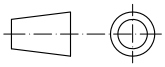
6. Installation Shaft Specification

6. 1 Motor size

Mounting screws
Hexagon screws Specification：M3*6 Material：stainless steel Quantity：1 Specification：M2.5*10 (add flat gasket) Material：stainless steel Quantity：2



Unit: mm

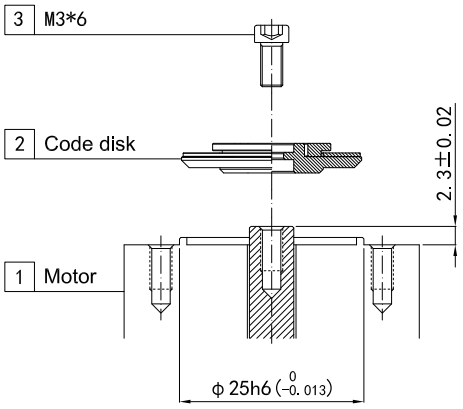


= Shaft rotation direction of the signal outpu
R.1 = Radial cable
R.2 = Radial socket

7. Installation Step

7.1 Code disk installation

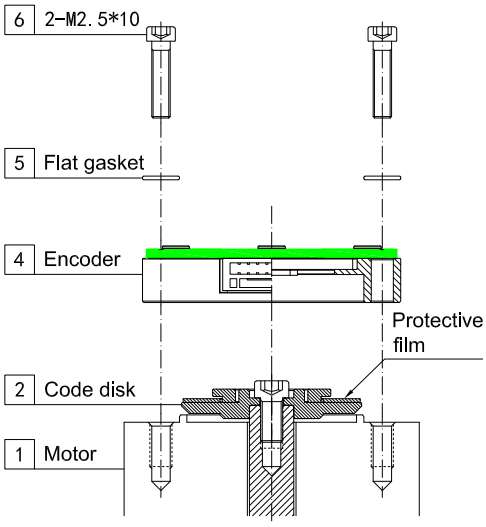
Code plate installation steps：
1. Check the motor shaft size: refer to page 5.
2. Install the code disk on the motor shaft
   (It is recommended that the motor shaft be coated with anaerobic adhesive).
3. Screw on the M3 bolts (coat with thread glue).



Notes on code disk installation：
- To prevent oil, foreign matter, dust, etc. from entering the encoder,please pay attention to the installation environment.
- Please pay special attention to avoid foreign matter adhesion, contamination, etc.
- If contamination such as grease adheres to the code disk pattern,please wipe it with alcohol and dust-free paper.However, please be careful not to use excessive force or use hard materials to wipe, as this may cause scratches on the pattern surface.
- Please note that after the code disk installed, check the height,concentricity (referring to the pattern), and parallelism.

7.2 Encoder body installation

Encoder installation steps：
1. After checking that the code disk is installed correctly, remove the protectivefilm on the surface of the code disk.
2. Install the encoder on the end face of the motor (pay attention to the size tolerance of the collar).
3. Screw on the two M2.5 bolts and add flat gasket (coat with thread glue).



Notes on encoder installation：
- In order to prevent electrical components from being subjected to over-voltage,etc., be sure to take antistatic measures in the installation environment.
- Vibration and impact transmitted to the encoder may cause malfunction, so please pay attention to the installation location.
- Please note that the volatilization of grease and other components around the encoder may also cause the generation of corrosive gases, etc.

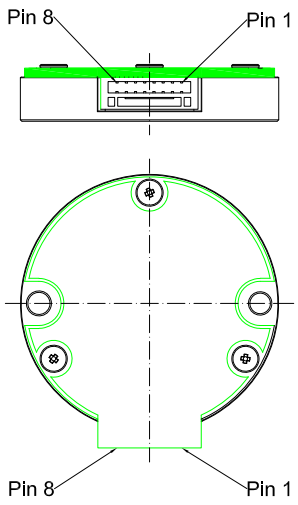
Unit：mm

8. Interface Definition

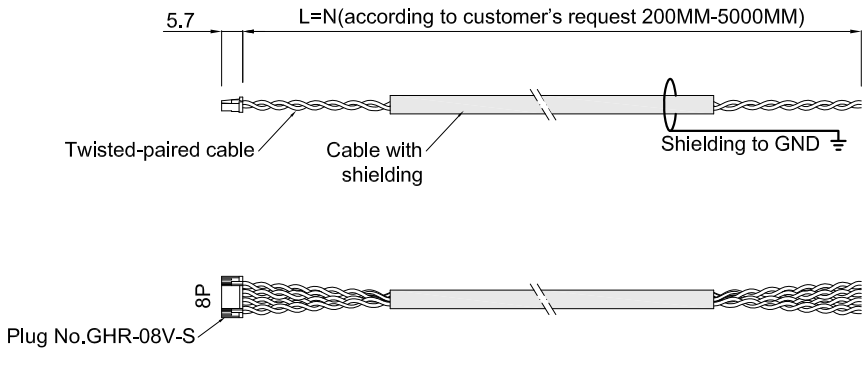
8.1 Function and definition of socket pin (Radial socket)

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	

Socket No: SM08B-GHS-TB



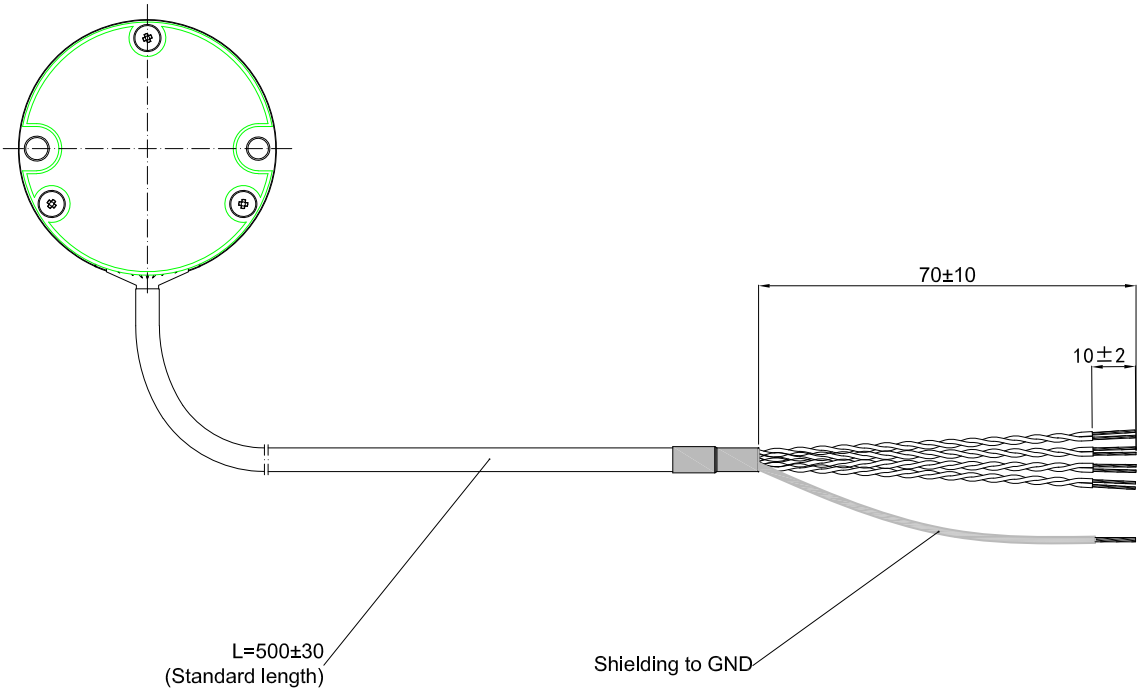
Plug+Shielding cable (order additionally)



Unit: mm

8. 2 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	



Unit: mm

8.3 Electrical Connection

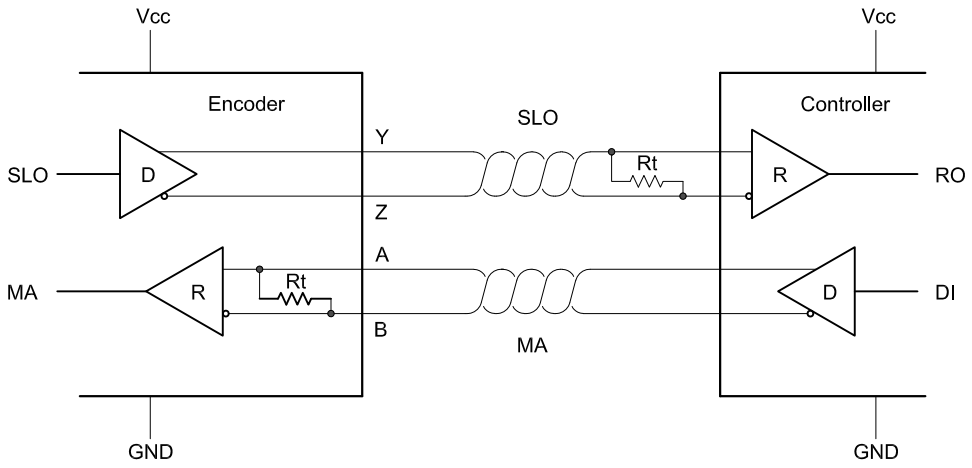


Figure 1: Point-to-point configuration

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.

8.4 BiSS_C Communication

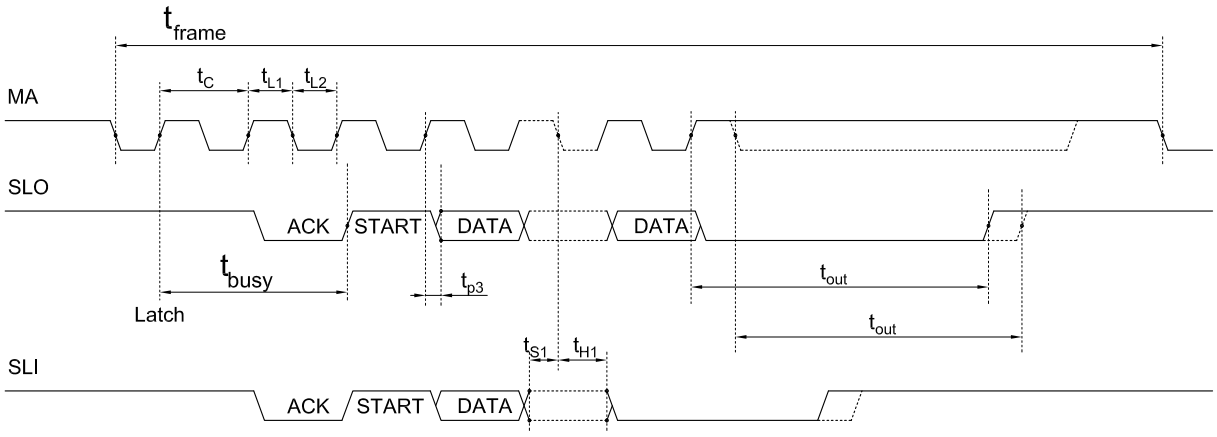


Figure 2: BiSS-C Timing

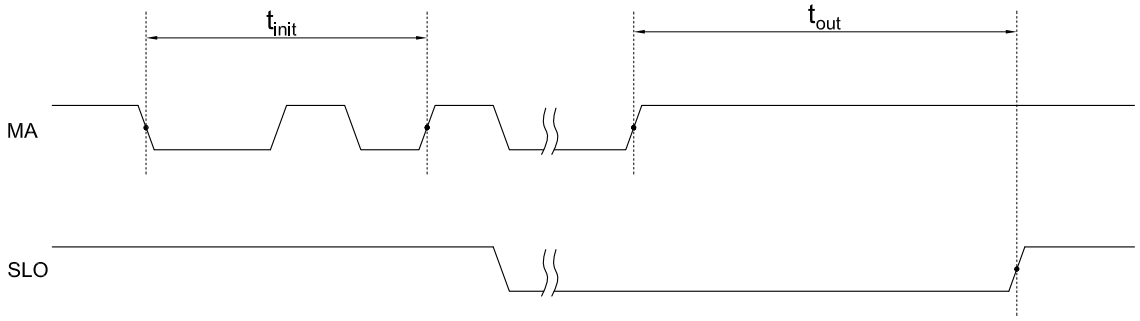


Figure 3: BiSS-C (SSI) Slave Timeout Sequence

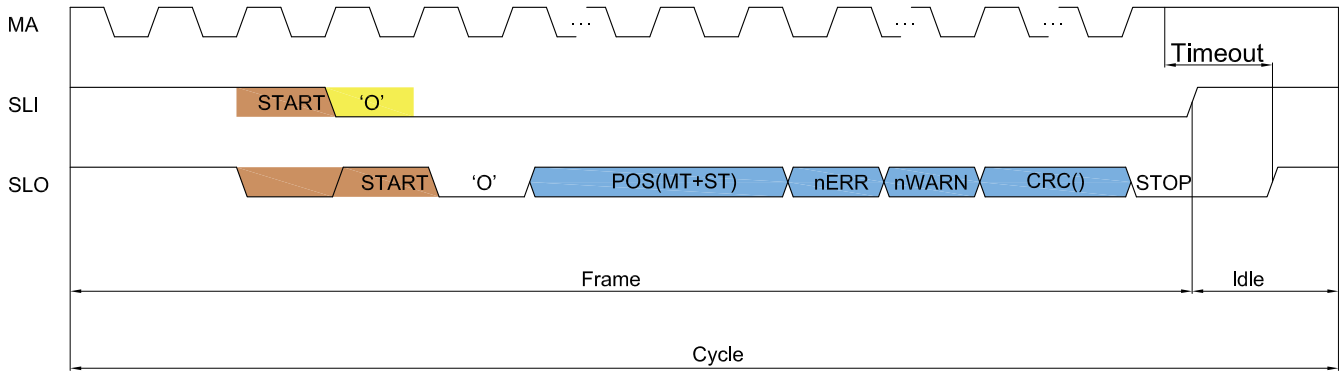


Figure 4: BiSS Frame Structure

8.5 SSI Communication

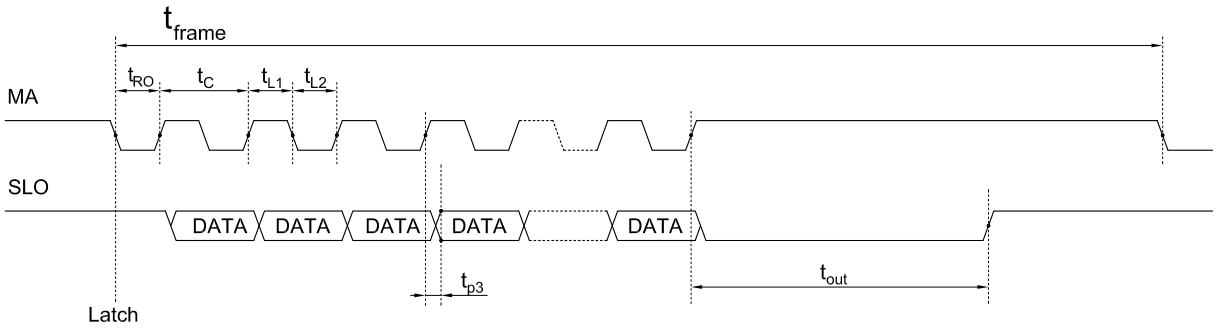


Figure 5: SSI Timing

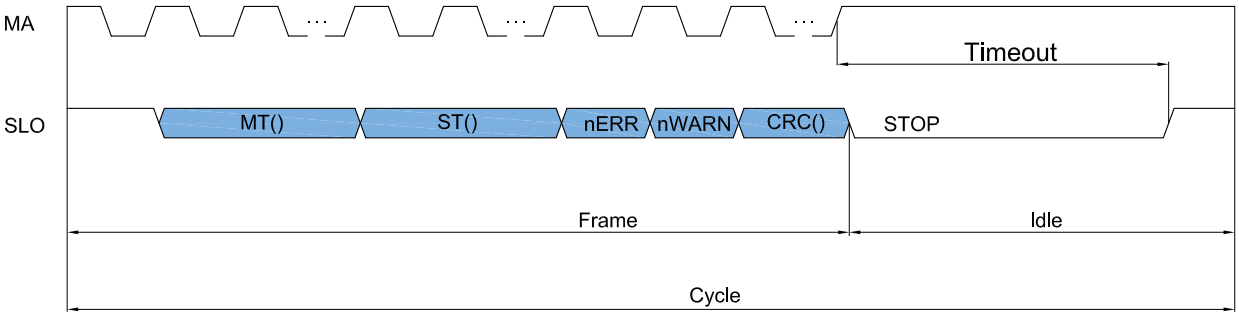


Figure 6: SSI Frame Structure

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. 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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