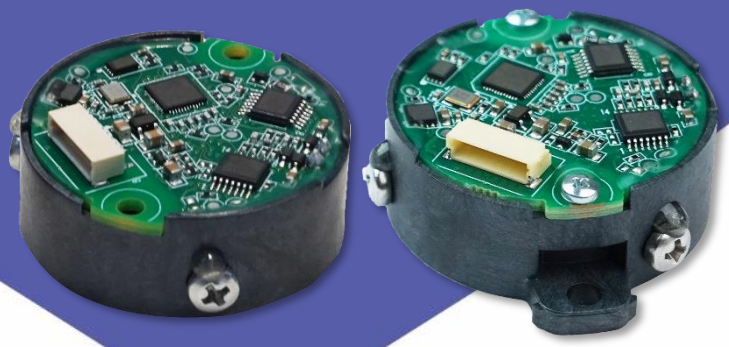
锐鹰传感
REAGLE SENSING

Split-type Multi-turn Absolute Rotary Encoder
SROA35-M16S23Bit-SY-C-5V
SROA46-M16S23Bit-SY-C-5V
SPECIFICATION



浙江锐鹰传感技术股份有限公司
ZHEJIANG REAGLE SENSING TECHNOLOGY INCORPORATED

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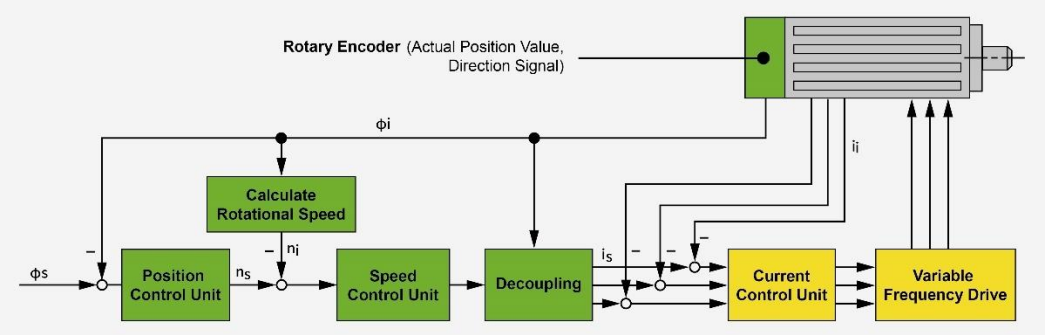
1. Summary Info

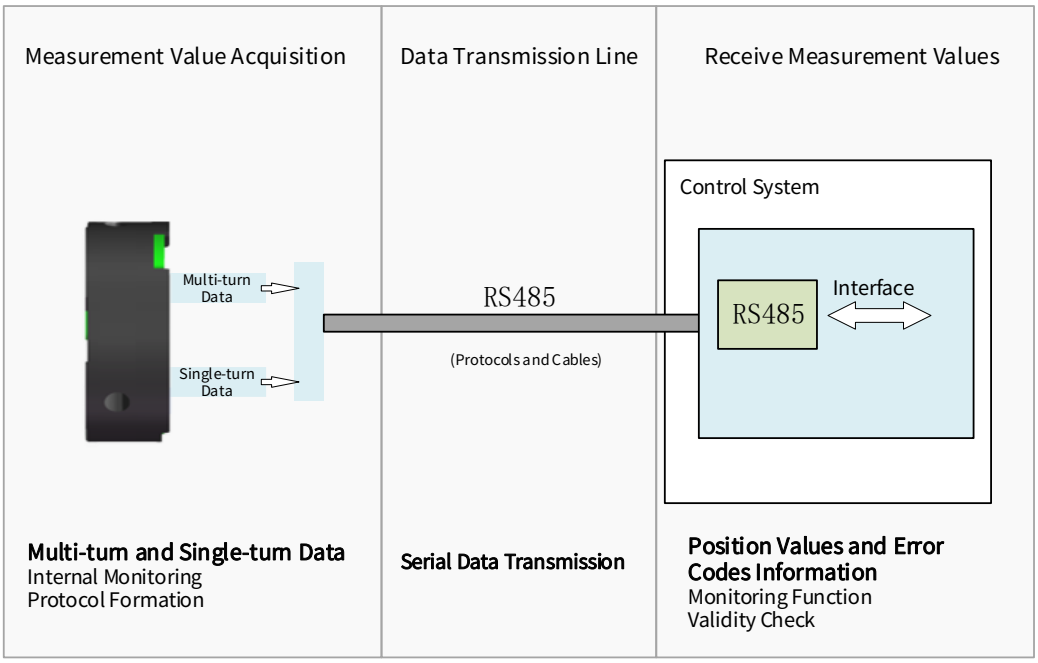
This manual primarily describes how to use the Reagle Sensing modular SROA35/SROA46 series multi-turn encoders. This product mainly serves servo-driven control systems, providing the feedback information necessary for accurate position and speed control.



Position and velocity control system

The performance of the encoder has a decisive impact on the essential characteristics of the motor, such as:

- Positioning accuracy
- Speed stability
- Bandwidth, determining the response speed to drive command signals and resistance to interference
- Motor size
- Noise



Equipped with RS485 communication encoder

2．Technical Specifications

Model	SROA35-M16S23Bit-SY-C-5V SROA46-M16S23Bit-SY-C-5V
Resolution	Supports up to 8,388,608 (23bit), compatible with 17bit.
Turns	65536（16bit）
Absolute positioning accuracy	—（Depends on motor shaft rotation accuracy）
Repeat positioning accuracy	＜±5 Arc seconds
Auxiliary functions	Fault Warning * Electromagnetic Environment Warning * Battery Voltage Warning
Communication interface	RS485
Communication frequency	≤16kHz
Baud rate	2.5Mbps
Input shaft allowable deviation	Axial：——　　Axial play：＜0.1mm Radial：±0.1mm　　Radial play＜0.01mm Tilt：＜0.1°
Main shaft speed	≤6000rpm
Shaft diameter	Straight Shaft Ø6mm
Moment of inertia	0.21kg·mm^2
Starting torque (20°C)	≤0.005Nm
Weight	≈0.021kg excluding cables)
Rotor angular acceleration	≤80000rad/s^2 when powered by a power source,
Vibration	Between 10 and 55Hz, maintain amplitude of 1.5mm. Between 55 and 2000Hz, acceleration is 98m/s². 2 hours per axis for XYZ, totaling 6 hours.
Mechanical shock	Shock acceleration of 980m/s², 11 milliseconds. 3 impacts per direction, totaling 18 impacts.
Operating Temperature	-20°C~105°C
Relative Humidity	≤90% (40°C/21 days, based on EN 60068-2-78); No condensation
Enclosure Protection Rating	—（Motor Rear Cover Protection）

3. Electrical Parameters

Items		T=25°C		
		Min.	Typ.	Max.
Main power supply voltage		4.75 V	5V	5.25V
Main power supply current (Typ)		--	90mA	--
Battery voltage		--	3.6V DC	--
Battery fault voltage		--	2.9V	--
Battery warning voltage		--	3.1V	--
Mode switching voltage	Main power supply to low power mode	--	4.2V	--
	low power mode to main power supply	--	4.3V	--
Differential Level	High	3.5V	--	--
	Low	--	--	1.7V
Edge change time		--	--	100ns
Insulation resistance		50MΩ	--	--

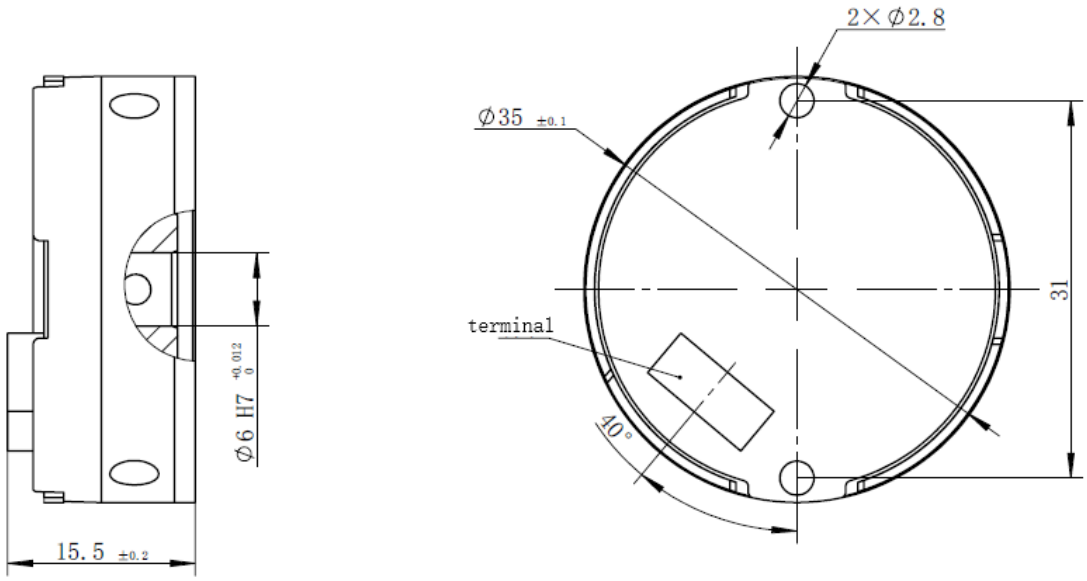
4. Cable Definition

Cable color	Definition
red	5V
black	GND
blue	485+
yellow	485-
brown	Battery +
white	Battery GND
shielding mesh	PE

5. Mechanical Specifications

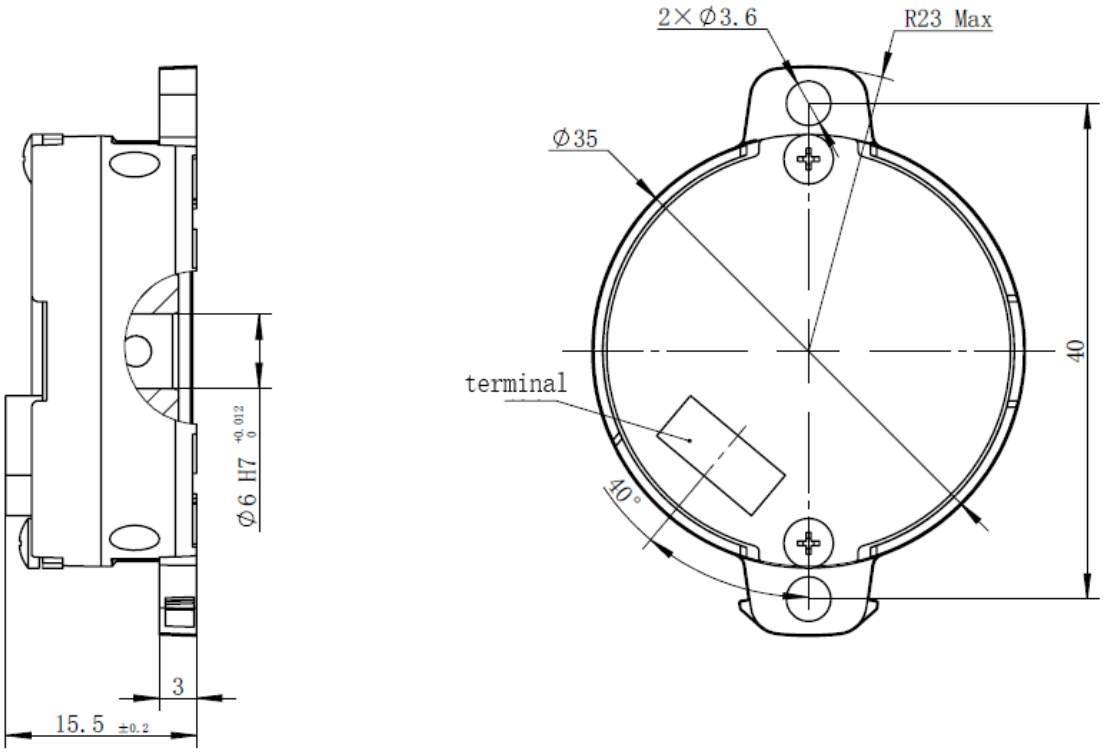
5.1 SROA35 Series

✧ Product Structural Dimensions Diagram

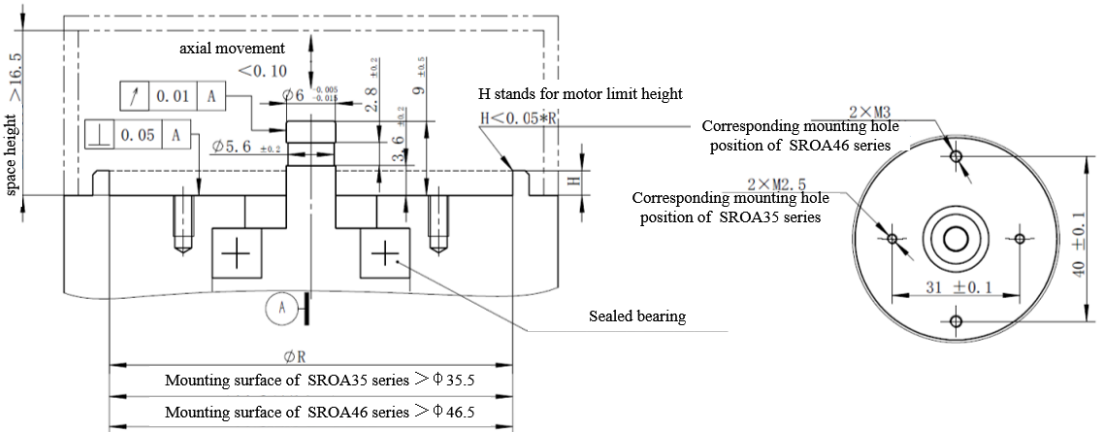


5.2 SROA46 Series

✧ Product Structural Dimensions Diagram



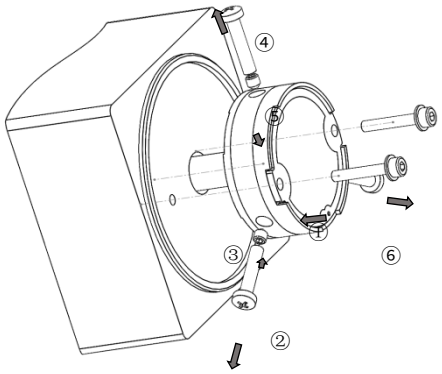
✧ Recommended Motor End Design Dimensions：



6. Mounting Procedure

6.1 SROA35 Series

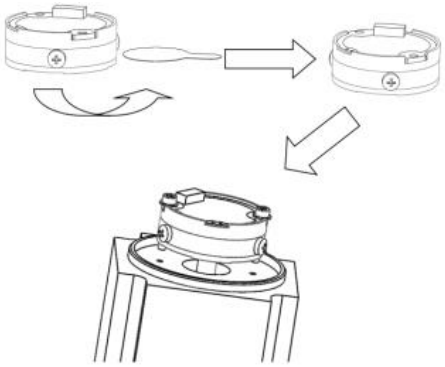
6.1.1 Installation Diagram



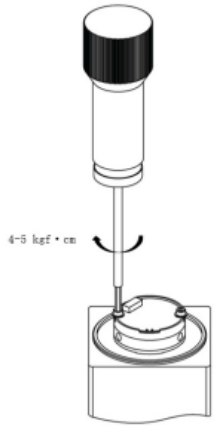
6.1.2 Installation Accessories

- Metric opposite side 1.5mm hexagonal torque wrench
- Metric opposite side 2.0mm hexagonal torque wrench
- Cross screwdriver

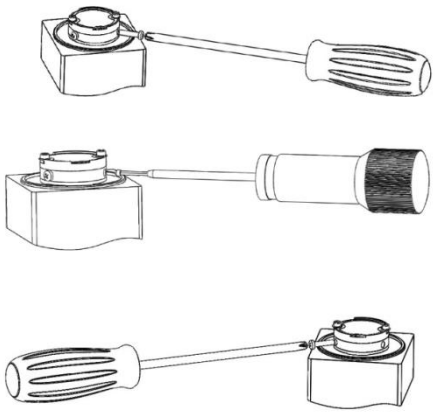
6.1.3 Installation Sequence



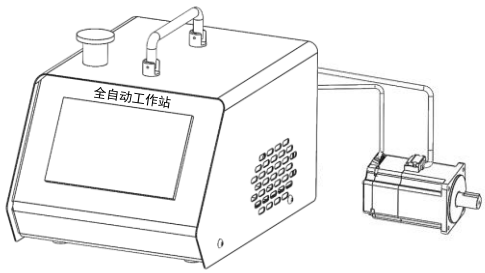
One. Remove the dust-proof sticker at the lower part of the encoder; Thread the encoder shaft into the motor shaft until the bottom surface of the encoder fully fits the rear end cover of the motor, then adjust the angle to make the encoder screw hole and the rear of the motor end cover threaded hole alignment; Install M2.5 combination screws in the screw holes on both sides of the encoder.



Two. To make the PCB flat, use the corresponding hexagon torque wrench to pre-tighten M2.5 screw assemblies on both sides in turn, and then use 4~5kgf·cm torque to tighten both screw.



Three. Remove one screw on the side wall with a cross screwdriver, insert m3*3 hexagon socket set screw and pre lock it, then remove another screw on the side wall, insert m3*3 hexagon socket set screw, lock it with 7kgf·cm, and then lock the previous set screw with 7kgf·cm; Finally, remove the remaining screw on the side wall to complete the encoder installation;

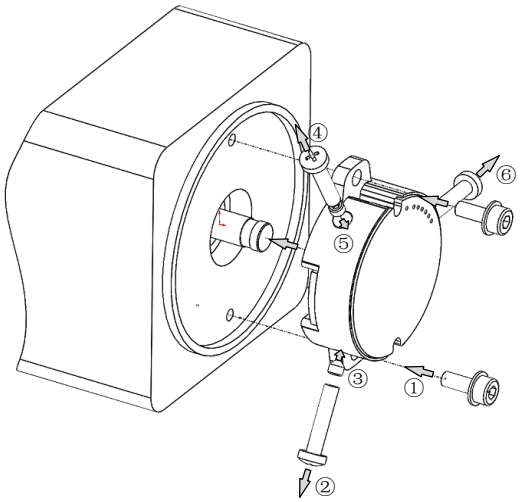


Four. After the motor rear cover is assembled, connect the motor line and encoder line to the workstation. If the test passes, it indicates that the encoder is installed completely correctly and the installation process is over.

[Note]: the encoder must be tested and confirmed by the workstation to ensure stable and reliable installation.

6.2 SROA46 Series

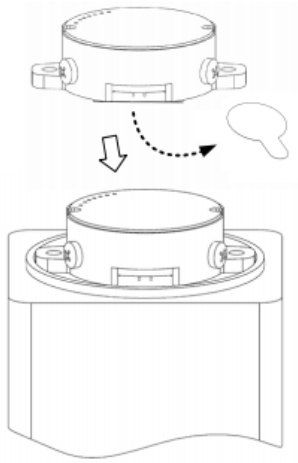
6.2.1 Installation Diagram



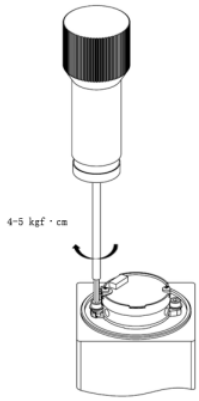
6.2.2 Installation Accessories

- Metric opposite side 1.5mm hexagonal torque wrench
- Metric opposite side 2.0mm hexagonal torque wrench
- Cross screwdriver

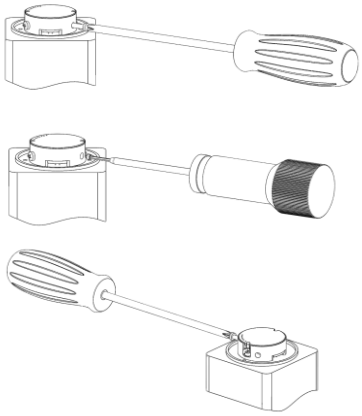
6.2.3 Installation Sequence



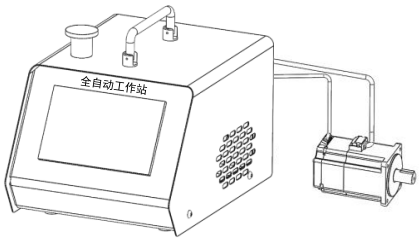
One. Remove the dust-proof sticker at the lower part of the encoder, Thread the encoder shaft into the motor shaft until the bottom of the encoder fits with the rear end cover of the motor. During normal cooperation, no force is required during the threading process of the encoder. If necessary, check the motor size and whether there are extrusion injuries, foreign matters, etc. Do not press down the encoder or knock it during installation.



Two. Use the corresponding hex torque wrench to lightly tighten the M3 screws on one side, then lightly tighten the M3 screws on the other side. Finally, tighten both screws to 4~5 kgf·cm torque sequentially.



Three. Remove one screw on the side wall with a cross screwdriver, insert m3*3 hexagon socket set screw and pre lock it, then remove another screw on the side wall, insert m3*3 hexagon socket set screw, lock it with 7kgf·cm, and then lock the previous set screw with 7kgf·cm; Finally, remove the remaining screw on the side wall to complete the installation.



Four. After the motor rear cover is assembled, connect the motor line and encoder line to the workstation. If the test passes, it indicates that the encoder is installed completely correctly, and the installation process is over.

[Note]: the encoder must be tested and confirmed by the workstation to ensure stable and reliable installation.

7. Communication Specifications

7.1 Overview

Items	Description	Remarks
Communication Code System	Binary	--
Communication Circuit	Differential Drive	RS485
Data Transmission Content	Single-Turn Position Information	17 bits (up to 23 bits supported)
	Multi-Turn Position Information	16 bit
Communication Rate	2.5 Mbps	--

7.2 E²PROM Communication Specifications

Items	Address	Description	Remarks
Readable and Writable User Parameter Address Range	0~0x7E* page8	User Parameter Domain	This address domain can be used to store user parameters. The partial area on page 8 is reserved and not recommended for customer use.
Page Address	0x7F	0~7	Within this range
Maximum Number of Erase Cycles	100000 次		Executable Operation Count

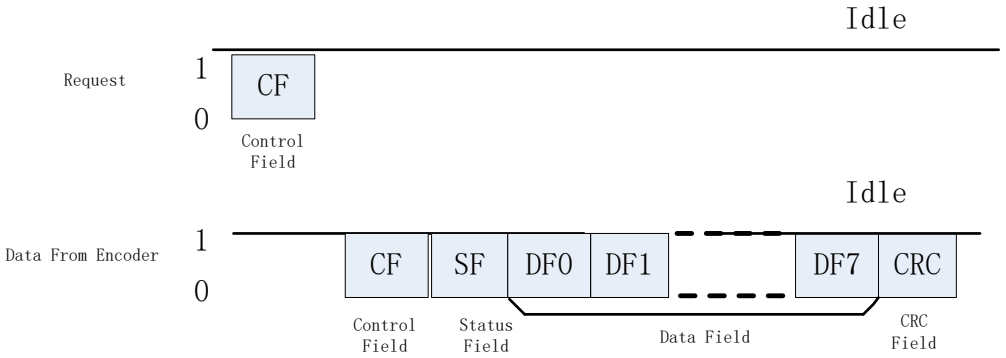
7.3 Frame Format

Each data frame is divided into several data words. Each data word is transmitted and received with 1 start bit, 8 data bits, and 1 stop bit, with the least significant bit first and the most significant bit last.

In the data frame transmission, the following terms are used:

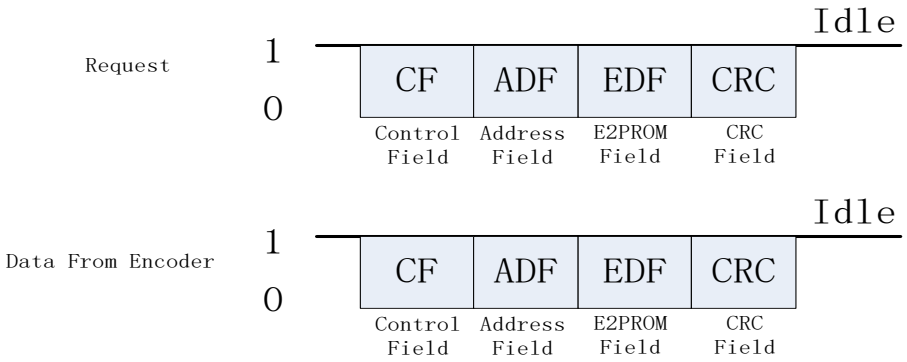
Items	Description	Remarks
CF	Control Field	Identifies different command types.
SF	Status Field	Provides information on the encoder's status
DF	Data Field	Encoder Position Data
ADF	Address Field	Accessible Encoder Address
EDF	E²PROM Field	The content at the specified address
CRC	CRC Check	Polynomial: x8+1 (XOR all data except CRC)

7.3.1 Position Data Reading



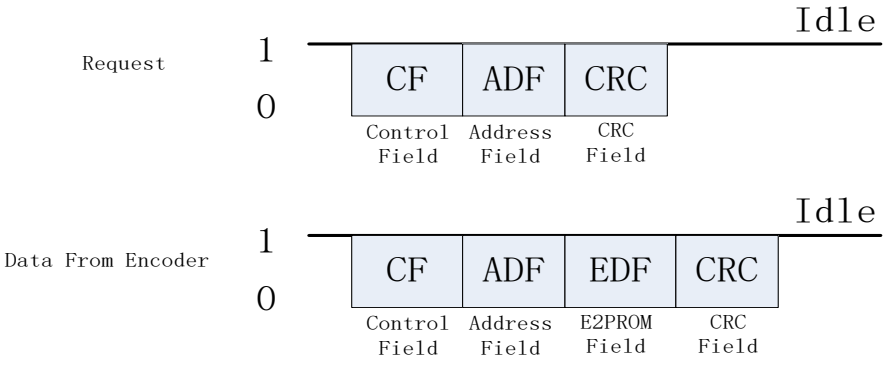
[Note]: The number of DF (Data Frames) varies depending on the CF (Configuration File).

7.3.2 Write E^2PROM



***The request frame and response frame have the same content**

7.3.3 Read E^2PROM



*** The return frame includes the content of the accessed address**

7.4 Detailed Description

7.4.1 Control Field（CF）

CF consists of one data word, with categories and contents as shown in the table below:

Items	CF type	Remarks
Read data	ID0(0x02)	Absolute position access（CF+SF+ABS+CRC）
	ID1(0x8A)	Multi-turn information access（CF+SF+ABM+CRC）
	ID2(0x92)	Encoder ID Information Read: (CF + SF + ID + CRC)
	ID3(0x1A)	Read All Data: (CF + SF + ABS + ID + ABM + ALMC + CRC)
Write E^2PROM	ID6(0x32)	You can write 8-bit user data to the specified address. After sending the instruction in the correct format, the encoder will respond with the data within 20 μs. During this time, avoid communicating with the encoder.
Read E^2PROM	IDD(0xEA)	You can read 8-bit user data from the specified address. After sending the instruction in the correct format, the encoder will respond with the data within 20 μs. During this time, avoid communicating with the encoder.
Reset	ID7(0xBA)	This reset command requires sending the instruction continuously 10 times with a time interval of no less than 62.5 μs between each. It will reset all fault status bits.
	ID8(0xC2)	This reset command requires sending the instruction continuously 10 times with a time interval of no less than 62.5 μs between each. It will reset the single-turn position to zero. Even after power cycling, the position data will remain at the reset position.
	IDC(0x62)	This reset command requires sending the instruction continuously 10 times with a time interval of no less than 62.5 μs between each. It will reset the multi-turn data to zero (without affecting single-turn data) and will also reset all fault status bits.

7.4.2 Status Field（SF）

SF is composed of one byte, with each bit defined as shown in the table below:

Bit number	Description	Remarks
Bit0	Rsvd	“0”
Bit1	Rsvd	“0”
Bit2	Rsvd	“0”
Bit3	Rsvd	“0”
Bit4	Counting Error	Equal to ALMC.Bit2
Bit5	Xor Multi Error	Equal to the logical OR of ALMC.Bit5, Bit6, and Bit7
Bit6	Rsvd	“0”
Bit7	Rsvd	“0”

7.4.3 Data Field (DF0~DF7)

Depending on the CF type, the DF contains a different number of bytes, as detailed in the table below:

CF Type	DF0	DF1	DF2	DF3	DF4	DF5	DF6	DF7
ID0(0x02)	ABS0	ABS1	ABS2					
ID1(0x8A)	ABM0	ABM1	ABM2					
ID2(0x92)	ENID							
ID3(0x1A)	ABS0	ABS1	ABS2	ENID	ABM0	ABM1	ABM2	ALMC
ID7(0xBA)	ABS0	ABS1	ABS2					
ID8(0xC2)	ABS0	ABS1	ABS2					
IDC(0x62)	ABS0	ABS1	ABS2					

[Note]:

1. ABS0~ABS2 represent the low, middle, and high positions of the encoder's absolute position, respectively. The high 7 bits of ABS2 are 0, and the remaining data forms a 17-bit position information (for a 23-bit encoder, the high 1 bit of ABS2 is 0, with the rest being valid bits).
2. ABM0~ABM2 represent the low, middle, and high positions of the encoder's multi-turn position, respectively. ABM2 is all 0s, and the remaining data forms a 16-bit multi-turn information.
3. ENID is the encoder ID, with a value of 0x11 (for 17-bit) or 0x17 (for 23-bit).
4. ALMC is the encoder fault flag, detailed in section 7.4.4.

7.4.4 Error Description

ALMC faults are detailed in the table below:

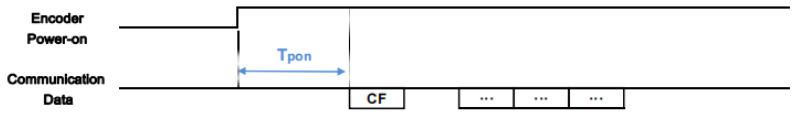
Bit	0	1	2	3	4	5	6	7
Name	Over-speed	“0”	Counting Error	“0”	“0”	Multi-turn error	Battery error	Battery alarm

Descriptions of fault flag bits are as follows:

Name	Function	Action
Over-speed	For 5V power mode, when speed exceeds 7200 RPM	Reset Power
Counting Error	Single-turn information calculation fault	Reset Power
Multi-turn error	Multi-turn data loss or multi-turn counting fault	Fault reset
Battery error	Battery voltage below 2.9V, set flag	Check battery power supply lines, replace battery
Battery alarm	Battery voltage below 3.1V, set flag	Fault will automatically clear after replacing with a battery of normal voltage

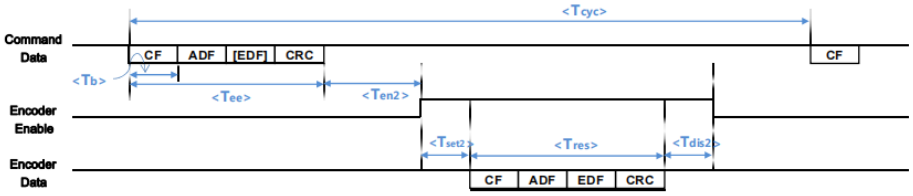
8. Timing Description

8.1 Timing Diagram



Reagle Power-on Timing Chart

Reagle CF Communication Timing Chart



Reagle EEPROM Communication Timing Chart

8.2 Detailed Specifications

Characteristic	Symbol	Minimum	Default	Maximum	Unit	Note
Power-On time	Tpon		450	550	ms	
Command cycle period	Tcyc	62.5			μs	
Data byte time	Tb		4		μs	
Encoder enable delay time	Ten1	1.5		3.5	μs	
	Ten2		4.5		μs	
Encoder EEPROM Command time	Tee		12		μs	Read: 3 bytes data
			16		μs	Write: 4 bytes data
Encoder response time	Tres		4*N		μs	N bytes data
Encoder data set-up delay time	Tset1	0.8		2	μs	
	Tset2	1		1.5	μs	
Encoder disable delay time	Tdis1	0.6		1.2	μs	
	Tdis2		1.3		μs	

9. Configuration Instructions

Order code details can be found in the "Reagle Sensing Absolute Encoder Ordering Instructions."

For terminal cable specifications, refer to the "Reagle Sensing Absolute Encoder Terminal Cable Drawings."

Optional Configuration	Description
Resolution	17Bit/23Bit

Revision History

Date	Version Number	Modification Details or Changes	
		Location	Content
20210831	V1.0	/	New Version
20220302	V2.0	Communication Specifications Timing Description	Refined communication protocol description Added timing section
20220505	V2.1	Mounting Procedure	Changed dust plug to dust sticker
20220620	V3.0	Product appearance	Replaced with new type of main body
20230213	V3.1	Operating Temperature	Updated temperature range
20230728	V3.2	Mechanical Specifications Recommended Motor End Design Dimensions	Removed PE connection plate Adjusted stop height
20240514	V3.3	Technical Specifications	Removed battery-powered angular acceleration

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