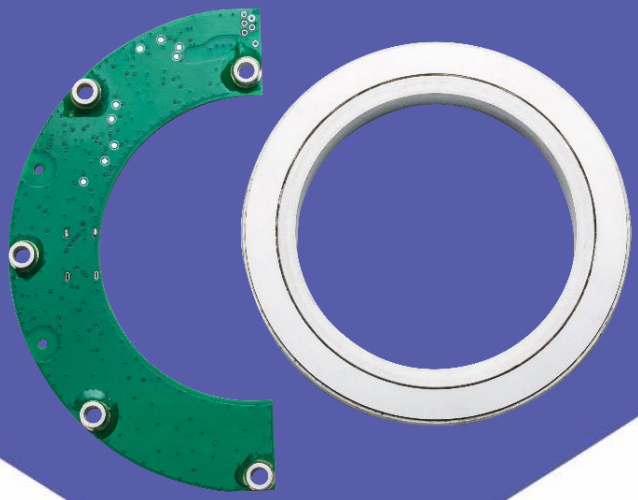
锐鹰传感
REAGLE SENSING

Reflective Hollow Shaft Absolute Encoder

KON113-M16S23ST00-HR63C0V5

SPECIFICATION



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ZHEJIANG REAGLE SENSING TECHNOLOGY INCORPORATED

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1. Summary Info

This manual primarily describes how to use the Reflective Hollow Shaft Absolute Encoder from Reagle Sensing. This product is mainly used in servo-driven control systems, providing the accurate position and speed feedback required by the control units.

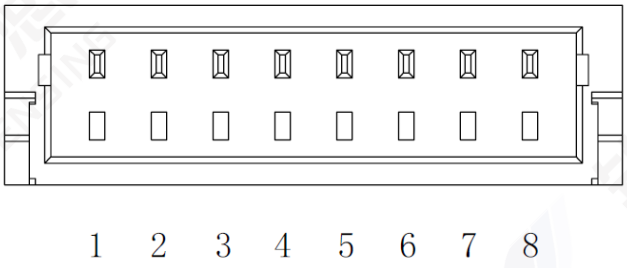
2. Technical Specifications

Product model	KON113-M16S23ST00-HR63C0V5	
Resolution	8388608（23bit）	
Turns	65536（16bit）	
Auxiliary Functions	Fault Warning * Electromagnetic Environment Warning	
Communication Interface	RS485	
Communication frequency	≤16K	
Baud rate	2.5Mbps	
Input shaft allowable deviation	Axial: - Radial: - Perpendicularity of Shaft to Stator Mounting Surface: 0.05	Axial Runout: < 0.1 mm Radial Runout: < 0.02 mm
Main shaft speed	≤6000rpm	
Moment of Inertia	8.9×10-5Kg*m^2	
Weight	0.066kg (Rotor)	
Rotor Angular Acceleration	≤80000rad/s2	
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℃ ~ 95℃	
Relative Humidity	≤ 90% (40 ° C/21 days, based on EN 60068-2-78); No condensation	
Enclosure Protection Rating	— (Motor Rear Case Protection)	

3. Electrical Parameters

Items		T=25℃		
		Min.	Typ.	Max.
Supply Voltage		4.75 V	5V	5.25V
Main power supply Current (Typ)		--	130mA	--
Battery Voltage		--	3.6V	--
Battery Fault Voltage		--	2.9V	--
Battery Warning Voltage		--	3.1V	--
Mode Transition Voltage	Main Power Switch to Low Power Mode	--	4.32V	--
	Low Power Mode Switch to Main Power Mode	--	4.16V	--
Differential Level	High	3.5V	--	--
	Low	--	--	1.7V
Edge Transition Time		--	--	100ns
Insulation Resistance		50MΩ	--	--

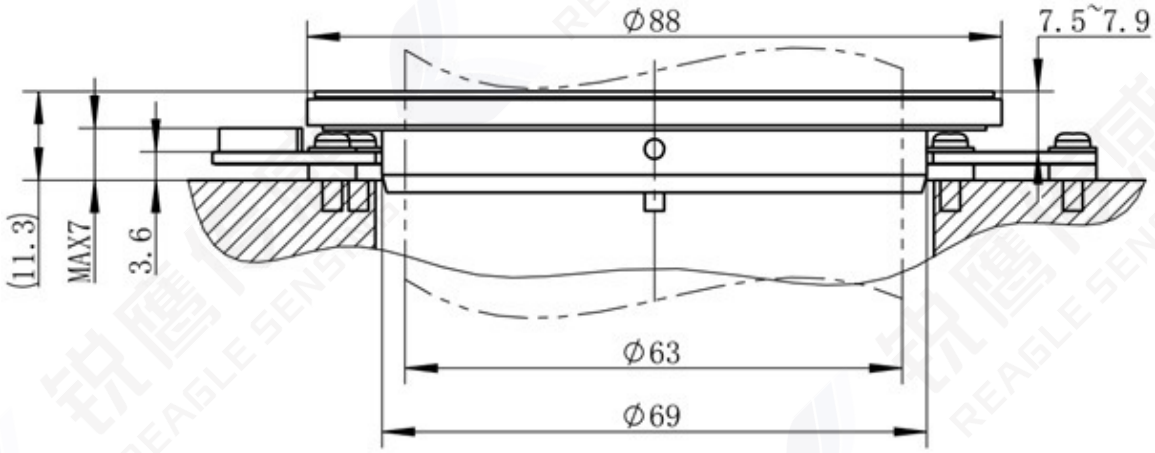
4. Cable Definition



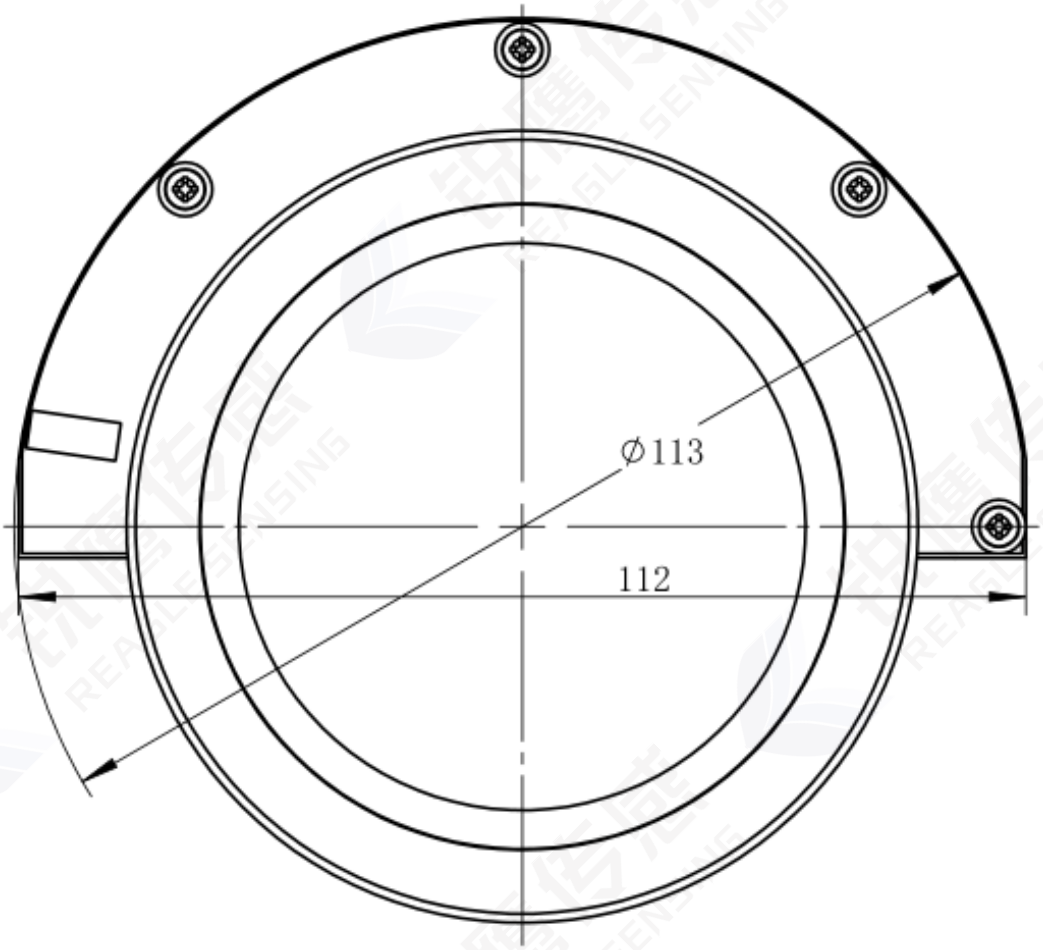
Terminal Numbering	1	2	3	4	5	6	7	8
Definition	5V	GND	485+	485-	Battery +	Battery GND	NC	PE
Cable color	red	black	blue	yellow	brown	white		shielding mesh

5. Mechanical Specifications

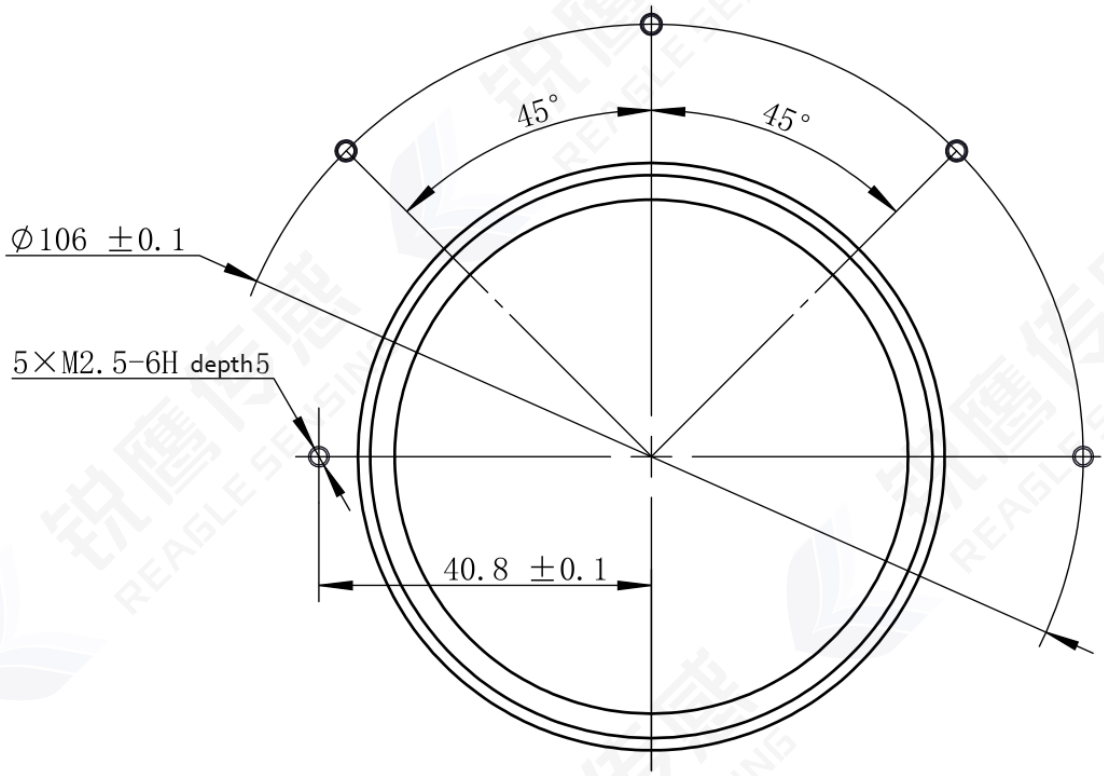
✧ Structural Dimensions 1



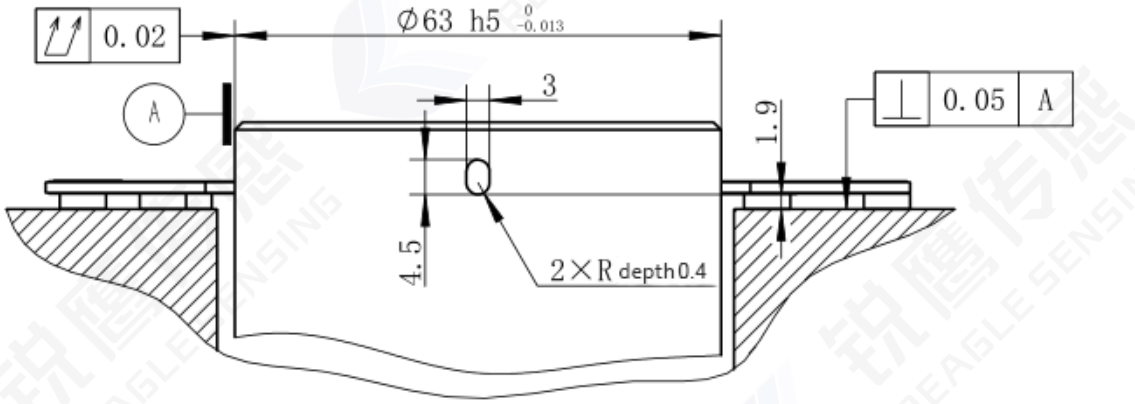
✧ Structural Dimensions 2



✧ Stator Mounting Hole Dimension Requirements

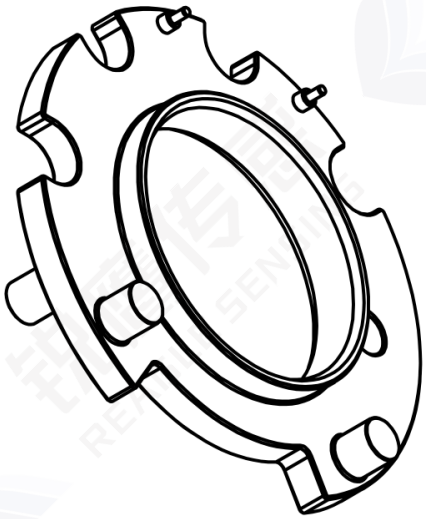


✧ Rotor Shaft Dimension Requirements

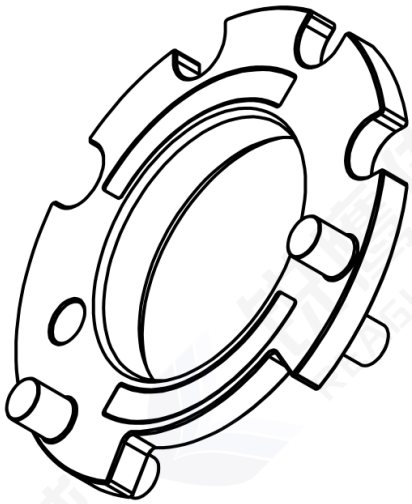


6. Mounting Procedure

6.1 Installation Jig Instructions



Jig Face A (for stator installation)

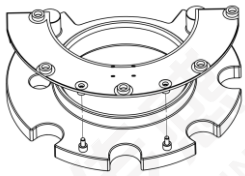


Jig Face B (for rotor installation)

6.2 Installation Accessories

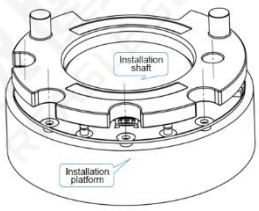
- Phillips torque screwdriver
- Metric 1.5mm hexagonal torque wrench

6.3 Installation Sequence

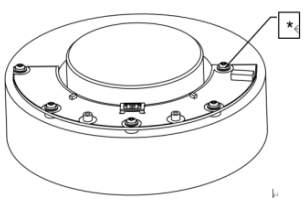


Stator Installation:

① Align the front of the stator (electronic device side) with Face A of the installation jig, fitting the pin holes with the jig's positioning pins.



② Reverse the assembled stator and jig, making the stator legs flush with the mounting platform, and align the jig's center hole with the installation shaft to determine the position of the mainboard. Use five M2.5×8 Phillips pan head screws with flat washers to fix the mainboard. Tighten with 5-7 kgf·cm of torque.

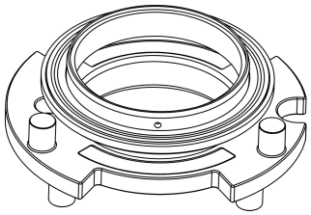


③ Carefully remove the jig without tilting it. The stator installation is complete.

[Note]:

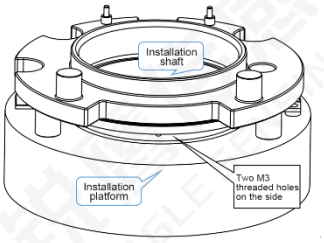
1) Pay attention to the screw head height, especially at the locations marked with an "*", where the screw head should not protrude more than 2.3mm from the PCB.

2) To prevent screw loosening, pre-apply thread locker in the screw holes or use screws pre-coated with thread locker.

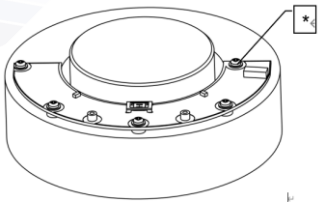


Rotor Installation：

① Align the back of the rotor (non-encoder side) with Face B of the installation jig, being mindful of the impact when the magnets attract. Try to center the rotor's shaft hole with the jig's shaft hole.



② Reverse the assembled rotor and jig, aligning the rotor's shaft hole with the installation shaft. Gently push the jig, slowly pressing down the rotor, ensuring the jig remains parallel with the mounting platform. Stop when the jig's legs are flush with the mounting platform. Do not push the rotor in too deeply. Use two M3×3 hexagon socket set screws with 7 kgf·cm of torque to lock the rotor to the shaft (be mindful of the rotor magnets' attraction to the screws and tools, and avoid touching the encoder disc).



③ Remove the jig. The rotor installation is complete. After installation, rotate the rotor one full turn to check for any interference, especially at the bottom screws of the encoder disc. Remove the protective film from the encoder disc and clean its surface with a cotton swab or lint-free cloth. The installation is complete, and proceed to the next test step.

6.4 Precautions

- This encoder has a split structure; the encoder shaft (including the encoder disc) is separate from the body structure and exposed to the air when installed on the motor shaft. Please assemble in a clean, dust-free environment.
- Before installation, degrease and clean the motor shaft to prevent oil and other contaminants from affecting the tightness of the encoder shaft or contaminating the encoder disc.
- Be careful not to touch the encoder disc directly with hands or hard objects, as fingerprints, oil, dust, etc., can cause abnormal signals, and hard objects may damage the encoder disc.
- After installation, check the cleanliness of the reflective encoder disc surface. If contaminated, gently wipe with lint-free cloth dampened with alcohol. Be careful not to apply excessive force or use other hard materials that could damage the disc.

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	23bit
	Multi-Turn Position Information	16bit
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

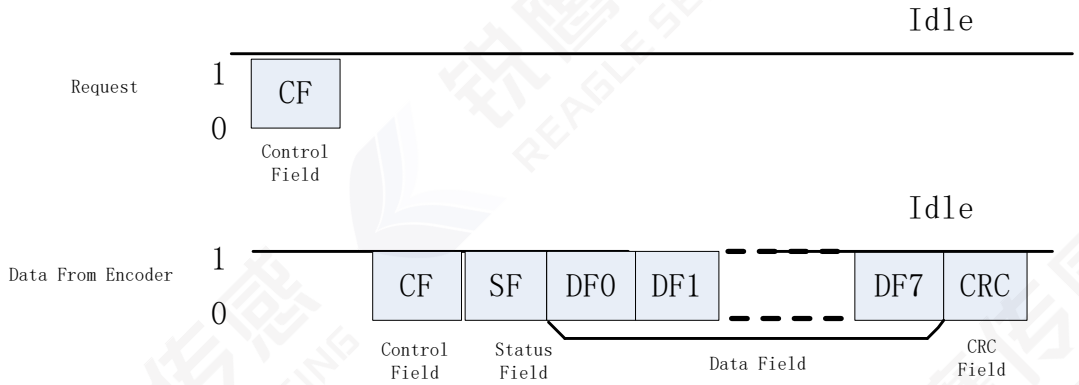
7.3 Frame Format

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:

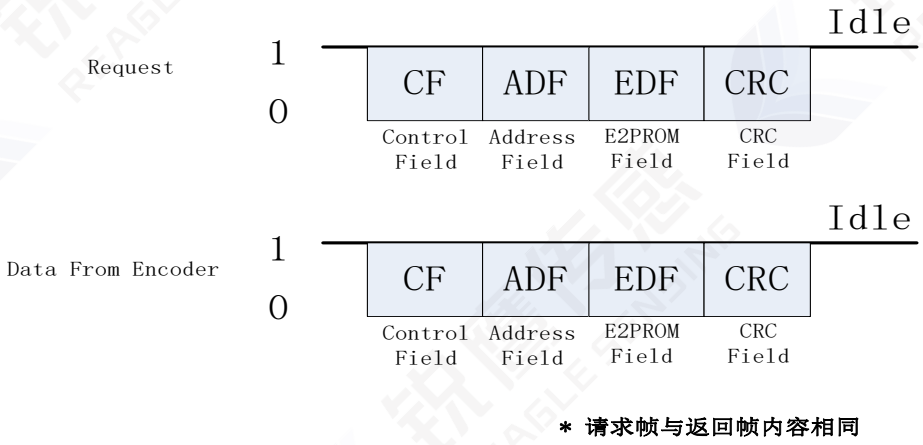
Items	Description	Remarks
CF	Control Field	Identifies different command types.
SF	Status Field	Provides information on the encoder's status
DF	Data Field	Encoder Position Data
ADF	Address Field	Accessible Encoder Address
EDF	E2PROM Field	The content at the specified address
CRC	CRC Check	Polynomial: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

7.3.1 Position Data Reading



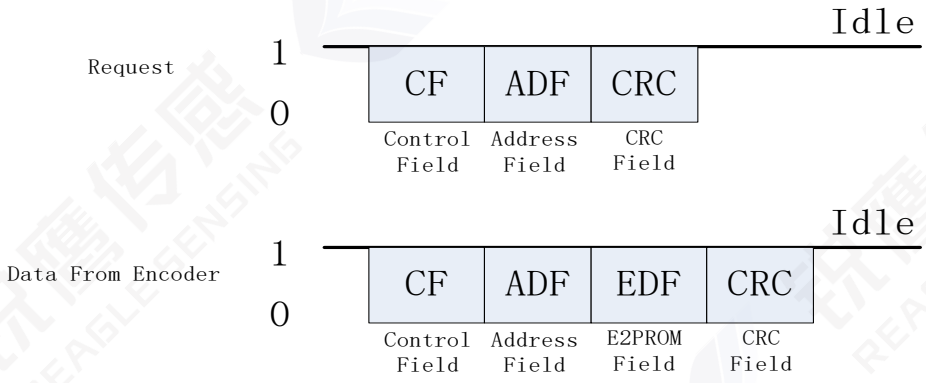
[Note]: The number of DF (Data Frames) varies depending on the CF (Configuration File).

7.3.2 Write E²PROM



* 请求帧与返回帧内容相同

7.3.3 Read E²PROM



* 返回帧中增加了所访问地址内容

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 to ABS2 are the low, middle, and high positions of the encoder's single-turn position, respectively, where the highest bit of ABS2 is 0, and the remaining data forms a 23-bit single-turn position information.
2. ABM0 to ABM2 are the low, middle, and high positions of the encoder's multi-turn position, respectively, where ABM2 is 0, and the remaining data forms a 16-bit multi-turn position information.
3. ENID is the encoder ID information, with a value of 0x17 (23Bit).
4. ALMC is the encoder fault flag bit, see Section 7.4.4 for details.

7.4.4 Error Description

ALMC faults are detailed in the table below:

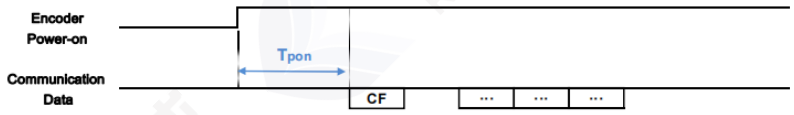
Bit	0	1	2	3	4	5	6	7
Name	Over-speed	“0”	Counting Error	“0”	“0”	Multi-turn error	Battery error	Battery alarm

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

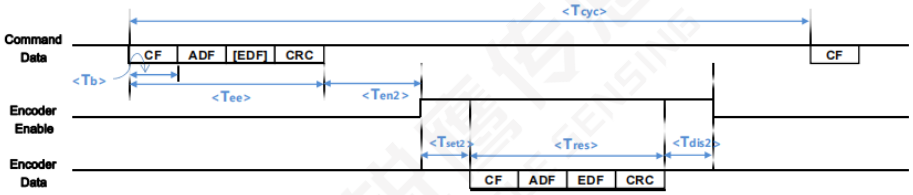
8. Timing Description

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: 3bytes 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

For ordering codes, refer to the "Reagle Sensing KON Series Encoder Ordering Instructions."

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

Revision History

Date	Version Number	Modification Details or Changes	
		Location	Content
20230326	V1.0	/	New Version

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