锐鹰传感
REAGLE SENSING

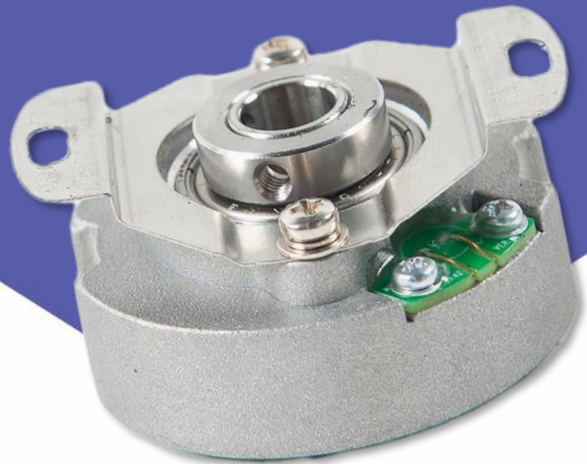# Multi-Turn Absolute Rotary Encoder
SROA42-M16S23Bit-SS□-C-5V
# SROA42-M16S17Bit-SS□-C-5V
SPECIFICATION

Contents

1．Summary Info

This manual primarily describes how to use the multi-turn straight shaft series SROA42 encoder from Reagle Sensing. This product is mainly used in servo-driven control systems, providing the feedback information required for accurate position and speed control units.

Position and velocity control system
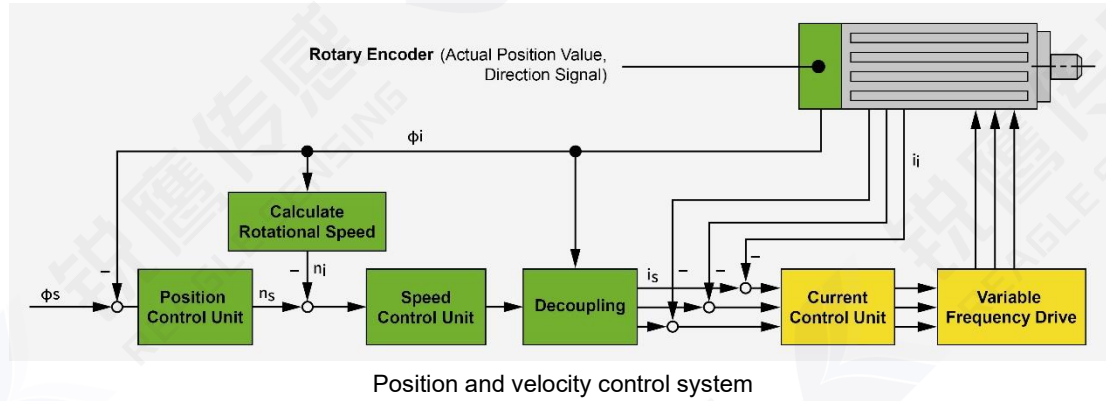
The performance of the encoder has a decisive impact on the essential characteristics of the motor, such as:

- Positioning accuracy
- Speed stability
- Bandwidth, determining the response speed to drive command signals and resistance to interference
- Motor size
- Noise
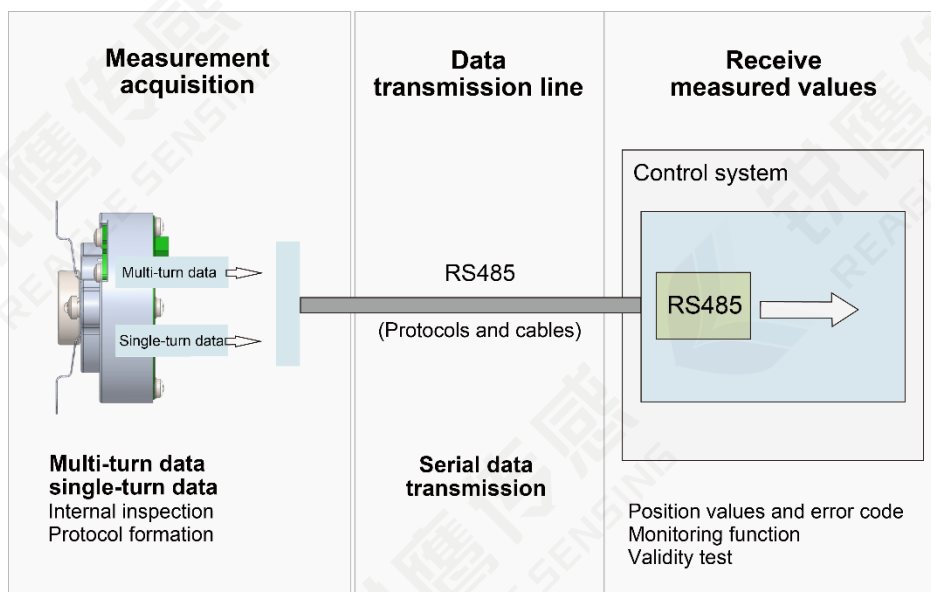
Equipped with RS485 communication encoder

2．Technical Specifications

Model	SROA42-M16S23Bit-SS□-C-5V SROA42-M16S17Bit-SS□-C-5V
Resolution	Supports up to 8388608 (23bit), compatible with 17bit.
Turns	65536（16bit）
Absolute positioning accuracy	＜±50″
Repeat positioning accuracy	＜±3″
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 Ø6/ Ø8 mm
Moment of inertia	0.66kg·mm²
Starting torque（20℃）	≤0.005N·m
Weight	≈0.06kg（excluding cables）
Rotor angular acceleration	≤80000rad/s² when powered by a power source; ≤8000rad/s² when powered by a battery.
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℃~105℃
Relative Humidity	≤90% (40℃/21 days, based on EN 60068-2-78);
Enclosure Protection Rating	IP 40

3．Electrical Parameters

Items		T=25℃		
		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

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5．Mechanical Specifications

✧ Product Structure Dimension Diagram

10° R21.7 R18.3 Ø42 0/-0.2 46 40

14 0.5 电子器件 Ø6/Ø8H7 2×M3 3 24.5（25 max）

R18.5 50° 端子或甩线
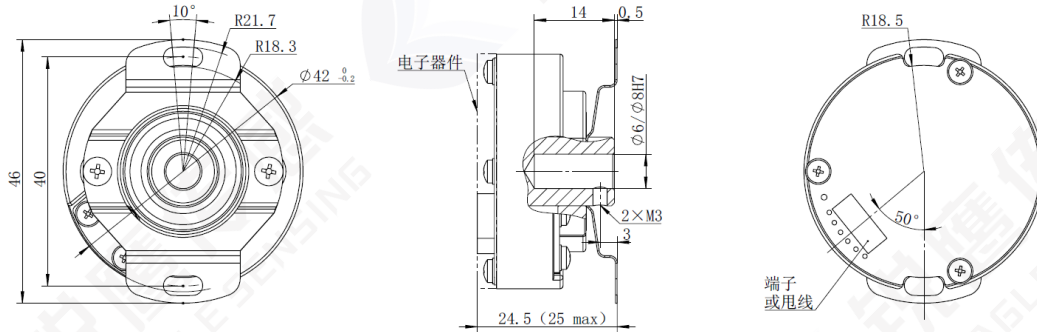
【Note】The above refers to the default connecting plate.

✧ Recommended Motor End Design Dimensions

| ↗ | 0.01 | A |
| ↗ | 0.1 | A |

Axial Play <0.2

Ø6/Ø8 g6~h6

8≤L≤14

2×M3

A

The clearance at the lowest point of the stop shoulder for the tightening wrench of the retaining screw.

2mm max
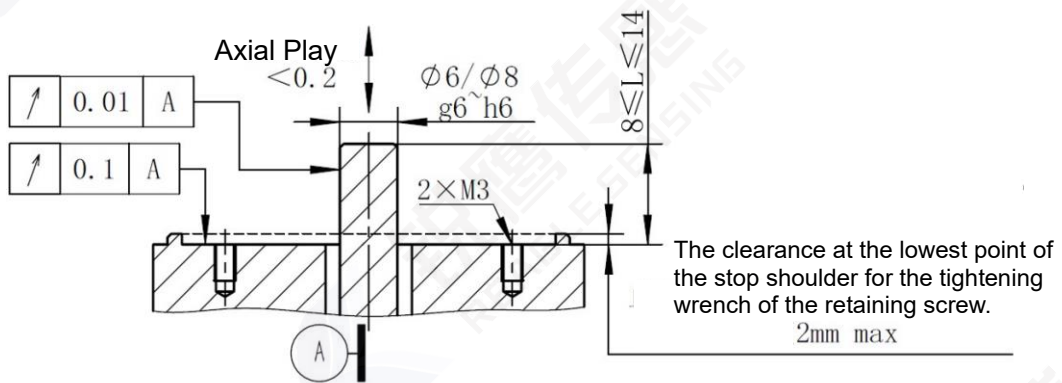
6．Mounting Procedure

### 6.1 Installation Diagram



① ② ③

REAGLE
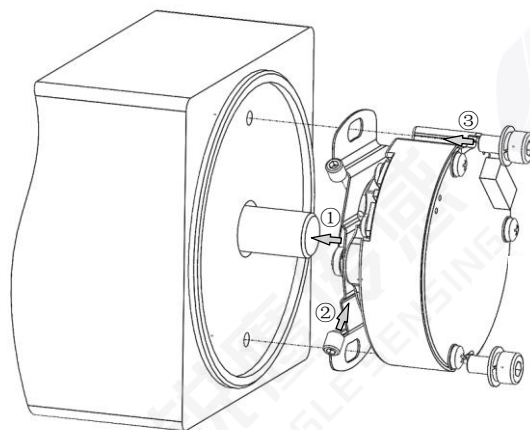
6.2 Installation Accessories

· 1.5mm metric hex key torque wrench
· 2.0mm metric hex key torque wrench

6.3 Installation Sequence

① Insert the encoder assembly onto the motor shaft, ensuring that the bottom surface of

the connecting plate is in contact with the rear end cover of the motor. Under normal conditions, the encoder should slide onto the shaft smoothly; if there is any obstruction, check the motor shaft diameter and look for any signs of crushing damage. Do not force the encoder down during the installation process, and avoid striking or pressing on the encoder's circuit board.

Correct   Incorrect   Incorrect
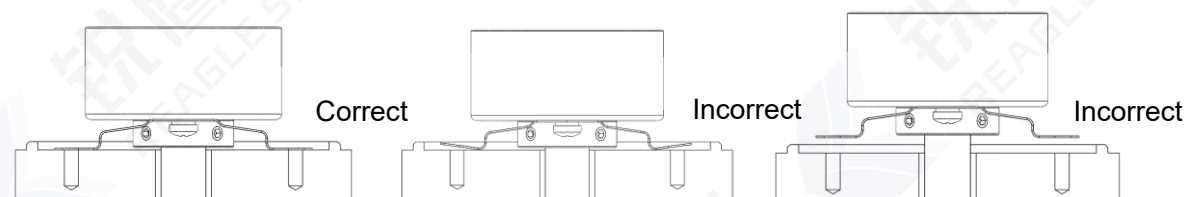
② Coat the head of the M3×4 countersunk end retaining screw with thread adhesive, and

use the corresponding hex key torque wrench to screw the first retaining screw into the encoder shaft and lightly tighten it to make contact with the motor shaft; then screw the second retaining screw into the encoder shaft and tighten it with a torque of 7 kgf·cm; finally, tighten the first screw with a torque of 7 kgf·cm.
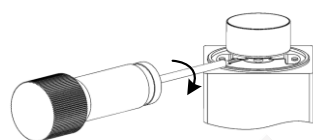
First step:
Gently screw in the first retaining screw.
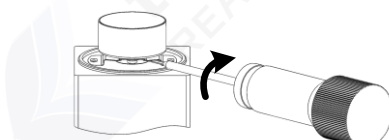
Second step:
Tighten the second retaining screw with a torque of 7 kgf·cm.
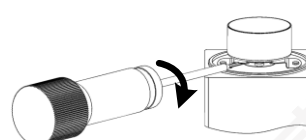
Third step:
Tighten the first retaining screw with a torque of 7 kgf·cm.

③ Using the corresponding hexagonal torque wrench, lightly tighten one side of the M3

combination screws, then lightly tighten the M3 combination screws on the other side. Afterwards, sequentially tighten the screws on both sides with a torque of 8 ~ 10 kgf·cm

First step:
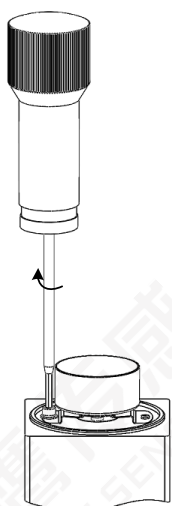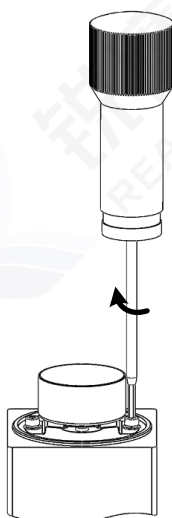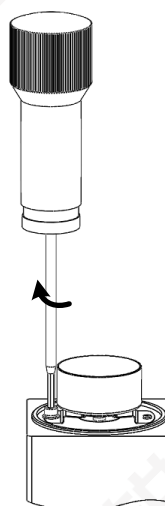Gently screw in the first retaining screw.

Second step:
Tighten the second retaining screw with a torque of 8-10 kgf·cm.

Third step:
Tighten the first retaining screw with a torque of 8-10 kgf·cm.

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 bit（maximum support 23bit）
	multi-turn Position Information	16bit
Communication Code System	2.5 Mbps	--

7.2 E^2PROM 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 times	-	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	Cyclic Redundancy Check	Polynomial: x8+1 (XOR all data except CRC)

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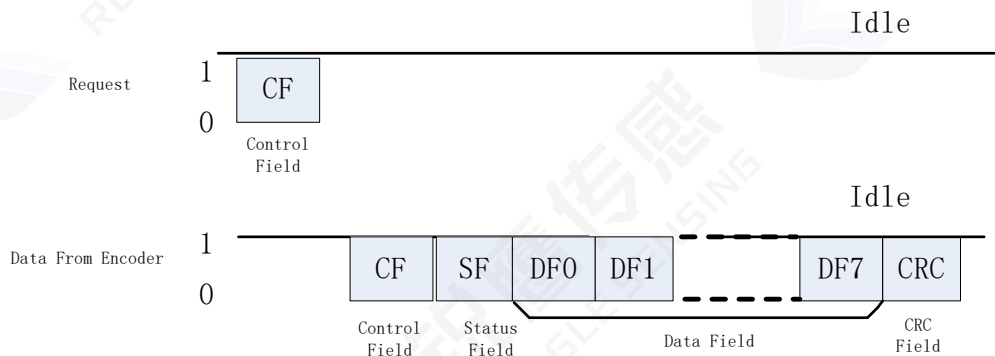
[Note]: The number of DF (Data Frames) varies depending on the CF (Configuration File).

7.3.2 Write E^{2}PROM
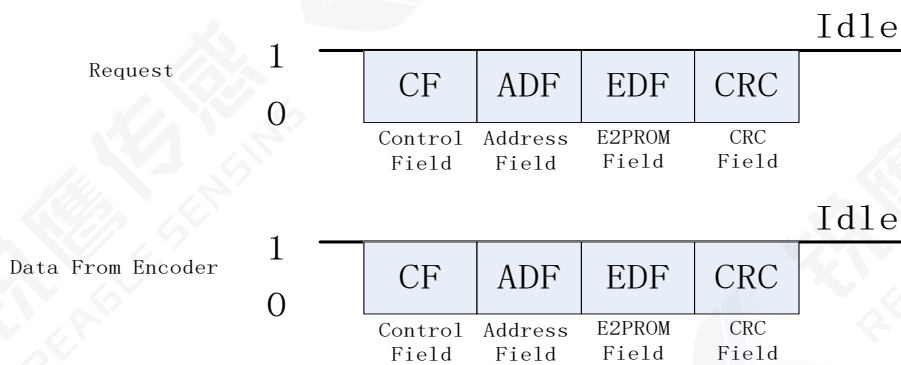
*The request frame and response frame have the same content

7.3.3 Read E^{2}PROM

The return frame has included 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:

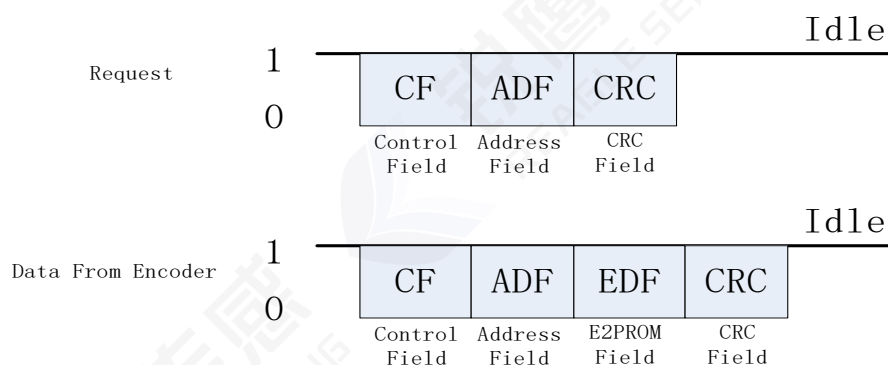| Items	CF type	Remarks
Read data	ID0(0x02)	Absolute Position Reading（CF+SF+ABS+CRC）
	ID1(0x8A)	multi-turn data information reading（CF+SF+ABM+CRC）
	ID2(0x92)	Encoder ID Information Read（CF+SF+ID+CRC）
	ID3(0x1A)	Read All Data（CF+SF+ABS+ID+ABM+ALMC+CRC）
Write E^{2}PROM	ID6(0x32)	8-bit 'user data' can be written to the specified address. After the instruction format is sent, the encoder will return data within 20 µs. During this process, please avoid communicating with the encoder.
Read E^{2}PROM	IDD(0xEA)	8-bit 'user data' can be read from the specified address. After the instruction format is sent, the encoder will return data within 20 µs. During this period, please do not communicate with the encoder.
Reset	ID7(0xBA)	The reset command requires sending 10 consecutive instructions with a time interval of no less than 62.5 µs between each, to reset all fault status flags.
	ID8(0xC2)	The reset command requires sending 10 consecutive instructions with a time interval of no less than 62.5 µs between each, to reset and zero the current single-turn position. The position data will remain at the reset value even after power is cycled.
	IDC(0x62)	The reset command requires sending the instruction 10 times at intervals of no less than 62.5 microseconds to reset the multi-turn data to zero (without affecting the single-turn data). At the same time, all fault flag bits are reset.

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)

SF is composed of one byte, with each bit defined as shown 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 bits of the encoder's single-turn position, where the high 7 bits of ABS2 are zero, and the remaining data forms a 17-bit position information.
2. ABM is always "0".
3. ENID is the encoder ID information, with a default value of 0x11.
4. ALMC is the encoder fault status 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 Description
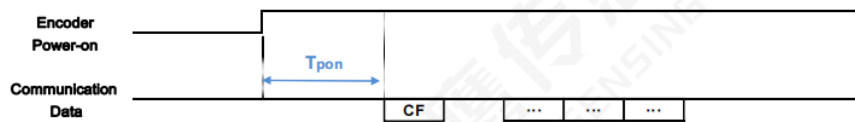
Reagle Power-on Timing Chart
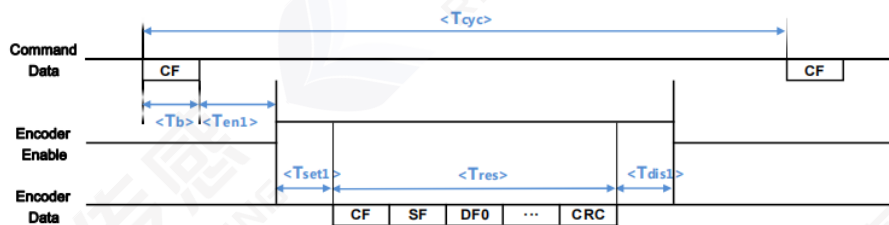
Reagle CF Communication Timing Chart
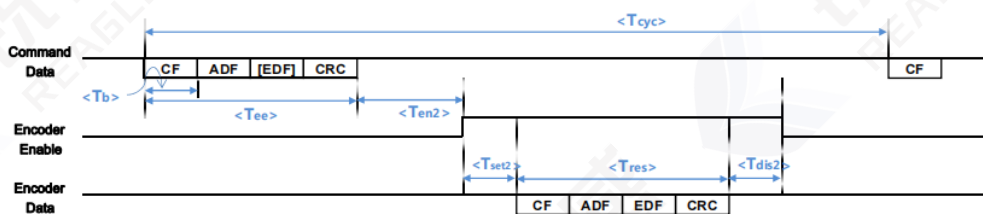
Reagle EEPROM Communication Timing Chart

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	

SROA Timing Characteristics

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
Axial hole size	Ø6/ Ø8mm
Resolution	17Bit/23Bit
Connection plate pattern	Type A (default type) / Type B

Revision History

Date	Version Number	Modification Details or Changes	
		Location	Content
20210831	V1.0	/	New Version
20220302	V2.0	Communication Protocol Timing	Detailed Communication Protocol Description Detailed Communication Protocol Description

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