

Multi-turn Absolute Rotational Encoder

SROA42-M16S23Bit-SC-C-5V

SROA42-M16S17Bit-SC-C-5V

SPECIFICATION

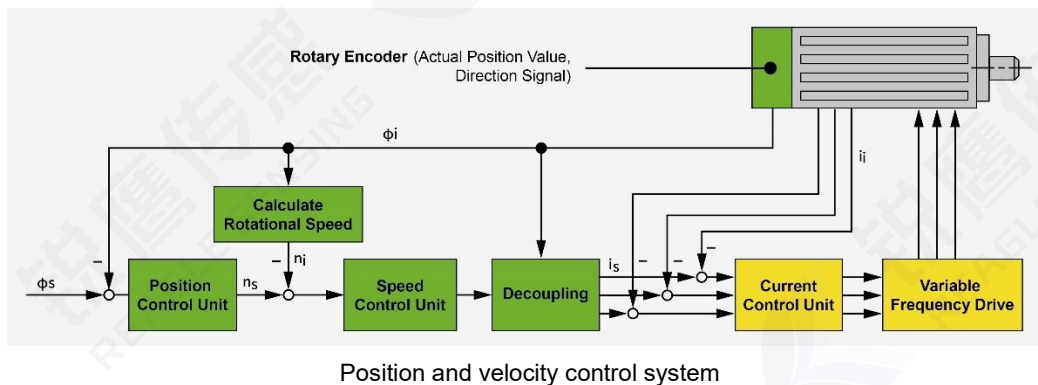


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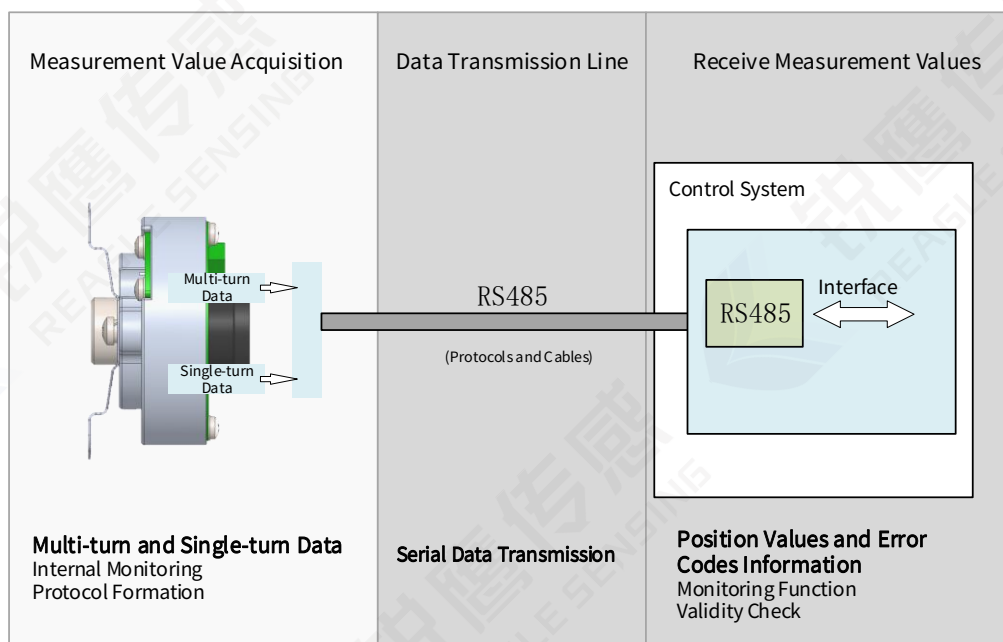
1. Summary Info

This manual primarily describes how to use the SROA42 conical shaft series multi-turn encoders from Reagle Sensing. This product mainly serves servo-driven control systems, providing the feedback information necessary for accurate position and speed control units.



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-SC-C-5V SROA42-M16S17Bit-SC-C-5V
Resolution	Supports up to 8,388,608 (23bit), compatible with 17bit.
Turns	65536 (16bit)
Absolute positioning accuracy	$< \pm 50$ Arc seconds
Repeat positioning accuracy	$< \pm 3$ Arc seconds
Auxiliary functions	Fault Warning * Electromagnetic Environment Warning * Battery Voltage Warning
Communication interface	RS485
Communication frequency	≤ 16 kHz
Baud rate	2.5Mbps
Input shaft allowable deviation	Axial: ± 0.5 mm Axial play: < 0.1 mm Radial: ± 0.1 mm Radial play: < 0.01 mm Tilt: 0.1°
Main shaft speed	≤ 6000 rpm
Shaft diameter	Cone axis $\varnothing 9$; Conical angle: 1:10
Moment of inertia	$0.68\text{kg}\cdot\text{mm}^2$
Starting torque (20°C)	≤ 0.005 Nm
Weight	≈ 0.06 kg (excluding cables)
Rotor angular acceleration	≤ 8000 rad/s ² when powered by a power source, ≤ 4000 rad/s ² when powered by a battery
Vibration	Between 10 and 55Hz, maintain amplitude of 1.5mm. Between 55 and 2000Hz, acceleration is 98m/s ² . 2 hours per axis for XYZ, totaling 6 hours.
Mechanical shock	Shock acceleration of 980m/s ² , 11 milliseconds. 3 impacts per direction, totaling 18 impacts.
Operating Temperature	$-10^\circ\text{C} \sim 105^\circ\text{C}$
Relative Humidity	$\leq 90\%$ (40°C/21 days, based on EN 60068-2-78); No condensation
Enclosure Protection Rating	IP 40

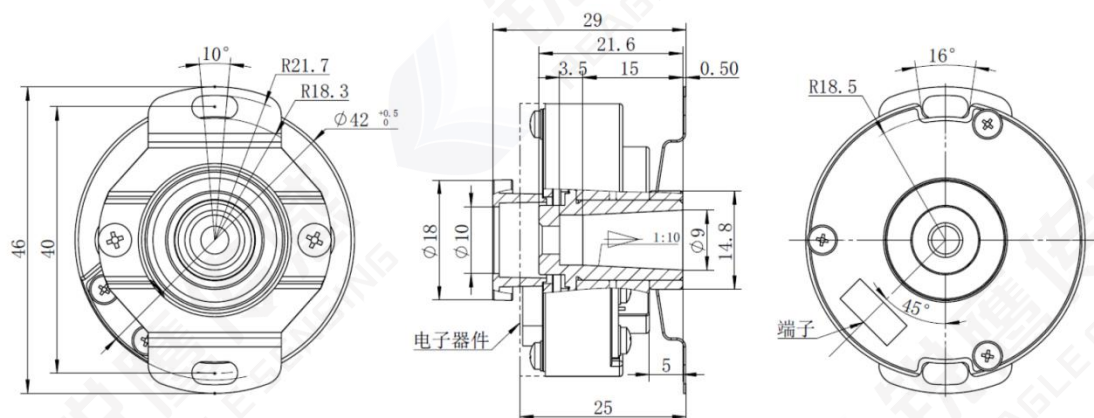
3. Electrical Parameters

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

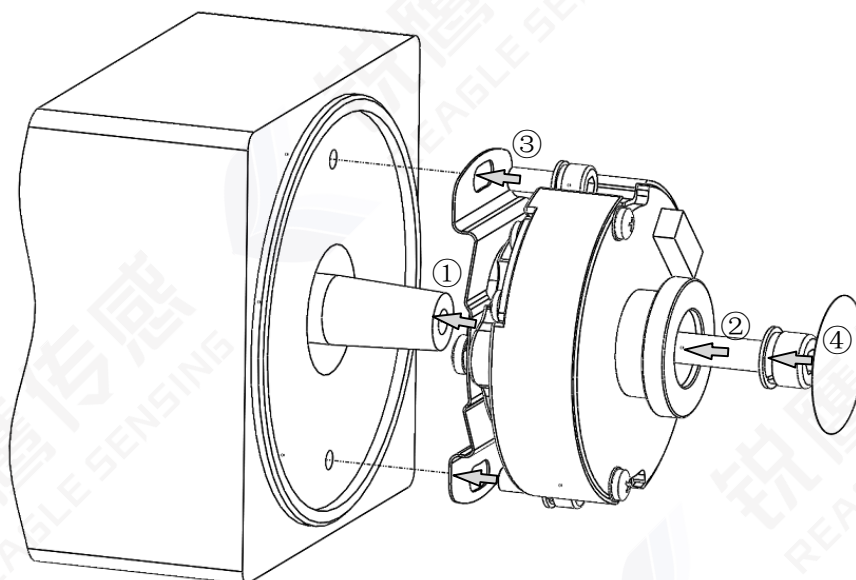
5. Mechanical Specifications



[Note]: The above are the default connection pins.

6. Mounting Procedure

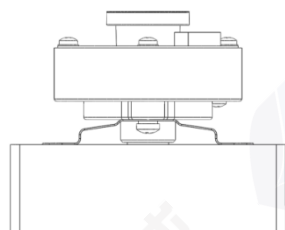
6.1 Installation Diagram



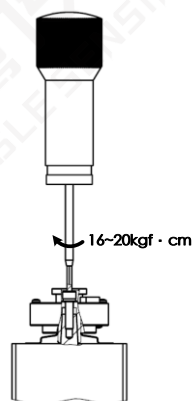
6.2 Installation Accessories

- Metric 2.5mm Hex Torque Wrench
- Metric 3.0mm Hex Torque Wrench

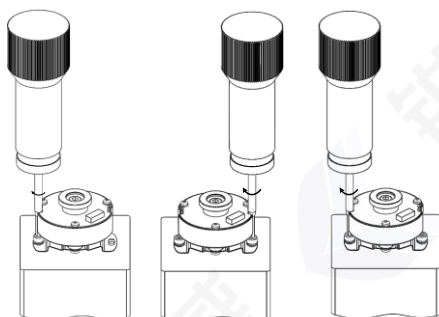
6.3 Installation Sequence



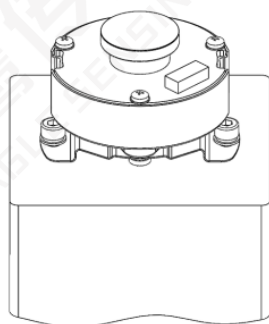
One. Place the encoder onto the motor shaft. When properly aligned, the encoder shaft should fit snugly with the motor shaft without any misalignment or looseness. If there is any issue, check the motor dimensions for deformation or foreign objects. Do not forcefully press down the encoder or strike it during installation.



Two. Insert an M4 hex socket head screw through the top of the encoder shaft and tighten it using the appropriate hex torque wrench. Recommended torque is 16~20 kgf·cm.



Three. Lightly tighten one side M3 screw with the corresponding hex torque wrench, then lightly tighten the other side M3 screw. Next, sequentially tighten both side screws to 8~10 kgf·cm torque.



Four. Apply a new dust-proof sticker over the hole on the rear cover.

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

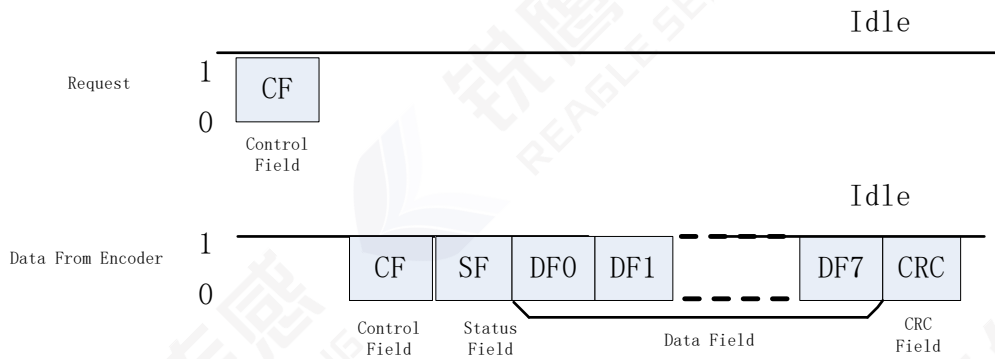
7.3 Frame Format

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:

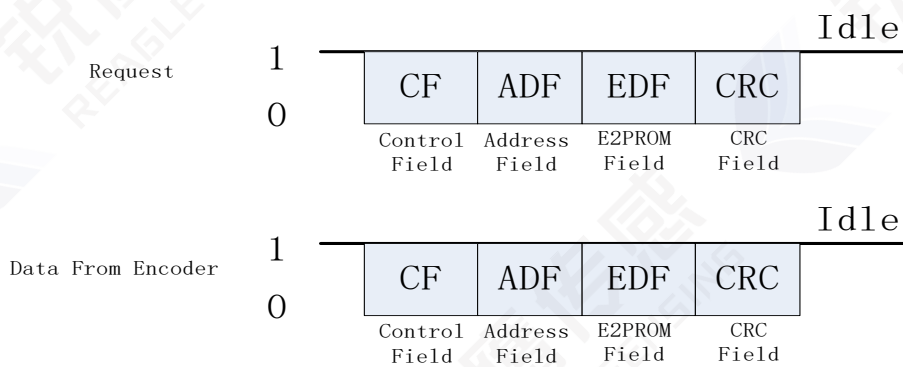
Items	Description	Remarks
CF	Control Field	Identifies different command types.
SF	Status Field	Provides information on the encoder's status
DF	Data Field	Encoder Position Data
ADF	Address Field	Accessible Encoder Address
EDF	E ² PROM Field	The content at the specified address
CRC	CRC Check	Polynomial: x8+1 (XOR all data except CRC)

7.3.1 Position Data Reading



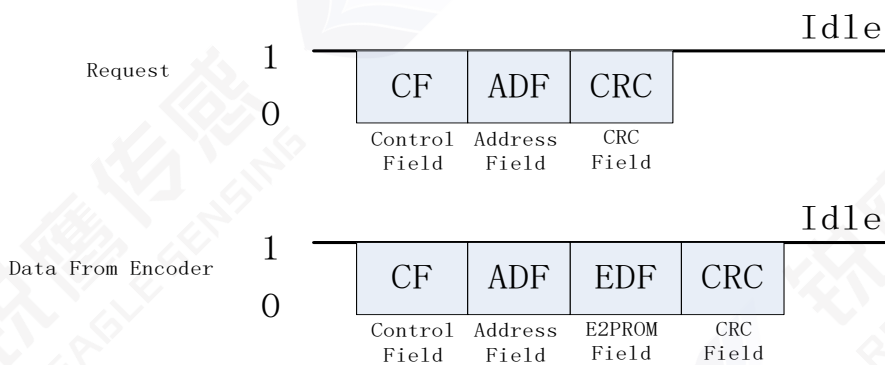
[Note]: The number of DF (Data Frames) varies depending on the CF (Configuration File).

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 ² PROM	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 ² PROM	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 类型	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:

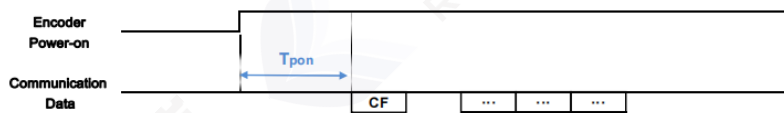
Bit	0	1	2	3	4	5	6	7
Name	Over-speed	"0"	Counting Error	"0"	"0"	Multi-turn error	Battery error	Battery alarm

Descriptions of fault flag bits are as follows:

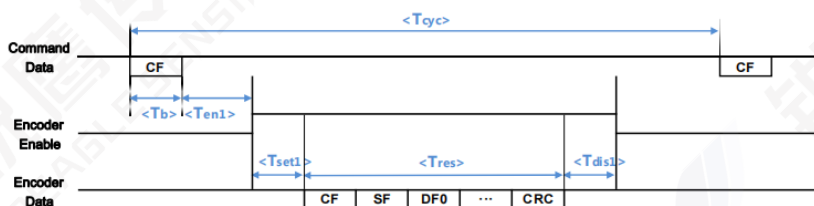
Name	Function	Action
Over-speed	For 5V power mode, when speed exceeds 7200 RPM	Reset Power
Counting Error	Single-turn information calculation fault	Reset Power
Multi-turn error	Multi-turn data loss or multi-turn counting fault	Fault reset
Battery error	Battery voltage below 2.9V, set flag	Check battery 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

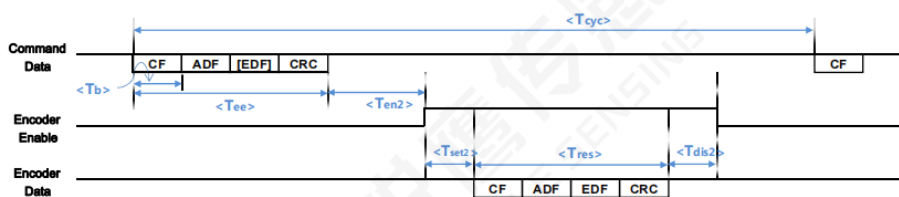
8.1 Timing Diagram



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	T_{pon}		450	550	ms	
Command cycle period	T_{cyc}	62.5			μs	
Data byte time	T_b		4		μs	
Encoder enable delay time	T_{en1}	1.5		3.5	μs	
	T_{en2}		4.5		μs	
Encoder EEPROM Command time	T_{ee}		12		μs	Read: 3bytes data
			16		μs	Write: 4 bytes data
Encoder response time	T_{res}		$4 \cdot N$		μs	N bytes data
Encoder data set-up delay time	T_{set1}	0.8		2	μs	
	T_{set2}	1		1.5	μs	
Encoder disable delay time	T_{dis1}	0.6		1.2	μs	
	T_{dis2}		1.3		μs	

SROA Timing Characteristics

9. Configuration Instructions

For ordering codes, please refer to the "Reagle Sensing Absolute Value Encoder Ordering Instructions."

For specifications and ordering codes for the terminal cables, please refer to the "Reagle Sensing Absolute Value Encoder Ordering Instructions."

Optional Configuration	Description
Connector Plate Type	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 Specifications Timing Description	Refine Communication Protocol Description Add Timing Section

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