

Multi-turn Absolute Rotational Encoder

SROA42-M16S23Bit-SC-C-5V

SROA42-M16S17Bit-SC-C-5V

SPECIFICATION

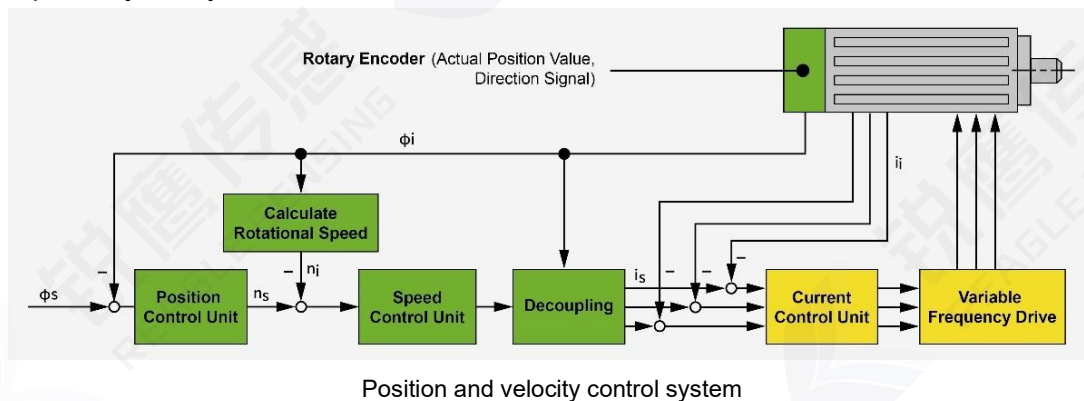


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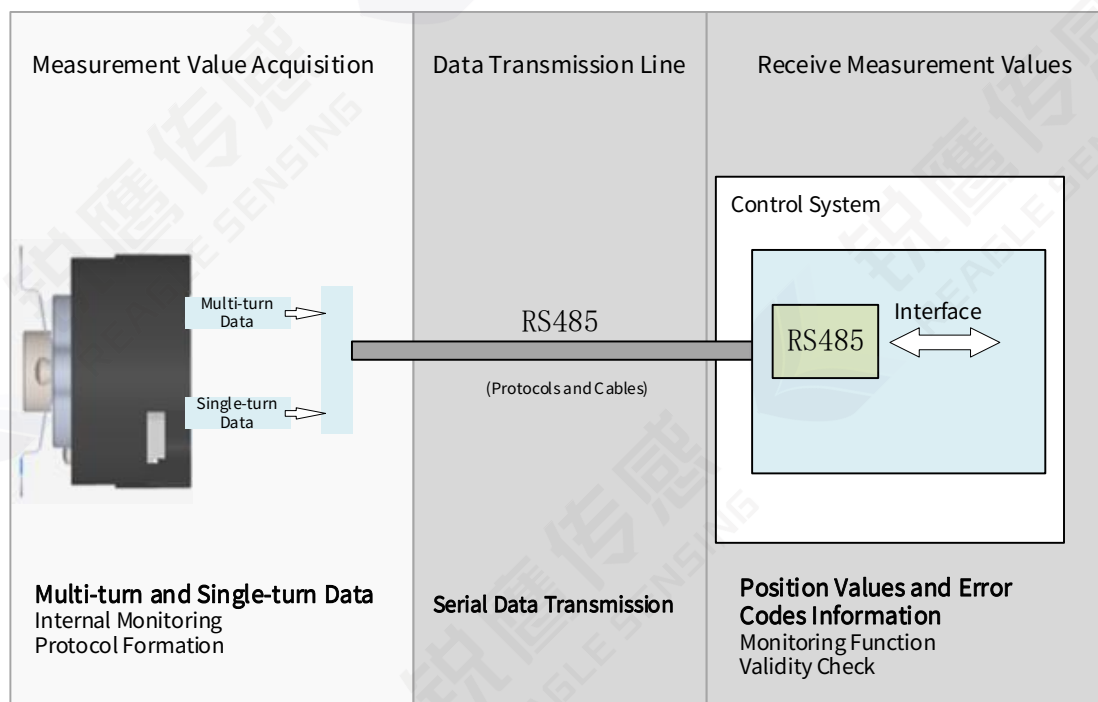
1. Summary Info

The manual primarily describes how to use the SROA42 cone axis series multi-turn encoder from Reagle Sensing's product line. This product mainly serves servo-driven control systems, providing the accurate position and speed control feedback information required by the 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-SC-C-5V SROA42-M16S17Bit-SC-C-5V |
|---------------------------------|--|
| Resolution | Supports up to 8,388,608 (23bit), compatible with 17bit. |
| Turn | 65536 (16bit) |
| Absolute positioning accuracy | $< \pm 50$ Arc seconds |
| Repeat positioning accuracy | $< \pm 3$ Arc seconds |
| Auxiliary functions | Fault Warning <ul style="list-style-type: none"> 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) | $\leq 0.005 \text{N} \cdot \text{m}$ |
| Weight | $\approx 0.06 \text{kg}$ (excluding cables) |
| Rotor Angular Acceleration | $\leq 80000 \text{ rad/s}^2$ when powered by a power supply; $\leq 4000 \text{ rad/s}^2$ 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 | $-20^\circ \text{C} \sim 105^\circ \text{C}$ |
| Relative Humidity | $\leq 90\%$ ($40^\circ \text{C}/21$ days, based on EN 60068-2-78); No condensation |
| Protection Rating | IP 40 |

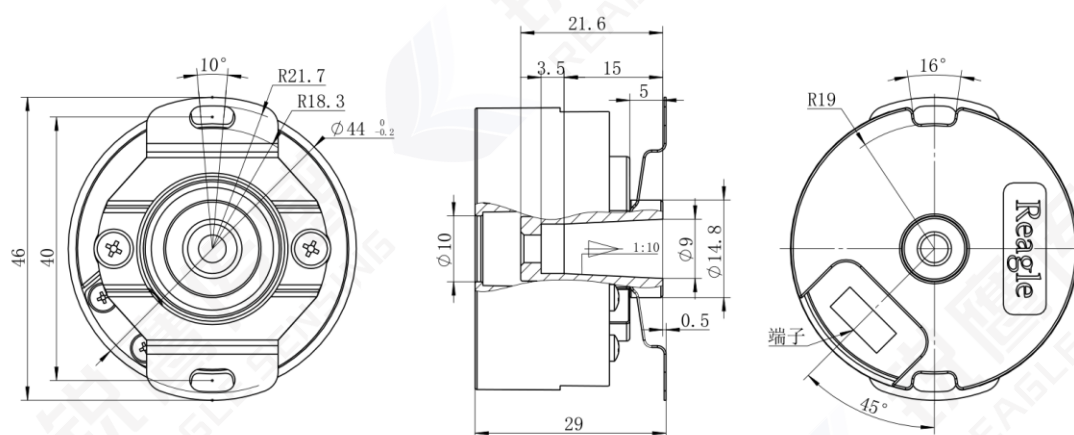
3. Electrical Parameters

| 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 to Low Power Mode Switching | -- | 4.2V | -- |
| | Low Power to Main Power Mode Switching | -- | 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 |

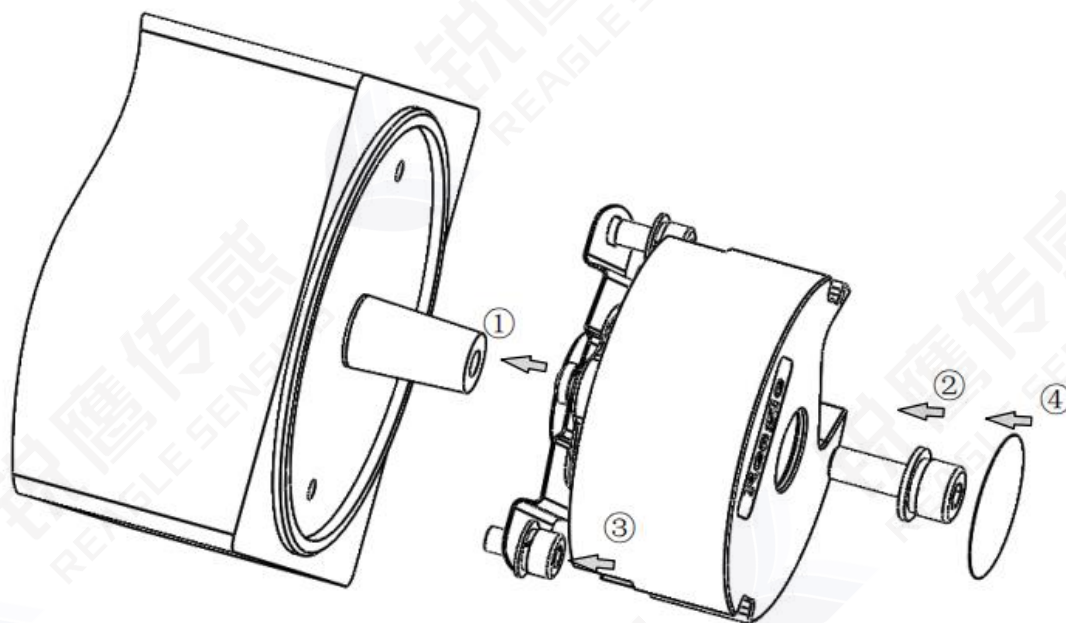
5. Mechanical Specifications



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

6. Mounting Procedure

6.1 Installation Diagram



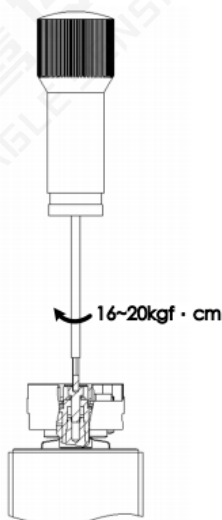
6.2 Installation Accessories

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

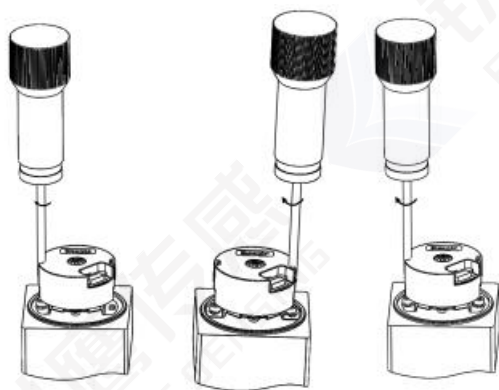
6.3 Installation Sequence



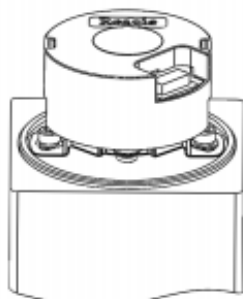
One. Place the encoder onto the motor shaft. When properly aligned, the encoder shaft should fit snugly with the motor shaft without any misalignment or looseness. If there is any issue, check the motor dimensions for deformation or foreign objects. Do not forcefully press down the encoder or strike 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*8 page | 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 order | | Executable Operation Count |

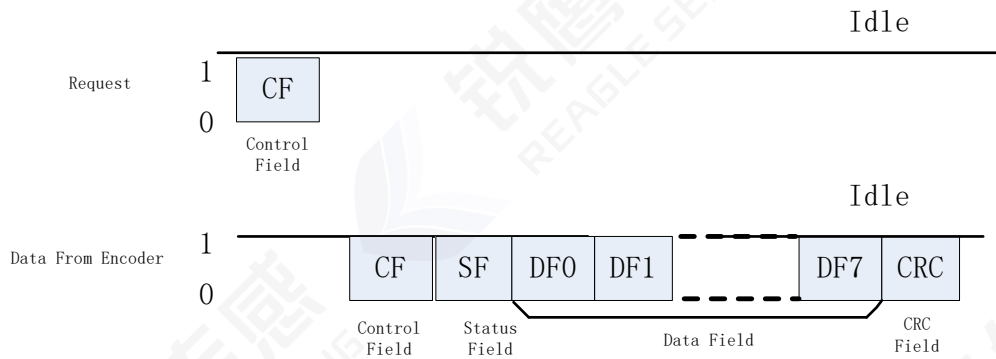
7.3 Frame Format

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:

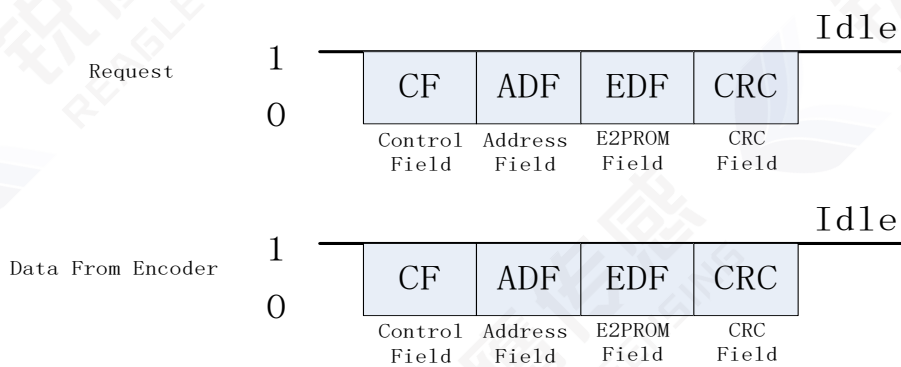
| Items | Description | Remarks |
|-------|---------------------------|---|
| CF | Control Field | Identifies different command types. |
| SF | Status Field | Provides information on the encoder's status |
| DF | Data Field | Encoder Position Data |
| ADF | Address Field | Accessible Encoder Address |
| EDF | E ² PROM Field | The content at the specified address |
| CRC | CRC Verification | Polynomial: x ⁸ +1 (XOR all data except CRC) |

7.3.1 Position Data Reading



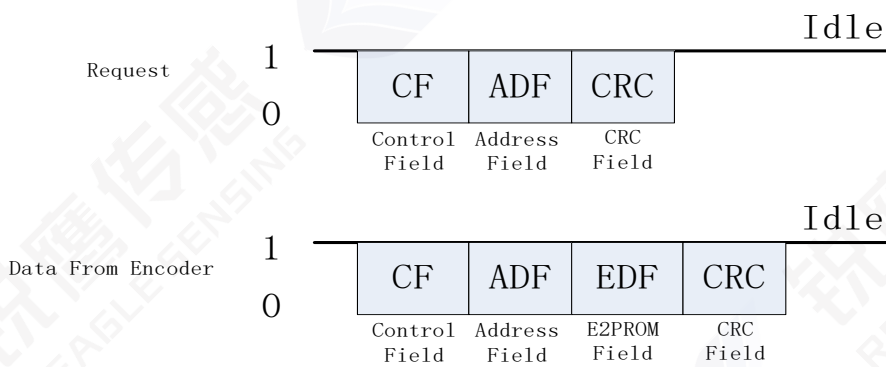
[Note]: The number of DF (Data Frames) varies depending on the CF (Configuration File).

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 Information Read (CF+SF+ABS+CRC) |
| | ID1(0x8A) | Multi-turn Data Information Read (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' Write (to a specified address) - User data can be written to a designated address. After sending the command in the correct format, the encoder will respond within 20 microseconds. During this time, do not communicate with the encoder. |
| Read E ² PROM | IDD(0xEA) | 8-bit 'User Data' Read (from a specified address) - User data can be read from a designated address. After sending the command in the correct format, the encoder will respond within 20 microseconds. During this process, avoid communicating with the encoder. |
| Reset | ID7(0xBA) | Reset Command (for all fault flags) - This reset command requires sending the command continuously 10 times with a minimum interval of 62.5 microseconds to reset all fault flags. |
| | ID8(0xC2) | Reset Command (for any single-turn position) - This reset command requires sending the command continuously 10 times with a minimum interval of 62.5 microseconds to reset any single-turn position to zero. This reset position remains even after re-powering. |
| | IDC(0x62) | Reset Command (for multi-turn data) - This reset command requires sending the command continuously 10 times with a minimum interval of 62.5 microseconds to reset multi-turn data to zero (does not affect single-turn data), and also resets all fault flags. |

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 | Equals the logical OR of ALMC.Bit5, Bit6, 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 respectively represent the low, middle, and high bits of the encoder's absolute position, where the top 7 bits of ABS2 are 0, and the rest form the 17-bit position information (for a 23-bit encoder, the top 1 bit of ABS2 is 0, and the rest are valid bits).
2. ABM0 to ABM2 represent the low, middle, and high bits of the encoder's multi-turn position, where ABM2 is all zeros, and the rest form the 16-bit multi-turn information.
3. ENID is the ID of the encoder, valued at 0x11 (17Bit) or 0x17 (23Bit).
4. ALMC is the encoder fault flag bit, see section 7.4.4 for details.

7.4.4 Fault description

ALMC faults are detailed in the table below:

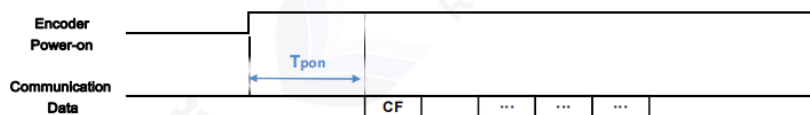
| Bit | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--------------------|------------|-----|----------------|-----|-----|------------------|---------------|---------------|
| Description | Over-speed | "0" | Counting Error | "0" | "0" | Multi-turn error | Battery error | Battery alarm |

Descriptions of fault flag bits are as follows:

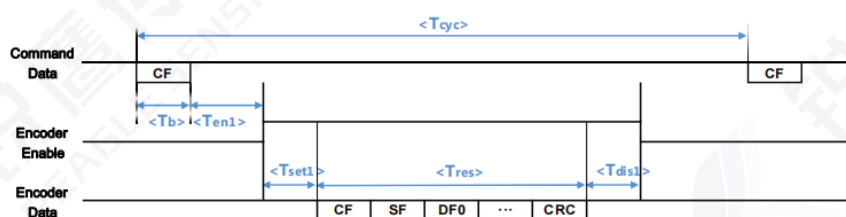
| Name | Function | Action |
|------------------|--|--|
| Over-speed | In a 5V power supply mode, the speed exceeds 7200 RPM. | Power cycle |
| Counting Error | Single-turn information solving failure. | Power cycle |
| Multi-turn error | Multi-turn data loss, multi-turn counting failure. | Fault reset |
| Battery error | Battery voltage below 2.9V, set. | Check battery power supply line, replace battery |
| Battery alarm | Battery voltage below 3.1V, set. | After replacing the battery with one of normal voltage, the fault disappears automatically |

8. Timing Description

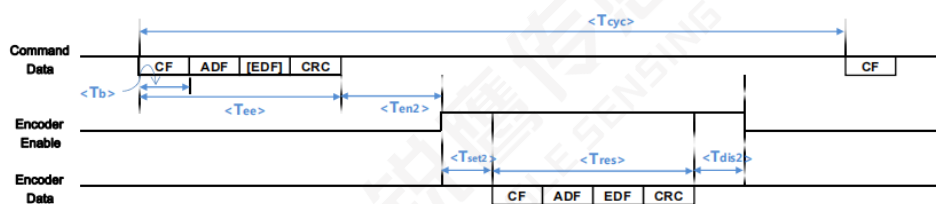
8.1 Timing Diagram



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 | |

9. Configuration Instructions

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

Specifications for terminal cables are detailed in the "Reagle Sensing Absolute Encoder Terminal Cable Drawings."

| Optional Configuration | Description |
|------------------------|---|
| Resolution | 17Bit/23Bit |
| Connector type | Type A (default type) / Type C / Type D |

Revision History

| No. | Version Number | Modification Details or Changes | |
|-------|----------------|--|--|
| | | Location | Content |
| 3378F | V1.0 | / | New |
| 35C8E | V2.0 | Communication Specifications Timing Description | Detailed communication protocol description Add timing section |
| 35D5B | V2.1 | Mechanical Specifications | Change in structural dimensions |
| 38345 | V2.2 | Operating Temperature | Update temperature range |
| 385A1 | V2.3 | Mechanical Specifications | Change in structural dimensions |
| | | | |
| | | | |
| | | | |
| | | | |

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