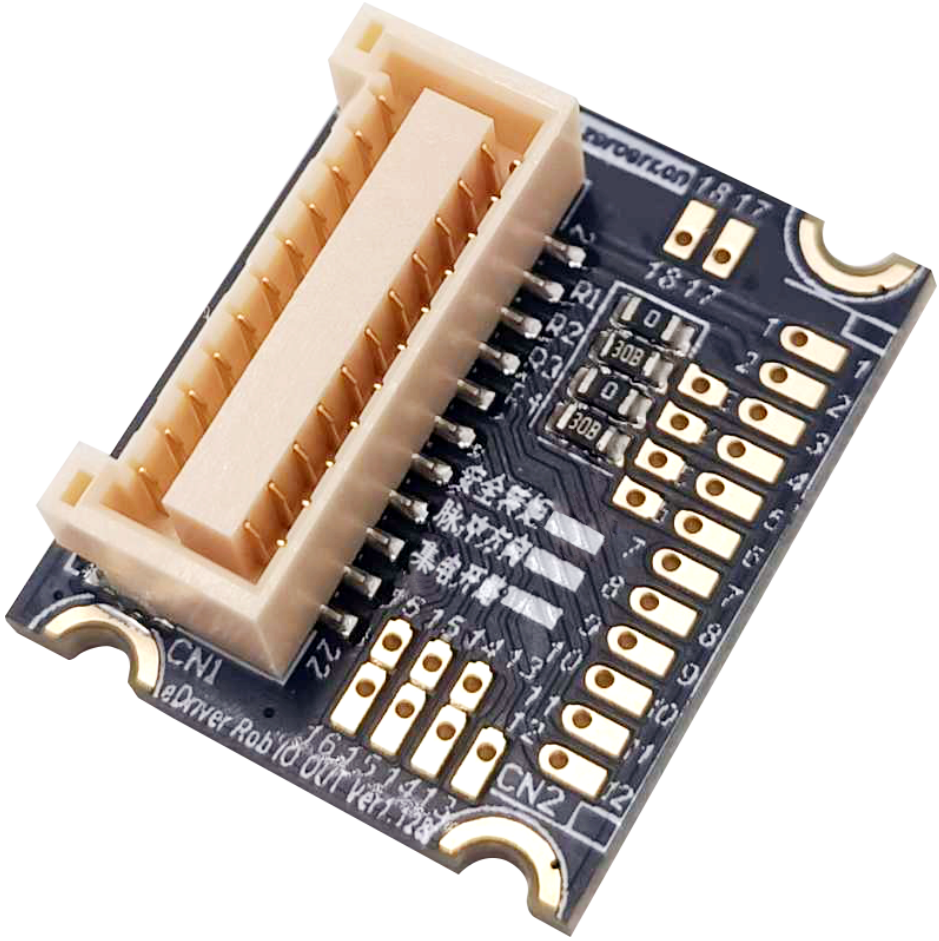
零差云控®

I/O Adapter Board User Manual

Version 1.0



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What's New

0.1 I/O Adapter Board User Manual Version 1.0 Update

0.1.1 Format

(1) NEW full English format.

0.1.2 Added Content

(1) NEW chapter added What's New
(2) NEW chapter added Content Modification Markings
(3) NEW chapter added Record of Revisions
(4) NEW enhanced chapter: SAFETY GUIDE.
Added new safety guide items and utilized the ZeroErr's proprietary safety symbols in compliance with the ISO3864-2.
(5) NEW chapter added Symbols and Abbreviations
(6) NEW chapter added Warranty
(7) NEW chapter added Declaration
(8) NEW chapter added About Us

0.1.3 Removed Content

(1) NONE.

Content Modification Markings

0.2 New Content

The new content in this document of the current version is marked with a blue strip and ★ symbol.

Example:

★ Thank you for choosing ZeroErr's eRob series rotary actuator module. We appreciate your trust and confidence in our product. To ensure your satisfaction and enhance your user experience, we have carefully designed this user manual to provide you with all the necessary information for operating and maintaining your eRob rotary actuator module.

0.3 Enhanced Content

The enhanced content in document of the current version is marked with a green strip and Δ symbol.

Example:

Δ If you have any questions or encounter any issues while using eRob rotary actuator module, please do not hesitate to reach out to our customer support team. We are here to assist you and provide timely assistance to ensure that you have a smooth and enjoyable experience.

Record of Revisions

Version	Iteration	Description	Date
1.0	1	Full english format; new safety guide items, utilized the ZeroErr's proprietary safety symbols in compliance with the ISO3864-2; new what's new chapter added; new content modification markings chapter added; new record of revisions chapter added; new symbols and abbreviations chapter added; new warranty chapter added; new declaration chapter added; new about us chapter added.	November 29, 2023

SAFETY GUIDE

Before installing, operating, maintaining, or inspecting this product, please be sure to read this SAFETY GUIDE and fully understand the information provided in this user manual and appendices before using the product. Mishandling the eRob I/O Adapter Board may cause harm to personnel or damage to property. Therefore, it is essential that the operator read and understand this manual thoroughly.

It is crucial to follow the SAFETY GUIDE outlined in this manual.

It is recommended to keep this manual in a readily accessible location for easy reference during operation and maintenance of the product.

0.4 NOTATION

Symbol	Definition
	**WARNING:** This indicates a potentially hazardous situation which, if not avoided, could result in personal injury or serious equipment damage.
	**WARNING:** This indicates a potentially hazardous electrical situation which, if not avoided, could esult in personal injury or serious equipment damage.
	**WARNING:** This indicates a hot surface that can create a hazard, which if touched, could result in personal injury.
	**CAUTION:** This refers to a situation which, if not avoided, could result in equipment damage.

0.5 Please Adhere to the Following Guidelines to Avoid Personal Injury:

WARNING:

1. Work in a Well-Ventilated Area:
Always solder in a well-ventilated space or use a fume extractor to remove harmful soldering fumes. Proper ventilation helps prevent inhalation of hazardous substances.

2. Wear Personal Protective Equipment (PPE):
Wear safety goggles to protect your eyes from potential solder splatter or debris.

3. Use a Soldering Iron Stand:
Always use a soldering iron stand or holder to secure the iron when not in use. This prevents accidental burns or fires by preventing direct contact with flammable materials.

WARNING:

1. Beware of Hot Surfaces:
Take caution when handling soldering irons, as they can reach high temperatures. Avoid touching the hot surfaces directly and use soldering iron stand to place the soldering iron during use

0.6 Please Adhere to the Following Guidelines to Avoid Board Damage:

WARNING:

1. Disconnect Power:
Before working on a PCB, always disconnect the power source. Ensure that the PCB and associated components are de-energized to avoid electric shock or damage.

WARNING:

1. Use Proper Soldering Techniques:
Follow correct soldering techniques and practices to ensure reliable and consistent connections. Avoid excessive heat or prolonged contact with components to prevent damage.

2. Storage:
Please do not stack or pile up this product without proper protection to avoid physical damage. Ensure that the storage environment is free from dust, metal particles, corrosive gases, flammable gases, oil mist, and other contaminants.

WARNING:

3. Pay Attention to Electrostatic Discharge (ESD) Protection:
During the handling, installation, and wiring process of this product, operators should take proper ESD precautions, such as wearing anti-static wristbands or gloves.
Do not directly touch this product with bare hands to prevent ESD damage to the components. When handling, hold the edges of the board and avoid touching the solder pads to prevent scratching, scraping, or contamination of the solder pads. Handle the product with care, avoiding friction between components to prevent mechanical damage.

0.7 Please Adhere to the Following Guidelines to Avoid Performance Issues:

CAUTION:

1.During the soldering and wiring process of this product, ensure that the soldering iron temperature does not exceed 280°C.
2.Avoid applying excessive pressure to the solder pads; simply ensure that the soldering iron tip makes sufficient contact with the solder joint.
3.Please be aware that excessive solder or solder droplets may cause electrical performance issues due to short circuits, so it is important to conduct inspections to prevent such issues.

0.8 Disposal Information:

WARNING:

1. Properly Dispose of Waste:
Dispose of solder waste, such as used soldering tips, flux, and solder dross, in accordance with local regulations. Avoid improper disposal that could harm the environment.

Table of Contents

Symbols and Abbreviations

0.9 Symbols

Symbol	Definition
Ω	Unit of Resistance (Ohm)
Φ	Diameter
mm	Unit of Length (millimeter)
V_{DC} / VDC	DC Voltage
W	Unit of Power (Watt)
$\%RH$	Relative Humidity
$°C$	Celsius Degree

★ 0.10 Abbreviations

Abbreviation	Definition
COM	Communication
DC	Direct Current
Dir	Pulse Command Direction
ESD	Electrostatic Discharge
GND	Ground / Earth
I/O	Input / Output
N/A	Not Applicable
R	Resister
SB	Emergency Stop Button
STO	Safe Torque Off
PCB	Printed Circuit Board
PPE	Personal Protective Equipment

Chapter 1 Overview

1.1 Product Description

The ZeroErr I/O Adapter Board is specifically designed for applications that require the use of eRob rotary actuator modules with Safe Torque Off (STO) functionality and pulse direction control. This adapter board is equipped with built-in resistors, eliminating the need for manual installation of resistors, and can be cascaded to the I/O interface of the next eRob robot joint module, making it easy to connect and highly recommended.

Chapter 2 Specifications

2.1 Physical Specifications

Table 2-1 Physical Specifications

Item	Specification	Description
Mass (g)	2	N/A
Dimensions (mm)	21.3 × 18.1 × 7	Refer to Figure 5-1 for details.

2.2 Environment Specifications

Table 2-2 Environment Specifications

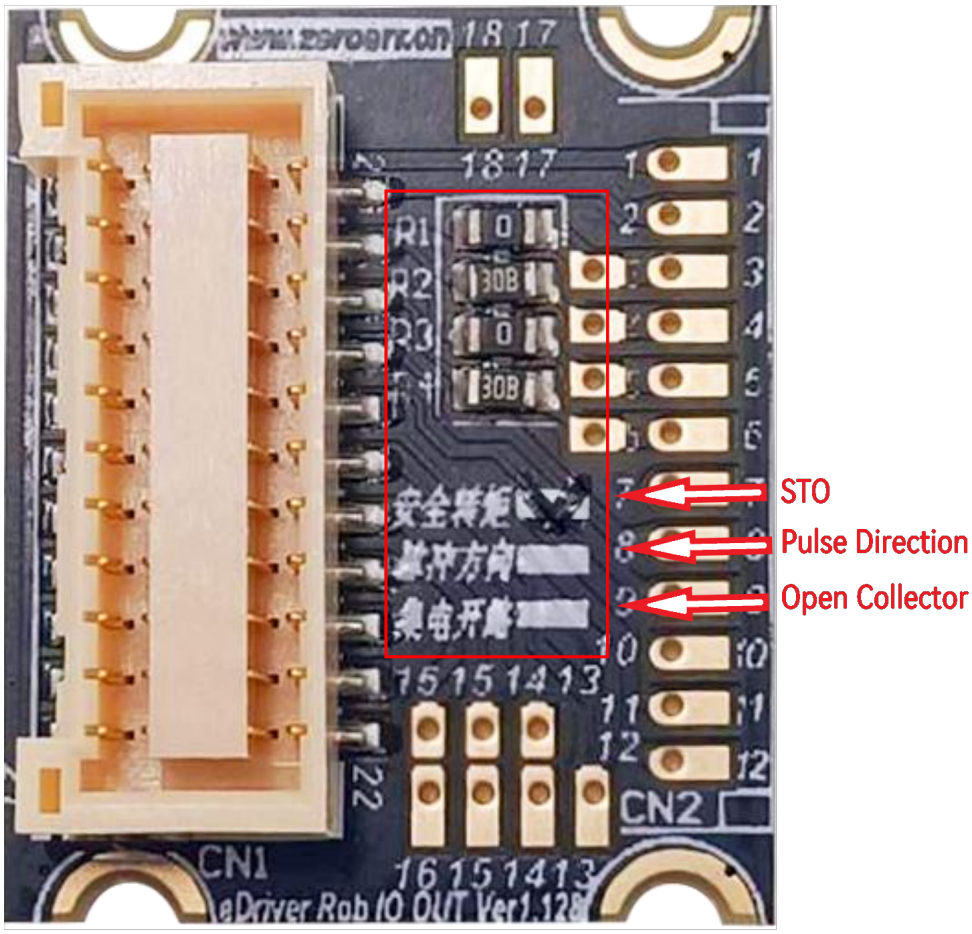
Condition	Specification
Operation Temperature	−40~85°C
Storage Temperature	−40~85°C
Operation & Storage Humidity	20%~85%RH (No condensation)

NOTE: Please ensure that the operation environment is free from dust, metallic particles, corrosive gases, flammable gases, oil mist, and other similar contaminants.

Chapter 3 Model Definition

Table 3-1 Resistance Under Different Control Mode

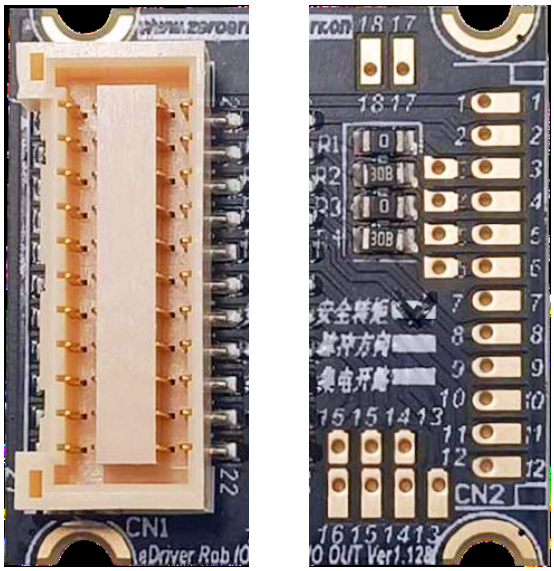
Control Mode	R1	R2	R3	R4
STO	0Ω 1/10W, ±1%, 0603	2kΩ 1/10W, ±1%, 0603	0Ω 1/10W, ±1%, 0603	2kΩ 1/10W, ±1%, 0603
Pulse Direction	0Ω 1/10W, ±1%, 0603	0Ω 1/10W, ±1%, 0603	0Ω 1/10W, ±1%, 0603	0Ω 1/10W, ±1%, 0603
Open Collector	470Ω 1/10W, ±1%, 0603	470Ω 1/10W, ±1%, 0603	470Ω 1/10W, ±1%, 0603	470Ω 1/10W, ±1%, 0603



Chapter 4 Terminal and Wiring Illustration

4.1 I/O Adapter Board Terminal Layout Illustration

The actual diagram of the I/O interface module is shown in Figure 4-1. The left side features a 22-pin terminal for connecting external control input signals, while the right side features 18-pin terminal for connecting eRob rotary actuator module I/O signal terminals. The electrical interface definitions can be found in Table 4-1 and Table 4-2.



(a) 22-Pin Terminal (b) 18-Pin Terminal

Figure 4-1 Terminal Layout Illustration

Table 4-1 22-Pin Terminal Layout

Pin	Terminal Label	Terminal Function
1	RS485-A	RS485 COM Interface DATA+
2	RS485-B	RS485 COM Interface DATA-
3	IN1- / Pulse- / STOA-	Digital Input DIn1 / Pulse Command Signal / STOA
4	IN1+ / Pulse+ / STOA+	
5	IN2- / Dir- / STOB-	Digital Input DIn2 / Pulse Command Direction / STOB
6	IN2+ / Dir+ / STOB+	
7	OUT_COM	Programmable output signal ground
8	OUT_1	Programmable digital output 1
9	OUT_2	Programmable digital output 2
10	GND	Signal ground
11	ANALOG1+	Analog signal input + (input range -10V ~+10V)
12	ANALOG1-	Analog signal input- (input range -10V ~+10V)
13	Reserved	—
14	Reserved	—
15	Reserved	—

Continued on next page

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Table 4-1 22-Pin Terminal Layout

PIN	Terminal Label	Terminal Function
16	Reserved	—
17	Reserved	—
18	Reserved	—
19	IN1- / STOA-	Digital Input DIn1 / STOA
20	IN1+ / STOA+	
21	IN2- / STOB-	Digital Input DIn2 / STOB
22	IN2+ / STOB+	

Table 4-2 18-Pin Terminal Layout

Pin	Terminal Label	Terminal Function
1	RS485-A	RS485 COM Interface DATA+
2	RS485-B	RS485 COM Interface DATA-
3	IN1- / Pulse- / STOA-	Digital Input DIn1 / Pulse Command Signal / STOA
4	IN1+ / Pulse+ / STOA+	
5	IN2- / Dir- / STOB-	Digital Input DIn2 / Pulse Command Direction / STOB
6	IN2+ / Dir+ / STOB+	
7	OUT_COM	Programmable output signal ground
8	OUT_1	Programmable digital output 1
9	OUT_2	Programmable digital output 2
10	GND	Signal ground
11	ANALOG1+	Analog signal input + (input range -10V ~+10V)
12	ANALOG1-	Analog signal input- (input range -10V ~+10V)
13	Reserved	—
14	Reserved	—
15	Reserved	—
16	Reserved	—
17	Reserved	—
18	Reserved	—

4.2 I/O Adapter Board Wiring Illustration

4.2.1 STO Function Wiring Illustration

STO function wiring for a single eRob rotary actuator module is shown in Figure 4-2. STO function wiring for a multiple eRob rotary actuator module is shown in Figure 4-3. For more details regarding the STO functionality, please refer to *Chapter 22* of the *eRob Rotary Actuator User Manual*

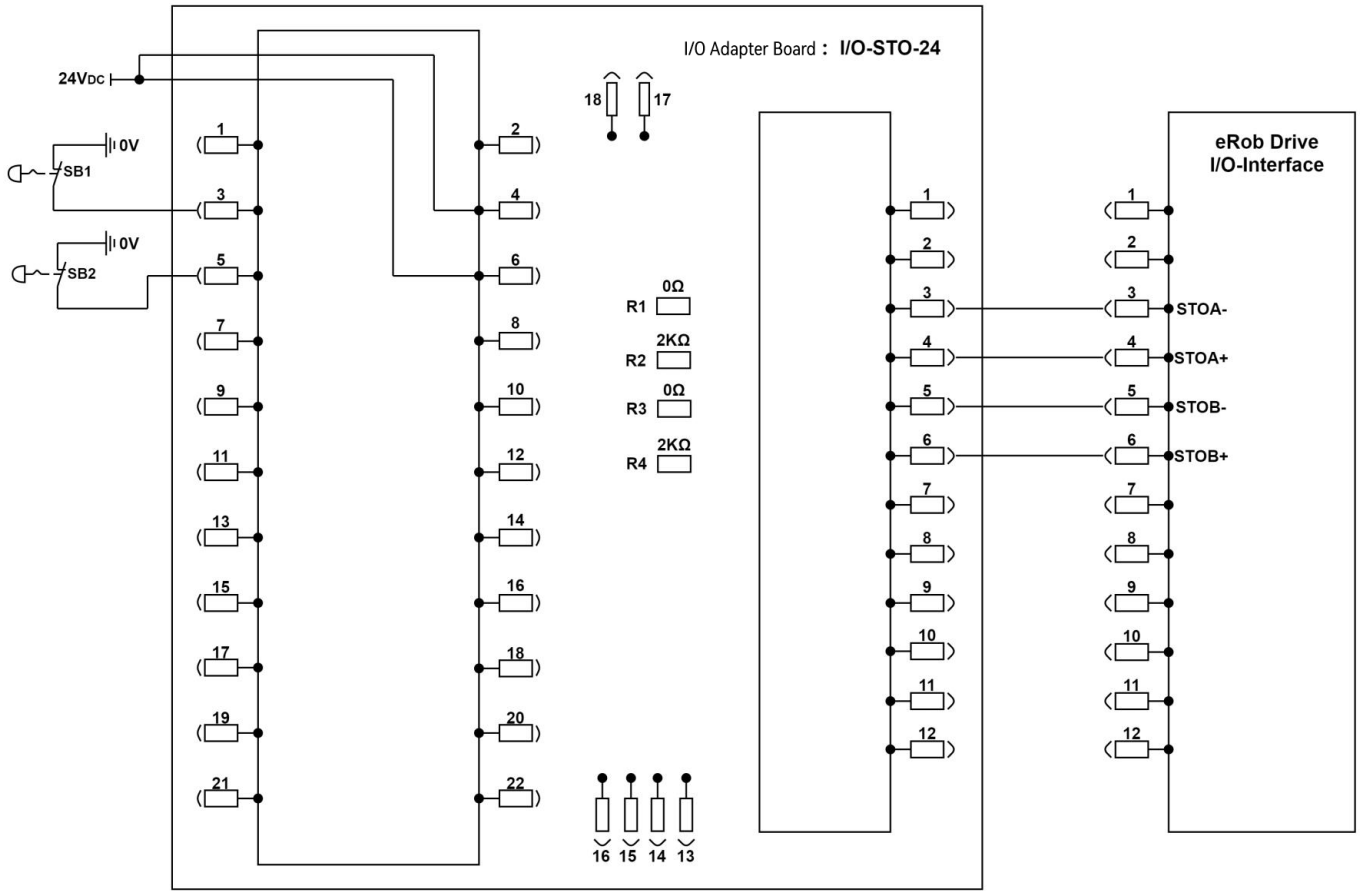


Figure 4-2 Single eRob Module Two STO Branch Circuit Function Wiring Diagram

NOTE:

(1) The power input voltage of the I/O Adapter Board is 24VDC.

(2) The SB1 & SB2 represent the emergency stop buttons.

(3) Figure 4-2 shown above shows the two STO branch circuits function configuration illustration diagram, when setting up the one STO branch circuits function configuration, connect STOA only.

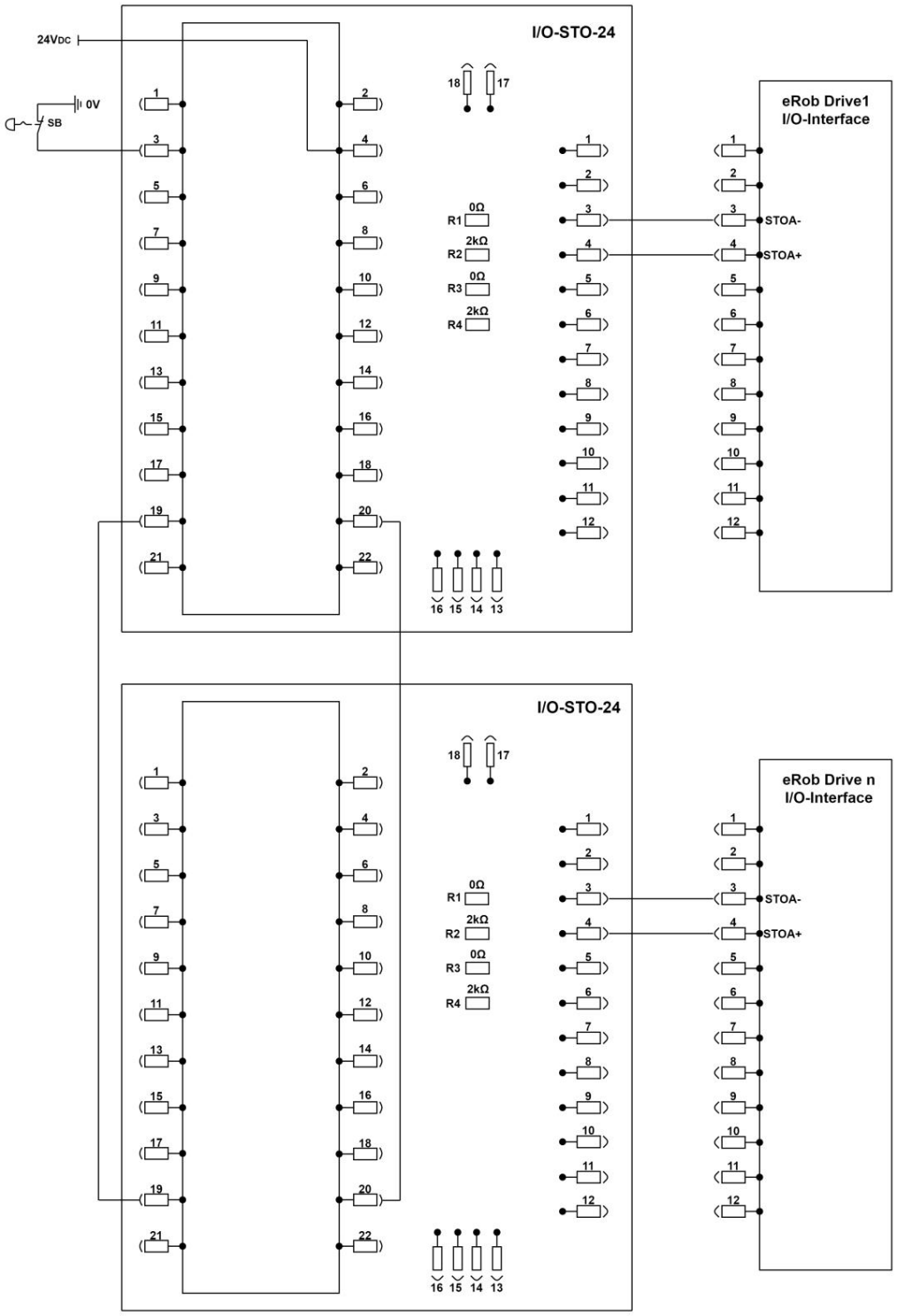
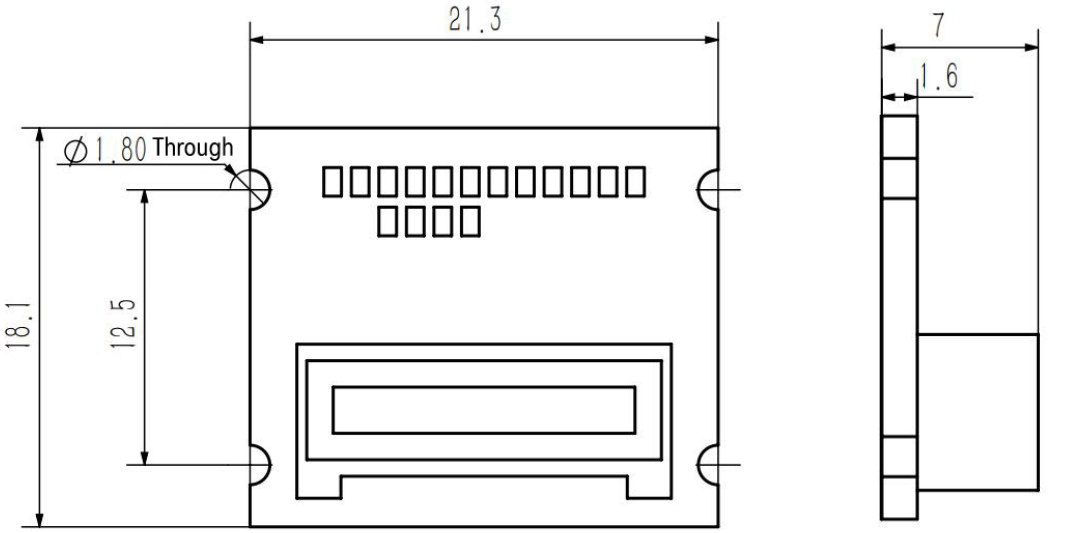


Figure 4-3 Multiple eRob Module One STO Branch Circuit Function Wiring Diagram

Chapter 5 Installation

5.1 Dimensions of I/O Adapter Board



(a) Top-View Dimensions (mm)

(b) Side-View Dimensions (mm)

Figure 5-1 Dimension of I/O Adapter Board Illustration

5.2 Installation Method

The permissible fastener installation area is as shown in Figure 5-2, the board is secured using fastener / screws, during installation, please make sure to establish proper insulation protection measures.

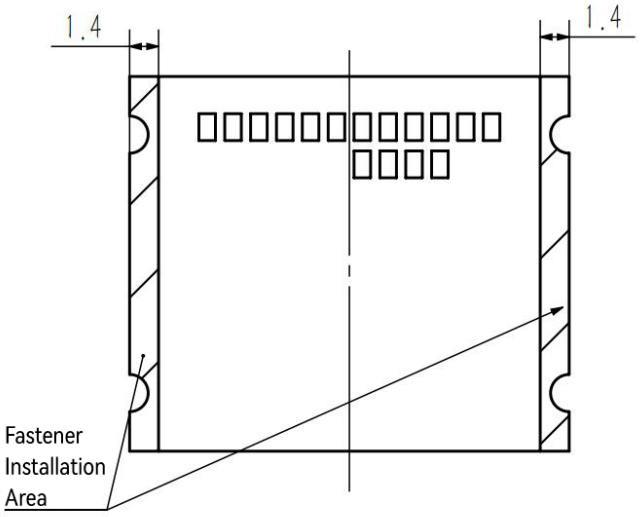


Figure 5-2 Permissible Fastener Installation Area (mm)

Appendix A Warranty

A.1 Warranty Period and Scope

(1) Within a period of 7 days from the day following the customer's receipt of the product, in the event of non-human-induced performance failure, subject to confirmation by the ZeroErr Control Co.,Ltd After-Sales Service, the customer shall be entitled to initiate a return procedure. The customer is required to furnish a valid purchase receipt and return the invoice upon making the return. In cases where complimentary items were provided, they shall also be returned in conjunction with the product.

(2) From 8 days to 365 days after the customer's receipt of the product, upon verification by the ZeroErr Control Co.,Ltd After-Sales Service that the issue pertains to an inherent quality fault of the product, priority replacement service shall be granted. It is to be noted that this product undergoes a series of stringent factory tests, and the company reserves the right to decline the customer's requests for return or exchange in cases where the issue does not originate from an inherent quality fault of the product.

(3) Provided that the product is operated, used, and maintained in accordance with the specifications, instructions, and manuals, all products shall be warranted for a period of one year ("Warranty Period") from the date of delivery. Furthermore, this warranty strictly pertains to the specific product. Any additional losses arising from the product malfunction, as well as costs associated with equipment assembly or disassembly, shall not fall within the purview of this company's responsibility. If a malfunction occurs within the aforementioned warranty period due to manufacturing defects attributable to this company, this company shall assume the responsibility of repairing or replacing the product.

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A.2 Non-Warranty Provisions

The following circumstances shall be excluded from the warranty coverage:

(1) Exceeding the warranty period as stipulated in the warranty terms.

(2) Unauthorized disassembly of the module or tampering with the integrity of tamper-evident labels.

(3) Occurrence of product abnormalities subsequent to destructive testing, such as extreme temperature variations, humidity exposure, overloading, submersion, electromagnetic compatibility (EMC) testing, vacuum testing, and similar assessments.

(4) Product damage or destruction resulting from improper utilization deviating from the user manual's prescribed instructions.

(5) Detachment, loosening, melting, or poor contact of the power interface; detachment or loosening of the communication interface, and similar issues.

(6) Slippage of threaded installation interfaces or broken screws.

(7) Substantial impact damage characterized by external damage exceeding dimensions of 3mm in any direction, accompanied by protrusion or depression greater than 0.02mm.

(8) Collisions occurring during loaded or unloaded utilization.

(9) Damage or destruction arising from improper operation, maintenance, installation, modification, testing, or other forms of unauthorized utilization.

(10) Conventional mechanical wear and tear unrelated to quality faults.

(11) Damage resulting from abnormal working conditions, including but not limited to falls, impacts, liquid ingress, severe collisions, and similar scenarios.

(12) Damage caused by acts of nature such as floods, fires, lightning strikes, earthquakes, or other force nature events.
(13) Damage resulting from the application of torque exceeding specified permissible maximum levels.
(14) Use of non-original genuine products from ZeroErr Control Co.,Ltd or inability to provide a legitimate purchase receipt.
(15) Other malfunctions or damage arising from product design, technology, manufacturing, quality-related issues, or similar factors.

Should any of the aforementioned circumstances arise, the customer shall bear the associated costs accordingly.

Declaration

Our product is not designed or intended for use outside the environmental limitations and operating parameters expressly stated on the product's datasheet. Products are not designed or intended for use in medical, military, aerospace, automotive or oil, gas applications or any safety-critical applications where a failure of the product could severe serious environmental or property damage, personal injury, or death. Any use in such applications must be specifically agreed to seller in writing and is subject to such additional terms as the seller may impose in its sole discretion. Use of products in such applications is at buyer's own risk, and buyer will indemnify and hold harmless seller and its affiliates against any liability, loss, damage, or expense arising from such use. Information contained in this datasheet was derived from product testing under controlled laboratory conditions and data reported thereon is subject to the stated, then to tolerances and variations, or if none are stated, then to tolerances and variations consistent with usual trade practices and testing methods. The product's performance outside of laboratory conditions, including when one or more operating parameters is at its maximum range, may not conform to the product's datasheet. Further, information in the product's datasheet does not reflect the performance of the product in any application, end-use or operating environment buyer or its customer may put the product to. Seller and its affiliates make no recommendation, warranty, or representation as to the suitability of the product for buyer's application, use, end-product, process, or combination with any other product or to any results buyer or its customer might obtain in their use of the product. Buyer should use its own knowledge, judgment, expertise, and testing in selecting the product for buyer's application, and-use and/or operating environment, and should not rely on any oral or written statement, representation, or samples made by seller or its affiliates for any purpose. Except for the warranties expressly set forth in the seller's terms and conditions of sale, seller makes no warranty express or implied with respect to the product, including any warranty of merchantability or fitness for any particular purpose, which are disclaimed and excluded. All sales are subject to seller's exclusive terms and conditions of sales which, where the seller is another person, are available on request, and in each case, are incorporated herein by reference, and are exclusive terms of sale. Buyer is not authorized to make any statements or representations that expand the environmental limitations and operating parameters of the products, or which imply permitted usage outside of that expressly stated on the datasheet or agreed to in writing by seller.

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ZEROERR CONTROL CO.,LTD

About Us

ZeroErr Control Co.,Ltd was founded in December 2016 in ShenZhen, China. ZeroErr stands for Zero Error Motion Control.
We design, develop and manufacture rotary actuators and encoders which are widely used in automation industry, collaborative robots, surgical robots and bionic robots. More than thousands of customer groups in the global use simple combinations with our products makes wide range of applications.
ZeroErr is committed to providing reliable quality standard production, cost-effective products and quick response technical support, enabling our customers to accelerate innovation, improve productivity and achieve extraordinary application performance.

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