



R3 Series Extension Module

User Manual



For models of R3 Series Module

©2020 Leadshine Technology Co., Ltd.

Address: 15-20/F, Block B, Nanshan I Valley, No.3185, Shahe West Road, Nanshan District,
Shenzhen, Guangdong, 518055, China

Tel: (86)755-26409254

Fax: (86)755-26402718

Web: www.leadshine.com

Sales: sales@leadshine.com

Support: tech@leadshine.com

Notice

Read this manual carefully before any assembling and using. Incorrect handling of products in this manual can result in injury and damage to persons and machinery. Strictly adhere to the technical information regarding installation requirements.

This manual is not for use or disclosure outside of Leadshine except under permission. All rights are reserved.

No part of this manual shall be reproduced, stored in retrieval form, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise without approval from Leadshine. While every precaution has been taken in the preparation of the book, Leadshine assumes no responsibility for errors or omissions.

Neither is any liability assumed for damages resulting from the use of the information contained herein.

This document is proprietary information of Leadshine that is furnished for customer use ONLY. Information in this document is subject to change without notice and does not represent a commitment on the part of Leadshine.

Therefore, information contained in this manual may be updated from time-to-time due to product improvements, etc., and may not conform in every respect to former issues.

◆ **Thank you for purchasing Leadshine R3 series products**

◆ **Please read this manual carefully before operating**

◆ **Please keep this manual appropriately**

Record of Revisions

Manual Reversion	Data	Description of Release
V1.0	12/23/2023	Initial Release
V1.1	3/10/2024	Add serial port and temperature module

Safety Precautions

Overall Notes



- Do not remove the housing with the R3 module powered on. Cables. Connectors and optional equipment.
- Commissioning the machine should be done with safety in mind! The user must design effective safety protection devices in the machine and include error handling programs in the software. Otherwise, it may cause personal safety accidents, property damage, etc.



- Please use the power supply specifications (number of phases.) that match the product. Voltage. Frequency.(DC).
- Connect the ground terminal of the R3 module to the grounding pole.
- Please do not disassemble the product yourself. Repair or modification.
- Make sure that all cable connectors are securely attached to this product. Improper installation may result in fire, or malfunction.



- Use double-insulated or reinforced insulation for control power.
- Do not use in places where water can be splashed. Corrosive environments. Do not use the product in the vicinity of flammable gases and combustible materials.
- Do not use damaged.
- Please set up an emergency stop circuit externally to ensure that the power can be cut off and the operation can be stopped immediately in case of an abnormality.
- Please to ensure that the input power is supplied within the specified voltage variation range.
- Please use a noise filter to reduce the influence of electromagnetic interference.

Precautions for Storage and Transportation



- Please follow the Commands on the packaging for storage and do not overload the product.
- Please place this product in the following environment:
 - No direct sunlight in the place.
 - Ambient temperature does not exceed the product specification.
 - Humidity does not exceed product specifications. Without condensation.
 - No corrosive gases. Place of flammable gas.
 - Dust. The place where there is less salt and metal powder.
 - No water. Oil. The place where the splash of medicine, etc. occurs.
 - Vibration or shock does not exceed product specifications.
 - No equipment generating strong magnetic fields in the vicinity.

Precautions for Installation



- Please install the R3 module in a cabinet that provides fire protection. Electrical protection in the control cabinet.
- Please install this product in the following environment:
 - No direct sunlight in the place.
 - Ambient temperature does not exceed the product specification.
 - Humidity does not exceed product specifications. Without condensation.
 - No corrosive gases. Place of flammable gas.
 - Dust. Dust. The place where there is less salt and metal powder.
 - No water. Oil. The place where the splash of medicine, etc. occurs.
 - Vibration or shock does not exceed product specifications.
 - No equipment generating strong magnetic fields in the vicinity.
- Do not block the air inlet and exhaust ports, and do not allow foreign objects to enter the R3 module.
- Do not step on the product or place heavy objects on the R3 module.
- Make sure to keep the specified intervals between the inner surfaces of the PLC control cabinet and other machines.

Precautions for Wiring



- Installation, wiring, etc. must be done after disconnecting all power sources; avoid wiring, plugging and unplugging cables in an electrified state, as this may cause electric shocks or damage to circuits.
- Avoid dropping metal shavings or wires into the controller when screwing and wiring, as this could result in malfunction, damage to electronic components, or fire.
- After wiring is completed, check carefully to make sure that the operating voltage and the position of the terminals are correct, otherwise it may cause a fire or an accident.
- Individual grounding or single point grounding is preferred for grounding, not common grounding. Please use a grounding wire of AWG14 (2mm²) or higher, with a grounding resistance of 100Ω or less. The grounding point should be as close as possible to the R3 module, and the distance between the grounding wires should be as short as possible.
- Please connect the power terminal and motor terminal firmly.
- Signal cable. The encoder cable should be a twisted shielded cable with the shield grounded at both ends.

Precautions during operation



- In locations where the operator has direct access to mechanical parts, such as loading and unloading of mechanical tools, or where machinery operates automatically, careful consideration must be given to the functioning of a field manual device or other back-up means, which needs to be independent of the programmable controller, and which can initiate or interrupt the automatic operation of the system.
- If it is necessary to modify the program while the system is running, locks or other safeguards must be considered to ensure that only authorized personnel can make the necessary modifications.
- When an alarm occurs, please reset it after investigating the cause and making sure it is safe.

Contents

User Manual	1
Notice	2
Record of Revisions	2
Safety Precautions	3
Overall Notes	3
Precautions for Storage and Transportation	3
Precautions for Installation	4
Precautions for Wiring	4
Precautions during operation	4
Contents	5
1. Introduction	7
1.1 Product Introduction	7
1.2 Arrival inspection	7
2. Product information	7
2.1 Related Products	7
2.2 Nameplate information	8
2.3 Part number	8
2.3.1 Coupler	8
2.3.2 I/O Module	8
2.4 Parts description	9
2.4.1 Coupler	9
2.4.2 Other Module	10
3. Product Specifications	11
3.1 Coupler	11
3.2 Digital Input Module	12
3.3 Digital Output Module	13
3.4 Digital I/O Module	14
3.5 Analog Input Module	15
3.6 Analog Output Module	16
3.7 Thermocouple Temperature Module	18
3.8 RTD Temperature Modules	19
3.9 Serial communications module	20
3.9.1 RS485 Bus Topology Considerations	22
4. Installation Guide	23
4.1 Installation Precautions	23
4.2 Mounting direction	23
4.3 Installation methods	24
4.4 Hardware Connections	25
4.4.1 Couplers	25
4.4.2 Extension Modules	25
4.5 Wiring	25
4.5.1 Communication-related cables	25
4.5.2 Power-related cables	26
5. Software User's Guide	27
5.1 Software Configuration and Setup Guide	27
5.1.1 PLC Routine Demo	27
5.1.2 Download the project after compilation and run it	32
6. Object dictionary	33
6.1 Calculation module address	33
6.2 EtherCAT Coupler	33
6.2.1 Service Data Objects (SDO)	33
6.2.2 Process Data Object (TxPDO)	34

6.3 Digital Input Module	34
6.3.1 Service Data Objects (SDO).....	34
6.3.2 Process Data Object (TxPDO).....	34
6.4 Digital Output Module	34
6.4.1 Service Data Objects (SDO).....	35
6.4.2 Process Data Object (TxPDO).....	35
6.5 Digital I/O Module	35
6.5.1 Service Data Objects (SDO).....	35
6.5.2 Process Data Object (TxPDO).....	35
6.5.3 Process Data Object (RxPDO).....	35
6.6 Analog Input Module	36
6.6.1 Service Data Objects (SDO).....	36
6.6.2 Process Data Object (TxPDO).....	37
6.7 Analog Output Module	37
6.7.1 Service Data Objects (SDO).....	38
6.7.2 Process Data Object (TxPDO).....	39
6.7.3 Process Data Object (RxPDO).....	40
6.8 Thermocouple Temperature Module	40
6.8.1 Service Data Objects (SDO).....	40
6.8.2 Process Data Object (TxPDO).....	46
6.9 RTD Temperature Modules	48
6.9.1 Service Data Objects (SDO).....	48
6.9.2 Process Data Object (TxPDO).....	53
6.10 Serial communications module	55
6.10.1 R3-RS02-COM Serial Communication Module.....	55
6.10.2 R3-RS02-485 Serial Communication Module.....	59
6.10.3 Object Dictionary Read/Write Error Code (SDO).....	64
7. Fault diagnosis	64
7.1 Coupler Common Failure Information.....	64
7.2 Expansion Module Common Failure Information.....	64
Contact us.....	65



1. Introduction

1.1 Product Introduction

R3 module is a new generation of ultra-thin remote IO module developed by Race Control, which has an ultra-small volume, the width of a single module is only 12mm, which can maximize the space-saving of the customer's electrical cabinet.

Digital inputs, digital outputs, analog inputs, analog outputs, temperature modules, encoder modules, etc. The R3 series modules are widely used in photovoltaic applications.

R3 series modules are widely used in photovoltaic, lithium-ion battery, 3C, electronics and other industries.

1.2 Arrival inspection

- Check whether the surface of the product is damaged or not during transportation.
- Check the nameplate models of the drive and motor are what you have ordered.
- Check if it is fully equipped with accessories. Accessories include power supply and motor output connector, control I/O signal connector.

CAUTION



- Neither the damaged nor missing accessories of stepper system are allowed to install.
- Contact Leadshine or local distributor if any failure was found.

2. Product information

2.1 Related Products

Module Types	Model	Descriptions
Coupler	R3EC	EtherCAT Bus Coupler, Expandable with 64 plug-in module
Digital input module	R3-1600	16 digital Input module, NPN/PNP, Inline Large Bore Push-In
Digital Output module	R3-0016-N	16 digital Output module, NPN, Inline Large Bore Push-In
	R3-0016-P	16 digital Output module, PNP, Inline Large Bore Push-In
Digital I/O Module	R3-0808-N	16 digital I/O module, PNP/NPN input, NPN output, Inline Large Bore Push-In
Analog module	R3-A0400-IV	4 analog input module, current/voltage input
	R3-A0004-IV	4 analog output module, current/voltage output
Temperature Module	R3-T0400-TC	4 temperature module, thermocouple type
	R3-T0400-TR	4 temperature module, thermal resistance type
Serial Module	R3-RS02-COM	2 Communication modules, support ModBus RTU Master /Slave, and protocol-free
	R3-RS02-485	

2.2 Nameplate information

Coupler:

Series name	→ R3EC		
Model name	→ EtherCAT Slave Coupler	二维码 (SN 码)	
Power Supply	→ POWER INPUT: DC24V 0.6A	SN: 001234	

I/O Module

Model name	→ R3-1600		
Version No.	→ 16 Digital Input Module	二维码 (SN 码)	
Power Supply	→ INPUT: DC24V	SN: 0012345	

2.3 Part number

2.3.1 Coupler

R	3	EC	-	XXX
①	②	③		④

N0.	Descriptions	
①	Series Name	R: Series
②	Product Type	1: Economic 2: General 3: Ultra-thin
③	Bus Type	EC: EtherCAT EIP: EtherNet/IP PN: ProfiNet
④	special use	Customized models or special applications

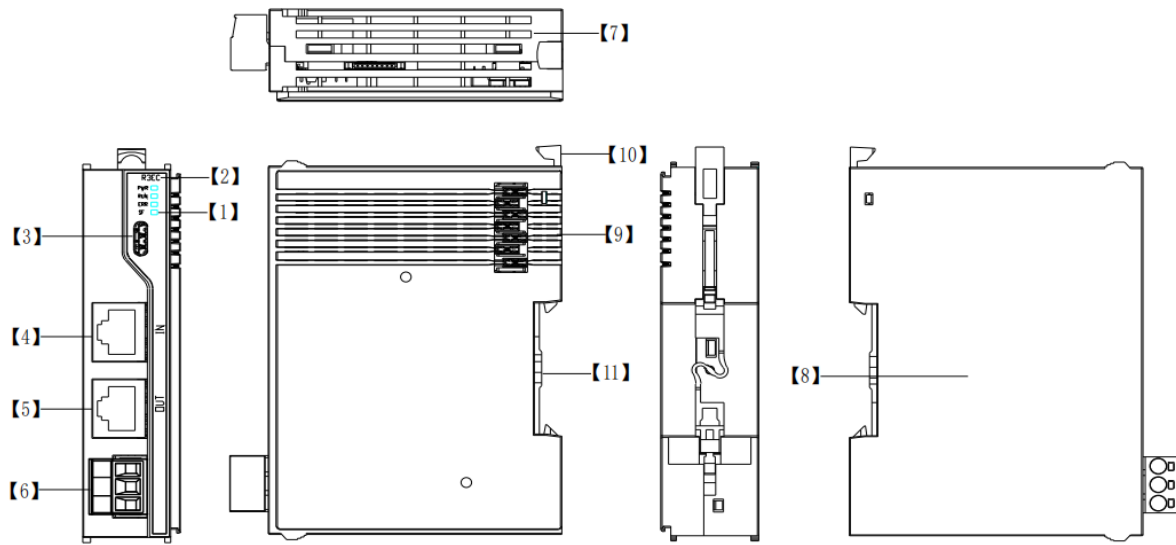
2.3.2 I/O Module

R3	-	X1	X2	X3	-	X4	-	XXX
①		②	③	④		⑤		⑥

N0.	Descriptions	
①	Series Name	R: R3 Series Ultra-thin
②	I/O Type	Blank: Digital A: Analog T: Temperature E: Encoder RS: Serial P: Pulse L: Weigh
③	Inputs	00,08,16,32 channel 00 no channel
④	Outputs	00,08,16,32 channel 00 no channel
⑤	I/O features	N: NPN P: PNP I: Current V: Voltage R: Relay
⑥	special use	Blank: Standard product

2.4 Parts description

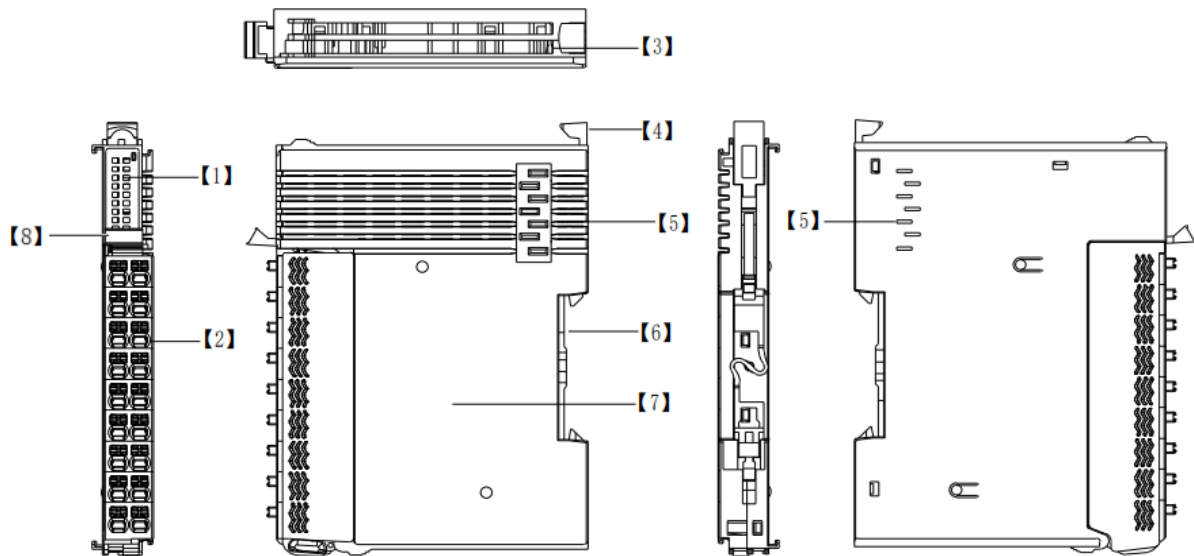
2.4.1 Coupler



NO.	Nome	Define			
[1]	Status indicator	PWR	Power indicator	Green	Power on, light on
		SYS	System operation indicator	ON 300ms OFF 300ms	Running normally
				ON 100ms OFF 200ms	Power-up scan being performed
				ON 500ms OFF 1500ms	Bus initialization failure
				ON 1500ms OFF 300ms	Module connection exception
				ON 1000ms OFF 1000ms	No sweep of the R3 submodule.
		RUN	EtherCAT Operation indicator	drown	Module in INIT state
				Flicker EtherCAT	Module in PreOP state
				Flicker EtherCAT	Module in SafeOP state
				light up	Module in OP state
		ERR	EtherCAT alarm indicator (red)	drown	EtherCAT communication normal state
				Flicker EtherCAT	EtherCAT communication receives instructions that cannot be executed
				Single Flicker EtherCAT	Network disconnection, module synchronization error
				Double blinking EtherCAT	EtherCAT communication is in watchdog error.
[2]	Module Model		Coupler Model		
[3]	Type-C		Type-C port		
[4]	EtherCAT IN		RJ45 network port indicator: Green: Link, Communication ok Yellow: Active, Blinking indicates data transfer		

[5]	EtherCAT OUT	RJ45 network port indicator: Green: Link, Communication ok Yellow: Active, Blinking indicates data transfer
[6]	power port	power port,DC24V
[7]	Radiator	Module cooling
[8]	Nameplate	Product Information
[9]	Expansion Bus port	Right Expansion Module
[10]	Snap	Standard DIN rail
[11]	Installation	

2.4.2 Other Module



NO.	Nome	Define
[1]	Output indicator	LED display
[2]	Output port	Output terminal
[3]	Radiator	Module cooling
[4]	Snap	Mounting
[5]	Extensions port	Connection module
[6]	Installation	Standard DIN rail
[7]	Nameplate	Product Information
[8]	Mark	- Grey: Digital input (R3-1600) - Red: Digital output (R3-0016-N) - Deep red: Digital I/O (R3-0808-N) - Green: Analog input (R3-A0400-IV) - Orange: Analog output (R3-A0004-IV) - Blue: Temperature (R3-T0200-TR) - Pale blue: Temperature (R3-T0200-TC) - Violet: Serial (R3-RS02-485) - Violet: Serial (R3-RS02-COM) - Gold: Encoder (R3-E0200-D) - Yellowish green: Encoder (R3-E0200-S)

3. Product Specifications

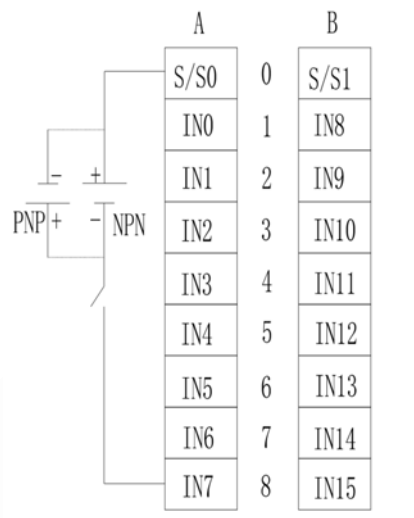
3.1 Coupler

Coupler Module			
Coupler		Marking	Define
		Type-C	--
		IN	EtherCAT IN
		OUT	EtherCAT OUT
		+24V	24V +
		0V	0V
		PE	PE

Specifications:

Event standard		R3EC
Power	Input Voltage	DC24V(-15%~20%)2A
	Output Voltage	DC24V(-15%~20%)2A
Max. power consumption		3W
Output protection		Overcurrent protection, anti-reverse connection protection, surge absorption
Alias Visits		Support
Bus function		Conforms to EtherCAT bus standard, occupies one slave node, 1 coupler can expand up to 64 R3 series modules, synchronization mode supports SM or DC synchronization mode
Bus Performance		Minimum cycle 125us
No. of PDO Input		Max. 1024 bytes
No. of PDO Output		Max. 1024 bytes
Working temperature		-20°C~60°C
Storage temperature		-40°C~70°C
Environmental humidity		5~95%RH
Electromagnetic compatibility		Noise suppression according to IEC 61000-6-2
Vibratory		Amplitude/acceleration: 5Hz≤f<9Hz 3.5mmpeak displacement, constant amplitude 9Hz≤f<150Hz 1.0gpeak acceleration, constant amplitude
Insulation resistance		5MΩ or more after measurement by DC500V insulation resistance meter
PE		Ground resistance: less 100Ω, Common grounding with strong electrical systems is not permitted
Operating environment		Non-corrosive, flammable gas, conductive dust normal locations
Running height		Use in environments below 2000m (above atmospheric pressure. Malfunction may occur.)
IP rating		IP20
Size (W*H*D)		W25* H100* D75 mm
weights		About 60g

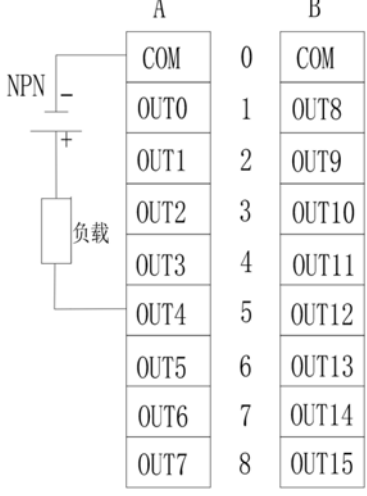
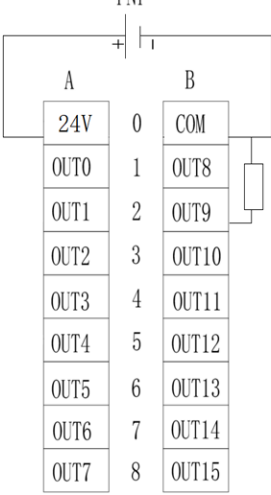
3.2 Digital Input Module

Digital Input Module					
R3-1600	Port	A	B	Port	Wiring
	S/S 0	1	1	S/S 1	
	IN 0	2	2	IN 8	
	IN 1	3	3	IN 9	
	IN 2	4	4	IN 10	
	IN 3	5	5	IN 11	
	IN 4	6	6	IN 12	
	IN 5	7	7	IN 13	
	IN 6	8	8	IN 14	
	IN 7	9	9	IN 15	

Specifications:

Event		standard	R3-1600
Power	Input Voltage		DC24V(-15%~20%)
	Output Voltage		\
Max. power consumption			<1W
Input pins			16
Input Connection Method			Inline Large Bore Push-In
Input Method			NPN/PNP
Input Current			5mA
Input impedance			4.7KΩ
OFF-ON statuses			Higher than DC15V, current 1.5mA
ON-OFF statuses			Below DC15V, current 1mA
Input protection			Optical coupling isolation, anti-interference filtering
Frequency			1K
Software Filtering Time			0ms~255ms
Working temperature			-20°C~60°C
Storage temperature			-40°C~70°C
Environmental humidity			5~95%RH
Electromagnetic compatibility			Noise suppression according to IEC 61000-6-2
Vibratory			Amplitude/acceleration: 5Hz≤f<9Hz 3.5mmpeak displacement, constant amplitude 9Hz≤f<150Hz 1.0gpeak acceleration, constant amplitude
Insulation resistance			5MΩ or more after measurement by DC500V insulation resistance meter
PE			Ground resistance: less 100Ω, Common grounding with strong electrical systems is not permitted
Operating environment			Non-corrosive, flammable gas, conductive dust normal locations
Running height			Use in environments below 2000m (above atmospheric pressure. Malfunction may occur.)
IP rating			IP20
Size (W*H*D)			W12* H100* D75 mm
weights			About 30g

3.3 Digital Output Module

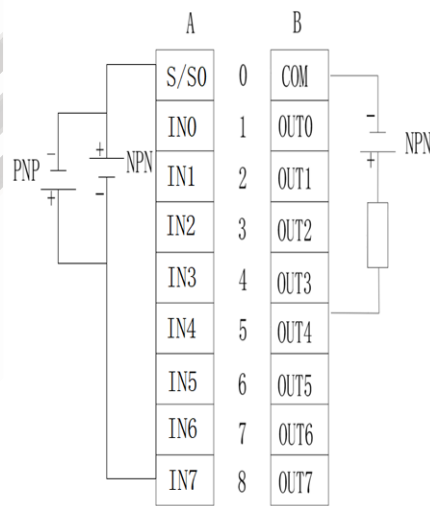
Digital Output Module					
R3-0016-N	Port	A	B	Port	Wiring
	COM	1	1	COM	
	OUT 0	2	2	OUT 8	
	OUT 1	3	3	OUT 9	
	OUT 2	4	4	OUT 10	
	OUT 3	5	5	OUT 11	
	OUT 4	6	6	OUT 12	
	OUT 5	7	7	OUT 13	
	OUT 6	8	8	OUT 14	
	OUT 7	9	9	OUT 15	
R3-0016-P	Port	A	B	Port	Wiring
	24V	1	1	COM	
	OUT 0	2	2	OUT 8	
	OUT 1	3	3	OUT 9	
	OUT 2	4	4	OUT 10	
	OUT 3	5	5	OUT 11	
	OUT 4	6	6	OUT 12	
	OUT 5	7	7	OUT 13	
	OUT 6	8	8	OUT 14	
	OUT 7	9	9	OUT 15	

Specifications:

Event		standard	R3-0016-N	R3-0016-P
Power	Input Voltage		\	
	Output Voltage		DC5V~DC24V	
Max. power consumption			<1W	
Output pins			16	
Connection Method			Inline Large Bore Push-In	
Output Method			NPN	PNP
Output Current			Peak 500mA/Pins (full load 300mA/Pins)	
OFF leakage current			<5mA	
Isolation method			Optical coupling isolation	
Output protection			Short circuit protection, over current protection	
Frequency			1K	
Working temperature			-20°C~60°C	
Storage temperature			-40°C~70°C	
Environmental humidity			5~95%RH	

Electromagnetic compatibility	Noise suppression according to IEC 61000-6-2
Vibratory	Amplitude/acceleration: 5Hz≤f<9Hz 3.5mmpeak displacement, constant amplitude 9Hz≤f<150Hz 1.0gpeak acceleration, constant amplitude
Insulation resistance	5MΩ or more after measurement by DC500V insulation resistance meter
PE	Ground resistance: less 100Ω, Common grounding with strong electrical systems is not permitted
Operating environment	Non-corrosive, flammable gas, conductive dust normal locations
Running height	Use in environments below 2000m (above atmospheric pressure. Malfunction may occur.)
IP rating	IP20
Size (W*H*D)	W12* H100* D75 mm
weights	About 30g

3.4 Digital I/O Module

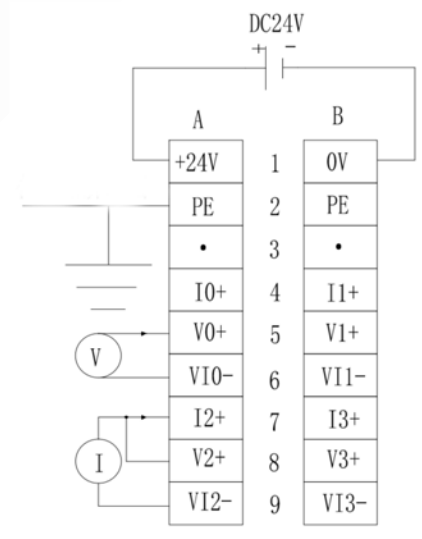
Digital Input Module					
R3-0808-N	Port	A	B	Port	Wiring
	S/S 0	1	1	COM	
	IN 0	2	2	OUT 8	
	IN 1	3	3	OUT 9	
	IN 2	4	4	OUT 10	
	IN 3	5	5	OUT 11	
	IN 4	6	6	OUT 12	
	IN5	7	7	OUT 13	
	IN6	8	8	OUT 14	
	IN7	9	9	OUT 15	

Specifications:

Event		standard	R3-0808-N
Power	Input Voltage		DC24V(-15%~20%)
	Output Voltage		DC5V~DC24V
Max. power consumption			<1W
I/O port	Input pins		8
	Output pins		8
Connection Method			Inline Large Bore Push-In
I/O Method	Input Method		NPN/PNP
	Output Method		NPN
Input Current			5mA
OFF leakage current			<5mA
Output Current			Peak 500mA/Pins (full load 300mA/Pins), COM max.2A
Inport impedance			4.7KΩ
OFF-ON statuses			Higher than DC15V, current 1.5mA
ON-OFF statuses			Below DC15V, current 1mA
Input protection			Optical coupling isolation, anti-interference filtering

Frequency	1K
Software Filtering Time	1ms~255ms
Isolation method	Optical coupling isolation
Output protection	Short circuit protection, over current protection
Working temperature	-20°C~60°C
Storage temperature	-40°C~70°C
Environmental humidity	5~95%RH
Electromagnetic compatibility	Noise suppression according to IEC 61000-6-2
Vibratory	Amplitude/acceleration: 5Hz≤f<9Hz 3.5mmpeak displacement, constant amplitude 9Hz≤f<150Hz 1.0gpeak acceleration, constant amplitude
Insulation resistance	5MΩ or more after measurement by DC500V insulation resistance meter
PE	Ground resistance: less 100Ω, Common grounding with strong electrical systems is not permitted
Operating environment	Non-corrosive, flammable gas, conductive dust normal locations
Running height	Use in environments below 2000m (above atmospheric pressure. Malfunction may occur.)
IP rating	IP20
Size (W*H*D)	W12* H100* D75 mm
weights	About 30g

3.5 Analog Input Module

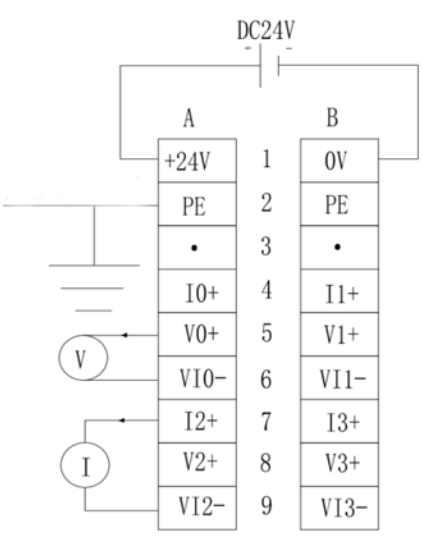
Analog Input Module					
R3-A0400-IV	Port	A	B	Port	Wiring
	+24V	1	1	0V	
	PE	2	2	PE	
	.	3	3	.	
	I0+	4	4	I1+	
	V0+	5	5	V1+	
	VI0-	6	6	VI1-	
	I2+	7	7	I3+	
	V2+	8	8	V3+	
	VI2-	9	9	VI3-	

Specifications:

Event	standard	R3-A0400-IV
Input Voltage		24V DC(20.4V DC ~ 28.8V DC)
Input Current		50mA
Max. power consumption		1W
Input pins		4
Resolution		16-Bit
Conversion time		250us/Channels
input method		Single-Ended/Differential (Compatible)
Default range		-10V~10V

Current input range	0-20mA(0~32000)
	4-20mA(0~32000)
	±20mA(-32000~32000)
Voltage input range	±5V(-32000~32000)
	1-5V(0~32000)
	±10V(-32000~32000)
	0-10V(0~32000)
	0-5V(0~32000)
Voltage Input Impedance	1MΩ
Current input impedance	250Ω
Accuracy	Voltage ±0.1%; Current ±0.2%(0-25°C)
Software Filtering Time	0ms~255ms
Current input limit	Instantaneous ±30mA, average ±24mA
Isolation method	Interface channel not isolated, power supply isolated from interface, interface isolated from bus
Working temperature	-20°C~60°C
Storage temperature	-40°C~70°C
Environmental humidity	5~95%RH
Electromagnetic compatibility	Noise suppression according to IEC 61000-6-2
Vibratory	Amplitude/acceleration: 5Hz≤f<9Hz 3.5mmpeak displacement, constant amplitude 9Hz≤f<150Hz 1.0gpeak acceleration, constant amplitude
Insulation resistance	5MΩ or more after measurement by DC500V insulation resistance meter
PE	Ground resistance: less 100Ω, Common grounding with strong electrical systems is not permitted
Operating environment	Non-corrosive, flammable gas, conductive dust normal locations
Running height	Use in environments below 2000m (above atmospheric pressure. Malfunction may occur.)
IP rating	IP20
Size (W*H*D)	W12* H100* D75 mm
weights	About 30g

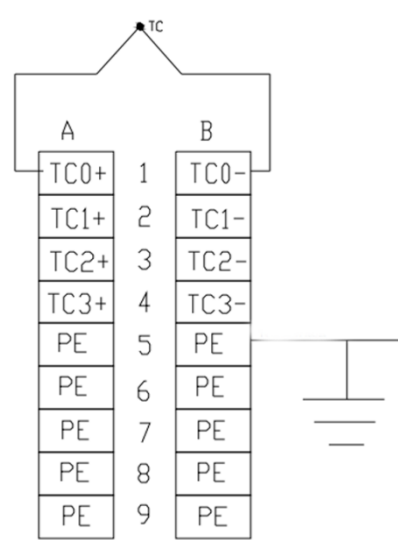
3.6 Analog Output Module

Analog Input Module					
R3-A0004-IV	Port	A	B	Port	Wiring
	+24V	1	1	0V	
	PE	2	2	PE	
	.	3	3	.	
	I0+	4	4	I1+	
	V0+	5	5	V1+	
	VI0-	6	6	VI1-	
	I2+	7	7	I3+	
	V2+	8	8	V3+	
	VI2-	9	9	VI3-	

Specifications:

Event	standard	R3-A0004-IV
Input Voltage		24V DC(20.4V DC ~ 28.8V DC)
Input Current		50mA
Max. power consumption		3W
Output pins		4
Resolution		16-Bit
Conversion time		250us/Channels
input method		Single-Ended/Differential (Compatible)
Default range		-10V~10V
Current output range		0-20mA(0~32000)
		4-20mA(0~32000)
		±20mA(-32000~32000)
Voltage output range		±5V(-32000~32000)
		1-5V(0~32000)
		±10V(-32000~32000)
		0-10V(0~32000)
		0-5V(0~32000)
Voltage Output Load		Max. load 1KΩ
Current Output Load		0~600Ω
Accuracy		Voltage ±0.1%; Current ±0.5%(0-25°C)
Software Filtering Time		0ms~255ms
Current output limit		Instantaneous ±30mA, average ±24mA
Voltage Output Diagnostics		Support short-circuit detection and over-temperature protection
Current Output Diagnostics		Supports open-circuit detection and over-temperature protection
Isolation method		Interface channel not isolated, power supply isolated from interface, interface isolated from bus
Working temperature		-20°C~60°C
Storage temperature		-40°C~70°C
Environmental humidity		5~95%RH
Electromagnetic compatibility		Noise suppression according to IEC 61000-6-2
Vibratory		Amplitude/acceleration: 5Hz≤f<9Hz 3.5mmpeak displacement, constant amplitude 9Hz≤f<150Hz 1.0gpeak acceleration, constant amplitude
Insulation resistance		5MΩ or more after measurement by DC500V insulation resistance meter
PE		Ground resistance: less 100Ω, Common grounding with strong electrical systems is not permitted
Operating environment		Non-corrosive, flammable gas, conductive dust normal locations
Running height		Use in environments below 2000m (above atmospheric pressure. Malfunction may occur.)
IP rating		IP20
Size (W*H*D)		W12* H100* D75 mm
weights		About 30g

3.7 Thermocouple Temperature Module

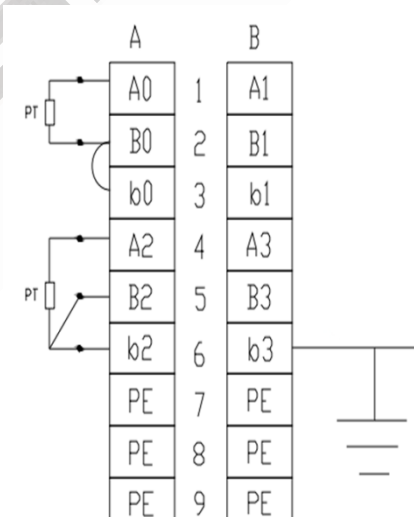
Thermocouple Temperature Module					
R3-T0400-TC	Port	A	B	Port	Wiring
	TC0+	1	1	TC0-	
	TC1+	2	2	TC1-	
	TC2+	3	3	TC2-	
	TC3+	4	4	TC3-	
	PE	5	5	PE	
	PE	6	6	PE	
	PE	7	7	PE	
	PE	8	8	PE	
	PE	9	9	PE	
	PE	9	9	PE	

Specifications:

Event	standard	R3-T0400-TC
Input pins		4
Sensor Type		J, K, R, S, T, E, N, B type, $\pm 100\text{mV}$ voltage input
Wiring Type		two wire
Resolution		24-Bit
Respond time		250ms, 500ms, 1000ms/ four channels (configurable by software)
input method		Single-Ended/Differential (Compatible)
Temperature		$^{\circ}\text{C}$ or $^{\circ}\text{F}$
Measurement input range		J: $-80^{\circ}\text{C}\sim 1200^{\circ}\text{C}/-112^{\circ}\text{F}\sim 2192^{\circ}\text{F}$
		K: $-90^{\circ}\text{C}\sim 1300^{\circ}\text{C}/-130^{\circ}\text{F}\sim 2372^{\circ}\text{F}$ (Default)
		R: $-50^{\circ}\text{C}\sim 1300^{\circ}\text{C}/-58^{\circ}\text{F}\sim 2372^{\circ}\text{F}$
		S: $-50^{\circ}\text{C}\sim 1300^{\circ}\text{C}/-58^{\circ}\text{F}\sim 2372^{\circ}\text{F}$
		T: $-100^{\circ}\text{C}\sim 400^{\circ}\text{C}/-148^{\circ}\text{F}\sim 752^{\circ}\text{F}$
		E: $-100^{\circ}\text{C}\sim 950^{\circ}\text{C}/-148^{\circ}\text{F}\sim 1742^{\circ}\text{F}$
		N: $-100^{\circ}\text{C}\sim 1300^{\circ}\text{C}/-148^{\circ}\text{F}\sim 2372^{\circ}\text{F}$
		B: $200^{\circ}\text{C}\sim 1800^{\circ}\text{C}/392^{\circ}\text{F}\sim 3272^{\circ}\text{F}$
		Voltage: $-100\text{mv}\sim 100\text{mv}$
Accuracy		$\pm 0.1\% + 1^{\circ}\text{C}$ (cold end compensation) at (25°C , 77°F)
		$\pm 0.3\% + 1^{\circ}\text{C}$ (cold end compensation) at (-20 to 60°C , -4 to 140°F)
Sensitivity		0.1°C , 0.1°F
Cold End Compensation		Cold end compensation accuracy $\pm 1^{\circ}\text{C}$
Diagnostic reporting		Support
Overrun detection enable		Support
Detection Limitations		Support
PID self-tuning		Support
Parameter saving		Support
Parameter reset		Support
Temperature shift		Range $-2050\sim 2050$ ($-205^{\circ}\text{C}\sim 205^{\circ}\text{C}$)
Diagnostic		Disconnection detection, overrun abnormality alarm, setup parameter abnormality alarm
Disconnect Display		32767 (default) or -32768 (minimum)
Filtering Time		0~100s(Default: 5s)

Working temperature	-20℃~60℃
Storage temperature	-40℃~70℃
Environmental humidity	5~95%RH
Electromagnetic compatibility	Zone B in accordance with IEC 61000-6-2
Vibratory	Amplitude/acceleration: 5Hz≤f<9Hz 3.5mmpeak displacement, constant amplitude 9Hz≤f<150Hz 1.0gpeak acceleration, constant amplitude
Insulation resistance	5MΩ or more after measurement by DC500V insulation resistance meter
PE	Ground resistance: less 100Ω, Common grounding with strong electrical systems is not permitted
Operating environment	Non-corrosive, flammable gas, conductive dust normal locations
Running height	Use in environments below 2000m (above atmospheric pressure. Malfunction may occur.)
IP rating	IP20
Size (W*H*D)	W12* H100* D75 mm
weights	About 30g

3.8 RTD Temperature Modules

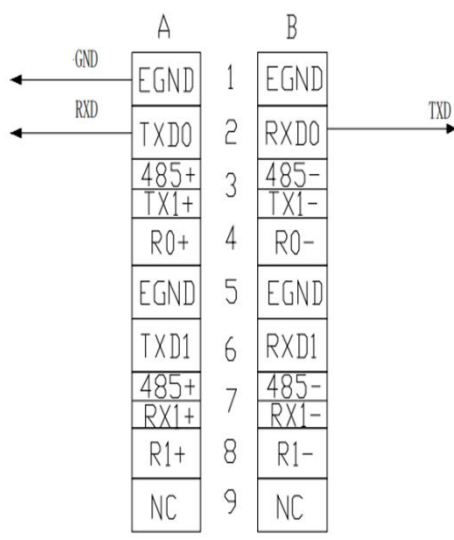
Thermocouple Temperature Module					
R3-T0400-TR	Port	A	B	Port	Wiring
	A0	1	1	A1	
	B0	2	2	B1	
	b0	3	3	b1	
	A2	4	4	A3	
	B2	5	5	B3	
	b2	6	6	b3	
	PE	7	7	PE	
	PE	8	8	PE	
	PE	9	9	PE	

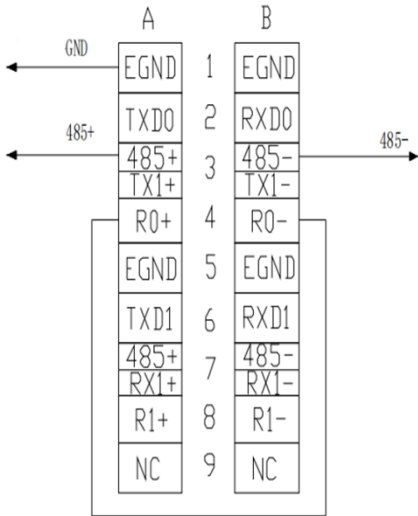
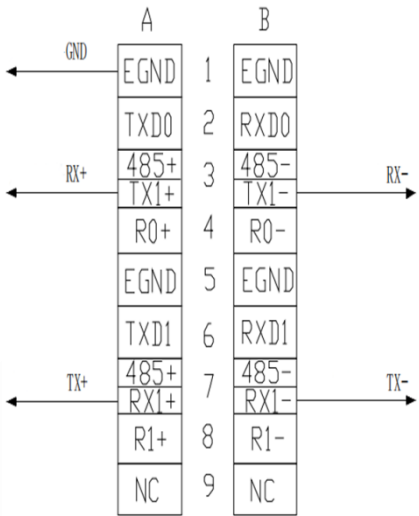
Specifications:

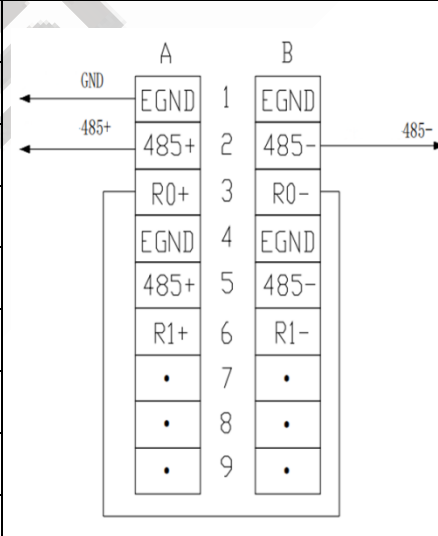
Event	standard	R3-T0400-TR
Input pins		4
Sensor Type		RTD (PT100/PT500/PT1000/Cu50/Cu100) and 0~300Ω/0~3000Ω
Wiring Type		Two-wire/three-wire
Resolution		24-Bit
Respond time		250ms, 500ms, 1000ms/ four channels (configurable by software)
input method		Single-Ended/Differential (Compatible)
Temperature		℃ or °F
Measurement input range		PT100: -180℃~800℃/-292°F~1472°F(Default)
		PT500: -180℃~800℃/-292°F~1472°F
		PT1000: -180℃~800℃/-292°F~1472°F
		Cu50: -50℃~150℃/-58°F~302°F
		Cu100: -50℃~150℃/-58°F~302°F

Accuracy	$\pm 0.1\% + 1\text{ }^{\circ}\text{C}$ (cold end compensation) at (25 $^{\circ}\text{C}$, 77 $^{\circ}\text{F}$)
	$\pm 0.3\% + 1\text{ }^{\circ}\text{C}$ (cold end compensation) at (-20 to 60 $^{\circ}\text{C}$, -4 to 140 $^{\circ}\text{F}$)
Sensitivity	0.1 $^{\circ}\text{C}$, 0.1 $^{\circ}\text{F}$
Cold End Compensation	Cold end compensation accuracy $\pm 1\text{ }^{\circ}\text{C}$
Diagnostic reporting	Support
Overrun detection enable	Support
Detection Limitations	Support
PID self-tuning	Support
Parameter saving	Support
Parameter reset	Support
Temperature shift	Range -2050~2050 (-205 $^{\circ}\text{C}$ ~205 $^{\circ}\text{C}$) /0~60(0~300 Ω)/0~600(0~3000 Ω)
Diagnostic	Disconnection detection, overrun abnormality alarm, setup parameter abnormality alarm
Disconnect Display	32767 (default) or -32768 (minimum)
Filtering Time	0~100s(Default: 5s)
Working temperature	-20 $^{\circ}\text{C}$ ~60 $^{\circ}\text{C}$
Storage temperature	-40 $^{\circ}\text{C}$ ~70 $^{\circ}\text{C}$
Environmental humidity	5~95%RH
Electromagnetic compatibility	Zone B in accordance with IEC 61000-6-2
Vibratory	Amplitude/acceleration: 5Hz $\leq f < 9\text{Hz}$ 3.5mm peak displacement, constant amplitude 9Hz $\leq f < 150\text{Hz}$ 1.0g peak acceleration, constant amplitude
Insulation resistance	5M Ω or more after measurement by DC500V insulation resistance meter
PE	Ground resistance: less 100 Ω , Common grounding with strong electrical systems is not permitted
Operating environment	Non-corrosive, flammable gas, conductive dust normal locations
Running height	Use in environments below 2000m (above atmospheric pressure. Malfunction may occur.)
IP rating	IP20
Size (W*H*D)	W12* H100* D75 mm
weights	About 30g

3.9 Serial communications module

Serial communications module						
R3-RS02-COM	Port	A	B	Port	RS232 Wiring	
	EGND	1	1	EGND		
	TXD0	2	2	TXD0		
	D0+ TX1+	3	3	D0- TX1-		
	R0+	4	4	R0-		
	EGND	5	5	EGND		
	TXD1	6	6	TXD1		
	D1+ TX1+	7	7	D1- TX1-		
	R1+	8	8	R1-		
	PE	9	9	PE		

R3-RS02-COM													
Port		A	B	Port		RS485 Wiring				RS422 Wiring			
EGND		1	1	EGND									
TXD0		2	2	TXD0									
D0+	TX1+	3	3	D0-	TX1-								
R0+		4	4	R0-									
EGND		5	5	EGND									
TXD1		6	6	TXD1									
D1+	TX1+	7	7	D1-	TX1-								
R1+		8	8	R1-									
PE		9	9	PE									

Serial communications module					
R3-RS02-485	Port	A	B	Port	Wiring
	EGND	1	1	EGND	
	485+	2	2	485-	
	R0+	3	3	R0-	
	EGND	4	4	EGND	
	485+	5	5	485-	
	R1+	6	6	R1-	
	PE	7	7	PE	
	PE	8	8	PE	
	PE	9	9	PE	

Note: Modules R+ and R- are terminating resistors.

Specifications:

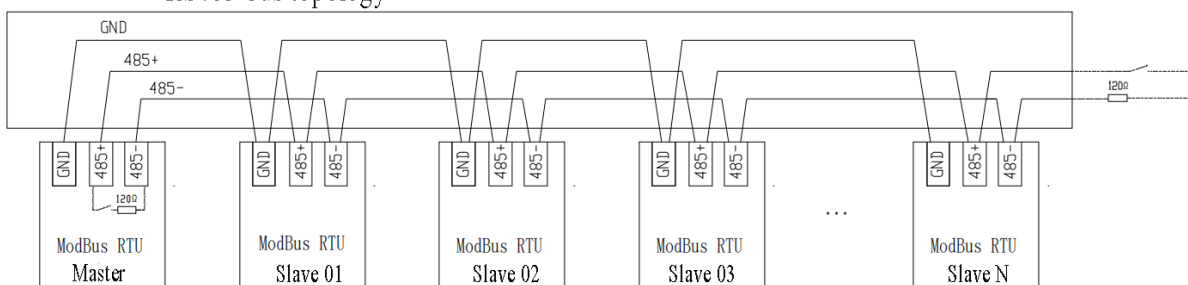
Event standard	R3-RS02-COM	R3-RS02-485
Input pins	2	
Connection Method	Inline Large Bore Push-In	
Communication interface type	Port 0: RS232/RS485 Port 0: RS232/RS485/RS422 Note: Port 1 selects RS422, Port 0 selects RS232 only	RS485
Terminating resistor	R+ / R-	
Protocol type	ModBus RTU Master / ModBus RTU Slave / protocol-free communication.	
Communication method	Half-duplex (RS485) / Full-duplex (RS232/RS422)	
Baudrate	4800/9600/19200/38400/57600/115200 bit/s	
Byte Size	7 bit / 8 bit	
Start Bits	1 bit	
Stop Bits	1 bit / 2 bit	

Parity	None Parity/Odd Parity/Even Parity
Slaves - number	RS485: Supports up to 31 slaves per port
	RS232/RS422: supports 1 slave only
Max. communication distance	RS232: 15 meters max.
	RS422/RS485: 1200 meters max.
Communications Data Refresh	Free Refresh
Per packet	22 bytes
Transmit buffer	1024 bytes
Receive buffer	1024 bytes
Frame interval	5~1000ms, default 5ms
Working temperature	-20°C~60°C
Storage temperature	-40°C~70°C
Environmental humidity	5~95%RH
Electromagnetic compatibility	Zone B in accordance with IEC 61000-6-2
Vibratory	Amplitude/acceleration: 5Hz≤f<9Hz 3.5mmpeak displacement, constant amplitude 9Hz≤f<150Hz 1.0gpeak acceleration, constant amplitude
Insulation resistance	5MΩ or more after measurement by DC500V insulation resistance meter
PE	Ground resistance: less 100Ω, Common grounding with strong electrical systems is not permitted
Operating environment	Non-corrosive, flammable gas, conductive dust normal locations
Running height	Use in environments below 2000m (above atmospheric pressure. Malfunction may occur.)
IP rating	IP20
Size (W*H*D)	W12* H100* D75 mm
weights	About 30g

3.9.1 RS485 Bus Topology Considerations

RS485 bus topology is shown in the figure below, it is recommended to use daisy-chain connection (prohibit the use of star connection), the use of twisted shielded cable, all the nodes of the RS485 signal connected together, up to a maximum of 31 nodes connected to the node, each node distance needs to be less than 3 meters, the bus needs to be matched with a terminating resistor of 120 Ω on both sides to prevent the signal from reflecting. (If the slave is a leadshine R3 series serial module, just short R+/R- at the other end)

RS485 bus topology



4. Installation Guide

4.1 Installation Precautions

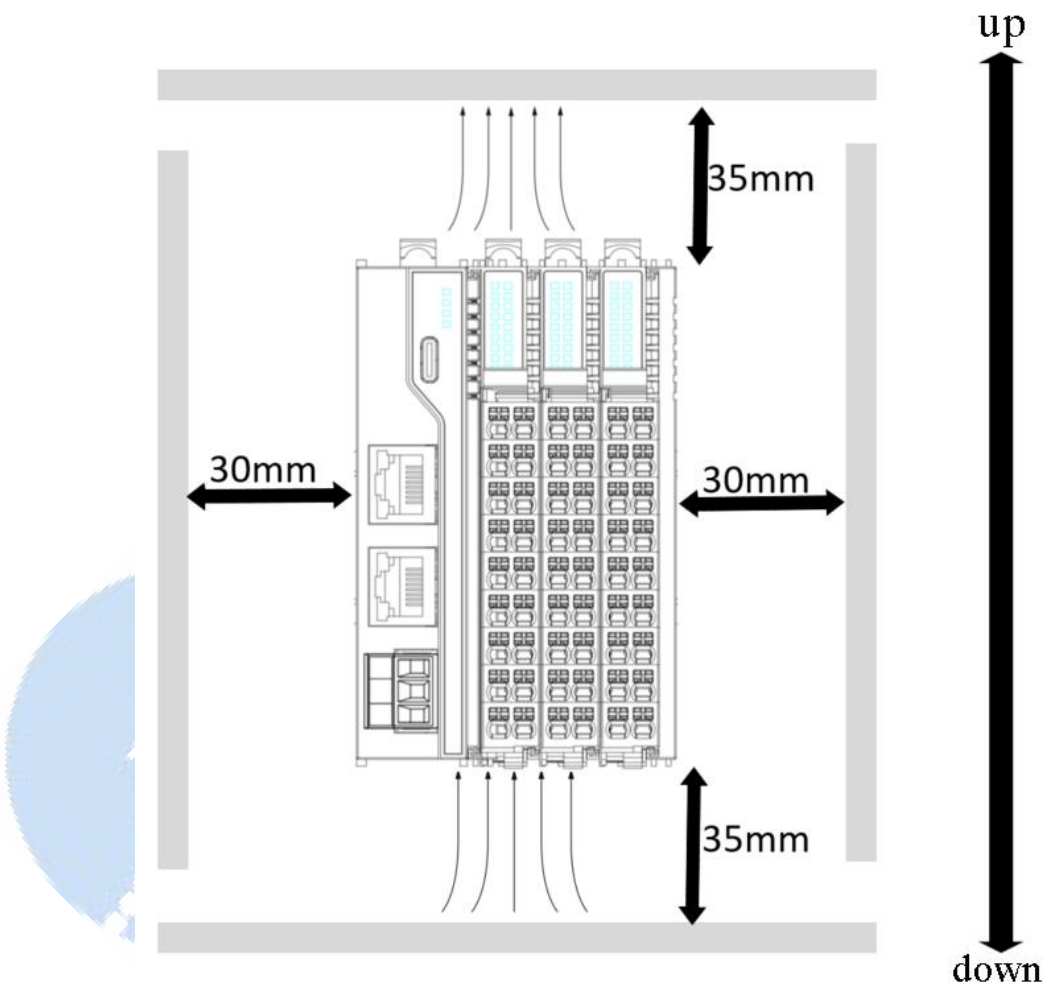
- Before installing or removing the module, make sure the module is powered off.
- Hot-plugging the module has a shock to the module itself, which may cause damage to the product, so please do not perform hot-plugging operation.
- Avoid damage to the module by not allowing the module's case or terminals to fall or be subjected to shock.

4.2 Mounting direction

This product is classified according to the installation direction: horizontal (DIN rail placed horizontally) and non-horizontal installation.

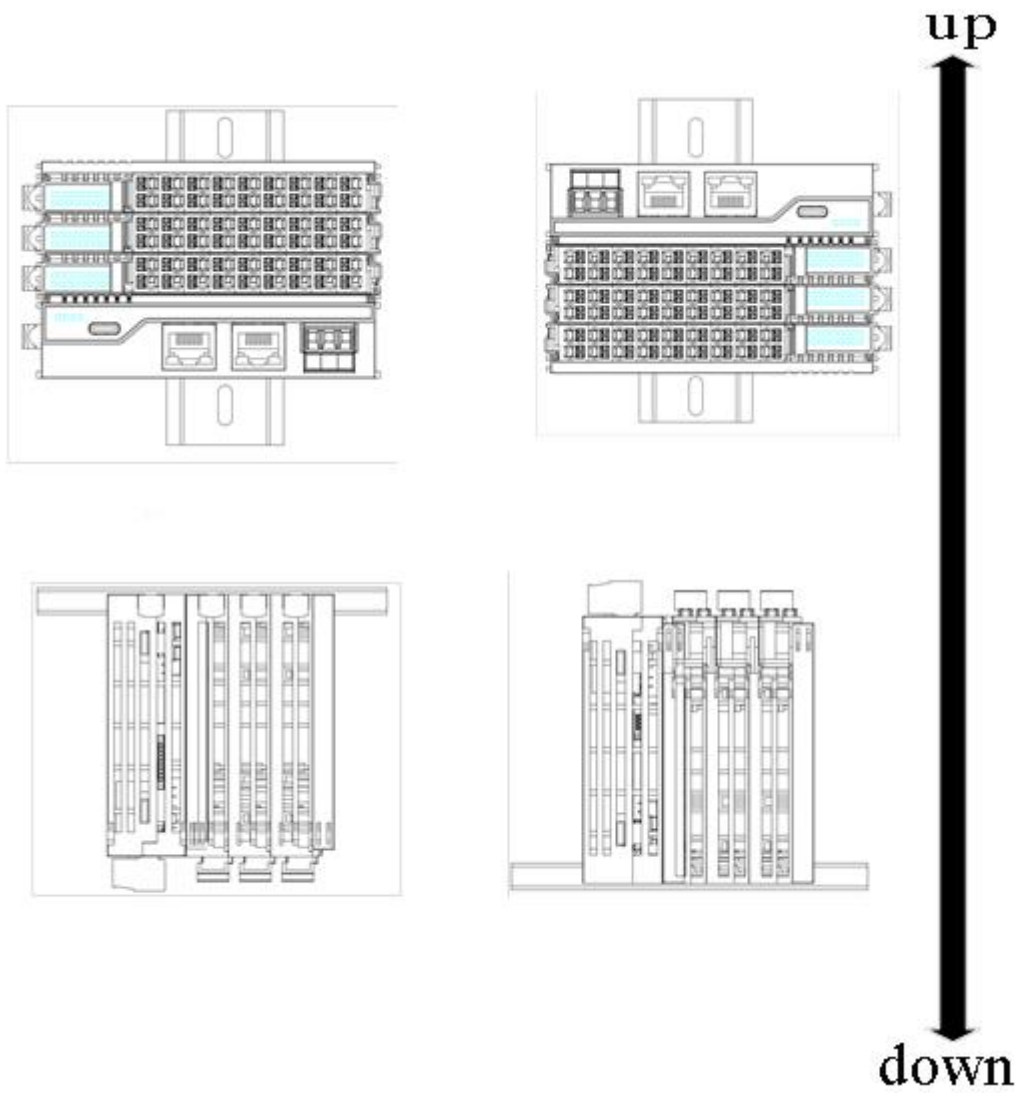
- Best Installation

The best mounting position for this product is horizontal mounting, and a minimum clearance must be retained around the periphery to ensure ventilation and heat dissipation and to reserve enough space for wiring, as shown in the following figure.



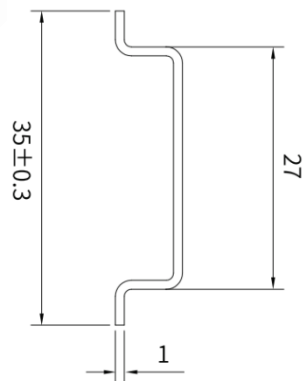
Note: When the product is surrounded by high temperature heat source equipment (heaters, transformers, large resistors, etc.), there should be a gap of at least 100mm between the product and the high temperature heat source equipment.

- Other installations



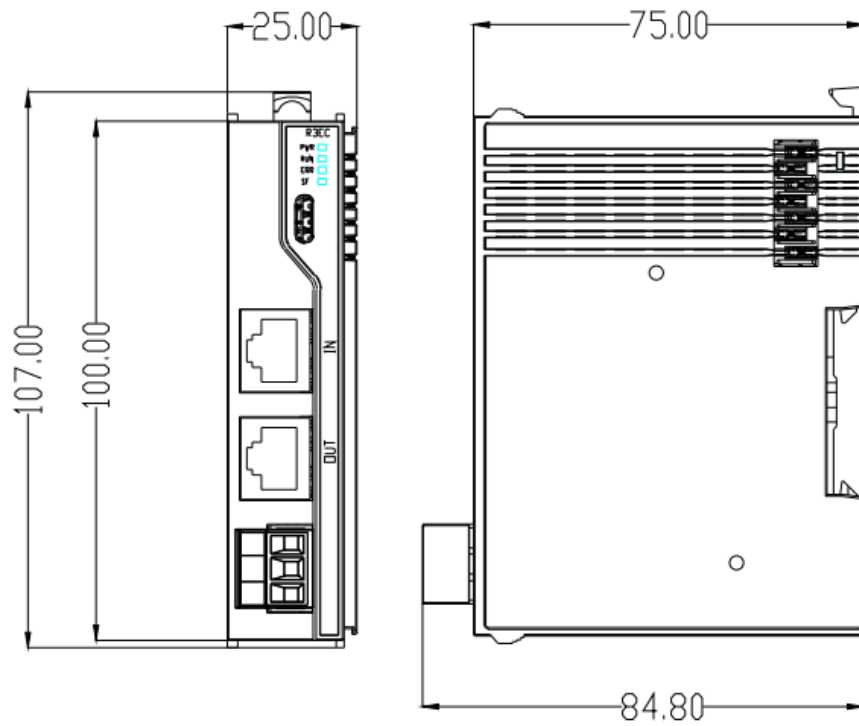
4.3 Installation methods

The modules are mounted on DIN rails, which need to comply with the IEC60715 standard (35mm wide, 1mm thick), and the dimensional information is shown below in (mm).

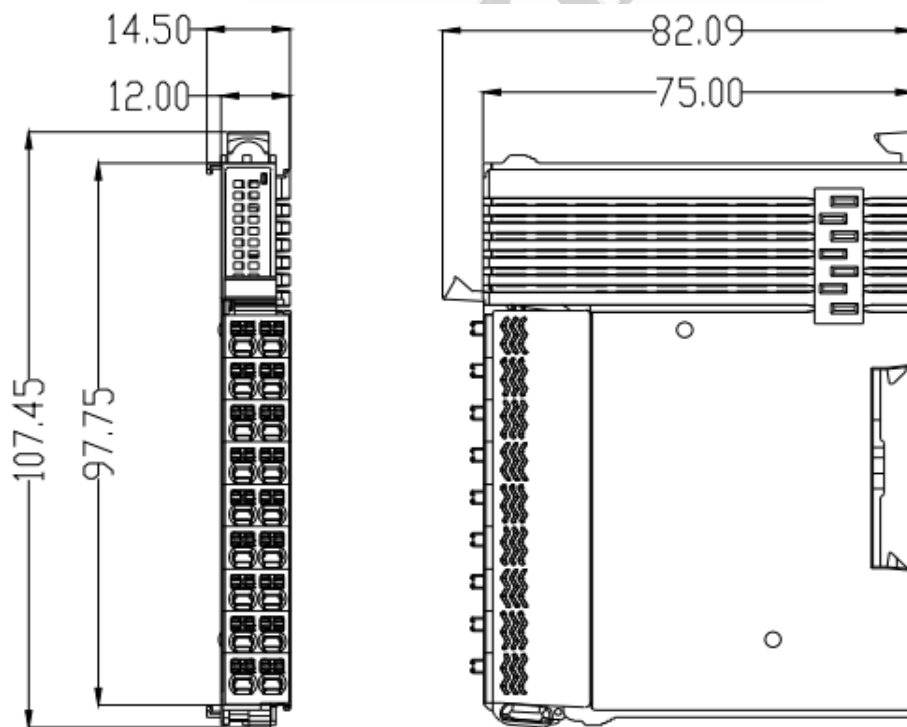


4.4 Hardware Connections

4.4.1 Couplers



4.4.2 Extension Modules



4.5 Wiring

4.5.1 Communication-related cables

100% conductivity test, no shorts, breaks, misalignments and poor contacts, the following cable specifications are recommended:

EtherCAT cable specification requirements:

Event	Specification Description
Cable Type	Flexible Crossover Cable, S-FTP, Category 5 Ultra
Standard	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TI Abulletin TSB, EIA/TIA SB40-A&TSB36
Wire cross-section	AWG26
Wire Type	Unshielded twisted pair
thread count	4

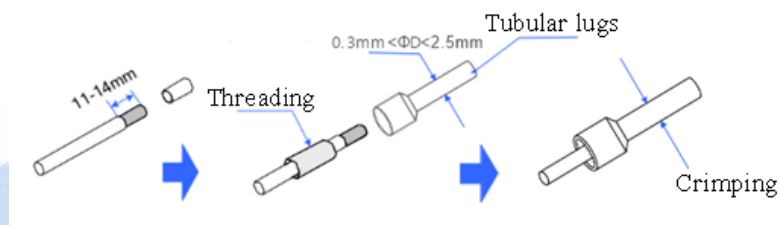
4.5.2 Power-related cables

- Cable selection and production standards

Applicable models	Name	Wire Diameter	
		GB/mm2	ASTM/AWG
Power Cord	Tubular lugs	0.5-1.5	24-16
Ground wire	Tubular lugs	≥ 2	14-15

- Steps for making tubular cables

- 1) Remove the cable insulation, the exposed copper part is 11-14mm, and thread the cable into the wire lug sleeve;
- 2) The conductor part of the cable is threaded into the round holes of the lugs and crimped using the crimping pliers recommended by the lug manufacturer;



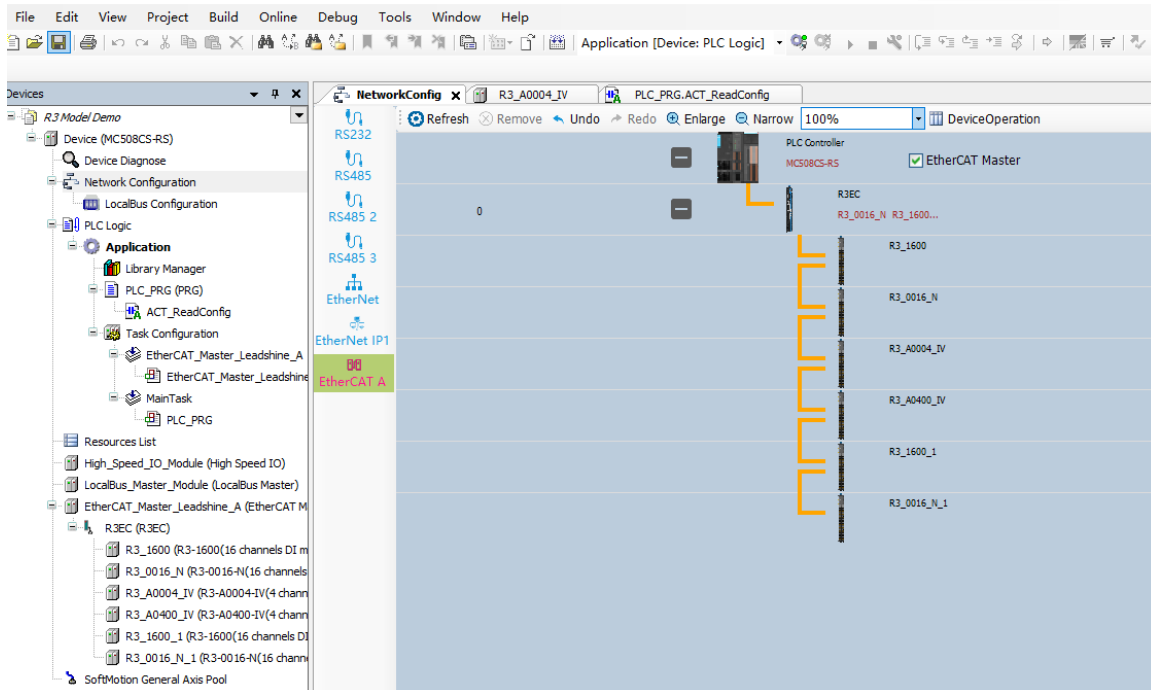
5. Software User's Guide

5.1 Software Configuration and Setup Guide

5.1.1 PLC Routine Demo

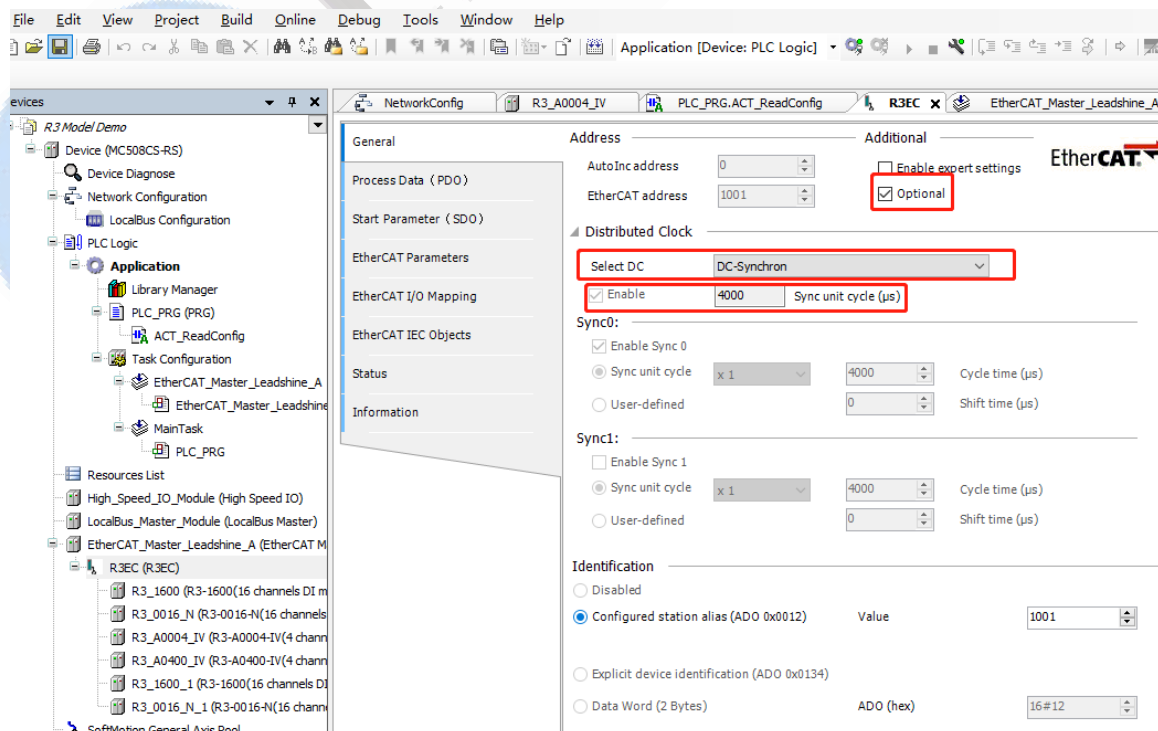
- New construction projects

This example uses leadshine MC532CS medium-sized PLC as the master, and leadshine R3 series expansion module R3EC coupler, R3-1600 digital input module, R3-0016-N digital output module, R3-A0400-IV, R3-A0004-IV and other modules for remote IO control. Create a new project of MC508CS in Leadsys Studio, and scan the slave at the EtherCAT bus to configure it, or manually configure it directly in the interface. After completion, the following figure is shown:

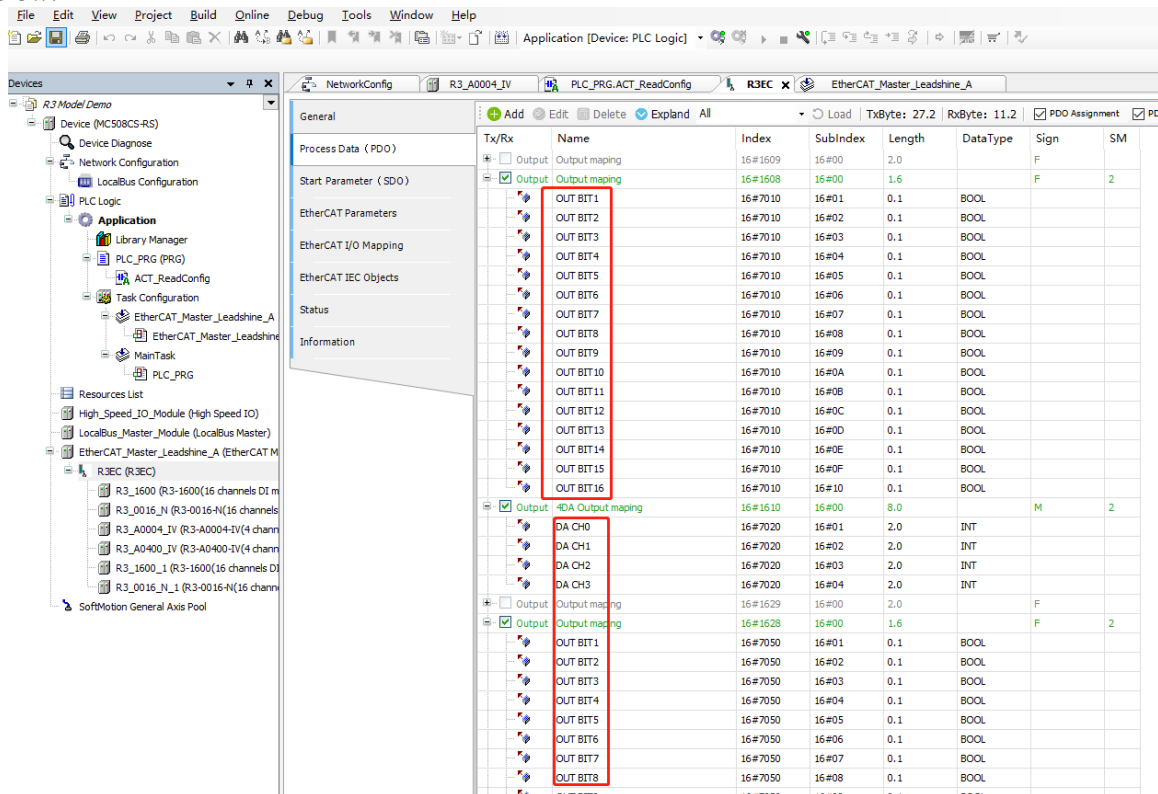


- Parameter Configuration

Double click the R3EC coupler, select “General” - “Distributed Clock” - “Select DC”. You can select “DC-Synchron” to set DC synchronization and set the period of synchronization unit. Or select “SM-Synchron” if the synchronization period is not required.

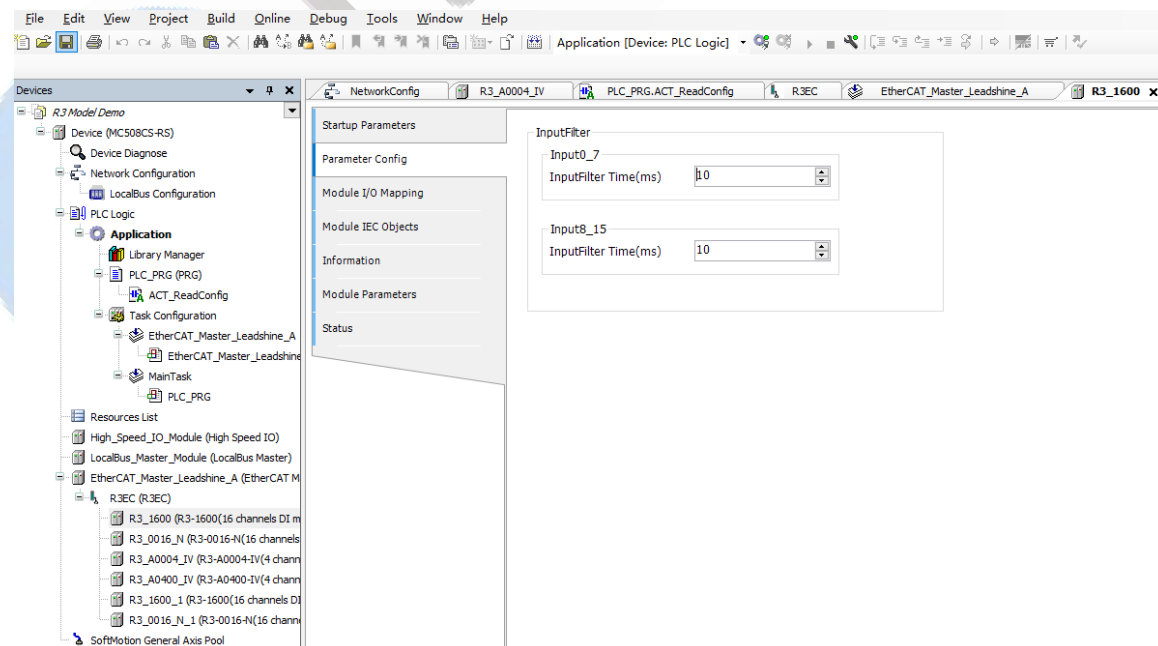


PDO configuration of module combination: double click R3EC coupler, select “Process Data PDO”, you can choose “input mapping” and “output mapping” according to the actual mapping requirements. You can choose “input mapping” and “output mapping” according to the actual mapping requirements. For the input and output module process data of leadshine R3EC, you can choose BOOL type or WORD type, and you can check the corresponding method on the interface. As shown in the figure below:



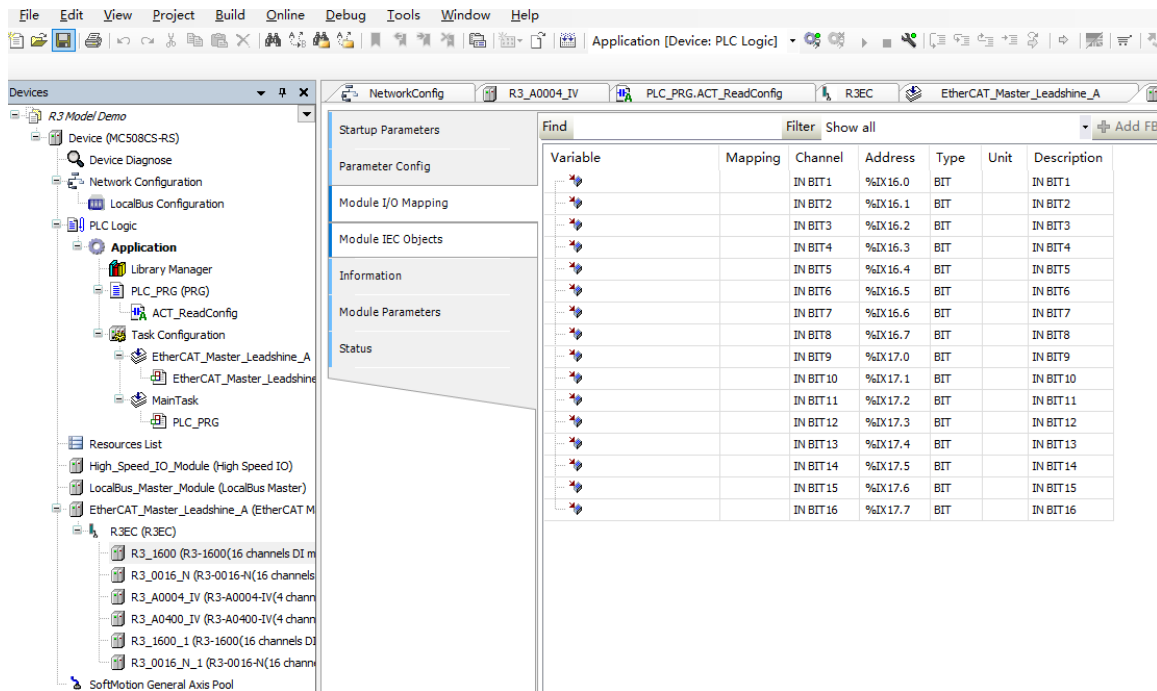
● Other Module Parameter Settings and Mapping Configurations

Digital Input Module: Double click “R3-1600” module, select “Parameter Configuration”, you can set the “Input Filter” parameter to set the filtering time for the input port on the module. The input ports on the module can be filtered by setting the “Input Filter” parameter. Use 1 filter parameter for every 8 inputs.

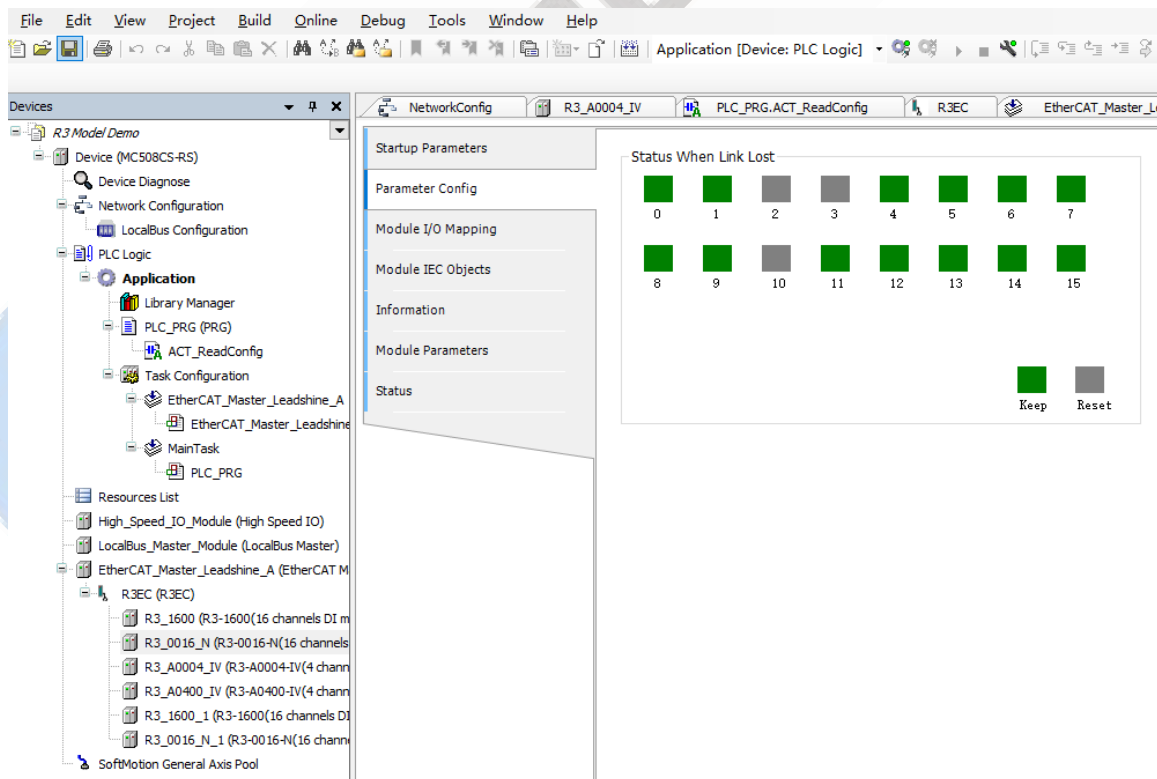


Double click “R3-1600” module, select “Module I/O Mapping”, you can map the input ports of this module to variables according to the BIT bit or according to the PORT method, so as to connect the

input state of the module and the actual application program. This will connect the input state of the module with the actual application program. The following figure shows the mapping of the input ports of the module.

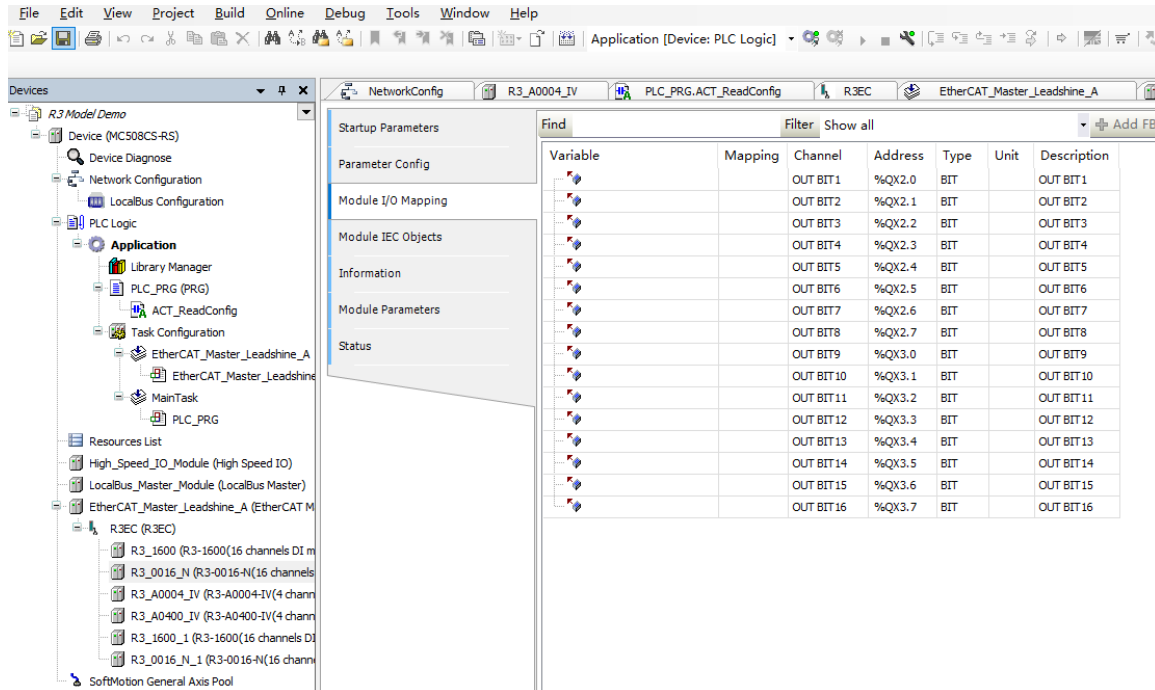


Digital Output Module: Double click “R3-0016-N” module, select “Parameter Configuration”, you can set the output status of the module after disconnection by bit. Each bit can choose “Hold” or “Reset”. As shown in the figure below:

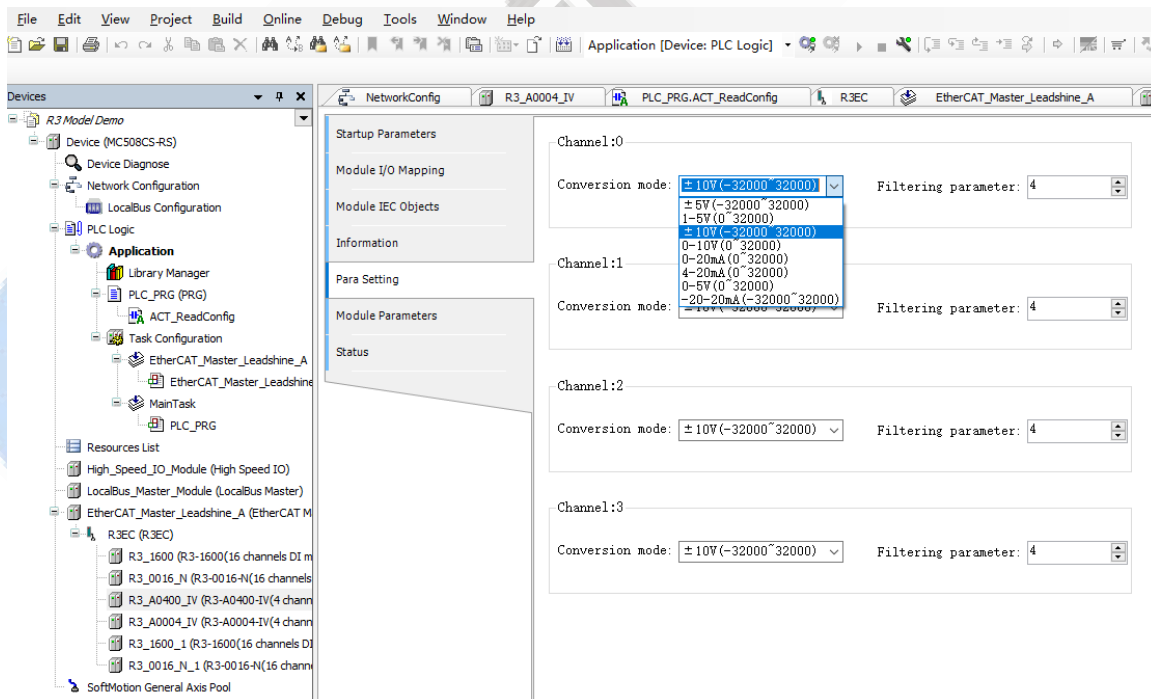


Double-click the “R3-0016-N” module and select “Module I/O Mapping” to map the output ports of the module to variables according to the BIT bit or according to the PORT method, so as to connect the input state of the module and the actual application program. This will connect the input state of the module to the actual application program. As shown in the figure below, you can map the output

ports of the module to variables according to BIT or PORT:

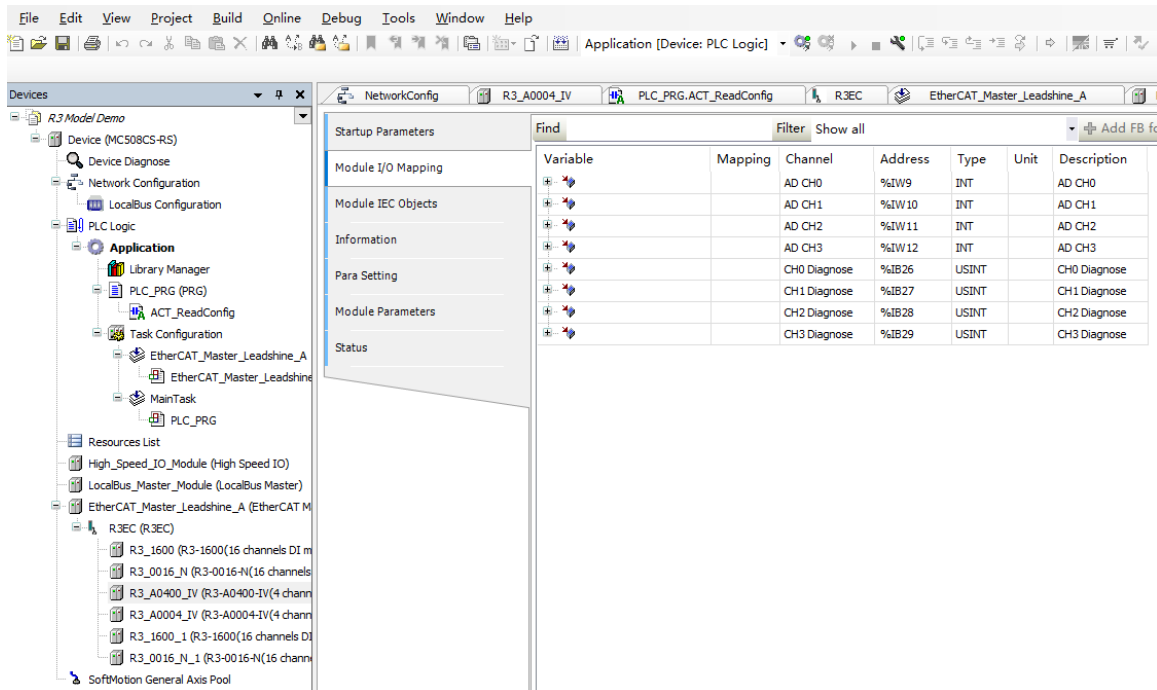


Analog Input Module: Double click “R3-A0400-IV” module, select “Parameter Configuration”, you can select voltage mode and current mode for the 4 input channels of the module, and each range has been corresponding to the conversion value. You can also fill in the filter parameters of each channel. As shown in the figure below:

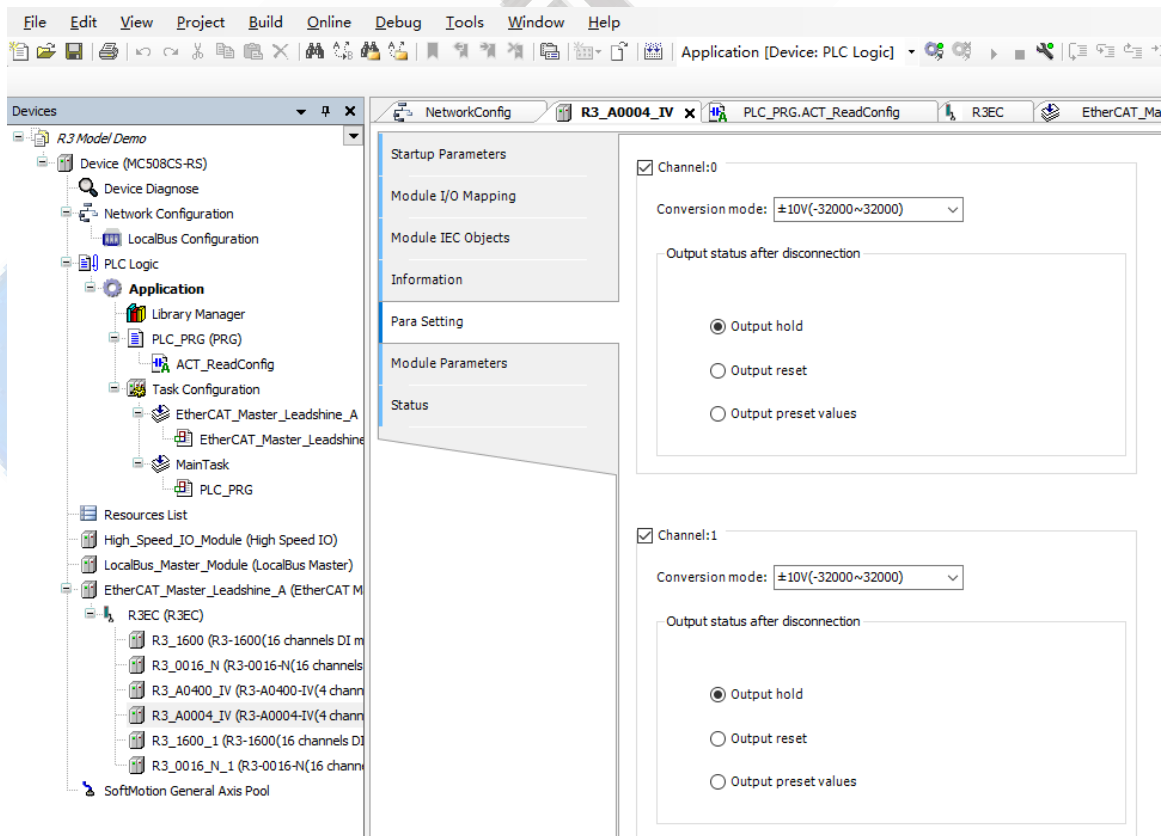


Double-click the “R3-A0400-IV” module and select “Module I/O Mapping” to map the four analog input ports of the module to variables, and then read the input values of each channel of the analog module by obtaining the values of the variables. By obtaining the value of the variable, you can read the input value of each channel of the analog module, thus connecting the status of each channel of the

module with the actual application program. As shown in the figure below:

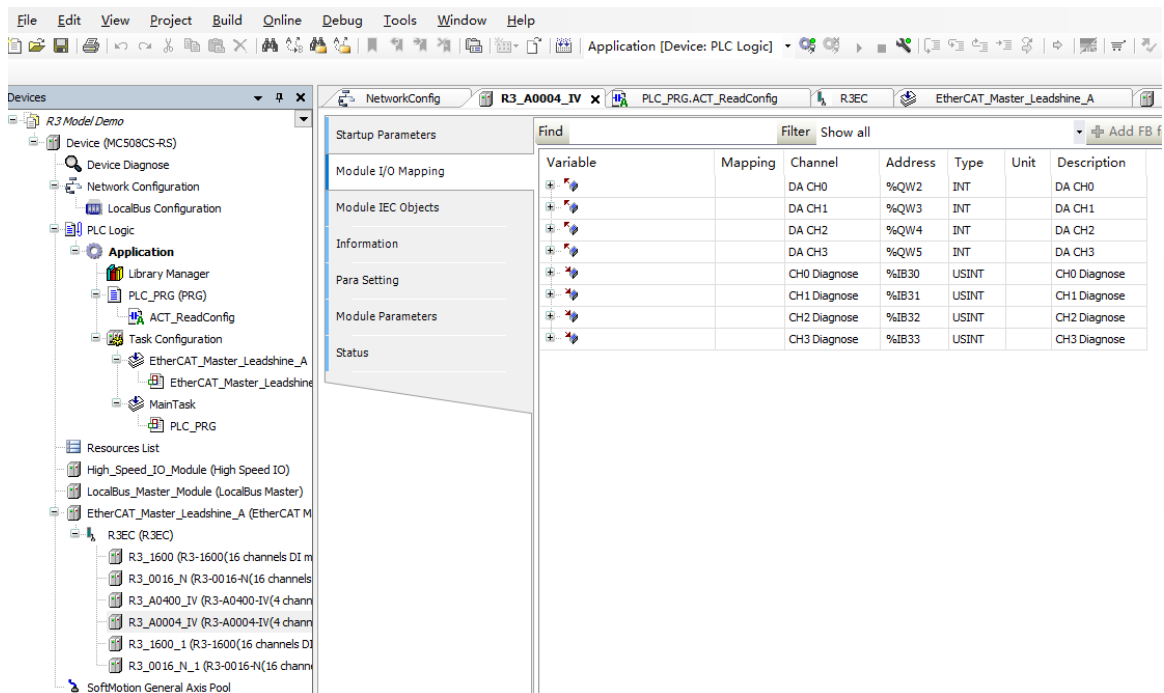


Analog output module: Double click “R3-A0004-IV” module, select “Parameter Configuration”, you can select voltage mode and current mode for the 4 output channels of the module, and each range has already corresponded to the value of conversion. You can also select the output state of the analog module after disconnection, including “output hold”, “output reset” and “output preset value” and other parameters. This is shown in the figure below:



Double-click the “R3-A0004-IV” module and select “Module I/O Mapping” to map the four analog

output ports of this module to variables, and then set the output value of each channel of the analog module by modifying the value of the variables, thus realizing the control of the output ports of the analog module through the application program. By modifying the value of the variable, you can set the output value of each channel of the analog module, thus realizing the control of the output ports of the analog module through the application program. As shown in the figure below:



5.1.2 Download the project after compilation and run it

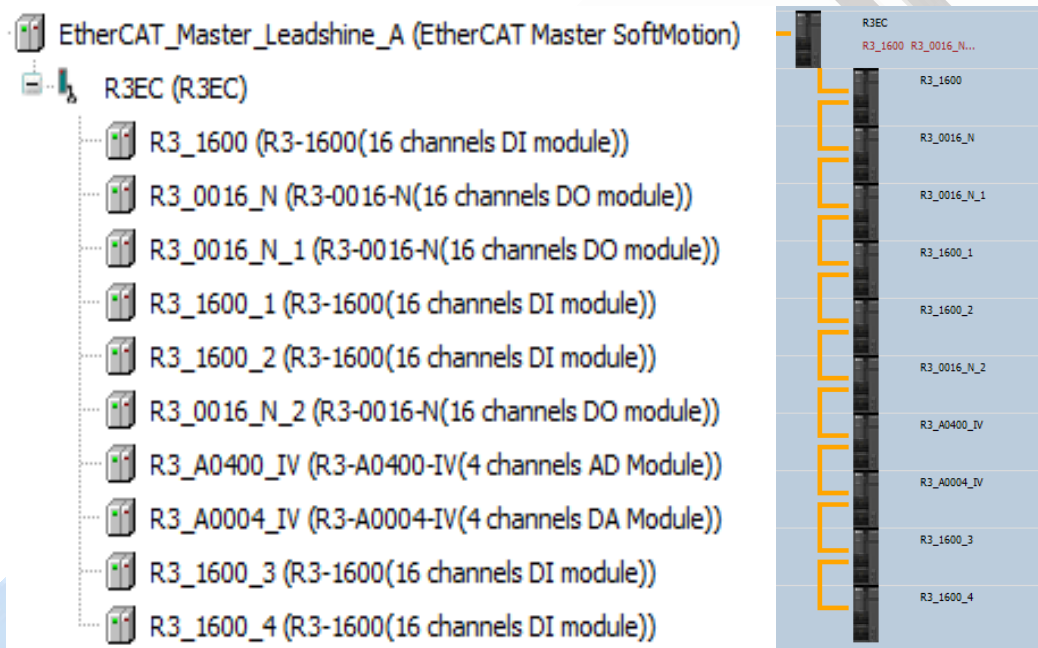
6. Object dictionary

6.1 Calculation module address

When using a leadshine master and an R3 series module, you can set the parameters of the expansion module through the configuration interface of the master or the “Startup Parameters” interface, and you do not need to operate the object dictionary through commands. When using a third-party master and an R3 series module, you can set or read the object dictionary through the command operation of accessing the object dictionary.

Before accessing the object dictionary of the expansion module, you need to determine the slot n of the target module. please start sorting from the first module after the coupler, the first module serial number is 0, i.e., $n=0$, starting from 0, according to the hexadecimal data in order of precedence, and the maximum value is 3F. The final address of the object dictionary to be accessed is: index value + $n \times 0x10$.

For example: as shown in the figure below, there are 10 modules mounted after the R3EC coupler, which are digital input, digital output, analog input module, analog output module, and now we need to set the module disconnection status of the 5th module (counting from 0), R3-0016-N-2, which corresponds to the index of the object dictionary of 8000h, according to the above calculation method, the index value of the 5th module corresponds to an index value of $8000h + (0 \times 05 \times 0x10) = 8050h$.



6.2 EtherCAT Coupler

The following is the object dictionary information related to the EtherCAT coupler R3EC

6.2.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Access	Description
1000H	00H	Device type	Unsigned32	ro	Device type and profile Initial value: x00001389
1001H	00H	Error Register	Unsigned32	ro	Error register Dfault: 0x00
1008H	00H	Device name	Vis String8	ro	Manufacturer's designation Dfault: R3EC
1009H	00H	Hardware version	Unsigned32	ro	Hardware version
100AH	00H	Software version	Unsigned32	ro	Software version
1018H	00H	Largest sub-index	Unsigned8	ro	Largest sub-index supported »04h

	01H	Vendor ID	Unsigned32	ro	Vendor ID Dfault: 0x00004321
	02H	Product code	Unsigned32	ro	Product code Dfault: 0x61400025
	03H	Revision	Unsigned32	ro	Revision number Dfault: 0x23042401
	04H	Serial number	Unsigned32	ro	Serial number Dfault: 0x00000001
F030H	00H	Configured Module Idnet List Num	Unsigned8	r/w	Number of configured modules
	01H	Module 0	Unsigned32	r/w	First module ID
	...	...			...
	40H	Module 63	Unsigned32	r/w	64th Module ID
F050H	00H	Detected Module Ident List Num	Unsigned16	ro	Number of scanned modules
	01H	Module 0	Unsigned32	ro	First module ID
	...	...	Unsigned32	ro	...
	40H	Module 63	Unsigned32	ro	64th Module ID

6.2.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Access	Description
F100H	01H	Module status	Unsigned64	ro	Each bit represents the status of the mounting module. 1: The corresponding bit module reports an error. 0: The corresponding bit module is normal

6.3 Digital Input Module

The following is the object dictionary information related to the digital input module R3-1600

6.3.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Effective range	Access	Description
8000H	03H	Input filter0	Unsigned 16	0~255	r/w	IN0-IN7 Input Filter Time
	04H	Input filter1	Unsigned 16		r/w	IN8-IN15 Input Filter Time
	05H	Input filter2	Unsigned 16		r/w	IN16-IN23 Input Filter Time
	06H	Input filter3	Unsigned 16		r/w	IN24-IN31 Input Filter Time
	07H	Version	Unsigned 16		ro	FPGA Version No.

6.3.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Access	Description
6000H	01H	Input bit [0-15]	Unsigned16	ro	Input
	02H	Input bit [16-31]	Unsigned16	ro	Input

6.4 Digital Output Module

The following is the object dictionary information for Digital Output Modules R3-0016-N and R3-0016-P.

6.4.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Effective range	Access	Description
8000H	01H	out state when link lost	Unsigned 16	0~0xffff	r/w	Out0-15 Control the status of the output port after a wire break, corresponding to bit: 1: Keep the output when the wire is broken; 0: Wire breakage reset (default) 0xff: Port 1-15 wire breakage hold output
	02H	out state when link lost	Unsigned 16	0~0xffff	r/w	Out16-31 Control the status of the output port after a wire break, corresponding to bit: 1: Keep the output when the wire is broken; 0: Wire breakage reset (default) 0xff: Port 16-31 wire breakage hold output
	07H	Version	Unsigned 16		ro	FPGA Version No.

6.4.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Access	Description
7000H	01H	Input bit [0-15]	Unsigned16	r/w	Input
	02H	Input bit [16-31]	Unsigned16	r/w	Input

6.5 Digital I/O Module

6.5.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Effective range	Access	Description
8000H	01H	out state when link lost	Unsigned 16	0~0xffff	r/w	Out0-7 Control the status of the output port after a wire break, corresponding to bit: 1: Keep the output when the wire is broken; 0: Wire breakage reset (default) 0xff: Port 0-7 wire breakage hold output
	03H	Input filter0	Unsigned 16	0~255	r/w	IN0-IN7 input port filter time
	07H	Version	Unsigned 16		ro	FPGA Version No.

6.5.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Access	Description
6000H	01H	Input bit [0-7]	Unsigned16	ro	Input

6.5.3 Process Data Object (RxPDO)

Index	Sub-index	Name	Data type	Access	Description
7000H	01H	Input bit [0-7]	Unsigned16	ro	Output

6.6 Analog Input Module

Below is the object dictionary information for the analog input module R3-A0400-IV

6.6.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Effective range	Access	Description
8000H	01H	AD0 Configure	Unsigned 8	0~7	r/w	Bit2-Bit0: 000: Voltage mode range $\pm 5V$ 001: Voltage mode range 1-5V 010: Voltage mode range $\pm 10V$ (Default) 011: Voltage mode range 0-10V 100: Current mode range 0-20mA 101: Current mode range 4-20mA 110: Voltage mode range 0-5V 111: Current mode range $\pm 20mA$
	02H	AD1 Configure	Unsigned 8	0~7	r/w	Bit2-Bit0: 000: Voltage mode range $\pm 5V$ 001: Voltage mode range 1-5V 010: Voltage mode range $\pm 10V$ (Default) 011: Voltage mode range 0-10V 100: Current mode range 0-20mA 101: Current mode range 4-20 mA 110: Voltage mode range 0-5V 111: Current mode range $\pm 20mA$
	03H	AD2 Configure	Unsigned 8	0~7	r/w	Bit2-Bit0: 000: Voltage mode range $\pm 5V$ 001: Voltage mode range 1-5V 010: Voltage mode range $\pm 10V$ (Default) 011: Voltage mode range 0-10V 100: Current mode range 0-20mA 101: Current mode range 4-20 mA 110: Voltage mode range 0-5V 111: Current mode range $\pm 20mA$
	04H	AD3 Configure	Unsigned 8	0~7	r/w	Bit2-Bit0: 000: Voltage mode range $\pm 5V$ 001: Voltage mode range 1-5V 010: Voltage mode range $\pm 10V$ (Default) 011: Voltage mode range 0-10V 100: Current mode range 0-20mA 101: Current mode range 4-20 mA 110: Voltage mode range 0-5V 111: Current mode range $\pm 20mA$
8001H	01H	Ad0 filter config	Unsigned 8	1~255	r/w	1-255ms
	02H	Ad1 filter config	Unsigned 8	1~255	r/w	1-255ms
	03H	Ad2 filter config	Unsigned 8	1~255	r/w	1-255ms
	04H	Ad3 filter	Unsigned 8	1~255	r/w	1-255ms

		config				
8002H	01H	Save control	Unsigned 8	0~1	r/w	1: Save current parameters
	02H	Reset params	Unsigned 8	0~1	r/w	1: Restore default parameters
8003H	01H	Ad0 enable	Unsigned 8	0~1	r/w	Ad0 enable (write 1 to enable the analog input channel, default is 1)
	02H	Ad1 enable	Unsigned 8	0~1	r/w	Ad1 enable (write 1 to enable the analog input channel, default is 1)
	03H	Ad2 enable	Unsigned 8	0~1	r/w	Ad2 enable (write 1 to enable the analog input channel, default is 1)
	04H	Ad3 enable	Unsigned 8	0~1	r/w	Ad3 enable (write 1 to enable the analog input channel, default is 1)
9000H	05H	VendorID	Unsigned32	-	ro	Manufacturer ID
	06H	Product Code	Unsigned32	-	ro	product code
	07H	Revision Number	Unsigned32	-	ro	Software Version No.
	08H	Serial Number	Unsigned32	-	ro	serial number
	09H	FPGA Version	Unsigned32	-	ro	FPGA Version No.

6.6.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Access	Description
6000H	01H	Ad ch0	Unsigned16	ro	Ad ch0 sample value
	02H	Ad ch1	Unsigned16	ro	Ad ch1 sample value
	03H	Ad ch2	Unsigned16	ro	Ad ch2 sample value
	04H	Ad ch3	Unsigned16	ro	Ad ch3 sample value
A000H	01H	Ch0 diagnose	Unsigned8	ro	Bit: 0-3 (keep) Bit: 4 1: Input overrun 0: Input normal
	02H	Ch1 diagnose	Unsigned8	ro	Bit: 0-3 (keep) Bit: 4 1: Input overrun 0: Input normal
	03H	Ch2 diagnose	Unsigned8	ro	Bit: 0-3 (keep) Bit: 4 1: Input overrun 0: Input normal
	04H	Ch3 diagnose	Unsigned8	ro	Bit: 0-3 (keep) Bit: 4 1: Input overrun 0: Input normal

6.7 Analog Output Module

The following is a dictionary of objects related to the Analog Output Module R3-A0004-IV

6.7.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Effective range	Access	Description
8000H	01H	DA0 Configure	Unsigned8	0~6	r/w	Bit2-Bit0: 000: Voltage mode range 0-5V 001: Voltage mode range 1-5V 010: Voltage mode range $\pm 5V$ 011: Voltage mode range 0-10V 100: Voltage mode range $\pm 10V$ 101: Current mode range 0-20mA 110: Current mode range 4-20mA
	02H	DA1 Configure	Unsigned8	0~6	r/w	Bit2-Bit0: 000: Voltage mode range 0-5V 001: Voltage mode range 1-5V 010: Voltage mode range $\pm 5V$ 011: Voltage mode range 0-10V 100: Voltage mode range $\pm 10V$ 101: Current mode range 0-20mA 110: Current mode range 4-20mA
	03H	DA2 Configure	Unsigned8	0~6	r/w	Bit2-Bit0: 000: Voltage mode range 0-5V 001: Voltage mode range 1-5V 010: Voltage mode range $\pm 5V$ 011: Voltage mode range 0-10V 100: Voltage mode range $\pm 10V$ 101: Current mode range 0-20mA 110: Current mode range 4-20mA
	04H	DA3 Configure	Unsigned8	0~6	r/w	Bit2-Bit0: 000: Voltage mode range 0-5V 001: Voltage mode range 1-5V 010: Voltage mode range $\pm 5V$ 011: Voltage mode range 0-10V 100: Voltage mode range $\pm 10V$ 101: Current mode range 0-20mA 110: Current mode range 4-20mA
8001H	01H	Da0 enable	Unsigned8	0~1	r/w	Da0 enable (write 1 to enable the analog output channel, default is 1)
	02H	Da1 enable	Unsigned8	0~1	r/w	Da1 enable (write 1 to enable the analog output channel, default is 1)
	03H	Da2 enable	Unsigned8	0~1	r/w	Da2 enable (write 1 to enable the analog output channel, default is 1)
	04H	Da3 enable	Unsigned8	0~1	r/w	Da3 enable (write 1 to enable the analog output channel, default is 1)
8002H	01H	Da0 state when link lost	Unsigned8	0~2	r/w	0: Output Hold 1: Output Clear 2: Output preset values
	02H	Da1 state when link lost	Unsigned8	0~2	r/w	0: Output Hold 1: Output Clear 2: Output preset values
	03H	Da2 state when link lost	Unsigned8	0~2	r/w	0: Output Hold 1: Output Clear 2: Output preset values
	04H	Da3 state	Unsigned8	0~2	r/w	0: Output Hold

		when link lost				1: Output Clear 2: Output preset values
8003H	01H	Da0 value when link lost	Unsigned16	-32000~32000	r/w	Output preset value when disconnected -32000-32000
	02H	Da1 value when link lost	Unsigned16	-32000~32000	r/w	Output preset value when disconnected -32000-32000
	03H	Da2 value when link lost	Unsigned16	-32000~32000	r/w	Output preset value when disconnected -32000-32000
	04H	Da3 value when link lost	Unsigned16	-32000~32000	r/w	Output preset value when disconnected -32000-32000
8004H	01H	Da save params	Unsigned8	0~1	r/w	Write 1 to save current parameters (excluding calibration parameters)
	02H	Da reset params	Unsigned8	0~1	r/w	Write 1 Reset to default parameters (excluding calibration parameters)
9000H	05H	VendorID	Unsigned32	-	ro	Manufacturer ID
	06H	Product Code	Unsigned32	-	ro	Product code
	07H	Revision Number	Unsigned32	-	ro	Software Version No.
	08H	Serial Number	Unsigned32	-	ro	Serial number
	09H	FPGA Version	Unsigned32	-	ro	FPGA Version No.

6.7.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Effective range	Access
A000H	01H	Ch0 diagnose	Unsigned8	ro	Bit: 0-3 (keep) Bit: 4 1: Output overrun 0: Output normal
	02H	Ch1 diagnose	Unsigned8	ro	Bit: 0-3 (keep) Bit: 4 1: Output overrun 0: Output normal
	03H	Ch2 diagnose	Unsigned8	ro	Bit: 0-3 (keep) Bit: 4 1: Output overrun 0: Output normal
	04H	Ch3 diagnose	Unsigned8	ro	Bit: 0-3 (keep) Bit: 4 1: Output overrun 0: Output normal

6.7.3 Process Data Object (RxPDO)

Index	Sub-index	Name	Data type	Access	Description
7000H	01H	Da Ch0	Unsigned16	r/w	DA0 set value
	02H	Da Ch1	Unsigned16	r/w	DA1 set value
	03H	Da Ch2	Unsigned16	r/w	DA2 set value
	04H	Da Ch3	Unsigned16	r/w	DA3 set value

6.8 Thermocouple Temperature Module

6.8.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Effective range	Access	Description
8000H	01H	CH0 Unit selset	Unsigned 8	0~1	r/w	Channel 0 ℃/ ℉ display 0: ℃ (Default) 1: ℉
	02H	CH1 Unit selset	Unsigned 8	0~1	r/w	Channel 1 ℃/ ℉ display 0: ℃ (Default) 1: ℉
	03H	CH2 Unit selset	Unsigned 8	0~1	r/w	Channel 2 ℃/ ℉ display 0: ℃ (Default) 1: ℉
	04H	CH3 Unit selset	Unsigned 8	0~1	r/w	Channel 3 ℃/ ℉ display 0: ℃ (Default) 1: ℉
8001H	01H	CH0 enable	Unsigned 8	0~1	r/w	Channel 0 Enable 0: OFF 1: ON (Default)
	02H	CH1 enable	Unsigned 8	0~1	r/w	Channel 1 Enable 0: OFF 1: ON (Default)
	03H	CH2 enable	Unsigned 8	0~1	r/w	Channel 2 Enable 0: OFF 1: ON (Default)
	04H	CH3 enable	Unsigned 8	0~1	r/w	Channel 3 Enable 0: OFF 1: ON (Default)
8002H	01H	CH0 Sensor type	Unsigned 8	0~8	r/w	Channel 0 Sensor Type Selection 0: J 1: K (Default) 2: E 3: N 4: T 5: R 6: S 7: B 8: 100mV
	02H	CH1 Sensor type	Unsigned 8	0~8	r/w	Channel 1 Sensor Type 0: J 1: K (Default) 2: E 3: N 4: T 5: R

						6: S 7: B 8: 100mV
	03H	CH2 Sensor type	Unsigned 8	0~8	r/w	Channel 2 Sensor Type 0: J 1: K (Default) 2: E 3: N 4: T 5: R 6: S 7: B 8: 100mV
	04H	CH3 Sensor type	Unsigned 8	0~8	r/w	Channel 3 Sensor Type 0: J 1: K (Default) 2: E 3: N 4: T 5: R 6: S 7: B 8: 100mV
8003H	01H	CH0 filter config	Unsigned 8	1~100	r/w	Channel 0 Filter Time 1~100 (default 5.Unit: s)
	02H	CH1 filter config	Unsigned 8	1~100	r/w	Channel 1 Filter Time 1~100 (default 5.Unit: s)
	03H	CH2 filter config	Unsigned 8	1~100	r/w	Channel 2 Filter Time 1~100 (default 5.Unit: s)
	04H	CH3 filter config	Unsigned 8	1~100	r/w	Channel 3 Filter Time 1~100 (default 5.Unit: s)
8004H	01H	CH0 threshold	Unsigned 8	0~1	r/w	Channel 0 set threshold enable 0: Default threshold (Default) 1: Set threshold
	02H	CH1 threshold	Unsigned 8	0~1	r/w	Channel 1 set threshold enable 0: Default threshold (Default) 1: Set threshold
	03H	CH2 threshold	Unsigned 8	0~1	r/w	Channel 2 set threshold enable 0: Default threshold (Default) 1: Set threshold
	04H	CH3 threshold	Unsigned 8	0~1	r/w	Channel 3 set threshold enable 0: Default threshold (Default) 1: Set threshold
8005H	01H	CH0 threshold low	Signed16	-32768~32767	r/w	Channel 0 temperature minimum (X10) Default: -1500(-150°C)
	02H	CH0 threshold high	Signed16	-32768~32767	r/w	Channel 0 temperature max. (X10) Default: 18000(1800°C)
	03H	CH1 threshold low	Signed16	-32768~32767	r/w	Channel 1 temperature minimum (X10) Default: -1500(-150°C)
	04H	CH1 threshold high	Signed16	-32768~32767	r/w	Channel 1 temperature max. (X10) Default: 18000(1800°C)
	05H	CH2	Signed16	-32768~	r/w	Channel 2 temperature minimum

		threshold low		32767		(X10) Default: -1500(-150°C)
	06H	CH2 threshold high	Signed16	-32768~ 32767	r/w	Channel 2 temperature max. (X10) Default: 18000(1800°C)
	07H	CH3 threshold low	Signed16	-32768~ 32767	r/w	Channel 3 temperature minimum (X10) Default: -1500(-150°C)
	08H	CH3 threshold high	Signed16	-32768~ 32767	r/w	Channel 3 temperature max. (X10) Default: 18000(1800°C)
8006H	01H	CH0 sensor monitor	Unsigned 8	0~1	r/w	Channel 0 Sensor Break Detection 0: OFF 1: ON (Default)
	02H	CH1 sensor monitor	Unsigned 8	0~1	r/w	Channel 1 Sensor Break Detection 0: OFF 1: ON (Default)
	03H	CH2 sensor monitor	Unsigned 8	0~1	r/w	Channel 2 Sensor Break Detection 0: OFF 1: ON (Default)
	04H	CH3 sensor monitor	Unsigned 8	0~1	r/w	Channel 3 Sensor Break Detection 0: OFF 1: ON (Default)
	05H	Line break display	Unsigned 8	0~1	r/w	Disconnected display value 0: Maximum value 32767 (default) 1: Minimum value -32767
8007H	01H	Temp sample period	Unsigned 8	0~2	r/w	Temperature sampling period 0: 250ms 1: 500ms (Default) 2: 1000ms
	02H	Save Params	Unsigned 16	0~1	wo	Write 1 to save the current parameter
	03H	Reset Params	Unsigned 16	0~1	wo	Write 1 to reset to default parameters
8008H	01H	CH0 offset config	Signed16	-32768~ 32767	r/w	Channel 0 offset configuration (the actual value is the input value divided by 10, e.g. if 200.5 is entered then the offset value is 20.5 °C, default: 0) Digital offset for 100mV type Temperature sensor offset by current unit
	02H	CH1 offset config	Signed16	-32768~ 32767	r/w	Channel 1 offset configuration (the actual value is the input value divided by 10, e.g. if 200.5 is entered then the offset value is 20.5 °C, default: 0) Digital offset for 100mV type Temperature sensor offset by current unit
	03H	CH2 offset	Signed16	-32768~	r/w	Channel 2 offset configuration

		config		32767		(the actual value is the input value divided by 10, e.g. if 200.5 is entered then the offset value is 20.5 °C, default: 0) Digital offset for 100mV type Temperature sensor offset by current unit
	04H	CH3 offset config	Signed16	-32768~32767	r/w	Channel 3 offset configuration (the actual value is the input value divided by 10, e.g. if 200.5 is entered then the offset value is 20.5 °C, default: 0) Digital offset for 100mV type Temperature sensor offset by current unit
8009H	01H	CH0 cold-junction enable	Unsigned 8	0~1	r/w	CH0 Cold End Compensation Enable 0: OFF 1: ON (default)
	02H	CH1 cold-junction enable	Unsigned 8	0~1	r/w	CH1 Cold End Compensation Enable 0: OFF 1: ON (default)
	03H	CH2 cold-junction enable	Unsigned 8	0~1	r/w	CH2 Cold End Compensation Enable 0: OFF 1: ON (default)
	04H	CH3 cold-junction enable	Unsigned 8	0~1	r/w	CH3 Cold End Compensation Enable 0: OFF 1: ON (default)
800AH	01H	CH0 cold-junction type	Unsigned 8	0~1	r/w	CH0 Cold End Compensation Type 0: Internal temperature chip compensation (default) 1: External input compensation
	02H	CH1 cold-junction type	Unsigned 8	0~1	r/w	CH1 Cold End Compensation Type 0: Internal temperature chip compensation (default) 1: External input compensation
	03H	CH2 cold-junction type	Unsigned 8	0~1	r/w	CH2 Cold End Compensation Type 0: Internal temperature chip compensation (default) 1: External input compensation
	04H	CH3 cold-junction type	Unsigned 8	0~1	r/w	CH3 Cold End Compensation Type 0: Internal temperature chip compensation (default) 1: External input compensation
800BH	01H	CH0 cold-junction value	Signed32	-2 ³¹ ~2 ³¹ -1	r/w	CH0 external input cold end compensation temperature (actual value is input value divided by 10, e.g. if 200.5 is input then actual is 20.5 °C) Compensation by current unit

	02H	CH1 cold-junction value	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	CH1 external input cold end compensation temperature (actual value is input value divided by 10, e.g. if 200.5 is input then actual is 20.5 °C) Compensation by current unit
	03H	CH2 cold-junction value	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	CH2 external input cold end compensation temperature (actual value is input value divided by 10, e.g. if 200.5 is input then actual is 20.5 °C) Compensation by current unit
	04H	CH3 cold-junction value	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	CH3 external input cold end compensation temperature (actual value is input value divided by 10, e.g. if 200.5 is input then actual is 20.5 °C) Compensation by current unit
800EH	01H	CH0 kp	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 0 Kp proportional control
	02H	CH0 ti	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 0 Ti Integral Control
	03H	CH0 td	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 0 Td Differential Control
	04H	CH0 cycle	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 0 Pid Run Cycle
	05H	CH1 kp	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 1 Kp proportional control
	06H	CH1 ti	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 1 Ti Integral Control
	07H	CH1 td	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 1 Td Differential Control
	08H	CH1 cycle	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 1 Pid Run Cycle
	09H	CH2 kp	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 2 Kp proportional control
	0AH	CH2 ti	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 2 Ti Integral Control
	0BH	CH2 td	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 2 Td Differential Control
	0CH	CH2 cycle	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 2 Pid Run Cycle
	0DH	CH3 kp	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 3 Kp proportional control
	0EH	CH3 ti	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 3 Ti Integral Control
	0FH	CH3 td	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 3 Td Differential Control
	10H	CH3 cycle	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 3 Pid Run Cycle
800FH	01H	CH0 set target	Signed16	$-32768 \sim 32767$	r/w	CH0 PID target value (integer value, the actual value is the input value divided by 10) e.g.: input 1205 then it represents 120.5 °C
	02H	CH1 set	Signed16	$-32768 \sim$	r/w	CH1 PID target value (integer

		target		32767		value, the actual value is the input value divided by 10) e.g.: input 1205 then it represents 120.5 °C
	03H	CH2 set target	Signed16	-32768~32767	r/w	CH2 PID target value (integer value, the actual value is the input value divided by 10) e.g.: input 1205 then it represents 120.5 °C
	04H	CH3 set target	Signed16	-32768~32767	r/w	CH3 PID target value (integer value, the actual value is the input value divided by 10) e.g.: input 1205 then it represents 120.5 °C
	05H	CH0 pid run	Unsigned 8	0~1	r/w	Channel 0 PID operation control 0: Disable (default) 1: Enable
	06H	CH0 pid calibration	Unsigned 8	0~1	r/w	Channel 0 PID self-tuning 0: Disable (default) 1: Enable
	07H	CH0 pid polartiy	Unsigned 8	0~1	r/w	Channel 0 PID Polarity 0: Unipolar (default) 1: Bipolar
	08H	CH1 pid run	Unsigned 8	0~1	r/w	Channel 1 PID operation control 0: Disable (default) 1: Enable
	09H	CH1 pid calibration	Unsigned 8	0~1	r/w	Channel 1 PID self-tuning 0: Disable (default) 1: Enable
	0AH	CH1 pid polartiy	Unsigned 8	0~1	r/w	Channel 1 PID Polarity 0: Unipolar (default) 1: Bipolar
	0BH	CH2 pid run	Unsigned 8	0~1	r/w	Channel 2 PID operation control 0: Disable (default) 1: Enable
	0CH	CH2 pid calibration	Unsigned 8	0~1	r/w	Channel 2 PID self-tuning 0: Disable (default) 1: Enable
	0DH	CH2 pid polartiy	Unsigned 8	0~1	r/w	Channel 2 PID Polarity 0: Unipolar (default) 1: Bipolar
	0EH	CH3 pid run	Unsigned 8	0~1	r/w	Channel 3 PID operation control 0: Disable (default) 1: Enable
	0FH	CH3 pid calibration	Unsigned 8	0~1	r/w	Channel 3 PID self-tuning 0: Disable (default) 1: Enable
	10H	CH3 pid polartiy	Unsigned 8	0~1	r/w	Channel 3 PID Polarity 0: Unipolar (default) 1: Bipolar
9000H	05H	VendorID	Unsigned32	-	ro	Manufacturer ID
	06H	Product Code	Unsigned32	-	ro	Product code
	07H	Revision Number	Unsigned32	-	ro	Software Version No.

	08H	Serial Number	Unsigned32	-	ro	Serial number
	09H	FPGA Version	Unsigned32	-	ro	FPGA Version No.

6.8.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Effective range	Access
6000H	01H	CH0 code	Signed16	ro	Channel 0 integer temperature (X10)
	02H	CH1 code	Signed16	ro	Channel 1 integer temperature (X10)
	03H	CH2 code	Signed16	ro	Channel 2 integer temperature (X10)
	04H	CH3 code	Signed16	ro	Channel 3 integer temperature (X10)
A000H	01H	CH0 state	Unsigned 8	ro	Channel 0 Status 0x00: Normal 0x01: Calibration mode, waiting for first standard value 0x02: waiting for second standard value 0x03: Calculate calibration value 0x04: Calculation of calibration value completed 0x10: Temperature overrun 0x20: Sensor disconnected 0x40: Threshold write error 0x80: Cold end compensation or temperature offset write error 0xFF: Channel not enabled
	02H	CH1state	Unsigned 8	ro	Channel 1 Status 0x00: Normal 0x01: Calibration mode, waiting for first standard value 0x02: waiting for second standard value 0x03: Calculate calibration value 0x04: Calculation of calibration value completed 0x10: Temperature overrun 0x20: Sensor disconnected 0x40: Threshold write error 0x80: Cold end compensation or temperature offset write error 0xFF: Channel not enabled
	03H	CH2 code	Unsigned 8	ro	Channel 2 Status 0x00: Normal 0x01: Calibration mode, waiting for first standard value 0x02: waiting for second standard value 0x03: Calculate calibration value 0x04: Calculation of calibration value completed 0x10: Temperature overrun 0x20: Sensor disconnected 0x40: Threshold write error 0x80: Cold end compensation or temperature offset write error 0xFF: Channel not enabled
	04H	CH3 state	Unsigned 8	ro	Channel 0 Status 0x00: Normal 0x01: Calibration mode, waiting for first standard value 0x02: waiting for second standard value 0x03: Calculate calibration value

					0x04: Calculation of calibration value completed 0x10: Temperature overrun 0x20: Sensor disconnected 0x40: Threshold write error 0x80: Cold end compensation or temperature offset write error 0xFF: Channel not enabled If both a temperature overrun and a sensor disconnection error occur, the error code is 0x10+0x20=0x30
A001H	01H	CH0 Pid state	Unsigned 8	ro	Channel 0 pid status Bit0: Running status 0-Stop,1-Run (1 after enabling Pid, 0 at self-tuning time, 1 at end of self-tuning) Bit1: output mode 0-heat,1-cool Bit2: Self-tuning 0-Stop,1-Tuning (1 when self-tuning is enabled, 0 when self-tuning is completed) Bit3: Self-tuning error 0-NO_Err, 1-Tune_Err Bit4: heat_out 0-NO_Output, 1-Temperature_Control_Output Bit5: cool_out 0-no output, 1-temperature control output
	02H	CH1 Pid state	Unsigned 8	ro	Channel 1 pid status Bit0: Running status 0-Stop,1-Run (1 after enabling Pid, 0 at self-tuning time, 1 at end of self-tuning) Bit1: output mode 0-heat,1-cool Bit2: Self-tuning 0-Stop,1-Tuning (1 when self-tuning is enabled, 0 when self-tuning is completed) Bit3: Self-tuning error 0-NO_Err, 1-Tune_Err Bit4: heat_out 0-NO_Output, 1-Temperature_Control_Output Bit5: cool_out 0-no output, 1-temperature control output
	03H	CH2 Pid state	Unsigned 8	ro	Channel 2 pid status Bit0: Running status 0-Stop,1-Run (1 after enabling Pid, 0 at self-tuning time, 1 at end of self-tuning) Bit1: output mode 0-heat,1-cool Bit2: Self-tuning 0-Stop,1-Tuning (1 when self-tuning is enabled, 0 when self-tuning is completed) Bit3: Self-tuning error 0-NO_Err, 1-Tune_Err Bit4: heat_out 0-NO_Output, 1-Temperature_Control_Output Bit5: cool_out 0-no output, 1-temperature control output
	04H	CH3 Pid state	Unsigned 8	ro	Channel 3 pid status Bit0: Running status 0-Stop,1-Run (1 after enabling Pid, 0 at self-tuning time, 1 at end of self-tuning) Bit1: output mode 0-heat,1-cool Bit2: Self-tuning 0-Stop,1-Tuning (1 when self-tuning is enabled, 0 when self-tuning is completed) Bit3: Self-tuning error 0-NO_Err, 1-Tune_Err

					Bit4: heat_out 0-NO_Output, 1-Temperature_Control_Output Bit5: cool_out 0-no output, 1-temperature control output
--	--	--	--	--	--

6.9 RTD Temperature Modules

6.9.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Effective range	Access	Description
8000H	01H	CH0 Unit setset	Unsigned 8	0~1	r/w	Channel 0 ℃/℉ display 0: ℃ (Default) 1: ℉
	02H	CH1 Unit setset	Unsigned 8	0~1	r/w	Channel 1 ℃/℉ display 0: ℃ (Default) 1: ℉
	03H	CH2 Unit setset	Unsigned 8	0~1	r/w	Channel 2 ℃/℉ display 0: ℃ (Default) 1: ℉
	04H	CH3 Unit setset	Unsigned 8	0~1	r/w	Channel 3 ℃/℉ display 0: ℃ (Default) 1: ℉
8001H	01H	CH0 enable	Unsigned 8	0~1	r/w	Channel 0 Enable 0: OFF 1: ON (Default)
	02H	CH1 enable	Unsigned 8	0~1	r/w	Channel 1 Enable 0: OFF 1: ON (Default)
	03H	CH2 enable	Unsigned 8	0~1	r/w	Channel 2 Enable 0: OFF 1: ON (Default)
	04H	CH3 enable	Unsigned 8	0~1	r/w	Channel 3 Enable 0: OFF 1: ON (Default)
8002H	01H	CH0 Sensor type	Unsigned 8	0~4	r/w	Channel 0 Sensor Type Selection 0: Pt100 (Default) 1: Pt500 2: Pt1000 3: Cu50 4: Cu100
	02H	CH1 Sensor type	Unsigned 8	0~4	r/w	Channel 1 Sensor Type Selection 0: Pt100 (Default) 1: Pt500 2: Pt1000 3: Cu50 4: Cu100
	03H	CH2 Sensor type	Unsigned 8	0~4	r/w	Channel 2 Sensor Type Selection 0: Pt100 (Default) 1: Pt500 2: Pt1000 3: Cu50 4: Cu100

	04H	CH3 Sensor type	Unsigned 8	0~4	r/w	Channel 3 Sensor Type Selection 0: Pt100 (Default) 1: Pt500 2: Pt1000 3: Cu50 4: Cu100
8003H	01H	CH0 filter config	Unsigned 8	1~100	r/w	Channel 0 Filter Time 1~100 (default 5.Unit: s)
	02H	CH1 filter config	Unsigned 8	1~100	r/w	Channel 1 Filter Time 1~100 (default 5.Unit: s)
	03H	CH2 filter config	Unsigned 8	1~100	r/w	Channel 2 Filter Time 1~100 (default 5.Unit: s)
	04H	CH3 filter config	Unsigned 8	1~100	r/w	Channel 3 Filter Time 1~100 (default 5.Unit: s)
8004H	01H	CH0 threshold	Unsigned 8	0~1	r/w	Channel 0 set threshold enable 0: Default threshold (Default) 1: Set threshold
	02H	CH1 threshold	Unsigned 8	0~1	r/w	Channel 1 set threshold enable 0: Default threshold (Default) 1: Set threshold
	03H	CH2 threshold	Unsigned 8	0~1	r/w	Channel 2 set threshold enable 0: Default threshold (Default) 1: Set threshold
	04H	CH3 threshold	Unsigned 8	0~1	r/w	Channel 3 set threshold enable 0: Default threshold (Default) 1: Set threshold
8005H	01H	CH0 threshold low	Signed16	-32768~32767	r/w	Channel 0 temperature minimum (X10) Default: -1500(-150°C)
	02H	CH0 threshold high	Signed16	-32768~32767	r/w	Channel 0 temperature max. (X10) Default: 18000(1800°C)
	03H	CH1 threshold low	Signed16	-32768~32767	r/w	Channel 1 temperature minimum (X10) Default: -1500(-150°C)
	04H	CH1 threshold high	Signed16	-32768~32767	r/w	Channel 1 temperature max. (X10) Default: 18000(1800°C)
	05H	CH2 threshold low	Signed16	-32768~32767	r/w	Channel 2 temperature minimum (X10) Default: -1500(-150°C)
	06H	CH2 threshold high	Signed16	-32768~32767	r/w	Channel 2 temperature max. (X10) Default: 18000(1800°C)
	07H	CH3 threshold low	Signed16	-32768~32767	r/w	Channel 3 temperature minimum (X10) Default: -1500(-150°C)
	08H	CH3 threshold high	Signed16	-32768~32767	r/w	Channel 3 temperature max. (X10) Default: 18000(1800°C)

8006H	01H	CH0 sensor monitor	Unsigned 8	0~1	r/w	Channel 0 Sensor Break Detection 0: OFF 1: ON (Default)
	02H	CH1 sensor monitor	Unsigned 8	0~1	r/w	Channel 1 Sensor Break Detection 0: OFF 1: ON (Default)
	03H	CH2 sensor monitor	Unsigned 8	0~1	r/w	Channel 2 Sensor Break Detection 0: OFF 1: ON (Default)
	04H	CH3 sensor monitor	Unsigned 8	0~1	r/w	Channel 3 Sensor Break Detection 0: OFF 1: ON (Default)
	05H	Line break display	Unsigned 8	0~1	r/w	Disconnected display value 0: Maximum value 32767 (default) 1: Minimum value -32767
8007H	01H	Temp sample period	Unsigned 8	0~2	r/w	Temperature sampling period 0: 250ms 1: 500ms (Default) 2: 1000ms
	02H	Save Params	Unsigned 16	0~1	wo	Write 1 to save the current parameter
	03H	Reset Params	Unsigned 16	0~1	wo	Write 1 to reset to default parameters
8008H	01H	CH0 offset config	Signed16	-32768~32767	r/w	Channel 0 offset configuration (the actual value is the input value divided by 10, e.g. if 200.5 is entered then the offset value is 20.5 °C, default: 0) Digital offset for 100mV type Temperature sensor offset by current unit
	02H	CH1 offset config	Signed16	-32768~32767	r/w	Channel 1 offset configuration (the actual value is the input value divided by 10, e.g. if 200.5 is entered then the offset value is 20.5 °C, default: 0) Digital offset for 100mV type Temperature sensor offset by current unit
	03H	CH2 offset config	Signed16	-32768~32767	r/w	Channel 2 offset configuration (the actual value is the input value divided by 10, e.g. if 200.5 is entered then the offset value is 20.5 °C, default: 0) Digital offset for 100mV type Temperature sensor offset by current unit
	04H	CH3 offset config	Signed16	-32768~32767	r/w	Channel 3 offset configuration (the actual value is the input value divided by 10, e.g. if 200.5 is entered then the offset

						value is 20.5 °C, default: 0) Digital offset for 100mV type Temperature sensor offset by current unit
800EH	01H	CH0 kp	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 0 Kp proportional control
	02H	CH0 ti	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 0 Ti Integral Control
	03H	CH0 td	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 0 Td Differential Control
	04H	CH0 cycle	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 0 Pid Run Cycle
	05H	CH1 kp	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 1 Kp proportional control
	06H	CH1 ti	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 1 Ti Integral Control
	07H	CH1 td	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 1 Td Differential Control
	08H	CH1 cycle	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 1 Pid Run Cycle
	09H	CH2 kp	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 2 Kp proportional control
	0AH	CH2 ti	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 2 Ti Integral Control
	0BH	CH2 td	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 2 Td Differential Control
	0CH	CH2 cycle	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 2 Pid Run Cycle
	0DH	CH3 kp	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 3 Kp proportional control
	0EH	CH3 ti	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 3 Ti Integral Control
	0FH	CH3 td	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 3 Td Differential Control
	10H	CH3 cycle	Signed32	$-2^{31} \sim 2^{31}-1$	r/w	Channel 3 Pid Run Cycle
800FH	01H	CH0 set target	Signed16	$-32768 \sim 32767$	r/w	CH0 PID target value (integer value, the actual value is the input value divided by 10) e.g.: input 1205 then it represents 120.5 °C
	02H	CH1 set target	Signed16	$-32768 \sim 32767$	r/w	CH1 PID target value (integer value, the actual value is the input value divided by 10) e.g.: input 1205 then it represents 120.5 °C
	03H	CH2 set target	Signed16	$-32768 \sim 32767$	r/w	CH2 PID target value (integer value, the actual value is the input value divided by 10) e.g.: input 1205 then it represents 120.5 °C
	04H	CH3 set	Signed16	$-32768 \sim 32767$	r/w	CH3 PID target value (integer

		target		32767		value, the actual value is the input value divided by 10) e.g.: input 1205 then it represents 120.5 °C
	05H	CH0 pid run	Unsigned 8	0~1	r/w	Channel 0 PID operation control 0: Disable (default) 1: Enable
	06H	CH0 pid calibration	Unsigned 8	0~1	r/w	Channel 0 PID self-tuning 0: Disable (default) 1: Enable
	07H	CH0 pid polartiy	Unsigned 8	0~1	r/w	Channel 0 PID Polarity 0: Unipolar (default) 1: Bipolar
	08H	CH1 pid run	Unsigned 8	0~1	r/w	Channel 1 PID operation control 0: Disable (default) 1: Enable
	09H	CH1 pid calibration	Unsigned 8	0~1	r/w	Channel 1 PID self-tuning 0: Disable (default) 1: Enable
	0AH	CH1 pid polartiy	Unsigned 8	0~1	r/w	Channel 1 PID Polarity 0: Unipolar (default) 1: Bipolar
	0BH	CH2 pid run	Unsigned 8	0~1	r/w	Channel 2 PID operation control 0: Disable (default) 1: Enable
	0CH	CH2 pid calibration	Unsigned 8	0~1	r/w	Channel 2 PID self-tuning 0: Disable (default) 1: Enable
	0DH	CH2 pid polartiy	Unsigned 8	0~1	r/w	Channel 2 PID Polarity 0: Unipolar (default) 1: Bipolar
	0EH	CH3 pid run	Unsigned 8	0~1	r/w	Channel 3 PID operation control 0: Disable (default) 1: Enable
	0FH	CH3 pid calibration	Unsigned 8	0~1	r/w	Channel 3 PID self-tuning 0: Disable (default) 1: Enable
	10H	CH3 pid polartiy	Unsigned 8	0~1	r/w	Channel 3 PID Polarity 0: Unipolar (default) 1: Bipolar
9000H	05H	Vendor ID	Unsigned32	–	ro	Manufacturer ID
	06H	Product Code	Unsigned32	–	ro	Product code
	07H	Revision Number	Unsigned32	–	ro	Software Version No.
	08H	Serial Number	Unsigned32	–	ro	Serial number
	09H	FPGA Version	Unsigned32	–	ro	FPGA Version No.

6.9.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Effective range	Access
6000H	01H	CH0 code	Signed16	ro	Channel 0 integer temperature (X10)
	02H	CH1 code	Signed16	ro	Channel 1 integer temperature (X10)
	03H	CH2 code	Signed16	ro	Channel 2 integer temperature (X10)
	04H	CH3 code	Signed16	ro	Channel 3 integer temperature (X10)
A000H	01H	CH0 state	Unsigned 8	ro	Channel 0 Status 0x00: Normal 0x01: Calibration mode, waiting for first standard value 0x02: waiting for second standard value 0x03: Calculate calibration value 0x04: Calculation of calibration value completed 0x10: Temperature overrun 0x20: Sensor disconnected 0x40: Threshold write error 0x80: Cold end compensation or temperature offset write error 0xFF: Channel not enabled
	02H	CH1state	Unsigned 8	ro	Channel 1 Status 0x00: Normal 0x01: Calibration mode, waiting for first standard value 0x02: waiting for second standard value 0x03: Calculate calibration value 0x04: Calculation of calibration value completed 0x10: Temperature overrun 0x20: Sensor disconnected 0x40: Threshold write error 0x80: Cold end compensation or temperature offset write error 0xFF: Channel not enabled
	03H	CH2 code	Unsigned 8	ro	Channel 2 Status 0x00: Normal 0x01: Calibration mode, waiting for first standard value 0x02: waiting for second standard value 0x03: Calculate calibration value 0x04: Calculation of calibration value completed 0x10: Temperature overrun 0x20: Sensor disconnected 0x40: Threshold write error 0x80: Cold end compensation or temperature offset write error 0xFF: Channel not enabled
	04H	CH3 state	Unsigned 8	ro	Channel 0 Status 0x00: Normal 0x01: Calibration mode, waiting for first standard value 0x02: waiting for second standard value 0x03: Calculate calibration value 0x04: Calculation of calibration value completed 0x10: Temperature overrun 0x20: Sensor disconnected 0x40: Threshold write error 0x80: Cold end compensation or temperature

					offset write error 0xFF: Channel not enabled If both a temperature overrun and a sensor disconnection error occur, the error code is 0x10+0x20=0x30
A001H	01H	CH0 Pid state	Unsigned 8	ro	Channel 0 pid status Bit0: Running status 0-Stop,1-Run (1 after enabling Pid, 0 at self-tuning time, 1 at end of self-tuning) Bit1: output mode 0-heat,1-cool Bit2: Self-tuning 0-Stop,1-Tuning (1 when self-tuning is enabled, 0 when self-tuning is completed) Bit3: Self-tuning error 0-NO_Err, 1-Tune_Err Bit4: heat_out 0-NO_Output, 1-Temperature_Control_Output Bit5: cool_out 0-no output, 1-temperature control output
	02H	CH1 Pid state	Unsigned 8	ro	Channel 1 pid status Bit0: Running status 0-Stop,1-Run (1 after enabling Pid, 0 at self-tuning time, 1 at end of self-tuning) Bit1: output mode 0-heat,1-cool Bit2: Self-tuning 0-Stop,1-Tuning (1 when self-tuning is enabled, 0 when self-tuning is completed) Bit3: Self-tuning error 0-NO_Err, 1-Tune_Err Bit4: heat_out 0-NO_Output, 1-Temperature_Control_Output Bit5: cool_out 0-no output, 1-temperature control output
	03H	CH2 Pid state	Unsigned 8	ro	Channel 2 pid status Bit0: Running status 0-Stop,1-Run (1 after enabling Pid, 0 at self-tuning time, 1 at end of self-tuning) Bit1: output mode 0-heat,1-cool Bit2: Self-tuning 0-Stop,1-Tuning (1 when self-tuning is enabled, 0 when self-tuning is completed) Bit3: Self-tuning error 0-NO_Err, 1-Tune_Err Bit4: heat_out 0-NO_Output, 1-Temperature_Control_Output Bit5: cool_out 0-no output, 1-temperature control output
	04H	CH3 Pid state	Unsigned 8	ro	Channel 3 pid status Bit0: Running status 0-Stop,1-Run (1 after enabling Pid, 0 at self-tuning time, 1 at end of self-tuning) Bit1: output mode 0-heat,1-cool Bit2: Self-tuning 0-Stop,1-Tuning (1 when self-tuning is enabled, 0 when self-tuning is completed) Bit3: Self-tuning error 0-NO_Err, 1-Tune_Err Bit4: heat_out 0-NO_Output, 1-Temperature_Control_Output Bit5: cool_out 0-no output, 1-temperature control output

6.10 Serial communications module

6.10.1 R3-RS02-COM Serial Communication Module

6.10.1.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Effective range	Access	Description
8000H	01H	PORT0 Operation Mode	Unsigned8	0~2	r/w	Port 0 Mode Selection 0: Free mode 1: ModBus RTU master mode 2: ModBus RTU slave mode
	02H	PORT0 Interface	Unsigned16	0~1	r/w	Port 0 Interface Selection 0: RS232 1: RS485
	03H	PORT0 Parity	Unsigned16	0~2	r/w	Port 0 checksum method 0: no 1: Odd 2: even
	04H	PORT0 DataBits	Unsigned16	0~1	r/w	Port 0 data bits 0: 8bit 1: 7bit
	05H	PORT0 StopBits	Unsigned16	0~1	r/w	Port 0 stop bit 0: 1bit 1: 2bit
	06H	PORT0 Baudrate	Unsigned16	0~5	r/w	Port 0 Baudrate 0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps 4: 57600bps 5: 115200bps
	08H	PORT0 ModBus RTU Slave Addr	Unsigned16	1~65535	r/w	Port 0 ModBus RTU slave mode address 1-65535
	09H	PORT0 ModBus RTU Send Times	Unsigned16	1~10	r/w	Port 0 ModBus RTU Master Mode Retransmission Counts 1-10
	0AH	PORT0 ModBus RTU Timeout MS	Unsigned16	0~65535	r/w	Port 0 ModBus RTU Master Mode Timeout Time 0-65535(ms)
	0BH	PORT0 TX Buffer Set	Unsigned16	0~1	r/w	Port 0 transmit buffer setting 0: keep current data when buffer is full 1: Clear current data when buffer is full
8001H	0CH	PORT0 RX Buffer Set	Unsigned16	0~1	r/w	Port 0 receive buffer setting 0: Retain current data when buffer is full 1: Clear current data when buffer is full
	01H	PORT1 Operation Mode	Unsigned8	0~2	r/w	Port 1 Mode Selection 0: Free mode 1: ModBus RTU master mode 2: ModBus RTU slave mode
	02H	PORT1 Interface	Unsigned16	0~1	r/w	Port 1 Interface Selection 0: RS232 1: RS485

	03H	PORT1 Parity	Unsigned16	0~2	r/w	Port 1 checksum method 0: no 1: Odd 2: even
	04H	PORT1 DataBits	Unsigned16	0~1	r/w	Port 1 data bits 0: 8bit 1: 7bit
	05H	PORT1 StopBits	Unsigned16	0~1	r/w	Port 1 stop bit 0: 1bit 1: 2bit
	06H	PORT1 Baudrate	Unsigned16	0~5	r/w	Port 1 Baudrate 0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps 4: 57600bps 5: 115200bps
	08H	PORT1 ModBus RTU Slave Addr	Unsigned16	1~65535	r/w	Port 1 ModBus RTU slave mode address 1-65535
	09H	PORT1 ModBus RTU Send Times	Unsigned16	1~10	r/w	Port 1 ModBus RTU Master Mode Retransmission Counts 1-10
	0AH	PORT1 ModBus RTU Timeout MS	Unsigned16	0~65535	r/w	Port 1 ModBus RTU Master Mode Timeout Time 0-65535(ms)
	0BH	PORT1 TX Buffer Set	Unsigned16	0~1	r/w	Port 1 transmit buffer setting 0: keep current data when buffer is full 1: Clear current data when buffer is full
	0CH	PORT1 RX Buffer Set	Unsigned16	0~1	r/w	Port 1 receive buffer setting 0: Retain current data when buffer is full 1: Clear current data when buffer is full
9000H	05H	VendorID	Unsigned32	-	ro	Manufacturer ID
	06H	Product Code	Unsigned32	-	ro	Product code
	07H	Revision Number	Unsigned32	-	ro	Software Version No.
	08H	Serial Number	Unsigned32	-	ro	Serial number
	09H	FPGA Version	Unsigned32	-	ro	FPGA Version No.

6.10.1.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Access	Description
7000H	01H	COM0 CtrlWord	Unsigned16	r/w	Port 0 control word 0xC0 (192): clear error flag or send completion flag 0xC1 (193): send only 0xC2 (194): receive only 0xC3 (195): send or receive 0xC1 (161): clear transmit cache 0xC2 (162): clear receive cache

	02H	COM0 Output Length	Unsigned16	r/w	Port 0 transmit data length
	03H	COM0 TransmitEn	Unsigned16	r/w	Port 0 transmit enable (rising edge triggered)
	04H	COM0 Transmit SID	Unsigned16	r/w	Port 0 sends data sequence number
	05H	COM0 Read SID	Unsigned16	r/w	Port 0 receives the data sequence number
7001H	01H	COM0 Data Out0	Array[0..1] of Byte	r/w	Port 0 sends data
	02H	COM0 Data Out1	Array[0..1] of Byte	r/w	Port 0 sends data
	03H	COM0 Data Out2	Array[0..1] of Byte	r/w	Port 0 sends data
	04H	COM0 Data Out3	Array[0..1] of Byte	r/w	Port 0 sends data
7002H	01H	COM0 Data Out4	Array[0..1] of Byte	r/w	Port 0 sends data
	02H	COM0 Data Out5	Array[0..1] of Byte	r/w	Port 0 sends data
	03H	COM0 Data Out6	Array[0..1] of Byte	r/w	Port 0 sends data
	04H	COM0 Data Out7	Array[0..1] of Byte	r/w	Port 0 sends data
7003H	01H	COM0 Data Out8	Array[0..1] of Byte	r/w	Port 0 sends data
	02H	COM0 Data Out9	Array[0..1] of Byte	r/w	Port 0 sends data
	03H	COM0 Data Out10	Array[0..1] of Byte	r/w	Port 0 sends data
7004H	01H	COM1 CtrlWord	Unsigned16	r/w	Port 1 control word 0xC0 (192): clear error flag or send completion flag 0xC1 (193): send only 0xC2 (194): receive only 0xC3 (195): send or receive 0xC1 (161): clear transmit cache 0xC2 (162): clear receive cache
	02H	COM1 Output Length	Unsigned16	r/w	Port 1 transmit data length
	03H	COM1 TransmitEn	Unsigned16	r/w	Port 1 transmit enable (rising edge triggered)
	04H	COM1 Transmit SID	Unsigned16	r/w	Port 1 sends data sequence number
	05H	COM1 Read SID	Unsigned16	r/w	Port 1 receives the data sequence number
7005H	01H	COM1 Data Out0	Array[0..1] of Byte	r/w	Port 1 sends data
	02H	COM1 Data Out1	Array[0..1] of Byte	r/w	Port 1 sends data
	03H	COM1 Data Out2	Array[0..1] of Byte	r/w	Port 1 sends data
	04H	COM1 Data Out3	Array[0..1] of Byte	r/w	Port 1 sends data
7006H	01H	COM1 Data Out4	Array[0..1] of Byte	r/w	Port 1 sends data
	02H	COM1 Data Out5	Array[0..1] of Byte	r/w	Port 1 sends data
	03H	COM1 Data Out6	Array[0..1] of Byte	r/w	Port 1 sends data
	04H	COM1 Data Out7	Array[0..1] of Byte	r/w	Port 1 sends data
7007H	01H	COM1 Data Out8	Array[0..1] of Byte	r/w	Port 1 sends data
	02H	COM1 Data Out9	Array[0..1] of Byte	r/w	Port 1 sends data
	03H	COM1 Data Out10	Array[0..1] of Byte	r/w	Port 1 sends data

6.10.1.3 Process Data Object (RxPDO)

Index	Sub-index	Name	Data type	Access	Description
F100H	01H	Module status	Unsigned32	ro	Each bit indicates the status of the mounted module 1: module error 0: module normal
6000H	01H	COM0 StateWord	Unsigned16	ro	Port 0 status word Send phase: Press packet miss alarm: 0xE001 Send buffer full alarm: 0xE002 Send completion flag: 0x0001 Receive phase: Normal wait to receive: 0x0003 Receive checksum error alarm: 0xE003 Receive buffer full alarm: 0xE004 SDO configuration phase: SDO configuration error alarm: 0xE006 Buffer clearing phase: Clear transmit buffer completion: 0x0004 Clear receive buffer completion: 0x0005
	02H	COM0 Input SID	Unsigned16	ro	Port 0 module receives data sequence number
	03H	COM0 Input Length	Unsigned16	ro	Port 0 Number of last received data volume
	04H	COM0 TX FIFO Exist	Unsigned16	ro	Port 0 sends the number of buffers remaining
	05H	COM0 RX FIFO Exist	Unsigned16	ro	Port 0 receive buffer remaining
6001H	01H	COM0 Data In0	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM0 Data In1	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM0 Data In2	Array[0..1] of Byte	ro	Port 0 receives data
	04H	COM0 Data In3	Array[0..1] of Byte	ro	Port 0 receives data
6002H	01H	COM0 Data In4	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM0 Data In5	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM0 Data In6	Array[0..1] of Byte	ro	Port 0 receives data
	04H	COM0 Data In7	Array[0..1] of Byte	ro	Port 0 receives data
6003H	01H	COM0 Data In8	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM0 Data In9	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM0 Data In10	Array[0..1] of Byte	ro	Port 0 receives data
6004H	01H	COM1StateWord	Unsigned16	ro	Each bit indicates the status of the mounted module 1: module error 0: module normal
	02H	COM1 Input SID	Unsigned16	ro	Port 0 status word Send phase: Press packet miss alarm: 0xE001 Send buffer full alarm: 0xE002 Send completion flag: 0x0001

					Receive phase: Normal wait to receive: 0x0003 Receive checksum error alarm: 0xE003 Receive buffer full alarm: 0xE004 SDO configuration phase: SDO configuration error alarm: 0xE006 Buffer clearing phase: Clear transmit buffer completion: 0x0004 Clear receive buffer completion: 0x0005
	03H	COM1 Input Length	Unsigned16	ro	Port 0 module receives data sequence number
	04H	COM1 TX FIFO Exist	Unsigned16	ro	Port 0 Number of last received data volume
	05H	COM1 RX FIFO Exist	Unsigned16	ro	Port 0 sends the number of buffers remaining
6005H	01H	COM1 Data In0	Array[0..1] of Byte	ro	Port 0 receive buffer remaining
	02H	COM1 Data In1	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM1 Data In2	Array[0..1] of Byte	ro	Port 0 receives data
	04H	COM1 Data In3	Array[0..1] of Byte	ro	Port 0 receives data
6006H	01H	COM1 Data In4	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM1 Data In5	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM1 Data In6	Array[0..1] of Byte	ro	Port 0 receives data
	04H	COM1 Data In7	Array[0..1] of Byte	ro	Port 0 receives data
6007H	01H	COM1 Data In8	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM1 Data In9	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM1 Data In10	Array[0..1] of Byte	ro	Port 0 receives data

6.10.2 R3-RS02-485 Serial Communication Module

6.10.2.1 Service Data Objects (SDO)

Index	Sub-index	Name	Data type	Effective range	Access	Description
8000H	01H	PORT0 Operation Mode	Unsigned8	0~2	r/w	Port 0 Mode Selection 0: Free mode 1: ModBus RTU master mode 2: ModBus RTU slave mode
	03H	PORT0 Parity	Unsigned16	0~2	r/w	Port 0 checksum method 0: no 1: Odd 2: even
	04H	PORT0 DataBits	Unsigned16	0~1	r/w	Port 0 data bits 0: 8bit 1: 7bit
	05H	PORT0 StopBits	Unsigned16	0~1	r/w	Port 0 stop bit 0: 1bit 1: 2bit
	06H	PORT0 Baudrate	Unsigned16	0~5	r/w	Port 0 Baudrate 0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps 4: 57600bps 5: 115200bps

	08H	PORT0 ModBus RTU Slave Addr	Unsigned16	1~65535	r/w	Port 0 ModBus RTU slave mode address 1-65535
	09H	PORT0 ModBus RTU Send Times	Unsigned16	1~10	r/w	Port 0 ModBus RTU Master Mode Retransmission Counts 1-10
	0AH	PORT0 ModBus RTU Timeout MS	Unsigned16	0~65535	r/w	Port 0 ModBus RTU Master Mode Timeout Time 0-65535(ms)
	0BH	PORT0 TX Buffer Set	Unsigned16	0~1	r/w	Port 0 transmit buffer setting 0: keep current data when buffer is full 1: Clear current data when buffer is full
	0CH	PORT0 RX Buffer Set	Unsigned16	0~1	r/w	Port 0 receive buffer setting 0: Retain current data when buffer is full 1: Clear current data when buffer is full
8001H	01H	PORT1 Operation Mode	Unsigned8	0~2	r/w	Port 1 Mode Selection 0: Free mode 1: ModBus RTU master mode 2: ModBus RTU slave mode
	03H	PORT1 Parity	Unsigned16	0~2	r/w	Port 1 checksum method 0: no 1: Odd 2: even
	04H	PORT1 DataBits	Unsigned16	0~1	r/w	Port 1 data bits 0: 8bit 1: 7bit
	05H	PORT1 StopBits	Unsigned16	0~1	r/w	Port 1 stop bit 0: 1bit 1: 2bit
	06H	PORT1 Baudrate	Unsigned16	0~5	r/w	Port 1 Baudrate 0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps 4: 57600bps 5: 115200bps
	08H	PORT1 ModBus RTU Slave Addr	Unsigned16	1~65535	r/w	Port 1 ModBus RTU slave mode address 1-65535
	09H	PORT1 ModBus RTU Send Times	Unsigned16	1~10	r/w	Port 1 ModBus RTU Master Mode Retransmission Counts 1-10
	0AH	PORT1 ModBus RTU Timeout MS	Unsigned16	0~65535	r/w	Port 1 ModBus RTU Master Mode Timeout Time 0-65535(ms)
	0BH	PORT1 TX Buffer Set	Unsigned16	0~1	r/w	Port 1 transmit buffer setting 0: keep current data when

						buffer is full 1: Clear current data when buffer is full
	0CH	PORT1 RX Buffer Set	Unsigned16	0~1	r/w	Port 1 receive buffer setting 0: Retain current data when buffer is full 1: Clear current data when buffer is full
9000H	05H	VendorID	Unsigned32	-	ro	Manufacturer ID
	06H	Product Code	Unsigned32	-	ro	Product code
	07H	Revision Number	Unsigned32	-	ro	Software Version No.
	08H	Serial Number	Unsigned32	-	ro	Serial number
	09H	FPGA Version	Unsigned32	-	ro	FPGA Version No.

6.10.2.2 Process Data Object (TxPDO)

Index	Sub-index	Name	Data type	Access	Description
7000H	01H	COM0 CtrlWord	Unsigned16	r/w	Port 0 control word 0xC0 (192): clear error flag or send completion flag 0xC1 (193): send only 0xC2 (194): receive only 0xC3 (195): send or receive 0xC1 (161): clear transmit cache 0xC2 (162): clear receive cache
	02H	COM0 Output Length	Unsigned16	r/w	Port 0 transmit data length
	03H	COM0 TransmitEn	Unsigned16	r/w	Port 0 transmit enable (rising edge triggered)
	04H	COM0 Transmit SID	Unsigned16	r/w	Port 0 sends data sequence number
	05H	COM0 Read SID	Unsigned16	r/w	Port 0 receives the data sequence number
7001H	01H	COM0 Data Out0	Array[0..1] of Byte	r/w	Port 0 sends data
	02H	COM0 Data Out1	Array[0..1] of Byte	r/w	Port 0 sends data
	03H	COM0 Data Out2	Array[0..1] of Byte	r/w	Port 0 sends data
	04H	COM0 Data Out3	Array[0..1] of Byte	r/w	Port 0 sends data
7002H	01H	COM0 Data Out4	Array[0..1] of Byte	r/w	Port 0 sends data
	02H	COM0 Data Out5	Array[0..1] of Byte	r/w	Port 0 sends data
	03H	COM0 Data Out6	Array[0..1] of Byte	r/w	Port 0 sends data
	04H	COM0 Data Out7	Array[0..1] of Byte	r/w	Port 0 sends data
7003H	01H	COM0 Data Out8	Array[0..1] of Byte	r/w	Port 0 sends data
	02H	COM0 Data Out9	Array[0..1] of Byte	r/w	Port 0 sends data
	03H	COM0 Data Out10	Array[0..1] of Byte	r/w	Port 0 sends data
7004H	01H	COM1 CtrlWord	Unsigned16	r/w	Port 1 control word 0xC0 (192): clear error flag or send completion flag 0xC1 (193): send only 0xC2 (194): receive only

					0xC3 (195): send or receive 0xC1 (161): clear transmit cache 0xC2 (162): clear receive cache
	02H	COM1 Output Length	Unsigned16	r/w	Port 1 transmit data length
	03H	COM1 TransmitEn	Unsigned16	r/w	Port 1 transmit enable (rising edge triggered)
	04H	COM1Transmit SID	Unsigned16	r/w	Port 1 sends data sequence number
	05H	COM1 Read SID	Unsigned16	r/w	Port 1 receives the data sequence number
7005H	01H	COM1 Data Out0	Array[0..1] of Byte	r/w	Port 1 sends data
	02H	COM1 Data Out1	Array[0..1] of Byte	r/w	Port 1 sends data
	03H	COM1 Data Out2	Array[0..1] of Byte	r/w	Port 1 sends data
	04H	COM1 Data Out3	Array[0..1] of Byte	r/w	Port 1 sends data
7006H	01H	COM1 Data Out4	Array[0..1] of Byte	r/w	Port 1 sends data
	02H	COM1 Data Out5	Array[0..1] of Byte	r/w	Port 1 sends data
	03H	COM1 Data Out6	Array[0..1] of Byte	r/w	Port 1 sends data
	04H	COM1 Data Out7	Array[0..1] of Byte	r/w	Port 1 sends data
7007H	01H	COM1 Data Out8	Array[0..1] of Byte	r/w	Port 1 sends data
	02H	COM1 Data Out9	Array[0..1] of Byte	r/w	Port 1 sends data
	03H	COM1 Data Out10	Array[0..1] of Byte	r/w	Port 1 sends data

6.10.2.3 Process Data Object (RxPDO)

Index	Sub-index	Name	Data type	Access	Description
F100H	01H	Module status	Unsigned32	ro	Each bit indicates the status of the mounted module 1: module error 0: module normal
6000H	01H	COM0 StateWord	Unsigned16	ro	Port 0 status word Send phase: Press packet miss alarm: 0xE001 Send buffer full alarm: 0xE002 Send completion flag: 0x0001 Receive phase: Normal wait to receive: 0x0003 Receive checksum error alarm: 0xE003 Receive buffer full alarm: 0xE004 SDO configuration phase: SDO configuration error alarm: 0xE006 Buffer clearing phase: Clear transmit buffer completion: 0x0004 Clear receive buffer completion: 0x0005
	02H	COM0 Input SID	Unsigned16	ro	Port 0 module receives data sequence number
	03H	COM0 Input Length	Unsigned16	ro	Port 0 Number of last received data volume
	04H	COM0 TX FIFO	Unsigned16	ro	Port 0 sends the number of

		Exist			buffers remaining
	05H	COM0 RX FIFO Exist	Unsigned16	ro	Port 0 receive buffer remaining
6001H	01H	COM0 Data In0	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM0 Data In1	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM0 Data In2	Array[0..1] of Byte	ro	Port 0 receives data
	04H	COM0 Data In3	Array[0..1] of Byte	ro	Port 0 receives data
6002H	01H	COM0 Data In4	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM0 Data In5	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM0 Data In6	Array[0..1] of Byte	ro	Port 0 receives data
	04H	COM0 Data In7	Array[0..1] of Byte	ro	Port 0 receives data
6003H	01H	COM0 Data In8	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM0 Data In9	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM0 Data In10	Array[0..1] of Byte	ro	Port 0 receives data
6004H	01H	COM1StateWord	Unsigned16	ro	Each bit indicates the status of the mounted module 1: module error 0: module normal
	02H	COM1 Input SID	Unsigned16	ro	Port 0 status word Send phase: Press packet miss alarm: 0xE001 Send buffer full alarm: 0xE002 Send completion flag: 0x0001 Receive phase: Normal wait to receive: 0x0003 Receive checksum error alarm: 0xE003 Receive buffer full alarm: 0xE004 SDO configuration phase: SDO configuration error alarm: 0xE006 Buffer clearing phase: Clear transmit buffer completion: 0x0004 Clear receive buffer completion: 0x0005
	03H	COM1 Input Length	Unsigned16	ro	Port 0 module receives data sequence number
	04H	COM1 TX FIFO Exist	Unsigned16	ro	Port 0 Number of last received data volume
	05H	COM1 RX FIFO Exist	Unsigned16	ro	Port 0 sends the number of buffers remaining
6005H	01H	COM1 Data In0	Array[0..1] of Byte	ro	Port 0 receive buffer remaining
	02H	COM1 Data In1	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM1 Data In2	Array[0..1] of Byte	ro	Port 0 receives data
	04H	COM1 Data In3	Array[0..1] of Byte	ro	Port 0 receives data
6006H	01H	COM1 Data In4	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM1 Data In5	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM1 Data In6	Array[0..1] of Byte	ro	Port 0 receives data
	04H	COM1 Data In7	Array[0..1] of Byte	ro	Port 0 receives data
6007H	01H	COM1 Data In8	Array[0..1] of Byte	ro	Port 0 receives data
	02H	COM1 Data In9	Array[0..1] of Byte	ro	Port 0 receives data
	03H	COM1 Data In10	Array[0..1] of Byte	ro	Port 0 receives data

6.10.3 Object Dictionary Read/Write Error Code (SDO)

Error Code Type	Description
0x08000000	The object does not exist.
0x06010002	Object access parameter error
0x05040000	Request timeout

7. Fault diagnosis

7.1 Coupler Common Failure Information

LED indicator		Descriptive	Cure
PWR	Go out	The coupler is not properly powered	Check the power wiring to the coupler to ensure proper power supply.
SYS	Blinking: ON 500ms OFF 1500ms	Bus initialization failure	Tighten R3 sub-module, re-power up
	Blinking: ON 1500ms OFF 300ms	Module connection anomaly, common in the operation of the R3 sub-module disconnection	1. Check the disconnected module nodes 2. Carry out individual module replacement or whole group module replacement
	Blinking: ON 1000ms OFF 1000ms	No sweep of the R3 submodule.	Check if there is a module connected after the coupler, add coupler module
RUN	OFF	No connection between EtherCAT master and slave	Ensure that the network is wired properly, perform a bus reset, and reconnect the buses
	Blinking:	The module is in a state other than OP and is not operable	Perform a bus reset and reconnect the bus
ERR	Blinking: (EtherCAT)	EtherCAT communication receives status commands that cannot be executed	Perform a bus reset and reconnect the bus
	single flash (EtherCAT)	Network disconnection, module synchronization error	
	double flash (EtherCAT)	Watchdog error in EtherCAT communication	
	Ever Bright	Serious communication errors or parameter setting errors	

7.2 Expansion Module Common Failure Information

LED indicator		Form	Descriptive	Cure
ERR	Ever Bright	Digital IO Modules	No data interaction on backplane	Make a bus connection or reset the bus
		Analog Input Modules	Over Range Input	Check the value of the inputs to make sure there are no overrun inputs
		Analog Output Module	1.Over-range output 2.Output broken wire or short circuit	1.Check the set range and output value, make sure there is no over-limit output. 2.Check the wiring of the module and restore normal wiring.
		Temperature control module	Input disconnection detection	Check the wiring of the module and restore normal wiring

Contact us

Leadshine Technology Co., Ltd.

Headquarters Address:

15-20/F, Block B, Nanshan i-Valley, No.3157, Nanshan District,
Shenzhen City, Guangdong Province, China

Tel: +86 755 26411692

Fax: +86 755 26402718

Website: www.leadshine.com

Emails: sales@leadshine.com

Leadshine Global Retailers Network



Get in touch with us or any of your local Leadshine certified retailers by visiting our global website.

Technical Support

Tel: 86-755-2641-8447

86-755-2641-8774 (Asia, Australia, Africa)

86-755-2665-5136 (North and South America)

86-755-8654-2465 (Europe)

Fax: 86-755-2640-2718

Email: tech@leadshine.com

Author Email: Sean@leadshine.com

Sales Hot Line

Tel: 86-755-2641-7674 (Asia, Australia, Africa)

86-755-2641-7617 (North and South America)

86-755-2640-9254 (Europe)

Email: sales@leadshine.com

Leadshine
overseas



Leadshine
America, Inc.

North America Office

Address: 26050 Towne
Centre Dr. Foothill
Ranch California
United States

Tel: 1-949-608-7270

Fax: 1-949-638-7298

Website:

www.leadshineusa.com

Emails:

sales@leadshineusa.com