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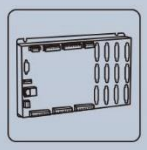
做更好用的运动控制，智造美好生活
Better Motion Control, Smarter Life

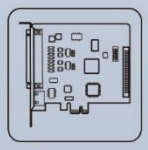
Vertical Bus Expansion Module

ZMIO310

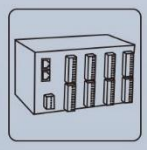
Vision Motion Controller



Motion Controller



Motion Control Card



IO Expansion Module

HMI

Statement

Thank you for choosing our Zmotion products. Please be sure to read this manual carefully before use so that you can use this product correctly and safely. Zmotion is not responsible for any direct or indirect losses caused by the use of this product.

The information in this manual is for reference only. Due to design improvements and other reasons, Zmotion reserves the right of final interpretation of this information! Contents are subject to change without prior notice!

➢ Notes

In order to prevent possible harm and damage caused by incorrect use of this product, the following instructions are given on matters that must be observed.

■ Danger

Do not use it in places with water, corrosive or flammable gases, or near flammable substances.	May cause electric shock, fire, damage, etc.
When installing or disassembling, make sure the product is powered off.	
Cables should be connected securely, and exposed parts that are energized must be insulated by insulators.	
Wiring work must be performed by professionals.	

■ Notes

It should be installed within the specified environmental range.	May cause damage, mis-operation, etc.
Make sure there are no foreign objects on the product hardware circuit board.	
After installation, the product and the mounting bracket should be tight and firm.	
After installation, at least 2-3cm should be left between the product and surrounding components for ventilation and replacement.	
Never disassemble, modify, or repair it by yourself.	

CONTENT

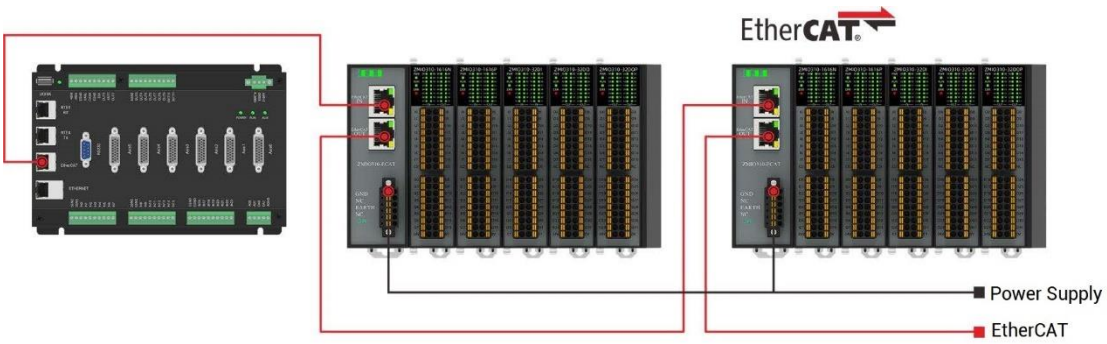
Chapter I Introduction

1.1. Product Introduction

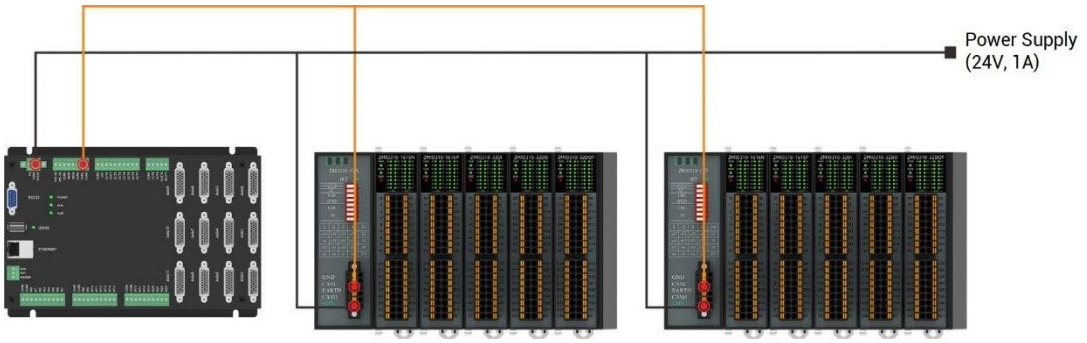
ZMIO310 Series expansion module is a kind of vertical fieldbus expansion module, which supports EtherCAT and CAN to expand IO, AD and DA. When IO, AD and DA are not enough, it needs a coupler module (ZMIO310-ECAT or ZMIO-CAN communication module) to match with submodules (input/output/AD/DA module) to expand.

Sub modules include: ZMIO310-1616N, ZMIO310-1616P, ZMIO310-32DI, ZMIO310-32DO, ZMIO310-DOP, ZMIO310-4AD, ZMIO310-4DA.

- **Expand by EtherCAT**



- **Expand by CAN**



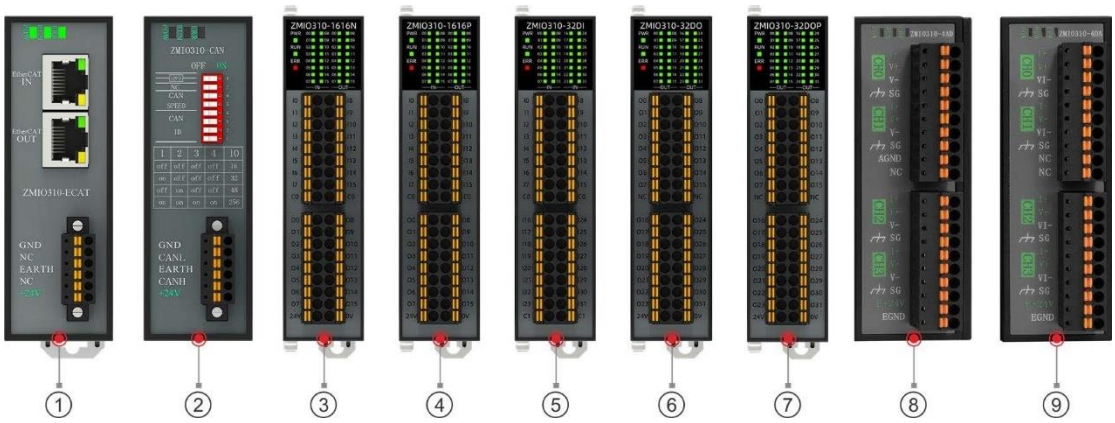
- Digital inputs and outputs are with signal indication lights, which are used to check IO states.
- The resolution of analog is 16-bit, there are voltage type or current type, and there

are multiple ranges.

- One single coupler can extend 512 inputs or 512 outputs at most. If you need more, please select several couplers.
- One single coupler can extend 32 ADs or 32 DAs at most. If you need more, please select several couplers.
- It is convenient to do expansion wiring.

This manual mainly describes ZMIO310 specification, property, usage, etc. Please read this manual carefully to know more about the product, and then you could use more safely.

1.2. Module Models



No.	Interface	Description
①	ZMIO310-ECAT	Coupler module, EtherCAT module
②	ZMIO310-CAN	Coupler module, CAN module
③	ZMIO310-1616N	Expansion sub-module, 16 IN (NPN/PNP), 16 OUT (NPN)
④	ZMIO310-1616P	Expansion sub-module, 16 IN (NPN/PNP), 16 OUT (PNP)
⑤	ZMIO310-32DI	Expansion sub-module, 32 IN (NPN/PNP)
⑥	ZMIO310-32DO	Expansion sub-module, 32 OUT (NPN)
⑦	ZMIO310-32DOP	Expansion sub-module, 32 OUT (PNP)
⑧	ZMIO310-4AD	Expansion sub-module, 4 AD, 16bit
⑨	ZMIO310-4DA	Expansion sub-module, 4 DA, 16bit

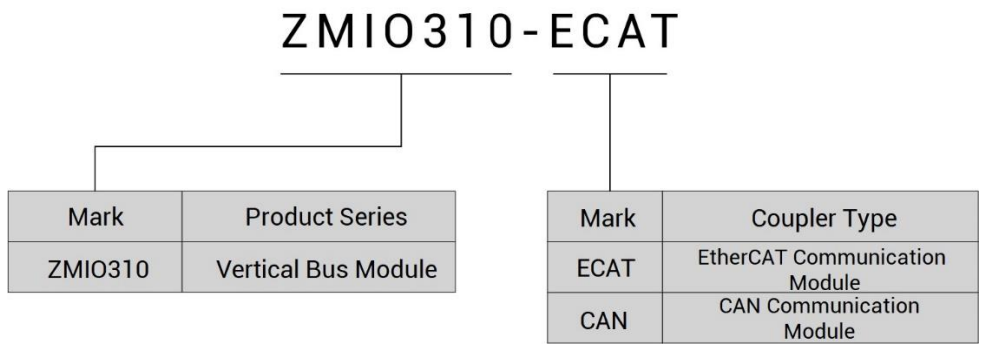
1.3. Product Specification

Model	ZMIO310-4AD	ZMIO310-4DA	ZMIO310-ECAT	ZMIO310-CAN
AD Analog Input	4	0	-	-
DA Analog Output	0	4	-	-
Analog Resolution	16bit	16bit	-	-
Communication Protocol	-	-	EtherCAT	CAN
Dimensions (mm)	32*95*93			

Model	ZMIO310-1616N	ZMIO310-1616P	ZMIO310-32DI	ZMIO310-32DO	ZMIO310-32DOP
Digital Input	16	16	32	0	0
Digital Input Type	NPN/PNP	NPN/PNP	NPN/PNP	-	-
Digital Output	16	16	0	32	32
Digital Output Type	NPN	PNP	-	NPN	PNP
Dimensions (mm)	24*95*93				

1.4. Nameplate & Models

- **Coupler:**



➢ **Coupler + Sub-Modules**

ZMIO310-1616N

Mark	Product Series
ZMIO310	Vertical Bus Module

Mark	Sub-Module
1616N	Digital Sub-Module
1616P	Digital Sub-Module
32DO	Digital Sub-Module
32DOP	Digital Sub-Module
4AD	Analog Sub-Module
4DA	Analog Sub-Module
32DI	Digital Sub-Module

Coupler	Inner IN	Inner OUT	Communication Interface	Functions
ZMIO310-ECAT	-	-	EtherCAT	EtherCAT Communication Module
ZMIO310-CAN	-	-	CAN	CAN Communication Module

Sub-Module	Inner IN	Inner OUT	AD/DA	IO Type	Functions
ZMIO310-1616N	16	16	-	IN: NPN/PNP OUT: NPN	IN / OUT Module
ZMIO310-1616P	16	16	-	IN: NPN/PNP OUT: PNP	IN / OUT Module
ZMIO310-32DI	32	-	-	IN: NPN/PNP	IN Module
ZMIO310-32DO	-	32	-	OUT: NPN	OUT Module
ZMIO310-32DOP	-	32	-	OUT: PNP	OUT Module
ZMIO310-4AD	-	-	4	-	AD Module (16Bit)
ZMIO310-4DA	-	-	4	-	DA Module (16Bit)

1.5. Power Requirements

This expansion module uses dual-power supply, that is, one coupler module ZMIO310-ECAT or ZMIO310-CAN uses one power supply, then one submodule uses another power supply (when there is enough power for power supply, submodules can use one power supply, but submodule and coupler module can't use the same one power).

Model/Item	Power Voltage	Current to open	Current to work
ZMIO310-ECAT	Coupler main power, DC24V is recommended. 18V-36V is max.	1A	0.5A
ZMIO310-CAN		0.2A	0.1A
ZMIO310-1616N	Submodule power supply, DC24V is recommended. 18V-36V is max.	0.2A	0.1A
ZMIO310-161P		0.6A	0.3A
ZMIO310-16DI		0.2A	0.1A
ZMIO310-16DO		0.2A	0.1A
ZMIO310-16DOP		1A	0.5A
ZMIO310-4AD		0.2A	0.1A
ZMIO310-4DA		0.2A	0.1A

1.6. Work Environment

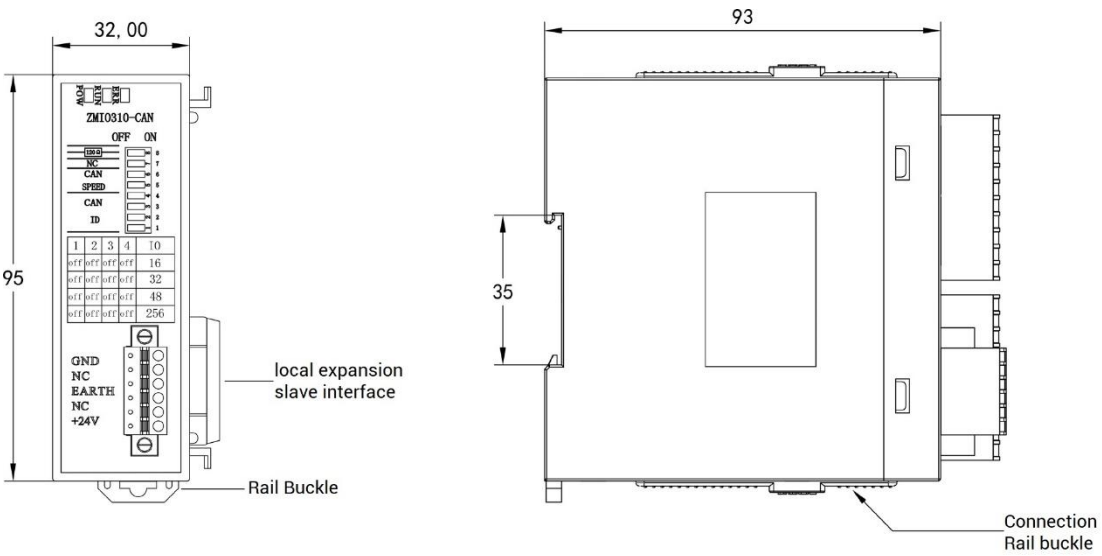
Item		Parameters
Work Temperature		-10℃-55℃
Work relative Humidity		10%-95% non-condensing
Storage Temperature		-40℃ ~ 80℃ (not frozen)
Storage Humidity		Below 90%RH (no frost)
vibration	Frequency	5-150Hz
	Displacement	3.5mm(directly install)(<9Hz)
	Acceleration	1g(directly install)(>9Hz)
	Direction	3 axial direction
Shock (collide)		15g, 11ms, half sinusoid, 3 axial direction
Degree of Protection		IP20

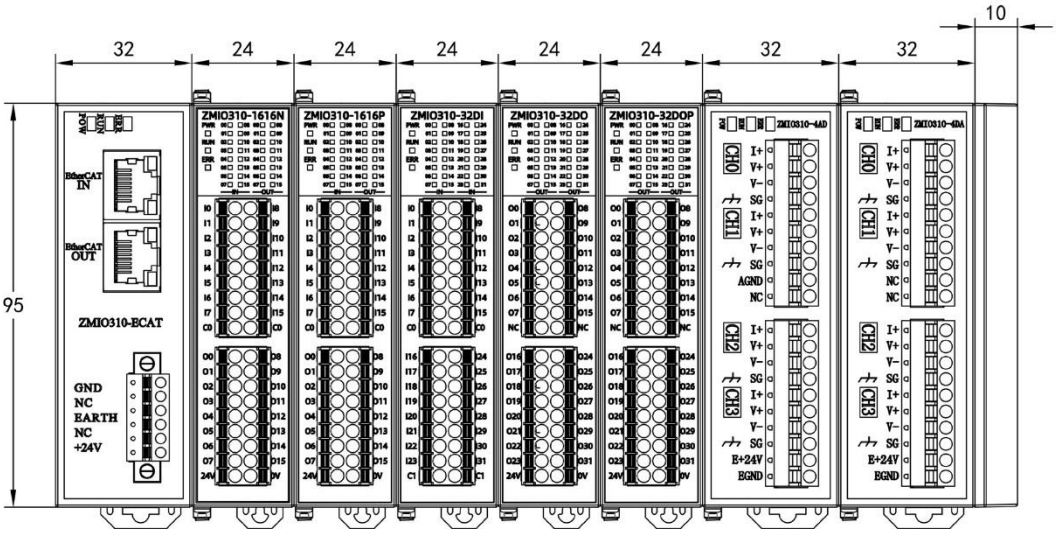
1.7. Hardware Installment

➢ **Installment Steps:**

- Please use a 35mm standard DIN rail.
- Open the rail buckle of the ECAT communication module and embed the ECAT communication module on the DIN rail.
- Press the rail buckle of the ECAT communication module to fix the ECAT communication module on the DIN rail.

➢ **Module Size (mm):**

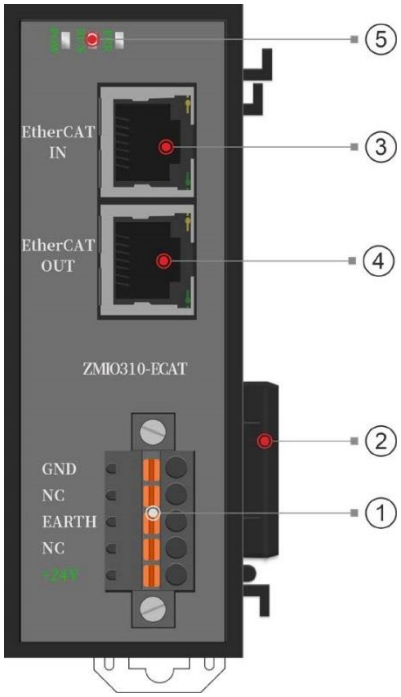




Chapter II Coupler Modules

2.1. ZMIO310-ECAT Communication Module

Interface Definition:

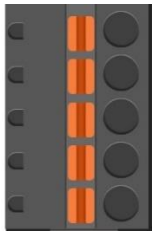


No.	Interface	Description
①	User terminal	Power terminal, connect to DC24V power.
②	Local expansion behind level interface	Connect to expansion submodules, plug in and pull out when in hot are unsupported.
③	EtherCAT IN	EtherCAT input, used to connect EtherCAT master station or former level EtherCAT slave station.
④	EtherCAT OUT	EtherCAT output, connect EtherCAT slave station.
⑤	State Indication Led	● Power state: green, it lights when power is conducted. ● Run state: green, it lights when runs normally ● Error state: red, it lights when runs incorrectly
Note: EtherCAT IN and EtherCAT OUT can't be mixed.		

Performance & Specification

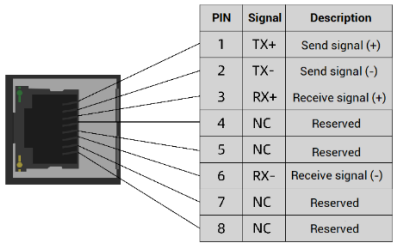
Item	Specification
Power Voltage	24V DC
Communication Protocol	EtherCAT Industrial Real-time Bus Protocol
Service	CoE (PDO, SDO), firmware upgrade
Communication Cycle	250μs, 500μs, 1ms, 2ms, 4ms, etc.
Max Communication Speed	Ethernet 100Mbqs
Network Port	Standard Ethernet RJ45 interface
Transfer Medium	5E Category STP
Transfer Distance	Distance between two nodes is less than 100m
Continuation Sub-Module Expansion	● ZMIO310-32DI/32DO/322DOP: max 16 submodules (can be mixed) ● ZMIO310-1616P/1616N: max 8 submodules (can be mixed) ● ZMIO310-4AD/DA: max 8 submodules (can be mixed) ➢ Note: all submodules can't > 16, for one ZMIO310-1616P/N, it belongs to 2 submodules. Real numbers refer to each module power.
Max IOs of Continuation Sub Module	512 inputs or 512 outputs
Max AIOs of Continuation Sub Module	32 ADs or 32 DAs
Self-Power	1.6W
Internal power for behind level	8.4W

User Terminal

Main Power Terminal	Mark	Type	Function
GND NC EARTH NC +24V 	GND	IN	Main Power Ground
	NC	-	Reserved
	EARTH	Ground	Shield
	NC	-	Reserved
	+24V	IN	Main Power 24V IN

EtherCAT

➢ **Specification**

Mark	Item	Description
	Communication Protocol	EtherCAT
	Communication Velocity	100Mbps
	Refresh Cycle	Max 500us
	Communication Cable	Super5E STP
	Cable Length	<100m

➢ **Wiring**

(1) When connect to EtherCAT drives / other devices, using one super 5e shielded cable to connect to slave device's EtherCAT IN. Then, this slave device (EtherCAT OUT) also can be connected to next one device (EtherCAT IN).

(2) Ethernet States:

LED & State	Common-ON	Shrink
Green Led	Build 10M communication	Data is receiving and sending
Yellow Led	Build 100M communication	Data is receiving and sending

➢ **Notes**

- Please use STP (Shielded Twisted Pair), especially in bad environments, and make sure the shielding layer is fully grounded.
- When on-site wiring, pay attention to make the distance between strong current and weak current, it is recommended for the distance to be more than 30cm.
- It should be noted that the equipment grounding (chassis) on the entire line must be good, and the grounding of the chassis should be connected to the standard factory ground pile.

➢ **Usage:**

(1) Please do correct power & EtherCAT module wiring.

(2) Connect controller to RTSys by Ethernet / Serial port.

(3) Connect to EtherCAT drivers:

a) SLOT_SCAN command to scan the slot No. on the EtherCAT

b) AXIS_ADDRESS command to map axis No.

c) SLOT_START command to open bus, SLOT_STOP closes bus

d) After that, configure and operate local pulse axes.

(4) Connect to EtherCAT expansion modules:

a) SLOT_SCAN command to scan the slot No. on the EtherCAT

b) AXIS_ADDRESS command to map axis No., NODE_IO/NODE_AIO to map IO No.

c) SLOT_START command to open bus, SLOT_STOP closes bus

d) After that, usage of extended IO and axis is same as local one.

(5) View slot No. and node information through RTSys>Controller>Controller State>Slot0Node.

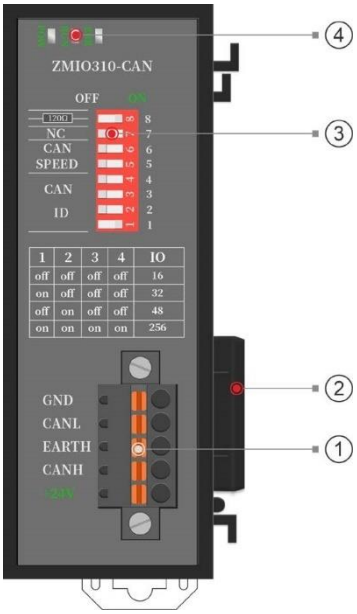
(6) Above commands and others, please refer to RTBasic Programming Manual.

Malfunction Indication & Solution

Status Indication Light			Reason	Solution
POW	RUN	ERR		
ON	twinkle alternately and slowly		The communication between EtherCAT master station and coupler module breaks	✓ Check if crystal head is loosened or not ✓ Check the net cable is damaged or not ✓ Restart the power.
ON	twinkle alternately and rapidly		The pre-scanned sub module and actual continuation sub module are not totally matched.	✓ Check if the continuation submodule is lost, or be in malfunction ✓ Check if appears hot plug or discharger ✓ Restart the power.

2.2. ZMIO310-CAN Communication Module

Interface Definition:



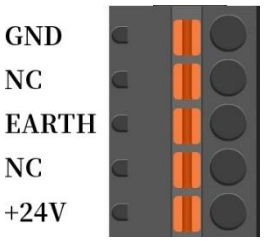
No.	Interface	Description
①	User terminal	Power terminal, connect to DC24V power.
	CAN	Connect to controller / submodules.
②	Local expansion behind level interface	Connect to expansion submodules, plug in and pull out when in hot are unsupported.
③	DIP switch	8 codes, CAN address, CAN speed can be set, and conduct CAN 120-ohm terminal resistor.
④	State Indication Led	● POW state: green, it lights when power is conducted. ● Run state: green, it lights when runs normally ● Error state: red, it lights when runs incorrectly

Performance & Specification

Item	Specification
Power Voltage	24V DC
Communication Protocol	CAN

Max Connected	Up to 16 CAN slave modules
Transfer Distance	Distance between two nodes is less than 30m
Address Configuration	By DIP switch
Continuation Sub-Module Expansion	● ZMIO310-32DI/32DO/322DOP: max 16 submodules (can be mixed) ● ZMIO310-1616P/1616N: max 8 submodules (can be mixed) ● ZMIO310-4AD/DA: max 8 submodules (can be mixed) ➢ Note: all submodules can't > 16, for one ZMIO310-1616P/N, it belongs to 2 submodules. Real numbers refer to each module power.
Self-Power	0.6W
Internal power for behind level	7.9W
Supported Service	Upgrade firmware
Note: mew version updated the module program, if added submodule numbers exceed the coupler limit, there will be alarm.	

User Terminal

Main Power Terminal	Mark	Type	Function
	GND	IN	Main Power Ground
	CANL	IN/OUT	CAN Differential Data -
	EARTH	Ground	Shield
	CANH	IN/OUT	CAN Differential Data +
	+24V	IN	Main Power 24V IN

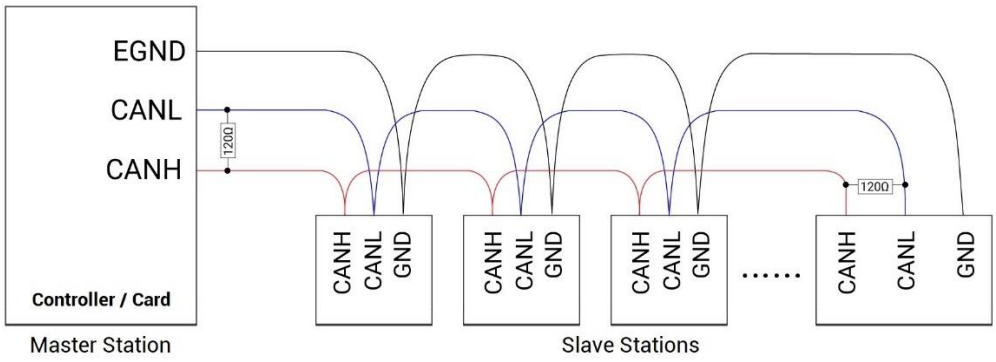
CAN

➢ **Specification**

CAN	Description
Communication Velocity	≤1Mbps
Terminal Resistor	120-ohm
Wiring Structure	Daisy Chain Structure
Max Nodes	≤16

Cable Length	Recommend: <30m (500kbps)
Communication Isolation	YES

➢ **Wiring**



➢ **Notes**

- As above, the daisy chain topology is used for wiring (the star topology structure cannot be used). When the use environment is ideal and there are no many nodes, the branch structure also can be used.
- Please connect a 120Ω terminal resistor in parallel to each end of the CAN bus for matching the circuit impedance and ensuring communication stability.
- Please be sure to connect the public ends of each node on the CAN bus to prevent the CAN chip from burning out.
- Please use STP (Shielded Twisted Pair), especially in bad environments, and make sure the shielding layer is fully grounded.
- When on-site wiring, pay attention to make the distance between strong current and weak current, it is recommended for the distance to be more than 30cm.
- It should be noted that the equipment grounding (chassis) on the entire line must be good, and the grounding of the chassis should be connected to the standard factory ground pile.

➢ **Usage:**

(1) Please do correct power & CAN module wiring.

(2) Connect controller to RTSys by Ethernet / Serial port.

(3) Configure controller CAN master station:

a) CANIO_ADDRESS command to set master station “address" & “velocity".

b) CANIO_ENABLE command to enable / disable CAN master station function.

c) View parameters by RTSys>controller>controller state>communication config.

(4) View bus node parameters by RTSys>controller>controller state>ZCanNode.

(5) Correctly set the "address" and "speed" of the CAN slave station expansion module according to the manual of the slave station, complete resource mapping.

(6) After all the settings are completed, restart the power supply of all stations to establish communication. Note that the "speed" settings of each node on the CAN bus must be consistent, and the "address" settings cannot cause conflicts, otherwise the "ALM" alarm light will be on, and the communication establishment will fail or the communication will be disordered.

(7) Above commands and others, please refer to RTBasic Programming Manual.

➢ **DIP Switch:**

The ZMIO310-CAN expansion module generally has an 8-bit DIP switch, dial ON to take effect, and the meaning of the DIP is as follows:

- 1-4: CAN module address ID, the corresponding values are 0-15 (4-bit, convert to decimal system from binary system).
- 5-6: CAN communication speed, corresponding values are 0-3 (2-bit, convert to decimal system from binary system), 4 kinds of speeds can be selected.
- 7: reserved.
- 8: 120-ohm resistor, dial ON means a 120-ohm resistor is connected between CANL and CANH.

More details of expansion IO address mapping and communication speed, please refer to

Chapter IV CAN Bus Expansion Description.

Malfunction Indication & Solution

Status Indication Light			Reason	Solution
POW	RUN	ERR		
ON	twinkle alternately and slowly		The communication between EtherCAT master station and coupler module breaks	Check if crystal head is loosened or not Check the net cable is damaged or not Restart the power.
ON	twinkle alternately and rapidly		The pre-scanned sub module and actual continuation sub module are not totally matched.	Check if the continuation submodule is lost, or be in malfunction Check if appears hot plug or discharger Restart the power.

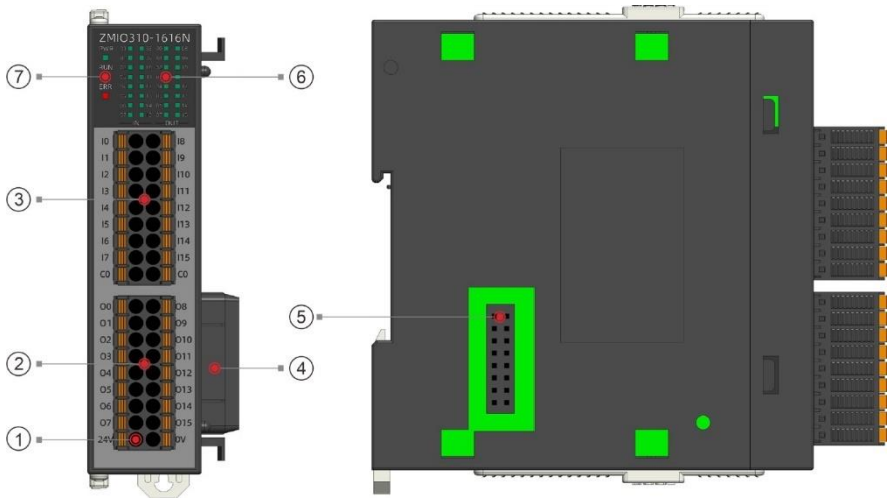
2.3. Coupler Sub-Modules Extension (16 / 32)

Coupler	Sub-Module Models	Max Sub-Modules
ZMIO310-ECAT	All modules combination: 1616N/1616P, one belongs to 2 submodules	16
	16DI / 16DO / 16DOP / 32DI / 32DO / 32DOP	16
	1616N / 1616P / 4AD / 4DA	8
ZMIO310-CAN	All modules combination: IN & OUT numbers can't exceed 16.	16
	16DI / 16DO / 16DOP / 1616N / 1616P	6
	32DI / 32DO / 32DOP / 4AD / 4DA	3

Chapter III Coupler Modules

3.1. ZMIO310-1616N

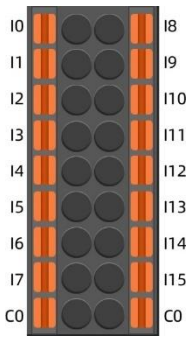
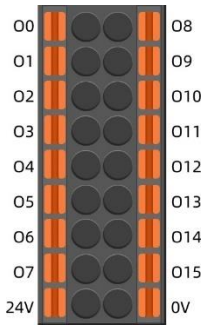
Interface Definition:



No.	Interface	Description
①	IO power	Power terminal, connect to DC24V power.
②	Digital output	OUT0-OUT15
③	Digital input	IN0-IN15
④	Local expansion behind level interface	Connect to expansion submodules, plug in and pull out when in hot are unsupported.
⑤	Local expansion front level interface	Connect to coupler / expansion submodules, plug in and pull out when in hot are unsupported.
⑥	IO signal indication led	Indicate each channel input / output signal
⑦	State Indication Led	● POW led: green, it lights when power is conducted. ● Run led: green, it lights when runs normally ● Error led: red, it lights when runs incorrectly

User Terminal

Terminal	Name	Type	Function

	I0	NPN / PNP type, low-speed inputs	Digital input 0
	I1		Digital input 1
	I2		Digital input 2
	I3		Digital input 3
	I4		Digital input 4
	I5		Digital input 5
	I6		Digital input 6
	I7		Digital input 7
	I8		Digital input 8
	I9		Digital input 9
	I10		Digital input 10
	I11		Digital input 11
	I12		Digital input 12
	I13		Digital input 13
	I14		Digital input 14
	I15		Digital input 15
	C0	➢ COM0: IN (0-15) = public ends, determine IN type. ➢ COM0 with 24V = NPN, COM0 with 0V = PNP.	
	O0	NPN type, low-speed outputs	Digital output 0
	O1		Digital output 1
	O2		Digital output 2
	O3		Digital output 3
	O4		Digital output 4
	O5		Digital output 5
	O6		Digital output 6
	O7		Digital output 7
	O8		Digital output 8
	O9		Digital output 9
	O10		Digital output 10
	O11		Digital output 11
	O12		Digital output 12
	O13		Digital output 13
	O14		Digital output 14
	O15		Digital output 15
	24V	24V power input +	

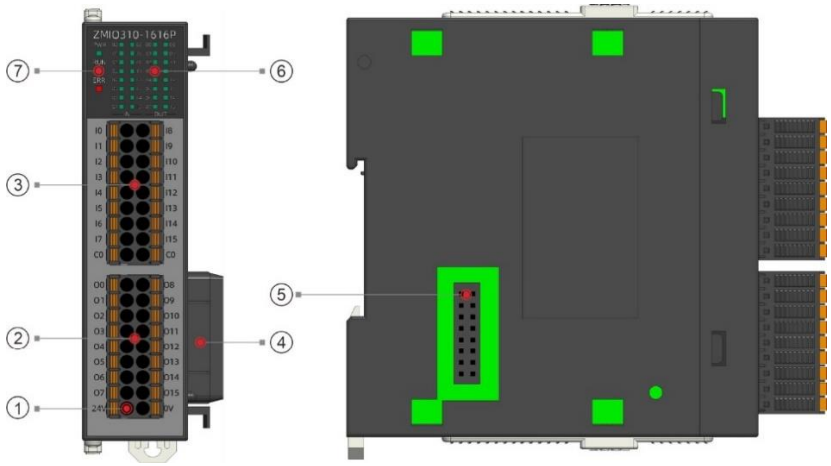
	0V	24V power input -, digital output public end

Malfunction Indication & Solution

Status Indication Led			Reason	Solution
POW	RUN	ERR		
ON	ON	ON	CAN communication Abnormal	⚓ Check whether CAN terminal wiring is correct. ⚓ Check whether bus two sides are connected one 120-ohm resistor ⚓ Check whether multiple CAN modules use the same hardware ID ⚓ Check whether the submodule numbers exceed max limit
ON	OFF	OFF	Preset submodule is not perfectly consistent with real connected submodule.	⚓ Check whether connected submodules are lost / are error ⚓ Check whether the power "plug-in & out under hot" ⚓ Restart the power supply
			Master / slave state firmware abnormal	⚓ Update the firmware for master station and slave station both.

3.2. ZMIO310-1616P

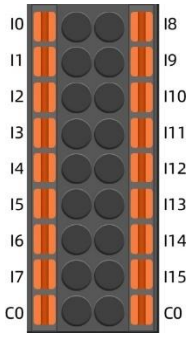
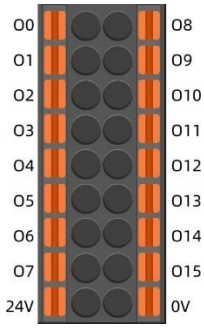
Interface Definition:



No.	Interface	Description
①	IO power	Power terminal, connect to DC24V power.
②	Digital output	OUT0-OUT15
③	Digital input	IN0-IN15
④	Local expansion behind level interface	Connect to expansion submodules, plug in and pull out when in hot are unsupported.
⑤	Local expansion front level interface	Connect to coupler / expansion submodules, plug in and pull out when in hot are unsupported.
⑥	IO signal indication led	Indicate each channel input / output signal
⑦	State Indication Led	● POW led: green, it lights when power is conducted. ● Run led: green, it lights when runs normally ● Error led: red, it lights when runs incorrectly

User Terminal

Terminal	Name	Type	Function
	I0	NPN / PNP type, low-speed	Digital input 0
	I1		Digital input 1

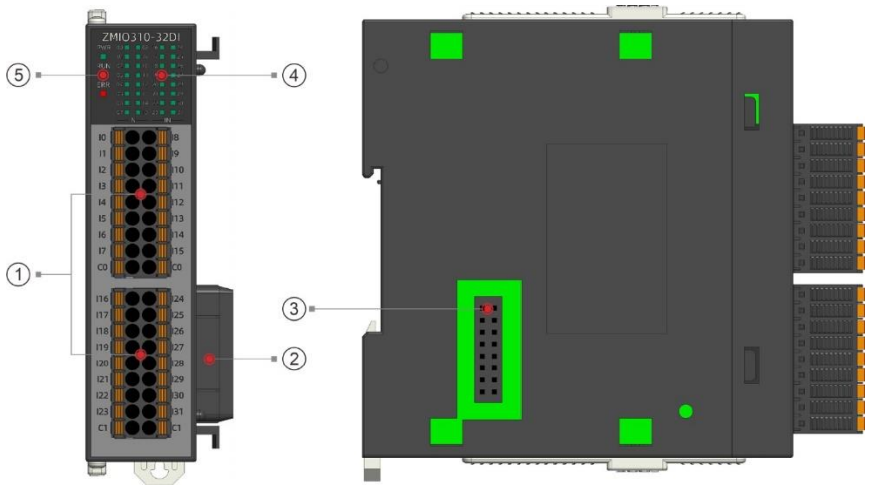
	I2	inputs	Digital input 2
	I3		Digital input 3
	I4		Digital input 4
	I5		Digital input 5
	I6		Digital input 6
	I7		Digital input 7
	I8		Digital input 8
	I9		Digital input 9
	I10		Digital input 10
	I11		Digital input 11
	I12		Digital input 12
	I13		Digital input 13
	I14		Digital input 14
	I15		Digital input 15
	C0	➢ COM0: IN (0-15) = public ends, determine IN type. ➢ COM0 with 24V = NPN, COM0 with 0V = PNP.	
	O0	PNP type, low-speed outputs	Digital output 0
	O1		Digital output 1
	O2		Digital output 2
	O3		Digital output 3
	O4		Digital output 4
	O5		Digital output 5
	O6		Digital output 6
	O7		Digital output 7
	O8		Digital output 8
	O9		Digital output 9
	O10		Digital output 10
	O11		Digital output 11
	O12		Digital output 12
	O13		Digital output 13
	O14		Digital output 14
	O15		Digital output 15
	24V	24V power input +	
	0V	24V power input -, digital output public end	

Malfunction Indication & Solution

Status Indication Led			Reason	Solution
POW	RUN	ERR		
ON	ON	ON	CAN communication Abnormal	✓ Check whether CAN terminal wiring is correct. ✓ Check whether bus two sides are connected one 120-ohm resistor ✓ Check whether multiple CAN modules use the same hardware ID ✓ Check whether the submodule numbers exceed max limit
ON	OFF	OFF	Preset submodule is not perfectly consistent with real connected submodule.	✓ Check whether connected submodules are lost / are error ✓ Check whether the power "plug-in & out under hot" ✓ Restart the power supply
			Master / slave state firmware abnormal	✓ Update the firmware for master station and slave station both.

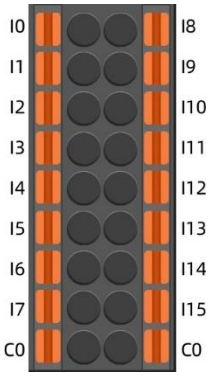
3.3. ZMIO310-32DI

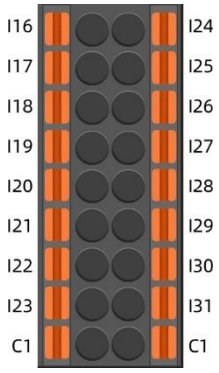
Interface Definition:



No.	Interface	Description
①	Digital input	IN0-IN31
②	Local expansion behind level interface	Connect to expansion submodules, plug in and pull out when in hot are unsupported.
③	Local expansion front level interface	Connect to coupler / expansion submodules, plug in and pull out when in hot are unsupported.
④	IO signal indication led	Indicate each channel input / output signal
⑤	State Indication Led	● POW led: green, it lights when power is conducted. ● Run led: green, it lights when runs normally ● Error led: red, it lights when runs incorrectly

User Terminal

Terminal	Name	Type	Function
	I0	NPN / PNP type, low-speed inputs	Digital input 0
	I1		Digital input 1
	I2		Digital input 2
	I3		Digital input 3
	I4		Digital input 4
	I5		Digital input 5
	I6		Digital input 6
	I7		Digital input 7
	I8		Digital input 8
	I9		Digital input 9
	I10		Digital input 10
	I11		Digital input 11
	I12		Digital input 12
	I13		Digital input 13
	I14		Digital input 14
	I15		Digital input 15
	C0	➢ IN (0-15) = public ends, determine the IN type. ➢ COM0 with 24V = NPN, COM0 with 0V = PNP.	
	I16	NPN / PNP type,	Digital input 16

	I17	low-speed inputs	Digital input 17
	I18		Digital input 18
	I19		Digital input 19
	I20		Digital input 20
	I21		Digital input 21
	I22		Digital input 22
	I23		Digital input 23
	I24		Digital input 24
	I25		Digital input 25
	I26		Digital input 26
	I27		Digital input 27
	I28		Digital input 28
	I29		Digital input 29
	I30		Digital input 30
	I31		Digital input 31
	C1	➢ IN (16-31) = public ends, determine the IN type. ➢ COM1 with 24V = NPN, COM1 with 0V = PNP.	
Note: this module itself doesn't have 24V / 0V power input terminal, no need to be powered separately. And its input type can be switched by C0/C1 connected coupler (+24v / GND) / other sub-module's (24V / 0V) interface.			

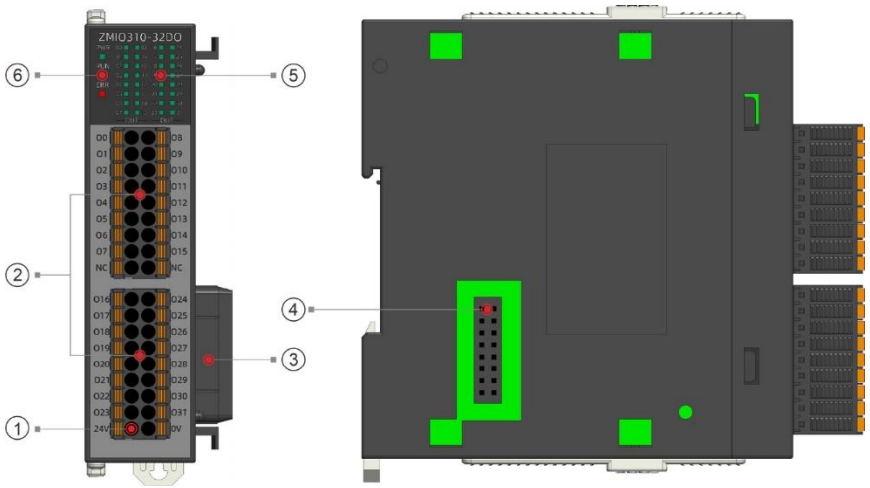
Malfunction Indication & Solution

Status Indication Led			Reason	Solution
POW	RUN	ERR		
ON	ON	ON	CAN communication Abnormal	🔧 Check whether CAN terminal wiring is correct. 🔧 Check whether bus two sides are connected one 120-ohm resistor 🔧 Check whether multiple CAN modules use the same hardware ID 🔧 Check whether the submodule numbers exceed max limit
ON	OFF	OFF	Preset submodule is not	🔧 Check whether connected

			perfectly consistent with real connected submodule.	submodules are lost / are error Check whether the power "plug-in & out under hot" Restart the power supply
			Master / slave state firmware abnormal	Update the firmware for master station and slave station both.

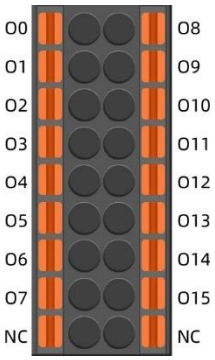
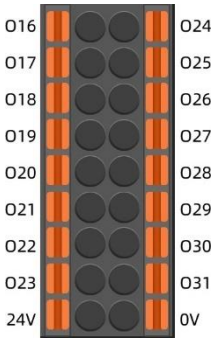
3.4. ZMIO310-32DO

Interface Definition:



No.	Interface	Description
①	IO power	Power terminal, connect to DC24V power.
②	Digital output	OUT0-OUT31
③	Local expansion behind level interface	Connect to expansion submodules, plug in and pull out when in hot are unsupported.
④	Local expansion front level interface	Connect to coupler / expansion submodules, plug in and pull out when in hot are unsupported.
⑤	IO signal indication led	Indicate each channel input / output signal
⑥	State Indication Led	● POW led: green, it lights when power is conducted. ● Run led: green, it lights when runs normally ● Error led: red, it lights when runs incorrectly

User Terminal

Terminal	Name	Type	Function
	O0	NPN type, low-speed outputs	Digital output 0
	O1		Digital output 1
	O2		Digital output 2
	O3		Digital output 3
	O4		Digital output 4
	O5		Digital output 5
	O6		Digital output 6
	O7		Digital output 7
	O8		Digital output 8
	O9		Digital output 9
	O10		Digital output 10
	O11		Digital output 11
	O12		Digital output 12
	O13		Digital output 13
	O14		Digital output 14
	O15		Digital output 15
	NC	Reserved	
	O16	NPN type, low-speed outputs	Digital output 16
	O17		Digital output 17
	O18		Digital output 18
	O19		Digital output 19
	O20		Digital output 20
	O21		Digital output 21
	O22		Digital output 22
	O23		Digital output 23
	O24		Digital output 24
	O25		Digital output 25
	O26		Digital output 26
	O27		Digital output 27
	O28		Digital output 28
	O29		Digital output 29

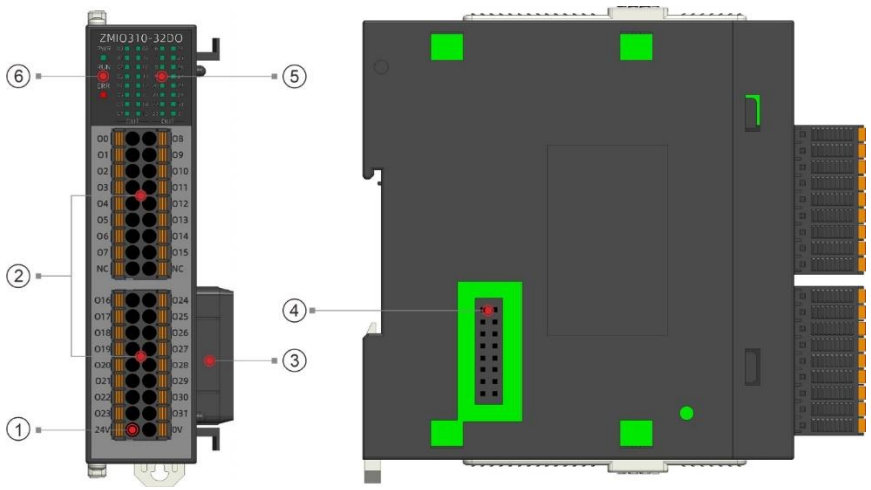
	O30		Digital output 30
	O31		Digital output 31
	24V	24 power input +	
	0V	24 power input -, digital output public end	

Malfunction Indication & Solution

Status Indication Led			Reason	Solution
POW	RUN	ERR		
ON	ON	ON	CAN communication Abnormal	✓ Check whether CAN terminal wiring is correct. ✓ Check whether bus two sides are connected one 120-ohm resistor ✓ Check whether multiple CAN modules use the same hardware ID ✓ Check whether the submodule numbers exceed max limit
ON	OFF	OFF	Preset submodule is not perfectly consistent with real connected submodule.	✓ Check whether connected submodules are lost / are error ✓ Check whether the power "plug-in & out under hot" ✓ Restart the power supply
			Master / slave state firmware abnormal	✓ Update the firmware for master station and slave station both.

3.5. ZMIO310-32DOP

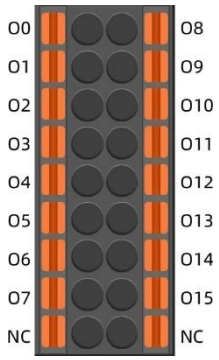
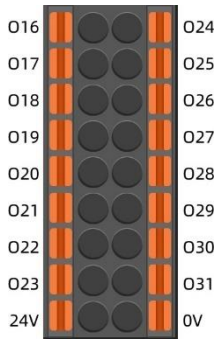
Interface Definition:



No.	Interface	Description
①	IO power	Power terminal, connect to DC24V power.
②	Digital output	OUT0-OUT31
③	Local expansion behind level interface	Connect to expansion submodules, plug in and pull out when in hot are unsupported.
④	Local expansion front level interface	Connect to coupler / expansion submodules, plug in and pull out when in hot are unsupported.
⑤	IO signal indication led	Indicate each channel input / output signal
⑥	State Indication Led	● POW led: green, it lights when power is conducted. ● Run led: green, it lights when runs normally ● Error led: red, it lights when runs incorrectly

User Terminal

Terminal	Name	Type	Function
	O0	PNP type, low-speed outputs	Digital output 0
	O1		Digital output 1
	O2		Digital output 2

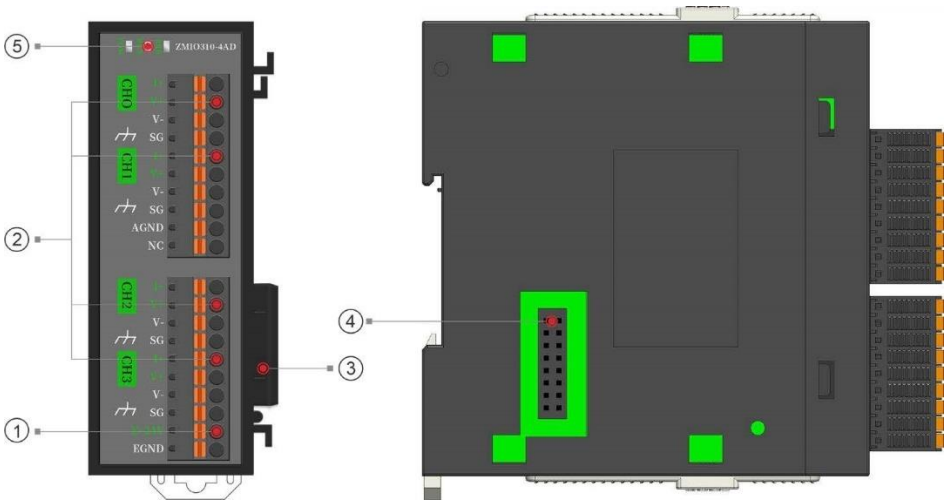
	O3		Digital output 3
	O4		Digital output 4
	O5		Digital output 5
	O6		Digital output 6
	O7		Digital output 7
	O8		Digital output 8
	O9		Digital output 9
	O10		Digital output 10
	O11		Digital output 11
	O12		Digital output 12
	O13		Digital output 13
	O14		Digital output 14
	O15		Digital output 15
	NC	Reserved	
	O16	PNP type, low-speed outputs	Digital output 16
	O17		Digital output 17
	O18		Digital output 18
	O19		Digital output 19
	O20		Digital output 20
	O21		Digital output 21
	O22		Digital output 22
	O23		Digital output 23
	O24		Digital output 24
	O25		Digital output 25
	O26		Digital output 26
	O27		Digital output 27
	O28		Digital output 28
	O29		Digital output 29
	O30		Digital output 30
	O31		Digital output 31
	24V	24 power input +	
	0V	24 power input -, digital output public end	

Malfunction Indication & Solution

Status Indication Led			Reason	Solution
POW	RUN	ERR		
ON	ON	ON	CAN communication Abnormal	✓ Check whether CAN terminal wiring is correct. ✓ Check whether bus two sides are connected one 120-ohm resistor ✓ Check whether multiple CAN modules use the same hardware ID ✓ Check whether the submodule numbers exceed max limit
ON	OFF	OFF	Preset submodule is not perfectly consistent with real connected submodule.	✓ Check whether connected submodules are lost / are error ✓ Check whether the power "plug-in & out under hot" ✓ Restart the power supply
			Master / slave state firmware abnormal	✓ Update the firmware for master station and slave station both.

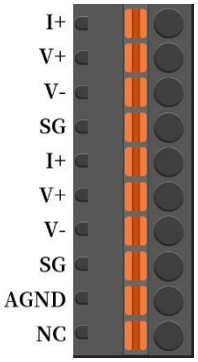
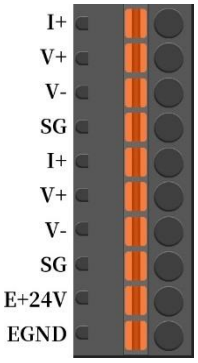
3.6. ZMIO310-4AD

Interface Definition:



No.	Interface	Description
①	IO power	Power terminal, connect to DC24V power supply.
②	Analog input	4-channel analog input
③	Local expansion behind level interface	Connect to expansion submodules, plug in and pull out when in hot are unsupported.
④	Local expansion front level interface	Connect to coupler / expansion submodules, plug in and pull out when in hot are unsupported.
⑤	State Indication Led	● POW led: green, it lights when power is conducted. ● Run led: green, it lights when runs normally ● Error led: red, it lights when runs incorrectly

User Terminal

Terminal	Name	Type	Function
	I+	Analog Input	Channel 0 current input +
	V+		Channel 0 voltage input +
	V-		Channel 0 voltage input -
	SG		Shielded
	I+		Channel 1 current input +
	V+		Channel 1 voltage input +
	V-		Channel 1 voltage input -
	SG		Shielded
	AGND		Analog public current input -
	NC		Reserved
	I+	Analog Input	Channel 2 current input +
	V+		Channel 2 voltage input +
	V-		Channel 2 voltage input -
	SG		Shielded
	I+		Channel 3 current input +
	V+		Channel 3 voltage input +
	V-		Channel 3 voltage input -
	SG		Shielded
	E+24V	/	24V power input +

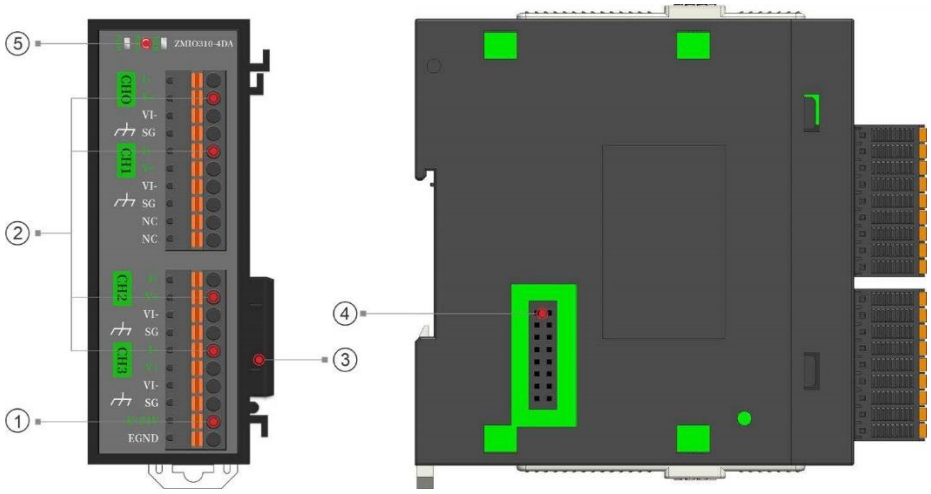
	EGND	/	24V power input -

Malfunction Indication & Solution

Status Indication Led			Reason	Solution
POW	RUN	ERR		
ON	ON	ON	CAN communication Abnormal	✓ Check whether CAN terminal wiring is correct. ✓ Check whether bus two sides are connected one 120-ohm resistor ✓ Check whether multiple CAN modules use the same hardware ID ✓ Check whether the submodule numbers exceed max limit
ON	OFF	OFF	Preset submodule is not perfectly consistent with real connected submodule.	✓ Check whether connected submodules are lost / are error ✓ Check whether the power “plug-in & out under hot" ✓ Restart the power supply
			Master / slave state firmware abnormal	✓ Update the firmware for master station and slave station both.

3.7. ZMIO310-4DA

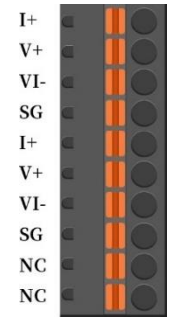
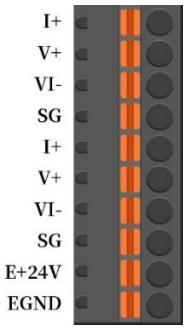
Interface Definition:



No.	Interface	Description
①	IO power	Power terminal, connect to DC24V power supply.
②	Analog input	4-channel analog output
③	Local expansion behind level interface	Connect to expansion submodules, plug in and pull out when in hot are unsupported.
④	Local expansion front level interface	Connect to coupler / expansion submodules, plug in and pull out when in hot are unsupported.
⑤	State Indication Led	● POW led: green, it lights when power is conducted. ● Run led: green, it lights when runs normally ● Error led: red, it lights when runs incorrectly

User Terminal

Terminal	Name	Type	Function
	I+	Analog Output	Channel 0 current output +
	V+		Channel 0 voltage output +
	VI-		Channel 0 voltage / current output -
	SG		Shielded

	I+		Channel 1 current output +
	V+		Channel 1 voltage output +
	VI-		Channel 1 voltage / current output -
	SG		Shielded
	NC		Reserved
	NC		Reserved
	I+	Analog Output	Channel 2 current output +
	V+		Channel 2 voltage output +
	VI-		Channel 2 voltage / current output -
	SG		Shielded
	I+		Channel 4 current output +
	V+		Channel 4 voltage output +
	VI-		Channel 4 voltage / current output -
	SG		Shielded
	E+24V	/	24V power input +
	EGND	/	24V power input -

Malfunction Indication & Solution

Status Indication Led			Reason	Solution
POW	RUN	ERR		
ON	ON	ON	CAN communication Abnormal	➢ Check whether CAN terminal wiring is correct. ➢ Check whether bus two sides are connected one 120-ohm resistor ➢ Check whether multiple CAN modules use the same hardware ID ➢ Check whether the submodule numbers exceed max limit
ON	OFF	OFF	Preset submodule is not perfectly consistent with real connected submodule.	➢ Check whether connected submodules are lost / are error ➢ Check whether the power "plug-in & out under hot" ➢ Restart the power supply

			Master / slave state firmware abnormal	Update the firmware for master station and slave station both.

3.8. Sub-Module Performance & Specification

Digital Inputs

Item	Specification
Power Voltage	24VDC
Input Type	Digital input
IO Power Supply Voltage Input Method	NPN / PNP NPN (IO public end connects to +24V) PNP (IO public end connects to EGND)
Input Current (Typical)	NPN (-4.8mA), PNP (+4.8mA)
Input Impendence	4.7KΩ
Voltage when ON	For PNP type, >7.2V. For NPN type, <14.5V
Voltage when OFF	For PNP type, <6.8V. For NPN type, >14.7V
Internal power	0.3W
Self-Power	1.9W
Isolation	Coupler isolation
Input Frequency	<5kHz
Action showing (output)	When the output is ON, output indication led will be ON.

Digital Outputs (NPN)

Item	Specification
Power Voltage	24VDC
Output Type	Digital output
Output Method	NPN type, it is low electric level when there is output
Output Overcurrent Protection	Max is 300mA, and the max tripping current is 600mA.
The max leakage current when OFF	25μA

Respond time when ON	12μA
Respond time when OFF	80μA
Internal power	0.3W
Self-Power	1.3W
Isolation	Coupler isolation
Input Frequency	<8kHz
Action showing (output)	When the output is ON, output indication led will be ON.
Supported Service	Update the firmware

Digital Outputs (PNP)

Item	Specification
Power Voltage	24VDC
Output Type	Digital output
Output Method	PNP type, it is high electric level when there is output
Output Overcurrent Protection	Max is 300mA, and the max tripping current is 600mA.
The max leakage current when OFF	25μA
Respond time when ON	12μA
Respond time when OFF	60μA
Internal power	0.3W
Self-Power	1.3W
Isolation	Coupler isolation
Input Frequency	<8kHz
Action showing (output)	When the output is ON, output indication led will be ON.
Supported Service	Update the firmware

Analog Inputs

Item	Specification
Power Voltage	24VDC
Input Channel	4

Voltage Input Impedance	>1MΩ
Voltage Input Range	Dual-polarity: -5~5V, -10~10V Single-polarity: 0~5V, 0~10V
Current Input Range	0~20mA, 4~20mA
Resolution	16-bit
Sampling Time	1ms/channel
Precision (common temperature 25℃)	Voltage ±0.1%, current ±0.1% (full-range)
Precision (environment temperature 0~55℃)	Voltage ±0.3%, current ±0.8%
Internal power	0.4W
Self-Power	0.7W
Isolation	Coupler isolation
Supported Service	Update the firmware

Analog Outputs

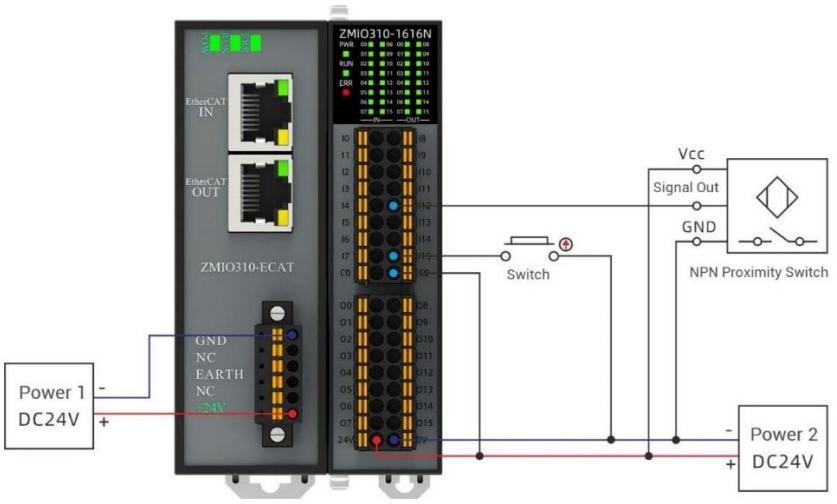
Item	Specification
Power Voltage	24VDC
Output Channel	4
Voltage Output Load	>10KΩ
Voltage Output Range	Dual-polarity: -5~5V, -10~10V Single-polarity: 0~5V, 0~10V
Current Output Range	0~20mA, 4~20mA
Resolution	16-bit
Converting Time	1ms/channel
Precision (common temperature 25℃)	Voltage ±0.1%, current ±0.1% (full-range)
Precision (environment temperature 0~55℃)	Voltage ±0.3%, current ±0.8%
Internal power	0.3W
Self-Power	0.9W
Isolation	Coupler isolation
Supported Service	Update the firmware

3.9. Sub-Module Wiring

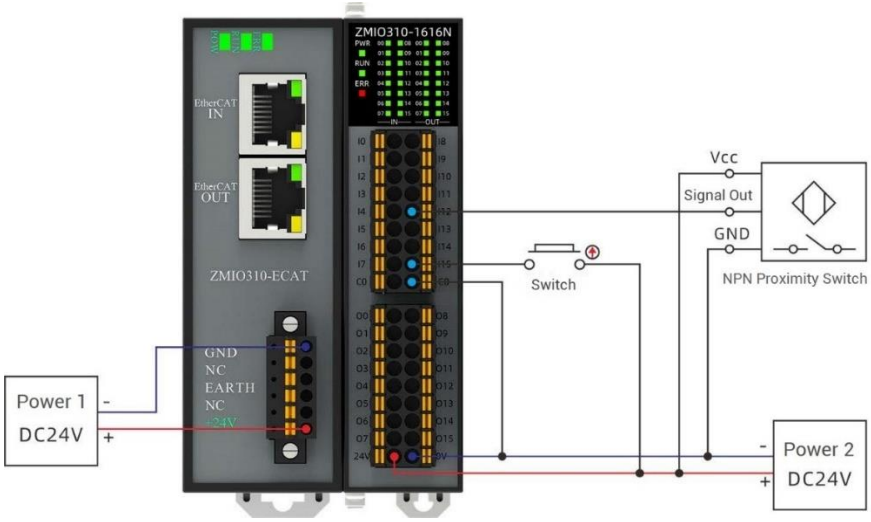
ZMIO310-32DI module itself doesn't have 24V / 0V power input terminal.

Its input type can be switched by C0/C1 connected coupler (+24v / GND) / other sub-module's (24V / 0V) interface.

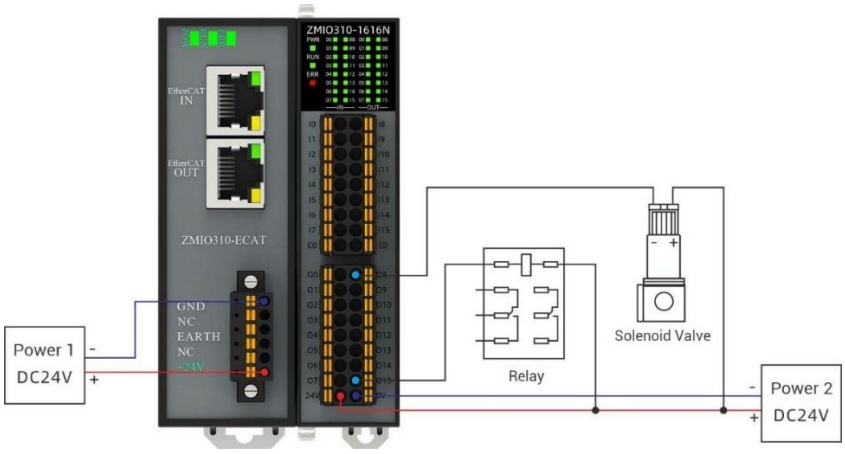
Digital Input (NPN)



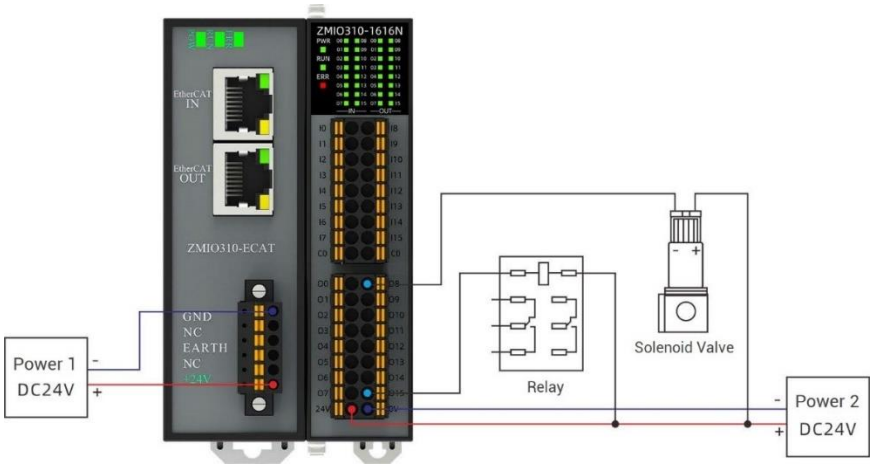
Digital Input (PNP)



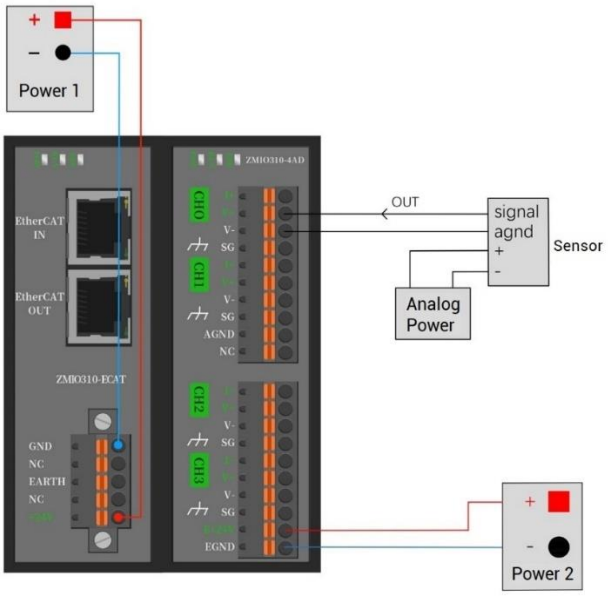
Digital Output (NPN)



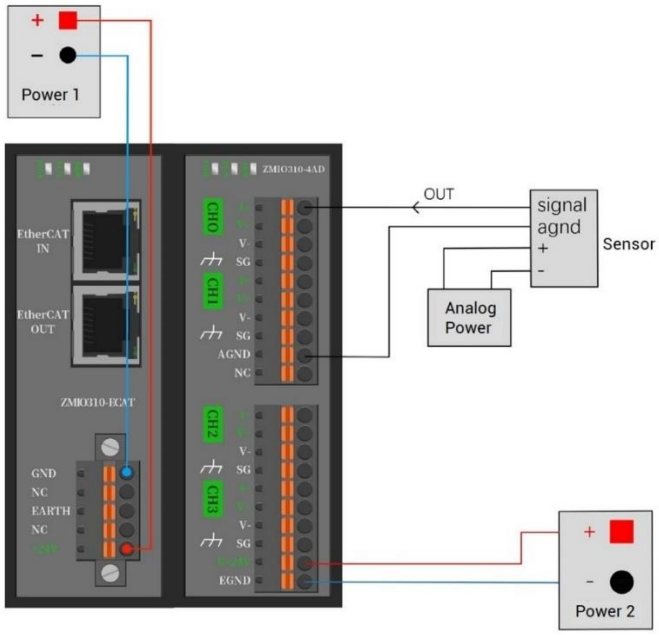
Digital Output (PNP)



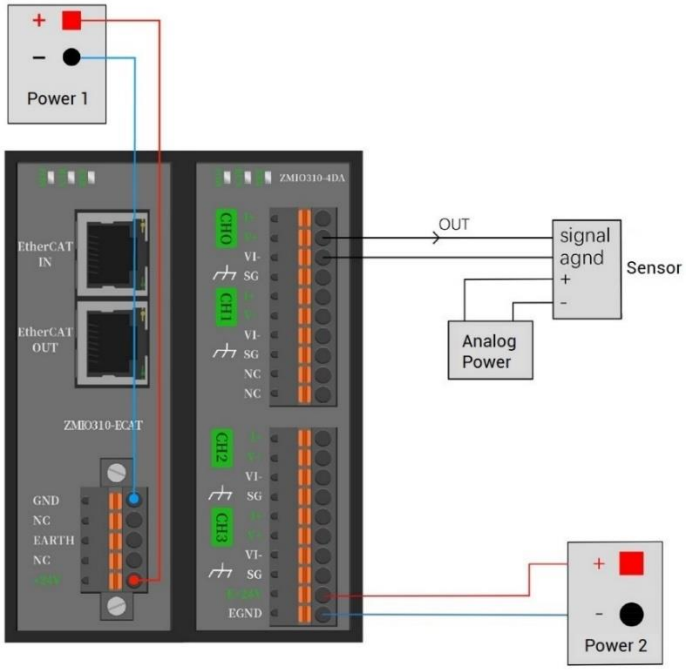
Analog Input (Voltage Type)



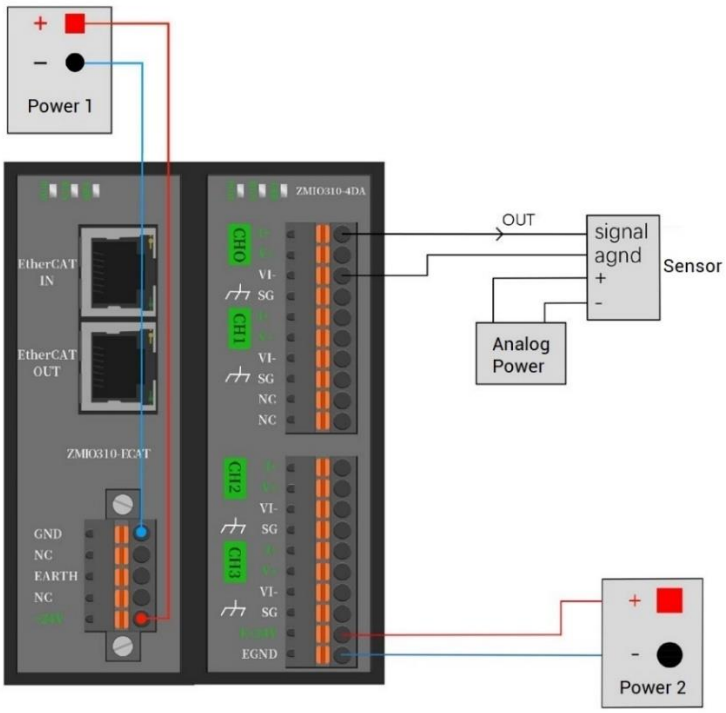
Analog Input (Current Type)



Analog Output (Voltage Type)



Analog Output (Current Type)



Chapter IV Usage Description

4.1. Power Consumption Calculation Example

For coupler module, here, take ZMIO310-ECAT communication module as the example.

ECAT communication module is supplied externally by DC24V, internal coupler supplies 5V power for each module, the max output current is 2A.

Except itself internal power consumption 1.6W, it supplies 8.4W power for each expansion submodule. Please see below form for reference.

Models	Description	Power Consumption
ZMIO310-ECAT	ECAT communication module	1.6W
ZMIO310-1616N	16 inputs & 16 outputs module	0.3W
ZMIO310-1616P	16 inputs & 16 outputs module	0.3W
ZMIO310-32DI	16 inputs module	0.3W
ZMIO310-4AD	4 analog inputs module	0.4W
ZMIO310-4DA	4 analog outputs module	0.3W
…	…	…

4.2. IO Starting No. Settings

Expand by EtherCAT

If the coupler uses ECAT communication module, IO starting No. of input module and output modules are configured through "NODE_IO" command, AIO starting No. of AD module and DA module are configured through "NODE_AIO" command.

- **Digital Inputs:**

NODE_IO			
Grammar	NODE_IO (slot, node) = iobase		
Parameters	slot	Controller bus slot No.	Default is 0
	node	Device No.	Start from 0
	iobase	IO start No.	Expanded input and output

			start No. are the same
Example	NODE_IO (0,0) = 32 'expanded IO start No. of Node 0 is 32		
Notes	▪ IO start No. only can be set as multiples of 8, like, 0, 8, 16, etc. If the IO start No. is 30, which means it should be set as 24. ▪ Firstly, check the controller status to know the local IO maximum value of controller exactly, then use NODE_IO for avoid repetition. If expanded IO No. and local IO repeat, they are valid simultaneously, so it is not recommended. ▪ No update, the IN value will be saved. For example, when the starting address is 16, offset to 32, former area of 16~31 have no real IO, then, IN state of this area will not be updated.		

NODE_AIO			
Grammar	NODE_IO (slot, node) = aiobase		
Parameters	slot	Controller bus slot No.	Default is 0
	node	Device No.	Start from
	aiobase	AIO start No.	Expanded AD and DA start No. are the same
Example	NODE_AIO (0,0) = 32 'expanded AIO start No. of Node 0 is 32		
Notes	▪ Firstly, check the controller status to know the local AIO maximum value of controller exactly, then use NODE_AIO for avoid repetition. If expanded AIO number and local AIO repeat, they are valid simultaneously, so it is not recommended.		

Expand by CAN

If the coupler uses CAN communication module, IO starting No. of input module and output module and AIO starting No. of AD module and DA module are configured through DIP (dial code switch). Dial 1-4 to set IO address, dial 5-6 to set CAN communication speed.

➢ **Set Digital IO Starting No.**

DIP codes 1-4 are used to set address combination value. Then, refer to current IO No., controller sets corresponding IO and AIO starting No. according to the address

combination values. *(OFF=0, ON=1, address combination value = dial code 4 × 8 + dial code 3 × 4 + dial code 2 × 2 + dial code 1).*

- For Example:

If the controller itself contains 28 INs and 16 OPs, then the starting address of the first expansion module should exceed the maximum value of 28.

According to below rule, the dial code should be set to the combination value 1 (binary combination value 0001, from right to left, dial code 1-4, at this time, dial 1 is set to ON, and the others are set to OFF), then IO No. on the expansion board = the expansion board No. value + the starting IO No. value, among them, the IOs that are vacant from 29-31 are not used. And subsequent extended boards continue to dial according to the IO points in turn.

- Digital IO Mapping No. Form:

The starting digital IO mapping No. starts from 16 and increases in multiples of 16

Code 4	Code 3	Code 2	Code 1	Address ID	Starting IO No.	End IO No.
0	0	0	0	0	16	31
0	0	0	1	1	32	47
0	0	1	0	2	48	63
0	0	1	1	3	64	79
0	1	0	0	4	80	95
0	1	0	1	5	96	111
0	1	1	0	6	112	127
0	1	1	1	7	128	143
1	0	0	0	8	144	159
1	0	0	1	9	160	175
1	0	1	0	10	176	191
1	0	1	1	11	192	207
1	1	0	0	12	208	223
1	1	0	1	13	224	239
1	1	1	0	14	240	255
1	1	1	1	15	256	271

- **Set Analog IO Starting No.**

The starting IO mapping No. of analog AD starts from 8 and increases in multiples of 8.

The starting IO mapping No. of analog DA starts from 4 and increases in multiples of 4.

The allocation of analog IO numbers corresponding to different dial code IDs is as follows:

Address ID	Starting AD No.	End AD No.	Starting DA No.	End DA No.
0	8	15	4	7
1	16	23	8	11
2	24	31	12	15
3	32	39	16	19
4	40	47	20	23
5	48	55	24	27
6	56	63	28	31
7	64	71	32	35
8	72	79	36	39
9	80	87	40	43
10	88	95	44	47
11	96	103	48	51
12	104	111	52	55
13	112	119	56	59
14	120	127	60	63
15	128	135	64	67

- **Set Communication Speed**

Dial code 5-6 to select CAN bus communication speed, speed combination value=dial code 6 × 2 + dial code 5×1, the combined value range is 0-3.

The corresponding speeds are as follows:

Code 6	Code 5	DIP 5-6 combination value	CAN communication speed
0	0	0	500Kbps (default value)
0	1	1	250Kbps
1	0	2	125Kbps
1	1	3	1Mbps

- Note

Please select CAN communication speed ratio according to actual application. There are some elements should be considered, such as, transfer distance, delay time, electronic interference, etc. It is recommended to use 500Kbps for Baud rate.

4.3. Read & Write IO & AIO

Expanded IO, AD and DA can be operated by related instructions, like, IN, OP, AIN, AOUT.

Type	Specific Models	Related Command	Permission	Related View
IN	ZMIO310-1616N ZMIO310—1616P ZMIIO310-32DI	IN	Read-Only	IN View
OUT	ZMIO310-1616N ZMIO310—1616P ZMIO310-32DO ZMIO310-32DOP	OP	R & W: Read & Write	OP View
AD	ZMIO310-4AD	AIN	Read-Only	AD /DA View
DA	ZMIO310-4DA	AOUT	R & W	AD /DA View

- Note:

AD, DA module ranges can be set and viewed by CANIO_INFO (can id, 17, submodule address). For more details, please refer to RTBasic Programming Manual.

4.4. Sub-Module Functions Configuration

"Function Configuration" is only valid when the ECAT communication coupler is used.

Use SDO_WRITE to write SDO, use SDO_READ to read SDO message.

Write Data Dictionary

SDO_WRITE	
Grammar	SDO_WRITE (slot, node, index, subindex, type, value)

Parameter List	Slot	Bus slot No.	Default is 0
	Node	Device No.	Start from 0, 0
	Index	Data dictionary No.	-
	Subindex	Sub module No.	-
	Type	Data type	Refer to “Type” form
	Value	Data value	-

Read Data Dictionary

SDO_READ			
Grammar	SDO_READ (slot, node, index, subindex, type, tablenum)		
Parameter List	Slot	Bus slot No.	Default is 0
	Node	Device No.	Start from 0, 0
	Index	Data dictionary No.	-
	Subindex	Sub No.	-
	Type	Data type	Refer to “Type” form
	tablenum	TABLE where saves read data	-

- Type: fill in “type” value according to data type described by data dictionary.

“type” value	**Corresponding Data Type**
1	boolean
2	integer 8
3	integer 16
4	integer 32
5	unsigned 8
6	unsigned 16
7	unsigned 32

Chapter V Data Dictionary Description

The data dictionary description only can be built by ECAT communication module, CAN module doesn't have data dictionary.

5.1. Data Dictionary Overview

Below form shows all dictionary overviews of ZMIO310-ECAT communication module.

- Note:

The address of the expansion sub-module is numbered from 0 according to the order of access to the coupler. **For example**, the first expansion sub-module connected to the coupler has an address of 0, the second expansion sub-module has an address of 1, and so on.

Index	Subindex	Description
5000h	-	Set equipment work mode.
	00h	The category of work modes.
	01h	Recover to initial state when power off, or hold the state when power off.
	02h	Reserved
(5001+expansion submodule address) h For example: (5001+a) h=500bh	-	Control dictionary.
	00h	The number of configured types.
	01h	Configure or get the type of AD/DA analog range.
	02h	Configure AD analog channel switch.
	03h	Reserved
	04h	Reserved
(6000+10*expansion submodule address) h For example: (6000+a*10) h=60a0h	-	State dictionary.
	00h	The number of state dictionary subindex of ZMIO310-1616N, ZMIO310-1616P.
	01h	Get the input state value of ZMIO310-1616N, ZMIO310-1616P.
(7000+10*expansion submodule address) h For example:	-	Control dictionary.
	00h	The number of control dictionary subindex of ZMIO310-1616N, ZMIO310-1616P.

(7000+a*10) h=70a0h	01h	Set the output state of ZMIO310-1616N, ZMIO310-1616P.
(6001+10*expansion submodule address) h For example: (6001+a*10) h=60a1h	-	State dictionary.
	00h	The number of state dictionary subindex of AD module.
	01h	Get the input status value of AD module channel 0.
	02h	Get the input status value of AD module channel 1.
	03h	Get the input status value of AD module channel 2.
	04h	Get the input status value of AD module channel 3.
(7001+10*expansion submodule address) h For example: (7001+a*10) h=70a1h	-	Control dictionary.
	00h	The number of control dictionary subindex of DA module.
	01h	Configure the output value of DA module channel 0.
	02h	Configure the output value of DA module channel 1.
	03h	Configure the output value of DA module channel 2.
	04h	Configure the output value of DA module channel 3.
(6002+10*expansion submodule address) h For example: (6002+a*10) h=60a2h	-	State dictionary
	00h	The number of state dictionary subindex of ZMIO310-32DI
	01h	Get the input state value of ZMIO310-32DI channel CH0-15
	02h	Get the input state value of ZMIO310-32DI channel CH016-31
(7002+10*expansion submodule address) h For example: (7002+a*10) h=70a2h	-	Control dictionary.
	00h	The number of control dictionary subindex of ZMIO310-32DO, ZMIO310-32DOP
	01h	Configure the output state value of ZMIO310-32DO / ZMIO310-32DOP channel CH0-15.
	02h	Configure the output state value of ZMIO310-32DO / ZMIO310-32DOP channel CH16-31.

5.2. Local Behind-level Expansion Address Description

After coupler module is power-on, it will scan local back-level expansion interface, and it will assign one expansion address for each scanned expansion submodule.

- **For Example:**

The local back-level interface of ECAT communication module (ZMIO310-ECAT) connects to 7 input submodules (2 ZMIO310-1616N + 2 ZMIO310-32DI + 1 ZMIO310-32DO + 1 ZMIO310-4AD + 1 ZMIO310-4DA). And the slot No. and node No. are 0 by default.

Sub-Module Address Assignment

Note: following command examples in data dictionary chapter are according to below submodules' addresses.

ECAT communication module starts to scan and assigns address when it is power-on. The submodule address is assigned starting from 0, then according to the connection sequence, that is, the expansion address of the first input module is 0, the expand address of DA module is 6.

Module sequence	Model name	Assigned address
ECAT Coupler	ZMIO310-ECAT	/
The first submodule	ZMIO310-1616N	0
The second submodule	ZMIO310-1616N	1
The third submodule	ZMIO310-32DI	2
The fourth submodule	ZMIO310-32DI	3
The fifth submodule	ZMIO310-32DO	4
The sixth submodule	ZMIO310-4AD	5
The seventh submodule	ZMIO310-4DA	6

- This expand address is used to build data dictionary, and the address assignment is not influenced by expansion submodule type.
- For CAN communication module, the address assigned is only for internal control.

Module Corresponding Data Dictionary

Address	Information	Dictionary Description	
		Rule	Dictionary
-	-	-	5000h
0	1st ZMIO310-1616N	IN state dictionary: (6000 + 10 * expansion sub module address) h	6000h 7000h
1	2rd ZMIO310-1616N	OUT state dictionary: (7000 + 10 * expansion sub module address) h	6010h 7010h
2	1st ZMIO310-32DI	State dictionary: (6002 + 10 * expansion sub module address) h	6022h
3	2rd ZMIO310-32DI		6032h

4	1st ZMIO310-32DO	Control dictionary: (7002 + 10 * expansion sub module address) h	7042h
5	1st ZMIO310-4AD	State dictionary: (6001 + 10 * expansion sub module address) h	6051h
		Control dictionary: (5001 + expansion sub module address) h	5006h
6	1st ZMIO310-4DA	Control dictionary: (7001 + 10 * expansion sub module address) h	7061h
		Control dictionary: (5001 + expansion sub module address) h	5007h

- Next, introduce each submodule's data dictionary content, function, and specific configuration methods.
- This address 0~6 corresponding data dictionary is built when the related expansion module connected only, for other modules, it will not create.

5.3. Data Dictionary Details

Here 5.3 mainly shows all dictionary details of ZMIO310-ECAT communication module.

Format Description

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Data type	Permission

- ✧ Index (hex): the index No. of object, a 4-bit hexadecimal system number.
- ✧ Subindex (hex): the subindex No. of object, a 2-bit hexadecimal system number.
- ✧ Object name: the name of object. For subindex, it is the name of subindex.
- ✧ Default value: the value is configured by default.
- ✧ Data range: for the object that only can be read, it is the read range. For the object that can be read and written, it is the configuration range.
- ✧ Data type: data type of object
- ✧ Permission: it is used to determine the object that only can read or be read and

written (RO=read only, RW=write only, RW=read & write).

Index: 5000h

<table>
<tr><th>Index</th><th>Subindex</th><th>Object</th><th>Default</th><th>Range</th><th>Type</th><th>Permission</th></tr>
<tr><td rowspan="4">5000h</td><td rowspan="2">00h</td><td>CANFIG_DATA</td><td>2</td><td>2</td><td>UNSIGND8</td><td>RO</td></tr>
<tr><td colspan="5">● The category of work mode, namely, the number of default subindex.
● The fixed value is 2.</td></tr>
<tr><td rowspan="2">01h</td><td>CANFIG_1_INDENT</td><td>2</td><td>1 / 2</td><td>UNSIGND16</td><td>RW</td></tr>
<tr><td colspan="5">● The state after power off -- resume initial state or keep state.
● The usage of data value:
1. After opening the bus by SLOT_START command, when the communication breaks, output states of DO/DOP module and DA modules recover as initial values.
2. After communication breaks, output states of DO/DOP module and DA modules keep current states.</td></tr>
<tr><td>02h</td><td colspan="5">Reserved</td></tr>
</table>

Configure Output State after Communication Broken

<table>
<tr><th>Command Used</th><td>SDO_WRITE</td></tr>
<tr><th>Command Usage</th><td>SDO_WRITE (slot, node, index, subindex, type, value)
● Slot: bus slot No., default is 0
● Node: device No., starting from 0
● Index: data dictionary No.
● Subindex: sub No.
● Type: data type, refer to Type form
<table>
<tr><th>Type Value</th><th>Data Type</th></tr>
<tr><td>1</td><td>Boolean</td></tr>
<tr><td>2</td><td>Integer 8</td></tr>
<tr><td>3</td><td>Integer 16</td></tr>
<tr><td>4</td><td>Integer 32</td></tr>
<tr><td>5</td><td>Unsigned 8</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>6</td><td>Unsigned 16</td></tr>
<tr><td>7</td><td>Unsigned 32</td></tr>
</table>
Value: data value
</td></tr>
<tr><td>Function Description</td><td>This function is used to keep / update the output state of DA/DO/DOP after the master-slave station communication is interrupted. There are two modes, and the default is mode 2.
Mode 1: after the communication breaks, the output state is the initial value (the output is 0, DA is the minimum value of the current range).
Mode 2: after the communication breaks, the output state is the state when it was disconnected.</td></tr>
<tr><td>Object to Use</td><td><u>--Digital output module--</u>
ZMIO310-1616N, ZMIO310-1616P, ZMIO310-32DO, ZMIO310-32DOP.
<u>--Analog output module--</u>
ZMIO310-4DA.
This function is only valid for output and DA expanded by the current coupler.</td></tr>
<tr><td>Data Dictionary</td><td>5000h</td></tr>
<tr><td>Examples</td><td>SDO_WRITE (0, 0, $5000, 1, 6, 1) ‘configure as mode 1
SDO_WRITE (0, 0, $5000, 1, 6, 2) ‘configure as mode 2</td></tr>
</table>

Index: 5001h

<table>
<tr><th>Index</th><th>Subindex</th><th>Object</th><th>Default</th><th>Range</th><th>Type</th><th>Permission</th></tr>
<tr><td rowspan="3">(5001 + expansion submodule address) h</td><td><u>00h</u></td><td>CONFIG_DATA</td><td>2</td><td>4</td><td>UNSIGND8</td><td>RO</td></tr>
<tr><td colspan="5">● The number of default subindex, the fixed value is 2.</td></tr>
<tr><td><u>01h</u></td><td>CONFIG_1_INDENT</td><td>2</td><td>2~7 or 10~15</td><td>UNSIGND16</td><td>RW</td></tr>
<tr><td colspan="5">● Configure the range type of analog module, or read range type value
● The meaning of data values:
<table>
<tr><th>Module</th><th>Data Value</th><th>Range</th><th>Module</th><th>Value</th><th>Range</th></tr>
<tr><td rowspan="2">AD</td><td>2</td><td>0~10V</td><td rowspan="2">DA</td><td>10</td><td>0~10V</td></tr>
<tr><td>3</td><td>-10V~10V</td><td>11</td><td>-10V~10V</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td>4</td><td>4~20mA</td><td></td><td>12</td><td>4~20mA</td></tr>
<tr><td></td><td>5</td><td>0~20mA</td><td></td><td>13</td><td>0~20mA</td></tr>
<tr><td></td><td>6</td><td>0~5V</td><td></td><td>14</td><td>0~5V</td></tr>
<tr><td></td><td>7</td><td>-5~5V</td><td></td><td>15</td><td>-5~5V</td></tr>
</table>
</td></tr>
<tr><td></td><td>02h</td><td>
<table>
<tr><td>CONFIG_2_INDENT</td><td>15</td><td>0~15</td><td>UNSIGND16</td><td>RW</td></tr>
</table>

Configure AD module channel data.
Data value model, namely, correspond to 4 channels of AD module.
<table>
<tr><th>AD Module</th><th>CH3</th><th>CH2</th><th>CH1</th><th>CH0</th></tr>
<tr><td>Value (16 hexadecimal)</td><td>8</td><td>4</td><td>2</td><td>1</td></tr>
</table>

The meaning of each data value:
<table>
<tr><th>Data Value</th><th>Range Type</th></tr>
<tr><td>0</td><td>All channels are OFF.</td></tr>
<tr><td>1</td><td>Channel 0 is ON.</td></tr>
<tr><td>2</td><td>Channel 1 is ON.</td></tr>
<tr><td>3</td><td>Channel 0 and channel 1 are ON.</td></tr>
<tr><td>4</td><td>Channel 2 is ON.</td></tr>
<tr><td>5</td><td>Channel 0 and channel 2 are ON.</td></tr>
<tr><td>6</td><td>Channel 1 and channel 2 are ON.</td></tr>
<tr><td>7</td><td>Channel 0, 1, 2 are ON.</td></tr>
<tr><td>8</td><td>Channel 3 is ON.</td></tr>
<tr><td>9</td><td>Channel 0 and channel 3 are ON.</td></tr>
<tr><td>10</td><td>Channel 1 and channel 3 are ON.</td></tr>
<tr><td>11</td><td>Channel 0, 1, 3 are ON.</td></tr>
<tr><td>12</td><td>Channel 2 and channel 3 are ON.</td></tr>
<tr><td>13</td><td>Channel 0, 2, 3 are ON.</td></tr>
<tr><td>14</td><td>Channel 1, 2, 3 are ON.</td></tr>
<tr><td>15</td><td>All channels are ON.</td></tr>
</table>

</td></tr>
<tr><td></td><td>03h</td><td>Reserved</td></tr>
<tr><td></td><td>04h</td><td>Reserved</td></tr>
</table>

Configure Channel Enabling

Command Used	SDO_WRITE

<table>
<tr><td>Command Usage</td><td>SDO_WRITE (slot, node, index, subindex, type, value)
● Slot: bus slot No., default is 0
● Node: device No., starting from 0
● Index: data dictionary No.
● Subindex: sub No.
● Type: data type, refer to Type form
<table><tr><th>Type Value</th><th>Data Type</th></tr><tr><td>1</td><td>Boolean</td></tr><tr><td>2</td><td>Integer 8</td></tr><tr><td>3</td><td>Integer 16</td></tr><tr><td>4</td><td>Integer 32</td></tr><tr><td>5</td><td>Unsigned 8</td></tr><tr><td>6</td><td>Unsigned 16</td></tr><tr><td>7</td><td>Unsigned 32</td></tr></table>● Value: data value</td></tr>
<tr><td>Function Description</td><td>This function is used to control whether the input channel of the AD module is enabled or not.
There are 16 channel enabling modes, and the default is to enable all channels.
● A four-bit binary number represents the enable status of four channels, each bit is a channel, the lowest bit is channel 0, and the highest bit is channel 3.</td></tr>
<tr><td>Object to Use</td><td><u>--Analog input module--</u>
ZMIO310-4AD.
This function is only valid for output and DA expanded by the current coupler.</td></tr>
<tr><td>Data Dictionary</td><td>5006h: (5001 + AD sub-module address No.) h</td></tr>
<tr><td>Examples</td><td>‘5006h is AD module control dictionary
SDO_WRITE (0, 0, $5006, 2, 6, 0) ‘full channels are OFF.
SDO_WRITE (0, 0, $5006, 2, 6, 3) ‘channel 0, 1 are ON.
SDO_WRITE (0, 0, $5006, 2, 6, 12) ‘channel 2, 3 are ON.
SDO_WRITE (0, 0, $5006, 2, 6, 15) ‘full channels are ON.</td></tr>
</table>

Configure Range Switching

<table>
<tr><td>Command Used</td><td>SDO_WRITE</td></tr>
<tr><td>Command Usage</td><td>SDO_WRITE (slot, node, index, subindex, type, value)
● Slot: bus slot No., default is 0
● Node: device No., starting from 0
● Index: data dictionary No.
● Subindex: sub No.
● Type: data type, refer to Type form
<table><tr><th>Type Value</th><th>Data Type</th></tr><tr><td>1</td><td>Boolean</td></tr><tr><td>2</td><td>Integer 8</td></tr><tr><td>3</td><td>Integer 16</td></tr><tr><td>4</td><td>Integer 32</td></tr><tr><td>5</td><td>Unsigned 8</td></tr><tr><td>6</td><td>Unsigned 16</td></tr><tr><td>7</td><td>Unsigned 32</td></tr></table>● Value: data value</td></tr>
<tr><td>Function Description</td><td>This function is used to switch the range of the input channel of the AD module (or the output channel of the DA module), and the default value of both modules is the range of 0~10V
The measuring range corresponds to the type number of the expansion sub-module, please refer to the table below.</td></tr>
<tr><td>Object to Use</td><td><u>--Analog input module--</u>
ZMIO310-4AD.
<u>--Analog output module--</u>
ZMIO310-4DA.</td></tr>
<tr><td>Data Dictionary</td><td>5006h: (5001 + AD sub-module address No.) h
5007h: (5001 + DA sub-module address No.) h</td></tr>
<tr><td>Examples</td><td>‘5006h is AD module control dictionary, 5007h is DA module control dictionary
SDO_WRITE (0, 0, $5006, 1, 6, 3)
‘AD module is switched to -10V~10V range
SDO_WRITE (0, 0, $5006, 1, 6, 5)
‘AD module is switched to 0~20mA range</td></tr>
</table>

	SDO_WRITE (0, 0, $5007, 1, 6, 11) 'DA module is switched to -10~10V range SDO_WRITE (0, 0, $5007, 1, 6, 13) 'DA module is switched to 0~20mA range

Note: when the same dictionary, but the subindex is not consistent, there needs the delay between 2 commands, refer to below program example:

```
SDO_WRITE (0, 0, $5007, 1, 6, 4)        'switch AD module range into 4~20mA
DELAT (10)
SDO_WRITE (0, 0, $5007, 2, 6, 15)       'open all channels

'when set $5007 and $5008, they are not the same one data dictionary, no need delay.
'set analog output ranger (analog output don't be with channel enable)
SDO_WRITE (0, 0, $5008, 1, 6, 12)       'switch AD module range into 4~20mA
```

➢ **Type No. Description:**

Type No.	Type Name	Module Type	Corresponding Range
1	ZM1111	Input module	--
2	ZM1112	AD module	0~10V
3	ZM1113	AD module	-10~10V
4	ZM1114	AD module	4~20mA
5	ZM1115	AD module	0~20mA
6	ZM1116	AD module	0~5V
7	ZM1117	AD module	-5~5V
9	ZM2111	Output module	--
10	ZM2112	DA module	0~10V
11	ZM2113	DA module	-10~10V
12	ZM2114	DA module	4~20mA
13	ZM2115	DA module	0~20mA
14	ZM2116	DA module	0~5V
15	ZM2117	DA module	-5~5V

- This function is valid for current AD module (or DA module).
- One AD module (or DA module) cannot use multiple ranges, and all channels use the same one range, different modules can match with multi-range.

- Type No.1 and No.9 are fixedly used by input module and output module. Type No.2~No.7 are used only by AD module, Type No.10~No.15 are used only by DA module.
- When using AD module, if input voltage (or current) exceeds the range, then it will keep with the maximum value.

Index: 6000h

<table>
<tr><th>Index</th><th>Subindex</th><th>Object</th><th>Default</th><th>Range</th><th>Type</th><th>Permission</th></tr>
<tr><td rowspan="3">(6000 + 10* expansion submodule address) h</td><td>00h</td><td>IN_GENERIC</td><td>1</td><td>1</td><td>UNSIGND8</td><td>RO</td></tr>
<tr><td colspan="6">● The number of default subindex, the fixed value is 1.</td></tr>
<tr><td>01h</td><td>IN_GENE_INT1</td><td>0</td><td>0x0000 ~0xFFFF</td><td>UNSIGND16</td><td>RO</td></tr>
<tr><td colspan="6">● Get the input state value of ZMIO310-1616N, ZMIO310-1616P.
● The usage of data value: 4-digit hexadecimal number is converted into 16-bit binary number, each 1-bit represents the input status of each channel.
--For Example--
The obtained input value is 0x0FF0, and the content of the channel status is as follows:
<table>
<tr><th>Channel</th><th>CH 15</th><th>CH 14</th><th>CH 13</th><th>CH 12</th><th>CH 11</th><th>CH 10</th><th>CH 9</th><th>CH 8</th></tr>
<tr><th>Bit (Binary)</th><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><th>Hexadecimal</th><td colspan="4">0</td><td colspan="4">F</td></tr>
<tr><th>Channel</th><th>CH 7</th><th>CH 6</th><th>CH 5</th><th>CH 4</th><th>CH 3</th><th>CH 2</th><th>CH 1</th><th>CH 0</th></tr>
<tr><th>Bit (Binary)</th><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><th>Hexadecimal</th><td colspan="4">F</td><td colspan="4">0</td></tr>
</table></td></tr>
</table>

Get ZMIO310-1616N/1616P Input State Values

Command Used	SDO_READ

<table>
<tr><td>Command Usage</td><td>SDO_READ (slot, node, index, subindex, type, tablenum)
● Slot: bus slot No., default is 0
● Node: device No., starting from 0
● Index: data dictionary No.
● Subindex: sub No.
● Type: data type, refer to Type form
<table><tr><th>Type Value</th><th>Data Type</th></tr><tr><td>1</td><td>Boolean</td></tr><tr><td>2</td><td>Integer 8</td></tr><tr><td>3</td><td>Integer 16</td></tr><tr><td>4</td><td>Integer 32</td></tr><tr><td>5</td><td>Unsigned 8</td></tr><tr><td>6</td><td>Unsigned 16</td></tr><tr><td>7</td><td>Unsigned 32</td></tr></table>● Tablenum: TABLE position that saves read data</td></tr>
<tr><td>Function Description</td><td>This function is used to read ZMIO310-1616N/1616P module's channel input state values.
➢ Note: one ZMIO310-1616N/1616P has one 16 input channels, that is, channel 0-15.
● 4-bit hexadecimal converts to 16-bit binary, each bit represents each channel's input state.</td></tr>
<tr><td>Object to Use</td><td>ZMIO310-1616N, ZMIO310-1616P.</td></tr>
<tr><td>Data Dictionary</td><td>6000h, 6010h: (6000 + ZMIO310-1616N/1616P sub-module address No. * 10) h</td></tr>
<tr><td>Examples</td><td>‘6000h, 6010h is ZMIO310-1616N/1616P state dictionary
‘read data are saved into TABLE, please use TABLE to get data
SDO_READ (0, 0, $6000, 1, 6, 100)
‘get 16-channel input state of the first ZMIO310-1616N
? TABLE (100)
‘read the first one ZMIO310-1616N channel state
SDO_READ (0, 0, $6010, 1, 6, 100)
‘get 16-channel input state of the second ZMIO310-1616N
? TABLE (100)
‘read the second ZMIO310-1616N channel state</td></tr>
</table>

Index: 7000h

<table>
<tr><th>Index</th><th>Subindex</th><th>Object</th><th>Default</th><th>Range</th><th>Type</th><th>Permission</th></tr>
<tr><td rowspan="3">(7000 + 10* expansion submodule address) h</td><td>00h</td><td>OUT_GENERIC</td><td>1</td><td>1</td><td>UNSIGND8</td><td>RO</td></tr>
<tr><td colspan="6">● The number of default subindex, the fixed value is 1.</td></tr>
<tr><td>01h</td><td>OUT_GEN_INT1</td><td>0</td><td>0x0000 ~0xFFFF</td><td>UNSIGND16</td><td>RW</td></tr>
<tr><td colspan="6">● Get the output state value of ZMIO310-1616N, ZMIO310-1616P.
● The usage of data value: 4-digit hexadecimal number is converted into 16-bit binary number, each 1-bit represents the input status of each channel.
--For Example--
The obtained output value is 0x0FF0, and the content of the channel status is as follows:
<table>
<tr><th>Channel</th><th>CH 15</th><th>CH 14</th><th>CH 13</th><th>CH 12</th><th>CH 11</th><th>CH 10</th><th>CH 9</th><th>CH 8</th></tr>
<tr><th>Bit (Binary)</th><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><th>Hexadecimal</th><td colspan="4">0</td><td colspan="4">F</td></tr>
<tr><th>Channel</th><th>CH 7</th><th>CH 6</th><th>CH 5</th><th>CH 4</th><th>CH 3</th><th>CH 2</th><th>CH 1</th><th>CH 0</th></tr>
<tr><th>Bit (Binary)</th><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><th>Hexadecimal</th><td colspan="4">F</td><td colspan="4">0</td></tr>
</table>
</td></tr>
</table>

Set ZMIO310-1616N/1616P Input State Values

<table>
<tr><th>Command Used</th><td>SDO_WRITE</td></tr>
<tr><th>Command Usage</th><td>SDO_WRITE (slot, node, index, subindex, type, value)
● Slot: bus slot No., default is 0
● Node: device No., starting from 0
● Index: data dictionary No.
● Subindex: sub No.
● Type: data type, refer to Type form
<table>
<tr><th>Type Value</th><th>Data Type</th></tr>
<tr><td>1</td><td>Boolean</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td>
<table>
<tr><td>2</td><td>Integer 8</td></tr>
<tr><td>3</td><td>Integer 16</td></tr>
<tr><td>4</td><td>Integer 32</td></tr>
<tr><td>5</td><td>Unsigned 8</td></tr>
<tr><td>6</td><td>Unsigned 16</td></tr>
<tr><td>7</td><td>Unsigned 32</td></tr>
</table>
Value: data value
</td></tr>
<tr><td>Function Description</td><td>This function is used to set ZMIO310-1616N/1616P module's channel output state values.
➢ Note: one ZMIO310-1616N/1616P has one 16 output channels, that is, channel 0-15.
● 4-bit hexadecimal converts to 16-bit binary, each bit represents each channel's output state.</td></tr>
<tr><td>Object to Use</td><td>ZMIO310-1616N, ZMIO310-1616P.</td></tr>
<tr><td>Data Dictionary</td><td>7000h, 7010h: (7000 + ZMIO310-1616N/1616P sub-module address No. * 10) h</td></tr>
<tr><td>Examples</td><td>'7000h, 7010h is ZMIO310-1616N/1616P control dictionary
'set the first ZMIO310-1616N high 8-bit output channel state as ON, make low 8-bit channel state as OFF.
SDO_WRITE (0, 0, $7000, 1, 6, 0xFF00)
'set the second ZMIO310-1616N high 8-bit output channel state as OFF, make low 8-bit channel state as ON.
SDO_WRITE (0, 0, $7010, 1, 6, 0xFF00)</td></tr>
</table>

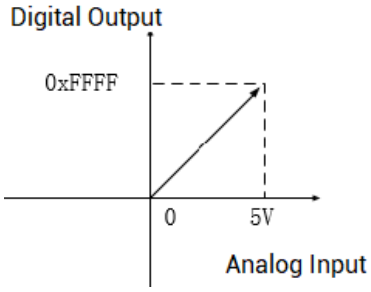
➢ **Notes:**

1) if SDO command is used to configure DO output, it is only valid before EtherCAT START, because the controller will automatically open PDO command to configure DO channel output after EtherCAT START.

2) PDO real-time is high, then it covers DO channel data of SDO configuration.

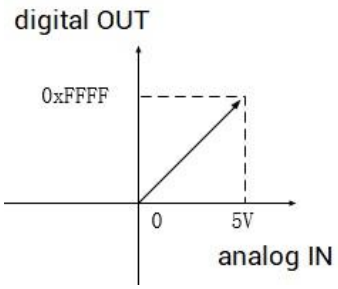
3) PDO command corresponds to OP in RTBasic, please refer to RTBasic manual for specific usage of OP.

Index: 6001h

<table>
<tr><th>Index</th><th>Subindex</th><th>Object</th><th>Default</th><th>Range</th><th>Type</th><th>Permission</th></tr>
<tr><td rowspan="5">(6001 + 10* expansion submodule address) h</td><td>00h</td><td>IN_GENERIC</td><td>4</td><td>4</td><td>UNSIGND8</td><td>RO</td></tr>
<tr><td colspan="6">● The number of default subindex, the fixed value is 4.</td></tr>
<tr><td rowspan="2">01h</td><td>IN_GEN_INT1</td><td>0</td><td>0x0000
~0xFFFF</td><td>UNSIGND16</td><td>RO</td></tr>
<tr><td colspan="5">● Get input state value of AD module channel 0.
● The meaning of date value: 0x0000~0xFFFF means the scale value of analog, which is converted from gained analog AD.
--For Example--
If the current range of AD module is 0~5V:
 

Digital converted from AD is represented by Y
Analog gained from AD is represented by X

Then:
✓ AD input value can be calculated from the above graphic: (Y-0)/ (0xFFFF-0) = (X-0) / (5V-0), namely, Y = 0xFFFF*X / 5V.
Value X is the gained known condition of current AD module, value Y is converted from AD through PC side. Same, value Y is gained from PC, then X value can be calculated reversely.</td></tr>
<tr><td rowspan="2">02h</td><td>IN_GEN_INT2</td><td>0</td><td>0x0000
~0xFFFF</td><td>UNSIGND16</td><td>RO</td></tr>
<tr><td colspan="5">● Get the input state value of AD channel 1.
● The meaning of date value: 0x0000~0xFFFF means the scale value of analog, which is converted from gained analog from AD.
--For Example--
If the current range of AD module is -5~5V:</td></tr>
</table>



Digital converted from AD is represented by Y

Analog gained from AD is represented by X

Then:

✓ AD input value can be calculated from the above graphic: (Y-0)/(0xFFFF-0) = [X-(5V)] / [5-(-5V)], namely, Y = 0xFFFF* [X-(5V)] / [5V-(-5V)].

Value X is the gained known condition of current AD module, value Y is converted from AD through PC side. Same, value Y is gained from PC, then X value can be calculated reversely.

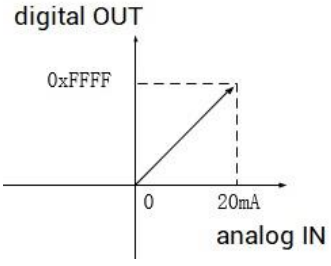
03h

IN_GEN_INT3	0	0x0000 ~0xFFFF	UNSIGND16	RO

- Get the input state value of AD **channel 2.**
- The meaning of date value: 0x0000~0xFFFF means the scale value of analog, which is converted from gained analog from AD.

--For Example--

If the current range of AD module is **0~20mA**:



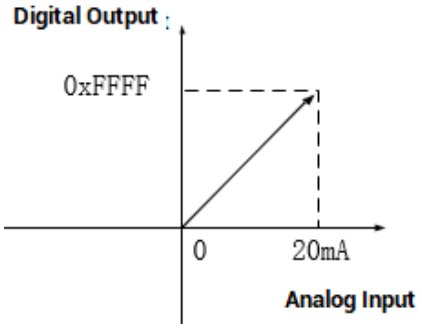
Digital converted from AD is represented by Y

Analog gained from AD is represented by X

Then:

✓ AD input value can be calculated from the above graphic: (Y-0)/(0xFFFF-0) = [X-0] / (20mA-0)], namely, Y = 0xFFFF* / 20mA.

Value X is the gained known condition of current AD module, value Y is

<table>
<tr><td></td><td></td><td colspan="5">converted from AD through PC side. Same, value Y is gained from PC, then X value can be calculated reversely.</td></tr>
<tr><td rowspan="2"></td><td rowspan="2">04h</td><td>IN_GEN_IN4</td><td>0</td><td>0x0000
~0xFFFF</td><td>UNSIGND16</td><td>RO</td></tr>
<tr><td colspan="5">● Get the input state value of AD channel 3.
● The meaning of date value: 0x0000~0xFFFF means the scale value of analog, which is converted from gained analog from AD.
--For Example--
If the current range of AD module is 4~20mA:
 

Digital converted from AD is represented by Y
Analog gained from DA is represented by X

Then:
✓ AD input value can be calculated from the above graphic: (Y-0)/ (0xFFFF-0) = [X-4mA] / (20mA-4mA)], namely, Y = 0xFFFF* / (X-4Ma) / (20mA-4mA).
Value X is the gained known condition of current AD module, value Y is converted from AD through PC side. Same, value Y is gained from PC, then X value can be calculated reversely.</td></tr>
</table>

Get AD Module Input State Values

Command Used	SDO_READ
Command Usage	SDO_READ (slot, node, index, subindex, type, tablenum) ● Slot: bus slot No., default is 0 ● Node: device No., starting from 0 ● Index: data dictionary No.

<table>
<tr><td></td><td>

Subindex: sub No.
Type: data type, refer to Type form

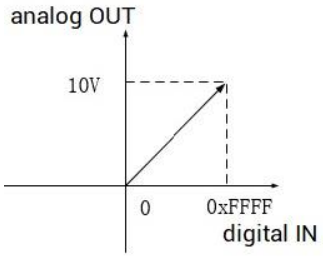
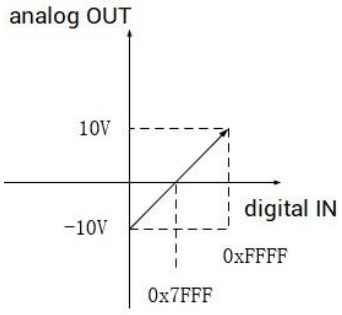
<table>
<tr><th>Type Value</th><th>Data Type</th></tr>
<tr><td>1</td><td>Boolean</td></tr>
<tr><td>2</td><td>Integer 8</td></tr>
<tr><td>3</td><td>Integer 16</td></tr>
<tr><td>4</td><td>Integer 32</td></tr>
<tr><td>5</td><td>Unsigned 8</td></tr>
<tr><td>6</td><td>Unsigned 16</td></tr>
<tr><td>7</td><td>Unsigned 32</td></tr>
</table>

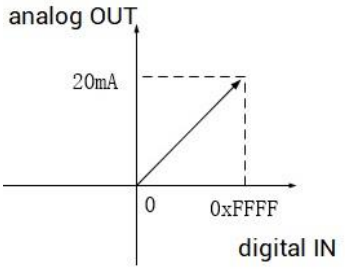
Tablenum: TABLE position that saves read data

</td></tr>
<tr><td>Function Description</td><td>This function is used to read AD module's channel input values
● One AD module has 4 channels: channel 0, channel 1, channel 2, and channel 3.</td></tr>
<tr><td>Object to Use</td><td>ZMIO310-4AD</td></tr>
<tr><td>Data Dictionary</td><td>6051h: (6001 + ZMIO310-4AD sub-module address No. * 10) h</td></tr>
<tr><td>Examples</td><td>‘6051h is ZMIO310-4AD state dictionary
‘read data are saved into TABLE, please use TABLE to get data
SDO_READ (0, 0, $6051, 1, 6, 100) ‘get channel 0 input state
? TABLE (100) ‘read channel 0 data
SDO_READ (0, 0, $6051, 2, 6, 100) ‘get channel 1 input state
? TABLE (100) ‘read channel 1 data
SDO_READ (0, 0, $6051, 3, 6, 100) ‘get channel 2 input state
? TABLE (100) ‘read channel 2 data
SDO_READ (0, 0, $6051, 4, 6, 100) ‘get channel 3 input state
? TABLE (100) ‘read channel 3 data</td></tr>
</table>

Index: 7001h

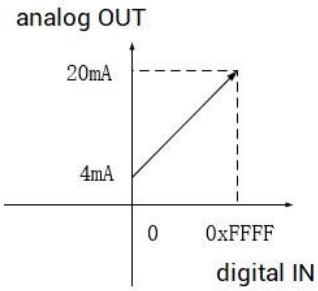
Index	Subindex	Object	Default	Range	Type	Permission
(7001 + 10* expansion submodule address) h	00h	IN_GENERIC	4	4	UNSIGND8	RO
		● The number of default subindex, the fixed value is 4.				
	01h	IN_GEN_INT1	0	0x0000 ~0xFFFF	UNSIGND16	RW
		● Get input state value of DA module **channel 0.**				

		● The meaning of date value: 0x0000~0xFFFF means the scale value of analog, PC side input scale value outputs analog transferred by DA. ***--For Example--*** If the current range of DA module is **0~10V**:  *Digital converted from DA is represented by Y* *PC side input digital, that is, the scale value, represented by X* Then: ✓ DA output value can be calculated from the above graphic: (Y-0)/ (10V-0) = (X-0) / (0xFFFF-0), namely, Y = 10*X/0xFFFF. Value X is the gained known condition of current PC side, then get Y from DA. Same, you can preset DA output value at first, then X value can be calculated reversely.
	02h	IN_GEN_INT2 | 0 | 0x0000 ~0xFFFF | UNSIGND16 | RW ● Get input state value of DA module **channel 1.** ● The meaning of date value: 0x0000~0xFFFF means the scale value of analog, PC side input scale value outputs analog transferred by DA. ***--For Example--*** If the current range of DA module is **-10V~10V**:  *Digital converted from DA is represented by Y* *PC side input digital, that is, the scale value, represented by X*

<table>
<tr><td></td><td></td><td>Then:
✓ DA output value can be calculated from the above graphic: [Y-(-10V)] / [10V-(-10V)] = (X-0) / (0xFFFF-0), namely, Y = [10V-(-10V)] * X / 0xFFFF – 10V
Value X is the gained known condition of current PC side, then get Y from DA. Same, you can preset DA output value at first, then X value can be calculated reversely.</td></tr>
<tr><td></td><td>03h</td><td><table><tr><td>IN_GEN_INT3</td><td>0</td><td>0x0000
~0xFFFF</td><td>UNSIGND16</td><td>RW</td></tr></table>
● Get input state value of DA module channel 2.
● The meaning of date value: 0x0000~0xFFFF means the scale value of analog, PC side input scale value outputs analog transferred by DA.
--For Example--
If the current range of DA module is 0mA~20mA:
 

Digital converted from DA is represented by Y
PC side input digital, that is, the scale value, represented by X

Then:
✓ DA output value can be calculated from the above graphic: (Y-0) / (20mA-0) = (X-0) / (0xFFFF-0), namely, Y = 20mA * X / 0xFFFF
Value X is the gained known condition of current PC side, then get Y from DA. Same, you can preset DA output value at first, then X value can be calculated reversely.</td></tr>
<tr><td></td><td>04h</td><td><table><tr><td>IN_GEN_IN4</td><td>0</td><td>0x0000
~0xFFFF</td><td>UNSIGND16</td><td>RW</td></tr></table>
● Get input state value of DA module channel 3.
● The meaning of date value: 0x0000~0xFFFF means the scale value of analog, PC side input scale value outputs analog transferred by DA.
--For Example--
If the current range of DA module is 4mA~20mA:</td></tr>
</table>



Digital converted from DA is represented by Y

PC side input digital, that is, the scale value, represented by X

Then:

✓ DA output value can be calculated from the above graphic: (Y-4mA) / (20mA-4mA) = (X-0) / (0xFFFF-0), namely, Y = (20mA-4mA) * X / 0Xffff + 4mA

Value X is the gained known condition of current PC side, then get Y from DA. Same, you can preset DA output value at first, then X value can be calculated reversely.

Set ZMIO310-4DA Output Values

Command Used	SDO_WRITE
Command Usage	SDO_WRITE (slot, node, index, subindex, type, value) ● Slot: bus slot No., default is 0 ● Node: device No., starting from 0 ● Index: data dictionary No. ● Subindex: sub No. ● Type: data type, refer to Type form

Type Value	Data Type
1	Boolean
2	Integer 8
3	Integer 16
4	Integer 32
5	Unsigned 8
6	Unsigned 16
7	Unsigned 32

	● Value: data value
Function Description	This function is used to set DA module's channel output values ● One DA module has 4 channels: channel 0, channel 1, channel 2, and channel 3.
Object to Use	ZMIO310-4DA
Data Dictionary	7061h: (7001 + ZMIO310-4DA sub-module address No. * 10) h
Examples	‘7061h is ZMIO310-4DA control dictionary SDO_WRITE (0, 0, $7061, 1, 6, 65535) ‘set channel 0 output value as 0xFFFF SDO_WRITE (0, 0, $7061, 2, 6, 65535) ‘set channel 0 output value as 0xFFFF SDO_WRITE (0, 0, $7061, 3, 6, 65535) ‘set channel 0 output value as 0xFFFF SDO_WRITE (0, 0, $7061, 4, 6, 65535) ‘set channel 0 output value as 0xFFFF

➢ **Notes:**

1) if SDO command is used to configure DA output, it is only valid before EtherCAT START, because the controller will automatically open PDO command to configure DA channel output after EtherCAT START.

2) PDO real-time is high, then it covers DA channel data of SDO configuration.

3) PDO command corresponds to AOUT in RTBasic, please refer to RTBasic manual for specific usage of AOUT.

Index: 6002h

Index	Subindex	Object	Default	Range	Type	Permission
(6002 + 10* expansion submodule	00h	IN_GENERIC	1	1	UNSIGND8	RO
		● The number of default subindex, the fixed value is 1.				
	01h	IN_GEN_INT1	0	0x0000 ~0xFFFF	UNSIGND16	RO

address) h

- Get the input state value of ZMIO310-32DI module's channel 0-15.
- The usage of data value: 4-digit hexadecimal number is converted into 16-bit binary number, each 1-bit represents the input status of each channel.

--For Example--

The obtained input value is 0x0FF0, and the content of the channel status is as follows:

Channel	**CH 15**	**CH 14**	**CH 13**	**CH 12**	**CH 11**	**CH 10**	**CH 9**	**CH 8**
Bit (Binary)	0	0	0	0	1	1	1	1
Hexadecimal	0				F			
Channel	**CH 7**	**CH 6**	**CH 5**	**CH 4**	**CH 3**	**CH 2**	**CH 1**	**CH 0**
Bit (Binary)	1	1	1	1	0	0	0	0
Hexadecimal	F				0			

IN_GEN_INT2	0	0x0000 ~0xFFFF	UNSIGND16	RO

02h

- Get the input state value of ZMIO310-32DI module's channel 16-31.
- The usage of data value: 4-digit hexadecimal number is converted into 16-bit binary number, each 1-bit represents the input status of each channel.

--For Example--

The obtained input value is 0x0FF0, and the content of the channel status is as follows:

Channel	**CH 31**	**CH 30**	**CH 29**	**CH 28**	**CH 27**	**CH 26**	**CH 25**	**CH 24**
Bit (Binary)	0	0	0	0	1	1	1	1
Hexadecimal	0				F			
Channel	**CH 23**	**CH 22**	**CH 21**	**CH 20**	**CH 19**	**CH 18**	**CH 17**	**CH 16**
Bit (Binary)	1	1	1	1	0	0	0	0
Hexadecimal	F				0			

Get ZMIO310-32DI Module Input State Values

<table>
<tr><td>Command Used</td><td>SDO_READ</td></tr>
<tr><td>Command Usage</td><td>SDO_READ (slot, node, index, subindex, type, tablenum)
● Slot: bus slot No., default is 0
● Node: device No., starting from 0
● Index: data dictionary No.
● Subindex: sub No.
● Type: data type, refer to Type form
<table><tr><th>Type Value</th><th>Data Type</th></tr><tr><td>1</td><td>Boolean</td></tr><tr><td>2</td><td>Integer 8</td></tr><tr><td>3</td><td>Integer 16</td></tr><tr><td>4</td><td>Integer 32</td></tr><tr><td>5</td><td>Unsigned 8</td></tr><tr><td>6</td><td>Unsigned 16</td></tr><tr><td>7</td><td>Unsigned 32</td></tr></table>● Tablenum: TABLE position that saves read data</td></tr>
<tr><td>Function Description</td><td>This function is used to read ZMIO310-32DI module's channel input values
● One ZMIO310-32DI module has 32 input channels: channel 0-31.
● 4-bit hexadecimal converts to 16-bit binary, each bit represents each channel's input state.</td></tr>
<tr><td>Object to Use</td><td>ZMIO310-32DI</td></tr>
<tr><td>Data Dictionary</td><td>6022h, 6032h: (6002 + ZMIO310-32DI sub-module address No. * 10) h</td></tr>
<tr><td>Examples</td><td>‘6022h, 6032h are ZMIO310-32DI state dictionary
‘read data are saved into TABLE, please use TABLE to get data
SDO_READ (0, 0, $6022, 1, 6, 100)
‘get the first ZMIO310-32DI channel 0-15 input state
? TABLE (100)
‘read the first ZMIO310-32DI channel state
SDO_READ (0, 0, $6022, 2, 6, 100)
‘get the first ZMIO310-32DI channel 16-31 input state</td></tr>
</table>

	? TABLE (100) 'read the first ZMIO310-32DI channel state SDO_READ (0, 0, $6032, 1, 6, 100) 'get the second ZMIO310-32DI channel 0-15 input state ? TABLE (100) 'read the second ZMIO310-32DI channel state SDO_READ (0, 0, $6032, 2, 6, 100) 'get the second ZMIO310-32DI channel 16-31 input state ? TABLE (100) 'read the second ZMIO310-32DI channel state

Index: 7002h

<table>
<tr><th>Index</th><th>Subindex</th><th>Object</th><th>Default</th><th>Range</th><th>Type</th><th>Permission</th></tr>
<tr><td rowspan="3">(7002 + 10* expansion submodule address) h</td><td>00h</td><td>IN_GENERIC</td><td>1</td><td>1</td><td>UNSIGND8</td><td>RO</td></tr>
<tr><td colspan="5">● The number of default subindex, the fixed value is 1.</td></tr>
<tr><td>01h</td><td>IN_GEN_INT1</td><td>0</td><td>0x0000
~0xFFFF</td><td>UNSIGND16</td><td>RW</td></tr>
<tr><td colspan="5">● Get the output state value of ZMIO310-32DO / ZMIO310-32DOP module's channel 0-15.
● The usage of data value: 4-digit hexadecimal number is converted into 16-bit binary number, each 1-bit represents the input status of each channel.
--For Example--
The obtained input value is 0x0FF0, and the content of the channel status is as follows:
<table>
<tr><th>Channel</th><th>CH 15</th><th>CH 14</th><th>CH 13</th><th>CH 12</th><th>CH 11</th><th>CH 10</th><th>CH 9</th><th>CH 8</th></tr>
<tr><th>Bit (Binary)</th><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><th>Hexadecimal</th><td colspan="4">0</td><td colspan="4">F</td></tr>
<tr><th>Channel</th><th>CH 7</th><th>CH 6</th><th>CH 5</th><th>CH 4</th><th>CH 3</th><th>CH 2</th><th>CH 1</th><th>CH 0</th></tr>
<tr><th>Bit (Binary)</th><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><th>Hexadecimal</th><td colspan="4">F</td><td colspan="4">0</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td>02h</td><td>IN_GEN_INT2</td><td>0</td><td>0x0000
~0xFFFF</td><td>UNSIGND16</td><td>RO</td></tr>
<tr><td></td><td></td><td colspan="5">

Get the output state value of ZMIO310-32DO / ZMIO310-32DOP module's channel 16-31.
The usage of data value: 4-digit hexadecimal number is converted into 16-bit binary number, each 1-bit represents the input status of each channel.

--For Example--
The obtained input value is 0x0FF0, and the content of the channel status is as follows:
<table>
<tr><th>Channel</th><th>CH 31</th><th>CH 30</th><th>CH 29</th><th>CH 28</th><th>CH 27</th><th>CH 26</th><th>CH 25</th><th>CH 24</th></tr>
<tr><th>Bit (Binary)</th><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><th>Hexadecimal</th><td colspan="4">0</td><td colspan="4">F</td></tr>
<tr><th>Channel</th><th>CH 23</th><th>CH 22</th><th>CH 21</th><th>CH 20</th><th>CH 19</th><th>CH 18</th><th>CH 17</th><th>CH 16</th></tr>
<tr><th>Bit (Binary)</th><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><th>Hexadecimal</th><td colspan="4">F</td><td colspan="4">0</td></tr>
</table>
</td></tr>
</table>

Set ZMIO310-32DO Output Values

<table>
<tr><th>Command Used</th><td>SDO_WRITE</td></tr>
<tr><th>Command Usage</th><td>
SDO_WRITE (slot, node, index, subindex, type, value)

Slot: bus slot No., default is 0
Node: device No., starting from 0
Index: data dictionary No.
Subindex: sub No.
Type: data type, refer to Type form

<table>
<tr><th>Type Value</th><th>Data Type</th></tr>
<tr><td>1</td><td>Boolean</td></tr>
<tr><td>2</td><td>Integer 8</td></tr>
<tr><td>3</td><td>Integer 16</td></tr>
<tr><td>4</td><td>Integer 32</td></tr>
<tr><td>5</td><td>Unsigned 8</td></tr>
<tr><td>6</td><td>Unsigned 16</td></tr>
</table>
</td></tr>
</table>

	7 | Unsigned 32 ● Value: data value
Function Description	This function is used to read ZMIO310-32DO / ZMIO310-32DOP module's channel input values ● One ZMIO310-32DO / ZMIO310-32DOP module has 32 output channels: channel 0-31. ● 4-bit hexadecimal converts to 16-bit binary, each bit represents each channel's output state.
Object to Use	ZMIO310-32DO, ZMIO310-32DOP
Data Dictionary	7042h: (7002 + ZMIO310-32DO / ZMIO310-32DOP sub-module address No. * 10) h
Examples	'7042h: (7002 + ZMIO310-32DO / ZMIO310-32DOP sub-module address No. * 10) h 'set the first ZMIO310-32DO / 32DOP module's channel 0-15 (CH0-15) high 8-bit output channel state as ON, make low 8-bit channel state as OFF. SDO_WRITE (0, 0, $7042, 1, 6, 0xFF00) 'set the first ZMIO310-32DO / 32DOP module's channel 16-31 (CH16-31) high 8-bit output channel state as ON, make low 8-bit channel state as OFF. SDO_WRITE (0, 0, $7042, 2, 6, 0xFF00)

➢ **Notes:**

1) if SDO command is used to configure DO output, it is only valid before EtherCAT START, because the controller will automatically open PDO command to configure DO channel output after EtherCAT START.

2) PDO real-time is high, then it covers DO channel data of SDO configuration.

3) PDO command corresponds to OP in RTBasic, please refer to RTBasic manual for specific usage of OP.

Chapter VI Programming

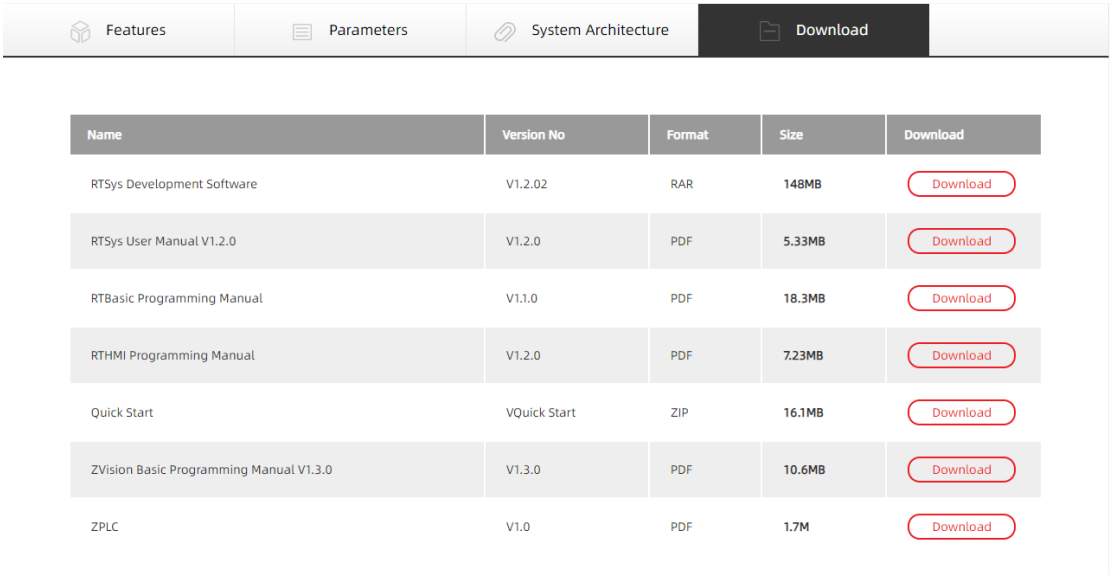
6.1. Program in RTSys Software

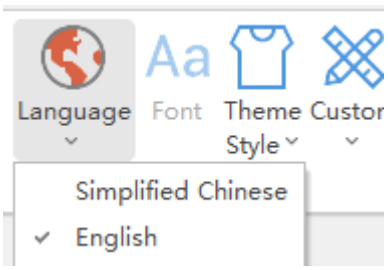
RTSys is a PC-side program development, debugging and diagnostic software for the Zmotion motion controllers. Through it, users can easily edit and configure the controller program, quickly develop applications, diagnose system operating parameters in real time, and debug the running program in real time. What's more, it supports Chinese and English bilingual environments.

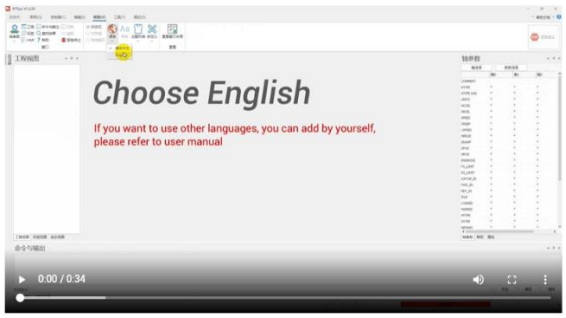
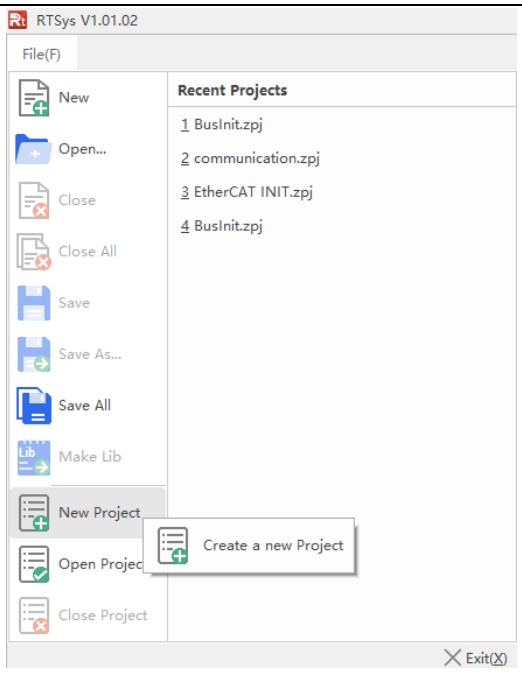
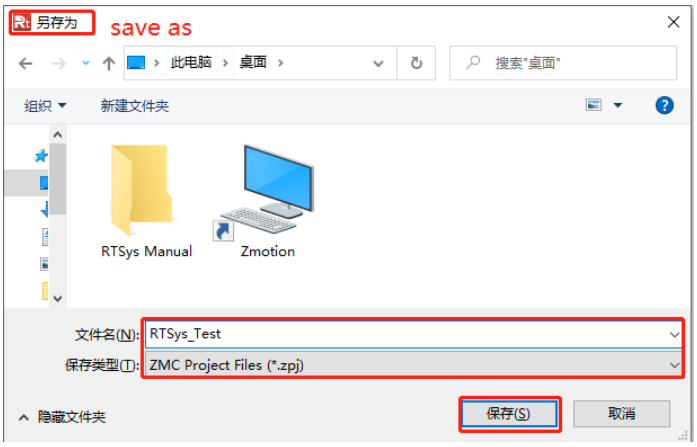
In RTSys, there are 4 programming languages for motion control development, Basic, PLC, HMI and C language, they can run multi-tasks among them, especially for Basic, multi-task running can be achieved separately, hybrid programming is also OK with PLC, HMI and C language.

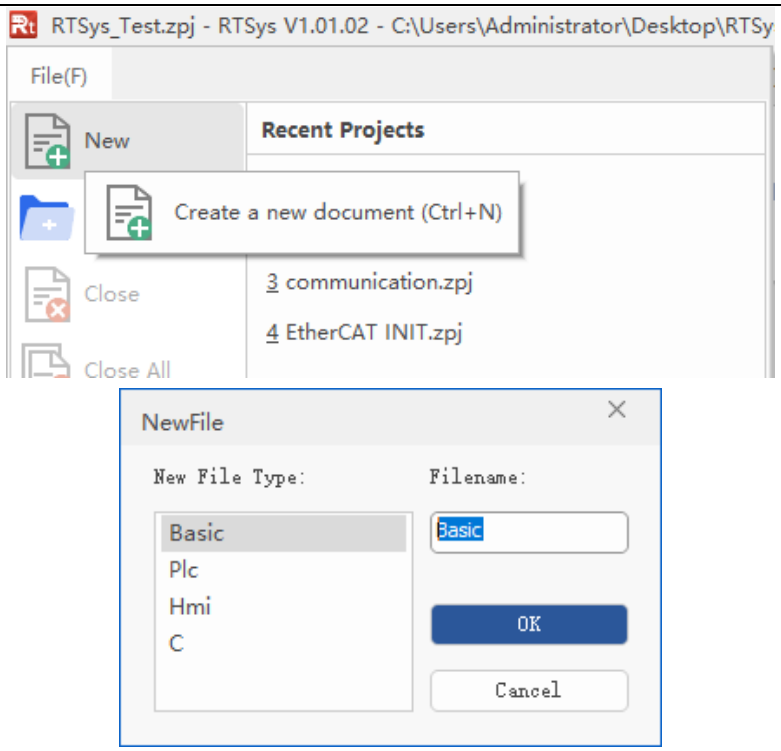
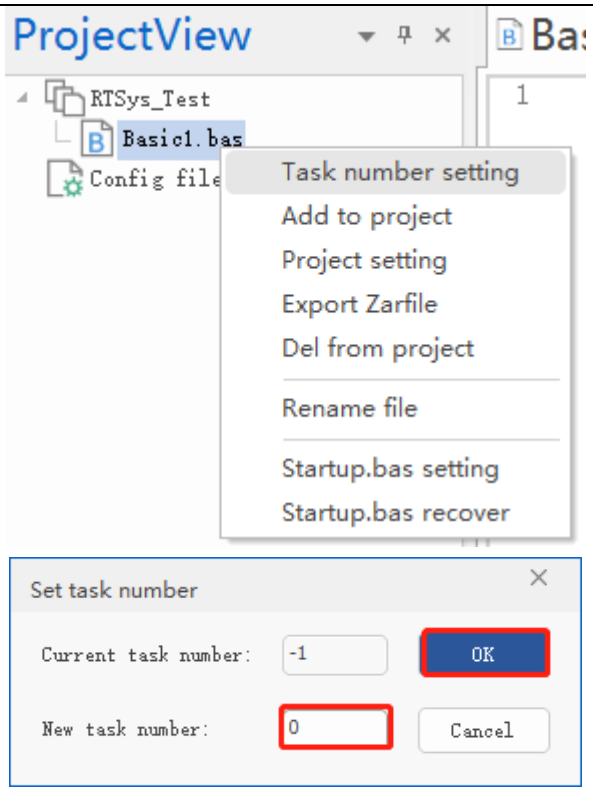
RTSys Downloading Address: https://www.zmotionglobal.com/pro_info_282.html

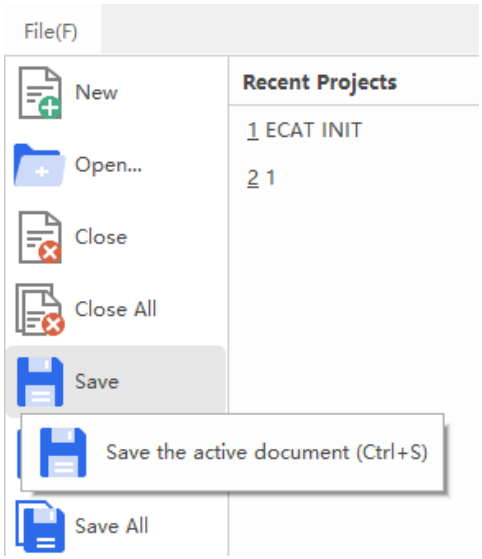
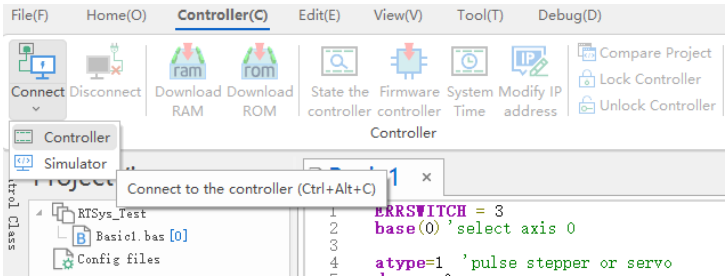
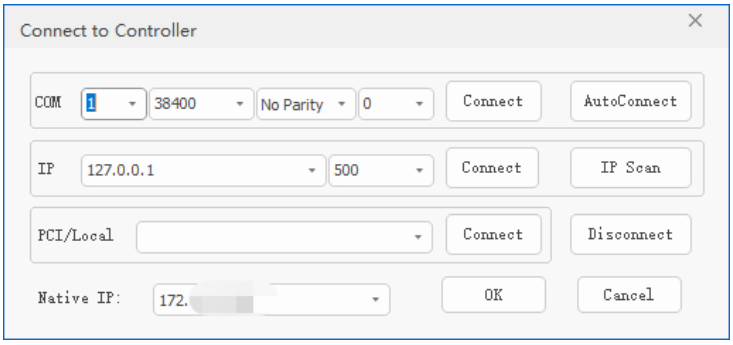
And related manuals can be found in "Download":

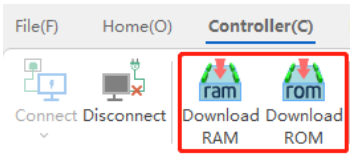
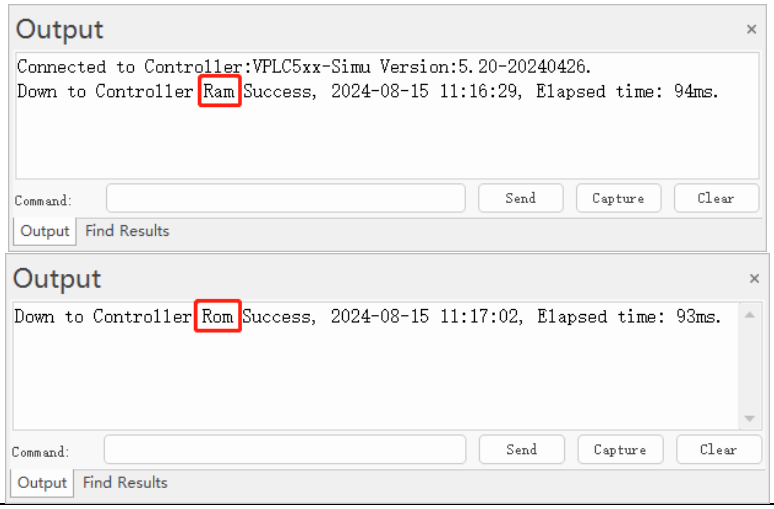
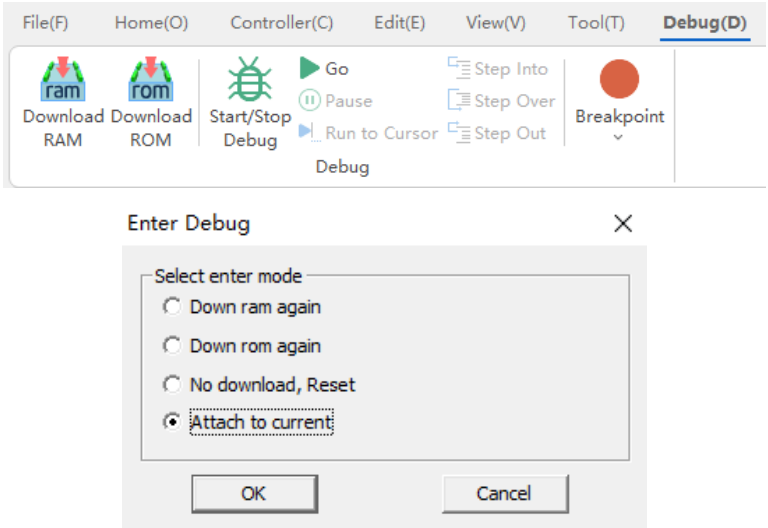


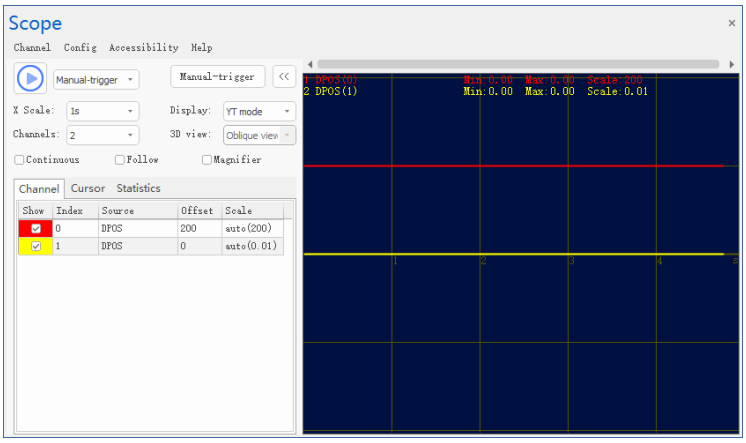
Step	Operations	Display Interface
1	Switch the Language: "Language" – "English", then there will pop	

	up one window, click OK, and restart it.	Language Switch Video Showing: **E. How to Switch the Language** Find "视图" (the fourth one in the above menu), then find the "语言", choose English, restart RTSys. Enligsh RTSys will take effect when opened again. 
2	New Project: "File" – "New Project", Save as window will pop up, then enter file name, save the project file with suffix "zpj.".	 

3	New File: “File” – “New File”, select file type to build, here select Basic, click “OK”.	
4	Set Auto Run No.: right click the file, open task number setting window, enter task No., which can be any + value, no priority, but not the same.	

5	Save File: edit the program in program editing window, click “save”, new built file will be saved under “zpj." project automatically. “Save all” means all files under this project will be saved.	
6	Connection: Click “controller – connect", if no controller, select connect to simulator.	
	Then, “connect to controller" window will pop up, you can select serial port or net port to connect, select matched serial port parameters or net port IP	

	address, then click "connect".	
7	Download Program into Controller: "Ram/Rom" – "download RAM / download ROM", if it is successful, there is print indication, at the same time, program is downloaded into controller and runs automatically.	• **RAM:** it will not save when power off. • **ROM:** it will save data when power off, and when the program is connected to controller again, running according to task No.  
8	Debug: "Debug" – "Start/Stop Debug" to call "Task" and "Watch" window, because it was downloaded before, here select "Attach the current".	

9	Scope function: Click "View" – "Scope" to open oscilloscope. It can capture needed data, for debugging.	

Notes:

- When opening an project, choose to open the zpj file of the project. If only the Bas file is opened, the program cannot be downloaded to the controller.
- When the project is not created, only the Bas file cannot be downloaded to the controller.
- The number 0 in automatic operation represents the task number, and the program runs with task 0, and the task number has no priority.
- If no task number is set for the files in the entire project, when downloading to the controller, the system prompts the following message WARN: no program set autorun

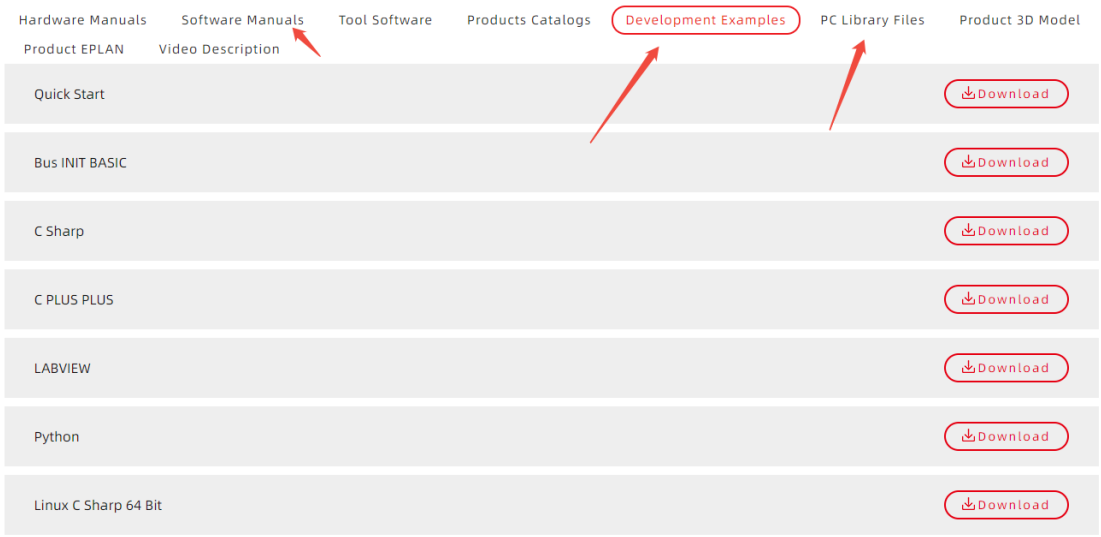
6.2. Program in Host-Computer by PC Languages

The controller supports development under various operating systems such as windows, linux, Mac, Android, and wince, and provides dll libraries in various environments such as vc, c#, vb.net, and labview, as shown in the figure below. PC software programming refers to "Zmotion PC Function Library Programming Manual".

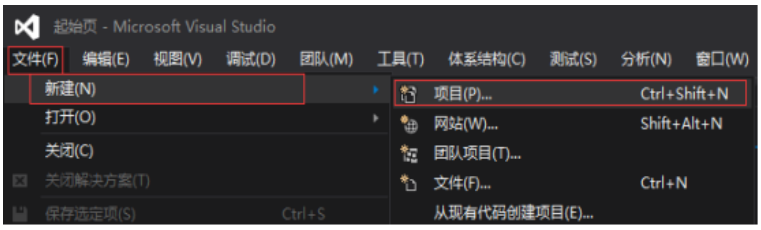
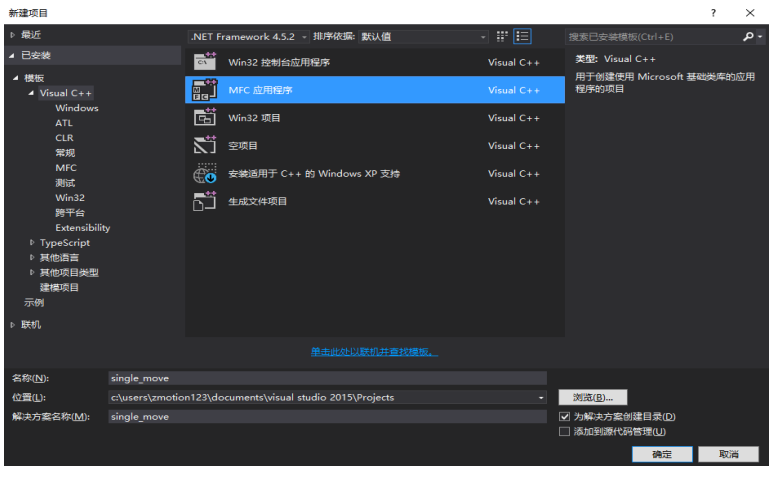
The program developed using the PC software cannot be downloaded to the controller, and it is connected to the controller through the dll dynamic library. The dll library needs

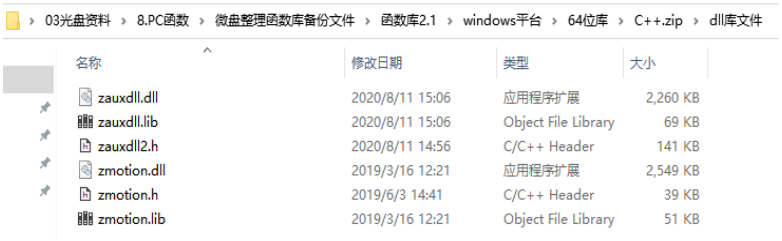
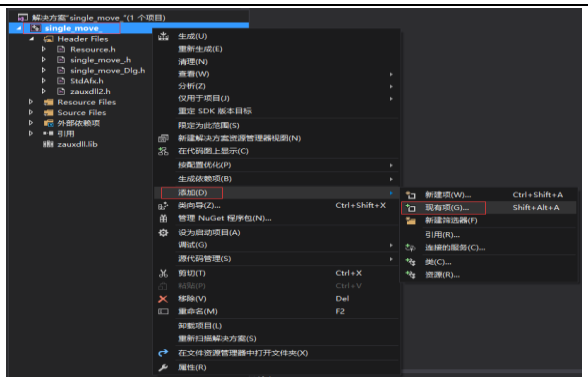
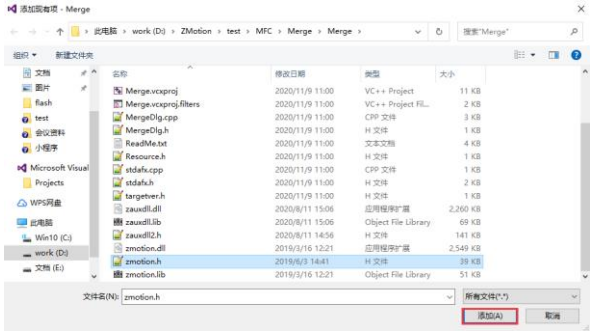
to be added to the header file and declared during development.

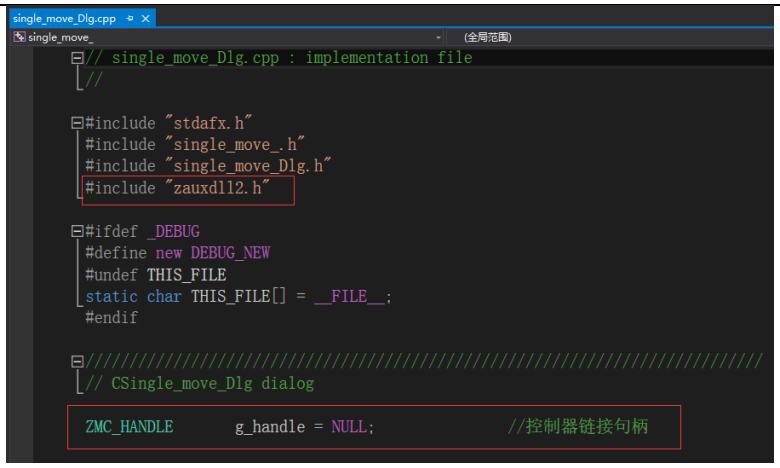
- Get PC library file, example: https://www.zmotionglobal.com/download_list_17.html



The c++ project development process in VS is as follows:

Step	Operations	Display Interface
1	Open VS, click “File” – “New” – “Project”.	
2	Select development language as “Visual C++” and the select program type as “MFC application type”.	

<table>
<tr><td>3</td><td>Select “Based on basic box”, click “next” or “finish”</td><td colspan="2"> 
</td></tr>
<tr><td>4</td><td>Find C++ function library provided by manufacturer. Routine is below (64-bit library)</td><td colspan="2"> 
</td></tr>
<tr><td>5</td><td colspan="3">Copy all DLL related library files under the above path to the newly created project.</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Add a static library and related header files to the project. Static library: zauxdll.lib, zmotion.lib
Related header files: zauxdll2.h, zmotion.h</td><td>1) Right-click the header file first, and then select: "Add" → "Existing Item".</td><td>  </td></tr>
<tr><td>2) Add static libraries and related header files in sequence in the pop-up window.</td><td>  </td></tr>
</table>

7	Declare the relevant header files and define the controller connection handle, so far the project is newly created.	

Chapter VII Operation and Maintain

The correct operation and maintenance of the device can not only guarantee and extend the life cycle of the equipment itself, but also take technical management measures according to the pre-specified plan or the corresponding technical conditions to prevent equipment performance degradation or reduce the probability of equipment failure.

7.1. Regular Inspection and Maintenance

The working environment has an impact on the device. Therefore, it is usually inspected regularly based on the inspection cycle of 6 months to 1 year. The inspection cycle of the device can be appropriately adjusted according to the surrounding environment to make it work within the specified standard environment.

Check item	Check content	Inspection standards
power supply	Check whether the voltage is rated	DC 24V (-5%~5%)
surroundings	Whether the ambient temperature is within the specified range (when installed in the cabinet, the temperature inside the cabinet is the ambient temperature)	-10°C - 55°C
	Whether the ambient humidity is within the specified range (when installed in the cabinet, the humidity in the cabinet is the ambient humidity)	10%-95% non-condensing
	Is there direct sunlight	No
	With or without droplets of water, oil, chemicals, etc.	No
	Whether there is dust, salt, iron filings, dirt	No
	Whether there is corrosive gas	No
	Whether there are flammable and	No

	explosive gases or articles	
	Whether the device is subjected to vibration or shock	Should be within the range of vibration resistance and impact resistance
	Is the heat dissipation good	Keep good ventilation and heat dissipation
Installation and Wiring Status	Whether the basic unit and the expansion unit are installed firmly	The mounting screws should be tightened without loosening
	Whether the connecting cables of the basic unit and the expansion unit are fully inserted	The connection cable cannot be loosened
	Are the screws of the external wiring loose	Screws should be tightened without loosening
	Whether the cable is damaged, aged, cracked	The cable must not have any abnormal appearance

7.2. Common Problems & Solutions

Problems	Suggestions
No signal comes to the input.	1. Check whether the limit sensor is working normally, and whether the "input" view can watch the signal change of the limit sensor. 2. Check whether the mapping of the limit switch is correct. 3. Check whether the limit sensor is connected to the common terminal of the controller.
The output does not work.	1. Check whether IO power is needed. 2. Check whether the output number matches the ID of the IO board.
No Voltage & Current Signal for IN Channel	1. Check whether IO power is needed. 2. Check whether the output number matches the ID of the IO board.
POWER led is ON, RUN led	1. Check whether the power of the power supply is

is OFF.	sufficient. At this time, it is best to supply power to the controller alone, and restart the controller after adjustment. 2. Check whether the ALM light flickers regularly (hardware problem).
RUN led is ON, ALM led is ON.	1. Program running error, please check RTSys error code, and check application program.
CAN expansion module cannot be connected.	1. Check the CAN wiring and power supply circuit, whether the 120 ohm resistor is installed at both ends. 2. Check the master-slave configuration, communication speed configuration, etc. 3. Check the DIP switch to see if there are multiple expansion modules with the same ID. 4. Use twisted-pair cables, ground the shielding layer, and use dual power supplies for severe interference (the main power supply of the expansion module and the IO power supply are separately powered)