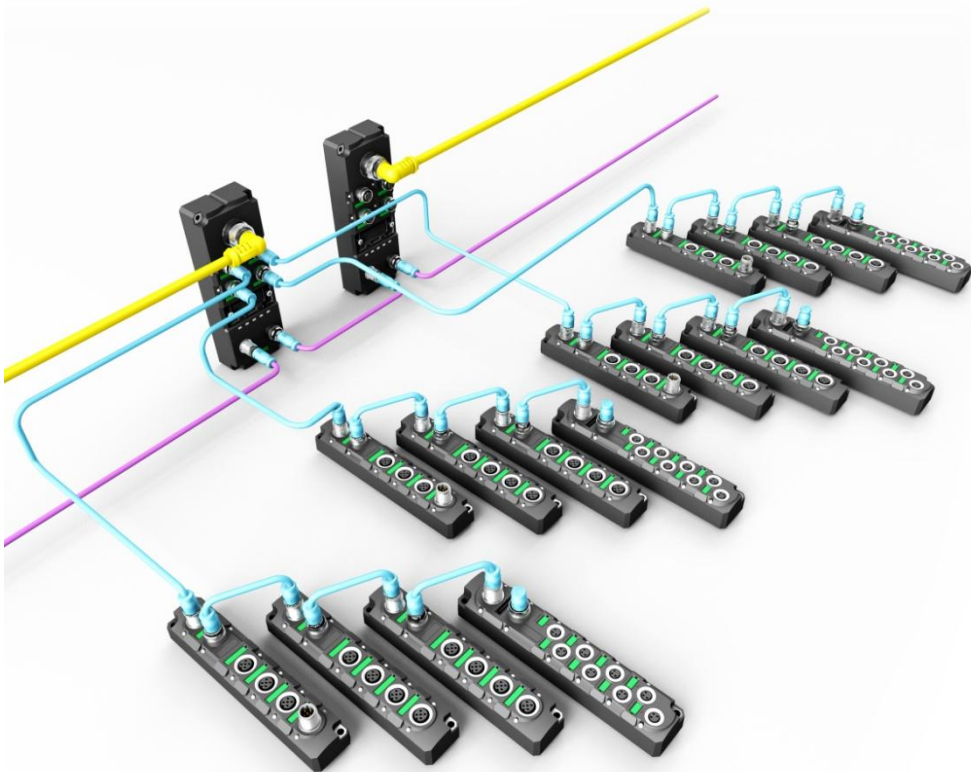


# Spider67 I/O Module

----EtherCAT System Manual



## Preface

### 1. Scope of this manual:

This manual applies to the ELCO EtherCAT Spider67 distributed I/O device. The information in this manual enables you to run the Spider67 module on EtherCAT in a distributed I/O device.

### 2. Basic knowledge requirements

This manual presumes a general knowledge in the field of automation engineering and describes the components based on the data valid at the time of its release.

ELCO reserves the right of including a product information for each new component, and for each component of a later version.

### 3. Guide

This manual describes the hardware of the EtherCAT Spider67 distributed I/O device.

Covered topics are:

- Installation and wiring
- Commissioning and diagnostics
- Components
- Article numbers
- Technical specifications

### 4. Technical support:

This manual describes the characteristics and the usage of a Spider67 distributed I/O device.

Please contact your local ELCO representative or dial 400-608-4005 if you have any questions about the products described in this manual.

Additional information about ELCO products is available:

<http://www.elco-holding.com/>

### 5. Disclaimer of liability:

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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## 1. Product overview

### 1.1 Introduction

Spider67 from ELCO supports modern installation methods with a new and revolutionary expandable I/O system. The simple and easy to install Fieldbus system Spider67 is especially suitable for applications in rough environments.

### 1.2 Applications

Recently, the wide-range usage of industrial fieldbus I/O products brought deep impact to the automation industry. The traditional centralized control method was replaced by intelligent distribution devices. Besides that, more devices were transferred from cabinets directly to the site. Therefore the reason lies in saving costs, reducing the operation time and shorten the maintenance period. It also optimizes the system procedure.

ELCO Spider67 exactly complies this tendency and represents a revolutionary new generation of I/O solutions. Spider67 is an expandable industrial fieldbus I/O product with protection class IP67. It supports standard industrial bus protocol gateways (such as Profibus-DP, Profinet, EtherCAT, CC-Link) and diversified extended I/O configuration modules and can easily be connected to PLC systems. Compared to the traditional IP67 I/O products, Spider67 expanded modules include digital modules, analog modules and high-speed counting modules etc. Regarding its functions, Spider67 can meet most of the requirements, e.g. processing concentrated / dispersed switch signals etc. At the same time, this product series offers flexible connection cable and can directly be mounted on a cage lifter or rotational device.

### 1.3 Features

- IP67 protection class leading to convenient mounting
- Compact design minimizes mounting space requirement
- Standard connection, fast, safe and reliable
- Various input and output signals
- Flexible I/O configuration with a combination of analog, digital, and function modules
- LED status indication, fast function diagnosis
- Can be combined with Spider67 system at random

## 1.4 Type

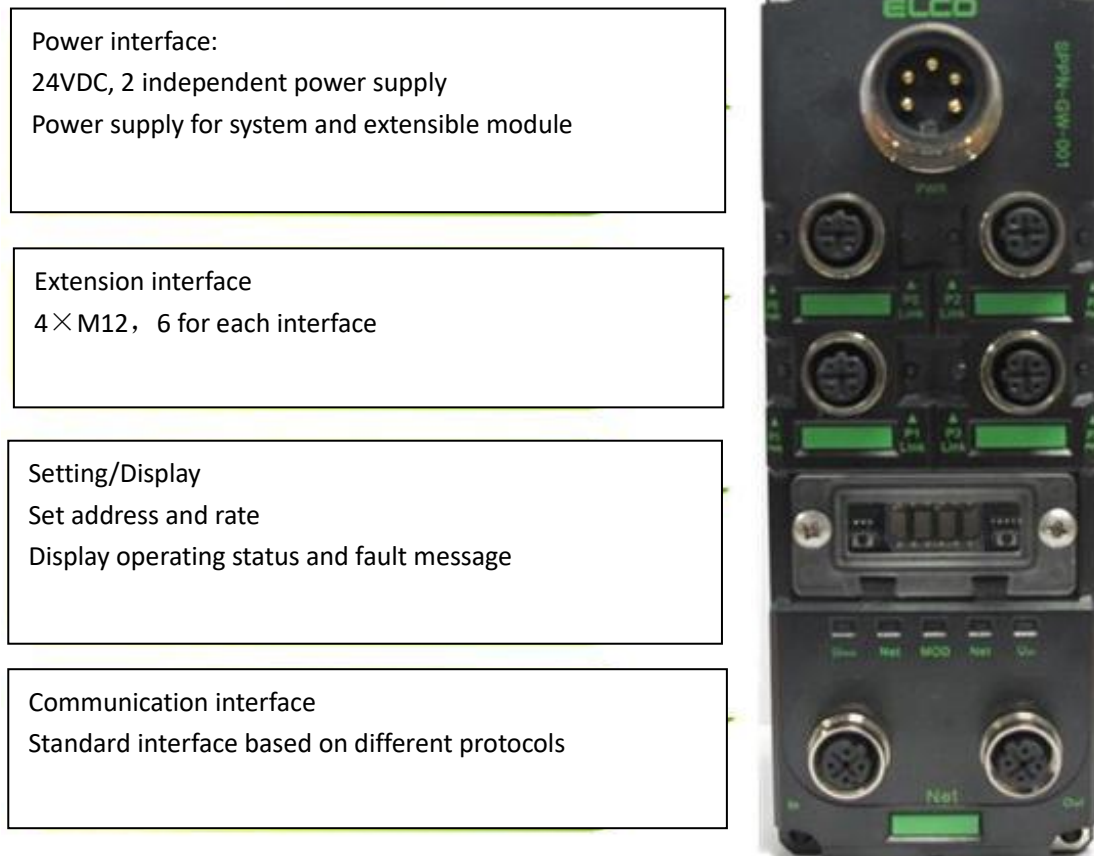
No.	Type	Description
1	SPEC-GW-001	EtherCAT substation interface module 1 male 7/8" power supply 2 female, M12 D-Code fieldbus interface 4 female, M12 B-Code extended interface
2	SPDB-0800D-001 SPDB-0800D-003	8 PNP/NPN switches or dry contact 4-female, M12 A-Code interface
3	SPDB-0800D-011 SPDB-0800D-013	8 PNP/NPN switches or dry contact 8-female, M8 interface, 3-pin
4	SPDB-0404D-001 SPDB-0404D-003	4 PNP/NPN switches or dry contact 4DI4DO, 0.5A each channel 4-female, M12 A-Code interface
5	SPDB-0404D-011 SPDB-0404D-013	4 PNP/NPN switches or dry contact 4DI4DO, 0.5A each channel 8-female, M8 interface, 3-pin
6	SPDB-08UP-001	8DI+DO, configurable 4-female, M12 A-Code interface
7	SPDB-08UP-011	8DI+DO, configurable 8-female, M8 interface, 3-pin
8	SPDB-0008D-001	8DO, 0.5A each channel 4-female, M12 A-Code interface
9	SPDB-0008D-011	8DO, 0.5A each channel 8-female, M8 interface, 3-pin
10	SPDB-0006D-001	8DO, 2A each channel 1-male, M12 A-Code interface 3-female, M12 A-Code interface
11	SPDB-0300A-001	3AI 0~20mA, 4~20mA, ±20mA optional 3-female, M12 A-Code interface
12	SPDB-0300A-002	3AI 0~10V, ±10V optional 3-female, M12 A-Code interface

13	SPDB-0003A-001	3AO 0~20mA, 4~20mA, ±20mA optional 3-female, M12 A-Code interface
14	SPDB-0003A-002	3AO 0~10V, ±10V optional 3-female, M12 A-Code interface
15	SPDB-0400A-005	4AI RTD PT100, PT200, PT500, PT1000, Ni100, Ni1000, 150/300/600/3000Ω 4-female, M12 A-Code interface
16	SPDB-0400A-006	4AI Thermocouple B, E, J, K, N, R, S, T 4-female, M12 A-Code interface
17	BB6S30P01Dxxx BB6S30P01Mxxx	Pre-wired extensible cable PVC, 5-core shielded, outer diameter 6.5mm Customized length, D=cm, M=dm
18	BB6S30P03Dxxx BB6S30P03Mxxx	Pre-wired extensible cable (drag chain) PUR, 5-core shielded, outer diameter 6.5mm Customized length, D=cm, M=dm
19	BB6S30P09Dxxx BB6S30P09Mxxx	Pre-wired extensible cable (long distance communication) PVC, 5-core shielded, outer diameter 8mm Customized length, D=cm, M=dm
20	BB6S06	Extension terminal resistance Connecting to the last I/O module

## 2. Technical characteristics

### 2.1 Gateway

The following picture is the schematic of a Spider67 gateway.



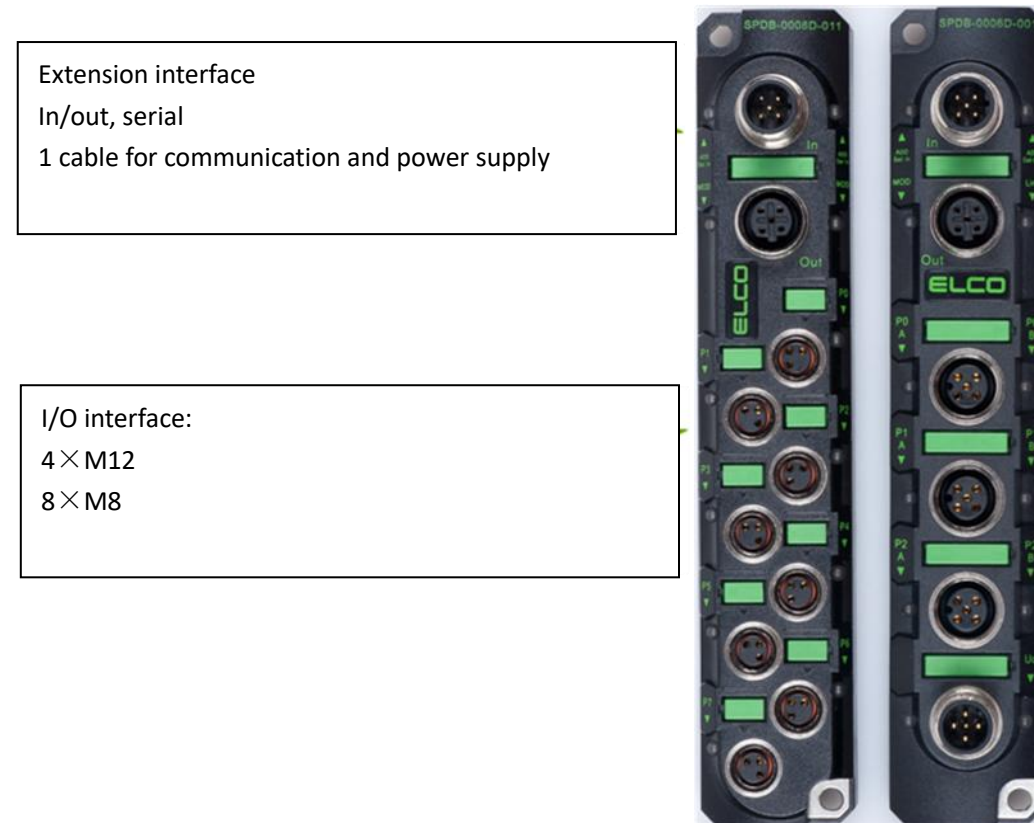
Each gateway occupies one sub-station address, maximum 4 strings, up to 6 I/O modules / string, extending distance up to 100 m.

As the sub-station of EtherCAT, one sub-station address will be assigned automatically from EtherCAT host station. Each Spider67 gateway connects up to 24 I/O modules by extension interface; the sequence of the module is assigned as 1~24 in the sequence of the connected extension interface (P0-P1-P2-P3) and the distance to the gateway (from near to far); the distribution of configuration will be executed in programming software Step7 (Refer to 4.4). If the number of connected modules is less than 6, then the number of the module will be brought forward, such as 3 modules connected to P0, then the number of first module connected to P1 is 4.



## 2.2 I/O module

This picture is a schematic of a Spider67 I/O module.



I/O modules of Spider67 are serial connected, and are connected to In of 1<sup>st</sup> module by extension cable, then Out of 1<sup>st</sup> module to In of 2<sup>nd</sup>, up to 6 modules.

Spider67 I/O modules are designed by the same housing dimensions, including digital, analog, input and output, only 2 different interfaces, 4-M12 and 8-M8. M12 A-Code, 2 digital or 1 analog are available. M8, 3-pin, 1 digital is available.

### **2.3 Extension cable**

Spider67 extension cable is used between gateways and I/O modules. The overall cable length from the extension interface to the last module is less than 100m.

P01 standard extension cable P09 series long distance communication cable is recommended if the extension distance is over 10m or high load current P03 series flexible communication cable is especially used for bending lifespan like drag chain (see 1.4)

Terminal resistance is recommended to eliminate reflection and echo, which are used to prevent discontinuous extensible cable resistance or interference caused by long distance communication. As Spider67 is installed terminal resistance, users need to connect a resistance to Out of the last module of each extension interface.

## 2.4 Hardware

### 2.4.1 Technical data of gateway

Type	SPEC-GW-001
Extensible channel	4 (P0~P3)
Extensible module/channel	4
Extension distance	Max. 100m
EtherCAT input	D-Code M12 (Female)
EtherCAT output	D-Code M12 (Female)
Extension channel	B-Code M12 (Female)
Power input	7/8" (Male,)
$U_{MOD}$	24VDC (18~30V)
$U_{SP}$	24VDC (18~30V)
Operation current	<200mA
Max. output current	6A/channel, total for gateway 8A
Operation temperature	-25°C...70°C
Storage temperature	-40°C...85°C
Shock resistance grade	Comply with IEC60068-2-6
EMC	EN 61000-6-2
Protection class	IP67
Operating life	100,000 hours

## 2.4.2 Digital value IO Module

Type	SPDB-0800D-001 SPDB-0800D-011	SPDB-0404D-001 SPDB-0404D-011	SPDB-08UP-001 SPDB-08UP-011	SPDB-0008D-001 SPDB-0008D-011	SPDB-0006D-001
Input points	8	4	Max 8	0	0
Output points	0	4	Max 8	8	6
Extension input	B-Code M12 ( Male )				
Extension output	B-Code M12 ( Female )				
Input and output Signal	A-Code M12 ( Female )				
Maximum output current	Each channel 0.5A, module 4A				Each channel 2A, Module 8A
Input response frequency	30Hz				
Output voltage	$U_{SP} - 0.7V$				
Signal type	PNP				
Input point Supply current	Holding current 200mA, Action current 400mA				
Normal input voltage	24VDC (10~30V)				
Operation temperature	-25°C ...70°C				
Storage temperature	-40°C ...85°C				
Anti-vibration Class	IEC60068-2-6				
Anti-interference EMC	EN 61000-6-2				
Protection class	IP67				
Operating life	100,000 hours				

### 2.4.3 Analog value IO Module

Model	SPDB-0300A-001	SPDB-0300A-002	SPDB-0003A-001	SPDB-0003A-002
Input points	3	3	0	0
Output points	0	0	3	3
Extension input	B-Code M12 (Male)			
Extension output	B-Code M12 (Female)			
Input and output Signal	A-Code M12 (Female)			
Input range	0~20mA 4~20mA -20~20mA	0~5V 0~10V -5~5V -10~10V	Null	Null
Output range	Null	Null	0~20mA 4~20mA	0~5V 0~10V -5~5V -10~10V
Internal impedance	<125Ω	<100kΩ	>450Ω	>1kΩ
Resolution	14Bit			
Measurement accuracy	±0.3%			
Input point Supply current	Max. 200mA			
Operation temperature	-25°C...70°C			
Storage temperature	-40°C...85°C			
Anti-vibration Class	IEC60068-2-6			
EMC	EN 61000-6-2			
Protection class	IP67			
Operating life	100,000 hours			

## 2.4.4 RTD and TC Module

Model	SPDB-0400A-005	SPDB-0400A-006
Input points	4	
Output points	0	
Extension input	B-Code M12 (Male)	
Extension output	B-Code M12 (Female)	
Input and output Signal	A-Code M12 (Female)	
Input range	PT100,PT200,PT500,PT1000 Ni100,Ni1000 0~150/300/600/3000Ω	Type B, E, J, K, N, R, S, T
Output range	Null Null	
Internal impedance	250Ω	1MΩ
Resolution	14Bit	
Measurement accuracy	±0.2%	
Input point Supply current	Max. 200mA	
Operation temperature	-25°C...70°C	
Storage temperature	-40°C...85°C	
Anti-vibration Class	IEC60068-2-6	
EMC	EN 61000-6-2	
Protection class	IP67	
Operating life	100,000 hours	

## 2.5 LED display

Gateway display

Extension communication indication

Extension power supply indication

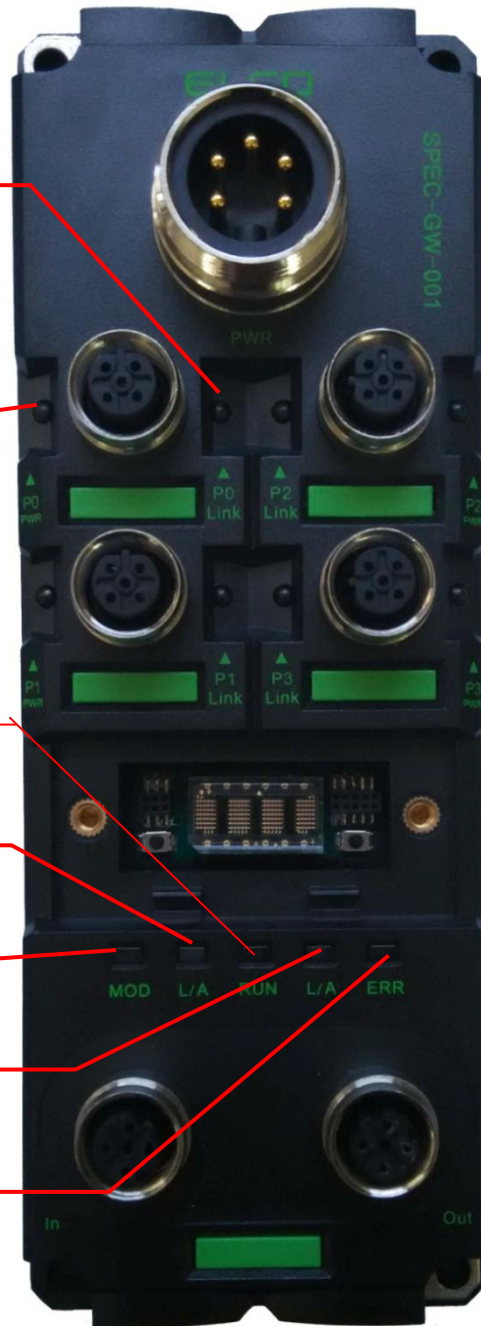
Gateway status indication

EtherCAT indication

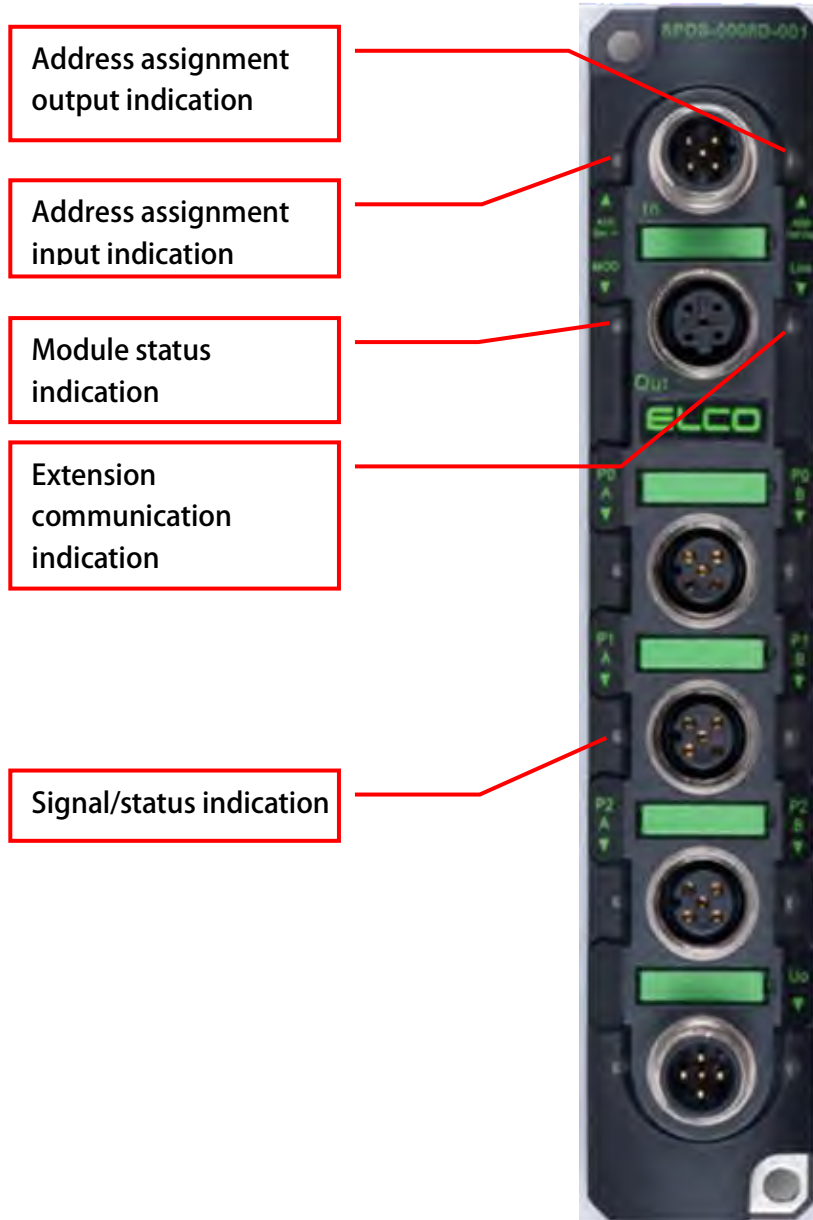
Status indication

EtherCAT indication

Error indication



# I/O module display

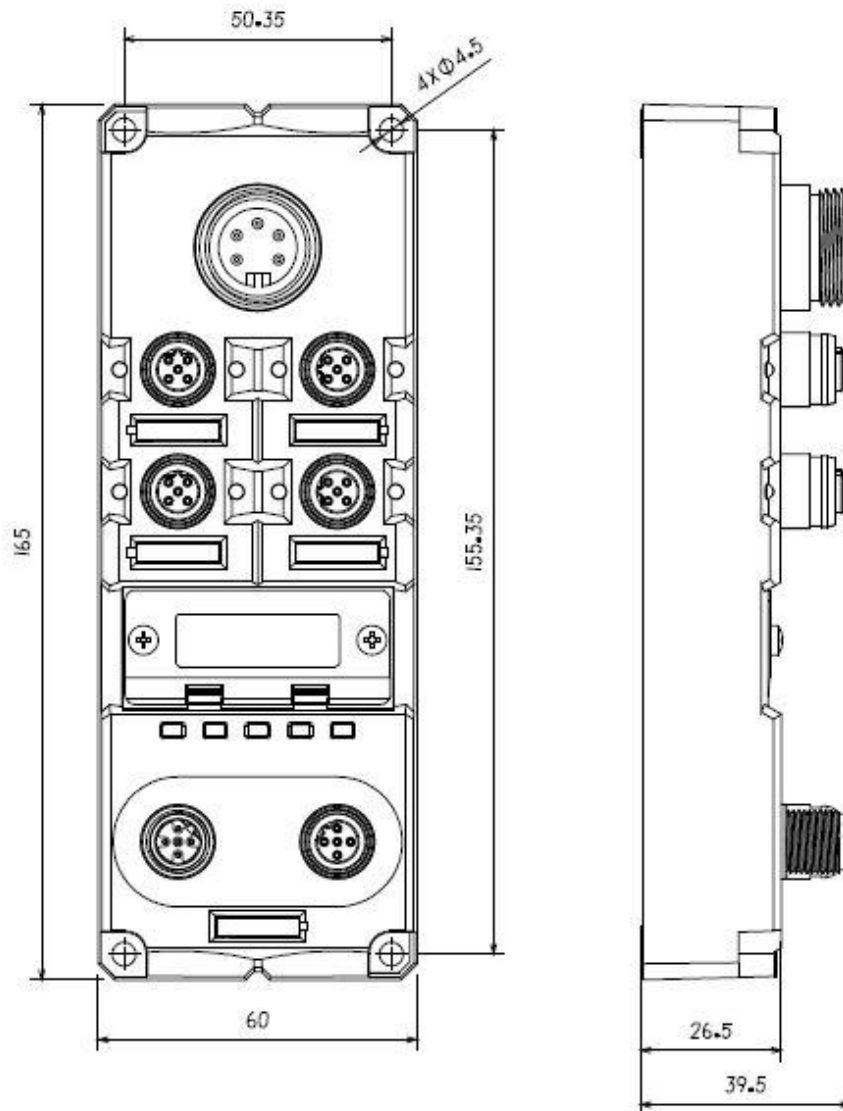




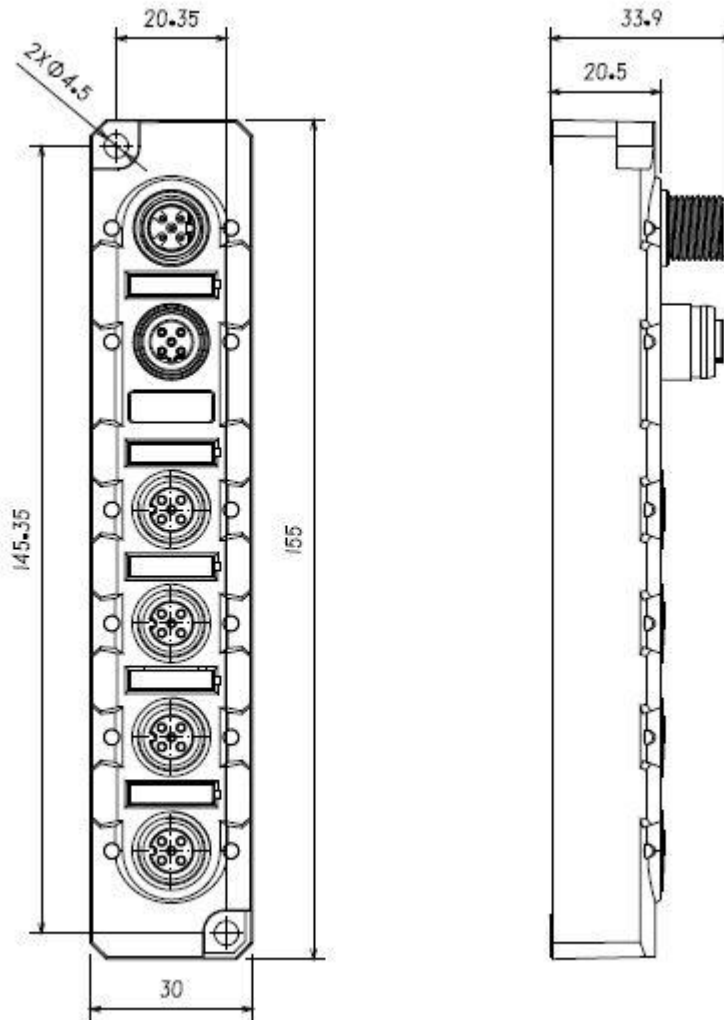
### 3. Installing

#### 3.1 Mounting dimensions

##### 3.1.1 Gateway dimensions



### 3.1.2 Module dimensions



### 3.2 Mounting position, mounting dimensions

Spider67 can be mounted in any position.

The following table shows the mounting dimensions of Spider67 gateway and I/O module.

	Gateway	I/O module
Mounting width	60mm	30mm
Mounting height	165mm	155mm
Mounting depth	39mm (without connector)	33.5mm (without connector)

### 3.3 Wiring Spider67

Please make sure to cut off power supply when wiring to ensure safety.

#### 3.3.1 Connecting Spider67 to protective earth (PE)

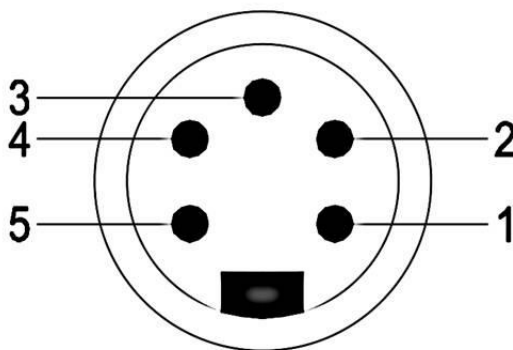
- Always connect the Spider67 to protective earth.
- The module also requires this connection to protective earth in order to discharge any interference currents to ground, and for EMC compatibility.
- Always make sure you have a low-impedance connection to protective earth.

#### 3.3.2 Spider67 power supply

Proposal: Spider67 series gateway uses 24VDC power supply, I/O module power supply by extensible cable, voltage range 18~30VDC, standard 7/8" connector.

Two parts for power supply: gateway module power supply  $U_{MOD}(1L+, 1M)$ , signal module power supply (2L+, 2M). Electrical isolation between 1L+ and 2L+, internally connected between common point 1M and 2M.

1) Power in (Male)

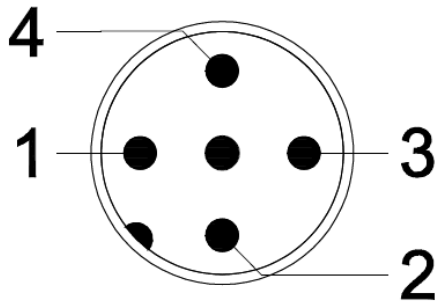


2) Power definition

Terminal	Function	Power supply
1	Signal module power supply 2M	0V
2	Gateway module power supply 1M	0V
3	PE	
4	Gateway module power supply 1L+	24V
5	Signal module power supply 2L+	24V

The six - point output module of Spider67, SPDB-0006D-001 supports auxiliary power supply to the load. The single output point can reach up to 2A, and the whole module can reach up to 8A. This power supply interface also uses standard 24VDC power supply and M12 A-Code standard interface.

1) Auxiliary power supply (Male)



2) Power definition

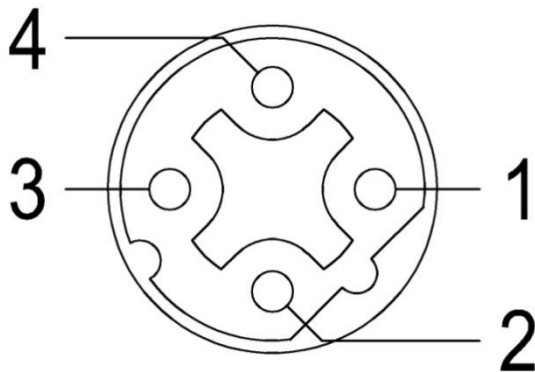
Terminal	Function	Power supply
1	Auxiliary power supply L+	24V
2	Auxiliary power supply L+	24V
3	Auxiliary power supply M	0V
4	Auxiliary power supply M	0V

**Note:** In order to improve the power supply capability of the interface, it is recommended that all four pins should be connected with power supply. In fact, pin 1 & 2 should be connected together and pin 3 & 4 should be connected together.

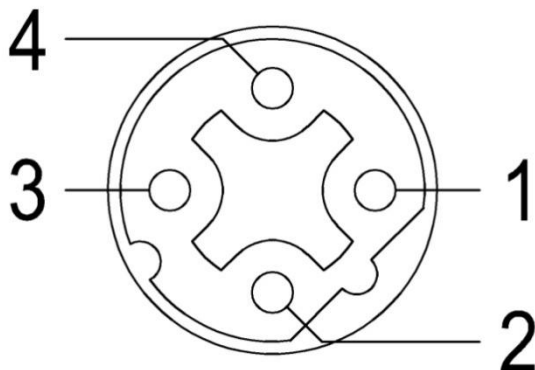
### 3.3.3 Spider67 BUS connection

Spider67 gateway, supporting EtherCAT protocol, transmits signals by a shielded cable, D-Code M12 connector.

#### 1) BUS-In (Female)



#### 2) BUS-Out (Female)



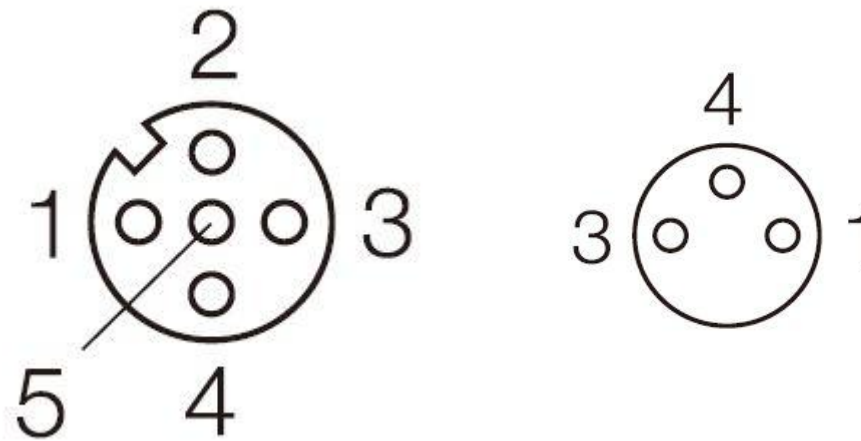
#### 3) Bus definition

Terminal	Function	Cable color
1	Transmit Data( TD+ )	Yellow
2	Receive Data( RD+ )	White
3	Transmit Data( TD- )	Orange
4	Receive Data( RD- )	Blue

### 3.3.4 Spider67 digital signal connection

Spider67 digital I/O modules are connected by standard 5-pin M12 or 3-pin M8 connector, max. 2 signals (input or output) can be connected to M12 interface, 1 signal (input or output) can be connected to M8 interface.

#### 1) Signal receiving (Female)



**M12 connector**

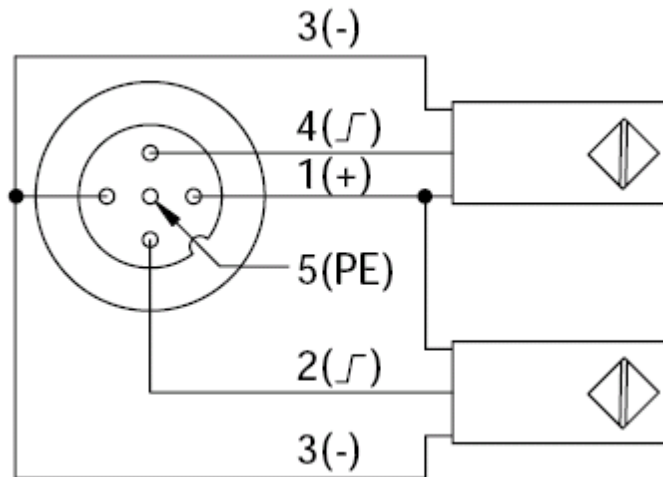
**M8 connector**

#### 2) Digital signal interface definition

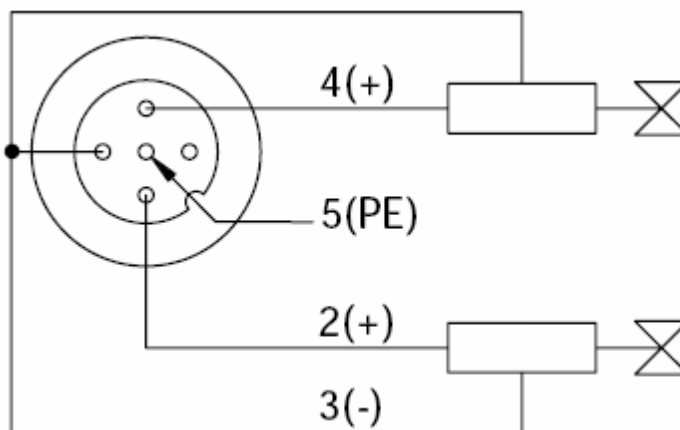
Terminal	M12 connector		M8 connector
1	Power supply 24V+		Power supply 24V+
2	Signal in/out B	2 <sup>nd</sup> signal	None
3	Power supply GND		Power supply GND
4	Signal in/out A	1 <sup>st</sup> signal	Signal in/out
5	PE		None

### 3) Wiring example

- a) Double input signal – 1 connector connects 2 DI, SPDB-0800D-001, SPDB-0404D-001, and SPDB-08UP-001 support this connection.

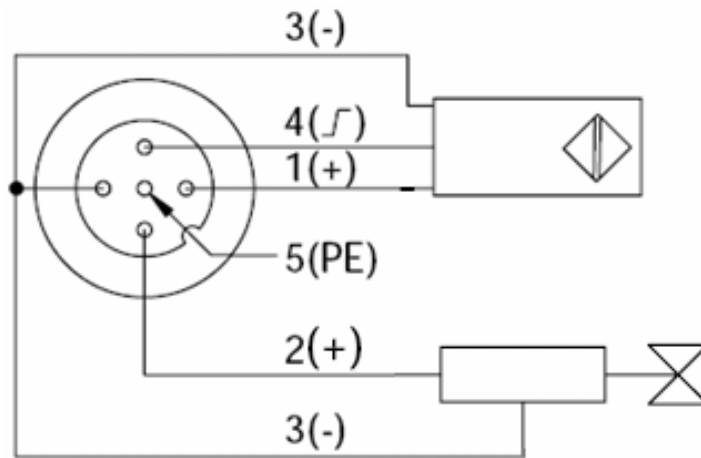


- b) Double output signal – 1 connector connects 2 DO, SPDB-0008D-001, SPDB-0404D-001, SPDB-08UP-001, SPDB-0006D-001 support this connection.

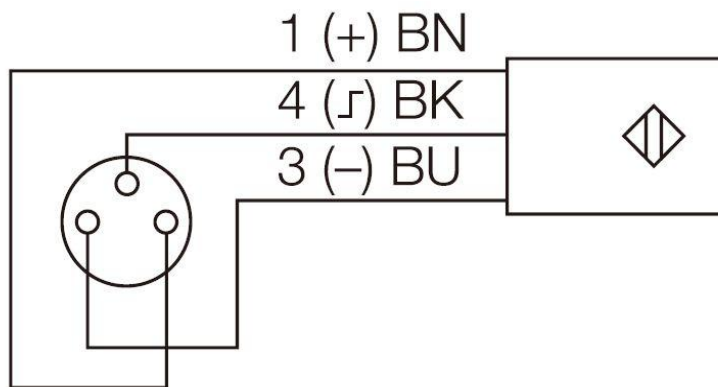




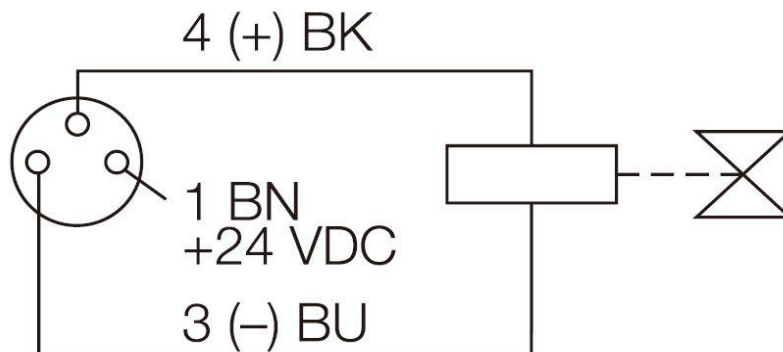
- c) Input and output signal – 1 connector connects 1 DI and 1 DO,  
 SPDB-08UP-001 supports this connection



- d) Single input signal – 1 connector connects 1 DI, SPDB-0800D-011,  
 SPDB-0404D-011, SPDB-08UP-011 support this connection.



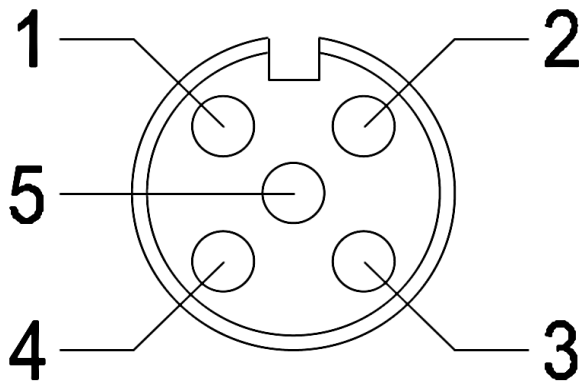
- e) Single output signal – 1 connector connects 1 DO, SPDB-0404D-011,  
 SPDB-0008D-011, SPDB-08UP-011 support this connection.



### 3.3.5 Spider67 analog signal

Spider67 analog I/O modules are connected by standard 5-pin M12, 1 signal (input or output) can be connected to interface.

#### 1) Signal receiving (Female)



#### 2) Analog signal interface definition

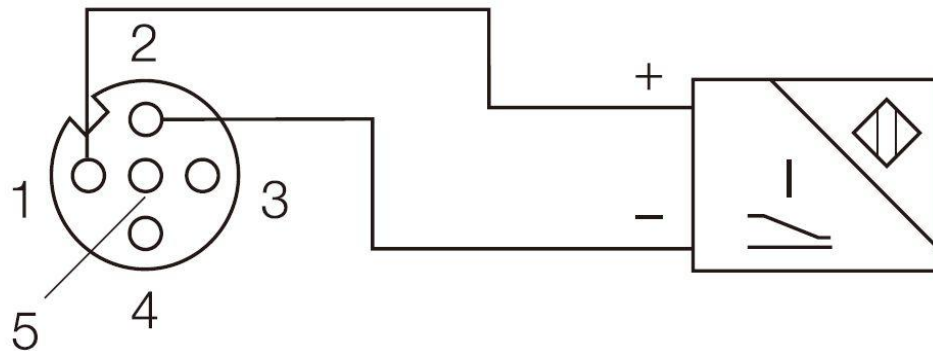
Terminal	Function	Function
1	Power supply 24V+	
2	Signal in/out +	AI/AO +
3	Power supply GND	
4	Signal in/out -	AI/AO -
5	PE	

#### RTD and TC signal interface definition

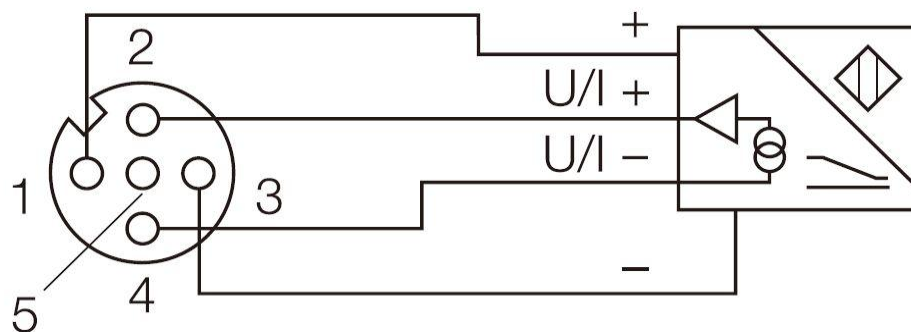
Terminal	Function	Function
1	Power supply I+	
2	Signal in M+	RTD/TC +
3	Power supply I-	
4	Signal in M-	RTD/TC -
5	PE	

### 3) Wiring example

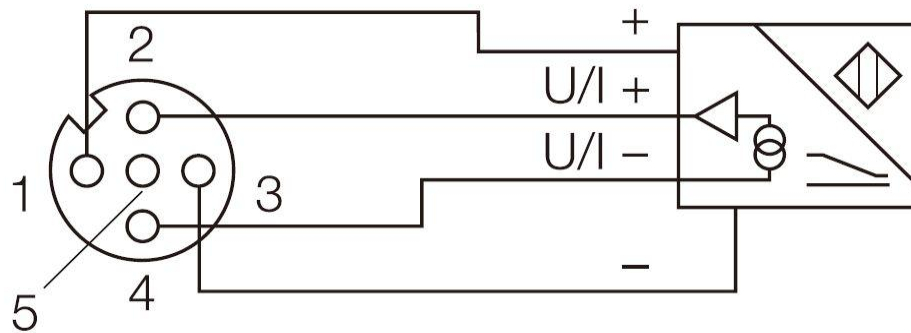
- a) 2-wire input - 1 connector connects 1 2-wire input, SPDB-0300A-001 supports this connection.



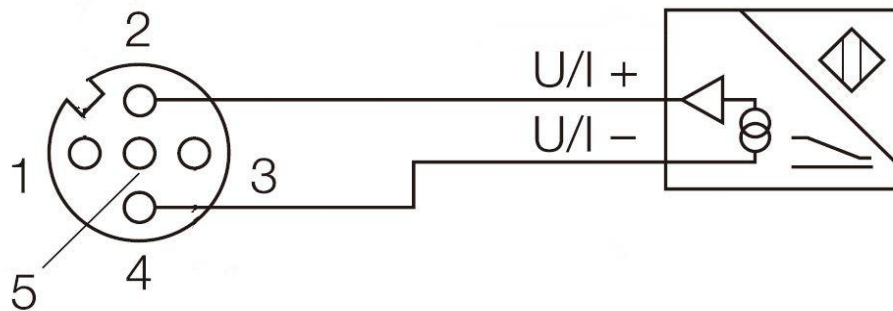
- b) 4-wire input - 1 connector connects 1 4-wire input, SPDB-0300A-001 supports this connection.



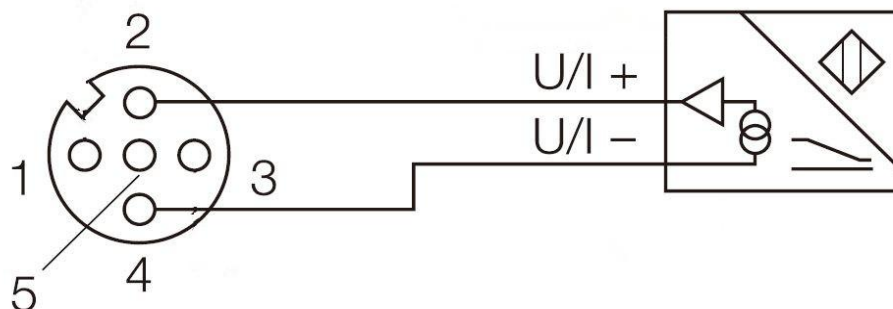
- c) Voltage input- 1 connector connects 1 voltage input, SPDB-0300A-002 supports this connection.



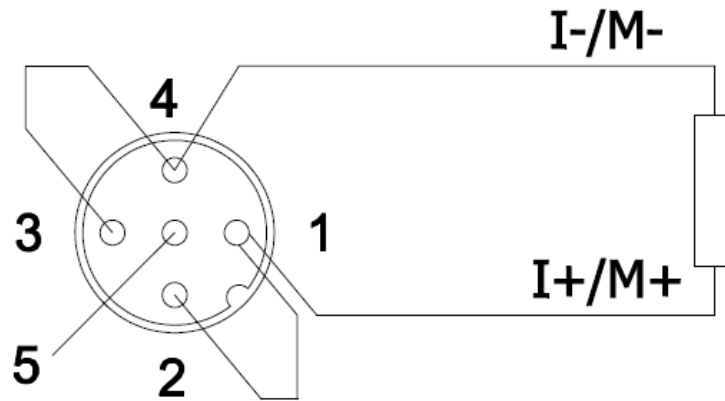
d) Current output- 1 connector connects 1 current output, SPDB-0003A-001 supports this connection.



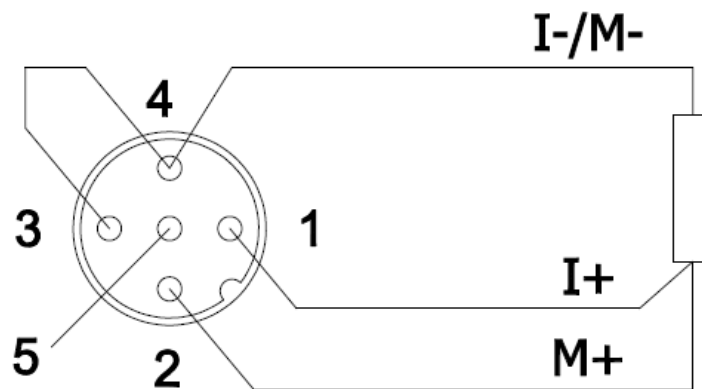
e) Voltage output- 1 connector connects 1 voltage output, SPDB-0003A-002 supports this connection.



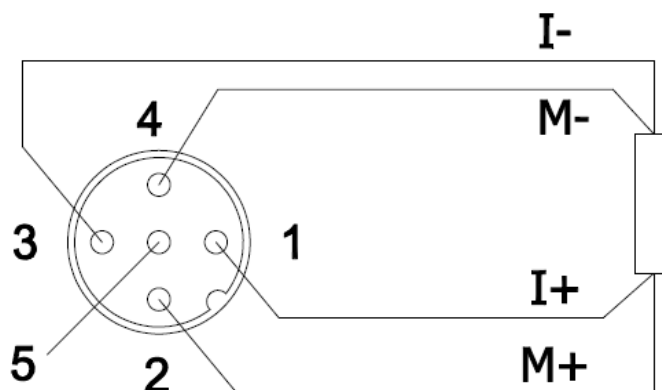
f) Two-wire thermal resistance signal — 1 connector connects 1 two-wire thermal resistance input signal, the model SPDB-0400A-005 of the signal module supports this form of connection.



g) Three-wire thermal resistance signal — 1 connector connects 1 three-wire thermal resistance input signal, the model SPDB-0400A-005 of the signal module supports this form of connection.

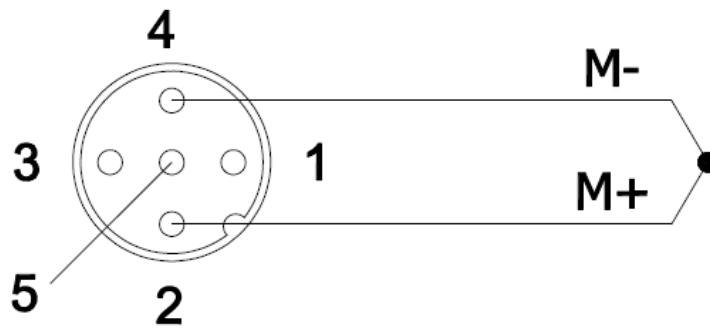


h) Four-wire thermal resistance signal — 1 connector connects 1 four-wire thermal resistance input signal, the model SPDB-0400A-005 of the signal module supports this form of connection.



i) Thermocouple signal — 1 connector connects 1 thermocouple input signal, the model SPDB-0400A-006 of the signal module supports this form of

connection.



## 4. Configuration Commissioning

### 4.1 Installation of configuration files

Using ESI file (XML format) to configure Spider67 distributed I/O device, the ESI file takes Spider67 as standard EtherCAT IO and integrates it into your system. You can visit ELCO's website to get latest GSD file or contact our technical support..

The integration of ESI file depends on the configuration software used. Take TwinCAT programming software from Beckoff for EtherCAT system for example, the process of adding ESI file is as follows.

Install TwinCAT, then copy xml file of Spider67 (hereafter referred to as xml file) to the following installation directory. e. g. C:\TwinCAT\Io\EtherCAT\.

## 4.2 Signal address assignment

Each signal module with M12 interface has 4 connectors (P0~P3) for signal communication; each connector has 5 pins (Pin1~Pin5). Each signal module with M8 interface has 8 connectors (P0~P7) for signal communication; each connector has 3 pins (Pin1, Pin3, Pin4). The following table indicates the matchup between signal status and bytes transmitted of EtherCAT.

### 1) 8-bit digital input modules SPDB-0800D-001, SPDB-0800D-011

Byte	Bit	M12 SPDB-0800D-001	M8 SPDB-0800D-011	e. g.
Input Byte 0	Bit 0	P0.Pin4	P0.Pin4	I 0.0
	Bit 1	P0.Pin2	P1.Pin4	I 0.1
	Bit 2	P1.Pin4	P2.Pin4	I 0.2
	Bit 3	P1.Pin2	P3.Pin4	I 0.3
	Bit 4	P2.Pin4	P4.Pin4	I 0.4
	Bit 5	P2.Pin2	P5.Pin4	I 0.5
	Bit 6	P3.Pin4	P6.Pin4	I 0.6
	Bit 7	P3.Pin2	P7.Pin4	I 0.7

### 2) 4-bit input; 4-bit output digital modules: SPDB-0404D-001, SPDB-0404D-011

The module occupies 8 bits for input and 8 bits for output. Each signal only has 4 bits, so input signal occupies I 0.0~I 0.3, and I 0.4~I 0.7 is useless; output signal occupies Q 0.4~Q 0.7, and Q 0.0~Q 0.3 is useless.

Byte	Bit	M12 SPDB-0404D-001	M8 SPDB-0404D-011	e.g.
Input Byte 0	Bit 0	P0.Pin4	P0.Pin4	Q 0.0
	Bit 1	P0.Pin2	P1.Pin4	Q 0.1
	Bit 2	P1.Pin4	P2.Pin4	Q 0.2
	Bit 3	P1.Pin2	P3.Pin4	Q 0.3
Output Byte 0	Bit 4	P2.Pin4	P4.Pin4	Q 0.4
	Bit 5	P2.Pin2	P5.Pin4	Q 0.5
	Bit 6	P3.Pin4	P6.Pin4	Q 0.6
	Bit 7	P3.Pin2	P7.Pin4	Q 0.7

3) 8-bit digital input/output configurable modules: SPDB-08UP-001, SPDB-08UP-011

The module occupies 8 bits for input and 8 bits for output; X-address and Y-address are configurable according to the actual application, and the rest addresses are useless. E.g. two signals of first interface are used as input, then I 0.0 and I 0.1 are occupied; Q 0.0 and Q 0.1 are useless.

Byte	Bit	M12 SPDB-08UP-001	M8 SPDB-08UP-011	e.g.
Input/Output Byte 0	Bit 0	P0.Pin4	P0.Pin4	I 0.0 Q 0.0
	Bit 1	P0.Pin2	P1.Pin4	I 0.1 Q 0.1
	Bit 2	P1.Pin4	P2.Pin4	I 0.2 Q 0.2
	Bit 3	P1.Pin2	P3.Pin4	I 0.3 Q 0.3
	Bit 4	P2.Pin4	P4.Pin4	I 0.4 Q 0.4
	Bit 5	P2.Pin2	P5.Pin4	I 0.5 Q 0.5
	Bit 6	P3.Pin4	P6.Pin4	I 0.6 Q 0.6
	Bit 7	P3.Pin2	P7.Pin4	I 0.7 Q 0.7

4) 8-bit digital output modules: SPDB-0008D-001, SPDB-0008D-011

The module occupies 8 bits for output.

Byte	Bit	M12 SPDB-0008D-001	M8 SPDB-0008D-011	e.g.
Output Byte 0	Bit 0	P0.Pin4	P0.Pin4	Q 0.0
	Bit 1	P0.Pin2	P1.Pin4	Q 0.1
	Bit 2	P1.Pin4	P2.Pin4	Q 0.2
	Bit 3	P1.Pin2	P3.Pin4	Q 0.3
	Bit 4	P2.Pin4	P4.Pin4	Q 0.4
	Bit 5	P2.Pin2	P5.Pin4	Q 0.5
	Bit 6	P3.Pin4	P6.Pin4	Q 0.6
	Bit 7	P3.Pin2	P7.Pin4	Q 0.7



5) 6-bit digital output modules: SPDB-0006D-001

The module occupies 8 bits for output.

Byte	Bit	M12 SPDB-0006D-001	e.g.
Output Byte 0	Bit 0	P0.Pin4	Q 0.0
	Bit 1	P0.Pin2	Q 0.1
	Bit 2	P1.Pin4	Q 0.2
	Bit 3	P1.Pin2	Q 0.3
	Bit 4	P2.Pin4	Q 0.4
	Bit 5	P2.Pin2	Q 0.5
	Bit 6	P3.Pin4	----
	Bit 7	P3.Pin2	-----

6) 3-channel analog input modules: SPDB-0300A-001, SPDB-0300A-002

The module occupies 6 bytes for input.

Byte	Byte	Connector	e.g.
Input Byte 0~5	Byte 0 Byte 1	P0	IW 0
	Byte 2 Byte 3	P1	IW 2
	Byte 4 Byte 5	P2	IW 4

7) 3-channel analog output modules: SPDB-0003A-001, SPDB-0003A-002

The module occupies 6 bytes for output.

Byte	Byte	Connector	e.g.
Output Byte 0~5	Byte 0 Byte 1	P0	QW 0
	Byte 2 Byte 3	P1	QW 2
	Byte 4 Byte 5	P2	QW 4

### 4.3 Instruction of Analog Value

PLC controller processes analog values in a binary system; the analog input module transfers analog process signals into digital signals; the analog output module transfers the digital output value into an analog signal.

Digital analog values are suitable to the same rated input and output value; each analog signal occupies 1 word PLC address, i. e. each analog signal corresponds to 16 bit. The symbol of analog is set on bit15: 0 represents '+'; 1 represents '1'. For the analog module with resolution less than 16 bits, the analog value is saved in the format of left justifying; the idle least significant bit is padded with '0'.

Example: analog value 18035 can be expressed in binary system as follows:

Resolution	Analog Value															
Bit No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16bit	0	1	0	0	0	1	1	0	0	1	1	1	0	0	1	1
14bit	0	1	0	0	0	1	1	0	0	1	1	1	0	0	0	0

Two types of analog signals: unipolar and bipolar. Current bipolar value  $\pm 20\text{mA}$ ; voltage bipolar value  $\pm 5\text{V}$  and  $\pm 10\text{V}$ ; current unipolar value  $0\sim 20\text{mA}$  and  $4\sim 20\text{mA}$ ; voltage unipolar value  $0\sim 5\text{V}$  and  $0\sim 10\text{V}$ .

**Note: Analog output only supports rated analog value; overshoot range only represents input module.**

- Analog value within bipolar current input/output range:

System Value			Input/Output Range	
	Decimalism	hexadecimal	$\pm 20$ mA	
118.5149%	32767	7FFF	$\geq 23.7$ mA	Overflow, lock the maximum
	27649	6C01		Overshoot range
100%	27648	6C00	20 mA	Rated range
75%	20736	5100	15 mA	
0.003617%	1	1	723.4 nA	
0%	0	0	0 mA	
	-1	FFFF	-723.4 nA	
-75%	-20736	AF00	-15 mA	
-100%	-27648	9400	-20 mA	
	-27649	93FF		Overshoot range
-118.519%	-32768	8000	$\leq -23.7$ mA	Underflow, lock the least value

- Analog value within bipolar voltage input/output range:

System Value			Input/Output Range		
	Decimalism	hexadecimal	$\pm 5$ V	$\pm 10$ V	
118.5149%	32767	7FFF	$\geq 5.926$ V	$\geq 11.85$ V	Overflow, lock the maximum
	27649	6C01			Overshoot range
100%	27648	6C00	5 V	10 V	Rated range
75%	20736	5100	3.75 V	7.5 V	
0.003617%	1	1	180.8 $\mu$ V	361.7 $\mu$ V	
0%	0	0	0 V	0 V	
	-1	FFFF	-180.8 $\mu$ V	-361.7 $\mu$ V	
-75%	-20736	AF00	-3.75 V	-7.5 V	
-100%	-27648	9400	-5 V	-10 V	
	-27649	93FF			Overshoot range
-118.519%	-32768	8000	$\leq -5.926$ V	$\leq 11.85$ V	Underflow, lock the least value

- Analog value within unipolar current input/output range:

System Value			Input/Output Range		
	Decimalism	hexadecimal	0~20mA	4~20mA	
118.5149%	32767	7FFF	≥ 23.7 mA	≥ 22.96 mA	Overflow, lock the maximum
	27649	6C01			Overshoot range
100%	27648	6C00	20 mA	20 mA	Rated range
75%	20736	5100	15 mA	16 mA	
0.003617%	1	1			
0%	0	0	0 mA	4 mA	
	-1	FFFF			
-75%	-20736	AF00	0 mA	0 mA	Underflow, lock the least value
-100%	-27648	9400			
	-27649	93FF			
-118.519%	-32768	8000	0 mA	0 mA	

- Analog value within unipolar voltage input/output range:

System Value			Input/Output Range		
	Decimalism	hexadecimal	0~5 V	0~10 V	
118.5149%	32767	7FFF	≥ 5.926 V	≥ 11.85 V	Overflow, lock the maximum
	27649	6C01			Overshoot range
100%	27648	6C00	5 V	10 V	Rated range
75%	20736	5100	3.75 V	7.5 V	
0.003617%	1	1			
0%	0	0	0 V	0 V	
	-1	FFFF			
-75%	-20736	AF00	0 V	0 V	Underflow, lock the least value
-100%	-27648	9400			
	-27649	93FF			
-118.519%	-32768	8000	0 V	0 V	



- Analog value within Ni x00 thermal resistance:

System Value			Input/Output Range	
	Decimalism	hexadecimal	-60~+250 °C	
	32767	7FFF	≥ 250.1 °C	Overflow, lock the maximum
	2500	9C4	250 °C	Rated range
	1875	753	187.5 °C	
	10	A	1 °C	
	0	0	0 °C	
	-10	FFF6	-1 °C	
	-450	FE3E	-45 °C	
	-600	FDA8	-60 °C	
	-32768	8000	≤ -60.1 °C	

- Analog value within thermocouple:

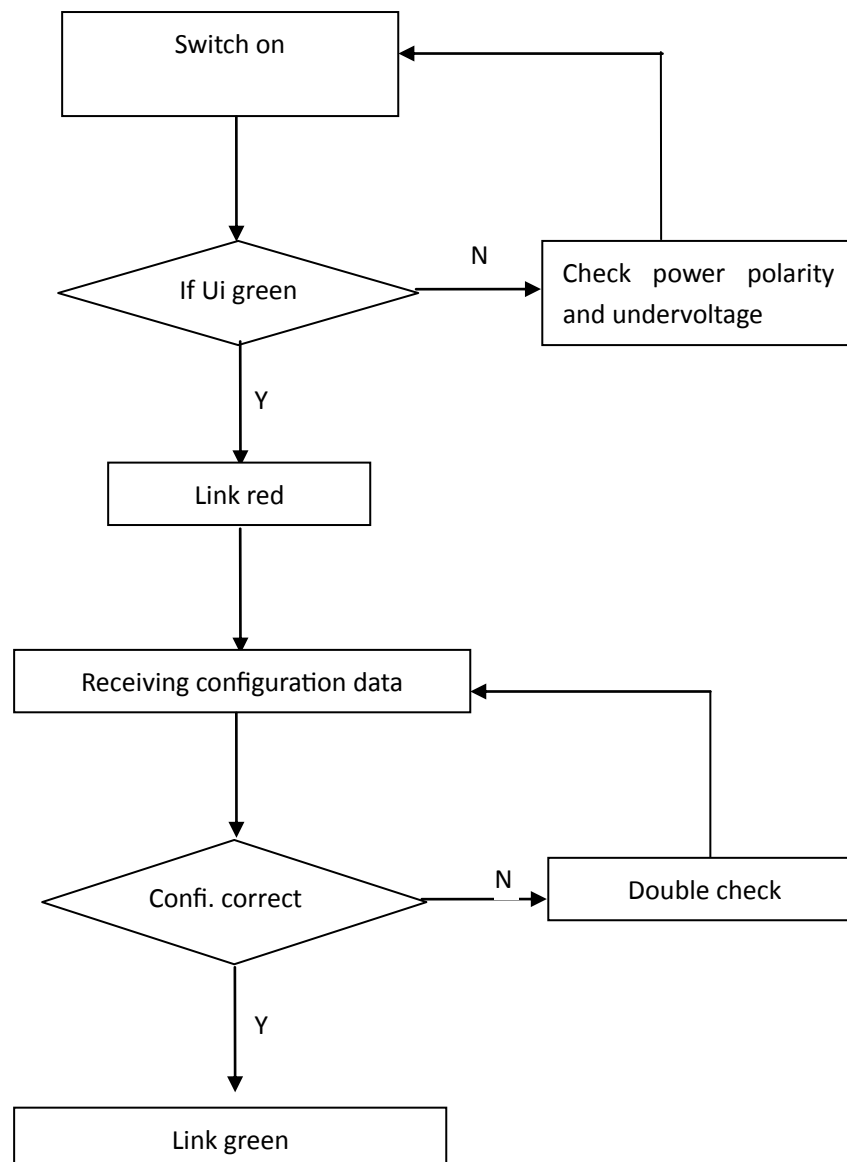
Type B, E, J, K, N, R, S, T thermocouple determines the rated input and output range according to the temperature range of the scale. Dividing the decimal value of the system by 10, the current temperature can be obtained. The resolution is 0.1 C, and the maximum or minimum value can be locked out beyond the limit.

## 4.4 Module Startup Process

Check whether the following requirements are met for the startup of the Spider67 distributed I/O module system:

- Spider67 gateway and module are power, bus and signal wired.
- The module address is set by software.
- Spider67 is configured and downloaded into the controller.
- Supply voltage for controller is switched on.

Startup of Spider67:

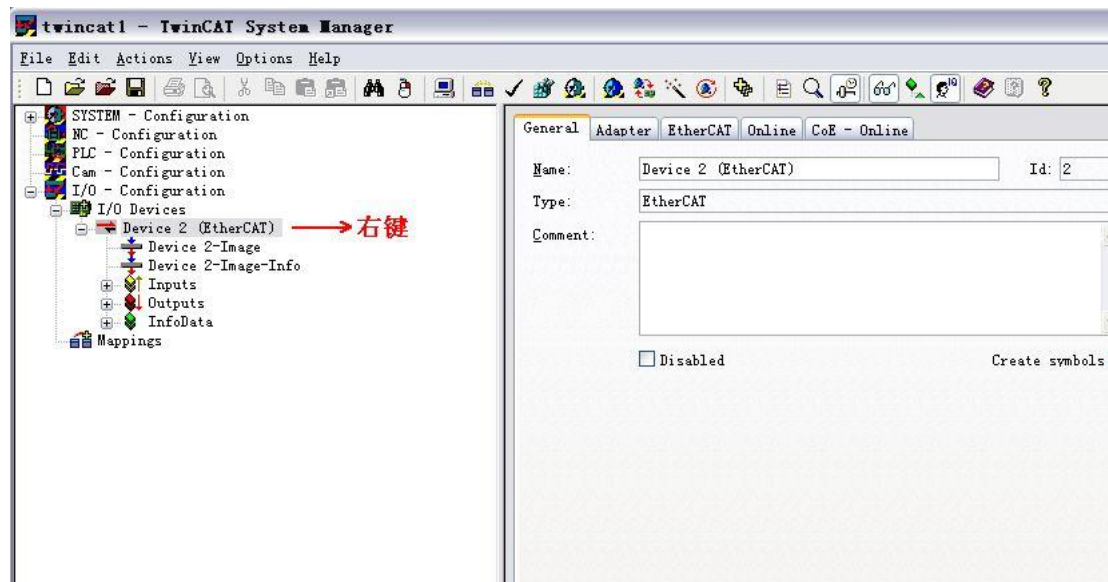


## 4.5 Example of Module Configuration

In the example, Spider67 is taken as EtherCAT sub-station and connected to EtherCAT controller CX1020 of Beckhoff. The following items are installed / set / connected by default, TwinCAT, network card information, ESI file, all power supply and bus. For details, please refer to TwinCat User Instruction.

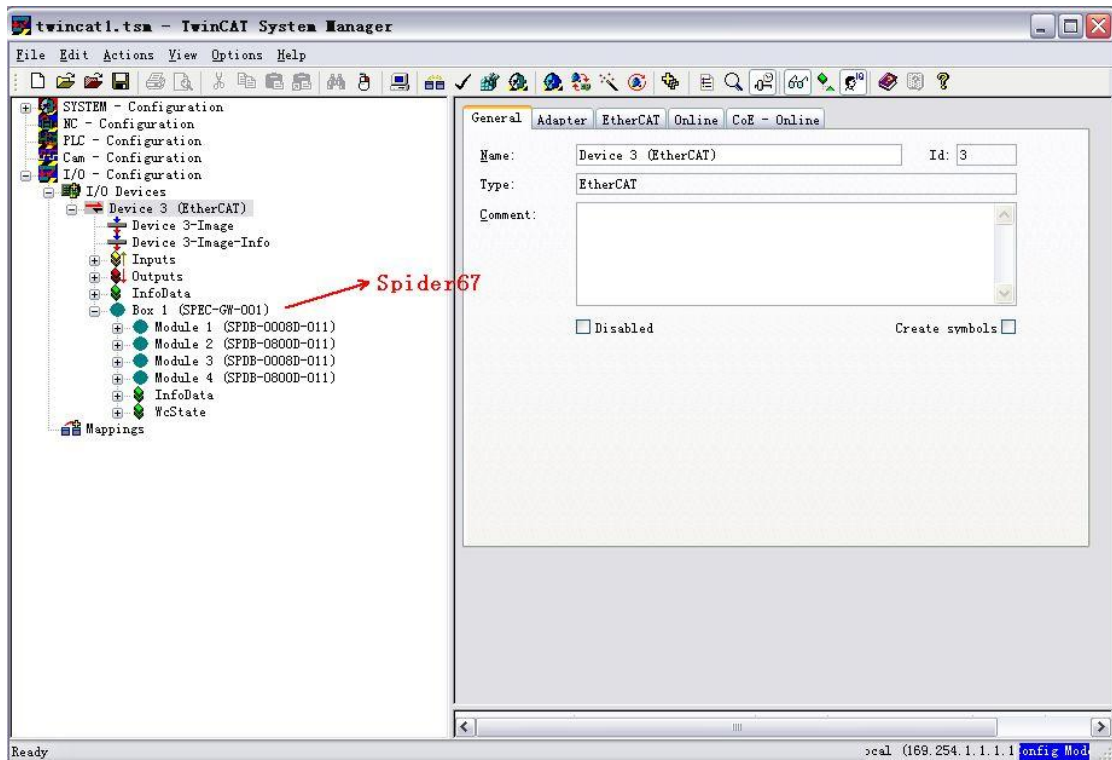
Spider67 consists of 1 gateway module - SPEC-GW-001, 1 SPDB-0008D-011 module connected with extended port P0, 1 SPDB-0800D-011 module connected with extended port P1, 1 SPDB-0008D-011 module connected with extended port P2 as well as 1 SPDB-0800D-011 module connected with extended port P3.

- 1) Search sub-station: right-click the highlighted part marked by arrow as follows> Scan Boxes...






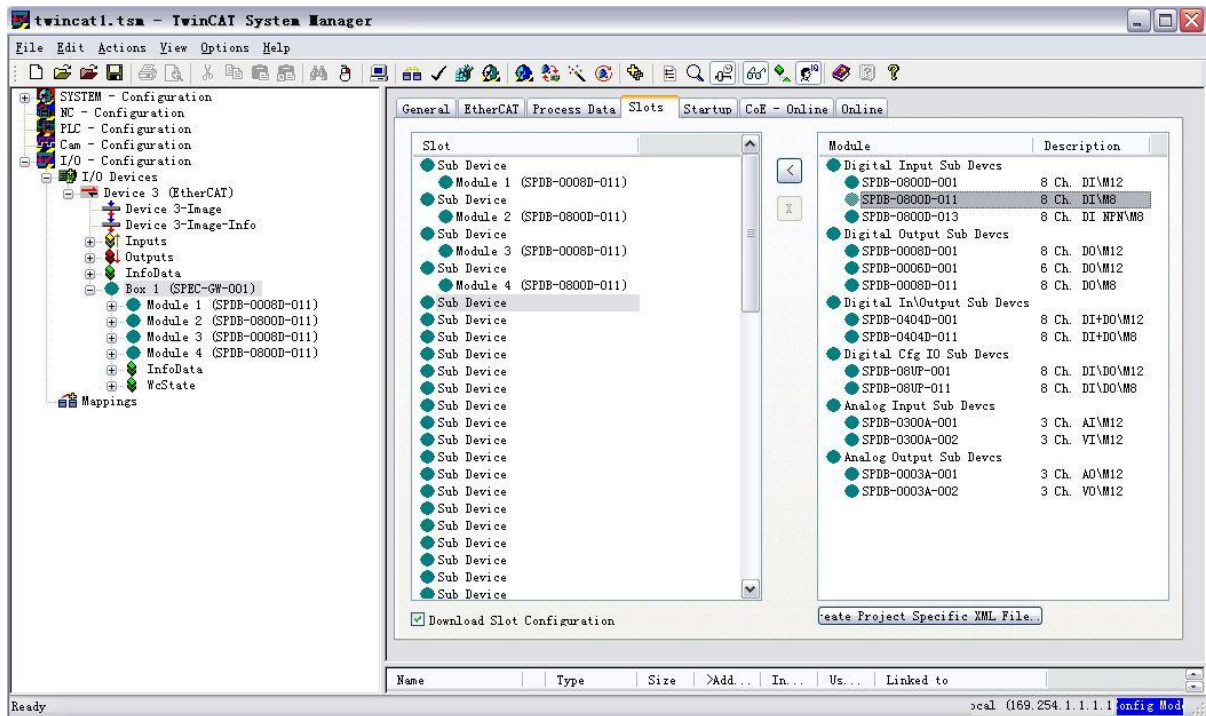
2) The found Spider67 sub-station as follows:



As indicated on the above figure, the Spider67 gateway sub-station and its related IO modules are all found. The IO module is added by automatic searching.

3) Add IO module manually: click Box1, choose “Slot”, choose “Sub Device” that need to be set by checking the box in ‘Slot’ left and choose the IO module model that need to be added by checking the box in ‘Module’ right, then click

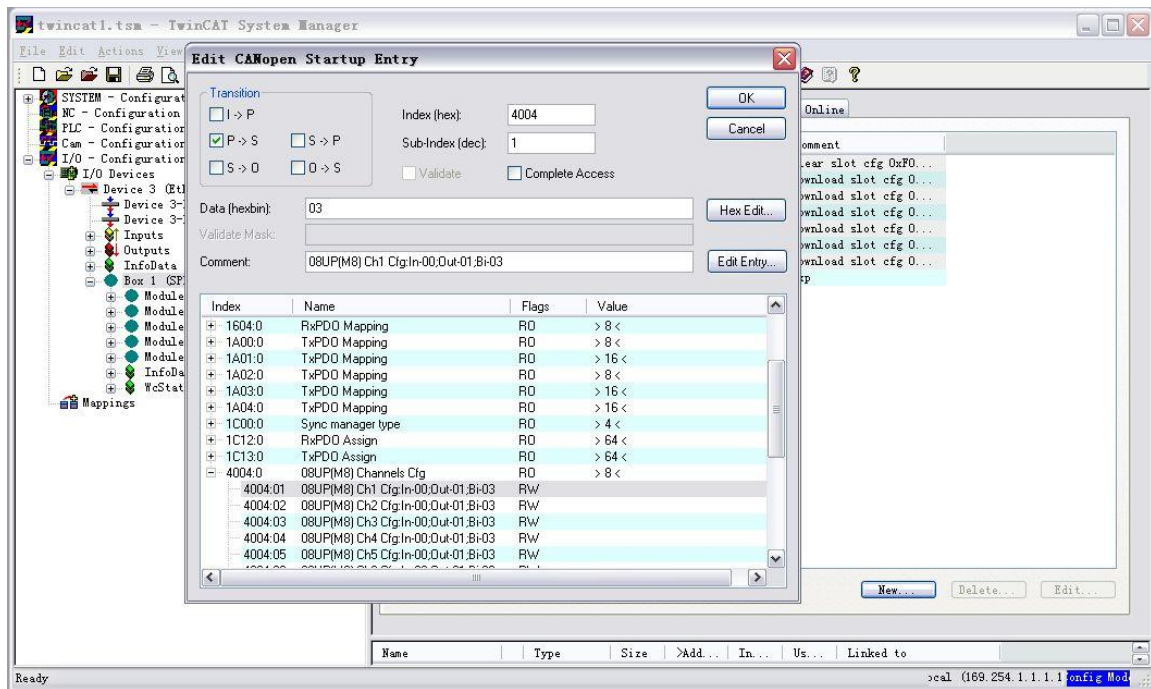
 to finish the adding.



After that the new added IO module number will appear in the list of Box1. What’s more, Download Slot Configuration has to be checked. NOTE: when choose Sub Device, it must be chosen from the first one in succession.

4) Add setting information for configurable IO module: For some IO modules that need to download setting information, it is necessary to add IO module to BOX according to the above process before setting IO module, then click

**New...** in tab Startup, choose corresponding 0x40XX in the popped-up Edit CANopen Startup Entry' and set download information as follows.



## 5. Alarm Diagnosis

### 5.1 LED fault indicator

The user can identify the working status in time by indicators on the Spider67 distributed I/O modules.

Gateway LED indicator				Meaning	Troubleshooting
MOD	L/A	RUN	ERR		
RD	-	-	-	Power voltage abnormal / IO module communication abnormal / IO module fault alarming	Check power supply, IO connection and IO module working status
-	Non flashing	-	-	No Ethercat communication	Check power supply and wiring
-	-	-	RD	Single slow flashing	Sub-station status error
				Double quick flashing	Out data error
				Single quick flashing	Sub-station configuration error
-	-	GN	-	Ethercat working status indicating	-
GN	GN	GN	-	Normal	-

Module LED indicator				Meaning	Troubleshooting
ADD <sub>In</sub>	ADD <sub>Out</sub>	Link	MOD		
RD	RD	-	-	Fault address assignment of extended module	Re-charge of gateway
-	-	RD	-	Fault connection of extended module	Check extended cable connection
				Extended module and gateway is under communication	Wait to recover
-	-	-	RD	Short-circuit / overload in I/O port	Check sensor or overloading
				The actual setting of extended module is different from the configuration	Check configuration setting
				Other module fault	Contact with technicians
GN	GN	GN	GN	Modules ready	-