iR-ECAT

iR-ECAT

This guide walks through important information about iR-ECAT.

UM019001E_20220307

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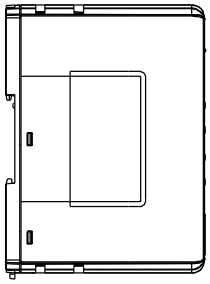
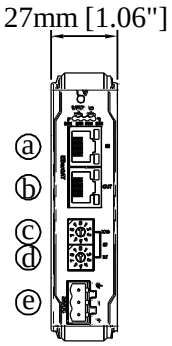
1. Product Overview

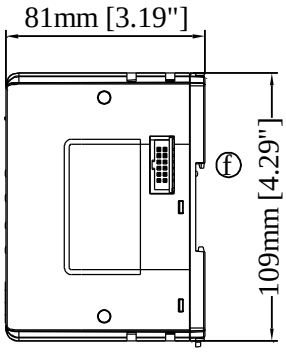
Top View



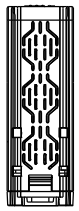
Side View



Front View



Side View



Bottom View

a	X1- EtherCAT IN	*e*	Power Connector
b	X2- EtherCAT OUT	*f*	Expansion Connector
c	Node ID Rotary Switch x10		
d	Node ID Rotary Switch x1		

2. Specifications

Communication Interface Specifications		
Model	iR-ECAT	
Expansion I/O Module	Number of Bus Terminals	Depends on Power Consumption. Max. allowable number of iR modules is 16.
	Digital Input Point	Max. 256
	Digital Output Point	Max. 128
	Analog Input Channel	Max. 64
	Analog Output Channel	Max. 64
Indicators	ECAT Run (Green)	Device Status Indicator
	ECAT ERR (Red)	Device Error Indicator
	L.V (Red)	Low Voltage Status Indicator
	IO RUN (Green)	Module Status Indicator
	IO ERR (Red)	Module Error Indicator
Data Transfer Rate	100 Mbps	
Data Transfer Medium	4 x 2 twisted pair copper cable; category 5 (100 Mbps)	
Distance Between Stations	100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler	
Protocol	EtherCat Slave	
MailBox	COE -SDO requests, SDO responses.	
ETG Standards	ETG 5001	
General Specification		
Power	Power Supply	24 VDC (-15%/+20%)
	Power Dissipation	Nominal 100mA@24VDC
	Current for-Internal Bus	Max 2A@5VDC
	Current Consumption	270mA@5VDC
	Electrical Isolation	Network to Logic : Isolation Logic to Field power : Isolation
	Back-up Fuse	≤ 1.6A Self-recovery
Specification	PCB Coating	Yes
	Enclosure	Plastic
	Dimensions WxHxD	27 x 109 x 81 mm
	Weight	Approx. 0.15 kg
	Mount	35mm DIN rail mounting
Environment	Protection Structure	IP20
	Storage Temperature	-20° ~ 70°C (-4° ~ 158°F)
	Operating Temperature	0° ~ 55°C (32° ~ 131°F)
	Relative Humidity	10% ~ 90% (non-condensing)
Certification	EMC Immunity	Conforms to EN 55032: 2012+AC: 2013, Class A EN 61000-6-4: 2007+A1:2011 EN 55024: 2010+A1: 2015 EN 61000-6-2:2005

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3. LED Insicators

3.1 L.V LED

L.V LED state	Description
OFF	24V power normal
Blinking	Detect 24V power
ON	24V power error

3.2 IO RUN/ERR LED

RUN LED	ERR LED	Description
OFF	OFF	Power off or no power
Blinking	OFF	IO initiating
Blinking	ON	IO initiation error
ON	OFF	IO working
ON	Blinking	IO module alarm
ON	ON	IO communication fault
Blinking	Blinking	Exceeding power limit or too many modules

3.3 ECAT RUN

LED State	Description
OFF	The device is in state INIT
Blinking	The device is in state PRE-OPERATIONAL
Single Flash	The device is in state SAFE-OPERATIONAL
ON	The device is in state OPERATIONAL
Flickering	The device is in state BOOTSTRAP

*Blinking: Alternates between ON/OFF at speed 200ms.

*Flickering: Alternates between ON/OFF at speed 50ms.

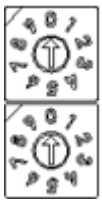
3.4 ECAT ERR

LED State	Description
ON	Error in the coupler
Double Flash	Process Data Watchdog Timeout / EtherCAT Watchdog Timeout
Single Flash	Device changes state from Op to SafeOp Error due to a synchronization error.
Blinking	Configuration error
OFF	No error

3.5 RJ45 Link/Act LED

Link/Act (green)	
OFF	No link
ON	Link without activity
Blinking	Link and activity

4. ID Setup Rotary



Setting	Description
0	Invalid Node Address
1~99	Valid Node Address

5. COE Object Dictionary

5.1 Communication Area

Index (hex)	Sub-index (hex)	Name	Default	R/W	Type
1000	00	Device type	0x00001389 (5001)	RO	UINT32
1008	00	Device Name	"iR-ECAT"	RO	string
1009	00	Hardware	“1.00”	RO	4 char
100A	00	Software Version	“1.00”	RO	4 char
1018	Identity Object				
	00	Length of this object	0x04	RO	UINT8
	01	Vendor-ID	0x000006DD	RO	UINT32
	02	Product code	0x00000706	RO	UINT32
	03	Revision number	0x00000001	RO	UINT32
	04	Serial number	0x00000000	RO	UINT32
1C00	Sync manager type				
	00	Length of this object	0x04	RO	UINT8
	01	Sync-Manager Type Channel 1: Mailbox Write	0x01	RO	UINT8
	02	Sync-Manager Type Channel 2: Mailbox Read	0x02	RO	UINT8
	03	Sync-Manager Type Channel 3: Process Data Write (Outputs)	0x03	RO	UINT8
	04	Sync-Manager Type Channel 4: Process Data Read (Inputs)	0x04	RO	UINT8
1C12	RxPDO assign				
	00	Length of this object	--	RO	UINT8
	01-0F	assignment RxPDO	--	RO	UINT16
1C13	TxPDO assign				
	00	Length of this object	--	RO	UINT8
	01-0F	assignment TxPDO	--	RO	UINT16

5.2 Input Area

Index(hex)	Name	R/W	Type
6000	Module 1 Input Area	RO	UNIT16

6010	Module 2 Input Area	RO	UNIT16
6020	Module 3 Input Area	RO	UNIT16
--	--	--	--
60n0	Module n Input Area	RO	UNIT16

- The Input Data are located in the object area 0x6000…0x6FFF.
- The Input Data is readable by SDO Upload services.
- The Input Data area and the TxPDOs of a module only exist if Input Data of the module is available.

In the following example, the first module connected to the coupler has 16 digital input points and the second module has 4 analog input channels.

Index (hex)	Sub-index (hex)	Name	Value	Type
6000	00	Length of this object	1	UINT8
	01	Digital Input value of the 1st module	-	UINT16
6010	00	Length of this object	4	UINT8
	01	Analog Input value of the 1st channel of the 2nd module	--	INT16
	02	Analog Input value of the 2nd channel of the 2nd module	--	INT16
	03	Analog Input value of the 3rd channel of the 2nd module	--	INT16
	04	Analog Input value of the 4th channel of the 2nd module	--	INT16

5.3 Output Area

Index	Name	R/W	Type
7000	Module 1 Output Area	RW	UNIT16
7010	Module 2 Output Area	RW	UNIT16
7020	Module 3 Output Area	RW	UNIT16
70F0	Module 16 Output Area	RW	UNIT16

- The Output Data are located in the object area 0x7000…0x7FFF; each module may have up to 16 Output Data objects.
- The Output Data shall be readable by SDO Upload services. Writable by SDO Download services.
- The Output Data area and the RxPDOs of a module only exist if Output Data of the module is available.

In the following example, the first module connected to the coupler has 16 digital input points and the second module has 4 analog input channels.

Index (hex)	Sub-index (hex)	Name	Value	Data Type
7000	00	Length of this object	1	UINT8
	01	Digital Input value of the 1st module	-	UINT16
7010	00	Length of this object	4	UINT8
	01	Analog Input value of the 1st channel of the 2nd module	--	INT16
	02	Analog Input value of the 2nd channel of the 2nd module	--	INT16
	03	Analog Input value of the 3rd channel of the 2nd module	--	INT16
	04	Analog Input value of the 4th channel of the 2nd module	--	INT16

5.4 Configuration Data object area

5.4.1 Module Register

Index(hex)	Name
8000	Register of module 1
8010	Register of module 2
8020	Register of module 3
…	…
80F0	Register of module 16

Sub-index (hex)	Name
00	Length of this object
01	Register 0 of module
02	Register 1 of module
03	Register 2 of module
…	…
n	Register n-1 of module

5.4.2 Output behavior on error

Index (hex)	Name
800F	Output behavior of module 1
801F	Output behavior of module 2
802F	Output behavior of module 3
…	…
80FF	Output behavior of module 16

Sub-index (hex)	Name
00	Length of this object
01	Output behavior On error mode Bit0-15 is Output point 0-15 Mode Value = 0：Keep output value Value = 1：Output value is Substitute Value.
2/17	Substitute Value 1~16

5.5 Object Areas of the Device

5.5.1 Modular device profile

Index (hex)	Sub-index (hex)	Name	Default	R/W	Type
F000	00	Length of this object	0x02	RO	UINT8
	01	Module Index distance	0x0010	RO	UINT16
	02	Maximum number of modules	0x0010	RO	UINT16

5.5.2 Configured Module Ident List

Index (hex)	Sub-index (hex)	Name	R/W	Type
F030	00	Module number	RO	UINT8
	01	Configured module identity of the module 1	RO	UINT32
	02	Configured module identity of the module 2	RO	UINT32
	…	…		
	0F	Configured module identity of the module 16	RO	UINT32

5.5.3 Detected Module Ident List

Index (hex)	Sub-index (hex)	Name	R/W	Type
F050	00	Module number	RO	UINT8
	01	Module identity of the module detected on position 1	RO	UINT32
	02	Module identity of the module detected on position 2	RO	UINT32
	…	…		
	0F	Module identity of the module detected on position 16	RO	UINT32

5.5.4 Module Identity

Item	Product	Code (Hex)
1	iR-DI16-K	0154
2	iR-DM16-P	0351
3	iR-DQ16-P	0251
4	iR-DM16-N	0352
5	iR-DQ16-N	0252
6	iR-DQ08-R	0243
7	iR-AQ04-VI	0525
8	iR-AI04-VI	0425
9	iR-AM06-VI	0635
10	iR-AI04-TR	0426

6. Power Consumption

Type	Device	Consumption(5V)	Power Supply(5V)	Power Consumption(24V)
Coupler	iR-ETN	220mA/1.1w	2A/10w	100mA/2.40W
	iR-COP	170mA/0.85w	2A/10w	100mA/2.40W
	iR-ECAT	270mA/1.35w	2A/10w	100mA/2.40W
Digital I/O	iR-DM16-P	130mA/0.65w	--	53mA/1.27W
	iR-DM16-N	130mA/0.65w	--	56mA/1.34W
	iR-DQ08-R	220mA/1.1w	--	84mA/2.02W
	iR-DQ16-N	205mA/1.02w	--	78mA/1.87W
	iR-DQ16-P	196mA/0.984w	--	75mA/1.80W
	iR-DI16-K	83mA/0.418w	--	31mA/0.74W
Analog I/O	iR-AQ04-VI	65mA/0.325w	--	25mA/0.60W
	iR-AI04-VI	70mA/0.35W	--	27mA/0.65W
	iR-AM06-VI	70mA/0.35W	--	27mA/0.65W
	iR-AI04-TR	65mA/0.325w	--	25mA/0.60W

Note:
The coupler is the only power supply for the modules in this system. Please consider power requirements when connecting multiple modules.

ex.

Device	Name	Consumption	Power Supply
Coupler	iR-ECAT	270mA/1.35 w	2A/10w
Module	iR-DM16-P *13	130mA*13=1.69A	X
System	Power consumption : $270\text{mA} + 1.69\text{A} = 1.96\text{ A}$ Power supply: $2\text{A} > 1.96\text{A}$		

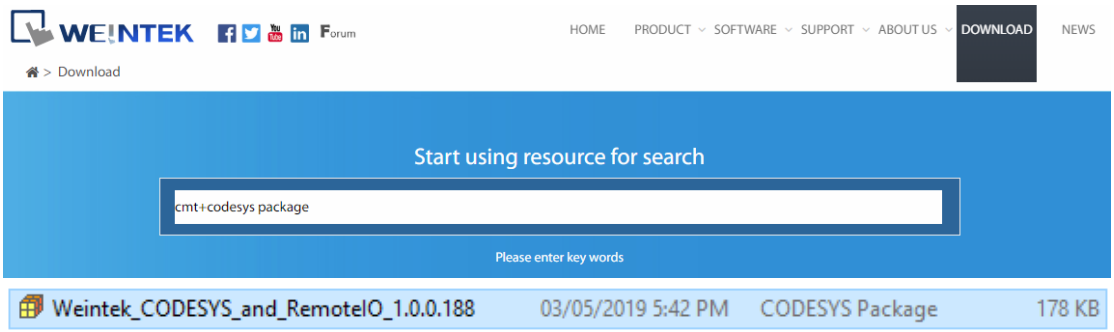
7. Connecting with CODESYS

7.1 Preparation

First of all, download and install [cMT+CODESYS Package].

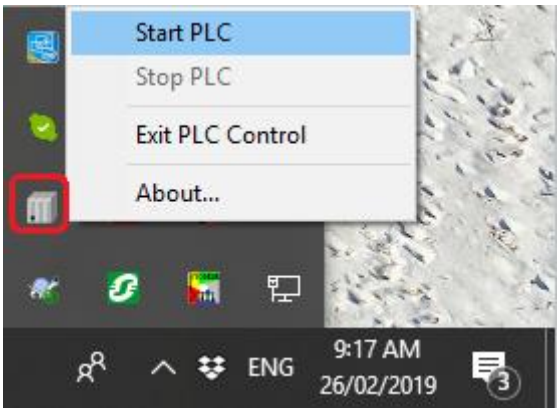
(https://www.weintek.com/globalw/Download/Download.aspx)

※Version 1.0.0.188 or later

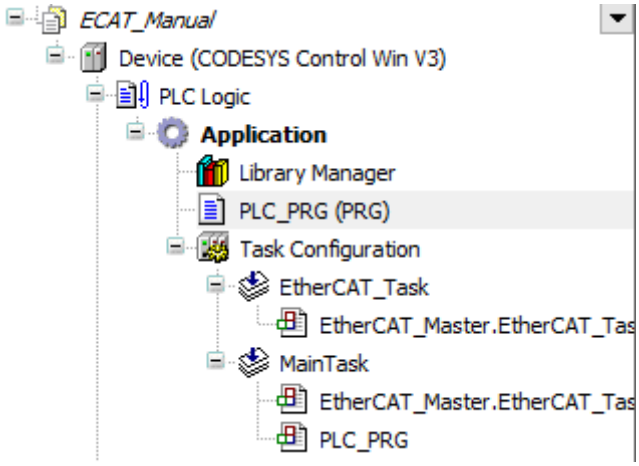


7.2 Connecting with CODESYS Device

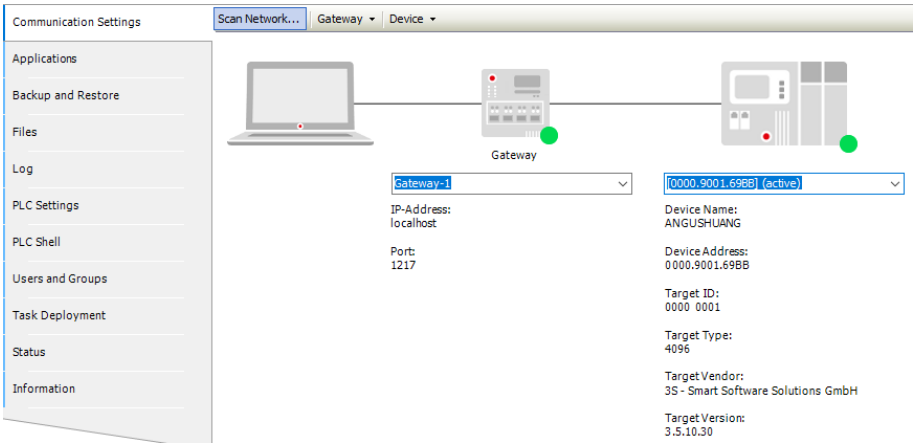
Step1. Find CODESYS PLC device at the bottom-right corner and click [Start PLC].



Step2. Create a simple project with the device of CODESYS Control Win V3.



Step3. Make a connection.

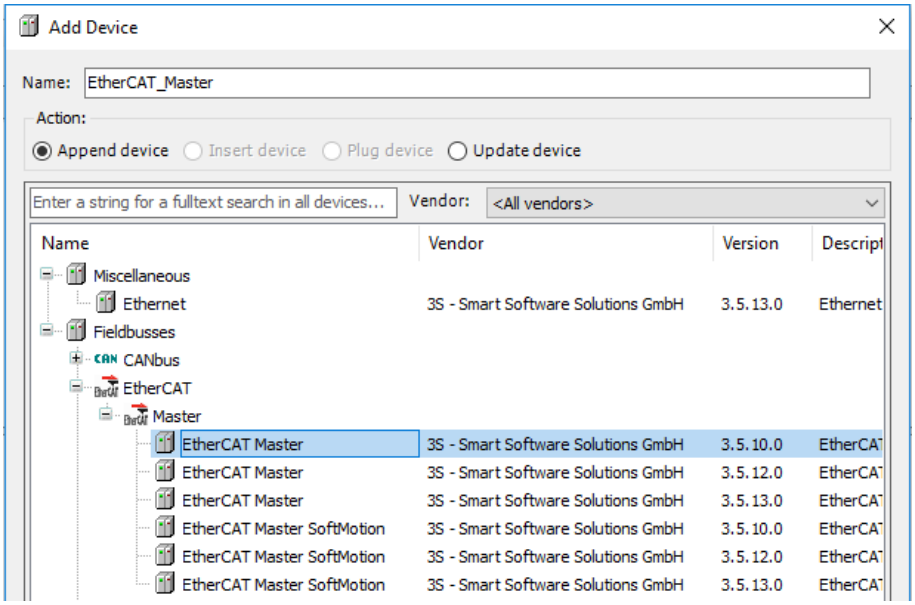


7.3 Adding EtherCAT Device

7.3.1 Adding devices manually

Step1. Add EtherCAT Device

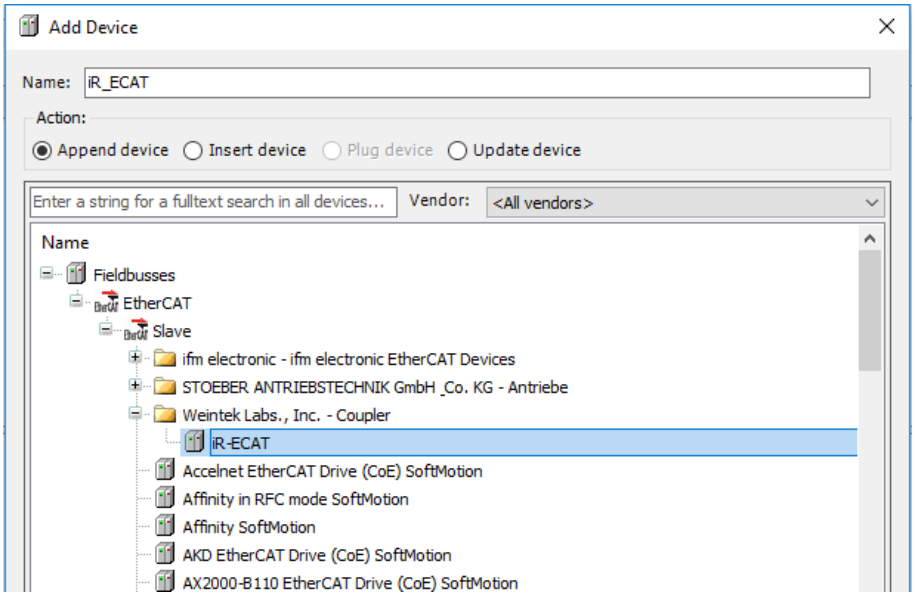
[Device] » [Add Device] » [Fieldbusses] » [EtherCAT] » [Master] » [EtherCAT Master]



Step2. Add iR-ECAT

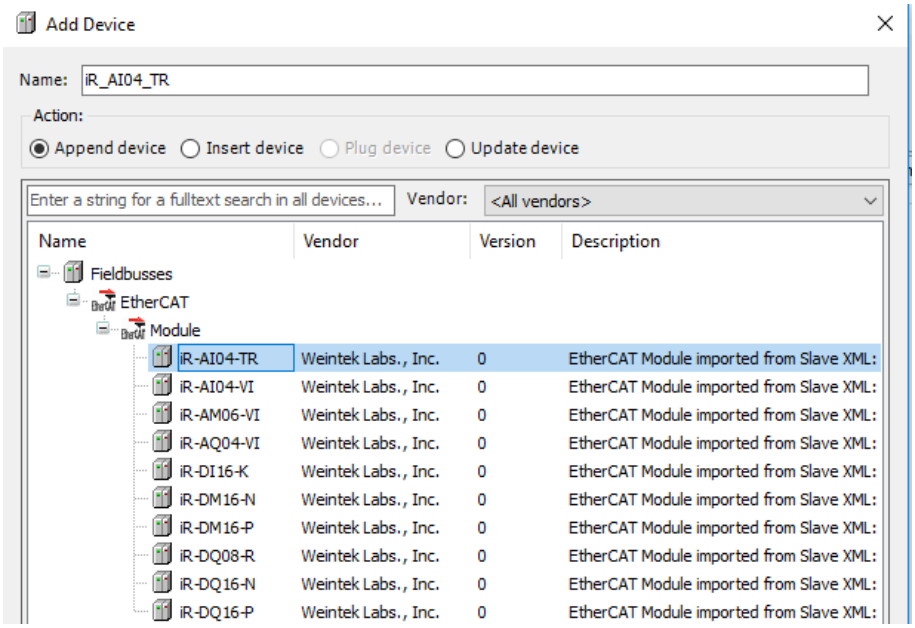
[EtherCAT Master] » [Add Device] » [Fieldbusses] » [EtherCAT] »

[Slave] » [iR-ECAT]



Step3. Add Modules

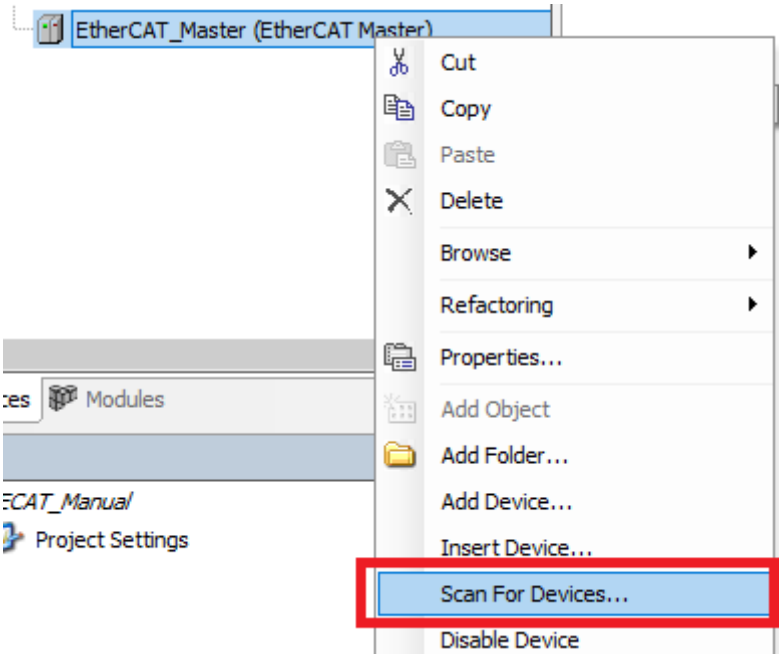
[iR-ECAT] » [Add Device] » [EtherCAT] » [Module] and add the iR-Module which you use.



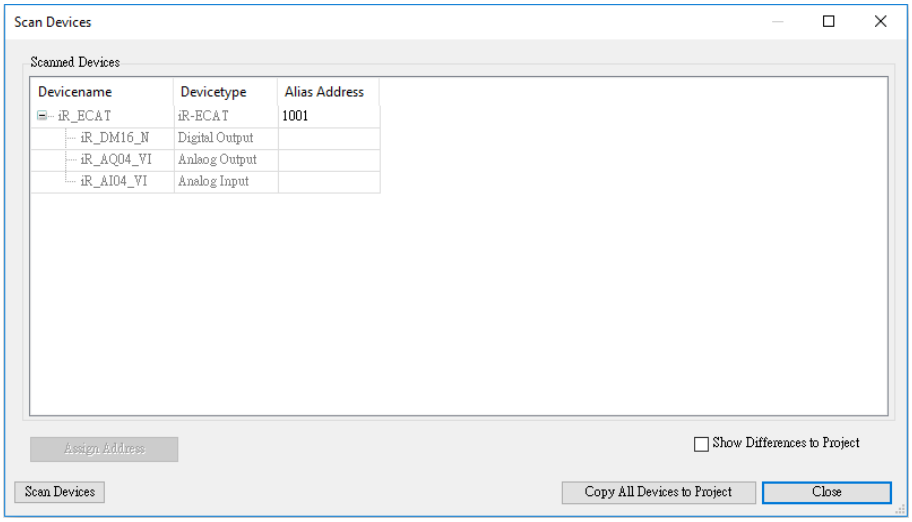
P.S. Module order should follow physical module.

7.3.2 Adding devices by scanning

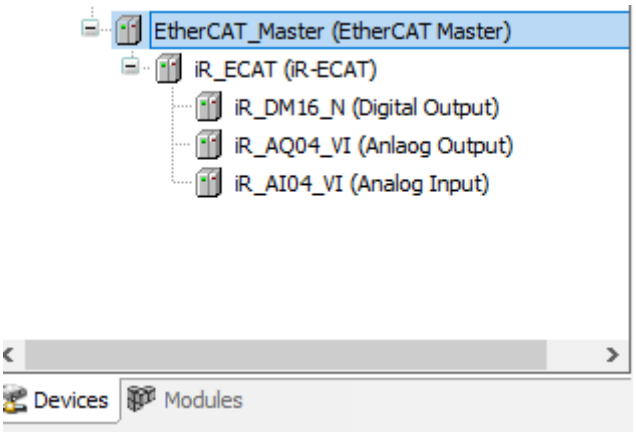
Step1. After adding the EtherCAT Master Device, you can right click on EtherCAT_Master and then [Scan For Devices].



It'll automatically look for EtherCAT couplers and its module on the network.



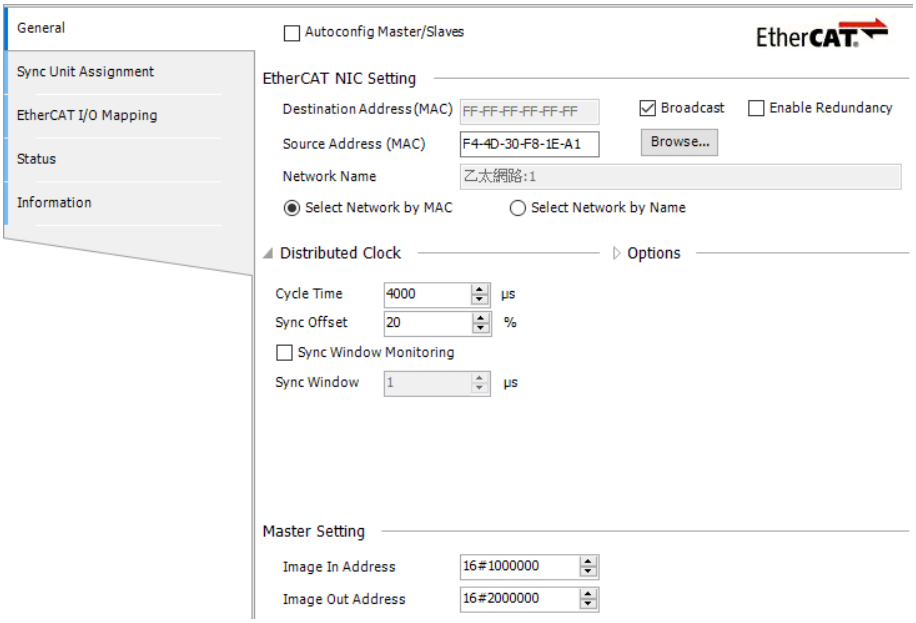
Step2. Press [Copy All Devices to Project] to add device.

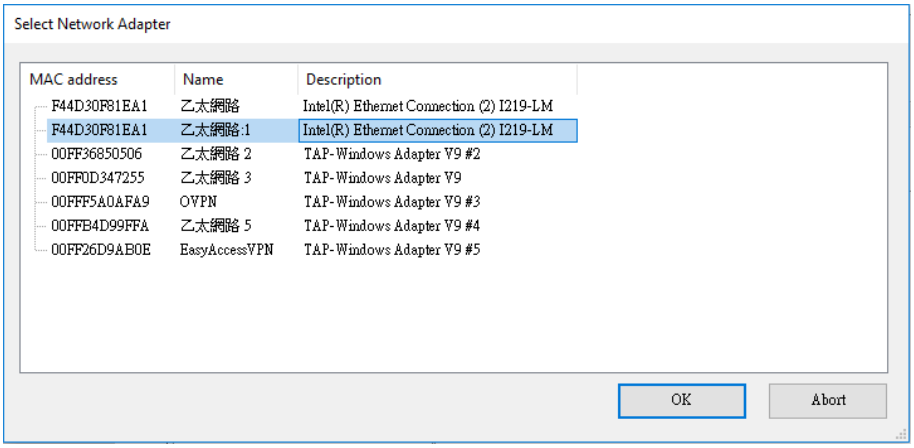


7.4 EtherCAT Configuration

Select your EtherCAT interface.

[EtherCAT_Master] » [General] » [Browse]

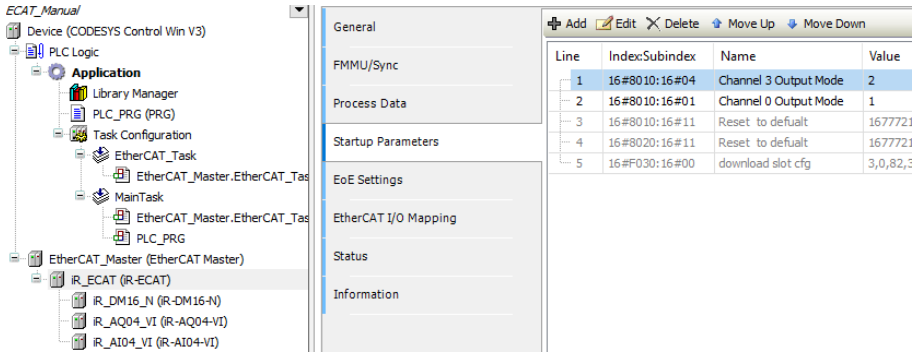




7.5 Module Configuration

If you're going to setup internal parameters of Module, you can take following steps.

Step 1. [iR_ECAT] » [Startup Parameters] » [Add]

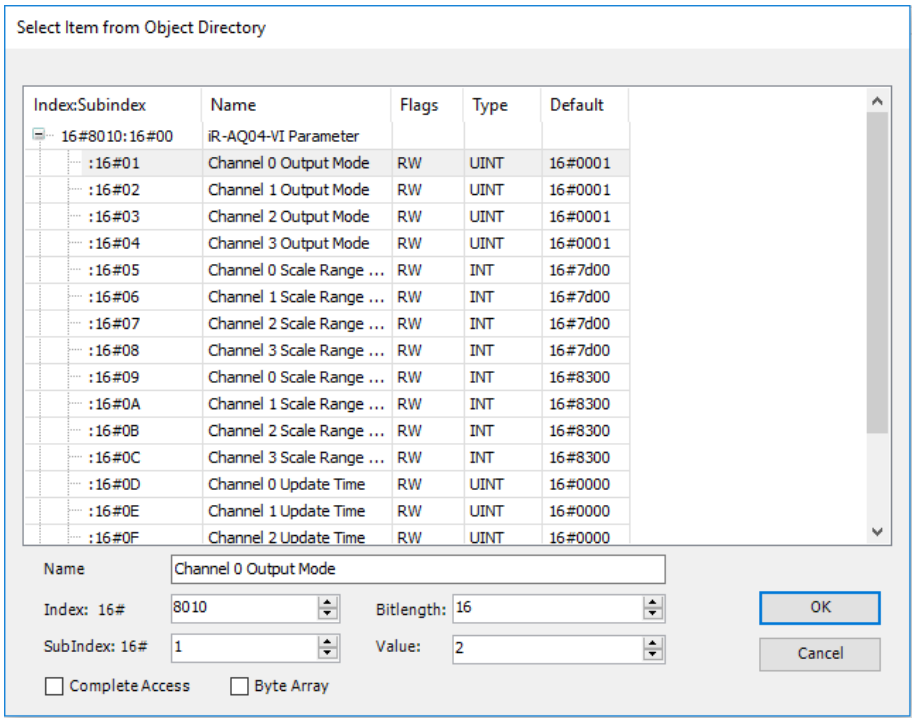


Step 2. You'll see the list of parameters of Module. The parameters access after Start PLC.

Index 8000: 1st module

Index 8010: 2nd module

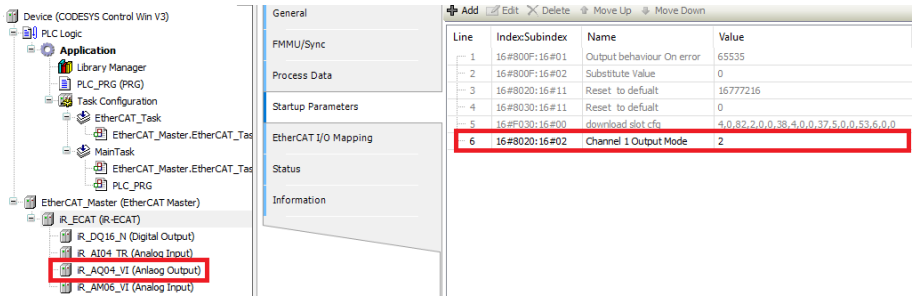
And so on.



7.5.1 Example 1

Configure three iR-AQ04-VI modules, set output mode to ±5V (register 1)

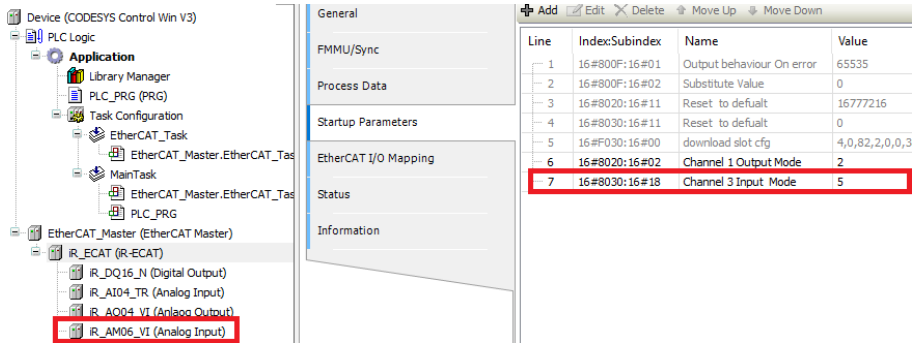
(Slot : 2 , index : 0x8020)



7.5.2 Example 2

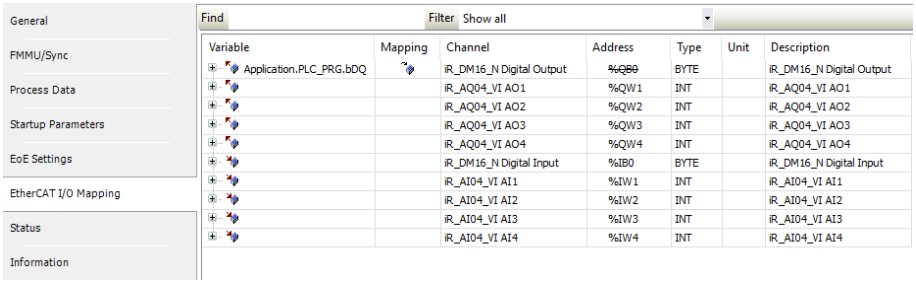
Configure four iR-AM06-VI modules, set input mode to 4-20mA for channel 3 (register 3)

(Slot : 3 ， index : 0x8030)



7.6 I/O Mapping

Open [iR-ECAT] » [EtherCAT I/O Mapping]



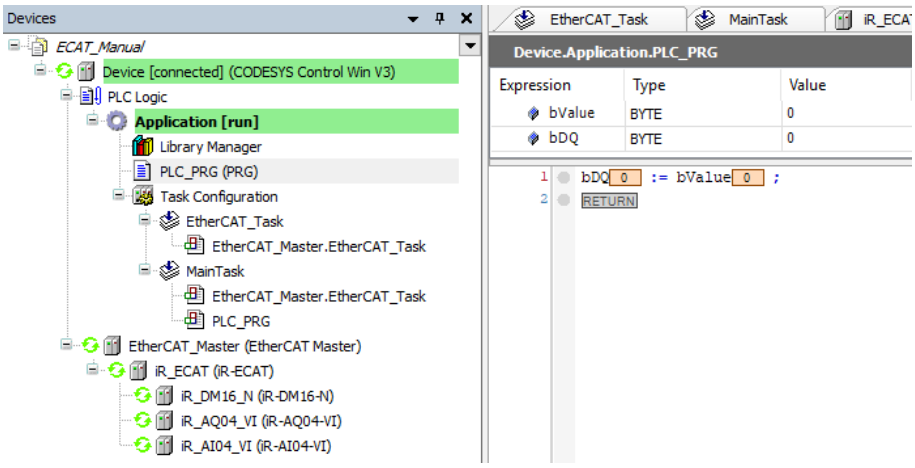
Programming

```
1  PROGRAM PLC_PRG
2  VAR
3      bValue,bDQ : BYTE ;
4  END_VAR
```

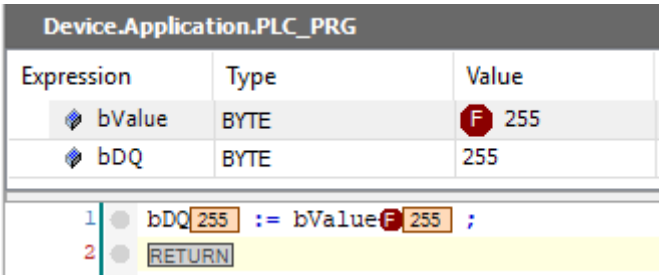
```
1  bDQ := bValue ;
```

7.7 Download Program and Run

[Login] » [Start]



Inspect Digital Outputs

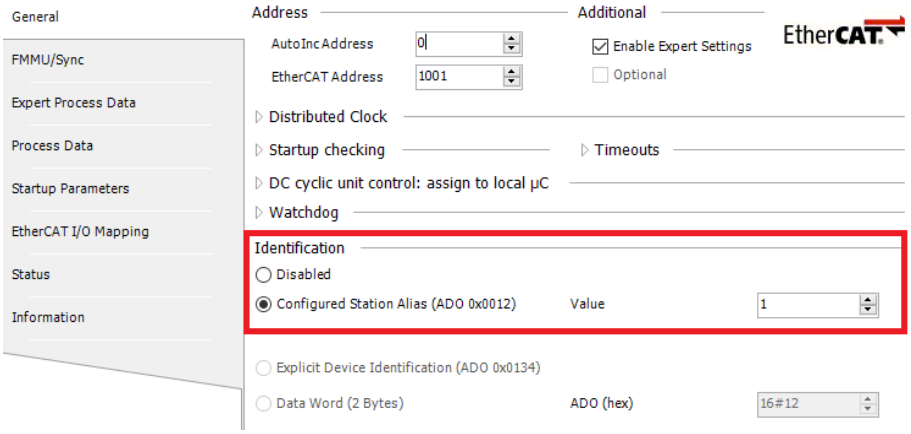


7.8 Configured Station Alias (Using Node ID of the devices)

The device addresses are automatically assigned by the master at startup. Another way to assign addresses is to use rotary switches to configure Node ID.

When Node ID is 0, then Station Alias will be the value read from E2PROM.

When Node ID is not 0, then Station Alias will be the Node ID configured using rotary switches.



8. Error Behavior Settings

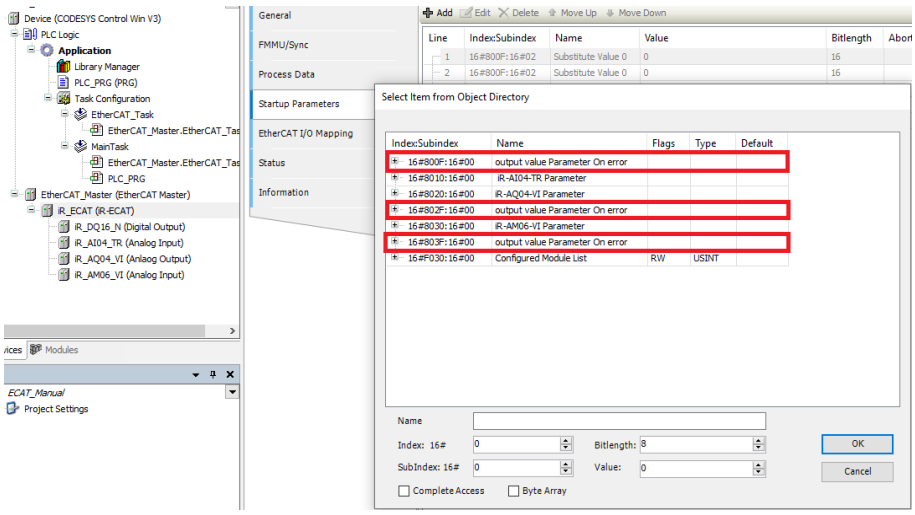
8.1 Function

The Error Behavior works while communication is disabled between EtherCAT Master and iR-ECAT. The Output modules behave corresponding settings according to Error Behavior Settings. The behavior can either be keeping the last output value or output a substitute value when communication error occurs.

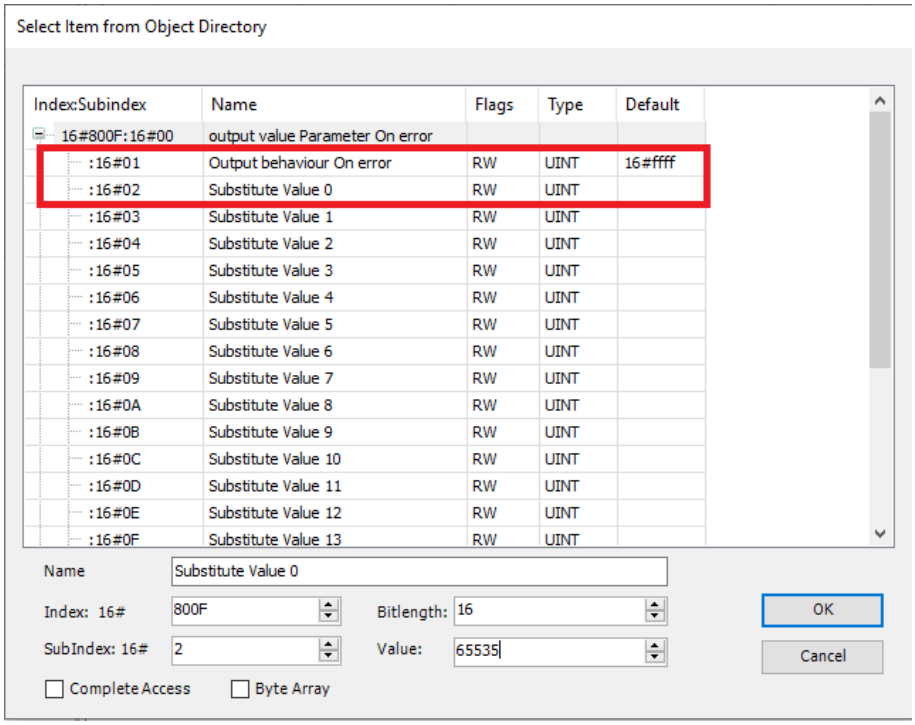
8.2 Configuration

[iR_ECAT] » [Startup Parameters] » [Add]

The Parameters for Error Behavior Settings are listed in Object Dictionary.



8.2.1 Digital Output settings



Sub index:

16#01 Output behavior On error (default: all activated, 0: keep the last output value, 1: output substitute value)

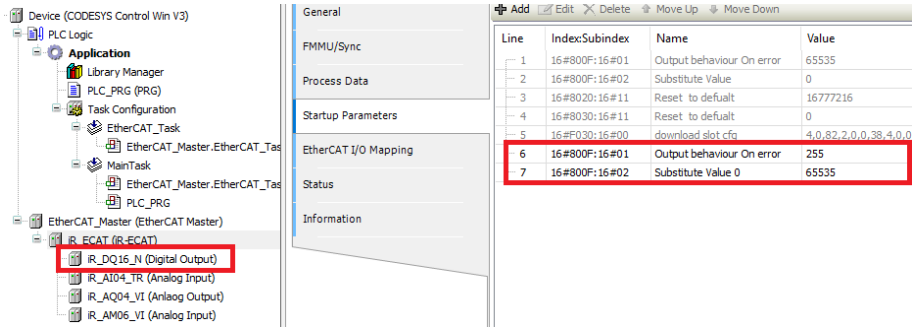
16#02 Error value

※Example : iR-DQ16-N

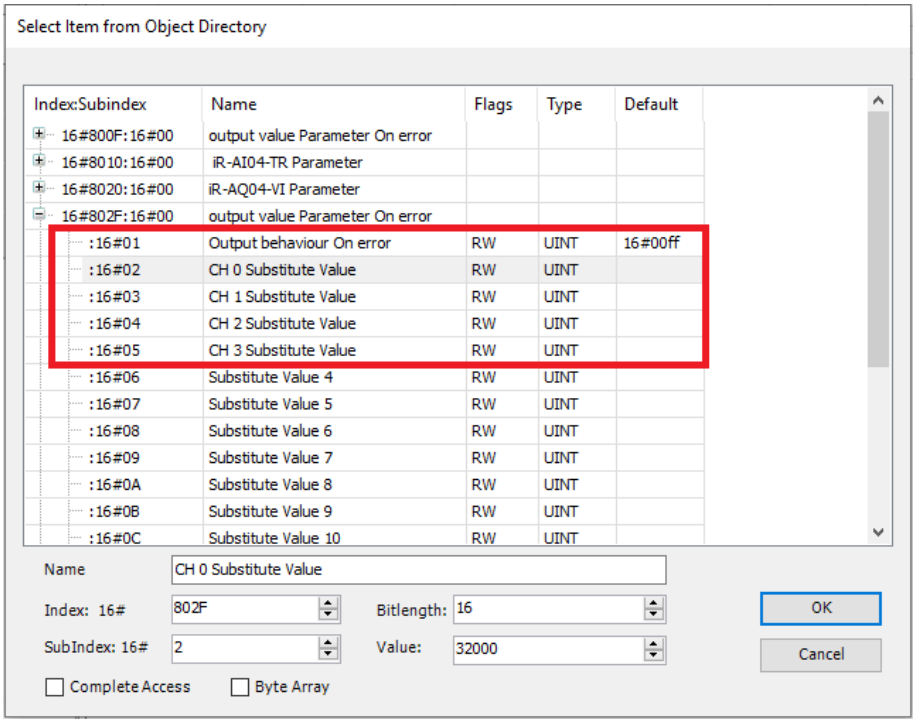
bit 0~7: Output On when error occurs.

bit 8~15: Keep the last output value when error occurs.

Corresponding settings as below.



8.2.2 Analog Output settings



Sub index:

16#01 Output behavior On error (default: all channel activated)

Bit0~3: Analog Output Channel 0-3, module settings.

(0: keep the last value, 1: output substitute value)

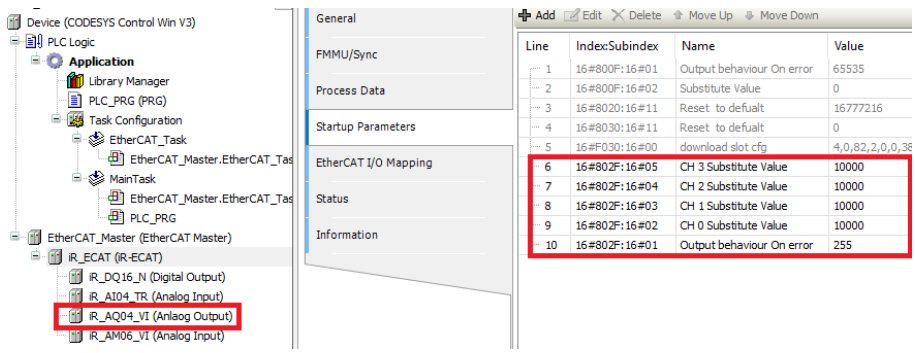
16#02 Channel 0 Substitute value

16#03 Channel 1 Substitute value

16#04 Channel 2 Substitute value

16#05 Channel 3 Substitute value

※Example : iR-AQ04-VI

Channel 0-3: Output substitute value = 10000 when error occurs.

Corresponding settings as below.