ECAT I/O Series

User's Manual

EtehrCAT I/O Slave Modules



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LEADING EDGE AI COMPUTING

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Revision	Description	Date
1.0	Initial release	2023-09-05
1.1	New product added	2025-07-17
1.2	New product added, specifications and mechanical layout updated	2026-06-15

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Preface

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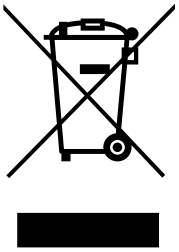
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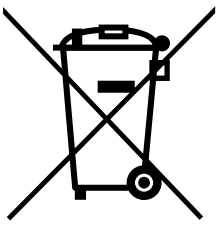
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Battery Labels (for products with battery)









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Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.



NOTE:

Additional information, aids, and tips that help users perform tasks.



CAUTION:

Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.



WARNING:

Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction

1.1 Overview

The ADLINK complete EtherCAT solution, from hardware to middleware to software, with every element tailored for dedicated EtherCAT functionality, includes PCIe-833x and SuperCAT master controllers, ECAT & EU slave systems, and remote monitoring and control providers. Additionally, ADLINK's Softmotion one-stop control kernel delivers flexible and easy-to-use intelligent platforms for driving next-generation modern Smart Factories.

Slave I/O Modules: ADLINK's ECAT IO Series system features a modular design for flexible high channel density, rugged construction, easy maintenance, and compatibility with third-party EtherCAT master products. Precise time-deterministic control enables I/O synchronization for critical applications, while the flexible terminal block design supports multiple wiring methods.

The ECAT IO Series' unique structural and electronic design supports hot swapping of modules, reducing repair time, and offers full operability from 0°C to 60°C. The ECAT slave system is also fully compliant with the EN 61131-2 standard for shock and vibration and EN 61000-6 for heavy industrial EMC protection, as well as **has** received an emissions certificate.

As the ECAT IO Series must be used with an EtherCAT master, we recommend using ADLINK products, such as the PCIe-833x series and SuperCAT, for the best performance, easiest integration, and potential for function expansion.

Available modules include:

- ECAT-DI32-M-N: 32-ch sinking / sourcing type digital input
- ECAT-DO32-M-N: 32-ch sinking type digital output
- ECAT-DI16DO16-M-NN: 16-ch digital input and 16-ch digital output
- ECAT-AI16AO2-M-VV: 16-ch analog input and 2-ch analog output
- ECAT-DI8DO8-C-NN: 8-ch digital input and 8-ch digital output

Terminal Base: Offers an easy wiring media. Both power and signal wiring go from the terminal base to the slave I/O modules, and master links to all slave I/O modules via the terminal base using RJ45 cable. The terminal base makes the slave I/O modules hot- swappable without interfering with other modules in the same EtherCAT network.

Wiring Cable: The cables connecting the EtherCAT master and slave I/O modules are standard 100 Base/TX with RJ45 connectors, which are identical with commercial Ethernet cables.

1.2 Features

- Supports up to 100μs EtherCAT cycle time with DC mode
- Status holding mode when disconnected
- Connects to 256 modules
- Easy maintenance by hot-plugging
- Flexible terminal block design for alternate wiring
- Compatible with APS function library
- Same wiring and layout as HSL IO

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1.2.1 EtherCAT Free-Run and Distributed Clock Modes

EtherCAT is a real-time Ethernet communication protocol that is used in industrial automation systems. It supports two different synchronization mechanisms: Free-Run and Distributed Clock.

Free Run Mode

Free-Run is the default synchronization mechanism used by EtherCAT. In this mechanism, each slave device uses its own internal clock and is responsible for maintaining its own synchronization with the EtherCAT master. The master sends out the control data and each slave reads this data, performs its required task, and sends its response back to the master.

DC Mode

In DC mode, all devices on the EtherCAT network use a shared, synchronized clock to determine when to perform their tasks. This ensures that all devices on the network are working together in a coordinated manner. The Distributed Clock mechanism requires that each slave device has a hardware clock that is synchronized with the master clock. The master sends out periodic synchronization messages, and each slave adjusts its clock based on these messages. Once all devices on the network are synchronized, they can all perform their tasks at the same time, with no timing discrepancies.

1.3 Unpacking the ECAT IO Series

Ensure that the following items are included in the package. If any items are missing, contact your sales representative for assistance.

- ECAT IO Series module



WARNING:

Before unpacking, check the shipping carton for any damage. If the shipping carton and/or contents are damaged, inform your dealer immediately. Retain the shipping carton and packing materials for inspection. Obtain authorization from your dealer before returning any product to ADLINK.

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2 Specifications

2.1 Product Specifications

Model	ECAT-DI32-M-N	ECAT-DO32-M-N	ECAT-D16DO16-M-NN/ ECAT-DI8DO8-C-NN
Digital Input			
Channels	32	N/A	16/8
Input Type	Wet (Sink/Source)		Wet (Sink/Source)
Operational Voltage (24V DC)	NPN[1]: On: 11.4V DC (max.) Off: 14.3V DC (min.) PNP[2]: On: 12.6V DC (min.) Off: 9.8V DC (max.)		NPN[1]: On: 11.4V DC (max.) Off: 14.3V DC (min.) PNP: (DI16DO16 only) On: 12.6V DC (min.) Off: 9.8V DC (max.)
Isolation Voltage	2000V DC		2000V DC
Input Current	4.5 mA (max.)		4.5 mA (max.)
Input Response	ON: 8.8 µs (Typical) OFF: 42 µs (Typical)		ON: 8.8 µs (Typical) OFF: 42 µs (Typical)
Input Impedance	4.7 KΩ		4.7 KΩ
Digital Output			
Channels	N/A	32	16/8
Output Type		Open Collector (Sink)	
Load Voltage		+3.5V to +30 V	
Output Switching Capacity		8 channel 400 mA; Full channels 50 mA at 100% duty cycle	
Isolation Voltage		2000V DC	
Output Response		ON → OFF: 750 ns OFF → ON: 25 ns (24V @4.7K)	
Communication Interface			
Connector	2x RJ45		
Protocol	EtherCAT		
Distance Between Stations	Max. 100 m (100BASE-TX)		
Communication Cycle Time	100 µs		
Data Transfer Medium	Ethernet/EtherCAT Cable (Min. CAT 5), Shielded		
Distributed Clocks	DC		
Status Holding Mode	N/A		
LED Indicator	Power, Run, Error, EEP, Link and DI status		
Power			
Input Voltage Range	20V to 28V DC		

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Power Consumption	1.8W@24V
General	
Installation	DIN Rail
Casing	Metal with IP40
Dimensions	82.5mm x 97.4mm x 21.5mm (H x W x D) ECAT-DI8DO8-C-NN 65.1mm x 85.1mm x 51mm (H x W x D)
Operating Temperature	0˚C to 60˚C (32˚F to 140˚F)
Storage Temperature	-20˚C to 80˚C (-4˚F to 176˚F)
Relative Humidity	95% (non-condensing)

Model Name	ECAT-AI16AO2-M-VV
Analog Input	
Channels	16
Wire Connection	8 Differential or 16 Single-ended
Type	Voltage
Range	±10, ±5, ±2.5, ±1.25 V
Resolution	16-bit
Sampling Rate	250KS/s
AD Conversion Time	4 us
Accuracy	±0.1% FSR at 25°C
Over Voltage Protection	±15 VDC
Analog Output	
Channels	2
Wire Connection	Single-ended
Range	±10 V
Resolution	16-bit
DA Settling Time	5 us
Accuracy	±0.1% FSR at 25°C
Communication Interface	
Connector	2 x RJ-45
Protocol	EtherCAT
Distance between Stations	Max. 100 m (100BASE-TX)
Communication Cycle Time	100 us
Data Transfer Medium	Ethernet/EtherCAT Cable (Min. CAT 5), Shielded
Distributed clocks	DC
Remain status after disconnection	Configurable
LED Indicator	Power, Run, Error, EEP, Link
Power	
Input Voltage Range	22V to 26VDC

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Power Consumption	5W
General	
Installation	DIN-Rail
Casing	Metal with IP40
Dimensions	82.5mm x 97.4mm x 21.5mm (H x W x D)
Operating Temperature	0˚C to 60˚C (32˚F to 140˚F)
Storage Temperature	-20˚C to 80˚C (-4˚F to 176˚F)
Relative Humidity	95 %, no condensation
Certification	CE, FCC, RoHS


NOTE:

[1] NPN: sinking type sensor input module.

[2] PNP: sourcing type sensor input modules.

2.2 Supported Software

2.2.1 OS Support / Software Compatibility

- OS Support
- Windows 7/10/11 (x86/x64)
- Software Compatibility
- Visual Studio VB.NET, C#, VC.NET
- APS Function Library Support

2.2.2 APS Functions

The ECAT IO Series is fully compliant with the APS (Automation Product Software) function library, independent of programming languages and operating systems (OS). A complete detailed listing of functions can be found in the APS Function Library User Manual.

2.2.3 Motion Creator Pro 2 (MCP2)

Motion Creator Pro 2™ is a user interface exclusively developed for ADLINK motion control products in a standard Windows environment to easily setup cards and axis parameters. A Setup Wizard guides users through hardware installation and wiring as well as single-axis manipulation in minutes.

Motion Creator Pro 2™ not only effectively reduces development time but also enables concurrent validation of overall mechanisms and electric design with all single axis and interpolation motion operation pages.

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2.3 Accessories

Available terminal bases include:

- ECAT-TB32-M-DIN: Terminal board exclusive for ECAT IO M type.
- ECAT-TB32-U-DIN: Terminal board exclusive for ECAT IO DB type.


NOTE:

ECAT-DI8DO8-C-NN comes with a terminal board, no additional accessories are required.

Series	Model	Specifications	Supports
For DB Series	ECAT-TB32	(1) : 32 channels direct connected terminal base (2): One DB slot	ECAT-DI16DO16-DB-NN only
	ECAT-TB32-U	(1) : 32 channels direct connected terminal base (2): One DB slot	All ECAT IO DB-series modules
	ECAT-TB64	(1) : 64 channels direct connected terminal base (2): Two DB slots	
For M Series	ECAT-TB32-M	32 channels direct connected terminal base for ECAT IO M-series module	All ECAT IO M-series modules

2.3.1 Features

- 32-channel ECAT IO Terminal Base
- Field I/O wiring connection for ECAT I/O modules
- Spring terminal for easy field wiring
- Power and ground included for each signal channel
- Interlocking design for rugged installation
- Power LED indicator
- DIN rail mounting

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3 Functional Block Diagram

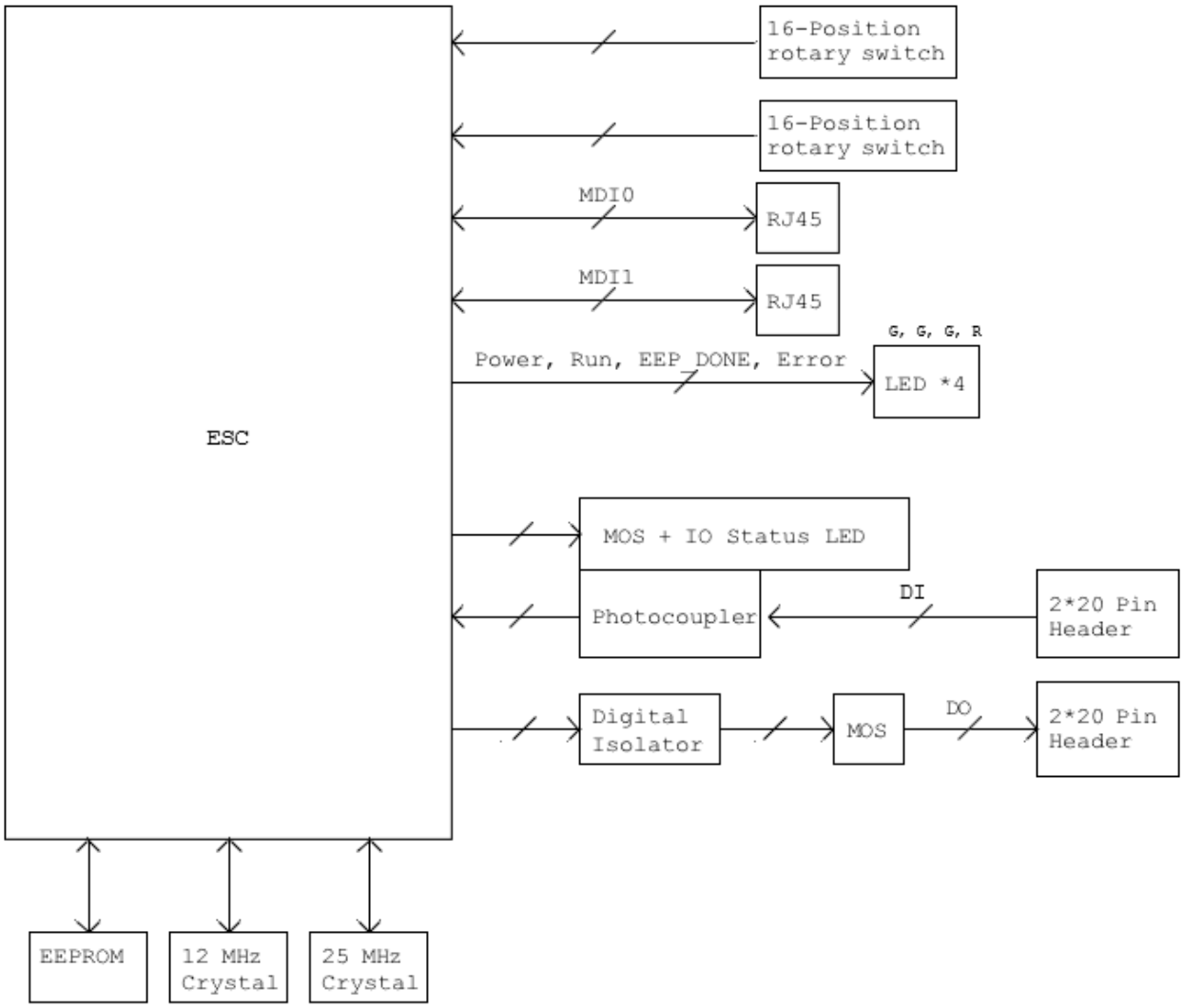


Figure 1: DIO functional diagram

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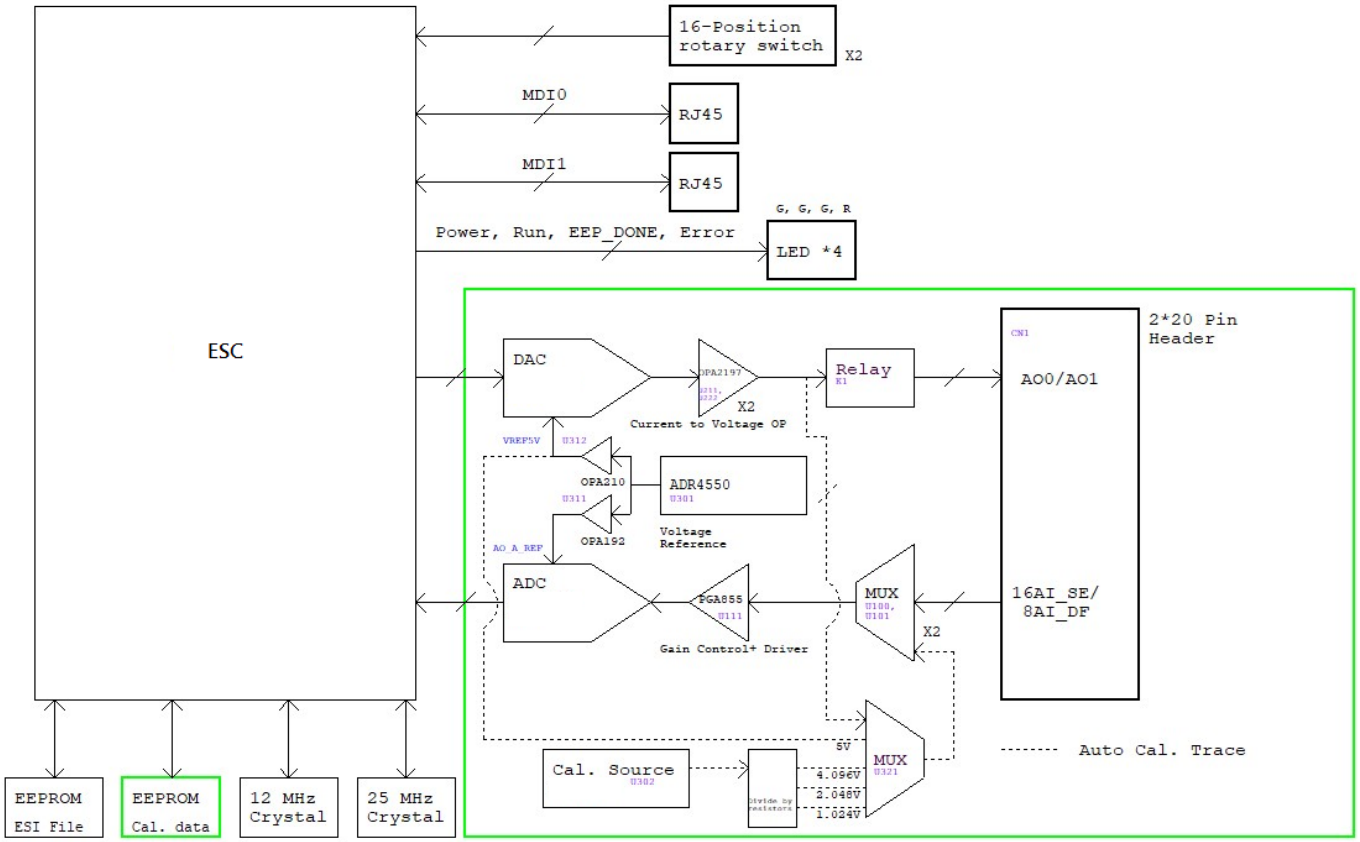


Figure 2: AIO functional diagram

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4 Mechanical Layout

4.1 M-Type Mechanical Dimensions

All dimensions in millimeters (mm) unless noted.

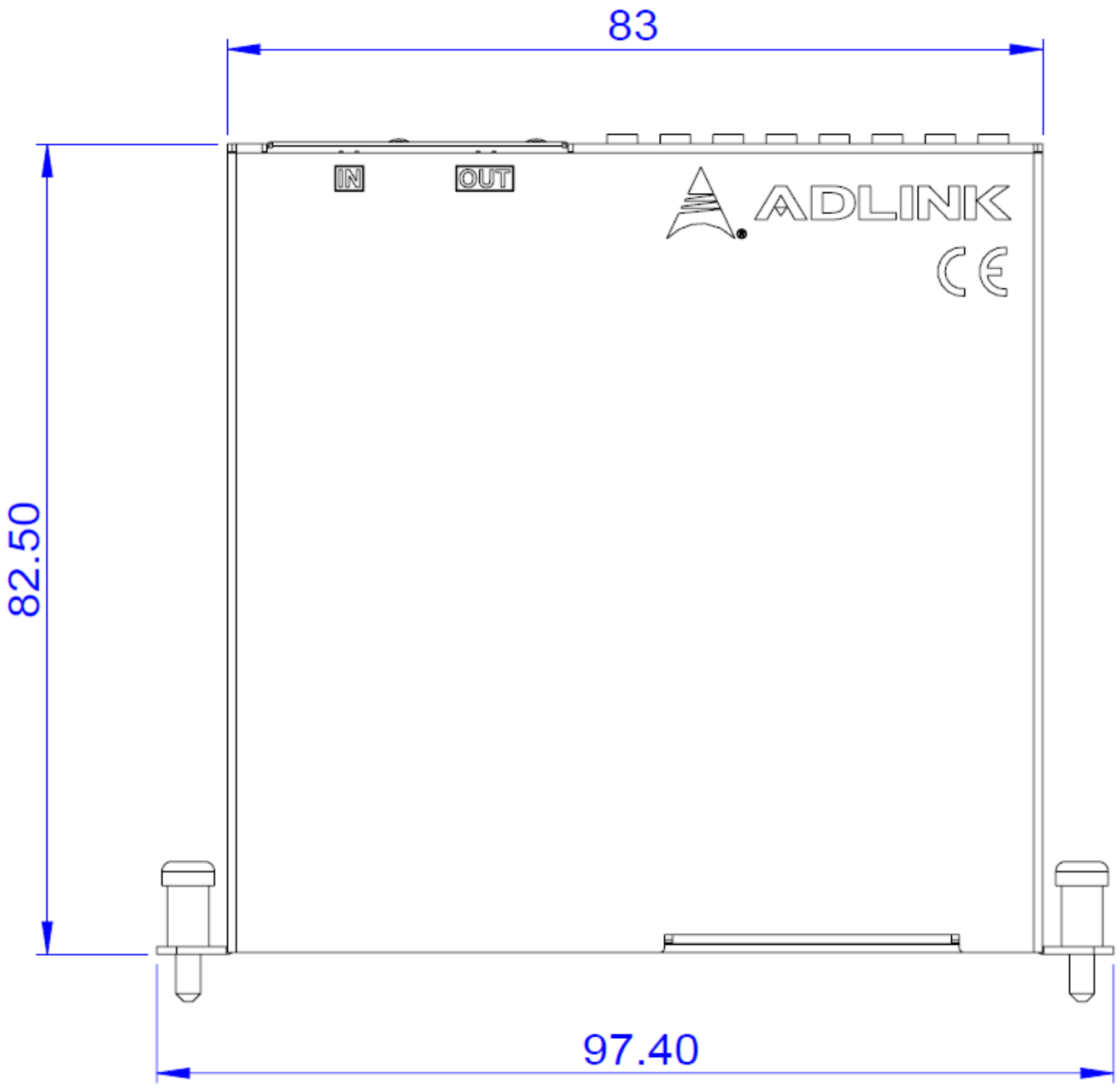


Figure 3: Mechanical dimensions (Top view)

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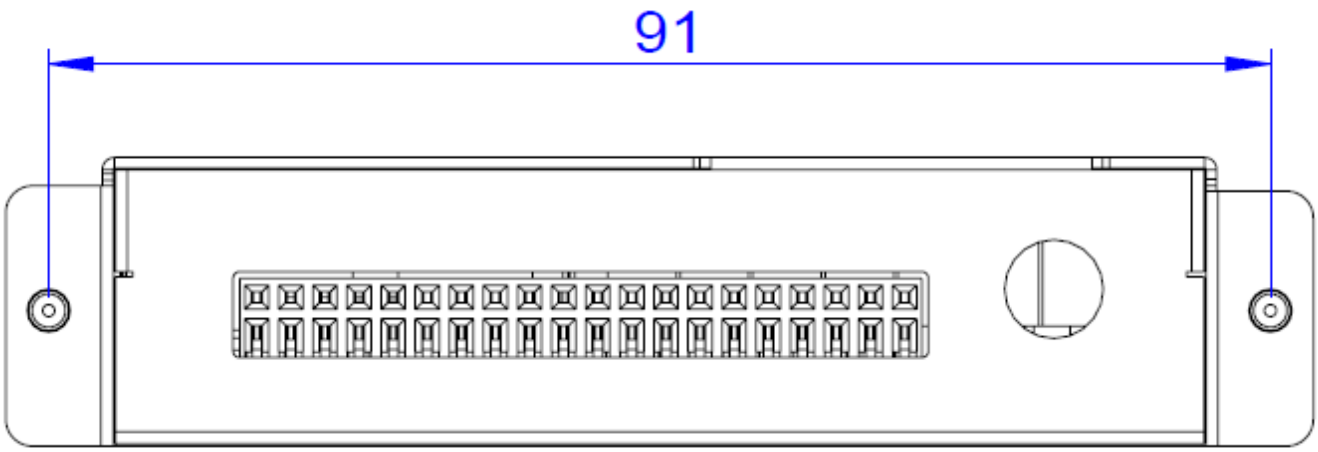


Figure 4: Mechanical dimensions (Front view)

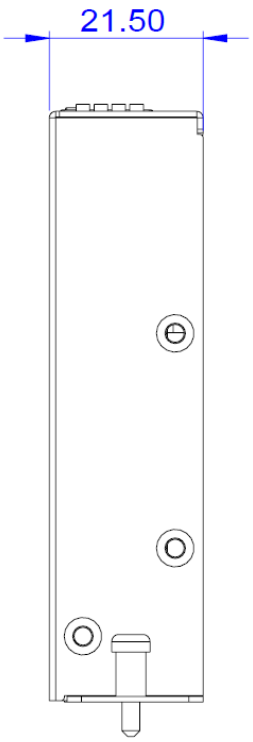


Figure 5: Mechanical dimensions (Right view)

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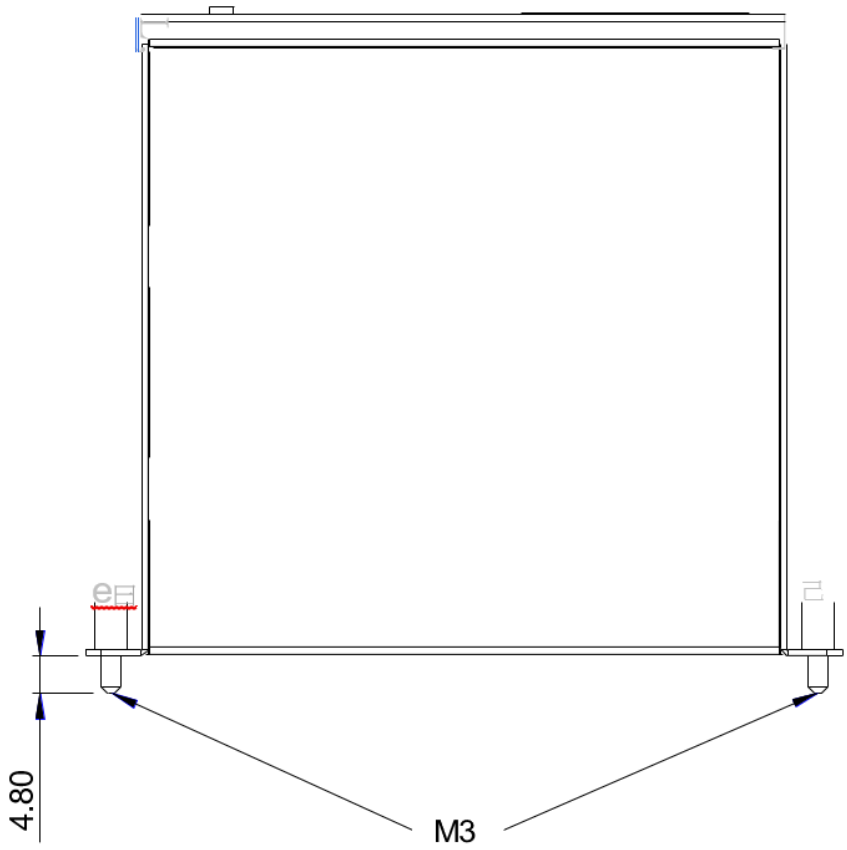
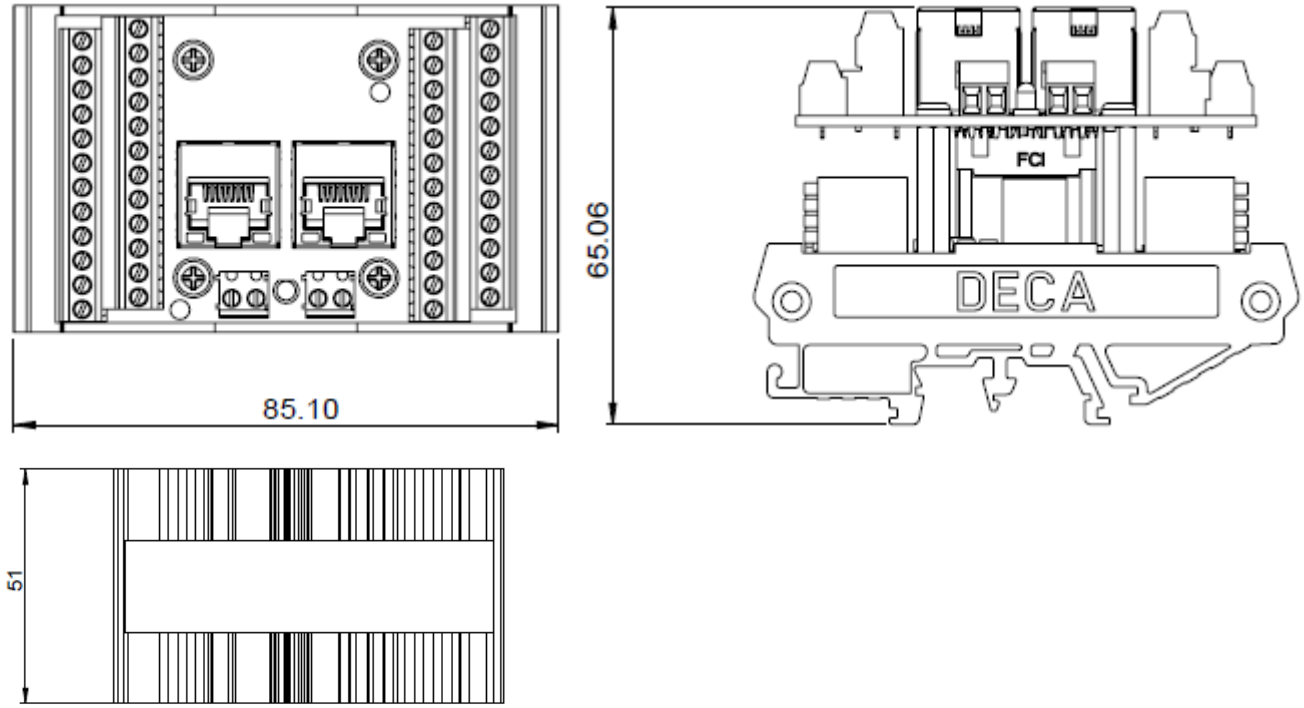


Figure 6: Mechanical dimensions (Bottom view)

4.1.1 ECAT-DI8DO8-C-NN Mechanical Dimensions

All dimensions in millimeters (mm) unless noted.



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4.2 M-Type Connector and Indicator Locations

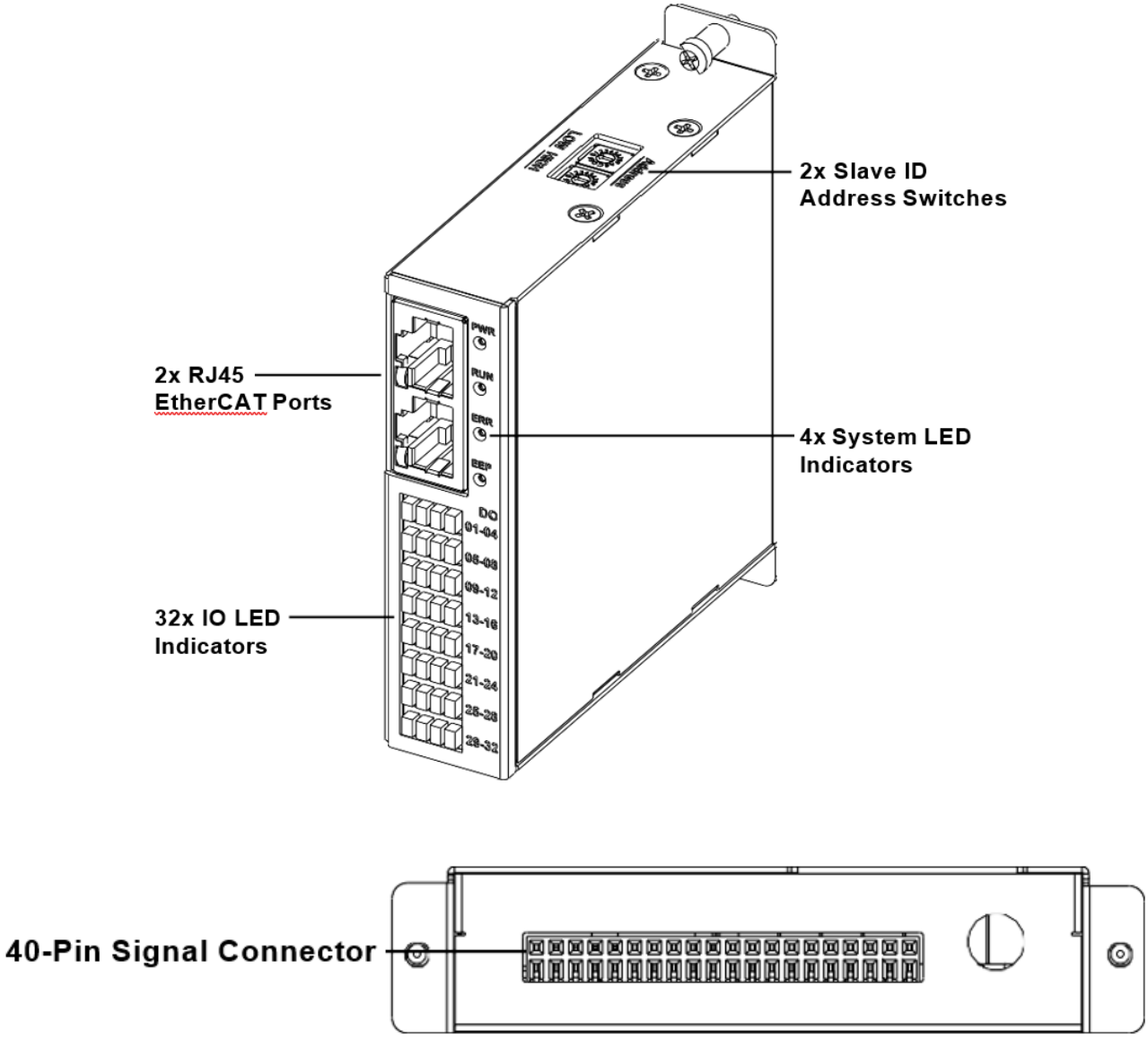


Figure 7: Connector and indicator locations

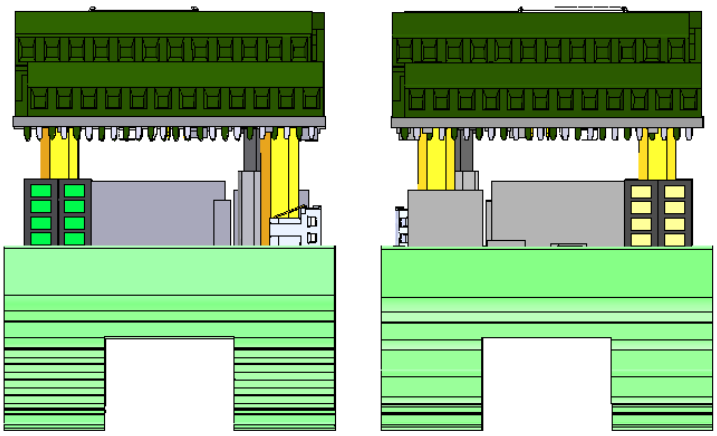
NOTE:

ECAT-AI16AO2-M-VV does not include 32x IO LED indicators.

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4.2.1 HSL-DI8DO8-C-NN Connector and Indicator Locations

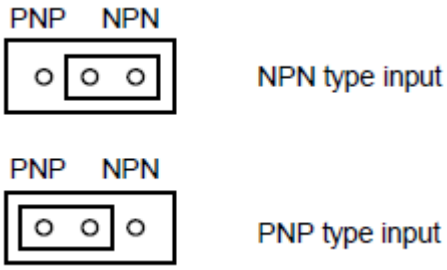
DI LED(Green)	
DI 1	DI 5
DI 2	DI 6
DI 3	DI 7
DI 4	DI 8



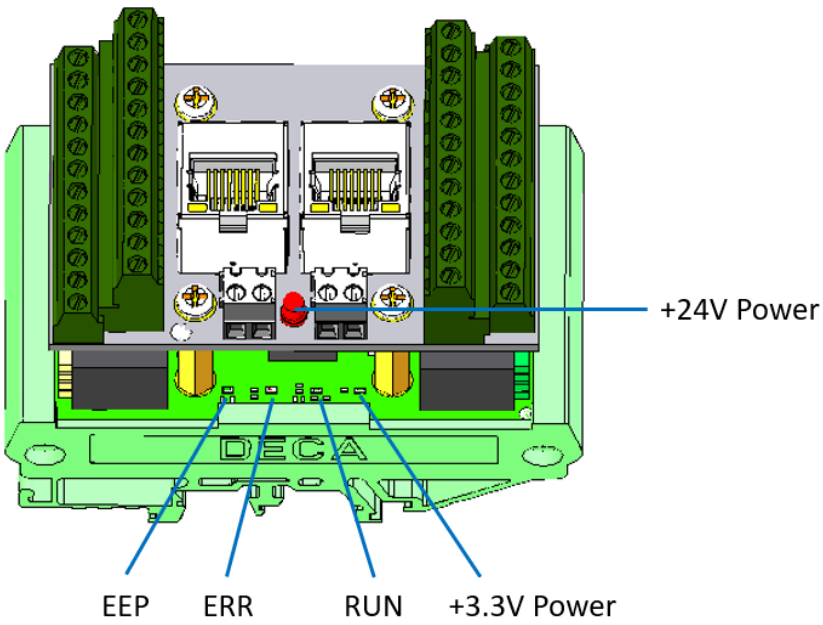
DO LED(Yellow)	
DO 5	DO 1
DO 6	DO 2
DO 7	DO 3
DO 8	DO 4

Jumper Settings:

JP1: Digital input type setting



System LEDs



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5 Connectors, Indicators, and Switches

5.1 LED Indicators

The LED indicator states follow the EtherCAT specifications.

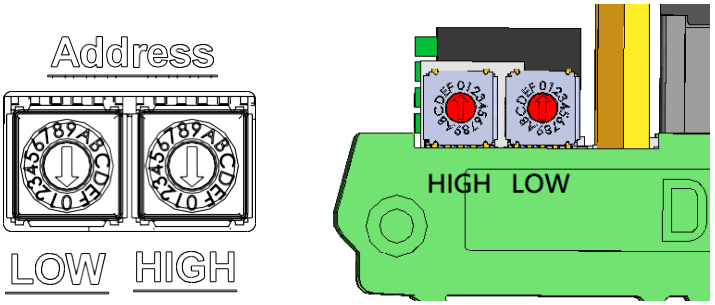
Function	Color	Status
PWR	Green	**Off**: Power off **On**: Power on
RUN	Green	**Off**: Initialization **Blinking**: Pre-Operational **Single Flash**: Safe Operational **On**: Operational **Flickering**: Bootstrap
ERR	Red	**Off**: No Error **Blinking**: Invalid Configuration **Single Flash**: Local Error **Double Flash**: Watchdog Timeout
EEP	Green	**Off**: the EEPROM is not successfully loaded by ESC **On**: the EEPROM is successfully loaded by ESC
Link (on RJ45)	Yellow	**Off**: No link **Blinking**: TX/RX activity **On**: Good link
Power (on RJ45)	Green	**Off**: power off **On**: power on
DO	Yellow	**Off**: DO state is "OFF" (DO = high) **On**: DO state is "ON" (DO = low)
DI	Green	**Off**: DI state is "OFF" (DI photocoupler is off) **On**: DI state is "ON" (DI photocoupler is on)

5.2 EtherCAT Ports

There are two RJ45 EtherCAT ports. One is the EtherCAT network "IN" and the other is the EtherCAT network "OUT". Refer to the markings on the eclosure to identify each port.

5.3 Slave ID Address Switches Settings

The slave ID address switches are used to set the ECAT IO mod- ule slave ID addresses. Index values can be set from 0 to 255. The default slave ID switch setting is 0.



HSL-DI8DO8-C-NN

NOTE:

Slave IDs can be defined in the following two ways through the settings of the Master:

1. If the Master is set to SII mode, the Slave ID is defined by the slave's EEPROM.
2. If the Master is set to AL mode, the Slave ID is defined by the slave's rotary ID address switch.

Table 1: Slave ID switch settings

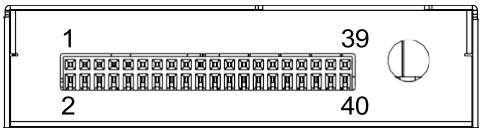
LOW	HIGH	ID	LOW	HIGH	ID	LOW	HIGH	ID	LOW	HIGH	ID
0	0	0	0	4	64	0	8	128	0	C	192
1	0	1	1	4	65	1	8	129	1	C	193
2	0	2	2	4	66	2	8	130	2	C	194
3	0	3	3	4	67	3	8	131	3	C	195
4	0	4	4	4	68	4	8	132	4	C	196
5	0	5	5	4	69	5	8	133	5	C	197
6	0	6	6	4	70	6	8	134	6	C	198
7	0	7	7	4	71	7	8	135	7	C	199
8	0	8	8	4	72	8	8	136	8	C	200
9	0	9	9	4	73	9	8	137	9	C	201
A	0	10	A	4	74	A	8	138	A	C	202
B	0	11	B	4	75	B	8	139	B	C	203
C	0	12	C	4	76	C	8	140	C	C	204
D	0	13	D	4	77	D	8	141	D	C	205
E	0	14	E	4	78	E	8	142	E	C	206
F	0	15	F	4	79	F	8	143	F	C	207
0	1	16	0	5	80	0	9	144	0	D	208
1	1	17	1	5	81	1	9	145	1	D	209
2	1	18	2	5	82	2	9	146	2	D	210
3	1	19	3	5	83	3	9	147	3	D	211
4	1	20	4	5	84	4	9	148	4	D	212
5	1	21	5	5	85	5	9	149	5	D	213
6	1	22	6	5	86	6	9	150	6	D	214
7	1	23	7	5	87	7	9	151	7	D	215
8	1	24	8	5	88	8	9	152	8	D	216
9	1	25	9	5	89	9	9	153	9	D	217
A	1	26	A	5	90	A	9	154	A	D	218
B	1	27	B	5	91	B	9	155	B	D	219
C	1	28	C	5	92	C	9	156	C	D	220
D	1	29	D	5	93	D	9	157	D	D	221
E	1	30	E	5	94	E	9	158	E	D	222
F	1	31	F	5	95	F	9	159	F	D	223
0	2	32	0	6	96	0	A	160	0	E	224
1	2	33	1	6	97	1	A	161	1	E	225
2	2	34	2	6	98	2	A	162	2	E	226
3	2	35	3	6	99	3	A	163	3	E	227
4	2	36	4	6	100	4	A	164	4	E	228
5	2	37	5	6	101	5	A	165	5	E	229
6	2	38	6	6	102	6	A	166	6	E	230
7	2	39	7	6	103	7	A	167	7	E	231

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8	2	40	8	6	104	8	A	168	8	E	232
9	2	41	9	6	105	9	A	169	9	E	233
A	2	42	A	6	106	A	A	170	A	E	234
B	2	43	B	6	107	B	A	171	B	E	235
C	2	44	C	6	108	C	A	172	C	E	236
D	2	45	D	6	109	D	A	173	D	E	237
E	2	46	E	6	110	E	A	174	E	E	238
F	2	47	F	6	111	F	A	175	F	E	239
0	3	48	0	7	112	0	B	176	0	F	240
1	3	49	1	7	113	1	B	177	1	F	241
2	3	50	2	7	114	2	B	178	2	F	242
3	3	51	3	7	115	3	B	179	3	F	243
4	3	52	4	7	116	4	B	180	4	F	244
5	3	53	5	7	117	5	B	181	5	F	245
6	3	54	6	7	118	6	B	182	6	F	246
7	3	55	7	7	119	7	B	183	7	F	247
8	3	56	8	7	120	8	B	184	8	F	248
9	3	57	9	7	121	9	B	185	9	F	249
A	3	58	A	7	122	A	B	186	A	F	250
B	3	59	B	7	123	B	B	187	B	F	251
C	3	60	C	7	124	C	B	188	C	F	252
D	3	61	D	7	125	D	B	189	D	F	253
E	3	62	E	7	126	E	B	190	E	F	254
F	3	63	F	7	127	F	B	191	F	F	255

5.3.1 40-Pin Signal Connector

The 40-pin signal connector provides input and output signals for ECAT IO series modules.



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Table 2: ECAT-DI32-M-N pin assignment

Pin	Signal	Description	Pin	Signal	Description
2	E24V	External power supply	1	E24V	External power supply
4	IO_PWR	I/O power supply	3	IO_PWR	I/O power supply
6	DICOM	Mechanical input / general input	5	DICOM	Mechanical input / general input
8	IO_GND	I/O ground	7	EGND	External power ground
10	DI2	Digital input	9	DI1	Digital input
12	DI4	Digital input	11	DI3	Digital input
14	DI6	Digital input	13	DI5	Digital input
16	DI8	Digital input	15	DI7	Digital input
18	DI10	Digital input	17	DI9	Digital input
20	DI12	Digital input	19	DI11	Digital input
22	DI14	Digital input	21	DI13	Digital input
24	DI16	Digital input	23	DI15	Digital input
26	DI18	Digital input	25	DI17	Digital input
28	DI20	Digital input	27	DI19	Digital input
30	DI22	Digital input	29	DI21	Digital input
32	DI24	Digital input	31	DI23	Digital input
34	DI26	Digital input	33	DI25	Digital input
36	DI28	Digital input	35	DI27	Digital input
38	DI30	Digital input	37	DI29	Digital input
40	DI32	Digital input	39	DI31	Digital input

Table 3: ECAT-DO32-M-N pin assignment

Pin	Signal	Description	Pin	Signal	Description
2	E24V	External power supply	1	E24V	External power supply
4	IO_PWR	I/O power supply	3	IO_PWR	I/O power supply
6	DICOM	N/A	5	DICOM	N/A
8	IO_GND	I/O ground	7	EGND	External power ground
10	DO2	Digital output	9	DO1	Digital output
12	DO4	Digital output	11	DO3	Digital output
14	DO6	Digital output	13	DO5	Digital output
16	DO8	Digital output	15	DO7	Digital output
18	DO10	Digital output	17	DO9	Digital output
20	DO12	Digital output	19	DO11	Digital output
22	DO14	Digital output	21	DO13	Digital output
24	DO16	Digital output	23	DO15	Digital output
26	DO18	Digital output	25	DO17	Digital output
28	DO20	Digital output	27	DO19	Digital output
30	DO22	Digital output	29	DO21	Digital output
32	DO24	Digital output	31	DO23	Digital output
34	DO26	Digital output	33	DO25	Digital output
36	DO28	Digital output	35	DO27	Digital output
38	DO30	Digital output	37	DO29	Digital output
40	DO32	Digital output	39	DO31	Digital output

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Table 4: ECAT-DI16DO16-M-NN pin assignment

Pin	Signal	Description	Pin	Signal	Description
2	E24V	External power supply	1	E24V	External power supply
4	IO_PWR	I/O power supply	3	IO_PWR	I/O power supply
6	DICOM	Mechanical input / general input	5	DICOM	Mechanical input / general input
8	IO_GND	I/O ground	7	EGND	External power ground
10	DI2	Digital input	9	DI1	Digital input
12	DI4	Digital input	11	DI3	Digital input
14	DI6	Digital input	13	DI5	Digital input
16	DI8	Digital input	15	DI7	Digital input
18	DI10	Digital input	17	DI9	Digital input
20	DI12	Digital input	19	DI11	Digital input
22	DI14	Digital input	21	DI13	Digital input
24	DI16	Digital input	23	DI15	Digital input
26	DO2	Digital output	25	DO1	Digital output
28	DO4	Digital output	27	DO3	Digital output
30	DO6	Digital output	29	DO5	Digital output
32	DO8	Digital output	31	DO7	Digital output
34	DO10	Digital output	33	DO9	Digital output
36	DO12	Digital output	35	DO11	Digital output
38	DO14	Digital output	37	DO13	Digital output
40	DO16	Digital output	39	DO15	Digital output

Table 5: ECAT-AI16AO2-M-VV pin assignment

Pin	Signal	Description	Pin	Signal	Description
2	E24V	External power supply	1	E24V	External power supply
4	IO_PWR	I/O power supply	3	IO_PWR	I/O power supply
6	DICOM	Mechanical input and general input common	5	DICOM	Mechanical input and general input common
8	IO_GND	I/O ground	7	EGND	External power ground
10	---	Reserve	9	---	Reserve
12	AGND	Analog GND	11	AGND	Analog GND
14	AGND	Analog GND	13	AGND	Analog GND
16	AGND	Analog GND	15	AGND	Analog GND
18	AGND	Analog GND	17	AGND	Analog GND
20	AGND	Analog GND	19	AGND	Analog GND
22	AGND	Analog GND	21	AGND	Analog GND
24	AI1/AI0-	Analog input	23	AI0/AI0+	Analog input
26	AI3/AI1-	Analog input	25	AI2/AI1+	Analog input
28	AI5/AI2-	Analog input	27	AI4/AI2+	Analog input
30	AI7/AI3-	Analog input	29	A6/AI3+	Analog input
32	AI9/AI4-	Analog input	31	AI8/AI4+	Analog input
34	AI11/AI5-	Analog input	33	AI10/AI5+	Analog input
36	AI13/AI6-	Analog input	35	AI12/AI6+	Analog input
38	AI15/AI7-	Analog input	37	AI14/AI7+	Analog input

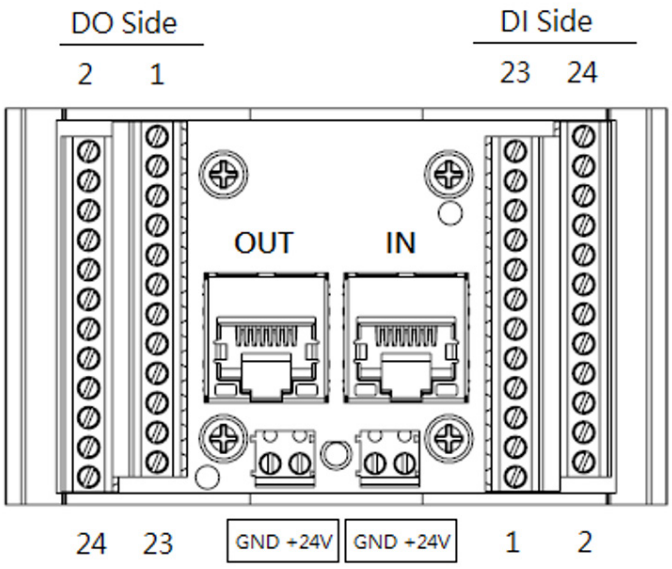
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40	AO1	Analog output	39	AO0	Analog output

Single-ended mode Pin define on terminal board				Differential mode Pin define on terminal board			
Terminal Pin No.	Signal name	Terminal Pin No.	Signal name	Terminal Pin No.	Signal name	Terminal Pin No.	Signal name
1	NC	17	AI2	1	NC	17	AI1+
2	NC	18	AI3	2	NC	18	AI1-
3	AGND	19	AI4	3	AGND	19	AI2+
4	AGND	20	AI5	4	AGND	20	AI2-
5	AGND	21	AI6	5	AGND	21	AI3+
6	AGND	22	AI7	6	AGND	22	AI3-
7	AGND	23	AI8	7	AGND	23	AI4+
8	AGND	24	AI9	8	AGND	24	AI4-
9	AGND	25	AI10	9	AGND	25	AI5+
10	AGND	26	AI11	10	AGND	26	AI5-
11	AGND	27	AI12	11	AGND	27	AI6+
12	AGND	28	AI13	12	AGND	28	AI6-
13	AGND	29	AI14	13	AGND	29	AI7+
14	AGND	30	AI15	14	AGND	30	AI7-
15	AI0	31	AO0	15	AI0+	31	AO0
16	AI1	32	AO1	16	AI0-	32	AO1

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Table 6: ECAT-DI8DO8-C-NN pin assignment



DO Side

Pin	Signal	Description	Pin	Signal	Description
2	G	I/O ground	1	G	I/O ground
4	13	Digital output 5	3	9	Digital output 1
6	V+	I/O power supply	5	V+	I/O power supply
8	G	I/O ground	7	G	I/O ground
10	14	Digital output 6	9	10	Digital output 2
12	V+	I/O power supply	11	V+	I/O power supply
14	G	I/O ground	13	G	I/O ground
16	15	Digital output 7	15	11	Digital output 3
18	V+	I/O power supply	17	V+	I/O power supply
20	G	I/O ground	19	G	I/O ground
22	16	Digital output 8	21	12	Digital output 4
24	V+	I/O power supply	23	V+	I/O power supply

DI Side

Pin	Signal	Description	Pin	Signal	Description
2	G	I/O ground	1	G	I/O ground
4	5	Digital input 5	3	1	Digital input 1
6	V+	I/O power supply	5	V+	I/O power supply
8	G	I/O ground	7	G	I/O ground
10	6	Digital input 6	9	2	Digital input 2
12	V+	I/O power supply	11	V+	I/O power supply
14	G	I/O ground	13	G	I/O ground
16	7	Digital input 7	15	3	Digital input 3
18	V+	I/O power supply	17	V+	I/O power supply
20	G	I/O ground	19	G	I/O ground
22	8	Digital input 8	21	4	Digital input 4
24	V+	I/O power supply	23	V+	I/O power supply

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6 Hardware and Software Driver Installation

6.1 Hardware Configuration

The ECAT IO Series is composed of two parts: an EtherCAT IO module and a terminal board.

6.2 Installation Procedures

1. Read through this manual and setup the jumper and I/O signals according to your application. The EtherCAT master will be automatically allocated according to the serial connection sequence of the ECAT IO module.
2. Carefully install the ECAT IO module on the terminal board until seated.
3. Secure the ECAT IO module to the terminal board with the 2 screws.
4. Using the terminal board DIN rail bracket, insert the DIN rail into the slots on the DIN rail attachment plate.
5. Connect DC power cables. (The DC power input connectors on the terminal board are E_24V, IO_24V, E_GND, IO_GND.)
6. Connect shielded ethernet cable to the RJ45 connector between EtherCAT Master and slave or between slaves.
7. Turn on the 24V DC power.
8. Verify the communication and IO signals between all modules via Motion Creator Pro 2.

6.3 Troubleshooting

If the computer cannot power on normally or the motion control system operates abnormally after system installation, follow the steps described below for troubleshooting. If the problem persists, consult your dealer for technical service.

Problem	Correction
Motion Creator Pro 2™ does not launch after driver installation.	Ensure .NET framework v3.5 or later is installed.
The NO Signal indicator in Motion Creator Pro 2™ appears after the slave is connected and the slave does not work.	Ensure 24 VDC power is provided to the system.
EtherCAT slaves (including servo/ stepper drive or I/O) in Motion Creator Pro 2™ will not connect.	Ensure all Ethernet cables connect all EtherCAT slave devices properly and every slave device is turned on for connection. Shielded CAT5e cable is recommended for best impedance matching.

6.4 Software Driver Installation

1. Download the APS SDK file from ADLINK and run it. The installation will start automatically.
2. Select **NEXT** as prompted to complete the installation.
3. After the installation is complete, select **FINISH**.
4. Restart the computer.

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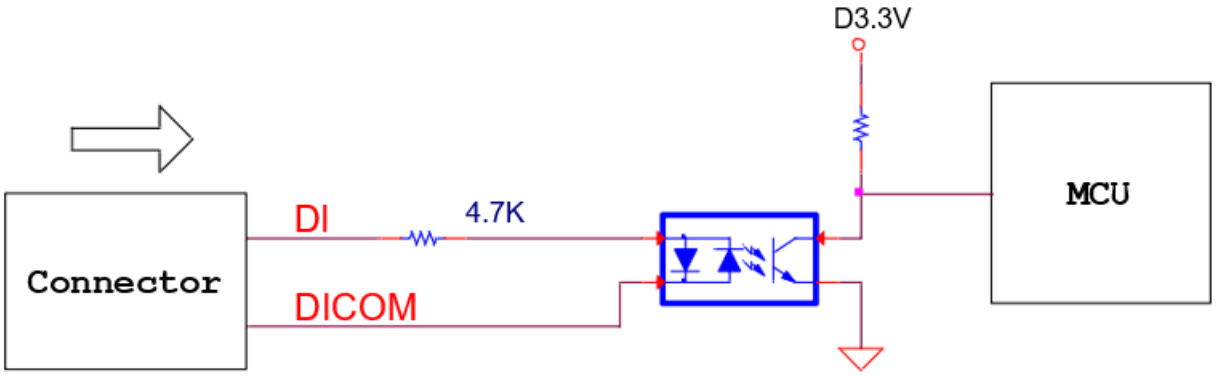
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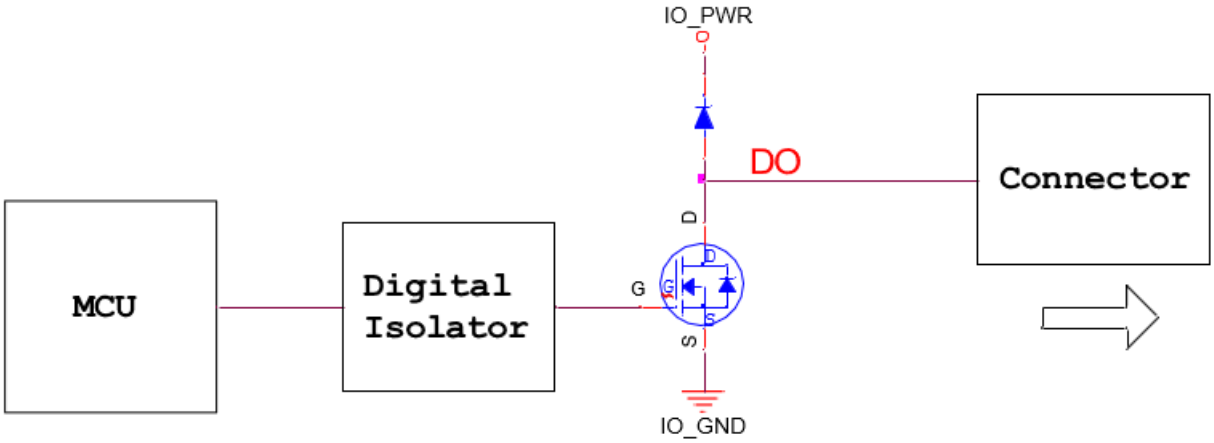
7 Signal Connections

Signal connections of all I/Os are described in this chapter. Refer to the contents of this chapter before wiring any cables between the ECAT IO Series module and any sensor devices.

7.1 Isolated Digital Input



7.2 Isolated Digital Output



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8 Process Data Objects

Process Data Objects are a fundamental concept in the EtherCAT protocol and are used to exchange real-time process data between EtherCAT devices. The definition of ECAT IO series modules is as follows.

8.1 ECAT-DI32

Index	Sub Index	Name/Description	PDO Mapping	Range	Data Type	Access	Description
0x6001	1	DI32	TxPDO	0~FFFF	U32	R	Digital input 32-ch data

8.2 ECAT-DO32

Index	Sub Index	Name/Description	PDO Mapping	Range	Data Type	Access	Description
0x7000	1	DO32	RxPDO	0~FFFF	U32	RW	Digital output 32-ch data
0x5000	0	Retain option for DO32	N/A	0~1	U32	RW	1. Retain option for digital output while network disconnected. 2. If value is 0, digital output will be retained. If value is 1 or above, digital output will not be retained. 3. Default retain option is 0.

8.3 ECAT-DI16DO16

Index	Sub Index	Name/Description	PDO Mapping	Range	Data Type	Access	Description
0x6002	1	DI16	TxPDO	0~FFFF	U16	R	Digital input 16-ch data
0x7002	1	DO16	RxPDO	0~FFFF	U16	RW	Digital output 16-ch data
0x5002	0	Retain option for DO16	N/A	0~1	U16	RW	1. Retain option for digital output while network disconnected. 2. If value is 0, digital output will be retained. If value is 1 or above, digital output will not be retained. 3. Default retain option is 0.

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8.4 ECAT-AI16AO2

Index	Sub Index	Name/Description	PDO Mapping	Range	Data Type	Access	Description
0x6003	1	CH0	TxPDO	0xFFFF	U16	R	Analog input Ch0~CH15 data (*)
	2	CH1					
	3	CH2					
	4	CH3					
	5	CH4					
	6	CH5					
	7	CH6					
	8	CH7					
	9	CH8					
	10	CH9					
	11	CH10					
	12	CH11					
	13	CH12					
	14	CH13					
	15	CH14					
	16	CH15					
0x7003	1	CH0	RxPDO	0~FFFF	U16	RW	Analog output Ch0 data (**)
	2	CH1	RxPDO	0~FFFF	U16	RW	Analog output Ch1 data
0x5003	0	Retain option for AO2	n/a	0~1	U16	RW	0: Retain AO when disconnection 1: Do not retain AO when disconnection
0x5004	0	Range option for AI16	n/a	0~3	U16	RW	0: +-10V 1: +-5V 2: +-2.5V 3: +-1.25V
0x5005	0	Mode option for AI16	n/a	0~1	U16	RW	0: single mode for analog input 1: diff mode for analog input

(*) Analog input formula:

- Signed 16-bit value
- Range: configured by OD 0x5004
- Resolution:
- +-10V: 10V / 2^15 = 0.0005V
- +-5V: 5V / 2^15
- +-2.5V: 2.5V / 2^15
- +-1.25V: 1.25V / 2^15
- Actual_voltage = ADC_code * Resolution

(**)Analog output formula:

- Signed 16-bit value
- Range: -10V to 10V
- Resolution: 10.0V / 2^15
- Actual_voltage = DAC_code * Resolution

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8.5 ECAT-DI8DO8

Index	Sub Index	Name/Description	PDO Mapping	Range	Data Type	Access	Description
0x600C	1	DI8	TxPDO	0~FFFF	U8	R	Digital input 8-ch data
0x700C	1	DO8	RxPDO	0~FFFF	U8	RW	Digital output 8-ch data
0x5002	0	Retain option for DO16/DO8	N/A	0~1	U32	RW	4. Retain option for digital output while network disconnected. 5. If value is 0, digital output will be retained. If value is 1 or above, digital output will not be retained. 6. Default retain option is 0.

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9 Appendix A Object Dictionary

An Object Dictionary is a structured collection of data objects that define the behavior, parameters, and communication characteristics of each ECAT IO module.

9.1 ECAT-DI32 Object Dictionary

Index	Sub Index	Name / Description	Access	Default Value
0x1000	0	Device type	RO	0x00810191
0x1001	0	Error Register	RO	0x00
0x1008	0	Device Name	RO	ECAT-DI32-M-N
0x1009	0	Hardware version	RO	A.1
0x100A	0	Software version	RO	2023021401
0x1018	0	identify	RO	4
0x1018	01	Vender ID	RO	0x0000144A
0x1018	02	Product Code	RO	0x00025100
0x1018	03	Revision	RO	0x00000001
0x1018	04	Serial number	RO	0x00000000

9.2 ECAT-DO32 Object Dictionary

Index	Sub Index	Name / Description	Access	Default Value
0x1000	0	Device type	RO	0x00820191
0x1001	0	Error Register	RO	0x00
0x1008	0	Device Name	RO	ECAT-DO32-M-N
0x1009	0	Hardware version	RO	A.1
0x100A	0	Software version	RO	2023021401
0x1018	0	identify	RO	4
0x1018	01	Vender ID	RO	0x0000144A
0x1018	02	Product Code	RO	0x00015100
0x1018	03	Revision	RO	0x00000001
0x1018	04	Serial number	RO	0x00000000

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9.3 ECAT-DI16DO16 Object Dictionary

Index	Sub Index	Name / Description	Access	Default Value
0x1000	0	Device type	RO	0x00830191
0x1001	0	Error Register	RO	0x00
0x1008	0	Device Name	RO	ECAT-DI16DO16-M-NN
0x1009	0	Hardware version	RO	A.1
0x100A	0	Software version	RO	2023050901
0x1018	0	identify	RO	4
0x1018	01	Vender ID	RO	0x0000144A
0x1018	02	Product Code	RO	0x00035100
0x1018	03	Revision	RO	0x00000001
0x1018	04	Serial number	RO	0x00000000

9.4 ECAT-AI16AO2 Object Dictionary

Index	Sub Index	Name / Description	Access	Default Value
0x1000	0	Device type	RO	0x008C0191
0x1001	0	Error Register	RO	0x00
0x1008	0	Device Name	RO	ECAT-AI16AO2-M-VV
0x1009	0	Hardware version	RO	A.1
0x100A	0	Software version	RO	2024122001
0x1018	0	identify	RO	4
0x1018	01	Vender ID	RO	0x0000144A
0x1018	02	Product Code	RO	0x00045100
0x1018	03	Revision	RO	0x00000001
0x1018	04	Serial number	RO	0x00000000

9.5 ECAT-DI8DO8 Object Dictionary

Index	Sub Index	Name / Description	Access	Default Value
0x1000	0	Device type	RO	0x00830191
0x1001	0	Error Register	RO	0x00
0x1008	0	Device Name	RO	ECAT-DI8DO8-C-NN
0x1009	0	Hardware version	RO	A.1
0x100A	0	Software version	RO	2026011901
0x1018	0	identify	RO	4
0x1018	01	Vender ID	RO	0x0000144A
0x1018	02	Product Code	RO	0x00055100
0x1018	03	Revision	RO	0x00000001
0x1018	04	Serial number	RO	0x00000000

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10 Appendix B TwinCAT

TwinCAT® is a software system from Beckhoff that provides an integrated development environment (IDE) for programming and configuring industrial automation and control systems.

This appendix will show how to connect an ECAT IO via TwinCAT and operate the IO functions.

10.1 Import EtherCAT Slave Information (ESI) Files

An ESI file is typically provided in an XML format and can be accessed and read by EtherCAT configuration and programming tools that support the EtherCAT communication protocol. The ESI file is an essential component of an EtherCAT system, as it enables the EtherCAT master device to communicate with and control EtherCAT slave devices on the network.

ESI files must be imported into the TwinCAT I/O EtherCAT installation folder before initiating TwinCAT.

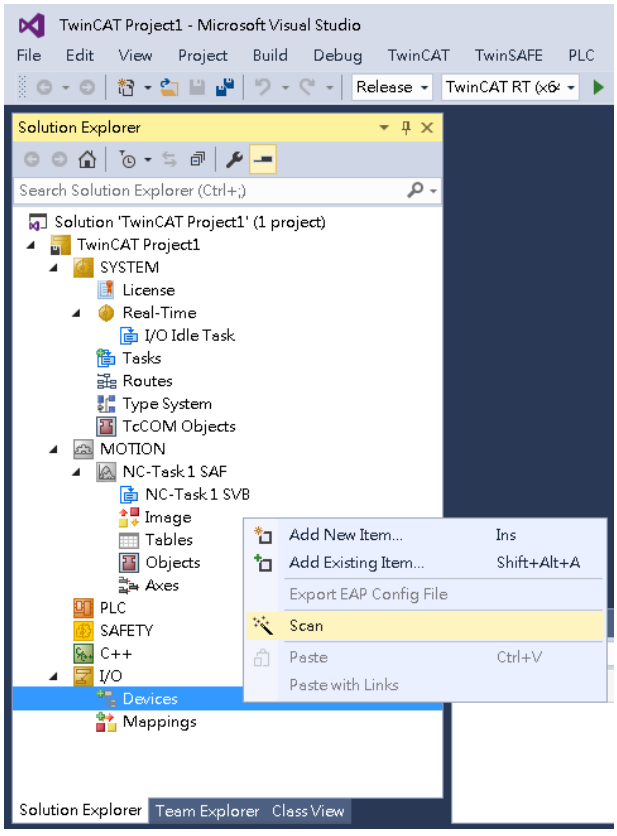
Using TwinCAT version 3.1 as an example, the default path is C:\TwinCAT\3.1\Config\Io\EtherCAT.

After importing an ESI file, reopen TwinCAT and wait for the utility to rebuild the EtherCAT device description cache.

10.2 Activate ECAT I/O Devices

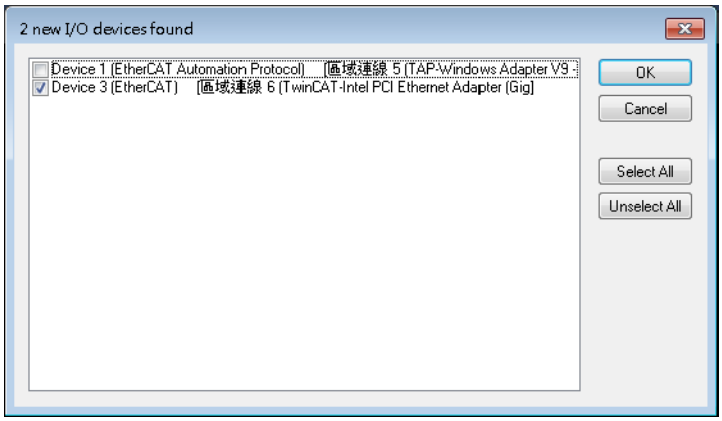
Follow the steps below to activate ECAT IO devices.

1. Create a project and right-click **I/O>Devices**, then select **Scan** to initiate a scan for EtherCAT devices.

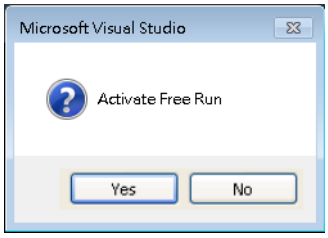


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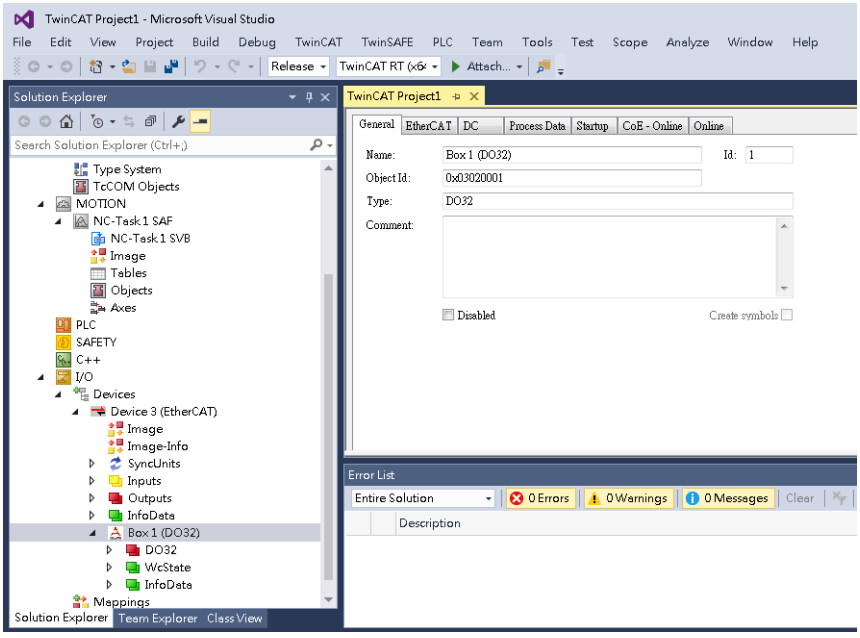
All network interface cards will be listed in the popup win- dow. If slaves are connected to the network interface card and have been identified by TwinCAT, the will be checked. Click **OK**.



2. Click **Yes** to activate the slave.



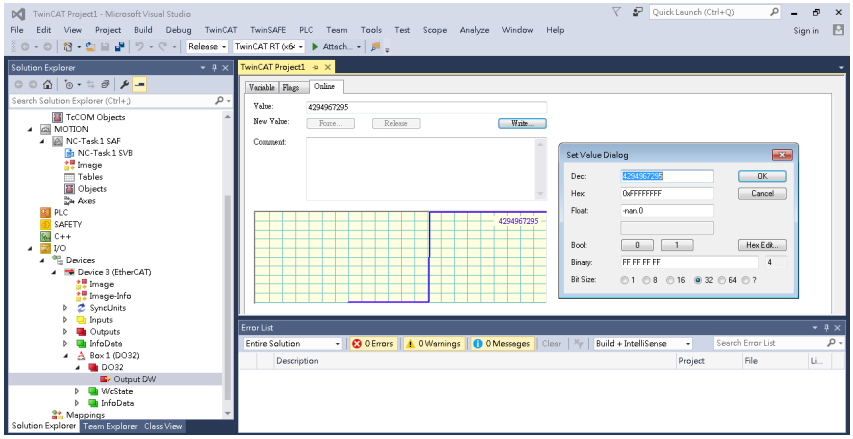
3. ECAT IO will be listed as a slave device of the EtherCAT master and the Run status LED will be green. This indicates that the user can begin operating the device.



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10.3 Operation

In this example, there is an ECAT-DO32 module in the topology with 32 digital output channels which are respectively controlled by bits 0-31. A bit value of "0" means it is turned off, and a bit value of "1" means it is turned on. The setting in the picture is decimal value "4,294,967,295", which means that all channels are turned on.



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Safety Instructions

For user safety, please read and follow all instructions, Warnings, Cautions, and Notes marked in this manual and on the associated device before handling/operating the device, to avoid injury or damage.

S'il vous plaît prêter attention stricte à tous les avertissements et mises en garde figurant sur l'appareil , pour éviter des blessures ou des dommages.

- Read these safety instructions carefully.
- Keep the User's Manual for future reference.
- Read the Specifications section of this manual for detailed information on the recommended operating environment.
- The device can be operated at an ambient temperature of 50ºC.
- When installing/mounting or uninstalling/removing device; or when removal of a chassis cover is required for user servicing:
  - Turn off power and unplug any power cords/cables.
  - Reinstall all chassis covers before restoring power.
- To avoid electrical shock and/or damage to device:
  - Keep device away from water or liquid sources.
  - Keep device away from high heat or humidity.
  - Keep device properly ventilated (do not block or cover ventilation openings).
  - Always use recommended voltage and power source settings.
  - Always install and operate device near an easily accessible electrical outlet.
  - Secure the power cord (do not place any object on/over the power cord).
  - Only install/attach and operate device on stable surfaces and/or recommended mountings.
- If the device will not be used for long periods of time, turn off and unplug from its power source.
- Never attempt to repair the device, which should only be serviced by qualified technical personnel using suitable tools.
- A Lithium-type battery may be provided for uninterrupted backup or emergency power.



Risk of explosion if battery is replaced with one of an incorrect type; please dispose of used batteries appropriately.

- The device must be serviced by authorized technicians when:
  - The power cord or plug is damaged.
  - Liquid has entered the device interior.
  - The device has been exposed to high humidity and/or moisture.
  - The device is not functioning or does not function according to the User's Manual.
  - The device has been dropped and/or damaged and/or shows obvious signs of breakage.
- Disconnect the power supply cord before loosening the thumbscrews and always fasten the thumbscrews with a screwdriver before starting the system up.
- It is recommended that the device be installed only in a server room or computer room where access is:
  - Restricted to qualified service personnel or users familiar with restrictions applied to the location, reasons therefore, and any precautions required.

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- Only afforded by the use of a tool or lock and key, or other means of security, and controlled by the authority responsible for the location.

- If PoE (Power over Ethernet) is enabled for the device, the system can ONLY be deployed indoors. Unless otherwise noted, the PoE system is NOT designed to withstand the rigors of outdoor use.

	**BURN HAZARD** Touching this surface could result in bodily injury. To reduce risk, allow the surface to cool before touching.

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Consignes de Sécurité Importante

S'il vous plaît prêter attention stricte à tous les avertissements et mises en garde figurant sur l'appareil, pour éviter des blessures ou des dommages.

- *Lisez attentivement ces consignes de sécurité.*
- *Conservez le manuel de l'utilisateur pour pouvoir le con- sulter ultérieurement.*
- *Lisez la section Spécifications de ce manuel pour des infor- mations détaillées sur l'environnement d'exploitation recom- mandé.*
- *L'appareil peut être utilisé à une température ambiante de 45°C avec entrée CC pour les série MVP-61; 35ºC avec entrée adaptateur pour la série MVP-61.*
- *Il est recommandé d'installer l'appareil dans des salles de technologie de l'information conformes à l'article 645 du National Electrical Code et à la NFPA 75.*
- *Pour éviter les chocs électriques et/ou d'endommager l'appareil:*
  - *Tenez l'appareil à l'écart de toute source d'eau ou de liq- uide.*
  - *Tenez l'appareil à l'écart d'une forte chaleur ou d'une humidité élevée.*
  - *Maintenez l'appareil correctement ventilé (n'obstruer ou ne couvrez pas les ouvertures de ventilation).*
  - *Utilisez toujours les réglages de tension et de source d'alimentation recommandés.*
  - *Installez et utilisez toujours l'appareil près d'une prise de courant facilement accessible.*
  - *Fixez le cordon d'alimentation (ne placez aucun objet sur le cordon d'alimentation).*
  - *Installez/fixez et utilisez l'appareil uniquement sur des surfaces stables et/ou sur les fixations recommandées.*
  - *Le cordon d'alimentation doit être connecté à une prise ou à une prise de courant avec mise à la terre.*
- Si l'appareil ne doit pas être utilisé pendant de longues péri- odes, éteignez-le et débranchez-le de sa source d'alimenta- tion
- *N'essayez jamais de réparer l'appareil, qui ne doit être réparé que par un personnel technique qualifié à l'aide d'outils appro- priés*
- *Une batterie de type Lithium peut être fournie pour une ali- mentation de secours ininterrompue ou d'urgence.*



ATTENTION: *Risque d'explosion si la pile est remplacée par une autre de type incorrect. Veuillez jeter les piles usagées de façon appropriée.*

- *Cet équipement ne convient pas à une utilisation dans des lieux pouvant accueillir des enfants.*
- *L'appareil doit être entretenu par des techniciens agrees lorsque:*
- *Le cordon d'alimentation ou la prise est endommagé(e)*
- *Un liquide a pénétré à l'intérieur de l'appareil.*
- *L'appareil a été exposé à une forte humidité et/ou de la buée.*
- *L'appareil ne fonctionne pas ou ne fonctionne pas selon le manuel de l'utilisateur.*
- *L'appareil est tombé et/ou a été endommagé et/ou présente des signes évidents de dommage.*
- *Débranchez le cordon d'alimentation avant de desserrer les vis à oreilles et serrez toujours les vis à oreilles avec un tourn- evis avant de mettre le système en marche.*
- *Il est recommandé d'installer l'appareil uniquement dans une salle de serveurs ou une salle informatique où l'accès est:*
  - *Réservé au personnel de service qualifié ou aux utilisa- teurs familiarisés avec les restrictions appliquées à l'emplacement, aux raisons de ces restrictions et toutes les précautions requises*
  - *Uniquement autorisé par l'utilisation d'un outil, d'une serrure et d'une clé, ou d'un autre moyen de*

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sécurité, et contrôlé par l'autorité responsable de l'emplacement.

	***RISQUE DE BRÛLURES*** ***Partie chaude!*** *Ne touchez pas cette surface, cela pourrait entraîner des blessures. Pour éviter tout danger, laissez la surface refroidir avant de la toucher.*

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Getting Services

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ADLINK Technology, Inc.
Address: No. 66, Huaya 1st Road, Guishan District
Taoyuan City 333, Taiwan
Tel: +886-3-216-5088
Fax: +886-3-328-5723
Email: service@adlinktech.com

Ampro ADLINK Technology, Inc.
Address: 6450 Via Del Oro, San Jose, CA 95119-1208, USA
Tel: +1-408-360-0200
Toll Free: +1-800-966-5200 (USA only)
Fax: +1-408-600-1189
Email: info@adlinktech.com

ADLINK Technology (China) Co., Ltd.
Address: 300 Fang Chun Rd., Zhangjiang Hi-Tech Park, Pudong New Area
Shanghai, 201203 China
Tel: +86-21-5132-8988
Fax: +86-21-5132-3588
Email: market@adlinktech.com

ADLINK Technology GmbH
Address: Hans-Thoma-Strasse 8-10, 68163 Mannheim, Germany
Tel: +49-621-43214-0
Fax: +49-621 43214-30
Email: emea@adlinktech.com

Please visit the Contact page at www.adlinktech.com for information on how to contact the ADLINK regional office nearest you.

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