CC-Link to EtherCAT Gateway

DGW-CE
User Manual
(R1) Version 1.0

DAINCUBE Corp.

주의: The contents may differ depending on the manual version.

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DGW-CE Hardware User Manual
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Preface

Copyright notice

Important information

This documentation is intended for qualified audience only. The product described herein is not an end user product. It was developed and manufactured for further processing by trained personnel.

Disclaimer

Although this document has been generated with the utmost care no warranty or liability for correctness or suitability for any particular purpose is implied. The information in this document is provided "as is" and is subject to change without notice.

Trademarks

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Safety precautions

Be sure to observe all of the following safety precautions.

Strict observance of these warning and caution indications are a MUST for preventing accidents, which could result in bodily injury and substantial property damage. Make sure you fully understand all definitions of these terms and related symbols given below, before you proceed to the manual.

Symbols

The following symbols may be used in this specification:

Warning: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury or damage to the equipment. Be careful of handling and handling.

Caution: Indicates that you must do this.

Prohibition: Indicates that you should never.

Revision history

Revision	Data	Comment
Version 1.0	2019.02.07	Initial Version

Contents

1. Safety Information 5

2. Warranty and warranty coverage 7

2.1. Warranty period 7
2.2. Scope of the warranty 7
2.3. Service coverage 7
2.4. Fire extinguish 7

3. Product description 8

3.1. Outline and dimensions 8
3.2. Specification 9
3.3. Overall configuration 10
3.4. Functional diagram 11
3.5. Mounting guide 12

4. EtherCAT 14

4.1. Process Data Object 14

5. CC-Link V1.1 16

5.1. Profile 16

6. Connectors 18

6.1. Connector description 18
6.2. Main Power 18
6.3. EtherCAT (RJ45) 18
6.4. EtherNet/IP (Not Used) 18
6.5. CC-Link Connector 19
6.6. USB to Serial (USB Dongle Optional) 19

7. Switches 20

7.1. CC-Link Baudrate Switch 20
7.2. CC-Link Station Number Switch 20

8. General care and maintenance 21

9. Appendix 22

1. Safety Information

- Before unpacking and installing the product or adding it to the unit, carefully read all the instructions that come with the package.
- Do not use the product in extreme dust, humidity or temperature conditions. Do not install the product where it is wet.
- The power cord must be disconnected before performing assembly and adjustment work or maintenance and inspection of the machine. There is a danger of electric shock.
- Turn off the power for 5 minutes before servicing the product and wait for longer. Otherwise, residual charge may cause electric shock.

Warning

- Please check the grounding before installing and using the product. There is a risk of injury due to electric shock.
- Use the device within the indicated voltage range.
- Operators must have more than a certain level of technical knowledge through training and be familiar with the details of the intended use described in the user manual.
- After installing the product, check the wiring to the main unit again and apply power.
- When the user (customer) extends wiring, malfunction may occur due to faulty wiring. In this case, inspect wiring thoroughly and check it for properness before turning on the power.
- Before operating the unit, be sure to check that there is no danger in or around the operating range.
- Do not allow water or oil to get on the unit and the power cord.
- Install the unit in a place which can endure its weight and conditions while running.
- Take care not to squeeze and thus damage the cable with any object.
- Do not lay the cable over sharp edges to avoid damaging the cable sheath.
- Check the mounting screws regularly so that they are always firmly tightened.
- Never touch terminals directly or internal parts of controller.
- Do not disassemble or modify the product.
- Before carrying out assembly and adjustment work or maintenance and inspection work of the machine, be sure to disconnect the power cord.
- Connect the power supply after completing the adjustment of all the cables and switches.

Caution

- After the shutdown window, turn off the power supply. Otherwise the components could be destroyed or undefined signals could occur.
- To prevent the equipment from falling to the ground.
- Never lay the device onto unstable surfaces. It could fall to ground and thus be damaged.
- It is recommended to use the unit in an environment where no electrical noise is present.
- In noisy environments, use a filter fitted.
- Never lay the device close to heat sources or into direct sunlight.
- Avoid exposing the device to mechanical vibrations, excessive dust, and humidity or to strong magnetic fields.
- Make sure that no foreign objects or liquids can penetrate into the device.
- Wipe the power plug with a clean, dry cloth periodically to eliminate dust.
- Always pay special attention to the robot's movement in the Teach Mode.

2. Warranty and warranty coverage

DAINCUBE's products are delivered only after passing strict quality inspection before shipment.

2.1. Warranty period

The warranty period is as follows

- 12 months after our shipment.

2.2. Scope of the warranty

Where a defective condition occurs during proper use conditions and obviously under the responsibility of the manufacturer, within the term above, we shall repair the product without charge.
However, any items that apply to the following are excluded from the warranty coverage.

- The warranty is not valid if the defect is due to accidental damage, mishandling, misuse, voltage fluctuation, high/low voltage or natural disaster.
- If the product is repaired or tried to repair from unauthorized personal/Repair Shop.
- If the product serial number is tempered.
- The product is defective due to wear of parts, which can be considered as consumable parts by the nature. (such as a cable)
- Defects resulting from changes over time such as natural color fading of paint.
- Defects resulting from mishandling or improper use.
- Defects resulting from an inadequacy or error in maintenance and inspection.
- Defects resulting from the use of any part other than our genuine parts.
- Defects resulting from a modification not approved by us or our dealers.

Only a delivered product shall be singly warranted, and no damage induced by the defect of the delivery product can be warranted. For repair, transport the product to our factory.

2.3. Service coverage

The cost of a delivered product does not include expenses for program creation and engineer dispatching. Therefore, the following are charged separately even within the warranty term:

- Maintenance and inspection.
- Technical guidance and technical training in the operating instructions.
- Technical guidance and technical training on program-related matters such as program creation.

2.4. Fire extinguish

Please use the CARBON DIOXIDE fire extinguisher to extinguish a fire in a robot (instrument, controller).

3. Product description

- This gateway (product name : DGW-CE) is a device that mapping and exchanges fieldbus protocol I/O data between EtherCAT Master and CC-Link Master
- When using Mitsubishi PLC (CC-Link) as host controller, EtherCAT type Robot Motion Controller can be connected with PLC by connecting the communication line simply.
- It can easily diagnose communication error status through external LED and it is easy to install in control panel by adopting DIN Rail mounting method.

3.1. Outline and dimensions

3.2. Specification

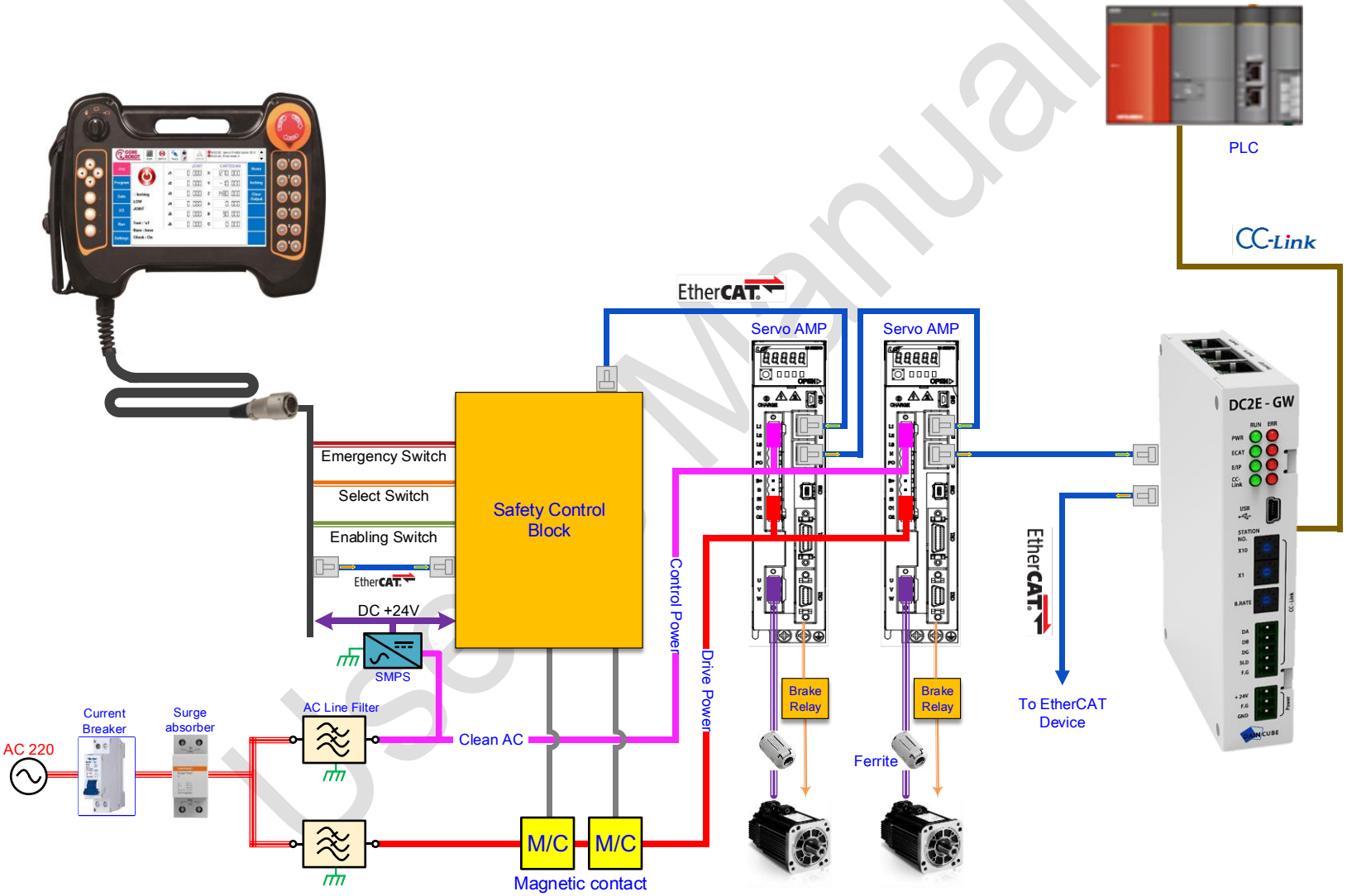
Function Specification

Certification		Passed a CC-Link Conformance Test (CLPA)
Communication		
EtherCAT	Type	Slave
	Number of Port	2 (In/Out)
	Speed	100Mbps
	Connector	8-pin RJ45
	Protection	Built-in 1.5kV magnetic isolation
CC-Link	Type	Slave
	Version	1.1
	Data size[bit]	96/96 (In/Out)
	Station Number	1~64 (Changed by switch)
	Occupied Station	1
	Number of Port	1
	Baud Rate	156Kbps ~ 10Mbps (Changed by switch)
	Connector	5-pin Terminal Block

H/W Specification

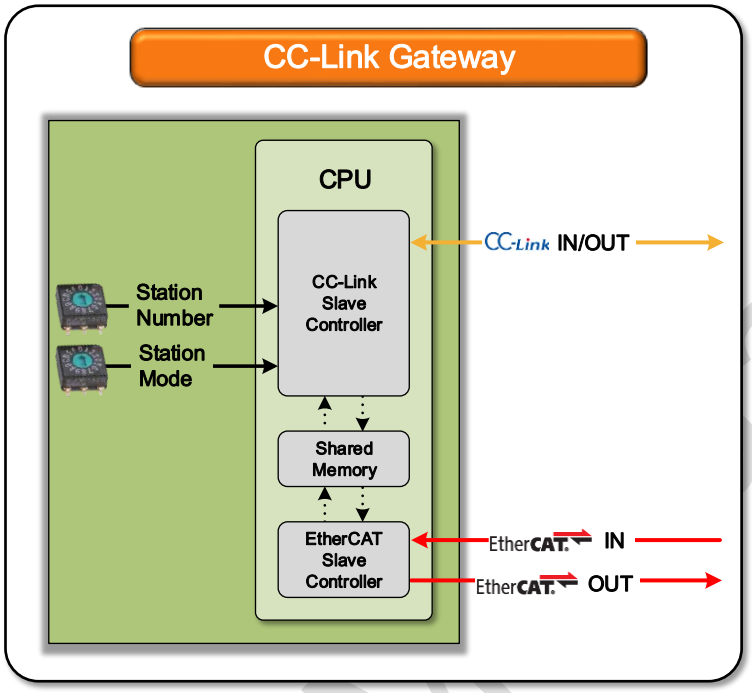
CPU		ARM Cortex-M3 32-bit RISC (100MHz)
Memory	Flash	4Mbytes (NOR)
	Instruction RAM	768Kbytes
	Data RAM	512Kbytes
	Buffer RAM	64Kbytes
Debug port		1 × Micro USB (USB dongle optional)
Power Input		+24VDC ± 5%
Power Consumption		300mA (Max) @ 24VDC
Dimension		25 × 119 × 110 [mm]
Weight		350g (Max)
Environment		Operating temperature : 0℃ to +50℃
		Storage temperature : -20℃ to +70℃
		Humidity : 10% to 85% (Non-condensing)
		Cooling method : Ambient

3.3. Overall configuration

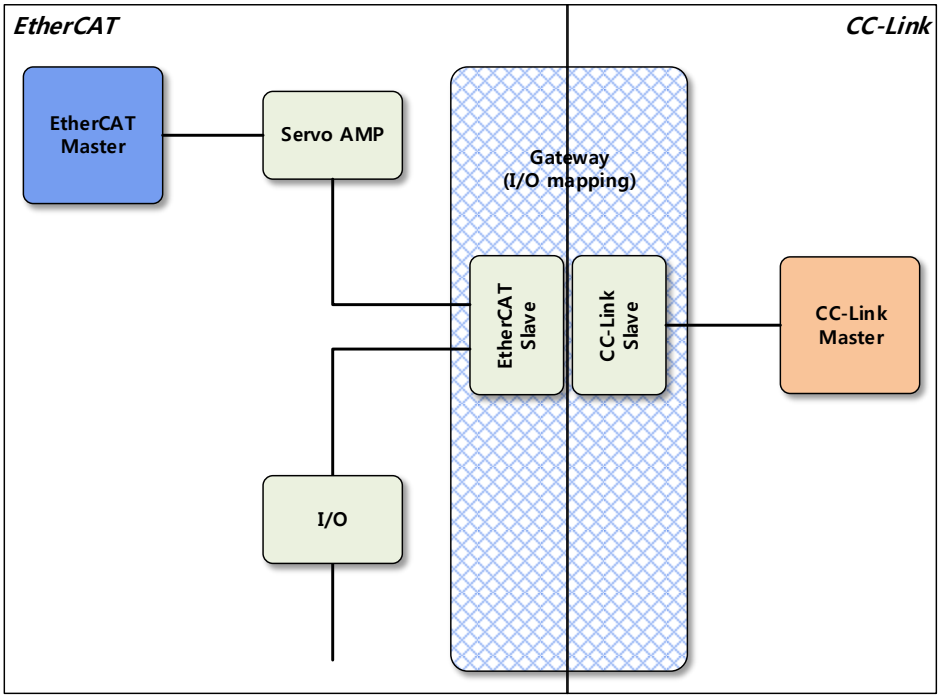


3.4. Functional diagram

■ Internal block diagram



■ EtherCAT Master - CC-Link Master connection configuration diagram

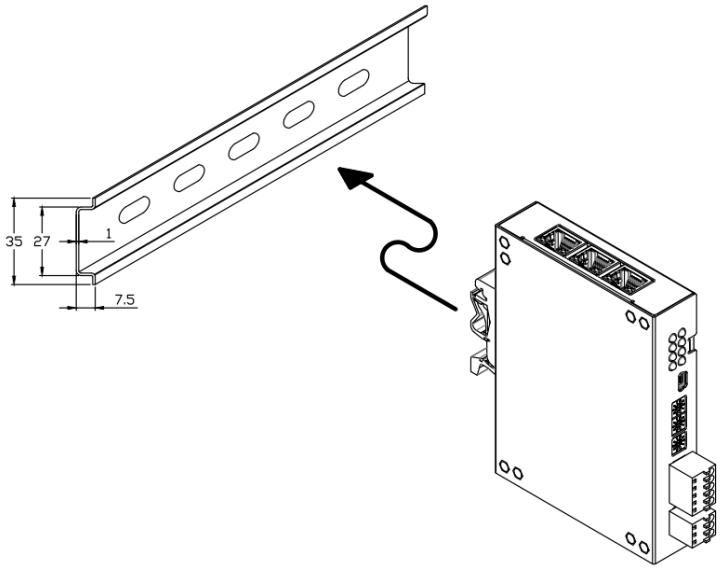


3.5. Mounting guide

1) Selection of DIN Rail

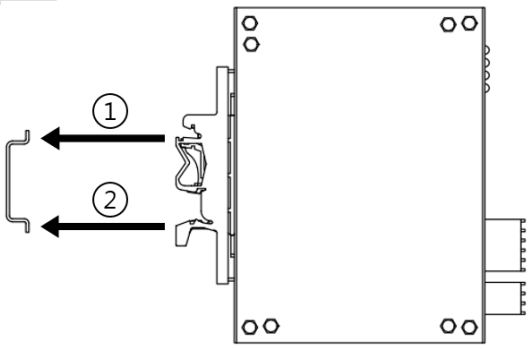
DGW-CE can be mounted on the control panel using DIN Rail.
Follow the guide and mount it correctly on the DIN Rail.

Refer to the figure below for specifications of DIN Rail.



2) Mounting methode

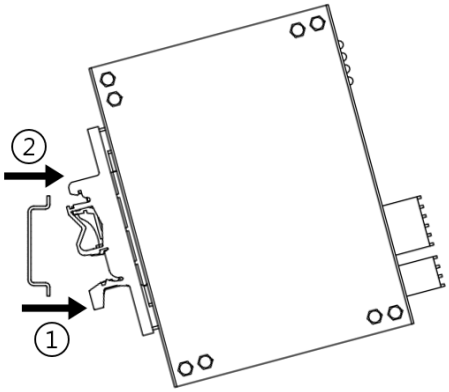
First joint the top of DIN Rail mount and the join the bottom



- After joining, confirm that it is firmly engaged.
- For ventilation, wiring and product exchange, make sure that the space is at least 20mm in side and 30mm in top and bottom.
- Turn the power off when assembling the unit or disconnecting wiring and removing the product

3) Separating methode

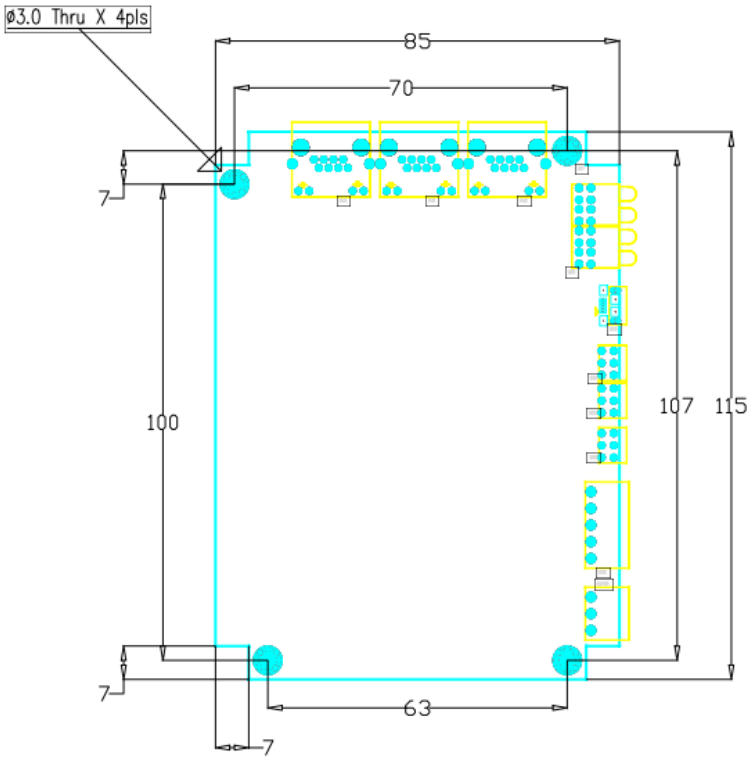
When removing the DGW-CE from the DIN Rail, remove the bottom of the DIN Rail mount first and remove the top.



- Disconnecting the upper part first or removing it with excessive force may damage the DIN Rail mount.
- Be sure to turn off the power before proceeding.

4) Mounting guide (Case not used)

If you are not using the case, please refer to the following mounting hole information.



4. EtherCAT

4.1. Process Data Object

	Sender	Receiver
RxPDO (1600h, sm2)	Master	Slave
TxPDO (1A00h, sm3)	Slave	Master

■ **RxPDO (Master -> Slave)**

Index	Sub-Index	BitLen	Bit Position	Name
7000h	1	8	0	Data Output Bit 0
			1	Data Output Bit 1
			2	Data Output Bit 2
			3	Data Output Bit 3
			4	Data Output Bit 4
			5	Data Output Bit 5
			6	Data Output Bit 6
			7	Data Output Bit 7
	2	8	0	Data Output Bit 8
			1	Data Output Bit 9
			2	Data Output Bit 10
			3	Data Output Bit 11
			4	Data Output Bit 12
			5	Data Output Bit 13
			6	Data Output Bit 14
			7	Data Output Bit 15
	3	8	0	Data Output Bit 16
			1	Data Output Bit 17
			2	Data Output Bit 18
			3	Data Output Bit 19
			4	Data Output Bit 20
			5	Data Output Bit 21
			6	Data Output Bit 22
			7	Data Output Bit 23
	4	8	0	Data Output Bit 24
			1	Data Output Bit 25
			2	Data Output Bit 26
			3	Data Output Bit 27
			4	Data Output Bit 28
			5	Data Output Bit 29
			6	Data Output Bit 30
			7	Data Output Bit 31
7001h	1	16	-	Data Output Word 0
	2	16	-	Data Output Word 1
	3	16	-	Data Output Word 2
	4	16	-	Data Output Word 3

■ **TxPDO (Slave -> Master)**

Index	Sub-Index	BitLen	Bit Position	Name
6000h	1	8	0	Data Input Bit 0
			1	Data Input Bit 1
			2	Data Input Bit 2
			3	Data Input Bit 3
			4	Data Input Bit 4
			5	Data Input Bit 5
			6	Data Input Bit 6
			7	Data Input Bit 7
	2	8	0	Data Input Bit 8
			1	Data Input Bit 9
			2	Data Input Bit 10
			3	Data Input Bit 11
			4	Data Input Bit 12
			5	Data Input Bit 13
			6	Data Input Bit 14
			7	Data Input Bit 15
	3	8	0	Data Input Bit 16
			1	Data Input Bit 17
			2	Data Input Bit 18
			3	Data Input Bit 19
			4	Data Input Bit 20
			5	Data Input Bit 21
			6	Data Input Bit 22
			7	Data Input Bit 23
	4	8	0	Data Input Bit 24
			1	Data Input Bit 25
			2	Data Input Bit 26
			3	Data Input Bit 27
			4	Data Input Bit 28
			5	Data Input Bit 29
			6	Data Input Bit 30
			7	Data Input Bit 31
6001h	1	16	-	Data Input Word 0
	2	16	-	Data Input Word 1
	3	16	-	Data Input Word 2
	4	16	-	Data Input Word 3

5. CC-Link V1.1

5.1. Profile

■ **RX, RWr (Slave -> PLC Master)**

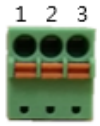
Index	BitLen	Bit Position	Name
RX	32	RX00	Data Input Bit 0
		RX01	Data Input Bit 1
		RX02	Data Input Bit 2
		RX03	Data Input Bit 3
		RX04	Data Input Bit 4
		RX05	Data Input Bit 5
		RX06	Data Input Bit 6
		RX07	Data Input Bit 7
		RX08	Data Input Bit 8
		RX09	Data Input Bit 9
		RX0A	Data Input Bit 10
		RX0B	Data Input Bit 11
		RX0C	Data Input Bit 12
		RX0D	Data Input Bit 13
		RX0E	Data Input Bit 14
		RX0F	Data Input Bit 15
		RX10	Data Input Bit 16
		RX11	Data Input Bit 17
		RX12	Data Input Bit 18
		RX13	Data Input Bit 19
		RX14	Data Input Bit 20
		RX15	Data Input Bit 21
		RX16	Data Input Bit 22
		RX17	Data Input Bit 23
		RX18	Data Input Bit 24
		RX19	Data Input Bit 25
		RX1A	Data Input Bit 26
		RX1B	Data Input Bit 27
		RX1C	Data Input Bit 28
		RX1D	Data Input Bit 29
		RX1E	Data Input Bit 30
		RX1F	Data Input Bit 31
RWr	16	RWr0	Data Input Word 0
	16	RWr1	Data Input Word 1
	16	RWr2	Data Input Word 2
	16	RWr3	Data Input Word 3

■ **RY, RWw (PLC Master -> Slave)**

Index	BitLen	Bit Position	Name
RY	32	RY00	Data Input Bit 0
		RY01	Data Input Bit 1
		RY02	Data Input Bit 2
		RY03	Data Input Bit 3
		RY04	Data Input Bit 4
		RY05	Data Input Bit 5
		RY06	Data Input Bit 6
		RY07	Data Input Bit 7
		RY08	Data Input Bit 8
		RY09	Data Input Bit 9
		RY0A	Data Input Bit 10
		RY0B	Data Input Bit 11
		RY0C	Data Input Bit 12
		RY0D	Data Input Bit 13
		RY0E	Data Input Bit 14
		RY0F	Data Input Bit 15
		RY10	Data Input Bit 16
		RY11	Data Input Bit 17
		RY12	Data Input Bit 18
		RY13	Data Input Bit 19
		RY14	Data Input Bit 20
		RY15	Data Input Bit 21
		RY16	Data Input Bit 22
		RY17	Data Input Bit 23
		RY18	Data Input Bit 24
		RY19	Data Input Bit 25
		RY1A	Data Input Bit 26
		RY1B	Data Input Bit 27
		RY1C	Data Input Bit 28
		RY1D	Data Input Bit 29
		RY1E	Data Input Bit 30
		RY1F	Data Input Bit 31
RWw	16	RWw0	Data Input Word 0
	16	RWw1	Data Input Word 1
	16	RWw2	Data Input Word 2
	16	RWw3	Data Input Word 3

6. Connectors

6.1. Connector description

	Power	Termianl block (Pluggable) 3.50mm pitch, Straight type, Push lock	MPC300-350 3P	1	EA	DECA
	CC-Link	Termianl block (Pluggable) 3.50mm pitch, Straight type, Screw lock	MC420-350 5P	1	EA	DECA

6.2. Main Power

Connector Reference	Name	Function	Direction
1	24V	+24V Power	IN
2	CHGND	CHGND	OUT
3	GND	24V GND	IN

6.3. EtherCAT (RJ45)

Connector Reference	Name	Function	Direction
RJ1	EtherCAT (IN)	EtherCAT (IN)	IN
RJ2	EtherCAT (OUT)	EtherCAT (OUT)	OUT

6.4. EtherNet/IP (Not Used)

Connector Reference	Name	Function	Direction
RJ3	EtherNet/IP	EtherNet/IP	I/O

6.5. CC-Link Connector

Connector Reference	Name	Function	Direction
1	DA	DATA (A+)	I/O
2	DB	DATA (B-)	I/O
3	DG	DATA GND	IN
4	SLD	Shield	IN
5	F.G	CHGND	OUT

6.6. USB to Serial (USB Dongle Optional)

Connector Reference	Name	Function	Direction
1	5V	+5V Power	IN
2	D-	Data -	I/O
3	D+	Data +	I/O
4	ID	N.C.	N.C.
5	GND	5V GND	IN

7. Switches

7.1. CC-Link Baudrate Switch

Connector Reference	Name	Function	description
B.RATE	CC-Link Baudrate Switch	CC-Link Baudrate setting	
0	0	156K	SW
1	1	625K	SW
2	2	2.5M	SW
3	3	5M	SW
4	4	10M	SW

7.2. CC-Link Station Number Switch

Connector Reference	Name	Function	description
X10	Station Number Switch	Station Number setting	
0~9	0~9	Station Number (x10)	SW
X1	Station Number Switch	Station Number	
0~9	0~9	Station Number (x1)	SW

8. General care and maintenance

Your device is a product of superior design and craftsmanship and should be treated with care.

The following suggestions will help you.

- Keep the device dry. Precipitation, humidity, and all types of liquids or moisture can contain minerals that will corrode electronic circuits. If your device does get wet, allow it to dry completely.
- Do not use or store the device in dusty, dirty areas. Its moving parts and electronic components can be damaged.
- Do not store the device in hot areas. High temperatures can shorten the life of electronic devices, damage cable, and warp or melt certain plastics.
- Do not store the device in cold areas. When the device returns to its normal temperature, moisture can form inside the device and damage electronic circuit boards.
- Do not attempt to open the device.
- Do not drop, knock, or shake the device. Rough handling can break internal circuit boards and fine mechanics.
- Do not paint the device. Paint can clog the moving parts and prevent proper operation.
- Unauthorized modifications or attachments could damage the device and may violate regulations governing radio devices.

9. Appendix

A list of installation related reference materials.

- Mitsubishi PLC
- Beckhoff : EtherCAT Catalog
- Electrical wiring design method considering EMC

Check the local regulations for disposal of electronic products.

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste.
Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment.
The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

CE

We hereby declare that the product is in compliance with the essential requirements and other relevant provisions of European Directive 2014/30/EC(The Electromagnetic Compatibility Directive).

We hereby declare that the product is in compliance with the essential requirements and other relevant provisions of Korea Directive (EMC standards)
Standard: Information Communication equipment such notice with regard to the assignment and management of the laboratory