

User Manual – Digital Output Module

EH-RIO2 Series

RIO2-YTP4, -YTP8, -YTP16, -YTP4C, -YR4, -YR8

Version 1.06



User Manual – Digital Output Module

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1. Important Notes

Solid state equipment has operational characteristics differing from those of electromechanical equipment.

Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls describes some important differences between solid state equipment and hard-wired electromechanical devices.

Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Hitachi be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Hitachi cannot assume responsibility or liability for actual use based on the examples and diagrams.

Warning!

- ✓ **If you don't follow the directions, it could cause a personal injury, damage to the equipment or explosion**
- Do not assemble the products and wire with power applied to the system. Else it may cause an electric arc, which can result into unexpected and potentially dangerous action by field devices. Arching is explosion risk in hazardous locations. Be sure that the area is non-hazardous or remove system power appropriately before assembling or wiring the modules.
- Do not touch any terminal blocks or IO modules when system is running. Else it may cause the unit to an electric shock or malfunction.
- Keep away from the strange metallic materials not related to the unit and wiring works should be controlled by the electric expert engineer. Else it may cause the unit to a fire, electric shock or malfunction.

Caution!

- ✓ **If you disobey the instructions, there may be possibility of personal injury, damage to equipment or explosion. Please follow below Instructions.**
- Check the rated voltage and terminal array before wiring. Avoid the circumstances over 55°C of temperature. Avoid placing it directly in the sunlight.
- Avoid the place under circumstances over 85% of humidity.
- Do not place Modules near by the inflammable material. Else it may cause a fire.
- Do not permit any vibration approaching it directly.
- Go through module specification carefully, ensure inputs, output connections are made with the specifications. Use standard cables for wiring.
- Use Product under pollution degree 2 environmen.

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1.1. Safety Instruction

1.1.1. Symbols

DANGER 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury, property damage, or economic loss. Attentions help you to identity a hazard, avoid a hazard, and recognize the consequences

1.1.2. Safety Notes

DANGER 	The modules are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the modules, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, e.g. FnBUS Pin.
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1.1.3. Certification

CE Certificate

EN 61000-6-2; Industrial Immunity

EN 61000-6-4; Industrial Emissions

RoHS (EU, CHINA)

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2. DIGITAL OUTPUT MODULE LIST

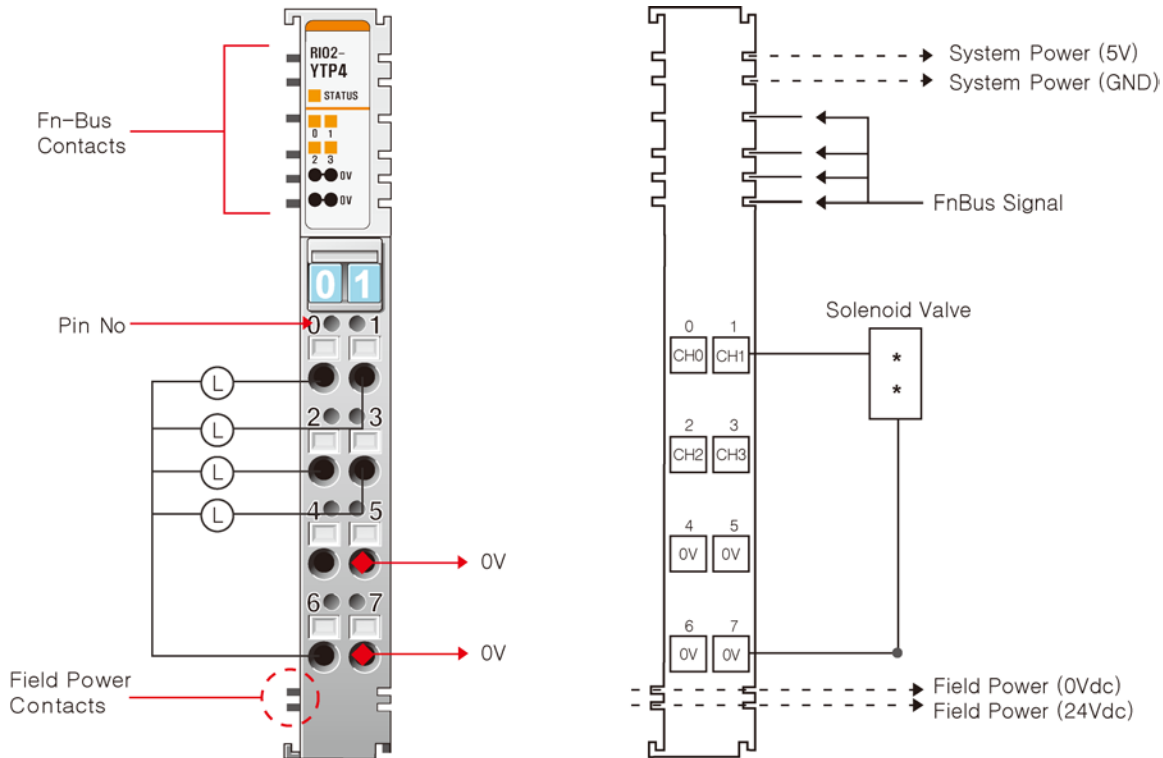
Number	Description	Production Status
RIO2-YTP16	16 Points Source(Positive Logic), 24Vdc/0.1A, 20P Connector	Active
RIO2-YTP4	4 Points Source(Positive Logic), 24Vdc/0.5A, Terminal	Active
RIO2-YTP8	8 Points Source(Positive Logic), 24Vdc/0.5A, Terminal	Active
RIO2-YTP4C	4 Points Source(Positive Logic), 24Vdc/2A, Terminal	Active
RIO2-YR4	4 Points, 230Vac/2A, 24Vdc/2A, Relay	Active
RIO2-YR8	8 Points, 230Vac/2A, 24Vdc/2A, Relay	Active

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3. Specification

3.1. The Interface

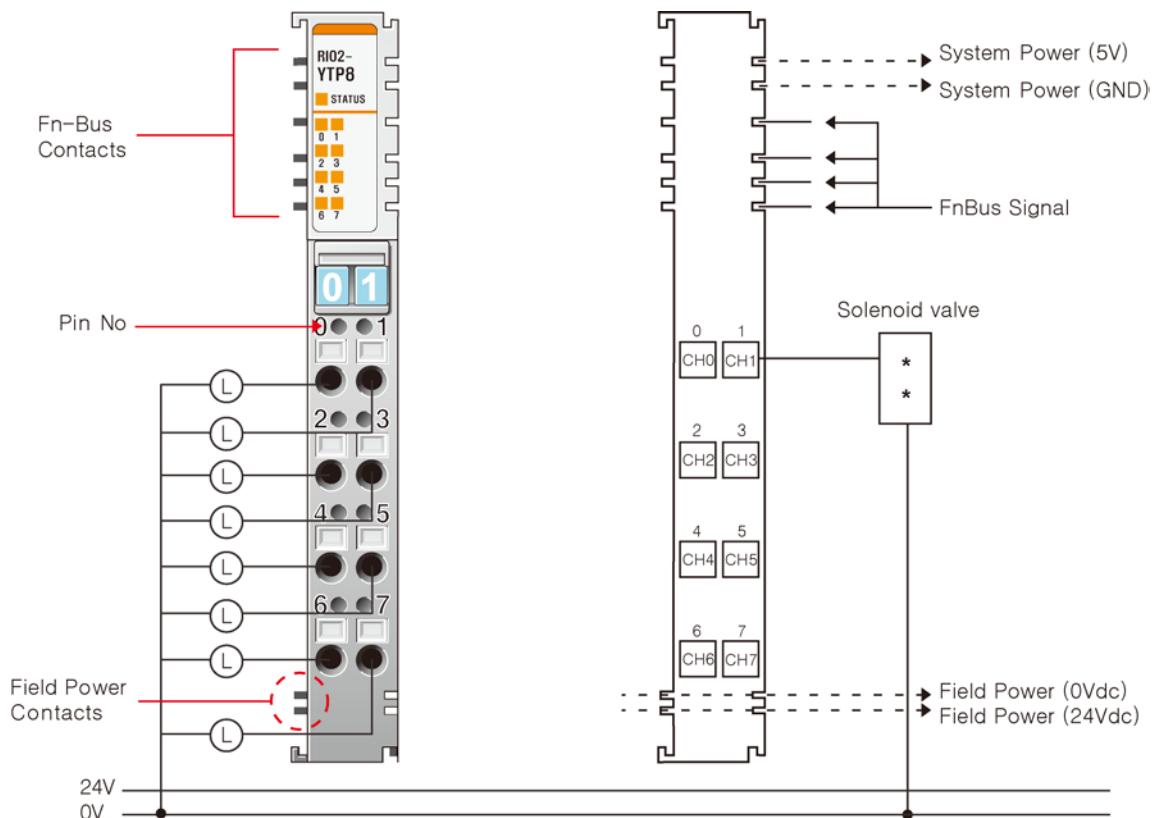
3.1.1. RIO2-YTP4



Pin No.	Description	Pin No.	Description
0	Output Channel 0	1	Output Channel 1
2	Output Channel 2	3	Output Channel 3
4	Field Ground (0V)	5	Field Ground (0V)
6	Field Ground (0V)	7	Field Ground (0V)

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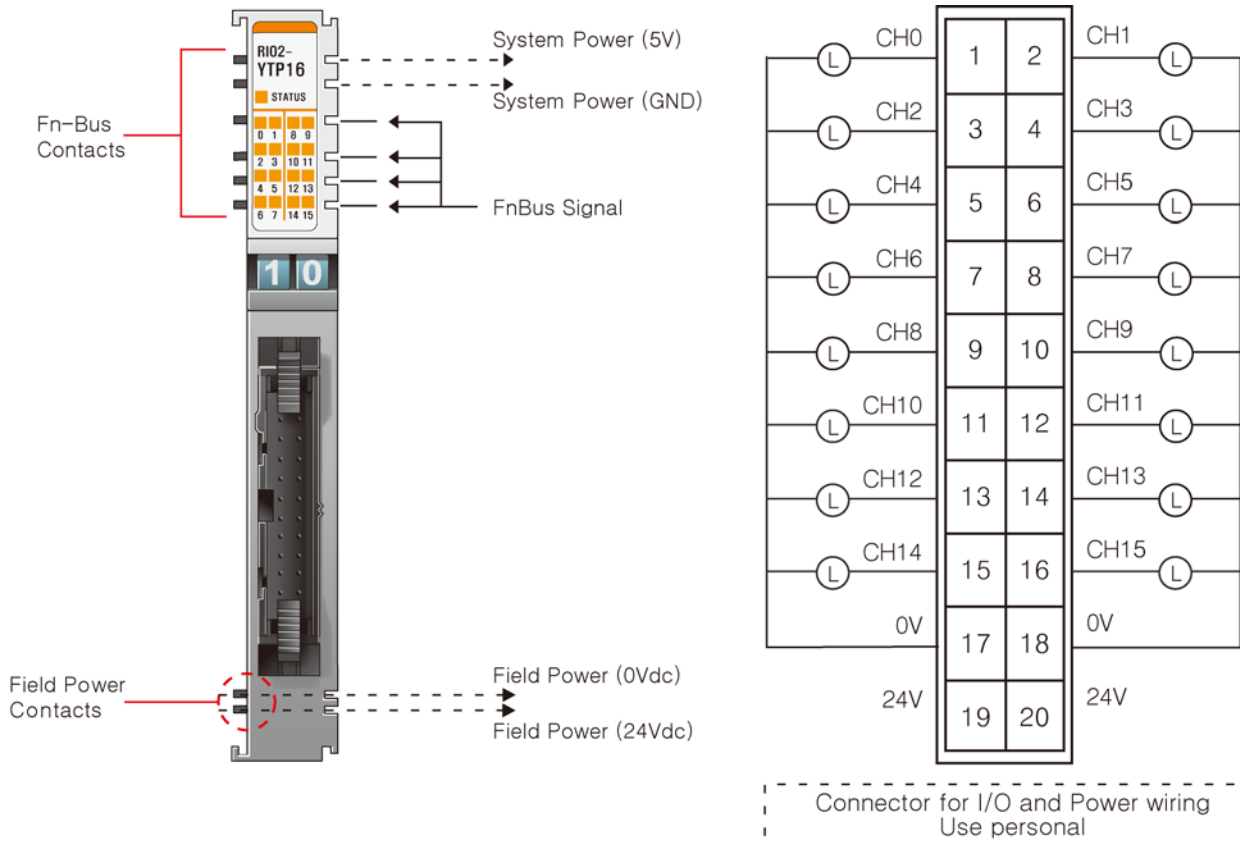
3.1.2. RIO2-YTP8



Pin No.	Description	Pin No.	Description
0	Output Channel 0	1	Output Channel 1
2	Output Channel 2	3	Output Channel 3
4	Output Channel 4	5	Output Channel 5
6	Output Channel 6	7	Output Channel 7

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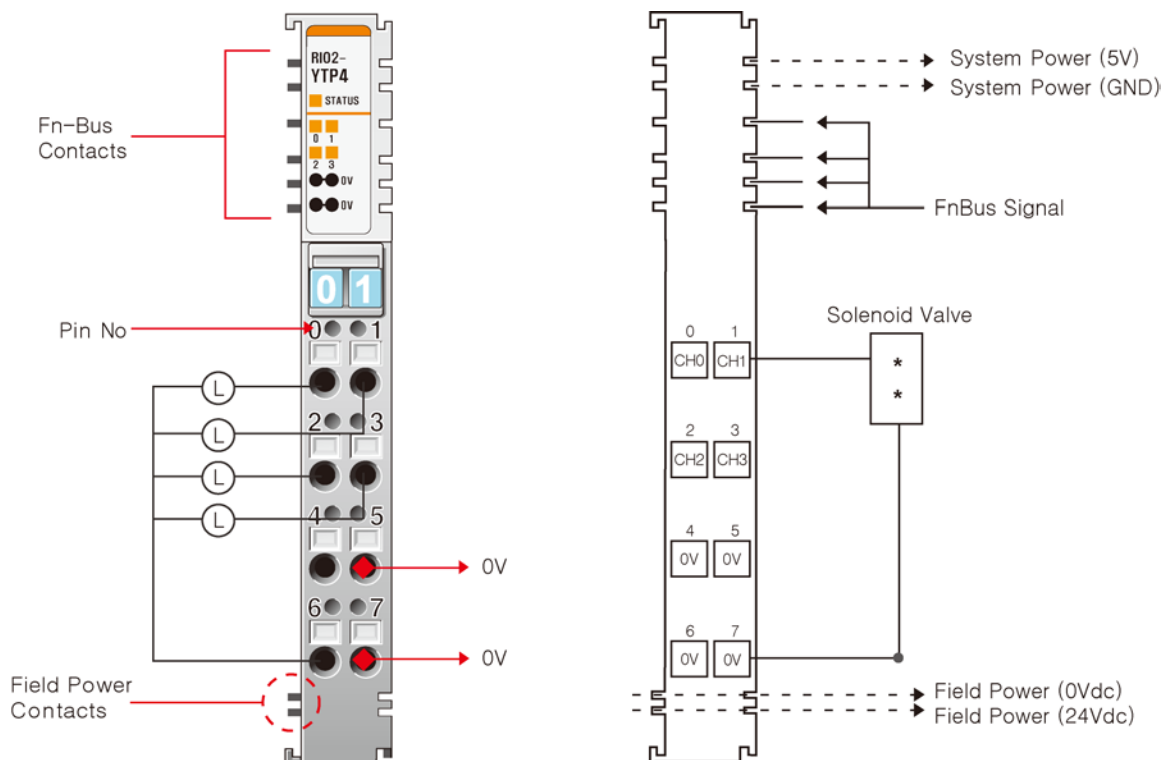
3.1.3. RIO2-YTP16



Pin No.	Description	Pin No.	Description
1	Output Channel 0	2	Output Channel 1
3	Output Channel 2	4	Output Channel 3
5	Output Channel 4	6	Output Channel 5
7	Output Channel 6	8	Output Channel 7
9	Output Channel 8	10	Output Channel 9
11	Output Channel 10	12	Output Channel 11
13	Output Channel 12	14	Output Channel 13
15	Output Channel 14	16	Output Channel 15
17	Field Ground(0V)	18	Field Ground(0V)
19	Field Power (+24Vdc)	20	Field Power (+24Vdc)

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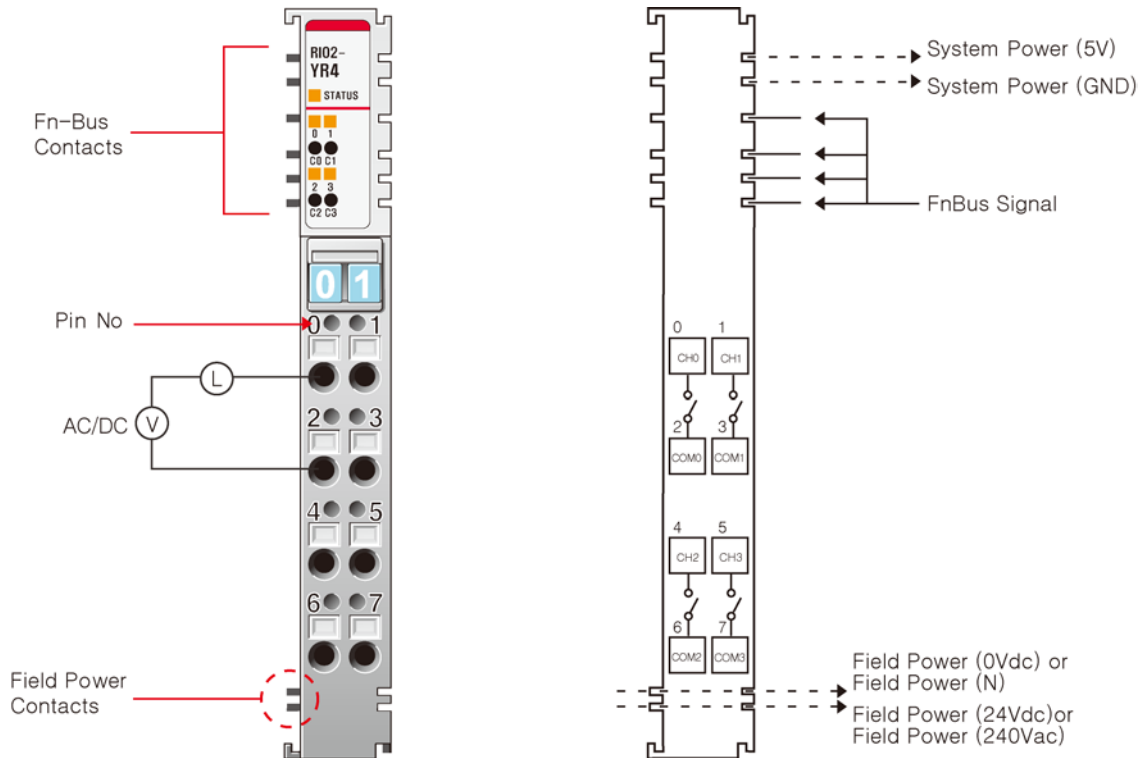
3.1.4. RIO2-YTP4C



Pin No.	Description	Pin No.	Description
0	Output Channel 0	1	Output Channel 1
2	Output Channel 2	3	Output Channel 3
4	Field Ground (0V)	5	Field Ground (0V)
6	Field Ground (0V)	7	Field Ground (0V)

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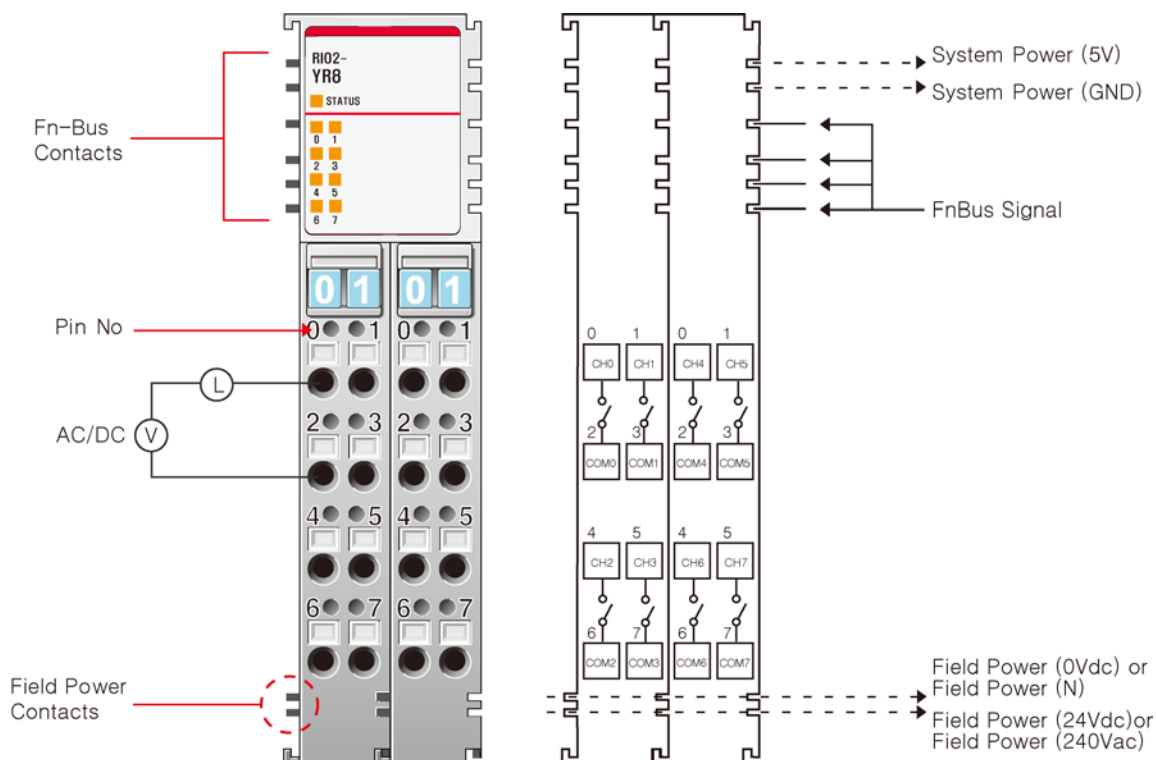
3.1.5. RIO2-YR4



Pin No.	Description	Pin No.	Description
0	Output Channel 0_A	1	Output Channel 1_A
2	COM 0	3	COM 1
4	Output Channel 2_A	5	Output Channel 3_A
6	COM 2	7	COM 3

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3.1.6. RIO2-YR8



Signals for Left Terminal

Pin No.	Description	Pin No.	Description
0	Output Channel 0_A	1	Output Channel 1_A
2	COM 0	3	COM 1
4	Output Channel 2_A	5	Output Channel 3_A
6	COM 2	7	COM 3

Signal for Right Terminal

Pin No.	Description	Pin No.	Description
0	Output Channel 4_A	1	Output Channel 5_A
2	COM 4	3	COM 5
4	Output Channel 6_A	5	Output Channel 7_A
6	COM 6	7	COM 7

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3.2. Environment Specification

Environmental Specifications	
Operating Temperature	-20 to 55°C (Discrete I/O) 0 to 55°C (Analog I/O)
Non-Operating Temperature	-40°C to 85°C
Relative Humidity	5%~90% non-condensing
Operating Altitude	2000m
Mounting	DIN rail
General Specifications	
Shock Operating	10g
Shock Non-Operating	30g
Vibration/Shock resistance	Displacement : 0.012Inch p-p from 10~57Hz Acceleration : 2G's from 57~500Hz Sweep Rate : 1 octave Per Minute Axes to test : x, y, z Frequency Sweeps Per Axis : 10
EMC resistance burst/ESD	Confirms to EN-61000-6-2
EMI	Confirms to EN-61000-6-4
Installation Pos. /Protect. Class	Variable / IP20
Product Certification	CE
Network Conformance	RIO2-PBA : PTO Conformance Test Completion
Isolation	DC Module (Included Analog Module) : Terminal Block to F.G 500Vac/1min AC Module : Terminal Block to F.G 1500Vac/1min Relay Module : Terminal Block to F.G 2500Vac/1min

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3.3. Specification

3.3.1. RIO2-YTP4

Items	Specification
Output Specification	
Outputs Per Module	4 Point Source Type (Positive Logic)
Indicators	4 Green Output States, 1 Green/Red FnBUS State
Output Voltage Range	24Vdc nominal Min. 11Vdc ~ Max. 28.8Vdc
ON-state Voltage Drop	Max. 0.3Vdc@25°C
ON-State Min. Current	1mA Per Channel
OFF-State Leakage Current	Max. 50uA
Output Signal Delay	OFF to ON: Max. 0.3ms ON to OFF: Max. 0.3ms
Output Current Rating	Max. 0.5A Per Channel Max. 2.0A All Common
Output Protection (VNS3NV04D-E)	Over Temperature Shutdown : Min. 150°C Over Current Limit: Min. 3.5A/Max. 7.5A Per Channel Short Circuit Protection ESD Protection : 5Kv
Common Type	4 Points / 4COM (Single Common)
General Specification	
Power Dissipation	Max. 45mA @ 5.0Vdc
Isolation	I/O to Logic : Photocoupler isolation
Field Power	Supply Voltage : 24Vdc nominal Voltage Range : 11~28.8Vdc Power Dissipation : 5mA@28.8 Vdc / Channel
Wiring	I/O Cable Max. 2.0 mm ² (AWG 14)
Weight	70g
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to " Environment Specification"(page : 10)

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3.3.2. RIO2-YTP8

Items	Specification
Output Specification	
Outputs Per Module	8 Point Source Type (Positive Logic)
Indicators	8 Green Output States, 1 Green/Red FnBUS State
Output Voltage Range	24Vdc nominal Min. 11Vdc ~ Max. 28.8Vdc
ON-state Voltage Drop	Max. 0.3Vdc@25°C
ON-State Min. Current	1mA Per Channel
OFF-State Leakage Current	Max. 50uA
Output Signal Delay	OFF to ON: Max. 0.3ms ON to OFF: Max. 0.3ms
Output Current Rating	Max. 0.5A Per Channel Max. 4.0A All Common
Output Protection (VNS3NV04D-E)	Over Temperature Shutdown : Min. 150°C Over Current Limit: Min. 3.5A/Max. 7.5A Per Channel Short Circuit Protection ESD Protection : 5Kv
Common Type	8 Points / External Common
General Specification	
Power Dissipation	Max. 60mA @ 5.0Vdc
Isolation	I/O to Logic : Photocoupler isolation
Field Power	Supply Voltage : 24Vdc nominal Voltage Range : 11~28.8Vdc Power Dissipation : 5mA@28.8 Vdc / Channel
Wiring	I/O Cable Max. 2.0 mm ² (AWG 14)
Weight	70g
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to " Environment Specification"(page : 10)

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3.3.3. RIO2-YTP16

Items	Specification
Output Specification	
Outputs Per Module	16 Point Source Type (Positive Logic)
Indicators	16 Green Output States, 1 Green/Red FnBUS State
Output Voltage Range	24Vdc nominal Min. 11Vdc ~ Max. 28.8Vdc
ON-state Voltage Drop	Max. 0.3Vdc@25°C
ON-State Min. Current	1mA Per Channel
OFF-State Leakage Current	Max. 50uA
Output Signal Delay	OFF to ON: Max. 0.3ms ON to OFF: Max. 0.3ms
Output Current Rating	Max. 0.5A Per Channel Max. 4.0A All Common
Output Protection (VNS3NV04D-E)	Over Temperature Shutdown : Min. 150°C Over Current Limit: Min. 3.5A/Max. 7A Per Channel Short Circuit Protection ESD Protection : 5Kv
Common Type	16 Points / 2COM (Single Common)
General Specification	
Power Dissipation	Max. 80mA @ 5.0Vdc
Isolation	I/O to Logic : Photocoupler isolation
Field Power	Supply Voltage : 24Vdc nominal Voltage Range : 11~28.8Vdc Power Dissipation : 5mA@28.8 Vdc / Channel
Wiring	Connector Type
Weight	70g
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to " Environment Specification"(page : 10)

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3.3.4. RIO2-YTP4C

Items	Specification
Output Specification	
Outputs Per Module	4 Point Source Type (Positive Logic)
Indicators	4 Green Output States, 1 Green/Red FnBUS State
Output Voltage Range	24Vdc nominal Min. 11Vdc ~ Max. 28.8Vdc
ON-state Voltage Drop	Max. 1Vdc@25°C
ON-State Min. Current	1mA Per Channel
OFF-State Leakage Current	Max. 150uA
Output Signal Delay	OFF to ON: Max. 0.3ms ON to OFF: Max. 0.3ms
Output Current Rating	Max. 2A Per Channel Max. 8A All Common
Output Protection (VNS3NV04D-E)	Over Temperature Shutdown : Min. 150°C Over Current Limit: Min. 6A/Max. 15A Per Channel Short Circuit Protection ESD Protection : 5Kv
Common Type	4 Points / 4COM (Single Common)
General Specification	
Power Dissipation	Max. 45mA @ 5.0Vdc
Isolation	I/O to Logic : Photocoupler isolation
Field Power	Supply Voltage : 24Vdc nominal Voltage Range : 11~28.8Vdc Power Dissipation : 5mA@28.8 Vdc / Channel
Wiring	I/O Cable Max. 2.0 mm ² (AWG 14)
Weight	70g
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to " Environment Specification"(page : 10)

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3.3.5. RIO2-YR4

Items	Specification
Output Specification	
Outputs Per Module	4 Point
Indicators	4 Green Output States, 1 Green/Red FnBUS State
Relay type	Form A, normally Open Single Pole, Single Throw
Output Range	5~28.8Vdc @ 2.0A Resistive 48Vdc @ 0.8A Resistive 110Vdc @ 0.5A Resistive 250Vac @ 2.0A Resistive
Min. Load	100uA, 100mVdc Per Point
Max. On-state Voltage Drop	0.5V @ 2.0A, Resistive Load, 24Vdc
Off-State Leakage Current	Max. 1.5mA
Output Signal Delay	On to Off: Max. 10ms, Off to On: Max. 10ms
Initial Contact Res.	20mΩ
Expected Contact Resistance	300K Cycles Resistive, 100K Cycles Inductive
Common Type	1 Points / 1 COM
General Specification	
Power Dissipation	Max. 130mA @ 5.0Vdc
Isolation	I/O to Logic : Relay Coil/Contact isolation 1250Vrms tested
Field Power	No Connection with Field Power Field Power passes through to the next module
Wiring	I/O Cable Max. 2.0 mm ² (AWG 14)
Weight	70g
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to " Environment Specification"(page : 10)

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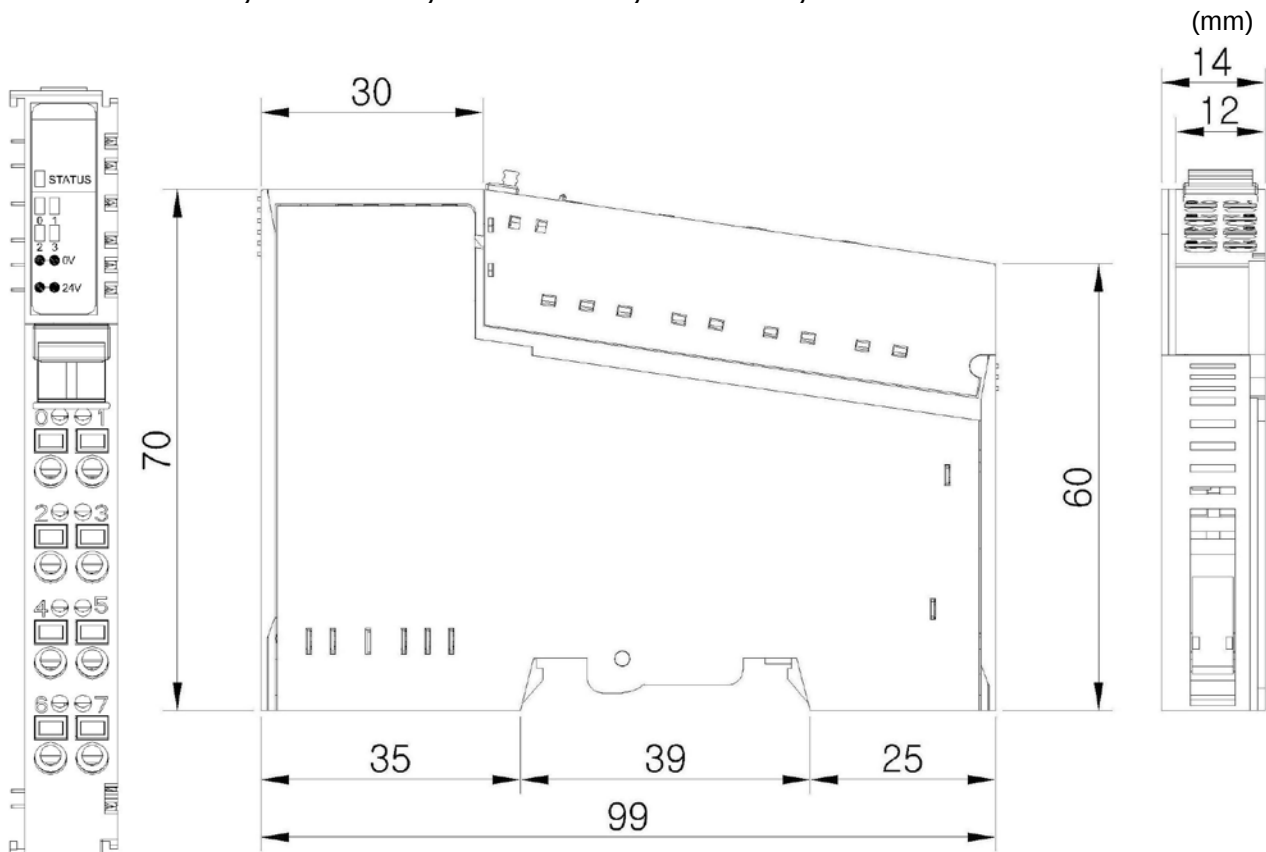
3.3.6. RIO2-YR8

Items		Specification
Output Specification		
Outputs Per Module		8 Point
Indicators		8 Green Output States, 1 Green/Red FnBUS State
Relay type		Form A, normally Open Single Pole, Single Throw
Output Range		5~28.8Vdc @ 2.0A Resistive 48Vdc @ 0.8A Resistive 110Vdc @ 0.5A Resistive 250Vac @ 2.0A Resistive
Min. Load		100uA, 100mVdc Per Point
Max. On-state Voltage Drop		0.5V @ 2.0A, Resistive Load, 24Vdc
Off-State Leakage Current		Max. 1.5mA
Output Signal Delay		On to Off: Max. 10ms, Off to On: Max. 10ms
Initial Contact Res.		20mΩ
Expected Contact Resistance		300K Cycles Resistive, 100K Cycles Inductive
Common Type		1 Points / 1 COM
General Specification		
Power Dissipation		Max. 235mA @ 5.0Vdc
Isolation		I/O to Logic : Relay Coil/Contact isolation 1250Vrms tested
Field Power		No Connection with Field Power Field Power passes through to the next module
Wiring		I/O Cable Max. 2.0 mm ² (AWG 14)
Weight		200g
Module Size		24mm x 99mm x 70mm
Environment Condition		Refer to " Environment Specification"(page : 10)

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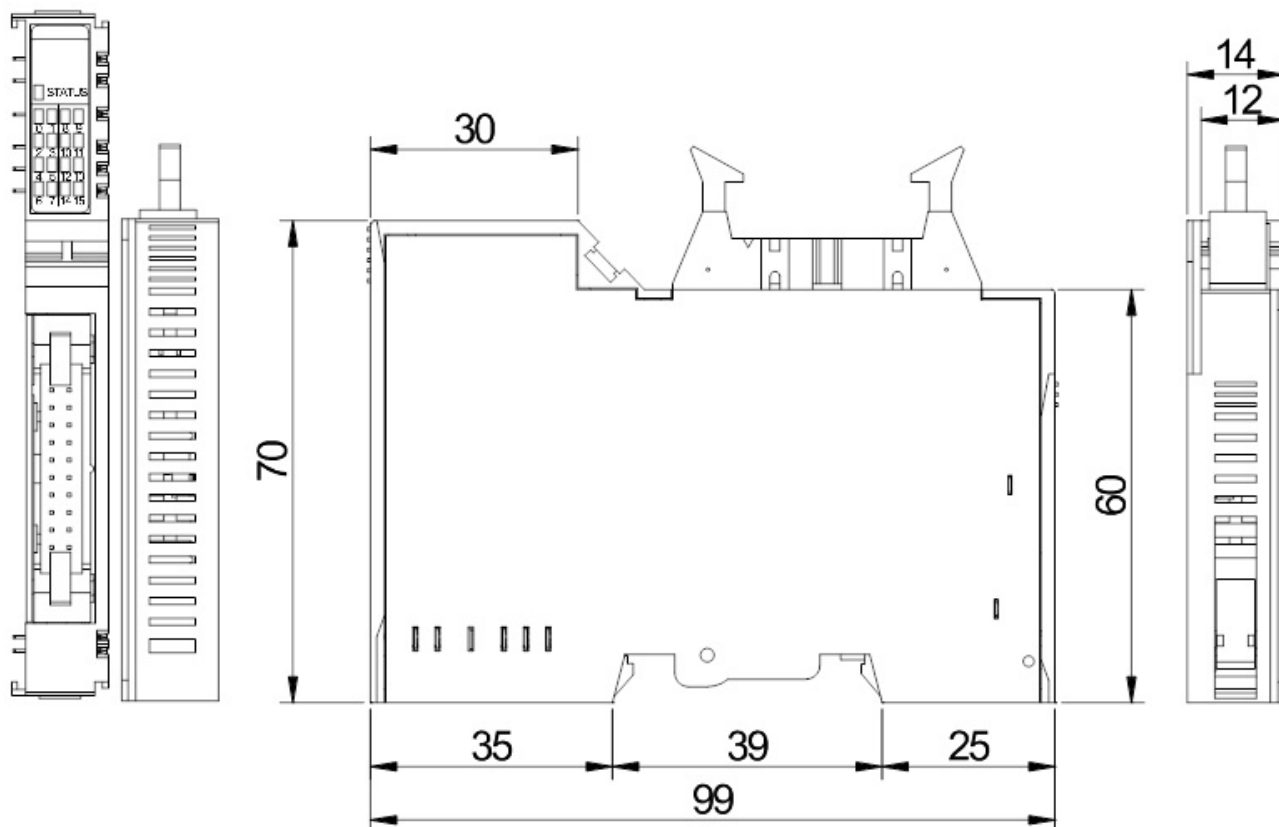
4. Dimensions

4.1. RIO2-YTP4, RIO2-YTP8, RIO2-YTP4C, RIO2-YR4, RIO2-YR8



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4.2. RIO2-YTP16



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5. Mapping Data into the image Table

5.1. RIO2-YTP4, RIO2-YTP4C, RIO2-YR4,

Output Image Value

Bit No	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Reserved				D3	D2	D1	D0



Output Module Data

D3	D2	D1	D0
----	----	----	----

5.2. RIO2-YTP8, RIO2-YR8

Output Image Value

Bit No	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	D7	D6	D5	D4	D3	D2	D1	D0



Output Module Data

D7	D6	D5	D4	D3	D2	D1	D0
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5.2.1. RIO2-YTP16

Output Image Value

Bit No	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	D7	D6	D5	D4	D3	D2	D1	D0
Byte 1	D15	D14	D13	D12	D11	D10	D9	D8



Output Module Data

D7	D6	D5	D4	D3	D2	D1	D0
D15	D14	D13	D12	D11	D10	D9	D8

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6. Trouble Shooting

ATTENTION


In this manual, it couldn't be described all variety case with Network Adapter of several protocols. So if you couldn't find any fault after investigating all below cases, refer to NA user manual.

6.1. Normal Module

LED Status	Cause	Action
EXPANSION MODULE STATUS LED		Device has no expansion Module or may not be powered
Off	Not Power No Initialized	The Parameter is not initialized yet.
Green	Fn-Bus Connection	FnBus normal Operation
Flashing Green	Fn-Bus Ready	FnBus ready
Flashing Red	Fn-Bus Fault	FnBus Time Out, FnBus Failed Communication
Red	Device Fault	Device fault
CHANNEL STATUS LED		
Off	Not Signal	Normal Operation
Green	On Signal	Normal Operation

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