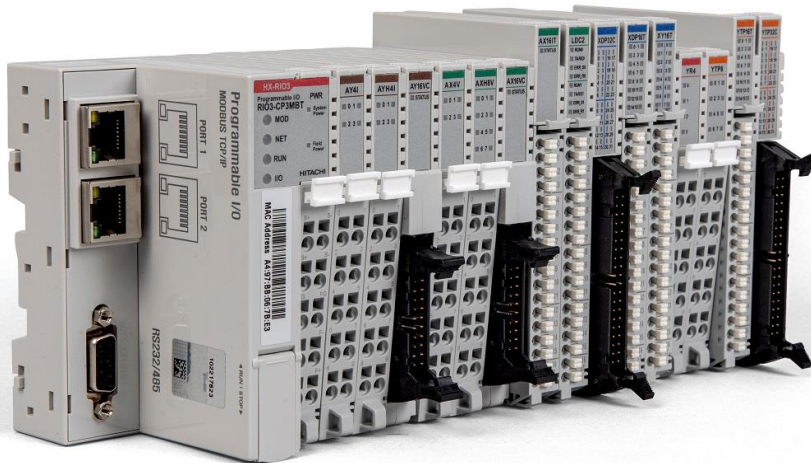


# Power Module

## User Manual



Version 1.01

REVISION HISTORY				
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1.01		New Document	Feb. 2021	(OPR), (PF)

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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 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 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 50°C of temperature. Avoid placing it directly in the sunlight.
- ✓ Avoid the place under circumstances over 85% of humidity.
- ✓ Do not place Modules nearby 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 environment.

## 1.1 Safety Instruction

### 1.1.1 Symbols

<p><b>DANGER</b></p> 	<p>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.</p>
<p><b>IMPORTANT</b></p>	<p>Identifies information that is critical for successful application and understanding of the product.</p>
<p><b>ATTENTION</b></p> 	<p>Identifies information about practices or circumstances that can lead to personal injury, property damage, or economic loss. Attentions help you to identify a hazard, avoid a hazard, and recognize the consequences.</p>

### 1.1.2 Safety Notes

<p><b>DANGER</b></p> 	<p>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, G-Bus Pin.</p>
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### 1.1.3 Certification

UL Listed Industrial Control Equipment, certified for U.S.

See UL File UL196687

CE Certificate

EN 61000-6-2; Industrial Immunity

EN 61000-6-4; Industrial Emissions

Reach, RoHS (EU, CHINA), EAC

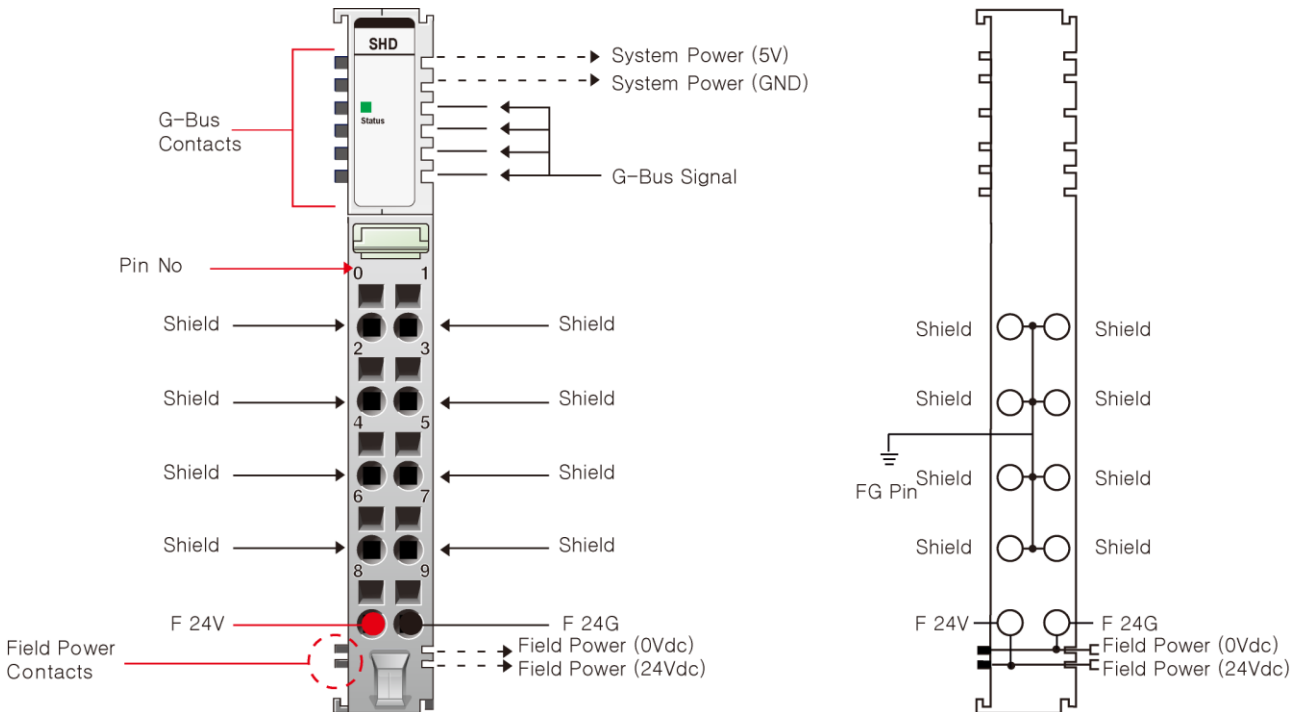
## 2 Power Module List

RIO3-Number	Description	ID (hex)
RIO3-SHD	Potential Distributor, 8 CHs, Shield, 10 RTB, ID Type	7408
RIO3-0VCD	Potential Distributor, 8 CHs, 0Vdc, 10 RTB, ID Type	7508
RIO3-PSD	Expansion Power, System/Field Power, Input 24Vdc, Output 5Vdc, 1A, 10 RTB, ID Type	7511
RIO3-24VDC	Potential Distributor, 10 CHs, 24Vdc, 10 RTB, ID Type	7518
RIO3-VDC	Potential Distributor, 5 CHs, 24Vdc / 5 CHs, 0Vdc, 10 RTB, ID Type	7588
RIO3-PS	Field Power Distribution 5~48 (Vdc), 120~240 (Vac) ID Type	7641

### 3 Specification

#### 3.1 RIO3-SHD

##### 3.1.1 Wiring Diagram



Pin No.	Signal Description	Signal Description	Pin No.
0	Shield	Shield	1
2	Shield	Shield	3
4	Shield	Shield	5
6	Shield	Shield	7
8	Field Power, 24V	Field Power, 24G	9



### 3.1.2 LED Indicator



LED No.	LED Function / Description	LED Color
Status	Internal Bus Status	Green

### 3.1.3 Status LED

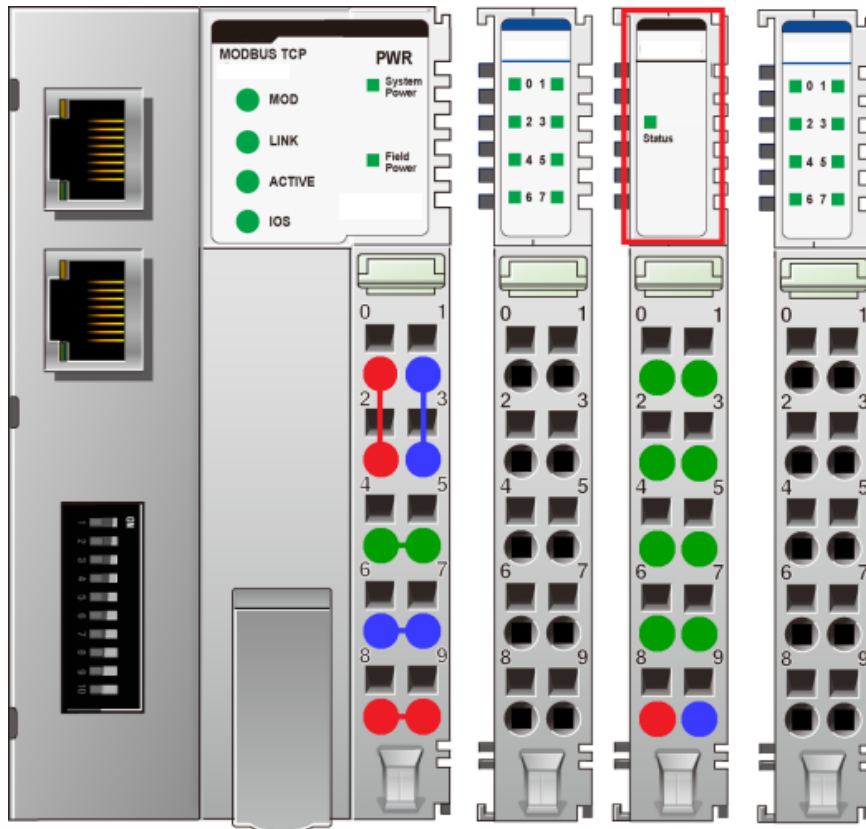
Status	LED	To indicate
Normal signal.	Green	The unit is operating in normal condition. (After normal initialization of G-Bus communication, this LED maintains ON status.)
Absence of network adapter	Off	Network adapter is not connected to this module.




### 3.1.4 Specification

Items	Specification
<b>Technical Data</b>	
UL Field Power	Supply voltage: 24Vdc nominal, Class 2
Field Power Voltage	24Vdc nominal
Field Power Contacts Current	Max. 10A Operating Temperature -40°C ~ 50°C: Max. 10A 50°C ~ 70°C: Max. 7A
Indicator	1 Green Internal Bus Status
<b>General Specification</b>	
System Power Dissipation	Max. 30mA @ 5Vdc
Wiring	I/O Cable Max. 2.0mm <sup>2</sup> (AWG 14)
Torque	0.8Nm (7 lb-in)
Weight	58g
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to '4. Environment Specification'

### 3.1.5 Example

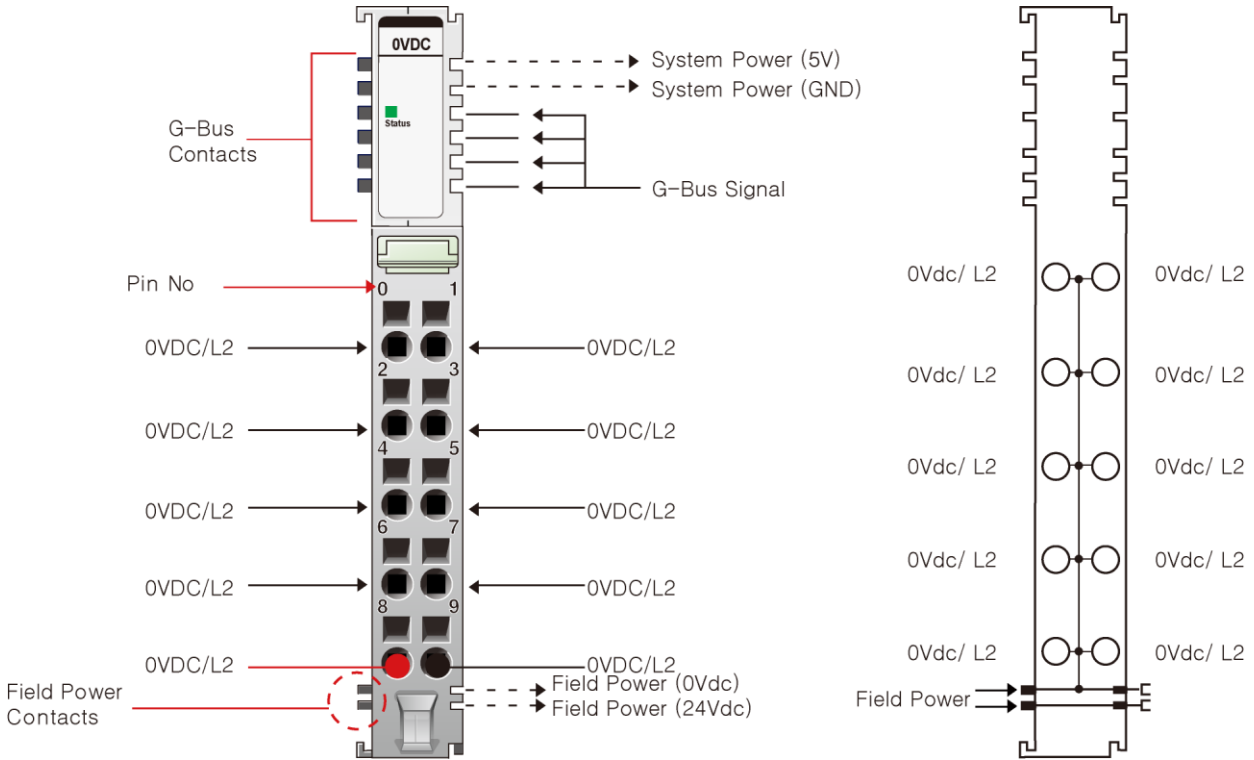
#### RIO3-SHD Shield



Color	System Power	Field Power
 Hole Number	0, 2	8, 9
 Hole Number	1, 3	6, 7
 Hole Number	4, 5 (F.G)	

### 3.2 RIO3-0VCD

#### 3.2.1 Wiring Diagram



Pin No.	Signal Description	Signal Description	Pin No.
0	0VDC/L2	0VDC/L2	1
2	0VDC/L2	0VDC/L2	3
4	0VDC/L2	0VDC/L2	5
6	0VDC/L2	0VDC/L2	7
8	0VDC/L2	0VDC/L2	9

### 3.2.2 LED Indicator



LED No.	LED Function / Description	LED Color
Status	Internal Bus Status	Green

### 3.2.3 Status LED

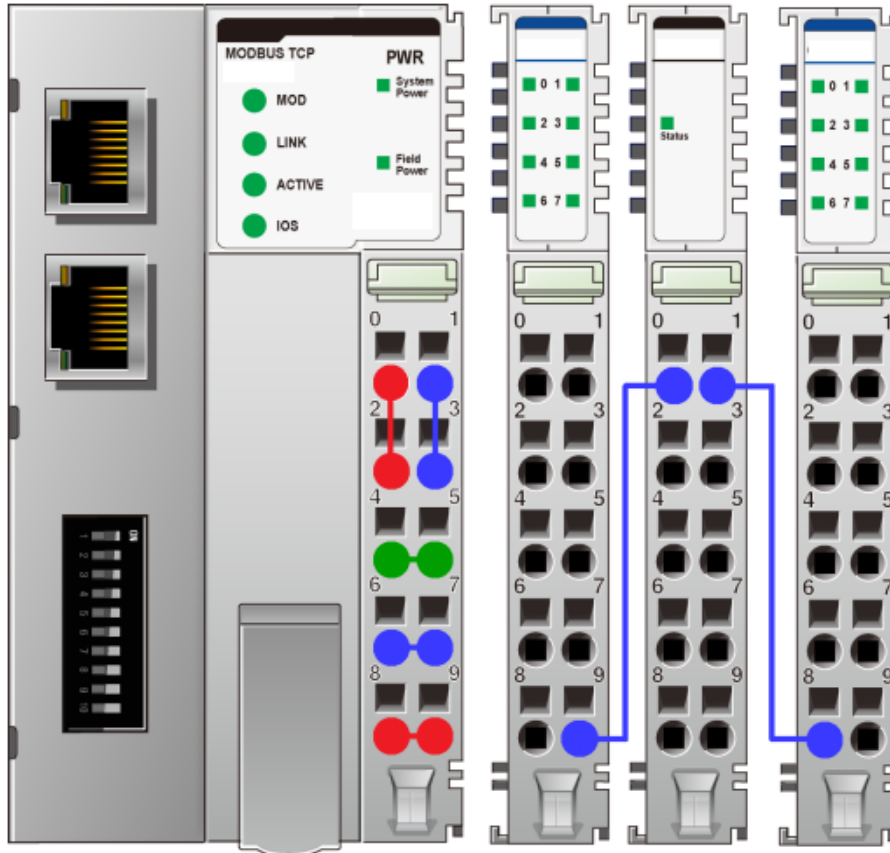
Status	LED	To indicate
Normal signal.	Green	The unit is operating in normal condition. (After normal initialization of G-Bus communication, this LED maintains ON status.)
Absence of network adapter	Off	Network adapter is not connected to this module.




### 3.2.4 Specification

Items	Specification
<b>Technical Data</b>	
UL Field Power	Supply voltage: 24Vdc nominal, Class 2
Field Power Voltage	24Vdc nominal
Field Power Contacts Current	Max. 10A Operating Temperature -40°C ~ 50°C: Max. 10A 50°C ~ 70°C: Max. 7A
Indicator	1 Green Internal Bus Status
<b>General Specification</b>	
System Power Dissipation	Max. 30mA @ 5Vdc
Wiring	I/O Cable Max. 2.0mm <sup>2</sup> (AWG 14)
Torque	0.8Nm (7 lb-in)
Weight	70g Max.
Module Size	12mm x 99mm x 70mm
<b>Environment Condition</b>	<b>Refer to '4. Environment Specification'</b>

### 3.2.5 Example

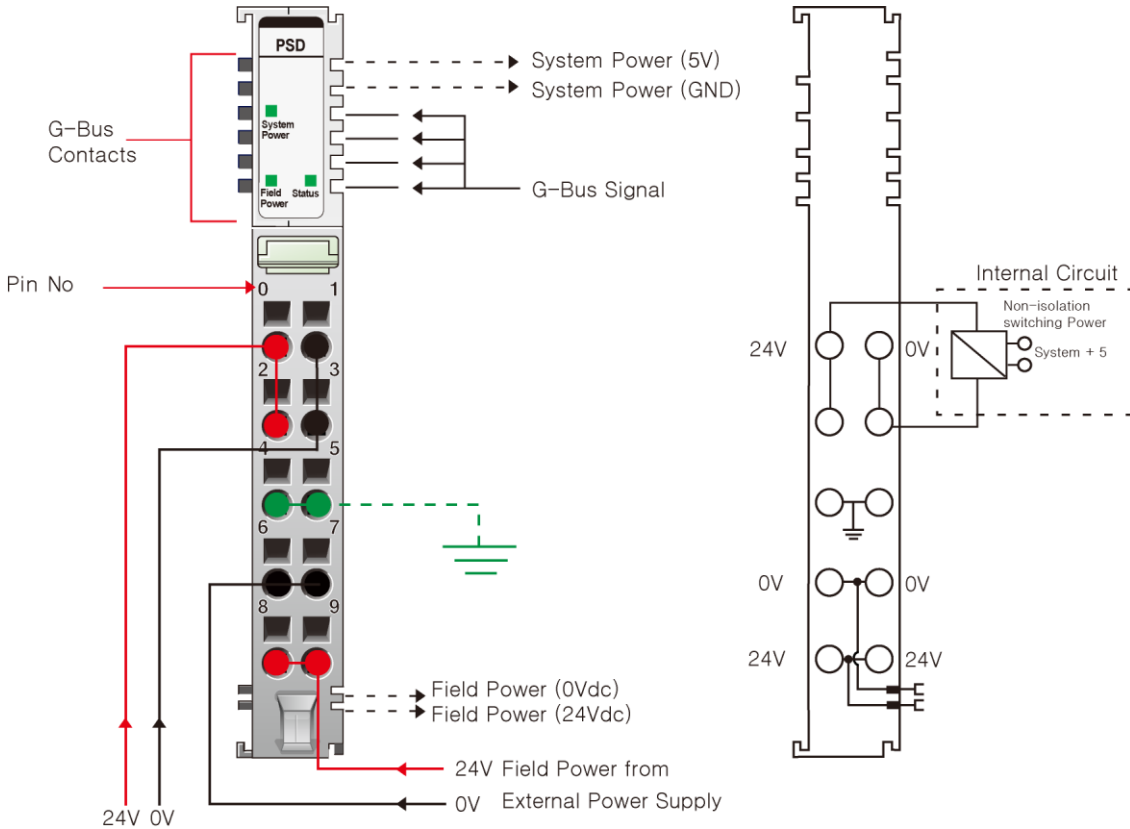
#### RIO3-0VCD Common 0Vdc



Color	System Power	Field Power
 Hole Number	0, 2	8, 9
 Hole Number	1, 3	6, 7
 Hole Number	4, 5 (F.G)	

### 3.3 RIO3-PSD

#### 3.3.1 Wiring Diagram



Pin No.	Signal Description	Signal Description	Pin No.
0	System Power, 24V	System Power, Ground	1
2	System Power, 24V	System Power, Ground	3
4	Frame Ground	Frame Ground	5
6	Field Power, Ground	Field Power, Ground	7
8	Field Power, 24V	Field Power, 24V	9



### 3.3.2 LED Indicator



LED No.	LED Function / Description	LED Color
System Power	System Power	Green
Field Power	Field Power	Green
Status	Internal Bus Status	Green

### 3.3.3 System / Field Power LED

Status	LED	To indicate
On Signal	Green	Normal Operation
No Signal	Off	Not Supplied 24Vdc System / Field power

### 3.3.4 Status LED

Status	LED	To indicate
Normal signal.	Green	The unit is operating in normal condition. (After normal initialization of G-Bus communication, this LED maintains ON status.)
Absence of data size.	Flashing green	Although this module is connected normally, there are not input/output data for communication.
Absence of Network adapter	Off	Network adapter is not connected to this module.

### 3.3.5 Specification

Items: RIO3-PSD	
<b>Input Specification</b>	
System Input Voltage range	15Vdc to 30Vdc
System Power Input Voltage	24Vdc nominal
Indicators	1 Green System Power status, 1 Green Field Power status, 1 Green G-Bus status
UL Field Power	Supply voltage: 24Vdc nominal, Class 2
Field Power Input Voltage	24Vdc ( $\pm 20\%$ ) nominal
Field Power Contacts Current	Max. 10A Operating Temperature -40°C ~ 50°C: Max. 10A 50°C ~ 70°C: Max. 7A
G-Bus Output Voltage	Max. 5Vdc, 1A *
<b>General Specification</b>	
System Power Dissipation	Max. 20mA @ 24Vdc
Wring	I/O Cable Max. 2.0mm <sup>2</sup> (AWG 14)
Torque	0.8Nm (7 lb-in)
Weight	59g
Module size	12mm x 99mm x 70mm

\* Operating temperature

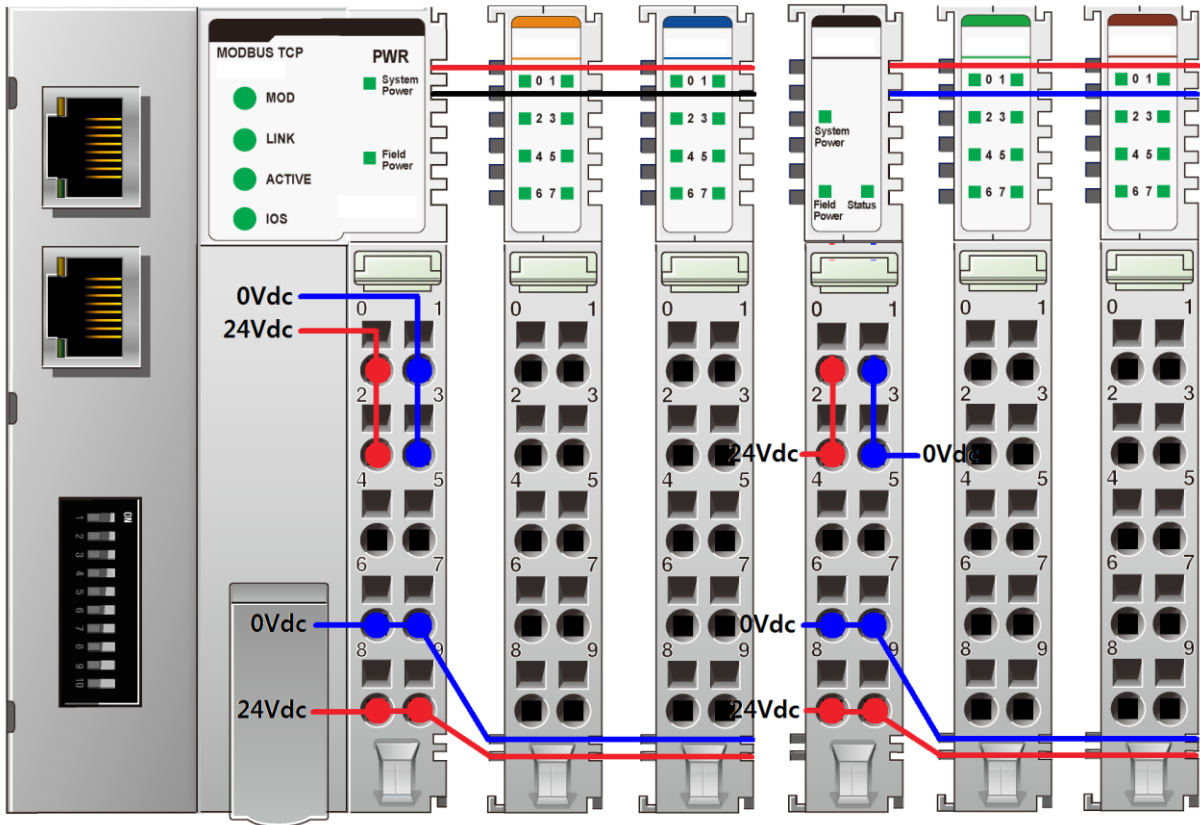
-40 ~ 70°C temperature range specification can be guaranteed under the following conditions.

> Current for I/O modules: 0.4 A below.

> Otherwise, temperature specification can be guaranteed with -40 ~ 60°C.

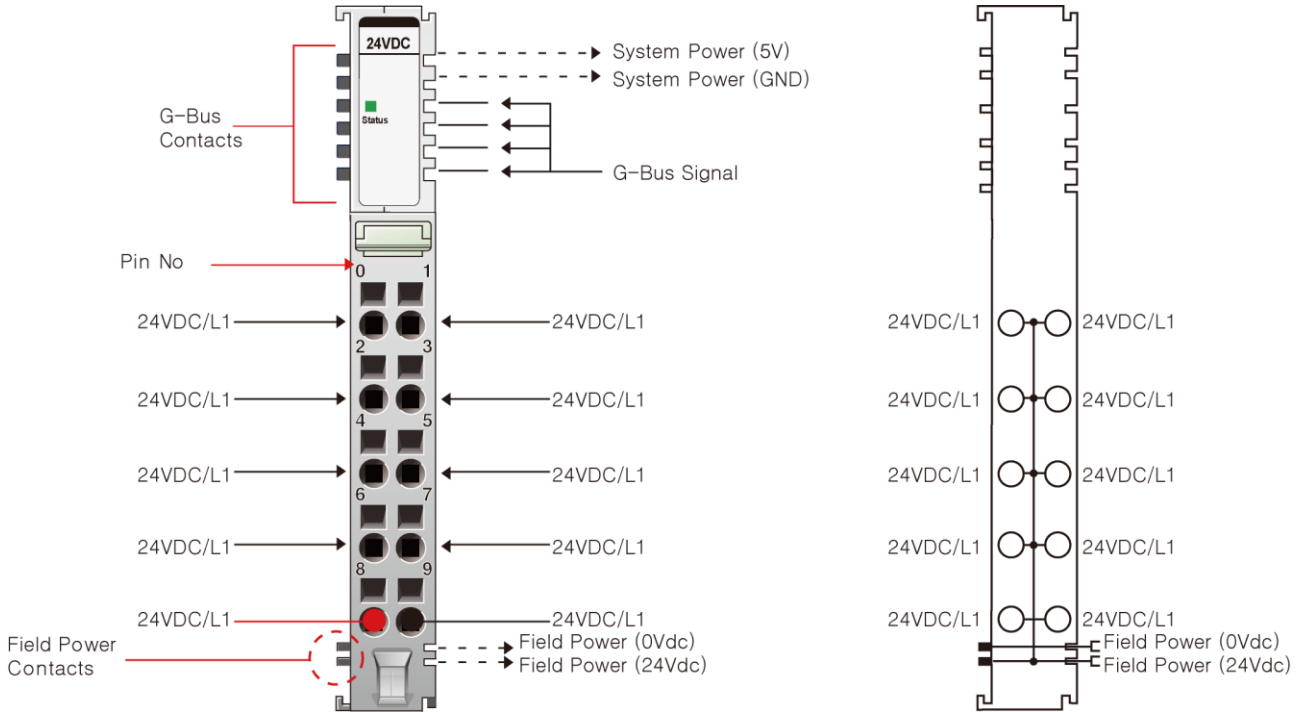
### 3.3.6 Example

RIO3-PSD Provides the additional Power.



### 3.4 RIO3-24VDC

#### 3.4.1 Wiring Diagram



Pin No.	Signal Description	Signal Description	Pin No.
0	24VDC/L1	24VDC/L1	1
2	24VDC/L1	24VDC/L1	3
4	24VDC/L1	24VDC/L1	5
6	24VDC/L1	24VDC/L1	7
8	24VDC/L1	24VDC/L1	9

### 3.4.2 LED Indicator



LED No.	LED Function / Description	LED Color
Status	Internal Bus Status	Green

### 3.4.3 Status LED

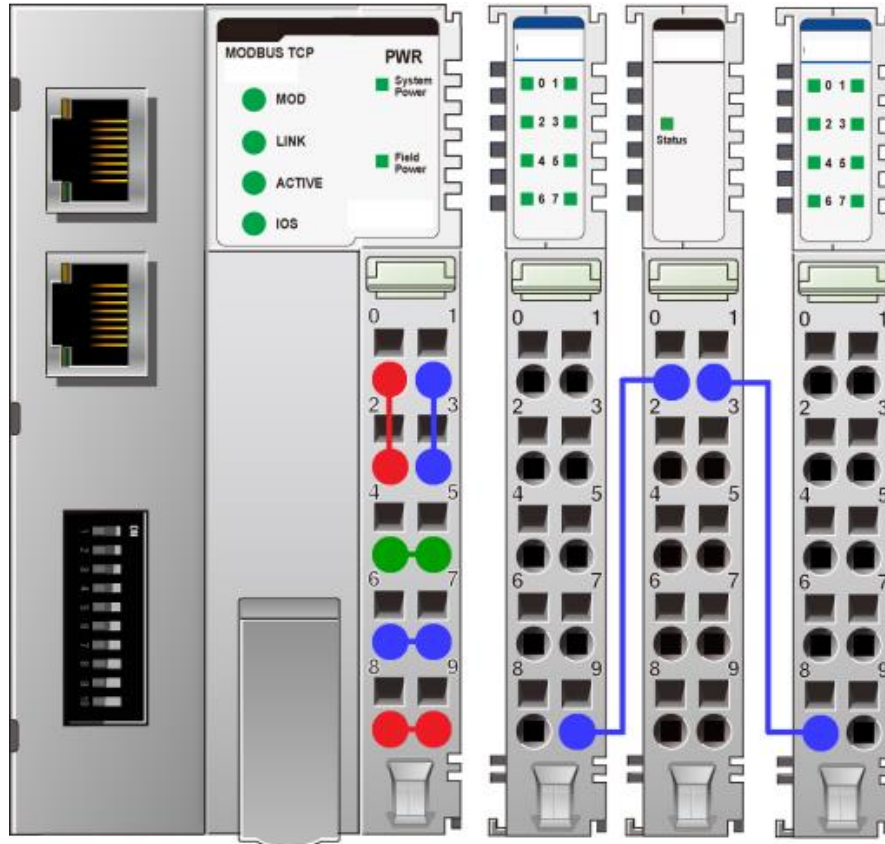
Status	LED	To indicate
Normal signal.	Green	The unit is operating in normal condition. (After normal initialization of G-Bus communication, this LED maintains ON status.)
Absence of network adapter	Off	Network adapter is not connected to this module.




### 3.4.4 Specification

Items	Specification
<b>Technical Data</b>	
UL Field Power	Supply voltage: 24Vdc nominal, Class 2
Field Power Voltage	24Vdc nominal
Field Power Contacts Current	Max. 10A Operating Temperature -40°C~50°C: Max. 10A 50°C~70°C: Max. 7A
Indicator	1 Green Internal Bus Status
<b>General Specification</b>	
System Power Dissipation	Max. 30mA @ 5Vdc
Wiring	I/O Cable Max. 2.0mm <sup>2</sup> (AWG 14)
Torque	0.8Nm (7 lb-in)
Weight	58g
Module Size	12mm x 99mm x 70mm
<b>Environment Condition</b>	<b>Refer to '4. Environment Specification'</b>

### 3.4.5 Example

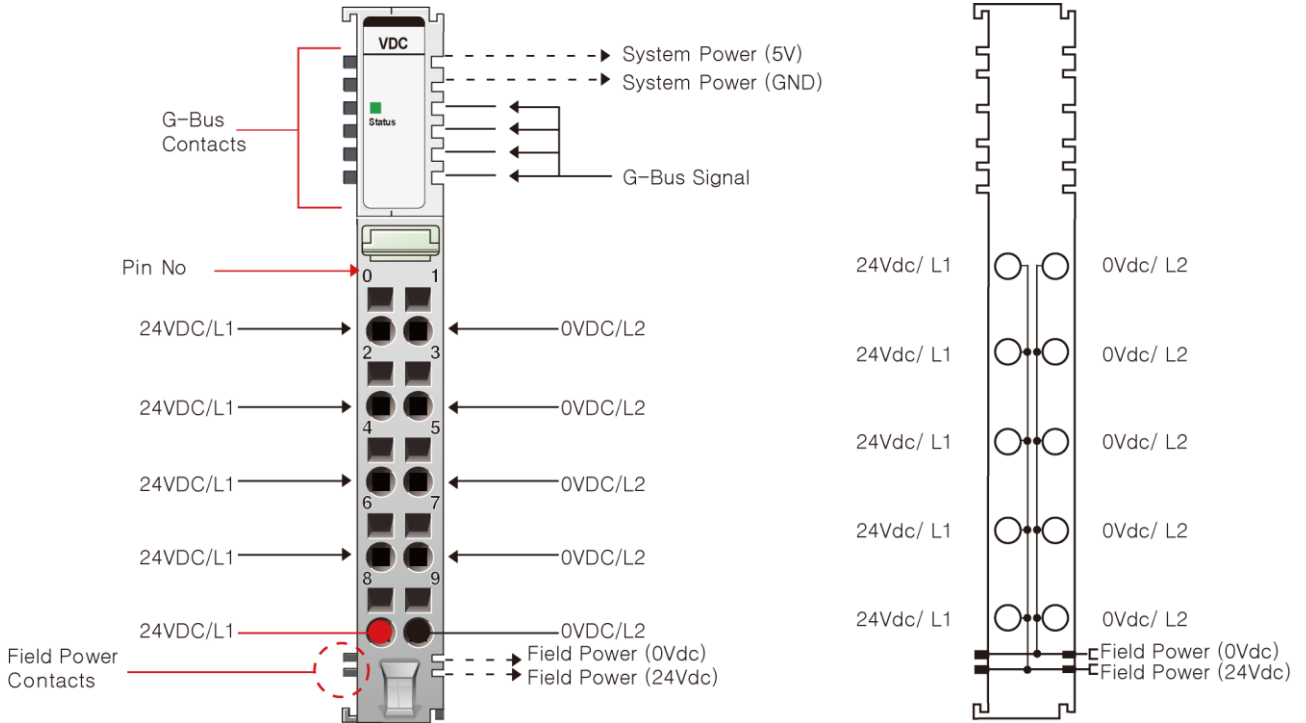
#### The RIO3-24VDC Common 24Vdc



Color	System Power	Field Power
	Hole Number	0, 2
	Hole Number	1, 3
	Hole Number	4, 5 (F.G)

### 3.5 RIO3-VDC

#### 3.5.1 Wiring Diagram



Pin No.	Signal Description	Signal Description	Pin No.
0	24VDC/L1	0VDC/L2	1
2	24VDC/L1	0VDC/L2	3
4	24VDC/L1	0VDC/L2	5
6	24VDC/L1	0VDC/L2	7
8	24VDC/L1	0VDC/L2	9



### 3.5.2 LED Indicator



LED No.	LED Function / Description	LED Color
Status	Internal Bus Status	Green

### 3.5.3 Status LED

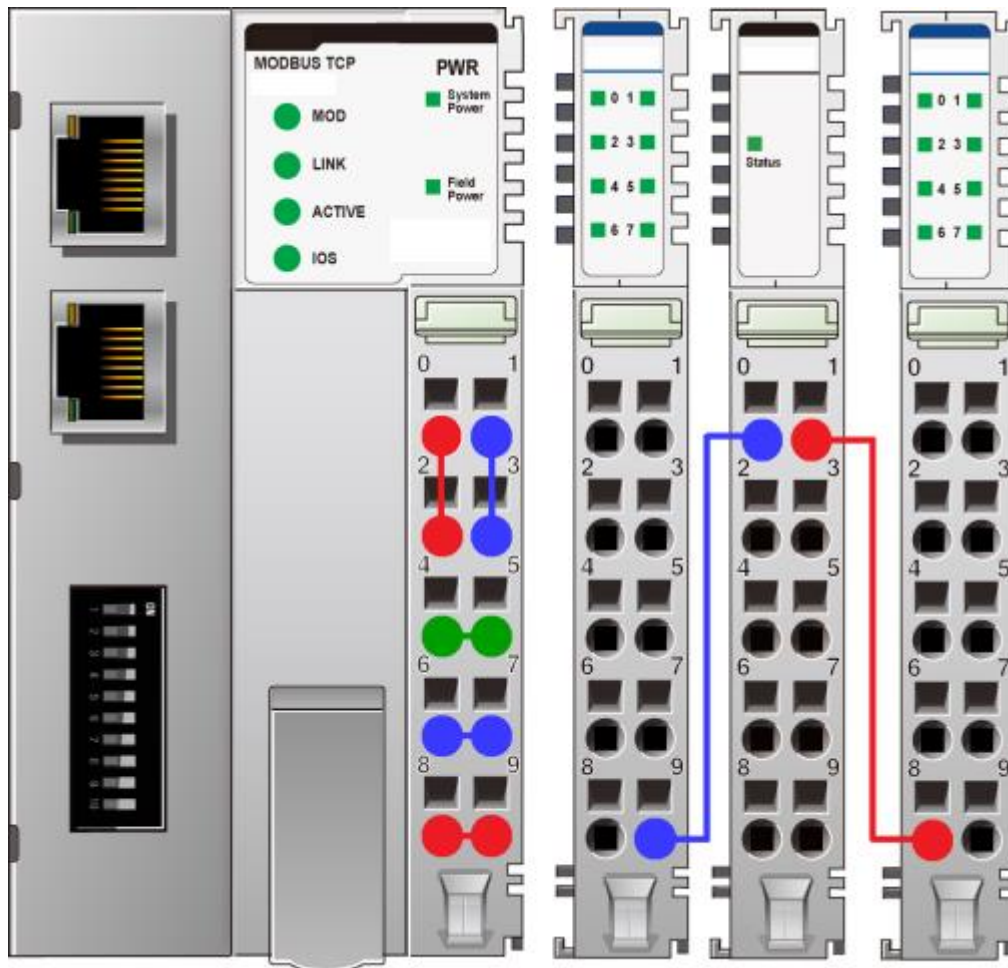
Status	LED	To indicate
Normal signal	Green	The unit is operating in normal condition. (After normal initialization of G-Bus communication, this LED maintains ON status.)
Absence of network adapter	Off	Network adapter is not connected to this module.

### 3.5.4 Specification

Items	Specification
<b>Technical Data</b>	
UL Field Power	Supply voltage: 24Vdc nominal, Class 2
Field Power Voltage	24Vdc nominal
Field Power Contacts Current	Max. 10A Operating Temperature -40°C~50°C: Max. 10A 50°C~70°C: Max. 7A
Indicator	1 Green Internal Bus Status
<b>General Specification</b>	
System Power Dissipation	Max. 30mA @ 5Vdc
Wiring	I/O Cable Max. 2.0mm <sup>2</sup> (AWG 14)
Torque	0.8Nm (7 lb-in)
Weight	58g
Module Size	12mm x 99mm x 70mm
<b>Environment Condition</b>	<b>Refer to '4. Environment Specification'</b>

### 3.5.5 Example

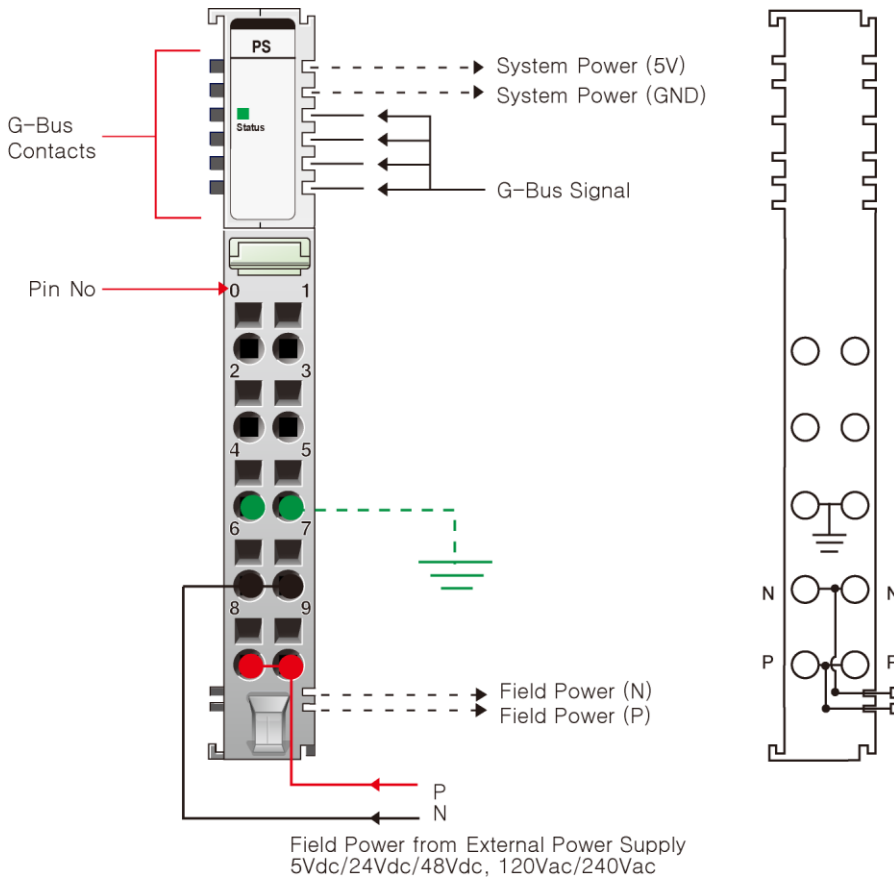
#### RIO3-VDC Common 24Vdc, 0Vdc



Color	System Power	Field Power
<span style="color: red;">█</span>	0, 2	8, 9
<span style="color: blue;">█</span>	1, 3	6, 7
<span style="color: green;">█</span>	4, 5 (F.G)	

### 3.6 RIO3-PS

#### 3.6.1 Wiring Diagram



Pin No.	Signal Description	Signal Description	Pin No.
0	NC	NC	1
2	NC	NC	3
4	Frame Ground	Frame Ground	5
6	Field Power, Arbitrary (N)	Field Power, Arbitrary (N)	7
8	Field Power, Arbitrary (P)	Field Power, Arbitrary (P)	9

### 3.6.2 LED Indicator



LED No.	LED Function / Description	LED Color
Status	Internal Bus Status	Green

### 3.6.3 Status LED

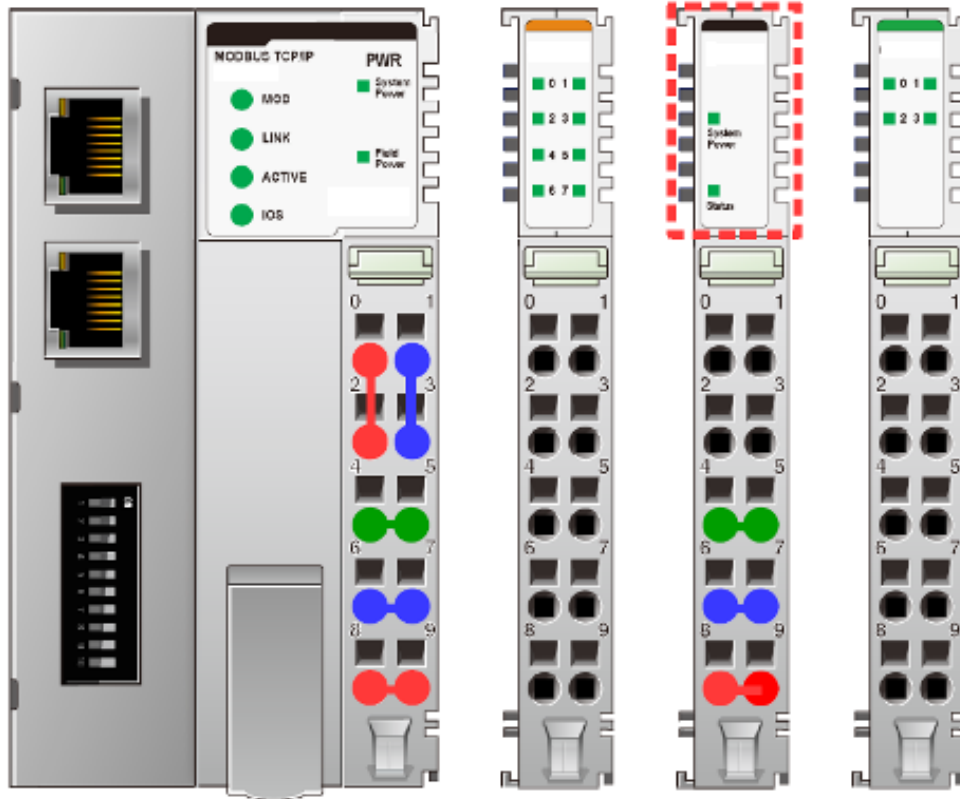
Status	LED	To indicate
Normal signal.	Green	The unit is operating in normal condition. (After normal initialization of G-Bus communication, this LED maintains ON status.)
Absence of network adapter	Off	Network adapter is not connected to this module.




### 3.6.4 Specification

Items	Specification
<b>Technical Data</b>	
UL Field Power	Supply voltage: 24Vdc nominal, Class 2
Field Power Voltage	24Vdc nominal
Field Power Contacts Current	Max. 10A Operating Temperature -40°C~50°C: Max. 10A 50°C~70°C: Max. 7A
Indicator	1 Green Internal Bus Status
<b>General Specification</b>	
System Power Dissipation	Max. 30mA @ 5Vdc
Wiring	I/O Cable Max. 2.0mm <sup>2</sup> (AWG 14)
Torque	0.8Nm (7 lb-in)
Weight	58g
Module Size	12mm x 99mm x 70mm
<b>Environment Condition</b>	<b>Refer to '4. Environment Specification'</b>

### 3.6.5 Example

#### RIO3-PS provides Field Power



Color	System Power	Field Power
 Hole Number	0, 2	8, 9
 Hole Number	1, 3	6, 7
 Hole Number	4, 5 (F.G)	

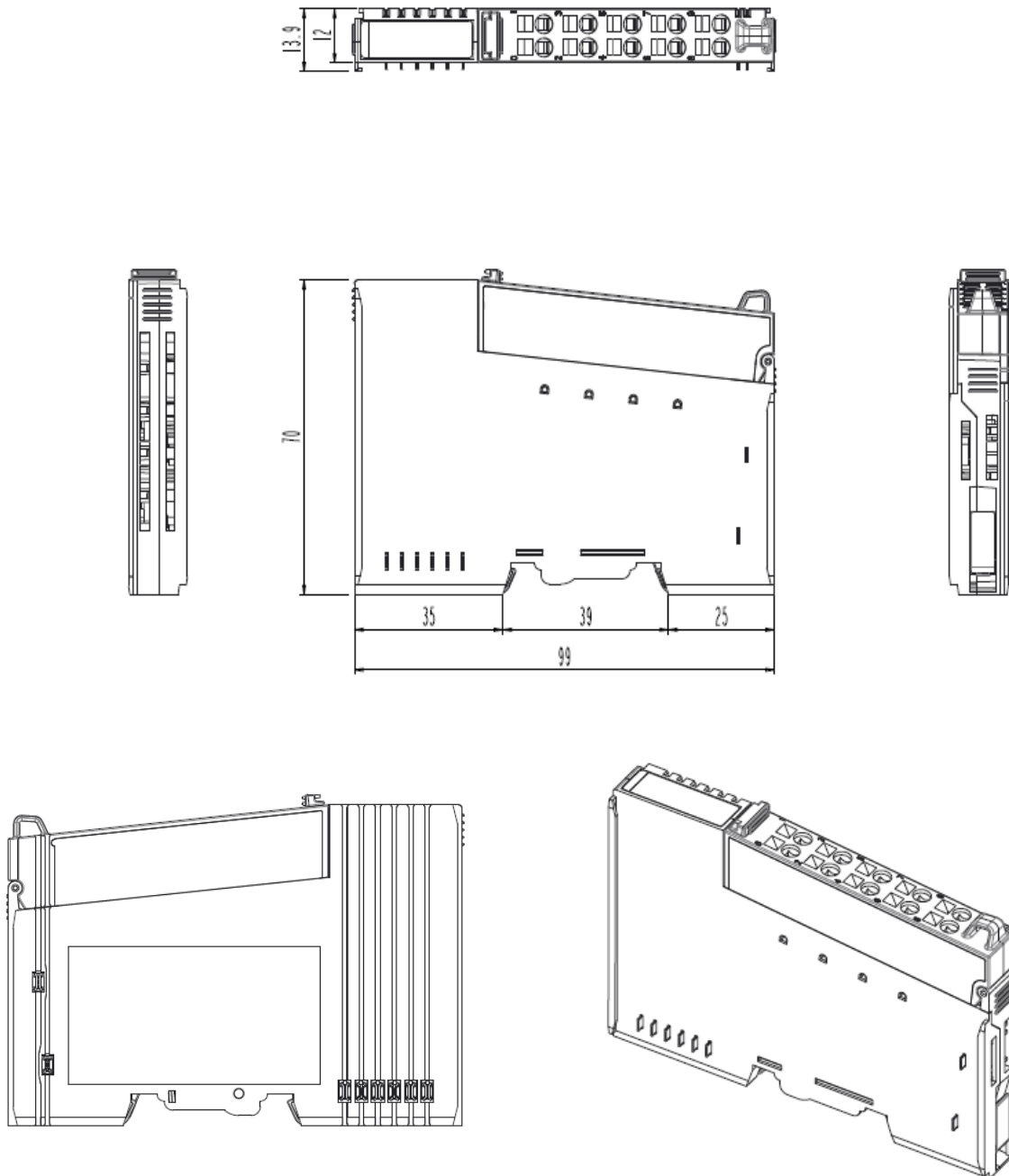
## 4 Environment Specification

Environmental Specification	
Operation Temperature	-40℃ ~ 70℃
UL Temperature	-20℃ ~ 60℃
Non-Operating Temperature	-40℃ ~ 85℃
Relative Humidity	5% ~ 90% Non-condensing
Mounting	DIN rail
General Specification	
Shock Operating	IEC 60068-2-27
Vibration Resistance	Based on IEC 60068-2-6 DNVGL-CG-0039: Vibration Class B, 4g
Industrial Emissions	EN61000-6-4:2007 +A1: 2011
Industrial Immunity	EN 61000-6-2: 2005
Installation Position	Vertical and horizontal installation is possible
Product Certifications	CE, UL, EAC



## 5 Dimension

### 5.1 10-Pts. Spring Type



*Dimensions in mm*

## 6 Mounting

### Caution!

#### Hot surface!

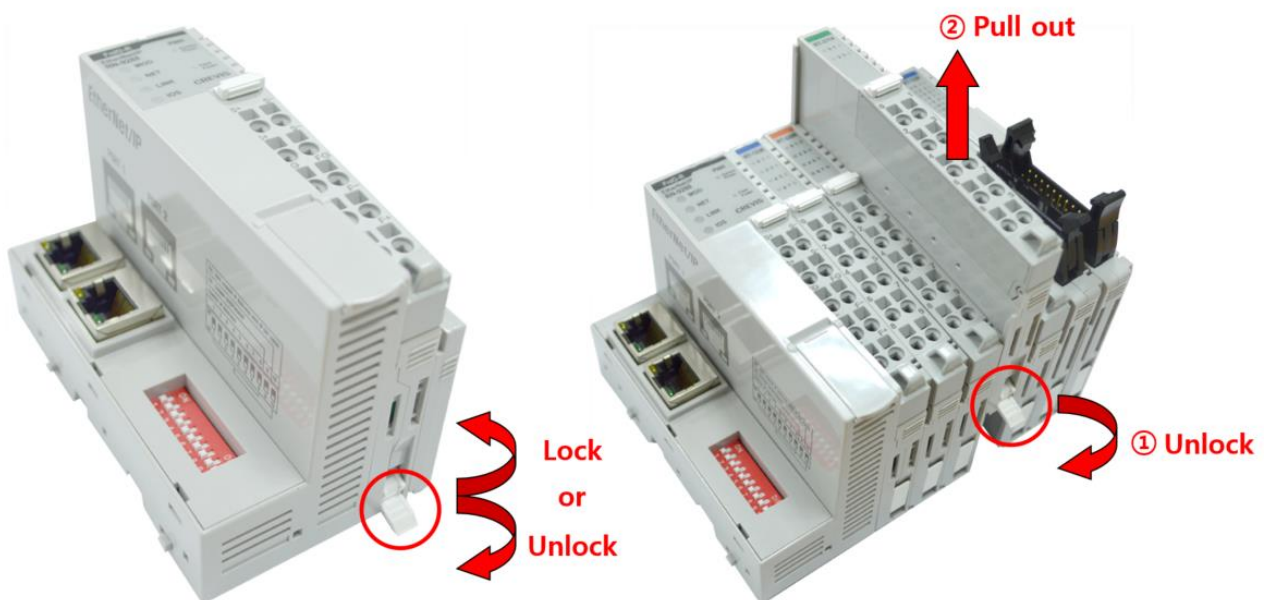
The surface of the housing can become hot during operation. If the device was operated at high ambient temperatures, allow it to cool off before touching it.

### Notice!

#### Perform work on devices only if they are de-energized!

Working on energized devices can damage them. Therefore, turn off the power supply before working on the devices.

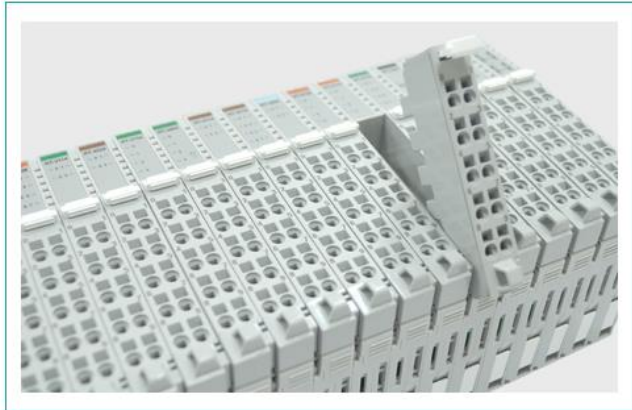
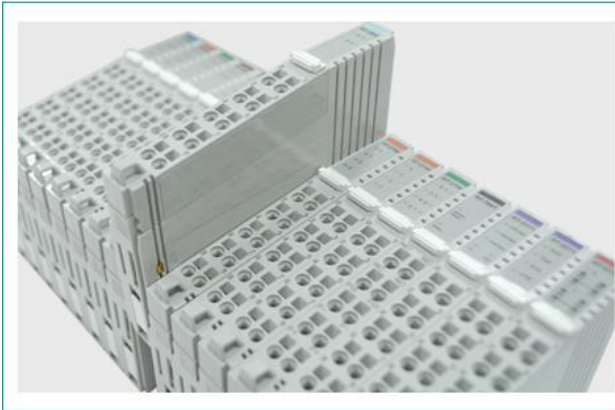
### 6.1 I/O Inserting and Removing Devices



As above figure in order to safeguard the RIO3-Module from jamming, it should be fixed onto the DIN rail with locking level. To do so, fold on the upper of the locking lever.

To pull out the RIO3-Module, unfold the locking lever as below figure.

## 6.2 RTB (Removable Terminal Block)



Whole terminal block can be combined and removed for the convenience of its maintenance.  
There is a locking switch on the RTB for the easy combination and easy removal.  
Easy combination and easy removal for IO modules on the din rail through One Touch Locking Switch.

## 7 G-Bus Pin Description

Communication between the RIO3-Series and the expansion module as well as system / field power supply of the bus modules is carried out via the internal bus. It is comprised of 6 data pin and 2 field power pin.



\*Please refer to the table below regarding the pin description from P1 to P8.

No.	Description
P1	Field Power (VCC)
P2	Field Power (GND)
P3	G-Bus CLK
P4	G-Bus MISO
P5	G-Bus MOSI
P6	G-Bus Token
P7	System Power (GND)
P8	System Power (VCC)

**DANGER**



Do not touch data and field power pins in order to avoid soiling and damage by ESD noise.

## 8 Troubleshooting

**DANGER**



In this manual, all variety cases can't be described.  
If you can't find any fault after investigating all below cases, please refer to user manuals of G-Series Network adapters.

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

## 9 APPENDIX

### 9.1 Product List

No.	RIO3-Number	Description	ID (hex)
<b>Digital Input Module</b>			
01	RIO3-XDP8	8 Points, Universal, 24Vdc, 10RTB	1238
02	RIO3-XDP16C	16 Points, Universal, 24Vdc, 20P connector	123F
03	RIO3-XDP16T	16 Points, Universal, 24Vdc, 18RTB	12DF
04	RIO3-XDP32C	32 Points, Universal, 24Vdc, 40P connector	12FA
05	RIO3-XY16T	8 Sink Input / 8 Source Output with Diagnostic, 24Vdc	1428
06	RIO3-XAH4	4 Points, 240Vac, 10RTB	1904
<b>Digital Output Module</b>			
07	RIO3-YTP8	8 Points, Source, 24Vdc/0.5A, 10RTB	2328
08	RIO3-YTP16C	16 Points, Source, 24Vdc/0.3A, 20P connector	222F
09	RIO3-YTP16T	16 Points, Source, 24Vdc/0.3A, 18RTB	226F
10	RIO3-YTP32C	32 Points, Source, 24Vdc/0.3A, 40P connector	22CA
11	RIO3-YS4	4 Points, MOS Relay, 240Vdc/ac, 0.5A, 10RTB	2734
12	RIO3-YS8	8 Points, MOS Relay Output Terminal, 240Vdc, 0.5A	2738
13	RIO3-YR4	4 Points, Relay, 24Vdc/2A, 240Vac/2A, 10RTB	2744
<b>Analog Input Module</b>			
14	RIO3-LDC2	2ch load cell input unit, strain gauge	3002
15	RIO3-AX4I	4 Channels, 0~20, 4~20mA, 12bits, 10RTB	3114
16	RIO3-AXH4I	4 Channels, 0~20, 4~20mA, 16bits, 10RTB	3154
17	RIO3-AX8I	8 Channels, 0~20, 4~20mA, 12bits, 10RTB	3118
18	RIO3-AXH8I	8 Channels, 0~20, 4~20mA, 16bits, 10RTB	3158
19	RIO3-AX16IC	16 Channels, 0~20, 4~20mA, 12bits, 20P connector	311F
20	RIO3-AX16IT	16 Channels, 0~20, 4~20mA, 12bits, 18RTB	317F
21	RIO3-AX4V	4 Channels, 0~10, 0~5, 1~5Vdc, 12bits, 10RTB	3424
22	RIO3-AXH4V	4 Channels, 0~10, 0~5, 1~5Vdc, 16bits, 10RTB	3464
23	RIO3-AX8V	8 Channels, 0~10, 0~5, 1~5Vdc, 12bits, 10RTB	3428
24	RIO3-AXH8V	8 Channels, 0~10, 0~5, 1~5Vdc, 16bits, 10RTB	3468
25	RIO3-AX16VC	16 Channels, 0~10, 0~5, 1~5Vdc, 12bits, 20P connector	342F
26	RIO3-AX16VT	16 Channels, 0~10, 0~5, 1~5Vdc, 12bits, 18RTB	347F
27	RIO3-RTD4T	4 Channels, RTD, 10RTB	3704
28	RIO3-RTD8C	8 Channels, RTD, 20P connector	3708
29	RIO3-TC4T	4 Channels, Thermocouple, 10RTB	3804
30	RIO3-E3AC	AC Measurement	3901
<b>Analog Output Module</b>			
31	RIO3-AY4I	4 Channels, Current Output, 4~20mA, 12bits	4214

32	RIO3-AYH4I	4 Channels, Current Output, 4~20mA, 16bits	4254
33	RIO3-AY8I	8 CHANNELS CURRENT OUTPUT, 4~20mA, 12BIT	4218
34	RIO3-AY4V	4CH, 0~10Vdc, 12Bits, 10RTB	4424
35	RIO3-AYH4V	4CH, 0~10Vdc, 16Bits, 10RTB	4464
36	RIO3-AY8V	8CH, 0~10Vdc, 12Bits, 10RTB	4428
37	RIO3-AY16VC	16CH, 0~10Vdc, 12Bits, 20P Connector	442F
38	RIO3-AY16VT	16CH, 0~10Vdc, 12Bits, 18RTB	447F
<b>Special Module</b>			
39	RIO3-CU24L	High Speed Counter, 2CHs, 24Vdc, Encoder Input, 10RTB	
40	RIO3-RS232	1CH, RS 232, RTS/CTS, Full Duplex Type, 10RTB	5211
41	RIO3-RS485	1CH, RS 485, Half Full Duplex Type, 10RTB	5231
42	RIO3-PWM2	PWM Output, 2CHs, 0.5A/24Vdc, Source, 18RTB	5442
43	RIO3-PO2	Pulse Output, 2CHs, 0.5A/24Vdc, Source, 18RTB	5642
<b>Power Module</b>			
44	RIO3-SHD	Shield Module	7408
45	RIO3-0VDC	Common for 0Vdc	7508
46	RIO3-PSD	Power Expansion, In 24Vdc, Out 1A/5Vdc	7511
47	RIO3-24VDC	Common for 24Vdc	7518
48	RIO3-VDC	Common for 0Vdc, 24Vdc	7588
49	RIO3-PS	Field Power, 5/24/48 Vdc, 110/220 Vac	7641

## 9.2 Glossary

System Power: The power for starting up CPU.

Field Power: The power for input and output line.

Terminator Resistor: Resistor for prevention reflected wave.

EDS: Electronic Data Sheet.

Sink: The method of in/output power supply if a device has no power source.

Source: The method of in/output power supply if a device has the power source.