KEYENCE

Multi-Protocol IO-Link Master Module

NQ-MP8L

EtherNet/IP™ IO-Link Master Module

NQ-EP4L

EtherNet/IP™ Temperature/Analog Input Module

NQ-EP4A

IO-Link I/O Module

NQ-IL8P

User's Manual

Introduction

This manual describes the handling, operation, and precautions for the following products.

- Multi-Protocol IO-Link Master Module NQ-MP8L
- EtherNet/IP^{TM} IO-Link Master Module NQ-EP4L
- EtherNet/IP^{TM} Temperature/Analog Input Module NQ-EP4A
- IO-Link I/O Module NQ-IL8P

Read this manual carefully and thoroughly understand its contents in order to take full advantage of the performance and functions of these products. Keep this manual in a safe place for future reference. Be sure to send this manual to the end user of the product.

Symbols

This manual uses the following symbols to alert readers to important messages. Be sure to read these messages carefully.

⚠ DANGER	**Indicates a hazardous situation which, if not avoided, will result in death or serious injury.**
⚠ WARNING	**Indicates a hazardous situation which, if not avoided, could result in death or serious injury.**
⚠ CAUTION	**Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.**
NOTICE	**Indicates a situation which, if not avoided, could result in product damage as well as property damage.**

▶ Important	**Indicates cautions and limitations that must be followed during operation.**
✎ Point	**Indicates additional information on proper operation.**
Reference	Indicates useful information or information that aids understanding of text descriptions.
📖	Indicates items and pages in this manual being referenced.

Safety Precautions

⚠ DANGER	• Do not use this product with the purpose of protecting the human body or a part of the human body. • Do not use this product in an application that may cause death, serious injury or serious property damage due to a failure with this product occurring, such as nuclear power plants, on aircrafts, trains, ships, or vehicles, used within medical equipment, playground equipment, roller coasters and other rides, etc. • Do not use this product in a hazardous location and/or potentially explosive atmosphere. • You must perform a sufficient risk assessment for the machine where this product is to be installed prior to installing this product. Provide appropriate protective fail-safe measures on the machine independent from this product in case a failure with this product should occur.
⚠ WARNING	If the product is used in a manner not specified by this manual, the protection provided by the product may be impaired.
⚠ CAUTION	When this product is used with a high load and under a high ambient operating temperature, the surface of the main unit will become hot. To prevent burns, avoid touching the main unit without additional protection.

■ Precautions for wiring

NOTICE	• Check the pin layout of the connection port, and then wire it correctly. • Apply voltage within the rated range when using the product. This product is an IO-Link master module that should be used with a DC power supply. Do not apply AC voltage. Also, do not use a load that exceeds the rated range. • Use an insulated stabilizing power supply. • Do not apply excessive tensile force to the cable. • Ensure that the cable tip is not submerged in water during wiring work. • Do not place the cables connected to this product together with power supply cables for other products. • Isolate the cables as far away as possible from any sources of noise. • When using IO-Link communication, ensure that the total length of the cable between the device and the IO port is 20 m or less. • Power supply for NQ is recommended to be solo and not to be shared with other devices if there is a possibility of noise influence from the other devices.

Precautions on Regulations and Standards

■ CE and UKCA Markings

KEYENCE Corporation has confirmed, on the basis of the following specifications, that this product complies with the essential requirements of the applicable EU Directive(s) and UK regulations. Be sure to consider the following specifications when using this product in the Member States of the European Union and in the United Kingdom.

■ EMC Directive (CE) and Electromagnetic Compatibility Regulations (UKCA)

• Applicable Standard (BS) EN 61131-2

These specifications do not give any guarantee that the end-product with this product incorporated complies with the essential requirements of the EMC Directive and Electromagnetic Compatibility Regulations. The manufacturer of the end-product is solely responsible for the compliance of the end-product itself according to the EMC Directive and Electromagnetic Compatibility Regulations.

■ UL Certification

This product is a UL/C-UL Listed product.
• UL File No. E207185

• Category NRAQ. NRAQ7

If the device connected to the IO port requires the use of a Class 2 power supply, use a UL/CSA certified power supply with Class 2 output for the power to supply to V1 and V2 of the power supply port.

■ North American EMI Regulations

This product complies with the following North American regulations.
• Applicable regulationsFCC Part15 Subpart B, Class A
    Digital Device
    ICES-003, Class A Digital Apparatus

• Operation is subject to the following two conditions:

(1) This product does not cause harmful radio frequency interference.
(2) This product accepts radio frequency interference even if this interference causes unexpected operations.
• Precautions on FCC rules

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

■ KC mark (Republic of Korea)

Class A Device
This product has been conformity assessed for use in business environments.
In a residential environment this product may cause radio interference.
Do not use power cables or daisy chains connection cable longer than 30 m.
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Article 8 (Base Law)
This agreement is to be adjudicated according to Japanese law.

Table of Contents

Chapter 1 Before Operation

Chapter 2 Specifications

Chapter 3 Installation and Wiring

Chapter 4 Use the NQ Sensor Monitor to Configure Settings

Chapter 5 Monitoring with NQ Sensor Monitor

Chapter 6 EtherNet/IP Communication

Chapter 7 Modbus/TCP Communication

Chapter 8 PROFINET Communication

Chapter 9 Appendix

NQ Series User's Manual

1

Before Operation

This chapter describes the contents that you should know before using this product, including the package contents and an overview of the NQ Series.

Overview of the NQ Series

The NQ Series is an IO-Link master module and a temperature / analog input module that supports the main industrial Ethernet protocols such as EtherNet/IP, PROFINET, and Modbus/TCP.

The NQ Series has two power supply ports and two Ethernet ports, and each module can be connected in a daisy chain. Along with this, I/O modules are available for connecting analog input modules and general-purpose I/O devices. These I/O modules make it possible to use data with simplified wiring and communication while using existing devices.

The NQ Series also boasts IP65/67/69K enclosure ratings for use in a wide range of environments.

> **Reference** IO-Link is a communication interface that complies with the international standard IEC 61131-9 and does not require a field bus be used for sensors and actuators. IO-Link utilizes conventional sensor and actuator cables / wires for communication, thereby enabling communication with sensors and actuators in a one to one manner.
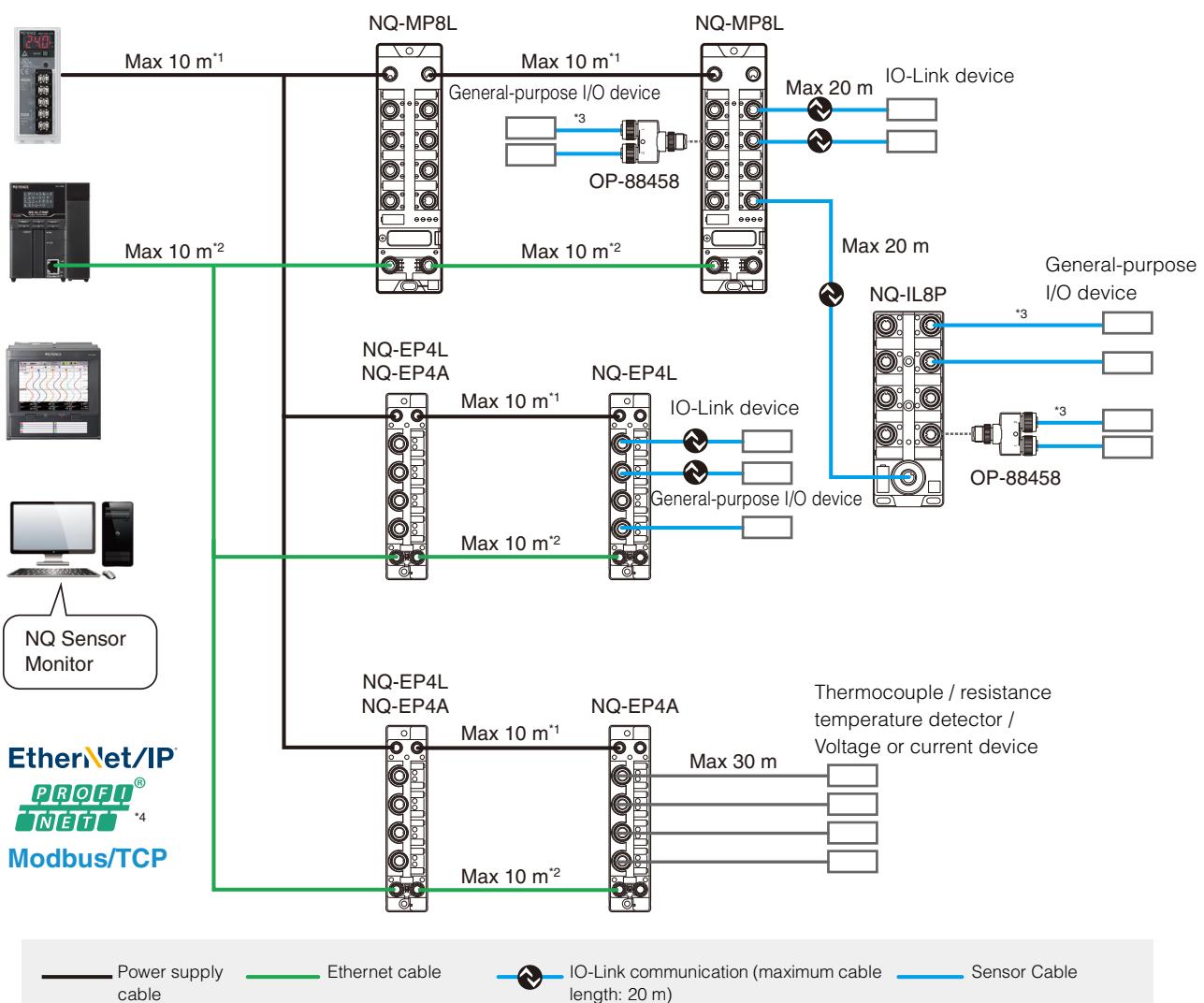
*1 Restriction due to the length of the connector cables included in KEYENCE's product lineup. This depends on the number of connected units and the current when connected through the terminal block.

*2 Restriction due to the length of the connector cables included in KEYENCE's product lineup. This complies with the Ethernet specifications when connected through a hub or similar device.

*3 The allowable extension distance depends on the devices.

*4 PROFINET is only available with the NQ-MP8L.

1-2 Checking the Package Contents

Multi-Protocol IO-Link Master Module

NQ-MP8L
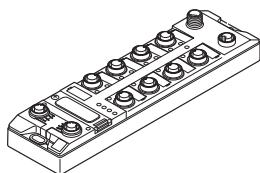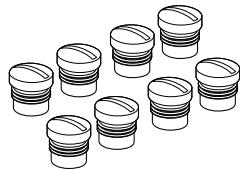
Main unit × 1	Signal label sheet × 1 (set of 10 sheets)
M12 waterproof cap × 8	Instruction manual × 1

(Separate M12 waterproof caps are attached to power supply port OUT and Ethernet port 2.)

EtherNet/IP^{TM} Temperature / Analog Input Module

NQ-EP4A

Main unit × 1	Signal label sheet × 1 (set of 10 sheets)
M12 waterproof cap × 4	Instruction manual × 1
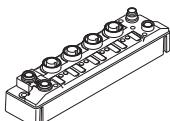
(Separate M8 waterproof caps are attached to power supply port OUT and Ethernet port 2.)

EtherNet/IP^{TM} IO-Link Master Module

NQ-EP4L

Main unit × 1	Signal label sheet × 1 (set of 10 sheets)
M12 waterproof cap × 4	Instruction manual × 1
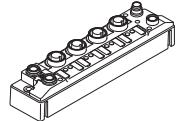
(Separate M8 waterproof caps are attached to power supply port OUT and Ethernet port 2.)

IO-Link I/O Module

NQ-IL8P
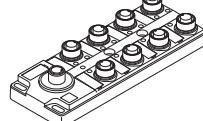
Main unit × 1	Signal label sheet × 1 (set of 9 sheets)
M12 waterproof cap × 8	Instruction manual × 1

1

Power Supply Cables

NQ-EP4L
NQ-EP4A

NQ-MP8L
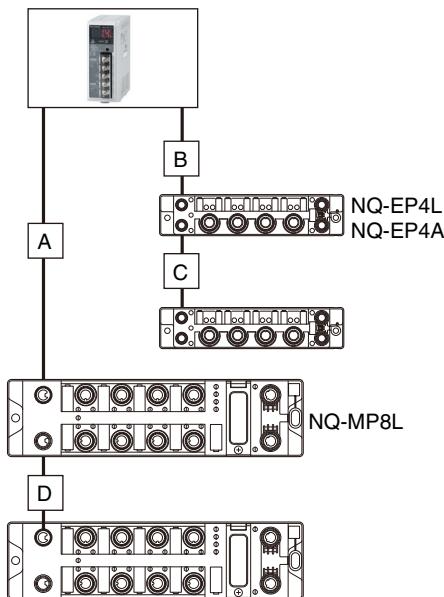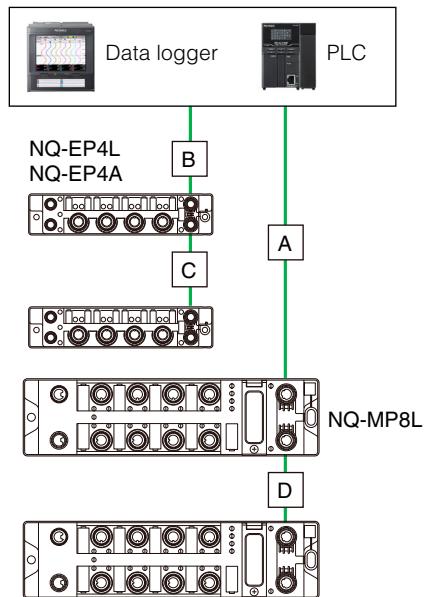
Cable	Cable Description	Model	Length	Material
A	M12 female (L-coded, straight) - Bare wires	NQ-P8B2	2 m	PVC
A	M12 female (L-coded, straight) - Bare wires	NQ-P8B5	5 m	PVC
A	M12 female (L-coded, straight) - Bare wires	NQ-P8B10	10 m	PVC
B	M8 female (A-coded, straight) - Bare wires	NQ-P4B2	2 m	PVC
B	M8 female (A-coded, straight) - Bare wires	NQ-P4B5	5 m	PVC
B	M8 female (A-coded, straight) - Bare wires	NQ-P4B10	10 m	PVC
C	M8 male (A-coded, straight) - M8 female	NQ-P4C03	0.3 m	PVC
C	M8 male (A-coded, straight) - M8 female	NQ-P4C2	2 m	PVC
C	M8 male (A-coded, straight) - M8 female	NQ-P4C10	10 m	PVC
D	M12 male (L-coded, straight) - M12 female (L-coded, straight)	NQ-P8C03	0.3 m	PVC
D	M12 male (L-coded, straight) - M12 female (L-coded, straight)	NQ-P8C2	2 m	PVC
D	M12 male (L-coded, straight) - M12 female (L-coded, straight)	NQ-P8C10	10 m	PVC

Ethernet Cables

Data logger   PLC

NQ-EP4L
NQ-EP4A

NQ-MP8L

Cable	Cable Description	Model	Length	Material
A	M12 male (D-coded, straight) - RJ45	OP-88086	2 m	PUR
A	M12 male (D-coded, straight) - RJ45	OP-88087	5 m	PUR
A	M12 male (D-coded, straight) - RJ45	OP-88088	10 m	PUR
B	M8 male (A-coded, straight) - RJ45	OP-88448	2 m	PUR
B	M8 male (A-coded, straight) - RJ45	OP-88449	5 m	PUR
B	M8 male (A-coded, straight) - RJ45	OP-88450	10 m	PUR
C	M8 male (A-coded, straight) - M8 male (A-coded, straight)	OP-88452	0.3 m	PUR
C	M8 male (A-coded, straight) - M8 male (A-coded, straight)	OP-88453	2 m	PUR
C	M8 male (A-coded, straight) - M8 male (A-coded, straight)	OP-88454	10 m	PUR
D	M12 male (D-coded, straight) - M12 male (D-coded, straight)	OP-88451	0.3 m	PUR
D	M12 male (D-coded, straight) - M12 male (D-coded, straight)	OP-88089	2 m	PUR
D	M12 male (D-coded, straight) - M12 male (D-coded, straight)	OP-88091	10 m	PUR

IO Port Cables

M12 (4 pins) connector sensor

M12 male

M12 female to M12 male

A

M12 female to M12 male

A

NQ-MP8L

NQ-EP4L
NQ-EP4A

M8 (4 pins) connector sensor

M8 male

M8 female to M12 male

B

M12 female to M12 male

A
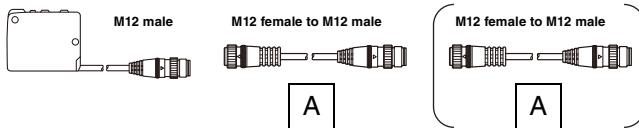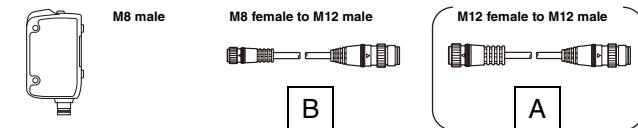
NQ-IL8P

M12 (8 pins) connector sensor (KEYENCE FL Series level sensor)
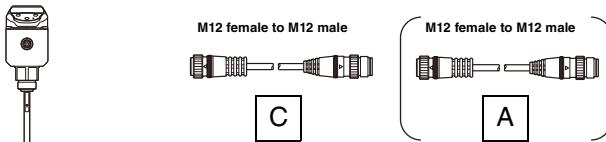
M12 female to M12 male

C

M12 female to M12 male

A

Bare wires sensor

OP-88296

NQ-IL8P

M12 female to M12 male

A

NQ-MP8L

NQ-EP4L
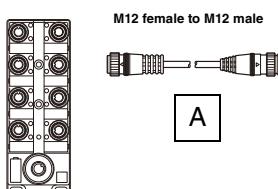
Cable	Cable Description	Model	Cable material	Length
A	M12 female (4 pins, straight) - M12 male (4 pins, straight)	OP-85503*	PVC	2 m
		OP-85504*		5 m
		OP-88075	PUR	2 m
		OP-88076		5 m
	M12 female (4 pins, L-shaped) - M12 male (4 pins, straight)	OP-88455		2 m
B	M8 female (4 pins, straight) - M12 male (4 pins, straight)	OP-88456	PVC	2 m
		OP-88457		5 m
		OP-88071	PUR	2 m
		OP-88072		5 m
	M8 female (4 pins, L-shaped) - M12 male (4 pins, straight)	OP-88073		2 m
		OP-88074		5 m
C	[For the FL Series] M12 female (8 pins, straight) - M12 male (4 pins, straight)	OP-88444	PVC	2 m
		OP-88445		5 m
		OP-88446		10 m
D	Bare wires - M12 male (4 pins, straight) conversion connector	OP-88296	-	-

* Cannot be used for connection between NQ-IL8P and IO-Link master.

Other

■ M12 Y-shaped Branch Connector OP-88458
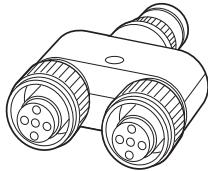
Rated current	4 A (with a temperature of 40°C)
Operating ambient temperature	−25 to +90°C
Enclosure rating	IP65/67 (with connector connected)
Tightening torque	0.4Nm
Materials	Case: TPU (polyurethane) Knurled section: Zinc die-casting (nickel alloy plating) Sealing: NBR

Reference: For details on the pin layout, refer to "Pin layout of the Y-shaped Branch Connector OP-88458." (Page 3-9)

■ M12 Conversion Connector for Thermocouples OP-88459
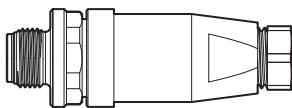
Applicable cable specifications	Cable outer diameter	3 to 6.5 mm
	Nominal cross-sectional area	0.75 mm^2 or less
Operating ambient temperature		0 to +55°C
Material		Case: PA (polyamide)

Reference: For details on the pin layout, refer to "Pin layout of the M12 Conversion Connector for Thermocouples OP-88459." (Page 3-9)

1-4 Part Names and Functions

Part Names and Functions

NQ-MP8L

Power supply port IN (PWR IN)
Power supply port OUT (PWR OUT)

Port 1 (C0)
Port 2 (C1)
Port 3 (C2)
Port 4 (C3)
Port 5 (C4)
Port 6 (C5)
Port 7 (C6)
Port 8 (C7)

Ethernet port 1 (P1)
Ethernet port 2 (P2)

Power supply ports
Page 3-4

IO ports
Page 3-6

IP address setting switches
Page 4-7

Ethernet ports
Page 3-5

Grounding metal clamp
Page 3-3

NQ-IL8P

Port 7 (C7)
Port 5 (C5)
Port 3 (C3)
Port 1 (C1)
Port 8 (C8)
Port 6 (C6)
Port 4 (C4)
Port 2 (C2)

IO ports
Page 3-6

IO-Link communication port
Page 3-8

> **Point**
>
> Note that the connector numbers for the NQ-MP8L/EP4L/EP4A start with "C0" and the connector numbers for the NQ-IL8P start with "C1."

NQ-EP4L/EP4A

Power supply port IN (PWR IN)
Power supply port OUT (PWR OUT)

Port 1 (C0)
Port 2 (C1)
Port 3 (C2)
Port 4 (C3)

Ethernet port 1 (P1)
Ethernet port 2 (P2)

Power supply ports
Page 3-4

IO ports
Page 3-6

Ethernet ports
Page 3-5

Grounding metal clamp
Page 3-3

1

Before Operation

1

Before Operation

LED Display

NQ-MP8L

Notation	Description	Color	Status	Description
PWR	Power supply	Green	Lit	Normal V1/V2 voltage
			Lit	V2 voltage is less than 18 V
		-	Unlit	V1 voltage is less than 18 V
ERR	Error status	Green	Lit	Diagnostic information not provided
		Red	Lit	Diagnostic information provided
		-	Unlit	Power supply OFF
BUS	Status of communication with the higher-level unit	Green	Lit	Connection with higher-level side enabled
			Blinking	Connection standby status
		Red	Lit	IP address duplication
				Modbus/TCP watch dog time-out IP address setting switches set to "0.0.0"
			Blinking	Blink command being executed
		Red/green	Blinking	Auto negotiation in progress or standing by for IP address assignment via DHCP/BootP
		-	Unlit	Power supply OFF
ETH1 ETH2	Ethernet communication status	Green	Lit	Connection established (100 Mbps)
			Blinking	Communication occurring (100 Mbps)
		Orange	Lit	Connection established (10 Mbps)
			Blinking	Communication occurring (10 Mbps)
		-	Unlit	No connection
0, 2, 4, 6, 8, 10, 12, 14	Pin 4 operation status	**IO-Link mode**		
		Green	Blinking	IO-Link connection enabled, process data enabled
		Red	Blinking	IO-Link connection enabled, process data disabled
			Lit	No IO-Link connection, process data disabled
		-	Unlit	No IO-Link connection, diagnostic information disabled
		Digital input mode		
		Green	Lit	Input ON
		-	Unlit	Input OFF
1, 3, 5, 7	Pin 2 operation status	Green	Lit	Input or output ON
		Red	Lit	Output overcurrent
			Blinking	Device power supply overload
		-	Unlit	Input or output OFF
9, 11, 13, 15	Class B port power supply	Green	Lit	Normal V2 (pin 2) power voltage
		Red	Lit	V2 (pin 2) power supply overload / short circuit
			Blinking	V1 (pin 1) power supply overload / short circuit
		-	Unlit	V2 (pin 2) power supply OFF
-	*	White	Blinking	Blink command being executed

NQ-EP4L

Notation	Description	Color	Status	Description
PWR	Power supply	Green	Lit	Normal V1/V2 voltage
		Red	Lit	V2 voltage is less than 18 V
		-	Unlit	V1 voltage is less than 18 V
ERR	Error status	Green	Lit	Diagnostic information not provided
		Red	Lit	Diagnostic information provided
		-	Unlit	Power supply OFF
BUS	Status of communication with the higher-level unit	Green	Lit	Connection with higher-level side enabled
			Blinking	Connection standby status
		Red	Lit	IP address duplication
				Modbus/TCP watch dog time-out
		Red/green	Blinking	Auto negotiation in progress or standing by for IP address assignment via DHCP/BootP
		-	Unlit	Power supply OFF
ETH1 ETH2	Ethernet communication status	Green	Lit	Connection established (100 Mbps)
			Blinking	Communication occurring (100 Mbps)
		Orange	Lit	Connection established (10 Mbps)
			Blinking	Communication occurring (10 Mbps)
		-	Unlit	No connection
0, 2, 4, 6	Pin 4 operation status	**IO-Link mode**		
		Green	Blinking	IO-Link connection enabled, process data enabled
		Red	Blinking	IO-Link connection enabled, process data disabled
			Lit	No IO-Link connection, process data disabled
		-	Unlit	No IO-Link connection, diagnostic information disabled
		Digital input mode		
		Green	Lit	Input ON
		-	Unlit	Input OFF
1, 3, 5, 7	Pin 2 operation status	Green	Lit	Input or output ON
		Red	Lit	Output overcurrent
		-	Unlit	Input or output OFF

1

NQ-EP4A

NQ-IL8P

Notation	Description	Color	Status	Description
PWR	Power supply	Green	Lit	Normal V1/V2 voltage
		-	Unlit	V1 voltage is less than 18 V
ERR	Error status	Green	Lit	Diagnostic information not provided
		Red	Lit	Diagnostic information provided
		-	Unlit	Power supply OFF
BUS	Status of communication with the higher-level unit	Green	Lit	Connection with higher-level side enabled
			Blinking	Connection standby status
		Red	Lit	IP address duplication
				Modbus/TCP watch dog time-out
		Red/ green	Blinking	Auto negotiation in progress or standing by for IP address assignment via DHCP/ BootP
		-	Unlit	Power supply OFF
ETH1 ETH2	Ethernet communication status	Green	Lit	Connection established (100 Mbps)
			Blinking	Communication occurring (100 Mbps)
		Orange	Lit	Connection established (10 Mbps)
			Blinking	Communication occurring (10 Mbps)
		-	Unlit	No connection
0, 1, 2, 3	Analog input status	**Voltage/current mode**		
		Green	Lit	Input enabled
		Red	Lit	V1 (pin 1) power supply overload / short circuit
			Blinking (0.5 Hz)	(Current) input wire disconnected
			Blinking (4 Hz)	Out of measured value range
		-	Unlit	Input disabled
		Resistance temperature detector mode		
		Green	Lit	Input enabled
		Red	Lit	Input short circuit
			Blinking (0.5 Hz)	Disconnection
			Blinking (4 Hz)	Out of measured value range
		-	Unlit	Input disabled
		Thermocouple mode		
		Green	Lit	Input enabled
		Red	Lit	Cold junction error
			Blinking (0.5 Hz)	Disconnection
			Blinking (4 Hz)	Out of measured value range
		-	Unlit	Input disabled

Notation	Description	Color	Status	Description
A	Pin 4 operation status	Green	Lit	Input or output ON
		Red	Lit	Output overload/overcurrent
			Blinking	Sensor power supply overload
		-	Unlit	Input or output OFF
B	Pin 2 operation status	Green	Lit	Input or output ON
		Red	Lit	Output overload/overcurrent
			Blinking	Sensor power supply overload
		-	Unlit	Input or output OFF
(Center LED)	IO-Link communication status	Green	Blinking	IO-Link connection enabled
		Red	Lit	No IO-Link connection
			Blinking	Process data disabled or diagnostic information provided
		-	Unlit	Power supply OFF

1-5 Procedure Prior to Operation

This section describes the procedure that should be followed prior to usage of the NQ Series.

1. Installation and wiring

- ● **Installation (Page 3-2)**
- ● **Wiring**
  Wire the Power Supply (Page 3-4)
  Wire the Ethernet Cable (Page 3-5)
  Wire to the IO Ports (Page 3-6)

2. Device settings

- ● **Use the NQ Sensor Monitor to Configure Settings (Page 4-1)**

3. PLC and controller settings

- ● **For EtherNet/IP Communication (Page 6-1)**
- ● **For Modbus/TCP Communication (Page 7-1)**
- ● **For PROFINET Communication (Page 8-1)**

4. Start of communication

2
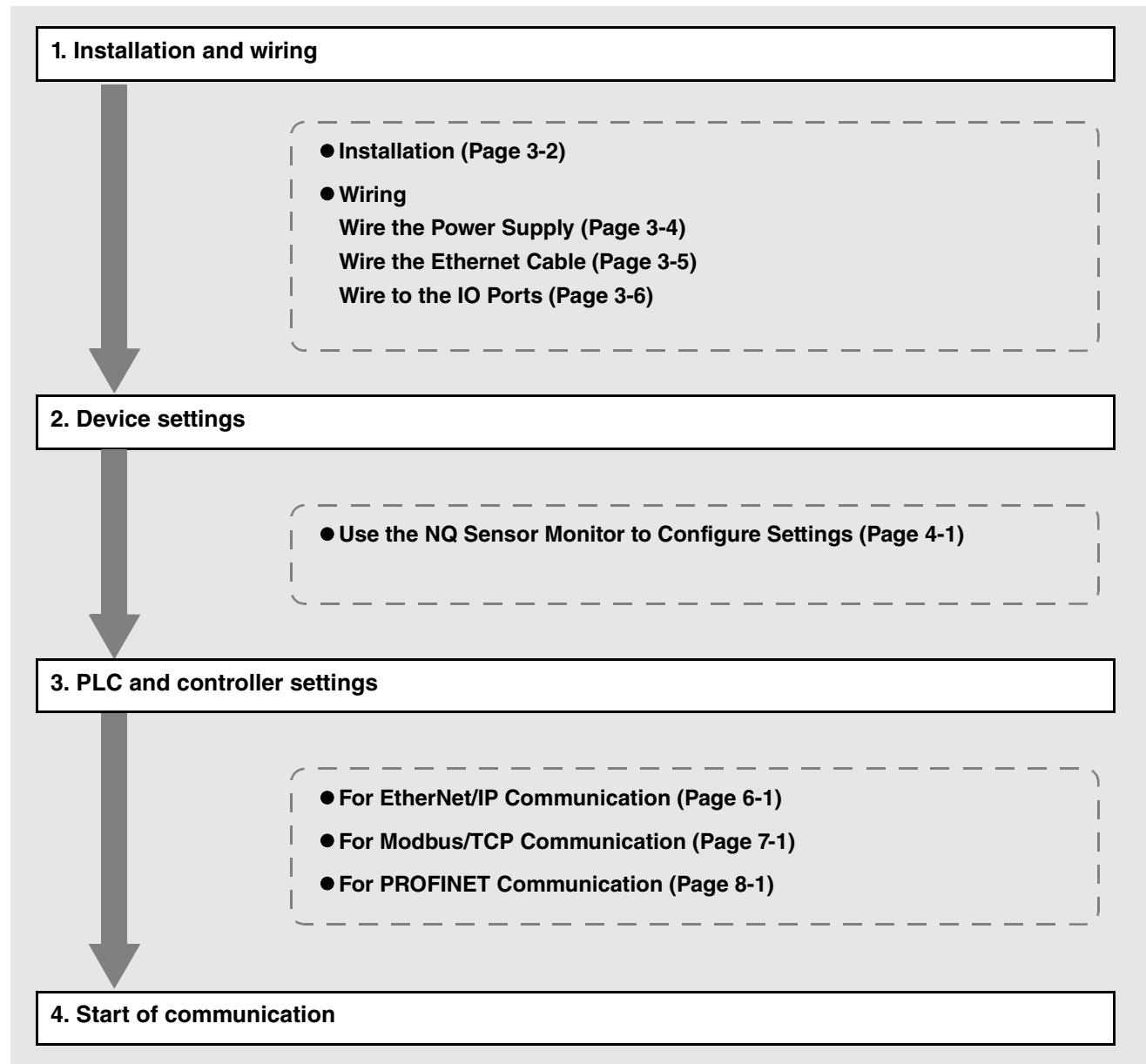
Specifications

This chapter describes the specifications and dimensions of the NQ Series.

2-1 General Specifications

NQ-MP8L/EP4L

left margin: **2** Specifications

Model		NQ-MP8L	NQ-EP4L
Network specifications	Supported networks	EtherNet/IP, PROFINET, Modbus/TCP	EtherNet/IP, Modbus/TCP
	Communication speed	10Mbps/100Mbps	10Mbps/100Mbps
	Connector	M12, 4 pins, female, D-code	M8, 4 pins, female, A-code
Power supply specifications	Connector type	Power supply port IN: M12, 5 pins, male, L-code Power supply port OUT: M12, 5 pins, female, L-code	Power supply port IN: M8, 4 pins, male, A-code Power supply port OUT: M8, 4 pins, female, A-code
	Power voltage	18 to 30 VDC (IO-Link communication: 20.4 V to 28.8 V)	18 to 30 VDC (IO-Link communication: 20.4 V to 28.8 V)
	Allowable current	Up to 9 A for V1 and for V2 Up to 11 A total for V1 and V2 combined	Up to 4 A for V1 and for V2
	Current consumption	V1: Max. 180 mA V2: Max. 90 mA	V1: Max. 110 mA V2: Max. 115 mA
Sensor connection specifications	Connector type	M12, 5 pins, female, A-code	M12, 5 pins, female, A-code
	V1 power supply capacity	Ports 1 and 5: Up to 4 A for each port, short-circuit protection Ports 2 to 4 and 6 to 8: Up to 2 A for each port, short-circuit protection	-
	V2 power supply capacity	Ports 5 and 6: Up to 4 A for each port, short-circuit protection Ports 7 and 8: Up to 2 A for each port, short-circuit protection	Ports 1 to 4: Max. 4 A total
IO-Link specifications	Number of connectable units	8	4
	Compliant standard	Ver1.1	Ver1.1
	Transmission rate	COM1: 4.8 kbps COM2: 38.4 kbps COM3: 230.4 kbps	COM1: 4.8 kbps COM2: 38.4 kbps COM3: 230.4 kbps
	Port type*1	Ports 1 to 4: Class A Ports 5 to 8: Class B	Ports 1 to 4: Class A
	Process data size	Input: Max. 32 bytes/Output: Max. 32 bytes	Input: Max. 32 bytes/Output: Max. 32 bytes
Digital input (DI) specifications	Number of inputs	Max. 12 (DI mode)	Max. 8 (DI mode)
	Input type	PNP	PNP
	ON voltage / ON current	11 V or more / 2 mA or more	11 V or more / 2 mA or more
	OFF voltage / OFF current	Less than 5 V / less than 1.5 mA	Less than 5 V / less than 1.5 mA
	Input current	pin 2 : Approx. 7 mA pin 4 : Approx. 12 mA	pin 2 : Approx. 7 mA pin 4 : Approx. 12 mA
Digital output (DO) specifications	Number of outputs	Max. 4	Max. 4
	Output type	PNP	PNP
	Maximum load current	Max. 2 A for each port	Max. 0.5 A for each port
	Short-circuit protection circuit	Available	Available
	Leakage current	0.1 mA or less	0.1 mA or less
	Residual voltage	1 V or less	1 V or less
Environmental resistance	Operating ambient temperature	−40°C to +70°C (No freezing)	−40°C to +70°C (No freezing)
	Enclosure rating	IP65 / IP67 / IP69K	IP65 / IP67 / IP69K
	Vibration resistance	5 to 150 Hz; 20 G; 10 sweeps each in the X, Y and Z directions	5 to 150 Hz; 20 G; 10 sweeps each in the X, Y and Z directions
	Shock resistance	15 G; 11 ms; X, Y, Z directions 3 times each axis	15 G; 11 ms; X, Y, Z directions 3 times each axis
Case material		Case: PA6-GF30 IP address setting switches cover: PEI Connector: SUS303	Case: PA6-GF30 Connector: SUS303
Weight		Approx. 530 g	Approx. 190 g

*1   When using this product as Class B, power must be supplied to V1 and to V2.

NQ-EP4A   2-3

| Model		NQ-EP4A
Network specifications	Supported networks	EtherNet/IP, Modbus/TCP
	Communication speed	10 Mbps / 100 Mbps
	Connector type	M8, 4 pins, female, A-code
Power supply specifications	Connector type	Power supply port IN: M8, 4 pins, male, A-code Power supply port OUT: M8, 4 pins, female, A-code
	Power voltage	18 to 30 VDC
	Allowable current	Up to 4 A for V1 and for V2 Up to 5.5 A total for V1 and V2 combined
	Current consumption	Max. 240 mA
Input specifications	Connector type	M12, 5 pins, female, A-code
	Number of inputs	4
	Input classification	Voltage / current / resistance temperature detector / thermocouple
	Resolution	16 bit
	V1 power supply capacity	Ports 1 to 4: Up to 1 A total, short-circuit protection
Voltage input specifications	Input range	Differential / single end 0 to 10 V / ±10 V / 2 to 10 V / 0 to 5 V / 1 to 5 V / ±1 V / ±500 mV / ±100 mV / ±50 mV
	Input filter	4 levels
	Absolute maximum input	11.85 V
	Input resistance	100 kΩ or more
	Conversion speed	4 ms or less
	Conversion precision (@25°C)	0.1% of F.S. or less
	(@-40°C to +70°C)	0.75% of F.S. or less
Current input specifications	Input range	Differential / single end 0 to 20 mA / 4 to 20 mA / ±20 mA
	Input filter	4 levels
	Absolute maximum input	23 mA
	Input resistance	50 Ω or less
	Conversion speed	4 ms or less
	Conversion precision (@25°C)	0.1% of F.S. or less
	(@-40°C to +70°C)	0.75% of F.S. or less
Resistance temperature detector input specifications	Input range	Pt100 / Pt200 / Pt500 / Pt1000 / Ni100 / Ni200
	Connection type	2-wire/3-wire/4-wire
	Input filter	4 levels
	Conversion speed	400 ms or less
	Conversion precision (@25°C)	Refer to the conversion precision lists shown below.
	(@-40°C to +70°C)	Refer to the overall accuracy lists shown below.
Thermocouple input specifications	Input range	K: −270 to 1370°C / B: 100 to 1820°C / E: −270 to 1000°C / J: −210 to 1200°C N: −270 to 1300°C / R: −50 to 1768°C / S: −50 to 1768°C / T: −270 to 400°C C: 0 to 2315°C / G: 0 to 2315°C
	Input filter	4 levels
	Conversion speed	400 ms or less
	Conversion precision (@25°C)	Refer to the conversion precision lists shown below.
	(@-40°C to +70°C)	Refer to the overall accuracy lists shown below.
Environmental resistance	Operating ambient temperature	−40°C to +70°C (No freezing)
	Enclosure rating	IP65 / IP67 / IP69K
	Vibration resistance	5 to 150 Hz; 20 G; 10 sweeps each in the X, Y and Z directions
	Shock resistance	15 G; 11 ms; X, Y, Z directions 3 times each axis
Case material		Case: PA6-GF30 Connector: SUS303
Weight		Approx. 190 g

2 Specifications

■ Thermocouple measurement accuracy

< Conversion precision (@25°C) >

Measurement range	Precision
K: −200 to 1370°C	0.7% of F.S.
B: 100 to 1820°C	0.5% of F.S.
E: −260 to 1000°C	1% of F.S.
J: −210 to 1200°C	0.1% of F.S.
N: −270 to 1300°C	0.1% of F.S.
R: −50 to 1768°C	0.2% of F.S.
S: −50 to 1768°C	0.2% of F.S.
T: −200 to 400°C	0.7% of F.S.
C: 0 to 2315°C	0.2% of F.S.
G: 300 to 2315°C	1.6% of F.S.

< Conversion precision (@-40°C to +70°C >

Measurement range	Accuracy
K: −200 to 1370°C	1.35% of F.S.
B: 100 to 1820°C	1.15% of F.S.
E: −260 to 1000°C	1.65% of F.S.
J: −210 to 1200°C	0.75% of F.S.
N: −270 to 1300°C	0.75% of F.S.
R: −50 to 1768°C	0.85% of F.S.
S: −50 to 1768°C	0.85% of F.S.
T: −200 to 400°C	1.35% of F.S.
C: 0 to 2315°C	0.75% of F.S.
G: 300 to 2315°C	2.25% of F.S.

■ Resistance temperature detector measurement accuracy

< Conversion precision (@25°C) >

Measurement range	2-wire	3-wire	4-wire
Pt100: −200°C to 850°C	0.2% of F.S.	0.2% of F.S.	0.2% of F.S.
Pt100: −200°C to 150°C	0.2% of F.S.	0.3% of F.S.	0.2% of F.S.
Pt200: −200°C to 850°C	0.7% of F.S.	0.2% of F.S.	0.3% of F.S.
Pt200: −200°C to 150°C	0.2% of F.S.	0.2% of F.S.	0.2% of F.S.
Pt500: −200°C to 850°C	0.3% of F.S.	0.2% of F.S.	0.2% of F.S.
Pt500: −200°C to 150°C	0.7% of F.S.	0.3% of F.S.	0.2% of F.S.
Pt1000: −200°C to 850°C	0.2% of F.S.	0.2% of F.S.	0.2% of F.S.
Pt1000: −200°C to 150°C	0.7% of F.S.	0.2% of F.S.	0.3% of F.S.
Ni100: −60°C to 250°C	0.2% of F.S.	0.3% of F.S.	0.2% of F.S.
Ni100: −60°C to 150°C	0.7% of F.S.	0.3% of F.S.	0.2% of F.S.
Ni1000: −60°C to 250°C	0.7% of F.S.	0.3% of F.S.	0.2% of F.S.
Ni1000: −60°C to 150°C	0.7% of F.S.	0.2% of F.S.	0.2% of F.S.

< Conversion precision (@-40°C to +70°C >

Measurement range	2-wire	3-wire	4-wire
Pt100: −200°C to 850°C	0.85% of F.S.	0.85% of F.S.	0.85% of F.S.
Pt100: −200°C to 150°C	0.85% of F.S.	0.95% of F.S.	0.85% of F.S.
Pt200: −200°C to 850°C	1.35% of F.S.	0.85% of F.S.	0.95% of F.S.
Pt200: −200°C to 150°C	0.85% of F.S.	0.85% of F.S.	0.85% of F.S.
Pt500: −200°C to 850°C	0.95% of F.S.	0.85% of F.S.	0.85% of F.S.
Pt500: −200°C to 150°C	1.35% of F.S.	0.85% of F.S.	0.85% of F.S.
Pt1000: −200°C to 850°C	0.85% of F.S.	0.85% of F.S.	0.85% of F.S.
Pt1000: −200°C to 150°C	0.95% of F.S.	0.85% of F.S.	0.85% of F.S.
Ni100: −60°C to 250°C	0.85% of F.S.	0.95% of F.S.	0.85% of F.S.
Ni100: −60°C to 150°C	1.35% of F.S.	0.95% of F.S.	0.85% of F.S.
Ni1000: −60°C to 250°C	1.35% of F.S.	0.95% of F.S.	0.85% of F.S.
Ni1000: −60°C to 150°C	1.35% of F.S.	0.85% of F.S.	0.85% of F.S.

NQ-IL8P

Model		NQ-IL8P
Network specifications	Supported networks	IO-Link
	Connector type	M12, 5 pins, male, A-code
	Applicable standard	Ver1.1
	Communication speed	COM2 / 38.4 kbps
	Min. cycle time	3.2 ms
Power supply specifications	Power voltage	20.4 to 28.8 VDC
	Allowable current	4 A total
	Power consumption	3.5 W or less (145 mA or less at 24 V)
Sensor connection specifications	Connector type	M12, 5 pins, female, A-code
	Power supply capacity	Port 1 to 8: Up to 120 mA for each port, short-circuit protection
Digital input (DI) specifications	Number of inputs	Max. 16
	Input type	PNP
	ON voltage / ON current	11 V or more / 2 mA or more
	OFF voltage / OFF current	Less than 5 V / Less than 1.5 mA
	Input current	Approx. 7 mA
Digital output (DO) specifications	Number of outputs	Max. 16
	Output type	PNP
	Maximum load current	Max. 0.5 A for each port
	Short-circuit protection circuit	Available
	Leakage current	0.1 mA or less
	Residual voltage	1 V or less
Environmental resistance	Operating ambient temperature	−40°C to +70°C (No freezing)
	Enclosure rating	IP65 / IP67 / IP69K
	Vibration resistance	5 to 150 Hz; 20 G; 10 sweeps each in the X, Y and Z directions
	Shock resistance	15 G; 11 ms; X, Y, Z directions 3 times each axis
Case material		Case: PA6-GF30 Connector: SUS303
Weight		Approx. 210 g

2-2 IO-Link Specifications

This section describes the IO-Link specifications of the NQ-MP8L/EP4L.

Communication Specifications

Item	Specifications
Transmission rate	COM1 (4.8 kbps) COM2 (38.4 kbps) COM3 (230.4 kbps)
Communication medium	Non-shielded cable
Communication distance	20 m or less
IO-Link version	Version 1.1

Port Types

There are 2 types of IO-Link ports: "Class A" and "Class B." The port types supported by the NQ Series are shown below.
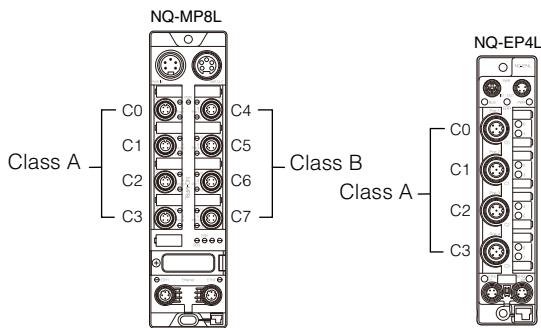
(1) Class A port

- Power is supplied to the IO-Link device via pin 1 and pin 3, and IO-Link communication is performed with pin 4.
- Pin 2 can be used for a digital input or digital output.

(2) Class B port
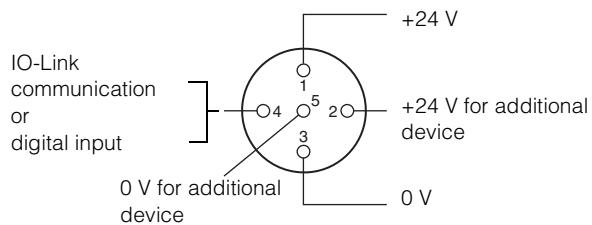
- Power is supplied to the IO-Link device via pin 1 and pin 3, and IO-Link communication is performed with pin 4.
- A separate system power supply can be provided to an actuator or a similar device via pin 2 and pin 5.

> **Point**
>
> **You can also connect Class A devices to the Class B port. However, there are precautions. For details, refer to** 📖 **"Wire to the IO Ports" (Page 3-6).**

Port Operation Modes

Set the functions of pin 4 (operation mode) and pin 2 for each port. (For Class B ports, there is no pin 2 setting.)

■ Pin 4 function (operation mode)

Operation mode	Description
IO-Link	This mode is used to perform IO-Link communication. Select this mode when connecting an IO-Link device to the port to be used.
Digital input (DI)	This mode is used to apply digital signals. (PNP input) Select this mode when connecting a non-IO-Link device to the port to be used.

■ Pin 2 function

Operation mode	Description
Digital input (DI)	This mode is used to apply digital signals. (PNP input) Even when an IO-Link device is connected to the port to be used, digital signals can be applied to pin 2 while performing IO-Link communication. Use this mode when the response must be faster than the IO-Link communication response or similar situations.
Digital output (DO)	This mode is used to output digital signals. (PNP output) Signals can be sent to the external input of the device connected to the port.

Communication Data Types

2-7

The following four types of communication data are handled by NQ Series IO-Link communication.

Type	Description	Example
Process data (periodic)	This data is communicated periodically. Communication is performed without a special program. The size of the process data is 0 to 32 bytes and is determined by the IO-Link device.	Output (ON/OFF), Current values such as the received light intensity
Service data (non-periodic)	This data is communicated from the IO-Link master at specified times. Parameter values can be read and written and the IO-Link device status can be read.	Setting value, Sensor operation mode, Sensor teaching signal
Status (periodic)	This data indicates the status of the device. It is transmitted periodically together with the process data.	Supply voltage drop
Event (non-periodic)	This data transmits the error information and the maintenance data of the IO-Link device.	Disconnection and other errors

Reference ▱ The data transmitted with process data, service data, and events varies depending on the IO-Link device. For details, refer to the instruction manual of each device.
The instruction manuals for KEYENCE's IO-Link sensors can be downloaded from the KEYENCE website.
<www.keyence.com/global.jsp>

2

Specifications

Dimensions

■ **NQ-MP8L**

Unit: mm

■ **NQ-EP4L/EP4A**

Unit: mm

2

■ **NQ-IL8P**

2×ø4.4 Depth: 11.5 Mounting holes
ø8 Spot-facing Depth: 4.5

2×4.3×10.55 Depth: 11
Mounting holes

Unit: mm

■ **OP-88458**

ø4 Depth:13.6
Mounting hole
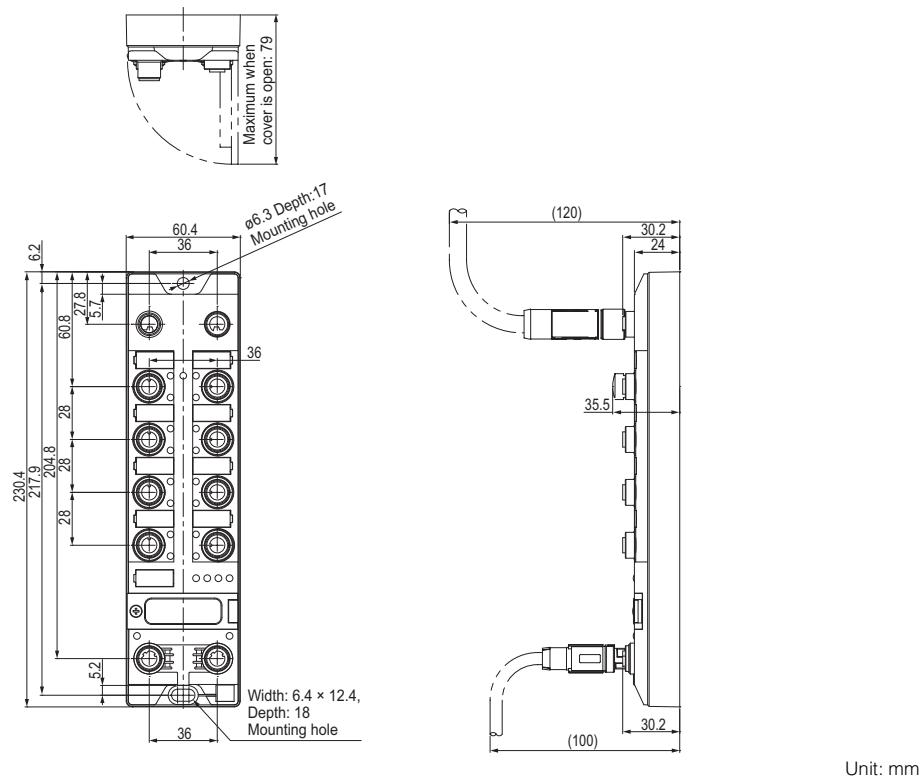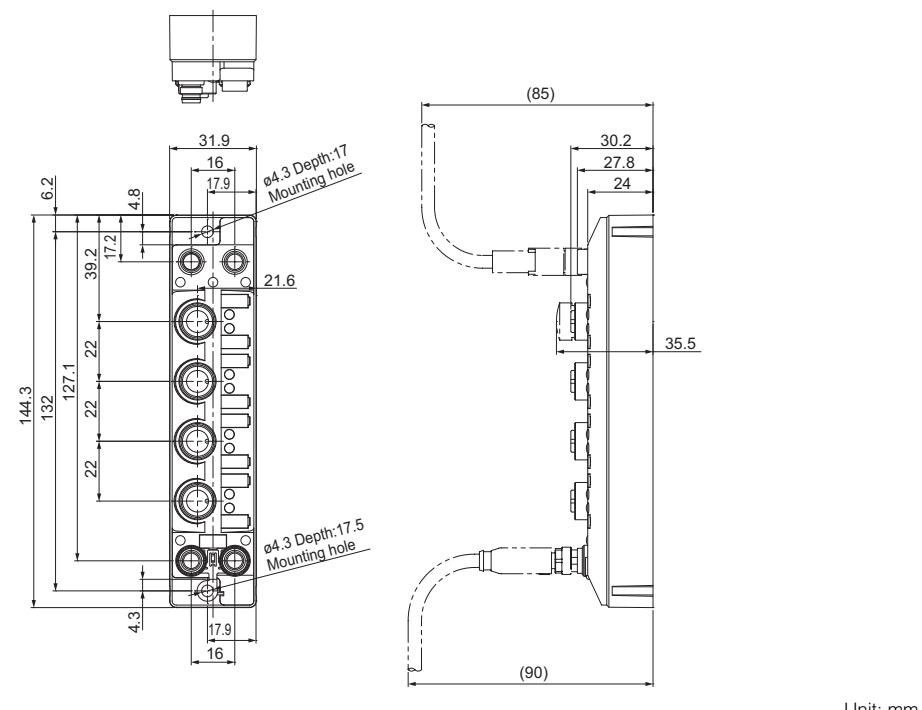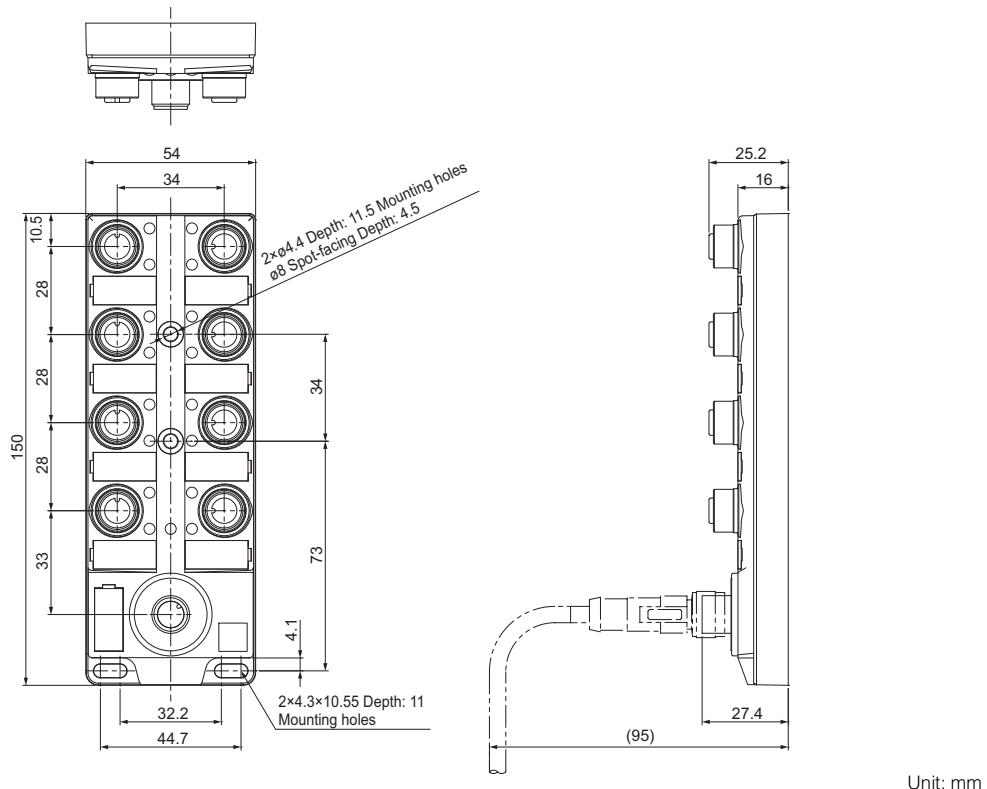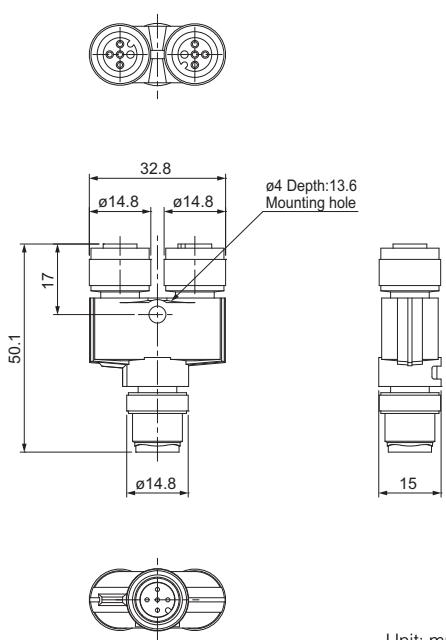
Unit: mm

■ **OP-88459**

Unit: mm

NQ-MP8L

Main circuit

Pin	Signal		
1	24 VDC	V1	Power supply port IN (PWR IN)
3	GND		
4	24 VDC	V2	
2	GND		
1	24 VDC	V1	Power supply port OUT (PWR OUT)
3	GND		
4	24 VDC	V2	
2	GND		

I/O circuit

IO-Link circuit

Pin	Signal		
1	24 VDC	V1	Class A: Port 1 (C0) to port 4 (C3)
3	GND		
2	Digital input / digital output		
5	No connection		
4	IO-Link/ digital input		

Pin	Signal		
1	24 VDC	V1	Class B: Port 5 (C4) to port 8 (C7)
3	GND		
2	24 VDC	V2	
5	GND		
4	IO-Link/ digital input		

IO-Link circuit

NQ-EP4L

2-11

2

Specifications

Power supply port IN
(PWR IN)

V1
1 24 VDC
3 GND

V2
2 24 VDC
4 GND

Power supply port OUT
(PWR OUT)

V1
1 24 VDC
3 GND

V2
2 24 VDC
4 GND

V2
1 24 VDC
3 GND

Class A:
Port 1 (C0)
to port 4 (C3)

2 Digital input /
   digital output

5 (No connection)

4 IO-Link/
   digital input

Main circuit

I/O circuit

IO-Link circuit

2

Specifications

NQ-EP4A

The functions of pins 1, 2, 3, and 4 on ports 1 to 4 vary depending on their operation mode. For details, refer to 📖 "Wire to the IO Ports" (Page 3-6).

3

Installation and Wiring

This chapter describes the installation and wiring of the NQ Series.

3-1　Installation

Installation Location

⚠ WARNING	**Do not install this product in a location where it may become submerged in a liquid. Doing so may lead to electric shock and damage due to insulation defects.**
NOTICE	• **Do not install the product in a location exposed to radiant heat from a heat source.** • **Install the product in a location that is well ventilated.** • **Mount on a flat surface. If the surface on which this product will be mounted is uneven, unnecessary force will be applied to the NQ Series, which may lead to malfunctions.**

If there is no load on the connector cable, there are no limitations on the installation orientation or on the distance between the installation location and surrounding objects.

When installing multiple NQ-MP8L units that are aligned horizontally, install the units so that there is at least 50 mm of space between them.

50 mm or more
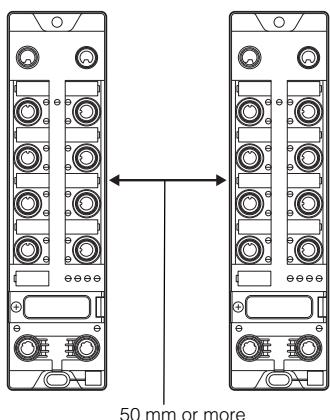
For models other than the NQ-MP8L, multiple units can be installed close to each other.

Installation Method

To fix the NQ Series in place, insert screws into all the fixing holes of the unit.

NQ-MP8L
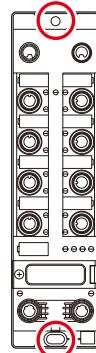
M6
1.5 N•m or less

NQ-EP4L/EP4A
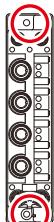
M4
1.3 N•m or less

NQ-IL8P
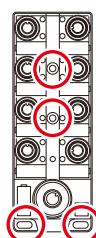
M4
0.5 N•m or less

Grounding

■NQ-MP8L

The mounting screws are used to connect the power supply ports and the case containing the Ethernet ports to the mounting surface. If these parts should not be connected to the mounting surface, use plastic screws to attach the unit to this surface.

Also, if not grounding the Ethernet port case through the NQ Series, remove the metal clamp. (Page 3-3)
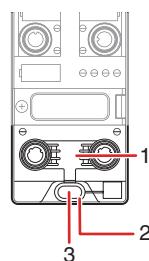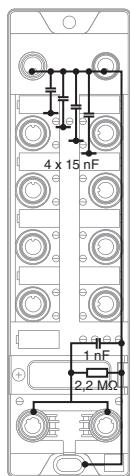
1: Metal clamp
2: Grounding ring
3: Mounting screw

■NQ-EP4L

The mounting screws and the grounding bar are used to connect the IO ports and the case containing the Ethernet ports to the mounting surface. If these parts should not be connected to the mounting surface, use plastic screws to attach the unit to this surface. Also ensure that the grounding bar does not come into contact with the mounting surface.

Also, if not grounding the Ethernet port case through the NQ Series, remove the metal clamp. (Page 3-3)
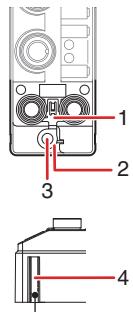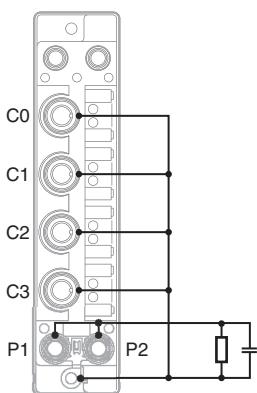
1: Metal clamp
2: Grounding ring
3: Mounting screw
4: Grounding bar

■NQ-EP4A

The mounting screws and the grounding bar are used to connect the pin 5 of the IO ports and the case containing the Ethernet ports to the mounting surface. If these parts should not be connected to the mounting surface, use plastic screws to attach the unit to this surface. Also ensure that the grounding bar does not come into contact with the mounting surface.

Also, if not grounding the Ethernet port case through the NQ Series, remove the metal clamp. (Page 3-3)
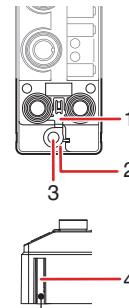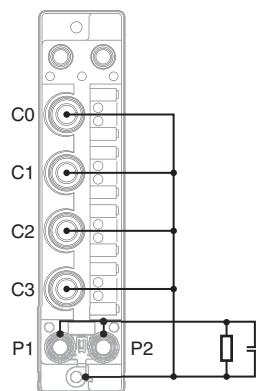
1: Metal clamp
2: Grounding ring
3: Mounting screw
4: Grounding bar

■ Removing the metal clamp

If not grounding through the NQ Series, remove the metal clamp. When the metal clamp is removed, the Ethernet port case and other metal parts are separated by the RC circuit.

Flathead screwdriver, etc.
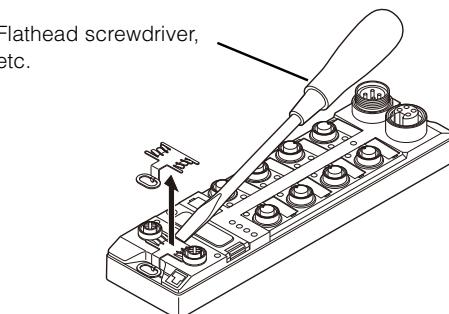
■Attaching the metal clamp

3

Installation and Wiring
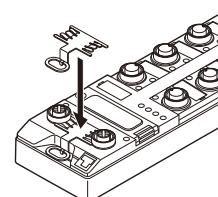
Use M12 or M8 connectors to connect items such as the power supply, the Ethernet cable, sensors, and the actuators.

NOTICE	Attach the included waterproof caps to the connectors that will not be used. Also, the waterproof specifications of the product are only met when all connectors and waterproof caps are tightened with the appropriate torque. • **NQ-MP8L** **Power supply ports: 0.8 N•m** **Ethernet ports: 0.6 N•m** **IO ports: 0.8 N•m** • **NQ-EP4L** **Power supply ports: 0.6 N•m** **Ethernet ports: 0.4 N•m** **IO ports: 0.6 N•m** • **NQ-EP4A** **Power supply ports: 0.6 N•m** **Ethernet ports: 0.4 N•m** **IO ports: 0.6 N•m** • **NQ-IL8P** **IO-Link communication port: 0.8 N•m** **IO ports: 0.8 N•m**

Wire the Power Supply

The NQ Series has an input power supply port (IN) and an output power supply port (OUT). These ports enable daisy chain connections between the power supplies of different units.

It is also possible to connect two systems of power supplies to the NQ Series. The roles of V1 and V2 vary depending on the model and the port.

Model	Power supply for main unit operation	Power supply to devices connected to the ports	
		Ports 1 to 4	Ports 5 to 8
NQ-MP8L	V1	V1	V1 / V2
NQ-EP4L	V1	V2	-
NQ-EP4A	V1	V1	-

Point	• **Turn the power supply OFF before wiring.** • **A connection to V1 is required regardless of the model.** • **The connection to V2 is required on the NQ-EP4L. For the NQ-MP8L, if an additional power supply for the device is required, connect V2.** **In all other situations, connect V2 if it is necessary to supply power to a downstream NQ Series unit by way of a daisy chain connection.** • **If there are requirements on the power supply to provide for the device connected to the port, use a power supply that complies with those requirements.** **(Example: UL Class 2 power supply)** • **Power supply for NQ is recommended to be solo and not to be shared with other devices if there is a possibility of noise influence from the other devices.**

■ Power supply daisy chain connection

When daisy chaining together the power supplies, wire the power supply OUT terminal (PWR OUT) of the unit that will supply power to the power supply IN terminal (PWR IN) of the unit that will receive the supplied power.

Power supply
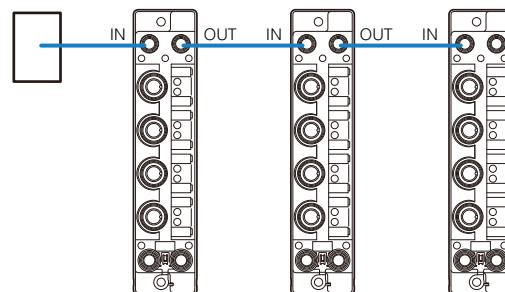
NOTICE	• **The largest current flows from the power supply source to the power supply connector of the first wired module. Ensure that the current of the power supply connector of this module is 9 A or less for V1 and V2, respectively, and is 11 A or less in total for V1 and V2 combined.** • **Consider the current consumption of the NQ Series and of the device connected to the NQ Series. For the current consumption of the NQ Series, refer to "2-1 General Specifications" (Page 2-2).**

■ NQ-MP8L pin layout

PWR IN
(M12 male,
L-code)

PWR OUT
(M12 female,
L-code)
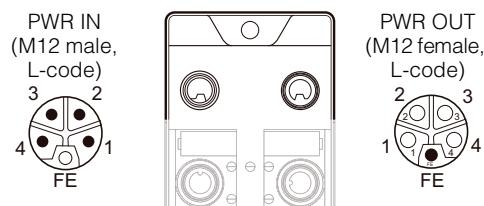
Pin number	Description	Wire color[*]
1	24 VDC (V1)	Brown
2	GND (V2)	White
3	GND (V1)	Blue
4	24 VDC (V2)	Black

* When using the KEYENCE NQ-P8Bx power supply cable

■ NQ-EP4L/EP4A pin layout

PWR IN
(M8 male)

PWR OUT
(M8 female)

Pin number	Description	Wire color[*]
1	24 VDC (V1)	Brown
2	24 VDC (V2)	White
3	GND (V1)	Blue
4	GND (V2)	Black

* When using the KEYENCE NQ-P4Bx power supply cable

Wire the Ethernet Cable

The NQ Series has two Ethernet ports. These ports support AutoMDI/MDI-X, so you can use a straight cable or a crossover cable.

■ NQ-MP8L

ETH1
(M12 female,
D-code)

ETH2
(M12 female,
D-code)
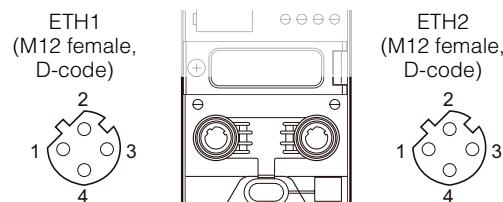
No.	Description		No.	Description
1	TX+		1	RX+
2	RX+		2	TX+
3	TX-		3	RX-
4	RX-		4	TX-

■ NQ-EP4L/EP4A

ETH1
(M8 female)

ETH2
(M8 female)
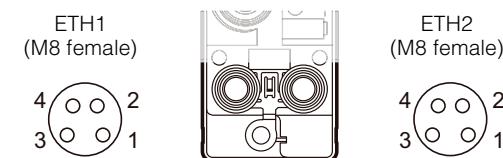
No.	Description		No.	Description
1	TX+		1	RX+
2	RX+		2	TX+
3	RX-		3	TX-
4	TX-		4	RX-

Reference | The maximum distance between stations for the Ethernet cable is 100 m. However, the distance may be shortened depending on the usage environment of the cable. For details, contact the manufacturer of the cable that you are using.

3

Installation and Wiring

3

Installation and Wiring

Wire to the IO Ports

Connect an M12 connector cable to each IO port.

NOTICE	• **When using the digital input (DI) mode, noise that is applied may be captured, so be sure to fully consider the input response time and usage environment of the NQ Series.** • **Supply power to the IO-Link device comes only from the IO port power supply terminals (pin 1 and pin 3).** • **When connecting a Class A device to a port for Class B, one of the following conditions must be met.** 　• **Only connect pins 1, 3, and 4 and do not connect pins 2 and 5.** 　• **Either do not connect the V2 power supply or set Power supply setting (V2) to "OFF" at "Power supply setting".** 📖**Power supply setting (Page 4-18)** • **Set the function of pin 2 for devices connected to Class B ports to PNP output.** **If these conditions are incorrect, the insulation between V1 and V2 may be lost, thereby leading to the input malfunctioning.** • **For the current capacity that can be supplied to IO devices, refer to the specifications.** 📖 **"Specifications" (Page 2-1)**

■ NQ-MP8L

C0 to C3
(M12 female,
A-code)

C4 to C7
(M12 female,
A-code)

C0 to C3 (Class A)

Pin number	Description
1	24 VDC (V1)
2	Digital input / digital output
3	GND (V1)
4	IO-Link / digital input (C/Q)
5	(No connection)

C4 to C7 (Class B)

Pin number	Description
1	24 VDC (V1)
2	24 VDC (V2)
3	GND (V1)
4	IO-Link / digital input (C/Q)
5	GND (V2)

■ NQ-EP4L

NOTICE	**The power supply does not have a built-in short-circuit protection circuit, so exercise caution to prevent incorrect wiring.**

C0 to C3
(M12 female,
A-code)
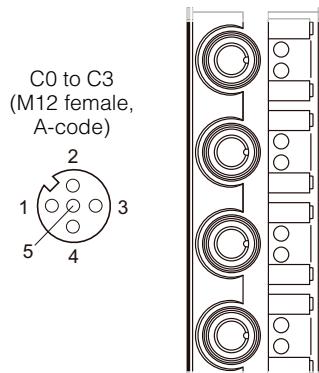
Pin number	Description
1	24 VDC (V2)
2	Digital input / digital output
3	GND (V2)
4	IO-Link / digital input (C/Q)
5	(No connection)

Reference	The maximum extension distance of the IO-Link cable is 20 m.

■ NQ-EP4A

NOTICE	**The input circuit switches according to the settings, so be sure to check the port settings before connecting the analog input device.**

C0 to C3
(M12 female,
A-code)
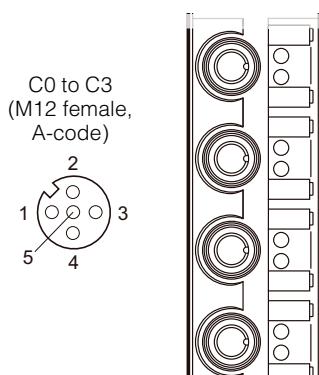
< Thermocouple mode >

Pin number	Description
1	Cold junction compensation (CJC) +
2	Thermocouple +
3	Cold junction compensation (CJC) –
4	Thermocouple –
5	FE

- Pins 1 and 3 are used only when the settings are configured to connect a resistance temperature detector for cold junction compensation.
📖 "NQ-EP4A" (Page 4-19)
- The M12 Conversion Connector for Thermocouples OP-88459 is useful when using the unit with the settings configured for connecting a resistance temperature detector. The OP-88459 connector has a built-in Pt1000 (RTD).
📖 "M12 Conversion Connector for Thermocouples OP-88459" (Page 3-9)

< Voltage/current mode >

Differential input

Pin number	Description
1	24 VDC (V1)
2	Analog input +
3	GND (V1)
4	Analog input −
5	FE

Single-end input

Pin number	Description
1	24 VDC (V1)
2	Analog input +
3	Analog input − / GND (V1)
4	(No connection)
5	FE

Reference

- With differential input, use the settings to select whether grounding is used.
  - Differential: Pin 4 and pin 3 are connected with a resistance of 10 kΩ.
  - Differential (no grounding): Pin 4 and pin 3 are not connected.
  📖 "Port Settings" (Page 4-11)
- When using differential input, basically, set [Input method] to [Differential]. If a problem is caused by an error in the current flowing from pin 4 to pin 2 (GND) through a pull-down resistor, select the [Differential (no ground)] setting. However, in this case, the input signal floats. Measurement is not possible when the input signal level is outside of the range of the GND standard ± 18 V.

< Resistance temperature detector mode >

Pin number	Description
1	B (RL +)
2	B (R +)
3	A (RL −)
4	A (R −)
5	FE

Wiring examples

- **Thermocouple mode**
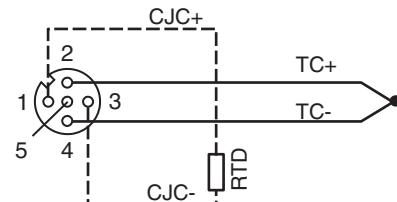
CJC = cold junction compensation

- **Voltage mode (Differential input 2-wire)**
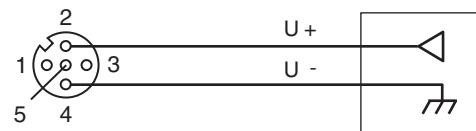
- **Voltage mode (Differential input 3-wire)**
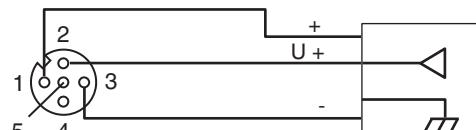
- **Voltage mode (Differential input 4-wire)**
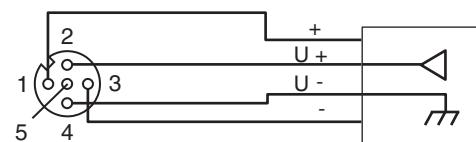
- **Voltage mode (Differential input 4-wire), external power supply**
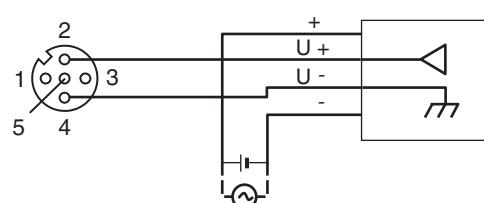
- **Current mode (Single-end input 2-wire)**
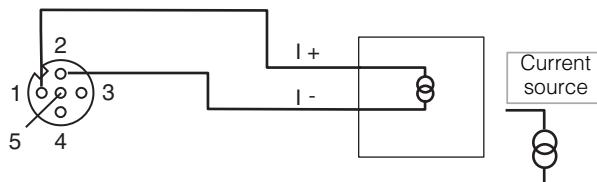
- **Current mode (Single-end input 3-wire)**

- **Current mode (Differential input 4-wire)**

- **Current mode (Differential input 4-wire), external power supply**
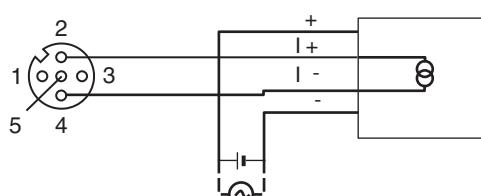
- **Resistance temperature detector (RTD) mode (2-wire)**

RTD = resistance temperature detector

- **Resistance temperature detector (RTD) mode (3-wire)**
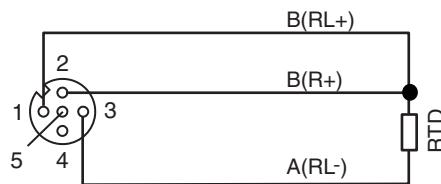
- **Resistance temperature detector (RTD) mode (4-wire)**
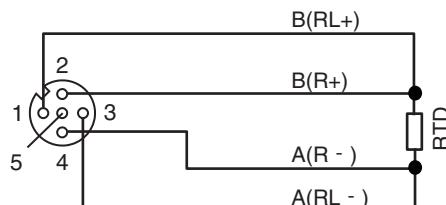
■ NQ-IL8P
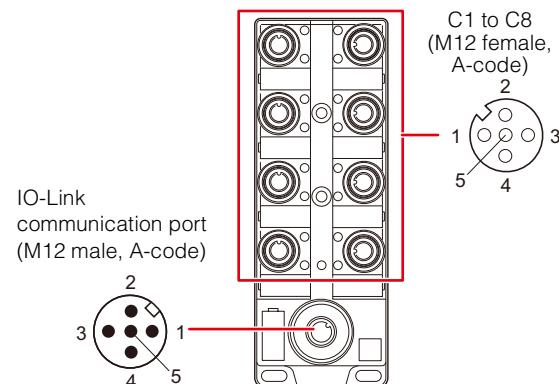
IO-Link communication port

Pin number	Description
1	24 VDC
2	(No connection)
3	GND
4	IO-Link
5	FE

C1 to C8

Pin number	Description
1	24 VDC
2	Digital I/O B
3	GND
4	Digital I/O A
5	FE

> **Point** Power can also be supplied externally to sensors or actuators connected to ports 1 (C1) to 8 (C8). In this situation, be sure to supply power to the sensor or actuator from an SELV or PELV power supply.

■ M12 Y-shaped Branch Connector OP-88458

■ M12 Conversion Connector for

Thermocouples OP-88459

MEMO

4

Use the NQ Sensor Monitor to Configure Settings

This chapter describes how to configure the NQ Series settings using NQ Sensor Monitor.

Overview of NQ Sensor Monitor

For the NQ Series, use the NQ settings and monitoring software NQ Sensor Monitor to configure the settings.

In addition, NQ Sensor Monitor not only makes it possible to configure NQ Series communication settings, but also makes it possible to easily construct, on a PC, monitor screens for the IO-Link devices connected to the NQ Series.

NQ Sensor Monitor can be downloaded from the KEYENCE website.

> www.keyence.com/global.jsp

If you are using the product in an environment in which you cannot download the software over the Internet, contact your nearest KEYENCE office.

Installation and Uninstallation

■ Operating environment

OS[1]	Windows
System language	English, Japanese, German, Chinese, French, Italian
CPU	Compliant with OS system requirements
Free space on system drive	1 GB[2]
Communication interface	Ethernet port
Display	Resolution: XGA (1024 × 768 pixels) or higher
Other	.NET Framework 4.6[3]

*1 Supports both 32-bit and 64-bit versions.
*2 The free space required for .NET Framework 4.6 is not included.
*3 If .NET Framework 4.6 is not installed, it will be automatically installed during NQ Sensor Monitor installation.

■ Preparing for installation

Before installing NQ Sensor Monitor, check the following items.

● Free space on system drive

NQ Sensor Monitor is installed on the system drive where the OS is installed. Check that the amount of free space on the drive where this software will be installed (such as the hard disk) is 1 GB or more. If the amount of free space is insufficient, make sure to free up space beforehand.

● Windows environment and installation destination

NQ Sensor Monitor is software that runs on Windows. The installation of this software must also be carried out in Windows. Check that Windows is installed on the PC and is operating correctly.

● Communication interface

The PC on which NQ Sensor Monitor has been installed and the NQ unit will communicate over Ethernet. Check that communication is enabled on the Ethernet adapter on the PC on which NQ Sensor Monitor is installed. For the configuration method, refer to the manual of the PC.

● Help file

The NQ Sensor Monitor help file has been created as a PDF file. To view PDF files, you have to install PDF viewer software, such as that made by Adobe Inc., on your PC. The PDF viewer software is distributed free of charge on the Adobe Inc. web site (www.adobe.com/).

■ Installation method

> **✎ Point** **To install this software, log on as a user with Administrator rights.**

When you run "setup.exe," which is included in the NQ Sensor Monitor installation file downloaded from the KEYENCE website, the installation wizard will start. After that, install the software according to the instructions of the installation program.
If the [User Account Control] screen appears during the installation, click [Continue].
The NQ Sensor Monitor program files are installed in the following folder.
C:\Program Files(x86)\Keyence\NQ Sensor Monitor

■ Uninstallation Method

> **✎ Point** **To uninstall this software, log on as a user with Administrator rights.**

To delete NQ Sensor Monitor from the PC, uninstall NQ Sensor Monitor from Control Panel in Windows.
If the [User Account Control] screen appears during the uninstallation, click [Continue].

Setting the IP Address of the PC

Set the pre-determined IP address on the PC.

Point	• **When the PC or NQ Series unit is connected to a network to which other devices are connected, IP addresses may be duplicated or connections may be incorrect, both of which may lead to network malfunctions. When configuring settings, including IP addresses, and connecting devices, be sure to do so according to the instructions provided by your network administrator.** • **If there are multiple network cards installed in the PC, be careful not to mistake the network cards.**

Connecting to the Network

Connect the PC and the NQ Series to the same network through a hub or similar device.
For details on how to connect the NQ Series unit, refer to 📖 "Wire the Ethernet Cable" (Page 3-5).

Starting the Software

1 Start NQ Sensor Monitor.

Click [KEYENCE NQ Sensor Monitor] in the Windows program list.

2 Select how to start the software.
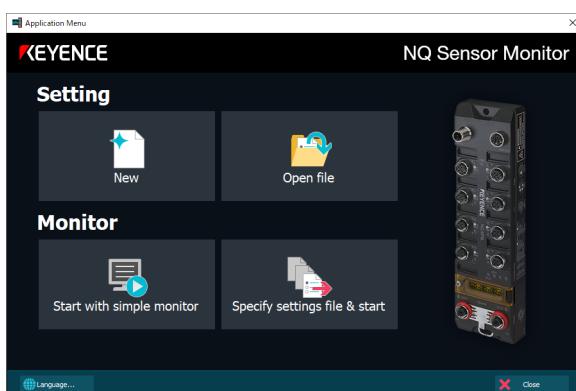
Reference	• Click [Language] to switch the display language of NQ Sensor Monitor. • Multiple instances of NQ Sensor Monitor cannot be started at the same time.

■ Setting

Select the items shown here to create new NQ Series settings or to change existing settings.

Item	Description
(1) New	Creates new NQ Series settings and monitor screens.
(2) Open file	Opens a saved settings file.

■ Monitor

Select the items shown here when monitoring the information of the IO-Link device connected to the NQ Series.

Point	**If the initial settings of the NQ Series unit have not been completed, select (1) [New] above, and then configure the NQ Series settings first.**

Item	Description
(3) Specify settings file & start	Opens a saved settings file and starts monitoring the connected NQ Series unit.
(4) Start with simple monitor	Starts monitoring the connected NQ Series unit with a simple graph.

For details on the monitor function, refer to 📖 "Monitor Function Overview" (Page 5-2).

4

Use the NQ Sensor Monitor to Configure Settings

4-2 NQ Sensor Monitor Screen Configuration

This section describes the layout of NQ Sensor Monitor. The following screen is displayed when [New] is selected.

Menu bar
Refer to the table shown below.

Setting/Monitor switch
Switches between the Setting screen and the Monitor screen.
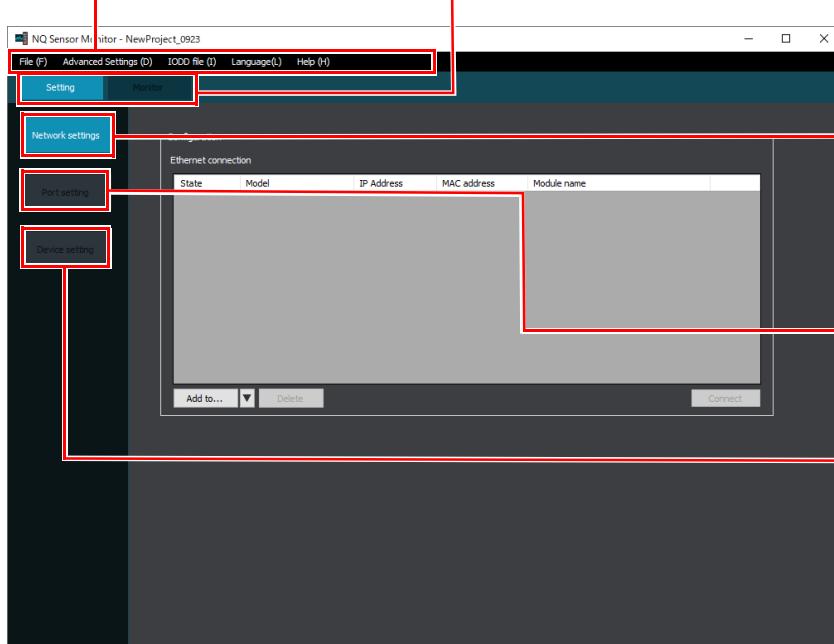
Network settings
Registers the NQ Series unit to set and monitor with NQ Sensor Monitor.
"4-4 Setting the IP Address" (Page 4-6)
"4-5 NQ Series Registration" (Page 4-8)

Port setting
Sets the IO ports of each NQ Series unit.
"4-6 Port Settings" (Page 4-11)

Device setting
Sets the IO-Link devices that are connected to the IO ports of each NQ Series unit.
"4-7 Device Settings" (Page 4-22)

Menu Bar

Major item	Minor item	Description
File (F)	New Project (N)	Creates a new file.
	Open (O)	Opens a saved file.
	Save (S)	Overwrites the file with the current settings.
	Save As (A)	Saves the current settings to a file with a different name.
	Exit (E)	Exits NQ Sensor Monitor.
Advanced Settings (D)	Settings read out (R)	Reads settings from the NQ Series unit that has been registered with the [Network settings]. "4-5 NQ Series Registration" (Page 4-8)
	Transfer settings (T)	Transfers settings to the NQ Series unit that has been registered with the [Network settings]. "4-5 NQ Series Registration" (Page 4-8)
	Copy setting (C)	Copies the settings of the specified port to another port. You can select multiple copy destinations. "4-6 Port Settings" (Page 4-11)
IODD file (I)		Registers and deletes IODD files. "4-3 Registering and Deleting IODD Files" (Page 4-5)
Language (L)		Switches the display language.
Help (H)	User's Manual (M)	Opens the NQ Series user's manual (this manual).
	Sensor Manual (D)	Opens the manual for the KEYENCE IO-Link sensor.
	Version information (A)	Display the version information for this software.
	License (L)	Displays the NQ Sensor Monitor license terms.

4-3 Registering and Deleting IODD Files

This section describes how to register IODD files to NQ Sensor Monitor.

Reference	• IODD (IO Device Description) files are provided by vendors for each IO-Link device. IODD files contain a variety of information related to IO-Link devices (such as the name of the vendor, the model, the contents of the process data, and the setting parameters). You can use NQ Sensor Monitor to set and monitor IO-Link devices by registering this IODD file to NQ Sensor Monitor.
	• Some KEYENCE IO-Link sensor IODD files are registered in NQ Sensor Monitor in advance.

Registering IODD Files

1 **Click the [IODD file (I)] menu.**
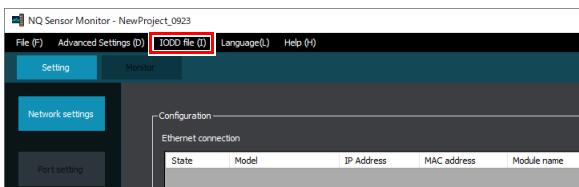
2 **Click [Registration:], and then select the file that you want to register.**
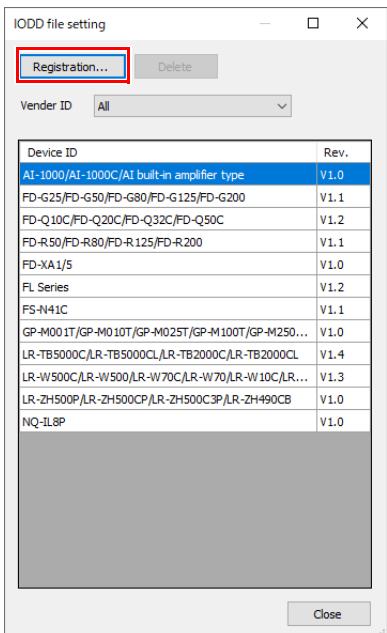
- If the IODD file is compressed, decompress it in advance.
- IODD files are composed of an XML file that contains IO-Link device information and an image file in the png format.

When registering IODD files, place the device information file and the image file in the same folder, and then select the XML format file (the file with the .xml extension).

Deleting IODD Files

Select the IODD file that you want to delete, and then click [Delete].
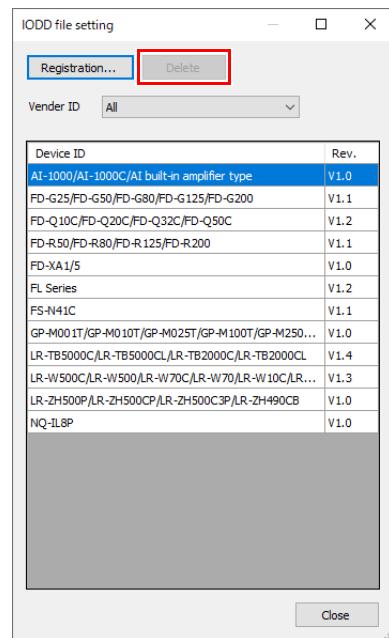
Reference	It is not possible to delete the preloaded Keyence IODD files.

Setting the IP Address

The NQ Series does not have a factory default IP address. There are three ways to set a new IP address on the NQ Series.

Setting method	NQ-MP8L	NQ-EP4L	NQ-EP4A
Use the IP address setting tool "IP Setting Tool."	✓	✓	✓
Use the NQ Series main unit.	✓	-	-
Use a BOOTP server or a DHCP server.	✓	✓	✓

Using IP Setting Tool

Point

To configure the NQ-MP8L using the IP Setting Tool, leave the IP address setting switches in their initial states with an IP address of "600" (PGM-DHCP).
📖 "Using the NQ Series Main Unit" (Page 4-7)

1 Connect the NQ Series unit and the PC to the network.

For details on how to connect the NQ Series unit, refer to 📖 "Wire the Ethernet Cable" (Page 3-5). Also, set the IP address of the PC in advance.

2 Start NQ Sensor Monitor.

3 Select [New].
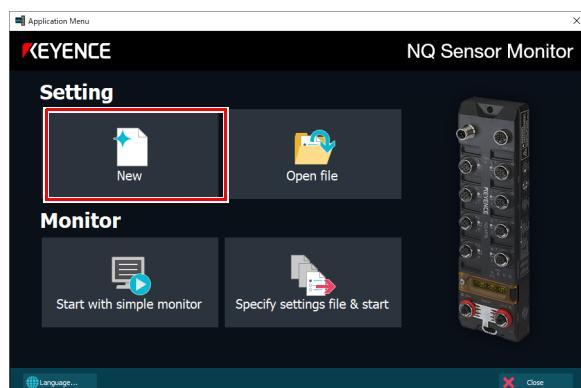
4 Select [Yes].
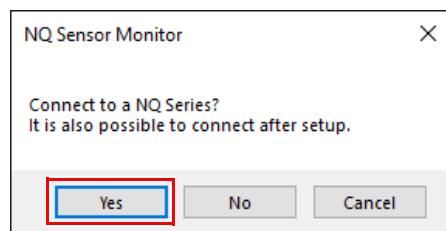
5 In the [Device search] dialog box, click [Start IP Setting Tool].
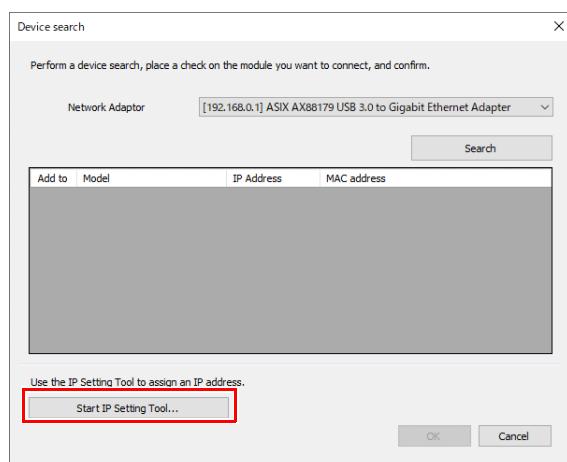
"IP Setting Tool" starts, and the list of devices for which IP addresses have not been set is displayed.

Point
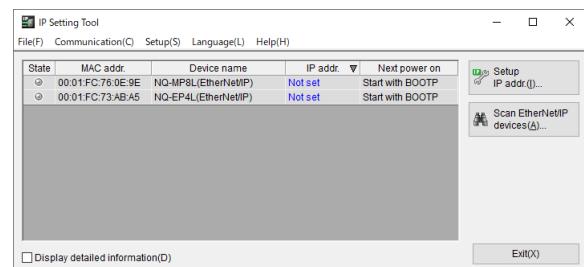
- **If IP Setting Tool is not installed on the PC, the IP Setting Tool installation wizard will start when you click [Start IP Setting Tool].**
- **The following are possible reasons for the intended device not being displayed in the list.**
  - **The NQ Series unit is not turned on.**
  - **The NQ and the PC are not connected to the same network.**
  - **An IP address that belongs to a network that differs from that of the PC has been assigned to the NQ Series.**

The "IP Setting Tool" manual can be checked from [Help (H)] in "IP Setting Tool."

6 **Select the device whose IP address you want to set, input the desired IP address, and then click [OK].**
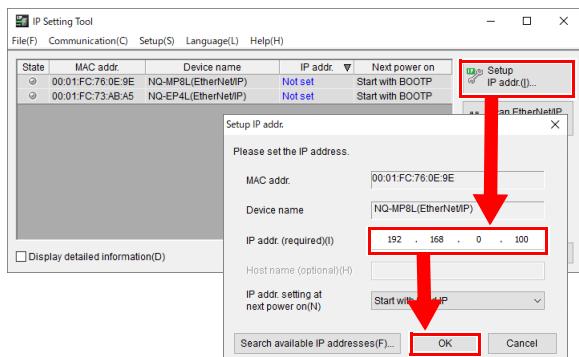
Reference　Click [Search for free IP addresses (F)] to search for unused IP addresses.

Check that the set IP address is displayed in the device list.
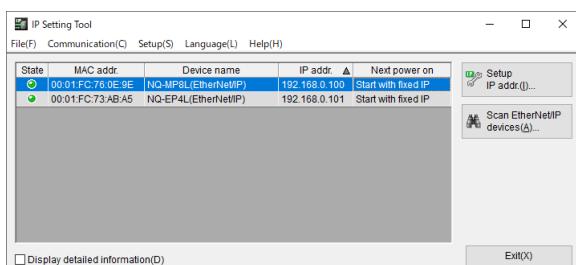
7 **To record the IP address, open the [IP Address Setting] dialog box again, check that [Start with fixed IP] is selected, and then click [OK].**

Point　**Because the NQ-EP4L/EP4A cannot be reset to its factory default state with this device, you cannot access this device if you have forgotten the IP address after changing the IP address from its initial state. Be sure to store a record of the changed IP address.**
In the rare event that you forget the IP address, contact your nearest KEYENCE office.

Using the NQ Series Main Unit

The NQ-MP8L IP address can be set with the IP address setting switches on the main unit.

Reset button　Rotary switches for setting the IP address
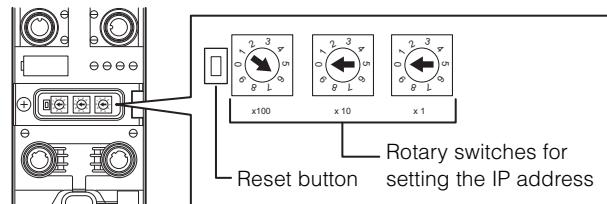
The IP address setting method varies according to the switch position.

No.	Description
000	Operations are performed with the following settings. 　IP address: 192.168.0.250 　Subnet mask: 255.255.255.0 　Default gateway: 192.168.0.1
001-254	Operations are performed with the following settings in which the value set with the switch is assigned to "xxx." 　IP address: 192.168.0.xxx 　Subnet mask: 255.255.255.0 　Default gateway: 192.168.0.1
300	BOOTP
400	DHCP
600	PGM-DHCP (initial value)
900	Resets the NQ-MP8L to the factory default state.

Point　• **The setting changes are applied after the device is restarted or the "Reset" button is pressed.**
• **After configuring the settings, use the prescribed torque to properly tighten the cover of the IP address setting switches. (Tightening torque: 0.4 N•m)**

Using a BOOTP Server or a DHCP Server

The NQ Series supports BOOTP and DHCP. When you use an IP address setting tool made by a company other than KEYENCE, a BOOTP server, or a DHCP server to set the IP address, refer to each company's manual.

Point　**For the NQ-MP8L, set the IP address setting switches to "300" (BOOTP), "400" (DHCP), or "600" (PGM-DHCP). When the switches are set to "300" (BOOTP) or "400" (DHCP), the system starts with BOOTP/DHCP each time that the power is turned on. To store in the nonvolatile memory the IP address set with DHCP, select "600" (PGM-DHCP).**

4

Use the NQ Sensor Monitor to Configure Settings

NQ Series Registration

You must register the NQ series unit to be able to monitor and configure the settings through NQ Sensor Monitor. You can register up to eight NQ Series units in one NQ Sensor Monitor file. There are two ways to register the NQ Series unit: connected (in which the NQ Series unit and the PC are connected to the network) and offline.

Connected Registration (From the Application Menu)

1 **Click [New] from the Application Menu.**
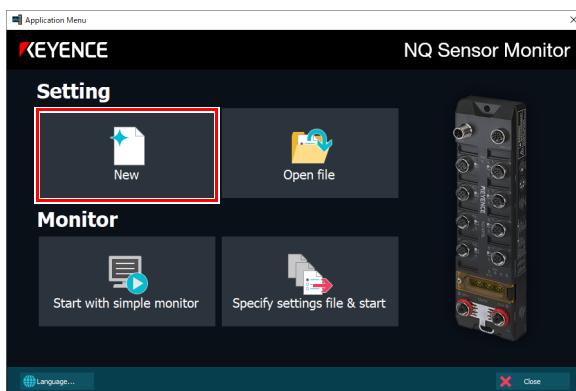
2 **Select [Yes].**
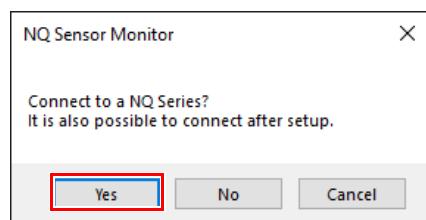
3 **Select the adapter of the network to which the NQ Series unit is connected, and then click [Search].**
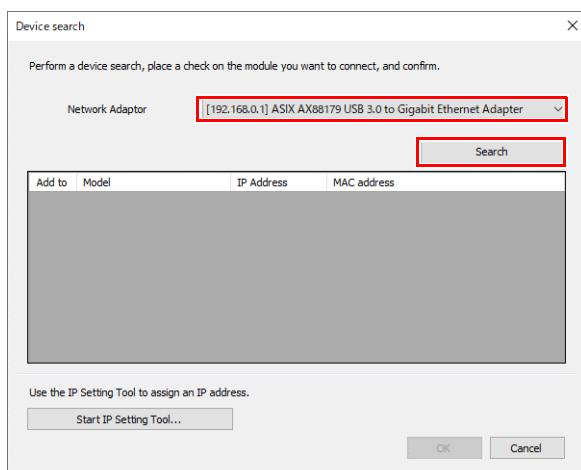
4 **To register all the found devices, click [OK].**
For devices that will not be registered, clear the check box in the [Add to] column.
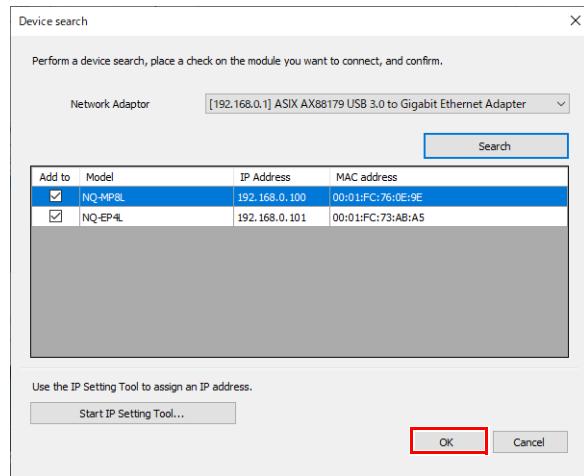
5 **Click [Edit] and change the [Module name] as needed.**
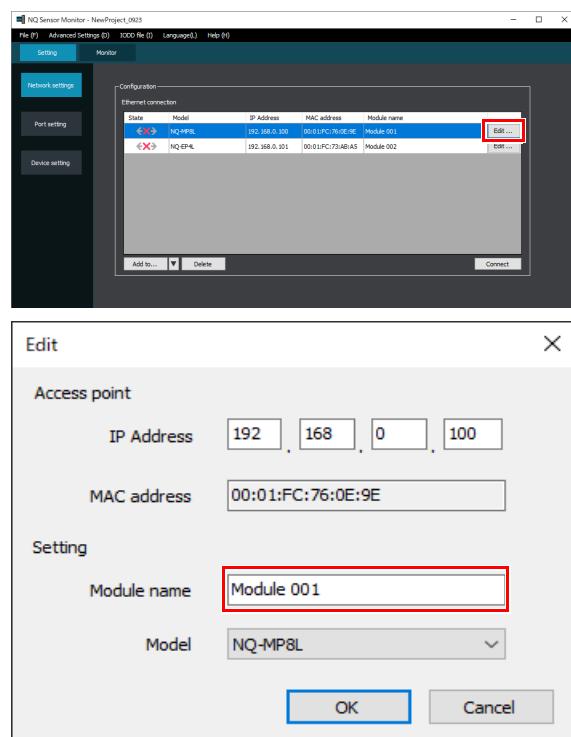
Reference The [Module name] is used to identify each device during configuration and monitoring. The [Module name] is saved to the NQ Sensor Monitor settings file but is not saved to the NQ main unit. (The module name cannot be read from the NQ main unit.)

Connected Registration (From the Setting Screen)

1 **Click [Network settings].**
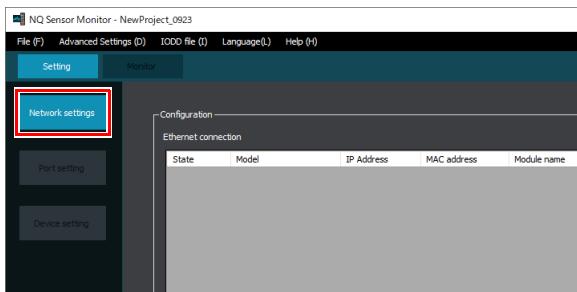
2 **Click [▼], and then select [Add a device from Ethernet search].**
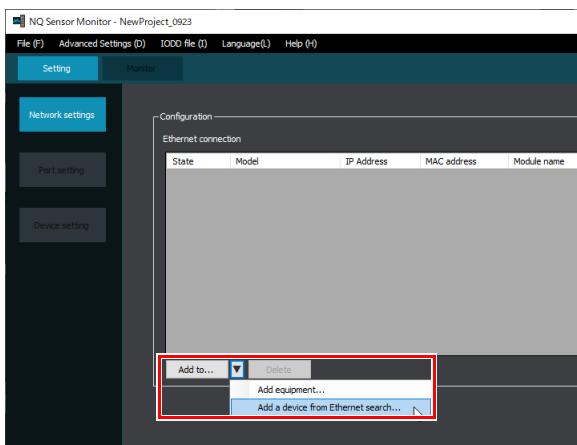
Hereafter, the procedure is the same as steps 3 to 5 in 📖 "Connected Registration (From the Application Menu)" (Page 4-8).

Offline Registration

This section describes how to manually register a device to which an IP address has been assigned.

1 **Click [Add to].**
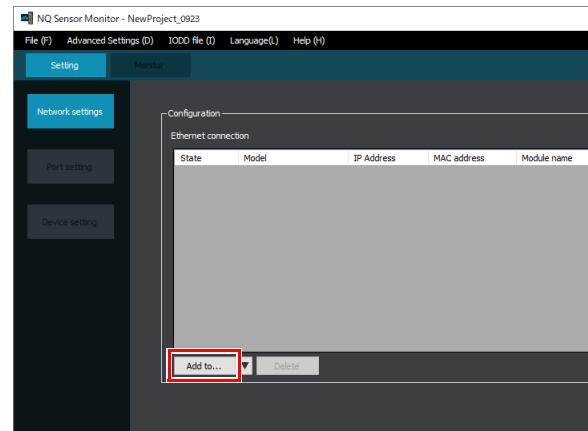
2 **Select the model you want to add, and then click [OK].**
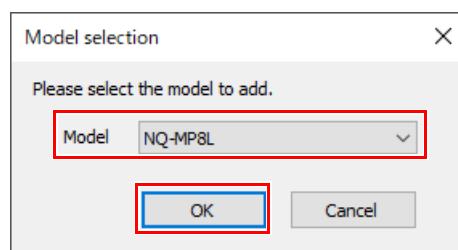
3 **Click [Edit] next to the added model.**

4
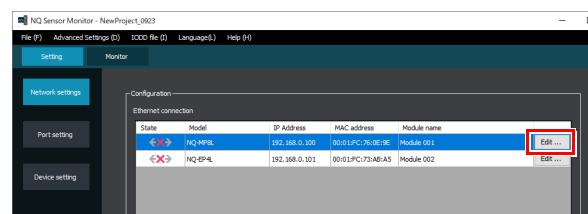
Use the NQ Sensor Monitor to Configure Settings

4 Enter the IP address of the device you are trying to connect, and then click [OK].
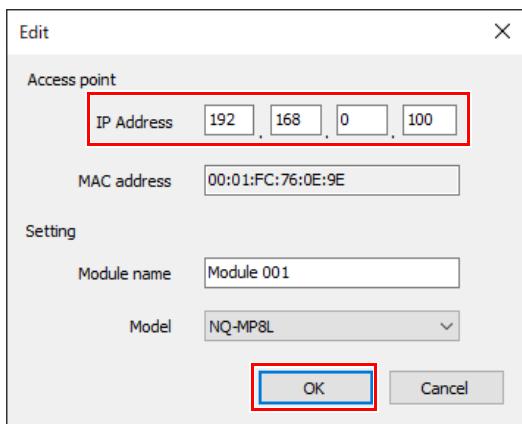
When the added device and the PC are correctly connected to the network, the [State] icon is displayed in green.
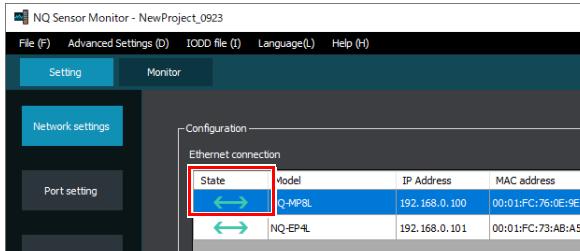
Reference
The [MAC Address] is displayed only when an online connection is established.

5 In the same manner, register all the necessary devices.

6 Click [Edit] and change the [Module name] as needed.
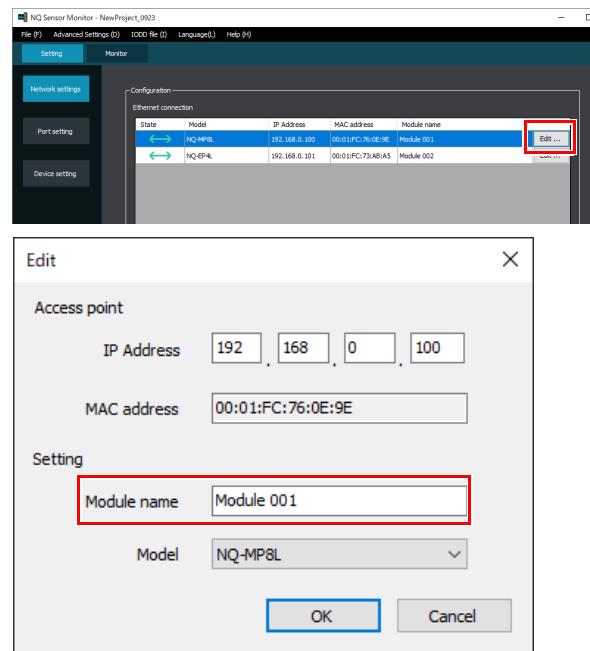
Reference
The [Module name] is used to identify each device during configuration and monitoring. The [Module name] is saved to the NQ Sensor Monitor settings file but is not saved to the NQ main unit. (The module name cannot be read from the NQ main unit.)

4-6 Port Settings

Configure each port using NQ Sensor Monitor.
You can configure settings such as the operation mode, data storage, and validation function of each port.

> **Point**
>
> In the following cases, set the port using each piece of network configuration software.
> - When using an "IOL 32IN/32OUT with Cfg." or "Analog Input with Cfg." connection over EtherNet/IP
> - When using PROFINET communication
>
> In the above cases, the port settings made with NQ Sensor Monitor are overwritten by the port settings made by each piece of network configuration software.

1 Register the NQ Series unit in advance.

"4-5 NQ Series Registration" (Page 4-8)

2 Click [Port setting].
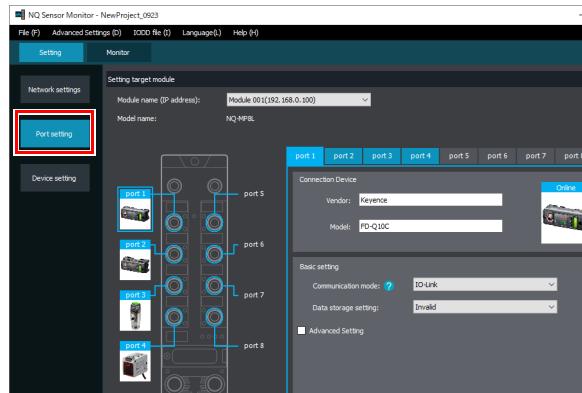
3 Select the module whose settings you want to change.
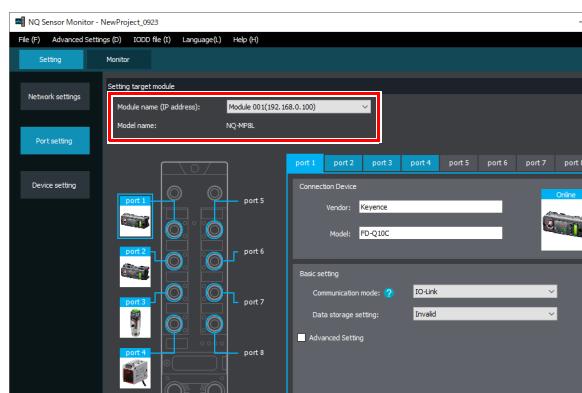
4 Select the port.

You can select the port by clicking the port in the illustration or by clicking the tab for the port.
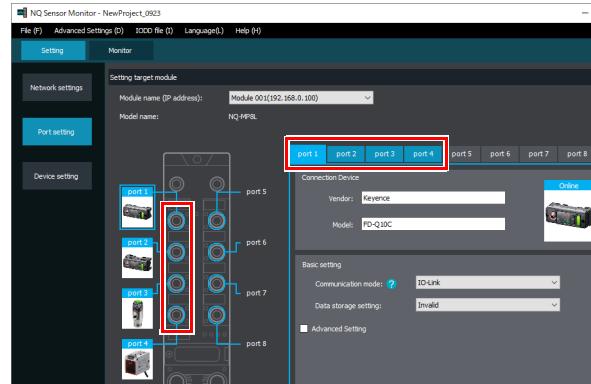
> **Point**
>
> If you click the IO-Link device illustration, the [Device setting] screen is displayed.
> "4-7 Device Settings" (Page 4-22)

5 Configure the settings of each port.
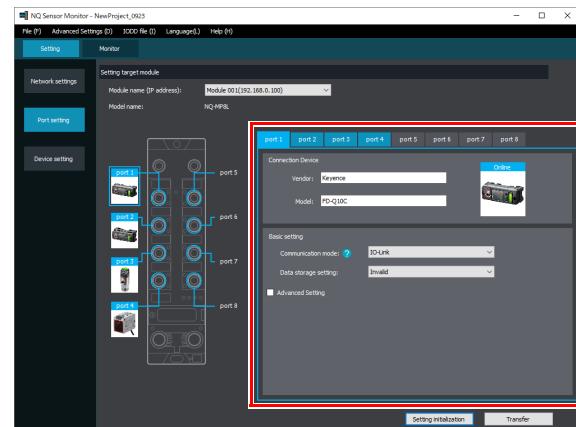
For details on setting items, refer to the next page.

> **Reference**
>
> You can also copy the port settings to another specified port. [Advanced Settings (D)] > [Copy setting (C)]
>
>
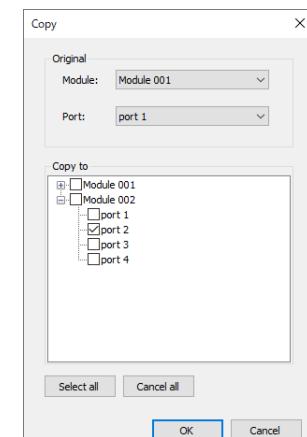
NQ-MP8L/EP4L

■ Device information

•: Initial value

Item	Description	Setting value
Vendor	Indicate the vendor and model of the IO-Link device connected to the port. These items are mandatory when the monitor function is used or when device parameters are edited in the [Device settings] menu. If an appropriate device is not shown in the list, register an IODD file. 📖 " Registering IODD Files" (Page 4-5)	
Model		Reference When the NQ Series to which an IO-Link device is connected is online, the vendor and model name are displayed automatically.	

■ Basic settings

•: Initial value

Item	Description	Setting value
Operation mode	Indicates the function of pin 4. 📖 "Operation mode and validation settings" (Page 4-13)	IO-Link • Digital input
Data storage setting	Indicates whether the data storage function is used or not. When this setting is changed to [Deactivate], the IO-Link device settings in the storage are cleared. 📖 "Data storage function" (Page 4-14)	Deactivate • Activate

■ Detailed settings

•: Initial value

Item	Description	Setting value
Data storage mode	Indicates the data storage mode. This item can be set only when [Data storage setting] is [Activate]. 📖 "Data storage function" (Page 4-14)	Always sync • Parameter save mode Parameter fix mode
Validation setting	Indicates whether to verify the IO-Link device to be connected to the IO port. 📖 "Operation mode and validation settings" (Page 4-13)	No validation • Vendor validation Series validation Serial validation
Validation function setting (Vendor / Device ID)	Indicates [Vendor ID] and [Device ID] used for the validation function. These can also be read from an IODD file or the device currently connected to the port.	(Refer to the manual of the IO-Link device.)
Digital input setting	This item can be set only when [Operation mode] is [Digital input]. This indicates whether to allow parameter setting through service data communication from the NQ Series in the digital input mode.	Allow parameter setting Do not allow parameter setting •
Digital output (Pin 2)	< NQ-MP8L ports 1 to 4 and NQ-EP4L only > Indicates the function of pin 2.	Deactivate (Digital input) • Activate (Digital output)
Output recovery method when overcurrent is detected	< NQ-MP8L ports 1 to 4 and NQ-EP4L only > Indicates the output recovery method after overcurrent detection when using digital output.	Automatic • Manual
Process data setting	Indicates whether to change the byte order of the process data. For example, when you use an EtherNet/IP master unit that processes data in little endian format to obtain 2-byte process data, selecting [16-bit conversion] eliminates the need for byte swapping on the master unit side. 📖 "Process data setting" (Page 4-16)	No conversion 16-bit conversion • 32-bit conversion Convert all
Cycle time change	Indicates the cycle time for the process data. 📖 "Cycle time" (Page 4-17)	Automatic • Manual
Diagnostic information notification level	Indicates whether to transfer IO-Link events from the NQ to the field bus. 📖 "Diagnostic information notification level" (Page 4-17)	Not transfer Excluding notifications Excludes notifications & warnings • Transfer all
Quick Start-Up	Indicates whether to use the Quick Start-Up function. 📖 "Quick Start-Up" (Page 4-17)	Deactivate • Activate
Power supply setting	< NQ-MP8L only > Indicates the power supplied from the port to the IO device. 📖 "Power supply setting" (Page 4-18)	24 V • Process data control Off

NQ Series User's Manual

Operation mode and validation settings

Select the operation mode, validation function setting, and digital input settings of pin 4 of the IO-Link device from the options shown below.

Operation mode		Description
IO-Link	Validation function setting	
	No validation	Pin 4 operates in IO-Link communication mode. The connected device is not validated.
	Vendor validation	Pin 4 operates in IO-Link communication mode. The connected device is validated with the vendor ID.[*1]
	Series validation	Pin 4 operates in IO-Link communication mode. The connected device is validated with the [Vendor ID] and [Device ID].[*1]
	Serial validation	Pin 4 operates in IO-Link communication mode. The connected device is validated with the [Vendor ID], [Device ID], and [Serial Number].[*1, *3]
Digital input	Digital input setting	
	Do not allow parameter setting	Pin 4 operates in digital input mode. IO-Link service data communication will not be received.
	Allow parameter setting	Pin 4 operates in digital input mode. IO-Link service data communication will be received.[*2]

*1   If a validation mismatch occurs, process data I/O is not performed, but parameter reading/writing and diagnostic information will be enabled.

*2   The data storage function cannot be used. Also, this function cannot be used as digital input during IO-Link communication.

*3   This mode can only be used when IO-Link devices supporting serial validation are connected. If an IO-Link device that does not support this validation is connected and serial validation is selected, the connected device will be validated with the [Vendor ID] and [Device ID].

> **Reference**   Each IO-Link device has a vendor ID and a device ID as the information for identification.
> < Examples >

	Vendor ID	Device ID
FD-Q20C	509	2001
FD-R125	509	2004
GP-M001T	509	2008

The validation function prevents the incorrect IO-Link devices from being connected by specifying, in advance, the vendor and device ID of the IO-Link device to connect to.

< Configuring settings via field bus >

Settings can also be configured via EtherNet/IP, Modbus/TCP, and PROFINET. In this situation, select the operation mode from the options shown below.

Operation mode	Description
IO-Link without validation	Pin 4 operates in IO-Link communication mode. The connected device is not validated.
IO-Link with family compatible device	Pin 4 operates in IO-Link communication mode. The connected device is validated with the [Vendor ID] and the highest-order byte of the [Device ID].[*1]
IO-Link with compatible device	Pin 4 operates in IO-Link communication mode. The connected device is validated with the [Vendor ID] and [Device ID].[*1]
IO-Link with identical device	Pin 4 operates in IO-Link communication mode. The connected device is validated with the [Vendor ID], [Device ID], and [Serial Number]. If a mismatch occurs, the [Pre-Operate Status] is maintained.[*1]
DI (with parameter access)	Pin 4 operates in digital input mode. Service data communication will be received.[*2]
DI	Pin 4 operates in digital input mode. Service data communication will not be received.

*1   If a validation mismatch occurs, process data I/O is not performed, but parameter reading/writing and diagnostic information will be enabled.

*2   The data storage function cannot be used. Also, this function cannot be used as digital input during IO-Link communication.

For the detailed setting method, refer to the following pages.

| Network	Parameter settings using the configuration software	Message communication
EtherNet/IP	Page 6-6	Page 6-19
Modbus/TCP	-	Page 7-6
PROFINET	Page 8-5	-

Data storage function

The data storage function automatically records IO-Link device settings on the IO-Link master and transfers settings stored on the IO-Link master, such as when replacing devices, to the IO-Link device. The NQ-MP8L/EP4L has the following three operation modes.

■ Always sync mode

Setting changes on IO-Link devices are always stored on the NQ.

When another new or initialized IO-Link device is connected, the data stored by the NQ will be written to the IO-Link device.

Setting change on the sensor

Sensor settings are stored on the master.

Sensor replacement

Settings are transferred from the master to the sensor.
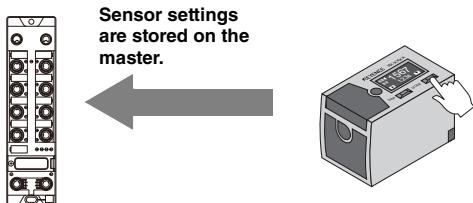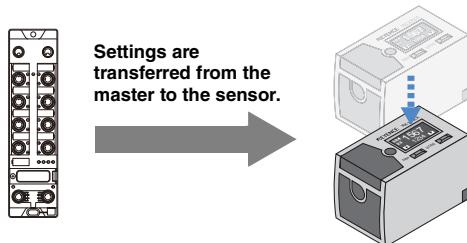
> **Point** During sensor replacement, settings are only transferred from the master to the sensor when the replacement sensor is a new one or has been initialized. When a sensor whose settings have been changed from the initial status is connected, the master reads and stores the sensor settings.

■ Parameter save mode

Setting changes on IO-Link devices are always stored on the NQ.

Even when another IO-Link device is connected, the IO-Link device settings are stored on the NQ.

Setting change on the sensor

Sensor settings are stored on the master.

Sensor replacement


Sensor settings are stored on the master.
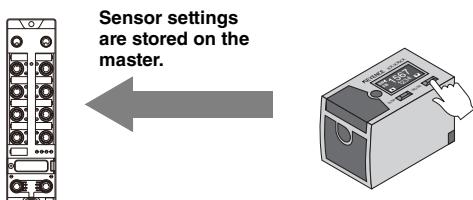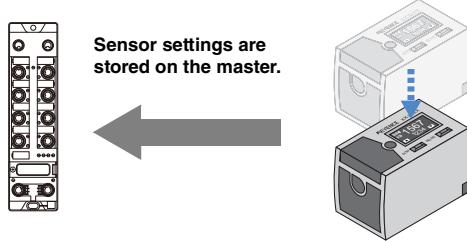
■ Parameter fix mode

The IO-Link device is overwritten with the data stored by the NQ at all times. It is not possible to change settings with operations on the IO-Link device side.

Store the IO-Link device settings on the NQ Series unit with [Always sync] mode or [Parameter save mode] before using this mode.

<u>Setting change on the sensor</u>
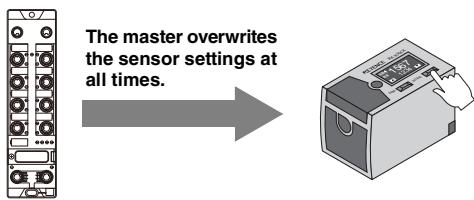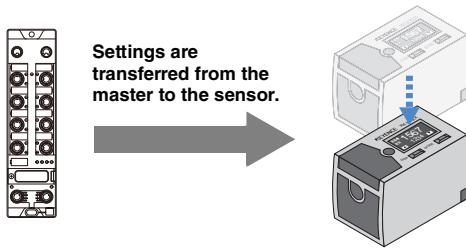
The master overwrites the sensor settings at all times.

<u>Sensor replacement</u>

Settings are transferred from the master to the sensor.

< Configuring settings via field bus >

Settings can also be configured via EtherNet/IP, Modbus/TCP, and PROFINET. For the detailed setting method, refer to the following pages.

Network	Parameter settings using the configuration software	Message communication
EtherNet/IP	Page 6-6	Page 6-19
Modbus/TCP	-	Page 7-6
PROFINET	Page 8-5	-

Process data setting

IO-Link devices and the NQ Series communicate data in big endian format. When using a PLC that processes data in little endian format (such as KEYENCE PLCs), it is necessary to change the byte order.

With the NQ Series, it is only possible to use the settings to change the byte order of the process data. (Service data is not supported.)

Data size	Process data setting	Data (HEX)							
		Byte 8	Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1
1 Byte	No conversion (direct)								12
	16-bit conversion (16 bit swap)								12
	32-bit conversion (32 bit swap)								12
	Convert all (swap all)								12
2 Byte	No conversion (direct)							12	34
	16-bit conversion (16 bit swap)							34	12
	32-bit conversion (32 bit swap)							12	34
	Convert all (swap all)							34	12
3 Byte	No conversion (direct)						12	34	56
	16-bit conversion (16 bit swap)						12	56	34
	32-bit conversion (32 bit swap)						12	34	56
	Convert all (swap all)						56	34	12
4 Byte	No conversion (direct)					12	34	56	78
	16-bit conversion (16 bit swap)					34	12	78	56
	32-bit conversion (32 bit swap)					78	56	34	12
	Convert all (swap all)					78	56	34	12
5 Byte	No conversion (direct)				12	34	56	78	9A
	16-bit conversion (16 bit swap)				12	56	34	9A	78
	32-bit conversion (32 bit swap)				12	9A	78	56	34
	Convert all (swap all)				9A	78	56	34	12
6 Byte	No conversion (direct)			12	34	56	78	9A	BC
	16-bit conversion (16 bit swap)			34	12	78	56	BC	9A
	32-bit conversion (32 bit swap)			12	34	BC	9A	78	56
	Convert all (swap all)			BC	9A	78	56	34	12
7 Byte	No conversion (direct)		12	34	56	78	9A	BC	DE
	16-bit conversion (16 bit swap)		12	56	34	9A	78	DE	BC
	32-bit conversion (32 bit swap)		12	34	56	DE	BC	9A	78
	Convert all (swap all)		DE	BC	9A	78	56	34	12
8 Byte	No conversion (direct)	12	34	56	78	9A	BC	DE	F1
	16-bit conversion (16 bit swap)	34	12	78	56	BC	9A	F1	DE
	32-bit conversion (32 bit swap)	78	56	34	12	F1	DE	BC	9A
	Convert all (swap all)	F1	DE	BC	9A	78	56	34	12

< Configuring settings via field bus >

Settings can also be configured via EtherNet/IP, Modbus/TCP, and PROFINET. For the detailed setting method, refer to the following pages.

Network	Parameter settings using the configuration software	Message communication
EtherNet/IP	Page 6-6	Page 6-19
Modbus/TCP	-	Page 7-6
PROFINET	Page 8-5	-

Cycle time

Set the cycle time of the process data.

When [Automatic] is specified, the minimum cycle time of the connected IO-Link device is followed.

When [Manual] is specified, you can set the cycle time to a value from 1.6 to 132.8 ms in intervals of 0.8 ms or 1.6 ms.

< Configuring settings via field bus >

Settings can also be configured via EtherNet/IP, Modbus/TCP, and PROFINET. The relationship between the value to write and the cycle time is shown below.

Setting value (HEX)	Time (ms)	Setting value (HEX)	Time (ms)	Setting value (HEX)	Time (ms)	Setting value (HEX)	Time (ms)	Setting value (HEX)	Time (ms)	Setting value (HEX)	Time (ms)
0	Automatic	56	15.2	7C	30.4	91	59.2	A4	89.6	B7	120
		58	16	7E	31.2	92	60.8	A5	91.2	B8	121.6
10	1.6	5A	16.8	80	32	93	62.4	A6	92.8	B9	123.2
18	2.4	5C	17.6	81	33.6	94	64	A7	94.4	BA	124.8
20	3.2	5E	18.4	82	35.2	95	65.6	A8	96	BB	126.4
28	4	60	19.2	83	36.8	96	67.2	A9	97.6	BC	128
30	4.8	62	20	84	38.4	97	68.8	AA	99.2	BD	129.6
38	5.6	64	20.8	85	40	98	70.4	AB	100.8	BE	131.2
40	6.4	66	21.6	86	41.6	99	72	AC	102.4	BF	132.8
42	7.2	68	22.4	87	43.2	9A	73.6	AD	104		
44	8	6A	23.2	88	44.8	9B	75.2	AE	105.6		
46	8.8	6C	24	89	46.4	9C	76.8	AF	107.2		
48	9.6	6E	24.8	8A	48	9D	78.4	B0	108.8		
4A	10.4	70	25.6	8B	49.6	9E	80	B1	110.4		
4C	11.2	72	26.4	8C	51.2	9F	81.6	B2	112		
4E	12	74	27.2	8D	52.8	A0	83.2	B3	113.6		
50	12.8	76	28	8E	54.4	A1	84.8	B4	115.2		
52	13.6	78	28.8	8F	56	A2	86.4	B5	116.8		
54	14.4	7A	29.6	90	57.6	A3	88	B6	118.4		

For the detailed setting method, refer to the following pages.

Network	Parameter settings using the configuration software	Message communication
EtherNet/IP	Page 6-6	Page 6-19
Modbus/TCP	-	Page 7-6
PROFINET	Page 8-5	-

Diagnostic information notification level

0: Transfer all IO-Link events.

1: Transfer IO-Link events other than notification-level events.

2: Transfer IO-Link events other than notification-level and warning-level events.

3: Do not transfer IO-Link events.

> Reference
> • The contents and level of the event depend on the IO-Link device.
> • For details, see the instruction manual for the IO-Link device.

Quick Start-Up

Normally, IO-Link devices start within 0.5 seconds, as defined in the IO-Link specifications.

If you enable the quick start-up function, the start-up time will be shortened to approximately 100 ms. Note, however, that not all IO-Link devices support this mode, so operations must be checked in advance.

Power supply setting

With the NQ-MP8L, the supply of power from each port to its IO device can be controlled. It can also be controlled dynamically over a network.

For the detailed method of controlling the power supply over a network, refer to the following pages.

Item	Description
Power supply setting (V1)	Controls the V1 power for pin 1 and 3.<NQ-MP8L port 1 to 8 only>
Power supply setting (V2)	Controls the V2 power for pin 2 and 5.<NQ-MP8L port 5 to 8 only>

<Setting value>   ●: Initial value

Setting range	Description
24V ●	Supplies 24V to the connected IO device.
Process data control	Controls the supply of power via the network.
OFF	Power is not supplied to the connected IO device.

Network	Parameter settings using the configuration software	Message communication
EtherNet/IP	Page 6-11	Page 6-19
Modbus/TCP	-	Page 7-6
PROFINET	Page 8-5	-

Reference When connecting a Class A device to a Class B port (ports 5 to 8) for NQ-MP8L,

assigning the function for pin 2 of the connected sensor to PNP input may cause the sensor to malfunction.

In such a situation, this problem can be avoided by setting "Power supply setting (V2)" to "OFF".

NQ-EP4A

■ Basic settings

●: Initial value

Item	Description	Setting value		
Operation mode	Indicates the device to be connected to the port.	Thermocouple ● Voltage input Current input RTD		
Input range	Indicates the input range.	Thermocouple	Type K, −270 to 1370°C ● Type B, 100 to 1820°C Type E, −270 to 1000°C Type J, −210 to 1200°C Type N, −270 to 1300°C Type R, −50 to 1768°C Type S, −50 to 1768°C Type T, −270 to 400°C Type C, 0 to 2315°C Type G, 0 to 2315°C	
		Voltage input	-10 to 10 V 0 to 10 V 2 to 10 V 0 to 5 V ● 1 to 5 V −1 to 1 V −500 to 500 mV −100 to 100 mV −50 to 50 mV	
		Current input	0 to 20 mA 4 to 20 mA ● −20 to 20 mA	
		RTD	PT100, −200 to 850°C ● PT100, −200 to 150°C NI100, −60 to 250°C NI100, −60 to 150°C PT200, −200 to 850°C PT200, −200 to 150°C PT500, −200 to 850°C PT500, −200 to 150°C PT1000, −200 to 850°C PT1000, −200 to 150°C NI1000: −60 to 250°C NI1000, −60 to 150°C	
Thermocouple cold junction compensation setting	Indicates the method of cold junction compensation when a thermocouple is used.	Conn. to Pt1000 (Use OP-88459) Conn. to Pt100 Use port 1 cold junction compensation No conn. (25°C fixed) ●		
Disable port	Deactivates a port. When a port is disabled, the analog input status LED is unlit even when no device is connected to the port.	-		
Input method	< Voltage or current input only > Indicates the type of wiring.	Single end ● Differential Differential (No grounding)		
Wiring type	< Resistance temperature detector only > Indicates the type of wiring.	2-wire 3-wire ● 4-wire		
Temperature unit	This item is displayed only when [Operation mode] is [Thermocouple] or [Resistance thermometer]. Indicates the unit of temperature.	0: °C ● 1: °F		
Present value	Indicates the present value. The value is updated each time [Updt] is clicked.	-		

4

Use the NQ Sensor Monitor to Configure Settings

■ Detailed settings

●: Initial value

Item	Description	Setting value
Data display	-	Normal range ● Extended range NE43 standard range
Filter setting	Sets the analog input filter.	Filter (Medium speed) ● Filter (Low speed) Filter (High speed) No filter
Power supply noise filter	Sets the power supply noise filter.	Off ● 50 Hz 60Hz
Diagnostic information notification setting	Indicates whether to activate or deactivate the diagnostic information.	Off (Diagnostic information activated) ● On (Diagnostic information deactivated)
Scaling setting	< Voltage or current input only > Indicates two-point scaling.	-

Filter setting

< Voltage/current >

Filter (Medium speed): 5 Hz

Filter (Low speed): 1 Hz

Filter (High speed): 30 Hz

No filter: 250 Hz

< Temperature >

Filter (Medium speed): 2 Hz

Filter (Low speed): 0.25 Hz

Filter (High speed): 15 Hz

No filter: 125 Hz

Cutoff frequency (−3 db)

Power supply noise filter

Off: No filter.

50 Hz: Select this when the AC power supply is 50 Hz.

60Hz: Select this when the AC power supply is 60 Hz.

Scaling

The scaling function converts (scales) the AD-converted data to the range with the set upper and lower limits.

You can use the scaling function to handle analog input values on the PLC side as arbitrary values without having to create a program to convert these analog input values.
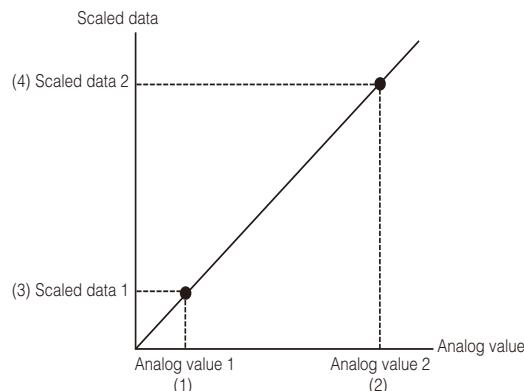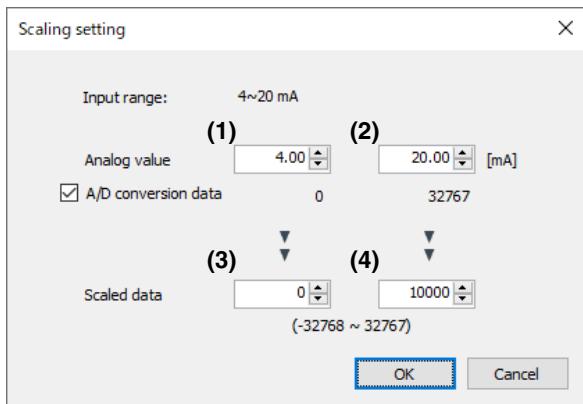
Item	Description
Input range	Indicates the set input range.
Analog value	Indicates the analog value before scaling conversion.
A/D conversion data	Select this check box to display the A/D conversion data.
Scaled data	Indicates scaled data. (Input range: −32768 to 32767)

4 Use the NQ Sensor Monitor to Configure Settings

4-7　Device Settings

If you selected NQ-MP8L or NQ-EP4L with [Setting target module], you can set the parameters of the IO-Link devices that are connected to the ports.

1　Register the NQ Series unit in advance.

📖"NQ Series Registration" (Page 4-8)

2　Register the IODD file.

📖"Registering and Deleting IODD Files" (Page 4-5)

3　Click [Device setting], and then select the module whose settings you want to change.
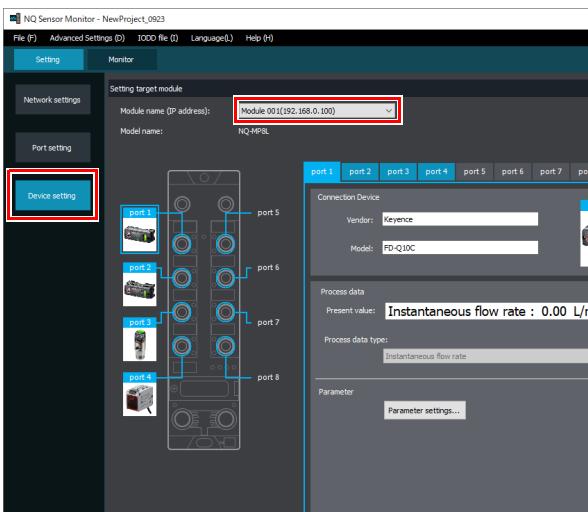
| Reference | If the NQ Series is online and a sensor is connected to the NQ Series, the sensor will be recognized and displayed automatically. |

4　Select the port that the device whose settings you want to change is connected to.

Click the sensor image or the port tab.
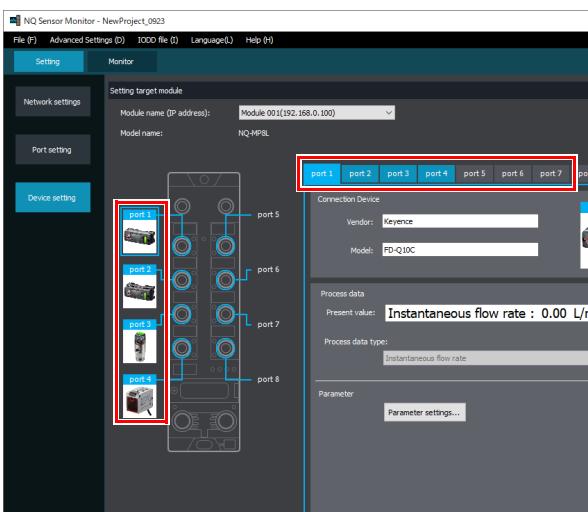
5　Configure the settings of the devices connected to the ports.
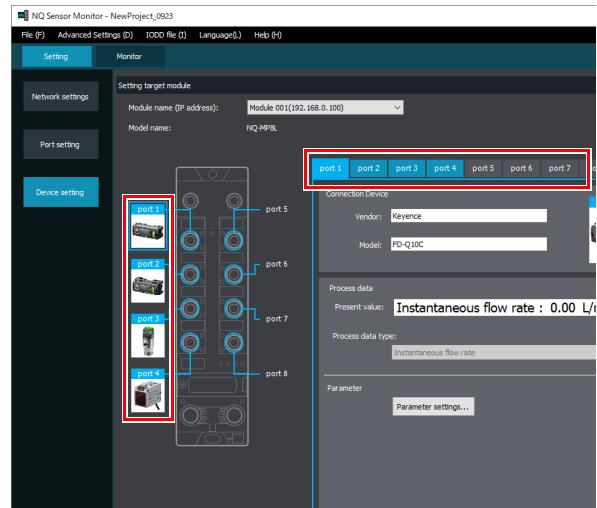
■ Device information

Item	Description
Vendor	Select the vendor and model of the IO-Link device connected to the port. These items are mandatory when the monitor function is used or when device parameters are edited in the [Device settings] menu.
Model	If an appropriate device is not shown in the list, register an IODD file. 📖"Registering IODD Files" (Page 4-5) Reference When the NQ Series to which an IO-Link device is connected is online, the vendor and model name are displayed automatically.

■ Process data

Item	Description
Present value	Indicates the present value of the process data. If the process data consists of multiple pieces of data, each piece of data is displayed separately.
Process data type	Depending on the IO-Link device, there may be multiple types of process data that can be switched between. For details, refer to the manual of the IO-Link device. You can change the process data type with the [Parameter settings] shown below.

■ Parameter

You can set the parameters of the IO-Link device. The parameters that can be set vary depending on the IO-Link device. For details, refer to the manual of the IO-Link device.

Use the NQ Sensor Monitor to Configure Settings

4

Parameter settings screen

Use this screen to read settings from and transfer settings to the connected IO-Link device.
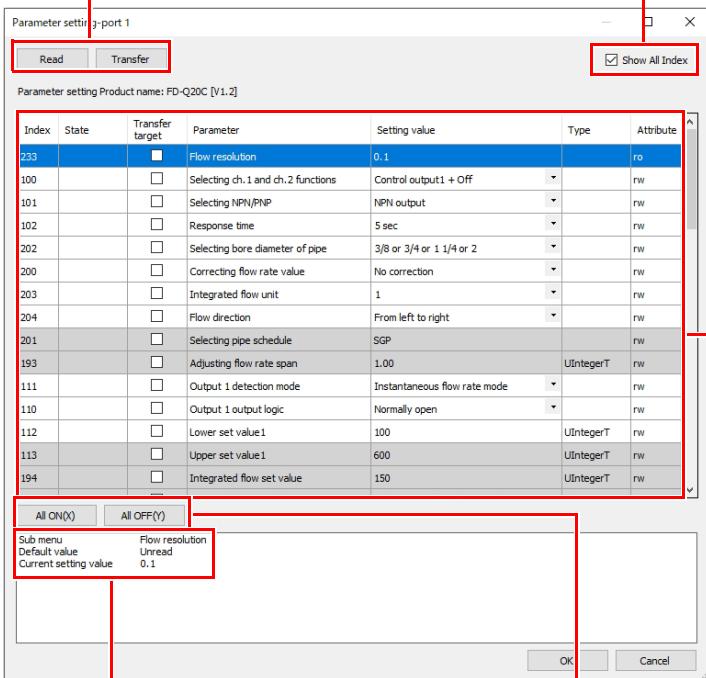
Displays the sub menu, initial value, and current value of the selected parameter.

Selects/clears, as a batch, the parameters to be configured.

■ **Show All Index**

Clear this check box to hide parameters whose settings cannot be changed (such as exclusion setting parameters). This simplifies the displayed parameters when using devices with many parameters.

■ **State**

[Edited] is displayed for parameters that have been edited in but have not been transferred from NQ Sensor Monitor.

■ **Transfer target**

Select the parameters to transfer.

■ **Parameter / Setting value**

Indicate the parameter item and setting value.

■ **Type**

UINT: Unsigned integer
INT: Signed integer
String: Character string

Also, if a unit is present in the setting item, the unit will be displayed here.
Example) The unit "ms" is displayed for the timer duration.

■ **Attribute**

ro: Read only
wo: Write only
rw: Reading and writing possible

MEMO

5

Monitoring with NQ Sensor Monitor

This chapter describes how to monitor the NQ Series using NQ Sensor Monitor.

Monitor Function Overview

The process data of IO-Link devices connected to the NQ-MP8L and the NQ-EP4L as well as the analog converted values of the devices connected to the NQ-EP4A can be monitored on graphs and with numeric values.

> **Point**
> • IO-Link devices cannot monitor data other than process data (such as data handled by message communication).
> • Settings must be configured in advance for IO-Link devices on which the process data type can be selected.
> 📖 **"Device Settings" (Page 4-22)**

There are two monitoring methods.

(1) Simple monitor

The trend graph of the process data of the IO-Link device connected to the NQ Series on the same network as the PC is automatically arranged and displayed on the screen.
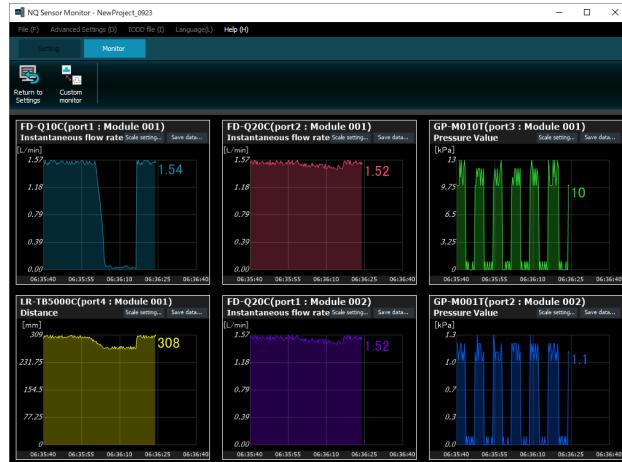
> **Point**
> • The process data of up to eight IO-Link devices can be displayed with a simple monitor.
> • One piece of process data is displayed per IO-Link device in the following order: module 1 port 1, 2, and so on; module 2 port 1, 2, and so on.
> • The simple monitor screen is created automatically and cannot be changed.

(2) Custom monitor

You can create a monitor screen by using parts such as graphs and numeric values.
You can easily restart the monitor by saving the created screen.

> **Point**
> A custom monitor can display up to 64 pieces of process data.

Monitor Screen Specifications

Up to 24 hours of data can be displayed and saved on a monitor screen. Subsequent data will be overwritten with the latest data and cannot be displayed or saved on the monitor screen. To save data for more than 24 hours, use the 📖 "Logging Function" (Page 5-11).

> **Point**
> Data is acquired and saved only during monitoring. If you stop monitoring, the process data acquired during the monitoring will be deleted. If necessary, save the data before stopping monitoring.
> 📖 **"Operating the Screen" (Page 5-3)**

5-2 Initiating Monitoring

This section explains how to begin monitoring.

If you want to create a monitor screen, do so before you start monitoring.
📖"Creating Monitor Screens" (Page 5-4)

Start Method

< Starting from the launcher >

Start NQ Sensor Monitor, and then select [Start with simple monitor] or [Specify settings file & start].
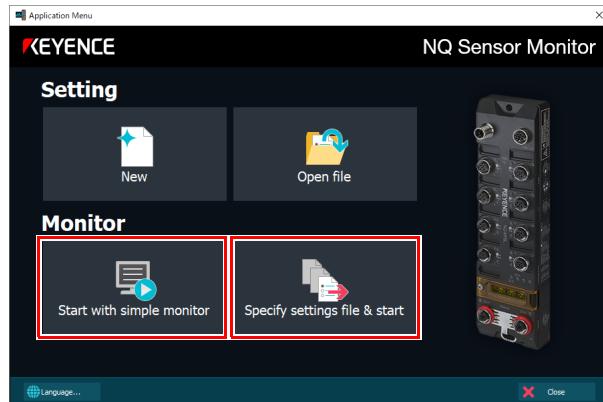
< Starting from the normal screen >

1 Click [Monitor].
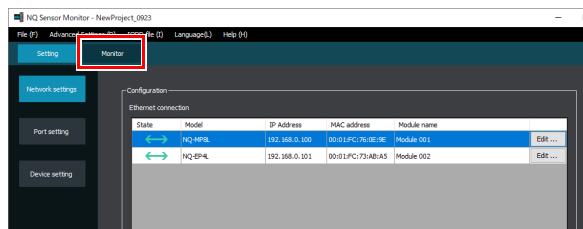
2 Click [Start monitor].
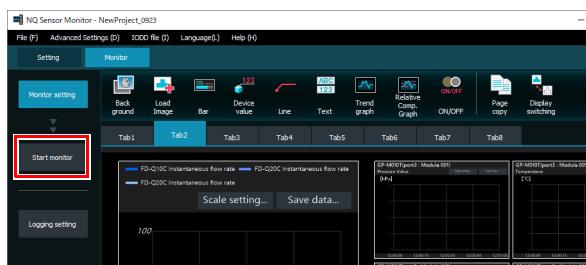
Operating the Screen

< Custom monitor only >
You can create up to eight screens. Click the tabs to switch between the screens. (Initially, all tabs other than Tab 1 are hidden.)

Exit the monitor and return to the settings screen.
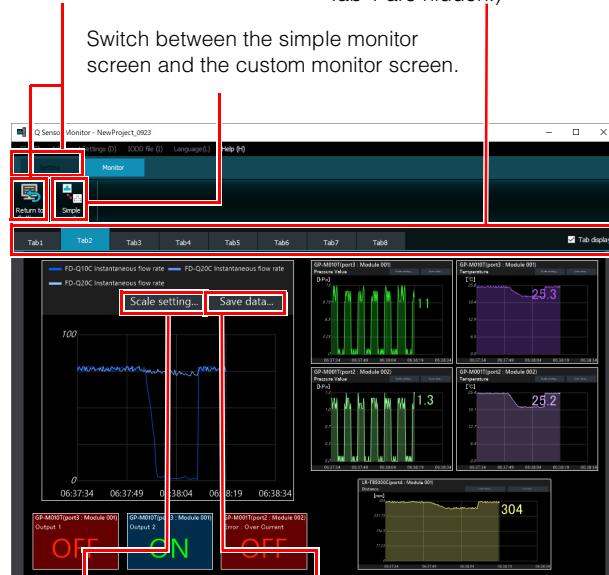
Switch between the simple monitor screen and the custom monitor screen.

Scale setting
Changes the scale of the horizontal axis of the graph. Select from seconds, minutes, and hours. (Initial value: seconds)

Save data
Saves the data being monitored to a file in CSV format.

> **Reference**
>
> Only data from the last 24 hours can be saved from a graph. To save data from a period longer than this, use the logging function.
> 📖"Output File Formats" (Page 9-14)
> 📖"Logging Function" (Page 5-11)

If an error occurs an IO-Link device connected to the NQ Series, an error warning will be displayed.

Creating Monitor Screens
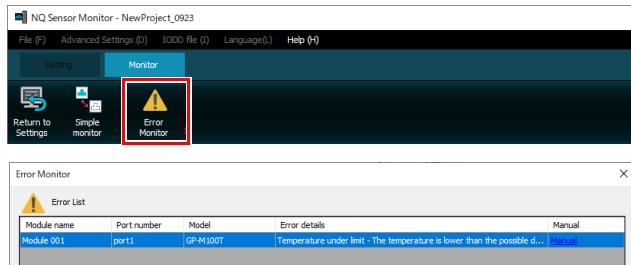
This section explains how to create monitor screens.

You have to configure the IO-Link device before creating the monitor screen.

📖 "Device Settings" (Page 4-22)

Monitor Settings Screen

Starts monitoring.

📖 "Drawing the Screen" (Page 5-5)
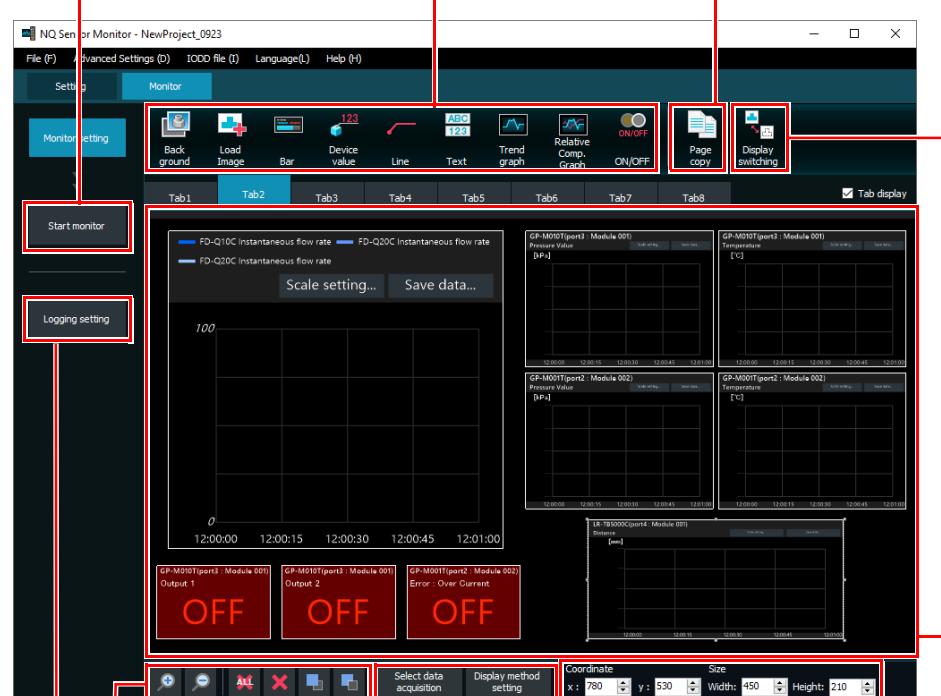
Copies the current screen to another tab.
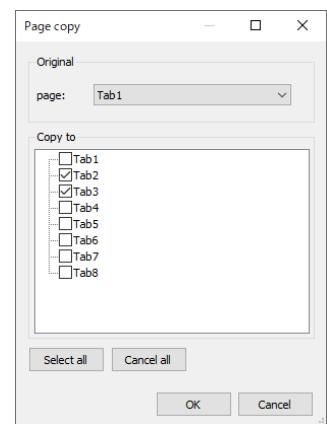
Switches between the simple monitor screen and the custom monitor screen.

This area is used to place objects such as graphs.

Expands or reduces the size of the drawing area.
If reducing the size of the drawing area causes a placed part to protrude past the edge of the screen, the position of the part is corrected automatically.

Deletes all the objects on the selected tab.

Deletes the selected object.

Moves the selected object to the front.

Moves the selected object to the back.

Displays the sub menu. The displayed items vary depending on the selected object.

You can use numeric values to specify the position and size of objects.

📖 "Logging Function" (Page 5-11)

Monitoring with NQ Sensor Monitor

5

Drawing the Screen

Use the toolbar at the top of the screen to draw the monitor screen by placing objects.

> **Reference** Up to 64 objects can be placed on a single tab.

Background

You can set the background image and background color.

■ Background image

Display an image file in the background.
- Supported file formats: BMP/JPG/PNG
- Supported size: max. 3440 × 1935

> **Point**
> - **If the image size is larger than the drawing area, the image will be trimmed to match the size of the drawing area.**
> - **If the image size is smaller than the drawing area, the image will be displayed in the center of the background. The image position and size cannot be changed.**

■ Background color

Set the background color.
- Initial value: black

> **Point** **The background color can only be changed within the drawing area.**

Load Image

Displays an image saved on the PC.
- Supported file formats: BMP/JPG/PNG
- Supported size: max. 3440 × 1935

> **Point**
> - **If the image size is larger than the drawing area, the image will be shrunk.**
> - **You can change the size, position, and angle of the image.**
> - **The image aspect ratio cannot be changed.**

Bar

Displays a bar graph that expands and contracts according to the present value.
Select from the following four types of bar graphs.

■ Bar (horizontal), device name / measured value
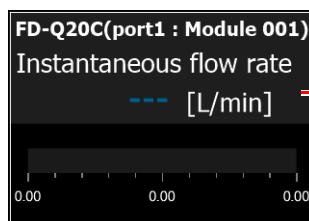
NQ-MP8L/EP4L
Model (port number: module name)

NQ-EP4A
Port number: module name

Present value

■ Bar (vertical), device name / measured value
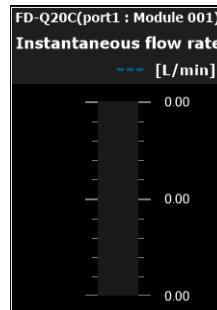
■ Bar only (horizontal)
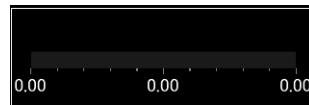
■ Bar only (vertical)
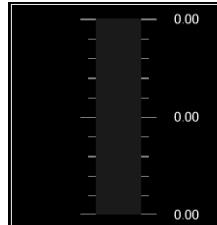
> **Reference** For KEYENCE IO-Link sensors, units are displayed automatically according to the IODD file to match the IO-Link sensor main unit settings. You cannot switch between units being displayed or hidden.

< Data Acquisition settings >


Item	Description
Target master	Select the NQ Series to which the device whose data is displayed is connected to.
Display module name	Select whether to display the port number and module name.
Target device	Select the device whose data will be displayed.
Display contents	< Only when the NQ-MP8L/EP4L is selected > If the process data contains multiple pieces of data, select which piece of data to display.
Display process data name	Select whether to display the process data name.
Color setting	Set the bar color.

< Graph Scaling >

Item	Description
Display method	Automatic* (initial value) Fixed

When [Automatic] is specified, the display range is set with an upper limit of 120% of the maximum value of the data acquired by the monitor. The minimum value is 0. |
| Maximum value / Minimum value | (These vary depending on the device.) |

Device value

Display the value of the process data of the device. Select the display method from the two shown below.

■ Device value
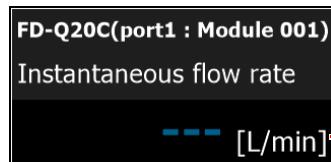
NQ-MP8L/EP4L
Model (port number: module name)
NQ-EP4A
Port number: module name

Present value

■ Peak value and Bottom value
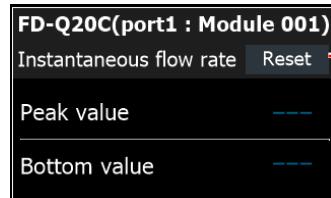
Resets the peak and bottom values. The peak and bottom values will also be reset when you stop monitoring.

Reference

- For KEYENCE IO-Link sensors, units are displayed automatically according to the IODD file to match the IO-Link sensor main unit settings. You cannot switch between units being displayed or hidden.
- The peak value and bottom value are displayed according to the values acquired by NQ Sensor Monitor at an interval of approximately 300 ms. Therefore, the peak and bottom values may not match the corresponding values maintained on the device main unit.

< Data Acquisition settings >
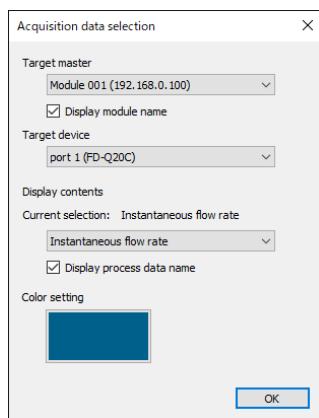
Item	Description
Target master	Select the NQ Series to which the device whose data is displayed is connected to.
Display module name	Select whether to display the port number and module name.
Target device	< Only when the NQ-MP8L/EP4L is selected > Select the device whose data will be displayed.
Display contents	If the process data contains multiple pieces of data, select which piece of data to display.
Display process data name	Select whether to display the process data name.
Color setting	Set the bar color.

Callout Line

Displays a callout line.
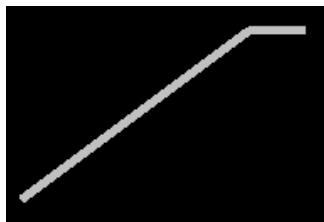
When you click the callout line, you can set the [Line color] and [Line width] items from the setting menu at the bottom of the screen.

< Line color >

You can set the color of the callout line.
• Initial value: gray

< Line width >

You can set the width of the callout line in five levels from one to five.
• Initial value: 3

Text

Displays an arbitrary character string.
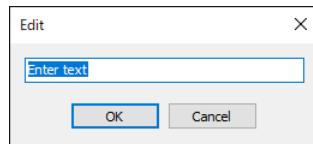
Reference
• You can use full-width, half-width, and alphanumeric characters.
• The maximum character count is 63 full-width characters and 127 half-width characters.

When you click the text, you can set the [Setting], [Font color], [BG color], and [Initialize] items from the setting menu at the bottom of the screen.

< Setting >

You can edit the text.

< Font color >

You can change the font color.
• Initial value: white

< BG color >

• Initial value: transparent

< Initialize >

Initializes the font color and background color.

5

Monitoring with NQ Sensor Monitor

Trend Graph

Displays the value of the process data of the specified device on a line graph. In addition, up to 24 hours worth of data can be saved.

NQ-MP8L/EP4L
Model (port number: module name)
NQ-EP4A
Port number: module name

Scale setting
Changes the scale of the horizontal axis of the graph. Select from seconds, minutes, and hours. (Initial value: seconds)

FD-Q20C(port1 : Module 001)
Instantaneous flow rate   Scale setting...   Save data...
[L/min]

12:00:00   12:00:15   12:00:30   12:00:45   12:01:00

Vertical axis: present value

Horizontal axis: time

Save data
Saves the current data to a .CSV file.

The data is sampled at an interval of approximately 300 ms and is displayed on a graph according to the scale setting, as shown below.

Scale setting	Plot interval	Display range	Number of displayed points
Second (s)	0.3 s	60 seconds	201
Minutes (m)	20 s	60 minutes	201
Time (h)	7.2 m	24 hours	201

Point

- **The graph display range cannot be changed. If you want to check data from a period of time earlier than the start of the display range, refer to the data saved in CSV format.**
- **When the data is saved, the most recent 24 hours of data will be recorded in a .CSV file at a sampling interval that corresponds to the current scale setting.** 📖**"Output File Formats" (Page 9-14) To save data from a period longer than 24 hours, use the logging function.**
  📖**"Logging Function" (Page 5-11)**
- **You can only click [Scale setting] and [Save data] when monitoring is in progress.**
- **The scale label is displayed automatically. It cannot be changed.**
- **A maximum of 10 Trend graphs and Relative comparison graphs can be displayed in a single tab.**

< Data Acquisition settings >

Acquisition data selection
Target master
Module 001 (192.168.0.100)
☑ Display module name
Target device
port 1 (FD-Q20C)
Display contents
Current selection: Instantaneous flow rate
Instantaneous flow rate
☑ Display process data name
Color setting

OK

| Item	Description
Target master	Select the NQ Series to which the device whose data is displayed is connected to.
Display module name	Select whether to display the port number and module name.
Target device	Select the device whose data will be displayed.
Display contents	< Only when the NQ-MP8L/EP4L is selected > If the process data contains multiple pieces of data, select which piece of data to display.
Display process data name	Select whether to display the process data name.
Color setting	Set the bar color.

< Graph Scaling >

Display method setting
Set the maximum and minimum values.
Display method: Automatic
Maximum value: 99.99   L/min
Minimum value: 0.00   L/min

OK

Item	Description
Display method	Automatic* (initial value) Fixed When [Automatic] is specified, the display range is set to the minimum value and maximum value of the data acquired by the monitor.
Maximum value / Minimum value	(These vary depending on the device.)

Relative comparison graph

Displays the values of the process data of up to four devices on a line graph. In addition, up to 24 hours worth of data can be saved.

NQ-MP8L/EP4L
Model module name
NQ-EP4A
Module name

Scale setting
Changes the scale of the horizontal axis of the graph. Select from seconds, minutes, and hours. (Initial value: seconds)

Vertical axis: present value

Horizontal axis: time

Save data
Saves the current data to a .CSV file.

The data is sampled at an interval of approximately 300 ms and is displayed on a graph according to the scale setting, as shown below.

Scale setting	Plot interval	Display range	Number of displayed points
Second (s)	0.3 s	60 seconds	201
Minutes (m)	20 s	60 minutes	201
Time (h)	7.2 m	24 hours	201

Point

- **The graph display range cannot be changed. If you want to check data from a period of time earlier than the start of the display range, refer to the data saved in CSV format.**
- **When the data is saved, the most recent 24 hours of data will be recorded in a .CSV at a sampling interval that corresponds to the current scale setting. "Output File Formats" (Page 9-14) To save data from a period longer than 24 hours, use the logging function.**
  "Logging Function" (Page 5-11)
- **You can only click [Scale setting] and [Save data] when monitoring is in progress.**
  The scale label is displayed automatically. It cannot be changed.
- **A maximum of 10 Trend graphs and Relative comparison graphs can be displayed in a single tab.**

< Data Acquisition settings >
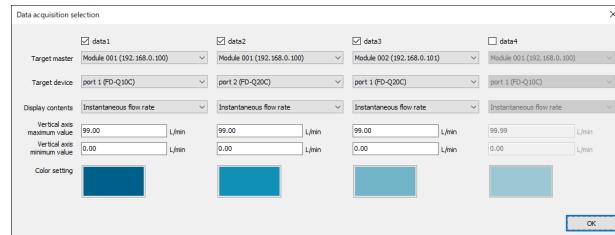
Item	Description
Data 1 to 4	Select these check boxes to display the corresponding data on the graph.
Target master	Select the NQ Series to which the device whose data is displayed is connected to.
Display module name	Select whether to display the port number and module name.
Target device	Select the device whose data will be displayed.
Display contents	< Only when the NQ-MP8L/EP4L is selected > If the process data contains multiple pieces of data, select which piece of data to display.
Vertical axis maximum value	Set the numeric value of the process data corresponding to the upper limit of the vertical axis.
Vertical axis minimum value	Set the numeric value of the process data corresponding to the lower limit of the vertical axis.
Color setting	Set the bar color.

5

Monitoring with NQ Sensor Monitor

ON/OFF

Displays the IO-Link device output status.

FD-Q20C(port1 : Module 001)
Instantaneous flow rate

OFF

NQ-MP8L/EP4L
Model (port number: module name)

NQ-EP4A
Port number: module name

Process data name
(KEYENCE sensors only)

Present value

< Data Acquisition settings >

Acquisition data selection ✕

Target master
Module 001 (192.168.0.100)
☑ Display module name

Target device
port 1 (FD-Q20C)

Display contents
Current selection: Instantaneous flow rate

Instantaneous flow rate
☑ Display process data name

OK

Item	Description
Target master	Select the NQ Series to which the device whose data is displayed is connected to.
Display module name	Select whether to display the port number and module name.
Target device	Select the device whose data will be displayed.
Display contents	< Only when the NQ-MP8L/EP4L is selected > If the process data contains multiple pieces of data, select which piece of data to display.
Display process data name	Select whether to display the process data name.

< Style settings >

Style settings ✕
Set the maximum and minimum values of the bar.
◉ Green/Red
○ ON/OFF

ON   OFF

OK   Cancel

Style settings ✕
Set the maximum and minimum values of the bar.
○ Green/Red
◉ ON/OFF

ON   OFF

OK   Cancel
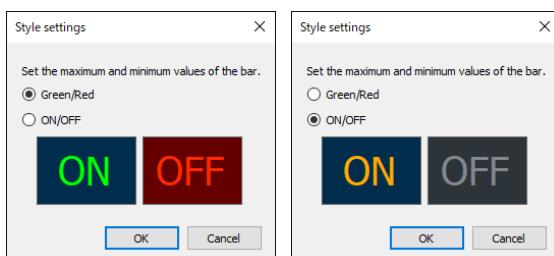
Reference | If the target data is a numeric value, the output status is [OFF] when the value is 0 and is [ON] in all other situations.

Switching between Screens Being Created

You can create up to eight screens.
Choose which tabs are visible using the [Tab display] check box at the top of the screen. Click the tabs to switch between them.

Show or hide tabs two to eight.

Background | Load Image | Bar | Device value | Line | Text | Trend graph | Relative Comp. Graph | ON/OFF | Page copy | Display switching

Tab1 | Tab2 | Tab3 | Tab4 | Tab5 | Tab6 | Tab7 | Tab8 | ☑ Tab displ
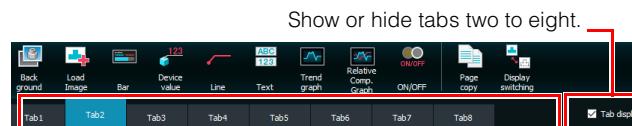
Select the tab to create the screen on.

Reference | To change the name of a tab, right-click it.

Saving Screens

Created screens are saved in the settings file.
On the [File (F)] menu, click [Save (S)] or [Save as (A)].

NQ Sensor Monitor - NewProject_0924

File (F) | Advanced Settings (D) | IODD file (I) | Language(L) | Help (H)

New Project(N)   Ctrl+N
Open(O)...   Ctrl+O
Save(S)   Ctrl+S
Save As(A)...   Ctrl+Shift+S
Exit(E)   Ctrl+Q

Load Image | Bar | Device value

5-4 Logging Function
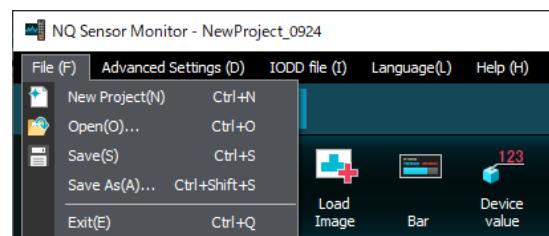
The process data of devices connected to the NQ Series can be logged with NQ Sensor Monitor and output to a CSV file or Excel file.
There are two ways to perform logging.

(1) Auto Trigger

Logging starts at the same time as [Start monitor] is executed, and the data is logged at the set interval. Logging stops when the preset number of values to log is reached.
Logging can be performed at intervals of 0.5 to 60 seconds, and the maximum number of values that can be logged is 10000.

(2) External input trigger

The input signal of a port set to [Digital input] on the NQ-MP8L or NQ-EP4L is used as the logging trigger. When using an external input trigger, set one of the ports to [Digital input] in advance and connect the input device.
📖"Port Settings" (Page 4-11)

✎ Point	• **Only the digital input signal applied to pin 4 can be used as a trigger. The digital input signal of pin 2 on the Class A port cannot be used as a trigger.** • **Minimum OFF time and minimum ON time of the external input are 300 ms.** • **The logging function can only be used while NQ Sensor Monitor is running.**

Setting Items

< Logging method >
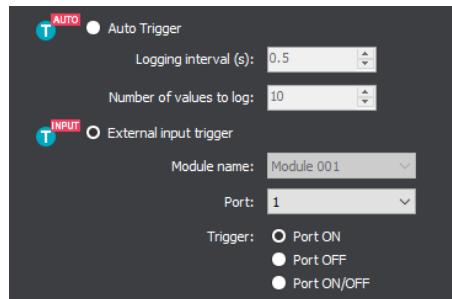
Item	Description
Auto Trigger	Logging starts at the same time as [Start monitor].
Logging interval (s)	Specify the logging interval. Setting range: 0.5 to 60.0 (s) Initial value: 0.5 (s)
Number of values to log	Specify the number of times to perform logging. Setting range: 1 to 10000 Initial value: 100
External input trigger	The input signal of a port set to [Digital input] on the NQ-MP8L or NQ-EP4L is used as the logging trigger.
Module name	Select the module to which the external input device is connected.
Port	Select the port to which the external input device is connected.
Trigger	Specify the trigger method. Port ON: Input rising edge Port OFF: Input falling edge Port ON/OFF: Input rising edge and falling edge

< Transfer settings >

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Automatically transfer to CSV file</td><td>When this check box is selected, the logging data is output as a CSV file. The CSV file is created at the start of logging, and the data is added as necessary. (The CSV file is locked during logging and cannot be edited by other applications.)</td></tr>
<tr><td>Folder path</td><td>Specify the path in which to save the CSV file. The file is saved in the specified folder with a name that corresponds to the format shown below. (The file name cannot be specified.)
　yyyymmdd_HHMMSS.csv</td></tr>
<tr><td>Automatically transfer to Excel file</td><td>When this check box is selected, the logging data is output as an Excel file.</td></tr>
<tr><td>Specify template file</td><td>Create a new workbook with the specified Excel template file (.xltx/.xltm/.xlt) and record the data.</td></tr>
<tr><td>Create new file</td><td>Create a new workbook and record the data.</td></tr>
<tr><td>Currently open Excel file</td><td>Record data in the currently open Excel file (the active Excel file). Specify the sheet name.</td></tr>
<tr><td>Header start cell</td><td>Specify the cell in which to output the header. A header consists of three lines.
📖"Output File Formats" (Page 9-14)</td></tr>
<tr><td>Data start cell</td><td>Specify the cell in which to output the data. If the data start cell is set in a manner that overlaps the header area, the header is overwritten with the data.
📖"Output File Formats" (Page 9-14)</td></tr>
<tr><td>Enable overwrite mode</td><td>When this check box is selected, in addition to normal logging data, the specified cell is always overwritten with the latest data.</td></tr>
<tr><td>Overwrite cell</td><td>Specify the cell in which to overwrite the data.</td></tr>
<tr><td>Transfer values</td><td>Select the module/port to transfer to the file.</td></tr>
</table>

Point

- **During automatic transferring to the Excel file, logging stops when:**
  - **An operation is performed on the workbook in which data is being recorded.**
  - **The maximum number of rows in Excel is exceeded.**
  - **The active Excel file is switched to another workbook (only when logging with the [Currently open Excel file] setting).**

6

EtherNet/IP Communication

6-1 NQ Series EtherNet/IP Communication Function

Overview

The NQ-MP8L/EP4L/EP4A is equipped with the EtherNet/IP^{TM} protocol, which operates as the gateway for IO-Link and EtherNet/IP communication. You can communicate over EtherNet/IP with a sensor or actuator connected via IO-Link communication, thereby reading or writing PLC or controller information.

Reading and writing of various parameters
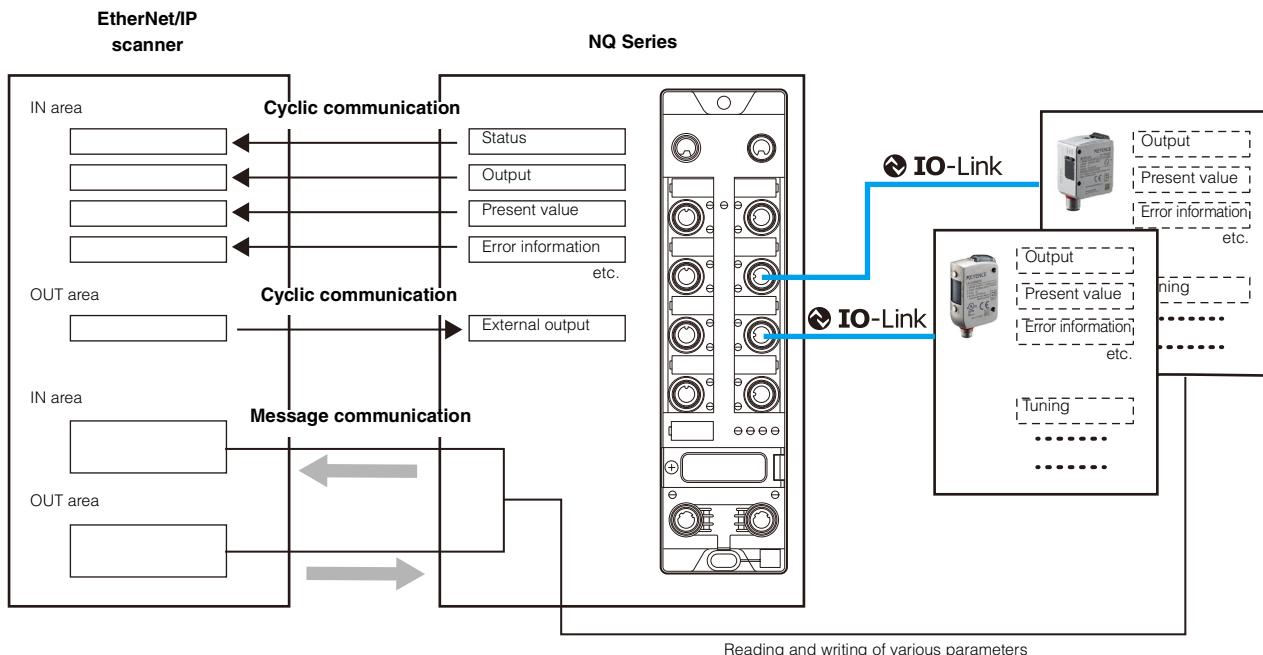
> **Point**
>
> **When starting communication in EtherNet/IP, open a communication circuit known as a connection. The device that opens the connection is referred to as the scanner, and the device to which the connection is opened is referred to as the adapter. With cyclic communication, you can send and receive data without using a program by setting the connection to exchange data between the EtherNet/IP scanner and the NQ Series unit. The data communication cycle (RPI) can be set for each connection.**
>
> **If a large number of devices are connected to a network, delay or packet loss may occur if a large load is applied to the network. Perform thorough verification before operation.**

■Cyclic communication

Cyclic communication is a function for sending and receiving data between the EtherNet/IP scanner and the NQ Series unit at the set RPI (communication cycle). Data such as the output status, present value, and error status of sensors connected to the NQ Series can be communicated without a ladder program. In cyclic communication, the RPI (communication cycle) can be set according to the priority of the data to be sent and received, and data can be transmitted with the overall communication load adjusted.
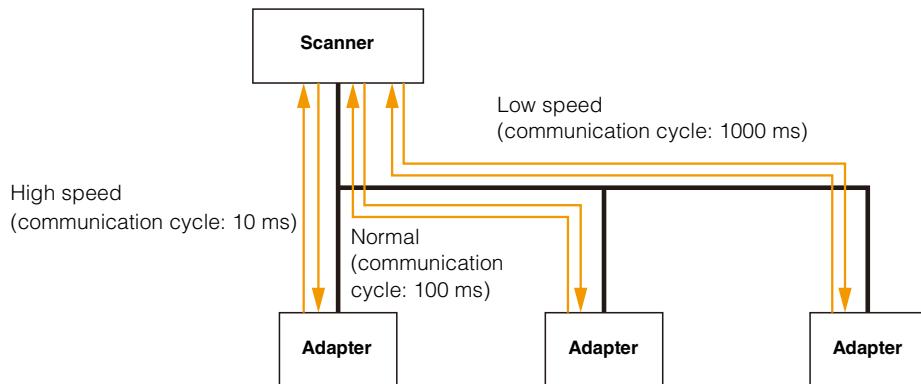
■Message communication

This can be used for communication applications that do not require fixed-time control like that of cyclic communication. The operations that can be performed include the reading and writing various parameters that contain all the data that can be exchanged via cyclic communication as well as tuning sensors.
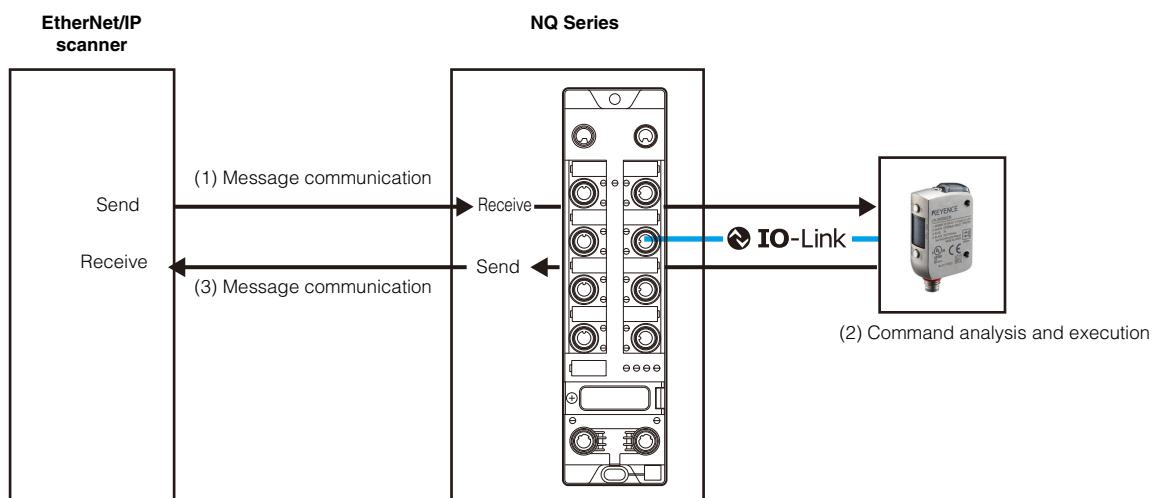
NQ Series EtherNet/IP Communication Specifications

Item		NQ-MP8L/EP4L/EP4A
Ethernet	Communication speed	10 Mbps (10BASE-T) 100 Mbps (100BASE-TX)
	Transmission media	STP cable or Category 3 or higher UTP cable (10BASE-T) STP cable or Category 5 or higher UTP cable (100BASE-TX)
	Maximum cable length	100 m (between nodes)
Basic specifications	Vendor name	Keyence Corporation
	Vendor ID	367
	Device type	12 (Communication Adapter)
EtherNet/IP	Supported functions	Cyclic communication (implicit messaging), message communication (explicit messaging)
	Number of connections	Max. 2
	RPI (communication cycle)	2 to 10000 ms
	Address setting	Fixed IP, BOOTP, DHCP
	Device Level Ring (DLR)	Supported

What Can Be Performed with EtherNet/IP Communication

Item	NQ Sensor Monitor	EtherNet/IP configuration software	Cyclic communication			Message communication		
			NQ-MP8L	NQ-EP4L	NQ-EP4A	NQ-MP8L	NQ-EP4L	NQ-EP4A
Set the NQ Series port.	●	●	-	-	-	●	●	●
Control the power supplied to each port.	●	●	●	●	-	●	●	-
Read the NQ Series error status.	-	-	●	●	●	●	●	●
When connected to an IO-Link device								
Read control output (ON/OFF).	●	-	●	●	-	●	●	-
Read the present value (measured value, etc.).	●	-	●	●	-	●	●	-
Read setting values.	●	-	-	-	-	●	●	-
Change (write) setting values.	●	-	-	-	-	●	●	-
Change (write) parameters.	●	-	-	-	-	●	●	-
Perform functions such as external input.	●	-	*1	*1	-	●	●	-
Read the error status.	●	-	●	●	-	●	●	-
When a general-purpose I/O device is connected								
Read digital input (ON/OFF).	-	-	●	●	-	●	●	-
Perform digital output (ON/OFF).	-	-	●	●	-	-	-	-
Read the present value (measured value, etc.).	-	-	-	-	-	-	-	-
Read the error status.	-	-	-	-	-	-	-	-
When an analog output device / thermocouple / resistance temperature detector is connected								
Change the scaling.	●	-	-	-	-	-	-	●
Read the analog input value.	●	-	-	-	●	-	-	●
Read the error status.	-	-	-	-	●	-	-	●

*1   Only for devices that have input process data.

> **Point**   **For the NQ-MP8L and NQ-EP4L, set the functions of pin 2 and pin 4 for each port. Changing the function of the pins makes it possible to switch between IO-Link communication and digital I/O. For details, refer to "Port Operation Modes" (Page2-6).**

6   EtherNet/IP Communication

6-2 Communication Settings

NQ Series Settings

There are two ways to configure the settings.

■ Using NQ Sensor Monitor

> ✎ **Point**
> When using an "IOL 32IN/32OUT with Cfg." or "Analog Input with Cfg." connection, use the network configuration software to set the port. The port set with NQ Sensor Monitor will be overwritten with the settings of the network configuration software.
> 📖 **"List of connections" (Page6-11)**

1 IP address setting

Set the NQ Series IP address.
📖 "4-4 Setting the IP Address" (Page4-6)

2 Port setting

Set the NQ Series port.
📖 "4-5 NQ Series Registration" (Page4-8)
📖 "4-6 Port Settings" (Page4-11)

3 Device process data setting

For the NQ-MP8L/EP4L, set the process data and parameters of the IO-Link device to connect to the NQ Series.
📖 "4-7 Device Settings" (Page4-22)

■ Using the Network Configuration Software

For details, refer to the manual of the network configuration software.

1 IP address setting

Set the NQ Series IP address.

2 Port setting

Set the NQ Series port.
📖 "6-3 Parameter Settings" (Page6-6)

3 Device process data setting

For the NQ-MP8L/EP4L, set the process data and parameters of the IO-Link device to connect to the NQ Series.
📖 "4-7 Device Settings" (Page4-22)

PLC and Controller Settings

To connect the NQ Series to an EtherNet/IP scanner, you have to configure the settings that are listed below. For details on how to configure settings on the scanner, refer to the manual of the scanner.

1 IP address setting

Set the scanner IP address.

2 NQ Series device profile registration

Use the scanner setup software to register the device profile of the NQ Series unit to establish a connection.
Device profiles can be registered manually and by reading an EDS (Electronic Data Sheet) file. The EDS file for the NQ Series can be downloaded from the KEYENCE website (www.keyence.com/global.jsp).

> **Reference**
> The latest version of KV STUDIO, ladder support software for KEYENCE PLCs (EtherNet/IP scanners), includes NQ Series EDS files. Depending on the KV STUDIO version, a dedicated file (EZ1 file) may be required. EZ1 files can also be downloaded from the KEYENCE website.

3 NQ Series communication settings

Configure the settings for cyclic communication and message communication.

● Cyclic communication (implicit messaging)

Set the connection to communicate data between the EtherNet/IP scanner and the NQ Series.
📖 "6-4 Cyclic Communication" (Page6-11)

● Message communication (explicit messaging)

Create the program for communication.
📖 "6-5 Message Communication" (Page6-19)

6

EtherNet/IP Communication

6-3 Parameter Settings

Use the network configuration software to set the parameters.

NQ-MP8L/EP4L

✎ Point The setting of parameters with the network configuration software is only supported for "IOL 32IN/32OUT with Cfg." connections. 📖 "List of connections" (Page6-11)

No.		Item	Attribute	port	Description
NQ-MP8L	NQ-EP4L				
100	100	Basic 1 - Manual reset after overcrnt.	R/W	1	< When pin 2 is set to digital output > Indicates the recovery method after an overcurrent is detected.
101	101	Basic 3 - Manual reset after overcrnt.	R/W	2	
102	102	Basic 5 - Manual reset after overcrnt.	R/W	3	(Same as Port 1)
103	103	Basic 7 - Manual reset after overcrnt.	R/W	4	
104	104	Basic 1 - Activate output	R/W	1	Indicates the function of pin 2.
105	105	Basic 3 - Activate output	R/W	2	
106	106	Basic 5 - Activate output	R/W	3	(Same as Port 1)
107	107	Basic 7 - Activate output	R/W	4	
148	128	IOL port 1 - Operation mode	R/W		Indicates the function of pin 4. 📖"Operation mode and validation settings" (Page4-13)
149	129	IOL port 1 - Data storage mode	R/W		Indicates the data storage mode. 📖"Data storage function" (Page4-14)
151	131	IOL port 1 - Cycle time	R/W		Indicates the cycle time for the process data. 📖"Cycle time" (Page4-17)
152	132	IOL port 1 - Revision	R/W		Indicates which IO-Link revision will be used for the operation.
153	133	IOL port 1 - Activate Quick Start-Up	R/W		Indicates whether to use the Quick Start-Up function. 📖"Quick Start-Up" (Page4-17)
154	134	Reserved	R/W	1	
155	135	IOL port 1 - Process input data invalid	R/W		Indicates whether to deactivate diagnostic information when the process data status is "Invalid."
156	136	IOL port 1 - Deactivate diagnostics	R/W		Indicates whether to transfer IO-Link events from the NQ to the field bus. 📖"Diagnostic information notification level" (Page4-17)
157	137	IOL port 1 - Input data mapping	R/W		Indicates whether to change the byte order of the process data. 📖"Process data setting" (Page4-16)
158	138	IOL port 1 - Output data mapping	R/W		
159	139	IOL port 1 - Vendor ID	R/W		Indicates [Vendor ID] and [Device ID] used for the validation function.
160	140	IOL port 1 - Device ID	R/W		
208	188	IOL port 2 - Operation mode	R/W		
209	189	IOL port 2 - Data storage mode	R/W		
211	191	IOL port 2 - Cycle time	R/W		
212	192	IOL port 2 - Revision	R/W		
213	193	IOL port 2 - Activate Quick Start-Up	R/W		
214	194	Reserved	R/W	2	
215	195	IOL port 2 - Process input data invalid	R/W		
216	196	IOL port 2 - Deactivate diagnostics	R/W		
217	197	IOL port 2 - Input data mapping	R/W		
218	198	IOL port 2 - Output data mapping	R/W		(Same as Port 1)
219	199	IOL port 2 - Vendor ID	R/W		
220	200	IOL port 2 - Device ID	R/W		
268	248	IOL port 3 - Operation mode	R/W		
269	249	IOL port 3 - Data storage mode	R/W		
271	251	IOL port 3 - Cycle time	R/W		
272	252	IOL port 3 - Revision	R/W	3	
273	253	IOL port 3 - Activate Quick Start-Up	R/W		
274	254	Reserved	R/W		
275	255	IOL port 3 - Process input data invalid	R/W		

No.		Item	Attribute	port	Description
NQ-MP8L	NQ-EP4L				
276	256	IOL port 3 - Deactivate diagnostics	R/W	3	
277	257	IOL port 3 - Input data mapping	R/W		
278	258	IOL port 3 - Output data mapping	R/W		
279	259	IOL port 3 - Vendor ID	R/W		
280	260	IOL port 3 - Device ID	R/W		
328	308	IOL port 4 - Operation mode	R/W	4	
329	309	IOL port 4 - Data storage mode	R/W		
331	311	IOL port 4 - Cycle time	R/W		
332	312	IOL port 4 - Revision	R/W		
333	313	IOL port 4 - Activate Quick Start-Up	R/W		
334	314	Reserved	R/W		
335	315	IOL port 4 - Process input data invalid	R/W		
336	316	IOL port 4 - Deactivate diagnostics	R/W		
337	317	IOL port 4 - Input data mapping	R/W		
338	318	IOL port 4 - Output data mapping	R/W		
339	319	IOL port 4 - Vendor ID	R/W		
340	320	IOL port 4 - Device ID	R/W		
388		IOL port 5 (Class B) - Operation mode	R/W	5	
389		IOL port 5 (Class B) - Data storage mode	R/W		
391		IOL port 5 (Class B) - Cycle time	R/W		
392		IOL port 5 (Class B) - Revision	R/W		
393		IOL port 5 (Class B) - Activate Quick Start-Up	R/W		
394		Reserved	R/W		
395		IOL port 5 (Class B) - Process input data invalid	R/W		
396		IOL port 5 (Class B) - Deactivate diagnostics	R/W		
397		IOL port 5 (Class B) - Input data mapping	R/W		
398		IOL port 5 (Class B) - Output data mapping	R/W		
399		IOL port 5 (Class B) - Vendor ID	R/W		
400		IOL port 5 (Class B) - Device ID	R/W		
448		IOL port 6 (Class B) - Operation mode	R/W	6	(Same as Port 1)
449		IOL port 6 (Class B) - Data storage mode	R/W		
451		IOL port 6 (Class B) - Cycle time	R/W		
452		IOL port 6 (Class B) - Revision	R/W		
453		IOL port 6 (Class B) - Activate Quick Start-Up	R/W		
454		Reserved	R/W		
455		IOL port 6 (Class B) - Process input data invalid	R/W		
456		IOL port 6 (Class B) - Deactivate diagnostics	R/W		
457		IOL port 6 (Class B) - Input data mapping	R/W		
458		IOL port 6 (Class B) - Output data mapping	R/W		
459		IOL port 6 (Class B) - Vendor ID	R/W		
460		IOL port 6 (Class B) - Device ID	R/W		
508		IOL port 7 (Class B) - Operation mode	R/W	7	
509		IOL port 7 (Class B) - Data storage mode	R/W		
511		IOL port 7 (Class B) - Cycle time	R/W		
512		IOL port 7 (Class B) - Revision	R/W		
513		IOL port 7 (Class B) - Activate Quick Start-Up	R/W		
514		Reserved	R/W		
515		IOL port 7 (Class B) - Process input data invalid	R/W		
516		IOL port 7 (Class B) - Deactivate diagnostics	R/W		
517		IOL port 7 (Class B) - Input data mapping	R/W		
518		IOL port 7 (Class B) - Output data mapping	R/W		
519		IOL port 7 (Class B) - Vendor ID	R/W		
520		IOL port 7 (Class B) - Device ID	R/W		
568		IOL port 8 (Class B) - Operation mode	R/W	8	
569		IOL port 8 (Class B) - Data storage mode	R/W		
571		IOL port 8 (Class B) - Cycle time	R/W		
572		IOL port 8 (Class B) - Revision	R/W		
573		IOL port 8 (Class B) - Activate Quick Start-Up	R/W		
574		Reserved	R/W		
575		IOL port 8 (Class B) - Process input data invalid	R/W		

6

EtherNet/IP Communication

| No. | | Item | Attribute | port | Description | |
NQ-MP8L	NQ-EP4L				
576		IOL port 8 (Class B) - Deactivate diagnostics	R/W	8	(Same as Port 1)
577		IOL port 8 (Class B) - Input data mapping	R/W		
578		IOL port 8 (Class B) - Output data mapping	R/W		
579		IOL port 8 (Class B) - Vendor ID	R/W		
580		IOL port 8 (Class B) - Device ID	R/W		
708		V1 control - V1 Pin1 C0 (Ch0/1)	R/W	1	Controls the V1 power supplied to each device.
709		V1 control - V1 Pin1 C1 (Ch2/3)	R/W	2	
710		V1 control - V1 Pin1 C2 (Ch4/5)	R/W	3	
711		V1 control - V1 Pin1 C3 (Ch6/7)	R/W	4	
712		V1 control - V1 Pin1 C4 (Ch8)	R/W	5	
713		V2 control - V2 Pin2 C4 (Ch9)	R/W	5	Controls the V2 power supplied to each device.
714		V1 control - V1 Pin1 C5 (Ch10)	R/W	6	Controls the V1 power supplied to each device.
715		V2 control - V2 Pin2 C5 (Ch11)	R/W	6	Controls the V2 power supplied to each device.
716		V1 control - V1 Pin1 C6 (Ch12)	R/W	7	Controls the V1 power supplied to each device.
717		V2 control - V2 Pin2 C6 (Ch13)	R/W	7	Controls the V2 power supplied to each device.
718		V1 control - V1 Pin1 C7 (Ch14)	R/W	8	Controls the V1 power supplied to each device.
719		V2 control - V2 Pin2 C7 (Ch15)	R/W	8	Controls the V2 power supplied to each device.

6

EtherNet/IP Communication

NQ-EP4A

✎ **Point** The setting of parameters with the network configuration software is only supported for "Analog values with Cfg." connections. 📖 "List of connections" (Page6-16)

No.	Item	Attribute	Port	Description
100	Port 1 - Operation mode	R/W		Indicates the device to be connected to the port.
101	Port 1 - Thermocouple type	R/W		< Thermocouple > Indicates the input range.
102	Port 1 - Thermocouple cold junc. config.	R/W		< Thermocouple > Indicates the method of cold junction compensation when a thermocouple is used.
103	Port 1 - Voltage range	R/W		< Voltage input > Indicates the input range.
104	Port 1 - Voltage wiring type	R/W		< Voltage input > Indicates the type of wiring.
105	Port 1 - Current range	R/W		< Current input > Indicates the input range.
106	Port 1 - Current wiring type	R/W		< Current input > Indicates the type of wiring.
107	Reserved		1	
108	Reserved			
109	Port 1 - RTD type	R/W		< Resistance temperature detector > Indicates the input range.
110	Port 1 - RTD wiring type	R/W		< Resistance temperature detector > Indicates the type of wiring.
111	Port 1 - Data representation	R/W		-
112	Port 1 - Temperature unit	R/W		Indicates the unit of temperature.
113	Port 1 - Input averaging filter	R/W		Sets the analog input filter.
114	Port 1 - Deactivate port	R/W		Deactivates a port. When a port is deactivated, the analog input status LED indicator is unlit even when no device is connected to the port.
115	Port 1 - Deactivate diagnostics	R/W		Indicates whether to activate or deactivate the diagnostic information.
116	Port 1 - Mains suppression	R/W		Sets the power supply noise filter.
126	Port 2 - Operation mode	R/W		
127	Port 2 - Thermocouple type	R/W		
128	Port 2 - Thermocouple cold junc. config.	R/W		
129	Port 2 - Voltage range	R/W		
130	Port 2 - Voltage wiring type	R/W		
131	Port 2 - Current range	R/W		
132	Port 2 - Current wiring type	R/W		
133	Reserved			
134	Reserved		2	
135	Port 2 - RTD type	R/W		
136	Port 2 - RTD wiring type	R/W		
137	Port 2 - Data representation	R/W		
138	Reserved			
139	Port 2 - Input averaging filter	R/W		(Same as Port 1)
140	Port 2 - Deactivate port	R/W		
141	Port 2 - Deactivate diagnostics	R/W		
142	Port 2 - Mains suppression	R/W		
152	Port 3 - Operation mode	R/W		
153	Port 3 - Thermocouple type	R/W		
154	Port 3 - Thermocouple cold junc. config.	R/W		
155	Port 3 - Voltage range	R/W		
156	Port 3 - Voltage wiring type	R/W		
157	Port 3 - Current range	R/W	3	
158	Port 3 - Current wiring type	R/W		
159	Reserved			
160	Reserved			
161	Port 3 - RTD type	R/W		

6

EtherNet/IP Communication

No.	Item	Attribute	Port	Description
162	Port 3 - RTD wiring type	R/W	3	
163	Port 3 - Data representation	R/W		
164	Reserved			
165	Port 3 - Input averaging filter	R/W		
166	Port 3 - Deactivate port	R/W		
167	Port 3 - Deactivate diagnostics	R/W		
168	Port 3 - Mains suppression	R/W		
178	Port 4 - Operation mode	R/W	4	(Same as Port 1)
179	Port 4 - Thermocouple type	R/W		
180	Port 4 - Thermocouple cold junc. config.	R/W		
181	Port 4 - Voltage range	R/W		
182	Port 4 - Voltage wiring type	R/W		
183	Port 4 - Current range	R/W		
184	Port 4 - Current wiring type	R/W		
185	Reserved			
186	Reserved			
187	Port 4 - RTD type	R/W		
188	Port 4 - RTD wiring type	R/W		
189	Port 4 - Data representation	R/W		
190	Reserved			
191	Port 4 - Input averaging filter	R/W		
192	Port 4 - Deactivate port	R/W		
193	Port 4 - Deactivate diagnostics	R/W		
194	Port 4 - Mains suppression	R/W		
204	Scaling Port 1 - Scaling function enable	R/W	1	Indicates whether to use the scaling function. 📖"Scaling" (Page4-21)
205	Scaling Port 1 - Before scaling A/D value 1	R/W		Indicates the A/D conversion data before scaling conversion. 📖"Scaling" (Page4-21)
206	Scaling Port 1 - Before scaling A/D value 2	R/W		
207	Scaling Port 1 - After scaling setting value 1	R/W		Indicates the data after scaling. 📖"Scaling" (Page4-21)
208	Scaling Port 1 - After scaling setting value 2	R/W		
210	Scaling Port 2 - Scaling function enable	R/W	2	(Same as Port 1)
211	Scaling Port 2 - Before scaling A/D value 1	R/W		
212	Scaling Port 2 - Before scaling A/D value 2	R/W		
213	Scaling Port 2 - After scaling setting value 1	R/W		
214	Scaling Port 2 - After scaling setting value 2	R/W		
216	Scaling Port 3 - Scaling function enable	R/W	3	
217	Scaling Port 3 - Before scaling A/D value 1	R/W		
218	Scaling Port 3 - Before scaling A/D value 2	R/W		
219	Scaling Port 3 - After scaling setting value 1	R/W		
220	Scaling Port 3 - After scaling setting value 2	R/W		
222	Scaling Port 4 - Scaling function enable	R/W	4	
223	Scaling Port 4 - Before scaling A/D value 1	R/W		
224	Scaling Port 4 - Before scaling A/D value 2	R/W		
225	Scaling Port 4 - After scaling setting value 1	R/W		
226	Scaling Port 4 - After scaling setting value 2	R/W		

6

EtherNet/IP Communication

6-4 Cyclic Communication

NQ-MP8L/EP4L

■ List of connections

Connection name	IO-Link process data size (bytes)		Input/output	Assembly instance		Size (words)		Application type
	Input	Output		HEX	DEC	NQ-MP8L	NQ-EP4L	
IOL 4IN/4OUT	4	4	Input (this unit → scanner)	78H	120	61	48	Exclusive Owner
			Output (scanner → this unit)	96H	150	19	10	
			Configuration	1H	1	0	0	
IOL 4IN Input Only	4	0	Input (this unit → scanner)	78H	120	61	48	Input Only
			Output (scanner → this unit)	FEH	254	0	0	
			Configuration	1H	1	0	0	
IOL 6IN/6OUT	6	6	Input (this unit → scanner)	7AH	122	69	52	Exclusive Owner
			Output (scanner → this unit)	97H	151	27	14	
			Configuration	1H	1	0	0	
IOL 6IN Input Only	6	0	Input (this unit → scanner)	7AH	122	69	52	Input Only
			Output (scanner → this unit)	FEH	254	0	0	
			Configuration	1H	1	0	0	
IOL 8IN/8OUT	8	8	Input (this unit → scanner)	7CH	124	77	56	Exclusive Owner
			Output (scanner → this unit)	98H	152	35	18	
			Configuration	1H	1	0	0	
IOL 8IN Input Only	8	0	Input (this unit → scanner)	7CH	124	77	56	Input Only
			Output (scanner → this unit)	FEH	254	0	0	
			Configuration	1H	1	0	0	
IOL 32IN/32OUT	32	32	Input (this unit → scanner)	67H	103	173	104	Exclusive Owner
			Output (scanner → this unit)	68H	104	131	66	
			Configuration	1H	1	0	0	
IOL 32IN Input Only	32	0	Input (this unit → scanner)	67H	103	173	104	Input Only
			Output (scanner → this unit)	FEH	254	0	0	
			Configuration	1H	1	0	0	
IOL 32IN/32OUT with Cfg[*1]	32	32	Input (this unit → scanner)	67H	103	173	104	Exclusive Owner
			Output (scanner → this unit)	68H	104	131	66	
			Configuration	6AH	106	79	41	

*1   You can use the EtherNet/IP configuration software to set the NQ Series parameters.

> **Reference**
>
> - The trigger timing of each connection is performed in a cyclic manner. The connection type supports both point-to-point and multicast.
> - The details of each application type are shown below.
>   - Exclusive Owner: This connection enables you to configure the data transmission from the scanner to the NQ and the data transmission from the NQ to the scanner at the same time. Specify this application type when the scanner not only reads NQ data but also performs output such as applying external input to the NQ. However, multiple "Exclusive Owner" connections cannot be established for a single NQ unit.
>   - Input Only: This connection enables you to only transmit data from the NQ to the scanner. Specify this application type when the scanner only reads NQ data. Multiple scanners can establish "Input Only" connections simultaneously for a single NQ unit.

6 EtherNet/IP Communication

■ Input data

NQ-MP8L 103	NQ-MP8L 120	NQ-MP8L 122	NQ-MP8L 124	NQ-EP4L 103	NQ-EP4L 120	NQ-EP4L 122	NQ-EP4L 124	Item	Attribute	Data type	bit	Description		Value
0	0	0	0	0	0	0	0	Module status	R	WORD	0	Diagnostic information	-	0: Diagnostic information not provided 1: Diagnostic information provided
											1	-	-	0
											2	-	-	0
											3	-	-	0
											4	-	-	0
											5	-	-	0
											6	-	-	0
											7	V2 voltage	Indicates the voltage value of the V2 power supply.	0: 18 VDC or higher 1: Lower than 18 VDC
											8	-	-	0
											9	V1 voltage	Indicates the voltage value of the V1 power supply.	0: 18 VDC or higher 1: Lower than 18 VDC
											10	-	-	0
											11	-	-	0
											12	-	-	0
											13	-	-	0
											14	-	-	0
											15	-	-	0
1	1	1	1	1	1	1	1	Port inputs	R	WORD	0 : 15	Indicates the input status of each port. Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port 8 7 6 5 4 3 2 1 / Pin - 4 - 4 - 4 - 4 2 4 2 4 2 4 2 4		0: OFF 1: ON
2	2	2	2	2	2	2	2	Process data status of the IO-Link device	R	WORD	0 : 15	Turns ON when the process data is valid. The process data is invalid in the following cases: • The sensor supply voltage is outside of the allowable range. • The operation mode of the port is set to [Digital input]. • No IO-Link device is connected. • No process data has been input from the connected device. • The device does not respond to the output process data. • The device outputs "process input data invalid." (For example, the value measured by the sensor is out of the operating range.) Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port - 8 - 7 - 6 - 5 - 4 - 3 - 2 - 1		0: Invalid/Deactivated 1: Valid/Active
3 : 18	3 : 4	3 : 5	3 : 6	3 : 18	3 : 4	3 : 5	3 : 6	IO-Link device process input data	R	-		Port 1 (C0)	Process data of each device. For details of the data, refer to the manual for the IO-Link device. Note that IO-Link devices and the NQ Series process data in big endian format. When using a PLC that processes data in little endian format (such as KEYENCE PLCs), change the byte order by using either of the following methods: • Using the NQ Series settings (Page 4-16) • Using a PLC program		-
19 : 34	5 : 6	6 : 8	7 : 10	19 : 34	5 : 6	6 : 8	7 : 10					Port 2 (C1)			
35 : 50	7 : 8	9 : 11	11 : 14	35 : 50	7 : 8	9 : 11	11 : 14					Port 3 (C2)			
51 : 66	9 : 10	12 : 14	15 : 18	51 : 66	9 : 10	12 : 14	15 : 18					Port 4 (C3)			
67 : 82	11 : 12	15 : 17	19 : 22	-	-	-	-					Port 5 (C4)			
83 : 98	13 : 14	18 : 20	23 : 26	-	-	-	-					Port 6 (C5)			
99 : 114	15 : 16	21 : 23	27 : 30	-	-	-	-					Port 7 (C6)			
115 : 130	17 : 18	24 : 26	31 : 34	-	-	-	-					Port 8 (C7)			
131	19	27	35	-	-	-	-	Diagnostic information[*1]	Power supply overcurrent	R	WORD	0 : 15	Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port 8 7 6 5 - - - - 8 7 6 5 4 3 2 1 / V2 V1		0: No overcurrent 1: Overcurrent detected

Offset (words)								Item	Attribute	Data type	bit	Description	Value
NQ-MP8L				NQ-EP4L									
103	120	122	124	103	120	122	124						
132	20	28	36	67	11	15	19	Digital output overcurrent	R	WORD	0 : 15	Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port 4 3 2 1 / Pin 2 - 2 - 2 - 2 -	0: No overcurrent 1: Overcurrent detected
133	21	29	37	68	12	16	20	Diagnostic information[1] / Port 1 (C0)	R	WORD	0	-	0
											1	-	
											2	Device undetected/ mismatched	• No device is connected. • The result of the device validation function was "mismatched."
											3	Data storage error	• An IO-Link V1.0 device is connected. • The connected device is not the one stored in the buffer. • Buffer overflow occurred. • The parameter lock function of the IO-Link device is active.
											4	Hardware error	There is a failure or a malfunction in the hardware.
											5	Process data invalid	• The device cannot perform measurements. • The result of the device validation function was "mismatched."
											6	Undefined event	An event that is not defined in the IO-Link specifications occurred.
											7	Maintenance event	An event that requires maintenance in the IO-Link specifications occurred.
											8	Parameter error	The device issued a parameter error. (Such as a loss of parameters or uninitialized status)
											9	Temperature error	The device issued temperature diagnostic information.
											10	Measured value lower limit exceeded	The measured value is below the device's measurement range or the set lower limit.
											11	Measured value upper limit exceeded	The measured value exceeds the device's measurement range or the set upper limit.
											12	Insufficient power voltage	The power voltage of the device is below the specified value.
											13	Power supply overvoltage	The power voltage of the device exceeds the specified value.
											14	Overload	The device has detected an overload.
											15	General error	The device has an error. (Device status 4 specified in the IO-Link specifications) For details about the error, check the event code.
134	22	30	38	69	13	17	21	Port 2 (C1)	R	WORD		Same as Port 1 (C0)	-
135	23	31	39	70	14	18	22	Port 3 (C2)					
136	24	32	40	71	15	19	23	Port 4 (C3)					
137	25	33	41	-	-	-	-	Port 5 (C4)					
138	26	34	42	-	-	-	-	Port 6 (C5)					
139	27	35	43	-	-	-	-	Port 7 (C6)					
140	28	36	44	-	-	-	-	Port 8 (C7)					

Also bit values: 2–7 value is "0: No error / 1: Error"; bits 8–15 value is "0: No error / 1: Error".

6 EtherNet/IP Communication

6

EtherNet/IP Communication

Offset (words)								Item		Attribute	Data type	bit	Description			Value
NQ-MP8L				NQ-EP4L												
103	120	122	124	103	120	122	124									
141	29	37	45	72	16	20	24	Diagnostic information (IO-Link event)	1st event	R	WORD	0	Event classification code (For details, refer to the IO-Link specifications.)	Instance	0: Unknown 1 to 3: Reserved 4: Application 5 to 7: Reserved
												1			
												2			
												3		Source	0: Device 1: Master
												4		Type	0: Reserved 1: Notification 2: Warning 3: Error
												5			
												6		Mode	0: Reserved 1: Event single shot 2: Event disappears 3: Event appears
												7			
												8	Port number of the event	Port number of the port where the event has occurred.	1 to 8 or 1 to 4
												9			
												10			
												11			
												12			
												13			
												14			
												15			
142	30	38	46	73	17	21	25			R	UINT		Event code		Event code for the event. For details, refer to the manual of the IO-Link device.	-
:	:	:	:	:	:	:	:		:	:	:		:		:	:
171	59	67	75	102	46	50	54		16th event	R	WORD		Event classification code		Same as the 1st event	-
													Port number of the event			
172	60	68	76	103	47	51	55			R	UINT		Event code			

*1   The conditions for the generation of diagnostic information and the presence or absence of items depend on the IO-Link device.

■Output data

Offset (words)								Item	Attribute	Data type	bit	Description	Value
NQ-MP8L				NQ-EP4L									
104	150	151	152	104	150	151	152						
0	0	0	0	0	0	0	0	Module status					
1	1	1	1	1	1	1	1	Port outputs	R/W	WORD	0 : 15	Indicates the output to each port.	0: OFF 1: ON
2	2	2	2	2	2	2	2	IO-Link device process output data	R/W	-		Process data of each device. For details of the data, refer to the manual for the IO-Link device. Note that IO-Link devices and the NQ Series process data in big endian format. When using a PLC that processes data in little endian format (such as KEYENCE PLCs), change the byte order by using either of the following methods: • Using the NQ Series settings (Page 4-16) • Using a PLC program	-
:	:	:	:	:	:	:	:	Port 1 (C0)					
17	3	4	5	17	3	4	5						
18	4	5	6	18	4	5	6	Port 2 (C1)					
:	:	:	:	:	:	:	:						
33	5	7	9	33	5	7	9						
34	6	8	10	34	6	8	10	Port 3 (C2)					
:	:	:	:	:	:	:	:						
49	7	10	13	49	7	10	13						
50	8	11	14	50	8	11	14	Port 4 (C3)					
:	:	:	:	:	:	:	:						
65	9	13	17	65	9	13	17						
66	10	14	18	-	-	-	-	Port 5 (C4)					
:	:	:	:	-	-	-	-						
81	11	16	21	-	-	-	-						
82	12	17	22	-	-	-	-	Port 6 (C5)					
:	:	:	:	-	-	-	-						
97	13	19	25	-	-	-	-						
98	14	20	26	-	-	-	-	Port 7 (C6)					
:	:	:	:	-	-	-	-						
113	15	22	29	-	-	-	-						
114	16	23	30	-	-	-	-	Port 8 (C7)					
:	:	:	:	-	-	-	-						
129	17	25	33	-	-	-	-						
130	18	26	34	-	-	-	-	Port power supply control	R/W	WORD	0 : 15	Controls the power supplied to each port.	0: OFF 1: ON

6 EtherNet/IP Communication

NQ-EP4A

■ List of connections

Connection name	Input/output	Assembly instance		Size (words)	Application type
		HEX	DEC		
Analog values Input Only	Input (this unit → scanner)	67H	103	12	Input Only
	Output (scanner → this unit)	FEH	254	0	
	Configuration	1H	1	0	
Analog values with Cfg.[1]	Input (this unit → scanner)	67H	103	12	Exclusive Owner
	Output (scanner → this unit)	68H	104	1	
	Configuration	6AH	106	61	

*1   You can use the EtherNet/IP configuration software to set the NQ Series parameters.

> Reference
> • The trigger timing of each connection is performed in a cyclic manner. The connection type supports both point-to-point and multicast.
> • The details of each application type are shown below.
>   • Exclusive Owner: This connection enables you to configure the data transmission from the scanner to the NQ and the data transmission from the NQ to the scanner at the same time. Specify this application type when the scanner not only reads NQ data but also performs output such as applying external input to the NQ. However, multiple "Exclusive Owner" connections cannot be established for a single NQ unit.
>   • Input Only: This connection enables you to only transmit data from the NQ to the scanner. Specify this application type when the scanner only reads NQ data. Multiple scanners can establish "Input Only" connections simultaneously for a single NQ unit.

■ Input data

Offset (words)	Item		Attribute	Data type	bit	Description		Value
0	Module status		R	WORD	0	Diagnostic information	-	0: Diagnostic information not provided 1: Diagnostic information provided
					1	-	-	0
					2	-	-	0
					3	-	-	0
					4	-	-	0
					5	-	-	0
					6	-	-	0
					7	-	-	0
					8	-	-	0
					9	V1 voltage	Indicates the voltage value of the V1 power supply.	0: 18 VDC or higher 1: Lower than 18 VDC
					10	-	-	
					11	-	-	0
					12	-	-	0
					13	-	-	0
					14	-	-	0
					15	-	-	
1	Analog input value	Port 1 (C0)	R	-		Analog input value	Indicates an analog input value. The input data varies depending on the settings of [Operation mode] and [Input range].	
2		Port 2 (C1)						
3		Port 3 (C2)						
4		Port 4 (C3)						

Offset (words)	Item		Attribute	Data type	bit		Description	Value
5	Diagnostic information	Port 1 (C0)	R	WORD	0	Cold junction compensation error	The measured temperature exceeded the measurement range by 1% or more or the setting is incorrect. In this case, the compensation is calculated by using the cold junction temperature of 25°C.	0: No error 1: Error
					1	Resistance temperature detector overcurrent	The resistance of the resistance temperature detector is lower than 5 Ω.	
					2	Upper limit exceeded	The measured value exceeds the specified upper limit. ☐"Analog input data format" (Page9-2)	
					3	V1 overcurrent	The current supplied to the analog device exceeds the specified value.	
					4	Disconnection	A wire disconnection (no signal) was detected. Note that in the voltage/ current mode, disconnection detection is effective only in the following measurement ranges. Voltage: 1 to 5 V or 2 to 10 V Current: 4 to 20 mA	
					5	Overflow	The measured value greatly exceeded the specified upper limit. Note that the overflow detection is disabled in thermocouple and resistance temperature detector modes. ☐"Analog input data format" (Page9-2)	
					6	Underflow	The measured value is greatly below the specified lower limit. Note that the underflow detection is disabled in the thermocouple and resistance temperature detector modes. ☐"Analog input data format" (Page9-2)	
					7	Lower limit exceeded	The measured value is below the specified lower limit. ☐"Analog input data format" (Page9-2)	
		Port 2 (C1)			8	Same as Port 1 (C0)	-	-
					9			
					10			
					11			
					12			
					13			
					14			
					15			
6		Port 3 (C2)	R	WORD		Same as Port 1 (C0)	-	-
		Port 4 (C3)				Same as Port 1 (C0)	-	-
7	Scaling value	Port 1 (C0)	R	-		Scaling value	Scaled values are entered when the scaling function is valid.	-
8		Port 2 (C1)						
9		Port 3 (C2)						
10		Port 4 (C3)						
11	Scaling function status		R	WORD	0	Port 1 (C0)	Turns ON when the scaling function is valid.	
					1	Port 2 (C1)		
					2	Port 3 (C2)		
					3	Port 4 (C3)		
					4	-		
					:	-		
					15	-		

6

EtherNet/IP Communication

6

■ Output data

There are two bytes (one word) of control words, but there is no valid assignment bit.

Message Communication

Data that can be read or written with message communication includes data of NQ Series-specific objects and data of standard objects specified by EtherNet/IP. The following operations can be performed with message communication using these objects.

NQ-MP8L	NQ-EP4L	NQ-EP4A	Communication item	Service type		Service code (HEX)	Class ID (HEX)	Instance ID (DEC)	Attribute ID	Transmission data	Transmission data size
✓	✓		Communication with IO-Link sensors	Reading	ISDU_Read	4B$_H$	85$_H$	1	Port number: 1 to 8	[image]	3 byte
				Writing	ISDU_Write	4C$_H$	85$_H$	1	Port number: 1 to 8	[image]	3 byte + writing data size
✓	✓		IO-Link port	Reading Writing	Get Attribute Single Set Attribute Single	0E$_H$ 10$_H$	304$_H$	Port number: 1 to 8		Page 6-23	
✓	✓		IO-Link event				305$_H$	1		Page 6-24	
✓	✓		Digital I/O setting/status				NQ-MP8L: 306$_H$ NQ-EP4L: 303$_H$	1		Page 6-24	
✓			Power supply control				307$_H$	1		Page 6-26	
		✓	Analog input				302$_H$	Port number: 1 to 4		Page 6-26	
✓	✓	✓	Gateway				300$_H$	2		Page 6-28	
✓	✓	✓	EtherNet/IP standard object data — Identify object	Reading	Get Attribute All Get Attribute Single	01$_H$ 0E$_H$ 10$_H$	1$_H$	1		Page 6-28	
✓	✓	✓	EtherNet/IP standard object data — Assembly object								
✓	✓	✓	EtherNet/IP standard object data — Connection Manager object	Refer to the CIP specifications.							
✓	✓	✓	EtherNet/IP standard object data — TCP/IP Interface object								
✓	✓	✓	EtherNet/IP standard object data — Ethernet Link object								

Reference
- If you are using a KEYENCE PLC (EtherNet/IP scanner), you can use dedicated instructions (SPRD/SPWR) to issue a message communication commands without worrying about the complicated EtherNet/IP communication specifications.
- Communication with IO-Link sensors (Class ID: 85H) is not supported with the dedicated instructions listed above.

6

EtherNet/IP Communication

Command Formats

The main command formats are shown below.

■ Command parameters

Item		Data	Description
Service code		XX_H	-
Class ID		XX_H	-
Instance ID		XX_H	-
Attribute ID		XX_H	-
Service data	Index	XXXX_H	-
	Sub-Index	XX_H	

■ Response parameters

< Normal >

Item	Data	Description
Service code	XX_H	A code corresponding to the service code is returned.
Fixed value	00_H	-
General status	00_H	-
Additional status	00_H	-
Response data*	AB_H	Data (byte 0)
	CD_H	Data (byte 1)
	:	
	XX_H	Data (byte x)

* The response data is an example.

< Error >

Item	Data	Description
Service code	XX_H	The code corresponding to the service code is returned.
Fixed value	00_H	-
General status	XX_H	The EtherNet/IP error code is stored here. 📖 "General status" (Page6-20)
Additional status	00_H	-
Response data	XXXX_H	IO-Link error code 📖 "IO-Link error codes" (Page6-20)

Error codes

■ General status

General status (HEX)	Description
00H	Normal completion
02H	The IO-Link port is processing another service.
05H	The specified class ID or instance ID is invalid.
08H	The specified service code is invalid.
09H	The specified attribute ID is invalid.
0CH	The device is in a state in which the requested command cannot be executed. (Example: Writing the port via EIP during PROFINET communication)
0EH	The specified attribute ID cannot be written to.
10H	The NQ Series unit is running.
13H	The service data size is less than the specified size.
14H	The specified attribute ID does not exist.
15H	The service data size has exceeded the specified size.
16H	The specified instance does not exist.
1EH	An error occurred during IO-Link service. The IO-Link error code, which was returned by the IO-Link master, is stored in the response data.
1FH	The service cannot be used with the specified attribute ID.
FEH	System error. Contact your nearest KEYENCE office.

■ IO-Link error codes

Error code	Name	Description
0000	No error	No error
7002	Port blocked	The specified port is occupied by another task.
8000	Timeout	Timeout. The IO-Link master or the device is busy.
8001	Wrong index	Index error. 32767 or 65535 has been specified.
8002	Wrong port address	The specified port number is invalid.
8003	Wrong port function	The specified port function is invalid.

Error type	Name	Description
1000	COM_ERR	Communication error (Example: The specified port is in digital input mode.)
1100	I_SERVICE_TIMEOUT	Communication timeout
5600	M_ISDU_CHECKSUM	It is not possible to access the device due to a checksum error.
5700	M_ISDU_ILLEGAL	The device cannot respond to requests from the IO-Link master.
8000	APP_DEV	Application error within the device
8011	IDX_NOTAVAIL	The specified index is invalid.
8012	SUBIDX_NOTAVAIL	The specified sub-index is invalid.
8020	SERV_NOTAVAIL	The service is temporarily invalid.
8021	SERV_NOTAVAIL_LOCCTRL	The service is temporarily invalid because the device is busy (example: teaching or setting operations are being performed on the device).
8022	SERV_NOTAVAIL_DEVCTRL	The service is temporarily invalid because the device is busy (example: teaching or setting operations are being performed on the PLC or DTM).
8023	IDX_NOT_WRITEABLE	Access invalid; the specified index is write-protected.
8030	PAR_VALOUTOFRNG	Parameter value out of range
8031	PAR_VALGTLIM	The parameter value exceeds the upper limit.
8032	PAR_VALLTLIM	The parameter value is lower than the lower limit.
8033	VAL_LENOVRRUN	The written data length and the data length defined by the parameters do not match.
8034	VAL_LENUNDRUN	
8035	FUNC_NOTAVAIL	The function cannot be used on the device.
8036	FUNC_UNAVAILTEMP	The function temporarily cannot be used on the device.
8040	PARA_SETINVALID	Invalid parameter (inconsistency with other parameters on device)
8041	PARA_SETINCONSIST	Parameter inconsistency
8082	APP_DEVNOTRDY	Application preparation not complete; device busy
8100	UNSPECIFIC	Vendor-specific error (Check the instruction manual of the IO-Link device.)
8101 to 8FFF	VENDOR_SPECIFIC	

6

EtherNet/IP Communication

NQ Series User's Manual

Communication with IO-Link Sensors (Class ID: 85H)

Read and write the data of IO-Link devices connected to the NQ Series.

■ Read (ISDU_Read)

< Request message >

Item		Data	Description
Service code		4BH	Specify the ISDU_Read service code.
Class ID		85H	Specify the class ID for communicating with the IO-Link sensor.
Instance ID		01H	(Fixed)
Attribute ID		01H to 08H	Specify the number of the port to which the device to communicate with is connected.
Service data	Index	XXXXH	Use two bytes to specify the index of the parameter to communicate with and one byte to specify the sub-index of this parameter. Refer to the manual of the IO-Link device.
	Sub-Index	XXH	

< Response (normal) >

Item	Data	Description
Service code	CBH	A code corresponding to the ISDU_Read service code is returned.
Fixed value	00H	-
General status	00H	
Additional status	00H	
Response data*	ABH	Data (byte 0)
	CDH	Data (byte 1)
	:	
	XXH	Data (byte x)

*The response data is an example.

< Response (error) >

Item	Data	Description
Service code	CBH	The code corresponding to the ISDU_Read service code is returned.
Fixed value	00H	-
General status	XXH	The EtherNet/IP error code is stored here. 📖"General status" (Page6-20)
Additional status	00H	
Response data	XXH	IO-Link error code 📖"IO-Link error codes" (Page6-20)
	XXH	Additional code

Example) Reading the response time of the Clamp-on Flow Sensor "FD-Q Series" connected to port 5 of the NQ-MP8L
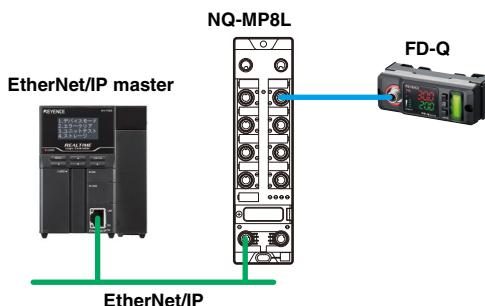
■ Excerpt from the list of FD-Q Series parameters

Index	Item	Data format	Data length	Attribute	Description
102 (66H)	Response time	UINT	1Byte	R/W	0: 0.5 s 1: 1 s 2: 2.5 s 3: 5 s 4: 10 s 5: 30 s 6: 60 s

■ Command parameters

Item		Data	Description
Service code		4BH	Specify the ISDU_Read service code.
Class ID		85H	Specify the class ID for communicating with the IO-Link sensor.
Instance ID		01H	(Fixed)
Attribute ID		05H	Specify the number of the port to which the device to communicate with is connected.
Service data	Index	0066H	Specify the index of the parameter to communicate with. Specify "00" for the sub-index because it is not used with this parameter.
	Sub-Index	00H	

> ✎ Point **The NQ Series handles two bytes or more of data in big-endian format. Therefore, for PLCs that use the little-endian format (such as KEYENCE PLCs), the above data is read as "6600H."**

■ Response parameters
< Normal >

Item	Data	Description
Service code	CBH	A code corresponding to the ISDU_Read service code is returned.
General status	00H	Normal completion
Additional status	00H	Normal completion
Response data	03H	The value of the read parameter

■ Writing (ISDU_Write)

< Request message >

Item		Data	Description
Service code		4C_H	Specify the ISDU_Write service code.
Class ID		85_H	Specify the class ID for communicating with the IO-Link sensor.
Instance ID		01_H	Specify the IO-Link master.
Attribute ID		01_H to 08_H	Specify the number of the port to which the device to communicate with is connected.
Service data	Index	XXXX_H	Specify the index and sub-index of the parameter to communicate with. Refer to the manual of the IO-Link device.
	Sub-Index	XX_H	
	Data to write *	AB_H	Data (byte 0)
		CD_H	Data (byte 1)
		:	
		XX_H	Data (byte x)

* The data to write is an example.

< Response (normal) >

Item	Data	Description
Service code	CC_H	A code corresponding to the ISDU_Write service code is returned.
Fixed value	00_H	-
General status	00_H	
Additional status	00_H	

< Response (error) >

Item	Data	Description
Service code	CC_H	A code corresponding to the ISDU_Write service code is returned.
Fixed value	00_H	-
General status	XX_H	The EtherNet/IP error code is stored here. 📖 "General status" (Page6-20)
Additional status	00_H	
Response data	XX_H	IO-Link error code 📖 "IO-Link error codes" (Page6-20)
	XX_H	Additional code

Example) Writing the setting value to the Clamp-on Flow Sensor "FD-Q Series" connected to port 5 of the NQ-MP8L
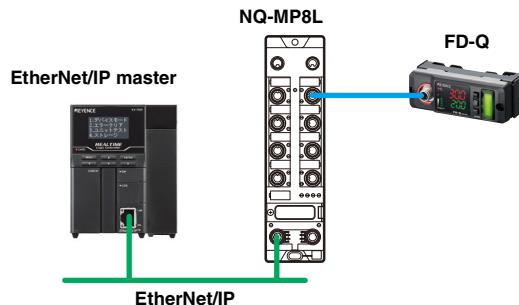
■ Excerpt from the list of FD-Q Series parameters

Index	Item	Data format	Data length	Attribute	Description
112 (70_H)	Output 1 setting value / output 1 lower limit value	UINT	2Byte	R/W	0 to 9999

■ Command parameters

Item		Data	Description
Service code		4C_H	Specify the ISDU_Write service code.
Class ID		85_H	Specify the class ID for communicating with the IO-Link sensor.
Instance ID		01_H	(Fixed)
Attribute ID		05_H	Specify the number of the port to which the device to communicate with is connected.
Service data	Index	0070_H	Specify the index of the parameter to communicate with. Specify "00" for the sub-index because it is not used with this parameter.
	Sub-Index	00_H	
	Data to write	03E8_H	Specify the data to write. In this example, "1000_{DEC}" is written.

> ✎ **Point** — **The NQ Series handles two bytes or more of data in big-endian format. For example, KEYENCE PLCs handle data in units of two bytes in little endian format, so the above service data is stored as "7000 0300 00E8_H."**

■ Response parameters

< Normal >

Item	Data	Description
Service code	CC_H	A code corresponding to the ISDU_Write service code is returned.
Fixed value	00_H	-
General status	00_H	Normal completion
Additional status	00_H	Normal completion

IO-Link Port (Class ID: 304$_H$)

•: Initial value

Attribute ID		Item	Description	Attribute	Data type	Description
HEX	**DEC**					
01	1	Operation mode	Indicates the function of pin 4. 📖"Operation mode and validation settings" (Page4-13)	R/W	USINT	0: IO-Link (No validation) • 1: IO-Link (Vendor validation) 2: IO-Link (Type validation) 3: IO-Link (Serial validation) 4: Digital input (Parameter access supported) 5 to 7: Reserved 8: Digital input
02	2	Data storage mode	Indicates the data storage mode. 📖"Data storage function" (Page4-14)	R/W	USINT	0: Always sync 1: Parameter fix 2: Parameter save 3: Data storage function deactivated •
03	3	Cycle time	Indicates the cycle time for the process data. 📖"Cycle time" (Page4-17)	R/W	USINT	00H: Automatic • 10H to BFH: Manual
04	4	Revision	Indicates which IO-Link revision will be used for the operation.	R/W	USINT	0: Automatic selection • 1: Use V1.0.
05	5	Activate Quick Start-Up function	Indicates whether to use the Quick Start-Up function. 📖"Quick Start-Up" (Page4-17)	R/W	USINT	0: Deactivate • 1: Activate
06	6	Reserved				
07	7	Diagnostic information for invalid process data	Indicates whether to deactivate diagnostic information when the process data status is "Invalid."	R/W	USINT	0: Valid • 1: Invalid
08	8	Diagnostic information notification level	Indicates whether to transfer IO-Link events from the NQ to the field bus. 📖"Diagnostic information notification level" (Page4-17)	R/W	USINT	0: Transfer all events 1: Transfer events other than notifications 2: Transfer events other than notifications and warnings • 3: Transfer nothing
09	9	Input process data mapping	Indicates whether to change the byte order of the process data. For example, when you use an EtherNet/IP master unit that processes data in little endian format to obtain 2-byte process data, selecting [16-bit conversion] eliminates the need for byte swapping on the master unit side. 📖"Process data setting" (Page4-16)	R/W	USINT	0: No conversion 1: 16-bit conversion • 2: 32-bit conversion 3: Convert all
0A	10	Output process data mapping		R/W	USINT	0: No conversion 1: 16-bit conversion • 2: 32-bit conversion 3: Convert all
0B	11	Vendor ID for validation	Indicates [Vendor ID] and [Device ID] used for the validation function.	R/W	INT	-
0C	12	Device ID for validation		R/W	DINT	-
0D	13	Device undetected/mismatched	• No device is connected. • The result of the device validation function was "mismatched."	R	USINT	0: No error 1: Error
0E	14	Data storage error	• A device of IO-Link V1.0 is connected. • The connected device is not the one stored in the buffer. • Buffer overflow occurred. • The parameter lock function of the IO-Link device is active.			
0F	15	Process data invalid	• The device cannot perform measurements. • The result of the device validation function was "mismatched."			
10	16	Hardware error	There is a failure or a malfunction in the hardware.			
11	17	Maintenance event	An event that requires maintenance in the IO-Link specifications occurred.			
12	18	Undefined event	An event that is not defined in the IO-Link specifications occurred.			
13	19	Parameter error	The device issued a parameter error. (Such as a loss of parameters or uninitialized status)			
14	20	Temperature error	The device issued temperature diagnostic information.			
15	21	Measured value lower limit exceeded	The measured value is below the device's measurement range or the set lower limit.			
16	22	Measured value upper limit exceeded	The measured value exceeded the device's measurement range or the set upper limit.			
17	23	Insufficient power voltage	The power voltage of the device is below the specified value.			
18	24	Power supply overvoltage	The power voltage of the device exceeded the specified value.			
19	25	Overload	The device detected overload.			
1A	26	General error	The device has an error (device status 4 specified in the IO-Link specifications). For details about the error, check the event code.			
1B	27	Reserved				
1C	28	Input data word 0	Indicates the input process data. The content depends on the IO-Link device.	R	UINT	-
:	:	:				
2B	43	Input data word 15				
2C	44	Output data word 0	Indicates the output process data. The content depends on the IO-Link device.			
:	:	:				
3B	59	Output data word 15				

6

EtherNet/IP Communication

IO-Link Event (Class ID: 305H)

●: Initial value

Attribute ID		Item		Description	Attribute	Data type	Description
HEX	DEC						
01	1	Port number of the event	1st event	Port number of the port where the event has occurred.	R	USINT	1 to 8 or 1 to 4
:	:		:				
10	16		16th event				

11	17	Event classification code	1st event	For details, refer to the IO-Link specifications.	R	USINT	Bits 0 to 2: Instance
							  0: Unknown
							  1 to 3: Reserved
							  4: Application
							  5 to 7: Reserved
							
							Bit 3: Source
							  0: Device
							  1: Master
							
							Bits 4 and 5: Type
							  0: Reserved
							  1: Notification
							  2: Warning
							  3: Error
							
							Bits 6 and 7: Mode
							  0: Reserved
							  1: Event single shot
							  2: Event disappears
							  3: Event appears

:	:		:				
20	32		16th event				
21	33	Event code	1st event	For details, refer to the manual of the IO-Link device.	R	UINT	-
:	:		:				
30	48		16th event				

Digital I/O (Class ID: 306H (MP8L), 303H (EP4L))

■ Class ID: 306H (MP8L)

< Pin 2 (Digital input or output) >

●: Initial value

Attribute ID		Item		Description	Attribute	Data type	Description
HEX	DEC						
01	1	Output reset after overcurrent detection	Port 1 (C0)	< When pin 2 is set to digital output > Indicates the recovery method after an overcurrent is detected.	R/W	USINT	0: Automatic reset ● 1: Reset by output OFF
02	2		Port 2 (C1)				
03	3		Port 3 (C2)				
04	4		Port 4 (C3)				
05	5	Digital output setting	Port 1 (C0)	Indicates the function of pin 2.	R/W	USINT	0: Digital input ● 1: Digital output
06	6		Port 2 (C1)				
07	7		Port 3 (C2)				
08	8		Port 4 (C3)				
09	9	V1 power supply overcurrent (pin 1)	Port 1 (C0)	Indicates the overcurrent status of the V1 power supply.	R	USINT	0: No overcurrent 1: Overcurrent detected
0A	10		Port 2 (C1)				
0B	11		Port 3 (C2)				
0C	12		Port 4 (C3)				
0D	13		Port 5 (C4)				
0F	15		Port 6 (C5)				
11	17		Port 7 (C6)				
13	19		Port 8 (C7)				
0E	14	V2 power supply overcurrent (pin 2)	Port 5 (C4)	Indicates the overcurrent status of the V2 power supply.	R	USINT	0: No overcurrent 1: Overcurrent detected
10	16		Port 6 (C5)				
12	18		Port 7 (C6)				
14	20		Port 8 (C7)				
15	21	Output overcurrent	Port 1 (C0)	< When pin 2 is set to digital output > Indicates the overcurrent detection status of the output.	R	USINT	0: No overcurrent 1: Overcurrent detected
16	22		Port 2 (C1)				
17	23		Port 3 (C2)				
18	24		Port 4 (C3)				
29	41	Input status	Port 1 (C0)	< When pin 2 is set to digital input > Indicates the input status.	R	USINT	0: OFF 1: ON
2A	42		Port 2 (C1)				
2B	43		Port 3 (C2)				
2C	44		Port 4 (C3)				
2D	45	Output status	Port 1 (C0)	< When pin 2 is set to digital output > Indicates the output status.	R	USINT	0: OFF 1: ON
2E	46		Port 2 (C1)				
2F	47		Port 3 (C2)				
30	48		Port 4 (C3)				

< Pin 4 (IO-Link communication or digital input) >

●: Initial value

Attribute ID		Item		Description	Attribute	Data type	Description
HEX	DEC						
19	25	Input status	Port 1 (C0)	< When digital input is set > Indicates the input status.	R	USINT	0: OFF 1: ON
1A	26		Port 2 (C1)				
1B	27		Port 3 (C2)				
1C	28		Port 4 (C3)				
1D	29		Port 5 (C4)				
1E	30		Port 6 (C5)				
1F	31		Port 7 (C6)				
20	32		Port 8 (C7)				
21	33	Process data status	Port 1 (C0)	< When IO-Link communication is set > Indicates the process data status.	R	USINT	0: Invalid 1: Valid
22	34		Port 2 (C1)				
23	35		Port 3 (C2)				
24	36		Port 4 (C3)				
25	37		Port 5 (C4)				
26	38		Port 6 (C5)				
27	39		Port 7 (C6)				
28	40		Port 8 (C7)				

■ Class ID: 303H (EP4L)

< Pin 2 (Digital input or output) >

●: Initial value

Attribute ID		Item		Description	Attribute	Data type	Description
HEX	DEC						
01	1	Output reset after overcurrent detection	Port 1 (C0)	< When pin 2 is set to digital output > Indicates the recovery method after an overcurrent is detected.	R/W	USINT	0: Automatic reset ● 1: Reset by output OFF
02	2		Port 2 (C1)				
03	3		Port 3 (C2)				
04	4		Port 4 (C3)				
05	5	Digital output setting	Port 1 (C0)	Indicates the function of pin 2.	R/W	USINT	0: Digital input ● 1: Digital output
06	6		Port 2 (C1)				
07	7		Port 3 (C2)				
08	8		Port 4 (C3)				
09	9	Output overcurrent	Port 1 (C0)	< When pin 2 is set to digital output > Indicates the overcurrent detection status of the output.	R	USINT	0: No overcurrent 1: Overcurrent detected
0A	10		Port 2 (C1)				
0B	11		Port 3 (C2)				
0C	12		Port 4 (C3)				
15	21	Input status	Port 1 (C0)	< When pin 2 is set to digital input > Indicates the input status.	R	USINT	0: OFF 1: ON
16	22		Port 2 (C1)				
17	23		Port 3 (C2)				
18	24		Port 4 (C3)				
19	25	Output status	Port 1 (C0)	< When pin 2 is set to digital output > Indicates the output status.	R	USINT	0: OFF 1: ON
1A	26		Port 2 (C1)				
1B	27		Port 3 (C2)				
1C	28		Port 4 (C3)				

< Pin 4 (IO-Link communication or digital input) >

Attribute ID		Item		Description	Attribute	Data type	Description
HEX	DEC						
0D	13	Input status	Port 1 (C0)	< When digital input is set > Indicates the input status.	R	USINT	0: OFF 1: ON
0E	14		Port 2 (C1)				
0F	15		Port 3 (C2)				
10	16		Port 4 (C3)				
11	17	Process data status	Port 1 (C0)	< When IO-Link communication is set > Indicates the process data status.	R	USINT	0: Invalid 1: Valid
12	18		Port 2 (C1)				
13	19		Port 3 (C2)				
14	20		Port 4 (C3)				

Power Supply Control (Class ID: 307ʜ)

●: Initial value

Attribute ID		Item		Description	Attribute	Data type	Description
HEX	DEC						
01	1	Control of V1 (Pin 1)	Port 1 (C0)	Controls the power supplied from pin 1 of Class A port and Class B port to each device.	R/W	USINT	0: Supply 24 VDC ● 1: Switch based on process data (Page 4-18) 2: Off
02	2		Port 2 (C1)				
03	3		Port 3 (C2)				
04	4		Port 4 (C3)				
05	5		Port 5 (C4)				
07	7		Port 6 (C5)				
09	9		Port 7 (C6)				
0B	11		Port 8 (C7)				
06	6	Control of V2 (pin 2)	Port 5 (C4)	Controls the power supplied from pin 2 of Class B port to each device.			
08	8		Port 6 (C5)				
0A	10		Port 7 (C6)				
0C	12		Port 8 (C7)				
0D	13	V1 (pin 1) power supply status	Port 1 (C0)	< When the V1 (pin 1) control is set to switching using the process data > Indicates the status of the power supplied from pin 1 of Class A port and Class B port to each device.	R	USINT	0: OFF 1: ON
0E	14		Port 2 (C1)				
0F	15		Port 3 (C2)				
10	16		Port 4 (C3)				
11	17		Port 5 (C4)				
13	19		Port 6 (C5)				
15	21		Port 7 (C6)				
17	23		Port 8 (C7)				
12	18	V2 (pin 2) power supply status	Port 5 (C4)	< When the V2 (pin 2) control is set to switching using the process data > Indicates the status of the power supplied from pin 2 of Class B port to each device.			
14	20		Port 6 (C5)				
16	22		Port 7 (C6)				
18	24		Port 8 (C7)				

Analog Input (Class ID: 302ʜ)

●: Initial value

Attribute ID		Item	Description	Attribute	Data type	Description
HEX	DEC					
01	1	Operation mode	Indicates the type of the device to be connected to the port.	R/W	USINT	0: Thermocouple ● 1: Voltage 2: Current 3: Reserved 4: Resistance temperature detector
02	2	Thermocouple type	Indicates the type of thermocouple.	R/W	USINT	0: Type K, –270 ... 1370°C, –454…2498°F ● 1: Type B, 100 ... 1820°C, 212…3308°F 2: Type E, –270 ... 1000°C, –454…1832°F 3: Type J, –210 ... 1200°C, –346…2192°F 4: Type N, –270 ... 1300°C, –454…2372°F 5: Type R, –50 ... 1768°C, –58…3214°F 6: Type S, –50 ... 1768°C, –58…3214°F 7: Type T, –270 ... 400°C, –454…752°F 8: Type C, 0 ... 2315°C, 32…4199°F 9: Type G, 0 ... 2315°C, 32…4199°F
03	3	Thermocouple cold junction compensation setting	Indicates the method of cold junction compensation when a thermocouple is used.	R/W	USINT	0: Conn. to Pt1000 (Use OP-88459) 1: Conn. to Pt100 2: Use port 1 cold junction compensation 3: Reserved 4: No conn. (25°C fixed) ●
04	4	Voltage range	Indicates the input range.	R/W	USINT	0: –10 to 10 V 1: 0 to 10 V 2: 2 to 10 V 3: 0 to 5 V ● 4: 1 to 5 V 5: –1 to 1 V 6: –500 to 500 mV 7: –100 to 100 mV 8: –50 to 50 mV
05	5	Voltage connection type	Indicates the type of wiring.	R/W	USINT	0: Differential 1: Single end ● 2: Differential (No grounding)
06	6	Current range	Indicates the input range.	R/W	USINT	0: 0 to 20 mA ● 1: 4 to 20 mA 2: –20 to 20 mA
07	7	Current connection type	Indicates the type of wiring.	R/W	USINT	0: Differential 1: Single end ● 2: Differential (No grounding)
08	8	Reserved				
09	9	Reserved				

Attribute ID		Item	Description	Attribute	Data type	Description
HEX	**DEC**					
0A	10	RTD type	Indicates the type of RTD.	R/W	USINT	0: Pt100, −200 ... 850°C, −328…1562°F • 1: Pt100, −200 ... 150°C, −328…302°F 2: Ni100, −60 ... 250°C, −76…482°F 3: Ni100, −60 ... 150°C, −76…302°F 4: Pt200, −200 ... 850°C, −328…1562°F 5: Pt200, −200 ... 150°C, −328…302°F 6: Pt500, −200 ... 850°C, −328…1562°F 7: Pt500, −200 ... 150°C, −328…302°F 8: Pt1000, −200 ... 850°C, −328…1562°F 9: Pt1000, −200 ... 150°C, −328…302°F 10: Ni1000, −60 ... 250°C, −76…482°F 11: Ni1000, −60 ... 150°C, −76…302°F
0B	11	RTD connection type	Indicates the type of wiring.	R/W	USINT	0: 2-wire type 1: 3-wire type • 2: 4-wire type
0C	12	Data display	-	R/W	USINT	0: Normal • 1: NE43 format 2: Extended range
0D	13	Temperature unit	Indicates the unit of temperature.			0: °C • 1: °F* * The actual temperature divided by 2 is stored in the analog input value.
0E	14	Filter setting	Sets the analog input filter.	R/W	USINT	0: Filter (Medium speed) • 1: Filter (Low speed) 2: Filter (High speed) 3: No filter
0F	15	Deactivate port	Deactivates a port. When a port is deactivated, the IO port operation indicator is unlit even when no device is connected to the port.	R/W	USINT	0: Activate channel • 1: Deactivate channel
10	16	Diagnostic information notification setting	Indicates whether to activate or deactivate the diagnostic information.	R/W	USINT	0: Activate diagnostic information • 1: Deactivate diagnostic information
11	17	Power supply noise filter	Sets the power supply noise filter.	R/W	USINT	0: Off • 1: 50 Hz 2: 60 Hz
12	18	Upper limit exceeded	The measured value exceeds the specified upper limit. "Analog input data format" (Page9-2)	R	USINT	0: No error 1: Error
13	19	Lower limit exceeded	The measured value is below the specified lower limit. "Analog input data format" (Page9-2)			
14	20	Overflow	The measured value greatly exceeded the specified upper limit. Note that the overflow detection is disabled in thermocouple and resistance temperature detector modes. "Analog input data format" (Page9-2)			
15	21	Underflow	The measured value is greatly below the specified lower limit. Note that the underflow detection is disabled in the thermocouple and resistance temperature detector modes. "Analog input data format" (Page9-2)			
16	22	Cold junction compensation error	The measured temperature exceeded the measurement range by 1% or more or the setting is incorrect. In this case, the compensation is calculated by using the cold junction temperature of 25°C.			
17	23	Resistance temperature detector overcurrent	The resistance of the resistance temperature detector is lower than 5 Ω.			
18	24	Disconnection	A wire disconnection (no signal) was detected. Note that in the voltage/current mode, disconnection detection is effective only in the following measurement ranges. Voltage: 1 to 5 V or 2 to 10 V Current: 4 to 20 mA			
19	25	V1 overcurrent	The current supplied to the analog device exceeds the specified value.			
1A	26	Analog input value	Indicates an analog input value. The input data varies depending on the settings of [Operation mode] and [Input range].	R	INT	
1B to 1F	27 to 31	Reserved				
20	32	Scaling value	Scaled values are displayed when the scaling function is valid. "Scaling" (Page4-21)	R	INT	
21	33	Scaling function enabled setting	Indicates whether to use the scaling function. "Scaling" (Page4-21)	R/W	USINT	0: Disabled • 1: Enabled
22	34	Pre-scaling A/D conversion data 1	Indicates the A/D conversion data before scaling conversion. "Scaling" (Page4-21)	R/W	INT	−32768 to 32767
23	35	Pre-scaling A/D conversion data 2				
24	36	Scaled data 1	Indicates the value after scaling when performing scaling. "Scaling" (Page4-21)			
25	37	Scaled data 2				

6

EtherNet/IP Communication

Gateway (Class ID: 300H)

●: Initial value

Attribute ID		Item	Description	Attribute	Data type	Description
HEX	DEC					
6D	109	Status word (Status register 2)		R	STRUCT	Module general information Module – Bit 15: reserved – Bit 14: reserved – Bit 13: reserved – bit 12: reserved Internal bus – bit 11: reserved – bit 10: reserved Voltage error – Bit 09: V1 voltage lower than 18 VDC – bit 08: reserved – Bit 07: V2 voltage lower than 14 VDC – bit 06: reserved – bit 05: reserved – bit 04: reserved Warning – bit 03: reserved – bit 02: reserved – bit 01: reserved – Bit 00: Diagnostic information provided for one or more I/O channels
73	115	ON IO CONNECTION TIMEOUT		R/W	ENUM USINT	Output operation when a time-out occurs 0: The output is set to an auxiliary value. 1: The output is set to 0. 2: The output is retained.

Identify Object (Class ID: 1H)

●: Initial value

Attribute ID		Item	Description	Attribute	Data type	Description
HEX	DEC					
01	1	Vendor ID	Vendor ID	R	UINT	367
02	2	Product type	General device type	R	UINT	12
03	3	Product code	Product identification code	R	UINT	MP8L: 2502, EP4L: 2503, EP4A: 2504
04	4	Revision	Product revision	R	Structure	-
				-	USINT	-
				-	USINT	-
05	5	Device status	For details, refer to the specifications of EtherNet/IP.	R	WORD	-
06	6	Serial number	Serial number (MAC ID)	R	UDINT	-
07	7	Product name	Name of the product	R	Structure	-
				-	USINT STRING [13]	NQ-MP8L NQ-EP4L NQ-EP4A

7

Modbus/TCP Communication

This chapter describes how to configure the NQ Series settings using NQ Monitor.

7-1 NQ Series Modbus/TCP Communication Function

Overview

Modbus is a general purpose networking protocol used in FA (Factory Automation) and PA (Process Automation).

Modbus only specifies the communication protocol, not the communication cable. Therefore, there are three types of cables: ModbusRTU and Modbus ASCII, which are based on serial communication such as RS-232C and RS-485, and Modbus/TCP, which communicates over Ethernet.

In Modbus communication, there are generally four types of data areas: coil, input status, input register, and holding register. By issuing commands that specify function codes and sending these commands to slave units from the master unit, it is possible to read and write the data in these areas.

The NQ Series operates as a slave unit (server device) in Modbus/TCP communication.

Note that unlike other network standards, Modbus is not subject to systematic application management. Therefore, it is necessary to use actual machines to verify that devices that support Modbus can be connected to each other.
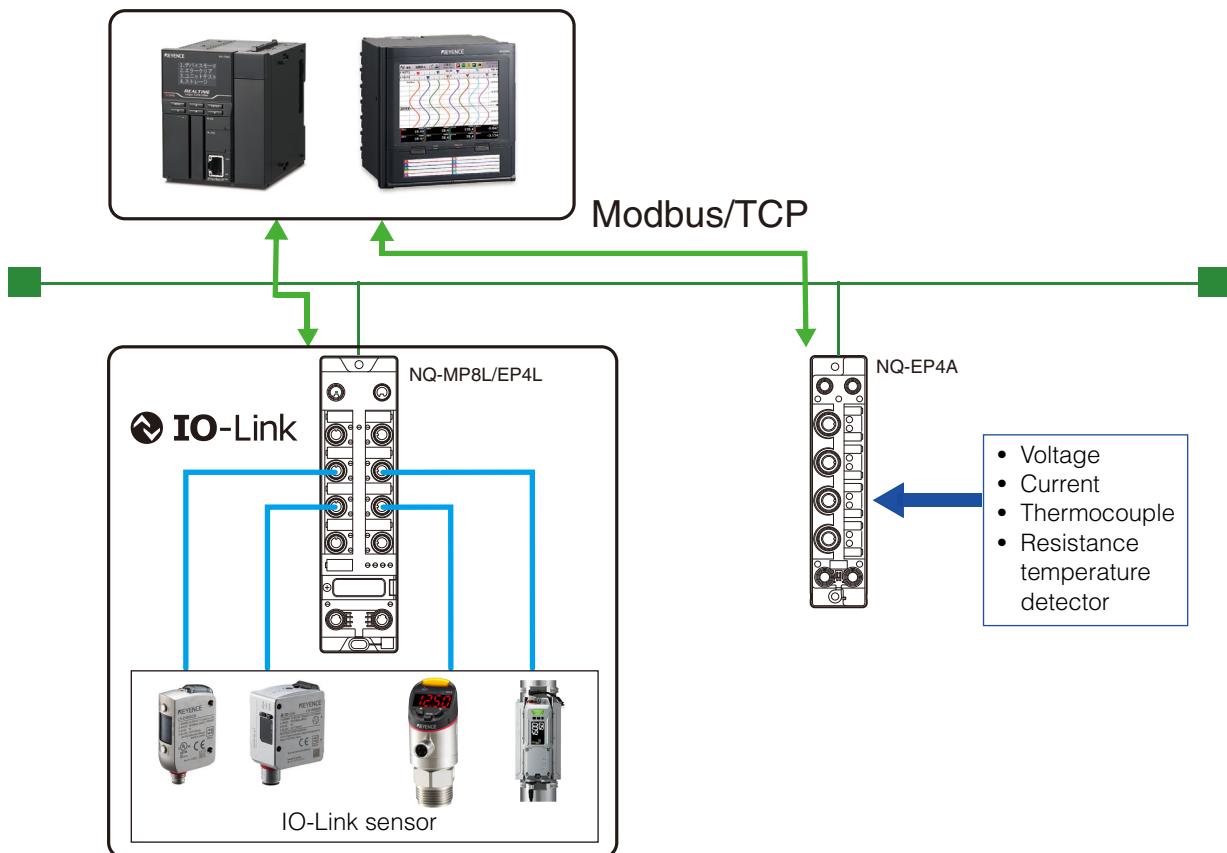
Modbus is a trademark or registered trademark of Schneider Automation Inc.

Modbus/TCP Communication Specifications

■ Modbus/TCP communication specifications

Item		NQ-MP8L	NQ-EP4L	NQ-EP4A
Ethernet	Communication speed	10 Mbps (10BASE-T) 100 Mbps (100BASE-TX)		
	Transmission media	STP cable or Category 3 or higher UTP cable (10BASE-T) STP cable or Category 5 or higher UTP cable (100BASE-TX)		
	Maximum cable length	100 m (between nodes)		
	IP address setting	Static IP, BOOTP, DHCP		
	Port number	502 (fixed)		
Modbus/TCP	Supported function codes	Refer to the Modbus/TCP-supported function codes shown below.		
	TCP connection count	8		
	Input register start address	0 (0x0000)		
	Holding register start address	2048 (0x800)		

■ Supported functions

Code (HEX)	Description
03 HEX	Reading multiple holding registers
04 HEX	Reading multiple input registers
06 HEX	Writing one holding register
10 HEX	Writing multiple holding registers
17 HEX	Reading and writing multiple holding registers

7

Modbus/TCP Communication

7-2 Communication Settings

NQ Series Settings

Configure the following settings. For details, refer to chapter 4.

1 IP address setting

Set the NQ Series IP address.

📖 "4-4 Setting the IP Address" (Page 4-6)

2 Port setting

Set the NQ Series port.

📖 "4-5 NQ Series Registration" (Page 4-8)

📖 "4-6 Port Settings" (Page 4-11)

3 Device process data setting

Set the process data of the IO-Link device to connect to the NQ Series.

📖 "4-7 Device Settings" (Page 4-22)

PLC and Controller Settings

This section explains the flow of settings on the Modbus/TCP client side. For details, refer to the manual of each device.

1 IP address setting

Set the IP address of the Modbus/TCP client.

2 NQ Series communication settings

The NQ Series operates as a server device for Modbus/TCP communication.

Use function codes to send commands from the client device (PLC or controller) to read and write information on the IO-Link device connected to the NQ Series.

For details, refer to the instruction manual of the client device.

For details on the NQ Series register settings, refer to "Modbus/TCP Communication Specifications" (Page 7-3).

Command Formats

Examples of the command formats are shown here.

■ Reading multiple holding registers (03$_H$)

< Request message >

Item	Size (bytes)	Value (HEX)	Description
Transaction ID	2	0000$_H$	Normally 0
Protocol ID	2	0000$_H$	Normally 0
Number of bytes	2	0006$_H$	Size of the data to send after this point
Unit ID	1	01$_H$	Normally 1
Function code	1	03$_H$	Function code for reading multiple holding registers
Start address	2	XXXX$_H$	Address of the register at which to start reading (Page 7-6)
Number of registers	2	XXXX$_H$	Number of registers to read continuously (n = 1 to 125$_D$)

< Response (normal) >

Item	Size (bytes)	Value (HEX)	Description
Transaction ID	2	0000$_H$	Same value as the request message
Protocol ID	2	0000$_H$	Same value as the request message
Number of bytes	2	(3 + 2 × n)$_H$	Size of the data to send after this point
Unit ID	1	01$_H$	Same value as the request message
Function code	1	03$_H$	Function code for reading multiple holding registers
Number of bytes of the data to read	1	(2 × n)$_H$	Size of the data to read
Data to read 1	2	XXXX$_H$	Read data
:	:	:	:
Data to read n	2		Read data

< Response (error) >

Item	Size (bytes)	Value (HEX)	Description
Transaction ID	2	0000$_H$	Same value as the request message
Protocol ID	2	0000$_H$	0
Number of bytes	2	0003$_H$	Size of the data to send after this point
Unit ID	1	01$_H$	Same value as the request message
Function code	1	83$_H$	The value with the highest-order bit of the value at the time of the request set to 1
Error code	1	XX$_H$	01$_H$: Unsupported function code 02$_H$: Register address out of range 03$_H$: Number of registers out of range

■ Writing multiple holding registers (10H)

< Request message >

Item	Size (bytes)	Value (HEX)	Description
Transaction ID	2	0000H	Normally 0
Protocol ID	2	0000H	Normally 0
Number of bytes	2	$(7 + 2 \times n)$H	Size of the data to send after this point
Unit ID	1	01H	Normally 1
Function code	1	10H	Function code for writing multiple holding registers
Start address	2	XXXXH	Relative address of the register at which to start writing (Page 7-6)
Number of registers	2	XXXXH	Number of registers to write continuously (n = 1 to 125D)
Number of bytes of the data to write	1	$(2 \times n)$H	Size of the data to write
Data to write 1	2	XXXXH	Data to write
:	:	:	:
Data to write n	2	XXXXH	Data to write

< Response (normal) >

Item	Size (bytes)	Value (HEX)	Description
Transaction ID	2	0000H	Same value as the request message
Protocol ID	2	0000H	Same value as the request message
Number of bytes	2	0006H	Size of the data to send after this point
Unit ID	1	01H	Same value as the request message
Function code	1	10H	Function code for writing multiple holding registers
Start address	2	XXXXH	Same value as the request message
Number of registers	2	XXXXH	Same value as the request message

< Response (error) >

Item	Size (bytes)	Value (HEX)	Description
Transaction ID	2	0000H	Same value as the request message
Protocol ID	2	0000H	0
Number of bytes	2	0003H	Size of the data to send after this point
Unit ID	1	01H	Same value as the request message
Function code	1	90H	The value with the highest-order bit of the value at the time of the request set to 1
Error code	1	XXH	01H: Unsupported function code 02H: Register address out of range 03H: Number of registers out of range

7

Modbus/TCP Communication

This section provides the register mapping of the NQ Series.

> ✎ **Point** **The address that is used will vary depending on the client device. Refer to the manual of the client device.**

NQ-MP8L/EP4L

Address						Item		Attribute	Data type	bit	Description	Value
NQ-MP8L			NQ-EP4L									
Relative		Absolute	Relative		Absolute							
HEX	DEC	DEC	HEX	DEC	DEC							
0000	0	400001	0000	0	400001	Port inputs		R	WORD	0 : 15	Indicates the input status of each port. (bit diagram: Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port 8 7 6 5 4 3 2 1 / Pin - 4 - 4 - 4 - 4 2 4 2 4 2 4 2 4)	0: OFF 1: ON
0001	1	400002	0001	1	400002	Process data status of the IO-Link device		R	WORD	0 : 15	Turns ON when the process data is valid. The process data is invalid in the following cases: • The sensor supply voltage is outside of the allowable range. • The operation mode of the port is set to [Digital input]. • No IO-Link device is connected. • No process data has been input from the connected device. • The device does not respond to the output process data. • The device outputs "process input data invalid." (For example, the value measured by the sensor is out of the operating range.) (bit diagram: Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port - 8 - 7 - 6 - 5 - 4 - 3 - 2 - 1)	0: Invalid/ Deactivated 1: Valid/Active
0002	2	400003	0002	2	400003	IO-Link device process input data	Port 1 (C0)	R	-		Process data of each device. For details of the data, refer to the manual for the IO-Link device. Note that IO-Link devices and the NQ Series process data in big endian format. When using a PLC that processes data in little endian format (such as KEYENCE PLCs), change the byte order by using either of the following methods: • Using the NQ Series settings (Page 4-16) • Using a PLC program	-
:	:	:	:	:	:							
0011	17	400018	0011	17	400018							
0012	18	400019	0012	18	400019		Port 2 (C1)					
:	:	:	:	:	:							
0021	33	400034	0021	33	400034							
0022	34	400035	0022	34	400035		Port 3 (C2)					
:	:	:	:	:	:							
0031	49	400050	0031	49	400050							
0032	50	400051	0032	50	400051		Port 4 (C3)					
:	:	:	:	:	:							
0041	65	400066	0041	65	400066							
0042	66	400067	-	-	-		Port 5 (C4)					
:	:	:	-	-	-							
0051	81	400082	-	-	-							
0052	82	400083	-	-	-		Port 6 (C5)					
:	:	:	-	-	-							
0061	97	400098	-	-	-							
0062	98	400099	-	-	-		Port 7 (C6)					
:	:	:	-	-	-							
0071	113	400114	-	-	-							
0072	114	400115	-	-	-		Port 8 (C7)					
:	:	:	-	-	-							
0081	129	400130	-	-	-							
0082	130	400131	-	-	-	Diagnostic information	Power supply over-current	R	WORD	0 : 15	(bit diagram: Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port 8 7 6 5 - - - - 8 7 6 5 4 3 2 1 / V2, V1)	0: No overcurrent 1: Overcurrent detected
0083	131	400132	0042	66	400067		Digital output over-current	R	WORD	0 : 15	(bit diagram: Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port 4 3 2 1 / Pin 2 - 2 - 2 - 2 -)	0: No overcurrent 1: Overcurrent detected

7

Modbus/TCP Communication

Address						Item	Attribute	Data type	bit	Description		Value
NQ-MP8L			NQ-EP4L									
Relative		Absolute	Relative		Absolute							
HEX	DEC	DEC	HEX	DEC	DEC							
									0	-	-	0
									1	-	-	
									2	Device undetected/ mismatched	• No device is connected. • The result of the device validation function was "mismatched."	
									3	Data storage error	• An IO-Link V1.0 device is connected. • The connected device is not the one stored in the buffer. • Buffer overflow occurred. • The parameter lock function of the IO-Link device is active.	
									4	Hardware error	There is a failure or a malfunction in the hardware.	
									5	Process data invalid	• The device cannot perform measurements. • The result of the device validation function was "mismatched."	
									6	Undefined event	An event that is not defined in the IO-Link specifications occurred.	
0084	132	400133	0043	67	400068	Diagnostic information	Port 1 (C0)	R	WORD	7	Maintenance event	An event that requires maintenance in the IO-Link specifications occurred.	0: No error 1: Error
									8	Parameter error	The device issued a parameter error. (Such as a loss of parameters or uninitialized status)	
									9	Temperature error	The device issued temperature diagnostic information.	
									10	Measured value lower limit exceeded	The measured value is below the device's measurement range or the set lower limit.	
									11	Measured value upper limit exceeded	The measured value exceeds the device's measurement range or the set upper limit.	
									12	Insufficient power voltage	The power voltage of the device is below the specified value.	
									13	Power supply overvoltage	The power voltage of the device exceeds the specified value.	
									14	Overload	The device has detected an overload.	
									15	General error	The device has an error. (Device status 4 specified in the IO-Link specifications) For details about the error, check the event code.	
0085	133	400134	0044	68	400069		Port 2 (C1)	R	WORD	Same as Port 1 (C0)		-
0086	134	400135	0045	69	400070		Port 3 (C2)					
0087	135	400136	0046	70	400071		Port 4 (C3)					
0088	136	400137	-	-	-		Port 5 (C4)					
0089	137	400138	-	-	-		Port 6 (C5)					
008A	138	400139	-	-	-		Port 7 (C6)					
008B	139	400140	-	-	-		Port 8 (C7)					

7

Modbus/TCP Communication

Address: NQ-MP8L Relative HEX	NQ-MP8L Relative DEC	NQ-MP8L Absolute DEC	NQ-EP4L Relative HEX	NQ-EP4L Relative DEC	NQ-EP4L Absolute DEC	Item	Attribute	Data type	bit	Description	Value
008C	140	400141	0047	71	400072	Diagnostic information (IO-Link event) — 1st event	R	WORD	0	Event classification code (For details, refer to the IO-Link specifications.) — Instance	0: Unknown / 1 to 3: Reserved / 4: Application / 5 to 7: Reserved
									1	Instance	
									2	Instance	
									3	Source	0: Device / 1: Master
									4	Type	0: Reserved / 1: Notification / 2: Warning / 3: Error
									5	Type	
									6	Mode	0: Reserved / 1: Event single shot / 2: Event disappears / 3: Event appears
									7	Mode	
									8	Port number of the event — Port number of the port where the event has occurred.	1 to 8 or 1 to 4
									9		
									10		
									11		
									12		
									13		
									14		
									15		
008D	141	400142	0048	72	400073		R	UINT		Event code — Event code for the event. For details, refer to the manual of the IO-Link device.	-
⋮	⋮	⋮	⋮	⋮	⋮		⋮	⋮		⋮	⋮
00AA	170	400171	0065	101	400102	16th event	R	WORD		Event classification code / Port number of the event	Same as the 1st event
00AB	171	400172	0066	102	400103		R	UINT		Event code	-
00AC	172	400173	0067	103	400104	Module status	R	WORD	0	Diagnostic information — -	0: Diagnostic information not provided / 1: Diagnostic information provided
									1	- / -	0
									2	- / -	0
									3	- / -	0
									4	- / -	0
									5	- / -	0
									6	- / -	0
									7	V2 voltage — -	0: 18 VDC or higher / 1: Lower than 18 VDC
									8	- / -	0
									9	V1 voltage — -	0: 18 VDC or higher / 1: Lower than 18 VDC
									10	- / -	0
									11	- / -	0
									12	- / -	0
									13	- / -	0
									14	- / -	0
									15	- / -	0
0800	2048	402049	0800	2048	402049	Port outputs	R/W	WORD	0 : 15	Indicates the output to each port. (Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port: 4, 3, 2, 1 / Pin: 2, -, 2, -, 2, -, 2, -)	0: OFF / 1: ON

Address						Item		Attribute	Data type	bit	Description		Value
NQ-MP8L			NQ-EP4L										
Relative		Absolute	Relative		Absolute								
HEX	DEC	DEC	HEX	DEC	DEC								
0801	2049	402050	0801	2049	402050	Process output data of the IO-Link device	Port 1 (C0)	R/W	-		Process data of each device. For details of the data, refer to the manual for the IO-Link device. Note that IO-Link devices and the NQ Series process data in big endian format. When using a PLC that processes data in little endian format (such as KEYENCE PLCs), change the byte order by using either of the following methods: • Using the NQ Series settings (Page 4-16) • Using a PLC program		-
:	:	:	:	:	:								
0810	2064	402065	0810	2064	402065								
0811	2065	402066	0811	2065	402066		Port 2 (C1)						
:	:	:	:	:	:								
0820	2080	402081	0820	2080	402081								
0821	2081	402082	0821	2081	402082		Port 3 (C2)						
:	:	:	:	:	:								
0830	2096	402097	0830	2096	402097								
0831	2097	402098	0831	2097	402098		Port 4 (C3)						
:	:	:	:	:	:								
0840	2112	402113	0840	2112	402113								
0841	2113	402114	-	-	-		Port 5 (C4)						
:	:	:	-	-	-								
0850	2128	402129	-	-	-								
0851	2129	402130	-	-	-		Port 6 (C5)						
:	:	:	-	-	-								
0860	2144	402145	-	-	-								
0861	2145	402146	-	-	-		Port 7 (C6)						
:	:	:	-	-	-								
0870	2160	402161	-	-	-								
0871	2161	402162	-	-	-		Port 8 (C7)						
:	:	:	-	-	-								
0880	2176	402177	-	-	-								
0881	2177	402178	-	-	-	Port power supply control		R/W	WORD	0 : 15	Controls the power supplied to each port. Bit 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Port 8 7 6 5 - - - - 8 7 6 5 4 3 2 1 V2 V1		0: OFF 1: ON
1000	4096	404097	1000	4096	404097	Module identification information		R	STRING		Model (STRING)		NQ-MP8L NQ-EP4L
:	:	:	:	:	:								
1003	4099	404100	1003	4099	404100								
100C	4108	404109	100C	4108	404109	Module status		R	WORD	0	Diagnostic information	-	0: Diagnostic information not provided 1: Diagnostic information provided
										1	-	-	0
										2	-	-	0
										3	-	-	0
										4	-	-	0
										5	-	-	0
										6	-	-	0
										7	V2 voltage	Indicates the voltage value of the V2 power supply.	0: 18 VDC or higher 1: Lower than 18 VDC
										8	-	-	0
										9	V1 voltage	Indicates the voltage value of the V1 power supply.	0: 18 VDC or higher 1: Lower than 18 VDC
										10	Internal bus error	System error that occurs internally.	0: No error 1: Error
										11	-	-	0
										12	-	-	0
										13	-	-	0
										14	-	-	0
										15	-	-	0
1017	4119	404120	1017	4119	404120	Reserved		R	-		-		-
1020	4128	404129	1020	4128	404129	Watch dog actual time		R	UINT		When the watch dog is active, it operates as follows: < Output > When the setting time is [= 0 (ms)]: The watch dog timer is deactivated. The output is retained.		-
1120	4384	404385	1120	4384	404385	Watch dog setting time		R/W	UINT		When the setting time is [> 0 (ms)]: If no communication is made before the setting time elapses, the output is set to 0. < LED display > [BUS LED]: Lit in red		(Initial value: 500)
1131	4401	404402	1131	4401	404402	Modbus connection time-out time		R/W	UINT		Indicates the Modbus connection time-out time. (Unit: Seconds) If no communication is made before the setting time elapses, the connection is disconnected automatically. When the setting time is [0], the connection time-out is not monitored. When the Modbus connection time-out is active, the [BUS LED] blinks in green.		0 to 65535 (Initial value: 0)

7

Modbus/TCP Communication

7

Modbus/TCP Communication

Address						Item	Attribute	Data type	bit	Description		Value
NQ-MP8L			NQ-EP4L									
Relative		Absolute	Relative		Absolute							
HEX	DEC	DEC	HEX	DEC	DEC							
113C	4412	404413	113C	4412	404413	Modbus parameter reset	R/W	UINT		Registers 1120H and 1130 to 113BH are reset to their initial values in the following procedure: (1) "6C6FH ("LO")" is written in register 113CH. (2) At the same time as (1) or within 30 seconds of (1), "6164H ("AD")" is written in 113DH.		See the left column.
113D	4413	404414	113D	4413	404414			UINT		If the Modbus connection settings are not saved (113EH and 113FH), the values in the EEPROM are not changed.		
113E	4414	404415	113E	4414	404415	Modbus parameter save	R/W	UINT		The values of registers 1120H and 1130 to 113BH are saved into the EEPROM using the following procedure: (1) "7361H ("SA")" is written in register 113EH. (2) At the same time as (1) or within 30 seconds of (1), "7665H ("VE")" is written in 113FH.		See the left column.
113F	4415	404416	113F	4415	404416			UINT				
1150	4432	404433	1150	4432	404433	LED operation when V2 voltage drops	R/W	WORD		Indicates the behavior of the [PWR] LED when the V2 voltage drops.		Bit 0: 0: Red 1: Blinks in green
2400	9216	409217	2400	9216	409217	V1 voltage	R	UINT		Indicates the V1 voltage. (Unit: mV)		0: Lower than 18 V 18000 or higher: Voltage value
2401	9217	409218	2401	9217	409218	V2 voltage	R	UINT		Indicates the V2 voltage. (Unit: mV)		0: Lower than 18 V 18000 or higher: Voltage value
B000	45056	445057	B000	45056	445057	Parameter — Output reset after over-current detection (Pin 2)	R/W	WORD	0	Reserved		0
									1	Port 1 (C0)	< When pin 2 is set to digital output > Indicates the recovery method after an overcurrent is detected.	0: Automatic reset 1: Reset by output OFF
									2	Reserved		0
									3	Port 2 (C1)	-	0: Automatic reset 1: Reset by output OFF
									4	Reserved		0
									5	Port 3 (C2)	-	0: Automatic reset 1: Reset by output OFF
									6	Reserved		0
									7	Port 4 (C3)	-	0: Automatic reset 1: Reset by output OFF
									8 9 10 11 12 13 14 15	Reserved		0
B001	45057	445058	B001	45057	445058	Parameter — Digital I/O setting (Pin 2)	R/W	WORD	0	Reserved		0
									1	Port 1 (C0)	Indicates the function of pin 2.	0: Digital input 1: Digital output
									2	Reserved		0
									3	Port 2 (C1)	-	0: Digital input 1: Digital output
									4	Reserved		0
									5	Port 3 (C2)	-	0: Digital input 1: Digital output
									6	Reserved		0
									7	Port 4 (C3)	-	0: Digital input 1: Digital output
									8 9 10 11 12 13 14 15	Reserved		0

Address						Item	Attribute	Data type	bit	Description		Value
NQ-MP8L			NQ-EP4L									
Relative		Absolute	Relative		Absolute							
HEX	DEC	DEC	HEX	DEC	DEC							
B002	45058	445059	B002	45058	445059	Parameter	R/W	WORD	0	Operation mode	Specifies the function of pin 4. 📖"Operation mode and validation settings" (Page 4-13)	0: IO-Link (No validation) 1: IO-Link (Family validation) 2: IO-Link (Model validation) 3: IO-Link (Serial validation) 4: Digital input (Parameter access supported) 5 to 7: Reserved 8: Digital input
									1			
									2			
									3			
									4	Data storage mode	Indicates the data storage mode. 📖"Data storage function" (Page 4-14)	0: Always sync 1: Parameter fix 2: Parameter save 3: Data storage function deactivated
									5			
									6	Quick Start-Up	Indicates whether to use the Quick Start-Up function. 📖"Quick Start-Up" (Page 4-17)	0: Deactivate 1: Activate
									7	Reserved		0
									8	Cycle time	Indicates the cycle time for the process data. 📖"Cycle time" (Page 4-17)	00H: Automatic 10H to BFH: Manual
									9			
									10			
									11			
									12			
									13			
									14			
									15			
B003	45059	445060	B003	45059	445060		Port 1 (C0)	R/W	WORD	0	Revision	Indicates which IO-Link revision will be used for the operation.	0: Automatic selection 1: Use V1.0.
									1	Diagnostic information for invalid process data	Indicates whether to provide diagnostic information when the process data status is "Invalid."	0: Activate 1: Deactivate
									2	Diagnostic information notification level	Indicates whether to transfer IO-Link events from the NQ to the field bus. 📖"Diagnostic information notification level" (Page 4-17)	0: Transfer all 1: Transfer events other than notifications 2: Transfer events other than notifications and warnings 3: Transfer nothing
									3			
									4	Input process data mapping	Indicates whether to change the byte order of the process data. For example, when you use an EtherNet/IP master unit that processes data in little endian format to obtain 2-byte process data, selecting [16-bit conversion] eliminates the need for byte swapping on the master unit side. 📖"Process data setting" (Page 4-16)	0: No conversion 1: 16-bit conversion 2: 32-bit conversion 3: Convert all
									5			
									6	Output process data mapping		0: No conversion 1: 16-bit conversion 2: 32-bit conversion 3: Convert all
									7			
									8	Reserved		
									9			
									10			
									11			
									12			
									13			
									14			
									15			
B004	45060	445061	B004	45060	445061					Reserved		
B005	45061	445062	B005	45061	445062					Reserved		
B006	45062	445063	B006	45062	445063		R/W	UINT		Vendor ID		
B007	45063	445064	B007	45063	445064		R/W	DUINT		Device ID		
B008	45064	445065	B008	45064	445065							
B009	45065	445066	B009	45065	445066					Reserved		

7

Modbus/TCP Communication

Address						Item		Attribute	Data type	bit	Description		Value
NQ-MP8L			NQ-EP4L										
Relative		Absolute	Relative		Absolute								
HEX	DEC	DEC	HEX	DEC	DEC								
B00A	45066	445067	B00A	45066	445067	Parameter	Port 2 (C1)	R/W	-		Same as Port 1		
:	:	:	:	:	:								
B011	45073	445074	B011	45073	445074								
B012	45074	445075	B012	45074	445075		Port 3 (C2)						
:	:	:	:	:	:								
B019	45081	445082	B019	45081	445082								
B01A	45082	445083	B01A	45082	445083		Port 4 (C3)						
:	:	:	:	:	:								
B021	45089	445090	B021	45089	445090								
B022	45090	445091	-	-	-		Port 5 (C4)						
:	:	:	-	-	-								
B029	45097	445098	-	-	-								
B02A	45098	445099	-	-	-		Port 6 (C5)						
:	:	:	-	-	-								
B031	45105	445106	-	-	-								
B032	45106	445107	-	-	-		Port 7 (C6)						
:	:	:	-	-	-								
B039	45113	445114	-	-	-								
B03A	45114	445115	-	-	-		Port 8 (C7)						
:	:	:	-	-	-								
B041	45121	445122	-	-	-								
B042	45122	445123	-	-	-	V1 power supply control setting		R/W	WORD	0	Port 1 (Ch 0/1)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
										1			
										2	Reserved		
										3			
										4			
										5			
										6			
										7			
										8	Port 2 (Ch 2/3)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
										9			
										10	Reserved		
										11			
										12			
										13			
										14			
										15			
B043	45123	445124	-	-	-			R/W	WORD	0	Port 3 (Ch 4/5)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
										1			
										2	Reserved		
										3			
										4			
										5			
										6			
										7			
										8	Port 4 (Ch 6/7)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
										9			
										10	Reserved		
										11			
										12			
										13			
										14			
										15			

Address						Item	Attribute	Data type	bit	Description		Value
NQ-MP8L			NQ-EP4L									
Relative		Absolute	Relative		Absolute							
HEX	DEC	DEC	HEX	DEC	DEC							
B044	45124	445125	-	-	-	V1 power supply control setting	R/W	WORD	0	Port 5 (Ch 8)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
									1			
									2	Reserved		
									3			
									4			
									5			
									6			
									7			
									8	Port 6 (Ch 10)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
									9			
									10	Reserved		
									11			
									12			
									13			
									14			
									15			
B045	45125	445126	-	-	-		R/W	WORD	0	Port 7 (Ch 12)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
									1			
									2	Reserved		
									3			
									4			
									5			
									6			
									7			
									8	Port 8 (Ch 14)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
									9			
									10	Reserved		
									11			
									12			
									13			
									14			
									15			
B046	45126	445127	-	-	-							
B047	45127	445128	-	-	-							
B048	45128	445129	-	-	-	V2 power supply control setting	R/W	WORD	0	Port 5 (Ch 9)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
									1			
									2	Reserved		
									3			
									4			
									5			
									6			
									7			
									8	Port 6 (Ch 11)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
									9			
									10	Reserved		
									11			
									12			
									13			
									14			
									15			

7

Modbus/TCP Communication

Address						Item	Attribute	Data type	bit	Description		Value
NQ-MP8L			NQ-EP4L									
Relative		Absolute	Relative		Absolute							
HEX	DEC	DEC	HEX	DEC	DEC							
B049	45129	445130	-	-	-	V2 power supply control setting	R/W	WORD	0	Port 7 (Ch 13)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
									1			
									2	Reserved		
									3			
									4			
									5			
									6			
									7			
									8	Port 8 (Ch 15)	Controls the power supplied to each device.	0: Supply 24 VDC • 1: Switch based on process data (Page 4-18) 2: Off
									9			
									10	Reserved		
									11			
									12			
									13			
									14			
									15			

7

Modbus/TCP Communication

NQ Series User's Manual

NQ-EP4A

Address			Item		Attribute	Data type	bit	Description	Value
Relative		Absolute							
HEX	DEC	DEC							
0000	0	400001	Analog input value	Port 1 (C0)	R	-		Analog input value	-
0001	1	400002		Port 2 (C1)				Indicates an analog input value. The input data varies depending on the settings of [Operation mode] and [Input range].	
0002	2	400003		Port 3 (C2)					
0003	3	400004		Port 4 (C3)					
0004	4	400005	Diagnostic information	Port 1 (C0)	R	WORD	0	Cold junction compensation error	The measured temperature exceeded the measurement range by 1% or more or the setting is incorrect. In this case, the compensation is calculated by using the cold junction temperature of 25°C.	0: No error 1: Error
							1	Resistance temperature detector overcurrent	The resistance of the resistance temperature detector is lower than 5 Ω.	
							2	Upper limit exceeded	The measured value exceeds the specified upper limit. "Analog input data format" (Page 9-2)	
							3	V1 overcurrent	The current supplied to the analog device exceeds the specified value.	
							4	Disconnection	A wire disconnection (no signal) was detected. Note that in the voltage/current mode, disconnection detection is effective only in the following measurement ranges. Voltage: 1 to 5 V or 2 to 10 V Current: 4 to 20 mA	
							5	Overflow	The measured value greatly exceeded the specified upper limit. Note that the overflow detection is disabled in thermocouple and resistance temperature detector modes. "Analog input data format" (Page 9-2)	
							6	Underflow	The measured value is greatly below the specified lower limit. Note that the underflow detection is disabled in the thermocouple and resistance temperature detector modes. "Analog input data format" (Page 9-2)	
							7	Lower limit exceeded	The measured value is below the specified lower limit. "Analog input data format" (Page 9-2)	
				Port 2 (C1)			8	Same as Port 1 (C0)	-	-
							9			
							10			
							11			
							12			
							13			
							14			
							15			
0005	5	400006	Diagnostic information	Port 3 (C2)	R	WORD		Same as Port 1 (C0)	-	-
				Port 4 (C3)				Same as Port 1 (C0)	-	-
0006	6	400007	Scaling value	Port 1 (C0)	R	-		Scaling value	Scaled values are entered when the scaling function is valid.	-
0007	7	400008		Port 2 (C1)						
0008	8	400009		Port 3 (C2)						
0009	9	400010		Port 4 (C3)						

7

Modbus/TCP Communication

Address			Item	Attribute	Data type	bit	Description		Value
Relative HEX	Relative DEC	Absolute DEC							
000A	10	400011	Scaling function status	R	-	0	Port 1 (C0)	Turns ON when the scaling function is valid.	
						1	Port 2 (C1)		
						2	Port 3 (C2)		
						3	Port 4 (C3)		
						4	-		
						:	-		
						15	-		
000B	11	400012	Module status	R	WORD	0	Diagnostic information	-	0: Diagnostic information not provided 1: Diagnostic information provided
						1	-	-	
						2	-	-	
						3	-	-	
						4	-	-	
						5	-	-	
						6	-	-	
						7	-	-	
						8	-	-	
						9	V1 voltage	Indicates the voltage value of the V1 power supply.	0: 18 VDC or higher 1: Lower than 18 VDC
						10	-	-	
						11	-	-	
						12	-	-	
						13	-	-	
						14	-	-	
						15	-	-	
1000 : 100B	4096 : 4107	404097 : 404108	Module identification information	R	STRING		Model (STRING)		NQ-EP4A
100C	4108	404109	Module status	R	WORD	0	Diagnostic information	-	0: Diagnostic information not provided 1: Diagnostic information provided
						1	-	-	
						2	-	-	
						3	-	-	
						4	-	-	
						5	-	-	
						6	-	-	
						7	-	-	
						8	-	-	
						9	V1 voltage	Indicates the voltage value of the V1 power supply.	0: 18 VDC or higher 1: Lower than 18 VDC
						10	-	-	
						11	-	-	
						12	-	-	
						13	-	-	
						14	-	-	
						15	-	-	
1017	4119	404120	Reserved	R					
1020	4128	404129	Watch dog actual time	R	UINT		When the watch dog is active, it operates as follows: < Output > When the setting time is [= 0 (ms)]: The watch dog timer is deactivated. The output is retained.		-
1120	4384	404385	Watch dog setting time	R/W	UINT		When the setting time is [> 0 (ms)]: If no communication is made before the setting time elapses, the output is set to 0. < LED display > [BUS LED]: Lit in red		(Initial value: 500)
1130	4400	404401	Reserved						
1131	4401	404402	Modbus connection time-out time	R/W	UINT		Indicates the Modbus connection time-out time. (Unit: Seconds) If no communication is made before the setting time elapses, the connection is disconnected automatically. When the setting time is [0], the connection time-out is not monitored. When the Modbus connection time-out is active, the [BUS LED] blinks in green.		0 to 65535 (Initial value: 0)
113C	4412	404413	Modbus parameter reset	R/W	UINT		Registers 1120H and 1130 to 113BH are reset to their initial values in the following procedure: (1) "6C6FH ("LO")" is written in register 113CH. (2) At the same time as (1) or within 30 seconds of (1), "6164H ("AD")" is written in 113DH. If the Modbus connection settings are not saved (113EH and 113FH), the values in the EEPROM are not changed.		See the left column.
113D	4413	404414			UINT				
113E	4414	404415	Modbus parameter save	R/W	UINT		The values of registers 1120H and 1130 to 113BH are saved into the EEPROM using the following procedure: (1) "7361H ("SA")" is written in register 113EH. (2) At the same time as (1) or within 30 seconds of (1), "7665H ("VE")" is written in 113FH.		See the left column.
113F	4415	404416			UINT				

Address			Item	Attribute	Data type	bit	Description		Value
Relative		Absolute							
HEX	DEC	DEC							
1140	4416	404417	Reserved						
1141	4417	404418	Reserved						
2400	9216	409217	V1 voltage	R	UINT		Indicates the V1 voltage. (Unit: mV)		0: Lower than 18 V 18000 or higher: Voltage value
2401	9217	409218	V2 voltage	R	UINT		Indicates the V2 voltage. (Unit: mV)		0: Lower than 18 V 18000 or higher: Voltage value
8000	32768	432769	Reserved						
:	:	:							
8FFF	36863	436864							
9000	36864	436865	Reserved						
:	:	:							
9FFF	40959	440960							
A000	40960	440961	Reserved						
:	:	:							
AFFF	45055	445056							
B000	45056	445057	Parameter	Port 1	R/W	WORD	0	Power supply noise filter	Sets the power supply noise filter.	0: Off • 1: 50 Hz 2: 60 Hz
							2	Temperature unit	Indicates the unit of temperature.	0: °C• 1: °F* * The actual temperature divided by 2 is stored in the analog input value.
							3	Reserved	-	0
							4	Operation mode	Indicates the type of the device to be connected to the port.	0: Thermocouple • 1: Voltage 2: Current 3: Reserved 4: Resistance temperature detector
							5			
							6			
							7			
							8	Diagnostic information notification setting	Indicates whether to activate or deactivate the diagnostic information.	0: Activate diagnostic information 1: Deactivate diagnostic information
							9	Deactivate port	Deactivates a port. When a port is deactivated, the IO port operation indicator is unlit even when no device is connected to the port.	0: Activate channel 1: Deactivate channel
							10	Data display	-	0: Normal • 1: NE43 format 2: Extended range
							11			
							12	Filter setting	Sets the analog input filter.	0: Filter (Medium speed) • 1: Filter (Low speed) 2: Filter (High speed) 3: No filter
							13			
							14			
							15			
B001	45057	445058			R/W	WORD	0	Voltage range	Indicates the input range.	0: −10 to 10 V 1: 0 to 10 V 2: 2 to 10 V 3: 0 to 5 V • 4: 1 to 5 V 5: −1 to 1 V 6: −500 to 500 mV 7: −100 to 100 mV 8: −50 to 50 mV
							1			
							2			
							3			
							4	Voltage connection type	Indicates the type of wiring.	0: Differential 1: Single end • 2: Differential (No grounding)
							5			
							6	Current range	Indicates the input range.	0: 0 to 20 mA • 1: 4 to 20 mA 2: −20 to 20 mA
							7			
							8	Current connection type	Indicates the type of wiring.	0: Differential 1: Single end • 2: Differential (No grounding)
							9			
							10	Reserved	-	-
							11			
							12	Reserved	-	-
							13			
							14	RTD connection type	Indicates the type of wiring.	0: 2-wire type 1: 3-wire type • 2: 4-wire type
							15			

7

Modbus/TCP Communication

Address			Item	Attribute	Data type	bit	Description		Value
Relative		Absolute							
HEX	DEC	DEC							
B002	45058	445059	Parameter	Port 1	R/W	WORD	0	RTD type	Indicates the type of RTD.	0: Pt100, −200 to 850°C • 1: Pt100, −200 to 150°C 2: Ni100, −60 to 250°C 3: Ni100, −60 to 150°C 4: Pt200, −200 to 850°C 5: Pt200, −200 to 150°C 6: Pt500, −200 to 850°C 7: Pt500, −200 to 150°C 8: Pt1000, −200 to 850°C 9: Pt1000, −200 to 150°C 10: Ni1000, −60 to 250°C 11: Ni1000, −60 to 150°C
							1			
							2			
							3			
							4			
							5			
							6			
							7			
							8	Thermocouple cold junction compensation setting	Indicates the method of cold junction compensation when a thermocouple is used.	0: Conn. to Pt1000 (Use OP-88459) 1: Conn. to Pt100 2: Use port 1 cold junction compensation 3: Reserved 4: No conn. (25°C fixed) •
							9			
							10			
							11			
							12	Thermocouple type	Indicates the type of thermocouple.	0: Type K, −270 to 1370°C • 1: Type B, 100 to 1820°C 2: Type E, −270 to 1000°C 3: Type J, −210 to 1200°C 4: Type N, −270 to 1300°C 5: Type R, −50 to 1768°C 6: Type S, −50 to 1768°C 7: Type T, −270 to 400°C 8: Type C, 0 to 2315°C 9: Type G, 0 to 2315°C
							13			
							14			
							15			
B003	45059	445060		Port 2	R/W	WORD				
B004	45060	445061								
B005	45061	445062								
B006	45062	445063		Port 3	R/W	WORD		Same as Port 1		
B007	45063	445064								
B008	45064	445065								
B009	45065	445066		Port 4	R/W	WORD				
B00A	45066	445067								
B00B	45067	445068								
B00C	45068	445069	Scaling setting	Port 1	R/W	WORD		Scaling function enabled setting	Indicates whether to use the scaling function.	0: Deactivate • 1: Activate
B00D	45069	445070				INT		Pre-scaling A/D conversion data 1	Indicates the A/D conversion data before scaling conversion.	−32768 to 32767
B00E	45070	445071						Pre-scaling A/D conversion data 2		
B00F	45071	445072						Scaled data 1	Indicates the value after scaling.	−32768 to 32767
B010	45072	445073						Scaled data 2		
B011	45073	445074		Port 2	R/W	WORD				
B012	45074	445075				INT				
B013	45075	445076								
B014	45076	445077								
B015	45077	445078								
B016	45078	445079		Port 3	R/W	WORD		Same as Port 1		
B017	45079	445080				INT				
B018	45080	445081								
B019	45081	445082								
B01A	45082	445083								
B01B	45083	445084		Port 4	R/W	WORD				
B01C	45084	445085				INT				
B01D	45085	445086								
B01E	45086	445087								
B01F	45087	445088								

NQ Series User's Manual

8

PROFINET Communication

This chapter describes how to configure the NQ-MP8L settings using NQ Monitor.

NQ-MP8L PROFINET Communication Function

Overview

The NQ-MP8L operates as a PROFINET IO device. You can use cyclic communication to obtain the output and measured values of devices connected to the NQ Series and to monitor the error status of the NQ Series. Also, you can use acyclic communication to read and write the settings of the NQ Series and the devices connected to the NQ Series.

Reading and writing of various parameters
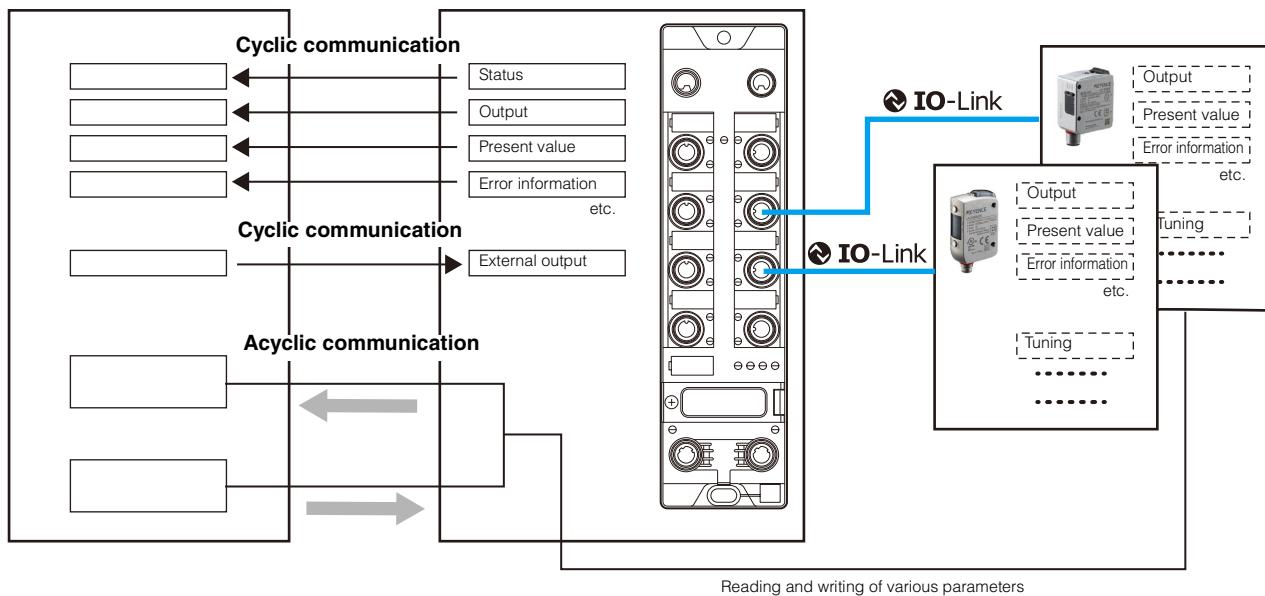
Point   **PROFINET is only supported by the NQ-MP8L. It is not supported by the NQ-EP4L and NQ-EP4A.**

NQ Series PROFINET Communication Specifications

Item		NQ-MP8L
Ethernet	Communication speed	100 Mbps (100BASE-TX)
	Transmission media	STP cable or Category 5 or higher UTP cable
	Max. cable length	100 m (between nodes)
PROFINET	Supported functions	Cyclic communication (data I/O communication) Acyclic communication (record data communication)
	FSU (Fast Start-UP)	Not supported
	MRP (Media Redundancy Protocol)	Supported
	Number of connectable IO controllers	1
	Update time	2 to 512 ms
	GSDML version	V2.35
	Conformance class	Compliant with Conformance Class B
	Conformance test version	Compliant with V2.35
	Applicable protocols	LLDP, DCP

What Can Be Performed with PROFINET Communication

Item	NQ Sensor Monitor	PROFINET configuration software	Cyclic communication	Acyclic communication
Set the NQ Series port.	●	●	-	●
Control the power supplied to each port.	●	●	●	●
Read the NQ Series error status.	-	-	●	●
When connected to an IO-Link device				
Read control output (ON/OFF).	●	-	●	●
Read the present value (measured value, etc.).	●	-	●	●
Read setting values.	-	-	-	●
Change (write) setting values.	-	-	-	●
Change (write) parameters.	-	-	●	●
Perform external input.	-	-	*1	●
Read the error status.	●	-	●	●
When a general-purpose I/O device is connected				
Read digital input (ON/OFF).	-	-	●	●
Perform digital output (ON/OFF).	-	-	●	●
Read the present value (measured value, etc.).	-	-	-	-
Read the error status.	-	-	-	-

*1   Only for devices that have input process data. KEYENCE IO-Link sensors are not supported.

Point **For the NQ-MP8L, set the functions of pin 2 and pin 4 for each port. Changing the function on the pins makes it possible to switch between IO-Link communication and digital I/O. For details, refer to "Port Operation Modes" (Page 2-6).**

8-2 Communication Settings

To connect the NQ Series to a PROFINET IO controller, you have to configure the settings that are listed below. For information such as detailed setting methods on the IO controller, refer to the manual of the IO Controller.

1 GSDML file registration

The function of NQ-MP8L in PROFINET IO is defined by the GSDML file. To setup the NQ-MP8L for the first time, install the GSDML file into the PROFINET IO controller configuration software.

2 Add the NQ Series to the PROFINET IO system.

Reading the GSDML file with the configuration software adds the NQ-MP8L to the hardware catalog of the configuration software. From the hardware catalog, select the NQ-MP8L to add it to the PROFINET IO system.

3 Enter the IP address.

Enter the NQ Series IP address that has been determined in advance.

4 Enter the device name.

Set the device name of the NQ Series. The initial value is: keyence-nq-mp8l

5 Assign the settings to a slot.

Assign the settings to a slot according to the IO-Link device connected to the NQ-MP8L and according to the communication details.

"Slot Assignment" (Page 8-6)

6 Port setting

Set the NQ Series port.

"8-3 Parameter Settings" (Page8-5)

7 Device process data setting

Set the process data of the IO-Link device to connect to the NQ Series.

"4-7 Device Settings" (Page4-22)

8-3 Parameter Settings

Use the network configuration software to set the parameters.

Slot	Type	Item	Description
1	basic	Manual reset after overcurr. Ch1	< When pin 2 is set to digital output > Indicates the recovery method after an overcurrent is detected.
		Manual reset after overcurr. Ch3	(Same as Port 1)
		Manual reset after overcurr. Ch5	
		Manual reset after overcurr. Ch7	
		Activate output Ch1	Indicates the function of pin 2.
		Activate output Ch3	(Same as Port 1)
		Activate output Ch5	
		Activate output Ch7	
2 to 9	-	Operation mode	Indicates the function of pin 4. 📖"Operation mode and validation settings" (Page 4-13)
		Data storage mode	Indicates the data storage mode. 📖"Data storage function" (Page 4-14)
		Cycle time	Indicates the cycle time for the process data. 📖"Cycle time" (Page 4-17)
		Revision	Indicates which IO-Link revision will be used for the operation.
		Activate Quick Start-Up	Indicates whether to use the Quick Start-Up function. 📖"Quick Start-Up" (Page 4-17)
		Process input data invalid	Indicates whether to deactivate diagnostic information when the process data status is "Invalid."
		Deactivate diagnostics	Indicates whether to transfer IO-Link events from the NQ to the field bus. 📖"Diagnostic information notification level" (Page 4-17)
		Vendor ID	Indicates [Vendor ID] and [Device ID] used for the validation function.
		Device ID	
12	V1/V2 control	V1 Pin1 C0 (Ch0/1)	Controls the V1 power supplied to each device.
		V1 Pin1 C1 (Ch2/3)	
		V1 Pin1 C2 (Ch4/5)	
		V1 Pin1 C3 (Ch6/7)	
		V1 Pin1 C4 (Ch8)	
		V2 Pin2 C4 (Ch9)	Controls the V2 power supplied to each device.
		V1 Pin1 C5 (Ch10)	Controls the V1 power supplied to each device.
		V2 Pin2 C5 (Ch11)	Controls the V2 power supplied to each device.
		V1 Pin1 C6 (Ch12)	Controls the V1 power supplied to each device.
		V2 Pin2 C6 (Ch13)	Controls the V2 power supplied to each device.
		V1 Pin1 C7 (Ch14)	Controls the V1 power supplied to each device.
		V2 Pin2 C7 (Ch15)	Controls the V2 power supplied to each device.

8

PROFINET Communication

8-4 Cyclic Communication

Slot Assignment

The NQ-MP8L is treated as a modular slave in the PROFINET IO system, and virtual slots are assigned as shown below.

By default, only slots 0 and 1 (Basic) are assigned.

If necessary, assign settings to slots 2 to 13 from the hardware catalog of the configuration software.

Slot	Assigned module	Description		Size (bytes)		Initial setting	See page
				IN	OUT		
0	keyence-nq-mp8l			-	-	● (fixed)	-
	X1	PROFINET parameter setting					
	X1 P1	Ethernet port parameter setting					
	X1 P2						
1	Basic	Input and input status of each port		4	2	● (fixed)	Page 8-7
2	Port configuration generic-subordinate module	IO-Link device process data	Port 1	Varies depending on the module to be assigned			Page 8-7
3			Port 2				
4			Port 3				
5			Port 4				
6			Port 5				
7			Port 6				
8			Port 7				
9			Port 8				
10	Diagnostics	Diagnostic information		20	0		Page 8-8
11	IO-Link Events	IO-Link event		64	0		Page 8-9
12	V1/V2 control	Port power supply control		0	2		Page 8-9
13	Module status	Module status		2	0		Page 8-10

8

PROFINET Communication

Slot 1: Basic   8-7

■ Input

Offset (words)	Item	Attribute	Data type	bit	Description	Value
0	Port inputs	R	WORD	0 : 15	Indicates the input status of each port. Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Port: 8 7 6 5 4 3 2 1 Pin: - 4 - 4 - 4 - 4 2 4 2 4 2 4 2 4	0: OFF 1: ON
1	Process data status of the IO-Link device	R	WORD	0 : 15	Turns ON when the process data is valid. The process data is invalid in the following cases: • The sensor supply voltage is outside of the allowable range. • The operation mode of the port is set to [Digital input]. • No IO-Link device is connected. • No process data has been input from the connected device. • The device does not respond to the output process data. • The device outputs "process input data invalid." (For example, the value measured by the sensor is out of the operating range.) Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Port: - 8 - 7 - 6 - 5 - 4 - 3 - 2 - 1	0: Invalid/ Deactivated 1: Valid/Active

■ Output

Offset (words)	Item	Attribute	Data type	bit	Description	Value
0	Port outputs	R/W	WORD	0 : 15	Indicates the output to each port. Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Port: 4 3 2 1 Pin: 2 - 2 - 2 - 2 -	0: OFF 1: ON

Slots 2 to 9: Port configuration generic

This is the process data of each IO-Link device. The size varies depending on the IO-Link device.

This section shows examples of KEYENCE IO-Link sensors.

Name	Series name	Size	
		IN	OUT
Digital Fiberoptic Sensor	FS-N40	2 word	0
Digital CMOS Laser Sensor	LR-X	2 word	0
All-Purpose Laser Sensor	LR-T	1 word	0
Self-contained CMOS Laser Sensor	LR-ZH	1 word	0
Self-Contained Full-Spectrum Sensor	LR-W	1 word	0
Pattern Matching Sensor	AI	3 byte	1 byte
Clamp-on Flow Meter	FD-R	2 word	0
Clamp-on Flow Sensor	FD-Q	1 word	0
Clamp-on Gas Flow Meter	FD-G	4 word	0
Clamp-on Flow Sensor	FD-X	2 word	0
Clamp-on Flow Sensor	FD-H	12 word	0
Standalone Display Unit	FI-1000	12 word	0
Clamp-on Temperature Sensor	FI-T	2 word	0
Heavy Duty Type Digital Pressure Sensor	GP-MT	3 word	0
Sensing Guide Pulse Level Sensor	FL	3 word	0

8

PROFINET Communication

Slot 10: Diagnostics

■ Input

Offset (words)	Item		Attribute	Data type	bit	Description		Value
0		Power supply overcurrent	R	WORD	0 : 15	Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port: 8 7 6 5 - - - - 8 7 6 5 4 3 2 1 / √2 √1		0: No overcurrent 1: Overcurrent detected
1		Digital output overcurrent	R	WORD	0 : 15	Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 / Port: 4 3 2 1 / Pin: 2 - 2 - 2 - 2 -		0: No overcurrent 1: Overcurrent detected
2	Diagnostic information	Port 1 (C0)	R	WORD	0	-	-	0
					1	-	-	
					2	Device undetected/ mismatched	• No device is connected. • The result of the device verification function was "mismatched."	0: No error 1: Error
					3	Data storage error	• An IO-Link V1.0 device is connected. • The connected device is not the one stored in the buffer. • Buffer overflow occurred. • The parameter lock function of the IO-Link device is active.	
					4	Hardware error	There is a failure or a malfunction in the hardware.	
					5	Process data invalid	• The device cannot perform measurements. • The result of the device verification function was "mismatched."	
					6	Undefined event	An event that is not defined in the IO-Link specifications occurred.	
					7	Maintenance event	An event that requires maintenance in the IO-Link specifications occurred.	
					8	Parameter error	The device issued a parameter error. (Such as a loss of parameters or uninitialized status)	0: No error 1: Error
					9	Temperature error	The device issued temperature diagnostic information.	
					10	Measured value lower limit exceeded	The measured value is below the device's measurement range or the set lower limit.	
					11	Measured value upper limit exceeded	The measured value exceeds the device's measurement range or the set upper limit.	
					12	Insufficient power voltage	The power voltage of the device is below the specified value.	
					13	Power supply overvoltage	The power voltage of the device exceeds the specified value.	
					14	Overload	The device has detected an overload.	
					15	General error	The device has an error. (Device status 4 specified in the IO-Link specifications) For details about the error, check the event code.	
3		Port 2 (C1)	R	WORD		Same as Port 1 (C0)		-
4		Port 3 (C2)						
5		Port 4 (C3)						
6		Port 5 (C4)						
7		Port 6 (C5)						
8		Port 7 (C6)						
9		Port 8 (C7)						

■ Output

None

Slot 11: IO-Link Events

■ Input

Offset (words)	Item		Attribute	Data type	bit	Description		Value
0	Diagnostic information (IO-Link event)	1st event	R	WORD	0	Event classification code (For details, refer to the IO-Link specifications.)	Instance	0: Unknown 1 to 3: Reserved 4: Application 5 to 7: Reserved
					1			
					2			
					3		Source	0: Device 1: Master
					4		Type	0: Reserved 1: Notification 2: Warning 3: Error
					5			
					6		Mode	0: Reserved 1: Event single shot 2: Event disappears 3: Event appears
					7			
					8	Port number of the event	Port number of the port where the event has occurred.	1 to 8 or 1 to 4
					9			
					10			
					11			
					12			
					13			
					14			
					15			
1			R	UINT		Event code	Event code for the event. For details, refer to the manual of the IO-Link device.	-
:		:	:	:	:	:	:	:
30		16th event	R	WORD		Event classification code	Same as the 1st event	-
						Port number of the event		
31			R	UINT		Event code		

■ Output

None

Slot 12: VAUX control

■ Input

None

■ Output

Offset (words)	Item	Attribute	Data type	bit	Description	Value
0	Port power supply control	R/W	WORD	0	Controls the power supplied to each port. Bit: 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Port: 8 7 6 5 - - - - 8 7 6 5 4 3 2 1 V2 V1	0: OFF 1: ON
				:		
				15		

Slot 13: Module status

■ Input

Offset (words)	Item	Attribute	Data type	bit	Description		Value
0	Module status	R	WORD	0	Diagnostic information	-	0: Diagnostic information not provided 1: Diagnostic information provided
				1	-	-	0
				2	-	-	0
				3	-	-	0
				4	-	-	0
				5	-	-	0
				6	-	-	0
				7	V2 voltage	-	0: 18 VDC or higher 1: Lower than 18 VDC
				8	-	-	0
				9	V1 voltage	-	0: 18 VDC or higher 1: Lower than 18 VDC
				10	-	-	0
				11	-	-	0
				12	-	-	0
				13	-	-	0
				14	-	-	0
				15	-	-	0

■ Output

None

Acyclic Communication

Device User Data

Index		Item	Description	Attribute	Data type	Description
HEX	**DEC**					
0001	1	Module parameters	Module parameters (slot 0)	R/W	WORD	
0002	2	Module designation	Module model	R	STRING	NQ-MP8L
0003	3	Reserved				
0004	4	Vendor ID	Vendor ID	R	WORD	509 (1FD$_H$)
0005	5	Reserved				
0006	6	Module type	Module type	R	STRING	NQ-MP8L
0007	7	Device-ID	Device ID	R	WORD	2502 (9C6$_H$)
0008	8	Reserved				
:	:					
0017	23					
0018	24	Module diagnostics	Diagnostic information (slot 0)	R	WORD	-
0019	25	Reserved				
:	:					
AFEF	45039					
AFF0	45040	I&M0-functions	Identification and maintenance services	R		Vendor ID: 509 (1FD$_H$) Order ID: 2502 (9C6$_H$) Serial Number Hardware Revision Software Revision
AFF1	45041	I&M1-functions	Function and usage location information	R/W	STRING [54]	-
AFF2	45042	I&M2-functions	Installation date and time	R/W	STRING [16]	-
AFF3	45043	I&M3-functions	Comments	R/W	STRING [54]	-
AFF4	45044	Reserved				
:	:					
AFFF	45055					

PROFINET Diagnostic Information

The diagnostic information issued by the NU-MP8L is shown below. For details, refer to 📖 "Slot 10: Diagnostics" (Page 8-8).

Classification	Slot	Channel	Error code	Description	
				Port	
Module diagnostic information	0	0	0002	-	V1 voltage drop
		1	0002	-	V2 voltage drop
I/O diagnostic information	1	1	0001	Port 1	Digital output overcurrent
		3	0001	Port 2	
		5	0001	Port 3	
		7	0001	Port 4	
Power supply diagnostic information	1	0	01D0	Port 1	V1 power supply overcurrent (pin 1)
			01D1	Port 2	
			01D2	Port 3	
			01D3	Port 4	
			01E8	Port 5	
			01EA	Port 6	
			01EC	Port 7	
			01EE	Port 8	
			01F9	Port 5	V2 power supply overcurrent (pin 2)
			01FB	Port 6	
			01FD	Port 7	
			01FF	Port 8	
IO-Link diagnostic information[*1]	2	0	0002	Port 1	Insufficient power voltage
			0003		Power supply overvoltage
			0004		Overload
			0005		Temperature error
			0006		Device undetected/mismatched
			0007		Measured value upper limit exceeded
			0008		Measured value lower limit exceeded
			0009		Data storage error
					Process data invalid
					Maintenance event
					Undefined event
			0010		Parameter error
			0015		Hardware error
	3	2	(Same as Port 1)	Port 2	(Same as Port 1)
	4	4		Port 3	
	5	6		Port 4	
	6	8		Port 5	
	7	10		Port 6	
	8	12		Port 7	
	9	14		Port 8	

*1 The conditions for the generation of diagnostic information and the presence or absence of items depend on the IO-Link device.

8 PROFINET Communication

IO-Link Function Blocks

IOL_CALL is defined by the IO-Link specifications, "IO-Link Integration Part 1- Technical Specification for PROFIBUS and PROFINET."

✎ Point	**The implementation of IO-Link function blocks may vary slightly from one PLC manufacturer to another.**

Input Variables

Variable name	Data type	Description
REQ	BOOL	The command is executed when this variable becomes true.
ID	DWORD	Specifies the ID of the IO-Link master module. <Step 7 Classic> Start address of the input data of the IO-Link master module < TIA Portal + old CPUs such as CPU 315 > Start address of the input data of the IO-Link master module < TIA Portal + recent CPUs such as CPU 1511 > HW identifier of slot 1 (the Basic slot)
INDEX_CAP	INT	Function block instance: 247 to 255
RD_WR	BOOL	0: Read 1: Write
ENTITY_PORT	INT	IO-Link port number to access
FI_INDEX	INT	65098 (fixed value) This is the IO-Link CALL function index. (This is not displayed by the PLC.)
IOL_INDEX	INT	These variables are the index and sub-index of the IO-Link parameter to read or write. For details on the parameters, see the instruction manual of each IO-Link device.
IOL_SUBINDEX	INT	
LEN	INT	This is the size of the data to read or write. (This is not required for Siemens PLCs.)
RECORD_IOL_DATA	BYTE array	This is the data array to read data into or the source data array to read data from (the size varies depending on the PLC).

Output Variables

Variable name	Data type	Description
DONE_VALID	BOOL	Normal completion.
BUSY	BOOL	Execution in progress.
ERROR	BOOL	An error has occurred.
STATUS	DWORD	This is the acyclic communication error status (refer to the table under "STATUS").
IOL_STATUS	DWORD	This is an error message defined in "IO-Link Integration Part 1 - Technical Specification for PROFIBUS and PROFINET" and "IO-Link Interface and System."
LEN	INT	This is the length of the data to read.

■STATUS

Indicates the error that occurred during PROFINET acyclic communication.

Status code (HEX)	Name	Description
FF000000	TIMEOUT	Internal error that occurred during communication with the IO-Link master
00FFFF00	INVALID_HANDLE	
00FFFE00	HANDLE_OUT_OF_BUFFERS	
00FFFD00	HANDLE_DESTINATION_UNAVAILABLE	
00FFFC00	HANDLE_UNKNOWN	
00FFFB00	HANDLE_METHOD_INVALID	
xx80A0xx	MASTER_READ_ERROR	Reading error
xx80A1xx	MASTER_WRITE_ERROR	Writing error
xx80A2xx	MASTER_MODULE_FAILURE	IO-Link master error
xx80A6xx	MASTER_NO_DATA	No received data
xx80A7xx	MASTER_BUSY	The IO-Link master is busy.
xx80A9xx	MASTER_FEATURE_NOT_SUPPORTED	The IO-Link master does not support the function (IOL_CALL).
xx80AAxx	MASTER_RESOURCE_UNAVAILABLE	The IO-Link master cannot be used.
xx80B0xx	ACCESS_INVALID_INDEX	• Invalid index • Invalid INDEX_CAP
xx80B1xx	ACCESS_WRITE_LENGTH_ERROR	The size of the written data is not supported.
xx80B2xx	ACCESS_INVALID_DESTINATION	Invalid slot
xx80B3xx	ACCESS_TYPE_CONFLICT	Invalid IOL_CALL
xx80B5xx	ACCESS_STATE_CONFLICT	IOL_CALL procedure error
xx80B6xx	ACCESS_DENIED	The IO-Link master cannot be accessed.
xx80C2xx	READ_BUSY	IO-Link master is busy or is waiting for a response from an IO-Link device.
xx80C3xx	RESOURCE_UNAVAILABLE	
xx8901xx	INPUT_LEN_TOO_SHORT	The stored data is larger than the length specified with "LEN".

■IOL_STATUS

Indicates the error that occurred during IO-Link acyclic communication.

Byte3	Byte2	Byte1	Byte0
Error code		Error type	

Error code	Name	Description
0000	No error	No error
7000	IOL_CALL conflict	Unexpected write request during read request
7001	Wrong IOL_CALL	Decoding error
7002	Port blocked	The specified port is occupied by another task.
8000	Timeout	Timeout. The IO-Link master or the device is busy.
8001	Wrong index	Index error. 32767 or 65535 has been specified.
8002	Wrong port address	The specified port number is invalid.
8003	Wrong port function	The specified port function is invalid.

Error type	Name	Description
1000	COM_ERR	Communication error (Example: The specified port is in digital input mode.)
1100	I_SERVICE_TIMEOUT	Communication timeout
5600	M_ISDU_CHECKSUM	It is not possible to access the device due to a checksum error.
5700	M_ISDU_ILLEGAL	The device cannot respond to requests from the IO-Link master.
8000	APP_DEV	Application error within the device
8011	IDX_NOTAVAIL	The specified index is invalid.
8012	SUBIDX_NOTAVAIL	The specified sub-index is invalid.
8020	SERV_NOTAVAIL	The service is temporarily invalid.
8021	SERV_NOTAVAIL_LOCCTRL	The service is temporarily invalid because the device is busy (example: teaching or setting operations are being performed on the device).
8022	SERV_NOTAVAIL_DEVCTRL	The service is temporarily invalid because the device is busy (example: teaching or setting operations are being performed on the PLC or DTM).
8023	IDX_NOT_WRITEABLE	Access invalid; the specified index is write-protected.
8030	PAR_VALOUTOFRNG	Parameter value out of range
8031	PAR_VALGTLIM	The parameter value exceeds the upper limit.
8032	PAR_VALLTLIM	The parameter value is lower than the lower limit.
8033	VAL_LENOVRRUN	The written data length and the data length defined by the parameters do not match.
8034	VAL_LENUNDRUN	
8035	FUNC_NOTAVAIL	The function cannot be used on the device.
8036	FUNC_UNAVAILTEMP	The function temporarily cannot be used on the device.
8040	PARA_SETINVALID	Invalid parameter (inconsistency with other parameters on device)
8041	PARA_SETINCONSIST	Parameter inconsistency
8082	APP_DEVNOTRDY	Application preparation not complete; device busy
8100	UNSPECIFIC	Vendor-specific error (Check the instruction manual of the IO-Link device.)
8101 to 8FFF	VENDOR_SPECIFIC	

8 PROFINET Communication

9

Appendix

This appendix explains supplemental information on the parameters and troubleshooting.

Analog input data format

■ Voltage: Normal form

Measurement range	Measured value	Process data Present value DEC	Process data Present value HEX	Diagnostic information	Conversion formula from the "present value" of process data to a measured value
−10 to 10 V	> 10.100 V	32767	7FFF	Upper limit exceeded ON	—
	< 10.050 V			Upper limit exceeded OFF	
	10.000V			None	Present value (DEC) $\times$ 3.052 $\times$ 10^{-4} [V]
	0.000V	0	0000		
	-10.000V				
	> −10.050 V	-32768	8000	Lower limit exceeded OFF	—
	< −10.100 V			Lower limit exceeded ON	
0 to 10 V	> 10.100 V	32767	7FFF	Upper limit exceeded ON	—
	< 10.050 V			Upper limit exceeded OFF	
	10.000V			None	Present value (DEC) $\times$ 3.052 $\times$ 10^{-4} [V]
	0.000V	0	0000		
	> −0.050 V			Lower limit exceeded OFF	—
	< −0.100 V			Lower limit exceeded ON	
2 to 10 V	> 10.100 V	32767	7FFF	Upper limit exceeded ON	—
	< 10.050 V			Upper limit exceeded OFF	
	10.000V			None	Present value (DEC) $\times$ 2.441 $\times$ 10^{-4} +2 [V]
	2.000V				
	> 1.950 V	0	0000	Lower limit exceeded OFF	—
	< 1.900 V			Lower limit exceeded OFF	
	> 1.500 V			Disconnection detection OFF	
	< 1.450 V			Disconnection detection ON	
0 to 5 V	> 5.100 V	32767	7FFF	Upper limit exceeded ON	—
	< 5.050 V			Upper limit exceeded OFF	
	5.000 V			None	Present value (DEC) $\times$ 1.526 $\times$ 10^{-4} [V]
	0.000V				
	> −0.050 V	0	0000	Lower limit exceeded OFF	—
	< −0.100 V			Lower limit exceeded ON	
1 to 5 V	> 5.100 V	32767	7FFF	Upper limit exceeded ON	—
	< 5.010 V			Upper limit exceeded OFF	
	5.000 V			None	Present value (DEC) $\times$ 1.2207 $\times$ 10^{-4} +1 [V]
	1.000V				
	> 0.950 V	0	0000	Lower limit exceeded OFF	—
	< 0.900 V			Lower limit exceeded OFF	
	> 0.750 V			Disconnection detection OFF	
	< 0.700 V			Disconnection detection ON	
−1 to 1 V	> 1.0100 V	32767	7FFF	Upper limit exceeded ON	—
	< 1.0050 V			Upper limit exceeded OFF	
	1.0000V			None	Present value (DEC) $\times$ 3.05185 $\times$ 10^{-5} [V]
	0.0000V	0	0000		
	-1.0000V				
	> −1.0050 V	-32768	8000	Lower limit exceeded OFF	—
	< −1.0100 V			Lower limit exceeded ON	
−500 to 500 mV	> 505.0 mV	32767	7FFF	Upper limit exceeded ON	—
	< 502.5 mV			Upper limit exceeded OFF	
	500.0 mV			None	Present value (DEC) $\times$ 1.5259 $\times$ 10^{-2} [mV]
	0.0mV	0	0000		
	-500.0 mV				
	> −502.5 mV	-32768	8000	Lower limit exceeded OFF	—
	< −505.0 mV			Lower limit exceeded ON	
−100 to 100 mV	> 101.0 mV	32767	7FFF	Upper limit exceeded ON	—
	< 100.5 mV			Upper limit exceeded OFF	
	100.0mV			None	Present value (DEC) $\times$ 3.0519 $\times$ 10^{-3} [mV]
	0.0mV	0	0000		
	-100.0mV				
	> −100.5 mV	-32768	8000	Lower limit exceeded OFF	—
	< −101.0 mV			Lower limit exceeded ON	

Measurement range	Measured value	Process data			Conversion formula from the "present value" of process data to a measured value
		Present value		Diagnostic information	
		DEC	HEX		
–50 to 50 mV	> 50.50 mV	32767	7FFF	Upper limit exceeded ON	—
	< 50.30 mV			Upper limit exceeded OFF	
	50.00 mV			None	Present value (DEC) $\times$ 1.526 $\times$ 10^{-3} [mV]
	0.00mV	0	0000		
	-50.00 mV				
	> –50.30 mV	-32768	8000	Lower limit exceeded OFF	—
	< –50.50 mV			Lower limit exceeded ON	

■ Voltage: Extended range

Measurement range	Measured value	Process data			Conversion formula from the "present value" of process data to a measured value
		Present value		Diagnostic information	
		DEC	HEX		
−10 to 10 V	11.851V	32767	7FFF		$\text{Present value (DEC)} \times 3.617 \times 10^{-4} \text{ [V]}$
	> 11.760 V	32513	7F01	Upper limit exceeded ON	
	< 11.600 V	32071	7D47	Upper limit exceeded OFF	
	10.000V	27648	6C00	None	
	0.000V	0	0000		
	-10.000V	-27648	9400		
	> −11.600 V	-32071	82B9	Lower limit exceeded OFF	
	< −11.760 V	-32513	80FF	Lower limit exceeded ON	
	-11.851V	-32768	8000		
0 to 10 V	11.851V	32767	7FFF		$\text{Present value (DEC)} \times 3.617 \times 10^{-4} \text{ [V]}$
	> 11.760 V	32513	7F01	Upper limit exceeded ON	
	< 11.600 V	32071	7D47	Upper limit exceeded OFF	
	10.000V	27648	6C00	None	
	0.000V	0	0000		
	> −0.05 V	-138	FF76	Lower limit exceeded OFF	
	< −0.10 V	-276	FEEC	Lower limit exceeded ON	
2 to 10 V	11.481V	32767	7FFF		$\text{Present value (DEC)} \times 2.8934 \times 10^{-4} + 2 \text{ [V]}$
	> 11.410 V	32527	7F0F	Upper limit exceeded ON	
	< 11.280 V	32077	7D4D	Upper limit exceeded OFF	
	10.000V	27653	6C05	None	
	2.000V	0	0000		
	> 0.676 V	0	0000	Lower limit exceeded OFF	
	< 0.592 V	0	0000	Lower limit exceeded ON	
	0.000V	0	0000		
0 to 5 V	5.926 V	32767	7FFF		$\text{Present value (DEC)} \times 1.808 \times 10^{-4} \text{ [V]}$
	> 5.880 V	32522	7F0A	Upper limit exceeded ON	
	< 5.800 V	32080	7D50	Upper limit exceeded OFF	
	5.000 V	27655	6C00	None	
	0.000V	0	0000		
	> −0.050 V	-277	FEEB	Lower limit exceeded OFF	
	< −0.100 V	-553	FDD7	Lower limit exceeded ON	
1 to 5 V	5.741 V	32767	7FFF		$\text{Present value (DEC)} \times 1.4468 \times 10^{-4} + 1 \text{ [V]}$
	> 5.700 V	32485	7EE5	Upper limit exceeded ON	
	< 5.640 V	32071	7D47	Upper limit exceeded OFF	
	5.000 V	27647	6C00	None	
	1.000V	0	0000		
	> 0.324 V	-4672	EDC0	Lower limit exceeded OFF	
	< 0.296 V	-4865	ECFF	Lower limit exceeded ON	
	0.000V	-6912	E500		
−1 to 1 V	1.185V	32767	7FFF		$\text{Present value (DEC)} \times 3.6164 \times 10^{-5} \text{ [V]}$
	> 1.176 V	32519	7F07	Upper limit exceeded ON	
	< 1.160 V	32076	7D4C	Upper limit exceeded OFF	
	1.000V	27651	6C03	None	
	0.000V	0	0000		
	-1.000V	-27651	93FD		
	> −1.160 V	-32076	82B4	Lower limit exceeded OFF	
	< −1.176 V	-32519	80F9	Lower limit exceeded ON	
	-1.185V	-32768	8000		
−500 to 500 mV	592.6 mV	32767	7FFF		$\text{Present value (DEC)} \times 1.8085 \times 10^{-2} \text{ [mV]}$
	> 588.0 mV	32513	7F01	Upper limit exceeded ON	
	< 580.0 mV	32071	7D47	Upper limit exceeded OFF	
	500.0 mV	27647	6BFF	None	
	0.0mV	0	0000		
	-500.0 mV	-27647	9401		
	> −580.0 mV	-32071	82B9	Lower limit exceeded OFF	
	< −588.0 mV	-32513	80FF	Lower limit exceeded ON	
	-592.6 mV	-32768	8000		

9

Appendix

Measurement range	Measured value	Process data			Conversion formula from the "present value" of process data to a measured value
		Present value		Diagnostic information	
		DEC	HEX		
−100 to 100 mV	118.5mV	32767	7FFF		Present value (DEC) × 3.6164 × 10⁻³ [mV]
	> 117.6 mV	32519	7F07	Upper limit exceeded ON	
	< 116.0 mV	32076	7D4C	Upper limit exceeded OFF	
	100.0mV	27652	6C04	None	
	000.0mV	0	0000		
	-100.0mV	-27652	93FC		
	> −116.0 mV	-32076	82B4	Lower limit exceeded OFF	
	< −117.6 mV	-32519	80F9	Lower limit exceeded ON	
	-118.5mV	-32768	8000		
−50 to 50 mV	59.3 mV	32767	7FFF		Present value (DEC) × 1.8097 × 10⁻³ [mV]
	> 58.8 mV	32492	7EEC	Upper limit exceeded ON	
	< 58.0 mV	32050	7D32	Upper limit exceeded OFF	
	50.0 mV	27629	6BED	None	
	0.0mV	0	0000		
	-50.0 mV	-27629	9413		
	> −58.0 mV	-32050	82CE	Lower limit exceeded OFF	
	< −58.8 mV	-32492	8114	Lower limit exceeded ON	
	-59.3 mV	-32768	8000		

The conversion formula column reads: "Present value (DEC) × 3.6164 × 10⁻³ [mV]" → $\text{Present value (DEC)} \times 3.6164 \times 10^{-3}$ [mV] and $\text{Present value (DEC)} \times 1.8097 \times 10^{-3}$ [mV].

■ Voltage: NE43

Measurement range	Measured value	Process data			Conversion formula from the "present value" of process data to a measured value
		Present value		Diagnostic information	
		DEC	HEX		
−10 to 10 V	> 11.00 V	11000	2AF8	Overflow ON	Present value (DEC) × 10⁻³ [V]
	< 10.95 V	10950	2AC6	Overflow OFF	
	> 10.50 V	10500	2904	Upper limit exceeded ON	
	< 10.25 V	10250	280A	Upper limit exceeded OFF	
	10.00V	10000	2710	None (within measurement range)	
	0.00V	0	0000		
	-10.00V	-10000	D8F0		
	> −10.25 V	-10250	D7F6	Lower limit exceeded OFF	
	< −10.50 V	-10500	D6FC	Lower limit exceeded ON	
	> −10.95 V	-10950	D53A	Underflow OFF	
	< −11.00 V	-11000	D508	Underflow ON	
0 to 10 V	> 11.00 V	11000	2AF8	Overflow ON	Present value (DEC) × 10⁻³ [V]
	< 10.95 V	10950	2AC6	Overflow OFF	
	> 10.50 V	10500	2904	Upper limit exceeded ON	
	< 10.25 V	10250	280A	Upper limit exceeded OFF	
	10.00V	10000	2710	None (within measurement range)	
	0.00V	0	0000		
	> −0.03 V	-30	FFE2	Lower limit exceeded & underflow OFF	
	< −0.05 V	-50	FFCE	Lower limit exceeded & underflow ON	
2 to 10 V	> 11.00 V	11000	2AF8	Overflow ON	Present value (DEC) × 10⁻³ [V]
	< 10.95 V	10950	2AC6	Overflow OFF	
	> 10.50 V	10500	2904	Upper limit exceeded ON	
	< 10.25 V	10250	280A	Upper limit exceeded OFF	
	10.00V	10000	2710	None (within measurement range)	
	2.00V	2000	07D0		
	> 1.95 V	1950	079E	Lower limit exceeded OFF	
	< 1.90 V	1900	076C	Lower limit exceeded ON	
	> 1.05 V	1050	041A	Disconnection OFF	
	< 1.00 V	1000	03E8	Disconnection ON	
	> −0.03 V	-30	FFE2	Underflow OFF	
	< −0.05 V	-50	FFCE	Underflow ON	

The conversion formula for the NE43 table is $\text{Present value (DEC)} \times 10^{-3}$ [V].

| Measurement range | Measured value | Process data | | | Conversion formula from the "present value" of process data to a measured value |
| | | Present value | | Diagnostic information | |
		DEC	HEX		
0 to 5 V	> 5.50 V	11000	2AF8	Overflow ON	Present value (DEC) × 10^{-3} / 2 [V]
	< 5.45 V	10900	2A94	Overflow OFF	
	> 5.25 V	10500	2904	Upper limit exceeded ON	
	< 5.13 V	10260	2814	Upper limit exceeded OFF	
	5.00 V	10000	2710	None (within measurement range)	
	0.00V	0	0000		
	> −0.03 V	-60	FFC4	Lower limit exceeded & underflow OFF	
	< −0.05 V	-100	FF9C	Lower limit exceeded & underflow ON	
1 to 5 V	> 5.50 V	11000	2AF8	Overflow ON	Present value (DEC) × 10^{-3} / 2 [V]
	< 5.45 V	10900	2A94	Overflow OFF	
	> 5.25 V	10500	2904	Upper limit exceeded ON	
	< 5.13 V	10260	2814	Upper limit exceeded OFF	
	5.00 V	10000	2710	None (within measurement range)	
	1.00V	2000	07D0		
	> 0.95 V	1900	076C	Lower limit exceeded OFF	
	< 0.90 V	1800	0708	Lower limit exceeded ON	
	> 0.55 V	1100	044C	Disconnection OFF	
	< 0.50 V	1000	03E8	Disconnection ON	
	> −0.03 V	-60	FFC4	Underflow OFF	
	< −0.05 V	-100	FF9C	Underflow ON	
−1 to 1 V	> 1.100 V	11000	2AF8	Overflow ON	Present value (DEC) × 10^{-4} [V]
	< 1.099 V	10990	2AEE	Overflow OFF	
	> 1.050 V	10500	2904	Upper limit exceeded ON	
	< 1.025 V	10250	280A	Upper limit exceeded OFF	
	1.000V	10000	2710	None (within measurement range)	
	0.000V	0	0000		
	-1.000V	-10000	D8F0		
	> −1.025 V	-10250	D7F6	Lower limit exceeded OFF	
	< −1.050 V	-10500	D6FC	Lower limit exceeded ON	
	> −1.099 V	-10990	D512	Underflow OFF	
	< −1.100 V	-11000	D508	Underflow ON	
−500 to 500 mV	> 550.0 mV	11000	2AF8	Overflow ON	Present value (DEC) × 10^{-1} / 2 [mV]
	< 549.5 mV	10990	2AEE	Overflow OFF	
	> 525.0 mV	10500	2904	Upper limit exceeded ON	
	< 512.5 mV	10250	280A	Upper limit exceeded OFF	
	500.0 mV	10000	2710	None (within measurement range)	
	0.0mV	0	0000		
	-500.0 mV	-10000	D8F0		
	> −512.5 mV	-10250	D7F6	Lower limit exceeded OFF	
	< −525.0 mV	-10500	D6FC	Lower limit exceeded ON	
	> −549.5 mV	-10990	D512	Underflow OFF	
	< −550.0 mV	-11000	D508	Underflow ON	
−100 to 100 mV	> 110.0 mV	11000	2AF8	Overflow ON	Present value (DEC) × 10^{-2} [mV]
	< 109.9 mV	10990	2AEE	Overflow OFF	
	> 105.0 mV	10500	2904	Upper limit exceeded ON	
	< 102.5 mV	10250	280A	Upper limit exceeded OFF	
	100.0mV	10000	2710	None (within measurement range)	
	000.0mV	0	0000		
	-100.0mV	-10000	D8F0		
	> −102.5 mV	-10250	D7F6	Lower limit exceeded OFF	
	< −105.0 mV	-10500	D6FC	Lower limit exceeded ON	
	> −109.9 mV	-10990	D512	Underflow OFF	
	< −110.0 mV	-11000	D508	Underflow ON	

| Measurement range | Measured value | Process data | | | Conversion formula from the "present value" of process data to a measured value |
| | | Present value | | Diagnostic information | |
		DEC	HEX		
−50 to 50 mV	> 55.00 mV	11000	2AF8	Overflow ON	Present value (DEC) × 10^{-2} / 2 [mV]
	< 54.95 mV	10990	2AEE	Overflow OFF	
	> 52.50 mV	10500	2904	Upper limit exceeded ON	
	< 51.25 mV	10250	280A	Upper limit exceeded OFF	
	50.00mV	10000	2710	None (within measurement range)	
	0.0mV	0	0000		
	-50.00 mV	-10000	D8F0		
	> −51.25 mV	-10250	D7F6	Lower limit exceeded OFF	
	< −52.50 mV	-10500	D6FC	Lower limit exceeded ON	
	> −54.95 mV	-10990	D512	Underflow OFF	
	< −55.00 mV	-11000	D508	Underflow ON	

■ Current: Normal form

| Measurement range | Measured value | Process data | | | Conversion formula from the "present value" of process data to a measured value |
| | | Present value | | Diagnostic information | |
		DEC	HEX		
0 to 20 mA	> 20.20 mA	32767	7FFF	Upper limit exceeded ON	-
	< 20.10 mA			Upper limit exceeded OFF	
	20.00mA			None	Present value (DEC) × 6.104 × 10^{-4} [mA]
	0.00mA	0	0000		
	> −0.10 mA	-164	FF5C	Lower limit exceeded & underflow OFF	-
	< −0.20 mA	-328	FEB8	Lower limit exceeded & underflow ON	
4 to 20 mA	> 20.20 mA	32767	7FFF	Upper limit exceeded ON	-
	< 20.10 mA			Upper limit exceeded OFF	
	20.00mA			None	Present value (DEC) × 4.883 × 10^{-4} + 4 [mA]
	4.00mA	0	0000		
	> 3.70 mA	-614	FD9A	Lower limit exceeded & underflow OFF	-
	<3.60mA	-819	FCCD	Lower limit exceeded & underflow ON	
	> 3.00 mA	-2048	F800	Disconnection detection OFF	
	< 2.90 mA	-2253	F733	Disconnection detection ON	
−20 to 20 mA	> 20.20 mA	32767	7FFF	Upper limit exceeded ON	-
	< 20.10 mA			Upper limit exceeded OFF	
	20.00mA			None	Present value (DEC) × 6.104 × 10^{-4} [mA]
	0.00mA	0	0000		
	-20.00mA				
	> −20.10 mA	-32768	8000	Lower limit exceeded & underflow OFF	-
	< −20.20 mA			Lower limit exceeded & underflow ON	

■ Current: Extended range

Measurement range	Measured value	Process data			Conversion formula from the "present value" of process data to a measured value
		Present value		Diagnostic information	
		DEC	HEX		
0 to 20 mA	23.703mA	32767	7FFF		$Present\ value\ (DEC) \times 7.234 \times 10^{-4}\ [mA]$
	> 23.519 mA	32511	7EFF	Upper limit exceeded ON	
	< 23.206 mA	32079	7D4F	Upper limit exceeded OFF	
	20.000mA	27647	6BFF	None	
	0.000mA	0	0000		
	> −0.100 mA	-138	FF76	Lower limit exceeded OFF	
	< −0.200 mA	-276	FEEC	Lower limit exceeded ON	
4 to 20 mA	22.962mA	32767	7FFF		$Present\ value\ (DEC) \times 5.787 \times 10^{-4} + 4\ [mA]$
	> 22.815 mA	32512	7F00	Upper limit exceeded ON	
	< 22.565 mA	32080	7D50	Upper limit exceeded OFF	
	20.000mA	27647	6BFF	None	
	4.000mA	0	0000		
	> 1.303 mA	-4660	EDCC	Lower limit exceeded & disconnection OFF	
	< 1.185 mA	-4864	ED00	Lower limit exceeded & disconnection ON	
−20 to 20 mA	23.703mA	32767	7FFF		$Present\ value\ (DEC) \times 7.234 \times 10^{-4}\ [mA]$
	> 23.519 mA	32513	7F01	Upper limit exceeded ON	
	< 23.206 mA	32080	7D50	Upper limit exceeded OFF	
	20.000mA	27647	6BFF	None	
	0.000mA	0	0000		
	-20.000mA	-27647	9401		
	> −23.206 mA	-32080	82B0	Lower limit exceeded & disconnection OFF	
	< −23.519 mA	-32513	80FF	Lower limit exceeded & disconnection ON	
	-23.704mA	-32768	8000		

■ Current: NE43

| Measurement range | Measured value | Process data | | | Conversion formula from the "present value" of process data to a measured value |
| | | Present value | | Diagnostic information | |
		DEC	HEX		
0 to 20 mA	> 22.00 mA	22000	55F0	Overflow ON	Present value (DEC) $\times 10^{-3}$ [mA]
	< 21.80 mA	21800	5528	Overflow OFF	
	> 21.00 mA	21000	5208	Upper limit exceeded ON	
	< 20.50 mA	20500	5014	Upper limit exceeded OFF	
	20.00mA	20000	4E20	None	
	0.00mA	0	0000	(within measurement range)	
	> −0.10 mA	-100	FF9C	Lower limit exceeded & underflow OFF	
	< −0.20 mA	-200	FF38	Lower limit exceeded & underflow ON	
4 to 20 mA	> 22.00 mA	22000	55F0	Overflow ON	Present value (DEC) $\times 10^{-3}$ [mA]
	< 21.80 mA	21800	5528	Overflow OFF	
	> 21.00 mA	21000	5208	Upper limit exceeded ON	
	< 20.50 mA	20500	5014	Upper limit exceeded OFF	
	20.00mA	20000	4E20	None	
	4.00mA	4000	0FA0	(within measurement range)	
	> 3.80 mA	3800	0ED8	Lower limit exceeded OFF	
	< 3.60 mA	3600	0E10	Lower limit exceeded ON	
	> 2.20 mA	2200	0898	Disconnection OFF	
	< 2.00 mA	2000	07D0	Disconnection ON	
	> −0.10 mA	-100	FF9C	Underflow OFF	
	< −0.20 mA	-200	FF38	Underflow ON	
−20 to 20 mA	> 22.00 mA	22000	55F0	Overflow ON	Present value (DEC) $\times 10^{-3}$ [mA]
	< 21.80 mA	21800	5528	Overflow OFF	
	> 21.00 mA	21000	5208	Upper limit exceeded ON	
	< 20.50 mA	20500	5014	Upper limit exceeded OFF	
	20.00mA	20000	4E20	None	
	0.00mA	0	0000	(within measurement range)	
	-20.00mA	-20000	B1E0		
	> −20.50 mA	-20500	AFEC	Lower limit exceeded OFF	
	< −21.00 mA	-21000	ADF8	Lower limit exceeded ON	
	> −21.80 mA	-21800	AAD8	Underflow OFF	
	< −22.00 mA	-22000	AA10	Underflow ON	

■ Resistance temperature detector

| Measurement range | Measured value | Process data* | | | Conversion formula from the "present value" of process data to a measured value |
| | | Present value | | Diagnostic information | |
		DEC	HEX		
Pt100/Pt200/Pt500/ Pt1000 (Normal range: −200 to 150°C)	> 151.5°C	15150	3B2E	Upper limit exceeded ON	Present value (DEC) $\times 10^{-2}$ [°C]
	150°C	15000	3A98	None	
	0°C	0	0000		
	−200°C	-20000	B1E0		
	< −202°C	-20200	B118	Lower limit exceeded ON	
Pt100/Pt200/Pt500/ Pt1000 (Extended range: −200 to 850°C)	> 858.5°C	8585	2189	Upper limit exceeded ON	Present value (DEC) $\times 10^{-1}$ [°C]
	850°C	8500	2134	None	
	0°C	0	0000		
	−200°C	-2000	F830		
	< −202°C	-2020	F81C	Lower limit exceeded ON	
Ni100/Ni1000 (Normal range: −60 to 150°C)	> 151.5°C	15150	3B2E	Upper limit exceeded ON	Present value (DEC) $\times 10^{-2}$ [°C]
	150°C	15000	3A98	None	
	0°C	0	0000		
	−200°C	-20000	B1E0		
	< −202°C	-20200	B118	Lower limit exceeded ON	
Ni100/Ni1000 (Extended range: −60 to 250°C)	> 252.5°C	2525	09DD	Upper limit exceeded ON	Present value (DEC) $\times 10^{-1}$ [°C]
	250°C	2500	09C4	None	
	0°C	0	0000		
	−60°C	-600	FDA8		
	< −60.6°C	-606	FDA2	Lower limit exceeded ON	

* The process data when disconnection is detected will be −32768DEC/8000HEX.

■Thermocouple

Type	Measured value	Process data*						Conversion formula from the "present value" of process data to a measured value
		Present value		Diagnostic information				
		DEC	HEX	Lower limit exceeded		Upper limit exceeded		
				ON	OFF	ON	OFF	
Type K thermocouple	−270 to 1370°C	−2700 to 13700	F574 to 3584	−272.7°C	−270.0°C	1383.7°C	1370.0°C	Present value (DEC) × 10⁻¹ [°C]
Type B thermocouple	100 to 1820°C	1000 to 18200	3E8 to 4718	99.0°C	100.0°C	1838.2°C	1820.0°C	
Type E thermocouple	−270 to 1000°C	−2700 to 10000	F574 to 2710	−272.7°C	−270.0°C	1010.0°C	1000.0°C	
Type J thermocouple	−210 to 1200°C	−2100 to 12000	F7CC to 2EE0	−212.1°C	−210.0°C	1212.0°C	1200.0°C	
Type N thermocouple	−270 to 1300°C	−2700 to 13000	F574 to 32C8	−272.7°C	−270.0°C	1313.0°C	1300.0°C	
Type R thermocouple	−50 to 1768°C	−500 to 17680	FE0C to 4510	−50.5°C	−50.0°C	1785.7°C	1768.0°C	
Type S thermocouple	−50 to 1768°C	−500 to 17680	FE0C to 4510	−50.5°C	−50.0°C	1785.7°C	1768.0°C	
Type T thermocouple	−270 to 400°C	−2700 to 4000	F574 to FA0	−272.7°C	−270.0°C	404.0°C	400.0°C	
Type C thermocouple	0 to 2315°C	0 to 23150	0 to 5A6E	−1.0°C	0.0°C	2338.2°C	2315.0°C	
Type G thermocouple	0 to 2315°C	0 to 23150	0 to 5A6E	−1.0°C	0.0°C	2338.2°C	2315.0°C	

* The process data when disconnection is detected will be −32768DEC/8000HEX.

9

Appendix

NQ-IL8P Parameters

This section describes the IO-Link-related parameters of the NQ-IL8P.

NQ-IL8P overview

The NQ-IL8P can be used to connect up to 16 IO devices, such as sensors and actuators, to one IO port of the IO-Link master module. There are eight connectors on the NQ-IL8P. Use one connector to establish two I/O connections.

NQ-IL8P IO-Link specifications

IO-Link approved standard	Version 1.1
Communication speed	COM2 (38.4kbps)
Min. cycle time	3.2 ms
Process data length	2 bytes

Process data

■ Input data

When the input from an IO device connected to a port turns ON, the corresponding bit turns ON.

Byte	1								0							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Port	C8		C7		C6		C5		C4		C3		C2		C1	
Pin	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A

■ Output data

When a bit is turned ON, the output to the IO device connected to the corresponding port turns ON.

Byte	1								0							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Port	C8		C7		C6		C5		C4		C3		C2		C1	
Pin	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A

Service data

■ IO-Link predetermined parameters

Index		Sub-index		Item		Description	Attribute	Data type	Size (bytes)	Description
HEX	DEC	HEX	DEC							
00	0	08	8	Vendor ID	Vendor ID	This is an ID that indicates KEYENCE.	R	WORD	2	01FDH
		09	9							
		0A	10	Device ID	Device ID	This is an ID that indicates the NQ-IL8P.	R	WORD	3	07DAH
		0B	11							
		0C	12							

■ Identification information

Index		Sub-index		Item		Description	Attribute	Data type	Size (bytes)	Value
HEX	DEC	HEX	DEC							
10	16	-	-	Vendor Name	Vendor name	-	R	String	7	Keyence
11	17	-	-	Vendor Text	Vendor text	-	R	String	34	https://www.keyence.com/global.jsp
12	18	-	-	Product Name	Product name	-	R	String	7	NQ-IL8P
13	19	-	-	Product ID	Product ID	-	R	String	7	NQ-IL8P
14	20	-	-	Product Text	Product text	-	R	String	7	I/O-Hub
15	21	-	-	Serial Number	Serial number	-	R	String	16	xxxxxxxxxxxxxxx
17	23	-	-	Firmware Revision	Firmware revision	-	R	String	16	xxxxxxxxxxxxxxx
18	24	-	-	Application Specific Tag	User-settable area	Arbitrary data can be stored here.	R/W	String	32	Initial value: "****"

■Vendor parameters

Initial value: •

Index		Sub-index		Item	Reference item	Description	Attribute	Data type	Size (bytes)	Value
HEX	DEC	HEX	DEC							
40	64	-	-	Parameter ID	Parameter ID	An arbitrary ID can be stored here.	R/W	String	4	
41	65			Invert digital input	Input logic inversion	Inverts the digital input. (You can also configure all the pins in a batch with parameter settings that use IODD.)	R/W	WORD	2	0: Do not invert • 1: Invert
42	66			Activate Output	Activate output	Specify the pins to be used as digital output. (You can also configure all the pins in a batch with parameter settings that use IODD.)	R/W	WORD	2	0: Deactivate (when using digital input) 1: Activate (when using digital input / digital output) •
43	67			Pulse Stretching input	Pulse signal retention setting	Stretches the input signal in units of 10 ms. (You can also configure all the pins in a batch with parameter settings that use IODD.)	R/W	WORD	16	0 to 255 (initial value: 0)
44	68			Manual output reset after overcurrent	Output recovery method when overcurrent is detected	Manual recovery after overcurrent (You can also configure all the pins in a batch via IODD.)	R/W	WORD	2	0: Automatic recovery • 1: Manual recovery
45	69			Output after error	Output retention method when an error occurs	Output after an error (You can also configure all the pins in a batch with parameter settings that use IODD.)	R/W	WORD	4	0: Set the output to 0. • 1: Set the output to 1. 2: Retain the present value.

Diagnostic information

Index		Sub-index		Item	Reference item	Description	Attribute	Data type	Size (bytes)	Value
HEX	DEC	HEX	DEC							
50	80			Supply Error	Power supply error	(Group diagnostic information / Undervoltage / Overvoltage / IO device power supply overcurrent)	R	WORD	2	0: No error 1: Error
51	81			Overcurrent output	Overcurrent detected during output	Output overcurrent	R	WORD	2	0: No error 1: Error

■ Standard Command

Index		Item	Reference item	Value	Description	Format	Data length	Attribute
HEX	DEC							
02	2	Device reset	Reset	128	Resets and restarts	Uint	1 Byte	W
		Restore factory settings	Initialization	130	Initializes the settings to the factory defaults.			
		Invert digital input (all ports)	Input logic inversion (all ports)	170	Input logic (all ports): Standard			
				171	Input logic (all ports): Inverted			
		Pulse stretching input (all ports)	Pulse signal retention setting (all ports)	180	Pulse signal retention setting (all ports): Disabled			
		Activate output (all ports)	Activate output (all ports)	190	Output (all ports): Disabled			
				191	Output (all ports): Enabled			
		Manual output reset after overcurrent (all ports)	Output recovery method when overcurrent is detected (all ports)	200	Recovery method when overcurrent is detected (all ports): Automatic			
				201	Recovery method when overcurrent is detected (all ports): Manual			
		Output after error (all ports)	Output retention method when an error occurs (all ports)	210	Output setting when a communication error occurs (all ports): OFF			
				211	Output setting when a communication error occurs (all ports): ON			
				212	Output setting when a communication error occurs (all ports): Retain			

Events

Event code (HEX)	Name	Event mode (HEX)	Description
5110	Overvoltage	F4 (appears)	NQ-IL8P power supply overvoltage
		B4 (disappers)	
5111	Undervoltage	F4 (appears)	NQ-IL8P power supply undervoltage
		B4 (disappers)	
7710	Overcurrent Vsens connector x or overcurrent output x	F4 (appears)	Power supply overcurrent or output overcurrent of the IO device connected to the NQ-IL8P
		B4 (disappers)	

9

Appendix

Output File Formats

■ **CSV file**

No.	Date	Time	Data					
No.	Date	Time	モジュール	モジュール	モジュール	モジュール	モジュール	モジュール
1	2020/11/1	9:14:55	301	268	254	128	FALSE	FALSE
2	2020/11/1	9:14:56	301	268	254	128	FALSE	FALSE
3	2020/11/1	9:14:56	301	268	254	128	FALSE	FALSE
4	2020/11/1	9:14:57	301	268	254	128	FALSE	FALSE
5	2020/11/1	9:14:57	301	268	254	128	FALSE	FALSE
6	2020/11/1	9:14:58	301	268	254	128	FALSE	FALSE
7	2020/11/1	9:14:58	301	268	254	128	FALSE	FALSE
8	2020/11/1	9:14:59	301	268	254	128	FALSE	FALSE
9	2020/11/1	9:14:59	301	268	254	128	FALSE	FALSE
10	2020/11/1	9:15:00	301	268	254	128	FALSE	FALSE
11	2020/11/1	9:15:00	301	268	254	128	FALSE	FALSE
12	2020/11/1	9:15:01	301	268	254	128	FALSE	FALSE
13	2020/11/1	9:15:01	301	268	254	128	FALSE	FALSE
14	2020/11/1	9:15:02	301	268	254	128	FALSE	FALSE
15	2020/11/1	9:15:02	301	268	254	128	FALSE	FALSE
16	2020/11/1	9:15:03	301	268	254	128	FALSE	FALSE
17	2020/11/1	9:15:03	301	268	254	128	FALSE	FALSE
18	2020/11/1	9:15:04	301	268	254	128	FALSE	FALSE
19	2020/11/1	9:15:04	301	268	254	128	FALSE	FALSE
20	2020/11/1	9:15:05	301	268	254	128	FALSE	FALSE
21	2020/11/1	9:15:05	301	268	254	128	FALSE	FALSE
22	2020/11/1	9:15:06	301	268	254	128	FALSE	FALSE
23	2020/11/1	9:15:06	301	268	254	128	FALSE	FALSE
24	2020/11/1	9:15:07	301	268	254	128	FALSE	FALSE

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•
•

■ Excel file

Data start cell

Header start cell

NewProject_1101.nqd			モジュール 001								Header part
			Port1 FD-(	Port2 FD-(	Port5 LR-1	Port6 LR-W500			Port7 LR-ZH500CP		
No.	Date	Time	瞬時流量値	瞬時流量値	距離	現在値	出力	スタビリテ	現在値	出力	
1	2020/11/01	09:37:41	304	292	1951	0	FALSE	4	1000	FALSE	
2	2020/11/01	09:37:41	304	295	1951	0	FALSE	4	1000	FALSE	
3	2020/11/01	09:37:42	304	294	1952	0	FALSE	4	1000	FALSE	
4	2020/11/01	09:37:42	303	292	1951	0	FALSE	4	1000	FALSE	
5	2020/11/01	09:37:43	304	293	1952	0	FALSE	4	1000	FALSE	
6	2020/11/01	09:37:43	305	292	1952	0	FALSE	4	1000	FALSE	
7	2020/11/01	09:37:44	304	292	1951	0	FALSE	4	1000	FALSE	
8	2020/11/01	09:37:44	303	294	1952	0	FALSE	4	1000	FALSE	
9	2020/11/01	09:37:45	303	294	1952	0	FALSE	4	1000	FALSE	
10	2020/11/01	09:37:46	303	295	1952	0	FALSE	4	1000	FALSE	
11	2020/11/01	09:37:46	305	296	1952	0	FALSE	4	1000	FALSE	
12	2020/11/01	09:37:47	304	292	1951	0	FALSE	4	1000	FALSE	
13	2020/11/01	09:37:47	304	293	1952	0	FALSE	4	1000	FALSE	Data part
14	2020/11/01	09:37:48	305	292	1952	0	FALSE	4	1000	FALSE	
15	2020/11/01	09:37:48	304	294	1951	0	FALSE	4	1000	FALSE	
16	2020/11/01	09:37:49	302	292	1952	0	FALSE	4	1000	FALSE	
17	2020/11/01	09:37:49	302	296	1951	0	FALSE	4	1000	FALSE	
18	2020/11/01	09:37:50	301	296	1952	0	FALSE	4	1000	FALSE	
19	2020/11/01	09:37:50	303	297	1951	0	FALSE	4	1000	FALSE	
20	2020/11/01	09:37:51	304	297	1951	0	FALSE	4	1000	FALSE	
21	2020/11/01	09:37:51	304	295	1952	0	FALSE	4	1000	FALSE	
22	2020/11/01	09:37:52	304	292	1952	0	FALSE	4	1000	FALSE	
23	2020/11/01	09:37:52	303	293	1952	0	FALSE	4	1000	FALSE	
24	2020/11/01	09:37:53	302	294	1952	0	FALSE	4	1000	FALSE	
25	2020/11/01	09:37:53	302	294	1952	0	FALSE	4	1000	FALSE	

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•
•

Troubleshooting

If the NQ Series unit encounters an error the cause will be shown on the indicator lights on the unit. See the tables below for countermeasures.

For details on the LED displays for each model, refer to the following pages.

📖 "NQ-MP8L" (Page 1-8)

📖 "NQ-EP4L" (Page 1-8)

📖 "NQ-EP4A" (Page 1-9)

📖 "NQ-IL8P" (Page 1-9)

■ It is not possible to communicate with a higher-level device (EtherNet/IP, PROFINET, Modbus/TCP). `NQ-MP8L/EP4L/EP4A`

If communication with a higher-level device is not successful, check the LED display shown below, and then implement countermeasures.

Notation	Description	LED status		Status	Countermeasure
PWR	Power supply	Green	Lit	Normal V1/V2 voltage	-
		Red	Lit	V2 voltage of less than 18 V*	• Check whether the power supply cable is connected correctly. • Check the power voltage and the power supply capacity.
		-	Unlit	V1 voltage of less than 18 V	
BUS	Status of communication with the higher-level unit	Green	Lit	Connection with higher-level side enabled	-
			Blinking	Connection standby status	Communication with the higher-level device has not been established. Check whether the connection has been set correctly.
		Red	Lit	IP address duplication	Check whether there are duplicate IP addresses.
				Modbus/TCP watch dog time-out	Check the watch dog time-out time.
				IP address setting switches set to "0.0.0.0"	Revise the IP address setting.
			Blinking	Blink command being executed	-
		Red/green	Blinking	Auto negotiation in progress or standing by for IP address assignment via DHCP/BootP	-
		-	Unlit	Power supply OFF	• Check whether the power supply cable is connected correctly. • Check the power voltage and the power supply capacity.
ETH1 ETH2		Green	Lit	Connection established (100 Mbps)	-
			Blinking	Traffic present (100 Mbps)	-
		Orange	Lit	Connection established (10 Mbps)	-
			Blinking	Traffic present (10 Mbps)	-
		-	Unlit	No connection	Check whether the Ethernet cable is connected correctly.

* The LED blinks in green on the NQ-MP8L.

■ Communication with the sensor is not possible. `NQ-MP8L/EP4L`

If communication with a sensor is not successful, check the LED display shown below, and then implement countermeasures.

● IO-Link mode

Notation	Description	LED status		Status	Countermeasure
PWR	Power supply	Green	Lit	Normal V1/V2 voltage	-
		Red	Lit	V2 voltage of less than 18 V*	• Check whether the power supply cable is connected correctly. • Check the power voltage and the power supply capacity.
		-	Unlit	V1 voltage of less than 18 V	
ERR	Error status	Green	Lit	Diagnostic information not provided	-
		Red	Lit	Diagnostic information provided	An error has occurred on this unit or a sensor. Check the diagnostic information.
		-	Unlit	Power supply OFF	• Check whether the power supply cable is connected correctly. • Check the power voltage and the power supply capacity.
MP8L: 0, 2, 4, 6, 8, 10, 12, 14 EP4L: 0, 2, 4, 6	Pin 4 operation status	Green	Blinking	IO-Link connection enabled, process data enabled	-
		Red	Blinking	IO-Link connection enabled, process data disabled	• Check whether the sensor can measure correctly. • Check whether the validation function is enabled and whether the validation result is not "mismatched."
			Lit	No IO-Link connection, process data disabled	Check whether the sensor is correctly connected.
		-	Unlit	No IO-Link connection	Check whether the sensor is correctly connected.

* The LED blinks in green on the NQ-MP8L.

● Digital input mode

Notation	Description	LED status		Status	Countermeasure
PWR	Power supply	Green	Lit	Normal V1/V2 voltage	-
		Red	Lit	V2 voltage of less than 18 V*	• Check whether the power supply cable is connected correctly.
		-	Unlit	V1 voltage of less than 18 V	• Check the power voltage and the power supply capacity.
MP8L: 0, 2, 4, 6, 8, 10, 12, 14 EP4L: 0, 2, 4, 6	Pin 4 operation status	Green	Lit	Input ON	-
		-	Unlit	Input OFF	-
1,3,5,7	Pin 2 operation status	Green	Lit	Input or output ON	-
		Red	Lit	Output overcurrent	Check whether the devices are wired correctly.
			Blinking	Device power supply overload (MP8L only)	Check whether the load is within the rated range.
		-	Unlit	Input or output OFF	-
MP8L: 9, 11, 13, 15	Class B port power supply	Green	Lit	Normal V2 (pin 2) power voltage	-
		Red	Lit	V2 (pin 2) power supply overload / short circuit	• Check whether the power supply cable is connected correctly.
			Blinking	V1 (pin 1) power supply overload / short circuit	• Check whether the load is within the rated range.
		-	Unlit	V2 (pin 2) power supply OFF	Check whether the devices are wired correctly.

* The LED blinks in green on the NQ-MP8L.

■ Analog input is not possible.

NQ-EP4A

If analog input is not successful, check the LED display shown below, and then implement countermeasures.

Notation	Description	LED status		Status	Countermeasure
0,1,2,3	Analog input status	**Voltage/current mode**			
		Green	Lit	Input enabled	-
		Red	Lit	V1 (pin 1) power supply overload / short circuit	• Check whether the power supply cable is connected correctly. • Check whether the load is within the rated range.
			Blinking (0.5 Hz)	Input disconnection (current mode)	Check whether the devices are wired correctly.
			Blinking (4 Hz)	Out of measured value range	Check whether the device can measure correctly.
		-	Unlit	Input disabled	The port has been disabled.
		Resistance temperature detector mode			
		Green	Lit	Input enabled	-
		Red	Lit	Input short circuit	• Check whether the devices are wired correctly.
			Blinking (0.5 Hz)	Disconnection	Check whether the devices are wired correctly.
			Blinking (4 Hz)	Out of measured value range	Check whether the device can measure correctly.
		-	Unlit	Input disabled	The port has been disabled.
		Thermocouple mode			
		Green	Lit	Input enabled	-
		Red	Lit	Cold junction error	• Check whether the resistance temperature detector for cold junction compensation is wired correctly.
			Blinking (0.5 Hz)	Disconnection	Check whether the devices are wired correctly.
			Blinking (4 Hz)	Out of measured value range	Check whether the device can measure correctly.
		-	Unlit	Input disabled	The port has been disabled.

9

Appendix

## ■ Troubleshooting when using NQ Sensor Monitor NQ-MP8L/EP4L/EP4A

The estimated causes of and countermeasures for messages displayed in NQ Sensor Monitor are shown below.

Check the LED display on the NQ Series main unit.

Message	Estimated cause	Countermeasure
Target device was not found.	• The power supply is not turned on. • The power supply capacity is insufficient. • The power supply cable is disconnected.	• Check whether the power supply cable is connected correctly. • Check the power voltage and the power supply capacity.
	The Ethernet cable is not connected.	Check whether the Ethernet cable is connected correctly.
	The IP address has not been assigned.	The IP address is not assigned in the factory default settings. Use the NQ Series main unit (MP8L) or IP Setting Tool to assign an IP address.
	The network group of the IP address is different.	NQ Sensor Monitor can search for NQ Series units in the same network group. Check the IP address of the network adapter.
Could not connect to device.	• The power supply is not turned on. • The power supply capacity is insufficient. • The power supply cable is disconnected.	• Check whether the power supply cable is connected correctly. • Check the power voltage and the power supply capacity.
	The Ethernet cable is not connected.	Check whether the Ethernet cable is connected correctly.
	The IP address has not been assigned.	The IP address is not assigned in the factory default settings. Use the NQ Series main unit (MP8L) or IP Setting Tool to assign an IP address.
	The network group of the IP address is different.	NQ Sensor Monitor can connect to NQ Series units in the same network group. Check the IP address of the network adapter.

9

Appendix

Data Update Time

This section shows an example of the data update time for cyclic communication.

■IO-Link communication

PLC | This unit | IO-Link sensor
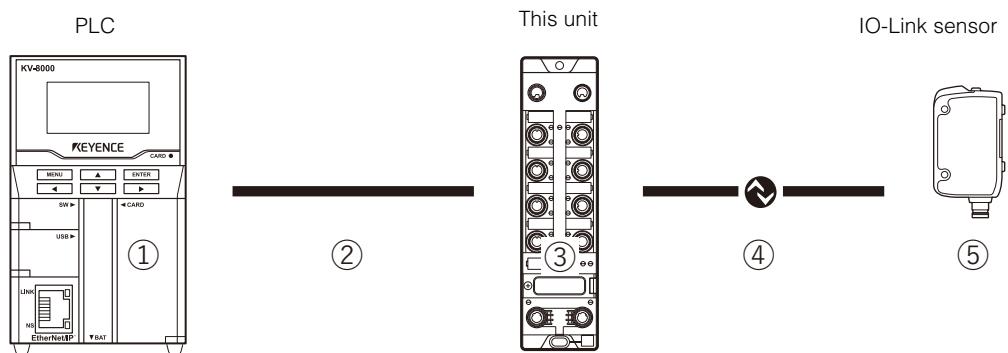
Maximum data update time = (1) + (2) + (3) + (4) + (5)

(1) PLC scan time
(2) Network update time
(3) Processing time of this unit (approximately 3 ms)
(4) IO-Link cycle time
(5) Sensor response time

> **Point**
> - **For details on the times indicated by (1), (2), (4), and (5), refer to the manual of each device.**
> - **The times indicated by (1), (2), (3), and (4) may be doubled depending on the communication timing.**

■Digital input

PLC | This unit | Sensor
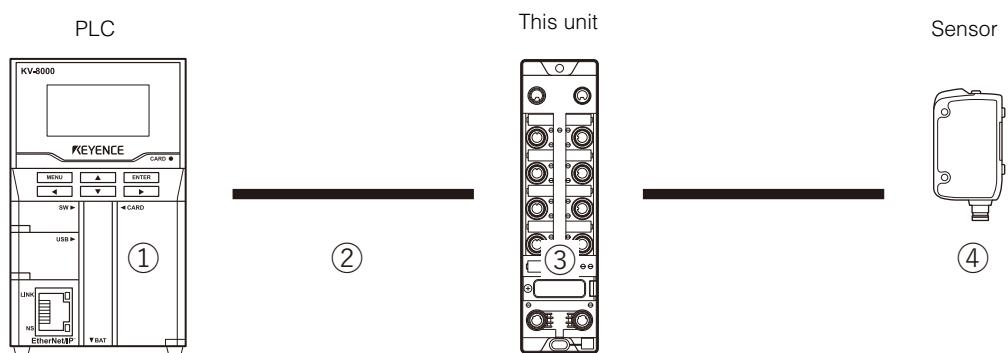
Maximum data update time = (1) + (2) + (3) + (4)

(1) PLC scan time
(2) Network update time
(3) Processing time of this unit (approximately 0.05 ms)
(4) Sensor response time

> **Point**
> - **For details on the times indicated by (1), (2), and (4), refer to the manual of each device.**
> - **The times indicated by (1) and (2) may be doubled depending on the communication timing.**

9

Appendix

Revision History

Date printed	Revision number	Revision contents
November 2020	Official release	
March 2021	2nd edition	
November 2021	Revised 1st edition	
February 2022	Revised 2nd edition	
July 2022	Revised 3rd edition	
October 2022	Revised 4th edition	
February 2024	Revised 5th edition	
March 2025	Revised 6th edition	
June 2025	Revised 7th edition	Windows 11 Support

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