OMRON

IO-Link AD Converter
K3CV

Analog signals are converted to digital signals with high precision and output via IO-Link communication. Improves signal accuracy and reliability while simplifying wiring to reduce costs
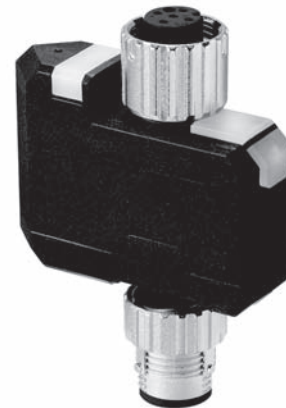
Selecting/Setting
- Select input type by model name
- Can be used without tools

Usability
- Easy connection with Smartclick
- Slim body for improved connectivity

User Interface
- LED display indicates operating status
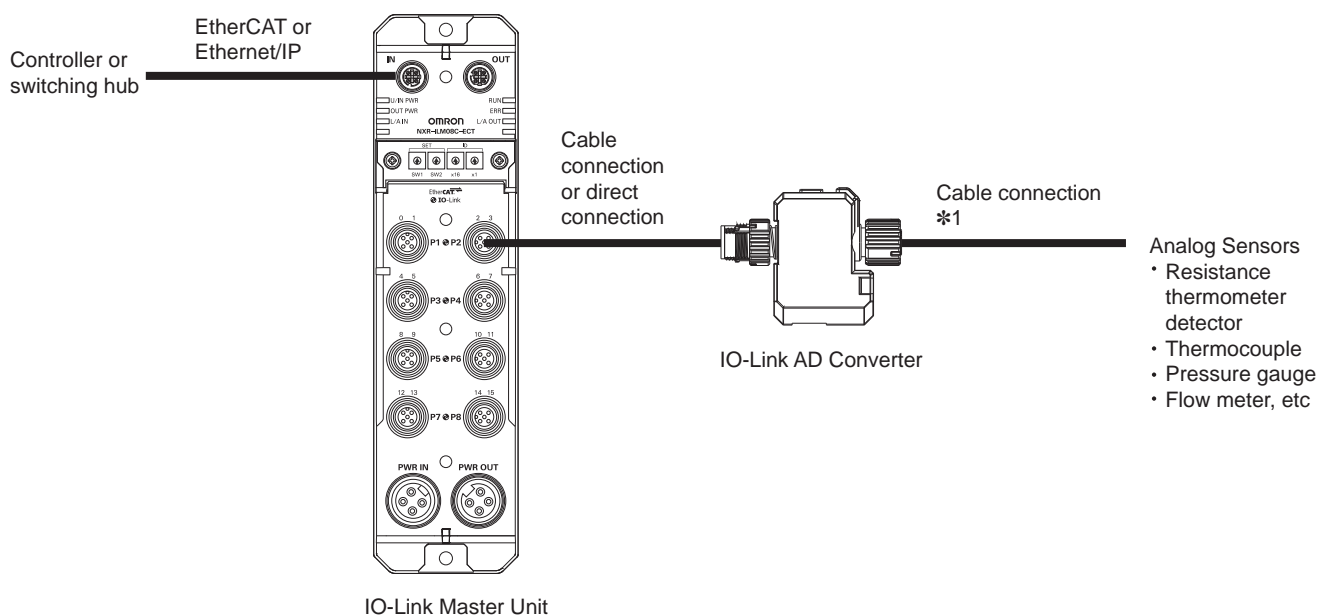- Nameplates simplify equipment management

⚠ **Refer to *Safety Precautions* on page 14.**

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

System Configuration Diagram

The configuration is as follows, with an IO-Link AD converter, an IO-Link master unit, and an analog sensor.

∗**1.** For the thermocouple input types, be sure to use compensation wires. Otherwise, this may cause a temperature error. Refer to page 3 for selection of connectors and compensation conductors.

K3CV

Model Number Legend

Model Number Legend

K3CV - ☐☐☐☐☐ - ☐

Series   **(1)**   **(2)**   **(3)**   **(4)**

Model	(1) Number of channels	(2) Input Type	(3) Input type details	(4) Communications method	Meaning
K3CV					A/D Converter
	1				1ch
		AD			Analog Input
		TC			Thermocouple
		PT			Resistance thermometer detector
			IA		Analog current 4 to 20 mA
			IB		Analog current 0 to 20 mA
			VA		Analog voltage 0 to 10 V
			VB		Analog voltage -10 to 10 V
			KA		K Thermocouple -20.0 to 500.0°C
			PA		Resistance temperature detector: -200.0 to 500.0°C
				IL3	IO-Link (COM3)

List of Models

Number of channels	Input Type	Input type details	Communications method	Model
1	Analog Input	Analog current 4 to 20 mA	IO-Link	**K3CV-1ADIA-IL3**
		Analog current 0 to 20 mA		**K3CV-1ADIB-IL3**
		Analog voltage 0 to 10 V		**K3CV-1ADVA-IL3**
		Analog voltage -10 to 10 V		**K3CV-1ADVB-IL3**
	Thermocouples	K Thermocouple -20.0 to 500.0°C		**K3CV-1TCKA-IL3**
	Resistance Temperature Detector	Resistance temperature detector: -200.0 to 500.0°C		**K3CV-1PTPA-IL3**

Optional Products (sold separately)

Mounting Bracket (Available soon)

Model
K3CV-F-1

Main Unit Fixture

Model
K3CV-F-2

Tool for M12 Threaded Connectors

Model
XY2F-0004

When connecting the IO-Link master and K3CV with a cable, use XS5W-D421-☐81-F, connectors with cables, socket and plug on both cable ends (M12 Smartclick). For more details, refer to the *XS5 datasheet*. This is not necessary when the IO-Link master are connected directly to the K3CV.

Installation of Compensation Conductors

Compensation Conductors for temperature controllers
The following assembly connector plugs and compensating conductor are recommended for use with the TC input type.

Type	Model	Details
Assembly Connector Plugs • 4 poles • Soldering connection	**XS5G-D423**	For 4 dia. (4 to 5 dia.) Cable connection direction: straight type
	XS5G-D424	For 4 dia. (4 to 5 dia.) Cable Connection direction: right-angle
Compensating Conductors (K)	**WCAG-N 1M**	Fully vinyl-covered (waterproof) (-20 to 70°C)
	WCAG-N 2M	
	WCAG-N 4M	
	WCAG-N 8M	
	WCAG-N 10M	
	WCAG-N 15M	
	WCAG-N 20M	
	WCAG-N 30M	
	WCAG-N 50M	
	WCAG-40 1M	Silicone-covered (0 to 150°C)
	WCAG-40 2M	
	WCAG-40 4M	
	WCAG-40 8M	
	WCAG-40 10M	
	WCAG-40 15M	
	WCAG-40 20M	
	WCAG-40 30M	
	WCAG-40 50M	

For instructions on how to install the connector and compensation conductors, refer to *Assembly Procedure for XS5C/XS5G (IDC models) Connector Assemblies* in the *XS5 datasheet.*

K3CV

Ratings/Performance

General specifications

Item	Description
Rated input voltage	24 VDC
Operating voltage range	18 to 30 VDC, including ripple (p-p) of 10%
External power supply (Analog input type)	24 VDC: Linked to input voltage Maximum load current 100 mA
Current consumption	8 mA (maximum 108 mA when powered externally: analog input type)
Ambient operating temperature	-40 to 70°C (with no condensation or freezing)
Ambient operating humidity	Relative humidity ≤ 85%
Storage temperature	-40 to 85°C (with no condensation or freezing)
Storage humidity	Relative humidity ≤ 85%
Vibration resistance	10 to 55 Hz double amplitude 1.5 mm 2h in each of X, Y, and Z directions
Shock resistance	500 m/s^2 Three times in each of X, Y, and Z directions
Weight	30 g
Material	PA
Protection circuit	Reverse polarity protection
Protection structure (dust-proof, waterproof)	IP67, UL Standard Type 1 Certification, IP30 (When cables are not connected)
Insert/Remove Durability	50 cycles
Cable length (from master to convertor)	≤ 20 m
Cable length (from master to sensor)	≤ 30 m and TC of 100 Ω or less and Pt of 10 Ω or less
Conformity standards	cULus: Listed (UL61010-1/UL61010-2-201/CSA-C22.2 No.61010-1/ CSA-C22.2 No.61010-2-201) CE/UKCA: EN61131-2 RCM: EN61000-6-4 IO-Link conformance
Environment	UL Certification Temperature: 70°C Indoor Use Altitude: 2,000 m max. Pollution Degree: 3 EMC Immunity Level: Zone B
Power Supply	Class2, LPS, LIM and SELV or PELV, PS2 and ES1

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Input specifications

Analog input type

Item			Description
Sampling rate			Switchable between 50 ms (default) and 5 ms
Influence of temperature			±1% FS ±1 digit or less
Influence of voltage			
Installation influence			
Influence of EMS			
Instruction range	**K3CV-1ADIA-IL3**	**Specification**	4 to 20 mA
		Instruction range	3.00 to 21.00 mA
		Input resistance	150 Ω or lower
	K3CV-1ADIB-IL3	**Specification**	0 to 20 mA
		Instruction range	-1.00 to 21.00 mA
		Input resistance	150 Ω or lower
	K3CV-1ADVA-IL3	**Specification**	0 to 10 V
		Instruction range	-1.00 to 11.00 V
		Input resistance	1 MΩ or higher
	K3CV-1ADVB-IL3	**Specification**	-10 to 10 V
		Instruction range	-11.00 to 11.00 V
		Input resistance	1 MΩ or higher
Instruction accuracy (ambient temperature: 23°C)			±0.2% FS ±1 digit or less

TC input type

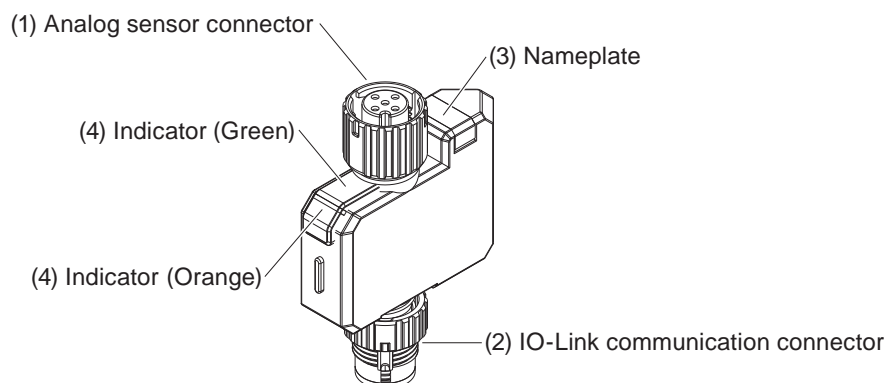| Item			Description
Sampling period			Switchable between 50 ms (default) and 10 ms
Influence of temperature			(The greater of ±1% of the instruction value or ±4°C) ±1 digits or fewer
Influence of voltage			
Installation influence			
Influence of EMS			
Influence of signal source resistance			0.1°C/Ω or less
Thermocouple type			K thermocouple
Cold junction compensation method			Switchable between ON (default) and OFF
Instruction range	**K3CV-1TCKA-IL3**	**Specification**	-20 to 500°C/0 to 900°F
		Instruction range	-40.0 to 520.0°C/-40.0 to 940.0°F
Instruction accuracy (ambient temperature: 23°C)			(The greater of ±1% of the instruction value or ±2°C) ±1 digits or fewer

Pt input type

Item			Description
Sampling period			Switchable between 50 ms (default) and 10 ms
Influence of temperature			(The greater of ±1% of the instruction value or ±2°C) ±1 digits or fewer
Influence of voltage			
Installation influence			
Influence of EMS			
Influence of signal source resistance			0.1°C/Ω or less
Compatible sensor			Pt100
Connection method			3-line
Sensor current			250 μA
Instruction range	**K3CV-1PTPA-IL3**	**Specification**	-200 to 500°C/-300 to 900°F
		Instruction range	-220.0 to 520.0°C/-340.0°C to 940.0°F
Instruction accuracy (ambient temperature: 23°C)			(The greater of ±0.2% of the instruction value or ±0.8°C) ±1 digits or fewer

K3CV

IO-Link Specifications

Item	Description
IO-Link device	Package 2024 compatible
Baud rate	COM3: 230.4 kbps (Fixed)
Device profile	Common Profile, Locator
Minimum cycle time	COM3: 2.0 ms
Data length	16 bit
Port class	Class A
Process data	16 bit
Conversion principle	ADC $\angle\Sigma$
ADC resolution	16 bit
Control output	Switchable between physical quantity (default) and count value
Moving average filter	0 (default), 2, 4, 8, 16, 32: Switchable

Please contact your OMRON sales representative regarding the IO-Link setup file (IODD file).

Nomenclature

(1) Analog sensor connector

(3) Nameplate

(4) Indicator (Green)

(4) Indicator (Orange)

(2) IO-Link communication connector

No.	Name	Function
(1)	Analog sensor connector	Connects external devices such as analog sensors. M12, 5Pin, Female, SmartClick Round Connector
(2)	IO-Link communication connector	Connects an IO-Link master or IO-Link cable. M12, 4Pin, Male, SmartClick Round Connector
(3)	Nameplate	Uses to describe the model name.
(4)	Indicator	Displays the device status. Green: Power supply, IO-Link communication indicator Orange: Operation indicator

LED

Display Specifications

Indicator		State	Event Code	Abnormal or Alarm	Description	Action
Green	Orange					
Blinking (1s period)	ON	Normal	0 × 0000	---	---	---
Green and orange are blinking fast alternatively (0.3s period)		Breakdown	0 × 1800 0 × 1803	Abnormal	There may be an internal malfunction in the product.	Restart the product and if the abnormality reoccurs, replace the product.
Blinking fast (0.3s period)	OFF	Parameter error	0 × 6302	Abnormal	There is inconsistency on the settings written in by the IO-Link communications (service data).	Execute the system command to "Back-to-box" to initialize the settings. Refer to *Service Data Index 2*.
Blinking (1s period)	OFF	Disconnection of lower devices ∗1	0 × 7700	Abnormal	An error in the input value from the sensor.	Review the sensor installation.
Blinking (1s period)	OFF	Process Data Overrun	0 × 8C10	Alarm	The process data exceeds the upper limit of the measurement range.	Check the process data and the upper limit of the measurement range.
Blinking (1s period)	OFF	Process Data Underrun	0 × 8C30	Alarm	The process data is below the lower limit of the measurement range.	Check the process data and the lower limit of the measurement range.
Blinking (1s period)	OFF	Process data alarm upper limit	0 × 1804	Alarm	The process data exceeds the alarm value upper limit.	Check the process data and the alarm value upper limit.
Blinking (1s period)	OFF	Process data alarm lower limit	0 × 1805	Alarm	The process data is below the alarm value lower limit.	Check the process data and the alarm value lower limit.

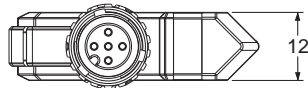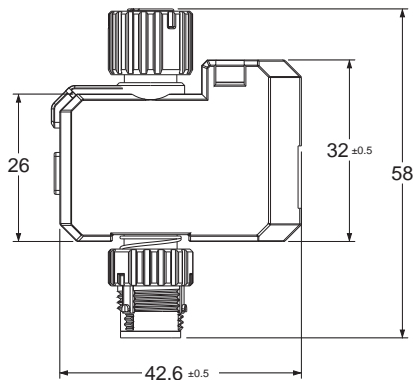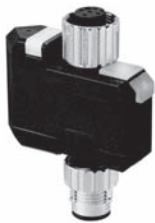∗1. In the case of K3CV-1ADIA-IL3/K3CV-1TCKA-IL3/K3CV-1PTPA-IL3.
    0 × 7700 occurs when the connector at analog sensor is open, and the process data is clamped to a lower limit of 3 mA for the K3CV-1ADIA-IL3 and to an upper limit of 520°C for the K3CV-1TCKA-IL3/K3CV-1PTPA-IL3.
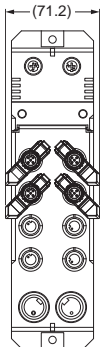
K3CV

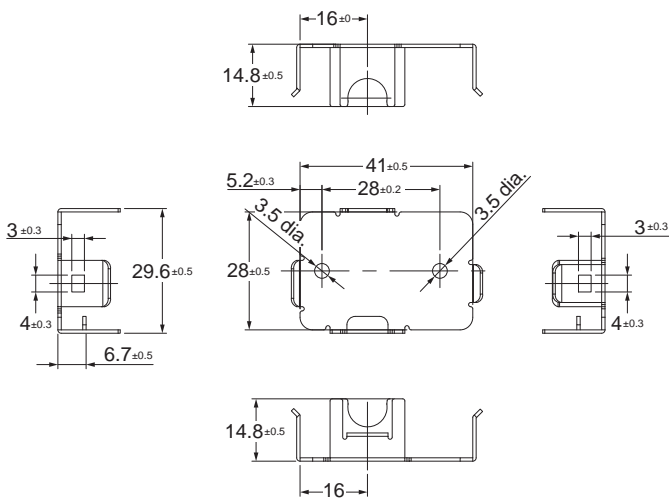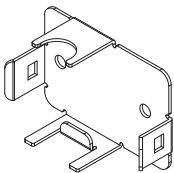## Dimensions (Unit: mm)

K3CV

Dimensions when some K3CVs connect directly to the NXR.

26
32 ±0.5
58
42.6 ±0.5
12
(71.2)

Option
Mounting Bracket
K3CV-F-1

16 ±0
14.8 ±0.5

41 ±0.5
5.2 ±0.3
28 ±0.2
3.5 dia.
3.5 dia.
3 ±0.3
29.6 ±0.5
28 ±0.5
28 ±0.5
3 ±0.3
4 ±0.3
4 ±0.3
6.7 ±0.5

14.8 ±0.5
16

Use cable ties to secure the K3CV to the mounting bracket (not included in the package). The length of 150 mm or more is recommended.

Material: SUS304

Mounting screws are not included in the package.
The mounting screws (M3, minimum length 3 mm, screw head height including washer 4 mm or less) are recommended.
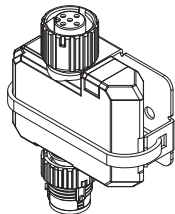
Main Unit Fixture
K3CV-F-2

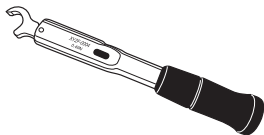22.5 ±0.5
3
1
19.5 ±0.5
18
10.9 ±0.2
10
20 ±0.5
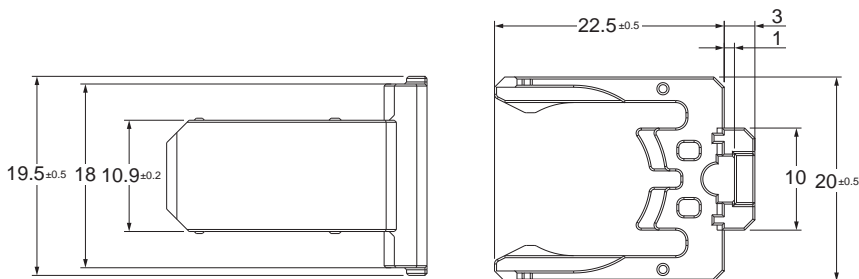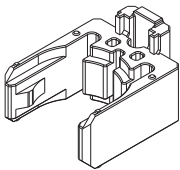
Material: PC
When attaching the fixture to a fixed IO-Link master unit, a clearance of approximately 5 cm is required.
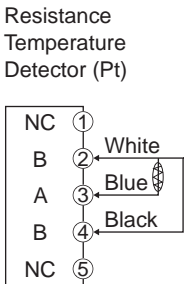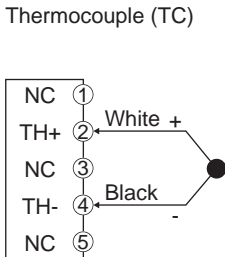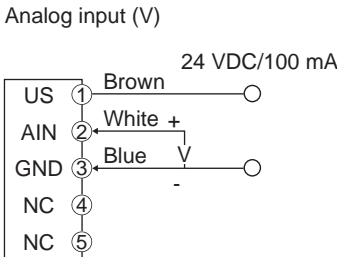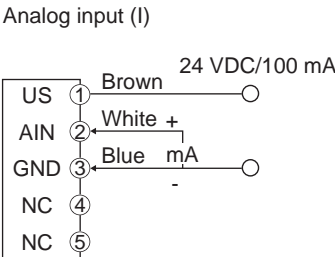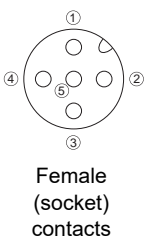
Tools for M12 threaded connectors

Use them to tighten the fixture of the M12 threaded connector to the specified torque value.
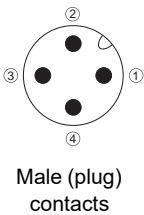
Torque Wrench
XY2F-0004

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Pin Assignment

Analog Sensor Connector

Female (socket) contacts

Analog input (I)

24 VDC/100 mA

US	①	Brown
AIN	②	White +
GND	③	Blue mA
NC	④	-
NC	⑤	

Analog input (V)

24 VDC/100 mA

US	①	Brown
AIN	②	White +
GND	③	Blue V
NC	④	-
NC	⑤	

Thermocouple (TC)

NC	①	
TH+	②	White +
NC	③	
TH-	④	Black
NC	⑤	-

Resistance Temperature Detector (Pt)

NC	①	
B	②	White
A	③	Blue
B	④	Black
NC	⑤	

IO-Link Communication Connector

Male (plug) contacts

Common Specifications

L+	①	Brown	①	L+
NC	②		②	I/Q
L-	③	Blue	③	L-
C/Q	④	Black	④	C/Q

IO-Link master
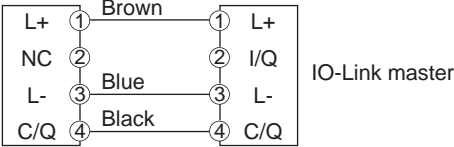
K3CV

Process Data

Alarm Function
Input Type: analog input
Select the setting for the alarm value according to the setting (physical quantity/count value) of the process data format (Index=72, Sub-Index=0).

When a physical quantity is set

Index	Sub-Index	Name	Range
64	0	Process Data Alarm Value Upper limit0	-32,768 to 32,767 (-327.68 to 327.67 [Unit: mA]) Default value: 32,767 (327.67)
65	0	Process Data Alarm Value Lower limit0	-32,768 to 32,767 (-327.68 to 327.67 [Unit: mA]) Default value: -32,768 (327.68)

When count value is set

Index	Sub-Index	Name	Range
66	0	Process Data Alarm Value Upper limit1	-32,768 to 32,767 Default value: 32,767
67	0	Process Data Alarm Value Lower limit1	-32,768 to 32,767 Default value: -32,768

Input Type: TC/Pt
Only physical quantities can be set

Index	Sub-Index	Name	Range
68	0	Process Data Alarm Value Upper limit	-32,768 to 32,767 (-3,276.8 to 3,276.7 [Unit: °C/°F]) Default value: 32,767 (3,276.7)
69	0	Process Data Alarm Value Lower limit	-32,768 to 32,767 (-3,276.8 to 3,276.7 [Unit: °C/°F]) Default value: -32,768 (-3,276.8)

Moving Average Filters
- You can set the number of data points for the moving average of process data. This function is used to reduce sudden changes in the input signal caused by noise components, etc.

Index	Sub-Index	Name	Range
70	0	Moving Average Times	0: OFF (Default value) 1: 2 times 2: 4 times 3: 8 times 4: 16 times 5: 32 times

Sampling Rate
- The sampling rate of in the process data can be selected.

Index	Sub-Index	Name	Range
71	0	Sampling Rate	0: 50 ms (Default value) 1: 5 ms for analog input, 10 ms for TC/Pt

Process Data Format

- The process data format can be set to physical quantity or count value.
- Available for analog input type

Index	Sub-Index	Name	Range
72	0	Process Data Format	0: Physical quantity (Default value) 1: Count value

Count value and Physical quantity

If the measured value is outside the indicated range, it is clamped to the upper and lower limits of the indicated range

Analog input 4 to 20 mA

Count Value		Physical Quantity
Dec.	Hex.	
32,511	7EFF	21.00 mA
30,599	7787	20.00 mA
1	0001	4 mA +522.9 nA
0	0000	4 mA
-1	FFFF	4 mA -522.9 nA
-1,912	F888	3 mA

Analog input 0 to 20 mA

Count Value		Physical Quantity
Dec.	Hex.	
32,511	7EFF	21.00 mA
30,963	78F3	20.00 mA
1	0001	645.9 nA
0	0000	0 mA
-1	FFFF	-645.9 nA
-1,548	F9F4	-1 mA

Analog input 0 to 10 V

Count Value		Physical Quantity
Dec.	Hex.	
32,511	7EFF	11 V
29,555	7373	10 V
1	0001	338.3 uV
0	0000	0 V
-1	FFFF	-338.3 uV
-2,956	F474	-1 V

Analog input: -10 to 10 V

Count Value		Physical Quantity
Dec.	Hex.	
32,511	7EFF	11 V
29,555	7373	10 V
1	0001	338.3u V
0	0000	0 V
-1	FFFF	-338.3 uV
-29,555	8C8D	-10 V
-32,512	8100	-11 V

Temperature Unit

- Temperature units can be selected as "°C" or "°F".
- When the temperature unit is changed, the upper and lower alarm limits of the process data are automatically converted.
- Available for TC or Pt input type

Index	Sub-Index	Name	Range
73	0	Temperature Unit	0: °C (Default value) 1: °F

Cold Junction Compensation Method

- You can choose whether to turn cold junction compensation ON or OFF.
- Available for TC input type

Index	Sub-Index	Name	Range
74	0	Cold junction	0: OFF No cold junction compensation 1: ON Cold junction compensation is enabled (Default value)

Communications Specifications

Bit	7	6	5	4	3	2	1	0
PD0				Instruction Value				
PD1				PD0: upper 8 bits, PD1: lower 8 bits				

Index List

Index	Sub-Index	Name	Back up target	Format	Access	Length	Default value	Range	Remark
0	0	Direct Parameter Page 1	---	Record	R/W	16 byte	---	---	
2	0	System-Command	---	Uinteger	W	1 byte	-	0×81: Application Reset 0×83: Back-to-Box 0×7E: Locator Start 0×7F: Locator Stop	Application reset: Returns the settable parameters except Tag information in Index 24 to 26 to the factory default state. Back-to-box: Returns the settable parameters including Tag information in Index 24 to 26 to the factory default state. After execution, IO-Link communication is disconnected and then sensor operation stops and the state becomes waiting for the sensor to be removed from the IO-Link master. Locator Start: Starts indicator (green) to blink fast Locator Stop: Stops indicator (green) from blinking fast
3	0	Data Storage	---	Record	R/W	---	---	---	Use when backing up or restoring the settings to/from the IO-Link master unit. ∗1
13	1	Profile Characteristic	---	Uinteger	R	2 byte	---	0×4000: Common Profile	Indicates the types that K3CV supports as functions of IO-Link. ∗1
	2		---	Uinteger	R	2 byte	---	0×8101: Locator	
14	0	PDInput Descriptor	---	Octet	R	12 byte	---	---	∗1
16	0	Vendor Name	---	String	R	64 byte	---	OMRON Corporation	
17	0	Vendor Text	---	String	R	64 byte	---	OMRON Corporation	
18	0	Product Name	---	String	R	64 byte	---	---	Model
19	0	Product ID	---	String	R	64 byte	---	---	Model
20	0	Product Text	---	String	R	64 byte	---	---	Sensor type
21	0	Serial Number	---	String	R	8 byte	---	---	
22	0	Hardware Version	---	String	R	4 byte	---	---	
23	0	Firmware Version	---	String	R	4 byte	---	---	
24	0	Application Specific Tag	○	String	R/W	32 byte	"***"	Optional	
25	0	Function Tag	○	String	R/W	32 byte	"***"	Optional	
26	0	Location Tag	○	String	R/W	32 byte	"***"	Optional	
36	0	Device Status	---	Uinteger	R	1 byte	---	0×00: Device is OK 0×02: Out-of-Specification (Out of range/Alarm) 0×04: Failure (Breakdown/Sensor Disconnection)	
37	0	Detailed Device Status	---	Record	R	18 byte	---	0×1800/0×1803: Breakdown 0×6320: Parameter error 0×7700: Disconnection of lower devices 0×8C10: Process data overrun 0×8C30: Process data underrun 0×1804: Process data alarm value upper limit 0×1805: Process data alarm value lower limit	For details, refer to Event function.
40	0	Process Data Input	---	Record	R	2 byte	---	---	

∗1. For the details, refer to the specification (IO-Link interface and System Specification V1.1.4 (https://io-link.com))

K3CV

Safety Precautions

⚠ Warning

This product is not designed to detect human forms either directly or indirectly for the purpose of ensuring safety.
Do not use this product as a detection device to protect people.

Never use this product with AC power supply or with voltage in excess of the rated voltage as doing so may result in rupturing or fire.

⚠ CAUTION

This product cannot be used in explosion hazard areas. Do not use the product in environments where flammable or explosive gases are present.

This product takes 30 minutes to display the correct measurement values after power is turned on. (This is the time it takes for the internal temperature of the K3CV product to stabilize and for the measurement values to become stable. Until the internal temperature stabilizes, the measurement values may have a significant error.)

Precautions for Safe Use

Observe the following to ensure safe use of K3CV.
- If the product is used in a manner not specified by the INSTRUCTION SHEET, the protection provided by the product may be impaired.
- Do not reverse the connection of the DC power supply polarity.
- Do not dismantle, modify, or repair the product.
- To prevent an accident due to the product falling, wear appropriate protective gear such as safety glasses and a helmet when performing installation work in a high location.
- Do not use the product if the case is damaged.
- If you feel that something is not right with the product, immediately discontinue use, turn off the power, and contact your OMRON representative.
- 🗑 Dispose of the product in accordance with applicable regulations.
- The base of the connector does not rotate. Do not try to turn it by force.
- Affix the mounting bracket using screws tightened to the specified torque.
- Fix the cables in place so as to avoid any load being applied directly to the connector.
- Wait for 1.5 seconds after switching the product on before using it.
- Fix the main unit to a wall or another stable place and do not use the product in places where it is subject to shock or vibration.
- Do not use the product under conditions or in environments that exceed its rated limits.

Precautions for Correct Use

- During installation, do not hit the product with a hammer or any other such tool.
- Install the product with screws tightened to the specified torque or lower.
  - For the M12 connector, the proper tightening torque is from 0.39 to 0.49 N·m.
  - In the case of the pre-wired M12 Smartclick Connector, firmly tighten the connector to the mating complete mark position by hand.
- Do not pull the cables forcefully.
- Do not use the product in direct sunlight.
- The product has an IP67 protection rating, but avoid using it in environments where it is constantly exposed to water or outdoors.
- Please assess the safety beforehand when using the product in chemicals and/or oil environments.
- Do not use the product in high humidity environments with the risk of condensation.
- Do not use the product where corrosive gases are present.
- Do not use the product in environments with a strong electric or magnetic field.
- Do not use organic solvents (e.g. paint thinner and alcohol) for cleaning, as this may cause deterioration in the protective structure.
- Stop using the product once the writing operation lifespan (100,000 operations) of the non-volatile memory has been reached. Setting information is written to the volatile memory when a threshold value change is executed.
- Be sure to turn off the power supply when connecting or disconnecting the cable.
- The analog input circuit is not insulated from internal circuits. Do not use grounded thermocouples, as stray currents may cause errors in the temperature readings.
- Do not use the product if the cables is pinched.
- Do not short-circuit the load.

Terms and Conditions Agreement

Read and understand this catalog.

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

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Note: Do not use this document to operate the Unit.