## **Digital panel indicators**

Omron's digital panel indicator series accepts a wide range of input signals (process, temperature, pulse/impulse, weight, etc.), that can be displayed in any required value. The series also includes a green / red colour change display feature, which clearly visualises the status of a process.

- Multiple inputs, including process, temperature, frequency and many more!
- Highly visible display provides a clear, highly stable read-out of values
- Large, front-panel keys for unambiguous, user-friendly programming
- Dust-proof and waterproof front case that complies with NEMA4X (IP66 equivalent) standards
- Wide range of models with communication capability including DeviceNet





### K3HB - Omron's new panel indicator

The K3HB indicators provide a bar graph position indication, which is unique in 1/8 DIN horizontal housing panel indicators. The sampling speed of this range has been increased to 50 times per second, or 2,000 times per second for the linear sensor indicator version.

Furthermore, users can specify DeviceNet communications, with the option of a DeviceNet output module delivering high-speed data communication with PLCs, without the need for special programming.

The full range of K3HB analogue input panel indicators includes a process indicator (K3HB-X), a temperature indicator (K3HB-H), a weighing indicator (K3HB-V) and a linear sensor indicator (K3HB-S). These indicators provide convenient, high-performance solutions in a broad spectrum of applications in the process industry, as well as in machinery applications such as binding, soldering, semiconductor manufacture, moulding and mixing machines. The K3HB indicators are modular in design, which enables users to select exactly the functionality they require.









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	Common to all K3HB-R-P-C	CD

### Selection table

	Category	1/32 DIN Multi- function		1/8 DIN Standard		1/8 Advanced Analogue
ection criteria		12345 H	1999	3500	50000	: 13 <u>999</u>
Se	Model	K3GN	K3MA-J	K3MA-L	K3MA-F	КЗНВ-Х
	Size	1/32 DIN		1/8	DIN	
	Colour change display					
	Number of digits	5	5	4	5	5
	Leading zero suppression		-			
	Forced zero function			-		
	Min. / max. hold function		-	-		
	Average processing	-	-	-		-
	User selectable inputs	-		-		-
	Start-up compensating time	-	_	_	-	_
	Key protection	-	-	-		-
	Decimal point position	-	-	-	-	-
	setting	_	_	_		-
es	Accuracy	±0.1% of full scale	±0.1% of full scale	±0.1% of full scale	±0.1% of full scale	±0.1% of full scale (DC voltage & DC current), ±0.5% of full scale (AC voltage & AC current)
Feature	Input range	0 to 20 mA, 4 to 20 mA or 0 to 5 V, 1 to 5 V, $-5$ to 5 V, $-10$ to 10 V or 0 to 30 Hz or 0 to 5 kHz	0 to 20 mA, 4 to 20 mA or 0 to 5 V, 1 to 5 V, -5 to 5 V, -10 to 10 V	Pt100, JPt100 or thermocouple K, J, T, E, L, U, N, R, S, B	0 to 30 Hz or 0 to 5 kHz	0.000 to 10.000 A, 0.0000 to 19.999 mA, -199.99 to 199.99 mA, 4.000 to 20.000 mA, 0.0 to 400.0 V, 0.0000
	Sample rate	250 ms	250 ms	500 ms	-	20 ms
	Features	Remote / local processing, parameter initialisation, programmable output configuration, process value hold	Teaching, comparative output pattern selection, parameter initialisation, programmable output configuration, process value hold	Programmable output configuration, process value hold	Teaching, comparative output pattern selection, programmable output configuration, process value hold	Scaling, teaching, averaging, output hysteresis, output OFF-delay, output test, bank selection, reset, comparative output
	Sensor power supply					
Front protection	IP rating	IP66	IP66	IP66	IP66	IP66
	Supply voltage	24 VDC	24 VAC / VDC or 100 to 240 VAC	24 VAC / VDC or 100 to 240 VAC	24 VAC / VDC or 100 to 240 VAC	100 to 240 VAC or 24 VAC / VDC
	NPN					
	PNP					
	Temperature					
	Contact					
outs	Voltage pulse					
Ē	Load cell					
	DC voltage					
	DC current					
	AC voltage					
	AC current					
	Relay					
ŝ	NPN					
tput	PNP					
Out	Linear					
	BCD	_				
	Comms		F 40	F 05	5.64	
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## **Digital panel indicators**

	1/8 Advanced Analogue			1/8 DIN Advanced Digital	
3 <u>158</u> ,	* 123YS1	- 0003- 	. 1234 <u>5</u> .	- 58 <u>000</u> 1	. 12345 
КЗНВ-Н	K3HB-V	K3HB-S	КЗНВ-С	КЗНВ-Р	K3HB-R
•	•		•	•	
5	5	5	5	5	5
	-	-		-	
-	-	-	-	-	-
-					
_	_	_	_	_	
	-	-		-	-
-	-	-	-	-	-
Thermocouple: ±0.3% of full scale, Pt-100: ±0.2% of full scale	±0.1% of full scale	One input: ±0.1% of full scale, two inputs: ±0.2% of full scale		±0.08% rgd ±1 digit	±0.006% rgd ±1 digit ±0.02% rgd ±1 digit
Pt100, thermocouple K, J, T, E, L, U, N, R, S, B, W	0.00 to 199.99 mV, 0.000 to 19.999 mV, 100.00 mV, 199.99 mV	0 to 20 mA, 4 to 20 mA, 0 to 5 V, -5 to 5 V, -10 to 10 V	No voltage contact: 30 Hz, voltage pulse: 50 kHz, open collector: 50 kHz	No voltage contact: 30 Hz, voltage pulse: 50 kHz, open collector: 50 kHz	No voltage contact: 30 Hz, voltage pulse: 50 kHz, open collector: 50 kHz
20 ms	20 ms	0.5 ms	-	-	-
Scaling, teaching, averaging, output hysteresis, output OFF-delay, output test, bank selection, reset, comparative output	Scaling, teaching, averaging, output hysteresis, output OFF-delay, output test, bank selection, reset, comparative output	Scaling, 2-input calculation, teaching, averaging, output hysteresis, output OFF-delay, output test, bank selection, reset, comparative output	Scaling, measurement operation selection, output hysteresis, output OFF-delay, output test, display value selection, display colour selection, key protection, bank selection, display refresh period, maximum / minimum hold, reset	Scaling, measurement operation selection, output hysteresis, output OFF-delay, output test, teaching, display value selection, display volour selection, key protection, bank selection, display refresh period, maximum / minimum hold, reset	Scaling, measurement operation selection, averaging, previous average value comparison, output hysteresis, output OFF-delay, output test, teaching, display value selection, display colour selection, key protection, bank selection, display refresh period, maximum / minimum hold, reset
IP66	IP66	IP66	IP66	IP66	IP66
100 to 240 VAC or 24 VAC / VDC	100 to 240 VAC or 24 VAC / VDC	100 to 240 VAC or 24 VAC / VDC	100 to 240 VAC or 24 VAC / VDC	100 to 240 VAC or 24 VAC / VDC	100 to 240 VAC or 24 VAC / VDC
				-	
			_	-	_
			-	-	-
□ F-73	□ F-77	□ F-81	□ F-97	□ F-91	□ F-85
1-75	1-11	1-01	1-01	1-01	1-00

Digital panel indicators

Standard Available

No / not available

## **LEADING IN SERVICE**

#### Focussed, progressive, distinctive. Be assured, choose Omron

At Omron we set high standards for ourselves. Our products are known all over the world for their unrivalled quality. But we offer more than just excellent quality. In an environment that places ever greater demands with regard to service, quality and costeffectiveness, other things are important too. Providing a top-quality service is what we do every day, including extra service as standard. This helps to ensure that we can provide tailor-made solutions for applications more effectively and more quickly.

More and more companies are choosing Omron as they seek to work in a partnership that is based on reliability and certainty.

Omron - the reassuring choice.



#### International standards and approvals

Our products carry all relevant international standards and approvals, including CCC (Chinese Compulsory Certification), which makes exporting your system much easier.

- Reliability, also for your customers
- Maximum flexibility
- Confidence



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- Reduced engineering time

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- · Readily available
- · Convenience that saves you time



30 View 2D View Download



3D View 2D View Download

## 1/32 DIN Digital Panel Meter

#### 1/32 DIN Digital Panel Meter for Downsizing **Equipment and Control Panels**

- Compact size: 24x48x83 (HxWxD).
- Multi-input compatible: DC voltage/current, rotary pulse.
- Two display colors (switchable): green/red.
- · Selectable outputs.
- CE marking and UL/CSA approval.
- Splash-proof construction (NEMA4X: equivalent to IP66).

Refer to Safety Precautions on page F-16. /ľ



### **Model Number Structure**

### Model Number Legend

#### K3GN-LL-L 」-∐ 24 VDC 2

3 4

#### 1. Input Type

ND: DC voltage/current, NPN

1

PD: DC voltage/current, PNP

#### 2. Output Type

- C: 2 relay contact outputs (SPST-NO)
- C-FLK: 2 relay contact outputs (SPST-NO) and RS-485
- C-L1: 2 relay contact outputs (SPST-NO) and DC current (0 to 20 mA, 4 to 20 mA)
- 2 relay contact outputs (SPST-NO) and DC voltage (0 to 5 V, 1 to 5 V, 0 to 10 V) C-L2:
- T1: 3 transistor outputs (NPN open collector)
- T1-FLK: 3 transistor outputs (NPN open collector) and RS-485
- T1-L1: 3 transistor outputs (NPN open collector) and DC current (0 to 20 mA, 4 to 20 mA)
- 3 transistor outputs (NPN open collector) and DC voltage (0 to 5 V, 1 to 5 V, 0 to 10 V) T1-L2:
- T2: 3 transistor outputs (PNP open collector)
- T2-FLK: 3 transistor outputs (PNP open collector) and RS-485

#### 3. Option

None: None

-400: Normally energized relays

#### 4. Supply Voltage

24 VDC: 24 VDC

### **Ordering Information**

#### ■ List of Models

Supply	Input type		Model	
voltage		Judgement output	Data transmission output	
24 VDC	DC voltage, DC current,	t, 2 relay contact outputs	None	K3GN-NDC 24 VDC
	or NPN input	(SPSI-NO)	RS-485	K3GN-NDC-FLK 24 VDC
			DC current (0 to 20 mA, 4 to 20 mA)	K3GN-NDC-L1 24 VDC
			DC voltage (0 to 5 V, 1 to 5 V, 0 to 10 V)	K3GN-NDC-L2 24 VDC
		2 relay contact outputs	None	K3GN-NDC-400 24 VDC
DC voltage, DC current, or PNP input		(SPST-NO) Normally energized relays (See note.)	RS-485	K3GN-NDC-FLK-400 24 VDC
			DC current (0 to 20 mA, 4 to 20 mA)	K3GN-NDC-L1-400 24 VDC
			DC voltage (0 to 5 V, 1 to 5 V, 0 to 10 V)	K3GN-NDC-L2-400 24 VDC
		3 transistor outputs (NPN open collector)	None	K3GN-NDT1 24 VDC
			RS-485	K3GN-NDT1-FLK 24 VDC
			DC current (0 to 20 mA, 4 to 20 mA)	K3GN-NDT1-L1 24 VDC
			DC voltage (0 to 5 V, 1 to 5 V, 0 to 10 V)	K3GN-NDT1-L2 24 VDC
	DC voltage, DC current,	2 relay contact outputs	None	K3GN-PDC 24 VDC
	or PNP input	(SPST-NO)	RS-485	K3GN-PDC-FLK 24 VDC
		3 transistor outputs (PNP	None	K3GN-PDT2 24 VDC
		open collector)	RS-485	K3GN-PDT2-FLK 24 VDC

Note: Refer to page 10 for information on models with normally energized relays.

### **Specifications**

### ■ Ratings

	Item	K3GN-ND With DC voltage, DC current, and NPN input	K3GN-PD With DC voltage, DC current, and PNP input			
Supply voltage		24 VDC				
Operating voltage rai	nge	85% to 110% of the rated supply voltage				
Power consumption	wer consumption (at max. load) (See note 1.) 2.5 W max. (at max. DC load with all indicators lit)					
Input signal		DC voltage, DC current, no-voltage contact, open collector				
DC voltage/current input	A/D conversion	Double integral method				
Pulse signal input	Pulse measurement method	Periodic measurement method				
External power supp	rnal power supply None					
Control input		Present value hold or forced zero (selectable) (See note 2.)				
Outputs (Outputs depend on	Relay contact output	1 A, 30 VDC (resistive load), mechanical life: 50,000,000 operations min., electrical life: 100,000 operations min.				
the model.) Transistor output		Max. load voltage: 24 VDC, Max. load current: 50 mA, Leakage current: 100 $\mu$ A max.				
	Communications output	RS-485 (2-wire, half-duplex)				
	Linear output	DC current (0 to 20 mA DC, 4 to 20 mA: Load: $500 \Omega$ max., Resolution: Approx. 10,000) DC voltage (0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC: Load: 5k Ω min., Resolution: Approx. 10,000)				
Display		Negative LCD (backlit LCD) display 7-segment digital display, character height: 7.0 m	n, and single illuminated display			
Main functions Scaling, prescaling, teaching, average processing, forced zero, displa selection, key protection, startup compensation timer, hysteresis		, forced zero, display color selection, output type ner, hysteresis				
Ambient temperature         Operating:         -10°C to 55°C (with no condensation or icing)           Storage:         -25°C to 65°C (with no condensation or icing)		or icing) or icing)				
Ambient humidity Operating: 25% to 85%						
Altitude		2,000 m max.				
Accessories		Rubber packing, fixture, operation manual				

Note: 1. A control power supply capacity greater than the rated capacity is required when the Digital Panel Meter is turned ON. Do not forget to take this into consideration when using several Digital Panel Meters. When power is supplied, all indicators will light and outputs will be OFF. When using startup compensation time operation, the display will read "DDDD" and all outputs will be OFF.

2. Enabled only when using DC voltage/current input. (Min.time for control signal input: 80 ms)

### ■ Characteristics

lte	em	K3GN-ND With DC voltage, DC current	K3GN-PD With DC voltage, DC current, and PNP input			
Input signal DC voltage/current (4 to 20 mA, 1 to 5 V, ±5 V, ±10 V) No-voltage contact (30 Hz max. with ON/OFF pulse width of 16 ms min.) Open collector (5 kHz max. with ON/OFF pulse width of 90 μs min.)			6 ms min.) min.)			
Displayable rang	e	5 digits (-19999 to 99999)				
Sampling period		250 ms				
Display refresh p	eriod	Sampling period (sampling times mult	iplied by number of avera	aging times if average processing is selected.)		
Comparative out time (transistor outpu	put response ts)	Provide the second s				
Linear output res	sponse time	750 ms max. (The time required for the analog output to be output if the output signal rapidly changes from 15% to 95% or from 95% to 15%.)				
Insulation resista	ance	20 M $\Omega$ min. (at 500 VDC) between external terminal and case. Insulation provided between inputs, outputs, and power supply.				
Dielectric streng	th	1,000 VAC for 1 min between external terminal and case.				
Noise immunity		±480 V on power supply terminals in normal mode, ±1,500 V in common mode, ±1 μs, or 100 ns for square-wave noise with 1				
Vibration resista	nce	Vibration frequency: 10 to 55 Hz, Acceleration: 50 m/s <sup>2</sup> for 10 min each in X, Y, and Z directions				
Shock resistance	9	Models with transistor outputs: 150 m/s <sup>2</sup> three times each in 3 axes, 6 directions Models with contact outputs: 100 m/s <sup>2</sup> three times each in 3 axes, 6 directions				
Weight		Approx. 100 g (Main Unit only)				
Degree of	Front panel	NEMA4X for indoor use (equivalent to IP66),				
protection	Rear case	IP20				
	Terminals	IP00 and finger protection (VDE0106/100)				
Memory protecti	on	Non-volatile memory (EEPROM) (pos	sible to rewrite 100,000 t	imes)		
Approved standa	ards	UL508, CSA C22.2 No. 142				
EMC		(EMI) Emission Enclosure: (EMS) Immunity ESD: Immunity RF-interference: Immunity Fast Transient Noise: Immunity Burge: Immunity Surge: Immunity Conducted Disturbance Immunity Power Frequency Magnetic	EN 61326 EN55011 Group 1 class EN 61326 EN 61000-4-2: EN 61000-4-3: EN 61000-4-4: EN 61000-4-5: EN 61000-4-6: EN 61000-4-8:	Industry s A Industry 4 kV (contact discharge) 8 kV (air discharge) 10 V/m (amplitude-modulated, 80 MHz to 1 GHz) 2 kV (power line) 1 kV line to line (I/O signal line) 2 kV line to ground (power line) 3 V (0.15 to 80 MHz) 30 A/m (50 Hz) continuous time		

### ■ Input Ranges: Measurement Range and Accuracy

Input type	Analog <b>RARL G</b>					Pulse		Remote	
	DC current input		DC voltag	je input		Ro	otary pulse		
Analog range <b>- RoSE</b>	4 to 20 mA <b>4-20</b>	Analog range <b>- AnGE</b>	1 to 5 V <b>/-5</b>	±5 V 5	±10 V <b>iD</b>	Pulse frequency <b>P-F-E</b>	30 Hz <b>30</b>	5 kHz 5 Hz	
Connection terminal	5-6	Connection terminal		4-5		Connection terminal	2	)-3	Range of display
Current range (mA) 20.00 4.00 0.00	22.00	Voltage range (V) <sup>10.00</sup> 5.000 0.000 -5.000 -10.00	5.500	5.500	-11.00	Frequency range 5000 (Hz) 4000 2000 1000 0.0	<u>30.00</u> 0.05	5000	from <b>9999</b> to <b>99999</b> using communications.
Input impedance	60 Ω	Input impedance	1 M $\Omega$ min.						
Measurement accuracy	±0.1% full s 23±3°C)	cale ± one digit	max. (at	±0.1% full s digit max. (a	cale ± one at 23±5°C)	±0.1% full scale 23±5°C)	e ± one digit	max. (at	

Note: The shaded ranges indicate default settings.

### ■ Input/Output Ratings

#### **Relay Contact Output**

(Incorporating G6K Relays)

Item	Resistive load ( $\cos\phi = 1$ )
Rated load	1 A at 30 VDC
Rated through current	1 A max. (at COM terminal)
Max. contact voltage	60 VDC
Max. contact current	1 A (at COM terminal)
Max. switching capacity	30 VA
Min. permissible load (P level, reference value)	10 mV, 10 μA
Mechanical life	50,000,000 operations min. (at a switching frequency of 36,000 operations/hr)
Electrical life (at an ambient temperature of 23°C)	100,000 operations min. (at the rated load with a switching frequency of 1,800 operations/hr)

#### Transistor Output

Rated load voltage	24 VDC
Max. load current	50 mA
Leakage current	100 μA max.

### **Communications Specifications**

	Item	RS-485
Communi	cations method	2-wire, half-duplex
Synchron	ization method	Start-stop synchronization
Baud rate		1,200/2,400/4,800/9,600/19,200 bps
Transmiss	sion code	ASCII
Commu- nications	Reading/ Writing to the K3GN	Read/write comparative set values, read/write scaling values, enable/ disable the writing of data through communications, forced-zero control, and other data.

#### Linear Output

Item	0 to 20 mA	4 to 20 mA	0 to 5 V	1 to 5 V	0 to 10 V
Permissible load impedance	500 Ω m	ax.	5 k $\Omega$ min.		
Resolution	Approx.	10,000			
Output error	±0.5% fu	III scale	±0.5 full ±0.15 V (no outp	scale. at 1 V or ut for 0 or	less · less)

### Nomenclature



4. Level key

5. Mode key	<ol><li>Shift key</li></ol>	7. Up/Zero key

Name 1. Main display		Functions           Displays process values, parameters, and set values.	
	OUT2	Lit when output 2 is ON.	
	SV	Lit when a set value is being displayed or changed.	
	т	Lit when the teaching function is enabled. Flashes when the K3GN is in teaching operation. Lit when a calibration value is being displayed during user calibration. Flashes while reading a calibra- tion value.	
	ZERO	Lit while the forced-zero function is activated.	
	HOLD	Lit when HOLD input is ON.	
	CMW	Lit when communications writing is "enabled" and is out when it is "disabled."	
3. Level indicator		Displays the current level that the K3GN is in. (See below for details.)	
4. Level Key		Used to change the level.	
5. Mode Key		Used to allow the Main display to indicate parameters sequentially.	
6. Shift Key		Used to enable that set value to be changed. When changing a set value, this key is used to move along the digits.	
7. Up/Zero Key		Used to change a set value. Used to set or clear a forced-zero function when a measurement value is being displayed.	

Level indicator	Level
ρ	Protect
Not lit	Operation
8	Adjustment
5	Initial setting
٢	Communications setting
F	Advanced function setting
U	User calibration

#### 

- The drive operation for the output relay is reversed in these models.
- Relay contacts can be made open (i.e., OFF) when comparative set values are being judged. This is effective when constructing systems that take failsafe measures into consideration.

#### List of Models

Models with Normally Energized Relays
K3GN-NDC-400 24 VDC
K3GN-NDC-FLK-400 24 VDC
K3GN-NDC-L1-400 24 VDC
K3GN-NDC-L2-400 24 VDC

#### Relation between Output Type and Relay Output Operation



### Connections

#### ■ Terminal Arrangement





Terminal No.	Name	Description
1-2	Operation power	Connect the operation power supply.
3-2	Event input or pulse/contact input	Operates as follows depending on parameter setting:
(3)-(1)		Holds process value.
		<ul> <li>Calibrate the process value to zero and clear the forced-zero function.</li> </ul>
		<ul> <li>Pulse or contact input.</li> </ul>
4,6-5	Analog input	Connect the voltage or current analog input.
7-8	Communications	RS-485 communications terminals.
	Linear output	0 to 20 mA DC, 4 to 20 mA DC
		0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC
(9),(1)-12 (8),(8),(1)-12	Outputs	Outputs relay or transistor outputs. There is also a PASS output for models with transistor outputs.

#### Block Diagram



#### ■ Input Circuits Analog Input (DC Voltage/Current)

Use terminal 5 for analog common.



#### **Comparative Output**

#### **Contact Output**



### **Transistor Output**



#### Pulse Input/Control Event Input (HOLD/ZERO)

- Use terminal 2 for the common terminal.
- Use the NPN open collector or the no-voltage contacts for the control input.

#### **NPN Input**



**PNP** Input



#### Linear Output



### Operation

#### Main Functions

#### **Scaling**

The K3GN includes a scaling function that can convert the input signal to a desired value and display that value.

The displayed values can be freely adjusted to shift values, to create reversed displays, or to create positive/negative displays.



#### **Teaching**

Teaching is used when using scaling or setting comparative set values to set the present measurement values as the set values instead of inputting with the Shift and Up/Zero Keys. Teaching is useful for making settings while checking the operation status of the K3GN.

#### Average Processing

Average processing can be performed for measurement values using four levels (OFF, 2 times, 4 times, or 8 times). Average processing stabilizes displayed values by averaging the corresponding input signals that fluctuate dynamically. Select the appropriate number of averaging times depending on the application.

#### **Forced-zero Function**

It is possible to shift from a value to the zero point with one touch of the Up/Zero Key on the front panel (for example, when adjusting reference values).

Note: This function can be used only when forced-zero operation protection is released.



Note: The commons for linear output and transistor output on models with L1 and L2 are connected internally.

Depending on how the common is wired for externally connected devices, unwanted current paths for the linear output signal in the circuit may prevent the output signal from being output.

When connecting an external device, externally connect a relay to the transistor output or provide another means of insulation.

#### Changing the Display Color

The color of the value displayed can be set to either red or green. Make the setting according to the purpose and application of the equipment in which the K3GN is installed. The display color can also be set to change from green to red, or from red to green, according to the status of the comparison criteria.

#### **Output Type Selection**

Output operation for comparative set values can be freely selected. Upper limit: Output ON if the measurement value  $\geq$  comparative set value.

Lower limit: Output ON if the measurement value  $\leq$  comparative set value.

Upper/lower limit: Output ON if the measurement value  $\geq$  comparative upper-limit set value or if the measurement value is  $\leq$  the comparative lower-limit value.

#### Key Protection

Key protection is used to restrict changes to displays and settings using the front panel keys and to restrict menu display and movement of operation levels. This function is effective for preventing misuse during operation.

#### Startup Compensation Time (Rotary Pulse Input Only)

The startup compensation time parameter keeps the measurement operation from sending an unnecessary output corresponding to instantaneous, fluctuating input from the moment the K3GN is turned ON until the end of the preset period.

#### **Hysteresis**

The hysteresis of comparative outputs can be set to prevent the chattering of relay or transistor outputs.

### Dimensions

Note: All units are in millimeters unless otherwise indicated.

#### K3GN



#### ■ Wiring Precautions

- Wire the power supply with the correct polarity. Wiring with incorrect polarity may result in damage or burning.
- Wire the terminals using crimp terminals.
- Tighten terminal screws to a torque of approx. 0.5 N·m.
- Wire signal lines and power lines separately to reduce the influence of noise.

### ■ Wiring

#### Power Supply

• Input 24 VDC to terminals 1 and 2.

• Use M3 crimp terminals of the type shown below.



#### Measurement Input

The following table shows the relation between input ranges and input terminals.

Input ra	Input terminals	
DC voltage/DC current	4 to 20 mA	5-6
	1 to 5 V	4-5
	±5 V	1
	±10 V	1
No-voltage contacts and NPN open collector (Models with NPN inputs)		2-3
No-voltage contacts and PNP open collector (Models with PNP inputs)		1-3

#### Be sure to read the Precautions for Correct Use and other information required when using the K3GN in the following user's manual. K3GN Digital Panel Meter User's Manual (Cat.No. N102)

### Application Examples

#### **Detection of Dust Exhaust**

The change in the density of the dust is detected via the E3SA and discriminated by the K3GN.



OUT2 OUT1 (Upper upperlimit alarm) Device stops instruction

#### Monitoring of Tank Pressure

The output of the pressure sensor is processed and the pressure is displayed. Remote monitoring of the operation is possible with the communications function.



Exhaust valve

#### Monitoring of Motor Load Current

If the startup time compensation of the K3GN is enabled, the K3GN will not be influenced by the inrush current from starting the motor, and no signal will be output from the K3GN.



#### Monitoring Difference between Two Line Speeds

The difference between the two line speeds is calculated by the PLC and the result is written via RS-485 to the K3GN where it is displayed.



## Monitoring the Remaining Quantity of Soup

The distance to the surface of the soup is detected with an ultrasonic sensor and, based on this distance, the K3GN displays the remaining quantity. When the remaining quantity of soup decreases to less than 20%, the K3GN lights the "Replenish" indicator.



#### Monitoring Number of Motor Revolutions



## Safety Precautions

#### 

Do not touch the terminals while power is being supplied. Doing so may possibly result in electric shock.

Do not allow pieces of metal, wire clippings, or fine metallic shavings or filings to enter the product. Doing so may occasionally result in minor or moderate injury or in property damage due to electric shock, fire, or malfunction caused by internal short circuiting.

Do not use the product in locations where flammable or explosive gases are present. Doing so may occasionally result in minor or moderate explosion, causing minor or moderate injury, or property damage.

Do not use the equipment for measurements within Measurement Categories II, III, or IV (according to IEC 61010-1). Doing so may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment. Use the equipment for measurements only within the Measurement Category for which the product is designed.



Failure to perform correct setting of the product according to the application may occasionally cause unexpected operation, resulting in minor or moderate injury, or damage to the equipment. Ensure safety in the event of product failure by taking safety measures, such as installing a separate monitoring system.

Product failure may occasionally prevent operation of comparative outputs, resulting in damage to the connected facilities and equipment. Ensure safety in the event of product failure by taking safety measures, such as installing a separate monitoring system.

Tighten the screws on the terminal block and the connector locking screws securely using a tightening torque within the following ranges. Loose screws may occasionally cause fire, resulting in minor or moderate injury, or damage to the equipment.

Terminal block screws: 0.43 to 0.58 N·m

Do not attempt to disassemble, repair, or modify the product. Doing so may occasionally result in minor or moderate injury due to electric shock.



### Precautions for Safe Use

#### **Environmental Precautions**

- 1. Do not use the product in the following locations.
- · Locations subject to direct radiant heat from heating equipment
- · Locations where the product may come into contact with water or oil
- · Locations subject to direct sunlight
- · Locations where dust or corrosive gases (in particular, sulfuric or ammonia gas) are present
- · Locations subject to extreme temperature changes
- · Locations where icing or condensation may occur
- · Locations subject to excessive shocks or vibration
- 2. Do not use the product in locations subject to temperatures or humidity levels outside the specified ranges or in locations prone to condensation. If the product is installed in a panel, ensure that the temperature around the product (not the temperature around the panel) does not go outside the specified range. Parts life is dependent on temperatures. A part life shortens when the temperature rises, and it lengthens when the temperature falls. Parts life can be lengthened by lowering the temperature inside the product.
- 3. In order to prevent inductive noise, wire the lines connected to the product separately from power lines carrying high voltages or currents. Do not wire in parallel with or in the same cable as power lines. Other measures for reducing noise include running lines along separate ducts and using shield lines.
- 4. Do not install the product near devices generating strong highfrequency waves or surges. When using a noise filter, check the voltage and current and install it as close to the product as possible. If several products are mounted side-by-side or arranged in a vertical line, the heat dissipation will cause the internal temperature of the product to rise, shortening the service life. If necessary, cool the products using a fan or other cooling method
- 5. Take care when cleaning the product, because the exterior of the product may be damaged by organic solvents (thinner, benzine, etc.), strong alkaline materials and strong acid materials.
- 6. Avoid storing in high humidity or in a corrosive gas environment (including during transportation)



#### Precautions for Safe Use

- 1. Use and store within the proper temperature and humidity described in the specifications.
- 2. Provide sufficient space around the product for heat dissipation.
- 3. When using the product stored unused over a year after purchasing, the product features may not be utilized sufficiently.
- 4. Avoid storing outdoors or in a place that receives direct sunlight (including during transportation).
- 5. The service life of the output relays depends on the switching capacity and switching conditions. Consider the actual application conditions and use the product within the rated load and electrical service life. Using the product beyond its service life may result in contact welding or burning.
- 6. Be sure to confirm the name and polarity for each terminal before wiring the terminal block and connectors. Faulty wiring may cause destruction or burnout of internal parts.
- 7. Use the product within the noted supply voltage and rated load.
- 8. Do not connect anything to unused terminals.
- **9.** Output turns OFF when the mode is changed or settings are initialized. Take this into consideration when setting up the control system.
- **10.**Install an external switch or circuit breaker and label them clearly so that the operator can quickly turn OFF the power.
- **11.**Ensure that the rated voltage is achieved no longer than 2 s after turning the power ON. When applying a voltage gradually, the power supply may not reset or the output may function in an uncertain manner.
- 12.Mount to a panel between 1 and 5 mm thick.
- 13.Use the specified size of crimp terminals (M3, width: 5.8 mm max.) for wiring. To connect bare wires, use AWG 28 to AWG 16 to wire the power supply terminals and AWG 22 to AWG 14 for other terminals. (Length of exposed wire: 6 to 8 mm)
- **14.** Allow the product to operate without load for at least 15 minutes after the power is turned ON.

#### Precautions for Correct Use

- 1. Note that errors may be increased by the magnification of the scaling function.
- 2. When using a noise filter on the power supply, check that the filter is suitable for the supply voltage and current ratings, and then attach the noise filter as close as possible to the K3GN.



**3.** Avoid using the K3GN in places near a radio, television, or other wireless device. These devices can cause radio disturbances which will adversely affect the K3GN.

### Warranty and Application Considerations

#### 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.

#### Warranty and Limitations of Liability

#### WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

#### LIMITATIONS OF LIABILITY

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#### Application Considerations

#### SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used.

Know and observe all prohibitions of use applicable to this product.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

#### Disclaimers

#### **PERFORMANCE DATA**

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON *Warranty and Limitations of Liability.* 

#### **CHANGE IN SPECIFICATIONS**

Product specifications and accessories may be changed at any time based on improvements and other reasons. Consult with your OMRON representative at any time to confirm actual specifications of purchased product.

#### DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. N160-E1-01

In the interest of product improvement, specifications are subject to change without notice.

## Process Meter K3MA-J

## Highly Visible LCD Display with 2-color (Red and Green) LEDs

- Multi-range DC voltage/current input.
- Front-panel key operation for easy setting.
- Average processing function suppresses flicker.
- Scaling, front-panel forced-zero, zero-limit functions.
- Easy confirmation of max/min display.
- Short 80-mm depth (measured from edge of face plate).
- Finger protective cover (standard equipment) guards against electric shock.
- Water- and dust-proof NEMA4X (IP66 equivalent) front panel.
- Recognized to U.S. and Canadian requirements under the Component Recognition Program of UL.
- CE marking.

### **Model Number Structure**

### Model Number Legend



ASKING NUMBER



Input Type
 DC voltage/current
 Output Type
 None: No output
 A2: 2 relay contact outputs (SPST-NO)
 Supply Voltage
 100-240VAC:100 to 240 VAC
 24VAC/VDC:24 VAC/VDC

### **Ordering Information**

#### ■ List of Models

Input type	Supply voltage	Output	Model
DC voltage/current	100 to 240 VAC	None	K3MA-J 100-240VAC
		2 relay contact outputs (SPST-NO)	K3MA-J-A2 100-240VAC
	24 VAC/VDC	None	K3MA-J 24VAC/VDC
		2 relay contact outputs (SPST-NO)	K3MA-J-A2 24VAC/VDC

#### ■ Accessories (Order Separately)

Name	Shape	Model
Splash-proof Soft Cover		K32-49SC
Hard Cover		K32-49HC

## Specifications

### Ratings

Model	K3MA-J 100-240VAC, K3MA-J-A2 100-240VAC	K3MA-J 24VAC/VDC, K3MA-J-A2 24VAC/VDC	
Supply voltage	100 to 240 VAC	24 VAC/VDC	
Operating voltage range	85% to 110% of the rated supply voltage		
Power consumption (under maximum load)	6 VA max.	4.5 VA max. (24 VAC) 4.5 W max. (24 VDC)	
Insulation resistance	$20\ M\Omega$ min. (at 500 VDC) between external terminal ar Insulation provided between inputs, outputs, and powe	nd case. r supply.	
Dielectric strength	2,000 VAC for 1 min between external terminal and cas Insulation provided between inputs, outputs, and powe	se. r supply.	
Noise immunity	±1,500 V on power supply terminals in normal or com- mon mode. ±1 μs, or 100 ns for square-wave noise with 1 ns.	$\pm$ 480 V on power supply terminals in normal mode. $\pm$ 1,500 V in common mode. $\pm$ 1 µs, or 100 ns for square-wave noise with 1 ns.	
Vibration resistance	Vibration: 10 to 55 Hz, Acceleration: 50 m/s <sup>2</sup> 5 min each in X, Y, and Z directions for 10 sweeps.		
Shock resistance	150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay contact outputs) 3 times each on 3 axes, 6 directions.		
Ambient temperature	Operating:-10°C to 55°C (with no condensation or icing) Storage:-25°C to 65°C (with no condensation or icing)		
Ambient humidity	Operating:25% to 85% (with no condensation)		
Approved safety standards	UL3121-1, conforms to EN61010-1 (Pollution degree 2/overvoltage category II) Conforms to VDE0106/P100 (finger protection)		
EMC	(EMI)EN61326+A1Industry Emission Enclosure:CISPR 11 Group 1 class A: CISRP16-1/-2 Emission AC Mains:CISPR 11 Group 1 class A: CISRP16-1/-2 (EMS)EN61326+A1Industry Immunity ESD:EN61000-4-2:4 kV contact discharge 8 kV air discharge Immunity RF-interference:EN61000-4-3:10 V/m (amplitude-modulated, 80 MHz to 1 GHz) Electrical Fast Transient Noise:EN61000-4-4:2 kV (power line) Immunity Burst Noise:1 kV line to line (I/O signal line) Immunity Surge:EN61000-4-5:1 kV (power line) 2 kV line to ground (power line) Immunity Conducted Disturbance:EN61000-4-6:3 V (0.15 to 80 MHz) Immunity Voltage Dip/Interrupting:EN61000-4-11:0.5 cycle, 0, 180°, 100% (rated voltage)		
Weight	Approx. 200 g		

### ■ Characteristics

Input signal	DC voltage/current (0 to 20 mA, 4 to 20 mA, 0 to 5 V, 1 to 5 V, ±5 V, ±10 V)	
A/D conversion	Double integral method	
Sampling period	250 ms	
Display refresh period	Sampling period (sampling times multiplied by number of measurements for averaging if average pro- cessing is selected.)	
Max. displayed digits	5 digits (-19999 to 99999)	
Display	7-segment digital display, Character height: 14.2 mm	
Polarity display	"-" is displayed automatically with a negative input signal.	
Zero display	Leading zeros are not displayed.	
Scaling function	Programmable with front-panel key inputs (range of display: -19999 to 99999). The decimal point position can be set as desired.	
Hold function	Max. hold (maximum value), Min. hold (minimum value)	
Hysteresis setting	Programmable with front-panel key inputs (0001 to 9999).	
Other functions	Forced-zero (with front-panel key) Zero-limit Scaling teach function Display color change (green (red), green, red (green), red) OUT type change (upper limit, lower limit, upper/lower limit) Average processing (simple average)	
Output	Relays: 2 SPST-NO	
Delay in comparative outputs	750 ms max.	
Degree of protection	Front panel: NEMA4X for indoor use (equivalent to IP66) Rear case: IEC standard IP20 Terminals: IEC standard IP00 + finger protection (VDE0106/100)	
Memory protection	Non-volatile memory (EEPROM) (possible to rewrite 100,000 times)	

## Measuring Ranges Process Voltage/Current Inputs

Input	Measuring range	Measuring accuracy	Input impedance	Displayable range
DC voltage	1.000 to 5.000 V	±0.1% FS ±1 digit max.	1 M $\Omega$ min.	-19999 to 99999
	0.000 to 5.000 V	(at 23±3°C)		(with scaling function)
	-5.000 to 5.000 V	±0.1% FS ±1 digit max.		
	-10.00 to 10.00 V	(at 23±5°C)		
DC current	4.00 to 20.00 mA/ 0.00 to 20.00 mA	±0.1% FS ±1 digit max. (at 23±3°C)	45 Ω	

### ■ Input/Output Ratings Relay Contact Output

Item	Resistive load (cos∳ = 1)	Inductive load ( $\cos\phi$ = 0.4, L/R=7 ms)		
Rated load (UL ratings)	5 A at 250 VAC, 5 A at 30 VDC	1.5 A at 250 VAC, 1.5 A at 30 VDC		
Rated carry current	5 A max. (at COM terminal)			
Max. contact voltage	250 VAC, 150 VDC	250 VAC, 150 VDC		
Max. contact current	5 A (at COM terminal)			
Max. switching capacity	1,250 VA, 150 W	250 VA, 30 W		
Min. permissible load (P level, reference value)	10 mA at 5 VDC			
Mechanical life	5,000,000 times min. (at a switching frequency of 1,200 times/min)			
Electrical life (at an ambient temperature of 20°C)	100,000 times min. (at a rated load switching frequency of 10 times/min)			

### Connections

#### Terminal Arrangement



Output terminals



\*Recommended DC power supply: eg. ORMON S8VS

Terminal No.	Name	Description
(A1) - (A2)	Operation power	Connects the operation power supply.
E4, E6-E5	Analog input	Connects the voltage or current analog input.
E1, E2-E3	Outputs	Outputs the relay outputs.

### Block Diagram



Note: Relay output models only.

### ■ Input Circuits



#### Analog Input (DC Voltage/Current)



### Operation

#### Main Functions

#### **Input Types and Ranges**

Input type (setting parameter)	Function	Input range (setting parameters)	Setting range
Input range (-n-E)	Selects DC voltage/current signal	0 to 20 mA (ⅅ-2ⅅ)	Displayable from -19999 to 99999
	input	4 to 20 mA (ᠲ-근급)	with scaling function.
		0 to 5 V (ⅅ-5)	The position of the decimal point
		1 to 5 V ( <i>i-5</i> )	can be set as desired.
		±5 V (5)	
		±10 V ( /0)	

Note: The initial value for the input range is "4 to 20 mA (4-20)."

The K3MA-J converts input signals into desired physical values.

#### **Scaling**

• Analog (Process) Inputs

INPUT2: Any input value

DISPLAY2:Displayed value corresponding to INPUT2 INPUT1:Any input value

DISPLAY1: Displayed value corresponding to INPUT1

When DISPLAY1 is set for INPUT1, and DISPLAY2 is set for INPUT2, a line will be displayed joining the two points. (Raise shift, reverse scaling, plus/minus display, etc., can be adjusted as desired.)

Parameter	Setting value	Meaning
inp.1	- 19999 to 99999	Input value for d5P. /
dsp.1	- 19999 to 99999	Display value for Lopp. 1
inp.2	- 19999 to 99999	Input value for d5P.2
dsp.2	- 19999 to 99999	Display value for InP.2

Parameter	Setting value	Meaning
dp	%.%%%%	Display four digits after decimal point
	%%.%%%	Display three digits after decimal point
	%%%.%%	Display two digits after decimal point
	%%%%.%	Display one digit after decimal point
	%%%%%	No decimal point



Instead of setting by inputting with the (a) Up Key and (b) Shift Key, current values can be input as scaling input values for teaching. This is useful for making settings while checking the operation status of the K3MA-J.

#### OMBOI

#### **Convenient Functions**

#### Scaling Teach

The parameters (inp. 1, inp.2) for the K3MA-J's initial setting level can be set using actual input values with the teaching function. After displaying the parameters, the actual input settings can be made with the following operation.



#### OUT Types (Comparative Output Models Only)

OUT 1 and OUT 2 can be set to operate in one of the three following modes in accordance with the compared values:

- Upper limit (High Acting):
- The output is turned ON when the measurement value is greater than its set value.
- Lower limit (Low Acting):
- The output is turned ON when the measurement value is less than its set value.
- Upper and lower limits (Outside Band Acting):

An upper limit (H set value) and lower limit (L set value) can be set independently.

The output is turned ON when the measurement value is greater than upper-limit set value or less than the lower-limit set value.

**Upper and Lower Limits Upper Limit (High Acting)** Lower Limit (Low Acting) (Outside Band Acting) OUT1/2 value OUT1/2 upper-limit value **Hysteresis** Measurement value Measurement value Measurement value OUT1/2 lower-limit value OUT1/2 value Output \_ Output ON ON Output OFF OFF OFF

The three types of output operations shown above can be combined as desired. The following are examples of possible combinations.

#### Upper Limit 2-stage Output



#### Parameter Initialization

This function returns all of the parameters to their initial values.

Parameter	Setting value	Meaning
init	off	
	on	Initializes all parame- ters.

Use this to reset the K3MA-J after returning it to its factory-set condition.

#### Average Processing

Average processing stabilizes displayed values to minimize flicker by averaging the fluctuating input signals. Average processing can be performed for the measurement values in either of four steps (OFF, 2 times, 4 times, or 8 times).



This is useful for ignoring rapid fluctuations, e.g., eliminating spike noise.

#### <u>Hysteresis (Comparative Output</u> <u>Models Only)</u>

The hysteresis of comparative outputs can be set to prevent chattering in the output when the measurement value fluctuates finely near the OUT value.

Upper limit (high acting)



#### Zero-limit Function

The zero-limit function changes any value below the set value to zero. This is useful when you want to change negative values to zero rather than display them, or when you want to make the display in the smallest part of the input range zero.

Parameter	Setting value	Meaning
=-lim	off	OFF: No zero-limit
	on	ON: Zero-limit
lim-p	0 to 99	0 to 99: Zero-limit value



#### **Changing the Display Color**

The color of the value displayed can be set to either red or green. For comparative output models, the display color can be set to change from green to red, or from red to green, according to the status of the comparison criterion.



#### **Display Auto-return Time**

This function automatically returns the display to the operation level's current value if no keys are pressed for a preset time (called the display auto-return time).

#### Move-to-Protect-Level Time

The time required to shift to the protect level can be set as desired.

#### **Forced-zero Function**

It is possible to shift from a value to the zero point with one touch of the Up Key on the front panel (for example, when adjusting reference values).



Note: Used only for releasing the forced-zero with the Protect menu.

#### MAX/MIN Display

The maximum and minimum measurement (display) values from the time the power is turned ON until the current time can be stored and displayed. This is useful, for example, when measuring the maximum value.



### Nomenclature



Name		Functions	
1. Main indicator Displays current values, parameters, and set values.		Displays current values, parameters, and set values.	
2. Operation	1	Lit when output 1 is ON.	
indicators	2	Lit when output 2 is ON.	
	SV	Lit when a set value is being displayed or changed.	
	Max	Lit when the main indicator is showing the MAX value.	
	Min	Lit when the main indicator is showing the MIN value.	
	Z	Lit during the forced-zero operation.	
	Т	Lit when the teaching function is operable. Blinks while the teaching function is operating.	
3. Level indica	ator	Displays the current level that the K3MA-J is in. (See below for details.)	
4. MAX/MIN K	Кey	Used to display the MAX and MIN values when a measurement value is being displayed.	
5. Level Key		Used to change the level.	
6. Mode Key Used to allow the main indicator to indicate parameters sequentially.		Used to allow the main indicator to indicate parameters sequentially.	
7. Shift Key		Used to enable a set value to be changed. When changing a set value, this key is used to move along the digits.	
8. Up Key		Used to change a set value. Used to set or clear a forced-zero function when a measurement value is being displayed.	

Level indicator	Level
р	Protect
Not lit	Operation
s	Initial setting
f	Advanced-function setting

### Dimensions





### **Application Examples**

## Monitoring interior tank pressure



• Monitoring gas pressure

• Inspection instruments in food or pharmaceutical plants

### Installation

- 1. Insert the K3MA-J into the panel cut-out hole.
- 2. For a waterproof installation, insert the rubber gasket onto the body of the K3MA-J.



**3.** Fit the adaptor into the grooves on the left and right sides of the rear case, then push it until it contacts the panel to secure the K3MA-J.



#### ■ Wiring Precautions

- Use crimp terminals.
- Tighten the terminal screws to a torque of approximately 0.5 N·m.
  To avoid the influence of noise, route signal lines and power lines separately.

### ■ Wiring

• Use the following M3 crimp terminals.

## Displaying/outputting liquid level



Monitoring liquid level in cleaning tanks
Water tanks, devices using chemicals, etc.

#### Flowrate sensor



- Monitoring sendout flowrate
- Water processing devices, etc.
- 5.8 mm max.

### ■ Unit Labels (Provided)

• The unit labels are not attached to the K3MA-J. Select the desired labels from the provided sheet.

١.								
	⊻	A	X	Å	%	J	Ра	Ω
	s	/	Ν	m	W	°C	m³	k
	°F	g	m	in	m	m	rp	m
	V	A	mV		m	ıΑ	ŀ	lz
	n	m/min <b>O</b>			nR	on		
	ουτ ουτ							

Note: For scales and gauges, use the unit labels that are specified by the relevant laws or regulations.

igital panel indicators

### Precautions

#### -/4 WARNING

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.

#### - 🕂 Caution

Do not disassemble the product or touch the internal components of the product while the power is being supplied. Doing so may result in electric shock.

#### - 🕂 Caution

Do not allow metal objects or wire cuttings to enter the product. Doing so may result in electric shock, fire, or malfunction.

#### - A Caution

Perform correct settings for the product according to the control application. Failure to do so may cause unexpected operation, resulting in damage to the product or injury.

#### — <u>A</u>Caution

Take safety measures, such as installing a separate monitoring system, to ensure safety even if the product fails. Product failure may prevent comparative outputs from being generated, resulting in serious accidents.

Observe the following precautions to ensure safety.

- 1. Maintain the power supply voltage within the range specified in the specifications.
- 2. Maintain the load within the ratings specified in the specifications.
- 3. Check each terminal for correct number and polarity before connecting it. Incorrect or reverse connections may damage or burn out internal components in the product.
- Tighten the terminal screws securely. The recommended tightening torque is 0.43 to 0.58 N⋅m. Loose screws may cause fire or malfunction.
- 5. Do not connect anything to unused terminals.
- 6. Provide a switch or circuit breaker so that operators can easily turn OFF the power supply when necessary. Also provide appropriate indications of such devices.
- 7. Do not attempt to disassemble, repair, or modify the product.
- 8. Do not use the product where flammable or combustible gases are present.

#### Application

#### **General Precautions**

- 1. Do not use the product in the following locations:
  - Locations subject to direct radiant heat from heating equipment.
  - · Locations subject to exposure to water, oil, or chemicals.
  - · Locations subject to direct sunlight.
  - Locations subject to dust or corrosive gases (particularly sulfuric gas or ammonia gas).
  - · Locations subject to severe changes in temperature.
  - Locations subject to icing or condensation.
  - Locations subject to shock or vibration.
- Do not block heat dissipation around the product, i.e., provide sufficient space for heat dissipation.
- **3.** Ensure that the rated voltage is reached within two seconds after the power is turned ON.
- 4. Conduct aging for 15 minutes min. after power is turned ON for correct measurement.

- **5.** Do not touch the slit sections or terminals while the power is being supplied to prevent the product from being affected by static electricity.
- 6. Do not lay heavy objects on the product during use or storage. Doing so may deform or deteriorate the product.
- 7. Do not use paint thinner for cleaning. Use commercially available alcohol.

#### Mounting

- Mount the product to a panel that is 1 to 8 mm thick.
- Install the product in a horizontal position.
- Use crimp terminals that match screw sizes.

#### **Noise Prevention**

- Install the product as far as possible from devices that generate strong, high-frequency fields (such as high-frequency welders or sewing machines) or surges.
- Install surge absorbers or noise filters on nearby devices that generate noise (particularly, motors, transformers, solenoids, magnet coils, and other devices that have a high inductance component).



• To prevent inductive noise, separate the terminal block wiring for the product from high-voltage or high-current power lines. Do not route the wiring for the product in parallel with or tie it in a bundle with power lines.

Take the following countermeasures against inductive noise in input lines.

#### **Analog Signal Inputs**



- When using a noise filter for the power supply, check for the voltage and current and install it as close as possible to the Process Meter.
- Do not install the product near radios, television sets, or wireless devices. Doing so may cause reception interference.

#### **Increasing Service Life**

- Do not use the product in locations where the temperature or humidity exceeds the ratings or where condensation may occur. When installing the product in a panel, be sure that the temperature around the product (not the temperature around the panel) does not exceed the ratings. The product service life depends on the ambient temperature. The higher the ambient temperature, the shorter the service life. To extend the product service life, lower the temperature inside the Process Meter.
- Use and store the product within the temperature and humidity ranges given in the specifications. When gang-mounting Process Meters or arranging them vertically, heat generated by the Process Meters will cause the internal temperature to rise, reducing the service life. In such cases, consider forced cooling methods, such as using a fan to circulate air around the Process Meters. Do not, however, allow only the terminals to be cooled. Doing so will increase measurement error.
- The life of the output relays is greatly affected by the switching capacity and switching conditions. Use these relays within their rated load and electrical life. The contacts may fuse or burn if they are used past their electrical life.

### **Operating Procedures**

### ■ Levels

"Level" refers to a grouping of parameters. The following table lists the operations that are possible in each of the levels, and the diagram tells how to move between levels. There are some parameters that are not displayed for certain models.

Level name	Function	Measurement
Protect	Setting lockouts.	Continue
Operation	Displaying current values, setting/clearing forced-zero function, and setting OUT 1/2 values.	Continue
Initial setting	Making initial settings of input type, scaling, output operating action, and other parameters.	Stopped
Advanced-function setting	Setting average processing, display color settings, and other ad- vanced-function parameters.	Stopped



Note: The move-to-protect-level time can be set in the advanced-function setting level.

#### Parameters

Note: 1. Some parameters are not displayed for certain models.

- 2. The K3MA-J will stop measurement if the level is changed to the initial setting level or the advanced-function setting level.
- 3. If the input range is changed, some parameters are set to default values. Therefore, set the input range first.
- 4. Settings displayed in reversed colors are defaults.







#### **Operation/Adjustment Lockouts**

Restricts key operations for operation level and adjustment level.

Parameter	Setting	Operation level		
		Current value display	Set value display	
oapt	0	Allowed	Allowed	
	1	Allowed	Allowed	
	2	Allowed	Prohibited	

• Initial setting is 0.

 This cannot be displayed on models not equipped with the comparative output function.

#### Setting Level Lockout

Restricts shifting to initial setting level or advanced-function setting level.

Parameter	Setting	Shift to initial setting level	Shift to advanced- function setting level
icpt	0	Allowed	Allowed
	1	Allowed	Prohibited
	2	Prohibited	Prohibited

#### Setting Change Lockout

Restricts setting changes by key operation. When this lockout is set, it is no longer possible to shift to a setting change mode.

Parameter	Setting	Setting change by key operation
wtpt	off	Allowed
	on	Prohibited

However, all protect level parameters can still be changed.

#### Forced-zero Lockout

Restricts the setting or release of a forced-zero by front-panel key operation.

Parameter	Setting	Setting/release of forced-zero by key operation
=rpt	off	Allowed
	on	Prohibited

### ■ Initial Settings





### ■ Setting Example

#### **Initial Settings**

The settings for the following example are shown here.

#### Example: Tank pressure display



Here, the pressure inside the tank is to be displayed in units of 0.1 kPa.

- Pressure Sensor: E8AA-M10
- Measuring range: 0 to 980 kPa, output 4 to 20 mA



- 1. Set the K3MA-J input type to the 4 to 20 mA input range. Parameter: co-t (input type), Setting value: 4-20
- Set the display values for the corresponding input values. Set the scaling as shown below for the following correspondence: input 4 mA-->display 0.0, input 20 mA-->display 980.0 ParameterSetting value
  - LoP. / (scaling input value 1)4.00
  - d5P. / (scaling display value 1)00000
  - EnP.2 (scaling input value 2)20.00
  - d5P.2 (scaling display value 2)09800
  - dP (decimal point position)
- **Note:** The decimal point position here refers to the position in the number after scaling. When setting the scaling display value, it is necessary to consider the number of digits to be displayed past the decimal point.

#### ■ Troubleshooting

When an error occurs, error details will be displayed on the main indicator. Confirm the error from the main indicator and take the appropriate countermeasures.

Level display	Main indicator	Error contents	Countermeasures
Not lit	e111	RAM memory error	Repair is necessary.
			Consult your OMRON sales representative.
5	e111	EEPROM memory error	When this error is displayed, press the Level Key for 3 sec- onds, and the settings will be restored to the factory set- tings. If the error cannot be recovered, repair is necessary. Con- sult your OMRON sales representative.
Not lit	Flashes 5.Err	You will see this indication when turning ON the product the first time after purchase. This is be- cause the input signal value is 0 mA at that time even though the range is factory set to 4 to 20 mA.	At the initial setting level, set the input type and other parameters according to your application.
		Input error	Promptly change the input voltage/current to a value that falls within the measurement range.
			If the error cannot be recovered, repair is necessary. Consult your OMRON sales representative.
Not lit	Flashes 99999	The scaling display value exceeds 99999.	Promptly change the input to a value that falls within the specified range.
			The scaling value may be inappropriate. Review the scaling value at the initial setting level.
Not lit	Flashes -19999	The scaling display value is lower than -19999.	Promptly change the input to a value that falls within the specified range.
			The scaling value may be inappropriate. Review the scaling value at the initial setting level.

Digital panel indicators

#### ■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DIS-CLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

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### **Application Considerations**

### ■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. N108-E2-04A In the interest of product improvement, specifications are subject to change without notice.

# Temperature Meter

## Highly Visible LCD Display with 2-color (Red and Green) LEDs

- Wide input range select from two types of platinum-resistance thermometers and ten types of thermocouples.
- Front-panel key operation for easy setting.
- Average processing function suppresses flicker.
- Temperature input shift and temperature unit selection functions.
- Easy confirmation of max/min display.
- Short 80-mm depth (measured from edge of face plate).
- Finger protective cover (standard equipment) protects against electric shock.
- Water- and dust-proof NEMA4X (IP66 equivalent) front panel.
- Recognized to conform to U.S. and Canadian requirements under the Component Recognition Program of UL.
- CE marking.

### **Model Number Structure**

#### Model Number Legend

 $\mathsf{K3MA-L}_{\overline{1}} \_ \_ \__{\overline{3}}$ 

## I. Input Type L: Platinum-resistance thermometer or thermocouple Output Type

2. Output Type
None: No output
C: With relay contact output (SPDT)
3. Supply Voltage
100-240VAC:100 to 240 VAC
24VAC/VDC:24 VAC/VDC

### **Ordering Information**

#### ■ List of Models

Input type	Supply voltage	Output	Model
Platinum-resistance thermometer or	100 to 240 VAC	None	K3MA-L 100-240VAC
thermocouple		1 relay contact output (SPDT)	K3MA-L-C 100-240VAC
	24 VAC/VDC	None	K3MA-L 24VAC/VDC
		1 relay contact output (SPDT)	K3MA-L-C 24VAC/VDC

#### Accessories (Order Separately)

Name	Shape	Model
Splash-proof Soft Cover		K32-49SC
Hard Cover		K32-49HC


# Specifications

# Ratings

	K3MA-L 100-240VAC, K3MA-L-C 100-240VAC	K3MA-L 24VAC/VDC, K3MA-L-C 24VAC/VDC		
Supply voltage	100 to 240 VAC	24 VAC (50/60 Hz), 24 VDC		
Operating voltage range	85% to 110% of the rated supply voltage			
Power consumption (under maximum load)	6 VA max.	4.5 VA max. (24 VAC) 4.5 W max. (24 VDC)		
Insulation resistance	20 $M\Omega$ min. (at 500 VDC) between external terminal ar Insulation provided between inputs, outputs, and powe	nd case. r supply.		
Dielectric strength	2,000 VAC for 1 min between external terminal and cas Insulation provided between inputs, outputs, and powe	se. r supply.		
Noise immunity	$\begin{array}{l} \pm 1,500 \text{ V on power supply terminals in normal or common mode.} \\ \pm 1 \ \mu s, \ or \ 100 \ ns \ for \ square-wave \ noise \ with \ 1 \ ns. \end{array}$	$\pm 480$ V on power supply terminals in normal mode. $\pm 1,500$ V in common mode. $\pm 1~\mu s,$ or 100 ns for square-wave noise with 1 ns.		
Vibration resistance	Vibration: 10 to 55 Hz, Acceleration: 50 m/s <sup>2</sup> 5 min each in X, Y, and Z directions for 10 sweeps.			
Shock resistance	150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay contact outputs) 3 times er	150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay contact outputs) 3 times each on 3 axes, 6 directions.		
Ambient temperature	Operating:-10°C to 55°C (with no condensation or icing Storage:-25°C to 65°C (with no condensation or icing)	g)		
Ambient humidity	Operating:25% to 85% (with no condensation)			
Approved safety standards	UL3121-1, conforms to EN61010-1 (Pollution degree 2 Conforms to VDE0106/P100 (finger protection)	/overvoltage category II)		
EMC	<ul> <li>(EMI)EN61326+A1Industry</li> <li>Emission Enclosure:CISPR 11 Group 1 class A: CISRP16-1/-2</li> <li>Emission AC Mains:CISPR 11 Group 1 class A: CISRP16-1/-2</li> <li>(EMS)EN61326+A1Industry</li> <li>Immunity ESD:EN61000-4-2:4 kV contact discharge</li> <li>8 kV air discharge</li> <li>Immunity RF-interference:EN61000-4-3:10 V/m (amplitude-modulated, 80 MHz to 1 GHz)</li> <li>Electrical Fast Transient Noise:EN61000-4-4:2 kV (power line)</li> <li>Immunity Burst Noise:1 kV line to line (I/O signal line)</li> <li>Immunity Surge:EN61000-4-5:1 kV (power line)</li> <li>2 kV line to ground (power line)</li> <li>Immunity Conducted Disturbance:EN61000-4-6:3 V (0.15 to 80 MHz)</li> <li>Immunity Voltage Dip/Interrupting:EN61000-4-11:0.5 cycle, 0, 180°, 100% (rated voltage)</li> </ul>			
Weight	Approx. 200 g			

## Characteristics

Indication accuracy (at 23±5°C)	Thermocouple: (+0.5% of indication value or $\pm 1^{\circ}$ C, whichever greater) $\pm 1$ digit may
	Platinum-resistance thermometer: ( $\pm 0.5\%$ of indication value or $\pm 1^{\circ}$ C, whichever greater) $\pm 1$ digit max.
Input	Thermocouple: K, J, T, E, L, U, N, R, S, B Platinum-resistance thermometer: JPt100, Pt100
Measurement method	Double integral method
Sampling period	500 ms
Display refresh period	Sampling period (sampling times multiplied by number of averaging times if average processing is se- lected.)
Max. displayed digits	4 digits (-1999 to 9999)
Display	7-segment digital display, Character height: 14.2 mm
Polarity display	"-" is displayed automatically with a negative input signal.
Zero display	Leading zeros are not displayed.
Input shift	Input shift equivalent to the setting value supported for all points within the sensor measurement range.
Hold function	Max hold (maximum value), Min hold (minimum value)
Hysteresis setting	Programmable with front-panel key inputs (0001 to 9999).
Other functions	Display color change (green (red), green, red (green), red) Average processing (simple average OFF/2/4/8 operations) Setting change lockout Parameter initialization
Output	Relay contact (SPDT)
Delay in comparative outputs	1 s max.
Degree of protection	Front panel: NEMA4X for indoor use (equivalent to IP66) Rear case: IEC standard IP20 Terminals: IEC standard IP00 + finger protection (VDE0106/100)
Memory protection	Non-volatile memory (EEPROM) (possible to rewrite 100,000 times)

Note: The indication accuracy of the K thermocouple at a temperature of -200 to 1300°C is ±2°C ±1 digit maximum.

The indication accuracy of the T and N thermocouples at a temperature of  $-100^{\circ}$ C or less is  $\pm 2^{\circ}$ C  $\pm 1$  digit maximum.

The indication accuracy of the U and L thermocouples at any temperature of  $\pm 2^{\circ}C \pm 1$  digit maximum. The indication accuracy of the B thermocouple at a temperature of  $400^{\circ}C$  or less is unrestricted. The indication accuracy of the R and S thermocouples at a temperature of  $200^{\circ}C$  or less is  $\pm 3^{\circ}C \pm 1$  digit maximum.

#### ■ Measuring Ranges **Platinum-resistance Thermometer**

In	put		Pt100	JPt100		
Range	°C	-200 to 850	-199.9 to 500.0	0.0 to 100.0	-199.9 to 500.0	0.0 to 100.0
	°F	-300 to 1500	-199.9 to 900.0	0.0 to 210.0	-199.9 to 900.0	0.0 to 210.0
Parameter		0	1	2	3	4

#### **Thermocouple**

Inpu	It		К		J		Т	E	L	l	J	Ν	R	S	В
Range	°C	–200 to 1300	-20.0 to 500.0	–100 to 850	-20.0 to 400.0	–200 to 400	-199.9 to 400.0	0 to 600	–100 to 850	–200 to 400	-199.9 to 400.0	–200 to 1300	0 to 1700	0 to 1700	100 to 1800
	°F	-300 to 2300	0.0 to 900.0	–100 to 1500	0.0 to 750	-300 to 700	-199.9 to 700.0	0 to 1100	–100 to 1500	-300 to 700	-199.9 to 700.0	-300 to 2300	0 to 3000	0 to 3000	300 to 3200
Paramet	ter	5	6	7	8	9	10	11	12	13	14	15	16	17	18

# ■ Input/Output Ratings

#### **Relay Contact Output**

Item	Resistive load ( $\cos \phi = 1$ )	Inductive load ( $\cos\phi$ = 0.4, L/R = 7 ms)			
Rated load (UL ratings)	5 A at 250 VAC, 5 A at 30 VDC	1.5 A at 250 VAC, 1.5 A at 30 VDC			
Rated carry current	5 A max. (at COM terminal)				
Max. contact voltage	400 VAC, 150 VDC				
Max. contact current	5 A (at COM terminal)				
Max. switching capacity	2,000 VA, 192 W	375 VA, 30 W			
Min. permissible load (P level, reference value)	10 mA at 5 VDC				
Mechanical life	20,000,000 times min. (at a switching frequency of 1,200 time/min)				
Electrical life (at an ambient temperature of 20°C)	100,000 times min. (at a rated load switching frequency of 10 time/min)				

# Connections

## Terminal Arrangement



Output terminals



\*Recommended DC power supply: eg. OMRON S8VS

Terminal No.	Name	Description
(A1) - (A2)	Operation power	Connects the operation power supply.
E4 - E6 - E5	Thermocouple or platinum-resistance ther- mometer input	Connects the thermocouple or platinum-resis- tance thermometer input.
E1 E2-E3	Outputs	Outputs the relay outputs.

## Block Diagram



Note: Relay output models only.

## Main Functions

#### **Input Types and Ranges**

Parameter	Setting	Input type		Meaning	
in-t	0	Platinum-resistance	Pt100	–200 to 850°C	–300 to 1500°F
	1	thermometer		–199.9 to 500.0°C	-1999 to 900.0°F
	2			0.0 to 100.0°C	0.0 to 210.0°F
	3		JPt100	–199.9 to 500.0°C	–199.9 to 900.0°F
	4			0.0 to 100.0°C	0.0 to 210.0°F
	5	Thermocouple	К	–200 to 1300°C	–300 to 2300°F
	6			–20.0 to 500.0°C	0.0 to 900.0°F
	7		J	-100 to 850°C	-100 to 1500°F
	8			–20.0 to 400.0°C	0.0 to 750.0°F
	9			-200 to 400°C	–300 to 700°F
	10			–199.9 to 400.0°C	–199.9 to 700.0°F
	11		E	0 to 600°C	0 to 1100°F
	12		L	-100 to 850°C	–100 to 1500°F
	13		U	-200 to 400°C	–300 to 700°F
	14			–199.9 to 400.0°C	–199.9 to 700.0°F
	15		Ν	–200 to 1300°C	–300 to 2300°F
	16		R	0 to 1700°C	0 to 3000°F
	17		S	0 to 1700°C	0 to 3000°F
	18		В	100 to 1800°C	300 to 3200°F

Note: The initial value is "5: thermocouple K (-200 to 1300°C/-300 to 2300°F)."

#### **Temperature Unit Selection**

Either centigrade (°C) or fahrenheit (°F) can be selected as the temperature unit.

Parameter	Setting	Meaning
d-u	С	Display in °C.
	f	Display in °F.

#### OUT Types (Comparative Output Models Only)

OUT 1 can be set to operate in one of the three following modes in accordance with the compared values:

Upper limit (High Acting):

The output is turned ON when the measurement value is greater than its set value.

#### **Upper Limit (High Acting)**







• Lower limit (Low Acting):

The output is turned  $\breve{ON}$  when the measurement value is less than its set value.

• Upper and lower limits (Outside Band Acting):

An upper limit (H set value) and lower limit (L set value) can be set independently.

The output is turned ON when the measurement value is greater than the upper-limit set value or less than the lower-limit set value.

Parameter	Setting	Meaning
out 1.t	hi	Upper limit: Alarm op- erates at upper limit.
	lo	Lower limit: Alarm op- erates at lower limit.
	hi-lo	Upper and lower lim- its: Alarm operates at upper and lower lim- its.

# Upper and Lower Limits (Outside Band Acting)



#### Temperature Input Shift

Input shift equivalent to the setting value supported for all points within the sensor measurement range.



#### Parameter Initialization

This function returns all of the parameters to their initial values.

Parameter	Setting	Meaning
init	off	
	on	Initializes all parame- ters.

Use this to reset the K3MA-L after returning it to its factory-set condition.

#### Average Processing

Average processing stabilizes displayed values to minimize flicker by averaging the fluctuating input signals. Average processing can be performed for the measurement values in either of four steps (OFF, 2 times, 4 times, or 8 times).



This is useful for ignoring rapid fluctuations, e.g., eliminating spike noise.

#### <u>Hysteresis</u> (Comparative Output Models Only)

The hysteresis of comparative outputs can be set to prevent chattering in the output when the measurement value fluctuates finely near the OUT value.

#### Upper limit (high acting)



#### **Changing the Display Color**

The color of the value displayed can be set to either red or green. For comparative output models, the display color can be set to change from green to red, or from red to green, according to the status of the comparison criterion.



#### **Display Auto-return Time**

This function automatically returns the display to the operation level's current value if no keys are pressed for a preset time (called the display auto-return time).

#### Move-to-Protect-Level Time

The time required to shift to the protect level can be set as desired.

#### MAX/MIN Display

The maximum and minimum measurement (display) values from the time the power is turned ON until the current time can be stored and displayed. This is useful, for example, when measuring the maximum value.



# Nomenclature



Name		Functions	
1. Main indicator		Displays current values, parameters, and set values.	
2. Opera-	1	Lit when output 1 is ON.	
tion indica-	SV	Lit when a set value is being displayed or changed.	
1015	Max	Lit when the main indicator is showing the MAX value.	
Min Lit when the main indicator is showing the MIN value.			
<ol><li>Level indicator</li></ol>		Displays the current level that the K3MA-L is in. (See below for details.)	
4. MAX/MI	N Key	Used to display the MAX and MIN values when a measurement value is being displayed.	
5. Level Key U		Used to change the level.	
6. Mode Key Used to allow the main indicator to indicate parameters sequentially.		Used to allow the main indicator to indicate parameters sequentially.	
7. Shift Key Used to enable a set value to be changed. When changing a set value		Used to enable a set value to be changed. When changing a set value, this key is used to move along the digits.	
8. Up Key		Used to change a set value. Used to set or clear a forced-zero function when a measurement value is being displayed.	

Level indicator	Level
р	Protect
Not lit	Operation
а	Adjustment
S	Initial setting
f	Advanced-function setting

# Dimensions



# **Application Examples**

Monitoring the temperature of an industrial furnace



- Monitoring the temperature of an industrial furnace/sintering furnace.
- Monitoring/alarm function for disinfecting equipment.

#### Sending a temperature alarm for molding equipment



- Monitoring (failsafe checking) abnormal temperatures in molding equipment.
- Monitoring the liquid temperature for cleaning devices.

#### Monitoring the bearing temperature for a generator motor



- Monitoring temperature rises in electric power generating facilities.
- Inspecting temperatures in machines and devices.

# Installation

- 1. Insert the K3MA-L into the panel cut-out hole.
- 2. For a waterproof installation, insert the rubber gasket onto the body of the K3MA-L.



**3.** Fit the adaptor into the grooves on the left and right sides of the rear case, then push it until it contacts the panel to secure the K3MA-L.



# ■ Wiring Precautions

- Use crimp terminals.
- Tighten the terminal screws to a torque of approximately 0.5 N·m.
- To avoid the influence of noise, route signal lines and power lines separately.

# ■ Wiring

• Use the following M3 crimp terminals.



## ■ Unit Labels (Provided)

• The unit labels are not attached to the K3MA-L. Select the desired labels from the provided sheet.



Note: For scales and gauges, use the unit labels that are specified by the relevant laws or regulations.

# **Precautions**

#### - 🕂 WARNING-

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.

#### - 🕂 Caution

Do not disassemble the product or touch the internal components of the product while the power is being supplied. Doing so may result in electric shock.

#### $-\underline{\land}$ Caution

Do not allow metal objects or wire cuttings to enter the product. Doing so may result in electric shock, fire, or malfunction.

#### - 🕂 Caution

Perform correct settings for the product according to the control application. Failure to do so may cause unexpected operation, resulting in damage to the product or injury.

#### — <u>A</u>Caution

Take safety measures, such as installing a separate monitoring system, to ensure safety even if the product fails. Product failure may prevent comparative outputs from being generated, resulting in serious accidents.

Observe the following precautions to ensure safety.

- 1. Maintain the power supply voltage within the range specified in the specifications.
- 2. Maintain the load within the ratings specified in the specifications.
- 3. Check each terminal for correct number and polarity before connecting it. Incorrect or reverse connections may damage or burn out internal components in the product.
- Tighten the terminal screws securely. The recommended tightening torque is 0.43 to 0.58 N⋅m. Loose screws may cause fire or malfunction.
- 5. Do not connect anything to unused terminals.
- 6. Provide a switch or circuit breaker so that operators can easily turn OFF the power supply when necessary. Also provide appropriate indications of such devices.
- 7. Do not attempt to disassemble, repair, or modify the product.
- 8. Do not use the product where flammable or combustible gases are present.

#### Application

#### **General Precautions**

- 1. Do not use the product in the following locations:
  - Locations subject to direct radiant heat from heating equipment.
  - · Locations subject to exposure to water, oil, or chemicals.
  - Locations subject to direct sunlight.
  - Locations subject to dust or corrosive gases (particularly, sulfuric gas or ammonia gas).
  - · Locations subject to severe changes in temperature.
  - · Locations subject to icing or condensation.
  - Locations subject to shock or vibration.
- Do not block heat dissipation around the product, i.e., provide sufficient space for heat dissipation.
- **3.** Ensure that the rated voltage is reached within two seconds after the power is turned ON.
- 4. Conduct aging for 15 minutes min. after power is turned ON for correct measurement.

- **5.** Do not touch the slit sections or terminals while the power is being supplied to prevent the product from being affected by static electricity.
- 6. Do not lay heavy objects on the product during use or storage. Doing so may deform or deteriorate the product.
- 7. Do not use paint thinner for cleaning. Use commercially available alcohol.

#### Mounting

- Mount the product to a panel that is 1 to 8 mm thick.
- Install the product in a horizontal position.
- Use crimp terminals that match screw sizes.

#### **Noise Prevention**

- Install the product as far as possible from devices that generate strong, high-frequency fields (such as high-frequency welders or sewing machines) or surges.
- Install surge absorbers or noise filters on nearby devices that generate noise (particularly motors, transformers, solenoids, magnet coils, and other devices that have a high inductance component). Do not connect a surge absorber to the temperature sensor input section of the K3MA-L.



• To prevent inductive noise, separate the terminal block wiring for the product from high-voltage or high-current power lines. Do not route the wiring for the product in parallel with or tie it in a bundle with power lines.

Take the following countermeasures against inductive noise in input lines.

#### **Temperature Inputs**

Separate the lead wire that connects the product with a temperature sensor from the load line to prevent the product from being affected by inductive noise.

- When using a noise filter for the power supply, check for the voltage and current and install it as close as possible to the Temperature Meter.
- Do not install the product near radios, television sets, or wireless devices. Doing so may cause reception interference.

#### **Increasing Service Life**

- Do not use the product in locations where the temperature or humidity exceeds the ratings or where condensation may occur. When installing the product in a panel, be sure that the temperature around the product (not the temperature around the panel) does not exceed the ratings. The product service life depends on the ambient temperature. The higher the ambient temperature, the shorter the service life. To extend the product service life, lower the temperature inside the Temperature Meter.
- Use and store the product within the temperature and humidity ranges given in the specifications. When gang-mounting Temperature Meters or arranging them vertically, heat generated by the Temperature Meters will cause the internal temperature to rise, reducing the service life. In such cases, consider forced cooling methods, such as using a fan to circulate air around the Temperature Meters. Do not, however, allow only the terminals to be cooled. Doing so will increase measurement error.
- The life of the output relays are greatly affected by the switching capacity and switching conditions. Use these relays within their rated load and electrical life. The contacts may fuse or burn if they are used past their electrical life.

# **Operating Procedures**

## ■ Levels

"Level" refers to a grouping of parameters. The following table lists the operations that are possible in each of the levels, and the diagram tells how to move between levels. There are some parameters that are not displayed for certain models.

Level name	Function	Measurement
Protect	Setting lockouts.	Continue
Operation	Displaying current values, and setting OUT 1 value.	Continue
Adjustment	Setting communications writing control.	Continue
Initial setting	Making initial settings of input type, output operating action, and other parameters.	Stopped
Advanced-function setting	Setting average processing, display color settings, and other ad- vanced function parameters.	Stopped



Note: The move-to-protect-level time can be set in the advanced-function setting level.

## Parameters

Note: 1. Some parameters are not displayed for certain models.

- 2. The K3MA-L will stop measurement if the level is changed to the initial setting level or the advanced-function setting level.
- 3. If the input range is changed, some parameters are set to default values. Therefore, set the input range first.
- 4. Settings displayed in reversed colors are defaults.



Digital panel indicators



Settings displayed in reversed colors are initial settings.



#### **Operation/Adjustment Lockouts**

Restricts key operations for operation level and adjustment level.

Paramet	Setting	Operation level		Moving to
er		Process value display	Set value display	adjustment level
oapt	0	Allowed	Allowed	Allowed
	1	Allowed	Allowed	Prohibited
	2	Allowed	Prohibited	Prohibited

• Initial setting is 0.

 This cannot be displayed on models not equipped with the comparative output function.

#### Setting Level Lockouts

Restricts shifting to initial setting level or advanced-function setting level.

Parameter	Setting	Shift to initial setting level	Shift to advanced- function setting level
icpt	0	Allowed	Allowed
	1	Allowed	Prohibited
	2	Prohibited	Prohibited

#### Setting Change Lockout

Restricts setting changes by key operation. When this lockout is set, it is no longer possible to shift to a setting change mode.

Parameter	Setting	Setting change by key operation
wtpt	off	Allowed
	on	Prohibited

However, all protect level parameters can still be changed.

# ■ Initial Settings





## ■ Setting Example

#### **Initial Settings**

The settings for the following example are shown here.

# Example: Monitoring the temperature of an industrial furnace



Here, the temperature inside the furnace is to be displayed in centigrade (°C).

Temperature sensor: E52-PR Thermocouple, Measurement range: 0 to 1,400°C.

- 1. Set the K3MA-L input type to the thermocouple R input range. Parameter: *Lo-L* (input type), Setting value: *I*5
- 2. Select centigrade (°C) as the temperature unit. Parameter: *d*-*U* (temperature unit), Setting value: *L*

If you are using a comparative output model, make the setting as desired.

## ■ Troubleshooting

When an error occurs, error details will be displayed on the main indicator. Confirm the error from the main indicator and take the appropriate countermeasures.

Level display	Main indicator	Error contents	Countermeasures
Not lit	e111	RAM memory error	Repair is necessary. Consult your OMRON sales repre-
5	e111	EEPROM memory error	When this error is displayed, press the Level Key for 3 seconds, and the settings will be restored to the factory settings.
			If the error cannot be recovered, re- pair is necessary.
			Consult your OMRON sales repre- sentative.
Not lit	Flashes 5.Err	Input error	Confirm that the temperature sen- sor is correctly connected, and that there are no broken signal lines to the temperature sensor.
			If the condition does not return to normal, repair is necessary.
			Consult your OMRON sales repre- sentative.
Not lit	Flashes 9999	The measurement value after tem- perature input correction exceeds	The temperature input correction value may be inappropriate.
		9999.	Use the adjustment level to review the temperature input correction value.
Not lit	Flashes - 1999	The measurement value after tem- perature input correction is lower than –1999.	The temperature input correction value may be inappropriate. Use the adjustment level to review the temperature input correction value.

#### ■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DIS-CLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

## ■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMER-CIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLI-GENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

# **Application Considerations**

## ■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. N109-E2-04 In the interest of product improvement, specifications are subject to change without notice.

# Frequency/Rate Meter

# Highly Visible LCD Display with 2-color (Red and Green) LEDs

- Contact, NPN, PNP, or voltage pulse input.
- Front-panel key operation for easy setting.
- Average processing function suppresses flicker.
- Includes scaling, auto-zero time, startup compensation time functions.
- Easy confirmation of max/min display.
- Short 80-mm depth (measured from edge of face plate).
- Finger protective cover (standard equipment) guards against electric shock.
- Water- and dust-proof NEMA4X (IP66 equivalent) front panel.
- Recognized to U.S. and Canadian requirements under the Component Recognition Program of UL.
- CE marking.

# **Model Number Structure**

# Model Number Legend



- 1. Input Type
- F: Rotary pulse
- 2. Output Type None: No output

A2: 2 relay contact outputs (SPST-NO)

# **Ordering Information**

## ■ List of Models

Input type	Supply voltage	Output	Model
Rotary pulse	100 to 240 VAC	None	K3MA-F 100-240VAC
		2 relay contact outputs (SPST-NO)	K3MA-F-A2 100-240VAC
24 VAC/VDC		None	K3MA-F 24VAC/VDC
		2 relay contact outputs (SPST-NO)	K3MA-F-A2 24VAC/VDC

#### ■ Accessories (Order Separately)

Name	Shape	Model
Splash-proof Soft Cover		K32-49SC
Hard Cover		K32-49HC



3. Supply Voltage 100-240VAC: 100 to 240 VAC 24VAC/VDC: 24 VAC/VDC

# Specifications

# Ratings

Model	K3MA-F 100-240VDC, K3MA-F	A2 100-240VAC	K3MA-F 24VAC/VDC, K3MA-F-A2 24VAC/VDC
Supply voltage	100 to 240 VAC		24 VAC/VDC
Operating voltage range	85% to 110% of the rated supply vo	oltage	
Power consumption (under maximum load)	6 VA max.		4.5 VA max. (24 VAC) 4.5 W max. (24 VDC)
Insulation resistance	20 M $\Omega$ min. (at 500 VDC) between Insulation provided between inputs	external terminal a outputs, and powe	nd case. er supply.
Dielectric strength	2,000 VAC for 1 min between exter Insulation provided between inputs	nal terminal and ca outputs, and powe	ise. er supply.
Noise immunity	$\pm 1,500$ V on power supply terminals mon mode. $\pm 1~\mu s,$ or 100 ns for square-wave network $\pm 1~\mu s$ and $\pm 100$ ns for square-wave network $\mu s$ and $\mu $	s in normal or com bise with 1 ns.	<ul> <li>±480 V on power supply terminals in normal mode.</li> <li>±1,500 V in common mode.</li> <li>±1 μs, or 100 ns for square-wave noise with 1 ns.</li> </ul>
Vibration resistance	Vibration: 10 to 55 Hz, Acceleration 5 min each in X, Y, and Z directions	: 50 m/s² for 10 sweeps.	
Shock resistance	150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay contact outputs) 3 times each on 3 axes, 6 directions.		
Ambient temperature	Operating: –10°C to 55°C (with no condensation or icing) Storage: –25°C to 65°C (with no condensation or icing)		
Approved safety standards	UL3121-1, conforms to EN61010-1 Conforms to VDE0106/P100 (finge	(Pollution degree 2 r protection)	2/overvoltage category II)
EMC	(EMI) Emission Enclosure: Emission AC Mains: (EMS) Immunity ESD: Immunity RF-interference: Electrical Fast Transient Noise: Immunity Burst Noise: Immunity Surge: Immunity Conducted Disturbance: Immunity Voltage Dip/Interrupting:	EN61326+A1 In CISPR 11 Group CISPR 11 Group EN61326+A1 In EN61000-4-2: 4 8 EN61000-4-3: 11 EN61000-4-4: 2 1 kV line to line (I EN61000-4-5: 1 2 EN61000-4-6: 3 EN61000-4-11: 0	ndustry 1 class A: CISRP16-1/-2 1 class A: CISRP16-1/-2 ndustry kV contact discharge kV air discharge 0 V/m (amplitude-modulated, 80 MHz to 1 GHz) kV (power line) /O signal line) kV (power line) kV (power line) kV line to ground (power line) V (0.15 to 80 MHz) .5 cycle, 0, 180°, 100% (rated voltage)
Weight	Approx. 200 g		

## ■ Characteristics

Input signal	No-voltage contact (30 Hz max., ON/OFF pulse width: 15 ms min.) Voltage pulse (5 kHz max., ON/OFF pulse width: 90 μs min., ON voltage: 4.5 to 30 V/OFF voltage: 0 to 2 V) Open collector (5 kHz max., ON/OFF pulse width 90 μs min.)		
	Connectable Sensors		
	ON residual voltage: 2.5 V max. OFF leakage current: 0.1 mA max. Load current: Must have switching capacity of 15 mA min. Must be able to dependably switch a load current of 5 mA max.		
Measuring accuracy	±0.1%FS ±1 digit (at 23±5°C)		
Measurement method	Cycle measurement		
Max. displayed digits	5 digits (–19999 to 99999)		
Display	7-segment digital display, Character height: 14.2 mm		
Polarity display	"-" is displayed automatically with a negative input signal.		
Zero display	Leading zeros are not displayed.		
Scaling function	Programmable with front-panel key inputs (range of display: –19999 to 99999). The decimal point position can be set as desired.		
Hold function	Max hold (maximum value), Min hold (minimum value)		
Hysteresis setting	Programmable with front-panel key inputs (0001 to 9999).		
Other functions	Scaling teach function Display color change (green (red), green, red (green), red) OUT type change (upper limit, lower limit, upper/lower limit) Average processing (simple average OFF/2/4/8 operations) Auto-zero time Startup compensation time Setting change lockout Parameter initialization Display auto-return time		
Output	Relays: 2 SPST-NO		
Delay in comparative outputs	750 ms max.		
Degree of protection	Front panel: NEMA4X for indoor use (equivalent to IP66) Rear case: IEC standard IP20 Terminals: IEC standard IP00 + finger protection (VDE0106/100)		
Memory protection	Non-volatile memory (EEPROM) (possible to rewrite 100,000 times)		

## ■ Measuring Ranges

#### No-voltage Contact/Open Collector Inputs

Input	Measuring range	Measuring accuracy	Displayable range
No-voltage contact (30 Hz max.) with ON/OFF pulse width of 15 ms min.	0.05 to 30.00 Hz	±0.1% FS ±1 digit max. (at 23±5°C)	–19999 to 99999 (with scaling function)
Open collector (5 kHz max.) with ON/OFF pulse width of 90 $\mu$ s min.	0 to 5 kHz		

## ■ Input/Output Ratings

#### **Relay Contact Output**

Item	Resistive load ( $\cos\phi = 1$ )	Inductive load (cos	
Rated load (UL ratings)	5 A at 250 VAC, 5 A at 30 VDC	1.5 A at 250 VAC, 1.5 A at 30 VDC	
Rated carry current	5 A max. (at COM terminal)		
Max. contact voltage	250 VAC, 150 VDC		
Max. contact current	5 A (at COM terminal)		
Max. switching capacity	1,250 VA, 150 W 250 VA, 30 W		
Min. permissible load (P level, reference value)	10 mA at 5 VDC		
Mechanical life	5,000,000 times min. (at a switching frequency of 1,200 times/min)		
Electrical life (at an ambient temperature of 20°C)	100,000 times min. (at a rated load switching frequency of 10 times/min)		

# Connections

#### Terminal Arrangement



External power supply



Note: Refer to Input Circuits on page F-55.

Terminal No.	Name	Description
(A1) - (A2)	Operation power	Connects the operation power supply.
(E4), (E6) - (E5)	Pulse input	No-voltage contact/open collector input
(E1), (E2) - (E3)	Outputs	Outputs the relay outputs.
(B5) - (B6)	External power supply	Use as the power supply for sensors.

## Block Diagram



Note: Relay output models only.

# ■ Input Circuits

## Pulse Input



#### Main Functions

#### **Input Types and Ranges**

Frequency range (setting parameter)	Function	Input range (setting p	oarameters)	Setting range
Pulse frequency selection	Selects pulse input signal.	0.05 to 30.00 Hz	(30)	Displayable from -19999 to 99999
(P-F-E)		0 to 5 kHz	(54)	with scaling function. The position of the decimal point can be set as desired.

#### **Pulse Frequency Selection**

Parameter	Setting value	Meaning
P-FrE	3	0.05 to 30.00 Hz measurement range
	52	0 to 5 kHz measure- ment range

Note: The default value is "0 to 5 kHz (5<sup>µ</sup>)."

#### **Scaling**

When the desired display value is set for a corresponding input, the value will be displayed on a line between two points determining the zero point.

Parameter	Setting value	Meaning
īnP	0 to 99999	Input value for d5P
dSP	- 19999 to 99999	Display value for Inp

Parameter	Setting value	Meaning
dP	0.0000	Display four digits after decimal point
	00.000	Display three digits after decimal point
	000.00	Display two digits after decimal point
	0000.0	Display one digit after decimal point
	00000	No decimal point



Instead of setting by inputting with the ( Up Key and ) Shift Key, current values can be input as scaling input values for teaching. This is useful for making settings while checking the operation status of the K3MA-F.

**Note:** The initial value will change depending on the pulse frequency selection.

• The decimal point can be optionally displayed.

 When displaying the decimal point, consider the number of digits to follow the decimal point prior to setting the scaling display value.

 If P-FrE is set to 30, the initial setting for the decimal display will be 000.00.

## OMPC

igital panel ndicators

#### **Convenient Functions**

#### Scaling Teach

The parameter (LnP) for the K3MA-F's initial setting level can be set using actual input values with the teaching function. After displaying the parameter, the actual input settings can be made with the following operation.



#### **OUT Types (Comparative Output Models Only)**

OUT 1 and OUT 2 can be set to operate in one of the three following modes in accordance with the compared values:

- Upper limit (High Acting):
- The output is turned ON when the measurement value is greater than its set value.
- Lower limit (Low Acting):

The output is turned ON when the measurement value is less than its set value.

• Upper and lower limits (Outside Band Acting):

An upper limit (H set value) and lower limit (L set value) can be set independently.

The output is turned ON when the measurement value is greater than upper-limit set value or less than the lower-limit set value. Lower Limit (Low Acting)

#### **Upper Limit (High Acting)**

#### OUT1 value Measurement value Measurement value Hyste OUT1 value ON Output \_\_\_\_ ON Output OFF OFF

The three types of output operations shown above can be combined as desired. The following are examples of possible combinations.

#### **Upper Limit 2-stage Output**

#### **Threshold Output**

#### Combination of Upper Limit and Upper/Lower Limits

ON

OFF

Output

Upper and Lower Limits (Outside Band Acting)

Hysteresis

eresis

OUT1 upper-limit

OUT1 lower-limit value

hent val

value

Measure



#### **Parameter Initialization**

This function returns all of the parameters to their initial values.

Parameter	Setting value	Meaning
init	ōFF	
	ōn	Initializes all parame- ters.

Use this to reset the K3MA-F after returning it to its factory-set condition.

#### Average Processing

Average processing stabilizes the display by minimizing any pulsating or flicker caused by fluctuations in the pulse width of sensor input or by eccentricity in rotating shafts.



#### <u>Hysteresis</u> (Comparative Output Models Only)

The hysteresis of comparative outputs can be set to prevent chattering in the output when the measurement value fluctuates finely near the OUT value.

Upper limit (high acting)



#### Auto-zero Time

This function sets the time for the display to return to zero when input pulses stop. Set the time longer than the expected input pulse cycle (the interval between one input pulse and the next). Proper measurement is not possible if the time is set shorter than the input pulse cycle.

#### Startup Compensation Time

The startup compensation time cancels measurement for a predetermined time when turning power ON, to prevent unwanted output due to temporary input fluctuations.



#### **Changing the Display Color**

The color of the value displayed can be set to either red or green. For comparative output models, the display color can be set to change from green to red, or from red to green, according to the status of the comparison criterion.



#### **Display Auto-return Time**

This function automatically returns the display to the operation level's current value if no keys are pressed for a preset time (called the display auto-return time).

#### Move-to-Protect-Level Time

The time required to shift to the protect level can be set as desired.

#### MAX/MIN Display

The maximum and minimum measurement (display) values from the time the power is turned ON until the current time can be stored and displayed. This is useful, for example, when measuring the maximum value.



# Nomenclature



Nar	me	Functions		
1. Main indicator		Displays current values, parameters, and set values.		
2. Opera- 1		Lit when output 1 is ON.		
tion indica-	2	Lit when output 2 is ON.		
1015	SV	Lit when a set value is being displayed or changed.		
	Max	Lit when the main indicator is showing the MAX value.		
	Min	Lit when the main indicator is showing the MIN value.		
	Т	Lit when the teaching function is operable. Blinks while the teaching function is operating.		
3. Level ind	licator	Displays the current level that the K3MA-F is in. (See below for details.)		
4. MAX/MI	N Key	Used to display the MAX and MIN values when a measurement value is being displayed.		
5. Level Ke	y	Used to change the level.		
6. Mode Key		Used to allow the main indicator to indicate parameters sequentially.		
7. Shift Key		Used to enable a set value to be changed. When changing a set value, this key is used to move along the digits.		
8. Up Key		Used to change a set value. Used to set or clear a forced-zero function when a measurement value is being displayed.		

Level indicator	Level
Ρ	Protect
Not lit	Operation
5	Initial setting
F	Advanced-function setting

# Dimensions



# **Application Examples**

Displaying conveyor belt feed speed



- Monitoring line speed for a reflow furnace
- Displaying feed speed for food processing, conveying, sintering

# Monitoring the rotations of a mixer or churner



- Mixers for resin molding
- Powdering/pelleting machines, centrifugal separators

#### Displaying the monitor output from an inverter as rotations or line speed



**Note:** If the monitor output from the inverter is analog, such as 0 to 10 V, use the K3MA-J.

- Monitoring conveyor speed
- Machining equipment (grinders, polishers)

# Installation

- 1. Insert the K3MA-F into the panel cut-out hole.
- 2. For a waterproof installation, insert the rubber gasket onto the body of the K3MA-F.



**3.** Fit the adaptor into the grooves on the left and right sides of the rear case, then push it until it contacts the panel to secure the K3MA-F.



## ■ Wiring Precautions

- Use crimp terminals.
- $\bullet$  Tighten the terminal screws to a torque of approximately 0.5 N  $\cdot m.$
- To avoid the influence of noise, route signal lines and power lines separately.

# ■ Wiring

• Use the following M3 crimp terminals.



## ■ Unit Labels (Provided)

• The unit labels are not attached to the K3MA-F. Select the desired labels from the provided sheet.

ſ	V	<u> </u>	ł	V	Â	%	J	Pa	Ω
	s	/	′	Ν	m	W	°C	m³	k
ľ	°F	ç	J	min		m	m	rp	m
	V	A		mV		m	ıΑ	ŀ	lz
	m/min <b>O</b>			nRe	on				
[	OU.	т	0	UT					

Note: For scales and gauges, use the unit labels that are specified by the relevant laws or regulations.

# **Precautions**

#### -/4 WARNING

Do not touch any of the terminals while the power is being supplied. Doing so may result in electric shock.

#### - 🕂 Caution

Do not disassemble the product or touch the internal components of the product while the power is being supplied. Doing so may result in electric shock.

#### $-\underline{\land}$ Caution

Do not allow metal objects or wire cuttings to enter the product. Doing so may result in electric shock, fire, or malfunction.

#### - A Caution

Perform correct settings for the product according to the control application. Failure to do so may cause unexpected operation, resulting in damage to the product or injury.

#### — <u>A</u>Caution

Take safety measures, such as installing a separate monitoring system, to ensure safety even if the product fails. Product failure may prevent comparative outputs from being generated, resulting in serious accidents.

Observe the following precautions to ensure safety.

- 1. Maintain the power supply voltage within the range specified in the specifications.
- 2. Maintain the load within the ratings specified in the specifications.
- 3. Check each terminal for correct number and polarity before connecting it. Incorrect or reverse connections may damage or burn out internal components in the product.
- Tighten the terminal screws securely. The recommended tightening torque is 0.43 to 0.58 N⋅m. Loose screws may cause fire or malfunction.
- 5. Do not connect anything to unused terminals.
- 6. Provide a switch or circuit breaker so that operators can easily turn OFF the power supply when necessary. Also provide appropriate indications of such devices.
- 7. Do not attempt to disassemble, repair, or modify the product.
- 8. Do not use the product where flammable or combustible gases are present.

#### **Application**

#### **General Precautions**

- 1. Do not use the product in the following locations:
  - Locations subject to direct radiant heat from heating equipment.
  - · Locations subject to exposure to water, oil, or chemicals.
  - Locations subject to direct sunlight.
  - Locations subject to dust or corrosive gases (particularly sulfuric gas or ammonia gas).
  - Locations subject to severe changes in temperature.
  - Locations subject to icing or condensation.
  - Locations subject to shock or vibration.
- Do not block heat dissipation around the product, i.e., provide sufficient space for heat dissipation.
- **3.** Ensure that the rated voltage is reached within two seconds after the power is turned ON.
- 4. Conduct aging for 15 minutes min. after power is turned ON for correct measurement.

- **5.** Do not touch the slit sections or terminals while the power is being supplied to prevent the product from being affected by static electricity.
- 6. Do not lay heavy objects on the product during use or storage. Doing so may deform or deteriorate the product.
- 7. Do not use paint thinner for cleaning. Use commercially available alcohol.

#### Mounting

- Mount the product to a panel that is 1 to 8 mm thick.
- Install the product in a horizontal position.
- Use crimp terminals that match screw sizes.

#### **Noise Prevention**

- Install the product as far as possible from devices that generate strong, high-frequency fields (such as high-frequency welders or sewing machines) or surges.
- Install surge absorbers or noise filters on nearby devices that generate noise (particularly motors, transformers, solenoids, magnet coils, and other devices that have a high inductance component).



- To prevent inductive noise, separate the terminal block wiring for the product from high-voltage or high-current power lines. Do not route the wiring for the product in parallel with or tie it in a bundle with power lines.
- When using a noise filter for the power supply, check for the voltage and current and install it as close as possible to the Frequency/ Rate Meter.
- Do not install the product near radios, television sets, or wireless devices. Doing so may cause reception interference.

#### **Increasing Service Life**

- Do not use the product in locations where the temperature or humidity exceeds the ratings or where condensation may occur. When installing the product in a panel, be sure that the temperature around the product (not the temperature around the panel) does not exceed the ratings. The product service life depends on the ambient temperature. The higher the ambient temperature, the shorter the service life. To extend the product service life, lower the temperature inside the Frequency/Rate Meter.
- Use and store the product within the temperature and humidity ranges given in the specifications. When gang-mounting Frequency/Rate Meters or arranging them vertically, heat generated by the Frequency/Rate Meters will cause the internal temperature to rise, reducing the service life. In such cases, consider forced cooling methods, such as using a fan to circulate air around the Frequency/Rate Meters. Do not, however, allow only the terminals to be cooled. Doing so will increase measurement error.
- The life of the output relays is greatly affected by the switching capacity and switching conditions. Use these relays within their rated load and electrical life. The contacts may fuse or burn if they are used past their electrical life.

# **Operating Procedures**

## Levels

"Level" refers to a grouping of parameters. The following table lists the operations that are possible in each of the levels, and the diagram tells how to move between levels. There are some parameters that are not displayed for certain models.

Level name	Function	Measurement
Protect	Setting lockouts.	Continue
Operation	Displaying current values, and setting OUT 1/2 set values.	Continue
Initial setting	Making initial settings of input type, scaling, output operating action, and other parameters.	Stopped
Advanced-function setting	Setting average processing, display color settings, and other ad- vanced-function parameters.	Stopped



Note: The move-to-protect-level time can be set in the advanced-function setting level.

#### Parameters

Note: 1. Some parameters are not displayed for certain models.

- 2. The K3MA-F will stop measurement if the level is changed to the initial setting level or the advanced-function setting level.
- 3. If the input range is changed, some parameters are set to default values. Therefore, set the input range first.
- 4. Settings displayed in reversed colors are defaults.



Digital panel indicators



Settings displayed in reversed colors are initial settings.

Press Devel Key + Press Node Key for more than 1 s.



#### **Operation/Adjustment Lockouts**

Restricts key operations for operation level and adjustment level.

Parameter	Setting	Operation level	
		Current value display	Set value display
GRPE	0	Allowed	Allowed
	1	Allowed	Allowed
	2	Allowed	Prohibited

<sup>•</sup> Initial setting is 0.

 This is not displayed on models with no comparative output function.

#### Setting Level Lockouts

Restricts shifting to initial setting level or advanced-function setting level.

Parameter	Setting	Shift to initial setting level	Shift to advanced- function setting level
CEPE	0	Allowed	Allowed
	1	Allowed	Prohibited
	2	Prohibited	Prohibited

#### Setting Change Lockout

Restricts setting changes by key operation. When this lockout is set, it is no longer possible to shift to a setting change mode.

Parameter	Setting	Setting change by key operation
YEPE	ōFF	Allowed
	ōn	Prohibited

However, all protect level parameters can still be changed.

## ■ Initial Settings



Press the Level Key  $\bigcirc$  for 3 s min. to move to the initial setting level.

IJ

Select the pulse frequency for measurement. Set the scaling values and OUT type as required.



## ■ Setting Example

#### **Initial Settings**

The settings for the following example are shown here.

#### Example: Display conveyor belt feed speed



Here, the conveyor belt feed speed is to be displayed in units of 0.1 m/min.

• Proximity Sensor: E2E-X5E1, NPN output



When displaying a flowrate (e.g., in l/min or l/h), make the scaling settings after confirming the I/O characteristics of the flowrate sensor. There are flowrate sensors that output analog signals. If this kind of flowrate sensor is used, consider using the K3MA-J.

- 1. Select the maximum input frequency for the K3MA-F. Set the pulse frequency selection to either 30 Hz or 5 kHz. In the example, this is set to 30 Hz because the conveyor belt is turning at a slow speed.
  - Parameter: P- $F_r E$  (pulse frequency), Setting value: 3D
- 2. Set the scaling. The relationship between the display value and the input value is shown in the following equation.

d: Roller diameter (m)

When the input conditions are applied to this equation, we obtain the following:

Display value =  $1/1 \times f \times 60 \times 0.1 \times \pi$ 

For an input of 1 Hz, the display value is 18.8495 (m/min).

The scaling settings for the K3MA-F must be integers. Also, to decrease error, the scaling value is multiplied by 1,000, to obtain an input of 1000 Hz and a display value of 18850. However, because the display value in this case is displayed to the first decimal place, the scaling is set as shown in the following example so that 18850 is displayed for an input of 100 Hz.

Parameter	Setting value
Input value)	IÕO
d5P (scaling display value)	18850
dP (decimal point position)	0000.0

Note: The decimal point position here refers to the position in the number after scaling. When setting the scaling display value, it is necessary to consider the number of digits to be displayed past the decimal point.

#### ■ Troubleshooting

When an error occurs, error details will be displayed on the main indicator. Confirm the error from the main indicator and take the appropriate countermeasures.

Level display	Main indicator	Error contents	Countermeasures
Not lit	E	RAM memory error	Repair is necessary.
			Consult your OMRON sales representative.
5	E 111	EEPROM memory error	When this error is displayed, press the Level Key for 3 sec- onds, and the settings will be restored to the factory set- tings. If the error cannot be recovered, repair is necessary. Con- sult your OMRON sales representative.
Not lit	Flashes 99999	The scaling display value exceeds 99999.	Promptly change the input to a value that falls within the specified range.
			The scaling value may be inappropriate. Review the scaling value at the initial setting level.
Not lit	Flashes - 19999	The scaling display value is lower than -19999.	Promptly change the input to a value that falls within the specified range.
			The scaling value may be inappropriate. Review the scaling value at the initial setting level.

#### ■ WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DIS-CLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

## ■ LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS, OR COMMER-CIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLI-GENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

# **Application Considerations**

## ■ SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products.

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this catalog.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. N107-E2-03A In the interest of product improvement, specifications are subject to change without notice.

#### OMRO

# **Process Indicator 3HB**

#### A Process Indicator Ideal for Discriminating and **Displaying Measurements for Voltage/Current** Signals

- · Easy recognition of judgement results using color display that can be switched between red and green.
- Equipped with a position meter for monitoring operating status trends.
- · External event input allows use in various measurement and discrimination applications.
- Series expanded to include DeviceNet models.
- Short body with depth of only 95 mm (from behind the front panel), or 97 mm for DeviceNet models.
- UL certification approval (Certification Mark License).
- CE Marking conformance by third party assessment body.
- Water-resistant enclosure conforms to NEMA 4X (equivalent to IP66).
- Capable of high-speed sampling at 50 times per second (20 ms)
- · Easy-to-set two-point scaling allows conversion and display of any userset values.

Refer to Precautions on CD.

# Model Number Structure

#### Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets. **Base Units** 

# **K3HB-X**

#### 1. Input Sensor Codes

VD: DC voltage input AD: DC current input VA: AC voltage input AA: AC current input

5. Supply Voltage

100-240 VAC: 100 to 240 VAC 24 VAC/VDC: 24 VAC/VDC

#### **Optional Board**

Sensor Power Supply/Output Boards



**Relay/Transistor Output Boards** 

```
K34-∟
```

#### **Event Input Boards**



- Note: 1. CPA can be combined with relay outputs only.
  - 2. Only one of the following can be used by each Digital Indicator:
  - RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

#### Accessories (Sold Separately)

K32-DICN: Special Cable (for event inputs, with 8-pin connector) K32-BCD: Special BCD Output Cable



КЗНВ-Х						]
	1	2	3	4	5	

#### 2. Sensor Power Supply/Output Type Codes None: None

- None: None CPA: Relay output (PASS: SPDT) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 1.) L1A: Linear current output (DCO(4) 20 mA) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.) L2A: Linear voltage output (DCO(1) 5 V, 0 to 10 V) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.) A: Sensor power supply (12 VDC +/-10%, 80 mA) FLK1A: Communications (RS-232C) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.) FLK3A: Communications (RS-485) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.)

#### 3. Relay/Transistor Output Type Codes

None: None

- C1: Relay contact (H/L: SPDT each)
- C2: Relay contact (HH/H/LL/L: SPST-NO each)
- T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
- T2: Transistor (PNP open collector: HH/H/PASS/L/LL) BCD: BCD output + transistor output (NPN open collector: HH/H/PASS/L/
- LL) DRT:DeviceNet (See note 2.)
- 4. Event input Type Codes
- None: None
  - 1: 5 points (M3 terminal blocks) NPN open collector
  - 2: 8 points (10-pin MIL connector) NPN open collector
  - 3: 5 points (M3 terminal blocks) PNP open collector
  - 4: 8 points (10-pin MIL connector) PNP open collector

# **Specifications**

## Ratings

Power supply voltage		100 to 240 VAC (50/60 Hz), 24 VAC/VDC, DeviceNet power supply: 24 VDC	
Allowable power supply voltage range		85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC	
Power consumption (See note 1.)		100 to 240 V: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)	
Current consumption	on	DeviceNet power supply: 50 mA max. (24 VDC)	
Input		DC voltage, DC current, AC voltage, AC current	
A/D conversion met	hod	Delta-Sigma method	
External power supp	ply	See Sensor Power Supply/Output Type Codes	
Event inputs (See Timing input note 2.)		NPN open collector or no-voltage contact signal ON residual voltage: 3 V max. ON current at 0 Ω: 17 mA max. Max. applied voltage: 30 VDC max. OFF leakage current: 1.5 mA max.	
	Startup compensa- tion timer input	NPN open collector or no-voltage contact signal ON residual voltage: 2 V max.	
	Hold input	ON current at 0 Ω: 4 mA max.	
	Reset input	IMax. applied voltage: 30 VDC max.	
	Forced-zero input		
	Bank input		
Output ratings (de- pends on the mod-	Relay output	250 VAC, 30 VDC, 5 A (resistive load) Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations	
el)	Transistor output	Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 µA max.	
	Linear output	Linear output 0 to 20 mA DC, 4 to 20 mA: Load: 500 $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC: Load: 5 k $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS (1 V or less: ±0.15 V; not output for 0 V or less)	
Display method		Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green)	
Main functions		Scaling function, measurement operation selection, averaging, previous average value comparison, forced-ze- ro, zero-limit, output hysteresis, output OFF delay, output test, teaching, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset	
Ambient operating temperature		-10 to 55°C (with no icing or condensation)	
Ambient operating humidity		25% to 85%	
Storage temperature		-25 to 65°C (with no icing or condensation)	
Altitude		2,000 m max.	
Accessories		Watertight packing, 2 fixtures, terminal cover, unit stickers, instruction manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3)	

Note: 1. DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

2. PNP input types are also available.

3. For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

# ■ Characteristics

Display range		-19,999 to 99,999		
Sampling period		20 ms (50 times/second)		
Comparative output response time		DC input: 100 ms max.; AC input: 300 ms max.		
Linear output re	esponse time	DC input: 150 ms max.; AC input: 420 ms max.		
Insulation resist	tance	20 MΩ min. (at 500 VDC)		
Dielectric streng	gth	2,300 VAC for 1 min between external terminals and case		
Noise immunity		<ul> <li>100 to 240 VAC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> <li>24 VAC/VDC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> </ul>		
Vibration resist	ance	Frequency: 10 to 55 Hz; Acceleration: 50 m/s <sup>2</sup> , 10 sweeps of 5 min each in X, Y, and Z directions		
Shock resistance	e	150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay outputs) 3 times each in 3 axes, 6 directions		
Weight		Approx. 300 g (Base Unit only)		
Degree of	Front panel	Conforms to NEMA 4X for indoor use (equivalent to IP66)		
protection	Rear case	IP20		
	Terminals	IP00 + finger protection (VDE0106/100)		
Memory protection		EEPROM (non-volatile memory) Number of rewrites: 100,000		
Applicable standards		UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001		
EMC		EMI: EN61326+A1 industrial applications		
		Electromagnetic radiation interference CISPR 11 Group 1, Class A: CISPRL16-1/-2		
		Terminal interference voltage CISPR 11 Group 1, Class A: CISPRL16-1/-2		
		EMS: EN61326+A1 industrial applications		
		Electrostatic Discharge Immunity EN61000-4-2: 4 kV (contact), 8 kV (in air)		
		Radiated Electromagnetic Field Immunity EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz)		
		Electrical Fast Transient/Burst Immunity EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)		
		Surge Immunity EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)		
		Conducted Disturbance Immunity EN61000-4-6: 3 V (0.15 to 80 MHz)		
		Voltage Dips and Interruptions Immunity EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage)		
# ■ Input Range (Measurement Range and Accuracy) CAT II

Input type	Range	Set value	Measurement range	Input impedance	Accuracy	Allowable instantaneous overload (30 s)
K3HB-XVD	А	R ud	±199.99 V	10 M $\Omega$ min.	±0.1%rdg ± 1	±400 V
DC voltage	В	b ud	±19.999 V	1 MΩ min.	digit max.	±200 V
	С	[ ud	±1.9999 V	-		
	D	d ud	1.0000 to 5.0000 V	-		
K3HB-XAD	A	R Rd	±199.99 mA	1 Ω max.	±0.1%rdg ± 1	±400 mA
DC current	В	ь Rd	±19.999 mA	10 Ω max.	digit max.	±200 mA
	С	C Rd	±1.9999 mA	33 Ω max.		
	D	d Rd	4.000 to 20.000 mA	10 Ω max.		
K3HB-XVA	A	RuR	0.0 to 400.0 V	1 MΩ min.	±0.3%rdg ± 5	700 V
AC voltage	В	ь иЯ	0.00 to 199.99 V	-	digits max.	
(See note 4.)	С	E uR	0.000 to 19.999 V		±0.5%rdg ± 10	400 V
	D	d uR	0.0000 to 1.9999 V		digits max.	
K3HB-XAA AC current	A	R RR	0.000 to 10.000 A	(0.5 VA CT) (See note 3.)	$\pm 0.5\%$ rdg $\pm 20$ digits max.	20 A
	В	6 RR	0.0000 to 1.9999 A	(0.5 VA CT) (See note 3.)		
	С	C RR	0.00 to 199.99 mA	1 Ω max.	±0.5%rdg ± 10	2 A
	D	d RR	0.000 to 19.999 mA	10 Ω max.	digits max.	

Note: 1. The accuracy is for an input frequency range of 40 Hz to 1 kHz (except for AD current input A and B ranges) and an ambient temperature of 23  $\pm$ 5°C. The error, however, increases below 10% of the maximum input value. DC voltage input (all ranges): 10% or less of max. input =  $\pm$ 0.15% FS

DC current input (all ranges): 10% or less of max. input = ±0.1% FS

AC voltage input (A: 0.0 to 400.0 V): 10% or less of max. input =  $\pm 0.15\%$  FS

AC voltage input (B: 0.00 to 199.99 V): 10% or less of max. input =  $\pm 0.2\%$  FS

AC voltage input (C: 0.000 to 19.999 V; D: 0.0000 to 1.9999 V): 10% or less of max. input =  $\pm 0.25\%$  FS AC current input (A: 0.000 to 10.000 A): 10% or less of max. input =  $\pm 0.25\%$  FS AC current input (B: 0.0000 to 1.9999 A): 10% or less of max. input =  $\pm 0.25\%$  FS

AC current input, (C: 0.00 to 199.99 mA; D: 0.000 to 19.999 A): 10% or less of max. input = ±0.15% FS

When DC voltage input models are used with a ±1.9999 V range, make sure that the connections between input terminals are not open. If the input terminals are open, the display will show large variations. Connect resistance of approximately 1 MΩ between the input terminals if they are open.

2. The letters "rdg" mean "reading" and refer to the input error.

3. The value (0.5 VA CT) is the VA consumption of the internal CT (current transformer).



4. The K3HB-XVA C complies with UL standards when the applied input voltage is within the range 0 to 150 VAC. If the input voltage is higher than 150 VAC, install an external transformer or take other measures to drop the voltage to 150 VAC or lower.

# OMROI

# **Temperature Indicator**

#### New High-speed, High-precision Temperature Indicator

- · Easy recognition of judgement results using color display that can be switched between red and green.
- Equipped with a position meter for monitoring operating status trends.
- · External event input allows use in various measurement and discrimination applications.
- · Series expanded to include DeviceNet models.
- Short body with depth of only 95 mm (from behind the front panel), or 97 mm for DeviceNet models.
- UL certification approval (Certification Mark License).
- · CE Marking conformance by third party assessment body.
- Water-resistant enclosure conforms to NEMA 4X (equivalent to IP66).
- · Capable of high-speed sampling at 50 times per second (20 ms).
- High-resolution of 0.01°C with platinum-resistance thermometer Pt100 input. Thermocouple sensor inputs also support a resolution of 0.1°C for all ranges.
- Temperature input shift is easily set using two points.

Refer to Precautions on CD.

# **Model Number Structure**

# Model Number Leaend

Base Units and Optional Boards can be ordered individually or as sets. **Base Units** 

#### K3HB-H 1 5

- 1. Input Sensor Codes
  - TA: Temperature input Thermocouple input/Platinum-resistance thermometer input
- 5. Supply Voltage 100-240 VAC: 100 to 240 VAC 24 VAC/VDC: 24 VAC/VDC

#### **Optional Board**

Sensor Power Supply/Output Boards

K33-

**Relay/Transistor Output Boards** 

K34-∟

#### **Event Input Boards**

K35-

- Note: 1. CPA can be combined with relay outputs only.
  - 2. Only one of the following can be used by each Digital Indicator:
    - RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

#### Accessories (Sold Separately)

K32-DICN: Special Cable (for event inputs, with 8-pin connector) K32-BCD: Special BCD Output Cable



#### **Base Units with Optional Boards**

K3HB-H	_,	-			
-	1	2	3	4	5

#### 2. Sensor Power Supply/Output Type Codes

- Sensor Power Suppry Carpar, 1, processed

   None: None

   CPA: Relay output (PASS: SPDT) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 1.)

   L1A: Linear current output (DCO(4) 20 mA) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.)

   L2A: Linear voltage output (DCO(1) 5 V, 0 to 10 V) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.)

   A: Sensor power supply (12 VDC +/-10%, 80 mA)

   FLK1A: Communications (RS-232C) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.)

   FLK3A: Communications (RS-485) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.)

   FLK3A: Communications (RS-485) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.)

- 3. Relay/Transistor Output Type Codes
  - None: None
  - C1: Relay contact (H/L: SPDT each) C2: Relay contact (HH/H/LL/L: SPST-NO each)

  - T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
  - T2: Transistor (PNP open collector: HH/H/PASS/L/LL) BCD: BCD output + transistor output (NPN open collector: HH/H/PASS/L/
  - 11) DRT: DeviceNet (See note 2.)
- 4. Event input Type Codes
- None: None
  - 1: 5 points (M3 terminal blocks) NPN open collector
  - 2: 8 points (10-pin MIL connector) NPN open collector
  - 5 points (M3 terminal blocks) PNP open collector 3.
  - 8 points (10-pin MIL connector) PNP open collector 4:

# Ratings

Power supply volta	ge	100 to 240 VAC (50/60 Hz), 24 VAC/VDC, DeviceNet power supply: 24 VDC		
Allowable power su	upply voltage range	85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC		
Power consumption (See note 1.)	n	100 to 240 V: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)		
Current consumpti	on	DeviceNet power supply: 50 mA max. (24 VDC)		
Input		Platinum-resistance thermometer: Pt100 Thermocouple: K, J, T, E, L, U, N, R, S, B, W		
A/D conversion me	thod	Delta-Sigma method		
External power sup	oply	See Sensor Power Supply/Output Type Codes		
Event inputs (See note 2.)	Timing input	NPN open collector or no-voltage contact signal ON residual voltage: 3 V max. ON current at 0 Ω: 17 mA max. Max. applied voltage: 30 VDC max. OFF leakage current: 1.5 mA max.		
	Startup compensa- tion timer input	NPN open collector or no-voltage contact signal ON residual voltage: 2 V max.		
	Hold input	JN current at 0 Ω: 4 mA max. Jax, applied voltage: 30 VDC max		
	Reset input	OFF leakage current: 0.1 mA max.		
	Bank input			
Output ratings (depends on the	Relay output	250 VAC, 30 VDC, 5 A (resistive load) Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations		
model)	Transistor output	Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 µA max.		
	Linear output	Linear output 0 to 20 mA DC, 4 to 20 mA: Load: 500 $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC: Load: 5 k $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS (1 V or less: ±0.15 V; not output for 0 V or less)		
Display method		Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green)		
Main functions		Scaling function, measurement operation selection, averaging, previous average value comparison, zero-limit, output hysteresis, output OFF delay, output test, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset		
Ambient operating temperature		-10 to 55°C (with no icing or condensation)		
Ambient operating humidity		25% to 85%		
Storage temperature		-25 to 65°C (with no icing or condensation)		
Altitude		2,000 m max.		
Accessories		Watertight packing, 2 fixtures, terminal cover, unit stickers, instruction manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3.)		

Note: 1. DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.
 PNP input types are also available.
 For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

# ■ Characteristics

Display range		-19,999 to 99,999			
Accuracy		Thermocouple input: ( $\pm 0.3\%$ PV or $\pm 1^{\circ}$ C, whichever is larger) $\pm 1$ digit max. (See note.) Platinum resistance thermometer input: ( $\pm 0.2\%$ PV or $\pm 0.8^{\circ}$ C, whichever is larger) $\pm 1$ digit max.			
Sampling period	ł	20 ms (50 times/second)			
Comparative ou	tput response time	Platinum-resistance thermometer input range: 120 ms max. Thermocouple input range: 180 ms max.			
Linear output re	esponse time	Platinum-resistance thermometer input range: 170 ms max. Thermocouple input range: 230 ms max.			
Insulation resist	tance	20 MΩ min. (at 500 VDC)			
Dielectric streng	gth	2,300 VAC for 1 min between external terminals and case			
Noise immunity		<ul> <li>100 to 240 VAC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> <li>24 VAC/VDC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> </ul>			
Vibration resista	ance	Frequency: 10 to 55 Hz; Acceleration: 50 m/s <sup>2</sup> , 10 sweeps of 5 min each in X, Y, and Z directions			
Shock resistance	e	150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay outputs) 3 times each in 3 axes, 6 directions			
Weight		Approx. 300 g (Base Unit only)			
Degree of pro-	Front panel	Conforms to NEMA 4X for indoor use (equivalent to IP66)			
tection	Rear case	IP20			
	Terminals	IP00 + finger protection (VDE0106/100)			
Memory protect	ion	EEPROM (non-volatile memory) Number of rewrites: 100,000			
Applicable stan	dards	UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001			
EMC		EMI: EN61326+A1 industrial applications Electromagnetic radiation interference CISPR 11 Group 1, Class A: CISPRL16-1/-2 Terminal interference voltage CISPR 11 Group 1, Class A: CISPRL16-1/-2 EMS: EN61326+A1 industrial applications Electrostatic Discharge Immunity EN61000-4-2: 4 kV (contact), 8 kV (in air) Radiated Electromagnetic Field Immunity EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz) Electrical Fast Transient/Burst Immunity EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line) Surge Immunity EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line) Conducted Disturbance Immunity EN61000-4-6: 3 V (0.15 to 80 MHz) Voltage Dips and Interruptions Immunity EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage)			

Note: K, T, N (-100°C or less): ±2°C ±1 digit max. U, L: ±2°C ±1 digit max. B (400°C max.): Nothing specified. R, S (200°C max.): ±3°C ±1 digit max. W: (±0.3% PV or ±3°C whichever is larger) ±1 digit max.

# ■ Input Ranges

# Platinum-resistance Thermometer/Thermocouple

Input typ	De	Plati resis thermo	num- tance ometer		Thermocouple											
Name		Pt1	100	ŀ	¢		J	Т	E	L	U	N	R	S	В	W (W/Re 5-26)
Connect terminal	ed s	E4) – E	5 - 6							E5 – E6	)					
Tem- pera- ture range (°C)	2300 1800 1300 900 800 700 600 400 200 100 0 -100	850.0	150.00		500.0	850.0	400.0	400.0	600.0	850.0	400.0		1700.0	0.0	1800.0	2300.0
	-200	-200.0	-150.00	-200.0	-20.0	-100.0	-20.0	-200.0		-100.0	-200.0	-200.0				
Setting of	code	0-PE	1-PE	2-2	3-2	4-3	5-3	8-5	7-8	8-1	9-11	10-0	11	12-5	13-6	14-2
Minimun setting u (compar set value	n unit ative e)	0.1°C	0.01°C							0.1°C						

The range shown in dark shading indicates the factory setting.

# Celsius/Fahrenheit Correlation Values and Setting/Specified Ranges

Input type	Setting	g range	Indication range		
	°C	°F	°C	°F	
Pt100 (1)	-200.0 to 850.0	-300.0 to 1500.0	-305.0 to 955.0	-480.0 to 1680.0	
Pt100 (2)	-150.00 to 150.00	-199.99 to 300.00	-180.00 to 180.00	-199.99 to 350.00	
K (1)	-200.0 to 1300.0	-300.0 to 2300.0	-350.0 to 1450.0	-560.0 to 2560.0	
K (2)	-20.0 to 500.0	0.0 to 900.0	-72.0 to 552.0	-90.0 to 990.0	
J (1)	-100.0 to 850.0	-100.0 to 1500.0	-195.0 to 945.0	-260.0 to 1660.0	
J (2)	-20.0 to 400.0	0.0 to 750.0	-62.0 to 442.0	-75.0 to 825.0	
Т	-200.0 to 400.0	-300.0 to 700.0	-260.0 to 460.0	-400.0 to 800.0	
E	0.0 to 600.0	0.0 to 1100.0	-60.0 to 660.0	-110.0 to 1210.0	
L	-100.0 to 850.0	-100.0 to 1500.0	-195.0 to 945.0	-260.0 to 1660.0	
U	-200.0 to 400.0	-300.0 to 700.0	-260.0 to 460.0	-400.0 to 800.0	
N	-200.0 to 1300.0	-300.0 to 2300.0	-350.0 to 1450.0	-560.0 to 2560.0	
R	0.0 to 1700.0	0.0 to 3000.0	-170.0 to 1870.0	-300.0 to 3300.0	
S	0.0 to 1700.0	0.0 to 3000.0	-170.0 to 1870.0	-300.0 to 3300.0	
В	100.0 to 1800.0	300.0 to 3200.0	-70.0 to 1970.0	10.0 to 3490.0	
W	0.0 to 2300.0	0.0 to 4100.0	-230.0 to 2530.0	-410.0 to 4510.0	

# OMRO

# Weighing Indicator

An Ideal Indicator for OK/NG Judgements in Automated and Picking Machines, Measuring Factors such as Pressure, Load, Torque, and Weight Using Load Cell Signal Input.

- Easy recognition of judgement results using color display that can be switched between red and green.
- · Equipped with a position meter for monitoring operating status trends. · External event input allows use in various measurement and discrimination applications.
- · Series expanded to include DeviceNet models.
- Short body with depth of only 95 mm (from behind the front panel), or 97 mm for DeviceNet models.
- UL certification approval (Certification Mark License).
- CE Marking conformance by third party assessment body.
- Water-resistant enclosure conforms to NEMA 4X (equivalent to IP66).
- Capable of high-speed sampling at 50 times per second (20 ms)
- · Easy-to-set two-point scaling allows conversion and display of any userset values.

/î Refer to Precautions on CD.

# Model Number Structure

# Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets.

#### **Base Units**



- 1. Input Sensor Codes LC: Load cell input (DC low-voltage input)
- 5. Supply Voltage 100-240 VAC: 100 to 240 VAC
  - 24 VAC/VDC: 24 VAC/VDC

#### **Optional Board**

Sensor Power Supply/Output Boards

#### K33-\_\_

**Relay/Transistor Output Boards** 

```
K34-
```

#### **Event Input Boards**

K35-\_\_

- Note: 1. CPB can be combined with relay outputs only.
  - 2. Only one of the following can be used by each Digital Indicator:
  - RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

#### Accessories (Sold Separately)

K32-DICN: Special Cable (for event inputs, with 8-pin connector) K32-BCD: Special BCD Output Cable



#### **Base Units with Optional Boards**



# 2. Sensor Power Supply/Output Type Codes

- Sensor Power Suppry/Output Type Codes

   None: None

   CPB: Relay output (PASS: SPDT) + Sensor power supply (10 VDC +/-5%, 100 mA) (See note 1.)

   L1B: Linear current output (DC0(4) 20 mA) + Sensor power supply (10 VDC +/-5%, 100 mA) (See note 2.)

   L2B: Linear voltage output (DC0(1) 5 V, 0 to 10 V) + Sensor power supply (10 VDC +/-5%, 100 mA) (See note 2.)

   B: Sensor power supply (10 VDC +/-5%, 100 mA)

   FLK1B: Communications (RS-232C) + Sensor power supply (10 VDC +/-5%, 100 mA) (See note 2.)

   FLK3B: Communications (RS-485) + Sensor power supply (10 VDC +/-5%, 100 mA) (See note 2.)
- 3. Relay/Transistor Output Type Codes
- None: None
- C1: Relay contact (H/L: SPDT each) C2: Relay contact (HH/H/L/L/: SPST-NO each) T1: Transistor (NPN open collector: HH/H/PASS/L/LL) T2: Transistor (PNP open collector: HH/H/PASS/L/LL)
- BCD: BCD output + transistor output (NPN open collector: HH/H/PASS/L/
- LL) DRT:DeviceNet (See note 2.)
- 4. Event input Type Codes
- None: None
  - 1: 5 points (M3 terminal blocks) NPN open collector
- 2: 8 points (10-pin MIL connector) NPN open collector
- 3: 5 points (M3 terminal blocks) PNP open collector
- 4: 8 points (10-pin MIL connector) PNP open collector

# Ratings

Power supply voltage		100 to 240 VAC (50/60 Hz), 24 VAC/VDC, DeviceNet power supply: 24 VDC		
Allowable power supply v	oltage range	85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC		
Power consumption (See note 1.)		100 to 240 V: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)		
Current consumption		DeviceNet power supply: 50 mA max. (24 VDC)		
Input		DC voltage		
A/D conversion method		Delta-Sigma method		
External power supply		See Sensor Power Supply/Output Type Codes		
Event inputs (See note 2.)	Timing input	NPN open collector or no-voltage contact signal ON residual voltage: 3 V max. ON current at 0 $\Omega$ : 17 mA max. Max. applied voltage: 30 VDC max. OFF leakage current: 1.5 mA max.		
	Startup compensation timer input	NPN open collector or no-voltage contact signal ON residual voltage: 2 V max.		
	Hold input	ON current at 0 $\Omega$ : 4 mA max.		
	Reset input	OFF leakage current: 0.1 mA max.		
	Forced-zero input			
	Bank input			
Output ratings (depends on the model)	Relay output	250 VAC, 30 VDC, 5 A (resistive load) Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations		
	Transistor output	Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 µA max.		
	Linear output	Linear output 0 to 20 mA DC, 4 to 20 mA: Load: 500 $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC: Load: 5 k $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS (1 V or less: ±0.15 V; not output for 0 V or less)		
Display method		Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green)		
Main functions		Scaling function, measurement operation selection, averaging, previous average value comparison, forced- zero, zero-limit, output hysteresis, output OFF delay, output test, teaching, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset		
Ambient operating temper	rature	-10 to 55°C (with no icing or condensation)		
Ambient operating humid	ity	25% to 85%		
Storage temperature		-25 to 65°C (with no icing or condensation)		
Altitude		2,000 m max.		
Accessories		Watertight packing, 2 fixtures, terminal cover, unit stickers, operation manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3.)		

Note: 1. DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

2. PNP input types are also available.

3. For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

# ■ Characteristics

Display range		-19,999 to 99,999			
Sampling perio	d	20 ms (50 times/second)			
Comparative ou	Itput response time	100 ms max.			
Linear output re	esponse time	150 ms max.			
Insulation resis	tance	20 MΩ min. (at 500 VDC)			
Dielectric stren	gth	2,300 VAC for 1 min between external terminals and case			
Noise immunity		<ul> <li>100 to 240 VAC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> <li>24 VAC/VDC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> </ul>			
Vibration resist	ance	Frequency: 10 to 55 Hz; Acceleration: 50 m/s $^2$ , 10 sweeps of 5 min each in X, Y, and Z directions			
Shock resistand	ce	150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay outputs) 3 times each in 3 axes, 6 directions			
Weight		Approx. 300 g (Base Unit only)			
Degree of	Front panel	Conforms to NEMA 4X for indoor use (equivalent to IP66)			
protection	Rear case	IP20			
	Terminals	IP00 + finger protection (VDE0106/100)			
Memory protect	tion	EEPROM (non-volatile memory) Number of rewrites: 100,000			
Applicable stan	dards	UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001			
EMC		EMI: EN61326+A1 industrial applications Electromagnetic radiation interference CISPR 11 Group 1, Class A: CISPRL16-1/-2 Terminal interference voltage CISPR 11 Group 1, Class A: CISPRL16-1/-2 EMS: EN61326+A1 industrial applications Electrostatic Discharge Immunity EN61000-4-2: 4 kV (contact), 8 kV (in air) Radiated Electromagnetic Field Immunity EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz) Electrical Fast Transient/Burst Immunity EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line) Surge Immunity EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line) Conducted Disturbance Immunity EN61000-4-6: 3 V (0.15 to 80 MHz) Voltage Dips and Interruptions Immunity EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage)			

# ■ Input Ranges (Measurement Range and Accuracy)

Input type	Range	Set value	Measurement range	Input impedance	Accuracy	Allowable instantaneous overload (30 s)
K3HB-VLC	A	R ud	0.00 to 199.99 mV	1 M $\Omega$ min.	$\pm 0.1\%$ rdg $\pm 1$ digit max.	±200 V
Load Cell, mV	В	b ud	0.000 to 19.999 mV		$\pm 0.1\%$ rdg $\pm 5$ digits max.	
	С	[ ud	±100.00 mV	-	±0.1%rdg ± 3 digits max.	
	D	d ud	±199.99 mV	-	±0.1%rdg ± 1 digit max.	

Note: 1. The accuracy is for an ambient temperature of 23±5°C. For all ranges,10% or less of max. input ±0.1% FS.
2. The letters "rdg" mean "reading."

	Input type	A LC	ьιс	[ [	а I С
	Connected terminals	Ē2 - Ē6	Ē3 - Ē6	Ē4 - Ē6	E5 – E6
(mV)	200,000	199.99			199.99
	200.000				
	150.000			100.00	
	100.000		19.999		
	50.000				
	0.00	0.00	0.000		
	-50.00	0.00	0.000		
	-100.00				
	-150.00			-100.00	
	-200.00				
	-200.00				-199.99

The area shown in dark shading indicates the factory setting.

# ■ Load Cell Wiring Example



# ■ Scaling Example Using Range A

Indicated on the K3HB-V as 0 to 49N in the load cell specifications (rated load 49N, recommended applied voltage 10 V, rated output 2 mV/V) (See note.)



Note: 2 mV/V indicates a load cell output of 2 mV for 1 V applied voltage for the rated load (when using a load of 1 N). When the applied voltage is 10 V, the load cell output is 20 mV (2 mV  $\times$  10).

# Linear Sensor Indicator

#### A Linear Sensor Indicator Capable of High-speed Response at 2,000 Times per Second

- Effective for high-speed measurement and discrimination with a sampling period of 0.5 ms and output response time of 1 ms max.
- · Easy recognition of judgement results using color display that can be switched between red and green.
- · Equipped with a position meter that represents measured amounts and relative positions
- Zero calibration can be performed easily with the forced zero function.
- · Series expanded to include DeviceNet models.
- Short body with depth of only 95 mm (from behind the front panel), or 97 mm for DeviceNet models.
- UL certification approval (Certification Mark License).
- CE Marking conformance by third party assessment body.
- Water-resistant enclosure conforms to NEMA 4X (equivalent to IP66).

Refer to Precautions on CD.

# **Model Number Structure**

# Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets. **Base Units** 

## K3HB-S

- 1. Input Sensor Codes SD: DC Process input
- 5. Supply Voltage 100-240 VAC: 100 to 240 VAC 24 VAC/VDC: 24 VAC/VDC

#### **Optional Board**

#### Sensor Power Supply/Output Boards

K33-\_

#### **Relay/Transistor Output Boards**

```
K34-__
```

#### **Event Input Boards**

K35-\_\_

Note: 1. CPA can be combined with relay outputs only.

- 2. Only one of the following can be used by each Digital Indicator:
  - RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

# Accessories (Sold Separately)

K32-DICN: Special Cable (for event inputs, with 8-pin connector) K32-BCD: Special BCD Output Cable

#### **Base Units with Optional Boards**



- 2. Sensor Power Supply/Output Type Codes None: None
- None: None CPA: Relay output (PASS: SPDT) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 1.) L1A: Linear current output (DC0(4) 20 mA) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.) L2A: Linear voltage output (DC0(1) 5 V, 0 to 10 V) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.) A: Sensor power supply (12 VDC +/-10%, 80 mA) FLK1A: Communications (RS-232C) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.) FLK3A: Communications (RS-485) + Sensor power supply (12 VDC +/-10%, 80 mA) (See note 2.)

#### 3. Relay/Transistor Output Type Codes

- None: None
- C1: Relay contact (H/L: SPDT each)
- C2: Relay contact (HH/H/LL/L: SPST-NO each)
- T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
- T2: Transistor (PNP open collector: HH/H/PASS/L/LL) BCD: BCD output + transistor output (NPN open collector: HH/H/PASS/L/ LL)

#### DRT:DeviceNet (See note 2.)

- 4. Event input Type Codes
  - None: None
  - 1: 5 points (M3 terminal blocks) NPN open collector
  - 2: 8 points (10-pin MIL connector) NPN open collector
  - 3: 5 points (M3 terminal blocks) PNP open collector 4: 8 points (10-pin MIL connector) PNP open collector



# Ratings

Power supply voltage		100 to 240 VAC (50/60 Hz), 24 VAC/VDC, DeviceNet power supply: 24 VDC		
Allowable power sup	ply voltage range	85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC		
Power consumption (See note 1.)		100 to 240 V: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)		
Current consumption	1	DeviceNet power supply: 50 mA max. (24 VDC)		
Input		DC voltage/current		
A/D conversion meth	od	Sequential comparison system		
External power suppl	У	See Sensor Power Supply/Output Type Codes		
Event inputs (See note 2.)	Timing input	NPN open collector or no-voltage contact signal ON residual voltage: 3 V max. ON current at 0 $\Omega$ : 17 mA max. Max. applied voltage: 30 VDC max. OFF leakage current: 1.5 mA max.		
	Startup compensa- tion timer input	NPN open collector or no-voltage contact signal ON residual voltage: 2 V max.		
	Hold input	ON current at 0 Ω: 4 mA max. Max. applied voltage: 30 VDC max. OFF leakage current: 0.1 mA max.		
	Reset input			
	Forced-zero input			
	Bank input			
Output ratings (de- pends on the model)	Relay output	250 VAC, 30 VDC, 5 A (resistive load) Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations		
	Transistor output	Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 $\mu$ A max.		
	Linear output	Linear output 0 to 20 mA DC, 4 to 20 mA: Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC: Load: 5 kΩ max, Resolution: Approx. 10,000, Output error: ±0.5% FS (1 V or less: ±0.15 V; not output for 0 V or less)		
Display method		Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green)		
Main functions		Scaling function, 2-input calculation function, measurement operation selection, averaging, previous average value comparison, forced-zero, zero-limit, output hysteresis, output OFF delay, output test, teaching, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset		
Ambient operating temperature		-10 to 55°C (with no icing or condensation)		
Ambient operating humidity		25% to 85%		
Storage temperature		-25 to 65°C (with no icing or condensation)		
Altitude		2,000 m max.		
Accessories		Watertight packing, 2 fixtures, terminal cover, unit stickers, instruction manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3.)		

Note: 1. DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

2. PNP input types are also available.

3. For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

# ■ Characteristics

Display range		-19,999 to 99,999			
Sampling period		One input: 0.5 ms; Two inputs: 1.0 ms			
Comparative out-	One input	OFF to ON: 1 ms max., ON to OFF: 1.5 ms max.			
put response times (transistor outputs)	Two inputs	OFF to ON: 2 ms max., ON to OFF: 2.5 ms max.			
Linear output re-	One input	i1 ms max.			
sponse time	Two inputs	52 ms max.			
Insulation resistar	nce	20 MΩ min. (at 500 VDC)			
Dielectric strength	ı	2,300 VAC for 1 min between external terminals and case			
Noise immunity		<ul> <li>100 to 240 VAC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> <li>24 VAC/VDC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> </ul>			
Vibration resistan	ce	Frequency: 10 to 55 Hz; Acceleration: 50 m/s <sup>2</sup> , 10 sweeps of 5 min each in X, Y, and Z directions			
Shock resistance		150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay outputs) 3 times each in 3 axes, 6 directions			
Weight		Approx. 300 g (Base Unit only)			
Degree of protec-	Front panel	Conforms to NEMA 4X for indoor use (equivalent to IP66)			
tion	Rear case	IP20			
	Terminals	IP00 + finger protection (VDE0106/100)			
Memory protection	n	EEPROM (non-volatile memory) Number of rewrites: 100,000			
Applicable standa	rds	UL61010C-1, CSA C22.2 No. 1010.1(evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001			
EMC		<ul> <li>EMI: EN61326+A1 industrial applications</li> <li>Electromagnetic radiation interference         CISPR 11 Group 1, Class A: CISPRL16-1/-2</li> <li>Terminal interference voltage         CISPR 11 Group 1, Class A: CISPRL16-1/-2</li> <li>EMS: EN61326+A1 industrial applications</li> <li>Electrostatic Discharge Immunity         EN61000-4-2: 4 kV (contact), 8 kV (in air)</li> <li>Radiated Electromagnetic Field Immunity         EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz)</li> <li>Electrical Fast Transient/Burst Immunity         EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)</li> <li>Surge Immunity         EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)</li> <li>Conducted Disturbance Immunity         EN61000-4-6: 3 V (0.15 to 80 MHz)</li> <li>Voltage Dips and Interruptions Immunity         EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage)</li> </ul>			

# ■ Input Ranges (Measurement Ranges and Accuracy)

Input	Input type	Measurement range	Indication range	Input impedance	Accuracy (at 23±5°C)	Maximum absolute rated input
K3HB-SSD	0 to 20 mA	20 mA 0.000 to 20.000 mA -2.000 to 22.000 mA 120 Ω max. One input:	±31 mA			
DC voltage/current input	4 to 20 mA	4.000 to 20.000 mA	2.000 to 22.000 mA		±0.1% F.S. ±1 digit max. Two inputs: ±0.2% F.S.	1
	0 to 5 V	0.000 to 5.000 V	-0.500 to 5.500 mA	1 M $\Omega$ min.		±10 V
	1 to 5 V	1.000 to 5.000 V	0.500 to 5.500 V			
	±5 V	±5.000 V	± 5.500 V	±1 digit max.		
	±10 V	±10.000 V	± 11.000 V			±14.5 V

Note: The accuracy is for an ambient temperature of  $23\pm5^{\circ}$ C.

Digital panel indicators

	Input type	DC curre	ent input		Input type	pe DC voltage input			
Connected	terminals	0-20	4-20	Connected	terminals	0-5 1-5 5 10			10
Input A	IN-F8	Ē2 – Ē3		Input A	In-F8		Ē4 – Ē3		
Input B	IU-FP	E1 ·	Input B	In-FP		<b>(5)</b> – <b>(3)</b>			
DC current range (mA)	24.000 20.000 16.000 12.000 8.000 4.000 0.000 -4.000	22.000	22.000	DC voltage range (V)	10.000 5.000 0.000 -5.000 -10.000	5.500	5.500	5.500	-11.000
	1.000	-2.000							

The range shown in dark shading indicates the factory setting.

# Sampling and Comparative Output Response Times

The K3HB-S sampling and comparative output response times depend on the calculation methods, timing hold type, and, for simple averaging, the averaging times. Refer to the following description for details.

# Output Refresh Period

The K3HB-S repeats input reads, calculation, and judgement output processing. The output refresh period differs depending on whether there are one or two inputs, as outlined below.

## One Input



#### Two inputs



# ■ Output Response Time

The comparative output response time is the sum of the data processing time and the output (relay or transistor) response time.

#### **One Input**



#### Two Inputs



**Note:** For transistor outputs:

For one input: OFF to ON 1 ms and ON to OFF 1.5 ms For two inputs: OFF to ON 2 ms and ON to OFF 2.5 ms For relay outputs:

The relay operation time of 15 ms is added to the transistor output response times.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. N131-E1-04

In the interest of product improvement, specifications are subject to change without notice.

gital pane ndicators

# Rotary Pulse Indicator

#### Digital Rotary Pulse Meter Capable of 50 kHz Measurements

 Measures High-speed Pulses at 50 kHz. Provides high-speed pulse measurements up to 50 kHz of rotary encoder or ON/OFF pulse signals and can perform rotating measurement of high-speed rotating objects.

Note: No-voltage contacts of up to 30 Hz are supported.

• Six Measurement Operations Including Rotation (rpm)/ Circumferential Speed, Ratio, and Cumulative One Rotary Pulse Meter has 6 rotary pulse measurement functions to support a variety of pulse measurement applications. Select the best function for your application from the following: rotation (rpm)/ circumferential speed, absolute ratio, error ratio, error, flow rate ratio, and passing time.

Refer to Precautions Common to all K3HB-R/-P/-C on CD..



# Model Number Structure

Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets.

#### Base Units

K3HB-R		
	1	5

- 1. Input Sensor Codes NB: NPN input/voltage pulse input
- PB: PNP input 5. Supply Voltage 100-240 VAC:100 to 240 VAC 24 VAC/VDC: 24 VAC/VDC

#### **Optional Board**

Sensor Power Supply/Output Boards

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K33-□
2
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#### **Relay/Transistor Output Boards**

K34-

3

#### **Event Input Boards**

K35-□

4

- ually or as sets. Base Units with Optional Boards
- **K3HB-R** 1 2 3 4 5

#### 2. Sensor Power Supply/Output Type Codes

- None: None
- CPA: Relay output (PASS: SPDT) + Sensor power supply (12 VDC±10%, 80 mA) (See note 1.)
- L1A: Linear current output (DC0(4)-20 mA) + Sensor power supply (12) VDC+10% = 80 mA) (Sec. pote 2.)
- (12 VDC±10%, 80 mÅ) (See note 2.)
   L2A: Linear voltage output (DC0(1)-5 V, 0 to 10 V) + Sensor power supply (12 VDC±10%, 80 mÅ) (See note 2.)
  - Sensor power supply (12 VDC  $\pm$ 10%, 80 mA)
- FLK1A: Communications (RS-232C) + Sensor power supply (12 VDC±10%, 80 mA) (See note 2.)
- FLK3A: Communications (RS-485) + Sensor power supply (12 VDC±10%, 80 mA) (See note 2.)

#### 3. Relay/Transistor Output Type Codes

- None: None
- C1: Relay contact (H/L: SPDT each)
- C2: Relay contact (HH/H/LL/L: SPST-NO each)
- T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
- T2: Transistor (PNP open collector: HH/H/PASS/L/LL)
- BCD: BCD output + transistor output (NPN open collector: HH/H/PASS/L/LL)
- DRT: DeviceNet (See note 2.)
- 4. Event input Type Codes
  - None: None
  - 1: 5 points (M3 terminal blocks) NPN open collector
  - 2: 8 points (10-pin MIL connector) NPN open collector
  - 3: 5 points (M3 terminal blocks) PNP open collector
  - 4: 8 points (10-pin MIL connector) PNP open collector
- Note: 1. CPA can be combined with relay outputs only.
  - 2. Only one of the following can be used by each Digital Indicator:

RS-232C/RS-485 communications, BCD communications, or DeviceNet communications.

#### Accessories (Sold Separately)

K32-DICN: Special Cable (for event inputs with 8-pin connector) K32-BCD: Special BCD Output Cable

# Ratings

Supply voltage		100 to 240 VAC, 24 VAC/VDC, DeviceNet power supply: 24 VDC				
Allowable powe range	er supply voltage	85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC				
Power consum (See note 1.)	ption	100 to 240 VAC: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)				
Current consur	nption	DeviceNet power supply: 50 mA max. (24 VDC)				
Input		No-voltage contact, voltage pulse, open collector				
External power	supply	12 VDC ±10%, 80 mA (models with external power supply only)				
Event inputs (See note 2.)	Startup compen- sation timer input	NPN open collector or no-voltage contact signal ON residual voltage: 2 V max.				
	Hold input	ON current at 0 Ω: 4 mA max.				
	Reset input	vax. applied voltage: 30 vDC max. DFF leakage current: 0.1 mA max.				
	Bank input					
Output ratings (depends on	Relay output	250 VAC, 30 VDC, 5 A (resistive load) Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations				
the model)	Transistor output	Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 µA max.				
	Linear output	Linear output 0 to 20 mA DC, 4 to 20 mA: Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC: Load: 5 kΩ max, Resolution: Approx. 10,000, Output error: ±0.5% FS (1 V or less: ±0.15 V; not output for 0 V or less)				
Display method		Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green))				
Main functions		Scaling function, measurement operation selection, averaging, previous average value comparison, output hystere- sis, output OFF delay, output test, teaching, display value selection, display color selection, key protection, bank se- lection, display refresh period, maximum/minimum hold, reset				
Ambient operating temperature		-10 to 55°C (with no icing or condensation)				
Ambient operating humidity		25% to 85%				
Storage temper	ature	-25 to 65°C (with no icing or condensation)				
Altitude		2,000 m max.				
Accessories		Watertight packing, 2 fixtures, terminal cover, unit stickers, instruction manual. DeviceNet models also include a DeviceNet connector (Hirose HR31-5.08P-5SC(01)) and crimp terminals (Hirose HR31-SC-121) (See note 3.)				

Note: 1. DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

2. PNP input types are also available.

3. For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

# ■ Characteristics

Display range		-19,999 to 99,999				
Measurement accur (at 23±5°C)	асу	Functions F1, F6: ±0.006% rgd ±1 digit (for voltage pulse/open collector sensors) Functions F2 to F5: ±0.02% rgd ±1 digit (for voltage pulse/open collector sensors)				
Measurement range		Functions F1 to F6: 0.5 mHz to 50 kHz (for voltage pulse/open collector sensors)				
Input signals		No-voltage contact (30-Hz max. with ON/OFF pulse width of 15 ms min.) Voltage pulse (50-KHz max. with ON/OFF pulse width of 9 $\mu$ s min.; ON voltage: 4.5 to 30 V; OFF voltage: –30 to 2 V; input impedance: 10 k $\Omega$ ) Open collector (50-KHz max. with ON/OFF pulse width of 9 $\mu$ s min.)				
Connectable sensor	'S	ON residual voltage: 3 V max. OFF leakage current: 1.5 mA max. Load current: Must have a switching capacity of 20 mA or higher. Must be able to properly switch load currents of 5 mA or less.				
Comparative output time (transistor output	response out)	Functions F1 to F6: 100 ms max. (time until the comparative output is made when there is a forced sudden change in the input signal from 15% to 95% or 95% to 15%.)				
Linear output respo	nse time	Functions F1 to F6: 110 ms max. (time until the final analog output value is reached when there is a forced sudden change in the input signal from 15% to 95% or 95% to 15%.)				
Insulation resistanc	е	20 MΩ min. (at 500 VDC)				
Dielectric strength		2,300 VAC for 1 min between external terminals and case				
Noise immunity		<ul> <li>100 to 240 VAC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> <li>24 VAC/VDC models: ±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> </ul>				
Vibration resistance	)	Frequency: 10 to 55 Hz; Acceleration: 50 m/s <sup>2</sup> , 10 sweeps of 5 min each in X, Y, and Z directions				
Shock resistance		150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay outputs) 3 times each in 3 axes, 6 directions				
Weight		Approx. 300 g (Base Unit only)				
Degree of	Front panel	Conforms to NEMA 4X for indoor use (equivalent to IP66)				
protection	Rear case	IP20				
	Terminals	IP00 + finger protection (VDE0106/100)				
Memory protection		EEPROM (non-volatile memory) Number of rewrites: 100,000				
Applicable standard	S	UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001				
EMC		<ul> <li>EMI: EN61326+A1 industrial applications</li> <li>Electromagnetic radiation interference CISPR 11 Group 1, Class A: CISPRL16-1/-2</li> <li>Terminal interference voltage CISPR 11 Group 1, Class A: CISPRL16-1/-2</li> <li>EMS: EN61326+A1 industrial applications</li> <li>Electrostatic Discharge Immunity EN61000-4-2: 4 kV (contact), 8 kV (in air)</li> <li>Radiated Electromagnetic Field Immunity EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz, 1.4 to 2 GHz)</li> <li>Electrical Fast Transient/Burst Immunity EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)</li> <li>Surge Immunity EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)</li> <li>Conducted Disturbance Immunity EN61000-4-6: 3 V (0.15 to 80 MHz)</li> <li>Power Frequency Magnetic Immunity EN61000-4-8: 30 A/m (50 Hz) continuous time</li> </ul>				

# Functions (Operating Modes)

# F1 to F6

Functions F1 to F6 provide rpm/circumferential speed and other calculation displays by measuring continuous pulses (frequencies). Example



Function name	Function No.
Rpm/circumferential speed	F (
Absolute ratio	F2
Error ratio	F3
Rotational difference	FY
Flow rate ratio	FS
Passing time	F6

- F1: Displays rotation (rpm) or circumferential speed for one input.
- F2 to F5: Displays the calculation result for two rotation (rpm) speeds.
- F6: Displays the passing time calculated from the circumferential speed and the length of the processing stage for one input.

The basic principle used by the Digital Indicator to calculate the rotation speed (rpm) display is to count the ON/OFF time (T) for input sensor or other device inputs using the internal system clock, and then automatically calculate the frequency. This frequency (f) is multiplied by 60 and displayed as the rotation (rpm) speed.

Input sensor or other input pulse ON/OFF time (T) = -T Frequency (f) =  $\frac{1}{T}$ 

- Rotation speed (rpm) =  $f \times 60$
- Circumferential speed = Roll circumference × Rotation speed (rpm)
- Passing time= Length of processing stage
- Circumferential speed

These calculations are automatically made internally and displayed whenever any input pulse is received.

Function		0	peration	Operation in	nage (application)				
F1 Rpm/cir- cumferen- tial speed/	Measures frequencies frequenci	uency for or circum ency.	input A and displays the ferential speed proportional to	Measuring roller winding speed	Measuring motor speed (for product testing)				
Instanta- neous	Calculation	Display unit	Prescale value (α)						
flowrate	Rotation	rpm	1/N	· 88888		L ► L			
	speed	rps	1/60 N			OK/NG			
	Frequency (of	Hz	1/60			Juagment			
	input pulse)	kHz	1/60000						
	Circumferenti al speed	mm/s	1000 πd/60 N	U U					
		cm/s	100 πd/60 N						
		m/s	πd/60 N						
		m/min	πd/N						
		km/h	0.06 πd/N						
	Instantaneous	l/min	Check the output						
	flowrate	l∕h	specifications of the input device and calculate the prescale value from the following equation: Display value $D = fa \times 60 \times \alpha$						
	$N = Pulses per  \pi d = Circumfer$	rotation ential len	gth per rotation						

Function	Operation	Operation image (application)
F2 Absolute ratio	Multiples input B divided by input A ( $\frac{B}{A}$ ) by 100 and displays the ratio as a percentage (%). Display unit: %	Measuring the speed ratio between two rollers
F3 Error ratio	Multiplies the error between input A and input B $(\frac{B}{A}-1)$ by 100 and displays the ratio as a percentage (%). Display unit: %	Measuring the line speed error ratio between two conveyors
F4 Rotational difference	Displays the difference between input A and input B (B - A) as the rotation (rpm) speed error or circumferential speed error. (Display unit: rpm, rps, rph, Hz, kHz, mm/s, m/s m/min, km/h l/min, l/h, etc.	Measuring the rotation (rpm)/circumferential speed error (absolute error) between two conveyors
F5 Flow rate ratio	Displays the flow rate ratio of B from inputs A and B $\left(\frac{B}{A+B}\right)$ as a ratio (%). Display unit: %	Monitoring liquid mixture flow rate ratio
F6 Passing time	Passing time (s) = $1/fa \times \alpha$ fa: Input frequency (Hz) Set the prescale value for the desired display unit using the following table for reference. Calculation       Display unit       Prescale value ( $\alpha$ )         Passing time       s       L/( $\pi$ d/N)         N = Pulses per rotation $\pi$ d = Circumferential length per rotation (m)         L = Length of process (m)	Displaying the passing time for a conveyor line

# ■ What Is Prescaling?

To make calculations using the input pulse to display rotation (rpm) or circumferential speed, the number of pulses per rotation or the length of the circumference must be multiplied by a certain coefficient. This coefficient is called the prescale value.

Rotation speed (rpm) =  $f \times 60 \times a$ 

f: Input pulse frequency (No. of pulses per second) a: Prescale value

If there are 5 pulses per rotation, then

 $a = 1/5 (= 0.2 = 2 \times 10^{-1})$ 

and an accurate rotation speed (rpm) can be calculated.

The actual setting is X = 2.0000 (mantissa) and  $Y = 10^{-1}$  (exponent).

# What Is the Auto-zero Function?

(Set this function before using the Digital Indicator.)

If a function **F** *I* to **F5** is set, the frequency can be force-set to zero if there is no input pulse for a set period. This period is called the auto-zero time. Set the auto-zero time to slightly longer than the longest input pulse interval. (The display will not easily return to zero if the auto-zero time is too long or left at the default setting.)

#### **Time Unit Settings**

Setting	Meaning
SCAL	Prescale value menu setting
ñ. n	Minute display
H.ññ.55	h.mm.ss display
ññ.55.d	mm.ss.d display (d = tenths of a second)

Note: Time unit can be set only when passing time (F6) is selected.

#### Input Type Setting

	NO: Voltage pulse high	NC: Voltage pulse low
No-contact or voltage pulse input	00	01
Contact	10	11

Note: Set to 12 or 11 when there is a large variation in the display. The largest measurement range is 30 Hz.

# Timer Interval Indicator

#### Digital Time Interval Meter for Measuring Passing Speed, Time, or Cycle between Two Points.

- Measures Wide Range of Pulse Interval Times Measures, calculates, and displays pulse intervals between two points. Wide range for pulse interval measurements, from 10 ms to 3,200 s, max.
- Six Measurement Operations, Including Passing Speed, Time, and Cycle Measurement between Two Points One Digital Time Interval Meter has six measurement functions, to support a variety of pulse interval measurement applications. Select the best function for your application from the following: Passing speed, cycle, time difference, time band, measuring length, and interval.

Refer to *Precautions Common to all K3HB-R/-P/-C* on CD..



# **Model Number Structure**

# Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets.

#### Base Units



- 1. Input Sensor Codes NB: NPN input/voltage pulse input PB: PNP input
- 5. Supply Voltage 100-240 VAC: 100 to 240 VAC 24 VAC/VDC: 24 VAC/VDC

## **Optional Board**

Sensor Power Supply/Output Boards



#### **Relay/Transistor Output Boards**



#### **Event Input Boards**

K35-\_

4

- L2A: Linear voltage output (DC0(1)-5 V, 0 to 10 V) + Sensor power supply (12 VDC±10%, 80 mA) (See note 2.)
   A: Sensor power supply (12 VDC ±10%, 80 mA)
  - A: Sensor power supply (12 VDC ±10%, 80 mA) FLK1A: Communications (RS-232C) + Sensor power supply

Relay output (PASS: SPDT) + Sensor power supply

Linear current output (DC0(4)-20 mÅ) + Sensor power supply

**Base Units with Optional Boards** 

5

(12 VDC±10%, 80 mA) (See note 1.)

(12 VDC±10%, 80 mA) (See note 2.)

- (12 VDC±10%, 80 mA) (See note 2.) FLK3A: Communications (RS-485) + Sensor power supply (12 VDC±10%, 80 mA) (See note 2.)
- 3. Relay/Transistor Output Type Codes None: None
  - C1: Relay contact (H/L: SPDT each)
  - C2: Relay contact (HH/H/LL/L: SPST-NO each)
  - T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
  - T2: Transistor (PNP open collector: HH/H/PASS/L/LL)
  - BCD: BCD output + transistor output (NPN open collector: HH/H/PASS/L/LL)

Timer Interval Indicator K3HB-P

- DRT: DeviceNet (See note 2.)
- 4. Event input Type Codes

**K3HB-P** 

None

None:

CPA:

L1A:

1 2 3 4

2. Sensor Power Supply/Output Type Codes

- None: None
- 1: 5 points (M3 terminal blocks) NPN open collector
- 2: 8 points (10-pin MIL connector) NPN open collector
- 5 points (M3 terminal blocks) PNP open collector
   8 points (10-pin MIL connector) PNP open collector
- **Note: 1.** CPA can be combined with relay outputs only.
  - 2. Only one of the following can be used by each Digital Indicator:
    - RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

#### Accessories (Sold Separately)

K32-DICN: Special Cable (for event inputs with 8-pin connector) K32-BCD: Special BCD Output Cable

F-91

# Ratings

Supply voltage	i.	100 to 240 VAC, 24 VAC/VDC, DeviceNet power supply: 24 VDC				
Allowable power range	er supply voltage	85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC				
Power consum (See note 1.)	ption	100 to 240 VAC: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)				
Current consu	mption	DeviceNet power supply: 50 mA max. (24 VDC)				
Input		No-voltage, voltage pulse, open collector				
External power	<sup>.</sup> supply	12 VDC 10%, 80 mA (for models with external power supplies only)				
Event inputs	Hold input	NPN open collector or no-voltage contact signal				
(See note 2.)	Reset input	ON residual voltage: 2 V max.				
	Bank input	Max. applied voltage: 30 VDC max. OFF leakage current: 0.1 mA max.				
Output ratings (depends on	Relay output	250 VAC, 30 VDC, 5 A (resistive load) Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations				
the model)	Transistor output	Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 µA max.				
	Linear output	Linear output 0 to 20 mA DC, 4 to 20 mA: Load: 500 $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC: Load: 5 k $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS (1 V or less: ±0.15 V; not output for 0 V or less)				
Display method	d	Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green))				
Main functions		Scaling function, measurement operation selection, output hysteresis, output OFF delay, output test, teaching, dis- play value selection, display color selection, key protection, bank selection, display refresh period, maximum/mini- mum hold, reset				
Ambient operating temperature		-10 to 55°C (with no icing or condensation)				
Ambient opera	ting humidity	25% to 85%				
Storage tempe	rature	-25 to 65°C (with no icing or condensation)				
Altitude		2,000 m max.				
Accessories		Watertight packing, 2 fixtures, terminal cover, unit stickers, instruction manual. DeviceNet models also include a De- viceNet connector (Hirose HB31-5 08P-5SC(01)) and crimp terminals (Hirose HB31-SC-121) (See note 3.)				

Note: 1. DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

2. PNP input types are also available.

3. For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

# ■ Characteristics

Display range		-19,999 to 99,999							
Measurement accur (at 23±5°C)	acy	±0.08% rgd ±1 digit (for voltage pulse/open collector sensors)							
Measurement range	•	Functions F1, F3, Function F2: Functions F5 and	and F4:10 20 F6: 0	0 ms to 3,200 s 0 ms to 3,200 s to 4 gigacounts					
Input signals		<ul> <li>No-voltage conta</li> </ul>	act (30 Hz	max. with ON/OF	F pulse width o	f 15 ms min.)			
		<ul> <li>Voltage pulse</li> </ul>	Mode	Input frequency range	ON/OFF pulse width	ON voltage	OFF voltage	Input impedance	
			F1 to F4	0 to 50 kHz	9 μs min.	4.5 to 30 V	-30 to 2 V	10 kΩ	
			F5, F6	0 to 30 kHz	16 μs min.				
		<ul> <li>Open collector</li> </ul>	Mode	Input frequency range	ON/OFF pulse width	Note: The will r	Digital Time Int	erval Meter pulse greater	
			F1 to F4	0 to 50 kHz	9 μs min.	than inpu	the input frequent. SYSERR may	ency range is / appear on	
			F5, F6	0 to 30 kHz	16 μs min.	the	display.		
Connectable sensors		ON residual voltag OFF leakage curre Load current:	ge: 3 V ma ent: 1.5 m Must Must	ax. A max. have a switching c be able to properly	apacity of 20 m switch load cu	A or higher. rrents of 5 mA	or less.		
Comparative output time (transistor out	t response put)	2 ms max. (time un from 15% to 95%	ntil the con or 95% to	nparative output is 15%)	made when the	re is a forced su	idden change in	the input signal	
Linear output respo	onse time	10 ms max. (time input signal from 1	until the fi 5% to 95	nal analog output v % or 95% to 15%)	alue is reached	d when there is	a forced sudde	n change in the	
Insulation resistance	e	20 $M\Omega$ min. (at 50	0 VDC)						
Dielectric strength		2,300 VAC for 1 m	in betwee	en external termina	ls and case				
Noise immunity		<ul> <li>100 to 240 VAC models:</li> <li>±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> <li>24 VAC/VDC models:</li> <li>±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> </ul>							
Vibration resistance	)	Frequency: 10 to 55 Hz; Acceleration: 50 m/s <sup>2</sup> , 10 sweeps of 5 min each in X, Y, and Z directions							
Shock resistance		150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay outputs) 3 times each in 3 axes, 6 directions							
Weight		Approx. 300 g (Base Unit only)							
Degree of	Front panel	Conforms to NEM	A 4X for ii	ndoor use (equival	ent to IP66)				
protection	Rear case	IP20							
	Terminals	IP00 + finger protection (VDE0106/100)							
Memory protection		EEPROM (non-volatile memory) Number of rewrites: 100,000							
Applicable standard	ls	UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001							
EMC		EMI: EN61326+A <sup>2</sup> Electromagnetic ra CISPR 11 Gro Terminal interferer CISPR 11 Gro EMS: EN61326+A Electrostatic Disch EN61000-4-2: Radiated Electrom EN61000-4-3: Electrical Fast Trai EN61000-4-4: Surge Immunity EN61000-4-5: Conducted Disturt EN61000-4-6: Power Frequency EN61000-4-8: Voltage Dips and I EN61000-4-11	I Industria adiation in up 1, Clas up 1, Clas up 1, Clas 1 industri arge Imm 4 kV (con 10 V/m 1 nsient/Bui 2 kV (pow 1 kV with bance Imr 3 V (0.15 Magnetic 30 A/m (5 nterruptic	al applications iterference ss A: CISPRL16-1/ e ss A: CISPRL16-1/ al applications hunity itact), 8 kV (in air) Field Immunity kHz sine wave am rst Immunity ver line), 1 kV (I/O line (power line), 2 munity to 80 MHz) Immunity 50 Hz) continuous 1 ons Immunity 60 %, 100% (f	-2 -2 plitude modulat signal line) 2 kV with ground ime ated voltage)	tion (80 MHz to d (power line)	9 1 GHz, 1.4GHz	z to 2 GHz)	

# Functions (Operating Modes)

#### F1 to F6

These functions use the internal system clock to measure the time between pulses or the pulse ON time and then display time measurements or a variety of other calculations.

Function name	Function No.
Passing speed	F (
Cycle	F2
Time difference	F3
Time band	FY
Measuring length	F5
Interval	F5



The time (T) between input A pulse and input B pulse is measured by the internal system clock. If, for example, the system clock measures 100,000 counts during time T, then

T = 1 system clock count (0.5  $\mu$ s) × 100,000 T = 0.05 s

F1 (the passing speed) is calculated internally using the formula  $\frac{1}{2} \times 60$  (m/min) and the

using the formula  $\frac{1}{T} \times 60$  (m/min), and the

display, in this example, would be  $\frac{1}{0.05 \text{ s}} \times 60=$  1200 (m/min).



Digital panel indicators

Function	Operation	Operation image (application)
F4 Time band	Displays input A ON time (T). Input A HOLD input Display Measurement range: 10 ms to 3,200 s • Recovery time (TR) of 20 ms is required before starting the next measurement. (Display unit: ms, s, min., min.s.1/10 s	Monitoring the ON time of a printing press Managing the valve release time Communications output
F5 Measuring length	Displays the number of input A pulses while input B is ON.	Measuring workpiece length
F6 Interval	Displays the number of input A pulses from when input B turns ON until input B turns ON again. Measurement is made every other time input B turns ON.	Measuring slit intervals

Timer Interval Indicator K3HB-P

# ■ What Is Prescaling?

To make calculations using the input pulse to display the passing speed between two points, the distance between the two points and the display unit must be set and the internally measured time multiplied by a certain coefficient. This coefficient is called the prescale value. (For information on settings details, refer to the User's Manual.)

#### **Time Unit Settings**

Setting	Meaning	
SERL	Prescale value menu setting	
ก้ยัก	Minute display	
H.ññ.SS	h.mm.ss display	
ňň.55.d	mm.ss.d display (d = tenths of a second)	

#### Input Type Setting

	NO: Voltage pulse high	NC: Voltage pulse low
No-contact or voltage pulse input	00	01
Contact	10	11

Note: Set to  $I_{a}^{a}$  or  $I_{a}^{b}$  when there is a large variation in the display. The largest measurement range is 30 Hz.

# Up/Down Counting Pulse Indicator

# Measure High-speed Up/down Pulses with this Up/down Pulse Meter.

• Perfect for Measuring Rotary Encoder and ON/OFF Pulse Signals at High Speed

Cumulative pulse input is 50 kHz, quadrature pulse inputs are 25 kHz, and up/down pulse inputs are 30 kHz.

Note: No-voltage contacts of up to 30 Hz are supported.

- The count value can be converted to any value.
- The length equivalent for any pulse can be set to any desired value. This is effective for feed amount and position monitor displays.

Refer to Precautions Common to all K3HB-R/-P/-C on CD.

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# **Model Number Structure**

# Model Number Legend

Base Units and Optional Boards can be ordered individually or as sets.

#### **Base Units**



- 1. Input Sensor Codes NB: NPN input/voltage pulse input PB: PNP input
- 5. Supply Voltage 100-240 VAC: 100 to 240 VAC 24 VAC/VDC: 24 VAC/VDC

# **Optional Board**

Sensor Power Supply/Output Boards

#### **Relay/Transistor Output Boards**



#### **Event Input Boards**

K35-

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## **Base Units with Optional Boards**



- 2. Sensor Power Supply/Output Type Codes
  - None: None
  - CPA: Relay output (PASS: SPDT) + Sensor power supply (12 VDC±10%, 80 mA) (See note 1.)
  - L1A: Linear current output (DC0(4)-20 mA) + Sensor power supply (12 VDC±10%, 80 mA) (See note 2.)
  - L2A: Linear voltage output (DC0(1)-5 V, 0 to 10 V) + Sensor power supply (12 VDC±10%, 80 mA) (See note 2.)
  - A: Sensor power supply (12 VDC  $\pm 10\%$ , 80 mA)
  - FLK1A: Communications (RS-232C) + Sensor power supply (12 VDC±10%, 80 mA) (See note 2.)
  - FLK3A: Communications (RS-485) + Sensor power supply (12 VDC±10%, 80 mA) (See note 2.)
- 3. Relay/Transistor Output Type Codes

#### None: None

- C1: Relay contact (H/L: SPDT each)
- C2: Relay contact (HH/H/LL/L: SPST-NO each)
- T1: Transistor (NPN open collector: HH/H/PASS/L/LL)
- T2: Transistor (PNP open collector: HH/H/PASS/L/LL)
- BCD: BCD output + transistor output (NPN open collector: HH/H/PASS/L/LL) DRT: DeviceNet (See note 2.)
- 4. Event input Type Codes
  - None: None
  - 1: 5 points (M3 terminal blocks) NPN open collector
  - 2: 8 points (10-pin MIL connector) NPN open collector
  - 3: 5 points (M3 terminal blocks) PNP open collector
  - 4: 8 points (10-pin MIL connector) PNP open collector

Note: 1. CPA can be combined with relay outputs only.

- 2. Only one of the following can be used by each Digital Indicator:
  - RS-232C/RS-485 communications, a linear output, or DeviceNet communications.

#### Accessories (Sold Separately)

K32-DICN: Special Cable (for event inputs with 8-pin connector) K32-BCD: Special BCD Output Cable

# Ratings

Supply voltage		100 to 240 VAC, 24 VAC/VDC, DeviceNet power supply: 24 VDC		
Allowable power supply voltage range		85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC		
Power consum (See note 1.)	ption	100 to 240 VAC: 18 VA max. (max. load) 24 VAC/DC: 11 VA/7 W max. (max. load)		
Current consur	mption	DeviceNet power supply: 50 mA max. (24 VDC)		
Input		No-voltage, voltage pulse, open collector		
External power	supply	12 VDC±10% 80 mA		
Event inputs Hold input		NPN open collector or no-voltage contact signal		
	Reset input	ON residual voltage: 2 V max.		
	Bank input	Max. applied voltage: 30 VDC max. OFF leakage current: 0.1 mA max.		
Output ratings (depends on	Relay output	250 VAC, 30 VDC, 5 A (resistive load) Mechanical life expectancy: 5,000,000 operations, Electrical life expectancy: 100,000 operations		
the model)	Transistor output	Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 µA max.		
Linear output		Linear output 0 to 20 mA DC, 4 to 20 mA: Load: 500 $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS Linear output 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC: Load: 5 k $\Omega$ max, Resolution: Approx. 10,000, Output error: ±0.5% FS (1 V or less: ±0.15 V; not output for 0 V or less)		
Display method		Negative LCD (backlit LED) display 7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green))		
Main functions		Scaling function, measurement operation selection, output hysteresis, output OFF delay, output test, display value selection, display color selection, key protection, bank selection, display refresh period, maximum/minimum hold, reset		
Ambient operating temperature		-10 to 55°C (with no icing or condensation)		
Ambient operating humidity		25% to 85%		
Storage temperature		-25 to 65°C (with no icing or condensation)		
Altitude		2,000 m max.		
Accessories		Watertight packing, 2 fixtures, terminal cover, unit stickers, instruction manual. DeviceNet models also include a De- viceNet connector (Hirose HB31-5 08P-5SC(01)) and crimp terminals (Hirose HB31-SC-121) (See note 3.)		

Note: 1. DC power supply models require a control power supply capacity of approximately 1 A per Unit when power is turned ON. Particular attention is required when using two or more DC power supply models. The OMRON S8VS-series DC Power Supply Unit is recommended.

2. For K3HB-series DeviceNet models, use only the DeviceNet Connector included with the product. The crimp terminals provided are for Thin Cables.

# ■ Characteristics

Measurement range		-19,999 to 99,999						
Input signals	Functions F1, F2: ±2 gigacounts							
Input signals	Functions F3 : 0 to 4 gigacounts							
 	No-voltage contact (30 Hz max. with ON/OFF pulse width of 15 ms min.)							
	<ul> <li>Voltage pulse</li> </ul>	Mode	Input frequency range	ON/OFF pulse width	ON voltage	OFF voltage	Input impedance	
		F1	0 to 30 kHz	16 μs min.	4.5 to 30 V	-30 to 2 V	10 kΩ	
		F2	0 to 25 kHz	20 μs min.				
	0	F3	0 to 50 kHz	9 μs min.				
	Open collector     Mode Input frequency ON/OFF     range pulse width Note: The Up/Dowr			Up/Down Cour	iting Pulse			
		F1	0 to 30 kHz	16 μs min.	Meter will malfunction if a puls greater than the input frequen range is input. SYSERR may		ut frequency	
		F2	0 to 25 kHz	20 µs min.			ERR may	
		гз		9 μs min.	appe	pear on the display.		
Connectable sensors	ON residual voltag	e: 3 V ma	IX.					
	OFF leakage curre	nt: 1.5 m. Must l	A max. have a switching c	apacity of 20 m	A or higher.			
		Must I	be able to properly	switch load cu	rrents of 5 mA	or less.		
Max. No. of display digits	5 (–19999 to 9999	9)						
Comparative output response	1 ms max.: Transis	stor outpu	t; 10 ms max.: Rel	ay contact outp	out			
time (	(time until the com to 95% or 95% to	parative o 15%)	utput is made whe	n there is a force	ed sudden char	ige in the input s	signal from 15%	
Linear output response time	10 ms max. (time i input signal from 1	until the fii 5% to 95°	nal analog output v % or 95% to 15%)	alue is reached	d when there is	a forced sudde	n change in the	
Insulation resistance	20 M $\Omega$ min. (at 50	0 VDC)						
Dielectric strength 2	2,300 VAC for 1 m	in betwee	n external termina	ls and case				
2	<ul> <li>±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> <li>24 VAC/VDC models:</li> <li>±1,500 V at power supply terminals in normal or common mode (waveform with 1-ns rising edge and pulse width of 1 μs/100 ns)</li> </ul>							
Vibration resistance	Frequency: 10 to 55 Hz; Acceleration: 50 m/s <sup>2</sup> , 10 sweeps of 5 min each in X, Y, and Z directions							
Shock resistance	150 m/s <sup>2</sup> (100 m/s <sup>2</sup> for relay outputs) 3 times each in 3 axes, 6 directions							
Weight	Approx. 300 g (Base Unit only)							
Degree of Front panel	Conforms to NEMA 4X for indoor use (equivalent to IP66)							
protection Rear case	IP20							
Terminals	IP00 + finger protection (VDE0106/100)							
Memory protection	EEPROM (non-volatile memory) Number of rewrites: 100,000							
Applicable standards UL61010C-1, CSA C22.2 No. 1010.1 (evaluated by UL) EN61010-1 (IEC61010-1): Pollution degree 2/Overvoltage category II EN61326: 1997, A1: 1998, A2: 2001								
EMC I	<ul> <li>EMI: EN61326+A1 industrial applications</li> <li>Electromagnetic radiation interference CISPR 11 Group 1, Class A: CISPRL16-1/-2</li> <li>Terminal interference voltage CISPR 11 Group 1, Class A: CISPRL16-1/-2</li> <li>EMS: EN61326+A1 industrial applications</li> <li>Electrostatic Discharge Immunity EN61000-4-2: 4 kV (contact), 8 kV (in air)</li> <li>Radiated Electromagnetic Field Immunity EN61000-4-3: 10 V/m 1 kHz sine wave amplitude modulation (80 MHz to 1 GHz, 1.4 to 2 GHz)</li> <li>Electrical Fast Transient/Burst Immunity EN61000-4-4: 2 kV (power line), 1 kV (I/O signal line)</li> <li>Surge Immunity EN61000-4-5: 1 kV with line (power line), 2 kV with ground (power line)</li> <li>Conducted Disturbance Immunity EN61000-4-6: 3 V (0.15 to 80 MHz)</li> <li>Power Frequency Magnetic Immunity EN61000-4-8: 30 A/m (50 Hz) continuous time</li> <li>Voltage Dips and Interruptions Immunity</li> </ul>							

# Operation

# Functions (Operating Modes)

## F1 to F3

Function name	Function No.	
Individual inputs	F ¦	
Phase differential inputs	F2	
Pulse counting input	F3	

Function	Operation	Operation image (application)
F1 Individual inputs	Counts input A as incremental pulses and input B as decremental pulses. The count is incremented on the rising edge of input A and decremented on the rising edge of input B. If both inputs rise at the same time, the count is not changed. The count is incremented when input B is later than input A and decremented when input B is earlier than input A.	Counting the number of people entering an area
F2 Phase dif- ferential in- puts	This function is normally used when connected to an incremental rotary encoder. The count is incremented on the falling edge of input B when input A is OFF. The count is decremented on the rising edge of input B when input A is OFF.	Detecting position and speed on a semiconductor wafer conveyor line
F3 Pulse counting input	Counted on the rising edge of input A	Counting the number of workpieces

Note: 1. Meaning of H and L in Display

Symbol	Input method	No-voltage input	
	Н	Short-circuit	
	L	Open	

2. Requires at least half the minimum signal width. If there is less than half, a  $\pm 1$  count error may occur.

#### Input Type Setting

	NO: Voltage pulse high	NC: Voltage pulse low
No-contact or voltage pulse input	00	01
Contact	10	11

# ■ What Is Prescaling?

Prescaling converts the count value to any numeric value.

To display  $\square\square\square.\square$  mm in a system that outputs 250 pulses for a 0.5-m feed,

the length per pulse = 500 mm (0.5 m)  $\div$  250 = 2.

1. The prescale value for the K3HB-C is set using the mantissa X  $\times$  exponent Y,

so the prescale value =  $2.0000 \times 10^{\circ}$ , X = 2.000, and Y = 00.

2. Next, set the decimal point position for one digit to the right of the decimal point: acase



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. N135-E2-02 In the interest of product improvement, specifications are subject to change without notice.