Up/Down Counting Pulse Indicator
K3HB-C

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 *Common Precautions* on page 30.

NEW

Model Number Structure

■ Model Number Legend

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

Base Units

K3HB-C □ □
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

K33-□
2

Relay/Transistor Output Boards

K34-□
3

Event Input Boards

K35-□
4

Base Units with Optional Boards

K3HB-C□-□□□ □
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) (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

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

Specifications

■ 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 consumption (See note 1.)		100 to 240 VAC: 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		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 ON residual voltage: 2 V max. ON current at 0 Ω: 4 mA max. Max. applied voltage: 30 VDC max. OFF leakage current: 0.1 mA max.
	Reset 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 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, 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.

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

■ Characteristics

<table>
<tr><td colspan="2">Display range</td><td>–19,999 to 99,999</td></tr>
<tr><td colspan="2">Measurement range</td><td>Functions F1, F2: ±2 gigacounts
Functions F3 : 0 to 4 gigacounts</td></tr>
<tr><td colspan="2">Input signals</td><td>• No-voltage contact (30 Hz max. with ON/OFF pulse width of 15 ms min.)
• Voltage pulse
<table>
<tr><th>Mode</th><th>Input frequency range</th><th>ON/OFF pulse width</th><th>ON voltage</th><th>OFF voltage</th><th>Input impedance</th></tr>
<tr><td>F1</td><td>0 to 30 kHz</td><td>16 μs min.</td><td rowspan="3">4.5 to 30 V</td><td rowspan="3">–30 to 2 V</td><td rowspan="3">10 kΩ</td></tr>
<tr><td>F2</td><td>0 to 25 kHz</td><td>20 μs min.</td></tr>
<tr><td>F3</td><td>0 to 50 kHz</td><td>9 μs min.</td></tr>
</table>
• Open collector
<table>
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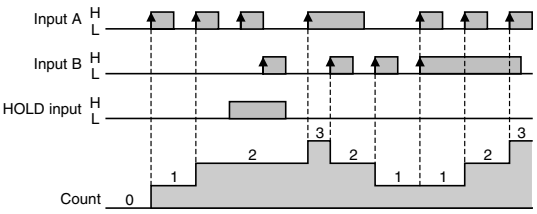
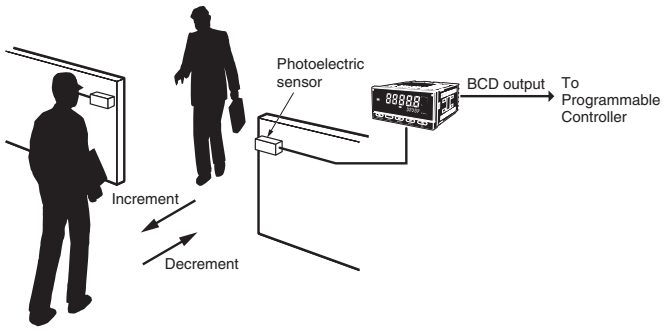
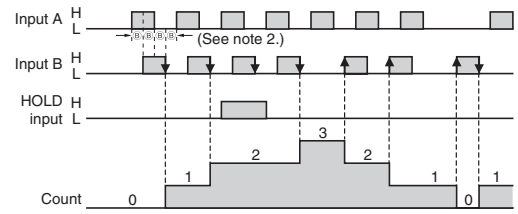
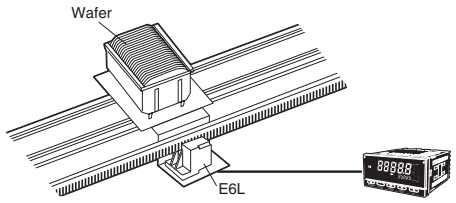
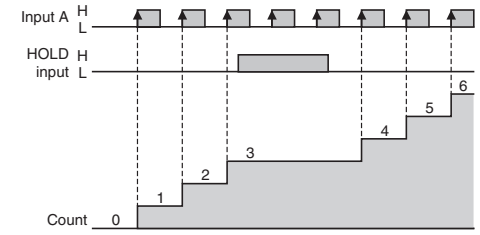
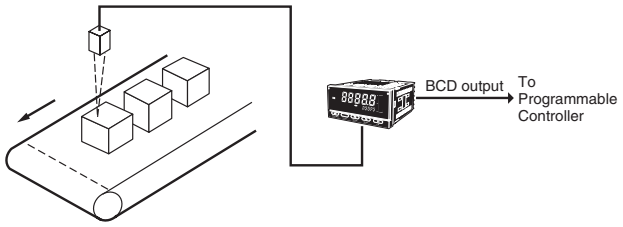
</table>
Note: The Up/Down Counting Pulse Meter will malfunction if a pulse greater than the input frequency range is input. SYSERR may appear on the display.</td></tr>
<tr><td colspan="2">Connectable sensors</td><td>ON residual voltage: 3 V max.
OFF leakage current: 1.5 mA max.
Load current: Must have a switching capacity of 20 mA or higher.
Must be able to properly switch load currents of 5 mA or less.</td></tr>
<tr><td colspan="2">Max. No. of display digits</td><td>5 (–19999 to 99999)</td></tr>
<tr><td colspan="2">Comparative output response time</td><td>1 ms max.: Transistor output; 10 ms max.: Relay contact output
(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%)</td></tr>
<tr><td colspan="2">Linear output response time</td><td>10 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%)</td></tr>
<tr><td colspan="2">Insulation resistance</td><td>20 MΩ min. (at 500 VDC)</td></tr>
<tr><td colspan="2">Dielectric strength</td><td>2,300 VAC for 1 min between external terminals and case</td></tr>
<tr><td colspan="2">Noise immunity</td><td>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)
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)</td></tr>
<tr><td colspan="2">Vibration resistance</td><td>Frequency: 10 to 55 Hz; Acceleration: 50 m/s^2, 10 sweeps of 5 min each in X, Y, and Z directions</td></tr>
<tr><td colspan="2">Shock resistance</td><td>150 m/s^2 (100 m/s^2 for relay outputs) 3 times each in 3 axes, 6 directions</td></tr>
<tr><td colspan="2">Weight</td><td>Approx. 300 g (Base Unit only)</td></tr>
<tr><td rowspan="3">Degree of protection</td><td>Front panel</td><td>Conforms to NEMA 4X for indoor use (equivalent to IP66)</td></tr>
<tr><td>Rear case</td><td>IP20</td></tr>
<tr><td>Terminals</td><td>IP00 + finger protection (VDE0106/100)</td></tr>
<tr><td colspan="2">Memory protection</td><td>EEPROM (non-volatile memory)
Number of rewrites: 100,000</td></tr>
<tr><td colspan="2">Applicable standards</td><td>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</td></tr>
<tr><td colspan="2">EMC</td><td>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, 1.4 to 2 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)
Power Frequency Magnetic Immunity
EN61000-4-8: 30 A/m (50 Hz) continuous time
Voltage Dips and Interruptions Immunity
EN61000-4-11: 0.5 cycle, 0°/180°, 100% (rated voltage)</td></tr>
</table>

Operation

■ Functions (Operating Modes)

F1 to F3

Function name	Function No.
Individual inputs	F1
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 differential inputs	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
H	Short-circuit
L	Open

2. Requires at least half the minimum signal width. If there is less than half, a ±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 □□□□.□ mm in a system that outputs 250 pulses for a 0.5-m feed,

the length per pulse = 500 mm (0.5 m) ÷ 250 = 2.

1. The prescale value for the K3HB-C is set using the mantissa X × exponent Y, so the prescale value = 2.0000 × 10°,
X = 2.000, and Y = 00.

2. Next, set the decimal point position for one digit to the right of the decimal point: ₀₀₀₀.₀