Digital Rotary Pulse Meter Capable of 50 kHz Measurements

- Visual confirmation of judgement results through display colors that switch between red and green. *1
- 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/ instantaneous flowrate (value proportional to frequency), absolute ratio, error ratio, error, flow rate ratio, and passing speed (value inversely proportional to frequency).

- DeviceNet models added to the series. *2
  *1 Visual confirmation of judgement results is not supported on models that do not have an output or models that do not support DeviceNet.
  You can change the display color by setting it, but you cannot switch it based on the judgement results.
  *2 DeviceNet models have a depth of 97 mm.

Refer to Safety Precautions for All Digital Panel Meters.

Model Number Structure

■ Model Number Legend

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

Base Units

<table>
<thead>
<tr>
<th>K3HB-R</th>
<th>1</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Input Sensor Code</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NB: NPN input/voltage pulse input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PB: PNP input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Supply Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100-240 VAC:100 to 240 VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24 VAC/VDC: 24 VAC/VDC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Optional Boards

Sensor Power Supply/Output Boards

<table>
<thead>
<tr>
<th>K33-</th>
<th>2</th>
</tr>
</thead>
</table>

Relay/Transistor Output Boards

<table>
<thead>
<tr>
<th>K34-</th>
<th>3</th>
</tr>
</thead>
</table>

Event Input Boards

<table>
<thead>
<tr>
<th>K35-</th>
<th>4</th>
</tr>
</thead>
</table>

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

Rubber Packing

<table>
<thead>
<tr>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>K32-P1</td>
</tr>
</tbody>
</table>

Note: Rubber packing is provided with the Controller.
## Specifications

### Ratings

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>100 to 240 V AC, 24 VAC/VDC, DeviceNet power supply: 24 VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowable power supply voltage range</td>
<td>85% to 110% of the rated power supply voltage, DeviceNet power supply: 11 to 25 VDC</td>
</tr>
<tr>
<td>Power consumption (See note 1.)</td>
<td>100 to 240 VAC: 18 VA max. (max. load)</td>
</tr>
<tr>
<td>Current consumption</td>
<td>24 VDC/DC: 11 VA/7 W max. (max. load)</td>
</tr>
<tr>
<td>Input</td>
<td>No-voltage contact, voltage pulse, open collector</td>
</tr>
<tr>
<td>External power supply</td>
<td>12 VDC ±10%, 80 mA (models with external power supply only)</td>
</tr>
<tr>
<td>Event inputs (See note 2.)</td>
<td>Startup compensation timer input: NPN open collector or no-voltage contact signal</td>
</tr>
<tr>
<td></td>
<td>Hold input: ON residual voltage: 2 V max. ON current at 0 Ω: 4 mA max.</td>
</tr>
<tr>
<td></td>
<td>Reset input: Max. applied voltage: 30 VDC max.</td>
</tr>
<tr>
<td></td>
<td>Bank input: OFF leakage current: 0.1 mA max.</td>
</tr>
<tr>
<td>Output ratings (depends on the model)</td>
<td>Relay output: 250 VAC, 30 VDC, 5 A (resistive load)</td>
</tr>
<tr>
<td></td>
<td>Transistor output: Maximum load voltage: 24 VDC, Maximum load current: 50 mA, Leakage current: 100 μA max.</td>
</tr>
<tr>
<td></td>
<td>Linear output: Linear output 0 to 20 mA DC, 4 to 20 mA DC: Load: 500 Ω max, Resolution: Approx. 10,000, Output error: ±0.5% FS</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>ON V or less: ±0.15 V; no output for 0 V or less)</td>
</tr>
<tr>
<td>Display method</td>
<td>Negative LCD (backlit LED) display</td>
</tr>
<tr>
<td>7-segment digital display (Character height: PV: 14.2 mm (green/red); SV: 4.9 mm (green))</td>
<td></td>
</tr>
<tr>
<td>Main functions</td>
<td>Scaling function, measurement operation selection, averaging, 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</td>
</tr>
<tr>
<td>Ambient operating temperature</td>
<td>10 to 55 °C (with no icing or condensation)</td>
</tr>
<tr>
<td>Ambient operating humidity</td>
<td>25% to 85%</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>25 to 65 °C (with no icing or condensation)</td>
</tr>
<tr>
<td>Altitude</td>
<td>2,000 m max.</td>
</tr>
<tr>
<td>Accessories</td>
<td>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).</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Display range</strong></td>
<td>−19,999 to 99,999</td>
</tr>
<tr>
<td><strong>Measurement accuracy</strong></td>
<td>(at 23±5°C) 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)</td>
</tr>
<tr>
<td><strong>Measurement range</strong></td>
<td>Functions F1 to F6: 0.5 mHz to 50 kHz (for voltage pulse/open collector sensors)</td>
</tr>
<tr>
<td><strong>Input signals</strong></td>
<td>Contact input (dry contact input) (30-Hz max. with ON/OFF pulse width of 15 ms min.) No contact voltage pulse (50-KHz max. with ON/OFF pulse width of 9 µs min.; ON voltage: 4.5 to 30 V; OFF voltage: −30 to 2 V; input impedance: 10 kΩ) Open collector (50-KHz max. with ON/OFF pulse width of 9 µs min.)</td>
</tr>
<tr>
<td><strong>Connectable sensors</strong></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><strong>Comparative output response time (transistor output)</strong></td>
<td>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%).</td>
</tr>
<tr>
<td><strong>Linear output response time</strong></td>
<td>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%).</td>
</tr>
<tr>
<td><strong>Insulation resistance</strong></td>
<td>20 MΩ min. (at 500 VDC)</td>
</tr>
<tr>
<td><strong>Dielectric strength</strong></td>
<td>2,300 VAC for 1 min between external terminals and case</td>
</tr>
<tr>
<td><strong>Noise immunity</strong></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/DC 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><strong>Vibration resistance</strong></td>
<td>Frequency: 10 to 55 Hz; Acceleration: 50 m/s², 10 sweeps of 5 min each in X, Y, and Z directions</td>
</tr>
<tr>
<td><strong>Shock resistance</strong></td>
<td>150 m/s² (100 m/s² for relay outputs) 3 times each in 3 axes, 6 directions</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Approx. 300 g (Base Unit only)</td>
</tr>
<tr>
<td><strong>Degree of protection</strong></td>
<td>Front panel: Conforms to NEMA 4X for indoor use (equivalent to IP66) Rear case: IP20 Terminals: IP00 + finger protection (VDE0106/100)</td>
</tr>
<tr>
<td><strong>Memory protection</strong></td>
<td>EEPROM (non-volatile memory) Number of rewrites: 100,000</td>
</tr>
<tr>
<td><strong>EMC</strong></td>
<td>EMI: EN61326 industrial applications Electromagnetic radiation interference CISPR 11 Group 1, Class A Terminal interference voltage CISPR 11 Group 1, Class A EMS: EN61326 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 Noise 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>
</tbody>
</table>
Functions (Operating Modes)

F1 to F6

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

Example

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 \( \times \) Rotation speed (rpm)
- Passing time = \( \frac{\text{Length of processing stage}}{\text{Circumferential speed}} \)

These calculations are automatically made internally and displayed whenever any input pulse is received.
<table>
<thead>
<tr>
<th>Function</th>
<th>Operation</th>
<th>Operation image (application)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F3</td>
<td>Error ratio</td>
<td>Measuring the line speed error ratio between two conveyors</td>
</tr>
<tr>
<td></td>
<td>Multiplies the error between input A and input B ( \frac{B}{A} - 1 ) by 100 and displays the ratio as a percentage (%). Display unit: %</td>
<td></td>
</tr>
<tr>
<td>F4</td>
<td>Rotational difference</td>
<td>Measuring the rotation (rpm)/circumferential speed error (absolute error) between two conveyors</td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>F5</td>
<td>Flow rate ratio</td>
<td>Monitoring liquid mixture flow rate ratio</td>
</tr>
<tr>
<td></td>
<td>Displays the flow rate ratio of B from inputs A and B ( \frac{B}{A+B} ) as a ratio (%). Display unit: %</td>
<td></td>
</tr>
<tr>
<td>F6</td>
<td>Passing time</td>
<td>Displaying the passing time for a conveyor line</td>
</tr>
<tr>
<td></td>
<td>The passing time for the desired distance is displayed by measuring the frequency of input A. Passing time ( t = \frac{1}{f_a} \times \alpha ) ( f_a: ) Input frequency (Hz) Set the prescale value for the desired display unit using the following table for reference.</td>
<td></td>
</tr>
</tbody>
</table>

**Calculation**

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Display unit</th>
<th>Prescale value (( \alpha ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passing time</td>
<td>s</td>
<td>( \frac{L}{\pi d/N} )</td>
</tr>
</tbody>
</table>

\( N = \) Pulses per rotation

\( \pi d = \) Circumferential length per rotation (m)

\( L = \) Length of process (m)

Display unit:

- Seconds (s), minutes (min), hours/minutes/seconds (h/min/s), minutes/seconds/tenths of seconds (min.s.1/10s), etc.
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 × 60 × 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 × 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 F₁ 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

<table>
<thead>
<tr>
<th>Setting</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\mathcal{C}$RL</td>
<td>Prescale value menu setting</td>
</tr>
<tr>
<td>$h:mm:ss$</td>
<td>Minute display</td>
</tr>
<tr>
<td>mm:ss.d</td>
<td>mm.ss.d display (d = tenths of a second)</td>
</tr>
</tbody>
</table>

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

Input Type Setting

<table>
<thead>
<tr>
<th>Setting</th>
<th>NO: Voltage pulse high</th>
<th>NC: Voltage pulse low</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-contact or voltage pulse input</td>
<td>00</td>
<td>01</td>
</tr>
<tr>
<td>Contact</td>
<td>10</td>
<td>11</td>
</tr>
</tbody>
</table>

Note: Set to 10 or 11 when there is a large variation in the display. The largest measurement range is 30 Hz.
Common Specifications

■ Event Input Specifications

K3HB-R S-TMR, HOLD, RESET, BANK1, BANK2, BANK4
Contact
ON: 1 kΩ max., OFF: 100 kΩ min.
No-contact
ON residual voltage: 2 V max.
OFF leakage current: 0.1 mA max.
Load current: 4 mA max.
Maximum applied voltage: 30 VDC max.

■ Output Ratings

Contact Output

<table>
<thead>
<tr>
<th>Item</th>
<th>Resistive loads (250 VAC, (\cos\phi=1); 30 VDC, (L/R=0) ms)</th>
<th>Inductive loads (250 VAC, closed circuit, (\cos\phi=0.4); 30 VDC, (L/R=7) ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated load</td>
<td>5 A at 250 VAC</td>
<td>1 A at 250 VAC</td>
</tr>
<tr>
<td>Mechanical life expectancy</td>
<td>5,000,000 operations</td>
<td></td>
</tr>
<tr>
<td>Electrical life expectancy</td>
<td>100,000 operations</td>
<td></td>
</tr>
</tbody>
</table>

Transistor Outputs

<table>
<thead>
<tr>
<th>Item</th>
<th>Maximum load voltage</th>
<th>Maximum load current</th>
<th>Leakage current</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 VDC</td>
<td>50 mA</td>
<td>100 µA max.</td>
</tr>
</tbody>
</table>

Linear Output

<table>
<thead>
<tr>
<th>Item</th>
<th>Inputs 0 to 20 mA</th>
<th>4 to 20 mA</th>
<th>0 to 5 V</th>
<th>1 to 5 V</th>
<th>0 to 10 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allowable load impedance</td>
<td>500 Ω max.</td>
<td>5 kΩ min.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>Approx. 10,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output error</td>
<td>±0.5% FS</td>
<td>±0.5% FS</td>
<td>±0.5% FS</td>
<td>±0.5% FS</td>
<td>±0.5% FS</td>
</tr>
</tbody>
</table>

Serial Communications Output

<table>
<thead>
<tr>
<th>Item</th>
<th>RS-232C, RS-485</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications method</td>
<td>Half duplex</td>
</tr>
<tr>
<td>Synchronization method</td>
<td>Start-stop synchronization (asynchronous)</td>
</tr>
<tr>
<td>Baud rate</td>
<td>9600/19200/38400 bps</td>
</tr>
<tr>
<td>Transmission code</td>
<td>ASCII</td>
</tr>
<tr>
<td>Data length</td>
<td>7 bits or 8 bits</td>
</tr>
<tr>
<td>Stop bit length</td>
<td>2 bits or 1 bit</td>
</tr>
<tr>
<td>Error detection</td>
<td>Vertical parity and FCS</td>
</tr>
<tr>
<td>Parity check</td>
<td>Odd, even</td>
</tr>
</tbody>
</table>

BCD Output I/O Ratings

(Input Signal Logic: Negative)

<table>
<thead>
<tr>
<th>I/O signal name</th>
<th>Item</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs REQUEST</td>
<td>Input signal</td>
<td>No-voltage contact input</td>
</tr>
<tr>
<td>MIN</td>
<td>Input current for no-voltage input</td>
<td>10 mA</td>
</tr>
<tr>
<td>MAX</td>
<td>Signal level</td>
<td>ON voltage</td>
</tr>
<tr>
<td>RESET</td>
<td>OFF voltage</td>
<td>3 V min.</td>
</tr>
<tr>
<td>Outputs DATA</td>
<td>Maximum load voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>POLARITY OVER</td>
<td>Maximum load current</td>
<td>10 mA</td>
</tr>
<tr>
<td>DATA VALID RUN</td>
<td>Leakage current</td>
<td>100 µA max.</td>
</tr>
<tr>
<td>HH H PASS LL LL</td>
<td>Maximum load voltage</td>
<td>24 VDC</td>
</tr>
<tr>
<td>LL</td>
<td>Maximum load current</td>
<td>50 mA</td>
</tr>
<tr>
<td></td>
<td>Leakage current</td>
<td>100 µA max.</td>
</tr>
</tbody>
</table>

Refer to the K3HB Communications User's Manual (Cat. No. N129) for details on serial and DeviceNet communications.
# DeviceNet Communications

<table>
<thead>
<tr>
<th>Communications protocol</th>
<th>Conforms to DeviceNet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supported communications</strong></td>
<td>Master-Slave connection (polling, bit-strobe, COS, cyclic) Conforms to DeviceNet communications standards.</td>
</tr>
<tr>
<td><strong>Remote I/O communications</strong></td>
<td>Allocate any I/O data using the Configurator. Allocate any data, such as DeviceNet-specific parameters and variable area for Digital Indicators. Input area: 2 blocks, 60 words max. Output area: 1 block, 29 words max. (The first word in the area is always allocated for the Output Execution Enabled Flags.)</td>
</tr>
<tr>
<td><strong>I/O allocations</strong></td>
<td>Explicit message communications CompoWay/F communications commands can be executed (using explicit message communications)</td>
</tr>
<tr>
<td><strong>Message communications</strong></td>
<td>Connection methods Combination of multi-drop and T-branch connections (for trunk and drop lines)</td>
</tr>
<tr>
<td><strong>Baud rate</strong></td>
<td>DeviceNet: 500, 250, or 125 Kbps (automatic follow-up)</td>
</tr>
<tr>
<td><strong>Communications media</strong></td>
<td>Special 5-wire cable (2 signal lines, 2 power supply lines, 1 shield line)</td>
</tr>
<tr>
<td><strong>Communications distance</strong></td>
<td><strong>Baud rate</strong></td>
</tr>
<tr>
<td>500 Kbps</td>
<td>100 m max. (100 m max.)</td>
</tr>
<tr>
<td>250 Kbps</td>
<td>100 m max. (250 m max.)</td>
</tr>
<tr>
<td>125 Kbps</td>
<td>100 m max. (500 m max.)</td>
</tr>
</tbody>
</table>

The values in parentheses are for Thick Cable.

| **Communications power supply** | 24-VDC DeviceNet power supply |
| **Allowable voltage fluctuation range** | 11 to 25-VDC DeviceNet power supply |
| **Current consumption** | 50 mA max. (24 VDC) |
| **Maximum number of nodes** | 64 (DeviceNet Configurator is counted as one node when connected.) |
| **Maximum number of slaves** | 63 |
| **Error control checks** | CRC errors |
| **DeviceNet power supply** | Supplied from DeviceNet communications connector |
Connections

■ External Connection Diagrams

Terminal Arrangements

Note: Refer to Internal Block Diagram on page 12 for information on isolation.

A Operating Power Supply

100 to 240 VAC
24 VAC/VDC

*Check the required power supply type.

B Sensor Power Supply/Output

Sensor power supply + PASS output

Sensor power supply + linear output

Sensor power supply + communications

C Relays, Transistors, BCD and DeviceNet

Relay Outputs

Relay Outputs

Transistor Outputs

DeviceNet Connector (Included)

BCD (NPN Open Collector): <BCD>
Applicable Connector (Sold separately)
K32-BCD (OMRON)
(HDR-E50MAG1 with 0.3-m cable)

The BCD COMMON is shared.
The pins indicated in the above diagram as blank (white) boxes have been removed.

Only one of the following can be used for each Digital Indicator: communications, BCD, or DeviceNet.

Contact Outputs

Transistor Outputs

(NPN Open Collector)

Safety Standards Conformance

- Always use a EN/IEC-compliant power supply with reinforced insulation or double insulation for the DeviceNet power supply.
- The product must be used indoors for the above applicable standards to apply.
**BCD Output Cable**

- **Model**: K32-BCD
- **Shape**: Connected device end (PLC, display device, etc.)
- **Cover**: HDR-E50LPA5 (manufactured by Honda Tsushin Co., Ltd.)
- **Connector**: HDR-E50MAG1 (manufactured by Honda Tsushin Co., Ltd.)

**Special Cable (for Event Inputs with 8-pin Connector)**

- **Model**: K32-DICN
- **Appearance**: 3,000 mm (3 m) Cable marking
- **Pin No.**
  - 1: N/C
  - 2: S-TMR
  - 3: HOLD
  - 4: RESET
  - 5: N/C
  - 6: COM
  - 7: BANK4
  - 8: BANK1
  - 9: BANK2
  - 10: COM

**NPN Input Model**
- **NPN input section**

**PNP Input Model**
- **Voltage pulse input section**

- Use terminal pin D6 as the common terminal.
- Use NPN open collector or no-voltage contacts for event input.

**D Event Inputs**

- **Models with Terminal Blocks**
  - E1: N/C
  - E2: S-TMR
  - E3: HOLD
  - E4: RESET
  - E5: N/C
  - E6: COM
  - E7: BANK4
  - E8: BANK2
  - E9: BANK1
  - E10: COM

- **Models with Connectors**

- **Applicable Connector (Sold separately)** XG4M-1030 (OMRON)
- **Special Cable (Sold separately)** K32-DICN (OMRON) (XG4M-1030 with 3-m cable)

**E Pulse Inputs**

- **Rotary Pulse Meter**: K3HB-R

**Note:** The BCD Output Cable has a D-sub plug. Cover: 17JE-37H-1A (manufactured by DDK); Connector: equivalent to 17JE-23370-02 (D1) (manufactured by DDK)
Derating Curve for Sensor Power Supply (Reference Values)

For 12V

Note: 1. The above values were obtained under test conditions with the standard mounting. The derating curve will vary with the mounting conditions, so be sure to adjust accordingly.

2. Internal components may be deteriorated or damaged. Do not use the Digital Indicator outside of the derating range (i.e., do not use it in the area labeled ①, above).

Internal Block Diagram

- Pulse input circuit
- BCD I/O
- Event input
- Linear output
- Sensor power supply
- Filter
- Power supply circuit (isolated)
- Power supply

- Waveform shaping circuit
- Micro-computer
- Key
- Indications
- Drive circuit
- BCD input circuit
- Digital input circuit
- Linear output circuit
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- Filter
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## BCD Output Timing Chart

A REQUEST signal from a Programmable Controller or other external device is required to read BCD data.

### Single Sampling Data Output

- **DATA**
  - All data "High" when requesting
  - Data is set in approximately 30 ms from the rising edge of the REQUEST signal and the DATA VALID signal is output.

- **DATA VALID**
  - Approx. 30 ms
  - 40 ms
  - 16 ms

The data is set in approximately 30 ms from the rising edge of the REQUEST signal and the DATA VALID signal is output. When reading the data from a Programmable Controller, start reading the data when the DATA VALID signal turns ON. The DATA VALID signal will turn OFF 40 ms later, and the data will turn OFF 16 ms after that.

### Continuous Data Output

- **Measurement data is output every 64 ms while the REQUEST signal remains ON.**

- **Note:** If HOLD is executed when switching between data 1 and data 2, either data 1 or data 2 is output depending on the timing of the hold signal. The data will not go LOW.

### Programmable Controller Connection Example

- **Digital Indicator**
- **Connector pin No.** (See note.)
- **SYSMAC Programmable Controller**
- **DC Input Unit**

### Display Unit Connection Example

- **Digital Indicator**
- **Connector pin No.** (See note.)
- **M7E Digital Display Unit**

**Note:** The BCD output connector pin number is the D-sub connector pin number when the BCD Output Cable (sold separately) is connected. This number differs from the pin number for the Digital Indicator narrow pitch connector (manufactured by Honda Tsushin Kogyo Co., Ltd.).

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Refer to the following User's Manual for application precautions and other information required when using the Digital Indicator:


The manual can be downloaded from the following site in PDF format: OMRON Industrial Web http://www.fa.omron.co.jp
### Component Names and Functions

#### MAX/MIN Key
- **Used to switch the display between the PV, maximum value, and minimum value and to reset the maximum and minimum values.**

#### LEVEL Key
- **Used to switch level.**

#### MODE Key
- **Used to switch the display between the PV, maximum value, and minimum value and to reset the maximum and minimum values.**

#### SHIFT Key
- **Used to change parameter settings. When changing a set value, this key is used to move along the digits.**

#### UP Key
- **When changing a set value, this key is used to change the actual value. When a measurement value is displayed, this key is used to execute or clear the forced-zero function or to execute teaching.**

#### PV display
- Displays PVs, maximum values, minimum values, parameter names, and error names.

#### Position meter
- Displays the position of the PV with respect to a desired scale.

#### SV display
- Displays SV and monitor values.

#### SV display status indicators

#### Comparative output status indicators
- Display the status of comparative outputs.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMW</td>
<td>Lit when communications writing is ON (enabled) and not lit when OFF (prohibited).</td>
</tr>
<tr>
<td>Hold</td>
<td>Turns ON/OFF when HOLD input turns ON/OFF.</td>
</tr>
</tbody>
</table>

#### Max./Min. status indicator
- Turns ON when the maximum value or minimum value is displayed in the RUN level.

#### Level/bank display
- In RUN level, displays the bank if the bank function is ON. (Turns OFF if the bank function is OFF.) In other levels, displays the current level.

#### Status indicators

<table>
<thead>
<tr>
<th>Display</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH, H, L, LL</td>
<td>In RUN level, turn ON when the comparative set value HH, H, L, or LL is displayed.</td>
</tr>
<tr>
<td>T</td>
<td>Turns ON when parameters for which teaching can be performed are displayed.</td>
</tr>
</tbody>
</table>

#### Indicator Function

- **CMW**: Lit when communications writing is ON (enabled) and not lit when OFF (prohibited).
- **Hold**: Turns ON/OFF when HOLD input turns ON/OFF.
- **HH, H, L, LL**: In RUN level, turn ON when the comparative set value HH, H, L, or LL is displayed.
- **T**: Turns ON when parameters for which teaching can be performed are displayed.
**Dimensions**

![Dimensions Diagram]

**Wiring Precautions**
- For terminal blocks, use the crimp terminals suitable for M3 screws.
- Tighten the terminal screws to the recommended tightening torque of approx. 0.5 N·m.
- To prevent inductive noise, separate the wiring for signal lines from that for power lines.

**Wiring**
- Use the crimp terminals suitable for M3 screws shown below.

* Terminal cover (included)

**Unit Stickers (included)**
- No unit stickers are attached to the Digital Indicator.
- Select the appropriate units from the unit sticker sheets provided.

**Mounting Method**
1. Insert the K3HB into the mounting cutout in the panel.
2. Insert watertight packing around the Unit to make the mounting watertight.
3. Insert the adapter into the grooves on the left and right sides of the rear case and push until it reaches the panel and is fixed in place.

**LCD Field of Vision**
The K3HB is designed to have the best visibility at the angles shown in the following diagram.

**Rubber Packing (Sold Separately)**
- K32-P1

If the rubber packing is lost or damaged, it can be ordered using the following model number: K32-P1.

(Depending on the operating environment, deterioration, contraction, or hardening of the rubber packing may occur and so, in order to ensure the level of waterproofing specified in NEMA4, periodic replacement is recommended.)

*Note: Rubber packing is provided with the Controller.*
Main Functions

Main Functions and Features

Measurement

F1: Rotation (rpm)/circumferential speed
F2: Absolute ratio
F3: Error ratio
F4: Rotational difference
F5: Flow rate ratio
F6: Passing time

The K3HB-R has the following six functions for receiving and displaying input pulses.

F1: Passing speed
F2: Cycle
F3: Time difference
F4: Time band
F5: Measuring length
F6: Interval

The K3HB-P has the following six functions for receiving and displaying input pulses.

F1: Individual inputs
F2: Phase differential inputs
F3: Pulse counting input

The K3HB-C has the following three functions for receiving and displaying input pulses.

Filters

Average Processing

Average processing of input signals with extreme changes or noise smooths out the display and makes control stable.

Input Types

Specify the types of sensor connected to input A and input B.

Input Compensation

Auto-zero Times

The frequency is forced to zero if there is no pulse input for a set period.

Key Operations

Teaching

The present measurement value can be used as a scaling value.

Key Protection

Key protection restricts level or parameter changes using the keys to prevent unintentional key operations and malfunctions.
Outputs

Comparative Output Pattern \textit{out-p}

Standard, zone, and level comparative output patterns can be selected for comparative outputs.

Hysteresis \textit{hy5}

Prevents comparative outputs from chattering when the measurement value fluctuates slightly near the set value.

Output Refresh Stop \textit{off-stp}

Holds the output status when a comparative result output other than PASS turns ON.

PASS Output Change \textit{pass}

Comparative results other than PASS and error signals can be output from the PASS output terminal.

Output OFF Delay \textit{off-d}

Delays turning OFF comparatives for a set period. This can be used to provide sufficient time to read the comparative output ON status when the comparative result changes at short intervals.

Shot Output \textit{shot}

Turns ON the comparative output for a specific time.

Output Logic \textit{out-n}

Reverses the output logic of comparative results.

Startup Compensation Timer \textit{s-tmr}

Measurements can be stopped for a set time using an external input.

Output Test \textit{test}

Output operation can be checked without using actual input signals by using the keys to set a test measurement value.

Linear Outputs \textit{lset.c}, \textit{lset.v}, \textit{lset.h}, \textit{lset.l}

A current or voltage proportional to the change in the measurement value can be output.

Standby Sequence \textit{stdby}

The comparison outputs can be kept OFF until the measurement value enters the PASS range.

Display

Display Value Selection \textit{disp}

The display value can be set to the present value, the maximum value, or the minimum value.

Display Color Selection \textit{color}

The present value display color can be set to green or red. The color of the present value can also be switched according to the comparative output.

Display Refresh Period \textit{d.ref}

When the input changes rapidly, the display refresh period can be lengthened to control flickering and make the display easier to read.

Position Meter \textit{pos-t, pos-h, pos-l}

The present measurement value can be displayed as a position in relation to the scaling width on a 20-gradation position meter.

Prescale \textit{p5r, p5y, p5b, p5by}

The input signal can be converted and displayed as any value.

Comparative Set Value Display \textit{sv.dsp}

Select whether or not to display the comparative value during operation.

Display auto-return \textit{ret}

Automatically returns the display to RUN level when there are no key operations (e.g., max./min. switching, bank settings using keys).

Max./Min. Hold \textit{bnk-c}

Holds the maximum and minimum measurement values.

Bank Selection \textit{bnk-\textit{c}}

Switch between 8 comparative value banks using the keys on the front panel or external inputs. A set of set comparative values can be selected as a group.

Bank Copy \textit{copy}

Any bank settings can be copied to all banks.

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

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

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

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