Timer Interval Indicator
K3HB-P

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 *Common Precautions* on page 30.

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Model Number Structure

■ Model Number Legend

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

Base Units

K3HB-P ☐ ☐☐☐
    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-P☐-☐☐☐ ☐☐☐
    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 (for models with external power supplies only)
Event inputs (See note 2.)	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, 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
Measurement accuracy (at 23±5°C)	±0.08% rgd ±1 digit (for voltage pulse/open collector sensors)
Measurement range	Functions F1, F3, and F4: 10 ms to 3,200 s Function F2: 20 ms to 3,200 s Functions F5 and F6: 0 to 4 gigacounts

Input signals:

• No-voltage contact (30 Hz max. with ON/OFF pulse width of 15 ms min.)

• Voltage pulse

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.			

• Opencollector

Mode	Input frequency range	ON/OFF pulse width
F1 to F4	0 to 50 kHz	9 μs min.
F5, F6	0 to 30 kHz	16 μs min.

Note: The Digital Time Interval Meter will malfunction if a pulse greater than the input frequency range is input. SYSERR may appear on the display.

| Connectable sensors	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 response time (transistor output)	2 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 response time	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%)
Insulation resistance	20 MΩ min. (at 500 VDC)
Dielectric strength	2,300 VAC for 1 min between external terminals and case
Noise immunity	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)
Vibration resistance	Frequency: 10 to 55 Hz; Acceleration: 50 m/s^2, 10 sweeps of 5 min each in X, Y, and Z directions
Shock resistance	150 m/s^2 (100 m/s^2 for relay outputs) 3 times each in 3 axes, 6 directions
Weight	Approx. 300 g (Base Unit only)
Degree of protection	Front panel	Conforms to NEMA 4X for indoor use (equivalent to IP66)
	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, 1.4GHz 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)

Operation

■ 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	F1
Cycle	F2
Time difference	F3
Time band	F4
Measuring length	F5
Interval	F6

Example: F1 Passing Speed
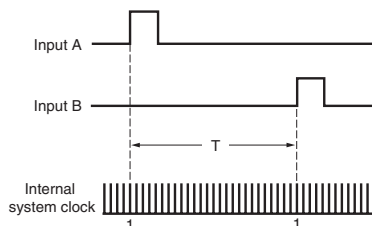
The time (T) between input A pulse and input B pulse is measured by the internal system clock. If, for example, the system clock measures 100,000 counts during time T, then

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

$T = 0.05\ s$

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

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

Function	Operation	Operation image (application)
F1 Passing speed	The reciprocal of the time (T) from input A ON to input B ON is multiplied by 60 and displayed. • Recovery time (T$_R$) of 20 ms is required before starting the next measurement. Display unit: mm/s, m/s m/min, km/h, etc.	Measuring workpiece passing speed between A and B
F2 Cycle	Measures and displays input A cycle (T). Measurement range: 20 ms to 3,200 s Display unit: ms, s, min., min.s.1/10 s	Measuring feed cycles for parts
F3 Time difference	Displays the time (T) from input A ON to input B ON. 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	Measuring workpiece passing time between A and B 	Measuring the length of a workpiece step by changing prescale values.

Function	Operation	Operation image (application)	
F4 Time band	Displays input A ON time (T). 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. • Recovery time (TR) of 20 ms is required before starting the next measurement. Display unit: mm, cm, m, etc.	Measuring workpiece length BCD → To Programmable Controller	
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. • Recovery time (TR) of 20 ms is required before starting the next measurement. Display unit: mm, cm, m, etc.	Measuring slit intervals H → PASS L → OK judgment	

■ 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
SCAL	Prescale value menu setting
m.n	Minute display
H.mn.SS	h.mm.ss display
mn.SS.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 10 or 11 when there is a large variation in the display. The largest measurement range is 30 Hz.