

Contact Displacement Sensor

D5V

Built-in Amplifier Ensures Ease of Use and Saves Wiring Effort. Sensor Operates with a Low Force in a Wide Range of Applications.

- Works with a low operating force (30 gf) to detect a wide variety of objects, including glass, plastic, and rubber
- Models with digital output for the B7A or 4 to 20 mA linear output, corresponding to the 0 to 5 mm travel distances of the actuator, are available
- Select from models with ball-, flat-, or pin-type actuators to detect a wide variety of objects
- Approved Standards
ASTA, BSEN61010-1, EN50081-1, prEN50082-2, ASTA Licence No. 332



Ordering Information

MODEL NUMBER LEGEND

D5V - -3 1
 1 2




1. Output

A: 4 to 40 mA linear output
M: B7A serial communications output

2. Actuator




B: Ball type
P: Pin type
F: Flat type

SENSOR

Travel Distance	Output	Appearance	Actuator	Resolution	Part Number
5 mm	4 to 20 mA		Ball type	10 µm	D5VA-3B1
			Pin type		D5VA-3P1
			Flat type		D5VA-3F1

(This table continues on the next page.)

Ordering Information Table - continued from previous page

Travel Distance	Output	Appearance	Actuator	Resolution	Part Number
5 mm	B7A serial communications output (See Note.)		Ball type	1 μ m	D5VM-3B1
			Pin type		D5VM-3P1
			Flat type		D5VM-3F1

Note: Use the D5VM-3□1 in combination with the 16-point B7A Output Link Terminals with a standard transmission delay (i.e., a transmission delay of 19.2 ms). No high-speed B7A Output Link Terminals can be used with the D5VM-3□1.

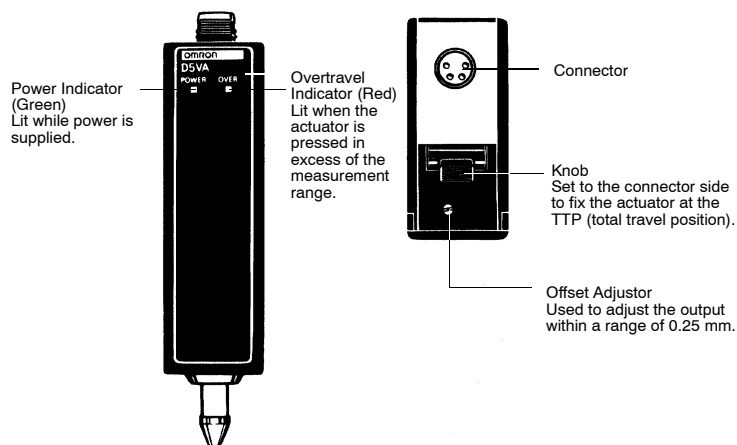
Specifications

Part number	D5VA-3□1	D5VM-3□1
Supply voltage	12 to 24 VDC \pm 10% (see note 1)	
Current consumption	100 mA max.	
Measurement range	5 mm	
Max. actuator travel distance	Approx. 5.7 mm (0.22 in)	
Offset adjustment range	\pm 0.25 mm	
Resolution	10 μ m	1 μ m
Linearity	\pm 0.5% FS max.	
Repeat accuracy	\pm 5 μ m max.	
Response speed	6 ms max.	37 ms max. including transmission delay
Operating force	0.3 N (30 gf) max.	
Output	4- to 20-mA linear current output	B7A serial communications output (see note 2) (BCD and multipoint output modes (see note 3))
Mounting method	M4 x 2	
Indicator	Power and overtravel indicators	Power, overtravel, setting, and output indicators
Life expectancy	Mechanical: 10,000,000 times min.	
Temperature influence	\pm 0.04% FS/ $^{\circ}$ C max.	
Ambient temperature	Operating temperature: -10 $^{\circ}$ C to 55 $^{\circ}$ C (14 $^{\circ}$ F to 131 $^{\circ}$ F) with no icing Storage temperature: -25 $^{\circ}$ C to 65 $^{\circ}$ C (-13 $^{\circ}$ F to 149 $^{\circ}$ F) with no icing	
Ambient humidity	Operating humidity: 35% to 85%	
Insulation resistance	100 M Ω min. at 100 VDC	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min.	
Noise resistance	1.5 kV with a pulse width of 100 ns to 1 μ s	
Vibration resistance	10 to 55 Hz, 0.75-mm double amplitude	
Shock resistance	196 m/s {20 G}	
Cable	2 m	
Weight	Approx. 80 g without cable	
Material	ABS and PC polymer alloy	
Enclosure Rating	IP40	

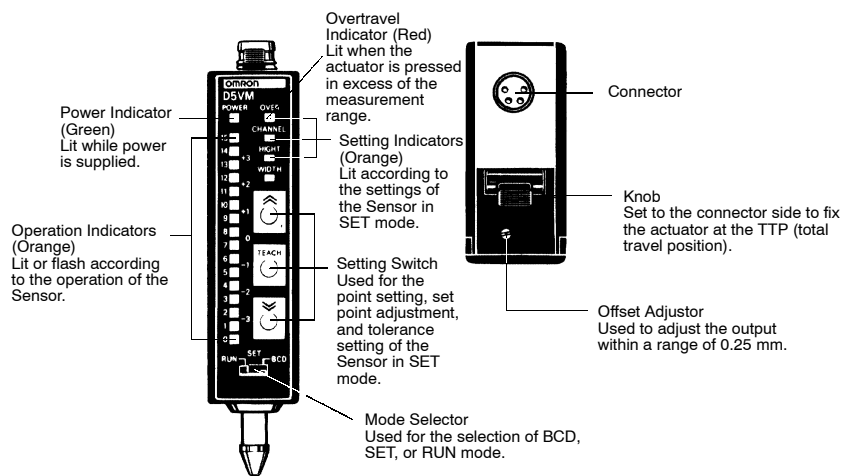
- Note:** 1. If power is supplied to both the D5VM-3□1 and B7A Output Link Terminals from a single power supply, the supply voltage must be 24 VDC \pm 10%.
2. Use the D5VM-3□1 in combination with the 16-point B7A Output Link Terminals with a standard transmission delay (i.e., a transmission delay of 19.2 ms). No high-speed B7A Output Link Terminals model can be used with the D5VM-3□1.
3. The BCD or multipoint output mode can be selected with the mode selector.

Nomenclature

■ D5VA-□□ WITH LINEAR OUTPUT



■ D5VM-□□ WITH B7A SERIAL COMMUNICATIONS OUTPUT



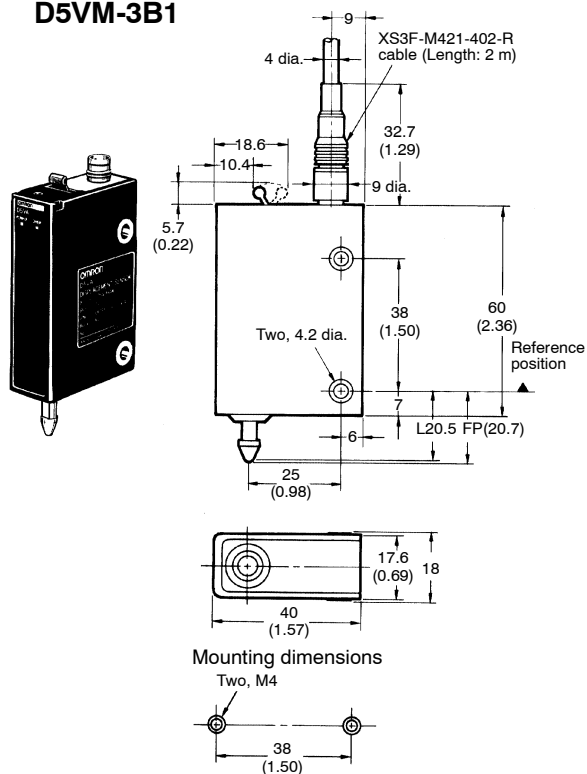
D5V Operation Indicators

BCD	Lit according to the travel distance of the actuator.	
SET	Channel	Indicators corresponding to all points that have been set are lit. At the time of point setting, an indicator corresponding to the point that is being set flashes
	Height	The adjustment value is displayed at the time of position adjustment
	Width	The output status and tolerance are displayed at the time of tolerance setting
RUN	The output statuses of points 0 to 15 are displayed	

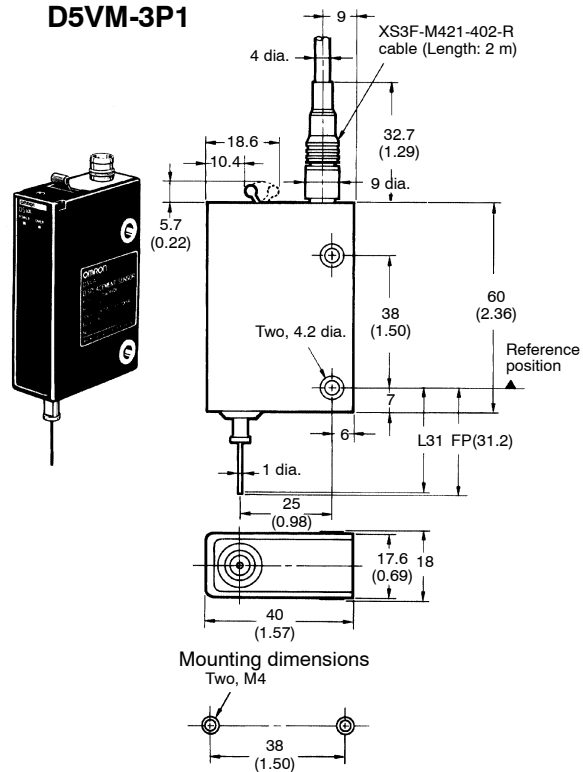
Dimensions

Unit: mm (inch)

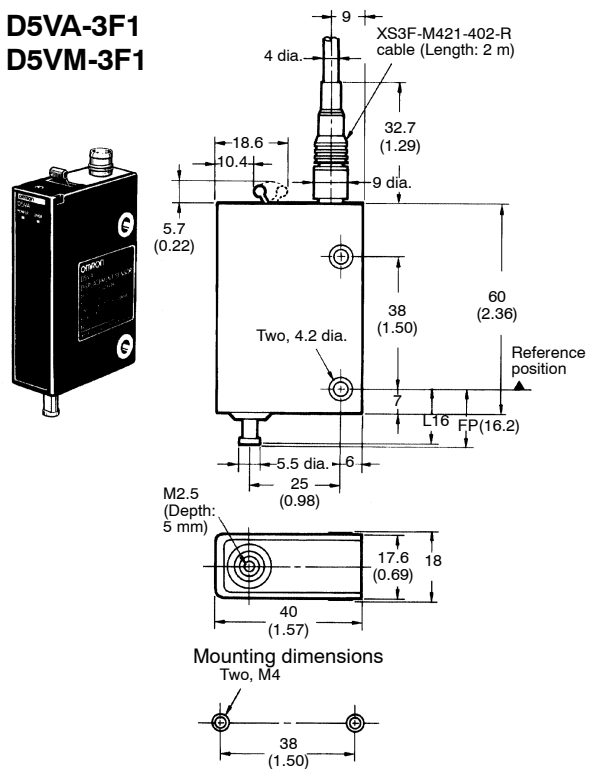
■ D5VA-3B1
D5VM-3B1



■ D5VA-3P1
D5VM-3P1



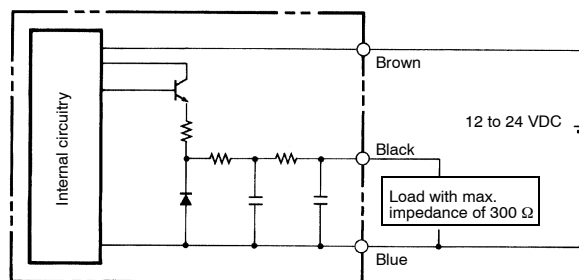
■ D5VA-3F1
D5VM-3F1



Engineering Data

■ OUTPUT CHARACTERISTICS

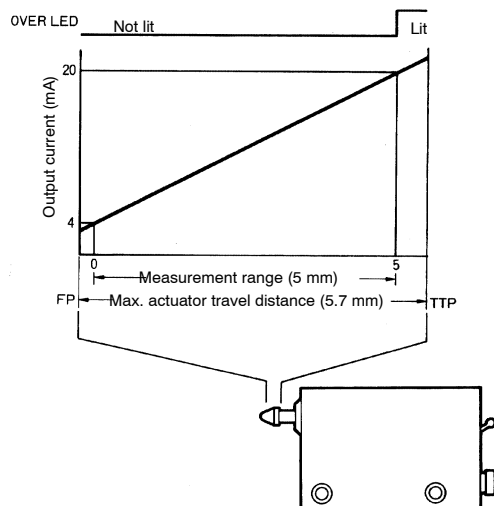
D5VA Output Circuit Diagram



D5VA Output Characteristics

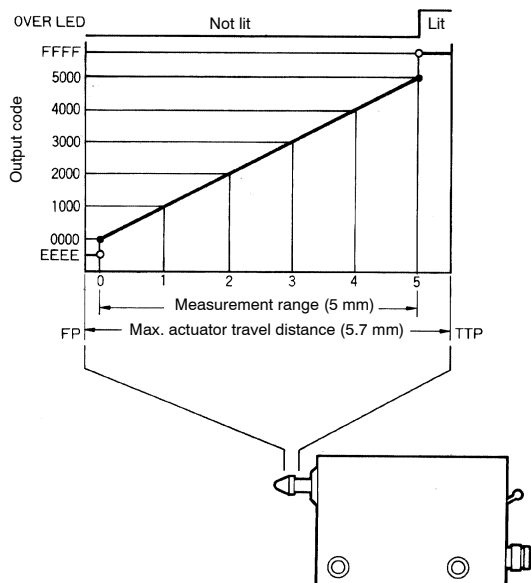
The lower limit of the effective output range of the D5VA is factory-set to 4 mA.

A current within a range between 4 and 20 mA is output according to the measurement range between 0 and 5 mm.



D5VM BCD Output Characteristics

A 16-bit BCD is output according to the measurement range between 0 and 5 mm.



The lower limit of the effective output range of the D5VM in BCD mode is factory-set to 0000.

The D5VM outputs codes within a range between 0000 and 5000 when the actuator is in the operating range; outputs the code EEEE when the actuator is at the FP (free position); and outputs the code FFFF when the actuator is pressed in excess of the measurement range.

B7A Output Link Terminals Data

B7A OUT	BCD Output	Multipoint Output
#0	1's digit = 1	Point 0
#1	1's digit = 2	Point 1
#2	1's digit = 4	Point 2
#3	1's digit = 8	Point 3
#4	10's digit = 1	Point 4
#5	10's digit = 2	Point 5
#6	10's digit = 4	Point 6
#7	10's digit = 8	Point 7
#8	100's digit = 1	Point 8
#9	100's digit = 2	Point 9
#10	100's digit = 4	Point 10
#11	100's digit = 8	Point 11
#12	1000's digit = 1	Point 12
#13	1000's digit = 2	Point 13
#14	1000's digit = 4	Point 14
#15	1000's digit = 8	Point 15

D5VM Multipoint Output Characteristics

The following four types of signals are output according to the set value of the D5VM.

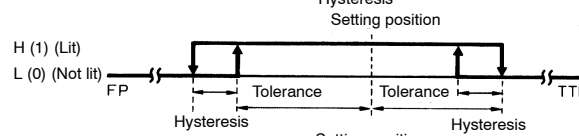
1. ON/OFF Output

Turns ON or OFF according to the set value as shown in the timing chart.



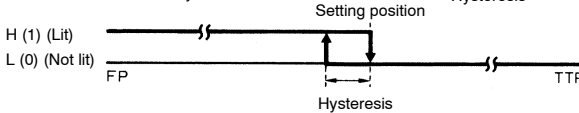
2. Tolerance Output

Turns ON or OFF according to the tolerance of the set value as shown in the timing chart.



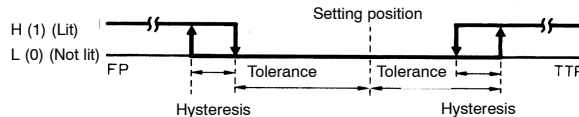
3. ON/OFF Reverse Output

Turns ON or OFF according to the set value. The signal timing is reverse to the signal 1 timing as shown in the timing chart.

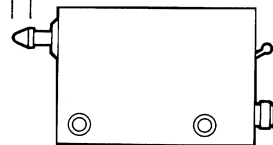


4. Tolerance Reverse Output

Turns ON or OFF according to the tolerance of the set value. The signal timing is reverse to the signal 2 timing as shown in the timing chart.

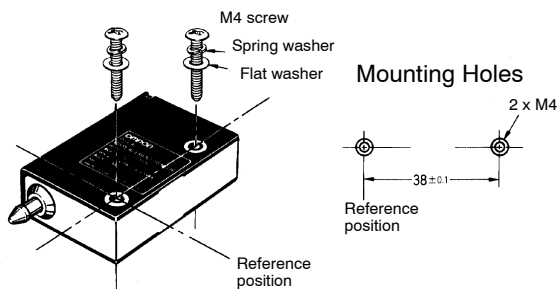


Note: The hysteresis, which is 10 μ m, is the difference between the position in the TTP direction where the actuator turns the output ON and the position in the FP direction where the actuator turns the output OFF.



Installation

■ MOUNTING

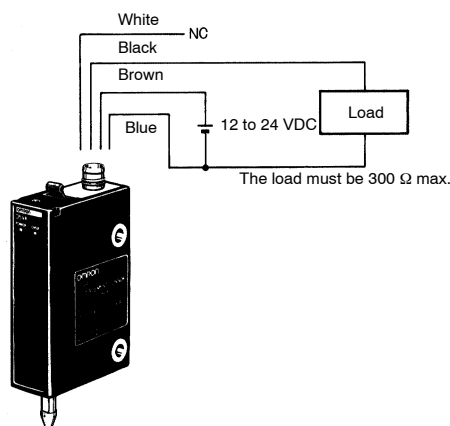


Mount the D5V with M4 screws, flat washers, and spring washers securely. Tighten each M4 screw to a torque of 1.18 to 1.47 N • m (12 to 15 kgf • cm).

Note: Refer to the *Dimensions Section* for the distance between the reference position and the measurement range.

■ CONNECTIONS

D5VA and Load



Be sure to turn off the D5VA when wiring the cable connected to the D5VA or connecting or disconnecting the connector to or from the D5VA, otherwise the D5VA or load may malfunction or be damaged.

The cable resists normal bending and twisting force. Do not bend, twist, or pull the cable with extreme force.


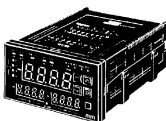
Separate the cable from power lines or equipment that may generate electrostatic noise.

The white lead wire of the cable is not used. Insulate the end of the white cable so that it will not come in contact with other lead wires.

Configuring D5V with A Controller and Output Boards

■ SELECTING A CONTROLLER — ORDERING INFORMATION

Use a signal process meter to display the linear output of the D5VA.

Item	Signal Process Meter	Signal Process Meter
Unit		
Part number	K3NX-VD1C 1=100 to 240 VAC supply voltage 2=12 to 24 VDC supply voltage	K3TS-SD1B 1=100 to 240 VAC supply voltage 2=12 to 24 VDC supply voltage
Features	DC voltage input; separate present value, and setpoint value LEDs; scaling function and forced zero function included; five level discrimination output with output boards.	DC voltage input; high-speed sampling of 1.04 ms; two-input operation; forced zero function and other versatile functions incorporated.

■ SELECTING OUTPUT BOARDS — ORDERING INFORMATION

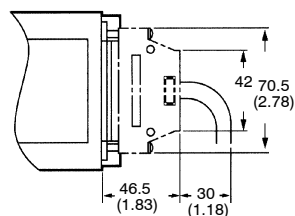
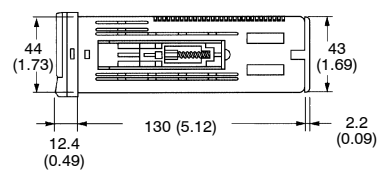
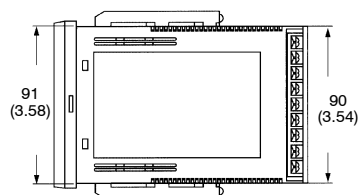
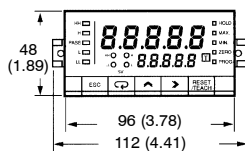
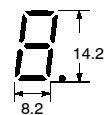
Output type	Output configuration	Part number	
		K3TS meter	K3NX meter
Comparative relay contact output	3 outputs (H, PASS, L); all SPDT	K31-C1	
	5 outputs (HH, H, PASS, L, LL); PASS is SPDT, others are SPST-NO	K31-C2	
Comparative transistor output	5 outputs (HH, H, PASS, L, LL); PASS is SPDT, others are SPST-NC	K31-C5	
Linear output	5 outputs (HH, H, PASS, L, LL); all NPN open collector	K31-T1	
	5 outputs (HH, H, PASS, L, LL); all PNP open collector	K31-T2	
	4 to 20 mA	K31-L1	
	1 to 5 VDC	K31-L2	
	1 mV/digit	K31-L3	
		K31-B2	
BCD	4 1/2 digit	K31-B2	
	RS-232C	K31-S1	K31-FLK1
	RS-485	K31-S2	K31-FLK2
Combination output and communications boards	RS-422	K31-S3	K31-FLK3
	4 to 20 mA linear output and 5 NPN open collector outputs	K31-L4	
	1 to 5 VDC linear output and 5 NPN open collector outputs	K31-L5	
	mV/digit linear output and 5 NPN open collector outputs	K31-L6	
	BCD output and 5 NPN open collector outputs	K31-B4	
	RS-485 serial output and 5 NPN open collector outputs	K31-S5	K31-FLK5
	RS-422 serial output and 5 NPN open collector outputs	K31-S6	K31-FLK6

Note: K3TS Model requires an Output Board for correct operation. K3TS requires a minimum of five cooperative outputs.

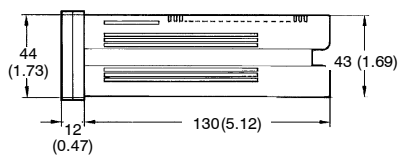
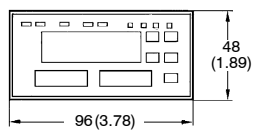
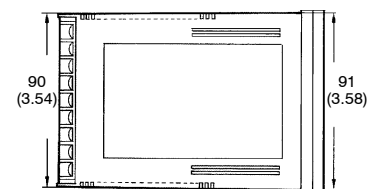
■ K3NX SIGNAL PROCESS METER DIMENSIONS

Unit: mm (inch)

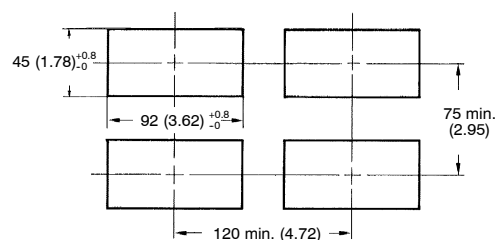
PV Display



■ K3TS SIGNAL PROCESS METER DIMENSIONS



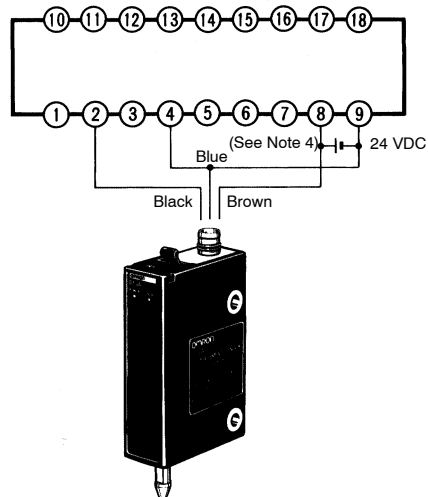
■ K3NX OR K3TS PANEL CUTOUTS



Connection Example

- The K3NX must be a DC input model.
- Various K3NX output models are available. Select the model most suited to the application.
- Connect an AC power supply to the K3NX and a DC power supply to the D5VA if the K3NX is an AC input model.

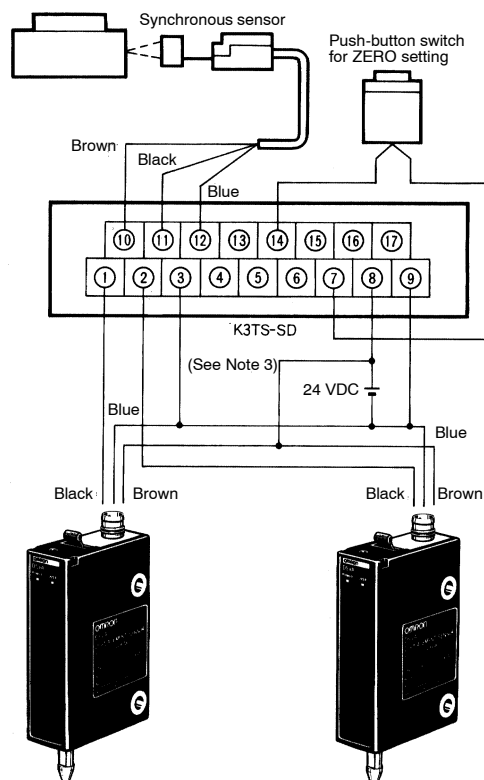
Note: Refer to the *K3NX Data Sheet* for more information.



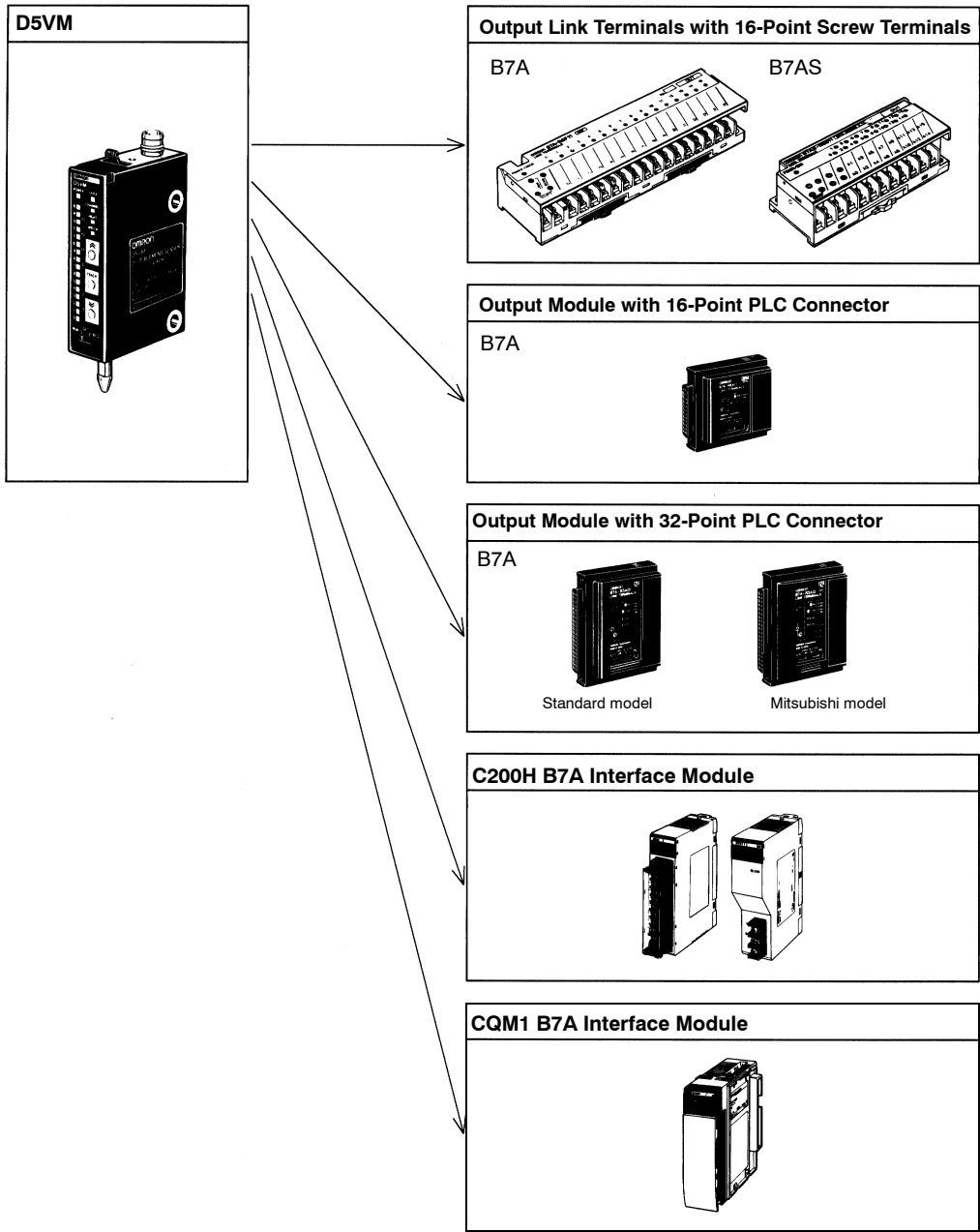
Connection Example

- Various K3NX output models are available. Select the model most suited to the application.
- The K3NX used in this connection example is a DC input model. Connect an AC power supply to the K3NX and a DC power supply to the D5VA if the K3NX is an AC input model.

Note: Refer to the *K3NS Data Sheet* for more information.



D5VM CONNECTIVITY

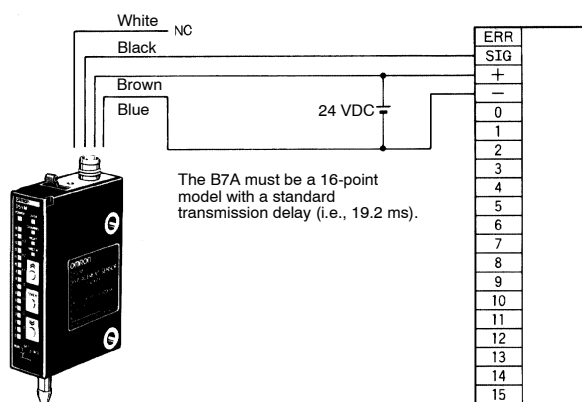


COMBINATION OF MODELS

Part number	Connecting unit/module	Remarks
D5VM-□□□	B7A-R6□□1 B7AS-R6□□1	Screw terminals (Output Unit)
	B7A-R□□□3-□	PLC connector (Output Unit)
	C200H-B7A21 (See Note 1.) C200H-B7A22 (See Note 1.) C200H-B7A11 C200H-B7A12 (See Note 2.)	C200H B7A Interface Module (Input Module)
	CQM1-B7A21 (See Note 1.) CQM1-B7A12 (See Note 2.) CQM1-B7A13 (See Note 2.)	CQM1 B7A Interface Model (Input Module)

Note: 1. Connect the D5VM to the input terminals of the above units and make standard settings on the D5VM.
2. Make standard settings on the above units.

D5VM, B7A Output Link Terminals, and Single Power Supply



Baud Rate	Transmission Distance
Standard	100 m

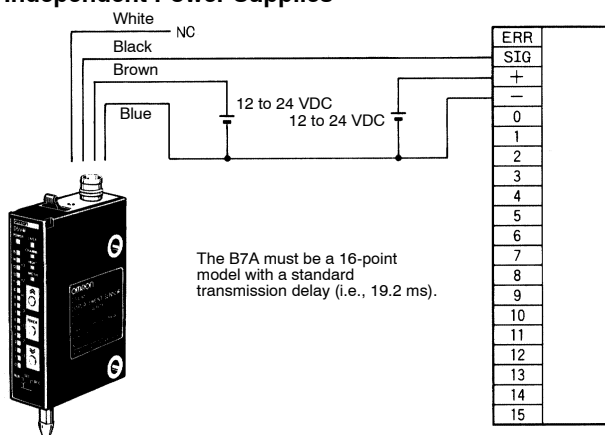
Be sure to turn OFF the D5VM when wiring the cable connected to the D5VM or connecting or disconnecting the connector to or from the D5VM, or the D5VM or load may malfunction or be damaged.

The cable resists normal bending and twisting force. Do not bend, twist, or pull the cable with extreme force.

Separate the cable from power lines or equipment that may generate electrostatic noise.

The white lead wire of the cable is not used. Insulate the end of the white cable so that it will not come in contact with other lead wires.

D5VM, B7A Output Link Terminals, and Independent Power Supplies



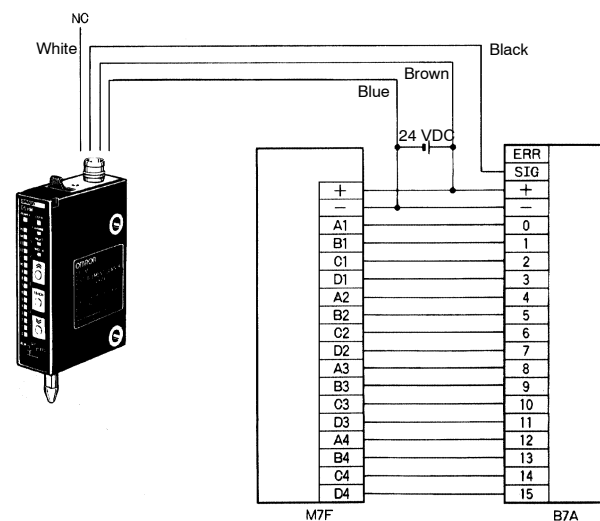
Baud Rate	Transmission Distance
Standard	500 m

Be sure to turn off the D5VM when wiring the cable connected to the D5VM or connecting or disconnecting the connector to or from the D5VM, or the D5VM or load may malfunction or be damaged.

The cable resists normal bending and twisting force. Do not bend, twist, or pull the cable with extreme force.

The white lead wire of the cable is not used. Insulate the end of the white cable so that it will not come in contact with other lead wires. Separate the cable from power lines or equipment that may generate electrostatic noise. wires.

D5VM, B7A Output Link Terminals, and M7F Digital Display



The B7A must be a 16-point output model with a standard transmission delay (i.e., 19.2 ms).

The M7F must be a static input model with a four-digit display.

Combination of B7A and M7F

B7A output configuration	NPN	PNP
M7F logic	Negative	Positive

Power supply	Independent power supplies	Single power supply
Supply voltage	12 to 24 V	24 V
Transmission distance	500 m max.	100 m max.

Precautions

■ CORRECT USE



Caution

The tip of a pin-type actuator is sharp. Be careful when handling the actuator to avoid injury.

- Do not disassemble the D5V, or an electric shock or injury may occur or the D5V may malfunction.
- The D5V will have detection errors if the operating speed of the actuator exceeds the response time.
- The operating force of the actuator is 0.3 N (30 gf). Before using the D5V for detectable objects, make sure that the actuator will not damage the objects.
- The D5V will have large detection errors if the D5V is used near generators, motors, or other machines generating strong magnetic fields.
- Make sure that the overtravel indicator of the D5V in operation is not lit. The Sensor will be damaged if the actuator is pressed in excess of the measurement range.
- Do not impose horizontal loads on the actuator, or the actuator will deform and have difficulty in detecting objects correctly.
- The D5V is not of watertight or dust-tight construction. Do not use or store the D5V in an area with excessive humidity or dust or where water may be sprayed onto the D5V.
- An adapter may be attached to the flat-type actuator. The operating force may, however, change due to the weight of the adapter. Some types of adapters, such as roller-type adapters, may cause detection errors.
- The white lead wire of the cable is not used. Insulate the end of the white cable, so that it will not come in contact with other lead wires.
- The D5V will not detect objects correctly if the knob is set to the connector side to fix the actuator at the TTP.

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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