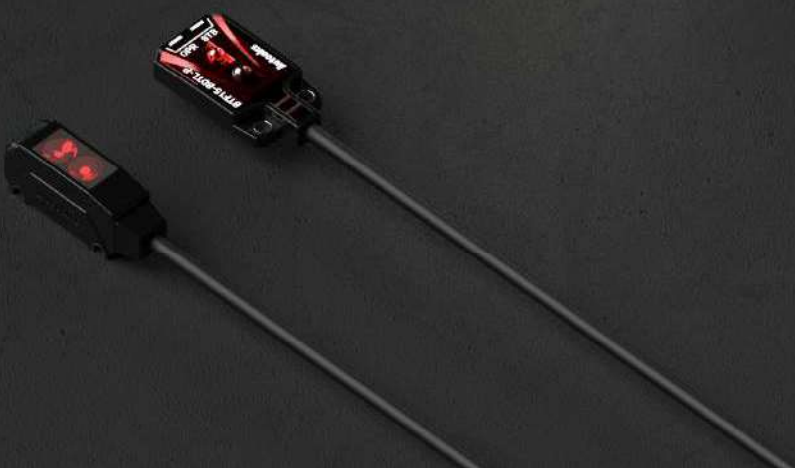


# A. Sensors

Sensors are commonly used components in automation used to detect changes in the environment and transmit the information electronically

- A1. Photoelectric Sensors
- A2. Photomicro Sensors
- A3. Fiber Optic Sensors
- A4. Displacement Sensors
- A5. LiDAR
- A6. Door Sensors
- A7. Area Sensors
- A8. Proximity Sensors
- A9. Rotary Encoders





A



# A1. Photoelectric Sensors

Photoelectric sensors are used to detect distance, absence or presence of objects using a light transmitter and receiver.

A1-1	Rectangular	BTS Series	W 7.2 mm Photoelectric Sensors
		BJ Series	Rectangular Photoelectric Sensors (Cable Type)
			Rectangular Photoelectric Sensors (Connector Type)
		BJX Series	Rectangular Photoelectric Sensors
		BM Series	General Photoelectric Sensors
		BMS Series	Side Sensing Photoelectric Sensors
		BY Series	Photoelectric Sensors with Synchronous Detection
		BYD Series	Photoelectric Sensors with Built-In Timer
		BH Series	Front / Side Mount Photoelectric Sensors
		BA Series	Diffuse Reflective Long-Distance Photoelectric Sensors
A1-2	Compact	BTF Series	L 3.7 mm Flat Photoelectric Sensors
		BPS Series	L 7.5 mm Flat Photoelectric Sensors
A1-3	Cylindrical	BRQ Series	Cylindrical Photoelectric Sensors (Front Sensing Type)
			Cylindrical Photoelectric Sensors (Side Sensing Type)
		BR Series	Cylindrical Photoelectric Sensors
A1-4	U-Shaped	BUM Series	4-Channel U-Shaped Photoelectric Sensors
		BUP Series	1-Channel U-Shaped Photoelectric Sensors
A1-5	AC / DC	BEN Series	Universal AC / DC Photoelectric Sensors
		BX Series	Universal AC / DC Photoelectric Sensors
A1-6	PCB Detection	BJP Series	Photoelectric Sensors for PCB Detection
A1-7	Oil-Resistant / Oil-Proof	BJR Series	Oil-Resistant Photoelectric Sensors
		BJR-F Series	Oil-Proof Photoelectric Sensors
A1-8	Color Mark	BC Series	Color Mark Photoelectric Sensors
A1-9	Liquid Level	BL Series	Liquid Level Photoelectric Sensors

# W 7.2 mm

## Photoelectric Sensors

### BTS Series



#### Features

- W 7.2 mm Photoelectric Sensors
  - W 7.2 × H 18.6 × L 9.5 mm (Through-beam type)
  - W 7.2 × H 24.6 × L 10.8 mm (Retroreflective, convergent reflective type)
- Detection methods and minimum target size
  - Through-beam type (BTS1M): Ø 2 mm
  - Retroreflective type (BTS200): Ø 2 mm (sensing distance: 100 mm)
  - Convergent reflective type (BTS15/BTS30): Ø 0.15 mm (sensing distance: 10 mm)
- Maximum sensing distance: 1 m (Through-beam type)
- Operation indicator (red) and stability indicator (green) show operation status
- Stainless steel (SUS304) mounting brackets
- IP67 protection rating (IEC standard)

#### Specifications

Model	BTS1M-TDT□-□	BTS200-MDT□-□	BTS□-LDT□-□
Sensing type	Through-beam	Retroreflective	Convergent reflective
Sensing distance	1 m	10 to 200 mm <sup>01)</sup>	5 to 15 mm <sup>02)</sup> 5 to 30 mm <sup>02)</sup>
Sensing target	Opaque materials	≥ Ø 27 mm Opaque materials	Opaque materials, translucent materials
Min. sensing target	≥ Ø 2 mm	≥ Ø 2 mm <sup>03)</sup>	≥ Ø 0.15 mm <sup>04)</sup>
Hysteresis	-	-	≤ 15 % of sensing distance
Response time	≤ 1 ms		
Light source	Red LED		
Peak emission wavelength	650 nm		
Operation mode	Light ON mode / Dark ON mode model		
Indicator	Operation indicator (red), stability indicator (green)		
Approval	CE ENEC	CE ENEC	CE ENEC
Unit weight (packaged)	≈ 40 g (≈ 65 g)	≈ 25 g (≈ 45 g)	≈ 25 g (≈ 45 g)

01) Reflector (MS-6)

02) Non-glossy white paper 50 × 50 mm

03) Sensing distance 100 mm

04) Sensing distance 10 mm

Power supply	12-24 VDC≐ ±10 % (ripple P-P: ≤ 10%)
Current consumption	It depends on the sensing type
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA
Reflective	≤ 20 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 26.4 VDC≐
Load current	≤ 50 mA
Residual voltage	NPN : ≤ 1 VDC≐, PNP : ≤ 2 VDC≐
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC≐ megger)
Noise immunity	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 10,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-20 to 55 °C, storage: -30 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP67 (IEC standard)
Connection	Cable type
Cable spec.	Ø 2.5 mm, 3-wire (emitter: 2-wire), 2 m
Wire spec.	AWG 28 (0.08 mm, 19-core), insulator outer diameter: Ø 0.9 mm
Material	Case: PBT, sensing part: PMMA, bracket: SUS304, bolt: SWCH10A



View product detail

# Rectangular Photoelectric Sensors (Cable Type)

## BJ Series



### Features

- Compact size: W 10.6 × H 32 × L 20 mm
- IP65 protection rating (IEC standard)
- Adjuster for selecting Light ON / Dark ON mode
- Built-in sensitivity adjustment adjuster (except BJG30-DDT)
- Reverse power protection circuit, output short overcurrent protection circuit
- Mutual interference prevention function (except through-beam and BGS reflective type)
- Excellent noise immunity and minimal influence from ambient light

### Specifications

Model	BJ□-TDT-□			BJ3M-PDT-□	BJ□-BDT-□		BJN□-NDT-□	
Sensing type	Through-beam			Polarized retroreflective	BGS reflective		Narrow beam reflective	
Sensing distance	7 m	10 m	15 m	3 m <sup>01)</sup>	10 to 30 mm <sup>02)</sup>	10 to 50 mm <sup>02)</sup>	30 to 70 mm <sup>03)</sup>	70 to 130 mm <sup>03)</sup>
Sensing target	Opaque materials			Opaque materials	Opaque materials, translucent materials		Opaque materials, translucent materials	
Min. sensing target	≥ Ø 8 mm	≥ Ø 12 mm		≥ Ø 75 mm	-		≥ Ø 0.2 mm (copper wire)	
Hysteresis	-			-	≤ 10% of sensing distance		≤ 25% of sensing distance	≤ 20% of sensing distance
Black/white difference	-			-	≤ 10% of sensing distance		-	
Response time	≤ 1 ms			≤ 1 ms	≤ 1.5 ms		≤ 1 ms	
Light source	Red	Red	Infrared	Red	Red		Red	
Peak emission wavelength	650 nm	660 nm	850 nm	660 nm	660 nm		650 nm	
Min. spot size	-			-	≈ Ø 5.0 mm	≈ Ø 4.5 mm	≈ Ø 2.0 mm	≈ Ø 2.5 mm
Sensitivity adjustment	YES (Adjuster)			YES (Adjuster)	YES (Adjuster) <sup>04)</sup>		YES (Adjuster)	
Mutual interference prevention	-			YES	-		YES	
Operation mode	Light ON mode - Dark ON mode selectable (Adjuster)							
Indicator	Operation indicator (red), stability indicator (green), power indicator (green) <sup>05)</sup>							
Approval	CE EAC			CE EAC	CE EAC		CE EAC	
Unit weight (packaged)	≈ 90 g (≈ 115 g)			≈ 60 g (≈ 85 g)	≈ 50 g		≈ 45 g	

01) Reflector (MS-2A)

02) Non-glossy white paper 50 × 50 mm

03) Non-glossy white paper 100 × 100 mm

04) ~10% of max. sensing distance, Non-glossy white paper

05) Only for the emitter



View product detail

Next Page ►

Model	BJ□-DDT-□	BJG30-DDT
Sensing type	Diffuse reflective	Diffuse reflective
Sensing distance	100 mm <sup>01)</sup> 300 mm <sup>01)</sup> 1 m <sup>02)</sup>	15 mm <sup>03)</sup> or 30 mm <sup>01)</sup>
Sensing target	Opaque materials, translucent materials	Transparent glass or opaque materials, translucent materials
Hysteresis	≤ 20% of sensing distance	≤ 20% of sensing distance
Response time	≤ 1 ms	≤ 1 ms
Light source	Infrared Red Infrared	Infrared
Peak emission wavelength	850 nm 660 nm 850 nm	850 nm
Sensitivity adjustment	YES (Adjuster)	-
Mutual interference prevention	YES	YES
Operation mode	Light ON mode - Dark ON mode selectable (Adjuster)	Light ON
Indicator	Operation indicator (red), stability indicator (green)	Operation indicator (red), stability indicator (green)
Approval	CE EAC	CE EAC
Unit weight (packaged)	≈ 45 g (≈ 70 g)	≈ 45 g

01) Non-glossy white paper 100 × 100 mm

02) Non-glossy white paper 300 × 300 mm

03) Transparent Glass 50 × 50 mm, t = 3.0 mm

Power supply	12-24 VDC≡ ±10% (ripple P-P: ≤ 10%)
Current consumption	It depends on the sensing type
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA
Reflective	≤ 30 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 26.4 VDC≡
Load current	≤ 100 mA
Residual voltage	NPN : ≤ 1 VDC≡, PNP : ≤ 2.5 VDC≡ (BGS reflective type : ≤ 2 VDC≡)
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC≡ megger)
Noise immunity	±240 VDC≡ the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-25 to 55 °C, storage: -40 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP65 (IEC standard)
Connection	Cable type
Cable spec.	Ø 3.5 mm, 3-wire (emitter: 2-wire), 2 m
Wire spec.	AWG24 (0.08 mm, 40-core), insulator outer diameter: Ø 1 mm
Material	Case: PC+ABS, CAP: PC, sensing part: PMMA, bracket: SUS304, bolt: SCM, nut: SCM, sleeve: Brass, Ni-plate

# Rectangular Photoelectric Sensors (Connector Type)

## BJ Series



### Features

- Compact size: W 10.6 × H 32 × L 20 mm
- IP67 protection rating (IEC standard)
- Adjuster for selecting Light ON / Dark ON mode
- Built-in sensitivity adjustment adjuster
- Reverse power protection circuit, output short overcurrent protection circuit
- Mutual interference prevention function
- Excellent noise immunity and minimal influence from ambient light
- High performance lens with long sensing distance
- Long sensing distance :  
Through-beam type 15 m,  
diffuse reflective type 1 m,  
polarized retroreflective type 3 m (MS-2A)
- M.S.R. (Mirror Surface Rejection) function (Polarized retroreflective type)



View product detail

### Specifications

Model	BJ□-TDT-C-□		BJ3M-PDT-C-□	BJ□-DDT-C-□		
Sensing type	Through-beam		Polarized retroreflective	Diffuse reflective		
Sensing distance	10 m	15 m	3 m <sup>01)</sup>	100 mm <sup>02)</sup>	300 mm <sup>03)</sup>	1 m <sup>03)</sup>
Sensing target	Opaque materials		Opaque materials	Opaque materials, translucent materials		
Min. sensing target	≥ Ø 12 mm		≥ Ø 75 mm	-		
Hysteresis	-		-	≤ 20% of sensing distance		
Response time	≤ 1 ms		≤ 1 ms	≤ 1 ms		
Light source	Red	Infrared	Red	Infrared	Red	Infrared
Peak emission wavelength	660 nm	850 nm	660 nm	850 nm	660 nm	850 nm
Sensitivity adjustment	YES (Adjuster)		YES (Adjuster)	YES (Adjuster)		
Mutual interference prevention	-		YES	YES		
Operation mode	Light ON mode - Dark ON mode selectable (Adjuster)					
Indicator	Operation indicator (red), stability indicator (green), power indicator (green) <sup>04)</sup>					
Approval	CE ENEC		CE ENEC	CE ENEC		
Unit weight (packaged)	≈ 20 g (≈ 45 g)		≈ 30 g (≈ 55 g)	≈ 10 g (≈ 35 g)		

01) Reflector (MS-2A)

02) Non-glossy white paper 100 × 100 mm

03) Non-glossy white paper 300 × 300 mm

04) Only for the emitter

Power supply	12-24 VDC≐ ±10 % (ripple P-P: ≤ 10%)
Current consumption	It depends on the sensing type
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA
Reflective	≤ 30 mA
Control output	NPN open collector output / PNP open collector output Model
Load voltage	≤ 26.4 VDC≐
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC≐, PNP: ≤ 2.5 VDC≐
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC≐ megger)
Noise immunity	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-25 to 55 °C, storage: -40 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP67 (IEC standard)
Connection	Connector type
Connector	M8 4-pin plug type
Material	Case: PC+ABS, CAP: PC, sensing part: PMMA, bracket: SUS304, bolt: SCM, nut: SCM, sleeve: Brass, Ni -plate



# Rectangular Photoelectric Sensors

## BJX Series



### Features

- Long sensing distance with high quality lens:  
Through-beam type 30 m,  
diffuse reflective type 1 m,  
polarized retroreflective type 3 m (MS-2A)
- M.S.R. (Mirror Surface Rejection) function  
(Polarized retroreflective type)
- Compact size : W 11 × H 32 × L 20 mm
- Switch for selecting Light ON/Dark ON mode
- Built-in sensitivity adjustment adjuster
- Reverse power protection circuit,  
output short overcurrent protection circuit
- Mutual interference prevention function  
(except through-beam type)
- Excellent noise immunity and  
minimal influence from ambient light
- IP65 protection rating (IEC standard)

### Specifications

Model	BJX□-TDT-□-□	BJX3M-PDT-□-□	BJX□-DDT-□-□
Sensing type	Through-beam	Polarized retroreflective	Diffuse reflective
Sensing distance	10 m 15 m 30 m	3 m <sup>01)</sup>	100 mm <sup>02)</sup> 300 mm <sup>02)</sup> 1 m <sup>03)</sup>
Sensing target	Opaque materials	Opaque materials	Opaque materials, translucent materials
Min. sensing target	≥ Ø 15 mm	≥ Ø 75 mm	-
Hysteresis	-	-	≤ 20 % of sensing distance
Response time	≤ 1 ms		
Light source	Red Infrared Red	Red	Infrared Red Red
Peak emission wavelength	660 nm 850 nm 660 nm	660 nm	850 nm 660 nm 660 nm
Sensitivity adjustment	YES (Adjuster)	YES (Adjuster)	YES (Adjuster)
Mutual interference prevention	-	YES	YES
Operation mode	Light ON mode - Dark ON mode selectable (Adjuster)		
Indicator	Operation indicator (yellow), stability indicator (green), power indicator (red) <sup>04)</sup>		
Approval	CE, RoHS, ENEC	CE, RoHS, ENEC	CE, RoHS, ENEC

01) Reflector (MS-2A)

02) Non-glossy white paper 100 × 100 mm

03) Non-glossy white paper 300 × 300 mm

04) Only for the emitter

	Through-beam	Polarized retroreflective	Diffuse reflective
Unit weight (packaged)	≈ 95 g (≈ 145 g)	≈ 50 g (≈ 115 g)	≈ 50 g (≈ 100 g)
Cable type	≈ 12 g (≈ 65 g)	≈ 6 g (≈ 75 g)	≈ 6 g (≈ 60 g)
Connector type	≈ 12 g (≈ 65 g)	≈ 6 g (≈ 75 g)	≈ 6 g (≈ 60 g)
Power supply	10-30 VDC± ±10 % (ripple P-P: ≤ 10 %)		
Current consumption	It depends on the sensing type		
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA		
Reflective	≤ 30 mA		
Control output	NPN open collector output / PNP open collector output model		
Load voltage	≤ 30 VDC±		
Load current	≤ 100 mA		
Residual voltage	NPN: ≤ 1 VDC±, PNP: ≤ 2 VDC±		
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit		
Insulation resistance	≥ 20 MΩ (500 VDC± megger)		
Noise immunity	±240 VDC± the square wave noise (pulse width: 1 μs) by the noise simulator		
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min		
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours		
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times		
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx		
Ambient temperature	-25 to 60 °C, storage: -40 to 70 °C (no freezing or condensation) <sup>01)</sup>		
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)		
Protection rating	IP65 (IEC standard)		
Connection	Cable type / Connector type model		
Cable spec.	Ø 4 mm, 3-wire (Emitter: 2-wire), 2 m		
Wire spec.	AWG26 (0.52 mm, 20-core), insulator outer diameter: Ø 1 mm		
Connector	M8 4-pin plug type		
Material	Case: PC, CAP: PC, sensing part: PMMA		

01) UL approved ambient temperature: 40 °C



View product detail

# General

## Photoelectric

### Sensors

#### BM Series



#### Features

- Easy to mount at a narrow space with small size and light weight
- Built-in external sensitivity adjuster (Diffuse reflective type only)
- Easy to mount by screw type in mounting hole
- Built-in reverse power protection circuit and output short overcurrent protection circuit

#### Specifications

Model	BM3M-TDT	BM1M-MDT	BM200-DDT
Sensing type	Through-beam	Retroreflective	Diffuse reflective
Sensing distance	3 m	1 m <sup>01)</sup>	200 mm <sup>02)</sup>
Sensing target	Opaque materials	Opaque materials	Opaque materials, translucent materials
Min. sensing target	≥ Ø 8 mm	≥ Ø 60 mm	-
Hysteresis	-	-	≤ 10 % of sensing distance
Response time	≤ 3 ms		
Light source	Infrared		
Peak emission wavelength	940 nm		
Sensitivity adjustment	-	-	YES (Adjuster)
Operation mode	Dark ON mode	Dark ON mode	Light ON mode (option: Dark ON mode)
Indicator	Operation indicator (red)		
Approval	CE EAC	CE EAC	CE EAC
Unit weight (packaged)	≈ 170 g (≈ 240 g)	≈ 105 g (≈ 188 g)	≈ 88 g (≈ 156 g)

01) Reflector (MS-2)

02) Non-glossy white paper 200 × 200 mm

Power supply	12-24 VDC± ±10 % (ripple P-P: ≤ 10 %)
Current consumption	It depends on the sensing type
Through-beam	Emitter: ≤ 45 mA, receiver: ≤ 45 mA
Reflective	≤ 40 mA
Control output	NPN open collector output
Load voltage	≤ 30 VDC±
Load current	≤ 100 mA
Residual voltage	≤ 1.5 VDC±
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC± megger)
Noise immunity	±240 VDC± the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (= 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-10 to 60 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	-
Connection	Cable type
Cable spec.	Ø 4 mm, 3-wire, 2 m (Emitter: Ø 3 mm, 2-wire, 2 m)
Wire spec.	AWG22 (0.08 mm, 60-core), insulator outer diameter: Ø 1.25 mm
Material	Case: ABS, sensing part: PC (through-beam type) or Acrylic (retroreflective, diffuse reflective type), bracket: SPCC, bolt: SCM, nut: SCM



View product detail

# Side Sensing Photoelectric Sensors

## BMS Series



### Features

- Built-in reverse polarity protection circuit and output short overcurrent protection circuit
- Response time: Max. 1 ms
- Light ON / Dark ON mode selectable by control wire
- Sensitivity adjuster (except for through-beam type)

### Specifications

Model	BMS5M-TDT-□	BMS2M-MDT-□	BMS300-DDT-□
Sensing type	Through-beam	Retroreflective	Diffuse reflective
Sensing distance	5 m	0.1 to 2 m <sup>01)</sup>	300 mm <sup>02)</sup>
Sensing target	Opaque materials	Opaque materials	Opaque materials, translucent materials
Min. sensing target	≥ Ø 10 mm	≥ Ø 60 mm	-
Hysteresis	-	-	≤ 20 % of sensing distance
Response time	≤ 1 ms		
Light source	Infrared		
Peak emission wavelength	940 nm		
Sensitivity adjustment	-	YES (Adjuster)	YES (Adjuster)
Operation mode	Light ON mode - Dark ON mode selectable (control wire)		
Indicator	Operation indicator (red), power indicator (red) <sup>03)</sup>		
Approval	CE ENEC	CE ENEC	CE ENEC
Unit weight	≈ 180 g	≈ 110 g	≈ 100 g

01) Reflector (MS-2)

02) Non-glossy white paper 100 × 100 mm

03) Only for the emitter

Power supply	12-24 VDC≐ ±10 % (ripple P-P: ≤ 10%)
Current consumption	It depends on the sensing type
Through-beam	Emitter: ≤ 50 mA, receiver: ≤ 50 mA
Reflective	≤ 45 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 30 VDC≐
Load current	≤ 200 mA
Residual voltage	NPN: ≤ 1 VDC≐, PNP: ≤ 2.5 VDC≐
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC≐ megger)
Noise immunity	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-10 to 60 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	-
Connection	Cable type
Cable spec.	Ø 5 mm, 4-wire (Emitter: 2-wire), 2 m
Wire spec.	AWG22 (0.08 mm, 60-core), insulator outer diameter: Ø 1.25 mm
Material	Case: ABS, sensing part: PC (through-beam type) or Acrylic (retroreflective, diffuse reflective type), bracket: SPCC, bolt: SCM, nut: SCM



View product detail

# Photoelectric Sensors

## with Synchronous Detection

### BY Series



#### Features

- Small size: W 12 × H 30 × L 16 mm
- Minimize malfunction by extraneous light by synchronizing emitter and receiver
- Reverse power protection circuit, output short overcurrent protection circuit
- Fast response speed: Max.1 ms

#### Specifications

Model	BY□500-TDT
Sensing type	Through-beam
Sensing distance	500 mm
Sensing target	Opaque materials
Min. sensing target	≥ Ø 5 mm
Response time	≤ 1 ms
Light source	Infrared
Peak emission wavelength	940 nm
Operation mode	Dark ON mode
Indicator	Operation indicator (red)
Approval	CE EAC
Unit weight	≈ 150 g
Power supply	12-24 VDC≐ ±10% (ripple P-P: ≤ 10%)
Current consumption	Emitter: ≤ 30 mA, receiver: ≤ 30 mA
Control output	NPN open collector output
Load voltage	≤ 30 VDC≐
Load current	≤ 100 mA
Residual voltage	≤ 1 VDC≐
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC≐ megger)
Noise immunity	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (= 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-10 to 60 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP50 (IEC standard)
Connection	Cable type
Cable spec.	Ø 4 mm, 4-wire (Emitter: 3-wire), 2 m
Wire spec.	AWG22 (0.08 mm, 60-core), insulator outer diameter: Ø 1.25 mm
Material	Case: ABS, sensing part: Acrylic, bracket: SPPC, bolt: SCM, nut: SCM



View product detail

# Photoelectric Sensors

## with Built-In Timer

### BYD Series



#### Features

- Easy installation by compact size
- Superior detection not affected by color of target (convergent reflective type)
- Operation indicator is located on the top (BYD30-DDT-U, BYD50-DDT-U)
- Easy to adjust the response time via timer function (OFF Delay Time: 0.1 to 2 sec)
- Reverse power protection circuit, output short overcurrent protection circuit

#### Specifications

Model	BYD3M-TDT-□	BYD100-DDT	BYD□-DDT-□
Sensing type	Through-beam	Diffuse reflective	Convergent reflective
Sensing distance	3 m	100 mm (01)	10 to 30 mm ±10% <sup>01</sup> 10 to 50 mm ±10% <sup>01</sup>
Sensing target	Opaque materials	Opaque materials, translucent materials	Opaque materials, translucent materials
Min. sensing target	≥ Ø 6 mm	-	-
Hysteresis	-	≤ 25 % of sensing distance	≤ 10 % of sensing distance
Response time	≤ 1 ms	Operation: ≤ 3 ms Return: ≤ 100 ms	Operation: ≤ 3 ms Return: ≤ 100 ms <sup>02</sup>
Light source	Infrared	Infrared	Infrared
Sensitivity adjustment	-	YES (Adjuster)	-
Timer function	-	-	OFF delay mode: 0.1 to 2 sec (Adjuster)
Operation mode	Dark ON mode	Light ON mode	Light ON mode
Indicator	Front	Front	Front / Upper operation indicator model
	Operation indicator (red)		
Approval	CE EAC	CE EAC	CE EAC
Unit weight (packaged)	≈ 80 g (≈ 105 g)	≈ 38 g (≈ 75 g)	≈ 38 g (≈ 75 g)

01) Non-glossy white paper 50 x 50 mm

02) When the timer adjuster is set to min (0.1 sec).

Power supply	12-24 VDC±10% (ripple P-P: ≤ 10%)
Current consumption	It depends on the sensing type
Through-beam	Emitter: ≤ 30 mA, receiver: ≤ 30 mA
Reflective	≤ 35 mA
Control output	Through-beam type : NPN open collector output / PNP open collector output model Diffuse reflective, convergent reflective type : NPN open collector output
Load voltage	≤ 30VDC±
Load current	Through-beam type : ≤ 100 mA Diffuse reflective, convergent reflective type : ≤ 50 mA
Residual voltage	NPN: ≤ 1 VDC±, PNP: ≤ 2.5 VDC±
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC± megger)
Noise immunity	±240 VDC± the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-20 to 65 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	Through-beam, convergent reflective type (front operation indicator model) : IP64 (IEC standard), Others: IP50 (IEC standard)
Connection	Cable type
Cable spec.	Ø 3.5 mm, 3-wire (Emitter: 2-wire), 2 m
Wire spec.	AWG24 (0.08 mm, 40-core), insulator outer diameter: Ø 1 mm
Material	Case: ABS, sensing part: Acrylic, bracket: SPCC, bolt: SCM, nut: SCM, sleeve: Brass, Ni-plate



View product detail

# Front / Side Mount Photoelectric Sensors

## BH Series



### Features

- Easy front (M18 nut) and side (M3 bolt/nut) installation
- NPN open collector / PNP open collector simultaneous output
- Sensing distance:
  - Through-beam type 20 m /
  - Polarized retroreflective type 4 m /
  - Diffuse reflective type 1 m, 300 mm
- Small size: W 14 × H 34.5 × L 28 mm
- M.S.R. (Mirror Surface Rejection) function prevents malfunction from reflective objects such as metals or mirrors (polarized retroreflective type)
- Built-in sensitivity adjuster
- Light ON / Dark ON selectable by switch
- Operation indicator (red), stability indicator (green)
- Reverse power protection circuit, output short overcurrent protection circuit
- Mutual interference prevention function (except through-beam type)
- IP67 protection rating (IEC standard)



View product detail

### Specifications

Model	BH20M-TDT	BH4M-PDT	BH□-DDT	
Sensing type	Through-beam	Polarized retroreflective	Diffuse reflective	
Sensing distance	20 m	4 m <sup>01)</sup>	300 mm <sup>02)</sup>	1 m <sup>03)</sup>
Sensing target	Opaque materials	Opaque materials	-	-
Min. sensing target	≥ Ø 20 mm	≥ Ø 75 mm	-	-
Hysteresis	-	-	≤ 20 % of sensing distance	
Response time	≤ 1 ms			
Light source	Red	Red	Red	Infrared
Peak emission wavelength	660 nm	660 nm	660 nm	850 nm
Sensitivity adjustment	YES (Adjuster)	YES (Adjuster)	YES (Adjuster)	
Mutual interference prevention	-	YES	YES	
Operation mode	Light ON mode - Dark ON mode selectable (Adjuster)			
Indicator	Operation indicator (red), stability indicator (green), power Indicator (green) <sup>04)</sup>			
Approval	CE  ENEC	CE  ENEC	CE  ENEC	
Unit weight (packaged)	≈ 120 g (≈ 190 g)	≈ 60 g (≈ 140 g)	≈ 60 g (≈ 130 g)	

01) Reflector (MS-2A)

02) Non-glossy white paper 100 × 100 mm

03) Non-glossy white paper 300 × 300 mm

04) Only for the emitter

Power supply	12-24 VDC ± 10 % (ripple P-P: ≤ 10%)
Current consumption	It depends on the sensing type
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA
Polarized retroreflective	≤ 30 mA
Diffuse reflective (300 mm)	≤ 30 mA
Diffuse reflective (1 m)	≤ 35 mA
Control output	NPN open collector - PNP open collector simultaneous output
Load voltage	≤ 26.4 VDC
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC, PNP: ≤ 2.5 VDC
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC = megger)
Dielectric strength	1,000 VAC ~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-25 to 55 °C, storage: -40 to 70 °C <sup>01)</sup> (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP67 (IEC standard)
Connection	Cable type
Cable spec.	Ø 4 mm, 4-wire (Emitter: 2-wire), 2.1 m
Wire spec.	AWG24 (0.08 mm, 40-core), insulator outer diameter: Ø 1.03 mm
Material	Case: PC, CAP: PC, sensing part: PMMA

01) UL approved ambient temperature 40°C

# Diffuse Reflective Long-Distance Photoelectric Sensors

## BA Series



### Features

- Realization of long sensing distance (2 m) by special optical design
- Built-in stability indicator
- Sensitivity adjustment function
- 2 color display
- IP64 protection rating (IEC standard)

### Specifications

Model	BA2M-DDT□-□
Sensing type	Diffuse reflective
Sensing distance	2 m <sup>01)</sup>
Sensing target	Opaque materials, translucent materials
Hysteresis	≤ 20 % of sensing distance
Response time	≤ 1 ms
Light source	Infrared
Peak emission wavelength	850 nm
Sensitivity adjustment	YES (Adjuster)
Operation mode	Light ON mode / Dark ON mode model
Indicator	Operation indicator (red), stability indicator (Light ON: orange, Dark ON: green)
Approval	CE ENEC
Unit weight	≈ 50 g
01) Non-glossy white paper 200 × 200 mm	
Power supply	12-24 VDC≐ ±10 % (ripple P-P: ≤ 10%)
Current consumption	≤ 15 mA (output ON: ≤ 30 mA)
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 26.4 VDC≐
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC≐, PNP: ≤ 2.5 VDC≐
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC≐ megger)
Noise immunity	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	100 m/s <sup>2</sup> (≈ 10 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-25 to 55 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP64 (IEC standard)
Connection	Cable type
Cable spec.	∅ 3 mm, 3-wire, 2 m
Wire spec.	AWG24 (0.08 mm, 40-core), insulator outer diameter: ∅ 1 mm
Material	Case: ABS, CAP: PC, sensing part: PC, adjuster: IXEF



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# L 3.7 mm Flat Photoelectric Sensors

## BTF Series



### Features

- Ultra-thin size of only 3.7 mm
  - W 13 × H 19 × L 3.7 mm (Through-beam type)
  - W 13 × H 24 × L 3.7 mm (Diffuse reflective type, BGS reflective type)
- Detection methods and minimum target size
  - Through-beam type (BTF1M): Ø 2 mm
  - Diffuse reflective type (BTF30): Ø 0.2 mm (sensing distance: 10 mm)
  - BGS reflective type (BTF15): Ø 0.2 mm (sensing distance: 10 mm)
- BGS (background suppression) minimizes detection errors from background objects and the color or material of target objects.
- Maximum sensing distance: 1 m (Through-beam type)
- Operation indicator (red) and stability indicator (green) show operation status
- Stainless steel (SUS304) mounting brackets
- IP67 protection rating (IEC standard)



View product detail

### Specifications

Model	BTF1M-TDT□-□	BTF30-DDT□-□	BTF15-BDT□-□
Sensing type	Through-beam	Diffuse reflective	BGS reflective
Sensing distance	1 m	5 to 30 mm <sup>01)</sup>	1 to 15 mm <sup>01)</sup>
Sensing target	Opaque materials	Opaque materials, translucent materials	Opaque materials, translucent materials
Min. sensing target	≥ Ø 2 mm	≥ Ø 0.2 mm <sup>02)</sup>	≥ Ø 0.2 mm non-illuminated objects <sup>02)</sup>
Hysteresis	-	≤ 20% of sensing distance	≤ 5% of sensing distance
Black/white difference	-	-	≤ 15% of sensing distance
Response time	≤ 1 ms		
Light source	Red		
Peak emission wavelength	650 nm		
Operation mode	Light ON mode / Dark ON mode model		
Indicator	Operation indicator (red), stability indicator (green)		
Approval	CE EAC	CE EAC	CE EAC
Unit weight (packaged)	≈ 40 g (≈ 70 g)	≈ 25 g (≈ 40 g)	≈ 25 g (≈ 40 g)
<small>01) Non-glossy white paper 50 × 50 mm</small>			
<small>02) Sensing distance 10 mm</small>			
Power supply	12-24 VDC= ±10 % (ripple P-P: ≤ 10%)		
Current consumption	It depends on the sensing type		
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA		
Reflective	≤ 20 mA		
Control output	NPN open collector output / PNP open collector output model		
Load voltage	≤ 26.4 VDC=		
Load current	≤ 50 mA		
Residual voltage	NPN: ≤ 1 VDC=, PNP: ≤ 2 VDC=		
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit		
Insulation resistance	≥ 20 MΩ (500 VDC= megger)		
Noise immunity	±240 VDC= the square wave noise (pulse width: 1 μs) by the noise simulator		
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min		
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours		
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times		
Ambient illuminance (receiver)	Sunlight: ≤ 10,000 lx, incandescent lamp: ≤ 3,000 lx		
Ambient temperature	-25 to 55 °C, storage: -40 to 70 °C (no freezing or condensation)		
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)		
Protection rating	IP67 (IEC standard)		
Connection	Cable type		
Cable spec.	Ø 2.5 mm, 3-wire (emitter: 2-wire), 2 m		
Wire spec.	AWG 28 (0.08 mm, 19-core), insulator outer diameter: Ø 0.9 mm		
Material	Case: PBT, sensing part: PMMA, bracket: SUS304, bolt: carbon steel, sleeve: SUS304		



# L 7.5 mm Flat Photoelectric Sensors

## BPS Series



### Features

- Easy to mount by flat type
- Realization of 3m sensing distance as small size
- IP67 protection rating (IEC standard)

### Specifications

Model	BPS3M-TDT□-□
Sensing type	Through-beam
Sensing distance	3 m
Sensing target	Opaque materials
Min. sensing target	≥ Ø 5 mm
Response time	≤ 1 ms
Light source	Infrared
Peak emission wavelength	850 nm
Operation mode	Light ON mode / Dark ON mode model
Indicator	Power Indicator of emitter (red), operation indicator of receiver (red)
Approval	CE ENEC
Unit weight	≈ 66 g
Power supply	12-24 VDC± ±10 % (ripple P-P: ≤ 10 %)
Current consumption	Emitter: ≤ 20 mA, receiver: ≤ 20 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 30 VDC±
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC±, PNP: ≤ 2.5 VDC±
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC± megger)
Noise immunity	±240 VDC± the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-25 to 65 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 90 %RH (no freezing or condensation)
Protection rating	IP67 (IEC standard)
Connection	Cable type
Cable spec.	Ø 3 mm, 3-wire (Emitter: 2-wire), 2 m
Wire spec.	AWG24 (0.08 mm, 40-core), insulator outer diameter: Ø 1 mm
Material	Case: PC, bolt: SCM, nut: SCM



View product detail

# Cylindrical Photoelectric Sensors (Front Sensing Type)

## BRQ Series



### Features

- Excellent noise immunity and minimal influence from ambient light
- Reverse power protection circuit, reverse output protection circuit, output short overcurrent protection circuit
- Mutual interference prevention function (except through-beam type)
- Sensitivity adjuster
- Light ON / Dark ON mode selectable by control wire
- Various materials:  
Plastic, Metal (Ni-plated Brass), SUS316L
- Long sensing distance:  
30 m (through-beam type)
- Body size
  - BRQT, BRQM: Standard
  - BRQP: Standard, Short body
- Protection rating
  - BRQT: IP67 (IEC standard), IP69K (DIN standard)
  - BRQM, BRQP: IP67 (IEC standard)



View product detail

### Specifications

Model	BRQ□□-TDT□-□-□	BRQ□3M-PDT□-□-□	BRQ□□-DDT□-□-□
<b>Sensing type</b>	Through-beam	Polarized retroreflective	Diffuse reflective
<b>Sensing distance</b>	5 m    20 m    30 m	3 m <sup>01)</sup>	100 mm <sup>02)</sup> 400 mm <sup>02)</sup> 1 m <sup>03)</sup>
<b>Sensing target</b>	Opaque materials	Opaque materials	Opaque, translucent materials
<b>Min. sensing target</b>	≥ Ø 7 mm	≥ Ø 75 mm	-
<b>Hysteresis</b>	-	-	≤ 20 % of sensing distance
<b>Response time</b>	≤ 1 ms		
<b>Light source</b>	Red	Red	Infrared    Red    Red
<b>Peak emission wavelength</b>	660 nm	660 nm	850 nm    660 nm    660 nm
<b>Sensitivity adjustment</b>	YES (Adjuster)	YES (Adjuster)	YES (Adjuster)
<b>Mutual interference prevention</b>	-	YES	YES
<b>Operation mode</b>	Light ON mode - Dark ON mode selectable (Control wire)		
<b>Indicator</b>	Operation indicator (yellow), stability indicator (green), power indicator (red) <sup>04)</sup>		
<b>Approval</b>	CE    e    SA    US    EAC	CE    e    SA    US    EAC	CE    e    SA    US    EAC

01) Reflector (MS-2A)

02) Non-glossy white paper 100 × 100 mm

03) Non-glossy white paper 300 × 300 mm

04) Only for the emitter

Unit weight (packaged)	Material	Through-beam	Polarized retroreflective, Diffuse reflective
<b>Cable type</b>	SUS316L	≈ 140 g (≈ 220 g)	≈ 70 g (≈ 150 g)
	Brass, Ni-plate	≈ 140 g (≈ 220 g)	≈ 70 g (≈ 150 g)
	Plastic	≈ 110 g (≈ 160 g)	≈ 60 g (≈ 120 g)
	Plastic (short)	≈ 100 g (≈ 150 g)	≈ 50 g (≈ 120 g)
<b>Connector type</b>	SUS316L	≈ 50 g (≈ 160 g)	≈ 30 g (≈ 140 g)
	Brass, Ni-plate	≈ 50 g (≈ 160 g)	≈ 30 g (≈ 140 g)
	Plastic	≈ 25 g (≈ 110 g)	≈ 15 g (≈ 110 g)
	Plastic (short)	≈ 20 g (≈ 100 g)	≈ 10 g (≈ 100 g)

<b>Power supply</b>	10-30 VDC≐ ±10 % (ripple P-P: ≤ 10 %)
<b>Current consumption</b>	It depends on the sensing type
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA
Reflective	≤ 30 mA
<b>Control output</b>	NPN open collector output / PNP open collector output model
Load voltage	≤ 30 VDC≐
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 2 VDC≐, PNP: ≤ 2 VDC≐
<b>Protection circuit</b>	Reverse power/output protection circuit, output short overcurrent protection circuit
<b>Insulation resistance</b>	≥ 20 MΩ (500 VDC≐ megger)
<b>Noise immunity</b>	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator
<b>Dielectric strength</b>	1,000 VAC~ 50/60 Hz for 1 min
<b>Vibration</b>	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient illuminance (receiver)</b>	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
<b>Ambient temperature</b>	-25 to 60 °C, storage: -30 to 70 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
<b>Protection rating</b>	IP67 (IEC standard), SUS316L material model: IP67 (IEC standard), IP69K (DIN standard)
<b>Connection</b>	Cable type / Connector type model
<b>Cable spec.</b>	Ø 4 mm, 4-wire, (Emitter: 2-wire), 2 m
<b>Wire spec.</b>	AWG26 (0.52 mm, 20-core), insulator outer diameter: Ø 1 mm
<b>Connector</b>	M12 4-pin plug type
<b>Material</b>	Case: It depends on the model. (refer to 'Ordering Information'), lens and lens cover: PMMA

# Cylindrical Photoelectric Sensors

(Side Sensing Type)

## BRQ Series



### Features

- Excellent noise immunity and minimal influence from ambient light
- Reverse power protection circuit, reverse output protection circuit, output short overcurrent protection circuit
- Mutual interference prevention function (except through-beam type)
- Sensitivity adjuster
- Light ON / Dark ON mode selectable by control wire
- Protection rating: IP67 (IEC standard)

### Specifications

Model	BRQPS□-TDTA-□-□	BRQPS3M-PDTA-□-□	BRQPS□-DDTA-□-□
Sensing type	Through-beam	Polarized retroreflective	Diffuse reflective
Sensing distance	10 m    20 m	3 m <sup>01)</sup>	100 mm <sup>02)</sup> 400 mm <sup>02)</sup> 700 mm <sup>03)</sup>
Sensing target	Opaque materials	Opaque materials	Opaque, translucent materials
Min. sensing target	≥ Ø 7 mm	≥ Ø 75 mm	-
Hysteresis	-	-	≤ 20 % of sensing distance
Response time	≤ 1 ms		
Light source	Red	Red	Red
Peak emission wavelength	660 nm	660 nm	660 nm
Sensitivity adjustment	YES (Adjuster)	YES (Adjuster)	YES (Adjuster)
Mutual interference prevention	-	YES	YES
Operation mode	Light ON mode - Dark ON mode selectable (Control wire)		
Indicator	Operation indicator (yellow), stability indicator (green), power indicator (red) <sup>04)</sup>		
Approval	CE c  ENEC	CE c  ENEC	CE c  ENEC

01) Reflector (MS-2S)

02) Non-glossy white paper 100 × 100 mm

03) Non-glossy white paper 200 × 200 mm

04) Only for the emitter

Unit weight (packaged)	Through-beam	Polarized retroreflective, Diffuse reflective
Cable type	≈ 120 g (≈ 170 g)	≈ 70 g (≈ 130 g)
Connector type	≈ 35 g (≈ 120 g)	≈ 25 g (≈ 120 g)
Power supply	10-30 VDC≐ ±10 % (ripple P-P: ≤ 10 %)	
Current consumption	It depends on the sensing type	
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA	
Reflective	≤ 30 mA	
Control output	NPN open collector output / PNP open collector output model	
Load voltage	≤ 30 VDC≐	
Load current	≤ 100 mA	
Residual voltage	NPN: ≤ 2 VDC≐, PNP: ≤ 2 VDC≐	
Protection circuit	Reverse power/output protection circuit, output short overcurrent protection circuit	
Insulation resistance	≥ 20 MΩ (500 VDC≐ megger)	
Noise immunity	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator	
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min	
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times	
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx	
Ambient temperature	-25 to 60 °C, storage: -30 to 70 °C (no freezing or condensation)	
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)	
Protection rating	IP67 (IEC standard)	
Connection	Cable type / Connector type model	
Cable spec.	Ø 4 mm, 4-wire, (Emitter: 2-wire), 2 m	
Wire spec.	AWG26 (0.52 mm, 20-core), insulator outer diameter: Ø 1 mm	
Connector	M12 4-pin plug type	
Material	Case: PC, lens and lens cover: PMMA	



View product detail

# Cylindrical Photoelectric Sensors

## BR Series



### Features

- Superior noise resistance with digital signal processing
- High-speed response time under 1 ms
- Built-in reverse power protection circuit and output short overcurrent protection circuit
- Suitable for sensing in narrow space (narrow beam type)
- External sensitivity adjustment
- Light ON / Dark ON mode selectable by control wire
- IP66 protection rating (IEC standard)

### Specifications

Model	BR□200-DDTN-□-□
Sensing type	Narrow beam reflective
Sensing distance	200 mm <sup>01)</sup>
Sensing target	Opaque materials, translucent materials
Hysteresis	≤ 20 % of sensing distance
Response time	≤ 1 ms
Light source	Infrared
Peak emission wavelength	850 nm
Sensitivity adjustment	YES (Adjuster)
Operation mode	Light ON mode - Dark ON mode selectable (Control wire)
Indicator	Operation indicator (red)
Approval	CE ENEC

01) Non-glossy white paper 100 × 100 mm

Unit weight (packaged)	Metal material model	Plastic material model
Cable type	≈ 120 g (≈ 160 g)	≈ 100 g (≈ 140 g)
Connector type	≈ 50 g (≈ 90 g)	≈ 30 g (≈ 70 g)
Power supply	12-24 VDC± ±10 % (ripple P-P: ≤ 10 %)	
Current consumption	≤ 45 mA	
Control output	NPN open collector output / PNP open collector output model	
Load voltage	≤ 30 VDC±	
Load current	≤ 200 mA	
Residual voltage	NPN: ≤ 1 VDC±, PNP: ≤ 2.5 VDC±	
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit	
Insulation resistance	≥ 20 MΩ (500 VDC± megger)	
Noise immunity	±240 VDC± the square wave noise (pulse width: 1 μs) by the noise simulator	
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min	
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times	
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx	
Ambient temperature	-10 to 60 °C, storage: -25 to 75 °C (no freezing or condensation)	
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)	
Protection rating	IP66 (IEC standard)	
Connection	Cable type / Connector type model	
Cable spec.	Ø 5 mm, 4-wire, 2 m	
Wire spec.	AWG22 (0.08 mm, 60-core), insulator outer diameter: Ø 1.25 mm	
Connector	M12 4-pin plug type	
Material	Case: Brass, Ni-plate (metal material model) or PA Black (plastic material model), sensing part: PC lens	



View product detail

# 4-Channel U-Shaped Photoelectric Sensors

## BUM Series



### Features

- Highly reliable 4 channel detection
- High-speed response time under 1 ms
- Built-in reverse power protection circuit and output short overcurrent protection circuit
- IP65 protection rating (IEC standard)

### Specifications

Model	BUM4-40D-W-4M	BUM4-40D-W-□/A	BUM4-40D-W-□/B
Sensing type	Through-beam		
Sensing distance	40 mm		
Sensing target	Opaque materials		
Min. sensing target	≥ Ø 4 mm		
Response time	≤ 1 ms		
Light source	Infrared		
Peak emission wavelength	940 nm		
Operation mode	Dark ON mode		
Indicator	Output Indicator (red), power indicator (green)		
Approval	CE ENEC		
Unit weight (packaged)	≈ 500 g (≈ 510 g)	≈ 500 g (≈ 1.5 kg)	≈ 500 g (≈ 1.5 kg)
Power supply	18-35 VDC± ±10 % (ripple P-P: ≤ 10%)		
Current consumption	≤ 50 mA		
Control output	NPN open collector output (individual 4 output)		
Load voltage	≤ 35 VDC±		
Load current	≤ 100 mA		
Residual voltage	≤ 4 VDC±		
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit		
Insulation resistance	≥ 20 MΩ (500 VDC± megger)		
Noise immunity	±240 VDC± the square wave noise (pulse width: 1 μs) by the noise simulator		
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min		
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours		
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times		
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx		
Ambient temperature	-25 to 65 °C, storage: -25 to 70 °C (no freezing or condensation)		
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)		
Protection rating	IP65 (IEC standard)		
Connection	Cable type		
Cable spec.	Ø 6 mm, 8-wire, 2 m / 3 m / 4 m model		
Wire spec.	AWG22 (1.2 mm, 60-core)		
Material	Case, cover: ABS		



View product detail

# 1-Channel U-Shaped Photoelectric Sensors

## BUP Series



### Features

- Various sensing distance's lineup:  
30 mm, 50 mm models
- High speed response type: Max. 1 ms
- Offers the sensitivity adjustable model
- Light ON / Dark ON operation mode  
selectable by control wire

### Specifications

Model	BUP-□-□		BUP-□-E		BUP-□S-□	
Sensing type	Through-beam					
Sensing distance	30 mm	50 mm	30 mm	50 mm	30 mm	50 mm
Sensing target	Opaque materials					
Min. sensing target	≥ Ø 4 mm				≥ Ø 1.5 mm	
Response time	≤ 1 ms					
Light source	Infrared					
Peak emission wavelength	940 nm					
Sensitivity adjustment	Fixed				YES (Adjuster)	
Operation mode	Light ON mode - Dark ON mode selectable (Control wire)					
Indicator	Operation indicator (red), power indicator (green)					
Approval	CE ENEC		CE		CE ENEC	
Unit weight (packaged)	≈ 85 g (≈ 120 g)	≈ 115 g (≈ 160 g)	≈ 60 g (≈ 95 g)	≈ 90 g (≈ 125 g)	≈ 85 g (≈ 120 g)	≈ 115 g (≈ 160 g)
Power supply	12-24 VDC± ±10 % (ripple P-P: ≤ 10%)					
Current consumption	≤ 30 mA					
Control output	NPN open collector output / PNP open collector output model					
Load voltage	≤ 30 VDC±					
Load current	≤ 200 mA					
Residual voltage	NPN: ≤ 1 VDC±, PNP: ≤ 2.5 VDC±					
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit					
Insulation resistance	≥ 20 MΩ (500 VDC± megger)					
Noise immunity	±240 VDC±: the square wave noise (pulse width: 1 μs) by the noise simulator					
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min					
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours					
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times					
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx					
Ambient temperature	Fixed sensitivity model: -25 to 65 °C, storage: -25 to 70 °C (no freezing or condensation) Sensitivity adjustable model: -10 to 60 °C, storage: -25 to 70 °C (no freezing or condensation)					
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)					
Protection rating	Fixed sensitivity model: IP66 (IEC standard) Sensitivity adjustable model: IP50 (IEC standard)					
Connection	Cable type, cable connector type					
Cable spec.	Cable type: Ø 4 mm, 4-wire, 2 m Cable connector type: Ø 4 mm, 4-wire, 0.5 m					
Wire spec.	AWG22 (0.08 mm, 60-core), insulator outer diameter: Ø 1.25 mm					
Connector	5-pin socket type					
Material	Case: ABS, CAP: PC					



View product detail

# Universal AC / DC Photoelectric Sensors

## BEN Series



### Features

- Small and power supply built-in type
- Easy installation with indicators on product
- Light ON / Dark ON mode selectable by switch
- Status and output indication
- Built-in IC photo diode for disturbing light and electrical noise

### Specifications

Model	BEN10M-T	BEN5M-M	BEN3M-P	BEN300-D
Sensing type	Through-beam	Retroreflective	Polarized retroreflective	Diffuse reflective
Sensing distance	10 m	0.1 to 5 m <sup>01)</sup>	0.1 to 3 m <sup>01)</sup>	300 mm <sup>02)</sup>
Sensing target	Opaque materials	Opaque materials	Opaque materials	Opaque, translucent materials
Min. sensing target	≥ Ø 16 mm	≥ Ø 60 mm	≥ Ø 60 mm	-
Hysteresis	-	-	-	≤ 20 % of sensing distance
Response time	AC/DC power, relay contact output model: ≤ 20 ms DC power, solid state (transistor) output model: ≤ 1 ms			
Light source	Infrared	Infrared	Red	Infrared
Peak emission wavelength	850 nm	940 nm	660 nm	940 nm
Sensitivity adjustment	-	YES (Adjuster)	YES (Adjuster)	YES (Adjuster)
Operation mode	Light ON mode - Dark ON mode selectable (Adjuster)			
Indicator	Operation indicator (red), stability indicator (green), power indicator (red) <sup>03)</sup>			
Approval	CE [RE]			
Unit weight (AC/DC power)	≈ 354 g	≈ 208 g	≈ 208 g	≈ 195 g
Unit weight (DC power)	≈ 342 g	≈ 200 g	≈ 200 g	≈ 187 g

01) Reflector (MS-2)

02) Non-glossy white paper 100 × 100 mm

03) Only for the emitter

Output method	AC/DC power, relay contact output	DC power, solid state (transistor) output
Power supply	24-240 VAC ~ ± 10 % 50/60 Hz 24-240 VDC ≐ ± 10 % (ripple P-P: ≤ 10 %)	12-24 VDC ≐ ± 10 % (ripple P-P: ≤ 10 %)
Power / current consumption	≤ 4 VA	It depends on the sensing type
Through-beam	-	Emitter: ≤ 50 mA, receiver: ≤ 50 mA
Reflective	-	≤ 50 mA
Control output	Relay contact output	NPN open collector - PNP open collector simultaneous output
Contact capacity	250 VAC ~ 3 A of resistance load, 30 VDC ≐ 3 A of resistance load	-
Contact composition	1c	-
Relay life cycle	Mechanical: ≥ 50,000,000 Electrical: ≥ 100,000	-
Load voltage	-	≤ 30 VDC ≐
Load current	-	≤ 200 mA
Residual voltage	-	NPN: ≤ 1 VDC ≐, PNP: ≤ 2.5 VDC ≐
Protection circuit	-	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC ≐ megger)	
Insulation type	Double or strong insulation (dielectric voltage between the measured input and the power: 1 kV)	-
Noise immunity	± 1,000 VDC ≐ the square wave noise (pulse width: 1 μs) by the noise simulator	± 240 VDC ≐ the square wave noise (pulse width: 1 μs) by the noise simulator



View product detail

<b>Dielectric strength</b>	1,000 VAC~ 50/60 Hz for 1 min
<b>Vibration</b>	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Vibration (malfunction)</b>	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 10 min -
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Shock (malfunction)</b>	100 m/s <sup>2</sup> (≈ 10 G) in each X, Y, Z direction for 3 times -
<b>Ambient illuminance (receiver)</b>	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
<b>Ambient temperature</b>	-20 to 65 °C, storage: -20 to 70 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
<b>Protection rating</b>	IP50 (IEC standard)
<b>Connection</b>	Cable type
<b>Cable spec.</b>	Ø 5 mm, Emitter: 2-wire, AC/DC power: 5-wire, DC power: 4-wire, 2 m
<b>Wire spec.</b>	AWG22 (0.08 mm, 60-core), insulator outer diameter: Ø 1.25 mm
<b>Material</b>	Case and case cover: heat resistant ABS, sensing part: PC (polarized retroreflective: PMMA)



# Universal AC / DC Photoelectric Sensors

## BX Series



### Features

- Built-in sensitivity adjuster
- Timer function (built-in timer model)
  - ON Delay, OFF Delay, One-shot Delay
- NPN / PNP open collector simultaneous output (DC power Type)
- Self-diagnosis function  
(green lights up in the stable level)
- Built-in reverse power protection circuit and output short overcurrent protection circuit
- Wide power supply range:  
Universal 24-240 VDC $\equiv$  / 24-240 VAC $\sim$
- IP66 protection rating (IEC standard)

### Specifications

Model	BX15M-T□-□	BX5M-M□-□	BX3M-P□-□	BX700-D□-□
<b>Sensing type</b>	Through-beam	Retroreflective	Polarized retroreflective	Diffuse reflective
<b>Sensing distance</b>	15 m	0.1 to 5 m <sup>01)</sup>	0.1 to 3 m <sup>02)</sup>	700 mm <sup>03)</sup>
<b>Sensing target</b>	Opaque materials	Opaque materials	Opaque materials	Opaque, translucent materials
<b>Min. sensing target</b>	≥ Ø 15 mm	≥ Ø 60 mm	≥ Ø 60 mm	-
<b>Hysteresis</b>	-	-	-	≤ 20 % of sensing distance
<b>Response time</b>	AC/DC power, relay contact output model: ≤ 20 ms DC power, solid state (transistor) output model: ≤ 1 ms			
<b>Light source</b>	Infrared	Infrared	Red	Infrared
<b>Peak emission wavelength</b>	850 nm	940 nm	660 nm	940 nm
<b>Sensitivity adjustment</b>	YES (Adjuster)	YES (Adjuster)	YES (Adjuster)	YES (Adjuster)
<b>Timer mode <sup>04)</sup></b>	OFF, ON Delay, OFF Delay, One Shot Delay mode selectable (Switch): 0.1 to 5 sec (Adjuster)			
<b>Operation mode</b>	Light ON mode - Dark ON mode selectable (Switch)			
<b>Indicator</b>	Operation indicator (yellow), self-diagnosis indicator (green), power indicator (yellow) <sup>05)</sup>			
<b>Approval</b>	CE ENEC	CE ENEC	CE ENEC	CE ENEC
<b>Unit weight</b>	Based on the standard model, timer model: weight + 1 g			
AC/DC power	≈ 225 g	≈ 130 g	≈ 148 g	≈ 115 g
DC power	≈ 211 g	≈ 123 g	≈ 141 g	≈ 116 g

01) Reflector (MS-2)

02) Reflector (MS-3)

03) Non-glossy white paper 200 × 200 mm

04) Only for the timer model

05) Only for the emitter

Output method	AC/DC power, relay contact output	DC power, Transistor solid state output
<b>Power supply</b>	24-240 VAC $\sim$ ± 10 % 50/60 Hz 24-240 VDC $\equiv$ ± 10 % (ripple P-P: ≤ 10 %)	12-24 VDC $\equiv$ ± 10 % (ripple P-P: ≤ 10 %)
<b>Power / current consumption</b>	≤ 3 VA	It depends on the sensing type
Through-beam		Emitter: ≤ 50 mA, receiver: ≤ 50 mA
Reflective		≤ 50 mA
<b>Control output</b>	Relay contact output	NPN open collector - PNP open collector simultaneous output
Contact capacity	250 VAC $\sim$ 3 A of resistance load, 30 VDC $\equiv$ 3 A of resistance load	-
Contact composition	1c	
Relay life cycle	Mechanical: ≥ 50,000,000 Electrical: ≥ 100,000	
Load voltage	-	≤ 30 VDC $\equiv$
Load current		≤ 200 mA
Residual voltage		NPN: ≤ 1 VDC $\equiv$ , PNP: ≤ 2.5 VDC $\equiv$
<b>Self-diagnosis output</b>	-	NPN open collector output <sup>01)</sup>
<b>Protection circuit</b>	-	Reverse power protection circuit, output short overcurrent protection circuit

01) Load voltage: ≤ 30 VDC $\equiv$ , load current: ≤ 50 mA, residual voltage: ≤ 1 VDC $\equiv$  (50 mA), ≤ 0.4 VDC $\equiv$  (16 mA)



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<b>Insulation resistance</b>	≥ 20 MΩ (500 VDC≐ megger)	
<b>Insulation type</b>	Double or strong insulation (dielectric voltage between the measured input and the power : 1.5 kV)	-
<b>Noise immunity</b>	± 1,000 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator
<b>Dielectric strength</b>	1,500 VAC~ 50/60 Hz for 1 min	
<b>Vibration</b>	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours	
<b>Vibration (malfunction)</b>	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 10 min	
<b>Shock</b>	500 m/s <sup>2</sup> (≐ 50 G) in each X, Y, Z direction for 3 times	
<b>Shock (malfunction)</b>	100 m/s <sup>2</sup> (≐ 10 G) in each X, Y, Z direction for 3 times	
<b>Ambient illuminance (receiver)</b>	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx	
<b>Ambient temperature</b>	-20 to 55 °C, storage: -25 to 70 °C (no freezing or condensation)	
<b>Ambient humidity</b>	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)	
<b>Protection rating</b>	IP66 (IEC standard)	
<b>Connection</b>	Terminal type	
<b>Material</b>	Case, lens cover: PC, sensing part: Acrylic, bracket: SPCC, bolt: SCM, nut: SCM	

# Photoelectric Sensors

## for PCB Detection

### BJP Series



#### Features

- 30 mm × 3 mm of rectangular light beam (at 30 mm distance) provides accurate detection of PCBs regardless of holes, incomplete fabrication, protrusions, or intrusions on the boards.
- Background suppression (BGS) sensing method allows stable detection regardless of the color, texture or surface of the background object.
- Sensing distance: 10 to 100 mm (adjustable distance: 20 to 100 mm)
- Switch for selecting Light ON / Dark ON mode
- Reverse power protection circuit, output short overcurrent protection circuit
- IP65 protection rating (IEC standard)

#### Specifications

Model	BJP100-BDT-□
Sensing type	BGS reflective
Sensing distance	10 to 100 mm <sup>01)</sup> (at sensing distance: 100 mm)
Sensing target	Opaque materials
Sensing distance setting	20 to 100 mm <sup>01)</sup>
Hysteresis	≤ 10 % of setting distance <sup>01)</sup>
Response time	≤ 1.5 ms
Light source	Red
Peak emission wavelength	660 nm
Beam spot size	W 3 × L 30 mm (at sensing distance: 30 mm)
Operation mode	Light ON mode - Dark ON mode selectable (Adjuster)
Indicator	Operation indicator (red), stability indicator (green)
Approval	CE ENEC
Unit weight (packaged)	≈ 50 g (≈ 105 g)
<small>01) Non-glossy white paper 100 × 100 mm</small>	
Power supply	12-24 VDC≒ ±10 % (ripple P-P: ≤ 10 %)
Current consumption	≤ 30 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 26.4 VDC≒
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC≒, PNP: ≤ 2 VDC≒
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC≒ megger)
Noise immunity	±240 VDC≒ the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (= 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: ≤ 10,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-25 to 55 °C, storage: -40 to 70°C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP65 (IEC standard)
Connection	Cable type
Cable spec.	∅ 3.5 mm, 3-wire, 2 m
Wire spec.	AWG24 (0.08 mm, 40-core), insulator outer diameter: ∅ 1 mm
Material	Case: PC+ABS, CAP: PC, sensing part: PMMA



View product detail

# Oil-Resistant Photoelectric Sensors

## BJR Series



### Features

- Long sensing distance with lens of high performance: Through-beam type 15 m, diffuse reflective type 1 m, polarized retroreflective type 3 m (MS-2S)
- M.S.R. (Mirror Surface Rejection) function (Polarized retroreflective type)
- Compact size: W 11 × H 32 × L 20 mm
- Light ON / Dark ON operation mode switch
- Built-in sensitivity adjustment adjuster
- Reverse power protection circuit and output short overcurrent protection circuit
- Mutual interference prevention function (except through-beam type)
- Excellent noise immunity and minimal influence from ambient light
- Stronger in the environment with full of cutting fluid or lubricating oil (optimized for automobile and machine tool industry)
- IP67 protection rating (IEC standard), IP67G oil resistance protection rating (JEM standard)



View product detail

### Specifications

Model	BJR15M-TDT-□-□	BJR3M-PDT-□-□	BJR□-DDT-□-□	
Sensing type	Through-beam	Polarized retroreflective	Diffuse reflective	
Sensing distance	15 m	3 m <sup>01)</sup>	100 mm <sup>02)</sup>	1 m <sup>03)</sup>
Sensing target	Opaque materials	Opaque materials	Opaque materials, translucent materials	
Min. sensing target	≥ Ø 12 mm	≥ Ø 75 mm	-	-
Hysteresis	-	-	≤ 20 % of sensing distance	
Response time	≤ 1 ms			
Light source	Infrared	Red	Infrared	Red
Peak emission wavelength	850 nm	660 nm	850 nm	660 nm
Sensitivity adjustment	YES (Adjuster)	YES (Adjuster)	YES (Adjuster)	
Mutual interference prevention	-	YES	YES	
Operation mode	Light ON mode - Dark ON mode selectable (Adjuster)			
Indicator	Operation indicator (yellow), stability indicator (green), power indicator (red) <sup>04)</sup>			
Approval	CE	CE	CE	

01) Reflector (MS-2S)

02) Non-glossy white paper 100 × 100 mm

03) Non-glossy white paper 300 × 300 mm

04) Only for the emitter

Unit weight (packaged)	Through-beam	Polarized retroreflective	Diffuse reflective
Cable type	≈ 95 g (≈ 145 g)	≈ 50 g (≈ 115 g)	≈ 50 g (≈ 100 g)
Cable connector type	≈ 55 g (≈ 105 g)	≈ 30 g (≈ 95 g)	≈ 30 g (≈ 80 g)
Power supply	10-30 VDC≐ ±10 % (ripple P-P: ≤ 10 %)		
Current consumption	It depends on the sensing type		
Through-beam	Emitter: ≤ 20 mA, receiver: ≤ 20 mA		
Reflective	≤ 30 mA		
Control output	NPN open collector output / PNP open collector output model		
Load voltage	≤ 30 VDC≐		
Load current	≤ 100 mA		
Residual voltage	NPN: ≤ 1 VDC≐, PNP: ≤ 2 VDC≐		
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit		
Insulation resistance	≥ 20 MΩ (500 VDC≐ megger)		
Noise immunity	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator		
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min		
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours		
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times		
Ambient illuminance (receiver)	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx		
Ambient temperature	-25 to 60 °C, storage: -40 to 70°C (no freezing or condensation)		
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)		
Protection rating	IP67 (IEC standard), IP67G (JEM standard)		
Connection	Cable type / Cable connector type model		
Cable spec.	Ø 4 mm, 3-wire (emitter: 2-wire), cable type: 2 m, cable connector type: 300 mm		
Wire spec.	AWG26 (0.52 mm, 20-core), insulator outer diameter: Ø 1 mm		
Connector	M12 4-pin plug type		
Material	Case: ABS, CAP: PA12, sensing part: PMMA		



# Color Mark Photoelectric Sensors

## BC Series



### Features

- Outstanding color matching accuracy
  - R.G.B light emitting diodes and 12-bit resolution
  - 2 detection modes (color only / color + intensity)
  - 3-step sensitivity adjustment for each mode (fine, normal, rough)
- External light interference reduction minimizes errors and allows stable detection
- Check reference color with teaching indicator
- Operation indicator (red), stability indicator (green), timer indicator (orange)
- Configure operation functions with external input from wiring
- W 1.24 × L 6.7 mm spot size for detection of tiny targets and color marks
- IP67 protection rating (IEC standard)

### Specifications

Model	BC15-LDT-C-□
Sensing type	Convergent reflective
Sensing distance	15 mm ± 2 mm
Sensing target	Opaque materials, translucent materials
Hysteresis	≤ 20 % of sensing distance (may vary by sensing mode or sensitivity)
Response time	≤ 500 μs
Light source	Full Color (Red, Green, Blue)
Min. spot size	W 1.24 × L 6.7 mm
Sensing mode	C mode (color only) - C+I mode (color + intensity) selectable (SET key or SET cable)
Sensitivity adjustment	YES (SET key or SET cable)
Operation mode	Color match (Normally Open) - Color mismatch (Normally Closed) mode selectable (Adjuster)
Teaching	YES
Timer	OFF-delay mode: 40 ms
Indicator	Operation indicator (red), stability indicator (green), teaching indicator (full color), timer indicator (orange)
Approval	CE ENEC
Unit weight (packaged)	≈ 14 g (≈ 80 g)
Power supply	12-24 VDC= ±10 % (ripple P-P: ≤ 10 %)
Current consumption	≤ 30 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 30 VDC=
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC=, PNP: ≤ 2.5 VDC=
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC= megger)
Noise immunity	±240 VDC= the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Incandescent lamp: ≤ 3,000 lx
Ambient temperature	-10 to 55 °C, storage: -25 to 75 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP67 (IEC standard)
Connection	Connector type
Connector	M12 4-pin plug type
Material	Case: PC, sensing part: Acrylic, bracket: SUS304, bolt: Carbon Steel



View product detail

# Liquid Level Photoelectric Sensors

## BL Series



### Features

- Detects liquid in a transparent / semitransparent pipe diameter Ø6 to 13 mm, thickness 1 mm
- Compact size: W 23 × H 14 × L 13 mm
- Selectable Light ON / Dark ON mode by operation mode switching button
- Easy to check operation status by operation mode indicator [green (Light ON: on, Dark ON: off)], operation indicator [red]
- Built-in reverse power protection circuit and output short overcurrent protection circuit
- Protection bracket (sold separately) helps to minimize the effects of external environment [Ø 12.7 mm (1/2 inch) pipes]
- IP64 protection rating (IEC standard)

### Specifications

Model	BL13-TDT-□
<b>Sensing type</b>	Through-beam
<b>Applicable pipe</b>	Transparent pipes in 1mm thickness (FEP (fluoroplastic) or with equivalent transparency) Using binding band: Ø 6 to 13 mm Using protection bracket: Ø 12.7 mm (1/2 inch)
<b>Sensing target</b>	Liquid in a pipe <sup>01)</sup>
<b>Response time</b>	≤ 2 ms
<b>Light source</b>	Infrared
<b>Peak emission wavelength</b>	950 nm
<b>Operation mode</b>	Light ON mode - Dark ON mode selectable (Button)
<b>Indicator</b>	Operation indicator (red), operation mode indicator (green)
<b>Approval</b>	CE ENEC
<b>Unit weight (packaged)</b>	≈ 13 g (≈ 50 g)
<b>Power supply</b>	12-24 VDC= ±10 % (ripple P-P: ≤ 10 %)
<b>Current consumption</b>	≤ 30 mA
<b>Control output</b>	NPN open collector output / PNP open collector output model
Load voltage	≤ 30 VDC=
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1 VDC=, PNP: ≤ 1 VDC=
<b>Protection circuit</b>	Reverse power protection circuit, output short overcurrent protection circuit
<b>Insulation resistance</b>	≥ 20 MΩ (500 VDC= megger)
<b>Noise immunity</b>	±240 VDC= the square wave noise (pulse width: 1 μs) by the noise simulator
<b>Dielectric strength</b>	1,000 VAC~ 50/60 Hz for 1 min (between all terminals and case)
<b>Vibration</b>	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient illuminance (receiver)</b>	Sunlight: ≤ 3,000 lx, incandescent lamp: ≤ 3,000 lx
<b>Ambient temperature</b>	10 to 55 °C, storage: -25 to 65 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
<b>Protection rating</b>	IP64 (IEC standard)
<b>Connection</b>	Cable type
<b>Cable spec.</b>	Ø 2.5 mm, 3-wire, 1 m
<b>Wire spec.</b>	AWG28 (0.08 mm, 19-core), insulator outer diameter: Ø 0.9 mm
<b>Material</b>	Case: PC

01) This may not detect the liquid with low transparent, with high viscosity, or with floating matters.



View product detail









## A2. Photomicro Sensors

Photomicro sensors are compact sized photoelectric sensors with built-in amplifiers used to detect presence of mechanical parts in equipments.

A2-1	Through-Beam	BS3 Series	Groove-Depth 6.5 mm Photomicro Sensors
		BS4 Series	Groove-Depth 6.5 mm Photomicro Sensors with Built-In Connector
		BS5 Series	Groove-Depth 9 mm Photomicro Sensors
A2-2	Push-Button	BS5-P Series	Push-Button Type Photomicro Sensors

# Groove-Depth 6.5 mm

## Photomicro Sensors

### BS3 Series



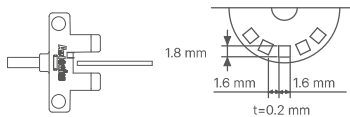
#### Features

- Ultra compact size
- Select appearance depending on the installation environment (K, F, R, U, L type)
- Minimize malfunction and improve visibility
  - Minimize sensing part, gap and flush of the body to reduce malfunctions caused by a foreign substance
  - Built-in the operation indicator can be checked in many directions
- Selectable models for the operation of indicator
  - Indicator turns ON under the light received condition
  - Indicator turns ON under the light interrupted condition
- Resistant structure for shock and vibration
  - Shock 15,000 m/s<sup>2</sup> (approx. 1,500 G)
  - Vibration 10 to 2,000 Hz (1.5 mm double amplitude)
- Selectable operation modes (Light ON / Dark ON)
- High-frequency response: 2 kHz

#### Specifications

Series	BS3
Sensing type	Through-beam
Sensing distance	5 mm
Sensing target	Opaque materials
Min. sensing target	≥ 0.8 mm × 1.8 mm
Hysteresis	≤ 0.05 mm
Response time	Received light: ≤ 20 μs, Interrupted light: ≤ 100 μs
Response frequency <sup>01)</sup>	2 kHz
Light source	Infrared LED
Peak emission wavelength	940 nm
Operation mode	Built-in Light ON / Dark ON
Indicator	Operation indicator (red)
Approval	CE <small>RoHS Compliant</small>
Unit weight	≈ 50 g

01) Response frequency is the value getting from revolving the circle panel below.



Power supply	5-24 VDC≐ ±10% (ripple P-P: ≤ 10%)
Current consumption	≤ 15 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 24 VDC≐
Load current	≤ 50 mA
Residual voltage	NPN: ≤ 1.2 VDC≐, PNP: ≤ 1.2 VDC≐
Protection circuit	Reverse power polarity protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (250 VDC≐ megger)
Noise immunity	± 240 VDC≐ square wave noise (pulse width 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude (max. acceleration 196 m/s <sup>2</sup> ) at frequency of 10 to 2,000 Hz in each X, Y, Z direction for 2 hours
Shock	15,000 m/s <sup>2</sup> (= 1,500 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Fluorescent lamp: ≤ 1,000 lx
Ambient temperature	-20 to 55 °C, storage: -25 to 85 °C (no freezing or condensation environment)
Ambient humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation environment)
Protection rating	IP50 (IEC standard)
Connection method	Cable type
Cable spec.	∅ 2.5 mm, 4-wire, 1 m
Wire spec.	AWG28 (0.08 mm, 19-core), insulator outer diameter: ∅ 0.65 mm
Material	Case: PBT, sensing part: PC



View product detail

# Groove-Depth 6.5 mm

## Photomicro Sensors

### with Built-In Connector

#### BS4 Series



#### Features

- Minimize the external size with the assembled connector insertion part
  - Dedicated sold separately and universal connector cables available
  - Various shapes available for installation flexibility (K, L, R, T, TA, F, Y types)
- Minimize malfunction and improved visibility
  - Minimize sensing part and body level to reduce malfunctions caused by foreign substances
  - Built-in operation indicators viewable from multiple directions
- Selectable models for the operation of indicator
  - Indicator turns ON under the light received condition
  - Indicator turns ON under the light interrupted condition
- Resistant structure for shock and vibration
  - Shock 15,000 m/s<sup>2</sup> (≈ 1,500 G), vibration 10 to 2,000 Hz (1.5 mm double amplitude)
- Selectable operation modes (Light ON / Dark ON)
- High-frequency response: 2 kHz

#### Specifications

Series	BS4
Sensing type	Through-beam
Sensing distance	5 mm
Sensing target	Opaque materials
Min. sensing target	≥ 0.8 mm × 1.8 mm
Hysteresis	≤ 0.05 mm
Response time	Received light: ≤ 20 μs, Interrupted light: ≤ 80 μs
Response frequency	2 kHz <sup>01)</sup>
Light source	Infrared LED
Peak emission wavelength	940 nm
Operation mode	Built-in Light ON / Dark ON
Indicator	Operation indicator (Red)
Approval	CE, RoHS, REACH, ENEC
Unit weight	≈ 2.4 g

01) Response frequency is the value getting from revolving the circle panel below.



Power supply	5-24 VDC= ±10% (ripple P-P: ≤ 10%)
Current consumption	≤ 15 mA
Control output	NPN open collector output / PNP open collector output Model
Load voltage	≤ 24 VDC=
Load current	≤ 50 mA
Residual voltage	NPN: ≤ 1.2 VDC=, PNP: ≤ 1.2 VDC=
Protection circuit	Reverse power polarity protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (250 VDC= megger)
Noise immunity	± 240 VDC= square wave noise (pulse width 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude (max. acceleration 196 m/s <sup>2</sup> ) at frequency of 10 to 2,000 Hz in each X, Y, Z direction for 2 hours
Shock	15,000 m/s <sup>2</sup> (≈ 1,500 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Fluorescent lamp: ≤ 1,000 lx
Ambient temperature	-20 to 55°C, Storage: -25 to 85°C (no freezing or condensation environment)
Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH (no freezing or condensation environment)
Protection rating	IP50 (IEC standard)
Connection method	Connector type
Material	Case: PBT, sensing part: PC



View product detail

# Groove-Depth 9 mm

## Photomicro Sensors

### BS5 Series



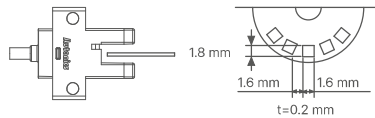
#### Features

- Select appearance depending on the install location (K, T, V, L, Y, F, R, TA type)
- Minimize malfunction and improve visibility
  - Minimize sensing part, gap and flush of the body to reduce malfunctions caused by a foreign substance
  - Built-in U-shaped indicator can be checked in many directions
- Selectable models for the operation of indicator
  - Indicator turns ON under the light received condition
  - Indicator turns ON under the light interrupted condition
- Resistant structure for shock and vibration
  - Shock 15,000 m/s<sup>2</sup> (approx. 1,500 G), vibration 10 to 2,000 Hz (1.5 mm amplitude)
- Selectable operation modes (Light ON / Dark ON) via connector or control wire
- High-frequency response: 2 kHz

#### Specifications

Series	BS5
Sensing type	Through-beam
Sensing distance	5 mm
Sensing target	Opaque materials
Min. sensing target	≥ 0.8 mm × 2 mm
Hysteresis	≤ 0.05 mm
Response time	Received light: ≤ 20 μs, Interrupted light: ≤ 100 μs
Frequency response	2 kHz <sup>01)</sup>
Light source	Infrared LED
Peak emission wavelength	940 nm
Operation mode	Light ON-Dark ON selectable (control wire)
Indicator	Operation indicator (red)
Approval	CE
Unit weight	Cable type: ≈ 50 g, Connector type: ≈ 30 g

01) Response frequency is the value getting from revolving the circle panel below.



Power supply	5-24 VDC≐ ±10 % (ripple P-P: ≤ 10 %)
Current consumption	≤ 30 mA
Control output	NPN open collector / PNP open collector output model
Load voltage	≤ 30 VDC≐
Load current	≤ 100 mA
Residual voltage	NPN: ≤ 1.2 VDC≐, PNP: ≤ 1.2 VDC≐
Protection circuit	Reverse power polarity protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (250 VDC≐ megger)
Noise immunity	The square wave noise (pulse width: 1μs) by the noise simulator ± 240 VDC≐
Dielectric strength	1,000 VAC~ 50/60 Hz for 1 minute
Vibration	1.5 mm double amplitude (max. acceleration 196 m/s <sup>2</sup> ) at frequency of 10 to 2,000 Hz in each X, Y, Z direction for 2 hours
Shock	15,000 m/s <sup>2</sup> (approx. 1,500 G) in each X, Y, Z direction for 3 times
Ambient illumination (receiver)	Fluorescent lamp: ≤ 1,000
Ambient temperature	-20 to 55 °C, storage: -25 to 85 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
Protection rating	IP50 (IEC standard)
Connection method	Cable / Connector type model
Cable spec.	∅ 3 mm, 4-wire, 1 m
Wire spec.	AWG28 (0.08 mm, 19-core), insulator outer diameter: ∅ 0.88 mm
Material	Case: PBT, Sensing part: PC



View product detail

# Push-Button Type Photomicro Sensors

## BS5-P Series



### Features

- Button operation enables accurate detection regardless of material, color, or reflectance of target object
- Optimized for transport detection of semiconductor wafer enclosures (FOUP, FOSB, etc.)
- Optical detection of button operation guarantees 5 million operations of the mechanical life cycle
- Total of 4 red LED indicators (side: 2, top: 2) for higher visibility of operation status
- Increased product durability with steel mounting brackets
- Emitter OFF function and check stable operation functions
- Built-in reverse polarity protection circuit and output short overcurrent protection circuit

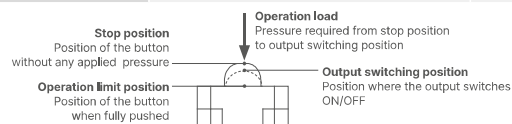


View product detail

### Specifications

Model	BS5-P1M□-□	BS5-P1M□-□-U
Sensing type	Push button type	
Button stop position <sup>01)</sup>	5.0 ± 0.4 mm	
Button output switching position <sup>01)</sup>	4.0 ± 0.5 mm	
Button operation limit position <sup>01)</sup>	≤ 0 mm	
Operation load <sup>01)</sup>	≤ 3 N	
Light source	Infrared LED	
Peak emission wavelength	940 nm	
Emitter OFF	YES (External input <sup>02)</sup> )	
Check stable operation	YES (External input <sup>02)</sup> )	
Operation mode	Light ON (Unpressed button, indicator + output ON) / Dark ON (Pressed button, indicator + output ON) mode model	
Indicator	Operation indicator (red)	
Approval	CE ENEC	CE  UL
Unit weight (packaged)	≈ 30 g (= 50 g)	≈ 30 g (= 50 g)

<sup>01)</sup>



<sup>02)</sup>

External input	NPN output	PNP output
Emitter OFF	Short at 0 V or ≤ 0.25 VDC= (outflow current ≤ 30 mA)	Short at +V or +V ≥ -0.25 VDC= (absorption current ≤ 30 mA)
Emitter ON	Open (leakage current ≤ 0.4 mA)	Open (leakage current ≤ 0.4 mA)
Response time	≤ 1 ms	

Power supply	12~24 VDC= ± 10 % (ripple P-P: ≤ 10 %)
Current consumption	≤ 35 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	≤ 26.4 VDC= =
Load current	≤ 50 mA
Residual voltage	NPN: ≤ 1.5 VDC= =, PNP: ≤ 1.5 VDC= =
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (250 VDC= = megger)
Noise immunity	±240 VDC= = the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ at 50/60 Hz for 1 min
Vibration	1.5 mm double amplitude at 10 to 55 Hz frequency in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (= 50 G) in each X, Y, Z direction for 3 times
Mechanical life cycle	≥ 5,000,000 operations (1 operation = stop position - operation limit position - stop position)
Ambient illumination (receiver)	Fluorescent lamp: ≤ 1,000 lx
Ambient temperature	-20 to 55 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection rating	IP40 (IEC standard)
Connection method	Cable type
Cable spec.	Ø 3 mm, 4-wire, 1 m
Wire spec.	AWG28 (0.08 mm, 19-core), insulator outer diameter: Ø 0.88 mm
BS5-P1M□-□-□	AWG26 (0.08 mm, 30-core), insulator outer diameter: Ø 0.93 mm
BS5-P1M□-□-□-U	AWG26 (0.08 mm, 28-core), insulator outer diameter: Ø 0.9 mm
Material	Case: PC + G, button: POM, sleeve: SUS304
BS5-P1M□-□-□-□	Case: PC + G, button: POM, sleeve: SUS304
BS5-P1M□-□-□-□-U	Case: PC, button: POM, sleeve: SUS304





## A3. Fiber Optic Sensors

Fiber optic sensors combine optic fiber cables and amplifiers to provide accurate detection of objects in various applications.

A3-1	Fiber Optic Amplifiers	BF5 Series	Single / Dual Display Fiber Optic Amplifiers
		BF4 Series	Button Adjustment Fiber Optic Amplifiers
		BF3 Series	Volume Adjustment Fiber Optic Amplifiers
		BFX Series	Dual Display Fiber Optic Amplifiers
		BFC Series	Fiber Optic Amplifier Communication Converters
A3-2	Fiber Optic Units	FT / GT Series	Through-Beam Type Fiber Optic Units
		FD / GD Series	Retroreflective Type Fiber Optic Units
		FL / GL Series	Convergent Reflective Type Fiber Optic Units



# Single / Dual Display

## Fiber Optic Amplifiers

### BF5 Series



#### Features

- Dual-display for light incident level and setting value (BF5 -D)
- Enables to detect the minute object with 1 / 10,000 high resolution
- Enables to detect with high-speed moving object (response time 50  $\mu$ s)
- 5 response times: ultra fast mode (50  $\mu$ s), fast mode (150  $\mu$ s), standard mode (500  $\mu$ s), long distance mode (4 ms), ultra long distance mode (10 ms)
- Anti-saturation setting function prevents malfunction by saturated light
- Easy sensitivity setting
- Long lasting amplifier regardless of element's life degradation or temperature change
- Multiple sensitivity setting modes available: auto-tuning, 1-point (maximum sensitivity), 2-point, positioning teaching
- Up to 8 units enable to connect with mutual interference prevention function using side connectors
- Auto channel setting function for multiple installations
- Adopts red, green, blue light sources
- Slim design with depth 10 mm (W 10 × H 30 × L 70 mm)

#### Specifications

Model	BF5R-D1-□	BF5G-D1-□	BF5B-D1-□
Light source	Red LED	Green LED	Blue LED
Peak emission wavelength	660 nm, modulated	530 nm, modulated	470 nm, modulated
Response time	Standard (500 $\mu$ s), Long distance (4 ms), Ultra long distance (10 ms), Ultra fast (50 $\mu$ s), Fast (150 $\mu$ s) mode		
Sensitivity setting	Manual, Teaching (Auto-tuning, 1-point, 2-point, positioning)		
Operation mode	Light ON, Dark ON		
Measured value display	7-segment LCD, 4-digit (decimal, percentage)		
Operation mode of the timer	OFF, OFF Delay, ON Delay, One-shot		
Max. cascading units	≤ 31 units		
Mutual interference prevention	≤ 8 units		
Indicator	Operation indicator (red), display screen (PV display part: red LED, SV display part: green LED)		
Approval	CE EAC	CE EAC	CE EAC
Unit weight (packaged)	≈ 20 g (≈ 138 g)	≈ 20 g (≈ 138 g)	≈ 20 g (≈ 138 g)
Model	BF5R-S1-□		
Light source	Red LED		
Peak emission wavelength	660 nm, modulated		
Response time	Standard (500 $\mu$ s), Long distance (4 ms), Fast (150 $\mu$ s) mode		
Sensitivity setting	Manual, Teaching (Auto-tuning)		
Operation mode	Light ON, Dark ON		
Measured value display	7-segment LCD, 4-digit (decimal, percentage)		
Operation mode of the timer	OFF Delay (time range: OFF, 10 ms, 40 ms)		
Mutual interference prevention	≤ 8 units		
Indicator	Operation indicator (red), display screen (PV / SV display part: red LED)		
Approval	CE EAC		
Unit weight (packaged)	≈ 20 g (≈ 138 g)		



View product detail

<b>Power supply</b>	12-24 VDC $\pm$ $\pm$ 10% (ripple P-P: $\leq$ 10%)
<b>Current consumption</b>	$\leq$ 50 mA
<b>Control output</b>	NPN open collector output / PNP open collector output model
Load voltage	$\leq$ 24 VDC $\pm$
Load current	$\leq$ 100 mA
Residual voltage	NPN: $\leq$ 1 VDC $\pm$ , PNP: $\leq$ 3 VDC $\pm$
<b>Protection circuit</b>	Reverse power protection circuit, output short over current protection circuit, surge protection circuit
<b>Insulation resistance</b>	$\geq$ 20 M $\Omega$ (500 VDC $\pm$ megger)
<b>Dielectric strength</b>	1,000 VAC $\sim$ 50 / 60 Hz for 1 min
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> ( $\approx$ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient illuminance (receiver)</b>	Sunlight: $\leq$ 11,000 lx, incandescent lamp: $\leq$ 3,000 lx
<b>Ambient temperature</b>	-10 to 50 °C, storage: -20 to 70 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
<b>Protection rating</b>	IP40 (IEC standard)
<b>Connection</b>	Connector cable
<b>Cable spec.</b>	$\varnothing$ 4 mm, 3-wire, 2 m
<b>Wire spec.</b>	AWG22 (0.08 mm, 60-core), insulator outer diameter: $\varnothing$ 1.25 mm
<b>Tightening torque for fiber optic unit</b>	$\geq$ 2kgf
<b>Material</b>	Case: PBT, cover: PC

# Button Adjustment

## Fiber Optic Amplifiers

### BF4 Series



#### Features

- High response time: max. 0.5 ms
- Auto sensitivity setting (button setting) / remote sensitivity setting type
- External synchronization input, mutual interference protection, self-diagnosis
- Reverse power protection and output short overcurrent protection circuit
- Timer function: OFF delay timer approx. 40 ms fixed.  
(standard type, remote sensitivity setting type only)
- Automatically selectable Light ON / Dark ON
- Precise detection of small target and easy to install in the complicated place

#### Specifications

Model	BF4R□□-□	BF4G□□-□
Light source	Red LED	Green LED
Peak emission wavelength	660 nm, modulated	525 nm, modulated
Response time	Built-in 2 differential frequencies (frequency 1: $\leq 0.5$ ms, frequency 2: $\leq 0.7$ ms)	
Sensitivity setting	Button / Remote sensitivity setting	
Operation mode	Light ON / Dark ON selectable	
Self-diagnosis output	YES	
Load voltage	$\leq 30$ VDC $\equiv$	
Load current	$\leq 50$ mA	
Residual voltage	NPN: $\leq 1$ VDC $\equiv$ (load current: 50 mA), $\leq 0.4$ VDC $\equiv$ (load current: 16 mA) PNP: $\leq 2.5$ VDC $\equiv$	
Indicator	Operation indicator (red), stability indicator (green)	
Approval	CE ENEC	CE ENEC
Unit weight (packaged)	$\approx 65$ g ( $\approx 120$ g)	$\approx 65$ g ( $\approx 120$ g)
Power supply	12-24 VDC $\equiv$ $\pm 10\%$ (ripple P-P: $\leq 10\%$ )	
Current consumption	$\leq 45$ mA	
Control output	NPN open collector output / PNP open collector output model	
Load voltage	$\leq 30$ VDC $\equiv$	
Load current	$\leq 100$ mA	
Residual voltage	NPN: $\leq 1$ VDC $\equiv$ (load current: 100 mA), $\leq 0.4$ VDC $\equiv$ (load current: 16 mA) PNP: $\leq 2.5$ VDC $\equiv$	
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit	
Insulation resistance	$\geq 20$ M $\Omega$ (500 VDC $\equiv$ megger)	
Noise immunity	$\pm 240$ VDC $\equiv$ the square wave noise (pulse width: 1 $\mu$ s) by the noise simulator	
Dielectric strength	1,000 VAC $\sim$ 50 / 60 Hz for 1 min	
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Shock	500 m/s <sup>2</sup> ( $\approx 50$ G) in each X, Y, Z directions for 3 times	
Ambient illuminance (receiver)	Sunlight: $\leq 11,000$ lx, incandescent lamp: $\leq 3,000$ lx	
Ambient temperature	-10 to 50 °C, storage: -20 to 70 °C (no freezing or condensation)	
Ambient humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)	
Cable spec.	Standard type: $\varnothing 4$ mm, 4-wire, 2 m External synchronization input, remote sensitivity setting type: $\varnothing 4$ mm, 6-wire, 2 m	
Wire spec.	Standard type: AWG22 (0.08 mm, 60-core), insulator outer diameter: $\varnothing 1.25$ mm External synchronization input, remote sensitivity setting type: AWG24 (0.08 mm, 40-core), insulator outer diameter: $\varnothing 1$ mm	
Material	Case: heat-resistance ABS, cover: PC	



View product detail

# Volume Adjustment

## Fiber Optic Amplifiers

### BF3 Series



#### Features

- Convenient DIN rail mounting type
- Response time: max. 1 ms
- Enables to adjust sensitivity with high accuracy by coarse and fine adjuster
- Selectable Light ON / Dark ON operation mode by control wire
- Reverse power protection and output short overcurrent protection circuit
- Adjustable length with free cut type fiber optic unit

#### Specifications

<b>Model</b>	BF3RX-□
<b>Light source</b>	Red LED
<b>Peak emission wavelength</b>	660 nm, modulated
<b>Response time</b>	≤ 1 ms
<b>Sensitivity setting</b>	Manual sensitivity setting (adjuster)
<b>Operation mode</b>	Light ON / Dark ON selectable (control wire)
<b>Indicator</b>	Operation indicator (red)
<b>Approval</b>	EH
<b>Unit weight</b>	≈ 90 g
<b>Power supply</b>	12-24 VDC≐ ±10% (ripple P-P: ≤ 10%)
<b>Current consumption</b>	≤ 40 mA
<b>Control output</b>	NPN open collector output / PNP open collector output model
<b>Load voltage</b>	≤ 30 VDC≐
<b>Load current</b>	≤ 200 mA
<b>Residual voltage</b>	NPN: ≤ 1 VDC≐, PNP: ≤ 2.5 VDC≐
<b>Protection circuit</b>	Reverse power protection circuit, output short overcurrent protection circuit
<b>Insulation resistance</b>	≥ 20 MΩ (500 VDC≐ megger)
<b>Noise immunity</b>	±240 VDC≐ the square wave noise (pulse width: 1 μs) by the noise simulator
<b>Dielectric strength</b>	1,000 VAC~ 50 / 60 Hz for 1 min
<b>Vibration</b>	1 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient illuminance (receiver)</b>	Sunlight: ≤ 11,000 lx, incandescent lamp: ≤ 3,000 lx
<b>Ambient temperature</b>	-10 to 50 °C, storage: -25 to 70 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
<b>Cable spec.</b>	∅ 5 mm, 4-wire, 2 m
<b>Wire spec.</b>	AWG24 (0.08 mm, 40-core), insulator outer diameter: ∅ 1 mm
<b>Material</b>	Case: ABS, cover: PC



View product detail

# Dual Display

## Fiber Optic Amplifiers

### BFX Series



### Features

- Dual-display for light incident level and setting value
- Enables to detect the minute object with 1/10,000 high resolution
- Enables to detect with high-speed moving object (response time 50  $\mu$ s)
- 5 response times: ultra fast mode (50  $\mu$ s), fast mode (150  $\mu$ s), standard mode (500  $\mu$ s), long distance mode (4 ms), ultra long distance mode (10 ms)
- Anti-saturation setting function prevents malfunction by saturated light
- External input: emitter OFF, remote sensitivity setting, peak reset, output ON/OFF/Keep, energy saving OFF
- Multiple sensitivity setting modes available: auto tuning (fine-adjusting sensitivity) teaching sensitivity setting (button or external input auto-tuning, 1-point, 2-point, positioning)

### Specifications

Model	BFX-D1-□
Light source	Red LED
Peak emission wavelength	660 nm, modulated
Response time	Standard (500 $\mu$ s), Long distance (4 ms), Ultra long distance (10 ms), Ultra fast (50 $\mu$ s), Fast (150 $\mu$ s) mode
Sensitivity setting	Manual, Teaching (Auto-tuning, 1-point, 2-point, positioning)
Operation mode	Light ON, Dark ON
Measured value display	7-segment LCD, 4-digit (decimal, percentage)
Operation mode of the timer	OFF, OFF Delay, ON Delay, One-shot
External input	Teaching sensitivity, initialization of the incident light level, emitter OFF, control output setting, energy saving mode release
Indicator	Operation indicator (red), display screen (PV display part: red LED, SV display part: green LED)
Approval	CE ENEC
Unit weight (packaged)	$\approx$ 16 g ( $\approx$ 115 g)
Power supply	12-24 VDC $\pm$ $\pm$ 10% (ripple P-P: $\leq$ 10%)
Current consumption	$\leq$ 50 mA
Control output	NPN open collector output / PNP open collector output model
Load voltage	$\leq$ 24 VDC $\pm$
Load current	$\leq$ 100 mA
Residual voltage	NPN: $\leq$ 1 VDC $\pm$ , PNP: $\leq$ 3 VDC $\pm$
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit, surge protection circuit
Insulation resistance	$\geq$ 20 M $\Omega$ (500 VDC $\pm$ megger)
Dielectric strength	1,000 VAC $\sim$ 50 / 60 Hz for 1 min
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> ( $\approx$ 50 G) in each X, Y, Z direction for 3 times
Ambient illuminance (receiver)	Sunlight: $\leq$ 11,000 lx, incandescent lamp: $\leq$ 3,000 lx
Ambient temperature <sup>01)</sup>	-10 to 50 °C, storage: -20 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
Protection rating	IP40 (IEC standard)
Connection	Connector cable
Cable spec.	$\varnothing$ 4 mm, 4-wire, 2 m
Wire spec.	AWG22 (0.08 mm, 60-core), insulator outer diameter: $\varnothing$ 1.25 mm
Tightening torque for fiber optic unit	$\geq$ 2kgf
Material	Case: POK, cover: PC

01) 1 to 2 units: -10 to 50 °C, 3 to 8 units: -10 to 35 °C  
 Be cautious about the heat transfer when the number of connected units is more than 8.  
 The ambient temperature varies with the number of connected amplifiers that are mounted on the DIN rail.  
 Be sure to check the temperatures when installing in the enclosed area.



View product detail

# Fiber Optic Amplifier Communication Converters

## BFC Series



### Features

- Sets all Functional performance and parameters from external devices (PC, PLC)
- Supports various communications: RS485 communication, Serial Communication, SW input
- Connected up to 32 amplifiers (BF5 series)
- Slim design with depth 10 mm (W 10 × H 30 × L 70 mm)

### Specifications

<b>Model</b>	BFC-□
<b>Supported amplifier</b>	BF5 Series
<b>Comm. function</b>	RS485, Serial communication, Switch (SW) input
<b>Switch (SW) input</b>	HIGH: 5-24 VDC≒, LOW: 0-1 VDC≒
<b>Function</b>	Real-time monitoring (incident light level, output state), Executes all functions and sets the parameters of BF5 Series via external devices (PC, PLC)
<b>Indicator</b>	TX indicator (red), RX indicator (green), display screen (PV display part: red LED, SV display part: green LED)
<b>Approval</b>	CE ENEC
<b>Unit weight</b>	≈ 15 g
<b>Power supply</b>	12-24 VDC≒ ±10% (using the power supply of the connected amplifier)
<b>Current consumption</b>	≤ 40 mA
<b>Control output</b>	NPN solid-state input / PNP solid-state input model
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient temperature</b>	-10 to 50 °C, storage: -20 to 60 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)
<b>Protection rating</b>	IP40 (IEC standard)
<b>Connection</b>	Connector cable
<b>Cable spec.</b>	Ø 4 mm, 4-wire, 2 m
<b>Wire spec.</b>	AWG22 (0.08 mm, 60-core), insulator outer diameter: Ø 1.25 mm
<b>Material</b>	Case: PBT, cover: PC
<b>Comm. protocol</b>	Modbus RTU



View product detail

# Through-Beam Type Fiber Optic Units

## FT / GT Series



### Features

- Various head types and sensing methods for diverse environments
- Thread, cylindrical, flat, L-shaped, plastic, perpendicular, stainless steel, U-shaped and area detection head types for various user requirements
- Through-beam, retroreflective and convergent reflective methods are available for diverse working conditions

#### \* Icon Overview

- Std.** Standard:  
Fiber optic units for general purpose
- Heat-resistant:  
Fiber optic units for the high-temperature environment (-60 to 350°C)
- Vacuum-resistant:  
Fiber optic units for the high-temperature (-60 to 250°C) and vacuum environment
- Flexible (R1, R2):  
Fiber optic units for withstanding repeated flexing
- Bending-resistant (R5):  
Fiber optic units for withstanding repeated bending

### Line Up

	Standard	Heat-resistant	Vacuum-resistant	Bending-resistant	Flexible
Threaded head 	Std.				
Cylindrical head 	Std.				
Flat head 					
L-shaped head 	Std.				
Molded plastic head 	Std.				
Perpendicular head 					
SUS head 	Std.				
U-shaped head 					
Wide area head 					



View product detail

# Retroreflective Type Fiber Optic Units

## FD / GD Series



### Features

- Various head types and sensing methods for diverse environments
- Thread, cylindrical, flat, L-shaped, plastic, perpendicular, stainless steel, U-shaped and area detection head types for various user requirements
- Through-beam, retroreflective and convergent reflective methods are available for diverse working conditions

#### \* Icon Overview



Standard:  
Fiber optic units for general purpose



Heat-resistant:  
Fiber optic units for the high-temperature environment (-60 to 350°C)



Vacuum-resistant:  
Fiber optic units for the high-temperature (-60 to 250°C) and vacuum environment
























Flexible (R1, R2):  
Fiber optic units for withstanding repeated flexing



Bending-resistant (R5):  
Fiber optic units for withstanding repeated bending

### Line Up

	Standard	Heat-resistant	Vacuum-resistant	Bending-resistant	Flexible
Threaded head 	Std.				
Cylindrical head 	Std.				
Flat head 					
L-shaped head 					
Molded plastic head 	Std.				
Perpendicular head 					
SUS head 	Std.				
Wide area head 					



View product detail



# Convergent Reflective Type Fiber Optic Units






## FL / GL Series



### Features

- Various head types and sensing methods for diverse environments
- Thread, cylindrical, flat, L-shaped, plastic, perpendicular, stainless steel, U-shaped and area detection head types for various user requirements
- Through-beam, retroreflective and convergent reflective methods are available for diverse working conditions

### Line Up

	Standard	Heat-resistant	Vacuum-resistant	Flexible
Flat head (flat view) 	Std.			
Flat head (top view) 	Std.			

### \* Icon Overview



Standard:  
Fiber optic units for general purpose



Heat-resistant:  
Fiber optic units for the high-temperature environment (-60 to 350°C)



Vacuum-resistant:  
Fiber optic units for the high-temperature (-60 to 250°C) and vacuum environment



Flexible (R1, R2):  
Fiber optic units for withstanding repeated flexing



View product detail







## A4. Displacement Sensors

Displacement sensors can measure thickness, width, level difference, disparity, curve, evenness of target objects by detecting the amount of displacement using laser beams.

A4-1	Displacement Sensors	BD Series	Laser Displacement Sensors (Sensor Head and Amplifier Unit)
		BD-C Series	Laser Displacement Sensor Communication Converter

# Laser Displacement Sensor (Sensor Head)

## BD Series



### Features

- Easy maintenance with detachable sensor head / amplifier unit
- Maximum resolution: 1  $\mu\text{m}$  (vary by model)
- Accurate measurement with minimal influence from target color or material
- Interconnection of up to 8 sensor Amplifier units:  
Mutual interference prevention function and auto channel sorting
- Various calculation functions supported (addition, subtraction, average)
- Various filter functions for stable measurement (movement average, differential, median)
- Auto sensitivity adjustment (1-point, 2-point teaching)
- DIN rail and wall mount support (bracket accessory required for wall mount)
- Sensor head: IP67 protection structure
- Extension cables available for various moving applications (sold separately)

### Specifications

#### [Sensor head]

Model	BD-030	BD-065	BD-100
<b>Beam shape</b>	Standard		
Spot diameter (near)	$\approx 290 \times 790 \mu\text{m}$ (25 mm)	$\approx 360 \times 1,590 \mu\text{m}$ (55 mm)	$\approx 480 \times 1,870 \mu\text{m}$ (80 mm)
Spot diameter (reference)	$\approx 240 \times 660 \mu\text{m}$ (30 mm)	$\approx 290 \times 1,180 \mu\text{m}$ (65 mm)	$\approx 410 \times 1,330 \mu\text{m}$ (100 mm)
Spot diameter (far)	$\approx 190 \times 450 \mu\text{m}$ (35 mm)	$\approx 210 \times 830 \mu\text{m}$ (75 mm)	$\approx 330 \times 950 \mu\text{m}$ (120 mm)
<b>Resolution</b> <sup>01)</sup>	1 $\mu\text{m}$	2 $\mu\text{m}$	4 $\mu\text{m}$
<b>Reference distance</b>	30 mm	65 mm	100 mm
<b>Maximum measurement range</b>	20 to 40 mm	50 to 80 mm	70 to 130 mm
<b>Rated measurement ranges</b> <sup>02)</sup>	25 to 35 mm	55 to 75 mm	80 to 120 mm
<b>Linearity</b> <sup>01) 03)</sup>	$\pm 0.1\%$ of F.S.	$\pm 0.1\%$ of F.S.	$\pm 0.15\%$ of F.S.
<b>Temperature characteristic</b> <sup>04)</sup>	0.05% F.S./ $^{\circ}\text{C}$	0.06% F.S./ $^{\circ}\text{C}$	
<b>Power supply</b> <sup>05)</sup>	-		
<b>Light source</b>	Red semiconductor laser (wavelength: 660 nm, IEC 60825-1:2014)		
<b>Optical method</b>	Diffuse reflection		
<b>Laser class</b>	Class 1 (IEC/EN), Class I (FDA (CDRH) CFR Part 1002)	Class 2 (IEC/EN), Class II (FDA (CDRH) CFR Part 1002)	
<b>Output</b>	$\leq 300 \mu\text{W}$	$\leq 1 \text{ mW}$	
<b>Operation Indicator</b>	Power Indicator (red), Laser emission indicator (green), NEAR/FAR indicator (green)		
<b>Connection</b>	Connector type		
<b>Insulation resistance</b>	$\geq 20 \text{ M}\Omega$ (500 VDC= megger)		
<b>Noise immunity</b>	Square shaped noise by noise simulator (pulse width: 1 $\mu\text{s}$ ) $\pm 500\text{V}$		
<b>Dielectric strength</b>	1,000 VAC $\sim$ 50/60 Hz for 1 minute		
<b>Vibration</b>	1.5 mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours		
<b>Shock</b>	300 m/s <sup>2</sup> ( $\approx 30 \text{ G}$ ) in each X, Y, Z direction for 3 times		
<b>Ambient illumination</b>	$\leq 10,000 \text{ lx}$ Incandescent lamp		
<b>Ambient temperature</b>	-10 to 50 $^{\circ}\text{C}$ , Storage: -15 to 60 $^{\circ}\text{C}$ (no freezing or condensation)		
<b>Ambient humidity</b>	$\leq 85\% \text{RH}$ , Storage: $\leq 85\% \text{RH}$ (no freezing or condensation)		
<b>Protection structure</b>	IP67 (IEC Standards, except connector of extension cable)		
<b>Material</b>	Case: Polycarbonate, Sensing part: Glass, Cable: Polyvinyl chloride		
<b>Amplifier unit compatibility</b>	BD Series amplifier unit: 1		
<b>Accessory</b>	Ferrite core (made by TDK co. ZCAT2132-1130), Mounting bracket, Bolt, Nut		
<b>Approval</b>	CE, RoHS, REACH		
<b>Unit weight (packaged)</b>	$\approx 56 \text{ g}$ ( $\approx 209 \text{ g}$ )	$\approx 68 \text{ g}$ ( $\approx 233 \text{ g}$ )	$\approx 68 \text{ g}$ ( $\approx 233 \text{ g}$ )

01) When measuring fixed non-glossy white paper (reference temperature: 25 $^{\circ}\text{C}$ , reference distance, response time: 1 ms, average 128 times).

02) The rated measurement range guarantees linearity.

03) Value indicates the error with respect to the ideal straight line.

04) Value measured by using an aluminum jig fix the sensor head and non-glossy white paper.

05) Using power from the amplifier unit.



View product detail


# Laser Displacement Sensors (Amplifier Unit)

BD-A1



## Specifications

### [Amplifier unit]

Model	BD-A1
Power supply	10 - 30 VDC $\pm$ 10% (when connecting BD-C Series communication converter, 12-30 VDC $\pm$ )
Power consumption <sup>01)</sup>	$\leq$ 2,800 mW (30 VDC $\pm$ )
Control Input <sup>02)</sup>	Timing / Output reset / Laser OFF / Zero-point adjustment / Bank change: No-voltage input
Judgment output (HIGH/GO/LOW)	NPN or PNP open collector output (load current: $\leq$ 100 mA)
Alarm output	NPN or PNP open collector output (load current: $\leq$ 100 mA)
Analog voltage output <sup>03)</sup>	-5 - 5 V, 0 - 5 V, 1 - 5 V (resistance: 100 $\Omega$ , $\pm$ 0.05% F.S., at 10 V)
Analog current output <sup>03)</sup>	4 - 20 mA (load resistance: $\leq$ 350 $\Omega$ , $\pm$ 0.2% F.S., at 16 mA)
Residual voltage	NPN: $\leq$ 1.5 V, PNP: $\leq$ 2.5 V
Protection circuit	Reverse polarity protection circuit, output over current (short-circuit) protection circuit
Response Time	0.33 / 0.5 / 1 / 2 / 5 ms
Min. display unit	1 $\mu$ m
Display type	11 segment (red, green), 6-digit, LED
Display range <sup>04)</sup>	$\pm$ 99.999 mm to $\pm$ 99 mm (4-step adjustment, parameter)
Display period	$\approx$ 100 ms
Insulation resistance	$\geq$ 20 M $\Omega$ (500 VDC $\pm$ megger)
Noise immunity	Square shaped noise by noise simulator (pulse width: 1 $\mu$ s) $\pm$ 500 V
Dielectric strength	1,000 VAC $\sim$ 50/60 Hz for 1 minute
Vibration	1.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	300 m/s <sup>2</sup> (approx. 30 G) in each X, Y, Z direction for 3 times
Ambient temperature	-10 to 50 °C, Storage: -15 to 60 °C (no freezing or condensation)
Ambient humidity	$\leq$ 85%RH, Storage: $\leq$ 85%RH (no freezing or condensation)
Material	Case: PC, Cover: PC, cable: PVC
Connection	Connector type
Sensor head compatibility	BD series sensor head: 1
Accessory	Mounting bracket, Side connector
Protection structure	IP40 (IEC standard)
Approval	CE   
Unit weight (packaged)	$\approx$ 126 g ( $\approx$ 228 g)

01) Power to the load is not included.

02) Use after assigning to external input line.

03) It is possible to use among -5-5V, 0-5V, 1-5V, 4-20mA by parameter setting.

04) Setting range is assigned automatically when connecting sensor head.



View product detail

# Laser Displacement Sensor Communication Converter

## BD-C Series



### Features

- Supports both RS232C and RS485 communication in one device:  
Separate ports for RS232C and RS485
- Connect up to 8 amplifier units
- Can be powered directly by amplifier units without additional wiring
- Support for dedicated device management software (atDisplacement)
  - : Batch parameter settings with save / load function
  - : Monitor measured values and outputs in real-time
- Set communication speed and addresses using DIP switch without connecting to host devices

### Specifications

Model	BD-CRS
Power supply <sup>01)</sup>	-
Power Consumption	≤ 2.3 W
Communication Protocol	Modbus RTU
Connection type	RS-232C, RS-485
Communication speed	9600, 19200, 38400, 115200 bps (default)
Function	Executes every BD-Series feature, sets parameter and real-time monitoring by external device (Master)
Ambient temperature	-10 to 50 °C, Storage: -15 to 60 °C (no freezing or condensation)
Ambient humidity	≤ 85%RH, Storage: ≤ 85%RH (no freezing or condensation)
Vibration	1.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	300 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Protection structure	IP40 (IEC standard)
Material	Case: PC
Accessory	Side connector, Connector for RS485
Sold separately	Communication converter: SCM Series
Approval	CE c US EMI
Unit weight (packaged)	≈ 49 g (≈ 91 g)

<sup>01)</sup> Using power from the amplifier unit. To use BD-C Series communication converter, the amplifier unit needs 12-30 VDC power supply.  
\* It is recommended to use Autonics communication converter. Please use twisted pair wire, which is suitable for RS485 communication.

### Software

Download the installation file and the manuals from the Autonics website.

#### [atDisplacement]

atDisplacement is a PC software for BD series laser displacement sensors. It is available for parameter setting, monitoring and data management. Visit our website ([www.autonics.com](http://www.autonics.com)) to download the user manual and the program.



View product detail









## A5. LiDAR

Laser scanners utilize time-of-flight (ToF) method to measure the round trip time of the infrared laser beam, to accurately detect presence of objects within a wide range area.

A5-1	2D Laser Scanners	LSC Series	2D 270° Laser Scanners
		LSE Series	2D 90° 4-Channel Laser Scanners
		LSE2 Series	2D 90° 1-Channel Laser Scanners

# 2D 270° Laser Scanners

## LSC Series



### Features

- Wide detection range up to 270°, 25 m
- Supports flexible field configuration with a total of 16 field sets (1 set: 3 fields)
- Accurate and stable object detection by supporting various filter functions
- Small size (L 60 × W 60 × H 86 mm) suitable for various installation environments
- Supports Ethernet communication
- Supports atLiDAR dedicated software
- ROS, API supported
- Sold separately
  - Ethernet cable (C18-2R-A, C18-5R-A, C18-10R-A, C48-2R-A, C48-5R-A, C48-10R-A)
  - Power I/O cable (CID-2-VG, CID-5-VG, CID-10-VG, CLD-2-VG, CLD-5-VG, CLD-10-VG)

### Specifications

Model	LSC-C5CT3-ET	LSC-C10CT3-ET	LSC-C25CT3-ET
Environment of use	Indoor		
Emitting property	Infrared laser		
Laser class	CLASS 1		
Wave length band	905 nm		
Max. pulse output power	6 W		
Beam conversion angle	9.5 mrad		
Scanning frequency	15 Hz		
Response time	Typ. 67 ms		
Detection distance range	0.05 to 5 m	0.05 to 10 m	0.05 to 25 m
Max. detection distance of 10 % reflector	5 m	8 m	
Detection distance error	System error: Typ. ± 60 mm, statistical error: Typ. 20 mm (1 σ)		
Min. object size <sup>01)</sup>	At detection distance of 8 m: ≈ 121 mm		
Angular resolution	0.33°		
Aperture angle	270°		
Object reflectivity	> 4 %		
Number of field sets	16 (1 set: Consists of subfields 1, 2, 3)		
Number of field sets that can be used concurrently	1		
Unit weight (package)	≈ 228 g (314 g)		
Approval	CE		
01) Even objects smaller than the set min. object size can be detected depending on the environment.			
Power supply	9 - 28 VDC==		
Power consumption <sup>01)</sup>	< 4 W		
Input	4 Photocoupler inputs - H: ≥ 9 - 28 VDC==, L: ≤ 3 VDC==		
Output signal	NPN-PNP open collector output setting (software)		
Load voltage	9 - 28 VDC==		
Load current	≤ 100 mA		
Residual voltage	≤ 3.0 VDC==		
Insulation resistance	≥ 5 MΩ (500 VDC== megger)		
Dielectric strength	500 VAC~ 50 / 60 Hz for 1 minute		
Vibration	10 sweep cycles in each X, Y, Z axes at sine wave, 10 to 500 Hz, acceleration 5 G		
Vibration (malfunction)	10 minutes in each X, Y, Z axes at sine wave, 10 to 500 Hz, acceleration 5 G		
Vibration (irregular)	5 hours in each X, Y, Z axes at 5 to 250 Hz, 42.4 m/s <sup>2</sup> RMS		
Shock	3 times in each X, Y, Z axes at sine half wave, acceleration 50 G, duration 11 ms 1000 times in each X, Y, Z axes at sine half wave, acceleration 25 G, duration 6 ms 5000 times in each X, Y, Z axes at sine half wave, acceleration 50 G, duration 3 ms		
Shock (malfunction)	6 times in each X, Y, Z axes at sine half wave, acceleration 50 G, duration 11 ms		
Ambient illuminance	≤ 80,000 lx		
Ambient temperature	-10 to 50 °C, storage: -30 to 70 °C (no freezing or condensation)		
Ambient humidity	0 to 95 %RH, storage: 0 to 95 %RH (no freezing or condensation)		
Protection structure	IP67 (IEC standard)		
Connector specification	Power I / O: M12 12-pin, Ethernet: M12 8-pin		
Material	Case: AL, Window: PC		
Comm. protocol	TCP/IP		

01) Excluding power supplied to the load



View product detail

## Software

Download the installation file and the manuals from the Autonics website. Supported devices are different for each software version.

### [atLiDAR (V2.0 or later)]

atLiDAR is the management program for laser scanner parameter settings, status information and monitoring data, etc.

This program communicates with the laser scanner via Ethernet communication.

# 2D

## 90° 4-Channel Laser Scanners

### LSE Series



### Features

- Monitoring zone up to 90 °, 5.6 × 5.6 m
- Supports up to 4 channels
- Small size (W 125 × H 80.3 × L 88 mm) suitable for various installation environments
- Ethernet communication support
- atLiDAR, PC-only software support

### Specifications

Model	LSE-4A5R2
<b>Emitting property</b>	Infrared laser
Laser class	CLASS 1
Wave length band	905 nm
Max. pulse output power	75 W
<b>Response time</b>	Typ. 20 to 80 ms + monitoring time
<b>Scanning mode</b>	Motion and presence
<b>Monitoring zone</b>	0.3 × 0.3 m to 5.6 × 5.6 m <sup>01)</sup>
<b>Front contamination</b>	Normal operation with max. 30 % contamination of one material
<b>Min. size of the scanning target <sup>02)</sup></b>	At detection distance of 3 m: = W 2.1 × H 2.1 × L 2.1 cm At detection distance of 5 m: = W 3.5 × H 3.5 × L 3.5 cm
<b>Angular resolution</b>	0.4°
<b>Aperture angle</b>	90°
<b>Object reflectivity</b>	≥ 2 %
<b>Laser scanner angle</b>	-45°, 0°, 45°
<b>Bracket rotation angle <sup>03)</sup></b>	-5 to 5°
<b>Bracket tilt angle</b>	-3 to 3°
<b>Life expectancy</b>	≤ 6.8 years
<b>Approval</b>	CE
<b>Korean Railway Standards</b>	KRS SG 0068
<b>Unit weight (package)</b>	≈ 0.58 kg (≈ 0.96 kg)
<small>01) At object reflectivity: 10 % 02) At object reflectivity: 90 % (Kodak Gray card R-27, White) 03) Indicates the laser scanner adjustment range.</small>	
<b>Power supply</b>	24 VDC± ± 20 %
<b>Power consumption</b>	≤ 8 W
<b>Communication interface</b>	Ethernet (TCP/IP) 10BASE-T
<b>Input</b>	Photocoupler input H <sup>01)</sup> : ≥ 8 - 30 VDC±, L: ≤ 3 VDC±
<b>Output</b>	PhotoMOS relay output Galvanic isolation, non-polarity Resistive load: 30 VDC± / 24 VAC~, ≤ 80 mA Output resistance: 30 Ω Switching time: t <sub>ON</sub> = 5 ms, t <sub>OFF</sub> = 5 ms
<b>Insulation resistance</b>	≥ 5 MΩ (500 VDC± megger)
<b>Dielectric strength</b>	500 VAC~ 50 / 60 Hz for 1 minute
<b>Vibration</b>	≤ 2 G (18.7 m/s <sup>2</sup> )
<b>Shock</b>	30 G / 18 ms
<b>Ambient illuminance</b>	Sunlight: ≤ 100,000 lx
<b>Ambient temperature <sup>02)</sup></b>	-30 to 60 °C (no freezing or condensation)
<b>Ambient humidity</b>	0 to 95 %RH, storage: 0 to 95 %RH (no freezing or condensation)
<b>Protection structure</b>	IP67 (IEC standard)
<b>Cable spec.</b>	Power, I/O cable: Ø 5 mm, 8-wire, 5 m Ethernet cable: Ø 5 mm, 4-wire, 3 m, shield cable, RJ45 connector
<b>Wire spec.</b>	AWG26 (0.16 mm, 7-core), insulator outer diameter: Ø 1 mm
<b>Material</b>	PC

01) Operates as output test mode and outputs obstacle detection output and error status output.  
02) Ambient temperature in power supplied status is -30 to 60°C and in power cut status is -10 to 60°C.



View product detail

## Software

Download the installation file and the manuals from the Autonics website.

### [atLiDAR]

atLiDAR is the management program for laser scanner installation, parameter settings, status information and monitoring data, etc.

This program communicates with the laser scanner via Ethernet communication.

# 2D 90° 1-Channel Laser Scanners

## LSE2 Series



### Features

- 90° detection angle,  
5.6 × 5.6 m detection range
- Compact size for flexible installation  
(W 120 × H 47.5 × L 89.4 mm)
- Various filter function to prevent malfunction  
due to fog, rain, snow and dusts
- Operation indicator to identify operation  
status and errors:  
check status even in unstable conditions or  
change in installation location
- Ethernet communication supported
- Dedicated software at LiDAR provided:  
PC, Mobile (Android)

### Specifications

Model	LSE2-A5R2-ET
<b>Laser for detection emitting property</b>	Infrared laser: 1
Laser class	CLASS 1
Wave length band	905 nm
Max. pulse output power	27 W
<b>Laser for installation emitting property</b>	Visible light laser: 2
Laser class	CLASS 3R
Wave length band	650 nm
Max. CW <sup>01)</sup> output power	4 mW
<b>Min. object size <sup>02)</sup></b>	OFF, 5, 8, 10, 15, 20, 25, 30, 35, 40 cm
<b>Scanning frequency</b>	25 Hz
<b>Response time</b>	≤ 50 ms + monitoring time
<b>Monitoring zone <sup>03)</sup></b>	≤ 5.6 × 5.6 m
<b>Angular resolution</b>	0.25°
<b>Aperture angle</b>	90°
<b>Object reflectivity <sup>04)</sup></b>	≥ 2 %
<b>Approval</b>	CE
<b>Korean Railway Standards</b>	KRS SG 0068
<b>Unit weight (package)</b>	= 0.8 kg (= 1 kg)

01) Continuous wave

02) It is based on a white reflector.

Even objects smaller than the set min. object size can be detected depending on the environment.

03) At detection distance: 4 m, object reflectivity: 5 %, fog filter level: 0

04) At detection distance: 1.5 m, fog filter level: 0, object size = W 700 × H 300 × L 200 mm

<b>Power supply</b>	24 VDC $\pm$ 15 %
<b>Power consumption</b>	< 10 W
<b>Input</b>	Photocoupler input: 1 H <sup>01)</sup> : ≥ 8 - 30 VDC $\pm$ , L: ≤ 3 VDC $\pm$
<b>Output</b>	PhotoMOS relay output: 2 Resistive load: 30 VDC $\pm$ / 24 VAC $\sim$ , ≤ 80 mA
<b>Vibration</b>	2 G
<b>Shock</b>	30 G / 18 ms
<b>Ambient illuminance</b>	Sunlight: ≤ 100,000 lx
<b>Ambient temperature</b>	-30 to 60 °C, storage: -30 ~ 70 °C (no freezing or condensation)
<b>Ambient humidity</b>	0 to 95 %RH, storage: 0 to 95 %RH (no freezing or condensation)
<b>Protection structure</b>	IP67 (IEC standard)
<b>Cable spec.</b>	Power I / O cable: Ø 5 mm, 8-wire, 5 m Ethernet cable: Ø 5 mm, 4-wire, 3 m, shield cable, RJ45 connector
<b>Wire spec.</b>	AWG26 (0.16 mm, 7-core), insulator outer diameter: Ø 1 mm
<b>Material</b>	Case: AL, Window: PC
<b>Comm. protocol</b>	TCP/IP

01) Operates as output test mode and outputs obstacle detection output and error status output.



View product detail

## Software

Download the installation file and the manuals from the Autonics website. Supported devices are different for each software version.

### [atLiDAR (PC, V2.1 or later)]

atLiDAR is the management program for laser scanner parameter settings, status information and monitoring data, etc.

This program communicates with the laser scanner via Ethernet communication.

### [atLiDAR (mobile)]

atLiDAR is Android only mobile application that can manage monitoring data such as laser scanner parameter settings and status information.

Connect the laser scanner with atLiDAR by connecting the USB-C to Ethernet gender.







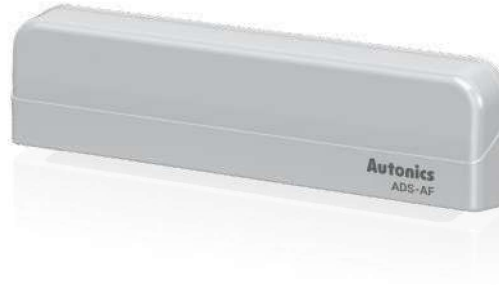
## A6. Door Sensors

Door sensors are special-purpose photoelectric sensors generally used in automatic door management systems.

A6-1	Door Sensors	ADS-A Series	Automatic Door Sensors
A6-2	Door Side Sensors	ADS-SE1/2 Series	Automatic Door Side Sensors

# Automatic Door Sensors

## ADS-A Series



### Features

- Adjustable hold time switch (2, 7, 15 sec)
- 4-step detection angle adjustment (7.5°, 14.5°, 21.5°, 28.5°)
- Adjustable sensing area (left / right area elimination)
- Power supply:  
24 - 240 VAC~ / 24 - 240 VDC= (universal AC / DC type),  
12 - 24 VAC~ / 12 - 24 VDC= (universal AC / DC type)
- Built-in microprocessor
- Max. sensing area : 2460 × 86 mm (installation height 2.7 m)

### Specifications

Model	ADS-A0
Mounting height	2.0 to 2.7 m <sup>01)</sup>
Sensing area	9-point
Sensing method	Infrared reflection method
Output holding time	Time delay = 0.5 sec
Stationary sensing time	2 sec, 7 sec, 15 sec (holding time setting switch)
Interference prevention	H, L (interference prevention switch)
Adjust angle	7.5°, 14.5°, 21.5°, 28.5° (angle adjustment lever)
Eliminate right / left sensing area	(1, 2, 3 area), (7, 8, 9 area) (eliminating right / left sensing area lever)
Light source	Infrared chip diode (modulated)
Indicator	Operation indicator (orange, green, red)
Approval	UL
Weight	≈ 320 g
01) In case of installing the unit higher than 2.7 m height, the unit may not detect small children. In case of installing the unit lower than 2.0 m height the unit may not work normally.	
Power supply	ADS-AF: 24 - 240 VAC~, 50 / 60 Hz, 24 - 240 VDC= (ripple P-P: ≤ 10 %) ADS-AE: 12 - 24 VAC~, 50 / 60 Hz, 12 - 24 VDC= (ripple P-P: ≤ 10 %)
Power consumption	ADS-AF: ≤ 4 VA (≤ 240 VAC~ at 50 / 60 Hz) ADS-AE: ≤ 2 VA (≤ 24 VAC~ at 50 / 60 Hz)
Control output	Relay contact output
Relay contact capacity <sup>01)</sup>	50 VDC= 0.1 A (resistive load)
Relay contact composition	1a
Relay life cycle	Mechanical: ≥ 20,000,000 times, electrical: ≥ 50,000 times
Insulation resistance	≥ 20 MΩ (500 VDC= megger)
Noise immunity	± 2,000 VDC= the square wave noise (pulse width: 1 μs) by the noise simulator
Dielectric strength	1,000 VAC~ 50 / 60 Hz for 1 minute
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	100 m/s <sup>2</sup> (≈ 10 G) in each X, Y, Z direction for 3 times
Ambient illumination (receiver)	Sunlight: ≤ 3,000 lx, incandescent lamp: ≤ 3,000 lx
Ambient temperature	-20 to 50 °C, storage: -20 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Protection	IP50 (IEC standard)
Connection	Cable connector type
Material	Case: ABS, lens: acryl, lens cover: acryl
01) Do not use the load which is beyond the rated capacity of contact point of relay. It may cause bad insulation, contact fusion, bad contact, relay breakdown, and fire etc.	



View product detail

# Automatic Door Side Sensors

## ADS-SE1/2 Series



### Features

- Long sensing distance: 0 to 10 m
- High ambient intensity of illumination: max. 100,000 lx of sunlight
- Easy to connect the sensor head to the controller
- Easy sensitivity setting (automatic sensitivity setting by one push method)
- Self-diagnosis function
- Compact Size (W 77 × L 44 × H 24 mm)

### Specifications

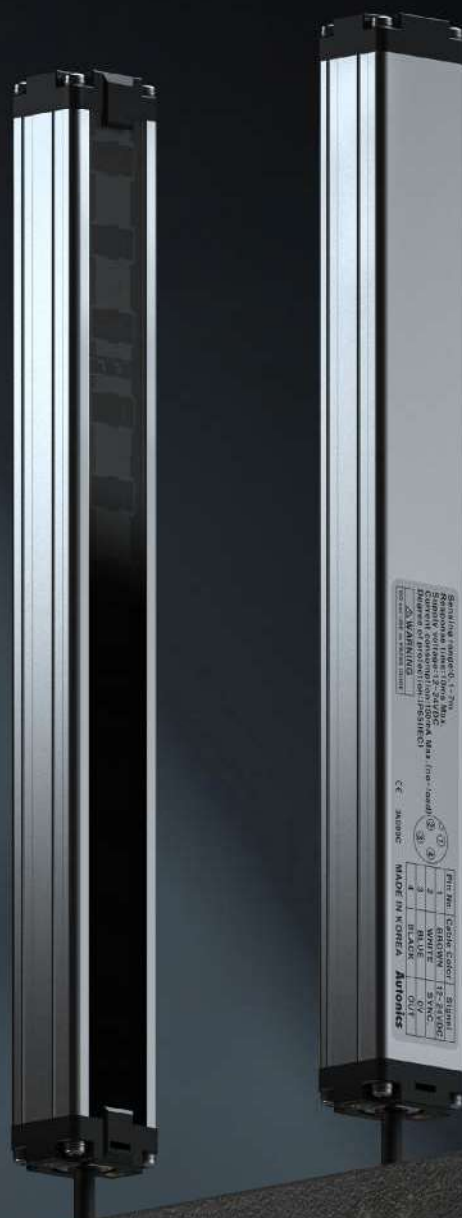
Model	ADS-SE1	ADS-SE2
Available sensor sets	1 channel	2 channels
Sensing distance	0 to 10 m	
Sensing target	Opaque materials	
Min. sensing target	≥ Ø 20 mm	
Sensing method	Through-beam type	
Response time	≈ 50 ms (from interrupted light)	
Output holding time	≈ 500 ms (from received light)	
Light source	Infrared LED (850 nm modulated)	
Indicator	OUT 1 indicator (red), OUT 2 indicator (green)	
Approval	CE ENEC	
Weight (packaged)	≈ 300 g (≈ 450 g)	
Power supply	12 - 24 VAC ~ ± 10 %, 50 / 60 Hz / 12 - 24 VDC = ± 10 % (ripple P-P: ≤ 10 %)	
Power consumption	AC: ≤ 2 VA / DC: ≤ 50 mA	
Control output	Relay contact output	
Relay contact capacity <sup>01)</sup>	50 VDC = 0.3 A (resistive load)	
Relay contact composition	1c	
Relay life cycle	Mechanical: ≥ 5,000,000 times, electrical: ≥ 100,000 times	
Insulation resistance	≥ 20 MΩ (500 VDC = megger)	
Vibration	1 mm double amplitude at frequency of 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours	
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times	
Ambient illumination (receiver)	Sunlight: ≤ 100,000 lx	
Ambient temperature	-20 to 55 °C, storage: -25 to 60 °C (no freezing or condensation)	
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)	
Protection structure	IP30 (IEC standard)	
Connection	Cable connector type	
Sensor cable	Ø 2.4 mm, 1-wire, 5 m	
Wire spec.	AWG26 (0.16 mm, 7-core), insulator outer diameter: Ø 1.32 mm	
Material of the controller	Housing: ABS, cover: ABS, bolt: SCM (brass, Ni-plate)	
Material of the sensor	Holder: ABS, lens: PMMA, lens guide: PC, nut: PC	

<sup>01)</sup> Do not use the load which is beyond the rated capacity of contact point of relay.  
It may cause bad insulation, contact fusion, bad contact, relay breakdown, and fire etc.



View product detail





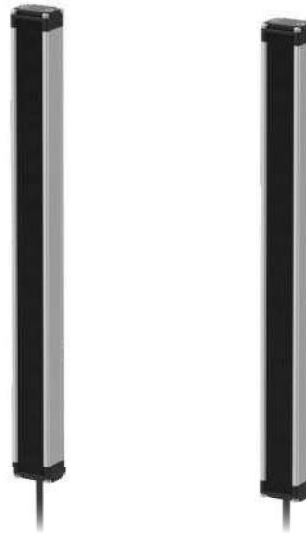
## A7. Area Sensors

Area sensors are convenient, general purpose light screens used to detect passing of objects in specified areas.

A7-1	Area Sensors	BWC Series	Cross-Beam Area Sensors
		BW Series	Single-Beam Area Sensors
		BWP Series	Slim Plastic Single-Beam Area Sensors
		BWPK Series	Slim Plastic Single-Beam Picking Sensors
A7-2	Mapping Sensors	BWM Series	Double-Scan Mapping Sensors (CC-Link, EtherCAT)
		BWML Series	Line-Beam Mapping Sensors (CC-Link, EtherCAT)

# Cross-Beam Area Sensors

## BWC Series



### Features

- 3-point cross-beam type detection minimizes non-detection area
- Long sensing distance up to 7 m
- 14 configurations (number of optics: 4 to 20 / optical pitch: 40, 80 mm / detection area: 120 to 1,040 mm)
- Easy installation with installation mode function
- Mutual interference prevention function, self-diagnosis function
- Self-diagnosis output: sensing screen pollution and blocking of optical axis can be checked from external device
- Bright LED indicators on emitter and receiver
- Korean Railway Standard compliant (BWC80-14HD models)
- IP67 protection structure (IEC standard)

### Specifications

Model	BWC40-□□H	BWC40-□□HD	BWC80-14H	BWC80-14HD
<b>Sensing method</b>	Through-beam			
<b>Beam pattern</b>	3-point cross beam netting type			
<b>Light source</b>	Infrared LED (850 nm modulated light)			
<b>Sensing distance</b>	1.0 to 7.0 m			
<b>Sensing target</b>	Opaque material			
<b>Min. sensing target</b>	≥ Ø 50 mm		≥ Ø 90 mm	
<b>Number of optical axes</b>	4 / 10 / 12 / 16 / 18 / 20		14	
<b>Sensing height</b>	120 to 760 mm		1,040 mm	
<b>Optical axis pitch</b>	40 mm		80 mm	
<b>Response time</b>	≤ 50 ms			
<b>Operation mode</b>	Light ON	Dark ON	Light ON	Dark ON
<b>Functions</b>	Self-diagnosis output (front screen pollution, covering optical axis), self-diagnosis			
<b>Installation mode</b>	YES			
<b>Interference protection</b>	Interference protection by frequency changing setting			
<b>Synchronization type</b>	Timing method by synchronous line			
<b>Indicator</b>	Emitter: Operation indicator (green, red), frequency indicator (green) Receiver: Operation indicator (red, yellow, green)			
<b>Approval</b>	CE ENEC	CE ENEC	CE ENEC	CE ENEC
<b>Korean Railway Standards</b>	-			KRS SG 0068
<b>Weight (packaged)</b>	≈ 1.7 kg (≈ 2.1 kg) (based on BWC80-14H)			
<b>Power supply</b>	12 ~ 24 VDC≡ (ripple P-P: ≤ 10 %)			
<b>Current consumption</b>	≤ 100 mA			
<b>Control output</b>	NPN open collector output			
<b>Load voltage</b>	≤ 30 VDC≡			
<b>Load current</b>	≤ 100 mA (self-diagnosis output: ≤ 50 mA)			
<b>Residual voltage</b>	≤ 1 VDC≡			
<b>Protection circuit</b>	Reverse power protection circuit, output short overcurrent protection circuit			
<b>Insulation resistance</b>	≥ 20 MΩ (500 VDC≡ megger)			
<b>Noise immunity</b>	± 240 V the square wave noise (pulse width: 1μs) by the noise simulator			
<b>Dielectric strength</b>	1,000 VAC~ 50 / 60 Hz for 1minute			
<b>Vibration</b>	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours			
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times			
<b>Ambient illuminance</b>	Ambient light: ≤ 100,000 lx			
<b>Ambient temperature</b>	-10 to 55 °C, storage: -20 to 60 °C (no freezing or condensation)			
<b>Ambient humidity</b>	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)			
<b>Protection rating</b>	IP67 (IEC standard)			
<b>Wire spec.</b>	Ø 5 mm, 4-wire, 300 mm			
<b>Connector spec.</b>	M12 plug connector			
<b>Material</b>	Case: AL, sensing part and indicator: acryl			



View product detail

# Single-Beam Area Sensors

## BW Series



### Features

- 20 mm optical pitch minimizes non-detection area (BW20-□)
- Long sensing distance up to 7 m
- 22 configurations (number of optics : 4 to 48 / optical pitch: 20, 40 mm / detection area: 120 to 940 mm)
- Mutual interference prevention function, self-diagnosis function, stable operation test
- Bright LED indicators on emitter and receiver
- Ambient illuminance : 100,000 lux (upgraded feature)
- IP65 protection structure (IEC standard)

### Specifications

Model	BW20-□(P)	BW40-□(P)
Sensing method	Through-beam	
Light source	Infrared LED (850 nm modulated light)	
Sensing distance	0.1 to 7.0 m	
Sensing target	Opaque material	
Min. sensing target	≥ Ø 30 mm	≥ Ø 50 mm
Number of optical axes	8 to 48	4 to 24
Sensing height	140 to 940 mm	120 to 920 mm
Optical axis pitch	20 mm	40 mm
Response time	≤ 10 ms	
Operation mode	Light ON	
Functions	Emitter OFF (external diagnosis), self-diagnosis	
Interference protection	Interference protection by MASTER / SLAVE function <sup>01)</sup>	
Synchronization type	Timing method by synchronous line	
Indicator	Emitter: Operation indicator (green, red), receiver: Operation indicator (red, yellow, green)	
Approval	CE ENEC	CE ENEC
Weight (packaged)	≈ 1.4 kg (≈ 2.1 kg) (based on BW20-48)	≈ 1.4 kg (≈ 2.1 kg) (based on BW40-24)
<small>01) Connect '(TEST)M/S' of SLAVE emitter to 'SYNC' of MASTER. Refer to the product manual.</small>		
Power supply	12 - 24 VDC≐ (ripple P-P: ≤ 10 %)	
Current consumption	Emitter / receiver: ≤ 120 mA	
Control output	NPN or PNP open collector output	
Load voltage	≤ 30 VDC≐	
Load current	≤ 100 mA	
Residual voltage	NPN: ≤ 1 VDC≐, PNP: ≤ 2.5 VDC≐	
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit	
Insulation resistance	≥ 20 MΩ (500 VDC≐ megger)	
Noise immunity	± 240 V the square wave noise (pulse width 1μs) by the noise simulator	
Dielectric strength	1,000 VAC~ 50 / 60 Hz for 1minute	
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times	
Ambient illumination (receiver)	Ambient light: ≤ 100,000 lx	
Ambient temperature	-10 to 55 °C, storage: -20 to 60 °C (no freezing or condensation)	
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)	
Protection rating	IP65 (IEC standard)	
Cable spec.	Ø 5 mm, 4-wire, 300 mm	
Connector spec.	M12 plug connector	
Material	Case: AL, front cover and sensing part: acryl	



View product detail



# Slim Plastic Single-Beam Area Sensors

## BWP Series



### Features

- Flat body (13 mm) area sensors with Fresnel lens
- High strength PC / ABS plastic body
- High-speed response time under 7ms
- 4 configurations (optical axis: 8 to 20, detection area: 140 to 380 mm)
- Operation test (emitter stop) function, mutual interference prevention function, Job indicator ON/FLASHING switch, Light ON / Dark ON operation mode switch
- Bright LED indicators on emitter and receiver
- IP40 protection structure (IEC standard)

### Specifications

Model	BWP20-08(P)	BWP20-12(P)	BWP20-16(P)	BWP20-20(P)
<b>Sensing method</b>	Through-beam			
<b>Light source</b>	Infrared LED (850 nm modulated light)			
<b>Sensing distance</b>	0.1 to 5.0 m			
<b>Sensing target</b>	Opaque material			
<b>Min. sensing target</b>	≥ Ø 30 mm			
<b>Number of optical axes</b>	8	12	16	20
<b>Sensing height</b>	140 mm	220 mm	300 mm	380 mm
<b>Optical axis pitch</b>	20 mm			
<b>Response time</b>	≤ 6 ms (frequency B: ≤ 7 ms)			
<b>Operation mode</b>	Light ON / Dark ON (switch)			
<b>Functions</b>	Emitter OFF, operation mode change, Job indicator ON / flashing			
<b>Interference protection</b>	Interference protection by transmission frequency selection			
<b>Synchronization type</b>	Timing method by synchronous line			
<b>Indicator</b>	Emitter: frequency A indicator (green), frequency B indicator (yellow) Receiver: operation indicator (red), stable indicator (green) Emitter / receiver: Job indicator (red)			
<b>Approval</b>	CE ENEC		CE ENEC	
<b>Weight (packaged)</b>	≈ 280 g (≈ 480 g)	≈ 320 g (≈ 520 g)	≈ 360 g (≈ 620 g)	≈ 430 g (≈ 680 g)
<b>Power supply</b>	12 ~ 24 VDC $\equiv$ (ripple P-P: ≤ 10 %)			
<b>Current consumption</b>	Emitter / receiver: ≤ 80 mA			
<b>Control output</b>	NPN / PNP open collector output model			
<b>Load voltage</b>	≤ 30 VDC $\equiv$			
<b>Load current</b>	≤ 150 mA			
<b>Residual voltage</b>	NPN: ≤ 1 VDC $\equiv$ , PNP: ≤ 2.5 VDC $\equiv$			
<b>Protection circuit</b>	Reverse power protection circuit, output short overcurrent protection circuit			
<b>Insulation resistance</b>	≥ 20 MΩ (500 VDC $\equiv$ megger)			
<b>Noise immunity</b>	± 240 V the square wave noise (pulse width: 1μs) by the noise simulator			
<b>Dielectric strength</b>	1,000 VAC~ 50 / 60 Hz for 1minute			
<b>Vibration</b>	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours			
<b>Shock</b>	500 m/s <sup>2</sup> (= 50 G) in each X, Y, Z direction for 3 times			
<b>Ambient illumination (receiver)</b>	Ambient light: ≤ 100,000 lx			
<b>Ambient temperature</b>	-10 to 55 °C, storage: -20 to 60 °C (no freezing or condensation)			
<b>Ambient humidity</b>	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)			
<b>Protection rating</b>	IP40 (IEC standard)			
<b>Cable spec.</b>	Ø 3.5 mm, 4-wire, 3 m			
<b>Wire spec.</b>	AWG 24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm			
<b>Material</b>	Case: PC / ABS, sensing part: PMMA			



View product detail

# Slim Plastic Single-Beam Picking Sensors

## BWPK Series



### Features

- Flat and compact size:  
W 30 × H 140 × D 9.9 mm
- High strength PC / ABS plastic body
- Sensing distance switch  
(long / short mode switch)
- Mutual interference prevention function  
(frequency switching), Picking indicators  
on emitter and receiver, Light ON / Dark ON  
operation mode switch
- IP40 protection structure (IEC standard)

### Specifications

<b>Model</b>	<b>BWPK25-05(P)</b>
<b>Sensing method</b>	Through-beam
<b>Light source</b>	Infrared LED (850 nm modulated light)
<b>Sensing distance</b>	Long / Short mode (switch)
Long mode	0.1 to 3.0 m
Short mode	0.05 to 1.0 m
<b>Sensing target</b>	Opaque material
<b>Min. sensing target</b>	≥ Ø 35 mm
<b>Number of optical axes</b>	5
Sensing height	100 mm
Optical axis pitch	25 mm
<b>Response time</b>	≤ 30 ms
<b>Operation mode</b>	Light ON / Dark ON (switch)
<b>Functions</b>	Selection for sensing distance, selection for operation mode, Picking indicator ON / flashing
<b>Interference protection</b>	Interference protection by transmission frequency selection
<b>Synchronization type</b>	Timing method by synchronous line
<b>External picking input</b>	Non-contact or contact input NPN open collector output: lighting (0 - 2 V), light out (5 - 30 V or open) PNP open collector output: lighting (4 - 30 V), light out (0 - 3 V or open)
<b>Indicator</b>	Emitter / receiver: operation indicator (red, green, yellow)
<b>Approval</b>	CE ENEC
<b>Weight (packaged)</b>	≈ 180 g (≈ 220 g)
<b>Power supply</b>	12 - 24 VDC≐ (ripple P-P: ≤ 10 %)
<b>Current consumption</b>	Emitter / receiver: ≤ 60 mA
<b>Control output</b>	NPN / PNP open collector output model
Load voltage	≤ 30 VDC≐
Load current	≤ 150 mA
Residual voltage	NPN: ≤ 1 VDC≐, PNP: ≤ 2.5 VDC≐
<b>Protection circuit</b>	Reverse power protection circuit, output short overcurrent protection circuit
<b>Insulation resistance</b>	≥ 20 MΩ (500 VDC≐ megger)
<b>Noise immunity</b>	± 240 V the square wave noise (pulse width: 1μs) by the noise simulator
<b>Dielectric strength</b>	1,000 VAC~ 50 / 60 Hz for 1minute
<b>Vibration</b>	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient illum. (receiver)</b>	Sunlight: 10,000 lx, incandescent lamp: 3,000 lx
<b>Ambient temp.</b>	-10 to 55 °C, storage: -20 to 60 °C (no freezing or condensation)
<b>Ambient humi.</b>	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
<b>Protection rating</b>	IP40 (IEC standard)
<b>Cable spec.</b>	Ø 4 mm, 4-wire, 2 m (emitter: 3-wire)
<b>Wire spec.</b>	AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
<b>Material</b>	Case: PC / ABS, sensing part: PMMA



View product detail

# Double-Scan Mapping Sensors (CC-Link, EtherCAT)


## BWM Series



### Features

- Stable glass substrate detection with using double scan method
- Sensing distance: glass G size +30 %
- Customized models available: sensing channels (4 to 62 channels), optical axis pitch (25 to 200 mm)
- Communication output: CC-Link (ver 1.1, 2.0), EtherCAT
- Easy installation with installation instruction mode
- Mutual interference prevention, bent optical axis alarm, 9-stage sensing level setting, emitter error alarm
- Bright status indicators on slave units

### Specifications

Model	BWM
Sensing method	Through-beam
Beam pattern	Double scan type
Light source	Infrared LED (850 nm modulated light)
Sensing distance	Glass + 30 %
Sensing target	Transparent or opaque glass plate
CH ordering orientation <sup>01)</sup>	Forward (bottom = 1 CH) / Backward (top = 1 CH)
Sensing CH <sup>01)</sup>	4 to 62 CH
Optical axis pitch <sup>01)</sup>	25 to 200 mm
Response time	≤ 120 ms
Operation mode <sup>01)</sup>	Light ON / Dark ON
Function	Installation guide mode, sensing level setting, optical axis misalignment alarm (low light intensity alarm), emitter damage alarm, self-diagnosis
Interference protection	Interference protection by transmission frequency selection
Synchronization type	Timing method by synchronous line
Indicator	Output indicator (red), stability indicator (green), status indicator (green, yellow, red)
Approval	CE  <sup>02)</sup>
Weight (packaged)	CC-Link: ≈3.2 kg (≈ 5.3 kg) (based on BWM82-24CLD-T, BWM28-50ECD-T) EtherCAT: ≈3.42 kg (≈ 5.52 kg) (based on BWM28-50ECD-T)

01) This product is order made.

02) Please refer to the website for KC certification model.

Power supply	24 VDC≐ (ripple P-P: ≤ 10 %)
Current consumption	Master: ≤ 200 mA, slave: ≤ 150 mA
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC≐ megger)
Noise immunity	The square wave noise by the noise simulator (voltage: 500 V, period: 10 ms, pulse width: 1 us)
Dielectric strength	Between all power input terminals and F.G. terminal : 500 VAC~ 50 / 60 Hz for 1 min Between all CC-Link communication input terminals and F.G. terminal: 1,000 VAC~ 50 / 60 Hz for 1 min Between all power input terminals and CC-Link communication input terminals: 1,000 VAC~ 50 / 60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	210 m/s <sup>2</sup> (≈ 21 G) in each X, Y, Z direction for 3 times
Ambient illumination	Light bulb: 5,000 lx, semiconductor: 5,000 lx
Ambient temperature	15 to 35 °C, storage: 15 to 35 °C (no freezing or condensation)
Ambient humidity	35 to 85 %, storage: 35 to 85 % (no freezing or condensation)
Cable spec.	∅ 5 mm, 6-wire, 250 mm
Connector spec.	M17 plug connector
Output connector spec.	Connector type: 4-pin, 6-pin connector (5.08 mm pitch) / terminal type: 10-pin terminal
Material	Case: AL / ABS, sensing part and Indicator part: PMMA
Comm. protocol	CC-Link, EtherCAT



View product detail

# Line-Beam Mapping Sensors (CC-Link, EtherCAT)

## BWML Series



### Features

- Stable glass substrate detection using line beam detection with minimal non-detection area
- Sensing distance: 95 ± 10 mm
- Customized models available: sensing channels (4 to 62 CH), sensing target pitch (≥ 20 mm), sensing area (280 to 1,775 mm)
- Communication output: CC-Link (ver 1.1, 2.0)
- Easy installation with installation instruction mode and background sensing mode
- Channel interference alarm, 5-stage sensing level setting, emitter / receiver error alarm
- Bright status indicators

### Specifications

Model	BWML
Sensing method	Diffuse reflective type
Beam pattern	Line-beam type
Light source	Infrared LED (850 nm modulated light)
Sensing distance	95 mm ± 10 mm
Sensing target	Transparent or opaque glass plate
CH ordering orientation <sup>01)</sup>	Forward (bottom = 1 CH) / Backward (top = 1 CH) (parameter setting)
Sensing CH <sup>01)</sup>	4 to 62 CH
Sensing target pitch <sup>01)</sup>	20 mm to ordered specification
Response time	≤ 120 ms
Operation mode <sup>01)</sup>	Light ON / Dark ON (parameter setting)
Function	Background sensing mode, installation guide mode, sensing level setting, output option, self-diagnosis
Indicator	Output indicator (red), stability indicator (green), status indicator (green, yellow, red)
Approval	CE  <sup>02)</sup> CC-Link
Weight (packaged)	≈ 3.64 kg (≈ 4.8 kg) (based on BWML82-20CLL, BWML82-20ECL)
Power supply	24 VDC= (ripple P-P: ≤ 10 %)
Current consumption	≤ 1.0 A
Protection circuit	Reverse power protection circuit, output short overcurrent protection circuit
Insulation resistance	≥ 20 MΩ (500 VDC= megger)
Noise immunity	The square wave noise by the noise simulator (voltage: 500 V, period: 10 ms, pulse width: 1 us)
Dielectric strength	Between all power input terminals and F.G. terminal : 500 VAC~ 50 / 60 Hz for 1 min Between communication input terminals and F.G. terminal : 1,000 VAC~ 50 / 60 Hz for 1 min Between power input terminals and communication input terminals: 1,000 VAC~ 50 / 60 Hz for 1 min
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	210 m/s <sup>2</sup> (≈ 21 G) in each X, Y, Z direction for 3 times
Ambient temperature	15 to 35 °C, storage: -10 to 50 °C (no freezing or condensation)
Ambient humidity	35 to 55 %, storage: 35 to 85 % (no freezing or condensation)
Protection rating	IP40 (IEC standard)
Material	Case: AL, sensing part and Indicator part: PMMA
Comm. protocol	CC-Link, EtherCAT

01) This product is order made.

02) Please refer to the website for KC certification model.



View product detail



PRD18-7D-IL2

BRN : L+ 12-24VDC max

BLK : C/Q 100mA

DD-IV

max

200611A

HYDREA

Autonics

## A8. Proximity Sensors

Proximity sensors are common, reliable, and durable solutions for applications requiring non-contact detection.

A8-1	Inductive	PRD Series	Cylindrical Inductive Long-Distance Proximity Sensors (DC 3-Wire)
			Cylindrical Inductive Long-Distance Proximity Sensors (DC 2-Wire)
			Cylindrical Inductive Long-Distance Proximity Sensors (IO-Link)
		PR Series	Cylindrical Inductive Proximity Sensors (DC 3-Wire)
			Cylindrical Inductive Proximity Sensors (DC 2-Wire)
			Cylindrical Inductive Proximity Sensors (AC 2-Wire)
		PRFD Series	Cylindrical Inductive Full-Metal Long-Distance Proximity Sensors (DC 2-Wire)
		PRF Series	Cylindrical Inductive Full-Metal Proximity Sensors (DC 2-Wire)
		PET Series	Cylindrical Inductive Transmission Couplers
		PS Series	Rectangular Inductive Proximity Sensors (DC 3-Wire, □ 8 / 12 / 50 mm)
			Rectangular Inductive Proximity Sensors (DC 3-Wire, □ 17 / 25 / 30 / 40 mm)
			Rectangular Inductive Proximity Sensors (DC 2-Wire)
Rectangular Inductive Proximity Sensors (AC 2-Wire)			
AS Series	Rectangular Inductive Long-Distance Proximity Sensors (DC 4-Wire)		
PFI Series	Rectangular Flat-Type Inductive Proximity Sensors (DC 3-Wire)		
	Rectangular Flat-Type Inductive Proximity Sensors (AC 2-Wire)		
A8-2	Capacitive	CR Series	Cylindrical Capacitive Proximity Sensors (DC 3-Wire)
			Cylindrical Capacitive Proximity Sensors (AC 2-Wire)
A8-3	Magnetic	MU Series	U-Shaped Magnetic Proximity Sensors

# Cylindrical Inductive Long-Distance Proximity Sensors (DC 3-Wire)

## PRD Series



### Features

- Spatter-resistant type:  
PTFE coated for high heat resistance  
(prevent malfunction from welding spatter)
- Operation indicator (red LED)
- IP67 Protection structure (IEC standards)
- Strain relief cables:  
improved flexural strength of  
cable connecting component  
(except DIA. of sensing side Ø 8 mm )

### Specifications

Installation	Flush type			
General	PRD□08-2D □	PRD□12-4D □	PRD□18-7D □	PRD□30-15D □
Spatter-resistant	-	PRD□12-4D □	PRD□18-7D □	PRD□30-15D □
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	2 mm	4 mm	7 mm	15 mm
Setting distance	0 to 1.4 mm	0 to 2.8 mm	0 to 4.9 mm	0 to 10.5 mm
Hysteresis	≤ 15 % of sensing distance			
Standard sensing target: iron	8 × 8 × 1 mm	12 × 12 × 1 mm	20 × 20 × 1 mm	45 × 45 × 1 mm
Response frequency <sup>01)</sup>	1 kHz	500 Hz	300 Hz	100 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 15 %)			
Indicator	Operation indicator (red)			
Approval	CE EAC	CE EAC	CE EAC	CE EAC
Installation	Non-flush type			
General	PRD□08-4D □	PRD□12-8D □	PRD□18-14D □	PRD□30-25D □
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Setting distance	0 to 2.8 mm	0 to 5.6 mm	0 to 9.8 mm	0 to 17.5 mm
Sensing distance	4 mm	8 mm	14 mm	25 mm
Hysteresis	≤ 15 % of sensing distance			
Standard sensing target: iron	12 × 12 × 1 mm	25 × 25 × 1 mm	40 × 40 × 1 mm	75 × 75 × 1 mm
Response frequency <sup>01)</sup>	800 Hz	400 Hz	200 Hz	100 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 15 %)			
Indicator	Operation indicator (red)			
Approval	CE EAC	CE EAC	CE EAC	CE EAC

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Unit weight (package)		Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Cable	Normal	≈ 43 g (≈ 63 g)	≈ 62 g (≈ 74 g)	≈ 97 g (≈ 115 g)	≈ 143 g (≈ 180 g)
	Long	-	≈ 82 g (≈ 94 g)	≈ 127 g (≈ 145 g)	≈ 183 g (≈ 220 g)
Cable connector	Normal	≈ 25 g (≈ 45 g)	≈ 37 g (≈ 67 g)	≈ 62 g (≈ 80 g)	≈ 108 g (≈ 145 g)
	Long	-	≈ 32 g (≈ 55 g)	≈ 92 g (≈ 110 g)	≈ 130 g (≈ 203 g)
Connector	Normal	≈ 12 g (≈ 32 g)	≈ 20 g (≈ 49 g)	≈ 41 g (≈ 81 g)	≈ 138 g (≈ 197 g)
	Long	-	≈ 24 g (≈ 54 g)	≈ 60 g (≈ 78 g)	≈ 193 g (≈ 252 g)



View product detail

<b>Power supply</b>	12 - 24 VDC≐ (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC≐
<b>Current consumption</b>	≤ 10 mA
<b>Control output</b>	≤ 200 mA
<b>Residual voltage</b>	DIA. of sensing side Ø 8mm: ≤ 2 V DIA. of sensing side Ø 12 mm, Ø 18 mm, Ø 30 mm: ≤ 1.5 V
<b>Protection circuit</b>	Surge protection circuit, output short over current protection circuit, reverse polarity protection
<b>Insulation resistance</b>	≥ 50 MΩ (500 VDC≐ megger)
<b>Dielectric strength</b>	DIA. of sensing side Ø 8mm : 1,000 VAC~ 50/60 Hz for 1 min (between all terminals and case) (connector type: 1,500 VAC~ 50/60 Hz for 1 min (between all terminals and case)) DIA. of sensing side Ø 12 mm, Ø 18 mm, Ø 30 mm : 1,500 VAC~ 50/60 Hz for 1 min (between all terminals and case)
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient temperature</b>	-25 to 70 °C, storage: -30 to 80 °C (non-freezing or non-condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (non-freezing or non-condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type <sup>01)</sup> / Cable connector type <sup>01)</sup> / Connector type model
<b>Cable spec. <sup>02)</sup></b>	DIA. of sensing side Ø 8 mm: Ø 3.5 mm, 3-wire DIA. of sensing side Ø 12 mm: Ø 4 mm, 3-wire DIA. of sensing side Ø 18 mm, Ø 30 mm: Ø 5 mm, 3-wire
<b>Wire spec.</b>	Ø 3.5 mm cable : AWG 24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm Ø 4 mm, Ø 5 mm cable : AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
<b>Connector spec.</b>	M12 connector
<b>Material</b>	Standard type cable (black): polyvinyl chloride (PVC) Oil resistant cable (gray): polyvinyl chloride (oil resistant PVC)
<b>General</b>	Case/Nut: nickel plated brass (DIA. of sensing side Ø 8 mm connector type case: SUS303), washer: nickel plated iron, sensing side: PBT
<b>Spatter-resistant</b>	Case/Nut: PTFE coated brass, washer: PTFE coated iron, sensing side: PTFE

01) Except spatter-resistant type

02) Cable type: 2 m, Cable connector type: 300 mm



# Cylindrical Inductive Long-Distance Proximity Sensors (DC 2-Wire)

## PRD Series



### Features

- Spatter-resistant type:  
PTFE coated for high heat resistance  
(prevent malfunction from welding spatter)
- Operation indicator (red LED)
- IP67 Protection structure (IEC standards)
- Strain relief cables:  
improved flexural strength of  
cable connecting component  
(except DIA. of sensing side Ø 8 mm )

### Specifications

Installation	Flush type			
<b>General</b>	PRD□T08-2 □	PRD□T12-4 □	PRD□T18-7 □	PRD□T30-15 □
<b>Spatter-resistant</b>	-	PRDA□T12-4 □	PRDA□T18-7 □	PRDA□T30-15 □
<b>DIA. of sensing side</b>	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
<b>Sensing distance</b>	2 mm	4 mm	7 mm	15 mm
<b>Setting distance</b>	0 to 1.4 mm	0 to 2.8 mm	0 to 4.9 mm	0 to 10.5 mm
<b>Hysteresis</b>	≤ 15 % of sensing distance			
<b>Standard sensing target: iron</b>	8 × 8 × 1 mm	12 × 12 × 1 mm	20 × 20 × 1 mm	45 × 45 × 1 mm
<b>Response frequency <sup>01)</sup></b>	1 kHz	450 Hz	250 Hz	100 Hz
<b>Affection by temperature</b>	≤ ± 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 15 %)			
<b>Indicator</b>	Operation indicator (red)			
<b>Approval</b>	CE EAC	CE EAC	CE EAC	CE EAC
Installation	Non-flush type			
<b>General</b>	PRD□T08-4 □	PRD□T12-8 □	PRD□T18-14 □	PRD□T30-25 □
<b>DIA. of sensing side</b>	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
<b>Sensing distance</b>	4 mm	8 mm	14 mm	25 mm
<b>Setting distance</b>	0 to 2.8 mm	0 to 5.6 mm	0 to 9.8 mm	0 to 17.5 mm
<b>Hysteresis</b>	≤ 15 % of sensing distance			
<b>Standard sensing target: iron</b>	12 × 12 × 1 mm	25 × 25 × 1 mm	40 × 40 × 1 mm	75 × 75 × 1 mm
<b>Response frequency <sup>01)</sup></b>	800 Hz	400 Hz	200 Hz	100 Hz
<b>Affection by temperature</b>	≤ ± 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 15 %)			
<b>Indicator</b>	Operation indicator (red)			
<b>Approval</b>	CE EAC	CE EAC	CE EAC	CE EAC

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Unit weight (package) <sup>01)</sup>		Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Cable	Normal	≈ 43 g (≈ 63 g)	≈ 62 g (≈ 74 g)	≈ 97 g (≈ 115 g)	≈ 143 g (≈ 180 g)
	Long	-	≈ 72 g (≈ 84 g)	≈ 122 g (≈ 134 g)	≈ 221 g (≈ 184 g)
Cable connector	Normal	≈ 25 g (≈ 45 g)	≈ 32 g (≈ 55 g)	≈ 62 g (≈ 80 g)	≈ 130 g (≈ 145 g)
	Long	-	≈ 42 g (≈ 54 g)	≈ 65 g (≈ 77 g)	≈ 143 g (≈ 155 g)
Connector	Normal	≈ 10 g (≈ 32 g)	≈ 20 g (≈ 50 g)	≈ 42 g (≈ 60 g)	≈ 110 g (≈ 150 g)
	Long	-	≈ 26 g (≈ 38 g)	≈ 49 g (≈ 61 g)	≈ 134 g (≈ 146 g)
		-	-	≈ 60 g (≈ 78 g)	≈ 150 g (≈ 190 g)

01) In case of normal body length, it is written in General type order. In case of long body length, it is only available general type.



View product detail

<b>Power supply</b>	12 - 24 VDC $\equiv$ (ripple P-P: $\leq$ 10 %), operating voltage: 10 - 30 VDC $\equiv$
<b>Leakage current</b>	DIA. of sensing side $\varnothing$ 8mm: $\leq$ 0.8 mA DIA. of sensing side $\varnothing$ 12 mm, $\varnothing$ 18 mm, $\varnothing$ 30 mm: $\leq$ 0.6 mA
<b>Control output</b>	2 to 100 mA
<b>Residual voltage <sup>01)</sup></b>	$\leq$ 3.5 V (Non-polarity: $\leq$ 5 V)
<b>Protection circuit</b>	Surge protection circuit, output short over current protection circuit, reverse polarity protection
<b>Insulation resistance</b>	$\geq$ 50 M $\Omega$ (500 VDC $\equiv$ megger)
<b>Dielectric strength</b>	DIA. of sensing side $\varnothing$ 8 mm : 1,000 VAC $\sim$ 50/60 Hz for 1 min (between all terminals and case) (connector type: 1,500 VAC $\sim$ 50/60 Hz for 1 min (between all terminals and case)) DIA. of sensing side $\varnothing$ 12 mm, $\varnothing$ 18 mm, $\varnothing$ 30 mm : 1,500 VAC $\sim$ 50/60 Hz for 1 min (between all terminals and case)
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> ( $\approx$ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient temperature</b>	-25 to 70 °C, storage: -30 to 80 °C (non-freezing or non-condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (non-freezing or non-condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type / Cable connector type / Connector type model
<b>Cable spec. <sup>02)</sup></b>	DIA. of sensing side $\varnothing$ 8 mm: $\varnothing$ 3.5 mm, 2-wire DIA. of sensing side $\varnothing$ 12 mm: $\varnothing$ 4 mm, 2-wire DIA. of sensing side $\varnothing$ 18 mm, $\varnothing$ 30 mm: $\varnothing$ 5 mm, 2-wire
<b>Wire spec.</b>	$\varnothing$ 3.5 mm cable : AWG 24 (0.08 mm, 40-core), insulator diameter: $\varnothing$ 1 mm $\varnothing$ 4 mm, $\varnothing$ 5 mm cable : AWG 22 (0.08 mm, 60-core), insulator diameter: $\varnothing$ 1.25 mm
<b>Connector spec.</b>	M12 connector
<b>Material</b>	Standard type cable (black): polyvinyl chloride (PVC) Oil resistant cable (gray): polyvinyl chloride (oil resistant PVC)
<b>General</b>	Case/Nut: nickel plated brass (DIA. of sensing side $\varnothing$ 8 mm connector type case: SUS303), washer: nickel plated iron, sensing side: PBT
<b>Spatter-resistant</b>	Case/Nut: PTFE coated brass, washer: PTFE coated iron, sensing side: PTFE

01) Check the condition of connected device.

02) Cable type: 2 m, Cable connector type: 300 mm

# Cylindrical Inductive Long-Distance Proximity Sensors (IO-Link)

## PRD Series



### Features

- Reduced installation work by identifying object IDs
- Malfunction and damage prevention through status monitoring
- Shortest time recovery through abnormal detection
- Mode indicator for check status
- IO-Link mode: Communication indicator (flashing green), operation indicator (orange), abnormal detect indicator (cross-flashing green, orange)
- SIO mode: Operation indicator (orange), stable indicator (green), abnormal detect indicator (cross-flashing green, orange)
- IP67 Protection rating (IEC standard)

### Specifications

Installation	Flush type		
Model	PRD□12-4D-□-IL2	PRD□18-7D-□-IL2	PRD□30-15D-□-IL2
DIA. of sensing side	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	4 mm	7 mm	15 mm
Setting distance	0 to 2.8 mm	0 to 4.9 mm	0 to 10.5 mm
Hysteresis	≤ 10 % of sensing distance		
Standard sensing target: iron	12 × 12 × 1 mm	20 × 20 × 1 mm	45 × 45 × 1 mm
Response frequency <sup>01)</sup>	500 Hz	250 Hz	100 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C		
Indicator <sup>02)</sup>	IO-Link mode, SIO mode		
IO-Link mode	Communication indicator (flashing green), operation indicator (orange), Abnormal detect indicator (cross-flashing green, orange)		
SIO mode	Operation indicator (orange), stable indicator (green), Abnormal detect indicator (cross-flashing green, orange)		
Approval	CE   IO-Link	CE   IO-Link	CE   IO-Link

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

02) In case of SIO mode, use the device within the range where the stable indicator (green) is ON. If the sensing target is in the too close detection distance, the stable indicator turns OFF, but it is in a stable detection state. In case of IO-Link mode, use the device within the range where unstable detection (Byte0\_bit6) turns 0. If the sensing target is in the too close detection distance, the too close detection (Byte0\_bit5) is 1, but it is a stable detection state.

Installation	Non-flush type		
Model	PRD□12-8D-□-IL2	PRD□18-14D-□-IL2	PRD□30-25D-□-IL2
DIA. of sensing side	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	8 mm	14 mm	25 mm
Setting distance	0 to 5.6 mm	0 to 9.8 mm	0 to 17.5 mm
Hysteresis	≤ 10 % of sensing distance		
Standard sensing target: iron	25 × 25 × 1 mm	40 × 40 × 1 mm	75 × 75 × 1 mm
Response frequency <sup>01)</sup>	400 Hz	200 Hz	100 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C		
Indicator <sup>02)</sup>	IO-Link mode, SIO mode		
IO-Link mode	Communication indicator (flashing green), operation indicator (orange), Abnormal detect indicator (cross-flashing green, orange)		
SIO mode	Operation indicator (orange), stable indicator (green), Abnormal detect indicator (cross-flashing green, orange)		
Approval	CE   IO-Link	CE   IO-Link	CE   IO-Link

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

02) In case of SIO mode, use the device within the range where the stable indicator (green) is ON. If the sensing target is in the too close detection distance, the stable indicator turns OFF, but it is in a stable detection state. In case of IO-Link mode, use the device within the range where unstable detection (Byte0\_bit6) turns 0. If the sensing target is in the too close detection distance, the too close detection (Byte0\_bit5) is 1, but it is a stable detection state.

Unit weight (package)	Ø 12 mm	Ø 18 mm	Ø 30 mm
Cable	≈ 62 g (≈ 74 g)	≈ 97 g (≈ 115 g)	≈ 143 g (≈ 180 g)
Cable connector	≈ 37 g (≈ 67 g)	≈ 62 g (≈ 80 g)	≈ 108 g (≈ 145 g)
Connector	≈ 20g (≈ 49 g)	≈ 41 g (≈ 81 g)	≈ 138 g (≈ 197 g)



View product detail

<b>Power supply</b>	12 - 24 VDC $\equiv$ (ripple P-P: $\leq$ 10 %), operating voltage: 10 - 30 VDC $\equiv$
<b>Current consumption</b>	IO-Link mode: $\leq$ 25 mA, SIO mode: $\leq$ 20 mA
<b>Control output</b>	$\leq$ 100 mA
<b>Residual voltage <sup>01)</sup></b>	$\leq$ 2 V
<b>Protection circuit</b>	Surge protection circuit, output short over current protection circuit, reverse polarity protection
<b>Insulation resistance</b>	$\geq$ 50 M $\Omega$ (500 VDC $\equiv$ megger)
<b>Dielectric strength</b>	1,000 VAC $\sim$ 50 / 60 Hz for 1 min
<b>Vibration</b>	1.5 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	1000 m/s <sup>2</sup> ( $\approx$ 100 G) in each X, Y, Z direction for 3 times
<b>Ambient temp. <sup>02)</sup></b>	-25 to 70 °C, storage: -25 to 70 °C (no freezing or condensation)
<b>Ambient humi.</b>	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
<b>Protection rating</b>	IP67 (IEC standard)
<b>Connection</b>	Cable / Cable connector / connector models
<b>Cable spec. <sup>03)</sup></b>	DIA. of sensing side $\varnothing$ 12 mm: $\varnothing$ 4 mm, 4-wire DIA. of sensing side $\varnothing$ 18 mm, $\varnothing$ 30 mm : $\varnothing$ 5 mm, 4-wire
<b>Wire spec.</b>	AWG 22 (0.08 mm, 60-core), insulator diameter: $\varnothing$ 1.25 mm
<b>Connector spec.</b>	M12 plug connector
<b>Material</b>	Standard type cable (black): polyvinyl chloride (PVC), Oil resistant cable (gray): polyvinyl chloride (oil resistant PVC), case / nut: nickel plated brass, washer: nickel plated iron, sensing side: PBT
<b>Comm. protocol</b>	IO-Link

01) Load current: 100 mA, cable length: 2 m

02) UL approved surrounding air temperature 40 °C

03) Cable type: 2 m, Cable connector type: 300 mm

## Software

Download the installation file and the manuals from the Autonics website.

### [atIOLink]

atIOLink with purposes for setting, diagnosis, and maintenance of IO-Link device via IODD file is provided as the Port and Device Configuration Tool (PDCT).

### [IODD (IO Device Description)]

This file contains information such as manufacturer information, process data, diagnostic data, and parameter setting of a sensor using IO-Link communication. By uploading the IODD file to PDCT Software, you can check the setting and communication data according to the user interface. Download the IODD file from the Autonics website.

# Cylindrical Inductive Proximity Sensors

(DC 3-Wire)

## PR Series



### Features

- Spatter-resistant type:  
PTFE coated for high heat resistance  
(prevent malfunction from welding spatter)
- Operation indicator (red LED)
- IP67 Protection structure (IEC standards)

### Specifications

Installation	Flush type			
General	PR□08-1.5D□	PR□12-2D□	PR□18-5D□	PR□30-10D□
Spatter-resistant	-	PRA□12-2D□	PRA□18-5D□	PRA□30-10D□
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	1.5 mm	2 mm	5 mm	10 mm
Setting distance	0 to 1.05 mm	0 to 1.4 mm	0 to 3.5 mm	0 to 7 mm
Hysteresis	≤ 10 % of sensing distance (DIA. of sensing side Ø 8 mm connector type: ≤ 15 %)			
Standard sensing target: iron	8 × 8 × 1 mm	12 × 12 × 1 mm	18 × 18 × 1 mm	30 × 30 × 1 mm
Response frequency <sup>01)</sup>	1.5 kHz	1.5 kHz	500 Hz	400 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 20 %)			
Indicator	Operation indicator (red)			
Approval	CE EAC	CE EAC	CE EAC	CE EAC

Installation	Non-flush type			
General	PR□08-2D□	PR□12-4D□	PR□18-8D□	PR□30-15D□
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	2 mm	4 mm	8 mm	15 mm
Setting distance	0 to 1.4 mm	0 to 2.8 mm	0 to 5.6 mm	0 to 10.5 mm
Hysteresis	≤ 10 % of sensing distance (DIA. of sensing side Ø 8 mm connector type: ≤ 15 %)			
Standard sensing target: iron	8×8×1 mm	12×12×1 mm	25×25×1 mm	45×45×1 mm
Response frequency <sup>01)</sup>	1.0 kHz	500 Hz	350 Hz	200 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 20 %)			
Indicator	Operation indicator (red)			
Approval	CE EAC	CE EAC	CE EAC	CE EAC

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Unit weight (package)		Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Cable	Normal	≈ 52 g (≈ 64 g)	≈ 72 g (≈ 84 g)	≈ 110 g (≈ 122 g)	≈ 170 g (≈ 207 g)
	Short	-	≈ 70 g (≈ 82 g)	-	-
	Long	≈ 54 g (≈ 66 g)	≈ 76 g (≈ 88 g)	≈ 130 g (≈ 142 g)	≈ 210 g (≈ 247 g)
Cable connector	Normal	≈ 32 g (≈ 44 g)	≈ 42 g (≈ 54 g)	≈ 58 g (≈ 70 g)	≈ 122 g (≈ 134 g)
	Long	≈ 34 g (≈ 46 g)	-	≈ 78 g (≈ 90 g)	≈ 158 g (≈ 195 g)
Connector	Normal	≈ 10 g (≈ 32 g)	≈ 26 g (≈ 38 g)	≈ 49 g (≈ 61 g)	≈ 134 g (≈ 146 g)
	Long	-	-	≈ 73 g (≈ 85 g)	≈ 169 g (≈ 181 g)



View product detail

<b>Power supply</b>	12 - 24 VDC $\equiv$ (ripple P-P: $\leq$ 10 %), operating voltage: 10 - 30 VDC $\equiv$
<b>Current consumption</b>	$\leq$ 10 mA
<b>Control output</b>	$\leq$ 200 mA
<b>Residual voltage</b>	DIA. of sensing side $\varnothing$ 8 mm: $\leq$ 2.0 V DIA. of sensing side $\varnothing$ 12 mm, $\varnothing$ 18 mm, $\varnothing$ 30 mm: $\leq$ 1.5 V
<b>Protection circuit</b>	Surge protection circuit, output short over current protection circuit, reverse polarity protection
<b>Insulation resistance</b>	$\geq$ 50 M $\Omega$ (500 VDC $\equiv$ megger)
<b>Dielectric strength</b>	1,500 VAC $\sim$ 50 / 60Hz for 1 min (between all terminals and case)
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> ( $\approx$ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient temperature</b>	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type / Cable connector type <sup>01)</sup> / Connector type model
<b>Cable spec.</b> <sup>02)</sup>	DIA. of sensing side $\varnothing$ 8 mm: $\varnothing$ 3.5 mm, 3-wire DIA. of sensing side $\varnothing$ 12 mm: $\varnothing$ 4 mm, 3-wire DIA. of sensing side $\varnothing$ 18 mm, $\varnothing$ 30 mm: $\varnothing$ 5 mm, 3-wire
<b>Wire spec.</b>	$\varnothing$ 3.5 mm cable : AWG 24 (0.08 mm, 40-core), insulator DIA.: $\varnothing$ 1 mm $\varnothing$ 4 mm, $\varnothing$ 5 mm cable : AWG 22 (0.08 mm, 60-core), insulator DIA.: $\varnothing$ 1.25 mm
<b>Connector spec.</b>	M12 connector
<b>Material</b>	Standard type cable (black): polyvinyl chloride (PVC) Oil resistant cable (gray): polyvinyl chloride (oil resistant PVC)
<b>General</b>	Case/Nut: nickel plated brass (DIA. of sensing side $\varnothing$ 8 mm connector type case: SUS303), washer: nickel plated iron, sensing side: PBT
<b>Spatter-resistant</b>	Case/Nut: PTFE coated brass, washer: PTFE coated iron, sensing side: PTFE

01) Except spatter-resistant type

02) Cable type: 2 m, cable connector type: 300 mm

# Cylindrical Inductive Proximity Sensors

(DC 2-Wire)

## PR Series



### Features

- Spatter-resistant type:  
PTFE coated for high heat resistance  
(prevent malfunction from welding spatter)
- Operation indicator (red LED)
- IP67 Protection structure (IEC standards)

### Specifications

Installation	Flush type			
General	PR□T08-1.5 □	PR□T12-2 □	PR□T18-5 □	PR□T30-10 □
Spatter-resistant	-	PRA□T12-2 □	PRA□T18-5 □	PRA□T30-10 □
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	1.5 mm	2 mm	5 mm	10 mm
Setting distance	0 to 1.05 mm	0 to 1.4 mm	0 to 3.5 mm	0 to 7 mm
Hysteresis	≤ 10 % of sensing distance (DIA. of sensing side Ø 8 mm connector type: ≤ 15 %)			
Standard sensing target: iron	8 × 8 × 1 mm	12 × 12 × 1 mm	18 × 18 × 1 mm	30 × 30 × 1 mm
Response frequency <sup>01)</sup>	1.5 kHz	1.5 kHz	500 Hz	400 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 20 %)			
Indicator	Operation indicator (red)			
Approval	CE EAC	CE EAC	CE EAC	CE EAC
Installation	Non-flush type			
General	PR□T08-2 □	PR□T12-4 □	PR□T18-8 □	PR□T30-15 □
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	2 mm	4 mm	8 mm	15 mm
Setting distance	0 to 1.4 mm	0 to 2.8 mm	0 to 5.6 mm	0 to 10.5 mm
Hysteresis	≤ 10 % of sensing distance (DIA. of sensing side Ø 8 mm connector type: ≤ 15 %)			
Standard sensing target: iron	8 × 8 × 1 mm	12 × 12 × 1 mm	25 × 25 × 1 mm	45 × 45 × 1 mm
Response frequency <sup>01)</sup>	1.0 kHz	500 Hz	350 Hz	200 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C (DIA. of sensing side Ø 8 mm: ≤ ± 20 %)			
Indicator	Operation indicator (red)			
Approval	CE EAC	CE EAC	CE EAC	CE EAC
Unit weight (package)	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Cable	≈ 52 g (≈ 64 g)	≈ 72 g (≈ 84 g)	≈ 110 g (≈ 122 g)	≈ 170 g (≈ 207 g)
Cable connector	≈ 32 g (≈ 44 g)	≈ 42 g (≈ 54 g)	≈ 58 g (≈ 70 g)	≈ 122 g (≈ 134 g)
Connector	≈ 10 g (≈ 32 g)	≈ 26 g (≈ 38 g)	≈ 49 g (≈ 61 g)	≈ 142 g (≈ 154 g) <sup>01)</sup>

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

01) Spatter-resistant type: ≈ 134 g (≈ 146 g)



View product detail

<b>Power supply</b>	12 - 24 VDC $\equiv$ (ripple P-P: $\leq$ 10 %), operating voltage: 10 - 30 VDC $\equiv$
<b>Leakage current</b>	$\leq$ 0.6 mA
<b>Control output</b>	2 to 100 mA
<b>Residual voltage</b>	$\leq$ 3.5 V (non-polarity <sup>01)</sup> ; $\leq$ 5 V)
<b>Protection circuit</b>	Surge protection circuit, output short over current protection circuit, reverse polarity protection
<b>Insulation resistance</b>	$\geq$ 50 M $\Omega$ (500 VDC $\equiv$ megger)
<b>Dielectric strength</b>	1,500 VAC $\sim$ 50 / 60 Hz for 1 min (between all terminals and case)
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> ( $\approx$ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient temperature</b>	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type / Cable connector type / Connector type model
<b>Cable spec.</b> <sup>02)</sup>	DIA. of sensing side $\varnothing$ 8 mm: $\varnothing$ 3.5 mm, 2-wire DIA. of sensing side $\varnothing$ 12 mm: $\varnothing$ 4 mm, 2-wire DIA. of sensing side $\varnothing$ 18 mm, $\varnothing$ 30 mm: $\varnothing$ 5 mm, 2-wire
<b>Wire spec.</b>	$\varnothing$ 3.5 mm cable : AWG 24 (0.08 mm, 40-core), insulator diameter: $\varnothing$ 1 mm $\varnothing$ 4 mm, $\varnothing$ 5 mm cable : AWG 22 (0.08 mm, 60-core), insulator diameter: $\varnothing$ 1.25 mm
<b>Connector spec.</b>	M12 connector
<b>Material</b>	Standard type cable (black): polyvinyl chloride (PVC) Oil resistant cable type cable (gray): polyvinyl chloride (oil resistant PVC)
<b>General</b>	Case/Nut: nickel plated brass (DIA. of sensing side $\varnothing$ 8 mm connector type case: SUS303), washer: nickel plated iron, sensing side: PBT
<b>Spatter-resistant</b>	Case/Nut: PTFE coated brass, washer: PTFE coated iron, sensing side: PTFE

01) Check the condition of connected device.

02) Cable type: 2 m, cable connector type: 300 mm



# Cylindrical Inductive Proximity Sensors

(AC 2-Wire)

## PR Series



### Features

- Spatter-resistant type: PTFE coated for high heat resistance (prevent malfunction from welding spatter)
- Operation indicator (red LED)
- IP67 Protection structure (IEC standards)

### Specifications

Installation	Flush type		
General	PR□12-2A□	PR□18-5A□	PR□30-10A□
Spatter-resistant	PRA□12-2A□	PRA□18-5A□	PRA□30-10A□
DIA. of sensing side	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	2 mm	5 mm	10 mm
Setting distance	0 to 1.4 mm	0 to 3.5 mm	0 to 7 mm
Hysteresis	≤ 10 % of sensing distance		
Standard sensing target: iron	12 × 12 × 1 mm	18 × 18 × 1 mm	30 × 30 × 1 mm
Response frequency <sup>01)</sup>	20 Hz		
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C		
Indicator	Operation indicator (red)		
Approval	CE ENEC	CE ENEC	CE ENEC

Installation	Non-flush type		
General	PR□12-4A □	PR□18-8A □	PR□30-15A □
DIA. of sensing side	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	4 mm	8 mm	15 mm
Setting distance	0 to 2.8 mm	0 to 5.6 mm	0 to 10.5 mm
Hysteresis	≤ 10 % of sensing distance		
Standard sensing target: iron	12 × 12 × 1 mm	25 × 25 × 1 mm	45 × 45 × 1 mm
Response frequency <sup>01)</sup>	20 Hz		
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C		
Indicator	Operation indicator (red)		
Approval	CE ENEC	CE ENEC	CE ENEC


01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Unit weight (package)	Ø 12 mm	Ø 18 mm	Ø 30 mm	
Cable	Normal	≈ 72 g (≈ 84 g) <sup>01)</sup>	≈ 118 g (≈ 130 g) <sup>02)</sup>	≈ 170 g (≈ 207 g)
	Long	-	≈ 130 g (≈ 142 g)	≈ 208 g (≈ 245 g)
Cable connector	Normal	≈ 42 g (≈ 54 g)	≈ 66 g (≈ 78 g)	≈ 122 g (≈ 134 g)
	Long	-	≈ 78 g (≈ 90 g)	≈ 158 g (≈ 195 g)
Connector	Normal	≈ 30 g (≈ 42 g)	≈ 54 g (≈ 66 g)	≈ 142 g (≈ 154 g)
	Long	-	≈ 66 g (≈ 78 g)	≈ 182 g (≈ 194 g)

01) Spatter-resistant type: ≈ 66 g (≈ 78 g)  
 02) Spatter-resistant type: ≈ 106 g (≈ 118 g)



View product detail

<b>Power supply</b>	100 - 240 VAC~ 50 / 60 Hz, operating voltage: 85 - 264 VAC~
<b>Leakage current</b>	≤ 2.5 mA
<b>Control output</b>	DIA. of sensing side Ø 12 mm: 5 to 150 mA DIA. of sensing side Ø 18 mm, Ø 30 mm: 5 to 200 mA
<b>Residual voltage</b>	≤ 10 V
<b>Protection circuit</b>	Surge protection circuit
<b>Insulation resistance</b>	≥ 50 MΩ (500 VDC≡ megger)
<b>Insulation type</b>	Double insulation or reinforced insulation (symbol:  ) dielectric strength between the measuring input part and the power part: general type 1 kV, spatter-resistant type 1.5 kV
<b>Dielectric strength</b>	General type : 2,500 VAC~ 50/60 Hz for 1 min (between all terminals and case) Spatter-resistant type : 1,500 VAC~ 50/60 Hz for 1 min (between all terminals and case)
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient temperature</b>	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type / Cable connector type <sup>01)</sup> / Connector type <sup>01)</sup> model
<b>Cable spec. <sup>02)</sup></b>	DIA. of sensing side Ø 12 mm: Ø 4 mm, 2-wire DIA. of sensing side Ø 18 mm, Ø 30 mm: Ø 5 mm, 2-wire
<b>Wire spec.</b>	AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
<b>Connector spec.</b>	M12 connector
<b>Material</b>	Standard type cable (black): polyvinyl chloride (PVC)
<b>General</b>	Case/Nut: nickel plated brass, washer: nickel plated iron, sensing side: PBT
<b>Spatter-resistant</b>	Case/Nut: PTFE coated brass, washer: PTFE coated iron, sensing side: PTFE

01) Except spatter-resistant type

02) Cable type: 2 m, cable connector type: 300 mm

# Cylindrical Inductive Full-Metal Long-Distance Proximity Sensors (DC 2-Wire)

## PRFD Series



### Features

- Long sensing distance
- High resistance to impact and wear caused by contact with workpieces or wire brushes (sensor head / housing : stainless steel)
- Reduced risk of malfunction caused by aluminum chips
- Spatter-resistant type: PTFE coating prevents malfunctions caused by welding spatter
- 360° ring type operation indicator (red LED) (except Ø 8 mm model)
- Oil resistant cable
- IP67 protection structure (IEC standards)

### Specifications

Installation	Flush type			
General	PRFD□T08-2DO-□	PRFD□T12-3DO-□	PRFD□T18-7DO-□	PRFD□T30-12DO-□
Spatter-resistant	PRFDA□T08-2DO-□	PRFDA□T12-3DO-□	PRFDA□T18-7DO-□	PRFDA□T30-12DO-□
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance <sup>01)</sup>	2 mm	3 mm	7 mm	12 mm
Setting distance	0 to 1.4 mm	0 to 2.1 mm	0 to 4.9 mm	0 to 8.4 mm
Hysteresis	≤ 15 % of sensing distance			
Standard sensing target: iron	12 × 12 × 1 mm	12 × 12 × 1 mm	30 × 30 × 1 mm	54 × 54 × 1 mm
Response frequency <sup>02)</sup>	150 Hz	80 Hz	80 Hz	50 Hz
Affection by temperature	≤ ± 20 % for sensing distance at ambient temperature 20 °C			
Indicator	Stability indicator (green), operation indicator (red)			
Approval	CE  ENEC	CE  ENEC	CE  ENEC	CE  ENEC
Unit weight (package)	≈ 55 g (≈ 80 g)	≈ 83 g (≈ 110 g)	≈ 97 g (≈ 132 g)	≈ 170 g (≈ 225 g)

01) Use accessories (nut, washer) made of SUS. Or, sensing distance cannot be guaranteed.

02) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Power supply	12 ~ 24 VDC≡ (ripple P-P: ≤ 10 %), operating voltage: 10 ~ 30 VDC≡
Leakage current	≤ 0.8 mA
Control output	3 to 100 mA
Residual voltage	≤ 3.5 V
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Insulation resistance	≥ 50 MΩ (500 VDC≡ megger)
Dielectric strength	1,000 VAC~ 50 / 60Hz for 1 minute (between all terminals and case)
Vibration	1.5 mm double amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	1,000 m/s <sup>2</sup> (≈ 100 G) in each X, Y, Z direction for 10 times (DIA. of sensing side Ø 8 mm: : 500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 10 times)
Ambient temp. <sup>01)</sup>	-25 to 70 °C, storage: -25 to 70 °C (no freezing or condensation)
Ambient humi.	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
Protection	IP67 (IEC standards)
Connection	Cable type / Cable connector type model
Cable spec. <sup>02)</sup>	DIA. of sensing side Ø 8 mm: Ø 4 mm, 2-wire DIA. of sensing side Ø 12 mm, Ø 18 mm, Ø 30 mm: Ø 5 mm, 2-wire
Wire spec.	AWG 22 (0.08 mm, 60-wire), insulator diameter: Ø 1.25 mm
Connector	M12 connector
Material	Oil resistant cable (dark gray): oil resistant polyvinyl chloride (PVC)
General	Case / Nut: stainless steel 303 (SUS303), washer: stainless steel 304 (SUS304), sensing side <sup>03)</sup> : stainless steel 303 (SUS303)
Spatter-resistant	Case / Nut: stainless steel 303 (SUS303, PTFE coated), washer: stainless steel 304 (SUS304), sensing side <sup>03)</sup> : stainless steel 303 (SUS303, PTFE coated)

01) UL approved surrounding air temperature 40 °C

02) Cable type: 2 m (option: 5 m), cable connector type: 300 mm

03) Thickness: DIA. of sensing side Ø 8 mm: 0.2 mm / DIA. of sensing side Ø 12 mm, Ø 18 mm: 0.4 mm / DIA. of sensing side Ø 30 mm: 0.5 mm



View product detail

# Cylindrical Inductive Full-Metal Proximity Sensors (DC 2-Wire)

## PRF Series



### Features

- High resistance to impact and wear caused by contact with workpieces or wire brushes (sensor head / housing: stainless steel)
- Reduced risk of malfunction caused by aluminum chips
- Spatter-resistant type: PTFE coating prevents malfunctions caused by welding spatter
- 360° ring type operation indicator (red LED) (except Ø 8 mm model)
- Oil resistant cable
- IP67 protection structure (IEC standards)

### Specifications

Installation	Flush type			
General	PRF□T08-1.5DO-□	PRF□T12-2DO-□	PRF□T18-5DO-□	PRF□T30-10DO-□
Spatter-resistant	PRFA□T08-1.5DO-□	PRFA□T12-2DO-□	PRFA□T18-5DO-□	PRFA□T30-10DO-□
DIA. of sensing side	Ø 8 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance <sup>01)</sup>	1.5 mm	2 mm	5 mm	10 mm
Setting distance	0 to 1.05 mm	0 to 1.4 mm	0 to 3.5 mm	0 to 7 mm
Hysteresis	≤ 15 % of sensing distance			
Standard sensing target: iron	8 × 8 × 1 mm	12 × 12 × 1 mm	30 × 30 × 1 mm	54 × 54 × 1 mm
Response frequency <sup>02)</sup>	200 Hz	100 Hz	80 Hz	50 Hz
Affection by temperature	± 20 % for sensing distance at ambient temperature 20 °C			
Indicator	Operating indicator (red)			
Approval	CE  ENEC	CE  ENEC	CE  ENEC	CE  ENEC
Unit weight (package)	≈ 55 g (≈ 80 g)	≈ 83 g (≈ 110 g)	≈ 97 g (≈ 132 g)	≈ 170 g (≈ 225 g)

01) Use accessories (nut, washer) made of SUS. Or, sensing distance cannot be guaranteed.

02) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Power supply	12 - 24 VDC (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC
Leakage current	≤ 0.8 mA
Control output	3 to 100 mA
Residual voltage	≤ 3.5 V
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Insulation resistance	≥ 50 MΩ (500 VDC megger)
Dielectric strength	1,000 VAC ~ 50/60Hz for 1 minute (between all terminals and case)
Vibration	1.5 mm amplitude at frequency 10 to 55 Hz in each X, Y, Z direction for 2 hours
Shock	1,000 m/s <sup>2</sup> (≈ 100 G) in each X, Y, Z direction for 10 times (DIA. of sensing side Ø 8 mm) : 500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 10 times
Ambient temp. <sup>01)</sup>	-25 to 70 °C, storage: -25 to 70 °C (non-freezing or non-condensation)
Ambient humi.	35 to 95 %RH, storage: 35 to 95 %RH (non-freezing or non-condensation)
Protection	IP67 (IEC standards)
Connection	Cable type / Cable connector type model
Cable spec. <sup>02)</sup>	DIA. of sensing side Ø 8 mm: Ø 4 mm, 2-wire DIA. of sensing side Ø 12 mm, Ø 18 mm, Ø 30 mm: Ø 5 mm, 2-wire
Wire spec.	AWG 22 (0.08 mm, 60-wire), insulator diameter: Ø 1.25 mm
Connector	M12 connector
Material	Oil resistant cable (dark gray): oil resistant polyvinyl chloride (PVC)
General	Case/Nut: SUS303, washer: SUS304, sensing side <sup>03)</sup> : SUS303
Spatter-resistant	Case/Nut: SUS303 (PTFE coated), washer: SUS304, sensing side <sup>03)</sup> : SUS303 (PTFE coated)

01) UL approved surrounding air temperature 40 °C

02) Cable type: 2 m (option: 5 m), cable connector type: 300 mm

03) Thickness: 0.8 mm (DIA. of sensing side Ø 8 mm: 0.4 mm)



View product detail

# Cylindrical Inductive Transmission Couplers

## PET Series



### Features

- Inductive coupling allows signals to be generated and transmitted without additional power supply
- Stable operation in various environmental settings including dust or oil
- Applications: drilling, robotics, automated conveyors system, etc.

### Specifications

Installation	Flush type
<b>Model</b>	PET18-5
<b>Transmitting distance</b>	5 mm
<b>Setting distance</b>	1 to 4.5 mm
<b>Response time</b>	≤ 1 ms
<b>Indicator</b>	Operation indicator (red)
<b>Approval</b>	CE
<b>Unit weight (package)</b>	≈ 121 g (≈ 133 g)
<b>Insulation type</b>	≥ 50 MΩ (500 VDC≡ megger)
<b>Dielectric strength</b>	1,500 VAC~ 50 / 60 Hz for 1 min
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) X, Y, Z directions for 3 times
<b>Ambient temperature</b>	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type model
<b>Wire spec.</b>	Ø 5 mm, 2-wire, 2 m
<b>Connector spec.</b>	AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
<b>Contact switch spec.</b>	Contact resistance is ≤ 300 mΩ, open resistance is ≥ 10 MΩ, leakage current at OFF is zero.
<b>Material</b>	Nut/Case: nickel plated brass, washer: nickel plated steel, sensing side: PBT, Standard type cable (black): polyvinyl chloride (PVC)



View product detail

# Rectangular Inductive Proximity Sensors

(DC 3-Wire,  
□ 8 / 12 / 50 mm)

## PS Series



### Features

- Alternate frequency models allow adjacent installation of multiple sensors without interference (PSN17-□-F model)
- Operation indicator (red LED)
- IP67 protection structure (IEC standard)

### Specifications

Installation	Standard type / Upper side type		
Model	PS08-2.5D□-□	PS12-4D□-□	PS50-30D□
Sensing side length	8 mm	12 mm	50 mm
Sensing distance	2.5 mm	4 mm	30 mm
Setting distance	0 to 1.75 mm	0 to 2.8 mm	0 to 21 mm
Hysteresis	≤ 10 % of sensing distance (sensing side length 8 mm: ≤ 20 %)		
Standard sensing target: iron	8 × 8 × 1 mm	12 × 12 × 1 mm	90 × 90 × 1 mm
Response frequency <sup>01)</sup>	1 kHz	500 Hz	50 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C (sensing side length 8 mm: ≤ ± 15 %)		
Indicator	Operating indicator (red)		
Approval	CE EAC	CE EAC	CE EAC
Unit weight (package)	≈ 16 g (≈ 30 g)	≈ 62 g (≈ 77 g)	≈ 220 g (≈ 256 g)

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Power supply	12 - 24 VDC≐ (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC≐
Current consumption	≤ 10 mA
Control output	Sensing side length 8 mm: ≤ 100 mA Sensing side length 12 mm, 50 mm: ≤ 200 mA
Residual voltage	Sensing side length 8 mm: ≤ 1.0 V Sensing side length 12 mm, 50 mm: ≤ 1.5 V
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Insulation resistance	≥ 50 MΩ (500 VDC≐ megger)
Dielectric strength	Between all terminals and case: 1,500 VAC~ 50 / 60Hz for 1 minute (sensing side length 8 mm - between all terminals and case: 1,000 VAC~ 50 / 60Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz in each of X, Y, Z directions for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) X, Y, Z directions for 3 times
Ambient temp.	-25 to 70 %RH, storage: -30 to 80 %RH (no freezing or condensation)
Ambient humi.	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
Protection rating	IP67 (IEC standards)
Connection	Cable type
Cable spec.	Sensing side length 8 mm: Ø 2.5 mm, 3-wire, 1 m Sensing side length 12 mm: Ø 4 mm, 3-wire, 2 m Sensing side length 50 mm: Ø 5 mm, 3-wire, 2 m
Wire spec.	Ø 2.5 mm cable : AWG 28 (0.08 mm, 19-core), insulator diameter: Ø 0.9 mm Ø 4 mm, Ø 5 mm cable : AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
Material	Sensing side length 8 mm Case: PC, Sensing side length 12 mm Case: Heat-resistant ABS, Sensing side length 50 mm Case: PBT, standard cable (black): polyvinyl chloride (PVC)



View product detail

# Rectangular Inductive

## Proximity Sensors

(DC 3-Wire,

□ 17 / 25 / 30 / 40 mm)

### PS Series



### Features

- Alternate frequency models allow adjacent installation of multiple sensors without interference (PSN17-□-F model)
- Operation indicator (red LED)
- IP67 protection structure (IEC standard)

### Specifications

Installation	Standard type / Upper side type		Standard type			
	PSN17-5D□□-□	PSN17-8D□□-□	PSN25-5D□	PSN30-10D□	PSN30-15D□	PSN40-20D□
Model						
Sensing side length	18 mm	18 mm	25 mm	30 mm	30 mm	40 mm
Sensing distance	5 mm	8 mm	5 mm	10 mm	15 mm	20 mm
Setting distance	0 to 3.5 mm	0 to 5 mm	0 to 3.5 mm	0 to 7 mm	0 to 10.5 mm	0 to 14 mm
Hysteresis	≤ 10 % of sensing distance					
Standard sensing target: iron	18 × 18 × 1 mm	25 × 25 × 1 mm	25 × 25 × 1 mm	30 × 30 × 1 mm	45 × 45 × 1 mm	60 × 60 × 1 mm
Response frequency <sup>01)</sup>	700 Hz	200 Hz	300 Hz	250 Hz	200 Hz	100 Hz
Affection by temperature	± 10 % for sensing distance at ambient temperature 20 °C					
Indicator	Operation indicator (red)					
Approval	CE EAC	CE EAC	CE EAC	CE EAC	CE EAC	CE EAC
Unit weight (package)	≈ 62 g (≈ 83 g)	≈ 62 g (≈ 83 g)	≈ 71 g (≈ 103 g)	≈ 96 g (≈ 165 g)	≈ 96 g (≈ 165 g)	≈ 135 g (≈ 225 g)

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Power supply	12 - 24 VDC≡ (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC≡
Current consumption	≤ 10 mA
Control output	≤ 200 mA
Residual voltage	≤ 1.5 V
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Insulation type	≥ 50 MΩ (500 VDC≡ megger)
Dielectric strength	1,500 VAC~ 50/60 Hz for 1 min (between all terminals and case)
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient temp.	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
Ambient humi.	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
Protection structure	IP67 (IEC standard)
Connection	Cable type model
Wire spec.	∅ 4 mm, 3-wire, 2 m
Connector spec.	AWG 22 (0.08 mm, 60-core), insulator diameter: ∅ 1.25 mm
Material	Case: Heat-resistant ABS, standard type cable (black): polyvinyl chloride (PVC)



View product detail

# Rectangular Inductive Proximity Sensors

(DC 2-Wire)

## PS Series



### Features

- Operation indicator (red LED)
- IP67 protection structure (IEC standard)

### Specifications

Installation	Standard type / Upper side type
Model	PSNT17-5D□□
Sensing side length	18 mm
Sensing distance	5 mm
Setting distance	0 to 3.5 mm
Hysteresis	≤ 10 % of sensing distance
Standard sensing target: iron	18 × 18 × 1 mm
Response frequency <sup>01)</sup>	700 Hz
Affection by temperature	± 10 % for sensing distance at ambient temperature 20 °C
Indicator	Operation indicator (red)
Approval	CE ENEC
Unit weight (package)	≈ 58 g (≈ 79 g)

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Power supply	12 - 24 VDC≐ (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC≐
Leakage current	≤ 0.6 mA
Control output	2 to 100 mA
Residual voltage	≤ 3.5 V
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Insulation type	≥ 50 MΩ (500 VDC≐ megger)
Dielectric strength	1,500 VAC~ 50 / 60 Hz for 1 min (between all terminals and case)
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient temperature	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
Ambient humidity	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
Protection structure	IP67 (IEC standards)
Connection	Cable type model
Wire spec.	Ø 4 mm, 2-wire, 2 m
Connector spec.	AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
Material	Case: PBT, standard type cable (black): polyvinyl chloride (PVC)



View product detail



# Rectangular Inductive Proximity Sensors

(AC 2-Wire)

## PS Series



### Features

- Operation indicator (red LED)
- IP67 protection structure (IEC standard)

### Specifications

Installation	Standard type			
Model	PSN25-5A□	PSN30-10A□	PSN30-15A□	PSN40-20A□
Sensing side length	25 mm	30 mm	30 mm	40 mm
Sensing distance	5 mm	10 mm	15 mm	20 mm
Setting distance	0 to 3.5 mm	0 to 7 mm	0 to 10.5 mm	0 to 14 mm
Hysteresis	≤ 10 % of sensing distance			
Standard sensing target: iron	25 × 25 × 1 mm	30 × 30 × 1 mm	45 × 45 × 1 mm	60 × 60 × 1 mm
Response frequency <sup>01)</sup>	20 Hz			
Affection by temperature	± 10 % for sensing distance at ambient temperature 20 °C			
Indicator	Operation indicator (red)			
Approval	CE EAC	CE EAC	CE EAC	CE EAC
Unit weight (package)	≈ 66 g (≈ 98 g)	≈ 92 g (≈ 161 g)	≈ 92 g (≈ 161 g)	≈ 130 g (≈ 219 g)

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

Power supply	100 - 240 VAC ~ 50 / 60 Hz, operating voltage: 85 - 264 VAC ~
Leakage current	≤ 2.5 mA
Control output	5 to 200 mA
Residual voltage	≤ 10 V
Protection circuit	Surge protection circuit
Insulation type	≥ 50 MΩ (500 VDC= megger)
Dielectric strength	Between all terminals and case: 1,500 VAC ~ 50/60 Hz for 1 min
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
Ambient temperature	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
Ambient humidity	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
Protection rating	IP67 (IEC standards)
Connection	Cable type model
Wire spec.	Ø 4 mm, 2-wire, 2 m
Connector spec.	AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
Material	Case: Heat-resistant ABS, standard type cable (black): polyvinyl chloride (PVC)



View product detail

# Rectangular Inductive Long-Distance Proximity Sensors (DC 4-Wire)

## AS Series



### Features

- Long sensing distance 50 mm
- Power supply: 12 - 48 VDC $\equiv$   
(operating voltage : 10 - 65 VDC $\equiv$ )
- Simultaneous output  
(Normally Open + Normally Closed)
- Power indicator (green LED) and  
operation indicator (red LED)
- IP67 protection structure (IEC standard)

### Specifications

Installation	Upper side type
Model	AS80-50D□
Sensing side length	80 mm
Sensing distance	50 mm
Setting distance	0 to 35 mm
Hysteresis	≤ 15 % of sensing distance
Standard sensing target: iron	150 × 150 × 1 mm
Response frequency <sup>01)</sup>	30 Hz
Affection by temperature	± 10 % for sensing distance at ambient temperature 20 °C
Indicator	Power indicator (green), operation indicator (yellow)
Approval	CE ENEC
Unit weight	≈ 470 g
<small>01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.</small>	
Power supply	12 - 48 VDC $\equiv$ (ripple P-P: ≤ 10 %), operating voltage: 10 - 65 VDC $\equiv$
Current consumption	≤ 20 mA
Control output	≤ 200 mA
Residual voltage	≤ 2 V
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Insulation type	≥ 50 MΩ (500 VDC $\equiv$ megger)
Dielectric strength	1,500 VAC~ 50/60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (= 50 G) X, Y, Z directions for 3 times
Ambient temperature	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
Ambient humidity	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
Protection structure	IP67 (IEC standard)
Connection	Cable type model
Wire spec.	Ø 5 mm, 4-wire, 2 m
Connector spec.	AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
Material	Case: PC+ABS, standard type cable (black): polyvinyl chloride (PVC)



View product detail

# Rectangular Flat-Type Inductive Proximity Sensors

(DC 3-Wire)

## PFI Series



### Features

- Flat, compact design (10 mm height) allows easy installation in limited spaces
- Operation indicator (red LED)
- IP67 protection structure (IEC standard)

### Specifications

Installation	Upper side type
<b>Model</b>	PFI25-8D□
<b>Sensing side length</b>	25 mm
<b>Sensing distance</b>	8 mm
<b>Setting distance</b>	0 to 5.6 mm
<b>Hysteresis</b>	≤ 10 % of sensing distance
<b>Standard sensing target: iron</b>	25 × 25 × 1 mm
<b>Response frequency <sup>01)</sup></b>	200 Hz
<b>Affection by temperature</b>	≤ ± 10 % for sensing distance at ambient temperature 20 °C
<b>Indicator</b>	Operation indicator (red)
<b>Approval</b>	CE [EAC]
<b>Unit weight</b>	≈ 70 g

01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.

<b>Power supply</b>	12 - 24 VDC= (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC=
<b>Current consumption</b>	≤ 10 mA
<b>Control output</b>	≤ 200 mA
<b>Residual voltage</b>	≤ 1.5 V
<b>Protection circuit</b>	Surge protection circuit, output short over current protection circuit, reverse polarity protection
<b>Insulation type</b>	≥ 50 MΩ (500 VDC= megger)
<b>Dielectric strength</b>	1,500 VAC~ 50 / 60 Hz for 1 min
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Shock</b>	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times
<b>Ambient temperature</b>	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
<b>Protection structure</b>	IP67 (IEC standards)
<b>Connection</b>	Cable type model
<b>Wire spec.</b>	Ø 4 mm, 3-wire, 2 m
<b>Connector spec.</b>	AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
<b>Material</b>	Case: PPS, standard type cable (black): polyvinyl chloride (PVC)



View product detail

# Rectangular Flat-Type Inductive Proximity Sensors

(AC 2-Wire)

## PFI Series



### Features

- Flat, compact design (10 mm height) allows easy installation in limited spaces
- Operation indicator (red LED)
- IP67 protection structure (IEC standard)

### Specifications

Installation	Upper side type
Model	PFI25-8A□
Sensing side length	25 mm
Sensing distance	8 mm
Setting distance	0 to 5.6 mm
Hysteresis	≤ 10 % of sensing distance
Standard sensing target: iron	25 × 25 × 1 mm
Response frequency <sup>01)</sup>	20 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C
Indicator	Operation indicator (red)
Approval	CE ENEC
Unit weight	≈ 70 g
<small>01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.</small>	
Power supply	100 - 240 VAC~ 50 / 60 Hz, operating voltage: 85 - 264 VAC~
Leakage current	≤ 2.5 mA
Control output	5 to 150 mA
Residual voltage	≤ 10 V
Protection circuit	Surge protection circuit
Insulation type	≥ 50 MΩ (500 VDC= megger)
Dielectric strength	1,500 VAC~ 50/60 Hz for 1 min
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Shock	500 m/s <sup>2</sup> (= 50 G) in each X, Y, Z direction for 3 times
Ambient temperature	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)
Ambient humidity	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)
Protection structure	IP67 (IEC standards)
Connection	Cable type model
Wire spec.	Ø 4 mm, 2-wire, 2 m
Connector spec.	AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
Material	Case: PPS, standard type cable (black): polyvinyl chloride (PVC)



View product detail

# Cylindrical Capacitive Proximity Sensors

(DC 3-Wire)

## CR Series



### Features

- Detect various materials including metal, iron, stone, plastic, water, and grain
- Built-in sensitivity adjuster for convenient configuration
- Operation indicator (red)
- Ideal for level detection and position control

### Specifications

Installation	Non-flush type	
	CR18-8D□	CR30-15D□
Model	CR18-8D□	CR30-15D□
DIA. of sensing side	Ø 18 mm	Ø 30 mm
Sensing distance	8 mm	15 mm
Setting distance	0 to 5.6 mm	0 to 10.5 mm
Hysteresis	≤ 20 % of sensing distance	
Standard sensing target: iron	50 × 50 × 1 mm	
Response frequency <sup>01)</sup>	50 Hz	
Affection by temperature	≤ ± 20 % for sensing distance at ambient temperature 20 °C	
Indicator	Operation indicator (red)	
Approval	CEC	CEC
Unit weight (package)	≈ 76 g (≈ 88 g)	≈ 206 g (≈ 243 g)
01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.		
Power supply	12 - 24 VDC≐ (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC≐	
Current consumption	≤ 15 mA	
Control output	≤ 200 mA	
Residual voltage	≤ 1.5 V	
Protection circuit	Surge protection circuit, reverse polarity protection	
Insulation resistance	≥ 50 MΩ (500 VDC≐ megger)	
Dielectric strength	1,500 VAC~ 50 / 60Hz for 1 min (between all terminals and case)	
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times	
Ambient temperature	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)	
Ambient humidity	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)	
Protection structure	DIA. of sensing side Ø 18 mm: IP66 (IEC standard) / DIA. of sensing side Ø 30 mm: IP65 (IEC standard)	
Connection	Cable type	
Cable spec.	DIA. of sensing side Ø 18 mm: Ø 4 mm, 3-wire, 2 m DIA. of sensing side Ø 30 mm: Ø 5 mm, 3-wire, 2 m	
Wire spec.	AWG 22 (0.08 mm, 60-core), insulator DIA.: Ø 1.25 mm	
Material	Standard type cable (black): polyvinyl chloride (PVC)	
DIA. of sensing side Ø 18 mm	Case / Nut: PA6	
DIA. of sensing side Ø 30 mm	Case / Nut: nickel-plated brass, washer: nickel-plated iron, sensing side: PBT	



View product detail

# Cylindrical Capacitive Proximity Sensors

(AC 2-Wire)

## CR Series



### Features

- Detect various materials including metal, iron, stone, plastic, water, and grain
- Built-in sensitivity adjuster for convenient configuration
- Operation indicator (red)
- Ideal for level detection and position control

### Specifications

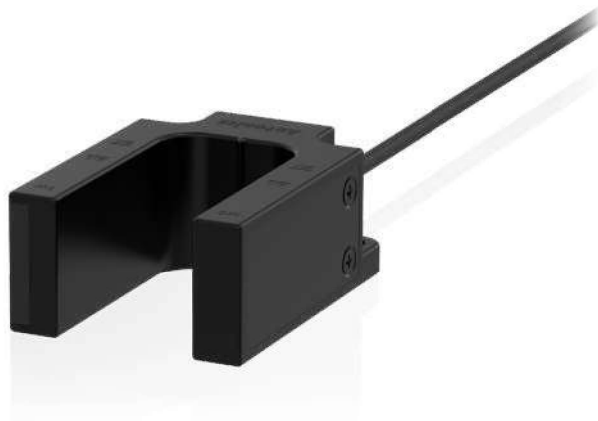
Installation	Non-flush type	
Model	CR18-8A□	CR30-15A□
DIA. of sensing side	Ø 18 mm	Ø 30 mm
Sensing distance	8 mm	15 mm
Setting distance	0 to 5.6 mm	0 to 10.5 mm
Hysteresis	≤ 20 % of sensing distance	
Standard sensing target: iron	50 × 50 × 1 mm	
Response frequency <sup>01)</sup>	20 Hz	
Affection by temperature	≤ ± 20 % for sensing distance at ambient temperature 20 °C	
Indicator	Operation indicator (red)	
Approval	ERC	ERC
Unit weight (package)	≈ 70 g (≈ 82 g)	≈ 200 g (≈ 237 g)
<small>01) The response frequency is the average value. The standard sensing target is used and the width is set as 2 times of the standard sensing target, 1/2 of the sensing distance for the distance.</small>		
Power supply	100-240 VAC~ / 50 / 60 Hz, operating voltage: 85 - 264 VAC~	
Leakage current	≤ 2.2 mA	
Control output	≤ 5 to 200 mA	
Residual voltage	≤ 20 V	
Protection circuit	Surge protection circuit	
Insulation resistance	≥ 50 MΩ (500 VDC= megger)	
Dielectric strength	1,500 VAC~ / 50 / 60Hz for 1 min (between all terminals and case)	
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Shock	500 m/s <sup>2</sup> (≈ 50 G) in each X, Y, Z direction for 3 times	
Ambient temperature	-25 to 70 °C, storage: -30 to 80 °C (no freezing or condensation)	
Ambient humidity	35 to 95 %RH, storage: 35 to 95 %RH (no freezing or condensation)	
Protection structure	DIA. of sensing side Ø 18 mm: IP66 (IEC standard) / DIA. of sensing side Ø 30 mm: IP65 (IEC standard)	
Connection	Cable type	
Cable spec.	DIA. of sensing side Ø 18 mm: Ø 4 mm, 2-wire, 2 m DIA. of sensing side Ø 30 mm: Ø 5 mm, 2-wire, 2 m	
Wire spec.	AWG 22 (0.08 mm, 60-core), insulator DIA.: Ø 1.25 mm	
Material	Standard type cable (black): polyvinyl chloride (PVC)	
DIA. of sensing side Ø 18 mm	Case / Nut: PA6	
DIA. of sensing side Ø 30 mm	Case / Nut: nickel-plated brass, washer: nickel-plated iron, sensing side: PBT	



View product detail

# U-Shaped Magnetic Proximity Sensors

## MU Series



### Features

- Non-voltage magnetic detection method
- Two wiring specifications of cable / cable connector type
- IP67 protection structure (IEC standard)

### Specifications

Model	MU-1A-30-□	MU-1B-30-□
Contact	N.O.	N.C.
Operating distance <sup>01)</sup>	OFF → ON	± 10 mm
	ON → OFF	± 20 mm
Standard sensing target	Steel plate - a galvanized steel sheet 1.6t	
Operating time	≤ 2 ms	
Release time	≤ 1 ms	
Operating frequency	≤ 500 Hz	
Approval	CE	
Unit weight (package)	Cable type: ≈ 132.5 g (≈ 172.3 g) Cable connector type: ≈ 107 g (≈ 147.2 g)	

01) Rated at the ambient temperature of 23 °C. It can be differed up to ±20 % according to the ambient temperature.

Switching voltage	≤ 24 VDC≐
Life expectancy	≥ 100 million times (at a resistive load of 5 VDC≐m 10 mA )
Insulated resistance	≥ 1,000 MΩ (500 VDC≐ megger)
Dielectric strength	500 VAC~ 50/60 Hz for 1 minute (between all terminals and case)
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	100 m/s <sup>2</sup> (≈ 10 G) in each X, Y, Z direction for 3 times
Ambient temperature	-10 to 65 °C, storage: -10 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage : 35 to 85 %RH (no freezing or condensation)
Protection structure	IP67 (IEC standard)
Connection	Cable type / Cable connector type
Cable	Cable type: Ø 4, 2-wire, 2 m (UL Style 20276, AWG22) Cable connector type: Ø 4, 2-wire, 0.5 m (UL Style 20276, AWG22)
Material	Cover/Case: PC (915R)

### [Applied REED SWITCH]

Model	ORD324-10-15 (STANDEX MEDER)
Contact	A (SPST-NO: single pole, single throw, normally open)
Contact rating <sup>01)</sup>	≤ 10 W/VA
Voltage	Switching: ≤ 200 VDC≐, Breakdown: ≥ 250 VDC≐
Current	Switching: ≤ 0.5 A, Carry: ≤ 1.0 A
Ambient temperature	-40 to 125 °C, storage : -65 to 125 °C <sup>02)</sup>
Material	Body: glass, leads: tin-plated Ni-Fe wire

01) Switching voltage and current should never exceed the wattage rating.

02) Long time exposure at elevated temperature may degrade solderability of the leads.



View product detail







## A9. Rotary Encoders

Rotary encoders are used to electronically monitor the position of a rotating shaft by converting shaft rotation into electronic pulses.

A9-1	Incremental	E15 Series	15 mm Diameter Incremental Rotary Encoders
		E18 Series	18 mm Diameter Incremental Rotary Encoders
		E20 Series	20 mm Diameter Incremental Rotary Encoders
		E30 Series	30 mm Diameter Incremental Rotary Encoders
		E40 Series	40 mm Diameter Incremental Rotary Encoders
		E50 Series	50 mm Diameter Incremental Rotary Encoders
		E58 Series	58 mm Diameter Incremental Rotary Encoders
		E60 Series	60 mm Diameter Incremental Rotary Encoders
		E68 Series	68 mm Diameter Incremental Rotary Encoders
		E80 Series	80 mm Diameter Incremental Rotary Encoders
		E88 Series	88 mm Diameter Incremental Rotary Encoders
		E100 Series	100 mm Diameter Incremental Rotary Encoders
		ENA Series	Side Mount Type Incremental Rotary Encoders
ENC Series	Wheel Type Incremental Rotary Encoders		
A9-2	Incremental (Sine Wave)	E18-A Series	18 mm Diameter Sine Wave Incremental Rotary Encoders
		E58-A Series	58 mm Diameter Sine Wave Incremental Rotary Encoders
		E60-A Series	60 mm Diameter Sine Wave Incremental Rotary Encoders
A9-3	Absolute (Single-Turn)	EP50 Series	50 mm Diameter Absolute Single-Turn Rotary Encoders (Optical)
		EP58 Series	58 mm Diameter Absolute Single-Turn Rotary Encoders (Optical)
		ENP Series	60 mm Diameter Absolute Single-Turn Rotary Encoders (Optical)
		MGA50 Series	50 mm Diameter Absolute Single-Turn Rotary Encoders (Magnetic)
		EWLS50 Series	50 mm Wire-Type Linear Scale Absolute Encoders (Optical)
A9-4	Absolute (Multi-Turn)	EPM50 Series	50 mm Diameter Absolute Multi-Turn Rotary Encoders (Optical)
		MGAM50 Series	50 mm Diameter Absolute Multi-Turn Rotary Encoders (Magnetic)
A9-5	Manual Handle	ENH Series	Manual Handle Type Pulse Generators
		ENHP Series	Portable Manual Handle Type Pulse Generators
A9-6	Flexible Coupling	ERB Series	Flexible Shaft Coupling

# 15 mm Diameter Incremental Rotary Encoders

## E15 Series



### Features

- Ultra-compact (Ø 15 mm) housing and ultra-lightweight (14 g) design
- Easy installation in tight or limited spaces
- Low shaft moment of inertia
- Resolution: 36 pulses per revolution
- Power supply:  
5 VDC $\pm$  5%

### Specifications

Model	E15S2-36-2-N-5-R
Resolution	36 PPR
Control output	NPN open collector output
Output phase	A, B
Inflow current	$\leq$ 30 mA
Residual voltage	$\leq$ 0.4 VDC $\equiv$
Response speed <sup>01)</sup>	$\leq$ 1 $\mu$ s
Max. response freq.	10 kHz
Max. allowable revolution <sup>02)</sup>	3,000 rpm
Starting torque	$\leq$ $10 \times 10^{-4}$ N m
Inertia moment	$\leq$ 0.5 g $\cdot$ cm <sup>2</sup> ( $5 \times 10^{-8}$ kg $\cdot$ m <sup>2</sup> )
Allowable shaft load	Radial: $\leq$ 200 gf, Thrust: $\leq$ 200 gf
Unit weight (packaged)	$\approx$ 14 g ( $\approx$ 37 g)
Approval	CE

01) Based on cable length: 1 m, I sink: 20 mA

02) Select resolution to satisfy Max. allowable revolution  $\approx$  Max. response revolution

$$[\text{max. response revolution (rpm)} = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}]$$

Power supply	5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%)
Current consumption	$\leq$ 50 mA (no load)
Insulation resistance	Between all terminals and case: $\geq$ 100 M $\Omega$ (500 VDC $\equiv$ megger)
Dielectric strength	Between all terminals and case: 500 VAC $\sim$ 50 / 60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	$\leq$ 50 G
Ambient temperature	-10 to 70 °C, storage: -20 to 80 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP50 (IEC standard)
Connection	Axial wiring type
Cable spec.	Ø 3 mm, 4-wire, 500 mm, flexible PVC insulation shield cable
Wire spec.	AWG30 (0.102 mm, 7-core), insulator diameter: Ø 0.71 mm



View product detail

# 18 mm Diameter Incremental Rotary Encoders



## E18 Series



### Features

- Ultra-compact (Ø 18 mm) housing and ultra-lightweight (12 g) design
- Easy installation in tight or limited spaces
- Low shaft moment of inertia
- Various resolutions: 100, 200, 300, 400 pulses per revolution
- Power supply: 5 VDC $\pm$  5%

### Specifications

Model	E18S□-□-1-N-5-□	E18S□-□-1-V-5-□
<b>Resolution</b>	100 / 200 / 300 / 400 PPR model	
<b>Control output</b>	NPN open collector output	Voltage output
Output phase	A	
Inflow current	≤ 30 mA	-
Residual voltage	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$
Outflow current	-	≤ 10 mA
<b>Response speed</b> <sup>01)</sup>	≤ 1 μs	
<b>Max. response freq.</b>	25 kHz	
<b>Max. allowable revolution</b> <sup>02)</sup>	6,000 rpm	
<b>Starting torque</b>	≤ 9.8 × 10 <sup>-4</sup> N m	
<b>Inertia moment</b>	≤ 0.5 g·cm <sup>2</sup> (5 × 10 <sup>-8</sup> kg·m <sup>2</sup> )	
<b>Allowable shaft load</b>	Radial: ≤ 200 gf, Thrust: ≤ 200 gf	
<b>Unit weight (packaged)</b>	Shaft outer diameter Ø 2 mm model: ≈ 12 g (≈ 35.4 g) Shaft outer diameter Ø 2.5 mm model: ≈ 12 g (≈ 34.2 g)	
<b>Approval</b>	CE  ENEC	CE  ENEC

01) Based on cable length: 1 m, I sink: 20 mA

02) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%)
<b>Current consumption</b>	≤ 50 mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)
<b>Dielectric strength</b>	Between all terminals and case: 500 VAC ~ 50 / 60 Hz for 1 minute
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
<b>Shock</b>	≤ 50 G
<b>Ambient temperature</b>	-10 to 70 °C, storage: -20 to 80 °C (no freezing or condensation)
<b>Ambient humidity</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
<b>Protection rating</b>	IP50 (IEC standard)
<b>Connection</b>	Axial / Radial cable type model
<b>Cable spec.</b>	Ø 1.28 mm, 3-wire, 150 mm, flat ribbon cable
<b>Wire spec.</b>	AWG26 (0.16 mm, 7-core), insulator diameter: Ø 1.28 mm



View product detail

# 20 mm Diameter Incremental Rotary Encoders

## E20 Series



### Features

- Easy installation in tight or limited spaces
- Low shaft moment of inertia
- Various resolutions:  
100, 200, 320, 360 pulses per revolution
- Various control output options
- Power supply:  
5 VDC $\pm$  5%, 12 VDC $\pm$  5%

### Specifications

Model	E20□□-□-3-N-□-□	E20□□-□-3-V-□-□	E20□□-□-6-L-5-□
<b>Resolution</b>	100 / 200 / 320 / 360 PPR model		
<b>Control output</b>	NPN open collector output	Voltage output	Line driver output
<b>Output phase</b>	A, B, Z	A, B, Z	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$
<b>Inflow current</b>	$\leq$ 30 mA	-	$\leq$ 20 mA
<b>Residual voltage</b>	$\leq$ 0.4 VDC $\equiv$	$\leq$ 0.4 VDC $\equiv$	$\leq$ 0.5 VDC $\equiv$
<b>Outflow current</b>	-	$\leq$ 10 mA	$\leq$ -20 mA
<b>Output voltage</b>	-	-	$\geq$ 2.5 VDC $\equiv$
<b>Response speed <sup>01)</sup></b>	$\leq$ 1 $\mu$ s		$\leq$ 0.5 $\mu$ s
<b>Max. response frequency</b>	100 kHz		
<b>Max. allowable revolution <sup>02)</sup></b>	6,000 rpm		
<b>Starting torque</b>	$\leq$ 5 $\times$ 10 <sup>-4</sup> N m		
<b>Inertia moment</b>	$\leq$ 0.5 g $\cdot$ cm <sup>2</sup> (5 $\times$ 10 <sup>-8</sup> kg $\cdot$ m <sup>2</sup> )		
<b>Allowable shaft load</b>	Radial: $\leq$ 200 gf, Thrust: $\leq$ 200 gf		
<b>Unit weight</b>	$\approx$ 35 g		
<b>Approval</b>	CE EAC	CE EAC	EAC

01) Based on cable length: 1 m, I sink: 20 mA

02) Select resolution to satisfy Max. allowable revolution  $\approx$  Max. response revolution  

$$[\text{max. response revolution (rpm)} = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}]$$

Model	E20□□-□-3-N-□-□	E20□□-□-3-V-□-□	E20□□-□-6-L-5-□
<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%) / 12 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%) model		5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%)
<b>Current consumption</b>	$\leq$ 60 mA (no load)		$\leq$ 50 mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: $\geq$ 100 M $\Omega$ (500 VDC $\equiv$ megger)		
<b>Dielectric strength</b>	Between all terminals and case: 500 VAC $\sim$ 50 / 60 Hz for 1 minute		
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours		
<b>Shock</b>	$\leq$ 50 G		
<b>Ambient temp.</b>	-10 to 70 °C, storage: -20 to 80 °C (no freezing or condensation)		
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)		
<b>Protection rating</b>	IP50 (IEC standard)		
<b>Connection</b>	Axial / Radial cable type model		
<b>Cable spec.</b>	$\varnothing$ 3 mm, 5-wire (Line driver output: 8-wire), 1 m, shield cable		

View product detail



Shaft Type



Blind Hollow  
Shaft Type

# 30 mm Diameter Incremental Rotary Encoders

## E30 Series



### Features

- Compact Ø 30 mm housing, Ø 4 mm solid shaft
- Easy installation in tight or limited spaces
- Low shaft moment of inertia
- Various resolutions: up to 3000 pulses per revolution
- Various control output options
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	E30S4-□- 3-T-□-□	E30S4-□- 3-N-□-□	E30S4-□- 3-V-□-□	E30S4-□- 6-L-5-□
Resolution	100 / 200 / 360 / 500 / 1,000 / 1,024 / 3,000 PPR model			
Control output	Totem pole output	NPN open collector output	Voltage output	Line driver output
Output phase	A, B, Z	A, B, Z	A, B, Z	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$
Inflow current	≤ 30 mA	≤ 30 mA	-	≤ 20 mA
Residual voltage	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.5 VDC $\pm$
Outflow current	≤ 10 mA	-	≤ 10 mA	≤ -20 mA
Output voltage (5 VDC $\pm$ )	≥ (power supply -2.0) VDC $\pm$	-	-	≥ 2.5 VDC $\pm$
Output voltage (12 - 24 VDC $\pm$ )	≥ (power supply -3.0) VDC $\pm$	-	-	-
Response speed <sup>01)</sup>	≤ 1 μs		≤ 1 μs <sup>02)</sup> ≤ 2 μs <sup>03)</sup>	≤ 0.5 μs
Max. response freq.	300 kHz			
Max. allowable revolution <sup>04)</sup>	5,000 rpm			
Starting torque	≤ 0.002 N m			
Inertia moment	≤ 20 g·cm <sup>2</sup> (2 × 10 <sup>-6</sup> kg·m <sup>2</sup> )			
Allowable shaft load	Radial: ≤ 2 kgf, Thrust: ≤ 1 kgf			
Unit weight	≈ 80 g			
Approval	CE EAC	CE EAC	CE EAC	EAC

01) Based on cable length: 2 m, I<sub>sink</sub>: 20 mA

02) Based on power supply: 5 VDC $\pm$ , output resistance: 820 Ω

03) Based on power supply: 12 - 24 VDC $\pm$ , output resistance: 4.7 kΩ

04) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max.response revolution (rpm)}] = \frac{\text{max.response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

Model	E30S4-□- 3-T-□-□	E30S4-□- 3-N-□-□	E30S4-□- 3-V-□-□	E30S4-□- 6-L-5-□
Power supply	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12-24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model			5 VDC $\pm$ 5% (ripple P-P: ≤ 5%)
Current consumption	≤ 80 mA (no load)			≤ 50 mA (no load)
Insulation resistance	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)			
Dielectric strength	Between all terminals and case: 750 VAC ~ 50 / 60 Hz for 1 minute			
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours			
Shock	≤ 50 G			
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)			
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)			
Protection rating	IP50 (IEC standard)			
Connection	Axial cable type / cable connector type model			
Cable spec.	Ø 5 mm, 5-wire (Line driver output: 8-wire), shield cable cable type: 2 m, cable connector type: 250 mm			
Wire spec.	AWG24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm			
Connector spec.	M17 6-pin socket type			M17 9-pin socket type



View product detail



# 50 mm Diameter Incremental Rotary Encoders

## E50 Series



### Features

- Ø 50 mm housing, Ø 8 mm solid shaft
- Accurate measurement of angle, position, revolution, speed, acceleration, and distance
- Cable type, cable connector type, axial / radial connector types available
- Various resolutions:  
1 to 8000 pulses per revolution
- Various control output options
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	E50S8-□-□-□-□-□	E50S8-□-□-□-□-□	E50S8-□-□-□-□-□	E50S8-□-□-□-□-□
Resolution	1 / 2 / 5 PPR <sup>01)</sup> 10 to 8,000 PPR model			
Control output	Totem pole output	NPN open collector output	Voltage output	Line driver output
Output phase	A, B, Z	A, B, Z	A, B, Z	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$
Inflow current	≤ 30 mA	≤ 30 mA	-	≤ 20 mA
Residual voltage	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.5 VDC $\pm$
Outflow current	≤ 10 mA	-	≤ 10 mA	≤ -20 mA
Output voltage (5 VDC $\pm$ )	≥ (power supply -2.0) VDC $\pm$	-	-	≥ 2.5 VDC $\pm$
Output voltage (12 - 24 VDC $\pm$ )	≥ (power supply -3.0) VDC $\pm$	-	-	≥ (power supply -3.0) VDC $\pm$
Response speed <sup>02)</sup>	≤ 1 μs			≤ 0.5 μs
Max. response freq.	300 kHz			
Max. allowable revolution <sup>03)</sup>	5,000 rpm			
Approval	CE ENEC	CE ENEC	CE ENEC	CE ENEC

01) Depending on the control output, only A, B or A,  $\bar{A}$ , B,  $\bar{B}$  are output.

02) Based on cable length: 2 m, I sink: 20 mA

03) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

Connection	Axial cable type	Axial cable connector type	Axial connector type	Radial connector type
Starting torque	≤ 0.007 N m		≤ 0.078 N m	
Inertia moment	≤ 80 g·cm <sup>2</sup> (8 × 10 <sup>-6</sup> kg·m <sup>2</sup> )		≤ 400 g·cm <sup>2</sup> (4 × 10 <sup>-5</sup> kg·m <sup>2</sup> )	
Allowable shaft load	Radial: ≤ 10 kgf, Thrust: ≤ 2.5 kgf			
Unit weight (packaged)	≈ 275 g (≈ 363 g)		≈ 180 g (≈ 268 g)	
Power supply	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model			
Current consumption	Totem pole, NPN open collector, Voltage output: ≤ 80 mA (no load) Line driver output: ≤ 50 mA (no load)			
Insulation resistance	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)			
Dielectric strength	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute			
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours			
Shock	≤ 75 G			
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)			
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)			
Protection rating	Axial cable type / cable connector type: IP50 (IEC standard) <sup>01)</sup> Axial / Radial connector type: IP64 (IEC standard)			
Cable spec.	Ø 5 mm, 5-wire (Line driver output: 8-wire), shield cable cable type: 2 m, cable connector type: 250 mm			
Wire spec.	AWG24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm			
Connector spec.	Totem pole, NPN open collector, Voltage output: M17 6-pin socket type Line driver output: M17 9-pin socket type			

01) Protection structure IP64 option is also available to order.

(starting torque: ≤ 0.078 N m, inertia moment: ≤ 400 g·cm<sup>2</sup> (4 × 10<sup>-5</sup> kg·m<sup>2</sup>))



View product detail



# 58 mm Diameter Incremental Rotary Encoders

## E58 Series



### Features

- Ø 58 mm flange incremental rotary encoders
- Accurate measurement of angle, position, revolution, speed, acceleration, and distance
- Shaft, hollow shaft, blind hollow shaft models available
- Cable type, cable connector type, axial / radial connector types available
- Various resolutions:  
1 to 8000 pulses per revolution
- Various control output options
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	E58□□-□□-□□-□□-□□	E58□□□□-□□-□□-□□	E58□□□□-□□-□□-□□	E58□□□□-□□-□□-□□
<b>Resolution</b>	1 / 2 / 5 / 12 PPR <sup>01)</sup> 10 to 8,000 PPR model			
<b>Control output</b>	Totem pole output	NPN open collector output	Voltage output	Line driver output
Output phase	A, B, Z	A, B, Z	A, B, Z	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$
Inflow current	≤ 30 mA	≤ 30 mA	-	≤ 20 mA
Residual voltage	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.5 VDC $\pm$
Outflow current	≤ 10 mA	-	≤ 10 mA	≤ -20 mA
Output voltage (5 VDC $\pm$ )	≥ (power supply -2.0) VDC $\pm$	-	-	≥ 2.5 VDC $\pm$
Output voltage (12 - 24 VDC $\pm$ )	≥ (power supply -3.0) VDC $\pm$	-	-	≥ (power supply -3.0) VDC $\pm$
<b>Response speed</b> <sup>02)</sup>	≤ 1 μs			
<b>Max. response freq.</b>	300 kHz			
<b>Max. allowable revolution</b> <sup>03)</sup>	5,000 rpm			
<b>Approval</b>	CE EAC	CE EAC	CE EAC	EAC

01) Depending on the control output, only A, B or A,  $\bar{A}$ , B,  $\bar{B}$  are output.

02) Based on cable length: 2 m, I sink: 20 mA

03) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution.

[max. response revolution (rpm) =  $\frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$ ]

Shaft type	Shaft clamping type	Shaft synchro type	Hollow type	Hollow Built-in type
<b>Starting torque</b>	≤ 0.004 N m		≤ 0.009 N m	
<b>Inertia moment</b>	≤ 15 g·cm <sup>2</sup> (1.5 × 10 <sup>-6</sup> kg·m <sup>2</sup> )		≤ 20 g·cm <sup>2</sup> (2 × 10 <sup>-6</sup> kg·m <sup>2</sup> )	
<b>Allowable shaft load</b>	Radial: ≤ 10 kgf, Thrust: ≤ 2.5 kgf		Radial: ≤ 2 kgf, Thrust: ≤ 1 kgf	
<b>Unit weight (packaged)</b>	Varies according to connection type			
Cable type, cable connector type	≈ 310 g (≈ 420 g)	≈ 285 g (≈ 395 g)	≈ 270 g (≈ 380 g)	≈ 270 g (≈ 380 g)
Connector type	≈ 230 g (≈ 340 g)	≈ 205 g (≈ 315 g)	-	≈ 200 g (≈ 310 g)
<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model			
<b>Current consumption</b>	Totem pole, NPN open collector, Voltage output: ≤ 80 mA (no load) Line driver output: ≤ 50 mA (no load)			
<b>Insulation resistance</b>	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)			
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC ~ 50 / 60 Hz for 1 minute			
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours			
<b>Shock</b>	≤ 75 G			
<b>Ambient temp.</b>	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)			
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)			
<b>Protection rating</b>	IP50 (IEC standard)			
<b>Connection</b>	Shaft type, Hollow Built-in type : Axial cable type / Axial cable connector type / Axial connector type / Radial connector type model Hollow type: Radial cable type / Radial cable connector type model			
<b>Cable spec.</b>	Ø 5 mm, 5-wire (Line driver output: 8-wire), shield cable cable type: 2 m, cable connector type: 250 mm			
<b>Wire spec.</b>	AWG24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm			
<b>Connector spec.</b>	Totem pole, NPN open collector, Voltage output: M17 6-pin socket type Line driver output: M17 9-pin socket type			

View product detail



Clamping  
Shaft Type



Synchro  
Shaft Type



Hollow Shaft Type



Blind Hollow  
Shaft Type

# 60 mm Diameter Incremental Rotary Encoders

## E60 Series



### Features

- Ø 60 mm housing, Ø 20 mm hollow shaft
- Accurate measurement of angle, position, revolution, speed, acceleration, and distance
- Various resolutions:  
up to 8192 pulses per revolution
- Various control output options
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	E60H20-□- 3-T-□-□	E60H20-□- 3-N-□-□	E60H20-□- 3-V-□-□	E60H20-□- 6-L-□-□
<b>Resolution</b>	100 / 1,024 / 5,000 / 8,192 PPR model			
<b>Control output</b>	Totem pole output	NPN open collector output	Voltage output	Line driver output
Output phase	A, B, Z	A, B, Z	A, B, Z	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$
Inflow current	≤ 30 mA	≤ 30 mA	-	≤ 20 mA
Residual voltage	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.5 VDC $\pm$
Outflow current	≤ 10 mA	-	≤ 10 mA	≤ -20 mA
Output voltage (5 VDC $\pm$ )	≥ (power supply -2.0) VDC $\pm$	-	-	≥ 2.5 VDC $\pm$
Output voltage (12 - 24 VDC $\pm$ )	≥ (power supply -3.0) VDC $\pm$	-	-	≥ (power supply -3.0) VDC $\pm$
<b>Response speed</b> <sup>01)</sup>	≤ 1 μs			
<b>Max. response frequency</b>	300 kHz			
<b>Max. allowable revolution</b> <sup>02)</sup>	6,000 rpm			
<b>Starting torque</b>	≤ 0.0147 N m			
<b>Inertia moment</b>	≤ 110 g·cm <sup>2</sup> (11 × 10 <sup>-8</sup> kg·m <sup>2</sup> )			
<b>Allowable shaft load</b>	Radial: ≤ 5 kgf, Thrust: ≤ 2.5 kgf			
<b>Unit weight (packaged)</b>	≈ 300 g (≈ 397 g)			
<b>Approval</b>	CE EAC	CE EAC	CE EAC	EAC

01) Based on cable length: 2 m, I sink: 20 mA

02) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model
<b>Current consumption</b>	Totem pole, NPN open collector, Voltage output: ≤ 80 mA (no load) Line driver output: ≤ 50 mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
<b>Shock</b>	≤ 100 G
<b>Ambient temp.</b>	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
<b>Protection rating</b>	IP50 (IEC standard)
<b>Connection</b>	Radial cable type / Cable connector type model
<b>Cable spec.</b>	Ø 5 mm, 5-wire (line driver output: 8-wire), shield cable cable type: 2 m, cable connector type: 250 mm
<b>Wire spec.</b>	AWG24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm
<b>Connector spec.</b>	Totem pole, NPN open collector, Voltage output: M17 6-pin socket type Line driver output: M17 9-pin socket type



View product detail

# 68 mm Diameter Incremental Rotary Encoders

## E68 Series



### Features

- Ø 68 mm housing, Ø 15 mm solid shaft
- High-strength shaft  
(radial load: 20 kgf, thrust load: 10 kgf)
- 180 kHz response frequency
- Radial connector type
- Various resolutions:  
500, 600, 1024 pulses per revolution
- Power supply:  
5 VDC $\pm$  5%
- IP65 protection structure (IEC standard)

### Specifications

Model	E68S15-□-6-L-5
Resolution	500 / 600 / 1,024 PPR model
Control output	Line driver output
Output phase	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$
Inflow current	$\leq$ 20 mA
Residual voltage	$\leq$ 0.5 VDC $\equiv$
Outflow current	$\leq$ -20 mA
Output voltage	$\geq$ 2.5 VDC $\equiv$
Response speed <sup>01)</sup>	$\leq$ 0.5 $\mu$ s
Max. response freq.	180 kHz
Max. allowable revolution <sup>02)</sup>	6,500 rpm
Starting torque	$\leq$ 0.15 N m
Allowable shaft load	Radial: $\leq$ 20 kgf, Thrust: $\leq$ 10 kgf
Unit weight	$\approx$ 550 g
Approval	ERC

01) Based on cable length: 1 m, I sink: 20 mA

02) Select resolution to satisfy Max. allowable revolution  $\geq$  Max. response revolution

$$[\text{max. response revolution (rpm)} = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}]$$

Power supply	5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%)
Current consumption	$\leq$ 50 mA (no load)
Insulation resistance	Between all terminals and case: $\geq$ 100 M $\Omega$ (500 VDC $\equiv$ megger)
Dielectric strength	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	$\lesssim$ 50 G
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP65 (IEC standard)
Connection	Radial connector type
Connector spec.	1-1/4-18UNEF-2A socket type



View product detail

# 80 mm Diameter Incremental Rotary Encoders

## E80 Series



### Features

- Ø 80 mm housing,  
Ø 30 mm / Ø 32 mm hollow shaft
- Install directly on motors or rotating shaft.  
Couplings not required.
- Various resolutions:  
up to 3200 pulses per revolution
- Various control output options
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	E80H□-□- 3-T-□-□	E80H□-□- 3-N-□-□	E80H□-□- 3-V-□-□	E80H□-□- 6-L-5-□
<b>Resolution</b>	60 / 100 / 360 / 500 / 512 / 1,024 / 3,200 PPR model			
<b>Control output</b>	Totem pole output	NPN open collector output	Voltage output	Line driver output
Output phase	A, B, Z	A, B, Z	A, B, Z	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$
Inflow current	≤ 30 mA	≤ 30 mA	-	≤ 20 mA
Residual voltage	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.5 VDC $\pm$
Outflow current	≤ 10 mA	-	≤ 10 mA	≤ -20 mA
Output voltage (5 VDC $\pm$ )	≥ (power supply -2.0) VDC $\pm$	-	-	≥ 2.5 VDC $\pm$
Output voltage (12 - 24 VDC $\pm$ )	≥ (power supply -3.0) VDC $\pm$	-	-	≥ (power supply -3.0) VDC $\pm$
<b>Response speed</b> <sup>01)</sup>	≤ 1 μs			≤ 0.5 μs
<b>Max. response freq.</b>	200 kHz			
<b>Max. allowable revolution</b> <sup>02)</sup>	3,600 rpm			
<b>Starting torque</b>	≤ 0.02 N m			
<b>Inertia moment</b>	≤ 800 g·cm <sup>2</sup> (8 × 10 <sup>-5</sup> kg·m <sup>2</sup> )			
<b>Allowable shaft load</b>	Radial: ≤ 5 kgf, Thrust: ≤ 2.5 kgf			
<b>Unit weight</b>	≈ 560 g			
<b>Approval</b>	CE EAC	CE EAC	CE EAC	EAC

01) Based on cable length: 2 m, I<sub>sink</sub>: 20 mA

02) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

Model	E80H□-□- 3-T-□-□	E80H□-□- 3-N-□-□	E80H□-□- 3-V-□-□	E80H□-□- 6-L-5-□
<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model			
<b>Current consumption</b>	Totem pole, NPN open collector, Voltage output: ≤ 80 mA (no load) Line driver output: ≤ 50 mA (no load)			
<b>Insulation resistance</b>	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)			
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute			
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours			
<b>Shock</b>	≤ 75 G			
<b>Ambient temp.</b>	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)			
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)			
<b>Protection rating</b>	IP50 (IEC standard)			
<b>Connection</b>	Radial cable type / cable connector type model			
<b>Cable spec.</b>	Ø 5 mm, 5-wire (Line driver output: 8-wire), shield cable cable type: 2 m, cable connector type: 250 mm			
<b>Wire spec.</b>	AWG24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm			
<b>Connector spec.</b>	Totem pole, NPN open collector, Voltage output: M17 6-pin socket type Line driver output: M17 9-pin socket type			



View product detail

# 88 mm Diameter Incremental Rotary Encoders

## E88 Series



### Features

- Ø 88 mm housing / Ø 30 mm hollow shaft
- Install directly on rotating shafts of elevator winding machines. No couplings required.
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%
- Output types: complementary, line driver

### Specifications

Model	E88H30-1024-2-15	E88H30-1024-2-L-5
Resolution	1,024 PPR	
Control output	Complemental output	Line driver output
Output phase	A, B	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$
Inflow current	$\leq$ 15 mA	$\leq$ 20 mA
Residual voltage	$\leq$ 2.0 VDC $\equiv$	$\leq$ 0.5 VDC $\equiv$
Outflow current	$\leq$ 15 mA	$\leq$ -20 mA
Output voltage	$\geq$ 10 VDC $\equiv$	$\geq$ 2.5 VDC $\equiv$
Response speed	$\leq$ 1 $\mu$ s <sup>01)</sup>	$\leq$ 0.5 $\mu$ s <sup>02)</sup>
Max. response freq.	150 kHz	
Max. allowable revolution <sup>03)</sup>	3,600 rpm	
Starting torque	$\leq$ 0.06 N m	
Inertia moment	$\leq$ 800 g·cm <sup>2</sup> ( $8 \times 10^{-5}$ kg·m <sup>2</sup> )	
Allowable shaft load	Radial: $\leq$ 5 kgf, Thrust: $\leq$ 2.5 kgf	
Unit weight	$\approx$ 1.45 kg ( $\approx$ 1.49 kg)	
Approval	CE EAC	EAC

01) Based on cable length: 8 m, load resistance: 1 k $\Omega$

02) Based on cable length: 8 m, I sink: 20 mA

03) Select resolution to satisfy Max. allowable revolution  $\geq$  Max. response revolution  

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

Model	E88H30-1024-2-15	E88H30-1024-2-L-5
Power supply	15 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%)	5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%)
Current consumption	$\leq$ 60 mA (no load)	$\leq$ 50 mA (no load)
Insulation resistance	Between all terminals and case: $\geq$ 100 M $\Omega$ (500 VDC $\equiv$ megger)	
Dielectric strength	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute	
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours	
Shock	$\leq$ 100 G	
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)	
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)	
Protection rating	IP50 (IEC standard)	
Connection	Radial cable type	
Cable spec.	$\varnothing$ 6 mm, 6-wire (Line driver output: 8-wire), 8 m, shield cable	
Wire spec.	AWG24 (0.16 mm, 11-core), insulator diameter: $\varnothing$ 1 mm	AWG24 (0.08 mm, 40-core), insulator diameter: $\varnothing$ 1 mm



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# 100 mm Diameter Incremental Rotary Encoders

## E100 Series



### Features

- Ø 100 mm housing, Ø 35 mm hollow shaft
- Ideal for application in elevator systems
- Various resolutions:  
512, 1024, 10000 pulses per revolution
- Various control output options
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	E100H35-□-3-T-□	E100H35-□-3-N-□	E100H35-□-3-V-□	E100H35-□-6-L-□
<b>Resolution</b>	512 / 1,024 / 10,000 PPR model			
<b>Control output</b>	Totem pole output	NPN open collector output	Voltage output	Line driver output
Output phase	A, B, Z	A, B, Z	A, B, Z	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$
Inflow current	≤ 30 mA	≤ 30 mA	-	≤ 20 mA
Residual voltage	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.5 VDC $\pm$
Outflow current	≤ 10 mA	-	≤ 10 mA	≤ -20 mA
Output voltage (5 VDC $\pm$ )	≥ (power supply -2.0) VDC $\pm$	-	-	≥ 2.5 VDC $\pm$
Output voltage (12 - 24 VDC $\pm$ )	≥ (power supply -3.0) VDC $\pm$	-	-	≥ (power supply -3.0) VDC $\pm$
<b>Response speed</b> <sup>01)</sup>	≤ 1 μs			
<b>Max. response freq.</b>	300 kHz			
<b>Max. allowable revolution</b> <sup>02)</sup>	3,600 rpm			
<b>Starting torque</b>	≤ 0.03 N m			
<b>Inertia moment</b>	≤ 800 g·cm <sup>2</sup> (8 × 10 <sup>-5</sup> kg·m <sup>2</sup> )			
<b>Allowable shaft load</b>	Radial: ≤ 5 kgf, Thrust: ≤ 2.5 kgf			
<b>Unit weight</b>	= 1130 g (= 1400 g)			
<b>Approval</b>	CE EAC	CE EAC	CE EAC	EAC

01) Based on cable length: 2 m, I sink: 20 mA

02) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model
<b>Current consumption</b>	Totem pole, NPN open collector, Voltage output: ≤ 80 mA (no load) Line driver output: ≤ 50 mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC~ 50 / 60 Hz for 1 minute
<b>Vibration</b>	1 mm double amplitude at frequency or 300 m/s <sup>2</sup> 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
<b>Shock</b>	≤ 75 G
<b>Ambient temp.</b>	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
<b>Protection rating</b>	IP50 (IEC standard)
<b>Connection</b>	Radial connector type
<b>Cable spec.</b>	Ø 5 mm, 5-wire (line driver output: Ø 6 mm, 8-wire), 2 m, shield cable
<b>Wire spec.</b>	AWG24 (0.08 mm, 40-core), insulator diameter: Ø 1 mm
<b>Connector spec.</b>	Totem pole, NPN open collector, Voltage output: SCN-16-7P Line driver output: SCN-20-10P



View product detail

# Side Mount Type Incremental Rotary Encoders

## ENA Series



### Features

- Die-cast external housing provides excellent immunity to impact
- Designed to mount directly onto frames
- Various resolutions:  
1 to 5000 pulses per revolution
- Various control output options
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	ENA-□-□-□-□-□-□-□-□	ENA-□-□-□-□-□-□	ENA-□-□-□-□-□
<b>Resolution</b>	1 / 2 / 5 PPR <sup>01)</sup> 10 to 5,000 PPR model		
<b>Control output</b>	Totem pole output	NPN open collector output	Voltage output
<b>Output phase</b>	A, B / A, B, Z output model	A, B / A, B, Z output model	A, B / A, B, Z output model
<b>Inflow current</b>	≤ 30 mA	≤ 30 mA	-
<b>Residual voltage</b>	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$
<b>Outflow current</b>	≤ 10 mA	-	≤ 10 mA
<b>Output voltage (5 VDC<math>\pm</math>)</b>	≥ (power supply -2.0) VDC $\pm$	-	-
<b>Output voltage (12 - 24 VDC<math>\pm</math>)</b>	≥ (power supply -3.0) VDC $\pm$	-	-
<b>Response speed<sup>02)</sup></b>	≤ 1 μs		
<b>Max. response freq.</b>	300 kHz		
<b>Max. allowable revolution<sup>03)</sup></b>	5,000 rpm		
<b>Starting torque</b>	≤ 0.007 N m		
<b>Inertia moment</b>	≤ 80 g·cm <sup>2</sup> (8 × 10 <sup>-6</sup> kg·m <sup>2</sup> )		
<b>Allowable shaft load</b>	Radial: ≤ 10 kgf, Thrust: ≤ 2.5 kgf		
<b>Unit weight</b>	≈ 345 g		
<b>Approval</b>	CE ENEC		

01) Depending on the control output, only A, B are output.

02) Based on cable length: 2 m, I sink: 20 mA

03) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model
<b>Current consumption</b>	≤ 80 mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC ~ 50 / 60 Hz for 1 minute
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
<b>Shock</b>	≤ 75 G
<b>Ambient temp.</b>	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
<b>Protection rating</b>	IP50 (IEC standard)
<b>Connection</b>	Radial connector type
<b>Cable spec.</b>	∅ 5 mm, 2 m, shield cable A, B phase output model: 4-wire / A, B, Z phase output model: 5-wire
<b>Wire spec.</b>	AWG24 (0.08 mm, 40-core), insulator diameter: ∅ 1 mm
<b>Connector spec.</b>	A, B phase output model: SCN-16-4P socket type A, B, Z phase output model: SCN-16-5P socket type



View product detail

# Wheel Type Incremental Rotary Encoders

## ENC Series



### Features

- Wheel type encoders ideal for measuring length or speed of continuously moving objects
- Output waveform of measured distance is proportional to International Weights and Measures (meters / inches)
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	ENC-1-□-T-□-□	ENC-1-□-N-□-□	ENC-1-□-V-□-□
Min. measuring unit [pulse]	1 mm / 1 cm / 1 m / 0.01 yd / 0.1 yd / 1 yd model		
Control output	Totem pole output	NPN open collector output	Voltage output
Output phase	A, B	A, B	A, B
Inflow current	≤ 30 mA	≤ 30 mA	-
Residual voltage	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$	≤ 0.4 VDC $\pm$
Outflow current	≤ 10 mA	-	≤ 10 mA
Output voltage (5 VDC $\pm$ )	≥ (power supply -2.0) VDC $\pm$	-	-
Output voltage (12 - 24 VDC $\pm$ )	≥ (power supply -3.0) VDC $\pm$	-	-
Response speed <sup>01)</sup>	≤ 1 μs		
Max. response freq.	180 kHz		
Max. allowable revolution <sup>02)</sup>	5,000 rpm		
Starting torque	Dependent on the coefficient of friction		
Unit weight	≈ 494 g		
Approval	CE EAC	CE EAC	CE EAC

01) Based on cable length: 2 m, I sink: 20 mA

02) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution  
 [max. response revolution (rpm)] =  $\frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$

Power supply	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model
Current consumption	≤ 80 mA (no load)
Insulation resistance	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)
Dielectric strength	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	≤ 75 G
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP50 (IEC standard)
Connection	Axial cable type / Cable connector type model
Cable spec.	∅ 5 mm, 4-wire, shield cable cable type: 2 m, cable connector type: 250 mm
Wire spec.	AWG24 (0.08 mm, 40-core), insulator diameter: ∅ 1 mm
Connector spec.	M17 6-pin socket type



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# 18 mm Diameter Sine Wave Incremental Rotary Encoders

## E18-A Series



### Features

- Ultra-compact (Ø 18 mm) housing and ultra-lightweight (10 g) design
- Easy installation in tight or limited spaces
- Low shaft moment of inertia
- Power supply:  
5 VDC $\pm$  5%
- No Amp. output

### Specifications

Model	E18S□-□-1-A-5-□
Resolution	200 / 300 PPR model
Control output	Quasi-sinusoidal (No Amp. output)
Output phase	A
Output waveform	Quasi-sinusoidal
Output signal amplitude	$\geq 150$ mV <sub>P-P</sub>
Output signal amplitude variation	$\leq 40\%$
Max. response freq.	10 kHz
Max. allowable revolution <sup>01)</sup>	3,000 rpm
LED optical elements	Current I <sub>F</sub> : $\leq 50$ mA Reverse voltage V <sub>R</sub> : $\leq 5$ VDC $\equiv$ Power consumption P <sub>F</sub> : $\leq 95$ mW
Photo transistor optical elements	C-E voltage V <sub>CE0</sub> : $\leq 30$ VDC $\equiv$ E-C voltage V <sub>EC0</sub> : $\leq 5$ VDC $\equiv$ C current I <sub>C</sub> : $\leq 20$ mA C power consumption P <sub>C</sub> : $\leq 75$ mW
Starting torque	$\leq 10 \times 10^{-4}$ N m
Inertia moment	$\leq 0.5$ g·cm <sup>2</sup> ( $5 \times 10^{-8}$ kg·m <sup>2</sup> )
Allowable shaft load	Radial: $\leq 200$ gf, Thrust: $\leq 200$ gf
Unit weight (packaged)	Shaft outer diameter Ø 2 mm model: $\approx 10.1$ g ( $\approx 33.5$ g) Shaft outer diameter Ø 2.5 mm model: $\approx 10.1$ g ( $\approx 32.3$ g)
Approval	CE c  US ENEC

01) Select resolution to satisfy Max. allowable revolution  $\geq$  Max. response revolution  

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

Power supply	5 VDC $\equiv$ $\pm 5\%$ (ripple P-P: $\leq 5\%$ )
Insulation resistance	Between all terminals and case: $\geq 100$ M $\Omega$ (500 VDC $\equiv$ megger)
Dielectric strength	Between all terminals and case: 500 VAC $\sim$ 50 / 60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	$\leq 50$ G
Ambient temperature	-10 to 50 °C, storage: -20 to 80 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP50 (IEC standard)
Connection	Axial / Radial cable type model
Cable spec.	Ø 1 mm, 4-wire, 150 mm, flat ribbon cable
Wire spec.	AWG26 (0.16 mm, 7-core), insulator diameter: Ø 0.98 mm



View product detail

# 58 mm Diameter Sine Wave Incremental Rotary Encoders

## E58-A Series



### Features

- Tapered shaft
- Analog sine wave operational amplifier (OP Amp.) output
- Power supply:  
5 VDC $\pm$  5%

### Specifications

<b>Model</b>	E58S9.25-2048-10-A-5-□
<b>Resolution</b>	2,048 PPR
<b>Control output</b>	Analog sine wave OP Amp. output
Output phase	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$ , C, $\bar{C}$ , D, $\bar{D}$
Output current	$\leq$ 10 mA
Output voltage $V_{P-P}$	0.5 $\pm$ 0.1 VDC $\pm$
DC OFFSET $V_{ref}$	2.5 $\pm$ 0.3 VDC $\pm$
<b>Max. response frequency</b>	200 kHz
<b>Max. allowable revolution</b>	6,000 rpm
<b>Shaft</b>	Taper shaft $\varnothing$ 9.25 mm, Taper 1 : 10
<b>Starting torque</b>	$\leq$ 0.0098 N m
<b>Inertia moment</b>	$\leq$ 15 g $\cdot$ cm <sup>2</sup> ( $1.5 \times 10^{-6}$ kg $\cdot$ m <sup>2</sup> )
<b>Allowable shaft load</b>	Radial: $\leq$ 10 kgf, Thrust: $\leq$ 2.5 kgf
<b>Unit weight (packaged)</b>	$\approx$ 930 g ( $\approx$ 1.02 kg)
<b>Approval</b>	CE ENEC
<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%)
<b>Current consumption</b>	$\leq$ 120 mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: $\geq$ 100 M $\Omega$ (500 VDC $\pm$ megger)
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
<b>Shock</b>	$\leq$ 100 G
<b>Ambient temp.</b>	-20 to 100 °C, storage: -25 to 100 °C (no freezing or condensation)
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
<b>Protection rating</b>	IP50 (IEC standard)
<b>Connection</b>	Axial / Radial cable type model
<b>Cable spec.</b>	$\varnothing$ 6 mm, 17-wire, 9 m, shield cable
<b>Wire spec.</b>	AWG28 (0.08 mm, 17-core), insulator diameter: $\varnothing$ 0.8 mm



View product detail

# 60 mm Diameter Sine Wave Incremental Rotary Encoders

## E60-A Series



### Features

- $\varnothing$  60 mm housing,  $\varnothing$  20 mm hollow shaft
- Analog sine wave operational amplifier (op-amp) output
- Power Supply:  
5 VDC $\pm$  5%

### Specifications

Model	E60H20-2048-10-A-5-□
Resolution	2,048 PPR
Control output	Analog sine wave OP Amp. output
Output phase	A, $\bar{A}$ , B, $\bar{B}$ , Z, $\bar{Z}$ , C, $\bar{C}$ , D, $\bar{D}$
Output current	$\leq$ 10 mA
Output voltage $V_{P-P}$	$0.5 \pm 0.1$ VDC $\pm$
DC OFFSET $V_{DC}$	$2.5 \pm 0.3$ VDC $\pm$
Max. response frequency	200 kHz
Max. allowable revolution	6,000 rpm
Starting torque	$\leq$ 0.02 N m
Inertia moment	$\leq$ 110 g $\cdot$ cm <sup>2</sup> ( $11 \times 10^{-6}$ kg $\cdot$ m <sup>2</sup> )
Allowable shaft load	Radial: $\leq$ 5 kgf, Thrust: $\leq$ 2.5 kgf
Unit weight (packaged)	$\approx$ 720 g ( $\approx$ 750 g)
Approval	CE EAC
Power supply	5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%)
Current consumption	$\leq$ 120 mA (no load)
Insulation resistance	Between all terminals and case: $\geq$ 100 M $\Omega$ (500 VDC $\pm$ megger)
Dielectric strength	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	$\leq$ 100 G
Ambient temp.	-20 to 100 °C, storage: -25 to 100 °C (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP40 (IEC standard)
Connection	Axial / Radial cable type model
Cable spec.	$\varnothing$ 6 mm, 17-wire, 9 m, shield cable
Wire spec.	AWG28 (0.08 mm, 17-core), insulator diameter: $\varnothing$ 0.8 mm



View product detail

# 50 mm Diameter Absolute Single-Turn Rotary Encoders (Optical)

## EP50 Series



### Features

- Ø 50 mm housing, Ø 8 mm solid shaft
- Various output code options:  
BCD, binary, Gray code
- Various resolutions:  
up to 10-bit (1024 divisions)
- IP64 protection structure (IEC standard)

### Specifications

Model	EP50S8-□□-□□-N-□	EP50S8-□□-□□-P-□
Resolution <sup>01)</sup>	≤ 1024 division	
Output code	BCD / Binary / Gray code model	
Control output	NPN open collector output	PNP open collector output
Inflow current	≤ 32 mA	-
Residual voltage	≤ 1 VDC≐	
Outflow current	-	≤ 32 mA
Output voltage	-	≥ (power supply -1.5) VDC≐
Response speed <sup>02)</sup>	T <sub>on</sub> ≤ 800 nsec, T <sub>off</sub> ≤ 800 nsec	
Max. response freq.	35 kHz	
Max. allowable revolution <sup>03)</sup>	3,000 rpm	
Starting torque	≤ 0.0069 N m	
Inertia moment	≤ 40 g·cm <sup>2</sup> (4 × 10 <sup>-6</sup> kg·m <sup>2</sup> )	
Allowable shaft load	Radial: 10 kgf, Thrust: 2.5 kgf	
Unit weight (packaged)	≈ 398 g (≈ 482 g)	
Approval	CE EAC	

01) Refer to resolution in 'Output Phase / Output Angle'.

02) Based on cable length: 2 m, I<sub>sink</sub> = 32 mA

03) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

Power supply	5 VDC≐ ± 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC≐ ± 5% (ripple P-P: ≤ 5%) model
Current consumption	≤ 100 mA (no load)
Insulation resistance	Between all terminals and case: ≥ 100 MΩ (500 VDC≐ megger)
Dielectric strength	Between all terminals and case: 750 VAC~ 50 / 60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	≤ 50 G
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP64 (IEC standard)
Connection	Axial cable type (cable gland)
Cable spec.	Ø 7 mm, 15-wire, 2m, shield cable
Wire spec.	AWG28 (0.08 mm, 40-core), insulator diameter: Ø 0.8 mm



View product detail



# 60 mm Diameter Absolute Single-Turn Rotary Encoders (Optical)

## ENP Series



### Features

- Ø 60 mm housing, Ø 10 mm solid shaft
- Output code: BCD code
- Various resolutions: up to 360 divisions
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	ENP-1□□□-□-N	ENP-1□□□-□-P
Resolution <sup>01)</sup>	≤ 360 division	
Output code	BCD code	
Control output	NPN open collector output	PNP open collector output
Inflow current	≤ 32 mA	-
Residual voltage	≤ 1 VDC $\pm$	
Outflow current	-	≤ 32 mA
Output voltage	-	≥ (power supply - 1.5) VDC $\pm$
Response speed <sup>02)</sup>	T <sub>ON</sub> ≤ 800 nsec, T <sub>OFF</sub> ≤ 800 nsec	
Max. response freq.	20 kHz	
Max. allowable revolution <sup>03)</sup>	3,600 rpm	
Starting torque	≤ 0.05 N m	
Inertia moment	≤ 300 g·cm <sup>2</sup> (3 × 10 <sup>-5</sup> kg·m <sup>2</sup> )	
Allowable shaft load	Radial: 10 kgf, Thrust: 2.5 kgf	
Unit weight (packaged)	≈ 400 g (≈ 478 g)	
Approval	EAC	

01) Refer to resolution in "Output Phase / Output Angle"

02) Based on cable length: 1 m, I<sub>sink</sub> = 32 mA

03) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

Power supply	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model
Current consumption	≤ 100 mA (no load)
Insulation resistance	Between all terminals and case: ≥ 100 MΩ (500 VDC $\pm$ megger)
Dielectric strength	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	≤ 75 G
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP50 (IEC standard)
Connection	Axial cable type
Cable spec.	Ø 8 mm, 12-wire, 1 m, double shield cable
Wire spec.	AWG24 (0.08 mm, 40-core), insulator diameter - power wire: Ø 1.5 mm, signal wire: Ø 1 mm



View product detail

# 50 mm Diameter Absolute Single-Turn Rotary Encoders (Magnetic)

## MGA50 Series



### Features

- High accuracy in harsh environments including shock, vibration, dust, and humidity (compared to optical encoders)
- Longer service life compared to optical encoders
- Various output code options: BCD, binary, Gray
- Various resolutions: up to 10-bit (1024 divisions)
- Power supply: 5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%
- IP50 protection structure (IEC standard)

### Specifications

Model	MGA50S8-□-□□-N-□
Resolution <sup>01)</sup>	≤ 1024 division
Output code	BCD / Binary / Gray code model
Control output	NPN open collector output
Inflow current	≤ 32 mA
Residual voltage	≤ 1 VDC $\equiv$
Output logic	Negative logic output
Response speed <sup>02)</sup>	≤ 1 μs
Max. response freq.	30 kHz
Max. allowable revolution <sup>03)</sup>	3,000 rpm
Starting torque	≤ 0.007 N m
Inertia moment	≤ 80 g·cm <sup>2</sup> (8 × 10 <sup>-6</sup> kg·m <sup>2</sup> )
Allowable shaft load	Radial: 10 kgf, Thrust: 2.5 kgf
Unit weight (packaged)	≈ 270 g (= 400 g)
Approval	CE ENEC

01) Refer to resolution in "Output Phase / Output Angle!"

02) Based on cable length: 2 m, I sink = 32 mA

03) Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)} = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}]$$

Power supply	5 VDC $\pm$ 5% (ripple P-P: ≤ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: ≤ 5%) model
Current consumption	≤ 60 mA (no load)
Insulation resistance	Between all terminals and case: ≥ 100 MΩ (500 VDC $\equiv$ megger)
Dielectric strength	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	≤ 75 G
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Protection rating	IP50 (IEC standard)
Connection	Axial (cable gland)
Cable spec.	∅ 6 mm, 17-wire, 2 m, shield cable
Wire spec.	AWG28 (0.08 mm, 17-core), insulator diameter: ∅ 0.8 mm



View product detail

# 50 mm Wire-Type Linear Scale Absolute Encoders (Optical)

## EWLS50 Series



### Features

- Resolution: 0.1 mm
- Maximum measurement range: 512 mm
- Various output code options:  
Binary, Gray code

### Specifications

Model	EWLS50-512-B-PN-24	EWLS50-512-G-PN-24
Measuring range	512 mm	
Max. output pulse	5,120 division / 512 mm	
Min. resolution	0.1 mm	
Accuracy	± 0.1 / 100 mm	
Response speed	≤ 500 mm / sec	
Wire movement limit when power is OFF <sup>01)</sup>	± 20 mm	
Output code	Binary	Gray
Output signal	Data, Overflow alarm (OVF)	
Control output	Parallel NPN open collector output	
Inflow current	≤ 32 mA	
Residual voltage	≤ 1 VDC≐	
Output logic	Negative logic output	
Response speed <sup>02)</sup>	≤ 1 μs	
Input signal	Reset signal input (Reset)	
Input level	H: 5 - 24 VDC≐, L: 0 - 1.2 VDC≐	
Input logic	Low Active, OPEN or HIGH for common use	
Input time	≥ 100 ms	
Max. response freq.	50 kHz	
Wire tensile force	0.5 to 4 N (50 to 400 g-f)	
Unit weight	≈ 450 g	
Approval	CE EAC	

01) The product cannot process data when the power is OFF. It calibrates the data comparing values of before and after power ON status. It shall be used on the condition that wire movement limit because proper data may not be available if any wire movement occurred over ±20mm from the position when power is off.

02) Based on cable length: 2 m, I sink = 32 mA

Power supply	12 - 24 VDC≐ ± 5% (ripple P-P: ≤ 5%)
Current consumption	≤ 150 mA (no load)
Insulation resistance	≥ 100 MΩ (500 VDC≐ megger)
Dielectric strength	750 VAC~ 50 / 60 Hz for 1 minute
Vibration	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	≤ 50 G
Ambient temp.	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
Ambient humi.	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
Connection	Axial cable type (cable gland)
Cable spec.	Ø 6 mm, 17-wire, 2 m, shield cable
Wire spec.	AWG28 (0.08 mm, 19-core), insulator diameter: Ø 0.8 mm
Material	Cap: SPCD, Body: A2024, Wire: SUS303



View product detail



# 50 mm Diameter Absolute Multi-Turn Rotary Encoders (Optical)

## EPM50 Series



### Features

- Ø 50 mm housing, Ø 8 mm solid shaft multi-turn absolute rotary encoders
- Output interface options:  
Parallel, SSI (Synchronous Serial Interface)
- 23-bit (8,388,608) total resolution
  - 10-bit single-turn (1,024 divisions)
  - 13-bit multi-turn (8,192 revolutions)
- Zero-point reset with single-turn data reset and multi-turn count reset functions
- Position memory backup
- CW / CCW direction setting function
- Overflow alarm (OVF) function
- Latch function (Parallel output type only)
- IP64 protection structure (IEC standard)

### Specifications

Model	EPM50S8-1013-B-PN-24-□	EPM50S8-1013-B-S-24-□
<b>Resolution</b>	• Single-turn: 1024 division, 10 bit • Multi-turn: 8192 revolution, 13 bit	
<b>Rotation limit when power OFF</b> <sup>01)</sup>	± 90°	
<b>Output code</b>	Binary 2 code	24 bit, Binary 2 code
<b>Output signal</b>	Single-turn data, Multi-turn count, Overflow alarm (OVF) <sup>02)</sup>	
<b>Control output</b>	Parallel NPN open collector output	SSI (Synchronous Serial Interface) Line driver output
<b>Inflow current</b>	≤ 32 mA	≤ 20 mA
<b>Residual voltage</b>	≤ 1 VDC≐	≤ 0.5 VDC≐
<b>Outflow current</b>	-	≤ -20 mA
<b>Output voltage</b>	-	≥ 2.5 VDC≐
<b>Output logic</b>	Negative logic output	-
<b>Response speed</b> <sup>03)</sup>	≤ 1 μs	-
<b>Single-turn data reset</b> <sup>04)</sup> <b>Multi-turn count reset</b> <sup>05)</sup> <b>Direction Clear</b>	Input level: 0 ~ 1 VDC≐ Input logic: Low Active, OPEN or HIGH in common use Input time: ≥ 100 ms	
<b>Latch</b>	Input level: 0 ~ 1 VDC≐ Input logic: Low Active, OPEN or HIGH in common use Input time: ≥ 500 μs	-
<b>Clock</b>	-	Input level: 5 VDC≐ ± 5% Input frequency: 100 kHz to 1 MHz
<b>Max. response freq.</b>	50 kHz	-
<b>Max. allowable revolution</b> <sup>06)</sup>	3,000 rpm	-
<b>Starting torque</b>	≤ 0.0069 N m	
<b>Inertia moment</b>	≤ 40 g·cm <sup>2</sup> (4 × 10 <sup>-6</sup> kg·m <sup>2</sup> )	
<b>Allowable shaft load</b>	Radial: 10 kgf, Thrust: 2.5 kgf	
<b>Unit weight (packaged)</b>	≈ 475 g (≈ 560 g)	≈ 324 g (≈ 409 g)
<b>Approval</b>	CE ENEC	

01) It calibrates the multi-turn count by comparing single-turn data before/after power off without counting multi-turn count when power off. Correct multi-turn count cannot be obtained if a rotating operation exceeding ± 90° is performed at the rotation position when power off.

02) Outputs when multi-turn count is out of counting range (0 to 8191 revolution).

03) Based on cable length: 2 m, I sink = 32 mA

04) If the single-turn data reset signal is applied, the single-turn data will be initialized to 0.

05) If the multi-turn count reset signal is applied, the multi-turn count will be initialized to 0.

06) For parallel model Select resolution to satisfy Max. allowable revolution ≥ Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

<b>Power supply</b>	12 ~ 24 VDC≐ ± 5% (ripple P-P: ≤ 5%)
<b>Current consumption</b>	Parallel NPN open collector output: ≤ 100 mA (no load) SSI Line driver output: ≤ 150 mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: ≥ 100 MΩ (500 VDC≐ megger)
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC~ / 50 / 60 Hz for 1 minute
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
<b>Shock</b>	≤ 50 G
<b>Ambient temp.</b>	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
<b>Protection rating</b>	Axial cable type: IP64 (IEC standard), Radial cable type: IP50 (IEC standard)
<b>Connection</b>	Axial / Radial cable type model (cable gland)
<b>Cable spec.</b>	Ø 6 mm, 2 m, shield cable Parallel NPN open collector output: 17-wire × 2, SSI Line driver output: 10-wire
<b>Wire spec.</b>	AWG28 (0.08 mm), insulator diameter: Ø 0.8 mm Parallel NPN open collector output: 17-core, SSI Line driver output: 19-core



View product detail

# 50 mm Diameter Absolute Multi-Turn Rotary Encoders (Magnetic)

## MGAM50 Series



### Features

- High accuracy in harsh environments including shock, vibration, dust, and humidity (compared to optical encoders)
- Longer service life compared to optical encoders
- Output code: binary
- Output interface options: Parallel, SSI (Synchronous Serial Interface)
- 23-bit (8,388,608) total resolution
  - 10-bit single-turn (1024 divisions)
  - 13-bit multi-turn (8192 revolutions)
- Power supply: 12 - 24 VDC $\pm$  5%
- Overflow alarm (OVF) function
- IP50 protection structure (IEC standard)

### Specifications

Model	MGAM50S8-1013-B-F-PN-24	MGAM50S8-1013-B-F-S-24
<b>Resolution</b>	• Single-turn: 1024 division • Multi-turn: 8192 revolution	
<b>Rotation limit when power OFF<sup>01)</sup></b>	$\pm 90^\circ$	
<b>Hysteresis</b>	$\pm 0.1^\circ$	
<b>Positioning error<sup>02)</sup></b>	$\pm 1$ bit (LSB: Least Significant Bit)	
<b>Output code</b>	Binary 2 code	24 bit, Binary 2 code
<b>Output signal</b>	Single-turn data, Multi-turn count, Overflow alarm (OVF) <sup>03)</sup>	
<b>Control output</b>	Parallel NPN open collector output	SSI (Synchronous Serial Interface) Line driver output
<b>Inflow current</b>	$\leq 20$ mA	$\leq 20$ mA
<b>Residual voltage</b>	$\leq 1$ VDC $\pm$	$\leq 0.5$ VDC $\pm$
<b>Outflow current</b>	-	$\leq -20$ mA
<b>Output voltage</b>	-	$\geq 2.5$ VDC $\pm$
<b>Output logic</b>	Negative logic output	-
<b>Response speed<sup>04)</sup></b>	$\leq 1$ $\mu$ s	-
<b>Multi-turn count reset</b>	Input level: 0 - 1 VDC $\pm$ Input logic: Low Active, Open for common use Input time: $\geq 100$ ms	
<b>Clock</b>	-	Input level: 5 VDC $\pm$ 5% Input frequency: 100 kHz to 1 MHz
<b>Max. response freq.</b>	30 kHz	-
<b>Max. allowable revolution<sup>05)</sup></b>	3,000 rpm	
<b>Starting torque</b>	$\leq 0.0069$ N m	
<b>Inertia moment</b>	$\leq 80$ g $\cdot$ cm <sup>2</sup> ( $8 \times 10^{-6}$ kg $\cdot$ m <sup>2</sup> )	
<b>Allowable shaft load</b>	Radial: 10 kgf, Thrust: 2.5 kgf	
<b>Unit weight (packaged)</b>	$\approx 393$ g ( $\approx 523$ g)	$\approx 261$ g ( $\approx 391$ g)
<b>Approval</b>	CC	

01) It calibrates the multi-turn count by comparing single-turn data before/after power off without counting multi-turn count when power off. Correct multi-turn count cannot be obtained if a rotating operation exceeding  $\pm 90^\circ$  is performed at the rotation position when power off. Use within the condition of rated rotating operation.

02) When power ON / OFF the unit,  $\pm 1$  bit (LSB) can be changed at current position due to hysteresis.

03) Outputs when multi-turn count is out of counting range (0 to 8191 revolution).

04) Based on cable length: 2 m, I sink = 20 mA

05) For parallel model Select resolution to satisfy Max. allowable revolution  $\geq$  Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

<b>Power supply</b>	12 - 24 VDC $\pm$ 5% (ripple P-P: $\leq 5\%$ )
<b>Current consumption</b>	Parallel NPN open collector output $\leq 100$ mA (no load) SSI Line driver output $\leq 150$ mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: $\geq 100$ M $\Omega$ (500 VDC $\pm$ megger)
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
<b>Shock</b>	$\leq 50$ G
<b>Ambient temp.</b>	-10 to 70 $^\circ$ C, storage: -25 to 85 $^\circ$ C (no freezing or condensation)
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)
<b>Protection rating</b>	IP50 (IEC standard)
<b>Connection</b>	Axial cable type (cable gland)
<b>Cable spec.</b>	$\varnothing 6$ mm, 2 m, shield cable Parallel NPN open collector output: 17-wire $\times 2$ , SSI Line driver output: 10-wire
<b>Wire spec.</b>	AWG28 (0.08 mm), insulator diameter: $\varnothing 0.8$ mm Parallel NPN open collector output: 17-core, SSI Line driver output: 19-core



View product detail

# Manual Handle Type Pulse Generators

## ENH Series



### Features

- Ideal for manual pulse input applications including NC machinery and milling machines
- Terminal connection type
- Resolutions: 25, 100 pulses per revolution
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	ENH-□-□-T-□	ENH-□-□-V-□	ENH-□-□-L-5
<b>Resolution</b>	25 / 100 PPR model		
<b>Control output</b>	Totem pole output	Voltage output	Line driver output
<b>Output phase</b>	A, B	A, B	A, B, $\bar{A}$ , $\bar{B}$
<b>Inflow current</b>	$\leq$ 30 mA	-	$\leq$ 20 mA
<b>Residual voltage</b>	$\leq$ 0.4 VDC $\equiv$	$\leq$ 0.4 VDC $\equiv$	$\leq$ 0.5 VDC $\equiv$
<b>Outflow current</b>	$\leq$ 10 mA	$\leq$ 10 mA	$\leq$ -20 mA
<b>Output voltage (5 VDC<math>\equiv</math>)</b>	$\geq$ (power supply -2.0) VDC $\equiv$	-	$\geq$ 2.5 VDC $\equiv$
<b>Output voltage (12 - 24 VDC<math>\equiv</math>)</b>	$\geq$ (power supply -3.0) VDC $\equiv$	-	-
<b>Response speed <sup>01)</sup></b>	$\leq$ 1 $\mu$ s	$\leq$ 1 $\mu$ s	$\leq$ 0.2 $\mu$ s
<b>Max. response freq.</b>	10 kHz		
<b>Max. allowable revolution <sup>02)</sup></b>	Normal: $\leq$ 200 rpm, Peak: $\leq$ 600 rpm		
<b>Starting torque</b>	$\leq$ 0.098 N m		
<b>Allowable shaft load</b>	Radial: $\leq$ 2 kgf, Thrust: $\leq$ 1 kgf		
<b>Unit weight (packaged)</b>	$\approx$ 260 g ( $\approx$ 330 g)		
<b>Approval</b>	CE EAC	CE EAC	EAC

01) Based on cable length: 1 m, I sink: 20 mA

02) Select resolution to satisfy Max. allowable revolution  $\geq$  Max. response revolution

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

Model	ENH-□-□-T-□	ENH-□-□-V-□	ENH-□-□-L-5
<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%) model		5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%)
<b>Current consumption</b>	$\leq$ 40 mA (no load)		$\leq$ 50 mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: $\geq$ 100 M $\Omega$ (500 VDC $\equiv$ megger)		
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute		
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours		
<b>Shock</b>	$\leq$ 50 G		
<b>Ambient temp.</b>	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)		
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)		
<b>Protection rating</b>	IP50 (IEC standard)		
<b>Connection</b>	Terminal block type		



View product detail

# Portable Manual Handle Type Pulse Generators

## ENHP Series



### Features

- Ideal for manual pulse input applications including NC machinery and milling machines
- Emergency stop switch, enable operation switch
- 6-position axis selector switch, 4-position rate selector switch
- Resolution: 100 pulses per revolution
- Power supply:  
5 VDC $\pm$  5%, 12 - 24 VDC $\pm$  5%

### Specifications

Model	ENHP-100-□-T-□	ENHP-100-□-L-5
<b>Resolution</b>	100 PPR	
<b>Control output</b>	Totem pole output	Line driver output
<b>Output phase</b>	A, B	A, $\bar{A}$ , B, $\bar{B}$
<b>Rotary switch output</b>	BCD code: Rate select switch (R1, R2, R3, R4) Axis select switch (OFF, X, Y, Z, A, B)	
<b>Inflow current</b>	$\leq$ 30 mA	$\leq$ 20 mA
<b>Residual voltage</b>	$\leq$ 0.4 VDC $\pm$	$\leq$ 0.5 VDC $\pm$
<b>Outflow current</b>	$\leq$ 10 mA	$\leq$ -20 mA
<b>Output voltage (5 VDC<math>\pm</math>)</b>	$\geq$ (power supply -2.0) VDC $\pm$	$\geq$ 2.5 VDC $\pm$
<b>Output voltage (12 - 24 VDC<math>\pm</math>)</b>	$\geq$ (power supply -3.0) VDC $\pm$	-
<b>Response speed <sup>01)</sup></b>	$\leq$ 1 $\mu$ s	$\leq$ 0.5 $\mu$ s
<b>Max. response freq.</b>	10 kHz	
<b>Max. allowable revolution <sup>02)</sup></b>	Normal: $\leq$ 200 rpm, Peak: $\leq$ 600 rpm	
<b>Starting torque</b>	$\leq$ 0.098 N m	
<b>Allowable shaft load</b>	Radial: $\leq$ 2 kgf, Thrust: $\leq$ 1 kgf	
<b>Unit weight</b>	= 730 g	
<b>Approval</b>	CE EAC	EAC

01) Based on cable length: 1 m, I sink: 20 mA

02) Select resolution to satisfy Max. allowable revolution  $\geq$  Max. response revolution  

$$[\text{max. response revolution (rpm)}] = \frac{\text{max. response frequency}}{\text{resolution}} \times 60 \text{ sec}$$

Model	ENHP-100-□-T-□	ENHP-100-□-L-5
<b>Power supply</b>	5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%) / 12 - 24 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%) model	5 VDC $\pm$ 5% (ripple P-P: $\leq$ 5%)
<b>Current consumption</b>	$\leq$ 40 mA (no load)	$\leq$ 50 mA (no load)
<b>Insulation resistance</b>	Between all terminals and case: $\geq$ 100 M $\Omega$ (500 VDC $\pm$ megger)	
<b>Dielectric strength</b>	Between all terminals and case: 750 VAC $\sim$ 50 / 60 Hz for 1 minute	
<b>Vibration</b>	1 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours	
<b>Shock</b>	$\leq$ 50 G	
<b>Ambient temp.</b>	-10 to 70 °C, storage: -25 to 85 °C (no freezing or condensation)	
<b>Ambient humi.</b>	35 to 85%RH, storage: 35 to 90%RH (no freezing or condensation)	
<b>Protection rating <sup>01)</sup></b>	IP67 (IEC standard)	
<b>Connection</b>	connector type	
<b>Cable spec.</b>	$\varnothing$ 5 mm, 18-wire, 8 m, spring code cable	
<b>Wire spec.</b>	AWG28 (0.08 mm, 18-core), insulator diameter: $\varnothing$ 0.7 mm	
<b>Connector spec.</b>	25-pin D-SUB	

01) It is protection for the back case and the wiring part.



View product detail

# Flexible Shaft Coupling

## ERB Series



### Features

- Zero backlash
- High-strength aluminum alloy (AL7075-T6), High elasticity
- Alumite treated surface provides high corrosion resistance
- 2 connection types (clamp type, screw type)

### Specifications

Model	ERB-A-19C-□	ERB-A-19S-□	ERB-A-26C-□	ERB-A-26S-□
Connection type	Clamp	Set screw	Clamp	Set screw
Max. revolution	8,000 rpm	20,000 rpm	6,000 rpm	15,000 rpm
Max. torque	1.2 N m		3.0 N m	
Rated torque	0.6 N m		1.5 N m	
Mounting bolt (mounting torque)	M2.5 (1 N m)	M3 (0.7 N m)	M3 (0.7 N m)	M4 (1.7 N m)
Torsional stiffness	140 N m / rad		240 N m / rad	
Inertia moment	$6.4 \times 10^{-7} \text{ kg}\cdot\text{m}^2$		$3.4 \times 10^{-6} \text{ kg}\cdot\text{m}^2$	
Max. allowable misalignment	Angular misalignment: $\leq 2.5^\circ$ Parallel misalignment: $\leq 0.15 \text{ mm}$ End-play: $\leq \pm 0.3 \text{ mm}$		Angular misalignment: $\leq 2.5^\circ$ Parallel misalignment: $\leq 0.2 \text{ mm}$ End-play: $\leq \pm 0.4 \text{ mm}$	
Standard bore diameter (tolerance h7)	$\varnothing 4, \varnothing 5, \varnothing 6 \text{ mm}$		$\varnothing 6, \varnothing 8 \text{ mm}$	
Max. allowable diameter	$\varnothing 4 \text{ to } 8 \text{ mm}$		$\varnothing 5 \text{ to } 12 \text{ mm}$	
Material	Aluminum (AL 7075-T6), Alumite surface			
Unit weight (packaged)	$\approx 14.4 \text{ g} (\approx 14.9 \text{ g})$		$\approx 36.7 \text{ g} (\approx 37.3 \text{ g})$	



View product detail



# B. Field Instruments

Field instruments including pressure and temperature transmitters measure and transmit important data in industrial applications and other diverse settings.

B1. Temperature Sensors

B2. Temperature Transmitters

B3. Pressure Sensors





B





# B1. Temperature Sensors

Temperature sensors are used to measure temperature of gases or liquids using thermocouples and thermoresistors.

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B1-1	Temperature / Humidity Transducers	THD Series	Temperature / Humidity Sensors
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# Temperature / Humidity Sensors

## THD Series



### Features

- Compact design
- Built-in high accuracy temperature / humidity sensor
- 7 segment LED display (THD-DD / THD-WD)
- Various output options: DC4 - 20 mA, 1 - 5 VDC, RS485 (Modbus RTU)
- Wide measurable range of temperature / humidity: -19.9 to 60.0 °C / 0.0 to 99.9 %RH
- Communication speed: 115200 bps

### Specifications

Model	THD-R-PT			
Sensor type	Temperature sensor			
Display type	Non-display type			
Temp. measuring range	-19.9 to 60.0 °C			
Temp. accuracy	± 0.8 °C			
Temp. output	DPT100Ω resistance value (TCR: 3850 ppm/°C)			
Protection structure	IP10 (IEC standards)			
Ambient temperature	-20 to 60 °C, Storage: -20 to 60 °C (rated at no freezing or condensation)			
Approval	CE EAC			
Model	THD-R-PT/C	THD-R-C THD-R-V THD-R-T	THD-D□-□ THD-W□-□	THD-DD□-□ THD-WD□-□
Power supply	24 VDC ± 10 %			
Power consumption	≤ 2.4W			
Sensor type	Temperature/Humidity Sensor			
Sensor response time	10 sec			
Display type	Non-display type			7 seg. LED display
Display digit	-			Each 3 digits for temp. / humi.
Temp. measuring range	-19.9 to 60.0 °C			
Humi. measuring range	0.0 to 99.9 %RH (THD-R is required to attend for using over 90 %RH)			
Temp. accuracy	± 1.0 °C (at room temp.)			
Humi. accuracy	± 3 %RH (30 to 70 %RH, at room temp.) ± 4 %RH (10 to 90 %RH)		Typ. ± 2 %RH (10 to 90 %RH, at room temp.) ± 2.5 %RH	
Temp. output	DPT100Ω resistance value (TCR: 3850 ppm/°C)		DC 4-20 mA (allowable impedance: ≤ 600 Ω), 1-5 VDC, RS485 Communication (Modbus RTU)	
Humi. output	DC 4-20 mA (allowable impedance: ≤ 600 Ω)			
Resolution	1/1000			
Sampling period	0.5 sec			
Insulation resistance	≥ 100 MΩ (500 VDC megger)			
Dielectric strength	500 VAC ~ 50/60 Hz for 1 min			
Noise immunity	± 0.3 kV the square wave noise (pulse width: 1 μs) by the noise simulator			
Vibration	0.75 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 1 hour			
Vibration (Malfunction)	0.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 1 hour			
Shock	300 m/s <sup>2</sup> (≈ 30 G) in each X, Y, Z direction for 3 times			
Shock (Malfunction)	100 m/s <sup>2</sup> (≈ 10 G) in each X, Y, Z direction for 3 times			
Protection structure	IP10 (IEC standards)		IP65 (except sensor part, IEC standards)	
Ambient temperature	-20 to 60 °C, Storage: -20 to 60 °C (rated at no freezing or condensation)			
Cable spec.	-		Ø4 mm, 4-wire, length: 2 m	
Wire spec.	-		AWG22 (0.08 mm, 60-wire), Insulator diameter: Ø1.25 mm	
Approval	CE (only for THD-□-T model) EAC			
Comm. protocol	Modbus RTU			



View product detail







B

## B2. Temperature Transmitters

Temperature transmitters measure temperature value from temperature sensors (thermocouples, RTD, etc) and transmits the data in voltage or current.

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B2-1 Temperature Transmitters

KT-502H Series

HART Protocol Transmitters

CN-502H Series

HART Protocol Cylindrical Temperature Transmitters

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# HART Protocol Transmitters

## KT-502H Series



### Features

- HART protocol
- 330 ° rotatable display for environment conditions
- Increased visibility with backlight function
- Multi-input (order 1 input type among 22 types)
  - RTD 8 types
  - Thermocouple 8 types
  - mV 4 types
  - Resistor 2 types
- Explosion class: Ex d IIC T6
- Protection structure: IP67 (IEC standard)

### Specifications

Model	KT-502H
Power supply	10.5-45 VDC== (with backlight LCD)
Output	DC 4-20 mA (2-wire)
Input specifications	Refer to 'Input Specifications'
Accuracy	± 0.3 %
Display method	PV display part: 7 segment 5 digit (character size: W4×H8 mm), Parameter display part: 14 segment 8 digit (character size: W2.6×H4.8 mm), 52 bar meter
Display range	-19,999 to 99,999
Setting method	HART-protocol (no setting key)
Response time	1 sec
Alarm	≤ 3.8 mA, > 20.5 mA / Sensor break 3.6 mA
Load	≤ (V power supply - 7.5 V) / 0.22 A
Galvanic insulation	2 kVAC~ (Input/Output)
Unit weight (Packaged)	≈ 1.2 kg (≈ 1.4 kg)
Ambient temp.	-20 to 70 °C, Storage: 20 to 80 °C (rated at no freezing or condensation)
Ambient humi.	0 to 85 %RH, Storage: 0 to 85 %RH (rated at no freezing or condensation)
Protection structure	IP67 (IEC standard)
Material	Body: Aluminum (AlDc.8S), Cover O-Ring: Buna N
Explosion class <sup>01)</sup>	Ex d IIC T6
Approval	CE [A] [B] [C] [D] [E] [F] [G] [H] [I] [J] [K] [L] [M] [N] [O] [P] [Q] [R] [S] [T] [U] [V] [W] [X] [Y] [Z]

01) The explosion class specification is acquired and managed by KONICS.

### Input Specifications

Input type		Input range (°C)	Input range (°F)
Thermocouple	K (NiCr-Ni)	-270 to 1,372	-454 to 2,501.6
	J (Fe-CuNi)	-210 to 1,200	-346 to 2,192
	E (NiCr-CuNi)	-270 to 1,000	-454 to 1,832
	T (Cu-CuNi)	-270 to 400	-454 to 752
	B (PtRh30-PtRh6)	0 to 1,820	32 to 3,308
	R (PtRh13-Pt)	-50 to 1,768	-58 to 3,214.4
	S (PtRh10-Pt)	-50 to 1,768	-58 to 3,214.4
	N (NiCrSi-NiSi)	-270 to 1,300	-454 to 2,372
RTD	Cu50 Ω	-50 to 150	-58 to 302
	Cu100 Ω	-50 to 150	-58 to 302
	DPT100 Ω	-200 to 850	-328 to 1,562
	DPT500 Ω	-200 to 250	-328 to 482
	DPT1000 Ω	-200 to 250	-328 to 482
	Ni100 Ω	-60 to 180	-76 to 356
	Ni500 Ω	-60 to 180	-76 to 356
	Ni1000 Ω	-60 to 150	-76 to 302
Resistance transmitter	Resistance (Ω)	0 to 400 Ω	-
		0 to 2000 Ω	-
Analog	Voltage	-10 - 75 mV	-
		-100 - 100 mV	-
		-100 - 500 mV	-
		-100 - 2,000 mV	-



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# HART Protocol Cylindrical Temperature Transmitters

## CN-502H Series



### Features

- HART protocol
- Multi-input
  - RTD 8 types
  - Thermocouple 7 types
  - mV 4 types
  - Resistor 2 types
- Small size:  $\varnothing 44 \times 24$  H
- High accuracy:  $\pm 0.3$  % F.S.

### Specifications

Model	CN-502H
Power supply	11-35 VDC $\equiv$
Power consumption	$\leq 1$ W
Display method <sup>01)</sup>	No mark
Measurable current	50 $\mu$ A (3-wire), 100 $\mu$ A (4-wire)
Resistance	$\leq 5$ $\Omega$
Input specification	Refer to 'Input Specifications'
Input accuracy	$\pm 0.1$ % F.S.
Output	DC 4-20 mA (2-wire)
Output accuracy	$\pm 0.1$ % F.S.
Response time	1 sec (10 to 90 % of output)
Load	$\leq$ (Power supply-11 VDC $\equiv$ ) / 0.023 A
Setting method	HART-protocol (no setting key)
Alarm	$\leq 3.8$ mA, $> 21.0$ mA, sensor break 22 mA or 3.6 mA
Sampling period	500 ms
Unit weight (Packaged)	$\approx 26$ g ( $\approx 66$ g)
<small>01) Parameter setting and state monitoring are available through an external device such as HART communicator or loader.</small>	
Dielectric strength	1000 VAC $\sim$ 50/60 Hz 1 min (between all terminals and case)
Noise immunity	IEC 61326-1
Vibration	0.75 mm amplitude a frequency of 5 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Insulation resistance	$\geq 100$ M $\Omega$ (500VDC $\equiv$ megger)
Memory protection	$\approx 10$ years (when using non-volatile semiconductor memory)
Tightening torque	Housing: 1 N m, Terminal: 0.9 N m
Galvanic insulation	1 kVAC $\sim$ (Input/Output)
Ambient temperature	-40 to 85 $^{\circ}$ C, Storage: -40 to 85 $^{\circ}$ C (rated at no freezing or condensation)
Ambient humidity	5 to 95 %RH, Storage: 5 to 95 %RH (rated at no freezing or condensation)
Protection structure	Housing: IP40 (IEC standard), Terminal: IP00 (IEC standard)
Material	Case: PC
Approval	CC <u>HARTATA</u>



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## B3. Pressure Sensors

Pressure sensors are devices used in a variety of applications requiring precise and accurate pressure measurement of gases or liquids.

B4-1	Digital Display	PSQ Series	Dual Display Type Pressure Sensors
		PSAN Series	Display Type Pressure Sensors
		PSB Series	Display Type Pressure Sensors
B4-2	Non-Indicating	PSS Series	Compact Pressure Sensors
B4-3	Pressure Sensor Indicators	PSM Series	Pressure Sensor Indicators

# Dual Display Type Pressure Sensors


## PSQ Series



### Features

- Pressure measurement of any gas, liquid or oil [fluid type] except substances which may corrode stainless steel 316L
- Dual display for simultaneous display of process value (PV) and setpoint value (SV)
- Secondary (SV) display: setpoint value, pressure unit, or display-OFF
- Switch between NPN and PNP open collector output via parameter configuration
- 3-color main (PV) display (RUN mode: green / red, parameter setting mode: orange)
- 12-segment LCD display capable of diverse alphanumeric characters
- Measurement range: -100.0 to 100.0 kPa / -100 to 1000 kPa  
(Pneumatic type : compound pressure, Fluid type : sealed gauge pressure)
- Analog output: voltage (1 - 5 VDC $\equiv$ ), current (DC 4 - 20 mA)
- Copy parameter settings function
- External input: Auto-Shift, Remote, Hold (PSQ-C□□□U-□ models only)
- Forced output control mode for device testing and inspection
- Display resolution: 0.1 kPa / 1 kPa (by model)
- One-touch connector type for easy wiring and maintenance
- Password lock for parameter configuration settings

### Specifications

Model	PSQ-C□□□□	PSQ-BC□□□□
<b>Applicable medium</b>	Pneumatic type (air, non-corrosive gas)	Fluid type (non-corrosive gas and fluid that do not corrode stainless steel 316L)
<b>Pressure type</b>	Gauge pressure	Sealed gauge pressure <sup>01)</sup>
<b>Rated pressure range</b>	-100.0 to 100.0 kPa / -100 to 1,000 kPa model	
<b>Display and setting pressure range</b>	<ul style="list-style-type: none"> <li>• Rated pressure range -100.0 to 100.0 kPa model: -101.3 to 110.0 kPa</li> <li>• Rated pressure range -100 to 1,000 kPa model: -101 to 1,100 kPa</li> </ul>	
<b>Display type</b>	PV / SV display part: 12 segment LCD, 4digit	
<b>Display accuracy</b>	-10 to 0 °C: $\leq \pm 1\%$ F.S., 0 to 50 °C: $\leq \pm 0.5\%$ F.S.	
<b>Min. display unit</b>	<ul style="list-style-type: none"> <li>• Rated pressure range -100.0 to 100.0 kPa model: 0.1 kPa</li> <li>• Rated pressure range -100 to 1,000 kPa model: 1 kPa</li> </ul>	
<b>Min. display interval</b>	Different by pressure unit <sup>02)</sup>	
<b>Max. pressure range</b>	<ul style="list-style-type: none"> <li>• Rated pressure range -100.0 to 100.0 kPa model: Rated pressure <math>\times 2</math></li> <li>• Rated pressure range -100 to 1,000 kPa model: Rated pressure <math>\times 1.5</math></li> </ul>	Rated pressure $\times 3$
<b>Connection</b>	Connector type	Cable type
<b>Cable</b>	$\varnothing$ 4 mm, 5 core, 2 m	$\varnothing$ 4 mm, 5 core, 3 m
<b>Wire</b>	AWG 24 (0.08 mm, 40 seam) insulator diameter: $\varnothing$ 1 mm	
<b>Material</b>	Front case: PC, back case: PBT+G15%, pressure port: SUS303	Front case: PC, back case: PA6, pressure port: SUS316L
<b>Protection structure</b>	IP40 (IEC standard)	
<b>Approval</b>	CE  ENEC	
<b>Unit weight (packaged)</b>	$\approx$ 80 g ( $\approx$ 165 g)	$\approx$ 125 g ( $\approx$ 210 g)
<small>01) The unit is sealed structure. It is based on atmospheric pressure 101.3kPa. 02) Refer to 'minimum display interval per pressure unit'.</small>		
<b>Power supply</b>	12 - 24 VDC $\equiv$ (ripple P-P: $\leq 10\%$ )	
<b>Allowable voltage range</b>	90 to 110% of rated voltage	
<b>Current consumption</b>	$\leq 50$ mA (analog output model: $\leq 70$ mA)	
<b>Control output</b>	NPN or PNP open collector output	
<b>Load voltage</b>	$\leq 30$ VDC $\equiv$	
<b>Load current</b>	$\leq 100$ mA	
<b>Residual voltage</b>	$\leq 2$ VDC $\equiv$	
<b>Hysteresis</b>	Different by output operation mode (parameter) <sup>01)</sup>	
<b>Repeat error</b>	$\pm 0.2\%$ F.S. $\pm$ min. display interval	
<b>Response time</b>	2.5 to 5,000 ms (parameter)	
<b>Protection circuit</b>	Output short over current protection circuit	
<b>Insulation resistance</b>	$\geq 50$ M $\Omega$ (500 VDC $\equiv$ megger)	
<b>Dielectric strength</b>	1,000 VAC $\sim$ 50 / 60 Hz for 1 min	
<b>Vibration</b>	1.5mm amplitude at frequency of 10 to 55Hz (for 1min) in each X, Y, Z direction for 2 hours	
<b>Ambient temperature</b>	-10 to 50 °C, storage: -20 to 60 °C (no freezing or condensation)	
<b>Ambient humidity</b>	30 to 80%RH, storage: 30 to 80%RH (no freezing or condensation)	
<small>01) Refer to 'Output operation mode'.</small>		
<b>External input</b>	Auto shift - Remote zero - Hold (parameter)	
<b>ON / OFF voltage input</b>	ON voltage: $\leq 0.4$ VDC $\equiv$ , OFF voltage: 5-Vin or open, input impedance: $\approx 100$ k $\Omega$	
<b>Resolution</b>	1 / 2,000	
<b>Option output</b>	Analog voltage - Analog current output (parameter)	
<b>Analog voltage output</b>	1 - 5 VDC $\equiv$ $\pm 2.5\%$ F.S., output impedance: $\approx 240$ $\Omega$	
<b>Analog current output</b>	DC4 - 20 mA $\pm 2.5\%$ F.S., output impedance: $\approx 100$ k $\Omega$	
<b>Linearity</b>	$\leq \pm 1\%$ F.S.	
<b>Resolution</b>	1 / 2,000	
<b>Response time</b>	50 ms	



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# Display Type

## Pressure Sensors

### PSAN Series



#### Features

- Pressure measurement of any gas, liquid or oil (except substances which may corrode stainless steel 304 / 316L)
- Auto shift function: with change in the original pressure, the external input adjusts the determined level to match the change in pressure (only available in models with auto shift / hold function)
- Hold function: hold current display value or control output
- Forced output control mode for device testing and maintenance
- One-touch connector type for easy wiring and maintenance
- Zero-point adjustment function, peak value monitoring function, chattering prevention function

#### Specifications

Model	PSAN- □V01C□□-□	PSAN- □01C□□-□	PSAN- □1□□□-□	PSAN- □C01□□□-□
Pressure Type	Pneumatic type model: Gauge pressure Fluid type model: Gauge pressure <sup>01)</sup> or sealed gauge pressure <sup>02)</sup>			
Pressure	Negative	Static		Compound
Min display unit	0.1 kPa	0.1 kPa	1 kPa	0.1 kPa
Rated pressure range	0.0 to -101.3 kPa	0.0 to 100.0 kPa	0 to 1,000 kPa	-101.3 to 100.0 kPa
Display & setting pressure range	5.0 to -101.3 kPa	-5.0 to 110.0 kPa	-101.3 to 1,100 kPa	-101.3 to 110.0 kPa
Display type	7 Segment LED, 4 ½ digit			
Display accuracy	-10 to 0 °C: ≤ ±1% F.S., 0 to 50 °C: ≤ ±0.5% F.S.			
Max. pressure	Rated pressure × 2	Rated pressure × 2	• Pneumatic type: Rated pressure × 1.5 • Fluid type: Rated pressure × 2	Rated pressure × 2

01) Only for static pressure, rated pressure range 100.0 kPa model

02) The unit is sealed structure. It is based on atmospheric pressure 101.3 kPa.

Applicable medium	Pneumatic type (air, non-corrosive gas)	Fluid type (non-corrosive gas and fluid that do not corrode stainless steel 316L)
Connection type	Connector type	Cable type / connector type
Cable	∅ 4 mm, 5-core, 2 m	Connector type: ∅ 4 mm, 5-core, 2 m Cable type: ∅ 4 mm, 5-core, 3 m
Wire spec.	AWG24 (0.08 mm, 40-core), insulator diameter: ∅ 1 mm	
Material	Front case: PC Back case: (back port) PC / (bottom port) PBT+GF15% Pressure port: Brass-nickel plated	Front case: PC Back case: PA6 Pressure port: SUS304/SUS316L
Protection structure	Connector type: IP40 (IEC standard)	Connector type: IP40 (IEC standard) Cable type: IP65 (IEC standard)
Approval	CE ENEC	
Unit weight (packaged)	Back port: ≈ 80 g (≈ 165 g) Bottom port: ≈ 85 g (≈ 170 g)	Connector type: ≈ 88 g (≈ 173 g) Cable type: ≈ 90 g (≈ 167 g)



View product detail

Next Page ►

<b>Power supply</b>	12 - 24 VDC $\equiv$ (ripple P-P: $\leq$ 10%)
<b>Allowable voltage range</b>	90 to 110% of rated voltage
<b>Current consumption</b>	$\leq$ 50 mA <sup>01)</sup>
<b>Control output</b>	NPN open collector output / PNP open collector output model
Load voltage	$\leq$ 30 VDC $\equiv$
Load current	$\leq$ 100 mA
Residual voltage	NPN: $\leq$ 1 VDC $\equiv$ , PNP: $\leq$ 2 VDC $\equiv$
Hysteresis	According to output operation mode <sup>02)</sup>
Repeat error	$\pm$ 0.2% F.S. $\pm$ min display interval
Response time	2.5, 5, 100, 500, 1000 ms
<b>Protection circuit</b>	Output short over-current protection circuit
<b>Insulation resistance</b>	$\geq$ 50 M $\Omega$ (500 VDC $\equiv$ megger)
<b>Dielectric strength</b>	1,000 VAC $\sim$ 50 / 60 Hz for 1 min
<b>Vibration</b>	1.5 mm amplitude at frequency of 10 to 55Hz (for 1 min) in each X, Y, Z direction for 2 hours
<b>Ambient temperature</b>	-10 to 50 °C, Storage: -20 to 60 °C (no freezing or condensation)
<b>Ambient humidity</b>	30 to 80%RH, Storage: 30 to 80%RH (no freezing or condensation)

01) Current output:  $\leq$  75 mA

02) Refer to "Output operation mode".  $\pm$ 1digit error may occur due to pressure unit operation.

<b>Analog output</b>	<b>Voltage (1 - 5 VDC<math>\equiv</math> <math>\pm</math>2% F.S)</b>	<b>Current (DC 4 - 20mA <math>\pm</math>2% F.S)</b>
Output impedance	1 k $\Omega$	-
Linearity	$\leq$ $\pm$ 1% F.S	$\leq$ $\pm$ 1% F.S
Zero-point	$\leq$ 1 VDC $\equiv$ $\pm$ 2% F.S.	$\leq$ DC 4 mA $\pm$ 2% F.S.
Span	$\leq$ 4 VDC $\equiv$ $\pm$ 2% F.S.	$\leq$ DC 16 mA $\pm$ 2% F.S.
Resolution	1/1000 or 1/2000 (different by pressure type and display unit)	
Response time	50 ms	70 ms

# Display Type

## Pressure Sensors

### PSB Series



#### Features

- High accuracy digital pressure sensor
- Bright red LED display (character height : 9.5 mm)
- High display resolution
  - negative pressure 0.1 kPa /
  - standard pressure 0.1 kPa, 1 kPa /
- compound pressure 0.2 kPa
- Unit conversion function
  - negative, compound pressure: kPa, kgf/cm<sup>2</sup>, bar, psi, mmHg, mmH<sub>2</sub>O, inHg
  - standard pressure: kPa, kgf/cm<sup>2</sup>, bar, psi
- Various output modes: hysteresis mode, automatic sensitivity adjustment mode, independent 2-point output mode, window comparison output mode
- Chattering prevention function (response time: 2.5 ms, 5 ms, 100 ms, 500 ms)
- Analog output (1 - 5 VDC $\equiv$ ) scale function
- Zero-point adjustment function
- Peak value and low value hold function
- Built-in reverse polarity protection circuit, overcurrent protection circuit



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#### Specifications

Model	PSB-V01□□-□	PSB-01□□-□	PSB-1□□-□	PSB-C01□□-□
Pressure type	Gauge pressure			
Applicable medium	Air, Non-corrosive gas			
Pressure	Negative	Static	Compound	
Min display interval	1-digit <sup>01)</sup>	1-digit <sup>01)</sup>	2-digit	
Rated pressure range	0.0 to -101.3 kPa	0.0 to 100.0 kPa	0 to 1,000 kPa	-100.0 to 100.0 kPa
Display & setting pressure range	5.0 to -101.3 kPa	-5.0 to 110.0 kPa	-50 to 1,100 kPa	-101.2 to 110.0 kPa
Display type	7 segment LED, 3 1/2 digit			
Display accuracy	-10 to 0 °C: $\leq \pm 2\%$ F.S., 0 to 50 °C: $\leq \pm 1\%$ F.S.			
Max. pressure	Rated pressure $\times 2$	Rated pressure $\times 2$	Rated pressure $\times 1.5$	Rated pressure $\times 2$
01) psi unit: 2-digit				
Connection type	Cable type / Connector type model			
Cable	<ul style="list-style-type: none"> <li>• Cable type: <math>\varnothing</math> 4 mm, 5-core, 2 m</li> <li>• Connector type: 5-core, 3 m</li> </ul>			
Wire spec.	AWG 24 (0.08 mm, 40-core), insulator diameter: $\varnothing$ 1 mm			
Material	Case, Pressure port, Cover: IXEF			
Guaranteed parameter write life	100,000 times			
Protection structure	IP40 (IEC standard)			
Approval	CE EAC			
Unit weight (packaged)	$\approx 70$ g ( $\approx 160$ g)			
Power supply	12 - 24 VDC $\equiv$ $\pm 10\%$ (ripple P-P: $\leq 10\%$ )			
Current consumption	$\leq 50$ mA			
Control output	NPN open collector output / PNP open collector output model			
Load voltage	$\leq 30$ VDC $\equiv$			
Load current	$\leq 100$ mA			
Residual voltage	NPN: $\leq 1$ VDC $\equiv$ , PNP: $\leq 2$ VDCT			
Hysteresis	Negative / Static: 1-digit (psi unit: 2-digit) Compound: 2-digit <sup>01)</sup>			
Repeat error	Negative / Static: $\pm 0.2\%$ F.S. $\pm 1$ digit Compound: $\pm 0.2\%$ F.S. $\pm 2$ digits			
Response time	2.5, 5, 100, 500 ms			
Protection circuit	Output short over-current protection circuit			
Vibration	1.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours			
Ambient temperature	-10 to 50 °C, storage: -20 to 60 °C (no freezing or condensation)			
Ambient humidity	35 to 85%RH, storage: 35 to 85%RH (no freezing or condensation)			
01) Due to the pressure unit operation, $\pm 1$ digit errors may occur in the hysteresis.				
Analog output	Voltage (1 - 5 VDC $\equiv$ $\pm 2\%$ F.S.)			
Output impedance	1 k $\Omega$			
Linearity	$\leq \pm 2\%$ F.S.			
Zero-point	$\leq 1$ VDC $\equiv$ $\pm 2\%$ F.S.			
Span	$\leq 4$ VDC $\equiv$ $\pm 2\%$ F.S.			
Resolution	1/200			

# Compact Pressure Sensors

## PSS Series



### Features

- Rated pressure range
  - negative pressure (0 kPa to -101.3 kPa)
  - positive pressure (0 kPa to 100.0 kPa / 0 kPa to 1000 kPa)
  - compound pressure (-101.3 kPa to 100 kPa)
- Compact size:
  - W 11.8 mm × H 29.3 mm × L 24.8 mm (with pressure port)
- Analog output: voltage (1 - 5 VDC $\pm$ ), current (DC 4 - 20 mA)
- Power supply: 12 - 24 VDC $\pm$   $\pm$ 10%

### Specifications

Series	PSS series
Applicable medium	Air, Non-corrosive gas
Pressure type	Negative, Static, Compound
Rated pressure range	Refer to 'Model'.
Cable	Ø 3 mm, 4-core, 3 m
Wire	AWG28 (0.08 mm, 19-core) insulator diameter: Ø 0.88 mm
Material	• R1/8 pressure port - Front/Rear case: PBT, Pressure port: Nickel plated brass • Reducer pressure port - Front/Rear case and pressure port: PBT
Protection structure	IP40 (IEC standard)
Approval	CE ENEC
Unit weight (packaged)	$\approx$ 26 g ( $\approx$ 60 g)
Power supply	12 - 24 VDC $\pm$ $\pm$ 10% (ripple P-P: $\leq$ 10%)
Current consumption	Voltage output model: $\leq$ 15 mA
Effect by power supply	$\leq$ $\pm$ 0.3%F.S
Protection circuit	Reverse polarity protection circuit
Voltage output	1 - 5 VDC $\pm$ $\pm$ 2% F.S.
Linearity	$\leq$ $\pm$ 1% F.S.
Output impedance	1 k $\Omega$
Current output	DC 4 -20 mA $\pm$ 2% F.S.
Linearity	$\leq$ $\pm$ 1% F.S.
Analog output temp. characteristic	$\leq$ $\pm$ 2% F.S. (in 0 to 50 °C temperature range, at 25 °C)
Insulation resistance	$\geq$ 50 M $\Omega$ (500 VDC $\pm$ megger)
Dielectric strength	2,000 VAC $\sim$ 50/60 Hz for 1 min
Vibration	1.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours
Ambient temperature	0 to 50 °C, Storage: -10 to 60 °C (no freezing or condensation)
Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH (no freezing or condensation)

### Model

Model name	Pressure	Rated pressure range	Expanded analog output range	Max. pressure range	Output	□: Pressure port			
PSS-V01V-□	Negative	0.0 to -101.3 kPa	5.0 to -101.3 kPa	Rated pressure $\times$ 2	Voltage	R1/8: R1/8 (Standard) R04: Ø4 reducer R06: Ø6 reducer			
PSS-V01A-□					Current				
PSS-01V-□	Static	0.0 to 100.0 kPa	-5.0 to 110.0 kPa	Rated pressure $\times$ 2	Voltage				
PSS-01A-□					Current				
PSS-1V-□					0 to 1,000 kPa		-50 to 1,100 kPa	Rated pressure $\times$ 1.5	Voltage
PSS-1A-□					Current				
PSS-C01V-□	Com -pound	-101.3 to 100.0 kPa	-101.3 to 110.0 kPa	Rated pressure $\times$ 2	Voltage				
PSS-C01A-□					Current				



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# Pressure Sensor Indicators

## PSM Series



### Features

- Display 8 (PSM8) or 4 (PSM4) channels of pressure value from pressure sensors
- Input range: 1 - 5 VDC $\equiv$ , DC 4 - 20 mA (by model)
- Pressure sensor model auto recognition (Autonics PSS Series pressure sensors)
- Set PV display color by control output type (red / green)
- Individual output indicators for each channel
- RS485 (Modbus RTU) communication support
- Refrigeration pressure control mode
- Easy wiring and connection with sensor connectors (CNE)
- Power supply: 12 - 24 VDC $\equiv$   $\pm$ 10%

### Specifications

Model	PSM4-□□□	PSM8-□□□
Display pressure range	Refer to 'Rated Pressure and Max. Pressure Display Range!'	
Max. inputs	4	8
Sensor input	<ul style="list-style-type: none"> <li>• 1 - 5 VDC<math>\equiv</math> (Input impedance: <math>\approx</math> 300 k<math>\Omega</math>)</li> <li>• DC 4 - 20 mA model (Input impedance: <math>\approx</math> 100 <math>\Omega</math>)</li> </ul>	
Sensor supply power	12 - 24 VDC $\equiv$ , 40 mA per channel (1 - 4 ch max. current: $\leq$ 100 mA, 5 - 8 ch max. current: $\leq$ 100 mA)	
Display type	7 Segment LED 4 digit	
Display accuracy	$\pm$ 0.1% F.S. $\pm$ 2 digit (at 23 $\pm$ 5 $^{\circ}$ C)	
Control output and display temp. characteristic	-10 to 0 $^{\circ}$ C: $\pm$ 0.3% F.S. $\pm$ 2 digit 0 to 50 $^{\circ}$ C: $\pm$ 0.2% F.S. $\pm$ 2 digit (at 25 $^{\circ}$ C)	
Option input	Digital input 1	
Contact input	[L]: $\leq$ 0.2 V	
Solid state input	Residual voltage $\leq$ 1.0 V, Leakage current $\leq$ 0.1 mA	
Protection structure	Front: IP65, the others: IP30 (IEC standard)	
Approval	CE ENEC	
Unit weight (packaged)	$\approx$ 65 g ( $\approx$ 108 g)	
Power supply	12 - 24 VDC $\equiv$ $\pm$ 10% (ripple P-P: $\leq$ 10%)	
Power consumption	$\leq$ 3 W	
Current consumption	$\leq$ 100 mA <sup>01)</sup>	
Control output	NPN open collector output / PNP open collector output model	
Load voltage	$\leq$ 30 VDC $\equiv$	
Load current	$\leq$ 100 mA	
Residual voltage	NPN: $\leq$ 1 VDC $\equiv$ , PNP: $\leq$ 2 VDC $\equiv$	
Hysteresis	Different by output operation mode <sup>02)</sup>	
Repeat error	$\pm$ 0.1% F.S. $\pm$ Min display interval	
Response time	<ul style="list-style-type: none"> <li>• 4 CH model: 2.5, 100, 500, 1000 ms</li> <li>• 8 CH model: 5, 100, 500, 1000 ms</li> </ul>	
RS485 comm.	Modbus RTU	
Protection circuit	Output short over-current protection circuit, power supply reverse connection protection circuit	
Insulation resistance	$\geq$ 100 M $\Omega$ (500 VDC $\equiv$ megger)	
Dielectric strength	Between power terminal and case: 1,000 VAC $\sim$ 50 / 60 Hz for 1 min Between power terminal and RS485 terminal: 500 VAC $\sim$ 50 / 60 Hz for 1 min	
Vibration	1.5 mm amplitude at frequency of 10 to 55 Hz (for 1 min) in each X, Y, Z direction for 2 hours	
Ambient temperature	-10 to 50 $^{\circ}$ C, storage: -20 to 60 $^{\circ}$ C (rated at no freezing or condensation)	
Ambient humidity	30 to 85%RH, storage: 30 to 85%RH (rated at no freezing or condensation)	
Comm. protocol	Modbus RTU	

01) Except sensor consumption current.  
All output indicators ON:  $\leq$  120 mA / RS485 communication connection: 120 mA  
02) Refer to output operation mode.



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