



NEW PRODUCT GUIDE

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SFL/SFLA Series

Safety Light Curtains

The SFL/SFLA series safety light curtains are installed in potentially dangerous or hazardous areas or machines to safeguard personnel from injury. The light curtains feature ▲finger/hand/body detection types ▲various protection height (144 mm to 1,868 mm) ▲15 m long sensing distance ▲various safety-related functions ▲top control output indicator & status display ▲IP65, IP67, IP67G protection structure for diverse applications.

CE UK CA TUV NORD cUL US LISTED S (industrial robot protection device)

► Product Specifications p.22



SFC/SFC-R Series

Safety Controllers

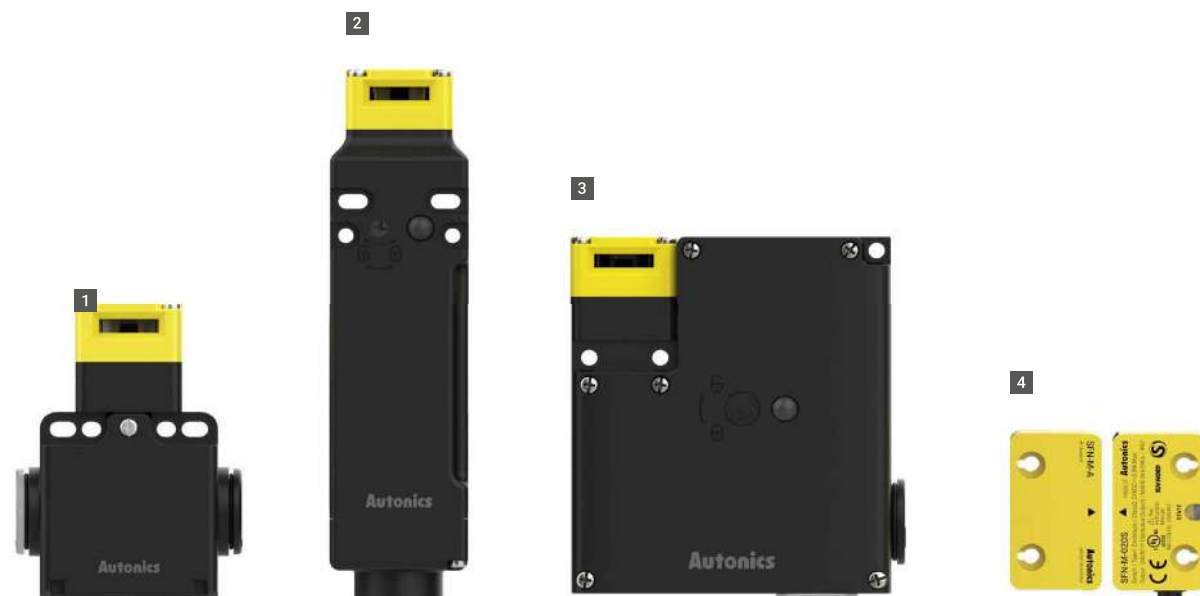
The SFC/SFC-R series safety controllers are used together with safety input devices (switches, sensors, etc.) to provide safe working environments. The controllers feature ▲17.5 mm slim size ▲front terminal design ▲up to 20 logic inputs ▲flexible OFF-delay output ▲safety circuit design to meet safety standards.

CE UK CA TUV NORD cUL US LISTED S EAC

► Product Specifications p.23



- 1 Safety Door Switches SFD Series
- 2 Safety Door Lock Switches SFDL Series
- 3 Safety Flat Type Door Lock Switches SFDL2 Series
- 4 Safety Non-contact Switches SFN Series



SFDL2/SFDL/SFD/SFN Series

Safety Door Switches

The safety door switches including door lock, door, and non-contact switches can detect the opening and closing of doors in machines. ▲The SFDL2/SFDL/SFD series safety door locks/door switches can be inserted by 6 different types of operation keys from 5 directions. ▲The SFN series non-contact door switches allow multiple connections of up to 30 units with a single controller. The switches can be installed vertically or horizontally and can also be installed from both sides.

CE UK TUVNORD cUL US LISTED S (Except SFN Series) EAC (SFD/SFDL Series)

► Product Specifications p.24

- 1 Safety Grip Type Enabling Switches SFEN Series
- 2 Safety Key Selector Switches SF2KR Series
- 3 Emergency Stop Button Switches SF2ER Series



SFEN/SF2KR/SF2ER Series

Safety Switches

The safety switches including grip type enabling switches, key selector switches and emergency stop button switches can be used within a hazardous area during maintenance. ▲The SFEN safety series safety grip type enabling switches provide high operation sensitivity with 3-position snap action and include standard and button types of model. ▲The SF2KR series provide additional worker safety within fences and are available in 240 different models. ▲The SF2ER series emergency stop button switches adopt direct opening mechanism to prevent contact welding and provide additional safety.

CE UK TUVNORD cUL US LISTED S

► Product Specifications p.26



VC Series

Smart Cameras

The VC series smart cameras utilize images captured by the integrated industrial camera lenses to determine the target object's code, OCR/OCV, patterns, alignment, presence, size, shape and more. The smart cameras feature ▲14 types of inspection functions ▲global shutter method ▲inspection simulator function ▲set up to 64 workgroups ▲optimized for heat dissipation ▲save data to FTP servers.



► Product Specifications p.28



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LSE2 Series

LiDAR

The LSE2 Series laser scanners offer 5.6 m x 5.6 m detection area with 90° detection angle. The LSE2 Series feature ▲compact size (W120 x H47.5 x L89.4 mm), ▲immunity to 5G frequency noise, ▲Ethernet communication, ▲various filter function and aluminum die-cast housing body to prevent malfunction due to fog, rain, snow and dusts.



► Product Specifications p.28

LSC Series

LiDAR

The LSC series laser scanners measure the round trip time of the infrared laser beam to accurately detect presence of objects within a wide range area. It can be used to detect presence or entry of people and to prevent the collision of AGV (Automated Guided Vehicle). The laser scanner feature ▲270° detection angle and up to 25 m detection distance ▲teaching button for setting detection area ▲up to 16 of field setting.



► Product Specifications p.29





BS3 Series

Photomicro Sensors

The BS3 series ultra-compact photomicro sensors are available in 5 different shapes (K, F, R, U, L types), offering maximum flexibility for various user applications and installation settings. The sensors feature ▲operation indicator on multiple directions ▲high resistance to shock and vibration ▲minimized detection errors occurring from foreign substances ▲2 kHz high-speed response frequency.



► Product Specifications p.29

BD Series

Laser Displacement Sensors

The BD series laser displacement sensors can measure thickness, width, level difference, disparity, curve, evenness of target objects by detecting the amount of displacement. The sensors feature ▲1μm maximum resolution ▲max. 100±20 mm measurement range ▲0.1% of F.S. linearity ▲various calculation functions ▲easy configuration with movement average, deferential and median filters.



► Product Specifications p.30



Sensor Head BD-030/065/100



Communication Converter BD-C Series



Amplifier Unit BD-A1



ADIO Series

Remote I/O System

The ADIO series remote I/O boxes transmit various input and output signals between master devices such as PCs or PLCs and secondary devices including sensors and actuators. The IO-Link master type ADIO-ILD can exchange signals from secondary devices (IO-Link, standard I/O) to industrial networking protocols (EtherCAT, EtherNET/IP, PROFINET). The ADIO series feature ▲IO-Link 8 channels, digital input 16 channels, digital output 8 channels ▲Push-Pull connector type ▲IP67, IP69K protection structure.

CE UK CA cUL US LISTED IO-Link

EtherCAT Conformance tested EtherNet/IP PROFINET

► Product Specifications p.32

PRD Series (IO-Link)

Proximity Sensors

The PRD series cylindrical inductive proximity sensors are available in standard and IO-Link communication models. The sensors feature ▲easy maintenance by checking individual sensor ID for misconnection, disconnection, and installation errors. ▲predictive maintenance to prevent malfunction ▲reduce downtime by checking the location and cause of the sensor ▲various cable types ▲Bi-Color LED indicator.

CE UK CA cUL US LISTED IO-Link

► Product Specifications p.31



SPRM Series

Power Controllers

The SPRM series power controllers are used to control the amount of electric currents in devices such as heaters, furnaces, thermostats, or motors. The power controllers feature ▲single-phase/three-phase control ▲real-time monitoring load current/voltage/output/heatsink temperature/ power ▲cycle control, phase control method with feedback control (constant current, constant voltage, constant power) ▲RS485, EtherCAT communication supported.



► Product Specifications p.34





GP/LP-A Series

HMI

Graphic/Logic panels provide users with an interface to directly interact with machines in order to control and monitor various processes. The panels feature ▲available in 4.6-inch, 5.7-inch, 7-inch, 10.4-inch ▲TFT LCD True Color display ▲various communication interfaces : RS232C, RS422/485, Ethernet, CAN(10.4-inch) ▲script, schedule, interlock functions ▲PLC, HMI, and I/O modules functions (LP-A) for diverse applications.

※ Screen Sizes
GP-A Series : 4.6-inch, 5.7-inch, 7-inch, 10.4-inch
LP-A Series : 7-inch, 10.4-inch



► Product Specifications p.35

TN Series

Temperature Controllers

The TN series programmable temperature controllers are used to identify measured temperature and release output to maintain desired temperatures. The temperature controllers feature ▲50/100/250 ms sampling cycle ▲Zone PID, Group PID functions ▲maximum of 10 patterns (20 steps) program control ▲6 alarm output options for stable temperature control.



► Product Specifications p.36



AiC-EC Series

Closed Loop Stepper Motor System

The AiC-EC series Ai-SERVO closed-loop stepper motors with EtherCAT support offers high compatibility between primary and secondary devices with EtherCAT open protocol. The AiC-EC series feature ▲multi-axis simultaneous control with 100 Mbps communication speed ▲closed-loop system with real-time position control ▲high speed and high torque drive without missed step.



► Product Specifications p.37





PRODUCT SPECIFICATIONS

Safety Light Curtains SFL/SFLA Series

Type	Standard type		
Models	SFL14-□-□	SFL20-□-□	SFL30-□-□
Sensing type	Through-beam		
Light source	Infrared LED (855 nm)		
Effective aperture angle (EAA)	Within ± 2.5 ° when the sensing distance is greater than 3 m for both emitter and receiver.		
Sensing distance	Short - Long mode (setting switch)		
Short mode	0.2 to 5 m	0.2 to 8 m	0.2 to 8 m
Long mode	0.2 to 10 m	0.2 to 15 m	0.2 to 15 m
Detection capability	Ø 14 mm (finger)	Ø 20 mm (hand)	Ø 30 mm (hand-body)
Detection object	Opaque object		
Number of optical axes ⁽⁰¹⁾	15 to 111	12 to 68	42 to 75
Protective height	144 to 1,008 mm	183 to 1,023 mm	1,043 to 1,868 mm
Optical axis pitch	9 mm	15 mm	25 mm
Series connection	Max. 3 SET (≤ 300 optical axes)		

Type	Advanced type		
Models	SFLA14-□-□	SFLA20-□-□	SFLA30-□-□
Sensing type	Through-beam		
Light source	Infrared LED (855 nm)		
Effective aperture angle (EAA)	Within ± 2.5 ° when the sensing distance is greater than 3 m for both emitter and receiver.		
Sensing distance	Short - Long mode (setting switch or atLightCurtain)		
Short mode	0.2 to 5 m	0.2 to 8 m	0.2 to 8 m
Long mode	0.2 to 10 m	0.2 to 15 m	0.2 to 15 m
Detection capability	Ø 14 mm (finger)	Ø 20 mm (hand)	Ø 30 mm (hand-body)
Detection object	Opaque object		
Number of optical axes ⁽⁰¹⁾	15 to 199	12 to 124	9 to 75
Protective height	144 to 1,800 mm	183 to 1,863 mm	218 to 1,868 mm
Optical axis pitch	9 mm	15 mm	25 mm
Series connection	Max. 4 SET (≤ 400 optical axes)		




01) It may differ depending on the models. For more information, refer to the "SFL/SFLA User Manual."

Power supply	24 VDC≒ ± 20 % (Ripple P-P: ≤ 10 %)
Current consumption ⁽⁰¹⁾	Emitter: ≤ 106 mA, receiver: ≤ 181 mA
Response time ⁽⁰¹⁾	T _{OFF} (ON → OFF): ≤ 19.9 ms, T _{ON} (OFF → ON): ≤ 49.7 ms
Safety related output :OSSD output	NPN or PNP open collector Load voltage ⁽⁰²⁾ : ON - 24 VDC≒ (except for the residual voltage), OFF - 0 VDC≒, Load current ⁽⁰³⁾ : ≤ 300 mA, Residual voltage ⁽⁰⁴⁾ : ≤ 2 VDC≒ (except for voltage drop due to wiring), Load capability: ≤ 2.2 μF, Leakage current: ≤ 2.0 mA, Wire resistance of load: ≤ 2.7 Ω
Auxiliary output (AUX 1/2) ⁽⁰⁵⁾	NPN or PNP open collector Load voltage: ≤ 24 VDC≒, Load current: ≤ 100 mA, Residual voltage: ≤ 2 VDC≒ (except for voltage drop due to wiring)
Lamp output (LAMP 1/2) ⁽⁰⁵⁾	NPN or PNP open collector, Load voltage: ≤ 24 VDC≒, Load current: ≤ 300 mA
External input	Reset input, mute 1/2 input, EDM, external test
	When setting NPN output ON: 0 - 3 VDC≒, OFF: 9 - 24 VDC≒ or open, short-circuit current: ≤ 3 mA When setting PNP output ON: 9 - 24 VDC≒, OFF: 0 - 3 VDC≒ or open, short-circuit current: ≤ 3 mA
Protection circuit	Reverse power polarity, reverse output polarity, output short-circuit over-current protection
Safety-related functions	Interlock (reset hold), external device monitoring (EDM), muting/override, Blanking (fixed blanking, floating blanking), reduced resolution
General functions	Self-test, alarm for reduction of incident light level, mutual interference prevention
Others functions	Change of sensing distance, switching to NPN or PNP, external test (light emission stops), auxiliary output (AUX 1, 2), lamp output (LAMP1, 2)
Synchronization type	Timing method by RS485 synchronous line
Insulation resistance	≥ 20MΩ (at 500 VDC≒ megger)
Noise immunity	± 240 VDC≒ the square wave noise (pulse width: 1μs) by the noise simulation
Dielectric strength	1,000 VAC~ 50 / 60 Hz for 1 minute
Vibration ⁽⁰⁶⁾	10 mm double amplitude at frequency of 5 to 150 Hz, 10 sweeps in each X, Y, Z direction
Shock ⁽⁰⁶⁾	250 m/s ² (≈ 25 G), pulse width 6 ms in each X, Y, Z direction for 100 times
Ambient illumination (receiver)	Incandescent lamp: ≤ 3,000 lx, sunlight: ≤ 10,000 lx
Ambient temperature	-30 to 60 °C, storage: -30 to 70 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 95 %RH (no freezing or condensation)
Protection rating ⁽⁰⁷⁾	IP65, IP67 (IEC standard), IP67G (JEM Standard), IP69K (DIN standard)
Material	Case: Aluminum, Front cover and sensing part: Polymethyl methacrylate, End cap: polycarbonate, Power I/O cable and connector cable: polyurethane (PUR) or polyvinyl chloride (PVC), Y type connector cable: polyvinyl chloride (PVC), lamp output cable and series connector cable: polyurethane (PUR), Top / Bottom adjustable bracket and Top / Bottom bracket: SUS304, Side adjustable bracket and Side bracket: nickel plated Zn
Approval	CE     (industrial robot protection device) ⁽⁰⁸⁾
International standards	UL 508, CSA C22.2 No. 14, ISO 13849-1 (PL e, Cat. 4), ISO 13849-2 (PL e, Cat. 4), UL 61496-1 (Type 4, ESPE), UL 61496-2 (Type 4, AOPDs), IEC/EN 61496-1 (Type 4, ESPE), IEC/EN 61496-2 (Type 4, AOPDs), IEC/EN 61508-1~7 (SIL 3), IEC/EN 62061 (SIL CL 3)

01) It may differ depending on the models. For more information, refer to the "SFL/SFLA User Manual."
02) The values of load voltage were drawn with PNP output, and in case of NPN output, apply these in reverse.
03) Be sure that the load current should be greater than 6 mA.
04) The residual voltage was drawn with 300 mA of load current.
05) It is the non-safety output. Do not use it for safety purposes.
06) Testing according to IEC 61496-1 standards.
07) Approved certification protection ratings are IP65 and IP67.
08) The certified models for S-mark and KCs (industrial robot protection device) have the same functional basis.










Safety Controllers SFC/SFC-R Series

Unit Model	Basic SFC-422-□	Advanced SFC-A322-2□-□	Non-contact door switch SFC-N322-2□-□
Power supply	24 VDC≒		
Allowable voltage range	85 to 110% of rated voltage		
Power consumption ⁽⁰¹⁾	≤ 2.5 W	≤ 3.0 W	≤ 3.5 W
Input	ON: ≥ 11 VDC≒ ≥ 5 mA, OFF: ≤ 5 VDC≒ ≤ 1 mA		
Input time	≥ 50 ms, feedback start (manual) : ≥ 100 ms		
Cable	≤ 100 m (≤ 100 Ω, ≤ 10nF)		
Safety output	P channel FET ⁽⁰²⁾		
Instantaneous	4 ×	3 × ⁽⁰³⁾	3 × ⁽⁰³⁾
Off-delay ⁽⁰⁴⁾	-	2 × ⁽⁰³⁾	2 × ⁽⁰³⁾
Time accuracy	-	≤ ± 5%	≤ ± 5%
Load current	Below 2-point output: ≤ DC 1 A, Over 3-point output: ≤ DC 0.8 A		
Leakage current	≤ 0.1 mA		
Operating time (OFF → ON) ⁽⁰⁵⁾	-	Logic input: ≤ 200 ms	Non-contact door switch input: ≤ 100 ms
	-	-	
Response (return) time (ON → OFF) ⁽⁰⁵⁾	≤ 15 ms, non-contact door switch input or logic input: ≤ 20 ms		
Auxiliary output	2 × PNP transistor: X1, X2 (error)		
Load current	≤ 100 mA		
Leakage current	≤ 0.1 mA		
Logical AND connections	No. of connections: max. 4 units, no. of total connections: max. 20 units No. of layers: max. 5 layers, cable length: ≤ 100 m		
SFN connections ⁽⁰⁶⁾	-	-	Max. 30 units
Approval	IEC/EN 61508 (SIL3), IEC/EN 62061 (SILCL3) IEC/EN 60947-5-1, EN ISO 13849-1 (Category 4, PL _e) UL listed E249635		
Certification	CE (TUV NORD)    ENEC		
Unit weight (package)	≈ 70 g (≈ 120 g)	≈ 90 g (≈ 140 g)	≈ 100 g (≈ 150 g)

01) Not include the power consumption of loads. (SFC-N exclude the power supplied to the non-contact door switch.)
02) Includes a diagnostic pulse (max. 600 μs). Be cautious when using the output signal as an input signal for the control device.



03) Available changing via setting switch on the back side of the product.
04) Available to set Off-delay time (max. 3 sec. / 300 sec., depends on model)
05) The operation (response) time of each model. The time increases when a logical connection or expansion relay unit is connected.
06) SFC-N units can only be connected to Autonics non-contact door switch units SFN Series.

Unit	Expansion relay		Relay	
Model	SFC-ER412-□	SFC-R412-□	SFC-R212-□	SFC-R212-R2□-□
Power supply	24 VDC≒			
Allowable voltage range	85 to 110% of rated voltage			
Power consumption ⁽⁰¹⁾	≤ 2.5 W	≤ 4.0 W	≤ 4.0 W	≤ 6.0 W
Input	ON: ≥ 11 VDC ≒ ≥ 5 mA, OFF: ≤ 5 VDC ≒ ≤ 1 mA			
Input time	≥ 50 ms, feedback start (manual) : ≥ 100 ms			
Cable	≤ 100 m (≤ 100 Ω, ≤ 10nF)			
Safety output	Relay (A contact)		Relay (A contact)	
Instantaneous	4 ×	4 ×	2 ×	2 ×
Off-delay ⁽⁰²⁾	-	-	-	2 ×
Time accuracy	-	-	-	≤ ± 5%
Capacity	240 VAC ~ 5 A resistance load, 30 VDC ≒ 5 A resistance load			
Life expectancy	Mechanical: ≥ 10,000,000 operations, Malfunction: ≥ 50,000 operations			
Contact resistance	≤ 100 mΩ			
Inductive load switching	IEC60947-5-1: AC-15(230 V/2 A), DC-13(24 V/1.5 A), UL508: B300/R300			
Conditional short-circuit current	100 A ⁽⁰³⁾			
Operating time (OFF → ON) ⁽⁰⁴⁾	≤ 30 ms ⁽⁰⁵⁾	≤ 100 ms		
Response (return) time (ON → OFF) ⁽⁰⁴⁾	≤ 10 ms	≤ 15 ms		
Auxiliary output	1 × PNP transistor: X2 (error)		1 × PNP transistor: X1	
Load current	≤ 100 mA		≤ 100 mA	
Leakage current	≤ 0.1 mA			
Expansion units connections	Max. 5 units		-	
Approval	IEC/EN 61508 (SIL3), IEC/EN 62061 (SILCL3) IEC/EN 60947-5-1, EN ISO 13849-1 (Category 4, PLe) UL listed E249635			
Certification	CE     ENEC		CE (TUV NORD)    ENEC	
Unit weight (package)	≈ 100 g (≈ 150 g)	≈ 110 g (≈ 160 g)	≈ 80 g (≈ 130 g)	≈ 110 g (≈ 150 g)

01) Not include the power consumption of loads.
02) Available to set Off-delay time (max. 3 sec. / 30 sec., depends on model)
03) Use 6 A fast-blow fuse under the IEC 60127 standard as a short-circuit protection device.
04) The operation (response) time of each model. The time increases when a logical connection or expansion relay unit is connected.
05) Except operation time of advanced unit, non-contact door switch unit

Pollution	3
Overvoltage category	III
Impulse withstand voltage for relay unit (IEC/EN 60947-5-1)	Input terminals and relay output terminals: 6 kV Relay contacts between 13-14 / 23-24 and 33-34 / 43-44 (37-38 / 47-48): 6 kV between 13-14 and 23-24: 4 kV between 33-34 and 43-44 (37-38 and 47-48): 4 kV
Dielectric strength	[Basic / Advanced / Non-contact door switch unit] Between all terminals and case: 500 VAC~ 50/60 Hz for 1 min. [Expansion relay / Relay unit] Between all terminals and case: 1,500 VAC~ 50/60 Hz for 1 min. Between input terminals and output terminals ⁽⁰¹⁾ : 2,500 VAC~ 50/60 Hz for 1 min.

01) In case of relay unit, output terminals between 13-14, 23-24 and 33-34, 43-44 (37-38, 47-48)



※ The specifications on this guide may be changed

Safety Flat Type Door Lock Switches SFDL2 Series

Model	SFDL2-□□□-□□ -□ SFDL2-□□□-□□K-□	SFDL2-□□□-□□ B-□ SFDL2-□□□-□□KB-□
Directing opening force	≥ 80 N	
Directing opening distance	≥ 10 mm	
Locking pullout strength	≥ 1,300 N	
Operating speed	0.05 to 1 m/s	
Operating frequency	≤ 20/min	
Mechanical life cycle	≥ 1,000,000 operations (20/min)	
Indicator	Solenoid status or contact status (orange, depending on connection) -	
Vibration (malfunction)	0.35mm amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 10 min	
Shock	1,000 m/s ² (≈ 100 G) in each X, Y, Z direction for 3 times	
Shock (malfunction)	80 m/s ² (≈ 8 G) in each X, Y, Z direction for 3 times	
Ambient temperature	-10 to 55°C, storage: -25 to 65 °C (a non freezing or condensation environment)	
Ambient humidity	35 to 85 %RH , storage: 35 to 85 %RH (a non freezing or condensation environment)	
Protection structure	IP67 ⁰¹⁾ (IEC standard, except for head)	
Material	Head: zinc or PA, case: PA	
Approval	CE (TUV NORD) 25 40 50 60	
Accessory	SFDL2-□□□-□□K/KB-□ (Special type release key): rotating key	
Unit weight (packaged)	Normal type: ≈ 400 g (≈ 490 g), rear release button type: ≈ 395 g (≈ 485 g)	

01) Rated protection structure is for the switch body. Be cautious about preventing the head part from entering the foreign materials such as dust and water.

Contact block	
Rated voltage/ current for load	Resistive load: 6 A/250 VAC~, 0.6 A/250 VDC= Inductive load (IEC): AC-15 3 A/240 VAC~, DC-13 0.27 A/250 VDC=, Inductive load (UL): A300, Q300
Impulse dielectric strength	Between the terminals of same polarity: 2.5 kV , Between the terminals of different polarity: 4 kV Between each terminal and non-live part: 6 kV
Insulation resistance	≥ 100 MΩ (500 VDC= megger)
Contact resistance	≤ 100 mΩ
Electrical life cycle	≥ 100,000 operations (250 VAC~/6 A)
Conditional short-circuit current	100 A
Solenoid	
Rated voltage	24 VDC=, class 2
Current consumption	Supplying power: 0.26A Normal: max. 0.2A (approx. 3 seconds after supplying power)
Insulation class	Class E
Indicator LED	
Rated voltage	24 VDC=
Current consumption	2.2 mA

Safety Door Lock Switches SFDL Series

Model	SFDL-□□□-□□	SFDL-□□□-C□□
Directing opening force	≥ 80 N	
Directing opening distance	≥ 10 mm	
Locking pullout strength	≥ 1,300 N	
Operating speed	0.05 to 1 m/s	
Operating frequency	≤ 20/min	
Mechanical life cycle	≥ 1,000,000 operations (20/min)	
Vibration (malfunction)	0.35mm amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 10 min	
Shock	1,000 m/s ² (≈ 100 G) in each X, Y, Z direction for 3 times	
Shock (malfunction)	80 m/s ² (≈ 8 G) in each X, Y, Z direction for 3 times	
Ambient temperature	-10 to 55°C ⁰¹⁾ , storage: -25 to 65 °C (a non freezing or condensation environment)	
Ambient humidity	35 to 85 %RH , storage: 35 to 85 %RH (a non freezing or condensation environment)	
Protection structure	IP67 ⁰²⁾ (IEC standard, except for head)	
Material	Head: zinc, case: polyamide 66, operation key: stainless steel 304	
Approval	CE (TUV NORD) 25 40 50 60	
Accessory	SFDL-□□□-□□K (Special type release keyse key) : rotating key	
Applicable cable	AWG22	-
Connection type	Terminal type	Connector type
Unit weight (packaged)	≈ 375 g (≈ 440 g)	≈ 325 g (≈ 395 g)

01) UL approved ambient temperature: 50°C

02) Rated protection structure is for the switch body. Be cautious about preventing the head part from entering the foreign materials such as dust and water.

Contact block	
Rated voltage/current for load	Resistive load: 1 A/120 VAC~, 0.22 A/125 VDC= Inductive load (IEC): AC-15 1 A/120 VAC~, DC-13 0.22 A/125 VDC= Inductive load (UL): C150, R150
Impulse dielectric strength	Between the terminals of same polarity: 1.5 kV Between the terminals of different polarity: 1.5 kV Between each terminal and non-live part: 2.5kV
Insulation resistance	≥ 100 MΩ (500 VDC= megger)
Contact resistance	≤ 200 mΩ
Electrical life cycle	≥ 100,000 operations (125 VAC~/1 A)
Conditional short-circuit current	100 A
Solenoid	
Rated voltage	24 VDC=, class 2
Current consumption	Supplying power: 0.26A Normal: max. 0.2A (approx. 3 seconds after supplying power)
Insulation class	Class E



Safety Door Switches SFD Series

Model	SFD-□□-□M20	SFD-□□-□G1/2	SFD-□□-C
Rated voltage/current for load	Resistive load: 6 A/250 VAC~, 0.6 A/250 VDC= Inductive load (IEC): AC-15 3 A/240 VAC~, DC-13 0.27 A/250 VDC= Inductive load (UL): A300, Q300		
Directing opening force	≥ 80 N		
Directing opening distance	≥ 10 mm		
Operating speed	0.05 to 1 m/s		
Operating frequency	≤ 20/min		
Insulation resistance	≥ 100 MΩ (500 VDC= megger)		
Contact resistance	≤ 50 mΩ (initial value)		
Impulse dielectric strength	Between the terminals: 2 kV (IEC 60947-5-1) Between each terminal and non-live part: 5 kV (IEC 60947-5-1)		
Conditional short circuit current	100 A		
Life cycle	Electrical: ≥ 100,000 operations (240 VAC~ 6 A) Mechanical: ≥ 1,000,000 operations		
Protection structure	IP67 ⁰¹⁾ (IEC standard, except for head)		
Material	Plastic head - polyamide 6, metallic head - zinc case: polyamide 6, operation key: stainless steel 304		
Approval	CE (TUV NORD) 25 40 50 60		
Connection type	M20 connector cable	G1/2 connector cable	M12 plug connector
Unit weight (packaged)	• 1 connection outlet plastic: ≈ 80 g (≈ 120 g) metallic: ≈ 110 g (≈ 150 g) • 2 connection outlet plastic: ≈ 110 g (≈ 140 g) metallic: ≈ 130 g (≈ 170 g)		Plastic: ≈ 85 g (≈ 130 g) Metallic: ≈ 115 g (≈ 160 g)

01) Rated protection structure is for the switch body. Be cautious about preventing the head part from entering the foreign materials such as dust and water.



Safety Non-contact Switches SFN Series

Model	SFN-M-□	
Operating distance ⁰¹⁾	OFF→ON	≥ 5 mm
	ON→OFF	≤ 15 mm
Approval	CE (TUV NORD) 25 40 50 60	
Unit weight (packaged)	Cable type (2 m): ≈ 100.5 g (≈ 113.8 g) Cable type (5 m): ≈ 199.5 g (≈ 214.8 g) Cable connector type: ≈ 58.1 g (≈ 71.6 g)	

01) It is rated at 23°C of ambient temperature, and it may be differed up to ± 20 % by ambient temperature.

Power supply	24 VDC= (± 10 %)
Operating frequency	100 Hz
Power consumption ⁰¹⁾	≤ 0.8 W
Auxiliary output	PNP open collector output - 24 VDC=, 10 mA
Operation indicator	ON: green, OFF: red
Life expectancy	≥ 20,000,000 times (with low load)
Insulation resistance	≥ 50 MΩ (500 VDC= megger)
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection circuit
Protection structure	IP67 (IEC standard)
Connection	Cable type / cable connector type model
Cable	Ø 5 mm, 5-wire, cable type: 2 m / 5 m, cable connector type: 0.3 m
Wire	AWG26 (0.08 mm), 28-core, core diameter: Ø 0.74 mm
Connector spec.	M12 plug connector
Material	Body/CAP: PC

01) Power to the load is not included.

Characteristic level / Safety category (with SFC-N322)	IEC 61508 SIL 3 IEC 62061 SIL CL 3 ISO 13849-1 PL Cat.4 - HFT = 1 - Diagnostic Coverage : 99 % (high) - MTTFd = 100 year (high) - Mission time = 20 year - PFH = 3.88E-09
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Safety status in case of error: the switch does not have an internal error recognition function, so it cannot maintain a safety status in the event of error. Error recognition is processed in the connected controller (SFC-N322).



※ The specifications on this guide may be changed

Safety Grip Type Enabling Switches **SFEN Series**

Enable switch	
Rated Insulation Voltage	250 VAC~
Rated through current	2.5 A
Rated inductive load ⁰¹⁾	AC-15 (0.75 A / 240 VAC~), DC-13 (0.55 A / 125 VDC=)
Rated resistive load ⁰²⁾	0.75 A / 240 VAC~, 0.55 A / 125 VDC=
Controller strength	Operation direction: 200 N, for 1 min
Operating frequency	Electrical: ≤ 20 / min, Machanical: ≤ 20 / min
Dielectric strength	Between terminals of same polarity, between terminals of different polarity, between terminal and non-live part : 2,500 VAC~ 50 / 60 Hz for 1 min (impulse dielectric strenght)
Electrical life cycle	≥ 100,000 operations (rated load)
Mechanical life cycle	OFF → ON → OFF: ≥ 100,000 opections / OFF → ON: ≥ 1,000,000 operations

01) Use a 10 A fuse gl or gG conforming to IEC60269 as short-circuit protection. The body does not have a built-in fuse.
02) Do not use the switch more than the controller strength. Failure to follow this instruction may result in product damage.

Stop button	
Rated Insulation Voltage	250 VAC~
Rated through current	3 A
Rated resistive load ⁰¹⁾	AC-12 (3 A / 250 VAC~), DC-12 (3 A / 30 VDC=)
Controller strength ⁰²⁾	Operation direction: 400 N, for 1 min (operation direction: 0.5 N m, for 1 min)
Operating frequency	Electrical: ≤ 10 / min, Machanical: ≤ 10 / min
Dielectric strength	Between terminals of same polarity: 1,000 VAC~ 50 / 60 Hz for 1 min. between terminals of different polarity, between terminal and non-live part : 2,000 VAC~ 50 / 60 Hz for 1 min.
Electrical life cycle	≥ 100,000 operations (rated load) (Push / Release 1 time)
Mechanical life cycle	≥ 100,000 operations (Push / Release 1 time)

01) Use a 10 A fuse gl or gG conforming to IEC60269 as short-circuit protection. The body does not have a built-in fuse.
02) Do not use the switch more than the controller strength. Failure to follow this instruction may result in product damage.

Momentary button	
Rated Insulation Voltage	125 VAC~
Rated through current	0.1 A
Rated resistive load ⁰¹⁾	AC-12 (0.1 A / 125 VAC~), DC-12 (0.1 A / 30 VDC=)
Controller strength ⁰²⁾	Operation direction: 10 N, for 1 min
Operating frequency	Electrical: ≤ 25 / min, Machanical: ≤ 60 / min
Dielectric strength	Between terminals of same polarity: 600 VAC~ 50 / 60 Hz for 1 min. between terminals of different polarity, between terminal and non-live part : 1,000 VAC~ 50 / 60 Hz for 1 min.
Electrical life cycle	≥ 100,000 operations (rated load)
Mechanical life cycle	≥ 1,000,000 operations

01) Use a 10 A fuse gl or gG conforming to IEC60269 as short-circuit protection. The body does not have a built-in fuse.
02) Do not use the switch more than the controller strength. Failure to follow this instruction may result in product damage.

Common spec.	
Conditional short circuit current	100 A
Min. applied load	DC24 V 4 mA
Directing opening force	30 N ± 10
Directing opening distance	4.8 mm ± 0.5
Insulation resistance	≥ 100 M.Ω (500 VDC= megger)
Vibration (malfunction)	1.5 mm double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 10 min
Shock (malfunction)	150 m/s ² (≈ 15 G) in each X, Y, Z direction for 3 times
Ambient temperature	-10 to 55 °C, storage: -25 to 65 °C (no freezing or condensation)
Ambient humidity	35 to 85 %RH, storage: 35 to 85 %RH (no freezing or condensation)
Insulation class	Class II (double insulation)
Indicator	Enable operation indicator (green)
Protection structure	SFEN: IP66 (IEC standard) SFEN-B, SFEN-M: IP65 (IEC standard)
Applicable wire	AWG 20 to 18 (0.5 to 0.75 mm ²)
Connection type	M20 connector cable grand
Meterial	Cover: PA66, button: PC, rubber grip: Silicone
International standards	IEC 60947-5-1, IEC 60947-5-8, UL 60947-5-1
Approval	CE (TUV NORD) UL CSA UL UL UL
Unit weight (package)	SFEN: ≈ 238 g (≈ 363 g) SFEN-B: ≈ 268 g (≈ 388 g) SFEN-M: ≈ 252 g (≈ 376 g)

Contact composition			
	SFEN	SFEN-B	SFEN-M
Enable switch	2 N.O.	2 N.O.	2 N.O.
Option output	1 N.C.	-	-
Stop button	-	2 N.C.	-
Momentary button	-	-	2 N.O.



Safety Key Selector Switches **SF2KR Series**

Model	SF2KR-□-□-□-□	SF2KR-M□-□-□
Solenoid input volatge	-	Non-polar 24 VDC= (± 10%)
Solenoid current consumption	-	38.7 mA ± 5%
Conditional short circuit current	100 A	
Indicator	-	Solenoid operation (green)
Applicable wire	Contact: AWG 18 (0.823 mm ²)	Solenoid power: AWG 24 + 18, Contact: AWG 18 (0.823 mm ²)
Allowable operation frequency ⁰¹⁾	30 times/minute	
Life cycle	Mechanical: ≥ 100,000 times, electrical: ≥ 100,000 times	
Key pushing force	≥ 20 N	
Key rotating torque	0.2 to 1.8 N·m	
Insulation resistance	≥ 100 M.Ω (500 VDC= megger)	
Dielectric strength	2,500 VAC~ 50/60 Hz for 1 minute	
Vibration	1.5 mm double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 2 hours	
Vibration (malfunction)	1.5 mm double amplitude at frequency of 10 to 55 Hz in each X, Y, Z direction for 10 minutes	
Shock	300 m/s ² (≈ 30 g) in each X, Y, Z direction for 3 times	
Shock (malfunction)	150 m/s ² (≈ 15 g) in each X, Y, Z direction for 3 times	
Ambient temperature	-20 to 70°C ⁰²⁾ , storage: -40 to 70 °C (at no freezing or condensation)	-10 to 55°C ⁰²⁾ , storage: -20 to 70 °C (at no freezing or condensation)
Ambient humidity	35 to 85%RH , storage: 35 to 85%RH (at no freezing or condensation)	
Protection structure	IP65 (front panel, IEC standard)	
Material	PC, POM	
Approval	CE (TUV NORD) UL CSA UL UL UL	
Unit weight (packaged) ⁰³⁾	≈ 130 g (≈ 192 g)	≈ 152 g (≈ 213 g)

01) Rotating and retuning once is counted as one operation.
02) UL approved ambient temperature: 55 °C
03) It is switch with contact blocks.

Contact capacity					
IEC (EN60947-5-1)					
Rated current	10 A				
Rated voltage	24 V	110 V	220 V	380 V	
AC	Resistive load (AC-12)	10 A	10 A	6 A	3 A
	Inductive load (AC-15)	10 A	5 A	3 A	2 A
DC	Resistive load (DC-12)	10 A	2 A	0.6 A	0.2 A
	Inductive load (DC-13)	1.5 A	0.5 A	0.2 A	0.1 A

UL / CSA (UL508, CSA C22.2 No. 14)
A300

Rated voltage	Through current	Current (A)		Volt ampere (VA)	
		Making	Breaking	Making	Breaking
AC120 V	10 A	60	6	7,200	720
AC240 V		30	3		

Rated voltage	Through current	Current (A)		Volt ampere (VA)	
		Making	Breaking	Making	Breaking
DC125 V	2.5 A	0.55	0.55	69	69
DC250 V		0.27	0.27		

Emergency Stop Button Switches **SF2ER Series**

Model	SF2ER-□□□□-□
Rated voltage/current	IEC: AC-15 (220 VAC~, 3 A), DC-13 (220 VDC=, 0.2 A) UL: A300, Q300
Contact operating power	3.0 to 8.0 N / 1 contact
Operation distance	5.0 mm (0/-0.5)
Rotation angle	CW (clock wise) 52°
Allowable operation frequency ⁰¹⁾	Mechanical: 20 times/minute, electrical: 20 times/minute
Life cycle	Mechanical: ≥ 250,000 times, electrical: ≥ 100,000 times
Applicable wire	AWG 18 (0.823 mm ²)
Insulation resistance	≥ 100 M.Ω (500 VDC= megger)
Protection structure	IP65 ⁰³⁾ (oil resistant, IEC standards)
Material	Button: PC, body: PA6, lever in fixing unit: PA6
Approval	CE (TUV NORD) UL CSA UL UL UL
Weight ⁰³⁾	≈ 66g

01) Setting and resetting once is counted as one operation.
02) It is only for part from front of the panel. Protection structure is guaranteed only when the switch is installed on flat and smooth surface with mounting holes Ø22mm.
03) It is switch with three contact blocks.

Contact capacity					
IEC (EN60947-5-1)					
Rated current	10 A				
Rated voltage	24 V	110 V	220 V	380 V	
AC	Resistive load (AC-12)	10 A	10 A	6 A	3 A
	Inductive load (AC-15)	10 A	5 A	3 A	2 A
DC	Resistive load (DC-12)	10 A	2 A	0.6 A	0.2 A
	Inductive load (DC-13)	1.5 A	0.5 A	0.2 A	0.1 A

UL / CSA (UL508, CSA C22.2 No. 14)
A300

Rated voltage	Through current	Current (A)		Volt ampere (VA)	
		Making	Breaking	Making	Breaking
AC120 V	10 A	60	6	7,200	720
AC240 V		30	3		

Rated voltage	Through current	Current (A)		Volt ampere (VA)	
		Making	Breaking	Making	Breaking
DC125 V	2.5 A	0.55	0.55	69	69
DC250 V		0.27	0.27		



※ The specifications on this guide may be changed

Smart Cameras VC Series

Model	VC-M50T-CE
Image element	1 inch mono CMOS
Resolution	5 MP (2,560 × 2,048)
Frame per second	16 fps ⁰¹⁾
Bit Depth	8 bit (256 gray level)
Shutter	Global shutter
Exposure time	3 μs to 3 sec
Lens type	C-Mount
eMMC	8 GB
DDR4	2 GB (LPDDR4), 512 MB (DDR4)
Inspection work group	64 (simultaneous inspection: 32)
Trigger mode	Continuous, External Trigger, Manual, Ethernet, RS232
Communication	Ethernet (TCP/IP & Modbus, 10/100/1000Base-T), RS232C
FTP trans. output	YES
Indicator	Power, LINK, DATA, USER 1, USER 2
Approval	CE, RoHS, REACH, FCC
Unit weight (packaged)	≈ 600 g (≈ 780 g)

01) The number of camera frames per second can be different by image setting or inspection item.

Power supply	24 VDC≐ ±10%
Current consumption	≤ 1 A
Rated input signal	24 VDC≐ ±10%
Output signal	NPN-PNP open collector output setting (software)
HS OUT 0	Strobe OUT
HS OUT 1	Inspection complete, Inspection result output (PASS / FAIL), Alarm, Camera work
Load voltage	24 VDC≐
Load current	≤ 100 mA
Residual voltage	≤ 2.5 VDC≐
Protection circuit	Output short overcurrent protection circuit, reverse voltage polarity protection circuit
Vibration	1.5 mm double amplitude at frequency 10 to 55 Hz (for 1 minute) in each X, Y, Z direction for 2 hours
Shock	300 m/s ² (≈ 30 G) in each X, Y, Z direction for 3 times
Ambient temp.	0 to 45 °C, storage: -30 to 80 °C (no freezing or condensation)
Ambient humi.	0 to 95%RH, storage: 0 to 95%RH (no freezing or condensation)
Protection structure	IP67 (IEC standard / When mounting waterproof lens cover)
Connection	Connector type
Connector spec.	Power I/O: M12 8-pin, Ethernet: M12 8-pin / RJ45 (cable tightening torque: 0.4 N·m)
Material	Die-cast Aluminum Housing
Components	Ethernet connector Cap (screw plug - waterproof) × 1 (tightening torque: 0.4 N·m)



LiDAR LSE2 Series

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

Power supply	24 VDC≐ ± 15 %
Power consumption	< 10 W
Input	Photocoupler input: 1, H ⁰⁰¹⁾ : ≥ 8 - 30 VDC≐, L: ≤ 3 VDC≐
Output	PhotoMOS relay output: 2, Resistive load: 30 VDC≐ / 24 VAC~, ≤ 80 mA
Vibration	2 G
Shock	30 G / 18 ms
Ambient illuminance	Sunlight: ≤ 100,000 lx
Ambient temperature	-30 to 60 °C, storage: -30 ~ 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)
Cable spec.	Power I / O cable: Ø 5 mm, 8-wire, 5 m, Ethernet cable: Ø 5 mm, 4-wire, 3 m, shield cable, RJ45 connector
Wire spec.	AWG26 (0.16 mm, 7-core), insulator outer diameter: Ø 1 mm
Material	Case: AL, Window: PC

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

Communication Interface

Ethernet

Communication protocol	TCP/IP
Communication speed	10BASE-TX
Baud rate	10Mbps



LiDAR LSC Series

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		
Light beam emitting angle	14.5 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	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, RoHS		

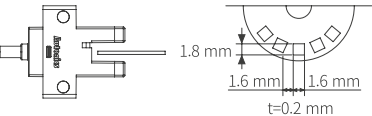
Power supply	9 - 28 VDC≐
Power consumption ⁰⁴⁾	< 4 W
Input	4 Photocoupler inputs H: ≥ 9 - 28 VDC≐, L: ≤ 3 VDC≐
Output signal	4: 3-output + 1-Ready / Error, Sync output NPN-PNP open collector output (software setting)
Load voltage	9 - 28 VDC≐
Load current	≤ 100 mA
Residual voltage	≤ 3.0 VDC≐
Protection structure	IP67 (IEC standard)
Connector specification	Power I / O: M12 12-pin, Ethernet: M12 8-pin
Material	Case: AL, Window: PC

01) Excluding power supplied to the load

Photomicro Sensors BS3 Series

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 ⁰¹⁾	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, RoHS, REACH
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
Vibration	1.5 mm double amplitude (max. acceleration 196 m/s ²) at frequency of 10 to 2,000 Hz in each X, Y, Z direction for 2 hours
Shock	15,000 m/s ² (≈ 1,500 G) in each X, Y, Z direction for 3 times
Protection rating	IP50 (IEC standard)
Connection method	Cable type
Cable spec.	Ø 2.5 mm, 4-wire, 1 m
Wire spec.	AWG28 (0.08 mm, 19-core), insulator outer diameter: Ø 0.65 mm
Material	Case: PBT, sensing part: PC



※ The specifications on this guide may be changed

Laser Displacement Sensors **BD Series**

Sensor head			
Model	BD-030	BD-065	BD-100
Beam shape	Standard		
Spot diameter (near)	≈ 290×790 μm (25 mm)	≈ 360×1,590 μm (55 mm)	≈ 480×1,870 μm (80 mm)
Spot diameter (reference)	≈ 240×660 μm (30 mm)	≈ 290×1,180 μm (65 mm)	≈ 410×1,330 μm (100 mm)
Spot diameter (far)	≈ 190×450 μm (35 mm)	≈ 210×830 μm (75 mm)	≈ 330×950 μm (120 mm)
Resolution ⁰¹⁾	1 μm	2 μm	4 μm
Reference distance	30 mm	65 mm	100 mm
Maximum measurement range	20 to 40 mm	50 to 80 mm	70 to 130 mm
Rated measurement ranges ⁰²⁾	25 to 35 mm	55 to 75 mm	80 to 120 mm
Linearity ⁰³⁾ ⁰⁴⁾	± 0.1% of F.S.	± 0.1% of F.S.	± 0.15% of F.S.
Temperature characteristic ⁰⁴⁾	0.05% F.S./°C	0.06% F.S./°C	
Power supply ⁰⁵⁾	-		
Light source	Red semiconductor laser (wavelength: 660 nm, IEC 60825-1:2014)		
Optical method	Diffuse reflection		
Laser class	Class I (IEC/EN), Class I (FDA (CDRH) CFR Part 1002)	Class 2 (IEC/EN), Class II (FDA (CDRH) CFR Part 1002)	
Output	≤ 300 μW	≤ 1 mW	
Operation Indicator	Power Indicator (red), Laser emission indicator (green), NEAR/FAR indicator (green)		
Connection	Connector type		
Protection structure	IP67 (IEC Standards, except connector of extension cable)		
Material	Case: Polycarbonate, Sensing part: Glass, Cable: Polyvinyl chloride		
Amplifier unit compatibility	BD Series amplifier unit: 1		
Accessory	Ferrite core (made by TDK co. ZCAT2132-1130), Mounting bracket, Bolt, Nut		
Approval	CE UK RoHS REACH		
Unit weight (packaged)	≈ 56 g (≈ 209 g)	≈ 68 g (≈ 233 g)	≈ 68 g (≈ 233 g)

01) When measuring fixed non-glossy white paper (reference temperature: 25°C, reference distance, response time: 1ms, 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.

Amplifier unit	
Model	BD-A1
Power supply	10 - 30 VDC≐ ±10% (when connecting BD-C Series communication converter, 12-30 VDC≐)
Power consumption ⁰¹⁾	≤ 2,800 mW (30 VDC≐)
Control Input ⁰²⁾	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: ≤ 100 mA)
Alarm output	NPN or PNP open collector output (load current: ≤ 100 mA)
Analog voltage output ⁰³⁾	-5 -5 V, 0 -5 V, 1 -5 V (resistance: 100 Ω, ± 0.05% F.S., at 10 V)
Analog current output ⁰³⁾	4 - 20 mA (load resistance: ≤ 350 Ω, ± 0.2% F.S., at 16 mA)
Residual voltage	NPN: ≤ 1.5 V, PNP: ≤ 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 μm
Display type	11 segment (red, green), 6-digit, LED
Display range ⁰⁴⁾	±99.999 mm to ±99 mm (4-step adjustment, parameter)
Display period	≈ 100 ms
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 UK RoHS REACH
Unit weight (packaged)	≈ 126 g (≈ 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.

Communication Converter for Laser Displacement Sensors **BD-C Series**

Model	BD-CRS
Power supply ⁰¹⁾	-
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)
Protection structure	IP40 (IEC standard)
Material	Case: PC
Accessory	Side connector, Connector for RS485
Sold separately	Communication converter: SCM Series
Approval	CE UK RoHS REACH
Unit weight (packaged)	≈ 49 g (≈ 91 g)

01) 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.



Proximity Sensors **PRD Series (IO-Link)**

Installation	Flush type			Non-flush type		
	PRD□12-4D-□-IL2	PRD□18-7D-□-IL2	PRD□30-15D-□-IL2	PRD□12-8D-□-IL2	PRD□18-14D-□-IL2	PRD□30-25D-□-IL2
Model						
DIA. of sensing side	Ø 12 mm	Ø 18 mm	Ø 30 mm	Ø 12 mm	Ø 18 mm	Ø 30 mm
Sensing distance	4 mm	7 mm	15 mm	8 mm	14 mm	25 mm
Setting distance	0 to 2.8 mm	0 to 4.9 mm	0 to 10.5 mm	8 mm	14 mm	25 mm
Hysteresis	≤ 10 % of sensing distance					
Standard sensing target: iron	12 × 12 × 1 mm	20 × 20 × 1 mm	45 × 45 × 1 mm	25 × 25 × 1 mm	40 × 40 × 1 mm	75 × 75 × 1 mm
Response frequency ⁰¹⁾	500 Hz	250 Hz	100 Hz	400 Hz	200 Hz	100 Hz
Affection by temperature	≤ ± 10 % for sensing distance at ambient temperature 20 °C					
Indicator ⁰²⁾	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 UK RoHS REACH 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.



Power supply	12 - 24 VDC≐ (ripple P-P: ≤ 10 %), operating voltage: 10 - 30 VDC≐
Current consumption	IO-Link mode: ≤ 25 mA, SIO mode: ≤ 20 mA
Control output	≤ 100 mA
Residual voltage ⁰¹⁾	≤ 2 V
Protection circuit	Surge protection circuit, output short over current protection circuit, reverse polarity protection
Protection rating	IP67 (IEC standard)
Connection	Cable / Cable connector / connector models
Cable spec. ⁰²⁾	DIA. of sensing side Ø 12 mm: Ø 4 mm, 4-wire DIA. of sensing side Ø 18 mm, Ø 30 mm : Ø 5 mm, 4-wire
Wire spec.	AWG 22 (0.08 mm, 60-core), insulator diameter: Ø 1.25 mm
Connector spec.	M12 plug connector
Material	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

01) Load current: 100 mA, cable length: 2 m
02) Cable type: 2 m, Cable connector type: 300 mm

Communication Interface

IO-Link	
Version	Ver. 1.1
Class	Class A
Baud rate	COM 2 (38.4 kbps)
Min. cycle time	2.3 ms
Data length	PD: 2 byte, OD: 1 byte (M-sequence: TYPE_2_2)
Vendor ID	899 (0x383)

※ The specifications on this guide may be changed

Remote I/O System **ADIO Series**

Electrical/Mechanical specifications	
Supply voltage	18 - 30 VDC≐
Rated voltage	24 VDC≐
Current consumption	2.4 W (≦ 216 W)
Supplying current per port	≦ 2 A/Port
Sensor current (US)	≦ 9 A
Dimensions	W 66 × H 215 × D 38 mm
Material	Zinc Die casting
Ethernet port	M12 (Socket-Female), 4-pin, D-coded, Push-Pull Number of ports: 2 (IN/OUT) Supported function: daisy chain
Power supply port	Input: 7/8" (Plug-Male), 5-pin Output: 7/8" (Socket-Female), 5-pin Number of ports: 2 (IN/OUT) Supported function: daisy chain
PDCT port	M12 (Socket-Female), 5-pin, A-coded, Push-Pull Number of ports: 1 Connection method: USB serial communication
I/O port	M12 (Socket-Female), 5-pin, A-coded, Push-Pull Number of ports: 8
Mounting method	Mounting hole: fixed with M4 screw
Grounding method	Grounding hole: fixed with M4 screw
Unit weight (packaged)	≈ 700 g (≈ 900 g)



Mode specifications	
Mode	Digital Input
Number of channels	16-CH (I/Q: 8-CH, C/Q:8-CH)
I/O common	NPN / PNP
Input current	5 mA
ON voltage/current	Voltage: ≧ 15 VDC≐ Current: ≧ 5 mA
OFF voltage	≦ 5 VDC≐

Mode	Digital Output
Number of channels	8-CH (C/Q)
I/O common	NPN / PNP
Power supply	24 VDC≐ (18 - 30 VDC≐), Max. 300 mA
Leakage current	≦ 0.1 mA
Residual voltage	≦ 1.5 VDC≐
Short circuit protection	YES

Mode	IO-Link
Input current	2 mA
ON voltage/current	Voltage: ≧ 15 VDC≐ Current: ≧ 2 mA
OFF voltage	≦ 5 VDC≐

Protection rating	IP67 (IEC standard), IP69K (DIN standard)
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Approvals	
Approval	CE UK ENEC IEC
Association approval	IO-Link EtherCAT EtherNet/IP PROFINET

Communication Interface

Ethernet	
Ethernet standard	100BASE-TX
Cable spec.	STP (Shielded Twisted Pair) Ethernet cable over Cat 5
Transmission rate	100 Mbps
Cable length	≦ 100 m
Protocol	EtherCAT




EtherNet/IP	
Ethernet standard	100BASE-TX
Cable spec.	STP (Shielded Twisted Pair) Ethernet cable over Cat 5
Transmission rate	10 / 100 Mbps
Cable length	≦ 100 m
Protocol	EtherNet/IP
Address settings	Rotary switches, DHCP, BOOTP, atIOLink
Factory settings	• IP Address: 192.168.2.3 • Subnet Mask: 255.255.255.0 • Gateway Address: 192.168.2.1
EDS file	Download the EDS file at the Autonics website.

PROFINET	
Ethernet standard	100BASE-TX
Cable spec.	STP (Shielded Twisted Pair) Ethernet cable over Cat 5
Transmission rate	100 Mbps
Cable length	≦ 100 m
Protocol	PROFINET
Address settings	Rotary switches, DCP, atIOLink
GSDML file	Download the GSDML file at the Autonics website.

IO-Link	
Version	1.1
Transmission rate	COM1 : 4.8 kbps / COM2 : 38.4 kbps / COM3 : 230.4 kbps
Port class	Class A
Standard	IO-Link Interface and System Specification Version 1.1.2 IO-Link Test Specification Version 1.1.2

※ The specifications on this guide may be changed

Power Controllers **SPRM Series**

Model	SPRM3-F□R		SPRM3-F□EC
Control phases	Single phase 3 Ch or 3-phase		
Rated load voltage	Free voltage 220 - 440 VAC ~ 50 / 60 Hz		
Rated load current ⁰¹⁾	25 / 40 / 55 / 70 / 90 / 110 / 160 A		
Display method	5 digit 11 segment LCD (white) × 4, Output BAR		
Auto control input	Current ⁰²⁾ : DC 4 - 20 mA × 3 Ch, voltage: 0 - 5 / 1 - 5 / 0 - 10 VDC≐, External adjuster (10 kΩ), communication: RS485, EtherCAT		
Manual control input	Parameter setting		
Digital input (DI)	RUN / STOP selectable, AUTO / MANU selectable, RESET		
Alarm output	250 VAC ~ 2 A, 30 VDC≐ 2 A, 1c resistance load		
Comm. output	RS485	RS485, EtherCAT	
Cooling method	Rated load current 25 / 40 / 55 A: natural cooling Rated load current 70 / 90 / 110 / 160 A: forced air cooling (with cooling fan)		
Unit weight (packaged)	Rated load current 25 / 40 / 55 A: ≈ 4.75 kg (≈ 5.75 kg) Rated load current 70 A: ≈ 4.8 kg (≈ 5.8 kg) Rated load current 90 / 110 / 160 A: ≈ 9.42 kg (≈ 10.55 kg)		
Approval	CE   		
SCCR Rating	100 kA (UL certification)		

01) It is the rated load current of each channel in single-phase operation.
02) Input impedance = 100 Ω




Control method	Phase control	Cycle control
Control mode	Normal / Constant current feedback / Constant voltage feedback / Constant power feedback	Fixed cycle / Variable cycle
Applied load	Resistance load, inductive load	Resistance load
Output range	Resistance load: 0 to 98 % Inductive load: 5 to 98 %	0 to 100 %
Output accuracy	Varies by control mode	
Normal	Within ± 10 % F.S. of rated load voltage	-
Constant current / voltage / power feedback	Within ± 3 % F.S. of rated load current / voltage / power	-

Power supply	24 VDC≐ ± 10 %
Min. load current	1 A
Power consumption	≤ 15 W
Insulation resistance	≥ 200 MΩ (500 VDC≐ megger)




Communication Interface

RS485	
Comm. protocol	Modbus RTU (16 bit CRC), Modbus ASCII
Application standard	Compliance with EIA RS485
Max. connection	31-unit (address: 1 to 99)
Comm. synchronous method	Asynchronous
Comm. method	2-wire half duplex
Comm. distance	≤ 800 m
Comm. speed	2,400 / 4,800 / 9,600 (default) / 14,400 / 19,200 / 38,400 / 57,600 / 115,200 bps
Comm. response time	0 to 9999 ms (default: 0 ms)
Start bit	-
Data bit	8 bit (fixed)
Parity bit	None (default), Even, Odd
Stop bit	1 bit (default), 2 bit
EEPROM life cycle	≈ 50,000 operations (Erase / Write)

EtherCAT	
Comm. specifications	EtherCAT
Association approval ⁰¹⁾	EtherCAT 
Connection cable	CAT5e class or over (Shield type: SF/FTP, S/FTP, SF/UTP)
Max. comm. distance	Within 100 m distance between nodes
Max. baud rate	10 / 100 Mbps
Topology	Star, Line, Tree

01) EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Graphic Panels **GP-A Series**




	GP-A046	GP-A057	GP-A070	GP-A104
Screen size	4.6 inch	5.7 inch	7.0 inch	10.4 inch
LCD type	TFT Color LCD			
Resolution	800×320 pixel	640×480 pixel	800×480 pixel	800×600 pixel
Display area	108×43.2 mm	115.2×86.4 mm	154.4×93.44 mm	211.2×158.4 mm
Display color	16,777,216 color	262,144 color	16,777,216 color	16,777,216 color
LCD view angle (top/bottom/left/right)	Within 75°/70°/80°/80° of each	Within 70°/70°/80°/80° of each	Within 50°/60°/65°/65° of each	Within 60°/70°/80°/70° of each
Backlight	White LED			
Luminance adjustment	Adjustable by software			
Touch	Resistive type (4-wire)			
Approval	CE   			
Unit weight (packaged)	≈ 272 g (≈ 382 g)	≈ 489 g (≈ 644 g)	≈ 520 g (≈ 706 g)	≈ 1.07 kg (≈ 1.62 kg)

Serial interface	RS232C, RS422
USB interface	USB Host, USB Device (USB2.0)
Ethernet interface	IEEE802.3(U), 10/100Base-T
CAN interface	24V CAN transceiver
External storage	Micro SD up to 32GB (FAT16/32)
Real-time controller	RTC embedded
Battery life cycle	3 years at 25°C

Supportive interface can be different up to model. For the detailed information, please refer to 'Ordering Information'.



Logic Panels **LP-A Series**

	LP-A070-T9D□-C5□	LP-A104-T9D□-C6□
Screen size	7.0 inch	10.4 inch
LCD type	TFT Color LCD	
Resolution	800×480 pixel	800×600 pixel
Display area	154.4×93.44 mm	211.2×158.4 mm
Display color	16,777,216 color	
LCD view angle (top/bottom/left/right)	Within 50°/60°/65°/65° of each	Within 60°/70°/80°/70° of each
Backlight	White LED	
Luminance adjustment	Adjustable by software	
Touch	Resistive type (4-wire)	
Input	16-point	32-point
Insulation method	Photo coupler insulation	
Rated input voltage	24 VDC≐	
Rated input current	X0 to X8: ≈ 10 mA, X9 to XF: ≈ 4 mA	X0 to X8: ≈ 10 mA, X9 to X1F: ≈ 4 mA
Voltage range	19.2-28.8 VDC≐	
Input resistance	X0 to X8: 3.3 kΩ, X9 to XF: 5.6 kΩ	X0 to X8: 3.3 kΩ, X9 to X1F: 5.6 kΩ
Response time	0.5 ms	
Common method	16-point/1COM	16-point/1COM, 16-point/1COM
Applicable wire	Stranded wire 0.3 to 0.7 mm²	
Output	16-point	32-point
Power supply	24 VDC≐	
Insulation method	Photo coupler insulation	
Rated load voltage	24 VDC≐	
Load voltage range	19.2-28.8 VDC≐	
Max. load current	0.1 A/1-point, 1.6 A/1COM	
Max. voltage falling when ON	≤ 0.2 VDC≐	
Common method	16-point/1COM	16-point/1COM, 16-point/1COM
Applicable wire	Stranded wire 0.3 to 0.7 mm²	
Approval	CE   	
Unit weight (package)	≈ 540 g (≈ 742 g)	≈ 1.10 kg (≈ 1.66 kg)

Serial interface	RS232C, RS422
USB interface	USB Host, USB Device (USB2.0)
Ethernet interface	IEEE802.3(U), 10/100Base-T
CAN interface	24V CAN transceiver
External storage	Micro SD up to 32 GB (FAT16/32)
Real-time controller	RTC embedded
Battery life cycle	3 years at 25°C

Supportive interface can be different up to model. Please refer to 'Ordering Information' for the supportive interface per model and 'LP-A Series user manual' and 'GP/LP user manual for communication' for the detailed information about each interface.



※ The specifications on this guide may be changed

Temperature Controllers **TN Series**

Model		TNS	TNH	TNL
Size		DIN W48 X H48 mm	DIN W48 X H96 mm	DIN W96 X H48 mm
Power supply		100 - 240 VAC~, 50/60 Hz ±10%		
Permissible voltage range		90 to 110 % of rated voltage		
Power consumption		≤ 8 VA		
Display type		11 segment, LCD type (operating value display part: 7 segment)		
Sampling period		50 / 100 / 250 ms (parameter)		
Input specification		Refer to 'Input Type and Using Range'		
Option input	CT	• 0.0-50.0 A (primary current measurement range) • CT ratio: 1/1,000 • Measurement accuracy: ±5% F.S. ±1digit		
	Digital	• Contact - ON: ≤ 2 kΩ, OFF: ≥ 90 kΩ • Non contact - residual voltage ≤ 1.0 V, leakage current ≤ 0.1 mA • Outflow current: ≈ 0.5 mA per input		
Control output	Relay	250 VAC~ 3A 1a		
	SSR	12 VDC≡ ±2 V, ≤ 20 mA		
Option output	Current	DC 0 - 20 mA or DC 4 - 20 mA (parameter), Load resistance: ≤ 500 Ω		
	Alarm	250 VAC~ 3 A 1a		
	Transmission	DC 4 - 20 mA (load resistance: ≤ 500 Ω, output accuracy: ±0.3% F.S.)		
Control type	Communication	RS485		
	Type	ON/OFF, P, PI, PD, PID		
	Multi SV	≤ 4 SV		
	Group PID	≤ 8 group		
	Zone PID	4 zones		
	ARW (Anti Reset Windup)	50 to 200 %		
Program control	Program	≤ 10 patterns		
	Step	≤ 200 steps (1 pattern: ≤ 20 steps)		
	Setting type	Time setting		
Hysteresis		• Thermocouple, RTD: 1 to 100 (0.1 to 100.0) °C/°F • Analog: 1 to 100 digit		
Proportional band (P)		0.1 to 999.9 °C (0.1 to 999.9%)		
Integral time (I)		0 to 9,999 sec		
Derivative time (D)		0 to 9,999 sec		
Control cycle (T)		• Relay / SSRP output: 0.1 to 120.0 sec • Selectable current or SSR drive output: 1.0 to 120.0 sec		
Manual reset		0.0 to 100.0%		
Protection structure		IP65 (Front panel, IEC standards)		
Loader port		• TNS: top side	• TNH, TNL: front side	
Unit weight (packaged)		• TNS: 128 g	• TNH: 184 g	• TNL: 301 g
Approval		CE, RoHS, REACH		





Closed Loop Stepper Motor System **AiC-EC Series**

Driver			
Model	-	AiC-D-28SB-EC	AiC-D-35SB-EC
	AiC-D-20MA-EC	AiC-D-28MB-EC	AiC-D-35MB-EC
AiC-D-20LA-EC		AiC-D-28LB-EC	AiC-D-35LB-EC
Power supply		24 VDC≡	
Permissible voltage range		90 to 110% of rated voltage	
Max. RUN power		≤ 60 W	
Stop power ⁰¹⁾		≤ 10 W	
Max. RUN current ⁰²⁾		0.6 A / Phase	1.0 A / Phase
Stop current		20 to 100% of max. RUN current	
Resolution		500, 1000, 1600, 2000, 3600, 4000, 5000, 6400, 7200, 10000 PPR	500, 1000, 1600, 2000, 3600, 5000, 6400, 7200, 10000, 16000 PPR



Model	AiC-D-42SA-□-EC	AiC-D-56SA-□-EC	AiC-D-60SA-□-EC
	AiC-D-42MA-□-EC	AiC-D-56MA-□-EC	AiC-D-60MA-□-EC
AiC-D-42LA-□-EC		AiC-D-56LA-□-EC	AiC-D-60LA-□-EC
Power supply		24 VDC≡	
Permissible voltage range		90 to 110% of rated voltage	
Max. RUN power		≤ 60 W	≤ 120 W
Stop power ⁰¹⁾		≤ 10 W	≤ 12 W
Max. RUN current ⁰²⁾		1.7 A / Phase	3.5 A / Phase
Stop current		20 to 100% of max. RUN current	
Resolution		500, 1000, 1600, 2000, 3200, 3600, 5000, 6400, 7200, 10000 PPR	

01) Based on ambient temp. 25°C, ambient humi. 55%RH, Stop current 50%
02) When changing the load rapidly, instantaneous peak current may increase. The capacity of power supply should be over 1.5 to 2 times of max. power consumption.

Run method	2-phase bipolar closed-loop control method
Speed filter	Disable, 2, 4, 6, 8, 10, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200 ms
Control Gain	0 (factory default) to 15, (15: Fine Gain)
Max. rotation speed	3,000 rpm
In-Position	Fast Response: 0 (factory default) to 7, Accurate Response: 0 to 7
Operation mode	CSP, CSV, PP, PV, HM
Home search	Homing on the negative limit switch and index pulse
	Homing on the positive limit switch and index pulse
	Homing on the home switch and index pulse (Positive)
	Homing on the home switch and index pulse (Negative)
	Homing without an index pulse (negative limit switch)
	Homing without an index pulse (positive limit switch)
	Homing without an index pulse (Positive and Home sensor ON)
	Homing without an index pulse (Negative and Home sensor ON)
	Homing on the index pulse (Negative)
	Homing on the index pulse (Positive)
	Set the Origin with Home offset
	Set the Origin and Reset Current Position
Torque Homing Search- with Home offset	
Torque Homing Search+ with Home offset	
Input	Exclusive input: 7, General input: 5
Output	Exclusive output: 2, General output: 4
External power supply	VEX (Default: 24 VDC ≡), GEX (GND)
Insulation resistance	≥ 100 MΩ (500 VDC ≡ megger)
Protection rating	IP20 (IEC standard)
Approval	CE  
Unit weight (packaged)	≈ 350 g (≈ 500 g)

Communication Interface

Ethernet	
Comm. specifications	EtherCAT
Association approval ⁽⁰¹⁾	EtherCAT [®]
Connection cable	CAT5e class or over (Shield type: SF/FTP, S/FTP, SF/UTP)
Max. comm. distance	Within 100 m distance between nodes
Baud rate	10 / 100 Mbps
Max. ID settings ⁽⁰²⁾	99
Topology	Star, Line, Tree

01) EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.
02) Max. connectable ID from Master is 1 to 65,535.

• 1 character of ModBus RTU is fixed at 11 bit.

※ The specifications on this guide may be changed

Motor

Model	Ai-M-20MA	Ai-M-20LA
Max. stop torque	0.018 N m	0.035 N m
Rotor inertia moment	2×10 ⁻⁷ kg · m ²	
Rated current	0.6 A / Phase	
Basic step angle	1.8° / 0.9° (Full / Half step)	
Resistance	6.6 Ω / Phase ±10%	10.5 Ω / Phase ±10%
Inductance	2.1 mH / Phase ±20%	4.0 mH / Phase ±20%
Unit weight (packaged)	≈ 0.092kg (≈ 0.192kg)	≈ 0.120kg (≈ 0.219kg)

Model	Ai-M-28SB	Ai-M-28MB	Ai-M-28LB
Max. stop torque	0.05 N m	0.14 N m	0.16 N m
Rotor inertia moment	9×10 ⁻⁷ kg · m ²	12×10 ⁻⁷ kg · m ²	18×10 ⁻⁷ kg · m ²
Rated current	1.0 A / Phase		
Basic step angle	1.8° / 0.9° (Full / Half step)		
Resistance	5.78 Ω / Phase ±10%	8.8 Ω / Phase ±10%	10.1 Ω / Phase ±10%
Inductance	3.2 mH / Phase ±20%	6.0 mH / Phase ±20%	6.2 mH / Phase ±20%
Unit weight (packaged)	≈ 0.162 kg (≈ 0.260 kg)	≈ 0.222 kg (≈ 0.318 kg)	≈ 0.248 kg (≈ 0.342 kg)

Model	Ai-M-35SB	Ai-M-35MB	Ai-M-35LB
Max. stop torque	0.07 N m	0.13 N m	0.31 N m
Rotor inertia moment	8×10 ⁻⁷ kg · m ²	14×10 ⁻⁷ kg · m ²	22×10 ⁻⁷ kg · m ²
Rated current	1.2 A / Phase		
Basic step angle	1.8° / 0.9° (Full / Half step)		
Resistance	2.1 Ω / Phase ±10%	3.25 Ω / Phase ±10%	5.0 Ω / Phase ±10%
Inductance	1.25 mH / Phase ±20%	2.85 mH / Phase ±20%	5.6 mH / Phase ±20%
Unit weight (packaged)	≈ 0.180 kg (≈ 0.278 kg)	≈ 0.250 kg (≈ 0.347 kg)	≈ 0.366 kg (≈ 0.456 kg)

Model	Ai-M-42SA-□	Ai-M-42MA-□	Ai-M-42LA-□
Max. stop torque	0.25 N m	0.4 N m	0.48 N m
Rotor inertia moment	35×10 ⁻⁷ kg · m ²	54×10 ⁻⁷ kg · m ²	77×10 ⁻⁷ kg · m ²
Rated current	1.7 A / Phase		
Basic step angle	1.8° / 0.9° (Full / Half step)		
Resistance	1.7 Ω / Phase ±10%	1.85 Ω / Phase ±10%	2.1 Ω / Phase ±10%
Inductance	1.9 mH / Phase ±20%	3.5 mH / Phase ±20%	4.4 mH / Phase ±20%
Unit weight (packaged) ⁰¹⁾	≈ 0.34 kg (≈ 0.45 kg) ≈ 0.67 kg (≈ 0.77 kg)	≈ 0.41 kg (≈ 0.52 kg) ≈ 0.73 kg (≈ 0.83 kg)	≈ 0.48 kg (≈ 0.59 kg) ≈ 0.80 kg (≈ 0.90 kg)

Model	Ai-M-56SA-□	Ai-M-56MA-□	Ai-M-56LA-□
Max. stop torque	0.6 N m	1.2 N m	2.0 N m
Rotor inertia moment	140×10 ⁻⁷ kg · m ²	280×10 ⁻⁷ kg · m ²	480×10 ⁻⁷ kg · m ²
Rated current	3.5 A / Phase		
Basic step angle	1.8° / 0.9° (Full / Half step)		
Resistance	0.55 Ω / Phase ±10%	0.57 Ω / Phase ±10%	0.93 Ω / Phase ±10%
Inductance	1.05 mH / Phase ±20%	1.8 mH / Phase ±20%	3.7 mH / Phase ±20%
Unit weight (packaged) ⁰¹⁾	≈ 0.62 kg (≈ 0.76 kg) ≈ 1.15 kg (≈ 1.30 kg)	≈ 0.85 kg (≈ 0.99 kg) ≈ 1.38 kg (≈ 1.52 kg)	≈ 1.22 kg (≈ 1.36 kg) ≈ 1.75 kg (≈ 1.90 kg)

Model	Ai-M-60SA-□	Ai-M-60MA-□	Ai-M-60LA-□
Max. stop torque	1.1 N m	2.2 N m	2.9 N m
Rotor inertia moment	240×10 ⁻⁷ kg · m ²	490×10 ⁻⁷ kg · m ²	690×10 ⁻⁷ kg · m ²
Rated current	3.5 A / Phase		
Basic step angle	1.8° / 0.9° (Full / Half step)		
Resistance	1.0 Ω / Phase ±10%	1.23 Ω / Phase ±10%	1.3 Ω / Phase ±10%
Inductance	1.5 mH / Phase ±20%	2.6 mH / Phase ±20%	3.8 mH / Phase ±20%
Unit weight (packaged)	≈ 0.75 kg (≈ 0.89 kg) ≈ 1.36 kg (≈ 1.53 kg)	≈ 1.13 kg (≈ 1.27 kg) ≈ 1.74 kg (≈ 1.90 kg)	≈ 1.44 kg (≈ 1.58 kg) ≈ 2.07 kg (≈ 2.23 kg)

01) Listed in order of Standard type
Built-in brake type

Common Specifications

Motor phase	2-phase
Run method	Bipolar
Insulation class	B type (130 °C)
Insulation resistance	Between Motor coil - Case: ≥ 100 MΩ (500 VDC≡ megger)
Protection rating	IP30 (IEC34-5 Specifications)
Approval	CE UK ENEC

Encoder

Encoder type	Incremental rotary encoder		
Frame size	□ 20 mm	□ 28 mm / □ 35 mm	□ 42 mm / □ 56 mm / □ 60 mm
Power supply	5 VDC≡ ± 5% (ripple P-P: ≤ 5%)		
Current consumption	≤ 50 mA (No load)		
Resolution	4,000 PPR (1,000 PPR × 4)	16,000 PPR (4,000 PPR × 4)	10,000 PPR (2,500 PPR × 4)
Control output	Line driver output		
Output phase	A, \bar{A} , B, \bar{B} , Z, \bar{Z}		
Output waveform	Output Duty rate: $\frac{T}{2} \pm \frac{T}{3}$, A-B phase difference: $\frac{T}{4} \pm \frac{T}{4}$ (T = 1 cycle of A)		Output Duty rate: $\frac{T}{2} \pm \frac{T}{4}$, A-B phase difference: $\frac{T}{4} \pm \frac{T}{8}$ (T = 1 cycle of A)
Inflow current	≤ 20 mA		
Residual voltage	≤ 0.5 VDC≡		
Outflow current	≤ -20 mA		
Output voltage	≥ 2.5 VDC≡		
Response speed ⁰¹⁾	≤ 1.5 μs	≤ 1 μs	≤ 0.5 μs
Max. response frequency	200 kHz	1,000 kHz	300 kHz

01) Cable length: 2 m, I sink = 20 mA

Brake

Frame size	<input type="checkbox"/> 42 mm	<input type="checkbox"/> 56 mm	<input type="checkbox"/> 60 mm
Rated excitation voltage 01)	24 VDC≡ ±10%		
Rated excitation current	0.208 A	0.275 A	
Static friction torque	≥ 0.18 N m	≥ 0.8 N m	
Rotation part inertia moment	6×10 ⁻⁷ kg · m ²	19×10 ⁻⁷ kg · m ²	
Insulation class	B type (130 °C)		
B type brake	Brake is released when power ON, brake is locked when power OFF		
Operating time	≤ 25 ms	≤ 30 ms	
Releasing time	≤ 10 ms	≤ 20 ms	

01) In order to reduce the heat generation of the built-in brake, the voltage drops from 24 VDC≡ to 11.5 VDC≡ to control



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* The dimensions or specifications on this product guide may change and some models may be discontinued without notice.

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