

SAFETY SIMPLIFIED TO THE MAX

Making safety transparent and understandable

In order to implement safety controls, it is essential to begin taking safety into consideration at the design stage. We offer safety systems that incorporate the latest sensing and control technologies combined with safety design, consulting services to ensure optimum machine and equipment safety and secure a safe production environment.



Understand safety in minutes and ask for your own free safety guide at:
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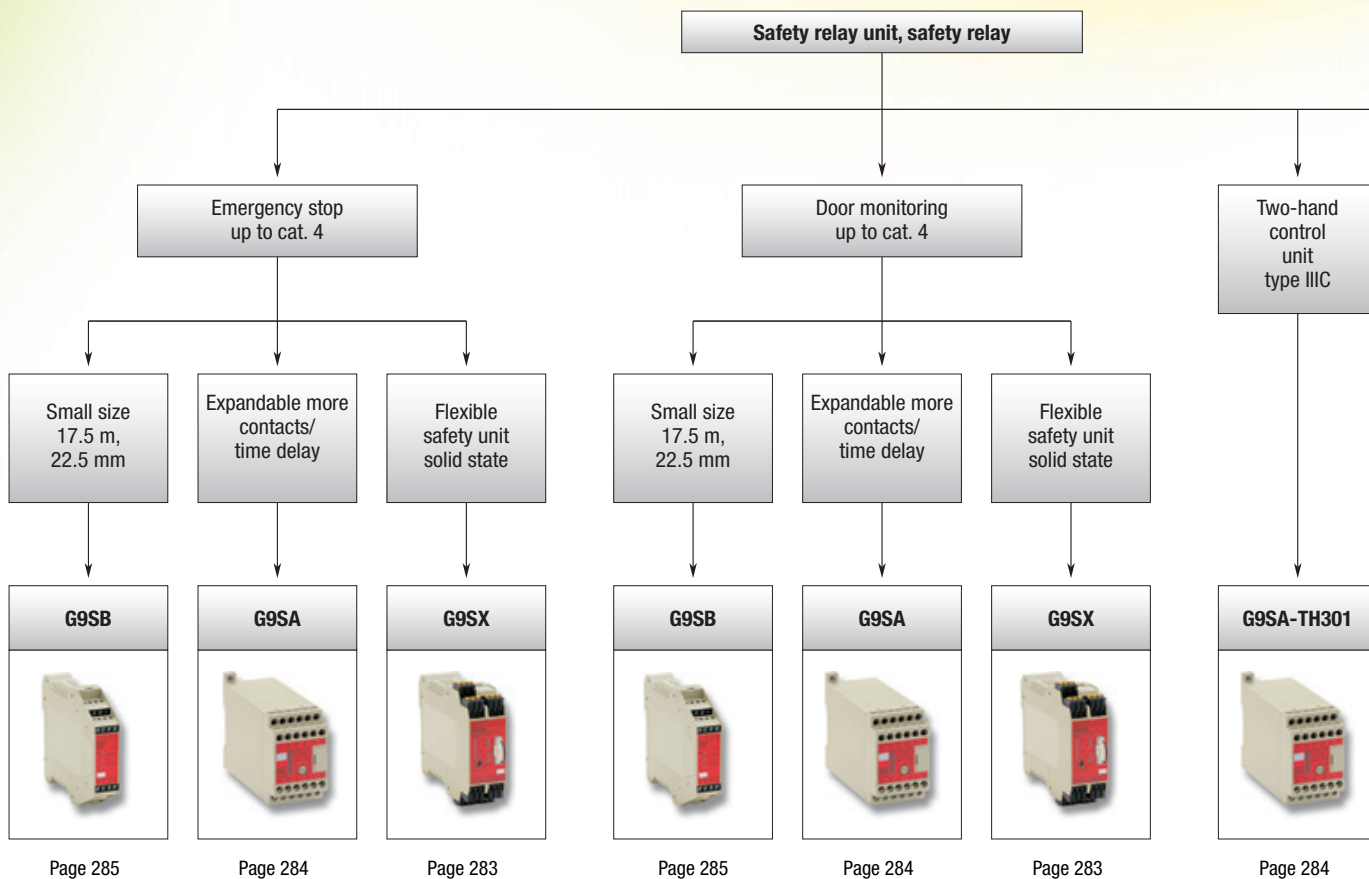
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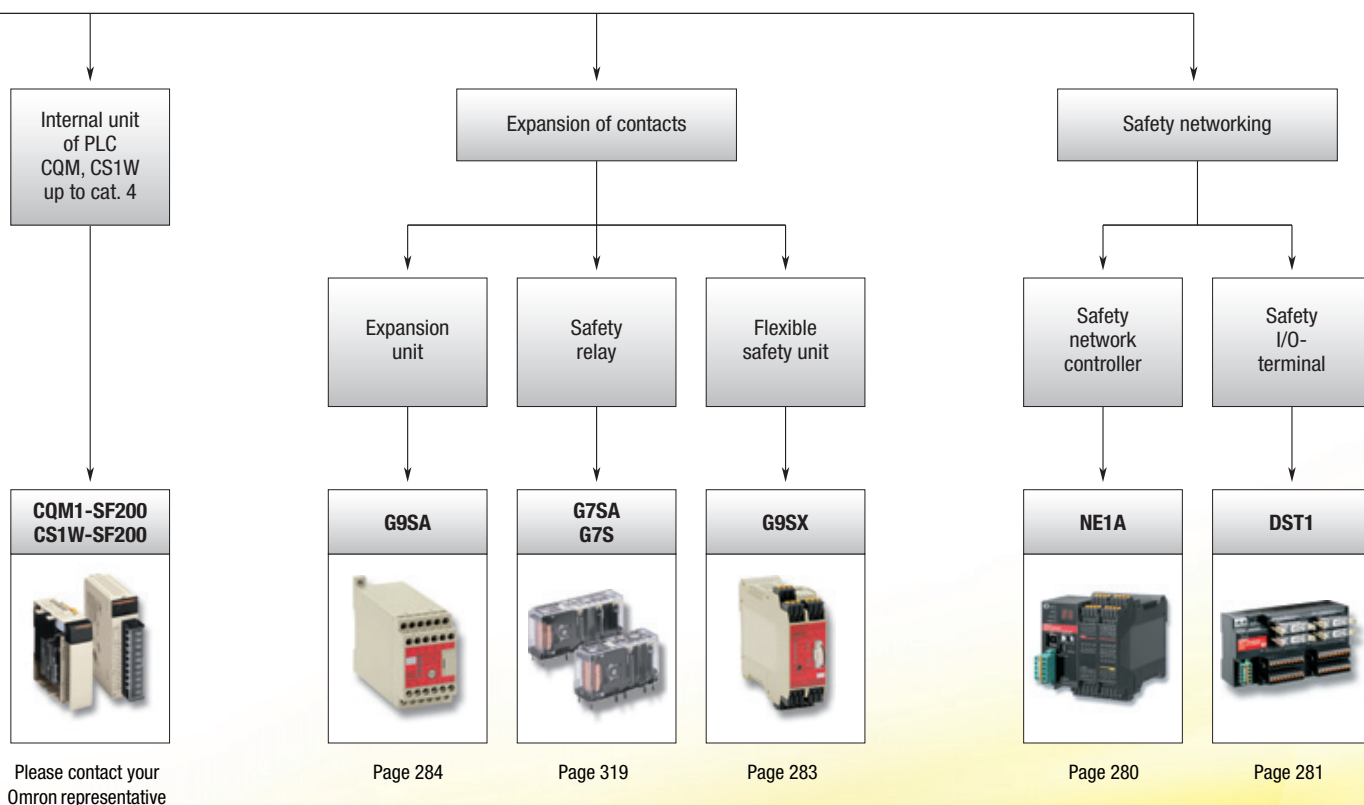
BREAK OLD BARRIERS IN SAFETY DESIGN

Our offer: Best-in-class expertise in safety and fieldbuses combined






The safety network controller is the heart of a DeviceNet safety network system. The safety network controller hosts the safety application program, monitors the safety inputs and controls the safety outputs. Either use it as a stand-alone controller or embedded in a DeviceNet network.

- IEC61508 (SIL3) and EN954-1/ISO13849-1 (Cat. 4) certification
- A maximum of 254 function blocks enables easily building safety circuits
- Equipped with DeviceNet slave function
- Monitoring can be done from a DeviceNet master







		Safety bus system		Flexible safety unit	Safety relay units	
						
Selection criteria	Model	NE1A	DST1-ID/-MD/-MRD	G9SX	G9SA	G9SB
	Safety category (EN 954-1)	up to Category 4		up to Category 4		
	Safety integrity level (IEC 61508)	SIL 3		SIL 3		
	Reaction time	dependent on safety application program		15 ms	max. 10 ms	
	DeviceNet safety Bus interface	■	■	—	—	—
	EDM function	■	■	■	■	■
	Interlock function	■	■	■	■	■
	Logical 'AND' connection	—	—	■	—	—
Features	Relay expansion units	—	—	■	■	—
	Detachable cage clamp terminals	■	■	■	—	—
	Detachable screw terminals	—	—	■	—	—
	Safe timing functions	■	■	■	■	—
	USB-interface	■	—	—	—	—
Application	Programming software	■	—	—	—	—
	E-Stop application	■	■	■	■	■
	Door switch monitoring	■	■	■	■	■
	Safety light curtain monitoring	■	■	■	■	■
	EDM monitoring	■	■	■	■	■
	Interlock function	■	■	■	■	■
	Logic function blocks	■	—	—	—	—
	Safe ON delay timer	■	■	—	—	—
	Safe OFF delay timer	■	■	■	■	—
	Two-Hand control	■	■	—	■	—
Supply voltage	Manual/automatic reset	■	■	■	■	■
	24 VDC	■	■	■	■	■
In- and outputs	100 VAC to 240 VAC	—	—	—	■	—
	Safety inputs	■	■	■	■	■
	Test signal output	■	■	■	—	—
	Solid state safety outputs	■	■	■	—	—
	Safety relay outputs	—	■	■	3PST-NO, 5PST-NO	DPST-NO, 3PST-NO
	Auxiliary outputs	■	■	■	SPST-NC	SPST-NC
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■ Standard

— No/not available



Safety network controller NE1A

The NE1A hosts the safety application program. All local and DeviceNet safety-based in- and outputs are monitored and controlled by the NE1A. It manages up to 16 DeviceNet safety slaves and can be seamlessly integrated in a standard DeviceNet system.

- Removable cage-clamp terminals for easy installation
- Predefined and certified function blocks for easy programming
- LED display and status LEDs for advanced diagnostics
- System status on DeviceNet for easy troubleshooting and predictive maintenance
- Easy scalability through the addition of DeviceNet safety devices

Ordering information

Appearance	Appearance description	Order code
Safety network controller	16 PNP inputs 8 PNP outputs 4 test outputs 128 function block programming removable cage clamp terminals	NE1A-SCPU01

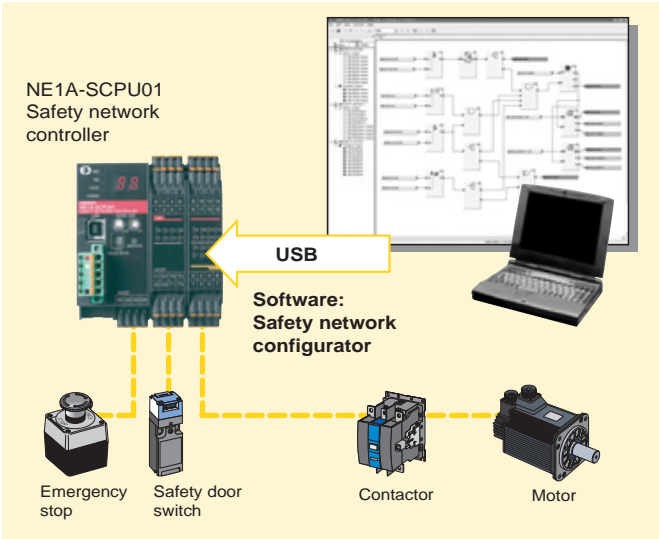
Software

Appearance	Appearance description	Order code
Safety network configurator	Installation disk (CD-ROM) IBM PC/AT compatible Windows 2000 or XP (English version)	WS02-CFSC1-E

Note: For further information please refer to chapter software.

Stand-alone programmable controller
Programmable safety circuits

Using DeviceNet safety offers benefits far before the need for a safety network is obvious. The safety network controller uses predefined logical function blocks to set up the programmable safety system. Modifications of the safety system in the life cycle of a machine are done without tedious wiring.



Specifications

General specifications

DeviceNet communications power supply voltage		11 to 25 VDC (supplied from communications connector)
Unit power supply voltage		20.4 to 26.4 VDC (24 VDC -15% +10%)
I/O power supply voltage		
Consumption current	Communications power supply	24 VDC, 15 mA
	Internal circuit power supply	24 VDC, 230 mA
Mounting method		35-mm DIN track
Ambient operating temperature		-10°C +55°C
Ambient storage temperature		-40°C +70°C
Degree of protection		IP20 (IEC 60529)

Safety input specifications

Input type	Sinking inputs (PNP)
ON voltage	11 VDC min. between each input terminal and G1
OFF voltage	5 VDC max. between each input terminal and G1
OFF current	1 mA max.
Input current	4.5 mA

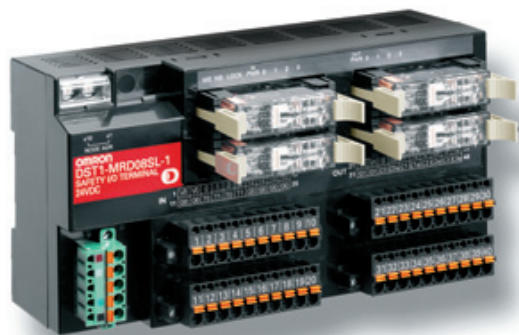
Safety output specifications

Output type	Sourcing outputs (PNP)
Rated output current	0.5 A max. per output
Residual voltage	1.2 V max. between each output terminal and V2

Test output specifications

Output type	Sourcing outputs (PNP)
Rated output current	0.7 A max. per output (see note.)
Residual voltage	1.2 V max. between each output terminal and V1

DeviceNet safety I/O terminal block family

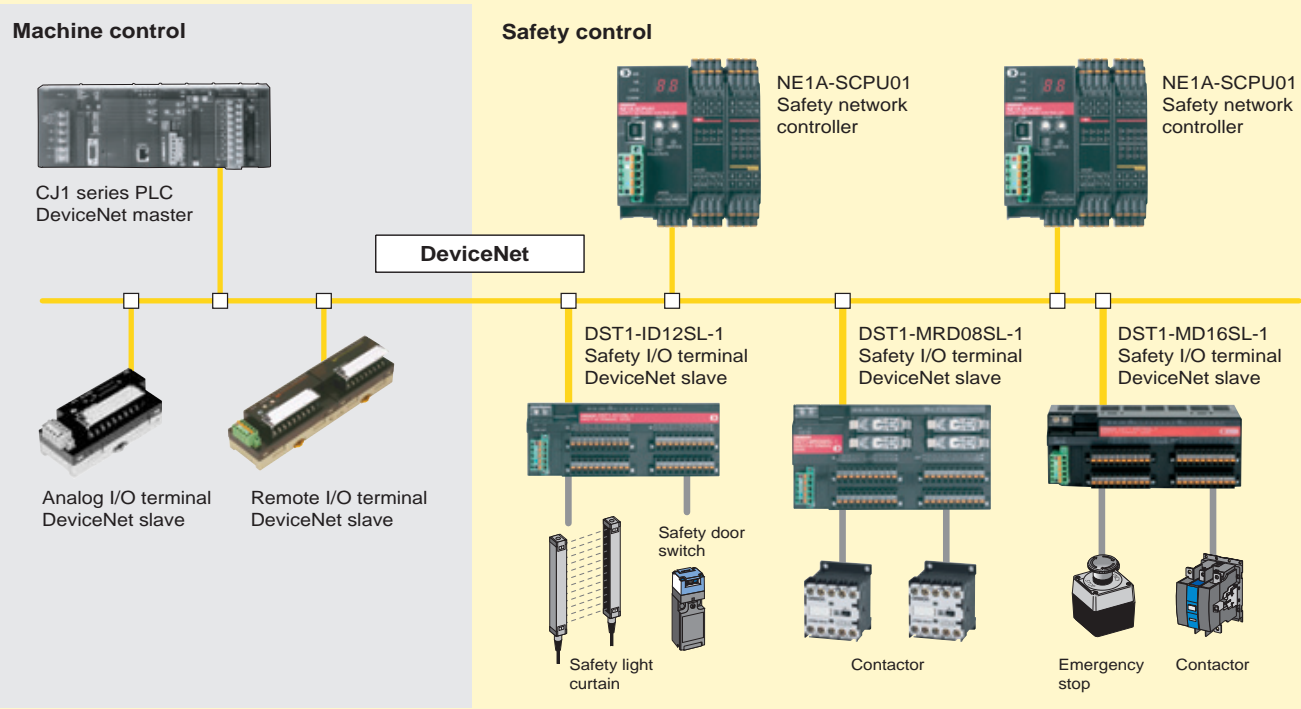


- Removable cage clamp terminals for easy installation
- up to 12 Inputs for safety signals
- 4 test pulse outputs to ensure crosstalk and short circuit detection
- up to 8 safety outputs (solid state or relay)
- Status LEDs for advanced diagnostics
- Mixed mode operation (safety and standard) for all in- and outputs

Ordering information

Safety network
Expand safety I/O through networks

Safety components distributed over many different installation locations required long and complicated wiring. Replacing the wiring with a network between safety components greatly improves productivity.



Appearance	Appearance description	Order code
Input terminal	12 PNP inputs 4 Test outputs Removable cage clamp terminals	DST1-ID12SL-1
Mixed I/O terminal	8 PNP inputs 8 PNP outputs 4 Test outputs Removable cage clamp terminals	DST1-MD16SL-1
Mixed I/O terminal	4 PNP inputs 4 relay outputs (4×2-single pole) 4 Test outputs Removable cage clamp terminals	DST1-MRD08SL-1

Specifications

General specifications

DeviceNet communications power supply voltage		11 to 25 VDC (supplied from communications connector)
Unit power supply voltage		20.4 to 26.4 VDC (24 VDC -15% +10%)
I/O power supply voltage		
Consumption current	Communications power supply	DST1-ID12SL-1/MD16SL-1: 100 mA DST1-MRD08SL-1: 110 mA
Mounting method		35-mm DIN track
Ambient operating temperature		-10°C +55°C
Ambient storage temperature		-40°C +70°C
Degree of protection		IP20 (IEC 60529)
Weight		DST1-ID12SL-1/MD16SL-1: 420 g DST1-MRD08SL-1: 600 g

Safety input specifications

Input type	Sinking inputs (PNP)
ON voltage	11 VDC min. between each input terminal and G1
OFF voltage	5 VDC max. between each input terminal and G1
OFF current	1 mA max.
Input current	6 mA

Safety output specifications

Output type	Sourcing outputs (PNP)
Rated output current	0.5 A max. per output
Residual voltage	1.2 V max. between each output terminal and V1

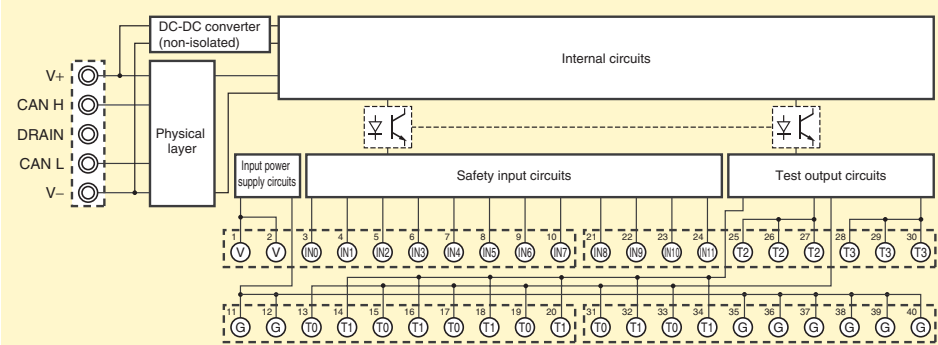
Test output specifications

Output type	Sourcing outputs (PNP)
Rated output current	0.7 A max. per point
Residual voltage	1.2 V max. between each output terminal and V0

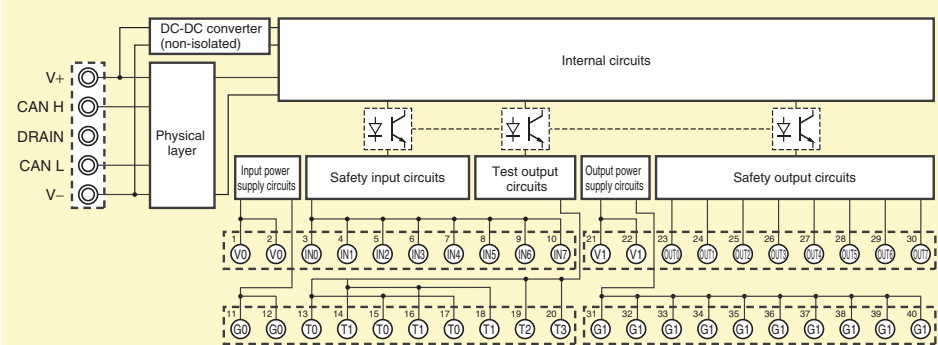
Safety output specifications for relay outputs

Relays	G7SA-2A2B, EN 50205 class A
Minimum applicable load	1 mA at 5 VDC
Rated load for a resistive load	240 VAC: 2 A, 30 VDC: 2 A
Rated load for an inductive load	2 A at 240 VAC (cosφ= 0.3), 1 A at 24 VDC
Mechanical life expectancy	5,000,000 operations min. (switching frequency of 7,200 operations/h)
Electrical life expectancy	100,000 operations min. (at rated load and switching frequency of 1,800 operations/h)

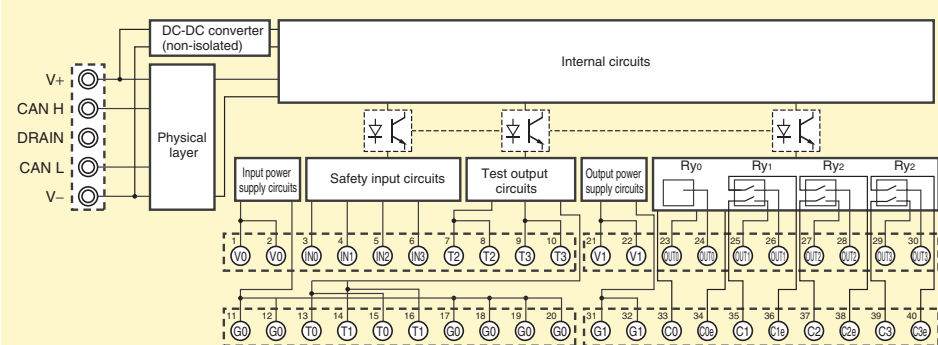
Safety I/O terminals
DST1-ID12SL-1



DST1-MD16SL-1



DST1-MRD08SL-1





Flexible safety unit

G9SX-family modules can be connected by a logical "AND" function to implement partial/global stopping of a machine. Solid-state outputs, detailed LED diagnosis and clever feedback signals help to keep maintenance easy. The line-up is completed by expansion units with safe timing functions.

- Clear and transparent segmentation of safety functions by use of unique "AND" connection
- Solid-state outputs for long life and relay outputs in extension box available
- Detailed LED indications enable easy diagnosis
- Clever feedback signals for easy maintenance
- Category-4 according to EN954-1 and SIL 3 according to EN 61508

Ordering information

Advanced unit

Safety outputs		Auxiliary outputs	No. of input channels	Max. OFF-delay time ^{*1}	Rated voltage	Terminal block type	Order code
Instantaneous	OFF-delayed						
3 P channel MOS-FET transistor output	2 P channel MOS-FET transistor output	2 PNP transistor outputs	1 or 2 channels	0 to 15 sec in 16 steps	24 VDC	Screw terminals	G9SX-AD322-T15-RT
						Cage clamp terminals	G9SX-AD322-T15-RC
2 P channel MOS-FET transistor output	2 P channel MOS-FET transistor output	2 PNP transistor outputs	1 or 2 channels	0 to 150 sec in 16 steps	24 VDC	Screw terminals	G9SX-AD-322-T150-RT
						Cage clamp terminals	G9SX-AD-322-T150-RC
				0 to 15 sec in 16 steps	24 VDC	Screw terminals	G9SX-ADA-222-T15-RT
						Cage clamp terminals	G9SX-ADA-222-T15-RC
				0 to 150 sec in 16 steps	24 VDC	Screw terminals	G9SX-ADA-222-T150-RT
						Cage clamp terminals	G9SX-ADA-222-T150-RC

^{*1} The OFF-delay time can be set in 16 steps as follows: T15: 0/0.2/0.3/0.4/0.5/0.6/0.7/1/1.5/2/3/4/5/7/10/15 s, T150: 0/10/20/30/40/50/60/70/80/90/100/110/120/130/140/150 s.

Basic unit

Safety outputs		Auxiliary outputs	No. of input channels	Rated voltage	Terminal block type	Order code
Instantaneous	OFF-delayed					
2 P channel MOS FET transistor output	—	2 PNP transistor output	1 or 2 channels	24 VDC	Screw terminals	G9SX-BC202-RT
					Cage clamp terminals	G9SX-BC202-RC

Expansion unit

Safety outputs		Auxiliary outputs	OFF-delay time	Rated voltage	Terminal block type	Order code
Instantaneous	OFF-delayed					
4 PST-NO (contact)	—	2 (solid state) PNP transistor outputs	—	24 VDC	Screw terminals	G9SX-EX401-RT
					Cage clamp terminals	G9SX-EX401-RC
—	4 PST-NO (contact)		Synchronized with G9S-X-AD - unit		Screw terminals	G9SX-EX041-T-RT
					Cage clamp terminals	G9SX-EX041-T-RC

Specifications

Power input

Item	G9SX-AD _	G9SX-BC202- _	G9SX-EX- _
Rated supply voltage	20.4 to 26.4 VDC (24 VDC -15% +10%)		

Inputs

Item	G9SX-AD _	G9SX-BC202- _
Safety input	Operating voltage: 20.4 VDC to 26.4 VDC, internal impedance: Approx. 2.8 kΩ	
Feedback/reset input		

Outputs

Item	G9SX-AD _	G9SX-BC202- _
Instantaneous safety output	P channel MOS FET transistor output	
OFF-delayed safety output	Load current: Using 2 outputs or less: 1 A DC max. Using 3 outputs or more: 0.8 A DC max.	
Auxiliary output	PNP transistor output Load current: 100 mA max.	

Expansion unit

Item	G9SX-EX- _
Rated load	250 VAC, 3A/30 VDC, 3A (resistive load)
Rated carry current	3 A
Maximum switching voltage	250 VAC, 125 VDC

Characteristics

Item	G9SX-AD _	G9SX-BC202- _	G9SX-EX- _
Operating time (OFF to ON state)	50 ms max. (Safety input: ON) 100 ms max. (Logical AND connection input: ON)	50 ms max. (Safety input: ON)	30 ms max.
Response time (ON to OFF state)	15 ms max.		10 ms max.
Durability	Electrical	—	100,000 cycles min.
	Mechanical	—	5,000,000 cycles min.
Ambient temperature	-10°C +55°C (with no icing or condensation)		



Expandable safety relay unit

G9SA-family offers a complete line-up of compact and expandable safety relay units. Modules with safe OFF-delay timing are available as well as a two-hand controller. Simple multiplication of safety contacts is possible by using the connection on the front.

- 45 mm-wide housing, expansion units are 17.5mm wide
- Safe OFF-delay timer
- Simple expansion connection
- Certification up to category 4 according to EN954-1 depending on the application

Ordering information

Emergency-stop units

Main contacts	Auxiliary contact	Number of input channels	Rated voltage	Category	Order code
3PST-NO	SPST-NC	1 channel or 2 channels possible	24 VAC/VDC 100 to 240 VAC	4	G9SA-301
5PST-NO	SPST-NC	1 channel or 2 channels possible	24 VAC/VDC 100 to 240 VAC		G9SA-501

Emergency-stop OFF-delay units

Main contacts	OFF-delay contacts	Auxiliary contact	Number of input channels	OFF-delay time	Rated voltage	Category	Order code
3PST-NO	DPST-NO	SPST-NC	1 channel or 2 channels possible	7.5 s	24 VAC/VDC 100 to 240 VAC	Main contacts: 4 OFF-delay contacts: 3	G9SA-321-T075
				15 s	24 VAC/VDC 100 to 240 VAC		G9SA-321-T15
				30 s	24 VAC/VDC 100 to 240 VAC		G9SA-321-T30

Two-hand controller

Main contacts	Auxiliary contact	Number of input channels	Rated voltage	Category	Order code
3PST-NO	SPST-NC	2 channels	24 VAC/VDC 100 to 240 VAC	4 (IIc, EN574)	G9SA-TH301

Expansion unit

The expansion unit connects to a G9SA-301, G9SA-501, G9SA-321, or G9SA-TH301.

Main contacts	Auxiliary contact	Category	Order code
3PST-NO	SPST-NC	4	G9SA-EX301

Expansion units with OFF-delay outputs

The expansion unit connects to a G9SA-301, G9SA-501, G9SA-321, or G9SA-TH301.

Main contact form	Auxiliary contact	OFF-delay time	Category	Order code
3PST-NO	SPST-NC	7.5 s	3	G9SA-EX031-T075
		15 s		G9SA-EX031-T15
		30 s		G9SA-EX031-T30

Specifications

Power input

Item	G9SA-301/TH301 / G9SA-501 / G9SA-321-T_
Power supply voltage	24 VAC/VDC: 24 VAC, 50/60 Hz, or 24 VDC 100 to 240 VAC: 100 to 240 VAC, 50/60 Hz
Operating voltage range	85 to 110% of rated power supply voltage

Inputs

Item	G9SA-301/321-T_ / TH301	G9SA-501
Input current	40 mA max.	60 mA max.

Contacts

Item	G9SA-301/501/321-T_ / TH301/EX301/EX031-T_
	Resistive load (cosφ= 1)
Rated load	250 VAC, 5 A
Rated carry current	5 A

Characteristics

Item	G9SA-301/TH301 / G9SA-501/321-T_ / G9SA-EX301/EX031-T_
Operating time	30 ms max. (not including bounce time)
Response time *1	10 ms max. (not including bounce time)
Durability	Mechanical 5,000,000 operations min. (at approx. 7,200 operations/hr)
	Electrical 100,000 operations min. (at approx. 1,800 operations/hr)
Minimum permissible load (reference value)	5 VDC, 1 mA
Ambient temperature	Operating: -25 to 55°C (with no icing or condensation) Storage: -25 to 85°C (with no icing or condensation)

*1 The response time is the time it takes for the main contact to open after the input is turned OFF.



Slim-size safety unit

G9SB is a family of slender safety relay units, providing two safety contacts in a 17.5 mm- and three safety contacts in a 22.5mm-wide housing.

- 17.5 mm- and 22.5 mm-wide housing
- 1- and 2-input channel units
- Manual and automatic reset units
- Certification up to category 4 according to EN954-1 depending on the application

Ordering information

Main contacts	Auxiliary contact	Number of input channels	Reset mode	Input type	Rated voltage	Category (EN954-1)	Size	Order code
DPST-NO 2 safety contacts	None	2 channels	Auto-reset	Inverse	24 VAC/VDC	4	17.5 mm	G9SB-2002-A
		1 channel or 2 channels		+ common				G9SB-200-B
		2 channels	Manual-reset	Inverse				G9SB-2002-C
		1 channel or 2 channels		+ common				G9SB-200-D
3PST-NO 3 safety contacts	SPST-NC	None (direct breaking)	Auto-reset	—	24 VDC	3	17.5 mm	G9SB-3010
		2 channels		Inverse	24 VAC/VDC	4	22.5 mm	G9SB-3012-A
		1 channel or 2 channels		+ common				G9SB-301-B
		2 channels	Manual-reset	Inverse				G9SB-3012-C
		1 channel or 2 channels		+ common				G9SB-301-D
		2 channels		Inverse				G9SB-3012-C

Specifications

Power input

Item	G9SB-200 _ _	G9SB-3010	G9SB-301 _ _
Power supply voltage	24 VAC/VDC: 24 VAC, 50/60 Hz, or 24VDC 24 VDC: 24 VDC		
Operating voltage range	85 to 110% of rated power supply voltage		
Power consumption	1.4 VA/1.4 W max.	1.7 W max.	1.7 VA/1.7 W max.

Inputs

Item	G9SB-200 _ _	G9SB-3010	G9SB-301 _ _
Input current	25 mA max.	60 mA max. (See note.)	30 mA max.

Note: Indicates the current between terminals A1 and A2.

Contacts

Item	G9SB-200 _ _	G9SB-3010	G9SB-301 _ _
Resistive load (cosφ= 1)			
Rated load	250 VAC, 5 A		
Rated carry current	5 A		

Characteristics

Item		G9SB-200 _ _	G9SB-3010	G9SB-301 _ _
Response time *1		10 ms max.		
Durability	Mechanical	5,000,000 operations min. (at approx. 7,200 operations/hr)		
	Electrical	100,000 operations min. (at approx. 1,800 operations/hr)		
Minimum permissible load (reference value)		5 VDC, 1 mA		
Ambient operating temperature		-25°C +55°C (with no icing or condensation)		

^{*1} The response time is the time it takes for the main contact to open after the input is turned OFF.

PROTECT OPERATORS AND PRODUCTION

Best fit safety sensors for individual risk reduction

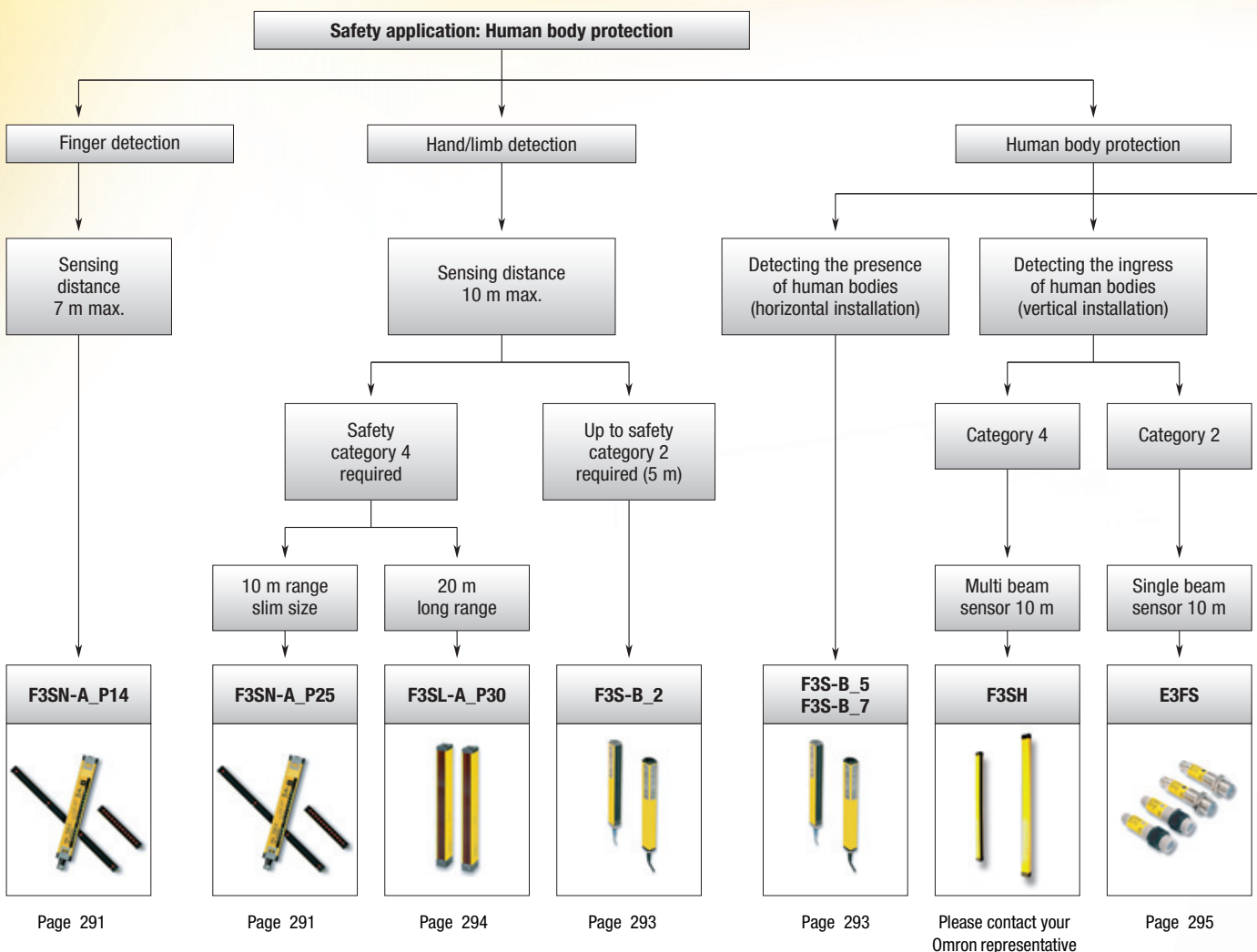
Dangerous points and hazardous areas are safeguarded with safety light curtains. Depending on the type, finger and hand protection are available with operating distances of up to 50m. They are available in safety categories 2 and 4 (according to IEC 61496). The smart functions guarantee minimum disturbance of your production.

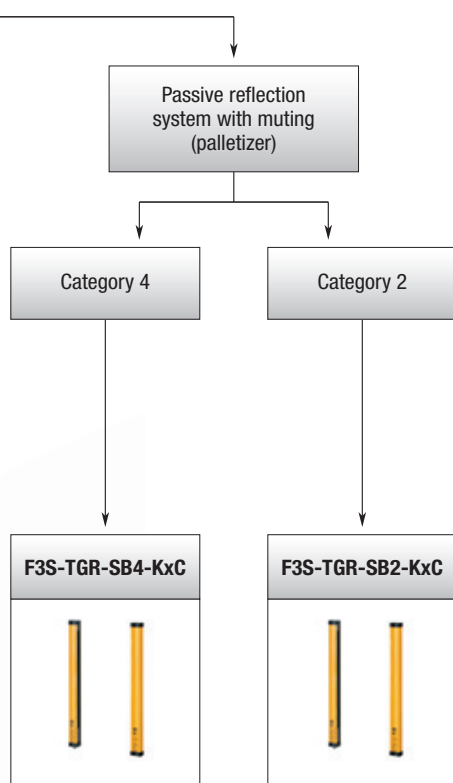
- Light curtain multi-beam sensors
- Compact single-beam sensors
- Sensors with integrated muting functions







Select the sensor you need in a split second:

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Selection table

		Category 4	Category 2	Category 4	Category 2
					
Selection criteria	Model	F3SN-A	F3S-B	F3SL	E3FS + F3SP-U3P/U5P
	Safety category	Category 4	Category 2	Category 4	Category 2
	Operating distance	0.2 to 7 m/0.2 to 10 m	0.3 to 5 m	0.3 to 20 m	0 to 10 m
	Protective height	189 to 1,822 mm	300 to 1,650 mm	351 to 2,095 mm	–
	Resolution	14, 25, 40, 70 mm	30, 55, 80 mm	30 mm	–
	Beam pitch	9, 15, 30, 60 mm	25, 50, 70 mm	22 mm	–
	Reaction time	10 to 19.5 ms	20 to 45 ms	20 to 35 ms	32 ms
	Temperature range	–10 to 55°C			
	Size of housing	30x30 mm	30x40 mm	35x50 mm	Sensor: M18 housing Control unit: 22,5/45 mm wide
Features	Blanking function	internal	option	internal	–
	Muting function	–	–	–	■
	EDM function	internal			–
	Interlock function	internal			–
	Series connection	option	option	–	–
	Mounting kits	option			–
	Parameter setting	option (Console)	option (PC)	internal DIP switch	–
	External control unit	–	–	–	■
Application	Optical heating	–	–	–	–
	Finger protection	■	–	–	–
	Hand protection	■	■	■	–
	Arm protection	■	■	■	–
	Body protection	■	■	■	■
	Presence detection	■	–	■	–
	Muting application	–	–	–	■
	Blanking application	■	–	–	–
Supply voltage	24 VDC	■	■	■	■
In- and Outputs	Safety outputs	2 PNP OSSD transistor outputs			
	Auxiliary output	2 PNP (non safety)	1 PNP (non safety)	1 PNP (non safety)	–
	Test input	■	■	–	■
	EDM input	■	■	■	–
	Reset input	■	■	■	■
	Muting sensor input	–	–	–	■
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		Category 2 and 4	Category 4	Category 4	
					
Selection criteria	Model	F3S-TGR	F3SS	F3SP-U4P	F3SH-A
	Safety category	Category 2 and 4	Category 4	Category 4	–
	Operating distance	0.5 to 6 m (active/passive) 0.5 to 5 m (active/passive)	0.3 to 60 m	–	0.2 to 10 m
	Protective height	500 to 900 m	–	–	900 mm
	Resolution	–	–	–	–
	Beam pitch	300 mm, 400 mm, 500 mm	–	–	300 mm
	Reaction time	16 ms	35 ms	30 ms	10 ms
	Temperature range	-10 to 55°C	0 to 55°C	-10 to 55°C	–
	Size of housing	30x30 mm	50x115x90 mm	45 mm wide	30x30 mm
Features	Blanking function	–	–	–	–
	Muting function	internal	–	■	–
	EDM function	–	–	–	–
	Interlock function	internal	■	■	–
	Series connection	–	–	–	option
	Mounting kits	■	■	–	–
	Parameter setting	–	–	–	option (console)
	External control unit	–	–	■	–
Application	Optical heating	–	■	–	–
	Finger protection	–	–	–	–
	Hand protection	–	–	–	–
	Arm protection	–	–	–	–
	Body protection	■	■	–	■
	Presence detection	–	–	–	–
	Muting application	■	–	–	■
	Blanking application	–	–	–	–
Supply voltage	24 VDC	■	■	–	■
In- and Outputs	Safety outputs	2 PNP OSSD transistor outputs	2 PNP OSSD transistor outputs	2 PNP OSSD transistor outputs	2 NO relay outputs
	Auxiliary output	–	–	–	2 PNP (non safety)
	Test input	■	–	■	■
	EDM input	–	–	–	■
	Reset input	■	■	■	■
	Muting sensor input	■	–	■	–
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■ Standard

– No/not available



Category-4 safety light curtain/ multi-beam safety sensor

The F3SN family is a category-4 safety light curtain with resolutions of 14, 25, 30 and 60 mm. An operating range of up to 10 m and protective heights from 189 to 1,822 mm are provided with no dead zone.

- Detection height = Sensor length
- Sensing distance up to 7 m (14 mm resolution) and 10 m for all other types
- LED bar for easy alignment and diagnosis
- Blanking function by using setup console
- Category-4 sensor complying with EN 61496-1

Ordering information

Safety light curtain

Minimum detection object	Sensing distance	Series connection, connector	Order code ^{*1}
14 mm dia. (finger protection)	0.2 to 7 m	No	F3SN-A____P14
		Yes	F3SN-A____P14H
25 mm dia. (hand protection)	0.2 to 10 m	No	F3SN-A____P25
		Yes	F3SN-A____P25-01
40 mm dia. (for presence protection)	0.2 to 10 m	No	F3SN-A____P40
		Yes	F3SN-A____P40-01
70 mm dia. (for presence detection)	0.2 to 10 m	No	F3SN-A____P70
		Yes	F3SN-A____P70-01

^{*1} ____ in the model name indicates the detection width (mm).

Multi-beam safety sensor

Optical axis pitch	Sensing distance	Number of optical axes	Distance between optical axes at each end	Series connection, connector	Order code
Body protection	0.2 to 10 m	4	900 mm	No	F3SH-A09P03
				Yes	F3SH-A09P03-01

List of safety light curtains

F3SN-A____P14, F3SN-A____P14-01, F3SN-A____P14H-01

Detection height	Number of optical axes	Order code
207	23	F3SN-A0207P14 (-01)
297	33	F3SN-A0297P14 (-01)
405	45	F3SN-A0405P14 (-01)
495	55	F3SN-A0495P14 (-01)
603	67	F3SN-A0603P14 (-01)
711	79	F3SN-A0711P14 (-01)
801	89	F3SN-A0801P14 (-01)
909	101	F3SN-A0909P14 (-01)
999	111	F3SN-A0999P14 (-01)
1,107	123	F3SN-A1107P14 (-01)
1,197	133	F3SN-A1197P14H(-01)
1,359	151	F3SN-A1359P14H(-01)
1,503	167	F3SN-A1503P14H(-01)
1,611	179	F3SN-A1611P14H(-01)

F3SN-A____P25, F3SN-A____P25-01

Detection height	Number of optical axes	Order code
307	19	F3SN-A0307P25 (-01)
457	29	F3SN-A0457P25 (-01)
607	39	F3SN-A0607P25 (-01)
907	59	F3SN-A0907P25 (-01)
1,057	69	F3SN-A1057P25 (-01)
1,207	79	F3SN-A1207P25 (-01)
1,357	89	F3SN-A1357P25 (-01)
1,507	99	F3SN-A1507P25 (-01)
1,657	109	F3SN-A1657P25 (-01)
1,807	119	F3SN-A1807P25 (-01)

Note: Highlighted products are preferred stock types, other detection heights are available.

Accessories (order separately)

Setting console

Order code	Accessories
F39-MC11	One branching connector, one connector cap, 2 m cable, instruction manual

Specifications

Item	Stand-alone	F3SN-A _____ P14 ^{*1 *3}	F3SN-A _____ P25 ^{*1}	F3SN-A _____ P40 ^{*1}	F3SN-A _____ P70 ^{*1}	F3SH-A09P03
	Series connection	F3SN-A _____ P14-01 ^{*1 *2 *3}	F3SN-A _____ P25-01 ^{*1}	F3SN-A _____ P40-01 ^{*1}	F3SN-A _____ P70-01 ^{*1}	F3SH-A09P03-01
Sensor type		Type 4 Safety Light Curtain				
Operating range		0.2 to 7 m	0.2 to 10 m			
Beam pitch (P)		9 mm	15 mm	30 mm	60 mm	300 mm
Protective height (PH)		189 to 1611 mm PH = n × P	217 to 1822 mm PH = (n – 1) × P + 37	217 to 1807 mm PH = (n – 1) × P + 37	277 to 1777 mm PH = (n – 1) × P + 37	—
Outermost beam gap		—				900 mm
Detection capability		Non-transparent: 14 mm in diameter	Non-transparent: 25 mm in diameter	Non-transparent: 40 mm in diameter	Non-transparent: 70 mm in diameter	—
Effective aperture angle (EAA)		Within ±2.5° for the emitter and receiver at a detection distance of at least 3 m according to IEC 61496-2				
Light source		Infrared LED (870 nm)				
Supply voltage (Vs)		24 VDC ±10% (ripple p-p 10% max.)				
OSSD		Two PNP transistor outputs, load current 300 mA max.				
Auxiliary output (non-safety output)		One PNP transistor output, load current 50 mA max.				
External indicator output (non-safety output) ^{*4}		One PNP transistor output, load current 40 mA max.				
Output operation mode		OSSD output: Light-ON Auxiliary output: Dark-ON (can be changed by the F39-MC11) External indicator output: Light-ON (can be changed by the F39-MC11) ^{*4}				
Input voltage		For test input, interlock selection input, reset input, and external relay monitor input voltages; ON voltage: 9 to 24 V (with a sink current of 3 mA max.), OFF voltage: 0 to 1.5 V or open				
Test functions		Self-test (after power ON, and during operation, one cycle during response time) External test (light emission stop function by test input)				
Safety-related functions		Auto reset/manual reset (interlock) ^{*5} EDM (external device monitoring) Fixed blanking ^{*6} Floating blanking ^{*6}				Auto reset mode/manual reset mode (interlock) ^{*5} EDM (external device monitoring)
Response time		ON to OFF: 10 to 15.5 ms max., 19.5 ms max. for 179 beams				ON to OFF: 10 ms max.
Ambient light intensity		Incandescent lamp: 3000 lx max. (light intensity on the receiver surface) Sunlight: 10000 lx max. (light intensity on the receiver surface)				
Ambient temperature		Operating: -10°C +55°C, storage: -30°C +70°C (with no icing or condensation)				
Degree of protection		IP65 (IEC60529)				
Connection method		M12 connector (8 pins)				
Materials		Case: Aluminum, cap: Zinc die-cast, optical cover: PMMA (acrylic resin)				
Size (cross section)		30x30 mm				

^{*1} The 4 digits in ____ in the model number represent the protective height. Use the formula given in the information on protective height specifications to calculate the height.

For example, if the beam gap is 9 mm, and the No. of beams is 21, the protective height will be 9×21 = 189 mm. The model with this protective height is F3SN-A0189P14.

^{*2} F3SN-A ____ P14-01 is a customized model. Consult with your Omron representative when ordering this model.

^{*3} For sizes above 1,125 mm add „H“ after P14, e.g. F3SN-A1143P14H. Ask for supplemental manual.

^{*4} Models ending in -01 only.

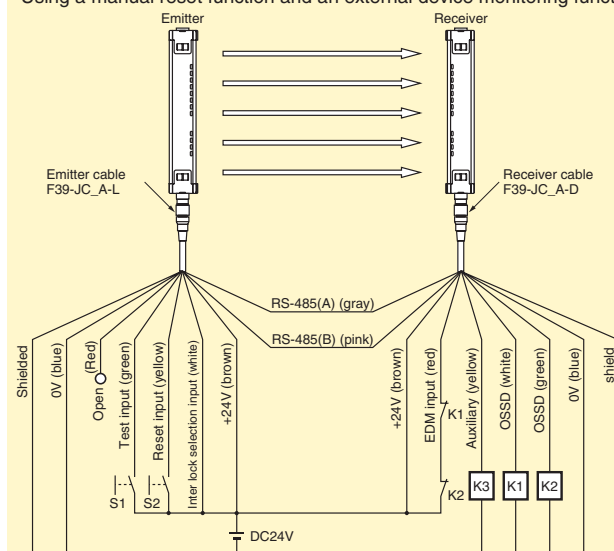
^{*5} For the factory setting, the manual reset mode is set to the “start/restart” interlock.

Using the F39-MC11 can select either the start interlock or the restart interlock.

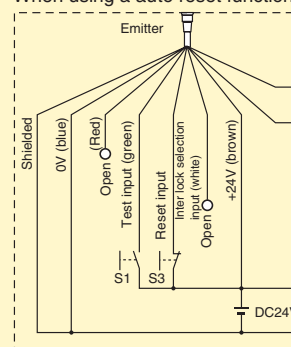
^{*6} For the factory setting, the function is not set. It can be enabled with the F39-MC11.

Connection

Using a manual reset function and an external device monitoring function



When using a auto reset function



- S1: External test switch
S2: Interlock/lockout reset switch
S3: Lock-out reset switch if the switch is not needed, connect to 24 VDC)
K1, K2: Relays for control of dangerous parts of machine.
K3: Load, PLC, etc. (for monitor)

Note: If you do not intend to use the external relay monitor, connect the auxiliary output that is set for dark: ON operation to the external relay monitor input, or use F39-MC11 to disable the external relay monitor function.



Category-2 safety light curtain

The F3S-B is a category-2 safety light curtain with resolutions of 30, 55 and 80 mm. An operating range of up to 5 m and protective heights from 300mm to 1,650 mm are provided with a very small dead zone.

- Sensing distance up to 5 m
- LEDs for easy alignment and diagnosis
- Series connection of two sensors is possible
- Category-2 sensor complying with EN 61496-1

Ordering information

Optical resolution	No. of optical axes	Protective height	Order code	Optical resolution	No. of optical axes	Protective height	Order code
30 mm	12	300 mm	F3S-B122P	55 mm	21	1,050 mm	F3S-B215P
	18	450 mm	F3S-B182P		24	1,200 mm	F3S-B245P
	24	600 mm	F3S-B242P		27	1,350 mm	F3S-B275P
	30	750 mm	F3S-B302P		30	1,500 mm	F3S-B305P
	36	900 mm	F3S-B362P		33	1,650 mm	F3S-B335P
	42	1,050 mm	F3S-B422P	80 mm	4	300 mm	F3S-B047P
	48	1,200 mm	F3S-B482P		6	450 mm	F3S-B067P
	54	1,350 mm	F3S-B542P		8	600 mm	F3S-B087P
55 mm	60	1,500 mm	F3S-B602P		10	750 mm	F3S-B107P
	66	1,650 mm	F3S-B662P		12	900 mm	F3S-B127P
	6	300 mm	F3S-B065P		14	1,050 mm	F3S-B147P
	9	450 mm	F3S-B095P	80 mm	16	1,200 mm	F3S-B167P
	12	600 mm	F3S-B125P		18	1,350 mm	F3S-B187P
	15	750 mm	F3S-B155P		20	1,500 mm	F3S-B207P
	18	900 mm	F3S-B185P		22	1,650 mm	F3S-B227P

Specifications

Item	F3S-B _ _ _ P *1 Stand-alone	F3S-BM _ _ _ P _ *1 Master unit for series connection	F3S-BS _ _ _ *1 Slave unit for series connection
Sensor type	Type 2 Safety Light Curtain		
Optical-axis pitch	25 mm	50 mm	75 mm
Optical resolution (Detection capability)	Non-transparent: In diameter		
	30 mm	55 mm	80 mm
Protective height	300/450/600/750/900/1,050/1,200/1,350/1,500/1,650 mm		
Detection distance	0.3 to 5.0 m		
Response time	ON to OFF 20 ms to 45ms (stand-alone) ON to OFF 20 ms to 65ms (series connection)		
Supply voltage (Vs)	24 VDC ±20% (including 5 Vp-p ripple)		
Current consumption	400 mA max. (under no-load conditions)		
Light source	Infrared LED (880 nm wavelength).		
Effective aperture angle	Within ±5° for the emitter and receiver at a detection distance of at least 3 m according to IEC 61496-2		
Control output	Two PNP transistor outputs, load current 200 mA max.		
Instability output	PNP transistor output (non safety output)		
Protection circuit	Output short-circuit protection, power supply reverse connection protection		
External test function	Mode selection by connecting "External test input" line to: Active: 17 VDC to Vs, 10 mA max. duration time at least 15 ms Inactive: No connection or 0 to 2.5 VDC, 2 mA max.		
Relay monitoring function (optional)	Default inactive, selectable with F39-U1E		
Start interlock function (optional)	Default inactive, selectable with F39-U1E		
Blanking function (optional)	Default inactive, selectable with F39-U1E		
Connection method	For extension cable: 8 pins, M12 connector For series connection cable: 6 pins, M12 connector		
Ambient temperature	Operating: -10°C +55°C (with no icing or condensation)		
Degree of protection	IP65 (IEC60529)		
Size (cross section)	30x40 mm		

*1 For detailed type names and optical specifications, see „Type Naming Rule“



Category-4 safety light curtain for long-distance detection

The F3SL category-4 safety light curtain is ideal for applications where long operating ranges of up to 20 m are needed. A resolution of 30mm ensures hand detection even in large machines and conveyor lines.

- Sensing distance up to 20 m
- LEDs for easy alignment and diagnosis
- Blanking function included
- EDM function included
- Category-4 sensor complying with EN 61496-1

Ordering information

Sensor type	Sensing distance	Detection width (mm)	Order code
Through-beam	0.3 to 20 m	351	F3SL-A0351P30
		523	F3SL-A0523P30
		700	F3SL-A0700P30
		871	F3SL-A0871P30
		1,046	F3SL-A1046P30
		1,219	F3SL-A1219P30
		1,394	F3SL-A1394P30
		1,570	F3SL-A1570P30
		1,746	F3SL-A1746P30
		1,920	F3SL-A1920P30
		2,095	F3SL-A2095P30

Specifications

Item	F3SL-A0351 P30	F3SL-A0523 P30	F3SL-A0700 P30	F3SL-A0871 P30	F3SL-A1046 P30	F3SL-A1219 P30	F3SL-A1394 P30	F3SL-A1570 P30	F3SL-A1746 P30	F3SL-A1920 P30	F3SL-A2095P 30
Sensing distance	0.3 to 20 m										
Optical axis pitch	22 mm										
Number of optical axes	16	24	32	40	48	56	64	72	80	88	96
Protective height	351 mm	523 mm	700 mm	871 mm	1,046 mm	1,219 mm	1,394 mm	1,570 mm	1,746 mm	1,920 mm	2,095 mm
Min. sensing object	Opaque object, 30-mm dia. or greater (52-mm or 74-mm dia. when using floating blanking)										
Effective aperture angle	Emitter/receiver: ±2.5° or less each (based on IEC61496-2 at detection distance of 3 m or greater)										
Light source	Infrared LED (850 nm)										
Supply voltage (Vs)	24 VDC ±20% including 5% ripple (p-p)										
Current consumption	Emitter: 285 mA or less, receiver: 1.4 A or less (including load output current)										
Control output	PNP transistor outputs x 2, load current 500 mA or less, Light ON										
Auxiliary output	Same signal as control output: PNP transistor outputs x 1 output (non-safety output), load current 100 mA or less										
Protective circuits	Output load short circuit protection, reverse power connection protection										
Safety functions	Start/restart interlock function (select enable/disable with DIP switch) • Blanking functions ① Channel select (fixed blanking) ② Floating blanking ③ No blanking (initial setting) Select ①, ②, or ③ with DIP switch. The optical axes for ① fixed blanking are set by a teach button.										
Diagnosis functions	• Self diagnosis functions when the power is turned on • External relay (MPCE) monitor function (connect external relay monitor input wire to contact b of external relay, 50 mA 24 VDC)										
Response time	ON to OFF 20 ms max.				ON to OFF 25 ms max.			ON to OFF 30 ms max.		ON to OFF 35 ms max.	
Ambient temperature	Operating/Storage: 0 to 55°C (with no icing or condensation)										
Degree of protection	IP65 (IEC 60529)										
Connection method	M12 Connector										
Accessories	Test rod, mounting brackets (upper/lower), operation manual, special hex wrench for program button access, test load resistors (1 kΩ, 2 resistors), surge protector (2)										
Size (cross section)	35x50 mm										



Single-beam safety sensor in compact housing

The slender M18-sized E3FS is a category-2 safety single beam with an operating range of up to 10 m. Plastic and metal housing, cable and M12-connector offer flexibility in application together with a control unit such as F3SP-U3P or F3SP-U5P.

- Sensing distance up to 10 m
- LEDs for easy alignment and diagnosis
- Cable and M12 plug categories
- Plastic and metal housing
- Category-2 sensor complying with EN 61496-1

Ordering information

Safety single beam sensors (Type 2)

Case material	Operation distance	Order code	
Plastic	0 to 10 m	Cable type	E3FS-10B4
Nickel Brass		Plug type	E3FS-10B4-P1
		Cable type	E3FS-10B4-M
		Plug type	E3FS-10B4-M1-M

Controller for safety single beam sensors

Sensors	Output contacts	Width	Order code
1 to 2 Safety single beam sensors	2 NO 2.5 A	22.5 mm	F3SP-U3P-TGR
1 to 4 Safety single beam sensors		45 mm	F3SP-U5P-TGR

Specifications

Sensors

Sensing method	Through-beam
Controller	F3SP-U3P-TGR, F3SP-U5P-TGR
Supply voltage (Vs)	24 VDC \pm 10% (ripple p-p 10% max.)
Effective aperture angle (EAA)	$\pm 5^\circ$ (at 3 m)
Current consumption	Emitter: 50 mA max. Receiver: 25 mA max.
Sensing distance	10 m
Standard sensing object	Opaque object: 11 mm min. in diameter
Response time	2.0 ms (E3FS only)
Control output	PNP transistor output, load current: 100 mA max.
Test input (emitter)	21.5 to 24 VDC: Emitter OFF (source current: 3 mA max.) Open or 0 to 2.5 V: Emitter ON (leakage current: 0.1 mA max.)
Ambient light intensity	Incandescent lamp: 3,000 lx max. (light intensity on the receiver surface) Sunlight: 10,000 lx max. (light intensity on the receiver surface)
Ambient temperature	Operating: -10°C $+55^\circ\text{C}$, storage: -30°C $+70^\circ\text{C}$ (with no icing or condensation)
Degree of protection	IP67 (IEC 60529)
Light source	Infrared LED
Protection	Output short-circuit protection, reverse polarity protection

Controllers

Item	F3SP-U3P	F3SP-U5P
Number of sensors	1 to 2 safety single beam sensor	1 to 4 safety single beam sensor
Width	22.5 mm	45 mm
Muting input	2 Inputs	4 Inputs
Safety related function	Override function Muting lamp Connection Interlock system (automatic and manual reset)	
Power supply voltage	24 VDC \pm 10%	
Power consumption	420 mA max.	
Output contacts	2 NO 2.5 A (protected by fuse), 115 VAC max.	2 NO 2.5 A (protected by fuse), 250 VAC max.
Indicators	6 LED for status and diagnostics	
Degree of protection	IP20 (IEC 60529)	
Terminal	16 screw terminals, detachable blocks with '4pin'	32 screw terminals, detachable blocks with '4pin'
Response time	≤ 30 ms	
Ambient temperature	Operation: -10°C $+55^\circ\text{C}$	
Housing material	Plastic; DIN rail mounting	



Safety light curtain controller with integrated muting function

The F3SP-U4P muting controller can handle up to two safety light curtains. It has a 45 mm-wide housing, two safety relay outputs with up to 2.5 A and additional functions such as muting-lamp monitoring and override function.

- Two independent muting functions with override
- Slim housing: 45 mm
- LEDs for status and diagnosis
- Detachable terminals
- Fully certified according to EN 61496-1

Ordering information

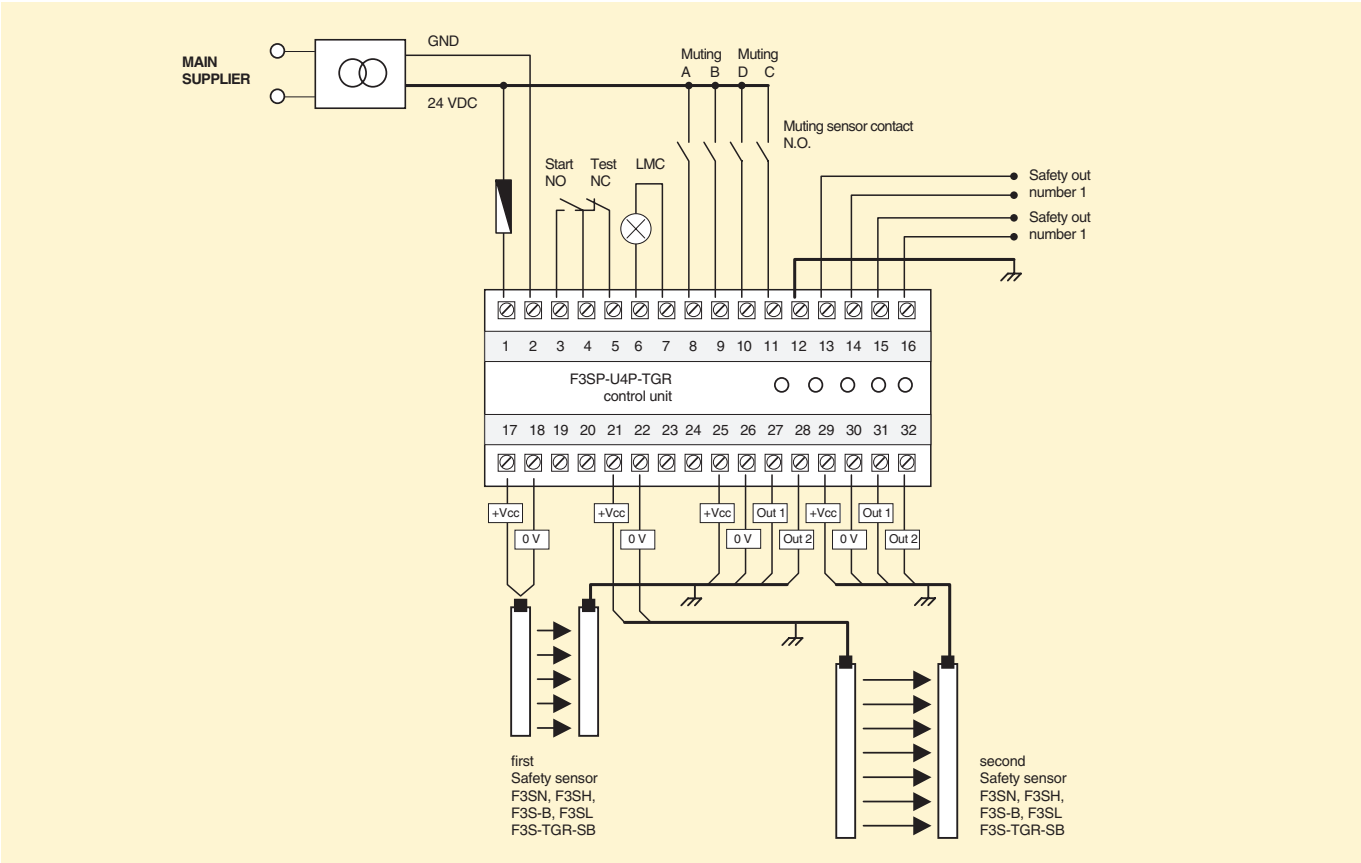
Description	Order code
Muting controller for safety light curtain F3S-B, F3SN and F3SH	F3SP-U4P-TGR

Specifications

Item	F3SP-U4P-TGR
Power supply voltage	24 VDC \pm 10%
Power consumption	420 mA max. (excl. SLC power consumption)
Output contacts	2 NO 2.5 A (protected by fuse)
Indicators	6 LEDs for status and diagnostics.
Degree of protection	IP20 (IEC 60529)
Terminal	32 screw terminals (1.5 mm ²), detachable blocks with 4 screws each
Response time	\leq 30 ms
Ambient temperature	Operating: -10 °C + 55 °C
Housing material	Plastic, DIN rail mounting

Wiring example

Control unit F3SP-U4P-TGR in a mixed configuration that allows the use of several Omron safety light curtains and perimetrical guards.





Active/passive multi-beam safety sensor

The F3S-TGR-KxC perimetrical guards are available in category 2 and category 4 with integrated muting function. They are available as active/passive guards with two, three or four beams and an operating range of up to 6 m.

- Sensing distance up to 6m for active/passive type
- Muting function included (no additional controller needed)
- Two muting connection boxes for easy muting applications
- Automatic and manual restart function included
- Category-2 and -4 sensor complying with EN 61496-1

Ordering information

Safety multi beam sensors

F3S-TGR-SB2-K_C mirror reflection type (type 2)

Number of optical axes	Sensing distance	Beam pitch	Order code
2	0.5 to 6 m	500	F3S-TGR-SB2-K2C-500(MTL) ^{*1}
3	0.5 to 5 m	400	F3S-TGR-SB2-K3C-800(MTL) ^{*1}
4		300	F3S-TGR-SB2-K4C-900(MTL) ^{*1}

^{*1} For muting applications with transport in only one direction, please add the MTL behind the model name. Ex. F3S-TGR-SB4-K2C-500MTL.

F3S-TGR-SB4-K_C mirror reflection type (type 4)

Number of optical axes	Sensing distance	Beam pitch	Order code
2	0.5 to 6 m	500	F3S-TGR-SB4-K2C-500(MTL) ^{*1}
3	0.5 to 5 m	400	F3S-TGR-SB4-K3C-800(MTL) ^{*1}
4		300	F3S-TGR-SB4-K4C-900(MTL) ^{*1}

^{*1} For muting applications with transport in only one direction, please add the MTL behind the model name. Ex. F3S-TGR-SB4-K2C-500MTL.

Flexible muting connector box

SLC connection type	Other connection	Order code
M12 8pin connector without cable	4× muting sensor connection (4pin)	F39-TGR-SB-CMB1
M12 8pin connector with 100 mm cable	1× muting lamp M12 (4pin) 1× override/Test input M12 (4pin) 1× cabinet connection M12 (8pin)	F39-TGR-SB-CMB2

Specifications

Safety sensors

Item	F3S-TGR-SB4-K_C-___ (MTL)	F3S-TGR-SB2-K_C-___ (MTL)
Sensor type	Type 4	Type 2
Operating range	F3S-TGR-SB_-K2C 0.5 to 6 m F3S-TGR-SB_-K3C/K4C 0.5 to 5 m	
Beam pitch and number of beam	F3S-TGR-SB_-K2C 500 mm 2 beam with mirror F3S-TGR-SB_-K3C 400 mm 3 beam with mirror F3S-TGR-SB_-K4C 300 mm 4 beam with mirror	
Effective aperture angle (EAA)	Within ±2.5°	Within ±5°
Light source	Infrared LED (880 nm)	
Supply voltage (Vs)	24 VDC ±20%	
OSSD	Two PNP transistor outputs, load current 500 mA max	
Output operation mode	Light - ON	
Test functions	Self-test (after power ON and during operation, one cycle during response time)	
Protection	Output short-circuit protection	
Response time	ON to OFF 16 ms max	
Ambient temperature	Operating: -10°C +55°C (with no icing or condensation)	
Degree of protection	IP65 (IEC 60529)	
Size (cross section)	38x48 mm	

Muting connection box

Supply voltage (Vs)	24 VDC ±20%
Ambient temperature	Operating: -10 to +55°C (with no icing or condensation)
Safety light curtain connector	M12 8 pins female
Cabinet connector	M12 8 pins male
Sensor connector	4× M12 4 pins female
Muting sensor connector	M12 4 pins female
Test/override connectors	M12 4 pins female
Degree of protection	IP65 (IEC60529)

BREAK CONVENTIONAL BARRIERS IN SAFETY DESIGN

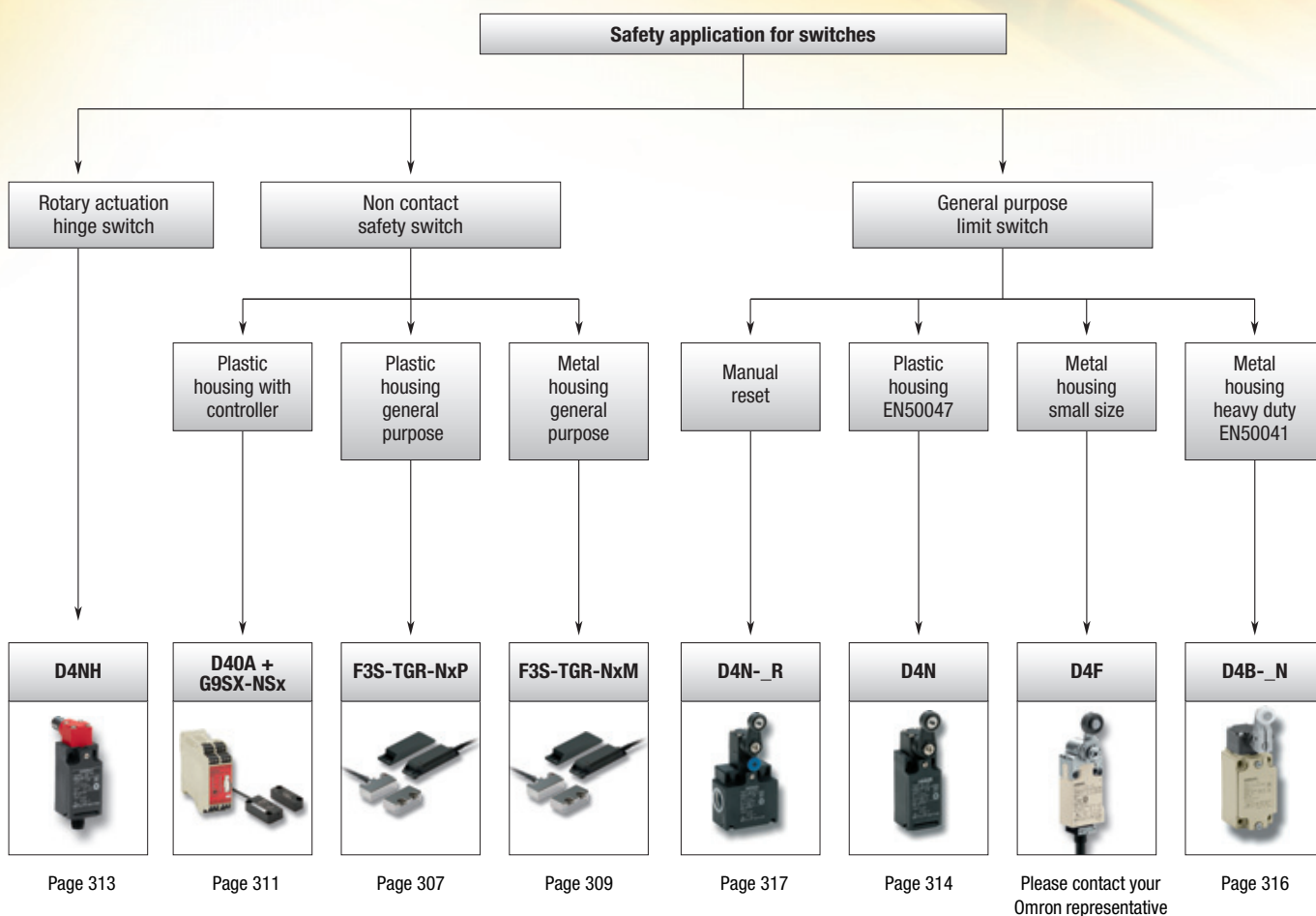
Flexibility selecting best fit control device for non contact switch application: F3S-TGR-N

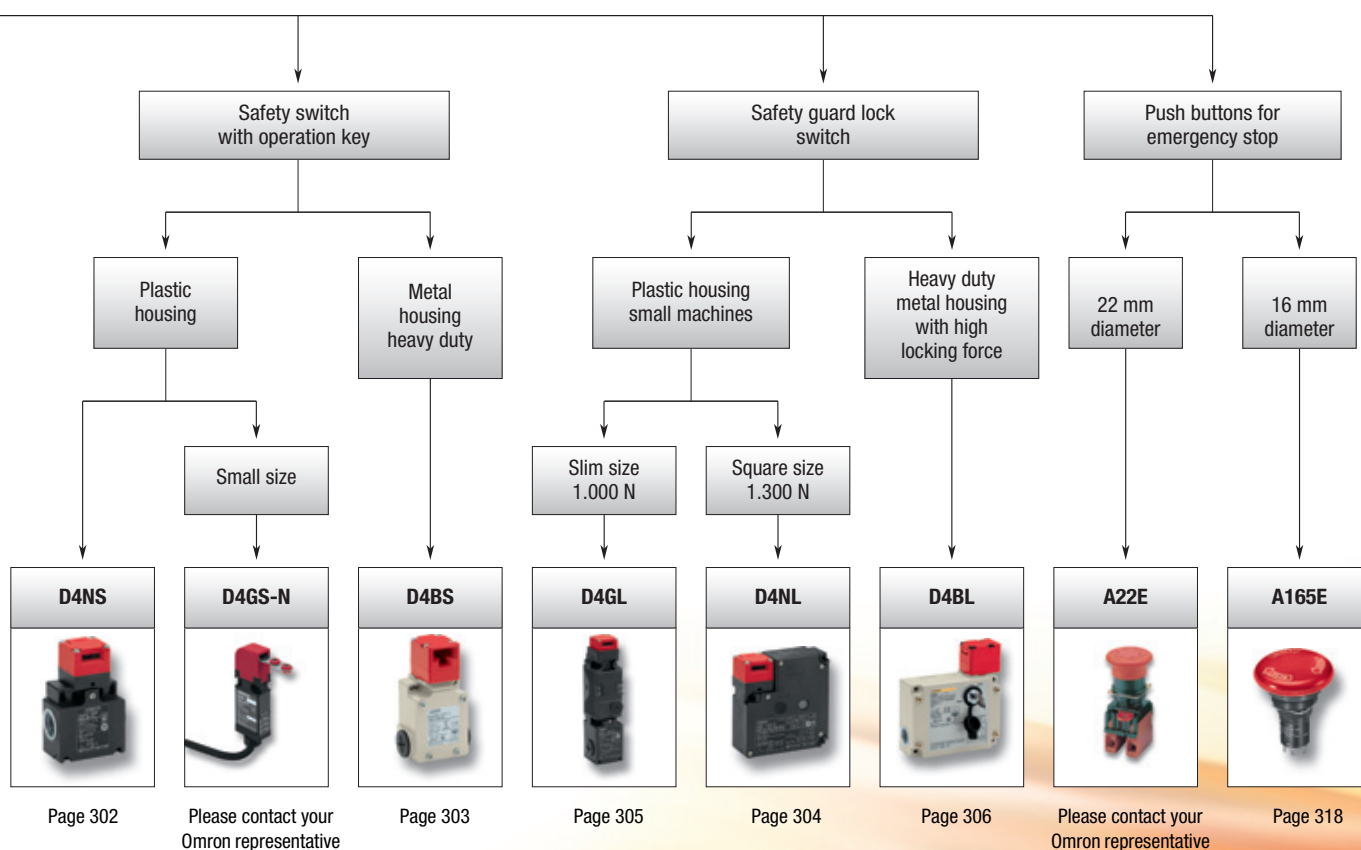
Omron has introduced a series of magnetic coded contactless switches for interlocking machine guard doors. The switches feature a built-in control function, thus saving the cost and space required for an external controller. The non-contact switches offer advantages in applications where a precise approach of the guard and lock is not possible. Applications with a large amount of dirt or high hygienic standards can also be addressed.

- Operates with all Omron safety relay units and safety bus interfaces
- Operates behind stainless steel fittings
- Non-contact – no abrasion – no particles
- Conforms to safety categories up to 4 acc. EN 954-1 and PDF-M acc. EN60947-5-3


















Select the sensor you need in a split second:
www.omron-industrial.com/safety





Selection table

		Safety door switches		Safety door-lock switches			Non-contact safety door switches			Safety hinge switch
										
Selection criteria	Model	D4NS	D4BS	D4NL	D4GL	D4BL	F3S-TGR-N_C	F3S-TGR-N_R	D40A/G9SX-NS	D4NH
	Housing	Plastic	Metal	Plastic	Plastic	Metal	Plastic/Metal	Plastic/Metal	Plastic	Plastic
	Connector type M12	■	—	—	—	—	■	■	—	■
	Head mounting	4 directions	4 directions	4 directions	4 directions	4 directions	—	—	—	—
	Actuation	Straight	Straight	Straight	Straight	Straight	—	—	—	Hinge
	Key holding force	—	—	1,300 N	1,000 N	700 N	—	—	—	—
	Protection class	IP67								
Features	Conformity	EN50047, EN1088						EN 954-1, EN60947-5-3		—
	Conduit size PG13.5	■	■	■	■	■	—	—	—	■
	Conduit size M20	■	■	■	■	■	—	—	—	■
	Conduit size G1/2	■	■	■	■	■	—	—	—	■
	Conduit size 1/2-14NPT	■	■	—	—	—	—	—	—	■
	Cable length 2, 5, 10 m	—	—	—	—	—	—	—	—	—
	Gold clad contacts	■	■	■	■	■	—	—	—	■
	Operation key adjustable	■	■	■	■	■	—	—	—	■
	Mechanical lock/24 VDC solenoid release	—	—	■	■	■	—	—	—	—
	Mechanical lock/110 VAC solenoid release	—	—	■	—	■	—	—	—	—
	Mechanical lock/230 VAC solenoid release	—	—	■	—	—	—	—	—	—
	24 VDC solenoid lock/mechanical release	—	—	■	■	■	—	—	—	—
	110 VAC solenoid lock/mechanical release	—	—	■	—	—	—	—	—	—
	240 VAC solenoid lock/mechanical release	—	—	■	—	—	—	—	—	—
	Shaft actuator	—	—	—	—	—	—	—	—	■
	Arm lever actuator	—	—	—	—	—	—	—	—	■
	High temperature sensor	—	—	—	—	—	■	■	—	—
Application	Door monitoring	■	■	■	■	■	■	■	■	■
	Door locking	—	—	■	■	■	—	—	—	—
Contact configuration	1NC/1NO SL	■	■	—	—	—	—	—	—	■
	2NC SL	■	■	—	—	—	—	—	—	■
	2NC/1NO	—	—	—	—	—	■	■	—	—
	2NC/1NO SL	■	—	—	—	—	—	—	—	■
	3NC SL	■	—	—	—	—	—	—	—	■
	1NC/1NO (MBB contact)	■	—	—	—	—	—	—	—	■
	2NC/1NO (MBB contact)	■	—	—	—	—	—	—	—	■
	1NO/1NC	—	—	—	—	—	—	—	■	—
	2NO/1NC	—	—	—	—	—	—	—	—	—
	1NC/1NO SL + 1NC/1NO SL	—	—	■	■	—	—	—	—	—
	1NC/1NO SL + 2NC SL	—	—	■	■	—	—	—	—	—
	1NC/1NO SL + 1NC SL	—	—	—	—	■	—	—	—	—
	2NC SL + 1NC/1NO SL	—	—	■	■	—	—	—	—	—
	2NC/1NO SL + 1NC/1NO SL	—	—	■	□	—	—	—	—	—
	2NC/1NO SL + 2NC SL	—	—	■	■	—	—	—	—	—
	2NC SL + 2NC SL	—	—	■	■	—	—	—	—	—
	2NC SL + 1NC SL	—	—	—	—	■	—	—	—	—
	3NC SL + 1NC/1NO SL	—	—	■	■	—	—	—	—	—
	3NC SL + 2NC SL	—	—	■	■	—	—	—	—	—
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		Safety limit switches			E-stop switches		Safety relay
							
Selection criteria	Model	D4N	D4B-_N	D4N-_R	A22E	A165E	G7SA
	Housing	Plastic	Metal	Plastic			Plastic
	M12 Plug connector	■	—	—	—	—	—
	Protection class	IP67			IP65		—
	Operating temperature range	-30 to 70°C	-40 to 80°C	-30 to 70°C	-20 to 70°C	-10 to 55°C	-40 to 85°C
	Head size	—	—	—	30 mm, 40 mm, 60 mm	30 mm, 40 mm	—
	Number of poles	—	—	—	—	—	4-pole and 6-pole
	Flux tight	—	—	—	—	—	■
Features	Conformity	EN50047, EN1088			EN 60947-5-1		EN50205
	M12 connector	■		■	—	—	—
	Conduit size PG13.5		■	■	—	—	—
	Conduit size M20	■	■	■	—	—	—
	Conduit size G1/2	■	■	■	—	—	—
	Conduit size 1/2-14NPT	■	■	■	—	—	—
	Gold clad contacts	■	■	■	—	—	■
	Actuators	—	—	—	—	—	—
	Resin roller, resin lever	■	—	—	—	—	—
	Resin roller, metal lever	■	■	■	—	—	—
	Metal roller, metal lever	■	—	—	—	—	—
	Bearing lever, metal lever	■	—	—	—	—	—
	Adj. resin roller, metal lever	■	■	■	—	—	—
	Adj. rubber roller, metal lever	■	—	■	—	—	—
	Adj. rod lever	—	■	—	—	—	—
	Top plunger	■	■	■	—	—	—
	Top roller plunger	■	■	■	—	—	—
	Roller arm lever	■	—	—	—	—	—
	Cat whisker	■	—	—	—	—	—
	Plastic rod	■	■	—	—	—	—
	Fork lever lock	■	—	—	—	—	—
	Lighted head	—	—	—	■	■	—
	Push lock – pull reset	—	—	—	■	—	—
	Push lock, turn reset	—	—	—	■	■	—
	Push lock, lock key reset	—	—	—	■	—	—
	Relay socket	—	—	—	—	—	■
Application	Position monitoring	■	■	■	—	—	—
	E-stop application	—	—	—	■	■	—
	General safety application	—	—	—	—	—	■
Contact configuration	1NC/1NO snap action	■	■	■	—	—	—
	2NC snap action	■	—	—	—	—	—
	1NC/1NO slow action	■	■	■	—	—	—
	2NC slow action	■	■	■	—	—	—
	2NC/1NO slow action	■	—	—	—	—	—
	3NC slow action	■	—	—	—	—	—
	1NC/1NO (MBB slow action)	■	—	—	—	—	—
Contact configuration	2NC/1NO (MBB slow action)	■	—	—	—	—	—
	SPST (NC)	—	—	—	■	■	—
	DPST (NC)	—	—	—	■	■	—
	SPST (NO) + SPST (NC)	—	—	—	■	—	—
	TPST (NC)	—	—	—	—	■	—
	4PST-NO + DPST-NC	—	—	—	—	—	■
	3PST-NO + 3PST-NC	—	—	—	—	—	■
	3PST-NO + SPST-NC	—	—	—	—	—	■
Contact configuration	DPST-NO + DPST-NC	—	—	—	—	—	■
	5PST-NO + SPST-NC	—	—	—	—	—	■
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■ Standard

□ Available

— No/not available



Safety door switch with plastic housing

The D4NS line-up includes three-contact models with 2NC/1NC and 3NC contact forms in addition to the previous contact forms, 1NC/1NO and 2NC. Models with M12 connectors and conduit opening, such as M20, are also available.

- Line-up with three contacts: 2NC/1NC and 3NC contact forms
- Line-up with two contacts 1NC/1NO and 2NC
- M12 connector types available
- Standardised gold-clad contacts for high contact reliability
- Applicable for standard loads and micro loads





Ordering information

Switches (with approved direct opening contacts)

Type	Contact configuration		Conduit opening/connector	Order code
1-conduit	Slow-action	1NC/1NO	M20	D4NS-4AF
		2NC	M20	D4NS-4BF
		2NC/1NO	M20	D4NS-4CF
		3NC	M20	D4NS-4DF
	Slow-action MBB contact	1NC/1NO	M20	D4NS-4EF
		2NC/1NO	M20	D4NS-4FF
2-conduit	Slow-action	1NC/1NO	M20	D4NS-8AF
		2NC	M20	D4NS-8BF
		2NC/1NO	M20	D4NS-8CF
	Slow-action MBB contact	1NC/1NO	M20	D4NS-8EF
	Slow-action MBB contact	2NC/1NO	M20	D4NS-8FF
1-conduit, with connector	Slow-action	1NC/1NO	M12 connector	D4NS-9AF
		2NC	M12 connector	D4NS-9BF
	Slow-action MBB contact	1NC/1NO	M12 connector	D4NS-9EF

Note: Additionally conduit sizes G1/2, 1/2-14NPT and Pg13,5 are available.

Operation keys (order separately)

Type		Order code	Type		Order code
Horizontal mounting		D4DS-K1	Adjustable mounting (horizontal)		D4DS-K3
Vertical mounting		D4DS-K2	Adjustable mounting (horizontal/vertical)		D4DS-K5

Specifications

Degree of protection		IP67 (EN60947-5-1) (This applies for the switch only. The degree of protection for the key hole is IP00.)
Durability *1	Mechanical	1,000,000 operations min.
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC 300,000 operations min. for a resistive load of 10 A at 250 VAC
Operating speed		0.05 to 0.5 m/s
Operating frequency		30 operations/minute max.
Direct opening force *2		60 N min.
Direct opening travel *2		10 mm min.
Minimum applicable load		Resistive load of 1 mA at 5 VDC (N-level reference value)
Protection against electric shock		Class II (double insulation)
Pollution degree (operating environment)		3 (EN60947-5-1)
Contact gap		2×2 mm min
Conditional short-circuit current		100 A (EN60947-5-1)
Rated open thermal current (I_{th})		10 A (EN60947-5-1)
Ambient temperature		Operating: -30°C to 70°C with no icing

*1 The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40 to 70%. For more details, consult your Omron representative.

*2 These figures are minimum requirements for safe operation.

Note: The above values are initial values.



Safety door switch with metal housing

The D4BS line-up includes two-contact models with 1NC/1NO and 2NC in a robust metal housing. 1 or 3 conduit openings, such as M20 or PG13,5 are available.


- Robust metal housing
- Line-up with two contacts: 1NC/1NO and 2NC
- Standardised gold-clad contacts for high contact reliability
- Applicable for standard loads and micro loads

Ordering information

Switches

Type	Mounting direction	Conduit size	Order code	
			1NC/1NO (slow-action)	2NC (slow-action)
1-conduit	Front-side mounting	Pg13.5	D4BS-15FS	D4BS-1AFS
		M20	D4BS-45FS	D4BS-4AFS
3-conduit		Pg13.5	D4BS-55FS	D4BS-5AFS
		M20	D4BS-85FS	D4BS-8AFS

Operation keys (order separately)

Type		Order code
Horizontal mounting		D4BS-K1
Vertical mounting		D4BS-K2
Adjustable mounting (horizontal)		D4BS-K3

Specifications

Degree of protection ^{*1}	IP67 (EN60947-5-1)
Durability ^{*2}	Mechanical: 1,000,000 operations min. Electrical: 500,000 operations min. (10 A at 250 VAC, resistive load)
Operating speed	0.1 m/s to 0.5 m/s
Operating frequency	30 operations/min max.
Rated frequency	50/60 Hz
Contact gap	2×2 mm min.
Direct opening force ^{*3}	19.61 N min. (EN60947-5-1)
Direct opening travel ^{*3}	20 mm min. (EN60947-5-1)
Full stroke	23 mm min.
Conventional enclosed thermal current (I _{th})	20 A (EN60947-5-1)
Conditional short-circuit current	100 A (EN60947-5-1)
Pollution degree (operating environment)	3 (EN60947-5-1)
Protection against electric shock	Class I (with ground terminal)
Ambient temperature	Operating: -40 to 80°C (with no icing)

^{*1} Although the switch box is protected from dust, oil, or water penetration, do not use the D4BS in places where dust, oil, water, or chemicals may penetrate through the key hole on the head, otherwise switch damage or malfunctioning may occur.

^{*2} The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40 to 70%. Contact your Omron sales representative for more detailed information on other operating environments.

^{*3} These figures are minimum requirements for safe operation.

Note: The above values are initial values.



Guard-lock safety door switch

The D4NL guard-lock safety-door switches are available with four or five built-in contacts. When locked, they have a key holding force of up to 1300N. Mechanical lock/solenoid release types and vice versa set up the complete range in combination with various conduit types, e.g. M20.

- Safety-door switch with electromagnetic lock or unlock mechanism
- Models with four or five built-in contacts
- Strong key holding force: 1300N
- For standard loads and micro loads
- Keys are compatible with D4GL and D4NS

Ordering information

Switches (with approved direct opening contacts)

For 110V and 230V version ask your local Omron representative

Lock and release types	Contact configuration	Conduit opening	Order code	Lock and release types	Contact configuration	Conduit opening	Order code
Mechanical lock solenoid release	1NC/1NO + 1NC/1NO	M20	D4NL-4AFA-B	Solenoid lock mechanical release	1NC/1NO + 1NC/1NO	M20	D4NL-4AFG-B
	1NC/1NO + 2NC	M20	D4NL-4BFA-B		1NC/1NO + 2NC	M20	D4NL-4BFG-B
	2NC + 1NC/1NO	M20	D4NL-4CFA-B		2NC + 1NC/1NO	M20	D4NL-4CFG-B
	2NC + 2NC	M20	D4NL-4DFA-B		2NC + 2NC	M20	D4NL-4DFG-B
	2NC/1NO + 1NC/1NO	M20	D4NL-4EFA-B		2NC/1NO + 1NC/1NO	M20	D4NL-4EFG-B
	2NC/1NO + 2NC	M20	D4NL-4FFA-B		2NC/1NO + 2NC	M20	D4NL-4FFG-B
	3NC + 1NC/1NO	M20	D4NL-4GFA-B		3NC + 1NC/1NO	M20	D4NL-4GFG-B
	3NC + 2NC	M20	D4NL-4HFA-B		3NC + 2NC	M20	D4NL-4HFG-B

Note: - Conduit sizes of G1/2 and Pg 13,5 are also available.
- Solenoid: 24 VDC, Orange LED: 10 to 115 VAC/VDC

Operation keys (order separately)

Type		Order code	Type		Order code
Horizontal mounting		D4DS-K1	Adjustable mounting (horizontal)		D4DS-K3
Vertical mounting		D4DS-K2	Adjustable mounting (horizontal/vertical)		D4DS-K5

Specifications

Degree of protection		IP67 (EN60947-5-1) (This applies for the switch only. The degree of protection for the key hole is IP00.)
Durability*1	Mechanical	1,000,000 operations min.
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC
Operating speed		0.05 to 0.5 m/s
Operating frequency		30 operations/minute max.
Rated frequency		50/60 Hz
Contact gap		2x2 mm min
Direct opening force *2		60 N min. (EN60947-5-1)
Direct opening travel *2		10 mm min. (EN60947-5-1)
Holding force		1,300 N min.
Minimum applicable load		Resistive load of 1 mA at 5 VDC (N-level reference value)
Thermal current (Ith)		10 A (EN60947-5-1)
Conditional short-circuit current		100 A (EN60947-5-1)
Pollution degree (operating environment)		3 (EN60947-5-1)
Protection against electric shock		Class II (double insulation)
Ambient temperature		Operating: -10°C to 55°C (with no icing or condensation)

*1 The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40 to 70%. For more details, consult your Omron representative.
*2 These figures are minimum requirements for safe operation.
Note: The above values are initial values.



Guard-lock safety door switch

The D4GL guard-lock safety-door switches are available with four or five built-in contacts. When locked, they have a key holding force of up to 1000 N. Mechanical lock/solenoid release types and vice versa set up the complete range in combination with various conduit types, e.g. M20.

- Slim safety-door switch with electromagnetic lock or unlock mechanism
- Models with four or five built-in contacts
- Strong key holding force: 1000 N
- For standard loads and micro loads
- Keys are compatible with D4NL and D4NS



Ordering information

Switches (with approved direct opening contacts)



Lock and release types	Contact configuration	Conduit size	Order code
Mechanical lock solenoid release	1NC/1NO + 1NC/1NO	M20	D4GL-4AFA-A
	1NC/1NO + 2NC	M20	D4GL-4BFA-A
	2NC + 1NC/1NO	M20	D4GL-4CFA-A
	2NC + 2NC	M20	D4GL-4DFA-A
	2NC/1NO + 1NC/1NO	M20	D4GL-4EFA-A
	2NC/1NO + 2NC	M20	D4GL-4FFA-A
	3NC + 1NC/1NO	M20	D4GL-4GFA-A
	3NC + 2NC	M20	D4GL-4HFA-A

Note: - conduit sizes of G1/2 and Pg13,5 are also available.
- solenoid: 24 VDC, orange/green LED: 24 VDC

Operation keys (order separately)

Type		Order code
Horizontal mounting		D4DS-K1
Vertical mounting		D4DS-K2

Lock and release types	Contact configuration	Conduit size	Order code
Solenoid lock mechanical release	1NC/1NO + 1NC/1NO	M20	D4GL-4AFG-A
	1NC/1NO + 2NC	M20	D4GL-4BFG-A
	2NC + 1NC/1NO	M20	D4GL-4CFG-A
	2NC + 2NC	M20	D4GL-4DFG-A
	2NC/1NO + 1NC/1NO	M20	D4GL-4EFG-A
	2NC/1NO + 2NC	M20	D4GL-4FFG-A
	3NC + 1NC/1NO	M20	D4GL-4GFG-A
	3NC + 2NC	M20	D4GL-4HFG-A

Type		Order code
Adjustable mounting (horizontal)		D4DS-K3
Adjustable mounting (horizontal/vertical)		D4DS-K5

Specifications

Degree of protection		IP67 (EN60947-5-1) (This applies for the switch only. The degree of protection for the key hole is IP00.)
Durability ^{*1}	Mechanical	1,000,000 operations min.
	Electrical	500,000 operations min. for a resistive load of 4 mA at 24 VDC; 150,000 operations min. for a resistive load of 1 A at 125 VAC in 2 circuits and 4 mA at 24 VDC in 2 circuits
Operating speed		0.05 to 0.5 m/s
Operating frequency		30 operations/minute max.
Rated frequency		50/60 Hz
Contact gap		2x2 mm min.
Direct opening force ^{*2}		60 N min. (EN60947-5-1)
Direct opening travel ^{*3}		10 mm min. (EN60947-5-1)
Holding force		1,000 N min.
Minimum applicable load		Resistive load of 4 mA at 24 VDC (N-level reference value)
Thermal current (I _{th})		2.5 A (EN60947-5-1)
Conditional short-circuit current		100 A (EN60947-5-1)
Pollution degree (operating environment)		3 (EN60947-5-1)
Protection against electric shock		Class II (double insulation)
Ambient temperature		Operating: -10°C to 55°C with no icing

^{*1} The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40 to 70%. For more details, consult your Omron representative.

^{*2} These figures are minimum requirements for safe operation.

^{*3} These figures are minimum requirements for safe operation.

Note: The above values are initial values.



Guard-lock safety door switch with metal housing

The D4BL guard-lock safety-door switches are available with three built-in contacts. They are mechanically locked when the key is inserted and have a solenoid release. An auxiliary release key ensures easy maintenance and unlocks the door in case of power failure.

- Automatically mechanical lock
- Auxiliary release key for easy maintenance
- Tough aluminium die-cast body
- Horizontal and vertical conduit opening
- Head direction can easily be changed

Ordering information

Switches

Lock method	Conduit size	Voltage for solenoid	Without indicator 1NC/1NO+ 1NC (slow-action)	With LED indicator 1NC/1NO+ 1NC (slow-action)	Without indicator 2NC+ 1NC (slow-action)	With LED indicator 2NC+ 1NC (slow-action)
Mechanical lock	PG13.5	24 VDC	D4BL-1CRA	D4BL-1CRA-A	D4BL-1DRA	D4BL-1DRA-A
		110 VAC	D4BL-1CRB	D4BL-1CRB-A	D4BL-1DRB	D4BL-1DRB-A
	M20	24 VDC	D4BL-4CRA	D4BL-4CRA-A	D4BL-4DRA	D4BL-4DRA-A
		110 VAC	D4BL-4CRB	D4BL-4CRB-A	—	—
Solenoid lock	Pg 13.5	24 VDC	D4BL-1CRG	D4BL-1CRG-A	D4BL-1DRG	D4BL-1DRG-A
	M20	24 VDC	—	D4BL-4CRG-A	—	—

Operation keys (order separately)

Type		Order code
Horizontal mounting		D4BL-K1
Vertical mounting		D4BL-K2

Type		Order code
Adjustable mounting (horizontal)		D4BL-K3

Specifications

Degree of protection	IP67 (EN60947-5-1)
Durability ^{*1}	Mechanical: 1,000,000 operations min. Electrical: 500,000 operations min. (10 A resistive load at 250 VAC)
Operating speed	0.05 to 0.5 m/s
Operating frequency	30 operations/min max.
Rated frequency	50/60 Hz
Operating characteristics	Direct opening force: 19.61 N min. (EN60947-5-1) Direct opening travel: 20 mm min. (EN60947-5-1) All stroke: 23 mm min.
Holding force	700 N min. (GS-ET-19)
Thermal current (I _{th})	10 A (EN60947-5-1)
Pollution degree (operating environment)	3 (EN60947-5-1)
Protection against electric shock	Class I (with ground terminal)
Ambient temperature	Operating: -10 to 55°C (with no icing)

^{*1} The durability is for an ambient temperature of 5 to 35°C and an ambient humidity of 40 to 70%.

Note: The above values are initial values.

Solenoid coil characteristics

Item	24 VDC mechanical lock models	110 VAC mechanical lock models	24 VAC solenoid lock models
Rated operating voltage	24 VDC $+10\%/-15\%$ (100% ED)	110 VAC $\pm 10\%$ (50/60 Hz)	24 VDC $+10\%/-15\%$ (100% ED)
Current consumption	Approx. 300 mA	Approx. 98 mA	Approx. 300 mA

Indicator characteristics

Item	LED
Rated voltage	10 to 115 VAC/VDC
Current leakage	Approx. 1 mA
Color (LED)	Orange, green



Non-contact switches for monitoring the status of guarding doors

Non-contact switches monitor the status of guarding doors. LED for easy diagnosis and stainless steel housing for high hygiene demands in the food industry are available

- Operates with all Omron safety relay units and safety bus interfaces
- Operates behind stainless steel fittings
- Non-contact – no abrasion – no particles
- Conforms to safety categories up to 4 acc. EN 954-1 and PDF-M acc. EN60947-5-3

Ordering Information

Elongated Sensors

Cable Connection	Contact Configuration	Order code
2 m pre-wired	2NC	F3S-TGR-NLPC-20-02
5 m pre-wired	2NC	F3S-TGR-NLPC-20-05
10 pre-wired	2NC	F3S-TGR-NLPC-20-10
M12, 8-pin	2NC	F3S-TGR-NLPC-20-M1J8
2 m pre-wired	2NC/1NO	F3S-TGR-NLPC-21-02
5 m pre-wired	2NC/1NO	F3S-TGR-NLPC-21-05
10 pre-wired	2NC/1NO	F3S-TGR-NLPC-21-10
M12, 8-pin	2NC/1NO	F3S-TGR-NLPC-21-M1J8

Small Sensor

Cable Connection	Contact Configuration	Order code
2 m pre-wired	2NC	F3S-TGR-NSMC-20-02
5 m pre-wired	2NC	F3S-TGR-NSMC-20-05
10 pre-wired	2NC	F3S-TGR-NSMC-20-10
M12, 8-pin	2NC	F3S-TGR-NSMC-20-M1J8
2 m pre-wired	2NC/1NO	F3S-TGR-NSMC-21-02
5 m pre-wired	2NC/1NO	F3S-TGR-NSMC-21-05
10 pre-wired	2NC/1NO	F3S-TGR-NSMC-21-10
M12, 8-pin	2NC/1NO	F3S-TGR-NSMC-21-M1J8

Specifications

Mechanical Data

Item	Model	Elongated Sensor	Small sensor
Operating distance	OFF → ON (Sao)	12 mm Close	
	ON → OFF (Sar)	17 mm Open	
Actuator approach speed	Min.	4 mm/s	
	Max.	1000 mm/s	
Operating temperature	–	-25°C...+80°C	-25°C...+105°C
Enclosure protection	Flying lead M12 connector	IP 67	
Material	–	Black Polycarbonate	Stainless steel 316

Electrical Data

Item	Model	Elongated Sensor	Small sensor
Power supply	–	24 VDC ±15%	
Power consumption	Max.	50 mA	
Switching current	Min.	10 mA, 10 VDC	
Rated loads	Max.	100 mA, 24 VDC	
		100 mA, 24 VDC	
Output type	–	Electronic output (potential-free optocoupler output)	

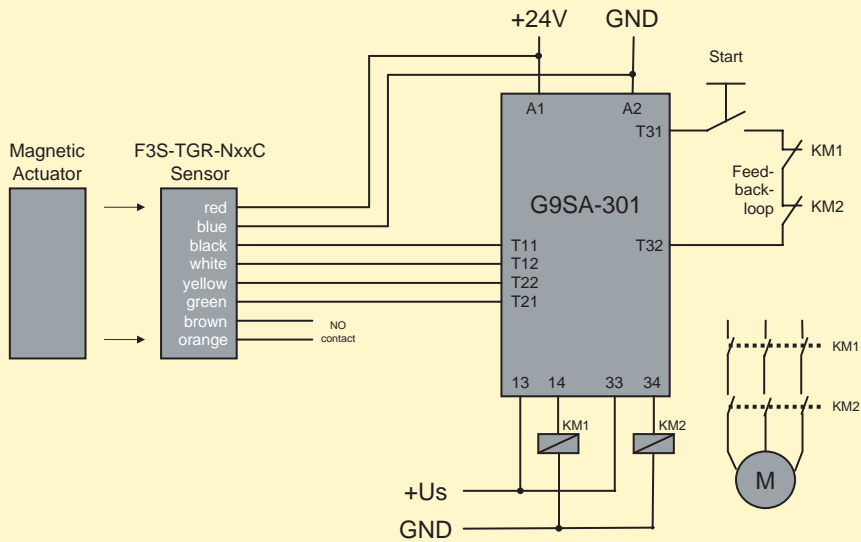
Approved Standards

EN standards certified by TÜV Rheinland
EN 954-1
EN 60204-1
EN/IEC 60947-5-3
UL 508, CSA C22.2
BS 5304
EN 1088-1 conformance

Wiring examples (Single head connection up to category 4 acc. EN954-1)

G9SA

Single Sensor Application with G9SA-301
(up to Safety Category 4 acc. EN954-1)





Non-contact switches for monitoring the status of guarding doors

Non-contact switches monitor the status of guarding doors. LED for easy diagnosis and stainless steel housing for high hygiene demands in the food industry are available.

- Operates with all Omron safety relay units and safety bus interfaces
- Operates behind stainless steel fittings
- Non-contact – no abrasion – no particles
- Conforms to safety categories up to 4 acc. EN 954-1 and PDF-M acc. EN60947-5-3

Ordering Information

Elongated Sensors

Cable Connection	Contact Configuration	Order code
2 m pre-wired	2NC	F3S-TGR-NLPR-20-02
5 m pre-wired	2NC	F3S-TGR-NLPR-20-05
10 pre-wired	2NC	F3S-TGR-NLPR-20-10
M12, 8-pin	2NC	F3S-TGR-NLPR-20-M1J8
2 m pre-wired	2NC/1NO	F3S-TGR-NLPR-21-02
5 m pre-wired	2NC/1NO	F3S-TGR-NLPR-21-05
10 pre-wired	2NC/1NO	F3S-TGR-NLPR-21-10
M12, 8-pin	2NC/1NO	F3S-TGR-NLPR-21-M1J8

Small Sensor

Cable Connection	Contact Configuration	Order code
2 m pre-wired	2NC	F3S-TGR-NSMR-20-02
5 m pre-wired	2NC	F3S-TGR-NSMR-20-05
10 pre-wired	2NC	F3S-TGR-NSMR-20-10
M12, 8-pin	2NC	F3S-TGR-NSMR-20-M1J8
2 m pre-wired	2NC/1NO	F3S-TGR-NSMR-21-02
5 m pre-wired	2NC/1NO	F3S-TGR-NSMR-21-05
10 pre-wired	2NC/1NO	F3S-TGR-NSMR-21-10
M12, 8-pin	2NC/1NO	F3S-TGR-NSMR-21-M1J8

Specifications

Mechanical Data

Item	Model	Elongated Sensor	Small sensor
Operating distance	OFF → ON (Sao)	10 mm Close	
	ON → OFF (Sar)	22 mm Open	
Actuator approach speed	Min.	4 mm/s	
	Max.	1000 mm/s	
Operating temperature	–	-25°C...+80°C	-25°C...+105°C
Enclosure protection	Flying lead M12 connector	IP 67	
Material	–	Black Polycarbonate	Stainless steel 316

Electrical Data

Item	Model	Elongated Sensor	Small sensor
Contact release time	Max.	2 ms	
Initial contact resistance	Max.	50 mA	
Switching current	Min.	1 mA, 10 VDC	
Rated load s	Max.	1 A, 250 VAC	
NC contacts		0.2 A, 24 VDC	
NO contact			

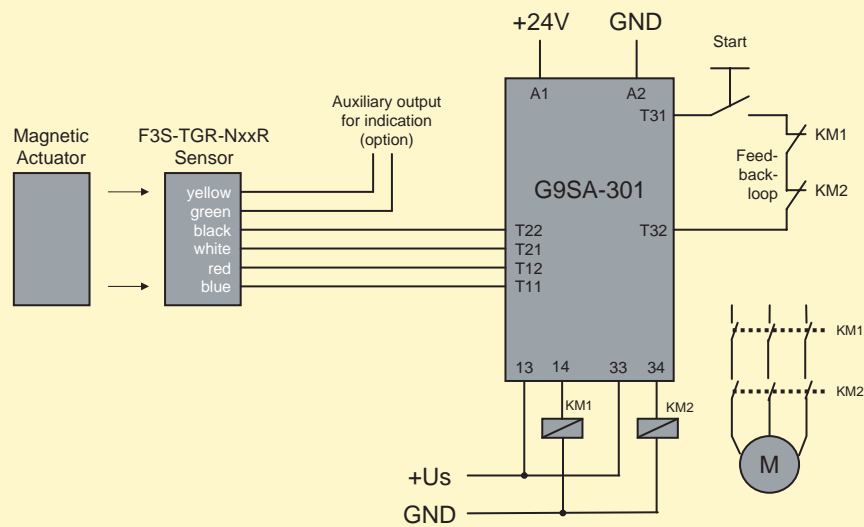
Approved Standards

EN standards certified by TÜV Rheinland
EN 954-1
EN 60204-1
EN/IEC 60947-5-3
UL 508, CSA C22.2
BS 5304
EN 1088-1 conformance

Wiring examples (Single head connection up to category 4 acc. EN954-1)

G9SA

Single Sensor Application with G9SA-301
(up to Safety Category 4 acc. EN954-1)





Compact non-contact door switch/ flexible safety unit

Electronic detection mechanism for better stability in non-contact door switch operation

- Stable operation reduces controller errors caused by unstable doors.
- Connect up to 30 non-contact door switches with LED indicators to one controller.
- Reversible switch provides flexibility in installation.
- Two-color LED indicator enables easier maintenance by identification of door status and cable disconnections.
- Safety category 3 (EN 954-1).

Ordering information

Non-contact door switches (Switch/Actuator)

Classification	Auxiliary outputs	Cable length	Order code
Standard models	Semiconductor outputs ^{*1}	2 m	D40A-1C2
		5 m	D40A-1C5

^{*1} PNP open-collector semiconductor output.

Note: Must be used in combination with a G9SX-NS_ non-contact door switch controller.

On-contact door switch controllers (Controllers for D40A)

Safety outputs ^{*1}		Auxiliary outputs ^{*2}	Logical AND connection input	Logical AND connection output	Max. OFF delay time ^{*3}	Rated voltage	Terminal block type	Order code
Instantaneous	OFF-delayed ^{*4}							
2 (Semi-conductors)	0	2 (Semi-conductors)	1	1	–	24 VDC	Screw terminals	G9SX-NS202-RT
							Spring-cage terminals	G9SX-NS202-RC
	2 (Semi-conductors)				3.0 s		Screw terminals	G9SX-NSA222-T03-RT
							Spring-cage terminals	G9SX-NSA222-T03-RC

^{*1} P channel MOS FET transistor output

^{*2} PNP transistor output

^{*3} The OFF-delay time can be set in 16 steps as follows:

0/0.2/0.3/0.4/0.5/0.6/0.7/0.8/0.9/1.0/1.2/1.4/1.8/2.0/2.5/3.0 s

^{*4} The OFF-delayed output becomes an instantaneous output by setting the OFF-delay time to 0 s.

Specifications

Ratings/Characteristics of non-contact door switches

Item	Model	D40A-1C_
Operating characteristics ^{*1}	Operating distance OFF→ON	5 mm min.
	Operating distance ON→OFF	15 mm max.
	Differential travel (max.)	20% of operating distance
Ambient operating temperature		–10 to 55°C (no icing or condensation)
Vibration resistance		10 to 55 to 10 Hz (single amplitude: 0.75 mm, double amplitude: 1.5 mm)
Shock resistance		300 m/s ² min.
Degree of protection		IP67
Material		PBT resin
Mounting method		M4 screws
Power consumption		0.6 W max.
Auxiliary outputs ^{*2}		24 VDC, 10 mA (PNP open-collector outputs)
LED indicators		Actuator not detected (red); actuator detected (yellow)
Connection cables		2 m, 5 m
Number of connectable switches		30 max. (wiring length: 100 m max.)

^{*1} This is the distance where the switch operates from OFF to ON when approaching and the distance where the switch operates from ON to OFF when separating when the switch and actuator target marks are on the same axis, and the sensing surfaces coincide.

^{*2} Turns ON when the actuator is approaching.

Ratings of non-contact door switch controllers

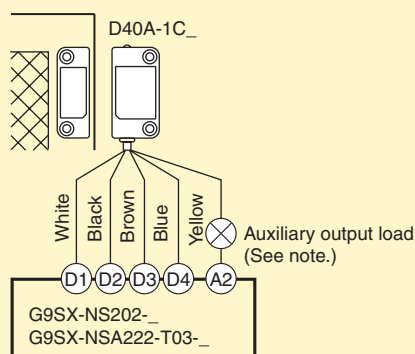
Power input			
Item	G9SX-NS202-__	G9SX-NSA222-T03-__	G9SX-EX-__
Rated supply voltage	24 VDC		
Inputs			
Item	G9SX-NS202-_/G9SX-NSA222-T03-__		
Safety input *1	Operating voltage: 20.4 VDC to 26.4 VDC, internal impedance: approx. 2.8 kΩ		
Feedback/reset input			

*1 Only applies to the G9SX-NSA222-T03-__. Refers to input other than that from the non-contact door switch.

Outputs

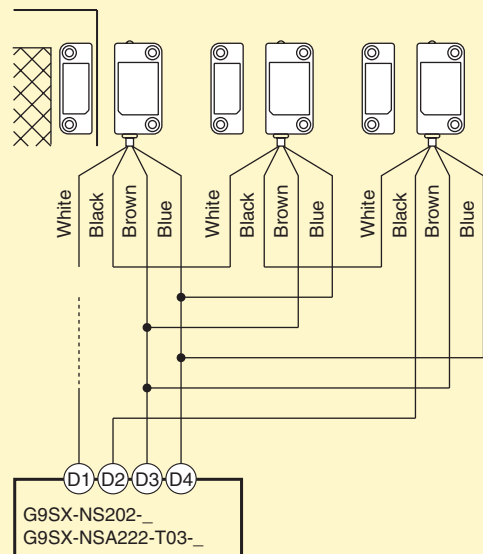
Item	G9SX-NS202-__ /G9SX-NSA222-T03-__
Instantaneous safety output OFF-delayed safety output	P channel MOS FET transistor output Load current: 0.8 A DC max.
Auxiliary output	PNP transistor output Load current: 100 mA max.

Non-contact Door Switch and
Non-contact Door Switch Controller Wiring
Example: Wiring a Single Switch



Note: The auxiliary output load current must be 10 mA max.

Example: Wiring Multiple Switches
Connect Up to 30 Non-contact Door Switches





Safety door hinge switch

D4NH safety-door hinge switches are available with one or two built-in contacts, shaft or arm lever actuator and various conduit types, e.g. M20.

- Direct opening mechanism
- Shaft or arm lever actuator
- Wide temperature range
- Metric conduit and M12 connector types are available

Ordering information

Switches

Actuator	Conduit size		Built-in switch mechanism		
			1NC/1NO (slow-action)	2NC (slow-action)	2NC/1NO (slow-action)
Shaft	1-conduit	M20	D4NH-4AAS	D4NH-4BAS	D4NH-4CAS
		M12 connector	D4NH-9AAS	D4NH-9BAS	–
	2-conduit	M20	D4NH-8AAS	D4NH-8BAS	D4NH-8CAS
Arm lever	1-conduit	M20	D4NH-4ABC	D4NH-4BBC	D4NH-4CBC
		M12 connector	D4NH-9ABC	D4NH-9BBC	–
	2-conduit	M20	D4NH-8ABC	D4NH-8BBC	D4NH-8CBC

Actuator	Conduit size		Built-in switch mechanism		
			3NC (slow-action)	1NC/1NO MBB (slow-action)	2NC/1NO MBB (slow-action)
Shaft	1-conduit	M20	D4NH-4DAS	D4NH-4EAS	D4NH-4FAS
		M12 connector	–	D4NH-9EAS	–
Arm lever	1-conduit	M20	D4NH-4DBC	D4NH-4EBC	D4NH-4FBC
		M12 connector	–	D4NH-9EBC	–

Note: Conduit types with G1/2, 1/2-14NPT and Pg13,5 are also available.

Specifications

Degree of protection		IP67 (EN60947-5-1)
Durability	Mechanical	1,000,000 operations min.
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC 300,000 operations min. for a resistive load of 10 A at 250 VAC
Operating speed		2 to 360°/s
Operating frequency		30 operations/minute max.
Protection against electric shock		Class II (double insulation)
Pollution degree (operating environment)		3 (EN60947-5-1)
Contact gap		Snap-action: 2x9.5 mm min Slow-action: 2x2 mm min
Conditional short-circuit current		100 A (EN60947-5-1)
Rated open thermal current (I _{th})		10 A (EN60947-5-1)
Ambient temperature		Operating: -30°C to 70°C with no icing



Safety-limit switch with plastic housing

The D4N-family is a complete line-up of safety-limit switches. They are available with one, two or three built-in contacts and a wide range of head and actuator types. To set up easy installation and maintenance, various conduit types, e.g. M20 and M12 connector types, are provided.

- Direct opening mechanism
- Various actuators
- Double insulation
- Gold-plated contacts for handling micro loads
- Metric conduit types available

Ordering information

Switches		Conduit size		Built-in switch mechanism					
				1NC/1NO (snap-action)		1NC/1NO (slow-action)		2NC (slow-action)	
				Direct opening	Order code	Direct opening	Order code	Direct opening	Order code
	Roller lever (resin lever, resin roller)	1-conduit	M20		D4N-4120		D4N-4A20		D4N-4B20
			M12 connector		D4N-9120		D4N-9A20		D4N-9B20
	Plunger	1-conduit	M20		D4N-4131		D4N-4A31		D4N-4B31
			M12 connector		D4N-9131		D4N-9A31		D4N-9B31
		2-conduit	M20		D4N-8131		D4N-8A31		D4N-8B31
	Roller plunger	1-conduit	M20		D4N-4132		D4N-4A32		D4N-4B32
			M12 connector		D4N-9132		D4N-9A32		D4N-9B32
		2-conduit	M20		D4N-8132		D4N-8A32		D4N-8B32
	One-way roller arm lever (horizontal)	1-conduit	M20		D4N-4162		D4N-4A62		D4N-4B62
			M12 connector		D4N-9162		D4N-9A62		D4N-9B62
		2-conduit	M20		D4N-8162		D4N-8A62		D4N-8B62
	One-way roller arm lever (vertical)	1-conduit	M20		D4N-4172		D4N-4A72		D4N-4B72
			M12 connector		D4N-9172		D4N-9A72		D4N-9B72
	Adjustable roller lever, form lock (metal lever, resin roller)	1-conduit	M20		D4N-412G		D4N-4A2G		D4N-4B2G
			M12 connector		D4N-912G		D4N-9A2G		D4N-9B2G
	Adjustable roller lever, form lock (metal lever, rubber roller)	1-conduit	M20		D4N-412H		D4N-4A2H		D4N-4B2H
			M12 connector		D4N-912H		D4N-9A2H		D4N-9B2H



Note: Conduit sizes 1/2-14NPT, G1/2 and Pg13,5 are also available.

Switches with two contacts and MBB contacts

Actuator		Conduit size		Built-in switch mechanism					
				1NC/1NO (snap-action)		1NC/1NO (slow-action)		2NC (slow-action)	
				Direct opening	Order code	Direct opening	Order code	Direct opening	Order code
	Roller lever (resin lever, resin roller)	1-conduit	M20		D4N-4C20		D4N-4E20		D4N-4F20
			M12 connector		—		D4N-9E20		—
		2-conduit	M20		D4N-8C20		D4N-8E20		D4N-8F20
	Roller plunger	1-conduit	M20		D4N-4C32		D4N-4E32		D4N-4F32
			M12 connector		—		D4N-9E32		—
		2-conduit	M20		D4N-8C32		D4N-8E32		D4N-8F32
	One-way roller arm lever (horizontal)	1-conduit	M20		D4N-4C62		D4N-4E62		D4N-4F62
			M12 connector		—		D4N-9E62		—
		2-conduit	M20		D4N-8C62		D4N-8E62		D4N-8F62

Note: Conduit sizes 1/2-14NPT, G1/2 and Pg13,5 are also available.

General-purpose switches with two contacts

Actuator		Conduit size		Built-in switch mechanism							
				1NC/1NO (snap-action)		2NC (snap-action)		1NC/1NO (slow-action)		2NC (slow-action)	
				Direct opening	Order code	Direct opening	Order code	Direct opening	Order code	Direct opening	Order code
	Cat whisker	1-conduit	M20	—	D4N-4180	—	D4N-4280	—	—	—	D4N-4B80
	Plastic rod	1-conduit	M20	—	D4N-4187	—	D4N-4287	—	—	—	D4N-4B87

Note: Conduit sizes 1/2-14NPT, G1/2 and Pg13,5 are also available.

Specifications

Degree of protection		IP67 (EN60947-5-1)
Durability ^{*1}	Mechanical	15,000,000 operations min./Fork lever 10,000,000 operations min.
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC 300,000 operations min. for a resistive load of 10 A at 250 VAC
Operating speed		1 mm/s to 0.5 m/s (D4-1120)
Operating frequency		30 operations/minute max.
Minimum applicable load		Resistive load of 1 mA at 5 VDC (N-level reference value)
Protection against electric shock		Class II (double insulation)
Pollution degree (operating environment)		3 (EN60947-5-1)
Contact gap		Snap-action: 2x0.5 mm min Slow-action: 2x2 mm min
Conditional short-circuit current		100 A (EN60947-5-1)
Rated open thermal current (I _{th})		10 A (EN60947-5-1)
Ambient temperature		Operating: -30°C to 70°C with no icing

^{*1} The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40 to 70%. For more details, consult your Omron representative.

Note: - The above values are initial values.



Safety-limit switch with metal housing

The D4BN family is a complete line-up of safety-limit switches in metal housing. They are available with two built-in contacts and a wide range of head and actuator types. To set up easy installation and maintenance, various conduit types, e.g. M20, are provided.

- Direct opening mechanism
- Various actuators
- Robust metal housing
- Gold-plated contacts for handling micro loads
- Metric conduit types available

Ordering information

Switches (EN50041)		Order code		
		1NC/1NO (snap-action)	1NC/1NO (slow-action)	2NC (slow-action)
Side rotary	Roller lever (form A)	D4B-4111N	D4B-4511N	D4B-4A11N
	Adjustable roller lever	D4B-4116N	D4B-4516N	D4B-4A16N
	Adjustable rod lever (form D)	D4B-4117N	D4B-4517N	D4B-4A17N
Top plunger	Plain (form B)	D4B-4170N	D4B-4570N	D4B-4A70N
	Roller (form C)	D4B-4171N	D4B-4571N	D4B-4A71N
Wobble lever	Coil spring	D4B-4181N	—	—
	Plastic rod	D4B-4187N	—	—

Note: Conduit sizes G1/2 and Pg 13,5 are also available

3-conduit Switch		Order code		
		1NC/1NO (snap-action)	1NC/1NO (slow-action)	2NC (slow-action)
Side rotary	Roller lever (form A)	D4B-8111N	—	—
	Adjustable roller lever	D4B-8116N	—	—
	Adjustable rod lever (form D)	D4B-8117N	—	—
Top plunger	Plain (form B)	—	—	—
	Roller (form C)	D4B-8171N	—	D4B-8A71N
Wobble lever	Coil spring	—	—	—
	Plastic rod	—	—	—

bold = safety limit switch, mechanical form lock

Specifications

Item		Snap-action	Slow-action
Durability ^{*1}	Mechanical	30,000,000 operations min.	10,000,000 operations min.
	Electrical	500,000 operations min. (at a 250 VAC, 10 A resistive load)	
Operating speed		1 mm/s to 0.5 m/s	
Operating frequency		Mechanical: 120 operations/min Electrical: 30 operations/min	
Rated frequency		50/60 Hz	
Contact resistance		25 mΩ max. (initial value)	
Pollution degree (operating environment)		3 (EN60947-5-1)	
Conditional short-circuit current		100 A (EN60947-5-1)	
Conventional enclosed thermal current (I _{th})		20 A (EN60947-5-1)	
Protection against electric shock		Class I (with ground terminal)	
Ambient temperature		Operating: -40 to 80°C (with no icing) ^{*2}	
Degree of protection		IP67 (EN60947-5-1)	

^{*1} The durability is for an ambient temperature of 5 to 35°C and ambient humidity of 40 to 70%. For further conditions, consult your Omron sales representative.

^{*2} -25 to 80°C for the flexible-rod type.







Safety-limit switch with manual reset

The D4NR family is a complete line-up of safety-limit switches with manual reset. They are available with one, two or three built-in contacts and a wide range of actuator types. To set up easy installation and maintenance, various conduit types, e.g. M20 and M12 connector types, are provided.

- Direct opening mechanism
- Various actuators
- Pull-reset switches
- Gold-plated contacts for handling micro loads
- Metric conduit types available

Ordering information

Switches		Conduit size		Order code	
				Built-in switch mechanism	
				1NC/1NO (slow-action)	2NC/1NO (slow-action)
	Roller lever (resin lever, resin roller)	1-conduit	M20	D4N-4A20R	D4N-4C20R
			M12 connector	D4N-9A20R	—
	Adjustable roller lever, form lock (metal lever, rubber roller)	1-conduit	M20	D4N-4A2HR	D4N-4C2HR
			M12 connector	D4N-9A2HR	—
	Plunger	1-conduit	M20	D4N-4A31R	D4N-4C31R
			M12 connector	D4N-9A31R	—
	Roller plunger	1-conduit	M20	D4N-4A32R	D4N-4C32R
			M12 connector	D4N-9A32R	—
		2-conduit	M20	D4N-8A31R	D4N-8C31R
			M20	D4N-8A32R	D4N-8C32R

Note: Conduit types with G1/2, 1/2-14NPT and Pg13,5 are also available.

Specifications

Degree of protection		IP67 (EN60947-5-1)
Durability	Mechanical	1,000,000 operations min.
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC 300,000 operations min. for a resistive load of 10 A at 250 VAC
Operating speed		1 mm/s to 0.5 m/s (D4N-1A20R)
Operating frequency		30 operations/minute max.
Protection against electric shock		Class II (double insulation)
Pollution degree (operating environment)		3 (EN60947-5-1)
Contact gap		Snap-action: 2×0.5 mm min Slow-action: 2×2 mm min
Rated open thermal current (I_{th})		10 A (EN60947-5-1)
Ambient temperature		Operating: -30°C to 70°C with no icing



Emergency stop switch

The A165E line-up offers E-Stop switches with various head types. For flexible application, a wide range of accessories is provided. To set up easy installation and maintenance, various contact combinations are available.

- Direct opening mechanism with minimum contact separation of 3 mm
- Safety lock mechanism prevents misuse
- Short mounting depth
- Modular construction; easy installation using snap-in switch

Ordering information

Switches	Rated voltage	Pushbutton color	Pushbutton size	Terminal	Contact	Order code Standard load (125 VAC at 5 A, 250 VAC at 3 A, 30 VDC at 3 A)
LED	24 VDC	Red	30 dia.	Solder terminal	SPST-NC	A165E-LS-24D-01
None	—				DPST-NC	A165E-LS-24D-02
					SPST-NC	A165E-S-01
					DPST-NC	A165E-S-02
LED	24 VDC		40 dia.		TPST-NC	A165E-S-03U
					SPST-NC	A165E-LM-24D-01
					DPST-NC	A165E-LM-24D-02
None	—				SPST-NC	A165E-M-01
					DPST-NC	A165E-M-02
					TPST-NC	A165E-M-03U

Note: The above models have a surface indication of "RESET." Models with "STOP" indication are also available. For further information, contact your Omron representative.

Accessories (order separately)

Item	Type	Precautions	Order code
Yellow plate	Yellow, 45 dia.	Use this as an emergency stop nameplate.	A16Z-5070
Panel plug	Round	Used for covering the panel cutouts for future panel expansion.	A16ZT-3003
Tightening tool	—	Useful for repetitive mounting. Be careful not to tighten excessively.	A16Z-3004
Extractor	—	Convenient for extracting the switch and lamp.	A16Z-5080

Specifications

Rated voltage	Resistive load		Features	Characteristics
	A165E series	A165E_U series		
125 VAC	5 A	1 A	Operating force (OF) max.	14.7 N
250 VAC	3 A	0.5 A	Releasing force (RF) min.	0.1 N·m
30 VDC	3 A	1 A	Pretravel (PT)	3.5±0.5 mm (3±0.5 mm in case of A165E_U series)
Minimum applicable load	150 mA at 5 VDC	1 mA at 5 VDC		

Item		Emergency stop switch
Allowable operating frequency	Mechanical	20 operations/minute max.
	Electrical	10 operations/minute max.
Insulation resistance		100 MΩ min. (at 500 VDC)
Dielectric strength		1,000 VAC, 50/60 Hz for 1 min between terminals of same polarity 2,000 VAC, 50/60 Hz for 1 min between terminals of different polarity and also between each terminal and ground 1,000 VAC, 50/60 Hz for 1 min between lamp terminals ^{*1}
Durability	Mechanical	100,000 operations min.
	Electrical	100,000 operations min.
Ambient temperature		Operating: -10 to 55°C (with no icing or condensation) Storage: -25 to 65°C (with no icing or condensation)
Protection against electric shock		Class II

^{*1} LED not mounted. Test them with the LED removed.



Relays with forcibly guided contacts

The slim G7SA relay family with forcibly guided contacts is available as a four- or six-pole type in various contact combinations and offers reinforced insulation. Terminals are arranged for easy PCB layout. It can be soldered directly to a PCB or used together with the P7SA sockets.

- Forcibly guided contacts
- Conforms to EN 50205
- 6A at 240 VAC and 6A at 24 VDC for resistive loads
- Reinforced insulation between inputs and outputs and poles
- 4- and 6-pole relays available

Ordering information

Relays with forcibly guided contacts

Type	Sealing	Poles	Contacts	Rated voltage	Order code
Standard	Flux-tight	4 poles	3PST-NO, SPST-NC	24 VDC ^{*1}	G7SA-3A1B
			DPST-NO, DPST-NC		G7SA-2A2B
		6 poles	5PST-NO, SPST-NC		G7SA-5A1B
			4PST-NO, DPST-NC		G7SA-4A2B
			3PST-NO, 3PST-NC		G7SA-3A3B

^{*1} 12 VDC, 21 VDC, 48 VDC are available on request.

Sockets

Type	LED indicator	Poles	Rated voltage	Order code
Track-mounting	Track mounting and screw mounting possible	4 poles	24 VDC	P7SA-10F-ND
		6 poles		P7SA-14F-ND
Back-mounting	PCB terminals	4 poles	—	P7SA-10P
		6 poles		P7SA-14P

Specifications

Coil

Rated voltage	Rated current	Coil resistance	Must-operate voltage	Must-release voltage	Max. voltage	Power consumption
24 VDC	4 poles: 15 mA 6 poles: 20.8 mA	4 poles: 1,600 Ω 6 poles: 1,152 Ω	75% max. (V)	10% min. (V)	110% (V)	4 poles: Approx. 360 mW 6 poles: Approx. 500 mW

Note: Refer to datasheet for details

Contacts

Load	Resistive load (cosφ = 1)	Load	Resistive load (cosφ = 1)
Rated load	6 A at 250 VAC, 6 A at 30 VDC	Max. switching current	6 A
Rated carry current	6 A	Max. switching capacity (reference value)	1,500 VA, 180 W
Max. switching voltage	250 VAC, 125 VDC		

Relays with forcibly guided contacts

Contact resistance		100 mΩ max. (The contact resistance was measured with 1 A at 5 VDC using the voltage-drop method.)
Operating time *1		20 ms max.
Response time *1		10 ms max. (The response time is the time it takes for the normally open contacts to open after the coil voltage is turned OFF.)
Release time *1		20 ms max.
Insulation resistance		100 MΩ min. (at 500 VDC) (The insulation resistance was measured with a 500 VDC megger at the same places that the dielectric strength was measured.)
Dielectric strength *2 *3		Between coil contacts/different poles: 4,000 VAC, 50/60 Hz for 1 min (2,500 VAC between poles 3-4 in 4-pole Relays or poles 3-5, 4-6, and 5-6 in 6-pole Relays.) Between contacts of same polarity: 1,500 VAC, 50/60 Hz for 1 min
Durability	Mechanical	10,000,000 operations min. (at approx. 36,000 operations/hr)
	Electrical	100,000 operations min. (at the rated load and approx. 1,800 operations/hr)
Min. permissible load*4		5 VDC, 1 mA (reference value)
Ambient temperature *5		Operating: -40 to 85°C (with no icing or condensation)
Ambient humidity		Operating: 35 to 85%
Approved standards		EN61810-1 (IEC61810-1), EN50205, UL508, CSA22.2 No. 14

^{*1} These times were measured at the rated voltage and an ambient temperature of 23°C. Contact bounce time is not included.

^{*2} Pole 3 refers to terminals 31-32 or 33-34, pole 4 refers to terminals 43-44, pole 5 refers to terminals 53-54, and pole 6 refers to terminals 63-64.

^{*3} When using a P7SA socket, the dielectric strength between coil contacts/different poles is 2,500 VAC, 50/60 Hz for 1 min.

^{*4} Min. permissible load is for a switching frequency of 300 operations/min.

^{*5} When operating at a temperature between 70°C and 85°C, reduce the rated carry current (6 A at 70°C or less) by 0.1 A for each degree above 70°C.

Note: The values listed above are initial values.