HS3A Non-contact RFID Safety Switches

Key features:

- RFID non-contact interlock switch, Category 4 and PLe (EN/ISO 13849-1) compliant.
- The sensor head with built-in safety function (redundant solid state output with internal monitoring) eliminates the need for a designated safety module.
- RFID ensures detection of slow-moving, open, sliding, and rattling doors.
- Multicode and unicode sensor heads are available. Unicode sensor head (one sensor head corresponds to one actuator) prevents tampering with the use of an unassigned spare actuator.
- Sensor head can be installed in 5 directions.
- Degree of protection IP67. Actuator IP67, IP69K (Note)

Note: IP69K is a degree of protection specified by Deutsches Institüt für Normung (DIN), DW 40050 Part 9 for hot and high-pressure water.

Interlock Switch
(Sensor Head)

Actuator

Part Numbers

HS3A Non-contact RFID Safety Switches

Outputs	Type	Part Number
Safety output: 2 Monitor output: 1	Multicode	HS3A-H21M4
	Unicode	HS3A-H21U4

Accessories

Name			Part Number	Remarks
Actuator			HS9Z-ZH31	Actuator for both multicode and unicode sensor heads. Supplied with two M5 × 10 mounting screws (stainless steel)
Terminal Plug (For serial connection)			HS9Z-H3TP	Used on Y-branch connector when connecting two or more switches in series.
Y-branch Connector (For serial connection)			HS9Z-H3YD	Used when connecting two or more switches in series. Plug connector: 8-pin (switch side), 5-pin (cable side)
M12 Plug Connection Cable 	 For connecting two or more switches in series	5-pin, 5m	HS9Z-H3F505	Used when connecting two or more switches in series. 5-pin plug connector is provided at one end.
		5-pin, 10m	HS9Z-H3F510	
	 For connecting a single switch	8-pin, 5m	HS9Z-H3F805	Used when connecting a single switch. 8-pin plug connector is provided at one end.
		8-pin, 10m	HS9Z-H3F810	
M12 Plug Connection Cable (For serial connection) 		5-pin, 5m	HS9Z-H3F5M05	Used when connecting two or more switches in series. 5-pin plug connectors are provided at both ends.
		5-pin, 10m	HS9Z-H3F5M10	

See below for an example of accessories required when connecting N number of HS3A switches in series.

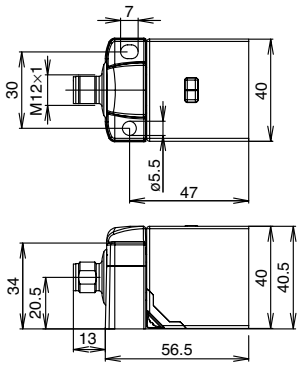
HS3A non-contact interlock switch (HS3Z-H21☐4): N pcs.
Actuator (HS9Z-ZH31): N pcs.
Terminal plug (HS9Z-H3TP): 1 pc.
Y-branch connector (HS9Z-H3YD): N pcs.
M12 plug connection cable, open end (HS9Z-H3F5☐☐): 1 pc.
M12 plug connection cable, plug connectors at both ends (HS9Z-H3F5M☐☐): N–1 pcs.

Specifications

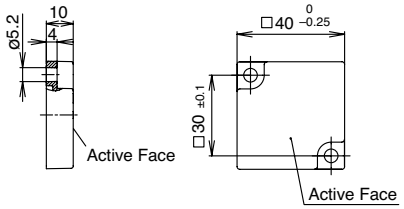
Applicable Standards		EN60947-5-3 (IFA approval) EN954-1 EN ISO13849-1 EN62061 GS-ET-14 (IFA approval) UL508 (UL listed) CSA C22.2 No.14 (c-UL listed)
Operating Temperature		–20 to +55°C (no freezing)
Relative Humidity		5 to 80% (no condensation)
Storage Temperature		–25 to +70°C
Pollution Degree		3
Sensor Classification		PDF-M (EN60947-5-3)
Performance Level (PL)		e (EN ISO 13849-1)
Safety Category		4 (EN ISO 13849-1)
Safety Integrity Level (SIL)		3 (EN 62061)
Degree of Protection	Interlock Switch (sensor head)	IP67
	Actuator	IP67, IP69K (Note)
Rated Voltage (UB)		24V DC ±15%
Current Consumption		80mA (at no load)
Dielectric Strength		500V AC
Output Specifications	Safety Output	Semiconductor output, P-channel Output voltage: Max: UB [V], Min.: UB-1.5 [V] Maximum output current per safety output: 400 mA
	Monitor Output	Semiconductor output, P-channel Output voltage: Max: UB [V], Min.: 0.8×UB [V] Maximum output current: 200 mA
Operation Distance	Turn-on Distance	15mm (typ.)
	Assured Turn-on Distance (Sao)	13mm
	Maximum Turn-off Distance (Sar)	58mm
Response Time	When using a single switch	260 ms (actuator removed)
		150 ms (non-identical input signal at IA/IB)
		150 ms (non-identical enabling input state at IA/IB)
		300 ms (short-circuit or cross-circuit at OA/OB, or internal error)
	When using two or more switches (max.)	360 ms (actuator removed)
		250 ms (non-identical input signal at IA/IB)
		400 ms (non-identical enabling input state at IA/IB)
		400 ms (short-circuit or cross-circuit at OA/OB, or internal error)
Shock Resistance		Operating extremes: 300 m/s^2 (11 ms)
Vibration Resistance		10 to 55 Hz, amplitude 0.5 mm
Material		PBT
Cable		M12 plug connection cable, 8-pin
Weight (approx.)		400g (HS3A-H21☐☐)
Attachment		System Manual (CD-ROM)

Dimensions (mm)

Sensor Head

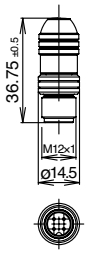


Actuator

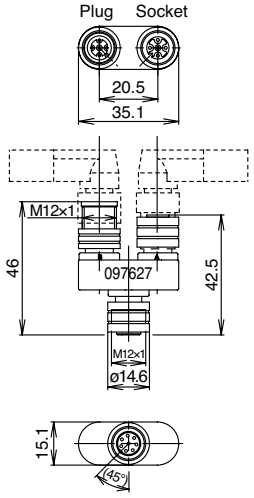


Supplied with two mounting screws (M5 × 10).

Terminal Plug HS9Z-H3TP

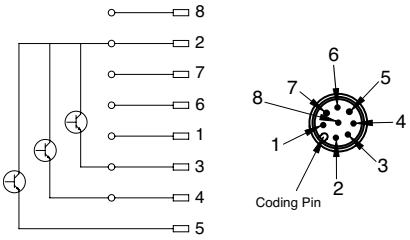


Y-branch Connector HS9Z-H3YD



Specifications

Non-contact Interlock Switch



Plug Connection Cable

HS9Z-H3FB

Pin	Wire	Legend	Description
1	White	IB	Enabling input (channel 2)
2	Brown	UB	Power supply (24V DC)
3	Green	OA	Safety output (channel 1)
4	Yellow	OB	Safety output (channel 2)
5	Gray	OUT	Monitoring output
6	Pink	IA	Enabling input (channel 1)
7	Blue	0V	0V
8	Red	RST	Reset input for hardware

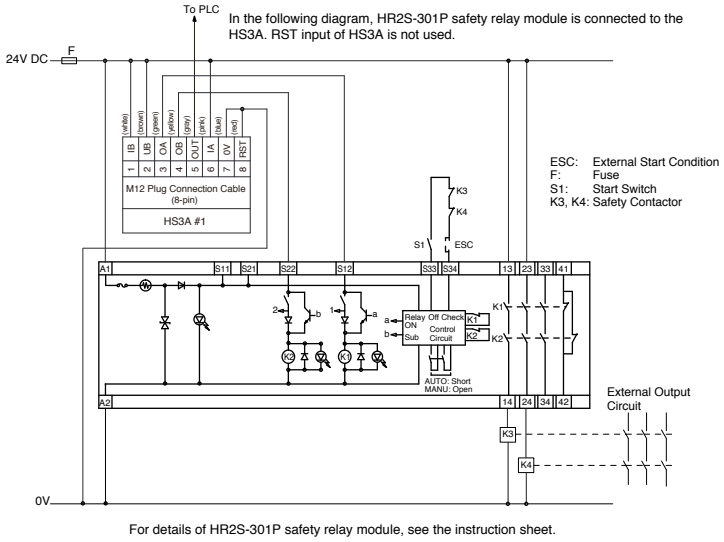
HS9Z-H3FS

Pin	Wire	Legend
1	Brown	UB
2	White	OA
3	Blue	0V
4	Black	OB
5	Gray	RST

Wiring Diagram

When using a single HS3A

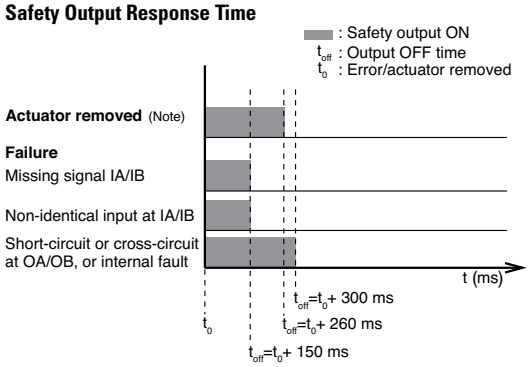
When using a single HS3A, connect as shown in the figure below (Note). The OUT output can be connected to a control system, to a PLC for example, as a monitoring output.
The HS3A can be reset via the RST input. To reset, apply 24V DC for at least 3 seconds. When not using the RST input, connect the RST input to 0V.



For details of HR2S-301P safety relay module, see the instruction sheet.

Note: Safety performance of the actual system is determined by performing a risk assessment on the entire system. Depending on the risk level the system may entail, K1 and K2 need to be monitored to prevent serious accidents.

Safety Output Response Time



Note: The time required for the safety output to turn off after the actuator moves outside the operating distance of the HS3A switch.

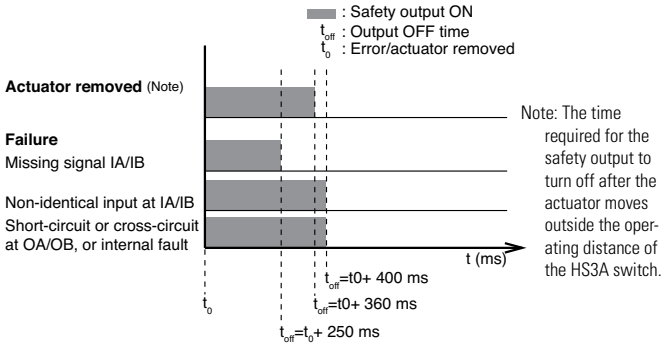
When using two or more HS3A in series

A maximum of 20 can be connected in series.
Pay attention to the contact resistance at the connection points.

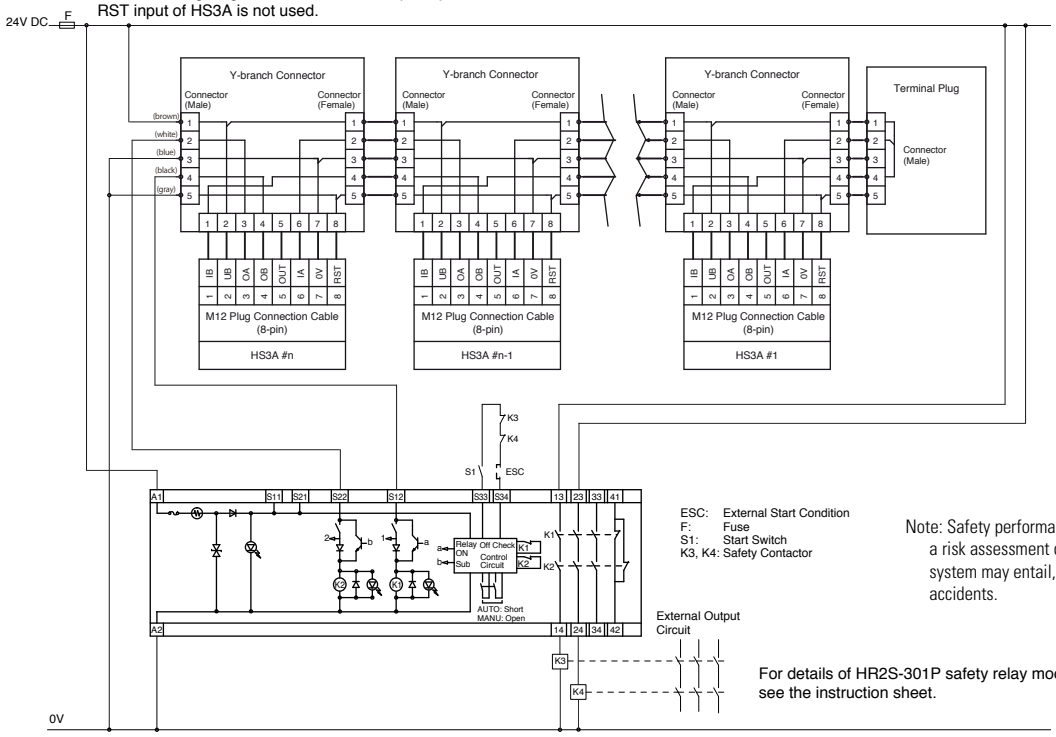
The HS3A switches can be connected in series using plug connection cables and Y-branch connectors as shown in the figure below (Note). When any of the HS3A switches detects that the safety guard is open, or when a failure has occurred on any of the switches, the system tuns off the machine. However, the external control system cannot detect which safety guard is open or where a failure has occurred.

The HS3A can be reset via the RST input. To reset, apply 24V DC for at least 3 seconds. When not using the RST input, connect the RST input to 0V.

Safety Output Response Time



In the following diagram, HR2S-301P safety relay module is connected to the HS3A.
RST input of HS3A is not used.



ESC: External Start Condition
F: Fuse
S1: Start Switch
K3, K4: Safety Contactor

Note: Safety performance of the actual system is determined by performing a risk assessment on the entire system. Depending on the risk level the system may entail, K1 and K2 need to be monitored to prevent serious accidents.

For details of HR2S-301P safety relay module, see the instruction sheet.

Operation Distance and Response Time

When installing the HS3A, ensure the safety of the door opening area by paying attention to the operation distance (Table 1) and response time (Table 2) shown below.

Table 1: Operation Distance [1]

Distance	Value (mm)		
	Min.	Typ.	Max.
Turn-on distance	—	15 [2]	—
Assured turn-on distance Sa0	13	—	—
Switching hysteresis	1.5	2.5	—
Assured turn-off distance Sar	—	—	58

1. When the off-center displacement of the interlock switch (sensor head) and actuator is 0 mm.
2. When surface-mounted on aluminum. When using by embedding in metal, pay attention to the operation distance affected by the metal. In non-metallic environment, the typical turn-on distance increases to 30mm.

Table 2: Response Time

Response Time	When connecting a single switch (max.)	260 ms (actuator removed)
		150 ms (missing enabling input IA/IB)
		150 ms (non-identical enabling input state at IA/IB)
		300 ms (short-circuit or cross-circuit at OA/OB, or internal fault)
	When connecting two or more switches (max.)	360 ms (actuator removed)
		250 ms (missing signal enabling input IA/IB)
		400 ms (non-identical enabling input state at IA/IB)
		400 ms (short-circuit or cross circuit at OA/OB or internal fault)

Note: To ensure safety, both safety outputs (OA and OB) must always be evaluated. Single-channel use of the safety outputs as shown below leads to a reduction of safety category stipulated in EN954-1.