HFGA1 SAFETY RELAY MODULE

Features

- Safety relay modules for monitoring emergency stop switches, safety electromagnetic switches, safety light grids, and safety door switches;
- Redundant design of internal circuits, even if a single component fails, the safety function can still be maintained;
- With built-in self-detection function, each start and stop cycle automatically detects the normal action and release of the internal relay;
- Non-delayed contacts, up to 4 safety contacts output, manual or automatic reset;
- Meet the requirements of EN 60947-5-1 and EN60204-1, the safety performance level can reach the PL e level of EN ISO 13849-1, meet the requirements of EN IEC 62061 safety integrity SIL 3, and meet the requirements of EN 61508 SIL 3;
- Pluggable screw terminals or spring-loaded terminals are optional.

Product Safety Functional Safety TÜVRheinland CERTIFIED www.tuv.com ID 0000000000

c UL us LISTED IND.CONT.EQ. ES17149

CE

认证号 ：N8A 053286 0058 Rev. 00 认证号 ：2021000303000047

SIL3 EN 61508 EN IEC 62061

PL e EN ISO13849-1

Cat.4 EN ISO13849-1

CHARACTERISTICS

INPUT

Nominal voltage	24VAC/VDC
Nominal voltage deviation range	-15% ～ 10%
Frequency range(AC)	50Hz ～ 60Hz
Power consumption	2 Poles:≤3.5VA/1.7W
	4 Poles:≤5.1VA/2.4W
wiring polarity	Polar(pay attention to wiring polarity
Terminal type	Terminal block(See Annex)

OUTPUT

Max. Rated output power	144W(24VDC,τ=0ms)
	144W(24VDC,τ=40ms)
	1500VA(250VAC,cosφ=1)
	1200VA(250VAC,cosφ=0.4)
Operating time (@rated voltage)	≤100ms
Release time (@rated voltage)	≤45ms
Recovery Time	≤0.5s
Minimum switching voltage	15VDC/VAC
Minimum switching power	0.4W
contact load(Res. load)	6A 24VDC/5A 230VAC

Terminal type		Terminal block(See Annex)		
Machanical endurance		10^7OPS (Operate frequence7200OPS/h)		
B10d DC13,Ue=24V	Ie	6A	3A	1A
	Cycles	300000	2000000	7000000
B10d AC15,Ue=250V	Ie	5A	3A	1A
	Cycles	200000	230000	380000

PILOT DUTY

Rating code	Continuous current	Voltage	Make/Break current
B300	5.0A	120VAC	30A/3.0A
		240VAC	15A/1.5A
C300	2.5A	120VAC	15A/1.5A
		240VAC	7.5A/0.75A
R300	1.0A	125VDC	0.22A
		250VDC	0.11A

ENVIRONMENTAL AND SAFETY REGULATIONS

Ambient temperature		-20～55℃
Storage temperature		-20～85℃
Mounting	Mode	DIN35mm
	Requirement	Installation location:IP54
Standard compliance		EN 60947-5-1、EN IEC 62061 EN ISO 13849-1、EN 61508
Rated impulse withand voltage		4kV
Vibration resistance		10Hz ～ 55Hz 1.5mm DA
Rated insulation voltage		250VAC
Pollution degree		2
Surge voltage category		III
Pollution degree	Terminal	IP20
	Shell	IP40

Safety instructions

●Please follow the safety regulations of electrical engineering, industrial safety and responsible units.
●Ignoring these safety regulations may result in death, serious personal injury or damage to equipment!
●Commissioning, installation, modification and update can only be done by professional electrical engineers!
●Operate in a closed control cabinet that meets IP54
●Turn off the power supply before working on the equipment!
●In emergency stop applications, a high-level control system must be used to avoid automatic restart of the equipment
●Dangerous voltages may be present on the components of electrical switchgear during operation!
●The maintenance of the equipment, especially the opening of the casing, must only be done by the manufacturer.
●When operating the relay module, on the contact side, the operator must follow the EMC standard EN 61000-6-4 for electrical and electronic equipment, and take appropriate measures if required
●A suitable and effective protection circuit needs to be provided for inductive loads (such as contactors, solenoid valves, motors, etc.); the protection circuit is connected in parallel with the load and not in parallel with the switch contacts.
● When at least one of the two input channel circuits is opened, the contacts switch to safe mode; the module can only be opened again after both input channel circuits are opened and closed.

ORDERING INFORMATION

	HFGA1	X-	XXXX-	XXX	(XXX)

Type

Product features
A: Basic function
B: Basic function+start monitoring
C: Multi function input
D: Multi function input+start monitoring
E: Two hands control
G: Contact extension module

Contact arrangement (1)
2H: 2 form A
1H1D: 1 form A+1 form B
3H1D: 3 form A+1 form B
4H: 4 form A
4H1D: 4 form A+1 form B

Nominal voltage
U24：24VAC/DC

Special code (2) **Nil:** Standard **XXX**：Customer special requirement

Notes: (1) Existing product model specifications are limited to the model list in the selection guide below;
(2) Special requirements of customers will be expressed as special codes after being evaluated by hongfa；such as: 013 characteristic number is the spring type terminal model.

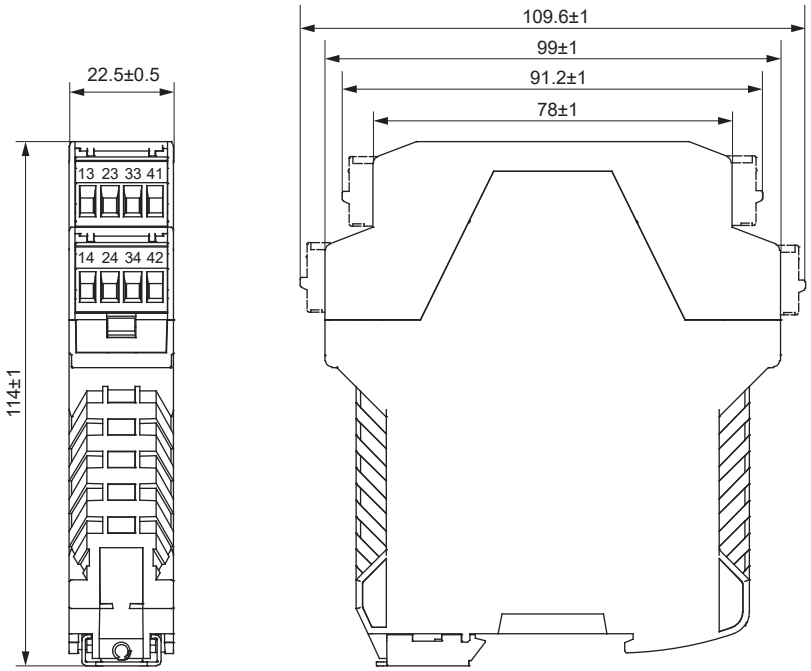
Selection Guide

Type	Input device								Output contact			Reset mode
	Emmergency stop switch	Safety door	Enable switch	Safety carpet	safety light grids	Non-contact safety door switch (OSSD)	Electromag-netic switch	Two hand control switch	Safety contact	time delay contact	Auxiliary contact	
HFGA1/A-1H1D-U24	√	√	√	√	—	—	—	—	1	—	1	Automatic/manual
HFGA1/A-2H-U24	√	√	√	√	—	—	—	—	2	—	0	Automatic/manual
HFGA1/A-3H1D-U24	√	√	√	√	—	—	—	—	3	—	1	Automatic/manual
HFGA1/A-4H-U24	√	√	√	√	—	—	—	—	4	—	0	Automatic/manual
HFGA1/B-1H1D-U24	√	√	√	√	—	—	—	—	1	—	1	Automatic/manual Start monitoring
HFGA1/B-2H-U24	√	√	√	√	—	—	—	—	2	—	0	Automatic/manual Start monitoring
HFGA1/B-3H1D-U24	√	√	√	√	—	—	—	—	3	—	1	Automatic/manual Start monitoring
HFGA1/B-4H-U24	√	√	√	√	—	—	—	—	4	—	0	Automatic/manual Start monitoring
HFGA1/C-3H1D-U24	√	√	√	√	√	√	√	—	3	—	1	Automatic/manual
HFGA1/D-2H-U24	√	√	√	√	√	√	√	—	2	—	0	Automatic/manual Start monitoring
HFGA1/E-3H1D-U24	√	√	√	√	—	—	—	√	3	—	1	Automatic/manual
HFGA1/G-4H1D-U24	Contact extension module								4	—	1	Automatic/manual
HFGA3/B-7H1D-U24	√	√	√	√	√	√	—	—	7	—	1	Automatic/manual Start monitoring

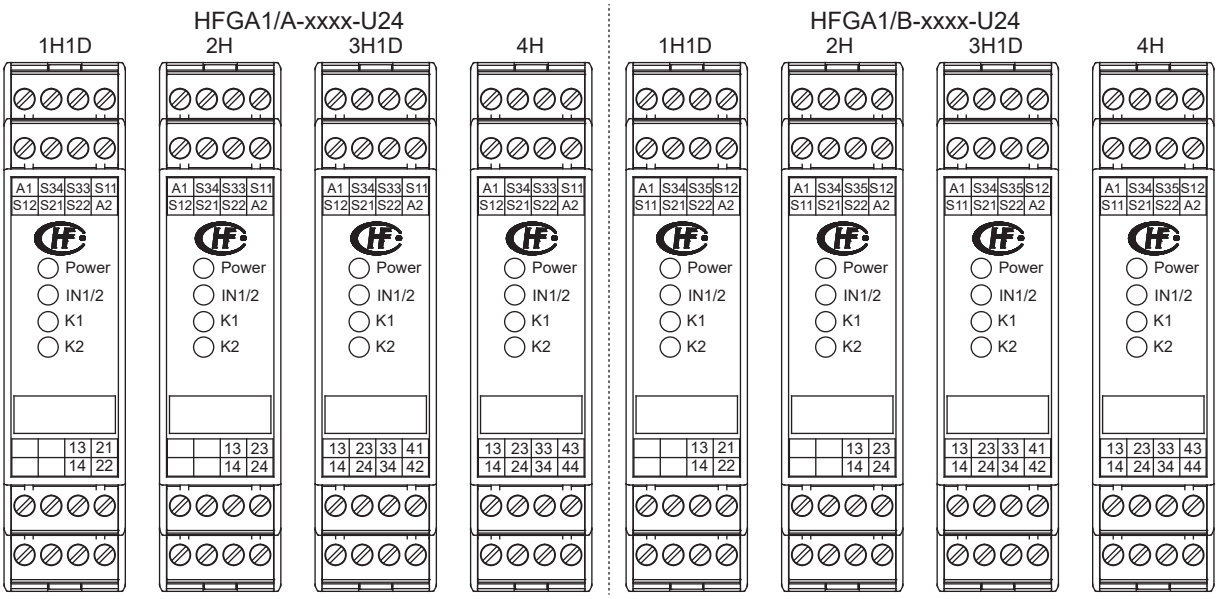
Note: "Gray section" indicates models that are not included in the current series.

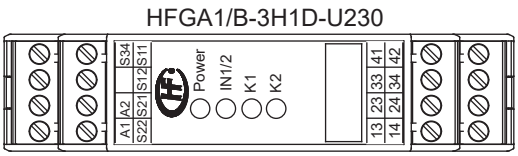
OUTLINE DEMENSIONS,WIRING ID DIAGRAM

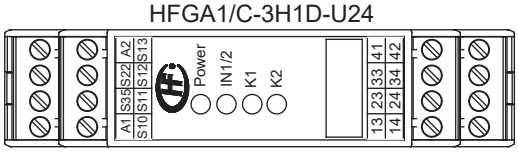
Unit：mm

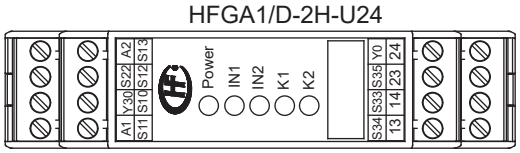


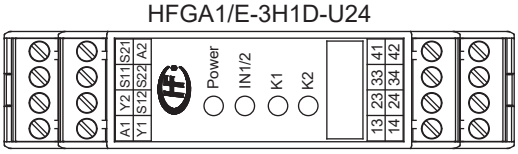
Wiring ID diagram

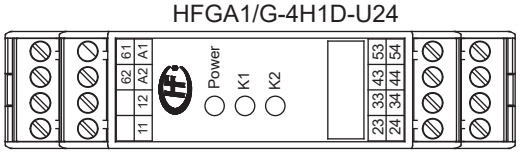










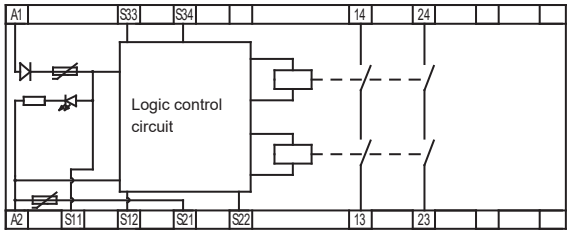


Remarks: The labels shown in the above figure are the same as those of the typical wiring diagram (see the actual identification for details)

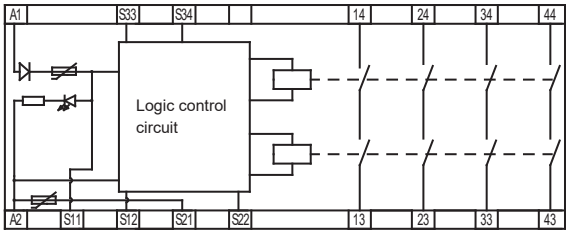
WIRING DIAGRAM,LOGICAL TIME SERIES DIAGRAM

HFGA1/A-xxxx-U24

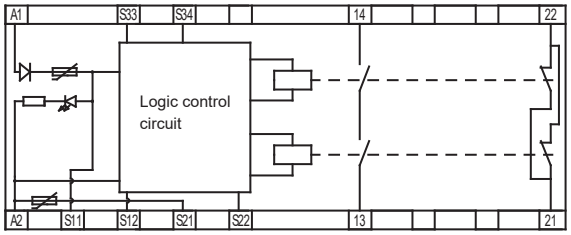
2H



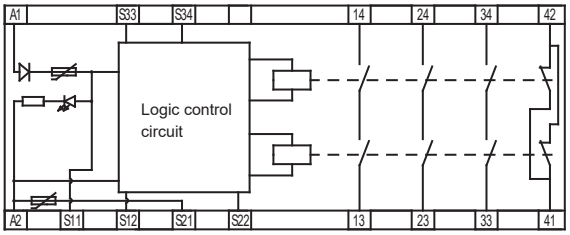
4H



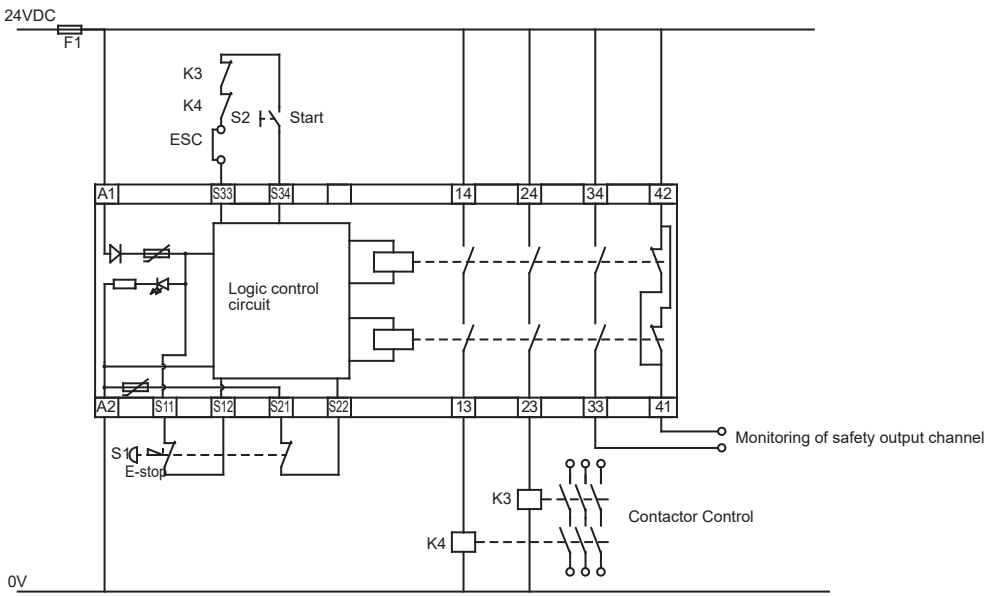
1H1D



3H1D

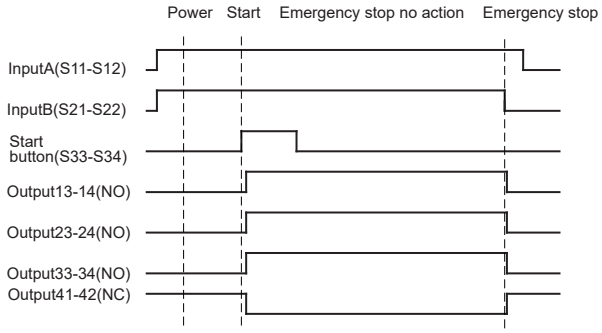


Wiring diagram connected to an emergency stop button with two normally closed contacts (3H1D is used as an example)

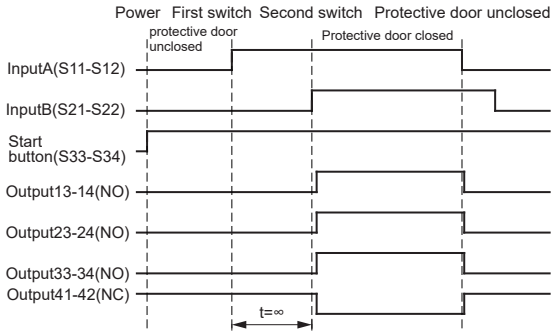


ESC=External start condition

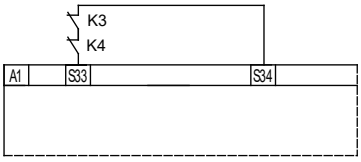
HFGA1/A Logic timing diagram of emergency stop function



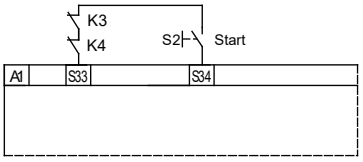
HFGA1/A Logic sequence diagram of safety door monitoring function with automatic start



Wiring of HFGA1/A automatic or manual start (reset) function:

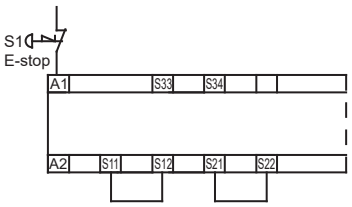


Autostart

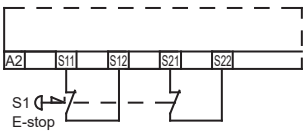


Manual start

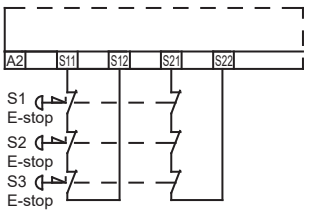
Typical example of HFGA1/A emergency stop monitoring function:



Notes：
(1) Emergency stop button with a normally closed contact;
(2) Unable to detect all faults: Short circuit on emergency stop button cannot be detected.

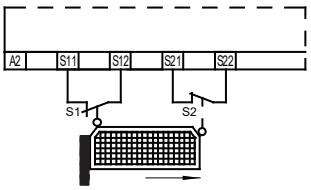


Notes：
(1) Emergency stop button with two normally closed contacts;
(2) The 2 input channels are connected to the different poles. A short circuit between the 2 inputs can be detected.



Notes：
(1) Multiple emergency stop buttons with two NC contacts (recommended application);
(2) The 2 input channels are connected to different poles and a short circuit between the 2 inputs can be detected.

Example of security door monitoring

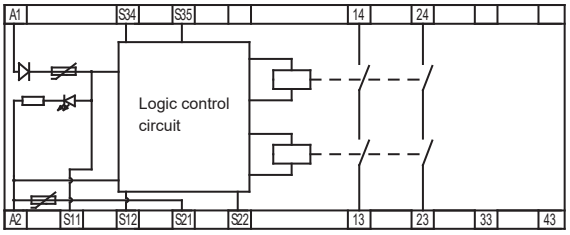


Notes：Monitors movable guard doors connected by 2 limit switches, each with 1 contact in combination mode.
(Switch S1 and S2 with normally closed contacts)

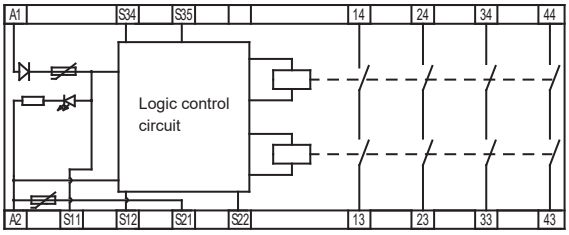
WIRING DIAGRAM,LOGICAL TIME SERIES DIAGRAM

HFGA1/B-xxxx-U24

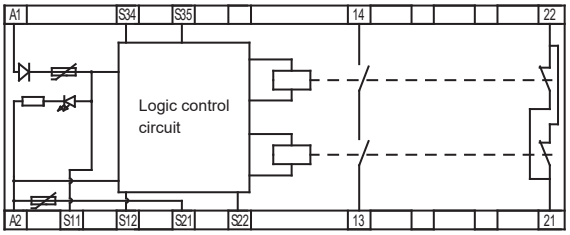
2H



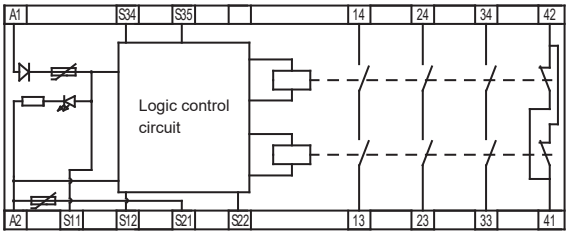
4H



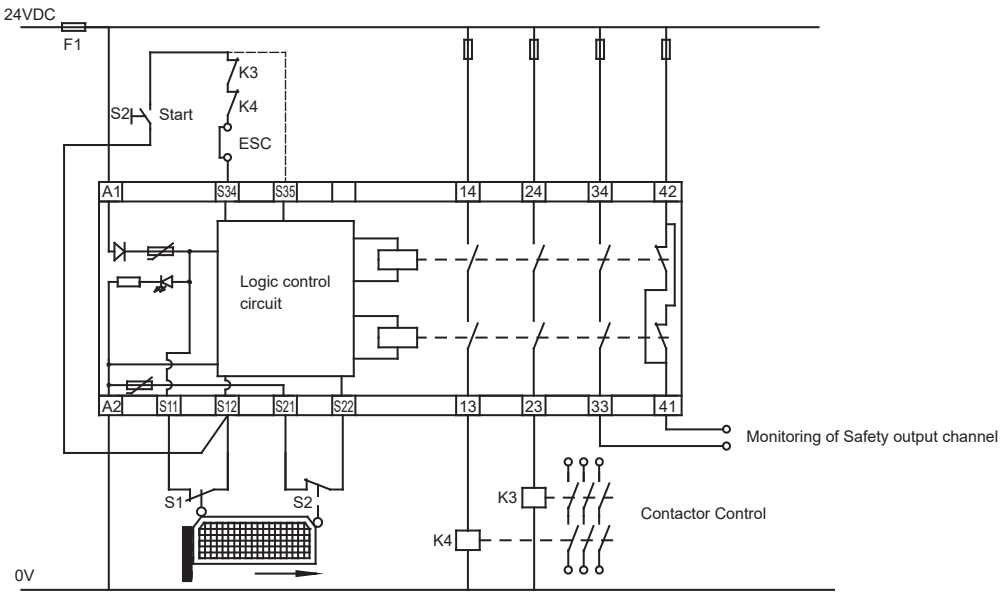
1H1D



3H1D

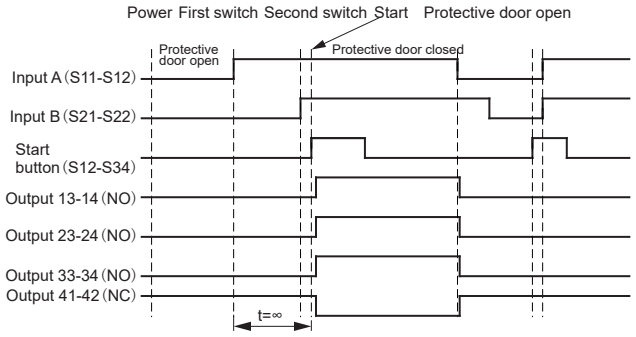


Wiring diagram of HFGA1/B connected to a safety door with two normally closed (take 3H1D as an example)

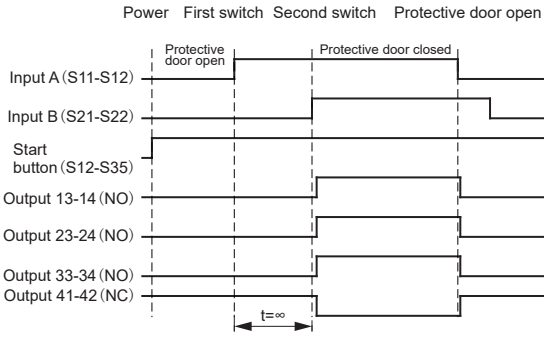


ESC=External start condition

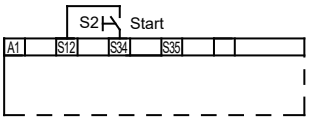
HFGA1/B-XXXX-U24 Logic timing diagram of emergency stop function with start monitoring



HFGA1/B-XXXX-U24 Logic sequence diagram of safety door monitoring function with automatic start



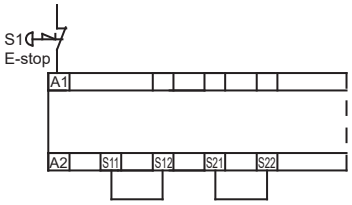
Wiring of HFGA1/B-XXXX-U24 automatic or manual start (reset) function:



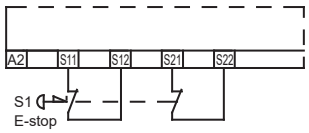
Manual start (with start monitoring)

Autostart

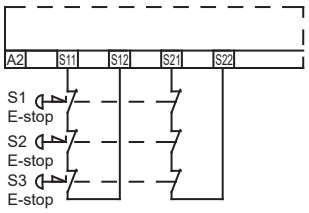
Typical example of HFGA1/B-XXXX-U24 emergency stop function



Notes：
(1) Emergency stop button with a normally closed contact;
(2) Unable to detect all faults: Short circuit on emergency stop button cannot be detected.

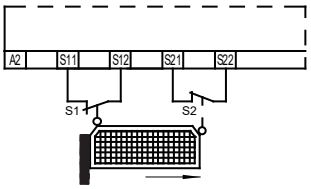


Notes：
(1) Emergency stop button with two normally closed contacts;
(2) The 2 input channels are connected to the different poles. A short circuit between the 2 inputs can be detected.



Notes：
(1) Multiple emergency stop buttons with two NC contacts (recommended application);
(2) The 2 input channels are connected to different poles and a short circuit between the 2 inputs can be detected.

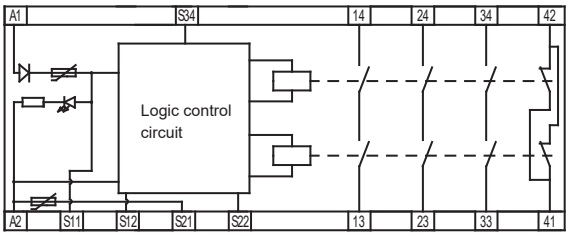
Example of security door monitoring



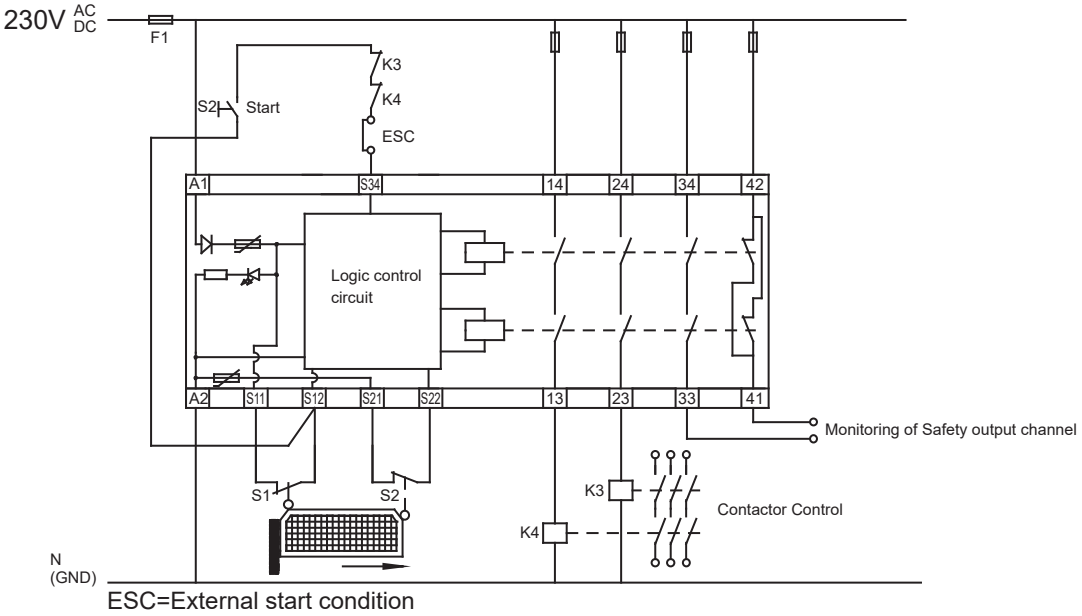
Notes：Monitors movable guard doors connected by 2 limit switches, each with 1 contact in combination mode.
(Switch S1 and S2 with normally closed contacts)

WIRING DIAGRAM,LOGICAL TIME SERIES DIAGRAM

HFGA1/B-3H1D-U230



Wiring diagram of HFGA1/B connected to a safety door with two normally closed

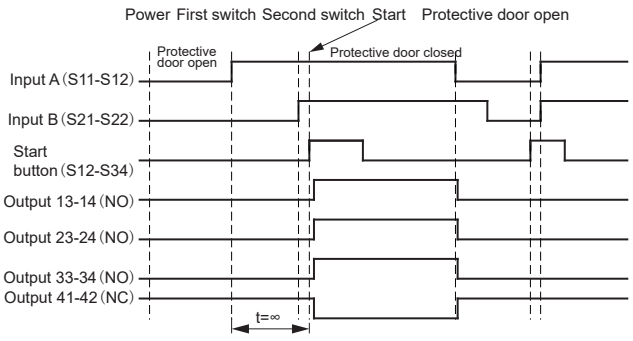


ESC=External start condition

HFGA1/B-XXXX-U24 Logic sequence diagram of safety door monitoring function with automatic start

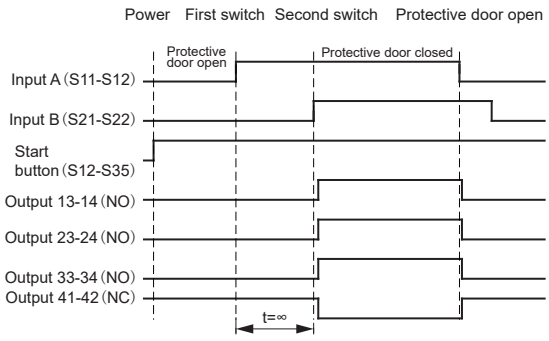
HFGA1/B-3H1D-U230

Safety gate monitoring with start-up monitoring Functional logic timing diagram

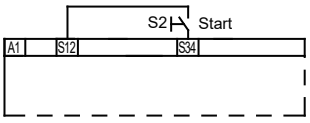


HFGA1/B-3H1D-U230

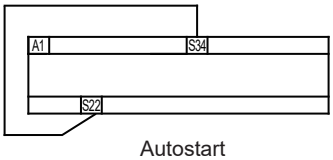
Logical timing diagram of the safety gate monitoring function with automatic start



HFGA1/B-3H1D-U230automatic or manual start (reset) function:

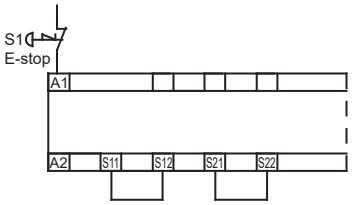


Manual start (with start monitoring)

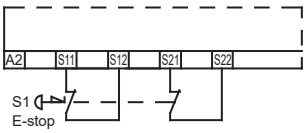


Autostart

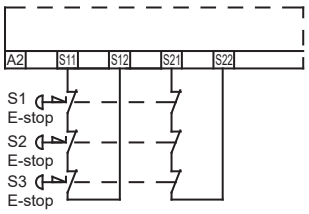
Typical example of HFGA1/B-3H1D-U230 emergency stop function



Notes：
(1) Emergency stop button with a normally closed contact;
(2) Unable to detect all faults: Short circuit on emergency stop button cannot be detected.

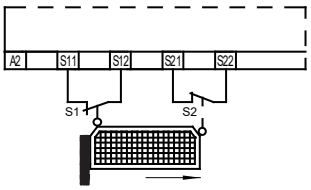


Notes：
(1) Emergency stop button with two normally closed contacts;
(2) The 2 input channels are connected to the different poles. A short circuit between the 2 inputs can be detected.



Notes：
(1) Multiple emergency stop buttons with two NC contacts (recommended application);
(2) The 2 input channels are connected to different poles and a short circuit between the 2 inputs can be detected.

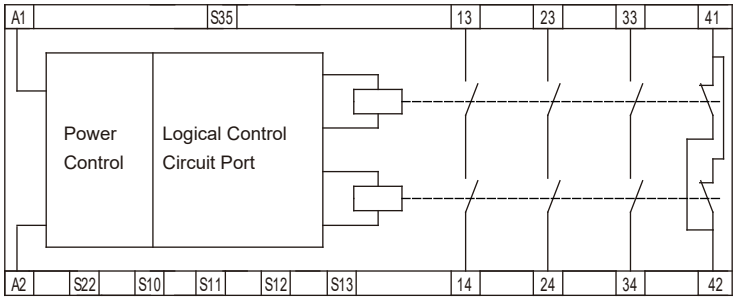
Example of security door monitoring



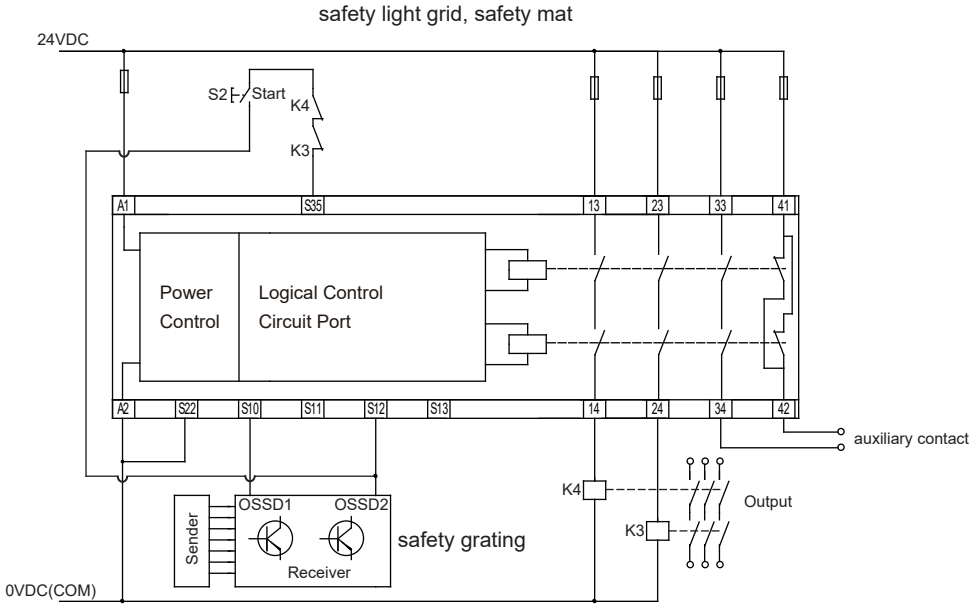
Notes：Monitoring of movable protective doors connected by 2 limit switches, each with 1 contact in combination mode (switches S1, S2 with normally closed contact)

WIRING DIAGRAM,LOGICAL TIME SERIES DIAGRAM

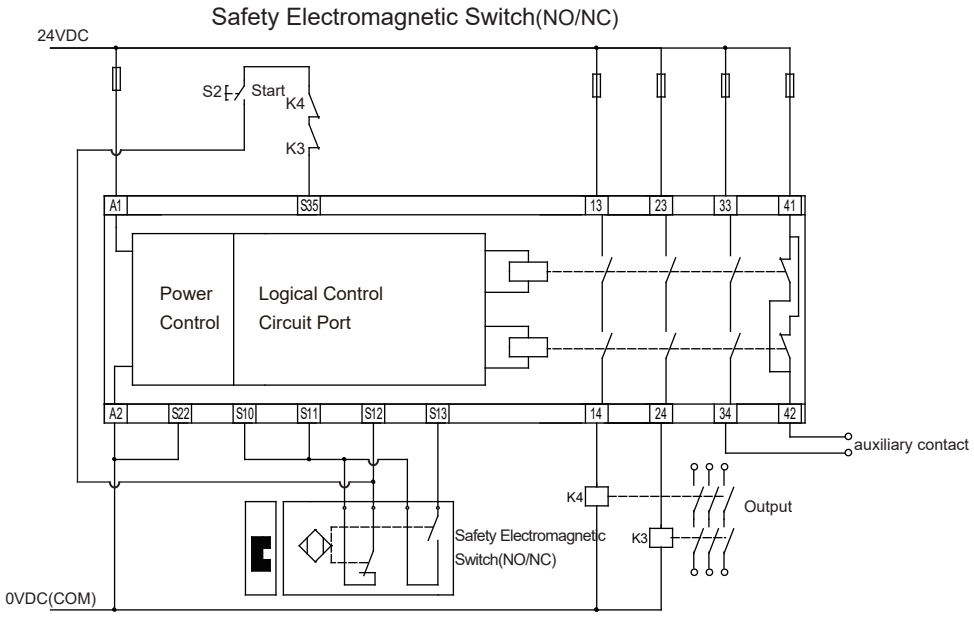
HFGA1/C-3H1D-U24



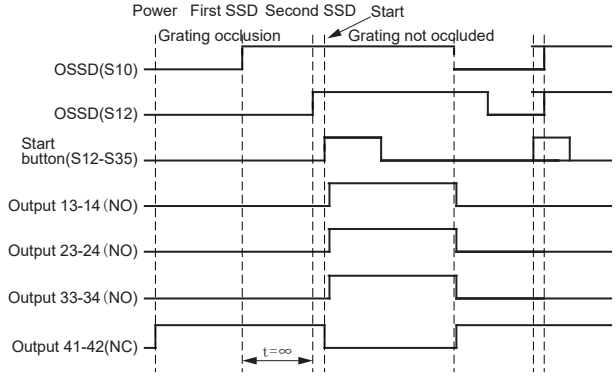
HFAG1/C monitoring safety light grid wiring diagram (3H1D)



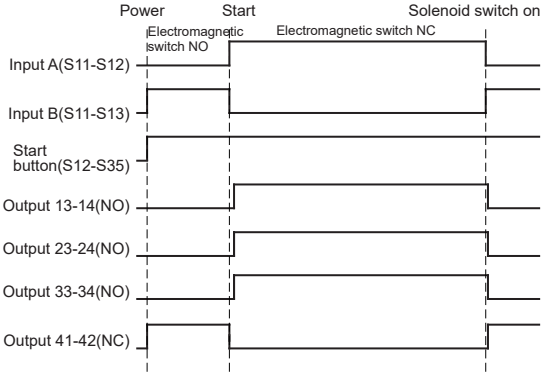
HFGA1/C Safety Electromagnetic Switch Wiring Diagram (3H1D)



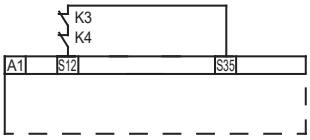
HFGA1/C Logic timing diagram of safety light grid monitoring function



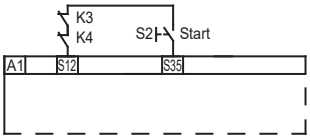
HFGA1/C Logic timing diagram of the monitoring function of the safety solenoid switch with automatic activation



Wiring for HFAG1/C automatic or manual start function



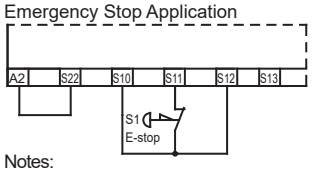
Autostart



Manual start

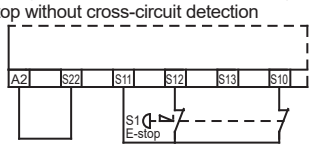
Typical example of HFGA1/C emergency stop monitoring function

Wiring Example for Single Channel Emergency Stop Application



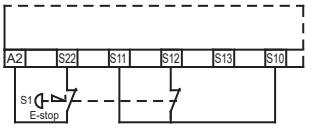
Notes:
(1) Emergency stop button with one normally closed contact
(2) Not all faults can be detected:
A short circuit on the emergency stop button cannot be detected.

Wiring example of dual-channel emergency stop without cross-circuit detection



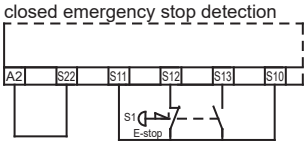
Notes:
(1) Emergency stop button with two normally closed contacts.
(2) 2 input channels are connected to the same pole.
A short circuit between the 2 inputs cannot be detected.

Wiring example of dual-channel emergency stop with cross-short-circuit detection



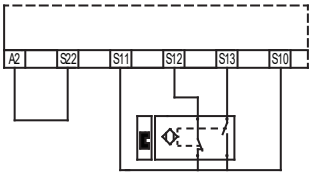
Notes:
(1) Emergency stop button with two normally closed contacts(recommended application).
(2) The 2 input channels are connected to different poles.Short circuit between 2 inputs can be detected.

Wiring example of one open and one closed emergency stop detection



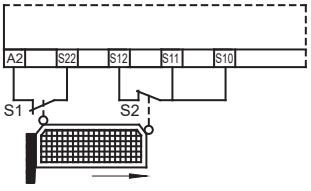
Notes:
(1) Emergency stop button with one normally open and one normally closed contact.
(2) 2 input channels are connected to the same pole.
A short circuit between the 2 inputs cannot be detected.

Example of Magnetic Switch Detection Wiring



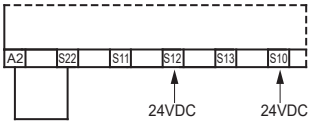
Notes:
(1) Solenoid switch with one normally open and one normally closed contact.
(2) 2 input channels are connected to the same pole.
A short circuit between the 2 inputs cannot be detected.

Wiring example for 2-channel safety door with cross-short detection



Notes:
For monitoring the movable protective door connected with 2 limit switches, each limit switch has a contact in combination mode (switches S1\S2 have normally closed contacts)

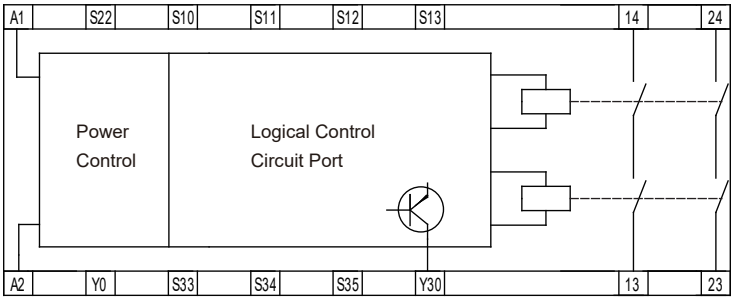
Dual-channel OSSD active input wiring example



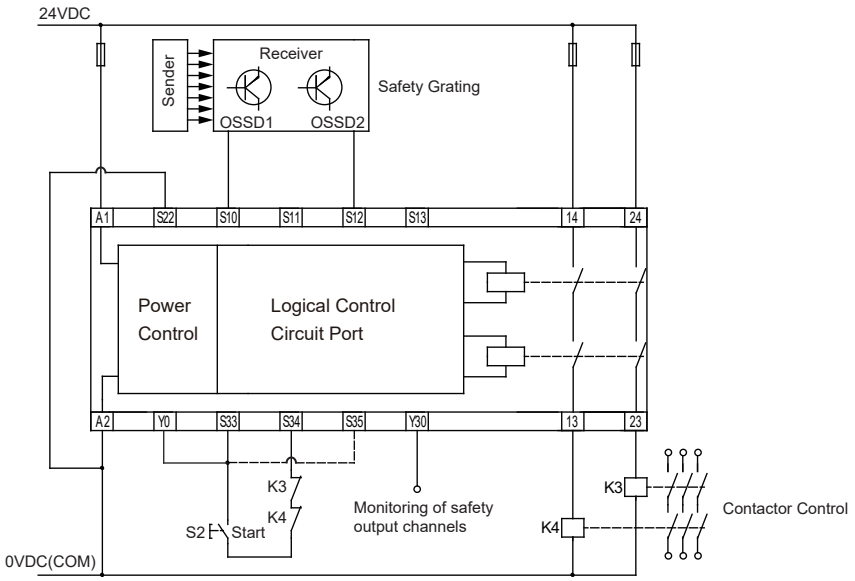
Notes:
For the monitoring of 2 24VDC power signal sources, such as the application of safety light grid, monitor OSSD1 and OSSD2 level signals.

WIRING DIAGRAM,LOGICAL TIME SERIES DIAGRAM

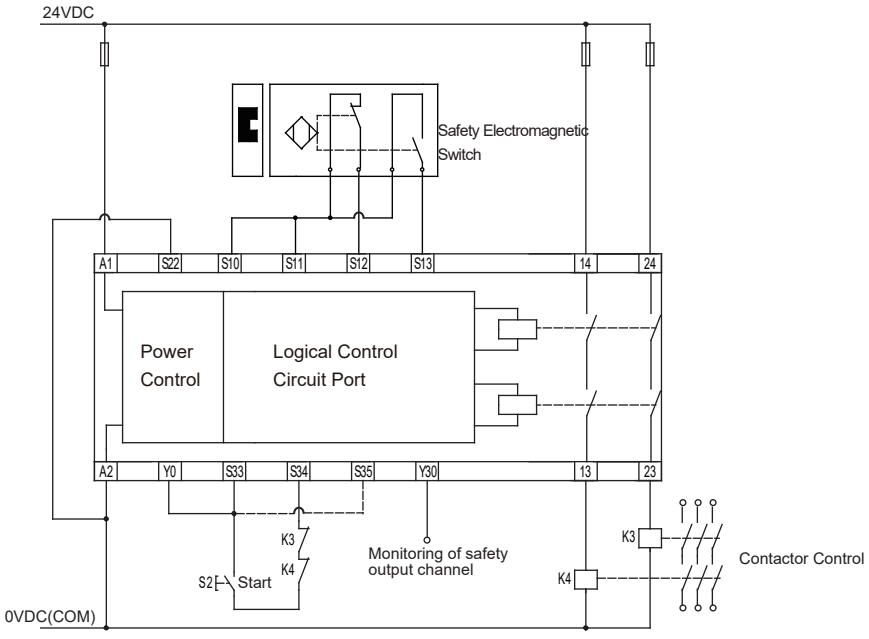
HFGA1/D-2H-U24



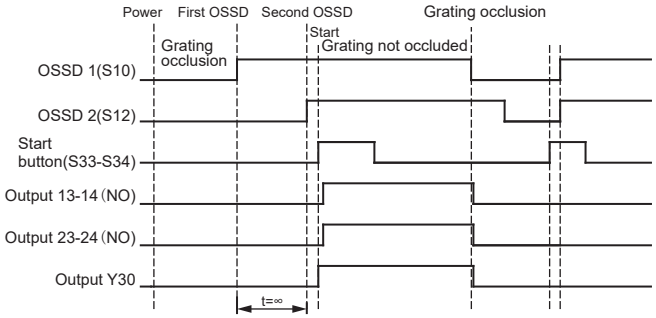
HFGA1/D Monitoring Safety Lighting Wiring Legend (2H)



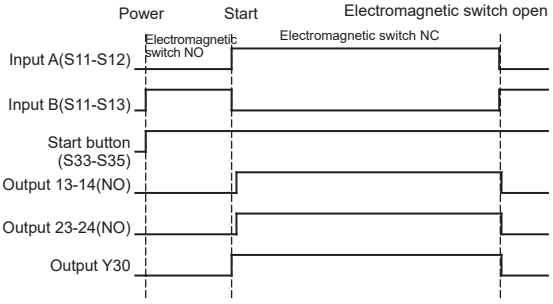
HFGA1/D Monitoring Safety Electromagnetic Switch Wiring Diagram (2H)



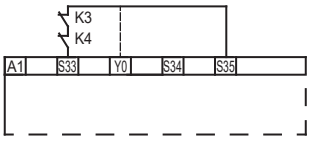
HFGA1/D Safety light grid monitoring function logic sequence diagram



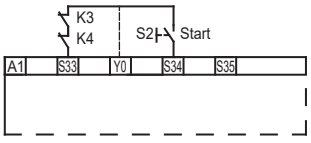
HFGA1/D Logic timing diagram of safety solenoid switch monitoring function with automatic start



Wiring of the HFGA1/D automatic or manual start function



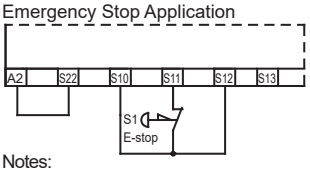
Autostart



Manual start (with start monitoring)

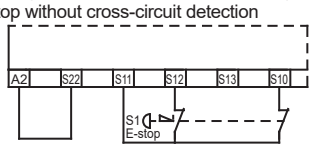
Typical example of HFGA1/D emergency stop monitoring function

Wiring Example for Single Channel Emergency Stop Application



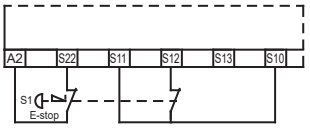
Notes:
(1) Emergency stop button with one normally closed contact
(2) Not all faults can be detected:
A short circuit on the emergency stop button cannot be detected.

Wiring example of dual-channel emergency stop without cross-circuit detection



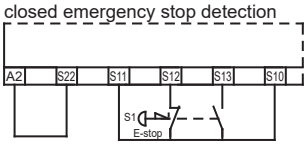
Notes:
(1) Emergency stop button with two normally closed contacts.
(2) 2 input channels are connected to the same pole.
A short circuit between the 2 inputs cannot be detected.

Wiring example of dual-channel emergency stop with cross-short-circuit detection



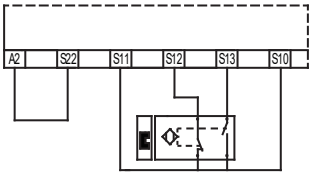
Notes:
(1) Emergency stop button with two normally closed contacts(recommended application).
(2) The 2 input channels are connected to different poles.Short circuit between 2 inputs can be detected.

Wiring example of one open and one closed emergency stop detection



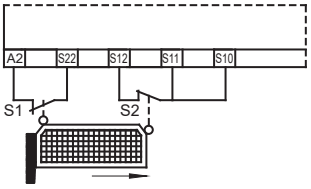
Notes:
(1) Emergency stop button with one normally open and one normally closed contact.
(2) 2 input channels are connected to the same pole.
A short circuit between the 2 inputs cannot be detected.

Example of Magnetic Switch Detection Wiring



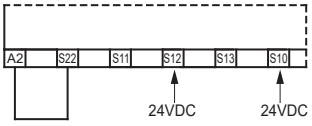
Notes:
(1) Solenoid switch with one normally open and one normally closed contact.
(2) 2 input channels are connected to the same pole.
A short circuit between the 2 inputs cannot be detected.

Wiring example for 2-channel safety door with cross-short detection



Notes:
For monitoring the movable protective door connected with 2 limit switches, each limit switch has a contact in combination mode (switches S1\S2 have normally closed contacts)

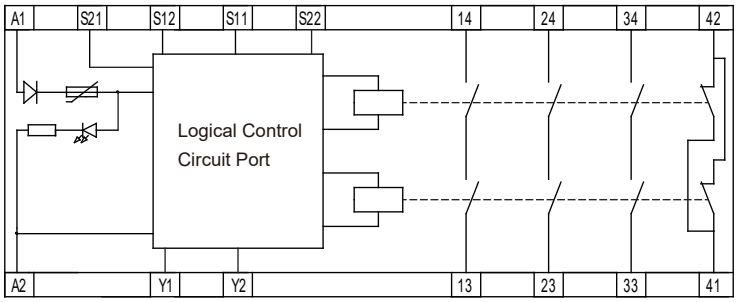
Dual-channel OSSD active input wiring example



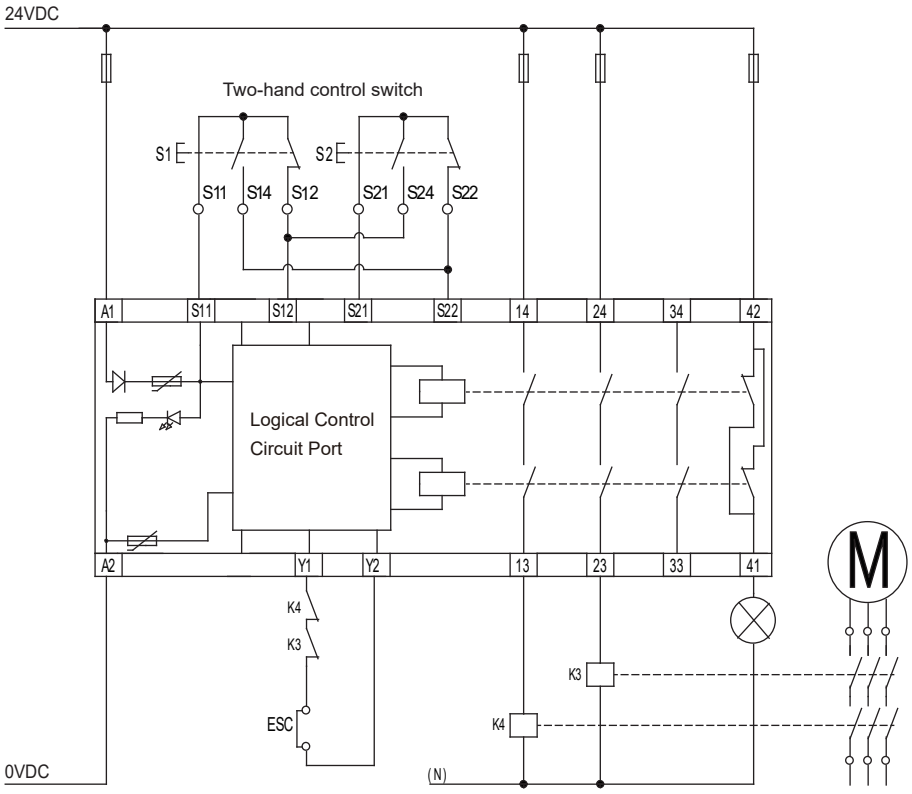
Notes:
For the monitoring of 2 24VDC power signal sources, such as the application of safety light grid, monitor OSSD1 and OSSD2 level signals.

WIRING DIAGRAM,LOGICAL TIME SERIES DIAGRAM

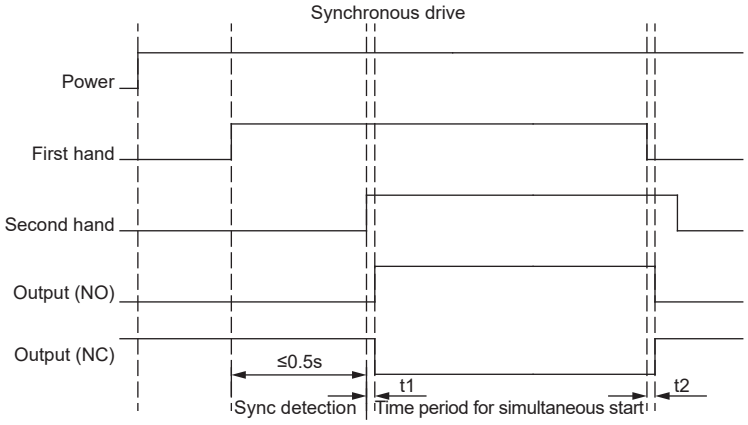
HFGA1/E-3H1D-U24



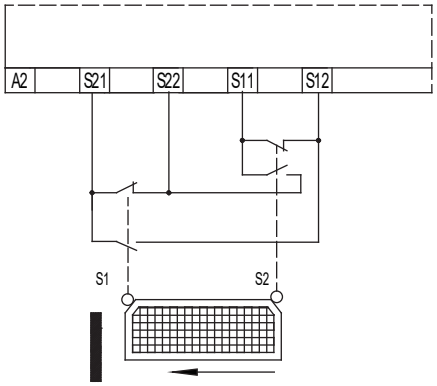
HFGA1/E two-hand synchronization control wiring example



HFGA1/E Two-hand synchronous control function logic timing diagram

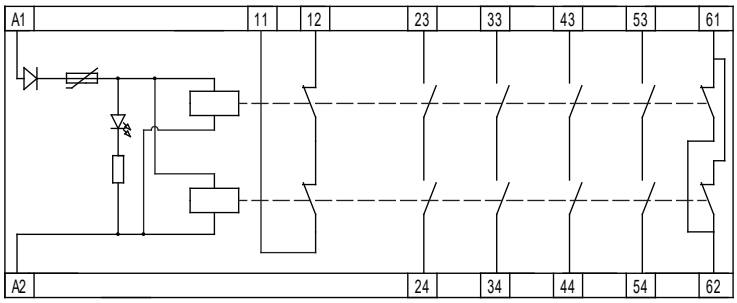


HFGA1/E Wiring example of two-hand synchronized control safety gate

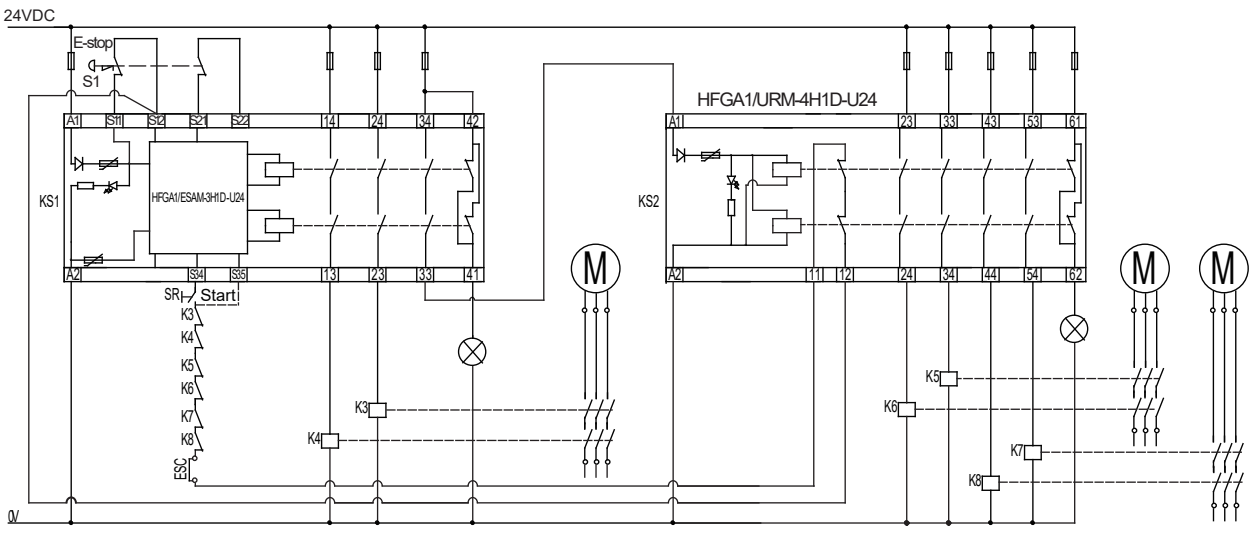


WIRING DIAGRAM

HFGA1/G-4H1D-U24

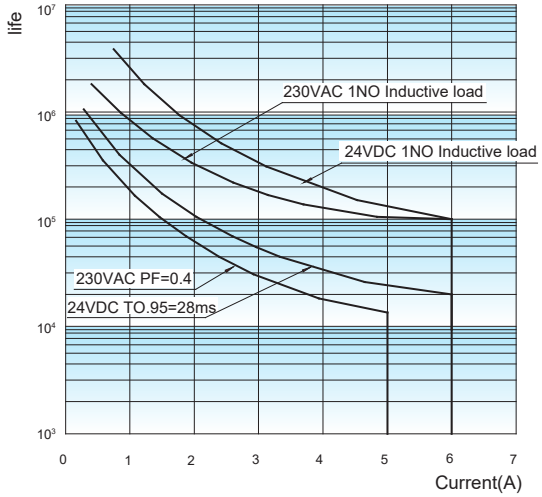


HFGA1/G Expansion Module Wiring Example



PERFORMANCE CURVE

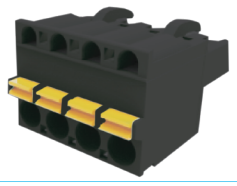
Electrical durability

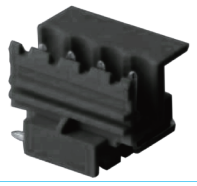


Complies with EN 60947-5-1 table C2
Ie: Measured working current
Ue: Measured working voltage
PF: Power Factor
T0.95: Time required to reach 95% of rated current.
Cycle: 1s:9s (1s on: 9s off)

Annex 1: Terminal Parameter Table

Plug-in screw terminal block plugs (regular)	
	
Rated current	15A
Rated voltage	300V
Conductor Cross Section	28-12 AWG (0.2-2.5mm²)
striping Length	7mm
Pitch	5.0mm（4P）
Ambient temperature	-40～105℃
Rated Withstand Pulse Voltage	4kV
Surge voltage category	III
Pollution degree	2

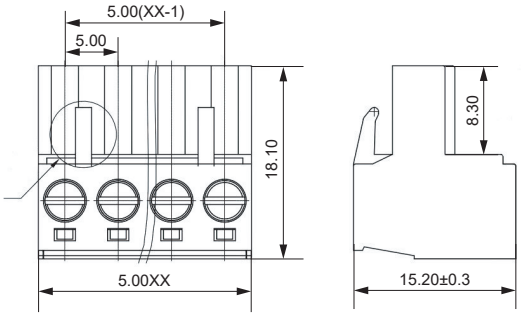
Plug-in spring-connected terminal plug (013)	
	
Rated current	15A
Rated voltage	300V
Conductor Cross Section	28-12 AWG (0.2-2.5mm²)
striping Length	7mm
Pitch	5.0mm（4P）
Ambient temperature	-40～105℃
Rated Withstand Pulse Voltage	4kV
Surge voltage category	III
Pollution degree	2

Plug-in spring connection terminal socket	
	
Rated current	15A
Rated voltage	300V
Conductor Cross Section	/
striping Length	/
Pitch	5.0mm（4P）
Ambient temperature	-40～105℃
Rated Withstand Pulse Voltage	4kV
Surge voltage category	III
Pollution degree	2

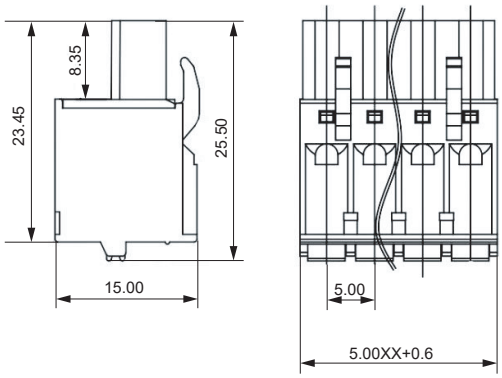
OUTLINE DIMENSIONS

Unit：mm

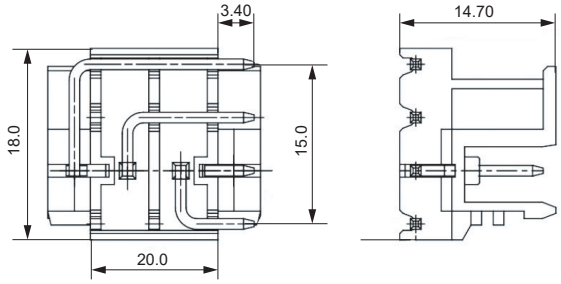
Plug-in screw terminal block plugs (regular)



Plug-in spring-connected terminal plug (013)



Plug-in spring connection terminal socket



Disclaimer:

The specification is for reference only. See to "Terminology and Guidelines" for more information. Specifications subject to change without notice. We could not evaluate all the performance and all the parameters for every possible application. Thus the user should be in a right position to choose the suitable product for their own application. If there is any query, please contact Hongfa for the technical service. However, it is the user's responsibility to determine which product should be used only.