



# SAFETY RELAY MODULE

## HFGA series products



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PROVIDING CUSTOMERS WITH SAFE AND  
RELIABLE INDUSTRIAL CONTROL GUARANTEE

# INTRODUCTION



Hongfa (Shanghai Stock Exchange: 600885) was founded in 1984 and has established a full-range and well-equipped industrial system by upholding the company spirit of “persevere for progress; strive for excellence”. Hongfa has set up three relay R&D and production bases. Hongfa products cover various types including relays, industrial electronic module (safety relay module), low-voltage and high-low voltage devices, connectors, capacitors, precision parts and automatic production equipment, which are widely used in industrial, energy, transportation, telecommunication, home appliance and medical areas.

With the widespread use of industrial automation equipment and the increasing complexity, as the country continues to revise the safety production standards and the Constitution of the Personal Injury Compensation Law, the importance of production safety and personal safety has been greatly increased. As the world's outstanding relay sales and manufacturers, Hongfa's self-developed safety relay module relies on its own manufacturing capacity in the industrial chain production of core devices, strive to promote the localization replacement of safety products and speed up the widespread use of safety relay modules in domestic mechanical equipment.

## CORE STRENGTHS THAT ARE HARD TO EMULATE ❖❖❖

### ○ DEEPLY INTEGRATED PRODUCTION AND MANUFACTURING CHAIN

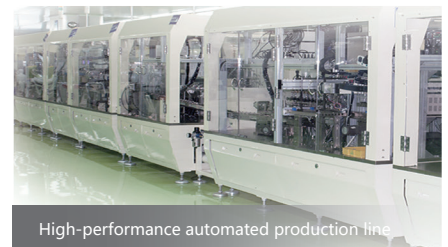
Starting from the quality control and production efficiency of the whole industrial chain, Hongfa has established core strengths that are difficult to imitate in the basic industries such as parts in the front channel and assembly equipment in the back channel, and successfully built an independent supporting industrial chain, which greatly ensures the high consistency and stability of the products.



Mold design and manufacturing



Precision parts production



High-performance automated production line

### ○ ADVANCED R&D AND INNOVATION

The First National Enterprise Technology Center in the relay industry in China, with Academician Workstation and Post-doctoral Workstation.  
The First Enterprise in the relay industry in China to preside over the development of national standards.  
The only Chinese enterprise to join the American UL Standards Organization.

### ○ COMPLETE PRODUCT TESTING AND ANALYSIS

The testing capability and results of Hongfa testing and analysis laboratory are recognized by VDE (Germany), UL (USA) and CNAS (China), and the test reports are mutually recognized by ILAC.

### ○ TOTAL QUALITY MANAGEMENT

Quality is our lifeline. Hongfa always insists on "winning by quality", pursues to provide customers with satisfactory products and services with perfect quality, and has established a quality management system with Hongfa's characteristics.



## HFGA series safety relay module



**SIL3**  
IEC 61508  
IEC 62061

**PLe**  
ISO 13849

**Cat.4**  
ISO 13849



Scan the QR code

Safety relay modules with a focus on automation ensure safety in industrial production, safer people, the environment and machinery, reduce accident rates, reduce production losses and thus reduce costs. Widely used in process control, discrete control and mechanical equipment and other automation fields, Such as injection molding machines, machine tools, packaging, new energy equipment, robot applications, automotive industry, wind power, petroleum, chemical industry and other fields

### Functional features

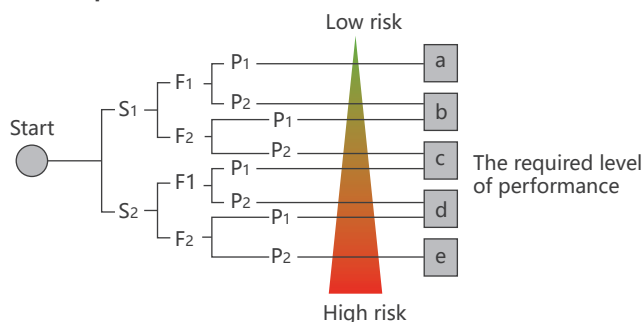
- ▶ Monitoring of emergency stop buttons, safety gates, enabling switches, solenoid switches, safety light curtains/light grids, safety mats, two-hand buttons, etc Multiple secure input device applications
- ▶ It adopts redundant design, interlock design, and built-in self-detection function of the product
- ▶ Support automatic reset/manual reset/with start-up monitoring optional
- ▶ There are a variety of output types, a single module can reach 8 normally open contacts, 1 NC contact is closed, and expansion modules can be freely matched
- ▶ Module width: 22.5mm and 45mm two universal housings
- ▶ Efficient wiring, quick installation, pluggable screw or spring-loaded terminal blocks are available
- ▶ Complete international certification: with CCC certification, CE certification, UL certification, FS (Functional Safety) certification High safety class: up to PLe class of EN ISO 13849-1/-Cat.4, EN 61508/EN IEC 62061 SIL3 class according to EN 60947-5-1, EN60204-1.

### Functional safety – for the protection of people, the environment and machines

In modern industrial production, the use of complex technical equipment is increasing. The aim of safety technology is to minimize safety risks for people, the environment and machines, while the availability of production equipment should not be limited by absolute necessity. In order to achieve the necessary functional safety of a machine or system, the safety-related components of safety equipment and controls must operate correctly, and in the event of a malfunction, the system must be kept in a safe state or entered a safe state.

The EU standards EN ISO 13849-1/-2 and EN IEC 62061 specify the requirements for safety-related components of machine control systems. Depending on the degree of risk, the standard specifies various safety levels for safety-related components in the form of "Performance Level" (PL) and "Safety Integrity Level" (SIL) and describes the characteristics of the safety function.

#### Risk map



#### Determination of the required performance level (PLr) according to EN ISO 13849-1

- ▶ **S-The severity of the injury**  
S1=Minor (usually reversible) injury  
S2=Severe (usually irreversible) injury
- ▶ **P-The possibility of avoiding or limiting damages**  
P1=Possibility under characteristic conditions  
P2=Almost impossible
- ▶ **F-Frequency and duration of exposure hazards**  
F1=Rarely to less frequent or short periods of exposure to danger  
F2=Frequent or persistent exposure to danger for a long period of time
- ▶ **The probability of a dangerous event occurring**  
A low probability can lower PLr by one notch

#### EN ISO 13849-1

This standard applies to electrical/electronic/programmable electronic/hydraulic/pneumatic/mechanical systems. The higher the risk, the higher the requirements placed on the control system. Hazardous situations are divided into five levels, the Performance Class (PL), from PL "a" (low) to PL "e" (high). Determine the required PL and consider it in accordance with EN ISO 13849-1 Conduct part of the risk assessment.

#### Determine the required Safety Integrity Level (SIL) according to EN/IEC 62061

| Effect                        | Severity S | Class 3-4      | Class 5-7 | Class 8-10 | Class 11-13 | Class 14-15 | P:circumvent | F:The probability of a dangerous event | FFrequency and timing time |
|-------------------------------|------------|----------------|-----------|------------|-------------|-------------|--------------|--|----------------------------|
| death Blindness or broken arm | 4          | SIL 2          | SIL 2     | SIL 2      | SIL 3       | SIL 3       |              | frequent                               | 5                          |
| permanent, Loss of a finger   | 3          | Other measures |           |            | SIL 1       | SIL 2       |              | possible                               | 4                          |
| Reversible treatment          | 2          |                |           |            | SIL 1       | SIL 3       |              | Occasionally                           | 4                          |
| Reversible, first aid         | 1          |                |           |            |             | SIL 1       |              | Very rarely                            | 3                          |
|                               |            |                |           |            |             |             |              | Negligible                             | 2                          |

#### EN/IEC 62061

EN/IEC 62061 stands for industry-specific standard under IEC 61508. This standard describes the implementation of safety-related electrical control systems on machines and examines the entire life from the concept stage to decommissioning Cycle. In contrast to EN/IEC 61508, EN/IEC 62061 is published as a harmonized standard under the Machinery Directive in the Official Journal of the European Union. Therefore, the presumption of conformity applies to this standard.



A set of safety control system consists of three parts: safety input signal (such as emergency stop signal, safety gate signal, etc.), safety logic control module (ie safety relay module) and controlled output components (such as main contactor, valve, etc.).

### Selection guide

| Model number       | Input device             |                |        |             |                                    |   |                 |                      | Output contacts |                     |                    | Reset mode                                   |
|--------------------|--------------------------|----------------|--------|-------------|------------------------------------|---|-----------------|----------------------|-----------------|---------------------|--------------------|--|
|                    | Emergency stop switch    | emergency exit | Enable | Safety mats | Safety light grids (Light Curtain) | Contactless security Door Switch (OSSD) | Solenoid switch | Hands in sync switch | Safety contacts | With delay function | Auxiliary contacts |  |
| 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<br>With start-up monitoring |
| HFGA1/B-2H-U24     | √                        | √              | √      | √           | —                                  | —                                       | —               | —                    | 2               | —                   | 0                  | Automatic/Manual<br>With start-up monitoring |
| HFGA1/B-3H1D-U24   | √                        | √              | √      | √           | —                                  | —                                       | —               | —                    | 3               | —                   | 1                  | Automatic/Manual<br>With start-up monitoring |
| HFGA1/B-3H1D-U230  | √                        | √              | √      | √           | —                                  | —                                       | —               | —                    | 3               | —                   | 1                  | Automatic/Manual<br>With start-up monitoring |
| HFGA1/B-4H-U24     | √                        | √              | √      | √           | —                                  | —                                       | —               | —                    | 4               | —                   | 0                  | Automatic/Manual<br>With start-up monitoring |
| HFGA1/B-1-1H1D-U24 | √                        | √              | √      | √           | √                                  | —                                       | —               | —                    | 1               | —                   | 1                  | Automatic/Manual                             |
| HFGA1/B-1-2H-U24   | √                        | √              | √      | √           | √                                  | —                                       | —               | —                    | 2               | —                   | 0                  | Automatic/Manual                             |
| HFGA1/B-1-3H1D-U24 | √                        | √              | √      | √           | √                                  | —                                       | —               | —                    | 3               | —                   | 1                  | Automatic/Manual                             |
| HFGA1/B-1-4H-U24   | √                        | √              | √      | √           | √                                  | —                                       | —               | —                    | 4               | —                   | 0                  | Automatic/Manual                             |
| HFGA1/B-2-1H1D-U24 | √                        | √              | √      | √           | √                                  | —                                       | —               | —                    | 1               | —                   | 1                  | Manual<br>With start-up monitoring           |
| HFGA1/B-2-2H-U24   | √                        | √              | √      | √           | √                                  | —                                       | —               | —                    | 2               | —                   | 0                  | Manual<br>With start-up monitoring           |
| HFGA1/B-2-3H1D-U24 | √                        | √              | √      | √           | √                                  | —                                       | —               | —                    | 3               | —                   | 1                  | Manual<br>With start-up monitoring           |
| HFGA1/B-2-4H-U24   | √                        | √              | √      | √           | √                                  | —                                       | —               | —                    | 4               | —                   | 0                  | Manual<br>With start-up monitoring           |
| HFGA1/C-3H1D-U24   | √                        | √              | √      | √           | √                                  | √                                       | √               | —                    | 3               | —                   | 1                  | Automatic/Manual                             |
| HFGA1/D-2H-U24     | √                        | √              | √      | √           | √                                  | √                                       | √               | —                    | 2               | —                   | 0                  | Automatic/Manual<br>With start-up monitoring |
| HFGA1/E-3H1D-U24   | √                        | √              | √      | √           | —                                  | —                                       | —               | √                    | 3               | —                   | 1                  | /  |
| HFGA1/F-1-4H-D24   | √                        | √              | √      | √           | —                                  | —                                       | —               | —                    | 2               | 2                   | 0                  | Automatic/Manual<br>With start-up monitoring |
| HFGA1/G-4H1D-U24   | Contact expansion module |                |        |             |                                    |   |                 |                      | 4               | —                   | 1                  | Automatic/Manual                             |
| HFGA1/G-5H2D-U24   | Contact expansion module |                |        |             |                                    |   |                 |                      | 5               | —                   | 2                  | Automatic/Manual                             |
| HFGA3/B-7H1D-U24   | √                        | √              | √      | √           | √                                  | √                                       | —               | —                    | 7               | —                   | 1                  | Automatic/Manual<br>With start-up monitoring |
| HFGA3/F-5H1D-D24   | √                        | √              | √      | √           | √                                  | √                                       | —               | —                    | 3               | 2                   | 1                  | Automatic/Manual<br>With start-up monitoring |
| HFGA3/G-8H1D-U24   | Contact expansion module |                |        |             |                                    |   |                 |                      | 8               | —                   | 1                  | Automatic/Manual                             |

### Example of an order mark

|                                    |  |   |                        |       |     |       |
|------------------------------------|--|---|------------------------|-------|-----|-------|
|                                    | HFGAX/   | X-  | X-                     | XXXX- | XXX | (XXX) |
| Type                               | Product model 1:width 22.5mm<br>Product model 3:width 45mm   |   |                        |       |     |       |
| Product features                   | <b>A:</b> Basic function <b>B:</b> Basic function+start monitoring<br><b>C:</b> Multi function input <b>D:</b> Multi function input+start monitoring<br><b>E:</b> Two hands control <b>G:</b> Contact extension module |   |                        |       |     |       |
| Additional features                | Please refer to the datasheet/selection list for details   |   |                        |       |     |       |
| Contact <sup>(1)</sup> arrangement | 2H:2 form A<br>3H1D:3 form A+1 form B<br>4H1D:4 form A+1 form B<br>7H1D:7 form A+1 form B  | 1H1D:1 form A+1 form B<br>4H:4 form A<br>5H1D:5 form A+1 form B<br>8H1D:8 form A+1 form B | 5H2D:5 form A+2 form B |       |     |       |
| Operating voltage                  | D24:24VDC  | U24: 24VAC/DC   | U230: 230VAC/DC        |       |     |       |
| Special code <sup>(2)</sup>        | 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.

The following typical application models are examples, and the specific models are matched and selected according to the actual needs of customers.

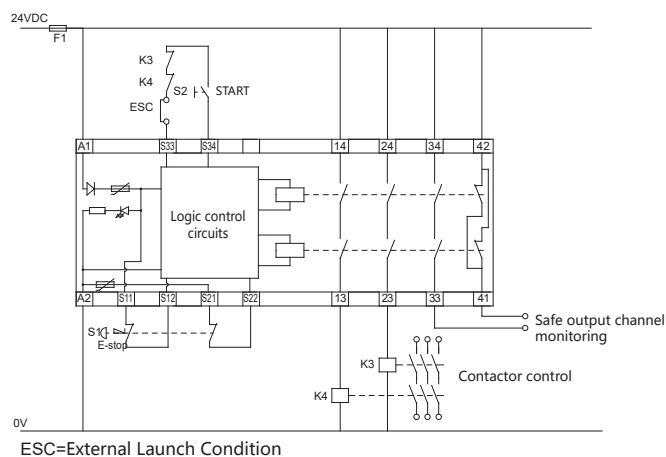
## Used to monitor the emergency stop button

An emergency stop button with two NC contacts is recommended

HFGA1/A Series Dual Input Emergency Stop Monitoring Wiring Example:

**Model: HFGA1/A-3H1D-U24**

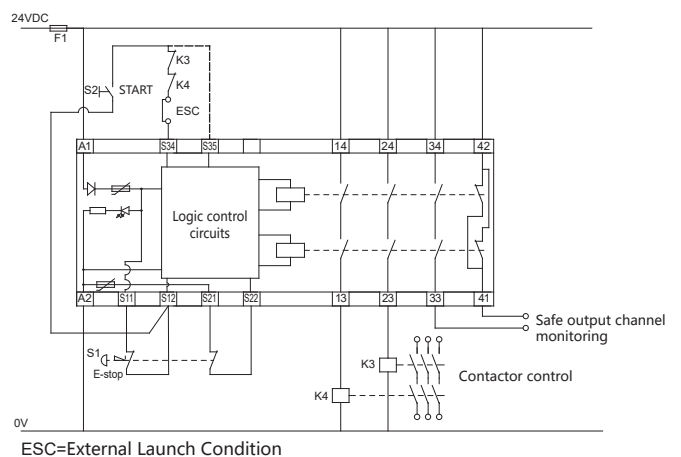
Manual/automatic reset, S33-S34 does not come with a start-up monitoring reset function.



HFGA1/B Series Dual Channel Emergency Stop Monitoring Wiring Example:

**Model: HFGA1/B-3H1D-U24**

Manual/automatic reset, S12-S35 is manual/automatic reset function without start monitoring reset function, S12-S34 is manual reset function with start monitoring.



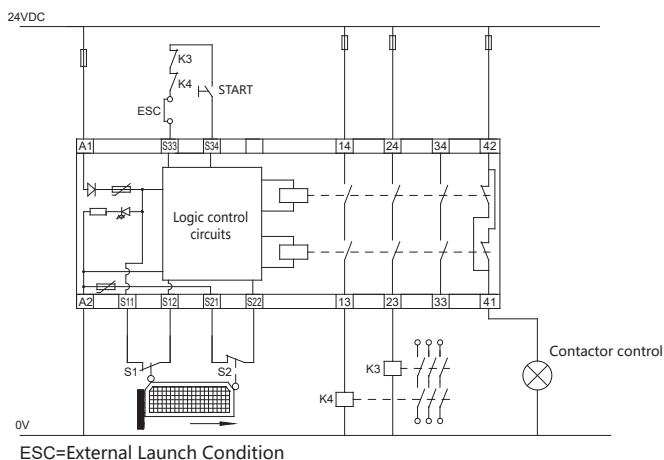
## Used to monitor security door locks

The safety door lock is recommended with 2 limit switches  
Connected movable protective door  
(switches S1 and S2 with normally closed contacts)

HFGA1/A Series Dual Input Monitoring Safety Gate Wiring Example:

**Model: HFGA1/A-3H1D-U24**

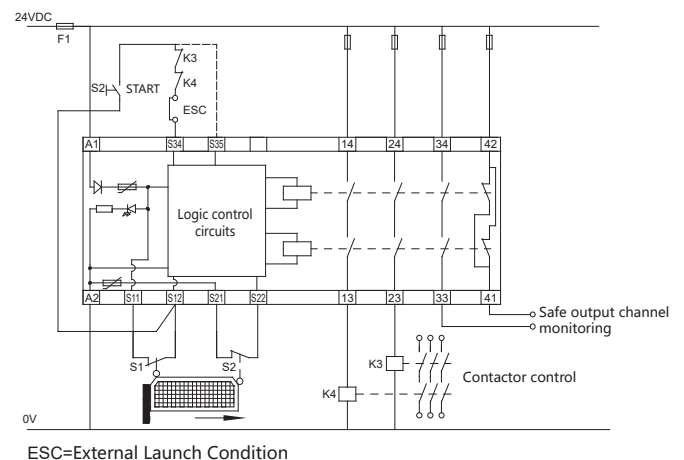
Manual/automatic reset, S33-S34 does not come with reset function for start monitoring.



HFGA1/B Series Dual Channel Safety Gate Monitoring Wiring Example:

**Model: HFGA1B-3H1D-U24**

Manual/automatic reset, S12-S35 is manual/automatic reset function without start monitoring reset function, S12-S34 is manual reset function with start monitoring.



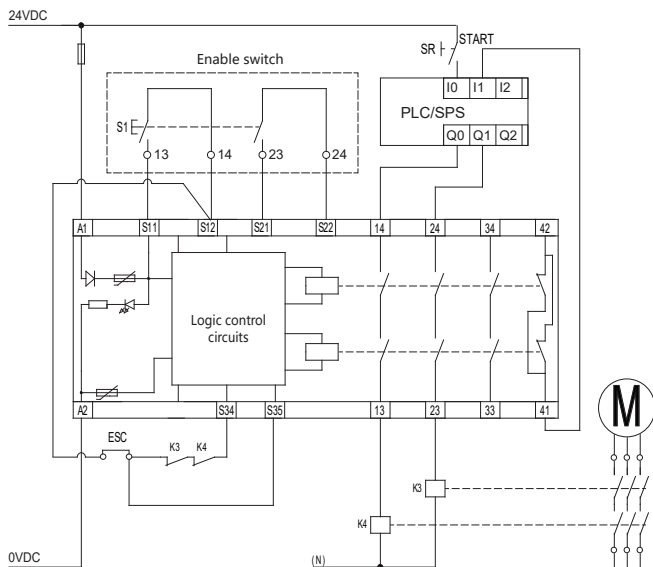
## Used to monitor the enable switch/two-hand sync button

The choice of double button requires two sets of changeover contacts

HFGA1/B Series Two-Stage Enable Switch Monitoring Wiring Example:

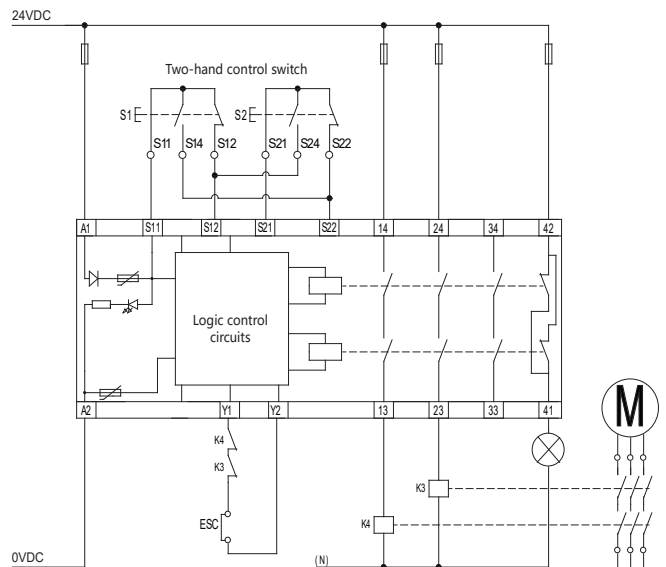
**Model: HFGA1/B-3H1D-U24**

Manual reset, S12-S34 with start monitoring reset function, S12-S35 without start monitoring reset function.



HFGA1/E Series Two-Hand Sync Button Monitoring Wiring Example:

**Model: HFGA1/E-3H1D-U24**



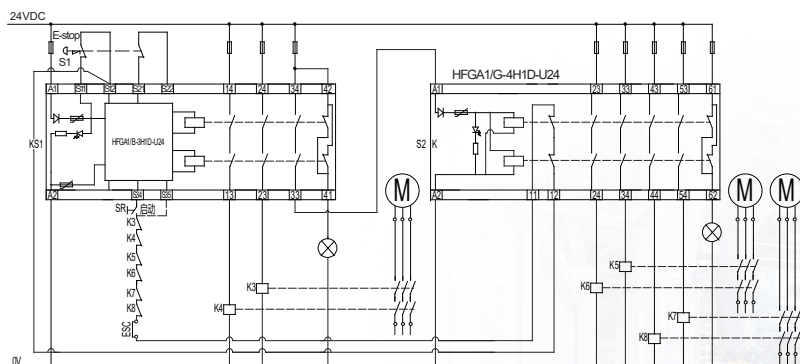
## Contact expansion module

Contact expansion modules can be used with any of the HFGA1 family master modules

## Delay function module

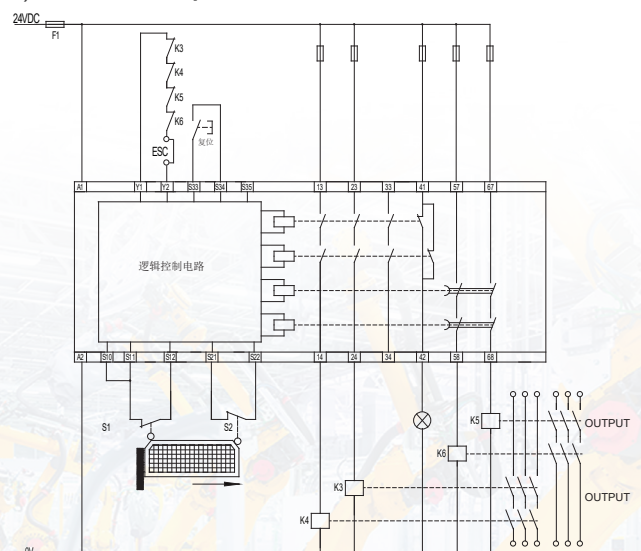
Example of wiring between the HFGA1/G model series contact expansion module and the main module HFGA1/B-3H1D-U24:

**Model: HFGA1/G-4H1D-U24**



Example of HFGA3/F model time-delay function module wiring (safety gate monitoring application with cross-short circuit detection):

**Model: HFGA3/F-5H1D-D24**



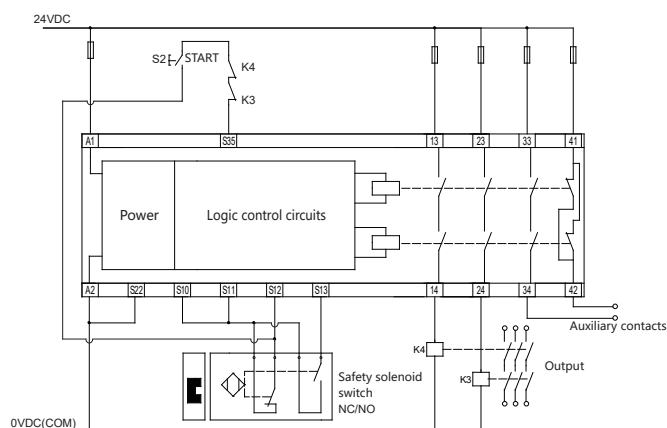
## Used to monitor solenoid switches

It is recommended to use a solenoid switch with one normally open and one normally closed contact, rated operating voltage 24VDC, rated output current > 100mA

HFGA1/C Series Dual Channel Solenoid Switch Monitoring Connection Example:

**Model: HFGA1/C-3H1D-U24**

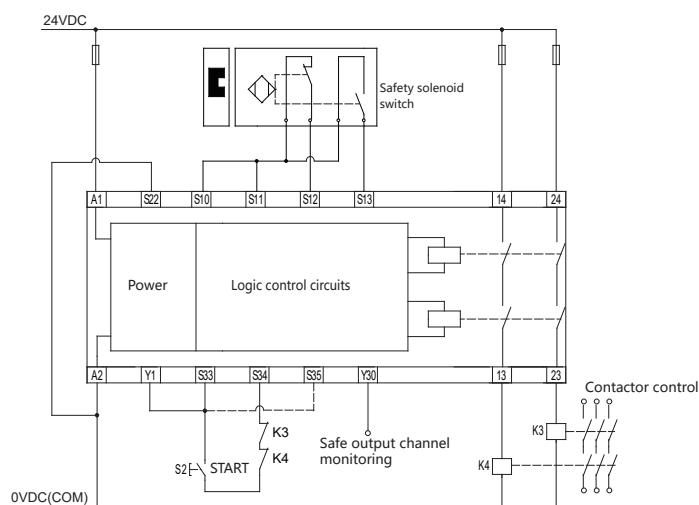
Manual/automatic reset, S12-S35 without start-up monitoring reset function.



HFGA1/D Series Dual Channel Solenoid Switch Monitoring Connection Example:

**Model: HFGA1/D-2H-U24**

Manual/automatic reset, S33-S34 with manual reset function for start monitoring, S33-S35 without start monitoring reset function.



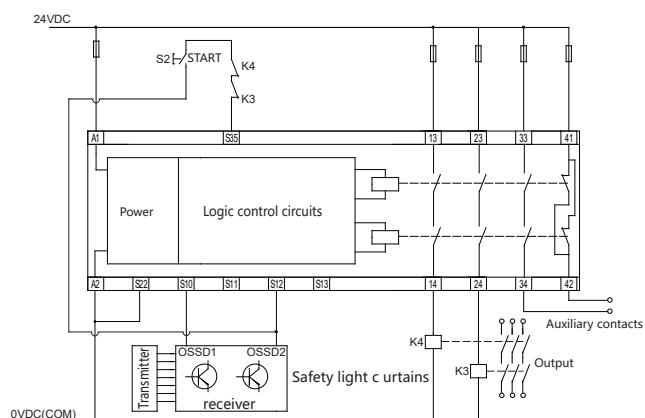
## For monitoring safety light curtains/light grids

Safety light curtains/light grids are recommended rated operating voltage 24VDC, Output current > 100mA, output signal is normally closed (NC) PNP output; Output channel: single-channel OSSD/dual-channel OSSD

HFGA1/C Series Dual Channel Safety Light Curtain/Light Grid Monitoring Wiring Example:

**Model: HFGA1/C-3H1D-U24**

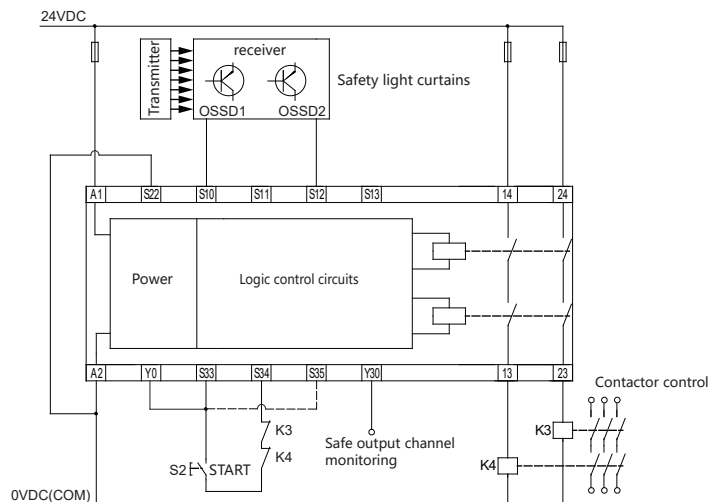
Manual/automatic reset, S12-S35 without start-up monitoring reset function.



HFGA1/D Series Dual Channel Safety Light Curtain/Light Grid Monitoring Wiring Example:

**Model: HFGA1/D-2H-U24**

Manual/automatic reset, S33-S34 with start monitoring reset function, S33-S35 without start monitoring reset function.



## Xiamen Hongfa Electroacoustic Co. Ltd

**Add:** No.560-578, Donglin Rd., Jimei North Ind. Dist., Xiamen, China

**TEL:** +86-592-6106688

**FAX:** +86-592-6106678

**E-mail:** marketing@hongfa.com

## Marketing & Sales Network

### Hongfa Europe GmbH

**ADD:** Marie-Curie-Ring 26, D-63477

Maintal, Germany

**TEL:** +49-6181-4306-0

**E-mail:** info@hongfa-europe.com

### Hongfa America, Inc.

**ADD:** 20381 Hermana Circle, Lake

Forest, CA92630, USA

**TEL:** +1-714-669-2888

**E-mail:** sales@hongfaamerica.com

### KG Technologies, Inc.

**ADD:** 6028 Stat Farm Drive

Rohnert Park, CA 94928, USA

**TEL:** +1.888.513.1874

**E-mail:** info@kgtechnologies.com

### Hongfa Italy Srl

**ADD:** C/O Regus Business Center

Via Paracleso, 26 Agrate

B.za (MB), Italy

**TEL:** +39-0362-890-1544

**E-mail:** info@hongfa-europe.com

### Hongfa Electroacoustic (Hongkong) Co., Ltd.

**ADD:** Rm 1810-12, 18/F., Shatin Galleria,

18-24 Shan Mei St., Fotan, N.T, HongKong

**TEL:** +852-2947-7889

**E-mail:** hongkong@hongfa.com

### Shanghai Hongfa Electroacoustic Co., Ltd.

**ADD:** NO.51.341, Jiuxin Rd., Jiuting

Town, Songjiang Dist., Shanghai

**TEL:** +86-21-37693111

**E-mail:** shanghai@hongfa.com

### Beijing Hongfa Electroacoustic Relay Co., Ltd.

**ADD:** 111Bldg, Phase IV Westside of Lian

-dong U Valley, Tongzhou Dist., Beijing

**TEL:** +86-10-56495556

**E-mail:** beijing@hongfa.com

### Sichuan Hongfa Relay Co., Ltd.

**ADD:** 12F, Hongfa Building, No.6 Wuxing 4th

Road, Wuhou District, Chengdu

**TEL:** +86-28-86627550

**E-mail:** sichuan@hongfa.com

### Hongfa India Branch

**TEL:** +91-9971187792

**E-mail:** rohit@hongfa.com

### Hongfa Korea Branch

**ADD:** RM302, Samwoo B/D, 286-4

Gaebong dong, Guro-gu,

Seoul, Korea

**TEL:** +82-10-5355-4899/+82-10-8704-4706

**E-mail:** korea@hongfa.com /

khlee@hongfa.com

### Hongfa Brazil Branch

Non-automotive relay project

**TEL:** +86-0592-6196714

**E-mail:** southamerica@hongfa.com

Automotive relay project

**TEL:** +55-11-949697906

**E-mail:** mauro-loyola@hongfa.com

### Hongfa Philippine Branch

**TEL:** +639177189352 / +639175780846

**E-mail:** nia-videna@hongfa.com

### Hongfa Turkey Branch

**TEL:** +90-535-0221881

**E-mail:** info-turkey@hongfa.com

***www.hongfa.com***

**SALES SERVICE HOTLINE: 400-600-1502**

