Installation Instructions for the FF-SRD5985 Safety Door Monitor Module

0217355
Issue 1
PK 107013-01

(pending)

⚠ WARNING
IMPROPER INSTALLATION

- Consult with US and/or European safety agencies and their requirements when designing a machine control, interface and all control elements that affect safety.
- Strictly adhere to all installation instructions.

Failure to comply with these instructions could result in death or serious injury.

PRODUCT DESCRIPTION

Protective gates are designed to limit or block access to the moving parts of dangerous machinery. These gates can be equipped with locking or interlocking devices, usually safety limit switches or any other safety sensors.

The FF-SRD5985 Safety Door Monitor module monitors the status of these safety sensor positions. When the protective gate is open, the initiation of dangerous motion is prevented. When the door is closed again, the next machine cycle can start, but only after initiating a manual restart sequence.

This device has two safety relays with positive-guided contacts to ensure redundancy.

This safety control module provides an emergency stop signal to the machine control circuitry. FF-SRD5985 helps to create a control reliable safety solution by providing redundancy and self-checking circuitry. Other features include high current capability, an increased number of contacts (using an extension control module FF-SRE3081), external relay monitoring and input closure timing.

APPROVALS

CE	The product, packaging and documentation of FF-SR Series products carry the CE mark; the CE declaration of conformity is available upon request.
cULus (pending)	This product is pending approval by Underwriters Laboratories Inc. according to Canadian and U.S. safety requirements.
BG	German Berufsgenossenschaft E+MIII

DIRECTIVES COMPLIANCE

Machine Directive 89/392 EEC
Low Voltage Directive 73/23 EEC
Electromagnetic Compatibility Directive 89/336

REGULATIONS COMPLIANCE

Regulation	Title
OSHA 29 CFR 1910.212	General Requirements for (guarding of) All Machines
OSHA 29 CFR 1910.217	(Guarding of) Mechanical Power Presses

STANDARDS COMPLIANCE

Standard	Title
ANSI B11.1	Mechanical Power Presses
ANSI B11.2	Hydraulic Power Presses
ANSI B11.19	Safeguarding when Referenced by the Other B11 Machine Tool Safety Standards
ANSI/RIA R15.06	Safety Requirements for Industrial Robots and Robot Systems
UL508	Underwriters Laboratories
EN 292	Safety of Machinery - Basic Concepts, General Principles for Design
EN 60204	Safety of Machinery - Electrical Equipment of Machines
EN 954	Safety of Machinery - Safety related parts of control system

SPECIFICATIONS

Input	
Nominal voltage	120 VAC (-15%, +10%), 230 VAC (-20%, +10%), 24 VDC (-10%, +20%)
Nominal consumption	120 VAC, 230 VAC: 4 VA; 24 VDC: 2.5 W
Nominal frequency	50 to 60 Hz
Control contacts	Two NO contacts
Nominal voltage at S13/S23	24 VDC / 0VDC (provided by control module)
Nominal input current between S13/S14 and S23/S24	35 mA (ensure 10 mA switching capability with sensors connected to two inputs)
Time required for simultaneous contact closure of S13/S14 and S23/S24	3 sec (max.)
Output	
Contact complement	2 NO contacts
Contact type	Safety relay, positive-guided
Response time	Activation/deactivation by inputs S13/S14 and S23/S24 : 30 ms
Switching Capability	Power factor = 1 with resistive load
Current Range (min. to max.)	1 mA to 10A (see caution)
Voltage Range (min. to max.)	0.1 to 250 VAC/DC
Typical Electrical Life Expectancy **3A** **5A** **10A**	Power factor = 1 at 230 VAC/DC (note 1) 1,000,000 operations 500,000 operations 220,000 operations
Typical Power Factor (cos φ) **0.3** **0.5** **0.7** **1.0**	Limitation Factor (note 2) 0.45 0.70 0.85 1.00
Fuse rating	6 A gL (max.)
Mechanical life	Ten million switching operations
General	
Temperature range	-15°C to + 55°C (5°F to 131°F) at 90% humidity (max.)
Sealing	Housing IP 40 Terminals IP 20
Housing material	Thermoplastic
Vibration resistance	Amplitude 0.35 mm; Frequency 10 to 55 Hz
Conductor connection	1 x 4 mm^2 solid (max.) [12 AWG] or 2 x 1.5 mm^2 (max.) [16 AWG] stranded wire with sleeve DIN 46288
Conductor attachment	M 3,5 screws terminals; wire contacts are enclosed to prevent electrical shock
Mounting	Quick install rail mounting EN 50022-35
Weight	450 g (0.99 lb.)

NOTE 1: Install arc suppression device across load to avoid module contact arcing and ensure specified relay life expectancy.

NOTE 2: Total operations = operations at power factor 1 multiplied by the limitation factor. If the power factor is 0.5 at 230 vac, 3A (1,000,000 operations), the limitation factor is 0.70. 1,000,000 x 0.70 = 700,000 total operations.

FIG 1. CONTACT LIFE FOR 100% RESISTIVE LOAD (typical) (note 1)
power factor = 1 (cos φ)

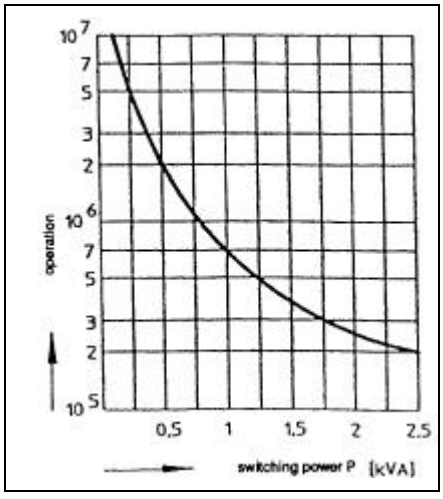
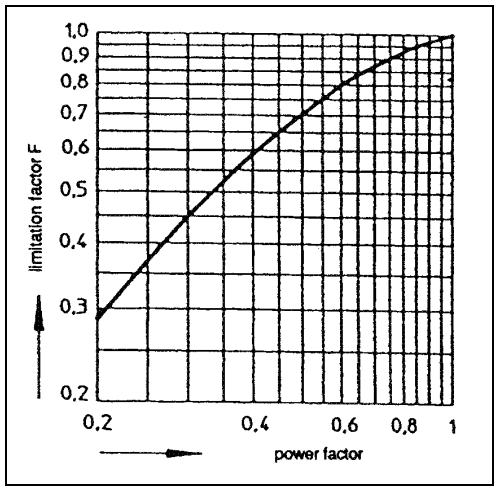


FIG 2. LIMITATION FACTOR FOR INDUCTIVE LOADS (note 2)
power factor < 1 (cos φ)



CAUTION
CONTACT DAMAGE
To ensure the 1 mA capability during the lifetime of the contact, NEVER exceed 300 mA and 60 V.
Failure to comply with these instructions will result in product damage.

FIG 3. CURRENT VS. TEMPERATURE LIMIT

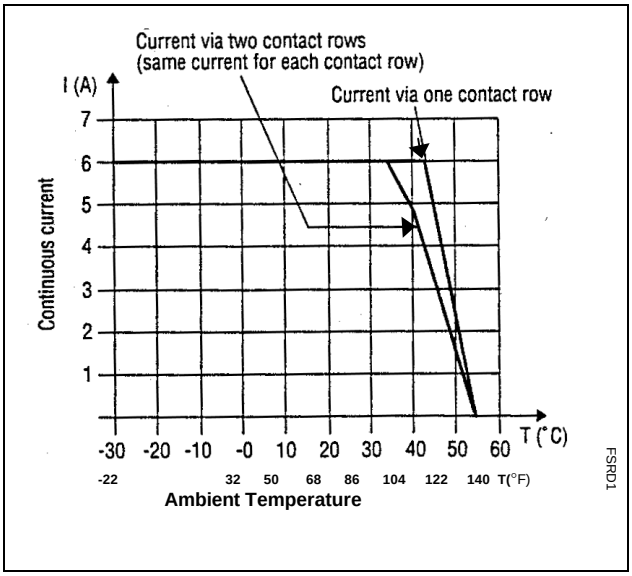


Figure 3. displays the maximal recommended external temperature versus the total load of all the safety module contacts. To use this curve, do the following:

(1) Follow the horizontal line from the value (vertical axis) equal to the current inside the safety module contacts and note intersection of the appropriate curve.

(2) Follow the intersection point down to determine the maximal recommended ambient temperature. (Ex: 4 A current inside each two safety contacts, then T = 43 °C (109 °F).

If the module is located in a higher temperature environment, the lifetime of the electronic components may be reduced. Ventilation of the cabinet may be required.

MECHANICAL INSTALLATION

The FF-SRD5985 must be installed inside a NEMA 3 (IEC IP54) rating enclosure or better. The module can be mounted easily onto a 45mm width DIN rail (see figures 4 and 5 below for installation and mounting).

FIG 4. MOUNTING DIMENSIONS (for reference only)

a Width: 45 mm 1.77 in.
b Height: 74 mm 2.91 in.
c Depth: 121 mm 4.76 in.

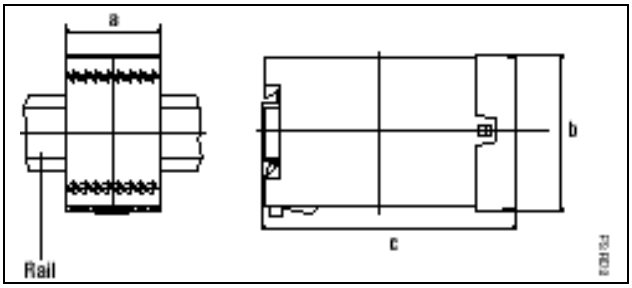
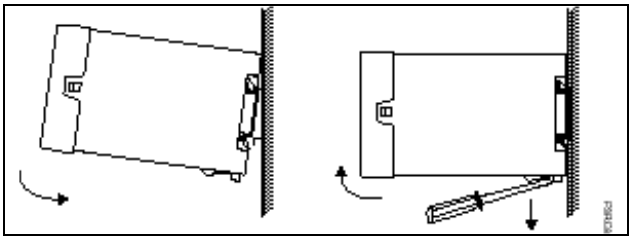


FIG 5. INSTALLATION DIAGRAM



CONTROL RELIABILITY

"Control Reliability" means that "the device, system or interface shall be designed, constructed and installed such that a single component failure within the device, interface or system shall not prevent normal stopping action from taking place but shall prevent a successive machine cycle." (ANSI B11.19-1990, 5.5)

OSHA 29 CFR 1910.217 states that "the control system shall be constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent initiation of a successive stroke until the failure is corrected. The failure shall be detectable by a simple test, or indicated by the control system."

Honeywell uses self-checking techniques that combine reliability with safety. This means that a faulty component in our system will make the safety control modules fail in a safe mode.

The FF-SRD5985 safety control module functions with dual internal channel redundancy and positive self-check monitoring.

The design of this device meets the highest requirements (Category 4 as described in the EN 954 European norm). Category 4 safety control modules are designed and manufactured in such a way that a single breakdown or an accumulation of internal failures does not lead to the loss of the safety function when a dangerous situation arises. **The safety function is maintained on a permanent basis.**

ELECTRICAL INSTALLATION

> **⚠ WARNING**
> **ELECTRICAL SHOCK**
> Remove power from FF-SR Series control modules and machine during installation.
> **Failure to comply with these instructions could result in death or serious injury.**

Multiple wiring configurations are possible for the FF-SRD5985 Safety door monitor module. General guidelines are provided because there are various ways to interface the module to machine control circuitry. Refer to the important warnings (page 5) and the application examples (page 6).

FUNCTIONAL DESCRIPTION

The module operates in an **automatic restart** mode and accepts immediate input from the safety device (safety switch).

If the module receives input (between S13/S14 and S23/24) from two safety position switches that are monitoring door closure, and this occurs in less than three seconds (assuming the external monitoring loop circuitry (Y1/Y2) is closed), the two normally open contacts of the module (13/14 and 23/24) will close.

When the door opens, the two normally open contacts (13/14 and 23/24) will open relaying the emergency stop condition to the machine control circuitry to arrest dangerous motion and/or remove power.

One or more FF-SRE3081 Extension modules or external contactors with positively driven contacts can be used to multiply the number of contacts of the FF-SRD5985 Safety door monitor module. If multiple safety contacts are used in parallel with one load, the maximum admissible current can be increased.

FIG 6. FUNCTIONAL DIAGRAM

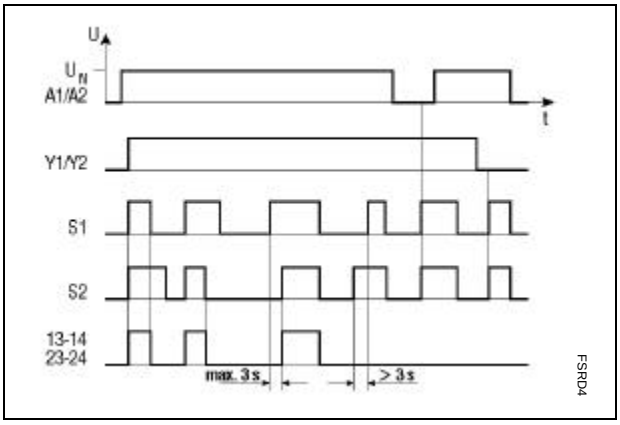


FIG 7. BLOCK DIAGRAM

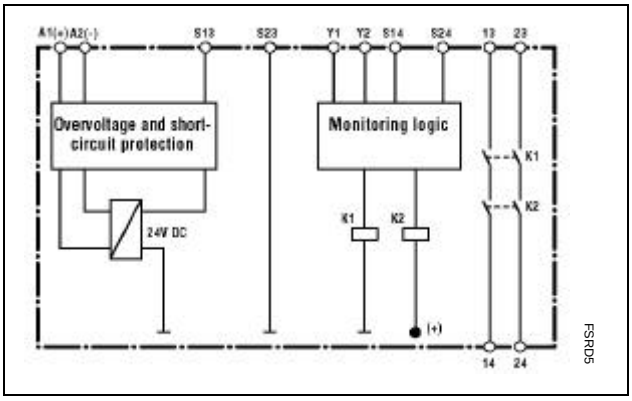
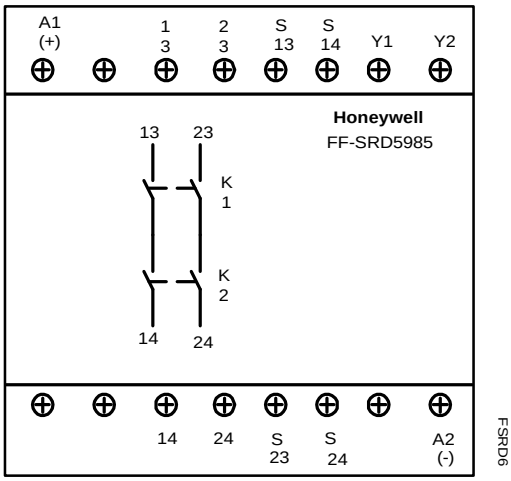


FIG 8. MODULE FRONT PANEL



APPLICATION WARNINGS

⚠ WARNING

IMPROPER INPUT CONNECTIONS

- To ensure the proper operation of the FF-SRD5985, always connect the two safety device outputs to the input channels of the safety door monitor module.

IMPROPER AUTOMATIC RESTART MODE

- As the module operates in an automatic restart mode, a part of the safety control circuitry must keep the latched function engaged.
- To keep the latched function engaged and maintain control reliability, use control reliable safety components (redundancy, self checking) only. Do NOT use a programmable logic controller (PLC).

IMPROPER PUSH BUTTON USE

- Ensure the location of the manual restart function is outside of the danger zone and provides the operator with a clear view of the zone.
- A Programmable Logic Controller must NOT be able to override a manual restart function.

CONTACT WELDING

- Always protect all safety contacts with correctly rated fuses. These fuses must never exceed the rated FF-SRD5985 safety output capability to prevent contact welding.

IMPROPER EXTERNAL SAFETY RELAY MONITORING

- When using additional safety relays, always connect one normally closed contact of each relay in series inside the Final Switching Device (FSD) monitoring loop circuit (Y1/Y2). This connection will ensure correct operation of the external relays after each FF-SRD5985 activation.
- If the FF-SRD5985 is not activated often, the customer is responsible for accomplishing any additional test procedures of the external safety components. For instance, this testing can be done by removing the power from the FF-SRD5985 every day at machine power up.

IMPROPER ARC SUPPRESSOR INSTALLATION

- Never install an arc suppressor across the safety output contact of the safety control module.
- Always install arc suppressors across the coils of external safety relays.

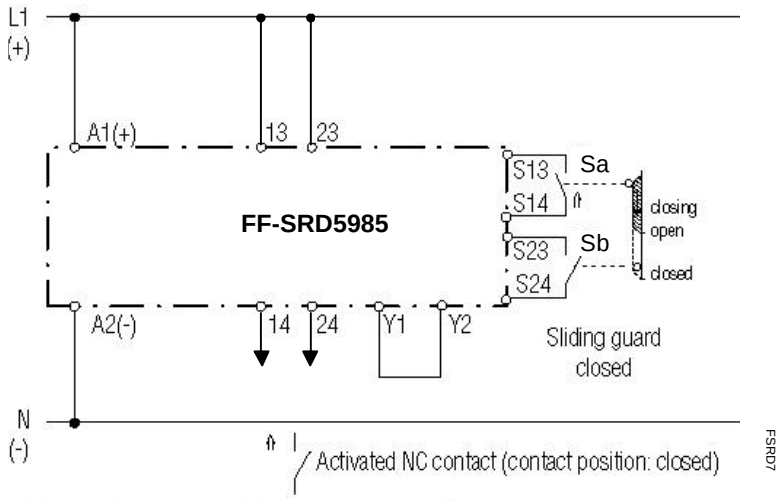
IMPROPER SYSTEM SAFETY LEVEL

- Multiple machine locations and/or applications can be protected by using several safety components (more than two) connected to one FF-SRD5985 control module. To ensure maximum safety, always use devices approved for safety applications. Keep in mind that this type of installation will degrade the overall safety level of the solution.

Failure to comply with these instructions could result in death or serious injury.

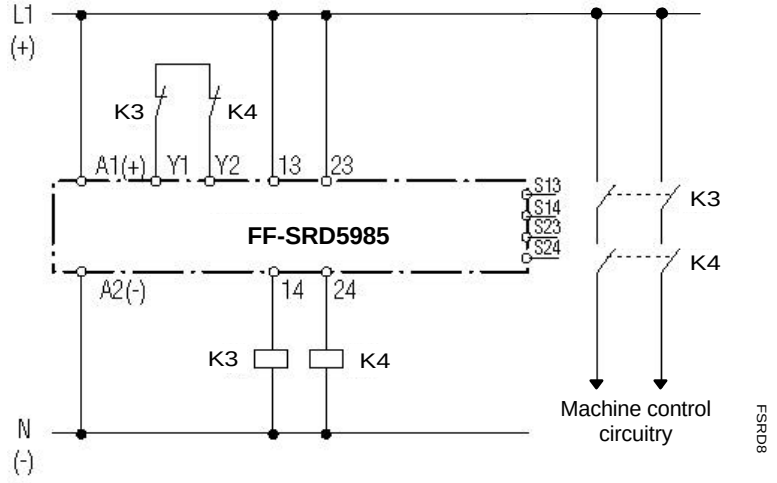
APPLICATION EXAMPLES

TWO-CHANNEL SAFETY DOOR MONITORING (WITHOUT EXTERNAL CONTACTORS)



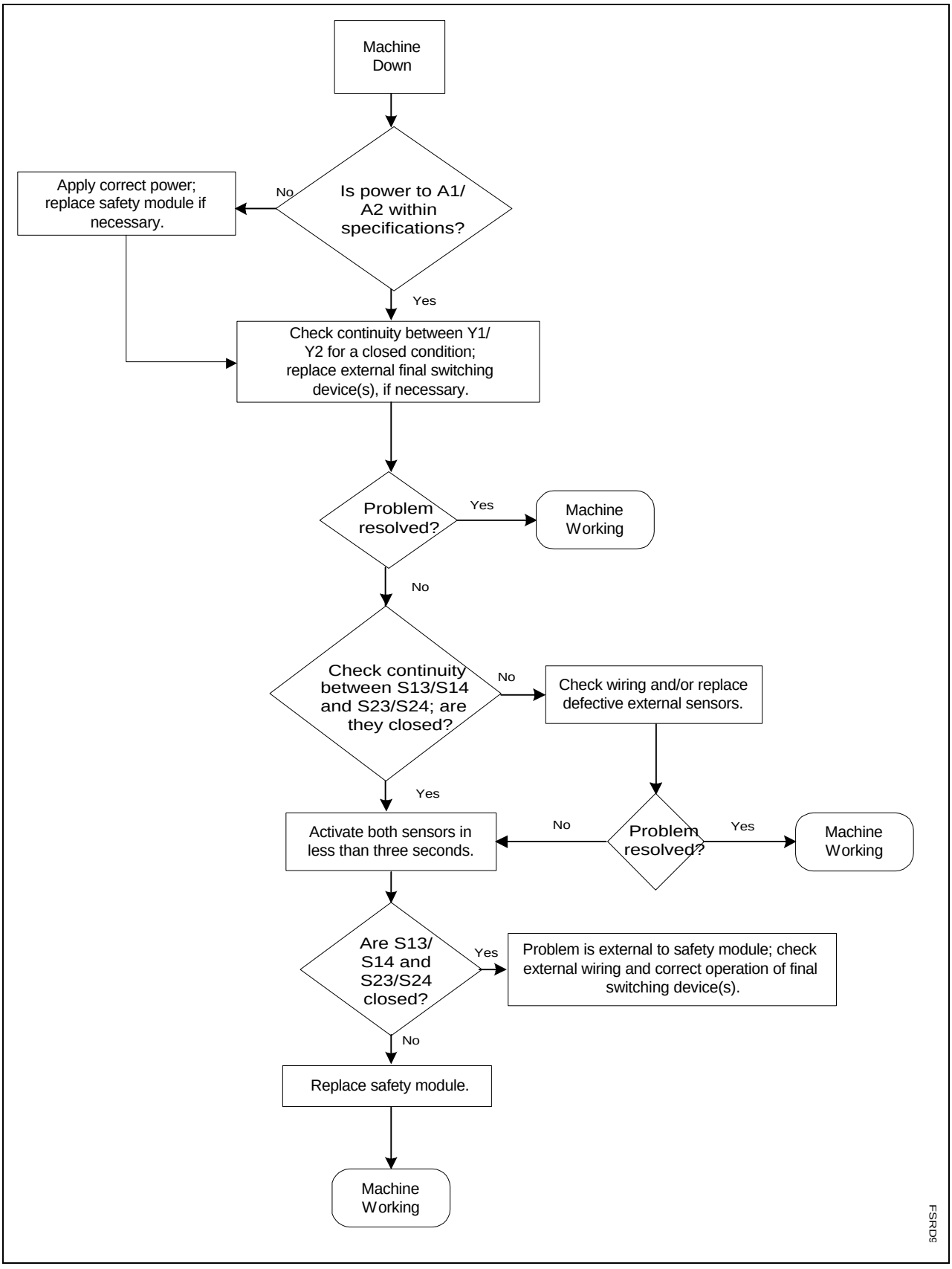
FUNCTIONAL DESCRIPTION:
After opening the door, the two external safety switch contacts Sa and Sb will open (as illustrated above) and the two internal safety relays K1 and K2 will de-energize. The normally open safety outputs 13/14 and 23/24 will open relaying the stop condition to the machine control circuitry. After closing the door and if Sa and Sb close in less than three seconds, the safety relays K1 and K2 will energize. The two normally open safety contacts will close and a manual restart sequence of the control system may then be initiated (allowing the machine to operate). The Final Switching Device monitoring loop (FSD) has to be closed (Y1-Y2, jumpered).

TWO-CHANNEL SAFETY DOOR MONITORING (WITH EXTERNAL CONTACTORS)



FUNCTIONAL DESCRIPTION:
For high current, the output contacts should be reinforced by using external safety relays.
The proper operation of the external contactors is monitored by connecting the NC contacts into the Final Switching Device monitoring loop (terminals Y1-Y2).
After opening the door, the two external safety switch contacts connected to S13/S14 and S23/S24 will open and the two internal safety relays K1 and K2 will de-energize. The normally open safety outputs 13/14 and 23/24 will open and de-energize the external contactors K3 and K4. After closing the door if the two inputs (S13/S14 and S23/S24) close in less than three seconds and if the two contactors K3 and K4 are working properly, the internal safety relays K1 and K2 will energize. The two normally open safety contacts will close and energize the external contactors K3 and K4. A manual restart sequence of the control system may then be initiated (allowing the machine to operate).

FF-SRD5985 TROUBLESHOOTING FLOW DIAGRAM



WARRANTY AND REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.
Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

TELEPHONE

1-800-737-3360 Canada
+ 33 (0) 4 76 41 7200 France
+ 49 (0) 69 8064 444 Germany
1-815-235-6847 International
+ 44 (0) 161 251 4079 UK
1-800-537-6945 USA

FAX

+ (33) 76 41 72 56 France
1-815-235-6545 USA

INTERNET

http://www.honeywell.com/sensing/
info@micro.honeywell.com

ORDER GUIDE

FF-SRD5985 ❑

Voltage :

2 = 24 VDC
E = 120 VAC
G = 230 VAC

Honeywell

Honeywell Cométa
European Photoelectric Center
21, Chemin du Vieux Chêne
38243 Meylan Cedex - FRANCE