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Honeywell

Fail Safe Control
Hardware Manual

FSC operating conditions

FSC cabinets

FSC systems are generally built into steel cabinet enclosures for mechanical protection of the delicate electronic equipment of the FSC system. Also, compliance with the CE directives requires the FSC systems to be properly enclosed.

FSC main components

An FSC system typically consists of the following main components:

- cabinet enclosure,
- field termination assemblies (FTAs) and/or terminals,
- central part (CP) racks with all CPU, memory and communication modules,
- input/output racks with all input and output modules, and
- power supply system consisting of power supply units (PSUs), main switches and circuit breakers.

FSC operating conditions

The operating conditions for FSC systems are as follows:

- Storage temperature: –25°C to +80°C (–13°F to +176°F)
- Operating temperature: 0°C to 60°C (32°F to 140°F)*
- Relative humidity: 95% (non-condensing)
- Vibration (sinusoidal): excitation: sine-shaped with sliding freq.
  frequency range: 10-150 Hz
  loads: 10 Hz - 57 Hz: 0.075 mm
  57 Hz - 150 Hz: 1 G
  no. of axes: 3 (x, y, z)
  traverse rate: 1 oct/min.
- Shock: 15 G in 3 axes (shock duration: 11 ms).

* Measured at the Central Part rack(s) by the Diagnostic and Battery Module (DBM).

FSC standards compliance

Description

This data sheet lists the standards that FSC complies with, and also provides some background information on CE marking (EMC directive and Low Voltage directive).

Table 1 FSC compliance to standards

Standard	Title	Remarks
DIN V 19250 (1/89, 5/94)	Measurement and control. Fundamental safety aspects to be considered for measurement and control equipment. *(German title: Leittechnik. Grundlegende Sicherheits-betrachtungen für MRS-Schutzeinrichtungen)*	Safety applications up to safety class AK 8
DIN V 0801 (1/90) and Amendment A (10/94)	Principles for computers in safety-related systems. *(German title: Grundsätze für Rechner in Systemen mit Sicherheitsaufgaben)*	Microprocessor-based safety systems
VDE 116 (10/89)	Electrical equipment of furnaces. *(German title: Elektrische Ausrüstung von Feuerungsanlagen)*	
EN 54 part 2 (01/90)	Components of automatic fire detection systems, Introduction *(German title: Bestandteile automatischer Brandmeldeanlagen)*	
EN 50081-2-1993	Electromagnetic compatibility – Generic emission standard, Part 2: Industrial environment	
EN 50082-2-1993	Electromagnetic compatibility – Generic immunity standard, Part 2: Industrial environment	
EN 61131-2-1994	Programmable controllers. Part 2: Equipment requirements and tests	
UL 1998	Safety-related software, first edition	Underwriters Laboratories
UL 508	Industrial control equipment, sixteenth edition	Underwriters Laboratories

Table 1 FSC compliance to standards (continued)

Standard	Title	Remarks
UL 991	Test for safety-related controls employing solid-state devices, second edition	Underwriters Laboratories
CSA C22.2	Process control equipment. Industrial products.	Canadian Standards Association No. 142 (R1993)
DIN IEC 68	Basic environmental testing procedures	
DIN IEC 68 Part 2-1	Cold test	0°C (32°F); 16 hours; system in operation; reduced power supply voltage (-15%) U=20.4 Vdc or (-10%); U=198 Vac
DIN IEC 68 Part 2-1	Cold test	–5°C (23°F); 16 hours; system in operation
DIN IEC 68 Part 2-2	Dry heat test	up to 60°C (140°F); 16 hours; system in operation; increased power supply voltage (+15%): U=27.6 Vdc or (+10%): U=242 Vac
DIN IEC 68 Part 2-3	Test Ca: damp heat, steady state	21 days at +40°C (104°F), 95% relative humidity; function test after cooling
DIN IEC 68 Part 2-3	Test Ca: damp heat, steady state	96 hours at +40°C (104°F), 95% relative humidity; system in operation
DIN IEC 68 Part 2-6	Environmental testing – Part 2: Tests – Test Fc: vibration (sinusoidal)	Excitation: sine-shaped with sliding frequence; Frequency range: 10-150 Hz Loads: 10-57 Hz; 0.075 mm 57-150 Hz; 1 G Duration: 10 cycles (20 sweeps) per axis No. of axes: 3 (x, y, z) Traverse rate: 1 oct/min System in operation
DIN IEC 68 Part 2-27	Environmental testing – Part 2: Tests – Test Ea: shock	Half sinus shock 1 shock per direction (6 in total) Maximum acceleration: 15 G Shock duration: 11 ms System in operation

CE marking

The CE mark (see Figure 1) is a compliance symbol which indicates that a product meets the requirements of the EU directives that apply to that product. CE (Conformité Européenne) marking is a prerequisite to marketing FSC systems in the European Union.

EU directives are documents issued on the authority of the Council of the European Union. They set out requirements and regulations for certain categories of products or problem areas. The directives apply not only to the member countries of the European Union but to the whole European Economic Area (EEA), which is made up of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom.

The directives have the following key objectives:

- free movement of goods within the EU/EEA geographical regions through harmonization of standards and elimination of trade barriers,
- safety of persons, their property and of animals, and
- protection of the environment.

CE

Figure 1 CE mark

For control products like FSC, a number of EU directives apply. The FSC product has been certified for two of these: the Electromagnetic Compatibility (EMC) Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC). Each is discussed in more detail below.

EMC directive (89/336/EEC)

One of the EU directives that FSC complies with is the EMC directive, or *Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility* as it is officially called. It "applies to apparatus liable to cause electromagnetic disturbance or the performance of which is liable to be affected by such disturbance" (Article 2).
The EMC directive defines protection requirements and inspection procedures relating to electromagnetic compatibility for a wide range of electric and electronic items.
Within the context of the EMC directive, 'apparatus' means all electrical and electronic appliances together with equipment and installations containing electrical and/or electronic components. 'Electromagnetic disturbance' means any electromagnetic phenomenon which may degrade the performance of a device, unit of equipment or system. An electromagnetic disturbance may be electromagnetic noise, an unwanted signal or a change in the propagation medium itself. 'Electromagnetic compatibility' is the ability of a device, unit of equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

There are two sides to electromagnetic compatibility: emission and immunity. These two essential requirements are set forth in Article 4, which states that an apparatus must be constructed so that:

(a) the electromagnetic disturbance it generates does not exceed a level allowing radio and telecommunications equipment and other apparatus to operate as intended;
(b) the apparatus has an adequate level of intrinsic immunity of electromagnetic disturbance to enable it to operate as intended.

The EMC directive was originally published in the Official Journal of the European Communities on May 23, 1989. The directive became effective on January 1, 1992, with a four-year transitional period. During the transitional period, a manufacturer can choose to meet existing national laws (of the country of installation) or comply with the EMC directive (demonstrated by the CE marking and Declaration of Conformity). The transitional period ended on December 31, 1995, which meant that as of January 1, 1996 compliance with the EMC directive became **mandatory** (a legal requirement). All electronic products may now only be marketed in the European Union if they meet the requirements laid down in the EMC directive. This also applies to FSC system cabinets.

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Low voltage directive (73/23/EEC)

The FSC product also complies with the low voltage directive, or *Council Directive 73/23/EEC of 19 February 1973 on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits* as it is officially called. It states that "electrical equipment may be placed on the market only if, having been constructed in accordance with good engineering practice in safety matters in force in the Community, it does not endanger the safety of persons, domestic animals or property when properly installed and maintained and used in applications for which it was made" (Article 2).
The low voltage directive defines a number of principal safety objectives that electrical equipment must meet in order to be considered "safe".

Within the context of the low voltage directive, 'electrical equipment' means any equipment designed for use with a voltage rating of between 50 and 1,000 V for alternating current and between 75 and 1,500 V for direct current.

The low voltage directive was originally published in the Official Journal of the European Communities on March 26, 1973. It was amended by Council Directive 93/68/EEC, which became effective on January 1, 1995, with a two-year transitional period. During the transitional period, a manufacturer can choose to meet existing national laws (of the country of installation) or comply with the low voltage directive (demonstrated by the CE marking and Declaration of Conformity). The transitional period ended on December 31, 1996, which meant that as of January 1, 1997 compliance with the low voltage directive became **mandatory** (a legal requirement). All electronic products may now only be marketed in the European Union if they meet the requirements laid down in the low voltage directive. This also applies to FSC system cabinets.

Key coding

Introduction

There are basically two types of modules in the racks of an FSC cabinet:

- Central Part modules (see section 4 of this manual), and
- I/O modules (see section 5 and section 6 of this manual).

Central Part modules

The Central Part modules must be placed in the Central Part rack(s), at the locations calculated by the FSC user station software. Only then will the Diagnostic and Battery Module (DBM, 10006/1/1 or 10006/2/.) and the diagnostic program indicate faulty module positions correctly.

I/O modules

The locations of the I/O modules in the I/O rack(s) are not predetermined by the FSC user station software. They are user-defined using the 'Configure FSC system' option of the FSC user station software. To ensure proper interfacing with the field devices (wiring, etc.) and to prevent damage to equipment, the I/O modules ***must*** be placed at the I/O rack positions as defined in the FSC user station software. To prevent insertion of an incorrect module type on a certain I/O position, the I/O rack connector and the module connector are key-coded with coding pins.

Note:
If the coding pins of the module are bent, they must be removed. If you try to bend the pins back to their correct position, they will break, and the connector will then need to be replaced.

Coding system

There are two types of FSC modules:

- Plug-and-play modules (type number 10xxx/2/x), and
- Non plug-and-play modules (type number 10xxx/1/x) (i.e. modules with I/O wiring on the rack connectors).

FSC I/O modules are coded using coding system type 5159, make SOURIAU. The items used for key coding the modules depend on the I/O module type. Table 1 and Table 2 below list the items used for key coding plug-and-play modules and non plug-and-play modules.

Table 1 Items used for key coding plug-and-play I/O modules

Plug-and-play modules (10xxx/2/x)	Souriau type no.
Module part: 2 holes	
Rack part: large pins	5159.009.17.22 (use special insertion tool, type 5159.009.96)

The rack connector must be coded by inserting two large pins in the appropriate holes (see Table 3).

Table 2 Items used for key coding non plug-and-play I/O modules

Non plug-and-play modules (10xxx/1/x)	Souriau type no.
Module part: pins	5159.009.17.01 (use special insertion tool, type 5159.009.99)
Rack part: blind stops	5159.009.18.01 (use special insertion tool, type 5159.009.98)
Rack part: large pins	5159.009.17.22 (use special insertion tool, type 5159.009.96)

The indicated coding pins are inserted in the appropriate holes in the module connector. The rack connector must be coded by inserting blind stops and one large pin in the appropriate holes (see Table 4).

Connectors

Every I/O module is fitted with a connector that is plugged into the appropriate rack connector.

Plug-and-play I/O modules

Figure 1 and Figure 2 show the layout of the module connector and rack connector of plug-and-play I/O modules (10xxx/2/x).

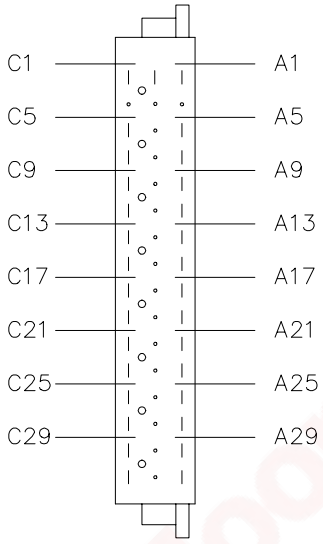

Figure 1 Module connector (back view)

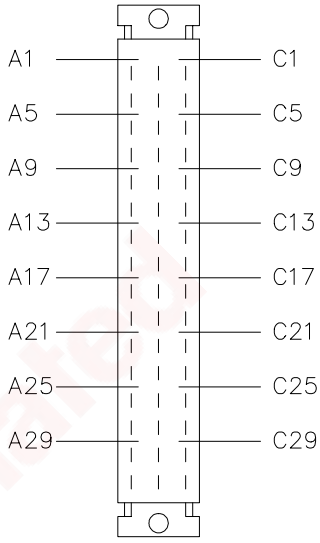

Figure 2 Rack connector (front view)

Non plug-and-play I/O modules

Figure 3 and Figure 4 show the layout of the module connector and rack connector of non plug-and-play I/O modules (10xxx/1/x).

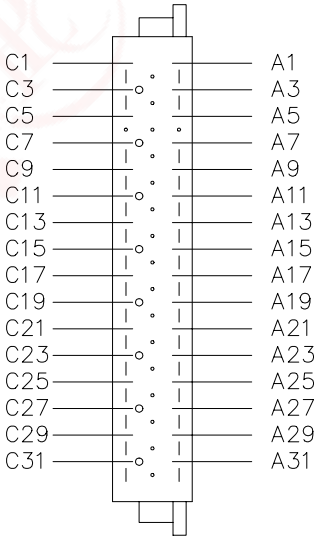

Figure 3 Module connector (back view)

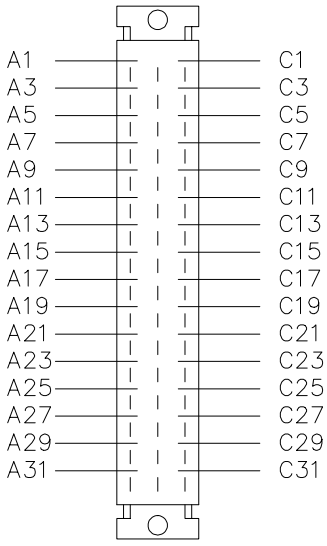

Figure 4 Rack connector (front view)

Key coding

Plug-and-play modules

Table 3 below shows the key coding of plug-and-play FSC modules (with type number 10xxx/2/x).

Table 3 Key coding of plug-and-play I/O modules

	Module code			Rack code	
Module type	Holes		Module type	Large pins	
10100/2/1	A5	A7	10100/2/1	A5	A7
10101/2/1	A5	C5	10101/2/1	A5	C5
10101/2/2	A5	C9	10101/2/2	A5	C9
10101/2/3	A5	C13	10101/2/3	A5	C13
10102/2/1	A5	C17	10102/2/1	A5	C17
10104/2/1	A5	C21	10104/2/1	A5	C21
10105/2/1	A5	C25	10105/2/1	A5	C25
10201/2/1	A9	C9	10201/2/1	A9	C9
10205/2/1	A9	C5	10205/2/1	A9	C5
10206/2/1	A9	C13	10206/2/1	A9	C13
10208/2/1	A9	C17	10208/2/1	A9	C17
10209/2/1	A9	C21	10209/2/1	A9	C21
10213/2/2	A9	C25	10213/2/2	A9	C25
10213/2/3	A9	C29	10213/2/3	A9	C29
10215/2/1	A13	C5	10215/2/1	A13	C5
10216/2/1	A13	C9	10216/2/1	A13	C9
10216/2/3	A13	C13	10216/2/3	A13	C13
10302/2/1	A5	A9	10302/2/1	A5	A9
10310/2/1	A5	A11	10310/2/1	A5	A11
10311/2/1	A5	A13	10311/2/1	A5	A13

1200 S 24 P067 24 Vdc power supply (45 A)

Description

The 1200 S 24 P067 power supply is a switched-mode DC power supply with a high efficiency (88%). It accepts a wide range of input voltages to provide 24 Vdc, 45 A output.

Figure 1 Full view

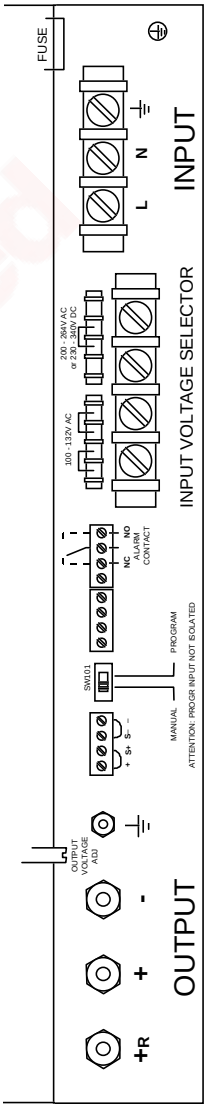

Figure 2 Connections

Main features

The unit's main features include:

- dual built-in overvoltage protection to comply with the strict functional safety requirements of the DIN V 19250 and VDE V 0801 standards,
- undervoltage alarm,
- redundant parallel operation (+R),
- serial operation (e.g. to create 48 Vdc), and
- optimum protection against continuous overload and short-circuiting.

Green LEDs in the front and rear panels are lit if the output voltage is present.

Installation

The 1200 S 24 P067 power supply can be mounted both vertically and horizontally, although vertical mounting is preferred for optimum cooling.
Convection cooling works best when the unit is mounted vertically, with the input connections facing upwards (see Figure 3). The unit is constructed in such a way that the heat generated in the semiconductors and transformer flows through a thick aluminum profile to both covers, which act as heat sinks. Thus, it is important that the air can flow freely along both vertical sides of the power supply unit. This design with natural convection cooling was chosen to avoid the use of forced ventilation, which has disadvantages like reliability, wear and tear, noise and dust filters. The unit is shipped with two H88 brackets for easy mounting.

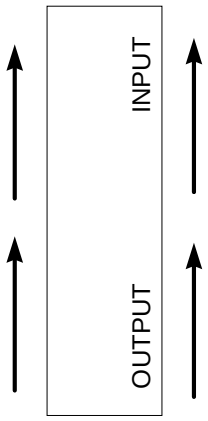

Figure 3 Vertical mounting

Although vertical mounting is preferred, the unit may also be mounted horizontally, providing that the maximum ambient temperature does not exceed 40°C (104°F) at full load (see Figure 4). When mounted in a 19" rack, the unit must have sufficient free space around it for optimum cooling (min. 1 HE, 1U).

Note:
If multiple power supplies are to be mounted above each other horizontally, it is recommended to use forced air cooling.

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