TÜV Rheinland Group

Automation, Software and Information Technology

Report of the type approval of Safety Manager

Report-No.: 968/EZ 195.00/05
Date: 2005-03-04

Report of the type approval of
Safety Manager

Report-No.:	968/EZ 195.00/05
Date	2005-03-04
Pages:	13
Test objects:	Safety Manager (see list of devices within the report for details)
Customer/Manufacturer:	Honeywell Safety Management Systems Rietveldenweg 32A NL-5222 AR's-Hertogenbosch The Netherlands
Order-No./Date:	Project 780031 dated 2004-04-06
Test Institute:	TÜV Industrie Service GmbH Automation, Software and Information Technology Competence Center Safeguards and Safety Components Am Grauen Stein D-51105 Köln
TÜV-Offer-No./Date:	968/230/03 dated 2003-12-16
TÜV-Order-No./Date:	9005888 dated 2004-03-04
Inspectors:	Dr. ir. M. J. Michel Houtermans Dipl.-Ing. Andreas Hesse Dipl.-Ing. Gernot Klaes
Test location:	see Test Institute and customer/manufacturer
Test duration:	March 2004 to March 2005

The test results are exclusively related to the test samples.

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1. Scope

In the following report the results of the type approval of the Safety-Manager for safety application are presented. The Safety Manager consists of Control-Processors-Chassis, programming/configuration tool and an assortment of I/O devices.

This test report is to provide traceable evidence, that the test object complies with the functional and safety-related requirements of the product specification, satisfies the requirements of the relevant regulations, and thus can be used as component for emergency shutdown, burner management, fire and gas applications.

Besides several application standards, the Safety Manager has been subject to an assessment in accordance with EN 954-1 category 4 and IEC 61508 Safety Integrity Level 3 (SIL 3).

This test report contains the essential safety engineering aspects, that were assessed during the concept and test phases, and identifies the various test steps, that were performed to provide evidence, that the test object complies with the safety-relevant requirements of the product specification and the relevant regulations.

It is described, which tests were performed, who performed them and which results were obtained.

2. Standards forming the basis for the requirements

Functional Safety

[S1] IEC 61508, parts 1 - 7:2000 Functional safety of electrical/electronic/programmable electronic safety-related systems

[S2] EN 954-1/1996 Safety of machinery, Safety related parts of control systems, Part 1: General principles of design

Application specific

[S3] EN 50156-1/2004 Electrical Equipment for Furnaces

[S4] IEC 61511/2004 Safety Instrumented Systems for the process industry sector

[S6] NFPA 72/2002 National Fire Alarm Code Handbook

[S7] NFPA 85/2001 Boiler and Combustion Systems Hazards Code

[S8] EN 54-2/1997 Fire Detection and Fire Alarm Systems
Control and indicating equipment

[S9] EN 54-4/2003 Fire Detection and Fire Alarm Systems

[S10] EN 298/2003 Automatic gas burner control systems for gas burners and gas burning appliances with or without fans

Electrical safety and resistance against environmental conditions

[S5] IEC 61131-2/2003 Programmable Controllers

[S11] IEC 61010-1/2001 Safety requirements for electrical equipment for measurement, control, and laboratory use

Climate

[S5]	IEC 61131-2/2003 Programmable Controllers		
	IEC 60068-2-1 Test Ab and Ad: Cold		(part of EN61131-2)
	IEC 60068-2-2 Test Bb and Bd: Dry heat		(part of EN61131-2)
	IEC 60068-2-14 Test N: Change of temperature		(part of EN61131-2)
	IEC 60068-2-30 Test Db: Damp heat, cyclic		(part of EN61131-2)
	IEC 60068-2-32 Test Ed. Free fall		(part of EN61131-2)

Shock/Vibration

[S5]	IEC 61131-2/2003 Programmable Controllers		
	IEC 60068-2-6	Test Fc: Vibration	(part of EN61131-2)
	IEC 60068-2-27	Test Ea: Shock	(part of EN61131-2)

EMC/EMI

[S5]	IEC 61131-2/2003 Programmable Controllers	
	EN 55011	(part of EN61131-2)
	IEC61000-4-2, ESD	(part of EN61131-2)
	EN 61000-4-3, RFI	(part of EN61131-2)
	EN 61000-4-4, Burst	(part of EN61131-2)
	EN 61000-4-5, Surge	(part of EN61131-2)
	EN 61000-4-6, cond. RFI	(part of EN61131-2)
	EN 61000-4-8, Magnetic	(part of EN61131-2)

3. Test object

3.1 History and test objects

The object of testing is the Safety Manager, which is the successor of the FSC-System. The FSC systems and its components have been previously approved by TÜV-Süddeutschland (Z10 03 09 201600 008). The test objects of the Safety Manager are the Control-Processor-Chassis (CPC), which consist of two identical Control-Processors (CP), a Battery-Keyswitch-Module (BKM) and a Power-Supply-Unit (PSU), the programming and configuration tool, called “Safety-Builder”, and the assortment of I/O-components.

The I/O-components from the FSC-System are reused with the Safety Manager and are identical, except for some minor changes that are not safety relevant (see [T3]).The I/O components are not described in this report and the previous certification reports remain as is and valid for these components [T5].

The relevant modules are listed in Appendix 1.

3.2 Product and test documents

The complete documentation was provided by the customer on four CD-ROMs. These CDs are available to the inspectors and will not be listed here. They are stored in the Test Institute. Only the documents which were discrete given to the inspectors are mentioned here.

No.	Document Title	Date
[K1]	Declaration of Commitment by Honeywell	2005-12-01
[K2]	Accreditation Certificate of KEMA Quality B.V., L022	valid till 2006-11-30

No.	Document Title	Date
[D1]	Safety Manual, EP-SM.MAN.6283, 100.3	2005-01-25
[D2]	Installation and Upgrade Guide, EP-SM.MAN.6277, 100.3	2005-01-25
[D3]	TÜV Süddeutschland, AUDIT REPORT Honeywell SMS - SIL / reliability calculations, Report Number: HS7008C, Revision 1.2,	2001-06-13

3.3 Test samples

Test samples are not present to the Test Institute, due to their size and complexity. Hence, all tests were performed on customer side together with hardware and software engineers.

The test samples, which were used during the main approval review, are stored at customer side. An adequate declaration of commitment is available from the customer, that the samples are unaltered, safely guarded, and available at any time for the test institute [K1].

The final hardware and software revisions of the Safety Manager are:

- Software Version: Safety Processor (QPP) 1.31.139.1 (CRC $789B26C4)
  Safety Builder R100.3
- Hardware Version: Quad Processor Pack V1.3
  Power Supply V1.1

Furthermore the source-codes of the Safety Manager are available within the inspectors documentation.

3.4 Previous test reports

[T1] 968/EL 280.00/04; Results of the concept approval review Safety Manager - Process Knowledge Solution (SM-PPKS) dated 2004-04-20

[T2] Meeting Minutes and Statements concerning the Safety Manager by Honeywell; dated 2004-12-07

[T3] Meeting Minutes concerning open items; dated 2005-03-01

[T4] Kompetenznachweis - Prüflabor at Honeywell side; dated 2004-12-03

[T5] TÜV Süddeutschland, Report to the Certificate, Certificate number Z10 03 09 20160 008, Report No.: SH99495C Revision 6.021 of 01, October 2003

[T6] RWTÜV, Certificate of Functional Safety Management System, Certificate-Register-No.: SAS0001/03, 2003-04-16

3.5 Description and result of the inspection of the safety structure

Each Control-Processor-Chassis (CPC) of the Safety Manager consist of up to two Control Processor (CP). A CP is built up by a Power-Supply-Unit (PSU), Quad Processor Pack (QPP), Universal Serial Interface (USI) and a Battery-Keyswitch-Module (BKM).

Several combinations between Control Processor and I/O-system lead to several system architectures. A non-redundant system configuration shows figure 1 and a fully redundant system configuration shows figure 2.

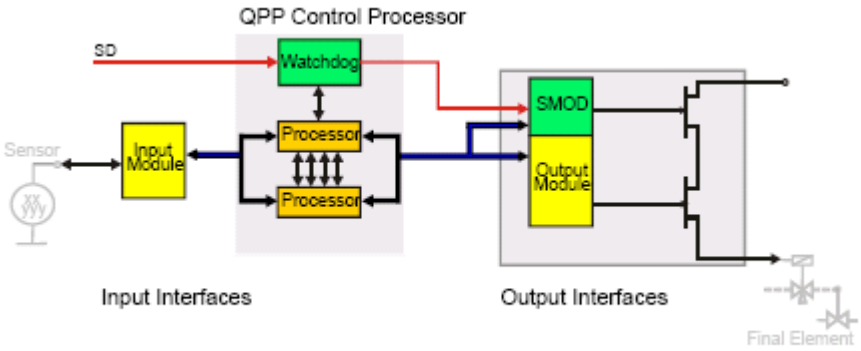

Figure 1: Non-redundant controller with non-redundant I/O

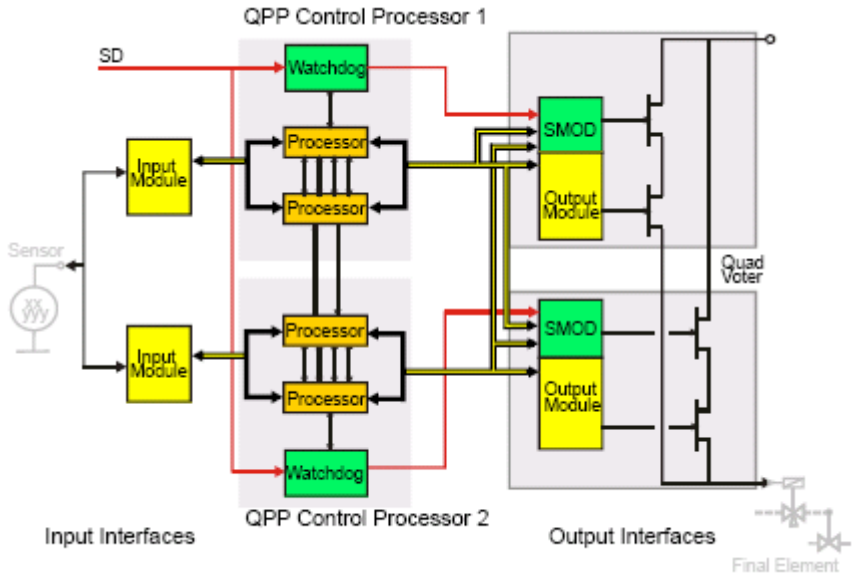

Figure 2: Redundant controller with redundant I/O

As pictured above, the QPP consists of two processors: main and redundant processor. Each processor has its own variable (RAM) and invariable (FLASH) memory. Both processors are running absolutely synchronously to each other. The synchronous run of both processors is checked by hardware comparators. The data bus of both systems is compared by a data comparator and the lower 4 bit of both systems are also compared by an address comparator. The correct function of both comparators are tested in the background by Watchdog Board (WD). Each processor system has its own logical program sequence monitoring. In conjunction with the temporal monitoring, which is done by the Watchdog Board, both measures achieve a high diagnostic coverage.

The invariable memory (FLASH) contains the operating system and the application program. A CRC 32 signature is applied to the FLASH memory to ensure the data integrity. The variable memory (RAM) is checked high dynamically by the data and address bus comparator unit. In addition, a transparent GALPAT is applied but lasts 2 years and a read / write test which will be repeated cyclic every 2 hours.

All data-, address-, stack-, control registers and all mnemonics of the microprocessors are checked within the Diagnostic Test Interval (DTI).

The Watchdog Board (WD) has a separate time base and monitors the function of the processor by a time-window. The function “watchdog “ exists twice on WD. This is due to test the watchdog function and to prevent a shut down of the outputs during the test phase. The voltage monitoring of the 24VDC and 5VDC are also located on the WD and are tested in background. Another functionality of WD is the background test of the data- and address comparators. In case of any detected fault, the outputs will be shut down by the Processor Board or by the Watchdog Board. Beside the shut down in case of a malfunction, an input on the WD allows the user to connect an external switch to shut down the safety related outputs independent from the safety processor.

The communication between the Control Processor and all input-/output interfaces is done by an I/O-bus driver board. This single channel communication is checked in background within the Diagnostic Test Interval.

The internal cross communication between both Control Processors in redundant applications is done by a dual channel communication path. In addition, the safety data are embedded within a safety layer with CRC32 signature and time expectation.

4. Protocol and results type approval

4.1 Overview

The testing has been carried out to show that at the basis the Safety Manager complies with the requirements for Safety Integrity Level 3 (SIL 3) as per IEC 61508 and the general requirements for fail-safe controls in accordance with EN 954-1 for safety category 4.

The devices used in the various tests are recorded in the inspectors' documentation.

4.2 Requirements in accordance with IEC 61508

4.2.1 General requirements

For the Safety Manager Safety Integrity Level 3 (SIL 3) is sought.

Due to the technology in the device and the intended application it is considered as a type B subsystem in accordance with IEC 61508-2. It operates beside as a component for a protective device in a "Low Demand Mode of Operation" also in "High Demand Mode of Operation" applications.

Along with the probabilistic requirements IEC 61508 the following points have to be judged:

- documentation
- measures for the avoidance of failures (QM) as well as
- measures for controlling failures in each case over the entire life cycle of the product

4.2.2 Assessment of the management of functional safety

Honeywell SMS has been certified by RWTÜV for their functional safety management system according to IEC 61508. The certification addresses the design, manufacturing and integration of microprocessor based safety systems including application software, design, development and maintenance of embedded and configuration software.

4.2.3 Documentation over the entire life cycle

The extensive documentation provided by Honeywell are listed in chapter 3.2. They have been prepared to suit the individual phases of the life cycle and are available to the Test Institute.

The test results and assessment of the documentation on the Safety Manager demonstrated, that they satisfy to the requirements in accordance with IEC 61508.

4.2.4 Assessment of the measures for controlling failures in hardware

To achieve the level of failure detection required in accordance with SIL 3 and the safe failure fraction measures for controlling failures must be taken for hardware failures given in a defined failure model. The used failure model corresponds to the requirements in table A.1 in annex A of IEC 61508-2. The effectiveness of the taken measures has been analysed by the manufacturer. They have been documented and verified by module- and system tests.

In addition the measures for the detection of failures and controlling failures were analysed in joint reviews with the Test Institute. The effectiveness was partly verified based on selected practical tests, which are documented in [T1], [T2].

Any detected fault will result in the configured fault reaction which by default is the deactivation of the outputs by the Processor Board or by the Watchdog Board. All applied measures have a high diagnostic coverage of at least 99%, which corresponds to the requirements [S1].

The safety structure, diagnostics and the detection of failures comply to the requirements in [S1].

4.2.5 Assessment of the measures for failures avoidance in hardware/software

The assessment of failure avoidance was part of the functional safety management (see chapter 4.2.2 and 4.2.3). The applied measures were partly verified by the Test Institute during several meetings on project level (see [T1] - [T4]).

4.2.6 Determination of PFD/PFH

Honeywell has a TÜV certified calculation method [D3] to determine the reliability parameters according to [S1]. The new products are included in the existing calculation method. The end-user must request Honeywell to perform the calculations for the desired system configuration.

The calculation method is accepted by the Test Institute.

4.3 Requirements in accordance with EN 954-1

All single failures will be detected by appropriate diagnostic measures. The effectiveness of these diagnostics were already assessed during [S1] assessment. A failure accumulation need not to be considered due to the fact that each failure leads into the configured fault reaction of the system.

The safety structure, diagnostics and the detection of failures comply to the requirements in [S2].

4.4 Electrical safety

The basis for the electrical safety evaluation is formed by [S11]. All 24VDC module ports must be supplied by reinforced or double insulated power supply. The customer favoured AC power supply units are listed in [D1] and [D2].

The actual clearance and creepage distances of the light shaded modules in chapter 3.1 meet the requirement of the above mentioned standard. A high voltage test is not necessary, due to the fact, that the clearance and creepage requirements are met and no separation according to double/reinforced insulation is necessary for protection against electric shock.

4.5 Environmental tests

The environmental tests temperature and climate are performed at Honeywell internal test laboratories. This laboratory was inspected and judged by inspectors of TÜV Rheinland (see [T4]).

All EMC/EMI tests are performed at KEMA laboratories. An accreditation certificate is present to the Test Institute [K2]. The vibration- and shock tests are performed at accredited test laboratory (DATECH), Reg.No. DAT-P-087/99.12).

The results are accepted by the Test Institute with some restrictions:

The present vibration results are not fully compliant with [S5] chapter 6.2.1 and long-term vibration in [S8] chapter 15.15. These tests might be carried out additionally if required in an application.

4.6 Accompanying documents

The Safety Manual [D1] and Installation and Upgrade Manual [D2] for Safety Manager has been reviewed. It contains the necessary information for the correct installation and safe operation.

The PFD/PFH results can be obtained in the sales phase as part of the quotation documentation.

4.7 Application specific considerations

4.7.1 Requirements according to EN 50156-1/2004

The EN 50156-1 lists beside the application specific requirements also system specific requirements which are in accordance with IEC 61508 and EN 954-1. Therefore, the system specific requirements are fulfilled.

The user still needs to comply with all other requirements from the standard including requirements that have an effect on the operation of the safety system. The end-user should refer to the safety manual [D1].

4.7.2 Requirements according to IEC 61511/2004

The Safety Manager fulfils the requirements for safety integrity level 3 in accordance with IEC 61508. Hence, the system can be used within the scope of IEC 61511.

The user still needs to comply with all other requirements from the standard including requirements that have an effect on the operation of the safety system. The end-user should refer to the safety manual [D1].

4.7.3 Requirements according to NFPA 72/2002

The Safety Manager meets the additional requirements imposed by the application standards NFPA 72 [S6].

The table below shows only those product requirements which have not yet performed by the manufacturer. Requirements which can be reached by planning or projecting measures, e.g. power supply, installation etc are not considered.

Clause	Requirement	Results
4.4.4.3	Transient Protection	Test not yet performed. Induced transients are part of the EMC tests of [S5]. But levels in terms of NFPA 70, section 760.7, e.g. 15 kV for ESD, were not tested.

The user still needs to comply with all other requirements from the standard including requirements that have an effect on the operation of the safety system. The end-user should refer to the specific sections of the safety manual [D1], especially chapter 9.

4.7.4 Requirements according to NFPA 85/2001

The Safety Manager meets the applicable requirements for logic solvers as defined by the application standard NFPA 85 [S7]. The test results were positive and are documented in the inspectors documentation.

The user still needs to comply with all other requirements from the standard including requirements that have an effect on the operation of the safety system. The end-user should refer to the safety manual [D1].

4.7.5 Requirements according to EN 54-2/2004

The Safety Manager meets the additional requirements imposed by the application standards EN 54-2 [S8].

The table below shows only those product requirements which have not yet performed by the manufacturer. Requirements which can be reached by planning or projecting measures, e.g. power supply, installation etc are not considered. Only the following test has not been carried out and is still pending.

Clause	Requirement	Results
15.15	Vibration, sinusoidal (endurance)	Not yet performed

The user still needs to comply with all other requirements from the standard including requirements that have an effect on the operation of the safety system. The end-user should refer to the specific sections of the safety manual [D1], especially chapter 9.

4.7.6 Requirements according to EN 54-4/2003

The EN 54-4 lists the requirements for power supply equipment in fire detection and fire alarm system applications. The present type approval of the Safety Manager was not directly within the scope of EN 54-4 due to the fact that the used power supply units only converts the primary 24VDC into a isolated 5VDC voltage.

The Safety Manager, especially with redundant controller (figure 2), is suited for application with two external power supply units which are in the scope of EN 54-4 clause 4.2.

The external power supply units were not in the scope of this type approval. Therefore, for full compliance the following conditions must be observed:

- The user is responsible to select external power supplies that are compliant with the standard.

4.7.7 Requirements according to EN 298/2003

The Safety Manager meets the additional requirements imposed by the application standard EN 298 [S10].

The table below shows only those product requirements which have not yet performed by the manufacturer. Requirements which can be reached by planning or projecting measures, e.g. power supply, installation etc are not considered.

Clause	Requirement	Results
6.5.2.2.1	Thermal stress test	not carried out in terms of this standard
6.5.2.2.2	Vibration test EN 60068-2-6:1995, test Fc	not carried out in terms of this standard
6.5.2.3	Long term performance test	must carried out by the manufacturer
7.6	Performance tests	not carried out in terms of this standard
7.6.1	At ambient temperature	
7.6.2	At low temperature (0°C)	not carried out in terms of this standard
7.6.3	At high temperature (60°C)	not carried out in terms of this standard
8.	Protection against environmental influences	
8.1	Temperature range	not carried out in terms of this standard
8.2	Supply voltage variations	
8.2.1	For voltage variations between 85 % and 110 % of the rated voltage or of the voltage range declared by the manufacturer, the system shall meet the requirements of this standard	not carried out in terms of this standard
8.3	Supply voltage dips, short interruptions and voltage variations immunity	not carried out in terms of this standard
8.4	Supply frequency variations	not applicable, due to DC voltage supply
8.5.2	Surge immunity test (table 3)	not carried out in terms of this standard
8.6.2	Electrical fast transient/burst immunity test (table 4)	not carried out in terms of this standard
8.7.1	Immunity to conducted disturbances, induced by radio-frequency fields (table 5)	not carried out in terms of this standard
8.7.2	Immunity to radiated disturbances, induced by radiated fields (table 6)	not carried out in terms of this standard
8.8.2	Electrostatic discharge immunity test (table 7)	not carried out in terms of this standard

For full compliance with EN 298 and a striven DIN - DVGW approval the following conditions must be observed:

The user still needs to comply with all other requirements from the standard including requirements that have an effect on the operation of the safety system. The end-user should refer to the safety manual [D1].

5. Conclusion

During the correctly performed test no infringement of the functional and safety-related requirements in the applied standards could be found. Observance must be given to the installation conditions and application notes defined in the Operating and Instruction Manuals.

The additional application specific requirements as listed in the related chapters above must be taken into consideration.

It was demonstrated, that the Safety Manager complies with the requirements of IEC 61508 for SIL 3 and EN 954-1 Cat. 4. The safety related parameters are specified within the Safety Manual /D1/ or will be given by the manufacturer on request. The electrical safety is given. The resistance against the specified environment conditions are mostly given, exceptions are mentioned in chapter 4.5 and 4.7.

Therefore the Safety Manager-System can be used in up to and including SIL 3/Cat. 4 applications.

The certificate no. 968/EZ 195.00/05 dated 2005-03-04 is an integral part of this test report.

Actual information about the certification status of the Safety Manager and actual releases of HW and SW components can be obtained from the homepage of the Test Institute. Please refer to the “List of type approved PES” published on: http://www.tuvasi.com/.

Cologne, 2005-03-04
TIS/ASI/Kst. 968 he-kg-nie

The inspectors

Dipl.-Ing. Andreas Hesse

Dipl.-Ing. Gernot Klaes

Appendix 1

TÜV Rheinland Group

Revision Release List:

SIL3 compliant HW Components:

Catalog Number	Description	Part Number	Rev.
FS-CPCHAS-0001	Chassis for Control Processor	3402000	-
FS-CPB-0001	Control processor backplane, part of FS-CPCHAS-0001	3410431	-
FS-TERM-0001	Bus terminator for non-redundant IO	3402007	-
FS-TERM-0002	Bus terminator for redundant IO	3402008	-
FS-IOCHAS-0001R	Chassis for redundant I/O modules	3402050	-
FS-IOCHAS-0001S	Chassis for non-redundant I/O modules	3402051	-
FS-IOB-0001S	I/O backplane for non-redundant I/O, part of FS-IOCHAS-0001S	3410432	-
FS-IOB-0001R	I/O backplane for redundant I/O, part of FS-IOCHAS-0001R	3410434	-
FS-IOBUS-HBS	Horizontal non-redundant I/O bus backplane, part of FS-IOCHAS-0001S	3410433	-
FS-IOBUS-HBR	Horizontal redundant I/O bus backplane, part of FS-IOCHAS-0001R	3410435	-
FS-IO-0001	I/O extender module part of the FS-IOCHAS-0001x	3402500	V1.0
FS-QPP-0001	Quad Processor Pack	3402001	V1.1
FS-QPP-0001	Quad Processor Pack	3402009	V1.2
FS-QPP-0001	Quad Processor Pack	3402013	V1.3
FS-BKM-0001	Battery and Key switch Module	3402003	V1.0
FS-PSU-240516	Power Supply Unit 24/5 Vdc, 16A	3402002	V1.0
FS-PSU-240516	Power Supply Unit 24/5 Vdc, 16A	3402011	V1.1
FS-SDI-1624	Safe digital input module (24 Vdc, 16 channels)	3402100	V1.0
FS-SAI-0410	Safe analog input module (4 channels)	3402102	V1.0
FS-SAI-1620m	Safe high-density analog input module (24 Vdc, 16 channels)	3402103	V1.0
FS-SDIL-1608	Safe line-monitored digital input module with earth fault monitor (16 channels)	3402104	V1.0
FS-SDO-0824	Safe digital output module (24 Vdc, 0.55 A, 8 channels)	3402202	V1.0
FS-SAO-0220m	Safe analog output module (0(4)-20 mA, 2 channels)	3402203	V1.0
FS-SDO-0424	Safe digital output module (24 Vdc, 2 A, 4 channels)	3402207	V1.0
FS-SDOL-0424	Safe loop-monitored digital output module (24 Vdc, 1 A, 4 ch.)	3402208	V1.0
FS-TSDI-16UNI	Safe Digital Input FTA(24/48Vdc, NAMUR 16 channels)	3410741	-

Catalog Number	Description	Part Number	Rev.
FS-TSDI-1624C	Current-limited digital input FTA (24 Vdc, 16 channels)	3410742	-
FS-TSDI-16115	Safe active/passive digital input FTA (115 Vac/dc, 16 ch.)	3410743	-
FS-TSAI-0410	Safe analog input FTA (4 channels)	3410745	-
FS-TSAI-1620m	Safe 0(4)-20 mA analog input FTA (16 channels)	3410746	-
FS-TSHART-1620m	Safe 0(4)-20 mA analog input FTA (16 channels) with HART interface	3410747	-
FS-TSGAS-1624	Safe Gas -Flame detector input FTA (0 - 20 mA, 16 channels)	3410748	-
FS-TSFIRE-1624	Safe Fire detector input FTA with Line Mon. (24 Vdc, 16 ch.)	3410763	V1.1
FS-TPSU-2430	24 Vdc to 30 Vdc/1 A converter	3410752	-
FS-TSAO-0220m	Safe 0(4)-20 mA analog input FTA (2 channels)	3410753	-
FS-TSDO-0424	Safe digital output FTA (24 Vdc, 4 channels)	3410755	-
FS-TSDO-04UNI	Safe digital output FTA (24/48/110 Vdc, 4 channels)	3410756	-
FS-TSDO-0824	Safe digital output FTA (24 Vdc, 8 channels)	3410757	-
FC-TSDO-0824C	Safe digital output FTA current limited (24 Vdc, 8 channels)	3410758	-
FC-TSDOL-0424C	Safe digital output FTA, current limited (24 Vdc, 4 channels)	3410759	-
FS-TSRO-0824	Digital output (relay) FTA for AK5/6 applications (8 channels)	3410761	-
FS-TSDI-1624	Safe digital input FTA (24 Vdc, 16 channels)	3410764	V1.0
1200 S 24 P067 V115 CM	1200 S PSU 115VAC/24VDC Complete Mounted 45 A	4220135	-
1200 S 24 P067 V230 CM	1200 S PSU 230VAC/24VDC Complete Mounted 45 A	4220136	-

5.1.1.1

Further HW Components suitable for use to build up safety loops up to SIL3 with the Safety Manager:

Catalog Number	Description	Part Number	Rev.
FS-USI-0001	Universal Safety Interface	3402004	V1.0
FS-USI-0001	Universal Safety Interface	3402012	V1.1
FS-DCOM-232/485	Communication interface FTA for RS232 and RS485	3402300	V1.0
FS-DCOM-232/485	Communication interface FTA for RS232 and RS485	3402304	V2.0
FS-UCOM-HSE	High speed ethernet switch, make: Hirschman, type RS2-TX	4600065	-
FS-PDB-HSE24	Power Distribution board to power 2x FS-UCOM-HSE	3402301	-
FS-UCOM-SDW	High speed ethernet switch, make: Westermo, type SDW-550-EC	4600072	-

Appendix 1

Further interference free HW Components suitable for use with the Safety Manager:

Catalog Number	Description	Part Number	Rev.
FS-DO-1224	Digital output module (24 Vdc, 0.55 A, 12 channels)	3402204	V1.0
FS-RO-1024	Relay output module (contacts, 36 Vdc, 2 A, 10 channels)	3402205	V1.0
FS-DO-1624	Digital output module (24 Vdc, 0.1 A, 16 channels)	3402206	V1.0
FS-TIDI-1624	Isolated passive digital input FTA (16 channels)	3410744	-
FS-TDO-1624	Digital output FTA (24 Vdc, 16 channels)	3410754	-
FS-TRO-0824	Digital output (relay contact) FTA (8 channels, NO/NC)	3410761	-
FS-TRO-1024	Digital output (relay contact) FTA (10 channels)	3410762	-

SIL3 compliant SW Components:

Catalog Number	Description	Part Number	Rev.
FS-QPP-0001	Quad Processor Pack	3402013	1.31.139.1 (CRC $789B26C4)

5.1.1.2 Further SW Components suitable for use to build up safety loops up to SIL3 with Safety Manager:

Catalog Number	Description	Part Number	Rev.
FS-SMSB-ST-100	Safety Builder R100.3 Software Basic Windows 2000/XP	3402900	-