

Safety Manager SC R214 Specification and Technical Data



Safety Manager SC Spec &Tech
12/2025

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1 Introduction

Safety Management Systems R214, designed and developed by Honeywell, ensures safety, simplifies operations and reduces costs by providing one safety system platform to support small packaged applications to large distributed plant-wide architectures.

Safety Manager SC simplifies engineering, development and testing using advanced features from Honeywell including LEAP™, Universal IO, offline simulation, and Experion® integration. It reduces time and money needed for spares, training and engineering tools that were previously required for multiple systems.

With the Safety Manager SC solution, industrial process facilities are assured of the utmost cost and performance benefits over the life of the asset. They will also realize significant value from simplified configuration and integration across their control and safety architecture.

The Safety Manager SC system can support a wide variety of safety solutions, easily configured to meet small to large safety applications requiring varying levels of redundancy. Because the system is IEC 61511/61508 SIL 3 TUV certified, it can provide the optimal level of safety and process control integration while still maintaining functional safety separation as mandated by those standards.

1.1 Features and Benefits

Safety Manager SC has the following features and benefits:

- IEC61508/61511 TÜV SIL 1,2 and 3 certified.
- Full system redundancy capabilities providing maximum availability for critical safety applications.
- Vertical orientation allows easy module installation, wiring and maintenance.
- Scalable and easily configured to meet small to large safety applications requiring varying levels of availability.
- Universal Safety IO with per channel selection of Digital Input, Digital Output, Analog Input, Analog Output.
- Slanted module mounting design creates a uniform heat distribution to extend module life and increase operating temperatures by reducing hot spots.
- Field power integrated with the IO modules, eliminating external loop wiring and separate power supplies.
- Local and remote Safety IO solutions up to 100Km (62 miles).
- Honeywell's LEAP project methodology allows early hardware selection and late changes to IO.
- HART pass through enabled Universal Safety I/O for greater configuration flexibility.
- IEC 61131 compliant Safety Builder engineering tool.
- ISA secure L2 certified cyber security ensuring the safety of the system, personnel and critical information.
- SafeNet, a proprietary TÜV SIL 3 certified peer to peer safety communication network enabling decentralized process safeguarding using Safety Manager SC with central process monitoring and control capabilities.
- Tightly integrated with Experion, Honeywell's best-in-class Distributed Control System (DCS) and Honeywell's Field Device Manager (FDM) for smart field device management.
- Safety Manager SC is TÜV SIL 3 out of the box meaning, no special engineering or user safety application required.

- Single vendor service and support across the Safety System, DCS, PLC and Field Device Manager.
- Segregated and independent safety and communication processing.
- Safety Manager SC is TÜV SIL 3 certified with unlimited runtime for redundant and non-redundant configurations.
- The Safety Manager SC Universal Safety IO family supports line monitoring and short circuit detection by default.
- TÜV SIL 3 certified On Line Modification capabilities, no process disturbance during modifications, expansions, upgrades and updates.
- Simulation capability - offline and Cloud based for faster development and checkout of safety logic using the Safety Builder engineering tool.
- Keyed Universal Safety IO boards to prevent incorrect insertion.
- In redundant configurations, all modules can be replaced without disturbing the safeguarded process, this includes both processor and IO modules. No additional spare slots or modules required.
- Provides detailed diagnostics for easier maintenance and trouble shooting.

1.2 Typical applications

Safety Manager SC provides a solution for a wide range of process safeguarding:

- High-Integrity Protection System (HIPS)
- Emergency Shut Down (ESD)
- Fire and Gas detection, alarming and/or mitigation Systems (FGS / F&G)
- Pipeline monitoring
- Turbine and compressor safeguarding

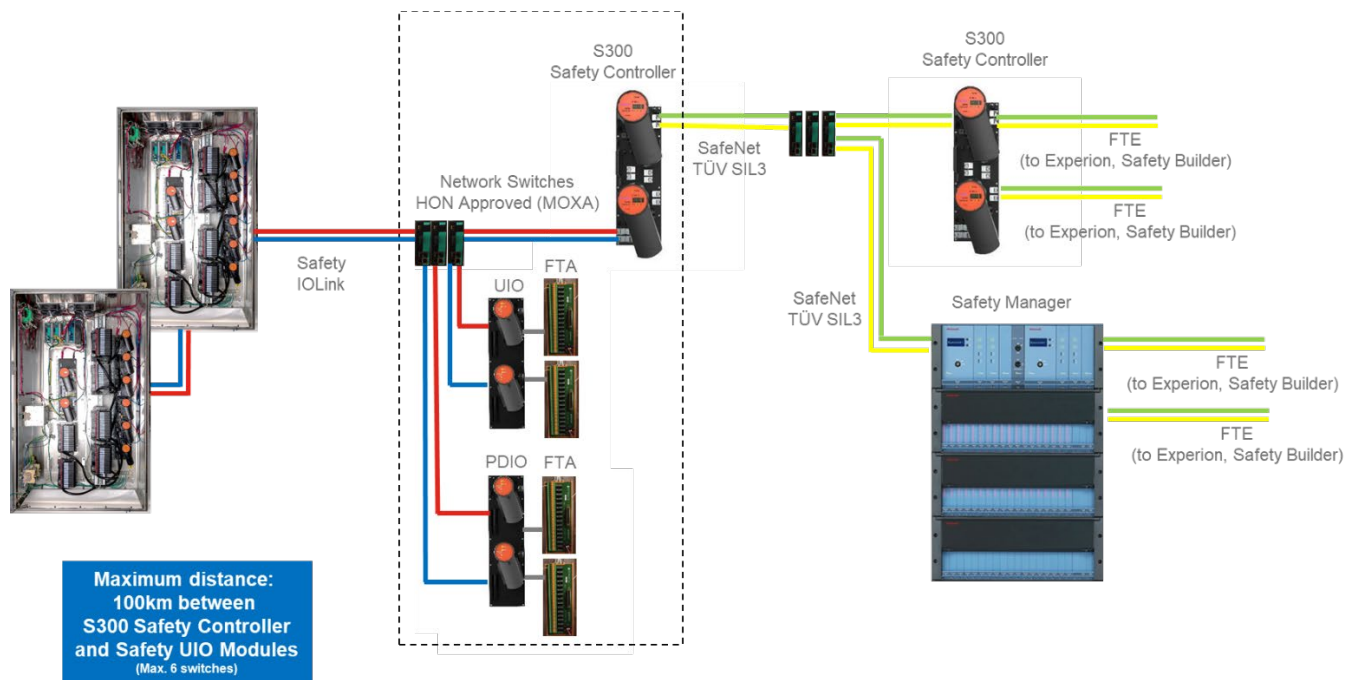
The most typical examples of applying Safety Manager SC are Emergency Shut Down and Fire and Gas.

2 Functional description

This chapter will give a general overview on the main functions of Safety Manager SC.

2.1 Safety Manager SC architectures

The below figure shows the basic system architecture of Safety Manager SC, at a high abstract level.



The Safety Manager SC Controller (S300 Safety Processor) performs several functions. It:

- Runs and controls the Safety Manager SC application logic,
- Communicates to other systems,
- Performs diagnostics on safety-critical functions,
- Reacts to detected faults while maintaining safety,
- Communicates with the Universal Safety IO modules via the Safety IO link using a SIL3 IEC 61508 certified proprietary protocol.

A Safety Manager SC Controller consists of two synchronous processors, flash memory for system and application program, data comparators for the processors and their memory, a redundant communication link with the other Control Processor, data exchange with its communication processors, watchdog, diagnostics display, and temperature monitors.

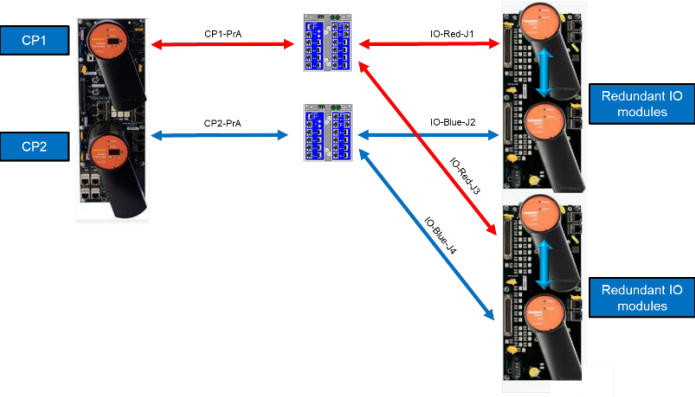
Safety Manager SC can be configured for a number of architectures. Each has its own characteristics and typical Safety Instrumented Functions. The below table provides an overview of the available architectures.

Controller architecture	IO Configuration	supports SIF1	Availability level
ART+	Redundant	SIL3	Maximized
Redundant	Redundant	SIL3	High
	Mixed Redundant and Non-Redundant	SIL3	High / Medium
	Non-Redundant	SIL3	Normal

All Safety Manager SC architectures support Safety Instrumented Functions for SIL1, SIL2 and SIL3 related applications. The preferred architecture depends on the availability requirements.

Redundant SC Controller and redundant IO

This Safety Manager SC architecture has a redundant SC Controller and redundant universal safety IO modules (see the below figure). The Safety Manager SC Universal Safety IO modules are controlled via a Safety IO link. The SC Controller and IO are fully redundant, which allows continuous operation and smooth (zero-delay) transfer of the control in case of an SC Controller or IO failure. This architecture can be used for Safety Instrumented Functions for SIL1, SIL2 and SIL3 related applications.

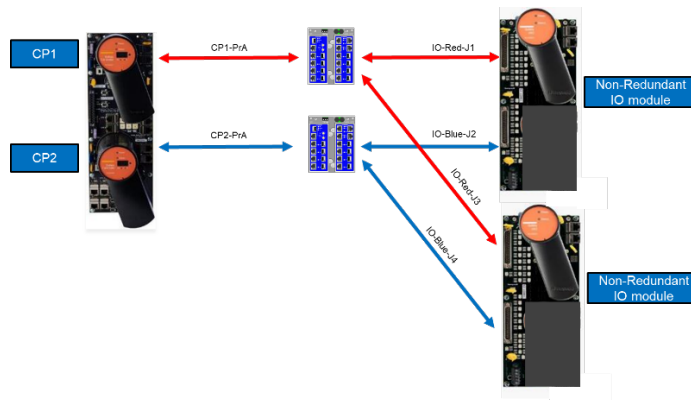


Both SC Controllers run in parallel, meaning that they simultaneously read input states and write output states. Via the redundant link both SC Controllers continuously inform each other about the achieved IO states and application states. The redundant link is used to synchronize actions and compare results.

In principle, when a fault is detected on an input channel, the SC Controller ignores the data from the faulty IO module. The correct value is obtained from the IO module connected to the other SC Controller via the redundant internal link *before* the application cycle is started. In principle, when a fault is detected in an output channel, this channel is de-energized by the SMOD (see Secondary Means Of De-energization). The correct value is driven into the field by the output channel on the redundant module.

Redundant SC Controller and non-redundant IO

This Safety Manager SC architecture has a redundant SC Controller and non-redundant universal safety IO modules (see the below figure). The Safety Manager SC Universal Safety IO modules are controlled via a Safety IO link. The SC Controller is fully redundant, which allows continuous operation and smooth (zero-delay) transfer of the control in case of an SC Controller failure. This architecture can be used for Safety Instrumented Functions for SIL1, SIL2 and SIL3 related applications.

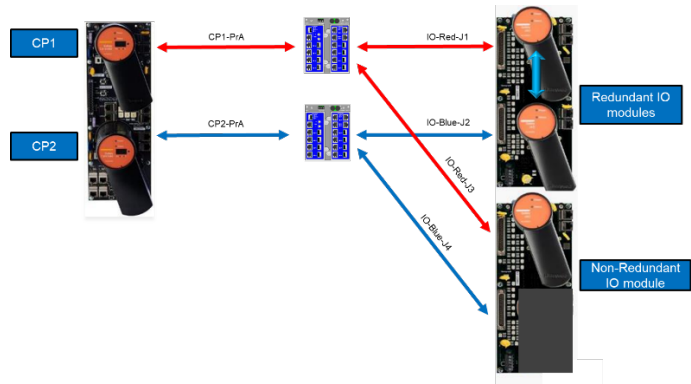


Both SC Controllers run in parallel, meaning that they simultaneously read input states and write output states. Via the redundant link both SC Controllers continuously inform each other about the achieved IO states and application states. The redundant link is used to synchronize actions and compare results.

In principle, when a fault is detected on an input or output channel, the SC Controller will apply the safe state for the faulty channel.

Redundant SC Controller, redundant and non-redundant IO

This Safety Manager SC architecture has a redundant SC Controller, redundant and non-redundant universal safety IO modules (see the below figure). The Safety Manager SC Universal Safety IO modules are controlled via a Safety IO link. The SC Controller is fully redundant, which allows continuous operation and smooth (zero-delay) transfer of the control in case of an SC Controller failure. This architecture can be used for Safety Instrumented Functions for SIL1, SIL2 and SIL3 related applications.



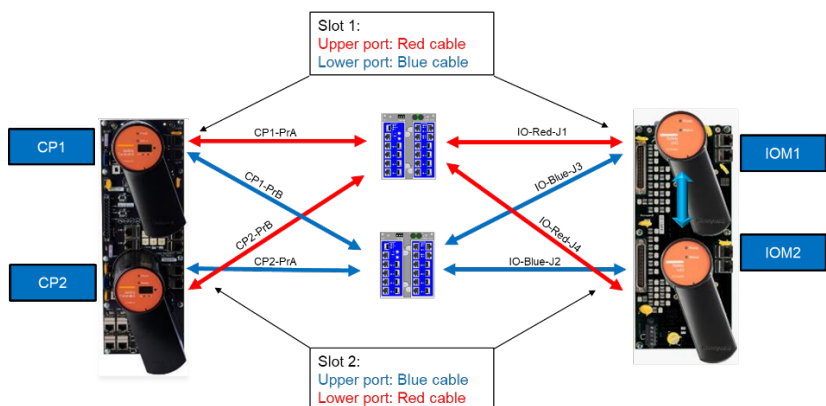
Both SC Controllers run in parallel, meaning that they simultaneously read input states and write output states. Via the redundant link both SC Controllers continuously inform each other about the achieved IO states and application states. The redundant link is used to synchronize actions and compare results.

In principle, when a fault is detected on a redundant input channel, the SC Controller ignores the data from the faulty IO module. The correct value is obtained from the IO module connected to the other SC Controller via the redundant internal link *before* the application cycle is started.

In principle, when a fault is detected in a redundant output channel, this channel is de-energized by the SMOD (see Secondary Means Of De-energization). The correct value is driven into the field by the output channel on the redundant module.

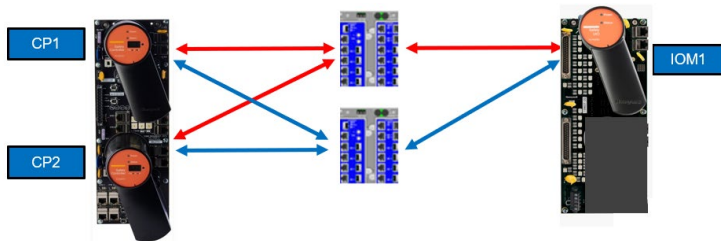
Safety Manager SC ART +

In Safety Manager SC, redundant physical links allow single fault tolerance, but the addition of two cables enable ART+ architecture with Multi-Fault Tolerance. Dual processor technology for each SC Controller set up as ART+ means that for redundant IO configurations, both paths can be controlled by each SC Controller. By enabling cross-communications between redundant paths, customers can be sure that losing a switch doesn't mean losing communication with IO. Typical applications of ART+ Architecture include process safeguarding applications, for which continuous operation is essential.



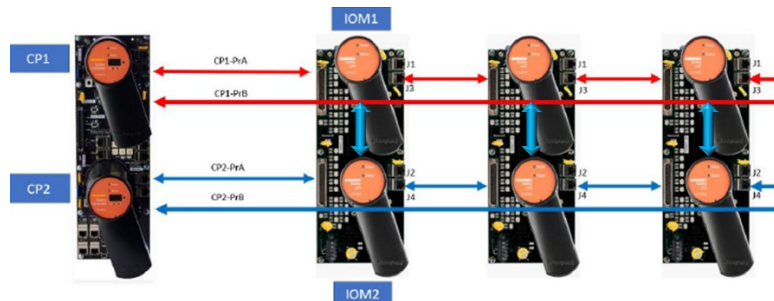
From releases R211 and later, attaching cables for an ART+ configuration prompts the SC Controller to recognize ART+ architecture and display relevant live status messages on the Controller Management System Information screen.

If the ART+ level of availability is required on controller level, but less availability level on IO module level is needed, the below architecture can be used.



Ring IO Link Architecture

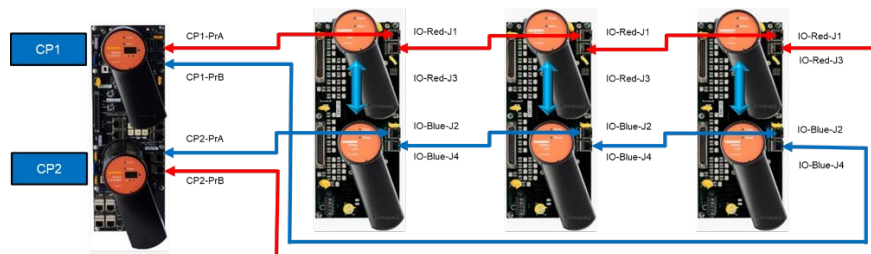
The Ring IO Link Architecture in Safety Manager SC provides a robust and resilient communication structure between IO modules and SC Controllers. By connecting IO modules in a ring topology, the architecture ensures that if a single cable or module fails, communication can still be maintained through the alternate path around the ring. This design enhances system availability and reliability and therefore achieves a high level of Multi-Fault Tolerance. This architecture is also cost effective due to the absence of switches (see also paragraph 5.5).



Please note that the Ring IO Link architecture can only be used within the same enclosure.

Ring+ IO Link Architecture

If even a higher level of Multi-Fault Tolerance is required, the Ring+ IO Link architecture can be used.



Like in the ART+ architecture, both rings can be controlled by each SC Controller in the Ring+ architecture, achieving an unmatched level of process availability. Also, the Ring+ IO Link architecture can only be used within the same enclosure.

The different architectures which are described in this paragraph have limits in the type and quantity of IO modules which can be used. The table below describes those limits:

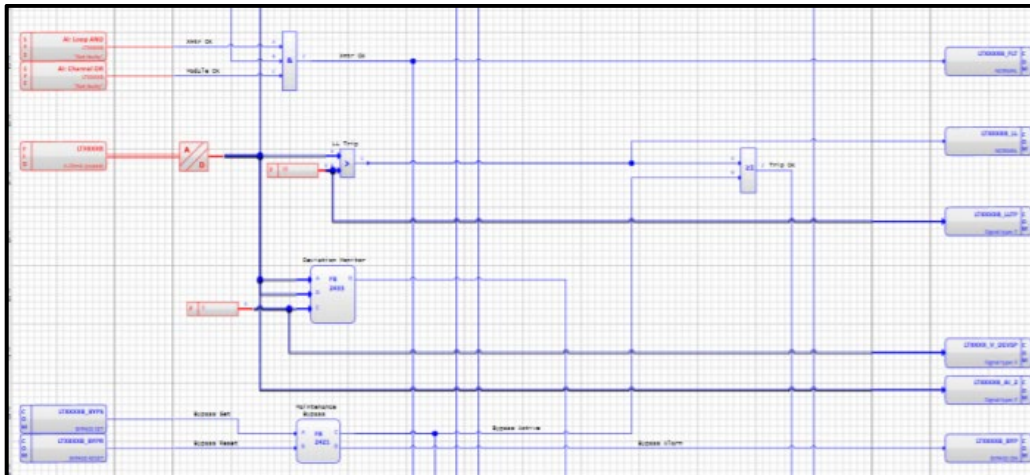
Architecture and Configuration	FC-RUSIO-3224	FC-PDIO01	FC-PUIO01	Max Modules
Redundant	Supported	Supported	Supported	62
Non-Redundant	Supported	Supported	Supported	32
A.R.T.	Supported	Not Supported	Not Supported	28
A.R.T.+Non-Redundant	Not Supported	Not Supported	Supported	28
A.R.T.+	Not Supported	Supported	Supported	28
Ring	Not Supported	Not Supported	Supported	25
Ring+	Not Supported	Not Supported	Supported	25

Note: In an ART+ configuration, a maximum of 20 modules can be used, combining 12 PUIO modules with 8 PDIO modules.

2.2 Application Programming

Part of Safety Manager SC solution is the availability of dedicated application programming, allowing the system to respond to its particular use.

Functional Logic Diagrams (FLD) are used, containing logical symbols, to define the response of the application program.



In most cases:

- point databases can be imported and exported,
- standard library functions can be adapted,

reducing design costs to an absolute minimum. The symbols used for programming conform the IEC 61131 part 3.

Attention:

Be aware that individual FLD's can be password protected. When an FLD is protected, you can only access and handle it by entering the correct password.

Precondition:

In Network Configurator, Safety Manager SC Controller properties (physical) - tab:

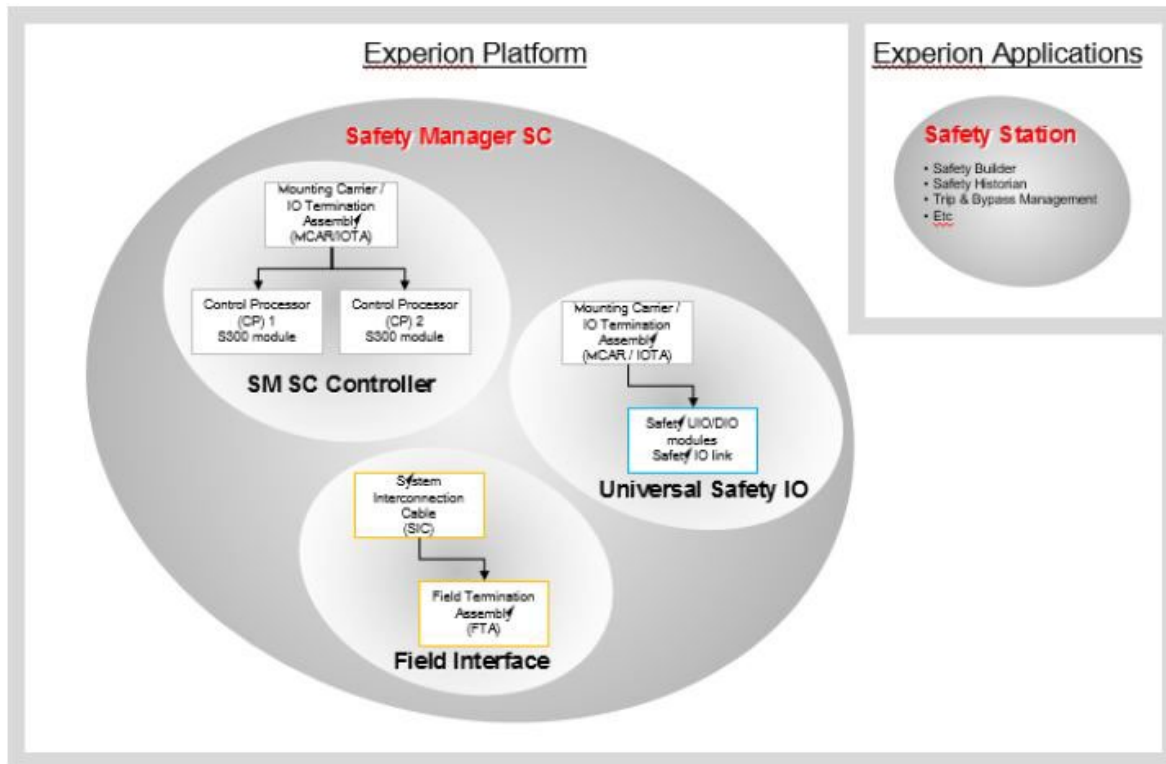
General, IP protection enabled must be selected.

For more information: see the Software Reference.

1. IP stands for Intellectual Property

2.3 Safety Manager SC components

The following figure shows a schematic presentation of the components of Safety Manager SC.



Safety Manager SC consists of:

- Safety Manager SC Controller
- Field interface
- Safety Manager SC Universal Safety IO

A Station is a PC running the operator interface. Stations may be either a remote computer through a LAN link, or a server computer.

The minimum requirements for a Safety Station are:

- Windows 10 Enterprise LTSB 2016 or Windows Server 2016.
- Windows 10 Enterprise LTSC 2019 or Window Server 2019.
- Intel Processor 2.40 GHz, 8 cores, or higher
- 8 Gb internal RAM or higher
- SSD hard disk type
- DVD / CD rom
- Screen resolution 1280×1024, 16-bit color.

As most Experion Stations have higher requirements, most Experion Stations can be upgraded to a Safety Station.

2.3.1 Safety Manager SC controller components

The Safety Manager SC Controller consists of:

- Mounting Carriers
- IO Termination Assemblies
- Safety Controller modules

Mounting Carrier (MCAR)

The mounting carrier (MCAR) is a power conducting baseplate on which an IO termination assembly can be fixed. The MCAR is available in various sizes and can be screwed on any flat surface.

IO Termination Assembly (IOTA)

Safety Manager SC utilizes separate IOTAs for Safety Manager SC Controller modules, Universal Safety IO modules, and PDIO modules. These IOTAs are connected to the MCAR.

The IOTAs enable the use of redundant and non-redundant Safety Manager SC Universal Safety IO modules. The Safety Manager SC Controller modules and Safety Manager SC Universal Safety IO Modules are mounted on the respective IOTA assemblies. They provide connection from Safety Manager SC Universal Safety IO modules to the Safety Manager SC Controller (communication) and to the SIC which provides communication to the field via the FTA. It also contains power switches for the Safety Manager SC Controller modules and Safety Manager SC Universal Safety IO modules and several features for hardware configuration settings.

Safety Controllers

The Safety Controller modules consist of a modular microprocessor system specifically designed for safety-critical applications and can be tailored to the requirements of many applications.

2.3.2 Field interface

Safety Manager SC uses the Universal Marshalling Solution or Field Terminal Assemblies (FTA) and internal cabling to connect IO to field devices.

Universal Marshalling Solution

Universal Marshalling Solution provides standardized marshalling for central and distributed installations using signal conditioning assemblies. The signal conditioning assemblies handle 16 I/O's including disconnect, fusing as default, and when needed signal conditioning adapters (SCA) including isolation, intrinsic safety, relay, and other functions can be plugged in optionally. The SCA supports standardized cabinet assembly and wiring configurations without the need for custom wiring.

IO FTA

An FTA module for IO converts input field signals to values appropriate for the Safety Manager SC input module that is used, or Safety Manager SC output module signals to values that can be used in the field. To enable this conversion, FTAs can be used in combination with input converter modules or output converter modules. For more information on IO FTAs see *Hardware Reference*.

HART handheld devices

Safety Manager SC Universal Safety IO allows one external HART handheld device to be connected to the IO channels to monitor, calibrate, modify, or proof-test a field device. The HART handheld device and the devices on the Safety Manager SC Universal Safety IO can co-exist.

When handheld devices are connected, the Safety Manager SC Universal Safety IO does not disturb HART communication between a HART device and the handheld devices. Similarly, the Safety Manager SC Universal Safety IO is not affected by a HART handheld device.

Cabling

System Interconnection Cables (SIC) connect field signals to IO modules. Depending on the type of SIC cable, an FTA is required to establish the connection. SIC cables terminate on an FTA. For details refer to *Hardware Reference*.

2.3.3 Safety Manager SC Universal Safety IO components

Safety Manager SC Universal Safety IO consists of:

- IO termination assemblies (IOTA)
- Safety Manager SC Universal Safety IO modules

IO termination assemblies

The IO termination assembly (IOTA) enables the use of redundant and non-redundant Safety Manager universal IO modules. It provides connection from the Safety Manager SC Universal Safety IO modules to the Safety Manager SC Controller (communication) and to the System Interconnection Cables (SIC), which

provide communication to the field via the FTA. It also contains power switches for the Safety Manager SC universal IO modules and several features for hardware configuration settings.

Safety UIO modules

A Safety UIO module is a Universal Safe device. It has multiple channels that can be configured individually depending on system needs. A Safety UIO module is placed on an IOTA.

Typical Safety Manager SC Universal Safety IO modules are:

- FC-RUSIO-3224
- FC-PUIO01
- FC-PDIO01

USIO modules have configurable IO channel functions; configuration is done in Safety Builder.

2.4 Safety vs Availability

Safety and availability do not easily coexist in the process industry:

- Safety means “Freedom from unacceptable risk”. To achieve safety, it is mandatory to keep a process away from its production limits.
- Availability is usually regarded as “productivity”. To achieve optimal productivity, one must operate a process as close as possible to its production limits.

In a SIS, safety prevails over availability; this means that when a SIS has to ‘choose’ between safety and availability, safety is chosen.

Safety

The design of Safety Manager SC complies with SIL3, no matter which system architecture is chosen. SIL3 is the highest level of safety integrity required for most process industries.

Availability

Safety Manager SC is highly available because the system:

- Can locate faults accurately.
Faulty parts are isolated from the process whenever possible to continue a safe operating state with minimum effect on the remaining process parts;
The fault location algorithm also reduces repair time, and brings possible down time to an absolute minimum,
- Offers possibilities for on-line repair.
For example, all redundant components can be exchanged while Safety Manager SC remains on-line. Furthermore, online exchange of communication modules and faulty (non-redundant) output modules is possible,
- Enables automatic upload of the required software in replaced modules, while being on-line.

2.4.1 Redundancy and Availability

Availability can be further improved by using redundancy in the architecture. Depending on the level of redundancy - and the hardware architecture - one refers to “normal availability” “medium availability”, “high availability” or “maximized availability”.

Fault tolerance

By applying redundancy, the system becomes fault tolerant with respect to availability. This means that any single system fault shall not create a nuisance trip.

Online repair and online modification

Redundancy also allows on- line repair of redundant components. When replacing controller modules, these are automatically loaded with the required software.

With a redundant controller you can also perform on-line modifications.

Availability levels

Because the design of Safety Manager SC complies with SIL3, any SIF up to and including SIL3 is supported. This independent of the Controller architecture. By offering different Controller architectures the user can choose the most appropriate configuration to suit the required availability level for the PUC.

The following table shows the relation between the applied redundancy - and the hardware architecture - within Safety Manager SC with the level of system availability.

Controller architecture	IO Configuration	supports SIF1	Availability level
ART+	Redundant	SIL3	Maximized
Redundant	Redundant	SIL3	High
	Mixed Redundant and Non-Redundant	SIL3	High / Medium
	Non-Redundant	SIL3	Normal

2.5 Online Modification (OLM)

Online modification (OLM) is a TÜV-approved option of Safety Manager SC which allows users to modify the application software, system software and/or the Safety Manager SC hardware configuration while the system remains operational.

For Safety Manager SC, a firmware upgrade and an application change online modification can be performed with a redundant SC Controller. Loading is done in the background and switching to the new program is flawless. There is no communication loss, and connected systems will not report communication loss.

Attention:

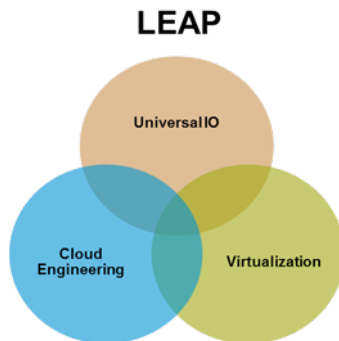
1. Every aspect of a modification must be carefully planned.
2. The amount of human interaction during modification of the Safety Controller may be considerable. Modifications should therefore be carried out with the utmost care, and by authorized and qualified persons only. If problems occur during the service or modification work, the Safety System can go to a safe state resulting in a process shutdown.
3. Before any service or modification work is done on the Safety System, make sure that all permits have been obtained from the plant operator.

For more information on OLM, refer to the Online Modification guide.

2.6 Safety Manager SC and LEAP

Honeywell's LEAP methodology redefines the way industrial firms deploy process control and safety systems in their facilities. Lean execution already entails removing waste on projects, including redundant tasks and rework. LEAP goes even further by eliminating the traditional dependencies that used to force project flows to be sequential in nature—drastically improving the overall project schedule and keeping automation systems off the critical path.

Through LEAP, Honeywell integrates best-in-class technology enablers. Universal Channel Technology, virtualization and cloud engineering, are combined to improve automation project results.



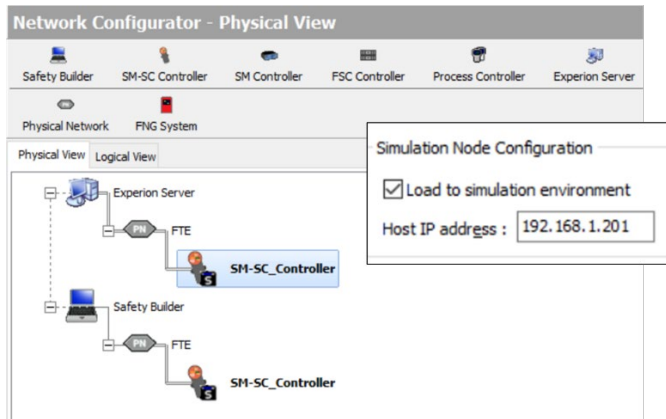
Safety Manager SC enables LEAP via Universal Safety IO and Cloud Engineering. Project engineers are able to use simulated Safety Manager SC controllers on the Honeywell Virtual Engineering Platform (VEP).



Via this cloud engineering option project teams can create and test applications early in the project without the necessity of having the Safety Manager SC hardware. The engineers can compile an application, which has no hardware allocations, in simulation mode and download it to a virtualized controller on the VEP.

2.7 Safety Manager SC Simulation

Simulation is a function that enables the user to test (verify and validate) the application and configuration in a simulated environment. SIM-SM is a virtual representation of the Safety Manager and Safety Manager SC Controller which can be installed on a local device using VMware software.

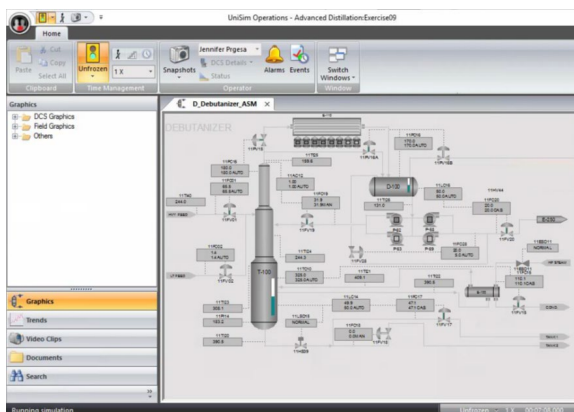


SIM-SM enables the simulation of real-time scenarios and validate the configuration, including the FLDs. A high level of probability can be achieved to ensure that the (modified) application and/or configuration is correct and functions as intended.

The simulator can also be used to perform integration testing. The virtual Safety Manager and Safety Manager SC controller can be connected to several virtual or physical devices. The following protocols can be used:

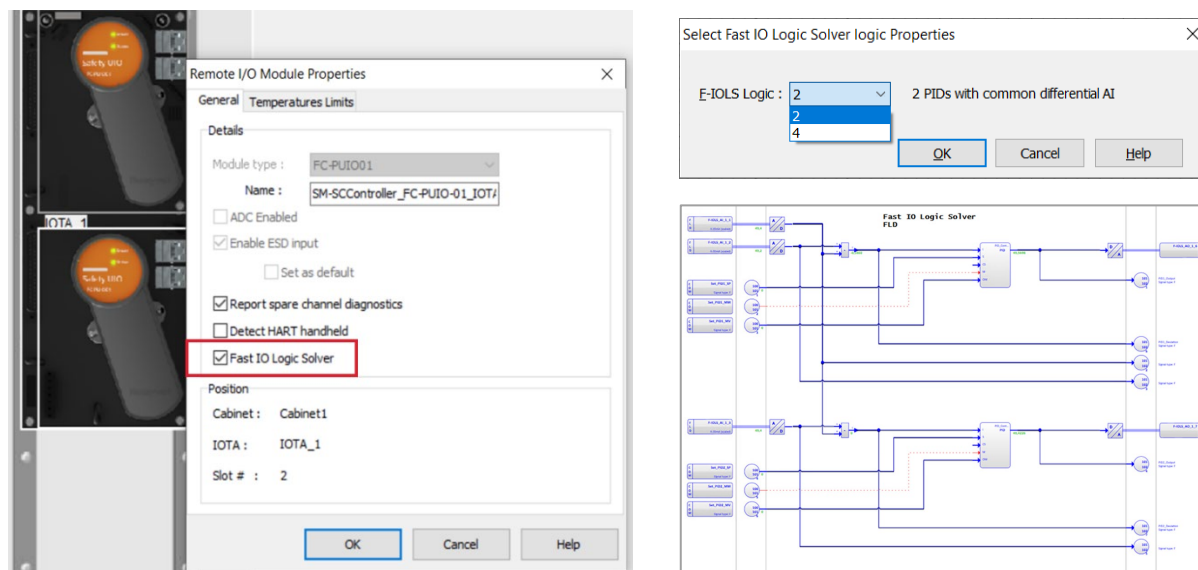
- Experion integration (CDA/SCADA)
- peer to peer with C300
- Field Device Manager (FDM)
- PCDI
- Safety Builder Protocol
- SafeNet
- Modbus Master & Responder
- Safety Historian
- NTP/PTP

SIM-SM is also part of the Honeywell digital twin offerings, the Experion Off Process solution and the Operator Training Simulator.



2.8 Fast IO Logic Solver

The Fast IO Logic Solver function can be used to execute a fixed application on a Universal IO (PUIO) module. This means that this PUIO module will act as a logic solver, in other words as a local controller which runs independently from the Safety Manager SC (S300) controller.



When F-IOLS is configured on a PUIO module, a fixed application can be chosen which will run on the PUIO module. This has several advantages:

- The F-IOLS is software enabled on the PUIO module, so this means no additional hardware is required, and that the function can be added at a later stage.
- The application will be provided via standardized preconfigured and tested libraries. This means that faster safety application development and commissioning can be done.
- Due to the fixed libraries, the Fast IO Logic Solver will also have a fixed and fast cycle time. So the F-IOLS function can be used for applications which require a fast scan time.
- The F-IOLS will run the application independent from the S300 controller, which increases the overall process availability. If for some reason the S300 controller stops working the PUIO continues to execute the local application. When the F-IOLS function is used the S300 controller is still required for interfacing and downloading to the Fast IO logic solver.

The Fast IOLS is supported for both Star and Ring IO networks and redundant and non-redundant IO architectures.

3 User Interface

3.1 Introduction

Safety Builder is the configuration, maintenance and on-line tool for Safety Manager SC. Safety Builder is therefore the main software tool on every Safety Station and user interface for Safety Manager SC.



The Safety Manager SC Controller module also has a user interface display that informs the user of the status of the Control module. Both Safety Builder and the Safety Manager SC display will be described in more detail in this chapter.

3.2 Safety Builder

Safety Builder has two main functionalities:

- Configuration (offline): software engineering tool for Safety Manager SC.
- On-line: user interface to Safety Manager SC.

For this, Safety Builder offers an extensive range of tools. Note that some of these tools may not be available, depending on your license and package. The tables below show an overview of the various tools.

Configuration tools	
Network Configurator	Here, you define where Safety Manager is located in the available networks.
Hardware Configurator	In this tool, you define the type and location of the cabinet, chassis and modules for Safety Manager.
Point Configurator	Here, you set all the properties of the points in the current system.
Application Editor	With this tool, you can design the Functional Logic Diagrams.
Application Compiler	Enables you to verify the syntax, completeness and consistency of the configuration. You can also compile the configuration to a controller file which can be uploaded to the Safety Manager Controller.

On-line tools	
Controller Management	Enables you to load and retrieve controller files and view the diagnostics and system status.
Point Viewer	In this Viewer, you can monitor values in user-defined screens while the application is running.
Application Viewer	In this Viewer, you can monitor values within FLDs while the application is running.

Miscellaneous tools	
Security	With this tool you control access to tools, functions and plants by means of password protection.
Configuration	This tool allows you to change user settings.
Audit Trail	This tool allows you to access the logging of all functional changes to the application.

3.2.1 Configuration tools

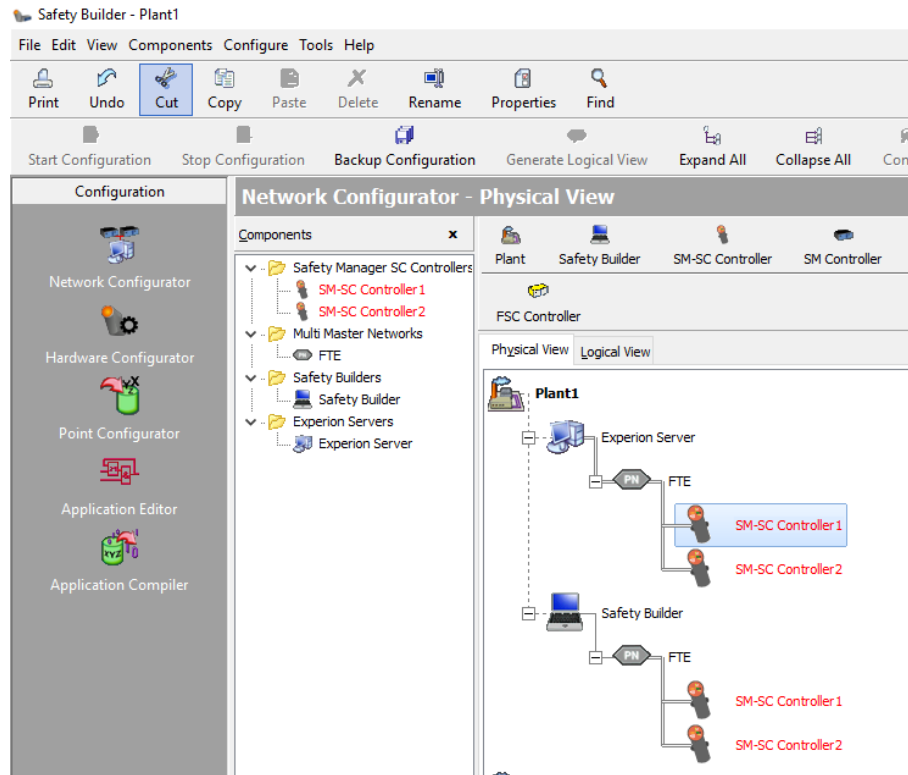
In this paragraph the main functions of the configuration part of the Safety Builder are highlighted.

Network Configurator

The Network Configurator tool in Safety Builder enables you to configure the network layout of your safety system. It also lets you select a Controller, which you then can configure.

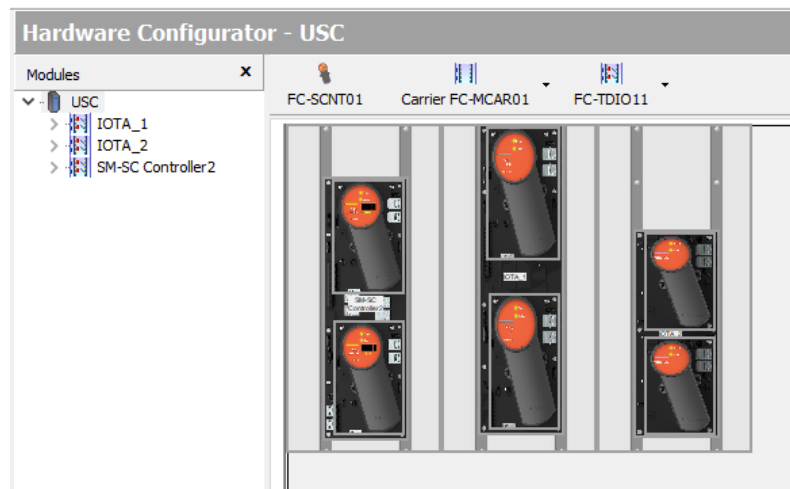
The Network Configurator is used to do the following:

- Create a clear physical network overview.
- Define a logical connection.
- Define the network properties for all the components used in the network.



Hardware Configurator

The Hardware Configurator can be used to select the hardware of the configured Safety Manager SC controllers in graphical user-friendly way.

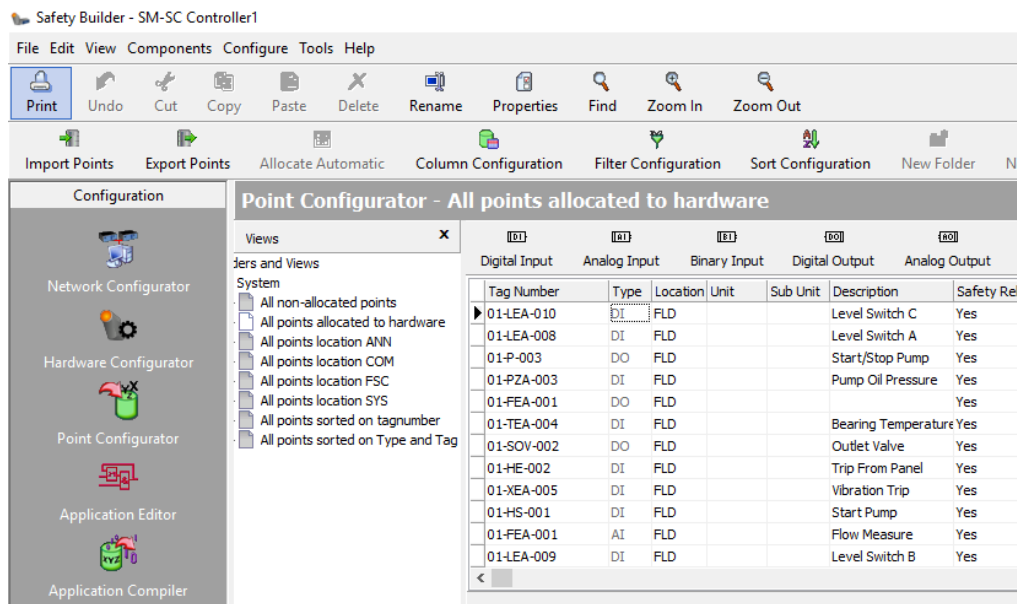


Point Configurator

Points contain (field) values that can be processed by a Control Processor. Points need to be configured in the Point Configurator before they can be processed. To configure points, the properties need to be set and they need to be allocated to IO channels or communication channels.

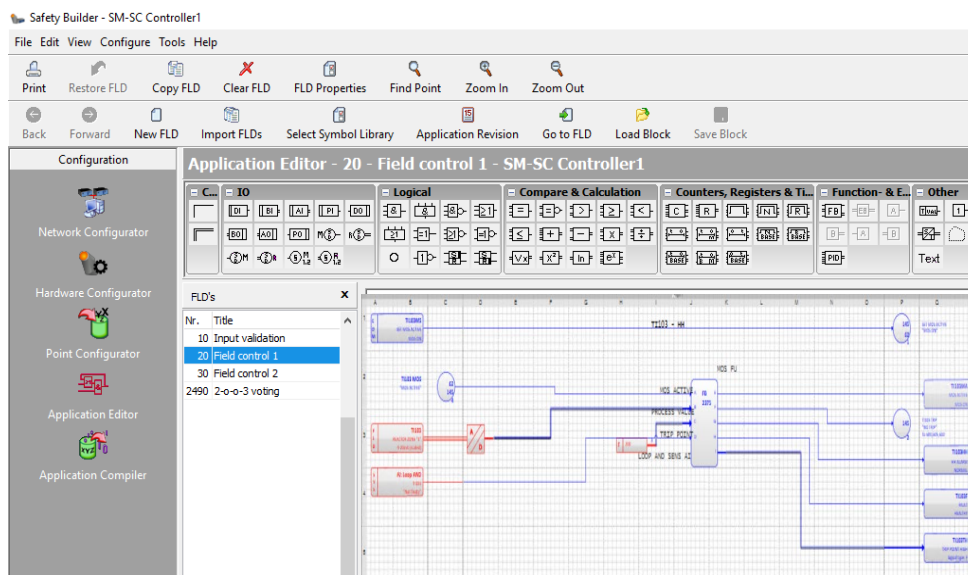
The Point Configurator can be used to:

- Create points & delete points.
- Allocate, modify and view points.
- Import and Export points.
- Define and change the layout of point Views for on-screen and in reports.
- Create hard copies (reports) of point Views.



Application Editor

The Application Editor tool enables you to create Functional Logic Diagrams (FLDs). Functional Logic Diagrams are combinations of logical operators that connect input signals to output signals. When these diagrams are compiled, a Safety Manager SC executes them one by one in the sequence of the sheet numbers (from the lowest sheet number to the highest).



3.2.2 On-line tools

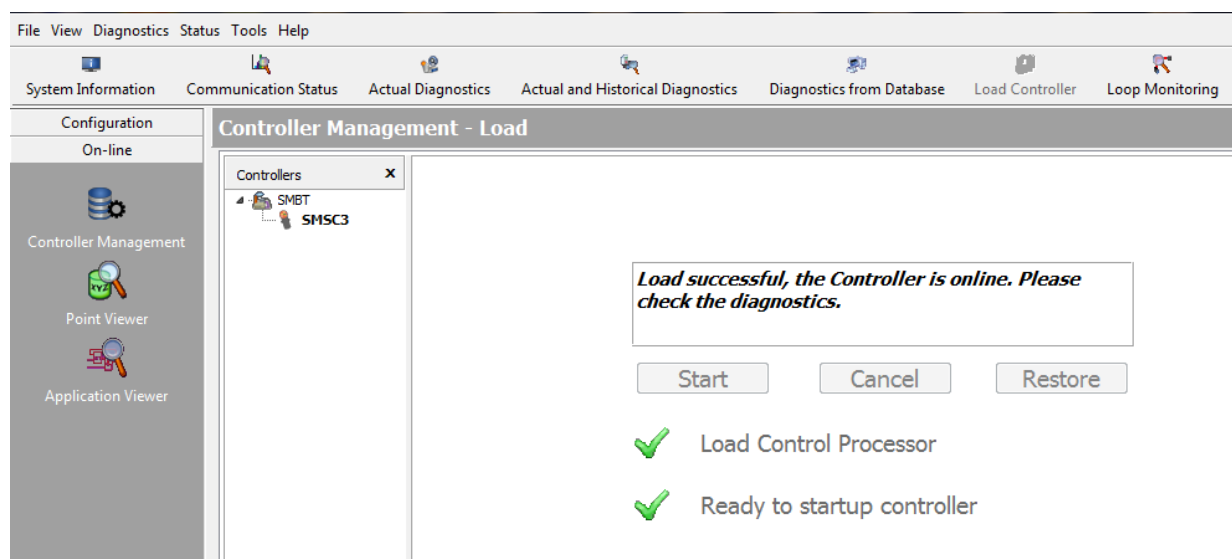
This section describes the various on-line tools available in the different Safety Builder packages. With the on-line tools it's possible to:

- Load Controller files (Controller Management).
- View diagnostics and system status data (Controller Management).
- View application data and live FLDs (Application & Point Viewer).

Controller Management

The Controller Management function in Safety Builder is the part of the on-line section that can perform the following:

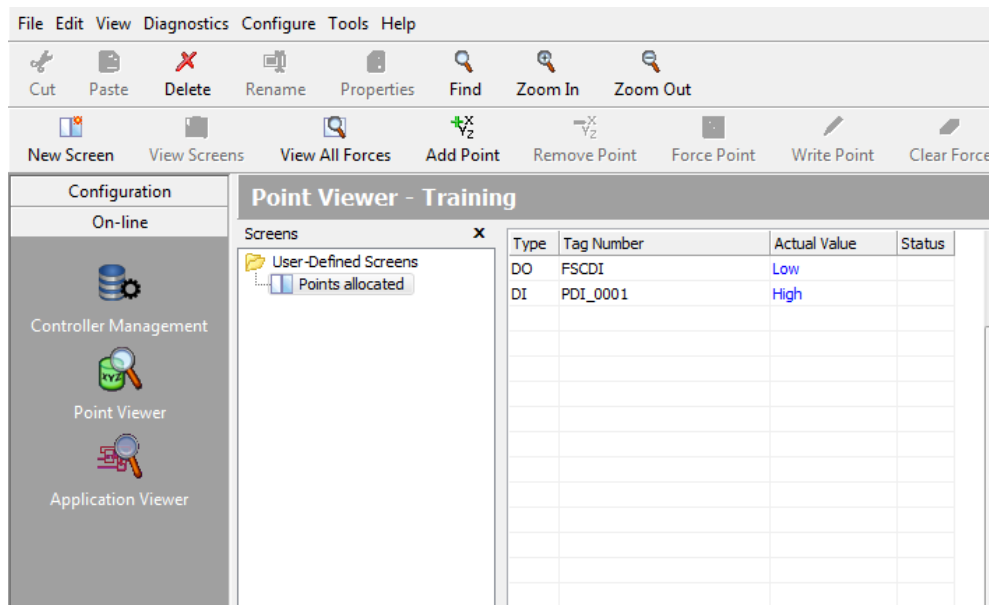
- Show actual and historical diagnostic messages of Safety Manager SC.
- Store diagnostic messages from Safety Manager SC in a database.
- Display diagnostic messages on-line and off-line.
- Assist in resolving reported faults.
- Display Safety Manager SC on-line status information.
- Show the loop status of points of which a loop fault has been reported.
- Synchronize the Safety Manager SC time with the time of the Safety Station.
- Load a controller file into the Controller.



Point Viewer

The Point Viewer function in Safety Builder enables the user to:

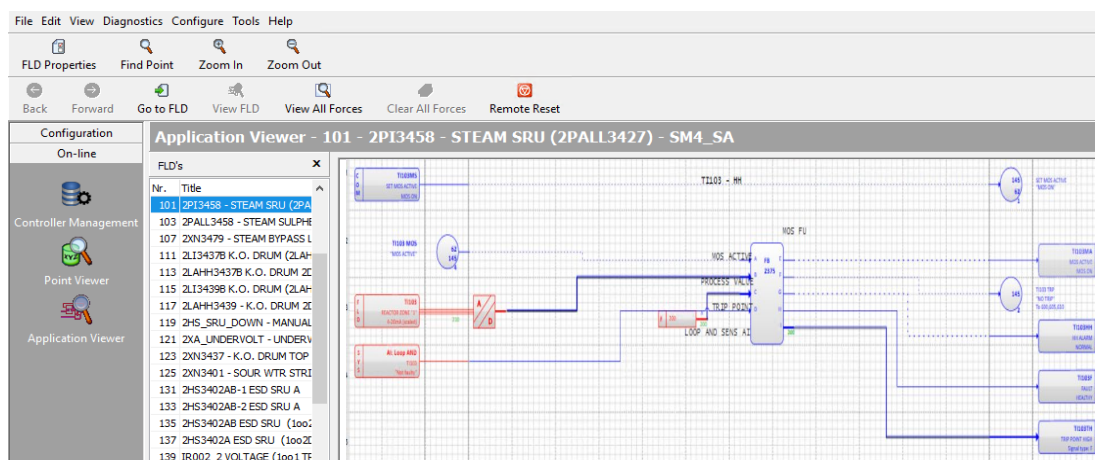
- Create user-defined screens and view actual point and signal values of an on-line Control Processor unit of the selected Safety Manager SC controller.
- Force and remove forces of points which have this option enabled.
- Change ("write") the value of points which have this option enabled.
- View the properties of points.



Application Viewer

The Application Viewer function in Safety Builder can perform the following:

- View in an FLD the actual point and signal values of an on-line Control Processor unit of the selected Safety Manager SC controller.
- Force and remove forces of points which have this option enabled.
- Change ("write") the value of point.
- View the properties of points.



3.3 Safety Manager SC controller User Interface

The SM SC Controller module has a user interface display that informs the user of the status of the Control Processor and all the IO related to it.

The four- character display scrolls automatically through several pieces of information, showing one message at a time. The user can scroll between messages with the use of the buttons on the right-hand side of the display.

Many messages, like diagnostic messages, are divided into sub-messages, called stages. When left alone for 30 seconds, the user interface display returns to the default status message.



Next to display, the controller module also has a Power and Status LED and two LED's showing the communication status of the FTE network connection.

More detailed information about the User Interface can be found in the Hardware Reference and the Troubleshooting and Maintenance guide

4 System Hardware

This chapter describes the most important hardware of Safety Manager SC.

4.1 Safety Manager SC Controller

4.1.1 FC-SCNT02 Controller Module

The SM SC Controller module (FC-SCNT02) is a SIL3 capable Logic Solver hardware module in Series-C form factor. It forms the heart of Safety Manager SC and controls all system operations while supporting up to 1984 IO channels in a flexible mix of redundant and non-redundant IO. This module is located inside the system cabinet and runs with firmware. The SM SC Controller Module uses 4x 100Mb Ethernet communication channels which are installed on a dedicated communication board which has an embedded hardware firewall. The redundant processors are also installed on a dedicated board for SIL3 safety application execution.



The SM SC Controller module communicates with Safety UIO modules and executes a Safety Builder Controller File. In Safety Manager SC configurations with two SM SC Controller Modules, the modules synchronize their operation through a dedicated redundant communication link. Continuous testing of the Safety Manager SC hardware by the SM SC Controller module ensures safe control of the process as well as extensive system and process equipment diagnostics.

Additional test hardware enables full testing of the FC-SCNT02 module to achieve SIL 3 compliance. This allows one FC-SCNT02 module to run applications up to and including SIL3 without time limitation.

The redundant controller configurations result in a 2oo4D voting architecture and therefore increased availability.

4.1.2 FC-TCNT11 for Safety Manager SC controller

SM SC Controller IOTA provides a platform for the server to communicate with the SM SC Controller module (Model #: FC-SCNT02) via Fault Tolerant Ethernet communication (FTE-A and FTE-B). SM SC Controller IOTA also provides a hardware path for the transfer of 24V power from the bus bars to the SM SC Controller module. The SM SC Controller IOTA interfaces with the SM SC Controller module via an 80 pin, 2.54 mm pitch dual row socket connector and 46-pin, 2.54 mm pitch dual row socket connector.

Power

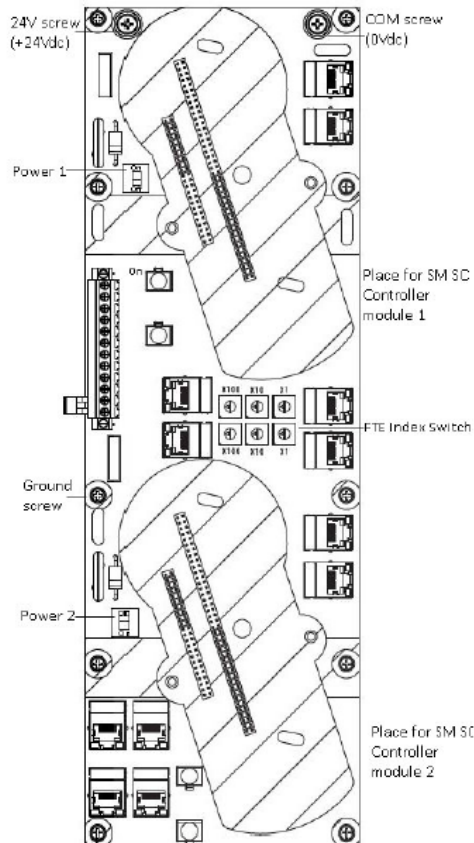
Input 24V DC power supply for this IOTA is obtained from bus bars installed in the cabinet. Power captive nut inserts are installed on the IOTA for power supply connections.

Current Limit

An 800mA (type F) cylindrical fuse is included for short circuit protection on the power line.

Ethernet interface

The IOTA has 2 ports for Fault Tolerant Ethernet (FTE) interface that connect to the server and 2 ports for Ethernet interface for downlinks.



4.1.3 Key Switches

The customer has the option to use a key switch module which can be connected to the Safety Manager SC controller. The module (FC-SSWM01) contains 4 key switches, as shown in the image below: Force Clear, Force Enable, Program Enable, and Fault Reset.



If the customer chooses, then certain functions will be allowed only if the key switch is closed, which makes it more secure and provides a higher level of safety. The customer can select the use of key switches or can choose to communicate with the processor via the Ethernet using Safety Builder.

Key Switch Behavior and Use

Note in the table below that:

- 0 means the key switch is not active
- 1 means the key switch is active

Key Switch	Position	Behavior
Force Clear (spring-return recommended)	0	No change to force status
	1	All forces will be cleared
Force Enable (two-position)	0	Forces (inputs or outputs) cannot be set
	1	Forces (inputs or outputs) can be set, for points which have option "force enable" checked
Program Enable (two position)	0	New application program cannot be downloaded
	1	New application program can be downloaded
Fault Reset (spring return recommended)	0	Faults are not cleared
	1	SC Controller clears all faults that were found.

4.2 Safety Manager SC Universal Safety IO modules

This paragraph describes the Safety Manager SC Universal Safety IO modules that are available for Safety Manager SC.

4.2.1 FC-PDIO01 - Safety Universal Digital IO (32 channels, 24 Vdc)

The Universal Digital IO module has 32 safe IO channels with configurable channel function; all 32 channels can be configured for safety, and configuration is done in Safety Builder.

The Safety Universal Digital IO module can be used in applications up to SIL 3, in compliance with IEC 61508/61511. It requires two modules to achieve a redundant configuration.

All channels are powered out of the 24Vdc supply.

The FC-PDIO01 module supports a 100 Mbaud dedicated SIL3 certified Ethernet link to communicate with a Safety Manager SC Controller.

Each channel can be configured as:

- Digital input (with or without loop monitoring)
- Digital output (with loop monitoring)

The FC-PDIO01 module has a housing that is in line with the patented Series C design of Honeywell.

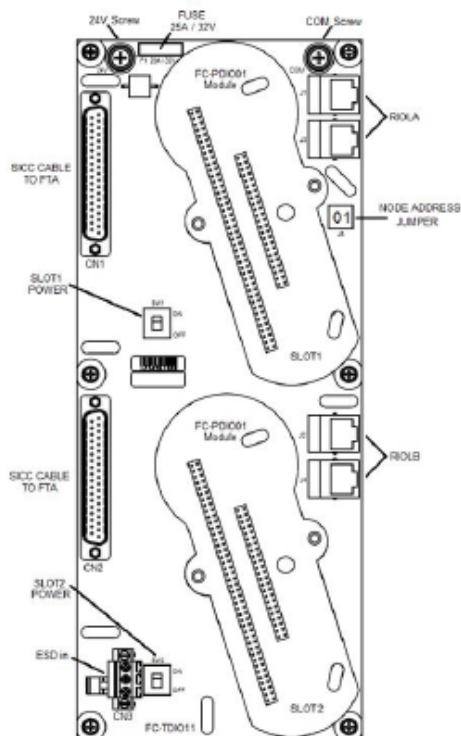
The FC-PDIO01 module has the following features:



- 32 Universal Safety IO channels that can be configured to control DI, DO (500mA. per channel)
- Operating temperature -40°C to 70°C (-40°F to 158°F).
- Short circuit protected.
- Field connections are made via 16- channel Field via System Interconnect Cables (SICC).
- Proven-in-use redundant processor concept that complies with the SIL 3 safety requirements in single channel operation.
- A dedicated communication link between these processors.
- A redundant communication link with the partner module (in redundant configuration).
- An Ethernet- based link to the networked Safety Manager SC Controller in the network, via dedicated switches.
- Monitoring the temperature of the module's internal electronics.
- ESD function via a dedicated IOTA input connector for dedicated safety related functions.
- Function-tested watchdogs that: monitor and/or handle:
 - Monitor cycle time and supply voltage
 - Handle the ESD function and memory errors
- LED indicators at the front of the module for power and health status indication

4.2.2 FC-TDIO11 - Redundant IO Termination Assembly

The FC-TDIO11 assembly enables the use of a redundant set of FC-PDIO01 modules. For physical representation of the FC-TDIO11 see the figure below.



The FC-TDIO11 IOTA provides:

- Connections for two (redundant) FC-PDIO01 modules.
- FC-PDIO01 modules are installed in Slot1 and Slot2 of the FC-TDIO11 IOTA as indicated in the above figure.
- Module in Slot1 (top) is addressed as module 'A', module in Slot2 (bottom) is addressed as module 'B'.
- The TDIO11 assembly can also be used in non-redundant IO architectures. If the IOTA is used in a non-redundant architecture Slot2 will be covered.
- Redundant 100MB Ethernet connections for each FC-PDIO01 module (RIOLA for module A and RIOLB for module B) to the controller.
- Fused 24V power connection (24V and COM screws to the carrier power rails).
- Node Address number is set by installing Node Address jumper on J5 of FC-TDIO11 IOTA.
- Emergency Shut Down (ESD) functionality is available at CN3.
- Channel connections for up to 32 Digital Input / Output are provided via two FTA assemblies and SIC cables connected to CN1 and CN2. Field wires are not landed on the IOTA.

The TDIO11 IOTA can be used in applications up to SIL 3, in compliance with IEC 61508/61511.

4.2.3 FC-PUI01 - Safety Universal IO module (32 channels, 24 Vdc)

The FC-PUI01 module has 32 universal safe IO channels, configurable using Safety Builder. Each channel can be configured as (line monitored) input or output.

The FC-PUI01 module can be used in applications up to SIL 3, in compliance with IEC 61508/61511. The module supports two (100Mbaud) ethernet links to communicate with a Safety Manager SC Controller.

Each channel can be configured as:

- Digital input (with or without loop monitoring)
- Digital output (with loop monitoring)
- Analog Input (0-20mA or 4-20mA active)
- Analog output (0-20mA or 4-20mA active)

The FC-PUI01 module has a housing that is in line with the patented Series C design of Honeywell.

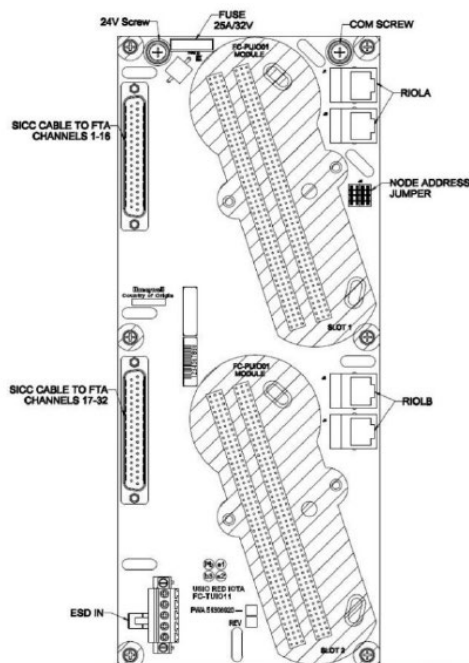


The FC-PDIO01 module has the following features:

- 32 Universal Safety IO channels that can be configured to control DI, AI, DO, AO
 - Operating temperature -40°C to 70°C (-40°F to 158°F).
 - Short circuit protected.
 - Any type of IO field signal has only to be connected to the two connections of the applicable universal channel on the IOTA
 - Proven-in-use redundant processor concept that complies with the SIL 3 safety requirements in single channel operation
 - A dedicated communication link between these processors
 - A redundant communication link with the partner module (in redundant configuration)
 - An Ethernet-based Safety Manager SC Universal I/O link to the Safety Manager SC Controller in the network via dedicated switches; the Safety Manager SC Universal I/O link uses a dedicated protocol
 - Monitoring the temperature of the electronics
- ESD function via a dedicated IOTA input connector for dedicated safety related functions.
 - Function-tested watchdogs that: monitor and/or handle:
 - Monitor cycle time and supply voltage
 - Handle the ESD function and memory errors
 - LED indicators at the front of the module for power and health status indication
 - Real-time clock for Sequence Of Event (SOE) time stamping with a resolution of 1 msec
 - HART pass-through, multiplexer per channel

4.2.4 FC-TUIO11 - Redundant IO Termination Assembly

The FC-TUIO11 assembly enables the use of a redundant set of FC-PUIO01 modules. For physical and schematic representations of the FC-TUIO11 see the figure below.



The FC-TUIO11 IOTA provides:

- Connections for two (redundant) FC-PUIO01 modules.
- FC-PUIO01 modules are installed in Slot1 and Slot2 of the FC-TUIO11 as indicated in the above figure.
- Module in Slot1 (top) is addressed as module 'A', module in Slot2 (bottom) is addressed as module 'B'.
- The TUIO11 assembly can also be used in non-redundant IO architectures. If the IOTA is used in a non-redundant architecture Slot2 will be covered.
- Redundant 100MB Ethernet connections for each FC- PUIO01 module (RIOLA for module A and RIOLB for module B) to the controller.
- Fused 24V power connection (24V and COM screws to the carrier power rails).
- Node Address number is set by installing Node Address jumper on J5 of FC-TUIO11.
- Emergency Shut Down (ESD) functionality is available at CN3.
- Channel connections for up to 32 Digital Input / Output are provided via two FTA assemblies
- and SIC cables connected to CN1 and CN2. Field wires are not landed on the IOTA.

The TUIO11 IOTA can be used in applications up to SIL 3, in compliance with IEC 61508/61511.

4.2.5 FC-RUSIO-3224 - Remote Universal Safe IO device (32 channels, 24 Vdc)

The FC- RUSIO- 3224 module is a Safety UIO module. It has 32 universal safe IO channels with configurable channel function; configuration is done in Safety Builder.

The FC- RUSIO- 3224 module can be used in applications up to SIL 3, in compliance with IEC 61508/61511.

It requires two FC-RUSIO-3224 modules to achieve a redundant configuration. All channels are powered out of the 24Vdc supply.

Each channel can be configured as:

- Digital input (with or without loop monitoring)
- Digital output (with loop monitoring)
- Analog input (0-20mA or 4-20mA active)
- Analog output (0-20mA or 4-20mA active)

The FC- RUSIO- 3224 module supports two (100Mbaud) Ethernet links to communicate with a Safety Manager SC Controller.

The FC-RUSIO-3224 module has a housing that is in line with the patented Series C design of Honeywell. It needs to be placed on an IO Termination Assembly (IOTA).



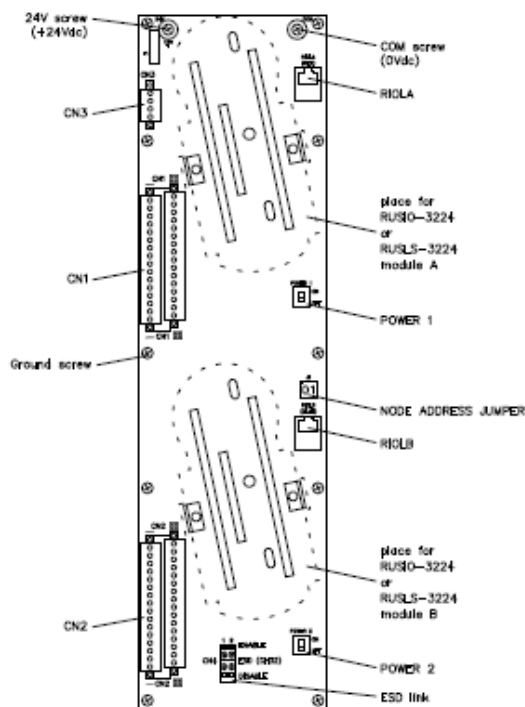
The FC-RUSIO-3224 module has the following features:

- 32 Universal Safety IO channels that can be configured to control DI, AI, DO, AO
- Operating temperature -40°C to 70°C (-40°F to 158°F).
- Short circuit protected.
- Any type of IO field signal has only to be connected to the two connections of the applicable universal channel on the IOTA
- Proven-in-use redundant processor concept that complies with the SIL 3 safety requirements in single channel operation
- A dedicated communication link between these processors

- A redundant communication link with the partner module (in redundant configuration)
- An Ethernet-based Safety Manager SC Universal I/O link to the Safety Manager SC Controller in the network via dedicated switches; the Safety Manager SC Universal I/O link uses a dedicated protocol
- Monitoring the temperature of the electronics
- A configurable ESD function via channel 32 for dedicated safety related functions
- Function-tested watchdogs that: monitor and/or handle:
 - monitor cycle time and supply voltage
 - handle the ESD function and memory errors
- LED indicators at the front of the module for power and health status indication
- Real-time clock for Sequence Of Event (SOE) time stamping with a resolution of 1 msec

4.2.6 IOTA-R24 - Redundant IO Termination Assembly

The IOTA-R24 assembly enables the use of a redundant set of RUSIO-3224 modules. For physical representation of the IOTA-R24 see below picture.



The IOTA-R24 can be used in applications up to SIL 3, in compliance with IEC 61508/61511.

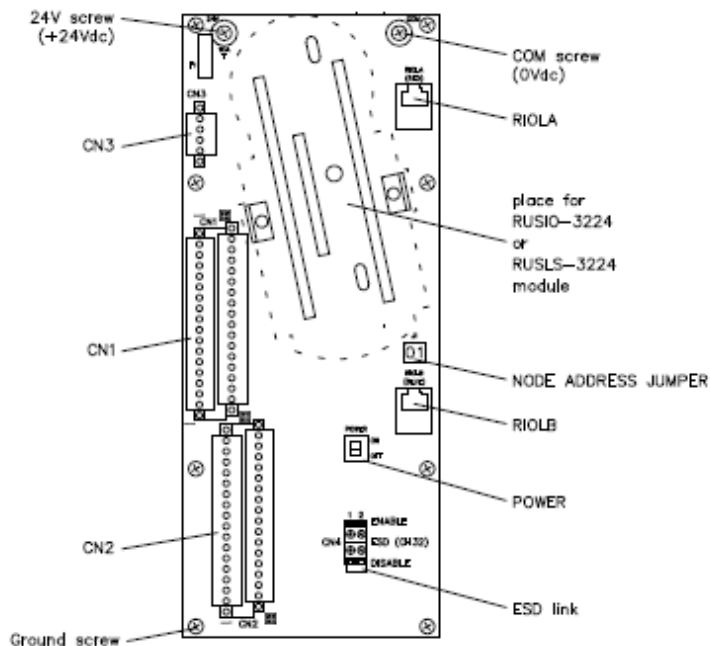
The IOTA-R24 provides for:

- Connectors for two (redundant) RUSIO-3224 modules.
- 32 (universal) IO channel connections (CN1 and CN2).
- 4 (identical) V+ connections (CN3), for active AI devices.
- Two RJ45 connectors for 100MB Ethernet communication (RIOLA and RIOLB).
- 24V power connection (24V screw and COM screw to the carrier power rails).

The RUSIO-3224 modules are placed on the indicated positions of the IOTA-R24. See above picture for details.

4.2.7 IOTA-NR24 - Non-Redundant IO Termination Assembly

The IOTA-NR24 assembly enables the use of one RUSIO-3224 module. For physical representation of the IOTA-NR24 see below figure.



The IOTA-NR24 can be used in applications up to SIL 3, in compliance with IEC 61508/61511.

The IOTA-NR24 provides for:

- connectors for one RUSIO-3224.
- 32 (universal) IO channel connections (CN1 and CN2).
- 4 (identical) V+ connections (CN3), for active AI devices.
- two RJ45 connectors for 100MB Ethernet communication (RIOLA and RIOLB).
- 24V power connection (24V screw and COM screw to the carrier power rails).

The RUSIO-3224 module is placed on the indicated position of the IOTA-NR24. See above figure for details.

The IOTA-NR24 module has a switch:

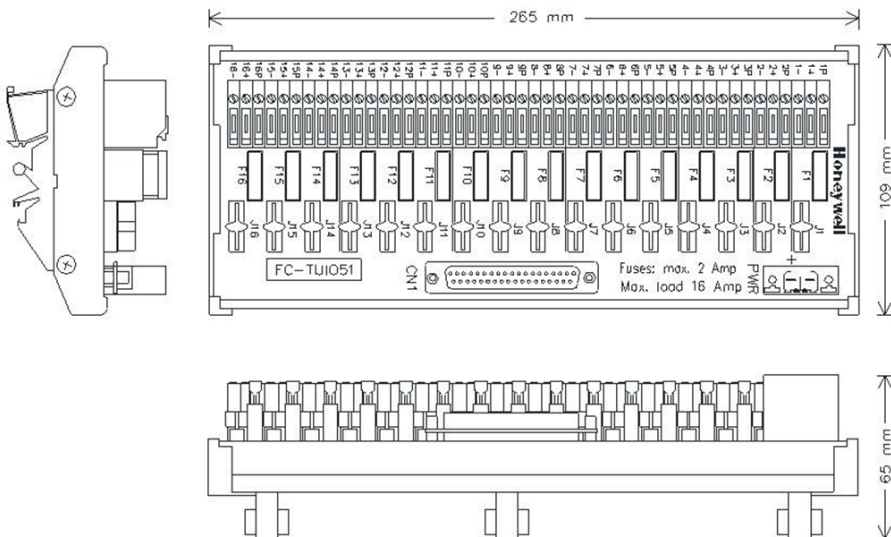
- use POWER to switch the Module on and off.

The node number of the IOTA-NR24 is set by placing the proper node address jumper on the IOTA-NR24 assembly.

4.3 Field Termination Assemblies and SIC Cables

A Field Termination Assembly (FTA) module is the interface between field components (such as sensors or valves) and IO modules in Safety Manager SC.

An FTA module converts input field signals to values appropriate for the Safety Manager SC Universal IO modules, or Safety Manager SC output signals to values suitable for the field. The below figure shows the Field Termination Assembly module FC-TUIO51 which provides sixteen sets of three knife terminals for FC-PUIO01 signals. Different types of FTA's are available to accommodate the connection of various IO signal types to the Universal IO modules



The connection between the FTA's and the IOTA's of the Universal IO modules can be established by using System Interconnection Cables (SIC). The below table shows which SIC cable can be used to connect the available type of FTA's (and other interfacing equipment) to the IOTA's of the Universal IO modules.

FTA	Description FTA	SIC Cable Type	Module Type
FC-TDIO51	SC SAFETY FTA KNIFE, EOL, 24VDC, 16CH, L	FC-SIC2xxx	FC-TDIO11
FC-TDIO52	SC SAFETY FTA KNIFE, EOL, 24VDC, 16CH, R		
FC-TUIO51	SC FTA FC-PUIO01 KNIFE, EOL, 24VDC, 16CH, L	FC-SIC2xxx	FC-TUIO11
FC-TUIO52	SC FTA FC-PUIO01 KNIFE, EOL, 24VDC, 16CH, R		
CC-USCA01 / CC-UGAIO1	SC SIC CABLE SCA LXM	FC-SIC5xxx	FC-TDIO11/ FC-TUIO11
CC-USCA01 / CC-UGAIO	SCA SC SIC CABLE SCA LXM	CC-SICC-1011/Lxx	FC-IOTA-(N)R24
FC-TSPKUNI-1624	SM RIO Safe FTA Knife, 3-wire, 24Vdc, 16ch	FC-SIC9xxx	FC-TDIO11/ FC-TUIO11
FC-TDOL-0724U	SM RIO DO FTA, loop mon, 2A, 24Vdc, 7ch	FC-SIC9xxx	FC-TUIO11
3rd party equip.	Wired (SIC-P)	FC-SIC4xxx	FC-TUIO11
FC-TSRO-0824	DO(RELAY) FTA FOR SIL3 APPL. 8CH CC	FS-SICC-2001/Lx	FC-IOTA-(N)R24
FC-TSRO-0824	DO(RELAY) FTA FOR SIL3 APPL. 8CH CC	FC-SIC6xxx	FC-TDIO11/ FC-TUIO11
FC-TSPKUNI-1624	SM RIO Safe FTA Knife, 3-wire, 24Vdc, 16ch	FS-SICC-1011/Lx	FC-IOTA-(N)R24
FC-TDOL-0724U	SM RIO DO FTA, loop mon, 2A, 24Vdc, 7ch		

4.4 Safety Manager SC Cabinets

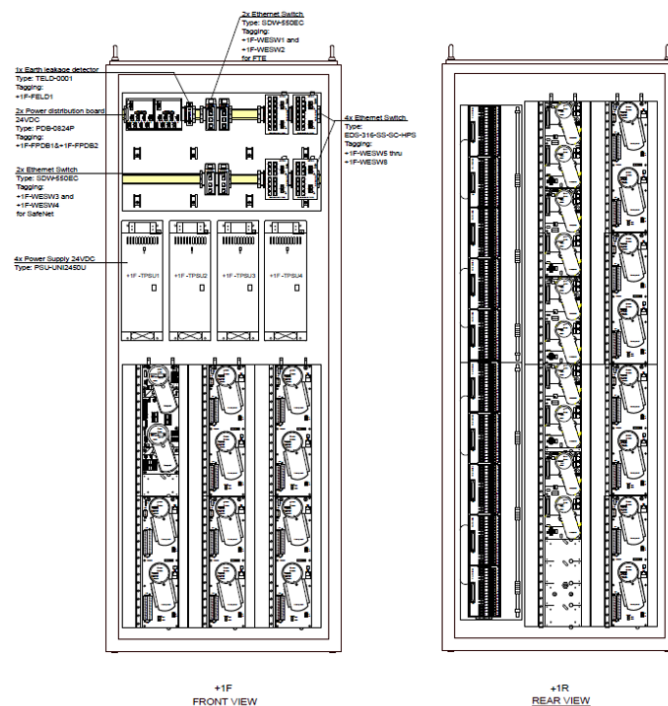
Honeywell certifies safety system cabinet designs to these standards, ensuring compliance of all system components and the overall system design. Safety Manager SC provides the basis for critical control and safety unification, reducing risks and installed costs, and improving plant safety while increasing plant uptime.

4.4.1 Large Safety Manager SC Universal Safety cabinet

The standard enclosure for Safety Manager SC is based on three cabinet types available in the Rittal TS 8 series.

Cabinet types	Rittal TS 8804	One of the three standard Rittal cabinet types is used for Safety Manager SC cabinets.
	Rittal TS 8806	
	Rittal TS 8808	

Safety Manager SC enclosures are default equipped with support glands, fans, an enclosure frame with steel doors, louvres and filters, an enclosure light, a thermostat, earth strips, a mounting wall of rails, gland plates, a rear panel and a roof or bottom plate. Side panels are mounted to the outer walls. A standard Safety Manager SC enclosure is painted in RAL 7035, with RAL 7022 for the plinth.



The large Universal cabinet has the following specifications:

- Standard certified cabinet design
- Size 2000mm X 800mm X 800mm
- Redundant fans
- Redundant S300 Safety Controller modules
- 448-732 Redundant IO configurations
- 50A Redundant power supplies
- Operating temperature -40 to +70 degrees C (Module ambient temperature)

For more information on the large Safety Manager SC Universal Safety cabinet please refer to the Hardware Reference document.

4.4.2 Universal Safety Cabinet for Safety Manager SC

The USC is a (1300mm high x 800mm wide x 400mm deep) cabinet that allows Universal Safety IO to be installed in remote field locations and in smaller enclosures.

Specific hardware configurations and complete and detailed information for the USC can be found in The Universal Safety Cabinet Planning, Installation and Service Guide.

The below figure shows a sample front view of the USC cabinet with the door removed.



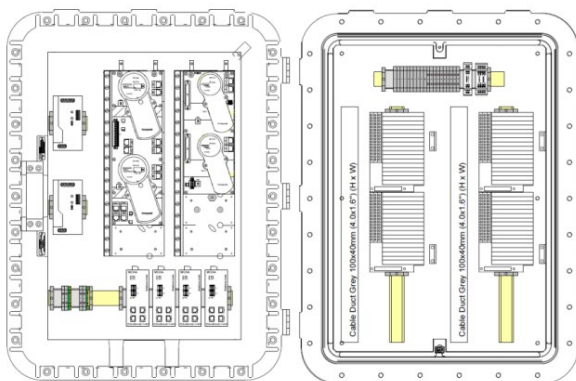
The USC has the following specifications:

- Standard certified cabinet design
- Size 1300mm X 800mm X 400mm
- Indoor or outdoor installation options using metal or stainless steel enclosures
- HAZLOC Certified
- Redundant S300 Safety Controller modules
- Redundant fans (internal circulation)
- 32, 64, 96 Redundant IO configurations
- 20A and 50A Redundant power supplies
- Operating temperature -40 to +70 degrees C (Module ambient temperature)

For more information on the Universal Safety Cabinet please refer to the Safety Manager SC USC specifications documents.

USC for Zone 1 – USCZ1

For the Zone 1 solution it has been chosen to use an Ex d box configured for remote IO with either 32 or 64 redundant Universal IO channels or as a small safety system with S300 controllers and 32 redundant Universal IO channels. The Exd cabinet will also have redundant power supplies and switches for communication. In addition, the required isolators on interface boards and/or field termination assemblies are connected to the redundant USIO module via the IOTA and system cables. These items are also part (placed in the Ex d box) of the solution. The cabinet can be either made from copper free aluminum or from SS316L stainless steel. This solution includes certification and welded couplings with threaded holes.



Certifications:

- ATEX II 2GD Exd [ia] IIBT6 or ATEX II 2GD Exd IIBT6 IP66
- Ambient temperature -20C /+55C
- TÜV IL 3.

4.4.3 Universal Marshalling Solution for Safety Systems

Universal Marshalling Solution provides standardized marshalling for central and distributed installations using signal conditioning assemblies. The signal conditioning assemblies handle 16 I/Os including disconnect, fusing as default, and when needed signal conditioning adapters (SCA) including isolation, intrinsic safety, relay, and other functions can be plugged in optionally. The SCA supports flexible wiring configurations without the need for custom wiring.

The unique features of UMS include:

- Three level flexible field terminations are provided to cater to various field wiring requirements.
- The Signal Conditioning Adapters are plugged into the USCA to eliminate the need for a separate installation of isolators, relays, signal converters and barriers.
- USCA has integral (optional) fuse and knife disconnect for easier plant installation and maintenance.
- D-Sub connector is provided on the USCA for interfacing with the IOTA.
- Field power is supplied through the USCA via the mass termination cable from the Safety IOTA.
- Optional power connector is provided to supply power to the active signal conditioning adapters.
- Optional 16 plug and play Signal Conditioning Adapters.
- Vertical mounting for more effective wiring since most field wiring applications require entry from the top or bottom of the cabinet.
- An LED for a quick visual cue to draw the Maintenance Technician's eye to important status information of relay and active signal conditioning adapters.



USCAs combine multiple functions into a single piece of equipment:

- Plug and Play adapters for optional signal conditioning.
- On-board flexible termination of process signals.
- On-board connection to Safety IOTAs.
- On-board Field power distribution.
- USCA receives 24 VDC power.

The following functions which are provided by the Signal Conditioning Adapters are available:

- Universal Pass Through Adapter – CC-UPTA01
- Digital Input with 5K resistor Adapter - FC-UDI501
- Digital Input Relay with 5K resistor Adapter - FC-UIR501
- Digital Input Relay Adapter - FC-UDIR01
- Digital Output Relay Adapter - FC-UDOR01
- Analog Input Adapter, type 3 wire - FC-UAIAO1
- Analog Input Adapter, type Sink - FC-UAISO1
- Digital Namur proximity switch Adapter - FC-UDIN01
- Digital Namur safety proximity switch Adapter - FC-UDNS01
- Analog Input Barrier, SIL 2 - FC-UGAI01
- Analog Output Barrier, SIL 2 - FC-UGAO01
- Digital Input/Output Barrier, SIL 2 - FC-UGDA01
- Universal Signal Conditioning Assembly IS 24 VDC - CC-UGIA01
- Universal Signal Conditioning High Current Assembly 24 VDC - FC-USCA01

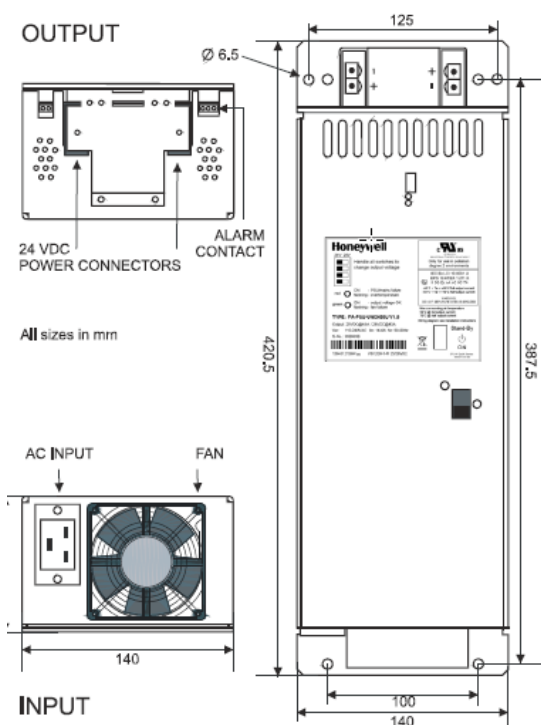
For more details on the Universal Marshalling Solution for Safety Systems Specification document.

4.5 Power Supply Units

Power supplies are used to convert different Vac input voltages to a specific Vdc output voltage, which is used by Safety Manager SC. This paragraph will describe the most common used Power Supply Units (PSU) for Safety Manager SC. For more detailed information and additional PSU's.

4.5.1 FC-PSU-UNI2450U

The PSU- UNI2450U power supply is a UL approved switched- mode DC power supply with a high efficiency (>85% at 187 Vac and >80% at 93, 5 Vac). It accepts a wide range of input voltages to provide 25 Vdc and 48 A output or 28 Vdc and 43 A output.



The units main features include:

- Dual built-in over-voltage protection, to comply with the functional safety requirements of the
- DIN V 19250 and VDE V 0801 standards
- ON/OFF switch on the power supply combined with isolated AC and DC power connectors
- Enable on-line replacement of the unit in a live system.
- A current limit feature, used to limit the maximum output power to 1200 W.
- Under-voltage alarm
- An output diode for parallel operation
- Optimum protection against continuous overload and short-circuiting.

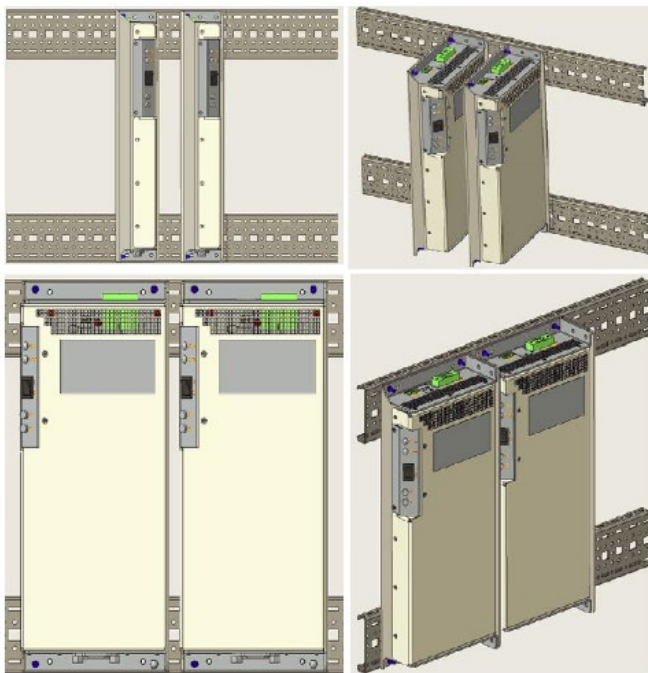
4.5.2 FC-PSUNI2424

The PSUNI2424 power supply is CE and UL approved for connection to industrial installations for use in process and safety controllers.

The power supply is a switched-mode AC to DC power supply with a high efficiency (87% with 230VAC input and 24A output) and supports a wide input voltage range between 100VAC and 240VAC. The output is SELV certified according the EN60950 standard.

The power supplies is certified for use in SIL3 applications where the output voltage needs to be guaranteed below 31VDC. This is done by using a dual independent over voltage protection supporting the IEC 61508 architectural constrains. In combination with an increase immunity for external EMC disturbances.

The power supplies can be connected in parallel up to eight power supplies to support higher output currents. The alarm outputs can be daisy-chained.



Main features of the power supply unit are:

- Dual built-in over-voltage protection, supporting SIL3 applications (IEC 61508)
- ON/OFF switch on the power supply combined with isolated AC and DC power connectors enable on-line replacement of the unit in a live system
- DC under-voltage alarm (<23.5V) AC under-voltage alarm (<80Vac) FAN alarm
- 50A/200ms peak current for clearing fuses Wide temperature range: -40°C to 70°C
- Inrush current limited (<60A); Supports 10A type C circuit breakers High holdup time: >50ms
- Optimum protection against continuous overload and short-circuiting Reduced FAN speed to reduce wear out in typical applications
- Increased EMC immunity to support alarm systems (EN50130-4)

4.5.3 QUINT4-PS/1AC/24DC/20/+

The Quint4+ is a Primary-switched QUINT POWER supply for DIN rail mounting, with selectable output characteristic curve and SFB Technology (selective fuse breaking), protective coating and integrated decoupling MOSFET, input: 1-phase, output: 24 V DC / 20 A.



The fourth generation of the high-performance QUINT power supplies ensures superior system availability by means of new functions. Signaling thresholds and characteristic curves can be individually adjusted via the NFC interface.

The unique SFB technology and preventive function monitoring of the QUINT power supply increases the availability of your application.

5 Communication and integration

Safety Manager SC has the option to communicate with other devices and systems (for example, a Safety Station, an Experion™ Station etc.) via the 6 Ethernet ports which are available on the controller.

The below table shows an overview of the possible Safety Manager SC connections:

Connection	Protocol	Physical network	Safe?	Data	Remarks
Safety Manager SC - Safety Manager SC	SafeNet	• Ethernet • FTE	yes	• safe points • non-safe points • time sync • remote (safe) reset	
Safety Manager SC - Safety Manager	SafeNet	• Ethernet • FTE	yes	• safe points • non-safe points • time sync • remote (safe) reset	
Safety Manager - Experion™	Experion SCADA	• Ethernet • FTE 1	no	• non-safe points • time sync • data viewing • diagnostics • Sequence Of Events (SOE) recording	For communication via FTE with Experion Server
Safety Manager - Experion™	Experion CDA	FTE	no	• non-safe points • data viewing • diagnostics	Full FTE node. Requires 2 ports per CP
				• Sequence Of Events (SOE) recording • process alarming • DCS peer-to-peer support	

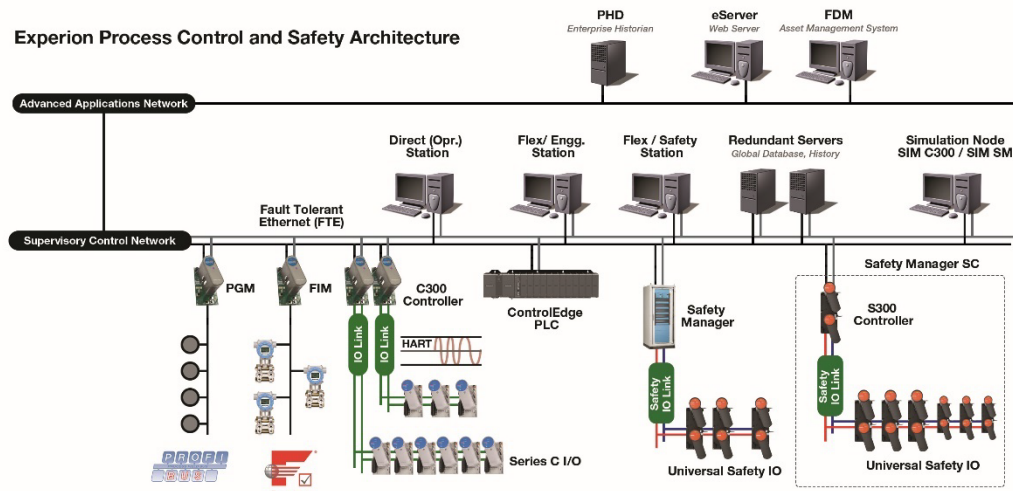
The following paragraphs will describe the most important communication options of Safety manager SC in more detail.

Connection	Protocol	Physical network	Safe?	Data	Remarks
Safety Manager - Controller	PCDI	• Ethernet • FTE ¹	no	non-safe points	For peer-to-peer communication via FTE with Process controller
Safety Manager - Modbus DCS device	Modbus	• TCP • Ethernet	no	• non-safe points • time set ²	Serial Modbus Responder communication is possible using Ethernet to Serial gateways.
Safety Manager - FDM Server	FDM	• Ethernet • FTE	no	non-safe data	Carry out an Export to FDM for newly configured HART devices
Safety Manager - plant clock	PTP and NTP	• Ethernet • FTE	no	time sync	Set the correct time zone in Plant properties
Safety Manager SC - Modbus Responder device	Modbus	• Ethernet • FTE	no	non-safe points	Serial Modbus Responder communication is possible using Ethernet to Serial gateways.
1. Redundant Ethernet 2. Only applies when Safety Manager acts as responder.					

5.1 Advanced Experion integration.

By using the CDA (Control Data Access) mechanism, fast and reliable data exchange between Safety Manager SC and Experion PKS is established.

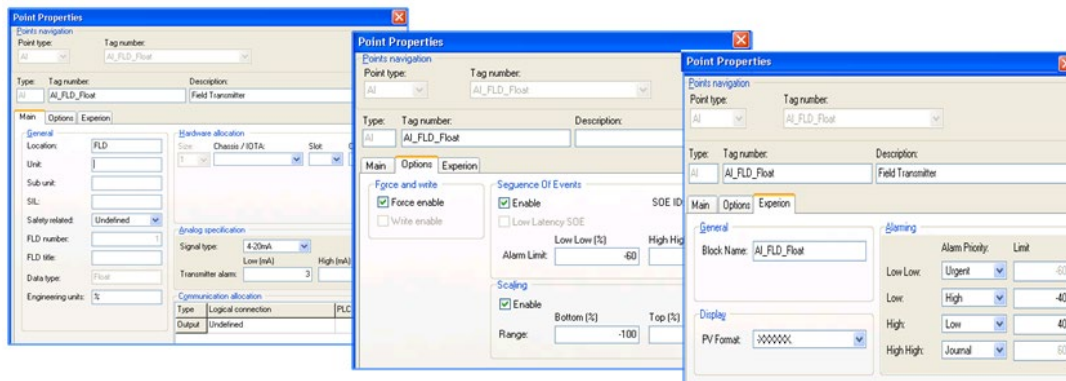
The advanced Experion integration also enables detailed Safety Manager SC system status, configuration information, application data and Alarm & Events integration without the need of additional engineering.



Advanced Experion Integration includes:

Single point of data entry

Detailed point configuration is done only once. By using the Safety Builder, point configuration details like engineering units, SOE/Alarm limits and many other parameters (see below figure below) are entered once and then published to Experion without the need of any further configuration or engineering within Experion.



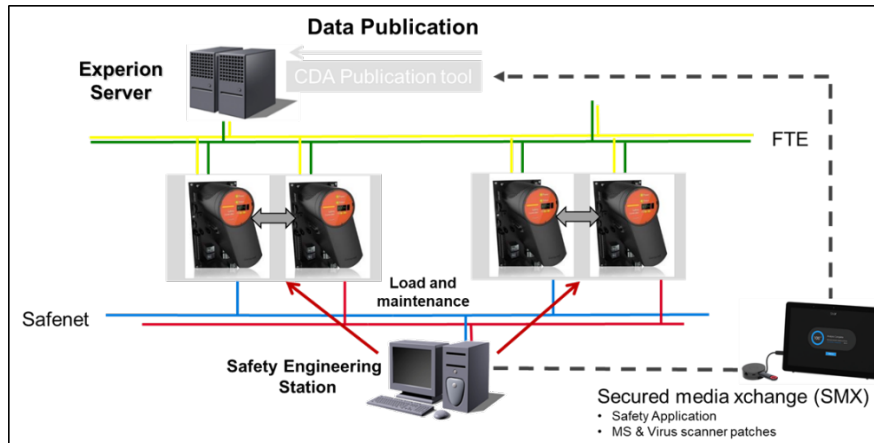
IEC61508 approved point publishing and integration methodology.

The unique publishing and integration method keeps strict segregation between the Safety Manager SC and Experion point databases. It keeps the safety and process environment strictly separated providing an additional security layer without losing operational integration. The architecture is such that only those points defined by the safety engineer will be accessible by Experion. While doing application

development or maintenance, the safety engineer will automatically be informed when publication is required.

Remote point publishing method.

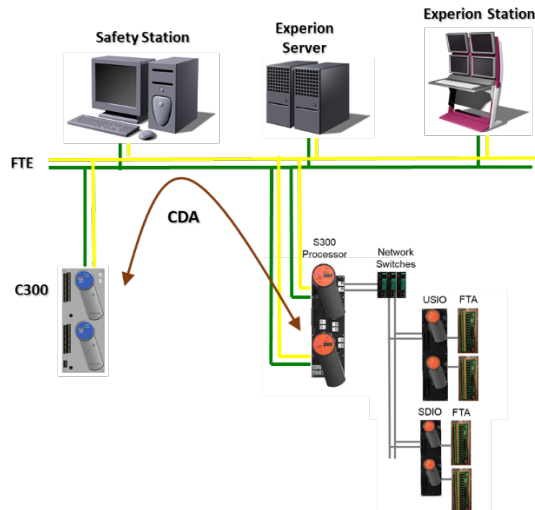
Due to new requirements related to cyber security, the possibility to publish points to Experion independent from the FTE network is now also available.



Via the remote publish function the application can be published to a file which will be stored on a secured media device. After the is imported on the Experion server all the information of the safety application will be available for the operator.

Peer-to-peer communication between Safety Manager and Experion nodes.

The Safety Manager SC Experion integration provides seamless peer to peer integration into C300, ACE and SIM C300. This will allow for reliable and cost effective data exchange between the process safety controllers and different process control environments within a broad field of applications.

**Integrated Alarm & Events (notifications)**

Safety Manager SC Experion integration provides integrated Alarm & Events within the Experion infrastructure. It will allow to see relevant notifications for both process and safety statuses within one window. Being integrated into general Experion System Alarm displays, analysis and decision making has never been easier, safer and faster.

Integrated Sequence of Events (SOE)

Safety Manager SC integrates the sequence-of-event (SOE) features as supported by Safety Manager SC into the Experion server. Safety Manager SC supports SOE for digital inputs and outputs, analog inputs and outputs and marker points. Each tag name that has been "SOE-enabled" is time-stamped by the Safety Manager SC Controller and reported to the Experion Server, where it is incorporated into the standard Experion Server SOE list which allows for detailed search, filter and automated archive functionality. Standard SOE displays are available to view the events as they are reported.

Experion compatibility

Table below shows compatibility and dependency between Experion, FDM and UNISIM / Workforce competency and Safety Manager SC functionality:

Safety Manager SC Controller		Experion						
Relevant function	SMS Releases		R43x	R500	R501	R51x	R52x	R53x
Experion Protocol (SCADA)	R214		p	p	✓	✓	✓	✓
CDA Integration (FTE)	R214		p	p	✓	✓	✓	✓
Sequence of Event	R214		p	p	✓	✓	✓	✓
PCDI	R214		p	p	✓	✓	✓	✓
FC-RUSIO-3224	R214		p	p	✓	✓	✓	✓
FC-PDIO01	R214		p	p	✓	✓	✓	✓
FC-PUIO01	R214		p	p	✓	✓	✓	✓

Safety Manager SC Controller		Experion LX						
Relevant function	SMS Releases		R43x	R500	R501	R51x	R52x	R53x
Sequence of Event	R214				✓	✓	✓	✓
PCDI	R214				✓	✓	✓	✓
Universal Safety I/O	R214				✓	✓	✓	✓
FC-PDIO01	R214				✓	✓	✓	✓
FC-PUIO01	R214				✓	✓	✓	✓
CDA Integration (FTE)	R214				✓	✓	✓	✓

Safety Manager SC Controller		Experion HS						
Relevant function	SMS Releases	R43x	R500	R501	R510	R511	R520	R530
Experion Protocol (SCADA)	R214				✓	✓	✓	✓
Sequence of Event	R214				✓	✓	✓	✓
PCDI	R214			✓	✓	✓	✓	✓

Safety Manager SC Controller		Field Device Manager (FDM)						
Relevant function	SMS Releases	R500	R501	R510	R511	R520	R530	R540.2
FC-RUSIO-3224 HART Pass thru	R214		✓	✓	✓	✓	✓	✓
FC-RUSIO-3224 HART handheld support	R214		✓	✓	✓	✓	✓	✓
FC-PUIO01 HART Pass thru	R214					✓	✓	✓
FC-PUIO01 HART handheld support	R214					✓	✓	✓

Safety Manager SC Controller		UNISIM / Workforce Competency						
Relevant function	SMS Releases				R46x	R470	R471	R520
Smoke & Heat Adapters	R214				✓	✓	✓	✓
Boolean Property Output								
FLD Export to Unisim	R214				✓	✓	✓	✓

Safety Manager SC Controller		Process, Machinery, and Drives (PMD)						
Relevant function	SMS Releases					R8xx	R90x	R92x
CDA Integration (FTE)	R214						✓	✓

✓

 Supported

p

 Update needed of Module and Fault ID

5.2 Field Device Manager (FDM) integration

Safety Manager SC supports smart field devices equipped with HART (Highway Addressable Remote Transducer) technology.



HART enabled devices provide detailed diagnostics and allow for cost saving maintenance solutions like e.g. PVST (Partial Valve Stroke testing)
In general HART provides:

- Device Diagnostics
- Device Troubleshooting
- Device Health and Status
- Device Configuration or re-configuration
- Additional measurement values provided by the device

All HART enabled devices, connected to Safety Manager SC, will be able to provide detailed device information to the Honeywell Field Device Manager (FDM)

Honeywell FDM is a centralized asset management system for remote configuration and maintenance of smart field devices. Honeywell FDM simplifies maintenance tasks, saves time and provides the flexibility and scalability to perform complete device configuration and management tasks in the plant environment through smart plant instrumentation.

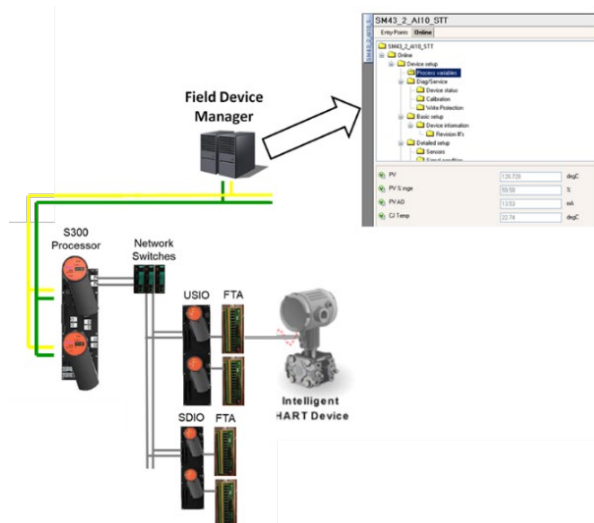
Safety Manager SC Universal Safety IO modules support HART pass through. HART enabled field devices connect directly to the Safety Manager SC Universal Safety IO field terminals and use the standard system network infrastructure into Honeywell's Field Device Manager (FDM) without the need for any additional infrastructure, engineering or application configuration. When integrated into Experion, HART device alerts are supported via Experion MUX monitoring

The pass through FDM integration is supported independent from the chosen Experion integration and can also be used in a standalone configuration.

Safety Manager SC Universal Safety IO HART pass through functionality

Safety Manager SC Universal Safety IO supports HART pass through directly into Field Device Manager (FDM).

The high-performance interaction between Safety Manager SC and FDM is transparent, easy to maintain and cost effective, the below figure shows the architecture as used between the intelligent Field Device and the Field Device Manager showing the actual device HART information. Device configuration can be done via unmodified use of both Device Description (DD) and Device Type Manager (DTM) technologies as provided by the device vendors



Safety Manager Field Device Manager integration

Configuring an FDM server within the Safety Builder Network Configurator enables the HART pass through functionality. HART enabled devices connected to Safety Manager SC Universal Safety IO can now be used to interface with FDM.

Safety Builder provides an automatically generated configuration file for Field Device Manager (FDM).

This configuration file contains:

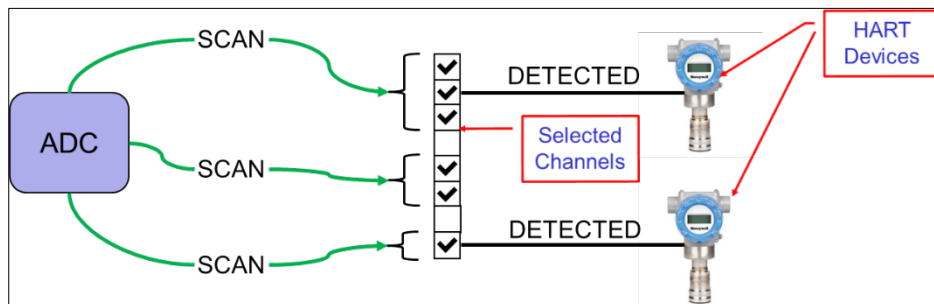
- The network topology as defined in Safety Manager SC,
- Safety Manager SC Universal Safety IO topology details,
- HART connected devices including Tag details

Safety Builder provides version management for the FDM integration, the user will be notified when Safety builder HART configuration has been changed and a new import into FDM is required.

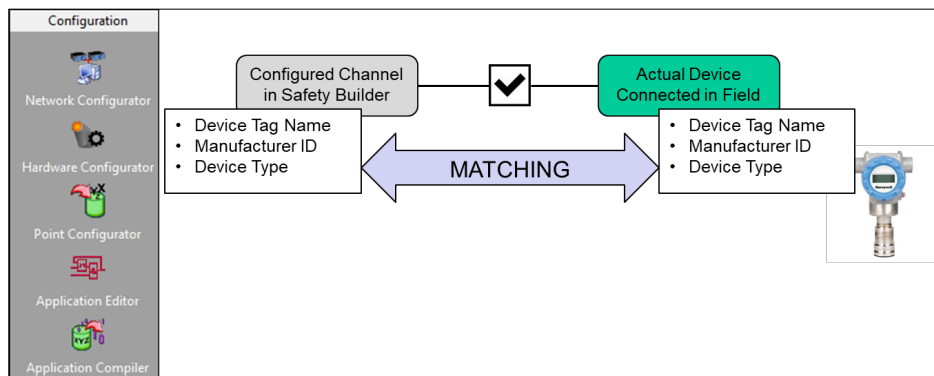
No additional engineering within FDM is required, all required configuration will automatically be done by simply importing the Safety Builder configuration file.

5.3 Auto Device Commissioning (ADC)

Safety Manager SC has the option to perform Auto Device Commissioning. ADC is already available for Experion, it is now also an option for Safety Manager SC. By using Safety Builder R212 (or higher) in combination with the Honeywell project engineering tool, it is possible to automatically identify Hart field devices and the allocation on the channels of the PUIO and or PDIO modules where they are connected.



It is also possible to automatically execute loop tests using the ADC function. Loop check test results are fully documented & auditable and easily transferable to 3rd party applications.



Using Auto Device Commissioning will result in increased projects efficiency and margin gain.

5.4 SIL3 Peer to Peer communication (SafeNet)

SafeNet is a communication protocol that:

- allows safe, SIL3 approved communication between Safety Manager SC controllers and supports remote loading, remote monitoring and remote reset of systems in the field.
- allows a mixture of both hierarchical Node ID/Peer ID communication architectures as well as flexible peer-to-peer architectures.
- includes timing restrictions and a high level of error detection and recovery, which makes it suitable for exchanging safety-related information while maintaining optimum availability.
- can be run on virtually any physical communication layer, varying from a telephone line, a satellite link, Ethernet, a fiber optic or an RS232 or RS485 link.

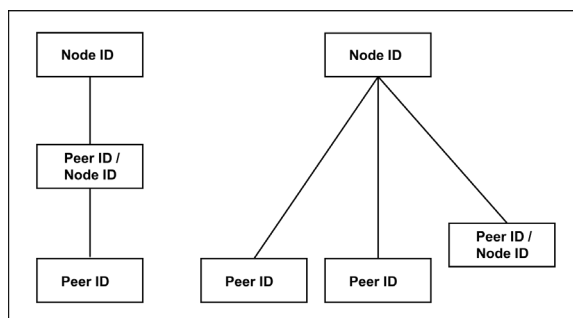
Note:

For a Safety Manager SC Controller, the following features of SafeNet will be available in a future release:

- Remote Load
- Remote Monitoring
- Remote Reset
- Serial Communication over SafeNet
- Time Synchronization over SafeNet

Architecture

SafeNet is based on a Node ID/Peer ID concept and can be used in STAR configuration (see the below figure). At least one network Node ID must be configured, but configuring multiple Node IDs is no problem either. A network Node ID is responsible for its communication activities to its network Peer IDs.



A Peer ID system can at the same time also be a Node ID:

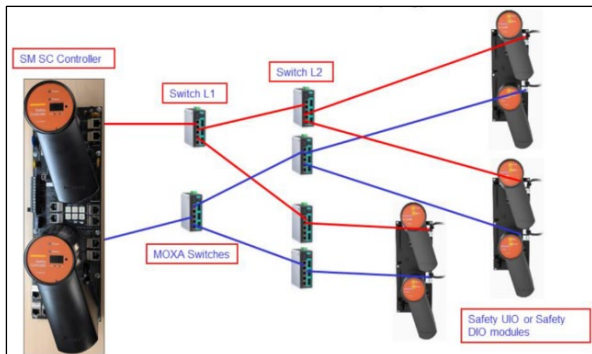
1. controlling Peer IDs in a lower network level
2. communicating peer-to-peer to other Peer IDs on the same network level.

Network domain and size

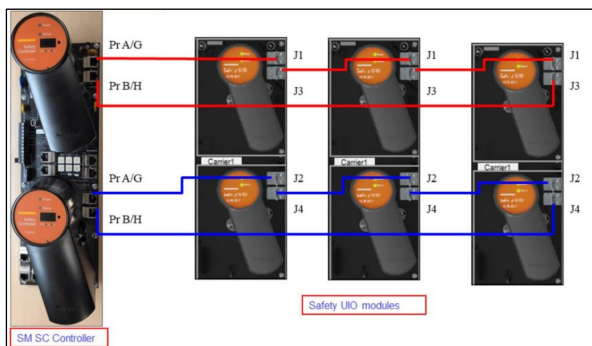
Up to 63 Safety Manager SC controllers can be configured and can communicate in a single domain. The actual number of configurable systems depends on the physical media (bit rate), network delay and the amount of data exchanged.

5.5 Ring IO link communication

Typical Safety Manager SC architectures use star topology to connect the Safety Manager SC controller to the Universal Safety IO modules. In this IO link communication structure, switches are used between the controller modules and the IO modules (see below picture).



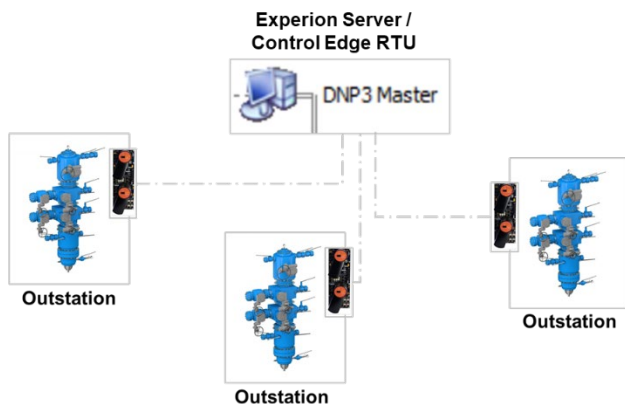
Safety Manager SC R211 introduces Ring IO link communication. With this option no switches are required to connect the Safety Manager SC controller to the Universal IO modules¹⁾. The ring communication structure will be established by using the Ethernet ports on the controller and IO IOATA's. The Ring IO link communication (see below picture) will result in a cost reduction and increased availability.



- 1) Ring IO communication can be used for a maximum of 25 FC-PUIO01 modules. Both the controller and the IO modules need to be installed in the same enclosure.

5.6 DNP3 Protocol Outstation Support

The DNP3 protocol with outstation support is a new feature which is introduced in R212. This protocol is important for Wellhead projects, as the Safety Manager SC controller can now act as an outstation. This means the controller can connect to a DNP3 master when the DNP3 protocol is configured and used. Either the Experion Server or a Control Edge RTU can act as a DNP3 master.



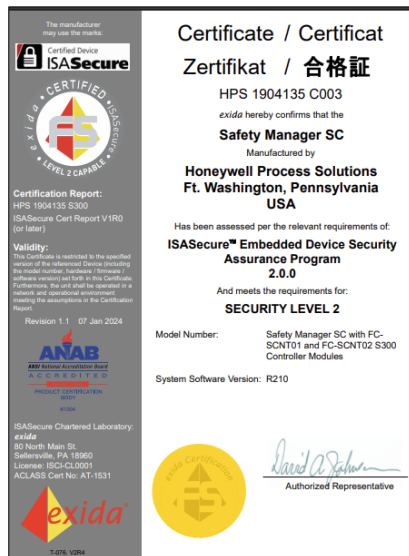
When the DNP3 protocol is configured in Safety Manager SC, the latest controller module is required. This module (FC-SCNT02) is able to support the DNP3 protocol because of its nonvolatile memory. This means when there is a loss of communication between the Safety Manager SC controller and DNP3 master, the SMSC controller stores all the DNP3 events. When the communication resumes, the Safety Manager controller sends all the DNP3 events to the master on request.

Each Outstation (Safety Manager SC controller) can be connected to one DNP3 master.

6 Safety and Security

Honeywell process control and safety systems, including Safety Manager SC, offer multi-layer cybersecurity protection and can be designed to meet individual customer architecture requirements. The Safety Manager SC Controller module can support a variety of communication networks/protocols and has a built-in hardware firewall (Honeywell CF9) protection against cybersecurity threats.

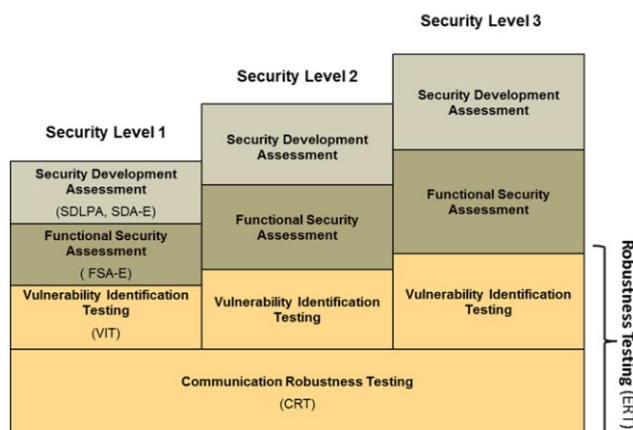
Because of these strict cyber security measures, the Safety Manager SC Controller is ISASecure Level 2 certified.



Certification is based upon the detailed results from evaluation of the following independent technical elements:

- Results of Vulnerability Identification testing
- Results of Development Assessment
- Results of Functional security assessment
- Results of Communication Robustness Testing

The below figure shows the increasing level of testing which is required for the higher ISA secure levels.



In compliance with the various standards and certificates, a Safety and Security Manual is published for every release of our products.

The manual:

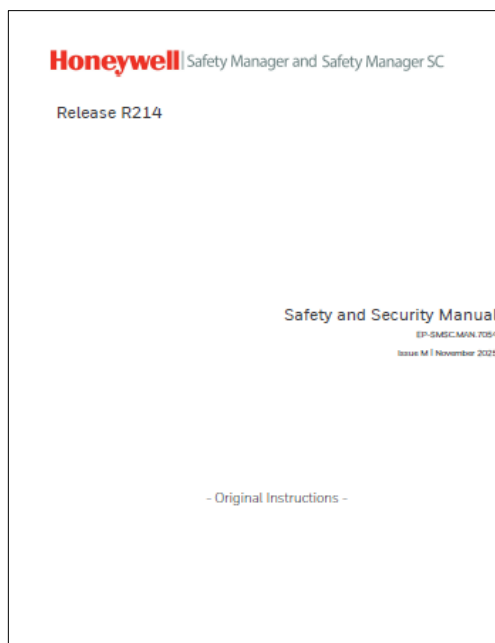
- Describes how to engineer, operate and maintain our solutions and be in compliance with the various standards.
- Provides recommendations and best practices for safe and secure operations.

Examples of topics which are described in the manual are:

- Organizational security.
- Physical security.
- Communication hardening.
- Securing Connection to Uplink Network/Downlink Network.
- Maintenance, Configuration and Operation.
- Patch Management.
- Backup/Recovery Capability.
- How to use the:
 - Force Enable Key Switch.
 - Program Enable Key Switch.
 - Program Enable Configuration.
 - Force Clear Key Switch.
 - Fault Reset Key Switch.
- Write Enable configuration and Write Lock System Points configuration.
- Remote Reset configuration and Remote Load configuration.
- Security Guidelines for (pre-) installing Safety Manager SC.

And many more....

The Safety and Security Manual is an integral part of the Safety Manager SC book set.



7 Certification and Compliance to Safety Standards

The advantage of applying and complying to standards is obvious:

- International standards force companies to evaluate and develop their products and processes according a consistent and uniform way.
- Products certified conform these international standards guarantee a certain degree of quality and product reliability that other products lack.

Since functional safety is the core of the Safety Manager SC design, the system has been certified for use in safety applications all around the world. Safety Manager SC has been developed specifically to comply with the IEC61508 functional safety standards, and has been certified by TUV for use in SIL1 to SIL3 applications.

Safety Manager SC has also obtained certification in the United States for the ANSI/ISA S84.01 standard. For a full list of all these and other certifications see the below "Certification".

Certification

Safety Manager SC has been certified to comply with the following standards:

	International Electrotechnical Commission (IEC) – The design and development of Safety Manager SC are compliant with IEC 61508 (as certified by TUV).
	Instrument Society of America (ISA) – Certified to fulfill the requirements laid down in ANSI/ISA S84.01.
	CE compliance – Complies with CE directives 2004/108/EEC (EMC) and 2006/95/EEC (Low Voltage), 2006/42/EEC (Machine Safety)
	European Committee for Standardization – CEN, CENELEC
	TUV (Germany) – Certified to fulfill the requirements of SIL1, 2 and 3 safety equipment as defined in the following documents: IEC61508, IEC60664-3, EN50156, EN 54-2, EN50178, IEC 60068, IEC 61131-2, IEC 61131-3, IEC60204.
	Canadian Standards Association (CSA) – Complies with the requirements of the following standards: ▪ CSA Standard C22.2 No. 0-M982 General Requirements – Canadian Electrical Code, Part II; ▪ CSA Standard C22.2 No. 142-M1987 for Process Control Equipment, including general Instructions up to No. 4 dated February 1989 (Reaffirmed 2004).

	▪ CSA Standard C22.2 No. 142- M1987 for Process Control Equipment, including general Instructions up to No. 4 dated February 1989 (Reaffirmed 2004).
	Underwriters Laboratories (UL) – Certified to fulfill the requirements of UL 508, UL 508A and ANSI/ISA S84.01.
	Factory Mutual (FM) – Certified to fulfill the requirements of FM 3611 and FM3600 (non-incentive field wiring circuits for selected modules and installation in Class 1 Div 2 environments).

Standards Compliance

This sub section provides a list of the standards Safety Manager SC complies with.

Standard	Title	Remarks
IEC 61508, Part 1-7 (2010) (S84.01)	Functional safety of electrical/electronic/programmable electronic (E/E/PE) safety-related systems.	SFF can be provided upon Values such as Prequest.FD, PFH
IEC 61511-1 (2017) (S84)	Functional safety - Safety instrumented systems for the process industry sector - Part 1: Framework, definitions, system, hardware and software requirements	
EN 62061 (2015)	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems	
ISO 13849-1 (2008)	Safety of machinery - Safety related parts of control systems. General principles for design	
EN 54 part 2 (2006)	Components of automatic fire detection systems, Introduction.	
EN 50130-4 (2014)	Electromagnetic compatibility - Immunity for requirements for components of fire, intruder and social alarm systems.	
EN 50156-1 (2015)	Electrical equipment of furnaces.	
EN 60204-1 (2009)	Safety of machinery - Electrical equipment of machines - Part 1: General requirements	
IEC 61000-6-2 (2005)	Electromagnetic compatibility - Generic immunity standard: Industrial environment.	
IEC 61010-1 (2010)	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use, Part 1: General Requirements.	
IEC 61131-2 (2007)	Programmable controllers. Part 2: Equipment requirements and tests.	
IEC 61326-3-1 (2008)	Immunity requirements for safety related systems.	

Standard	Title	Remarks
(2010)		
NFPA 85 (2011)	Boiler and Combustions Systems Hazards Code	
NFPA 86 (2011)	Standard for Ovens and Furnaces	
ANSI/ISA 71.04 (2013)	Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants G3 level: harsh environments	
UL 508	Industrial control equipment, seventeenth edition.	Underwriters Laboratories.
UL 508A (2001)	UL Standard for Safety Industrial Control Panels	Underwriters Laboratories.
CSA C22.2	Process control equipment. Industrial products.	Canadian Standards Association No. 142.
IEC 60068-1 (2004)	Basic environmental testing procedures.	
IEC 60068-2-1	Cold test. (undervoltage)	Safety Manager SC; -5°C (23°F)
SM Universal Safety IO module; -40°C (-40°F)	SM Universal Safety IO module; -40°C (-40°F)	SM Universal Safety IO module; -40°C (-40°F)
16 hours; system in operation; reduced power supply voltage:	16 hours; system in operation; reduced power supply voltage:	16 hours; system in operation; reduced power supply voltage:
(-15%): U=20.4 Vdc or (-10%): U=198 Vac.	(-15%): U=20.4 Vdc or (-10%): U=198 Vac.	(-15%): U=20.4 Vdc or (-10%): U=198 Vac.
IEC 60068-2-1	Cold test. (nominal)	Safety Manager SC; -10°C (14°F)
SM Universal Safety IO module; -45°C (-49°F)	SM Universal Safety IO module; -45°C (-49°F)	SM Universal Safety IO module; -45°C (-49°F)
16 hours; system in operation.	16 hours; system in operation.	16 hours; system in operation.
IEC 60068-2-2	Dry heat test.	up to 70°C (158°F)

Standard	Title	Remarks
16 hours; system in operation; increased power supply voltage:	16 hours; system in operation; increased power supply voltage:	16 hours; system in operation; increased power supply voltage:
(+30%): U=31.2 Vdc or (+10%): U=253 Vac.	(+30%): U=31.2 Vdc or (+10%): U=253 Vac.	(+30%): U=31.2 Vdc or (+10%): U=253 Vac.

8 Specifications

The following specifications apply to Safety Manager SC systems and modules mounted in a standard Safety Manager SC cabinet:

Mechanical Parameters Safety Manager SC controller module

Style	Honeywell Series-C
Size	165.1 x 72.4 x 145 mm (L x W x H) 6.5" x 2.9" x 5.7" (L x W x H)
Weight	0,5 kg / 18 oz

Safety Related Parameters Safety Manager SC controller module

Safety Integrity Level (IEC 61508)	1, 2 and 3
Performance Level (EN 13849-1)	PL e Category 3
PFD _{avg}	5.8×10 ⁻⁵ with Proof Test Interval of 20 years
PFH [1/h]	7.1×10 ⁻¹⁰
Diagnostics Coverage	91% (Medium)
λ_d	7.9×10 ⁻⁹
λ_{du}	7.1×10 ⁻¹⁰
Common Cause Factor β	2%
Diagnostic Test Interval	< 1h
Safety solution performance analysis ⁽¹⁾	SMSC-FSC_Rel.xlsm

⁽¹⁾ Part count analysis for the safety solution without field devices, provides the MTTR, MTTF, PFD_{avg}, SFF.

Security Related Parameters Safety Manager SC system

Cyber Security Level (IEC 62443)	2
Authentication and Encryption	IPSEC
Secure Boot	Yes
Genuine Part Detection	Yes

Safety Manager SC Environmental Conditions

Operating Temperature	-40°C to 70°C (-40°F to +158°F), ambient ⁽¹⁾
Storage Temperature:	-40°C to +85°C (-40°F to +185°F)
Relative Humidity:	10% to 95%, non-condensing
Pollution Degree	PD 2 or better
Protection	Module; plastic (RoHS compliant), IP20 IOTA; No protection against contact
PCB Coating	Humiseal, spray-coated
Altitude	IEC 61131-2 up to 2,000m
Vibration, Sinusoidal:	IEC 60068-2-6; 1 G at 57 Hz to 150 Hz; 10 Hz to 57 Hz: 0.075mm
Shock:	IEC 60068-2-27; 15 G for 11 ms, 3 axes
Electrostatic Discharge:	IEC 61000-4-2, Level 4 (15 kV)

Conducted Susceptibility:	IEC 61000-4-4, Level 3, Fast Transient/Burst IEC 61000-4-5, Level 3, Surge Withstand IEC 61000-4-6, Level 3, Conducted Field
Rated Susceptibility:	IEC 61000-4-3, Level 3
Conducted Emissions:	Measured per CISPR 11 & CISPR 22
Rated Emissions:	Measured per CISPR 11 & CISPR 22

⁽¹⁾ "Ambient" refers to the air temperature measured directly below the Safety Manager SC enclosure.

Safety Manager SC Controller and IO Capacity

Operating Modes	Redundant Controller and Redundant and /or Non-Redundant IO
Module Removal and Insertion Under Power	Supported
IO Points	2048 ⁽⁴⁾ , any mix of AI, AO, DI, DI-LM, DO, DO-LM
DI	24VDC, ranges as per IEC61131-2 Type 1 ⁽¹⁾
DI-LM	24VDC ⁽¹⁾
DO	24VDC / 500mA Short Circuit Proof ^{(1) (2)}
DO-LM	24VDC / 500mA Short Circuit Proof
AI	0..25mA / 4..20mA Short Circuit Proof, HART ^{(1) (2)}
AO	0..20mA / 4..20mA Current Source, HART ⁽¹⁾
Supported Number of I/O Networks - Universal Safety IO Link	2 links to a total sum of 62 I/O Units of 32 channels each. Routed to the Safety Processor through a managed on-board Ethernet switch
Supported Number of I/O Modules	62
Supported I/O Types	Universal Safety IO (32 channels per Unit) Universal Safety Digital IO (32 channels per Unit)
Diagnostic Test Interval (DTI)	User configurable 1 t/w 20 seconds
Execution Period	100ms to 2000ms (calculated, adjustable to a higher number) ⁽³⁾
Sequence of Events	DI: 1ms or Execution period (configurable) AI, DO, AO: Execution period
Number of S300 per Experion cluster	60 redundant controllers with a maximum of 20,000 points
Functional Logic Diagrams	2000
Timers	100 × 10ms 1000 × 100ms 1000 × 1s 1000 × 60s
Counters	500
Markers	25000 bits
Registers	25000 bytes
Embedded PID	Supported. Requires firmware R210.1 or higher
Embedded Annunciators	Not supported ⁽⁴⁾
SafeNet capacity	4kbyte per link up to a total of 24kbyte
Communication capacity	Markers in: 16352 (bits) Registers in: 8188 bytes
Communication Processor	Xilinx Zynq 7020 with 512Mbyte EEC RAM FC-SCNT01 has 128Mbyte FLASH FC-SCNT02 has 256Mbyte FLASH and additional 512Kbyte MRAM FLASH and MRAM retention > 20years

Safety Processor	Dual NXP MCF5275L 'Coldfire' with 8Mbyte ECC RAM, 16Mbyte FLASH and 512Kbyte MRAM
IO Processor	Dual NXP MCF5275L 'Coldfire'
RAM Retention (Warm start)	512Kbyte MRAM, warm start is not yet supported ⁽⁴⁾
Real Time Clock	Drift: < 10minutes/year Retention: 1F High Cap supporting approximately 12 days over full temperature range without loss of accuracy.

(1) Please refer to the hardware manual for detailed specifications

(2) De-rating may apply depending on ambient temperature

(3) The lower cycle time boundary depends on the size and complexity of the application and the number of I/O points configured.

(4) Will be supported with a future release.

Controller Communication

Ethernet Communication Ports	6 per Cp (2 reserved for IO), redundant Cp use identical configurations
Serial Communication Ports ⁽⁵⁾	2 per Cp, redundant Cp use identical configurations
CDA (includes FTE)	Integration with Honeywell Experion DCS
SCADA	Integration with Honeywell Experion DCS or third party DCS
PCDI	Native peer to peer with C300
Modbus TCP Master and Responder	Panels
SafeNet (SIL4)	62x Safety Manager and Safety Manager SC Peer to Peer
Safety Builder	Native peer to peer with Safety Builder
FDM	HART pass-thru
Universal Safety IO Link (SIL 4)	Native peer to peer with IO modules
PTP / NTP	Precision Time Protocol, Network Time Protocol
DNP3 Outstation	Integration with Honeywell Experion DCS and PLC Requires FC-SCNT02 and firmware R212.1 or higher

(5) Not supported with R201

Safety Manager SC Standard Cabinet Specifications

Safety Manager SC cabinet dimensions (Rittal, model TS 8):	2m 78"	2000 x 800 x 800 mm (H x W x D) 78¾" x 31½" x 31½" (H x W x D)
Universal Safety Cabinets (USC)	1,30m 47"	1300 x 800 x 373 mm (H x W x D) 51.2" x 31.5" x 16.9" (H x W x D)
IO Module sizes and weights:		
– Carrier (MCAR)	18" Carrier 36" Carrier	478 x 145.6 x 32 mm (L x W x H) / 0,25 kg 18.8" x 5.7" x 1.3" (L x W x H) / 9 oz 918.7 x 170 x 80 mm (L x W x H) / 0,45 kg 36.2" x 6.7" x 3.1" (L x W x H) / 16 oz
– Universal Safety IO termination assembly (IOTA)	15"	443.2 x 120.7 x 64 mm (L x W x H) / 0,3 kg 17.4" x 4.8" x 2.5" (L x W x H) / 11 oz
– Universal Safety IO Module		165.1 x 72.4 x 145 mm (L x W x H) / 0,6 kg 6.5" x 2.9" x 5.7" (L x W x H) / 21 oz

Safety Manager SC Electrical Specifications

Supply voltages:	24 Vdc: +30% / -15%
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International Approvals

Standards	Comments
EN 298: 2012 with EMC of EN 13611: 2015	-
EN 50130-4:2011 + A1:2014	-
EN 50156-1:2015 with EMC of EN 61000-6-7	-
EN 54-2:1997 + AC:1999 + A1:2006	-
EN 60079-11 'ic'	-
EN 60204-1 2006 + A1:2009 + AC:2010	-
EN 61131-2:2007	-
EN 61511-1:2004 / IEC 61511-1:2016	-
EN ISO 13849-1: 2015	-
IEC 61010-1:2017	-
IEC 61326-3-1:2008	-
IEC 61508:2010	-
EN 62061:2005 + AC:2010 + A1:2013 + A2:2015	-
NFPA 85:2015	-
NFPA 86:2015	-
NFPA 87:2015	-
UL/CSA 61010-1	-
UL/CSA 61010-2-201 / IEC 61010-2-201 2013 / EN 61010-2-201 2013 + AC:2013	-

For More Information

Learn more about Safety Manager SC – Easy Integration and Flexible Deployment. Visit our website www.honeywellprocess.com or contact your Honeywell account manager.

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