



Technical article

Innovative cooperation in fire protection: The GreCon PROTECTOR as a pioneer of functionally safe, decentralised fire protection systems

Authors: Fagus-GreCon together with MESCO Engineering GmbH May 2025



Fig1.: GreCon PROTECTOR complete system with Ranger decentralised control unit

Introduction

Preventive fire protection systems are of central importance in industrial production – not only to protect people and systems, but also to avoid production downtimes. With the GreCon PROTECTOR, Fagus-GreCon and MESCO Engineering have created an innovative, highly integrated system that sets standards in terms of safety, decentralisation and communication capability. Honoured with the iF DESIGN AWARD 2025 in gold, the GreCon PROTECTOR combines practice-oriented design with functional safety in accordance with current standards.





The eight highlights of the **GreCon PROTECTOR's** hardware and software development can be summarised in several innovative and technically advanced points:

1. Innovative fire protection system with distinction

- The GreCon PROTECTOR combines user-friendliness and industrial safety at a high level.
- Honoured with the **iF DESIGN AWARD 2025 in gold**, which underlines the design and functional quality.

2. Ranger - decentralised control unit as a fundamental building block of swarm intelligence

- Control unit that handles both power supply and communication with the control centre.
- The basis for the modular structure and scalability of the system.

3. Single pair Ethernet (SPE) with PoDL

- Data and power transmission via just one twisted pair of wires (compact, cost-efficient, up to 1000 m range).
- Power over Data Line (PoDL) supplies the Ranger and connected components with power.
- Increases flexibility and reduces installation effort

4. Secure communication with PROFINET & PROFIsafe

- PROFINET for industrial Ethernet communication.
- PROFIsafe ensures safety-related transmission enables safe machine shutdown in the event of a fault.

5. Redundant safety architecture (1002)

- Developed on the basis of MESCO's Safety Design Packages with the STM32F745/746.
- The Ranger architecture complies with IEC 61508 SIL2, ISO 13849 Cat3 PL d.
- Including libraries for self-tests, synchronisation and monitoring.

6. Hardware development for the EX area (IEC 60079, ATEX Zone 2)

- Creation of the Exconcept
- Circuit design with calculations
- Documentation for certification

7. Multi-function interface (MFI) - versatile, monitored interface to sensors and actuators

- 8× MFI per Ranger, connection of GreCon and third-party components.
- Integrated diagnostics and control mechanisms: short circuit, cable break detection, etc.
- Supports ISO 13849 and additional fire protection requirements.

8. TÜV-certified development process

- Realisation according to the V-model with clear division of tasks between MESCO and Fagus-GreCon.
- Utilisation of tried and tested modules from MESCO Design Packages accelerates development and reduces documentation effort.

The result is a state-of-the-art, safe and highly flexible fire protection system, that combines both technological innovation and practice-orientated implementation.





Intelligent system architecture: the Ranger control module

Decentralised control

The core component of the system is the Ranger control module, which is installed directly in the vicinity of the system area to be monitored. This decentralised architecture reduces the need for central control cabinets and increases the modularity and scalability of the system.



Fig2.: System architecture



Fig3.: Ranger with spark detector (sensor for spark detection)





Energy and data transmission via SPE

The Ranger communicates with the system centre via Single Pair Ethernet (SPE). This technology enables both full-duplex data transmission and Power over Data Line (PoDL) via a single twisted pair of wires.

- Transmission power: up to 50 W
- Data rate: 10 Mbit/s
- Range: up to 1000 m
- Basis for standardisation:
 - IEEE 802.3cg (10BASE-T1L)
 - IEEE 802.3bu (PoDL)

SPE was selected as the communication medium as it saves cabling costs. In addition, an electrically isolated power supply increases operational reliability.

Secure communication: PROFINET and PROFIsafe in use

The system uses PROFINET, a widely used industrial Ethernet protocol that is optimised for cyclical, deterministic data exchange between control systems and field devices. (IEC 61158 / IEC 61784-3-3 PROFIsafe). PROFIsafe - a safety protocol based on PROFINET - is used to transmit safety-related data. This enables the safe shutdown of machines in the event of a fault, which is essential for machine protection.

The safety-relevant hardware and software architecture

Hardware architecture:

The safety of the system is realised by a loo2 safety architecture, developed with the MESCO Safety Design Package, which uses the STM32F745/746 microcontroller as a core component as the hardware basis. This achieves a redundancy level HFT = 1 (Hardware Fault Tolerance) and safety level SIL2 in accordance with IEC 61508 and Category 3, Performance Level d (PL d) according to ISO 13849.

In these fire protection applications, additional special requirements must be met in order to fulfil the explosion protection guidelines (such as ATEX, IECEx). These include, for example, protection against sparking, the choice of certain materials and compliance with strict safety standards. As the GreCon **PROTECTOR** is designed to detect and extinguish sparks, it has been tested in accordance with the relevant standards for hazardous areas in accordance with z. IEC 60079 (for explosion protection) and IECEx (ATEX Zone 2). With over 30 years of experience in the field of Ex hardware development, MESCO was able to fully contribute its expertise and prepare the documents for the approvals and defend them before the approval body.





Software architecture:

The software architecture comprises the core artefacts:

- Synchronisation and mutual monitoring of the two CPUs
- Self-tests and memory tests
- Secure task switching
- Use of secure black channel communication via UART

		Safe Ext	nc	ction Appl	ication		
		Sc	oftv	vare Packages	i		
Scheduler	1002 Base				1002 Lii	braries	
Cross Communication	Device self-tests	Device diagnostic		Safe Fieldbus			
Failure handling	Parameter storage	Nonvolatile memory		PROFIsafe	Parameter Download	Software Update	
ServiceCom interface	Debug Interface	Hardware Abstraction					

Fig4.: Safety Design Package Software Overview

The connection logic with Multi Function Interface (MFI):

Each Ranger decentralised control unit has eight Multi Function Interfaces (MFI). These are modular, diagnostics-capable IO interfaces with the option of connecting GreCon components (e.g. spark detectors, extinguishing systems), integrating third-party detectors, pressure boosting systems, heating cable monitoring and integrated diagnostic functions: Short-circuit and cable break detection, self-monitoring in accordance with ISO 13849 and a status diagnosis for all connected actuators and sensors.



Fig5.: Multifunctional interfaces MFI





Development process was carried out according to the V-model (based on IEC61508)

The system was implemented in accordance with the development process at MESCO using the TÜV-certified **V-model**. Development took place in dedicated phases:

- System requirements
- Safety concept development
- Hardware/software design
- Integration and verification

In the collaboration, MESCO took care of the safety-related hardware and software, while Fagus-GreCon realised the non-safety-related software with technical support from MESCO. Thanks to the use of ready-made modules from the **MESCO Safety Design Packages**, the development time was significantly reduced, as was the documentation effort.



Fig.6: Ranger modular electronics architecture

Conclusion

The Ranger sets new standards in preventive fire protection technology: it combines modern communication technologies (SPE, PROFINET), high functional safety (SIL2, PL d) and a decentralised, easily scalable system architecture.

The close and successful collaboration between Fagus-GreCon and MESCO, as well as the modular, agile development strategy, make the Ranger a future-proof solution for modern fire protection.

Thanks to its highly reliable products and many years of experience in fire protection, Fagus-GreCon had all the necessary prerequisites to develop an outstanding, innovative new product. MESCO was able to fully contribute its expertise in hardware and software development for the areas of industrial communication, explosion protection and functional safety. This resulted in a successful development with a deservedly award-winning result!





An overview of the standards relevant to this project:

Standard	Designation
IEC 61508	Functional safety of electrical/electronic/programmable electronic systems
ISO 13849	Safety of machinery - Safety-related parts of control systems
IEC 61784-3-3	Functional safety of industrial networks - PROFIsafe
IEEE 802.3cg	Ethernet Physical Layer SPE
IEEE 802.3bu	Power over Data Line (PoDL)
IEC 61158 / 61784	Communication standards for PROFINET

Relevant Links - AWARD 2025:

https://www.fagus-grecon.com/de/brandschutz/news/detail/grecon-protector-wins-the-if-design-award-2025-in-gold/

Brief description of the authors

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Your development partner. For 35 years.

...and ideas turn into success!

MESCO Engineering is your partner for innovative electronics development for products in the field of process and factory automation. Our core competence lies in the development of hardware and software.

The combination of the technical fields of industrial communication, functional safety and explosion protection is our strength. Since 1990, we have been offering our customers worldwide the latest cross-industry expertise, integrated solutions and comprehensive service. Honest, transparent and partnership-based cooperation is our top priority.

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