

RFC 480S PN 4TX safety-related controller for PROFI-safe applications

Extremely powerful and safe

For several years the demand for safety-related solutions in automation systems has been steadily growing. Users do not just want a concept that satisfies the highest safety integrity level: SIL 3. They also want to be able to use the existing Ethernet infrastructure to forward safety data. With the RFC 480S PN 4TX, Phoenix Contact offers a new high-performance controller that meets all of these requirements and more (lead image).



Lead Image

Profisafe, the safety-oriented protocol, is a transmission medium that can satisfy the expectations described above. Profisafe operates according to the so-called Black-Channel principle which allows use of the available Ethernet-based physics. On the one hand, PROFIsafe telegrams can be sent via the available copper or fibre optic cables. On the other, the standard protocol Profinet as well as the backplane bus protocol of any manufacturer can be used for the Profisafe communication. In light of this, more and more manufacturers are bringing devices onto the market that support Profisafe. Due to further development of the standard in the PROFIsafe profile V 2.6.1 and the high demand for safety-oriented solutions, the safety protocol is also expected to become more widespread in future (Figure 1).

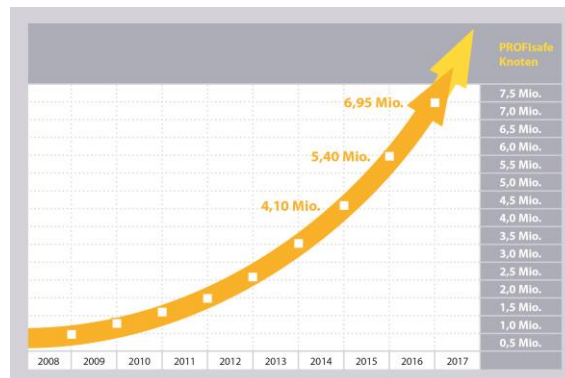


Figure 1 - Development of number of installed Profisafe nodes

High performance for computing-intensive applications



Figure 2 - The RFC 480S PN 4TX is a high-performance controller with integrated Profisafe safety controller

By introducing the RFC 480S PN 4TX, Phoenix Contact has expanded its comprehensive range of controllers to include a new high-performance controller. This device is a combination of a PLC control system for standard I/Os in Profinet systems and a safety control that manages a large number of Profisafe participants (F-Devices). The various application programs for the standard I/Os and the safety-oriented Profisafe participants are executed and computed in different processing units. In this case, the hardware of the two logical control units is accommodated separately in one housing. By using state-of-the-

art fast processor architecture, computing-intensive applications can also be implemented. Furthermore, the RFC 480S PN 4Tx can be used in automation solutions with exceptionally rigorous safety demands up to SIL 3 in accordance with EN IEC 62061 or PL e according to DIN EN ISO 13849-1 (Figure 2).

Deterministic execution of programs

A high-performance Intel i5 Dual Core processor is used in the management controller for the standard I/Os. The firmware architecture ensures that the load is distributed evenly between the two cores. The runtime environment for the IEC61131 program is executed on

core 1. Core 2 provides the computing power for all communication via Profinet, OPC, the web server and also the majority of operating system processes. This arrangement offers a number of advantages over a single-core system for the user application created in IEC 61131. One of these is shorter program runtimes that fluctuate less around their mean value, i.e. that have a lower variance. This is due for example to the fact that the transfer of data via PROFINET or a process in the operating system does not interrupt the runtime of the IEC61131 user program for a longer period. Consequently, the program is executed in a much more deterministic manner.

Safety-oriented processing unit with two different CPUs

The safety-oriented controller performs the function of an F-Host in the Profisafe network which can bring up to 300 lower-level F-Devices into operation. The RFC 480S PN 4TX also supports the latest PROFIsafe protocol V 2.6.1 which means it can be used to control F-Devices already delivered with this profile. In addition, the concept of the safety PLC is future-proof because it can even interact with F-Devices that have the maximum specified process data width of 123 bytes.

The safety-oriented processing unit of the RFC 480S PN 4TX consists of two different CPUs.

To achieve a higher diversity, the two processing cores are equipped with different architectures. Both CPUs compute the safety-oriented program components in parallel then compare the results. If the result is identical, the outputs are written. If not, the safe

controller of the RFC 480S PN 4TX is put in the safe state. The CPU cores are synchronised with 600 MHz or 800 MHz which is why the safety-oriented computing performance of the safety PLC has proven to be one of the most powerful on the market. The new safety-oriented controller offers a number of advantages over the predecessor model RFC 470S PN 3TX. In addition to advanced operations such as multiplication and division, further data types, such as SINT and SWORD for example, have been introduced into the safety-oriented user project (Figure 3).

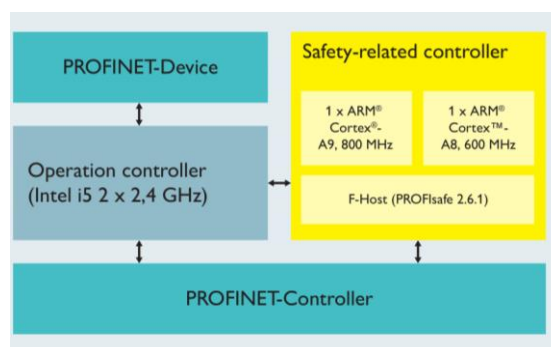


Figure 3 - Block diagram of internal architecture of the RFC 480S PN 4TX

User-friendly operation and diagnostics via touch display



Figure 4 - The resistive touch-capable display is used for programming and diagnostics

The RFC 480S PN 4TX, the first controller by Phoenix Contact, comes with a resistive touch-capable display. The display, which features a state-of-the-art tiled display, allows the user to perform rapid programming and diagnostics. Diagnostic data is visualised both for the management controller and safety-oriented controller. The user also receives important information about communication via Profinet and OPC UA. The tiles for the Profinet controller can show how many connections have been configured and set up, for example. The bus and serial faults of a PROFINET station are displayed alongside its PROFINET name. In addition, IP addresses can be conveniently assigned via the display. The RFC 480S PN 4TX is equipped with four Ethernet interfaces. LAN 1 and LAN 2 can each be operated with up to 1 Gbps. LAN 3.1 and LAN 3.2 are switched and operate with up to 100 Mbps. Each of the three LAN interfaces can be programmed via the display.

Reliable pitch control in wind turbine generators

The RFC 480S PN 4TX is a high-performance PLC which, for example, is suitable for controlling wind turbine generators in situations where safety-oriented components are required based on the safety assessment. One such application is adjustment of the rotor blades – also referred to as "pitch control". The pitch control performs failsafe detection of the current position of the rotor blade (actual value) and forwards this to the safety PLC. The safety-oriented program then compares the actual value of the rotor blade position with the corresponding set point. The set point is calculated based among other things on the failsafe detection of the prevailing wind speed via an anemometer which is then processed in the safety-oriented program of the RFC 480S PN 4TX. If the set point calculated for rotor blade adjustment deviates from the actual value, the RFC 480S PN 4TX activates a safety-oriented participant (F-Device) which moves the rotor blades to the desired position.

Comprehensive services throughout entire life cycle

The safety PLC can be part of a solution developed by the Competence Centre Safety which is individually tailored to a specific user. When a project request is submitted, the safety experts initially perform a safety assessment of the planned facility. Requirements for specific safety-related products are derived from this assessment. This is followed by the validation and planning phase of the devices used in the facility of the user. The proposed solution is

then worked out and configured. In the final step, the employees of the Competence Centre Safety bring the facility into operation to ensure a successful start-up. These employees therefore consider themselves as an all-round service provider which supports the safety-related application throughout its entire life cycle - from the safety assessment through to maintenance of the producing facility (Figure 5).

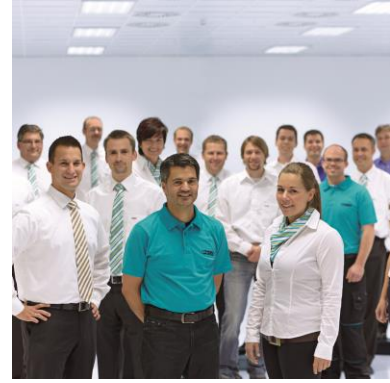


Figure 5 - The safety experts at Phoenix Contact support the user throughout the entire life cycle of their application

More information:

www.phoenixcontact.de/safety

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