PreventaSupport

Library Guide
for Preventa XPS Safety Modules

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

BEFORE YOU BEGIN

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠ WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

START-UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

⚠ WARNING

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book

At a Glance

Document Scope

This document describes the function blocks `FB_PreventaDiag` and `FB_PreventaMain` contained in the PreventaSupport library. `FB_PreventaDiag` can be used to evaluate the diagnostic output of Preventa XPS safety modules, thus monitoring the device functionality by "translating" the bit sequence into diagnostic code. `FB_PreventaMain` uses this diagnostic code as input and executes calculations concerning maintenance tasks based on the code.

Validity Note

This document has been updated for the release of SoMachine V4.3.

The technical characteristics of the devices described in the present document also appear online. To access the information online:

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the reference or product range. ● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product Datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.
6	To save or print a data sheet as a .pdf file, click **Download XXX product datasheet**.

The characteristics that are presented in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Product Related Information

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

Before you attempt to provide a solution (machine or process) for a specific application using the POUs found in the library, you must consider, conduct and complete best practices. These practices include, but are not limited to, risk analysis, functional safety, component compatibility, testing and system validation as they relate to this library.

⚠ WARNING

IMPROPER USE OF PROGRAM ORGANIZATION UNITS

- Perform a safety-related analysis for the application and the devices installed.
- Ensure that the Program Organization Units (POUs) are compatible with the devices in the system and have no unintended effects on the proper functioning of the system.
- Use appropriate parameters, especially limit values, and observe machine wear and stop behavior.
- Verify that the sensors and actuators are compatible with the selected POUs.
- Thoroughly test all functions during verification and commissioning in all operation modes.
- Provide independent methods for critical control functions (emergency stop, conditions for limit values being exceeded, etc.) according to a safety-related analysis, respective rules, and regulations.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Care must be taken and provisions made for use of this library for machine control to avoid inadvertent consequences of commanded machine operation, state changes, or alteration of data memory or machine operating elements.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Place operator devices of the control system near the machine or in a place where you have full view of the machine.
- Protect operator commands against unauthorized access.
- If remote control is a necessary design aspect of the application, ensure that there is a local, competent, and qualified observer present when operating from a remote location.
- Configure and install the Run/Stop input, if so equipped, or, other external means within the application, so that local control over the starting or stopping of the device can be maintained regardless of the remote commands sent to it.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Update your application program as required, paying particular attention to I/O address adjustments, whenever you modify the hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Related Documents

Document title	Reference
SoMachine Functions and Libraries User Guide	*EIO0000000735 (ENG)*; *EIO0000000792 (FRE)*; *EIO0000000793 (GER)*; *EIO0000000794 (ITA)*; *EIO0000000795 (SPA)*; *EIO0000000796 (CHS)*;
SoMachine Programming Guide	*EIO0000000067 (ENG)*; *EIO0000000069 (FRE)*; *EIO0000000068 (GER)*; *EIO0000000070 (ITA)*; *EIO0000000071 (SPA)*; *EIO0000000072 (CHS)*;
Preventa XPSUABx1C User Guide	EIO0000003454 (ENG) EIO0000003455 (FRE) EIO0000003456 (GER) EIO0000003457 (ITA) EIO0000003458 (SPA) EIO0000003461 (CHS)
Preventa XPSUAFx3A User Guide	EIO0000003465 (ENG) EIO0000003466 (FRE) EIO0000003467 (GER) EIO0000003468 (ITA) EIO0000003469 (SPA) EIO0000003472 (CHS)
Preventa XPSUAKx2A User Guide	EIO0000003476 (ENG) EIO0000003477 (FRE) EIO0000003478 (GER) EIO0000003479 (ITA) EIO0000003480 (SPA) EIO0000003483 (CHS)
Preventa XPSUATx3A3A User Guide	EIO0000003443 (ENG) EIO0000003444 (FRE) EIO0000003445 (GER) EIO0000003446 (ITA) EIO0000003447 (SPA) EIO0000003450 (CHS)
Preventa XPSUDNx3A User Guide	EIO0000003498 (ENG) EIO0000003499 (FRE) EIO0000003500 (GER) EIO0000003501 (ITA) EIO0000003502 (SPA) EIO0000003505 (CHS)

Document title	Reference
Preventa XPSUEPx4A User Guide	EIO0000003509 (ENG) EIO0000003510 (FRE) EIO0000003511 (GER) EIO0000003512 (ITA) EIO0000003513 (SPA) EIO0000003516 (CHS)
Preventa XPSUSx2A User Guide	EIO0000003487 (ENG) EIO0000003488 (FRE) EIO0000003489 (GER) EIO0000003490 (ITA) EIO0000003491 (SPA) EIO0000003494 (CHS)
Preventa XPSUABx1C Instruction Sheet	PHA71839 (ENG, FRE, GER, ITA, SPA, CHS)
Preventa XPSUABx1C Instruction Sheet	PHA71840 (ENG, JAP, KOR, POR, RUS, TUR)
Preventa XPSUAFx3A Instruction Sheet	PHA71842 (ENG, FRE, GER, ITA, SPA, CHS)
Preventa XPSUAFx3A Instruction Sheet	PHA71843 (ENG, JAP, KOR, POR, RUS, TUR)
Preventa XPSUAKx2A Instruction Sheet	PHA71845 (ENG, FRE, GER, ITA, SPA, CHS)
Preventa XPSUAKx2A Instruction Sheet	PHA71846 (ENG, JAP, KOR, POR, RUS, TUR)
Preventa XPSUATx3A3A Instruction Sheet	PHA71829 (ENG, FRE, GER, ITA, SPA, CHS)
Preventa XPSUATx3A3A Instruction Sheet	PHA71837 (ENG, JAP, KOR, POR, RUS, TUR)
Preventa XPSUDNx3A Instruction Sheet	PHA71850 (ENG, FRE, GER, ITA, SPA, CHS)
Preventa XPSUDNx3A Instruction Sheet	PHA71851 (ENG, JAP, KOR, POR, RUS, TUR)
Preventa XPSUEPx4A Instruction Sheet	PHA71854 (ENG, FRE, GER, ITA, SPA, CHS)
Preventa XPSUEPx4A Instruction Sheet	PHA71855 (ENG, JAP, KOR, POR, RUS, TUR)
Preventa XPSUSx2A Instruction Sheet	PHA71847 (ENG, FRE, GER, ITA, SPA, CHS)
Preventa XPSUSx2A Instruction Sheet	PHA71849 (ENG, JAP, KOR, POR, RUS, TUR)
Safety chain solution: “Emergency Stop with Safety Module, Emergency Stop, Cat.1, PL c, SIL 1 / Stop Category 0”	SCS1201
Safety chain solution: “Guard Monitoring with Safety Module, Guard Switch and Variable Speed Drive, Cat.1, PL c, SIL 1 / Stop Category 0”	SCS1202
Safety chain solution: “Guard Monitoring with Safety Module, Coded Magnetic Switch and Motor Starter with STO, Cat.3, PL e, SIL 3 / Stop Category 0”	SCS1203
Safety chain solution: “Guard Monitoring with Safety Module, Coded Magnetic Switch and Variable Speed Drive, Cat.3, PL d, SIL 2 / Stop Category 0”	SCS1204

Document title	Reference
Safety chain solution: “Guard Monitoring with Safety Module, Coded Magnetic Switch and Contactor, Cat.3, PL d, SIL 2 / Stop Category 0”	SCS1205
Safety chain solution: “Guard Monitoring with Safety Module, Coded Magnetic Switch and Contactor, Cat.3/4 PL e, SIL 3 / Stop Category 0”	SCS1207
Safety chain solution: “Guard Monitoring with Safety Module, Coded Magnetic Switch and Motor Starter with STO, Cat.3, PL e/PL d, SIL 3/SIL 2 / Stop Category 0”	SCS1208
Safety chain solution: “Guard Monitoring with Safety Module, Coded Magnetic Switch with Lock and Servo Drive, Cat.3, PL e, SIL 3 / Stop Category 1”	SCS1209
Safety chain solution: “Enabling Movement with Safety Module, Enabling Switch and Variable Speed Drive, Cat. 4, PL e, SIL 3 / Stop Category 0”	SCS1210
Safety chain solution: “Enabling Movement with Safety Module, Two-hand Control Station and Motor Starter with STO, Cat.1, PL c, SIL 1 / Stop Category 0”	SCS1211
Safety chain solution: “Enabling Movement with Safety Module, Two-hand Control Station and Servo Drive, Cat.3, PL e, SIL 3 / Stop Category 0”	SCS1212
Safety chain solution: “E-Stop with Safety Module, Guard Switch Lock Management and Variable Speed Drive, Cat.3 PL d, SIL 2 / Stop Category 1”	SCS1213
Safety chain solution: “Emergency Stop with Safety Module, Emergency Stop and Motor Starter with STO, Cat.3, PL e, SIL 3 / Stop Category 0”	SCS1214
Safety chain solution: “Guard Monitoring with Safety Module, Coded Magnetic Switch and Contactor, Cat.3/4, PL e, SIL 3 / Stop Category 0”	SCS1215
Safety chain solution: “Perimeter Guarding with Safety Module, Light Curtain and Contactor, Cat.4 PL e, SIL 3 / Stop Category 0”	SCS1216

Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in this manual, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2015	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2015	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
IEC 61784-3:2016	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive* (*2006/42/EC*) and *ISO 12100:2010*.

NOTE: The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

Part I
General Information

Chapter 1
Presentation of the Library

General Information

Library Overview

The PreventaSupport library provides the `FB_PreventaDiag` and `FB_PreventaMain` function blocks to be used for diagnostic and maintenance purposes with Preventa XPS safety modules.

Preventa XPS safety modules provide the auxiliary output Z1. At Z1, a bit sequence signal is delivered which encodes diagnostic device information relating to the device. For details on this module output, refer to the corresponding user manual listed in the section *Related Documents* *(see page 12)*.

When connected to a standard controller input or a suitable input device, the bit sequence signal can be used as an input signal for the `FB_PreventaDiag` function block. `FB_PreventaDiag` decodes the bit sequence sent from the device and outputs a diagnostic code as shown in section *Status Output at q_dwStatus* *(see page 36)*.

This diagnostic code can be forwarded to the `FB_PreventaMain` function block. Based on the diagnostic code, `FB_PreventaMain` executes calculations concerning the maintenance and life cycle of the Preventa XPS safety module and the devices (sensors/actuators) connected to the module.

General Considerations

The diagnostic bit sequence output by the Preventa XPS safety module is composed of 10 bits with a duration of 200 ms each. In order to detect the entire bit sequence correctly, the cycle time of the task that executes the function blocks must be less than or equal to 50 ms.

NOTE: The function blocks must only be used in a cyclic task and they are to be executed in each task cycle.

NOTE: The entire bit sequence has a length of two seconds (10 x 200 ms). Status changes which occur during a running sequence are only transmitted in the following sequence. If such status changes do not last until the next sequence starts (that is, if several changes occur within two seconds), they are not encoded in the bit sequence. In this case, they cannot be detected by the `FB_PreventaDiag` function block. As a consequence, the operating cycle counter may miss operating cycles.

NOTE: If several input devices are connected to a Preventa XPSUDN or XPSUS safety module, the operating cycle counter may miss operating cycles under the following circumstances: If one connected input device has switched to the inactive state but not yet back to the active state and further connected input devices perform switching operations in the meanwhile.

NOTE: Switching off the Preventa XPS safety module is detected by the library with a delay of up to eight seconds.

NOTE: Switching off the Preventa XPS safety module may cause the `FB_PreventaDiag` function block to detect an incorrect status information.

NOTE: If the time period between the inactivation and the following reactivation of a connected input device (as part of a proof test) is shorter than two seconds, the proof test counter may not be reset.

Characteristics of the Library

The table indicates the characteristics of the library:

Characteristic	Value
Library title	PreventaSupport
Company	Schneider Electric
Category	Application
Component	Library_PreventaSupport_V1.0.x.0
Default namespace	Preventa
Language model attribute	qualified-access-only
Forward compatible library	Yes (FCL)

NOTE: For this library, qualified-access-only is set. This means that the POUs, data structures, and constants have to be accessed using the namespace of the library. The default namespace of the library is **Preventa**.

Part II
Data Unit Types

Chapter 2
Structures

What Is in This Chapter?

This chapter contains the following topics:

ST_DiagCodes

Overview

Type:	Structure
Available as of:	V1.0.0.0
Inherits from:	-

Description

The `ST_DiagCodes` structure data type contains the defined diagnostic codes *(see page 36)* of the Preventa XPS safety module, each represented as a BOOLEAN structure member. The structure is used at the output parameter `q_stDiagCodes` of the `FB_PreventaDiag` function block. Depending on the analysis result of the bit sequence applied to the function block input `i_xDiagSignal`, the corresponding structure element `q_stDiagCodes` is set to TRUE.

Structure Elements

Name	Data type	Description
`xOperational`	BOOL	Device in operating state Run, safety-related outputs activated.
`xWaitMonStartFTrig`	BOOL	Start input activated. Waiting for falling edge for monitored start.
`xWaitMonStartRTrig`	BOOL	Waiting for rising edge for automatic/manual or monitored start.
`xWaitStartUpTest`	BOOL	Waiting for startup test.
`xInp63ChangeState`	BOOL	Input S63 is expected to change its state.
`xInp62ChangeState`	BOOL	Input S62 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S62 and S63 are expected to change their state.
`xInp53ChangeState`	BOOL	Input S53 is expected to change its state.
`xInp52ChangeState`	BOOL	Input S52 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S52 and S53 are expected to change their state.
`xInp43ChangeState`	BOOL	Input S43 is expected to change its state.
`xInp42ChangeState`	BOOL	Input S42 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S42 and S43 are expected to change their state.
`xInp33ChangeState`	BOOL	Input S33 is expected to change its state.

Name	Data type	Description
xInp32ChangeState	BOOL	Input S32 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S32 and S33 are expected to change their state.
xInp23ChangeState	BOOL	Input S23 is expected to change its state.
xInp22ChangeState	BOOL	Input S22 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S22 and S23 are expected to change their state.
xInp13ChangeState	BOOL	Input S13 is expected to change its state.
xInp12ChangeState	BOOL	Input S12 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S12 and S13 are expected to change their state.
xIoffAllNOCoff	BOOL	Safety-related inputs deactivated, safety-related outputs deactivated.
xIoffNOCoffDelayC	BOOL	Instantaneous safety-related outputs are deactivated, delayed safety-related outputs are still activated.
xSyncFltTestInRun	BOOL	Synchronization alert. Both synchronized safety-related inputs have been activated, but not within the synchronization time.
xSyncFltWaitTest	BOOL	Synchronization alert. One of the synchronized safety-related inputs is still deactivated, but the synchronization time has already elapsed.
xErrorS2x	BOOL	Antivalence alert at input S2x.
xErrorS1x	BOOL	Antivalence alert at input S1x.
xExtFltDelayCirc	BOOL	Cross-circuit detected at input used for Cancel Delay function.
xExtFltStartMonFdb	BOOL	Cross-circuit detected at start input.
xExtFltIn63Circ	BOOL	Cross-circuit detected in circuit of input terminal S63.
xExtFltIn62Circ	BOOL	Cross-circuit detected in circuit of input terminal S62.
xExtFltIn53Circ	BOOL	Cross-circuit detected in circuit of input terminal S53.
xExtFltIn52Circ	BOOL	Cross-circuit detected in circuit of input terminal S52.
xExtFltIn43Circ	BOOL	Cross-circuit detected in circuit of input terminal S43.
xExtFltIn42Circ	BOOL	Cross-circuit detected in circuit of input terminal S42.
xExtFltIn33Circ	BOOL	Cross-circuit detected in circuit of input terminal S33.
xExtFltIn32Circ	BOOL	Cross-circuit detected in circuit of input terminal S32.
xExtFltIn23Circ	BOOL	Cross-circuit detected in circuit of input terminal S23.
xExtFltIn22Circ	BOOL	Cross-circuit detected in circuit of input terminal S22.
xExtFltIn13Circ	BOOL	Cross-circuit detected in circuit of input terminal S13.
xExtFltIn12Circ	BOOL	Cross-circuit detected in circuit of input terminal S12.
xErrorConfig	BOOL	Configuration error detected.

Name	Data type	Description
xIntFltInExModule	BOOL	General error detected in expansion module.
xIntFlt	BOOL	General error detected.
xSupplyOutOfTol	BOOL	Supply voltage exceeded the upper limit value. Otherwise, if the supply voltage is under the lower limit value, the auxiliary Z1 output is switched off.

Used By

- FB_PreventaDiag

ST_InputControl

Overview

Type:	Structure
Available as of:	V1.0.0.0
Inherits from:	-

Description

The inputs (S12..S63), which can be monitored, depending on the module type and its configuration.

The `ST_InputControl` data structure defines the monitoring parameters for the input channels of the module and so for the devices connected to the inputs. Such devices can be, for example, sensors or command devices.

The `ST_InputContol` structure relates to exactly one (dual-channel) input.

The `FB_PreventaMain` function block uses this structure at the input `i_astControlInp`.

Structure Elements

Name	Data type	Description
`udiMaxNumOp`	UDINT	Maximum number of operating cycles of the input device (that is, sensor or command device) connected to the input specified at `byMonitorInput1` (and `byMonitorInput2` in case of a dual-channel device). The value of 0 means that the number of operating cycles is not counted.
`byMonitorInput1`	BYTE	First input to be monitored. Enter the input channel of the Preventa XPS safety module to which the input device is connected. Format: enter xy to use Sxy as first input. Examples: 12 defines S12, 62 defines S62 to be monitored. The value 0 means that the input channel is not monitored.
`byMonitorInput2`	BYTE	Second input to be monitored. Use the second input for dual-channel devices. Format: enter xz to use Sxz as second input. Examples: 13 defines S13, 63 defines S63 to be monitored. The value 0 means that the input channel is not monitored.

Name	Data type	Description
xReset	BOOL	State-controlled input for resetting the maintenance result (operating cycle statistics) for the connected device to 0. A reset is necessary, for example, after an input device has been replaced or, if applicable, after you have performed particular maintenance works which require a statistics reset to follow. If, for example, a device has been replaced after the maximum number of operating cycles has been reached, the counting cannot be restarted without a reset. **NOTE:** After resetting a maintenance result value with xReset = TRUE, xReset must explicitly be switched back to FALSE by the application program. Otherwise, with a permanent TRUE value, a continuous statistics reset occurs.

Used By

- FB_PreventaMain

ST_DevControl

Overview

Type:	Structure
Available as of:	V1.0.0.0
Inherits from:	-

Description

The `ST_DevControl` data structure defines the monitoring parameter for the safety contacts channels of the Preventa XPS safety module and for its output channels (that is, the actuator devices connected to the outputs).

The `FB_PreventaMain` function block uses this structure at the inputs `i_astControlOut` and `i_stControlProc`.

Structure Elements

Name	Data type	Description
`udiMaxNumOp`	UDINT	Maximum number of operating cycles of the output device (actuator) connected to the output or to the safety module itself. The value of 0 means that the number of operating cycles is not counted.
`xReset`	BOOL	State-controlled input for resetting the maintenance result (operating cycle statistics) for the connected device to 0. A reset is necessary, for example, after an output device has been replaced or, if applicable, after you have performed particular maintenance works which require a statistics reset to follow. If, for example, a device has been replaced after the maximum number of operating cycles has been reached, the counting cannot be restarted without a reset. **NOTE:** After resetting a maintenance result value with `xReset` = TRUE, `xReset` must explicitly be switched back to FALSE by the application program. Otherwise, with a permanent TRUE value, a continuous statistics reset occurs.

Used By

- `FB_PreventaMain`

ST_RemainNumOp

Overview

Type:	Structure
Available as of:	V1.0.0.0
Inherits from:	-

Description

The structure `ST_RemainNumOp` stores the calculation results. It has to be connected to and is written by the `q_stRemainNumOp` output of the `FB_PreventaMain` function block.

Structure Elements

Name	Data type	Description
`udiNumRemainingProc`	UDINT	Remaining number of operating cycles of the safety contacts channels in the Preventa XPS safety module.
`audiNumOpRemainInp`	ARRAY(1..6) OF UDINT	Remaining number of operating cycles for devices connected to the inputs of the Preventa XPS safety module. The fixed number of 6 array elements corresponds to the maximum number of dual-channel inputs that a Preventa XPS safety module can have.
`audiNumOpRemainOut`	ARRAY(1..13) OF UDINT	Remaining number of operating cycles for devices connected to the outputs of the Preventa XPS safety module. The fixed number of 13 array elements corresponds to the maximum of the 7 outputs that a Preventa XPS safety module can have plus 6 outputs provided by an optional extension module.

Used By

- `FB_PreventaMain`

Part III
XML Program Organization Units (POU)

Chapter 3
Function Blocks

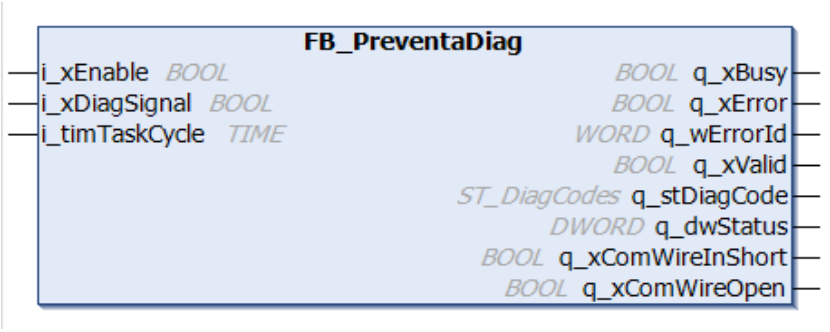
What Is in This Chapter?

This chapter contains the following topics:

FB_PreventaDiag

Overview

Type:	Function block
Available as of:	V1.0.0.0
Inherits from:	-
Implements:	-



Functional Description

The `FB_PreventaDiag` function block decodes the bit sequence applied to its input `i_xDiagSignal`. This sequence is delivered from a Preventa XPS safety module via the auxiliary module output Z1. The pulsed message encodes diagnostic information on the module (see table in section *Status Output at q_dwStatus* *(see page 36)* for a list of defined codes).

In order to analyze the incoming sequence and deliver a diagnostic code, the function block needs to be activated by setting its `i_xEnable` input to TRUE. If the `i_xEnable` input is reset to FALSE, the sequence analysis is stopped and the function block outputs are set to their default values.

At the `i_timTaskCycle` input, the cycle time of the task in which the function block is called has to be specified. Using this time value, the function block evaluates whether the task is fast enough to correctly detect the bit sequence signal output by the Preventa XPS safety module. See chapter *General Considerations* *(see page 19)* for details.

NOTE: The function block must only be used in a cyclic task and it has to be executed in each task cycle.

The function block implements an internal routine which verifies that it is called in each task cycle. If not, the function block enters the error state (error code `16#1000`).

The diagnostic data decoded from the incoming bit sequence is delivered as a STRUCT data type at `q_stDiagCode`. Depending on the analysis result, the corresponding structure element `q_stDiagCodes` is set to TRUE. The output `q_dwStatus` shows the 6-bit code part (without the 4-bit start part) of the last detected bit sequence as a double word.

After detecting a static TRUE signal at input `i_xDiagSignal`, the output `q_xComWireInShort` switches to TRUE, thus indicating a possible short circuit in the Preventa XPS safety module. A static FALSE signal at `i_xDiagSignal` results in switching q_xComWireOpen to TRUE.

The function block provides several outputs for the function block status (`q_xBusy`, `q_xValid`) as well as error indications (`q_xError` and `q_wErrorId`).

Interface

Input	Data type	Description
`i_xEnable`	BOOL	TRUE activates the function block. While activated, the bit sequence at input `i_xDiagSignal` is continuously read and evaluated.
`i_xDiagSignal`	BOOL	Input for connecting the bit sequence output by the Preventa XPS safety module. Connect this input to the variable which is assigned to the auxiliary output Z1 signal.
`i_timTaskCycle`	TIME	Currently configured cycle time in [ms] of the cyclic task in which the function block is executed. **NOTE:** To detect the bit sequence correctly, the task cycle time must be equal to or less than 50 ms. See chapter *General Considerations* *(see page 19)* for details.

Output	Data type	Description
`q_xBusy`	BOOL	If this output is set to TRUE, the function block execution is in progress.
`q_xError`	BOOL	If this output is set to TRUE, the function block has detected an error. For details, refer to `q_wErrorId`.
`q_wErrorId`	WORD	Provides diagnostic and status information as a numeric value. Possible error codes are listed in section *Error Codes* *(see page 38)*.
`q_xValid`	BOOL	The output value TRUE indicates for one cycle a valid bit sequence at the `i_xDiagSignal` input.

Output	Data type	Description
q_stDiagCode	ST_DiagCode	Diagnostic information decoded from the input bit sequence: the corresponding bit values in the ST_DiagCodes *(see page 24)* structure are set to TRUE.
q_dwStatus	DWORD	Indicates the 6-bit code part (without the 4-bit start part) of the last detected bit sequence converted to a double word data type. Refer to the section below this table.
q_xComWireInShort	BOOL	The output value TRUE indicates a static TRUE signal at input i_xDiagSignal. This may indicate a short circuit in the Preventa XPS safety module or the wire from the auxiliary Z1 output to the controller input.
q_xComWireOpen	BOOL	The output value TRUE indicates a static FALSE signal input i_xDiagSignal. This may indicate that either the auxiliary output Z1 of the Preventa XPS safety module is not connected correctly to the controller input or the Preventa XPS safety module is switched off. Verify that the wiring and the power supply of the Preventa XPS safety module are correct and the auxiliary Z1 output is not overloaded.

Status Output at q_dwStatus

The sequence is composed of 10 bits with a duration of 200 ms each. The first 4 bits (always 0010) represent the start sequence followed by a 6-bit code sequence.

The following table lists the 6-bit code part of the diagnostic codes sent by the Preventa XPS safety module, as applied to the q_dwStatus output.

Code	Code part of bit sequence	Decimal value	Description	Class. (1)
40	101111	47	Device in operating state Run, safety-related outputs activated.	S
39	101110	46	Start input activated. Waiting for falling edge for monitored start.	S
38	101010	42	Waiting for rising edge for automatic/manual or monitored start.	S
37	101011	43	Waiting for start-up test.	S

Code	Code part of bit sequence	Decimal value	Description	Class. (1)
36	101001	41	Input S63 is expected to change its state.	S
35	101000	40	Input S62 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S62 and S63 are expected to change their state.	S
34	111000	56	Input S53 is expected to change its state.	S
33	111001	57	Input S52 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S52 and S53 are expected to change their state.	S
32	111011	59	Input S43 is expected to change its state.	S
31	111010	58	Input S42 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S42 and S43 are expected to change their state.	S
30	111110	62	Input S33 is expected to change its state.	S
29	111111	63	Input S32 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S32 and S33 are expected to change their state.	S
28	111101	61	Input S23 is expected to change its state.	S
27	111100	60	Input S22 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S22 and S23 are expected to change their state.	S
26	110100	52	Input S13 is expected to change its state.	S
25	110101	53	Input S12 is expected to change its state. In the case of a configuration with antivalent inputs, the inputs S12 and S13 are expected to change their state.	S
24	110111	55	Safety-related inputs deactivated, safety-related outputs deactivated.	S
23	110110	54	Instantaneous safety-related outputs are deactivated, delayed safety-related outputs are still activated.	S
22	100111	39	Synchronization alert. Both synchronized safety-related inputs have been activated, but not within the synchronization time.	A
21	110011	51	Synchronization alert. One of the synchronized safety-related inputs is still deactivated, but the synchronization time has already elapsed.	A
20	100000	32	Antivalence alert at input S2x.	A
19	100110	38	Antivalence alert at input S1x.	A
18	100011	35	Cross-circuit detected at input used for Cancel Delay function.	E
17	110000	48	Cross-circuit detected at start input.	E

Code	Code part of bit sequence	Decimal value	Description	Class. (1)
16	011100	28	Cross-circuit detected at input S63.	E
15	011101	29	Cross-circuit detected at input S62.	E
14	011111	31	Cross-circuit detected at input S53.	E
13	011110	30	Cross-circuit detected at input S52.	E
12	011010	26	Cross-circuit detected at input S43.	E
11	011011	27	Cross-circuit detected at input S42.	E
10	101100	44	Cross-circuit detected at input S33.	E
9	011000	24	Cross-circuit detected at input S32.	E
8	001110	14	Cross-circuit detected at input S23.	E
7	001111	15	Cross-circuit detected at input S22.	E
6	001101	13	Cross-circuit detected at input S13.	E
5	001100	12	Cross-circuit detected at input S12.	E
4	000111	7	Configuration error detected.	E
3	000110	6	General error detected in expansion module.	E
2	000011	3	General error detected.	E
1	101101	45	Supply voltage is out of tolerance.	E

(1) Classification of the message: A = alert, E = error, S = status

Error Codes

If the function block detects an error, the output `q_xError` switches to TRUE and an error code is indicated at `q_wErrorId`. This error ID provides detailed information on the error cause.

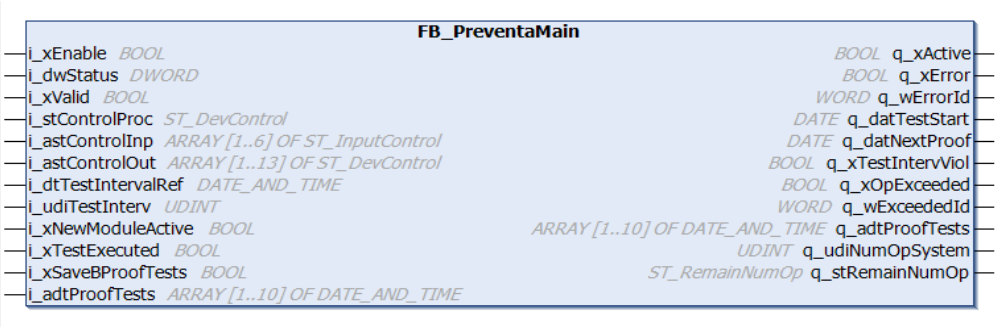
Error ID	Description
16#1000	Function block is not called cyclically. **Remedy**: Call the function block in a cyclic task and make sure that the function block call cannot be skipped (for example, by a preceding conditional jump).
16#1001	Invalid task cycle time connected to input `i_timTaskCycle`. **Remedy**: Connect a time value which is equal to or less than 50 ms. See chapter *General Considerations* *(see page 19)* for details.
16#1002	Synchronization with the bit sequence output by the Preventa XPS safety module not successful. (Error in state 20.) **Remedy**: Ensure that a valid signal (output at the auxiliary Z1 output of the Preventa XPS safety module) is connected correctly to the function block input and verify that the Preventa XPS safety module is in operating mode.

Error ID	Description
16#1004	The maximum number of invalid bit sequences is exceeded. (Error in state 30.) **Remedy**: Ensure that a valid signal (output at the auxiliary Z1 output of the Preventa XPS safety module) is connected correctly to the function block input and verify that the Preventa XPS safety module is in operating mode.
16#1005	Internal function block error. **Remedy**: Disable and then re-enable the function block.

FB_PreventaMain

Overview

Type:	Function block
Available as of:	V1.0.0.0
Inherits from:	-
Implements:	-



Functional Description

The `FB_PreventaMain` function block evaluates the diagnostic code which was decoded by the `FB_PreventaDiag` function block from the diagnostic bit sequence output by the Preventa XPS safety module. Based on this diagnostic code, the function block executes calculations regarding maintenance and life cycle considerations for the Preventa XPS safety module itself as well as the devices (sensors and actuators) connected to the inputs and outputs of the module. The function block indicates the number of remaining operating cycles for those inputs, safety contacts channels in the Preventa XPS safety module, and output devices that you have configured to be monitored. It furthermore monitors the cyclical proof tests which are required for the safety function.

NOTE: Both, the function blocks `FB_PreventaMain` and `FB_PreventaDiag` must be called in the same task cycle.

In order to evaluate the incoming diagnostic code, the function block needs to be activated by setting its `i_xEnable` input to TRUE. If the `i_xEnable` input is reset to FALSE, the code evaluation is stopped and the function block outputs are set to their default values.

The inputs i_dwStatus and i_xValid have to be directly connected to the corresponding outputs of the FB_PreventaDiag function block. This way, i_dwStatus receives the last detected bit sequence, which is the data basis for the maintenance-related calculations done by the function block.

Configuration of the Function Block

To be able to execute the calculation of the remaining operating cycles for inputs, logic and output devices, the function block needs the following information:

- Which inputs and output contacts of the Preventa XPS safety module are to be monitored? Calculations are only done for contacts, which are activated by you.
- How many operating cycles are to be expected in total from each input/output or safety contacts channel? This value is taken as the start value and it is decreased by each executed operating cycle that has been detected by the FB_PreventaDiag function block.
  (An operating cycle is possibly not detected if switching occurs too fast. Refer to the last note in section *General Considerations* *(see page 19)*.)

This information is provided as data structures, which must be connected to the function block formal parameters. These structure data types map the hardware implementation, that is, the sensors and actuators connected to the Preventa XPS safety module in your controller application and configure the function block instance accordingly:

- The structure ST_InputControls is available for devices (sensors) connected to the module inputs. This structure configures the device connected to one redundant input of the module. An array of this structure with the length of 6 has to be connected to the i_astControlInp input.
- The structure ST_DevControls refers to the safety contacts channels in the Preventa XPS safety module, its outputs, and output devices. The structure has to be connected to the i_stControlProc input to specify the safety contacts channels in the Preventa XPS safety module itself. An array of this structure at the i_astControlOut input specifies the devices (actuators) connected to the module outputs.

For the inputs, outputs, and the safety contacts channels, the maintenance information "remaining number of operations" is summarized in a common structure data type ST_NumOp. This structure has to be connected to and is written by the q_stRemainNumOp output of the function block.

NOTE: To avoid an unintended reset of the counters, the related variables have to be defined as persistent variables. See section *Persistent Variables* *(see page 46)* for details.

Output q_xOpExceeded becomes TRUE if at least one structure element has the value 0. This means that no operating cycles are left for the corresponding input or output device, or the safety contacts channels of the Preventa XPS safety module itself. q_wExceededId then provides detailed information about the affected contact.

At output q_udiNumOpSystem, the cumulated number of operating cycles of the entire safety system, including safety contacts channels in the Preventa XPS safety module, is applied.

Proof Tests

For safety-related modules, periodic proof tests are required, which have to be run and repeated within a defined interval. Date and time of the proof test have to be defined at the input `i_dtTestIntervalRef`. The interval between two proof tests has to be defined at `i_udiTestInterv`. Each executed proof test must be confirmed with a rising edge at input `i_xTestExecuted`. After this confirmation, the function block internally stores a relating time stamp and applies it to the function block output `q_datTestStart` for evaluation purposes. The due date of the next required proof test is provided at output `q_datNextProof`. The function block outputs the last ten time stamps of executed proof tests in an array data type at output `q_adtProofTests`.

For a newly added or replaced module, a rising edge at input `i_xNewModuleActive` confirms the execution of the first proof test.

NOTE: After exchanging a module, the confirmation at `i_xNewModuleActive` is required.

The value TRUE output at `q_xTestIntervViol` indicates that the defined time interval has been violated, that is, the proof test has not been run on schedule.

Proof test time stamps can also be read in from an external proof test array. Such results may be, for example, generated in and provided by an HMI application. For that purpose, switch the input `i_xSaveBProofTest` to TRUE. As a result, the array data type connected to input `i_adtProofTests` is read and copied to the internal array.

The function block provides status outputs about its own status. While the function block is activated and processes the input values, `q_xActive` is TRUE. If an error occurs, output `q_xError` switches to TRUE and detailed information is output at `q_wErrorId`.

Interface

Input	Data type	Description
`i_xEnable`	BOOL	TRUE activates the function block. While activated, the diagnostic code at input `i_dwStatus` is read and evaluated.
`i_dwStatus`	DWORD	Connect this input directly to the `q_dwStatus` output of the `FB_PreventaDiag` function block. The function block processes this status information and updates its outputs accordingly. This way, the calculated maintenance information is written into the data structures connected to the corresponding function block outputs.
`i_xValid`	BOOL	Connect this input directly to the `q_xValid` output of the `FB_PreventaDiag` function block.

Input	Data type	Description
i_stControlProc	ST_DevControl	Defines the threshold value (max. number) for operating cycles of the safety contacts channels in the Preventa XPS safety module and specifies the devices connected to the module outputs.
i_astControlInp	ARRAY[1..6] OF ST_InputControl	Specification of the input devices connected to the Preventa XPS safety module. This includes the threshold value (max. number of operating cycles) as well as the input channel numbers for the devices (actuators) connected to the input channels of the Preventa XPS safety module. The fixed number of 6 STRUCT array elements corresponds to the maximum number of dual-channel inputs that a Preventa XPS safety module can have.
i_astControlOut	ARRAY[1..13] OF ST_DevControl	Specification of the output devices connected to the Preventa XPS safety module. This includes the threshold value (max. number of operating cycles) for the devices (actuators) connected to the outputs of the Preventa XPS safety module. The fixed number of 13 STRUCT array elements corresponds to the maximum of the 7 outputs that a Preventa XPS safety module can have plus 6 outputs provided by an optional extension module.
i_dtTestIntervalRef	DATE_AND_TIME	Date and time of the proof test to be executed (reference to the current controller time).
i_udiTestInterv	UDINT	Proof test interval. Enter the number of days [d] between two proof tests.
i_xNewModuleActive	BOOL	Edge-triggered input (rising edge) to confirm the execution of the first proof test for a newly added or replaced module. After this confirmation, ● the array of executed proof test time stamps is reset, and ● the first proof test is executed, ● and output q_datTestStart is updated accordingly.

Input	Data type	Description
i_xTestExecuted	BOOL	Edge-triggered input (rising edge) to confirm the executed proof test. After this confirmation, ● a relating time stamp is stored internally and applied to function block output q_datTestStart. ● the due date of the next required proof test is provided at output q_datNextProof.
i_xSaveBProofTests	BOOL	Edge-triggered input (rising edge) to read the time stamps from the proof test array connected to the input i_adtProofTests. Refer to the description of the i_adtProofTests input for details.
i_adtProofTests	ARRAY[1..10] OF DATE_AND_TIME	External proof test array containing proof test time stamps which have been, for example, generated in and provided by an HMI application.

Output	Data type	Description
q_xActive	BOOL	If this output is set to TRUE, the function block execution is in progress.
q_xError	BOOL	If this output is set to TRUE, the function block has detected an error. For details, refer to q_wErrorId.
q_wErrorId	WORD	Provides diagnostic and status information as a numeric value. Possible error codes are listed in section *Error Codes* *(see page 45)*.
q_datTestStart	DATE	Confirmed date value of the first executed proof test.
q_datNextProof	DATE	Calculated date for the execution of the next proof test.
q_xTestIntervViol	BOOL	The output value TRUE indicates that the proof test interval has been exceeded.
q_xOpExceeded	BOOL	The output value TRUE indicates that the number of remaining operating cycles is 0 for at least one monitored device or safety contacts channel of the Preventa XPS safety module.

Output	Data type	Description
q_wExceededId	WORD	ID of the input/output that exceeded its operation count. (Format: 16#101x for inputs; 16#102x for outputs.) Refer to the table in section *IDs Output at q_wExceededId* *(see page 45)* for details.
q_adtProofTests	ARRAY[1..10] OF DATE_AND_TIME	Array of time stamps of the last ten executed proof tests.
q_udiNumOpSystem	UDINT	Number of operating cycles of the entire safety system, including the safety contacts channels in the Preventa XPS safety module.
q_stRemainNumOp	ST_RemainNumOp	Indicates the result of the maintenance calculation: For each monitored input and output channel as well as the safety contacts channels in the Preventa XPS safety module itself, the number of remaining operating cycles is written into the ST_RemainNumOp structure.

Error Codes

If the function block detects an error, the output q_xError switches to TRUE and an error code is indicated at q_wErrorId. This error ID provides detailed information on the error cause.

Error ID	Description
16#1003	Invalid proof test interval value applied to function block input i_udiTestInterv. Value must be > 0.
16#1004	A new module has been detected, but the value for the first proof test at q_datTestStart has not been activated. The value is also shown after enabling the function block for the first time.
16#1050 + input trigger (with input trigger = 1…6)	Invalid input contact defined in structure ST_InputControl. Valid parameters are listed in section *ST_InputControl* *(see page 27)*.

IDs Output at q_wExceededId

If zero operating cycles remain for a contact, the output q_xOpExceeded switches to TRUE and q_wExceededId indicates the ID of the contact concerned.

ID	Description
16#1005	Remaining number of operating cycles for the safety contacts channels in the Preventa XPS safety module is 0.

ID	Description
16#1011	Remaining number of operating cycles for the input contact 1 is 0.
16#1012	Remaining number of operating cycles for the input contact 2 is 0.
16#1013	Remaining number of operating cycles for the input contact 3 is 0.
16#1014	Remaining number of operating cycles for the input contact 4 is 0.
16#1015	Remaining number of operating cycles for the input contact 5 is 0.
16#1016	Remaining number of operating cycles for the input contact 6 is 0.
16#1021	Remaining number of operating cycles for the output contact 1 is 0.
16#1022	Remaining number of operating cycles for the output contact 2 is 0.
16#1023	Remaining number of operating cycles for the output contact 3 is 0.
16#1024	Remaining number of operating cycles for the output contact 4 is 0.
16#1025	Remaining number of operating cycles for the output contact 5 is 0.
16#1026	Remaining number of operating cycles for the output contact 6 is 0.
16#1027	Remaining number of operating cycles for the output contact 7 is 0.
16#1028	Remaining number of operating cycles for the output contact 8 is 0.
16#1029	Remaining number of operating cycles for the output contact 9 is 0.
16#102A	Remaining number of operating cycles for the output contact 10 is 0.
16#102B	Remaining number of operating cycles for the output contact 11 is 0.
16#102C	Remaining number of operating cycles for the output contact 12 is 0.
16#102D	Remaining number of operating cycles for the output contact 13 is 0.

Persistent Variables

Some internal function block variables are to be declared as persistent variables, as they must not be reset during a cold or warm start of the controller or while power is switched off.

If you are using SoMachine as programming system, proceed as follows to add the instance paths of the contained persistent values to the list of persistent variables in the Logic Builder:

Step	Action
1	In the Application tree under the Application node, add the **[Persistent Variables]** object.
2	Open the editor, right-click with the mouse and select `Add all instance paths`.

This adds the following persistent global variables to the list:

Variable	Data IDs Output at `q_wExceededIdType`	Default Value	Description
`R_udiCountSystem`	UDINT	`0`	Total number of operating cycles of the entire safety system, including the safety contacts channels in the Preventa XPS safety module. (Diagnostic code: Operation).
`R_audiCountInp`	ARRAY[1..6] OF UDINT	`0` (1)	Remaining number of operating cycles for devices at input contacts. The array size of six covers the maximum number of (dual-channel) inputs that a Preventa XPS safety module can provide.
`R_udiCountProc`	UDINT	`0`	Remaining number of operating cycles of the safety contacts channels in the Preventa XPS safety module.
`R_audiCountOut`	ARRAY[1..13] OF UDINT	`0` (1)	Remaining number of operating cycles for devices at output contacts. The array size of 13 covers the maximum number of outputs that a Preventa XPS safety module with extension module can provide.
`R_adtProof`	ARRAY[1..10] OF DATE_AND_TIME	`DT#1970-1-1-0:0:0.0` (1)	Array for storing the time stamps of the last proof tests.
`R_datTestStart`	DATE	`D#1970-1-1`	Time stamp of the first executed proof test for a new module.

(1) Default value refers to each element of the array

Via the `i_xNewModuleActive` input, the `FB_PreventaMain` function block provides the possibility to reset the persistent variables to their default values. This is necessary after a new Preventa XPS safety module or a new input device or output device has been installed.

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