Emergency Stop with Emergency Stop Pushbutton, Preventa™ Module and TeSys™ island

Stop Category 0, PLc, SIL1

Data Bulletin

TeSys offer innovative and connected solutions for motor starters. This data bulletin illustrates an example implementation of emergency stop with a TeSys™ island.

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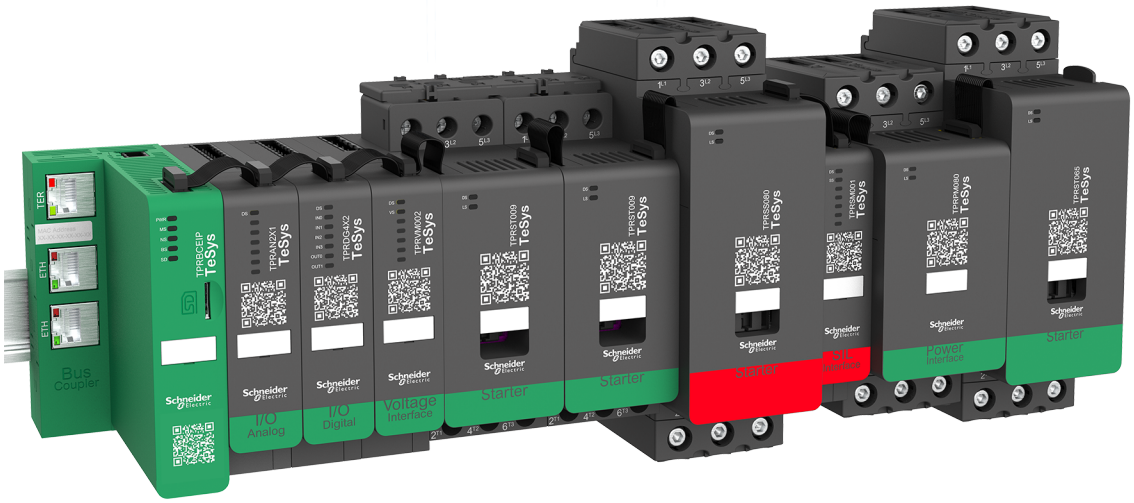

Legal Information

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Hazard Categories and Special Symbols

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 bulletin or on the equipment to warn of hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either 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 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.

NOTE: Provides additional information to clarify or simplify a procedure.

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, installation, and operation of electrical equipment 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 that does not have point-of-operation protection.
- Do not reach into the machinery during operation.

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

This automation equipment and related software are 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, and government regulations. 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 interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States) 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 and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of 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.

Startup Test

Before using electrical control and automation equipment for regular operation after the 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 reference.

Test the software in both simulated and real environments.

Verify that the 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. for instance). If high-potential voltage testing is necessary, follow the recommendations in the equipment documentation to prevent accidental equipment damage.

Before energizing the equipment;

- Remove tools, meters, and debris from equipment.
- Close the 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.
- 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

Document Scope

This document describes the use of the following devices in a TeSys™ island system to achieve emergency stop functionality:

- an emergency stop switch
- a Preventa™ XPSUAB module
- a TeSys island SIL[1] interface module

The following topics are included:

- Standards used in this data bulletin
- Functional Description
- Typical Applications
- Design
- Overview
- Hardware Schematic
- Functional Safety[2] Related Software
- Chain Structure
- Safety Integrity Level Calculation, according to standard IEC 61508
- Characteristics
- Reliability Data

This document is intended to serve as an example of emergency stop functionality. This document is **not** intended for use in determining the suitability or reliability of the products described in it for specific applications.

It is the duty of the user or integrator to perform an appropriate and complete risk analysis, and to evaluate and test the suitability of the products for the application. Neither Schneider Electric nor any of its affiliates or subsidiaries are responsible or liable for misuse of the information contained in this document.

1. Safety Integrity Level according to standard IEC 61508.
2. Functional Safety as defined in IEC 61508-4. Part of the overall safety relating to the EUC and the EUC control system that depends on the correct functioning of the E/E/PE safety-related systems and other risk reduction measures.

Validity Note

The Schneider Electric Machine Safety website contains references to many standards, specifications, and guides to assist you in understanding and determining the applicability of the information in this document to your installation. See *www.schneider-electric.com/machinesafety*.

For product compliance and environmental information (RoHS, REACH, PEP, EOLI, etc.), see *www.schneider-electric.com/green-premium*.

The technical characteristics of the devices described in this document are also available online. Perform the steps in the following table to access product datasheets online.

Table 1 - Finding Product Data Online

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box, type the product reference. Do not include blank spaces.
3	Scroll through the search results and click on the product reference that interests you.
4	Depending on the size of your screen, you may need to scroll down to see all the information in the product datasheet.
5	To download the datasheet, double click **Product Datasheet**.

The characteristics presented in this document should be the same as the characteristics that appear online; however, we may revise content over time to improve clarity and accuracy. If you see a difference between this document and the online information, use the online information as your reference.

Related Documentation

Table 2 - Related Documentation

Title	Document Number
XALD/K Harmony Control Station Instruction Sheet	*1562206*
Preventa XPS Universal - XPSUAB Safety Module, Instruction Sheet	*PHA71839*
Instructions for XB4B, XB5A, ZB4B, ZB5A 22 mm Push Buttons	*65013-037-26*
TeSys™ island Starters and Power Interface Modules, Size 1 and 2	*MFR77070*
TeSys™ island Starters and Power Interface Modules, Size 3	*MFR77085*
TeSys™ island SIL Interface and Voltage Interface Modules	*MFR44100*
TeSys™ island EtherNet/IP™ Bus Coupler, TPRBCEIP	*MFR44097*
TeSys™ island PROFINET™ Bus Coupler, TPRBCPFN	*MFR44098*
TeSys™ island PROFIBUS™ Bus Coupler, TPRBCPFB	*GDE55148*
TeSys™ island Analog I/O and Digital I/O Modules	*MFR44099*
TeSys™ island Functional Safety Guide	*8536IB1904*
ABL 7 RE• / 7RP• / ABL 8REM• Regulated switch mode power supplies, Phaseo Optimum	*1569140 01 11 A07*
M241 DC Logic Controller - Instruction sheet	*HRB59603*

You can download these documents and additional technical information from our website at *www.schneider-electric.com*.

Precautions

Read and understand the following precautions before performing any procedures in this guide.

⚠DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside this equipment.
- Use only the specified voltage when operating this equipment and any associated products.
- Always use a properly rated voltage sensing device to confirm power is off.
- Use appropriate interlocks where personnel and/or equipment hazards exist.
- Power line circuits must be wired and protected in compliance with local and national regulatory requirements.
- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices per NFPA 70E, NOM-029-STPS, or CSA Z462 or local equivalent.

Failure to follow these instructions will result in death or serious injury.

⚠WARNING

UNINTENDED EQUIPMENT OPERATION

- For complete instructions about functional safety, refer to the *TeSys™ island Functional Safety Guide*, 8536IB1904.
- Do not disassemble, repair, or modify this equipment. There are no user serviceable parts.
- Install and operate this equipment in an enclosure appropriately rated for its intended application environment.
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.
- Perform an in-depth risk analysis to determine the appropriate safety integrity level for your application, based on all applicable standards.
- Do not include in your machine or process any wiring information, programming, configuration logic, or parameter values from the examples in this document without thoroughly testing the entire application.
- 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.

⚠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.[3]
- 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.

⚠ **WARNING:** This product can expose you to chemicals including Antimony oxide (Antimony trioxide), which is known to the State of California to cause cancer. For more information go to *www.P65Warnings.ca.gov*.

Intended Use

The products described in this instruction bulletin, together with software, accessories, and options, are starters for low-voltage electrical loads, intended for industrial use according to the instructions, directions, examples, and safety information contained in this document and other supporting documentation.

The product may only be used in compliance with all applicable safety regulations and directives, the specified requirements, and the technical data.

Before using the product, you must perform a hazard analysis and risk assessment of the planned application. Based on the results, appropriate safety-related measures must be implemented.

Since the product is used as a component of a machine or process, you must ensure the safety of persons by means of the overall system design.

Operate the product only with the specified cables and accessories. Use only genuine accessories and spare parts.

Any use other than the use explicitly permitted is prohibited and can result in unanticipated hazards.

3. 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.

Qualified Personnel

Only appropriately trained persons who are familiar with and understand the content of this guide and all other related product documentation are authorized to work on and with this product.

The qualified person must be able to detect possible hazards that may arise from modifying parameter values and generally from mechanical, electrical, or electronic equipment. The qualified person must be familiar with the standards, provisions, and regulations for the prevention of industrial accidents, which they must observe when designing and implementing the system.

The use and application of the information contained in this guide requires expertise in the design and programming of automated control systems. Only you, the user, the machine builder, or the integrator, can be aware of all the conditions and factors present during installation, setup, operation, and maintenance of the machine or process, and can therefore determine the automation and associated equipment and the related safeties and interlocks which can be effectively and properly used.

When selecting automation and control equipment (and any other related equipment or software) for a particular application, you must also consider applicable local, regional, or national standards and/or regulations.

Pay particular attention to adhere to any safety information, electrical requirements, and normative standards that apply to your machine or process in the use of this equipment.

Terminology Derived from Standards

The functional safety terminology used in this instruction bulletin is defined below.

Table 3 - Functional Safety Terminology

Term	Standard	Definition
Dangerous Failure	IEC 61800–5–2	Failure of a component, subsystem, or system that plays a part in implementing the safety sub-function that: a) Causes a safety sub-function of PDS(SR) to fail such that the equipment or machinery driven by the PDS(SR) is put into a hazardous or potentially hazardous state; or b) Decreases the probability that the safety sub-function operates correctly. Source: IEC 615084:2010, 3.6.7, modified – “EUC: replaced by “PDS((SR)”
Fault Tolerance	IEC 61511–1	Ability of a functional item to continue to perform a required function in the presence of faults or errors
Functional Safety	IEC 61508-4	Part of the overall safety relating to the EUC and the EUC control system that depends on the correct functioning of the E/E/PE safety related systems and other risk reduction measures
Mean Time to Dangerous Failure ($MTTF_d$)	ISO 13849-1	Expectation of the mean time to dangerous failure.
Performance Level (PL)	ISO 13849–1	Discrete level used to specify the ability of safety-related parts of control systems to perform a safety function under foreseeable conditions.
Probability of Dangerous Failure (PFH_d)	ISO 13849–1	Average probability of dangerous failure per hour.
Stop Categories	EN/IEC 60204-1	The Stop categories are defined as: • Stop Category 0: Stopping by immediate removal of power to the machine actuators (i.e. an uncontrolled stop – see 3.56). • Stop Category 1: A controlled stop (see 3.11) with power available to the machine actuators to achieve the stop and then removal of power when the stop is achieved.
Safety Integrity Level (SIL)	IEC 61508	Standard IEC 61508 defines four Safety Integrity Levels (SILs) for safety functions: SIL 1 is the lowest integrity level and SIL 4 is the highest. A hazard analysis and risk assessment serves as a basis for determining the required safety integrity level.

Typical Applications

Typical emergency stop applications include the following:

- Wood-working machines
- Shears
- Conveyor systems
- Printing machines
- Textile machines
- Rolling mills
- Test laboratories
- Paint shops
- Surface treatment works
- Food and beverage
- Durable goods
- Logistics and feeding systems of production machines

Figure 1 - Applications

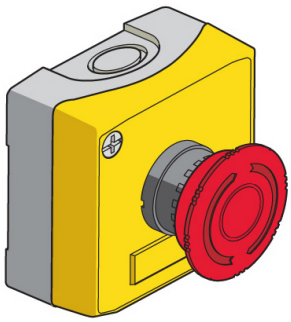
Functional Description

The following functionality helps to prevent potential hazardous tool movement or hazardous states of the machine.

- When the Emergency Stop switch is pressed, the Emergency Stop switch contacts open.
- The Preventa™ XPSUAB module monitors the state of the Emergency Stop switch contacts. When these contacts open, the Preventa module outputs open.
- The Preventa module outputs are monitored by the SIL[4] interface module. When the Preventa module outputs open, the SIL interface module sends a Stop command to the SIL starters in the SIL group (Stop categories according to EN/IEC 60204-1).

  NOTE: The status of the SIL group is reported to the Preventa module for monitoring via the SIL interface module (SIM) Mirror In/Out connections.

Figure 2 - Emergency Stop Switch



4. Safety Integrity Level according to standard IEC 61508.

Design

In this document, object classifications such as S1, S2, F1, SS-1, and SS-2 are in accordance with IEC 81346-2.

- The emergency stop function is performed by means of an emergency stop switch (S1) and SIL[5] starters (SS-1/SS-2).
- The start button (S2) must be located outside the zone of operation and at a point from which the potential hazard is visible.
- The emergency stop switch (S1) has direct opening action, and it is regarded as a well-tried component.
- The Preventa™ module satisfies the requirements for performance level PL c in accordance with ISO 13849-1, and SILCL 1 in accordance with IEC 62061.
- The SIL starter in single channel (and in association with a SIL interface module) satisfies the requirements for performance level PL d in accordance with ISO 13849-1, and SILCL 2 in accordance with ISO 62061.
- The SIL interface module provides a contact for external diagnostic monitoring, which is integrated into the feedback of the Preventa module.

5. Safety Integrity Level according to standard IEC 61508.

Overview

Figure 3 - System Overview

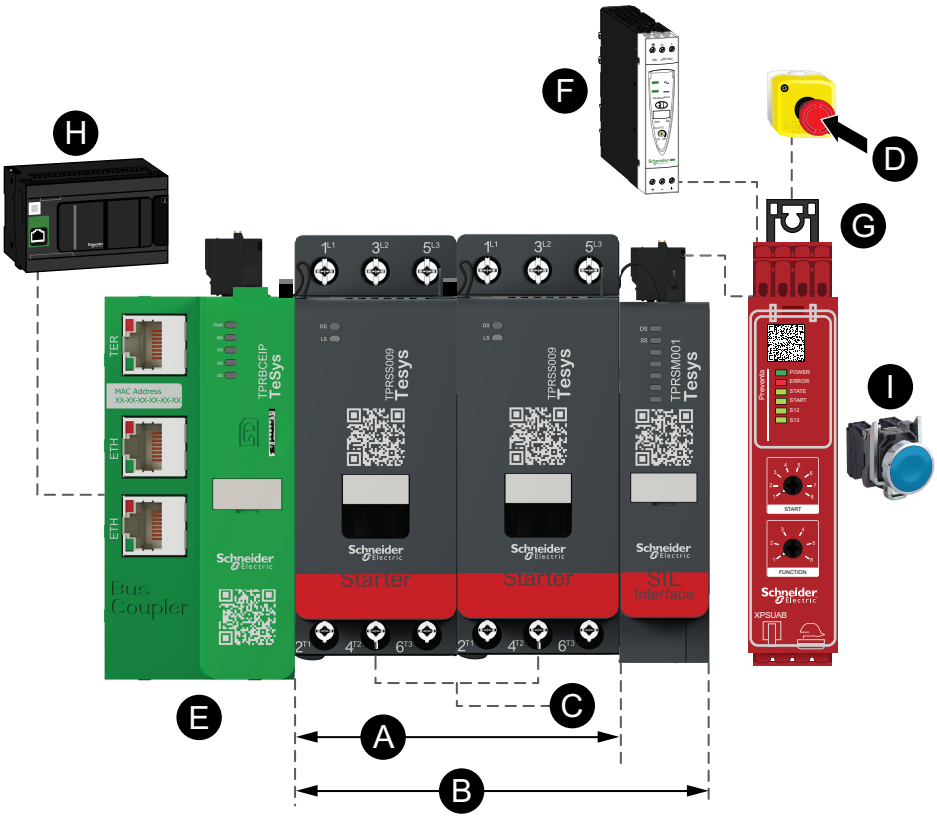


Table 4 - Legend

A	Avatar A1 (SIL[6] starters)
B	SIL Group 1 (SIL Starters + SIL interface module)
C	Motor
D	Emergency Stop Switch XALK178
E	Bus Coupler
F	Phaseo™ ABL8REM Regulated SMPS
G	Preventa™ XPSUAB Module
H	Programmable Logic Controller, Modicon™ M241
I	Harmony™ XB4 Pushbutton

6. Safety Integrity Level according to standard IEC 61508.

Hardware Schematic

Figure 4 - Wiring

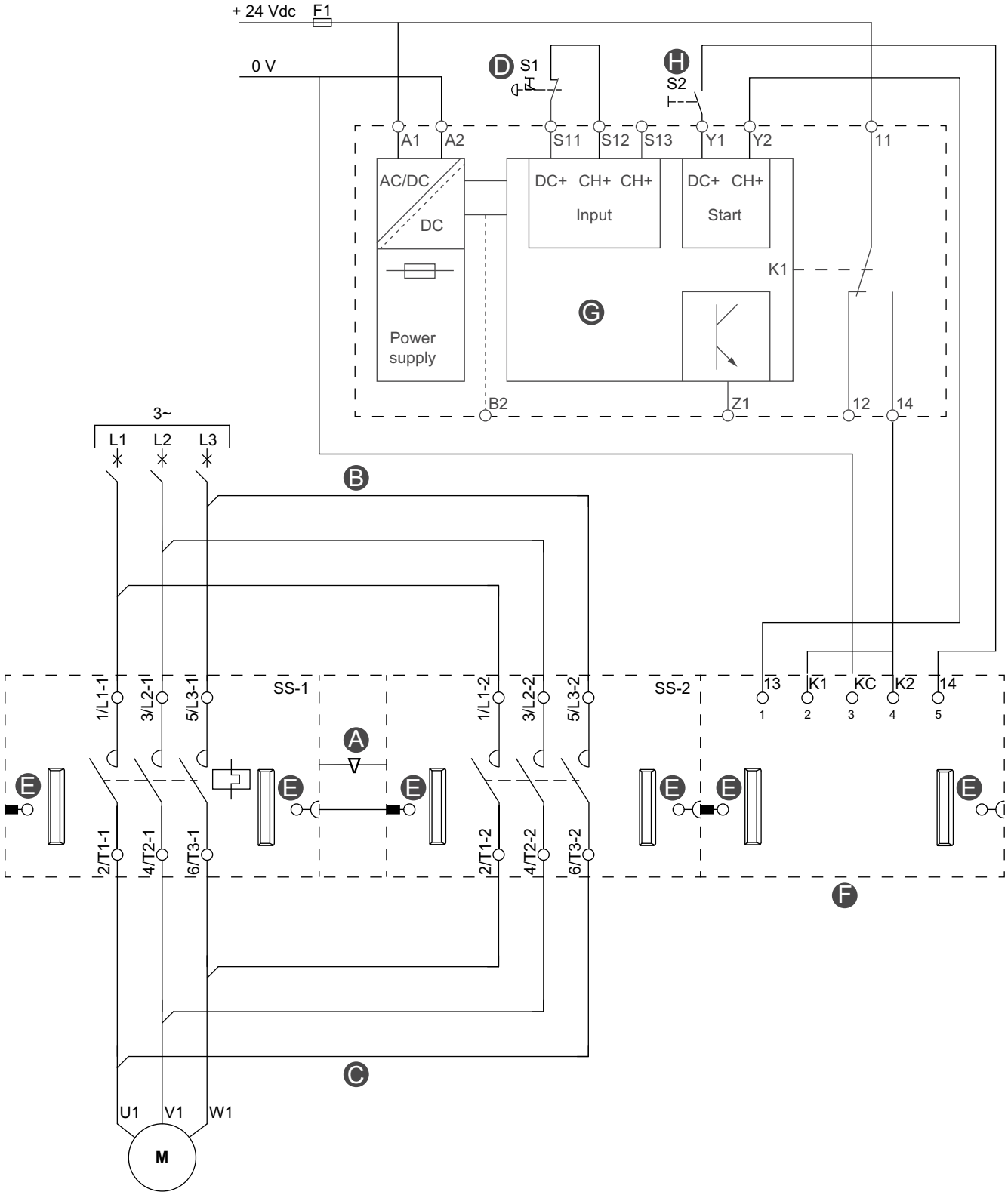


Table 5 - Legend

A	Mechanical interlock	**E**	Flat cable connector
B	Parallel link	**F**	SIL[7] interface module (SIM)

7. Safety Integrity Level according to standard IEC 61508.

Table 5 - Legend (Continued)

C	Reversing link	**G**	Preventa™ XPSUAB module
D	Emergency stop push button (S1)	**H**	Start button (S2)

Configuration

Preventa™ Module Configuration

When using the emergency stop function with the Preventa™ XPSUAB module, set the function selector switch to position 1.

When defining the start configuration, refer to the product documentation and your risk assessment.

Software

No software configuration is necessary for this application. However, a SISTEMA[8] project file is available containing the functional safety-related calculation for the emergency stop solution. A SISTEMA software utility provides developers and testers of functional safety–related machine controls with comprehensive support in the evaluation of functional safety in the context of the following standard: EN ISO 13849-1, “Safety of machinery – Safety-related parts of controls systems – Part 1: General principles for design.” Read and understand the EN ISO 13849-1 standard before using the SISTEMA software utility.

You can download the SISTEMA project file (Schneider Electric reliability value Libraries) from Schneider Electric’s Machine Safety website at *https://www.se.com/ww/en/download/document/Reliability_values/*.

8. SISTEMA =functional Safety Integrity Software Tool for the Evaluation of Machine Applications.

Chain Structure

The circuit diagram is a conceptual schematic diagram intended to present the functional safety (in accordance with standard IEC 61508–4) with the relevant components shown.

The designated architecture for category 1 corresponds to a single channel system with input (I), logic (L) and output (O) blocks.

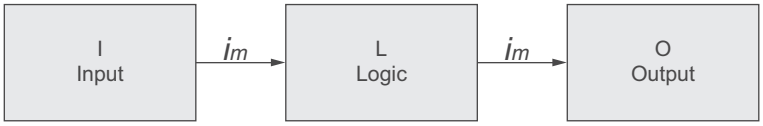
The functional channel can be represented by a single emergency stop switch (S1) that corresponds to the input.

The Preventa™ module (XPSUAB) corresponds to the logic block (K1).

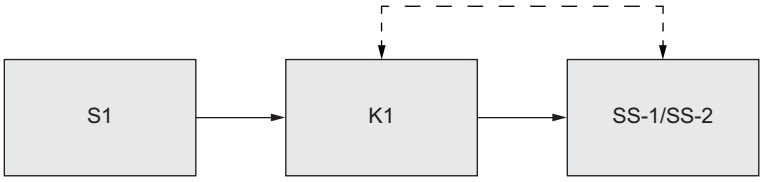
The output block is represented by two contactors (SS1 and SS2) that are monitored by the logic block (Preventa module) to detect an error.

The complete wiring must be in accordance with IEC 60204-1 and short-circuit protection must be provided (ISO 13849-2 Table D.4).

Figure 5 - Chain Structure Diagrams



NOTE: $_m$: Interconnecting means



Functional Safety Level Calculation Example

Table 6 - Duty Assumptions

Cycle time (s)	594,400
Number of hours of operation per day (h)	12
Number of days of operation per year (d)	220
Number of operations per year (n_{op})	16

Table 7 - Functional Safety Level Calculation Example

Functional Safety Level Calculation Example		**Values, Channel 1**
Acquire information (input) XALK178	PL	c
	Category	1
	$MTTF_D$ (years)	187500
Monitoring and processing (Logic) XPSUAB11C•	PL	c
	Category	1
	PFH_D (1/h)	1.20E-06
SIL[9] Interface Module	PL	e
	Category	4
	PFH_D (1/h)	1E-10
SIL Starter	PL	c
	Category	1
	$MTTF_D$ (years)	856164
Result of calculation made with SISTEMA Software	PL attained	c
	PFH_D (1/h)	2,30E-06

A required performance level (PL_r) must be specified for each intended functional safety function after a risk evaluation. The performance level (PL) attained by the control system must be greater than or equal to the PL_r.

If the emergency stop switch is assumed to be operated every 594,400 seconds during 220 days of operation per year and 12 hours of operation, the number of operations (n_{op}) would be 16.

A B_{10D} value of 300,000 cycles is stated for the mechanical aspects of S1. In accordance with the assumed n_{op} value, the $MTTF_D$ would be 187,500 years.

A PFH_D value of 1 x 10^{-10}/h is stated for the SIL Interface Module (SIM). This value comes directly from the device data and it is certified by a notified certification body.

For the SIL starters (SS-1, SS-2), the B_{10D} value is 1,369,863 operations. With the assumed value for n_{op}, it results in an $MTTF_D$ of 856,164.4 years for SS-1 and SS-2.

Measures against common cause failures (Annex F of ISO 13849-1) must attain at least 65 points; for example, separation (15), overvoltage protection (15), and environmental conditions (25+10).

The functional safety control system corresponds to category 1 with high $MTTF_D$. This complete functional safety calculation as it pertains to the combination of all functional safety devices results in average probability of dangerous failure (PFH_D) of 2.3 x 10^{-6}/h. This PFH_D value corresponds to PL c SIL 1.

9. Safety Integrity Level according to standard IEC 61508.

In order to claim PL c, all other applicable requirements from ISO 13849-1 must be met.

In order to claim SIL 1, all other applicable requirements from IEC 62061 must be met.

Calculations were made with SISTEMA[10] software version 2.0.8 build 3.

Maximum response time between actuation of Emergency stop and the opening of the SIL starter contactors is less than 165 ms. This corresponds to the total response time of the Safety Chain Solution.

A yearly maintenance of the safety function with Device usage checks and safety function proof test must be performed as defined in the Safety Function Maintenance Requirements of the TeSys island Functional Safety Guide, Document number 8536IB1904.

10. SISTEMA =functional Safety Integrity Software Tool for the Evaluation of Machine Applications.

Specifications

Table 8 - General Specifications

Specifications	Outside a Cabinet	Inside a Cabinet		
	Emergency Stop Switch, Preventa™ Harmony XALK178 (XB5)	**Preventa Module XPSUAB11C•**	**SIL[11] Starter TPRSS009**	**SIL Interface Module (SIM) TPRSM001**
Degree of protection	IP66	Terminals: IP20 Enclosure: IP40	IP20	IP20
Ambient operating temperature (horizontal installation)	−40 to +70 °C (−40 to +158 °F)	−25 to +55 °C (−13 to +131 °F)	−10 to +50 °C (14 to +122 °F)	−10 to +50 °C (14 to +122 °F)
Maximum height above sea level (operation)	—	2000 m	2000 m (without derating)	2000 m (without derating)
Storage temperature	−40 to +70 °C (−40 to +158 °F)	−40 to +70 °C (−40 to +158 °F)	−25 to +70 °C (−13 to +158 °F)	−40 to +80 °C (−40 to +176 °F)
Maximum relative humidity (storage)	—	95% non-condensing	95% non-condensing	95% non-condensing
Overvoltage category	—	II (III)	III	III
Pollution degree	3	2	2	2
Rated isolation voltage	600 V	300 V	600 V	—

Table 9 - Supply Specifications

Specifications	Outside a Cabinet	Inside a Cabinet			
	Emergency Stop Switch, Preventa Harmony XALK178 (XB5)	**Preventa Module XPSUAB11C•**	**SIL Starter TPRSS009**	**Bus Coupler TPRBCEIP**	**SIL Interface Module (SIM) TPRSM001**
Supply Voltage	24 Vdc	24 Vdc (20% / +20%) 24 Vac (15% / +10%)	24 Vdc	24 Vdc	24 Vdc
Rated Power	—	3.5 VA 1.5 W	4 kW at 380–415 Vac	—	—

Table 10 - Output Circuit Specifications

Specifications	Outside a Cabinet	Inside a Cabinet	
	Emergency Stop Switch, Preventa Harmony XALK178 (XB5)	**Preventa Module XPSUAB11C•**	**SIL Starter TPRSS009**
Maximum current	AC-15: A600:3 A at 240 V DC-13 Q600:0.27 A at 250 V	NO: AC–15: 3 A at 250 V DC–13: 2 A at 24 V NC: AC–15: 1 A at 250 V DC–13: 1 A at 24 V	15 A (≤ 50 °C) at ≤ 440 Vac, AC-1 for power circuit 9 A (≤ 50 °C) at ≤ 440 Vac, AC-3 for power circuit
Protection of outputs	10 A by aM cartridge fuse	Rated fuse, category aM (CO): 6 A Circuit breaker, specification B/C: 6 A	20 A aM at ≤ 690 V, coordination type 2 for power circuit 25 A aM at ≤ 690 V, coordination type 1 for power circuit 10 A aM for signaling circuit

11. Safety Integrity Level according to standard IEC 61508.

Table 11 - Functional Safety Reliability Data

Functional safety reliability data used for PL and SIL	**Emergency Stop Switch, Preventa harmony XALK178 (XB5)**	**Preventa Module XPSUAB11C•**	**SIL Starter without Diagnostics TPRSS009**
Function	Detect an emergency stop request	Monitor an emergency stop	Single channel with TPRSM001
Performance Level (PL), Category (cat.), ISO 13849	PL e, cat.4	PL c, cat.1	PL c, cat.1
Safety Integrity Level (SIL), IEC 61508	SIL 3	SIL 1	SIL 1
Safety Integrity Level, Claim Limit (SILCL), IEC 62061	SIL 3	SIL 1	SIL CL1
Mean number of cycles until 10% of the components fail dangerously (B_{10D}), ISO 13849-1	300,000	—	1,369,863
PFH_D resulting (1/h)	9.10E-10	1.7E-6	1.1E-10
Mean Time to Dangerous Failure ($MTTF_D$), ISO 13849-1	2,500 years	—	>2,500 years
Diagnostic Coverage (DC), ISO 13849-1	99%	70%	—
Lifetime	20 years	20 years	20 years
Response time	—	20 ms	145 ms
Stop category according to IEC 60204-1	—	—	0

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As standards, specifications, and design change from time to time, please ask for confirmation of the information given in this publication.

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