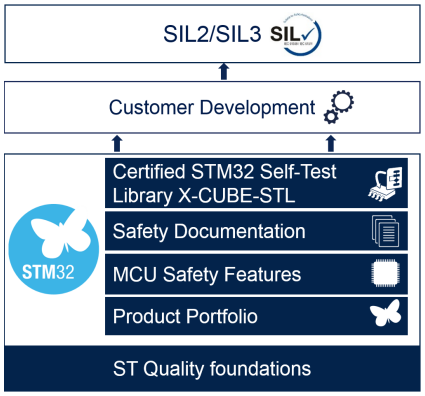
X-CUBE-STL

Data brief

Functional safety package for STM32 microcontrollers in systems implementing safety functions up to IEC 61508:2010 safety integrity level SIL2/SIL3



Product status
X-CUBE-STL

Features

- MCU safety manual
  - Detailed list of safety requirements (conditions of use) and examples to guide STM32 users to achieve safety integrity level certification in compliance with IEC 61508:2010
  - SIL2 safety functions can be implemented with a single STM32 MCU; SIL3 safety functions implementation requires two STM32 MCUs in an 1oo2 scheme
- MCU FMEA
  - Detailed list of MCU failure modes and related mitigation measures adopted (qualitative analysis)
- MCU FMEDA snapshot
  - Static snapshot reporting failure rates compliant to IEC 61508:2010, computed at both MCU and basic function levels of detail
- X-CUBE-STL library
  - Software-based diagnostic suite designed to detect random hardware failures in STM32 application-independent core components (CPU + SRAM + flash memory)
  - Compliant to IEC 61508:2010 SC3 (SIL3) development process
  - Diagnostic coverage verified by state-of-the-art ST proprietary fault injection methodology
  - Application independent: can be used in potentially any end-user application
  - Compiler independent: delivered as object code
  - Certified by TÜV Rheinland
  - Including the X-CUBE-STL user guide, a functional-only document related to STL functions (such as API details and performance figures)
  - Including the X-CUBE-STL safety manual, the instructions/conditions of use for end user related to the use of X-CUBE-STL in a safety application

Description

On the basis of the ST Quality foundations, the STM32 microcontrollers portfolio and the STM32 embedded safety features, the STM32 SIL functional safety design package helps users to market STM32-based safety critical applications quickly, targeting the industry safety standard IEC 61508:2010 safety integrity level (SIL2/SIL3) in domains such as industrial, motor control, factory automation, or power generation/conversion.

The package helps end-users to target safety applications according to various safety standards such as ISO 13849, IEC 62061, and IEC 61800 for the compatible STM32 microcontrollers.

1 General information

The X-CUBE-STL functional safety package runs on STM32 microcontrollers based on Arm® cores.

Note: Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

1.1 Ordering information

The MCU safety manual is available on *www.st.com* for download.

Contact an STMicroelectronics local representative to request the X-CUBE-STL software, MCU FMEA and FMEDA documentation (NDA agreement required).

1.2 Certification information

The original certificate and the updated list of certificated software versions can be downloaded from TÜV Rheinland websites fs-products.tuvasi.com and www.certipedia.com.

1.3 What is STM32Cube?

STM32Cube is an STMicroelectronics original initiative to improve designer productivity significantly by reducing development effort, time, and cost. STM32Cube covers the whole STM32 portfolio.

STM32Cube includes:

- A set of user-friendly software development tools to cover project development from conception to realization, among which are:
  - STM32CubeMX, a graphical software configuration tool that allows the automatic generation of C initialization code using graphical wizards
  - STM32CubeIDE, an all-in-one development tool with peripheral configuration, code generation, code compilation, and debug features
  - STM32CubeCLT, an all-in-one command-line development toolset with code compilation, board programming, and debug features
  - STM32CubeProgrammer (STM32CubeProg), a programming tool available in graphical and command-line versions
  - STM32CubeMonitor (STM32CubeMonitor, STM32CubeMonPwr, STM32CubeMonRF, STM32CubeMonUCPD), powerful monitoring tools to fine-tune the behavior and performance of STM32 applications in real time
- STM32Cube MCU and MPU Packages, comprehensive embedded-software platforms specific to each microcontroller and microprocessor series (such as STM32CubeG4 for the STM32G4 series), which include:
  - STM32Cube hardware abstraction layer (HAL), ensuring maximized portability across the STM32 portfolio
  - STM32Cube low-layer APIs, ensuring the best performance and footprints with a high degree of user control over hardware
  - A consistent set of middleware components such as RTOS, USB Device USB PD, and FAT file system
  - All embedded software utilities with full sets of peripheral and applicative examples
- STM32Cube Expansion Packages, which contain embedded software components that complement the functionalities of the STM32Cube MCU and MPU Packages with:
  - Middleware extensions and applicative layers
  - Examples running on some specific STMicroelectronics development boards

Revision history

Table 1. Document revision history

Date	Revision	Changes
23-Apr-2018	1	Initial release.
01-Jun-2018	2	Updated product status link on cover page.
17-Jul-2019	3	Updated functional safety documentation framework. Updated *Features*. Updated *Description*. Added *Section 1 General information*.
28-Apr-2020	4	Extended the availability of all package components to the STM32F1 Series, STM32F7 Series, STM32L0 Series, STM32G4 Series, and STM32H7 Series. Updated the document title. Updated *Features* and *Description*. Added *Ordering information*, *Certification information*, and *What is STM32Cube?*
21-May-2025	5	Removed the detailed lists of compatible microcontrollers from Features and updated Description accordingly. Updated all references to IEC 61508 to specify the version IEC 61508:2010 across the document. Updated What is STM32Cube?

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