

ENGINEERING
TOMORROW

Danfoss

An **easy guide** to
functional safety with VLT[®] drives

Effortless

safety functionality,
even sensorless

drives.danfoss.com

VLT[®]

Determine your safety category

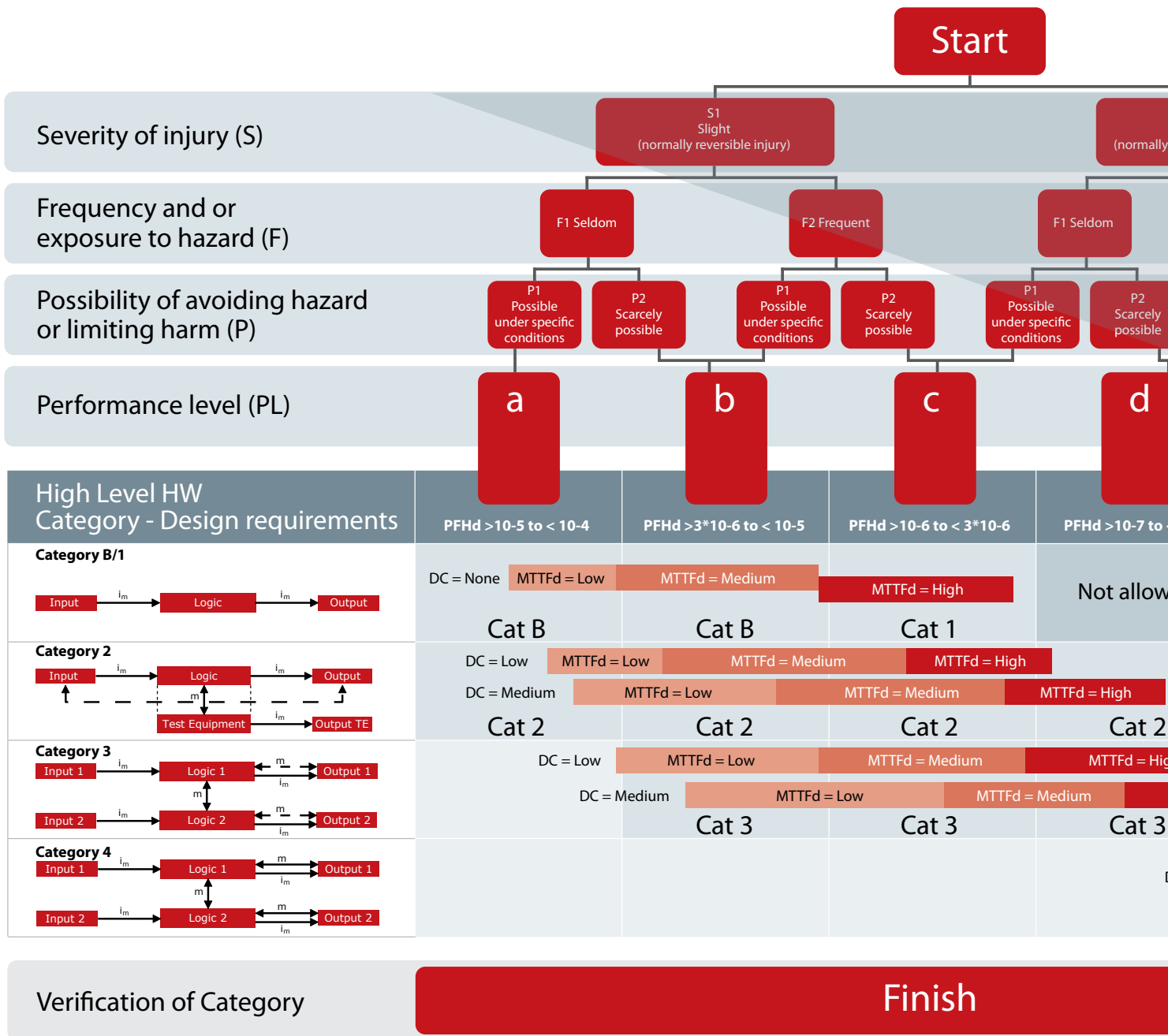
Hazard & Risk Analysis

The primary standard addressing functional safety requirements is ISO 13849-1: 2015 Safety of machinery – Safety-related parts of control systems.

ISO 13849-1 provides safety requirements and guidance on the principles for the design and integration of safety-related parts of control systems (SRP/CS), including the design of software.

For these parts of SRP/CS, the standard specifies characteristics that include the performance level required for carrying out safety functions. It applies to SRP/CS, regardless of the type of technology and energy used (electrical, hydraulic, pneumatic, mechanical, etc.) for all kinds of machinery.

The figure below illustrates how to evaluate which Performance Level is required for a specific safety function, and the design requirements needed to achieve the required Performance Level.



0 - 10 years 10 - 30 years 30 - 100 years

Safety as standard

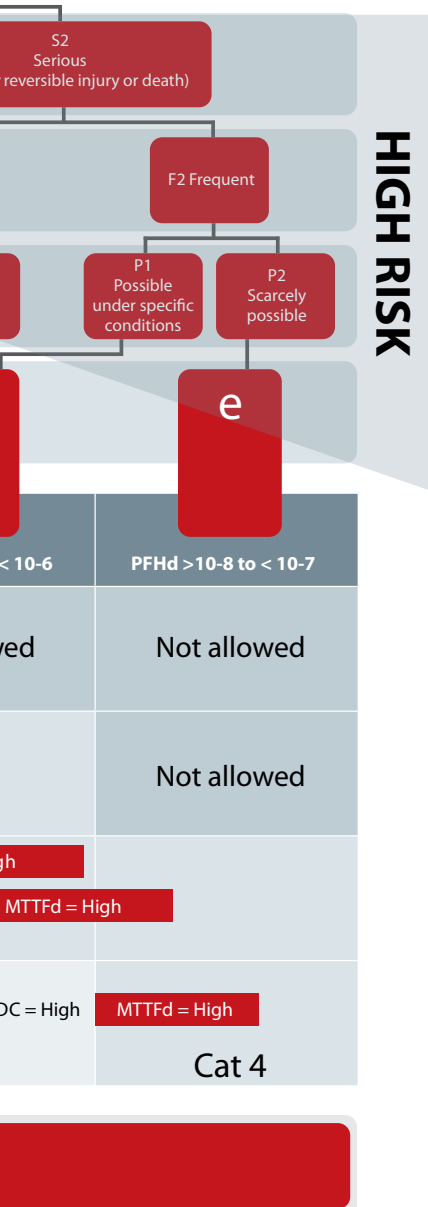
VLT® drives are delivered as standard with the Safe Stop (Safe Torque Off) function in compliance with ISO 13849-1 PL d and SIL 2, according to IEC 61508/IEC 62061.

Scalable functional safety

The safety functions can be extended to include SS1, SLS, SMS, safe jog mode and more, with the VLT® Safety Option MCB 150 Series.

SISTEMA library available

Use the SISTEMA software tool as support in evaluation and calculation of performance level (PL) during the design process. Functional safety data for Danfoss devices are available as a SISTEMA data library, available for download at danfoss.com.

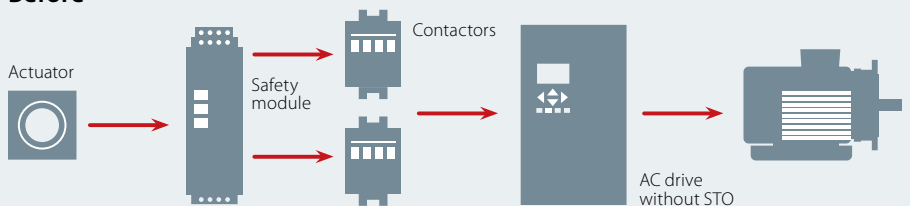


Integrated enhancements

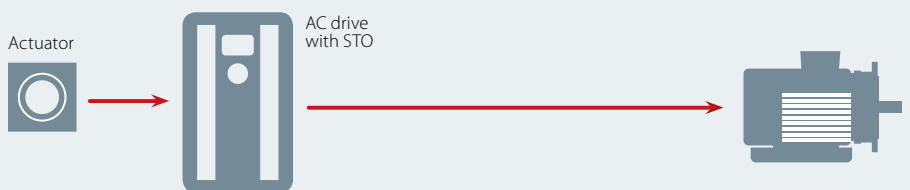
The modular design of VLT® drives means that they can be expanded with options from the factory, or later with simple plug-and-play, to perform complex tasks.

As additional options are contained inside the drive, installation is easy and without a multitude of external space consuming components. This saves costs as it is possible to eliminate external components and the labour associated with integrating them into the production setup.

Before



After



Two contactors can be omitted in safety installations due to the integrated safety functionality.

VLT® Safety Options

Optimize the safety profile of your VLT® drive with additional features and parameters.

VLT® Safe PLC I/O MCB 108

The VLT® AutomationDrive FC 302 provides a safety input based on a single-pole 24 V DC input.

- For the majority of applications, this input enables the user to implement safety in a cost-effective way. For applications that work with more advanced products like Safety PLC and light curtains, the Safe PLC interface enables the connection of a two-wire safety link
- The Safe PLC Interface allows the Safe PLC to interrupt on the plus or the minus link without interfering the sense signal of the Safe PLC

Ordering number

130B1120 standard
130B1220 coated (Class 3C3/IEC 60721-3-3)

VLT® Safety Option MCB 150, 151 and MCB 159

The VLT® Safety Options MCB 150 and MCB 151 expand the Safe Torque Off (STO) function, which is integrated in a standard VLT® AutomationDrive. Use the Safe Stop 1 (SS1) function to perform a controlled stop before removing torque. Use the Safely-Limited Speed (SLS) or Safe Maximum Speed (SMS) function to monitor whether a specified speed is exceeded.

When the VLT® Safety Option MCB 151 is combined with the built-in VLT® Sensorless Safety MCB 159 option, an external sensor is no longer required for safe speed monitoring.

The functions can be used up to PLd according to ISO 13849-1 and SIL 2 according to IEC 61508.

- Additional standards-compliant safety functions
- Replacement of external safety equipment
- Reduced space requirements
- 2 safe programmable inputs
- 1 safe output (for T37)
- Easier machine certification
- Drive can be powered continuously
- Safe LCP Copy
- Dynamic commissioning report
- TTL (MCB 150) or HTL (MCB 151) encoder as speed feedback

Ordering number

130B3280 MCB 150, 130B3290 MCB 151

VLT® Safety Option MCB 152

The VLT® Safety Option MCB 152 enables activation of Safe Torque Off (STO) via the PROFIsafe fieldbus in combination with VLT® PROFINET MCA 120 fieldbus option. It improves flexibility by connecting safety devices within a plant.

The safety functions of the MCB 152 are implemented according to EN IEC 61800-5-2. The MCB 152 supports PROFIsafe functionality to activate integrated safety functions of the VLT® AutomationDrive from any PROFIsafe host, up to Safety Integrity Level SIL 2 according to EN IEC 61508 and EN IEC 62061, Performance Level PLd, Category 3 according to EN ISO 13849-1.

- PROFIsafe device (in combination with MCA 120)
- Replacement of external safety equipment
- 2 safe programmable inputs
- Safe LCP copy
- Dynamic commissioning report

Ordering number

130B9860 coated (Class 3C3/IEC 60721-3-3)

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VLT® | VAGON®

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