

ENGINEERING  
TOMORROW

*Danfoss*

An **easy guide** to  
**functional safety** with VLT<sup>®</sup> drives



[www.danfoss.com/drives](http://www.danfoss.com/drives)

**VLT**<sup>®</sup>  
THE REAL DRIVE

# Determine your safety category

## Hazard & risk analysis

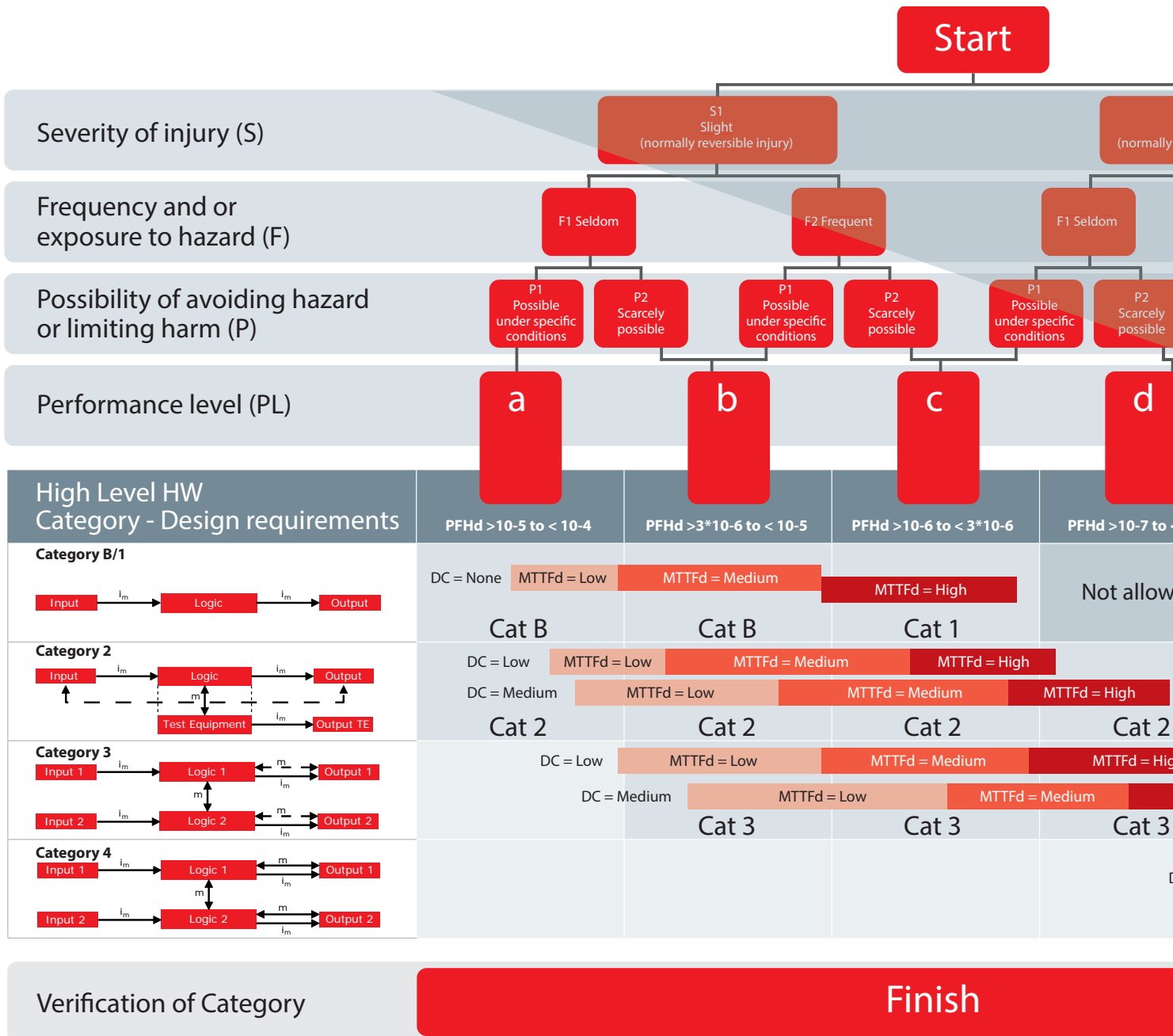
The primary standard addressing functional safety requirements is ISO 13849-1: 2006 Safety of machinery —Safety-related parts of control systems.

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.

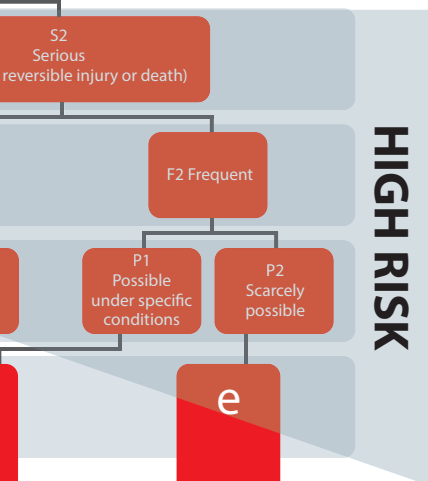
The below figure illustrates how you can evaluate the needed Performance Level for a specific safety function and how this Performance Level required can be achieved.



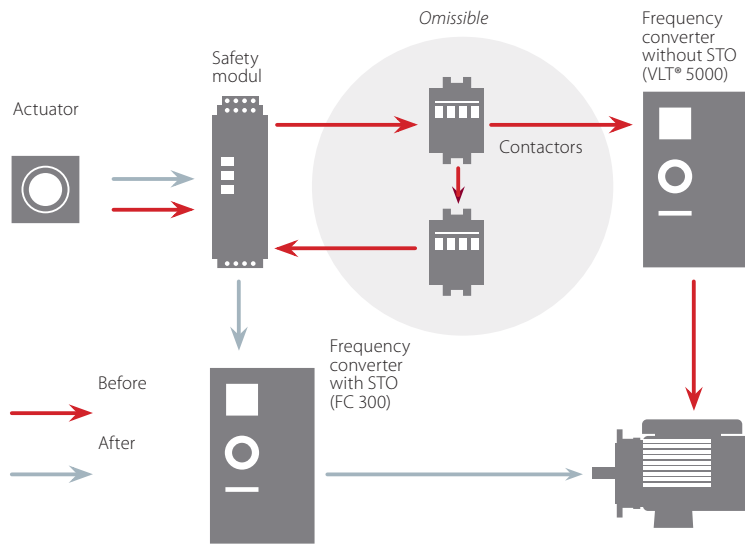
0 - 10 years    10 - 30 years    30 - 100 years

**SAFETY AS STANDARD IN VLT® AutomationDrive FC302.**  
**The drive is 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.**

**OPTIONAL ADDITIONS**  
 The safety functions can be extended to include SS1, SLS, SMS, SSM, safe jog mode, etc. with the VLT® Safe Option MCB 140 Series and VLT® Safe Option MCB 150 Series.



< 10 <sup>-6</sup>	PFHd > 10 <sup>-8</sup> to < 10 <sup>-7</sup>
Not allowed	Not allowed
Not allowed	Not allowed
MTTFd = High	
DC = High	MTTFd = High
<b>Cat 4</b>	



### Scalable functional safety

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.

The safety functions can be extended to include SS1, SLS, SMS, SSM, safe jog mode, etc. with the VLT® Safe Option MCB 140 Series and VLT® Safe Option MCB 150 Series.

### 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.

# VLT® Safe Options

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



## VLT® Safe PLC I/O MCB 108

The VLT® Safe PLC I/O MCB 108 provides safety input based on a dual pole 24 V DC input (plus-minus). For applications that work with more advanced products like Safe PLC, Light curtains etc, the VLT® Safe PLC I/O MCB 108 interface enables the connection of a two wire safety link.

The VLT® Safe PLC I/O MCB 108 interface allows the Safe PLC to interrupt on the plus and the minus link.

- Directly connect dual-pole outputs from safety PLC's
- Galvanic isolated input/output
- Easier wiring in the field



## VLT® Safe Option MCB 140 Series

VLT® Safe Option MCB 140 Series are safety options providing Safe Stop 1 (SS1), Safely Limited Speed (SLS) and Safe Speed Monitor (SSM) functionality. The options can be used up to PL e according to ISO 13849-1.

be easily configured by using the on board display and buttons. The options provide only a limited set of parameters for easy and fast parameterization.

MCB140 is a standard B-Option while MCB141 offers the same functionality in an external 45 mm housing. MCB141 enables the user to use the MCB140 functionality also if another B-Option is used. Different operating modes can

- MCB140 standard B-Option
- MCB141 external Option
- Single channel or dual channel operation possible
- Proximity switch as speed feedback
- SS1, SLS and SMS functionality
- Easy and fast parameterization
- Drive independent (can be mounted externally)



## VLT® Safe Option MCB 150 Series

The VLT® Safe Option MCB 150 Series expands the Safe Torque Off STO function, which is integrated in a standard VLT® AutomationDrive. By using the Safe Stop 1 function it is possible to perform a controlled stop before removing torque. Using the Safely Limited Speed SLS function it is also able to monitor whether a specified speed is exceeded. The functions can be used up to PL d according to EN ISO 13849 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
- FC 302 integrated (seamless interaction with drive)
- Status over all field busses & LCP