



## ABB DRIVE SERVICES

# Failure Mode and Effects Analysis (FMEA)

## Service note for Drive System Consulting

To improve the reliability and availability of your drive system, ABB offers a specific application of its Drive System Consulting service, called Failure Mode and Effects Analysis (FMEA). FMEA is a specific method to measure and evaluate the robustness of a drive system, design or process for potential failure mechanisms.

### What is it about?

Ideally, FMEA is part of the design process of a new installation and should be conducted throughout the design process. We also offer FMEA for existing installations in order to identify and address potential root causes that could lead to system failure. FMEA can be described as a systematic set of activities intended to identify and evaluate the various possibilities of failure, as well as to identify actions that can reduce or prevent them or, if they cannot be avoided, mitigate their effects.

FMEA is a structured approach that consists of the following general steps:

- Defining the system
- Identifying potential failure modes

- Assessing identified failure modes
- Prioritizing risks
- Developing solutions
- Implementing selected improvement actions

### Working together

The role of ABB's drive system experts can vary according to your needs. They can work as consultants supporting you in the FMEA process, or they can offer a full turnkey delivery. You decide whether you want ABB to support the whole process – from the first stage of defining the system to the final implementation – or just some of the phases.

A thorough FMEA is the result of a cross-functional team composed of individuals qualified to recognize and assess the magnitude and consequences of

potential inadequacies in the system design that might lead to failures. The advantage of this teamwork is that it stimulates the thought process, and ensures that the necessary expertise is available. As a result, customers can expect a list of relevant improvement actions that will substantially increase the robustness of their systems in coping with potential failures on the drive system.

#### **Defining the system**

To define the scope and the detailed analysis, the system is broken down into a hierarchy of its basic elements. This preparation work includes developing a system description with the defined scope for the FMEA together with the customer. This stage defines which parts are included in the system and should be analyzed, as well as the purpose and the objectives of the analysis.

#### **Identifying potential failure modes**

Once the detailed system description has been divided into function subsystems and parts, the analysis starts with the lowest-level elements. Analysis of possible failure modes and their effects on the higher levels of the system are conducted level by level in a bottom-up manner to identify the final effect on the system. Often, a collection of the customer's previously observed and recorded failures helps to identify potential failure modes. In addition, ABB's drive system experts help identify other possible failure modes that have not occurred in the past.

#### **Assessing identified failure modes**

Once all the potential failure modes are identified, they are assessed from three different perspectives. The first is the likelihood that the failure will be detected before it leads to a non-functioning system. The second perspective is the severity of the failure. Here, the range is defined from "insignificant" to "catastrophic," the latter of which describes a failure mode that could result in the failure of system's primary functions and therefore cause serious damage to the system and its environment and/or personal injury. The third aspect is the failure probability, giving an expected (or observed) occurrence rate.

#### **Prioritizing risks**

The completed FMEA overview is reviewed, and the most relevant failure modes are identified, typically by multiplying the three factors (detection, severity, probability). Different or additional prioritization is possible, e.g. addressing all the failure modes with severe consequences irrespective of their probability. As a result, all the potential failure modes are assigned a risk and priority number (RPN).

#### **Developing solutions**

The identified failure modes are classified according to the RPN number, and relevant mitigation actions, corrective actions or compensating provisions are proposed for those failure modes that need to be addressed. The final findings are documented, including recommendations, actions and remarks, in a final report for the customer. The actions for implementation are selected and assigned to responsible personnel.

#### **Implementing selected improvement actions**

The findings can result in various activities for system-level optimization on both the customer's and ABB's side. The activities on ABB's side can be agreed and offered separately.

For more information, please contact your local ABB representative or visit:

[www.abb.com/drives](http://www.abb.com/drives)  
[www.abb.com/searchchannels](http://www.abb.com/searchchannels)



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