



TEAMCENTER

Failure Mode and Effects Analysis

Teamcenter 2412

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1. About FMEA in Teamcenter

Failure Mode and Effects Analysis (FMEA) is a methodology to identify and optimize the risk involved at the design or the manufacturing stage. You can use Teamcenter to predict different failure modes for a product design or a process at the initial stage itself so that appropriate actions can be taken for preventing them. This avoids defects prior to production, improves functional safety, and reduces warranty claims and costs.

There are two types of FMEA – Design FMEA (D-FMEA) and Process FMEA (P-FMEA). The three main phases of FMEA are *identifying* what can go wrong, *analyzing* the chances of a failure mode and its consequences, and *taking actions* to mitigate the cause and reduce its risk priority value.

Teamcenter helps you to perform FMEA using the following phases:




- Planning and preparation
- Structure analysis
- Function analysis
- Failure analysis
- Risk analysis
- Optimization analysis
- Results documentation using formsheets

Example:

Consider the air intake system of a car engine. One of the components, the air filter is prone to wear and tear. If the air filter tears, unfiltered air can enter the engine. This potential failure of the air filter can affect the performance of the car engine or cause it to fail. You can use FMEA to analyze the function of each component in the air intake assembly. You can identify and add potential failures, such as the breakdown of the air filter, and assess the causes and effects of this failure. After the analysis, you can recommend prevention and detection actions to minimize the risks.



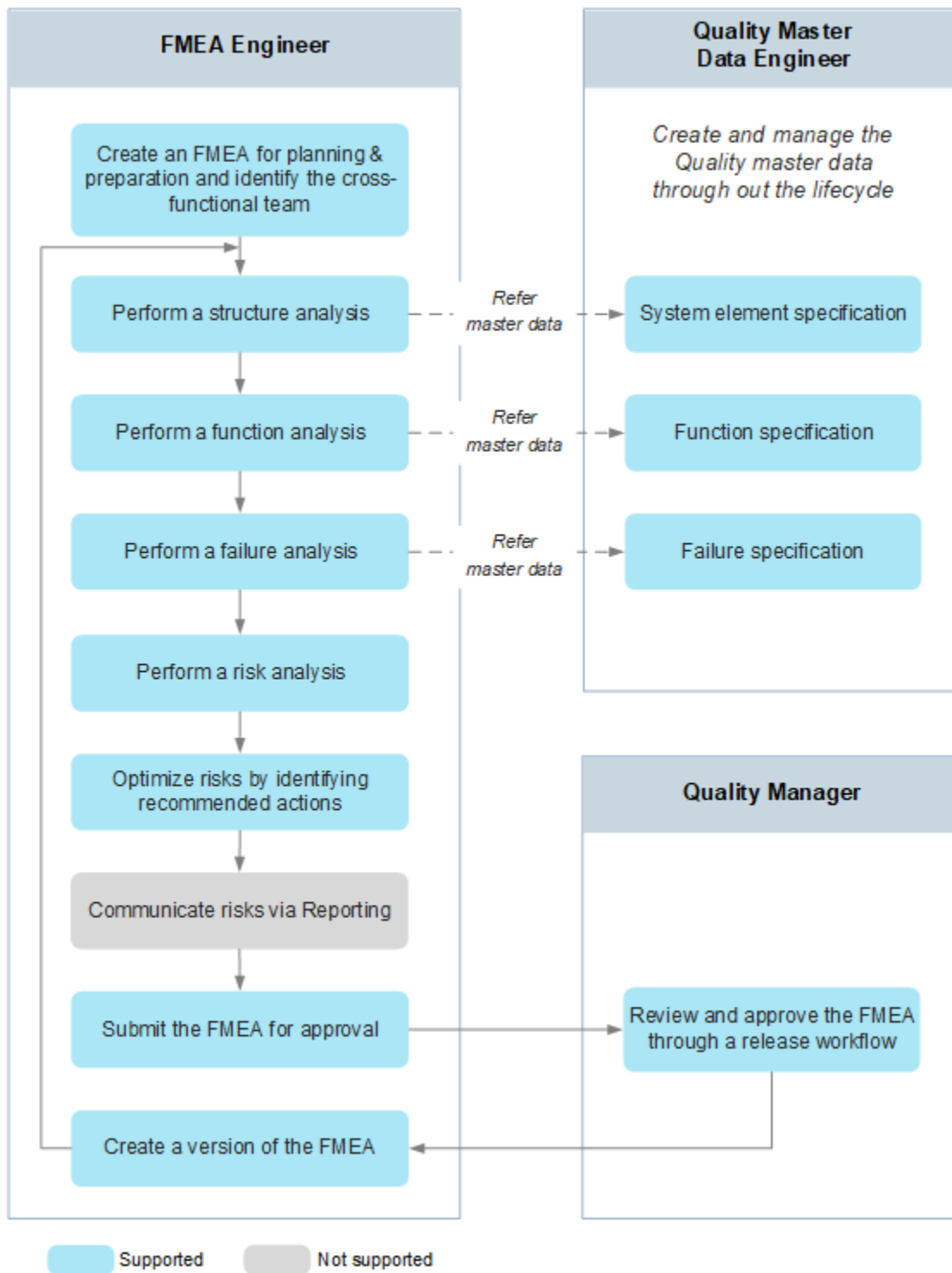
Where do I go from here?

 Administrator	To know which features are required to install FMEA, see Install FMEA .
 Administrator	To attach the configuration file to guideline objects, or to modify the guideline values, see What are FMEA guideline objects . To customize the FMEA formsheet, see Customizing formsheets .
 Business User	
How can I analyze failure modes for a product or a process design in Teamcenter?	To analyze different failure modes for a product or a process design at the initial stage itself so that appropriate actions can be taken to prevent them, you can perform a structure analysis , function analysis , failure analysis , risk analysis , and optimization analysis .
Is it necessary to create catalogs for users? Who creates these?	The FMEA master data is created as a hierarchy of items by a designated user. These help the FMEA engineer to search for and locate items while creating function specifications and failure specifications.
What are the steps involved in performing FMEA in Teamcenter?	To learn about how to perform the risk assessment for a product or a process design in Teamcenter, see FMEA workflow process .
Can I create variants of an existing FMEA structure?	After you create an FMEA structure, you can use it as a reference and create a new variant with a few modifications. To learn about creating FMEA variants, see Create variants of a master FMEA . You can also compare and align FMEA structures if required.
After performing the FMEA, how can I track other quality-related tasks and the identified issues?	To know more about how to create, execute, and track the recommended prevention or detection actions, and other quality-related tasks, see the information in Quality Actions . To investigate a potential problem that must be addressed, you can capture it as an issue. For more information on how to do this, see Quality Issues . To know about how to generate a control plan from an existing FMEA, see the information in Control Plans

Note:

A separate license is required for **Quality Actions, Quality Issues, and Control Plans** respectively.

2. FMEA task flow in Teamcenter

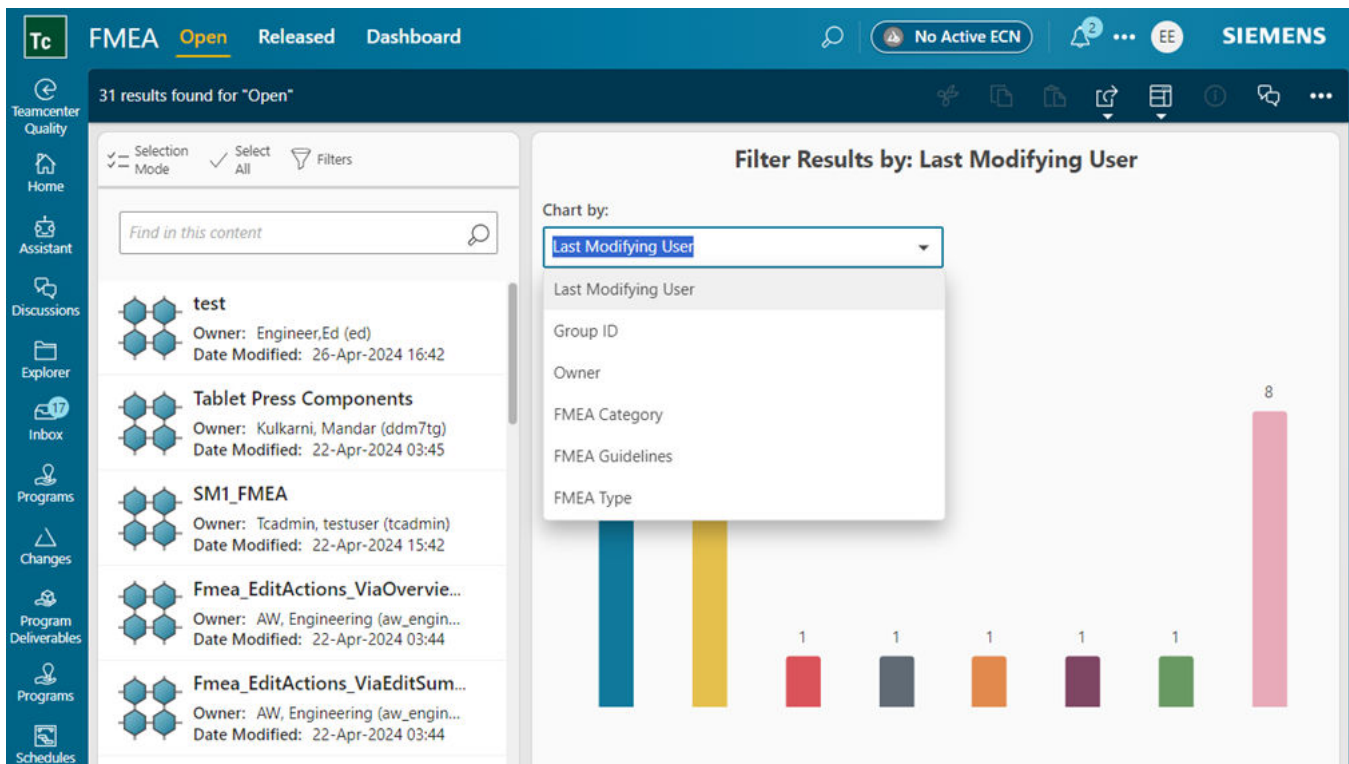


3. Access the FMEA tile in the Quality Management workspace

The **Quality Management** workspace is a workspace dedicated to working with Teamcenter Quality applications. The FMEA tile in the **Quality Applications** section in the **Quality Management** workspace has options specifically for working in FMEA.

You can:

- View any open or released FMEAs on the respective tabs.
- View the dashboard for FMEA including the quality master data.
- Search for and filter your search results as required.
- Segregate the FMEA data and view specific charts using the options in the **Chart by** list.
- Access other applications, such as **Assistant**, **Discussions**, **Programs**, and **Schedules**, on the global navigation toolbar.

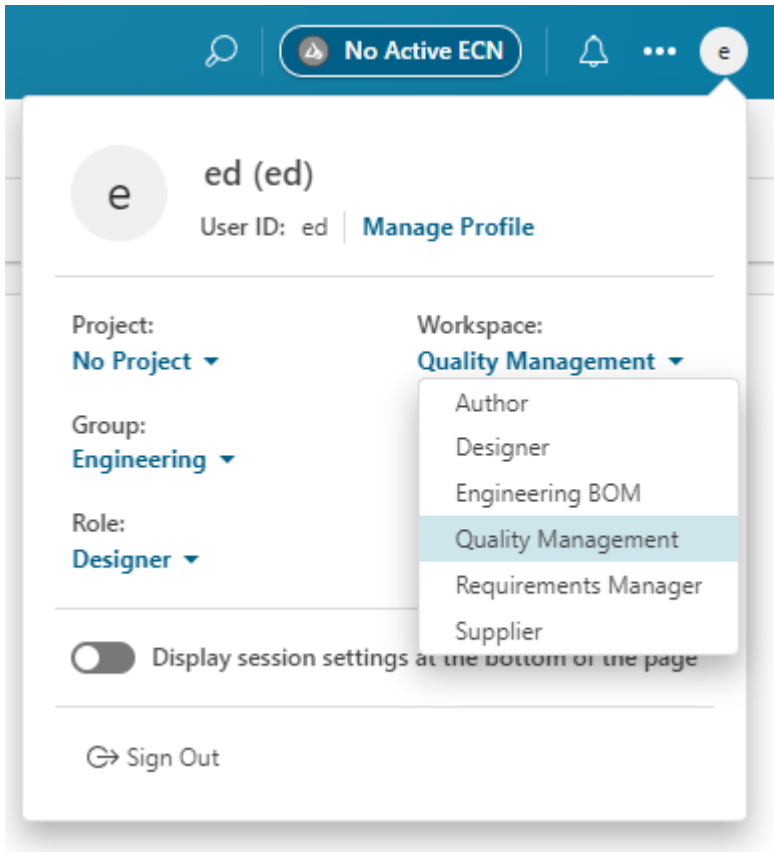


Your administrator must make the **Quality Management** workspace available for your organization's groups and roles.

For more information about workspaces, see *Learn about workspaces* in *Active Workspace Customization* of the Teamcenter documentation.

To access the tile for your Quality application in the **Quality Management** workspace:

1. Click your profile icon.
2. From the **Workspace** list, select **Quality Management**.



3. In the **Quality Applications** section, click the FMEA tile.

Teamcenter Quality | Quality | Problem Solving | No Active C... | SIEMENS

Quality Applications

- QUALITY ACTIONS
- QUALITY MASTER DATA
- CONTROL PLAN AND INSPECTION PLAN
- FMEA
- QUALITY PROJECTS
- TRAINING AND QUALIFICATION
- PROBLEM SOLVING PROCESS
- QUALITY ISSUE MANAGEMENT
- AUDIT AND ASSESSMENT

Report Dashboard | Last Updated: 20-Oct-2023 10:49

Open Problem Solving Processes
Total Objects: 968

Category	Object Count
Process	294
Product	47
Shipping	625

All Quality Actions
Total Objects: 886

Status	Object Count
Draft	578
Active	179
Completed	45
Tentative	35
Confirmed	33
Cancelled	16

Favorites

- Control Plan for Crank Shaft
CP-000179
Revision: A
- Tablet Press Components
Owner:
Date Modified: 16-Oct-2023 07:47
- Car engine overheating issue
PSP-00275
Revision: A
- Audit and Assessment_63618423

Inbox

- Active
Trigger/Workflow
Targets: TT
Assignee: ed (ed)
Start Date: 18-Oct-2023 14:18
- Completed
Trigger/Workflow
Targets: Confr
Assignee: ed (ed)
Start Date: 17-Oct-2023 13:14
- Draft
Trigger/Workflow
Targets: Dep1
Assignee: ed (ed)
Start Date: 17-Oct-2023 13:14



3. Access the FMEA tile in the Quality Management workspace

4. Manage the FMEA master data

About the FMEA master data

The FMEA master data is a collection of system element specifications, function specifications, and failure specifications.

Typically, the Quality Master Data Engineer or the designated user creates the system element, function, and failure specifications in the **Quality Master Data Library** or in any folder.

While creating the FMEA structure, you can search for specifications in the **Quality Master Data Library** and add them to the FMEA structure. Alternatively, you can create the required system element specifications, function specifications, or failure specifications and add them to the **Quality Master Data Library**.

Each time the master data is edited and saved, the system creates a new version of it. This helps in tracking all the changes made over a period of time. In addition, the master data can be deactivated so that it cannot be further used for creating the FMEA structure.

Creating the master data provides the following benefits:

- Common quality standard within a company that can be shared by different products and processes
- Detection of unknown quality dependencies because the specifications are shared between different products and processes
- Easy way to structure the data
- Enhancement of the quality data by using versioning. Users can see what has changed and update to the latest version.

Create the system element specifications master data

A *system element specification* is a workspace object corresponding to each component, assembly, or process you have identified for which FMEA is required. As an example, let us consider this specification to be the air filter assembly of a car.

You can create the system element specifications master data in **Folders** or in the **Quality Master Data** library. The Quality Engineer—while creating the FMEA structure—can search for and add them to the FMEA structure.

After creating the system element specifications, you can **edit them to specify additional properties**.

Create the system element specification master data in Folders

1. On the **HOME** page, click **EXPLORER**, and select a folder.
2. Choose **More Commands ... > New ✨ > Add**.
3. In the **Type** list, type **system element**, and select **System Element Specification**.
4. Specify a name (mandatory) and type a description (optional).
5. To add this system element specification, click **Add**.

Create the system element specification master data in the Quality Master Data library

Typically, the Quality Master Data Engineer or the designated user creates the system element specifications master data in the **Quality Master Data** library.

1. On the **HOME** page, click the **QUALITY MASTER DATA** tile.
2. Click the **System Elements** page.
3. Choose **More Commands ... > New ✨ > System Element Specification**.
4. Specify a name (mandatory) and type a description (optional).
5. To add this system element specification, click **Add**.

Specify additional properties of system element representations

You can edit the system element representations to specify additional information and properties. These properties can help you while performing the structure analysis.

1. Open the system element representation for which you want to specify additional information.
2. Click **More Commands ... > Edit ✎ > Start Edit**.
3. Add, update, or modify the following properties of the system element representation.
 - **Name**
 - **Description**
 - **Sequence** - Specify the sequence of the system element representation in the FMEA structure. The default value of the of the **Sequence** property of the first system element that you create is **10**. For the subsequent siblings that you create, the value is automatically populated in

increments of 10. You can edit the value of this property and modify the sequence of system element representations.

- **System Element Type** - Specify the system element type as **Process** or **Design**.
- **System Element Sub-Type** - Specify if the system element subtype is **Operation**, **Storage**, **Test Characteristic**, or **Transportation**. This property available only for the **Process** type of FMEAs.
- **Part/ Material Number** - Specify the part number from the BOM in the FMEA structure.
- **Operation Number** - Specify the operation number from the BOP in the FMEA structure. This property available only for **Process** type of FMEAs: In the process flow chart, the system displays specific icons for the different system element subtypes. Specifying these additional properties can help you easily identify and categorize the types of processes in the process flow chart.

4. Click **More Commands** **...** > **Edit**  > **Save Edits**.


Create the function specifications master data

A *function specification* is a workspace object corresponding to each action associated with a part in the structure. In the context of the example of an air filter assembly of a car, one of the functions of the air filter is providing clean and compressed air to the car engine.

You can create the function specifications master data in **Folders** or in the **Quality Master Data** library. The Quality Engineer—while creating the FMEA structure—can search for and add them to the FMEA structure.

After creating the function specifications, you can **edit them to specify additional properties**.

Create the function specification master data in Folders

1. On the **HOME** page, click **EXPLORER**, and select a folder.
2. Choose **More Commands** **...** > **New**  > **Add**.
3. Type *function specification* in the **Type** list, and select **Function Specification**.
4. Specify a name (mandatory), type a description (optional), and click **Add**.

Create the function specification master data in the Quality Master Data library

A function specification master data consists of parent and child function specifications. To create the master data, you can create a parent function specification and create child function specifications under the parent. You can also drag and drop child function specifications from one parent to another.

1. On the **HOME** page, click the **QUALITY MASTER DATA** tile.

2. Click the **Function Specifications** page.
3. Choose **More Commands ... > New ✨ > Function Specification**.
4. Specify a name (mandatory), type a description (optional), and click the **Add** button.
5. Create a child function specification.
 - a. Select a function specification from the catalog.
 - b. Choose **More Commands ... > New ✨ > Child**.
 - c. Specify a name (mandatory) and type a description (optional).
 - d. To create the child function specification, click **Add**.

Specify additional properties of function representations

You can edit the function representations to specify additional information and properties. These properties can help you while performing the function analysis.

1. Open the function representation for which you want to specify additional information.
2. Choose **More Commands ... > Edit ✎ > Start Edit**.
3. Update or modify the following properties:
 - **Name**
 - **Description**
 - **Sequence** - Specify the sequence of the function specification in the FMEA structure. The default value of the of the **Sequence** property of the first function representation that you create is **10**. For the subsequent siblings that you create, the value is automatically populated in increments of 10. You can edit the value of this property and modify the sequence of function representations.
4. Choose **More Commands ... > Edit ✎ > Save Edits**.

Create a failure specifications catalog

A *failure specification* is a workspace object for predicting potential failures. For example, in the air filter assembly, one of the failures could be the air filter not working due to wear and tear of the filter element.

You can create the system element specifications master data in **Folders** or in the **Quality Master Data** library. The Quality Engineer—while creating the FMEA structure—can search for and add them to the FMEA structure.

After creating the failure specifications, you can **edit them to specify additional properties**.

Create the failure specifications master data in Folders

1. On the **HOME** page, click **EXPLORER**, and select a folder.
2. Choose **More Commands** **...** > **New** **✳** > **Add**.
3. Type *failure specification* in the **Other** filter and select **Failure Specification**.
4. Specify a name (mandatory) and description (optional), and click **Add**.



Create the failure specifications master data in the Quality Master Data Library

The failure specification master data consists of parent and child failure specifications. To create the master data, you can create a parent failure specification and create child failure specifications under the parent. You can also drag and drop child failure specifications from one parent to another.


1. On the **HOME** page, click the **QUALITY MASTER DATA** tile.
2. Click the **Failure Specifications** page.
3. Choose **More Commands** **...** > **New** **✳** > **Failure Specification**.
4. Specify a name (mandatory), type a description (optional), and click **Add**.
5. Create a child failure specification.
 - a. Select a failure specification from the catalog.
 - b. Choose **More Commands** **...** > **New** **✳** > **Child**.
 - c. Specify a name (mandatory) and type a description (optional).
 - d. To create the child failure specification, click **Add**.

Specify additional properties of failure representations

You can edit the failure representations to specify additional information and properties. These properties can help you while performing the failure analysis.

1. Open the failure representation for which you want to specify additional information.
2. Choose **More Commands** **...** > **Edit**  > **Start Edit**.
3. Add, update, or modify the following properties:
 - **Name**
 - **Description**
 - **Sequence** - Specify the sequence of the failure in the FMEA structure. The default value of the of the **Sequence** property of the first failure representation that you create is **10**. For the subsequent siblings that you create, the value is automatically populated in increments of 10. You can edit the value of this property and modify the sequence of failure representations.
4. Choose **More Commands** **...** > **Edit**  > **Save Edits**.

Activate system element, function, or failure specifications

1. On the **HOME** page, click the **QUALITY MASTER DATA** tile.
2. Click the **System Elements, Functions, or Failures** page.
3. Click **Filter**  and under **Status**, select the **View Inactive** check box.
4. Select the specification you want to activate and click **Edit**.

Inactive specifications are displayed in a less opaque color.
5. To activate the specification, select the **Active** check box.
6. Click **Save** to save your changes.

Mark system element, function, or failure specifications as inactive

1. On the **HOME** page, click the **QUALITY MASTER DATA** tile.
2. Click the **System Elements, Functions, or Failures** page.
3. Select the specification you want to inactivate and click **Edit**.
4. To deprecate the specification, clear the **Active** check box.
5. Click **Save** to save your changes.

By default, deprecated specifications are not displayed in the **Quality Master Data** library.

Replace system element, function, or failure specifications from the representation

1. Open the FMEA.
2. In the FMEA tree, select the system element, function, or failure specification that you want to replace.
3. In the **Overview** tab, in the **Specification** table, select the system element, function specification, or failure specification, and click **Replace** ⇄.
4. In the **Replace** panel, select the system element, function specification, or failure specification that you want to replace the existing one with.
5. To update the name of the existing system element, function specification, or failure specification, select the **Update system element name based on selection** check box.

If you do not select this check box, the name of the system element, function specification, or failure specification remains the same, but the name of the associated specification object is updated.

6. Click **Replace**.

Create a version of a system element, function, or failure specification


You can create a version of a released system element, function, and failure specification.

1. On the **Home** page, select the **QUALITY MASTER DATA** tile.
2. Open the system element, function, or failure specification that you want to version.
3. Choose **More Commands** ⋮ > **Manage** ⚙ > **Submit to Workflow**.
4. In the **Submit to Workflow** panel, from the **Template** list, select the **TCM Release Process** template and click **Submit** to release the object.
5. Choose **More Commands** ⋮ > **New** ✨ > **Version**.

Note:

This command is available only when you use the **TCM Release Process** workflow to release the FMEA object.

A new version of the object is created and displayed in the **Overview** tab in edit mode.

6. Modify the name of the new version of the FMEA object and choose **More Commands ... > Edit**  **> Save Edits** to save your changes.

You can view all the versions of the FMEA object in the **History** tab.


View the contextual information of FMEA master data

For system element specifications, function specifications, failure specifications, and quality actions, you can view the related FMEA representations and the context where the master data is used.

Procedure

1. On the **HOME** page, click the **QUALITY MASTER DATA** tile.
2. Click the **System Elements, Functions, Failures, or Quality Actions** page.
3. Select a system element specification, function specification, failure specification, or quality action and click the **Where Used** tab.

Remove system element, function, or failure specifications from the representation

1. Open the FMEA.
2. In the **Overview** tab, in the **Specification** table, select the system element, function specification, or failure specification.
3. Click **Remove** .

The selected object is removed.

Delete a system element, function, or failure specification

1. On the **HOME** page, click the **QUALITY MASTER DATA** tile.
2. Click the **System Elements, Functions, or Failures** page.

3. Select the specification you want to delete.

You cannot delete specifications that have child specifications.

4. Choose **More Commands**  **Edit**  **Delete**.

5. Create an FMEA

About FMEA in Teamcenter

You can use FMEA methodologies to predict different failure modes for a product design or a process at the initial stage itself so that appropriate actions can be taken for preventing them. A failure mode is essentially a cause-effect chain of events that you have not anticipated.

In Teamcenter, you can perform the analysis for the following:

Design FMEA (D-FMEA)

Design FMEA analysis is performed to analyze the various functions, failure modes, and their effects for a new or changed design of a product. The **net views**, **boundary diagrams**, and **interface matrices** help you visualize the hierarchy and detect the dependencies and interface relations between the system element, function, and failure representations in the FMEA structure.

Process FMEA (P-FMEA)

Process FMEA analysis is performed to analyze a process flow and the various stages that a product goes through in new or existing processes. **Process flow charts** show a graphical representation of the processes at the various design stages.

Before you create the FMEA structure, it is recommended that the Quality Master Data Engineer **creates the FMEA master data** in the **Quality Master Data Library** or in **Folders**.

After you create the FMEA structure, you add the various system element, function, and failure representations to it. You can create and add new system element representations to the FMEA structure by searching for the required objects in the **Quality Master Data Library**, or creating them as required. For more information about the various tasks that you can perform to analyze designs and processes, refer to the **FMEA task flow in Teamcenter** topic.

You can view the FMEA data of the system element representation such as failure effects, failure causes, and all other related actions in the **Formsheet view**.


Create an FMEA

You can create an FMEA by independently by creating a hierarchy of system element representations, function representations, and failure representations. Alternatively, you can create an FMEA from an existing bill of materials (BOM) or bill of processes (BOP) or import the FMEA.

After creating the FMEA, you can edit it to change the FMEA guideline that was selected during creation. You cannot change the type (design or process) of the FMEA after creation.

Create an FMEA


You can create the FMEA structure by creating an FMEA first and then creating a hierarchy of system element representations, function representations, and failure representations. When you create the FMEA, you must specify the top-level system element specification for the analysis.

1. On the **Home** page, click **EXPLORER**.
2. Choose **More Commands** **...** > **New**  > **Add**.
3. In the **OTHER** filter, type **FMEA** and select **FMEA**.
4. In the **Add** panel, in **PROPERTIES**, specify the following:
 - a. Specify a name for the FMEA.
 - b. (Optional) Type a description.
 - c. Specify the FMEA guideline for the analysis.
5. In **Root System Element Properties**, specify the following:
 - a. Specify a name for the system element representation.
 - b. (Optional) Type a description.
6. Click **Add**.

The FMEA is created with the system element representation at the root node.

Create FMEA from an existing BOM or BOP

You can create an FMEA from an existing bill of materials (BOM) or bill of processes (BOP).

1. Search for a product structure (BOM) or BOP and open it.
2. To create an FMEA based on the structure opened, choose **More Commands** **...** > **Manage**  > **Generate FMEA Structure**.
3. In the **Generate FMEA** panel, specify a name, select the FMEA guideline type, and click **Generate**.

Note:

If you are generating large FMEA structures, you can select the **Run in Background** check box, to continue running the FMEA generation process in the background. You will receive an alert when the FMEA generation process is complete.

4. From the **Home** folder, open the FMEA.

The FMEA structure opens in the tree view.

The system element name of the generated FMEA is the same as that of the product structure.

Import an FMEA

1. On the **Home** page, click **EXPLORER**.
2. Choose **More Commands ... > New ✨ > Import FMEA**.
3. In the **Import FMEA** panel, click **Choose File** and browse to select the file that you want to import.

You can import XML files only in the MSR format.

4. From the **FMEA Guidelines** list, select the required guideline.
5. Click **Import**.

The FMEA is imported in the specified folder.

Specify the category of an FMEA



After you create the FMEA, you can edit the FMEA properties and specify the FMEA category. You can specify the FMEA as master, variant, or generic.

1. Open the FMEA for which you want to specify the category.
2. Choose **More Commands ... > Edit ✎ > Summary**.
3. In the **Overview** tab, from the **FMEA Category** list, select **Master**, **Generic**, or **Variant**.

To create a variant of an FMEA, you must specify it as a **Master** FMEA.

4. Click **More Commands ... > Edit ✎ > Save Edits** to save your changes.

Copy an FMEA

1. Open the FMEA structure that you want to copy.
2. Choose **More Commands**  **> New**  **> Save As**.
3. In the **Save As** panel, modify the current name, description, and FMEA guideline object if required.
4. Specify if you want to copy the cross-functional team.
5. Click **Save**.

A copy of the FMEA structure is created in the **Newstuff** folder with a copy of all system elements, function representations, and failure representations (along with all the relations of cause and effect) and actions under it.

- All the representations and the FMEA structure are created with version 1.
- All the actions are created with the same status as that of the parent FMEA.
- If the failure cause or effect in the source FMEA is a failure specification, then a new relation is created with the copy of failure mode inside the new FMEA.
- If the next higher-level or lower-level function in the source FMEA is a function specification, then a new relation is created with the copy of the function mode inside the new FMEA.
- Inspection definitions and requirements linked to the selected FMEA structure are also linked to newly created FMEA structure.
- If the parent FMEA was generated from an item structure, the copy is also linked to the item structure. The configuration of the FMEA refers to the configuration of the parent FMEA and not to the global configuration of the item structure.

Create a link between FMEAs

About linking FMEAs

You can link different design or process FMEAs. This helps you to connect FMEA structures or processes that are related to each other.

When you link FMEAs, you can create a link to an FMEA at a higher or lower level of the current FMEA.

A  icon next to the FMEA name indicates that the FMEA is linked to other FMEAs.

While saving linked FMEAs, you can carry forward any existing linkages of the current FMEA. To do this, in the **Save As** panel, make sure that you select the **Include FMEA Linkages** check box.

The FMEA linkages are retained when you create a variant of an FMEA, release an FMEA, or import or export an FMEA that is linked.

Note:

- You cannot create circular linkages between FMEAs.
- You cannot link FMEAs that are already in the released state.
- When you release an FMEA, and if it is linked to another FMEA, each FMEA must be released independently.

The screenshot displays the Siemens Teamcenter interface for an FMEA. The main window title is 'Air Intake System Design FMEA V2'. The left sidebar shows a tree view of the FMEA structure, including 'Air Intake System Design FMEA V2', 'Air Intake System', 'Supply Clean and compress the ambient air', 'CR F1', 'Connecting Hose', 'Turbocharger', 'Intake Snorkel', 'Air Filter Assembly', 'Intake Manifold', and 'External Failures'. The right pane shows the 'FMEA Linkages' tab, which displays a diagram of the linkage between the current FMEA and a linked FMEA (FMEA-00000016). The linked FMEA is shown below the current FMEA, with a yellow arrow pointing from the current FMEA to the linked FMEA. The linked FMEA details include 'Owner: Engineer,Ed (ed)' and 'Date Modified: 24-Apr-2024 10:52'.

Create a link between related FMEAs

You can create a link between design or process FMEAs and connect FMEA structures or processes that are related to each other.

Procedure

1. Open the FMEA that you want to link to another design or process FMEA.

2. Access the **Create FMEA Linkages** command in any one of the following ways:
 - Click the **FMEA Linkages** tab, and click **Create FMEA Linkages** ⊕.
 - In the FMEA tree view, click **Add > Create FMEA Linkages** ⊕.
 - In the FMEA tree view, right-click the FMEA root node and choose **Create FMEA Linkages** ⊕.
 - Choose **More Commands** ⋮ > **New** ✨ > **Create FMEA Linkages** ⊕.
3. In the **Create FMEA Linkage** panel, in the **Input** list, specify if you want to search for a design or process FMEA, or both.

If you do not specify any filters, a list of all the FMEAs is available for selection.

4. Click **Search** to view the search results.
5. To specify whether you want to link the FMEA as a parent or a child of the current FMEA, select **Higher Level** or **Lower Level**.
6. Select an FMEA from the search results.

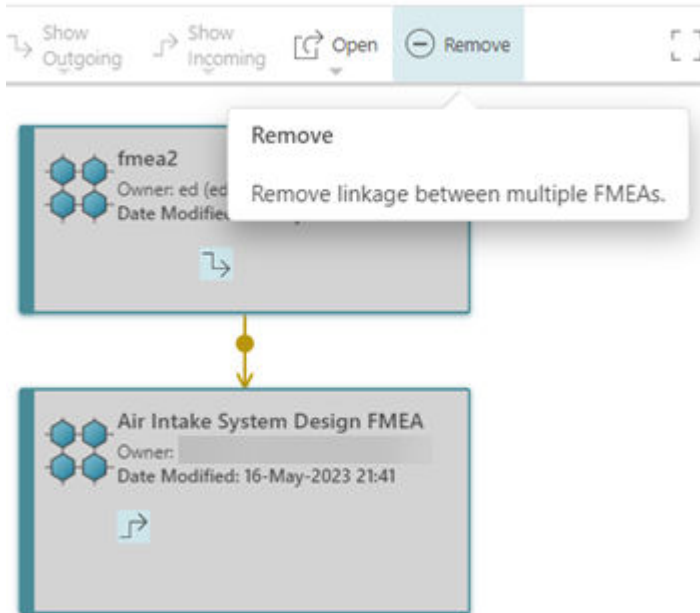
You can select multiple FMEAs to link.

7. Click **Create**.

The **FMEA Linkages** tab shows all the FMEAs linked to the current FMEA.

The link  icon next to the FMEA name indicates that the FMEA is linked to other FMEAs.

To delete the linkages between the FMEAs, click on the link between the FMEAs tile and click **Remove**.



Create variants of an FMEA structure

About FMEA variants

After you create an FMEA structure, you can use that FMEA as a reference and a new variant with a few modifications. To do this, you must first specify an FMEA as a master FMEA. For more information about how to specify an FMEA as a master FMEA, see [Specify the category of an FMEA](#).

While creating the variant, you can select the objects that you want to include in the variant FMEA. This reduces the time required to create an FMEA that is based on an existing FMEA. For example, PFMEA's for different plants, DFMEA's for different parts which have common components, and so on.

Consider an air filter assembly. Since the overall purpose, design, and failure modes of the an air filter of all car models is the same, you can create and categorize it's FMEA structure as a master FMEA and release it. You can then create variants of this master air filter assembly FMEA structure by selecting the objects that are relevant for a specific car model.

You can also compare the structures and properties of the master FMEA and the variant FMEA or vice versa. After studying the differences, you can align the source and the target FMEA structures as required. This helps you to incorporate learnings and update the master FMEAs with issues identified in the variant FMEAs and vice versa.

In the case of the master FMEA structure of the air filter assembly and its variant, while analyzing the master or the variant, if you come across any risks or issues that are applicable to both, you can compare the structures and study the similarities and differences. You can then align the master FMEA with the variant FMEA or vice-versa, to carry forward the required issues and failure modes.

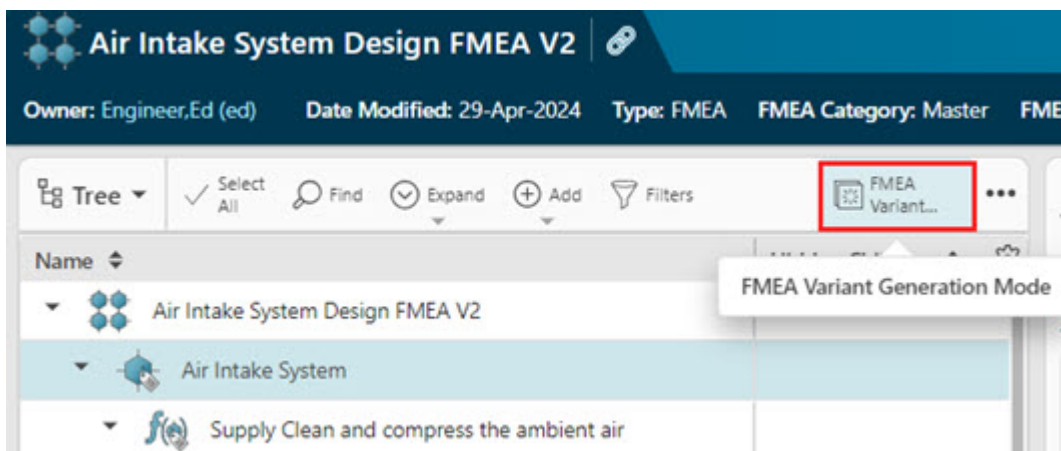
Creating, comparing, and aligning FMEAs can help you to build a knowledge database within a company by transferring knowledge between all FMEAs.

Create variants of a master FMEA

You can create a variants of released **FMEAs whose category is set to Master**.

You can specify the FMEA properties that you want to include or reset in the FMEA variant, using the configuration file.

1. Open the master FMEA.
2. Click **FMEA Variant Generation Mode**.



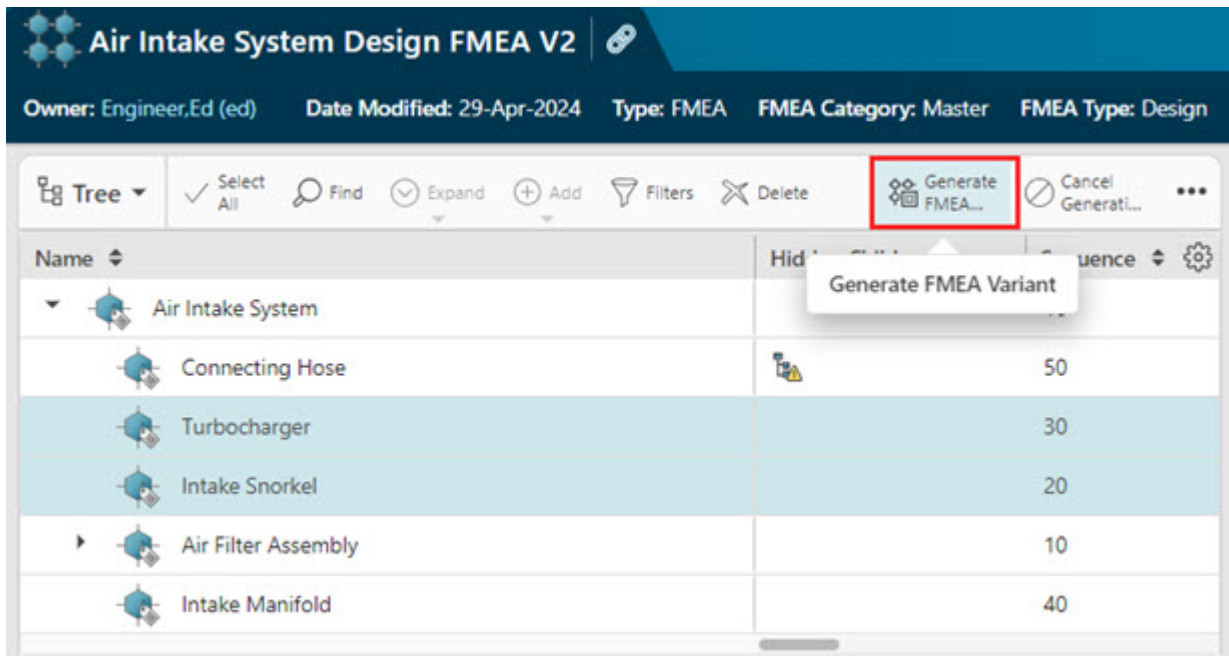
The FMEA tree structure changes to system element view.

3. Select the system elements that you want to include in the variant.

Name	Release Stat
Air Intake System	<input type="checkbox"/>
Air Filter Assembly	<input checked="" type="checkbox"/>
Intake Snorkel	<input type="checkbox"/>
Intake Manifold	<input type="checkbox"/>
Turbocharger	<input type="checkbox"/>
Connecting Hose	<input type="checkbox"/>

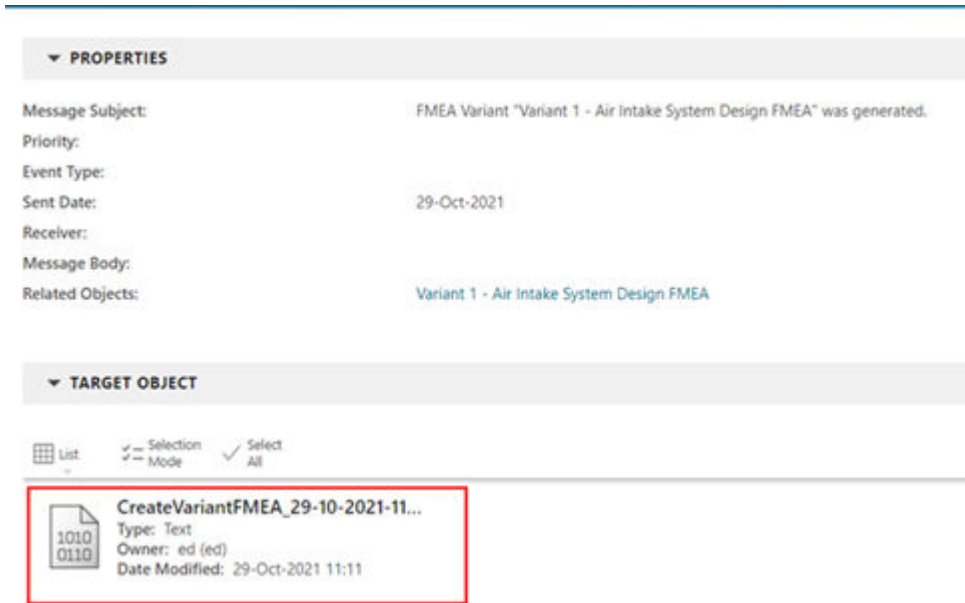
If you select a parent, the child elements are not selected automatically. However, if you select a child the parents are automatically considered while creating the variant.

4. Click **Generate Variant FMEA**.

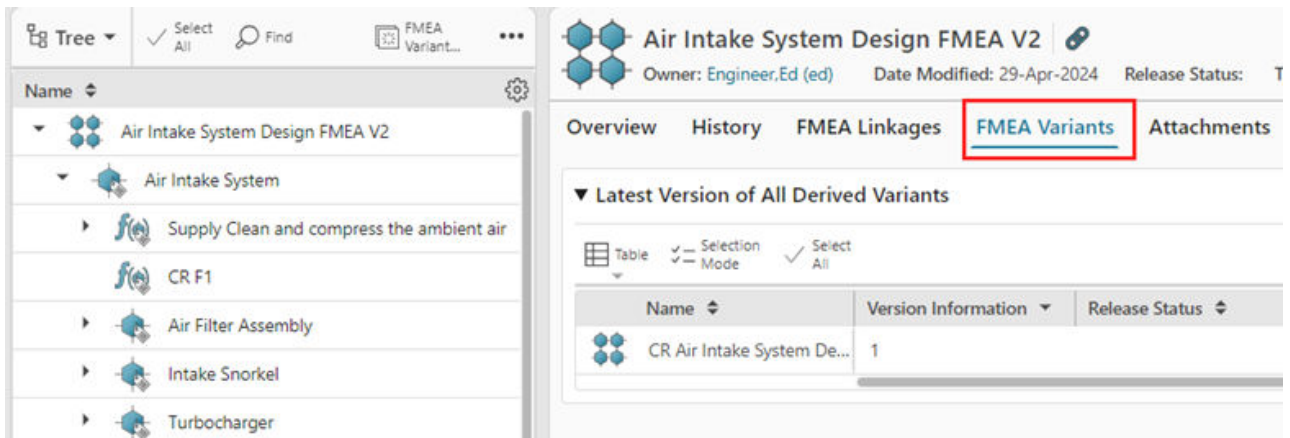


5. In the **Generate FMEA Variant** panel, specify the **Name** and **Description** of the FMEA variant.
6. Select the **Run in Background** check box to continue running the FMEA variant generation process in the background. You will receive an alert when the FMEA variant generation process is complete.
7. Click **Generate**.

You receive an alert when the variant FMEA is created. When you open the object in the notification, in the **Target Object** section, the logs file contains information about the status of the FMEA variant creation (partially created, successfully created, or not created).



You can view all the derived variants in the **FMEA Variants** tab of the master FMEA.



Compare and align FMEA structures

After creating a variant FMEA, if you update the variant FMEA, or create a new version of the master FMEA, you can do the following:


- Compare and align the variant FMEA with the master FMEA
- Compare and align the master FMEA with the variant FMEA

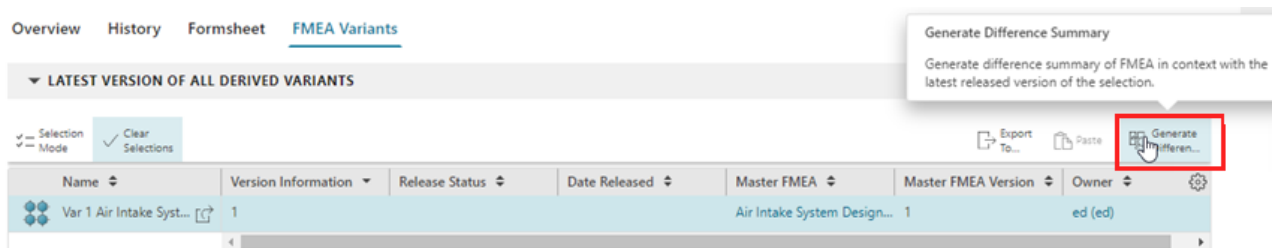
After comparing the **differences** of the FMEA structures, you can align the FMEA structures.

Compare and align the variant FMEA with the master FMEA

1. Open the master FMEA object.
2. Click the **FMEA Variants** tab.

All the variants of the FMEA that are derived from the master FMEA are displayed in the **FMEA Variants** tab.

3. In the **Latest version of all derived variants** section, select the variant that you want to compare with the master FMEA.
4. Click **Generate Difference Summary** .



To specify if you want to generate the difference summary report asynchronously, in the message box, click **Generate in Background**.

In the **Alerts** tab, you receive a notification when the difference summary is generated.



5. Open the difference summary object.
6. In the **Target Object** section, open the difference summary.

The difference summary of "Air Intake System Design FMEA" with "Var 1 Air Intake System Design FMEA" was generated.

PROPERTIES

Message Subject: The difference summary of "Air Intake System Design FMEA" with "Var 1 Air Intake System Design FMEA" was generated.
 Priority:
 Event Type:
 Sent Date: 29-Oct-2021
 Receiver: Ratnakar, Saurabh (saurabh)
 Message Body: Air Intake System Design FMEA
 Related Objects: Air Intake System Design FMEA

TARGET OBJECT

List Selection Mode Select All

	FMEA-Compare-0000002 Owner: ed (ed) Date Modified: 28-Oct-2021 13:26
--	---

The comparison of the source and target FMEA objects is displayed.

The source FMEA is the latest released version of the FMEA that you select in the **Latest version of all derived variants** table that you want to compare with the master FMEA. The target FMEA is the master FMEA that you used as reference to create the variant.


FMEA-Compare-0000002/Difference summary of source and target FMEA

Source FMEA: Var 1 Air Intake System Design FMEA Target FMEA: Air Intake System Design FMEA

Difference Type	Name	Context	Description	ID
Structure Modified	Air Intake System	Air Intake System Design FMEA		SE-REP-000000001
Structure Modified	Clean and compress the ambi...	Air Intake System Design FMEA		FUN-REP-000000001
Structure Modified	Air Filter Assembly	Air Intake System Design FMEA		SE-REP-000000002
Structure Modified	Intake Snorkel	Air Intake System Design FMEA		SE-REP-000000008
Structure Modified	Intake Manifold	Air Intake System Design FMEA		SE-REP-000000007
Structure Modified	Connecting Hose	Air Intake System Design FMEA		SE-REP-000000006

The difference summary is also available in the **History** tab.

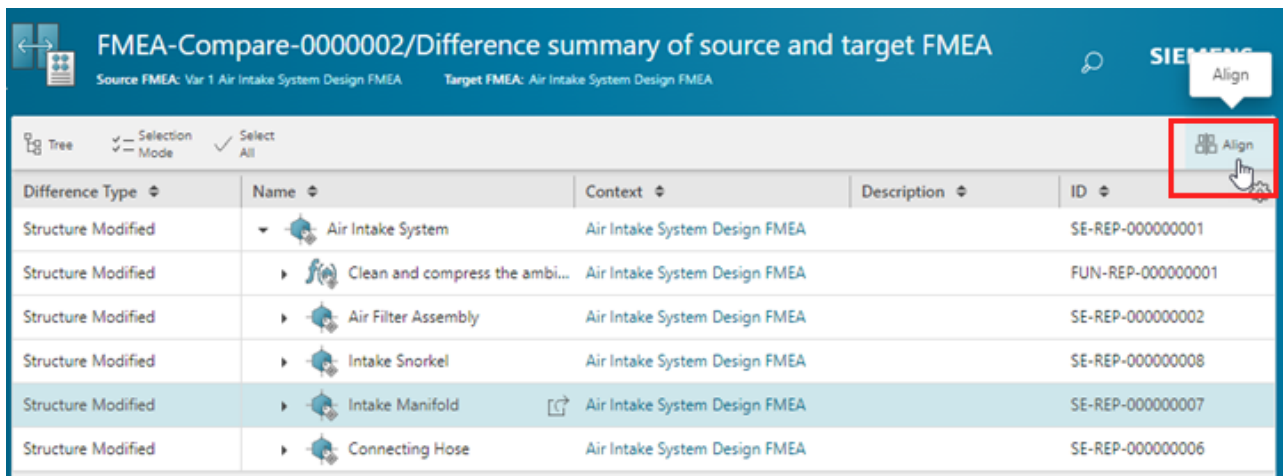
Based on the changes in the FMEA structures listed in the difference summary, you can align the FMEA structures as required. To know more about the *types of differences* listed in the difference summary and their resolutions after alignment, see [FMEA comparison difference types](#).

7. To align the source FMEA with the target FMEA, in the difference summary, select the row corresponding to the difference that you want to align with the target FMEA.
8. Click **Align** .

To align an object that has children, make sure that you expand the structure and select the child objects.

Note:

You cannot align target objects that are released. To align a released master FMEA with the variant, you must first create a version of the master FMEA.

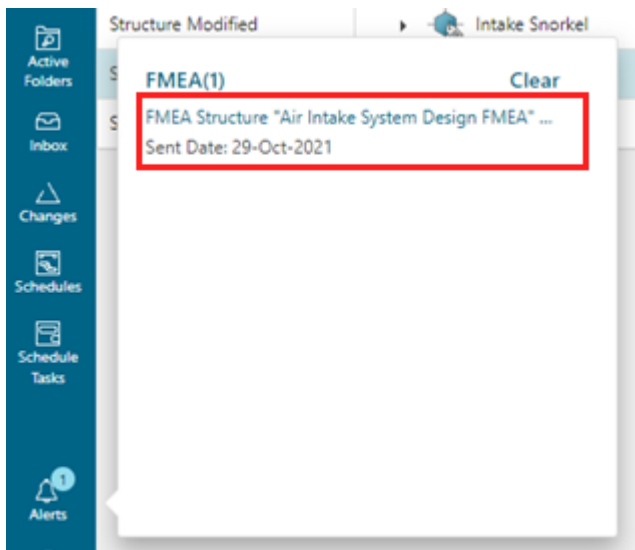


FMEA-Compare-0000002/Difference summary of source and target FMEA

Source FMEA: Var 1 Air Intake System Design FMEA Target FMEA: Air Intake System Design FMEA

Difference Type	Name	Context	Description	ID
Structure Modified	Air Intake System	Air Intake System Design FMEA		SE-REP-000000001
Structure Modified	Clean and compress the ambi...	Air Intake System Design FMEA		FUN-REP-000000001
Structure Modified	Air Filter Assembly	Air Intake System Design FMEA		SE-REP-000000002
Structure Modified	Intake Snorkel	Air Intake System Design FMEA		SE-REP-000000008
Structure Modified	Intake Manifold	Air Intake System Design FMEA		SE-REP-000000007
Structure Modified	Connecting Hose	Air Intake System Design FMEA		SE-REP-000000006

In the **Alerts** tab, you receive a notification that displays the status of the alignment.



Structure Modified Intake Snorkel

FMEA(1) Clear

FMEA Structure "Air Intake System Design FMEA" ...

Sent Date: 29-Oct-2021

You can open the log file to view details about the alignment.

1010
0110

FMEA Structure " Air Intake System Design FMEA" was aligned with Structure

▼ **PROPERTIES**

Message Subject: FMEA Structure "Air Intake System Design FMEA" was aligned with Structure "Var 1 Air
 Priority:
 Event Type:
 Sent Date: 29-Oct-2021
 Receiver:
 Message Body:
 Related Objects: Air Intake System Design FMEA

▼ **TARGET OBJECT**

List Selection Mode Select All

1010
0110

AlignFMEAStructure_29-10-2021-...
 Type: Text
 Owner: ed (ed)
 Date Modified: 29-Oct-2021 11:21

Compare and align the master FMEA with the variant FMEA

1. Open the variant FMEA object.
2. In the **Overview** tab, the **MASTER TEMPLATE** section displays the information about the latest version of the master FMEA that was used as reference to create the variant.

Tree with Summary Select All FMEA Variant...

Name

- External Failures
- Air Intake System


Overview History Formsheet FMEA Variants

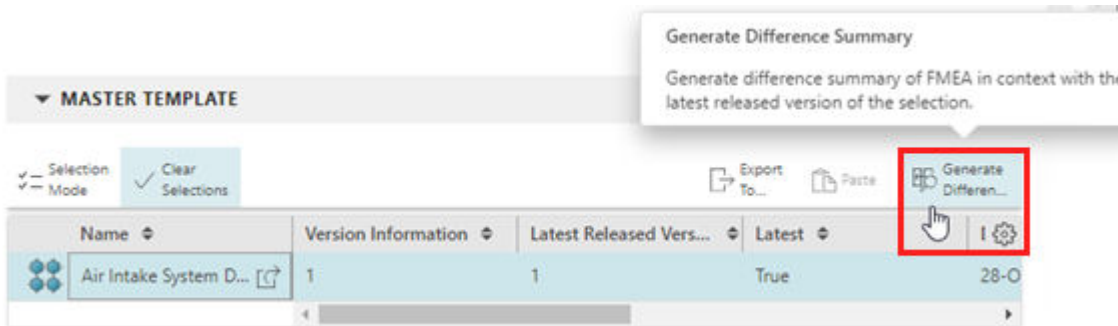
Creation Date: 28-Oct-2021
 Engineering/Manufacturing Location: Pune
 Confidentiality Level: Business Use

▼ **MASTER TEMPLATE**

Selection Mode Select All Export To... Paste Generate Differen...

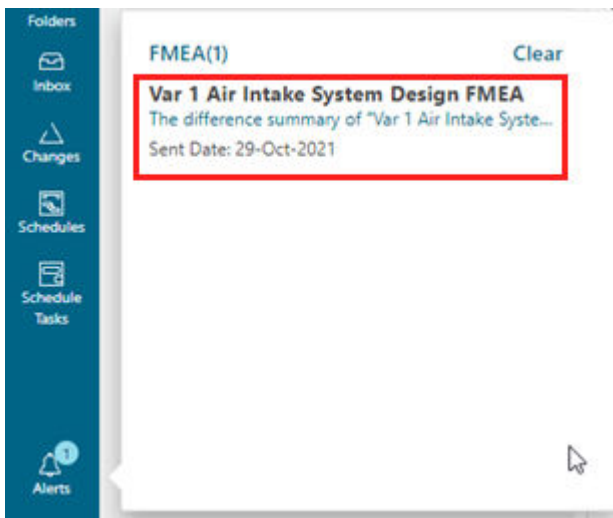
Name	Version Information	Latest Released Vers...	Latest	
Air Intake System Design...	1	1	True	28-C

- In the **Master Template** table, select the master FMEA and click **Generate Difference Summary** .



To specify if you want to generate the difference summary report asynchronously, in the message box, click **Generate in Background**.

In the **Alerts** tab, you receive a notification when the difference summary is generated.



- Open the difference summary object.
- In the **Target Object** section, open the difference summary.

The difference summary of "Var 1 Air Intake System Design FMEA" with "Air Intake System Design FMEA" was generated.

PROPERTIES

Message Subject: The difference summary of "Var 1 Air Intake System Design FMEA" with "Air Intake System Design FMEA" was generated.
 Priority:
 Event Type:
 Sent Date: 29-Oct-2021
 Receiver: Ratnakar, Saurabh (saurabh)
 Message Body:
 Related Objects: Var 1 Air Intake System Design FMEA

TARGET OBJECT

List Selection Mode Select All Export To...

FMEA-Compare-0000001
 Owner: ed (ed)
 Date Modified: 29-Oct-2021 11:21

The comparison of the source and target FMEA objects is displayed.

The source FMEA is the master FMEA that you select in the **Master Template** table that you want to compare with the variant FMEA. The target FMEA is the variant FMEA.

FMEA-Compare-0000001/Difference summary of source and target FMEA

Source FMEA: Air Intake System Design FMEA Target FMEA: Var 1 Air Intake System Design FMEA

Tree Selection Mode Select All Align

Difference Type	Name	Context	Description	ID
Structure Modified	Air Intake System	Var 1 Air Intake System Design FMEA		SE-REP-000000017
Structure Modified	Clean and compress the ambi...	Var 1 Air Intake System Design FMEA		FUN-REP-000000001
Structure Modified	Intake Manifold	Var 1 Air Intake System Design FMEA		SE-REP-000000018
Structure Modified	Connecting Hose	Var 1 Air Intake System Design FMEA		SE-REP-000000019
Structure Modified	Air Filter Assembly	Var 1 Air Intake System Design FMEA		SE-REP-000000021
Structure Modified	Intake Snorkel	Var 1 Air Intake System Design FMEA		SE-REP-000000022

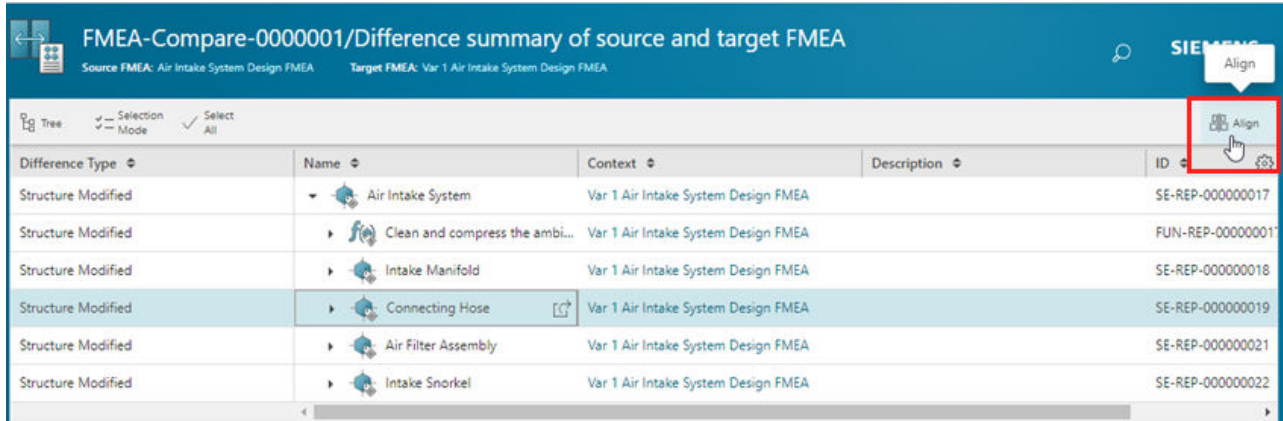
The difference summary is also available in the **History** tab.

Based on the changes in the FMEA structures listed in the difference summary, you can align the FMEA structures as required. To know more about the difference types listed in the difference summary and their resolutions after alignment, see [FMEA comparison difference types](#).

- To align the source FMEA with the target FMEA, in the summary report, select the row corresponding to the difference that you want to align with the target FMEA.

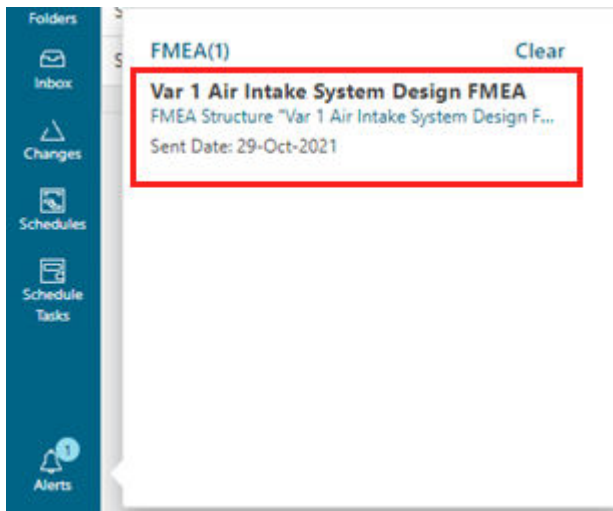
7. Click **Align** .

To align an object that has children, make sure that you expand the structure and select the child objects.

**Note:**

You cannot align target objects that are released. To align a released master FMEA with the variant, you must first create a version of the master FMEA.

In the **Alerts** tab, a notification displays the status of the alignment.



You can open the log file to view details about the alignment.



FMEA comparison difference types

After comparing the changes in the FMEA structures listed in the difference summary, you can **align the FMEA structures**.

The following table specifies the difference types listed in the report and their resolutions after alignment.

Difference type	Description	Resolution after alignment
Structure modified	<p>The structure of the source FMEA is modified. Therefore, the structure of the target FMEA is not the same as that of the source FMEA.</p> <p>For example, if you add or remove the existing system elements, functions and its related higher or lower functions, or failures and the related causes and effects of the source FMEA, the difference summary will show these changes as Structure modified.</p>	The structure of the target FMEA is updated to align the target FMEA with the source FMEA.
Structure and property modified	<p>The structure and properties of the source FMEA are modified. Therefore, the structure and properties of the target FMEA are not the same as that of the source FMEA.</p> <p>For example, if you add or remove the existing system elements, functions and its related higher or lower functions, or failures and the related causes and effects of the source FMEA, or update the name and description of the source FMEA, the difference summary shows these changes as Structure and property modified.</p>	The structure and properties of the selected objects in the target FMEA are updated to align the target FMEA with the source FMEA.

Difference type	Description	Resolution after alignment
Property modified	<p>A property of the source FMEA is modified, so the properties of the target FMEA are not the same as that of the source FMEA.</p> <p>For example, if you modify the name and description of the source FMEA, the difference summary shows these changes as Property modified.</p>	<p>The modified properties of the target FMEA are copied from the source FMEA to align the target FMEA with the target FMEA.</p>
Missing in Target	<p>Objects that exist in the source FMEA are missing in the target FMEA.</p> <p>For example, if you delete objects in the target FMEA, or add new objects in the source FMEA, or while creating the variant you do not select some objects in the source FMEA, the difference summary shows such changes as Missing in target.</p>	<p>The objects missing in the target FMEA are created to align the target FMEA with the source FMEA.</p>
Exist only in Target	<p>Objects that exist in the target FMEA are missing in the source FMEA.</p> <p>For example, delete objects in the target FMEA, or add new objects in the source FMEA, the difference summary shows such changes as Exist only in Target.</p>	<p>The objects that exist only in the target FMEA are deleted to align the target FMEA with the source FMEA.</p>

6. Create the cross-functional team

Specify users responsible for creating and modifying the FMEA

After you create an FMEA, you must specify the users who are responsible for creating the FMEA structure, specifying the functions, failure causes and effects, and the initial and revised prevention and detection actions. You also specify the stakeholders who will review and approve the FMEA.

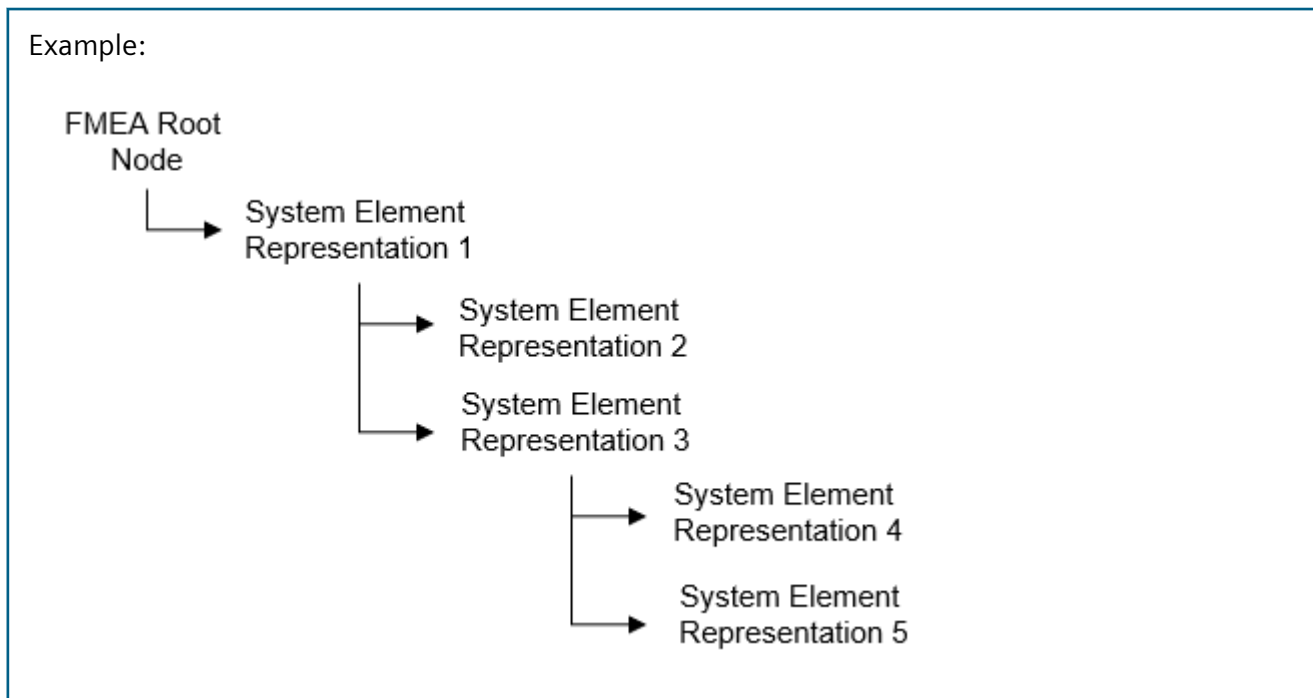
1. Open the FMEA.
2. In the **Overview** tab, in the **Cross-Functional Team** section, click **Add to** ⊕.
3. In the **Add** panel, select the relevant group and role, select the users, and click the **Add** button.

After you create the cross-functional team, you can **create the FMEA structure using system elements and perform the structure analysis**.

7. Perform the structure analysis

About structure analysis of an FMEA

After you specify the scope of the FMEA and the cross-functional team, you can perform the structural analysis of the FMEA. To do this, you identify the different components within the assembly of a design FMEA, or the logical hierarchical steps of a process FMEA, and add them as system element representations to the FMEA. To create the FMEA structure, you can add child system element representations or functions under the system element as required.




You can perform the structure analysis using any of the following methods:

- **Create boundary diagrams for design FMEAs.**
- **Create the Interface matrix for design FMEAs.**
- **Create process flow charts for process FMEAs.**

Create the structural representation of the FMEA

To perform the structural analysis of the FMEA that you are analyzing, you identify the different components within the assembly of a design FMEA, or the logical hierarchical steps of a process FMEA, and add them as system element representations to the FMEA.

1. Open the FMEA.

2. Choose **More Commands** **...** > **New**  > **Child**.
3. In the **Search** tab, a list of the system element specifications is displayed. You can filter the list by typing the name of the system element and select the system element.
4. Select a system element representation.
5. To include the system element, click **Add**.
6. If the required system element specification is not available, click the **New** tab, and specify the name and description to create a new system element representation.

You can add child system element representation under a system element representation as required.

While creating a new system element representation, if you retain the **Create and link its master data** check box selection, the system element representation that you create specific to the FMEA is created as a specification at the highest level in the **Quality Master Data** library.

After creating the FMEA structure, you can **perform the function analysis** where you specify the functions of the different components in the FMEA structure and their requirements and characteristics.

Using boundary diagrams for structure analysis of design FMEAs

About boundary diagrams for design FMEAs

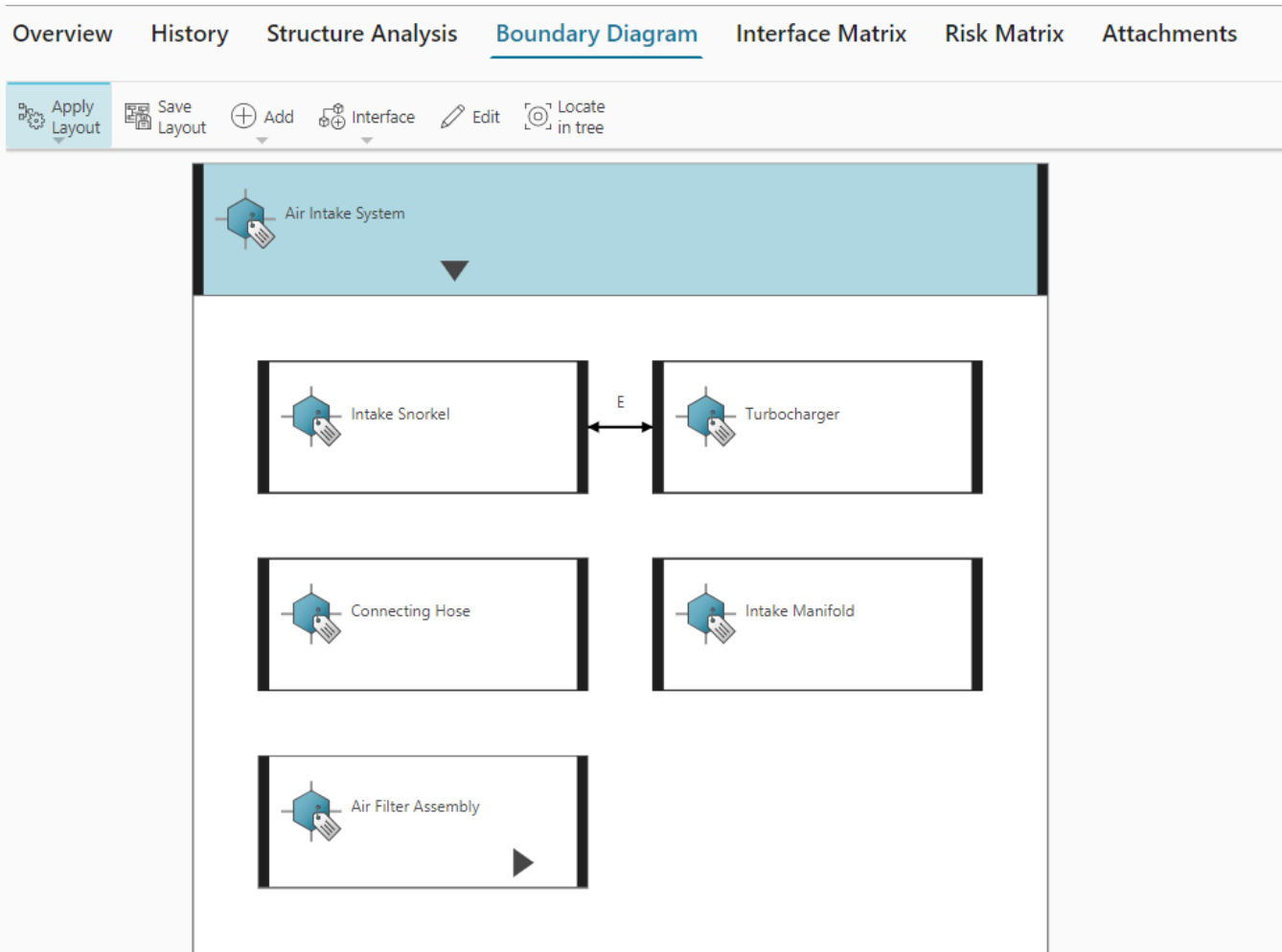
A *boundary diagram* is a graphical tool that facilitates the brainstorming and structure analysis of the system under consideration. You can add, edit, or delete system element representations in the boundary diagram.

You can create the following types of interface between the various system elements:

- **P** - Indicates a physical connection between the system elements. For example, the system elements can be welded, bolted, or clamped.
- **E** - Indicates that energy is transferred between the system elements. For example, there is force or heat exchanged between the system elements.
- **I** - Indicates that information is transferred between the system elements. For example, ECU, sensors, or signals, can be transferred between the system elements.
- **M** - Indicates that material is exchanged between the system elements. For example, cooling fluid, or exhaust gases, can be exchanged between the system elements.
- **D** - Indicates that data is exchanged between the system elements. For example, data transfer between a USB drive and a computer.

- **H - Human-Machine:** Indicates a human-machine interaction where data is exchanged between humans and machines.


The systems, sub-systems, and components are represented by boxes and you can connect them using arrows which represents their interaction. The boundary diagram helps you in performing the structure analysis of the system and connect it using interfaces.



Add system element representations in the boundary diagram

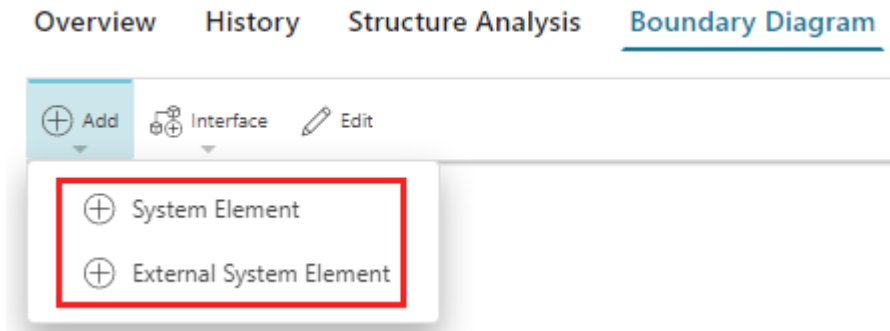
You can add system element representations to the FMEA boundary diagram.

Procedure

1. Select the system element representation in the FMEA tree structure and choose **More Commands** **...** > **Manage**  > **Show Boundary Diagram**.
2. Click the **Boundary Diagram** tab.

A visual representation of the FMEA structure is displayed.

3. Select a system element in the boundary diagram, on the top toolbar, click **Add** and choose **System Element** or **External System Element** as relevant.




4. In the **Create** panel, do one of the following:
 - Search for an existing system element.
 - Click the **New** tab, specify the name for the system element representation, and click **Create** to create it.

The system element representation is added as a child to the existing system element representation.


Specify interfaces between the system elements in the boundary diagram

After you add system element representations in the boundary diagram, you can specify the interface types between them.


Procedure

1. Open the FMEA object.
2. Select the root node of the FMEA in the tree structure and choose **More Commands ... > Manage**  **> Show Boundary Diagram**.
3. In the **Boundary Diagram** tab, click **Interface**, and select the required connection type from one of the following:
 - **One Way Direct**
 - **Two Way Direct**
 - **One Way Indirect**

- **Two Way Indirect**

4. Select the system element representation from which you want to create the interface connection.
5. Drag to select the second system element representation that you want to connect to.
6. Click **Exit Interface** after you have created the required connections.
7. To specify the interface type, click **Edit** to edit the boundary diagram.
8. Select the connection between the system elements and click **Edit Interface** .
9. In the **Edit Interface** panel, select the required **Interface Type** option from the list.

You can also modify the **Interface Type Value**, **Interface Details**, **Connection Type**, or **Interaction Type**.



10. Click **Save** to save your changes.
11. Click **Save Edits**  to save the changes to the boundary diagram.

Modify the properties of system element representations or interface connections in the boundary diagram


After you add the system element representations and specify the interface relation types, you can edit the interface connections, delete a system element representations, or modify its properties in the boundary diagram.


You can do the following:

Edit the properties of system element representations in the boundary diagram


1. Select the system element representation and click **Edit** .
2. Modify the properties as required.
3. Click **Save Edits** .

Edit the interface type between the system element representations

1. Select the connection between the two system element blocks and click **Edit Interface** .
2. In the **Edit Interface** panel, modify the required options.
3. Click **Save** to save your changes.

- Click **Save Edits**  to save the changes to the boundary diagram.

Delete a system element representation in the boundary diagram

To delete a system element representation in the boundary diagram, select it and click **Delete** .

Using the interface matrix to perform structure analysis of design FMEAs

About the FMEA interface matrix

An *interface matrix* provides additional inputs for system or subsystem FMEAs.

In Teamcenter, depending on the scope of the FMEA, the interface matrix table shows the subsystems and the components in the columns and rows of a table. This representation helps you to identify the interfaces and their types that must be considered while performing the structure analysis.

You can specify the following types of interfaces between the various system elements:

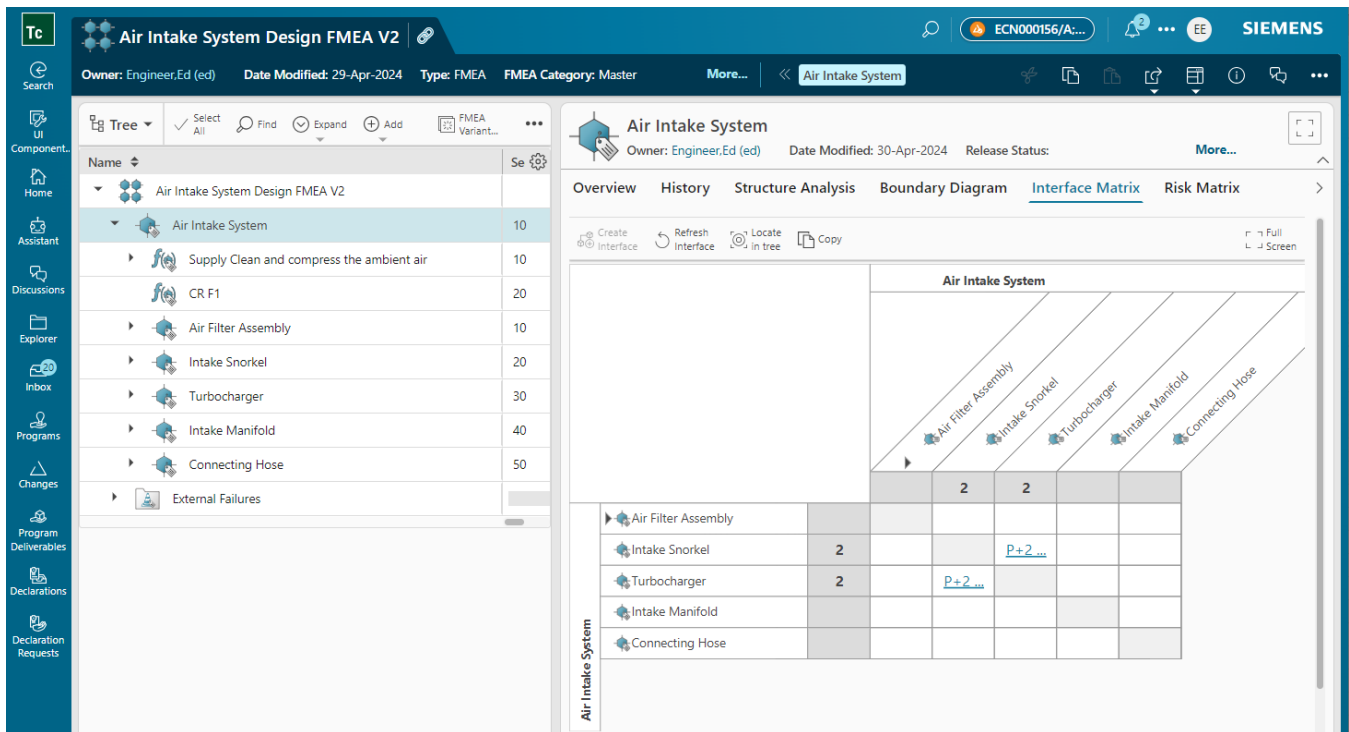
- **D - Data Exchange:** Indicates that data is exchanged between the system elements. An example of this is data transfer between a USB drive and a computer.
- **E - Energy Transfer:** Indicates that energy is transferred between the system elements. For example, there is force or heat exchanged between the system elements.
- **I - Information Transfer:** Indicates that information is transferred between the system elements. For example, ECU, sensors, or signals, can be transferred between the system elements.
- **M - Material Transfer:** Indicates that material is exchanged between the system elements. For example, cooling fluid, or exhaust gases, can be exchanged between the system elements.
- **P - Physical Connection:** Indicates a physical connection between the system elements. For example, the system elements can be welded, bolted, or clamped.
- **H - Human-Machine:** Indicates a human-machine interaction where data is exchanged between humans and machines.

Creating an interface matrix ensures that all the types of interfaces are included in the FMEA. The functions of the FMEA include all the identified interfaces. Each interface in the FMEA boundary diagram and the FMEA interface matrix has a one-to-one linkage to a corresponding function in the design FMEA.

In the interface matrix, you can:

- Create or add system elements at the same hierarchical level as siblings and the subsequent level as children.

- Edit or delete the existing system elements and their properties.
- Change the order of the system elements (based on the sequence numbers).
- Add, edit, or delete the interface type between the system elements.



Add system elements in the interface matrix

You can add system element representations in the interface matrix table of the FMEA.

Procedure


1. Open the FMEA object.
2. Select the system element representation in the FMEA tree structure and choose **More Commands** **...** > **Manage** **✎** > **Show Interface Matrix**.
3. Click the **Interface Matrix** tab.
4. Select the root node of the FMEA in the interface matrix table and click **New** > **Child**.
5. In the **Create** panel, do one of the following:
 - a. Click **New** to create and add a new system element.

- b. Search for the required system element.
6. Click **Add** or **Create**.

Specify the interface type between the system elements in the interface matrix

After you add the system elements to the FMEA structure, in the interface matrix, you can specify the interface type between two system elements. You can create multiple interface types between two system elements if required.

Procedure

1. Open the FMEA object.
2. Select the root node of the FMEA in the tree structure and choose **More Commands ... > Manage**  **> Show Interface Matrix**.
3. In the **Interface Matrix** tab, in the table, select any cell that corresponds to the intersection of the row and column of the system element representations between which you want to specify the interface type.

The direction of the interaction is created from the selected row to the selected column.

4. Click **Create Interface** .

Overview History Structure Analysis Boundary Diagram **Interface Matrix** Risk Matrix

Create Interface Refresh Interface Locate in tree Copy Full Screen

		Air Intake System				
		Air Filter Assembly	Intake Snorkel	Turbocharger	Intake Manifold	Connecting Hose
Air Intake System	Air Filter Assembly					
	Intake Snorkel	2		P+2...		
	Turbocharger	2	P+2...			
	Intake Manifold					
	Connecting Hose					

In the **Create Interface** panel, verify the primary and secondary system elements.

5. In **Properties**, select the required function type from the **Interface Type** list.

- **D - Data Exchange**
- **E - Energy Transfer**
- **I - Information Transfer**
- **M - Material Exchange**
- **P - Physical Connection**
- **H - Human-Machine**

6. Specify the **Interface Type Value**.

You can specify the following values:

- +2 - Indicates that the interaction is necessary for the functionality.
 - +1 - Indicates that the interaction is beneficial, but not necessary for the functionality.
 - 0 - Indicates that the interaction does not affect the functionality.
 - -1 - Indicates that the interaction causes negative effects on the functionality but does not prevent it
 - -2 - Indicates that the interaction must be prevented to achieve the required functionality.
7. In the **Interface Details** box, enter any additional information that you want to specify.
 8. Specify the **Connection Type** as **Direct** or **Indirect**.
 9. Specify the **Interaction Direction** as **Two Way** or **One Way**.


For one way interactions, the direction of the interaction is created from the selected row to the selected column.

10. Click **Create**.

Modify the system element connections and interface types in the interface matrix


You can edit the system element connections and interface types in the interface matrix.

Procedure

1. Open the FMEA object.
2. Select the system element representation in the FMEA tree structure and **More Commands ... > Manage**  **> Show Interface Matrix**.
3. In the **Interface Matrix** tab, in the interface matrix table, select a cell that corresponds to the primary system element whose interface you want to edit.

		Air Intake System					
			Air Filter Assembly	Intake Snorkel	Turbocharger	Intake Manifold	Connecting Hose
Air Intake System	Air Filter Assembly						
	Intake Snorkel	2		P+2...			
	Turbocharger	2		P+2...			
	Intake Manifold						
	Connecting Hose						

A table that lists the system element is displayed.

- Select the system element row in the table, and click **Edit Interface** .


Primary System Element	Secondary System Element	Interface Type
Intake Snorkel	Turbocharger	P
Intake Snorkel	Turbocharger	M

- In the **Edit Interface** panel, modify the properties as required.
- Click **Save**.

Delete system element representations in the interface matrix

You can delete the system element representations in the interface matrix. You can also delete multiple interface types specified between the system elements.

Procedure

- Open the FMEA and click the **Interface Matrix** tab.
- Select the row corresponding to the primary system element in the interface matrix table and click **Delete** .

The interface matrix table is updated accordingly.

Using process flow charts to perform structure analysis of process FMEAs

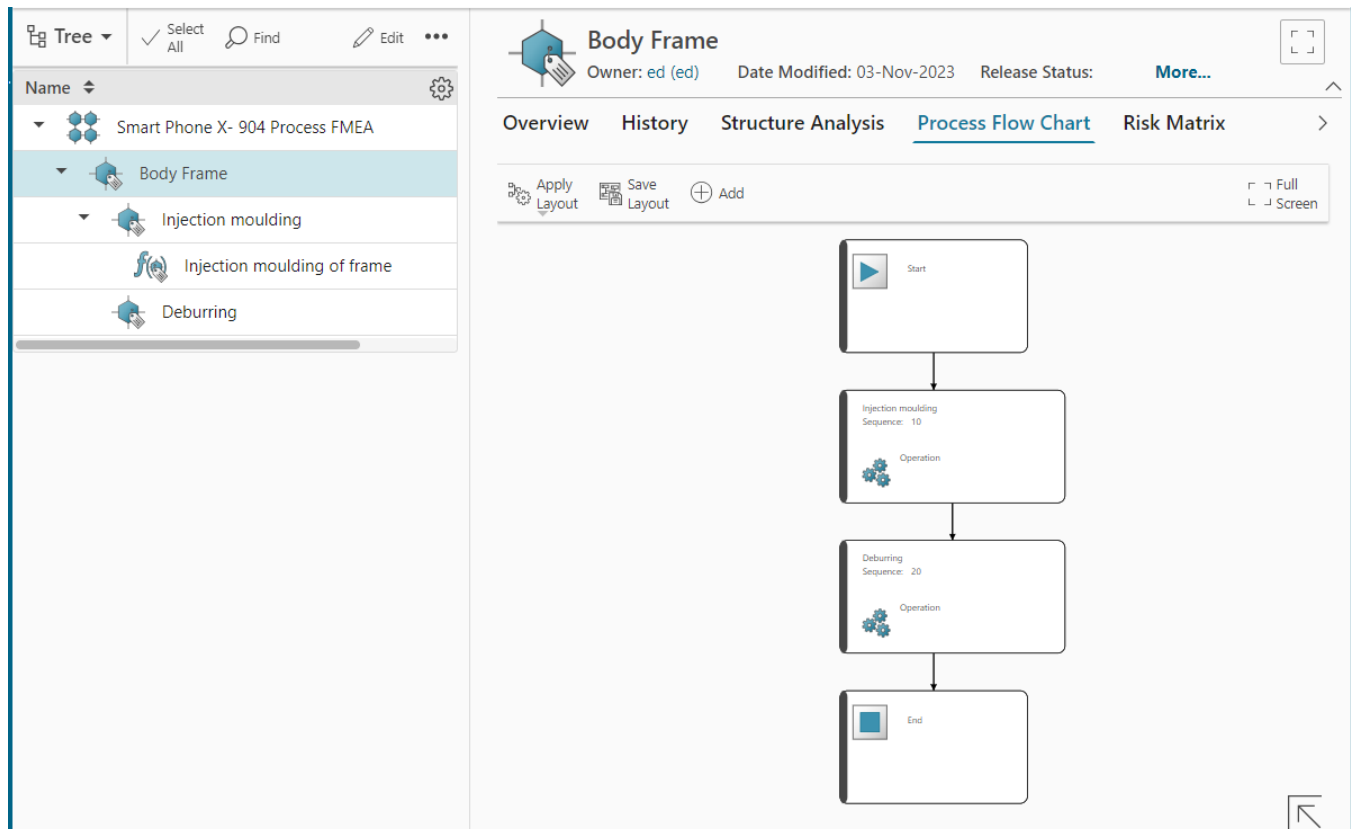
Using process flow charts to analyze processes

A process flow chart shows a graphical representation of the process flow and the various stages that the product goes through in the process. You can view or update process flow charts to identify and analyze processes.

You can:

- Create and add new system element representations to the process flow chart.
- Edit or delete existing system element representations.
- Modify the order of the processes as required.


The following graphic shows an example of the process flow chart for a process FMEA.



View the process flow chart for process FMEAs

You can view process flow charts that show a graphical representation of the process flow and the various stages that the product goes through in the process.

Procedure

1. Open the process FMEA object.
2. Select the system element representation in the FMEA tree structure.
3. Choose **More Commands** **...** > **Manage** > **Show Process Flow Chart** .


The **Process Flow Chart** tab displays the graphical representation of all the processes in the FMEA.

To hide the process flow chart, choose **More Commands** **...** > **Manage** > **Hide Process Flow Chart** .

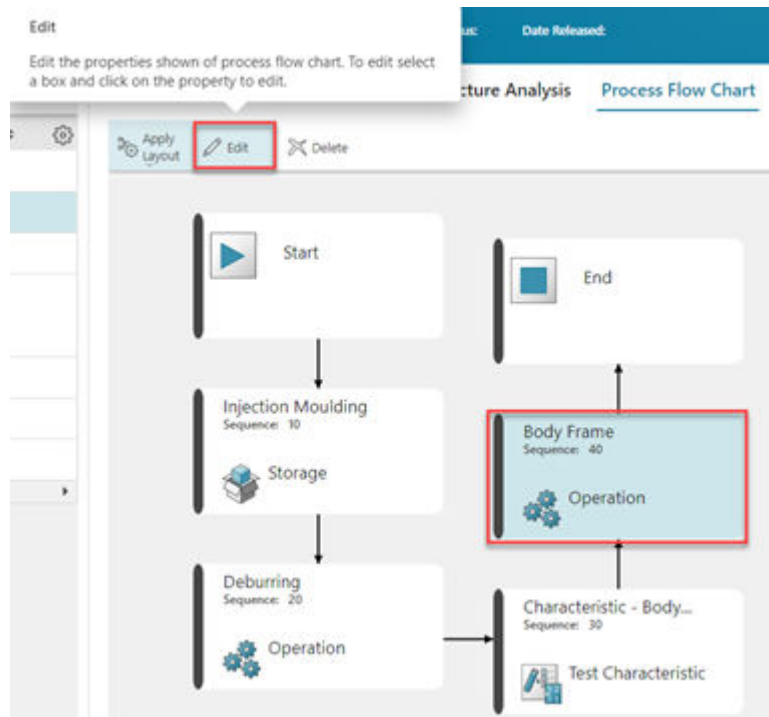
Edit the process flow chart

You can edit the layout of the process flow chart to modify the name and sequence of the system element representations. You can also edit or delete objects in the process flow chart.

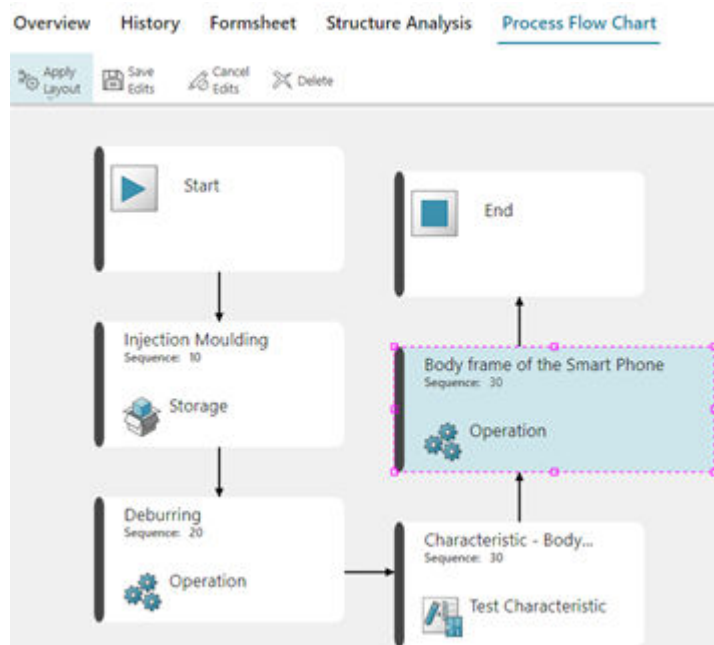
Procedure


1. Open the process FMEA object.
2. Select the system element representation in the FMEA tree structure and click the **Process Flow Chart** tab.
3. Modify the objects in the process flow chart in one of the following ways:
 - Edit the system element representation in the process flow chart
 - a. Select the system element representation and click **Edit** .

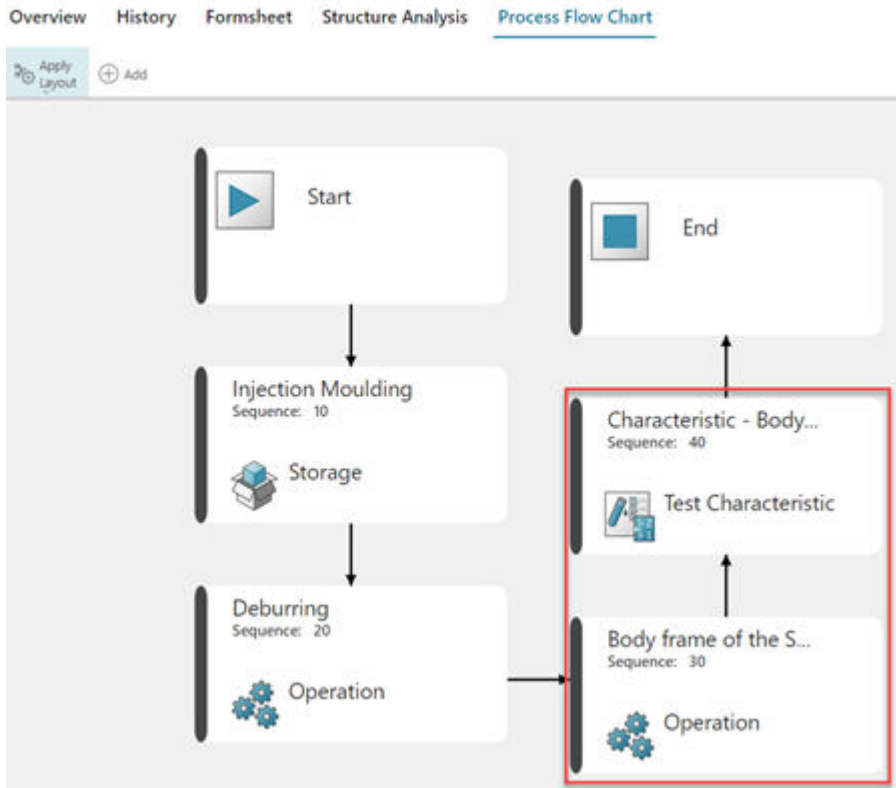
7. Perform the structure analysis



- b. Update the name and sequence of the system element representation.



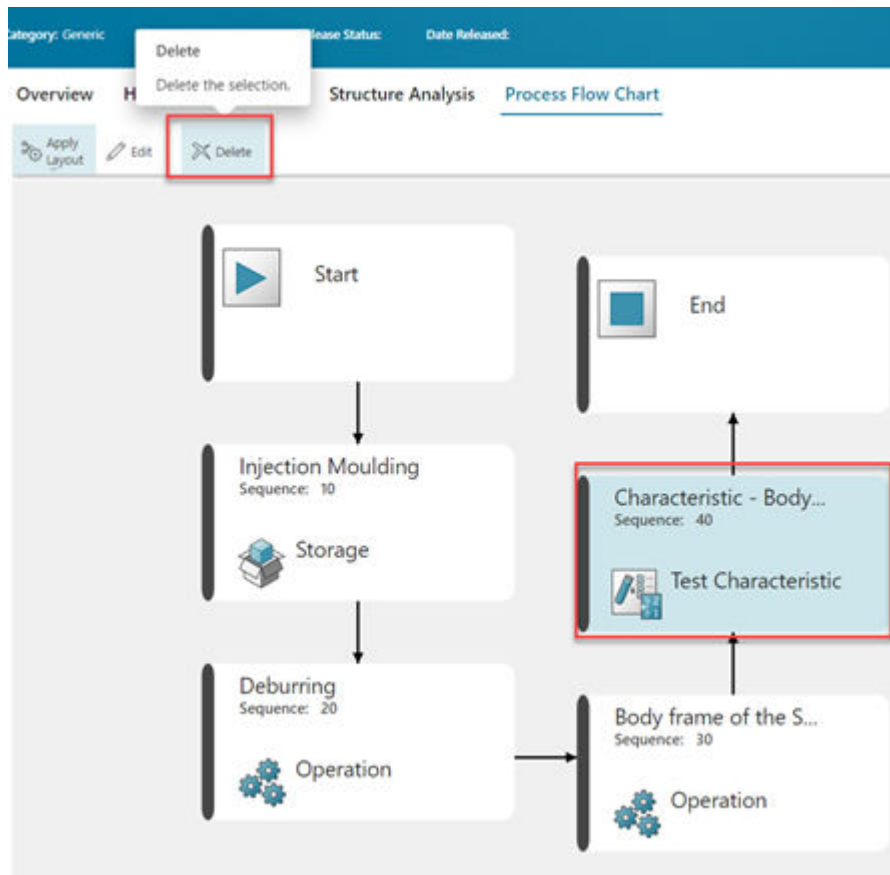
- c. Follow similar steps to edit the sequence value of other system element representations that you want to reorder.
- d. Click **Save Edits**  to save your changes.



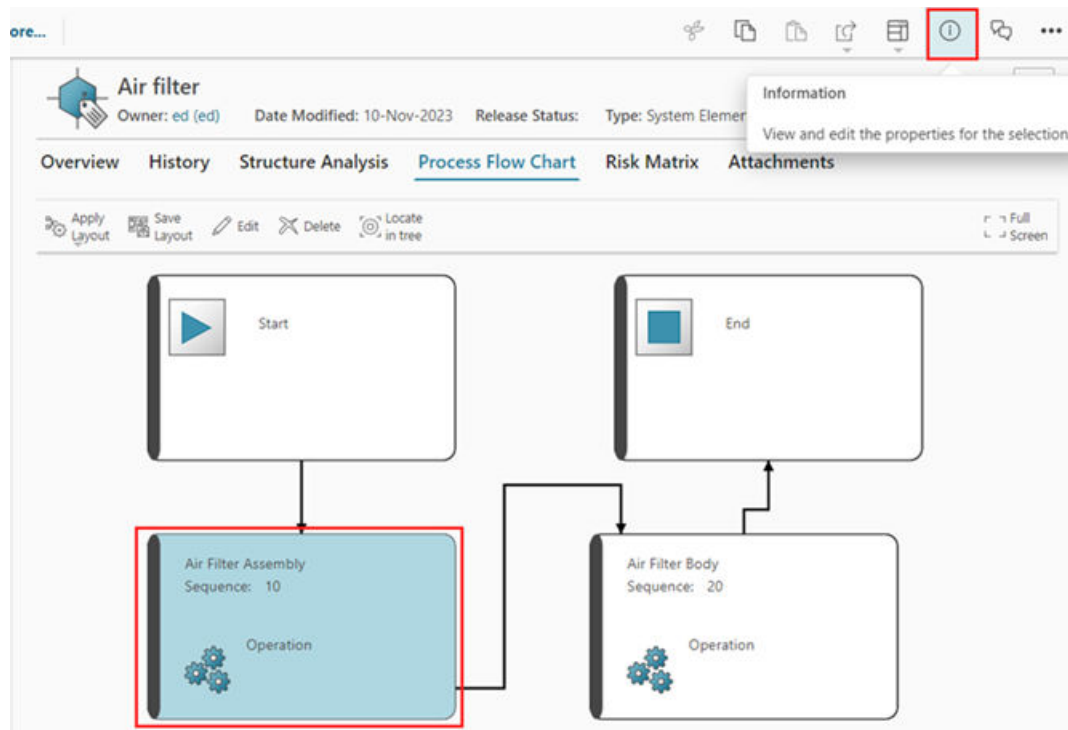
- Delete the system element representations in the process flow chart

In the **Process Flow Chart** tab, select the system element representation and click **Delete** to remove it from the process flow chart.

7. Perform the structure analysis



- Edit the properties of the system element representation in the Information panel
 - a. In the **Process Flow Chart** tab, select the system element representation, and click **Information**.



- b. In the **Information** panel, click **Edit**.
- c. Select the required **System Element Sub-Type**.

Note:

You can also edit other system element representation properties displayed in the **Information** panel.

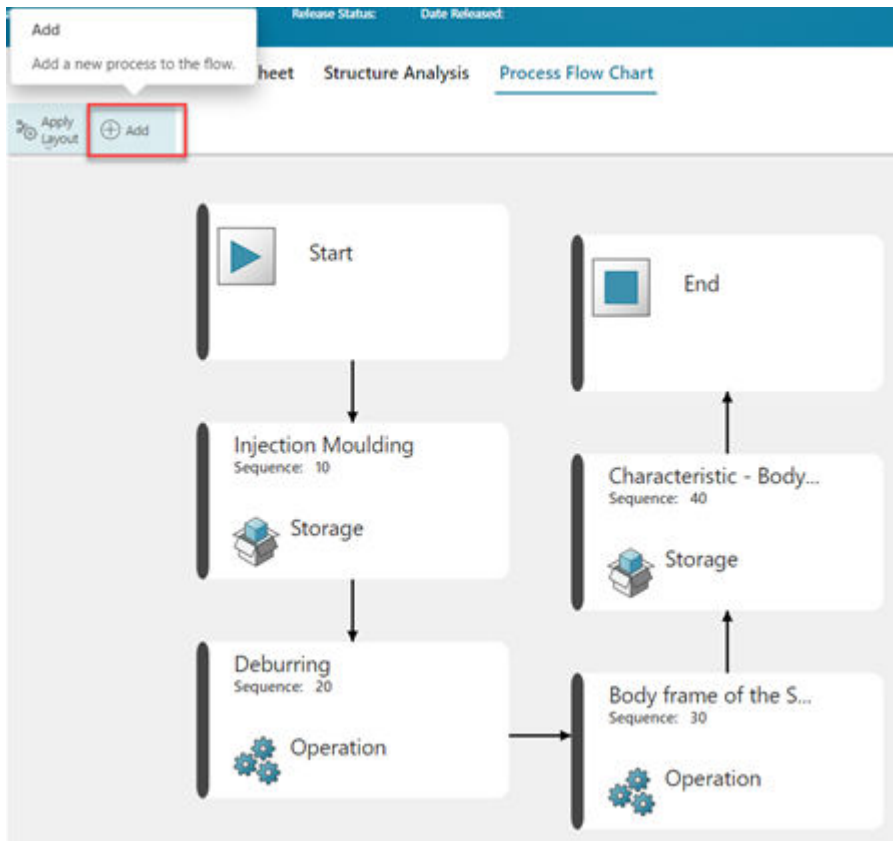
- d. Click **Save**.

Create and add new system element representations to the process flow chart

You can create and add new system element representations in an existing process flow chart. When you create system element representations in the process flow chart, they are displayed in the FMEA tree structure and the process flow chart.

Procedure

1. In the **Process Flow Chart** tab, click **Add** ⊕.



2. In the **Add** panel, specify the **Name** and **Description**.
3. Click **Add**.

Note:

The default type of the system element representation that you create in the **Process Flow Chart** tab is set to **Process**. You can edit the type and change it to **Design**. After modifying, the design type of system element representation is removed from the process flow chart. However, it is retained in the FMEA tree structure.

8. Perform the function analysis

Specify the functions of the system elements in the FMEA structure


During function analysis, you define the functions of each component of the assembly or process for which the FMEA is performed. You also add the requirements and characteristics of the function representations. You can perform the function analysis after you perform the structure analysis of the FMEA.

To perform a function analysis:

1. **Add a function representation to a system element representation**
2. **Add higher-level or lower-level functions to the function representation**
3. **Add requirements to the function representation**
4. **Add characteristics to the function representation**

Add a function representation to a system element representation

A system element representation such as **Air Filter Element** can have function representations such as **Filter the air**.

1. Select a system element representation.
2. Choose **More Commands** **>>>** **New**  **>** **Function**.
3. In the **Create** panel, do one of the following:
 - In the **Search** tab, under **FUNCTIONS**, type the name, or use a wild card character such as an asterisk (*), to search for and add the required function representation to the system element.
 - Click the **New** tab to create a new function representation and add it to the system element.


While creating a new function representation, if you retain the **Create and link its master data** check box selection, the function representation that you create specific to the FMEA is created as a specification at the highest level in the **Quality Master Data** library.

Add higher-level or lower-level functions to the function representation

1. Open the FMEA.
2. Select a function that is added under the system element representation.

- Click the **Function Analysis** tab that is displayed to open it.

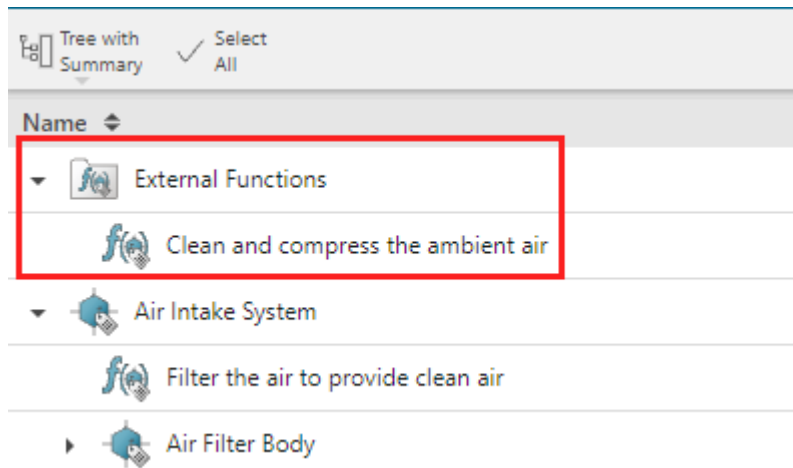
The net view of the FMEA is displayed.

- To add a function at the level immediately above the selected function, choose **More Commands** **...** > **New**  > **Next Higher Level Function**.

You can also drag a function from the FMEA tree structure and drop it in the net view display.


- In the **Add** panel, do one of the following:
 - Click **New** to create a new function and add it to the FMEA.
 - Click **Search** to search for an existing function. You can select a function within the current FMEA.
 - Specify if you want to add functions from the current FMEA, or select the **Function Library** check box to search for a function from the library.

In the FMEA tree structure, you can view the external (local) functions of an FMEA under **External Functions**.



- After you select the required function from the search results, or create a new one, click **Add**.

The function is added to the FMEA.

- To add a function at the level immediately below the selected function, choose **More Commands** **...** **New**  > **Next Lower Level Function**, and perform steps 5 and 6.

Add requirements to the function representation

- Open the function representation from the **FMEA** object in the tree view.

This is the object you created when you added a function representation to a system element representation.

- To add the requirement, click the **Requirements** tab and click **Add to** ⊕. In the **Add** panel, select the requirement from the **New** or **Palette** tab or search for it in the **Search** tab and click **Add**.

Note:

You can also copy an object and add it as a requirement to the function representation.

- (Optional) To remove the object, select it and click **Remove** ⊖.

Add characteristics to the function representation

For each manufacturing operation, you can optionally add the characteristics that define what is being measured on the shop floor. For this, you add an Inspection Definition that contains the required Quality Characteristic.

You can also add characteristics such as diameter, length, surface roughness, and so on, which are important for the production of prototypes and pre-series parts. These characteristics are required for prototype control plans and pre-series control plans.

- Open the function representation from the **FMEA** object in the tree view.

This is the object you created when you added a function representation to a system element representation.

- To add the characteristic, click the **Characteristics** tab and under **Inspection Definition**, click **Add** ⊕.

Note:

You can also copy an inspection definition and add it as a characteristic to the function representation.

- In the **Add Inspection Definition** panel, under **Properties**, specify the **Name** and **Description**.
- In the **Add Characteristic** section, click **Add To** ⊕.
- To add a Quality Characteristic including its criteria, do the following:
 - From the **Characteristic Group Type** list displayed, select the required Characteristic Group.
 - Select the required Quality Characteristic from the available Quality Characteristics of the group, and click **Attach**.

- c. (Optional) To replace the Quality Characteristic that you have added, click **Replace** ⇄ in the **Add Characteristic** section.

6. Click **Add**.

7. (Optional) To remove the object, select it and click **Remove** ⊖.

The FMEA object to which the function is attached is displayed in the **Context** field in the **Overview** tab. You can return to the FMEA object and add more functions to the structure if required.

After adding the required functions, requirements, and characteristics, and ensuring that they are appropriately allocated to the system elements, you can **perform a failure analysis of the FMEA**.

9. Perform the failure analysis


Specify the potential failure modes of the FMEA structure

To perform the failure analysis of an FMEA, you add the potential failure modes of the FMEA structure and specify the failure effects and failure causes. In addition, you can also assign a severity value to the failure effects.

To perform a failure analysis:

1. **Add a failure representation to the function representation**
2. **Associate a failure effect and specify the severity**
3. **Associate a failure cause**

Add a failure representation to the function representation

1. Open an FMEA.
2. Select a function representation and choose **More Commands** **...** > **New**  **Failure**.
3. In the **Create** panel, in the **Search** tab, a list of the failure representations is displayed. You can filter the list by typing the name of the failure representation and select the failure representation.

OR

If the required failure representation is not available, click the **New** tab, and specify the name and description to create a new failure representation.

While creating a new failure representation, if you retain the **Create and link its master data** check box selection, the failure representation that you create specific to the FMEA is created as a specification at the highest level in the **Quality Master Data** library.

You can select multiple failure representations.

4. To include the failure representation, click **Create**.

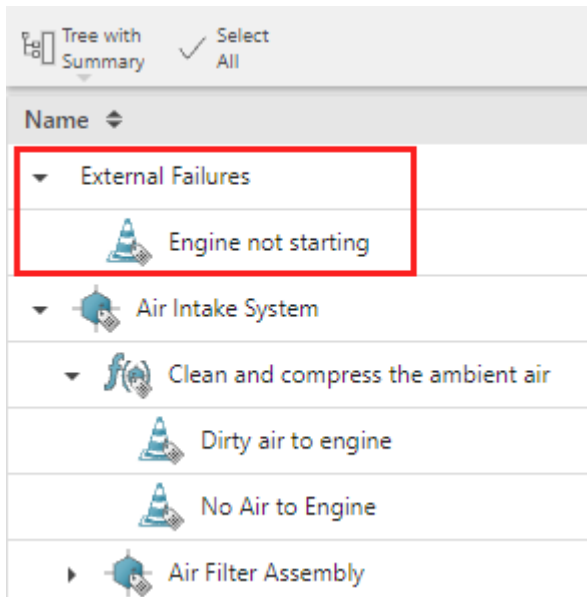
Associate a failure effect and specify the severity

1. Open the failure representation and click the **Failure Analysis** tab.

The net view of the FMEA is displayed.

2. To add a failure effect, choose **More Commands** \dots > **New** \star > **Failure Effect**.
3. In the **Add** panel, specify if you want to add failure effects from within the FMEA structure, or select the **Failure Library** check box to search for and add failure effects from the quality master data.

In the FMEA tree structure, you can view the external (local) failures of an FMEA under **External Failures**.




4. Do one of the following:
 - Click **New** to create a new failure effect and add it to the FMEA.
 - Click **Search** to search for an existing failure effect.
5. After you select the required failure effect from the search results, or create a new one, click **Add**.

If you add a failure effect specification, the corresponding representation object is also added.

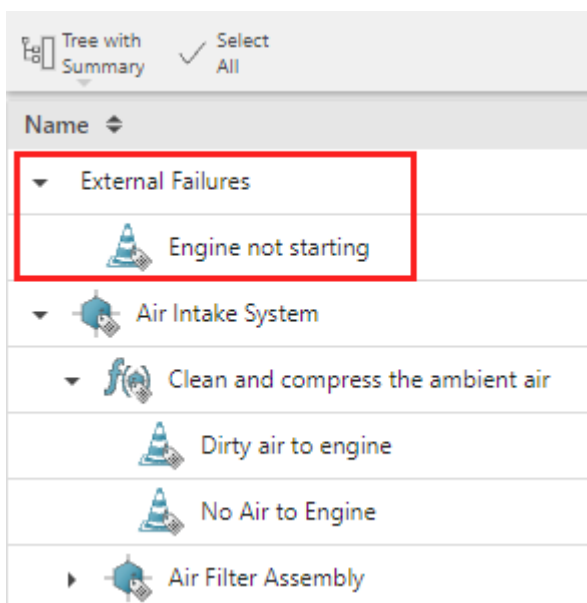
You can also drag a failure effect from the FMEA tree structure to the function in the net view display.

6. To specify the severity of the failure effect, do the following:
 - a. Select the failure representation from the FMEA structure and switch to the **Table** view.
 - b. In the **Failure Effect** table, in the **Severity** column, double-click the required cell and select a value from the list.

Associate a failure cause

1. Open the failure representation and click the **Failure Analysis** tab.
2. To add a failure cause, choose **More Commands** **...** > **New**  > **Failure Cause**.
3. In the **Add** panel, specify if you want to add failure causes from within the FMEA structure, or select the **Failure Library** check box to search for and add a failure causes from the quality master data.

In the FMEA tree structure, you can view the external (local) failures of an FMEA under **External Failures**.



4. Do one of the following:
 - Click **New** to create a new failure cause and add it to the FMEA.
 - Click **Search** to search for an existing failure cause.
5. After you select the required failure cause from the search results, or create a new one, click **Add**.

If you add a failure cause specification, the corresponding representation object is also added.

You can also drag a failure cause from the FMEA tree structure and add it to the function in the net view display.

After you perform a failure analysis, you can perform a **risk analysis for the failure cause**.

Classify failures in an FMEA

You can classify failures in an FMEA to categorize them according to their causes, effects, or detectability by specifying special characteristics for the failure. This can help you identify if a particular failure is critical or minor, or whether the root cause of the failure is a functional, safety, or any other compliance issue.

Procedure

1. Open the FMEA and navigate to the failure that you want to classify.
2. To classify the failure, do one of the following:
 - Specify the classification type in the **Classification** column in the **Tree** view:
 - a. In the **Tree** view, select the failure in the FMEA structure.
 - b. Scroll horizontally to navigate to the **Classification** column and double-click the cell that corresponds to the failure that you want to classify.
 - c. Select the required option.
 - d. Click outside the cell to save your changes.
 - Specify the classification type in the **Formsheet** view:
 - a. In the **Formsheet** view, navigate to the failure that you want to classify.
 - b. In the **Special Characteristics** column, double-click the cell that corresponds to the failure that you want to classify.
 - c. Select the required option.
 - d. Click outside the cell to save your changes.
 - Specify the classification type in the **Classification** column in the **Tree** view:
 - a. In the **Formsheet** view, navigate to the failure that you want to classify.
 - b. In the **Special Characteristics** column, double-click the cell that corresponds to the failure that you want to classify.
 - c. Select the required option.
 - d. Click outside the cell to save your changes.

The classification category of the failure along with its icon is displayed in the in the **Classification** column in the tree view, the **Special Characteristics** column in the formsheet view, and on the tile in the **Failure Analysis** tab.


Edit the severity values

The default value of the severity for all failure causes and failure effects that you create is set to 10. Depending on the intensity of the severity, you can edit the default severity value. You can edit the


severity of failure representation, failure cause, or failure effect in the **Overview** tab or the failure analysis net view and table view.

The following procedure shows how to edit the severity value in the net view.

Procedure

1. Open the FMEA object and navigate to the failure representation.
2. Click the **Failure Analysis** tab.
3. Select the failure representation, failure cause, or failure effect with the severity value you want to modify.
4. Click **Edit Severity** .

You can also right-click the tile and choose **Edit Severity**, or choose **More Commands ... > Edit**  **> Edit Severity**.

5. In **Edit Severity**, select a value from the list and click **Save**.
6. Click **Save Edits**  to save your changes.

Note:

- The cascading severity behavior is applicable when you add or remove a failure cause or effect.
- For relatively smaller failure data the severity value is updated synchronously. If the data is large, the operation is asynchronous, and you receive an alert when it is completed. The AP or RPN values are not updated immediately for an asynchronous operation.

10. Perform the risk analysis

Specify the current prevention and detection actions to mitigate the failure modes

To perform a risk analysis, you associate the current prevention and detection actions to a failure cause. You can use template actions to create these prevention and detection actions. You specify the occurrence and detection values for the prevention and detection actions, respectively. These values can be from **1** to **10**. Based on the values you specify and the design FMEA (D-FMEA) or process FMEA (P-FMEA) guideline objects, the system determines the initial priority value, such as low, medium, or high.

1. Open an FMEA.
2. Select a failure representation associated with a function within the FMEA structure.
3. Click the **Risk Analysis and Optimization** tab and select a failure cause from the **Failure Cause Actions** table.

You can create prevention and detection actions for a failure cause.

You can create preventive action and detection action if your administrator has enabled the editing of these.

4. To add prevention actions linked to a failure cause and specify an occurrence value, do the following:
 - a. In the **Failure Cause Actions** table, under the failure cause, click **Add** ⊕ and select **Prevention Action** or **Prevention Action From Template**.
 - b. In the **Add Quality Action** panel, specify the required parameters.

If you select **Prevention Action from Template**, in the **Add Quality Action from Template** panel, select the required template from the list of existing templates and click **Select**.

- c. Click **Add** to create the quality action.

The system automatically creates the **Initial State** group, if it is not already created, and adds the quality action to it.

- d. To specify an occurrence value, in the **Failure Cause Actions** table, select the action group, or expand the action group to select an action, double-click the required cell in the **Occurrence** column, and select a value from the list.
5. To add detection actions linked to a failure cause and specify a detection value, do the following:

- a. In the **Failure Cause Actions** table, click **Add** ⊕ > **Detection Action** or **Detection Action From Template**.
- b. In the **Add Quality Action** panel, specify the required parameters.

If you select **Detection Action from Template**, in the **Add Quality Action from Template** panel, select the required template from the list of existing templates and click **Select**.

- c. Click **Add**.

The system automatically creates the **Initial State** group, if it is not already created, and adds the action to it.

- d. To specify detection value, in the **Failure Cause Actions** table, select the action group, or expand the action group to select an action, double-click the required cell in the **Detection** column, and select a value from the list.

Note:

Your administrator can modify the preference value so that you can edit the occurrence and detection values for the actions in an action group.

After performing the risk analysis, you can **optimize the risks by prioritizing the recommended actions**.

Add initial state prevention or detection actions for a failure

You can create prevention or detection actions for failures in the FMEA tree even if they are not linked to a failure cause.

Specify initial state prevention actions for a failures

1. Open the FMEA and click the **Risk Analysis and Optimization** tab.
2. In the **Failure Actions** table, click **Add** ⊕ > **Prevention Action** or **Prevention Action from Template**.
3. In the **Add Quality Action** panel, specify the required parameters.

If you select **Prevention Action from Template**, in the **Add Quality Action from Template** panel, select the required template from the list of existing templates and click **Select**.

4. Click **Add**.

The system automatically creates the **Initial State** group, if it is not already created, and adds the quality action to it.

5. To specify an occurrence value, in the **Failure Actions** table, select the action group, or expand the action group to select an action, double-click the required cell in the **Occurrence** column, and select a value from the list.

Specify initial state detection actions for a failure

1. Open the FMEA and click the **Risk Analysis and Optimization** tab.
2. In the **Failure Actions** table, click **Add** ⊕ > **Initial Action Group**.
3. Select **Initial State** and click **Add** > **Detection Action** or **Detection Action from Template**.
4. In the **Add Quality Action** panel, specify the required parameters.

If you select **Detection Action from Template**, in the **Add Quality Action from Template** panel, select the required template from the list of existing templates and click **Select**.

5. Click **Add**.

The system automatically creates the **Initial State** group, if it is not already created, and adds the quality action to it.

6. To specify detection value, in the **Failure Actions** table, select the action group, or expand the action group to select an action, double-click the required cell in the **Detection** column, and select a value from the list.

Assign users responsible for the prevention or detection actions

If you have not specified the users who are responsible for performing the prevention and detection actions, or if you want to specify additional users, or the due date for the actions, you can do the following:

1. Open the FMEA and click the **Risk Analysis and Optimization** tab.
2. Select the quality action in the **Failure Actions** or **Failure Cause Actions** table.
3. Choose **More Commands** ⋮ > **Manage** ⚙ > **Assign Responsible User**.
4. In the **Assign Responsible User** panel, select the required users and click **Assign**.
5. To specify the due date, double-click the respective cell in the **Due Date** column, and select the due date as required.

Visualize the identified risks in a risk matrix

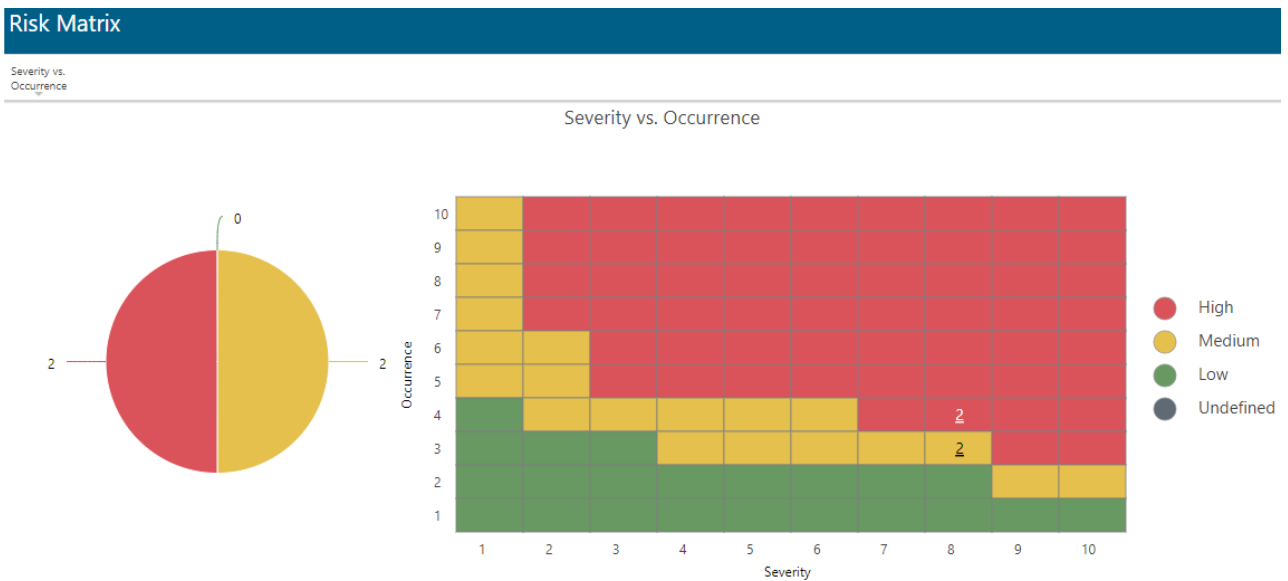
The risk matrix displays a color-coded grid of the severity, occurrence, and detection values associated with the risks. You can use the risk matrix as a reference to prioritize the quality actions for risk mitigation.

Procedure

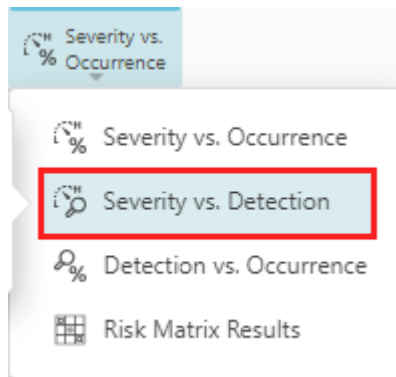
1. Open the FMEA and select the system element representation.
2. Click the **Risk Matrix** tab.

A default grid view of the severity and occurrence values of the failure causes associated with the risks is displayed.

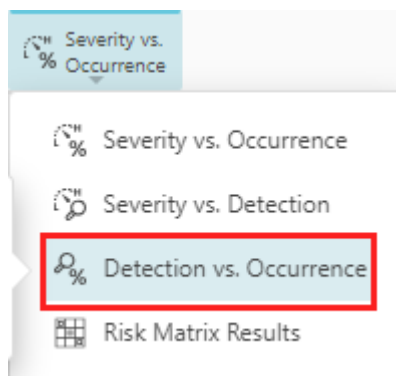
Administrators can modify the risk priority value in the risk matrix and override the calculated values if required.



3. You can do the following:
 - To view the grid view of the severity and detection values, on the top toolbar, click **Severity vs Occurrence** and from the list select **Severity vs Detection**.

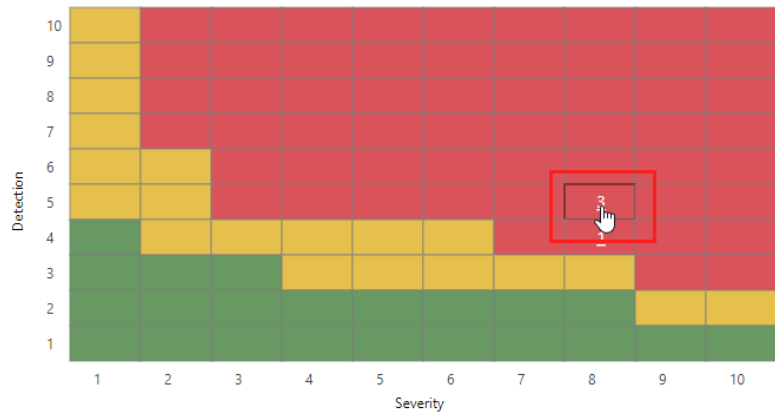
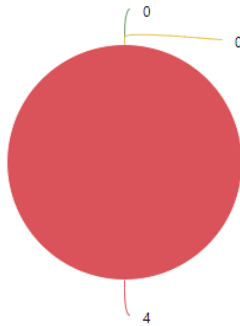


- To view the grid view of the detection and occurrence values, on the top toolbar, click **Severity vs Occurrence** and from the list select **Detection vs Occurrence**.



- To view the failure causes and action groups associated with a risk, click the number in the cell. The **Failure Cause and Action Group** section displays all the failures.

Severity vs. Detection

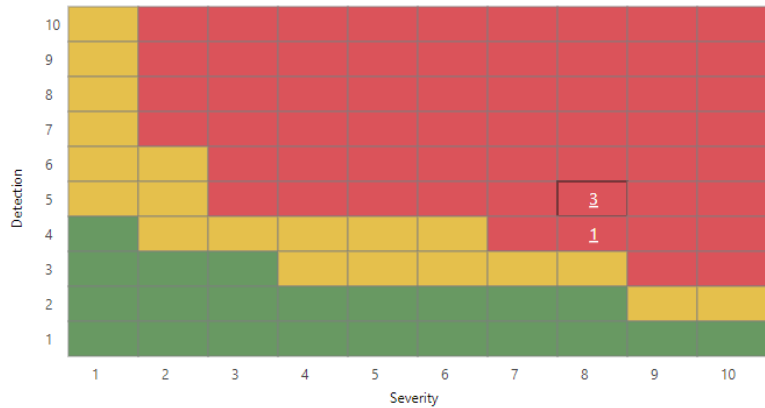
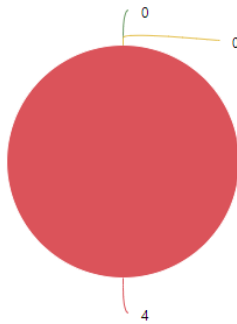


▼ Failure Cause and Action group			
Name	Severity	Action	Occurrence
Air Filter Element torn	8	Initial State	3
loosening of air filter bolts	8	Initial State	4
Water in Air Filter Element	8	Initial State	4

- To view all the actions associated with a failure, in the **Failure Cause and Action Group** section, select a failure.

The **Actions** section displays all the quality actions, their type, and their status.

Severity vs. Detection



▼ Failure Cause and Action group

Name	Severity	Action	Occurrence
Air Filter Element torn	8	Initial State	3
loosening of air filter bolts		Initial State	4
Water in Air Filter Element	8	Initial State	4

▼ Actions

Name	Sequence	Quality Action Subtype	Action Item ID	Quality Action St...	Release Sta...	Comments	Description
Structural Analysis of Filter Element	10	Prevention Action	QA00000000029	Draft			
Filter Element rig testing	20	Detection Action	QA00000000028	Draft			


Prioritize risks by viewing the consolidated risk matrix results

The risk matrix results display the priority of the severity, occurrence, and detection values associated with the risks in a consolidated tabular format.

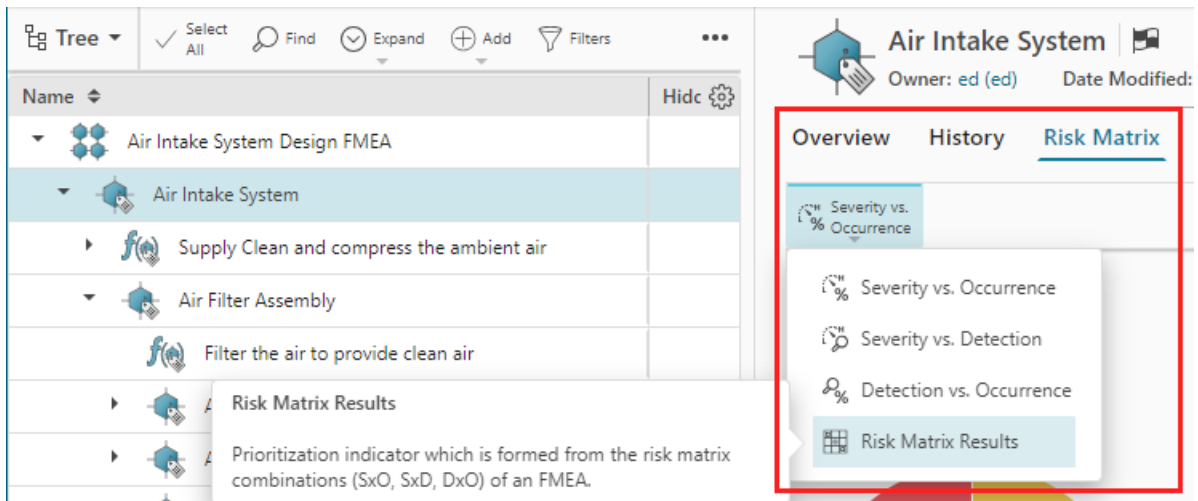
Procedure

1. Open the FMEA and select the system element representation.
2. Click the **Risk Matrix** tab.

A default grid view of the severity and occurrence values of the failure causes associated with the risks is displayed.

3. To view the consolidated risk matrix results, in the **Risk Matrix tab**, click **Risk Matrix Results** .

10. Perform the risk analysis



Administrators can modify the appearance of the risk matrix results associated to a guideline object by changing the colors associated with the risk priority value.

11. Optimize the identified risks

Optimize risks by identifying recommended actions

After analyzing the risks, you must optimize them by identifying some recommended actions. To do so, you can add prevention actions and detection actions. You can use template actions to create these prevention and detection actions. For each of these actions, you can specify a due date, occurrence, and detection values, and assign a responsible user for the action. The final priority is calculated based on the occurrence and detection values you have specified.

The responsible user can then **mark the activity as complete** and the system automatically assigns a completion date.

1. Open an FMEA object.
2. Select a failure representation from the FMEA structure.
3. Click the **Risk Analysis and Optimization** tab and from the **Failure Cause Actions** table, select a failure cause.

You can add multiple prevention actions and detection actions to a failure cause.

Add a revision state prevention action linked to a failure cause

1. Open an FMEA object.
2. Click the **Risk Analysis and Optimization** tab and from the **Failure Cause Actions** table, select a failure cause.
3. In the **Failure Cause Actions** table, click **Add** ⊕, and select **Prevention Action** or **Prevention Action from Template**.
4. In the **Add Quality Action** panel, specify the required parameters.

If you select **Prevention Action from Template**, in the **Add Quality Action from Template** panel, select the required template from the list of existing templates and click **Select**.

5. Click **Add** to create the quality action.

The system automatically creates the **Revision State** group, if it is not already created, and adds the quality action to it.

6. To specify a detection value, in the **Failure Cause Actions** table, select the action group, or expand the action group to select an action, double-click the required cell in the **Detection** column, and select a value from the list.

Add a revision state detection action linked to a failure cause

1. Open an FMEA object.
2. Click the **Risk Analysis and Optimization** tab and from the **Failure Cause Actions** table, select a failure cause.
3. In the **Failure Cause Actions** table, click **Add** ⊕, and select **Detection Action** or **Detection Action from Template**.
4. In the **Add Quality Action** panel, specify the required parameters.

If you select **Detection Action from Template**, in the **Add Quality Action from Template** panel, select the required template from the list of existing templates and click **Select**.

5. Click **Add** to create the quality action.

The system automatically creates the **Revision State** group, if it is not already created, and adds the quality action to it.

6. To specify a detection value, in the **Failure Cause Actions** table, select the action group, or expand the action group to select an action, double-click the required cell in the **Detection** column, and select a value from the list.

Add revision state prevention or detection actions for a failure

Add a revision state prevention action for a failure

1. Open the FMEA and click the **Risk Analysis and Optimization** tab.
2. In the **Failure Actions** table, click **Add** ⊕ > **Prevention Action** or **Prevention Action from Template**.
3. In the **Add Quality Action** panel, specify the required parameters.

If you select **Prevention Action from Template**, in the **Add Quality Action from Template** panel, select the required template from the list of existing templates and click **Select**.

4. Click **Add**.

The system automatically creates the **Revision State** group, if it is not already created, and adds the quality action to it.

5. To specify an occurrence value, in the **Failure Actions** table, select the action group, or expand the action group to select an action, double-click the required cell in the **Occurrence** column, and select a value from the list.

Add a revision state detection action for a failure

1. Open the FMEA and click the **Risk Analysis and Optimization** tab.
2. In the **Failure Actions** table, click **Add** ⊕ > **Detection Action** or **Detection Action from Template**.
3. In the **Add Quality Action** panel, specify the required parameters.

If you select **Detection Action from Template**, in the **Add Quality Action from Template** panel, select the required template from the list of existing templates and click **Select**.

4. Click **Add**.

The system automatically creates the **Revision State** group, if it is not already created, and adds the quality action to it.

5. To specify a detection value, in the **Failure Actions** table, select the action group, or expand the action group to select an action, double-click the required cell in the **Detection** column, and select a value from the list.

Assign users responsible for the prevention or detection actions



If you have not specified the users who are responsible for performing the prevention and detection actions, or if you want to specify additional users, or the due date for the actions, you can do the following:

1. Open the FMEA and click the **Risk Analysis and Optimization** tab.
2. Select the quality action in the **Failure Actions** or **Failure Cause Actions** table.
3. Choose **More Commands** ⋮ > **Manage** ✎ > **Assign Responsible User**.
4. In the **Assign Responsible User** panel, select the required users and click **Assign**.
5. To specify the due date, double-click the respective cell in the **Due Date** column, and select the due date as required.

Complete the identified risk mitigation actions

The FMEA engineer adds prevention action and detection actions to optimize risks. For each of the prevention and detection actions, the FMEA engineer specifies the due date, occurrence and detection values, and assigns a responsible user for the action.

The responsible user completes the identified risk mitigation actions and the system automatically assigns the completion date.

1. Enter the search criteria in the global search, and click .
2. In **Filters**, from **Type**, select **Quality Action**.
3. (Optional) In **Filters**, from **Responsible User**, select a user.
4. In **Search Filters**, select the prevention action or detection action and click **Open** .
5. Click **Activate** and type a comment.
6. Click **Complete** to finish this activity.


12. Submit the FMEA for review

Initiate the review process of the FMEA structure

After optimizing the risks and identifying recommended actions, the FMEA is submitted for review using the **Release FMEA Structure** workflow. To do this:

1. Open the FMEA.

Make sure that you have not selected any row in the FMEA tree structure.

2. Choose **More Commands** **>** **Manage**  **>** **Submit to Workflow**.
3. In the **Submit to Workflow** panel, from the **Template** list, select **Release FMEA Structure**.
4. Click **Submit**.

A notification verifying that the selected FMEA was submitted to the workflow is displayed.

13. Review and approve the FMEA

Releasing an FMEA using a workflow

Once the FMEA is submitted to the **Release FMEA Structure** workflow, you receive an email notification in the inbox that the FMEA is released and the status of the FMEA in the **Overview** tab is automatically set to **TCM Released**.

The workflows for releasing the FMEA can be created based on your requirements, and you can specify if you want to route it to users, such as quality managers, for approval.

When you release the FMEA:

- For actions in the FMEA, the released column displays the **TCM Released** status for released actions.
- If the FMEA is already released and it is submitted to the workflow, then its release status remains the same. However, any of the unreleased linked objects such as the system elements, functions, failures, actions, inspection definitions, requirements or guideline objects are released.

After the FMEA is released, you can **create a new version of this released FMEA** and use it as a reference to create and analyze another FMEA with a similar structure.

14. Reuse FMEA objects

Reusing FMEA objects

You can copy system elements, functions, failures, or actions and paste them as new objects in the same FMEA structure, or in another FMEA structure.

When you paste the FMEA object as a new object, a copy of the source FMEA object is created in the destination where you paste it. You can modify the properties of the new object as required. The newly created objects are independent of the source object. Any changes to the properties, relations, or interfaces of the source object are not propagated to the properties, relations, or interfaces of the new object, even if they are within the boundary or hierarchy of the source object. The IDs of the copied and pasted objects are different.




If you are copy-pasting large FMEA objects, you can select the **Run in Background** option to specify if you want to run the operation asynchronously. You will receive an alert when the copy-paste operation is complete.

During copy-paste, the initial state or revision state quality action groups, and the actions within the groups are copy-pasted independently. During the paste operation, the occurrence and detection values, or RPN values of the source quality action are not carried over, irrespective of whether the automatic carry over of occurrence and detection values from the initial state actions to the revision state actions is enabled by your administrator. The occurrence and detection values of the pasted actions are reset to 10, which is the default value. You can update these values after the paste operation is complete. This ensures that the risk estimation of the FMEA is not affected by the occurrence and detection values, or the RPN values of the source object.

Copy and paste FMEA objects

You can copy system elements, functions, failures, or actions, and paste them as new objects in the same FMEA structure, or in another FMEA structure.

Procedure

1. To copy the FMEA object to the clipboard, do any of the following:
 - In the tree view, formsheet view, or net view, right-click the FMEA object that you want to copy and choose **Copy** .
 - In the tree view, choose **More Commands ... > Copy** .
2. Navigate to the location where you want to paste the copied FMEA object, right-click the destination object and choose **Paste As**  **> New Object**.

In the tree view, you can also choose **More Commands ... > Paste As**  **> New Object**.



When you paste the FMEA object as a new object, a copy of the source FMEA object is created in the destination where you paste it. You can modify the properties of the new object as required. The newly created objects are independent of the source object. Any changes to the properties, relations, or interfaces of the source object are not propagated to the properties, relations, or interfaces of the new object, even if they are within the boundary or hierarchy of the source object. The IDs of the copied and pasted objects are different.

3. (Optional) As the time taken to complete the copy-paste operation is based on the sub-structure of the copied object, for large FMEA objects, select the **Run in Background** check box to specify if you want to run the operation asynchronously.

You will receive an alert when the copy-paste operation is complete.

15. Create a version of an FMEA

Create a new version of a released FMEA structure

1. Open the latest released FMEA structure.
2. Choose **More Commands**  > **New**  > **Version FMEA**.

Note:

This command is available only when you use the **Release FMEA Structure** workflow to release the FMEA structure.

3. In the message box that appears, click **OK**.

A validation message appears when the new version of the FMEA structure is created.

4. Click the **History** tab to view the new version of the FMEA structure.
 - All the associated system element, function, and failure representations are also changed to the next version.
 - A copy of the objects, which is equivalent to the output of a Save As operation, is created for all the actions from the previous version of FMEA in the new version of FMEA with the same status as earlier.
 - If the previous FMEA is generated from an item structure then the new version of the FMEA is also linked to the source structure and can be aligned.
 - **Inspection Definitions & Requirements** are now also linked to the new version of function.
 - All system element, function, and failure representations are versioned even if they are not in released state.

16. Visualize the FMEA structure

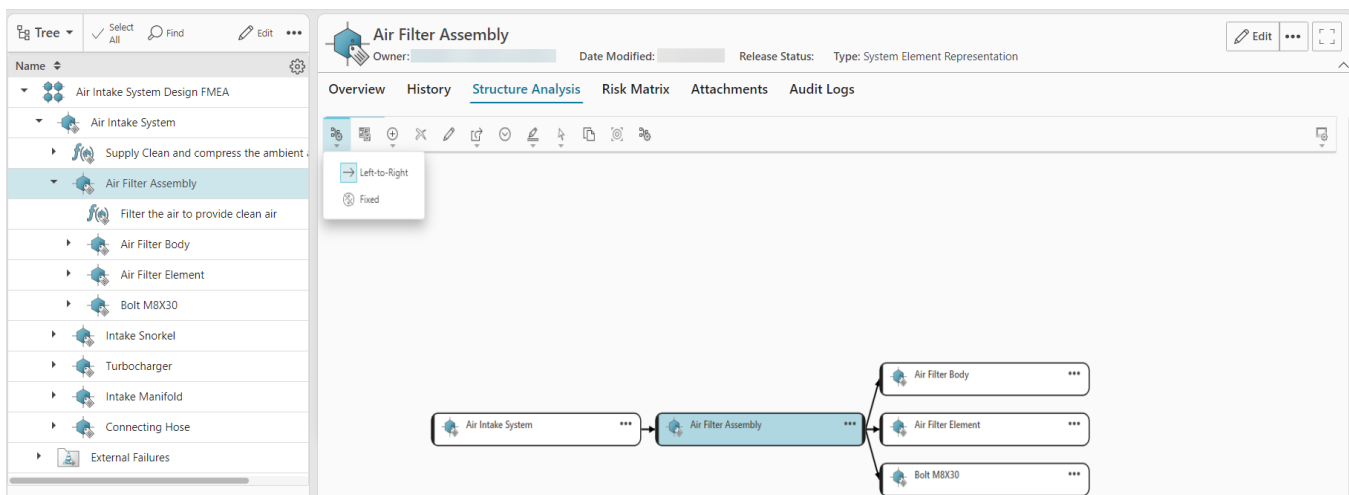
Visualize the hierarchy of the FMEA in a net view

What are FMEA net views?

Net views help you visualize the hierarchy of the system element, function, and failure representations in the FMEA structure. It is the default view when you perform the structure analysis, function analysis, or failure analysis of the FMEA structure. Net views help you detect the dependencies between failures, function elements, and system elements. The visual format helps define the causes and effects within an FMEA structure.

You can apply **Left-to-Right** or **Fixed** layout.

The following graphic shows the **Left-to-Right** layout of the net view in the **Structure Analysis** tab.







Working with FMEAs in the net view


Net views display the hierarchy of the system element, function, and failure representations of the FMEA structure in a graphical format.

When you open the FMEA object and click the **Structure Analysis**, **Function Analysis**, or **Failure Analysis** tab, a graphical view of the selected representation is displayed.

You can do the following:

- Show or hide the FMEA objects associated with the selected object. To do this, click **Show More ...** and then click , , or  icon in the tile.



The  icon indicates that there are objects at a higher level in the hierarchy.

The  icon indicates that there are objects at a lower level in the hierarchy.

Click the icons again to hide all the objects, except the selected representation.




- **Save the layout of the current view.** After you save the current layout and change tabs or reopen tabs the display changes to the default layout. To **revert to the saved layout**, click **Apply Layout** and select **Fixed Layout**.

If you perform any operation in a fixed layout, like adding or deleting an element or expanding the next level elements, the node positions change and might differ from the saved node positions of the saved layout.


If you add, modify, or delete any objects in the FMEA structure and revert to the saved layout, the  or  icon on the tile indicates that the saved layout is partially loaded. You can click the icon and select the required option to display the parent or child objects that were added after you saved the layout.



- Change the orientation of the net view. To do this, click **Apply Layout** and select the required option.



For **Function Analysis** and **Failure Analysis**, you can switch between the **Net View** and the **Table** view if required.

- Delete an object from the net view. To do this, right-click the tile and choose **Delete**. You can also select the tile, and on the top toolbar, click **Delete** .
- Remove the next higher or lower level object associated with the selected object. To do this, select an edge between any two nodes, and on the top toolbar, click **Remove** .
- Edit the properties of an object. To do this, right-click the tile and choose **Summary**, or on the top toolbar, click **Summary**. After editing, on the top toolbar, click **Save Edits** to save your changes.
- Highlight the immediate connections or entire path. To do this, select the node and click **Highlight** .

Select **Direct Connections**  to highlight the immediate connections to and from the selected node.

Select **Entire Path**  to highlight the entire path to and from the selected node.

- Select corresponding higher or lower level nodes to move. To do this, select the node and click **Select**.
- Sort function and failure analysis items in the net view by order number or tree hierarchy. To do this, click **Sort** .
- Pin a net view in a separate floating panel. To do this click **Screen** and select **Pin Net View** . All the operations supported in the analysis tab are available in the pinned view.

- Focus on a specific area of the net view in the graphics window. To do this, click **Show graphic overview**  and drag the cursor to focus on a specific area of the net view. To hide the graph view, click **Hide graph overview** .

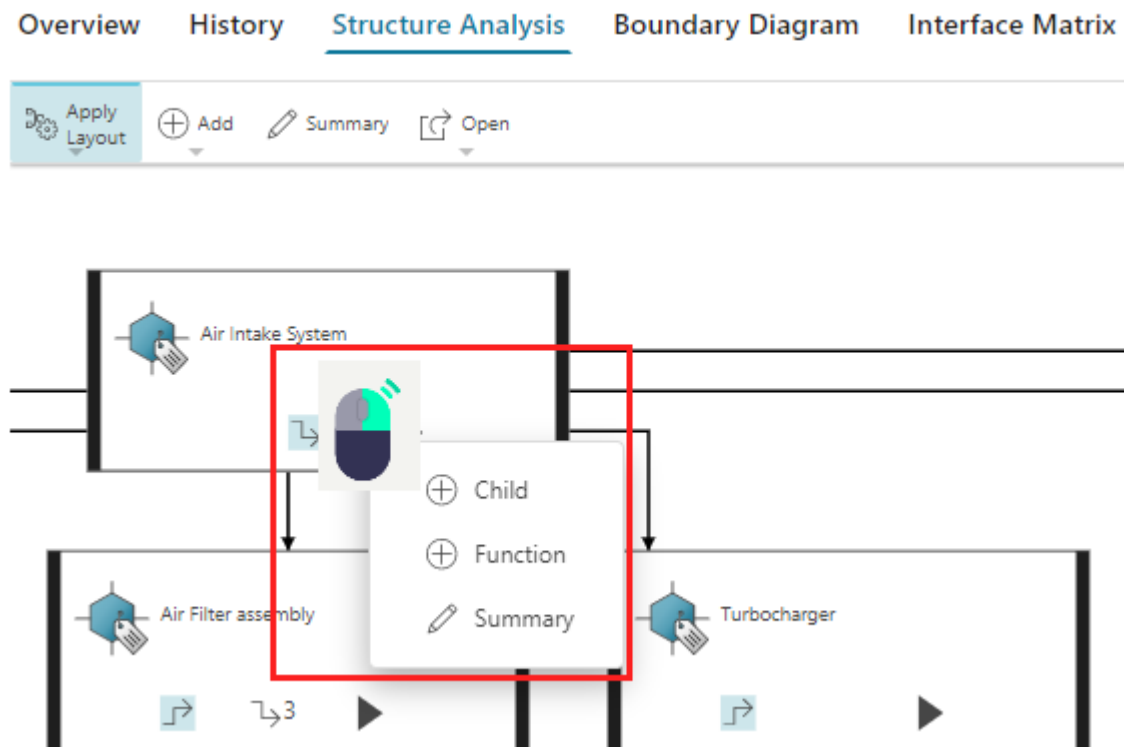
Add or modify objects in the net view

You can add system elements, functions, and failure representations in the net view for and FMEA. You can also add higher and lower level functions, and failure causes and effects in the net view.

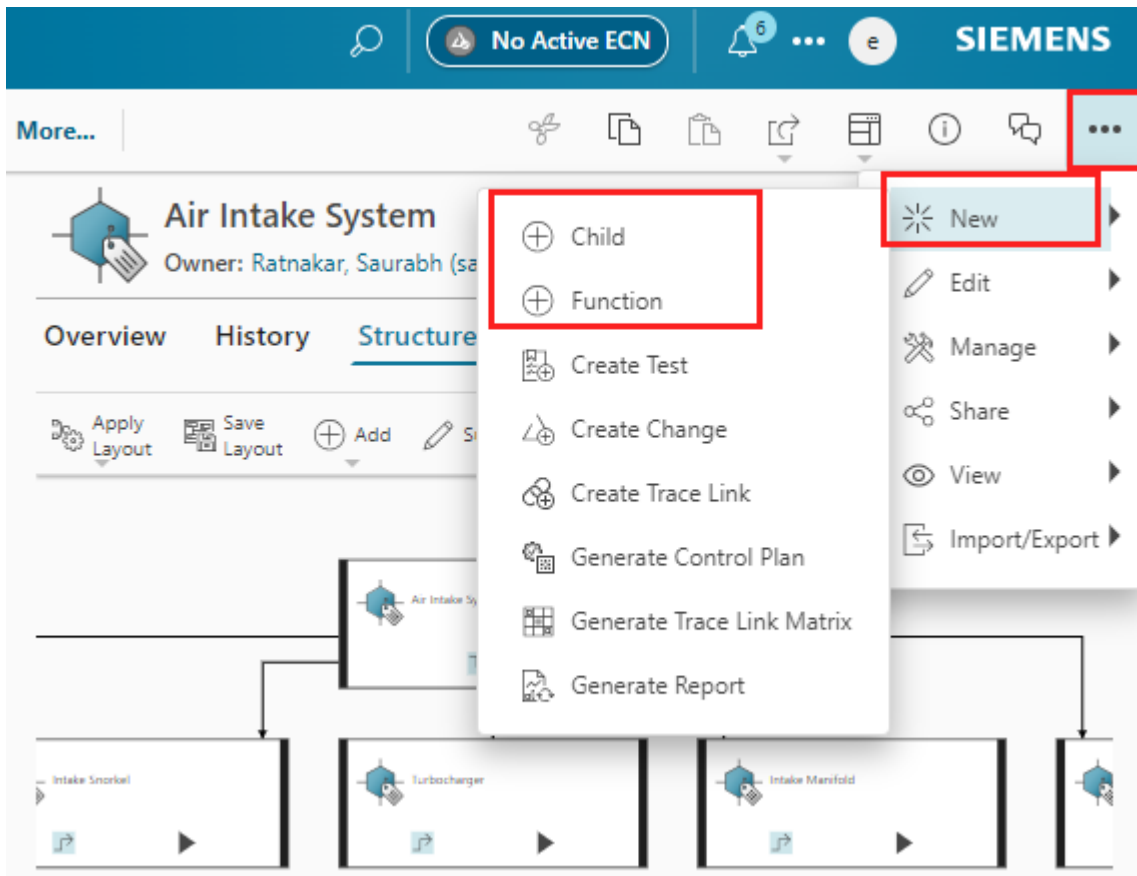
1. Open the FMEA.
2. Click the **Structure Analysis**, **Function Analysis**, or **Failure Analysis** tab as relevant.
3. In the net view, use one of the following methods to add the objects:
 - Use the options available in the net view.



- Select a tile and right-click to choose the required options.



- Use the options are available on the work area toolbar.



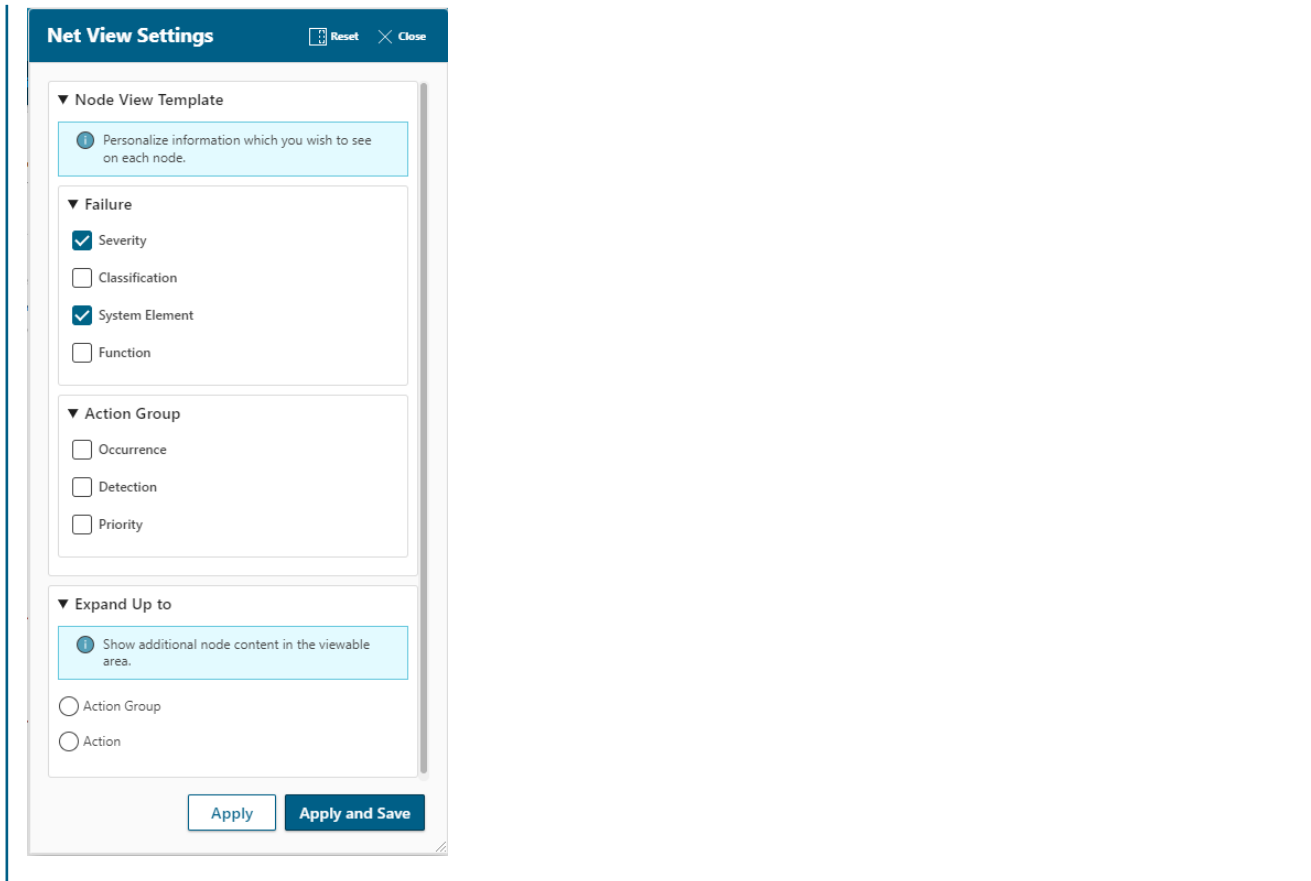
4. Click **Save Edits**  to save your changes.

Personalize a view


You can personalize the information displayed on each FMEA node such as system element, function, or failure in the net view.

Example:

Personalize a failure analysis to display its severity and the associated system element in the net view.



Procedure

1. Open the FMEA in the **Tree** view.
2. Select a node and click the **Structure Analysis**, **Function Analysis**, or **Failure Analysis** tab as relevant.
3. Click **Net View Settings** .
4. In the **Net View Settings** panel, do the following:
 - From the **Node View Template** section, select the required options to display content in nodes in the net view.
 - From the **Expand Up to** section, specify the level up to which you want to display additional content.
5. To save the net view settings even after switching tabs, click **Apply and Save**, or click **Apply** to save the net view settings temporarily until you switch tabs.

Your administrator can configure the parameters available in the **Net View Settings** panel.

Specify the initial or revised prevention and detection actions in the net view

You can specify the initial state and revision state prevention and detection actions for failure representations, failure causes, and failure effects. While specifying the prevention and detection actions, you can add the actions from templates.

Procedure

1. Open an FMEA.
2. Select a failure representation associated with a function within the FMEA structure.
3. Click the **Failure Analysis** tab and select a failure cause or failure effect.

You can create prevention and detection actions for a failure cause. You can create preventive action and detection action if your administrator has enabled the editing of these.

4. To add the action group, do one of the following:
 - In the net view, click **Add > Initial Action Group** or **Revision Action Group**.

OR

- Right-click the tile and choose **Initial Action Group** or **Revision Action Group**.


The **Initial State** or **Revision State** action group is created in the tile.

5. Select the tile, and click **Add**, and select **Prevention Action from template**, **Prevention Action**, **Detection Action from template**, or **Detection Action**.
6. In the **Add Quality Action** panel, specify a name.
7. (Optional) Specify a description, a due date, owning project, and responsible user.
8. Click **Add** to create the quality action.

Save a current layout as a fixed view

You can save the current layout of the net view for structure analysis, function analysis, failure analysis, process flowchart, or boundary diagram.

Procedure

1. Modify the layout to the orientation that you want to save for reference.
2. In the net view, click **Save Layout** .
3. In the message box, click **Save**.

The current layout is saved as a fixed view.

After you save the current layout and change tabs or reopen tabs the display changes to the default layout. You can **revert to the saved layout** whenever required.



Revert to the layout that is saved as a fixed view

After you save the current layout of the net view for structure analysis, function analysis, failure analysis, process flowchart, or boundary diagram, and change tabs or reopen the current tab the display changes to the default layout. You can revert to the saved layout using the **Fixed** layout option.

Procedure

1. Open the tab of the net view, boundary diagram, or process flowchart.
2. Choose **Apply Layout > Fixed**.

The display reverts to the saved layout.

If you add, modify, or delete any objects in the FMEA structure and revert to the saved layout, the  or  icon on the tile indicates that the saved layout is partially loaded. You can click the icon and select the required option to display the parent or child objects that were added after you saved the layout.

Expand FMEA net views

You can now expand or collapse a selected tile in the FMEA net view. You can specify the structure level up to which you want to expand the selected tile and expand all objects in the hierarchy.


Procedure

1. Open the FMEA and make sure you are in the **Structure Analysis, Function Analysis, or Failure Analysis** tab.
2. You can do the following:
 - **Expand the tiles in the net view**

- a. Select the tile, and click **Expand N Levels**.
- b. Select **Higher Levels**, **Lower Levels**, **Effects**, or **Causes**.
- c. In the **Expand to Level** box, specify the number of levels up to which you want to expand the net view
- d. Click **Expand**.


The FMEA net view is expanded up to the specified level.

- **Expand all lower level elements in the net view**

- a. Select the tile, and click .
- b. Click **Expand All Lower Level Elements**.

After expanding, click **Hide Lower Level Elements** to collapse the nodes.

- **Expand all higher level elements in the net view**

- a. Select the tile, and click .
- b. Click **Expand All Higher Level Elements**.

After expanding, click **Hide Higher Level Elements** to collapse the nodes.

To collapse, on the tile click the ▼ icon and select **Collapse**.

Note:

Expanding or collapsing net views of FMEA structures that have more than 500 nodes may take few more minutes than expected.

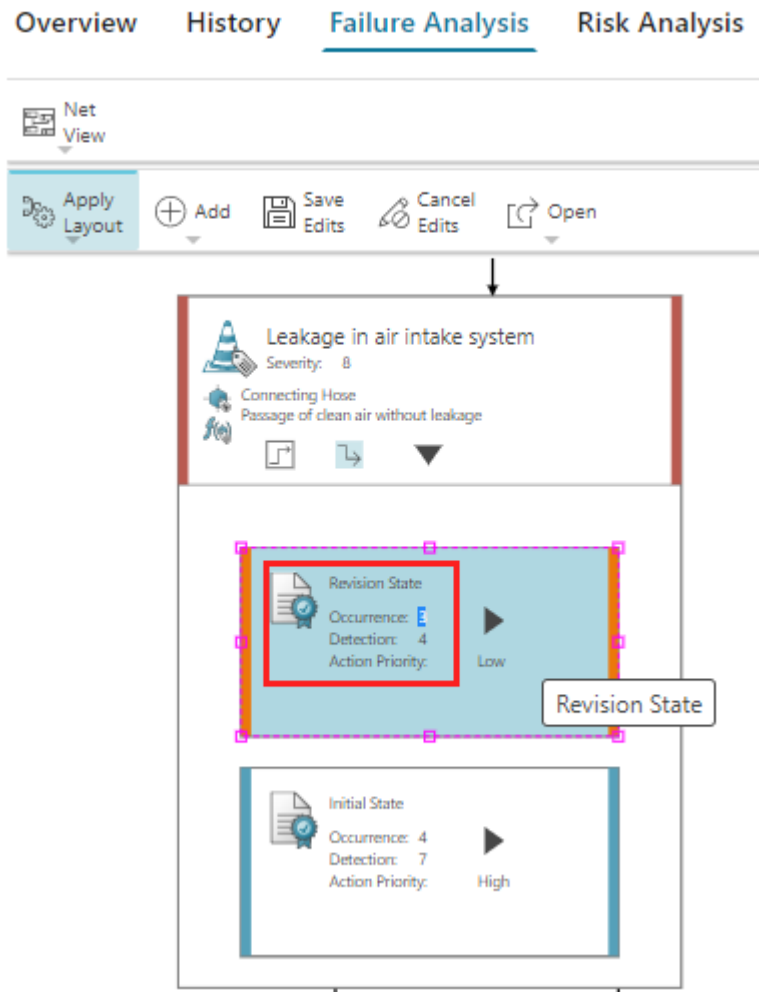
Edit the occurrence or detection values in the net view


You can edit the occurrence and detection values for all initial and revision state action groups.

Procedure

1. Open the FMEA object and navigate to the failure representation.
2. Click the **Failure Analysis** tab.
3. Expand the failure to view the occurrence or detection actions in the net view.

- Select the tile and click **Summary**  to edit the values.



- Modify the occurrence and detection values.
- Click **Save Edits**  to save your changes.

Visualize the hierarchy of the FMEA in a tree structure

About the FMEA tree structure

The FMEA tree structure is a hierarchical representation of all the system elements, functions, failures, and initial and revision states as well as their corresponding action groups. It also includes any external system elements, functions, or failures in the FMEA.

The FMEA tree shows information about the FMEA objects, such as the sequence, structure level, release status, attachments, their IDs, and the network information of functions and failures. For failures, the

Network Information column shows the number of causes and effects linked to the failure, and for functions, it shows the higher-level and lower-level functions linked to the function.

You can **move structures** within the FMEA tree by dragging and dropping them at the required level. You can also **modify the sequence** of the system element representations, function representations, or failure representations by updating the value in the **Sequence** column.

The following commands are available on the top toolbar in the **Tree** or **Tree with Summary** view:

- **Find - Search** for any element in the FMEA tree structure. You can also refine your search results using filters.
- **Expand - Expand or collapse** the nodes in the FMEA tree structure.
- **Add** - Add system elements, function, failure, action group, or actions to the selected element in the FMEA tree structure
- **Specification** - Replace the selected specification with the specified alternative.
- **Delete** - Delete the selected system element, function, failure, action group, or action in the FMEA tree structure.
- **Save Working Context** - Save the current working view of the FMEA tree structure.
- **Restore** - Restore the last saved working state.
- **Edit** - Edit the value of the sequence of the elements. You can also double-click the cell and edit the value.

Air Intake System Design FMEA

Owner: Date Modified: 05-Nov-2023 Type: FMEA FMEA Category: Generic FMEA Type: Design


Tree Select All Find Expand Add Filters Specification Delete Save Worki...

Name	Hidden Children	Sequence	Structure Level
▼ Air Intake System Design FMEA			
▼ Air Intake System		10	1
▼ f Supply Clean and compress the ambient air		10	1
No Air to Engine		10	1
Dirty air to engine		20	1
▼ Air Filter Assembly		10	2
f Filter the air to provide clean air		10	2
▼ Air Filter Body		10	3
▼ f Act as a reservoir of clean and compressed air		10	3
Air Filter Leakage		10	3
▶ Air Filter Element		20	3
▶ Bolt M8X30		30	3
▶ Intake Snorkel		20	2
▶ Turbocharger		30	2
▶ Intake Manifold		40	2
▶ Connecting Hose		50	2
▶ External Failures			

Add system elements, functions, or failures in the FMEA tree

You can insert FMEA objects above system elements, functions, or failures in the FMEA tree structure.

Procedure

1. Open the FMEA and make sure you are in the **Tree** view.
2. Select the system element, function, or failure in the FMEA tree structure.
3. Right-click the selection and choose **Insert** .

Name	Sequence	Structure Level
▼ Air Intake System	10	1
▶ Supply Clean and compress the ambient air	10	1
SE_ReleaseSaveAsActionGroupActions	5	3
▶ Air Filter	10	2
▶ Intake System	20	2
▶ Turbocharger	30	2
▶ Intake Manifold	40	2
▼ Connecting Pipe	50	2
▶ Passage	10	2
▶ Leak	10	2
▶ Inlet		
▶ Reservoir		

Open	Open in New Tab	Open in New Window	Open in Formsheet	Copy	Create Trace Link	Existing Trace Link	Insert
Open	Open in New Tab	Open in New Window	Open in Formsheet	Copy	Create Trace Link	Existing Trace Link	Insert

Insert object above the selection

4. In the **Create** panel, search for an existing FMEA object or create a new one.
5. Click **Create**.

Move structures within the FMEA tree

You can move structures within the FMEA tree by dragging and dropping them at the required level and reorganize the FMEA structure. When you move an object within the FMEA tree, all objects such as system elements, functions, and failures inside the structure are also moved.

Procedure

1. Open the FMEA and make sure you are in the **Tree** view.
2. Select the node that you want to move.
3. Drag it to the required location in the FMEA tree.

The selected node along with any objects such as system elements, functions, and failures inside the structure is moved.


Note:

You cannot move an FMEA node if there are system interfaces associated with it.

Save the current state of the FMEA tree structure

You can capture and save a snapshot of the current state of the FMEA tree structure. After you save a current working state and expand or collapse the nodes in the FMEA tree to perform other operations, you can revert to the saved state.


Procedure

1. Open the FMEA and make sure that you are in the **Tree** view.
2. On the work area toolbar, click **Save Working State** .

Revert to a saved state of the FMEA tree structure

After you save a current working state and expand or collapse the nodes in the FMEA tree to perform other operations, you can revert to the saved state of the FMEA tree.

Procedure

1. Open the FMEA and make sure that you are in the **Tree** view.
2. On the work area toolbar, click **Restore Saved State** .

Specify the sequence of FMEA objects

When you create the FMEA objects, the default value of the of the **Sequence** or **Order** property of the first FMEA object that you create is 10. For the subsequent siblings that you create, the value is automatically populated in increments of 10. You can edit the value of these properties and modify the sequence of FMEA objects displayed in the **Tree**, **Tree with Summary**, or net view.

You can specify the order of the FMEA objects as follows:

- For FMEA objects such as system element representations, function representations, failure representations, and actions, you can modify the value of the **Sequence** property.

The sequencing is maintained when you perform the **Save As** operation or create a new version of the FMEA. In the formsheet view, the FMEA objects are ordered based on the ascending value of the **Sequence** property.

- For higher level or lower level functions or failure causes and effects, you can modify the value of the **Order** property available in the **Table** view of the **Function Analysis** or **Failure Analysis** tab.

- Modify the **Sequence** property in the **Information** panel.















If you edit the **Sequence** property in the **Information** panel, the tree view and net view may not reflect your changes. You must switch to another tab and then switch to the net view or tree view to view the FMEA as per the updated sequence.



Modify the sequence of system element representations, function representations, or failure representations in the FMEA tree structure

To specify the order of FMEA objects in the tree structure, you can edit the value of the **Sequence** property.

1. Open the FMEA object.
2. Expand the node of the FMEA object and its siblings that you want to reorder.

The default value of the **Sequence** property is populated based on the creation sequence.

Name	Sequence
▼ Air -6.1	
▼ AC -1	10
▼  Act as a reservoir of compressed air	10
 Air Filter Clogging	10
 Air Filter Leakage	20
 Act as a reservoir of clean air	20
▼ Air Filter Body	10
▼  Clean and compress the ambient air	10
 Air Filter Clogging	10
 Air Filter Element torn	20
 Dirty air to engine	30
 Air Filter Leakage	40
 Engine not starting	50
 Engine not starting	60
 Wheel_Function	20
▶  External Functions	
▶  External Failures	

3. Choose **More commands** ... > **Edit**  > **Summary**
4. In the **Overview** tab, edit the value of the **Sequence** property to reorder the sequence as required.
5. Choose **More commands** ... > **Edit**  > **Save Edits** to save your changes.

The sequence of the FMEA objects is reordered as per the modified value of the **Sequence** property. The sequencing is maintained when you perform the **Save As** operation, or create a new version of the FMEA.

Tip:

If the tree structure does not reflect the modified sequence, you can collapse the node in the tree structure and expand it again to refresh the view.

Name	Sequence
▼ Air -6.1	
▼ AC -1	10
▼ Act as a reservoir of compressed air	10
Air Filter Clogging	10
Air Filter Leakage	20
Act as a reservoir of clean air	20
▼ Air Filter Body	10
▼ Clean and compress the ambient air	10
Engine not starting	10
Dirty air to engine	20
Air Filter Element torn	30
Air Filter Leakage	40
Air Filter Clogging	50
Engine not starting	60
Wheel_Function	20
▶ External Functions	
▶ External Failures	

Modify the sequence of higher level or lower level functions, and failure causes or effects in the table

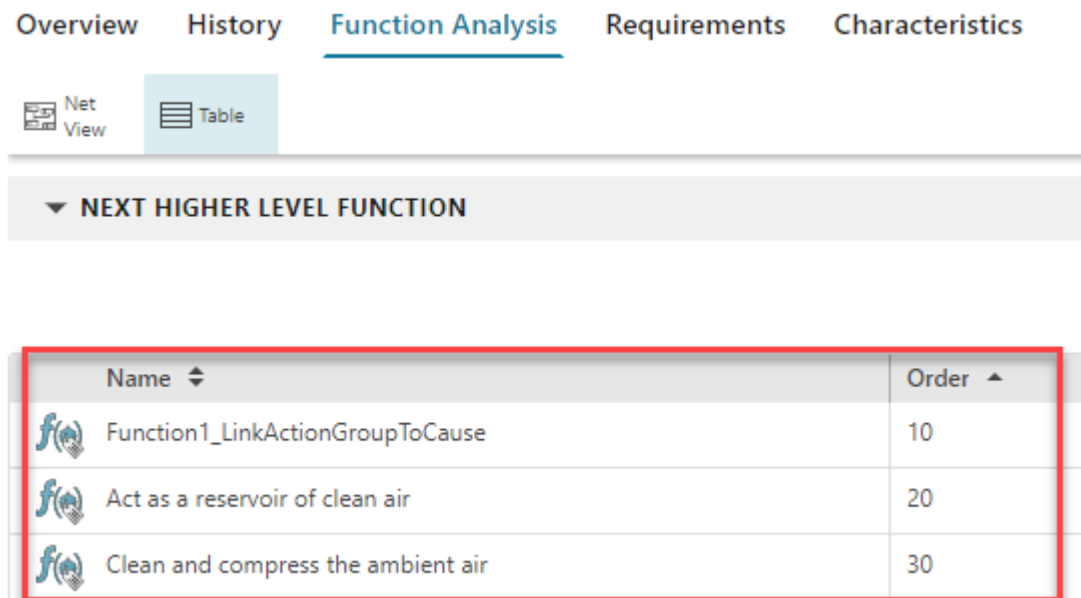
To specify the order of FMEA objects in the table, you can edit the value of the **Order** property.

In the **Function Analysis** net view, the **Order** property of the **Lower Level Functions** table is used for arranging the nodes. The **Order** property from the **Higher Level Functions** table is not considered.

In the **Failure Analysis** net view, the **Order** property from the **Cause** table is used for arranging the nodes. The **Order** property from the **Effect** table is not considered.

1. Open the FMEA object.
2. Click the **Function Analysis** or **Failure** analysis tab.
3. Click **Table** to switch from the default view to the table view.

The default value of the **Order** property is populated based on the creation sequence.



The screenshot shows the software interface with the 'Function Analysis' tab selected. Below the navigation tabs, there are two view options: 'Net View' and 'Table'. The 'Table' view is active, displaying a table with the following data:

Name	Order
Function1_LinkActionGroupToCause	10
Act as a reservoir of clean air	20
Clean and compress the ambient air	30

4. In the **Order** column from the **Lower Level Functions** table for function analysis, or the **Cause** table for failure analysis, double-click a cell to edit the value.
5. After you finish editing, make sure that you click outside the cell to save your changes

The sequence of the functions is reordered as per the modified value of the **Order** property.




If the table does not reflect your changes, you can switch to the net view and reopen the table view to see the updated sequence.

Overview History **Function Analysis** Requirements Characteristics

Net View

Table


▼ NEXT HIGHER LEVEL FUNCTION

Name	Order
 Function1_LinkActionGroupToCause	10
 Clean and compress the ambient air	20
 Act as a reservoir of clean air	30

Replace a specification in the FMEA tree structure

You can replace an existing system element, function specification, or failure specification in the FMEA tree structure.

Procedure

1. Open the FMEA and select the specification that you want to replace.
2. Click **Specification** .
3. In the **Replace** panel, select the system element, function specification, or failure specification that you want to replace the existing one with.
4. To update the name of the existing system element, function specification, or failure specification, select the **Update system element name based on selection** check box.

If you do not select this check box, the name of the system element, function specification, or failure specification remains the same, but the name of the associated specification object is updated.

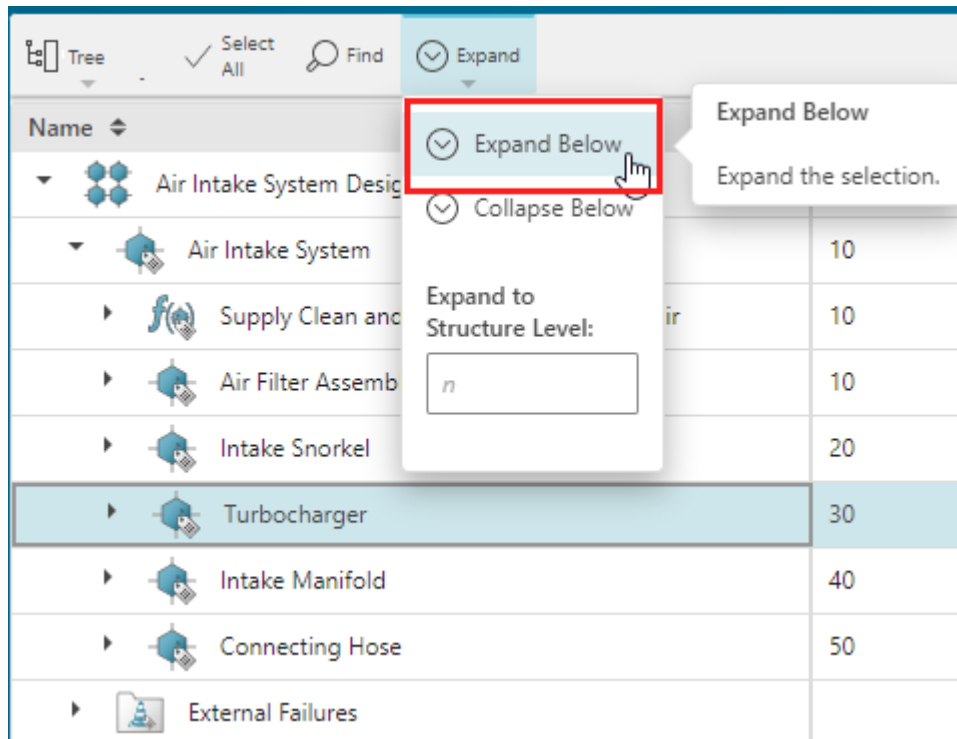
5. Click **Replace**.

Expand or collapse the FMEA tree structure

You can expand or collapse a selected node in the FMEA tree structure. You can expand the selected node in the FMEA tree structure up to a specified structure level.

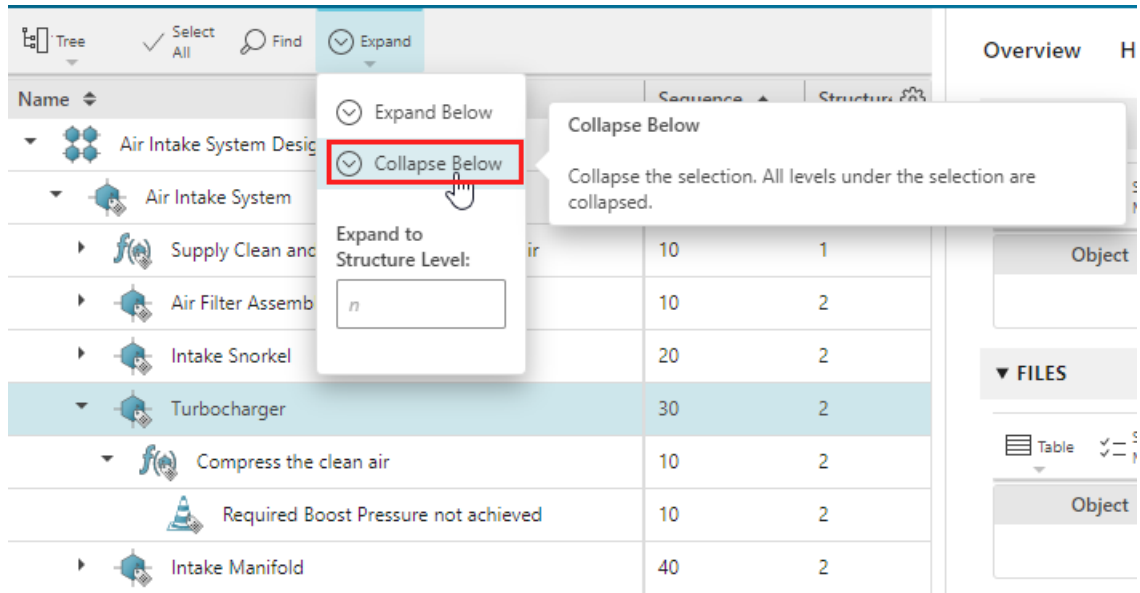
Procedure

1. Open the FMEA and make sure you are in the **Tree** or **Tree with Summary** view.
2. Do the following:
 - To expand a node in the FMEA tree structure, select the node, and click **Expand > Expand Below**.

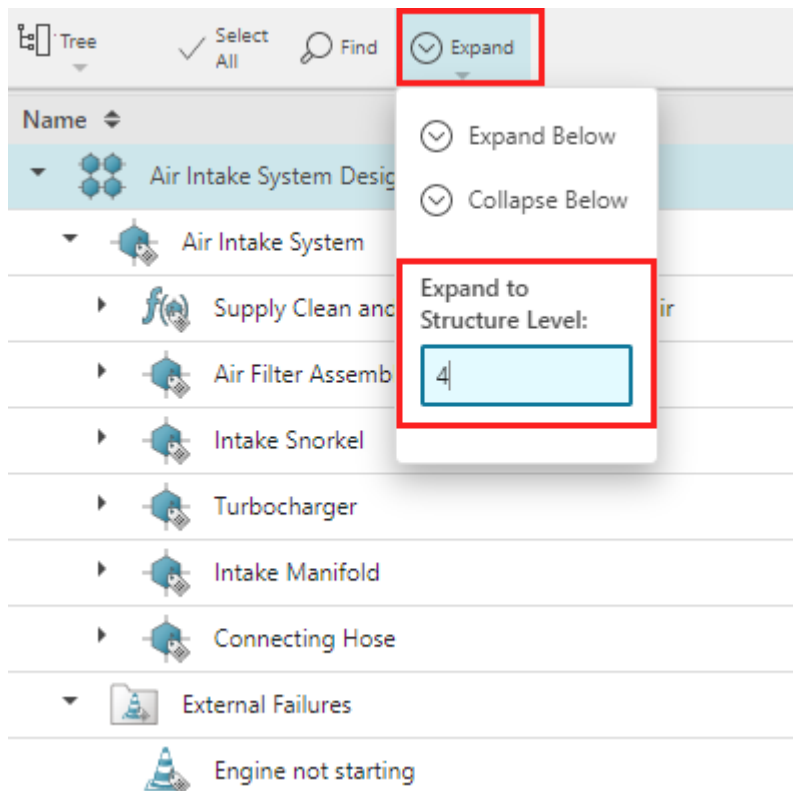


- To collapse a node in the FMEA tree structure, select the node, and click **Expand > Collapse Below**.

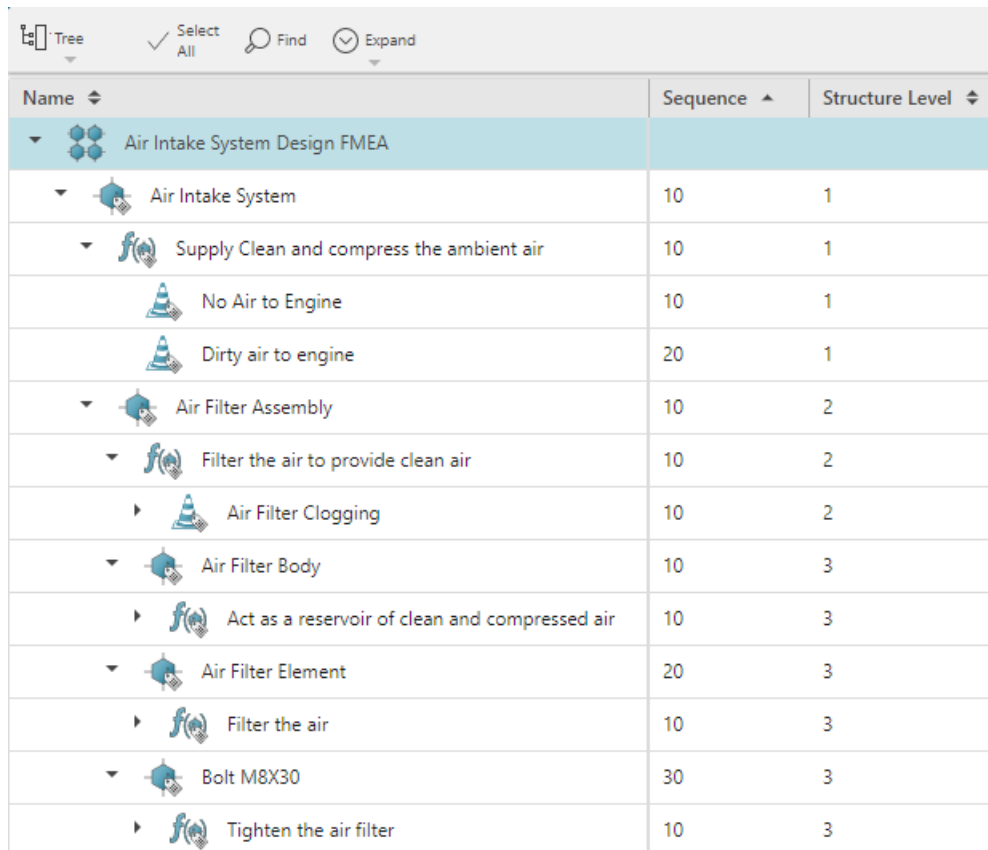
16. Visualize the FMEA structure



- To expand a node in the FMEA tree structure up to a specified structure level:
 - a. Select a node in the FMEA tree structure, and click **Expand**.
 - b. In the **Expand to Structure Level** box, specify the structure level and press Enter.



The FMEA node is expanded up to the specified level.



Name	Sequence	Structure Level
Air Intake System Design FMEA		
Air Intake System	10	1
Supply Clean and compress the ambient air	10	1
No Air to Engine	10	1
Dirty air to engine	20	1
Air Filter Assembly	10	2
Filter the air to provide clean air	10	2
Air Filter Clogging	10	2
Air Filter Body	10	3
Act as a reservoir of clean and compressed air	10	3
Air Filter Element	20	3
Filter the air	10	3
Bolt M8X30	30	3
Tighten the air filter	10	3

Modify the FMEA structure using filters

In the FMEA tree, you can apply available filters to modify the FMEA structure using the options available in the **Filters** panel.

For example, you can view all the failures in the FMEA structure that have a severity greater than 8. The following procedure shows how to use filters such that FMEA tree view displays only those failures whose severity value is greater than 8, and save the FMEA tree structure.



Procedure

1. Open the FMEA and click **Filters** .
2. In the **Filters** panel, specify **View = Failure**, and **Severity = Greater than 8**.

The FMEA tree view displays only those failures whose severity value is greater than **8**.

The **View** option in the **Filters** panel, helps you specify the objects that you want to display in the tree.


Option	Description
View = System Element	View only system elements in the FMEA tree.
View = Function	View system elements with functions in the FMEA tree.
View = Failure	View system elements with functions and their associated failures in the FMEA tree.
View = Quality Actions	View system elements with functions and their associated failures and actions in the FMEA tree.

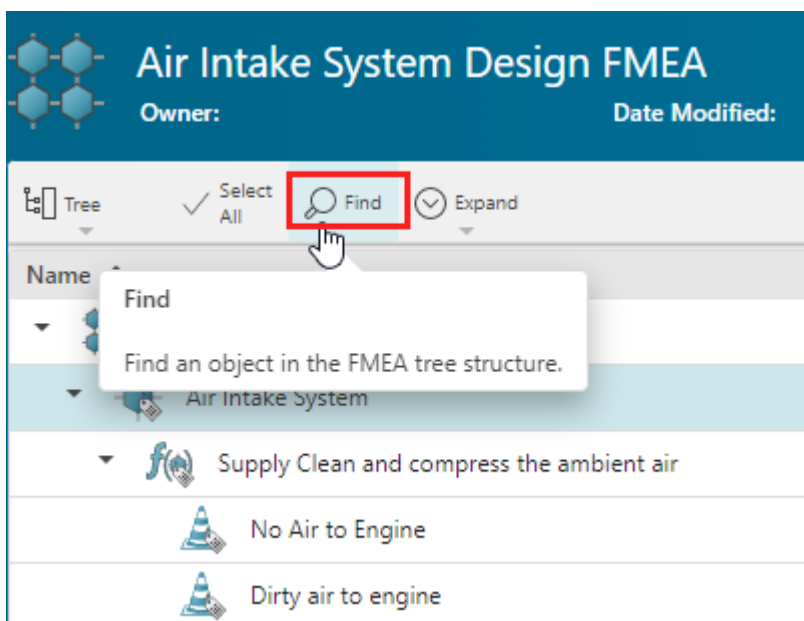
After you apply the filters, you can choose **Save Working State**  to **save the current state of the FMEA structure**. You can modify the severity of all failures as required. You can then choose **Restore Saved State**  to **revert to the saved state**.

Search for and filter the search results in the FMEA tree structure

You can search for objects in the FMEA tree structure. You can also use filters to narrow down the search results.

Procedure

1. Open the FMEA and make sure you are in the **Tree** view.
2. On the work area toolbar, click **Find** .



3. In the **Find** panel, enter the search keywords and press Enter or click .





You can use wild card characters to search for the objects in the FMEA tree structure.

Find ✕ Close

Air* ✕ 🔍

Results **Filters**

▼ **RESULTS (22)**

-  **Air Intake System**
Owner:
Date Modified: 12-Oct-2022 12:05
-  **Air Filter Assembly**
Owner:
Date Modified: 11-Oct-2022 01:36
-  **Air Filter Body**
Owner:
Date Modified: 11-Oct-2022 01:36
-  **Air Filter Element**
Owner:
Date Modified: 11-Oct-2022 01:36

The **Results** tab displays the search results.

4. To filter the search results, click the **Filters** tab.
5. Select the required filter criteria.

Find ✕ Close

✕ 🔍

Results Filters

System Element

Function

Failure





Quality Action

When you switch back to the **Results** tab, the search results are filtered as per the specified filter criteria.

Find Close

Results Filters

▼ RESULTS (9)

-  Provide ambient air to air filter
Owner:
Date Modified: 11-Oct-2022 01:36
-  Act as a reservoir of clean and co...
Owner:
Date Modified: 11-Oct-2022 01:36
-  Supply Clean and compress the a...
Owner:
Date Modified: 11-Oct-2022 01:36
-  Act as a reservoir of clean air
Owner: I
Date Modified: 11-Oct-2022 01:36

- Click **Close** to close the **Find** panel.

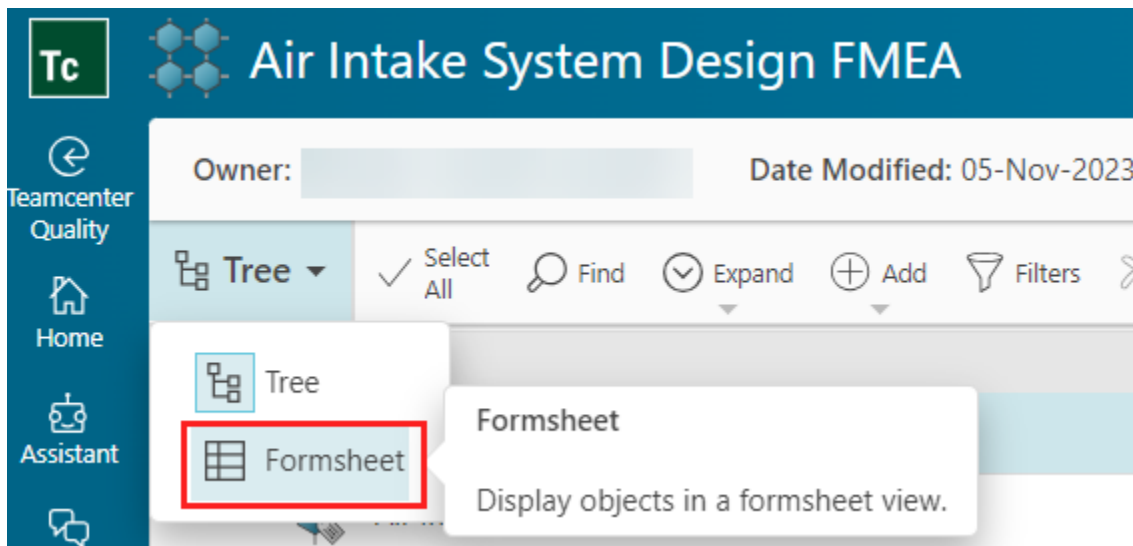
17. View the FMEA data in the formsheet

About FMEA formsheets

You can view the FMEA data of a system element representation, such as failure effects, failure causes, and other related actions in the formsheet. While creating FMEA objects, you specify the failure analysis mode type as process FMEA or design FMEA and specify the guidelines associated with them. FMEA provides guidelines based on the AIAG & VDA, IATF 16949, AS13004, and AS13100 industry standards. These guidelines are linked to a configuration file, which is used to render the **Formsheet** view.

You can open the formsheet in one of the following ways:

- Open the **Formsheet** view on the top toolbar. When you open the formsheet using this method, it opens in full mode that contains information about the systems, subsystems, and components, and the entire hierarchy of the FMEA that is analyzed.



- Right-click a system element and choose **Open in Formsheet** in the **Tree** view. When you open the formsheet using this method, it is displayed in a new browser tab in the **Lite** mode which displays information specific to the focus element only.

The screenshot displays the 'Air Intake System Design FMEA' interface. At the top, it shows the owner 'Ratnakar, Saurabh (saurabhr)', the date modified '05-Nov-2023', and the type 'FMEA'. Below this is a toolbar with various icons, including a 'Tree' icon highlighted with a red box. The main area shows a tree view of the FMEA structure with columns for 'Name', 'Hidden Children', 'Sequence', and 'Structur'. A right-click context menu is open over the 'Air Intake System' node, with the 'Open in Formsheet' option highlighted by a red box. A tooltip for this option reads: 'Open in Formsheet' and 'Open the selection in Formsheet View in a new browser tab.' The table below the tree view shows the following data:

Name	Hidden Children	Sequence	Structur
Air Intake System Design FMEA			
Air Intake System		10	1
Supply Clean		10	1
No Air to E		10	1
Dirty air to			
Air Filter Asse		20	2
Intake Snorkel		30	2
Turbocharger		40	2
Intake Manifo		50	2
Connecting H			
External Failures			

Note:

The **Lite** mode is not available in the **Formsheet** view. It is available only when you open the formsheet using the **Open in Formsheet** right-click menu option in the **Tree** or **Tree with Summary** view.

In the formsheet, you can perform basic actions such as creating system element representations, creating function representations, or associating failure effects and failure causes to failure representations.

Formsheet Header

DESIGN FAILURE MODE AND EFFECTS ANALYSIS (DESIGN FMEA)					
PLANNING AND PREPARATION (STEP 1)					
Company Name	BMW	Subject	Air Intake System Design FMEA	DFMEA ID Number	FMEA-00000008 / 1
Engineering Location	Pune	DFMEA Start Date	11/5/2023 2:03:18 PM	Design Responsibility	
Customer Name	Sogefi	DFMEA Revision Date	11/5/2023 2:03:18 PM	Confidentiality Level	Business Use
Model Year/Platform	2021-22 / Passenger Cars	Cross Functional Team			

STRUCTURE ANALYSIS (STEP 2)			FUNCTIONAL ANALYSIS (STEP 3)			
1. Next Higher Level	2. Focus Element	3. Next Lower Level	1. Next Higher Level Function	2. Focus Element Function and Requirement or Characteristic	3. Next Lower Level Function	Failure Effects (FE)
	Air Intake System	Air Filter Assembly			Act as a reservoir of clean and compressed air	Engine not starting
		Intake Snorkel			Provide ambient air to air filter	
		Turbocharger		Supply Clean and compress the ambient air	Compress the clean air	


1 Commands in the formsheet

The formsheet has the following commands:

- **Refresh** - Refreshes the display of the formsheet after you have made updates.
- **Filter** - Allows you to **apply filters** on different columns in the formsheet to narrow down the search results.
- **Print Formsheet** - Lets you **download and print the formsheet data** to an HTML file.
- **Edit > Header** - Allows you to edit the information in the header.
- **Edit > Cross Functional Team** - Lets you update the information regarding the cross functional team that is performing the FMEA.
- **Lite Mode** - This mode available only when you open the formsheet using the **Open in Formsheet** right-click menu option in the **Tree** view. It displays the information with respect to the functions, failures, and actions of the focus system element. The information about its children is not shown. In large formsheets, this helps you to work with smaller chunks of data.

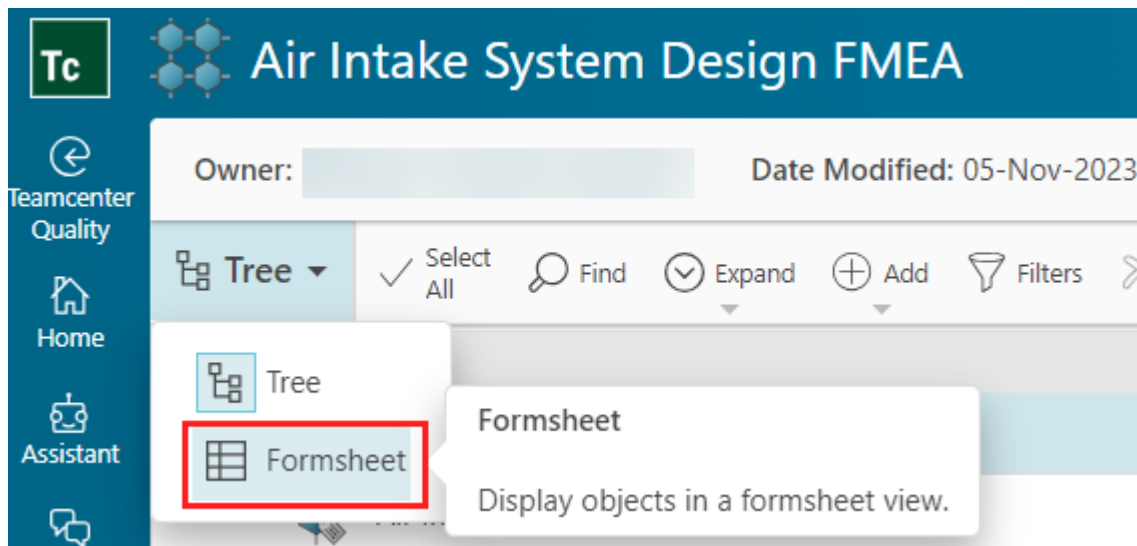
The **Print Formsheet** command is not available in the **Lite** mode.

- **Rows per Page** - Lets you specify the number of rows that you want to display on each page in the formsheet.

		<ul style="list-style-type: none"> • Full Screen - Displays the formsheet in the full screen mode.
2	Formsheet header	The formsheet header row displays information about the planning and preparation step of the FMEA such as the company name and company logo, the start and revision date of the FMEA, and the cross functional team. The formsheet header row is collapsed by default.
3	Columns	<p>The formsheet columns display information about each step in the FMEA. You can show or hide these columns, or apply filters as required.</p> <p>You can open FMEA objects from within the formsheet. To do this, right-click a cell in the formsheet and click Open .</p>

View the formsheet for the FMEA data

1. **Open an FMEA object.**
2. Switch to the **Formsheet** view.



The **Formsheet** view displays the complete FMEA data, including system element representations, function representations, failure representations, failure causes, failure effects, requirements, characteristics, initial and revision action groups, the occurrence and detection values, severity, prevention and detection actions, and so on.

You can **add**, **edit**, **filter**, or **delete** the data in the formsheet view. You can also **download and share the FMEA data** of the selected system element.

Add FMEA objects in the formsheet view

You can add system elements, functions, failures, requirements, characteristics, failure causes, failure effects, initial and revision action groups, and prevention and detection actions to the formsheet data in the formsheet view for design and process FMEAs.

Procedure

1. Open the FMEA and switch to the **Formsheet** view.
2. Do one of the following:

Add system elements or functions in the formsheet view

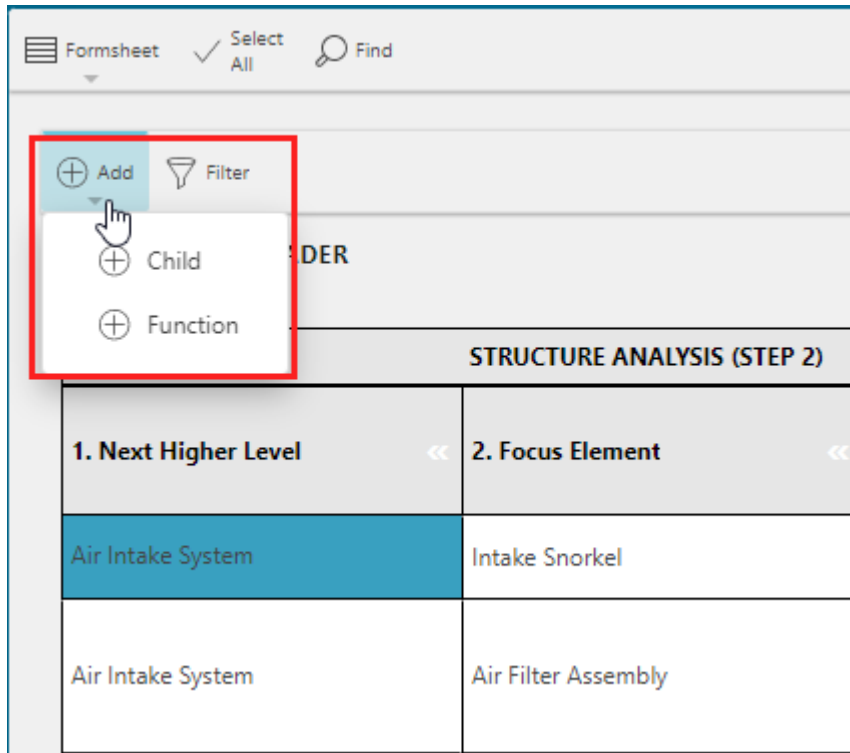
- a. Select a cell that corresponds to a system element representation.
- b. Right-click the cell and choose **Child** or **Function**.

The screenshot shows the 'Formsheet' view of a FMEA. The interface includes a top toolbar with 'Formsheet', 'Select All', and 'Find' options. Below the toolbar is a 'FORMSHEET HEADER' section. The main area is a table titled 'STRUCTURE ANALYSIS (STEP 2)'. The table has three columns: '1. Next Higher Level', '3. Next Lower Level', and an unlabeled middle column. The '1. Next Higher Level' column contains three rows of 'Air Intake System'. The '3. Next Lower Level' column contains three rows: 'Air Filter Body', 'Air Filter Element', and 'Bolt M8X30'. The middle column contains one row with 'Turbocharger'. A right-click context menu is open over the first 'Air Intake System' cell, with options: 'Open in New Tab', 'Child', 'Function', and 'Delete'. The 'Child' and 'Function' options are highlighted with a red box.

STRUCTURE ANALYSIS (STEP 2)		
1. Next Higher Level		3. Next Lower Level
Air Intake System		
Air Intake System		Air Filter Body
Air Intake System	Turbocharger	Air Filter Element
		Bolt M8X30

OR

Click **Add** and select **Child** or **Function**.



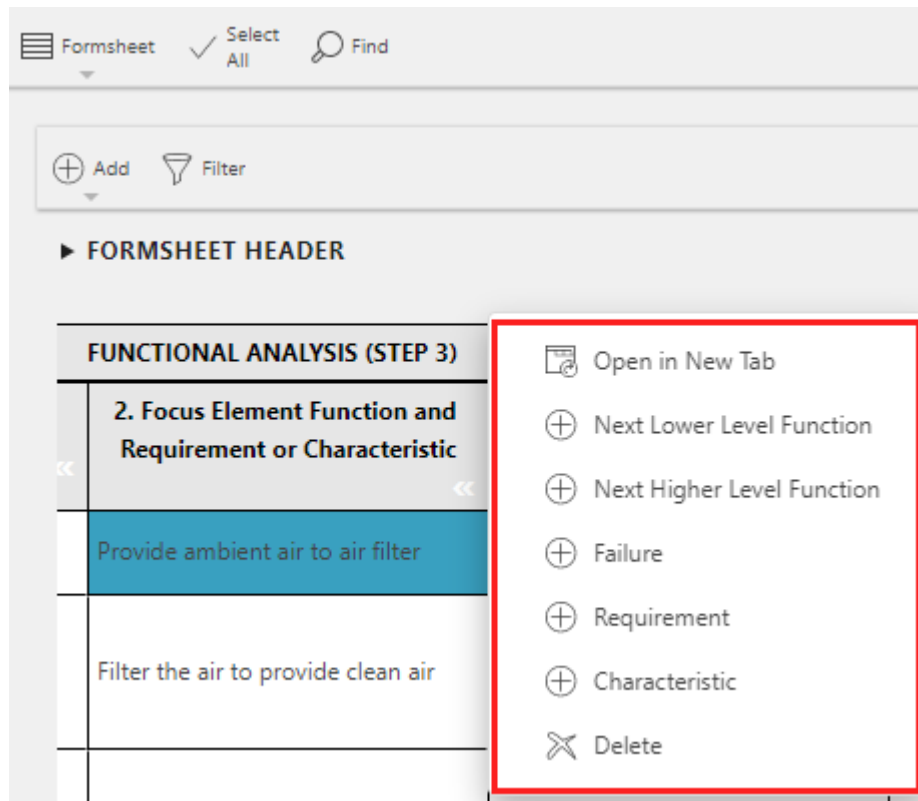
Note:

If you select a cell that represents a child system element representation, you will also see the **Sibling** option.

- c. Enter the required properties in the **Create** panel and click **Add**.

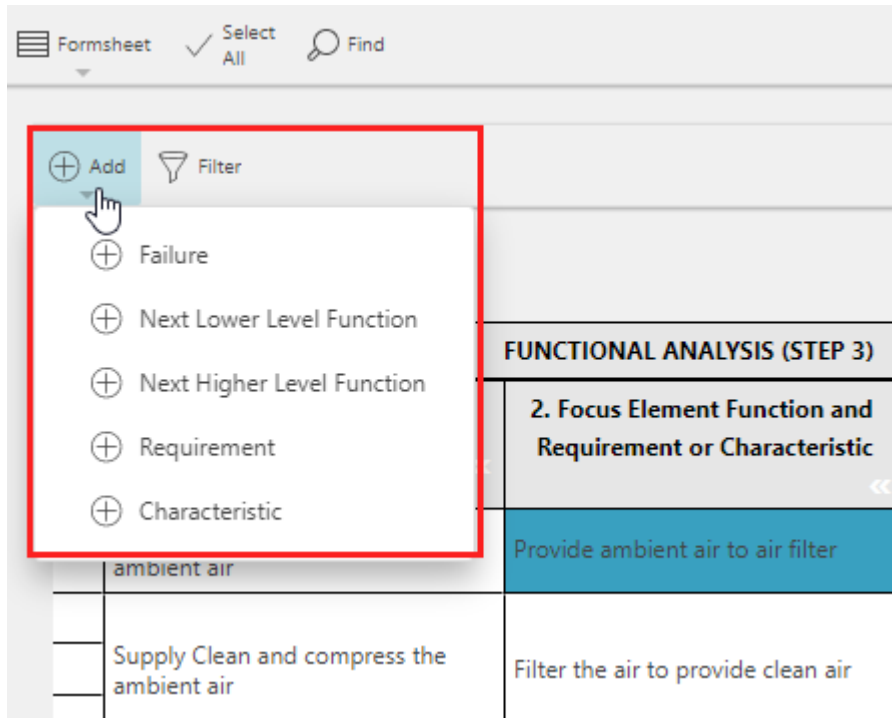
Add functions, failures, requirements, or characteristics in the formsheet view

- a. Select a cell that corresponds to a function representation.
- b. Right-click the cell and choose the required option.



OR

Click **Add** and select the required option.

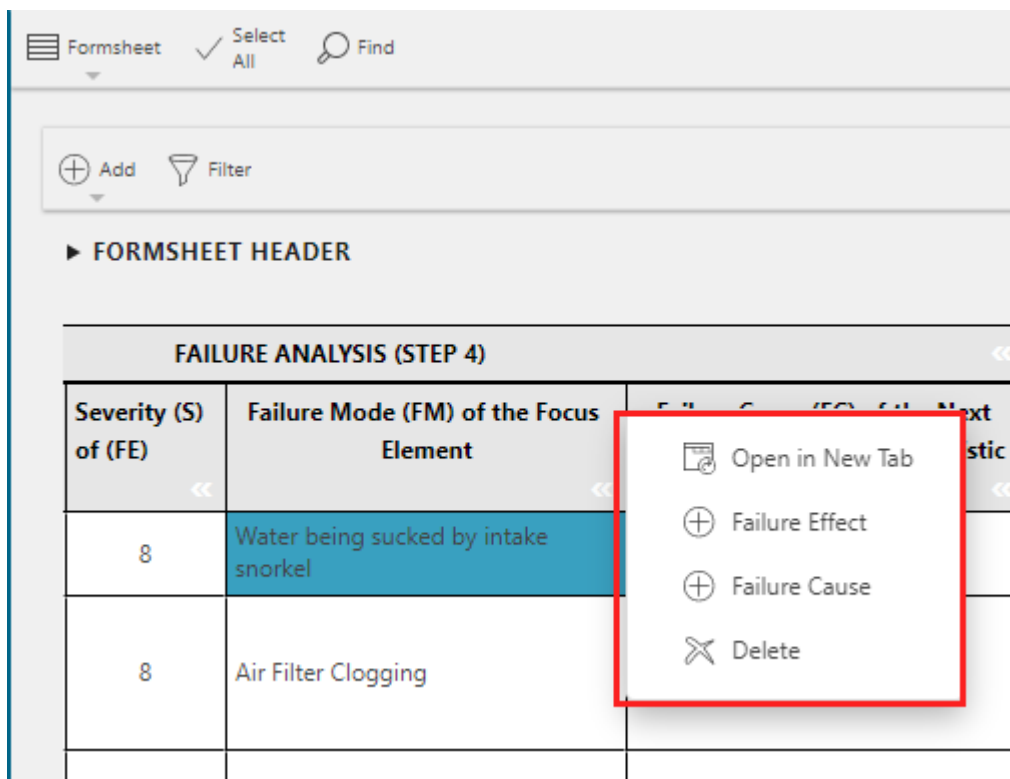
**Note:**

If you select a cell that represents a child system element representation, you will also see the **Sibling** option.

- c. Enter the required properties in the **Create** panel and click **Add**.

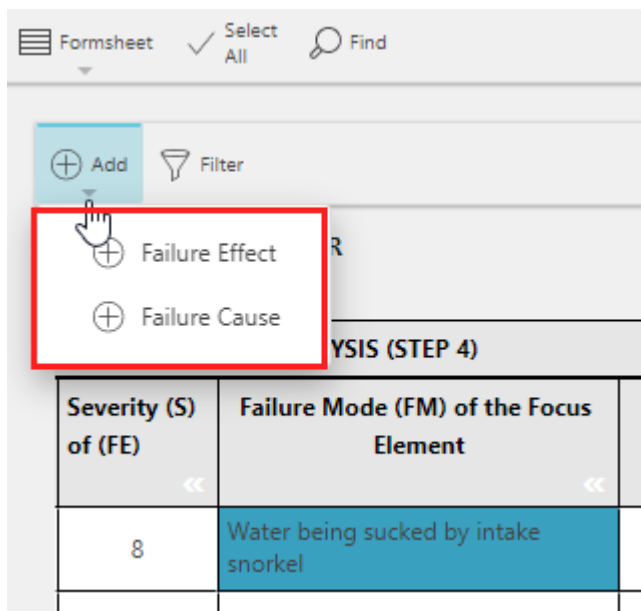
Add failure causes and failure effects in the formsheet view

- a. Select a cell that corresponds to a failure mode.
- b. Right-click the cell and select **Failure Effect** or **Failure Cause**.



OR

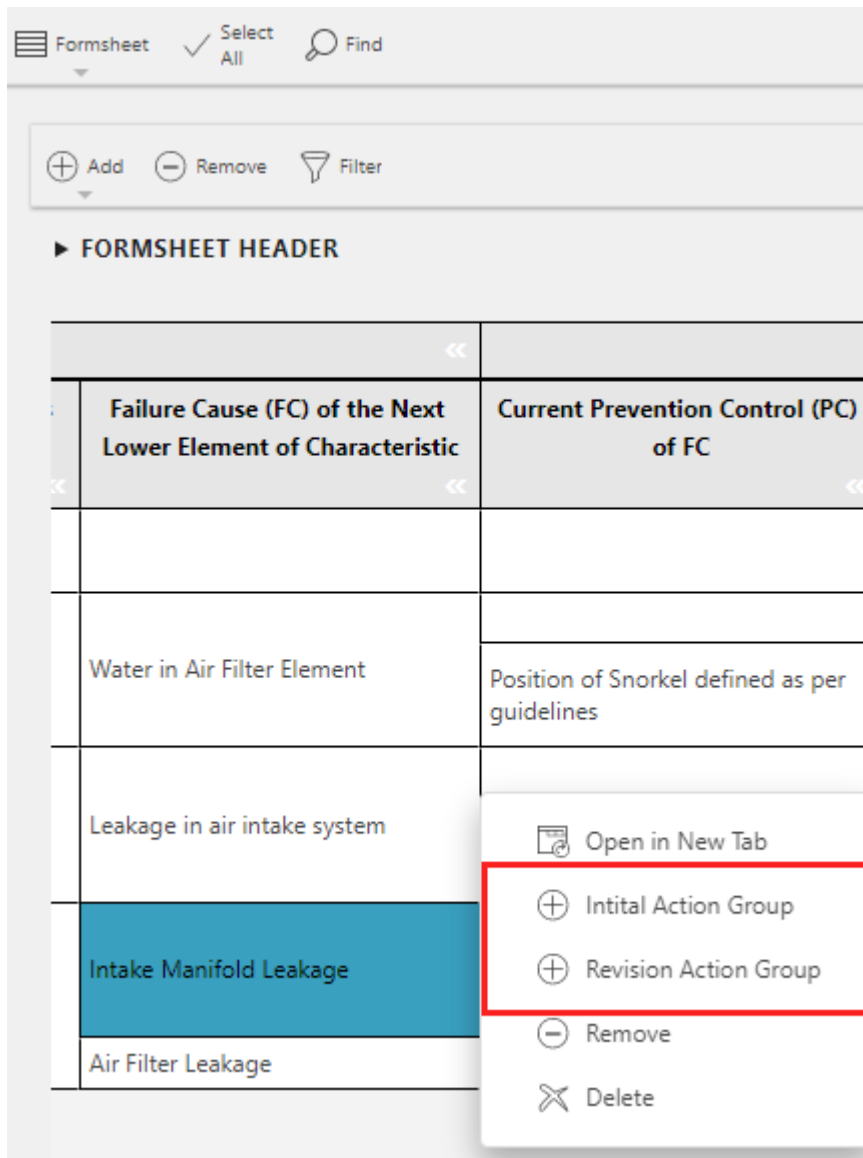
Click **Add** and select **Failure Effect** or **Failure Cause**.



- c. Enter the required properties in the **Create** panel and click **Add**.

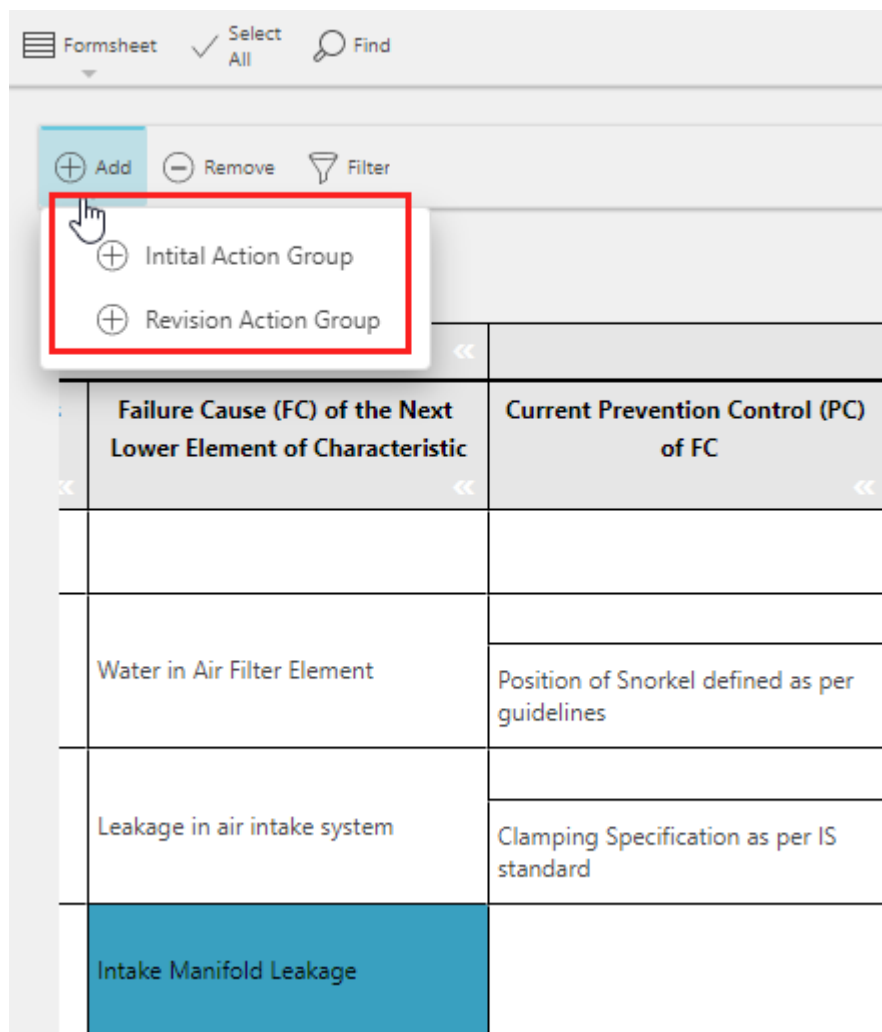
Add initial and revision action groups in the formsheet view

- a. Select a cell that corresponds to a failure cause.
- b. Right-click the cell and select **Initial Action Group** or **Revision Action Group**.



OR

Click **Add** and select **Initial Action Group** or **Revision Action Group**.



- c. Enter the required properties in the **Create** panel and click **Add**.

Add prevention and detection actions to the action groups in the formsheet view

- a. Select a cell that corresponds to the occurrence or detection value for the failure cause.
- b. Right-click the cell and select **Prevention Action** or **Detection Action**.

17. View the FMEA data in the formsheet

Formsheet Select All Find

+ Add Filter

► FORMSHEET HEADER

RISK ANALYSIS (STEP 5)		
Current Prevention Control (PC) of FC	Occurrence (O) of FC	Current Detection Controls (DC) of FC or FM
Position of Snorkel defined as per guidelines	4	

- + Prevention Action
- + Detection Action

OR

Click **Add** and select **Prevention Action** or **Detection Action**.

The screenshot shows the 'Formsheet' view with a toolbar containing 'Add', 'Filter', 'Select All', and 'Find'. A dropdown menu is open under the 'Add' button, showing 'Prevention Action' and 'Detection Action' options. Below this is a table titled 'RISK ANALYSIS (STEP 5)' with three columns: 'Current Prevention Control (PC) of FC', 'Occurrence (O) of FC', and 'Current Detection Controls (DC) of FC or FM'. The table has a header row and a data row. The data row shows 'Position of Snorkel defined as per guidelines' in the first column, '4' in the second column, and 'Shower Test on Vehicle' in the third column. The text 'Initial State' is centered above the data row.


Current Prevention Control (PC) of FC	Occurrence (O) of FC	Current Detection Controls (DC) of FC or FM
Initial State		
Position of Snorkel defined as per guidelines	4	Shower Test on Vehicle

- c. Enter the required properties in the **Create** panel and click **Add**.

Edit the data in the formsheet view

You can edit the data that is displayed in the formsheet.

Procedure

1. In the **Formsheet** view, double-click a cell to switch to the edit mode.
2. Modify the contents of the cell as required.
3. Click **Save Edits**  to save your changes.

Remove the data in the formsheet view

You can remove data in the FMEA formsheet. When you remove an object from the formsheet, the system removes the relation of the object with the formsheet.

Procedure

1. Open the FMEA and switch to the **Formsheet** view.

2. Select the cell that corresponds to the data that you want to delete, and do one of the following:
 - Right-click the cell and choose **Remove** ⊖.
 - In the formsheet, click **Remove** ⊖.

Delete data in the formsheet view

You can delete the data in the FMEA formsheet view.

Procedure

1. Open the FMEA and switch to the **Formsheet** view.
2. Select the cell that corresponds to the data that you want to delete, and do one of the following:
 - Right-click the cell and choose **Delete** ✕.
 - In the formsheet, choose **Delete** ✕.

Hide or show the columns in the formsheet

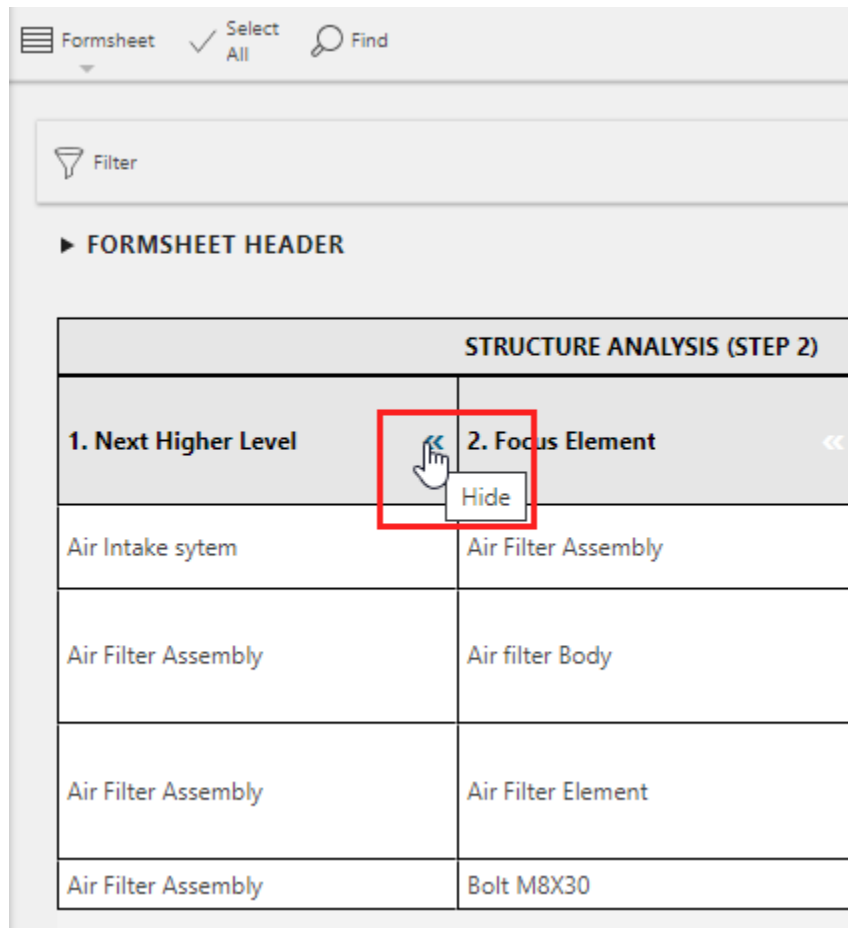
You can hide the columns in the formsheet view and show them as required.

Procedure

1. Open the **Formsheet** view.
2. Do one of the following:

To hide a column in the formsheet

- a. Navigate to the column that you want to hide.
- b. In the column header, click **Hide** ⏪.



The screenshot shows a software interface with a top bar containing 'Formsheet', 'Select All', and 'Find' options. Below this is a 'Filter' section. The main content area is titled 'FORMSHEET HEADER' and contains a table titled 'STRUCTURE ANALYSIS (STEP 2)'. The table has two columns: '1. Next Higher Level' and '2. Focus Element'. A red box highlights the '2. Focus Element' header, which has a double-left arrow icon and a 'Hide' tooltip. The table rows contain the following data:

1. Next Higher Level	2. Focus Element
Air Intake system	Air Filter Assembly
Air Filter Assembly	Air filter Body
Air Filter Assembly	Air Filter Element
Air Filter Assembly	Bolt M8X30

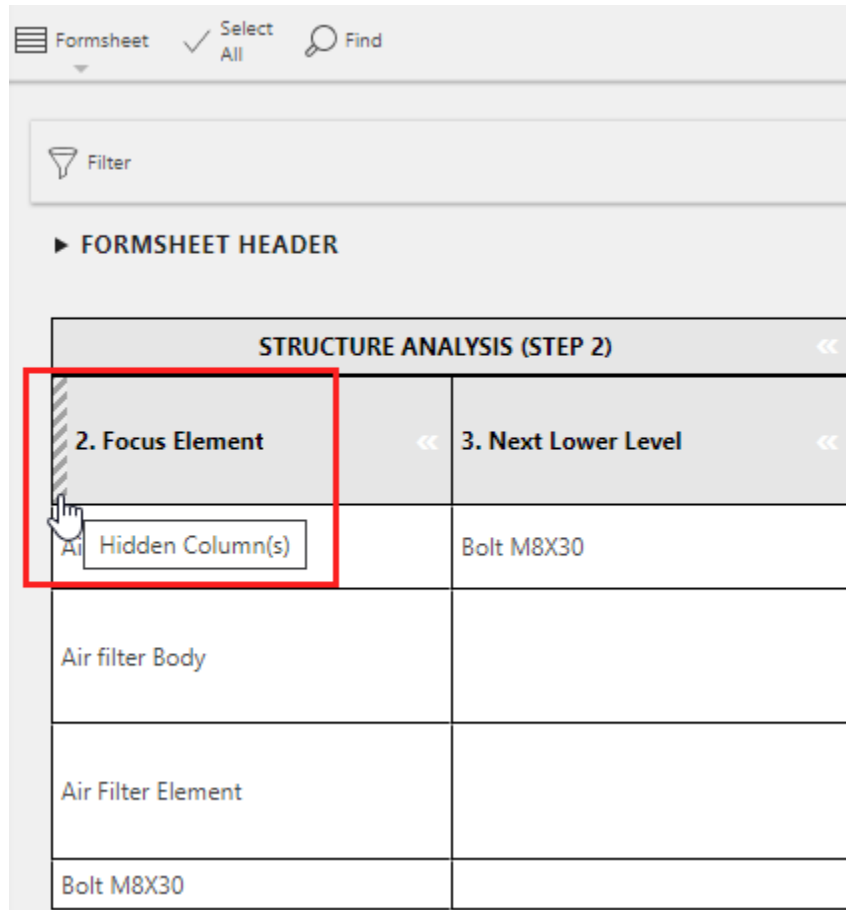
A  next to the column header indicates that the column next to it is hidden.


STRUCTURE ANALYSIS (STEP 2) <<	
2. Focus Element <<	3. Next Lower Level <<
Air Filter Assembly	Bolt M8X30
Air filter Body	
Air Filter Element	
Bolt M8X30	

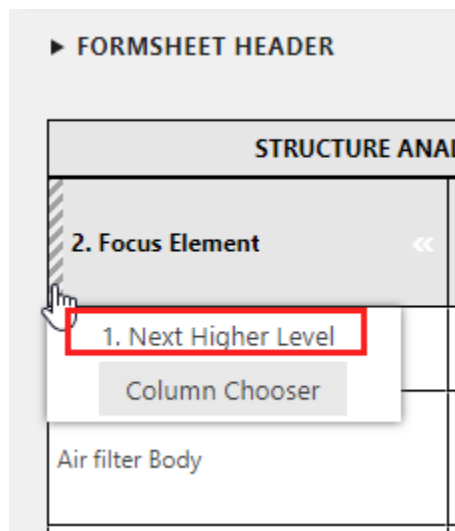
To show a hidden column in the formsheet

- Navigate to the column that you want to show.

A  next to the column header indicates that the column next to it is hidden.




- b. Click  and select the name of the column that you want to show.

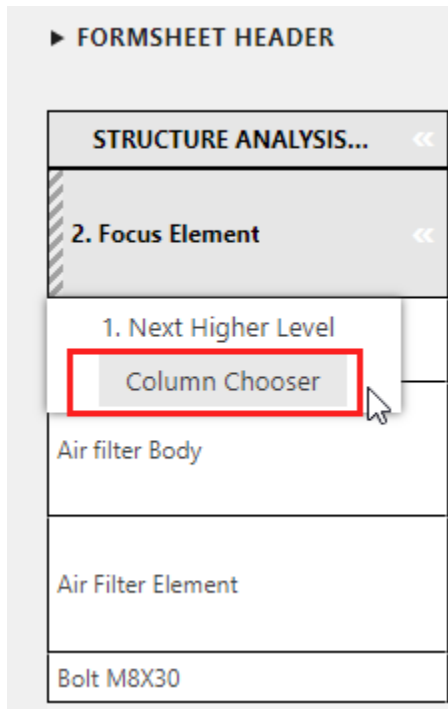


The hidden column is displayed.

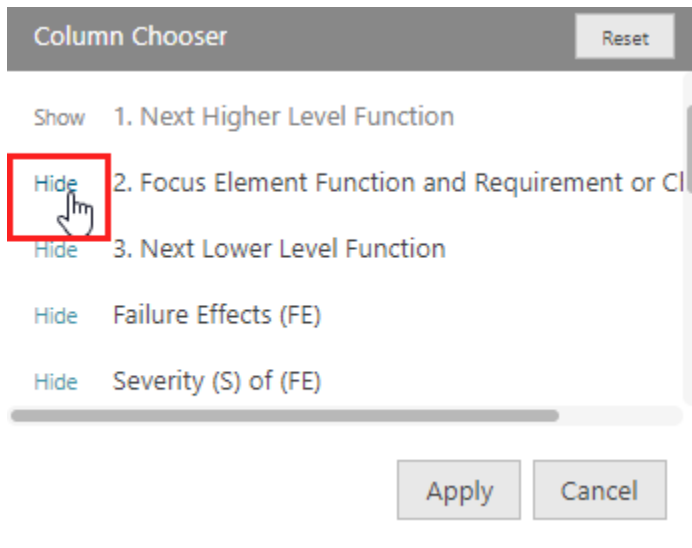
To show or hide multiple columns in the formsheet

17. View the FMEA data in the formsheet

- a. Navigate to a hidden column and click .
- b. Select **Column Chooser**.



- c. In the **Column Chooser** box, specify the columns that you want to show or hide.




- d. Click **Apply**.

Filter data in the formsheet


You can filter data in one or multiple columns in the formsheet. When you print the formsheet data to an html file, you can specify if you want to retain the layout of the formsheet as per the filter criteria.

Procedure


1. Open the FMEA and switch to the **Formsheet** view.
2. On the top toolbar, click **Filter** .
3. In the **Filter** panel, select a name from the **Column Names** list.
4. Select the criteria from the available options, or specify the filter criteria as required.
5. Click **Add**.
6. Repeat steps 3- 5 to specify multiple filter criteria.

You cannot apply multiple filters to the same column.

Note:

- To delete a filter click **Remove Filter**  in the **Filter** panel.
- To remove all filters, click **Clear All**.

7. Click **Apply** to filter the formsheet data per the filter criteria that you have specified.

A  icon in the column header indicates that the data is filtered.

The screenshot shows the 'FORMSHEET HEADER' section of a software interface. At the top, there are buttons for 'Formsheet', 'Select All', and 'Find'. Below that, there are 'Filter' and 'Clear All...' options. The main content is a table titled 'FAILURE ANALYSIS (STEP 4)'. The table has two columns: 'Severity (S) of (FE)' and 'Failure Mode (FM) of the Focus Element'. The first cell in the first column contains a filter icon (a funnel) and is highlighted with a red box. The table contains five rows of data, all with a severity of 8.

Severity (S) of (FE)	Failure Mode (FM) of the Focus Element
8	Air Filter Clogging
8	Air Filter Leakage
8	Air Filter Element torn
8	Water in Air Filter Element
8	loosening of air filter bolts

Note:


To clear all the filters applied to the formsheet data, on the top toolbar, click **Clear All Filters**




Download and share the FMEA formsheet data

You can generate and share an html file or an xlsx file that contains the formsheet data of the selected FMEA object. For example, you can share the risk assessment with third parties if required.

Procedure

1. **Open an FMEA object.**
2. Switch to the **Formsheet** view.
3. Do one of the following:
 - In the formsheet, click **Print Formsheet** .

OR

- Choose **More Commands** **...** > **Share**  > **Print Formsheet**.

4. In the **Print Formsheet** panel, specify the number of pages you want to print.
5. From the **Report Format** list, select **HTML** or **MS Excel**.
6. To print the formsheet by retaining any filters applied in the formsheet view, select the **Apply current Filters for print** check box.

The check box is available only if filters are applied to the formsheet data.

7. Click **Print**.

You can download the html or xlsx file and share it as required.

18. View audit logs for FMEA objects

Audit logs for FMEA objects

You can access audit logs for system elements, functions, failures, and quality actions.

The audit logs provide the information about the following events:

Create

Indicates that the object is newly created.

Modify

Indicates that the properties of the object are modified.

Attach

If you add child objects to an FMEA object, the modification is recorded as an **Attach** event in the audit logs. If you move an FMEA object from the current parent object to another, the modification is recorded as an **Attach** event for the new parent object.

Detach

If you move child objects from one FMEA object to another, the modification is recorded as a **Detach** event in the audit logs.

The **Workflow Logs** table provides detailed information about specific workflow events for each FMEA object.

For more information about each logged event, you can select the event and click **Information** ⓘ. The **Information** panel provides detailed information about the changes made.

Note:

Your administrator must set up preferences and configure **Audit Manager** in BMIDE so that you can view audit logs for FMEA objects.

View audit logs for FMEA objects

You can view audit logs for system elements, functions, failures, and quality actions in the FMEA, or the FMEA variants.

Prerequisites

Your administrator must configure **Audit Manager** in BMIDE so that you can view audit logs for FMEA objects.

Procedure

1. Open the FMEA and select the required system element, function, failure, or quality action whose audit log you want to view.
2. Click the **Audit Logs** tab.

The **General Logs** table lists displays the logged date, the event type name, user ID, group name, and other details.

The **Workflow Logs** table displays the workflow-related actions that have been performed for the FMEA object.

3. (Optional) To view additional information, select an event and click **Information** ⓘ > **All Properties** tab. The **Information** panel displays the old values and the new values of the fields that are modified.

19. Using an FMEA as reference to create other quality tasks

After you have identified the failure modes for a design or a process using the FMEA methodology, you can do the following to create other quality-related tasks and issues using the FMEA or the findings as reference:

- Create a quality issue to investigate a potential problem that must be addressed. You can capture issues in various forms of complaints, defects, or non-conformance that inconvenience customers.
- Create a control plan to trim down the design or process inefficiencies by identifying their sources and monitoring them. This can help you to further minimize the process and product variation, decrease product development time, and the associated costs.

The **Control Plan** tab displays a history of all the control plans that are created using an existing FMEA as reference.

Note:

A separate license is required to create **Quality Issues** and **Control Plans** respectively.

The screenshot displays the Siemens Teamcenter interface for an FMEA project titled "Air Intake System Design FMEA". The left-hand navigation pane shows a component tree with the following items:

- Air Intake System Design FMEA
 - Air Intake System
 - Supply Clean and compress the ambient a
 - Air Filter Assembly
 - Intake Snorkel
 - Turbocharger
 - Intake Manifold
 - Connecting Hose
 - External Failures

The main workspace shows the "Control Plan" tab selected, which displays a "Control Plan History" table. The table has the following data:

Name	ID	Revision	Control Plan Type
Air Intake System Desig...	CP-000003	A	Production