Critical manufacturing
an ASM PT company

Material Defects

11.2

February 2026

DOCUMENT ACCESS

Public

Material Defects

Estimated time to read: 9 minutes

Material Defects in manufacturing occur when a **Product** is improperly manufactured and departs from its intended design. It is something or a lack of something that results in incompleteness, inadequacy, or imperfection (example: a flaw in a **Product** that creates an unreasonable risk of harm in its normal use).

A **Material Defect** in any item, whether tangible or intangible, is something that substantially prevents the item from operating or functioning according to its specifications.

Material Defects can result from the manipulation and fabrication processes of **Materials**, and in manufacturing, a defect, is one that the manufacturer did not intend.

Defects in **Materials** are known to have a negative effect on the device performance. Removing or decreasing the number of such defects is a common challenge for every industry.

Moreover, if you consider Product Policy, which ensures consistency and alignment across all stages of the lifecycle of the **Product**, it is important to mention that in some industries, such as the Medical Industry, some defects for specific critical **Products** are not acceptable, so even the possibility of managing these defects is not doable.

This document will guide you through the required configurations for the **Material Defects** functionality.

Overview

The **Material Defects** functionality is intended to support the inspection processes in the capture of defects in a **Material** and by managing the lifecycle of those defects. The defects need to be recorded so that they can later be handled in a rework/repair/classification station. The concepts and functionalities of the Critical Manufacturing **Material Defects** functionalities will be described in more detail over the next sections.

Defect Lifecycle

After a defect has been captured it needs to be handled in a rework/repair/classification station. A defect can be:

- Marked as a False
- Marked as Accepted
- Fixed, by performing a repair action (example: by replacing the part)
- Considered as Not Fixable in which case, the **Material** is scrapped

> **Info**
>
> The handling of defects and their reclassification can have an impact on the First Pass Yield. For example, for a Product with 100 Materials of one unit each, if one Material is marked as having a defect, is then classified as repaired, and is in fact repaired, the Yield outcome of this Product is 100%, but the First Pass Yield is only 99%.

Setting up Material Defects-Related Entities

To enable the **Material Defects** functionalities, you have to set up specific Critical Manufacturing MES entities.

Follow the steps as described in the table below to set up the needed **Material Defects** entities:

Step Number	Step	Description
1	**Create the necessary Reasons and Repair Actions**	Create the necessary Defect Reasons and Repair Actions.
2	**Configure the Reasons in the Steps**	Configure the Defect Reasons in the Steps.
3	**Configure the Products' drawings, if applicable**	Configure the drawings in the Products.
4	**Configure the Product Repair Policy**	Define the Repair Policy of the Product if required.

Table: Steps to set up the Material Defects-related Entities

The MES object model is displayed in the figure below:

```
graph LR
    A1[Step] --- N1[Defect Reason]
    A3[Product] --- N1
    N1 --- N2[Repair Action]
    A1 --- A2[Material]
    A2 --- A3
    A2 --- L1[Material Defect] --- N2
    A1 --- L2[Part Number] --- L1

classDef mermaid_title color:#000, fill:#fafafa, stroke:#fafafa, stroke-width:0x, font-size:100%,
font-weight:200;
classDef mermaid_start color:#000, fill:#fafafa, stroke:#fafafa, color:#fafafa, stroke-width:0x,
font-size:100%, visibility: hidden;
classDef mermaid_businessdata color:#000, fill:#65CDE8, stroke:#65CDE8, stroke-width:0px, font-
size:100%;
classDef mermaid_nonbusinessdata color:#000, fill:#B7DEE8, stroke:#B7DEE8, stroke-width:0px, font-
size:100%;
classDef mermaid_entity color:#000, fill:#FB9F53, stroke:#FB9F53, stroke-width:0px, font-size:100%;
classDef mermaid_entitylinked color:#000, fill:#FCD5B5, stroke:#FCD5B5, stroke-width:0px, font-
size:100%;
classDef mermaid_context color:#000, fill:#B9CDE5, stroke:#B9CDE5, stroke-width:0px, font-
size:100%;
classDef mermaid_optional color:#000, fill:#B7DEE8, stroke:#65CDE8, stroke-width:1px, font-
size:100%, stroke-dasharray: 5 5;
class Main mermaid_entity
class A1,A2,A3,A4,A5,A6,A7,A8,A9,A10,A11,A12,A13,A14 mermaid_businessdata
class L1,L2,L3,L4,L5,L6,L7 mermaid_entitylinked
class C1,C2,C3,C4,C5,C6 mermaid_context
class N1,N2,N3,N4,N5,N6 mermaid_nonbusinessdata
```

Tip

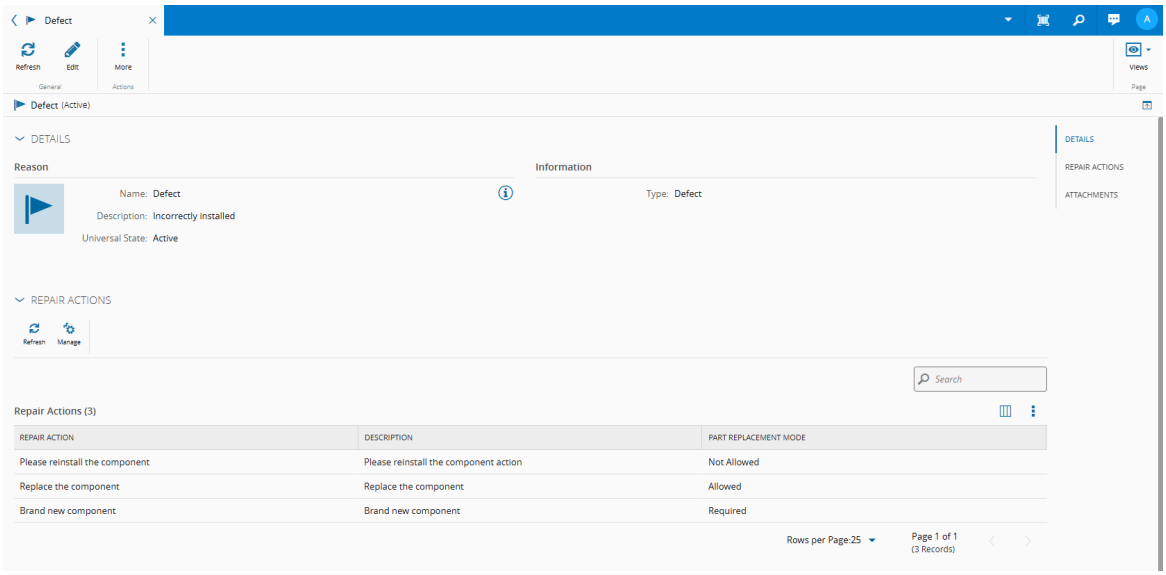
It may also be helpful to look at Import Product Information and Product Page.

The next sub-sections will cover the required configuration steps in more detail.

1 - Reason

The classification of a defect in a **Material** is registered under the Entity Type **Reason** having the Type defined as `Defect`.

You can define a set of Repair Actions for a **Reason** that are operations which can be performed in the **Material** in order to fix a defect. For each Repair Action, you can also define if a replacement of a part can take place, as displayed in the image below:

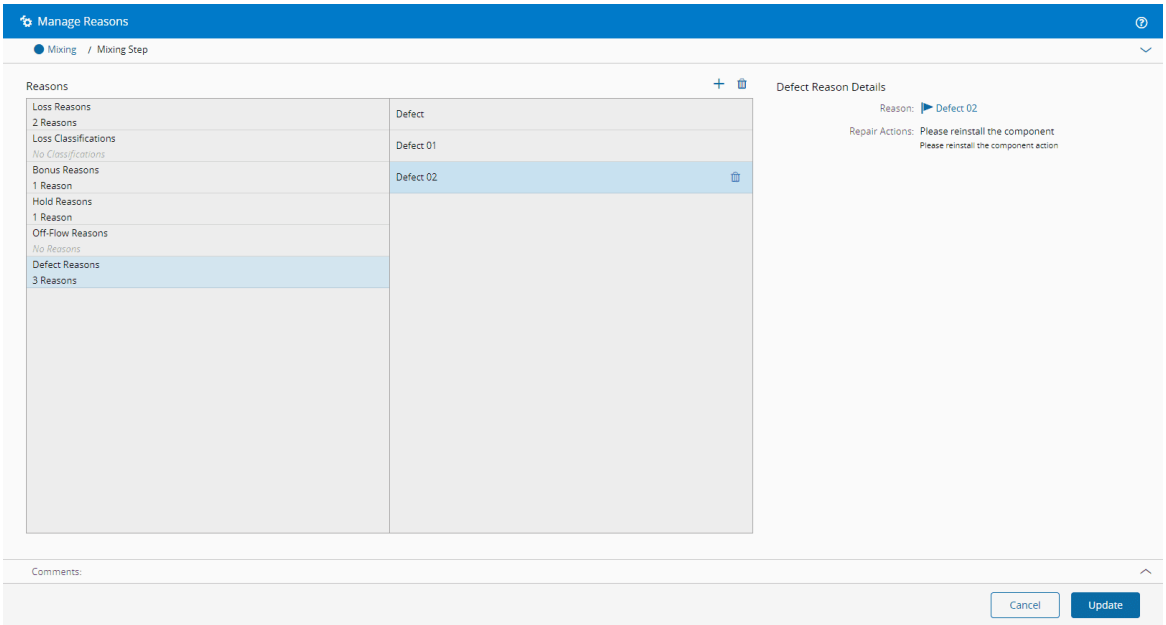


As can be seen, the following Part Replacement Modes are available:

- Not Allowed: you cannot select a **Material** to replace the defective part.
- Allowed: you are allowed to select a **Material** to replace the defective part.
- Required: you must select a **Material** to replace the defective part.

2 - Step

After the creation of the Defect Reasons, these can be configured in the **Step** through the Manage Reasons wizard available in the **Reasons** section of the **Step** page, as displayed in the image below:



3 - Product

When recording a defect it is possible to indicate the location of the defect in a CAD snapshot or a drawing. To enable this, you can configure a CAD (ECAD or MCAD) File and/or a Drawing and Schematic for the **Product**. Alternatively, a picture can also be provided at the time of recording the defect.

Furthermore, if a Default BOM is defined for the **Product**, it will be possible to replace defective parts.

Using Material Defects

After setting up the required configurations mentioned in the previous sections, the **Material Defects** functionalities can be used, as described in the next sections.

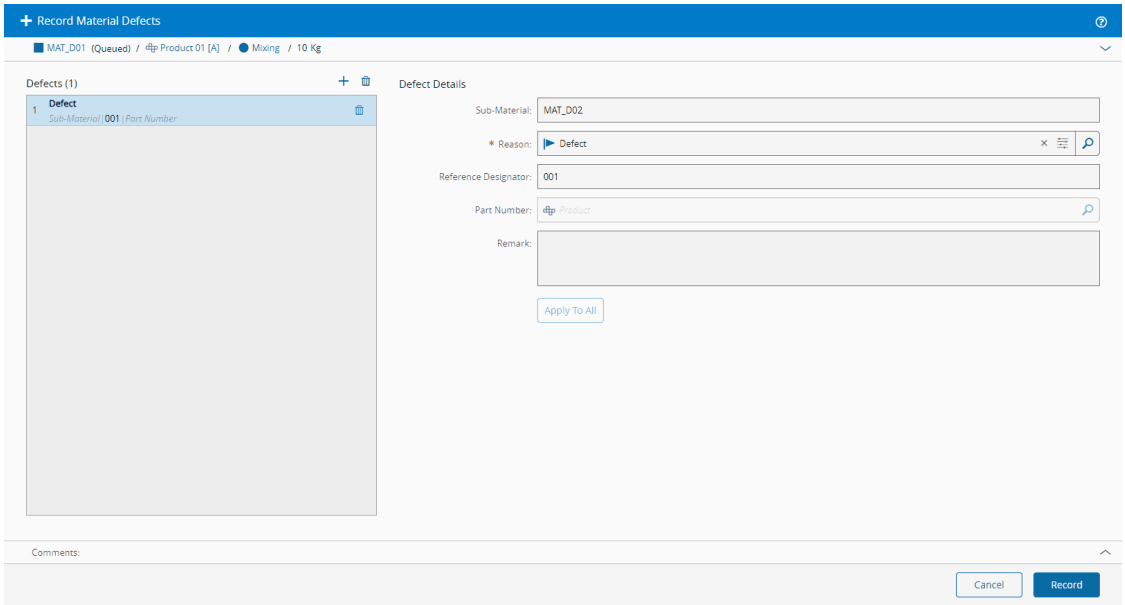
Record Defect

🔒 MaterialDefect.**Record**

If a **Material** is in a **Step** with Defect Reasons defined, it is possible to record a defect through the Record Material Defects wizard available in the Defects view of the **Material**.

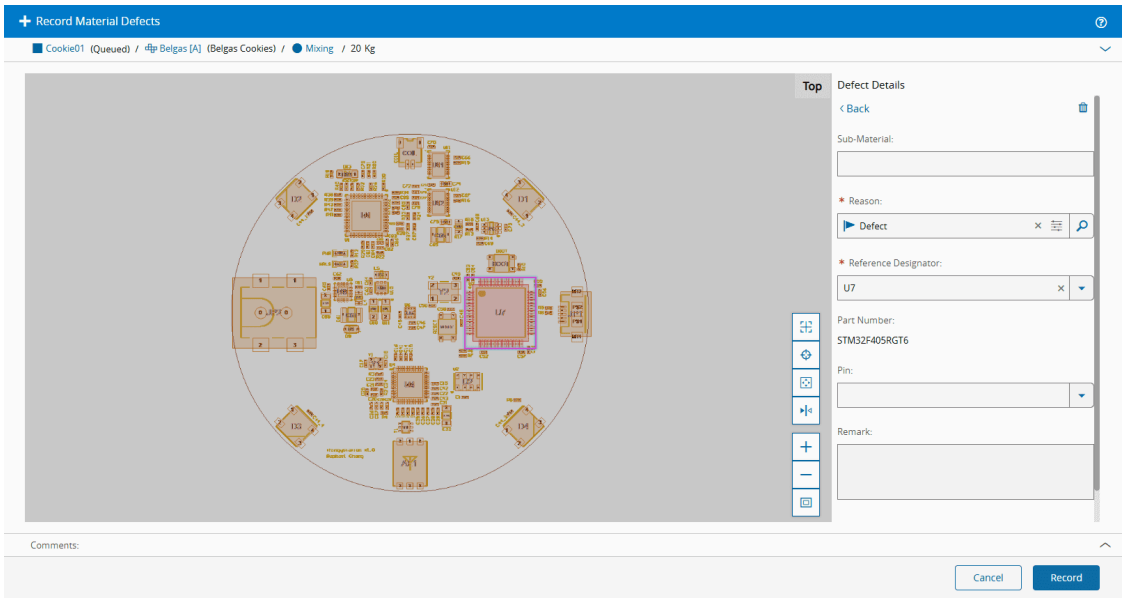
There are three options to record a defect:

- Record Using no Drawing: you specify a Sub-Material (optional), a Reason (mandatory), Reference Designator (optional), Part Number (optional), and a Remark (optional) as shown in the image below:

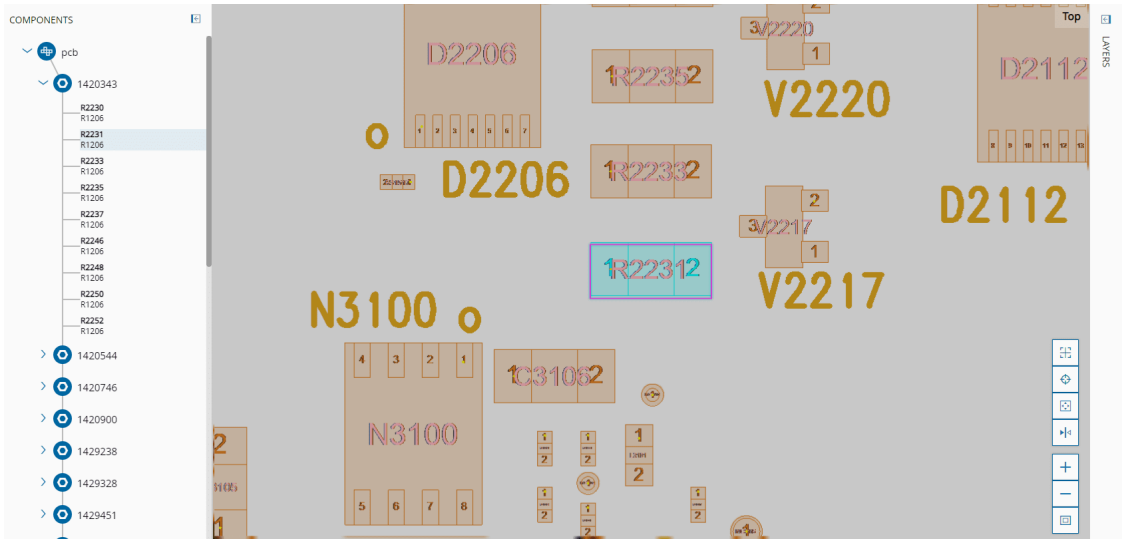


- Record Using CAD - depending on the **CAD Content Type** (ODB++ or STEP) of the **Product**, the following is possible:

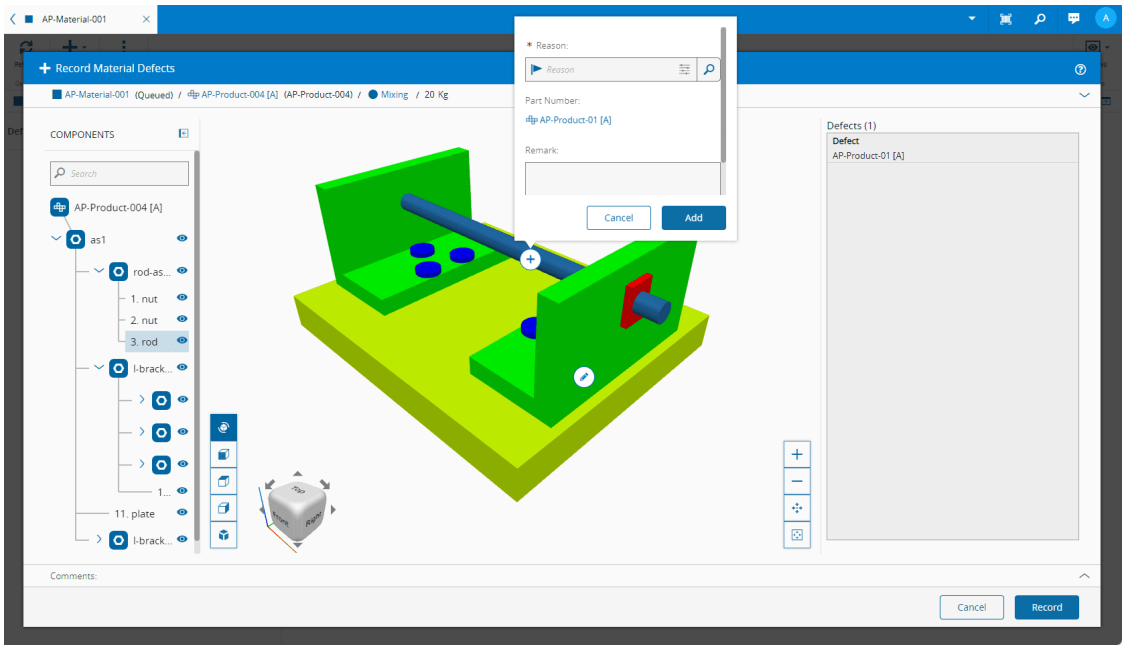
  ECAD: you specify a Sub-Material (optional), a Reason (mandatory), Reference Designator (mandatory), Part Number (displayed upon selection of Reference Designator), Pin (optional), and a Remark (optional) as shown in the image below:



Alternatively, when the ECAD file is open, and only if it has defined Product Components, you can select the defective component, as displayed in the image below:

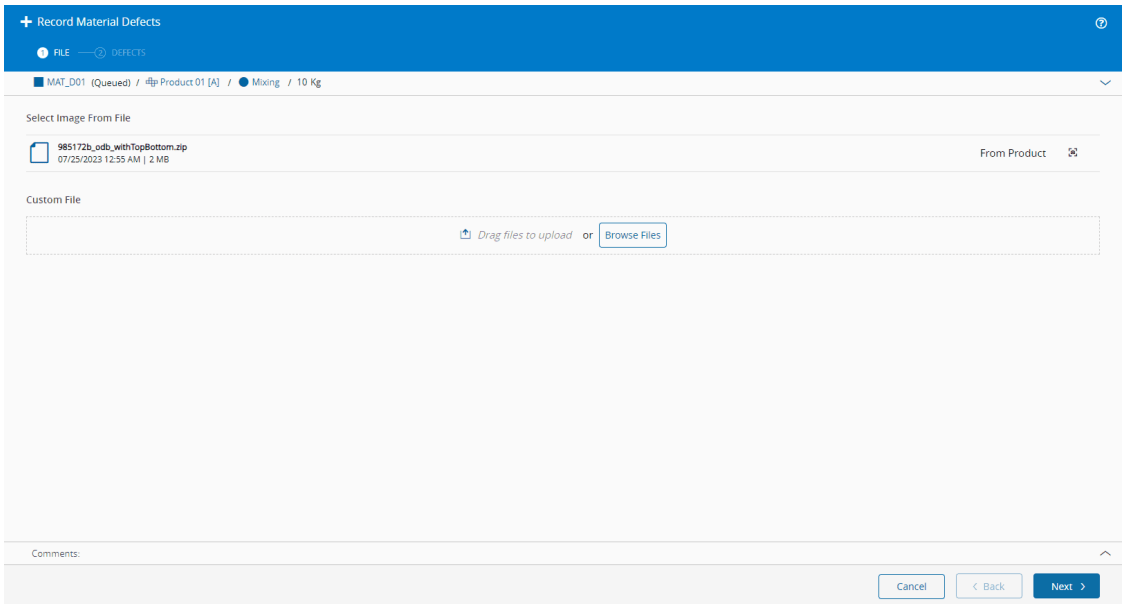


MCAD: you search or select a component, select + on the component, specify a Reason (mandatory), Remark (optional), and a Sub-Material (optional) as shown in the image below:

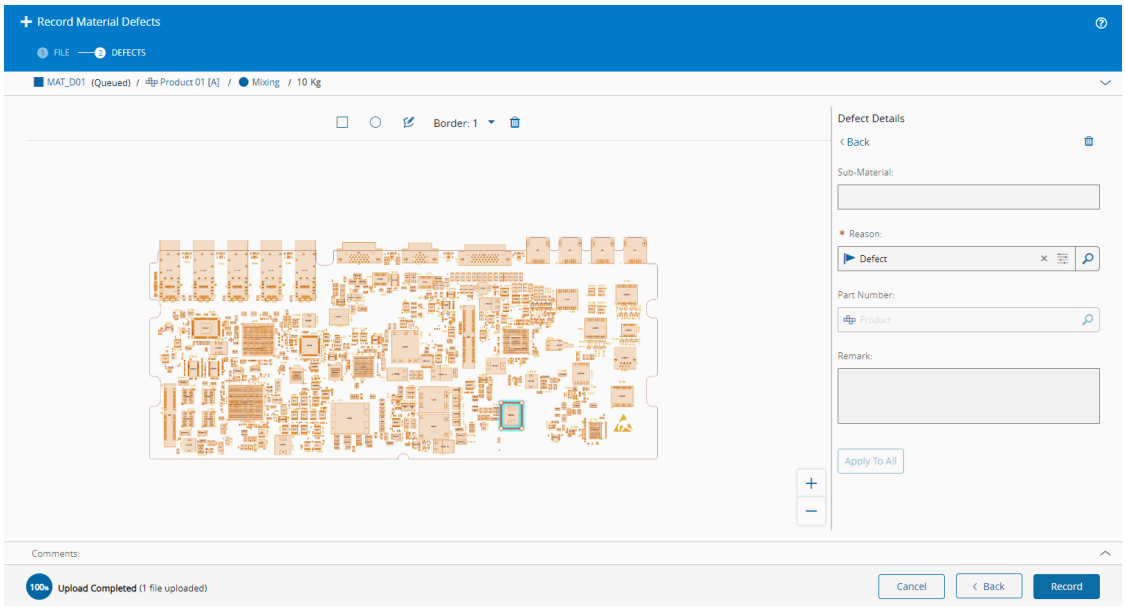


When you select **Add**, the defect will appear in the **Defects** panel on the right.

- Record Using Picture: you specify a Defect Reason in a Drawing, either in a snapshot of the CAD file or in an image. The image can either be provided by the Drawings linked to the **Product** of the **Material** or provided when recording the defect, as displayed in the image below:



In the Drawing, it is possible to select where the defect is found by using either a pre-defined shape, such as a square or circle, or you can draw a specific shape, as displayed in the image below:



Info

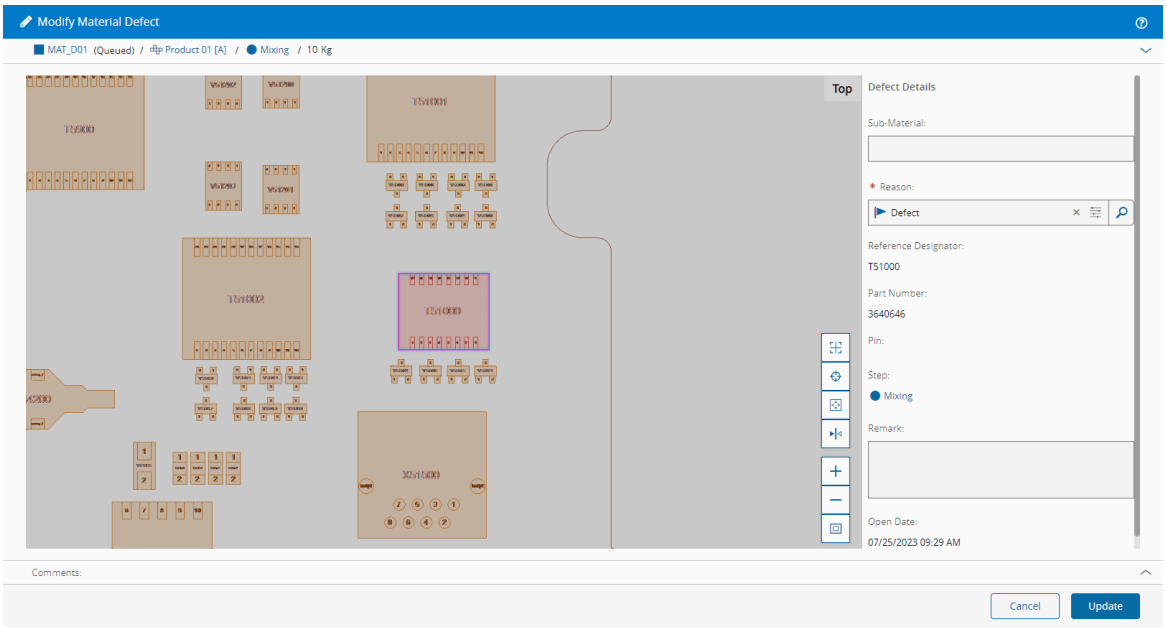
Depending on the Record Defect option, you may need to have the Default BOM set as well as the Product Components.

For more information, see Record Material Defect.

Modify Defect

MaterialDefect.**Edit**

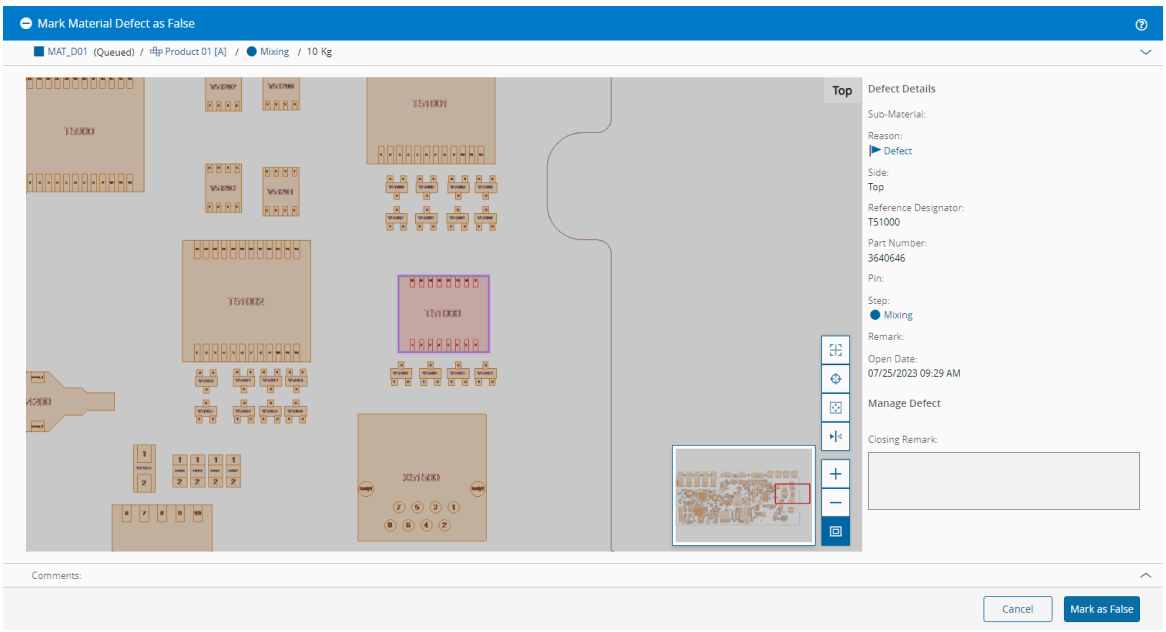
If you want to change the information of the defect, it can be done through the Modify Material Defect wizard as displayed in the image below:



Mark as False

🔒 MaterialDefect.**MarkAsFalse**

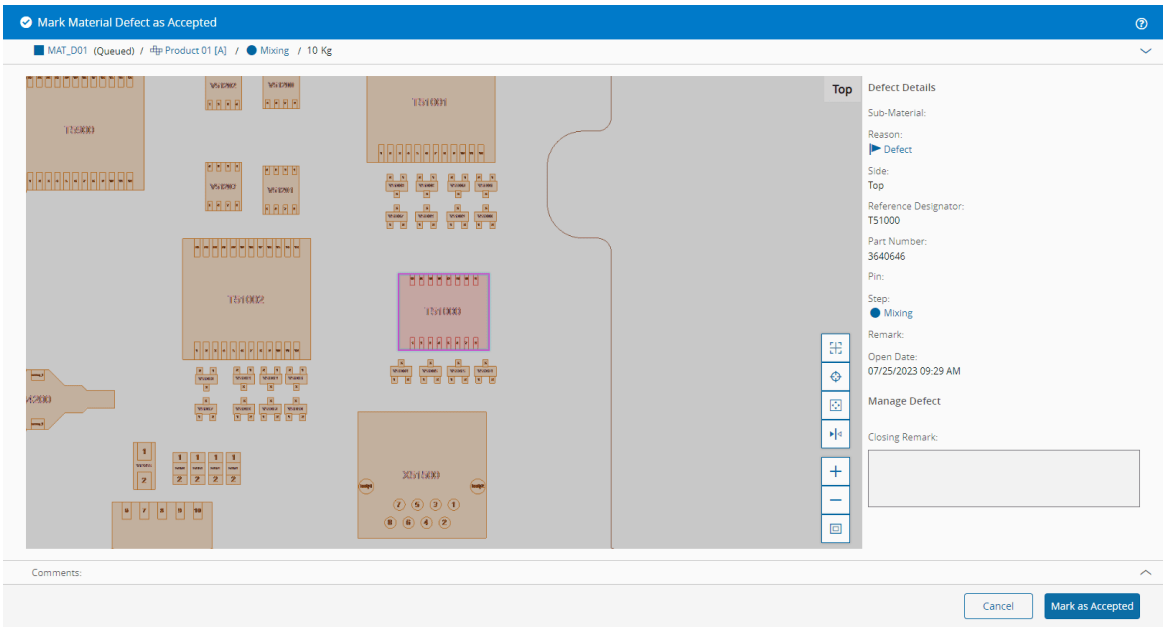
If a defect is identified as a false defect - that is, it has been opened in error, it can be closed through the Mark Material Defect as False wizard, as displayed in the image below:



Mark as Accepted

🔒 MaterialDefect.**MarkAsAccepted**

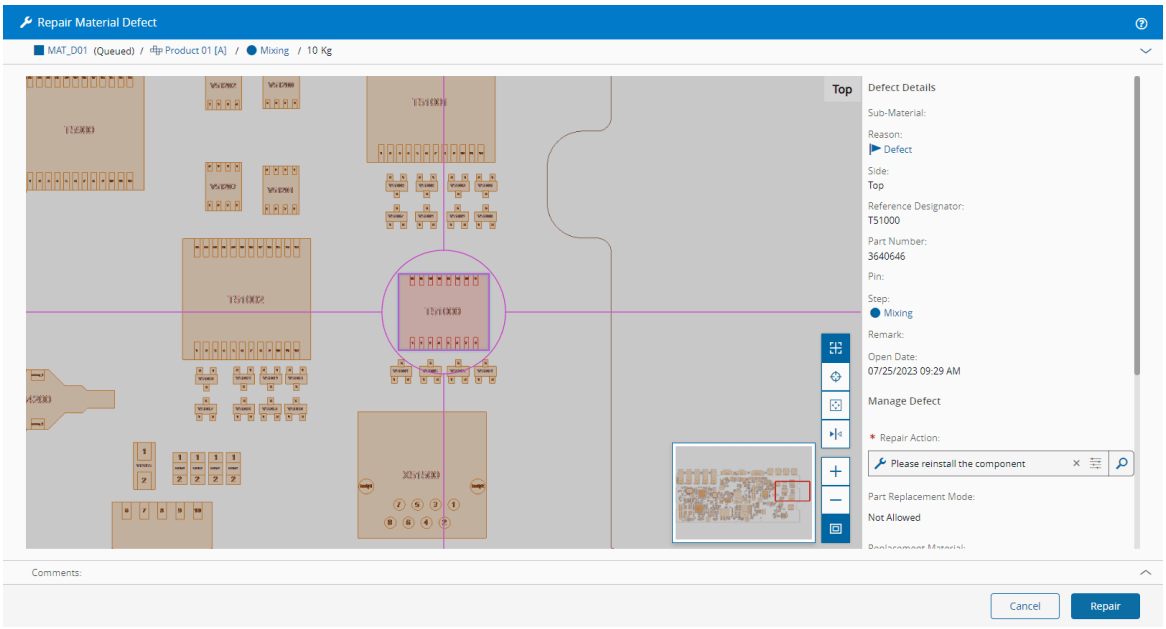
If you want to acknowledge and accept the defect as-is, it can be accepted using the Mark Material Defect as Accepted wizard, as displayed in the image below:



Repair Defect

🔒 MaterialDefect.**Repair**

To fix a defect, you can access the Repair Material Defect wizard and select a Repair Action, as displayed in the image below:



Depending on the Parts Replacement Mode of the Repair Action, you can (or must) select a Replacement Material. The **Materials** available for selection must have the same **Product** as the Material Defect Part Number and they must be in the same **Facility** as the **Material** being fixed.

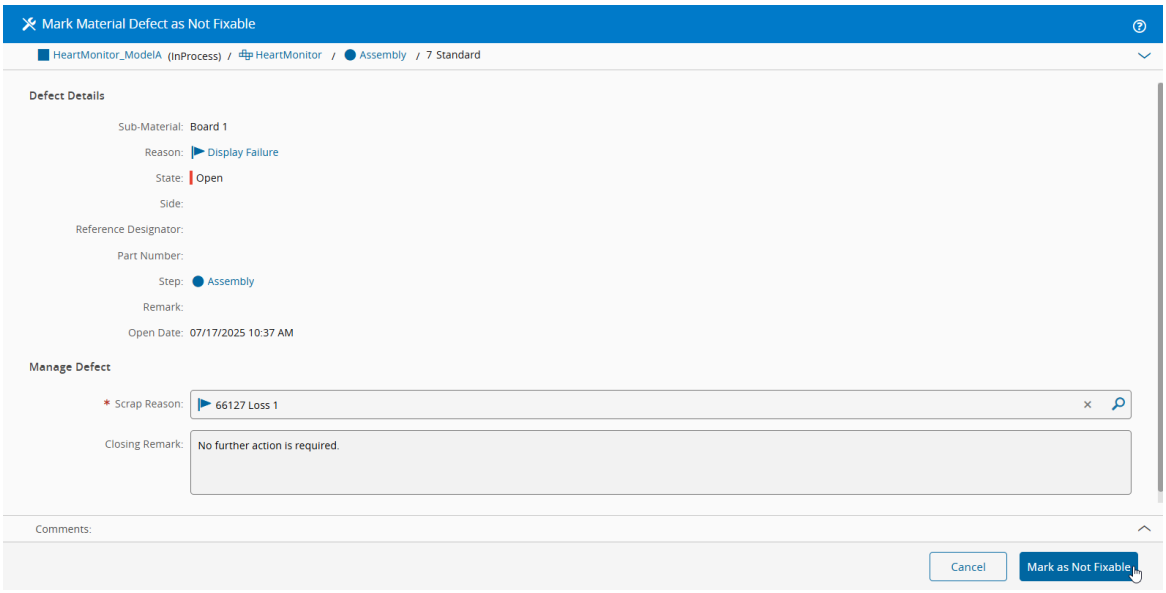
> **Info**
>
> The Repair Actions available for selection are the ones defined in the Defect Reason of the defect.

Mark as Not Fixable

🔒 MaterialDefect.**MarkAsNotFixable**

If the defect cannot be fixed, it can be marked as non-fixable using the Mark Material as Not Fixable wizard, as displayed in the image below.

> **Info**
>
> If the defect applies to an existing Sub-Material Id, the loss will be applied to the Sub-Material only, and the Sub-Material will be terminated. If the defect applies to a virtual Sub-Material, a loss of one unit will be recorded on the Parent Material.
>
> For more information, see the Mark Material Defect as Not Fixable section in the User Guide.



Warning

A Material with active defects can continue to be processed, but it cannot be shipped until all the defects have been duly reclassified.

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