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EQUIPMENT TRACKING PHASES

RELEASE 8.4

FUNCTIONAL REQUIREMENT SPECIFICATION

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Allen-Bradley • Rockwell Software

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Chapter 1

Introduction

This document details the requirements of the functions implemented by the phases specific to equipment tracking. The phases are executed in the Production Execution Client of PharmaSuite.

Each requirement is composed of a name and a unique identifier (e.g. Instruction (SR0300.8.1)). If a requirement's meaning is for requirement grouping only, the identifier is appended by a plus sign (e.g. Process parameters (SR0300.8+)).
For requirements with **Framework capability** as identifier, see "Functional Requirement Specification Execution Framework" for their unique identifier, [A1] (page 99).

The revision history (page 101) lists the changes made to the document with PharmaSuite 8.3 as the comparison baseline. Changes related to a requirement are marked as "Editorial", "Update", "New", or "Deleted", changes to the additional context information are marked as "Context information-related".

Typographical Conventions

This documentation uses typographical conventions to enhance the readability of the information it presents. The following kinds of formatting indicate specific information:

Bold typeface — Designates user interface texts, such as

- window and dialog titles
- menu functions
- panel, tab, and button names
- box labels
- object properties and their values (e.g. status).

`Monospaced typeface` — Designates code examples.

Chapter 2

Recipe and Workflow Configuration for Equipment Tracking

This section provides an overview of equipment tracking within workflows and process orders.

Phases

The following phases are available for equipment tracking:

- Identify equipment (page 13)
  The **Identify equipment** phase allows to identify an equipment entity or an equipment entity group and to bind the entity to the context in which it is being used (e.g. order, workflow). Additionally, the phase allows to build an equipment entity group. As a prerequisite for binding, the phase performs fit-for-purpose checks. For verification purposes, an already bound equipment entity can be re-scanned within the same unit procedure context.
- Change equipment status
  The **Change equipment status** phase allows an operator to set an FSM-related status of a previously identified equipment entity.
  The phase neither supports equipment graphs that are maintained in Data Manager - Equipment nor equipment entity groups.
- Trigger graph transition (page 55)
  The **Trigger graph transition** phase allows an operator to change an equipment graph-related status of a previously identified equipment entity or equipment entity group (parent entity and its child entities) by executing a graph trigger.
- Separate equipment (page 73)
  The **Separate equipment** phase allows an operator to separate an equipment entity group. Either the entire group is separated into single entities or a single entity or a sub-group is separated from a main group.
  Based on the phase configuration, a separated equipment entity can keep its binding status and a separated sub-group can keep its grouping by retaining its relations to its own child entities.

- Unbind equipment (page 87)
  The **Unbind equipment** phase allows an operator to release a previously bound equipment entity or all equipment entities of a group before a unit procedure is finished. Thus the entity or entity group can be identified within another unit procedure context while the current unit procedure is still running.

Binding of Equipment

An equipment entity or equipment entity group can only be used in the context of one unit procedure at any given time. To ensure the exclusive usage, the **Identify equipment** phase does not only identify an equipment entity, but also binds it to the current unit procedure if all relevant checks have passed successfully. As soon as an equipment entity has been identified (i.e. successfully scanned, but not yet bound) or bound, it is no longer available in the context of any other unit procedure.
Equipment entities are either released automatically upon completion of a unit procedure or they can be released explicitly with the **Unbind equipment** phase.

All binding- and release-related activities are tracked in the equipment logbook (if maintained).

Grouping of Equipment

An equipment entity group consists of a parent entity and one or more child entities. Thus a child entity that has children is the sub-parent to a sub-group, which itself belongs to a main group that has its main parent.

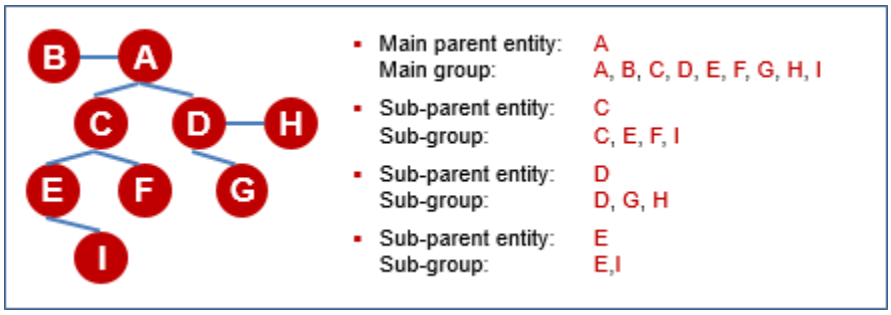

Figure 1: Structure of an equipment entity group

Equipment entity groups support different use cases on the shop floor:

- Setting up a production line or work center.
- Assembling and disassembling equipment.
- Grouping equipment entities that only share a loose connection (e.g. equipment entities that are placed on a tray to be sterilized in an autoclave).

In general, the grouping of equipment entities is considered to be runtime data that is primarily executed on the shop floor. All grouping-related actions are tracked within the logbook (if maintained) of the affected equipment entities.

In order to support ad-hoc repair use cases, the assignment between parent and child entities can also be updated by authorized users within Data Manager - Equipment. If the grouping is updated while a parent entity is already bound to a unit procedure, the system automatically records the update as an exception in the context of this unit procedure.

For examples how to configure the related equipment tracking phases in support of different grouping and separation scenarios, see

- create an equipment entity group (page 5),
- identify an equipment entity group for usage (page 7),
- re-identify an already bound equipment entity or entity group (page 8),
- trigger a graph transition on an equipment entity group (page 8), and
- separate an equipment entity group (page 9).

Creating an Equipment Entity Group

The **Identify equipment** phase supports two identification scenarios: identify a **parent entity** and identify the **child entities** that are added to the parent entity.

An equipment entity can only belong to one equipment entity group at a given point in time.

For creating of an equipment entity group, the following configuration rules apply to the process parameters of the **Identify equipment** phase:

- Parent entity of group (page 25) must only be defined to identify a child entity to be added.
- Identify in current binding context (page 26) must be set to **Yes** if the new child is already bound to the same unit procedure context, otherwise it must be set to **No**.
- Identification mode (page 26) can be set to **Entity or group** (if both is allowed), **Single entity required** (if only a single entity must be identified), or **Entity group required** (if only an entity group must be identified), but must not be set to **Child entity (already bound)**.

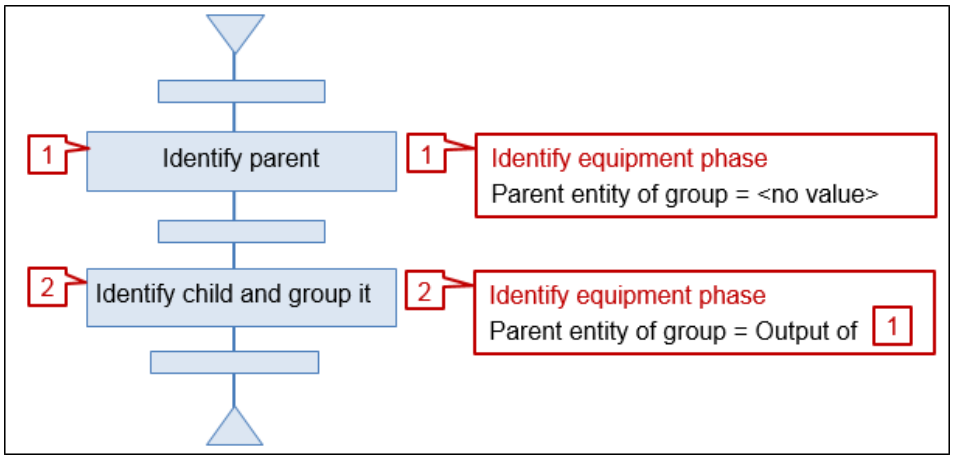

Figure 2: Example configuration - group two equipment entities

The subsequent figure shows the assembly of an equipment entity group (Compactor) that finally will contain a sub-group (Crusher).

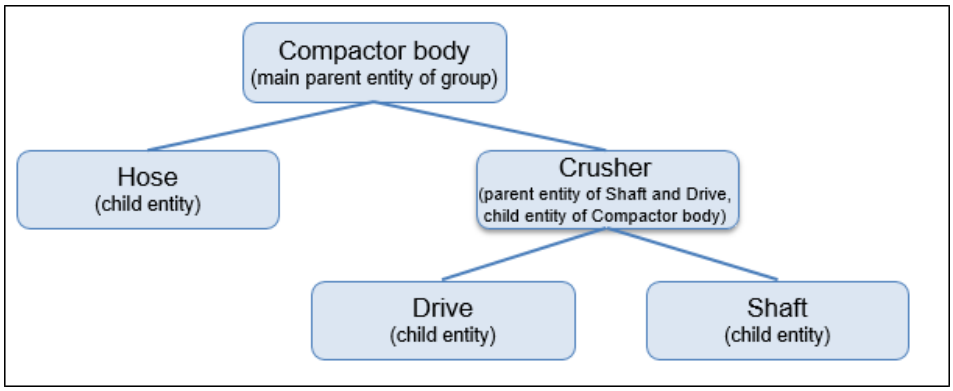

Figure 3: Compactor - example equipment entity group with sub-group

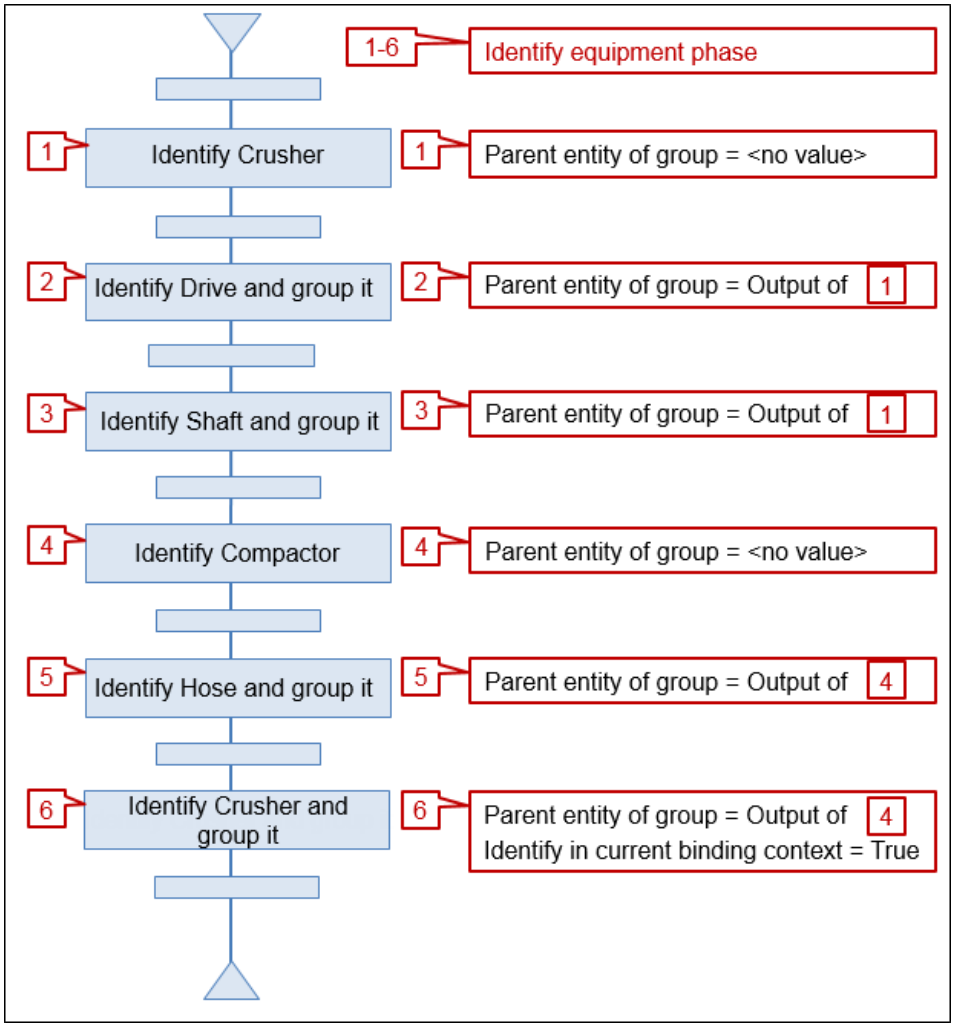

Figure 4: Compactor - example configuration - group equipment entities and a sub-group

Identifying an Equipment Entity Group for Usage

To use an equipment entity group for production, e.g. a Compactor, the group must be identified with the **Identify equipment** phase.

For identifying of an equipment entity group for usage, the following configuration rules apply to the process parameters of the **Identify equipment** phase:

- Parent entity of group (page 25) must not be set.
- Identify in current binding context (page 26) must be set to **No**.
- Identification mode (page 26) must be set to **Entity or group** (if the identification of an entity group is optional) or **Entity group required** (if only an entity group must be identified).

It is sufficient to identify any one entity of the group, its main parent entity or even any child entity, e.g. the Hose of the Compactor. After the successful identification, the **Identify equipment** phase determines the main parent entity as the identified entity, however, all of the entities of the group are bound to the current unit procedure context. For a successful identification, all defined equipment requirement rules must be fulfilled. The child entities of the group are checked with the group-enabled conditional rules. Other equipment requirements are only checked against the main parent entity of the group. In addition, the equipment graph status values of all entities are checked and refreshed, if expired.

Re-identifying an Already Bound Equipment Entity or Group

The **Identify equipment** phase also supports the re-identification of an already bound equipment entity or entity group.

A typical use case during execution is the re-identification of an equipment entity in a different room, but within the same unit procedure. Another use case is the disassembling of a group (see "Separating an Equipment Entity Group" (page 9)).

For re-identifying of an equipment entity or entity group, the following configuration rules apply to the process parameters of the **Identify equipment** phase:

- Parent entity of group (page 25) must not be set.
- Identify in current binding context (page 26) must be set to **Yes**.
- Identification mode (page 26) can be set to **Entity or group** (if both are allowed), **Single entity required** (if only a single entity must be identified), **Entity group required** (if only an entity group must be identified), or **Child entity (already bound)** (if the system shall not determine the related main parent entity, e.g., for separation).

Triggering a Graph Transition on an Equipment Entity Group

In order to support status transitions on many equipment entities that are assigned to a group, the **Trigger graph transition** phase performs the selected trigger on all entities of the group that hold an equipment graph of the configured purpose.

For triggering a graph transition on an equipment entity group, the following configuration rules apply to the process parameters of the **Trigger graph transition** phase:

- Identified equipment entity (page 64) must reference the main parent entity of the group.
- Allowed triggers (page 65) must be set to a purpose that at least one entity of the group holds.

Graphs with a different purpose are simply ignored. However, if none of the entities of the group holds a graph of the configured purpose, the result is a data mismatch system-triggered exception.

Depending on the graph configuration, the configured trigger may result in alternative status transitions, based on preconditions or different source statuses. For details, see "Functional Requirement Specification Data Management" [A3] (page 99).

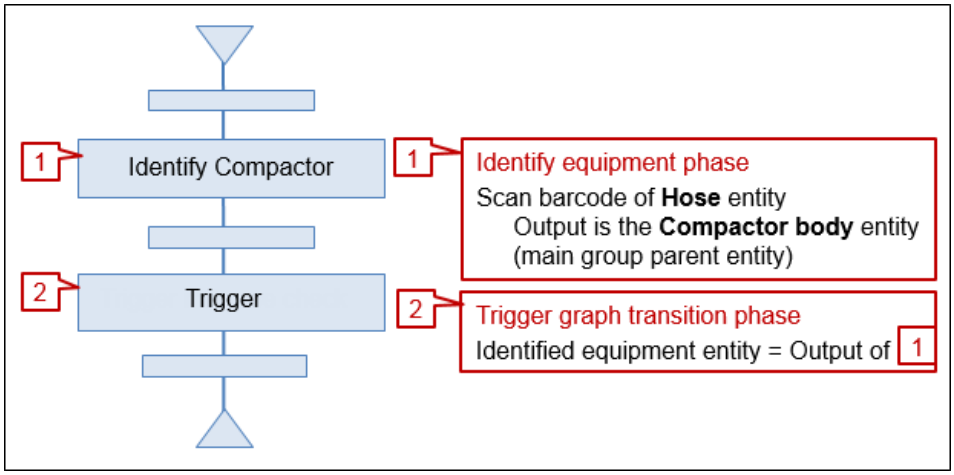

Figure 5: Compactor - example configuration - trigger a graph transition

Separating an Equipment Entity Group

In case of disassembly, the equipment entity or sub-group that has been disassembled physically also needs to be separated from the main group logically.
For this purpose, the **Separate equipment** phase supports the following key scenarios:

- Separating the entire group into all of its single entities, including the separation of all sub-groups (if applicable).
- Separating all child entities or sub-groups from the main parent entity, but keep all sub-groups (if applicable).
- Separating a specific child entity or sub-group from the main group (specific sub-group can be kept or completely separated, too).

In addition, the phase allows to configure if the separated entities or groups shall keep their binding status or shall be unbound from the current unit procedure.

For separating an equipment entity group, the following configuration rules apply to the process parameters of the **Separate equipment** phase (see also figure below):

- Parent entity of group (page 80) must reference the main parent entity of the group.

- Child entity to be separated (page 81) can reference the specific child entity or sub-group to be separated (see "Re-identifying an Already Bound Equipment Entity or Group" (page 8)). If no entity is referenced (null), all child entities and sub-groups are separated from the main parent entity.
- Keep sub-group (page 81) can be set to **True** (if separated sub-groups shall remain as a group) or **False**.
- Keep binding (page 82) can be set to **True** (if separated entities shall keep their binding status) or **False**.

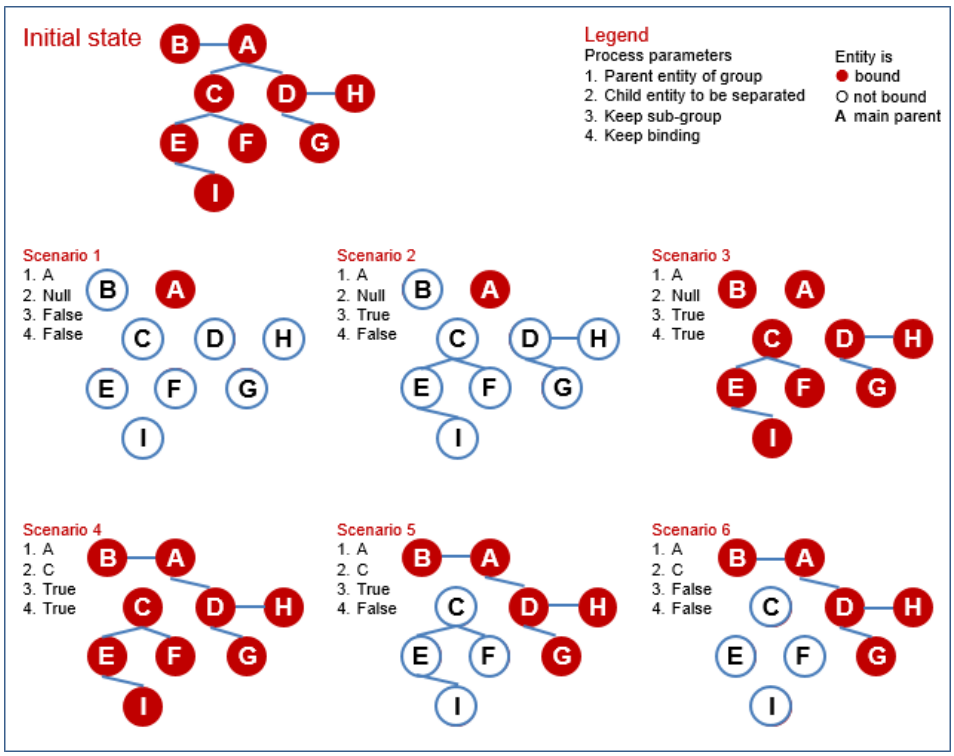

Figure 6: Separate equipment scenarios

The example configuration below shows a use case where a sub-group is separated from its main group and the sub-group remains as a group: The Compactor needs a special cleaning, but the Crusher of the Compactor can be reused unchanged with another compactor unit. For this reason, the Crusher sub-group shall be kept.
The Crusher and the Hose are separated from the Compactor body. The Drive and Shaft child entities remain grouped with the Crusher as their parent. All separated entities are unbound from the current unit procedure context.

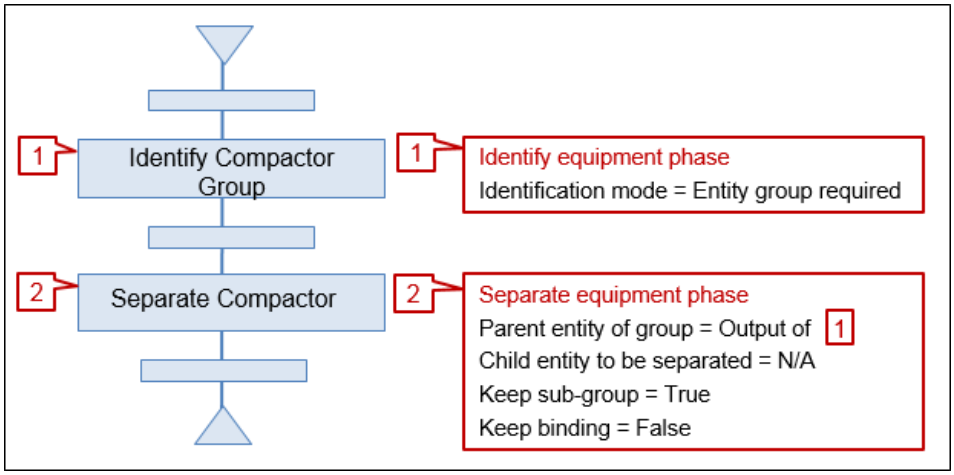

Figure 7: Compactor - example configuration - separate sub-groups

The given example results in the following parent-child relations of the original Compactor.

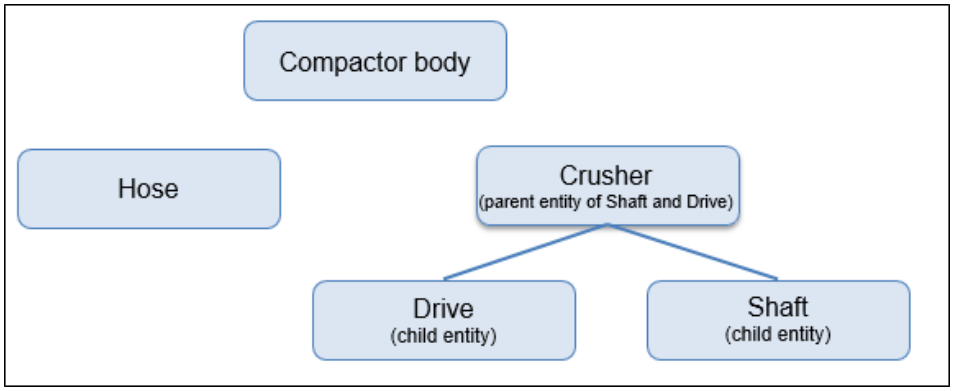

Figure 8: Compactor - example equipment entity group after separation

Chapter 3

Identify Equipment Phase (SR0300+)

The **Identify equipment** phase allows to identify an equipment entity or an equipment entity group and to bind the entity to the context in which it is being used (e.g. order, workflow). Additionally, the phase allows to build an equipment entity group. As a prerequisite for binding, the phase performs fit-for-purpose checks. For verification purposes, an already bound equipment entity can be re-scanned within the same unit procedure context.

Example use cases are:

- Verifying that an equipment entity or an equipment entity group (parent entity and its child entities) meets requirements
  Equipment entities used during processing must meet various requirements. Prior to being used, an equipment entity is checked against the defined requirements (equipment class and additional properties). The ensuing results are documented in the entity's logbook.
- Exclusive usage of an equipment entity or equipment entity group for processing an order
  In order to ensure the exclusive usage of a specific equipment entity or equipment entity group, the entity or entity group (including all of its child entities) is bound to a batch and unit. The binding itself is documented in the batch report and the entity's logbook.
- Identification of parent and child equipment entities either for grouping equipment entities or for separating equipment entity groups.

The identified equipment entity, its equipment class, grouping details (if applicable), and the equipment property values are stored in the batch record, thereby becoming available for documentation purposes in the sub-report and batch report (page 17).

Anomalies that occur during processing are covered by the phase exception handling (page 29) (e.g. requirements are not met).

After completion the phase displays the identified equipment entity with the following data in the Execution Window:

- Required class identifier and short description
- Additional requirements (property and rule level)
- Parent entity for grouping (if applicable)
- Actual entity identifier and short description

- Statuses of the identified entity
- List of child entities (if applicable)

The Navigator displays the identifier of the identified equipment entity and the scanned equipment entity (if applicable).

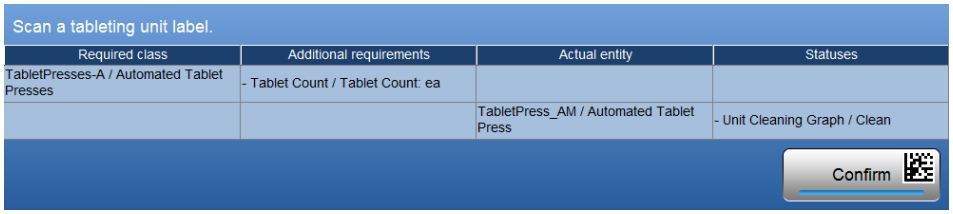

Figure 9: Identify equipment during execution

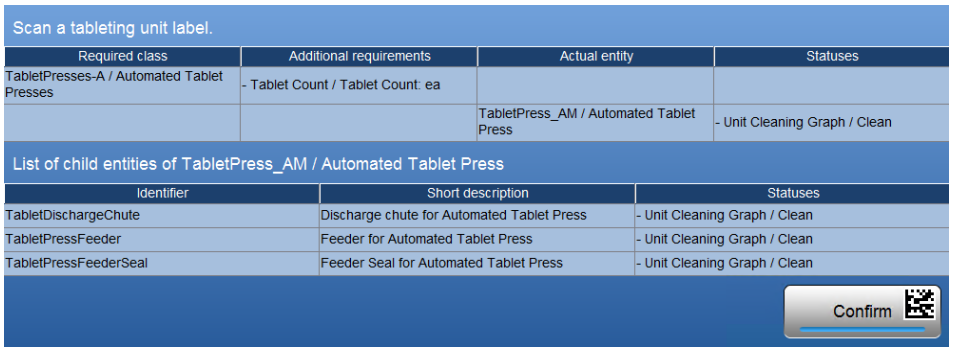

Figure 10: Identify equipment group during execution

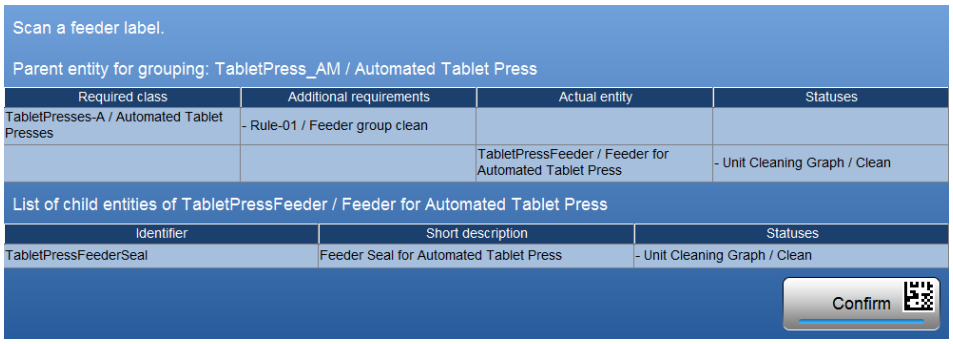

Figure 11: Identify equipment group for grouping during execution

Layout

The phase provides individual layouts for its representation during execution (page 14), in the Navigator (page 16), and in the sub-report (page 17).

Representation during Execution (SR0300.1+)

The representation during execution depends on the phase mode.

Preview mode (SR0300.1.1)

1. <Instruction text>
   (taken from **Instruction (SR0300.8.1)** process parameter (page 25))
2. Parent entity for grouping: /
   - Only if the **Parent entity of group (SR0300.8.6)** process parameter (page 25) is not null.
3. Table with list of equipment requirements required for identification
   (taken from **Equipment parameters (SR0300.6.1)** process input (page 24))
4. List of child entities of the group
   - Only if the **Show children (SR0300.8.9)** process parameter (page 26) is set to **True**.
5. **Confirm** button (disabled).

Active mode (SR0300.1.2)

1. <Instruction text>
   (taken from **Instruction (SR0300.8.1)** process parameter (page 25))
2. Parent entity for grouping: <parent entity identifier> / <parent entity short description, if applicable>
   - Only if the **Parent entity of group (SR0300.8.6)** process parameter (page 25) is not null.
3. Table with list of equipment requirements required for identification
   (taken from **Equipment parameters (SR0300.6.1)** process input (page 24))
   - Required class
   - Additional requirements [rule identifier / description or rule expression (if description is empty)]
     (This is related to properties, property values, and flexible rules.)
   - Actual entity (identified equipment)
     - If an entity group has been identified, the actual entity is the main parent entity of the group, which may not be the entity that was scanned.
   - Statuses (all actual statuses (available in the used FSM or graph) of the identified entity)
4. List of child entities of the group <actual entity identifier> / <actual entity short description, if applicable>
   - Only if an entity group has been identified and the **Show children (SR0300.8.9)** process parameter (page 26) is set to **True**.

- Details of child entity.

<Child entity identifier>	<Child entity short description>	<Entity graph status>

5. **Confirm** button.

Completed mode (SR0300.1.3)

1. <Instruction text>
   (taken from **Instruction (SR0300.8.1)** process parameter (page 25))
2. Parent entity for grouping: <parent entity identifier> / <parent entity short description, if applicable>
   - Only if the **Parent entity of group (SR0300.8.6)** process parameter (page 25) is not null.
3. Table with list of equipment requirements required for identification
   (taken from **Equipment parameters (SR0300.6.1)** process input (page 24))
4. List of child entities of the group <actual entity identifier> / <actual entity short description, if applicable>
   - Only if an entity group has been identified and the **Show children (SR0300.8.9)** process parameter (page 26) is set to **True**.
   - Details of child entity.

<Child entity identifier>	<Child entity short description>	<Entity graph status>

5. **Confirm** button (completed).

Representation in Navigator (SR0300.4+)

The Navigator provides the following details:

Phase column (Framework capability)

- <Phase name>
  - Example:
    Identify mixer

Information column (SR0300.4.1)

- <Identifier of identified equipment entity>
  - Example: 23480Compactor

- If an entity group has been identified:
  - <Identifier of identified equipment entity (main parent>)
    <Identifier of the scanned entity>
    - Example:
      23480Compactor
      23478Frame
- If the identification has been skipped, no data is displayed.

Action column

- There are no actions available.

Representation in Sub-report (SR0300.5+)

The sub-report contains the following information:

Common sub-report elements (Framework capability)

- <Start time>
- <Completion time>
- <Unit procedure> / <operation> / <phase>
- <Work center> / <station> / <device> - <phase completion user>

Sub-report elements (SR0300.5.1)

➢ For recent changes, see revision history (page 101).

- Instruction text
- Parent entity for grouping: <parent entity identifier> / <parent entity short description>
  - Only if the **Parent entity of group (SR0300.8.6)** process parameter (page 25) is not null.
- Required equipment class (identifier and short description)
- Identified equipment entity (identifier and short description)
  - Represents the main parent entity if an entity group has been identified.
- Scanned equipment entity (identifier and short description)
  - Only if an entity group has been identified.
- Additional requirements [rule identifier / description or rule (if description is empty)]

- Actual property names and values (for additional non-status property type-based requirements of the identified equipment) and all status values (available in the used FSM or graph) of the identified equipment entity (e.g. cleaning status)
  - If an equipment entity group has been identified, data of the parent entity is shown.
  - For properties of the **Automation** type, the value is always N/A.
- Child equipment entities (identifier and short description)
- All status values (available in the used graph) of child equipment entities (e.g. cleaning status)

Business Logic (SR0300.2+)

The phase implements the following business logic.

Identify and bind equipment entity (SR0300.2.1)

- Function: Identify equipment entity or equipment entity group
- Trigger: Phase becomes active
- Postcondition: Equipment entity or entity group is identified

Step	#	Description
Phase activation	10	Phase displays its user interface according to the **Active mode (SR0300.1.2)** layout (page 15).
Operator scans barcode	20	The **Scan equipment entity barcode (SR0300.2.2)** function (page 19) becomes active. For manual identification, see **Enter identifier manually (SR0300.3.1.1)** user-triggered exception (page 33).
Phase performs pre-identification checks	30	The **Identify equipment entity (SR0300.2.3)** function (page 19) becomes active.
Phase performs pre-binding checks	40	The **Bind equipment entity (SR0300.2.4)** function (page 21) becomes active.
Operator confirms phase	50	■ If no equipment entity or entity group has been identified successfully, phase displays the **Nothing identified (SR0300.3.6.5)** error message (page 38). The phase cannot be completed. ■ If the checks have passed successfully and an equipment entity or entity group is bound, the operator confirms the identification of the equipment entity or entity group.

Step	#	Description
		■ Phase sets the **Result (SR0300.9.4)** output variable (page 41) to `IDENTIFIED`. ■ Phase is completed.
Phase runs in **Automatic completion** mode	60	In case the entity or entity group has been identified and is bound without any exceptions and the **Mode (SR0300.8.10)** process parameter (page 25) is set to **Automatic completion**, phase sets the **Result (SR0300.9.4)** output variable (page 41) to `IDENTIFIED` and is completed automatically.

Scan equipment entity barcode (SR0300.2.2)

- Function: Scan an equipment entity barcode
- Trigger: Operator scans barcode
- Postcondition: Equipment entity barcode is scanned

Step	#	Description
Operator scans barcode	10	Phase reads scanned data.
Phase performs checks	20	■ If barcode reading was technically successful, phase updates background color of phase representation according to style sheet in order to confirm the reading. ■ If barcode reading was technically not successful, phase remains in listening mode. ■ If barcode reading was not successful, phase displays the **Cannot find entity (SR0300.3.6.1)** error message (page 36).
		If the checks have passed successfully, phase continues with the **Identify and bind equipment entity (SR0300.2.1)** function (page 18).

Identify equipment entity (SR0300.2.3)

- Function: Identify a scanned equipment entity or equipment entity group
- Trigger: Equipment entity is scanned successfully
- Postcondition: Equipment entity or entity group is identified

Step	#	Description
Phase checks identification mode	05	■ If the **Identification mode (SR0300.8.8)** process parameter (page 26) is set to **Entity group required**, but the scanned entity is not member of an entity group: Phase displays the **Entity is not part of a group (SR0300.3.6.11)** error message (page 39). ■ If the **Identification mode (SR0300.8.8)** process parameter (page 26) is set to **Single entity required**, but the scanned entity is member of a group: Phase displays the **Entity is part of a group (SR0300.3.6.10)** error message (page 39). ■ If the **Identification mode (SR0300.8.8)** process parameter (page 26) is set to **Child entity (already bound)**, but one of the following items applies: the **Parent entity of group (SR0300.8.6)** process parameter (page 25) is not null, or the entity is not member of a group, or the entity is a main parent, or the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is not set to **True**: Phase displays the **Not a child entity of bound group (SR0300.3.6.13)** error message (page 40).
Phase determines main parent entity	10	If the scanned equipment entity is member of a group, phase determines, for the scanned entity, the main parent entity of its group and all child entities that belong to the same group.
Phase checks availability of equipment entity	15	The following checks either apply to a single entity or to a main parent entity and to all of its child entities, respectively: ■ If the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **True**, phase expects and only allows entities that are already bound to the current unit procedure context. In case an entity is not already bound to the current unit procedure context: Phase displays the **Not available for usage (SR0300.3.6.4)** error message (page 37). ■ If the **Identify in current binding context (SR0300.8.7)** process parameter is set to **False**, phase expects an unbound entity. In case an entity has already been identified or bound in the context of a different phase or even order: Phase displays the **Not available for usage (SR0300.3.6.4)** error message (page 37).

Step	#	Description
	20	The following checks either apply to a single entity or to a main parent entity (not to all child entities of a group): ■ If the entity has already been identified in the context of this phase: Phase displays the **Already identified (SR0300.3.6.2)** error message (page 37). ■ Only if the phase has been resumed and the entity has already been identified in the context of this phase: Phase continues with the **Bind identified equipment entity (SR0300.2.4)** function (page 21).
Phase performs grouping-related checks	25	The following check applies if the **Parent entity of group (SR0300.8.6)** process parameter (page 25) is not null: ■ If the **Parent entity of group (SR0300.8.6)** process parameter (page 25) is not null, but the referenced entity is not bound to the current unit procedure context: Phase displays the **Parent entity not bound (SR0300.3.6.14)** error message (page 40). ■ If the identified entity to be added to the group is the same as the pre-defined parent entity of the group according to the **Parent entity of group (SR0300.8.6)** process parameter (page 25): Phase displays the **Group cycle error (SR0300.3.6.12)** error message (page 39).
Phase sets binding status to **Identified**	30	If all checks pass successfully, the following logic either applies to a single entity or to a main parent entity and to all of its child entities, respectively: ■ If the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **True**: Phase does not update the binding status because the equipment entity is already bound to the current unit procedure context. ■ If the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **False**: Phase changes the binding status of the equipment entity to **Identified**, updates the logbook accordingly (if maintained), and continues with the **Bind identified equipment entity (SR0300.2.4)** function (page 21).

Bind identified equipment entity (SR0300.2.4)

- Function: Bind an identified equipment entity or equipment entity group
- Trigger: Equipment entity or entity group is identified successfully
- Postcondition: Equipment entity or entity group is bound

Step	#	Description
Phase checks if graph statuses are expired	5	Only if the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **False**: The **Refresh expired equipment status (SR0300.2.5)** function (page 23) becomes active.
Phase checks class membership of equipment entity	10	The following check either applies to a single entity or to a main parent entity (not to child entities of a group). However, the resulting action applies to all entities of an entity group (if applicable): ■ If the identified entity is not member of the required class, phase resets the binding status of the equipment entity (all entities of the entity group) to **Available**, updates the logbook accordingly (if maintained), and displays the **Not member of required class (SR0300.3.6.3)** error message (page 37). ■ If the check passes successfully, phase continues with the next check.
Phase checks if class and entity fulfill the minimum required status	15	The following check either applies to a single entity and its required class, or, in case of an entity group, to the main parent entity and its required class and to all child entities, respectively. In addition, it applies to all classes that are explicitly defined as an equipment requirement with a conditional rule and the **equipmentIsMemberOfClass** function. For details, see **Expressions for Conditional Rules (SR3146.9.9.4.12)** and **Expression Editor - Runtime Context Data (SR3146.9.9.6)** in "Functional Requirement Specification Recipe and Workflow Management" [A2] (page 99). ■ Phase checks for the minimum class status and the minimum entity status according to the **Equipment status check (SR0300.8.5)** process parameter (page 27). If the check fails, phase creates the **Equipment status check (SR0300.3.2.2)** system-triggered exception (page 31). ■ If the check passes successfully, phase continues with the next check.
Phase checks if property values of equipment entity match and if rules are fulfilled	20	The following checks either apply to a single entity or to a main parent entity (not to child entities of a group): ■ If any of the property value-related or flexible rule-related checks fail, phase creates the **Property value check (SR0300.3.2.1)** system-triggered exception (page 29). The following check either applies to a single entity or to a main parent entity and to all of its child entities, respectively: ■ If the group-enabled conditional rule-related check fails, phase creates the **Property value check (SR0300.3.2.1)** system-triggered exception (page 29).

Step	#	Description
Phase sets binding status to **Bound**	30	If all checks pass successfully or the exception is recorded, the following logic either applies to a single entity or to a main parent entity and to all of its child entities, respectively: ■ If the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **True**: Phase does not update the binding status because the equipment entity is already bound to the current unit procedure context. ■ If the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **False**: Phase sets the status of the equipment entity to **Bound** and updates the binding context in the **Context** tab of the equipment entity (not for workflows) and the logbook accordingly (if maintained).
Phase performs group assignment	40	The following logic either applies to a single entity or to a main parent entity (not to child entities of a group): ■ If the **Parent entity of group (SR0300.8.6)** process parameter (page 25) is not null: Phase assigns the identified equipment entity as new child entity to the pre-defined parent entity of the group according to the **Parent entity of group (SR0300.8.6)** process parameter (page 25). (In case the identified equipment entity has been a main parent entity, it now becomes a sub-parent entity.)

Refresh expired equipment status (SR0300.2.5)

- Function: Refresh the expired statuses of an equipment entity or equipment entity group
- Trigger: Equipment entity or entity group is identified successfully
- Postcondition: Expired equipment graph statuses of entity or entity group are updated

Step	#	Description
Phase checks if graph statuses are expired	10	The following logic either applies to a single entity or to a main parent entity and to all of its child entities, respectively: Phase checks in a loop for all equipment graphs assigned to the entity if the current status of equipment graph has expired. ■ If the status is **not expired**, phase checks the next equipment graph. ■ If the status is **expired**, phase performs the **Expired (RS)** equipment graph trigger and checks the next equipment graph.

Step	#	Description
	20	The following logic either applies to a single entity or to a main parent entity and to all of its child entities, respectively: If the execution of any **Expired (RS)** equipment graph trigger fails, phase resets the binding status of the equipment entity to **Available**, updates the logbook accordingly (if maintained), and displays the **Expired trigger execution failed (SR0300.3.6.9)** error message (page 38).
	30	If the execution of all **Expired (RS)** equipment graph trigger passed successfully, the phase continues with further checks of the **Bind identified equipment entity (SR0300.2.4)** function (page 21).

Phase Parameters

The phase provides equipment parameters as process inputs (page 24) and process parameters (page 25).

Process Inputs (SR0300.6+)

Equipment Parameters (SR0300.6.1)

Equipment parameters allow to define equipment requirements as follows:

- by assigning an equipment class,
- by assigning a specific property type (check against existence),
- by setting specific property values (check against value, see **Technical Property Types and Editors (SR3071.8.7+)** in "Functional Requirement Specification Data Management" [A3] (page 99)),
- by defining a flexible rule, or
- by defining a conditional rule.

For properties of the following data types, the property values cannot be accessed within rules:

- Equipment type
- Flexible tag definition
- Ranges
- Room cleaning rules
- Scale configuration
- Work center assignment

For details about rules, see **Expressions for Flexible Rules (SR3146.9.9.4.10)** and **Expressions for Conditional Rules (SR3146.9.9.4.12)** in "Functional Requirement Specification Recipe and Workflow Management" [A2] (page 99).

Process Parameters (SR0300.8+)

The following process parameters define the behavior of the phase.

BASIC PARAMETERS

Instruction (SR0300.8.1)

➢ For recent changes, see revision history (page 101).

Attribute	Type	Comment
Text	HTML text	Instruction text to be displayed. **Restriction**: Maximum length is 2000 characters (including HTML tags).

Mode (SR0300.8.10)

Attribute	Type	Comment
Mode	Choice list	Defines the processing mode. **Manual completion (default)**: Operator confirms phase manually. **Automatic completion**: Phase is completed automatically when the identified entity or entity group is bound without any exceptions.

Parent entity of group (SR0300.8.6)

Attribute	Type	Comment
Equipment object	Reference	Reference to the equipment object output variable of a preceding phase that defines the parent entity of the group. The identified equipment entity is added to the parent entity as a child entity.

Identify in current binding context (SR0300.8.7)

Attribute	Type	Comment
Enabled	Boolean	Controls if the identification is only possible if the entity or entity group is already bound to the current unit procedure context. Default setting: **False**

Identification mode (SR0300.8.8)

Attribute	Type	Comment
Enabled	Choice list	Defines the identification mode. Available settings: **Entity or group**, **Single entity required**, **Entity group required**, **Child entity (already bound)**. Default setting: **Entity or group**.

Show children (SR0300.8.9)

Attribute	Type	Comment
Enabled	Boolean	Controls if the list of child entities is displayed during execution. Default setting: **True**

CONFIGURATION OF SYSTEM-TRIGGERED EXCEPTIONS

Property value check (SR0300.8.2)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Property value check (SR0300.3.2.1)** system-triggered exception (page 29).

Equipment status check (SR0300.8.5)

Attribute	Type	Comment
Minimum class status	Choice list	Defines the minimum class status required for equipment identification. Available settings: **Verification**, **Approved**. Default setting: **Approved**.
Minimum entity status	Choice list	Defines the minimum entity status required for equipment identification. Available settings: **Verification**, **Approved**. Default setting: **Approved**.
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Equipment status check (SR0300.3.2.2)** system-triggered exception. (page 31)

CONFIGURATION OF USER-TRIGGERED EXCEPTIONS

Enter identifier manually (SR0300.8.3)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**,

Attribute	Type	Comment
		High (mandatory comment). Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Enter identifier manually (SR0300.3.2.1)** user-triggered exception (page 33).

Undo identification (SR0300.8.4)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Undo identification (SR0300.3.1.2)** user-triggered exception (page 34).

Skip identification (SR0300.8.11)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.

Attribute	Type	Comment
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Skip identification (SR0300.3.1.3)** user-triggered exception (page 35).

Exceptions (SR0300.3+)

The phase supports user-defined, user-triggered (page 33), system-triggered (page 29), and post-completion exceptions (page 36) and their configuration by means of process parameters (page 25).

User-defined exceptions cannot be configured by process parameters since they are provided by the framework and independent of phases.

System-triggered Exceptions (SR0300.3.2+)

➢ For recent changes, see revision history (page 101).

A system-triggered exception is represented in a message dialog along with an **Exception** button, in the Exception Window as the read-only description of the exception, and in the batch report.

The following system-triggered exceptions are available.

Property value check (SR0300.3.2.1)

For each property that does not match, the exception lists the related rule identifier, the rule description (or the rule content, if the description is not maintained), the property identifier, and the expected and actual values.
For each flexible rule that is not fulfilled, the exception lists the related rule identifier, the rule description (or the rule expression, if the description is not maintained), and the expected and actual values of the expression.
For each conditional rule that is not fulfilled, the exception lists the related entity, the rule identifier, the rule description (or the rule expression, if the description is not maintained), and the expected and actual values of the expression.

Representation of the exception:

Exception dialog

- <Exception text>
  (taken from **Property value check (SR0300.8.2)** process parameter (page 26))
  Cannot identify the <Identifier of identified equipment entity> entity, since it does not meet the defined equipment requirements.

Exception Window

- <Exception text>
  (taken from **Property value check (SR0300.8.2)** process parameter (page 26))
  Cannot identify the <Identifier of identified equipment entity> entity, since it does not meet the defined equipment requirements.

  Rule: <identifier>
  Description: <rule description> (or <rule content/expression>, if the description is not maintained)

  - For properties that do not match:
    Equipment property: <identifier>
    Expected value: <value>
    Actual value: <value>
  - For flexible rules that are not fulfilled:
    Expected value: Yes
    Actual value: No
  - For conditional rules that are not fulfilled, same rule can apply to multiple entities:
    Entities: <identifier of entity 1 to which the rule applies>, …, <identifier of entity n>
    Expected value: Yes
    Actual value: No
  - Example:
    Equipment requirement violation
    Cannot identify the AX67 entity, since it does not meet the defined equipment requirements.

    Rule: Rule_01
    Description: Check of cleaning status
    Equipment property: Cleaning status
    Expected value: Clean
    Actual value: To be cleaned

    Rule: Rule_02
    Description: Required volume range
    Equipment property: Volume
    Expected value: 150 - 200 l
    Actual value: 100 l

    Rule: Rule_03
    Description: Counter less or equal 5
    Entities: Filter005

Expected value: Yes
Actual value: No

Property value check - Logic (SR0300.3.2.1.1)

- Trigger: Check has failed
- Postcondition: Exception is recorded

Step	#	Description
Operator accepts exceptional situation	1-10	Phase shows exception description to be signed.
Operator signs exception	1-20	Phase records exception.
Operator does not accept exceptional situation	2-10	The following logic either applies to a single entity or to a main parent entity and to all of its child entities, respectively: Phase resets status of equipment entity to **Available** and updates the logbook accordingly (if maintained).

Equipment status check (SR0300.3.2.2)

The phase checks if the defined minimum statuses for the equipment class and entity are fulfilled according to the **Equipment status check (SR0300.8.5)** process parameter (page 27).
The check either applies to a single entity and its required class, or, in case of an entity group, to the main parent entity and its required class and to all child entities, respectively.
In addition, the check applies to all classes (incl. classes of child entities) that are explicitly defined as an equipment requirement with a conditional rule and the **equipmentIsMemberOfClass** function. For details, see **Expressions for Conditional Rules (SR3146.9.9.4.12)** and **Expression Editor - Runtime Context Data (SR3146.9.9.6)** in "Functional Requirement Specification Recipe and Workflow Management" [A2] (page 99).

Representation of the exception:

Exception dialog

- <Exception text>
  (taken from **Equipment status check (SR0300.8.5)** process parameter (page 27))
  - If class status does not match:
    Cannot identify the <entity identifier > equipment entity, since its required class (<class identifier>) is in the <status> status.

- If entity status does not match:
  Cannot identify the <identifier> equipment entity, since it is in the <status> status.

Exception Window

- <Exception text>
  (taken from **Equipment status check (SR0300.8.5)** process parameter (page 27))
  - If class status does not match:
    Cannot identify the <entity identifier > equipment entity, since its required class (<class identifier>) is in the <status> status.
    Required minimum status: <status>
  - If entity status does not match:
    Cannot identify the <identifier> equipment entity, since it is in the <status> status.
    Required minimum status: <status>
  - Example:
    Equipment status violation
    Cannot identify the AX67 equipment entity, since its required class (CX14) is in the Verification status.
    Required minimum status: Approved

    Cannot identify the AX67 equipment entity, since it is in the Draft status.
    Required minimum status: Approved

Equipment status check - Logic (SR0300.3.2.2.1)

- Trigger: Check has failed
- Postcondition: Exception is recorded

Step	#	Description
Operator accepts exceptional situation	1-10	Phase shows exception description to be signed.
Operator signs exception	1-20	Phase records exception.
Operator does not accept exceptional situation	2-10	The following logic either applies to a single entity or to a main parent entity and to all of its child entities, respectively: Phase resets status of equipment entity to **Available** and updates the logbook accordingly (if maintained).

Multiple failed checks (SR0300.3.2.3)

➢ For recent changes, see revision history (page 101).

In case multiple system-triggered exceptions occur, only one combined exception (system-triggered exception) is recorded including information about all exceptions. The highest risk assessment of all related exceptions and its related signature privilege apply.

After the exception has been recorded, the phase must be manually completed.

Representation in the message dialog:

1. Several exceptions have occurred.
   For details refer to the Exception Window.
2. **Exception** button

Representation during exception handling:

1. Exception text:
   <Concatenation of multiple exception texts>.

User-triggered Exceptions (SR0300.3.1+)

A user-triggered exception is represented in the list of available user-triggered exceptions in the Exception Window, as the description of the exception, and in the batch report.

The following user-triggered exceptions are available.

Enter identifier manually (SR0300.3.1.1)

The **Enter identifier manually** exception allows an operator to enter the barcode of an equipment entity manually.

The exception is disabled, if the required equipment entity is already in the **Identified** or **Bound** status.

Representation during exception handling:

- Instruction:
  Identify by typing the entity barcode.
  Box for identifier input.
  Confirm button.
- Exception text:
  <Exception text>
  (taken from **Enter identifier manually (SR0300.8.3)** process parameter (page 27))
  Manual entry: <barcode string>
  - Example:
    Equipment entity barcode entered manually
    Manual entry: 23478asUi

Enter identifier manually - Logic (SR0300.3.1.1.1)

- Trigger: Exception is selected
- Postcondition: Barcode string is entered manually

Step	#	Description
Operator confirms exception	10	If entered barcode string does not match an equipment entity, phase displays the **Cannot find entity (SR0300.3.6.1)** error message (page 36).
Operator signs exception	20	If equipment entity can be identified as an existing entity and exception is signed, phase continues with **Identify equipment entity (SR0300.2.3)** function (page 19) (see also **Identify and bind equipment entity (SR0300.2.1)** function (page 18).

Undo identification (SR0300.3.1.2)

The **Undo identification** exception allows an operator to revoke the identification of an equipment entity or an equipment entity group.

In case an identified entity or entity group has been added to a pre-defined parent entity according to the **Parent entity of group (SR0300.8.6)** process parameter (page 25), the exception also revokes this grouping.

The exception is disabled, if the required equipment entity or entity group is not in the **Bound** status.

Representation during exception handling:

- Instruction:
  Undo the identification of the entity.
  Confirm button.
- Exception text:
  <Exception text>
  (taken from **Undo identification (SR0300.8.4)** process parameter (page 28))
  Released entity (group): <Equipment (parent) entity identifier> / <Equipment (parent) entity short description>
  - Example:
    Undo of identification during identification process
    Released entity (group): 23478H / Hose 45 cm

Undo identification - Logic (SR0300.3.1.2.1)

- Trigger: Exception is selected
- Postcondition: Equipment entity or entity group is no longer bound

Step	#	Description
Operator confirms exception	10	Phase shows exception description to be signed according to **Undo identification (SR0300.8.4)** process parameter (page 28).
Operator signs exception	20	The following logic either applies to a single entity or to a main parent entity (not to child entities of a group): ■ If the identified equipment entity has been assigned to the pre-defined parent entity according to the **Parent entity of group (SR0300.8.6)** process parameter (page 25): Phase separates the identified equipment entity from the pre-defined parent entity. The following logic either applies to a single entity or to a main parent entity and to all of its child entities, respectively: ■ Phase resets the binding status of equipment entity to **Available** and updates the binding context in the **Context** tab of the equipment entity (not for workflows) and the logbook accordingly (Unbind) (if maintained).

Skip identification (SR0300.3.1.3)

The **Skip identification** exception allows an operator to skip the identification of an equipment entity or an equipment entity group.

The exception is disabled, if the required equipment entity or entity group is in the **Identified** or **Bound** status.

Representation during exception handling:

- Instruction:
  Skip the identification.
  Confirm button.
- Exception text:
  <Exception text>
  (taken from **Skip identification (SR0300.8.11)** process parameter (page 28))
  No equipment entity identified.
  - Example:
    Identification of further equipment entities to load autoclave has been skipped.
    No equipment entity identified.

Skip identification - Logic (SR0300.3.1.3.1)

- Trigger: Exception is selected
- Postcondition: Phase can be completed without equipment entity identification

Step	#	Description
Operator confirms exception	10	Phase shows exception description to be signed according to **Skip identification (SR0300.8.11)** process parameter (page 28).
Operator signs exception	20	Phase returns to the Execution Window and can be completed without having identified an equipment entity. Phase sets the **Result (SR0300.9.4)** output variable (page 41) to `SKIPPED`.

Post-completion Exceptions

There are no post-completion exceptions available.

Information Messages

There are no information messages available.

Questions

There are no questions available.

Decisions

There are no decisions available.

Error Messages (SR0300.3.6+)

Error messages are represented in an error message dialog containing a message type-specific icon, the error message, and an **OK** button.

The following error messages are available to inform the operator about error conditions.

Cannot find entity (SR0300.3.6.1)

UI text	Comment
Cannot identify the <scanned identifier> entity, since it is not available in the system.	Message pack: PhaseEqmEqIdentification<version> Message ID: EqNotExist_ErrorMsg

Already identified (SR0300.3.6.2)

UI text	Comment
Cannot identify the <scanned identifier> entity, since you have already identified a suitable entity. To identify another entity, revoke the identification of the <currently identified identifier> entity first.	Message pack: PhaseEqmEqIdentification<version> Message ID: EqReqAlreadyIdent_ErrorMsg

Not member of required class (SR0300.3.6.3)

UI text	Comment
The <scanned entity or main parent identifier> equipment entity is not suitable, since it does not belong to the required class (<class identifier>).	Message pack: eqm.Validation Message ID: eqmClassNotMatch_ErrorMsg

Not available for usage (SR0300.3.6.4)

UI text	Comment
Cannot identify the <identifier> equipment entity, since it has already been identified or bound at the <identifier> work center for <workflow, order> (unit procedure: <identifier>, operation: <identifier>, phase: <identifier>).	If the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **False**: Applies either to a single entity or to a main parent entity (not to child entities of a group). Message pack: fsm_S88EquipmentBinding Message ID: identifyNotAllowedOwnedByOther_ErrorMsg
Cannot identify the <parent identifier> equipment entity, since at least one of its child entities has already been identified or bound.	If the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **False**: Applies if the check only fails for at least one child entity of a group. Message pack: fsm_S88EquipmentBinding Message ID: identifyDescendantNotAllowedOwnedByOther_ErrorMsg

UI text	Comment
Cannot identify the <identifier> equipment entity, since it is not yet bound to the current unit procedure context.	If the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **True**: Applies either to a single entity or to a main parent entity (not to child entities of a group). Message pack: fsm_S88EquipmentBinding Message ID: identifyNotAllowedIncompatibleBindingContext_ErrorMsg
Cannot identify the <parent identifier> equipment entity, since at least one of its child entities is not yet bound to the current context.	If the **Identify in current binding context (SR0300.8.7)** process parameter (page 26) is set to **True**: Applies if the check only fails for at least one child entity of a group. Message pack: fsm_S88EquipmentBinding Message ID: identifyDescendantNotAllowedIncompatibleBindingContext_ErrorMsg

Nothing identified (SR0300.3.6.5)

UI text	Comment
You have to identify an entity before you can confirm the phase.	Message pack: PhaseEqmEqIdentification<version> Message ID: EqNotIdentified_ErrorMsg

Expired trigger execution failed (SR0300.3.6.9)

UI text	Comment
1. The <equipment identifier> entity is not suitable, since the update of at least one expired status failed. 2. The <equipment identifier> entity group is not suitable, since the update of at least one expired status failed.	1. Message pack: pec_ExceptionMessage Message ID: cannotIdentifyExpiryTriggerFailure_ErrorMsg 2. Message pack: pec_ExceptionMessage Message ID: cannotIdentifyExpiryTriggerGroupFailure_ErrorMsg The **Details** button provides access to more graph-specific information (for each entity of an entity group): <the reason that applies> Equipment: <equipment identifier> / <equipment short description> Equipment type: <list of equipment types> (if available) Graph (ID): <graph display text> (<identifier>) Purpose: <purpose> Current status (key): <display text> (<key>) Failed trigger (key): <display text> (<key>)

UI text	Comment
	The potential reasons for a failed status transition are: ■ Cannot find a transition for the current status. ■ Cannot find a fulfillable transition condition for the current status. ■ There is more than one fulfillable transition condition available for the current status: <TR-ID; TR-ID; ...>. ■ Cannot evaluate the transition condition (<TR-ID>). ■ Cannot evaluate the transition action (<TR-Action ID>) from the current status to the new status (<display text (key)>).

Entity is part of a group (SR0300.3.6.10)

UI text	Comment
Cannot identify the <identifier> equipment entity, since it is a member or the parent of a group (<parent identifier>).	Message pack: PhaseEqmEqIdentification<version> Message ID: EqPartOfGroup_ErrorMsg

Entity is not part of a group (SR0300.3.6.11)

UI text	Comment
Cannot identify the <identifier> equipment entity, since it is not a member of a group.	Message pack: PhaseEqmEqIdentification<version> Message ID: EqNotPartOfGroup_ErrorMsg

Group cycle error (SR0300.3.6.12)

UI text	Comment
Cannot add the <identifier> equipment entity to the group, since it already belongs to the group, either as member of a sub-group or as member of the main group.	Message pack: eqm.Validation Message ID: eqmGroupCycle_ErrorMsg

Not a child entity of bound group (SR0300.3.6.13)

UI text	Comment
Cannot identify the <identifier> equipment entity, since it is not a child entity of an already bound group or there is a configuration issue in the phase.	Message pack: PhaseEqmEqIdentification<version> Message ID: EqIsNotBoundChildOfGroup_ErrorMsg

Parent entity not bound (SR0300.3.6.14)

UI text	Comment
Cannot identify the child entity, since the parent of the group is not available.	Message pack: PhaseEqmEqIdentification<version> Message ID: EqParentDoesNotExistButIsRequired_ErrorMsg

Output Variables (SR0300.9+)

The following output variables are available to reference the phase's output.

Instance count (Framework capability)

- Data type: Long
- Usage: The output variable provides the count of the number of instances the phase has been processed, for example in a loop. The count is also increased when the phase is skipped from an operator's perspective, since the phase is still executed, but as a hidden phase.
  The count variable of a phase that has not been executed provides 0 as output value.

Start time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the start time of the phase.

Completion time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the completion time of the phase.

Identifier (Framework capability)

- Data type: String
- Usage: The output variable provides the identifier of the phase.

Equipment object (SR0300.9.1)

- Data type: IMESS88Equipment
- Usage: The output variable provides the complete object of the identified equipment entity. This is the output to use in subsequent phases for accessing data of the equipment object, such as changing its status or writing a property.
  In case an entity group has been identified, the main parent entity of the entity group is provided.

Equipment ID (SR0300.9.2)

- Data type: String
- Usage: The output variable provides the identifier of the identified equipment entity for displaying it as text.
  In case an entity group has been identified, the main parent entity of the entity group is provided.

Equipment short description (SR0300.9.3)

- Data type: String
- Usage: The output variable provides the short description of the identified equipment entity for displaying it as text.
  In case an entity group has been identified, the main parent entity of the entity group is provided.

Result (SR0200.9.4)

- Data type: String
- Values: `SKIPPED`, `IDENTIFIED`
- Usage: The output variable states if an equipment entity has been identified:
  - The value is `SKIPPED` if the phase has been completed without identifying an equipment entity.
  - The value is `IDENTIFIED` if an equipment entity has been identified and thus bound.

Chapter 4

Change Equipment Status Phase (SR0310+)

The **Change equipment status** phase allows an operator to set an FSM-related status of a previously identified equipment entity.
The phase neither supports equipment graphs that are maintained in Data Manager - Equipment nor equipment entity groups.

An example use case is:

- Need to set the equipment entity's status
  Depending on the current process step, the status must be changed from **Clean** to **In use**.

The affected equipment entity, its FSM property, the performed action, and the old and new statuses are stored in the batch record, thereby becoming available for documentation purposes in the sub-report and batch report (page 45).

Anomalies that occur during processing are covered by the phase exception handling (page 49) (e.g. status change failed).

After completion the phase displays the affected equipment entity with the following data in the Execution Window:

- Entity identifier and short description
- Property identifier
- Performed action
- Old status
- New status

The Navigator displays the identifier of the affected equipment entity.

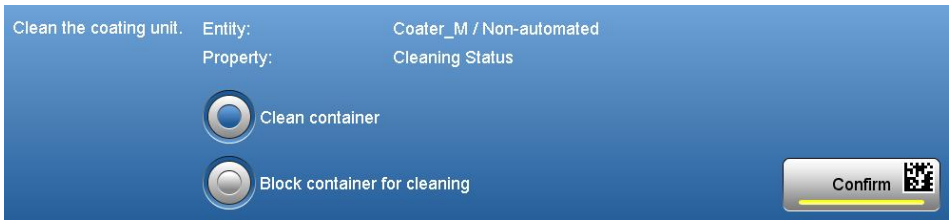

Figure 12: Change equipment status during execution

Layout

The phase provides individual layouts for its representation during execution (page 44), in the Navigator (page 45), and in the sub-report (page 45).

Representation during Execution (SR0310.1+)

The representation during execution depends on the phase mode.

Preview mode (SR0310.1.1)

1. <Instruction text>
   (taken from **Instruction (SR0310.8.1)** process parameter (page 47))
2. Entity:
3. Property: <property identifier>
   (taken from **Allowed change actions (SR0310.8.3)** process parameter (page 48))
4. List of allowed actions
   (taken from **Allowed change actions (SR0310.8.3)** process parameter (page 48))
5. **Confirm** button (disabled).

Active mode (SR0310.1.2)

1. <Instruction text>
   (taken from **Instruction (SR0310.8.1)** process parameter (page 47))
2. Entity: <equipment entity identifier> / <equipment entity short description>
   (taken from **Identified equipment entity (SR0310.8.2)** process parameter (page 47))
3. Property: <property identifier>
   (taken from **Allowed change actions (SR0310.8.3)** process parameter (page 48))
4. List of available actions
   (taken from **Allowed change actions (SR0310.8.3)** process parameter (page 48))
   Based on the actual status of the identified equipment entity, the phase displays only the available actions from the list of allowed actions.
5. **Confirm** button.

Completed mode (SR0310.1.3)

1. <Instruction text>
   (taken from **Instruction (SR0310.8.1)** process parameter (page 47))
2. Entity: <equipment entity identifier> / <equipment entity short description>
   (taken from **Identified equipment entity (SR0310.8.2)** process parameter (page 47))

3. Property: <property identifier>
   (taken from **Allowed change actions (SR0310.8.3)** process parameter (page 48))
4. Performed action: <action>
5. New status: <status>
6. **Confirm** button (completed).

Representation in Navigator (SR0310.4+)

The Navigator provides the following details:

Phase column (Framework capability)

- <Phase name>
  - Example:
    Set status of blender

Information column (SR0310.4.1)

- <Identifier of affected equipment entity>
  - Example: BlenderA12

Action column

- There are no actions available.

Representation in Sub-report (SR0310.5+)

The sub-report contains the following information:

Common sub-report elements (Framework capability)

- <Start time>
- <Completion time>
- <Unit procedure> / <operation> / <phase>
- <Work center> / <station> / <device> - <phase completion user>

Sub-report elements (SR0310.5.1)

- Instruction text
- Entity (identifier and short description)
- FSM property (identifier)
- Performed action

- Old status
- New status

Business Logic (SR0310.2+)

The phase implements the following business logic.

Determine available actions (SR0310.2.1)

- Function: Determine available actions of pre-defined FSM for affected equipment entity
- Trigger: Phase becomes active
- Postcondition: Available actions are displayed

Step	#	Description
Phase activation	10	Phase displays its user interface according to the **Active mode (SR0310.1.2)** layout (page 44).
Phase checks if the referenced equipment entity is available at runtime	20	If the check fails, phase creates the **Equipment data mismatch (SR0310.3.2.1)** system-triggered exception (page 49).
Phase checks if the property type fits the equipment entity	30	■ If the check fails, phase creates the **Equipment data mismatch (SR0310.3.2.1)** system-triggered exception (page 49). ■ If the check passes successfully, phase continues with the next check.
Phase checks for available actions	40	■ Based on the actual status of the identified equipment entity and the settings of the **Allowed change actions (SR0310.8.3)** process parameter (page 48), phase displays the list of all available actions. ■ Phase continues with the **Perform status change (SR0310.2.2)** function (page 46).

Perform status change (SR0310.2.2)

- Function: Perform a status change on the equipment entity
- Trigger: Operator confirms phase
- Postcondition: Status is set

Step	#	Description
Operator confirms phase without having selected an action	10	Phase displays the **No action selected (SR0310.3.6.1)** error message (page 52).
Operator selects action and confirms phase	20	■ If previously executed checks still fail (e.g. system-triggered exception has been canceled), phase creates the **Equipment data mismatch (SR0310.3.2.1)** system-triggered exception (page 49). ■ If the action cannot be performed, phase displays the **Change action failed (SR0310.3.6.2)** error message (page 52). ■ If the action was successful, phase sets the new status of the equipment entity.

Process Parameters (SR0310.8+)

The following process parameters define the behavior of the phase.

BASIC PARAMETERS

Instruction (SR0310.8.1)

➢ For recent changes, see revision history (page 101).

Attribute	Type	Comment
Column 1	HTML text	Instruction text to be displayed. **Restriction**: Maximum length is 2000 characters (including HTML tags).
Column 2	HTML text	Not used.
Column 3	HTML text	

Identified equipment entity (SR0310.8.2)

Attribute	Type	Comment
Equipment object	Reference	Reference to the output of a preceding phase that provides an identified equipment entity.

PROPERTY TYPE PARAMETERS

Allowed change actions (SR0310.8.3)

Attribute	Type	Comment
Property and allowed change actions	Text (structured)	The property that needs to match the respective status property of the identified equipment entity on the shop floor and the allowed actions from the list of all supported actions of the selected property.

Change Action Selection Editor (SR0310.8.3.1)

The system provides a Change Action Selection editor for selecting change actions based on their property type.

CONFIGURATION OF SYSTEM-TRIGGERED EXCEPTIONS

Equipment data mismatch (SR0310.8.4)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Equipment data mismatch (SR0310.3.2.1)** system-triggered exception (page 49).

CONFIGURATION OF USER-TRIGGERED EXCEPTIONS

Force status (SR0310.8.5)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Force status (SR0310.3.1.1)** user-triggered exception (page 50).

Exceptions (SR0310.3+)

The phase supports user-defined, user-triggered (page 50), system-triggered (page 49), and post-completion exceptions (page 51) and their configuration by means of process parameters (page 47).

User-defined exceptions cannot be configured by process parameters since they are provided by the framework and independent of phases.

System-triggered Exceptions (SR0310.3.2+)

➢ For recent changes, see revision history (page 101).

A system-triggered exception is represented in a message dialog along with an **Exception** button, in the Exception Window as the read-only description of the exception, and in the batch report.

The following system-triggered exceptions are available.

Equipment data mismatch (SR0310.3.2.1)

The exception text is extended by messages specific to the current situation.

Representation of the exception:

- <Exception text>
  (taken from **Equipment data mismatch (SR0310.8.4)** process parameter (page 48))

- If the expected equipment is not available:
  Cannot find the expected entity.
- If the property type check fails:
  The <identifier> entity does not have a <property identifier> property or the property has no FlexibleStateModel.
- Example:
  Equipment data configuration error.
  The BlenderA12 entity does not have a CleaningBlender property.

Equipment data mismatch - Logic (SR0310.3.2.1.1)

- Trigger: Equipment entity or property type do not match
- Postcondition: Exception is recorded

Step	#	Description
Operator triggers exception	10	Phase records exception.

User-triggered Exceptions (SR0310.3.1+)

A user-triggered exception is represented in the list of available user-triggered exceptions in the Exception Window, as the description of the exception, and in the batch report.

The following user-triggered exceptions are available.

Force status (SR0310.3.1.1)

The **Force status** exception allows an operator to force a status change or to keep the current status.

Representation during exception handling:

- Instruction:
  Force status:
  Display of possible target statuses and the **<current status> (keep current status)** option.
  Confirm button.
- Exception text:
  <Exception text>
  (taken from **Force status (SR0310.8.5)** process parameter (page 49))
  <Identifier> property of <identifier> entity was forced to <target status> status.
  - Example:
    Status change forced
    CleaningBlender property of BlenderA12 entity was forced to Clean status.

Force status - Logic (SR0310.3.1.1.1)

- Trigger: Exception is selected
- Postcondition: Status of equipment entity is set

Step	#	Description
Operator selects status	10	Phase displays all available target statuses of the equipment entity, based on the list of allowed actions (see **Allowed change actions (SR0310.8.3)** process parameter (page 48). The selected status is marked.
Operator confirms exception	20	Phase shows exception description to be signed according to **Force status (SR0310.8.5)** process parameter (page 49).
Operator signs exception	30	Phase sets status of equipment entity to the selected one and records the exception.

Post-completion Exceptions

There are no post-completion exceptions available.

Information Messages

There are no information messages available.

Questions

There are no questions available.

Decisions

There are no decisions available.

Error Messages (SR0310.3.6+)

Error messages are represented in an error message dialog containing a message type-specific icon, the error message, and an **OK** button.

The following error messages are available to inform the operator about error conditions.

No action selected (SR0310.3.6.1)

UI text	Comment
You have to select an action before you can confirm.	Message pack: PhaseEqmEqChangeStatus<version> Message ID: HintUserSelectionRequired_ErrorMsg

Change action failed (SR0310.3.6.2)

UI text	Comment
<action> action failed for the <identifier> property of the <identifier> equipment. <details of failure>	Message pack: PhaseEqmEqChangeStatus<version> Message ID: TransitionFailed_ErrorMsg

Output Variables (SR0310.9+)

The following output variables are available to reference the phase's output.

Instance count (Framework capability)

- Data type: Long
- Usage: The output variable provides the count of the number of instances the phase has been processed, for example in a loop. The count is also increased when the phase is skipped from an operator's perspective, since the phase is still executed, but as a hidden phase.
  The count variable of a phase that has not been executed provides 0 as output value.

Start time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the start time of the phase.

Completion time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the completion time of the phase.

Identifier (Framework capability)

- Data type: String
- Usage: The output variable provides the identifier of the phase.

Status change result (SR0310.9.1)

- Data type: String
- Values: `PLANNED`, `FORCED`, `SKIPPED`
- Usage: The output variable states the conditions under which the status change has been performed.
  - The value is `PLANNED` if the status change has been performed as defined in the phase.
  - The value is `FORCED` if the status change has been forced by the operator.
  - The value is `SKIPPED` if no status change has been performed at all (**Keep current status** option).

New status (SR0310.9.2)

- Data type: String
- Usage: The output variable provides the new status of the equipment entity.

Chapter 5

Trigger Graph Transition Phase (SR0311+)

The **Trigger graph transition** phase allows an operator to change an equipment graph-related status of a previously identified equipment entity or equipment entity group (parent entity and its child entities) by executing a graph trigger.

An example use case is:

- Need to trigger a graph transition on the equipment entity
  Depending on entity properties like counter, dates, and the current status, a trigger causes a status transition from **In use** to **Reusable** or **Uncleaned**.

The affected equipment entities, their equipment graphs, the performed trigger, and the old and new statuses are stored in the batch record, thereby becoming available for documentation purposes in the sub-report and batch report (page 59).

Anomalies that occur during processing are covered by the phase exception handling (page 66) (e.g. no transition exists for the current status).

After completion the phase displays the identified equipment entity with the following data in the Execution Window:

- Entity identifier and short description
  (of a single entity or a main parent entity of a group)
- Equipment graph
- Performed trigger
- Old status
- New status
- List of child entities (if applicable)

The Navigator displays the identifier of the identified equipment entity and the number of child entities that hold an equipment graph of the configured purpose (if applicable).

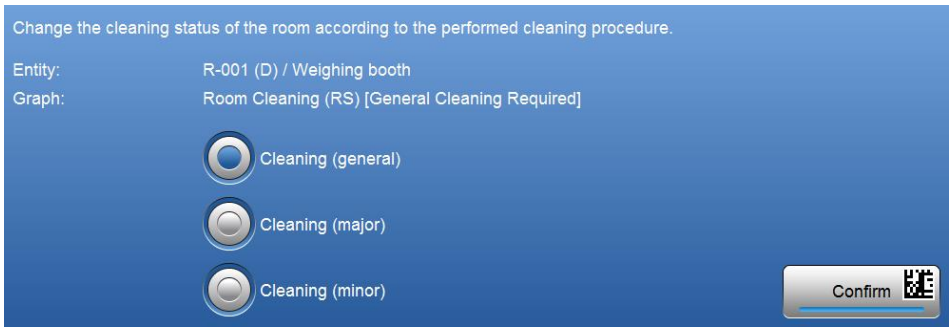

Figure 13: Trigger graph transition during execution

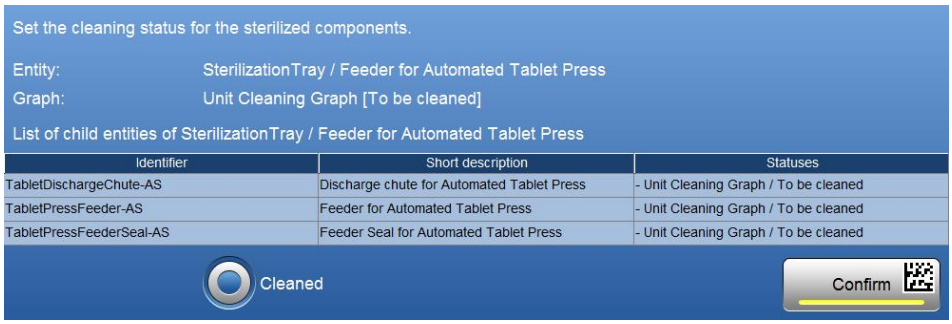

Figure 14: Trigger graph transition of group during execution

Layout

The phase provides individual layouts for its representation during execution (page 56), in the Navigator (page 58), and in the sub-report (page 59).

Representation during Execution (SR0311.1+)

The representation during execution depends on the phase mode.

Preview mode (SR0311.1.1)

1. <Instruction text>
   (taken from **Instruction (SR0311.8.1)** process parameter (page 64))
2. Entity:
3. Graph:
4. List of child entities of the group
   - Only if the **Show children (SR0311.8.7)** process parameter (page 64) is set to **True**.
5. List of allowed triggers
   (taken from **Allowed triggers (SR3011.8.4)** process parameter (page 65))
   The phase displays the complete list of allowed triggers with their key.

6. **Confirm** button (disabled).

Active mode (SR0311.1.2)

1. <Instruction text>
   (taken from **Instruction (SR0311.8.1)** process parameter (page 64))
2. Entity: <equipment entity identifier> / <equipment entity short description>
   (taken from **Identified equipment entity (SR0311.8.2)** process parameter (page 64))
3. Graph: <equipment graph display text> [<equipment graph current status>]
   (equipment graph is determined by the purpose taken from **Allowed triggers (SR0311.8.4)** process parameter (page 65), current status has to be stored at activation for later use as old status)
   - In case of an entity group, this is the graph of the main parent entity. If it does not exist, phase displays "N/A".
4. List of child entities
   - Only in case of an entity group and if the **Show children (SR0311.8.7)** process parameter (page 64) is set to **True**.
   - Only if the list is not empty: includes only entities that hold an equipment graph of the configured purpose.
   - Details of child entity.

<Child entity identifier>	<Child entity short description>	<equipment graph display text> [<equipment graph old status>]

5. List of allowed triggers
   (taken from **Allowed triggers (SR3011.8.4)** process parameter (page 65))
   The phase displays the complete list of allowed triggers with their display text.
   - If the display text is not unique, phase displays the key of the trigger.
   - If the trigger is not available at any entity, phase displays "<trigger key> (N/A)".
   - If the trigger is not available at all entities to which the graph is assigned, phase displays "<trigger key/display text> (incomplete)".
6. **Confirm** button.

Completed mode (SR0311.1.3)

1. <Instruction text>
   (taken from **Instruction (SR0311.8.1)** process parameter (page 64))

2. Entity: <equipment entity identifier> / <equipment entity short description> (taken from **Identified equipment entity (SR0311.8.2)** process parameter (page 64))
3. Graph: <equipment graph display text> [<equipment graph current status>] (equipment graph is determined by the purpose taken from **Allowed triggers (SR0311.8.4)** process parameter (page 65))
   - In case of an entity group, this is the graph of the main parent entity. If it does not exist, phase displays "N/A".
4. Performed trigger: <trigger display text>
5. Old status: <equipment graph old status>
   (old status is taken from value stored at **Active mode (SR0311.1.2)** layout (page 57))
   - In case of an entity group, this is the old status of the main parent entity. If it does not exist, phase displays "N/A".
6. New status: <equipment graph current status>
   - In case of an entity group, this is the new status of the main parent entity. If it does not exist, phase displays "N/A".
7. List of child entities
   - Only in case of an entity group and if the **Show children (SR0311.8.7)** process parameter (page 64) is set to **True**.
   - Only if the list is not empty: includes only entities that hold an equipment graph of the configured purpose.
   - Details of child entity.

<Child entity identifier>	<Child entity short description>	<equipment graph display text> [<equipment graph new status>]

8. **Confirm** button (completed).

Representation in Navigator (SR0311.4+)

The Navigator provides the following details:

Phase column (Framework capability)

- <Phase name>
  - Example:
    Set container to cleaned

Information column (SR0311.4.1)

- <Identifier of affected equipment entity>
  - Example: Gran0033
- Only in case of an entity group
  - <Identifier of affected equipment entity>
    <Number of child entities that hold an equipment graph of the configured purpose> child entities
    - Example:
      Gran0033
      5 child entities

Action column

- There are no actions available.

Representation in Sub-report (SR0311.5+)

The sub-report contains the following information:

Common sub-report elements (Framework capability)

- <Start time>
- <Completion time>
- <Unit procedure> / <operation> / <phase>
- <Work center> / <station> / <device> - <phase completion user>

Sub-report elements (SR0311.5.1)

- Instruction text
- Entity: <identifier> / <short description>
- Equipment graph (ID): <display text> (key)
  - In case of an entity group, this is the graph of the main parent entity. If it does not exist, phase displays "N/A".
- Performed trigger (key): <display text> (key)
- Old status (key): <display text> (key)
  - In case of an entity group, this is the old status of the main parent entity. If it does not exist, phase displays "N/A".
- New status (key): <display text> (key)

- In case of an entity group, this is the new status of the main parent entity. If it does not exist, phase displays "N/A".

- Child equipment entities (identifier, short description, graph display text [new status])
  - Only in case of an entity group.
  - Includes only entities that hold an equipment graph of the configured purpose.
- <Phase completion signature>
  (only if a phase completion signature is assigned to the phase)

Business Logic (SR0311.2+)

The phase implements the following business logic.

Phase Mode

Business logic related to phase modes.

Manual completion mode (SR0311.2.1)

- Function: **Manual completion** mode of phase
- Type: Phase mode
- Trigger: Phase becomes active
- Postcondition: Phase is active

Step	#	Description
Phase activation	10	Phase displays its user interface according to the **Active mode (SR0311.1.2)** layout (page 57)
Operator interaction	20	Operator selects a trigger of the equipment graph (see **Determine available triggers (SR0311.2.3)** function (page 61)).
Phase completion	30	See **Trigger graph transition (SR0311.2.4)** function (page 62).

Automatic completion mode (SR0311.2.2)

- Function: **Automatic completion** mode of phase
- Type: Phase mode
- Trigger: Phase becomes active
- Postcondition: Phase is completed

Step	#	Description
Phase activation	10	Phase displays its user interface according to the **Active mode (SR0311.1.2)** layout (page 57).
Phase determines available trigger	20	See **Determine available triggers (SR0311.2.3)** function (page 61) ■ If more than one trigger is available, phase must be completed manually. See **Manual completion (SR0311.2.1)** mode (page 60). ■ If a phase completion signature is assigned, the phase must be completed manually. See **Manual completion (SR0311.2.1)** mode (page 60).
Phase performs trigger		See **Trigger graph transition (SR0311.2.4)** function (page 62). ■ If no error has occurred, phase is completed automatically. ■ If an error has occurred, phase must be completed manually. See **Manual completion (SR0311.2.1)** mode (page 60).

Main Path

Business logic related to the main path:

Determine available triggers (SR0311.2.3)

- Function: Determine available triggers of the pre-defined purpose for affected equipment entities
- Type: Main path
- Trigger: Phase becomes active
- Postcondition: Available triggers are displayed

Step	#	Description
Phase activation	10	Phase displays its user interface according to the **Active mode (SR0311.1.2)** layout (page 57) and performs checks based on the settings of the **Identified equipment entity (SR0311.8.3)** process parameter (page 64) and the **Allowed triggers (SR0311.8.4)** process parameter (page 65). TIP If a check fails, phase displays an appropriate error message that has to be confirmed with OK. The system-triggered exception related to the failed check is created upon phase completion.
Phase checks if the referenced equipment entity is available at runtime	20	■ If the **Identified equipment entity (SR0311.8.3)** process parameter (page 64) is null, phase displays the **Entity not available (SR0311.3.6.2)** error message (page 70). ■ If the check passes successfully, phase continues with the next check.

Step	#	Description
Phase checks entity of group	25	■ In case of an entity group and if the entity is not the main parent entity of the group, phase displays the **Entity not main parent (SR0311.3.6.6)** error message (page 70). ■ If the check passes successfully, phase continues with the next check.
Phase checks if the purpose fits the equipment entity	30	The following check either applies to a single entity or to a main parent entity and to all of its child entities, respectively: ■ If none of the graphs assigned to the equipment entities matches the pre-defined purpose according to the **Allowed triggers (SR0311.8.4)** process parameter (page 65), phase displays the **Graph with purpose not assigned to entity (SR0311.3.6.3)** error message (page 70). ■ If the check passes successfully, phase continues with the next check.
Phase checks for available triggers	40	The following logic and check either applies to a single entity or to a main parent entity and to all of its child entities, respectively: ■ Based on settings of the **Allowed triggers (SR0311.8.4)** process parameter (page 65), phase displays the list of all configured triggers. ■ If triggers are not available at any of the determined graphs, phase displays the key of the missing trigger and appends "(N/A)" to the key. ■ If triggers are not available at all of the determined graphs, phase displays the key/display text of the trigger and appends "(incomplete)". ■ If triggers are available, but their display text is not unique (within a graph or between graphs), phase displays the key of the trigger instead of any display text. ■ If only one trigger is available, phase automatically selects the trigger. ■ If no trigger is available, phase displays the **No trigger is available (SR0311.3.6.4)** error message (page 71).

Trigger graph transition (SR0311.2.4)

- Function: Trigger graph transition on the equipment entities
- Type: Main path
- Trigger: Operator confirms phase
- Postcondition: Graph status transition and graph transition actions are done and/or phase is completed

Step	#	Description
Operator confirms phase without having selected a trigger	10	Phase displays the **No trigger selected (SR0311.3.6.1)** error message (page 70).
Operator selects a trigger and confirms the phase	20	The following logic either applies to a single entity or to a main parent entity and to all of its child entities, respectively: ■ If a phase completion signature is assigned, the signature is requested. ■ If previously executed checks of the **Determine available triggers (SR0311.2.3)** function (page 61) still fail, phase creates the **Equipment data mismatch (SR0311.3.2.1)** system-triggered exception (page 66). ■ Phase triggers the status transitions at all entities that hold an equipment graph of the configured purpose. ■ If a status transition at any entity that holds an equipment graph of the configured purpose cannot be performed, phase creates the **Status transition failed (SR0311.3.2.2)** system-triggered exception (page 67). ■ If the status transitions were successful for all entities that hold an equipment graph of the configured purpose or the **Status transition failed (SR0311.3.2.2)** system-triggered exception (page 67) was confirmed, phase reads the new status of each equipment entity. TIP A successful status transition depends on the transition configuration within the graph master data, including condition and action definitions. Properties of the equipment entity can be set along with the status transition, as defined at the transition actions.
A system-triggered exception has been canceled	30	The following logic either applies to a single entity or to a main parent entity and to all of its child entities, respectively: ■ Phase cannot be completed without confirmation of created system-triggered exceptions. ■ If the **Status transition failed (SR0311.3.2.2)** system-triggered exception (page 67) is canceled: Phase is still **active**, **no status transition** has been performed for any entity that holds an equipment graph of the configured purpose, and the operator can continue with a **different trigger** (if available).

Process Parameters (SR0311.8+)

The following process parameters define the behavior of the phase.

BASIC PARAMETERS

Instruction (SR0311.8.1)

➢ For recent changes, see revision history (page 101).

Attribute	Type	Comment
Text	HTML text	Instruction text to be displayed. **Restriction**: Maximum length is 2000 characters (including HTML tags).

Mode (SR0311.8.2)

Attribute	Type	Comment
Mode	Choice list	Defines the processing mode. **Manual completion (default)**: Operator confirms phase manually. **Automatic completion**: Phase is completed automatically if only one trigger is available.

Identified equipment entity (SR0311.8.3)

Attribute	Type	Comment
Equipment object	Reference	Reference to the output of a preceding phase that provides an identified equipment entity. In case of an entity group, the main parent entity of the group must be referenced.

Show children (SR0311.8.7)

Attribute	Type	Comment
Enabled	Boolean	In case of an entity group: controls if the list of child entities is displayed during execution. If so, only entities that hold an equipment graph of the configured purpose are displayed. Default setting: **True**

EQUIPMENT GRAPH PARAMETERS

Allowed triggers (SR0311.8.4)

Attribute	Type	Comment
Purpose and allowed triggers	Text (structured)	Defines the equipment graph (based on its purpose) and the allowed triggers. The equipment graph needs to match an equipment graph of the identified equipment entity or entity group on the shop floor. All equipment graphs of the identified entity or entity group with this purpose are affected during execution by the selected transition trigger.

Trigger Selection editor (Framework capability)

The system provides a Trigger Selection editor for selecting triggers based on their equipment graph. The graph purpose determines which triggers of which equipment graphs are available. System triggers and triggers of graphs in the **Archived** status are not available.

CONFIGURATION OF SYSTEM-TRIGGERED EXCEPTIONS

Equipment data mismatch (SR0311.8.5)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Equipment data mismatch (SR0311.3.2.1)** system-triggered exception (page 66).

Status transition failed (SR0311.8.6)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Status transition failed (SR0311.3.2.2)** system-triggered exception (page 67).

Exceptions (SR0311.3+)

The phase supports user-defined, user-triggered (page 69), system-triggered (page 66), and post-completion exceptions (page 69) and their configuration by means of process parameters (page 63).

User-defined exceptions cannot be configured by process parameters since they are provided by the framework and independent of phases.

System-triggered Exceptions (SR0311.3.2+)

➢ For recent changes, see revision history (page 101).

A system-triggered exception is represented in a message dialog along with an **Exception** button, in the Exception Window as the read-only description of the exception, and in the batch report.

The following system-triggered exceptions are available.

Equipment data mismatch (SR0311.3.2.1)

The exception text is extended by messages specific to the current situation.

Representation of the exception:

Exception dialog

- <Exception text>
  (taken from **Equipment data mismatch (SR0311.8.5)** process parameter (page 65))
  - If the expected equipment is not available:
    Cannot find the expected entity.
  - In case of a single equipment entity:
    If an equipment graph of the purpose is not available at any entity:
    The <identifier> entity does not hold an equipment graph of the <purpose> purpose.
  - In case of an equipment group:
    If an equipment graph of the purpose is not available at all entities:
    None of the entities of the <identifier> entity group holds an equipment graph of the <purpose> purpose.
  - If no trigger is configured:
    No purpose or trigger available.
  - Example:
    Equipment data configuration error.
    The IBC0033 entity does not hold an equipment graph of the Container Cleaning (RS) purpose.

Equipment data mismatch - Logic (SR0311.3.2.1.1)

- Trigger: Equipment entity or equipment graph do not match or no trigger was configured.
- Postcondition: Exception is recorded and phase is completed

Step	#	Description
Operator accepts exceptional situation	1-10	Phase shows exception description to be signed.
Operator signs exception	1-20	■ Phase records exception. ■ Phase is completed automatically.

Status transition failed (SR0311.3.2.2)

The **Status transition failed** exception is displayed automatically if a certain status transition could not be performed based on the given graph purpose and trigger.

The potential reasons for a failed status transition are:

- Source status does not match.
- Condition cannot be fulfilled or is not unique (in case of multiple transition definitions per trigger).
- Error during condition evaluation.
- Error during action evaluation.

The exception either applies to a single entity or to a main parent entity and to all of its child entities, respectively.

Representation of the exception:

Exception dialog

- <Exception text>
  (taken from **Status transition failed (SR0311.8.6)** process parameter (page 66))
  - In case of a single equipment entity:
    <the reason that applies>
  - In case of an entity group:
    <the reasons that apply>
  - List of potential reasons:
    - Cannot find the selected trigger.
    - Cannot find a transition for the current status.
    - Cannot find a fulfillable transition condition for the current status.
    - There is more than one fulfillable transition condition available for the current status: <TR-ID; TR-ID; ...>.
    - Cannot evaluate the transition condition (<TR-ID>).
    - Cannot evaluate the transition action (<TR-Action ID>) from the current status to the new status (<display text (key)>).

Exception Window

- <Exception text>
  (taken from **Status transition failed (SR0311.8.6)** process parameter (page 66))
  (Information is provided for each entity for which a transition fails)
  <reason>
  Equipment: <equipment identifier> / <equipment short description>
  Equipment type: <list of equipment types> (if available)
  Graph (ID): <graph display text> (<identifier>)
  Purpose: <purpose>
  Current status (key): <display text> (<key>)
  Failed trigger (key): <display text> (<key>)

- Example:
  Status transition failed.
  Cannot find a transition for the current status.
  Equipment: IBC0033
  Equipment type: Container (RS)
  Graph (ID): IBC Cleaning (IBCCleaning01)
  Purpose: Container Cleaning (RS)
  Current status (key): Blocked (BLOCKED)
  Failed trigger (key): In use (IN_USE)

Status transition failed - Logic (SR0311.3.2.2.1)

- Trigger: The trigger could not be performed on the entity with the equipment graph and the given purpose.
- Postcondition: Exception is recorded and phase is completed

Step	#	Description
Operator accepts exceptional situation	1-10	Phase shows exception description to be signed.
Operator signs exception	1-20	■ Phase records exception. ■ In case of an entity group and if any transition fails, none of the transitions are performed at all. ■ Phase is completed automatically.

User-triggered Exceptions

There are no user-triggered exceptions available.

Post-completion Exceptions

There are no post-completion exceptions available.

Information Messages

There are no information messages available.

Questions

There are no questions available.

Decisions

There are no decisions available.

Error Messages (SR0311.3.6+)

Error messages are represented in an error message dialog containing a message type-specific icon, the error message, and an **OK** button.

The following error messages are available to inform the operator about error conditions.

No trigger selected (SR0311.3.6.1)

UI text	Comment
You have to select a trigger before you can confirm.	Message pack: PhaseEqmEqTriggerTrans<version> Message ID: HintUserSelectionRequired_ErrorMsg

Entity not available (SR0311.3.6.2)

UI text	Comment
Cannot find the expected entity.	Message pack: PhaseEqmEqTriggerTrans<version> Message ID: IdentifiedEquipmentNull_ErrorMsg

Entity not main parent (SR0311.3.6.6)

UI text	Comment
The <identifier> entity is a member of a group, but not its main parent.	Message pack: PhaseEqmEqTriggerTrans<version> Message ID: "IdentifiedEquipmentIsASubgroup_Error"

Graph with purpose not assigned to entity (SR0311.3.6.3)

UI text	Comment
The <identifier> entity does not hold an equipment graph of the <purpose> purpose.	In case of a single equipment entity: Message pack: PhaseEqmEqTriggerTrans<version> Message ID: NoStatusGraphAssignedForPurpose_ErrorMsg
None of the entities of the <identifier> entity group holds an equipment graph of the <purpose> purpose.	In case of an entity group: Message pack:: PhaseEqmEqTriggerTrans<version> Message ID:: NoStatusGraphAssignedForPurposeOnGroup_ErrorMsg

No trigger available (SR0311.3.6.4)

UI text	Comment
No purpose or trigger available.	Message pack: PhaseEqmEqTriggerTrans<version> Message ID: NoPurposeOrTriggerConfigured_ErrorMsg

Output Variables (SR0311.9+)

The following output variables are available to reference the phase's output.

Instance count (Framework capability)

- Data type: Long
- Usage: The output variable provides the count of the number of instances the phase has been processed, for example in a loop. The count is also increased when the phase is skipped from an operator's perspective, since the phase is still executed, but as a hidden phase.
  The count variable of a phase that has not been executed provides 0 as output value.

Start time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the start time of the phase.

Completion time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the completion time of the phase.

Identifier (Framework capability)

- Data type: String
- Usage: The output variable provides the identifier of the phase.

Trigger execution successful (SR0311.9.1)

- Data type: Boolean
- Values: `true`, `false`
- Usage: The output variable states if the result of the equipment graph trigger execution was successful.

- The value is `true` if the graph transition with the selected trigger has been executed successfully.
- The value is `false` if the phase is completed with an exception.

Graph (SR0311.9.2)

- Data type: String
- Usage: The output variable provides the identifier of the used equipment graph. It applies to a single entity or to a main parent entity; it does not represent the graph of a child entity.

Selected trigger (SR0311.9.3)

- Data type: String
- Usage: The output variable provides the trigger (key) of the used equipment graph.

Old status (SR0311.9.4)

- Data type: String
- Usage: The output variable provides the old status (key) of the equipment entity. It applies to a single entity or to a main parent entity; it does not represent the status of a child entity.

New status (SR0311.9.5)

- Data type: String
- Usage: The output variable provides the new status (key) of the equipment entity. It applies to a single entity or to a main parent entity. It does not represent the status of a child entity.

Separate Equipment Phase (SR0312+)

The **Separate equipment** phase allows an operator to separate an equipment entity group. Either the entire group is separated into single entities or a single entity or a sub-group is separated from a main group.
Based on the phase configuration, a separated equipment entity can keep its binding status and a separated sub-group can keep its grouping by retaining its relations to its own child entities.

An example use case is:

- Need to separate a coater before cleaning
  A coater has to be separated into single equipment entities to run specific cleaning processes for different parts.

The affected equipment entities are stored in the batch record, thereby becoming available for documentation purposes in the sub-report and batch report (page 77).

Anomalies that occur during processing are covered by the phase exception handling (page 82) (e.g. skip separation).

After completion the phase displays the affected equipment entities with their identifiers and short descriptions in the Execution Window.

The Navigator displays the identifier of the parent equipment entity and the equipment entity to be separated (if applicable).

Figure 15: Separate equipment (single entity) during execution

Figure 16: Separate equipment (entity group) during execution

Figure 17: Separate equipment (all entities) during execution

Layout

The phase provides individual layouts for its representation during execution, (page 74) in the Navigator, (page 76) and in the sub-report (page 77).

Representation during Execution (SR0312.1+)

The representation during execution depends on the phase mode.

Preview mode (SR0312.1.1)

1. <Instruction text>
   (taken from **Instruction (SR0312.8.1)** process parameter (page 80))
2. Parent entity of group:
3. Keep sub-group: <Yes/No>
   (taken from **Keep defined sub-group (SR0312.8.9)** process parameter (page 81))
4. Keep binding: <Yes/No>
   (taken from **Keep binding (SR0312.8.10)** process parameter (page 82))

5. List of child entities to be separated from the group:
   - Only if the **Show children (SR0320.8.4)** process parameter (page 81) is set to **True**.
6. **Confirm** button (disabled).

Active mode (SR0312.1.2)

1. <Instruction text>
   (taken from **Instruction (SR0312.8.1)** process parameter (page 80))
2. Parent entity of group: <parent entity identifier> / <parent entity short description>
   (taken from **Parent entity of group (SR0312.8.2)** process parameter (page 80))
3. Entity to be separated: <equipment entity identifier> / <equipment entity short description>
   (taken from **Child entity to be separated (SR0312.8.5)** process parameter (page 81))
   - Only if the **Child entity to be separated (SR0312.8.5)** process parameter (page 81) is not null.
4. Keep sub-group: <Yes/No>
   (taken from **Keep defined sub-group (SR0312.8.9)** process parameter (page 81))
5. Keep binding: <Yes/No>
   (taken from **Keep binding (SR0312.8.10)** process parameter (page 82))
6. List of child entities to be separated from the group:
   - Only if the **Show children (SR0320.8.4)** process parameter (page 81) is set to **True**.
   - Details of child entity.

<Child entity identifier>	<Child entity short description>

7. **Confirm** button.

Completed mode (SR0312.1.3)

1. <Instruction text>
   (taken from **Instruction (SR0312.8.1)** process parameter (page 80))
2. Parent entity of group: <parent entity identifier> / <parent entity short description>
   (taken from **Parent entity of group (SR0312.8.2)** process parameter (page 80))

3. Separated entity: <equipment entity identifier> / <equipment entity short description>
   (taken from **Child entity to be separated (SR0312.8.5)** process parameter (page 81))
   - Only if the **Child entity to be separated (SR0312.8.5)** process parameter (page 81) is not null.
4. Keep sub-group: <Yes/No>
   (taken from **Keep defined sub-group (SR0312.8.9)** process parameter (page 81))
5. Keep binding: <Yes/No>
   (taken from **Keep binding (SR0312.8.10)** process parameter (page 82))
6. List of child entities that were separated from the group:
   - Only if the **Show children (SR0320.8.4)** process parameter (page 81) is set to **True**.
   - Details of child entity.

<Child entity identifier>	<Child entity short description>

7. **Confirm** button (completed).

Representation in Navigator (SR0312.4+)

The Navigator provides the following details:

Phase column (Framework capability)

- <Phase name>
  - Example:
    Separate coater

Information column (SR0312.4.1)

- <Identifier of parent equipment entity>
  - Example: CompactorC33
- Only if the **Child entity to be separated (SR0312.8.5)** process parameter (page 81) is not null.
  - <Identifier of parent equipment entity>
    <Identifier of child equipment entity>
    - Example:
      CompactorC33
      CompactorCrusher01

Action column

- There are no actions available.

Representation in Sub-report (SR0312.5+)

The sub-report contains the following information:

Common sub-report elements (Framework capability)

- <Start time>
- <Completion time>
- <Unit procedure> / <operation> / <phase>
- <Work center> / <station> / <device> - <phase completion user>

Sub-report elements (SR0312.5.1)

- Instruction text
- Group parent entity: <parent entity identifier> / <parent entity short description>
- Separated entity: <equipment entity identifier> / <equipment entity short description>
  - Only if the **Child entity to be separated (SR0312.8.5)** process parameter (page 81) is not null.
- Defined sub-group kept: <Yes/No>
- Binding kept: <Yes/No>
- List of separated child entities (identifier and short description) that were separated from the group

Business Logic (SR0312.2+)

The phase implements the following business logic.

Separate a group (SR0312.2.1)

- Function: Separate equipment entities from a group
- Trigger: Phase becomes active
- Postcondition: Equipment entities are no longer grouped

Step	#	Description
Phase activation	10	Phase displays its user interface according to the **Active mode (SR0312.1.2)** layout (page 75).

Step	#	Description
Phase checks availability of parent entity definition	20	If the **Parent entity of group (SR0312.8.2)** process parameter (page 80) is null, phase displays the **Parent entity of group not defined (SR0312.3.6.3)** error message (page 85).
Phase checks that parent entity is main parent entity	30	If the entity defined with the **Parent entity of group (SR0312.8.2)** process parameter (page 80) is not a main parent entity: ■ Phase displays the **Not main parent (SR0312.3.6.2)** error message (page 84).
Phase checks parent-child relationship of referenced equipment entities	40	If the entity defined with the **Child entity to be separated (SR0312.8.5)** process parameter (page 81) is not member of the group defined with the **Parent entity of group (SR0312.8.2)** process parameter (page 80): ■ Phase displays the **Not part of group (SR0312.3.6.1)** error message (page 84). (It is not necessary that the **child entity to be separated** is a direct child of the **parent entity of group**.)
Phase checks the completion mode	50	If all checks have passed successfully, phase continues as follows: ■ **Mode (SR0312.8.3)** process parameter (page 81) is set to **Manual completion**: Phase continues with the next step upon phase confirmation by the operator. ■ **Mode (SR0312.8.3)** process parameter (page 81) is set to **Automatic completion**: Phase automatically continues with the next step.
Phase **separates** equipment entities **completely**	70.1	If the **Child entity to be separated (SR0312.8.5)** process parameter (page 81) is null and the **Keep sub-group (SR0312.8.9)** process parameter (page 81) is set to **False**: ■ Phase completely separates the group defined with the **Parent entity of group (SR0312.8.2)** process parameter (page 80), including all of its sub-groups (if available). ■ Example: Scenario 1 in figure "Separate equipment scenarios" (page 80).
Phase **separates** equipment entities **partially**	70.2	If the **Child entity to be separated (SR0312.8.5)** process parameter (page 81) is null and the **Keep sub-group (SR0312.8.9)** process parameter (page 81) is set to **True**: ■ Phase separates all direct child entities from the **parent entity of group**, but keeps all sub-groups (if applicable). ■ Example: Scenarios 2 and 3 in figure "Separate equipment scenarios" (page 80).

Step	#	Description
		If the **Child entity to be separated (SR0312.8.5)** process parameter (page 81) is not null: ■ Phase separates the **child entity to be separated** from its direct parent (which is not necessarily the main parent according to the **Parent entity of group (SR0312.8.2)** process parameter (page 80)). ■ If the **Keep sub-group (SR0312.8.9)** process parameter (page 81) is set to **True**: Phase keeps all sub-groups of the separated entity (if applicable). ■ Example: Scenarios 4 and 5 in figure "Separate equipment scenarios" (page 80). ■ If the **Keep sub-group (SR0312.8.9)** process parameter (page 81) is set to **False**: Phase separates all sub-groups of the separated entity (if applicable). ■ Example: Scenario 6 in figure "Separate equipment scenarios" (page 80).
	70.3	If the separation of entities was successful, the logbooks of parent and child equipment entities are updated accordingly (if maintained).
Phase handles binding status	80	If the **Keep binding (SR0312.8.10)** process parameter (page 82) is set to **False**: ■ For all separated equipment entities and sub-groups, phase resets binding status of each entity to **Available** and updates the binding context in the **Context** tab of the equipment entity (not for workflows) and the logbooks accordingly (Unbind) (if maintained). ■ Example: Scenarios 1, 5, and 6 in figure "Separate equipment scenarios" (page 80). If the **Keep binding (SR0312.8.10)** process parameter (page 82) is set to **True**: ■ For all separated equipment entities and sub-groups, phase keeps the current binding status of each entity. ■ Example: Scenarios 3 and 4 in figure "Separate equipment scenarios" (page 80).
	90	In case an error has occurred during separation, phase displays the **Equipment separation failed (SR0312.3.6.4)** error message (page 85). In case an error has occurred during unbinding, phase displays the **Equipment unbinding (SR0312.3.6.5)** error message (page 85). In case of an error, all already executed separation or unbinding actions are undone. In case no error has occurred, phase is completed automatically.

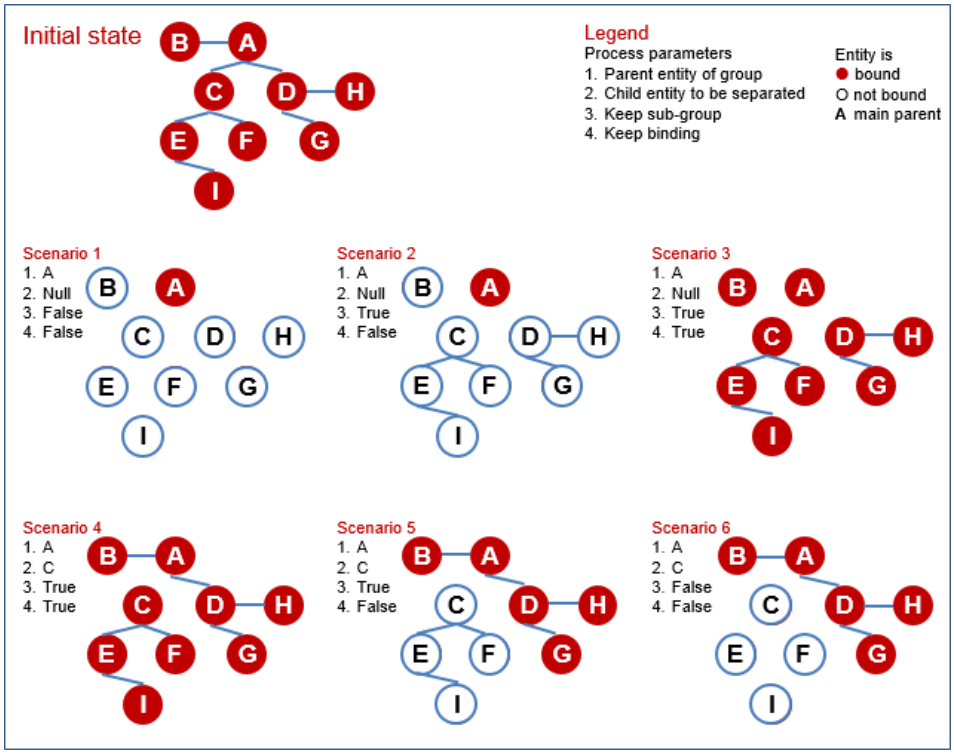

Figure 18: Separate equipment scenarios

Process Parameters (SR0312.8+)

The following process parameters define the behavior of the phase.

BASIC PARAMETERS

Instruction (SR0312.8.1)

➢ For recent changes, see revision history (page 101).

Attribute	Type	Comment
Text	HTML text	Instruction text to be displayed. **Restriction**: Maximum length is 2000 characters (including HTML tags).

Parent entity of group (SR0312.8.2)

Attribute	Type	Comment
Equipment object	Reference	Reference to the equipment object output variable of a preceding phase that provides the main parent entity of a group.

Child entity to be separated (SR0312.8.5)

Attribute	Type	Comment
Equipment object	Reference	Optional. Reference to the equipment object output variable of a preceding phase that provides the child entity to be separated from a group.

Mode (SR0312.8.3)

Attribute	Type	Comment
Mode	Choice list	Defines the processing mode. **Manual completion** (default): Operator confirms the phase. **Automatic completion**: Phase automatically separates the equipment entities and is completed.

Show children (SR0312.8.4)

Attribute	Type	Comment
Enabled	Boolean	Controls if the list of child entities that are separated is displayed during execution. Default setting: **True**

Keep sub-group (SR0312.8.9)

Attribute	Type	Comment
Enabled	Boolean	Controls if any sub-groups (if applicable) of a separated entity are kept. If not, all sub-groups of the separated entity are completely separated as well. Default setting: **True**

Keep binding (SR0312.8.10)

Attribute	Type	Comment
Enabled	Boolean	Controls if separated entities or sub-groups keep their binding status. If not, they are unbound along with the separation. Default setting: **True**

CONFIGURATION OF USER-TRIGGERED EXCEPTIONS

Skip separation (SR0312.8.8)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Skip separation (SR0312.3.1.1)** user-triggered exception (page 83).

Exceptions (SR0312.3+)

The phase supports user-defined, user-triggered (page 83), system-triggered (page 82), and post-completion exceptions (page 83) and their configuration by means of process parameters (page 80).

User-defined exceptions cannot be configured by process parameters since they are provided by the framework and independent of phases.

System-triggered Exceptions

There are no system-triggered exceptions available.

User-triggered Exceptions (SR0312.3.1+)

A user-triggered exception is represented in the list of available user-triggered exceptions in the Exception Window, as the description of the exception, and in the batch report.

The following user-triggered exceptions are available.

Skip separation (SR0312.3.1.1)

The **Skip separation** exception allows an operator to skip the phase in order to pass an error situation. This may require the separation process to be performed in Data Manager [A3] (page 99).

Representation during exception handling:

- Instruction:
  Skip the separation.
  Confirm button.
- Exception text:
  <Exception text>
  (taken from **Skip separation (SR0312.8.8)** process parameter (page 82))
  Parent entity: <identifier of parent equipment entity>
  Child entity: <identifier of child equipment entity>

  (If an entity is not available or not configured, phase displays "N/A" as identifier.)
  - Example:
    Separation has been skipped.
    Parent entity: CompactorC33
    Child entity: CompactorCrusher01

Skip separation - Logic (SR0312.3.1.1.1)

- Trigger: Exception is selected
- Postcondition: **Separate equipment** phase is skipped

Step	#	Description
Operator confirms exception	10	Phase shows exception description to be signed according to **Skip separation (SR0312.8.8)** process parameter (page 82).
Operator signs exception	20	■ Phase records exception. ■ Phase is completed automatically.

Post-completion Exceptions

There are no post-completion exceptions available.

Information Messages

There are no information messages available.

Questions

There are no questions available.

Decisions

There are no decisions available.

Error Messages (SR0312.3.6+)

Error messages are represented in an error message dialog containing a message type-specific icon, the error message, and an **OK** button.

The following error messages are available to inform the operator about error conditions.

Not part of group (SR0312.3.6.1)

UI text	Comment
The <child entity identifier> entity that is to be separated from the group is no child of the defined group (<parent entity identifier>).	Message pack: PhaseEqmEqSeparate<version> Message ID: ChildEntityNotPartOfGroup_ErrorMsg

Not main parent (SR0312.3.6.2)

UI text	Comment
Cannot perform the separation, since the <parent entity identifier> entity is not the main parent of the group.	Message pack: PhaseEqmEqSeparate<version> Message ID: NotRootEntity_ErrorMsg

Parent entity of group not defined (SR0312.3.6.3)

UI text	Comment
There is no parent entity of the group defined.	Message pack: PhaseEqmEqSeparate<version> Message ID: NoRootEntity_ErrorMsg

Equipment separation failed (SR0312.3.6.4)

UI text	Comment
An error has occurred while separating the <entity identifier> entity from its group.	Message pack: PhaseEqmEqSeparate<version> Message ID: SeparationFailed_ErrorMsg The **Details** button provides access to more specific information about the error.

Equipment unbinding failed (SR0312.3.6.5)

UI text	Comment
An error has occurred while unbinding the <entity identifier> entity.	Message pack: PhaseEqmEqSeparate<version> Message ID: ReleaseFailed_ErrorMsg The **Details** button provides access to more specific information about the error and the entities that cause the error.

Output Variables (SR0310.9+)

The following output variables are available to reference the phase's output.

Instance count (Framework capability)

- Data type: Long
- Usage: The output variable provides the count of the number of instances the phase has been processed, for example in a loop. The count is also increased when the phase is skipped from an operator's perspective, since the phase is still executed, but as a hidden phase.
  The count variable of a phase that has not been executed provides 0 as output value.

Start time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the start time of the phase.

Completion time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the completion time of the phase.

Identifier (Framework capability)

- Data type: String
- Usage: The output variable provides the identifier of the phase.

Unbind Equipment Phase (SR0320+)

The **Unbind equipment** phase allows an operator to release a previously bound equipment entity or all equipment entities of a group before a unit procedure is finished. Thus the entity or entity group can be identified within another unit procedure context while the current unit procedure is still running.

Example use cases are:

- Need to explicitly unbind an equipment entity.
  A measuring tool needs to be used in multiple orders that run in parallel. It must be released from one order prior to the automatic release along with order step finish. Once released, it can again be identified and used in a different order.
- Need to explicitly unbind an equipment group
  Cleaning of a used machine with all of its components has to be started before the current order step is completed. The machine can be unbound as soon as it is no longer used in the context of the current order step.

The affected equipment entities are stored in the batch record, thereby becoming available for documentation purposes in the sub-report and batch report (page 90).

Anomalies that occur during processing are covered by the phase exception handling (page 94) (e.g. equipment entity is not available).

After completion the phase displays the affected (parent) equipment entity and the child entities (if applicable) with their identifiers and short descriptions in the Execution Window.

The Navigator displays the identifier of the affect (parent) equipment entity and the number of child entities (if applicable).

Figure 19: Unbind equipment during execution

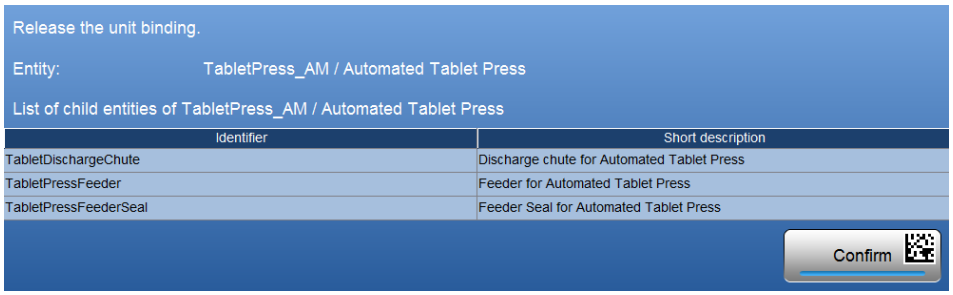

Figure 20: Unbind equipment group during execution

Layout

The phase provides individual layouts for its representation during execution (page 88), in the Navigator (page 89), and in the sub-report (page 90).

Representation during Execution (SR0320.1+)

The representation during execution depends on the phase mode.

Preview mode (SR0320.1.1)

1. <Instruction text>
   (taken from **Instruction (SR0320.8.1)** process parameter (page 92))
2. Entity:
3. List of child entities of the group
   - Only if the **Show children (SR0320.8.6)** process parameter (page 92) is set to **True**.
4. **Confirm** button (disabled).

Active mode (SR0320.1.2)

1. <Instruction text>
   (taken from **Instruction (SR0320.8.1)** process parameter (page 92))
2. Entity: <equipment entity identifier> / <equipment entity short description>
   (taken from **Identified equipment entity (SR0320.8.2)** process parameter (page 92))
3. List of child entities:
   - Only in case of an entity group and if the **Show children (SR0320.8.6)** process parameter (page 92) is set to **True**.

- Details of child entity.

<Child entity identifier>	<Child entity short description>

4. **Confirm** button.

Completed mode (SR0320.1.3)

1. <Instruction text>
   (taken from **Instruction (SR0320.8.1)** process parameter (page 92))
2. Entity: <equipment entity identifier> / <equipment entity short description>
   (taken from **Identified equipment entity (SR0320.8.2)** process parameter (page 92))
3. List of child entities:
   - Only in case of an entity group and if the **Show children (SR0320.8.6)** process parameter (page 92) is set to **True**.
   - Details of child entity.

<Child entity identifier>	<Child entity short description>

4. **Confirm** button (completed).

Representation in Navigator (SR0320.4+)

The Navigator provides the following details:

Phase column (Framework capability)

- <Phase name>
  - Example:
    Unbind blender

Information column (SR0320.4.1)

- <Identifier of affected equipment entity>
  - Example: BlenderA12
- Only in case of an entity group
  - <Identifier of affected equipment entity>
    <Number of child entities> child entities

- Example:
  BlenderA12
  5 child entities

Action column

- There are no actions available.

Representation in Sub-report (SR0320.5+)

The sub-report contains the following information:

Common sub-report elements (Framework capability)

- <Start time>
- <Completion time>
- <Unit procedure> / <operation> / <phase>
- <Work center> / <station> / <device> - <phase completion user>

Sub-report elements (SR0320.5.1)

- Instruction text
- Entity <identifier and short description>
  - If the equipment entity is the main parent of a group, the list of its child entities (identifier and short description) is added to the report.

Business Logic (SR0320.2+)

The phase implements the following business logic.

Unbind equipment entity (SR0320.2.1)

- Function: Unbind affected equipment entities
- Trigger: Phase becomes active
- Postcondition: Equipment entities are no longer bound

Step	#	Description
Phase activation	10	Phase displays its user interface according to the **Active mode (SR0320.1.2)** layout (page 88).

Step	#	Description
Phase checks the completion mode	20	■ **Mode (SR0320.8.3)** process parameter (page 92) is set to **Manual completion**: Phase continues with the next step upon phase confirmation by the operator. ■ **Mode (SR0320.8.3)** process parameter (page 92) is set to **Automatic completion**: Phase automatically continues with the next step.
Phase checks if the referenced equipment entity or entity group is available at runtime	30	■ If no equipment entity is referenced, phase creates the **Equipment data mismatch (SR0320.3.2.1)** system-triggered exception (page 94). ■ If the equipment entity is member of a group, but not the main parent entity, phase creates the **Equipment data mismatch (SR0320.3.2.1)** system-triggered exception (page 94). If the check passes successfully, phase continues with the next check.
Phase checks if all entities are bound	40	The following checks either apply to a single entity or to a main parent entity and to all of its child entities, respectively: ■ If any equipment entity is not bound, phase creates the **Equipment unbind failed (SR0320.3.2.2)** system-triggered exception (page 95). ■ If any equipment entity is bound to a different unit procedure context, phase creates the **Equipment unbind failed (SR0320.3.2.2)** system-triggered exception (page 95). If the check passes successfully, phase continues with the next check.
Phase resets the status of the equipment entity or entity group to **Available**	50	■ If a system-triggered exception has been recorded, phase does not change the binding status of any equipment. ■ If the binding status of all equipment entities can be set to **Available**, the binding context in the **Context** tab of the equipment entity (not for workflows) and the logbook of all entities is updated accordingly (Unbind) (if maintained) and phase is completed.

Process Parameters (SR0320.8+)

The following process parameters define the behavior of the phase.

BASIC PARAMETERS

Instruction (SR0320.8.1)

➢ For recent changes, see revision history (page 101).

Attribute	Type	Comment
Text	HTML text	Instruction text to be displayed. **Restriction**: Maximum length is 2000 characters (including HTML tags).

Identified equipment entity (SR0320.8.2)

Attribute	Type	Comment
Equipment object	Reference	Reference to the output of a preceding phase that provides an identified equipment entity.

Mode (SR0320.8.3)

Attribute	Type	Comment
Mode	Choice list	Defines the processing mode. **Manual completion** (default): Operator confirms the phase. **Automatic completion**: Phase automatically unbinds the equipment entities and is completed.

Show children (SR0320.8.6)

Attribute	Type	Comment
Enabled	Boolean	Controls if the list of child entities is displayed during execution. Default setting: **True**

CONFIGURATION OF SYSTEM-TRIGGERED EXCEPTIONS

Equipment data mismatch (SR0320.8.4)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Equipment data mismatch (SR3220.3.2.1)** system-triggered exception (page 94).

Equipment unbind failed (SR0320.8.5)

Attribute	Type	Comment
Risk assessment	Choice list	Defines the risk level of the exception and thus controls the related signature privilege. Available settings: **None**, **Low**, **Low (mandatory comment)**, **Medium**, **Medium (mandatory comment)**, **High**, **High (mandatory comment)**. Default setting: **High**.
Exception text	Text	Defines the exception description used during exception handling and within the batch record. Maximum length is 250 characters.

See also **Equipment unbind failed (SR0320.3.2.2)** system-triggered exception (page 95).

Exceptions (SR0320.3+)

The phase supports user-defined, user-triggered (page 96), system-triggered (page 94), and post-completion exceptions (page 96) and their configuration by means of process parameters (page 91).

User-defined exceptions cannot be configured by process parameters since they are provided by the framework and independent of phases.

System-triggered Exceptions (SR0320.3.2+)

➢ For recent changes, see revision history (page 101).

A system-triggered exception is represented in a message dialog along with an **Exception** button, in the Exception Window as the read-only description of the exception, and in the batch report.

The following system-triggered exceptions are available.

Equipment data mismatch (SR0320.3.2.1)

The exception text is extended by messages specific to the current situation.

Representation of the exception:

- <Exception text>
  (taken from **Equipment data mismatch (SR0320.8.4)** process parameter (page 93))
  - If the expected equipment is not available:
    Cannot find the expected entity.
  - If the expected equipment entity is member of a group, but not the main parent entity:
    The <entity identifier> entity is only a member and not the main parent of the group (<parent entity identifier>).
  - Example:
    Equipment data configuration error.
    The Hose047 entity is only a member and not the main parent of the group (Compactor-base).

Equipment data mismatch - Logic (SR0320.3.2.1.1)

- Trigger: Equipment entity or entity status do not match
- Postcondition: Exception is recorded

Step	#	Description
Operator triggers exception	10	Phase records exception.

Equipment unbind failed (SR0320.3.2.2)

The exception text is extended by messages specific to the current situation.

Representation of the exception:

Exception dialog

- <Exception text>
  (taken from **Equipment unbind failed (SR0320.8.5)** process parameter (page 93))
  - If a single equipment entity is not in the **Bound** status:
    The <entity identifier> entity is not bound.
  - If a single equipment entity is bound within a different unit procedure context:
    Cannot unbind the <entity identifier> entity.
    Cannot unbind the <entity identifier> equipment entity here, since it has already been identified or bound at the <work center identifier> work center for <process order or workflow identifier> (unit procedure: <unit procedure identifier>, operation: <operation identifier>, phase: <phase identifier>).
  - If any equipment entity of a group is not in the **Bound** status or bound within a different unit procedure context:
    Unbind of <identifier of main parent entity> failed.

Exception Window

- <Exception text>
  (taken from **Equipment unbind failed (SR0320.8.5)** process parameter (page 93))
  - If a single equipment entity is not in the **Bound** status:
    The <entity identifier> entity is not bound.
  - If a single equipment entity is bound within a different unit procedure context:
    Cannot unbind the <entity identifier> entity.
    Cannot unbind the <entity identifier> equipment entity here, since it has already been identified or bound at the <work center identifier> work center for <process order or workflow identifier> (unit procedure: <unit procedure identifier>, operation: <operation identifier>, phase: <phase identifier>).
  - If any equipment entity of a group is not in the **Bound** status or bound within a different unit procedure context:
    Unbind of <identifier of main parent entity> failed.
    - For each equipment entity of the group, the following details are listed:
      Entity: <entity identifier>

Reason: The entity is not bound.
Entity: <entity identifier>
Reason: Cannot unbind the <identifier> equipment entity here, since it has already been identified or bound at the <work center identifier> work center for <process order or workflow identifier> (unit procedure: <unit procedure identifier>, operation: <operation identifier>, phase: <phase identifier>).

- Example:
  Unbind failed.
  Cannot unbind the BlenderA12 equipment entity.
  Cannot unbind the BlenderA12 equipment entity here, since it has already been identified or bound at the WKC_Processing work center for WF_Blender (unit procedure: UP-01, operation: OP-01, phase: PH-Release-Blender).

Equipment unbind failed - Logic (SR0320.3.2.2.1)

- Trigger: Unbind of equipment entity or of an equipment entity of a group failed
- Postcondition: Exception is recorded

Step	#	Description
Operator triggers exception	10	Phase records exception.

User-triggered Exceptions

There are no user-triggered exceptions available.

Post-completion Exceptions

There are no post-completion exceptions available.

Information Messages

There are no information messages available.

Questions

There are no questions available.

Decisions

There are no decisions available.

Error Messages

There are no error messages available.

Output Variables

The following output variables are available to reference the phase's output.

Instance count (Framework capability)

- Data type: Long
- Usage: The output variable provides the count of the number of instances the phase has been processed, for example in a loop. The count is also increased when the phase is skipped from an operator's perspective, since the phase is still executed, but as a hidden phase.
  The count variable of a phase that has not been executed provides 0 as output value.

Start time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the start time of the phase.

Completion time (Framework capability)

- Data type: Timestamp
- Usage: The output variable provides the completion time of the phase.

Identifier (Framework capability)

- Data type: String
- Usage: The output variable provides the identifier of the phase.

Chapter 8

Reference Documents

The following documents are available from the Rockwell Automation Download Site.

No.	Document Title	Part Number
A1	PharmaSuite Functional Requirement Specification Execution Framework	PSFRSEF-RM004E-EN-E
A2	PharmaSuite Functional Requirement Specification Recipe and Workflow Management	PSFRSRD-RM008E-EN-E
A3	PharmaSuite Functional Requirement Specification Data Management	PSFRSDM-RM004E-EN-E

TIP

To access the Rockwell Automation Download Site, you need to acquire a user account from Rockwell Automation Sales or Support.

Appendix A

Document Information

The document information covers various data related to the document.

Approval

This document has been approved electronically via the Rockwell Automation Document Management System (DMS). The required approvers of this document include the following:

Name	Role
Martin Dittmer	Product Manager
Steffen Landes	Development Manager
Martin Irmisch	Test Manager

In addition, the electronic document approval via DMS is confirmed by a handwritten signature of all approvers in the Quality Document when the release is completed. The Quality Document summarizes the quality-related planning activities and results of a PharmaSuite release.

Version Information

Object	Version
PharmaSuite	8.4
Identify equipment	2.0 MR1
Change equipment status	1.0 MR4
Trigger graph transition	2.0
Separate equipment	1.0
Unbind equipment	2.0 MR1
Functional Requirement Specification	1.0

Revision History

The following table describes the history of this document.

Changes related to the document:

Object	Description	Document
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Changes related to "Recipe and Workflow Configuration for Equipment Tracking" (page 3):

Object	Description	Document
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Changes related to "Identify Equipment Phase" (page 13):

Object	Description	Document
System-triggered Exceptions (SR0300.3.2+) (page 29)	Update The message dialog of a system-triggered exception no longer provides a **Cancel** button.	1.0
Multiple Failed Checks (SR0300.3.2.3) (page 33)	Update The message dialog of a combined system-triggered exception no longer provides a **Cancel** button.	1.0
Sub-report Elements (SR0300.5.1) (page 17)	Update Sequence of report data updated: "Additional requirements" moved after "Scanned equipment entity", "All status values" moved to "Actual property names ...", "Rule identifiers, property names ..." replaced by "Actual property names...", both "Rule identifiers and actual values" removed. No change of code.	1.0
Instruction (SR0300.8.1) (page 25)	Update The maximum length of the **Instruction** process parameter is 2000 characters (including HTML tags). No change of code.	1.0

Changes related to "Change Equipment Status Phase" (page 43):

Object	Description	Document
System-triggered Exceptions (SR0310.3.2+) (page 49)	Update The message dialog of a system-triggered exception no longer provides a **Cancel** button.	1.0
Instruction (SR0310.8.1) (page 47)	Update The maximum length of the **Instruction** process parameter is 2000 characters (including HTML tags). No change of code.	1.0

Changes related to "Trigger Graph Transition Phase" (page 55):

Object	Description	Document
System-triggered Exceptions (SR0311.3.2+) (page 66)	Update The message dialog of a system-triggered exception no longer provides a **Cancel** button.	1.0
Instruction (SR0311.8.1) (page 64)	Update The maximum length of the **Instruction** process parameter is 2000 characters (including HTML tags). No change of code.	1.0

Changes related to "Separate Equipment Phase" (page 73):

Object	Description	Document
Instruction (SR0312.8.1) (page 80)	Update The maximum length of the **Instruction** process parameter is 2000 characters (including HTML tags). No change of code.	1.0

Changes related to "Unbind Equipment Phase" (page 87):

Object	Description	Document
System-triggered Exceptions (SR0320.3.2+) (page 94)	Update The message dialog of a system-triggered exception no longer provides a **Cancel** button.	1.0
Instruction (SR0320.8.1) (page 92)	Update The maximum length of the **Instruction** process parameter is 2000 characters (including HTML tags). No change of code.	1.0

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