Maintenance Booking

Version 5.11

Manual

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Content

1 Concept

If machine malfunctions occur, FORCAM FORCE™ provides the option to request maintenance via the shop floor terminal. In doing so, the malfunction report is sent to the maintenance via ERP.
The repair personnel process the maintenance order and finish the repair. The machine malfunction is eliminated this way and the production continues.
The maintenance process is displayed in Figure 1. The according change of phases and statuses is summarized in Table 1 (see below).

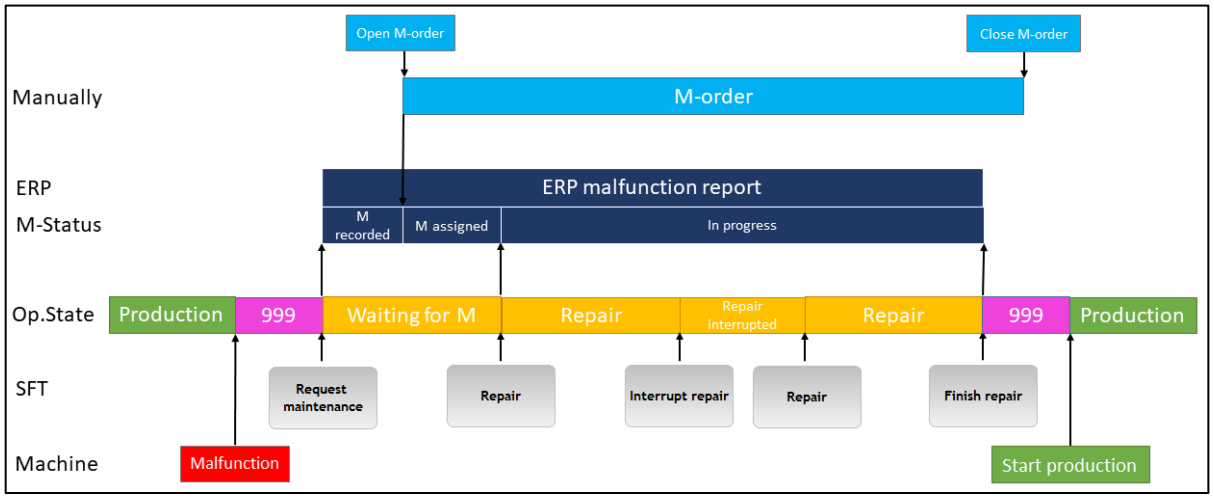

Figure 1: Maintenance process from the ticket to the elimination of the malfunction

Figure 1 is based on the following process:

- A machine malfunction occurs.
  The workplace status changes from **Production** to **Undefined stoppage with the mnemonic 999**.
- The operator is unable to eliminate the malfunction on his own.
- The operator pushes the button **Request maintenance in the SFT a**nd by doing so requests maintenance.
  The workplace status changes to **Waiting for maintenance**.
  A malfunction report is created in ERP. The status of the malfunction report is **Recorded**.
- A maintenance order is generated in ERP.
  A maintenance technician is determined. The status of the malfunction report changes to **Assigned**.
- The maintenance technician opens the maintenance order.
- The maintenance technician pushes the button **Repair in the SFT**.
  A ticket is sent to ERP. The status of the malfunction report changes to **In progress**.
- All MDE machine signals are ignored during the repair, so that the machine can be turned off and on as needed.
- The maintenance technician can push the button **Interrupt repair in the SFT**.

- The maintenance technician finishes the repair and pushes the button **Finish repair in the SFT**.
  The workplace status changes to **Undefined stoppage**.
  A ticket is sent to ERP. The malfunction report in ERP is finished.
- The maintenance technician finishes the maintenance order.
- The production continues on the machine. The workplace status changes to **Production**.

The following Table 1 describes the change of phases and statuses during maintenance based on the process shown in Figure 1:

Table 1: Change of phases and statuses during maintenance

Status	Production	Undefined stoppage	Waiting for maint-enance	Repair	Repair interrupted	Repair	Undefined stoppage /Produc-tion
Machine status	Production	Downtime + R1	Downtime + R1	Downtime/ production (suppressed)	Downtime/ production (suppressed)	Downtime/pro duction (suppressed)	Downtime/ production
Workplace Status	Production	Downtime	Waiting for maintenance	Maintenance	Maintenance interrupted	Maintenance	Downtime/ production
Workplace Phase	Production	Production	Production	Production	Production	Production	Production
Operation Status	Production	Downtime	Waiting for maintenance	Maintenance	Maintenance interrupted	Maintenance	Downtime/ production
Operation Phase	Production	Production	Production	Production	Production	Production	Production
Operating state	Production	R1	Waiting for maintenance	Maintenance	Maintenance interrupted	Maintenance	Downtime/ production

The maintenance ticket is realized via two activity steps:

The first step is executed by the operator and requests maintenance.
The second step is executed by the maintenance technician and changes the maintenance status.
The configuration of a superordinate button is required.

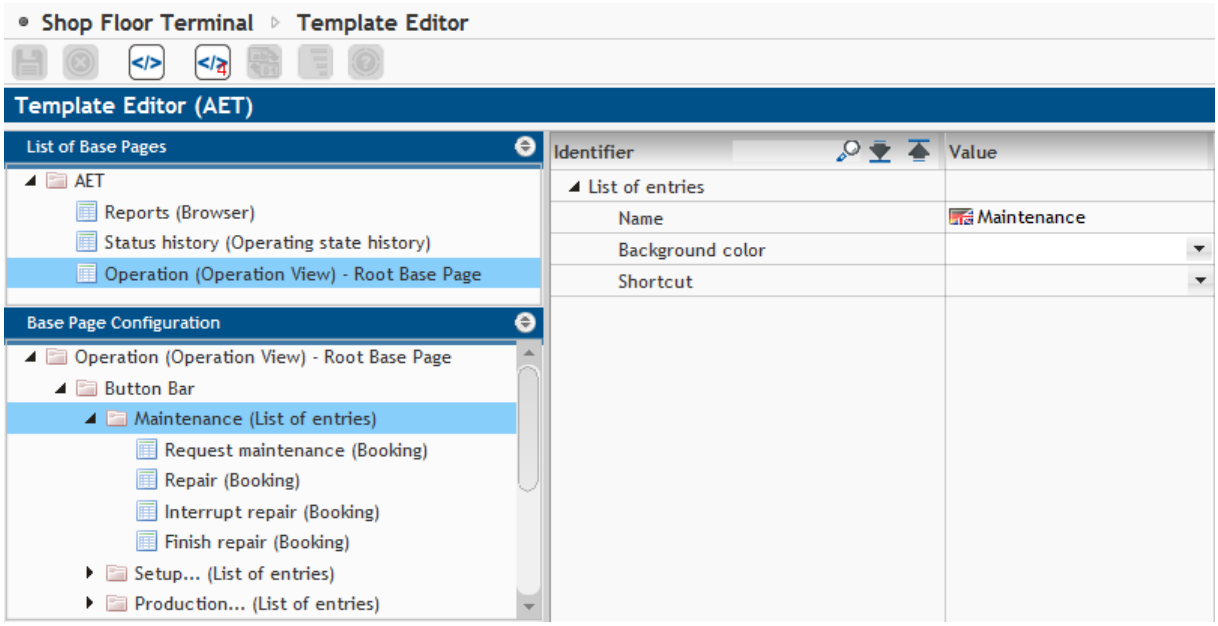

Figure 2: Button maintenance with subdivided activity steps

2 Request Maintenance

To request maintenance, the operator presses the button with the configured activity step in the shop floor terminal (see below).
The activity step to request maintenance is **Maintenance request**.

This step opens a dialog, in which the operator enters the following data:

- Operator
- Time stamp of request
- Workplace (equipment number)
- Mnemonic of the current operating state
- Text or name, respectively, of the current operating state or the malfunction, respectively
- Remark of the operating state or the malfunction, respectively
- Request ID (optional)

After sending the dialog, the current downtime is automatically split (subdivided). The downtime before the split is coded according to the state entered in the dialog. The status after the split becomes **Waiting for maintenance.**

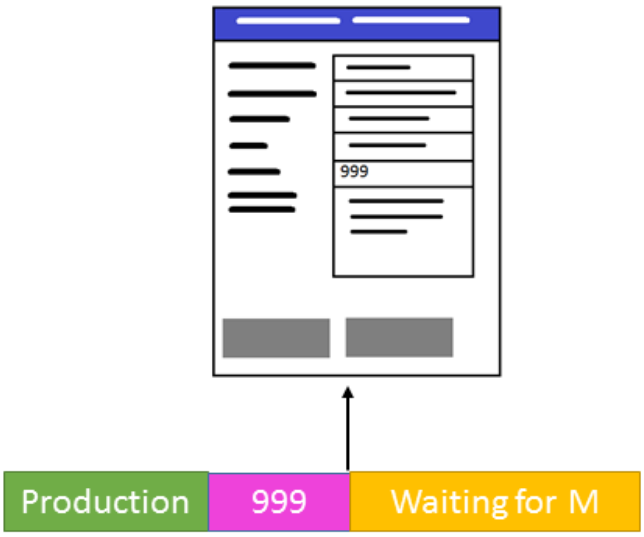

Figure 3: Change of the operating state after requesting maintenance

The following Table 2 contains all configurations needed in this step:

Table 2: Values of the activity step maintenance request

Identifier	Value
Input parameter	Workplace (WORKPLACE) – Workplace (APL) Person (PERS) – Person (PERS)
Person information required	Optional: If a check mark is set, the step requires the indication of a personnel ID to execute.
Ticket class	Simple comment

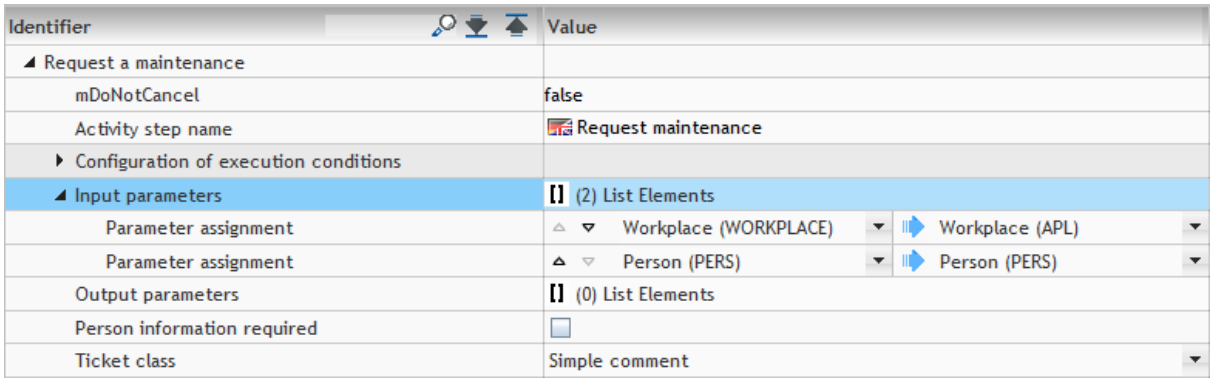

Figure 4: Configuration of the activity step maintenance request

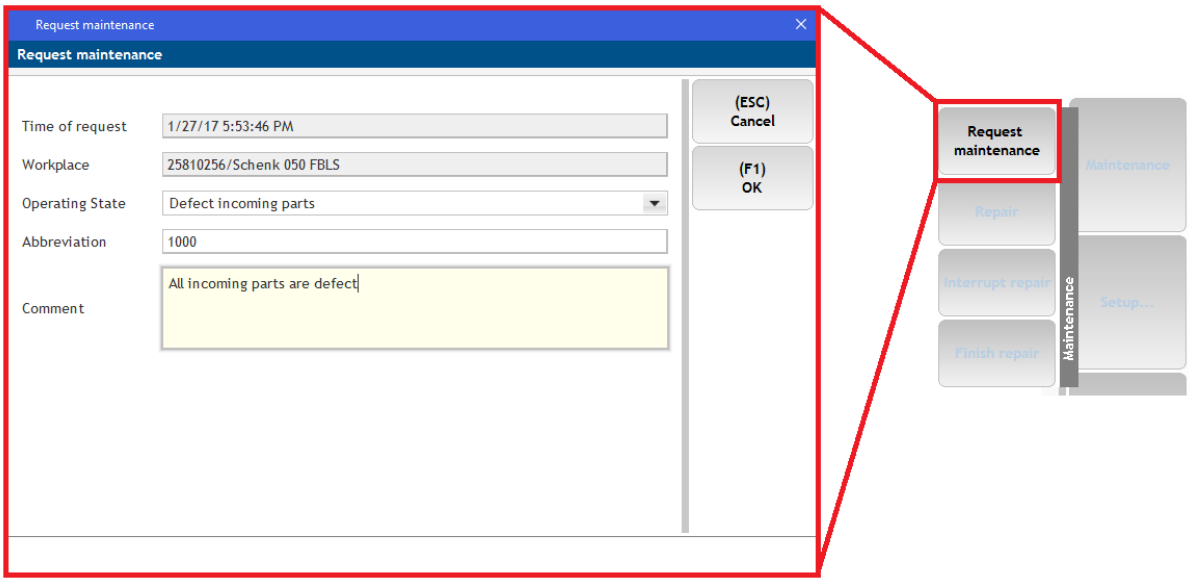

Figure 5: Dialog to request maintenance

3 Repair

To conduct maintenance, the maintenance technician presses several buttons with the accordingly configured activity step in the shop floor terminal (see below). The activity step for the repair is **Changing the maintenance status**. The step is configured in a way that the maintenance adopts the according status that corresponds with the button.

The following buttons should at least be created:

- Repair
  The maintenance technician starts the repair.
- Interrupt repair (optional)
  The maintenance technician has the option to interrupt the maintenance, e.g. to supply necessary tools. The interruption enables a more precise recording of the actual maintenance duration.
- Continue repair (optional)
  The maintenance technician continues the maintenance.
- Finish repair
  The maintenance technician eliminated the malfunction. The maintenance is finished.

3.1 Start Repair

The maintenance technician starts the problem solving at the machine. He presses the button **Repair** in the shop floor terminal. The operating state changes from **Waiting for maintenance** to **Repair**.

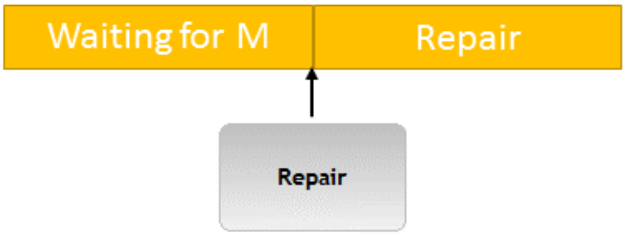

Figure 6: Changing the operating state at the start of the repair

When activating the step, a malfunction report is sent to ERP. The duration of the repair is recorded or booked, respectively, from this time on.
All MDE machine signals are ignored during the repair, so that the machine can be turned off and on as needed.

The following Table 3 contains all configurations needed in the step:

Table 3: Values of the button Repair

Identifier	Value
Input parameter	Workplace (WORKPLACE) – Workplaces
Maintenance status	Maintenance

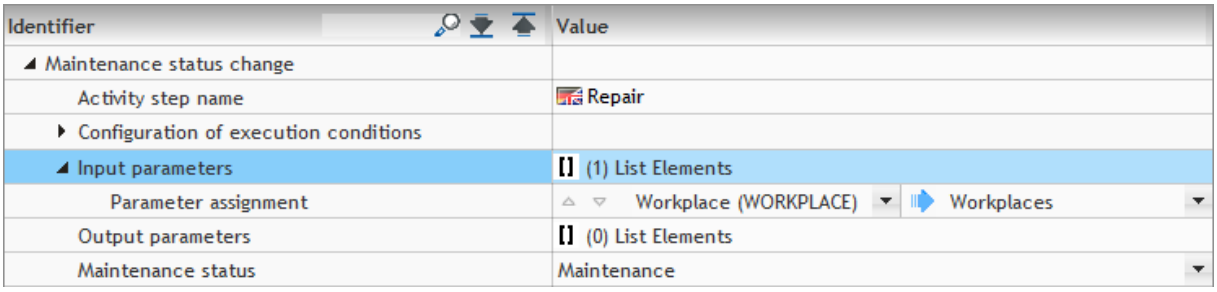

Figure 7: Configuration of the button Repair

3.2 Interrupt and Continue Repair

The maintenance technician is unable to continue the repair, e.g. because he needs spare parts or support. He presses the button **Interrupt repair** in the shop floor terminal. The operating state changes from **Repair** to **Repair interrupted**.

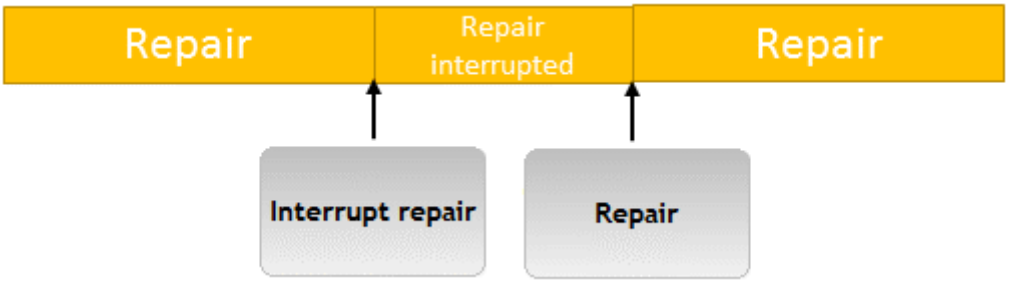

Figure 8: Interrupt and continue repair

The ERP malfunction report is not interrupted during the interruption of the repair. The interruption of the repair merely records the time in which the maintenance in fact continues, but nobody actually works on the problem solving.

The maintenance technician presses the button **Repair** to continue the repair (see section 3.1). The status changes again to **Repair**.

The following Table 4 contains all configurations needed in the step:

Table 4: Values of the button Interrupt repair

Identifier	Value
Input parameter	Workplace (WORKPLACE) – Workplaces
Maintenance status	Maintenance Interrupt

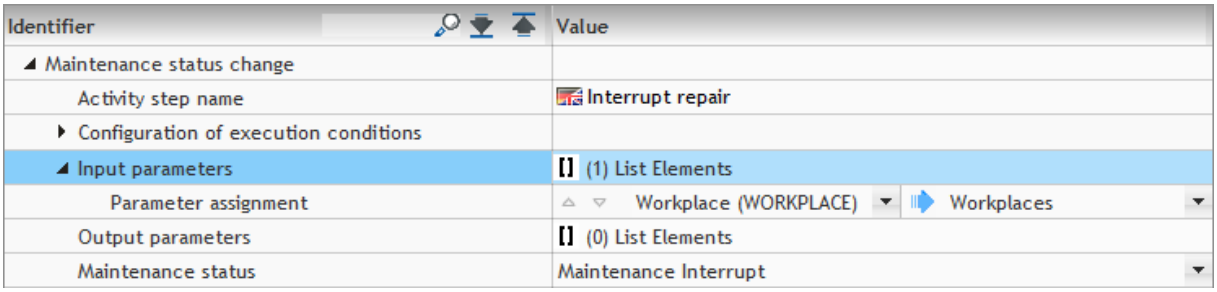

Figure 9: Configuration of the button Interrupt repair

3.3 Finish Repair

The maintenance technician finishes the problem solving on the machine. He presses the button **Finish repair** in the shop floor terminal. The operating state changes from **Repair** to **Undefined stoppage** with the mnemonic **999**.

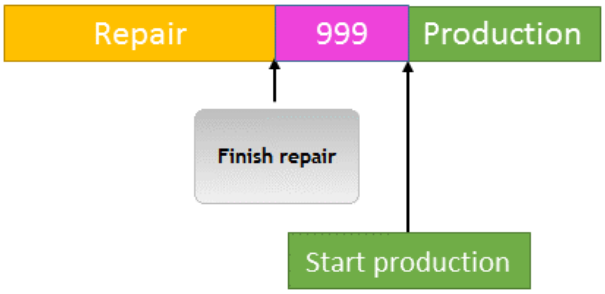

Figure 10: Finishing the repair

When activating the step, a ticket is sent to ERP that finishes the malfunction report.
As soon as the machine reports the production start, the status changes back to **Production**.

The following Table 5 contains all configurations needed in the step:

Table 5: Values of the button Finish repair

Identifier	Wert
Input parameter	Workplace (WORKPLACE) – Workplaces
Maintenance status	No Maintenance

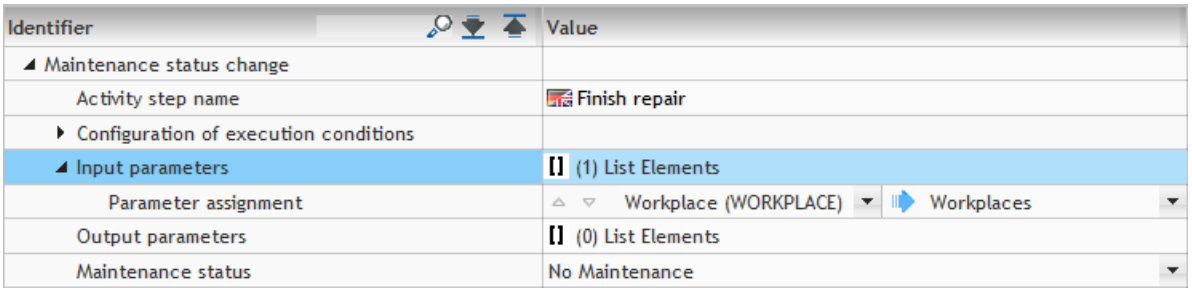

Figure 11: Configuration of the button Finish repair

4 Logic Components

To be able to configure the maintenance ticket, the runtime has to be supplemented by according logic components. This section lists all necessary logic components and their functions.

4.1 MAINTENANCE STATUS BASED EVENT FILTER

The logic component **MAINTENANCE STATUS BASED EVENT FILTER** filters machine events based on specific maintenance statuses. The logic component has to be inserted in the Real-Time-Preprocessing-Process.

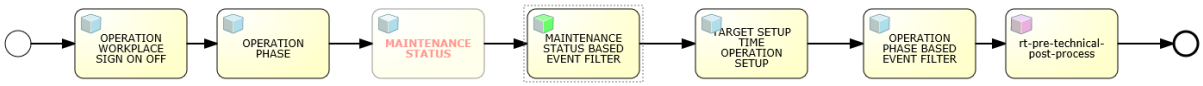

Figure 12: The logic component MAINTENANCE STATUS BASED EVENT FILTER in the process flow

The logic component requires the following configuration:

- eventName:
  Class name of the event that can be filtered out. Possible values:
  - MachineStatusEvent
  - MachineStrokeEvent
  - MachineQuantityEvent
  - MachineCountEvent
  - MachineCounterArrayEvent
- Status code of the maintenance:
  Code of the maintenance that controls the filter. Possible values:
  - 1 (No maintenance)
  - 2 (Waiting for maintenance)
  - 3 (Maintenance)
  - 4 (Maintenance interrupted)

The logic component is usually used to suppress quantity messages of the machine during the maintenance.

4.2 MAINTENANCE STATUS

The logic component **MAINTENANCE STATUS** sets maintenance status according to the events WorkplaceMaintenanceRequestEvent and WorkplaceMaintenanceStatusEvent. The logic component has to be inserted in the Core-Process.

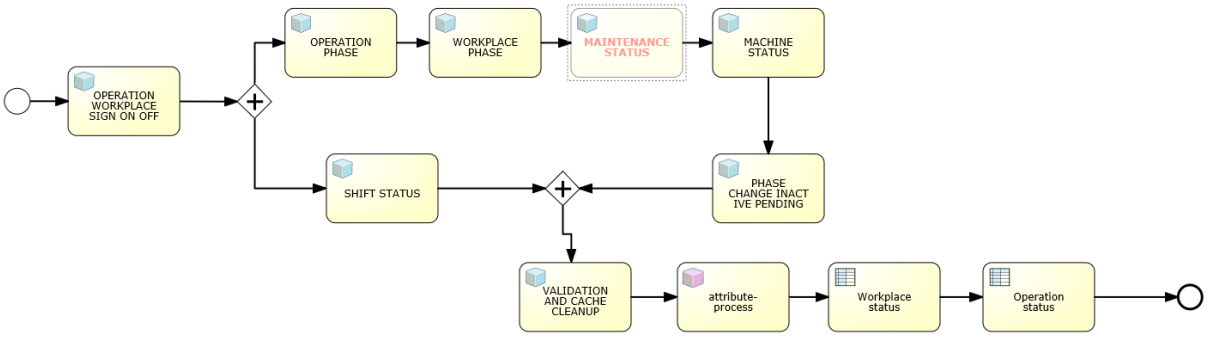

Figure 13: The logic component MAINTENANCE STATUS in the process flow

The maintenance status can have the following values:

- 1 (No maintenance)
- 2 (Waiting for maintenance)
- 3 (Maintenance)
- 4 (Maintenance interrupted)

The initial status is **No maintenance**.

4.3 MAINTENANCE REPORTING

The logic component **MAINTENANCE REPORTING** generates maintenance tickets to ERP to request, start and finish maintenance. It thereby encloses the whole maintenance process.
An ID is generated for each maintenance and is included in each maintenance ticket. The ID is recorded in the logic component **MAINTENANCE STATUS**. Therefore **MAINTENANCE REPORTING** depends on **MAINTENANCE STATUS**.

An event of the type WorkplaceMaintenanceRequestEvent triggers a ticket to request maintenance.
An event of the type WorkplaceMaintenanceStatusEvent triggers a ticket to start/finish maintenance.

The logic component has to be placed in the ERP process (ERP downstream).

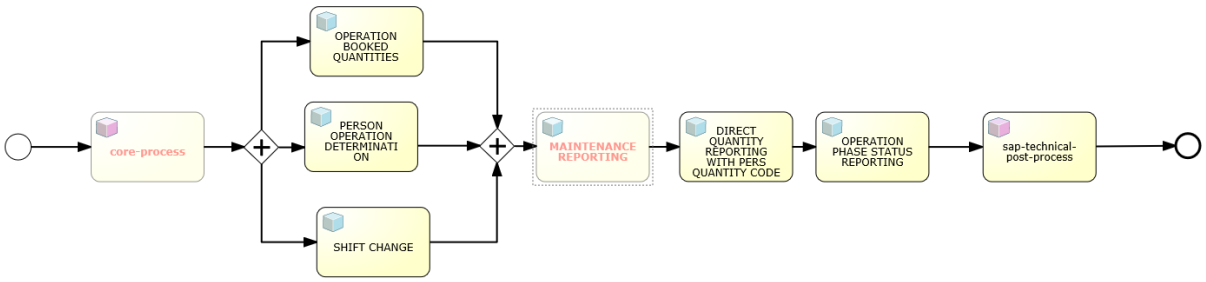

Figure 14: The logic component MAINTENANCE REPORTING in the process flow

5 Field Definitions for IDoc Generation

To activate the necessary actions in SAP and document the maintenance duration, the following IDocs are defined.

5.1 Request Maintenance

Table 6: IDocs for RequestMaintenance /FFMES/REQPM

Name in ERPUpload.xml	Length	Meaning	Source in FORCAM FORCE™
SART	5	Parameter	
NOTIFICATION_TYPE	2	notification type	set in FFWorkbench: status reason --> Customer Code
EQUIPMENT	18	equipment number	set in FFWorkbench: machine --> equipment number
REPORTER_ID	12	reported by	person --> personnel number
MALFUNCTION_COMMENT	40	short description of malfunction	status reason --> short description or manual worker input (if entered)
MALFUNCTION_START_DATE	10	malfunction start data (format:dd.MM.yyyy)	fetched from cache
MALFUNCTION_START_TIME	6	malfunction start time (format: HHMMSS)	fetched from cache
MALFUNCTION_CODE	4	damage code	status reason --> mnemonic
MALFUNCTION_ CODE_GROUP	8	damage code group	status reason --> mnemonic (assumption: code and code group always the same)
MES_PM_ID	12	MES id number for referencing maintenance request	generated in SFT during creation of request, fetched from WorkplaceMaintenanceRequestCommand
MATERIAL_NUMBER	40	material number	fetched from cache (if available): operation --> material --> material number
MATERIAL_DESCRIPTION	40	material description	fetched from cache (if available): operation --> material --> getDefaultTranslation

5.2 Start Maintenance

Table 7: IDocs for StartMaintenance /FFMES/CHGPM

Name in ERPUpload.xml	Length	Meaning	Source in FORCAM FORCE™
SART	5	Parameter	
MES_PM_ID	12	MES ID number of referenced maintenance request	fetched from WorkplaceMaintenanceStatusCommand
MAINTENANCE_START_DATE	10	Maintenance start date (format: dd.MM.yyyy)	fetched from WorkplaceMaintenanceStatusCommand
MAINTENANCE_START_TIME	6	Maintenance start time (format: HHMMSS)	fetched from WorkplaceMaintenanceStatusCommand

5.3 Finish Maintenance

Table 8: IDocs for FinishMaintenance /FFMES/CHGPM

Name in ERPUpload.xml	Length	Meaning	Source in FORCAM FORCE™
SART	5	Parameter	
MES_PM_ID	12	MES id number of referenced maintenance request	fetched from WorkplaceMaintenanceStatusCommand
MALFUNCTION_END_DATE	10	Malfunction end date (format: dd.MM.yyyy)	fetched from WorkplaceMaintenanceStatusCommand
MALFUNCTION_END_TIME	6	Malfunction end time (format: HHMMSS)	fetched from WorkplaceMaintenanceStatusCommand

6 Annex

6.1 History of Changes

Table 9: List changes to the document

Date	Type	Description	Section
2020-10-20	Created	Created from Version 5.10	

6.2 Terms and Abbreviations

Table 10: Abbreviations used

Abbreviation	Description
APL (WPL)	Workplace
ID	Identifier (unique, system-internal name)
IDoc	Intermediate Document (SAP document format)
M	Maintenance
MES	Manufacturing Execution System
R	Repair
R1	Operating state of the first level of detail
SFT	Shop floor terminal

Table 11: Terms used

Abbreviation	Description
Button	Button in the shop floor terminal
Split	Split of an operation
Workbench	Multilingual, web based application for the configuration of master data and other terminal-specific adjustments. The workbench is used to configure FORCAM FORCE™.

6.3 Icons

Table 12: Icons used

Icon	Function	Icon	Function
	Move function one level up		Move function one level down
	Navigate one level up		Navigate one level down
	Navigate to the left		Navigate to the right
	Move everything to the left		Move to the left
	Move everything to the right		Move to the right
	Open selection window		Edit entry
	Add		Remove
	Create new file		Open help menu
	Set search area		Release set search area
	Navigate junction higher		Navigate junction lower

Icon	Function	Icon	Function
	Restore original navigator symbols		Update/ reload
	Export		Import
	Show XML code		Open drop-down menu
	Select line		Name/ description (literal)
	Copy link of the selected terminal		Minimize/ Maximize
	Change size		Export in PDF format
	Export in CSV format		Change configuration
	Search		Reset search filter
	Apply changes		Reject changes
	Activity step dialog		Activity step command
	Close content		

6.4 Convention and Navigation

Table 13: Document Conventions

Conventions	Description
Boldface	The label of buttons and title of tables and fields are printed in boldface.
Icons	If a function is displayed as an icon, the icon is referred to as an object.
Path	Each specified path relates to the navigator in the workbench.
Action step	Action steps are marked as numbers at the beginning of the sentence. The order of numbers corresponds to the order of the actions. Alternative action steps are separated by Or.
Action prerequisite	Action prerequisites are marked by ✓.
Action result	Action results are marked by ➔.
Notice	Notices are marked by ⓘ.
Sub-steps of an action	Sub-steps of an action are indented and have uniform symbols per action level. The order of the levels is: 1. a. i.

Table 14: Navigation in the workbench

Navigation	Description
Close con	Each content called-up in the navigator can be closed via  at the right-hand edge of the screen.
Breadcrumb bar	If sub-pages or continuative displays respectively, a breadcrumb bar appears at the upper edge of the screen. A click on the first element closes all sub-pages.
Direct editing	Most of the cells in displayed tables can be edited either directly or via the context menu (right click or drop-down menu).
Blocked columns	Columns with a gray background (display fields) cannot be edited.
Update	Since the workbench is web based, updating via the browser (refresh) leads to a log out in the workbench.
Error message	Error messages appear at the lower left-hand edge of the screen.

6.5 Table of Figures