FORCAM™ FORCE

Version 5.10
Performance Analysis
Manual

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1   Concept

This user manual describes the Performance Analysis module of FORCAM FORCE™. It provides instructions for creating and configuring your own reports, visualizations and alarms.

Reports integrate the data collected in production to provide meaningful information. They are used to create different types of operational analyzes. They may be created in a tabular or graphic layout. Several reports including their views can be integrated in a multi-report or dashboard.
In addition to several predefined reports included, you can use the Report Editor to create your own reports based on all data collected. The relevant data are defined in the Data Source Editor. A data source consists of several data fields that are queried from the database by an SQL instruction. The Filter Criteria Editor is provided for defining filters that can be used for selecting data sets for reports per freely defined criteria. You can also define target values to be able to compare the data collected against defined target values.

The key performance indicators (KPI) used in this document are equivalent to those of the German VDMA standard sheet 66412-1 published in October 2009. However, FORCAM also uses SAP concepts and terms to accommodate common operational practices. For example, concepts such as **processing time** should be interpreted per the meaning of the SAP concept.
The key performance indicator terms originate from common business practice. Hence, the **performance rate** is a criterion describing efficiency and not effectiveness as it is proposed in the VDMA standard sheet. **Availability** and **rate of capacity utilization** are used as synonyms in practice. The VDMA standard distinguishes between **rate of capacity utilization** and **degree of utilization**. This distinction may cause misunderstandings. For this reason, **availability** is consistently used in FORCAM FORCE™.
The **technical efficiency** defined in the VDMA standard sheet differs from the usual definition of technical efficiency. This key performance indicator is termed **process availability** here since it reflects the availability of a plant during the machining process. This reflects not only plain technical failures but is also reduced by interruptions due to organizational issues.
To obtain a consistent system of key performance indicators reflecting the overall equipment effectiveness (OEE), FORCAM FORCE™ uses the additional concept of **setup reduction rate**. It is 100 percent if all internal setup times are eliminated. In this way, a loss of availability is further broken down into losses caused by the lack of a job in the plant/machine (**occupancy rate**, referred to as **allocation efficiency** in the VDMA standard sheet), losses caused by internal setup times (**setup reduction rate**) and losses caused by interruptions and problems during the machining process.

The following table describes the individual applications (presented on tabs in FORCAM FORCE™) of the Reporting module.

Table 1: Applications in the Reporting module

Application	Description
Reports	Selection and viewing of all available reports
Report Editor	Definition of new reports
Data Sources	Definition of data sources (data fields from the database tables)
Filter Criteria Editor	Definition of filter criteria that can be used for filtering data sets for reports
Target Values	Definition of target values for comparison and analysis of the data presented in reports
Export	Export of reports into an XML file
Import	Import of reports from an XML file

2 Basic Functions

Path: Performance Analysis > Reporting > Reports

Reports can be displayed in several different ways. A drill-down view makes it possible to view a report with varying depths of detail.

2.1 Filtering and Display of Data Sets

Reports usually present major data volumes. Displaying predefined values automatically might therefore increase the loading time unnecessarily. For this reason, elements in the navigation area are not displayed until related filters are selected in the display area.
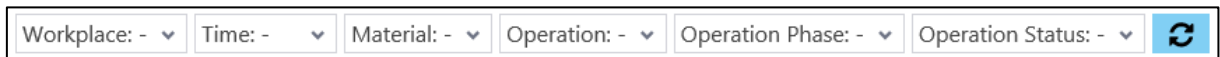
Fig. 1: Filter bar in the display area

The filters influence each other. A left filter always affects the right one. Depending on the selection of a left filter, the selection of the right filter is restricted or adjusted.
Example based on Fig. 1: Initially, materials M1, M2 and M3 are available for selection, but after selecting work center A, only material M2 is available since only M2 is produced on this workplace.
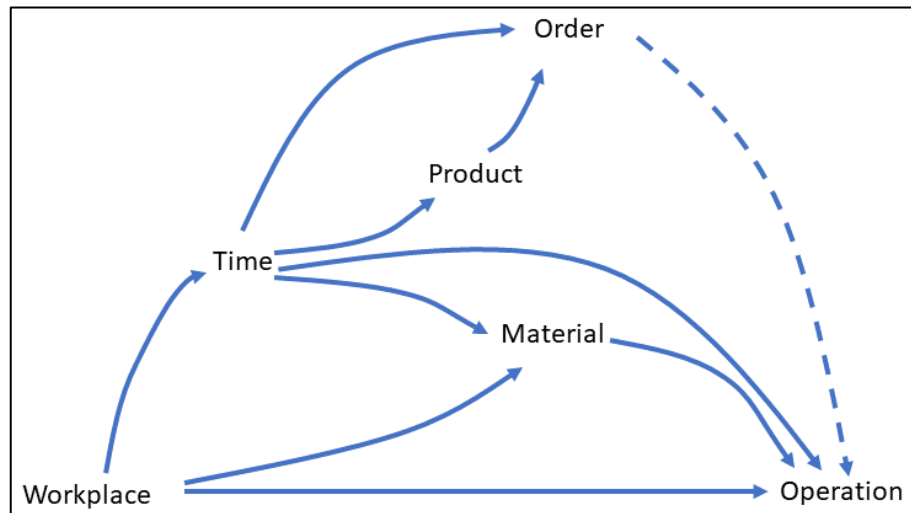
Fig. 2: Filter Dependencies

The workplace filter is not dependent on other filters. The time filter, on the other hand, needs the workplace filter to display a specific shift, and so on.

The operation filter is not necessarily dependent on the order filter. However, if an order is selected in the order filter, the operation filter can use this data. It then only displays the operations of the selected order.

To display a data set:
1. Open the dropdown menu of filters you want to apply.
2. Select or enter the appropriate parameters.
3. Click on the **Update report** icon.

2.2   Show/Hide Values

Many diagrams and tables are provided with a legend explaining the meanings of the colors used. You can show or hide the corresponding value by clicking on an element in the legend.

Workplace	C170101	C170102
Availabilty	99.39%	75.36%
Performance Rate	49.93%	72.89%
Quality	100%	100%
OEE	49.63%	54.93%
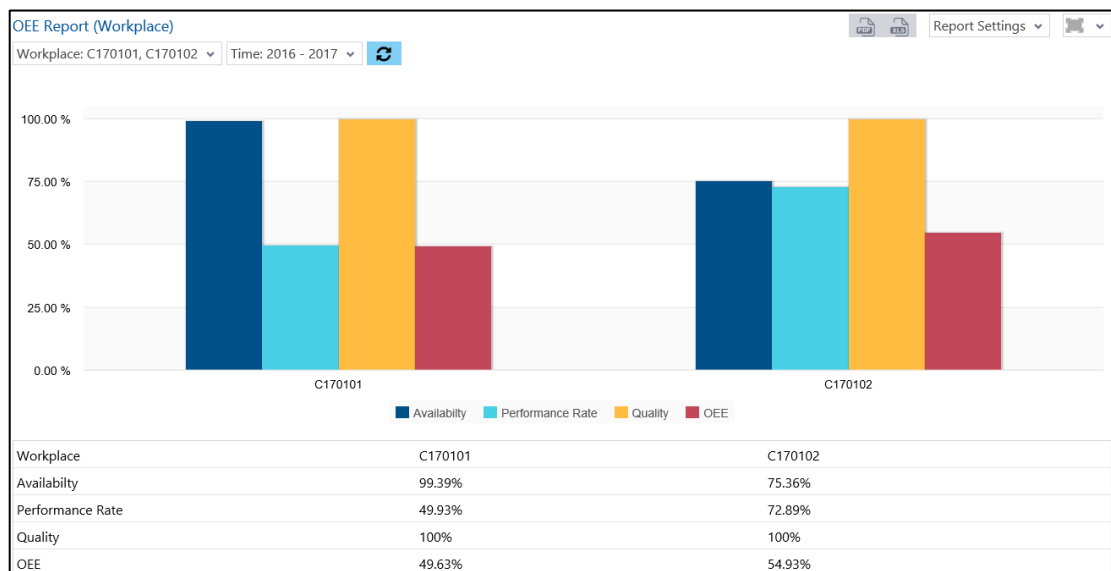
Fig. 3: Legend of a view

2.3 Tables

Reports in table format display data sets row by row. The content and layout of columns is governed by the data type.

Operating State History Sum (Workplace)			
Duration (HH:mm:ss)	Frequency	Code	Operating State
06:01:02	242	000	Production
00:21:11	1	24	Tools missing
15:37:46	5	992	Free capacity inside shift
02:00:00	2	993	Break

Fig. 4: Report in table format

- Changing the order of columns:
  You can change the order of columns by drag-and-drop in the column header.
- Changing the order of rows:
  When you click into a column header, the column is sorted hierarchically. The sort sequence is governed by the content of the column.

2.4 Bar and Column Charts

Bar and column charts are particularly useful to present several data items one above the other or side by side. This provides a clearly arranged view of the data and allows comparisons at a glance.
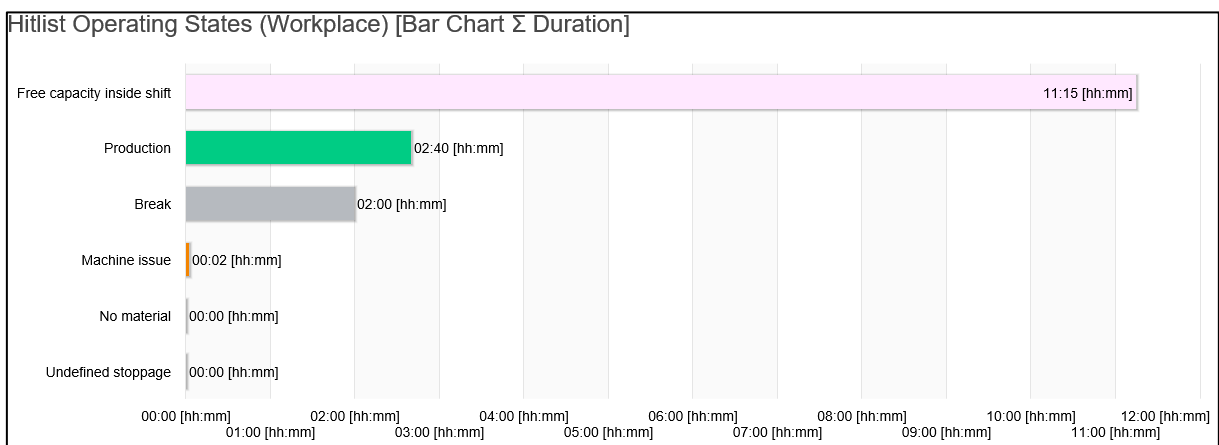
Fig. 5: Display as a bar chart

2.5 Timeline Charts

Timeline charts visualize events to be reported that relate to workplaces, operations or persons within a certain period of time. The color shown may relate to operating states defined as necessary (e.g. workplace phases, workplace status or operation phases).

Fig. 6: Timeline chart

You can zoom into the timeline by selecting an interval within the timeline. Clicking on **Reset zoom** on the upper right resets the zoom setting.
Fig. 7 below shows the runtime record from Fig. 6 zoomed to the interval between 04:00 o'clock and 16:00 o'clock on 04/02/2017.
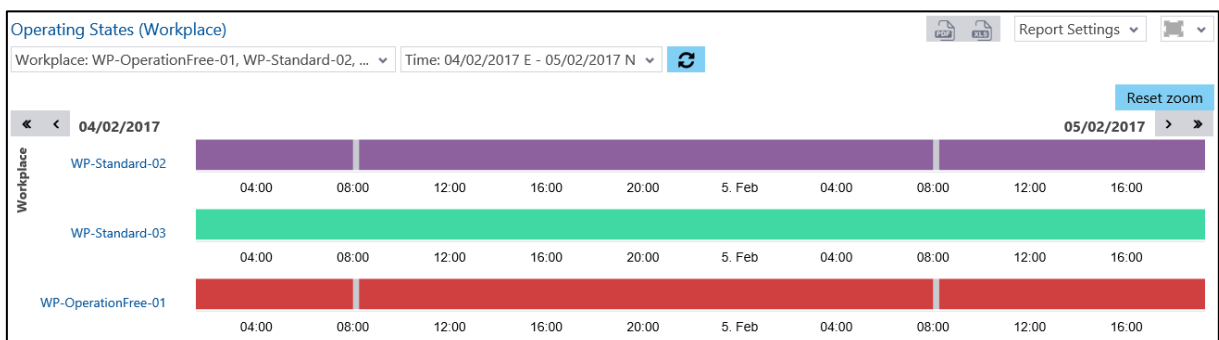
Fig. 7: Zooming into a timeline interval

2.6 Calling up a Drill-Down

Some reports offer a drill-down functionality. A Drill-down opens a pop-up dialog to a specific and detailed target report that calls up further details for a specific line as a sub-report.

ⓘ To configure a Drill-down, see section 4.4.
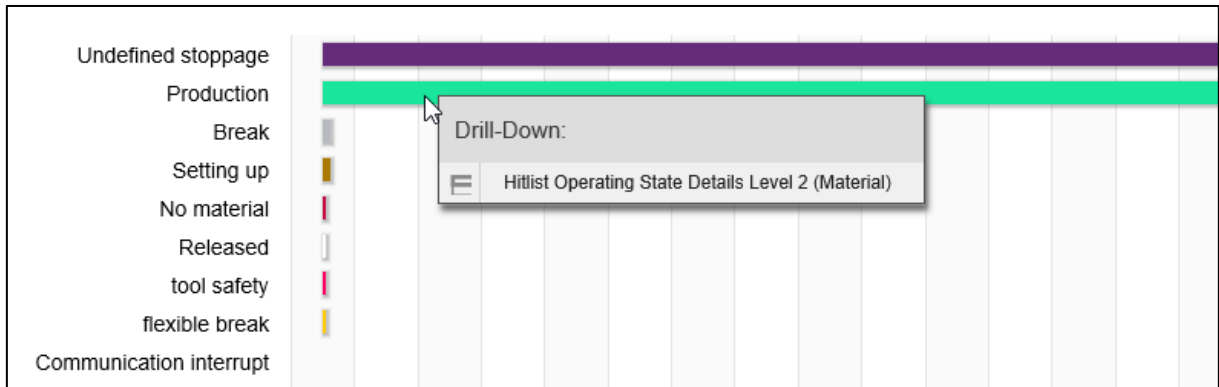
Fig. 8: Drill-down

If configured, a drill-down can lead to another drill-down. The next drill-down is opened in the same pop-up dialog and a breadcrumb bar appears above the filters. All drill-downs are lined up in the bar. The drill-down currently displayed is highlighted in bold in the bar. By clicking on an element in the bar, the view changes to the corresponding drill-down.
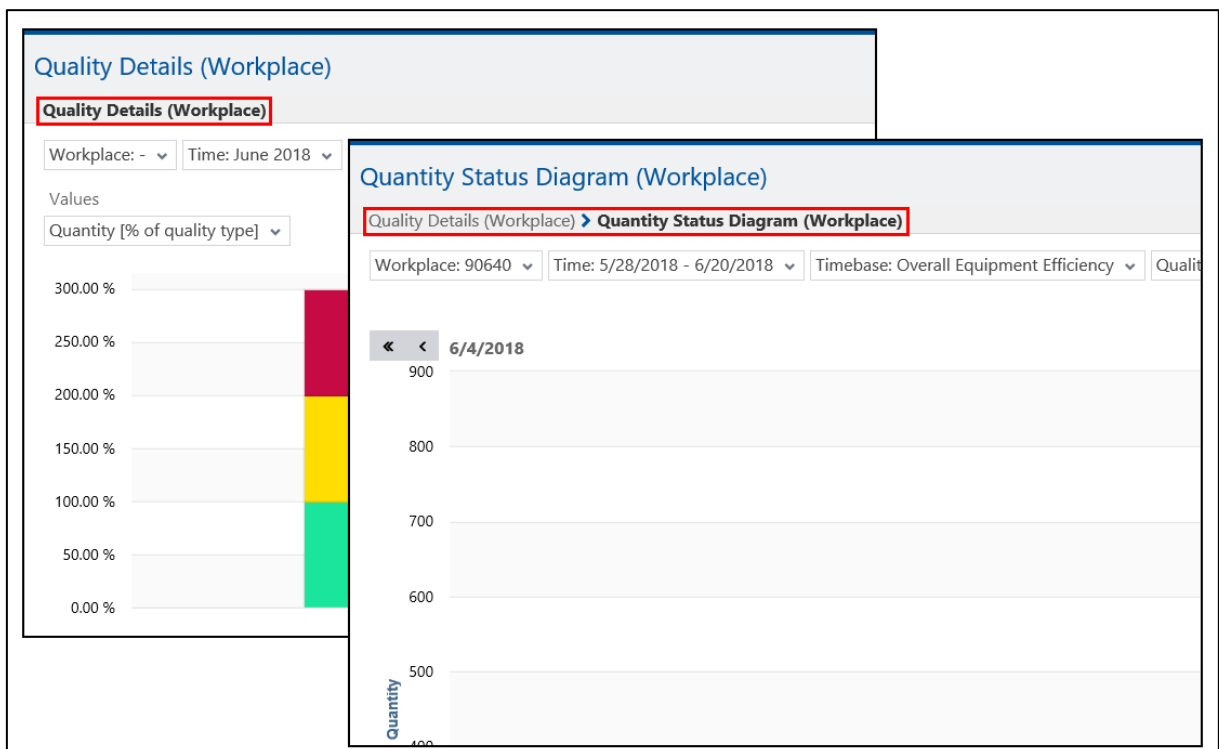
Fig. 9: Breadcrumb bar for drill-downs called successively

To display a drill-down:
1. Open the context menu in the appropriate area of a report.
   Open the context menu in tables by clicking with the right mouse key and for columns or bars by clicking with the left mouse key.
2. Click on the appropriate sub-report in the context menu.
3. Click the **Back** icon at the top right of the screen to return to the report.

ⓘ Opening the context menu is different for the various view types for technical reasons. You can access drill-downs in tables with a right-hand click and in graphs with a left-hand click.
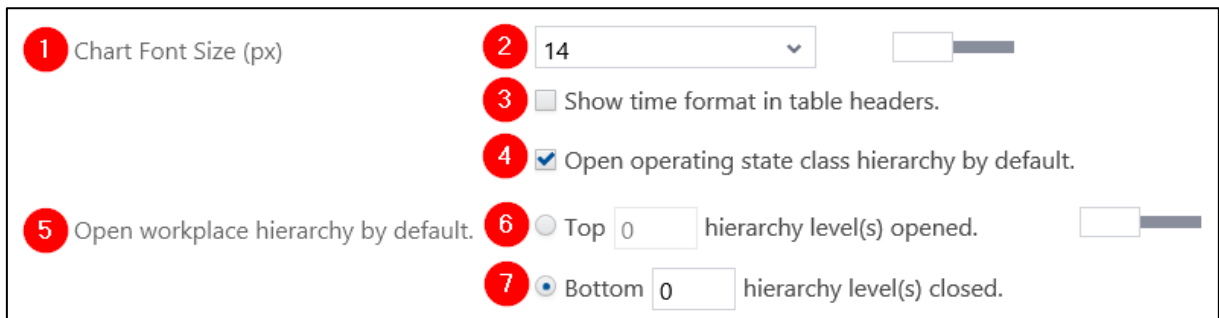
The following reports offer a drill-down:
- Order Overview
- Hitlists
- Operating State Class Reports

2.7 User Settings

Path: Performance Analysis > Reporting > User Settings

The User Preferences tab offers some configurations concerning the usability of the Reporting module. The configurations are saved for the logged in user account. The following configurations are currently available:

Fig. 10: Configuration options in the user settings

(1) Determines the font size of the X and Y axis labels for diagrams.
   If the slider is active, the default size 14 px is used. Changing the font size automatically applies to all diagrams after saving.
(2) Selection of font size between 6 and 36 px.
   1 point corresponds to approx. 1.3 px.
(3) If a check mark is set, the time format is displayed in table headers with durations (e.g. HH:mm:ss, see Fig. 11).
(4) If a check mark is set, all operating state classes in each operating state filter are opened by default (see Fig. 12).
(5) Determines the number of levels expanded in the hierarchy tab of the workplace filter.
   If the slider is active, all levels are expanded.
(6) Defines the number of levels that are to be expanded from top.
   Example: If **2** is entered, only the two top levels are expanded (see Fig. 13).
(7) Defines the number of levels that are to be collapsed from the bottom.
   Example: If **1** is entered, only the lowest level is collapsed.

Fig. 11: Time format for durations hidden and displayed

Fig. 12: Operating state classes expanded and collapsed

Fig. 13: Two top hierarchy levels collapsed

2.8 Downloading or Emailing Reports and Tickets

You can export reports and tickets and download them or send them by e-mail.
You can export reports in PDF or XLS format and tickets also in CSV format.
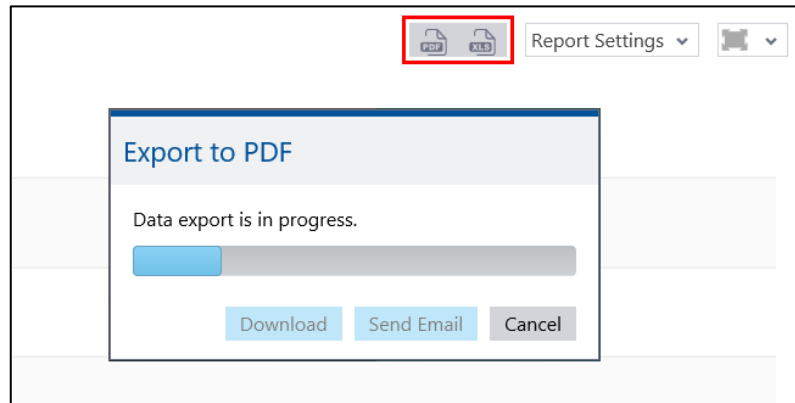
Fig. 14: Exporting a report in PDF format

With PDF export of multi-reports, each partial report will be displayed on a separate page. If there is a graphic before or after a table in a multi-report, both elements will be displayed on the same page. Example: The multi-report OEE (Overall View) consists of two partial reports with a column diagram above and an exposed table below it. In this case the PDF export will display both partial reports on one page.

To export a report:
1. Click on the desired target format in the upper right corner of the screen.
➔ The report or ticket is exported.
2. Click on **Download** and follow the instructions of your browser.
   Or
   Click on **Send E-Mail** and add recipient and text in the subsequent dialog (see section 12).

2.9 Save Settings

In each report, you can save the selections made as settings. For reports in table format, the width and order of columns are saved in a table.

To save report settings:
1. Open the dropdown menu at the top right of the screen next to **Report Settings**.
2. Click on **Save settings** in the context menu.
3. Enter a name for the settings.
4. Click **Save**.

ⓘ If you set a check mark for **Mark as global**, the settings are also available to other users.

The dropdown menu of **Report Settings** provides a few other options:
- Save settings as:
  Save the settings under a different name

- Delete settings
- Edit settings
- Rename the settings

2.10 Display Options

To ensure an optimum display across devices and platforms, FORCAM FORCE™ offers various display options.

2.10.1 Full Screen

Reports, visualizations and dashboards can be displayed in full screen mode. In full screen mode, the content fills the complete browser page. The navigation bar and breadcrumb bar are hidden.

To activate full screen mode:
1. Select the content to be displayed (report/visualization/dashboard).
2. Click on the **View** icon.
3. Click **Full screen** in the dropdown menu.
4. Exit full screen mode by clicking on the **Close fullscreen** icon.

2.10.2 New Tab

You can open reports, visualizations and dashboards in a new tab. The content of the new tab fills the complete browser page. The navigation bar and breadcrumb bar are hidden.

To open content in a new tab:
1. Select the content to be displayed (report/visualization/dashboard).
2. Click on the **View** icon.
3. Click **New Tab** in the dropdown menu.

ⓘ In some browsers, the content will open in a new window.

2.10.3 Output Address (URL)

FORCAM FORCE™ is a web-based application. Reports, visualizations and dashboards are assigned a dedicated and independent URL. You can output this URL.

To output the URL of a visualization:
1. Select the appropriate visualization.
2. Click on the **View** icon.
3. Click **Address (URL)** in the dropdown menu.
➔ The URL of the visualization is displayed. The URL is selected and may be copied.

To output the URL of a report or dashboard:
1. Select the appropriate report/dashboard.
2. Click on the **View** icon.
3. Click **Address (URL)** in the dropdown menu.
4. Select the appropriate filter setting.
   The selected filter setting is adopted for the report/dashboard. Once the URL is created, you cannot change the setting any more.
5. Set the overwrite parameter.
   If a check mark is set for **Overwrite URL Parameter**, you can edit the URL later after creation (see section 2.10.3.1).
6. Click **Generate link**.
➔ The URL of the report or dashboard is displayed. The URL is selected and may be copied.

To output the URL of a sub-report:
1. Select the appropriate sub-report in the Report Editor.
2. Go to the **Reports** tab.
3. Click on the **View** icon.
4. Click **Address (URL)** in the dropdown menu.
5. Select the appropriate filter setting.
   The selected filter setting is adopted for the sub-report. Once the URL is created, you cannot change the setting any more.
6. Set the overwrite parameter.
   If a check mark is set for **Overwrite URL Parameter**, you can edit the URL later after creation (see section 2.10.3.1).
7. Click **Generate link**.
➔ The URL of the sub-report is displayed. The URL is selected and may be copied.

2.10.3.1 GET Parameters

You can add GET parameters to a previously output URL to edit the content displayed. You can add several GET parameters to the URL in a row. The parameters are separated by **&**.
The following GET parameters are supported:
   - language=[Language code]
     Determines the language of the content displayed. The language code is defined according to ISO 639.
     Example: language=de-DE
   - filter_mode=[edit|show|hide]
     Changes the display of the filter for a report/dashboard:
        o edit: The filter is shown and can be edited.
        o show: The filter is shown but cannot be edited.
        o hide: The filter is hidden.
     Example: filter_mode=edit
   - show_title=[true|false]
     The title of the report or dashboard is shown/hidden.

Example of a URL with several GET parameters:
http://fctestfactory05.cloudapp.net:19080/ffnewoffice/#!authorized.link?key=7243bd4c-daeb-4fc9-b3af-bb7c38c91de8&language=de-DE&filter_mode=hide&show_title=false

2.10.3.2 Inserting into HTML Code

✓ The URL of the desired content should be available (see section 2.10.3).

FORCAM FORCE™ supports inserting reports, dashboards and visualizations into any internet page. The URL can be included into the source code of a HTML page using iframe tags.

Source code of a sample page:

<html>

<h2>My Page</h2>

</br>

<h3>Report</h3>

<iframe src="http://fctestfactory05.cloudapp.net:19080/ffnewoffice/#!authorized.link?filter_mode=hide&show_title=false&language=en-gb&key=dcc2803a-ad29-44b8-bea5-7134d5d1709a" height="500" width="800"></iframe>

<html>

Sample page displayed:
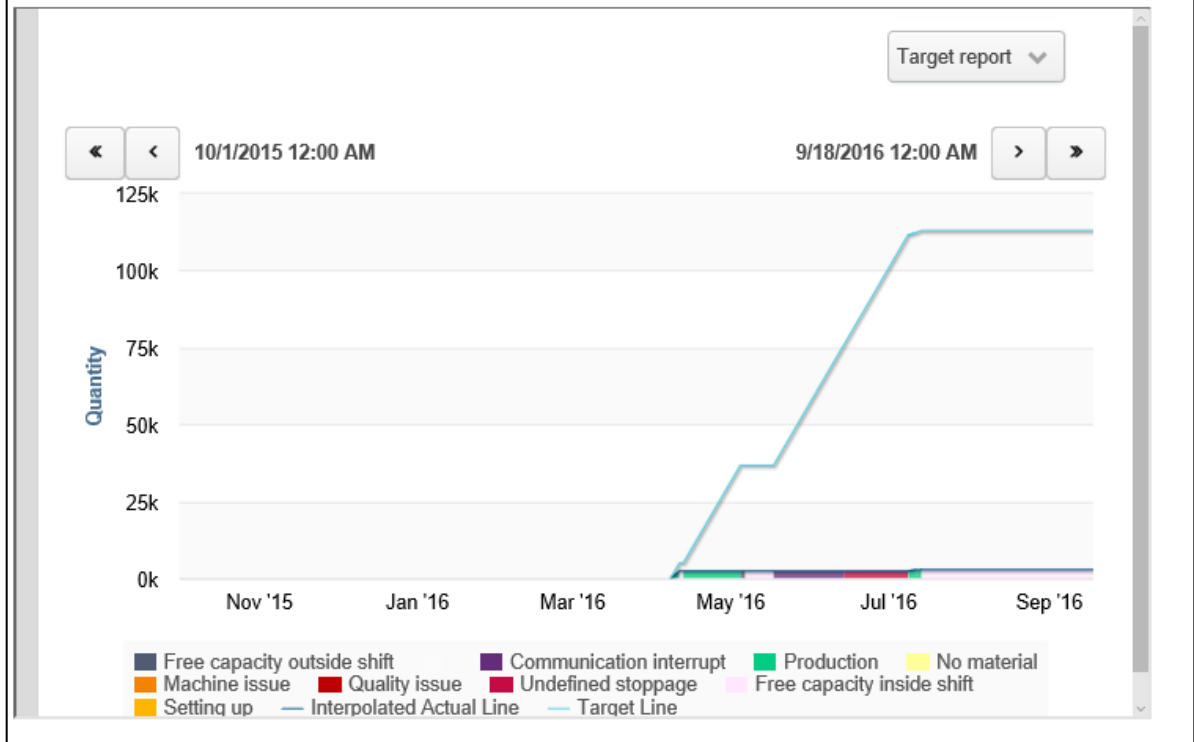
Fig. 15: Report embedded into an internet page

2.11 Entering Texts in Several Languages

You can enter names and descriptions in various other languages. FORCAM FORCE™ appears in the language used for logon. You can add entries in other languages if the **Open input dialog** icon appears next to the input field.

To add an entry in another language:
1. Click on the **Open input dialog** icon.
2. Type the entry in the desired languages.
3. Click **Done**.

2.12 Using the Search Field

The navigation area includes an active search field. You can find any report or data source in the navigation area by entering search words. All entries that do not match the search words are hidden. The search results narrow down during typing, so it is not necessary to write search words out in full.

It is also possible to use key words for a search in the search field. When using a key word for a search, the results include those matches where the search word forms part of the description text of the content you are looking for. Hence, the descriptions are used as metadata referencing the relevant content.
A key word search is recommended, for example, if the reports included in the FORCAM FORCE™ package use a different nomenclature from other IIoT platforms, e.g. for key performance indicators.

The search field does not distinguish upper and lower case.

2.13 Exporting into and Importing from XML

FORCAM FORCE™ lets you export and import data from/into XML, respectively. You can export/import the following data:
- Visualizations
- Additional fields
- Dashboards
- Reports
- Data sources
- Filter criteria
- Data formats

2.13.1 Export

Path: Performance Analysis > Reporting/Visualization/Dashboard > Export

Dependencies may exist between data. For example, reports need certain data sources, dashboards include certain reports, etc. Whenever a file is selected for export, all dependent or required related data are automatically included in the selection. If a required file is deselected, an error message appears (see Fig. 16). You can still proceed with the export operation; however, the XML file may cause errors in further processing or display.

ⓘ Additional fields (see section 5.10) do not have a specific database dependency. Hence, the additional fields used in a visualization are not included when the visualization is selected. Additional fields need to be selected individually, if necessary.
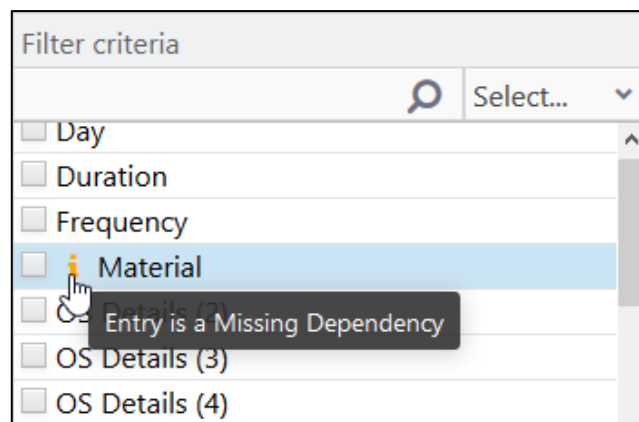
Fig. 16: Error message of a missing dependency

To export a file:
1. Select the file to be exported.
   You can select several files at a time.
2. Click **Export** at the bottom left of the screen.
3. Save the file as appropriate.

2.13.2 Import

Path: Performance Analysis > Reporting/Visualization/Dashboard > Import

When an import file has been selected, all entries included (reports, data sources, etc.) are displayed. A consistency check informs about entries that already exist in the system (see Fig. 17). The entries already contained can be temporarily overwritten but will be replaced by the original entries after the next restart of the module.
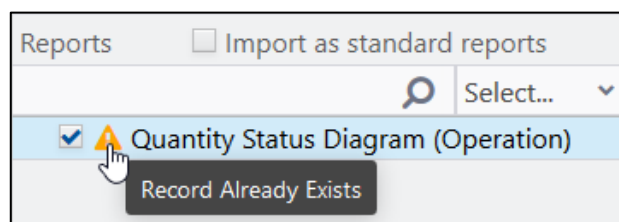
Fig. 17: Entry already existing in an import file

To import a file:

1. Click on **Select import file…**.
2. Select and confirm the appropriate XML file on the hard disk.
➔ All entries of the file are shown. Inconsistent entries are selected.
3. Deselect the inconsistent entries.
4. Click **Import** at the bottom left of the screen.
➔ A message confirms successful import.
   The file imported is assigned to its category (a report to **Reports**, a data source to **Data Sources**, etc.).

ⓘ If a check mark is set for **Import as standard reports**, the report imported is added to the standard reports.

2.14 Report-Specific Filters

2.14.1 Filter by Values

Reports on quality details are provided with an additional value filter. This filter enables you to specify quality types and quality details more precisely.
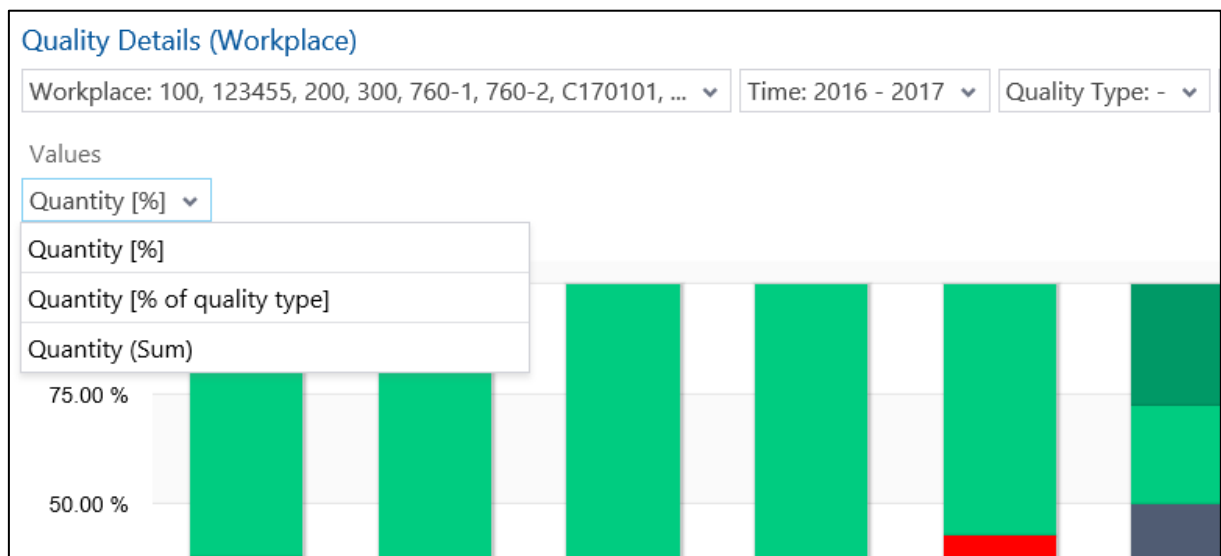
Fig. 18: Value filters

The following selections can be made:

− Quantity [%]:
  Percentage of quality types and quality details out of the total quantity.
  If a quality type is selected, the percentage is shown for this type only.
  If a quality detail is selected, the percentage is shown for this detail only.

− Quantity [% of quality type]
  Percentage of quality details of the corresponding quality type. Each type corresponds to a value of 100%. The details of the specific type are percentages of this value.
  If a quality type is selected, the details are shown for this type only.
  If a quality detail is selected, only the percentage of this detail is shown for this type.

- Quantity (Sum):
  Sum of the total quantity of a material with proportionate quantities for quality types and quality details.
  If a quality type is selected, the quantity is shown for this type only.
  If a quality detail is selected, only the quantity of this detail is shown.

2.14.2 Filter by Duration

Reports on operating states in **Availability Analysis** are provided with an additional duration filter. You can use this filter to display the percentage share of durations of operating states.
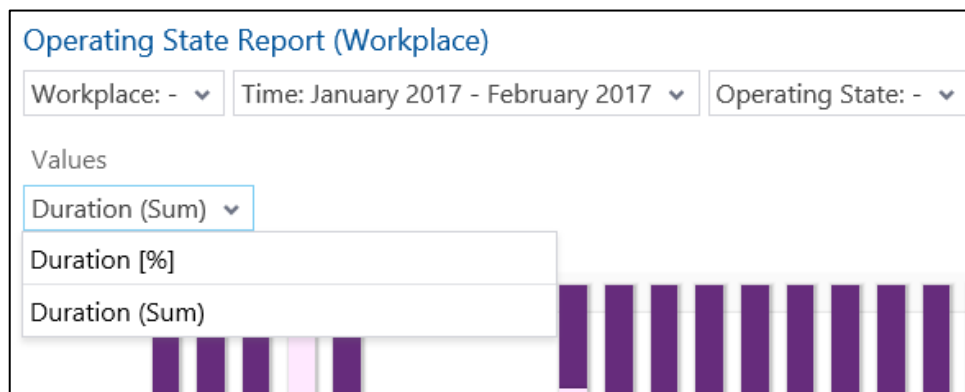
Fig. 19: Duration filter

The following selections can be made:

- Duration [%]:
  Percentage of operating states in the total duration. The percentage relates only to those operating states pertaining to the selected time base. If no time base is selected, Duration [%] and Duration (Sum) are identical.
  If an operation status is selected, only the percentage of this status is shown.
- Duration (Sum):
  Total of durations of operating states in HH:mm format.
  If an operation status is selected, only the sum of durations of this status is shown.

2.14.3 Filter by Status Class

Reports on operating states in **Availability Analysis** are provided with a filter for operating states. In addition to selecting individual operating states (ungrouped), you can select status classes. Status classes are used to group operating states in a parent class.

Each status class must have at least one operating state. The following status classes are defined by default:

Table 2: Status classes defined by default

Mnemonic	Status class	Related operating state (example)
ORG	Organizational issue	No personnel, tools missing, etc.
TEC	Technical issue	Hydraulic/supply malfunction, etc.
BRK	Break	Not scheduled, flexible
FC	Free capacity	Free capacity inside shift
MNT	Maintenance	Scheduled maintenance/repair, etc.
STP	Setup	Setting up, retrofit
PRD	Production	Production
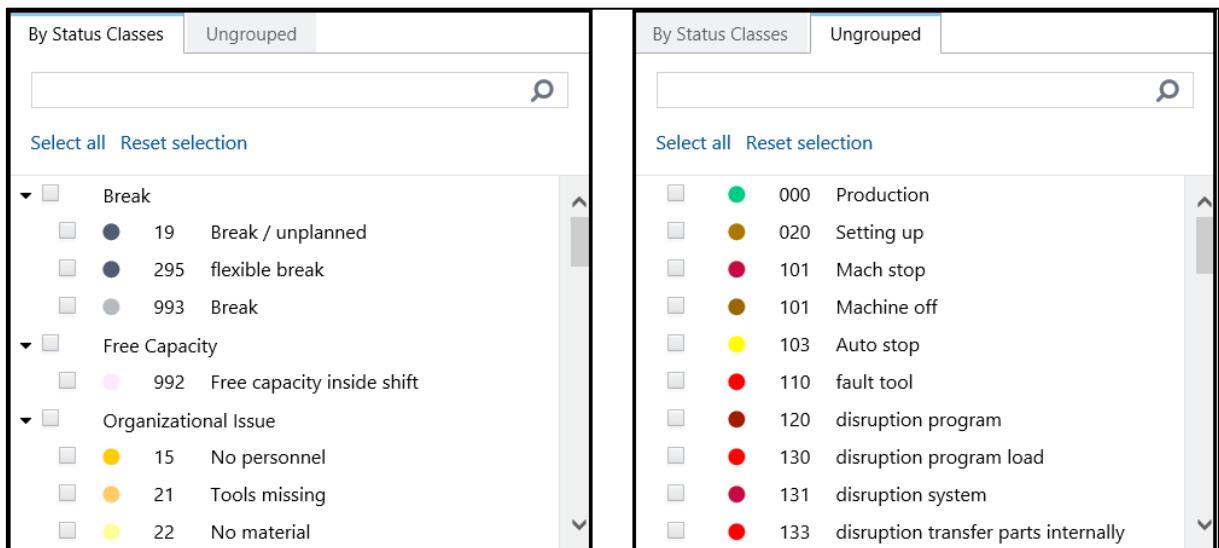
Fig. 20: Filter by status classes and ungrouped operating states

If a status class is selected/deselected, all related operating states are automatically selected/deselected as well.

If a status class is selected and individual related operating states are deselected, the status class is automatically deselected. A status class can only be selected if all related operating states are also selected.

2.14.4 Filter by Operation

Reports visualizing data of operations are provided with an operation filter (e.g. operation details, quality report (operation), etc.). All available operations are listed here and can be selected.

Fig. 21: Operation filter (example)

The following data are displayed for each operation if they are defined:

- Order number
- Operation number
- Material number
- Text (material description)
- Workplace
- Operation period (From...To)

Operations visualized may be in different phases. The period may be calculated from different values depending on the phase. Table 3 shows the calculation of values for each phase:

Table 3: Various phases of an operation and calculation of the corresponding period

Operation phase	From	To
Not yet started	Planned start time	Planned end time
Started but not yet completed	Start time	Max. (planned end time, now + remaining time + shift break times)
Completed	Start time	End time

2.15 Selecting Time Zone

From version 5.7.1 onwards, the time zone selection in FORCAM FORCE™ will no longer be made on the login page. Users can set the time zone after login in the user settings. UTC is predefined by default.

ⓘ All times specified in FORCAM FORCE™ refer to the selected time zone.

To select a time zone:
- ✓ A user is logged in.
1. Open the drop-down menu on the upper right.
2. Glick the globe icon.
   The label next to the icon indicates the currently selected time zone.
3. Select the desired time zone in the subsequent dialog and click **Apply**.
➜ The system refreshes itself and adopts the new time zone.
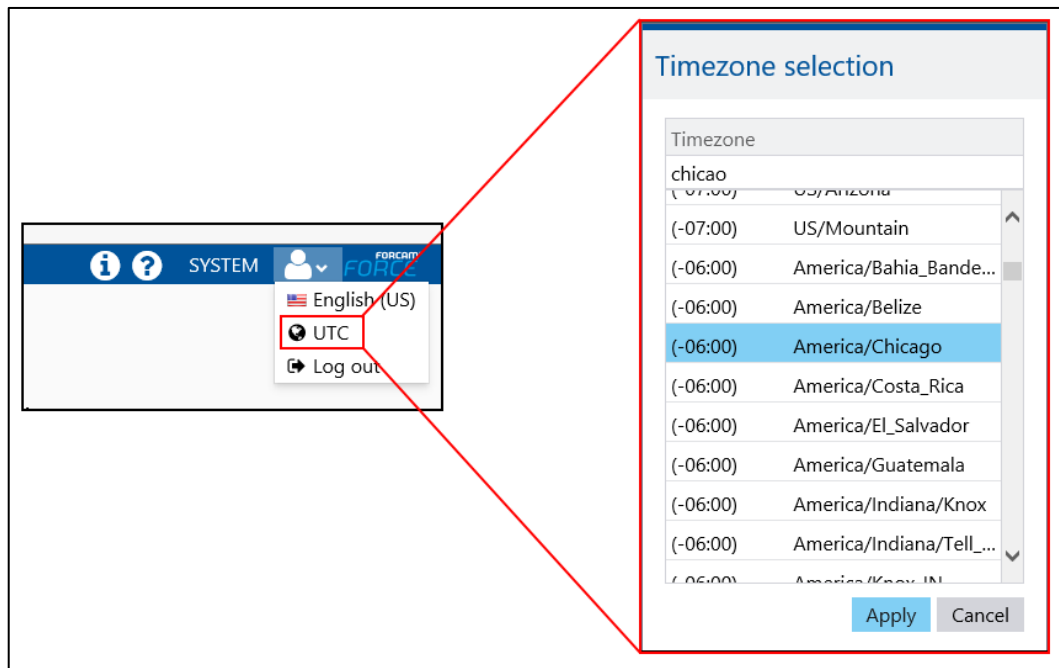
Fig. 22: Selecting a Time Zone

3 Predefined Reports

Various reports are predefined in FORCAM FORCE™ and can be used immediately. All the reports described in this section are included in the standard application.

ⓘ You can change the arrangement of the reports in the navigation area (see section 4.1).

⚠ The maximum number of rows in reports is limited within the system to avoid crashes, loss of performance, or overload. The limit can be increased manually in the Workbench system settings (see the Master Data and System Configuration manual): Configurations > System > Modules > NewOffice > Rendering Reports.

3.1 Overview

The reports listed in Table 7 are useful for precise analysis of the data collected from production that are primarily needed for a daily analysis of the production processes of the previous day or preceding shift. Logs can also be used for real-time analysis of the current shift. They enable you to see detailed causes of stoppages or scrap produced.

ⓘ A user with write permissions has read permissions for all reports automatically.
ⓘ All reports are displayed in the browser time.

Table 4: Online Logs

Report	Description
Quantity Status Diagram	A real-time report of quantities and the operating state development for operations and a workplace within a freely definable period in ramp chart format. Display of a target line for an actual/target comparison of the quantity produced.
Operating State Timeline	A real-time report of the operating states for selected workplaces, orders and operations within a freely definable period in timeline chart format
Operating State Log	A real-time report of the operating states for a workplace within a freely definable period
Quantity Log	A real-time report of the quantities of all operations at a workplace during a definable period
Shift Book	A real-time report of quantities, operating states and operations at a workplace during a shift
Shift Log	A real-time report of the operations within a shift and the total number of hits of an operation as well as the frequency distribution of the operating states within the specific shift
Daily Log	A real-time report of the accumulated number of hits of the operations of a day and the total number of hits of an operation as well as the frequency distribution of the operating states on the specific day
Message Log	A real-time report of all messages received within a freely definable period from one or more workplaces (machines or shop floor terminals)

The reports listed in Table 5 provide condensed information about operating states. They are therefore suitable for analyzing the availability within larger periods (e.g. weekly, monthly or yearly review) and facilitate comparing different plants and production areas.

Table 5: Availability Analysis

Report	Description
Availability (Overall View)	Occupancy rate, process availability (processing share of execution time), setup reduction rate and availability for viewing the complete plant or individual plant areas within a defined period
Operating State Class Report	Accumulated durations of the status classes of workplaces, materials, orders and operations within a defined period
Operating State Class Development	History of status classes for workplaces and materials within a defined period
Operating State Report	Accumulated durations of operating states of workplaces or hierarchical levels, orders, operations and operating states that occurred during the production of materials within a defined period
Operating State Development	History of operating states for workplaces or hierarchical levels and operating states that occurred during the production of materials within a defined period
Hitlist of Operating States	Durations and frequencies of operating states at individual workplaces or hierarchical levels, operations, orders and operating states that occurred during the production of individual materials or articles within a defined period

The reports listed in Table 6 summarize the OEE as an overall view, report or development view.

Table 6: Overall Equipment Effectiveness (OEE)

Report	Description
OEE (Overall View)	OEE analysis of all or selected workplaces for a definable period
OEE Report	Column chart analysis in conformity with OEE for comparing individual workplaces or hierarchical levels and operations within a defined period
OEE Development (Workplace)	History of OEE analysis for selectable cumulative periods (day, week, month, quarter, year) within a defined period

The reports listed in Table 7 show the OPE. In addition to an OPE overall view, the individual key performance indicators are available in reports.

Table 7: Overall Process Efficiency (OPE)

Report	Description
OPE (Overall View)	OPE analysis of all or selected products or orders for a definable period
Production Process Ratio (Overall View)	Shows the production process ratio for one or more workplaces for a definable period. The production process ratio is the product of throughput efficiency of orders, process availability and setup reduction rate.
Order Analysis	Detailed information on an order for a definable period
Operation Analysis	Detailed information on one or more operations for a definable period

The following reports provide condensed information about quantities produced. They are also suitable for analyzing the availability within larger periods and facilitate comparing different plants and production areas.

Table 8: Quality Analysis

Report	Description
Quality Report	Accumulated quantities per workplace, per operation or per material within a definable period
Quality Details	Quality details (scrap and rework reasons) for workplaces (including development), materials (including development) and operations
Quality Development	History of quantities accumulated for each workplace or material within a definable period
Hitlist of Quality Details	Quality details (scrap and rework reasons) for workplaces, materials and operations, sorted by frequency

Table 9: Performance Rate Analysis

Report	Description
Hit Report (Workplace)	Hits (machine strokes) accumulated at one or more workplaces within a definable period
Hit Development (Workplace)	History of hits (machine strokes) accumulated at one or more workplaces within a definable period
Performance Report (Operation)	Evaluation of the performance rate of individual operations

The reports listed in Table 10 show data on resource allocation. Reports show the occupancy of workplaces or machines.

Table 10: Resource Allocation

Report	Description
Planned Allocation	A real-time report on shifts at one or more workplaces within a definable period
Workplace Allocation	Shows one or more workplaces and the associated operations/orders for a selected period
Workplace Availability	Shows one or more workplaces and the associated operating states for a selected period
Shift Schedule	A real-time report on shifts for a definable period in the form of a Gantt chart and table for *one* or *more* workplaces

The following reports provide overviews of orders with production-related data, operations not started, in progress, interrupted and completed.

Table 11: Order Overview

Report	Description
Order Overview	A tabular overview of all orders with all production-related data on material, quantity, finish dates and ERP status
Order Details	A tabular overview of orders with production-related data and supplementary details for each order
Order Backlog	A tabular overview of the operations not yet started
Operations in Progress	A tabular overview of the operations in progress and interrupted
Operations Completed	A tabular overview of the operations completed
Operation Details	All operation-related details of planned dates, target duration of individual operation phases and target quantities for the actual dates, durations and quantities of materials to be produced including actual/target comparisons and a number of key performance indicators

The reports listed in Table 12 show maintenance times for selected workplaces. The development of maintenance in the course of time makes it possible, for example, to draw conclusions about how much maintenance effort was necessary to achieve an optimization of the OEE, if any.

Table 12: Maintenance

Report	Description
Maintenance Report	A graphic and tabular view of the PPM degree and the share of unscheduled maintenance in the total maintenance time for each workplace. The PPM degree is the proportion of planned maintenance in the total maintenance time.
Maintenance Development	A graphic and tabular view of the development of the PPM degree and the share of unscheduled maintenance in the total maintenance time in the course of time.
Stoppage Reason Development	A graphic and tabular view of the malfunction reasons in the course of time. It shows frequency, percentage and absolute durations of malfunction reasons and MTBF and MTTR.

3.2 Time Base Cross-References in Reports

Some reports use time bases to calculate the required values. Table 13 lists all reports that require a time base for calculation and specifies the time base used in each case.

ⓘ For information on time base configuration, refer to the Master Data and System Configuration manual.

Table 13: Reports and their related time bases

Abbreviation	OEE	PROD	SETUP	MALFUNCTION	MAINT	U/M
FORCAM term	Scheduled operating time	Production time	Setup time	Technical interruption	Maintenance time	Unscheduled maintenance time
Quantity Status Diagram (Workplace)	-	✓	-	-	-	-
Quantity Status Diagram (Operation)	-	✓	-	-	-	-
OEE Report (Workplace)	✓	✓	-	-	-	-
OEE Development (Workplace)	✓	✓	-	-	-	-
OEE (Overall View)	✓	✓	✓	-	-	-
Availability (Overall View)	✓	✓	✓	-	-	-
Operation Details	✓	✓	✓	-	-	-
Maintenance Report	-	-	-	-	✓	✓
Maintenance Development	-	-	-	-	✓	✓

3.3   Online Logs

This section describes all reports that are updated in real time. Such reports are referred to as online reports.

ⓘ All online logs are only available back to the time of last archiving. In the archiving process, only condensed reports are written to the archive. Online logs are discarded. For information on archiving and related settings, refer to the Master Data and System Configuration manual.

3.3.1   Workplace

3.3.1.1   Quantity Status Diagram (Workplace)

Path: Performance Analysis > Reporting > Reports > Online Logs > Workplace > Quantity Status Diagram (Workplace)

✓ The **Production** time base is configured.

Quantity and operating state development for a selected period for *one* workplace in real time. The quantity produced until this point in time defines the height of the bars (zero point = start time). The **Interpolated Actual Line** indicates the upper limit of the operating states and refers to the left Y-axis (yield). The **Target Line** results from the duration of each operating state multiplied by the target time per unit specified for the order and refers to the left Y-axis.

The quality type influences the gradient of the actual line. If the operation runs, the quantity in the quantity status diagram increases by the quantity not yet qualified (in real time). The quantity not yet qualified is indicated for the selection of scrap and rework as well as yield. As soon as the quantity is qualified, it is only displayed for the appropriate quality type.

The time base influences the gradient of the target line. This line only grows within the selected time base in proportion with the target time per unit specified for the operation. If there is no operation assigned, the target line no longer rises since there is no target time per unit defined and therefore a gradient of the target line cannot be determined. When selecting the **Production** time base, the ratio of actual line and target line is equivalent to the OEE performance rate. This is the only case where the efficiency characteristic corresponds to the average performance rate until the specific point of time (with different times per unit, the performance indicated here is not identical with the performance rate in the OEE report). When selecting the **OEE** time base, the difference between the target line and the actual line reflects the sum of efficiency losses and effectiveness losses. Quality losses may also be considered, depending on whether yield only is considered.

ⓘ Interpolation is a mathematical method to determine an unknown function value by approximation using known adjacent function values. In this way, the increase in the quantity produced is shown as a steady line rather than having a step increase at the time of the quantity message.
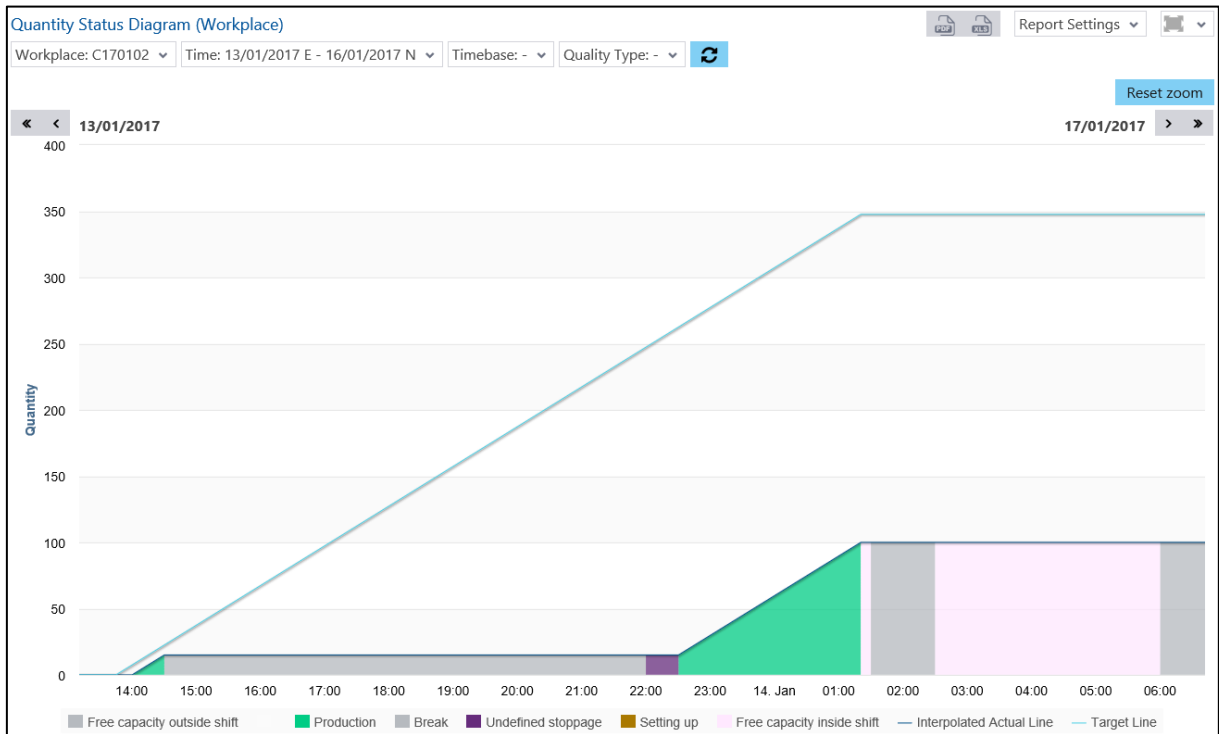
Fig. 23: Quantity Status Diagram (Workplace)

The following filters are available:

- Workplace (single)
- Time base
  Only those operating states that are assigned to this time base will cause an increase of the **Target Line**.
- Time (time, shift)
- Quality type (yield, scrap, rework quantity)

3.3.1.2 Operating State Timeline (Workplace)

Path: Performance Analysis > Reporting > Reports > Online Logs > Workplace > Operating State Timeline (Workplace)

Gantt chart of *one* or *more* workplaces with operating states for the defined period in real time:
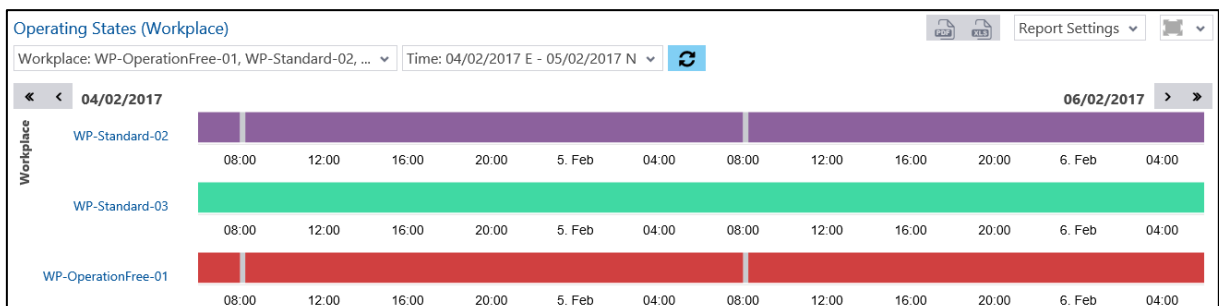
Fig. 24: Operating States (Workplace) as a Gantt chart

The following filters are available:
- Workplace (multiple)
- Time (time, shift)

ⓘ You can zoom into the timeline by selecting an interval within the timeline. Clicking on **Reset zoom** on the upper right resets the zoom setting.

3.3.1.3 Operating State Log (Workplace)

Path: Performance Analysis > Reporting > Reports > Online Logs > Workplace > Operating State Log (Workplace)

Multi-report with operating states, their duration and incidence for *one* workplace in real time:
- Operating States (Sum) (Fig. 25):
  Sum of operating states durations with the incident occurances for the selected period
- Operating States (Details) (Fig. 26):
  List of operating states with start time and duration

Operating States (Sum)		
Code	Operating State	☰
000	Production	
020	Setting up	
135	disruption robot	
25	Quality issue	
991	Free capacity outside shift	
992	Free capacity inside shift	
993	Break	
999	Undefined stoppage	

Fig. 25: Operating States (Sum)

Operating States (Details)				
Start Time	Duration (HH:mm:ss)	Code	Operating State	☰
11-Jan-2017 05:20:...	00:39:09	992	Free capacity inside shift	
11-Jan-2017 03:00:...	02:20:09	000	Production	
11-Jan-2017 02:30:...	00:30:40	999	Undefined stoppage	
11-Jan-2017 02:00:...	00:29:19	993	Break	
11-Jan-2017 01:30:...	00:30:40	000	Production	
11-Jan-2017 01:00:...	00:29:23	000	Production	
11-Jan-2017 00:30:...	00:30:00	135	disruption robot	
11-Jan-2017 00:30:...	00:00:00	999	Undefined stoppage	
11-Jan-2017 00:00:...	00:30:00	020	Setting up	
10-Jan-2017 22:00:...	02:00:35	992	Free capacity inside shift	

Fig. 26: Operating States (Details)

The following filters are available:
- Workplace (single)
- Time (time, shift)

3.3.2 Operation

3.3.2.1 Quantity Status Diagram (Operation)

**Path**: Performance Analysis > Reporting > Reports > Online Logs > Operation > Quantity Status Diagram (Operation)

✓ The **Production** time base is configured.

Quantity and operating state development for a selected period for operations in real time. The quantity produced until this point in time defines the height of the bars (zero point = start time). The **Interpolated Actual Line** indicates the upper limit of the operating states and refers to the left Y-axis (quantity). The **Target Line** results from the duration of each operating state multiplied by the target time per unit specified for the order and refers to the left Y-axis. The **OEE** line shows the OEE performance at a glance and refers to the right Y-axis.

The quality type influences the gradient of the actual line. If the operation runs, the quantity in the quantity status diagram increases by the quantity not yet qualified (in real time). The quantity not yet qualified is indicated for the selection of scrap and rework as well as yield. As soon as the quantity is qualified, it is only displayed for the appropriate quality type.

The time base influences the gradient of the target line. It only grows within the selected time base in proportion with the target time per unit specified for the operation. If there is no operation assigned, the target line no longer rises since there is no target time per unit defined and therefore a gradient of the target line cannot be determined. When selecting the **Production** time base, the ratio of actual line and target line is equivalent to the OEE performance rate. This is the only case where the performance characteristic corresponds to the average performance rate until the specific point of time. When selecting the **OEE** time base, the difference between the target line and the actual line reflects the sum of efficiency losses and effectiveness losses. Quality losses may also be considered, depending on whether yield only is considered.

ⓘ Interpolation is a mathematical method to determine an unknown function value by approximation using known adjacent function values. In this way, the increase in the quantity produced is shown as a steady line rather than having a step increase at the time of the quantity message.
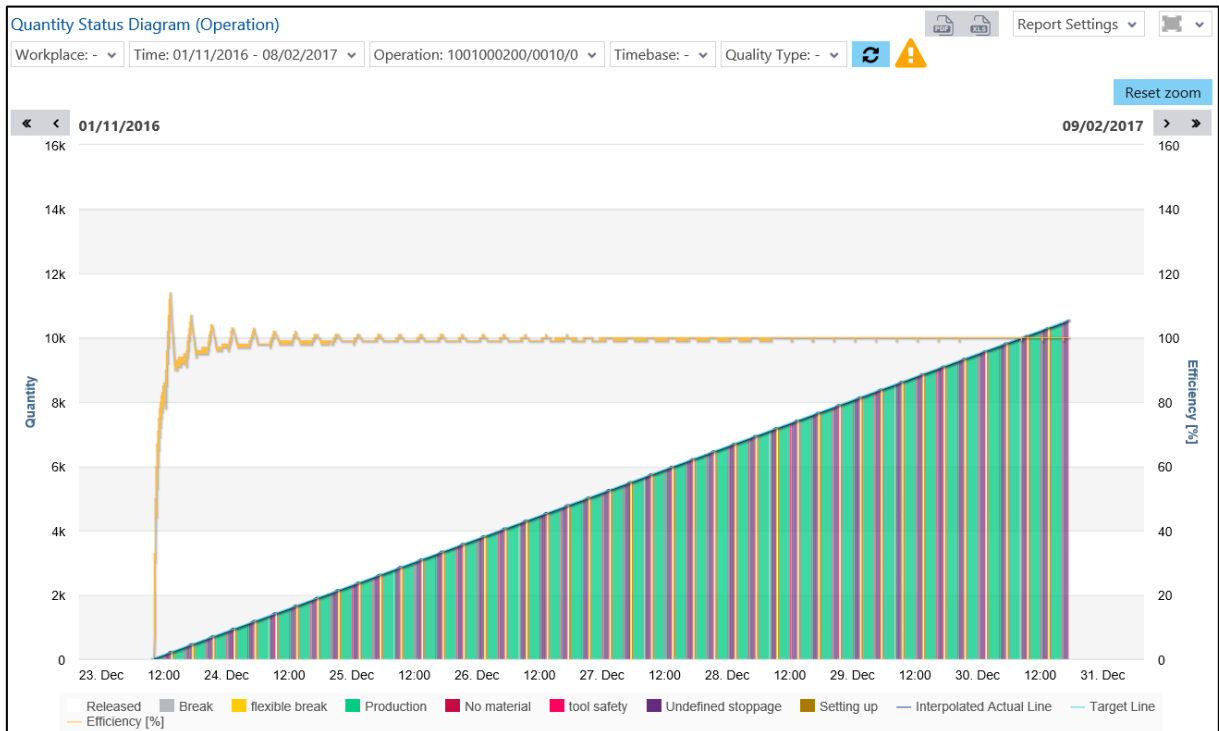
**Fig. 27: Quantity Status Diagram (Operation)**

The following filters are available:

- Workplace (single)
- Time (time, shift, day)
- Operation (multiple)
- Time base
  Only those operating states that are assigned to this time base will cause an increase of the **Target Line**.
- Quality type (yield, scrap, rework quantity)

3.3.2.2 Operating State Timeline (Operation)

Path: Performance Analysis > Reporting > Reports > Online Logs > Operation > Operating State Timeline (Operation)

Gantt chart of *one* or *more* operations with operating states for the defined period in real time:
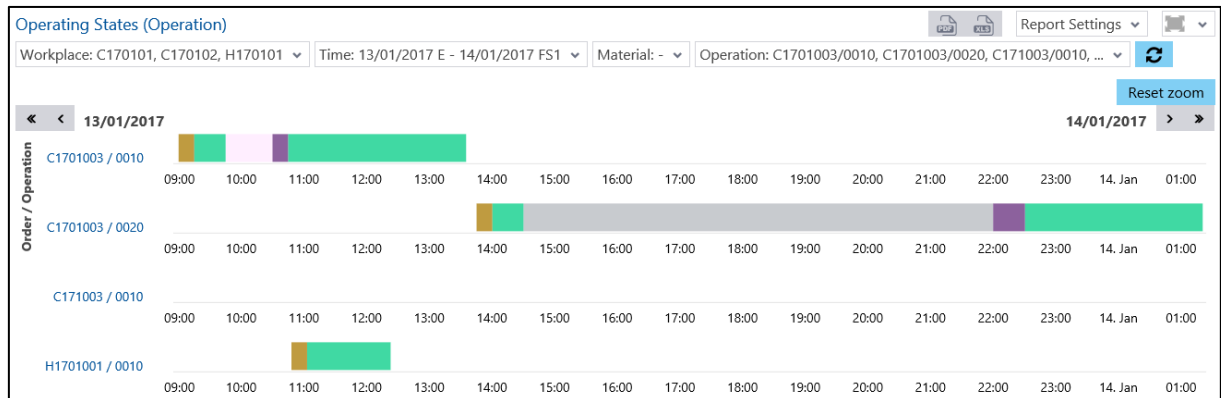
Fig. 28: Operating States (Operation)

The following filters are available:
- Workplace (multiple)
- Time (time, shift, day)
- Material (multiple)
- Operation (multiple)

3.3.3 Order

3.3.3.1 Operating State Timeline (Order)

Path: Performance Analysis > Reporting > Reports > Online Logs > Order > Operating State Timeline (Order)

Gantt chart of *one* or *more* orders with operating states for the defined period in real time:
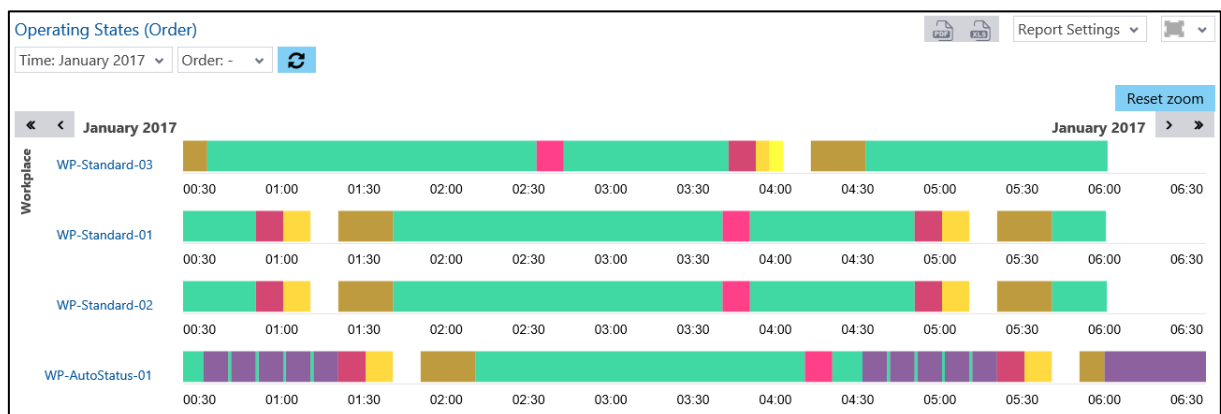
Fig. 29: Operating State Timeline (Order)

The following filters are available:
- Time (day, week, month, quarter, year)
- Order (multiple)

3.3.4 Summaries

3.3.4.1 Quantity Log

Path: Performance Analysis > Reporting > Reports > Online Logs > Summaries > Quantity Log

Real-time multi-report of quantities of all operations at *one* workplace for a defined period in table format:
- Sum of quantities of the operation (Fig. 30):
  Information about quantities including start and end time of the operation, quality and target time per unit for an operation
- Quantity Log with Quality Details (Fig. 31):
  Information about quantities including type, reason and booking time for an operation

ⓘ **Target Time per Unit** is an average value.

Shift: 08/02/17 [E]: 6:00 - 14:00

Actual Quantity

Total Quantity	Yield Qty.	Yield [%]	Scrap Qty.	Scrap [%]	Rework Qty.	Rework [%]	☰
292	156	53.42%	78	26.71%	58	19.86%	

Fig. 30: Output quantity

Quality Details

Booking Time	Quantity	Quality Type	Quality Details
13.01.2017 11:05:05	1	Yield quantity	Yield quantity standard
13.01.2017 11:06:06	1	Scrap quantity	Material Surface
13.01.2017 11:07:36	1	Rework quantity	Material Surface
13.01.2017 11:09:06	1	Rework quantity	Dimensional Precision
13.01.2017 11:11:06	1	Yield quantity	Yield quantity standard
13.01.2017 11:13:06	1	Yield quantity	Yield quantity standard

Fig. 31: Quantity log with quality details

The following filters are available:
- Workplace (single)
- Time (time, shift)

3.3.4.2 Shift Book

Path: Performance Analysis > Reporting > Reports > Online Logs > Summaries > Shift Book

Real-time multi-report of quantities, operating states and operations at *one* workplace during a shift in table format:
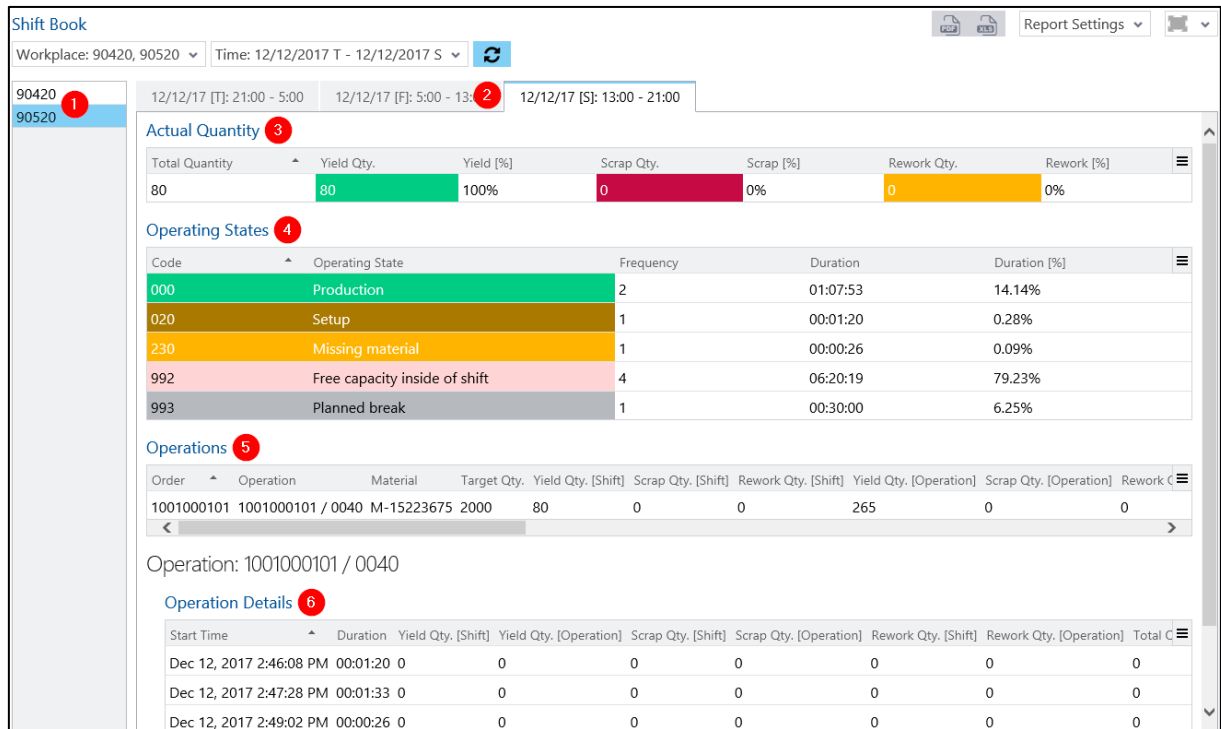
Fig. 32: Shift Book Report

(1) List of all selected workplaces.
    If only one workplace is selected in the filter, this column is hidden.
(2) Tab per shift.
    Each tab specifies data for one shift. The number of tabs or shifts depends on the selected time filter.
(3) Actual quantity:
    Total quantity produced with information on quality (yield, scrap or rework quantity)
(4) Shift sums of the operating states:
    Operating states with respective frequency and duration
(5) Shift book overview of the operations:
    Detailed information on quantities, strokes, target times and operating states of operations
(6) Operation details with subtotals:
    Detailed information on an operation such as duration, quality, strokes, remarks, operating states with up to 6-step detailing

The following filters are available:
  − Workplace (single)
  − Time (time, shift)

3.3.4.3 Shift Log

Path: Performance Analysis > Reporting > Reports > Online Logs > Summaries > Shift Log

ⓘ If no workplace is selected in the filter, data sets are loaded for all workplaces. The volume of data involved may cause increased loading time.

Real-time multi-report of total number of hits and frequency distribution of operating states for *one* workplace in table format:

- Sum of hits for operations in a shift (Fig. 33):
  Start and end times of an operation with total number of hits. Referring to a shift.
- Frequency distribution of the operating states within a shift (Fig. 34):
  Lists operating states, their frequency and duration for the selected shift

Sum of Hits							
Order ▲	Operation	Start Time	End Time	Material	Hits [Shift]	Hits [Operation]	≡
H170105_ODR2	H170105_ODR2 / 1	08-Feb-2017 07:30:18	08-Feb-2017 10:48:32	M2	30	30	

Fig. 33: Sum of hits for operations of a shift

Operating States					
Code ▲	Operating State	Frequency	Duration	Duration [%]	≡
000	Production	71	02:58:14	37.13%	
020	Setting up	1	00:05:00	1.04%	
101	Machine stop	1	00:05:00	1.04%	
19	Break / unplanned	1	00:05:00	1.04%	
25	Quality issue	1	00:00:00	0%	
992	Free capacity inside shift	2	03:11:28	39.89%	
993	Break	1	00:05:00	1.04%	
999	Undefined stoppage	2	01:30:18	18.81%	

Fig. 34: Frequency distribution of operating states during a shift

The following filters are available:

- Workplace (single)
- Time (shift)

3.3.4.4 Daily Log

Path: Performance Analysis > Reporting > Reports > Online Logs > Summaries > Daily Log

Real-time multi-report of total number of hits and frequency distribution of operating states for *one* workplace in table format:

   – Sum of hits for operations of the day (Fig. 35):
Start and end times of an operation with total number of hits and information about the material. Referring to a day.

   – Frequency distribution of the operating states within a day (Fig. 36):
Lists operating states, their frequency and duration for the selected day

Day: 24/10/16

Sum of Hits

Order	Operation	Start Time	End Time	Material	Material Description	Hits [Day]	Hits [Operation]
1001332	0010	24.10.2016 00:00:00	24.10.2016 13:31:29	4	Tool	0	5
1001431	0010	24.10.2016 13:35:39	25.10.2016 05:00:00	4	Tool	0	0

Fig. 35: Sum of hits for operations of the day

Operating States

Code	Operating State	Frequency	Duration	Duration [%]
999	Undefined stoppage	4	23:40:52	81.66%
991	Free capacity outside shift	1	05:00:00	17.24%
020	Setting up	1	00:14:57	0.86%
992	Free capacity inside shift	1	00:04:09	0.24%

Fig. 36: Frequency distribution of operating states during a day

The following filters are available:

   – Workplace (single)

   – Time (day)
The results per day are shown for each period

3.3.4.5 Message Log

Path: Performance Analysis > Reporting > Reports > Online Logs > Message Log

Messages from *one* or *more* workplaces including time, order details, quantity message and information about the worker in real time.

Message	Order	Operation	Details (Status)	Number	Yield Qty.	Scrap Qty.	Rework Qty.
Machine State		0	Production	0	0	0	0
Machine State		0	Production	0	0	0	0
Shift State		0	Shift	0	0	0	0
Shift State		0	Shift	0	0	0	0
Shift State		0	Shift	0	0	0	0
Shift State		0	Shift	0	0	0	0
Shift State		0	Shift	0	0	0	0
Shift State		0	No Shift	0	0	0	0
Shift State		0	Shift	0	0	0	0
Shift State		0	Shift	0	0	0	0
Machine State		0	Undefined stoppage	0	0	0	0

Filter row: Workplace: - | Time: 01/08/2016 E - 31/08/2016 N | Message Type: -

Fig. 37: Messages from workplaces in table format

The following filters are available:
- Workplace (multiple)
- Time (time, shift, day)
- Message types
  Messages are signals representing a change in the shop floor terminal. These are recorded at a central location via FFRuntime, interpreted and prepared for reporting and/or SAP. The following message types are available:
  - Machine Counter
    Counter for the number of units produced by a machine
  - Machine Hits
    Number of hits, or strokes of a machine
  - Machine Quantity
    Any unit of quantity produced by a machine (e.g. kg)
  - Machine State
    Status of the machine
  - Operation Phase
    Phase of an operation
  - Operation Quantity
    Yield quantity in contrast with scrap and rework quantity
  - Person Operation
    The person assigned to the operation.
  - Person Workplace
    The person assigned to the workplace.
  - Shift State
    Generated by the shift generator. The status of the shift whenever it starts/ends.

3.4 Overall Equipment Effectiveness (OEE)

This section describes the OEE analyses. The OEE index is the product from the availability, performance and quality key performance indicators. The availability depends on the operating states and is the quotient from production time / scheduled operating time. Performance is an actual/target comparison of the time per unit. Quality is determined by the quality types (yield, scrap, rework) and is the quotient from yield quantity / total quantity output.

ⓘ The OEE analysis includes production within breaks. Production from non-working shifts is not included since these are non-scheduled times.
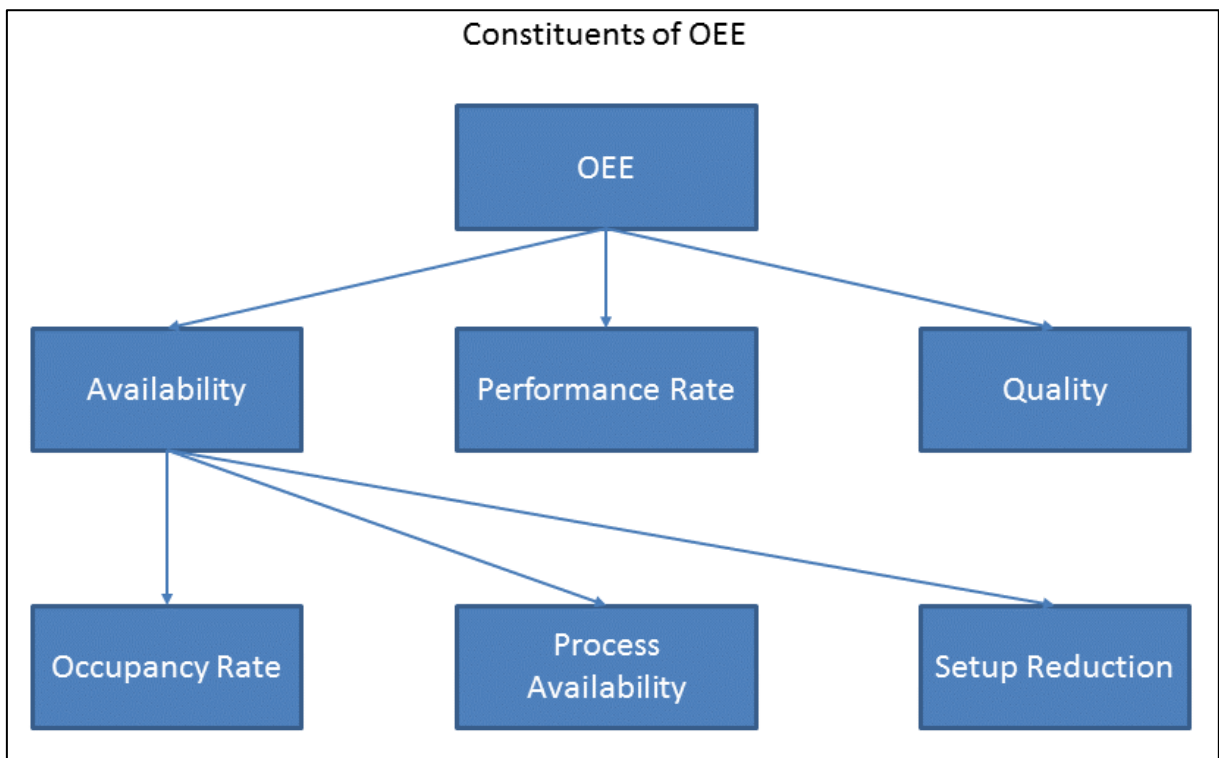
Fig. 38: OEE components

3.4.1 OEE (Overall View)

Path: Performance Analysis > Reporting > Reports > Overall Equipment Effectiveness (OEE) > OEE (Overall View)

✓ The **OEE** and **Production** time bases are configured.

Multi-report with OEE-compliant evaluation of *all* or *selected* workplaces of a plant or group for a selected period. If no workplace is selected, the analysis includes all workplaces:

– OEE (Overall View) as a column chart (Fig. 39):
Display of availability, performance rate, quality and the OEE index derived from these in a group of columns.
– OEE (Overall View) as a table (Fig. 40):
Table view of availability, performance rate, quality and the OEE index derived from these.
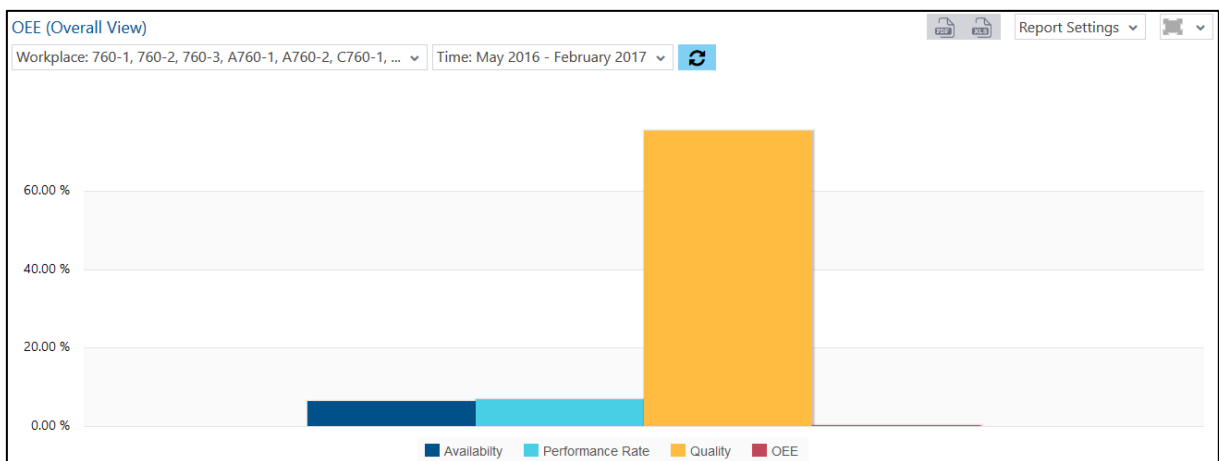
Fig. 39: OEE (Overall View) as a column chart

Availabilty	6.64%
Performance Rate	7.19%
Quality	75.52%
OEE	0.36%

Fig. 40: OEE (Overall View) as a table

The following filters are available:

– Workplace (multiple)
– Time (day, week, month, quarter, year)

3.4.2 Workplace

3.4.2.1 OEE Report (Workplace)

Path: Performance Analysis > Reporting > Reports > Overall Equipment Effectiveness (OEE) > Workplace > OEE Report (Workplace)

✓ The **OEE** and **Production** time bases are configured.

Multi-report with OEE-compliant evaluation of *one* or *more* workplaces for comparison for the selected period:

- OEE Report (Workplace) as a column chart (Fig. 41):
  Display of availability, performance rate, quality and the OEE index derived from these in groups of columns for each workplace.
- OEE Report (Workplace) as a table (Fig. 42):
  Table view of availability, performance rate, quality and the OEE index derived from these for each workplace.

Fig. 41: OEE Report (Workplace) as a column chart

Workplace	C760-1	C760-2	H760-1	H760-2
Availabilty	78.57%	0.86%	0.08%	0.38%
Performance Rate	2.31%	239.06%	84.75%	141.54%
Quality	89.42%	61.16%	100%	90.91%
OEE	1.62%	1.26%	0.07%	0.49%

Fig. 42: OEE Report (Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)

3.4.2.2 OEE Development (Workplace)
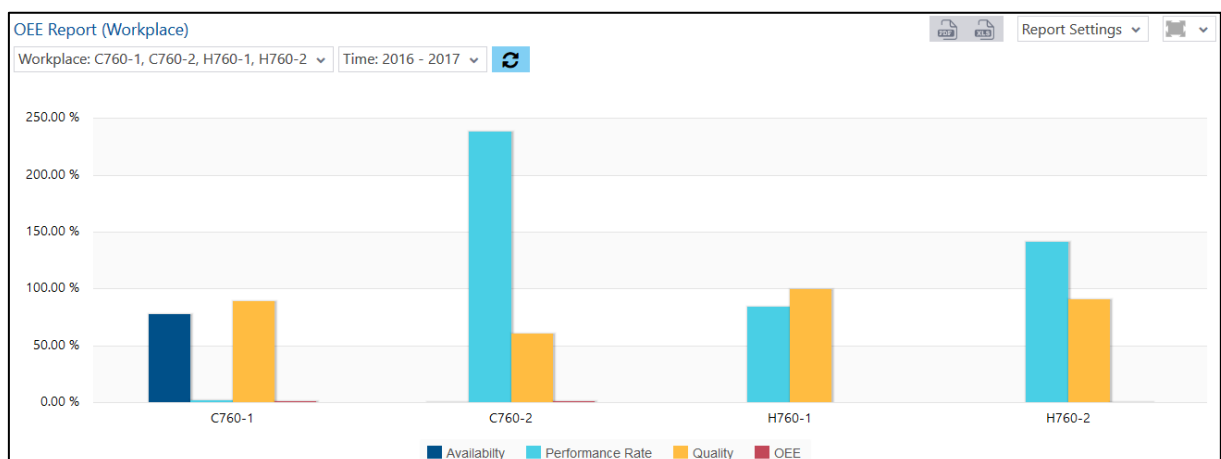
Path: Performance Analysis > Reporting > Reports > Overall Equipment Effectiveness (OEE) > Workplace > OEE Development (Workplace)

✓ The **OEE** and **Production** time bases are configured.

Multi-report showing the development over time of the OEE analysis for *one* workplace for the selected period:

− OEE Development (Workplace) as a column chart (Fig. 43):
  Display of the development of availability, performance rate, quality and the OEE index derived from these in a column chart. Each group of columns reflects the data for a period. The group of columns on the right shows the average of the data.
− OEE Development (Workplace) as a table (Fig. 44):
  Table view of the development of availability, performance rate, quality and the OEE index derived from these. Each column represents a period.
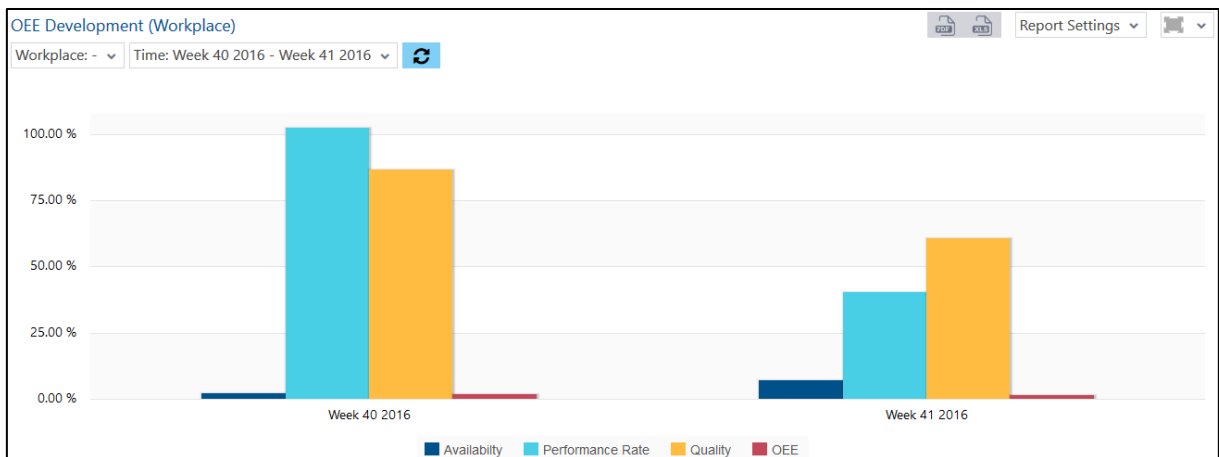
Fig. 43: OEE Development (Workplace) as a column chart

Date	2016/40	2016/41
Availabilty	2.35%	7.47%
Performance Rate	102.92%	40.74%
Quality	87.04%	61.04%
OEE	2.11%	1.86%

Fig. 44: OEE Development (Workplace) as a table

The following filters are available:
− Workplace (single)
− Time (day, week, month, quarter, year)

3.4.3 Operation

3.4.3.1 OEE Report (Operation)

Path: Performance Analysis > Reporting > Reports > Overall Equipment Effectiveness (OEE) > Operation > OEE Report (Operation)

✓ The **OEE** and **Production** time bases are configured.

Multi-report with OEE-compliant evaluation of *one* or *more* operations for comparison for the selected period:

– OEE Report (Operation) as a column chart (Fig. 45):
Display of availability, performance rate, quality and the OEE index derived from these in groups of columns for each operation.

– OEE Report (Operation) as a table (Fig. 46):
Table view of availability, performance rate, quality and the OEE index derived from these for each workplace.

Fig. 45: OEE Report (Operation) as a column chart

Order / Operation	H170105_ODR1 / 105_1	H170105_ODR2 / 1
Availability	99.6%	94.69%
Performance Rate	199.94%	163.83%
Quality	100%	53.42%
OEE	199.15%	82.87%

Fig. 46: OEE Report (Operation) as a table

The following filters are available:

– Workplace (multiple)
– Time (day, week, month, quarter, year)
– Operation phase (multiple)
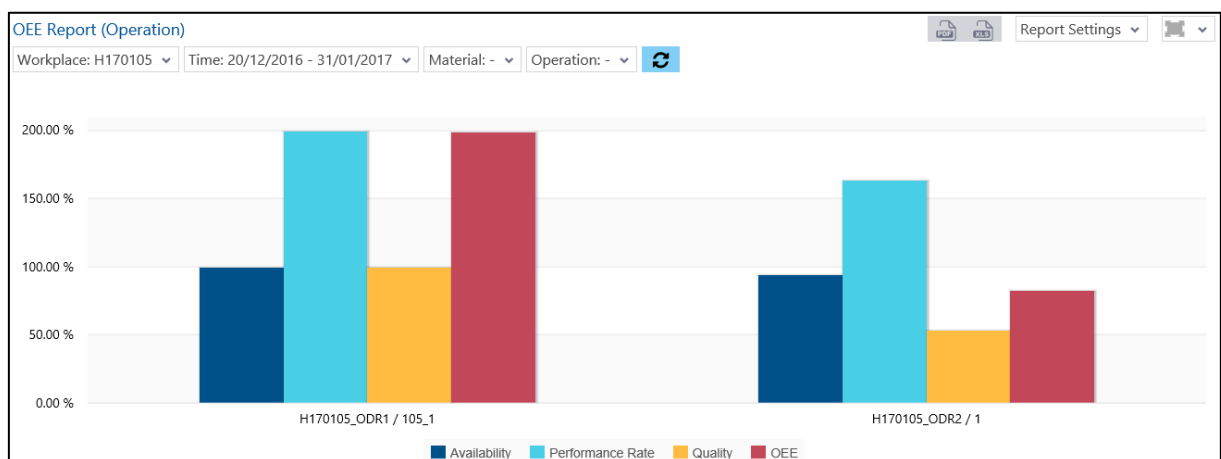– Material (multiple)
– Operation (multiple)

3.5 Availability Analysis

The reports in this section inform about operating states.
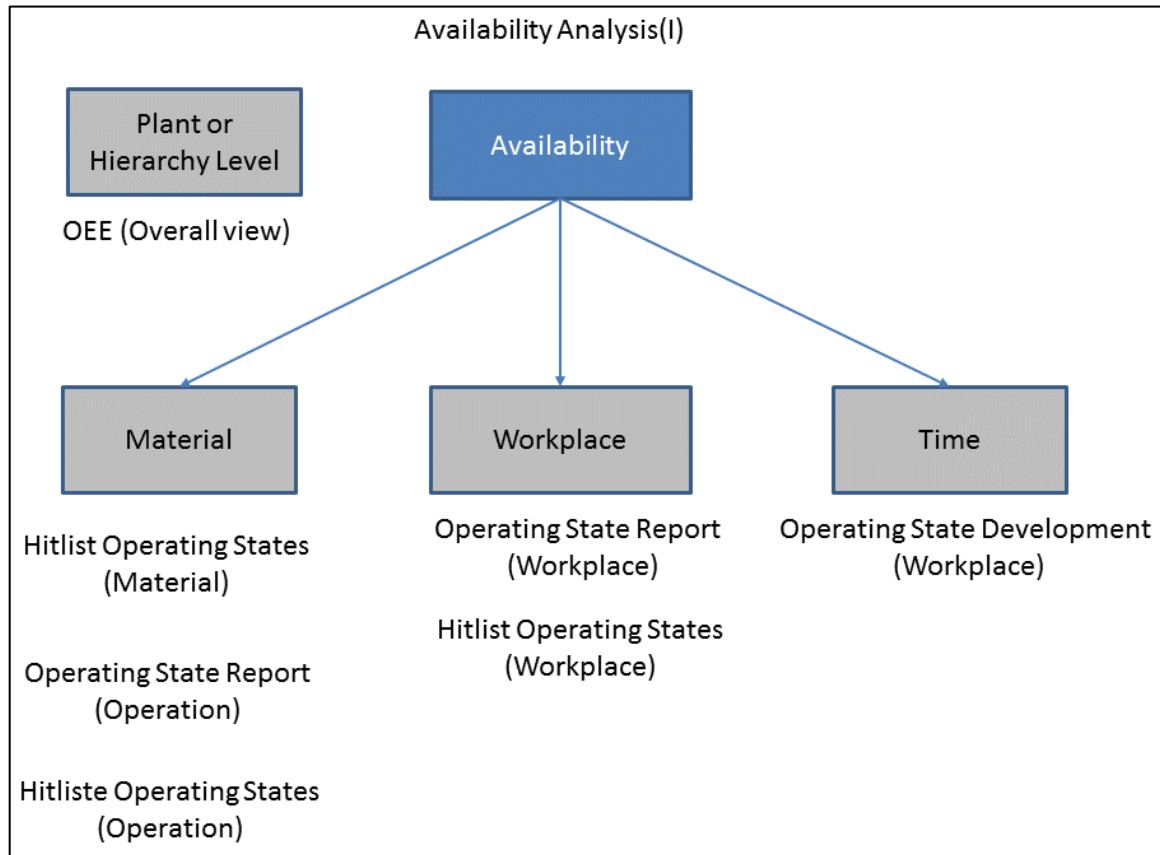
Fig. 47: Components of the availability analysis

3.5.1 Availability (Overall View)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Availability (Overall View)

✓ The **OEE**, **Production** and **Setup** time bases are configured.

The availability is calculated as the product of occupancy rate, process availability and setup reduction rate.

- Occupancy rate:
  The allocative component of availability which can be improved by production scheduling. The occupancy rate is the quotient from busy time of a workplace / scheduled operating time according to the shift model.
- Process availability:
  The technical component of availability that can be increased significantly using the Advanced Shop Floor Management methods. The process availability is the quotient from production time (production time base) / processing time including any interruptions due to malfunctions.
ⓘ Setting up does not form part of the processing time of an operation and is therefore considered in a third component.

- Setup reduction rate:
  Reaches 100% if setup times are eliminated completely and is determined as the quotient of processing time / busy time of operations on a workplace.
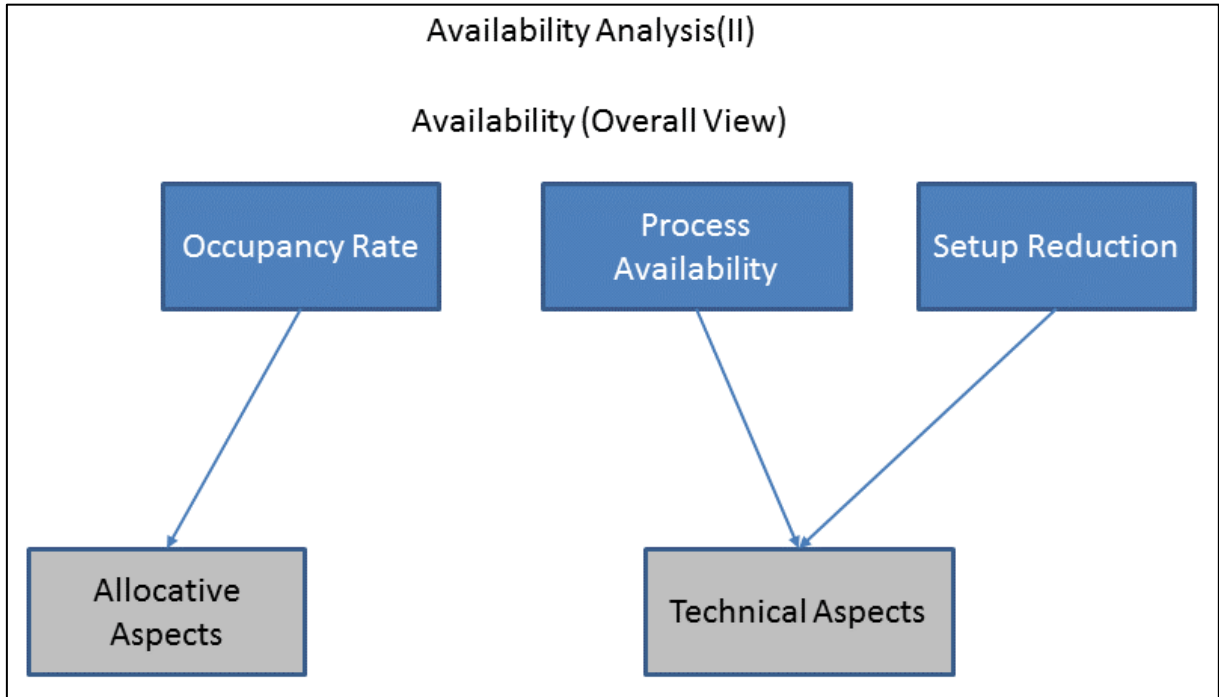
Fig. 48: Aspects of availability

Multi-report showing the availability for *one* or *more* workplaces for a period. The percentages specified indicate the proportion in relation to an optimum (100%) availability.

- Availability as a column chart (Fig. 49):
  Occupancy rate, process availability, setup reduction rate and the availability calculated from these shown as columns
- Availability as a table (Fig. 50):
  Table view of occupancy rate, process availability, setup reduction rate, the availability calculated from these and the setup rate
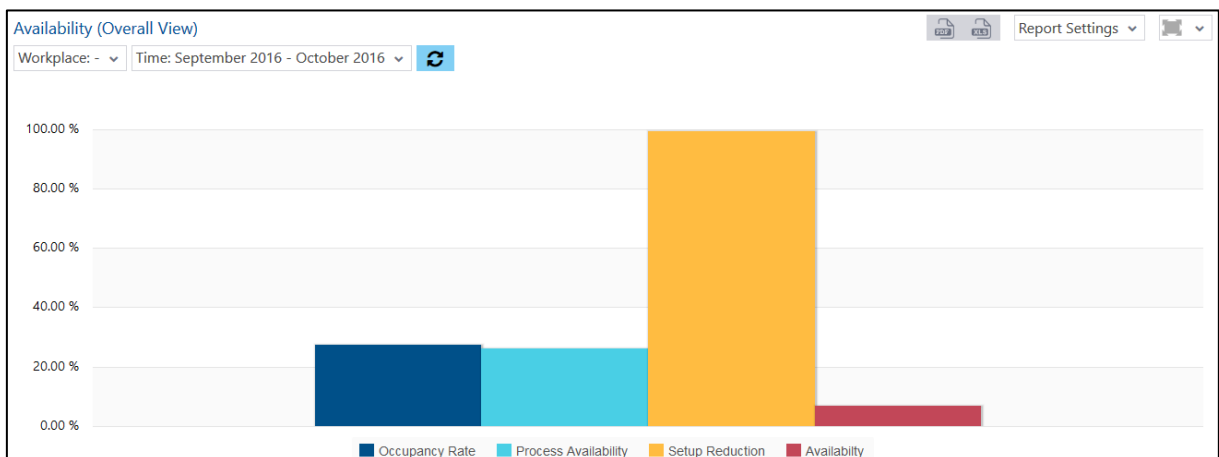
Fig. 49: Availability as a bar chart

|	
Occupancy Rate	27.83%
Process Availability	26.32%
Setup Reduction	99.6%
Availabilty	7.3%

Fig. 50: Availability as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)

3.5.2 Workplace

3.5.2.1 Operating State Class Report (Workplace)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Workplace > Operating State Class Report (Workplace)

✔ Status classes are configured.

Multi-report showing status classes for *one* or *more* workplaces for a period:

- Operating State Class Report (Workplace) as a column chart (Fig. 51):
  Shows the durations of status classes proportionately in columns. Each column represents the duration for a selected workplace. The duration may be shown as a percentage (of the total value or scheduled operating time) or in minutes, depending on the value filter selected.
- Operating State Class Report (Workplace) as a table (Fig. 52):
  A table listing the status classes. The duration is shown as a percentage (of the total value or scheduled operating time) or in minutes. The columns relate to workplaces. The value filter does not influence this table.

Fig. 51: Operating State Class Report (Workplace) as a column chart

Status Class	H170101 Duration	Duration [% of SOT]	Duration [% of total]	H170102 Duration	Duration [% of SOT]	Duration [% of total]	H170103 Duration	Duration [% of SOT]	Duration [% of total]	H170201 Duration	Duration [% of
Technical Issue	59:30	100%	88.15%								
Break	08:00	13.45%	11.85%	08:00	13.45%	11.85%	02:00	29.63%	22.86%	01:07	1.71%
Free Capacity				59:30	100%	88.15%	06:45	100%	77.14%	10:30	15.82%
Production										47:51	72.12%
Setup										08:00	12.06%
∑	67:30	113.45%	100%	67:30	113.45%	100%	08:45	129.63%	100%	67:30	101.71%

Fig. 52: Operating State Class Report (Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Status class (multiple)
  If a status class is selected in the filter, the report shows only data for this class.

You can display a drill-down to Operating State Report (Workplace) by left-clicking on a bar graph.
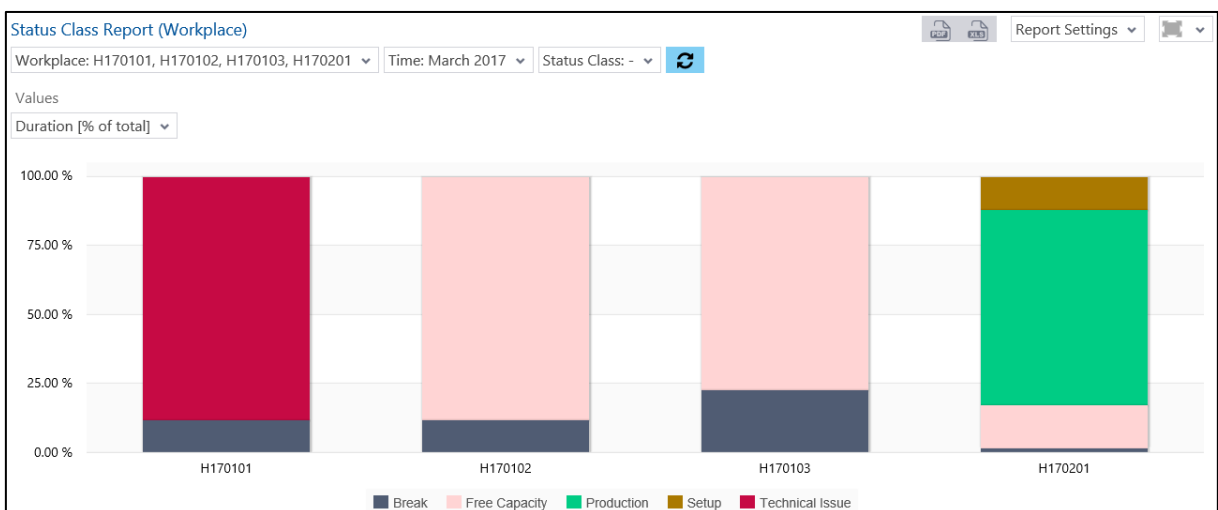
3.5.2.2 Operating State Class Development (Workplace)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Workplace > Operating State Class Development (Workplace)

✔ Status classes are configured.

Multi-report showing the development of status classes over time for *one* or *more* workplaces for a selected period:

- Operating State Class Development (Workplace) as a column chart (Fig. 53):
  Shows the durations of status classes proportionately in columns. Each column represents the duration for a selected period (e.g. month, calendar week, etc.). The duration may be shown as a percentage (of the total value or scheduled operating time) or in minutes, depending on the value filter selected. The data reflect all selected workplaces.
- Operating State Class Development (Workplace) as a table (Fig. 54):
  A table listing the status classes. The duration is shown as a percentage (of all status classes, of the scheduled operating time SOT) or in minutes. The data reflect all selected workplaces. The columns relate to selected periods (e.g. month, calendar week, etc.). The value filter does not have an effect on this table.

Fig. 53: Operating State Class Development (Workplace) as a column chart

Status Class	Week 07 2017 Duration	Duration [% of PPT]	Duration [% of total]	Week 08 2017 Duration	Duration [% of PPT]	Duration [% of total]	Week 09 2017 Duration	Duration [% of PPT]	Duration [% of total]
Production	01:40	2.29%	2.06%				15:51	23.91%	23.5%
Setup	11:16	15.45%	13.92%	96:00	100%	100%	40:00	60.27%	59.26%
Technical Problems	60:03	82.27%	74.14%				10:30	15.82%	15.56%
∑	73:00	100%	90.12%	96:00	100%	100%	66:22	100%	98.32%

Fig. 54: Operating State Class Development (Workplace) as a table

The following filters are available:
- – Workplace (multiple)
- – Time (day, week, month, quarter, year)
- – Status class (multiple)
  If a status class is selected in the filter, the report shows only data for this class.

You can display a drill-down to Operating State Development (Workplace) by left-clicking on a bar graph.
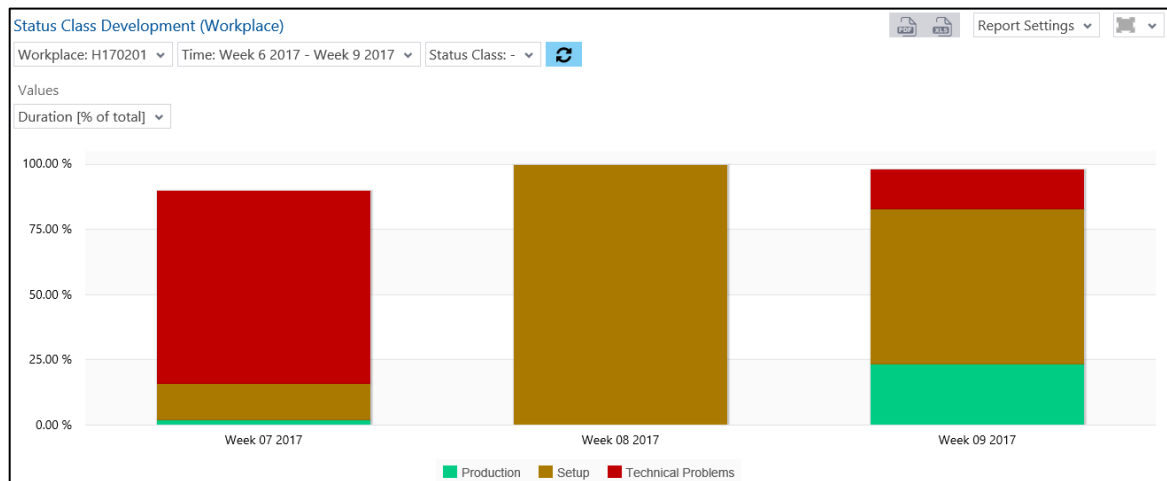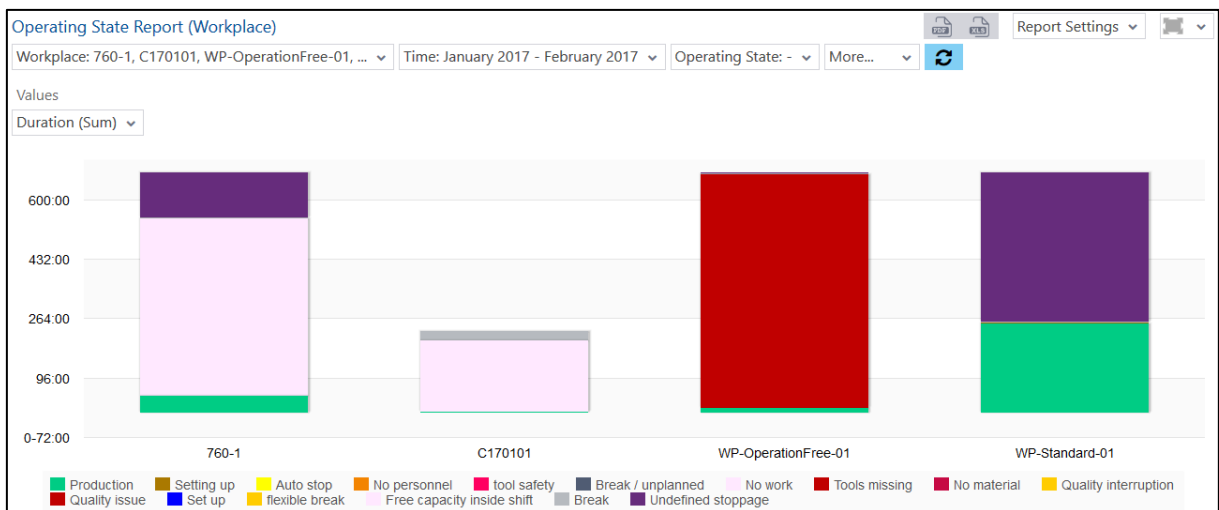
3.5.2.3 Operating State Report (Workplace)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Workplace > Operating State Report (Workplace)

Multi-report showing the (proportionate) duration of operating states for *one* or *more* workplaces for a period:

- Operating State Report (Workplace) as a column chart (Fig. 55):
  Operating states shown as columns for each workplace. Each column shows operating states as a share of the total usage time.
- Operating State Report (Workplace) as a table (Fig. 56):
  Lists operating states and detailed information about duration for each workplace with proportionate duration, average and sum.

Fig. 55: Operating State Report (Workplace) as a column chart

Operating State	760-1 Duration (HH:mm)	Duration [%]	C170101 Duration (HH:mm)	Duration [%]	WP-OperationFree-01 Duration (HH:mm)	Duration [%]	WP-Standard-01 Duration (HH:mm)	Duration [%]	Total Ø Duration (HH:mm)	Total ∑ Duration (HH:m
Production	46:54	6.9%	01:20	0.58%	11:51	1.74%	252:21	37.11%	78:06	312:27
Break	02:15	0.33%	29:00	12.5%	02:15	0.33%	02:15	0.33%	08:56	35:45
Undefined stoppage	128:00	18.82%	00:00	0%	02:56	0.43%	421:56	62.05%	138:13	552:52
Free capacity inside sh...	502:50	73.95%	201:39	86.92%	00:05	0.01%	00:02	0%	176:09	704:37
Break / unplanned					00:02	0%			00:00	00:02
No work					00:04	0.01%			00:01	00:04
No personnel					00:04	0.01%			00:01	00:04
Tools missing					661:53	97.34%			165:28	661:53

Fig. 56: Operating State Report (Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
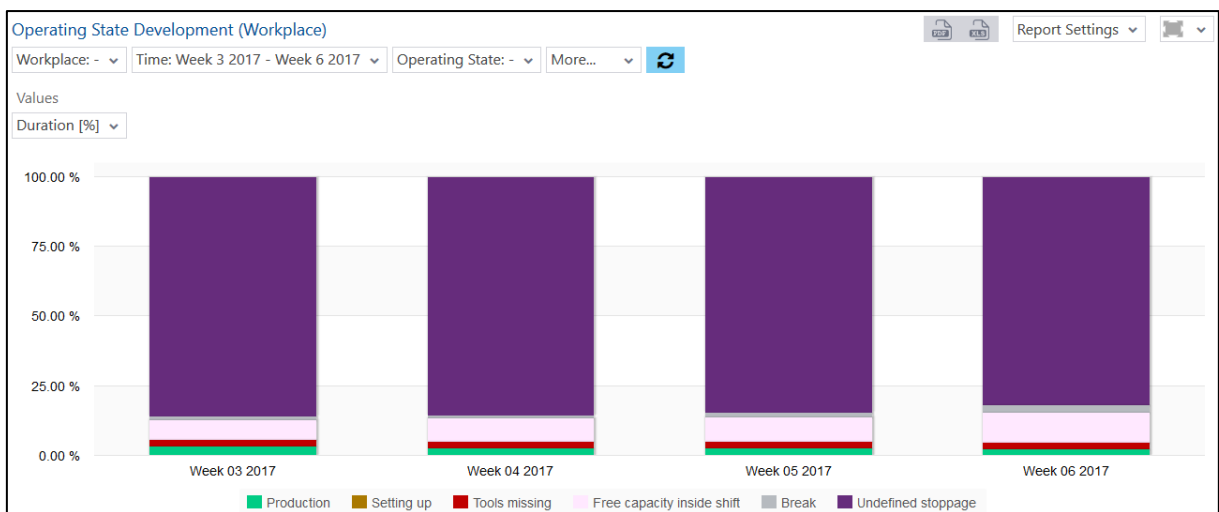- Operating state

3.5.2.4 Operating State Development (Workplace)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Workplace > Operating State Development (Workplace)

Multi-report showing the development of operating states for *one* or *more* workplaces for a period:

- Operating State Development (Workplace) as a column chart (Fig. 57):
  Operating states shown as columns for each period selected. Each column represents the development of the operating states of selected workplaces for the selected period.
- Operating State Development (Workplace) as a table (Fig. 58):
  Lists operating states and detailed information about duration for the selected period with proportionate duration, sum and average. The data relate to all workplaces selected.

Fig. 57: Operating State Development (Workplace) as a column chart

Operating State	Week 03 2017			Week 04 2017			Week 05 2017			Week 06 2017	
	Duration (HH:mm)	Duration (%)	Duration [%]	Duration (HH:mm)	Duration (%)	Duration [%]	Duration (HH:mm)	Duration (%)	Duration [%]	Duration (HH:mm)	Duration (%)
Setting up	00:05	0%	0%								
Production	152:21	3.21%	3.21%	112:00	2.57%	2.57%	144:00	2.57%	2.57%	80:00	2.41%
Break	66:00	1.39%	1.39%	50:00	1.15%	1.15%	98:30	1.76%	1.76%	93:00	2.8%
Undefined stoppage	4070:01	85.79%	85.79%	3722:00	85.37%	85.37%	4740:30	84.53%	84.53%	2714:00	81.75%
Free capacity inside sh...	335:46	7.08%	7.08%	364:00	8.35%	8.35%	482:00	8.59%	8.59%	354:00	10.66%
Tools missing	119:45	2.52%	2.52%	112:00	2.57%	2.57%	143:00	2.55%	2.55%	79:00	2.38%
∑	4744:00	100%	100%	4360:00	100%	100%	5608:00	100%	100%	3320:00	100%

Fig. 58: Operating State Development (Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Operating state

3.5.2.5 Hitlist Operating States (Workplace)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Workplace > Hitlist Operating States (Workplace)

Multi-report with operating states and detailed information about duration and frequency for *one* or *more* workplaces for the selected period:

- Hitlist Operating States (Workplace) as a bar chart (Fig. 59):
  Shows selected operating states and their total duration in a bar chart. The operating states relate to all workplaces selected.
- Hitlist Operating States (Workplace) as a table (Fig. 60):
  Lists selected operating states for each workplace with duration and frequency for the selected period. Share of frequency in the total frequency of all operating states
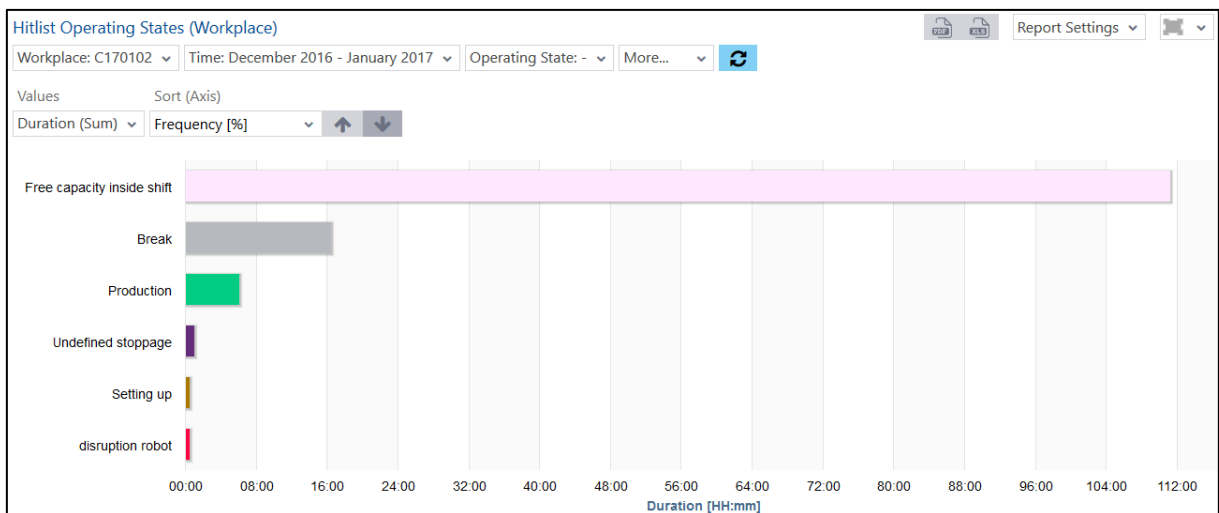
Fig. 59: Hitlist Operating States (Workplace) as a bar chart

Workplace ▲	Code	Operating State	Frequency	Frequency [%]	Duration (HH:mm)	Duration [%]	Duration [% absolute]	Duration [Ø] (HH:mm)
C170102	992	Free capacity inside shift	33	56.9%	111:19	81.85%	81.85%	03:22
C170102	993	Break	17	29.31%	16:29	12.12%	12.12%	00:58
C170102	000	Production	3	5.17%	06:10	4.54%	4.54%	02:03
C170102	999	Undefined stoppage	3	5.17%	01:01	0.75%	0.75%	00:20
C170102	135	disruption robot	1	1.72%	00:30	0.37%	0.37%	00:30
C170102	020	Setting up	1	1.72%	00:30	0.37%	0.37%	00:30
			58	100%	136:00	100%	100%	07:44

Fig. 60: Hitlist Operating States (Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Operating state
  The selected operating state appears only if bookings occurred at the specific workplace within the selected period.
- Duration (equal to, less than or equal to, greater than or equal to)
  If a duration is entered, only operating states with a matching duration are displayed (e.g. all operating states with a duration >95 hours).

– Frequency (equal to, greater than or equal to)
If a frequency is entered, only operating states with a matching frequency are displayed (e.g. all operating states with a frequency >=2).

ⓘ The frequency is a shift-related factor; an operating state active across two shifts is therefore considered twice here.

You can display the following drill-down by clicking on an operating state (right-click in table, left-click on bar graph):

– Hitlist Operating State Details Level 2 (Workplace):
Details of the selected operating state displayed either in a table or in a bar chart:
o Hitlist Operating States Level 2 (Workplace) as a bar chart (Fig. 61):
Shows the selected operating state in a bar chart with the total duration collected from all workplaces where this state occurs.
o Hitlist Operating States Level 2 (Workplace) as a table (Fig. 62):
Only the operating state selected is displayed in a table. Each row refers to one workplace.
Frequency: The frequency of the operating state at the specific workplace.
Frequency [%]: Share of frequency in the total frequency of the selected operating state.
Duration (HH:mm): Total duration of the operating state for each workplace.
Duration [%]: Share of duration in the total duration of the selected operating state.
Duration [% absolute]: Share of duration in the total duration of all operating states.

ⓘ A drill-down is only possible for malfunction codes (e.g. **Undefined stoppage** or **No connection**, etc.) but not for **Production** or **Setup**.
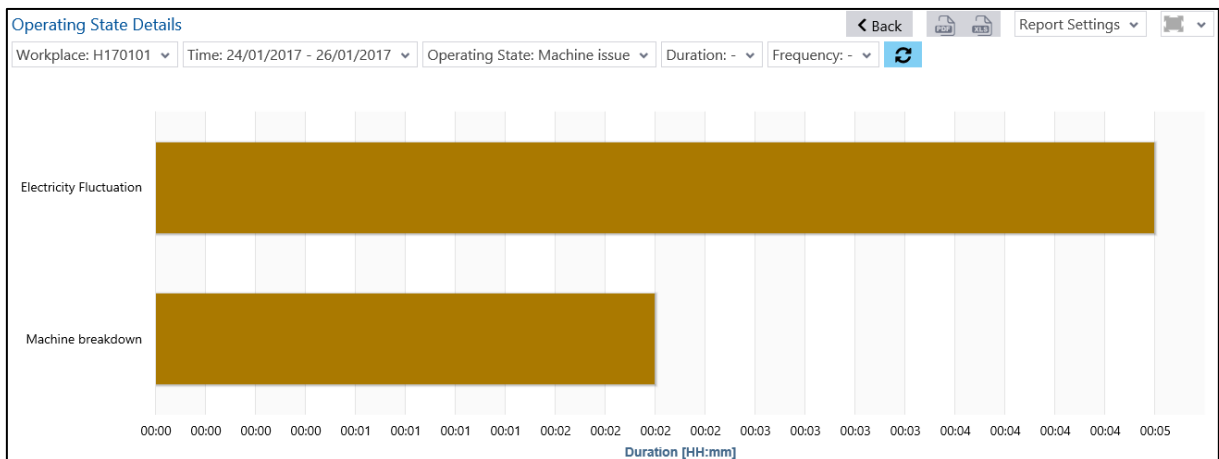
Fig. 61: Hitlist Operating States Level 2 (Workplace) as a bar chart

Code (2)	Details (2)	Frequency	Frequency [%]	Duration	Duration [%]	Duration [%absolute]
M231	Machine breakdown	3	75%	00:02	33.35%	0.26%
M232	Electricity Fluctuation	1	25%	00:04	66.65%	0.52%
		4	100%	00:07	100%	0.78%

Fig. 62: Hitlist Operating States Level 2 (Workplace) as a table
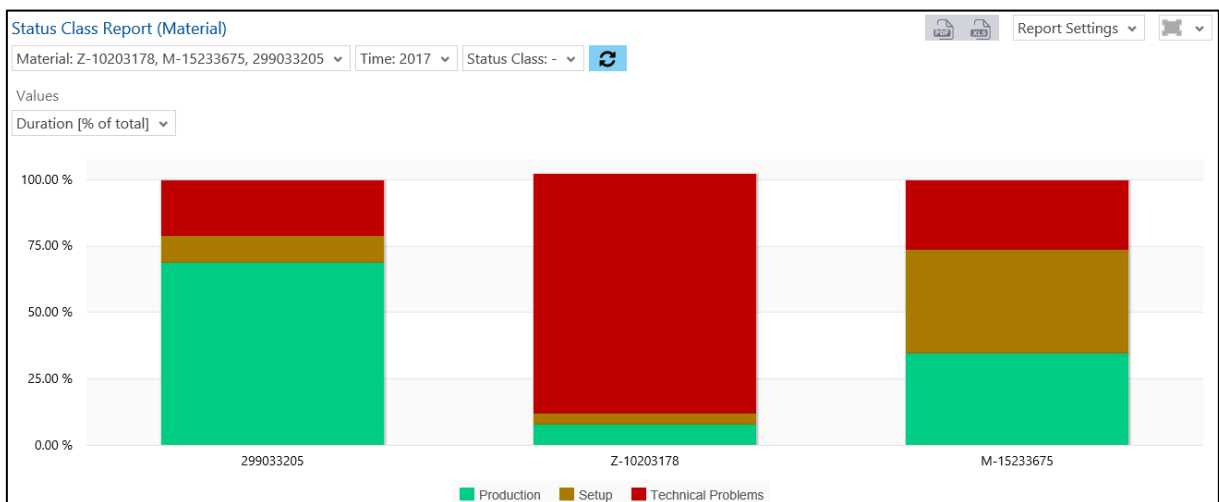
3.5.3 Material

3.5.3.1 Operating State Class Report (Material)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Material > Operating State Class Report (Material)

✔ Status classes are configured.

Multi-report showing status classes for *one* or *more* materials for a period:

– Operating State Class Report (Material) as a column chart (Fig. 63):
Shows the durations of status classes proportionately in columns. Each column represents the duration for a selected material. The duration may be shown as a percentage (of the total value) or in minutes, depending on the value filter selected.

– Operating State Class Report (Material) as a table (Fig. 64):
A table listing the status classes. The duration is shown as a percentage (of the total value) or in minutes. The columns relate to materials. The value filter does not have an effect on this table.

Fig. 63: Operating State Class Report (Material) as a column chart

State Class	299033205 Duration	299033205 Duration [% of total]	M-15233675 Duration	M-15233675 Duration [% of total]	Z-10203178 Duration	Z-10203178 Duration [% of total]
Production	03:20	68.83%	00:40	34.81%	00:48	7.98%
Setup	00:30	10.31%	00:45	39.11%	00:25	4.15%
Technical Problems	01:00	20.86%	00:30	26.08%	09:05	90.36%
∑	04:50	100%	01:55	100%	10:18	102.49%

Fig. 64: Operating State Class Report (Material) as a table

The following filters are available:

– Material (multiple)
– Time (day, week, month, quarter, year)
– Status class (multiple)
If a status class is selected in the filter, the report shows only data for this class.

You can display a drill-down to Operating State Report (Material) by left-clicking on a bar graph.
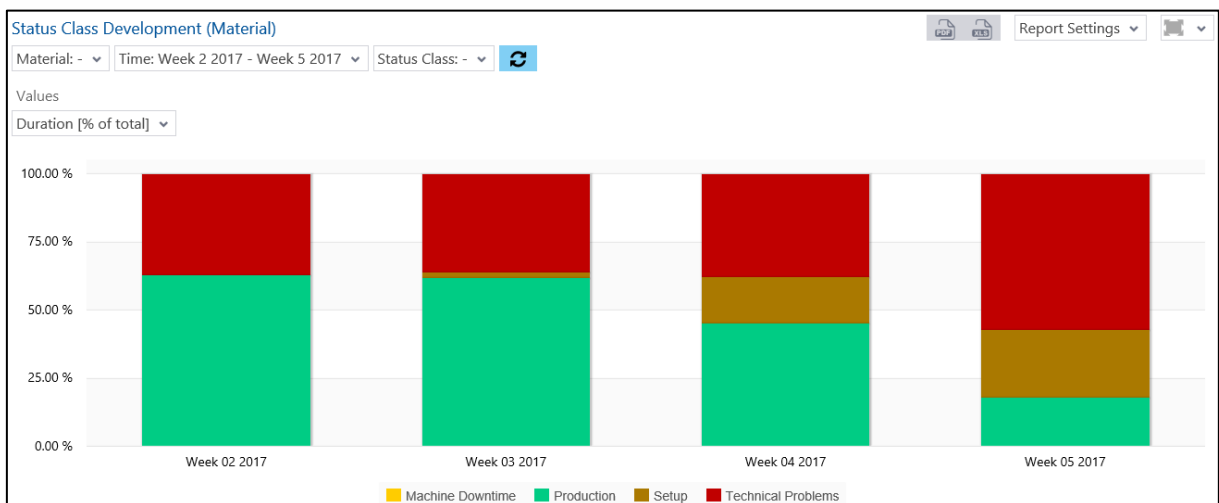
3.5.3.2 Operating State Class Development (Material)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Material > Operating State Class Development (Material)

✓ Status classes are configured.

Multi-report showing the development of status classes over time for *one* or *more* materials for a selected period:

- Operating State Class Development (Material) as a column chart:
  Shows the durations of status classes proportionately in columns. Each column represents the duration for a selected material. The duration may be shown as a percentage (of the total value) or in minutes, depending on the value filter selected. The data reflect all selected materials.

- Operating State Class Development (Material) as a table:
  A table listing the status classes. The duration is shown as a percentage (of the total value) or in minutes. The data reflect all selected materials. The columns relate to selected periods (e.g. month, calendar week, etc.). The value filter does not have an effect on this table.

Fig. 65: Operating State Class Development (Material) as a column chart

State Class	Week 02 2017		Week 03 2017		Week 04 2017		Week 05 2017	
	Duration	Duration [% of total]	Duration	Duration [% of total]	Duration	Duration [% of total]	Duration	Duration [% of total]
Production	262:24	62.84%	255:32	61.85%	208:48	45.39%	57:25	17.9%
Setup	00:30	0.12%	08:38	2.09%	76:50	16.7%	80:04	24.97%
Technical Problems	154:39	37.04%	149:13	36.12%	174:09	37.86%	183:15	57.13%
Machine Downtime							00:25	0.13%
∑	417:34	100%	413:24	100.06%	459:48	99.96%	321:10	100.13%

Fig. 66: Operating State Class Development (Material) as a table

The following filters are available:

- Material (multiple)
- Time (day, week, month, quarter, year)
- Status class (multiple)
  If a status class is selected in the filter, the report shows only data for this class.
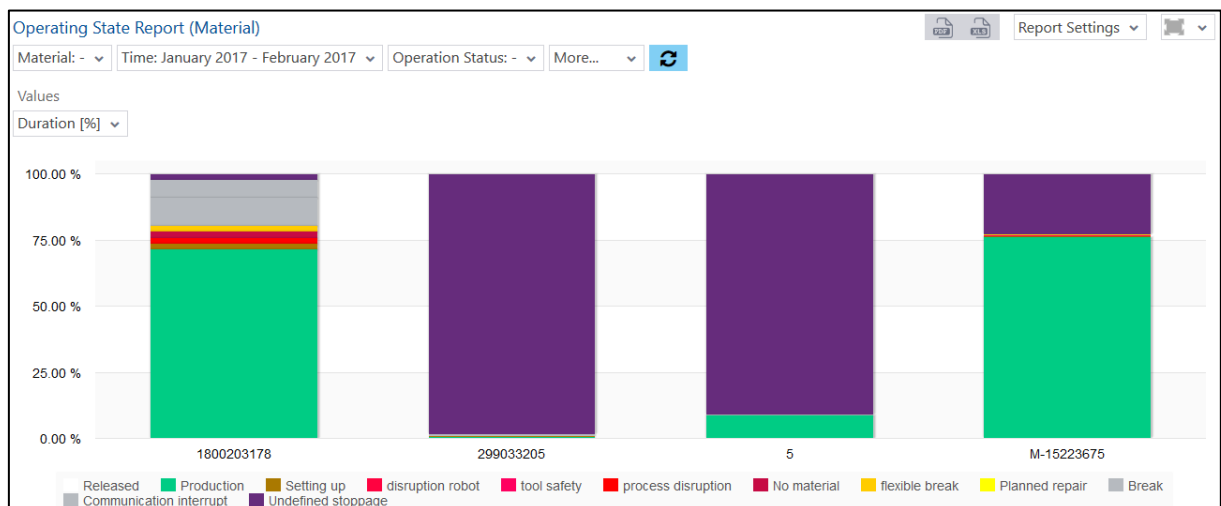
You can display a drill-down to Operating State Development (Material) by left-clicking on a bar graph.

3.5.3.3 Operating State Report (Material)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Material > Operating State Report (Material)

Multi-report showing the (proportionate) duration of operating states for *one* or *more* materials for a period:

- Operating State Report (Material) as a column chart (Fig. 67):
  Operating states shown as columns for each material. Each column shows operating states as a share of the total usage time.
- Operating State Report (Material) as a table (Fig. 68):
  Lists operating states and detailed information about duration for each material with proportionate duration, average and sum.

Fig. 67: Operating State Report (Material) as a column chart

Operating State	1800203178 Duration (HH:mm)	Duration [%]	299033205 Duration (HH:mm)	Duration [%]	5 Duration (HH:mm)	Duration [%]	M-15223675 Duration (HH:mm)	Duration [%]	Total Ø Duration (HH:mm)	Total Σ Duration (HH:mm)	
Released	00:00	0%	00:03	0.01%			02:40	0.21%	00:40	02:43	
Setting up	00:10	2.17%	00:33	0.13%			05:00	0.4%	01:25	05:43	
Production	05:30	71.74%	03:20	0.78%	49:44	8.96%	950:42	76.07%	252:19	1009:17	
Break	00:50	10.88%	02:44	0.64%	02:15	0.41%	00:15	0.02%	01:31	06:04	
Undefined stoppage	00:09	2.16%	421:46	98.32%	503:23	90.64%	283:05	22.65%	302:06	1208:26	
Communication interrupt	00:30	6.52%							00:07	00:30	
No material	00:10	2.17%					02:40	0.21%	00:42	02:50	

Fig. 68: Operating State Report (Material) as a table

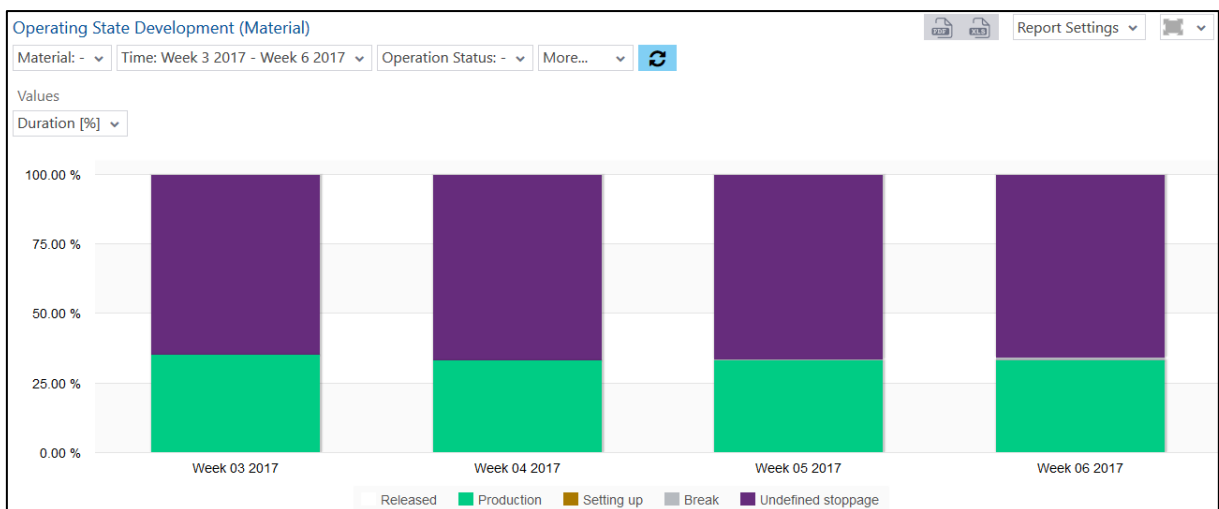The following filters are available:

- Time (day, week, month, quarter, year)
- Material (multiple)
- Operation status

3.5.3.4 Operating State Development (Material)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Material > Operating State Development (Material)

Multi-report showing the development of operating states for *one* or *more* materials for a period:

‒ Operating State Development (Material) as a column chart (Fig. 69):
Operating states shown as columns for each period selected. Each column represents the development of the operating states of selected materials for the selected period.

‒ Operating State Development (Material) as a table (Fig. 70):
Lists operating states and detailed information about duration for the selected period with proportionate duration, sum and average. The data relate to all materials selected.

Fig. 69: Operating State Development (Material) as a column chart

Operating State	Week 03 2017 Duration (HH:mm)	Duration [%]	Week 04 2017 Duration (HH:mm)	Duration [%]	Week 05 2017 Duration (HH:mm)	Duration [%]	Week 06 2017 Duration (HH:mm)	Duration [%]	Total ∑ Duration (HH:mm)	Total Ø Duration (HH:mm)	Total Durati
Released	00:03	0.01%							00:03	00:00	0%
Setting up	00:05	0.02%							00:05	00:01	0.01%
Production	152:21	35.27%	112:00	33.33%	144:00	33.33%	80:00	33.33%	488:21	122:05	33.91
Break	00:45	0.17%			02:00	0.46%	02:00	0.83%	04:45	01:11	0.33%
Undefined stoppage	278:46	64.53%	224:00	66.67%	286:00	66.2%	158:00	65.83%	946:46	236:41	65.75
∑	432:01	100%	336:00	100%	432:00	100%	240:00	100%	1440:01	360:00	100%

Fig. 70: Operating State Development (Material) as a table

The following filters are available:

‒ Time (day, week, month, quarter, year)

‒ Material (multiple)

‒ Operation status

3.5.3.5 Hitlist Operating States (Material)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Material > Hitlist Operating States (Material)

Multi-report with operating states and detailed information about duration and frequency for *one* or more materials for the selected period:

- Hitlist Operating States (Material) as a bar chart (Fig. 71):
  Shows operating states and their total duration in a bar chart. The operating states relate to all materials selected.
- Hitlist Operating States (Material) as a table (Fig. 72):
  Lists operating states for each material with duration and frequency for the selected period. Share of frequency in the total frequency of all operating states.
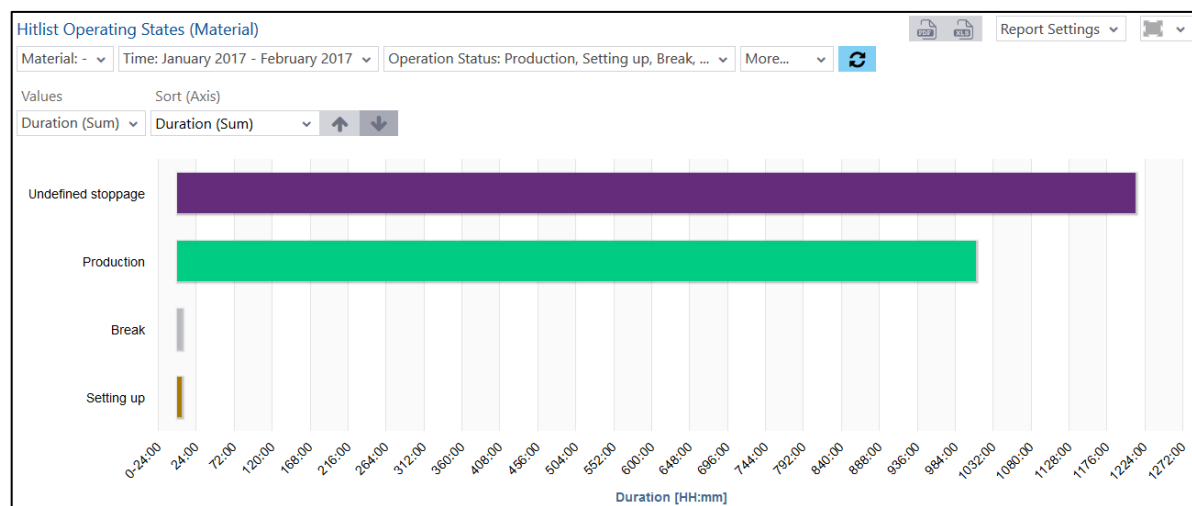
Fig. 71: Hitlist Operating States (Material) as a bar chart

Material	Material Description	Code	Operating State	Frequency	Frequency [%]	Duration (HH:mm)	Duration [%]	Duration [% absolute]	Duration [Ø] (HH:mm)
299033205	Rear Flap	999	Undefined stoppage	13	7.83%	423:44	18.96%	18.85%	32:35
299033205	Rear Flap	000	Production	2	1.2%	03:20	0.15%	0.15%	01:40
299033205	Rear Flap	993	Break	10	6.02%	02:44	0.12%	0.12%	00:16
299033205	Rear Flap	020	Setting up	3	1.81%	00:33	0.02%	0.02%	00:11
1800203178	Verstellhuelse L=82,5	000	Production	4	2.41%	05:30	0.25%	0.24%	01:22
1800203178	Verstellhuelse L=82,5	993	Break	1	0.6%	00:50	0.04%	0.04%	00:50
1800203178	Verstellhuelse L=82,5	020	Setting up	1	0.6%	00:10	0.01%	0.01%	00:10

Fig. 72: Hitlist Operating States (Material) as a table

The following filters are available:

- Time (day, week, month, quarter, year)
- Material (multiple)
- Operation status (multiple)
- Duration (equal to, less than or equal to, greater than or equal to)
  If a duration is entered, only operating states with a matching duration are displayed (e.g. all operating states with a duration >45 hours).
- Frequency (equal to, greater than or equal to)
  If a frequency is entered, only operating states with a matching frequency are displayed (e.g. all operating states with a frequency >=12).

ⓘ The frequency is a shift-related factor; an operating state active across two shifts is therefore considered twice here.

You can display the following drill-down by clicking on an operating state (right-click in table, left-click on bar graph):

  − Hitlist Operating State Details Level 2 (Material):
    Details of the selected operating state displayed either in a table or in a bar chart:
      o Operating State Details (Material) as a table (Fig. 73):
        Only the operating state selected is displayed in a table. Each row refers to one material.
        Frequency: Frequency of the operating state in connection with the specific material.
        Frequency [%]: Share of frequency in the total frequency of the selected operating state.
        Duration (HH:mm): Total duration of the operating state in connection with the specific material.
        Duration [%]: Share of duration in the total duration of the selected operating state.
        Duration [% absolute]: Share of duration in the total duration of all operating states.
      o Operating State Details (Material) as a bar chart (Fig. 74):
        Shows the selected operating state in a bar chart with the total duration collected from all materials where this state occurs.

ⓘ A drill-down is only possible for malfunction codes (e.g. **Undefined stoppage** or **No connection**, etc.) but not for **Production** or **Setup**.

Code (2) ▲	Details (2)	Frequency	Frequency [%]	Duration	Duration [%]	Duration [%absolute]	☰
M231	Machine breakdown	3	75%	00:02	33.35%	0.26%	
M232	Electricity Fluctuation	1	25%	00:04	66.65%	0.52%	
		4	100%	00:07	100%	0.78%	

Fig. 73: Hitlist Operating States Level 2 (Material) as a table
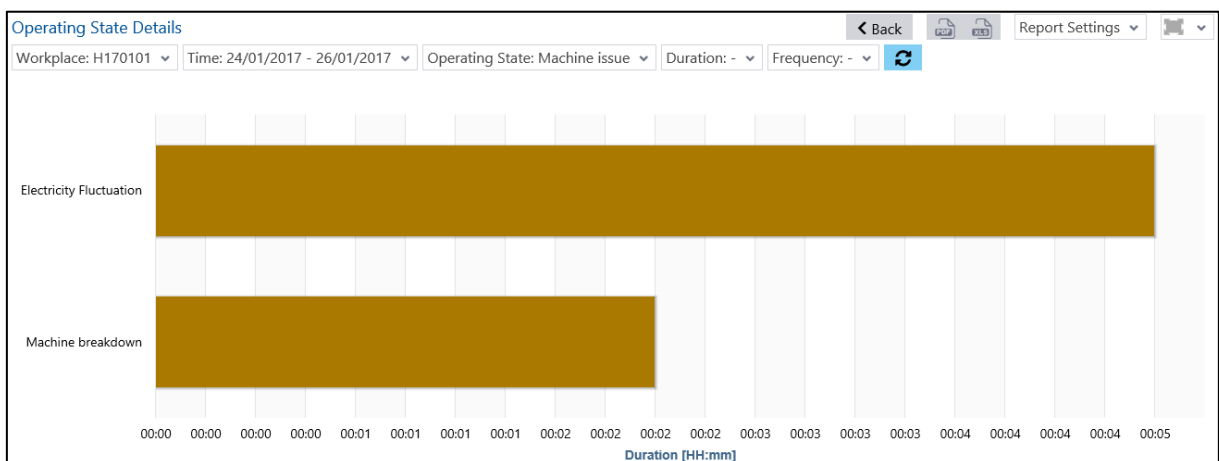
Fig. 74: Hitlist Operating States Level 2 (Material) as a bar chart

3.5.4 Order

3.5.4.1 Operating State Class Report (Order)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Order > Operating State Class Report (Order)

✔ Status classes are configured.

Multi-report showing status classes for *one* or *more* orders for a period:
- Operating State Class Report (Order) as a column chart (Fig. 75):
  Shows the durations of status classes proportionately in columns. Each column represents the duration for a selected order. The duration may be shown as a percentage (of the total value) or in minutes, depending on the value filter selected.
- Operating State Class Report (Order) as a table (Fig. 76):
  A table listing the status classes. The duration is shown as a percentage (of the total value) or in minutes. The columns relate to orders. The value filter does not influence this table.
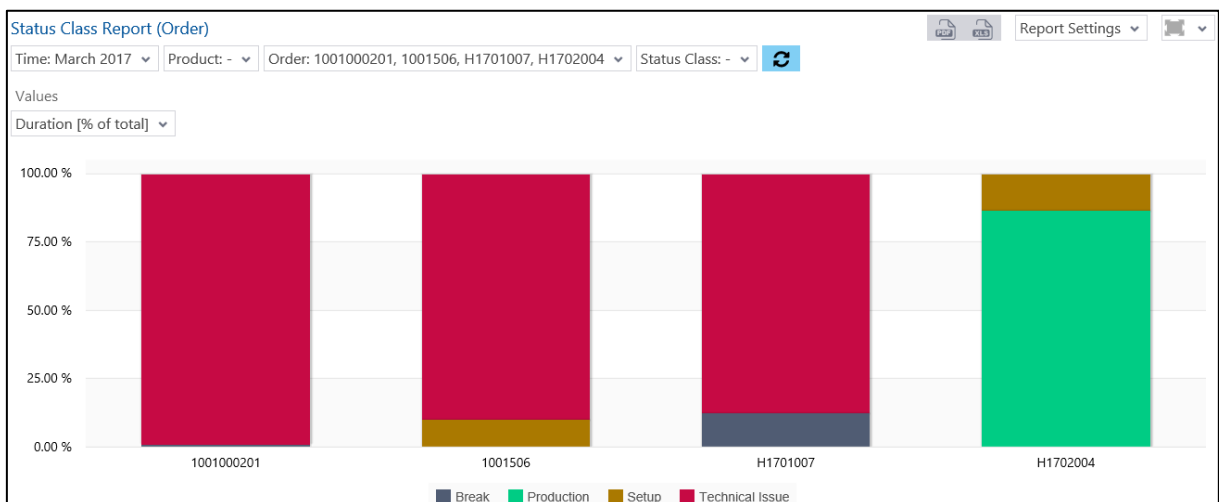
Fig. 75: Operating State Class Report (Order) as a column chart

State Class	1001000201 Duration	1001000201 Duration [% of total]	1001506 Duration	1001506 Duration [% of total]	H1701007 Duration	H1701007 Duration [% of total]	H1702004 Duration	H1702004 Duration [% of total]
Technical Issue	150:15	98.85%	00:01	89.87%	63:00	87.5%		
Break	01:45	1.15%			09:00	12.5%	00:02	0.08%
Setup			00:00	10.13%			08:00	13.24%
Production							52:21	86.68%
∑	152:00	100%	00:02	100%	72:00	100%	60:24	100%

Fig. 76: Operating State Class Report (Order) as a table

The following filters are available:
- Time (day, week, month, quarter, year)
- Product (multiple)
- Order (multiple)
- Status class (multiple)
  If a status class is selected in the filter, the report shows only data for this class.

You can display a drill-down to Operating State Report (Order) by left-clicking on a bar graph.

3.5.4.2   Operating State Report (Order)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Order > Operating State Report (Order)

Multi-report showing the (proportionate) duration of operating states for *one* or *more* orders for a period:
- Operating State Report (Order) as a column chart (Fig. 77):
  Operating states shown as columns for each order. Each column shows operating states as a share of the total usage time.
- Operating State Report (Order) as a table (Fig. 78):
  Lists operating states and detailed information about duration for each order with proportionate duration, average and sum.
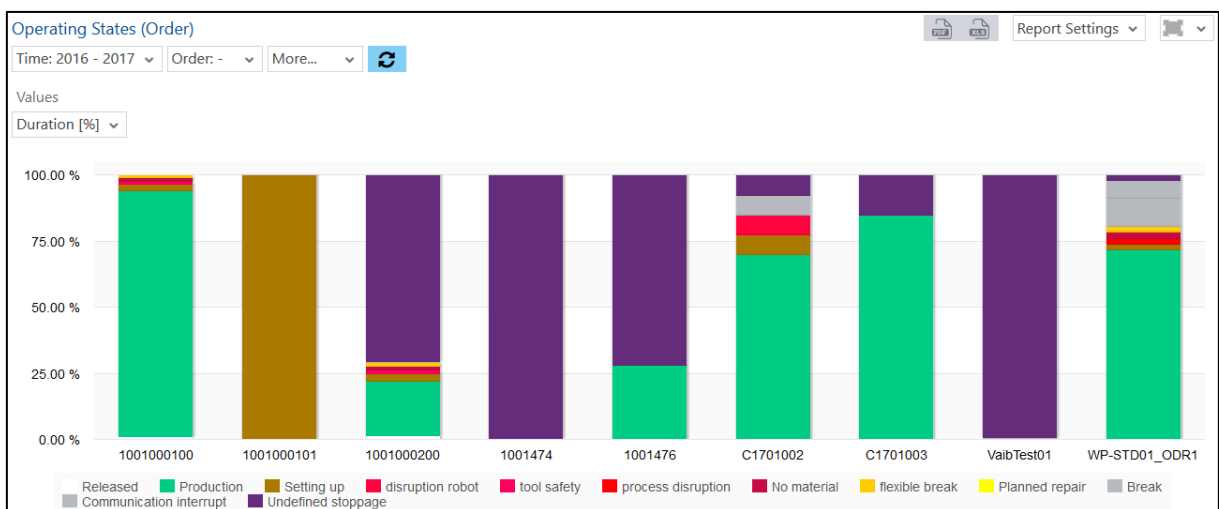
Fig. 77: Operating State Report (Order) as a column chart

Operating State	1001000100		1001000101		1001000200		1001474		1001476		C1701
	Duration (HH:mm)	Duration [%]	Duration (HH:mm)	Duration [%]	Duration (HH:mm)	Duration [%]	Duration (HH:mm)	Duration [%]	Duration (HH:mm)	Duration [%]	Durati
Break					00:15	0.06%	02:00	0.52%	00:15	0.15%	00:29
Communication interrupt											
No material	15:40	1.19%			06:40	1.52%					
Planned repair	01:00	0.08%									
Production	1225:05	92.81%			90:05	20.47%			46:54	27.91%	04:40

Fig. 78: Operating State Report (Order) as a table

The following filters are available:

- Order (multiple)
- Time (empty, day, week, month, quarter, year)

3.5.4.3 Hitlist Operating States (Order)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Order > Hitlist Operating States (Order)

Multi-report with operating states and detailed information about duration and frequency for *one* or *more* orders for the selected period:

- Hitlist Operating States (Order) as a bar chart (Fig. 79):
  Shows selected operating states and their total duration in a bar chart. The operating states relate to all orders selected.
- Hitlist Operating States (Order) as a table (Fig. 80):
  Lists selected operating states for each order with duration and frequency for the selected period. Share of frequency in the total frequency of all operating states.
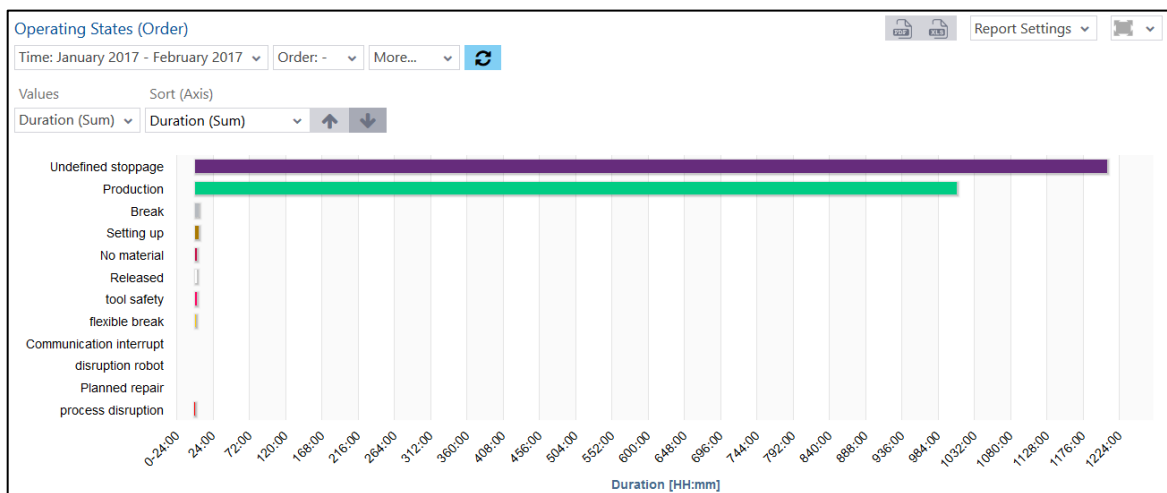
Fig. 79: Hitlist Operating States (Order) as a bar chart

Order	Code	Operating State	Frequency	Frequency [%]	Duration (HH:mm)	Duration [%]	Duration [% absolute]	Duration [Ø] (HH:mm)
1001000200	999	Undefined stoppage	23	9.54%	283:05	12.63%	12.63%	12:18
1001000200	000	Production	28	11.62%	09:00	0.4%	0.4%	00:19
1001000200	020	Setting up	4	1.66%	00:58	0.04%	0.04%	00:14
1001000200	180	tool safety	4	1.66%	00:40	0.03%	0.03%	00:10
1001000200	-	Released	4	1.66%	00:40	0.03%	0.03%	00:10
1001000200	22	No material	4	1.66%	00:40	0.03%	0.03%	00:10
1001000200	295	flexible break	4	1.66%	00:40	0.03%	0.03%	00:10

Fig. 80: Hitlist Operating States (Order) as a table

The following filters are available:
  – Order (multiple)
  – Time (day, week, month, quarter, year)
  – Frequency (equal to, greater than or equal to)
    If a frequency is entered, only operating states with a matching frequency are displayed (e.g. all operating states with a frequency >=2).
  – Duration (equal to, less than or equal to, greater than or equal to)
    If a duration is entered, only operating states with a matching duration are displayed (e.g. all operating states with a duration >5 minutes).

ⓘ The frequency is a shift-related factor; an operating state active across two shifts is therefore considered twice here.

3.5.5 Operation

3.5.5.1 Operating State Class Report (Operation)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Operation > Operating State Class Report (Operation)

✔ Status classes are configured.

Multi-report showing status classes for *one* or *more* operations for a period:
  – Operating State Class Report (Operation) as a column chart (Fig. 81):
    Shows the durations of status classes proportionately in columns. Each column represents the duration for a selected operation. The duration may be shown as a percentage (of the total value) or in minutes, depending on the value filter selected.
  – Operating State Class Report (Operation) as a table (Fig. 82):
    A table listing the status classes. The duration is shown as a percentage (of the total value) or in minutes. The columns relate to operations. The value filter does not influence this table.
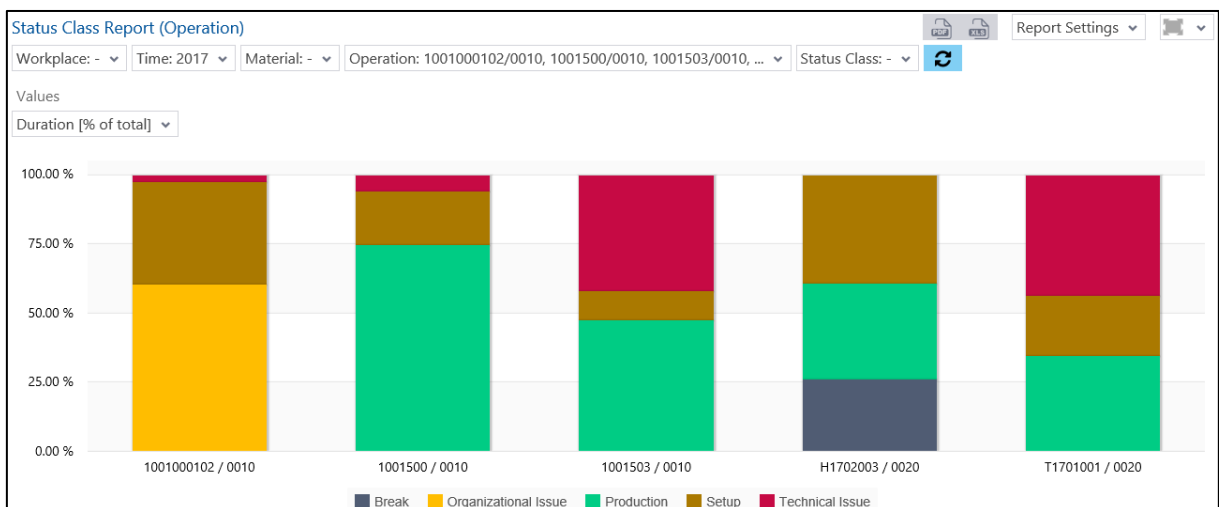
Fig. 81: Operating State Class Report (Operation) as a column chart

Status Class	1001000102 / 0010		1001500 / 0010		1001503 / 0010		H1702003 / 0020		T1701001 / 0020	
	Duration	Duration [% of total]	Duration	Duration [% of total]	Duration	Duration [% of total]	Duration	Duration [% of total]	Duration	D
Setup	00:01	36.93%	00:01	19.46%	00:00	10.44%	00:45	39.11%	00:25	2
Technical Issue	00:00	2.59%	00:00	5.91%	00:03	41.83%	00:00	0%	00:50	4
Organizational Issue	00:02	60.48%								
Production			00:04	74.63%	00:04	47.73%	00:40	34.81%	00:40	3
Break							00:30	26.08%		
∑	00:03	100%	00:06	100%	00:09	100%	01:55	100%	01:55	1

Fig. 82: Operating State Class Report (Operation) as a table

The following filters are available:
- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Material (multiple)
- Operation (multiple)
- Status class (multiple)
  If a status class is selected in the filter, the report shows only data for this class.

You can display a drill-down to Operating State Report (Operation) by left-clicking on a bar graph.

3.5.5.2 Operating State Report (Operation)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Operation > Operating State Report (Operation)

Multi-report with (proportionate) duration of operating states for operations:
- Operating State Report (Operation) as a column chart (Fig. 83):
  Operating states shown as columns for each operation. Each column shows operating states as a share of the total usage time.
- Operating State Report (Operation) as a table (Fig. 84):
  Lists operating states and detailed information about duration for each operation with proportionate duration, sum and average
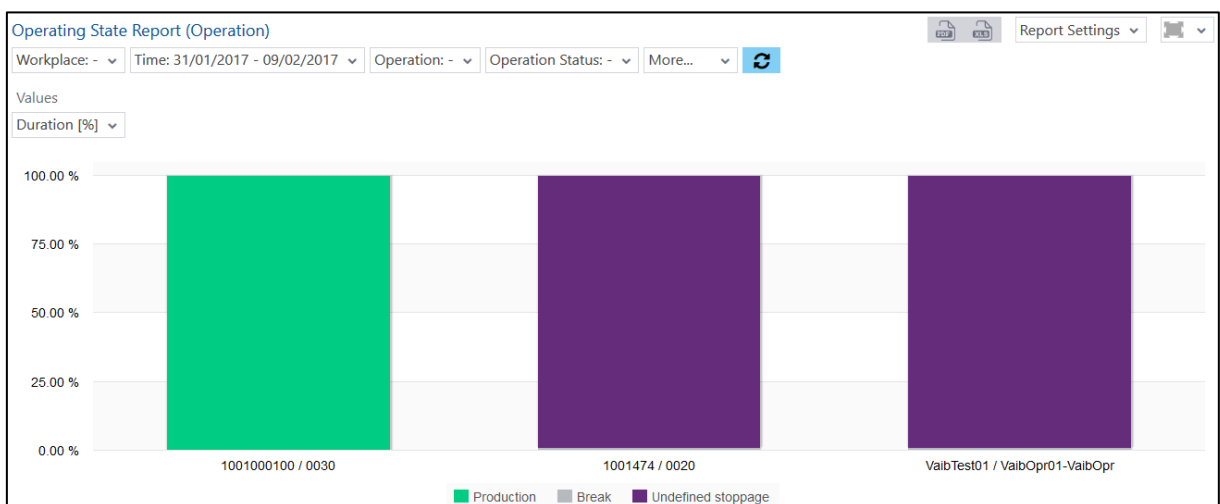
Fig. 83: Operating State Report (Operation) as a column chart

	1001000100 / 0030		1001474 / 0020		VaibTest01 / VaibOpr01-VaibOpr		Total ∑	Total ∅	Total %
Operating State	Duration (HH:mm)	Duration [%]	Duration (HH:mm)	Duration [%]	Duration (HH:mm)	Duration [%]	Duration (HH:mm)	Duration (HH:mm)	Duration
Production	208:00	100%					208:00	69:20	33.33%
Break			02:00	0.96%	02:00	0.96%	04:00	01:20	0.64%
Undefined stoppage			206:00	99.04%	206:00	99.04%	412:00	137:20	66.03%
∑	208:00	100%	208:00	100%	208:00	100%	624:00	208:00	100%

Fig. 84: Operating State Report (Operation) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Operation (multiple)
- Operation status

ⓘ The selected workplace restricts the operations that can be selected.

3.5.5.3 Hitlist Operating States (Operation)

Path: Performance Analysis > Reporting > Reports > Availability Analysis > Operation > Hitlist Operating States (Operation)

Multi-report with operating states and detailed information about duration and frequency for *one* or *more* operations for the selected period:

- Hitlist Operating States (Operation) as a bar chart (Fig. 85):
  Shows selected operating states and their total duration in a bar chart. The operating states relate to all operations selected.
- Hitlist Operating States (Operation) as a table (Fig. 86):
  Lists selected operating states for each operation with duration and frequency for the selected period. Share of frequency in the total frequency of all operating states.
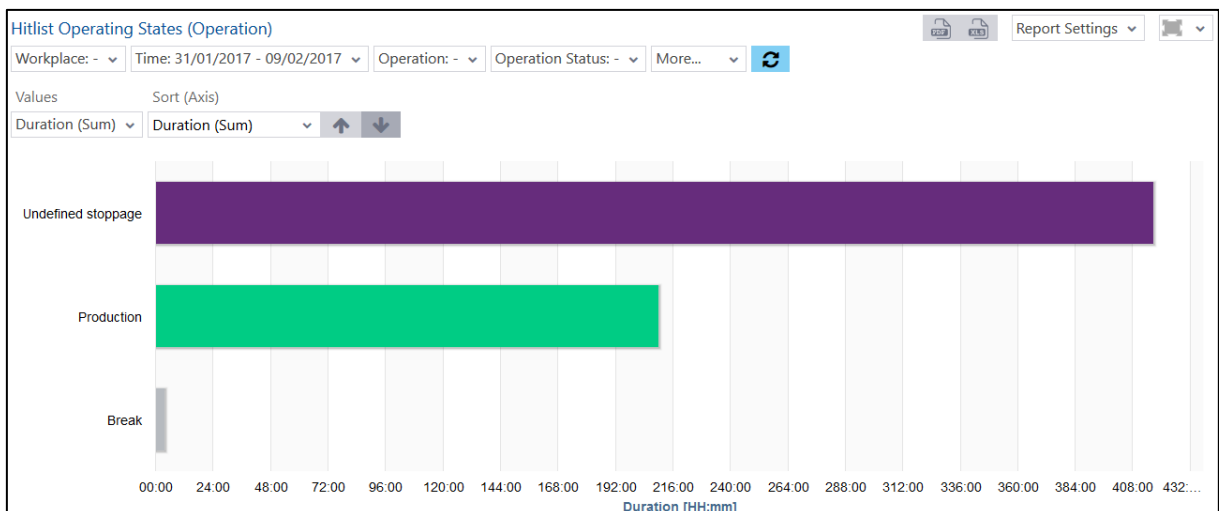
Fig. 85: Hitlist Operating States (Operation) as a bar chart

Order	Operation	Code	Operating State	Frequency	Frequency [%]	Duration (HH:mm)	Duration [%]	Duration [% absolute]	Duration [Ø] (HH:mm
1001000100	0030	000	Production	1	2.86%	210:21	33.33%	33.33%	210:21
1001474	0020	999	Undefined stoppage	9	25.71%	208:21	33.02%	33.02%	23:09
1001474	0020	993	Break	8	22.86%	02:00	0.32%	0.32%	00:15
VaibTest01	VaibOpr01-VaibOpr	999	Undefined stoppage	9	25.71%	208:21	33.02%	33.02%	23:09
VaibTest01	VaibOpr01-VaibOpr	993	Break	8	22.86%	02:00	0.32%	0.32%	00:15
				35	100%	631:05	100%	100%	257:09

Fig. 86: Hitlist Operating States (Operation) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Operation (multiple)
 The workplaces selected determine which operations are available.
- Operation status (multiple)
  The operations available determine which operation states are available.
- Duration (equal to, less than or equal to, greater than or equal to)
  If a duration is entered, only operating states with a matching duration are displayed (e.g. all operating states with a duration >5 minutes).
- Frequency (equal to, greater than or equal to)
  If a frequency is entered, only operating states with a matching frequency are displayed (e.g. all operating states with a frequency >=2).

ⓘ The frequency is a shift-related factor; an operating state active across two shifts is therefore considered twice here.

You can display the following drill-down by clicking on an operating state (right-click in table, left-click on bar graph):

- Hitlist Operating State Details Level 2 (Operation):
  Details of the selected operating state displayed either in a table or in a bar chart:
  o Operating State Details (Operation) as a table (Fig. 87):
  Only the operating state selected is displayed in a table. Each row refers to one operation.
  Frequency: The frequency of the operating state at the specific workplace.
  Frequency [%]: Share of frequency in the total frequency of the selected operating state.
  Duration (HH:mm): Total duration of the operating state for each workplace.
  Duration [%]: Share of duration in the total duration of the selected operating state.
  Duration [% absolute]: Share of duration in the total duration of all operating states.
  o Operating State Details (Operation) as a bar chart (Fig. 88):
  Shows the selected operating state in a bar chart with the total duration collected from all operations where this state occurs.

ⓘ A drill-down is only possible for malfunction codes (e.g. **Undefined stoppage** or **No connection**, etc.) but not for **Production** or **Setup**.

Code (2) ▲	Details (2)	Frequency	Frequency [%]	Duration (HH:mm)	Duration [%]	Duration [%absolute]	≡
M231	Machine breakdown	3	75%	00:02	33.35%	2.32%	
M232	Electricity Fluctuation	1	25%	00:04	66.65%	4.64%	
		4	100%	00:07	100%	6.97%	

Fig. 87: Operating State Details (Operation) as a table
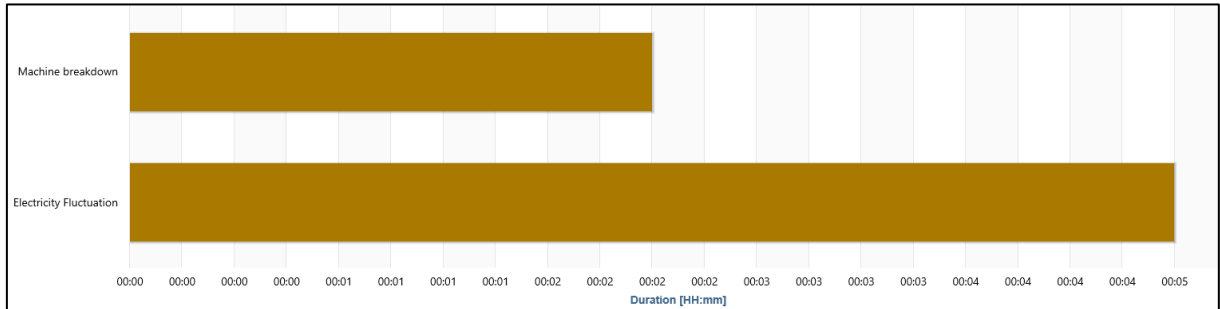
Fig. 88: Operating State Details (Operation) as a bar chart

3.6 Performance Rate Analysis

The following reports address hits, i.e. machine strokes.
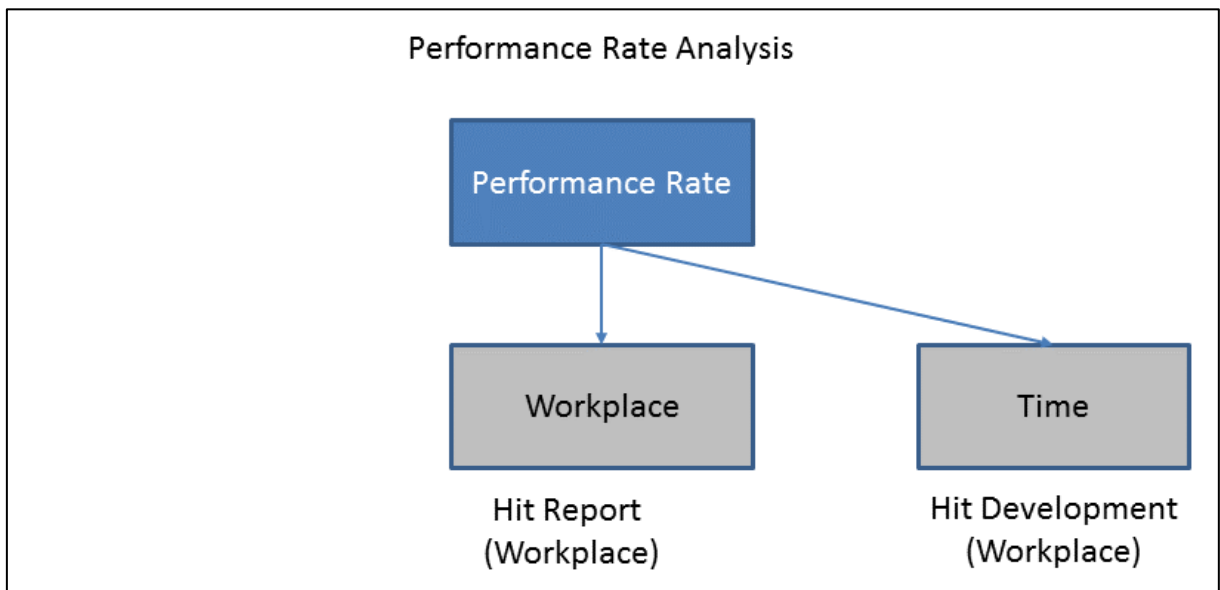
Fig. 89: Components of the performance rate analysis

3.6.1 Workplace

3.6.1.1 Hit Report (Workplace)

Path: Performance Analysis > Reporting > Reports > Performance Rate Analysis > Workplace > Hit Report (Workplace)

Multi-report showing the total number of hits for *one* or *more* workplaces for the selected period:

- Hit Report (Workplace) as a bar chart (Fig. 90):
  Displays the total number of hits for each workplace in columns.
- Hit Report (Workplace) as a table (Fig. 91):
  Total number of hits per workplace. Each column shows the number for one workplace.
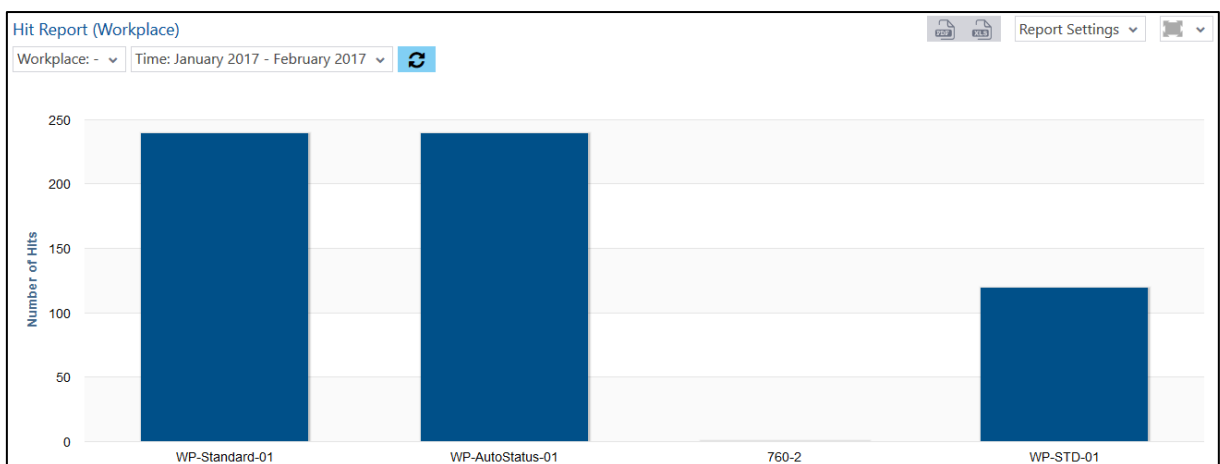
Fig. 90: Hit Report (Workplace) as a bar chart

Workplace	WP-Standard-01	WP-AutoStatus-01	760-2	WP-STD-01
Number of Hits	240	240	1	120

Fig. 91: Hit Report (Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)

3.6.1.2 Hit Development (Workplace)

Path: Performance Analysis > Reporting > Reports > Performance Rate Analysis > Workplace > Hit Development (Workplace)

Multi-report showing the development of the number of hits over time. Total number of hits for *one* or *more* workplaces for the selected period:

- Hit Development (Workplace) as a column chart (Fig. 92):
  Total number of hits shown as columns. Each column shows the number for a period (e.g. month). The number relates to the workplaces selected.
- Hit Development (Workplace) as a table (Fig. 93):
  Total number of hits over the selected period. Each column shows the number for a period (e.g. calendar week). The number relates to the workplaces selected.
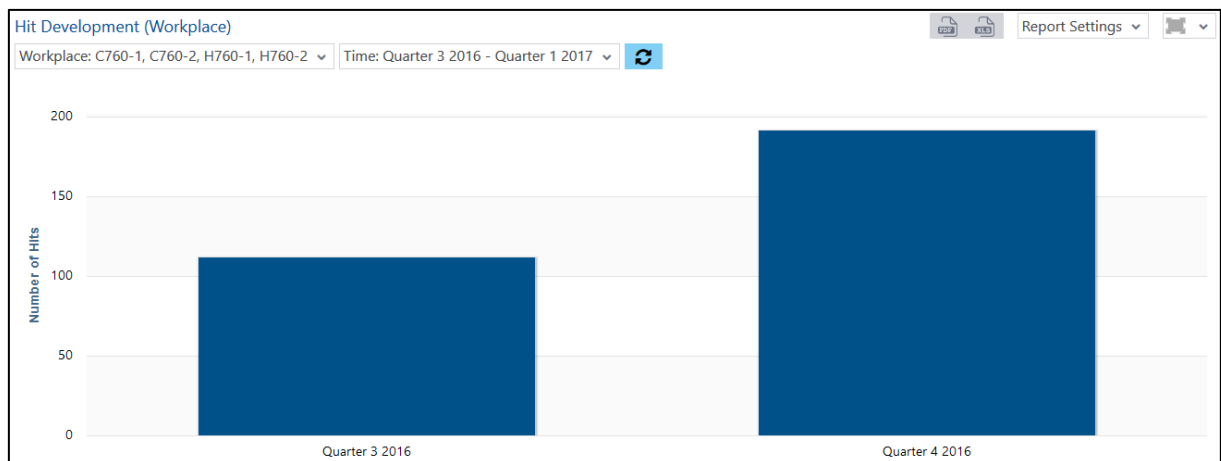
Fig. 92: Hit Development (Workplace) as a column chart

Period of Time	2016/04	2016/04	2016/03	2016/04	2016/03
Number of Hits	60	120	2	12	110

Fig. 93: Hit Development (Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)

3.6.2 Operation

3.6.2.1 Performance Report (Operation)

Path: Performance Analysis > Reporting > Reports > Performance Rate Analysis > Operation > Performance Report (Operation)

Multi-report showing the performance rate for *one* or *more* operations for the selected period:
- Performance Report (Operation) as a column chart (Fig. 94):
  Shows the performance rate percentage for each selected operation in a column
- Performance Report (Operation) as a table (Fig. 95):
  Shows operations and the performance rate percentage including quantity and time values in table format.
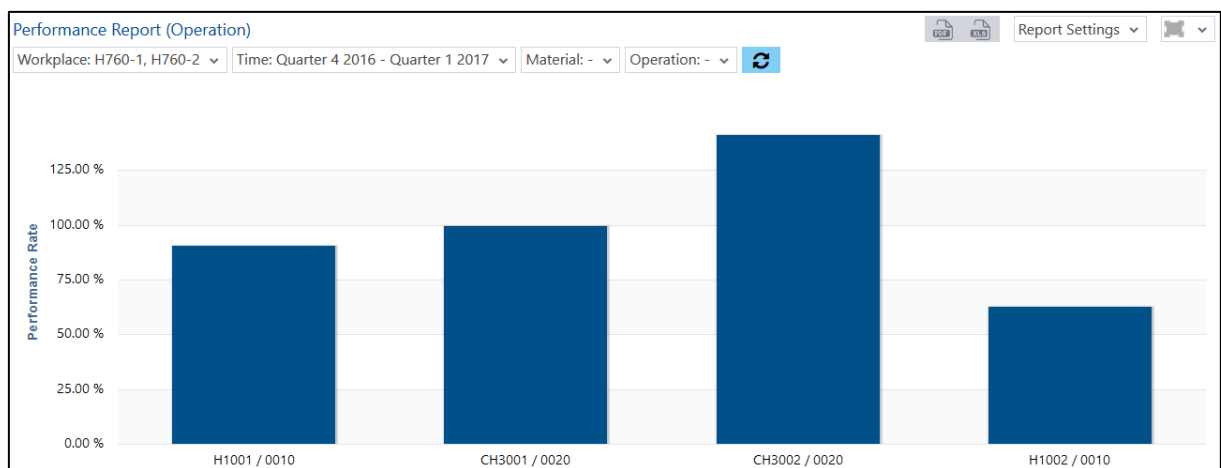
Fig. 94: Performance Report (Operation) as a column chart

Order / Operation	CH3001 / 0020	CH3002 / 0020	H1001 / 0010	H1002 / 0010
Material	4	4	4	4
Unit	ST	ST	ST	ST
Performance Rate	99.92%	141.54%	90.59%	63.1%
Target Quantity	10	100	100	10
Total Quantity	10	110	2	12
Yield Qty.	10	100	2	12
Target Time per Unit	00:05:00	00:06:00	00:05:00	00:02:00
Time per Unit	00:05:00	00:04:14	00:05:31	00:03:10
Production	00:50:02	07:46:18	00:11:02	00:38:02
Actual/Target Deviation (Time per Unit)	00:00:00	-00:01:45	00:00:31	00:01:10
Actual to Target Time per Unit [%]	0.08%	-29.35%	10.39%	58.48%

Fig. 95: Performance Report (Operation) as a table

The following filters are available:
- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Operation (multiple)
- Material (multiple)

3.7 Quality Analysis

The following reports provide condensed information about quantities produced.
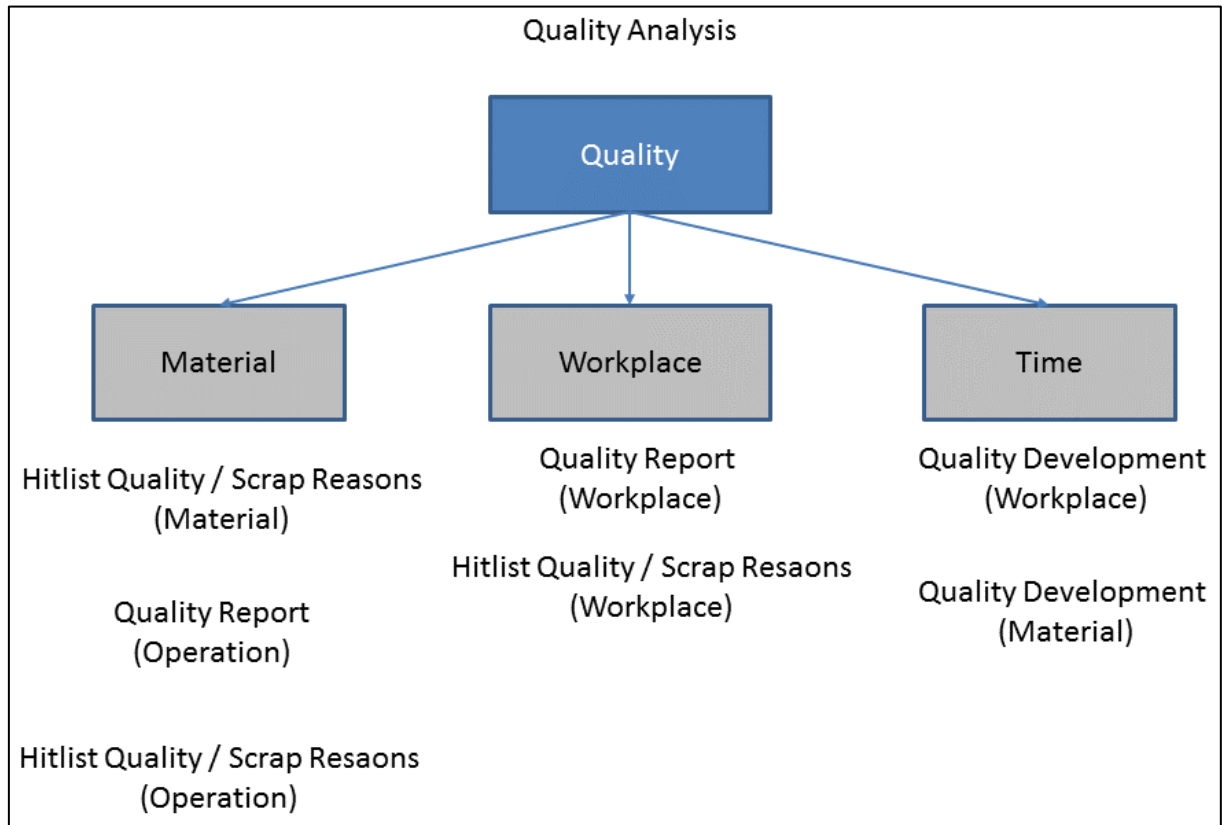
Fig. 96: Components of quality analysis

3.7.1 Workplace

3.7.1.1 Quality Report (Workplace)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Workplace > Quality Report (Workplace)

Multi-report showing quantities produced. Quality types and details for *one* or *more* workplaces for the selected period:

- Quality Report (Workplace) as a column chart (Fig. 97):
  Quality types with percentage for each workplace in columns
- Quality Report (Workplace) as a table (Fig. 98):
  Quality types with precise number and percentage for each workplace as a table

Fig. 97: Quality Report (Workplace) as a column chart

Quality Type	760-1 Quantity	760-1 Quantity (%)	760-2 Quantity	760-2 Quantity (%)	A760-1 Quantity	A760-1 Quantity (%)	C760-1 Quantity	C760-1 Quantity (%)	H760-1 Quantity	H760-1 Quantity (%)	Total ∑ Quantity	Total % Quantity
Yield quantity	111	86.05%	46	73.02%	100	38.61%	89	100%	2	100%	348	64.21%
Scrap quantity	12	9.3%	10	15.87%	80	30.89%					102	18.82%
Rework quantity	6	4.65%	7	11.11%	79	30.5%					92	16.97%
∑	129	100%	63	100%	259	100%	89	100%	2	100%	542	100%

Fig. 98: Quality Report (Workplace) as a table
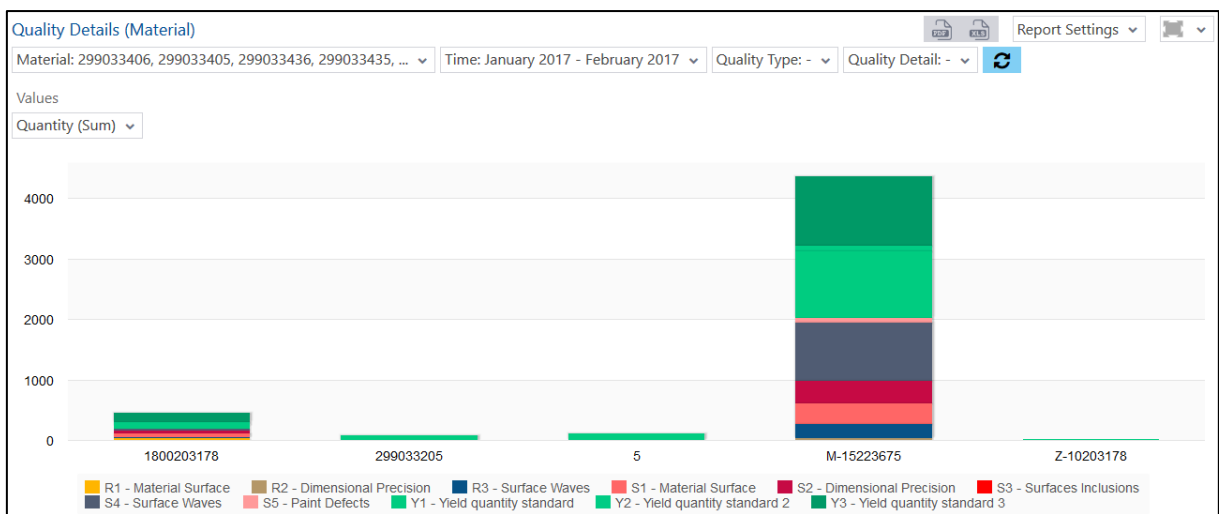
The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)

3.7.1.2 Quality Details (Workplace)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Workplace > Quality Details (Workplace)

Multi-report showing quantities produced. Quality types and the corresponding details for *one* or *more* workplaces for the selected period:

- Quality Details (Workplace) as a column chart (Fig. 99):
  Quality details with percentage of total quantity shown as bars.
- Quality Details (Workplace) as a table (Fig. 100):
  Quality types and quality details with precise number and percentage for each workplace as a table.
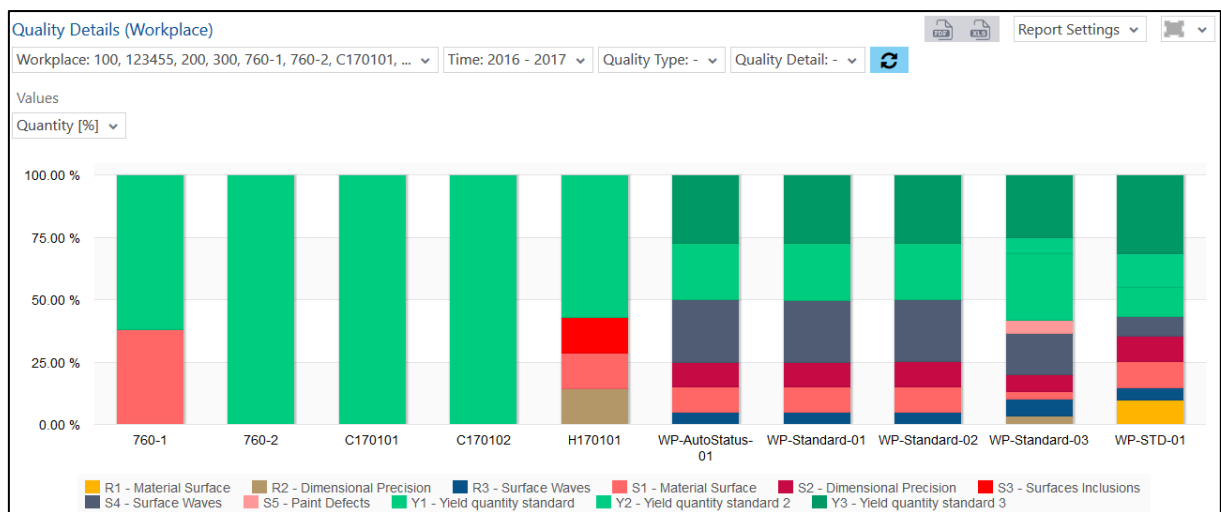
Fig. 99: Quality Details (Workplace) as a column chart

		760-1		760-2		C170101		C170102		H170101		WP-AutoStatus-01	
Quality Type	Quality Details	Quantity	Quantity [%]	Quantity	Quantity [%]	Quantity	Quantity [%]	Quantity	Quantity [%]	Quantity	Quantity [%]	Quantity	Quantity [%]
Yield quantity	Yield quantity standard	13	61.9%	2	100%	41	100%	200	100%	20	57.14%	2160	22.5%
Scrap quantity	Material Surface	8	38.1%							5	14.29%	960	10%
Scrap quantity	Surfaces Inclusions									5	14.29%		
Rework quantity	Dimensional Precision									5	14.29%		

Fig. 100: Quality Details (Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Quality type (yield, scrap, rework quantity)
- Quality detail (multiple)
- Values (% of total, % of quality type, Sum)

3.7.1.3 Quality Development (Workplace)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Workplace > Quality Development (Workplace)

Multi-report showing the development of quantities produced over time. Quality types and details for *one* or *more* workplaces for the selected period:
- Quality Development (Workplace) as a column chart (Fig. 101):
  Percentage of quality types in the total quantity. Each column shows the quantities for a period (e.g. quarter).
- Quality Development (Workplace) as a table (Fig. 102):
  Quantities produced over the selected period broken down per quality types. Each column shows the quantities for a period (e.g. quarter).
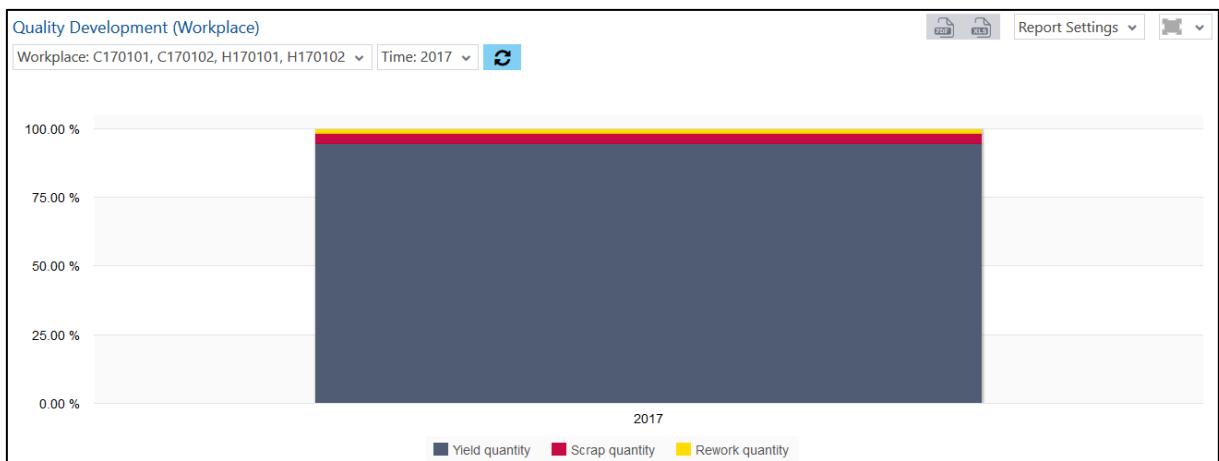
Fig. 101: Quality Development (Workplace) as a column chart

Quality Type	2017		Total ∑	Total %
	Quantity	Quantity (%)	Quantity	Quantity
Yield quantity	261	94.57%	261	94.57%
Scrap quantity	10	3.62%	10	3.62%
Rework quantity	5	1.81%	5	1.81%
∑	276	100%	276	100%

Fig. 102: Quality Development (Workplace) as a table

The following filters are available:
- Workplace (multiple)
- Time (day, week, month, quarter, year)

3.7.1.4 Quality Details (Development per Workplace)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Workplace > Quality Details (Development per Workplace)

Multi-report showing quantities produced over time. Quality types and the corresponding quality details for *one* or *more* workplaces for the selected period. If no workplace is selected, the figures include all workplaces:

- Quality Details (Development per Workplace) as a column chart (Fig. 103):
  Quality details with percentage of total quantity shown as bars. Each bar shows the quality details for a selected period (week, month, year, etc.).
- Quality Details (Development per Workplace) as a table (Fig. 104):
  Quality types and quality details with precise number and percentage for a selected period (week, month, year, etc.).
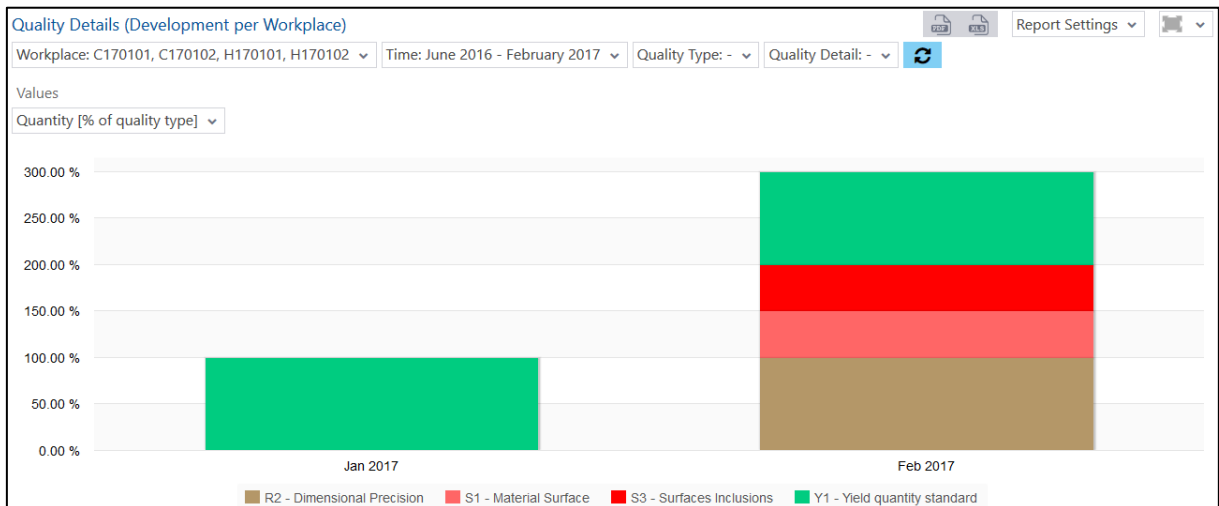
Fig. 103: Quality Details (Development per Workplace) as a column chart

Quality Type	Quality Details	Jan 2017 Quantity	Quantity [%]	Feb 2017 Quantity	Quantity [%]	Total ∑ Quantity	Total Ø Quantity [%]
Rework quantity	Dimensional Precision			5	14.29%	5	250%
Scrap quantity	Material Surface			5	14.29%	5	250%
Scrap quantity	Surfaces Inclusions			5	14.29%	5	250%
Yield quantity	Yield quantity standard	241	100%	20	57.14%	261	13050%
∑		241	100%	35	100%	276	13800%

Fig. 104: Quality Details (Development per Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Quality type (yield, scrap, rework quantity)
- Quality detail (multiple)
- Values (% of total, % of quality type, Sum)

3.7.1.5 Hitlist Quality Details (Workplace)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Workplace > Hitlist Quality Details (Workplace)

Multi-report showing quantities produced. Quality details for *one* or *more* workplaces for the selected period in comparison:

- Hitlist Quality Details (Workplace) as a bar chart (Fig. 105):
  Quality details with precise quantity shown for each detail, sorted by frequency. The quantity displayed refers to the frequency of the detail for all selected workplaces.
- Hitlist Quality Details (Workplace) as a table (Fig. 106):
  Quality types and quality details with precise quantity shown for each detail. Each line shows the frequency of a detail for a workplace.

Fig. 105: Hitlist Quality Details (Workplace) as a bar chart

Fig. 106: Hitlist Quality Details (Workplace) as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Quality type (yield, scrap, rework quantity)
- Quality detail (multiple)
- Values (% of total, % of quality type, Sum)

3.7.2 Material

#### 3.7.2.1 Quality Report (Material)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Material > Quality Report (Material)

Multi-report showing quantities produced. Quality types and details for *one* or *more* materials for the selected period:

- Quality Report (Material) as a column chart (Fig. 107):
  Quality types with percentage for each material shown in columns
- Quality Report (Material) as a table (Fig. 108):
  Quality types with precise number and percentage for each material as a table
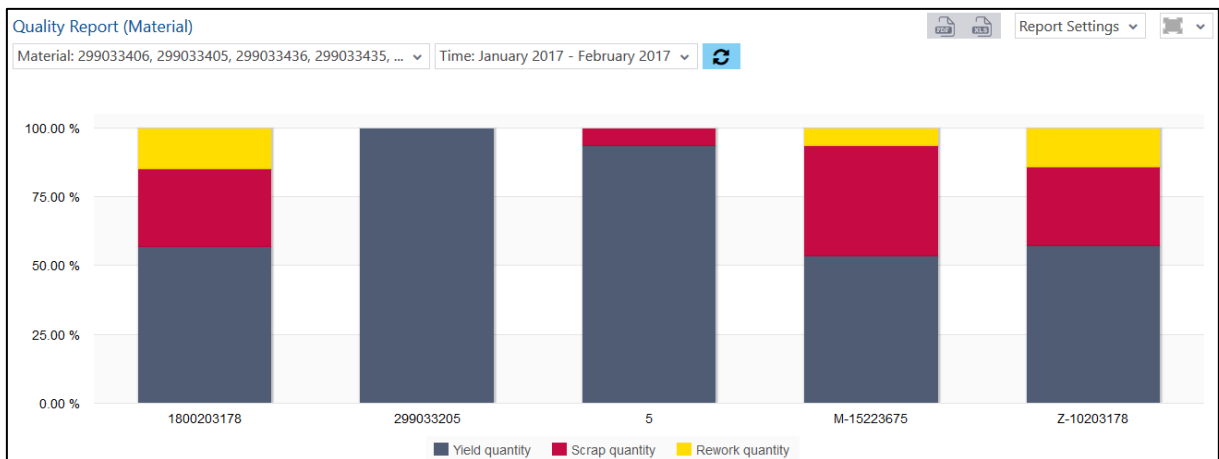
Fig. 107: Quality Report (Material) as a column chart

Quality Type	1800203178		299033205		5		M-15223675		Z-10203178		Total ∑	Total %
	Quantity	Quantity (%)	Quantity	Quantity (%)	Quantity	Quantity (%)	Quantity	Quantity (%)	Quantity	Quantity (%)	Quantity	Quantity
Yield quantity	264	56.77%	100	100%	115	93.5%	2344	53.59%	20	57.14%	2843	55.78%
Scrap quantity	132	28.39%			8	6.5%	1744	39.87%	10	28.57%	1894	37.16%
Rework quantity	69	14.84%					286	6.54%	5	14.29%	360	7.06%
∑	465	100%	100	100%	123	100%	4374	100%	35	100%	5097	100%

Fig. 108: Quality Report (Material) as a table

The following filters are available:

- Material (multiple)
- Time (day, week, month, quarter, year)

3.7.2.2 Quality Details (Material)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Material > Quality Details (Material)

Multi-report showing quantities produced. Quality types and the corresponding quality details for *one* or *more* materials for the selected period:

–   Quality Details (Material) as a column chart (Fig. 109):
    Quality details with percentage of total quantity shown as bars

–   Quality Details (Material) as a table (Fig. 110):
    Quality types and quality details with precise number and percentage for each material as a table

Fig. 109: Quality Details (Material) as a column chart

Quality Type	Quantity Details	1800203178 Quantity	Quantity [%]	299033205 Quantity	Quantity [%]	5 Quantity	Quantity [%]	M-15223675 Quantity	Quantity [%]	Z-10203178 Quantity	Quantity [%]	Total ∑ Quantity	Total Ø Quantity
Rework quantity	Material Surface	45	9.68%									45	900%
Rework quantity	Surface Waves	24	5.16%					238	5.44%			262	5240%
Rework quantity	Dimensional Precision							48	1.1%	5	14.29%	53	1060%
Scrap quantity	Material Surface	48	10.32%			8	6.5%	332	7.59%	5	14.29%	393	7860%
Scrap quantity	Dimensional Precision	48	10.32%					380	8.69%			428	8560%
Scrap quantity	Surface Waves	36	7.74%					960	21.95%			996	19920%

Fig. 110: Quality Details (Material) as a table

The following filters are available:

–   Material (multiple)

–   Time (day, week, month, quarter, year)

–   Quality type (yield, scrap, rework quantity)

–   Quality detail (multiple)

–   Values (% of total, % of quality type, Sum)

3.7.2.3 Quality Development (Material)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Material > Quality Development (Material)

Multi-report showing the development of quantities produced over time. Quality types and details for *one* or *more* materials for the selected period:

− Quality Development (Material) as a column chart (Fig. 111):
  Percentage of quality types in the total quantity. Each column shows the quantities for a period (e.g. month).
− Quality Development (Material) as a table (Fig. 112):
  Quantities produced over the selected period broken down according to quality types. Each column shows the quantities for a period (e.g. month).
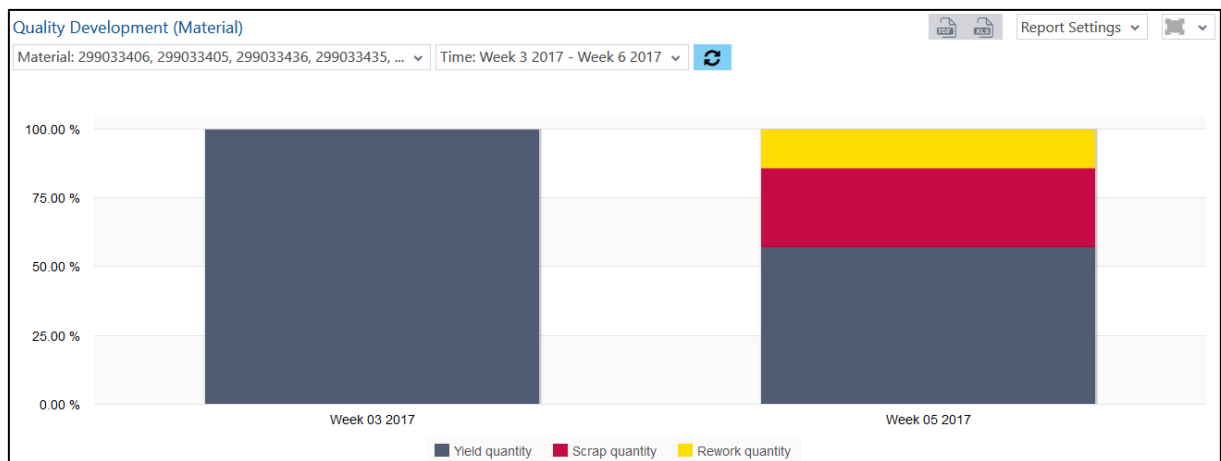
Fig. 111: Quality Development (Material) as a column chart

Quality Type	Week 03 2017 Quantity	Quantity (%)	Week 05 2017 Quantity	Quantity (%)	Total ∑ Quantity	Total % Quantity
Yield quantity	33	100%	20	57.14%	53	77.94%
Scrap quantity			10	28.57%	10	14.71%
Rework quantity			5	14.29%	5	7.35%
∑	33	100%	35	100%	68	100%

Fig. 112: Quality Development (Material) as a table

The following filters are available:

− Material (multiple)
− Time (day, week, month, quarter, year)

3.7.2.4 Quality Details (Development per Material)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Material > Quality Details (Development per Material)

Multi-report showing quantities produced over time. Quality types and the corresponding quality details for *one* or *more* materials for the selected period. If no material is selected, the figures include all materials:

   − Quality Details (Development per Material) as a column chart (Fig. 113):
   Quality details with percentage of total quantity shown as bars. Each bar shows the quality details for a selected period (week, month, year, etc.).
   − Quality Details (Development per Material) as a table (Fig. 114):
   Quality types and quality details with precise number and percentage for a selected period (week, month, year, etc.).
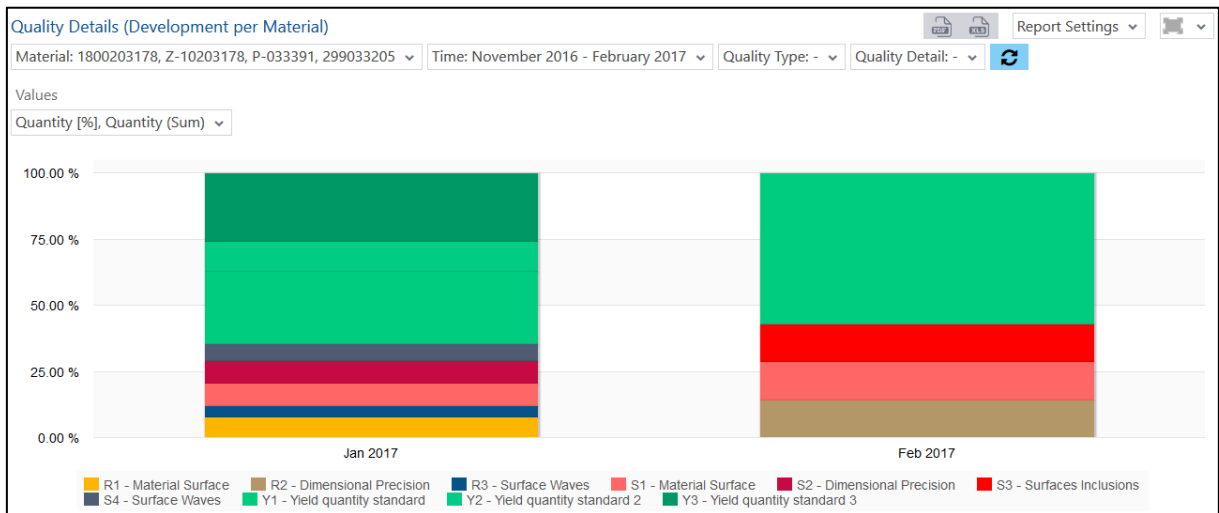
Fig. 113: Quality Details (Development per Material) as a column chart

Quality Type	Quality Details	Jan 2017 Quantity	Quantity [%]	Feb 2017 Quantity	Quantity [%]	Total ∑ Quantity	Total ∅ Quantity [%]
Rework quantity	Material Surface	45	7.96%			45	2250%
Rework quantity	Surface Waves	24	4.25%			24	1200%
Rework quantity	Dimensional Precision			5	14.29%	5	250%
Scrap quantity	Material Surface	48	8.5%	5	14.29%	53	2650%
Scrap quantity	Dimensional Precision	48	8.5%			48	2400%
Scrap quantity	Surface Waves	36	6.37%			36	1800%

Fig. 114: Quality Details (Development per Material) as a table

The following filters are available:

   − Material (multiple)
   − Time (day, week, month, quarter, year)
   − Quality type (yield, scrap, rework quantity)
   − Quality detail (multiple)
   − Values (% of total, % of quality type, Sum)

3.7.2.5 Hitlist Quality Details (Material)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Material > Hitlist Quality Details (Material)

Multi-report showing quantities produced. Quality details for *one* or *more* materials for the selected period in comparison:

- Hitlist Quality Details (Material) as a bar chart (Fig. 115):
  Quality details with precise quantity shown for each detail, sorted by frequency. The quantity displayed refers to the frequency of the detail for all selected materials.
- Hitlist Quality Details (Material) as a table (Fig. 116):
  Quality types and quality details with precise quantity shown for each detail. Each line shows the frequency of a detail for a material.
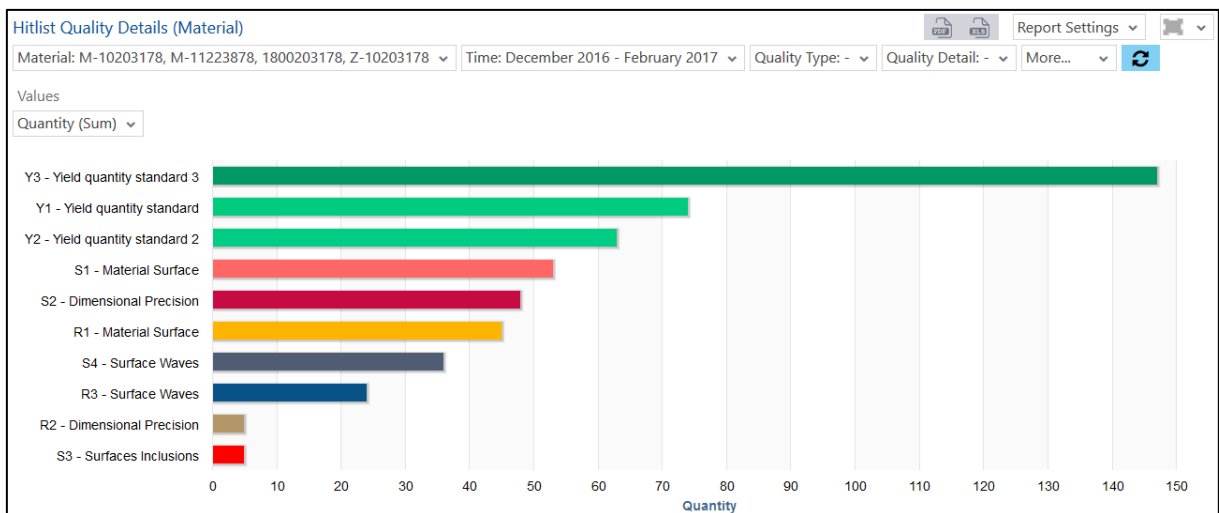
Fig. 115: Hitlist Quality Details (Material) as a bar chart

Material	Quantity	Quality Type	Quantity Details
1800203178	45	Rework quantity	Material Surface
1800203178	24	Rework quantity	Surface Waves
1800203178	48	Scrap quantity	Material Surface
1800203178	48	Scrap quantity	Dimensional Precision
1800203178	36	Scrap quantity	Surface Waves
1800203178	54	Yield quantity	Yield quantity standard
1800203178	63	Yield quantity	Yield quantity standard 2

Fig. 116: Hitlist Quality Details (Material) as a table

The following filters are available:

- Material (multiple)
- Time (day, week, month, quarter, year)
- Quality type (yield, scrap, rework quantity)
- Quality detail (multiple)
- Operation (multiple)
- Values (% of total, % of quality type, Sum)

3.7.3 Operation

3.7.3.1 Quality Report (Operation)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Operation > Quality Report (Operation)

Multi-report showing quantities produced. Quality types and details for *one* or *more* operation for the selected period:

- Quality Report (Operation) as a column chart (Fig. 117):
  Quality types with percentage for each operation in columns
- Quality Report (Operation) as a table (Fig. 118):
  Quality types with precise number and percentage for each operation as a table
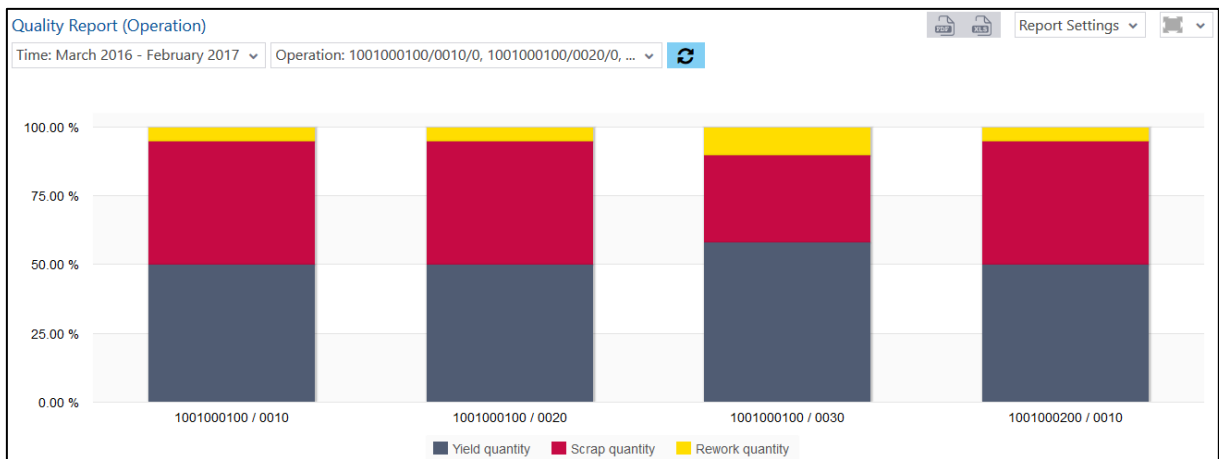
Fig. 117: Quality Report (Operation) as a column chart

Quality Type	1001000100 / 0010		1001000100 / 0020		1001000100 / 0030		1001000200 / 0010		Total ∑	Total %
	Quantity	Quantity (%)	Quantity	Quantity (%)	Quantity	Quantity (%)	Quantity	Quantity (%)	Quantity	Quantity
Yield quantity	4963	50.17%	4930	50%	2520	58.33%	4800	50%	17213	51.12%
Scrap quantity	4436	44.84%	4436	44.99%	1368	31.67%	4320	45%	14560	43.24%
Rework quantity	494	4.99%	494	5.01%	432	10%	480	5%	1900	5.64%
∑	9893	100%	9860	100%	4320	100%	9600	100%	33673	100%

Fig. 118: Quality Report (Operation) as a table

The following filters are available:

- Time (day, week, month, quarter, year)
- Operation (multiple)

3.7.3.2 Quality Details (Operation)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Operation > Quality Details (Operation)

Multi-report showing quantities produced. Quality types and the corresponding quality details for *one* or *more* materials for the selected period:

- Quality Details (Operation) as a column chart (Fig. 119):
  Quality details with percentage of total quantity shown as bars
- Quality Details (Operation) as a table (Fig. 120):
  Quality types and quality details with precise number and percentage for each operation as a table

Fig. 119: Quality Details (Operation) as a column chart

Quality Type ▲	Quality Details	1001000100 / 0010 Quantity	Quantity [%]	1001000100 / 0020 Quantity	Quantity [%]	1001000100 / 0030 Quantity	Quantity [%]	1001000200 / 0010 Quantity	Quantity [%]	Total ∑ Quantity	Tot Qu
Rework quantity	Surface Waves	494	4.99%	494	5.01%	288	6.67%	480	5%	1756	43
Rework quantity	Dimensional Precision					144	3.33%			144	36
Scrap quantity	Material Surface	988	9.99%	988	10.02%	144	3.33%	960	10%	3080	77
Scrap quantity	Dimensional Precision	988	9.99%	988	10.02%	288	6.67%	960	10%	3224	80
Scrap quantity	Surface Waves	2460	24.87%	2460	24.95%	720	16.67%	2400	25%	8040	20
Scrap quantity	Paint Defects					216	5%			216	54

Fig. 120: Quality Details (Operation) as a table

The following filters are available:

- Material (multiple)
- Operation (multiple)
- Quality types (scrap, yield, rework)
- Quality detail (multiple)
- Values (% of total, % of quality type, Sum)

3.7.3.3 Hitlist Quality Details (Operation)

Path: Performance Analysis > Reporting > Reports > Quality Analysis > Operation > Hitlist Quality Details (Operation)

Multi-report showing quantities produced. Quality details for *one* or *more* operations for the selected period in comparison:

 − Hitlist Quality Details (Operation) as a bar chart (Fig. 121):
  Quality details with precise quantity shown for each detail, sorted by frequency. The quantity displayed refers to the frequency of the detail for all selected operations.
 − Hitlist Quality Details (Operation) as a table (Fig. 122):
  Quality types and quality details with precise quantity shown for each detail. Each line shows the frequency of a detail for an operation.
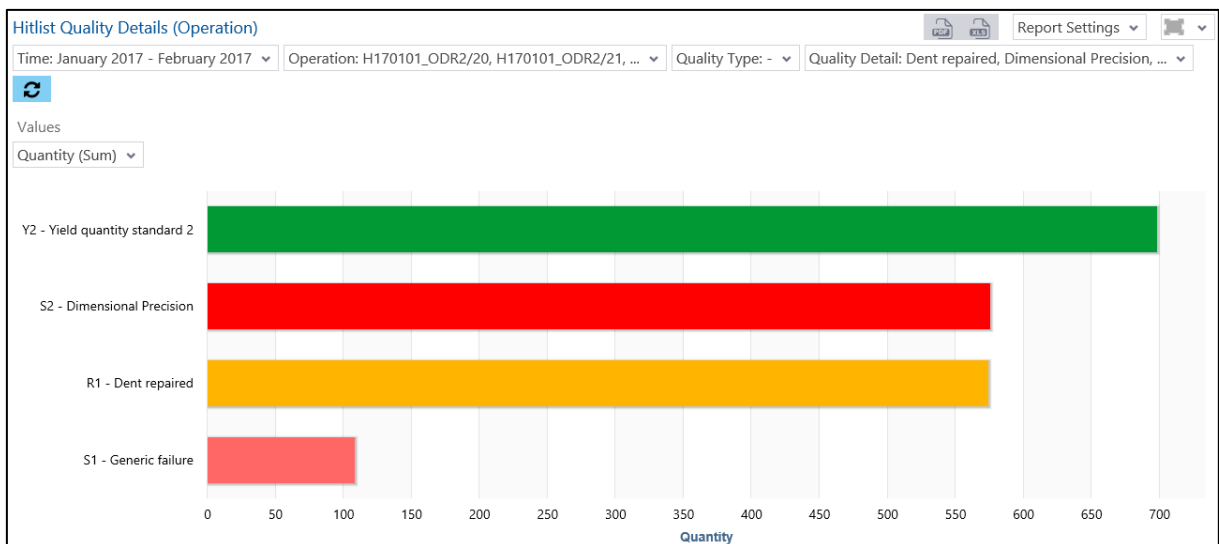
Fig. 121: Hitlist Quality Details (Operation) as a bar chart

Operation	Workplace	Quantity	Quality Type	Quality Details
H170103_ODR1 / 103_1	H170103	109	Scrap quantity	Generic failure
H170103_ODR1 / 103_1	H170103	327	Yield quantity	Yield quantity standard 2
H170103_ODR1 / 103_1	H170103	1	Scrap quantity	Dimensional Precision
H170103_ODR1 / 103_3	H170102	455	Scrap quantity	Dimensional Precision
H170103_ODR1 / 103_3	H170102	455	Rework quantity	Dent repaired
H170105_ODR1 / 105_1	H170105	372	Yield quantity	Yield quantity standard 2
H170102_ODR1 / 102_1	H170102	120	Scrap quantity	Dimensional Precision
H170102_ODR1 / 102_1	H170102	120	Rework quantity	Dent repaired

Fig. 122: Hitlist Quality Details (Operation) as a table

The following filters are available:

 − Time (day, week, month, quarter, year)
 − Operation (multiple)
 − Quality types (scrap, yield, rework)
 − Quality detail (multiple)
 − Values (% of total, % of quality type, Sum)

3.8 Overall Process Efficiency (OPE)

This section describes the OPE analysis. The OPE index is calculated as the product from the production process ratio, performance rate and quality key performance indicators. The production process ratio is the product of throughput efficiency, process availability and setup reduction rate. The performance rate is an actual/target comparison of the time per unit. Quality is determined by the quality types (yield, scrap, rework) and is the quotient from yield quantity / total quantity.
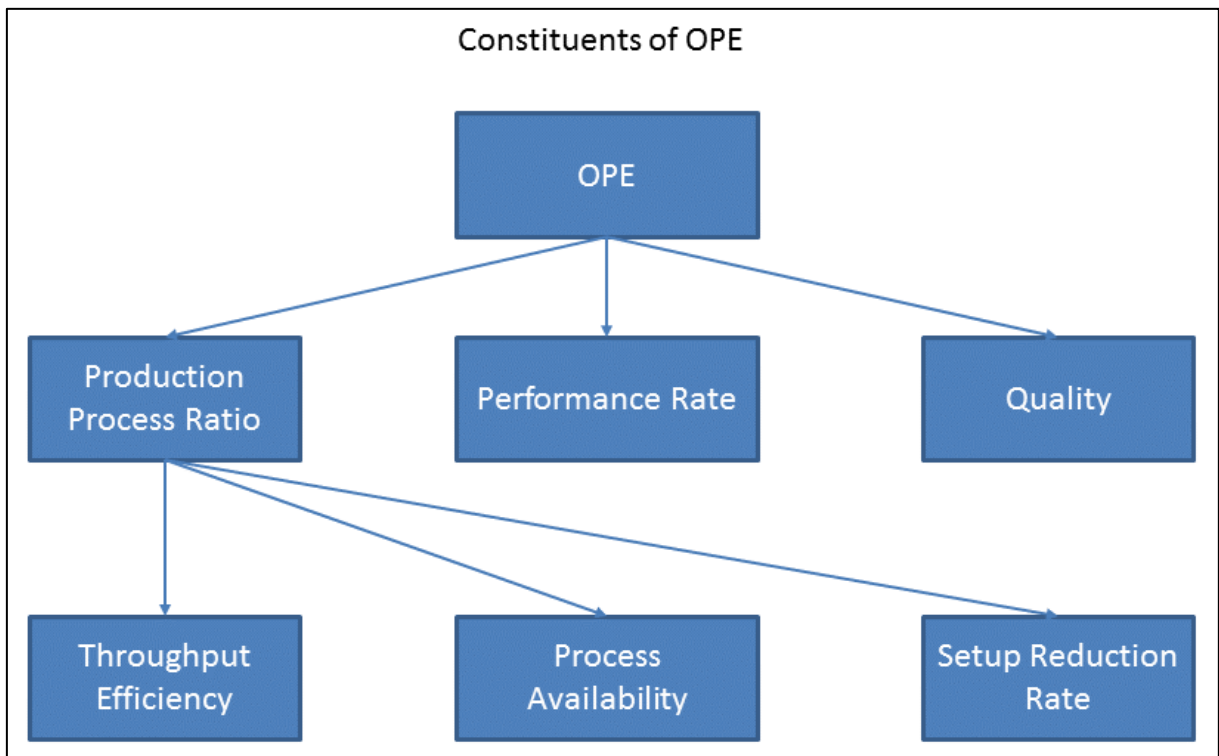
Fig. 123: OPE components

3.8.1 OPE (Overall View)

Path: Performance Analysis > Reporting > Reports > Overall Process Efficiency (OPE) > OPE (Overall View)

✓ The **OEE** and **Production** time bases are configured.

Multi-report with OPE-compliant evaluation of *all* or *selected* orders for a selected period. If no order is selected, the analysis includes all orders:

– OPE report as a column chart (Fig. 124):
  Display of production process ratio, performance rate, quality and the OPE index derived from these in a group of columns.
– OPE report as a table (Fig. 125):
  Tabular view of production process ratio, performance rate, quality and the OPE index derived from these.
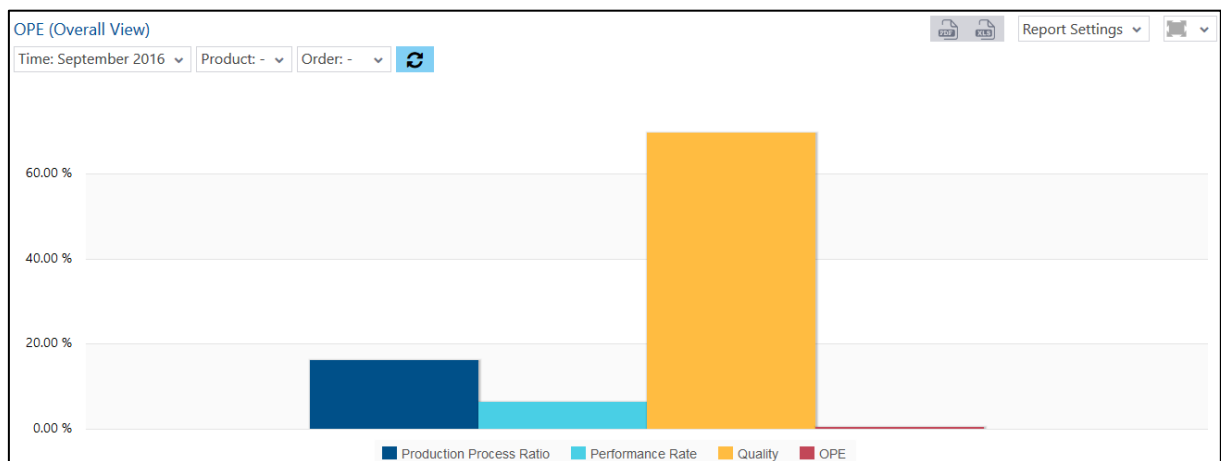
Fig. 124: OPE report as a column chart

Production Process Ratio	16.35%
Performance Rate	6.51%
Quality	69.91%
OPE	0.74%

Fig. 125: OPE report as a table

The following filters are available:

– Time (day, week, month, quarter, year)
– Product (single)
– Order (multiple)

3.8.2 Production Process Ratio (Overall View)

Path: Performance Analysis > Reporting > Reports > Overall Process Efficiency (OPE) > Production Process Ratio (Overall View)

✓ The **OEE**, **Production** and **Setup** time bases are configured.

The production process ratio is the product of throughput efficiency of orders, process availability and setup reduction rate.

– Throughput efficiency:
  The allocative component of availability which can be improved by production scheduling. The throughput efficiency is the quotient from execution time / lead time of a production order.

– Process availability:
  The technical component of availability that can be increased significantly using the Advanced Shop Floor Management methods. The process availability is the quotient from production time (production time base) / processing time including any interruptions due to malfunctions.
  o Setting up does not form part of the processing time of an operation and is therefore considered in a third component.

– Setup reduction rate:
  Reaches 100% if setup times are eliminated completely and is determined as the quotient of processing time / execution time of the operations at a workplace.
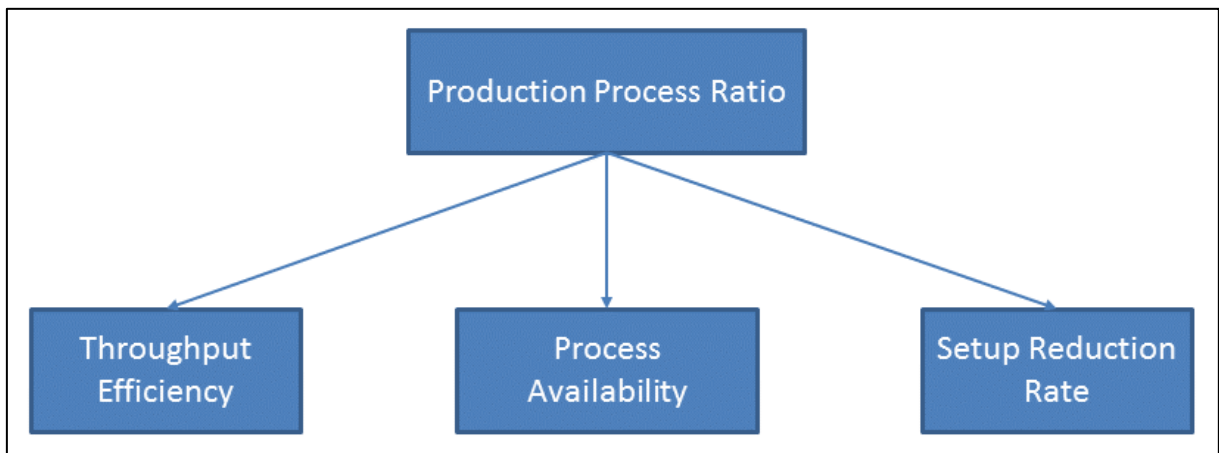
Fig. 126: Components of production process ratio

Multi-report showing the production process ratio for *one* or *more* workplaces for a period. The percentages specified indicate the proportion in relation to an optimum (100%) production process ratio.

– Production Process Ratio (Overall View) as a column chart (Fig. 127):
  Throughput efficiency, process availability, setup reduction rate and the production process ratio calculated from these shown as columns

– Production Process Ratio (Overall View) as a table (Fig. 128):
  A table listing throughput efficiency, process availability, setup reduction rate and the production process ratio calculated from these
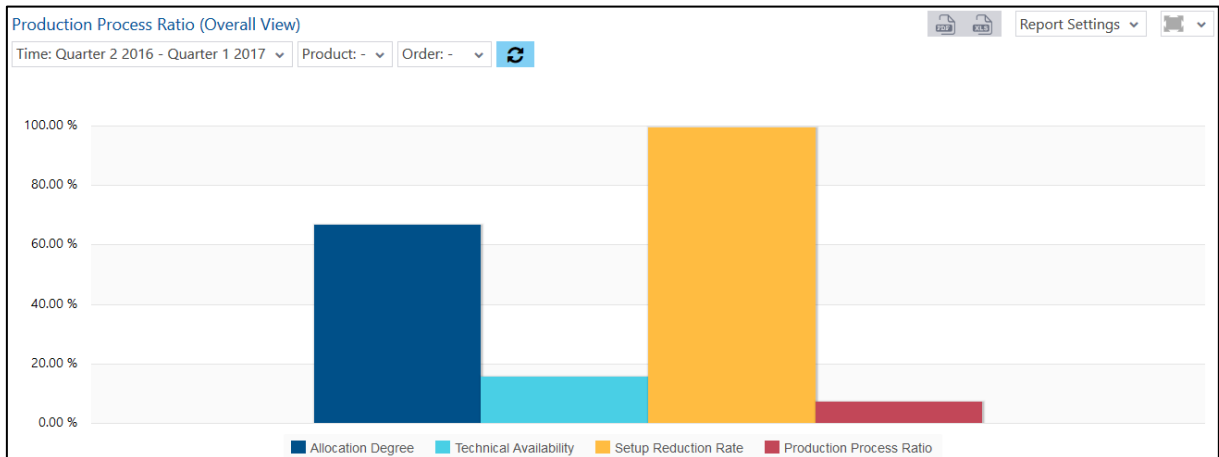
Fig. 127: Production Process Ratio (Overall View) as a column chart

Allocation Degree	66.92%
Technical Availability	15.83%
Setup Reduction Rate	99.63%
Production Process Ratio	7.52%

Fig. 128: Production Process Ratio (Overall View) as a table

The following filters are available:

- Time (day, week, month, quarter, year)
- Product (multiple)
- Order (multiple)

3.8.3 Order Analysis

Path: Performance Analysis > Reporting > Reports > Overall Process Efficiency (OPE) > Order Analysis

✔ The **OEE**, **Production** and **Setup** time bases are configured.

Multi-report with detailed information about *one* order for the selected period. The data relate to all orders selected.

- Order Analysis as a timeline chart (Fig. 129):
  A timeline chart showing operating states for the selected period and for each selected order. One and the same order may be assigned to several workplaces/operations.
- Production time information for an order (Fig. 130):
  Precise production time of an order, key performance indicators and the resulting OPE.
- Quantity information for an order (Fig. 131):
  Production-related information with details about quantities, times in relation to target times, key performance indicators and the resulting OEE.
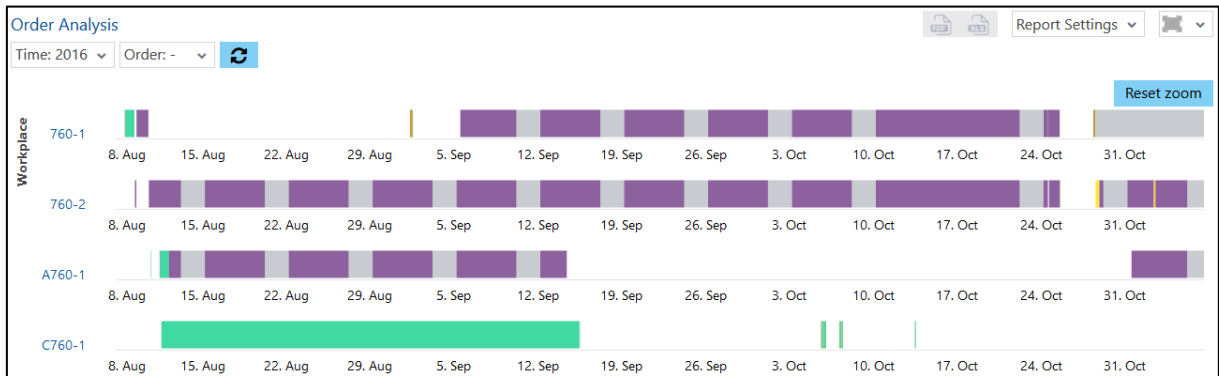
Fig. 129: Order Analysis as a timeline chart

Actual Production Time	09:40:42
Processing Time	09:25:41
Execution Time	09:40:42
Lead Time	26:50:33
Throughput Efficiency	95.65%
Process Availability	99.12%
Setup Reduction	97.42%
Production Process Ratio	34.8%
Performance Rate	57.09%
Quality	100%
OPE	19.87%

Fig. 130: Production time information for an order

Order / Operation	H170103_ODR5 / 0010	H170103_ODR5 / 0020	H170103_ODR5 / 0030
Operation Phase	Finished	Finished	Finished
Operation Status	Finished	Finished	Finished
Workplace	H170103	H170103	H170103
Material	M1	M3	M2
Target Quantity	50	50	50
Total Quantity	50	50	60
Yield Qty.	50	50	60
Scrap Qty.	0	0	0
Rework Qty.	0	0	0
Start Time	02/02/17 10:44	02/02/17 12:44	03/02/17 06:29
End Time	02/02/17 12:44	03/02/17 06:29	03/02/17 13:35
Production	01:40:08	01:40:08	06:00:13
Downtime	00:00:00	16:00:02	00:04:57
Target Time per Unit	00:02:00	00:02:00	00:02:00

Fig. 131: Quantity information for an order

The following filters are available:

- Time (day, week, month, quarter, year)
- Order (single)

3.8.4 Operation Analysis

Path: Performance Analysis > Reporting > Reports > Overall Process Efficiency (OPE) > Operation Analysis

✔ The **OEE**, **Production** and **Setup** time bases are configured.

Multi-report with detailed information on *one* or *more* operations for the selected period.

- Operation Analysis as a timeline chart (Fig. 132):
  A timeline chart showing operating states for the selected period and for each selected operation.
- Operation Analysis as a table (Fig. 133):
  Production-related information with details about quantities, times in relation to target times, key performance indicators and the resulting OEE. Each column shows the data pertaining to a selected operation.
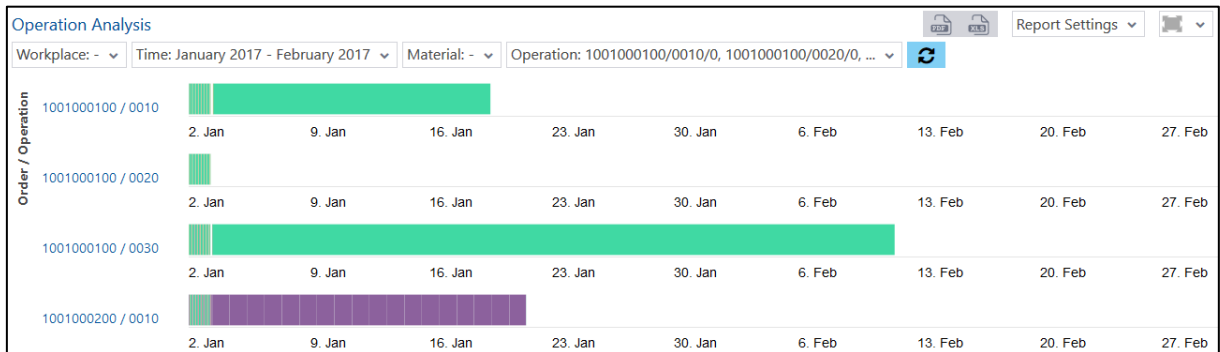
Fig. 132: Operation Analysis as a timeline chart

Order / Operation	1001000100 / 0010	1001000100 / 0020	1001000100 / 0030	1001000200 / 0010
Operation Phase	Finished	Finished	Production	Finished
Operation Status	Finished	Finished	Production	Finished
Workplace	WP-Standard-01	WP-Standard-02	WP-Standard-03	WP-AutoStatus-01
Material	M-15223675	M-15223675	M-15223675	M-15223675
Target Quantity	2000	2000	2000	2000
Total Quantity	14493	14460	6030	14161
Yield Qty.	7268	7240	3550	7081
Scrap Qty.	6500	6496	1872	6372
Rework Qty.	725	724	608	708
Start Time	22/12/16 06:10	22/12/16 06:12	30/12/16 12:11	23/12/16 09:40
End Time	18/01/17 06:21	02/01/17 06:00	10/02/17 08:15	20/01/17 07:18
Production	583:28:54	202:55:49	985:10:55	132:58:53
Downtime	30:20:11	30:10:11	08:47:59	503:09:04
Target Time per Unit	00:01:00	00:01:00	00:01:00	00:01:00

Fig. 133: Operation Analysis as a table

The following filters are available:

- Workplace (multiple)
  The workplaces selected determine which operations are available.
- Time (day, week, month, quarter, year)
- Material (multiple)
- Operation (multiple)

3.9 Resource Allocation

Resource allocation reports provide detailed information about availability and allocation of orders. Shift schedules give a clear overview of all shifts allocated to a workplace.

3.9.1 Workplace Allocation

Path: Performance Analysis > Reporting > Reports > Resource Allocation > Workplace Allocation

Multi-report showing *one* or *more* workplaces and the associated operations/orders for a selected period:

- Workplace Allocation as a table (Fig. 134):
  Busy time, scheduled operating time and occupancy rate accumulated for all selected workplaces.
- Workplace Allocation as a timeline chart (Fig. 135):
  Timelines for each selected workplace for the selected period. The bars reflect operations/orders and appear on the time segments where they run on the associated workplaces. Bars appearing in the past correspond to operating states. Bars appearing in the future are scheduled operation phases.

Busy Time	00:00:00
Scheduled Operating Time	624:00:00
Occupancy Rate	0%

Fig. 134: Workplace Allocation as a table
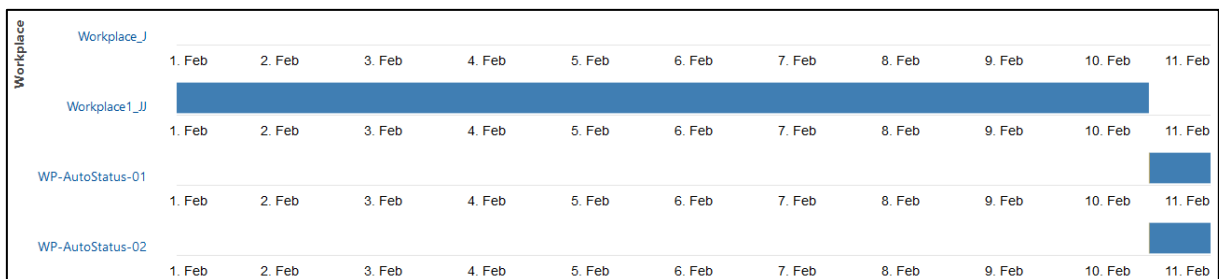
Fig. 135: Workplace Allocation as a timeline chart

The following filters are available:

- Workplace (multiple)
- Time (time, shift, day)

3.9.2   Workplace Availability

Path: Performance Analysis > Reporting > Reports > Resource Allocation > Workplace Availability

Multi-report showing *one* or *more* workplaces and the related operating states for a selected period:
-   Workplace Availability as a table (Fig. 136):
    Accumulated availability times for all selected workplaces.
-   Workplace Availability as a timeline chart (Fig. 137):
    Timelines for each selected workplace for the selected period. The bars reflect operating states with information about the corresponding operations/orders and appear on the time segments where these run on the associated workplace.

Actual Production Time	00:00:00
Processing Time	416:00:00
Busy Time	416:00:00
Scheduled Operating Time	559:30:00
Occupancy Rate	74.35%
Process Availability	0%
Setup Reduction	100%
Availabilty	0%

Fig. 136: Workplace Availability as a table
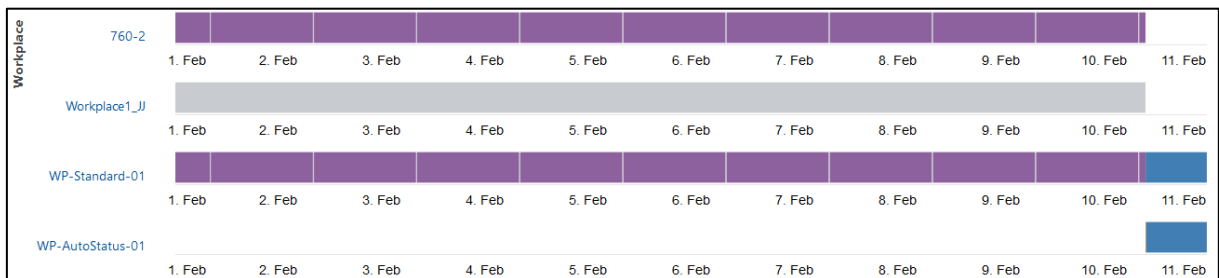
Fig. 137: Workplace Availability as a timeline chart

The following filters are available:
-   Workplace (multiple)
-   Time (time, shift, day)

3.9.3 Scheduled Operating Time

Path: Performance Analysis > Reporting > Reports > Resource Allocation > Scheduled Operating Time

A real-time report on shifts for a definable period in the form of a Gantt chart for *one* or *more* workplaces (Fig. 138):
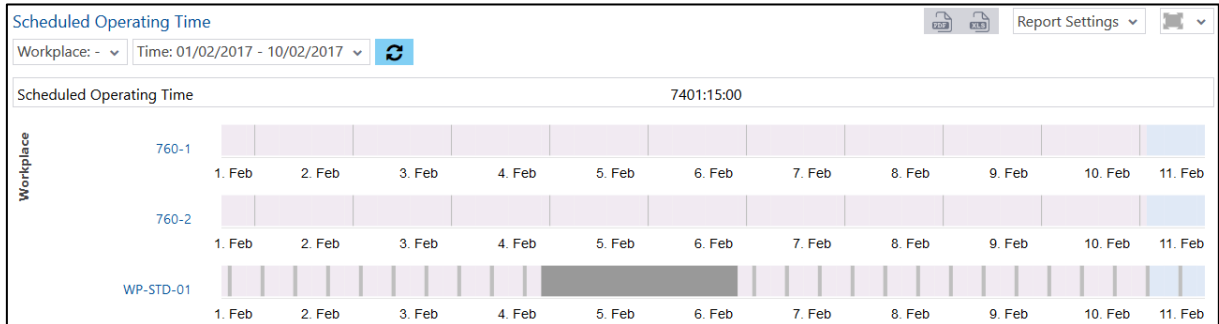
Fig. 138: Scheduled Operating Time

The following filters are available:
- Workplace (multiple)
- Time (time, shift, day)

3.9.4 Shift Schedule

Path: Performance Analysis > Reporting > Reports > Resource Allocation > Shift Schedule

A real-time report on shifts for a definable period in the form of a Gantt chart and table for *one* or *more* workplaces:
- Shift overview in a Gantt chart (Fig. 138):
  Lists workplaces with detailed information on shifts and their times in a Gantt chart
- Shifts shown in a table (Fig. 139):
  Lists shifts for each workplace with information about start and end times and shift type

Workplace	Shift Date	Start Timestamp	End Timestamp	Shift	Description
WP-Standard-01	10-Feb-2017	10-Feb-2017 22:00	11-Feb-2017 06:00	N	Night shift
WP-Standard-01	10-Feb-2017	10-Feb-2017 14:00	10-Feb-2017 22:00	L	Late shift
WP-Standard-01	10-Feb-2017	10-Feb-2017 06:00	10-Feb-2017 14:00	E	Early shift
WP-Standard-01	09-Feb-2017	09-Feb-2017 22:00	10-Feb-2017 06:00	N	Night shift
WP-Standard-01	09-Feb-2017	09-Feb-2017 14:00	09-Feb-2017 22:00	L	Late shift
WP-Standard-01	09-Feb-2017	09-Feb-2017 06:00	09-Feb-2017 14:00	E	Early shift
WP-Standard-01	08-Feb-2017	08-Feb-2017 22:00	09-Feb-2017 06:00	N	Night shift

Fig. 139: Shifts shown in a table

The following filters are available:
- Workplace (multiple)
- Time (day, week, month, quarter, year)

3.10 Order Overview

The order overview offers detailed summaries of orders and operations. All available information is shown in condensed format and may be filtered as necessary to show only relevant information.

3.10.1 Order

3.10.1.1 Order Overview

Path: Performance Analysis > Reporting > Reports > Order Overview > Order > Order Overview

A table listing all orders along with all production-related data. The table summarizes all orders comprising the selected products for the selected times (Fig. 140):

- Information about material and quantity
- Production dates
- ERP status (status of production order in SAP)
- Execution data

Fig. 140: Order Overview

The following filters are available:

- Product (multiple)
- Time (day, week, month, quarter, year)

You can display a drill-down to Order Details by right-clicking in a cell.

3.10.1.2 Order Details

Path: Performance Analysis > Reporting > Reports > Order Overview > Order > Order Details

A table listing orders with production-related data and supplementary details for each order. The tables summarize all orders comprising the selected products:

- Overview of all orders (see Fig. 140):
    - o Information about material and quantity
    - o Production dates
    - o ERP status
    - o Execution data
- Supplementary details on orders (Fig. 141):
    - o Identification of orders, operations, material and workplace
    - o Production times
    - o Quantities and quality details
    - o Target vs. actual times
    - o Phases
    - o Operator-related times

Order	Operation	Material	Material Number	Material Description	Operation Phase	Operation Status	Status since	Last Logout	Last Login	Time Remaining	Worl
1001332	0010	4	4	Tool	Finished	finished	24/10/16 13:...	24/10/16 13:...	05/09/16 12:...	00:00:00	
1001332	0020	4	4	Tool	Released	not assigned	08/08/16 11:...			01:22:00	
1001333	0010	4	4	Tool	Released	not assigned	08/08/16 11:...			01:23:00	
1001333	0020	4	4	Tool	Released	not assigned	08/08/16 11:...			01:22:00	
1001333	11111-11111	4	4	Tool	Released	not assigned	14/12/16 08:...			01:23:00	
1001334	0010	1000000...	100000002	TEST finished material 2	Released	not assigned	08/08/16 11:...			01:02:00	
1001334	0020	1000000...	100000002	TEST finished material 2	Released	not assigned	08/08/16 11:...			01:02:00	

Fig. 141: Supplementary Order Details

The following filters are available:

- Product (multiple)
- Time (day, week, month, quarter, year)
- Order (multiple)

3.10.2 Operation

3.10.2.1 Order Backlog

Path: Performance Analysis > Reporting > Reports > Order Overview > Operation > Order Backlog

A table listing operations not yet started along with detailed information about times, materials, quantities and OEE:

Order	Operation	Material	Operation Phase	Operation Status	Workplace Group	Workplace	Planned Starting Date	Planned Finishing ...	Target Quant
1001332	0020	4	Released	not assigned			10/08/16 04:38	10/08/16 06:00	20
1001333	0010	4	Released	not assigned			10/08/16 03:15	10/08/16 04:38	20
1001333	0020	4	Released	not assigned			10/08/16 04:38	10/08/16 06:00	20
1001334	0010	100000002	Released	not assigned			12/08/16 03:56	12/08/16 04:58	20
1001334	0020	100000002	Released	not assigned			12/08/16 04:58	12/08/16 06:00	20
1001335	0020	100000002	Released	not assigned			01/09/16 04:52	01/09/16 06:00	22

Fig. 142: Order Backlog

The following filters are available:
- Workplace (multiple)
- Operation (multiple)
- Material (multiple)

3.10.2.2 Operations in Progress

Path: Performance Analysis > Reporting > Reports > Order Overview > Operation > Operations in Progress

A table listing operations currently running or interrupted, along with detailed information about times, materials, quantities and OEE:

Order	Operation	Material	Operation Phase	Operation Status	Status since	Priority	Workplace	Planned Starting Date	Start Time	Planned Finishing Date	End Time	
1001331	0020	1000000...	In Progress	Downtime	14/12/16 13:...		760-2	12/08/16 04:17	14/12/16 13:...	12/08/16 06:00	17/01/17 21:...	0
WPL1_OD...	WPL1_OPR1-1	844	In Progress	Downtime	01/12/16 11:...		WPL1	19/09/16 07:20	19/09/16 08:...	19/09/16 07:20	01/12/16 11:...	3(
A1004	0010	4	In Progress	Downtime	18/01/17 13:...	8	A760-1	04/10/16 09:44	31/10/16 13:...	04/10/16 10:39	17/01/17 21:...	0(
C1005	0030	4	In Progress	Production	13/10/16 13:...	8	C760-2	12/10/16 14:00	13/10/16 06:...	14/10/16 07:45	13/10/16 13:...	0.
C1005	0030	4	In Progress	Production	13/10/16 13:...	8	C760-1	12/10/16 14:00	13/10/16 10:...	14/10/16 07:45	13/10/16 13:...	0.

Fig. 143: Operations in Progress

The following filters are available:
- Workplace (multiple)
- Operation (multiple)
- Material (multiple)

3.10.2.3 Operations Completed

Path: Performance Analysis > Reporting > Reports > Order Overview > Operation > Operations Completed

A table listing operations completed along with detailed information about times, materials, quantities and OEE:

Fig. 144: Operations Completed

The following filters are available:
- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Operation (multiple)
- Material (multiple)

3.10.2.4 Operation Details

Path: Performance Analysis > Reporting > Reports > Order Overview > Operation > Operation Details

✓ The **OEE**, **Production** and **Setup** time bases are configured.

Table view of all details of *one* or *more* operations:
- Order
- Operation
  Operation number, operation phase
- Status
  Operation status, start time of status
- Material
  Material number, material description
- Quantity
  Target quantity, total quantity, yield quantity, scrap quantity, rework quantity, open quantity, actual/target deviation, actual/target comparison
- Unit
  E.g. pieces, kg, etc.
- Time per unit
  Time, target time, actual/target deviation, actual/target comparison
- Priority
- Start/end time
  Actual start, actual end, scheduled start, scheduled end, schedule deviation

- Hits
  Hit factor, time per hit, target time per hit, HPH (hits per hour), PPH (units produced/pieces per hit), actual/target deviation, actual/target comparison
- Setup time
  Start time, end time, actual setup time, target setup time, actual/target deviation, actual/target comparison, setup rate
- Processing time
  Start time, end time, actual processing time, target processing time, actual/target deviation, actual/target comparison
- Execution time
  Actual execution time, target execution time, actual/target deviation, actual/target comparison
- Lead time
  Actual lead time, planned lead time, actual/planned deviation, actual/planned comparison
- Production process ratio
- Availability
- Performance rate
- Quality
- OEE
- Labor time

Operation Details

Order	Operation	Material	Operation Phase	Operation Status	Status since	Last Logout	Last Login	Time Remaining	Workplace	Target Quantity	Schedule Deviat
A1004	0010	4	In Progress	Downtime	18/01/17 13:...		31/10/16 13:...	00:50:00	A760-1	10	00:00:00
C1001	0010	4	Finished	finished	15/09/16 11:...	15/09/16 11:...		00:00:00	C760-1	100	855:05:14
C1002	0010	4	Finished	finished	06/10/16 01:...	06/10/16 01:...		00:00:00	C760-1	100	04:35:54
C1003	0010	4	Finished	finished	07/10/16 03:...	07/10/16 03:...		00:00:00	C760-2	50	16:43:36
C1003	0020	4	Finished	finished	07/10/16 11:...	07/10/16 11:...		00:00:00	C760-1	50	24:33:45
C1004	0010	4	Finished	finished	11/10/16 12:...	11/10/16 12:...	11/10/16 12:...	00:00:00	C760-1	5	-00:23:46
C1004	0010	4	Finished	finished	11/10/16 12:...	11/10/16 12:...		00:00:00	C760-2	5	-00:22:46
C1005	0030	4	In Progress	Production	13/10/16 13:...	13/10/16 13:...	13/10/16 13:...	02:22:25	C760-2	500	00:00:00
C1005	0030	4	In Progress	Production	13/10/16 13:...		13/10/16 10:...	03:57:23	C760-1	500	00:00:00

Fig. 145: Operation Details

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Operation (multiple)
- Material (multiple)
- Operation phase
- Operation status

3.11 Maintenance

The reports listed in this section show maintenance times for selected workplaces.
Unscheduled maintenance incurred is a measure of the effectiveness of scheduled maintenance: The lower the unscheduled maintenance figure, the more effective is scheduled maintenance.
The PPM degree allows conclusions about OEE: The lower the PPM degree, the better the OEE development, or optimization.
Table 14 shows the calculation of the PPM degree and unscheduled maintenance:

Table 14: Calculation of maintenance values

Value	Calculation	Description
PPM Degree	Scheduled maintenance / Scheduled operating time * 100%	Share of scheduled maintenance in the total operating time
Unscheduled maintenance [% of total]	Unscheduled maintenance / Total maintenance * 100%	Share of unscheduled maintenance in total maintenance

ⓘ Reports relating to maintenance require the **Maintenance** and **Unscheduled Maintenance** time bases.

3.11.1 Maintenance Report

Path: Performance Analysis > Reporting > Reports > Maintenance > Maintenance Report

✓ The **Maintenance** and **Unscheduled Maintenance** time bases are configured.

Multi-report showing the duration of maintenance activities for *one* or *more* workplaces for a period:
- Maintenance Report as a column chart (Fig. 146):
  PPM degree and unscheduled maintenance (U/M) shown as columns for each workplace. The columns appear individually or by pairs, depending on the selection made in the value filter.
- Maintenance Report as a table (Fig. 147):
  A table listing the durations of maintenance activities in minutes. It shows the overall maintenance time, scheduled and unscheduled maintenance times, scheduled operating time and PPM degree. The columns relate to workplaces. The value filter does not have an effect on this table.
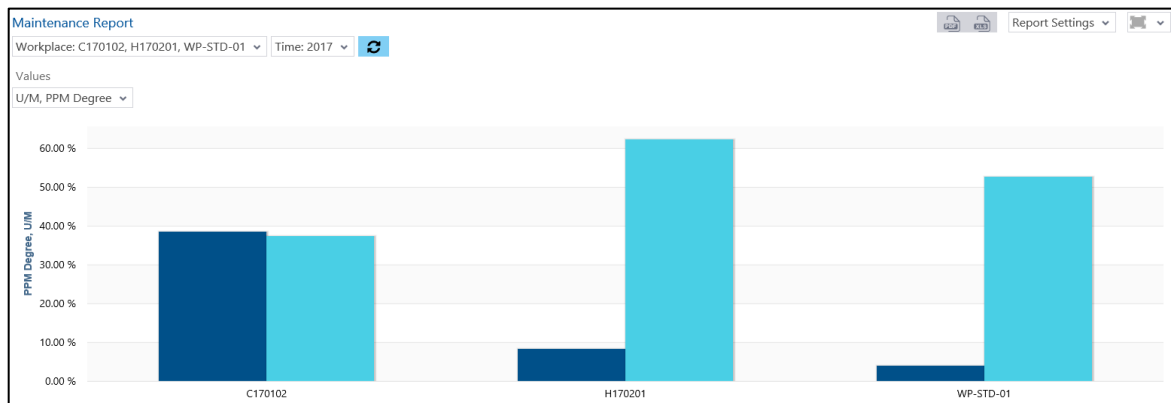
Fig. 146: Maintenance Report as a column chart

Workplace	C170102	H170201	WP-STD-01
Maintenance	435:39	100:15	104:55
Scheduled	272:18	37:34	49:27
Unscheduled	163:21	62:40	55:27
Scheduled Operating Time	705:50	447:06	1195:24
PPM Degree	38.58%	8.4%	4.14%
U/M	37.5%	62.52%	52.86%

Fig. 147: Maintenance Report as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)

3.11.2 Maintenance Development

Path: Performance Analysis > Reporting > Reports > Maintenance > Maintenance Development

✔ The **Maintenance** and **Unscheduled Maintenance** time bases are configured.

Multi-report showing the development over time of the durations of maintenance activities for *one* or *more* workplaces for a period:

- Maintenance Development as a column chart (Fig. 148):
  PPM Degree and unscheduled maintenance (U/M) shown as columns. The columns appear individually or by pairs, depending on the selection made in the value filter. Each column or pair represents the duration for a selected period (e.g. month, calendar week, etc.). The data reflect all selected workplaces.
- Maintenance Development as a table (Fig. 149):
  A table listing the durations of maintenance activities in minutes. It shows the overall maintenance time, scheduled and unscheduled maintenance times, scheduled operating time and PPM degree. The data reflect all selected workplaces. The columns relate to selected periods (e.g. month, calendar week, etc.). The value filter does not have an effect on this table.
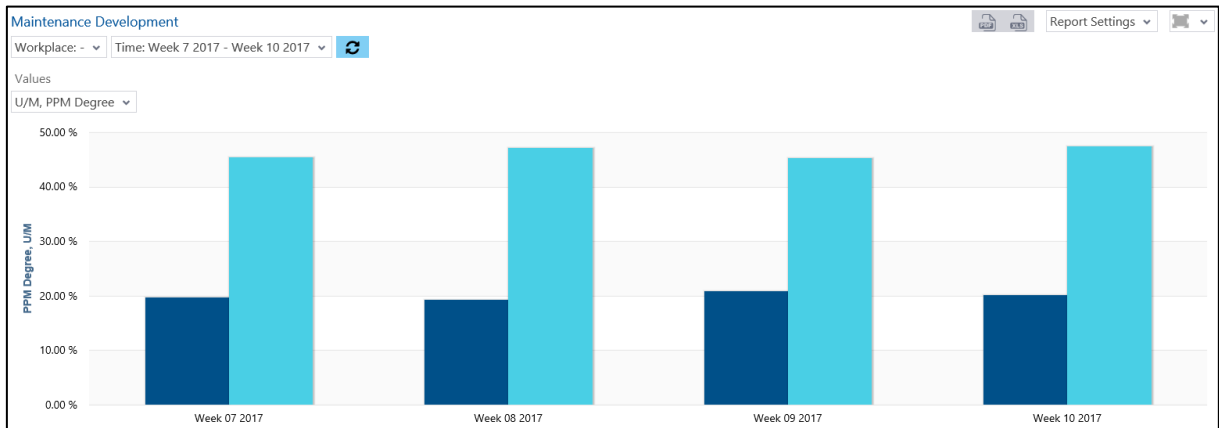
Fig. 148: Maintenance Development as a column chart

Period of Time	2017/07	2017/08	2017/09	2017/10
Maintenance	2273:37	2295:55	2381:01	742:25
Scheduled	1236:55	1210:15	1300:50	388:49
Unscheduled	1036:42	1085:40	1080:10	353:35
Scheduled Operating Time	6252:37	6233:34	6184:26	1915:41
PPM Degree	19.78%	19.42%	21.03%	20.3%
U/M	45.6%	47.29%	45.37%	47.63%

Fig. 149: Maintenance Development as a table

The following filters are available:

 − Workplace (multiple)
 − Time (day, week, month, quarter, year)

3.11.3 Stoppage Reason Development

Path: Performance Analysis > Reporting > Reports > Maintenance > Stoppage Reason Development

 ✓ The **Maintenance** and **Unscheduled Maintenance** time bases are configured.

Multi-report showing the development of stoppage reasons over time for *one* or *more* workplaces for a selected period:

 − Stoppage Reason Development as a column chart (Fig. 150):
 Shows the development of stoppage reasons proportionately in columns. Each column represents the duration for a selected period (e.g. month, calendar week, etc.). The development is shown either as a duration (in minutes or as a percentage), frequency (number or percentage), MTBF or MTTR depending on the selection made in the value filter. The data reflect all selected workplaces.
 − Stoppage Reason Development as a table (Fig. 151):
 A table listing the development of stoppage reasons. The development is shown either as a duration (in minutes or as a percentage), frequency (number or percentage), MTBF or MTTR. The data reflect all selected workplaces. The columns relate to selected periods (e.g. month, calendar week, etc.). The value filter does not influence this table.
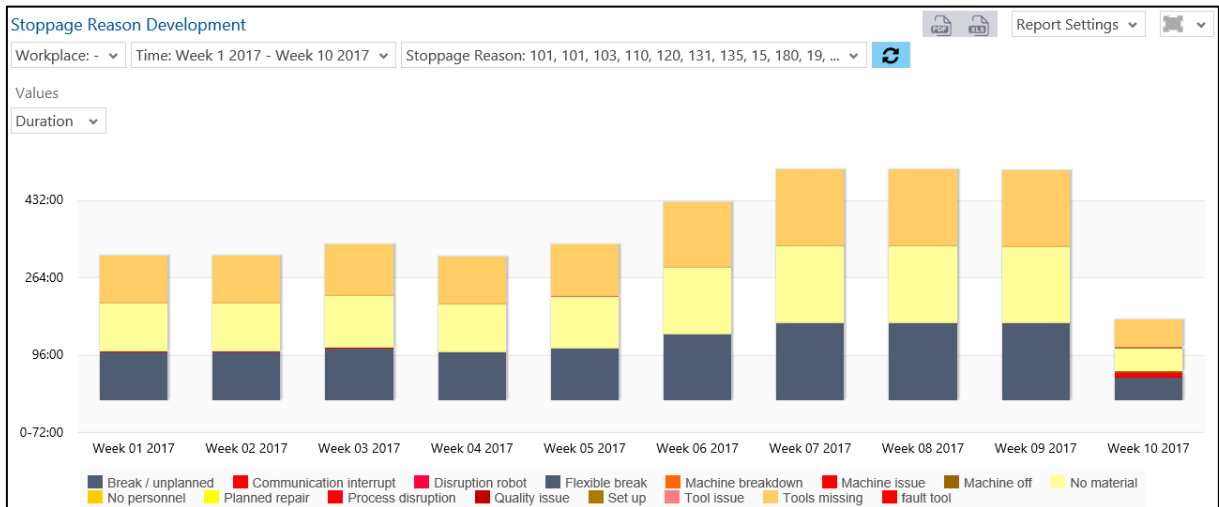
Fig. 150: Stoppage Reason Development as a column chart

Stoppage Reason	Week 01 2017						Week 02 2017				
	Duration	Duration [% absolute]	Frequency	Frequency [% absolute]	MTBF	MTTR	Duration	Duration [% absolute]	Frequency	Frequency [% absolute]	M
Communication interrupt	00:30	0.01%	1	2.86%	4061:21	00:30					
Break / unplanned	104:00	2.7%	0	0%	00:00	00:00	104:00	2.43%	0	0%	00
Tools missing	104:00	2.7%	0	0%	00:00	00:00	104:00	2.43%	0	0%	00
No material	104:10	2.71%	1	2.86%	4061:21	104:10	104:00	2.43%	0	0%	00
Process disruption	00:10	0%	1	2.86%	4061:21	00:10					
Planned repair	00:00	0%	1	2.86%	4061:21	00:00					
Flexible break	00:10	0%	1	2.86%	4061:21	00:10					
Machine breakdown	00:07	0%	1	2.86%	4061:21	00:07					

Fig. 151: Stoppage Reason Development as a table

The following filters are available:

- Workplace (multiple)
- Time (day, week, month, quarter, year)
- Stoppage reason (multiple)
  If a stoppage reason is selected, the data refer to this stoppage reason only.

4   Report Editor

Path: Performance Analysis > Reporting > Report Editor

The Report Editor lets you define new reports and combine several individual reports in a multi-report. You can delete or edit your own reports. You can specify whether your own reports should be displayed in the navigation area. It is recommended to hide sub-reports of a multi-report (see section 4.7) since they are only displayed together with other reports and this would overcrowd the navigation area unnecessarily.

4.1   Creating and Editing Report Categories

Reports can be grouped per categories in the navigation area. Categories facilitate arranging your reports in a structured way. Open categories in the navigation area by clicking the **Open Report** icon and close them by clicking the **Close Report** icon.

ⓘ Categories within the navigation area can be moved via drag-and-drop.
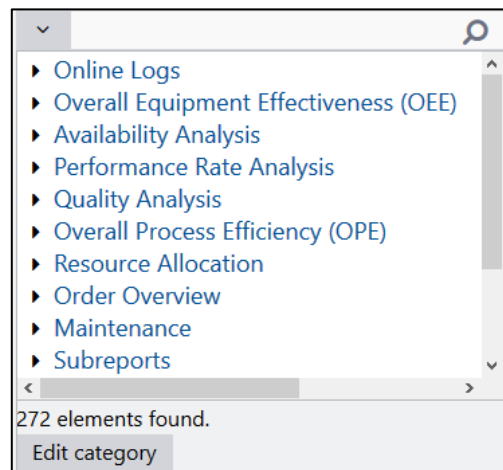
Fig. 152: Navigation area

To create a new category:
1. Click **Edit category** (see Fig. 152).
➜   The navigation area changes to editing mode.
2. Click **Add category**.
3. Enter a name for the category.
➜   The category appears in the language set by the user when logging on to FORCAM FORCE™.
4. Click **Add**.
5. Save by clicking **Done**.

To create a subcategory:
1. Select a category and click **Add category**.
2. Enter a name for the category.
➔ The category appears in the language set by the user when logging on to FORCAM FORCE™.
3. Click **Add**.
Repeat the steps 1 to 3 as often as necessary.
4. Save by clicking **Done**.

To edit or delete a category:
1. Select a category.
2. Click on the **Edit** icon, edit the entries and then click **Apply**.
Or
Click on the **Delete** icon and confirm.
3. Save by clicking **Done**.

4.2 Creating a New Report

When creating a new report, the contents to be displayed as well as their format can be specified individually.

ⓘ Any changes made to reports can be undone by clicking **Undo** at the top right of the screen.
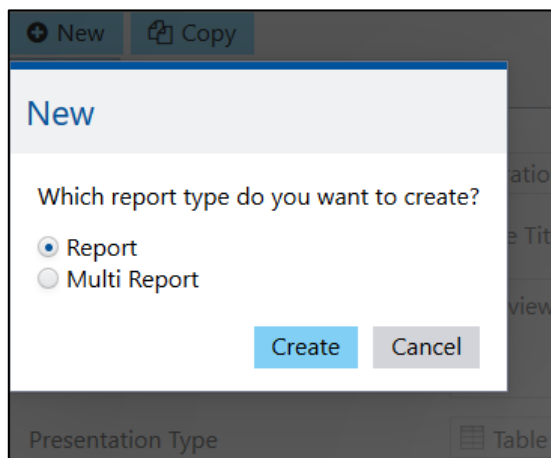
Fig. 153: Creating a new report

To create a new report:
1. Click **New** in the display area (see Fig. 153).
2. Select **Report**.
3. Click **Create**.
➔ The view changes to editing mode.

ⓘ Click on the **Preview** tab to change to preview mode. All settings and any changes are displayed here in a preview without saving.

The configuration of a report is determined by the selected presentation type. Depending on the type, parameters are displayed or hidden. This section describes the complete configuration of each type.

Some presentation types allow display options that display various additional information in reports. One of these options is the line that can be selected, for example, in a bar chart. The line represents data as a straight line and can cross several graphs, in this case column groups.

The line draws the straight line from one data point to the next and is therefore only useful for signal values and their progression. If there is no value between two data points, the line bridges this value to the next data point. The point without value can be misunderstood by this type of mapping. It is therefore recommended to use the line only for existing data.
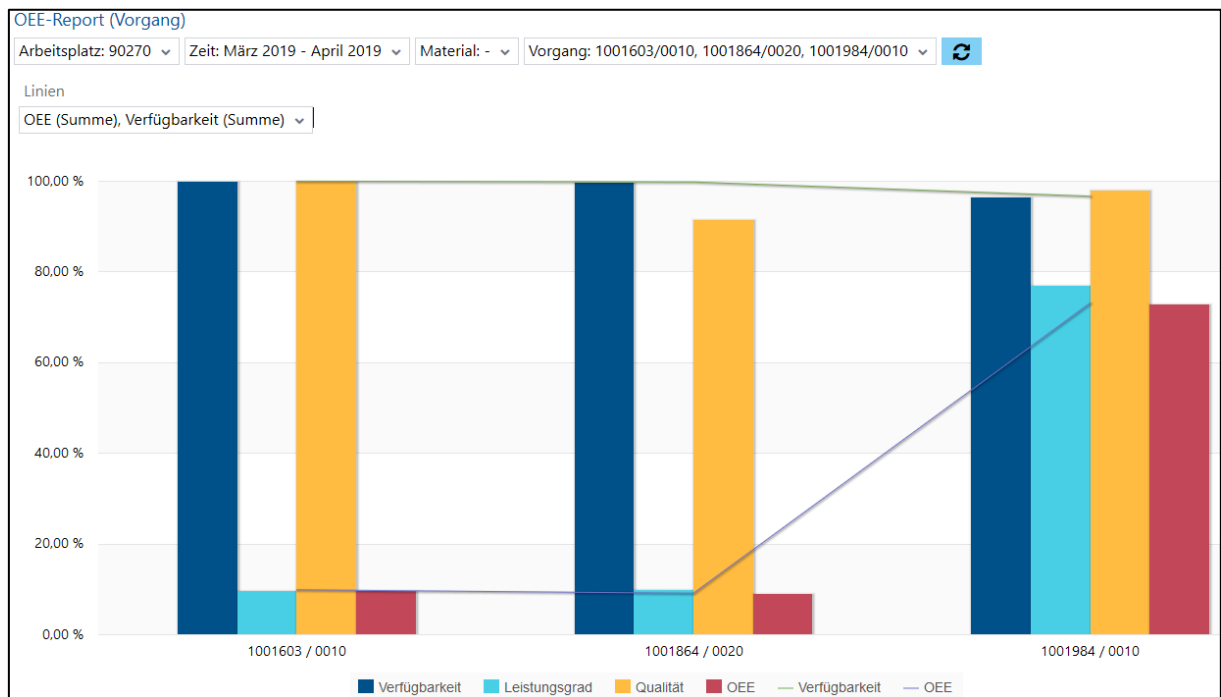
Fig. 154: Line in a report

4.2.1 Table

Display of data in table format (for example, see Fig. 105).

To create a report in table format:
1. Enter the name of the report.
2. Enter a title and additional information as appropriate (see section 4.2.7).
3. Enter the description of the report.
4. Select the **Table** presentation type.
5. Select the data source (see section 6).
6. Select the row color.
   Data field from the data source which defines the colors of the individual states.
7. Edit the columns:
   a. Add a new column by clicking the **Add** icon.
   b. Remove a column by clicking the **Remove** icon.
   c. Replace a column by another one by clicking the **Edit** icon.
   d. Move a column up by clicking the **Up** icon or down by clicking the **Down** icon one position at a time.
8. Show or hide total rows.
   If you set a check mark at **Show total rows**, a row showing the totals is added below the last row of the table. It displays the totals of all values for all columns containing values.
9. Set the alignment of the table.
   If you set a check mark at **Transposed Display**, the rows and columns of the table will be interchanged.
10. Add drill-down (optional, see section 4.4).
11. Set whether the report should be displayed as a standalone report.
    If you set a check mark at **Visible as a standalone report**, the report will be displayed as an individual report in the navigation area.
12. Configure a filter if applicable (see section 4.5).
13. Click **Save** in the top menu bar.

4.2.2 Pivot Table

A pivot table can be used to display and analyze the data of a table in various ways. It presents the data in a condensed and summarized format. This makes it possible to reduce major volumes of data to the desired essential contents in a clear arrangement.

Quality Type	Quality Details	Week 06 2017 Quantity	Quantity [%]	Week 08 2017 Quantity	Quantity [%]	Week 09 2017 Quantity	Quantity [%]	Total ∑ Quantity	Total Ø Quantity [%]
Rework quantity	Dent repaired	178	27.3%	114	7.23%	5	3.62%	297	9900%
Rework quantity	Surface Waves			238	15.1%	4	2.9%	242	8066.67%
Scrap quantity	Generic failure	20	3.07%	352	22.34%	6	4.35%	378	12600%
Scrap quantity	Dimensional Precision	178	27.3%			8	5.8%	186	6200%
Yield quantity	Yield quantity standard	218	33.44%	766	48.6%	100	72.46%	1084	36133.33%
Yield quantity	Yield quantity standard 2	58	8.9%	106	6.73%	15	10.87%	179	5966.67%
∑		652	100%	1576	100%	138	100%	2366	78866.67%

Fig. 155: Pivot table

To create a report in pivot table format:
1. Enter the name of the report.
2. Enter a title and additional information as appropriate (see section 4.2.7).
3. Enter the description of the report.
4. Select the **Pivot table** presentation type.
5. Select the data source (see section 6).
6. Select the column field.
   The column to be used for grouping. All data sets with the same content in the selected column are merged to one separate column each in the pivot table.
7. Select the column header date field.
   The period for accumulation.
8. Select the column header rendering field.
   Time unit.
9. Add row fields:
   a. Add columns by clicking the **Add** icon.
   b. Select data column.
      The column from the source report from which data are to be adopted.
   c. Select a color column, if necessary.
   d. Click **Apply**.
10. Add row presentation fields.
    First column of the pivot table:
    a. Add columns by clicking the **Add** icon.
    b. Select data column.
       The column from the source report from which data are to be adopted.
    c. Select a color column, if necessary.
    d. Click **Add**.
11. Add value fields.
    Data fields, the values of which are to be aggregated:
    a. Add columns by clicking the **Add** icon.
    b. Select data column.
       Data field from the data source, the values of which are to be aggregated.
    c. Select the method.
    d. Click **Add**.
12. Add row totals (optional).
    Cumulation row by row or averaging of values within specific columns:
    a. Add columns by clicking the **Add** icon.
    b. Select data column.
    c. Select the method.
    d. Click **Add**.
13. Show or hide total rows.
    If you set a check mark at **Show total rows**, a row showing the totals is added below the last row of the table. It displays the totals of all values for all columns containing values.
14. Set whether the report should be displayed as a standalone report.
    If you set a check mark at **Visible as a standalone report**, the report will be displayed as an individual report in the navigation area.
15. Configure a filter if applicable (see section 4.5).
16. Click **Save** in the top menu bar.

4.2.3 Bar Chart

Horizontal distribution of values in the form of bars along the X-axis (for example, see Fig. 106).

To create a report in bar chart format:
1. Enter the name of the report.
2. Enter a title and additional information as appropriate (see section 4.2.7).
3. Enter the description of the report.
4. Select the **Bar chart** presentation type.
5. Select the data source (see section 6).
6. Add categories.
   Specify all data columns from the data source that should be available as categories. The contents of the various data columns are the variables of the bar chart. Each content in a data column is represented by a separate bar:
   a. Add columns by clicking the **Add** icon.
   b. Select data column.
      The data field from the data source that should be available for selection as a category.
   c. Select a color column, if necessary.
      Specifies the color of the bar.
   a. Click **Add**.
7. Add values.
   Specify a data column, the contents of which can be added up to show the total in a bar graph. The data must be numbers.
   a. Add columns by clicking the **Add** icon.
   b. Select data column.
      The data column, the contents of which are to be added up.
   c. Select the method.
   a. Click **Add**.
8. Add target values (optional).
   One or more target values to be displayed as comparison value(s) in the chart (see section 11).
9. Edit the display options:
   a. Select axis.
      The Y-axis of the chart.
   b. Select partition.
      The X-axis of the chart.
   c. Select values (single).
   d. Specify the sort order.
      If several categories are specified, the partition of the column can be sorted.
   e. Show/hide diagram options.
      If you set a check mark for **Show Diagram Options**, the display options (step 8) are shown in the diagram.
   f. Show/hide average column.
      If you set a check mark for **Show Average Column**, an additional bar appears in the diagram and shows the average of all bars.
   g. Show/hide legend.
      If you set a check mark for **Show Legend**, the legend for the bars is shown in the diagram.
10. Add drill-down (optional, see section 4.4).
11. Set whether the report should be displayed as a standalone report.

If you set a check mark at **Visible as a standalone report**, the report will be displayed as an individual report in the navigation area.

12. Configure a filter if applicable (see section 4.5).
13. Click **Save** in the top menu bar.

4.2.4 Column Chart

Vertical distribution of values in the form of bars along the Y-axis (for example, see Fig. 106).
The configuration of a column chart is identical with the one of a bar chart. The only difference is the view.
For information about configuring a column chart, refer to section 4.2.3.

4.2.5 Ramp Chart

Distribution of values along an X-axis in the form of adjacent columns. Display of values in the form of curves with amplitude on the Y-axis.
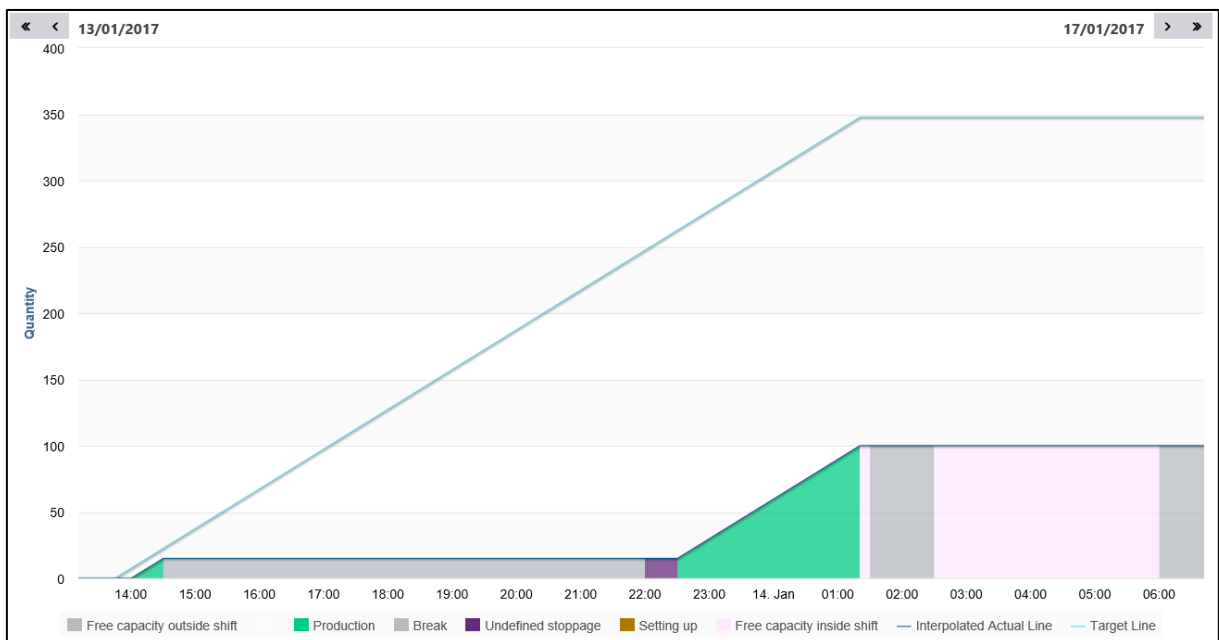
Fig. 156: Ramp chart

To create a report in ramp chart format:
1. Enter the name of the report.
2. Enter a title and additional information as appropriate (see section 4.2.7).
3. Enter the description of the report.
4. Select the **Ramp chart** presentation type.
5. Select the data source (see section 6).
6. Specify the X-axis.
   The period to be reflected on the X-axis.
7. Select a value.
   The value to be presented on the Y-axis on the left and which determines the height of the bars.
8. Select the row color.
   Data field from the data source which defines the colors of the individual states.
9. Select a value description.
   The description appears on the Y-axis on the left and informs about the value.
10. Add additional rows (optional).
    Specify an additional value to be shown as a line on the vertical axis when the ramp chart is displayed. This must be a number:
    a. Add a row by clicking the **Add** icon.
    b. Select data column.
    c. Click **Add**.
    d. Show/hide the row in the legend.
       If you set a check mark for **Show Legend**, the row is displayed in the legend for the diagram.
11. Add drill-down (optional, see section 4.4).
12. Select the target line.
13. Select the time base for target.
14. Select the time base for yield.
15. Show/hide OEE performance.
    If you set a check mark for **OEE**, the OEE performance is displayed in the diagram on the Y-axis on the right.
16. Set whether the report should be displayed as a standalone report.
    If you set a check mark at **Visible as a standalone report**, the report will be displayed as an individual report in the navigation area.
17. Configure a filter if applicable (see section 4.5).
18. Click **Save** in the top menu bar.

4.2.6 Timeline Chart

Shows the development of events or states over time. In reports, these charts reflect events to be reported relating to workplaces, operations or persons within a specific period as well as the resulting operating states in different colors. The color codes can be freely used to identify specific operating states.
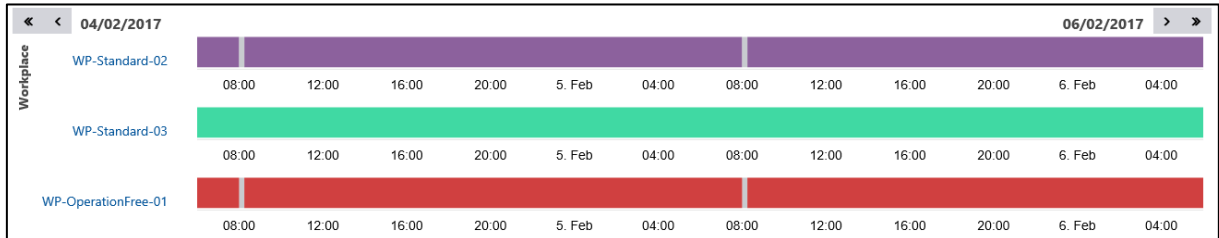
Fig. 157: Timeline chart

Depending on the selection in the filter, several rows (charts) are displayed in the timeline diagram. By default, each line has its own X-axis with a time specification. It is also possible to combine several lines over an X-axis (see step 8 below). Only an X-axis is displayed, and the desired number of lines is arranged above it.
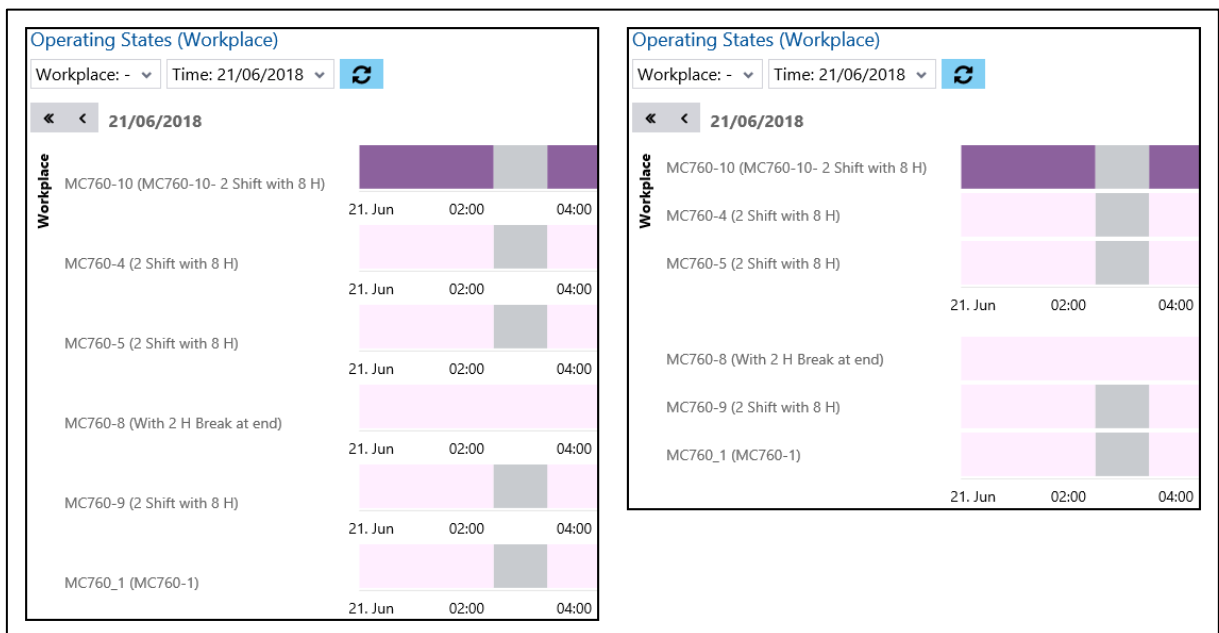
Fig. 158: Timeline with three charts per X-axis

To create a report in timeline chart format:
1. Enter the name of the report (mandatory).
2. Click on **Use Title** to enter Title and Addition if applicable (see Section 4.2.7).
3. Enter the description of the report.
4. Select the **Timeline chart** presentation type.
5. Select the data source (see section 6).
6. Define Y-axis.
   Element that is to be displayed on the Y-axis (here workplace). Define element and sorting by clicking the **Edit** icon.
7. Specify the X-axis.
   The period to be reflected on the X-axis.
8. Define charts per X-axis.
   Determines the number of charts (rows) that are combined over the X-axis (see Fig. 158).
9. Select the row color.
   Data field from the data source which defines the colors of the individual states.
10. Select Tooltip.
    Determines the displayed information when the mouse pointer hovers over an element of the timeline.
11. Add additional rows (optional).
    Specify an additional value to be shown as a line on the vertical axis if the ramp chart is displayed. This must be a number:
    a. Add a row by clicking the **Add** icon.
    b. Select data column.
    c. Click **Add**.
    d. Show/hide the row in the legend.
       If you set a check mark for **Show Legend**, the row is displayed in the legend for the diagram.
12. Add drill-down (optional, see section 4.4).
13. Set whether the report should be displayed as a standalone report.
    If you set a check mark at **Visible as a standalone report**, the report will be displayed as an individual report in the navigation area.
14. Configure a filter if applicable (see section 4.5).
15. Click **Save** in the top menu bar.

4.2.7   Line Diagram

Representation of a certain value over a selected period as a line.
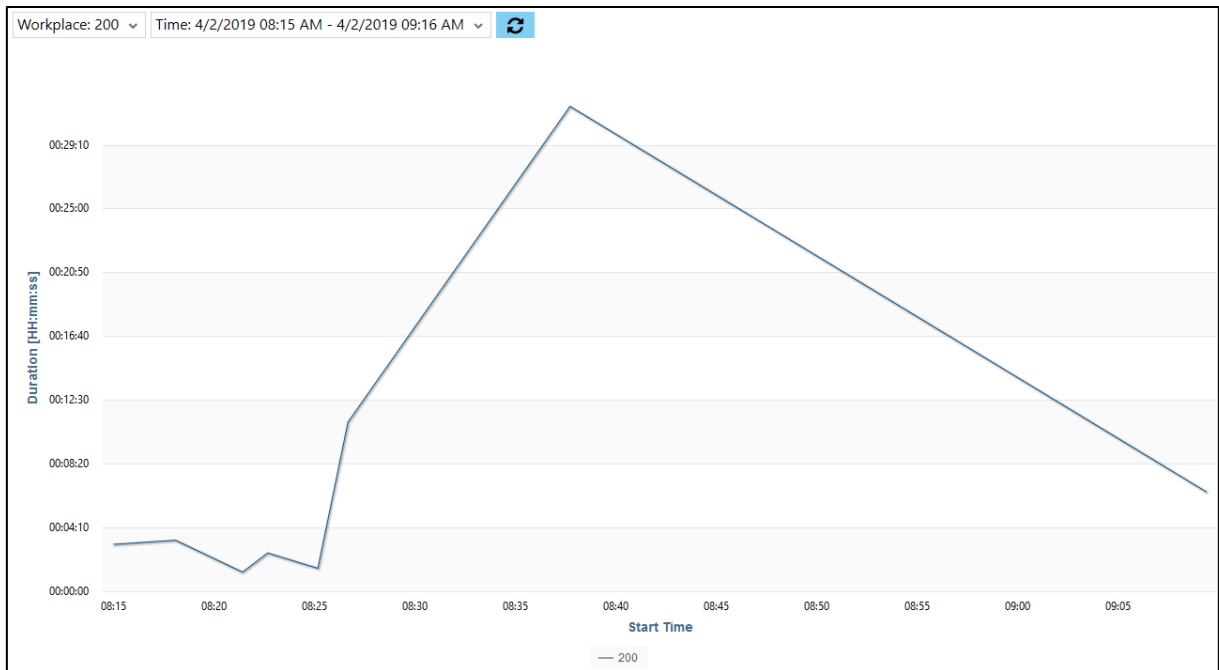
Bild 159: Line Diagram

To create a report in line diagram format:
1. Enter the name of the report (mandatory).
2. Click on **Use Title** to enter title and addition if applicable (see Section 4.2.7).
3. Enter the description of the report.
4. Select the **Line Diagram** presentation type.
5. Select the data source (see section 6).
6. Specify the X-axis.
   The period to be reflected on the X-axis.
7. Add categories.
   Specify all data columns from the data source that should be available as categories. The contents of the various data columns are the variables of the bar chart. Each content in a data column is represented by a separate bar:
   a. Add columns by clicking the **Add** icon.
   b. Select data column.
      The data field from the data source that should be available for selection as a category.
   c. Select a color column, if necessary.
      Specifies the color of the bar.
   d. Select a sort order column.
      Determines the order priority.
   e. Click **Add**.
8. Add Y-Values.
   Specify a data column, the contents of which is to be displayed on the y-axis. The data must be numbers.
   a. Add columns by clicking the **Add** icon.
   b. Select data column.

The data column, the contents of which are to be added up.

      c.   Click **Add**.

9. Add target values (optional).

One or more target values to be displayed as comparison value(s) in the chart (see section 11).

10. Edit the display options:

Determines which of the selected values should be displayed or hidden in the graph.

      a.   Change display options by clicking the **Edit** icon.

          Selection of another value to be displayed on the Y axis.

      b.   Show/Hide Display Options.

          Check the box under **Visible** to display the respective value in the diagram.

      c.   Show/hide Legend.

          Set the check mark under **Show Legend** to display the legend in the diagram.

      d.   Show/hide Axis Title.

          Set the check mark under **Show Axis Title** to display the title of the axis in the diagram. The axis title corresponds to the selected value (e.g. target quantity).

      e.   Limit Percentage Axis.

          Set the check mark under **Limit Percentage Axis to 100%** to prevent a percentage above 100%. The maximum load of the axis is then 100% and the values are displayed proportionately.

11. Add drill-down (optional, see section 4.4).

12. Set whether the report should be displayed as a standalone report.

If you set a check mark at **Visible as a standalone report**, the report will be displayed as an individual report in the navigation area.

13. Configure a filter if applicable (see section 4.5).

14. Click **Save** in the top menu bar.

4.2.8 Pie Chart

Representation of different proportional values in a pie chart.
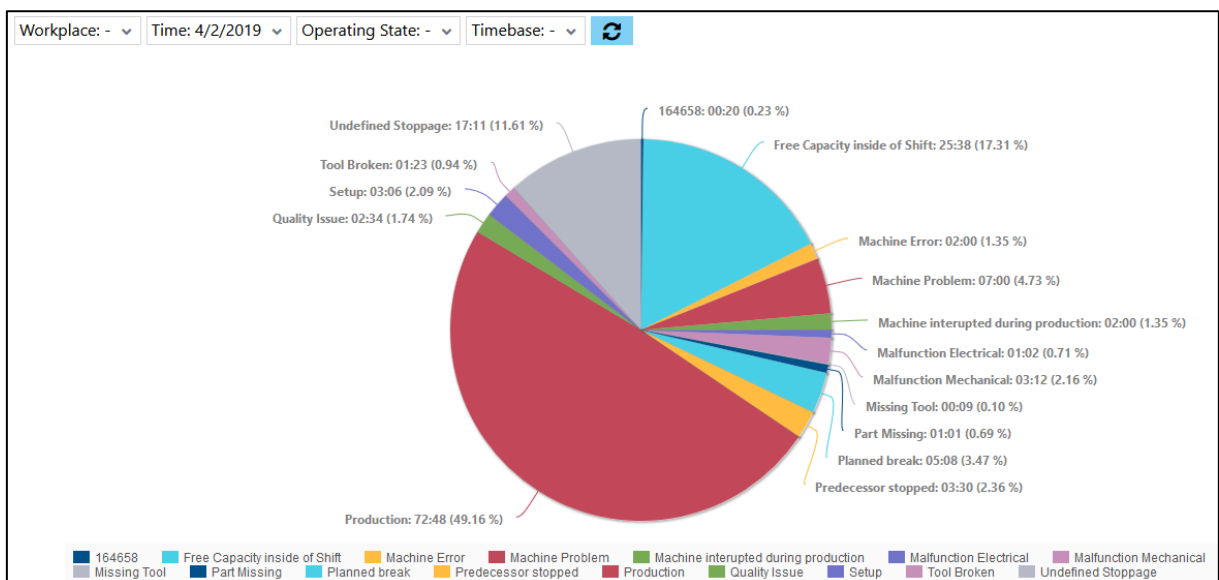
Fig. 160: Pie Chart

To create a report in pie chart format:

1. Enter the name of the report (mandatory).
2. Click on **Use Title** to enter title and addition if applicable (see Section 4.2.7).
3. Enter the description of the report.
4. Select the **Pie Chart** presentation type.
5. Select the data source (see section 6).
6. Add categories.
   Specify all data columns from the data source that should be available as categories. The contents of the various data columns are the variables of the bar chart. Each content in a data column is represented by a separate bar:
   a. Add columns by clicking the **Add** icon.
   b. Select data column.
      The data field from the data source that should be available for selection as a category.
   c. Select a color column, if necessary.
      Specifies the color of the bar.
   d. Select a sort order column.
      Determines the order priority.
   e. Click **Add**.
7. Add Values.
   Value to be displayed on the diagram.
8. Edit the display options:
   Determines which of the selected values should be displayed or hidden in the graph.
   a. Change display options by clicking the **Edit** icon.
      Selection of another value to be displayed on the Y axis.
   b. Show/Hide Display Options.
      Check the box under **Visible** to display the respective value in the diagram.
   c. Show/hide Legend.
      Set the check mark under **Show Legend** to display the legend in the diagram.
   d. Show/hide Axis Title.
      Set the check mark under **Show Axis Title** to display the title of the axis in the diagram. The axis title corresponds to the selected value (e.g. target quantity).
   e. Limit Percentage Axis.
      Set the check mark under **Limit Percentage Axis to 100%** to prevent a percentage above 100%. The maximum load of the axis is then 100% and the values are displayed proportionately.
9. Add drill-down (optional, see section 4.4).
10. Set whether the report should be displayed as a standalone report.
    If you set a check mark at **Visible as a standalone report**, the report will be displayed as an individual report in the navigation area.
11. Configure a filter if applicable (see section 4.5).
12. Click **Save** in the top menu bar.

4.3 Adding a Title and an Addition to a Report

You can add a title and an addition to a report. The title and the addition appear in the report only in the display area. The name of the report remains unaffected.

Titles can be used to identify a report based on personal preferences. For widgets, it is recommended to use short titles to ensure a clear arrangement of dashboards.
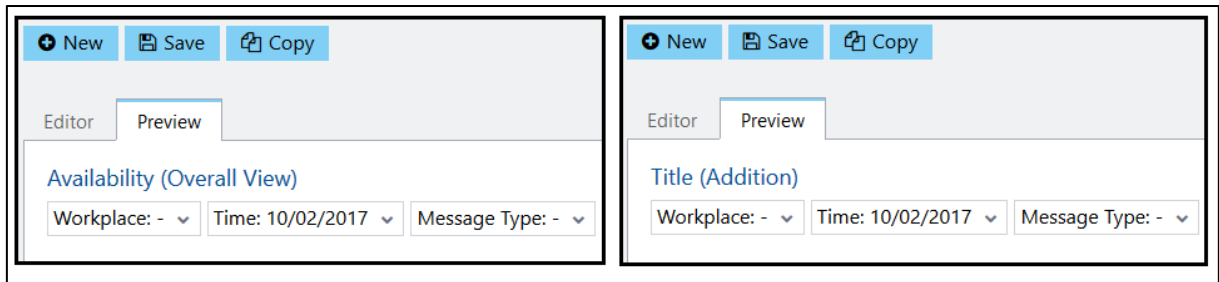
Fig. 161: Title and addition of a report

To add a title and an addition to a report:
1. Select the appropriate report in the Report Editor in the navigation area.
2. Set a check mark for **Use Title**.
➔ The input fields for title and addition appear.
3. Enter the appropriate title and addition as necessary.
   The addition appears behind the title in parentheses.
4. Click **Save** in the top menu bar.
➔ The title and the addition appear above the report in the display area. The name of the report is unchanged.

4.4 Adding a Drill-Down

A drill-down can be added to each report. By calling up the drill-down (see section 2.6), the view changes to the configured target report. It is recommended to select target reports that display specific and detailed information about the source report.

In Fig. 162, a drill-down with two target reports was created for the report **Hitlist Operating States (Workplace)**:

Fig. 162: Drill-Down of the report Hitlist Operating States (Workplace)

In the configuration dialog of the drill-down, you first select the report to which the drill-down should lead. In addition, values and filters of the source report can be determined as filters of the target report. The drill-down to the report **Operational State Development (Workplace)** has been configured as follows:

Fig. 163: Configuration dialog of a Drill-Down

(1) Report to which the drill-down is to lead.
All reports listed in the navigation area, including the source report, can be selected as the target report.
At least one of the filters in the target report must be of the same data format as a column in the source report.

(2) Column of the source report whose value is to be used in the selected row as a filter in the target report.
The column in the source report must be of the same data type as the filter in the target report.

(3) Filter in the source report whose value is to be adopted in a filter in the target report.
The filter in the source report must be of the same data type as the filter in the target report.

Fig. 164 shows how the configuration of the drill-down is displayed in the target report:
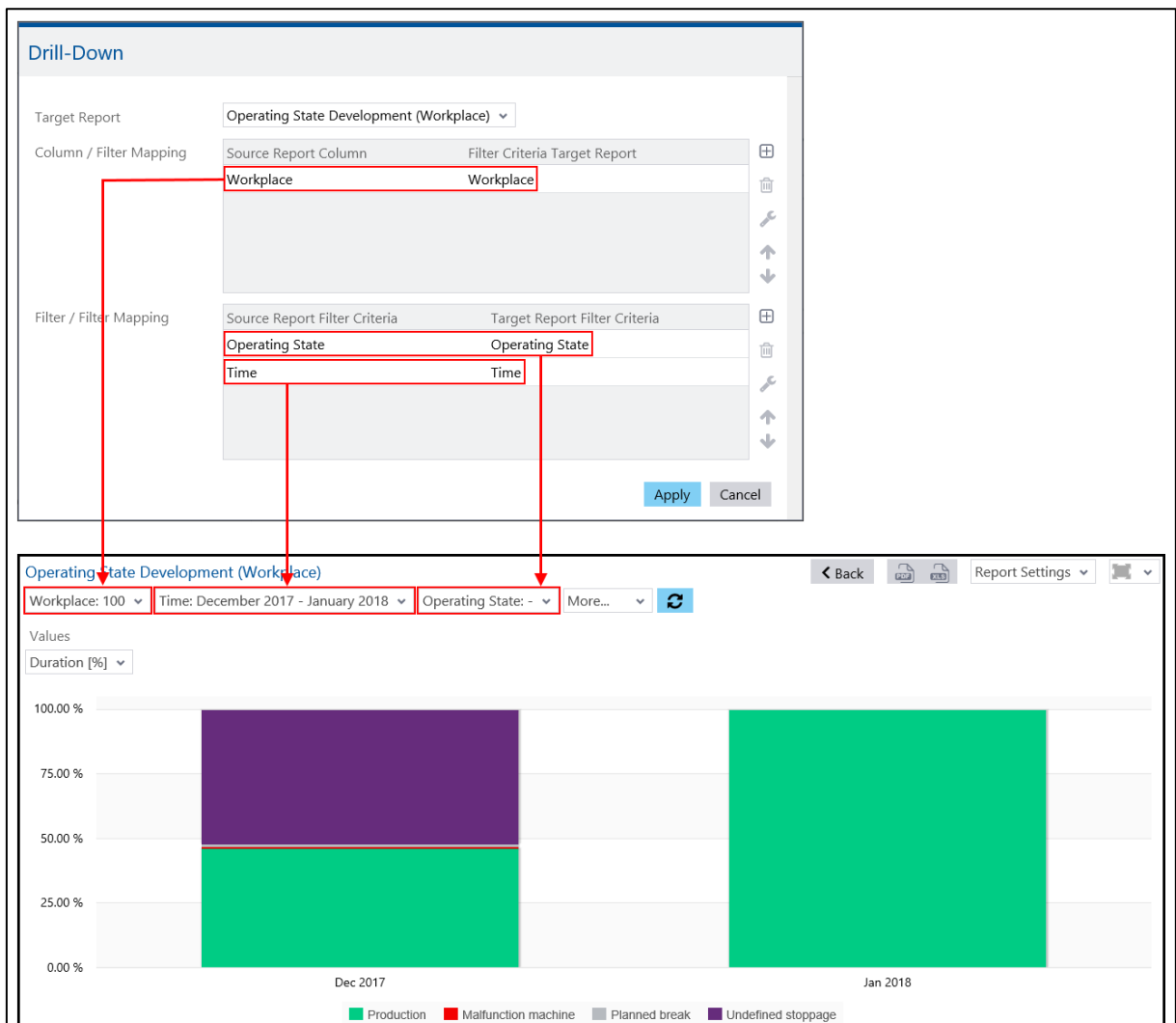
Fig. 164: Display of filters on the target report

To create a drill-down:

1. Add a new drill-down by clicking the **Add** icon.
2. In the configuration dialog (see Fig. 163), select the Target Report referenced by the drill-down.
3. In the drop-down menu under **Only available for column**, select which column in the source report should lead to the drill-down (optional).
   Example: The report **OEE Overall View (Column Chart)** shows a total of four columns. If **Quality (Sum)** is selected in this drop-down menu, the drill-down can only be called from the **Quality** column.
4. Select Category Column.
   The drop-down menu is inactive and predefined if there is only one selection here
5. Add column/filter mapping by clicking the **Add** icon.
   a. Use **Source Report Column** to select the column from the source report to be used in the selected row as a filter in the target report.
   b. Use **Target Report Filter Criteria** to select the criterion to be used for filtering the column.
   c. Click **Add**.
6. Add filter/filter mapping by clicking the **Add** icon:
   a. Use **Source Report Filter Criteria** to select a filter value to be adopted.
   b. Use **Target Report Filter Criteria** to select a criterion to be overwritten by the previously selected criterion.
   c. Click **Add**.
7. Click **Apply**.

4.5 Configuring Filters

Filters for reports can be shown or hidden. It is possible to group several filters in a dropdown menu, for example, to show rarely used filters only if necessary. It is also possible to set default values for filters such as time, frequency, duration, etc.

Filter Configuration	Filter Name	Visiblity	Default
	Workplace	Visible	Workplace: -
	Time	Visible	Time: 20/03/2017 - 29/03/2017
	Operation	Visible	Operation: -
	Operation Status	Visible	
	Frequency	Additional	Frequency: -
	Duration	Additional	Duration: -

Fig. 165: Filter configuration

To configure a filter:
1. Select the appropriate report in the Report Editor in the navigation area.
2. Select the appropriate filter in the **Filter Configuration** area.
3. Click on the **Edit** icon.
4. Open the dropdown menu for **Visibility** and make the appropriate setting:
    − Visible:
       The filter is shown permanently.
    − Hidden:
       The filter is hidden permanently.
    − Additional:
       The filter is available in a dropdown menu in the report display area.
5. Enter the desired default value into the **Default** field (if available).
6. Click **Apply**.
7. Click **Save** in the top menu bar.

ⓘ Change the arrangement of filters by clicking on the **Up/Down** icons.

4.6   Editing a Report

Reports can also be edited or deleted at a later date.
Predefined and standard reports included in the application can neither be edited nor deleted. This is only possible with copies of them.
You can make copies of a report, for example, to keep the original report and create a new one using it as a template.

To copy a report:
1. Select a report in the navigation area.
2. Click **Copy** in the top menu bar.
➔ The name of the report appears with the addition **(Copy)**. Now you can edit this copy.
    The **Copy** option is now deactivated since you cannot make a copy from a copy.
3. Edit the report as necessary.
4. Click **Save** in the top menu bar.
➔ The copied report appears (with its new name, if specified) in the navigation area.
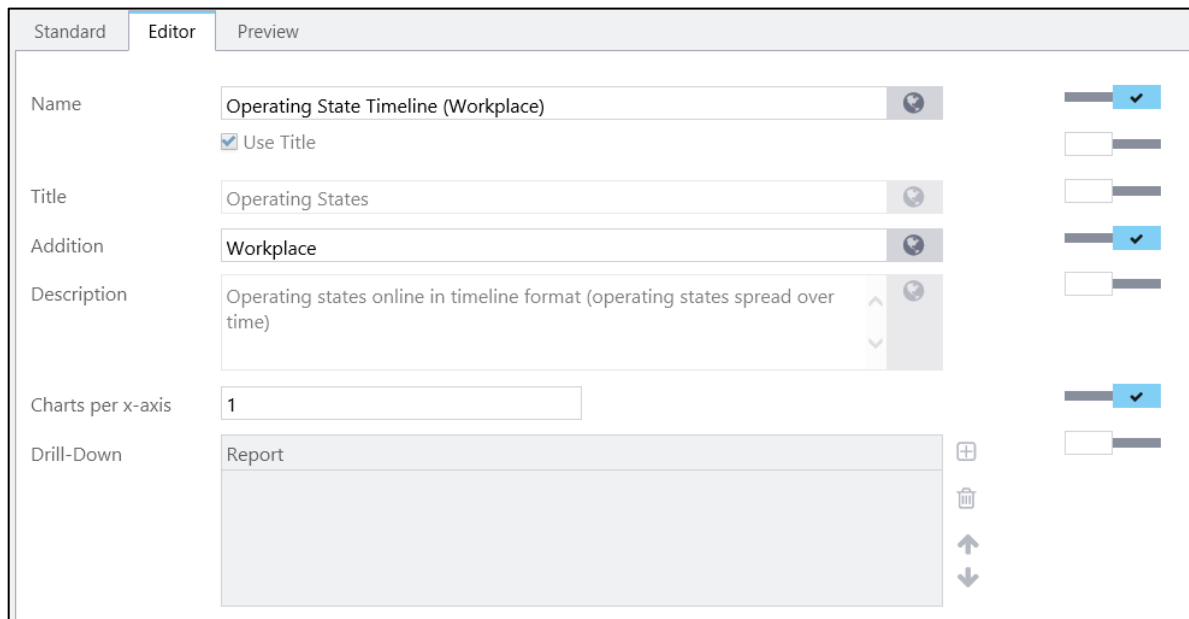
To edit a report:
1. Select a report in the navigation area.
2. Edit the report as necessary.
3. Click **Save** in the top menu bar.

To delete a report:
1. Select a report in the navigation area.
2. Click **Delete** at the top right of the screen and confirm.

Name, title, addition and description of a report are write-protected for editing by default. Editing is only possible in the sub-tab **Editor**. This ensures that these default values are not overwritten unintentionally.
Drill-downs can also be created here (see section 4.4).
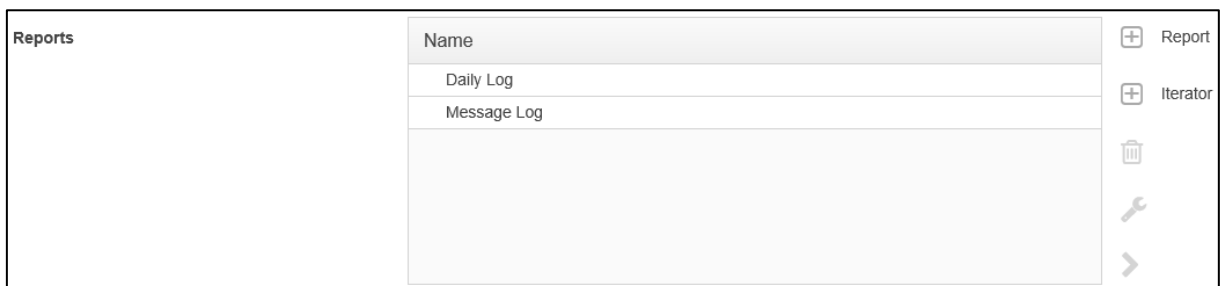
Fig. 166: Sub-tab Editor with sliders for write protection

Next to each line there is a slider that activates the editing of the line. If the value of a line is edited and saved, the new value applies. However, the default value in the **Standard** tab remains the same. If a line in the tab **Editor** is deactivated by the slider, the default values apply again.
Example: The value in the line **Charts per X-axis** in the **Standard** tab is 1. Under the **Editor** tab, the value is set to 6. After saving, the X-axis has 6 charts. The slider is now deactivated. The value from **Standard** applies again. The X-axis has 1 chart again.

4.7 Multi-Report

Multi-reports are compilations of several individual reports. This does not involve creating new reports but only presenting existing reports together in a single combined report.

Fig. 167: Combining several reports

4.7.1 Creating a Multi-Report

To create a multi-report:
1. Click **New** in the display area (see Fig. 153).
2. Select **Multi Report**.
3. Click **Create**.
➜ The view changes to editing mode.
4. Enter the name of the multi-report.
5. Enter a title and an addition as appropriate (see section 4.2.7).
6. Enter the description of the multi-report.
7. Add report(s).
    a. Add a report by clicking the **Add** icon.
    b. Select a report and click **Add**.
    c. Repeat steps a and b as often as necessary.
8. Add an iterator, if applicable (see section 4.7.2).
9. Select/deselect hierarchical view.
   If you set a check mark for **Hierarchical view**, those reports that are subordinate to an iterator will be slightly indented.
10. Show the titles of partial reports.
    If a check is set at **Use Title**, the titles for all partial reports will be displayed on top.
11. Display reports that have no data.
    If a check is set, all partial reports will be displayed, even if they do not contain data.
12. Set the space between the reports.
    Enter the distance between the reports in pixels.
13. Set whether the report should be displayed as a standalone report.
    If you set a check mark at **Visible as a standalone report**, the report will be displayed as an individual report in the navigation area.
14. Configure a filter if applicable (see section 4.4).
15. Click **Save** in the top menu bar.

4.7.2 Iterator

You can use an iterator in a multi-report. An iterator is used to execute and display the same report with different filter values.
Example:
You may want to execute an existing report once for each workplace in the filter. Specify an iterator for this. It is assigned a data source which supplies the workplaces and has a workplace filter. Now add the report to this iterator. It must also have a workplace filter since otherwise the same data would be displayed in each iteration.
The report will now be executed as often as there are workplaces selected in the filter.

To add an iterator:
1. Click on the **Add iterator** icon.
2. Select data source.
3. Select data column.
4. Select presentation column.
5. Select filter.
6. Click **Add**.
➔ The iterator appears in the **Reports** field and can be opened. An iterator may contain several iterators itself (nesting). An iterator requires at least one report.
7. Select an iterator and click on the **Add report** icon (see section 4.7.1).

Fig. 168: Adding an iterator

Fig. 169: Iterator displayed

5   Visualization

Path: Performance Analysis > Visualization > Views

Visualizations provide a clearly arranged real-time view of the current situation in production. The view editor offers a number of basic graphic elements to design your own visualizations according to your requirements. These can also be used as group elements in other visualizations (i.e. nesting). Graphic elements can be assigned to a workplace to provide a visual presentation of operating states and production progress. Group elements for the visualization of a single line or machine can be integrated into the shop floor layout or any other background design so that a complete production shop can be visualized. Visualizations can be displayed on any terminal device equipped with a suitable Internet browser. It is recommended to use Internet Explorer Version 10 or higher.
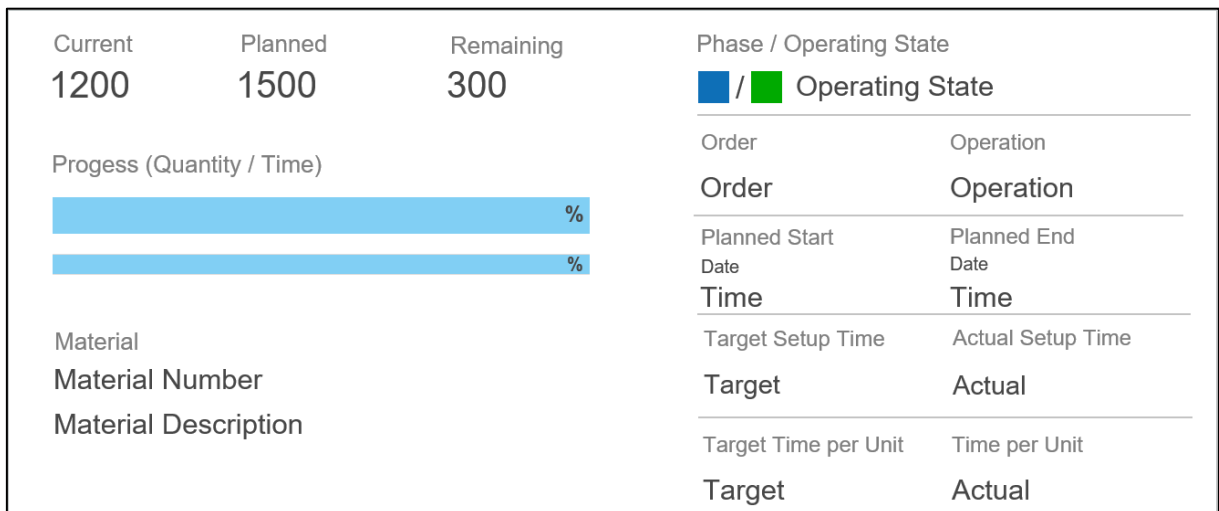
Fig. 170: Visualization (example)

The graphic elements can be linked to the data existing in FORCAM FORCE™. Use this, for example, to create a machine element in which the operating state is illustrated in color. It is also possible to display the order, operation status, quantity produced etc.

ⓘ In addition to the standard view, the visualization is available as a RISC view (see section 5.11). The RISC view is based on the RISC architecture and offers additional functions and better performance.

A visualization is composed of the following elements:
- Rectangle
- Text
- Image
  Graphic formats supported by the browser
- Buttons
- Lines
- HTML page
- Self-defined group element

To create a new visualization:
1. Click **New** in the top menu bar.
2. Enter the name of the visualization.
3. Enter the description of the visualization.
4. Enter the width and height of the visualization in pixels.
5. Select the refresh interval.
➜ The visualization refreshes the data displayed at the selected interval in seconds.
6. Click **Save**.
➜ The visualization appears in the navigation area.

ⓘ If you want to change these settings, click **Settings** in the top menu bar.

To go to the visualization editor:
1. Select the visualization in the navigation area.
2. Click **Edit** in the top menu bar.

5.1 Icons and Functions

The visualization editor consists of a central editing area surrounded by bars offering different functions. The left-hand bar provides elements for the visualization. The top menu bar provides functions for viewing and editing. The functions in the right-hand bar can be used for editing the appearance and properties of elements.

Fig. 171: Editor for visualizations

5.1.1 Elements for Visualizations

Drag and drop the elements from the bar into the editing area. Table 15 summarizes all available elements. Section 5.3 describes how to insert and edit elements.

Table 15: Elements for visualizations

Element	Description
	Rectangle
	Text field
	Image
	Button
	Horizontal line
	Vertical line
	Web page
	Group element (existing visualization)

5.1.2 Viewing and Editing

The functions listed in Table 16 provide options for editing elements and changing their display size.

Table 16: Icons for viewing and editing

Icon	Description
	Undo
	Redo
	Move editing area to original position (top left)
	Delete element
	Copy element
	Insert element
Preview	Preview visualizations in a separate window
100 %	Zoom ratio of view
	Zoom in
	Zoom out
	Restore original size of view
	Optimize zoom. Adjusts the view to the size of the display.

5.1.3 Appearance and Properties

The appearance and function of each element can be modified. The following settings are available for elements:

ⓘ The functions available depend on the element selected.

- General
    - Name:
      Internal identification of the element. The name is not shown in the visualization.
    - Tool tip:
      The text displayed when the mouse pointer hovers over the element.
    - Workplace assignment:
      Selection of a workplace to be linked to the element.
- Size
    - Width:
      Dynamic width setting of an element
    - Height:
      Dynamic height setting of an element
    - X-offset:
      Dynamic offset of an element on the X-axis
    - Y-offset:
      Dynamic offset of an element on the Y-axis
- Text
    - Text
      Text to be displayed within the element. The text overlays the background image and color.
    - Font
    - Text color
    - Horizontal alignment
      Horizontal alignment of the text within the element
    - Vertical alignment
      Vertical alignment of the text within the element
- Background
    - Color
    - Transparency
      The degree of transparency of the selected background color
    - Flashing
      The flashing rate of the selected background color
    - Image
      The background image placed on the background color. The image overlays the background color.
- Line
    - Color
      Color of the element frame or color of the line
    - Thickness
      Thickness of the element frame or thickness of the line

- Button
  - o Action

    Activity to be performed when clicking the element:
    - HTML:

      Opens a web page.
    - REPORT:

      Opens a report.
    - VIEW:

      Opens a visualization.

5.2 Dynamic Content

Dynamic visualization objects have parameters, the values of which are calculated dynamically based on a formula at runtime. Formulas are operations with logical or numerical expressions or any kind of strings.

Elements inserted in a visualization can include content related to an associated workplace, such as values, color or size, and automatically change it per the actual status of the workplace. It is possible to edit the parameters included to create self-defined formulas and display data in a flexible way. Dynamic contents can be configured in those fields for which the **Edit Formula** icon is available. It becomes active by clicking on **Dynamic**.
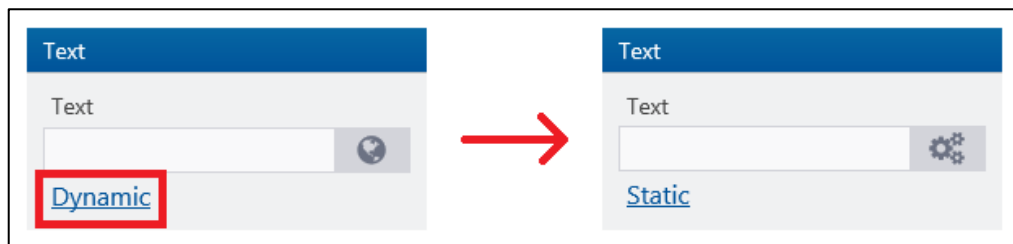
Fig. 172: Showing the dynamic content configuration function

An element must be assigned to a workplace before a dynamic field can be configured.

ⓘ In some cases, it may happen that a workplace-independent dynamic field is not refreshed. In these cases, the field must first be assigned a workplace. You may un-assign the workplace after the first refresh event.

To assign a workplace to an element:
- ✓ An element should be placed in the editing field.
  1. Select the element you want to assign a workplace to.
  2. Open the **General** area in the right-hand bar.
  3. Click on the **Edit** icon in the Workplace Assignment field.
  4. Select the appropriate workplace in the pop-up window and click **OK**.
- ➜ The name of the selected workplace appears in the **Workplace Assignment** field. This field cannot be edited.
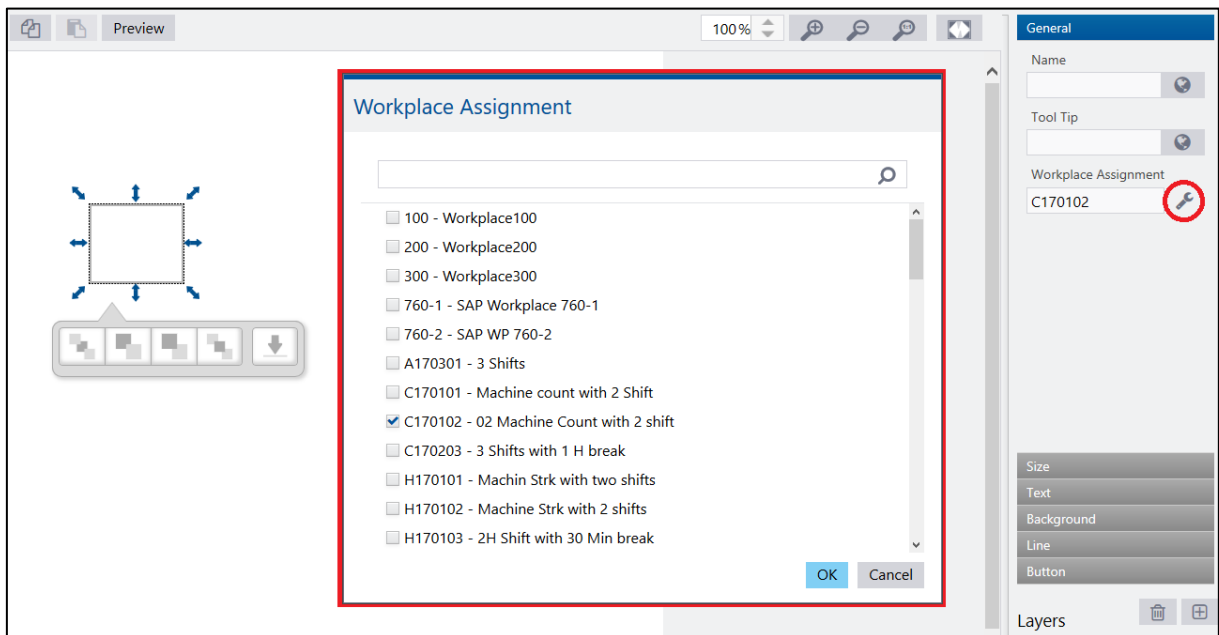
Fig. 173: Assigning a workplace to an element

5.2.1 Value

It is possible to include any information item that can be acquired for a workplace and display it dynamically in the visualization. Some examples are the workplace name, operating state or duration of a malfunction.

To assign a dynamic value to an element:
- ✔ An element should be placed in the editing field.
1. Select the element you want to assign a dynamic value.
2. Open the **Text** area in the right-hand bar.
3. Click the **Dynamic** option in the **Text** area.
4. Click on the **Edit Formula** icon.
5. In the formula editor (next dialog), double-click on the appropriate parameter, the value of which you want to display in the element.
6. Edit the formula as necessary in the left-hand area of the formula editor.
7. Click **OK**.
- ➔ Since the value is dynamic, it is only displayed when not in editing mode.
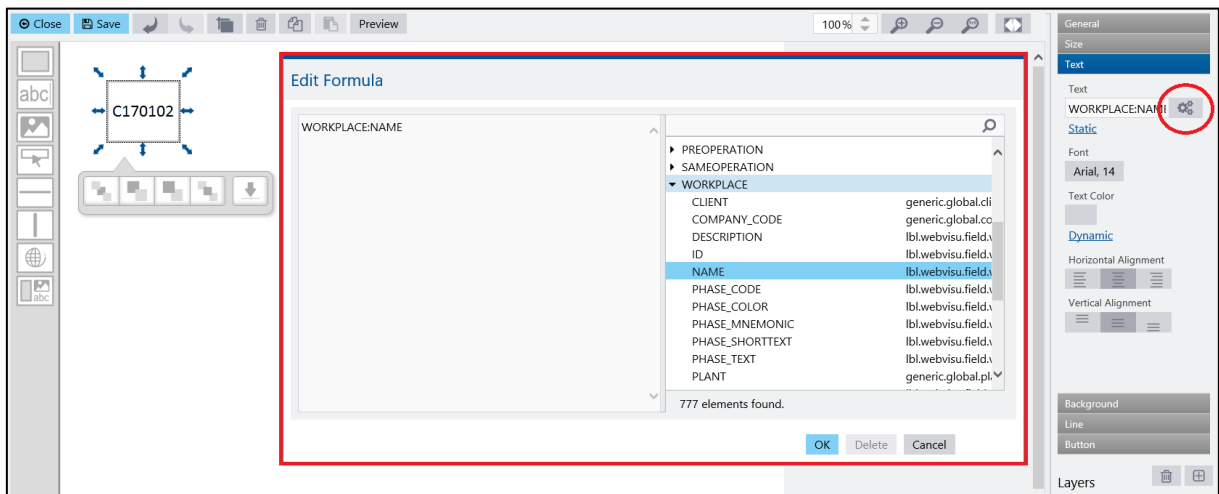
Fig. 174: Assigning the workplace name as a dynamic value

Table 17 lists values that are frequently used in visualizations. It is also possible to define additional fields with user-defined attributes (see section 5.10).

Table 17: Dynamic values and their descriptions

Parameter	Description
Header data	
OPERATION:ORDER	Order number
OPERATION:ORDER_SPLIT	Order split
OPERATION:OPERATION	Operation number
OPERATION:OPERATION_SPLIT	Operation split
Default values	
OPERATION:MAT_NUMBER	Material number
OPERATION:MAT_DESCRIPTION	Material description
OPERATION:TARGET_QUANTITY	Target quantity
OPERATION:TARGET_START	Target start
OPERATION:TARGET_END	Target end
Values acquired	
OPERATION:YIELD_QUANTITY	Yield quantity
OPERATION:SCRAP_QUANTITY	Scrap quantity
OPERATION:REWORK_QUANTITY	Rework quantity

OPERATION:TEMP_QUANTITY	Non-qualified quantity (machine counts)
OPERATION:USER1 (-USER10)	User fields (1-10)
Workplace-related data	
WORKPLACE:CLIENT	Client
WORKPLACE:COMPANY_CODE	Company code
WORKPLACE:PLANT	Plant
WORKPLACE:NAME	Workplace
WORKPLACE:DESCRIPTION	Workplace description
WORKPLACE:STATE_TIME	Start time of workplace state
WORKPLACE:STATE_DURATION	Duration of workplace state
WORKPLACE:STATE_MNEMONIC	Mnemonic of workplace state
WORKPLACE:STATE_SHORTTEXT	Short text of workplace state
WORKPLACE:STATE_TEXT	Workplace state
WORKPLACE:STATUS_DERIVED_DESCRIPTION	Operating state
WORKPLACE:STATUS_DERIVED_MNEMONIC	Mnemonic of operating state
WORKPLACE:STATUS_DERIVED_SHORTDESCRIPTION	Short text of operating state

5.2.2 Color

It is possible to include any information that has a color assigned for a workplace and display it dynamically in the visualization. The operating state is an example of an information item with an assigned color. The color changes in the visualization per the actual state.

To assign a dynamic color to an element:
- ✓ An element should be placed in the editing field.
1. Select the element you want to assign a dynamic color to.
2. Open the **Background** area in the right-hand bar.
3. Click the **Dynamic** option in the **Color** area.
4. Click on the **Edit Formula** icon.
5. In the formula editor (next dialog), double-click on the appropriate parameter, the color of which you want to define for the element.
6. Edit the formula as necessary in the left-hand area of the formula editor.
7. Click **OK**.
➔ Since the color is a dynamic value, it is only displayed when not in editing mode.
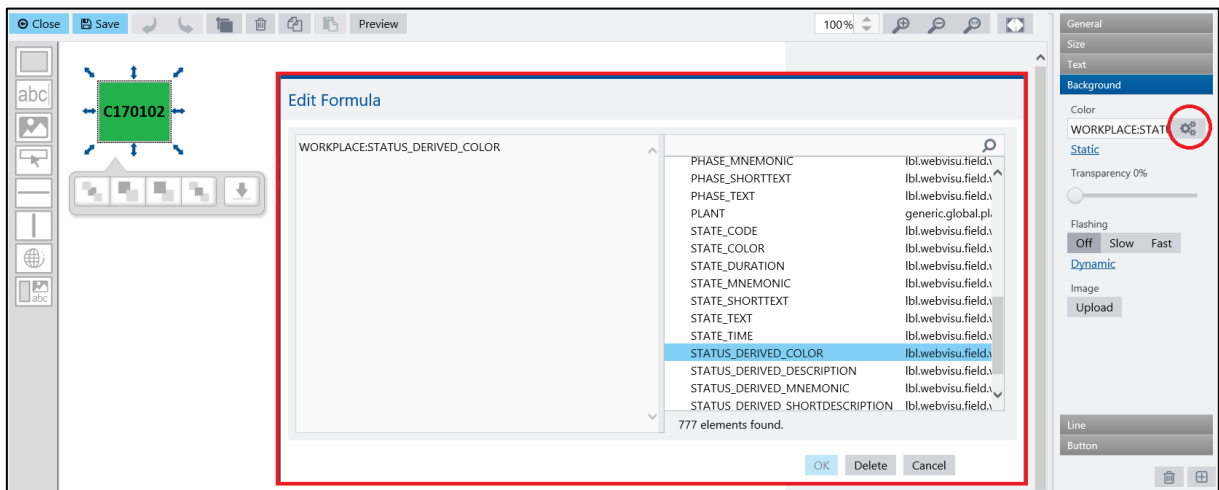
Fig. 175: Assigning the operating state color as a dynamic value

Table 18 lists colors that are frequently used in visualizations.

Table 18: Dynamic colors and their descriptions

Parameter	Description
OPERATION:PHASE_COLOR	Color of the operation phase
WORKPLACE:STATUS_DERIVED_COLOR	Color of the operating state

Example for Dynamic Background Color

The formula in the following example colors the background according to the value of a variable:

if OEE:MONTH_OEE < 50 then "#FF0000"
else if OEE:MONTH_OEE < 75 then "#FFFF00"
else "#00FF00"

5.2.3 Size

The width, height as well as X and Y offset of elements can be varied dynamically. The formula determines the parameters that are to influence the size of the element. Dynamic size is usually used for the presentation of dynamic progress bars.
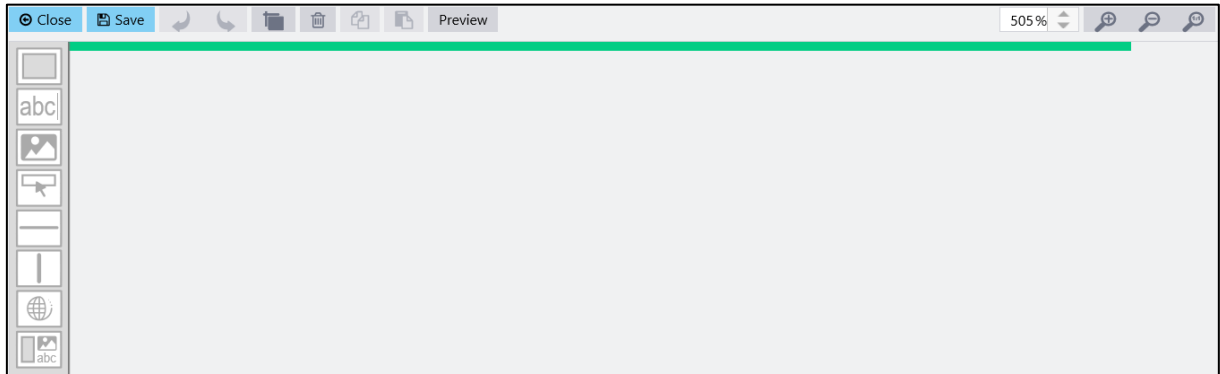
Fig. 176: Simple progress bar in a visualization

The progress bar shown in Fig. 176 is a simple rectangle with a static color. The width of the bar was set to 200 pixels. It was configured in such a way that it changes dynamically per a formula. According to this formula, the width of the bar starts at 0 pixels and may reach a maximum width of 200 pixels depending on progress.
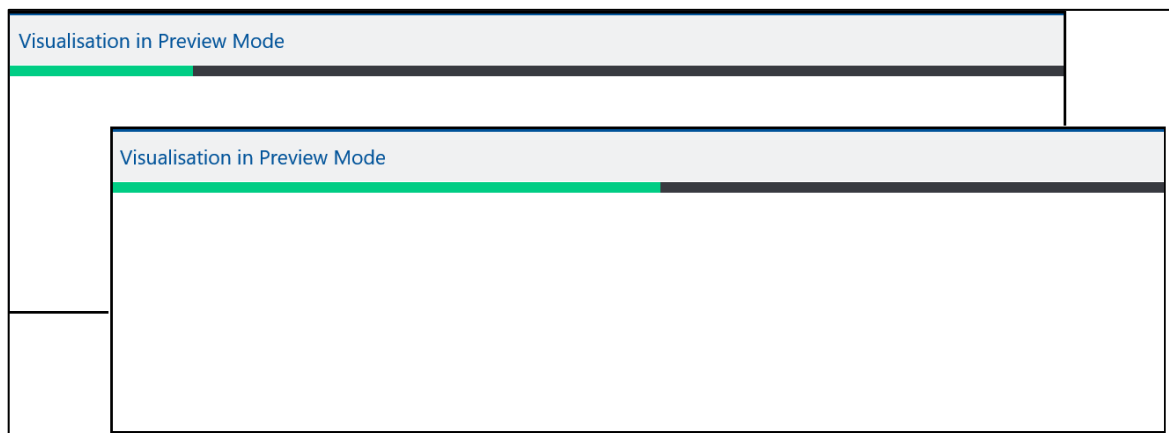
Fig. 177: Dynamic development of a simple progress bar

The dynamic size of an element is configured by a formula which is based on values acquired (see Table 17 in section 5.2.1). Formulas defining size are very flexible and can be configured individually as necessary.
The progress bar shown above was configured with the following formula:
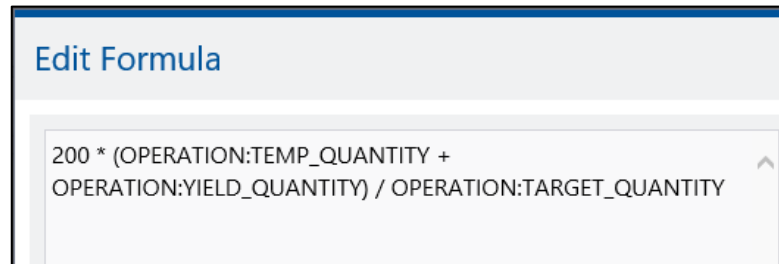
Fig. 178: Formula for a dynamic progress bar (example)

The formula contains the following expressions:
- The maximum width of the bar is 200 pixels.
- It is based on the non-categorized parameters of quantity, yield quantity and target quantity.
- The quantity produced (non-categorized + yield quantity) divided by the target quantity results in the actual (percentage) value of quantity produced in relation to the target quantity.
- The bar becomes wider with each quantity additionally produced.
- The bar reaches the maximum width when the quantity produced is equal to the target quantity.

To assign a dynamic size to an element:
- ✔ An element should be placed in the editing field.
1. Select the element you want to assign a dynamic size.
2. Open the **Size** area in the right-hand bar.
3. Click on the **Edit Formula** icon below the appropriate size field.
4. In the formula editor (next dialog), double-click on the appropriate parameter and edit the formula in the left-hand area.
5. Click **OK**.
➔ Since the size is a dynamic value, it is only displayed when not in editing mode.
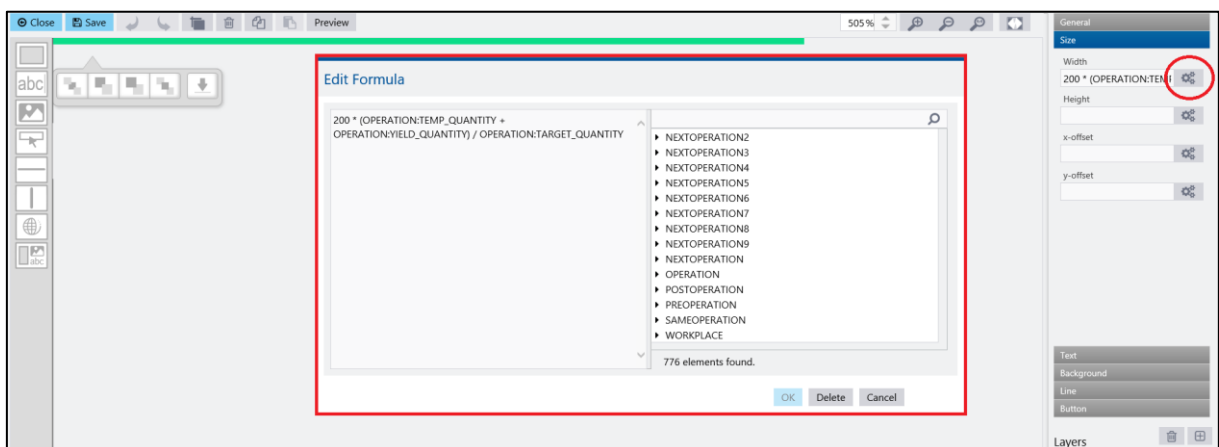
Fig. 179: Assigning a dynamic width based on a formula

5.2.4 Operators

Formulas are operations with logical or numerical expressions or any kind of strings. Numerous operators are available to design formulas in a flexible way in the visualization. The following tables list all available operators.

Table 19: Numerical operators

Operation	Formula
Addition	\<Numerical expression 1\> **+** \<Numerical expression 2\>
Subtraction	\<Numerical expression 1\> **-** \<Numerical expression 2\>
Multiplication	\<Numerical expression 1\> ***** \<Numerical expression 2\>
Division	\<Numerical expression 1\> **/** \<Numerical expression 2\>
Exponent	\<Numerical expression 1\> **^** \<Numerical expression 2\>
Sine	**sin**(\<Numerical expression\>)
Cosine	**cos**(\<Numerical expression\>)
Tangent	**tan**(\<Numerical expression\>)
Unary minus	**-** \<Numerical expression\>
Bitwise AND	\<Numerical expression 1\> **AND** \<Numerical expression 2\>
Bitwise OR	\<Numerical expression 1\> **OR** \<Numerical expression 2\>
Bitwise inversion	**NOT** \<Numerical expression\>
Square root	**SQRT** \<Numerical expression\>

Table 20: Logical operators

Operation	Formula
Logical AND	\<Boolean expression 1\> **AND** \<Boolean expression 2\>
Logical OR	\<Boolean expression 1\> **OR** \<Boolean expression 2\>
Negation	**NOT** \<Boolean expression\>

Table 21: String operators (string processing)

Operation	Formula
Concatenation	<String 1> **+** <String 2>
Substring	**SUBSTRING**(<String>, <Numerical expression 1>, <Numerical expression 2>) **SUBSTRING**(<String>, <Numerical expression 1>) <Numerical expression 1> is the start index of the substring beginning with 0. <Numerical expression 2> is the index of the first character no longer included in the substring. If <Numerical expression 2> is missing, the substring reaches to the end of the original string.
String-to-number conversion	**TONUMBER**(<String>) <String> is converted to a number. If <String> does not represent a number, the result returned is 0.
Number-to-string conversion	**TOSTRING**(<Numerical expression>) **TOSTRING**(<Numerical expression>, <String>)
String length	**LENGTH**(<String>)
Examples	
Formula	**Result**
SUBSTRING("hamburger", 4, 8)	urge
TONUMBER ("10") + 2	12
LENGTH("hamburger")	9

Table 22: Format indications

Control parameter	Effect
[.decimal_places]	Number of decimal places to be shown. The last decimal place is rounded. If a minimum length is specified and the number of decimal places not defined, the value is rounded to an integer number and all decimal places are truncated.
[Minimum length]	The minimum length of the number displayed including the decimal point and the decimal places shown. If the specified minimum length is less than the number (including the decimal point and the decimal places shown), the value is ignored. If the minimum length specified is greater than the number to be converted (including the decimal point and the decimal places shown), the result string is padded.
[-]	If **-** is specified, left-justified formatting is applied, otherwise right-justified.
[0]	If **0** is specified with right-justified formatting, the string is padded with leading zeros up to the minimum length, otherwise with blanks.

[x] or [X]	If **x** or **X** is specified, the value is output in hexadecimal format with lower case or upper case letters, respectively. In this case, decimal places are always truncated.
Examples	
Formula	**Result**
TOSTRING(3.1, "03.3")	3.100 (minimum length is ignored)
TOSTRING(3.1, "07.3")	003.100 (minimum length causes 2 leading 0's)
TOSTRING(255,"06X")	0000FF
TOSTRING(10,"x")	A
TOSTRING(2.9992, "03.3")	2.999
TOSTRING(2.9999, "03.3")	3.000 (rounding)
TOSTRING(29.1, "-09.3")	29.100... (trailing blanks caused by the leading "-")

Table 23: Relational operators

Operation	Formula
Equal	<Expression 1> **=** <Expression 2> <Expression 1> **==** <Expression 2>
Unequal	<Expression 1> **!=** <Expression 2> <Expression 1> **<>** <Expression 2>
Less than	<Numerical expression 1> **<** <Numerical expression 2>
Less than or equal to	<Numerical expression 1> **<=** <Numerical expression 2>
Greater than	<Numerical expression 1> **>** <Numerical expression 2>
Greater than or equal to	<Numerical expression 1> **>=** <Numerical expression 2>

ⓘ <Expression 1> and <Expression 2> must always be of the same type (logical, numerical or string).

5.3   Editing a Formula

Assigning a formula with dynamic content is not limited to merely selecting the formula. You can edit formulas manually, for example, to add static content, link several parameters by operators or format a time value.

To add static text to a formula:
You can add static text in a formula using quotes. Use a plus operator to display the text and the formula side by side.

Example:
"The status " + (WORKPLACE:STATUS_DERIVED_DESCRIPTION) + " can be ignored"
In this example, static texts precede and follow the formula and are joined by operators. The blanks before and after the quotes, respectively, are necessary to separate the texts by a blank also in the display.

Fig. 180: Static text within a formula and the resulting display

To format a duration:
Formatting a duration is initiated by the **FORMATDURATION** instruction, supplemented with the desired format.

Example:
FORMATDURATION(6000000, "HH:mm")
The number in brackets is interpreted as a millisecond value and converted to hours and minutes. The resulting display is 01:40.

Typical use case:
FORMATDURATION (WORKPLACE:STATE_DURATION,"HH:mm").
The duration of the workplace state is read in milliseconds and formatted to a display value in hours and minutes.

Fig. 181: Formatting of a duration as a formula and the resulting display

5.4 Inserting Elements

1. Click on the desired element in the bar on the left and use drag-and-drop to insert it into the editing area.
2. Change the size of the element by the blue arrows.
3. Set the layer position of the element.
   Move the element to the front or back on the current layer by clicking the icons appearing below the element when it is selected. Move the element to a different layer by clicking on the **Layer Up** or **Layer Down** icon.
4. Enter the name and a tool tip for the element in the **General** menu in the bar on the right.
5. Select and assign a workplace by clicking on the **Edit** icon.
6. Enter and format any **Text** you may want to appear in the element.
7. Format the **Background** of the element according to your requirements.
   It is possible to upload an image to fill the background of the element.
8. Format the frame around the element according to your requirements in the **Line** menu.
9. You can assign an action to the element in the **Button** menu:
   a. HTML:
      Opens a web page. Enter an URL by clicking on the **URL** icon.
   b. REPORT:
      Opens a report. Select the report by clicking into the input field.
   c. VIEW:
      Opens a visualization. Select a visualization by clicking into the input field.
10. Click **Save** in the top menu bar.

5.5 Grouping Elements

You can combine several elements in a group to edit them simultaneously or assign the same function. Grouping relates only to the selection. The elements are not joined into a single element.

To group elements:
1. Keep the CTRL key pressed and select several elements.
   Or:
   Left-click into a free area, keep the mouse key pressed and move it across several elements.
2. Assign the desired function to the group element.
3. Drag the group element by the blue arrows to enlarge/reduce it.
4. Finish grouping by left-clicking into the free area.
5. Click **Save** in the top menu bar.
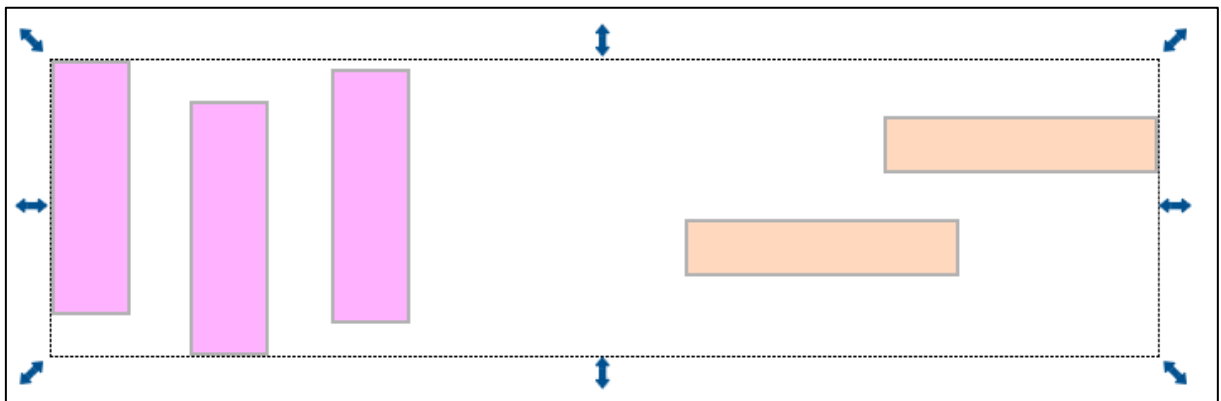
Fig. 182: Elements grouped

5.6   Changing Layers

Elements can be placed on different layers in the visualization. The **Foreground** and **Background** layers are predefined. The elements placed on the **Foreground** layer overlap those elements placed on the **Background** layer. Elements placed on the **Foreground** layer cannot be edited when the **Background** layer is selected and vice versa. Elements can be copied from one layer to another.
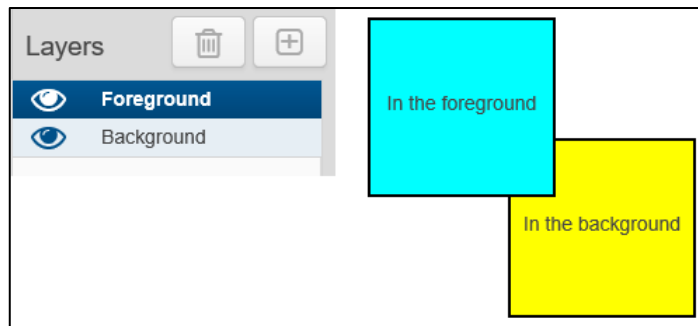
Fig. 183: Layer selection

To copy an element from one layer to another:
1. Select the desired element in the editing area.
2. Click on the **Copy** icon in the top menu bar.
3. Go to **Layers** at the bottom right of the screen and select the layer to which you want to copy the element.
    Add other layers as necessary by clicking on the **Add layer** icon.
4. Click on the **Paste** icon in the top menu bar.
➔   The element is inserted at the selected layer. It can only be edited at this layer.
5. Click **Save** in the top menu bar.

ⓘ   Move layers up or down by dragging-and-dropping in the **Layers** area.

To show or hide a layer:
1. Select a layer in the **Layers** area at the bottom right of the screen.
2. Click on the eye icon.
➔   This shows or hides the associated layer and all elements on this layer.

ⓘ   When you want to edit an element placed on a lower layer which is overlapped by an element of a higher layer, the higher layer must be hidden first.

5.7 Visualization of a Machine (Example)

Visualizations are usually used to display machines with dynamic content. This section presents a sample visualization with production-related data and all the necessary configurations.

Fig. 184: Visualization of a machine with production-related data (example)

The visualization shown in Fig. 184 represents a machine in a real-time view. All the data displayed are received directly from the machine and generated dynamically. The visualization includes 14 dynamic elements that are dynamically updated or shown in preview mode. Fig. 185 shows the visualization above in editing mode:

Fig. 185: Visualization of a machine in editing mode before generating dynamic content

Table 24 explains the numbered elements from Fig. 185:

Table 24: Configuration of the sample visualization of a machine

	Contents	Formula
1	Color of the operating state	WORKPLACE:STATUS_DERIVED_COLOR
2	SAP number of the workplace	WORKPLACE:NAME
3	Order number	OPERATION:ORDER
4	Operation number	OPERATION:OPERATION
5	Target quantity	OPERATION:TARGET_QUANTITY
6	Material number	OPERATION:MAT_NUMBER
7	Yield quantity posted	OPERATION:YIELD_QUANTITY
8	Material description	OPERATION:MAT_DESCRIPTION
9	Count of non-posted quantities	OPERATION:TEMP_QUANTITY
10	Rework quantity posted	OPERATION:REWORK_QUANTITY
11	Progress bar of operation	200 * (OPERATION:TEMP_QUANTITY + OPERATION:YIELD_QUANTITY) / OPERATION:TARGET_QUANTITY
12	Operating state	WORKPLACE:STATUS_DERIVED_DESCRIPTION
13	Duration of operating state	FORMATDURATION (1000 * WORKPLACE:STATE_DURATION,"HH:mm") The duration is multiplied by 1000 to convert the milliseconds value acquired to minutes.
14	Scrap quantity posted	OPERATION:SCRAP_QUANTITY

The visualization of a machine can be combined with other machines in an overall shop layout. In this way, a complete production shop can be displayed where the contents are continuously updated to show the status of the machines with all relevant data in an overall view:
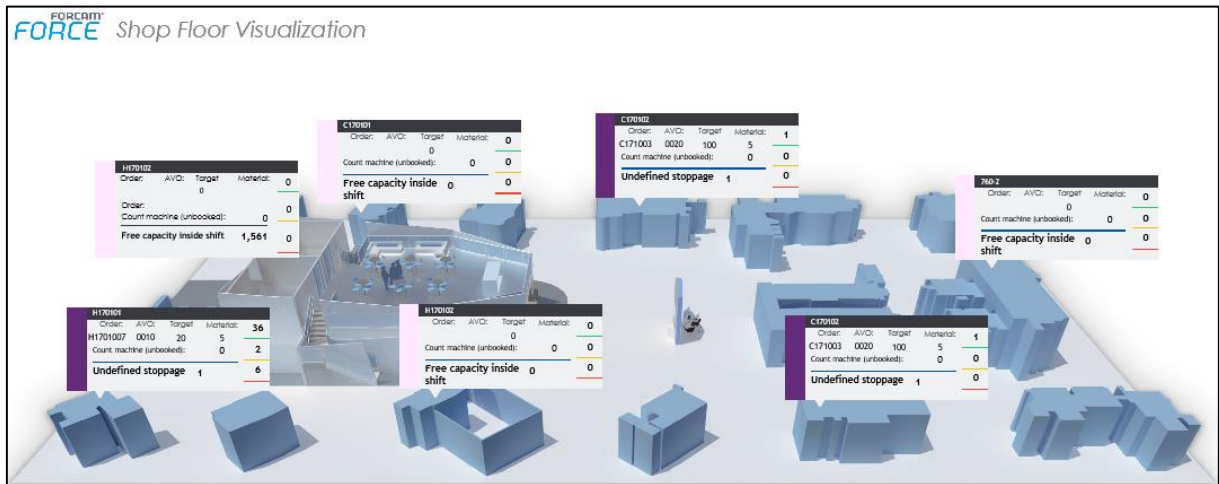
Fig. 186: View of a production shop with several machine visualizations

5.8 Editing a Visualization

1. Select the visualization in the navigation area.
2. Click **Settings** in the top menu bar.
3. Make the changes as necessary and then click **Save**.
4. Click **Edit** in the top menu bar.
5. Make the changes as necessary and then click **Save** in the top menu bar.

5.9 Copying a Visualization
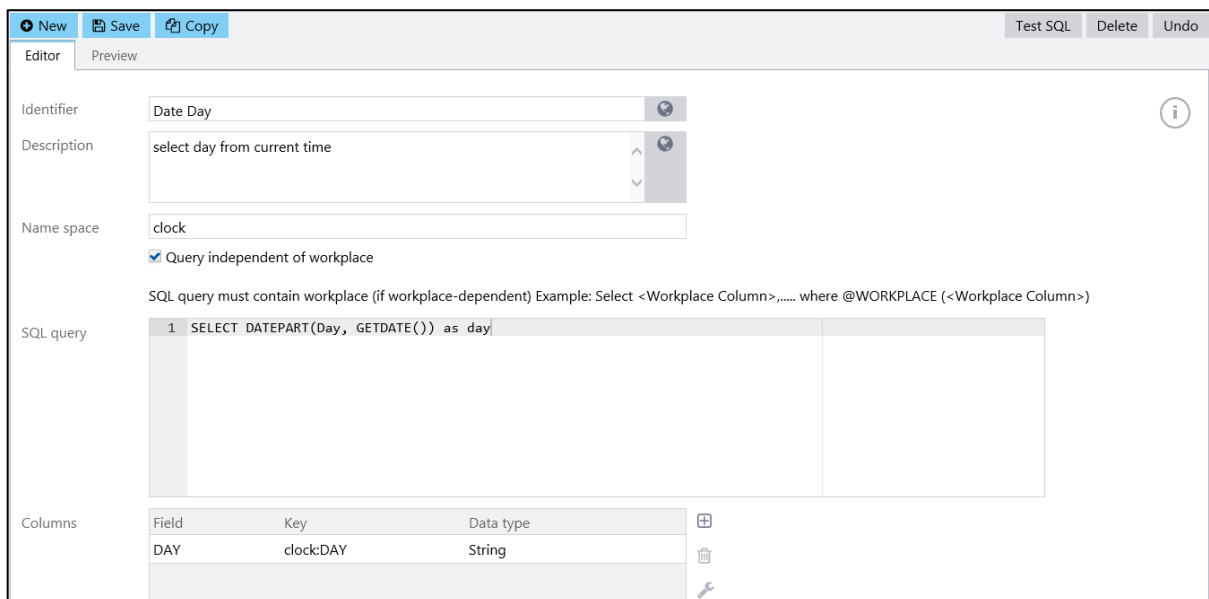
1. Select the visualization in the navigation area.
2. Click **Copy** in the top menu bar.
3. Change the settings as necessary.
4. Click **Save**.
➔ The copy appears in the navigation area below the original visualization.

5.10 Additional Fields

Path: Performance Analysis > Visualization > Additional Fields

In addition to the predefined values (see section 5.2), additional fields can be created. SQL expressions can be used to define your own attributes. These can be used in visualizations to display user-defined data.

ⓘ The configuration of (multiple) additional fields can have an adverse effect on the system performance.

Fig. 187: User-defined additional fields

To create an additional field:
1. Click **New** in the top menu bar.
2. Enter an identifier and a description for the additional field.
   The additional field appears in the formula editor with these entries.
3. Enter the name space.
   The name space appears as a node in the formula editor. The additional field appears under this node.
4. Set dependence/independence of workplace.
   The SQL query must include the workplace so that data to be displayed can be retrieved from it. However, some data items do not require a workplace specification since they get general information e.g. from a server (e.g. date and time). If a check mark is set for **Query independent of workplace**, no workplace needs to be specified. Otherwise an additional field must be defined with a workplace ID.
5. Enter the SQL query.
6. Click on the **Add** icon in the **Columns** field.
   Each column specified in the SQL query must be selected here.
   a. Select a field in the next dialog.
      The previously entered SQL query governs the field selection.
   b. Select the data type.

Determines the format for the data to be displayed (e.g. string for day, number for hour, etc.).

    c.   Set workplace ID.

    d.   Click **Apply**.

7. Click **Save** in the top menu bar.

ⓘ Check the syntax of the SQL query for any errors by clicking **Test SQL** at the upper right of the screen. When **Preview** is clicked in the top menu bar, the workplace, key and value are displayed according to the SQL query.
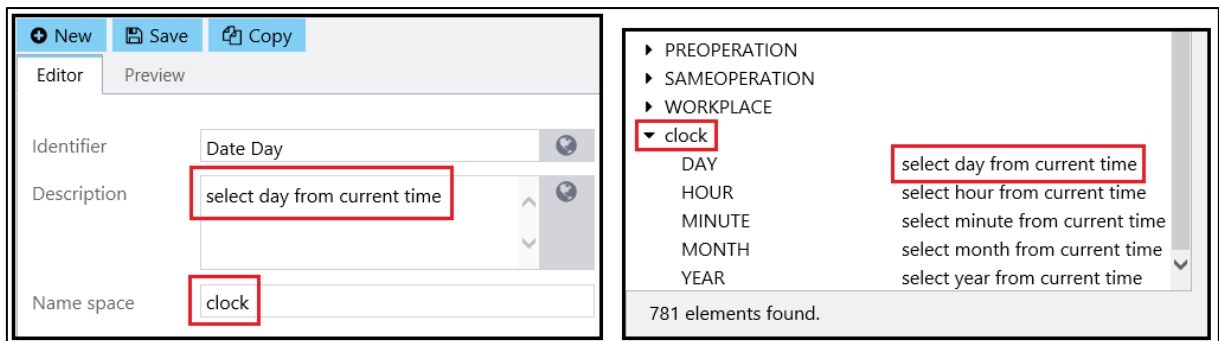
Fig. 188: Entries in additional fields shown in the formula editor

Example:

The SQL query and column configuration from Table 25 outputs the current day. Fig. 189 shows SQL queries for the current day, month and year and the value output in the visualization.

Table 25: SQL query and column configuration to display the current day

Value	Contents
Query independent of workplace	Yes
SQL query	SELECT DATEPART(Day, GETDATE()) as day
Field	DAY
Key	clock:DAY
Data type	String
Value output	14 (indicating the date 14.03.2017)
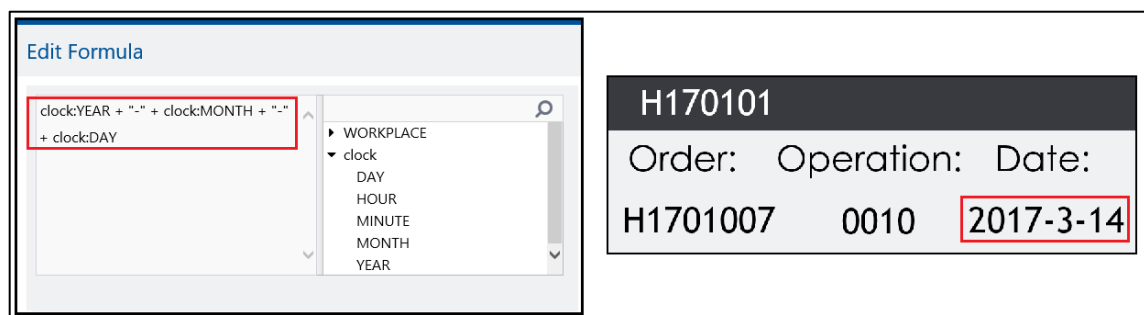
Fig. 189: SQL queries for the current date and the value output in the visualization

5.11 RISC View

Path: Performance Analysis > Visualization > RISC Views

In addition to the standard view, the visualization is available as a RISC view. The RISC view includes all functions mentioned in chapter 5. In addition to improved performance, the RISC view offers several new functions.
This section summarizes the most important new features and differences compared to the standard view.

Placing Elements

Elements can not only be dragged and dropped into the editing area. By clicking on an element and then clicking in the editing area, it also appears.

Resizing Elements

Items highlighted in the editing area (by selecting) do not have blue arrows for manual resizing. The size of an element can be dragged to its edge or corner by keeping the mouse button pressed.

Editing Elements: Z-Layer

If an element is selected, tabs with different editing options appear on the right side of the screen. In addition to the previous size and position settings, the **Z-Layer** function is available on the **Arrangement** (formerly **Size**) tab. This function specifies the order in which elements overlap each other. The element with a higher position number overlaps the element with the lower number (see (3) in Fig. 190).
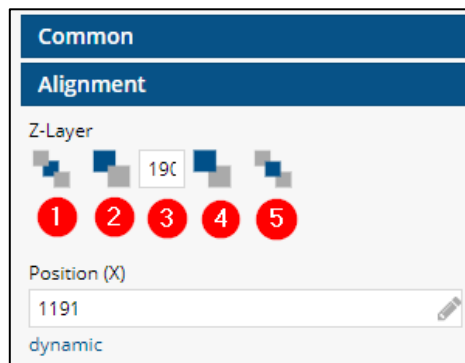
Fig. 190: Z-Layer function in the RISC view

> (1) Moves the selected element to the lowest position.
>   It is overlapped by all other elements.
> (2) Moves the selected element one position down
> (3) Indicates the position of the selected element
> (4) Moves the selected element one position up
> (5) Moves the selected element to the top position.
>   It overlaps all other elements.

Editing Elements: Layers

The layers **Foreground** and **Background** are predefined in the visualization by default. In the RISC view, you can move single elements in the **Layers** tab to another layer by clicking on the desired layer.

ⓘ An element can only be edited on the layer on which it is located. If an element is in the background, for example, it can only be edited if the background layer has been selected in the editing area.

Aligning

Elements can be arranged in different ways by using the corresponding buttons in the upper tab. They can be centered horizontally or vertically or aligned at specific positions. Elements can also be distributed evenly horizontally or vertically. The edges of the elements are then stacked in the desired arrangement.
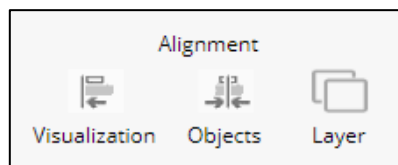
Fig. 191: Aligning elements in the RISC view

- Visualization:
  Aligns elements to the editing area of the visualization. Example: Selecting **Right-justified** aligns all selected elements at the right edge of the editing area.
- Objects:
  Aligns the edges of elements to each other. Example: Selecting **Right-justified** aligns all selected elements so that their right edges lie on a line.
- Layer:
  Moves elements to the selected layer
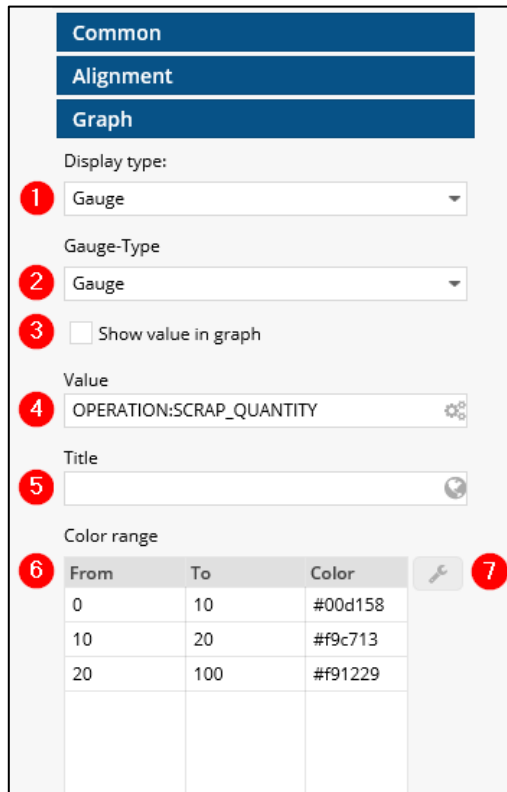
5.11.1 New Element: Gauge

The RISC view introduces the gauge as a new element (**Graph** element). The gauge is a graphical display that can be connected to a workplace to indicate the development of data dynamically through a needle. The gauge is particularly suitable for cases in which a value increases or the increase of a value should become visible as an overview.
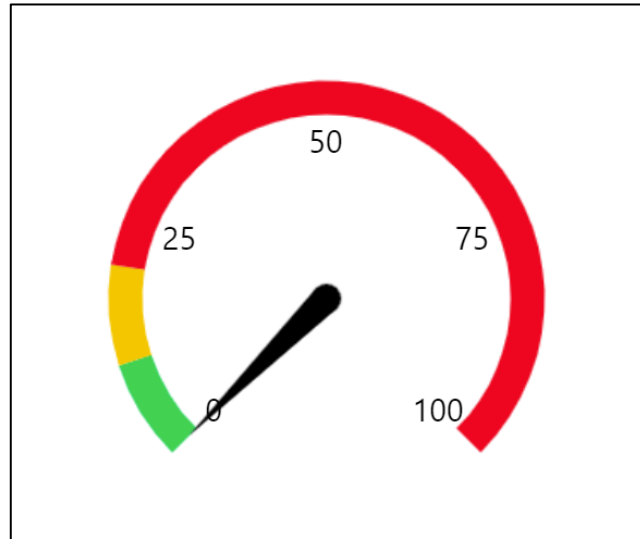
Fig. 192: New gauge element in the RISC view

The gauge is configured in the **Graph** tab. Here you can determine which dynamic value of the workplace is to be displayed. The thresholds can be freely defined and identified by different colors. The following figure shows an example configuration of a gauge. In this case, the scrap quantity of an operation is fed in as a dynamic value. The thresholds are defined in such a way that a scrap quantity of up to 10 is unproblematic and 10 to 20 can still be acceptable. From a quantity of 20, the gauge needle moves in the red area and therefore indicates an excessive scrap quantity.

Fig. 193: Example configuration of a gauge

    (1) Display type:
Display type of the graphic. At present, only the gauge is available, which indicates values by means of an arrow or needle (see (2)).

    (2) Type of measurement display:
- Gauge
- Level Meter
- Odometer

    (3) If a check mark is set, the current value of the needle is displayed in the gauge.

    (4) Displayed value:
The value can be entered manually and thus displayed statically.
By clicking on the editing icon, a formula can be entered (see section 5.2.1), by which the value is referenced and displayed dynamically (here: OPERATION:SCRAP_QUANTITY for displaying the scrap quantity of an operation).

    (5) Graphic title:
The title appears in the center of the gauge, below the meter and above the odometer.

    (6) Graphic values and color range:
The values entered here determine the minimum and maximum value of the display.
Each display type is divided into three sections. Each section can be given its own color (standard colors are green, yellow and red). In Fig. 193 these are entered manually and are therefore static (example: from 0 to 10 the needle moves in the green area). To configure a dynamic color range, see section 5.11.2.

    (7) Opens the configuration of values and color ranges (see section 5.11.2)

5.11.2 Configuring Dynamic Value and Color Range

The values of a gauge and the corresponding color ranges can be generated dynamically. You can transfer existing values from a workplace.

In this section, a gauge is configured as an example as follows:

The gauge should represent an individual value of a workplace as a threshold. The color range should remain static:

- – In the Workbench, the number 42 is entered in a user field 1 of the corresponding workplace.
- – An additional field for thresholds is created in the New Office. The SQL query of the additional field queries the content of user field 1 and defines it under the abbreviation **T1**.
- – In the RISC view, the additional field appears under the formulas for dynamic content.
- – The value under **T1** is assigned to the desired range of values and stored as a threshold in the gauge. The limit value changes dynamically when the value in the workplace changes.

To configure a dynamic value:

1. Enter a value in a user field in the workplace configuration of the Workbench.
   For details on workplace configuration, see the Master Data and System Configuration manual.
2. Create a new additional field in the New Office (see section 5.10).
   a. Assign Identifier and Name space.
   b. Enter SQL query.
   The following SQL query queries the contents of user field 1 and defines it under the abbreviation **T1**:
   ```
   SELECT wp.ID AS WORKPLACE_ID, ud.UF_01 AS T1 FROM FR_MD_WORKPLACE wp
   JOIN FR_MD_USER_DATA ud ON ud.ID = wp.USER_DATA_ID WHERE
   @WORKPLACE(wp.ID)
   ```
   c. Create columns **WORKPLACE_ID** und **T1**:

Field	Key	Data type
WORKPLACE_ID	thresholds:WORKPLACE_ID	String
T1	thresholds:T1	Number

Fig. 194: Columns of the additional field for dynamic thresholds

3. Select the gauge in the RISC view and enter dynamic values.
   Select a desired value in the **Color Range** area and click the **Edit** icon.

Color Range			
From	To	Color	
0	50	#f91229	
50	75	#f9c713	
75	100	#00d158	

Fig. 195: Open editing of color ranges

a. Click on **dynamic** in the subsequent dialog below the desired value or color and open the formula editor by clicking on the **Edit formula** icon.
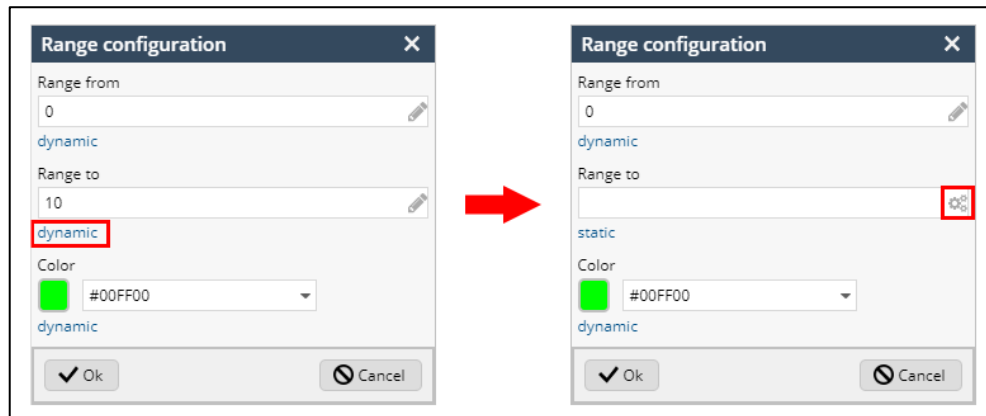
Fig. 196: Switch to dynamic value

b. Enter desired formula and confirm.

4. Save.

5.11.3 Graphics Library

In the RISC View, graphics are inserted directly into the editing area. After selecting and placing this element, graphics can be searched for and added locally via a dialog. Graphics already used remain and can be selected from a list. The dialog then becomes the graphics library.
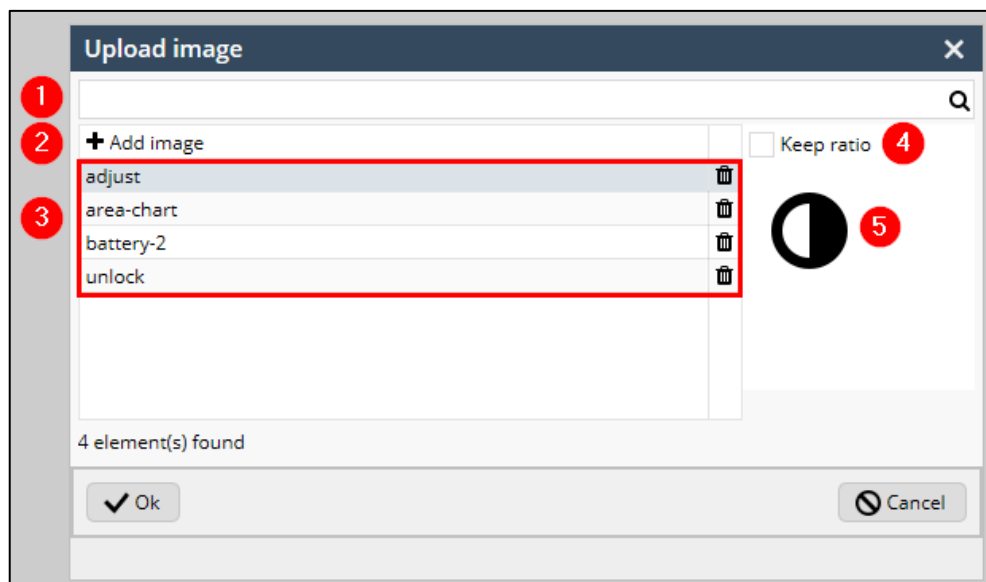
Fig. 197: Add graphic (RISC View)

(1) Search field for saved graphics
(2) Uploads a local graphic
(3) List of all uploaded graphics
(4) If a check mark is set, the aspect ratio of the graphic is retained in the visualization.
(5) Preview of the graphic selected in (3)

An added graphic is uploaded from the system. To upload a graphic, you must first enter a path in the system. The system saves all graphics in this directory. The path must not be local but must be on the installation server.

The path is stored in the system configuration of the Workbench. For detailed Workbench configurations, see the **Master Data and System Configuration** manual.

Fig. 198: Path for the graphics library

6　Dashboard
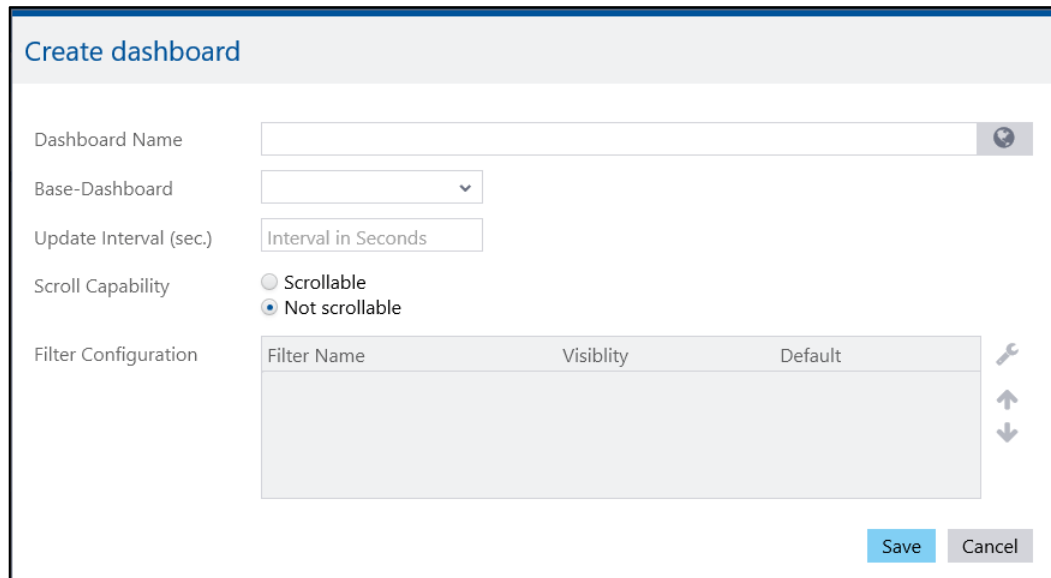
Dashboards are views in which several reports and visualizations can be displayed as widgets in an overall view. A dashboard can be composed by selecting from all existing reports and visualizations. You can enlarge (**Expand widget** icon) and reduce (**Contract widget** icon) the widgets individually.
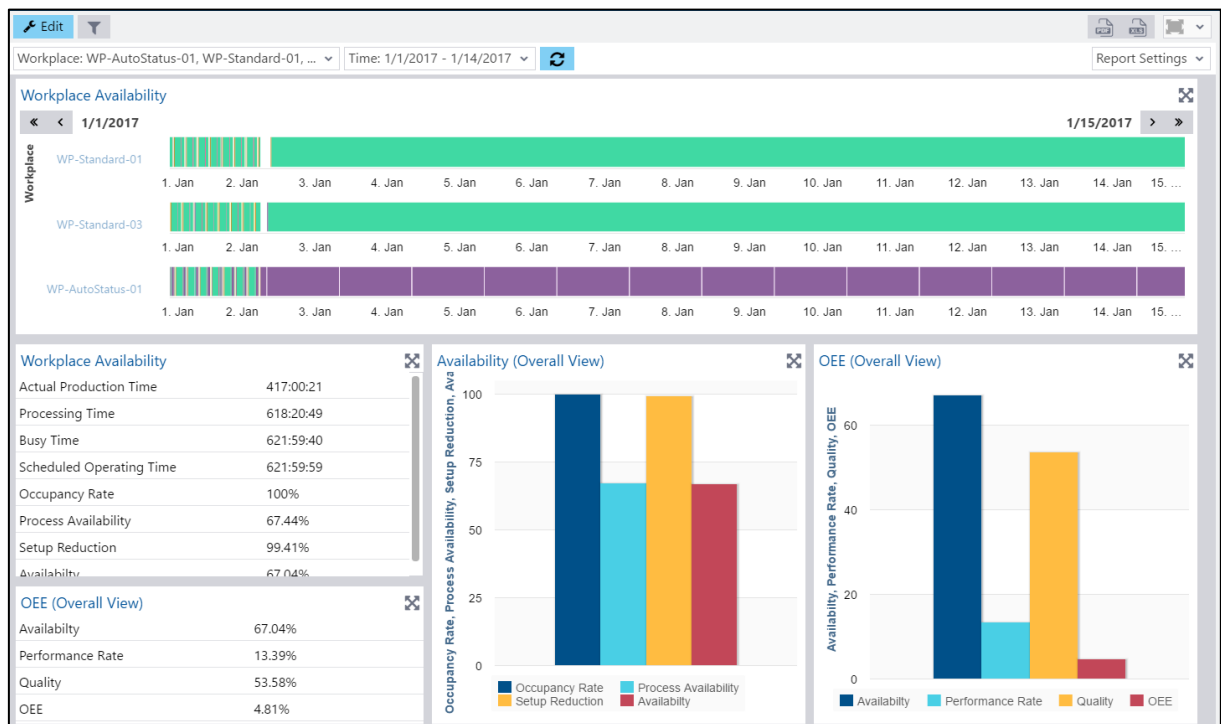
Fig. 199: Dashboard containing widgets on availability and OEE (example)

The first step is to create the dashboard with its initial configuration. Subsequently you can import reports and visualizations at will.

6.1.1 Creating a Dashboard

Fig. 200: Dialog for creating a dashboard

To create a new dashboard:
1. Click **New** in the top menu bar.
2. Enter a **Dashboard Name**.
3. Select **Base Dashboard** (optionally).
   Here you can specify an existing dashboard to be copied and modified as necessary for a new one.
4. Enter the **Update Interval** for the view in a new tab.
   If the dashboard is displayed in a new tab, the time specified here (in seconds) determines the refresh rate for the dashboard.
5. Set the **Scroll Capability** for the dashboard.
   If you select **Scrollable**, the dashboard appears with a scroll bar on the right.
6. Determine filter visibility:
   Filters are only visible the first time a dashboard is created if a base dashboard is selected. Otherwise, filters will only be visible after adding widgets and saving the dashboard (see section 6.1.2).
   Each filter can be made **Visible**, **Hidden** or **Additional** using the **Edit** icon. Additional filters are grouped in the dashboard under the filter **More…** (see Fig. 201).
7. Click **Save**.

ⓘ The scrollability cannot be changed afterwards (after creating the dashboard).

⚠ Scrollable dashboards cannot be exported and therefore cannot be sent as auto reports.
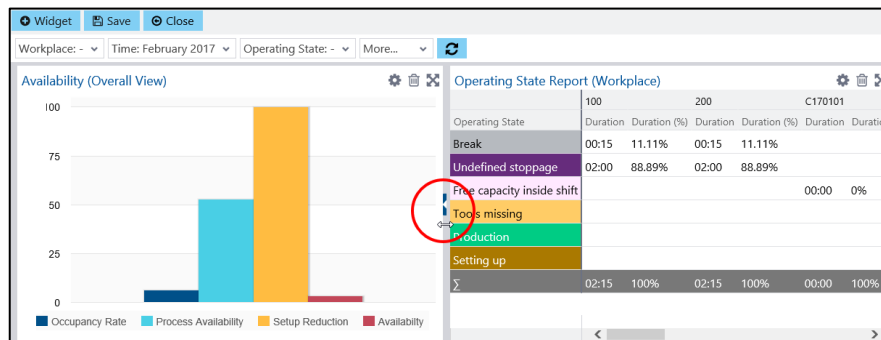
Fig. 201: Combining and scaling widgets

6.1.2 Adding Widgets

Reports or visualizations can be added multiple times to a dashboard.
The number of widgets in a dashboard is not limited.

To add reports/visualizations to a dashboard:
1. Click on the appropriate dashboard in the navigation area.
2. Click **Edit** in the top menu bar.
➜ The view changes to editing mode.
3. Click **+ Widget** in the top menu bar.
4. Select the appropriate report/visualization/WebApp in the pop-up window and click **Add**.
5. Repeat the steps 3 and 4 as often as necessary.
6. You can optionally enlarge/reduce widgets by dragging their edges with the mouse button kept pressed.
   If you also keep the CTRL key pressed, only the size of the selected widget changes.
7. Configure a filter for the widget (optionally).
   The filter configuration of the widget has priority over the global filter of the dashboard.
   a. Click on the **Edit** icon at the top right of the widget.
   b. Configure the filter for the widget as necessary.
   c. Click on the **Contract** icon at the top right.
8. Move widgets (optionally).
   Keeping the mouse button pressed on the top edge of the widget, move it to the new position.
9. Click **Save** in the top menu bar.
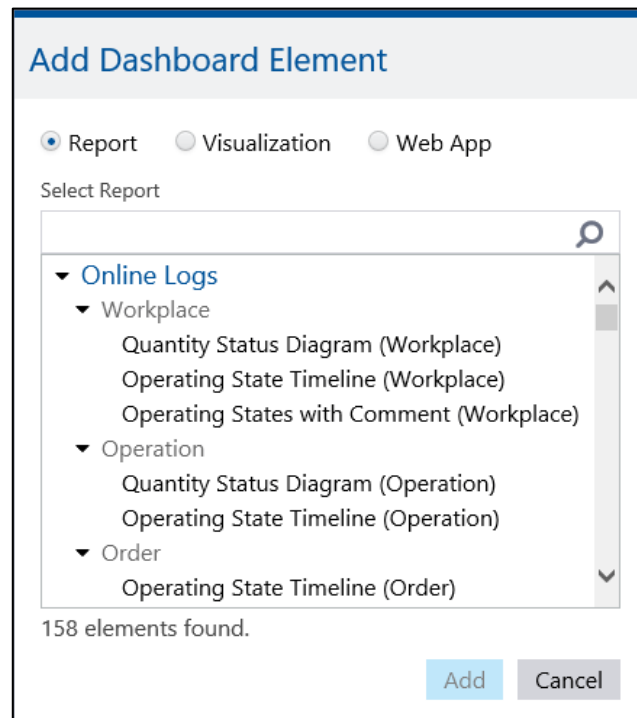
Fig. 202: Dialog to add widgets

6.1.3 Editing Widgets

To edit widgets:
1. Select the appropriate dashboard in the navigation area.
2. Click **Edit** in the top menu bar.
3. Drag the widget by the blue arrows at the edge to enlarge/reduce it.
4. Click on the **Edit widget** icon to select the local filters for the widget.
   Local filters apply only to the specific widget. Local filters apply to the widget with priority over the global filters of the dashboard.
5. Click on the **Delete** icon to delete the widget.
6. Click **Save** in the top menu bar.

7 Data Sources

Path: Performance Analysis > Reporting > Data Source Editor

Data sources are used in reports to supply the contents shown in the reports. You can use the Data Source Editor to define new data sources and delete or edit your own data sources. Predefined and standard data sources included in the application can neither be edited nor deleted. This is only possible with copies of them.

7.1 Predefined Data Sources

The data listed in Table 26 are predefined and included in the standard application.

ⓘ Some data sources require time bases for calculation (see section 7.3).

Table 26: Predefined data sources

Data source	Description
Runtime Log (Workplace)	Runtime data for a workplace such as period, operating state, malfunction reason, description and remark
Runtime Log Details (Workplace)	Detailed runtime data for a workplace with additional information such as operating state codes at several levels of detail
Runtime Log Sum (Workplace)	Totals of data relating to a workplace such as operating states and their frequency of occurrence
Status Gantt (Workplace)	Runtime data for a workplace such as period, operating state and duration in real time
Quantity Status Diagram	Data on quantities and states such as period, target time and time base
Messages (Workplace Perspective)	Data on messages at a workplace such as message type, order, operation, quantities and person
Shift Book Summary of Operations (Source: Timeline)	Summary of shift books on operations including data such as IDs, order, operation, material, quantities, hits and operating states
Shift Book Subtotals of Operations (Source: Timeline)	Shift books on operations including data such as IDs, order, operation, material, quantities, hits, operating states and detailing at several levels
Shift Totals of Operating States (Source: Timeline)	Frequency and duration of operating states during a shift
Shift Totals of Quantities (Source: Timeline)	Frequency and duration of quantities during a shift
Sum of Quantities of the Operation (Source: Timeline)	Data on quantities for operations such as period, material, quantities and target time
Quantity Log of an Operation during a Period of Time (Source: Timeline)	Data on quantities of an operation such as IDs, booking time and quantities during a period of time

Quantity Log of an Operation during a Period of Time with Remark (Source: Timeline)	Data on quantities of an operation such as IDs, booking time and quantities during a period of time with an option to enter remarks
Frequency Distribution of Operating States during a Day	Data on the frequency of operating states occurring during a day
Sum of Hits for Operations of a Day	Total sum of hits for operations of a day such as IDs, order, operation, material and period
Operating State Report (Workplace)	Data on operating states of a workplace such as period, code, operation and duration
Operating State Development (Workplace)	Data on the development of operating states of a workplace over time such as period, duration, time unit and time stamp
Operating State Report (Operation)	Data on operating states of an operation such as period, code, operation and duration
Operating State Development (Operation)	Data on the development of operating states of an operation over time such as period, duration, time unit and time stamp
Operating State Report (Order)	Data on operating states of an order such as period, code, operation and duration
Hitlist Operating States (Workplace)	A list of operating states sorted by duration and frequency for a workplace
Hitlist Operating State Details (Workplace)	A detailed list of operating states sorted by duration and frequency for a workplace at several levels of detail
Hitlist Operating States (Operation)	A list of operating states sorted by duration and frequency for an operation
Hitlist Operating State Details (Operation)	A detailed list of operating states sorted by duration and frequency for an operation at several levels of detail
Hitlist Operating States (Material)	A list of operating states sorted by duration and frequency for materials
Hitlist Operating State Details (Material)	A detailed list of operating states sorted by duration and frequency for materials at several levels of detail
Quantity Report (Workplace)	Data on the quantities of a workplace such as material, quality types, code and quality detail
Quantity Development (Workplace)	Development of quantities at a workplace over time with data such as period, duration, time unit and time stamp
Hit Report (Workplace)	Number of hits for a workplace
Hit Development (Workplace)	Development of the number of hits over time for a workplace
Operations	Data on operations such as phase, status, order, code, times, material, target date, plan, quantities, hits, comparisons and OEE
OEE Report (WP)	OEE data for a workplace
OEE Development (WP)	Development of OEE data over time for a workplace
KPI (Plant Area)	Key performance indicators for a plant area, such as OEE, sort order, allocation efficiency, setup rate and time buffer

KPI (Order)	Key performance indicators for an order, such as OEE, sort order, throughput efficiency and production process ratio

7.2 Calculating Individual Columns

Table 27: Quantity status diagram

Column	Calculation
Quantity	Open quantity + Yield quantity in production time

Table 28: Time bases

Time concept	Time base
Scheduled operating time	OEE (usually all operating states except breaks)
Production time	Production (usually only the production operating state)
Setup time	Setup (usually only the setup operating state)

Table 29: Operations

Column	Calculation
Time per unit	$$\frac{\text{Production time}}{\text{Total quantity} + \text{Open quantity}}$$
Actual/target deviation (time per unit)	$\text{Time per unit} - \text{Target time per unit}$
Actual/target comparison (time per unit)	$$\frac{\text{Time per unit} - \text{Target time per unit}}{\text{Target time per unit}}$$
Actual/target deviation (yield quantity)	$\text{Target quantity} - \text{Yield quantity}$
Actual/target comparison (yield quantity) [%]	$$\frac{\text{Target quantity} - \text{Yield quantity}}{\text{Target quantity}}$$
Actual/target deviation (scrap quantity)	$\text{Target scrap quantity} - \text{Scrap quantity}$
Actual/target comparison (scrap) [%]	$$\frac{\text{Target scrap quantity} - \text{Scrap quantity}}{\text{Target scrap quantity}}$$
Hit factor	Units produced per hit
Target number of hits [hits/hour]	$$\frac{3600}{\text{Target time per unit [sec./unit]} * \text{Hit factor [unit/hit]}}$$
HPH	$$\frac{\text{Hits}}{\text{Scheduled operating time [hours]}}$$

PPH	$$\frac{\text{Total quantity}}{\text{Scheduled operating time [hours]}}$$
Actual/target deviation (hits)	Target number of hits – HPH
Actual/target comparison (hits) [%]	$$\frac{\text{Target no. of hits} - \text{HPH}}{\text{Target no. of hits}}$$
Target execution time	Target setup time + Target time per unit * Target quantity
Execution time	Processing time + Setup time
Actual/target deviation (execution time)	Target execution time – Execution time
Actual/target comparison (execution time) [%]	Target execution time – Execution time / Target execution time
Target processing time	Target time per unit * Target quantity
Processing time	Execution time – Setup time
Actual/target comparison (processing time)	$$\frac{\text{Target processing time} - \text{Processing time}}{\text{Target processing time}}$$
Setup time	Setup time base
Actual/target deviation (setup time)	Target setup time – Setup time
Actual/target comparison (setup time) [%]	$$\frac{\text{Target setup time} - \text{Setup time}}{\text{Target setup time}}$$
Setup rate [%]	$$\frac{\text{Setup time}}{\text{Processing time}}$$
Process availability	$$\frac{\text{Production time}}{\text{Processing time}}$$
Planned lead time	Planned end – Planned start
Lead time	Operation end – Operation start
Production process ratio	$$\frac{\text{Production time}}{\text{Lead time}}$$

Table 30: OEE key performance indicators

Time concept	Time base
OEE	Availability $*$ Performance rate $*$ Quality
Availability	$\dfrac{\text{Production time}}{\text{Scheduled operating time}}$
Performance	$\dfrac{\text{Target time per unit} * \text{Total quantity}}{\text{Production time}}$ total for all operations
Quality	$\dfrac{\textit{Yield quantity}}{\textit{Total quantity}}$

7.3 Time Base Cross-References in Data Sources

Some data sources use time bases to calculate the required values. Table 31 lists all data sources that require a time base for calculation and specifies the time base used in each case.

ⓘ For information on time base configuration, refer to the Master Data and System Configuration manual.
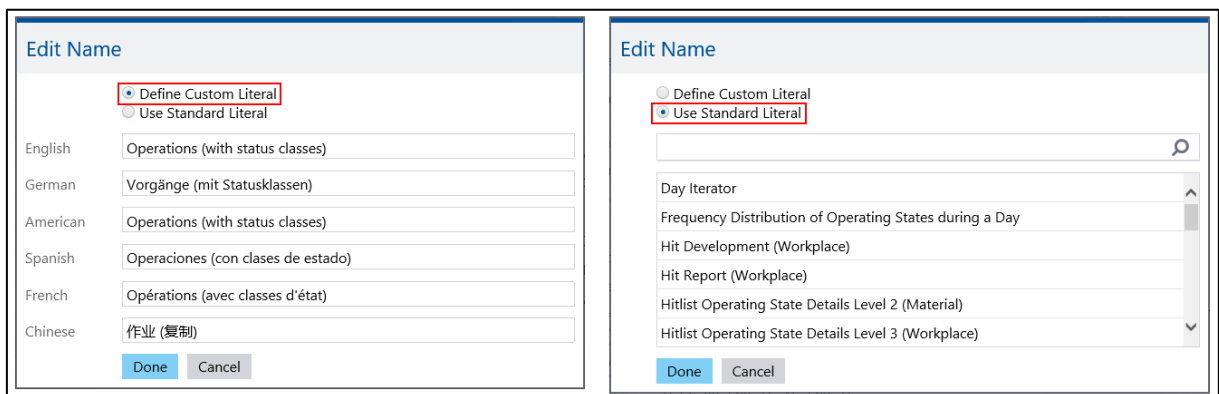
Table 31: Data sources and their related time bases

Abbreviation	OEE	PROD	SETUP	MALFUNCTION
FORCAM term	**OEE**	**Production**	**Setup**	**Malfunction**
Quantity Status Diagram (Workplace)	-	✓	-	-
Quantity Status Diagram (Operation)	-	✓	-	-
OEE Report (Workplace)	✓	✓	-	-
OEE Development (Workplace)	✓	✓	-	-
KPI (Plant Area)	✓	✓	✓	-
KPI (Order)	✓	✓	✓	-
Operations	✓	✓	✓	-

7.4 Defining a New Data Source

1. Click **New** in the top menu bar.
2. Enter the name of the data source.
3. Enter the description of the data source.
4. Set any filter (see section 7.4.1).
5. Enter an SQL statement (see section 7.4.2).
6. Add columns (see section 7.4.3).
7. Click **Save** in the top menu bar.

A custom literal can be defined as the name of the data source or selected from predefined standard literals. The dialog for the selection opens by clicking on the globe icon. The column header in tables can also be freely defined.

Fig. 203: Define custom literal or use standard literal

7.4.1 Setting a Filter

Filter	Name	Description	Filter Identifier	
	Description1		@DESCRIPTION_FILTER11(<DESCRIPTION>)	
	Active		@ACTIVE_FILTER(<PHASE_ACTIVE>)	
	Workplace phase		@CODE_FILTER(<PHASE_CODE>)	

Fig. 204: Filters in the Data Source Editor

1. Click on the **Add** icon.
2. Set the filter type:
    a. Standard Filter:
       Predefined filters that can be created and edited in the Filter Criteria Editor (see section 8).
       Select a filter from the dropdown menu and click **Add**.
    b. Custom Filter:
        i. Enter the name of the filter.
        ii. Enter the description of the filter.
        iii. Enter a filter identifier.
            This is used in the WHERE clause of the SQL statement (see section 7.4.2).
            This is not visible for the user.
        iv. Select the data type.
3. Set the visibility option for the filter.
4. If you set a check mark for **Permanently Visible**, the filter is always shown in the report.
5. Set the single choice option.
6. If you set a check mark for **Single choice**, you can only select one content item for the filter (e.g. only one workplace).
7. Set as mandatory field, if appropriate.
8. If you set a check mark for **Mandatory**, selecting a filter content is mandatory.
9. Click **Add**.

The following data types are available:
   − Workplace ID
     A unique identification of a workplace
   − Material ID
     A unique identification of a material
   − Operation ID
     A unique identification of an operation
   − Date/Time
   − String
   − Boolean
     Defined in four different formats with the following value pairs: True/False, Yes/No, IO/NIO (OK/NOT OK), 1/0
   − Number
   − Multi Selection
     Generated from an SQL statement (see section 8)
   − Time base
     A previously defined time base to be applied
   − Duration (ms)

7.4.2 Entering an SQL Statement

1. Enter an SQL statement directly.
2. Verify the validity of the statement by clicking **Test SQL** at the top right of the screen.

```
SQL                    1  SELECT TOP 10000
                       2      ID,
                       3      NAME
                       4  FROM FR_MD_WORKPLACE
                       5  WHERE
                       6      @WORKPLACE_FILTER(ID)
                       7  ORDER BY
                       8      NAME
                       9  |
```

Fig. 205: SQL statement (example)

An SQL statement comprises the following commands:

- SELECT
  The column (ID) to be included. All columns specified here must be defined in Columns (see section 7.4.3).
- FROM
  The source of the data to be displayed.
- WHERE
  The source of the filter. All conditions specified here must be defined in Filter (see section 7.4.1).
- ORDER BY (optional)
  Sort order of the data.

7.4.3 Adding Columns

1. Click on the **Add** icon.
   a. Select a column identifier.
      Those column identifiers entered with SELECT in the SQL statement are available. The master and inventory data items of workplace, shift, order, material and operation can only be addressed by their ID in SQL statements.
   b. Enter a column title.
   → The column title appears as the column header in the report. You can define the column header freely by clicking the globe icon (see section 7.4).
   c. Select the data type.
   d. Select the data format (see section 8).
   e. Click **Add**.
2. Click on the **Create column** icon.
3. Click **Create**.

The following data types are available:
- Date/Time
- String
- Boolean
  Defined in four different formats with the following value pairs: True/False, Yes/No, IO/NIO (OK/NOT OK), 1/0
- Number
- Color
- Duration (ms)

7.5 Editing a Data Source

1. Select a data source in the navigation area.
2. Edit the data source according to your requirements.
3. Click **Save** in the top menu bar.

To copy a data source:
1. Select a data source in the navigation area.
2. Click **Copy** in the top menu bar.
➔ The name of the data source appears with the addition **(Copy)**. This copy can now be edited.
➔ The **Copy** option is now deactivated since you cannot make a copy from a copy.
3. Edit the data source according to your requirements.
4. Click **Save** in the top menu bar.
➔ The data source copied appears (with its new name, if specified) in the navigation area.

To delete a data source:
1. Select a data source in the navigation area.
2. Click **Delete** at the top right of the screen and confirm.

8   Data Format

Path: Performance Analysis > Reporting > Data Format Editor

Data formats determine how data appear, e.g. number, description, type, etc. Data formats describe and identify the format of data fields. The date type determines the data format that is available. In addition to the predefined data formats, FORCAM FORCE™ allows defining custom data formats.

ⓘ The preview field shows the content of the data format in real time as it will appear later.

To create a new data format:
1. Click **New** in the top menu bar.
2. Enter a name and a description.
3. Select the data type.
   The data type selected determines which formats are available.
4. Enter a format (formatting of the date type).
   Enter a placeholder for the content to be displayed.
   Example: To display the material number, type <MATERIAL_NUMBER> (case-sensitive).
   All available formats are listed in the field next to **Properties**.
5. Set the format as the default value (optionally).
   If you want to set the format as the default value for the selected data type, set a check mark below the **Properties** field in the **Default** check box.
   If you want to cancel the default value defined, set another format as the default value. One default value must always be defined.
6. Click **Save** in the top menu bar.

ⓘ Placeholders have a fixed designation. Their values are retrieved by an SQL statement. Freely entered designations do not form part of an SQL statement and are not assigned a value. Nevertheless, it may be useful to enter user-defined designations.
   Example: <MATERIAL_NUMBER> *for material* <MATERIAL_DESCRIPTION> will display: *0815 for material ball screw 5 inch.*

ⓘ The placeholders <OPERATION_NUMBER_SPLIT> and <ORDER_NUMBER_SPLIT> display the split number only if it exists.

The format of a placeholder can also be changed. For example, you can display a number as an integer, with decimal places, as a percentage, etc. Time values can be displayed with minutes/seconds shown or hidden. User-defined display items can be included in addition to predefined display options. FORCAM FORCE™ supports the notation commonly used, for example, in Microsoft Excel.
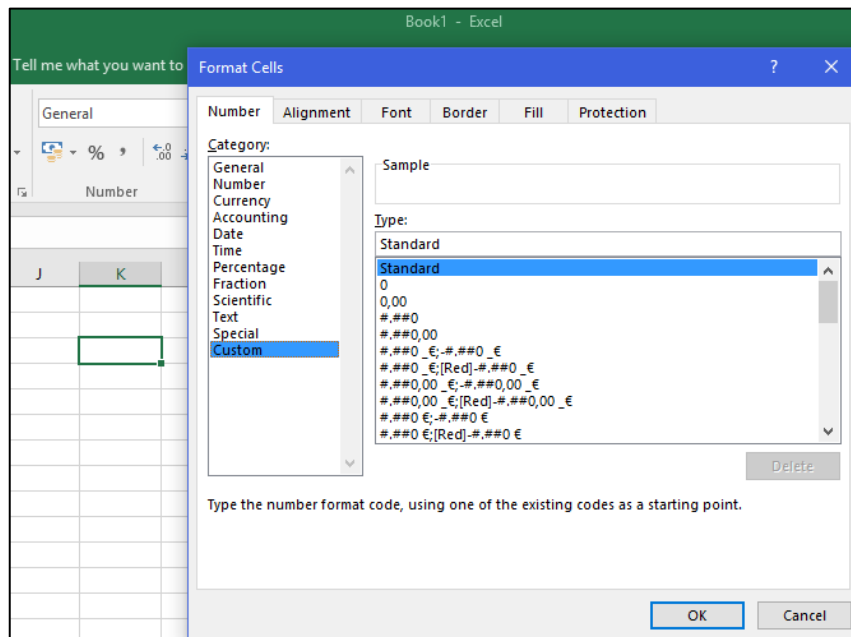
Fig. 206: Custom cell formatting in Microsoft Excel

To change the format of a placeholder:
1. Select the appropriate data format in the navigation area.
2. Select the placeholder, the format of which you want to change, in the **Properties** area.
3. Click on the **Edit** icon.
4. Select the appropriate format in the dropdown menu next to **Data Format**.
➔ The notation of the format appears next to the **Format** field, depending on the format selected. If you select **Custom**, you can freely define the format (see Fig. 206).
5. Click **Apply**.
6. Click **Save** in the top menu bar.

To edit a data format:
1. Select the appropriate data format in the navigation area.
2. Make the changes as necessary.
3. Click **Save** in the top menu bar.

To copy a data format:
1. Select the appropriate data format in the navigation area.
2. Click **Copy** in the top menu bar.
➔ The name of the data format appears with the addition **(Copy)**.
➔ The **Copy** option is now deactivated since you cannot make a copy from a copy.
3. Make the settings as necessary.
4. Click **Save** in the top menu bar.
➔ The data format copied appears (with its new name, if specified) in the navigation area.

9   Filter Criteria Editor

Path: Performance Analysis > Reporting > Filter Criteria Editor

You can use the Filter Criteria Editor to define standard filters that can be used in the Data Source Editor.

To create a new filter:
1. Click **New** in the display area.
2. Enter the name of the filter.
3. Enter the description of the filter.
4. Enter a filter identifier.
   A unique identifier for the standard filter that is used in the SQL statement of the Data Source Editor (see section 7.4.2). This is not visible for the user.
5. Select the data type.

The following data types are available:
- Workplace ID
  A unique identification of a workplace
- Material ID
  A unique identification of a material
- Operation ID
  A unique identification of an operation
- Date/Time
- String
- Boolean
  Defined in four different formats with the following value pairs: True/False, Yes/No, IO/NIO (OK/NOT OK), 1/0
- Number
- Multi Selection
  Generated from an SQL statement
- Time base
  A previously defined time base to be applied
- Duration (ms)

If you select the **Multi Selection** data type for a standard filter, the additional fields **SQL** and **Columns** appear. In this case, you must define or select the database table and the column for the SQL statement.

To add a column:
1. Click on the **Add** icon.
2. Enter a column identifier.
   Enter a column from the previously selected database table.
3. Enter a column identifier for color (optionally).
   Specify the color column from which the color should be adopted.
4. Enter a column title.
   The column title appears as the column header in the report.
5. Click **Add**.

10   SQL Browser

Path: Performance Analysis > Reporting > SQL Browser

In the SQL Browser, you can see tables and views used in data sources. Column names, type and length are listed for each table or view.
You can execute (only) SELECT queries in an SQL query field. Here you can query single columns of selected tables/views to display their entries.

ⓘ Views can be changed during an update process. Columns can be removed or added. However, columns will never be removed from default views (beginning with **V_**). Default views may only be used in data sources.
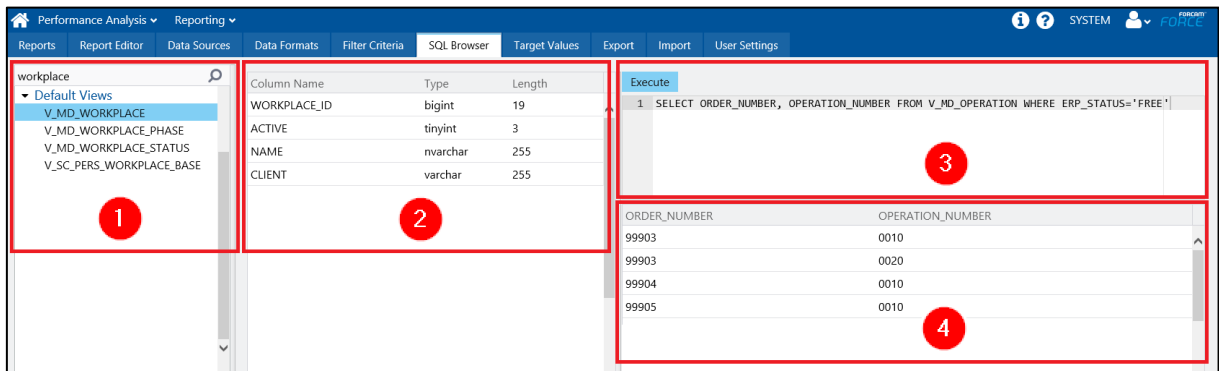
Fig. 207: SQL Browser

    (1) List of all tables and views
    (2) List of all columns of the table/view selected in (1)
    (3) SQL query field
    (4) Result of the query executed in (3)

Example:
The following query was used in Fig. 207:
SELECT ORDER_NUMBER, OPERATION_NUMBER FROM V_MD_OPERATION WHERE ERP_STATUS='FREE'

This query polls all order and operation numbers from the default view **V_MD_OPERATION** with the ERP status **free**.

ⓘ See the annex Report Table Description for a description of all table and views.

11 Target Values

Target values can be displayed as a line in reports and serve as a possible orientation value. For example, they allow a target/actual comparison or show a discrepancy for a particular object. Target values can be freely configured and used in any report of bar, column and line graph type.
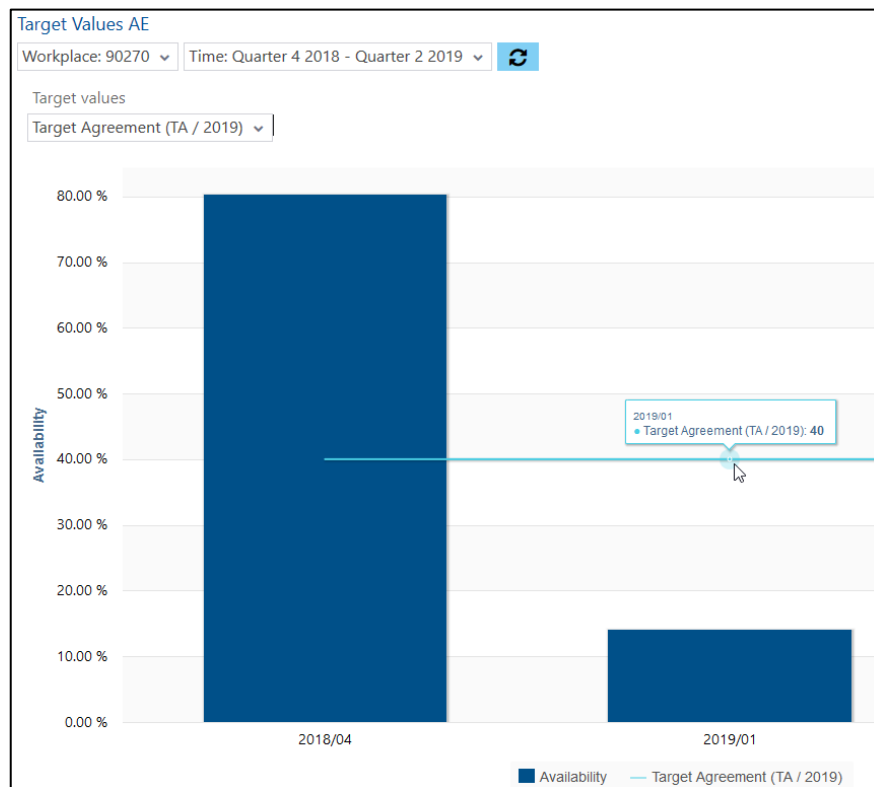
Fig. 208: Target value in a report

After selecting an object, the parameters can be defined individually. The parameter of an existing target value becomes available in the drop-down selection of a new target value.

Fig. 209: Defining target values

(1) The target value is configured for an object but is not only available for this object. It can be displayed in any report. Object type and object are for user convenience.
The object type determines which object can be selected. If the object type is, for example, **Workplace**, any available workplace can be selected as an object in the drop-down menu.
(2) Optional parameters for individualizing the target value
(3) Value and unit to which the target value line is to be set in the report. For example, if **40 percent** is defined, the line is at 40 % in the corresponding report.

⚠ A target value only becomes available in a report if a check mark is set under **Visible** in the display options (see section 4.2).

To define a new target value:
1. Click **New** in the top menu bar.
➔ An existing target value previously selected is copied and the associated data are adopted.
2. Select the object type.
3. Select the object.
The object type selected determines which objects are available.
4. Enter group, reference, name and year of the target value (optional).
5. Enter value and unit.
6. Click **Save** in the top menu bar.

⚠ Only use the TAB or Enter key to switch between input fields when creating a new target value, otherwise the new entry will not be accepted. This is standard behavior of the underlying framework and cannot be changed.

To edit or delete a target value:
1. Select the appropriate line.
2. Make the changes as necessary and then click **Save** in the top menu bar.
Or:
Click **Delete** at the top right of the screen and confirm.

12 Alarming

Specific data from production can be defined as a trigger for an alarm. When an alarm is triggered, selected persons or groups can be notified by email. Different layout templates can be defined to design and re-use email notifications.

Fig. 210: Alarming (example)

12.1 Creating and Editing Alarms

Path: System Administration > Configuration > Alarming

To define a new alarm:
1. Click **New** in the top menu bar.
2. Enter the name of the alarm.
3. Enter the description of the alarm.
4. Select the polling interval.
   The time interval in minutes at which the alarm trigger is to be polled.
5. Enter the trigger.
   Enter an SQL statement for the signal to be used as a trigger for the alarm. The alarm will be triggered when the SQL statement outputs at least one data set.
6. Enter trigger parameters in the lower area by clicking on the **Add** icon.
7. Change to the **Email** tab.
8. Enter or select an email server.
9. Enter a subject for the email.
10. Enter recipients by clicking on the **Add** icon.
    For information about how to create email groups, refer to section 12.2.
11. Enter the text of the email in the **Content** field.
12. Change to the **Parameter** tab.
    If any parameters are specified, an email is only sent to persons matching the criteria specified here.
13. Enter any additional parameters by clicking on the **Add** icon.
14. Enter SQL parameters in the lower area.
15. Click **Save** in the top menu bar.

To copy an alarm:
1. Select an alarm in the navigation area.
2. Click **Copy** in the top menu bar.
➜ The name of the alarm appears with the addition **(Copy)**. This copy can now be edited.
➜ The **Copy** option is now deactivated since you cannot make a copy from a copy.
3. Edit the alarm according to your requirements.
4. Click **Save** in the top menu bar.
➜ The alarm copied appears (with its new name, if specified) in the navigation area.

To edit an alarm:
1. Select an alarm in the navigation area.
2. Edit the alarm according to your requirements.
3. Click **Save** in the top menu bar.

To delete an alarm:
1. Select an alarm in the navigation area.
2. Click **Delete** at the top right of the screen and confirm.

12.2 Email Groups

Path: System Administration > Configuration > Email Groups

Email groups can be created to assign several persons to a group. Whenever an email is sent to the group, all members of the group will receive it. You can use email groups for alarms or auto reports (see section 13).

Name	FORCAM Team		
Emails	**User** ▲	**Email**	⊞
	Admin	info@forcam.com	🗑
	USERDT1	mail@forcam.com	

Fig. 211: Creating an email group

To create a new email group:
1. Click **New** in the top menu bar.
2. Enter the name of the group.
3. Add users.
   Keep the shift key pressed to select several users at a time.
4. Click **Save** in the top menu bar.
➜ The group just created appears in the navigation area.

To copy an email group:
1. Select an email group in the navigation area.
2. Click **Copy** in the top menu bar.
➜ The name of the group appears with the addition **(Copy)**. Now you can edit this copy.
➜ The **Copy** option is now deactivated since you cannot make a copy from a copy.
3. Edit the email group according to your requirements.
4. Click **Save** in the top menu bar.
➜ The group copied appears (with its new name, if specified) in the navigation area.

To edit an email group:
1. Select an email group in the navigation area.
2. Edit the group according to your requirements.
3. Click **Save** in the top menu bar.

To delete an email group:
1. Select an email group in the navigation area.
2. Click **Delete** at the top right of the screen and confirm.

13   Auto Reporting

Path: System Administration > Configuration > Auto Reporting

Auto reporting allows you to send reports or dashboards via email automatically. It is possible to freely select the reports or dashboards you want to send. Recipients can be individuals or groups. Reports are sent at fixed time intervals.

ⓘ When selecting a report/dashboard, it is possible to configure its filters so that only the desired data are sent. If you specify a past period (e.g. the last 4 days), the current date is not included. The current day is not included in the period of the past 4 days.

Name	File format	Execution time	Recipient	Active Flag
Operating State Timeline (Workplace)-[WEEKLY]	EXCEL	Weekly cycle,Monday,06:00;		☐
Test in autoreport fro Past 3 days - Quantity Status Diagram (Workplace) (Copy)-[DAILY]	PDF	Daily,06:13;		☑
Operating State Timeline (Workplace)-[WEEKLY]	PDF	Weekly cycle,Monday,06:14;		☐
D1-[DAILY]	EXCEL	Daily,06:34;		☐
D1-[DAILY]	PDF	Daily,15:56;		☑

Fig. 212: Auto reporting (example)

13.1 Creating and Editing an Auto Report

ⓘ All mandatory fields are marked with an asterisk (*).

To define a new auto report:
1. Click **New** in the top menu bar.
2. Enter Name and Description of the auto report.
3. Set the active option as necessary.
   If a check mark for **Active** is set, the auto report is active.
4. Add attachments.
   Attach one or more reports/dashboards by clicking the **Add** icon. The attachments are sent in the e-mail.
5. Select language.
   The e-mail and attachment will be sent in the language selected here.
6. Select time zone.
   The execution time of the auto report refers to the time zone selected here.
7. Set the execution time:
   a. Enter execution times by clicking on the **Add** icon.
   b. Select the cycle type.
      The type selected determines the other fields appearing in this dialog.
   c. Select the date.
   d. Select the time.
   e. Click **Add**.
8. Enter recipients by clicking on the **Add** icon.
   For information about how to create email groups, refer to section 12.2.
9. Enter a subject.
   Appears in the subject line of the e-mail.

10. Enter text.
    Text of the sent e-mail.
11. Click **Save** in the top menu bar.
12. Click **Debug** in the top menu bar.
➜ The configuration is checked for any errors.
13. Click **Close** in the top menu bar.

To copy an auto report:
1. Select an auto report.
2. Click **Copy** in the top menu bar.
➜ The name of the auto report appears with the addition **(Copy)**. Now you can edit this copy.
3. Edit the auto report as necessary.
4. Click **Save** in the top menu bar.
5. Click **Close** in the top menu bar.

To edit an auto report:
1. Select an auto report.
2. Click **Edit** in the top menu bar.
3. Edit the auto report as necessary.
4. Click **Save** in the top menu bar.
5. Click **Close** in the top menu bar.

To delete an auto report:
1. Select an auto report.
2. Click **Delete** at the top right of the screen and confirm.

13.2 Document Templates

Path: System Administration > Configuration > Document Templates

A document template is used to define the layout of reports during PDF export. An object can be a report, a dashboard, or a visualization. The object itself does not change during PDF export. However, it is possible to add a header, footer, and an individual logo to the PDF.
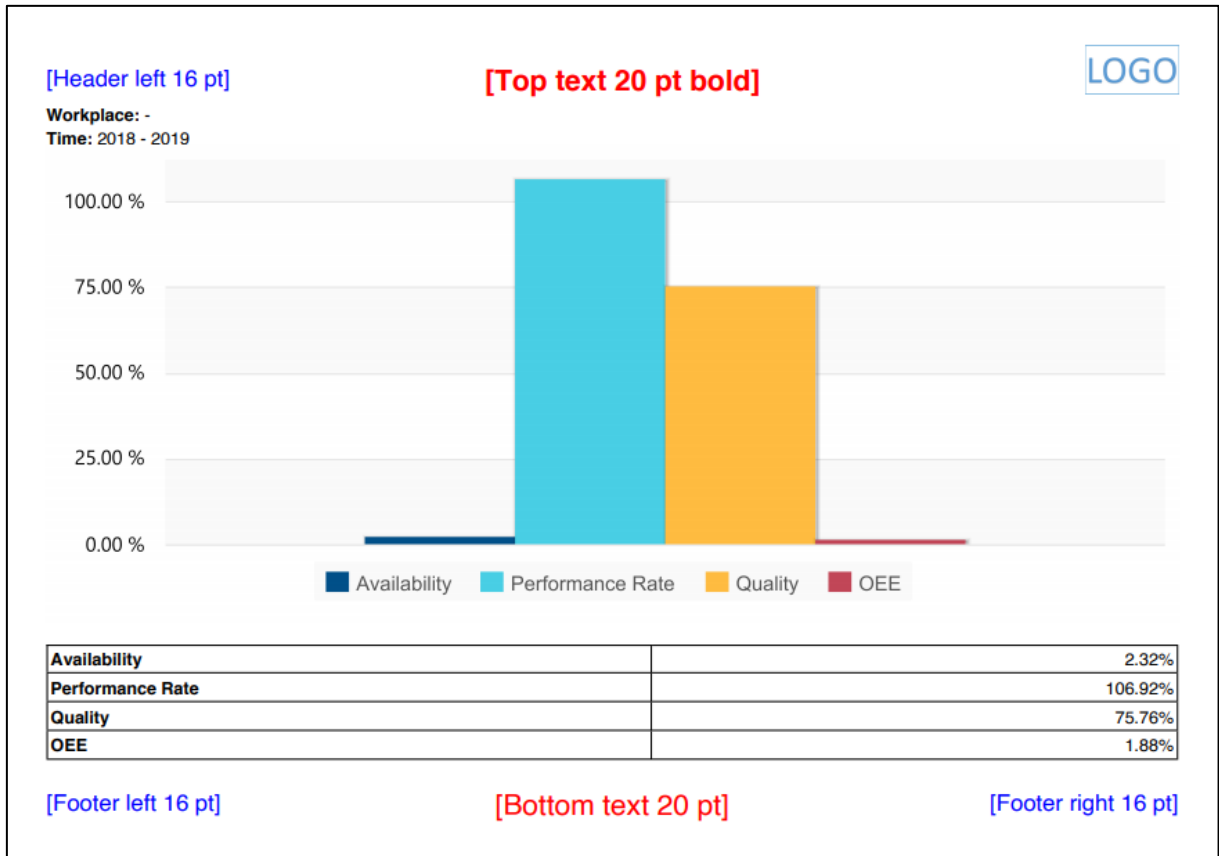
Fig. 213: PDF export of the OEE (Overall View) report with header, footer and logo

Some values and the logo are preset by default on the configuration page. These can be adjusted as needed.

The height of the header/footer determines the possible font size of the text in it. When using a height of 12.7 mm, for example, texts of 20pt fit well into the space. If the height used is about 5mm, the maximum font size would be 12pt.

In the header and footer, texts can be displayed in 3 places next to each other: left, center and right. If the texts are too long, they run into each other, so it is recommended not to use long texts next to each other.

Fig. 214: Configuring the layout at PDF export

To create a new document template:
1. Click **New** in the top menu bar.
2. Enter the name of the template.
   The template can be saved after this step. All the other steps are optional.
3. Select the format, alignment and distance in the **Page** tab.
4. In the **Header** tab, select what should be displayed in in the left, middle, and right part of the header.
   Name is the description of the exported content (i.e. title of the dashboard).
5. In the **Footer** tab, select what should be displayed in the left, middle, and right part of the footer.
   It is possible to include pictures if the footer height is set accordingly.
6. Save.
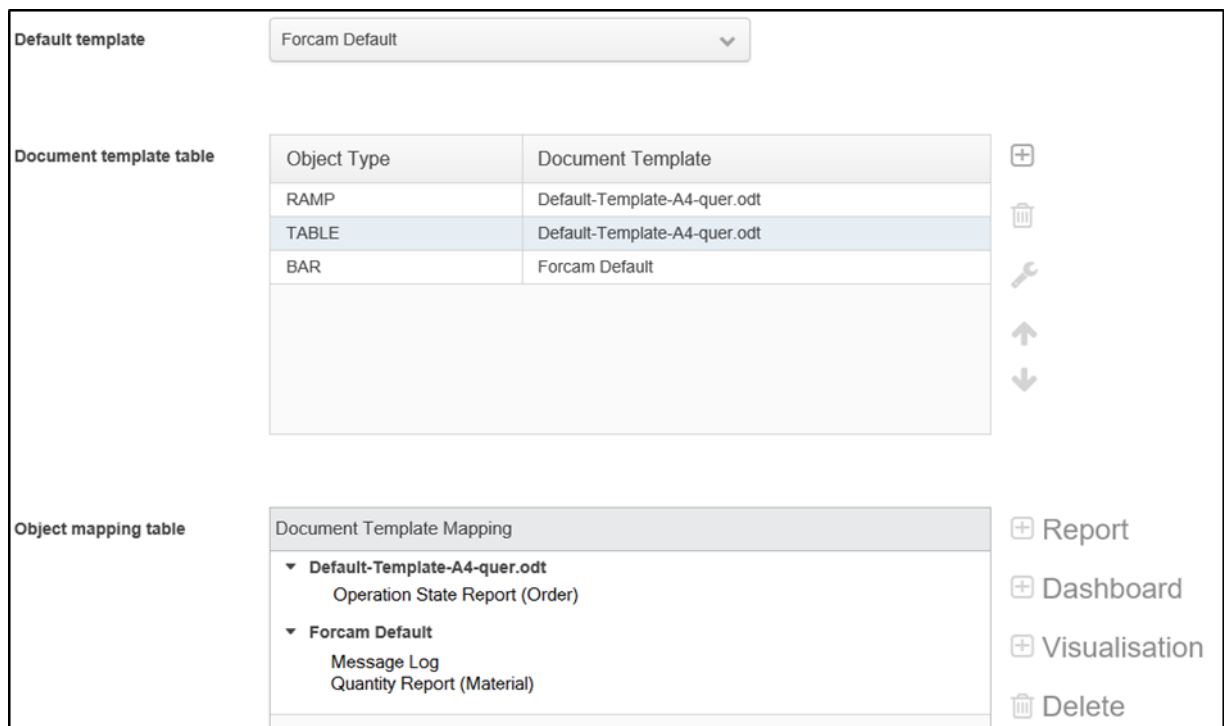
13.3 Document Template Mapping

Path: System Administration > Configuration > Template Mapping

You can assign document templates to object types (e.g. all reports of a certain type) or individual objects (e.g. specific reports). If you assign a template to an object, this mapping is preferred even if the object type has a different mapping.
You can select a default template to be used as a basis for all object types.

Fig. 215: Document template mapping

To define a default template:
Select the template from the dropdown menu next to **Default template**.
The template selected will be used by default for all objects.

To assign a template to an object type:
1. Click on the **Add** icon in the document template table area.
2. Select the appropriate object type.
3. Select the appropriate document template.
4. Click **Add**.
➔ The template is assigned to the object type. The mapping is saved.

To assign a template to an object:
1. Select a template to be assigned to the object in the **Object mapping table** area.
2. Click on the **Add** icon of the appropriate object type.
3. Select the object and click **Select**.
➔ The template is assigned to the object. The mapping is saved.

14 Tickets

Tickets facilitate communication and handling of issues, inquiries and errors. A ticket contains a description of an issue and any additional data such as priority, date and subject. When a ticket has been opened, you can add an activity (answer or response). An observation entered at the shop floor terminal appears as a ticket here.
The history enables tracking of activities.

14.1 Ticket Editor

Path: Schedule & Dispatch > Ticket

It is possible to create new tickets and add activities to existing tickets in the ticket editor. Various parameters facilitate a precise description of the issue.
Tickets can be exported, downloaded or sent by e-mail just like reports (see section 2.8).

ⓘ All mandatory fields are marked with an asterisk (*).

Fig. 216: Ticket editor (example)

To create a new ticket:

1. Click **Add** in the top menu bar.
   The ticket number is assigned automatically and cannot be edited. Each new ticket receives a number 1 higher.
2. Enter the ticket title (mandatory field).
→ The ticket appears with this title in the navigation area after saving.
3. Select status.
4. Fill in the root cause.
   Reason or cause for the ticket.
5. Select priority.
6. Enter a description (mandatory field).
   Describe the issue or error in detail.
7. Select ticket class (see section 14.2).
8. Select desired parameters in the **Attributes** tab below.
   The parameters are assigned to the ticket created.
9. Switch to the **Attachments** tab.
10. Add Attachment.
    a. Click the **Add** icon.
    b. Enter a description of the attachment in the subsequent dialog (mandatory field).
    c. Upload the attachment by clicking on **Load attachment**.
    → The remaining fields are filled automatically according to the selected file.
    d. Click **Add**.
11. Switch to the **Actions** tab.
12. Add action.
    Measure against the ticket cause.
    a. Click **Add Activity**.
    b. Add title and description in the subsequent screen (mandatory fields).
       Description of the action/measure against the ticket cause.
    c. Select Editor.
       Person who is to process the ticket.
    d. Select status.
    e. Determine due date.
       Date by which the ticket is to be processed.
    f. Add remark.
    g. Add attachment (see step 10).
    h. Send action by e-mail if applicable.
       Click on **Send E-mail** in the upper right corner of the screen (see section 12 for e-mail configuration).
    i. Click **Save** in the top menu bar.
    → The action is saved and assigned to the ticket.
13. Click **Save** in the top menu bar.
→ The ticket is saved together with attachments and actions

Fig. 217: Editing dialog of a ticket

To copy a ticket:
1. Select a ticket in the navigation area.
2. Click **Copy** in the top menu bar.
➔ The view changes to the ticket editing screen (see Fig. 217).
3. Edit the ticket as necessary.
   Assign new title to avoid confusion.
4. Click **Save** in the top menu bar.

To edit a ticket:
1. Search for a ticket and select it in the selection area.
2. Click **Edit** in the top menu bar.
➔ The view changes to the ticket editing screen (see Fig. 217).
3. Edit the ticket as necessary.
4. Click **Save** in the top menu bar.

To delete a ticket:
1. Search for a ticket and select it in the selection area.
2. Click **Delete** in the top menu bar.
3. Confirm deletion in the subsequent dialog.

14.2 Ticket Classes Editor

Path: Schedule & Dispatch > Ticket > Ticket Classes Editor

Ticket classes facilitate creating classes of tickets. In this way, you can summarize tickets according to subjects. Some useful classes are, for example, material, tool, machine, etc.
It is recommended to address only the specific subject in a ticket which is assigned a class.

ⓘ All mandatory fields are marked with an asterisk (*).

Code *	1	
Short Description *	Material issue	🌐
Description *	Tickets for defective materials	🌐
Sequence *	0	

Fig. 218: Creating a new ticket class

To create a new ticket class:
1. Click **New** in the top menu bar.
2. Enter a code.
   Number between 1 and 1000, which is used as an abbreviation. The field appears in the navigation area before the short description. Zeros in front of a number are ignored (e. g. 00001 becomes 1).
3. Enter a short description.
   It appears in the navigation area behind the code.
4. Enter a description for the class.
5. Specify the sequence (optional).
6. Click **Save** in the top menu bar.

To copy a ticket class:
1. Select a ticket class in the navigation area.
2. Click **Copy** in the top menu bar.
➔ The name of the class appears with the addition **(Copy)**. Now this copy can be edited.
3. Edit the ticket class as necessary.
4. Click **Save** in the top menu bar.

To edit a ticket class:
1. Select a ticket class in the navigation area.
2. Edit the ticket class as necessary.
3. Click **Save** in the top menu bar.

To delete a ticket class:
1. Select a ticket class in the navigation area.
2. Click **Delete** at the top right of the screen and confirm.

14.3 Ticket Status Editor

Path: Schedule & Dispatch > Ticket > Ticket Status Editor

The Ticket Status Editor lists all the statuses that a ticket can have. The statuses are pre-defined and cannot be edited. Only the color can be freely determined by clicking on the corresponding cell.
If a new color is selected, it is applied directly. It is not necessary to save. Existing tickets take over the new color immediately.
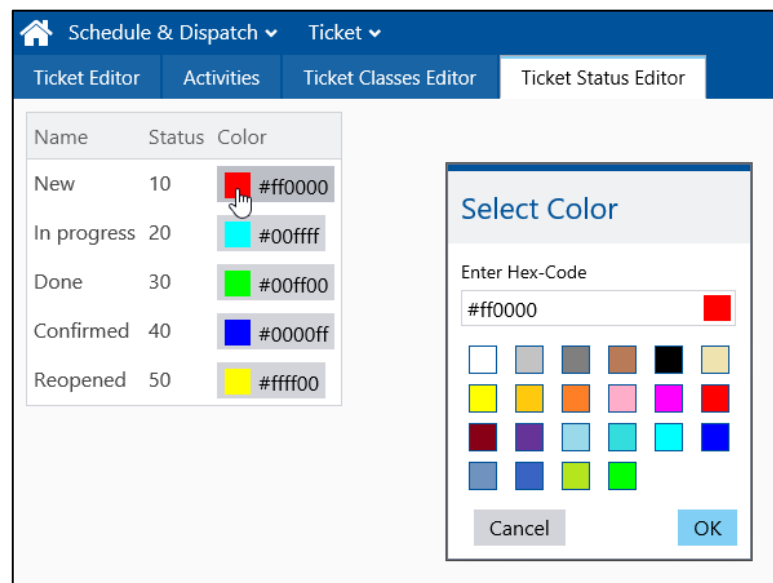
Fig. 219: Selecting colors for ticket status

15 Annex

15.1 History of Changes

Table 32: List of changes between release version 5.9 and 5.10

Date	Type	Description	Chapter
2019-07-16	Added	Explanation of PDF export	2.8
2019-07-16	Added	Steps „Show the titles of partial reports" and „Display reports that have no data"	4.7.1
2019-07-17	Added	Warning for switching input fields	11
2019-07-17	Reworked	Reworked the chapter (new configuration page)	13.2

15.2 Abbreviations

Table 33: Abbreviations used

Abbreviation	Description
ERP	Enterprise Resource Planning
HH:mm	Hours:minutes
HPH	Hits per hour (machine strokes)
HTTP	Hypertext Transfer Protocol: A general stateless object-oriented protocol for data transmission in the World Wide Web
ID	Identifier (unique system-internal identifier)
ms	Milliseconds
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
OEE	Overall Equipment Effectiveness
OPE	Overall Process Efficiency
PPH	Pieces per hit (units produced per machine stroke)
px	Pixel
QM	Quality management
RISC	Processor architecture with a reduced instruction set. The machine commands are processed simultaneously in a common command pipeline.
SOT	Scheduled Operating Time
SQL	Database language for the definition of data structures
URL	Uniform Resource Locator
UTC	Coordinated Universal Time
XLS	File extension of Microsoft Excel files

15.3 Terms and Concepts

Table 34: Terms used

Term	Description
Display area	The central viewing area of the display screen
Dashboard	Views in which several reports and visualizations can be displayed in an overall view
Drag-and-drop	Drag a screen element with the mouse and drop it at the new position
Drill-down	Open detail information of a report
GET parameters	Parameters that can be passed when using the 'GET' HTTP method. If the call is made in the address bar of a web browser, the first parameter of the calling string is identified by a leading **?** and all other parameters by a leading **&**.
Hit list	List of operating states or quality types sorted by duration and frequency
iframe tag	HTML element used for structuring web pages. It is used to another web content as a separate document in the browser.
PPM degree	(Scheduled maintenance / Scheduled operating time) * 100%
Interpolation	A mathematical method to determine an unknown function value by approximation using known adjacent function values
Link	Hyperlink (a cross-reference to an electronic document or another place within the same document)
Multi-report	A compilation of several individual reports
Navigation area	The navigation area on the left of the screen
OEE	A measure of effectiveness resulting from availability, performance and quality
SQL statement	A command or line written in SQL language
Scroll bar	A display control bar used to displace the visible content of a screen page
Shop Floor Terminal	Central source of information and operating state acquisition unit. Can be executed on devices with browser capability.
Status class	A group of operating states. Status classes are defined in the Workbench.
Tool tip	A short description of an element or button that appears when the mouse pointer hovers over it
Trigger	A trigger initiates an action.
Operation	The term "operation" is used in this document to denote an operating process or activity.
Widget	Single view within a dashboard
Zoom	Zoom in/zoom out

15.4 Document Conventions

Table 35: Conventions used in the document

Convention	Description
Bold type	The names of buttons and options are printed in bold type.
Italics	Words that are emphasized are printed in italics.
Path	All **Paths** specified relate to FORCAM FORCE™.
Values/quantities	Values/quantities that are not specified more precisely (e.g. by modifiers such as "target" or "actual" values/quantities) refer to data collected.
Icons	A function shown as an icon involves a reference to the icon as an object.
Alternative action	Alternative actions are identified by Or.
Substeps of an action	Substeps of an action are indented and provided with unique symbols on each action level. The order of levels is as follows: 1. 　　　a. 　　　　　i. 　　　　　　　1. etc.
Action result	Results of an action are identified by ➜.
Note	Notes are identified by ⓘ.
Requirements	Requirements are identified by ✓.

15.5 Navigation
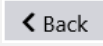
Table 36: Navigation in FORCAM FORCE™

Navigation	Description
Breadcrumb bar	Each function and subfunction selected in FORCAM FORCE™ appears in a breadcrumb bar at the top edge of the screen. It is possible to go to another area by clicking on an element in the bar.
Navigation area	– The navigation area includes an active search field which relates to all entries in the navigation area (see section 2.12). The entries can be opened or closed. – It is also possible to change the width of the navigation area by dragging its edge. – A dropdown menu at the top left offers filter criteria that can be applied to reports.
Preview	Functions with editing option are provided with a Preview tab. Click on the **Preview** tab to change to preview mode. All settings and any changes are displayed here in a preview without saving.
Tables	– Columns in tables can be repositioned by drag-and-drop. Change the width of columns by dragging their edge. – Show or hide columns using the **Filter table** icon at the top right.
View/update data	When data are requested, for example, for a report, they are not loaded immediately since the preset values may not match the desired target values and this would extend the loading time unnecessarily. The data are not loaded or updated until the **Update report** icon is clicked.
Back (from drill-down)	When opening a drill-down view, a **Back** icon appears in the top menu bar on the right. Clicking this icon returns back to the report.
Wide tables	Some tables are wider than the screen because of their content. To scroll the content of a table horizontally, select a line and use the arrow keys on the keyboard.
Language	The default dialog language of the Office Client is set per the language setting of the browser.

15.6 Icons

Table 37: Icons used

Icon	Description
▶	Open report
▼	Close report
⟳	Update report
≡	Filter table
›	Display selected report
🔧	Edit
🌐	Open input dialog to enter content in multiple languages. The content is displayed in the language used for logon.
⊞	Add
🗑	Delete
⬆	Move up
⬇	Move down
⛶	View
⛶✕	Close full screen
♻	Create column
✏	Edit dashboard
🗐	Copy dashboard / visualization element
⚙	Edit widget

⊕	Add widget
⛶	Expand widget
✖	Contract widget
↗	Enter URL
PDF	Export to PDF format
XLS	Export to XLS format
‹ Back	Back
▭	Insert rectangle
abc	Insert text
🖼	Insert image
▭▸	Insert button
—	Insert horizontal line
│	Insert vertical line
🌐	Insert web page
abc🖼	Insert group element
↵	Undo

	Redo
	Align
	Insert visualization element
	Zoom in
	Zoom out
	Restore original size
	Optimize zoom
	Move visualization element one layer up
	Move visualization element one layer down
	Edit formula

15.7 Table of Figures