DOCUMENTATION

Visual Advanced Production Scheduler (VAPS)

Version: **1. 20** | as of 3 February 2025

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1. Release and version status

1.1. Is the VAPS available for BC/NAV, for cloud/on-prem, for all partners? And when?

Learn about "all things availability" when it comes to the Visual Advanced Production Scheduler.

1.1.1. Is the VAPS available for Dynamics 365 Business Central and Dynamics NAV?

No, the VAPS is only available for Dynamics 365 Business Central. The minimum version required is Business Central v14 (cu4).

1.1.2. Is the VAPS available for Business Central on-prem and cloud?

The VAPS is available both for Business Central on-prem and cloud.

1.1.3. Is the VAPS available for sale?

Yes, the VAPS is available for sale and to be implemented at and used by customers. Version 1.0 was released on 17 January 2020.

1.1.4. Is the VAPS available for all NETRONIC partners?

No. The VAPS requires specific skills and expertise as it enhances and changes Business Central significantly.

Please reach out to sales@netronic.com if you want to achieve the VAPS certification.

1.2. Where can I find the VAPS release notes?

Learn how to find the release notes for the Visual Advanced Production Scheduler. Learn how you can check if you're on the latest version. Learn what is new.

The release notes of the Visual Advanced Production Scheduler can be found here:

https://www.netronic.com/microsoft-dynamics-365-business-central/visual-advanced-production-scheduler/release-notes

2. Installing the VAPS

2.1. How can I install the VAPS in my on-prem environment?

Learn where and how you get the runtime package of the VAPS

First, you as a partner need to become "VAPS certified". Talk to sales@netronic.com to find out details about the certification process.

Once you are VAPS certified, you'll get access to our "NETRONIC VAPS Partner Community". It is based on Microsoft Teams, and your place to go to get your demo version/ runtime package of the product as well as Marketing and Sales collateral.

2.1.1. Prerequisites to install the VAPS:

- An **up and running full-fledged** Dynamics 365 Business Central Installation
- Minimum required version: **Business Central v14 (cu4)**.
- Access to the backend via the "**Business Central Administration Shell**" or the "**NAV Container Helper**"
- The Web Client needs to be enabled – and using the **Web Client is highly recommended**

2.1.2. The VAPS D365 on-prem can be installed in two different ways:

I. THE NAVSERVER INSTANCE IS INSTALLED DIRECTLY ON THE COMPUTER

What is needed for the installation:

- Admin access to the NAV/BC server computer
- Access to the NAV/BC Admin Shell & Development Shell with admin rights on this computer
- The "Name" of the NAV/BC ServerInstance into which the extension should be installed
- An updated NAV/BC license installed, which has the extension objects included
- Access to the NAV/BC Web Client to test the installation
- Access as "SUPER" user to NAV/BC, to assign Permission Sets to other users

Installation instructions:

- Run the "**Business Central Administration Shell**" as administrator and enter the following commands:
- Publish-NAVApp -ServerInstance NAV -Path "NETRONIC Software GmbH_Visual Advanced Production Scheduler_1.x.y.z_runtime.app" -SkipVerification
- Sync-NAVApp -ServerInstance NAV -Name "Visual Advanced Production Scheduler"
- Install-NAVApp -ServerInstance NAV -Name "Visual Advanced Production Scheduler"
- If the install call gives an error regarding "DataUpgrade," try Start-NAVAppDataUpgrade -ServerInstance NAV -Name "Visual Advanced Production Scheduler"
- Open the NAV/BC Web Client as user with "SUPER" permissions
- Check the "extension management" page if the extension got installed properly
- Check if you can open/run the extension
- Assign the "NETRONIC VAPS" permission set to all users which should work with the extension.

II. THE NAVSERVER INSTANCE IS RUNNING FROM A DOCKER ENVIRONMENT

What is needed for the installation?

- Admin access to server computer and the corresponding Docker environment
- Access to a powershell with the NAVContainerHelper module installed
- The "Name" of the NAV/BC Container into which the extension should be installed

- An updated NAV/BC license installed, which has the VAPS objects included
- Access to the NAV/BC Web Client to test the installation
- Access as “SUPER” user to NAV/BC, to assign Permission Sets to other users

Installation Instructions:

- Please enter the following command with the help of the "**NAV Container Helper**":
- Publish-NavContainerApp -containerName navserver -appFile “NETRONIC Software GmbH_Visual Advanced Production Scheduler_1.x.y.z_runtime.app” -skipVerification -sync -install
- If the publish call gives an error regarding “DataUpgrade,” try Start-NAVContainerAppDataUpgrade -containerName navserver -Name “Visual Advanced Production Scheduler”
- Open the NAV/BC Web Client as user with “SUPER” permissions
- Check the “extension management” page if the extension got installed properly
- Check if you can open/run the extension
- Assign the “NETRONIC VAPS” permission set to all users which should work with the extension.

2.2. How can I deploy the VAPS into a cloud infrastructure?

If you want to use the VAPS in a cloud environment you can download the app from Microsoft or purchase it via your partner.

In both cases, the VAPS needs to be licensed. With the release of VAPS version 1.15.1.0, we have implemented a new licensing system within the extension. This update is specifically designed to ensure that proper licensing is maintained within SaaS environments. This also applies to existing customers migrating to the new licensing system.

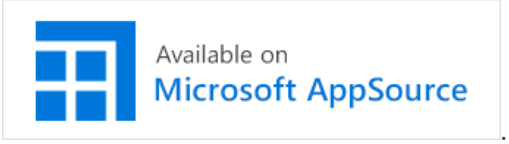
To ensure a smooth and fault-free licensing process, we've included the necessary steps for you in the following instructions.

2.2.1. For existing customers migrating to the new licensing system as of VAPS version 1.15.1.1

How to license the VAPS - new licensing system .

2.2.2. For new customers wanting to purchase the VAPS via AppSource or directly from NETRONIC

How to purchase and license the VAPS via AppSource or NETRONIC.



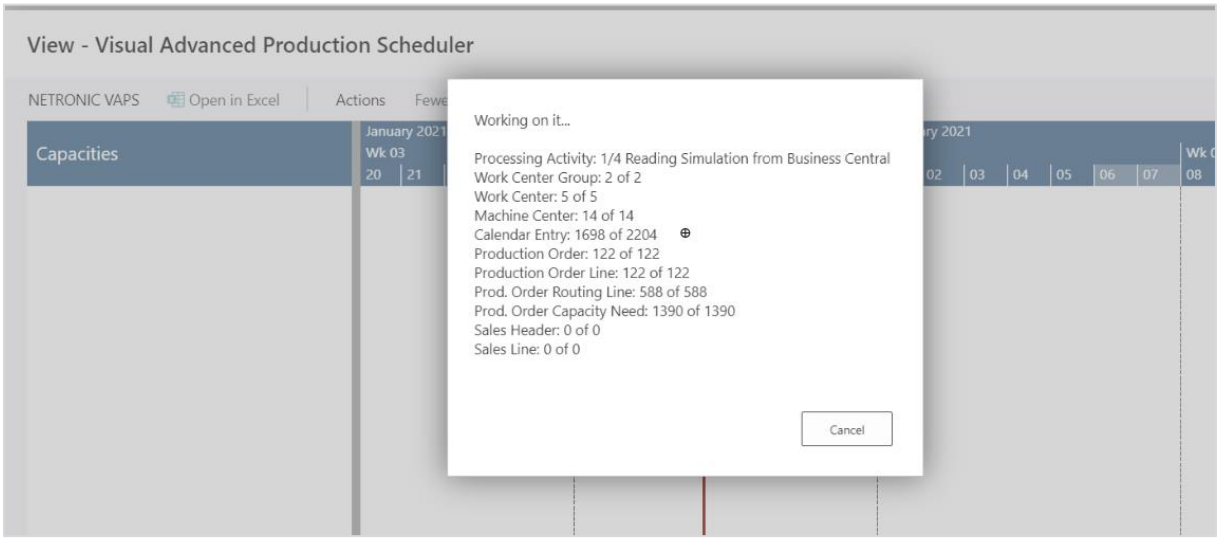
3. Look and feel of the visual schedule

3.1. Info window shows progress

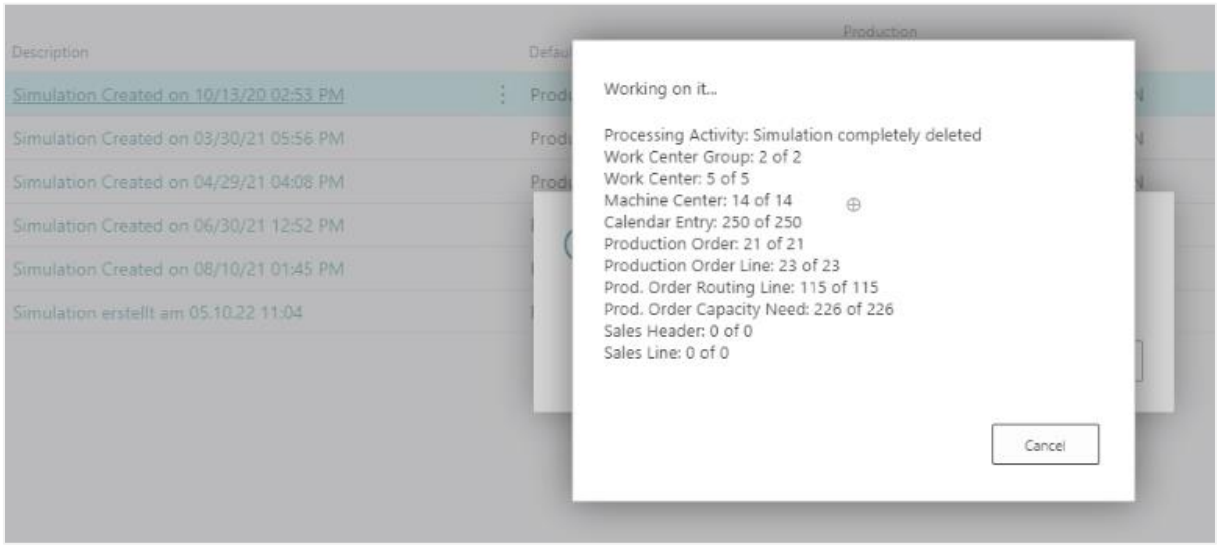
When a simulation gets loaded into the VAPS, multiple stages of data processing are executed until the visualization finally appears and the user can start working with it. Especially when there are large amounts of data to be loaded/reloaded, this can take some time during which the users do not know what is happening and are often unsure whether the application is still working.

To give the users more feedback as to what is happening during the loading process, we have implemented a new info window that:

- gives feedback that something is happening at all (meaning the extension has not crashed)
- informs about the amount of data getting loaded, thus explaining why the process might take so long
- informs about how long this process might take and how long the users might need to wait
- also helps our support team during customer trainings or support cases to get a better understanding of the customers' environment.



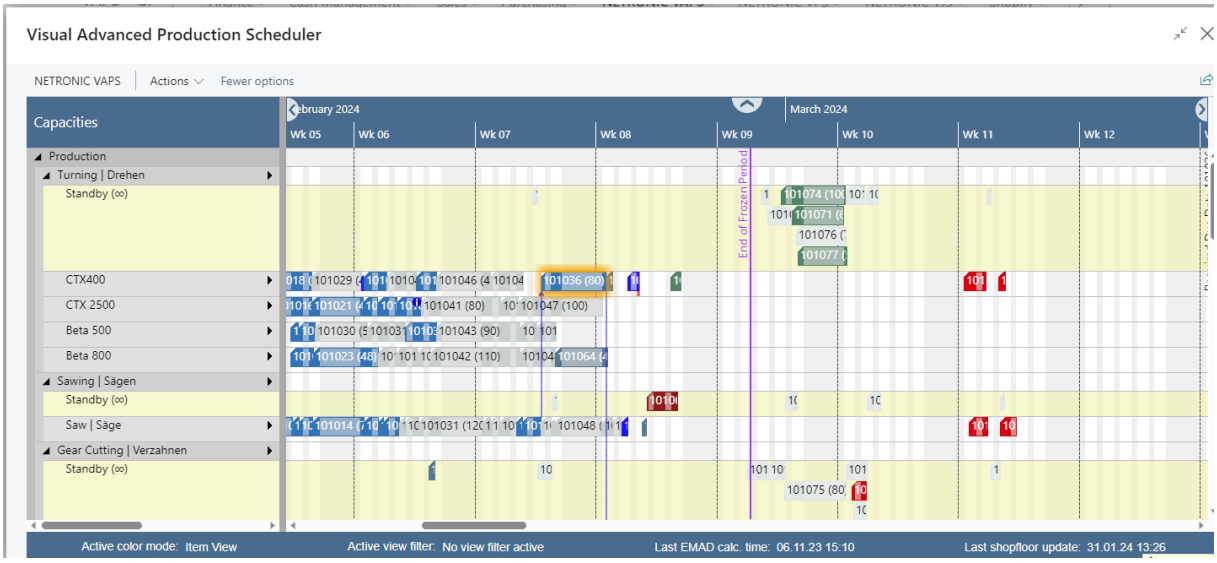
The info window also shows up when you create, delete, copy, publish, and close (with saving) a simulation.



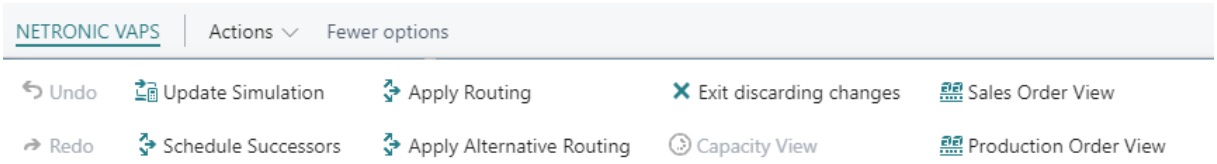
3.2.The structure of the schedule

The VAPS provides you with a visual drag & drop frontend to manage your production schedule.

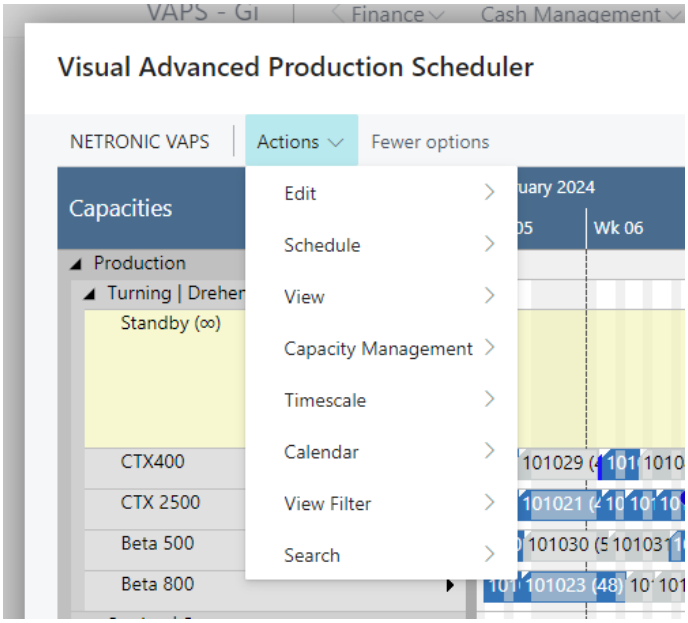
Since the VAPS is a Gantt Chart, it naturally has all its characteristics and elements:



- A time scale at the top.
- A table at the left.
- On the right below the time scale, a diagram displaying the schedule with a calendar in the background indicating work free periods in grey while working times appear in white.
- A **menu ribbon** is placed above the plan, the item “NETRONIC VAPS” summarizing all menu options that we think are the most frequently used ones::



All options of the VAPS can be found under “Actions”:

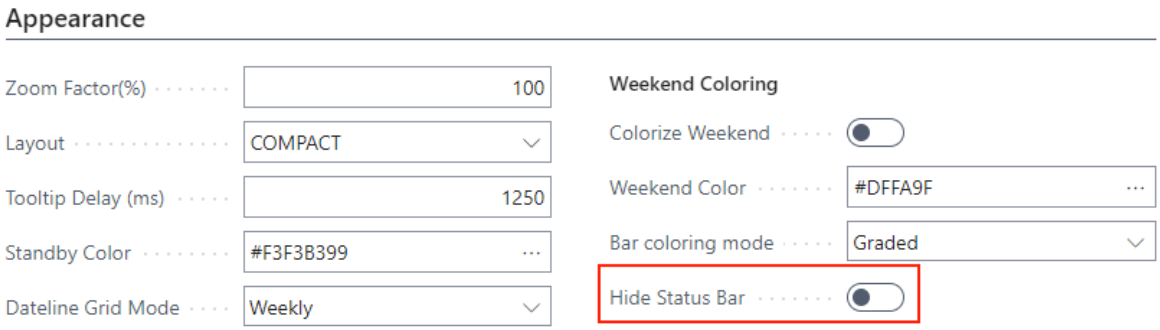


In case the “Actions” item is not visible in the menu ribbon, click “More options". To hide it again, click “Fewer options.”

Please note, that, depending on the task you are currently working on (setting-up the VAPS, working in a simulation etc., the contents of the menu ribbon will differ.

- An interactive **status area** can be shown below the visual schedule, providing the planners with useful information about
  - Whether new warehouse activity line or shopfloor data is available. Clickable to load the new data.
  - The active color mode, clickable to select another mode.
  - Whether a view filter or the focus mode is active. Clickable to choose another filter.
  - The last time the EMAD was calculated.
  - The last time the schedule was updated with shopfloor data.

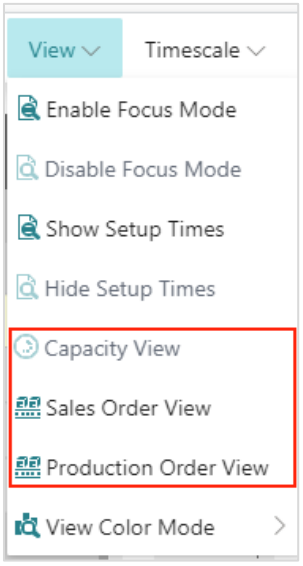
The status area is activated by default but can be switched off in the "Appearance" area of the VAPS setup.



3.3. Three different views

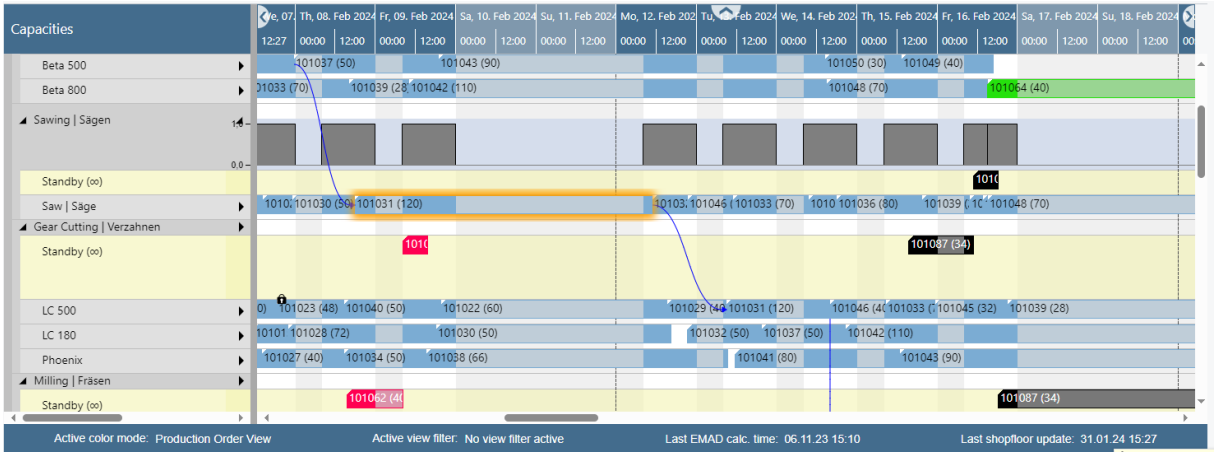
There are three different views in the VAPS: the Capacity View, the (read-only) Production Order View and the (read-only) Sales Order View.

You can switch between the views by the corresponding context menu items:



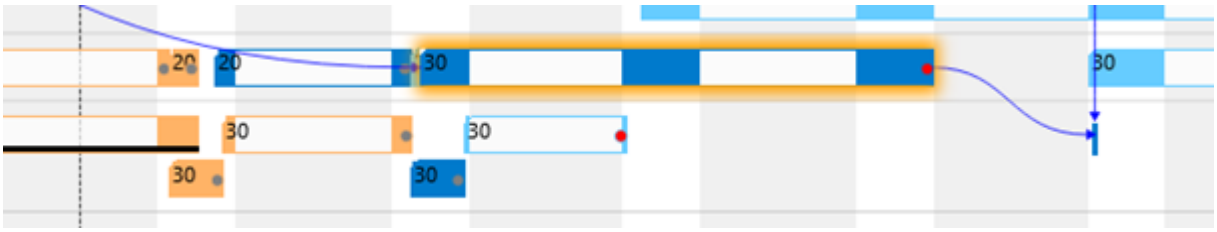
3.3.1. The Capacity View

The capacity view shows capacity loads of work centers and machine centers, grouped by work center groups:

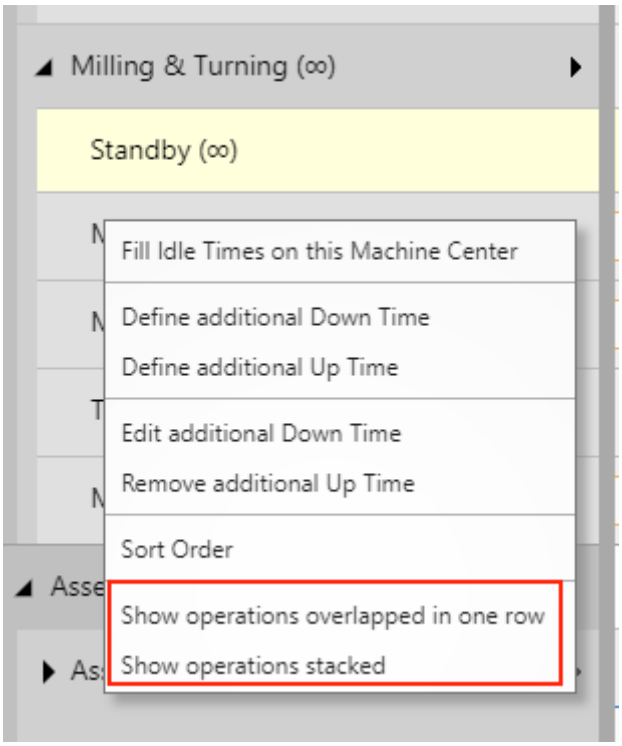


Select display mode for overlapping operations

Usually, overlapping operations are shown in an "optimized" way, meaning that the resource row with the respective operations gets extended in height so that the operations are completely visible. Since the VAPS schedules with finite capacity, overlapping operations are avoided, and hence this is a rare case.



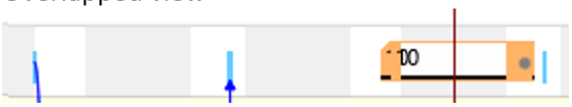
However, some customers have contacted us with the following use case: They need to create operations with a length of zero to define a common starting point for parallel routings without blocking capacity. These operations will then be scheduled at the first possible position which will result in a very high stacked resource. For these cases, we added two new context menu items so that users can now decide whether overlapping operations are to be shown overlapped in one row or stacked. This also applies to resources on Standby.



The picture below illustrates the different display modes:

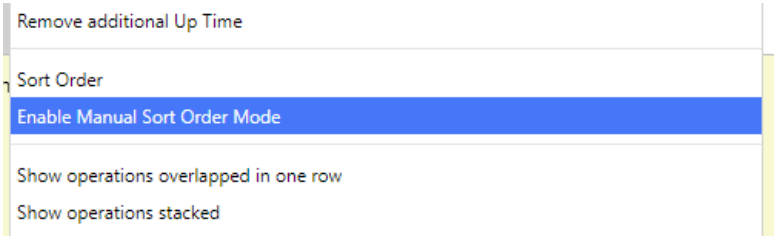
Stacked view

Overlapped view

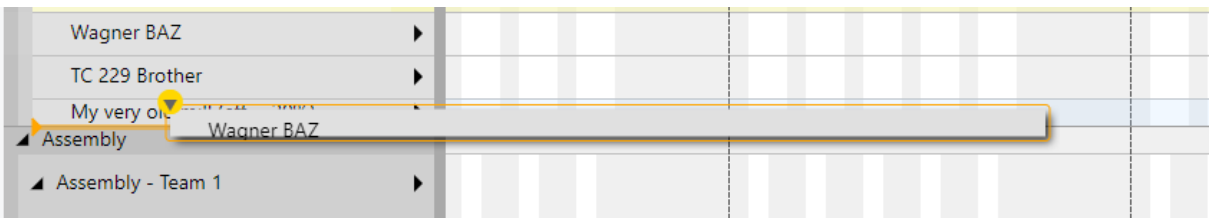


Reorder the table per drag and drop

The table context menu offers an option to enable manual sorting per drag and drop:



Once enabled, you can, e.g., drag the “Wagner BAZ” machine center easily to another place:



Visualization of the field "Earliest Start Date"

The VAPS comes with the convenient automatic scheduling functions "Add all", "Fill idle times", "Apply routing," and "Tighten operations". With the new version, users can limit these functions to only schedule production order routing lines/operations so that they start at or later than the date defined. This is done by the new field "Earliest Start Date", having been implemented on production order, production order line, and production order routing line level. Depending on the configuration in the “Appearance” section of the “Setup” menu, this line will appear when hovering over and/or clicking an operation with an earliest start date.

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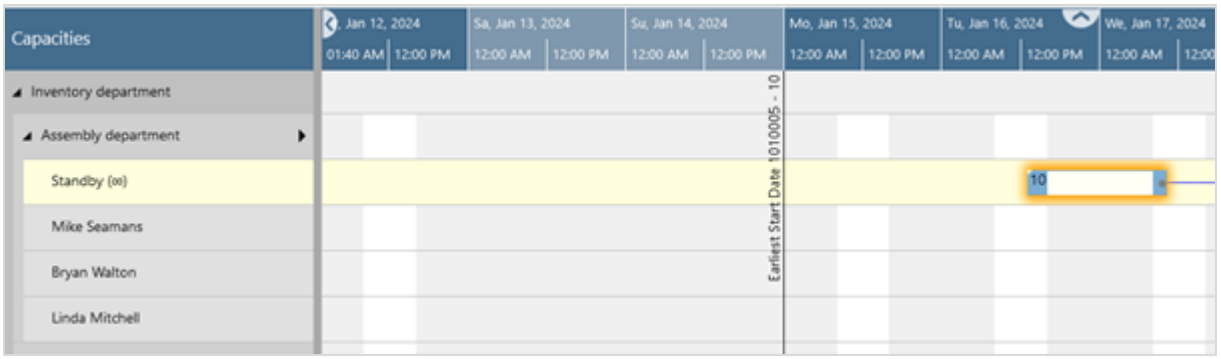
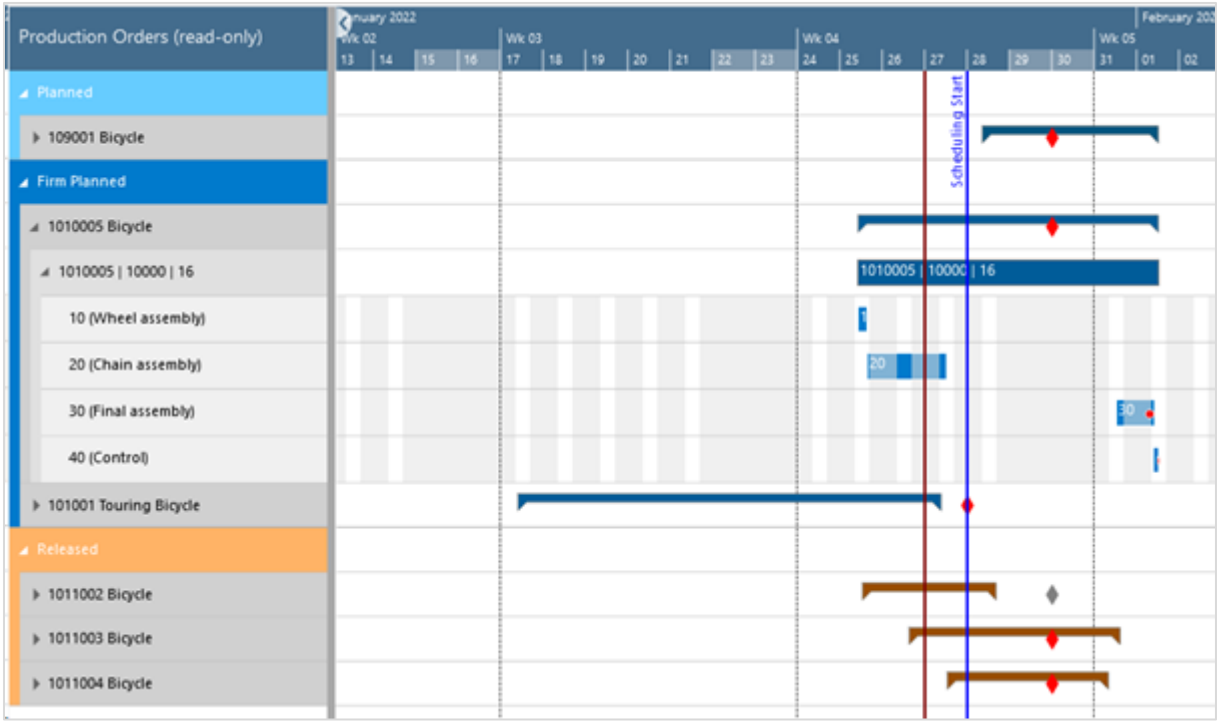


If the earliest start date is defined on all levels, the latest available date will be used for scheduling and if the "Consider EMAD" option is activated, this date will also be taken into account, meaning that the latest of all four dates will be considered.

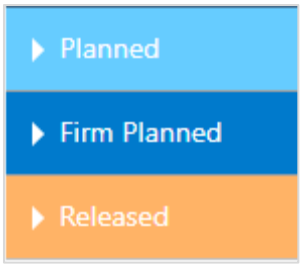
Operations with an earliest start date can nevertheless still be dragged manually to an earlier start.

3.3.2. The Production Order View (read only)

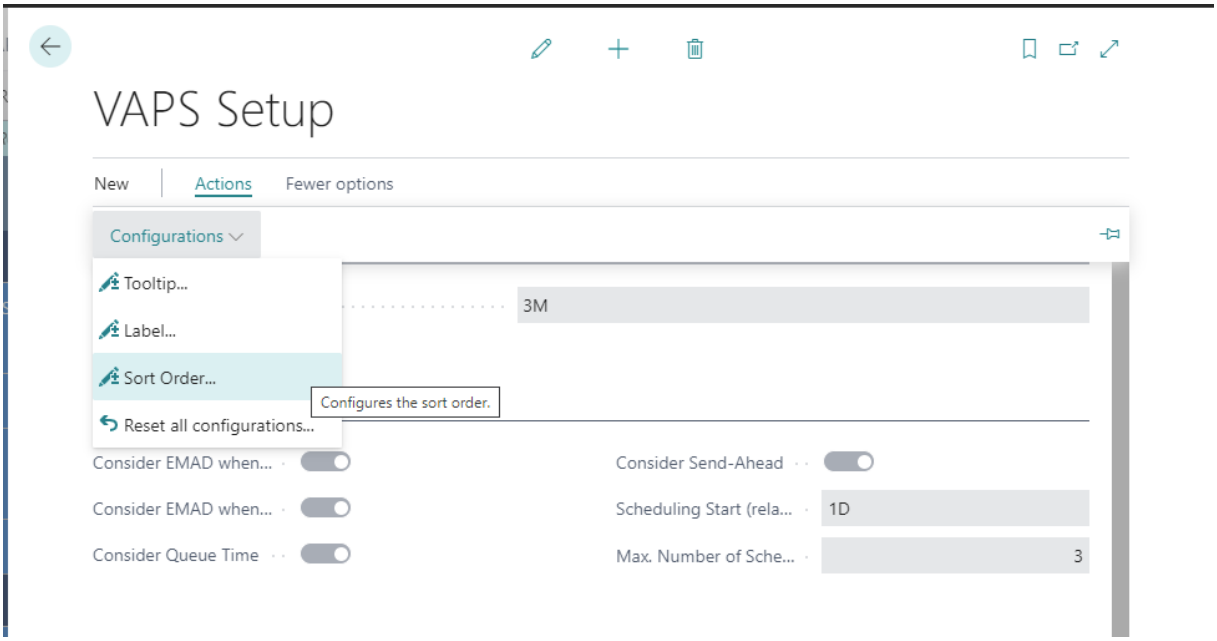
The Production Order View shows production orders categorized by their status.



The categories are indicated by different colors:

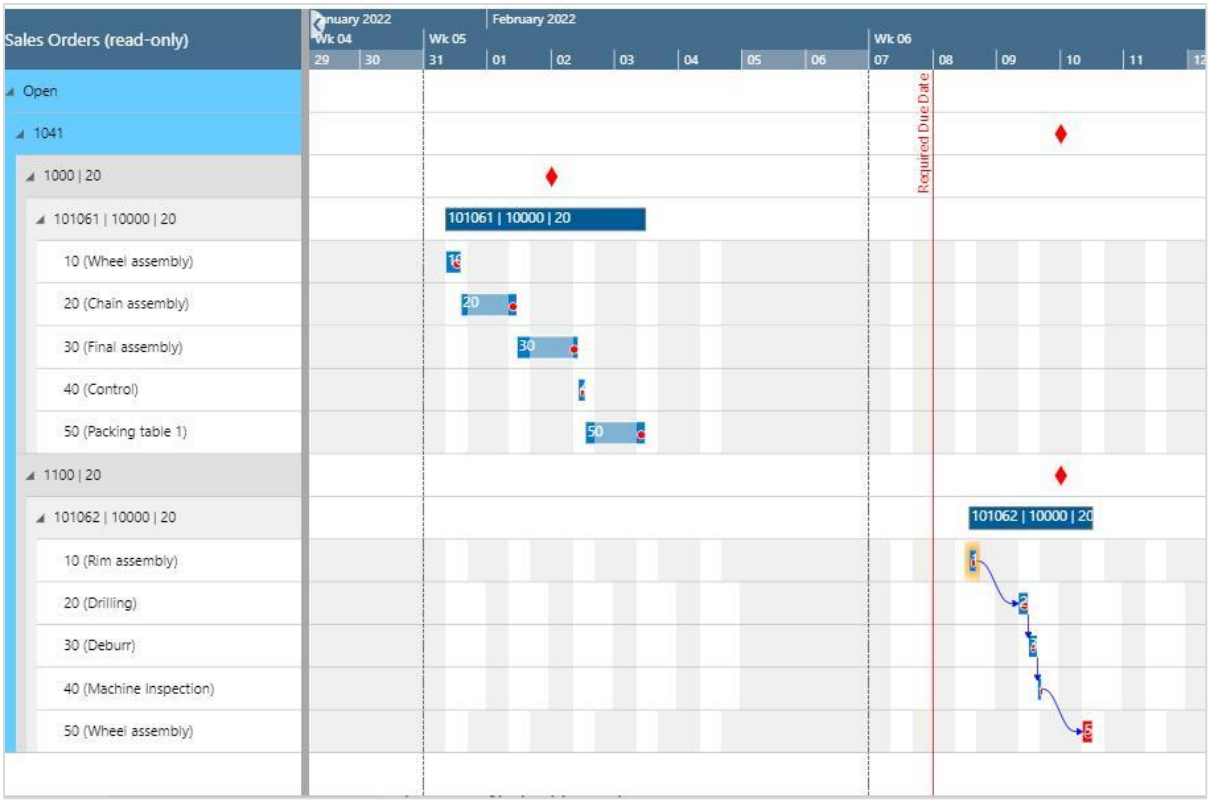


Production orders, their production order lines, and production order routing lines are sorted in ascending numerical order. Within each production order, the relating production order lines with their production order routing lines are listed. The default sorting order for nearly all elements in the plan can be changed either by context menu or via the “Configurations” tab in the VAPS setup.



3.3.3. The Sales Order View (read only)

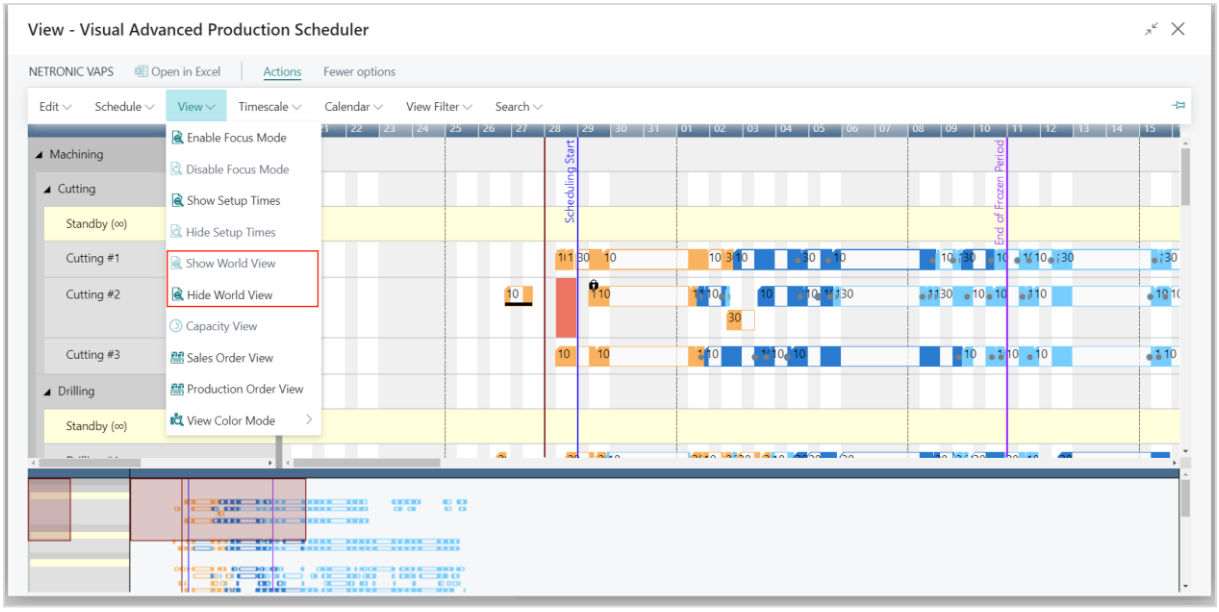
The Sales Order View shows those sales orders that have production orders against it and when those production orders (lines) are scheduled. A visual alert is given if the production order's finish date is past the sales order's requested delivery date.



3.3.4. For better overview in large plans: the World View

Especially in large plans, it often happens that the planner loses herself a bit in the vastness of operations. To help them find their way and to not lose track of the overall situation, we implemented the "World View" that shows a small additional window underneath the actual plan and is available in all three views described above.

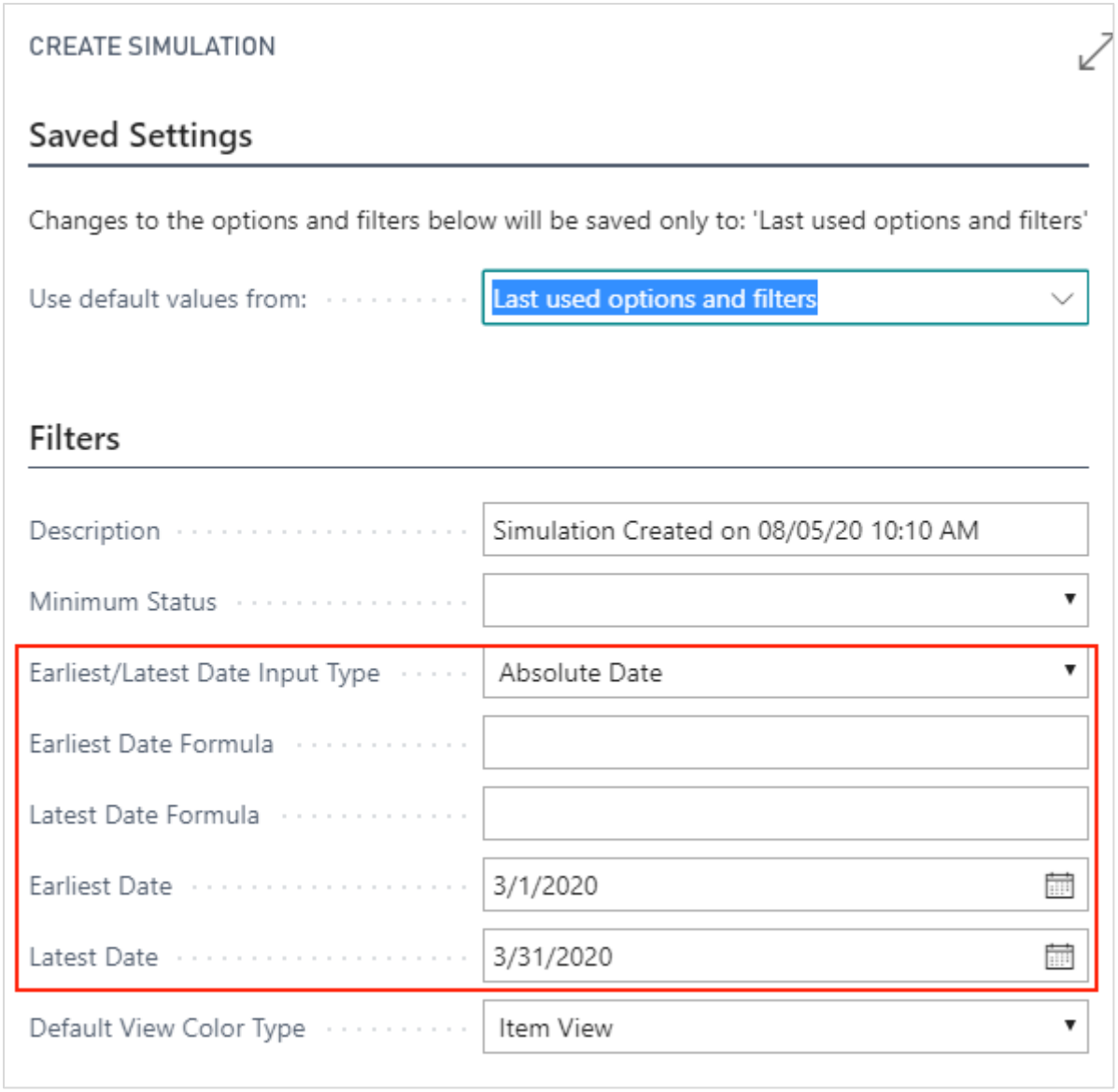
By dragging the red rectangle in the "World View", you can quickly shift your focus to another part of the plan.



3.4.The time scale part of the schedule

The time scale is one of the three main areas in your schedule and is positioned at the top of the view.

The time scale covers the period that was defined in the simulation's filter. This is the time from the earliest date to the latest date.

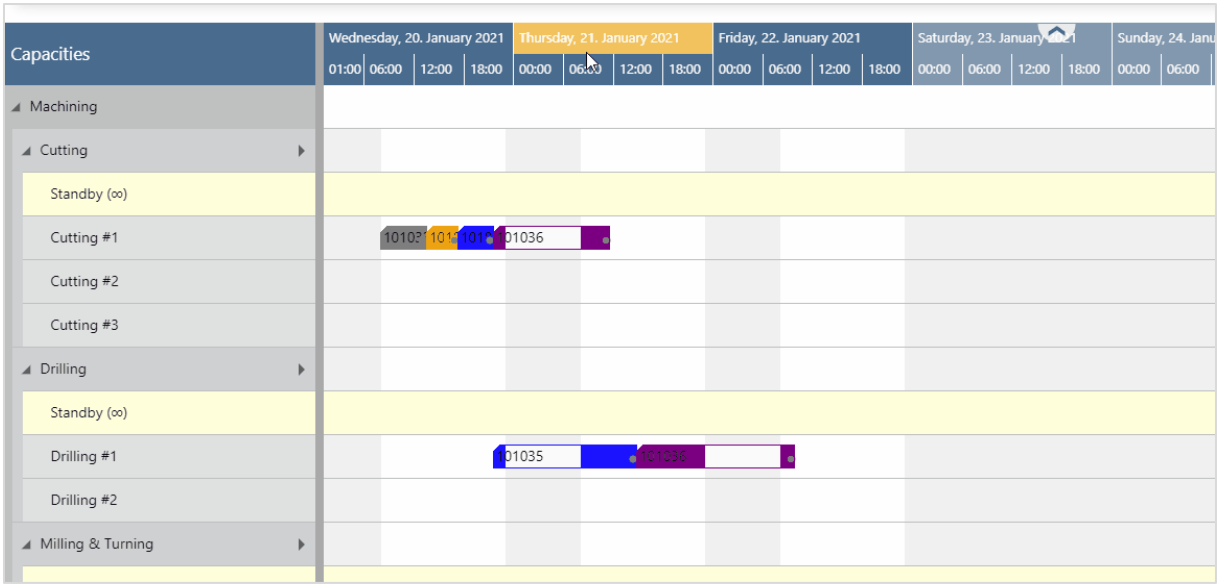


3.5.Zooming and scrolling

The VPS offers various options of adjusting the size of your working area and going directly to a particular place in your diagram.

3.5.1. Increase/reduce time scale solution

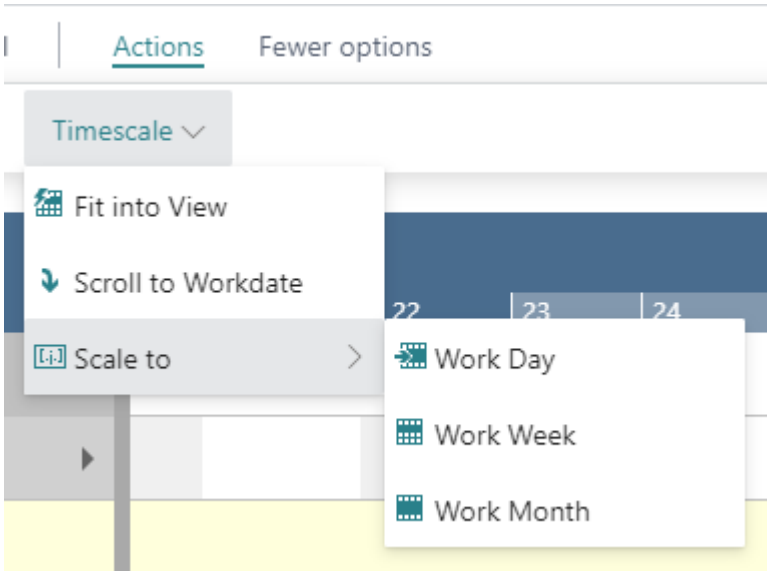
Depending on how much detail or summary is required, you can either increase or reduce the time scale solution by mouse wheel or touchpad (move two fingers up and down on your touchpad) within the time scale.



3.5.2. Show orders of a certain timespan only

A more precise way of showing certain parts of your plan is offered by the options of the "Timescale" menu items. Click the according one to show either

- all orders of your current workday
- all orders within a week starting from the current work date
- all orders of a month starting from the current work date

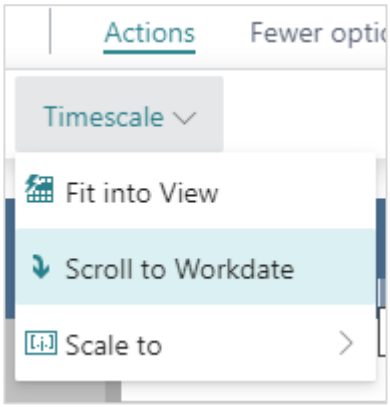


3.5.3. Scrolling

The VAPS offers the following options for quickly navigating to certain positions in the diagram:

- the common scrolling options by vertical and/or horizontal scrollbar
- dragging the timescale either right or left

- scroll directly to the Dynamics 365 Business Central work date by selecting the corresponding item from the “Actions” menu.

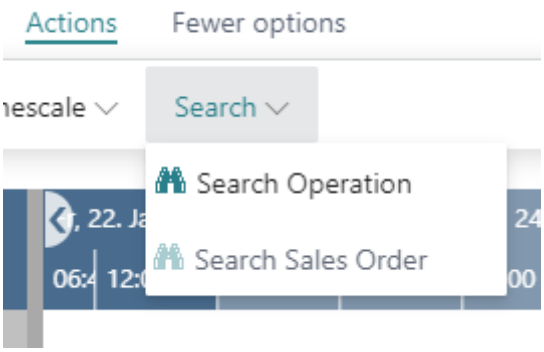


3.5.4. Return to default time range

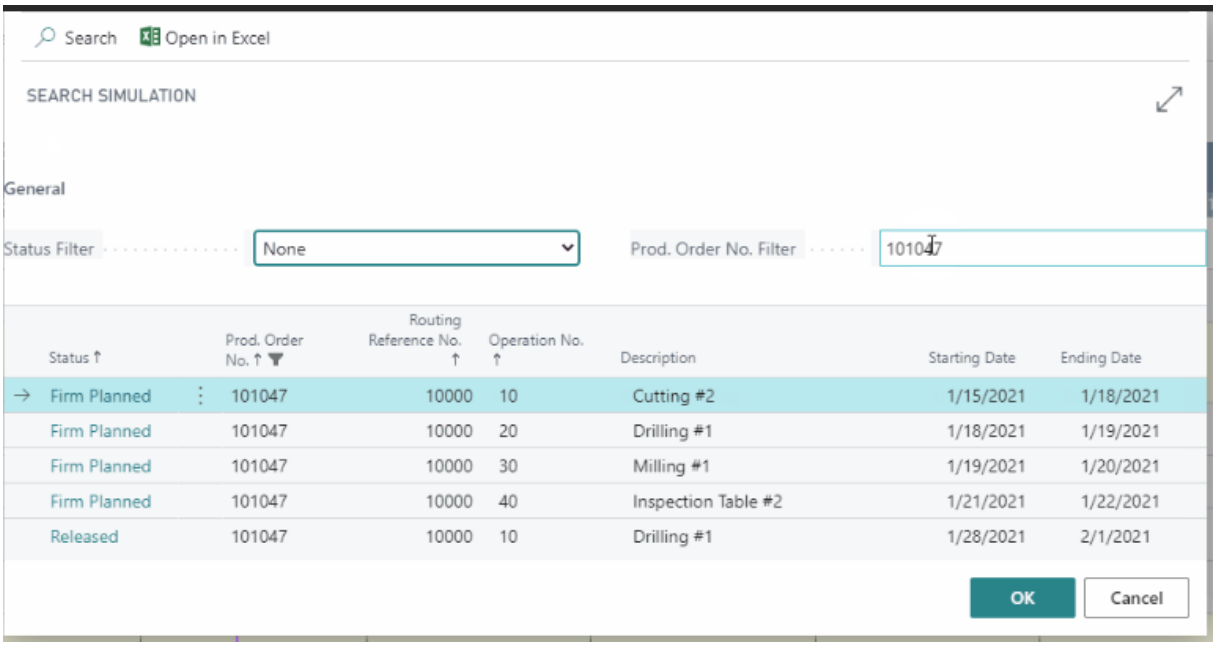
Select "Fit into view" to switch directly to the timescale as defined in the filter settings of the simulation.

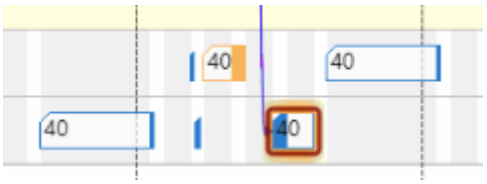
3.5.5. Search function

In both views, you can search for certain production orders:

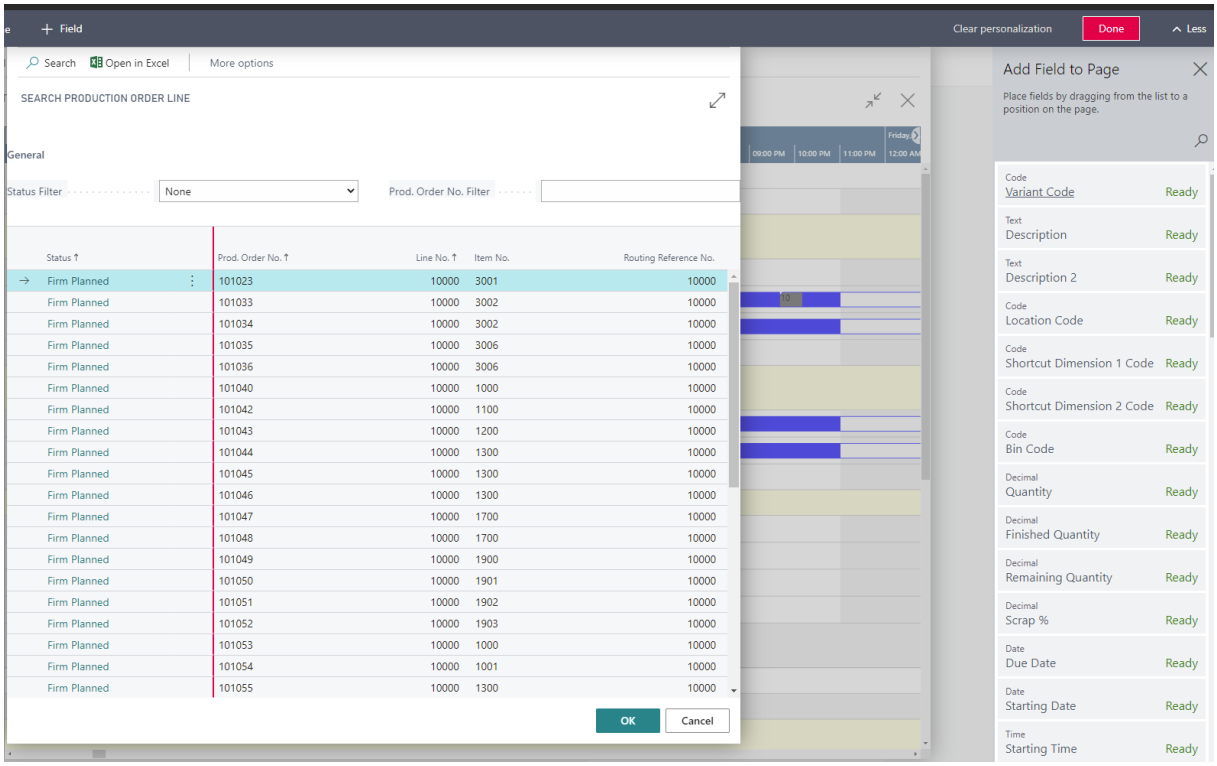


- In the Capacity View, users can search for production orders and production order lines.
- In the Sales Order View, users can search for sales orders and sales item lines.
- The respective view then automatically scrolls to the first search result which gets highlighted as well.





The search dialogs can be personalized the same way as is known from Business Central by adding columns in the fields list.

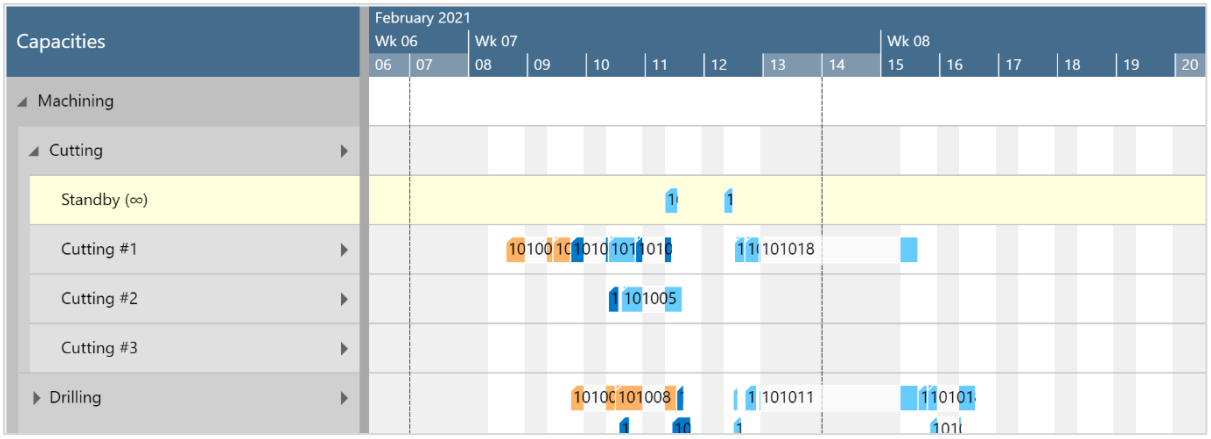


3.6. The table part of the schedule

The table is one of the three main areas in your schedule and is positioned at the left. It shows your resources grouped by work center groups, work centers, and machine centers.

3.6.1. The "Standby" resource

The standby resource does ***not*** exist in your Dynamics 365 Business Central work centers. It is a virtual machine center that we automatically create in every work center. It contains all production order routing lines/operations that are **not yet scheduled** from within the VAPS, and hence are just scheduled by the Business Central scheduling run. The standby resource gets highlighted by a yellow background and an infinity symbol next to its name:



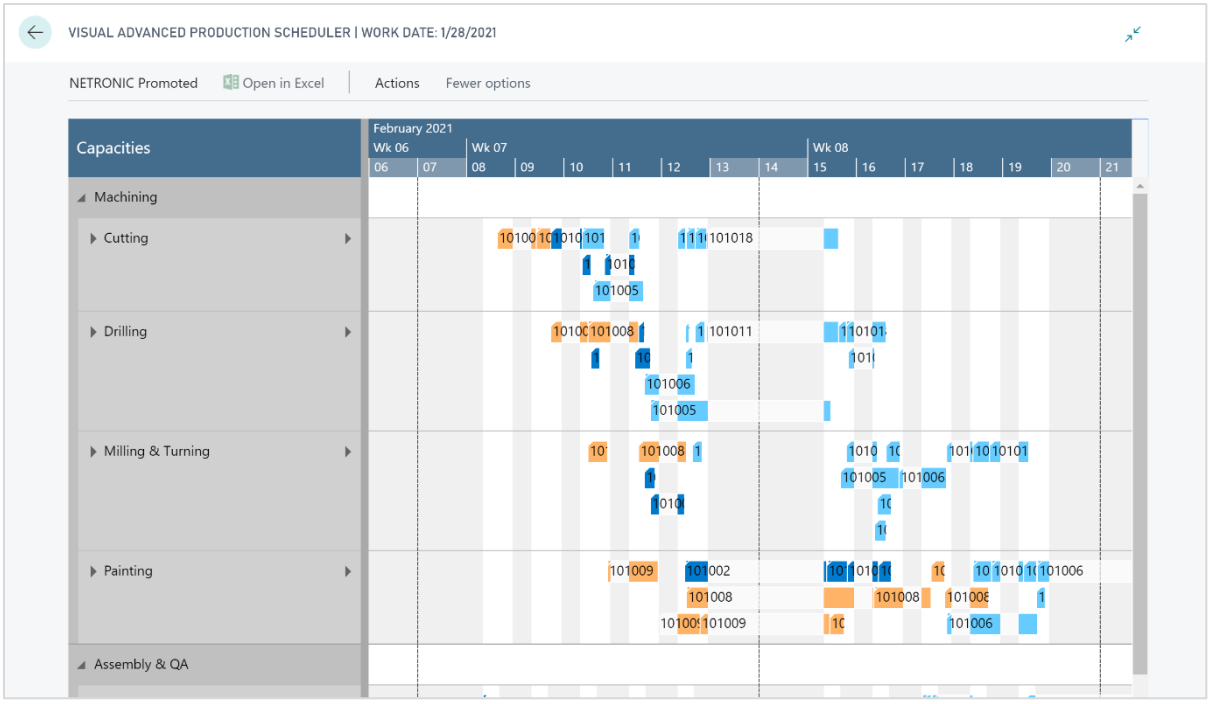
Please note that

- the standby resource always is treated as a resource with infinite capacity
- all other machine centers are treated as finite capacity resources)

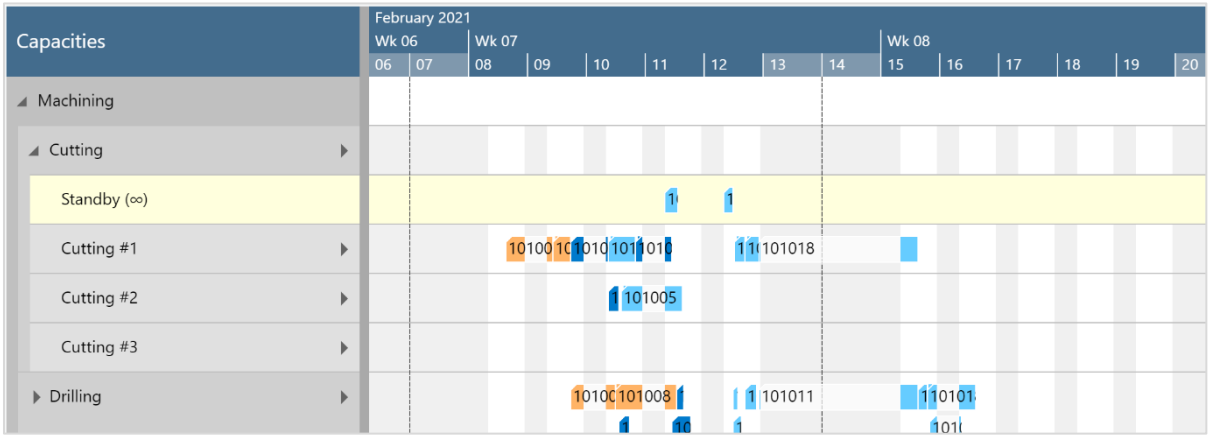
3.6.2. Collapsing and expanding

Symbols located to the left of the work center groups and work centers provide the ability to collapse or expand these centers. This feature allows you to conveniently hide or reveal specific details, making it easier to navigate through the information presented in the table.

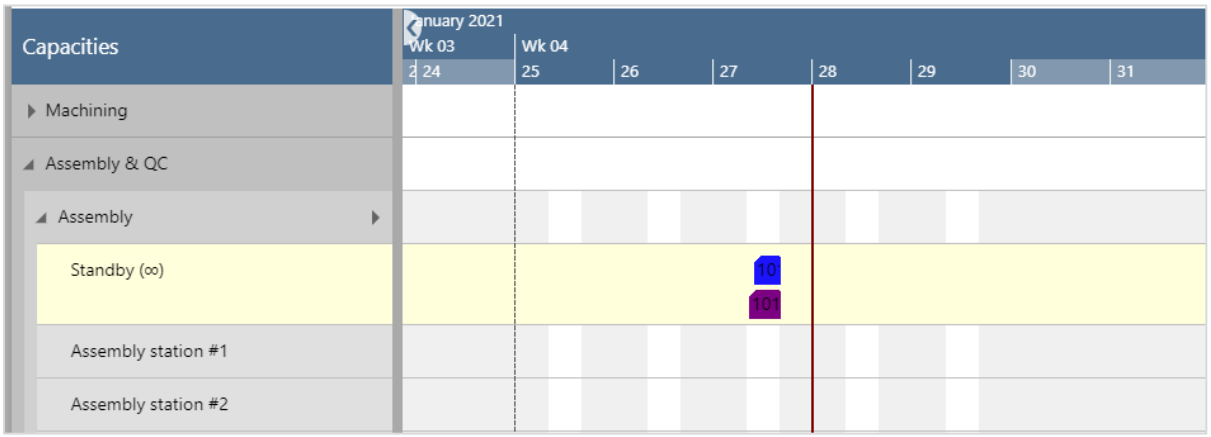
In the picture below, the work center group "Machining" is expanded, and the related work centers are collapsed:



Now, the work center "Cutting" is expanded, showing all its operations



Please note, that in collapsed work center groups, no operations are shown:

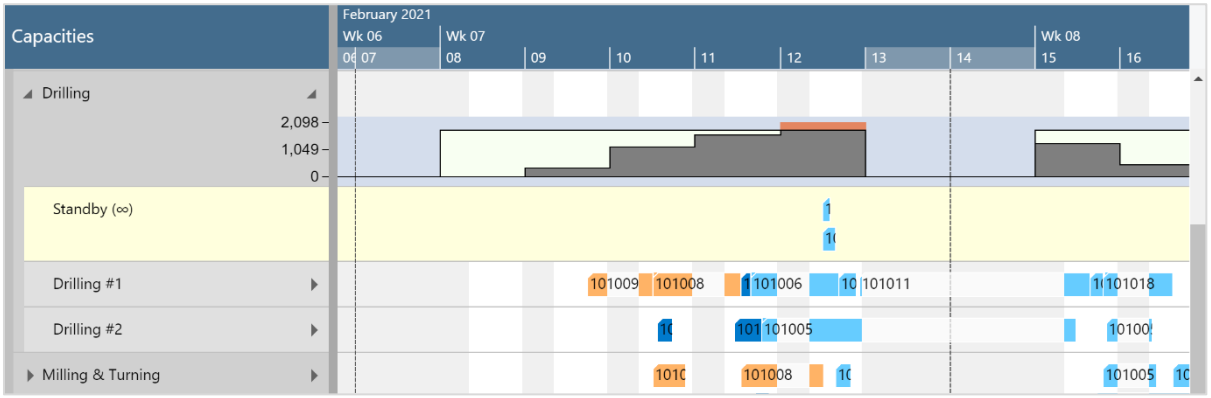


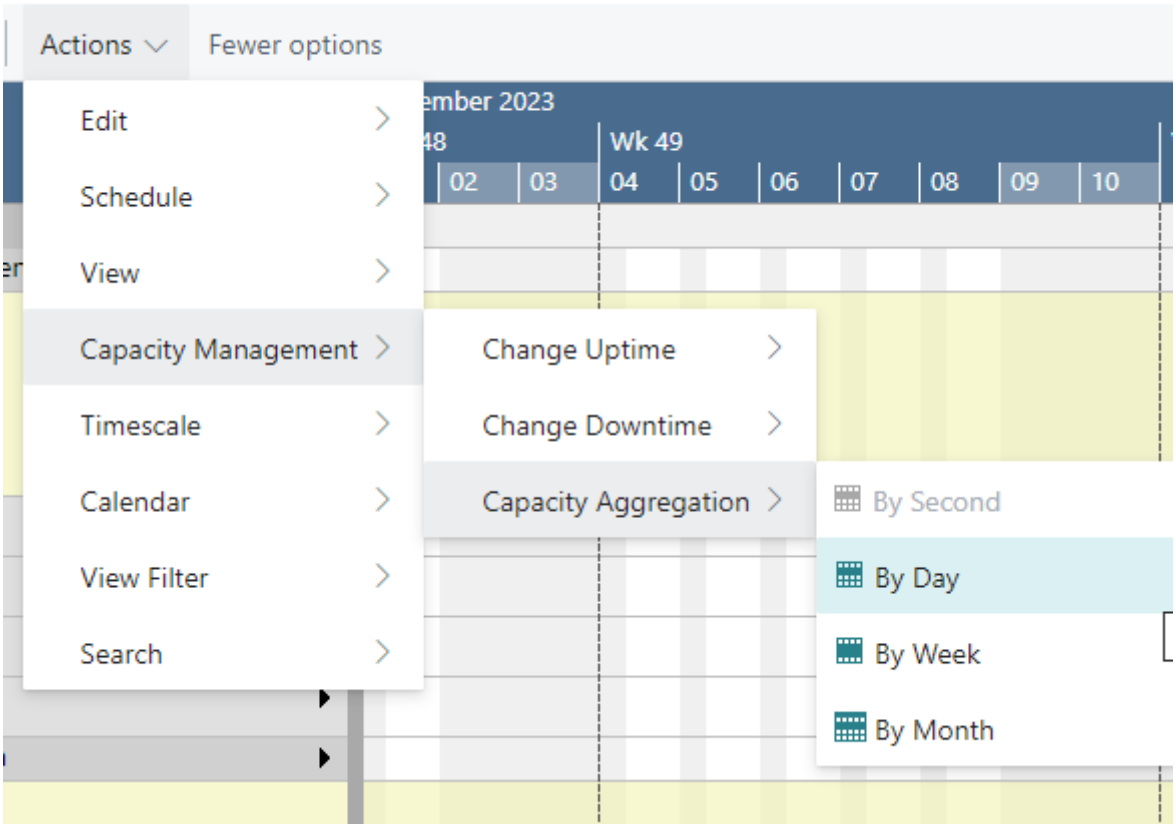
The VAPS automatically saves the complete collapsed/expanded state of a view so that you can start exactly with the status you saw when you left the view.

3.6.3. Show/hide the histogram

In the "Capacities" view, planners can easily get a visual representation of the workload by displaying a histogram. To access this feature, simply look for the symbol located on the right-hand side next to the name of the work center or machine center:

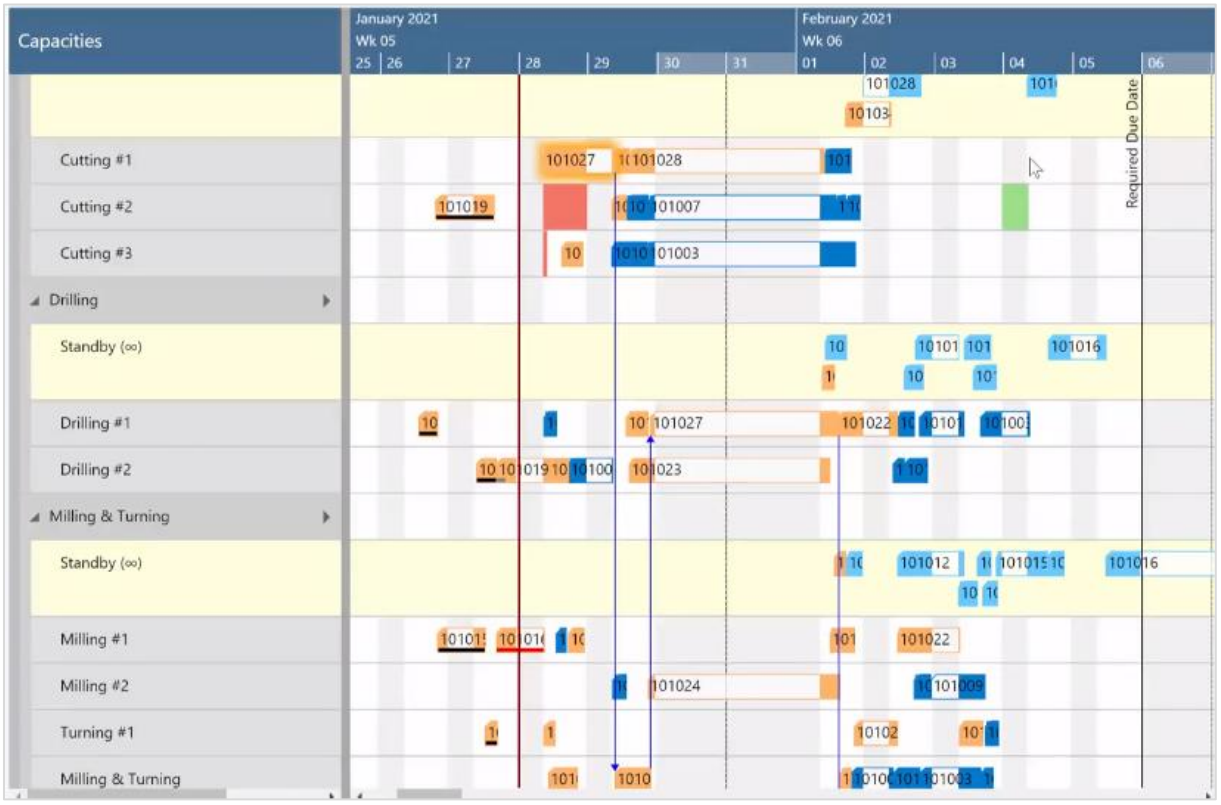
Clicking this symbol will either show or hide the capacity curve for this work or machine center. The picture below shows the histogram for the "Drilling" work center:





3.7. The graphical part of the schedule

The graphical part - the diagram - is one of the three main areas in your schedule and is positioned in the middle of the view. It shows you which machine center is working on which production order routing line/operation and when.



3.7.1. The elements of the graphical part in detail

Bars

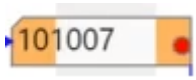
Each production order routing line/operation of a production order is represented by a bar that is either colored or white. The colored area of a bar indicates that this timespan is during the work time of the underlying machine center. The white area of a bar indicates that this timespan is during the non-work time of the underlying machine center (also see below "Calendar". The bar color depends on the selected color scheme (see below).

The following information can be gathered from optical indicators:

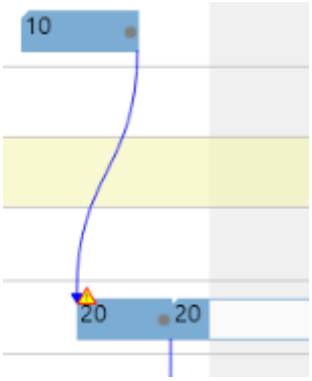
- Currently marked operation

- Operation changed but not saved yet

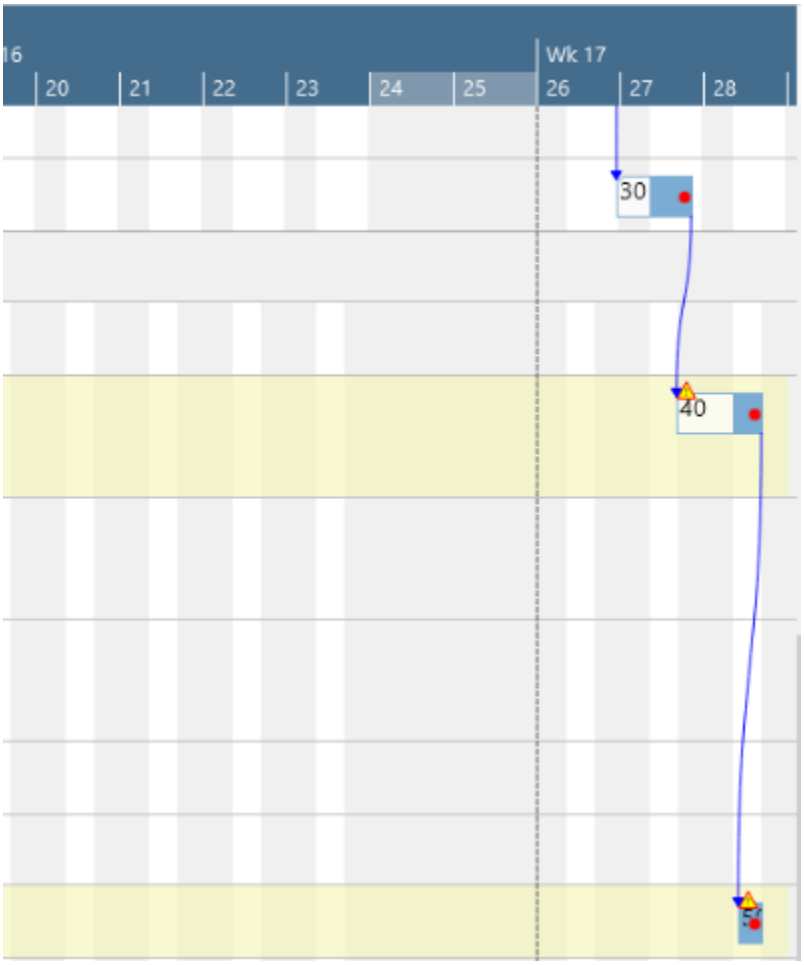
- Violated due date



- Violated routing links

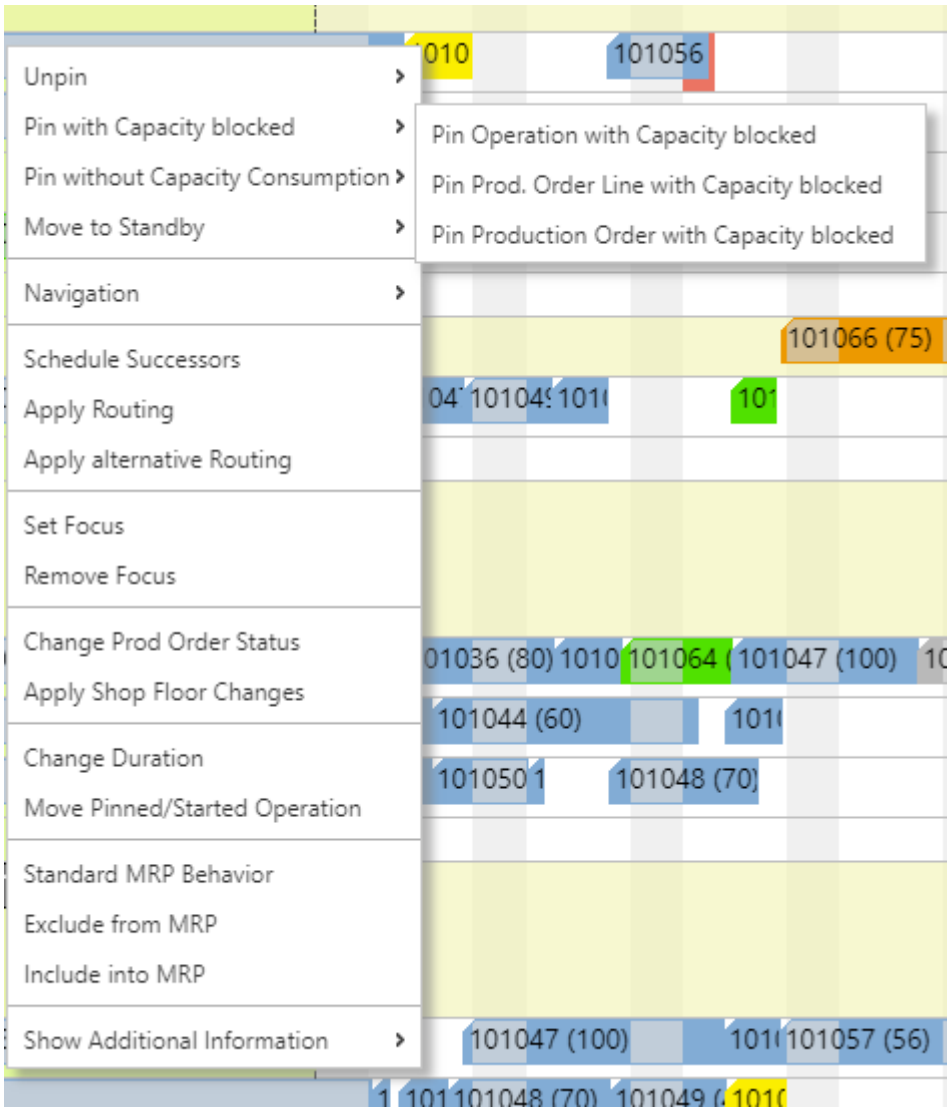


- Operations potentially scheduled outside the visible time range
  In addition to being indicated by a warning symbol, these operations get moved to the standby resource.



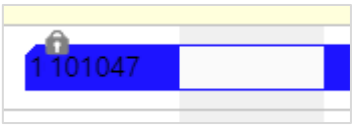
- **Pinned operations, production order lines, production orders**

  The context menu allows to pin the above elements so that they can't be moved.

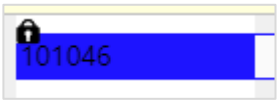


  The different options are visually indicated as follows:

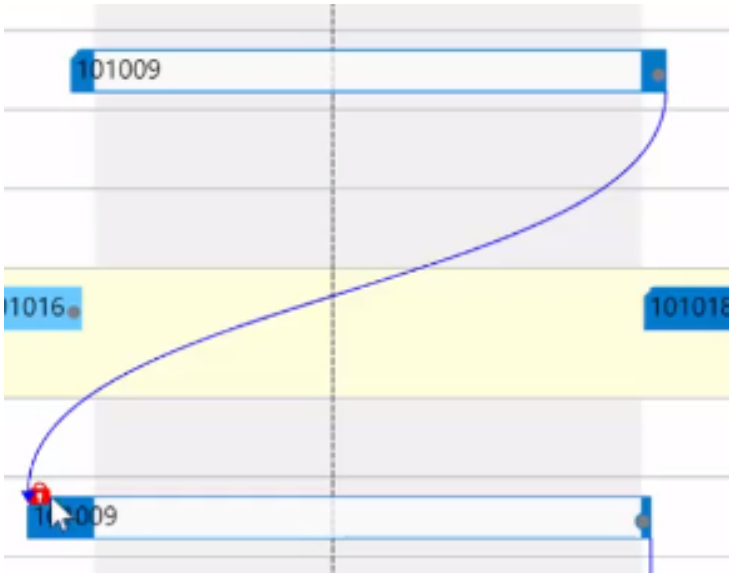
- Pin without consuming capacity



- Pin consuming capacity



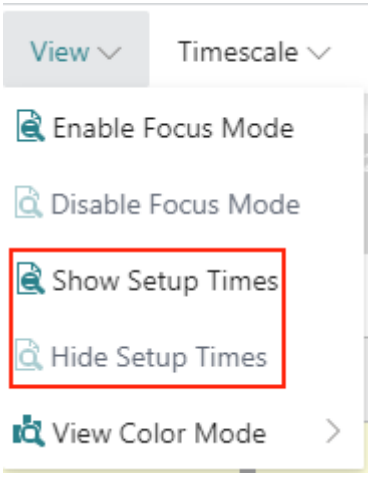
- Link violation after having pinned an element. The picture below shows that the predecessor of a pinned operation was moved behind this operation



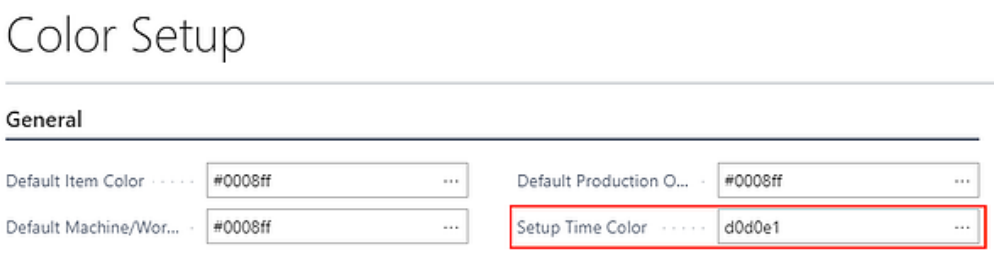
- Setup times

The setup times can be visualized as light grey section at the beginning of the bar.

You can switch between showing and hiding the setup times by a menu item:

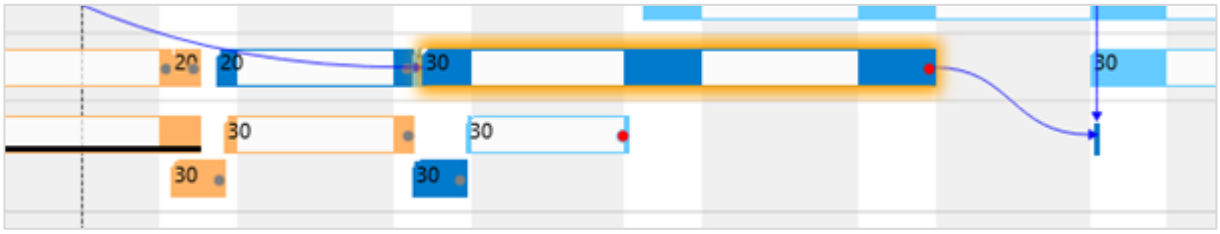


The color representing the setup time can be easily specified in the VAPS color settings:

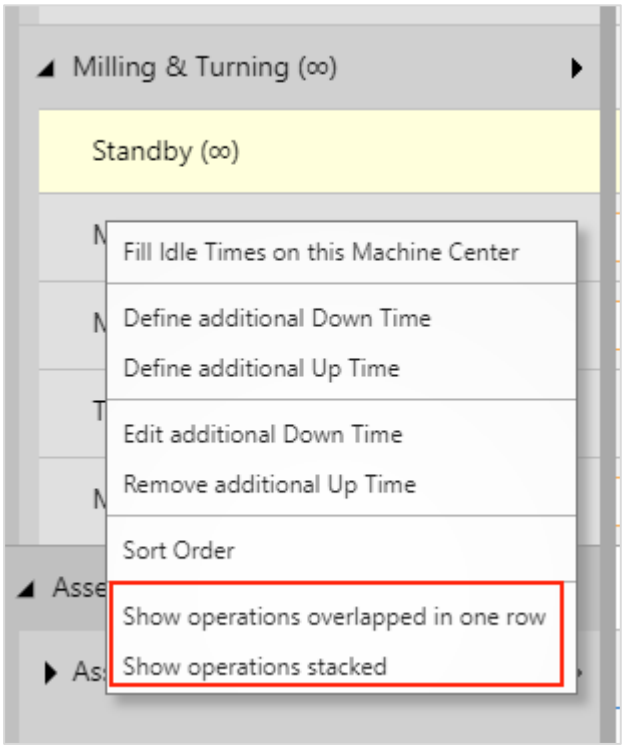


- **Display mode for overlapping operations**

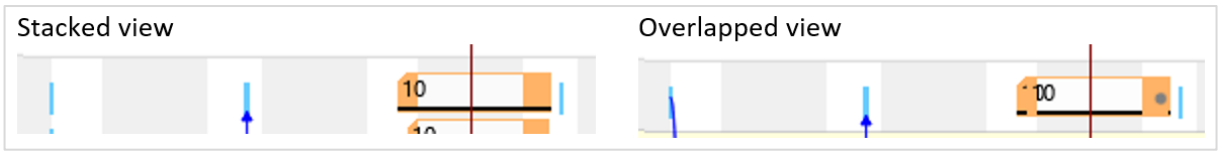
  Usually, overlapping operations are shown in an "optimized" way, meaning that the resource row with the respective operations gets extended in height so that the operations are completely visible. Since the VAPS schedules with finite capacity, overlapping operations are avoided, and hence this is a rare case.



  However, some customers have contacted us with the following use case: They need to create operations with a length of zero to define a common starting point for parallel routings without blocking capacity. These operations will then be scheduled at the first possible position which will result in a very high stacked resource. For these cases, we added two new context menu items so that users can now decide whether overlapping operations are to be shown overlapped in one row or stacked.

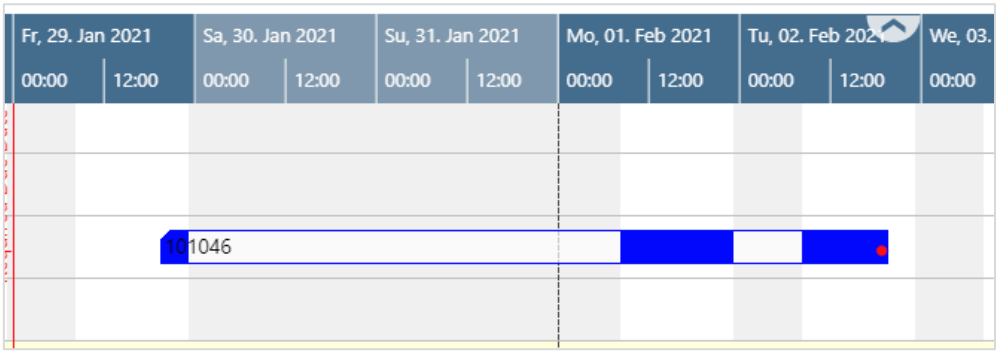


  The picture below illustrates the different display modes:



3.7.2. Calendar

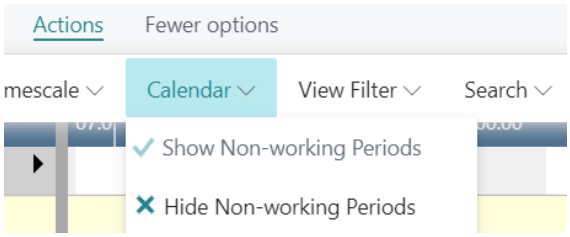
The grey and white area in the background visualizes the work and non-work periods of the respective work/machine center. They are derived from the respective shift calendars.



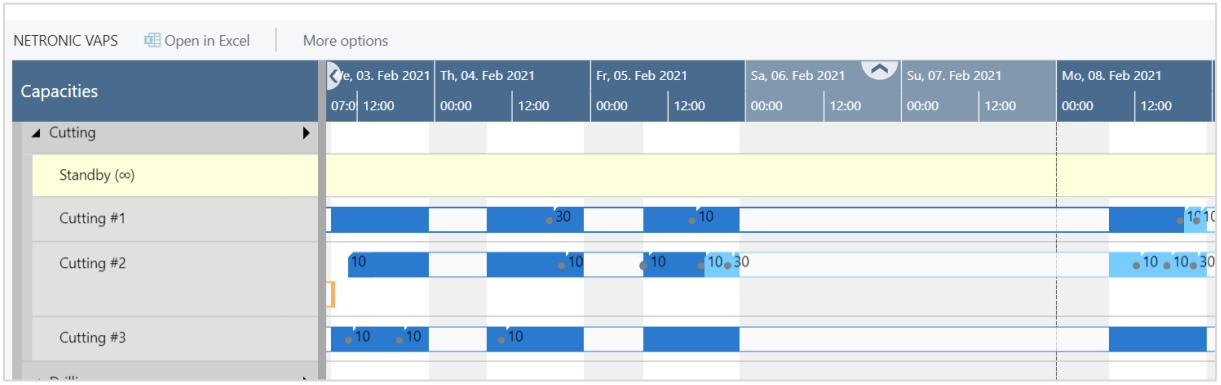
Show/hide non-working times

Some planning situations require to focus on the working periods of a work or machine center only.

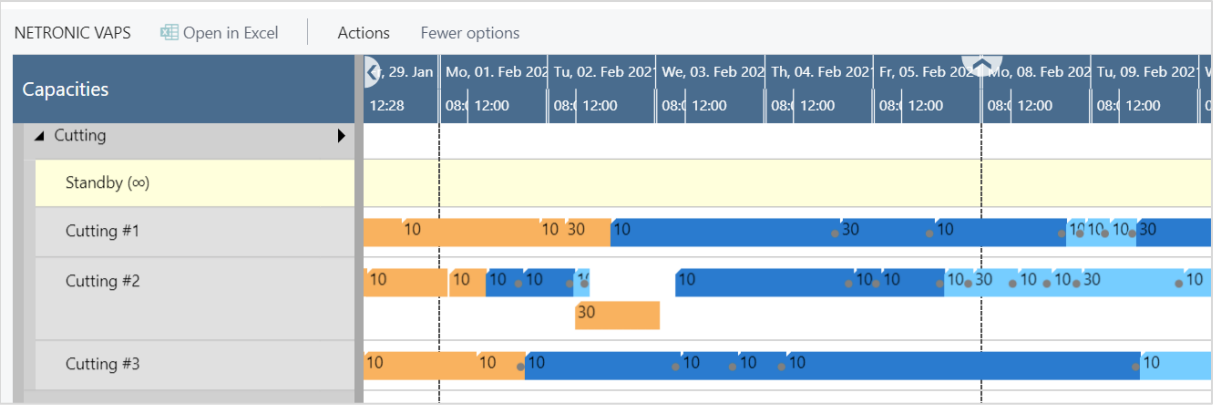
To show or hide non-working periods, click the "Calendar" item in the "Actions" menu and select the desired option. This feature allows to hide or show the common non-working periods.



Non-working times are shown:



Non-working times are not shown



- Handling of standby resources

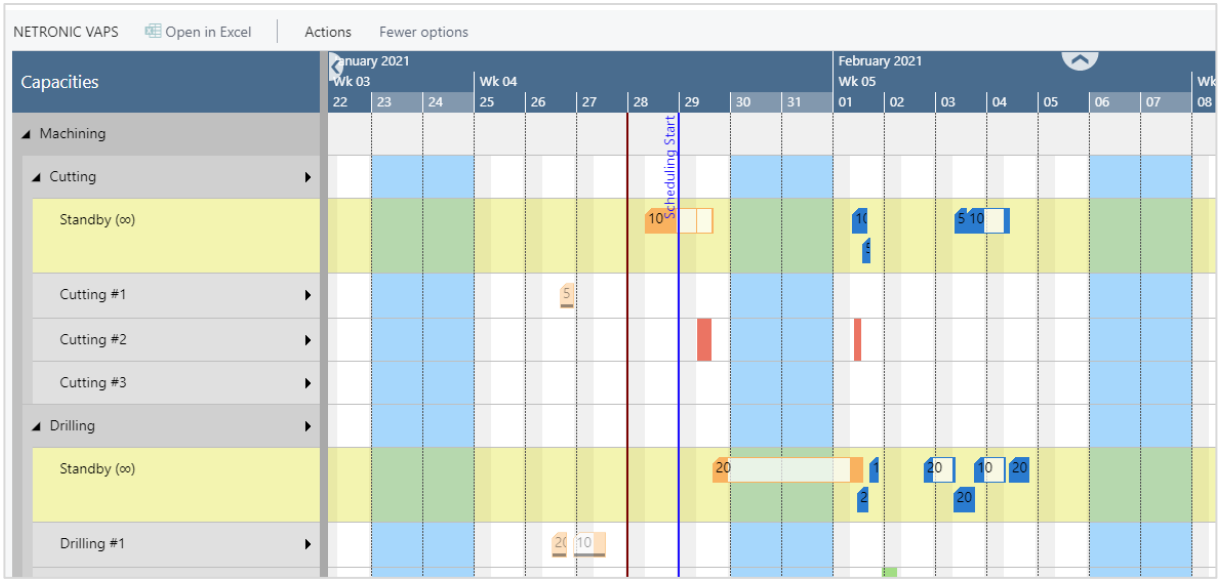
  Currently, the calendar of the related work center is applied to standby resources, so that when the non-working period is hidden, the non-working periods that are shared by all calendars will not be displayed and the timescale gets collapsed during these periods. On the other hand, switching the non-working periods on means that those periods that are common to all calendars will be displayed.

- Individual design of weekend colors and of date line grids

  Some of our customers use a 24-hour working calendar and, as they told us, sometimes have difficulties to navigate and plan by day in the diagram area because the change between the days and/or weekends and working periods are not clearly visible. This, in turn, forces the planner to constantly look back and forth between the timescale and the plan. So, we set to work and implemented three new visual elements to create a better connection between timescale and diagram area:

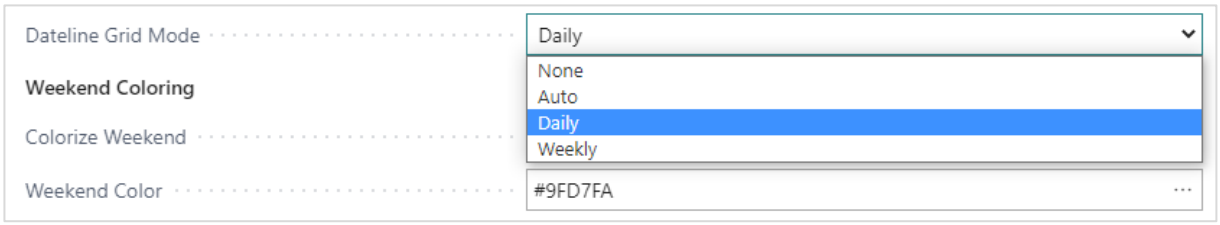
  - vertical separation lines between individually selectable intervals
  - individual background and bar coloring, and transparency degree for weekends
  - an individual background color and transparency degree for the standby resource

  In the picture below, the date line grid mode is set to "Daily", the background color for the weekend to a light blue, and the Standby color to a slightly darker yellow with a high degree of transparency:



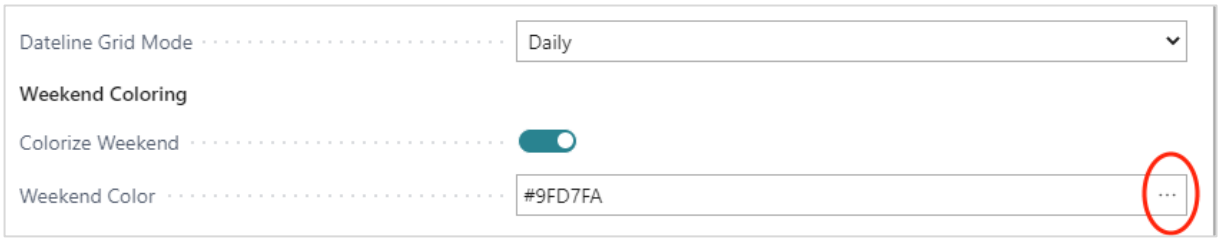
The according settings can be found in the "Appearance" area of the VAPS setup dialog:

- Dateline Grid Mode



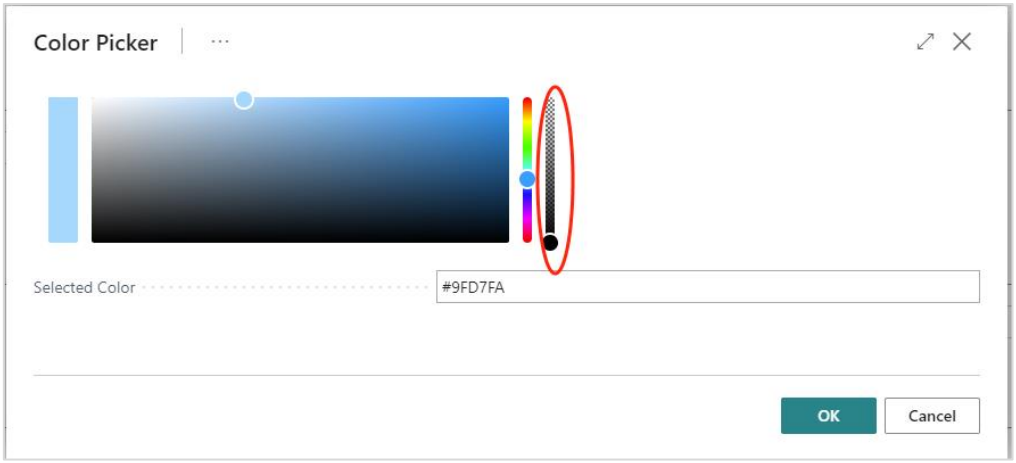
The "Auto" mode causes the grids to automatically adjust to the resolution of the time scale resulting from zooming in or out.

- Weekend coloring

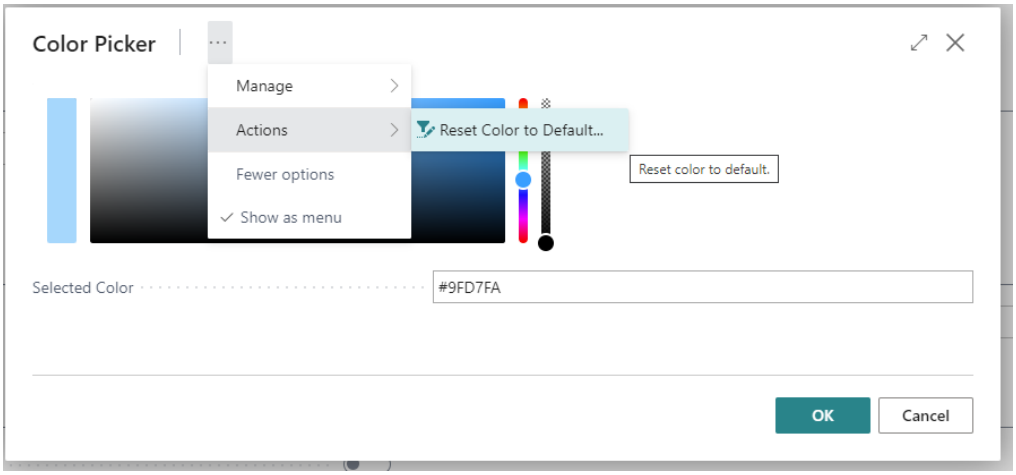


If you want to color the weekends individually, you can activate this here.

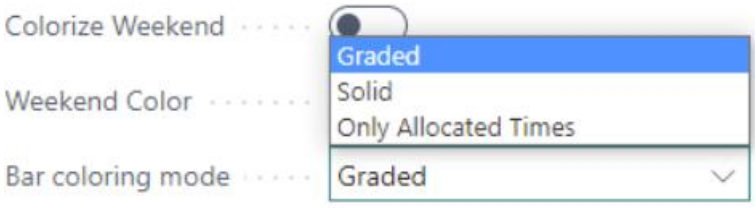
  - By clicking "…"you open the Color Picker dialog where you can
    - select the desired color
    - adjust the transparency:



- reset the weekend color to default comfortably and at one click:

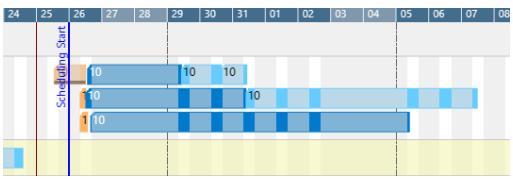


- Bar colors: Select individual bar color schemes that ensure that the label texts are always visible.

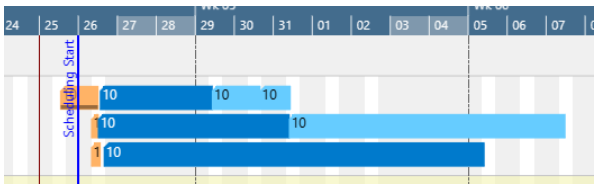


The options in detail:

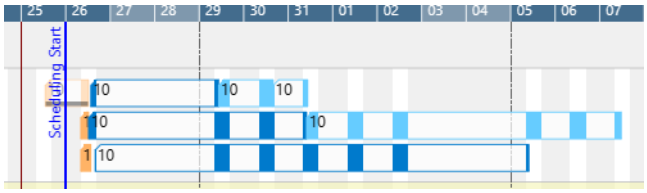
- Graded (default): nonworking times are displayed in a lighter shade of the main color; in case there are assignments during non-working periods they are drawn in the main color



- Solid: draws a continuous block in the main color

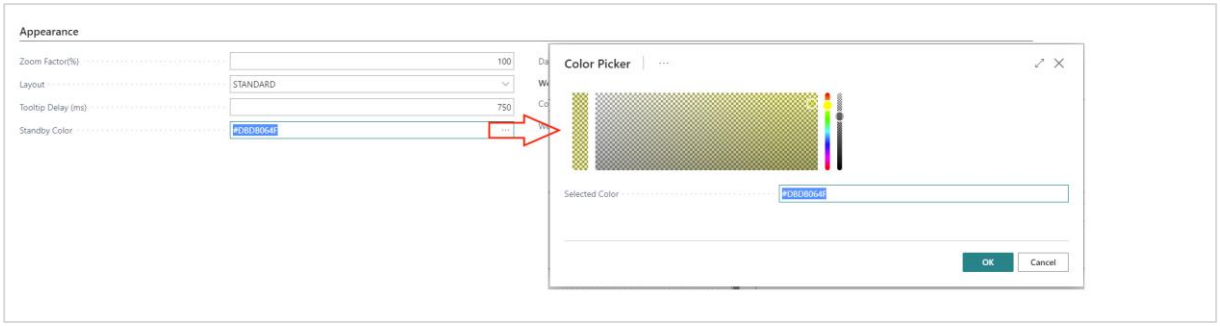


- Only Allocated Times: nonworking times appear with a white background



- Standby color

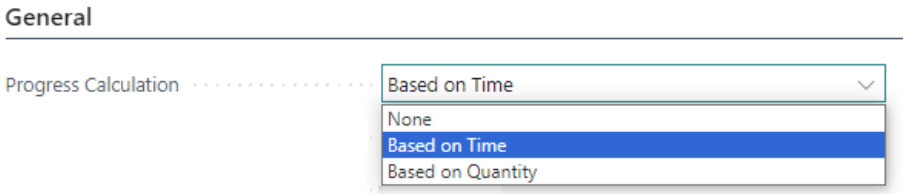
The procedure for editing the standby color is the same as for the weekend coloring:



A note on transparency: weekends, standby and calendar grids may overlap and by setting the transparency, the user can determine what should be hidden or what should shine through. For example, if you want to see the calendar grids or the weekends on the standby resource, you have to make the standby color translucent accordingly.

3.7.3. Progress

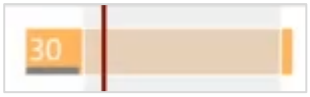
For production order routing lines of **released** production orders, a progress bar can be displayed below the actual bar being based on the posted quantity consumption or on the production time passed



The color of the progress bar depends on the routing status and the percentage of completion:

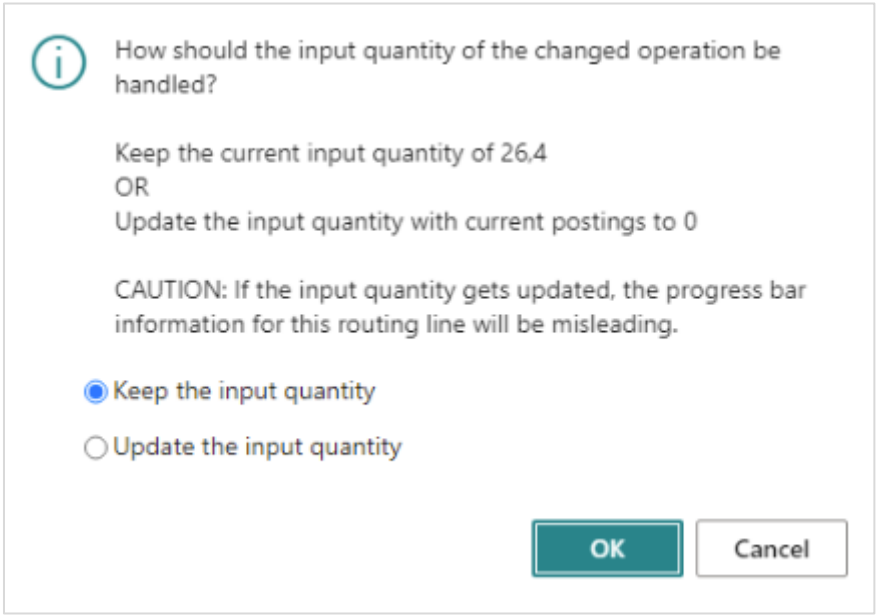
- finished: black

- Status “none,” “planned,” “in progress”:
  - Progress by quantity / by time < 100% : grey



  - Progress by quantity / by time > 100 % : red

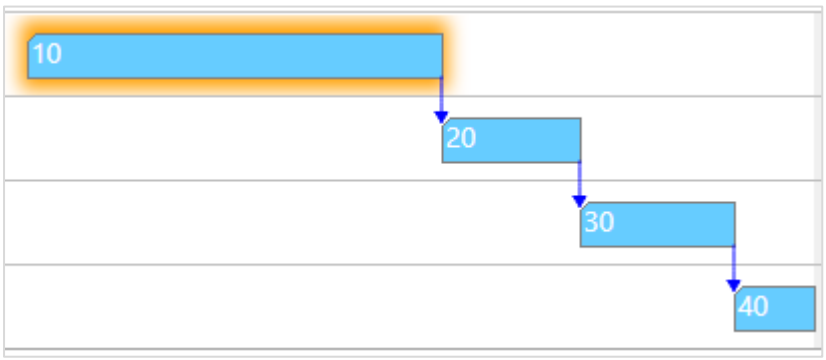
When attempting to move operations that are "in progress," a warning message appears, prompting whether scheduling should proceed with the original quantity or with the current remaining quantity. In the latter case, the input quantity will change, with a warning to the user that this action may result in misleading progress bar information.



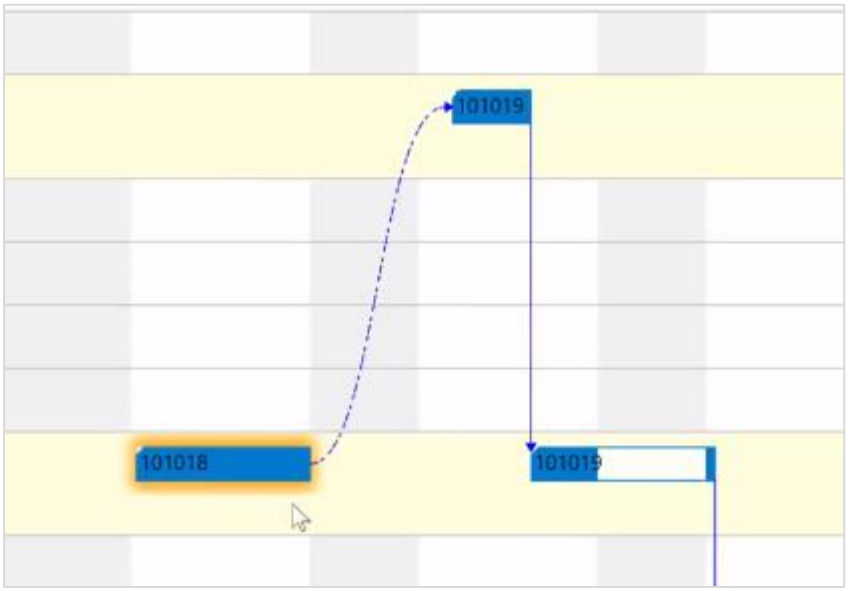
3.7.4. Links

Predecessor/successor relations are shown as arrows ("links") between the bars. They are only shown for the production order that is currently selected.

- links between operations of **one** production order

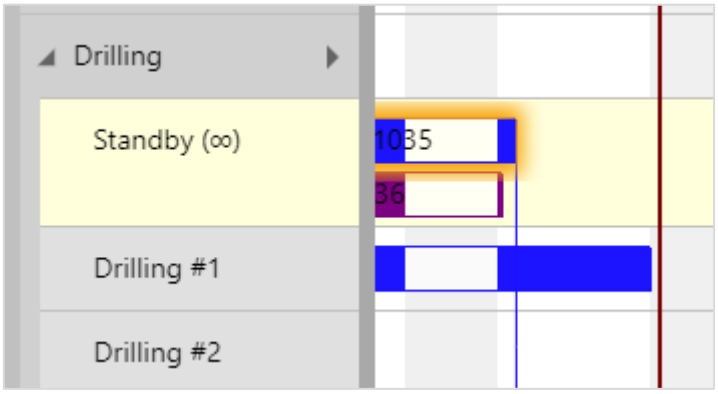


- links between operations of different production orders if they are linked to each other by reservations (make to order) OR links between production order lines coming from one production order (make to stock)



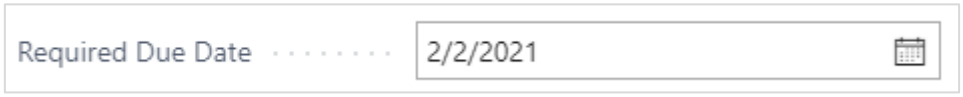
3.7.5. Work date

A red vertical line in the chart indicates the work date, this usually being the current date.

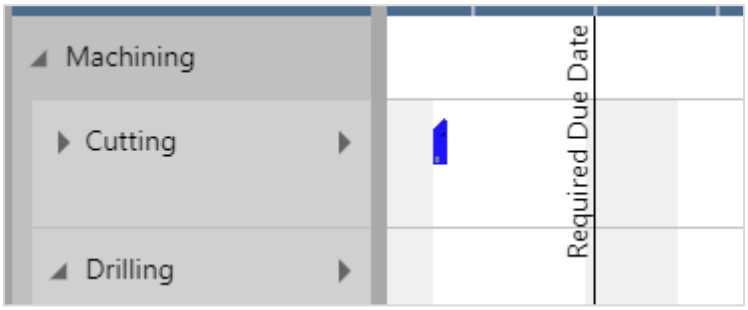


3.7.6. Required due date

The “Required Due Date” is a dedicated VAPS field that can be set on the “Production Order” card and is visually represented in the plan by a corresponding line. Depending on the configuration in the “Appearance” section of the “Setup” menu, this line will appear when hovering over and/or clicking the relevant operation.

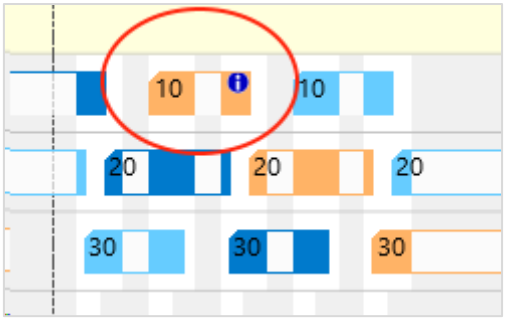


This date can only be set and modified by the user and is recommended for cases where specific production orders have strict due dates.



3.7.7. Info symbol for additional information on operations

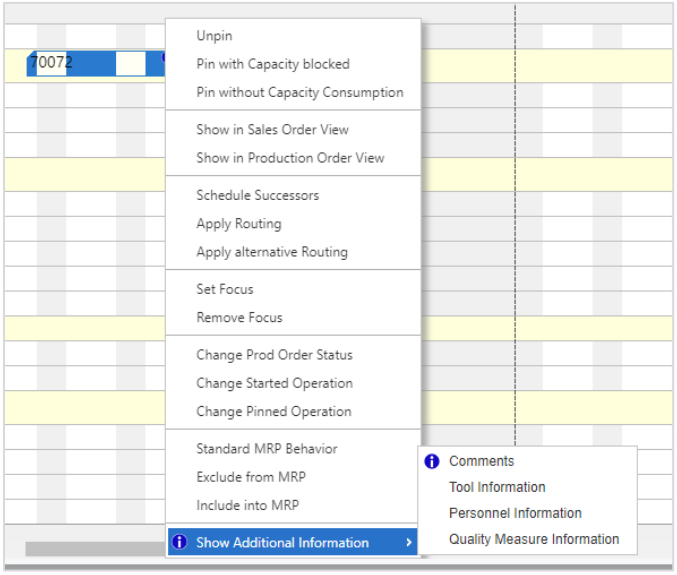
In Business Central, users can add additional information to a production order routing line by creating comments, tool information, personnel information, and quality measure information that are used, e.g., for describing certain specialties that need to be followed during the production process. As this is, of course, valuable information, the VAPS helps the planner to quickly recognize whether a production order line has such additional information so that the special requirements are not overlooked.



To activate this feature, tick the according option in the "General" settings of the VAPS setup dialog:

Shortcut to creating additional information

You can directly create and edit additional information by clicking the according item in the context menu.



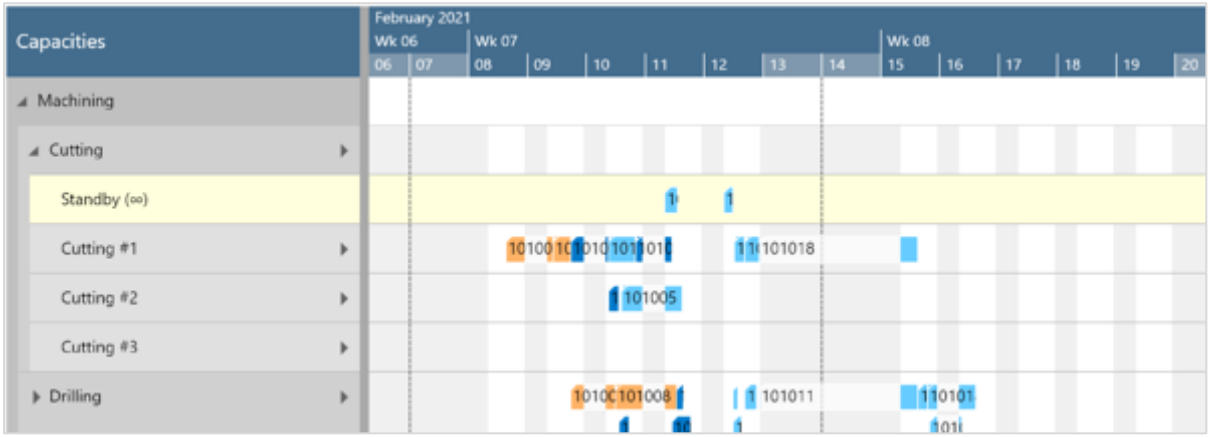
3.7.8. The tooltip

The tooltip of the VAPS provides further details about an operation and is customizable.

No.:	3002
Item.:	3 Operations Subcontracing in Middle1 Operation Simple Subcontracting
Status:	Firm Planned
No.:	101034
Prod Order Description:	3 Operations Subcontracing in Middle1 Operation Simple Subcontracting
Last Date Modified:	04/14/20
Quantity:	20
Required Due Date:	01/28/21
Operation No.:	20
Setup Time:	10
Starting Time:	11:50:00 AM
Starting Date:	01/27/21
Ending Time:	1:50:00 PM
Ending Date:	01/28/21
Alternate Routing Set:	
Category:	
Work Centre:	Subcontractor 1
Machine:	

3.7.9. The "Standby" resource

The standby resource does **not** exist in your Dynamics 365 Business Central machine centers. It is a virtual machine center that we automatically create in every work center. It contains all production order routing lines/operations that are **not yet scheduled** from within the VAPS, and hence are just scheduled by the Business Central scheduling run. The standby resource gets highlighted by a **yellow background** (and an infinity symbol next to its name in the table part):



Please note that

- the standby resource always is treated as a resource with infinite capacity
- all other machine centers are treated as finite capacity resources)

3.8. Navigating in the plan

The VAPS offers various options of adjusting the size of your working area and going directly to a specific position in your plan

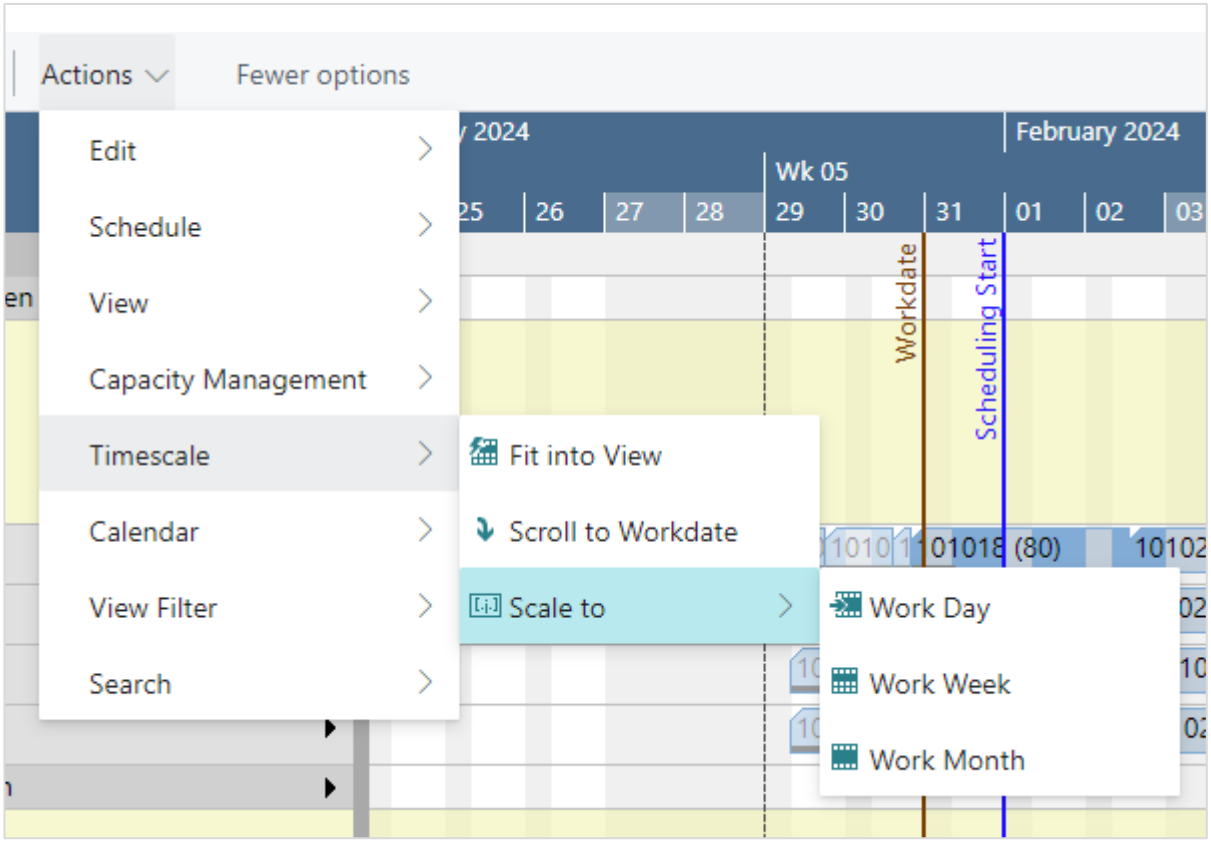
3.8.1. Adjust the time scale

Depending on how much detail or summary is required, you can either increase or reduce the time scale solution by mouse wheel or touch pad.

3.8.2. Show operations of a certain timespan only

Click the according item to show either

- all operations of your current workday
- all operations within a week starting from the current work date
- all operations of a month starting from the current work date

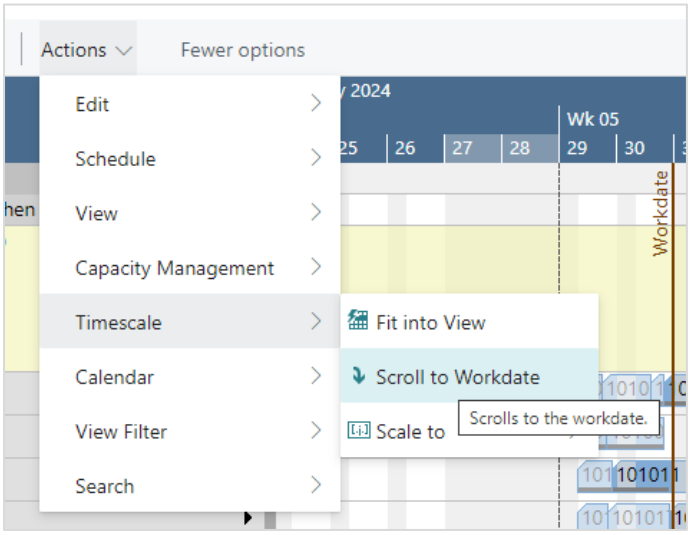


3.8.3. Scrolling

The VJS offers the following options for quickly navigating to specific positions in the diagram:

- the common scrolling options by vertical and/or horizontal scrollbar
- dragging the timescale either right or left by mouse

- scroll directly to the Dynamics 365 Business Central work date by selecting the corresponding item from the “Actions” menu.



3.8.4. Navigate within one routing

This function allows you to navigate in your plan easily and quickly, integra especially if you have long routings with lots of operations. It can be found in the "Navigation" entry of the context menu.

3.8.5. Adjust the width ratio between table and diagram

You can modify the width ratio between the table and the diagram by moving the vertical splitter bar between them.

3.8.6. Return to default time range

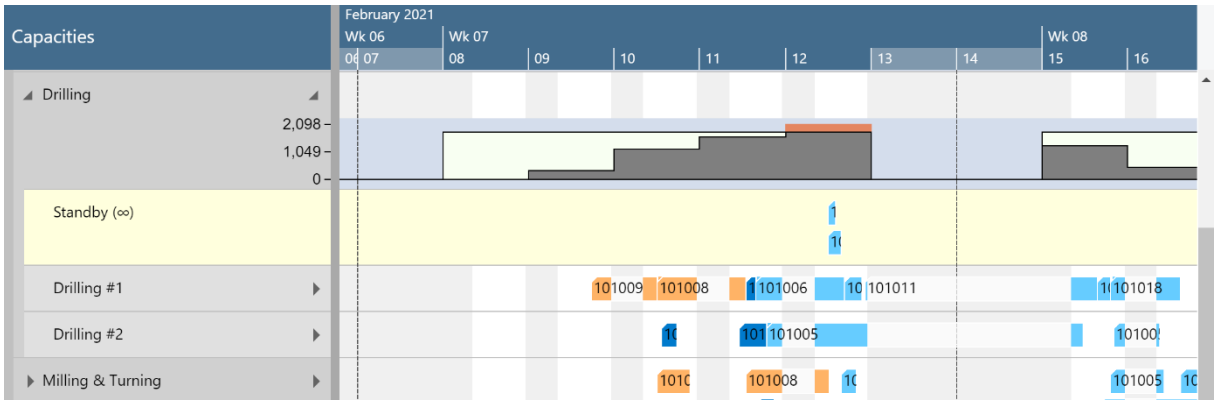
Select "Fit into view" to switch directly to the timescale as defined in the simulation's settings.

3.9. The histogram provides capacity information

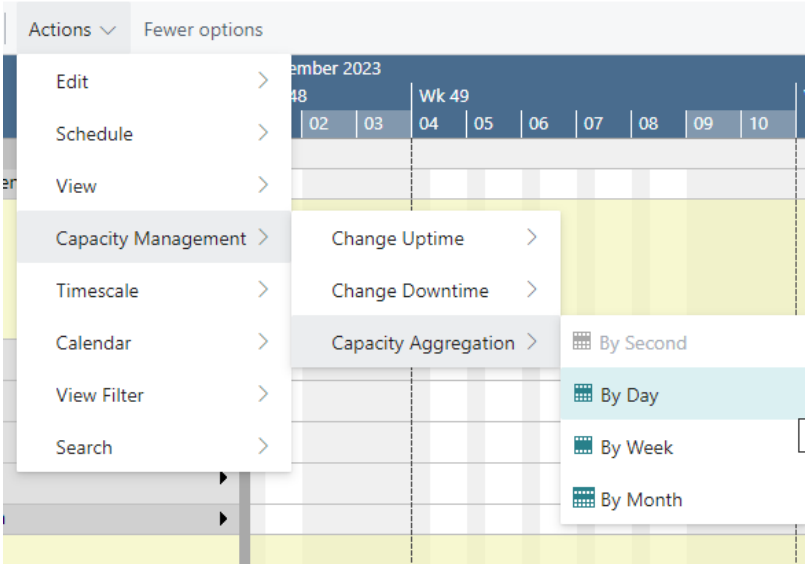
A histogram offers visual decision support by showing impending capacity problems. In the VAPS, you have the option to view histograms of work centers and their associated machine centers. These histograms allow you to easily identify available capacities, as well as any instances where capacities have been exceeded, indicated by red markings.

The histogram is a capacity utilization chart:

- The outer (black) line shows you the maximum available capacity per selected aggregation (derived from the capacity of the underlying machine centers).
- The grey-filled area indicates how much of that available capacity will be utilized by the current schedule.
- The red area indicates that, according to the current schedule, you will need more capacity than what is available on Friday, February 12th.

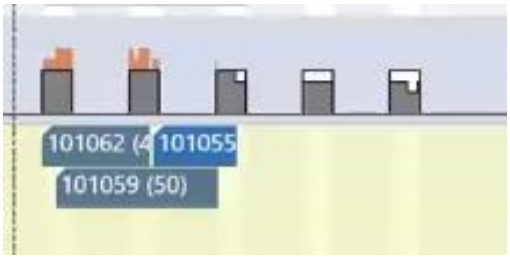


By “Actions”-> Capacity Management” -> ”Capacity Aggregation” you can select the aggregation that fits your requirements best.



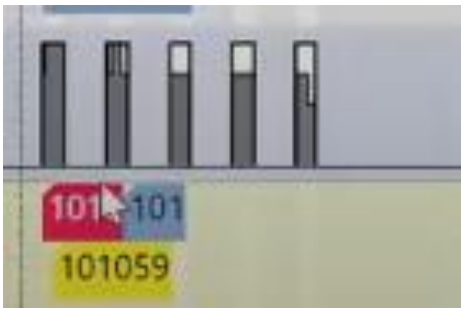
3.9.1. Include/exclude standby operations for the load curve

Until version 15 of the VAPS, the workload shown in the histogram was determined by considering both the scheduled production orders and those on standby, as shown in the picture below:



However, we have recognized that our customers have varying preferences. Some require a histogram that exclusively reflects the current workload, while others prefer to include standby operations for a comprehensive view, enabling them to identify potential bottlenecks or unrealistic delivery times. To accommodate these diverse needs, we have introduced a new switch in the VAPS setup dialog. This allows users to specify whether they want to include standby operations in the histogram or not.

This is what our example from above looks like when the operations on standby are excluded from the load curve:



4. The view color modes

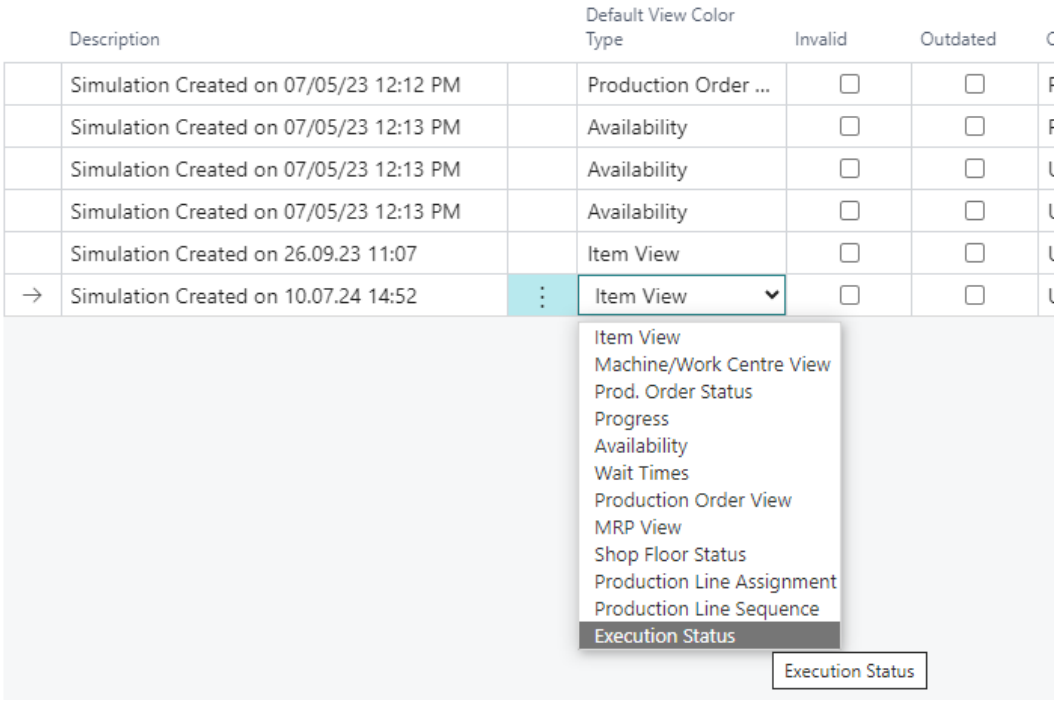
The VAPS offers different views that let you stress different aspects of your plan by defining and using certain colors for the bars depending on the things you want to highlight. This will help you

tackle certain challenges and answer certain questions.

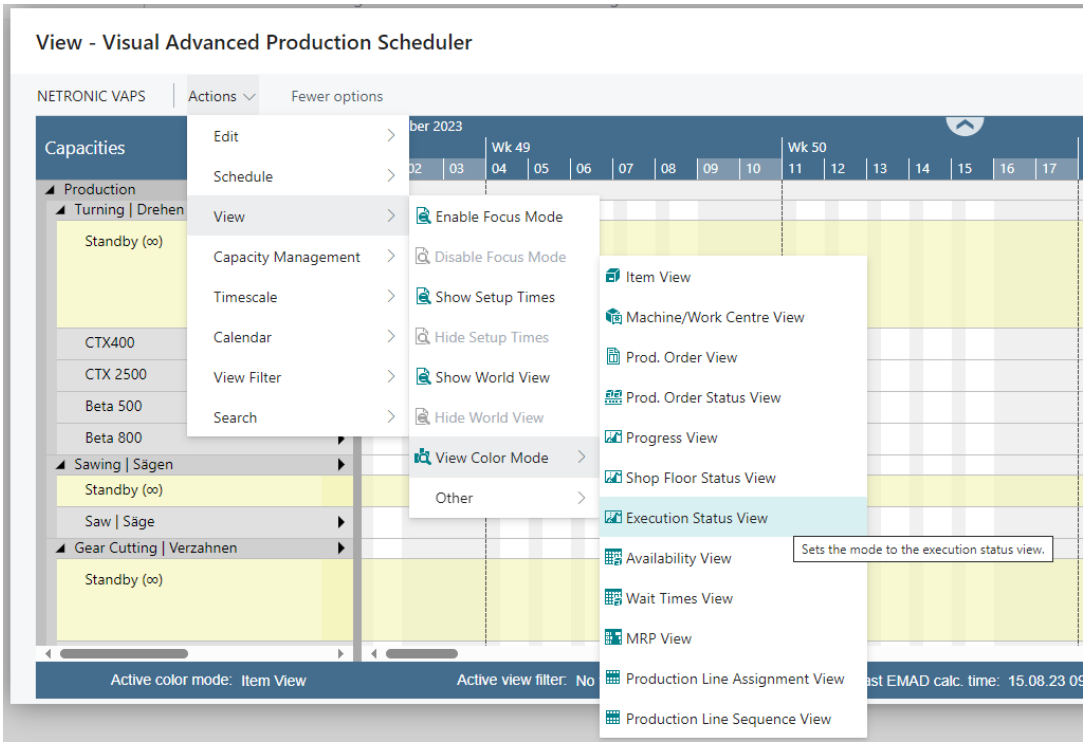
4.1.1. How to apply a view color mode

You can apply the view color modes in two ways:

- When **creating a new simulation**, you can choose the desired mode as the default view color type from a drop-down list:



- In the visual schedule, select Actions --> View --> View Color Mode:



4.1.2. How to change the default colors of a view color mode

The default colors of a view color mode can be specified in the VAPS Color Setup dialog.

4.2.The Item View (color mode)

The Item View helps you to focus on production orders for certain items.

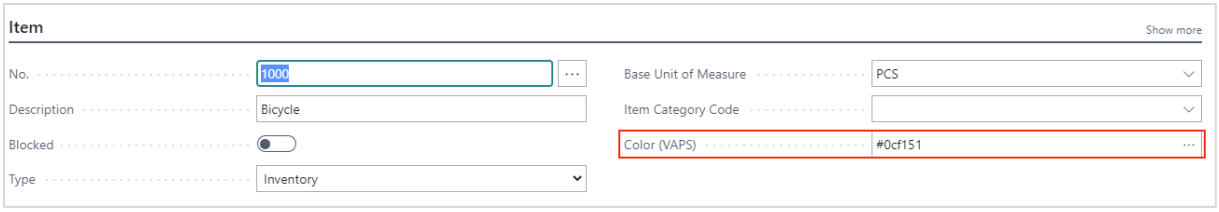
The Item View highlights production orders for items that you want to visually stand out. For that reason, you can define a default item color in the color setup and item-specific colors on the item card.

The Item View is useful if you have certain items that require a specific attention. This could e.g., be items for production orders that are very time sensitive. Or it could be items where the cost of material are very high.

Important to know: the item color is applied to an entire production order (line).

4.2.1. Change color for individual items

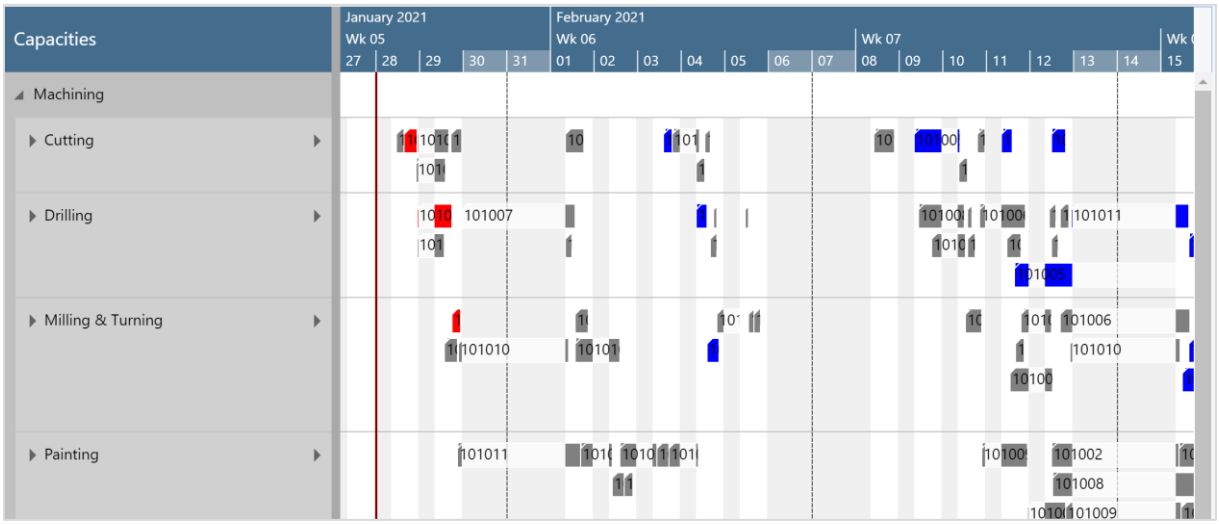
If, for some reasons, you want to highlight one or more specific items, you can do so by changing their individual color on the respective item card:



Example

The below screenshot shows a production schedule with the Item View applied. The following settings are used:

- Default item color = grey
- Item color "frame" = blue
- Item color "rim for mountain bike" = red



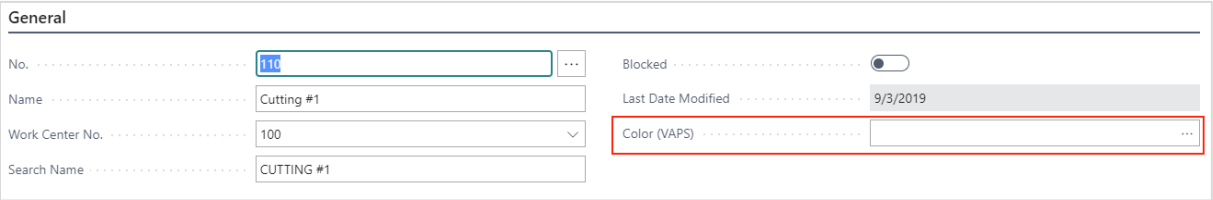
4.3.The Machine/Work Center View (color mode)

The Machine/Work Center View helps you to focus on production orders for certain items. It highlights production orders that are processed through certain work or machine centers. For that reason, you can define a default machine/work center color in the color setup and e.g., machine center-specific colors on the machine center card.

> **The Machine/Work Center View is particularly useful if you have one (or a few) bottleneck resources that require your special attention. In such a case, you can make them visual stand out with this view.**
>
> **Important to know: the machine center color is applied to single production order routing lines/operations.**

4.1.Change color for an individual Machine/Work Center

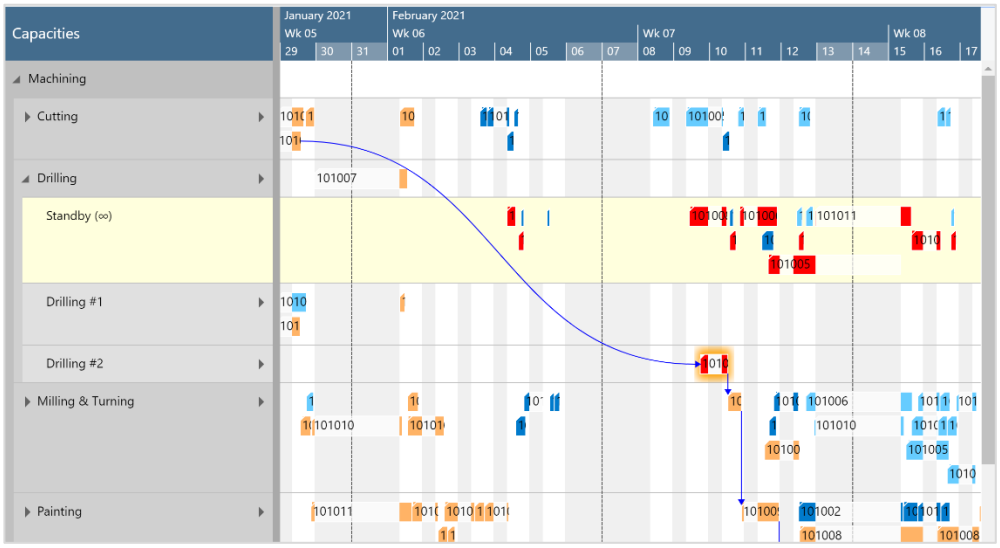
If, for some reasons, you want to highlight one or more specific machine/work centers, you can do so by changing their individual color on the respective machine/work center card:



Example

The below screenshot shows a production schedule with the Machine/Work Center View applied. The following settings are used:

- Default machine/work center color = by production order status
- Machine center color for machine center "drilling #2" = red



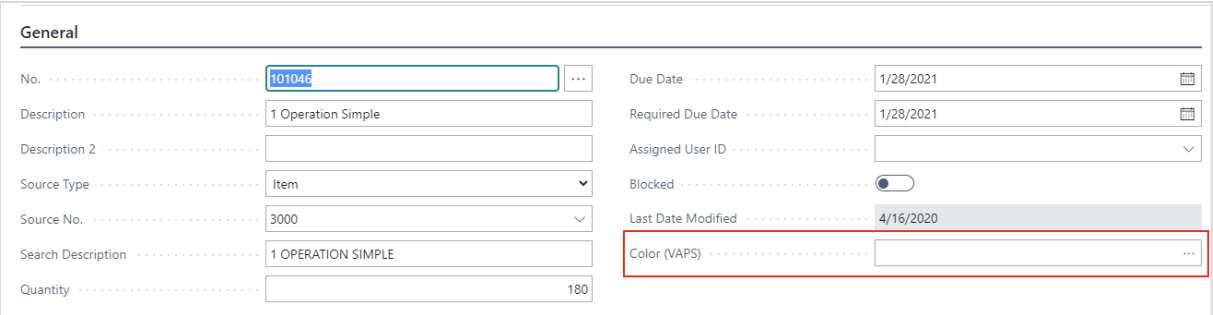
4.2.The Production Order View (color mode)

The Production Order View helps you to focus on certain production orders. It highlights production orders that you want to visually stand out. For that reason, you can define a default production order color in the color setup and production order-specific colors on the production order card.

> **The Production Order View is useful to recognize certain production orders at a glance. This could be the case, e.g., if your orders are typically both make-to-order as well as make-to-stock. Then, if things get tight because a deadline approaches and you need to shift out some order, you might want to shift out your stock orders, because with them, there is usually more time flexibility. If you have defined a unique color for your stock orders you can quickly and easily recognize them.**
>
> **Important to know: the production order color is applied to an entire production order (line).**

4.2.1. Change color for an individual production order

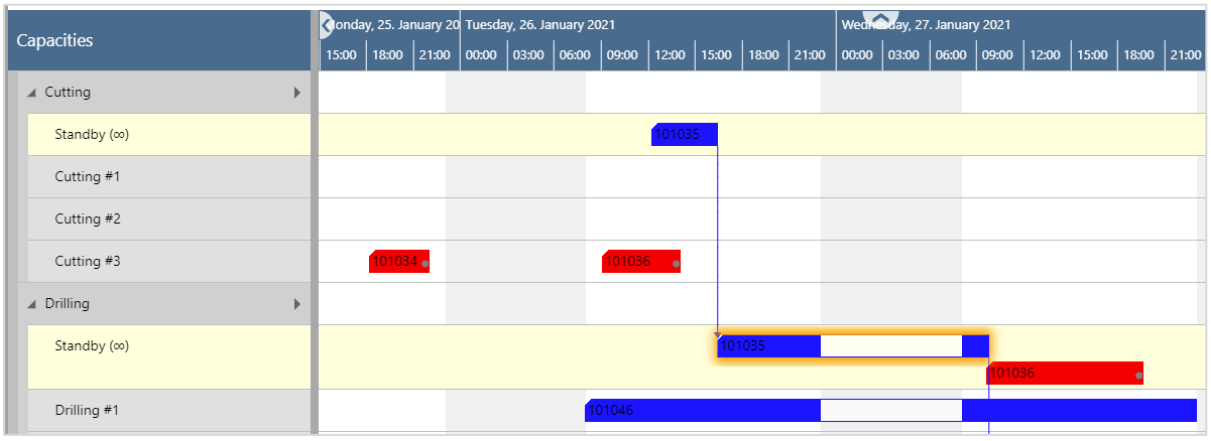
If you want to highlight one or more production orders in your plan, because, perhaps, they are urgent or belong to quite important customers, you can change the color on the Production Order Card:



Example

The below screenshot shows a production schedule with the Production Order View applied. The following settings are used:

- Default production order color = blue
- Production order color for orders no. 101034 and 101036 = red



4.3. The Production Order Status View (color mode)

The Production Order Status View helps you to quickly see where in your scheduling & execution process your production orders are. It differentiates production orders by their respective status and lets you define different colors for the following statuses:

- Planned
- Firm planned
- Released

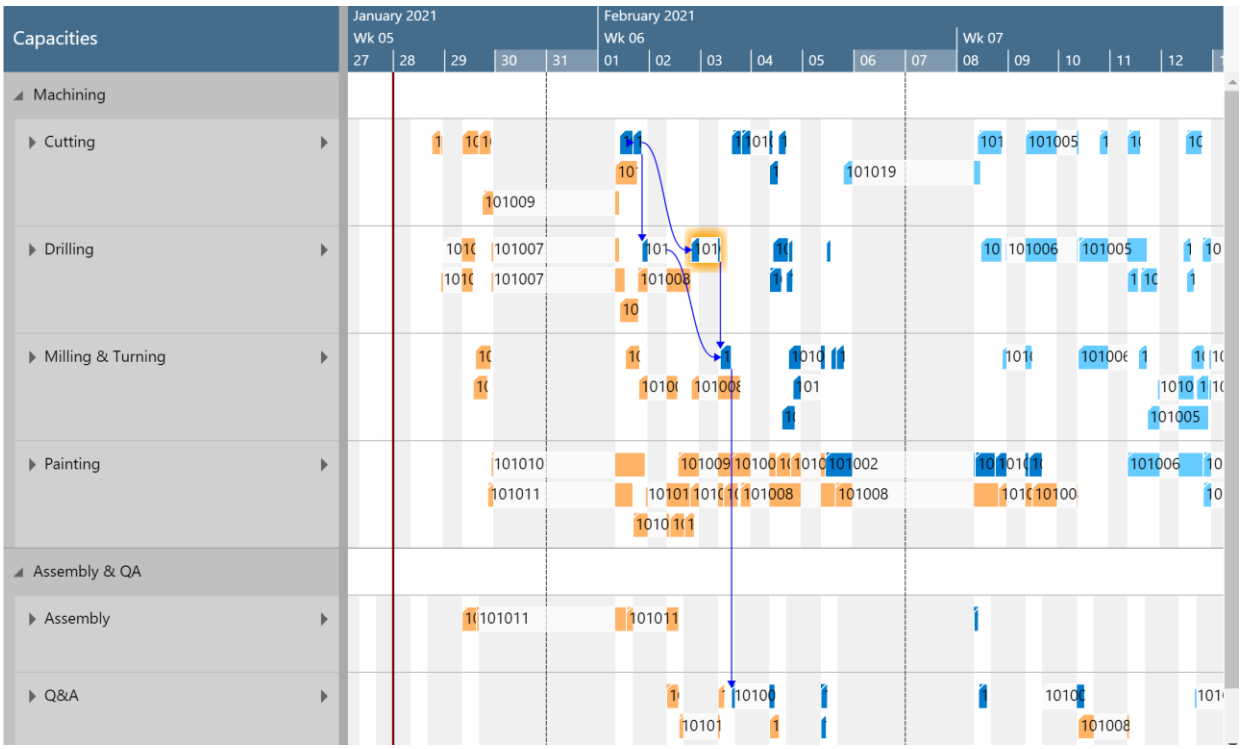
> **The Production Order Status View is particularly useful if you want to quickly see where in your scheduling & execution process your production orders are.**

Important to know: the production order status color is applied to an entire production order.

The picture below shows the default colors coming with the VAPS.

Example

The below screenshot shows a production schedule with the Production Order Status View applied with the default colors coming with the VAPS.



4.4. The Progress View (color mode)

The Progress View helps you to quickly see which productions are late. This is both with respect to production orders that start late and those that finish late. It differentiates production orders by their lateness and lets you define different colors for the following statuses:

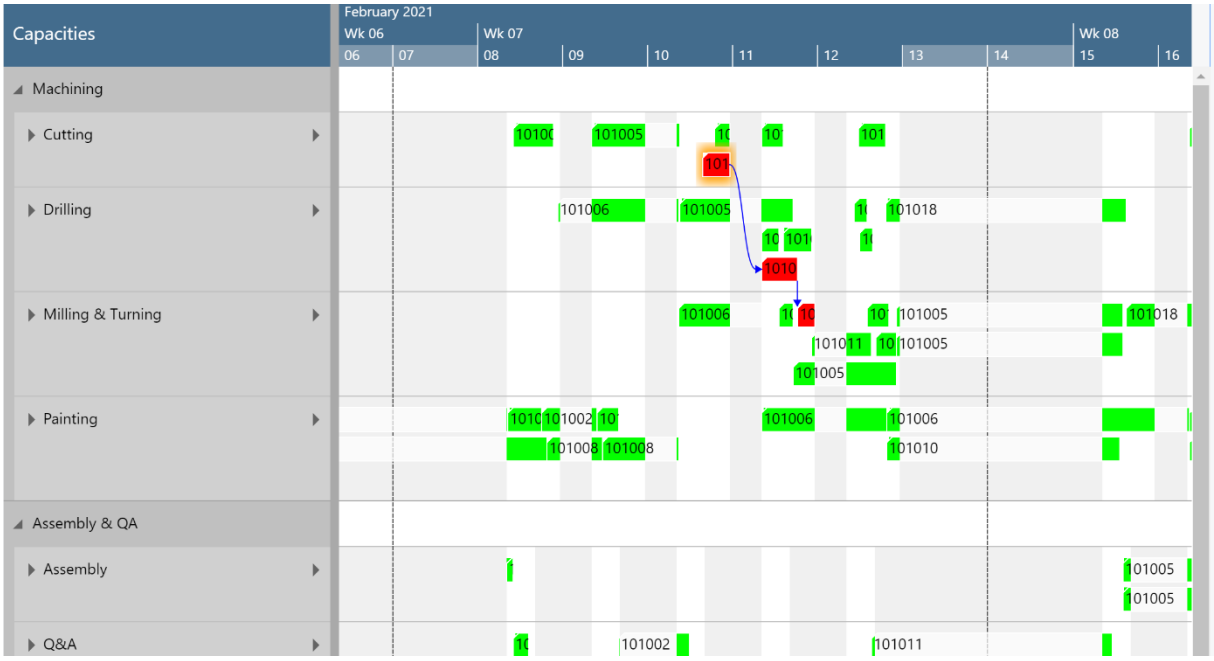
- Progress status **missed**. It indicates production orders that are planned to finish past a requested date. Hence, this is the default color that is used if the end date of an operation is past the required due date.
- Progress status **not started**. It indicates production orders that should have been started by now but are not. Hence, this is the default color that is used if the start date of a planned operation is before the current date/time.
- Progress status **OK**. It indicates those production orders that neither start nor finish too late. Hence, this is the default color that is used if none of the above mentioned two colors get applied.

The Production Order Status View is particularly useful if you want to quickly see if you are running late.

Important to know: the progress status color is applied to an entire production order.

Example

The below screenshot shows a production schedule with the Progress View applied and using the default colors coming with the VAPS:



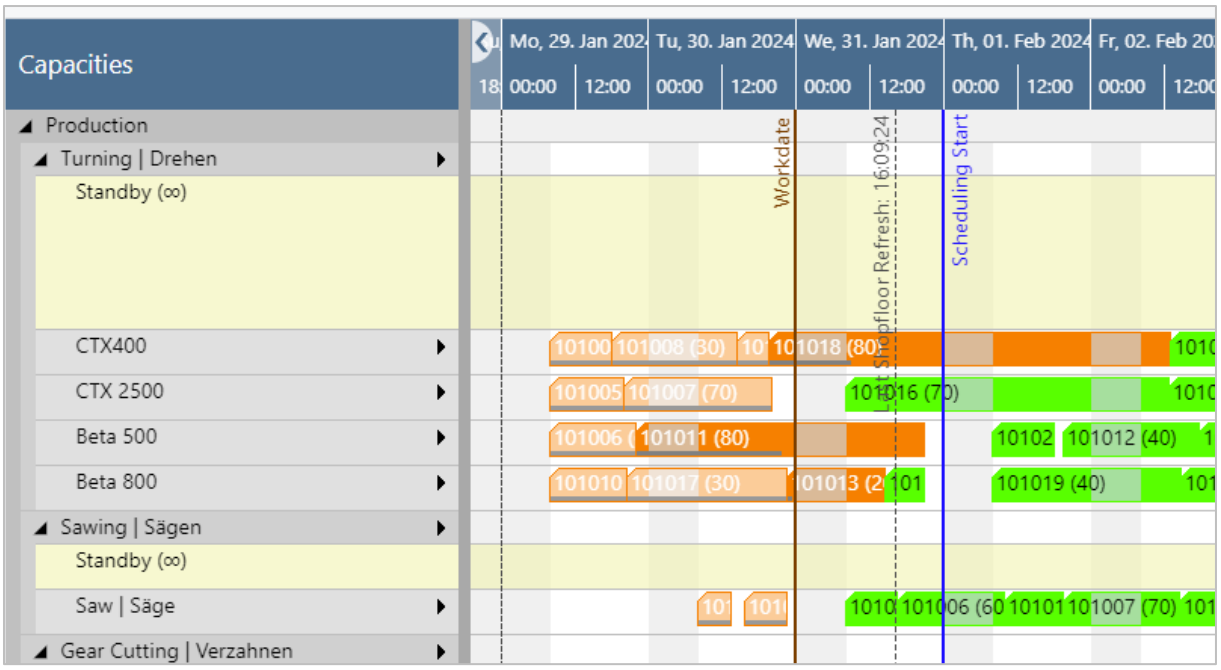
4.5. The Shop Floor Status View

The Shop Floor Status View helps you to quickly highlight and recognize deviations between actual data from the shopfloor and the schedule.

> **The Shop Floor Status View lets you recognize how incidents that happen on the shopfloor impact your schedule.**
>
> **Important to know: the shop floor status color is applied to an entire production order routing line**.

Example

The screenshot below shows a schedule with the Shop Floor Status View applied with the -described default colors. Please note that this view also comes with a vertical line indicating when the last “update according to actuals” was made.



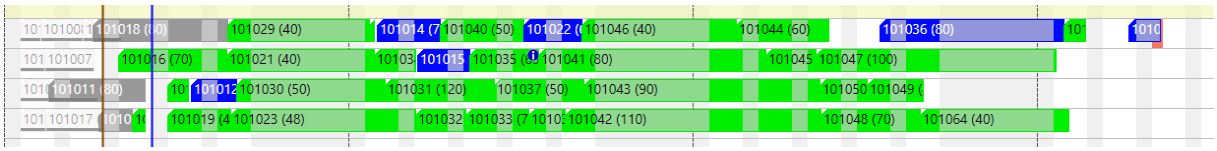
4.6. The Execution Status View (color mode)

The VAPS offers the "Shop Floor Status" color scheme to highlight deviations between the planned schedule and actual data from the shop floor. To offer even more transparency, we implemented the "Execution Status" color scheme to give feedback on the operations' status on the shop floor: "ready to get in progress", "in progress", "finished", operation with posting issues, and "rest"

The direct predecessors and successors are taken into account

Example

The below screenshot shows a schedule with the Execution Status View applied with the default colors.



4.7. The Availability View (color mode)

The Availability View helps you to focus on the material availability of your production orders. It lets you see which production orders have or don't have the needed material when the first operation is meant to start.

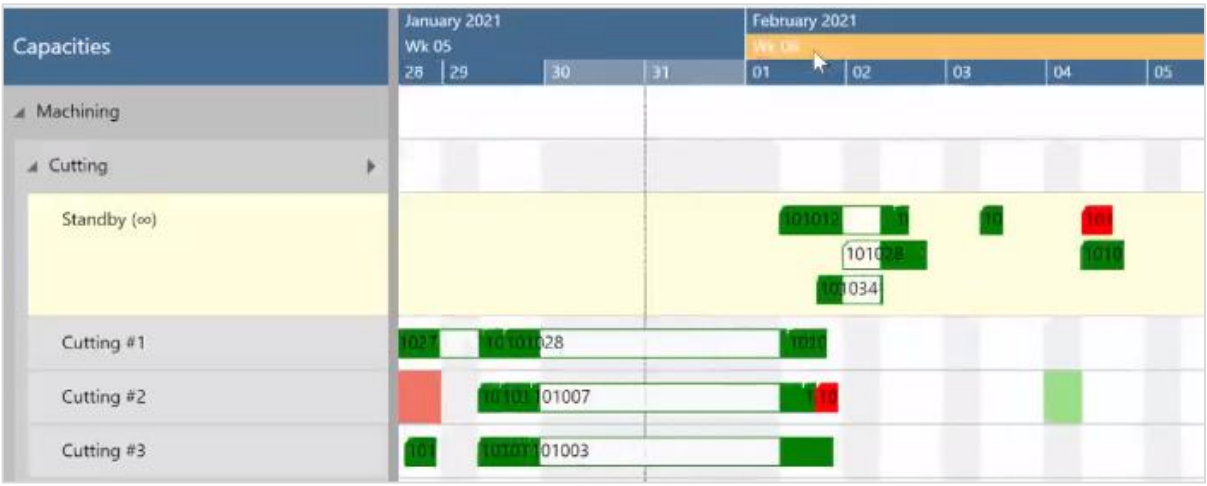
The Availability is useful to recognize the material availability of your production orders at a glance.

Important to know: the availability color is applied to an entire production order (line).

Example

In the picture below ,the Availability View is applied. The default settings are:

- production orders where the material is available = green
- production orders that are scheduled before the required material is available = red



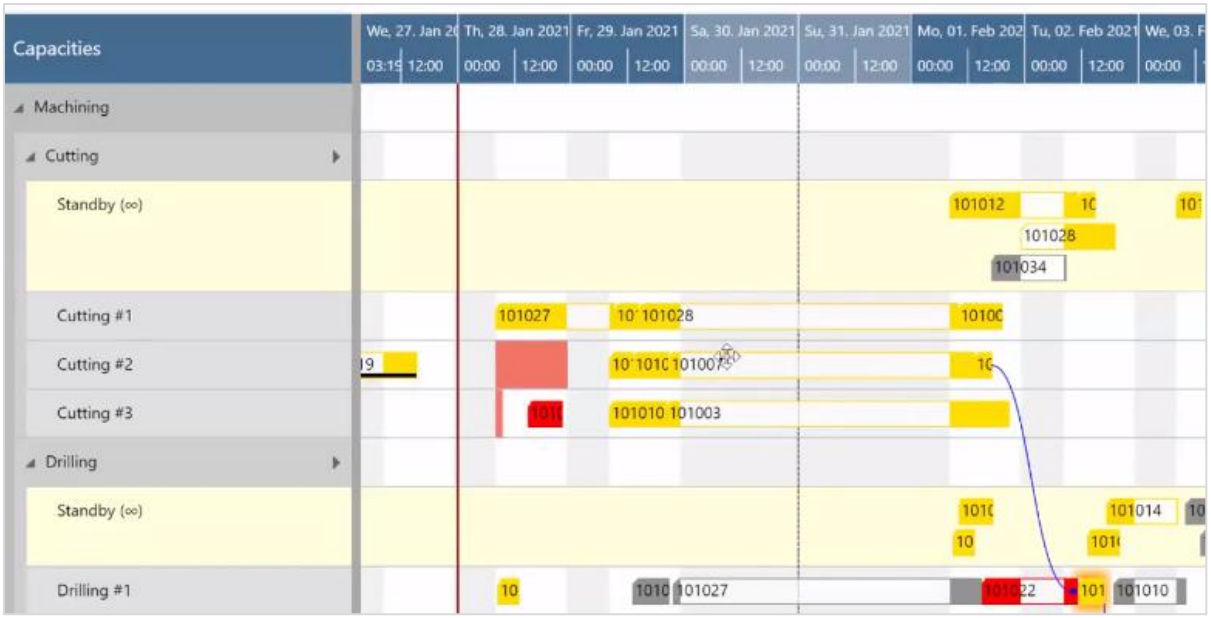
4.8.The Wait Times View (color mode)

The Wait Times View helps you to recognize bottlenecks quickly and gives you an overview of critical and uncritical waiting times of operations at the machines.

> **The idea behind this view: operations might need to wait for other operations to finish as the other operations have (an implicit) higher priority.**
>
> **Important to know: the wait times color is applied to an entire production order (line).**

The below screenshot shows a production schedule with the Wait Times View applied. The default settings are:

- no waiting times = grey
- waiting times, but the production order finishes in time = orange
- waiting time and part of a late production order = red

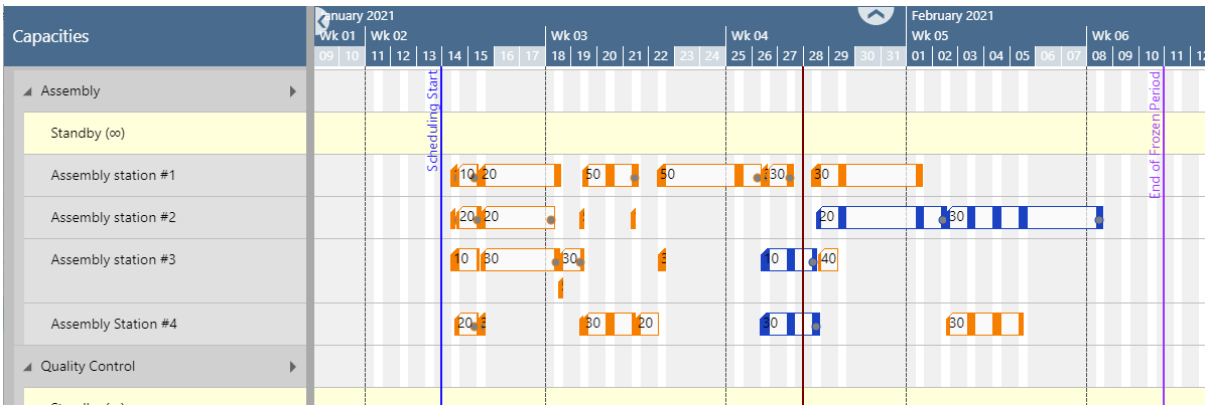


4.9.The MRP View (color mode)

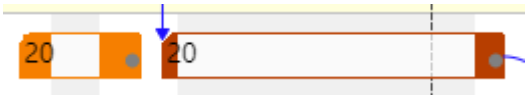
The MRP View helps you to quickly differentiate production orders that belong to the VAPS area of responsibility from those that belong to the MRP area of responsibility.

> **The MRP view lets you recognize production orders that are not touched by the planning worksheet since they belong into the VAPS area of responsibility.**
>
> **Important to know: the MRP color is applied to an entire production order (line).**

The below screenshot shows a production schedule with the MRP View applied. The orders planned by the VAPS appear in orange, the ones planned by MRP in blue.



The darker red shows that for this production order you have set an exception to the standard rule by context menu



4.10. The Production Line Assignment View

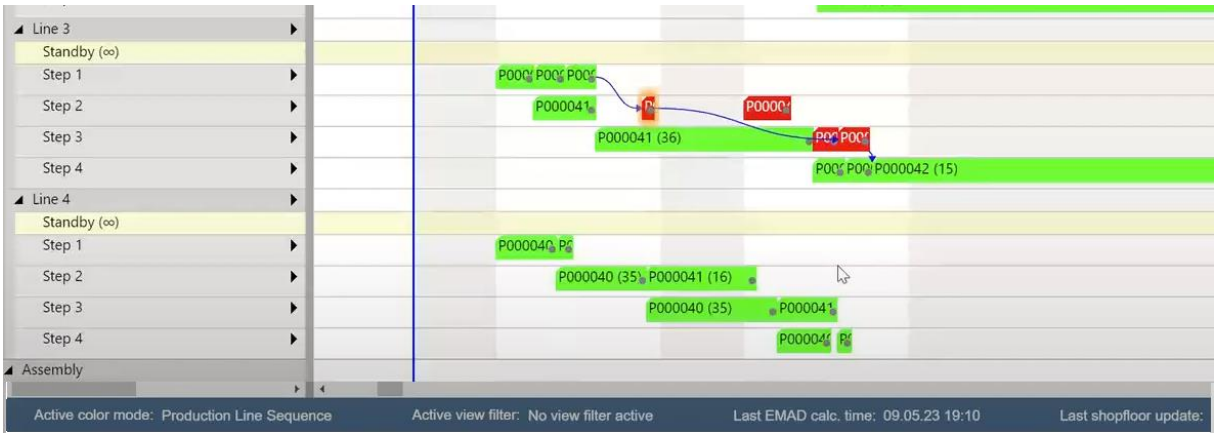
The Production Line Assignment View lets you quickly recognize assignment errors when you work with production lines.

If you work with production lines, the Production Line Assignment View will visually indicate if there is a violation of the “line dependency” restriction, such as multiple operations from one production order switching between lines.

4.11. The Production Line Sequence View

The Production Line Sequence View lets you quickly recognize sequence errors when you work with production lines.

If you work with production lines, the Production Line Sequence View will visually indicate if there is a violation of the “physical dependency” restriction, such as one production order overtaking the other.



5. Setting up the VAPS

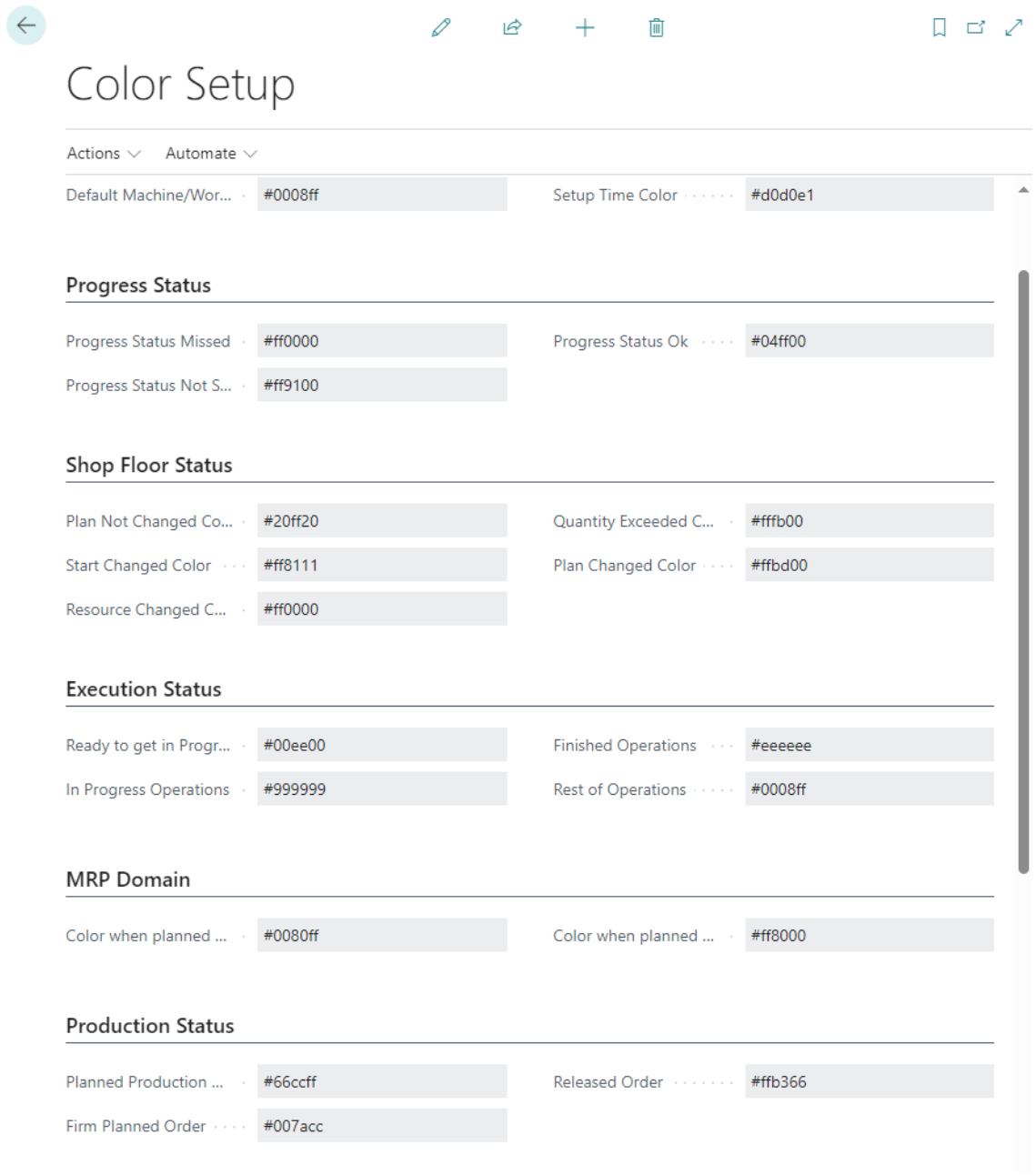
5.1. How can I define the default colors?

Define default colors at one central page so that you can quickly apply different color schemes in the planning board.

The Visual Advanced Production Scheduler allows you to quickly change the coloring in the planning board. This enables you to focus on different kinds of information at one glance - quicker. Overall, we support the following color schemes:

- Item view
- Machine/ work center view
- Production order view
- Production order status view
- Progress view
- Shopfloor status view
- Availability view
- Wait times view
- MRP view
- Production line assignment view
- Production Line Sequence view
- Execution Status view

All these color schemes are based on default colors. You can define them on the "color setup" page, which you can access from the NETRONIC VAPS menu, or by simply searching for "color setup". The color setup page looks as follows:



5.1.1. General information

You can define colors either by their hex value or by clicking the three dots in each color-related line. This opens a color picker.

All colors that you define here are always only applied to the bars in the planning board. Hence, these colors are used to determine the color or a production order routing line (operation) in the planning board.

5.1.2. Specific settings and what they are for

Let's look at all the settings that you can make in more detail.

General

- Default **item color**: This is relevant for the **Item View**. This is the color in which every bar is shown in the Item View. If you want to focus on certain items, you have to define item-specific colors on the item page.
- Default **machine/ work center color**: This is relevant for the **Machine/ Work Center View**. This is the color in which every bar is shown in the Machine/ Work Center View. If you want to focus on certain machines, you have to define machine-specific colors on the machine center (or work center) page.
- Default **production order color**: This is the color in which every bar is shown in the Production Order View. If you want to focus on certain production orders, you have to define production order-specific colors on the production order page.
- **Setup time color**: The color being used for the small rectangle at the beginning of the bar that visualizes setup times of an operation.

Progress status

These colors are relevant for the **Progress View**.

- Progress status **missed**: Indicates production orders that are planned to finish past a requested date. Hence, this is the default color that is used if the end date of an operation is past the required due date. The required due date is a new data field provided by the VAPS. It is fixed and will not be changed by any Business Central scheduling run. The "progress status missed" color will be applied to all operations of a production order of which a minimum of one operation ends past the required due date.
- Progress status **not started**: Indicates production orders that should have been started by now but are not. Hence, this is the default color that is used if the start date of a planned operation is before the current date/time. The "progress status not started" color will be applied to all operations of a production order of which a minimum of one operation ends past the required due date.
- Progress status **OK**: Indicates those production orders that neither start nor finish too late. Hence, this is the default color that is used if none of the above mentioned two colors get applied.

Shopfloor Status

These colors are relevant for the **Shop Floor Status View**

- Here you can define the standard colors for deviations from the plan:
  - No deviations
  - Start date changed
  - Changed resource
  - Exceeded quantity
  - Any other deviations from the plan

Execution Status

These colors are relevant for the **Execution Status View**. You can specify the default colors for the operations' different processing status on the shop floor:

- Ready to get in progress
- In progress operations
- Finished operations
- All other operations

MRP Domain

These colors are relevant for the **MRP View**.

- Specify the default colors for bars that are planned by MRP or by the VAPS.

Production Status

These colors are relevant for the **Production Order Status View**.

- **Planned** order: Defines the color in which all planned production orders are shown.
- **Firm planned** order: Defines the color in which all firm planned production orders are shown.
- **Released** order: Defines the color in which all released production orders are shown.

Material Availability

These colors are relevant for the **Availability View**.

- Material **available**: Defines the color in which production orders are shown when the material is available.
- Material **not available**: Defines the color in which production orders are shown when the material is not available.

Waiting Times

These colors are relevant for the **Wait Times View**.

- **Due date warning**: Defines the color in which production orders are shown that have operations that need to wait AND the production order runs late.
- **Wait time warning**: Defines the color in which production orders are shown that have operations that need to wait, but the production order finishes in time.
- **Wait time default**: Defines the color in which production orders are shown that have no waiting times.

Work center

- **Subcontract work center color**: Defines the default color for subcontract work centers.

Production Line

These colors are relevant for the **Production Line Assignment View** and the **Production Line Sequence View** and are important when you work with production order lines.

Specify the default color for

- No conflict
- Operations that are not assigned to a production line
- Operations assigned to a wrong production line
- Operations that are sequenced in the wrong order

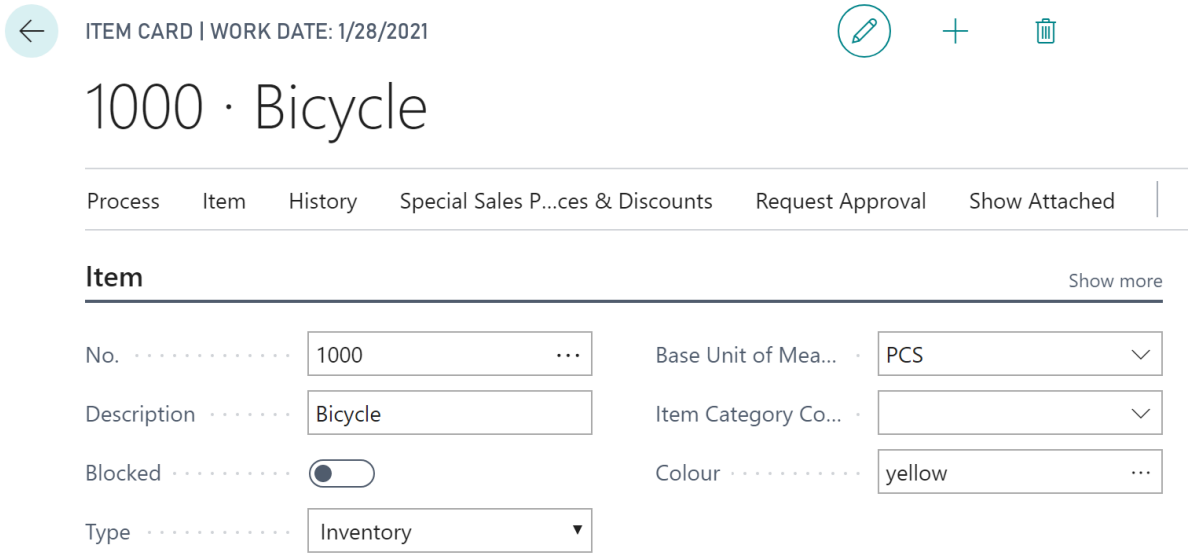
5.2.How can I define individual colors for specific items?

Define item colors on the item card. This helps you to make production orders visually stand out in the "Item View".

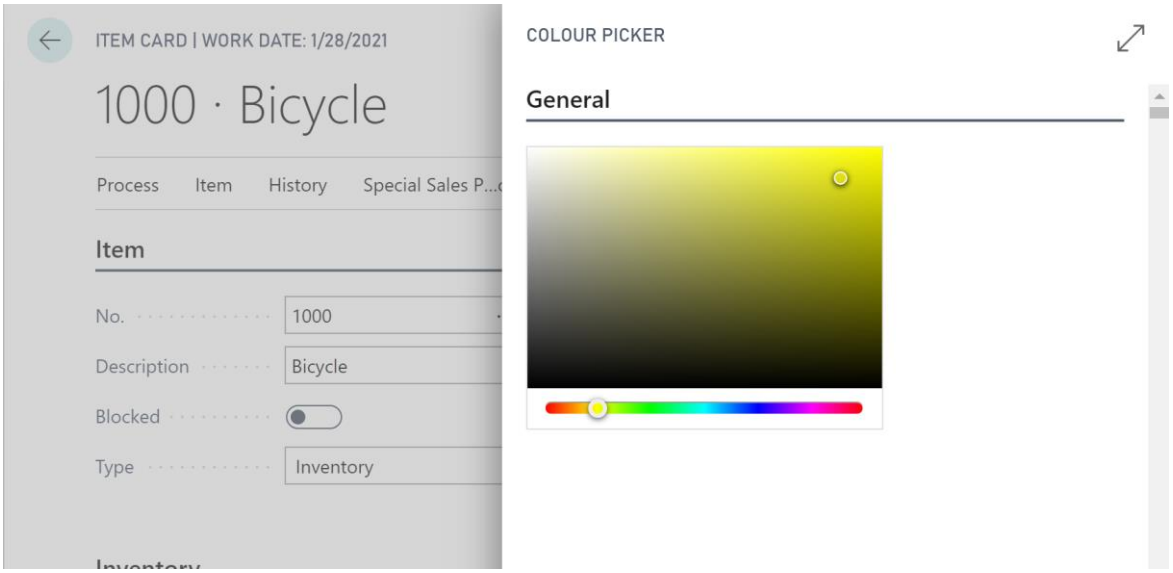
You can make production orders visually stand out in the Item View. That means you can define specific colors for specific items that you do not want to be shown in the default item color.

You can do this from the item card. We added a color field to the item header.

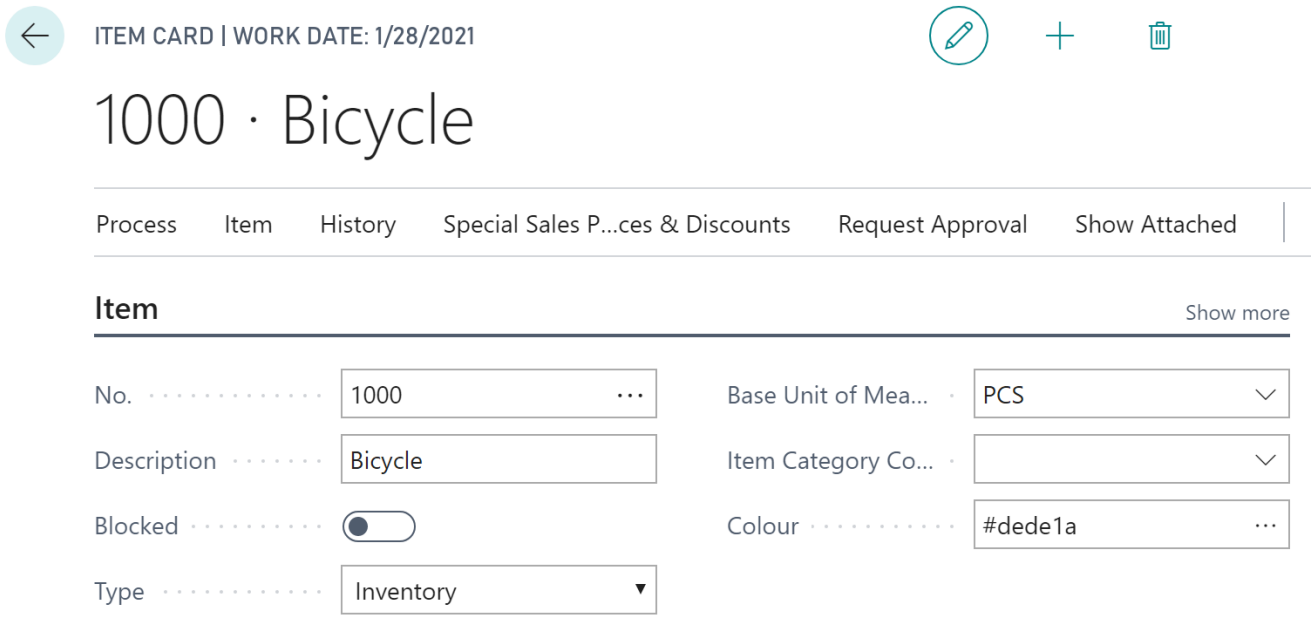
You can either type in the color's name:



Or you can specify and color via color picker if you click the three dots at the end of the color field:



This populates the color field with the respective hex code (you also can type in the hex code directly if you know it):

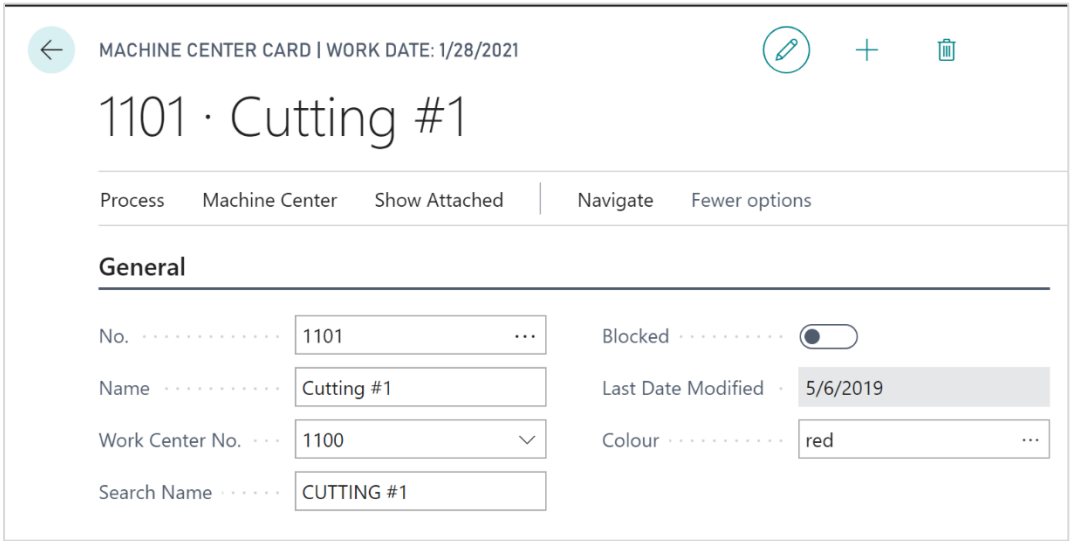


5.3. How can I define individual colors for specific machine centers?

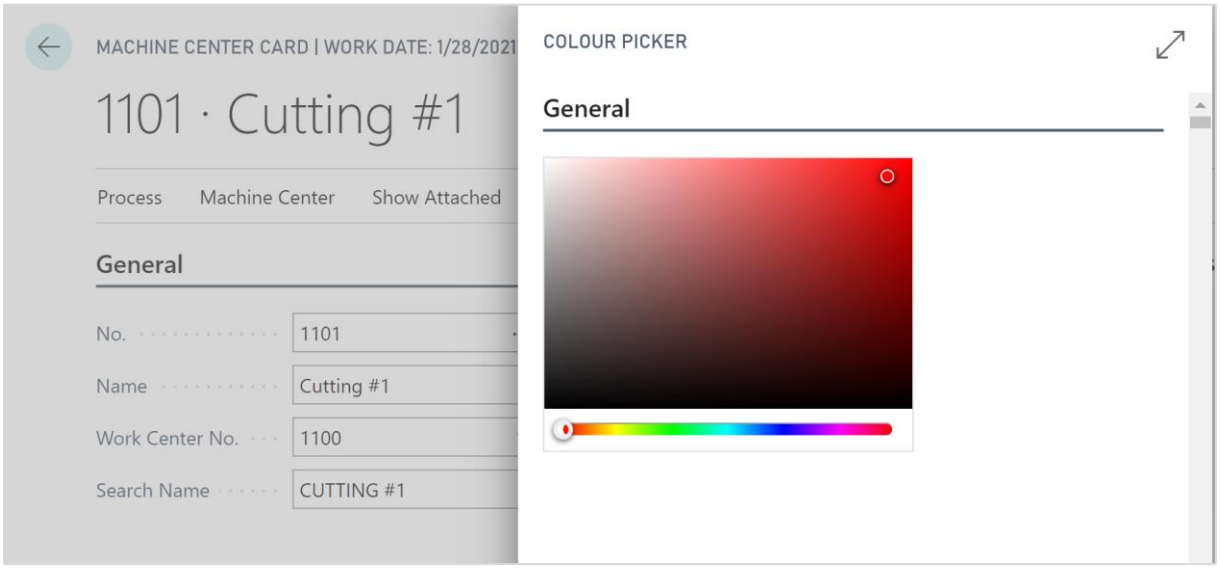
You can make production orders visually stand out in the Machine/ Work Center View. That means you can define specific colors for specific machine and/or work centers that you do not want to be shown in the default item color. If an operation is assigned to that machine/work center, it will be shown in the color you select for it.

You can do this from the machine/ work center card. We added a color field to the machine/work center header.

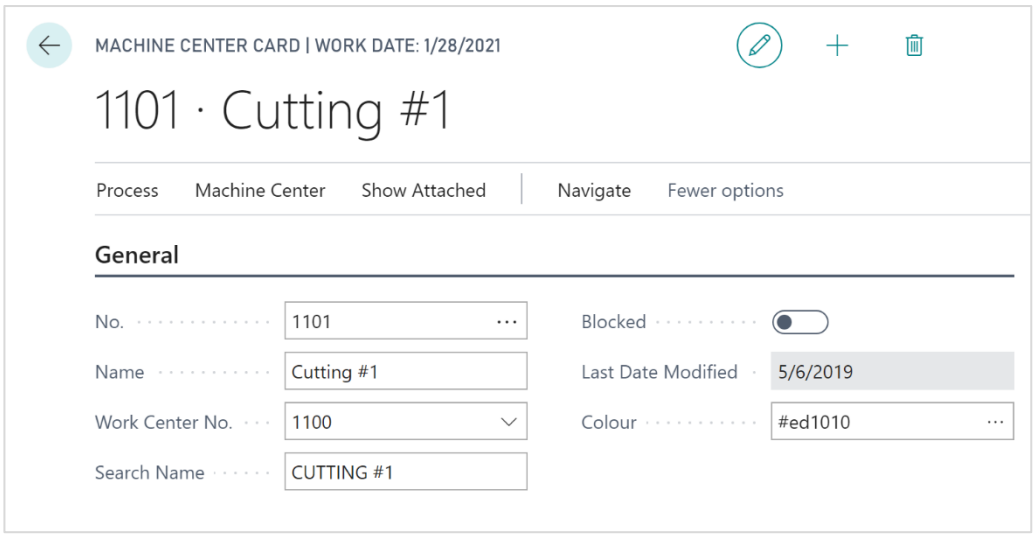
- You can either type in the color's name:



- Or you can specify and color via color picker if you click the three dots at the end of the color field:



This populates the color field with the respective hex code (you also can type in the hex code directly if you know it):



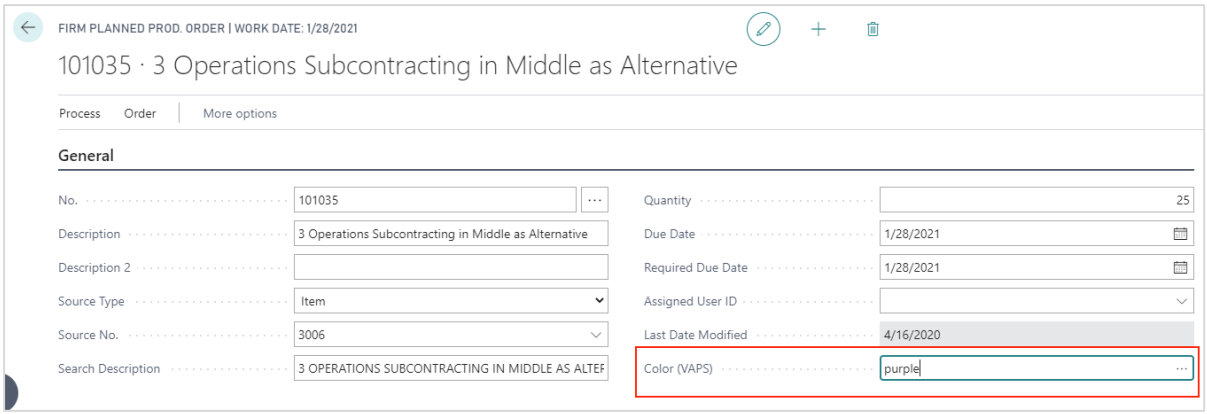
5.4. How can I define individual colors for specific production orders?

If you want to highlight certain production orders you can define specific colors for specific production orders that you do not want to be shown in the default item color.

This is done on the production order card where we added a color field to the production order header.

Specify the color by either

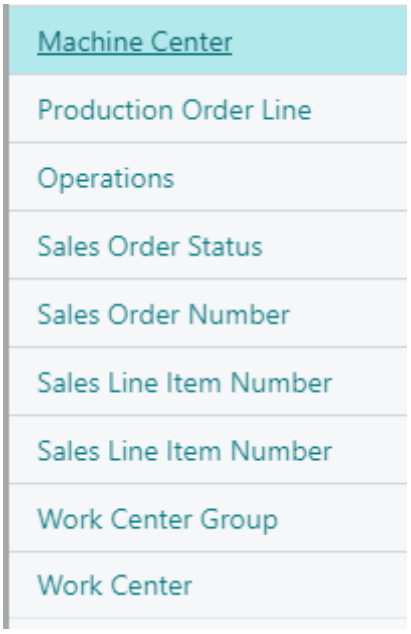
- Entering the color's name



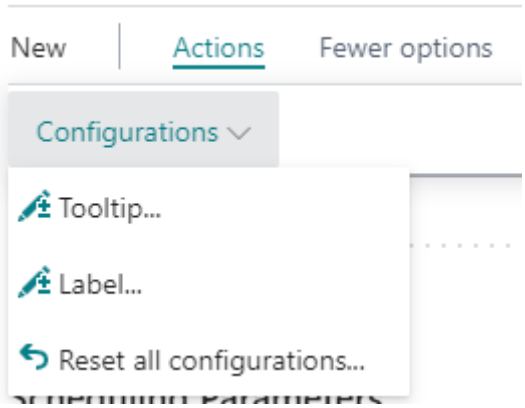
- Clicking on ··· in the color field and select the color via color picker - the color's respective hex code will be entered.
- Type in the hex code.

5.5. How to configure tooltips

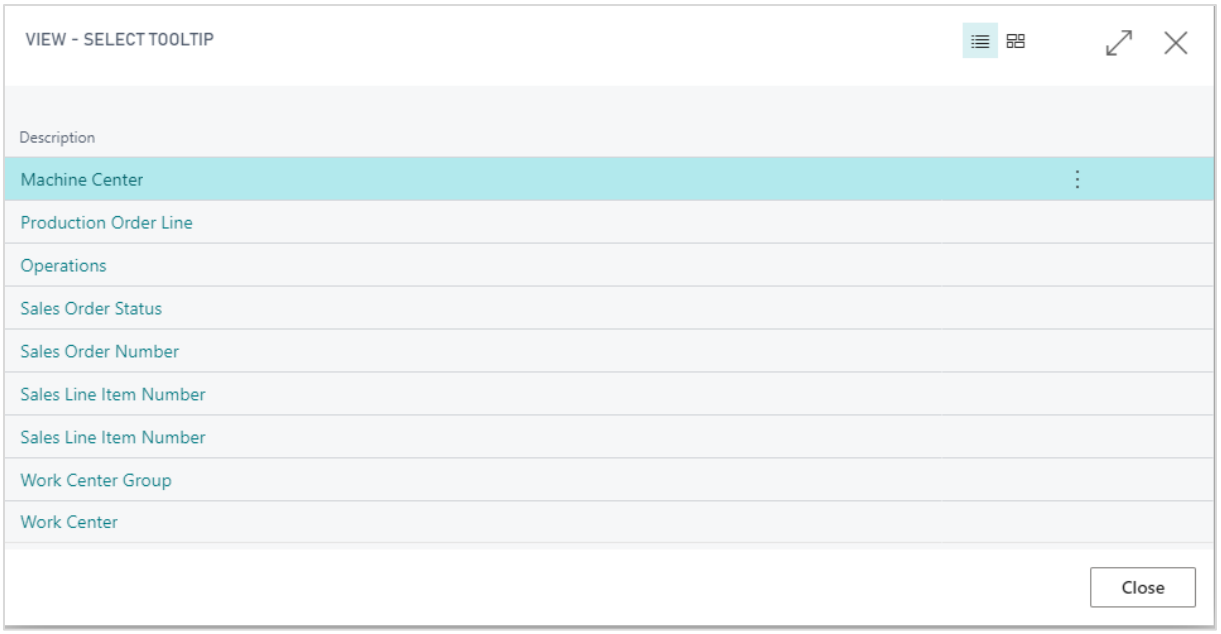
The tooltips of the VAPS provide further information on the following items of your production schedule:



You can specify which information is to be shown in the tooltip of the respective item in the "Tooltip" dialog - to be reached by clicking "Configurations" in the "Actions“ menu of the "VAPS Setup" dialog:



In the dialog popping up, you select the item for which you want to customize the tooltip and then either delete, edit, or add fields and then click the “Edit” item from the “Actions” menu:

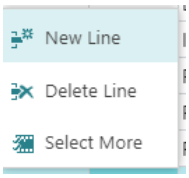


The dialog “Edit – Define configuration” pops up.

Here you can:

- Add a new field:
  either click +NEW or just click in the last row. You can select the desired Dynamics 365 BC data by clicking "…" either for table and field name.

- Insert a new field:
  Select the field above which you want to insert a new one and proceed as described above.
- Delete a field:
  Click ⋮ and select "Delete line"



5.6. How to configure bar labels

You can decide which D365 BC information is to be shown as bar label.

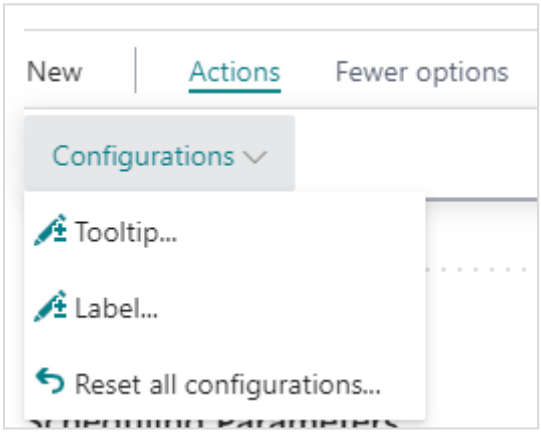
Bar labels are shown on

- operations in the Production View
- operations in the Capacity View

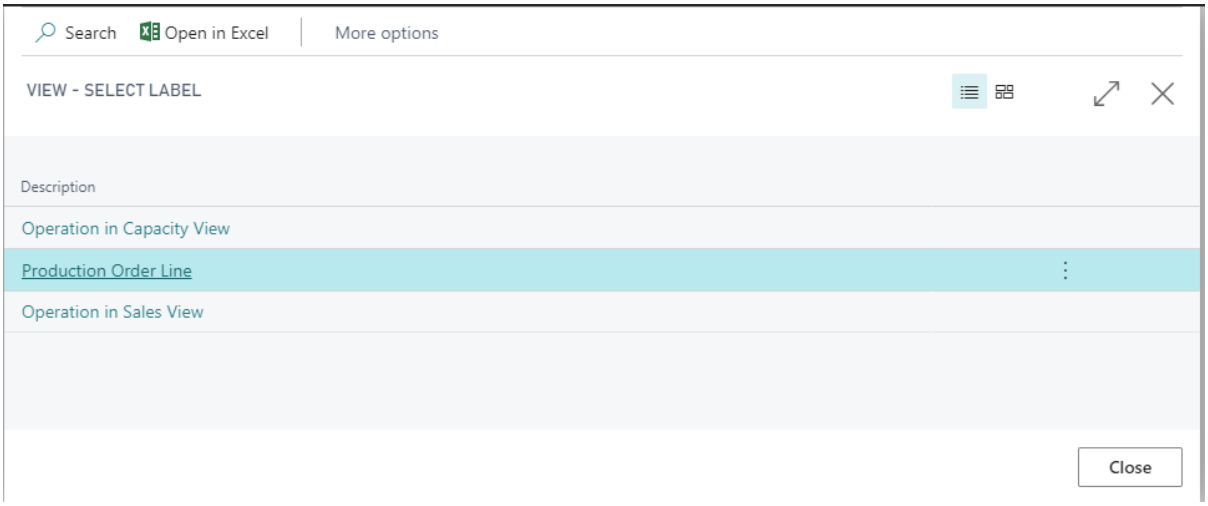
In the picture below, you see the bar label of a production order line in the Sales View, showing

- the production order number
- the number of the production order line
- the quantity

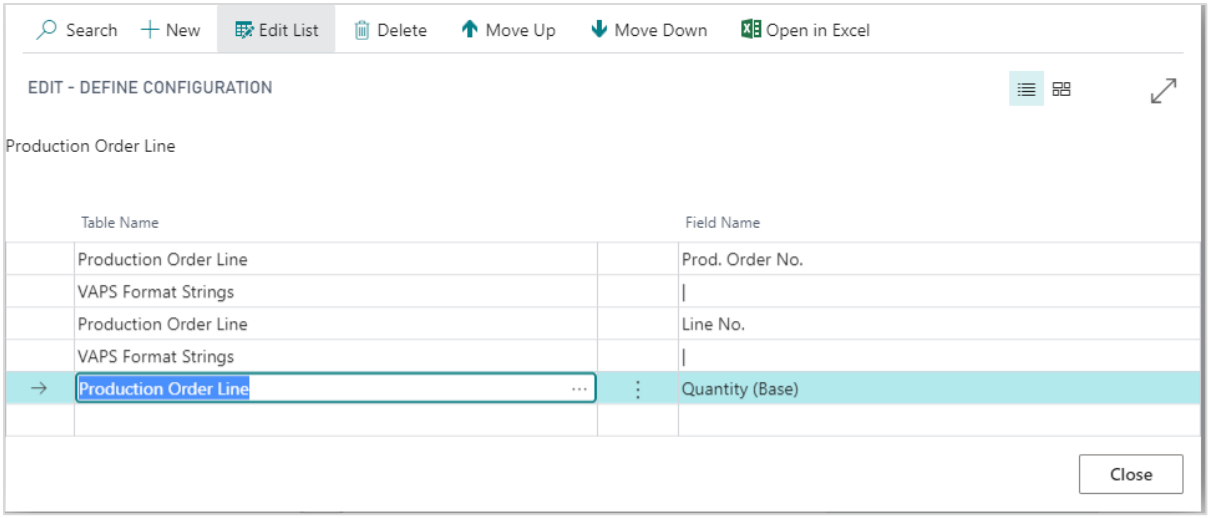
You can specify which information is to be shown on the bar label of the respective item in the according dialog to be reached by clicking "Configurations" in the "Actions“ menu of the "Setup" dialog:



- In the "View - select label" dialog, select the item and/or view for which you want to customize the bar label - in our case "Production Order Line":



- The “Edit – Define Configuration” dialog pops up:



- Here you can add, insert, edit, and delete fields as well as change their order. You can select the desired table name and field name from your Dynamics 365 BC data by clicking "…"

5.6.1. Formatting the labels

Separate the field contents in the table label by a line break, a blank or other separators by selecting the according separator from the “VAPS Format Strings” table.

AVAILABLE VALUES

	Value
	New Line
	Space
	|
	:
	(
→	)

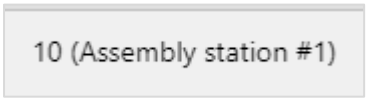
5.7. Configure table texts

You can decide which D365 BC information is to be shown as labels in the table for:

- Machine centers
- Production order lines
- Production order routing lines
- Production orders
- Sales order lines
- Sales orders
- Work centers
- Work center groups

The picture below shows the table text for a production order routing line, containing:

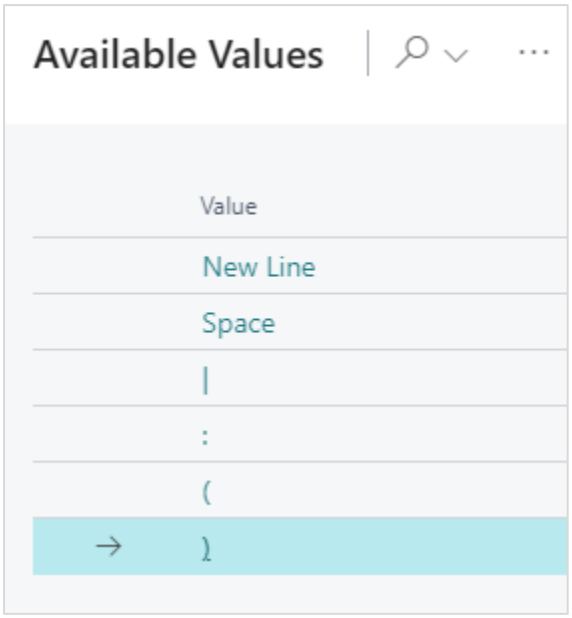
- the operation number
- a blank
- the description in brackets



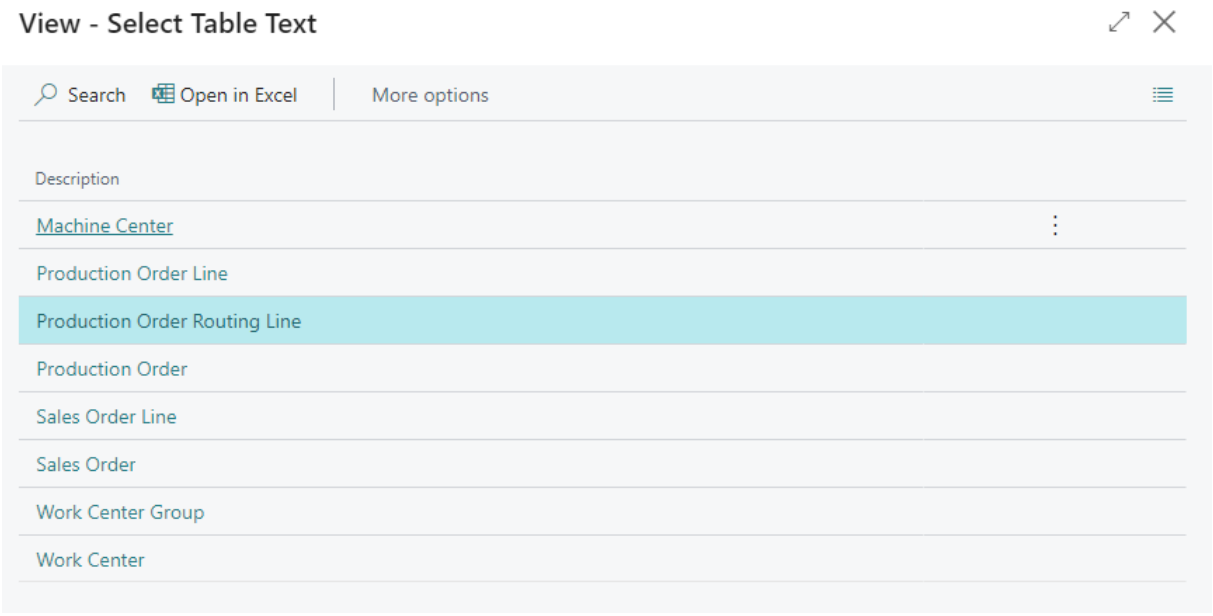
5.7.1. How to proceed

For customizing the table label, proceed as follows:

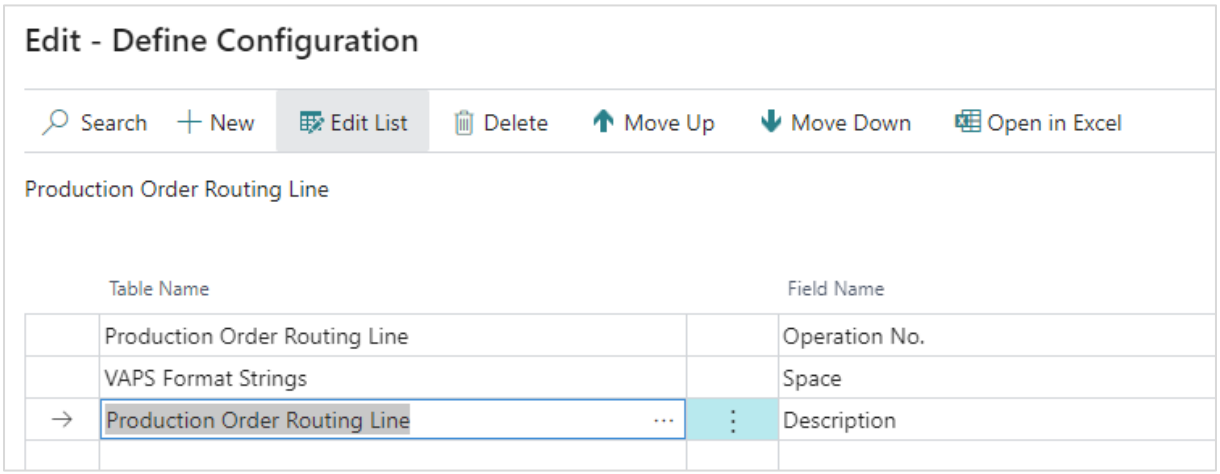
- Click "Configurations" in the "Actions" menu of the "User Setup" dialog:



- In the "View - select table text" dialog, select the item for which you want to customize the table label which, in our case, would be "Production Order Routing Line":



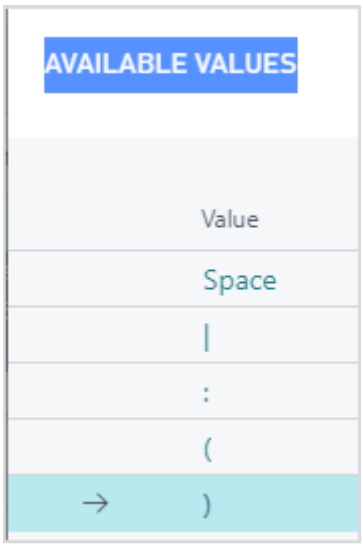
The “Edit – Define Configuration” dialog pops up:



Here you can add, insert, edit, and delete fields as well as change their order. You can select the desired table name and field name from your Dynamics 365 BC data by clicking “…”.

5.7.2. Formatting the text

Separate the field contents by a blank, or by the separators shown below by selecting the according character from the “VAPS Format Strings” table.

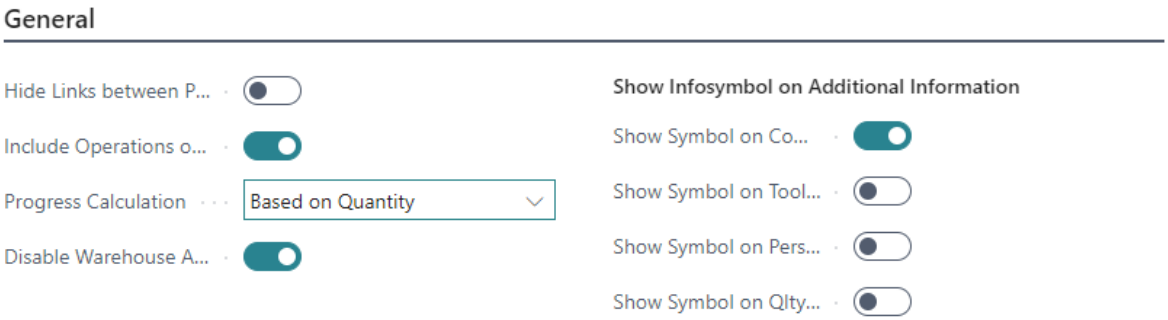


5.8. How to use flow fields for tooltips, table, and label texts in NETRONIC'S simulation tables

With certain conditions met, flow fields can also be created directly in NETRONIC's own simulation tables, and be used for tooltips, bar labels, and table labels.

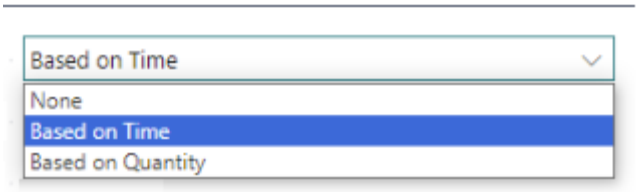
Important: Please note that only persistent records can be used as the foundation for calculating the values in the flow field formulas. This means that values resulting from interactive rescheduling in the planning board are not considered in the calculation. Additionally, there is no event triggered before the flow field value is calculated, making it impossible to apply a date filter to restrict the calculation to dynamic values, for example. Therefore, we recommend utilizing this feature only together with values from standard Business Central tables.

5.9. The “General “settings

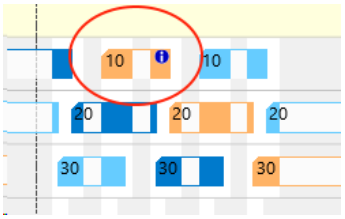


- Decide whether you want to see links between production order lines or whether you want to hide them.
- Choose whether standby operations are to be included in the histogram

- Select whether a progress bar is shown and hether the progress should be calculated based on the time consumed or the quantity produced. The calculation of the consumed quantity is derived from the input quantity, allowing consideration for scrap as well.

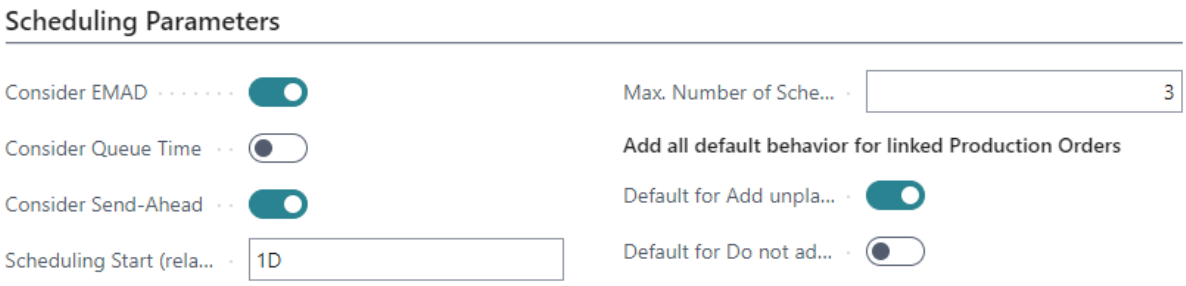


- Specify whether an info symbol will be shown on the according production order routing lines when additional information was added to this routing lines in BC.



5.10. The “Scheduling” settings in the VAPS

The VAPS offers two semi-automatic scheduling tools, the functions "Add all" and "Fill idle times" either with or without considering the EMAD. The settings described below make sure that these functions work properly.



- **Consider EMAD:** Tick this option, if the EMAD shall also be considered when using "Add all" and "Fill idle times.
  - With the function "Add all" you can schedule a bunch of production orders in one go.
  - The function "Fill Idle Times" helps you to avoid idle times on machine centers and thus fully use your capacities.

  Recommendation: If material availability is crucial for you, switch on this option, so that you never schedule without having material available.

- **Consider queue time**: Decide whether the queue time specified in Business Central on the work/machine center card is to be considered for the scheduling process.
- **Consider send-ahead time**: Decide whether the send-ahead time specified in Business Central when defining a routing is to be considered for the scheduling process.
- **Scheduling Start**: Here you can define the scheduling start for the two functions, starting from the current work date. This will be indicated in the plan by a blue vertical line.
  Recommendation: We recommend to initially set it to "2D" or "3D" to the short-term schedule as stable as possible.
- **Maximal Number of Scheduling Iterations:** This option is mostly related to the "Fill idle times" functions and lets you specify how often the scheduling process shall be carried out. No matter

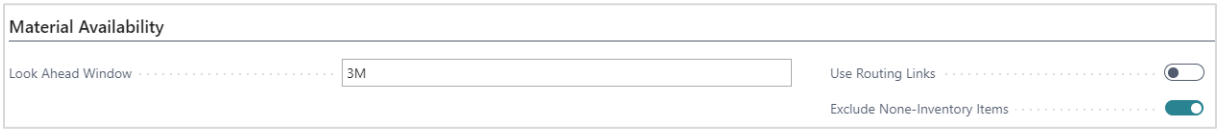
which number you have entered here, the process will be stopped, when it brings no more change to the schedule.
Recommendation: We recommend starting with 5, if this takes too long, reduce to 3. But at least enter 1 here.

- **Add all default behavior for linked Production Orders:** With this option you can determine the default behavior of preceding and succeeding linked production orders when adding them from standby to the plan.

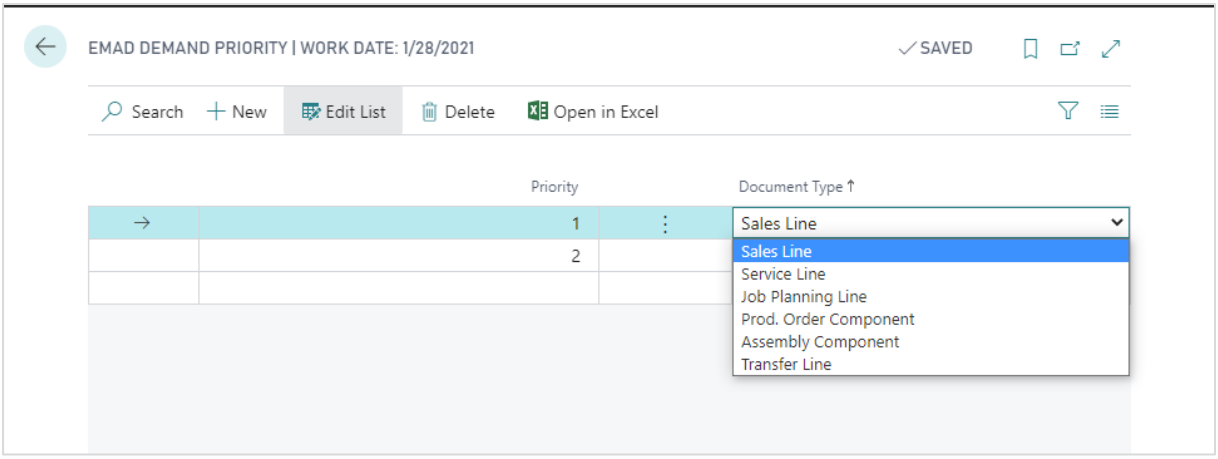
5.11. How to set the parameters for EMAD calculation

When you want to setup an EMAD (= Earliest Material Availability Date) calculation, you need two settings:

- Define the "Look ahead window" i.e., specify how far from now (= today) you would like to make the allocation of component supply to component demand. This is done in the "VAPS Setup":



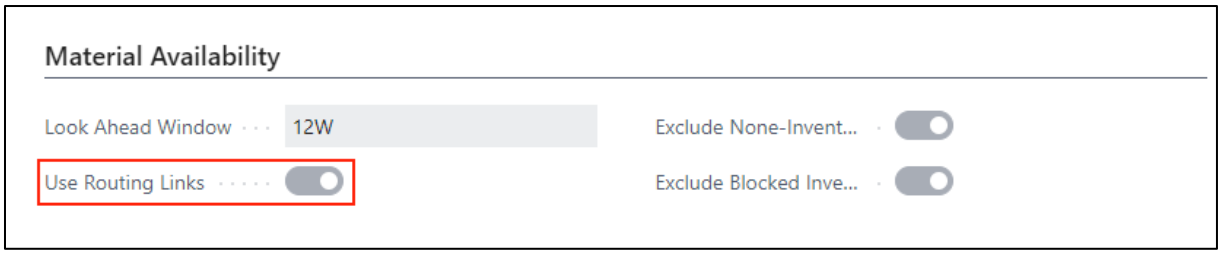
- Define which kind of demand type should get supplied first, second, third etc. This is done in the "EMAD Demand" dialog under "Manage -> Edit List". Here you can also change the priority order:



5.11.1. Consider EMAD on production order routing line level

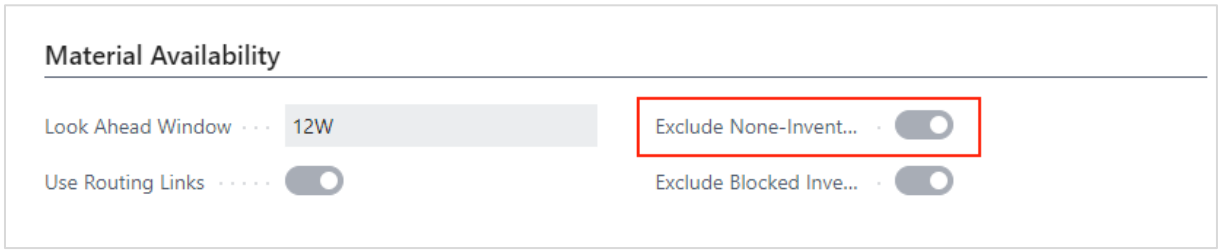
Without any further specification, the VAPS calculates the EMAD on production order line level with no EMAD per operation at all. You can, however, have the VAPS also consider routing links so that the EMAD can be calculated by the production order routing line which means that a production order line can be started even when the material for one (or more) operations is not yet available.

This option has to be switched on the VAPS Setup page:



5.11.2. Exclude item type “non-inventory”

By clicking the according option, you can specify that the item type “non-inventory” is to be excluded from the EMAD calculation.



5.11.3. Exclude blocked inventory

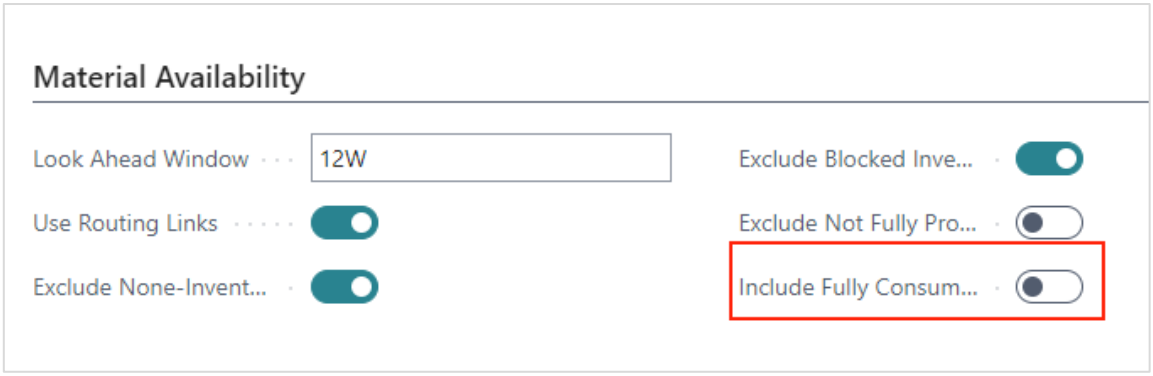
You can easily and quickly block certain lots from the EMAD calculation. This could become necessary, e.g., if you have items the material of which is on-site but need a further quality inspection. Then you could block them from the EMAD calculation, and we would treat them as not available.

5.11.4. Exclude not fully promised receipt date from automatic functions like Add All

You can exclude production orders without a promised delivery date from the planning with "Add all" and "Add all incl. alternatives". You can still plan these orders manually per drag and drop. You can still plan these orders manually per drag and drop

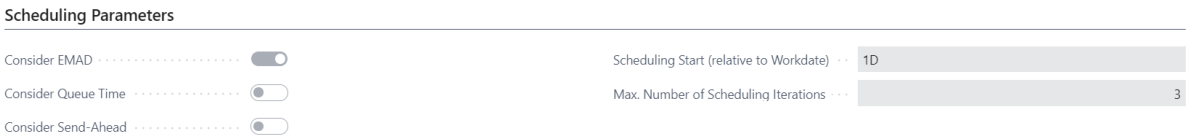
5.11.5. Include fully consumed items into EMAD calculation

Planners can decide whether to include or exclude fully consumed items into/from the EMAD calculation by ticking the according option:



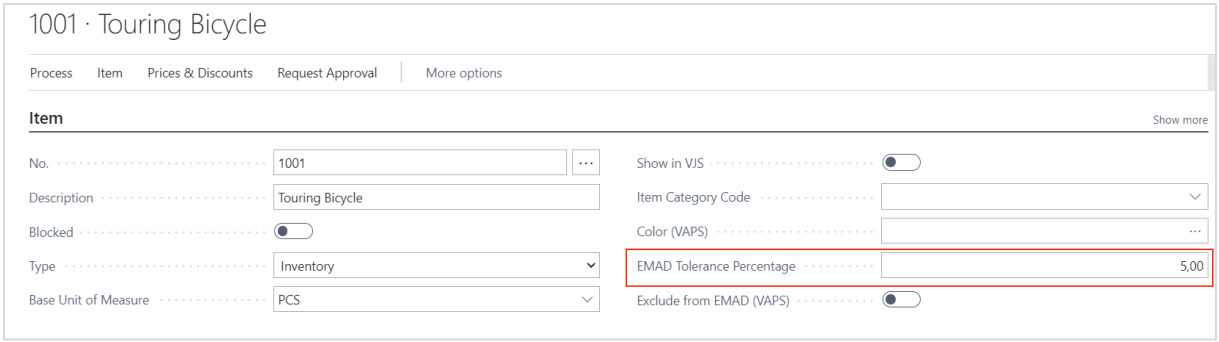
5.11.6. Consider EMAD in semi-automatic scheduling

The VAPS offers two semi-automatic scheduling tools, the functions "Add all" and "Fill idle times" either with or without taking into account the EMAD. The settings below make sure that these functions work properly. All settings can be found in the scheduling settings of the VAPS Setup:



5.11.7. Apply EMAD tolerance to an item

As is commonly known, the EMAD calculation provides a date from which the required quantity of component demand is available and before which the production order must not start. The newly implemented EMAD tolerance allows defining the criterion not too narrowly so that, e.g., an order could already start if only 95% of the required material is available. To be able to do so, we have enhanced the item card with the respective setting option. When calculating the demand, the entered value is multiplied by the available quantity.

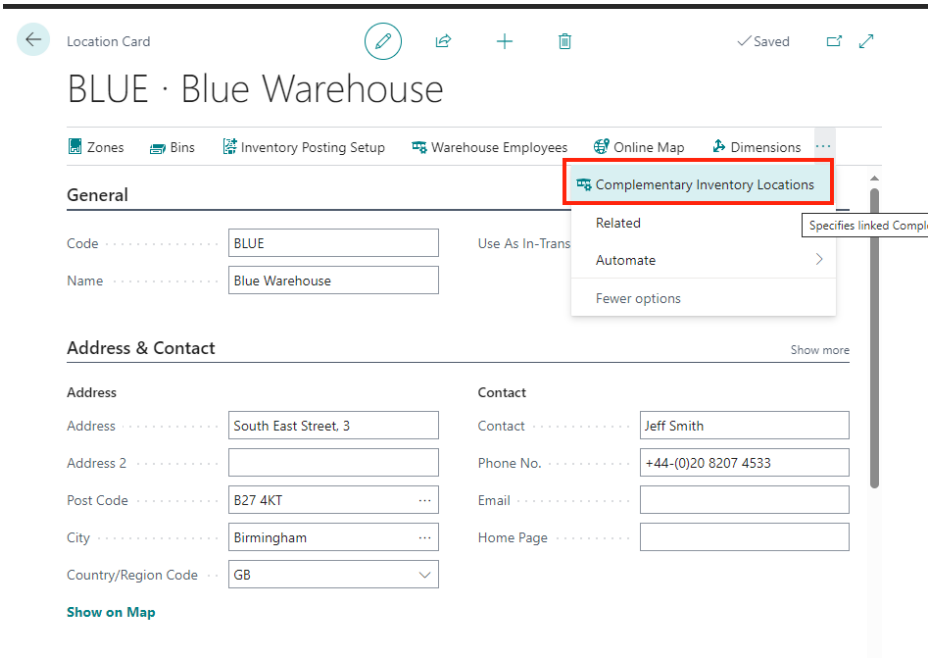


5.11.8. Consider sub-locations when calculating EMAD

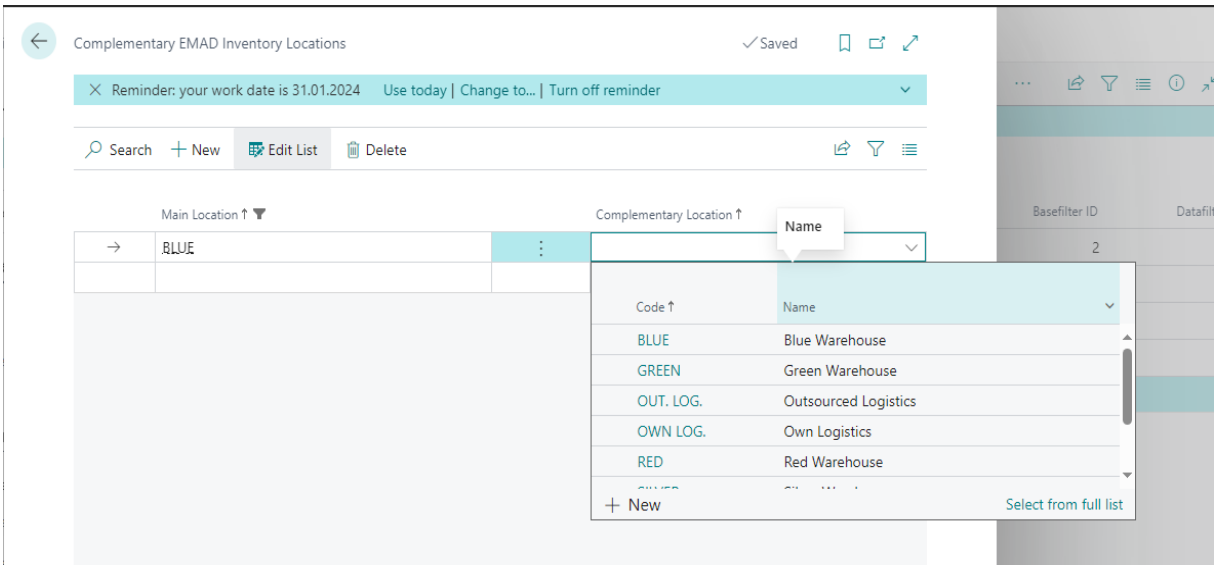
With this feature, we resolve the challenge faced by manufacturing companies that store materials in multiple locations. Treating different location codes as one tackles the issue of supply shortages at the production facility by offering a consolidated view of inventory across all relevant locations. Here's why this approach works:

- **Unified inventory view**: By treating all involved location codes as one, the system views the combined inventory levels, thus recognizing the overall available supply instead of seeing a possible shortage at one or two particular locations.
- **Elimination of short-notice transfers**: The need for short-notice transfer orders is minimized since the inventory system accounts for the combined stock at all locations. This reduces the frequency of urgent transfers and the associated disruptions.
- **Accurate production scheduling**: The VAPS will now schedule production orders based on the total available inventory, preventing the orders from showing up in red due to perceived shortages. This ensures a smoother production workflow.
- **Improved planning efficiency**: With a comprehensive view of inventory, planning and replenishment processes become more efficient, leading to better stock management and reduced risk of supply gaps.

We have implemented this in the VAPS by enabling locations to have sub-locations, which is done on the Location Card:



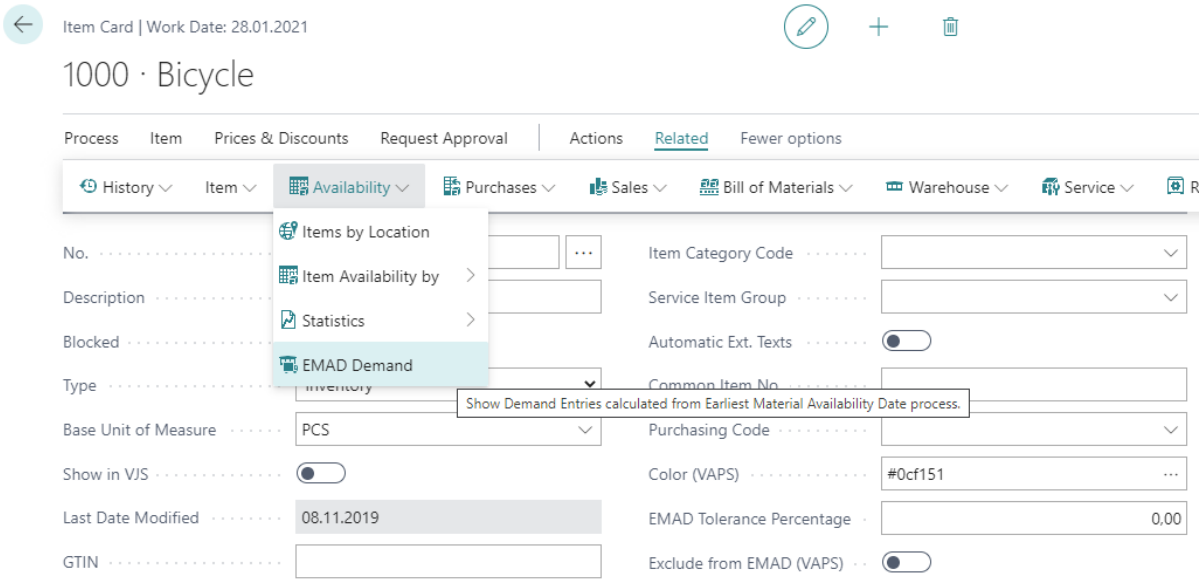
Another dialog appears, where the user can define the needed additional locations:



When calculating EMAD, the sub-locations are consolidated with the main location, enabling inventory checks across all defined locations if the demand originates from the main one.

5.11.9. Shortcut to EMAD demand

On the Item card you can directly navigate to the EMAD demand entries.



5.11.10. Run EMAD calculation from Job Queue

With the help of the Business Central job queue, you can schedule certain background jobs for regular execution. The EMAD calculation, which until now could only be called via the VAPS (interactively with - depending on the data volume - long calculation times), can now be triggered via the job queue as soon as the VAPS is installed. Thus, it could be run at night, for example, without supervision and without the need for someone to log on to the system to start the VAPS.

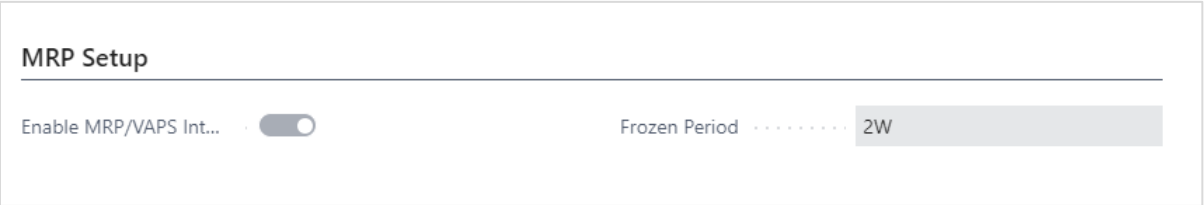
Setting up the job queue has to be done within Business Central by the administrator

5.12. Settings for integrating MRP/planning worksheet

Please note, that the concept of MRP/planning worksheet is described in detail in this chapter.

Here, you can:

- enable/disable the MRP/VAPS integration
- define a frozen period relative to the work date, meaning the period in which the VAPS is responsible and production orders remain untouched by the planning worksheet.



5.13. How to set up the automatic calculation of the earliest start date

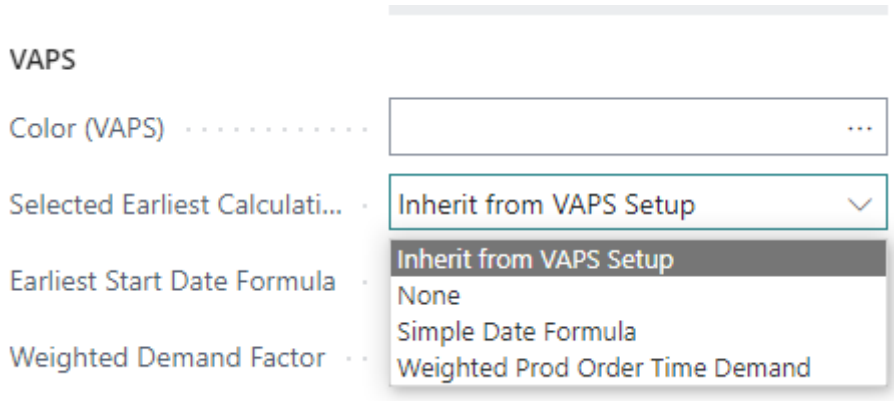
Usually, the fields “Earliest Start Date” on production order, production line, and production order routing line level have to be filled manually.

We have improved the handling on the production order level so that the “Earliest Start Date” on this level can be calculated and filled automatically. In particular, customers who often have orders whose required due date is relatively far in the future will appreciate this functionality.

The settings for this can be found in th area “Earliest Start Date Calculation” Here you can define which mode of calculation should be used along with the associated custom values:

- **None** – same behavior as previously
  Recommended usage: If the shopfloor can manage the current production order volume, allowing for immediate ASAP planning without any need to “bench” tasks to align with the required due date so that storage cost will be minimized.
- **Simple Date Formula** - will be applied to the “Required Due Date” to fill the Earliest Start Date.
  Recommended usage: If the shop floor must delay production orders to prevent long-term storage of components or finished items until delivery, AND if the average production order can be completed within a day or a few days of entering the shop floor with minimal variation between orders.
- **Weighted Production Order Time Demand** - encompasses all times (setup time, run time multiplied by quantity, wait time, and move time) to represent the total raw duration of the production order. This total is then multiplied by a user-defined factor and subtracted from the "Required Due Date" in real time (without using work/shift calendars).
  Recommended usage: If the shop floor must delay production orders to prevent long-term storage of components or finished items until delivery, AND if the average production order spans several days, albeit with significant variation between orders. Recommended multiplication factor: on a one-shift Mo-Fr shopfloor, a factor of 8 would give the best results.

The settings of the VAPS dialog are taken as default. However, users also have the option to customize settings for individual production orders on the related production order card, which will overwrite the default settings from the dialog.



This allows users to establish a "one size fits all" setting that applies broadly, while still having the flexibility to apply unique settings for specific production orders.

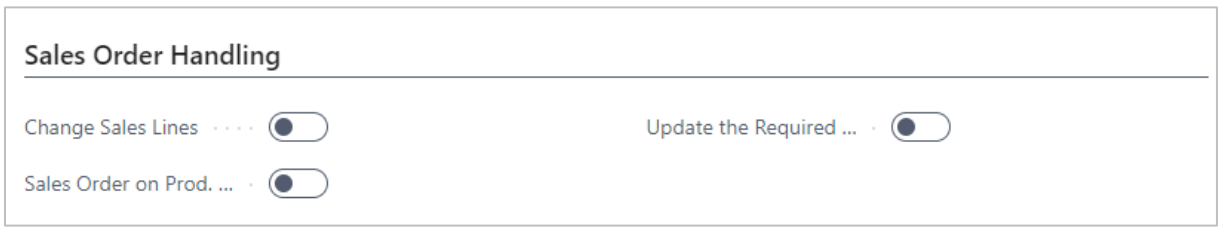
The calculation of the Earliest Start Date will be performed:

- whenever a “Refresh Production Order…” is run
- on changing the required due date
- on changing the custom value (date formula or multiplication factor)
- on performing a new action “Recalculate Earliest Start Date” on both the production order card and production order list as well as in the VAPS setup which the user can activate

5.14. The “Sales order handling” settings

Decide whether you want to

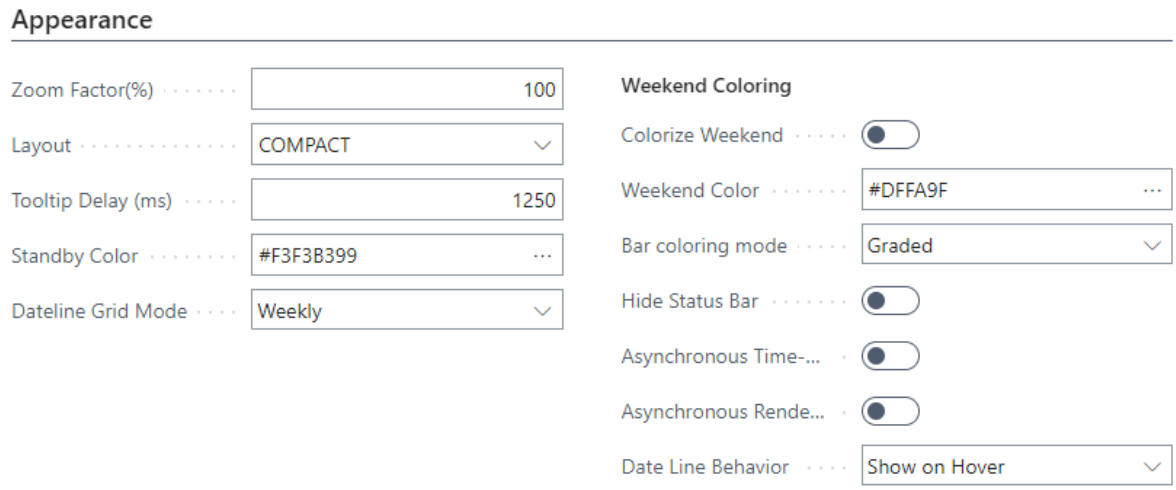
- keep reservations when production order due dates get shifted
- show the sales order number on the production order line
- automatically update the due date of a connected production order when sales order dates (Planned Delivery Date, Planned Shipment Date, Shipment Date) are postponed.



For more information, see here.

5.15. The “Appearance” settings

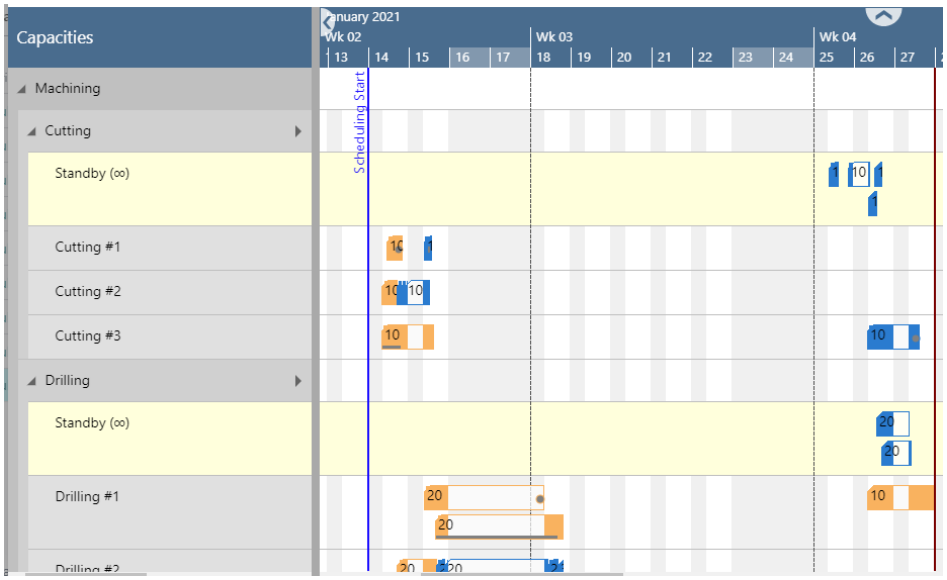
This area offers various setting options that affect the appearance of your plan



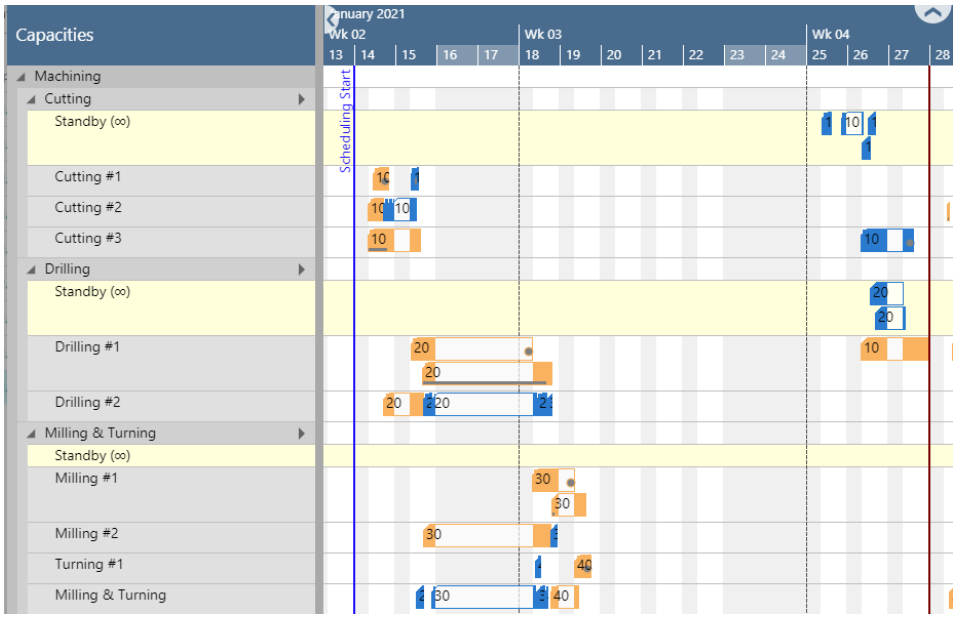
Here you can:

- Specify a **zoom factor** in percent.
- Choose a **layout**: In the "Compact" layout, the display is reduced as much as possible to provide a better overview, especially with large plans.

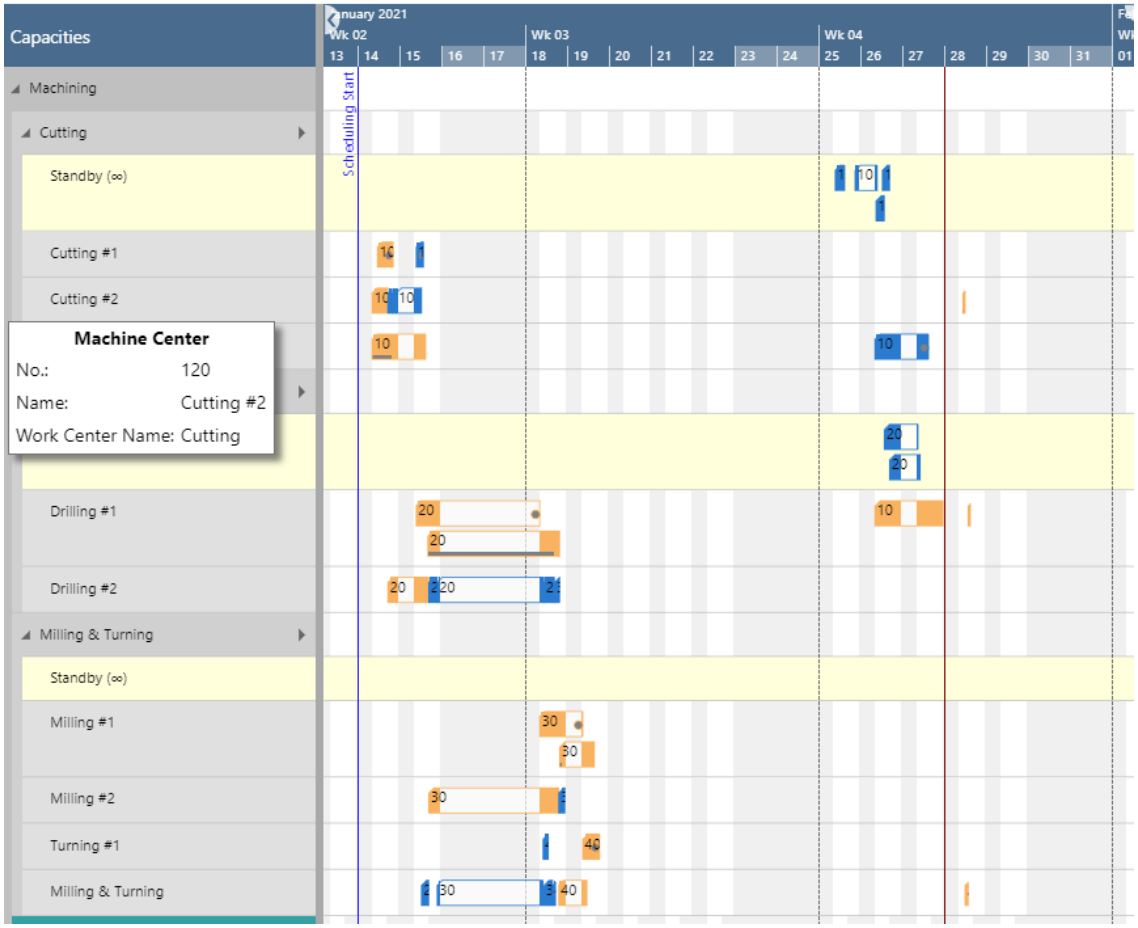
    - Standard layout, zoom factor 100 %:



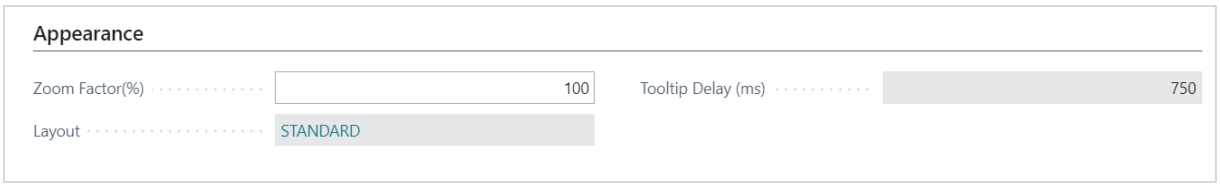
- Compact layout, zoom factor 100 %



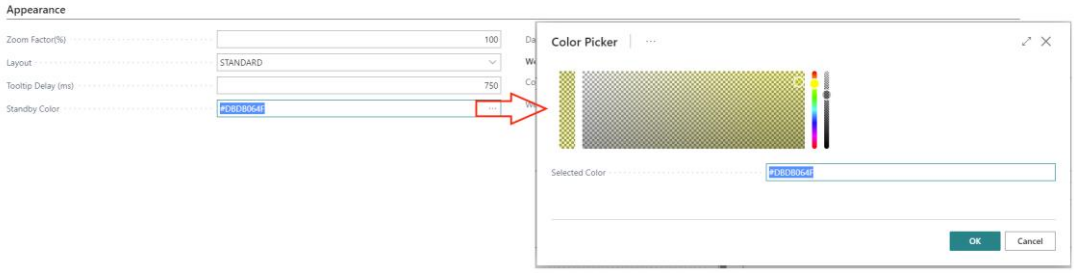
- Standard view, zoom factor 80 %



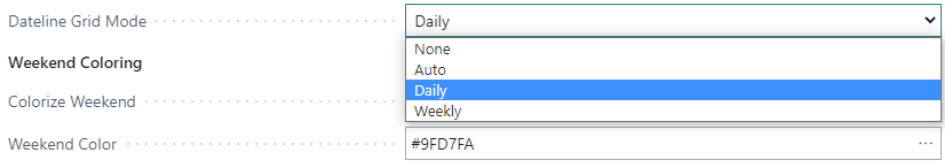
- Specify **a tooltip delay**: give a time in milliseconds after which the tooltip shall appear



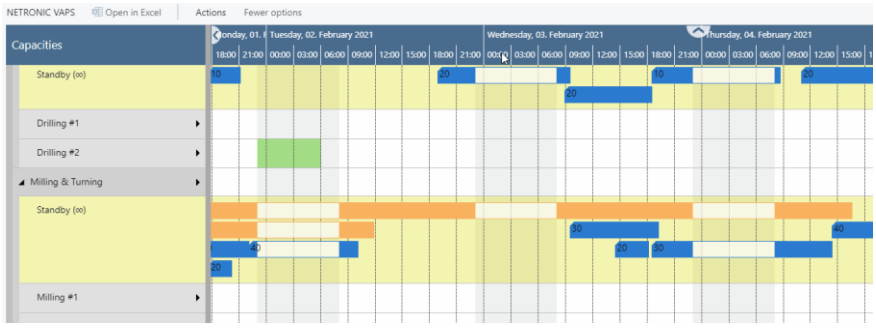
- Support of visual connection between timescale and diagram/ planning area
  - Select an individual background color and transparency degree for the **standby resource.** The procedure for editing the standby color is the same as for the weekend coloring (please see description there):



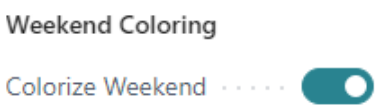
  - Chose a **date line grid mode** for the vertical separation lines between individually selectable intervals



  - The "Auto" mode causes the grids to automatically adjust to the resolution of the time scale resulting from zooming in or out.

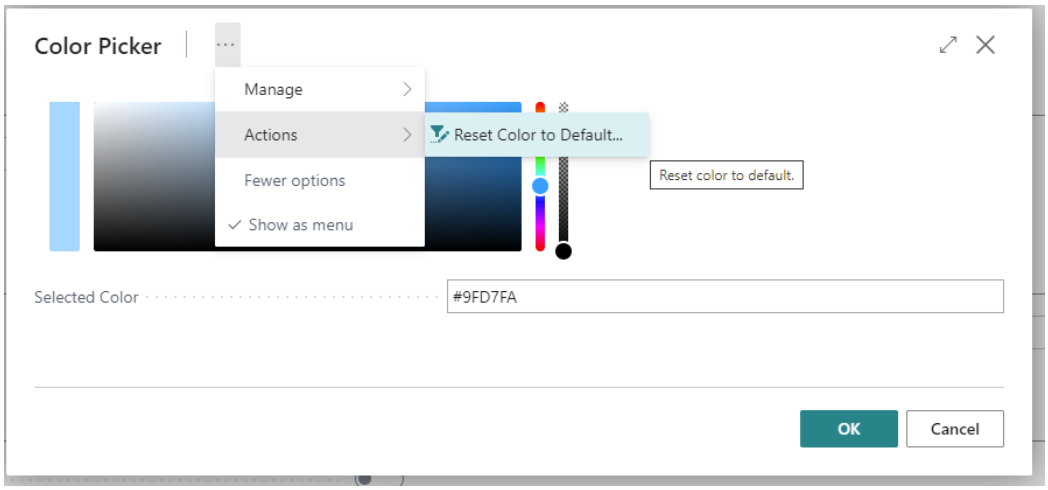


  - Make settings for the weekend coloring
    - Decide, whether you want to color the weekends individually:

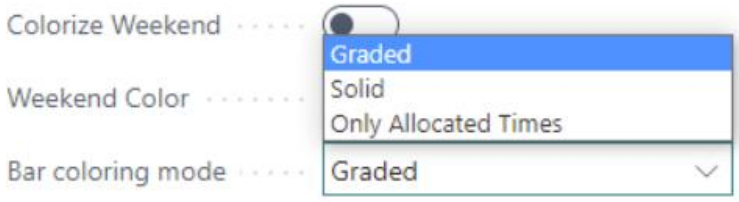


- Specify weekend color and transparency by clicking to open the "Color Picker"

- reset the weekend color to default comfortably and at one click:

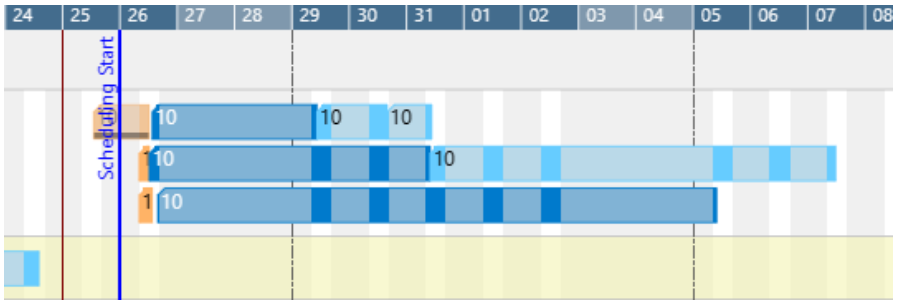


- Bar colors: Select individual bar color schemes that ensure that the label texts are always visible.

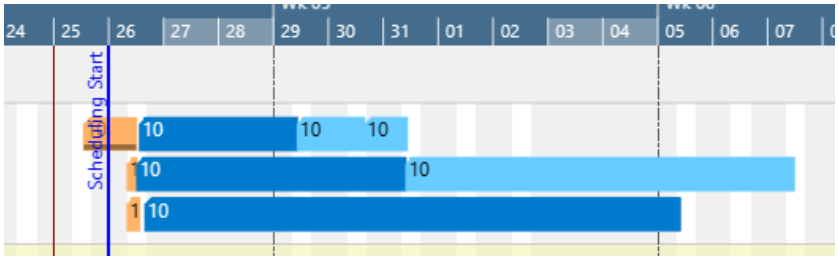


The options in detail:

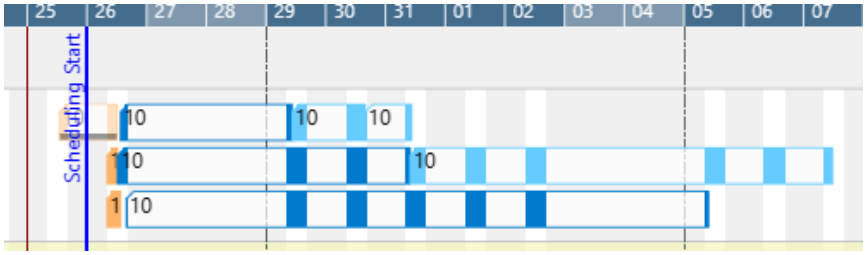
- Graded (default): nonworking times are displayed in a lighter shade of the main color; in case there are assignments during non-working periods they are drawn in the main color



- Solid: draws a continuous block in the main color

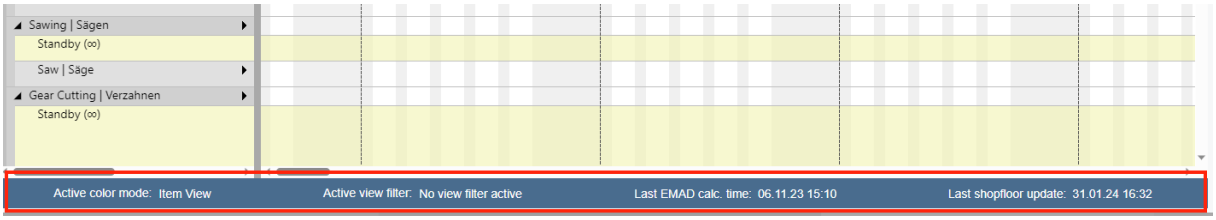


- Only Allocated Times: nonworking times appear with a white background



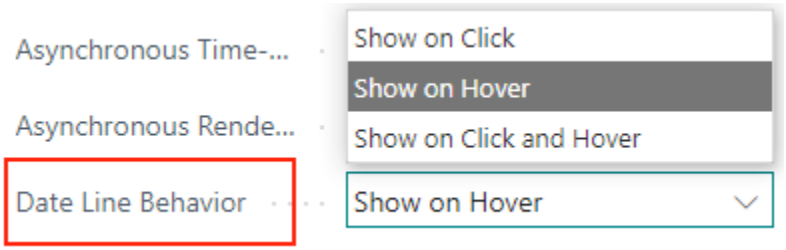
A note on transparency: weekends, standby and calendar grids may overlap and by setting the transparency the user can determine what should be hidden or what should shine through. For example, if you want to see the calendar grids or the weekends on the standby resource, you have to make the standby color translucent accordingly.

- Show/hide the status area below the visual schedule



- Improve visual responsiveness and performance when navigating big plans by ticking off/on the options:
  - Asynchronous Time-Area Stretching
  - Asynchronous Rendering

- Specify whether the date lines “Required Due Date” and “Earliest Start Date” get visualized by hovering above and/or by clicking the corresponding operation.



5.16. Show/hide the notifications window

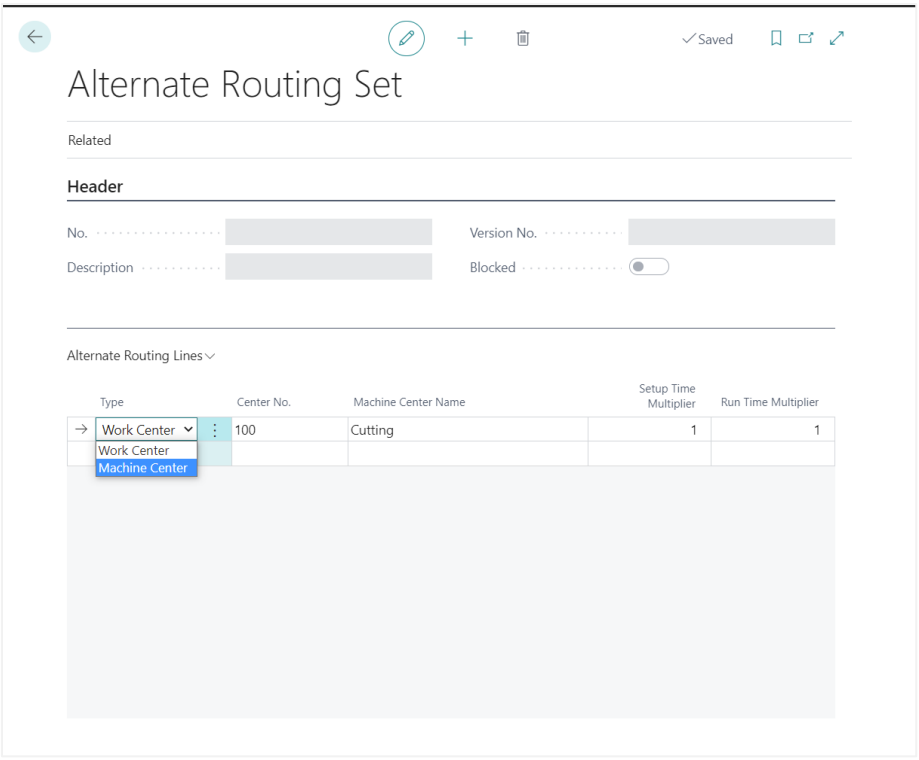
When simulations get **outdated or invalidated**, e.g., when you add or delete production orders, the VAPS shows a notification window, informing you about this:

If you don’t want this notification window to be shown tick the according option in the VAPS Setup dialog:

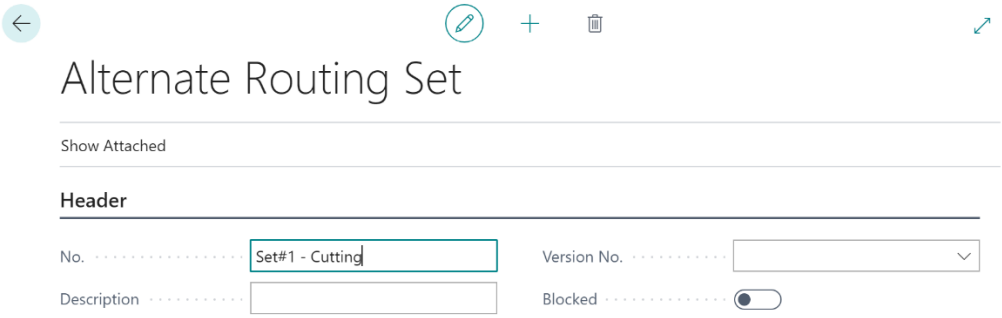
5.17. Define alternative routings/ alternative work/machine centers

You might have work/machines that can do the same job. With the alternate routing sets, you can define these alternatives. Plus: you can also define production (and setup!) coefficients if some work /machine centers can run faster than the others.

You can define alternative routings/ alternative work/machine centers on the "alternate routing set" page, which you can access from the NETRONIC VAPS menu, or by simply searching for "alternate routing set". The alternate routing set setup page looks as follows:



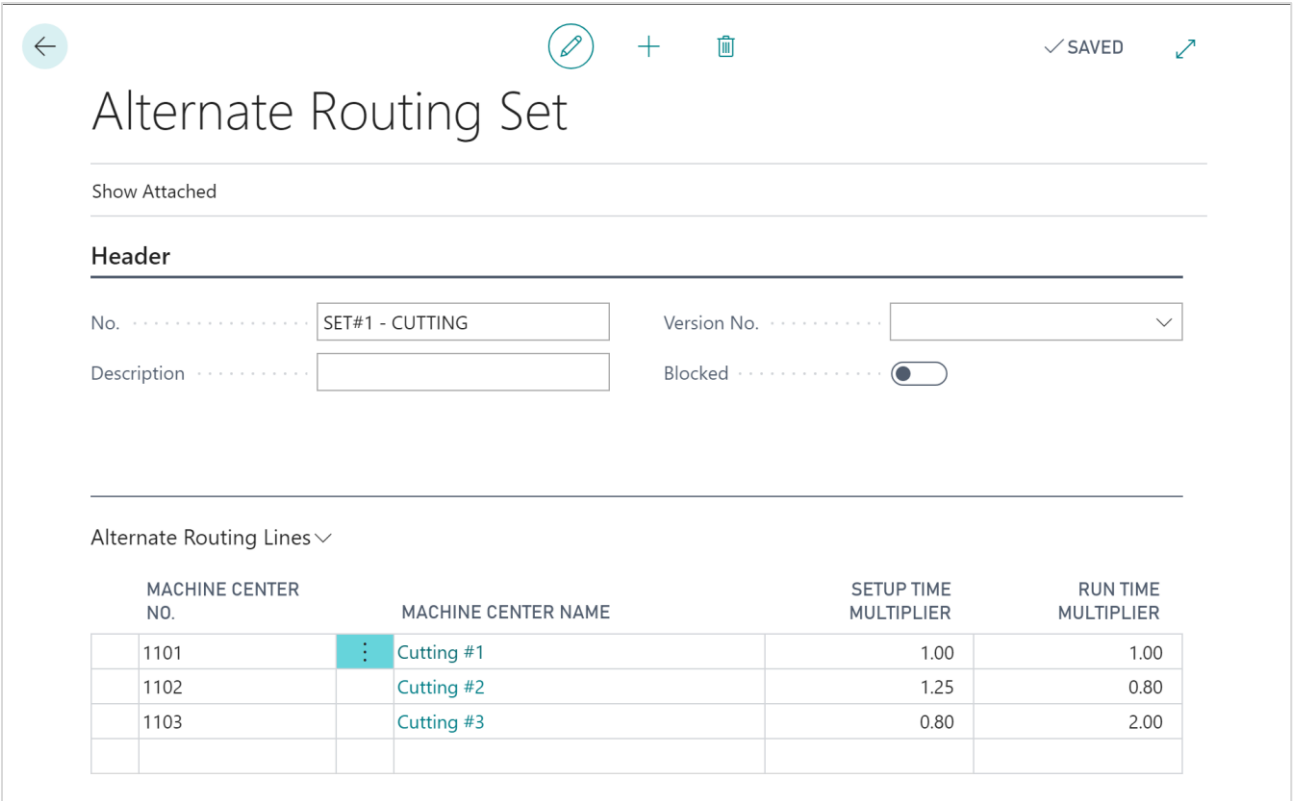
You then can create a new alternative routing set by clicking the "+" icon which you find at the top of the page. Then you need to give your routing set a unique number:



After that, you can add all those machines and/or work centers to the alternate routing set that can work as alternative resources within one routing.

However, you not just define the respective alternative resources. **In addition to this you can also define two different types of production coefficients:**

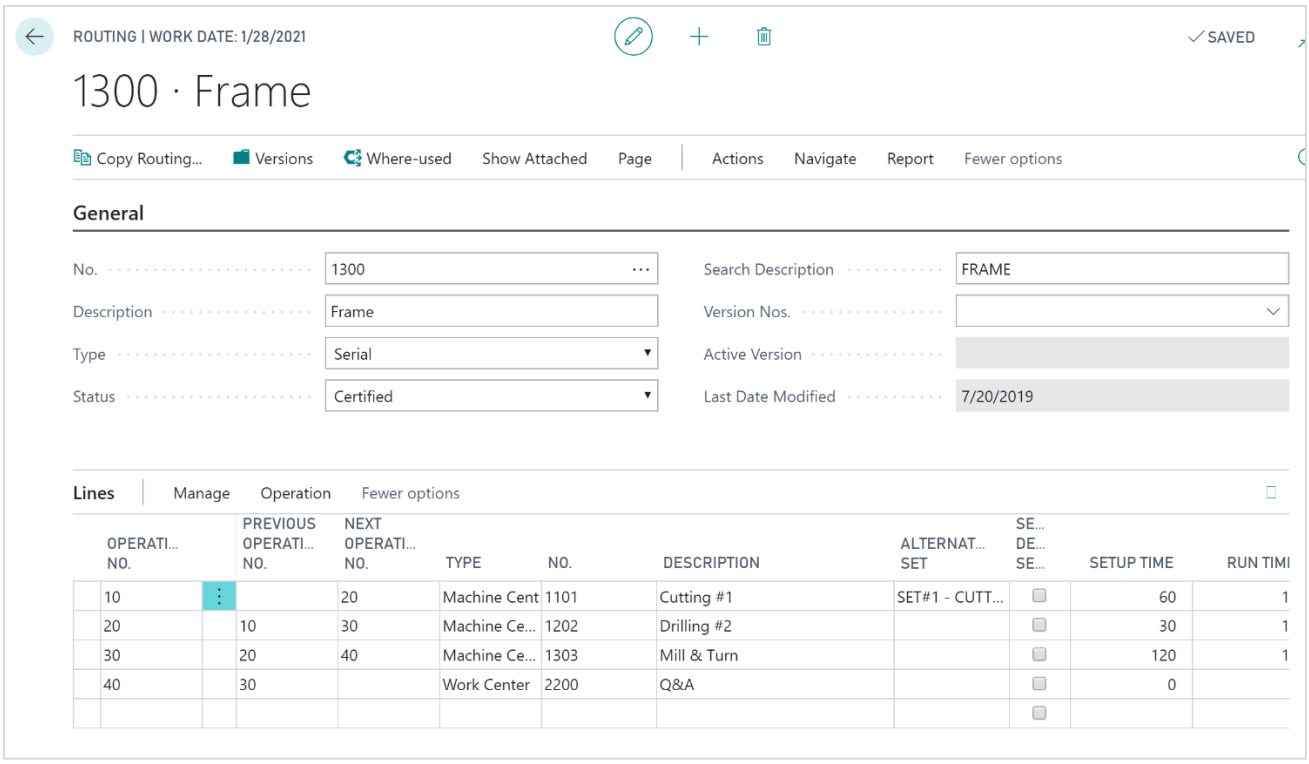
- The setup multiplier
- The runtime multiplier



In the above example, the alternate routing set "SET#1 - CUTTING" determines the following:

1. The machine centers 1101, 1102 and 1103 (cutting #1, cutting #2, and cutting #3) are alternative machines.
2. The machine center cutting #1 is the reference machine (both setup time multiplier and run time multiplier equal 1).
3. Cutting #2 takes 25% longer to set-up than cutting #1 but can run 20% faster (only takes 80% of the run time).
4. Cutting #3 can be set-up 20% faster than cutting #1 but runs 2x longer.

Once you defined an alternate routing set, you can add it to any routing that you have.



The above example shows the routing 1300 for the item frame. Operation 10 by default is assigned to machine center 1101 (cutting #1). However, you see that the "SET#1 - CUTTING" is also defined as the alternate set.

When you now create a new production order using this routing, and when you then (re)calculate the production order via the standard Business Central scheduling, the alternate set is added to the production order routing line of that production order.

Consequently, all alternative machine centers will get highlighted when you drag operation 10 of the routing in the planning board. Also, when you reassign it from cutting #1 to one of the alternative machine centers, the setup time multiplier and the runtime multiplier will get taken into account.

6. Integrating with Microsoft Dynamics 365 Business Central

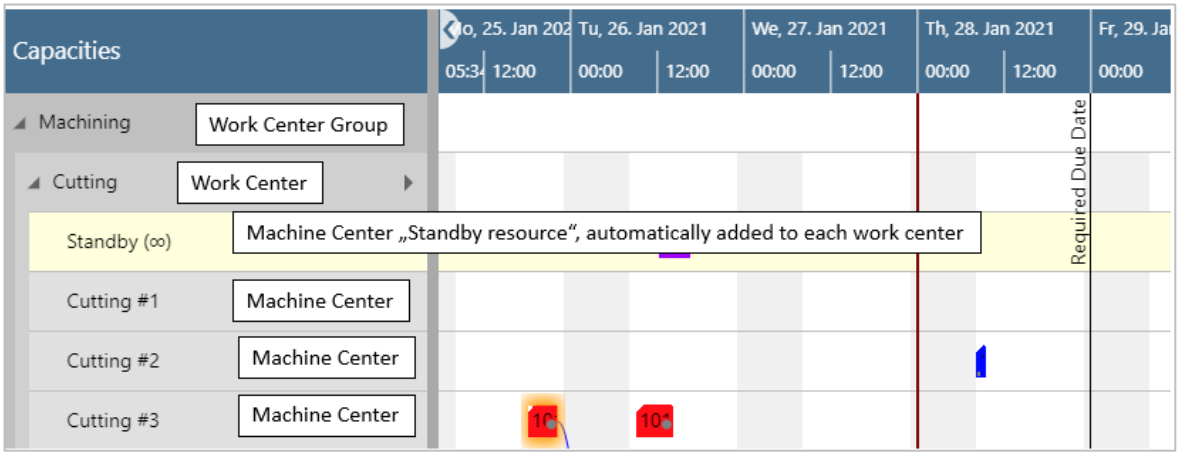
6.1. Integrating with Business Central standard manufacturing

The VAPS integrates with some standard Business Central tables & function:

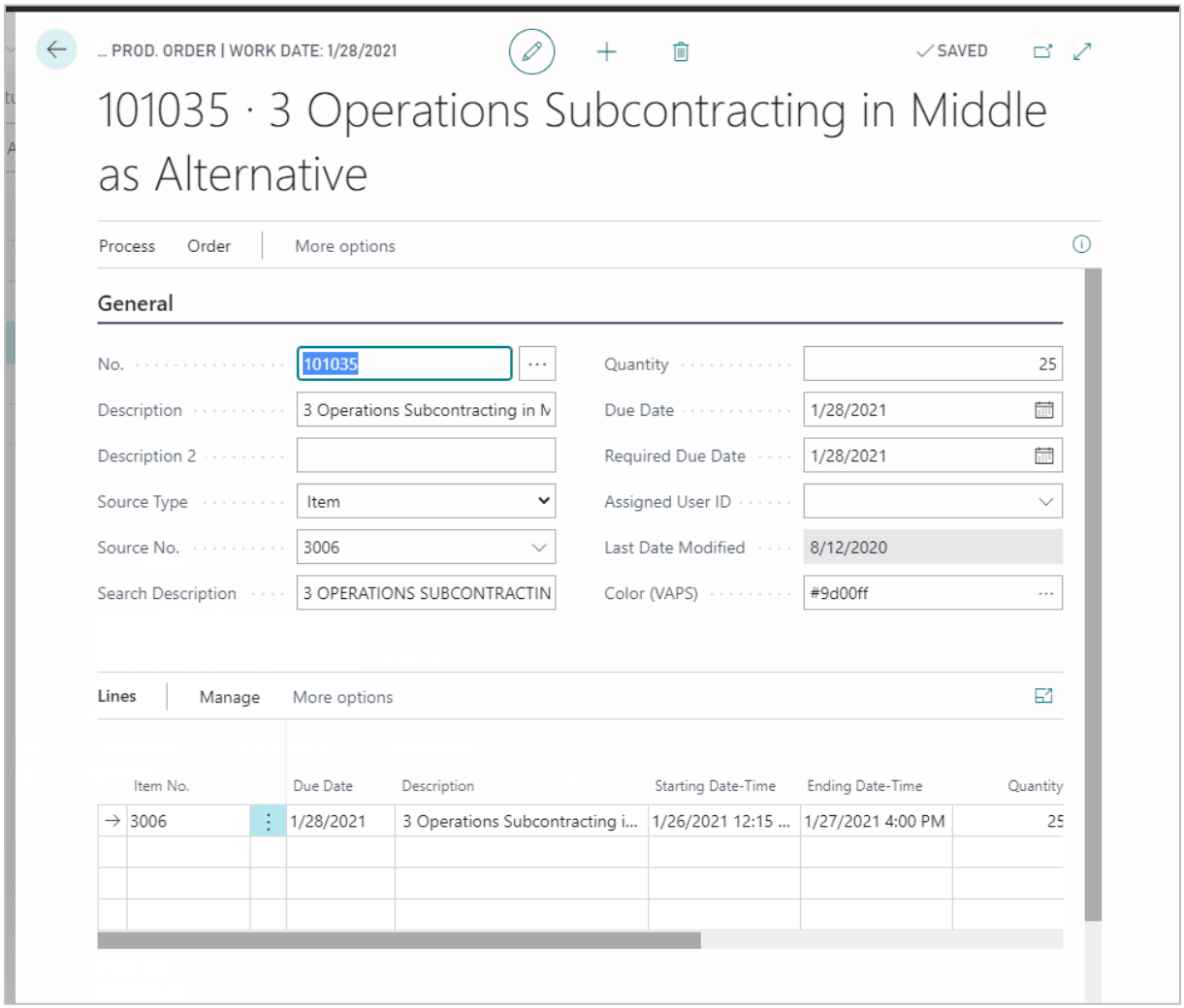
- Work/machine centers
- Shop calendars
- Production orders
- Routings

6.1.1. How does the VAPS integrate with work/machine centers?

In the plan, work center groups, work centers and machine centers are shown as follows:

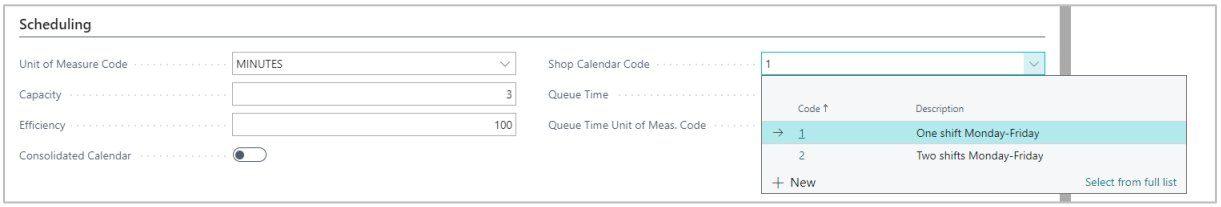


By double-clicking you can open the according Business Central card:



Shop calendars

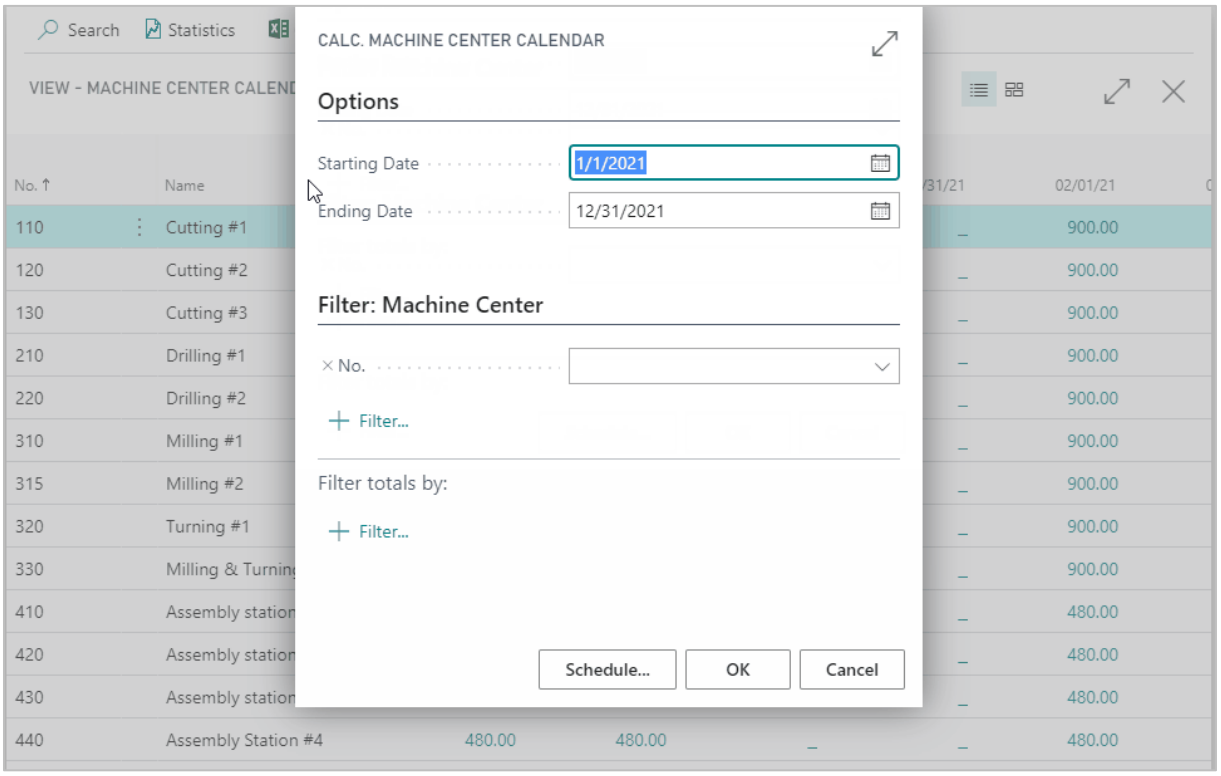
In Business Central, the work times come via the work center. This means, that you have to specify a shop calendar code on the Work Center card and this shop calendar code then defines the work times/non-work times.



Please note that you need at least one shop calendar code. If you have multiple work centers with multiple shifts you need multiple shop calendar codes.

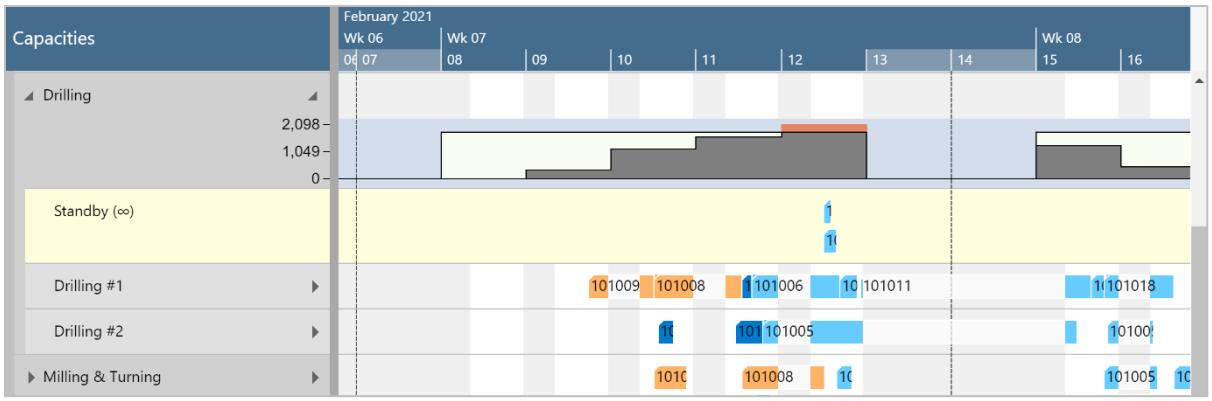
Add capacity to machine center

In addition, you'll have to update the capacity of the machine center. The machine center inherits the calendar of the work center, but you need to specify this on the machine center card.



The capacity curve

The capacity curve shows the capacity of a work center group. It is calculated by taking the capacity per day from the shop calendar and multiply it by the number of machine centers.



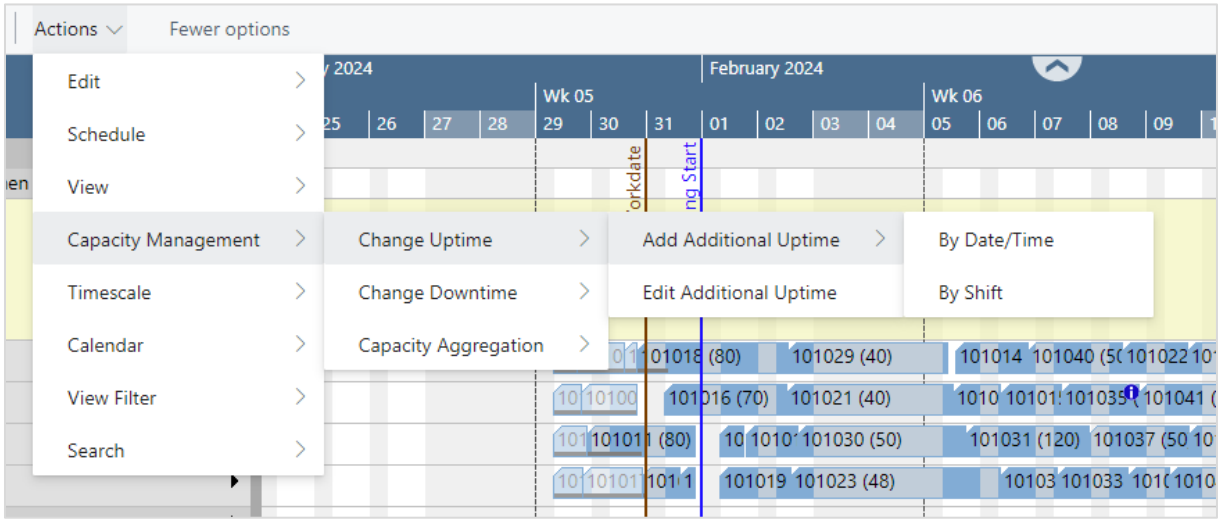
Add/remove work time

With the VAPS, you can comfortably define variations in capacity for multiple machine/work centers or entire shifts in one go.

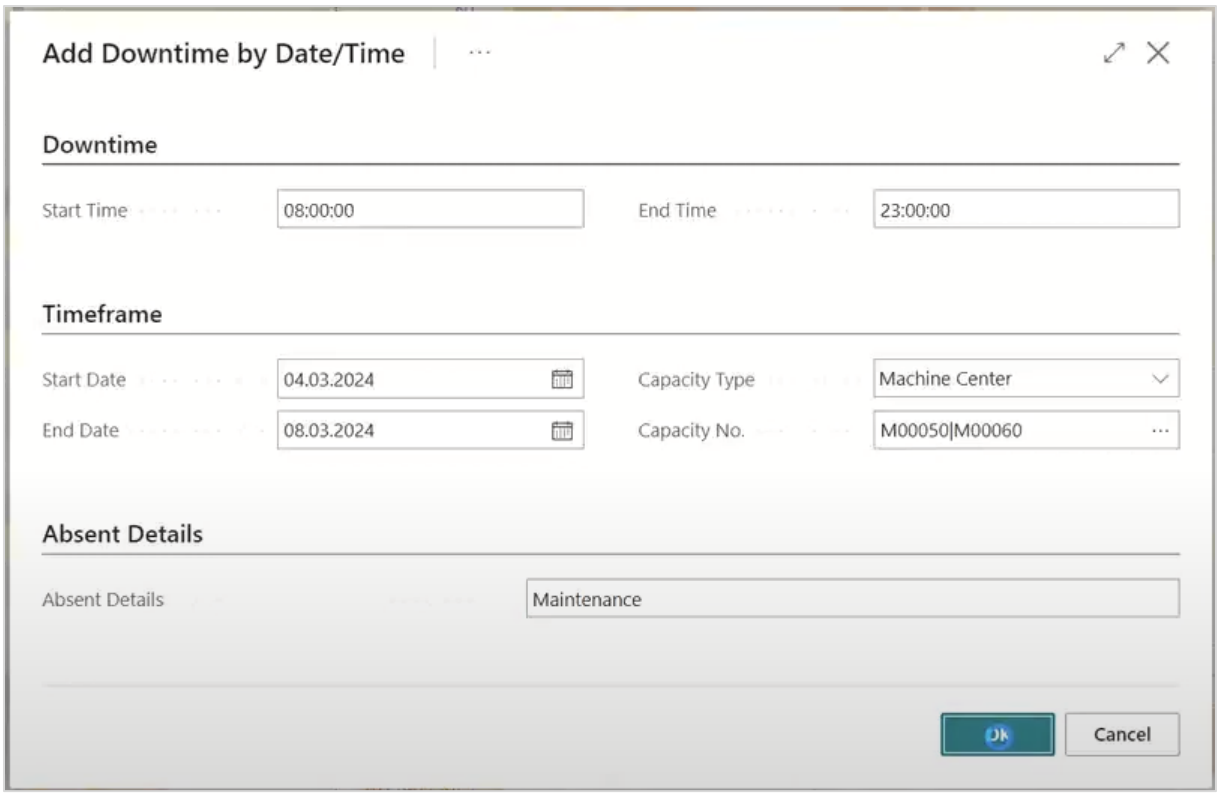
The VAPS lets you

- add/remove work time for multiple machine/work centers in one interaction
- add/remove work time for entire shifts by work shift codes for one or multiple machine/work centers

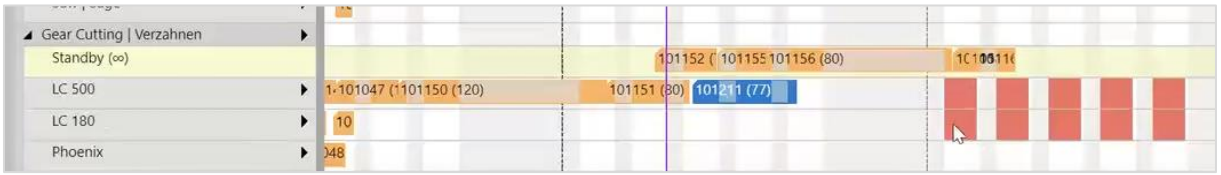
Both options can be found under the "Actions" menu entry "Capacity Management"



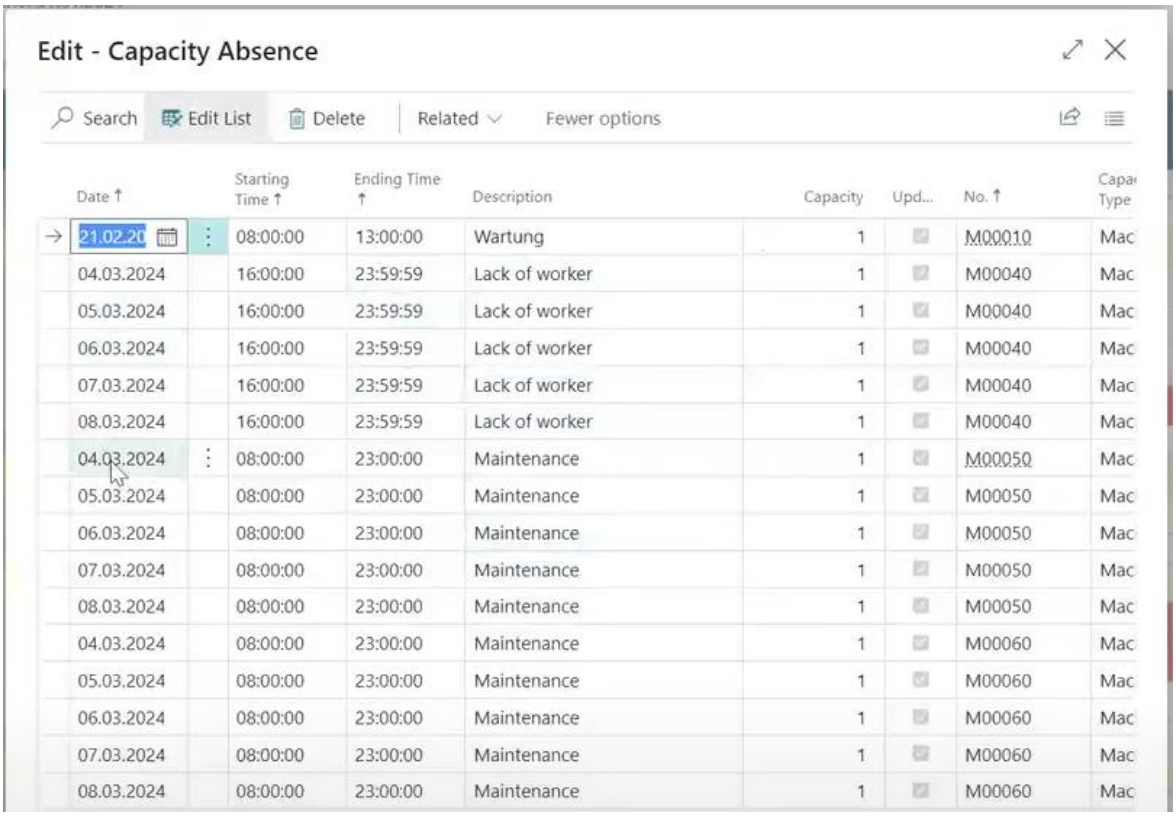
In the picture below, downtimes have been added by date/time for two machine centers:



This is what the result looks like:



In the "Edit" dialog, you can change all your up/downtimes:



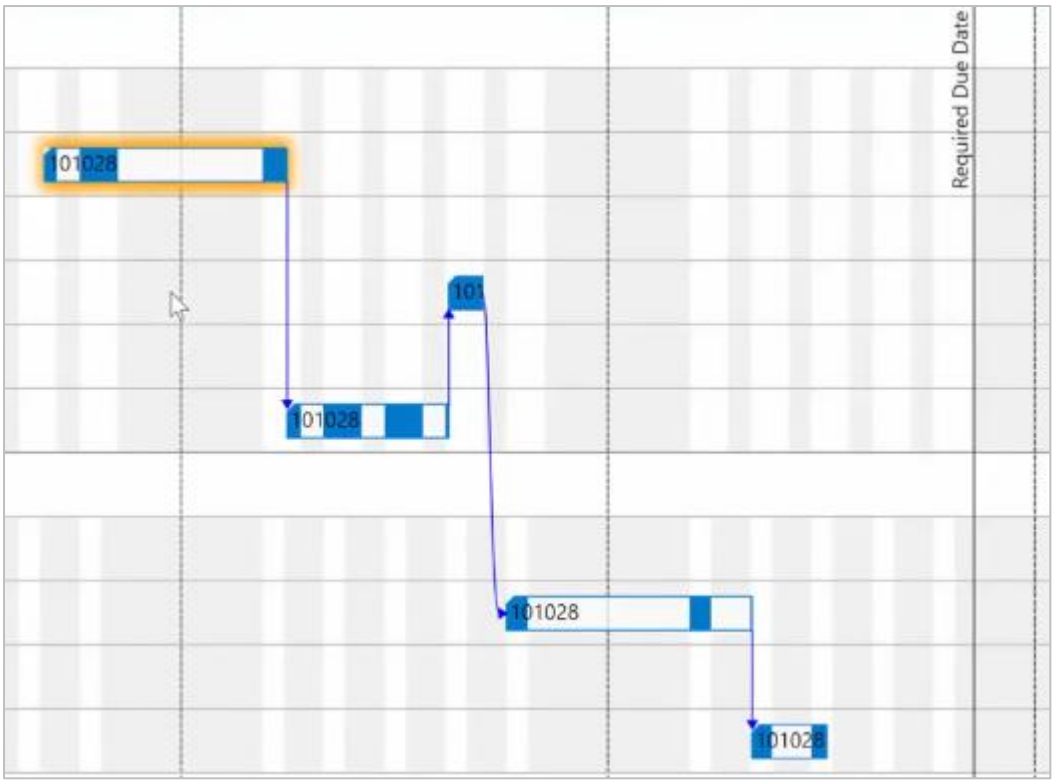
Date	Starting Time	Ending Time	Description	Capacity	Upd...	No.	Capa Type
21.02.20	08:00:00	13:00:00	Wartung	1		M00010	Mac
04.03.2024	16:00:00	23:59:59	Lack of worker	1		M00040	Mac
05.03.2024	16:00:00	23:59:59	Lack of worker	1		M00040	Mac
06.03.2024	16:00:00	23:59:59	Lack of worker	1		M00040	Mac
07.03.2024	16:00:00	23:59:59	Lack of worker	1		M00040	Mac
08.03.2024	16:00:00	23:59:59	Lack of worker	1		M00040	Mac
04.03.2024	08:00:00	23:00:00	Maintenance	1		M00050	Mac
05.03.2024	08:00:00	23:00:00	Maintenance	1		M00050	Mac
06.03.2024	08:00:00	23:00:00	Maintenance	1		M00050	Mac
07.03.2024	08:00:00	23:00:00	Maintenance	1		M00050	Mac
08.03.2024	08:00:00	23:00:00	Maintenance	1		M00050	Mac
04.03.2024	08:00:00	23:00:00	Maintenance	1		M00060	Mac
05.03.2024	08:00:00	23:00:00	Maintenance	1		M00060	Mac
06.03.2024	08:00:00	23:00:00	Maintenance	1		M00060	Mac
07.03.2024	08:00:00	23:00:00	Maintenance	1		M00060	Mac
08.03.2024	08:00:00	23:00:00	Maintenance	1		M00060	Mac

6.1.2. Production orders

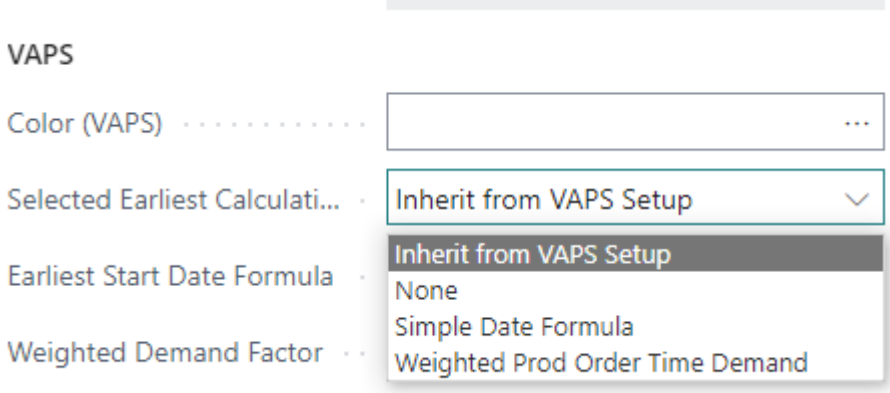
Production orders are represented in the VAPS by the bars of the single operations. Double-clicking a bar will open the respective card:

The following production order data are visualized in the plan:

- production order number: displayed on the bars
- starting date/time - when the first operation of the production order starts
- ending date/time - when the last operation of the production order starts
- required due date, a field added by us : symbolized by a vertical line, shown for the production order just selected
- order in which operations are worked off, coming from the routing - visualized by links



- **Earliest start date calculation type**: the VAPS allows to calculate the earliest start date on production order level automatically. The default settings being valid for all production orders are made in the according area in the VAPS setup dialog.
  However, users also have the option to customize settings for individual production orders, which will overwrite the default settings from the dialog.

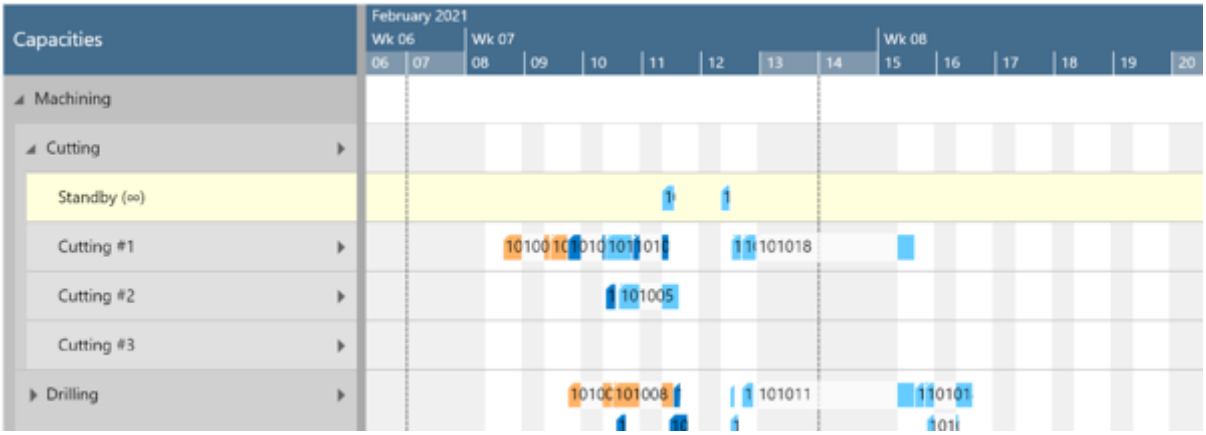


Detailed information about the automatic calculation of the earlies start date can be found here.

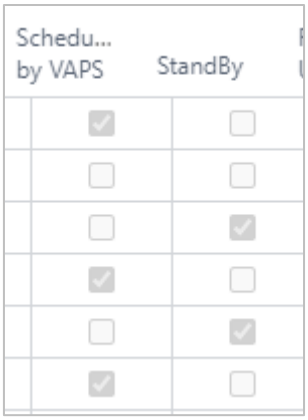
6.1.3. Standby resource

The standby resource contains all production order routing lines/operations that are not yet scheduled from within the VAPS, and hence are just scheduled by the Business Central scheduling run.

The standby resource gets highlighted by a yellow background (and an infinity symbol next to its name in the table part):



You can also get an overview of orders that are not yet scheduled by the VAPS in the simulation data:



6.2. Output and consumption postings

Output and consumption postings can be seen as information about the progress of your production execution. When you post output or consumption on your production order line you basically tell your system that you started or finished an operation or that you have achieved a certain percentage of completion.

6.2.1. Fundamentals on output/consumption postings:

- Output/consumption postings can happen very often, sometimes, even automatically
- They reflect a constant data updating process
- No impact on an existing simulation:
  - The simulation doesn't get outdated
  - The simulation doesn't get invalid
- The progress information you see in the visual schedule is about the moment in time when you created your simulation.
- After posting output/consumption you have to create a new simulation

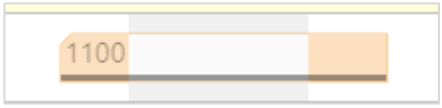
6.2.2. The impact of the production order status

- You can only post output and consumption to a released production order
- Any output/consumption posting on a released production order results in showing a progress bar in the VAPS

6.2.3. Visualization of progress information in the VAPS

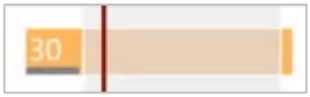
For production order routing lines of released production orders, a slim progress bar is displayed below the actual bar being based on the posted quantity consumption. The color of the progress bar appears as follows:

- finished: black and grayed out



- still in progress and output/consumption <= originally planned quantity: grey

- still in progress and output/consumption > originally planned quantity: red



Please note, that

- you can only post output and consumption to a released production order
- 0perations that are already in progress, cannot be moved any more
- the percentage of completion is shown in relation to the net working time.

6.2.4. Special case: Posting on an operation that is still on the standby resource

This is a rare case that normally should not happen, but you need to be aware of it.

Important to know

- If you post output/consumption on an operation that is still on the standby resource, this operation gets automatically moved to the machine center that is specified in the routing because if an operation is started (what the posting means) it de facto cannot be on the standby resource any longer.
- If there already is another operation on this specific machine, this could result in an overload which the planner has to fix manually.

6.3. Integration with MRP/planning worksheet

The VAPS/MRP integration establishes clear rules as to which production orders belong into the VAPS area of responsibility and hence have to be untouched by the planning worksheet.

With this functionality we wanted to overcome the constant battle between planning and scheduling, and the VAPS offers a close cooperation and interweaving between the finite capacity scheduling (VAPS) and the planning worksheet (MRP).

The VAPS is responsible for the shorter-term finite capacity scheduling, whereas MRP and the planning worksheet are responsible for the mid-term demand planning. The VAPS/MRP integration establishes clear rules as to which production orders belong into the VAPS area of responsibility and hence have to be untouched by the planning worksheet.

We determine this by two parameters:

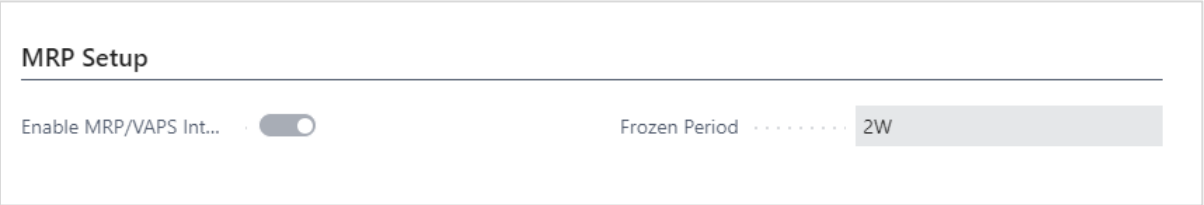
- Timeframe (we introduce a "frozen period" as a period in which production orders will not get changed by MRP)
- Production order status

The below chart summarizes these areas of responsibility:

TIMEFRAME	PRODUCTION ORDER STATUS: Released	Firm Planned	Planned
In frozen period	VAPS	VAPS "Planning flexibility" is set to "none" when simulation is published **and** next regenerative plan is created	MRP / planning worksheet
After frozen period	VAPS	MRP / planning worksheet	MRP / planning worksheet

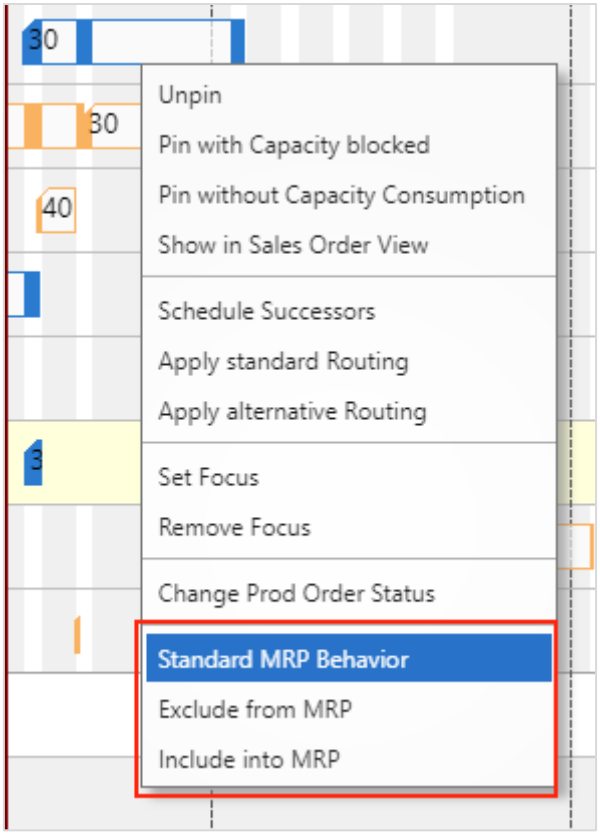
6.3.1. Here is how we implemented this concept in the VAPS:

For the needed settings, we have implemented a corresponding area in the VAPS Setup dialog:



Here, you can

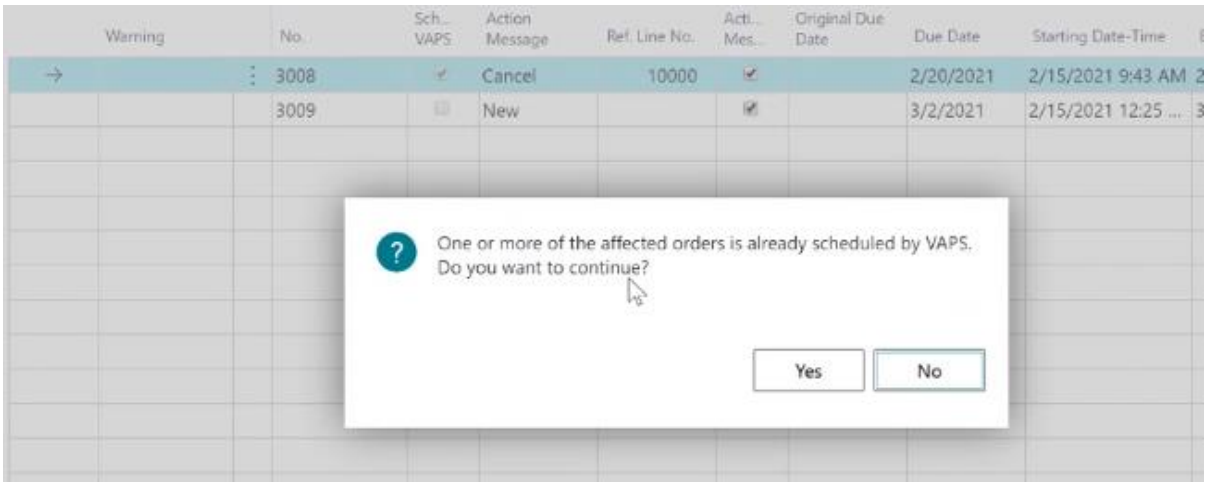
- enable/disable the MRP/VAPS integration
- Define a **frozen period** relative to the work date, meaning the period in which the VAPS is responsible and production orders remain **untouched** by the planning worksheet.
- Select the according options from the enhanced context menu which fits your situation to **allow deviations from standard rules** concerning the VAPS/MRP integration:



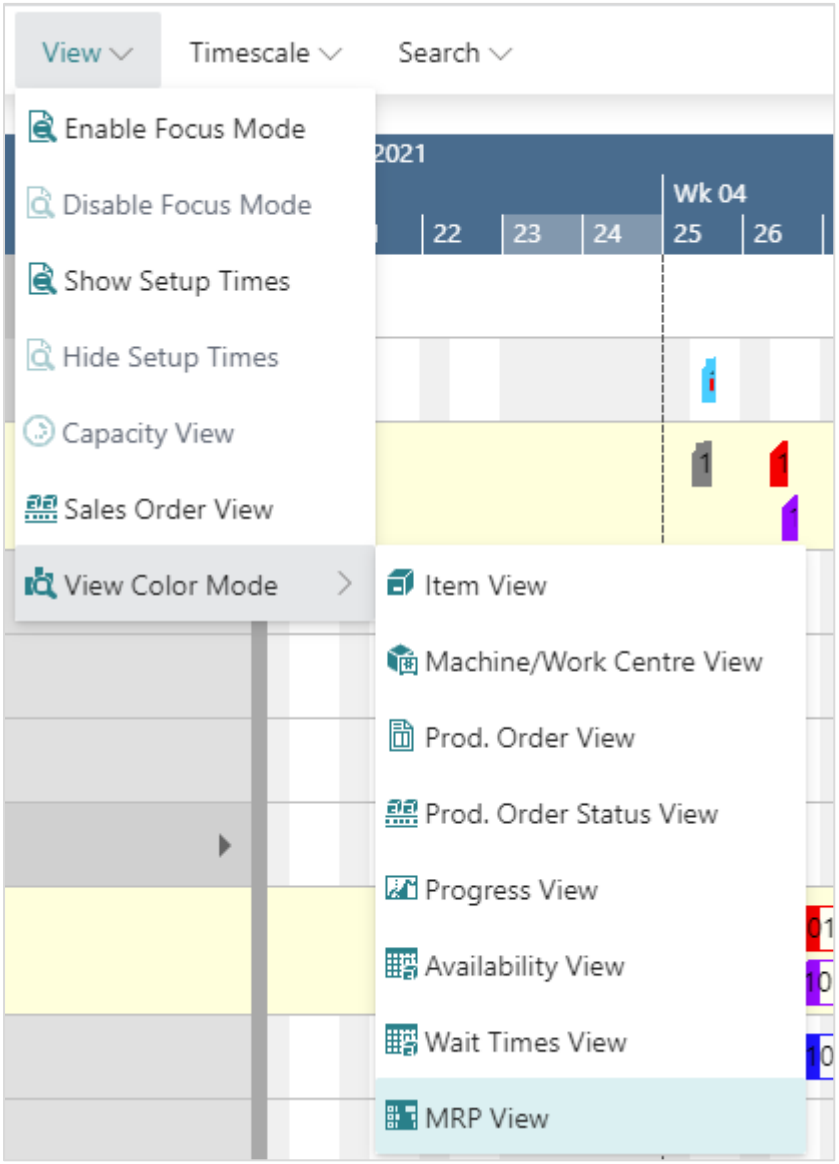
- Check in the enhanced planning worksheet which production orders are scheduled by VAPS.

Warning	No.	Scheduled VAPS	Action Message
	1000	☑	Cancel
	LS-10PC	☐	New
	LS-10PC	☐	New
Emergency	LS-120	☐	New
	LS-120	☐	New
	LS-150	☐	New

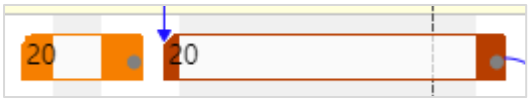
- When action messages are carried out, a warning message is given that this might change production orders that are scheduled by the VAPS.



- The color scheme "MRP" view helps you to quickly differentiate production orders that belong to the VAPS area of responsibility from those that belong to the MRP area of responsibility.



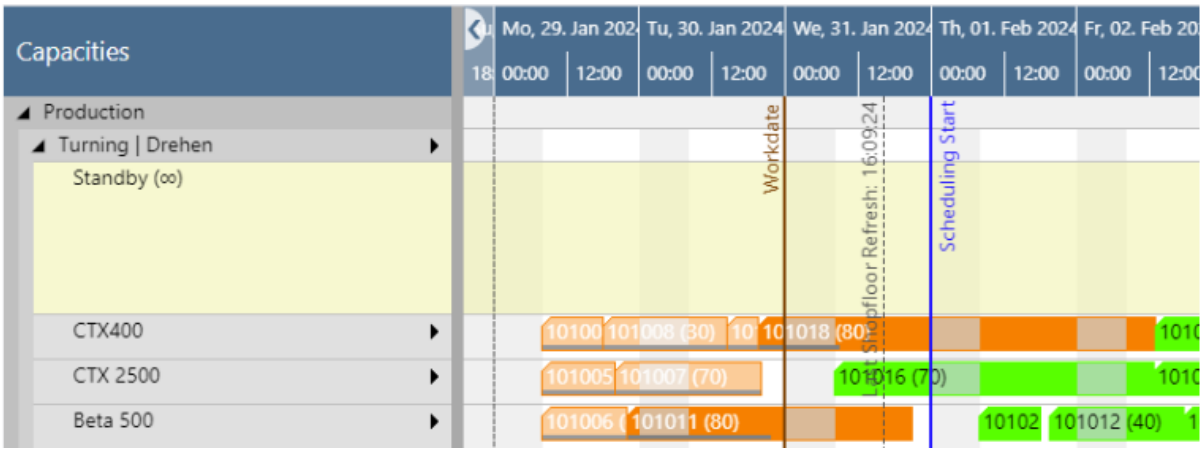
The darker red shows that for this production order you have set an exception to the standard rule by context menu as described above



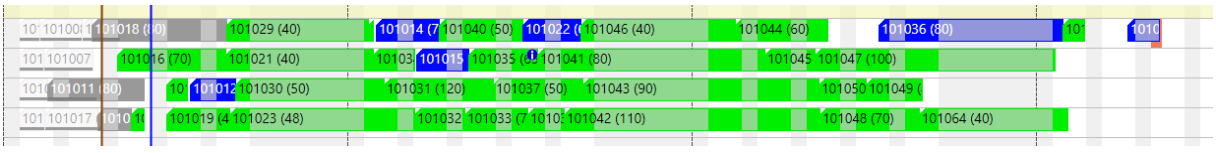
6.4. Integration with shopfloor data

Customers need and want to update their schedule based on actual data and if unexpected incidents happen on the shopfloor, they want to quickly see the impact on the schedule. This is exactly what this functionality offers. For easy and comfortable use, we implemented the following features:

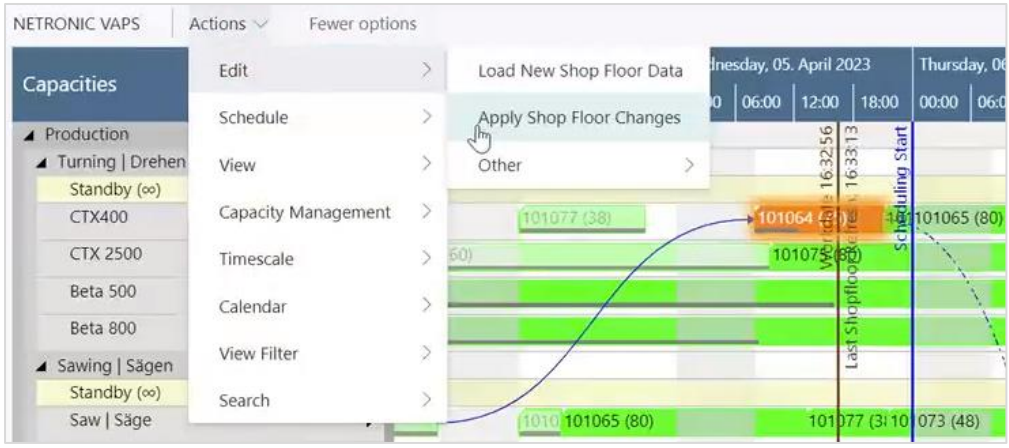
- Capability to load recent shop floor data (capacity ledger entries) into simulation
- Special color mode "Shop Floor Status View" to highlight deviations between actuals and schedule. The below screenshot shows the "Shop Floor Status View" with the default colors applied



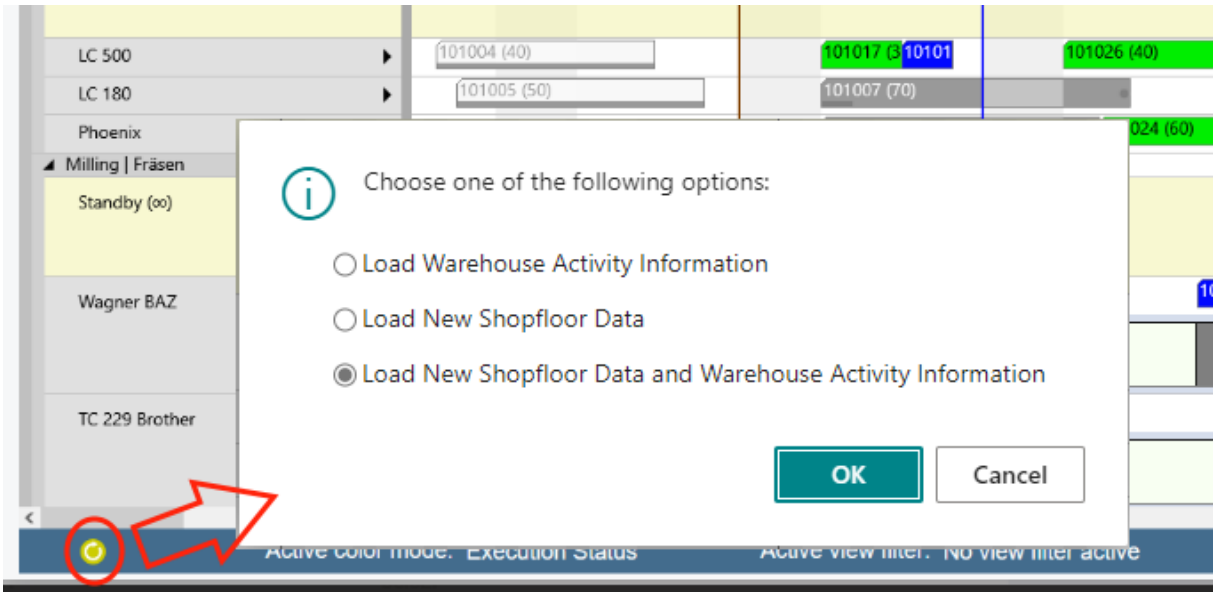
- Color mode "Execution Status View" to give feedback on the operations' status on the shop floor: "ready to get in progress", "in progress", "finished", and the "rest".
  The screenshot below shows the "Execution Status" view with the default colors applied:



- Option to (automatically) update the schedule based on actuals, either via the "Actions" menu or via the context menu
  - information from capacity ledger entries gets written into the production order routing lines
- Vertical line indicating when the last "update according to actuals" was made



- Button in the status bar that turns yellow, when new warehouse acitvity line or shopfloor data is available. By clicking this button, users can also initiate these actions in addition to using the existing “Action” menu entries.



6.5. Integration of sales orders and production orders

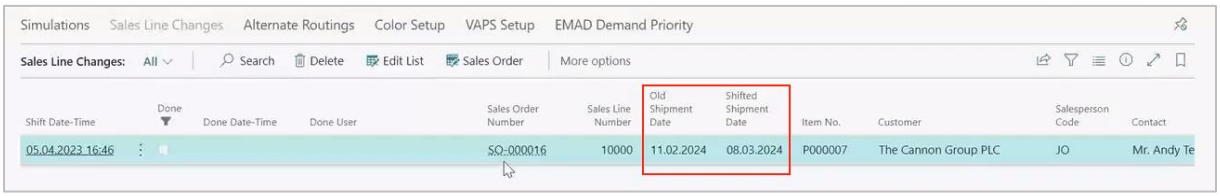
Planners do not want reservations between production orders and sales orders to break if there are delays in production. Finite Capacity Scheduling Instruments. Instead, they want to quickly understand which sales orders run late due to material and/or capacity constraints.

To solve these problems, the VAPS offers an (optional) integration of sales orders and production orders with the following functionalities:

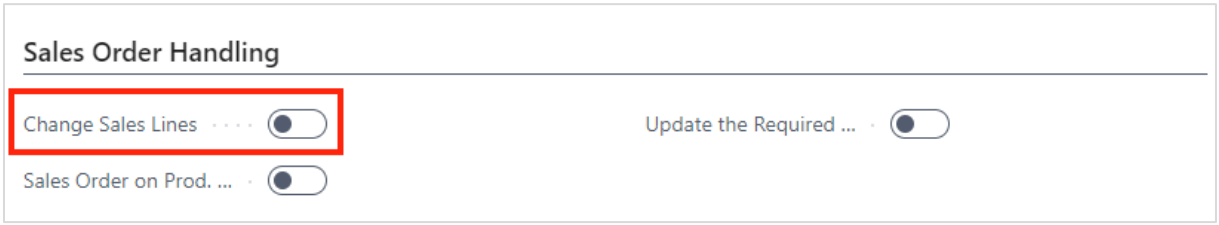
- The automatic shift of sales order expected shipment date in case production orders have to get shifted

- Reservation between production orders and sales orders is being kept although the production order due date > original sales order expected shipment date

- Comprehensive report to see which sales orders have been shifted due to production order shifts

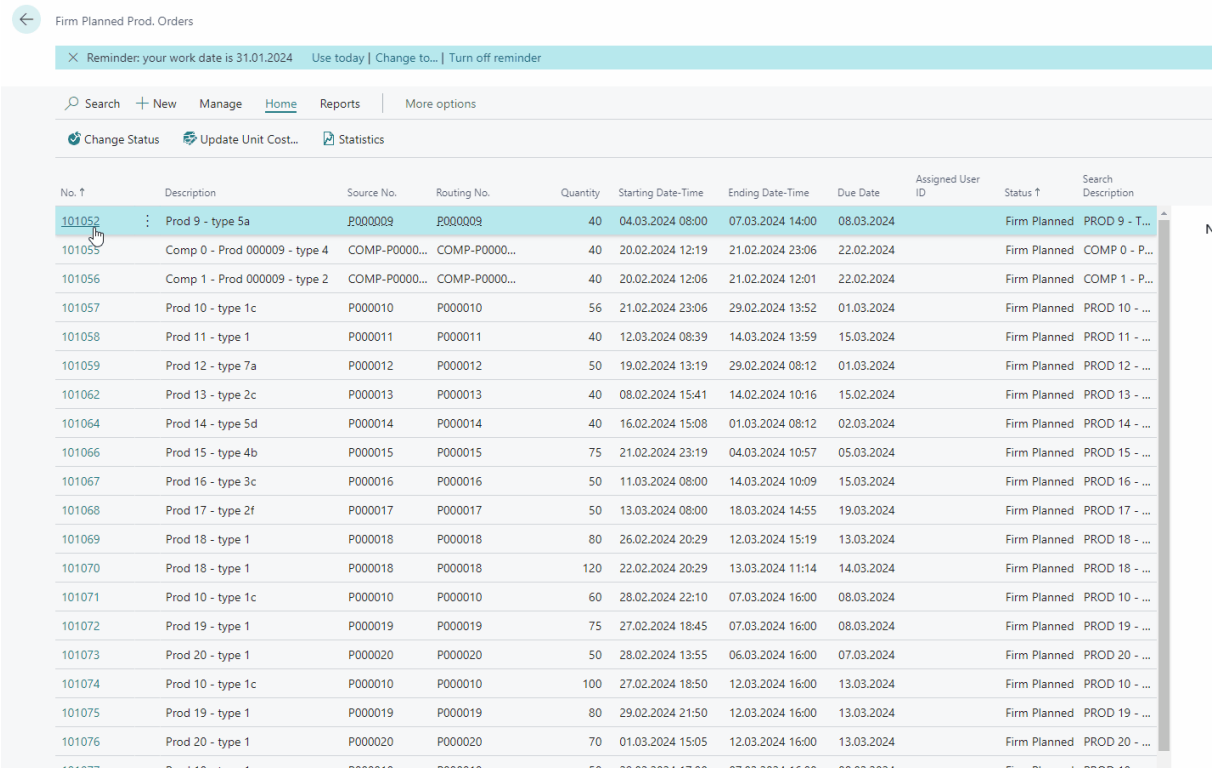


This functionality has to be enabled in the "Sales Order Handling" area of the VAPS setup:

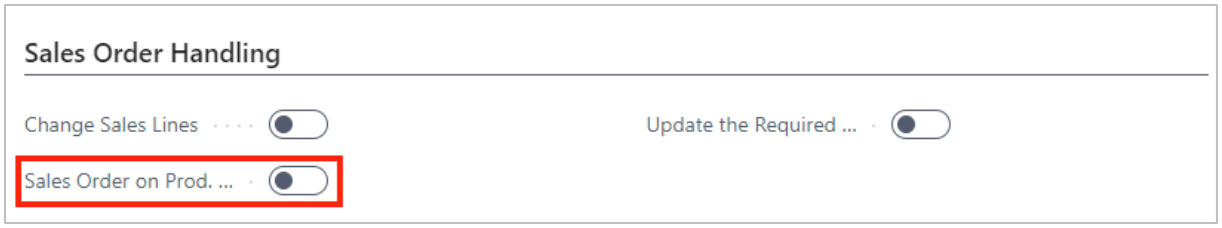


6.6.Show sales order number on production order line

With this function we further expanded the integration of production orders and sales orders, making the connection shown already on the according production order line card. What is more, you can also directly open the sales order from here:

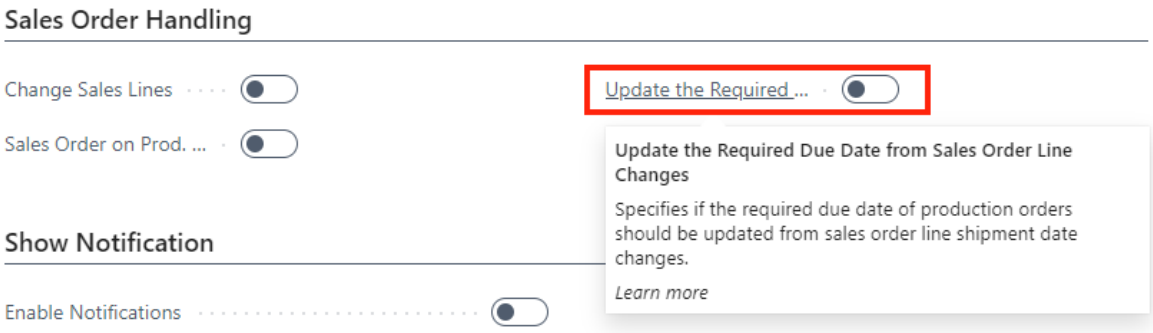


This function has also to be activated in the "Sales Order Handling" area of the VAPS setup.



6.7. Reflect sales department updates in the production schedule

This feature automatically updates the due date of a connected production order when sales order dates (Planned Delivery Date, Planned Shipment Date, Shipment Date) are postponed. This ensures that the production schedule accurately reflects updates made by the sales department. Please note that the new feature only covers situations where sales lines are postponed. If they are moved to an earlier date, the production orders are not rescheduled automatically, which may result in schedule conflicts and the removal of reservations. The feature is disabled by default and can be activated in the VAPS Setup dialog:

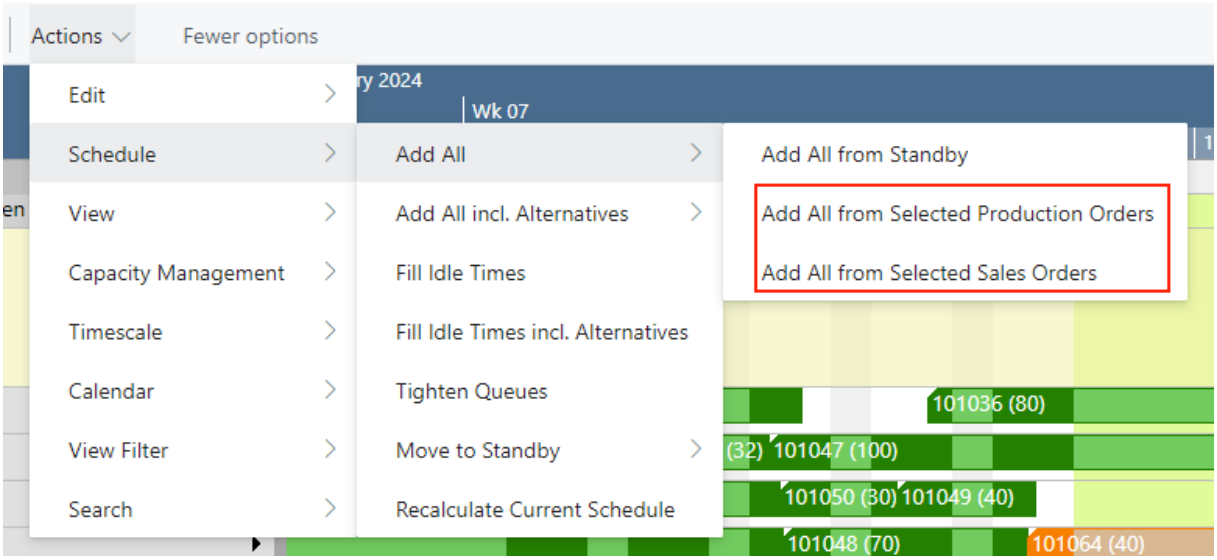


6.8. Planning per sales orders

Sales orders can have different priorities and planners often like to schedule them en bloc based on these priorities. This would ensure that the next free capacity is used in the best possible way for the corresponding sales order.

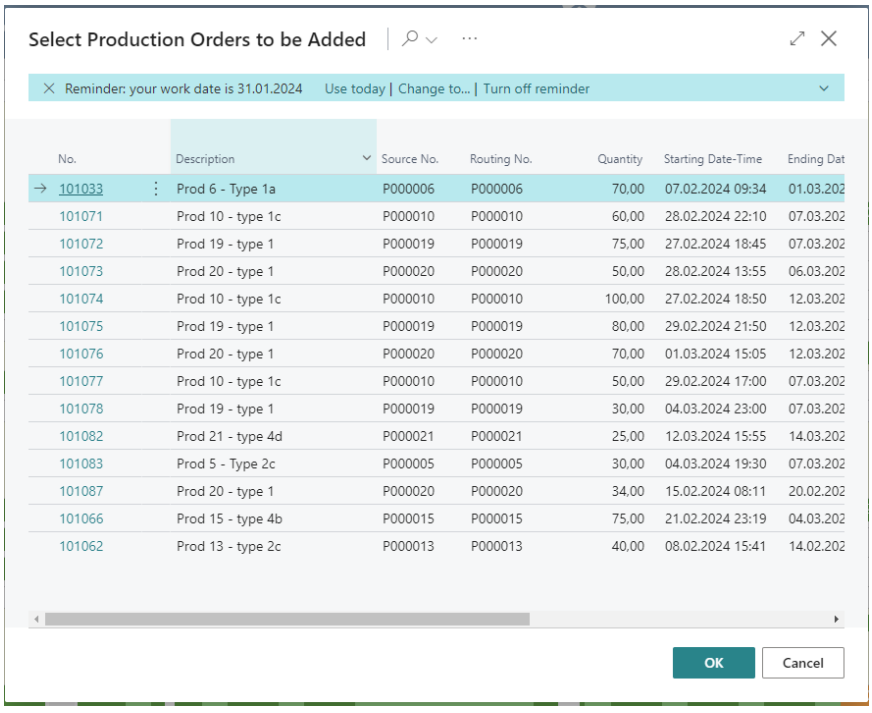
But, however, what if a sales order consists of, let's say, 40 items that on the other hand lead to 40 production orders? This is where it gets difficult because these 40 production orders are on Standby with the other production orders.

Two according options in the "Add all" and "Add all incl. alternatives" menus offer to solve this problem:



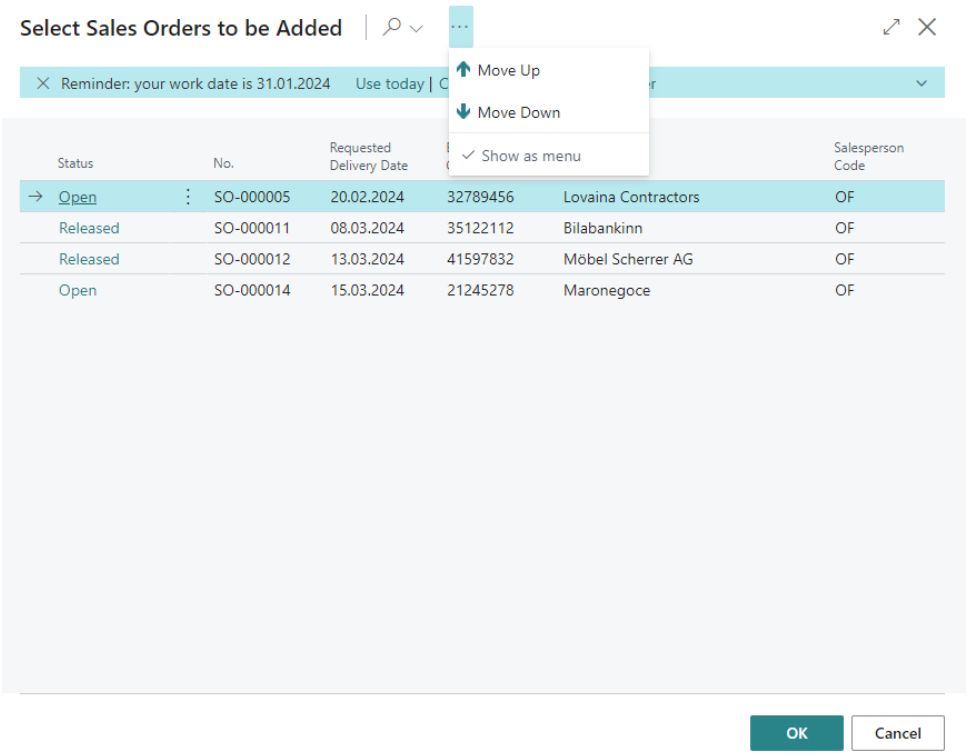
The options in detail:

- "Add all from selected production orders" shows a list where you can select from all production orders where at least one operation is still on standby:



No.	Description	Source No.	Routing No.	Quantity	Starting Date-Time	Ending Dat
101033	Prod 6 - Type 1a	P000006	P000006	70,00	07.02.2024 09:34	01.03.202
101071	Prod 10 - type 1c	P000010	P000010	60,00	28.02.2024 22:10	07.03.202
101072	Prod 19 - type 1	P000019	P000019	75,00	27.02.2024 18:45	07.03.202
101073	Prod 20 - type 1	P000020	P000020	50,00	28.02.2024 13:55	06.03.202
101074	Prod 10 - type 1c	P000010	P000010	100,00	27.02.2024 18:50	12.03.202
101075	Prod 19 - type 1	P000019	P000019	80,00	29.02.2024 21:50	12.03.202
101076	Prod 20 - type 1	P000020	P000020	70,00	01.03.2024 15:05	12.03.202
101077	Prod 10 - type 1c	P000010	P000010	50,00	29.02.2024 17:00	07.03.202
101078	Prod 19 - type 1	P000019	P000019	30,00	04.03.2024 23:00	07.03.202
101082	Prod 21 - type 4d	P000021	P000021	25,00	12.03.2024 15:55	14.03.202
101083	Prod 5 - Type 2c	P000005	P000005	30,00	04.03.2024 19:30	07.03.202
101087	Prod 20 - type 1	P000020	P000020	34,00	15.02.2024 08:11	20.02.202
101066	Prod 15 - type 4b	P000015	P000015	75,00	21.02.2024 23:19	04.03.202
101062	Prod 13 - type 2c	P000013	P000013	40,00	08.02.2024 15:41	14.02.202

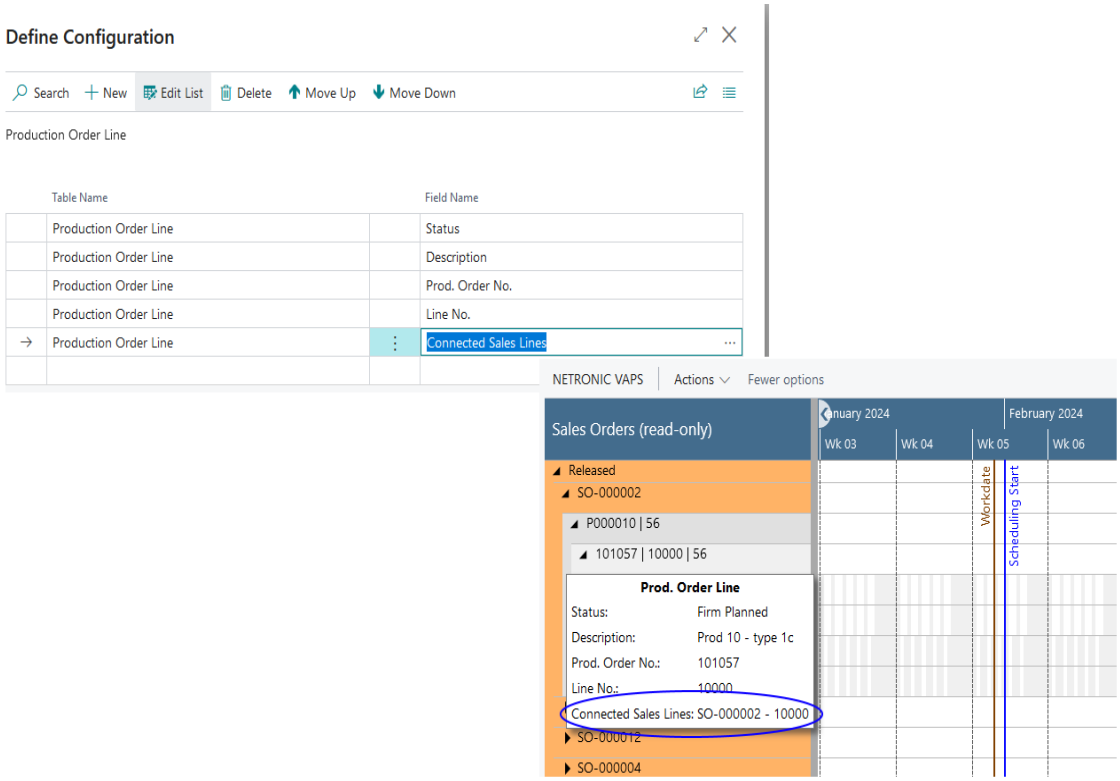
- "Add all from selected sales orders" shows a list where you can select from all sales orders with an assigned production order where at least one operation is still on Standby:



In both dialogs, you can change the order by "Move up" and "Move down".

6.9. Use sales order line information in tooltip, label, and table texts

Tooltip, label, and table texts of production order lines can be equipped with information about connected sales order lines.



7. Finite capacity scheduling instruments

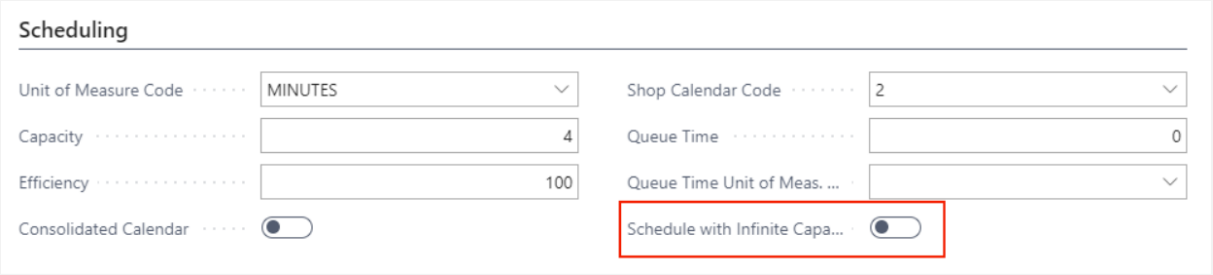
7.1. What is finite capacity scheduling?

The VAPS works with finite capacity scheduling. Finite capacity scheduling means to schedule with limited capacities:

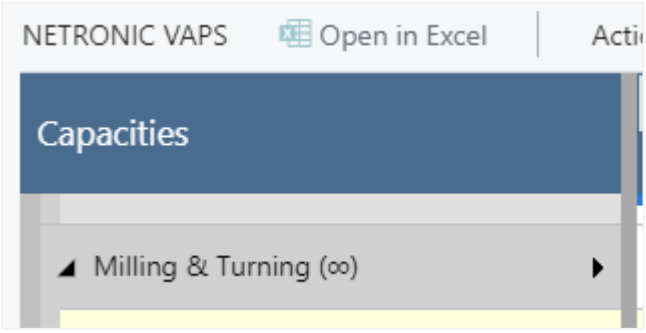
- It makes sure that you do NEVER overload a machine center (exception see above under 7.2).
- Any change in the schedule leads to automatic recalculation of the entire schedule.
- This principle is also applied to complex routings:
  - serial
  - parallel
- Dependencies are considered:
  - dependencies between operations (of one production order)
  - dependencies between production orders (if made from reservations)

7.1.1. Working with infinite capacity on certain work/machine centers

As mentioned above, finite capacity scheduling makes sure that you do NEVER overload a machine center. However, there are cases, where it could be useful to have work centers/machine centers with infinity capacity. Some customers have e.g., certain clearly defined bottleneck areas in which it is imperative to plan with limited capacity and other areas in which it is perfectly possible to plan with unlimited capacity. Moreover, in cases of orders being late, this feature helps to find out more easily where the bottleneck is, based on the overload that has occurred (when setting a machine center to infinite). The according option can be found on the respective work center/machine center cards.



Having activated this setting will be indicated by the ∞ symbol on the respective work/machine center:



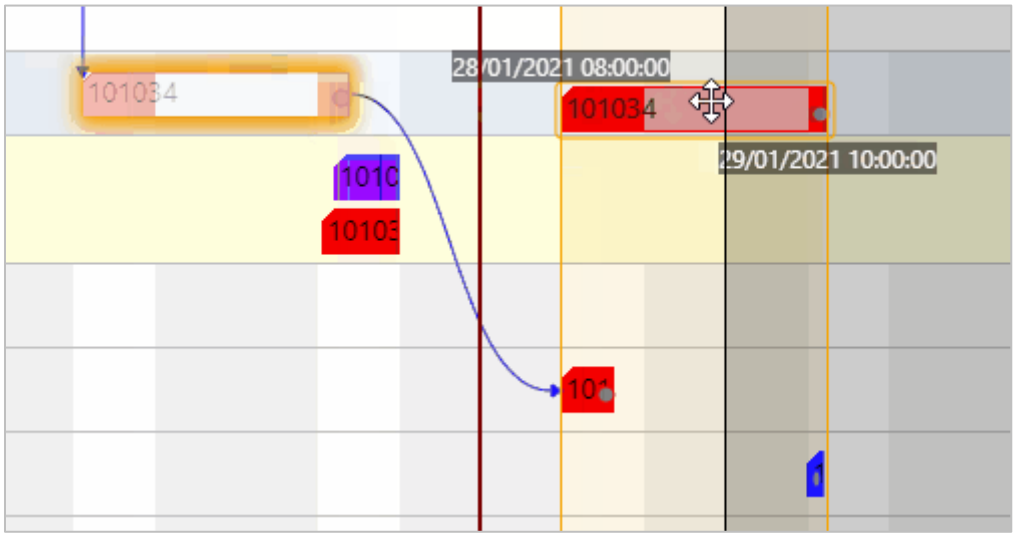
The behavior on such an "infinite" center is the same as on standby resources and subcontractor work centers. Operations may overlap without driving out each other. Switching on or off this option will affect the respective center in all existing simulations but operations having been scheduled already will not be rescheduled automatically.

7.2. Move operations

Operations can easily be scheduled and rescheduled either interactively by drag & drop or via context menu considering the rules of finite capacity scheduling.

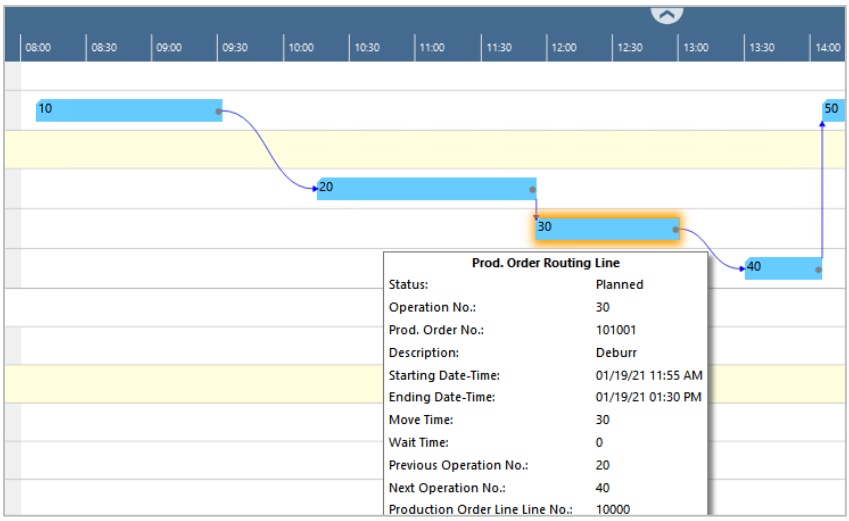
7.2.1. Change timing of an operation

If you move an operation horizontally along the time scale, you'll change the timing. While moving the operation, a “phantom” bar will remain at the original place until the mouse gets released.



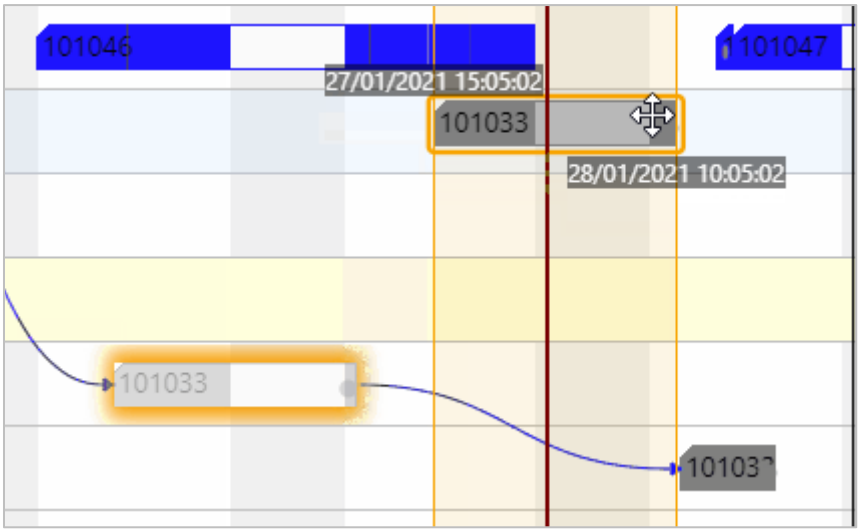
Consider move and wait times when calculating ending date-times

The scheduling logic of the VAPS is adapted to that of Dynamics Business Central 365 so that also move and wait times are taken into account for scheduling. In the picture below, operation 30 ends at 1:00 pm and the following operation 40 starts at 1:30 pm. The tooltip explains the gap: operation 30 has a move time of 30 minutes which isn't visualized at the bar but gets considered for scheduling and so the ending date-time of operation 30 is calculated as 1:30 pm.



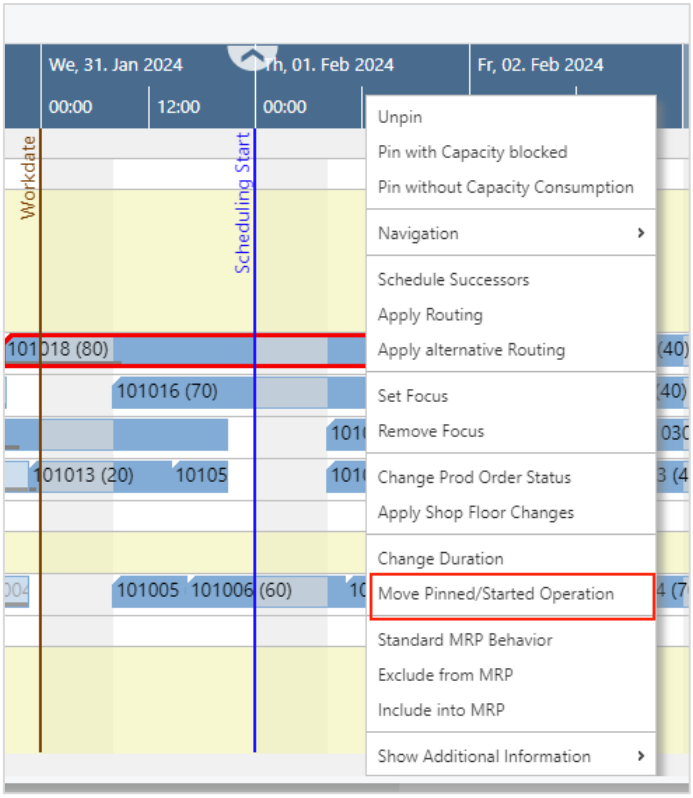
7.2.2. Change resource of operation

If you move an operation vertically you can change the machine center where the operation is to be worked upon. While moving the operation, a “phantom” bar will remain at the original place until the mouse gets released.

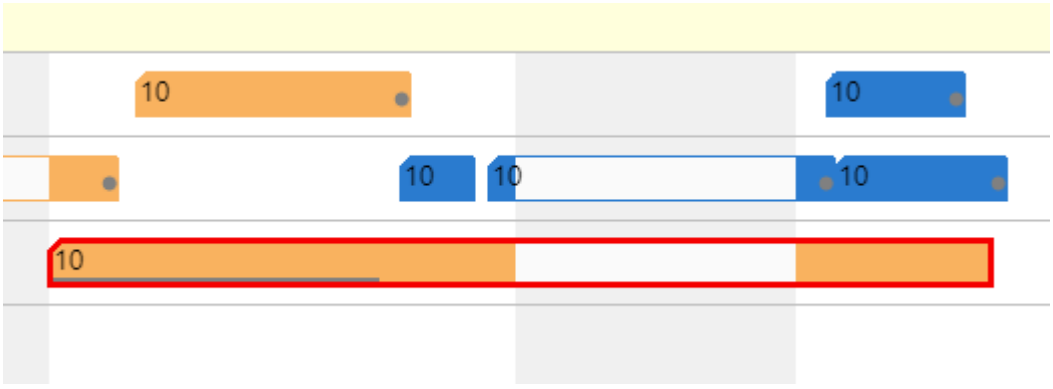


7.2.3. Move operations that have already been started

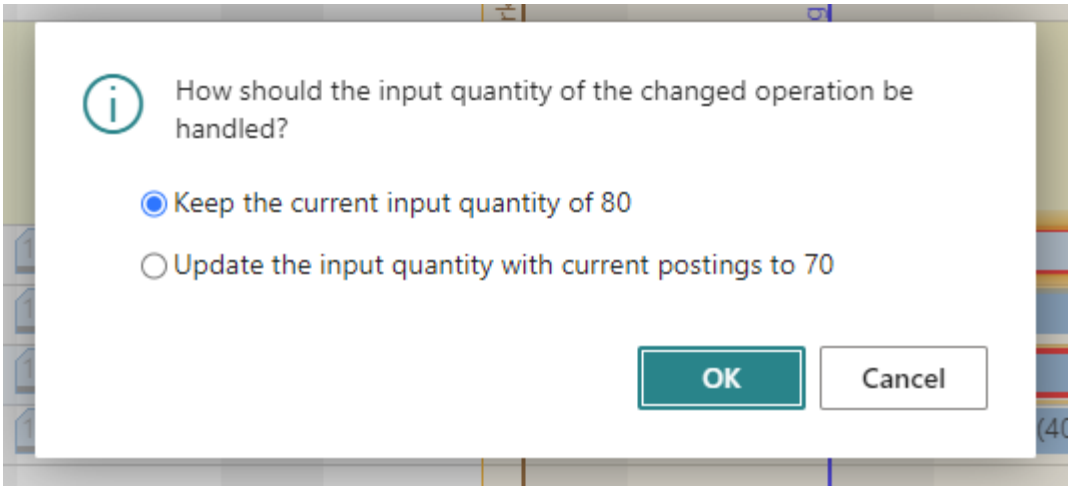
Operations that have already been started, i.e., operations having postings already, can also be changed interactively. For this, click “Move Pinned/Started Operation” in the context menu:



The operation gets a **red frame** and can be moved to another point in time and/or another machine center. :



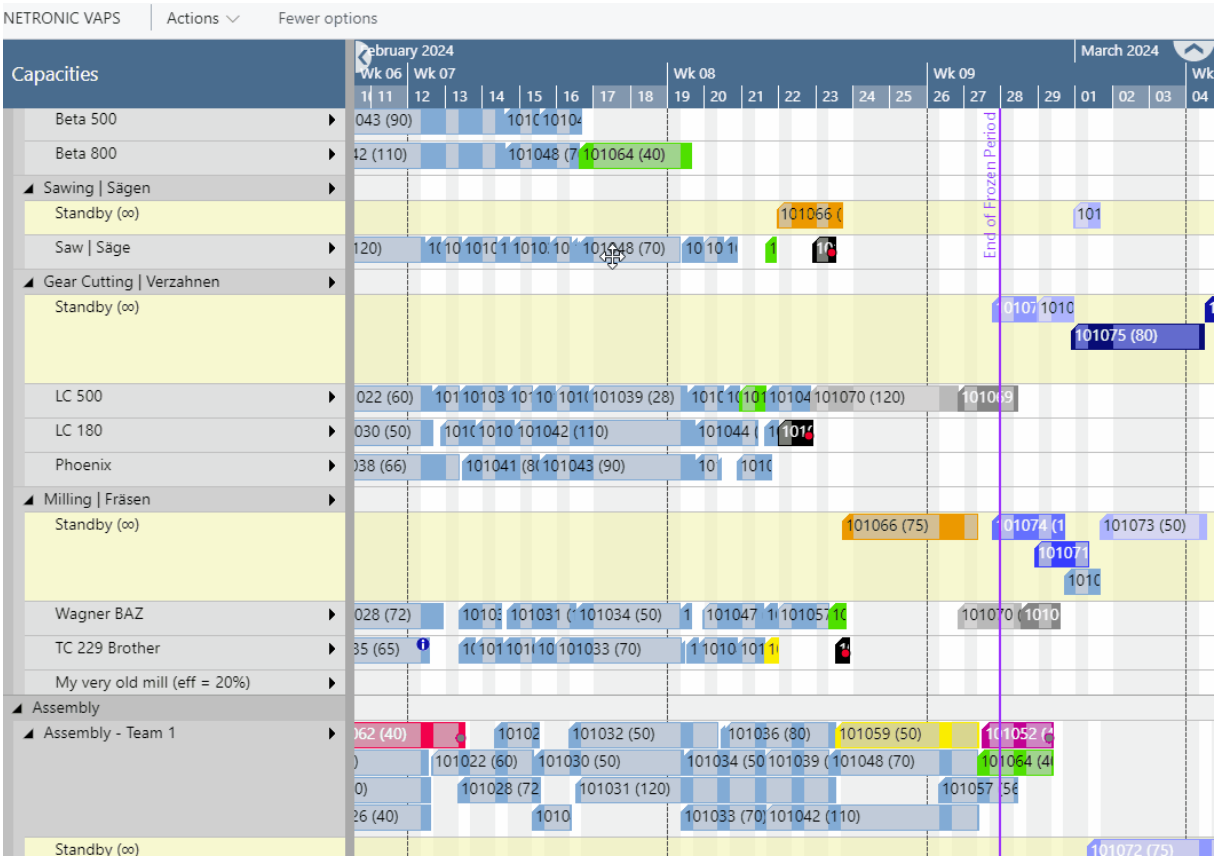
In both cases, the following dialog pops up:



Here you can decide whether you want to schedule the operation at the new date and/or place with the remaining quantity or virtually start anew with the original quantity. A possible scenario for this could be that a machine broke down and the already produced items are defective.

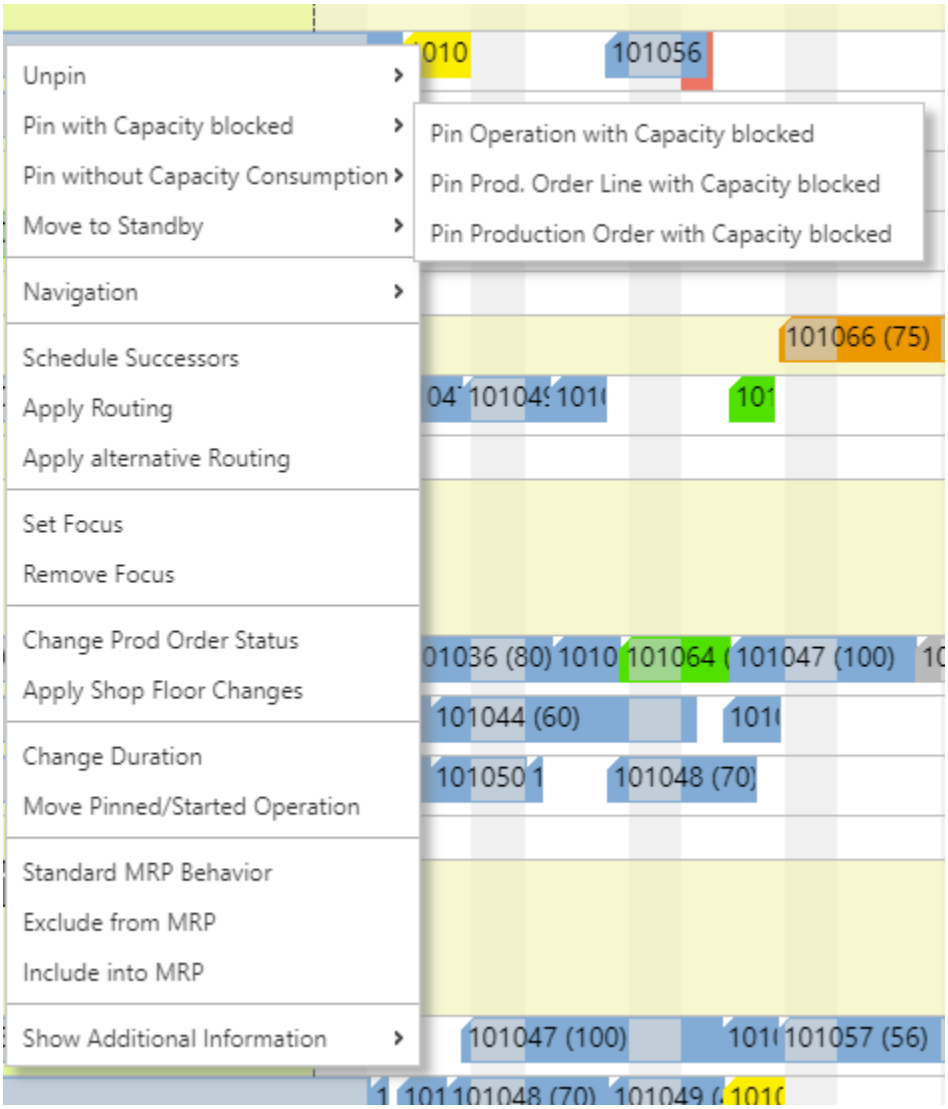
7.3. Change the duration of operations

The duration of operations can be changed interactively. For this, click “Change Duration” in the context menu:



7.3.1. Pin operations, production order lines, production orders

If you want to make sure that a certain element doesn't get moved any more by any automatic scheduling, you can pin (and unpin) it by the according context menu option:

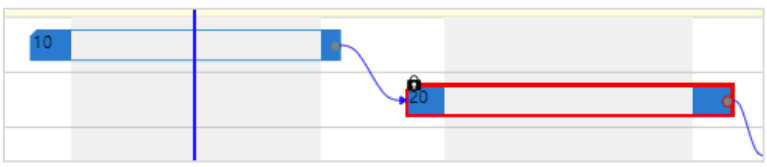


These pinned elements can be seen as being dealt with manually by the scheduler working with the VAPS

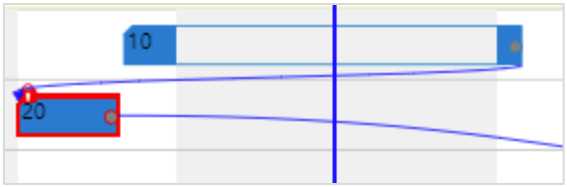
Allow moving of pinned operations

However, in case operations are dealt with manually, some customers need an extra portion of flexibility as exception from the overall automatic scheduling. This is offered by the above-described context menu item "Move Pinned/Started Operations" which allows to move a pinned operation without unpinning it.

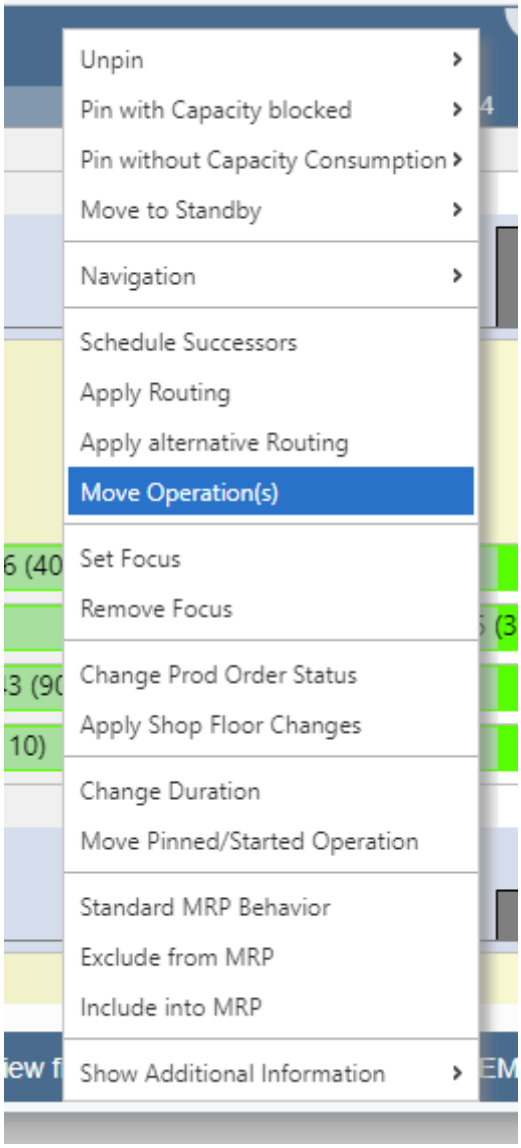
The according operation gets a red frame and can now be moved without any restrictions.



This means that it also can get placed manually in a way the automatic scheduler would never place it. For example, you can drag & drop a pinned operation so that the start date of the successor is before the end date of the predecessor.

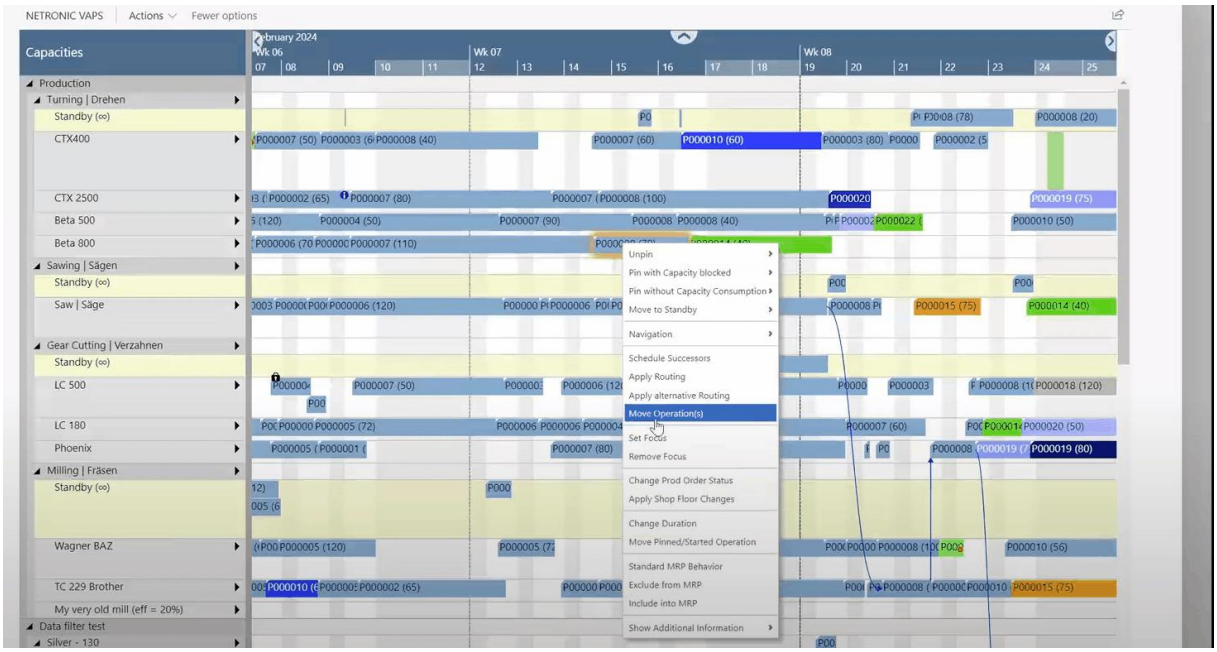


7.3.2. Move (multiple) operations via dialog



With this function, you can move multiple operations individually, rather than as a single block.

By clicking the "Move Operation(s)" item in the context menu, the dialog "Select Production Order Routing Line(s) to move" will appear, allowing you to precisely choose the desired operation(s) and even change their order. Following this selection, all further adjustments can be made in the dialog "Move Production Order Routing Line(s) Settings." Here, you can define parameters such as the new start date, capacity type, target machine center, and more.

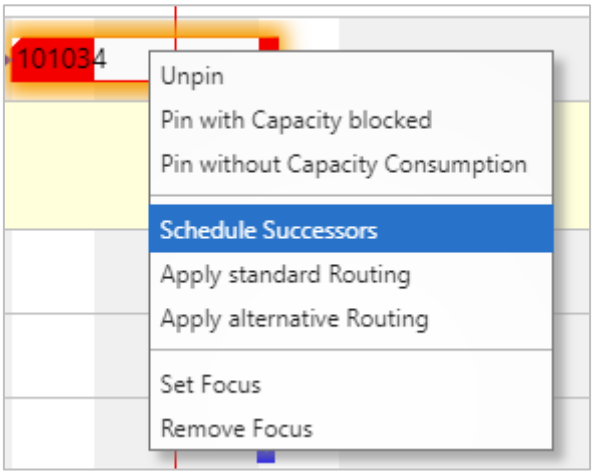


7.3.3. The underlying principles of drag & drop

- The sequence on a machine can be changed.
- Can have an impact on other machines (as successors might get moved).
- We do not allow you to violate the routing structure (exception: if operations are pinned)
    - predecessors will never be impacted
    - right move -> successors will get moved
    - left move -> successors will not get moved

7.4.Schedule successors

With this instrument you tell the software to give the current production order the highest priority from here. The function "Schedule successors" can be found in the bar's context menu:



By ticking this item, you schedule all successors of the currently marked operation (if you marked the first operation of a production order then, of course, the complete production order will get scheduled).

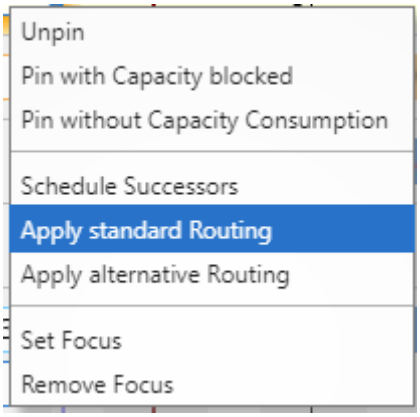
7.4.1. The underlying principles of “Schedule Successors”

- Changes the timing (start date; hence: end date) of all successors.
- Will not change the sequence on the machine where it is triggered.
- Has an impact on other machines (as successors will get moved).
- Will not violate the routing structure.

7.5.Apply standard routing

This instrument is meant to help you efficiently bring production orders from the standby resource to a dedicated machine center.

The function "Apply Standard Routing" can be found in the bar’s context menu:



By ticking this item, you add the operations of a production order to the schedule starting at least at the current work date, or later, if requested by a linked predecessor without changing the schedule and using the standard machines from the standard Business Central routing.

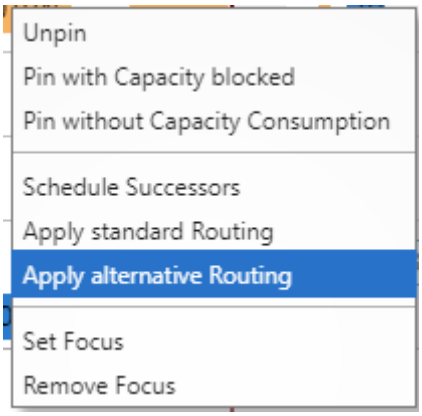
7.5.1. The underlying principles of "Apply Standard Routing"

- Changes the assigned machine center of the triggering operation and all successors (move
- from standby to a concrete machine center).
- Changes the timing (start date; hence: end date) of all successors.
- Adds this production order to the schedule with the lowest priority.
- Will not change the sequence on any machine.
- Will not violate the routing structure.

7.6.Apply alternative routing

This instrument is meant to help you efficiently bring production orders from the standby resource to a dedicated machine center simultaneously looking for the best alternatives (i.e., earliest completion)

The function "Apply Alternative Routing" can be found in the bar's context menu:



By ticking this item, you add the operations of a production order to the schedule starting at least at the current work date, or later, if requested by a linked predecessor, without changing the schedule but making sure that it will be finished as early as possible. For this, the alternative routing you have defined will be used.

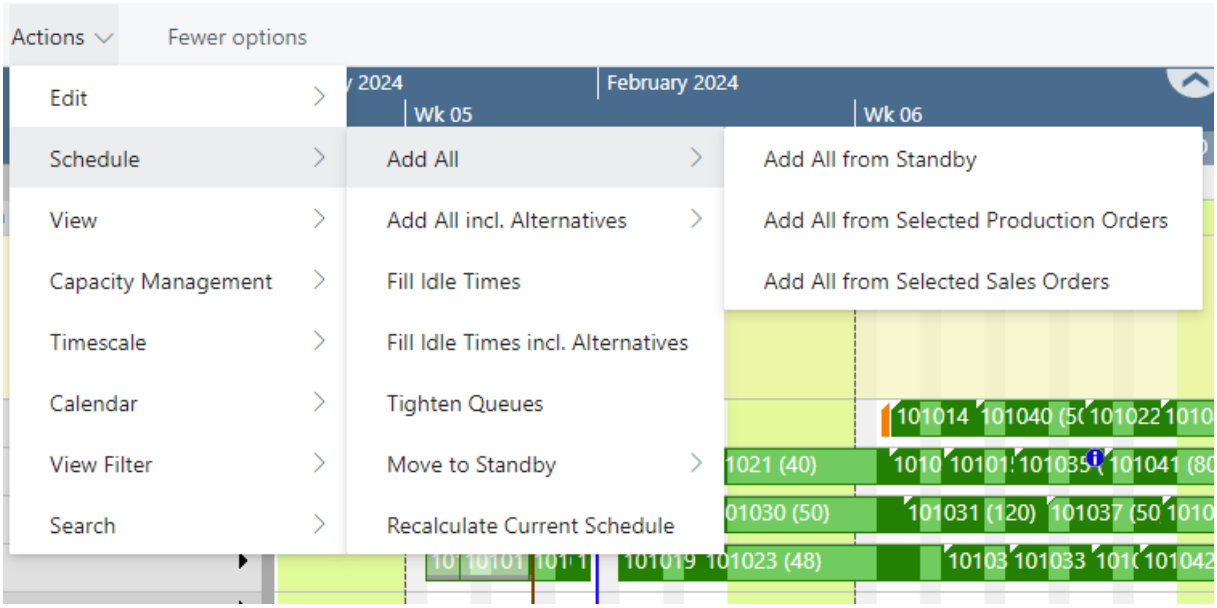
7.6.1. The underlying principles of "Apply Alternative Routing"

- Changes the assigned machine center of the triggering operation and all successors (move from standby to a concrete machine center).
- Changes the timing (start date; hence: end date) of all successors.
- Adds this production order with the lowest priority applying an ASAP strategy
- Will not change the sequence on any machine.
- Will not violate the routing structure.

7.7. Schedule production orders from standby in one go by the "Add all" function

With the function "Add all" you can schedule a bunch of production orders in one go, considering alternate machine centers, if desired.

Production orders that are not yet scheduled in the VAPS, are shown on the respective standby resource - a collection, so to say, of production orders that need to be added from the scheduler to the schedule. With the function "Add all" you can add them to the schedule all at once.



Of course, this doesn't happen at random, but follows strict prioritization rules.

7.7.1. How it works

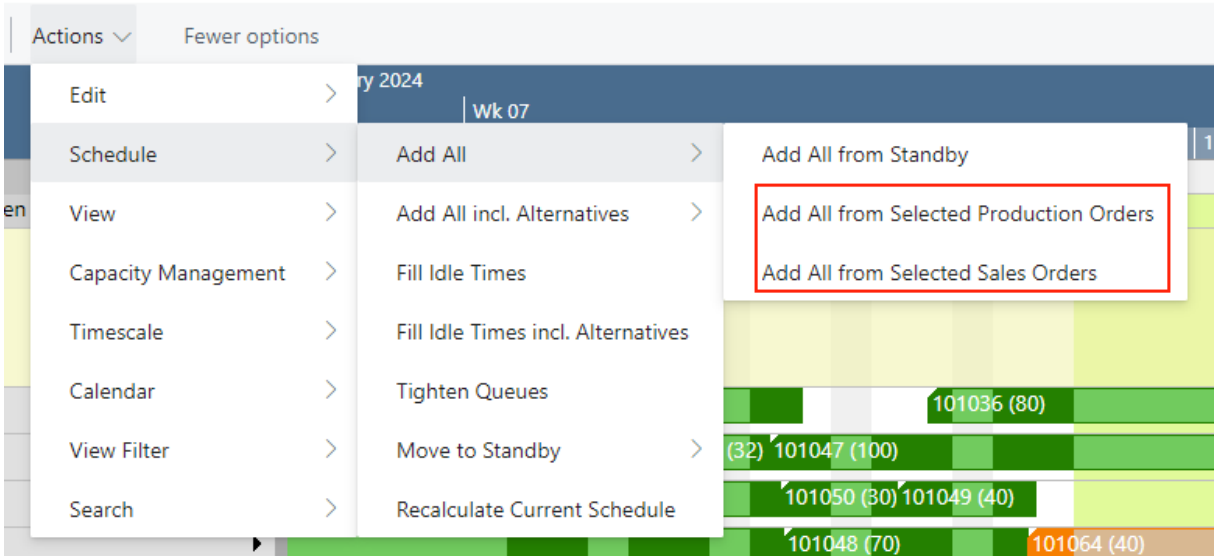
- Based on the assumption that late production orders are to be avoided, the VAPS automatically creates a prioritized list of the production orders that are on standby, proceeding as follows:
  - calculating a buffer time per production order, following the formula:
  - buffer time = [required due date] - [end date of last operation as per BC]
  - starting with released production orders, then firm planned, then planned
  - within each category, assigning the highest priority to production orders with the lowest buffer, the next highest to those with the next lower buffer, etc.
- The orders are added to the schedule according to their priority
- The following settings can be made in the VAPS setup:
  - define the "schedule start" date
  - decide whether you want to take into account EMAD
  - specify the number of iterations

7.7.2. More efficiency by planning per sales orders

Sales orders can have different priorities and planners often like to schedule them en bloc based on these priorities. This would ensure that the next free capacity is used in the best possible way for the corresponding sales order.

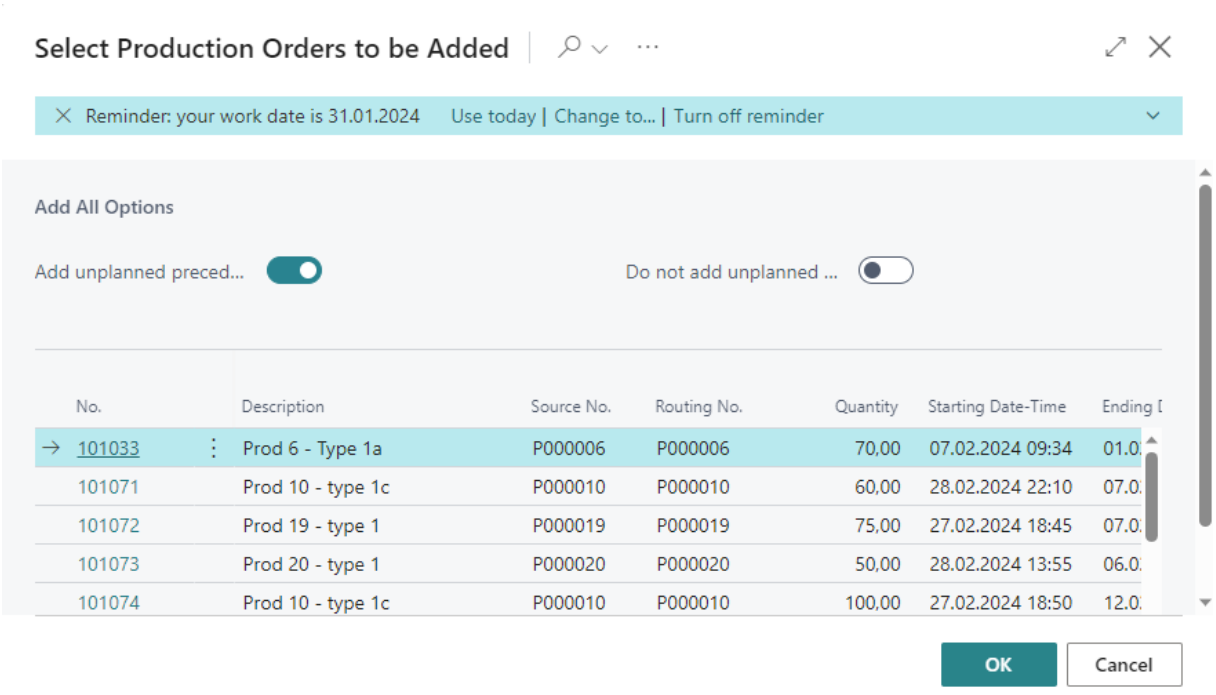
But, however, what if a sales order consists of, let's say, 40 items that on the other hand lead to 40 production orders? This is where it gets difficult because these 40 production orders are on Standby with the other production orders.

Two according options in the "Add all" and "Add all incl. alternatives" menus offer to solve this problem:

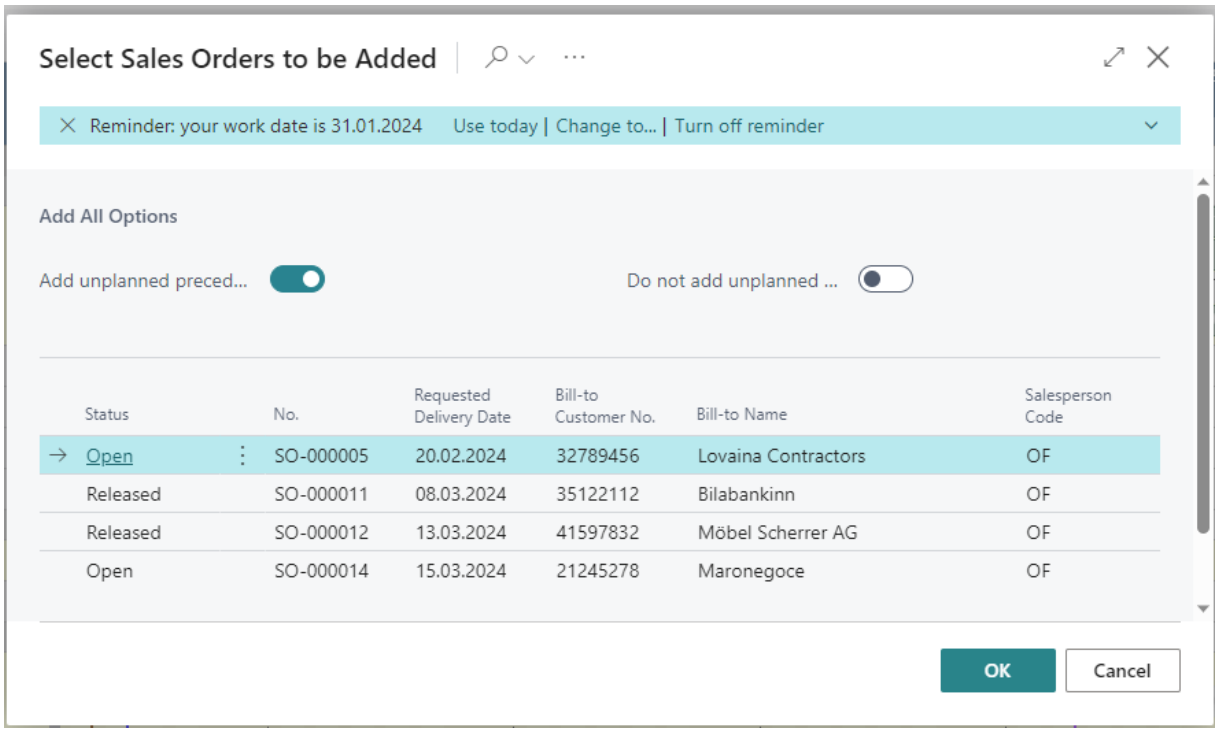


The options in detail:

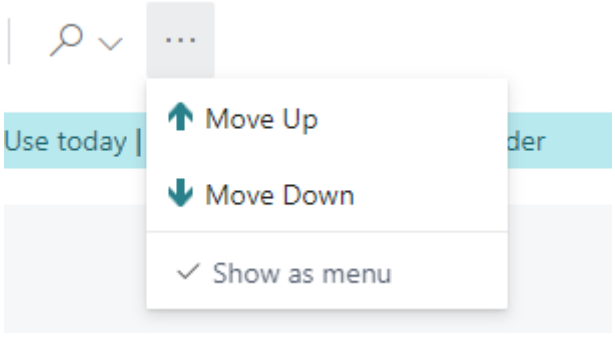
- "Add all from selected production orders" shows a list where you can select from all production orders where at least one operation is still on standby:



- "Add all from selected sales orders" shows a list where you can select from all sales orders with an assigned production order where at least one operation is still on Standby:



In both dialogs, you can change the order by "Move up" and "Move down".

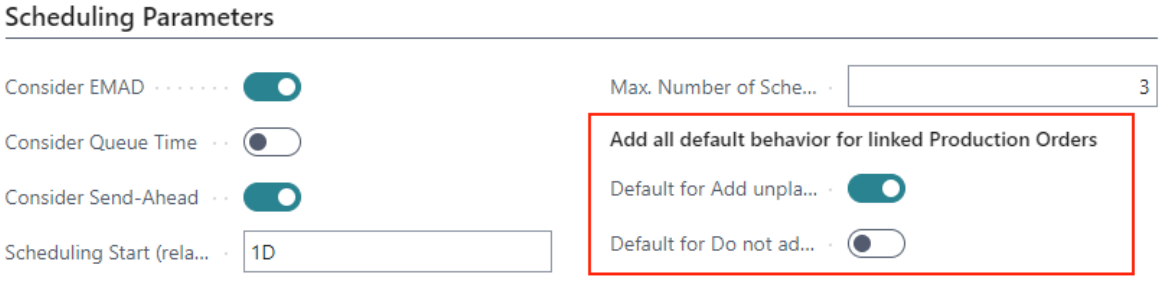


7.7.3. Regulate the behavior of preceding and succeeding linked production orders

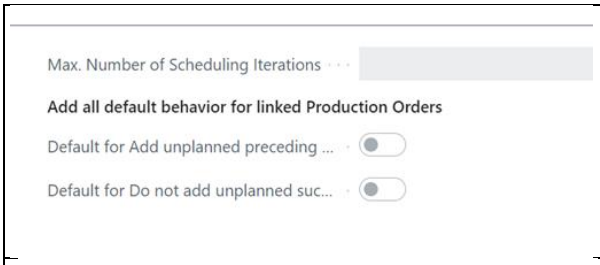
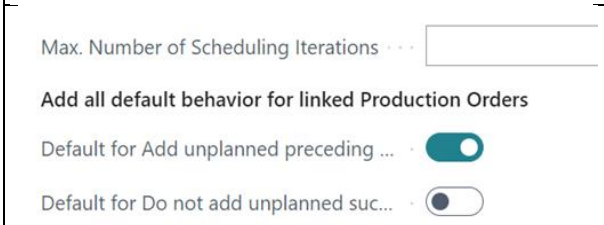
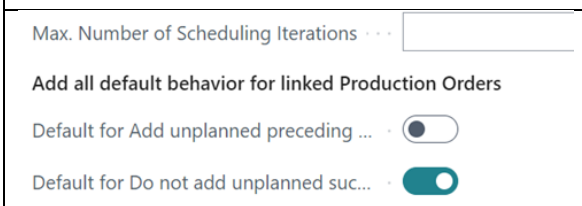
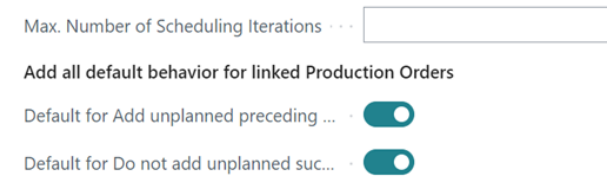
Two options allow for regulating how preceding and/or succeeding linked production orders are treated:

- add unplanned preceding production orders first
- do not add unplanned succeeding production orders

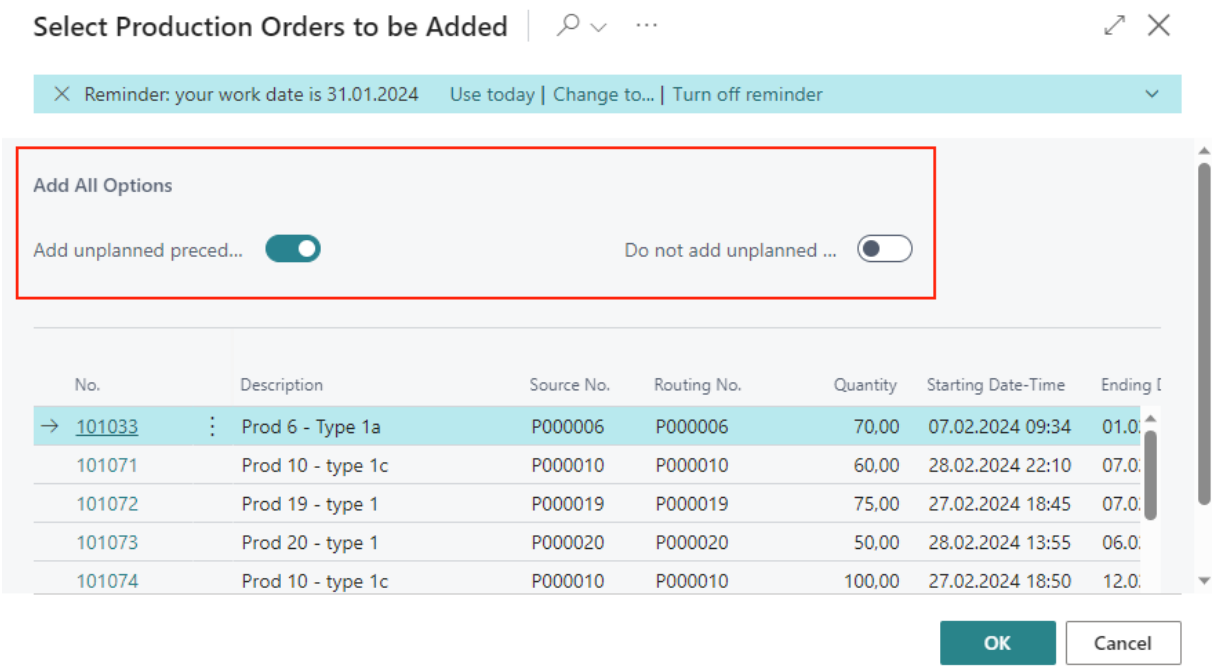
These options can be defined as default settings via the VAPS setup:



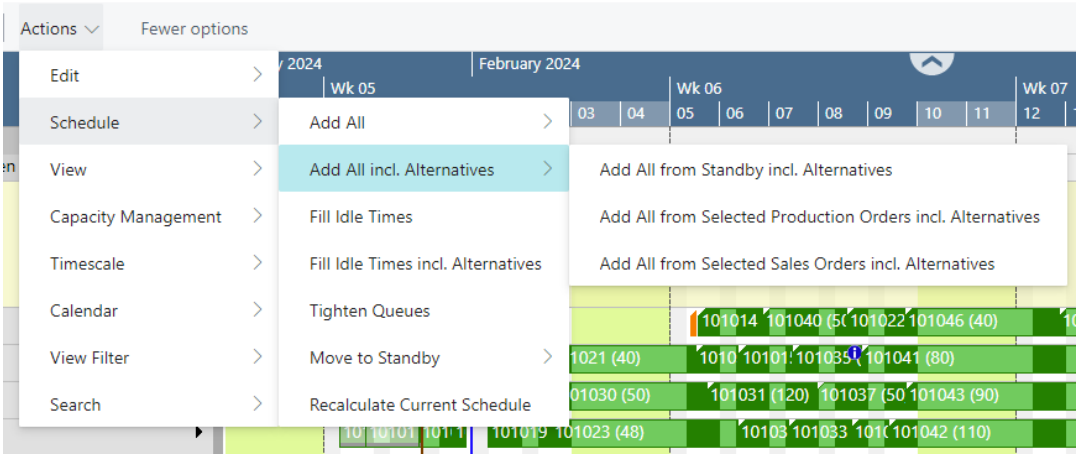
The overview below lists all possible combinations and their respective effects.

	NEVER schedule predecessors/ Always schedule ALL successors Upstream prod. orders (“preceding”) do NOT get scheduled Downstream prod. orders (“succeeding”) get scheduled
	Always schedule ALL predecessors Upstream prod. orders (“preceding”) get scheduled Downstream prod. orders (“succeeding”) get scheduled
	NEVER schedule successors or predecessors Upstream prod. orders (“preceding”) do NOT get scheduled Downstream prod. orders (“succeeding”) do NOT get scheduled
	NEVER schedule successors Upstream prod. orders (“preceding”) get scheduled Downstream prod. orders (“succeeding”) do NOT get scheduled

However, in the "Add all" dialog, you can also spontaneously determine a deviation from the standard specifications every time you schedule new production orders via the "add all" function.



All procedures described above, also apply when you want to take into account **alternate machine centers:**



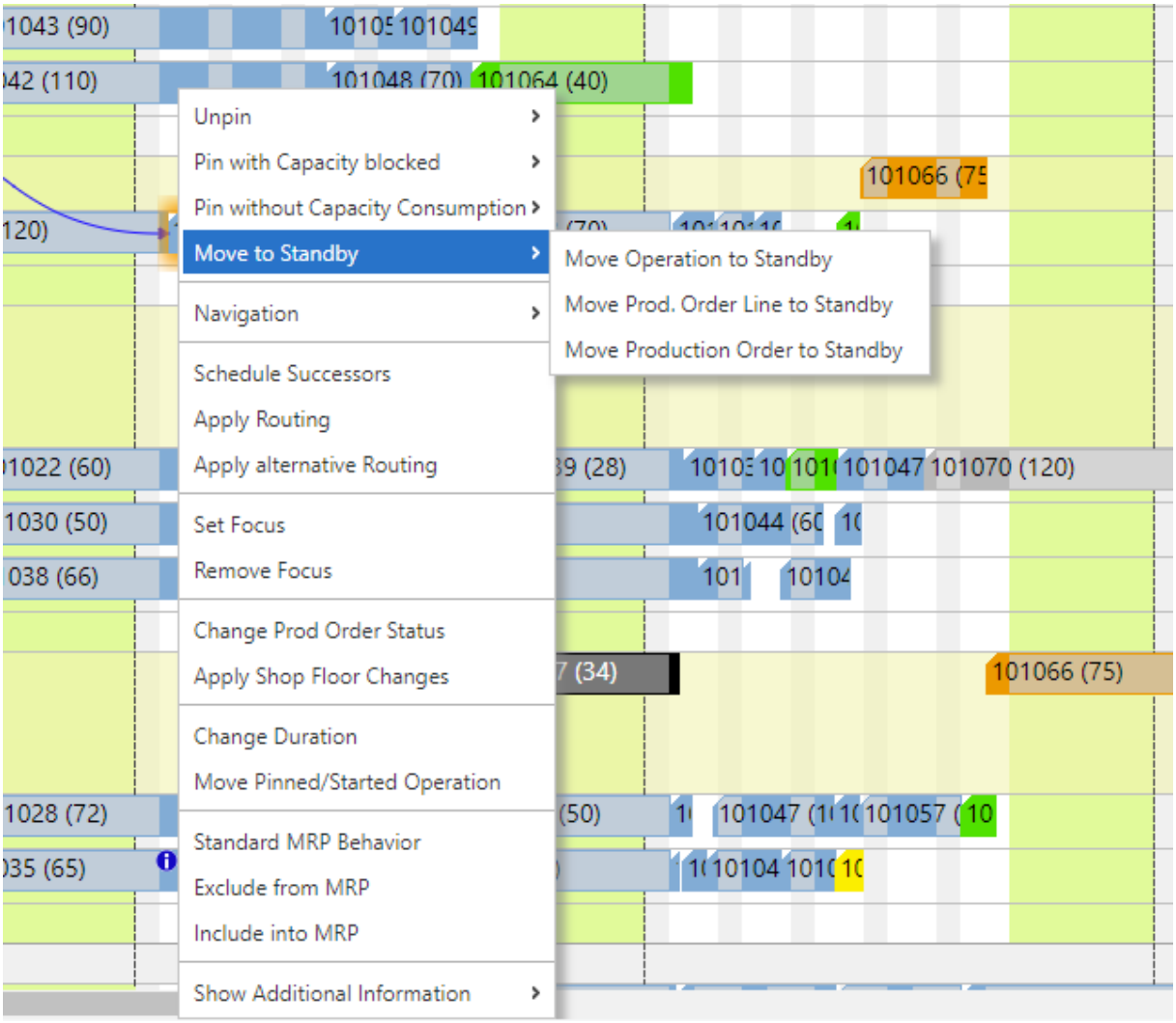
7.8. Move unhandled production orders, production order lines, or operations to standby in one go

The VAPS allows moving unhandled production orders, production order lines, or operations back to standby in one go.

7.8.1. Definition of “unhandled”

- Unhandled future processes that are to start after the scheduling start date. In case users have "played around" a lot and then they may realize that they are no longer 100% satisfied with the plan, this feature helps them to quickly replan starting from a certain date by moving the operations to standby and then applying the "add all" function.

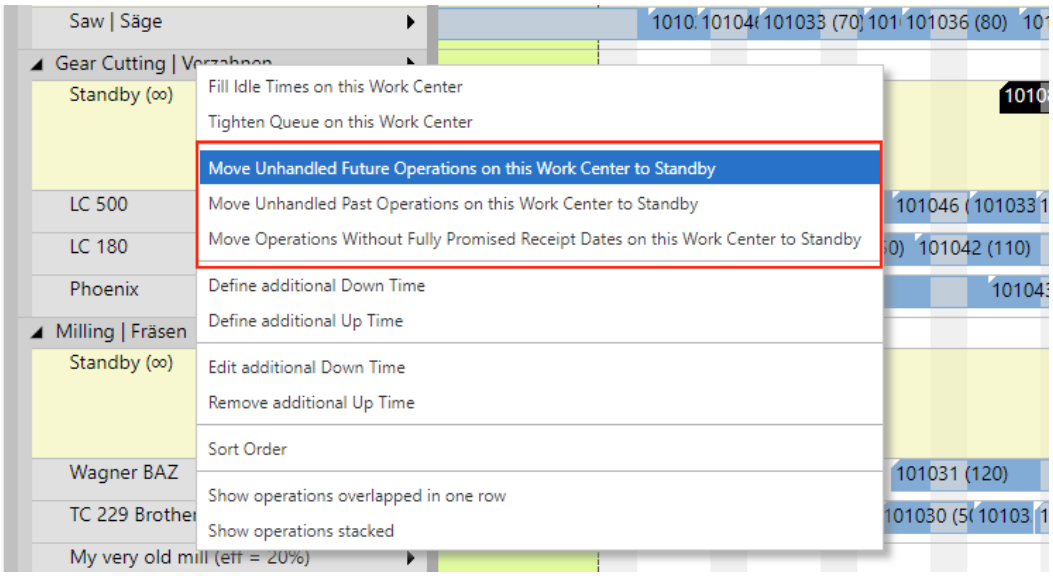
- Unhandled past processes, i.e., operations the routing status of which is not “in progress” or “finished,” meaning operations that should have started before the current work date but haven't.



7.8.2. Move unhandled operations to Standby per work or machine center

Sometimes planners don’t want to move operations of the whole plan but are focusing just on a single work or machine center and want a more granular version of this functionality.

The context menu of the work/machine center in the capacity view offers according options:



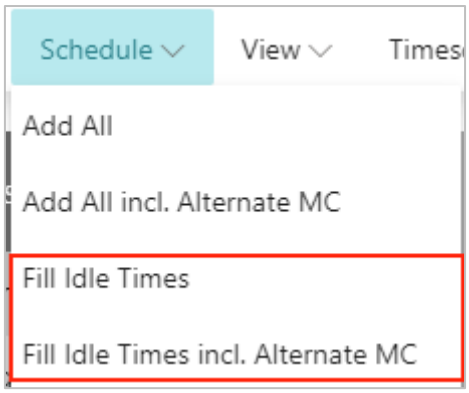
7.9. Fill idle times

Typically, scheduling with finite capacities, will often lead to idle times on machine centers and of course, for the sake of efficiency and cost cutting, everybody in planning wants to use their capacities to the fullest extent possible. The function "Fill idle times" helps to avoid idle times on machine centers.

7.9.1. How it works

- The VAPS automatically creates a prioritized list of the production orders that are already assigned to machine centers, following the same strict prioritization rules as in the "Add all" function.
- All operations are tried to be moved forward to avoid idle times.

- Already scheduled production orders are not getting pushed out (they are only squeezed in).
- The following settings can be made in the VAPS setup
    - define the "schedule start" date
    - decide whether you want to take into account EMAD
    - specify the number of iterations
- When you start the scheduling process under "Actions -> Schedule", click the according option to determine whether you want to take into account alternate machine centers or not.



7.9.2. Fill idle times on a single work or machine center

If you want to fill the idle times on a certain work/machine center only, select the according item from the center's context menu.

7.10. Tighten Queues

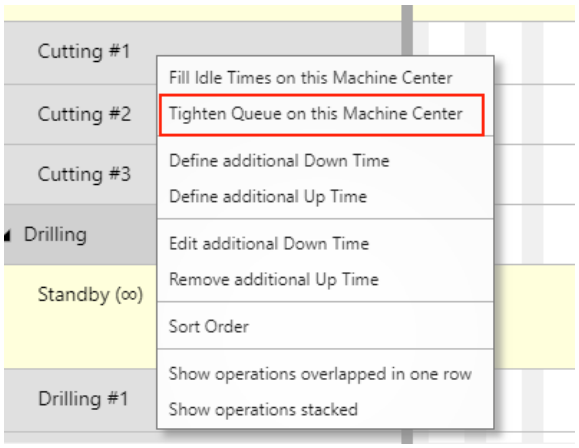
With this feature you can minimize gaps between operations on a resource by shifting all operations to the scheduling start position as far as possible. The function differs from "Fill idle times" in that it does not change the order of the operations. Please note that operations before the scheduling start will not be affected.

The picture below shows an example with operations before they were tightened:

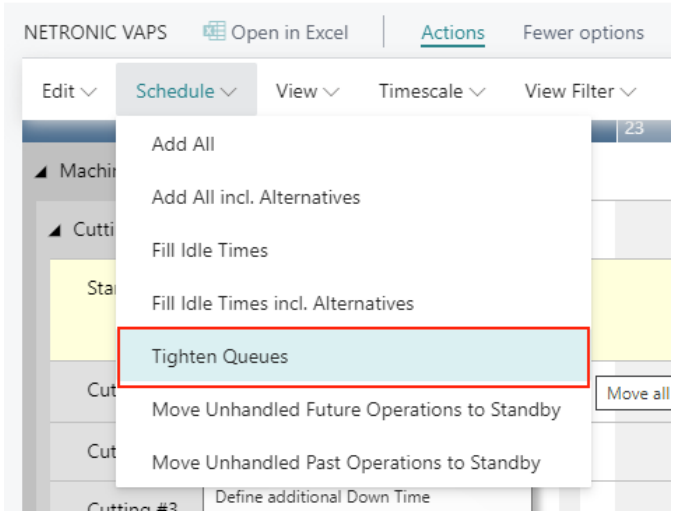
And this is how it looks after tightening the operations:

You can activate this feature

- for a single resource via context menu



- for all resources by clicking the according item in the "Schedule" menu:



7.11. Calculating and working with earliest material availability

The VAPS takes into account the earliest material availability date = EMAD.

7.11.1. Material availability: Fundamentals

Without any further specification, the VAPS calculates the EMAD just on production order line level. Hence, there is no EMAD per operation at all. You can, however, have the VAPS also consider routing links so that the EMAD can be calculated by the production order routing line which means that a production order line can be started even when the material for one (or more) operations is not yet available. • We calculate a value that we call EMAD = earliest material availability date

7.11.2. Basics of the EMAD calculation

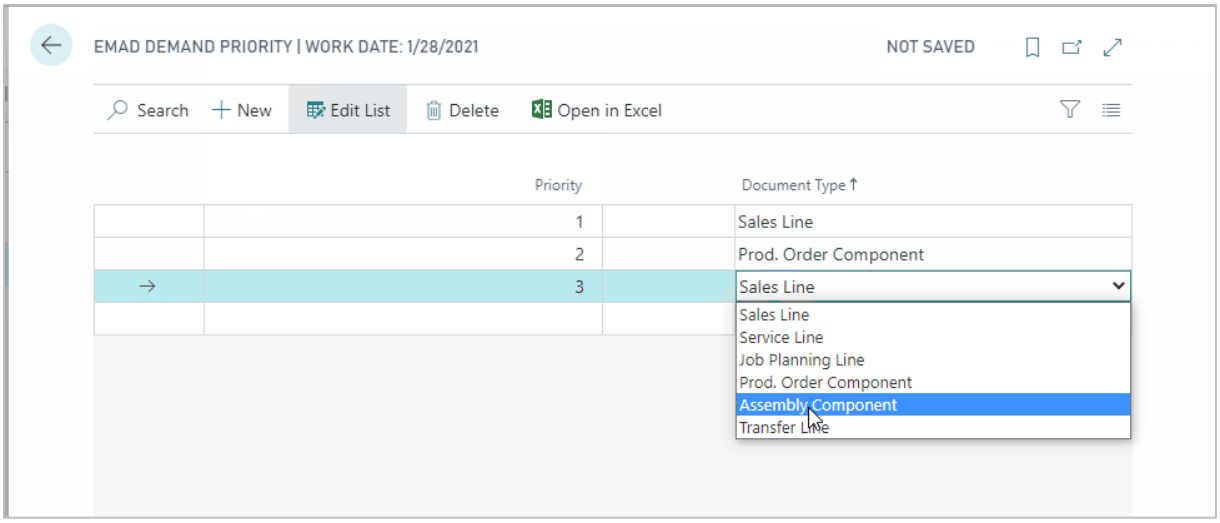
- We create a unique list of component demand day by day
- We take into account

    - Demand from production orders
    - Demand from sales orders
    - Demand from transfer lines
    - Demand from job planning lines
    - Demand from service lines
    - Demand from assembly orders
- Then we create a unique list of component supply day by day
- We take into account
    - Supply on inventory
    - Supply from purchase orders
    - Supply from production orders
    - etc.
- Then we allocate component supply to component demand

7.11.3. How we allocate

- First we remove any reservations because reserved components will never get allocated
- Then, day by day, we allocate an available component to a component demand
- You can define the priority which demand to supply first

  Example: sales orders first, then production orders, then transfer orders



- If there is enough component supply on a certain day, we allocate that supply to the component line, and have an earliest material availability date for that component.

Supply	Monday	Tuesday	Wednesday	Thursday	Friday
Component 1	100	500	300	50	600
Demand	Monday	Tuesday	Wednesday	Thursday	Friday
Component 1	50	600	300	250	601
Allocation	Monday	Tuesday	Wednesday	Thursday	Friday
Component 1	YES (50)	NO	YES (300)	NO	NO
EMAD	Monday	Tuesday	Wednesday	Thursday	Friday
Component 1	Monday	none	Wednesday	none	none

7.11.4. Setting the EMAD

A production order typically requires multiple components. If all components are available in the look ahead window timeframe, each component line gets an EMAD. We take the latest EMAD of all component lines as the EMAD for the production order. Example:

- Production order 1
  - Component 1 – EMAD = December 1
  - Component 2 – EMAD = November 20
  - Component 3 – EMAD = December 4
- EMAD for production order 1 = December 4

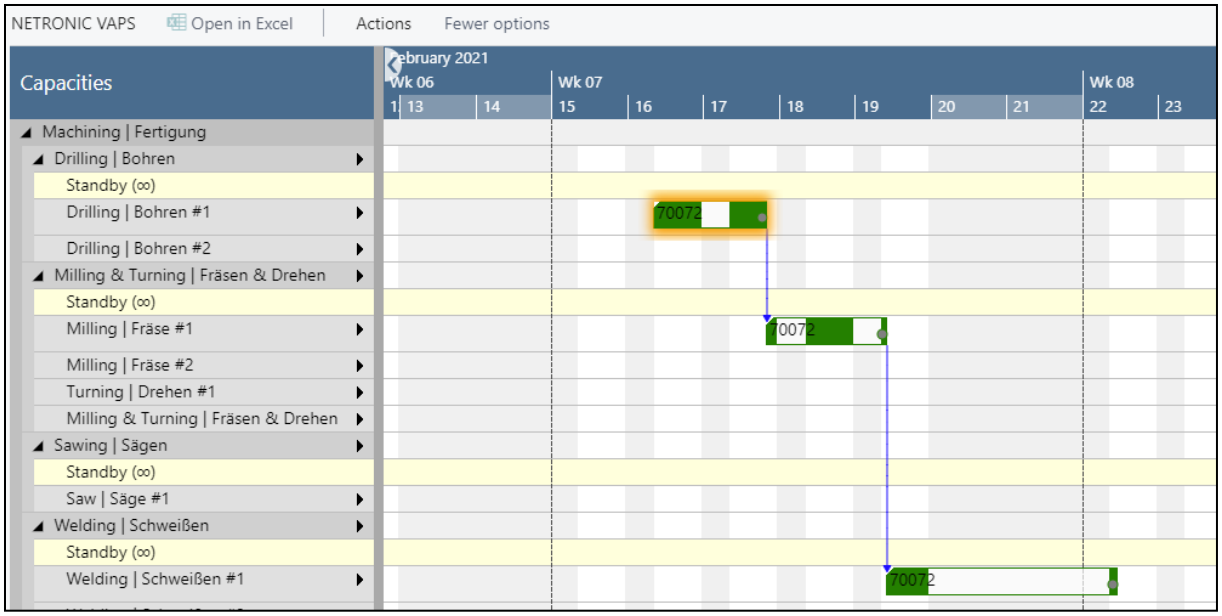
7.11.5. Consider the EMAD on the production order routing line level

Without any further specification, the VAPS calculates the EMAD on production order line level with no EMAD per operation at all. You can, however, have the VAPS also consider routing links so that the EMAD can be calculated by the production order routing line which means that a production order line can be started even when the material for one (or more) operations is not yet available.

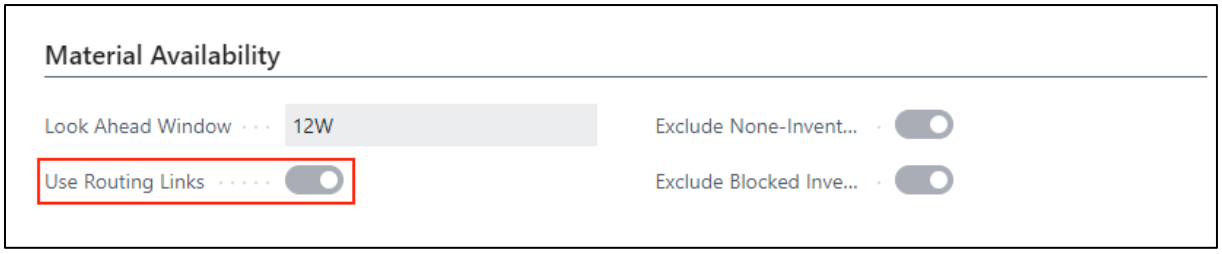
Let's assume you have three operations. Let's also assume that this requires a very expensive raw material, but only at the third. Hence, you want that expensive material to be there only when you plan that third operation to start. In other words: you can start the first two operations without that precious raw material available. If you assign that particular raw material to the third operation via a routing link, you now get EMAD information as follows (on the production order routing line level):

Operation No. ↑	Type	No.	Description	Alternate Routing Set	Earliest Start Date	Earliest Material Availability Date
→ 10	Machine Ce...	110	Drilling | Bohren #1			28.01.2021
20	Machine Ce...	210	Milling | Fräse #1			28.01.2021
30	Machine Ce...	410	Welding | Schweißen #1			16.02.2021

Per default, after having calculated the EMAD allocation, the VAPS would schedule all three operations starting after the EMAD of the latest operation. For the sake of clarity, I switched on the Availability View where you see operations with available material in green, the ones with unavailable material in red:

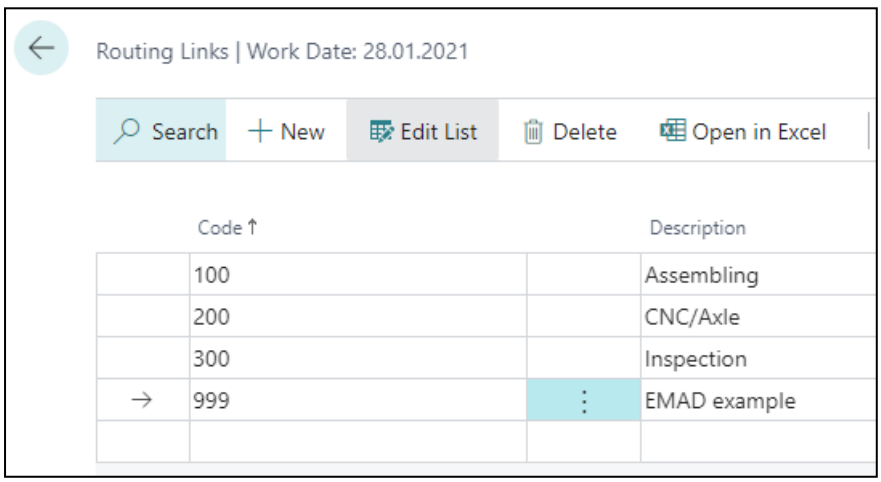


As stated above, you can instruct the VAPS to consider the routing links. This is done on the VAPS Setup page:



Further steps needed:

- Create the desired routing link code



- Enter this routing link code on the according routing page and in the BOM
  - Routing:

Lines | Manage | More options

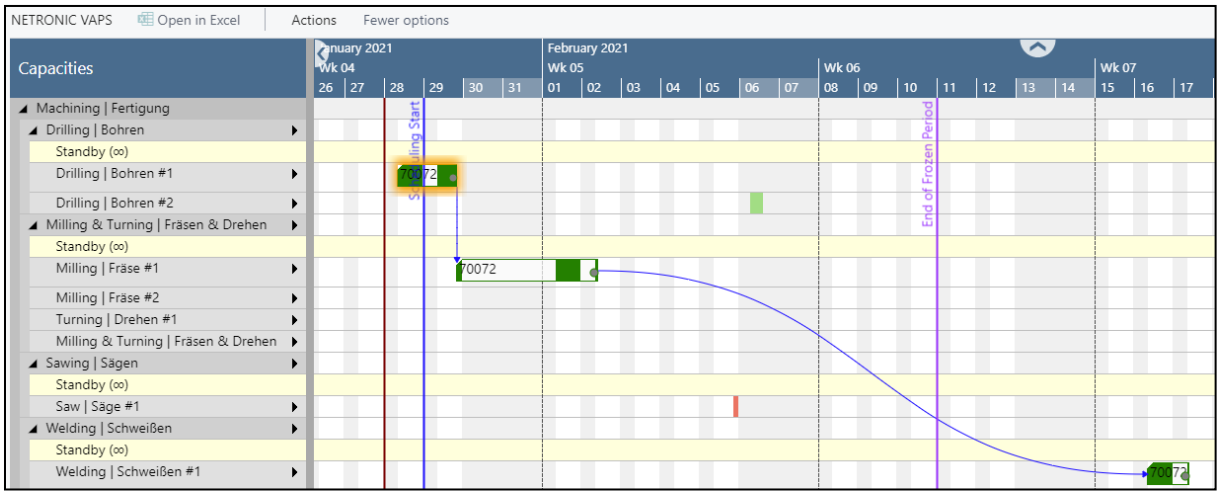
Operation No.	Previ... Oper... No.	Next Opera... No.	Type	No.	Description	AlternateRou... Set	Routing Link Code
10		20	Machine Ce...	110	Drilling | Bohren #1		
20	10	30	Machine Ce...	210	Milling | Fräse #1		
30	20		Machine Ce...	410	Welding | Schweißen #1		999

  - BOM

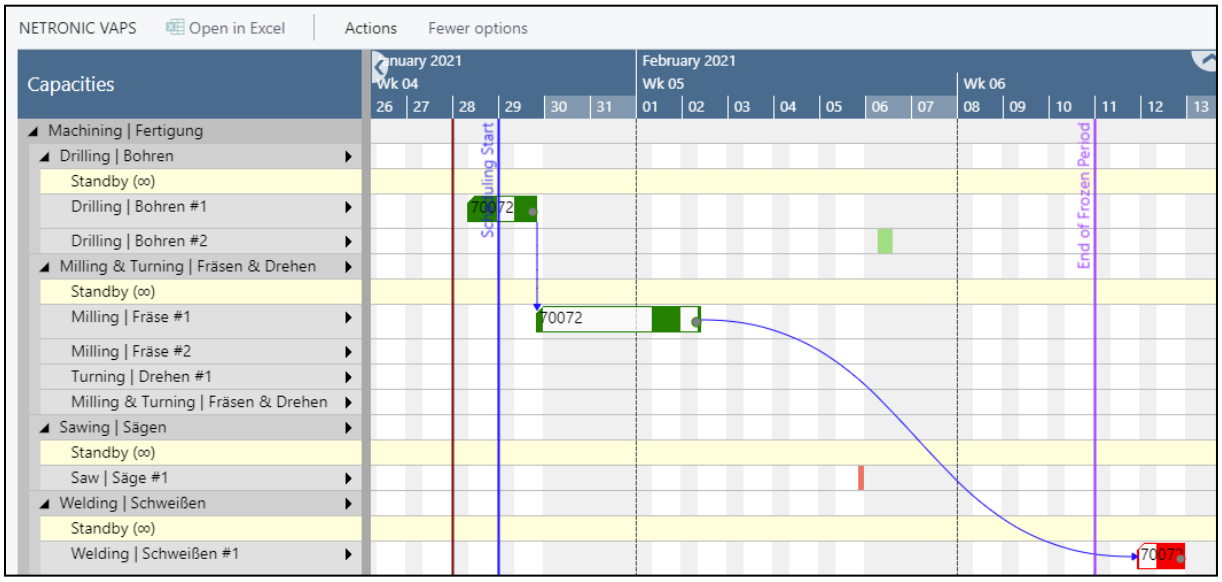
Lines | Manage | More options

Type	No.	Description	Quantity per	Unit of Measure Code	Scrap %	Routing Link Code
Item	70073	Teil 1 - EMAD Routing Link Test	1	PCS	0	
Item	70074	Teil 2 - EMAD Routing Link Test	1	PCS	0	
Item	70075	Teil 3 - EMAD Routing Link Test	1	PCS	0	
Item	70076	Teil 4 - EMAD Routing Link Test	1	PCS	0	999

As a result, two of your operations start at their earlier EMAD, the last one at its own, later EMAD, this, of course, saving you time in your production processes.



In the Availability View, the VAPS even provides an optical warning, if you drag an operation to a point of time that is before its EMAD by showing the according operation in red:



Tip: If you work with routing link codes you should define priorities in the dialogs "EMAD demand priority" and "Routing demand priority".

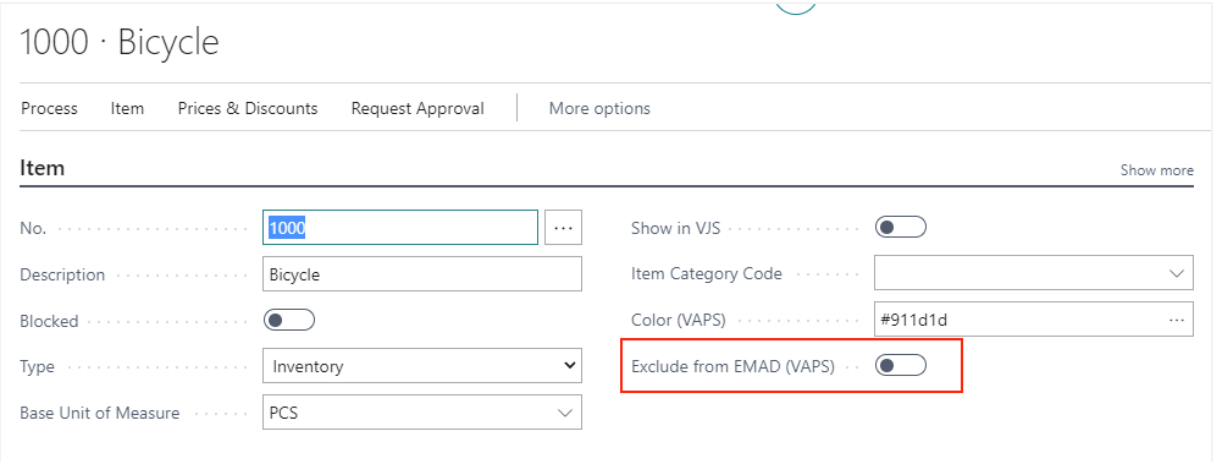
7.11.6. Exclude items from EMAD calculation

In the current EMAD calculation logic, “all” components of a production order are considered when calculating the availability date.

With very detailed BOMs and having even low priority material in these BOMs (meaning material which could be replenished very easily e.g., by a local dealer around the corner), this could create some downsides:

- material that is out of stock but could easily be replenished might render a production order as “unable to allocate”
- all these materials need to be calculated, although they won’t be a blocker for the production process

Because of this, you can exclude certain items from the EMAD calculation by ticking the option “Exclude from EMAD (VAPS)” on the item card and related pages. You can also exclude complete item categories from EMAD, by ticking the option on the respective category card. In this case, the setting is passed on to all associated articles and does not have to be made separately for each article.



7.11.7. Consideration of the supplier's delivery date promises in planning

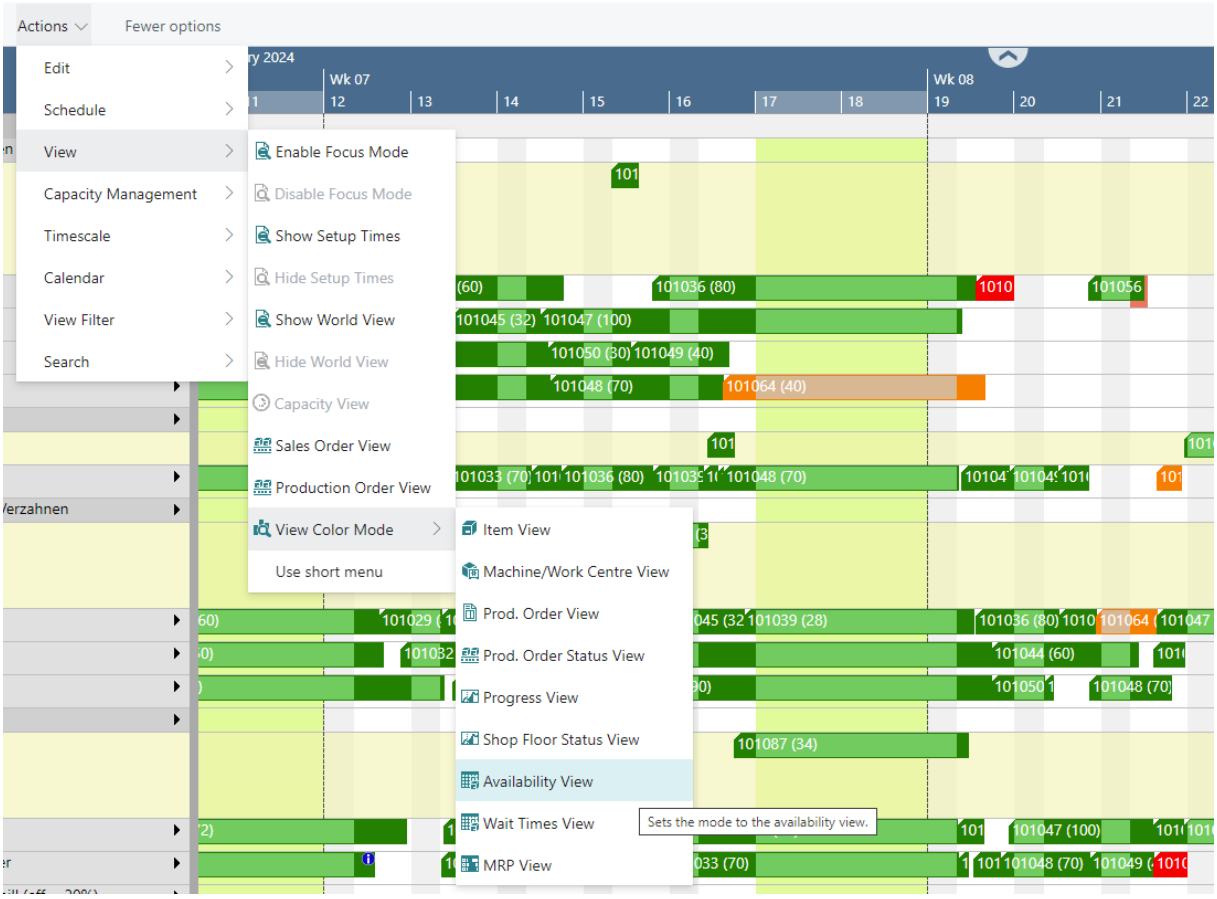
In times of uncertain supply chains, information about material availability has become more and more important. When parts are ordered, it is important to know whether the supplier has confirmed a delivery date and what that date is. Production planners need to know for which production order lines (still to be planned) there are unconfirmed required materials. What is more, they only want to specifically schedule the production order lines for which the supplier has confirmed a specific date. We have taken care of these planning requirements and implemented a new functionality.

The "VAPS Setup" dialog offers a new option that allows to exclude production orders without a promised delivery date from the planning with "Add all" and "Add all incl. alternatives":

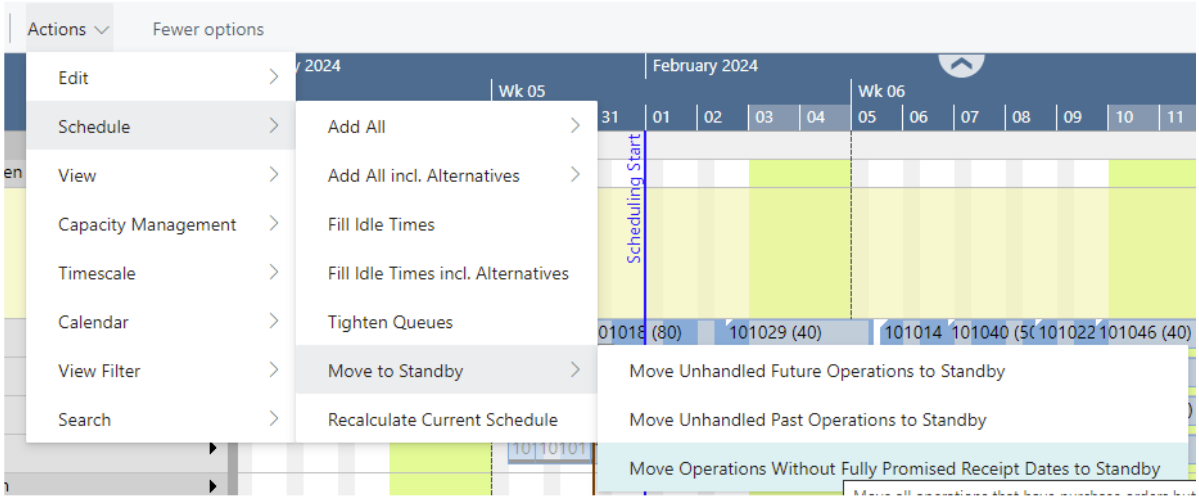
Please note that you can still plan these orders manually per drag and drop.

Handling of operations without promised receipt date that are already allocated

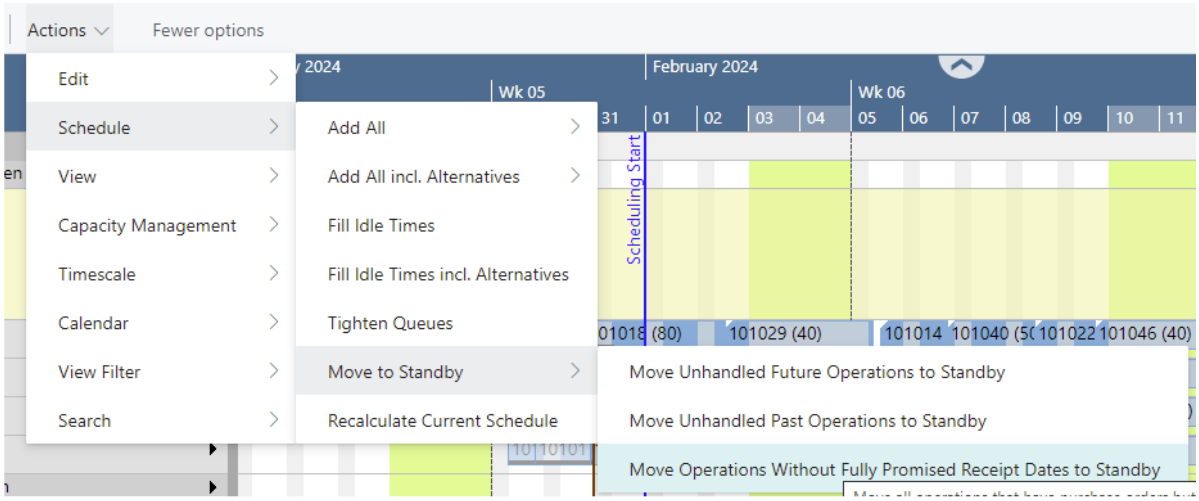
In case operations of a production order with missing promised receipt date are already allocated to resources, they can be made directly visible. For this, we have added a new option to the "Availability View". Now operations needing material that is not fully promised are shown in orange (default).



You can change the default color in the VAPS setup:



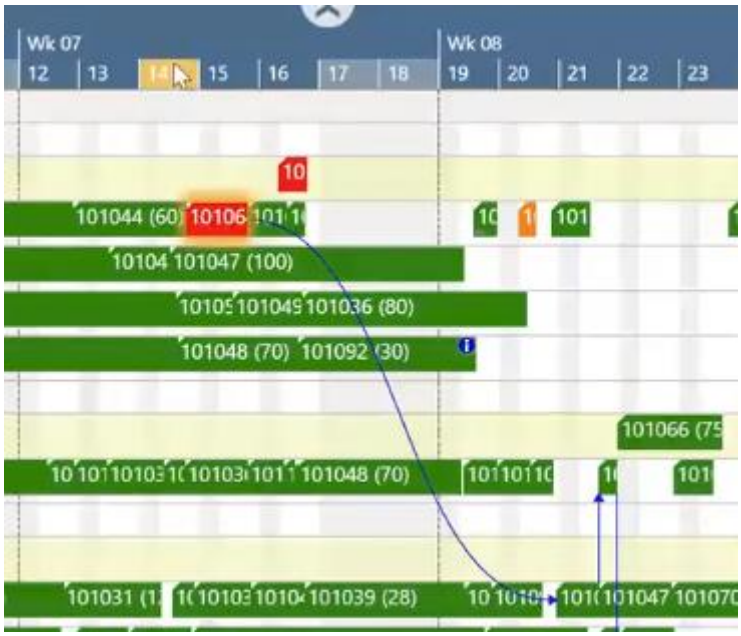
The planner can move these operations back to Standby by an according menu item:



More options to exclude/include certain items from EMAD calculation can be found on the Setup page.

7.11.8. Handling of operations with missed EMAD

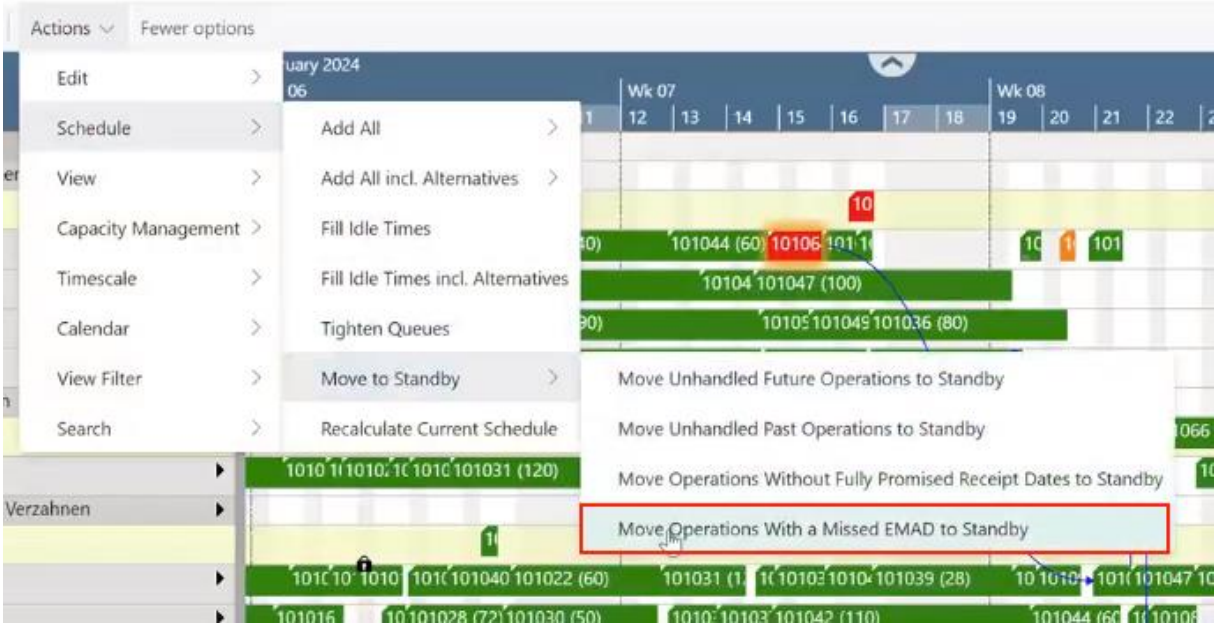
The picture below shows a production order that is scheduled to start on the 14th (of February)



However, when you have a look at the EMAD calculation, you'll see that the earliest availability date is the 16th.

Item No.	Starting Date-Time	Ending Date-Time	Quant...	Reserved Quantity	Planning Flexibility	Unit of Measure Code	Sales Order No.	Sales Order Line No.	Earliest Material Availability Date
P000014	14.02.2024 18:40	01.03.2024 08:30	40	40	None	PCS	SO-000006	10000	16.02.2024

The VAPS provides a helpful feature in the "Schedule" menu that allows you to easily move any production orders that violate their earliest material availability date back to standby. This ensures that your production process stays on track and avoids any delays caused by unavailable materials.



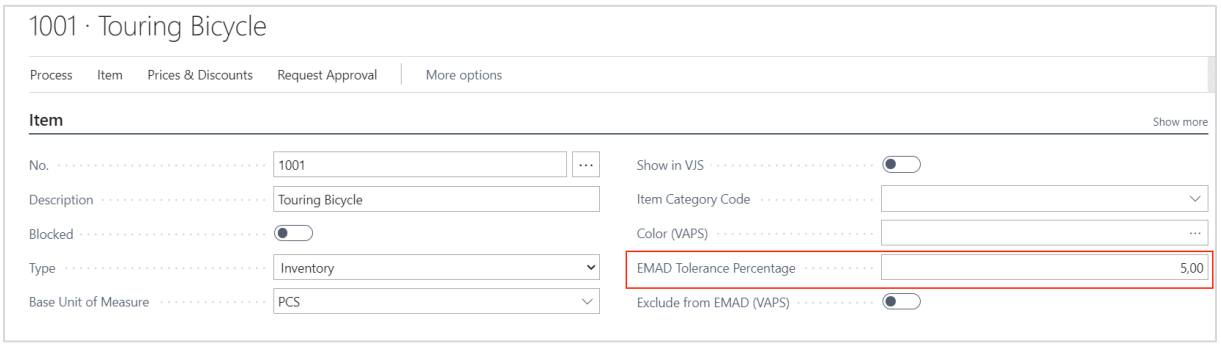
7.11.9. Handling of completely picked items

Completely picked (i.e., taken from inventory) items are treated with a higher priority than unpicked ones

7.11.10. Apply EMAD tolerance to an item

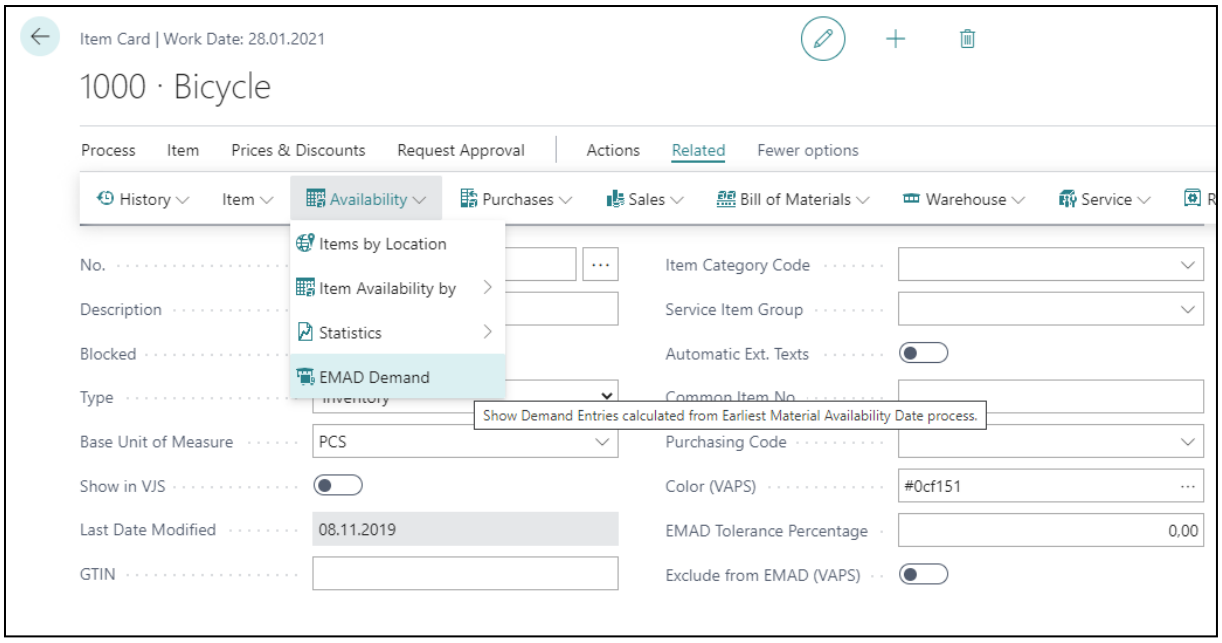
As is commonly known, the EMAD calculation provides a date from which the required quantity of component demand is available and before which the production order must not start. The newly implemented EMAD tolerance allows defining the criterion not too narrowly so that, e.g., an order could already start if only 95% of the required material is available.

To be able to do so, we have enhanced the item card with the respective setting option. When calculating the demand, the entered value is multiplied by the available quantity.



7.11.11. Shortcut to EMAD demand entries

We enhanced the Item card so that you can directly navigate to the EMAD demand entries.



7.11.12. Run EMAD calculation from Job Queue

With the help of the Business Central job queue, you can schedule certain background jobs for regular execution. The EMAD calculation, which until now could only be called via the VAPS (interactively with - depending on the data volume - long calculation times), can now be triggered via the job queue as soon as the VAPS is installed. Thus, it could be run at night, for example, without supervision and without the need for someone to log on to the system to start the VAPS.

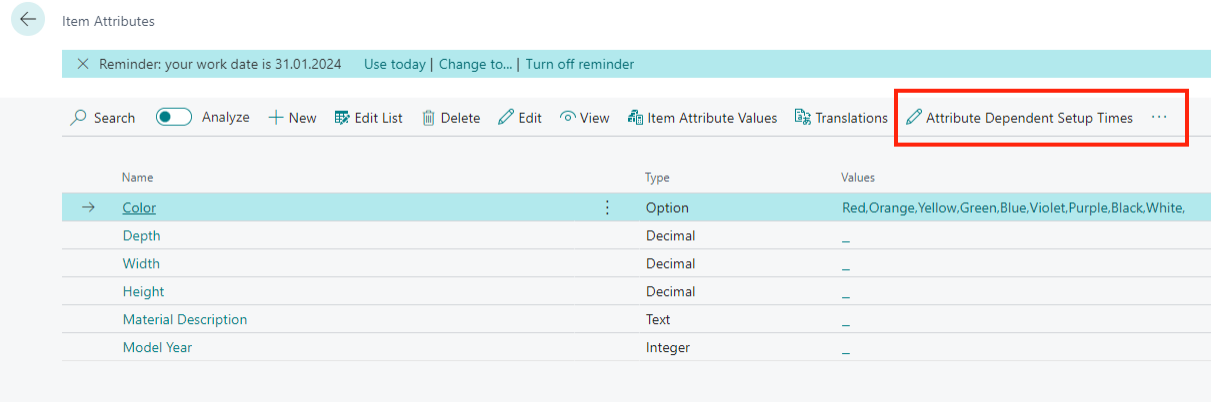
Setting up the job queue has to be done within Business Central by the administrator.

7.12. Sequence-dependent setup times

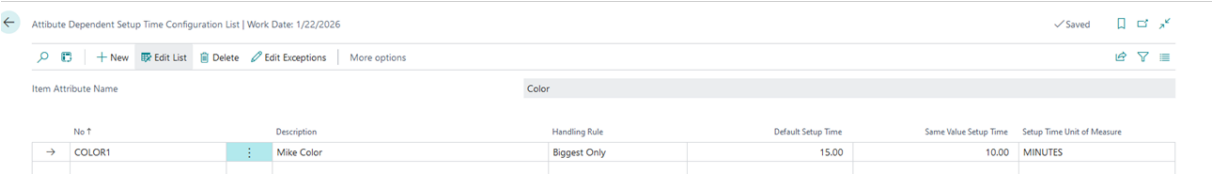
Reduce downtimes and operational costs while optimizing resource use with (lightweight) SDST = Sequence Dependent Setup Times.

With the VAPS, we typically schedule by production order to help customers complete their orders on time through prioritization methods like “apply all” and “fill idle times.” However, optimizing the sequence of operations on key machines to reduce setup times can also increase throughput and reduce late orders. Sequence-dependent setup times (SDST) support this by grouping certain operations on specific machines to minimize overall setup times.

The SDST function of the VAPS works based on item attributes, so we enhanced the "Item Attributes" card accordingly:



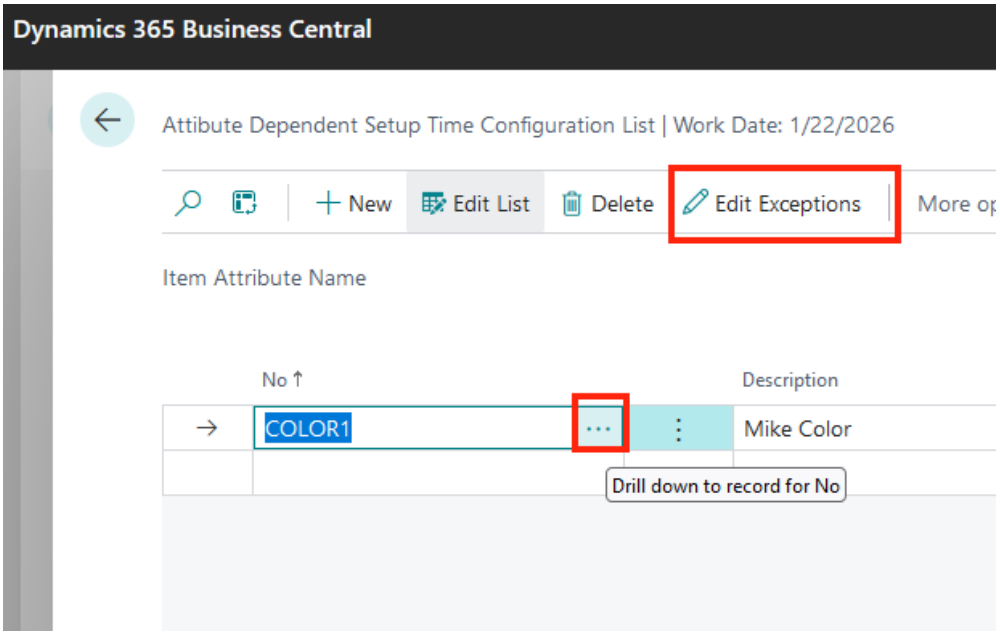
Clicking on this button will open the new SDST configuration list for the selected attribute:



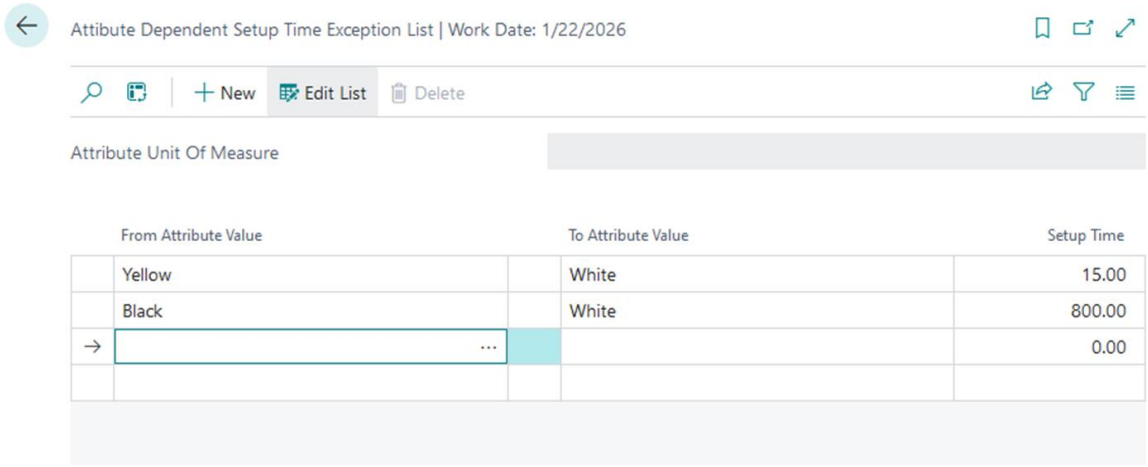
Meaning of the columns in detail:

- **No**: Used for identifying and referencing configurations for work and machine centers that will follow the SDST configuration.
- **Description**: Provides additional information for users.
- **Handling** Rule: Can be set to "Additive" or "Biggest Only."
    - "Additive" means the regular setup time of the production order routing line, the default setup time defined in the next column, and either the same value setup time or special case exception setup time will all be summed up.
    - "Biggest Only" will choose the longest setup time from the list.
- **Setup Time Unit of Measure**: Defines the unit of measure for all setup times on this page or for the exceptions.

To add special cases for switching between distinct attribute values, click "Edit Exception" on the action bar or click the "..." in the "No" column.

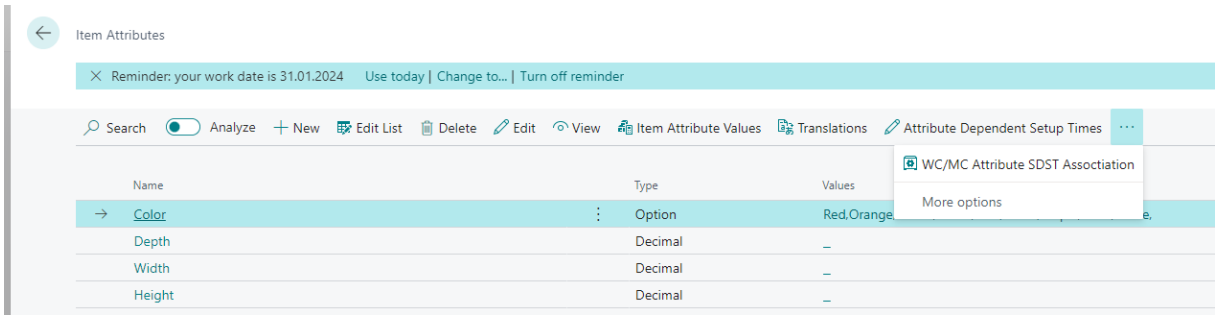


In the Exceptions list, you can define exceptions to the rule when one operation with a certain attribute value follows another with a different attribute value. Enter the values to check against in the "from" and "to" columns. Clicking "..." here will give you a list of all attribute values entered in regular BC so far, including option attributes, number (integer, decimal), and text attributes. You can also enter values directly via the keyboard. The setup time here follows the same unit of measure defined in the main SDST configuration for this attribute.



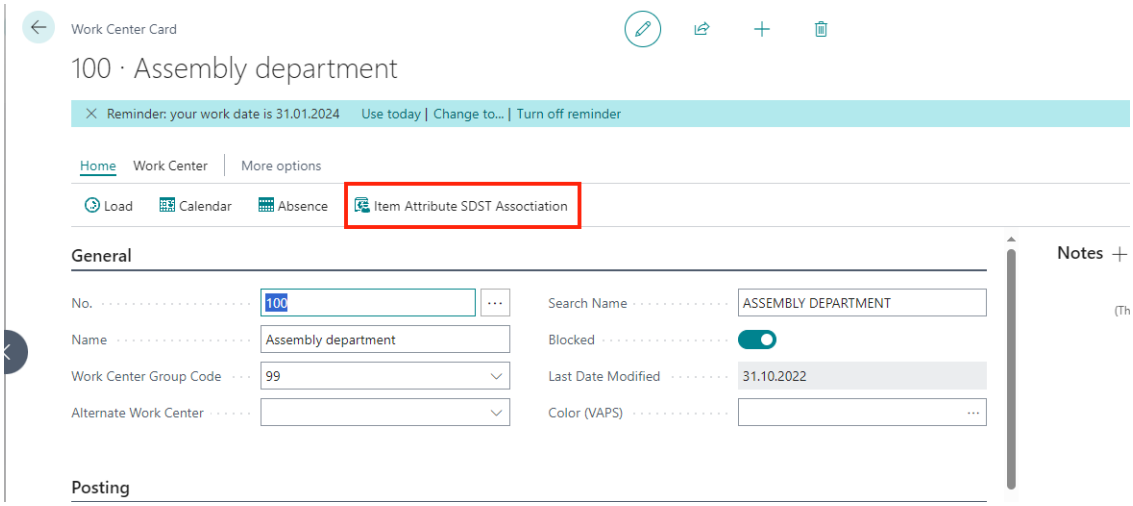
After setting up the SDST attributes, you need to assign the resources to which SDST will be applied. This can be done either

- on the Item Attributes List page:

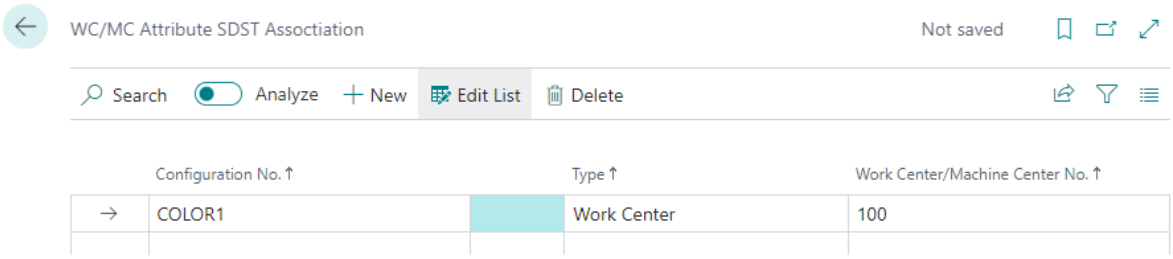


or

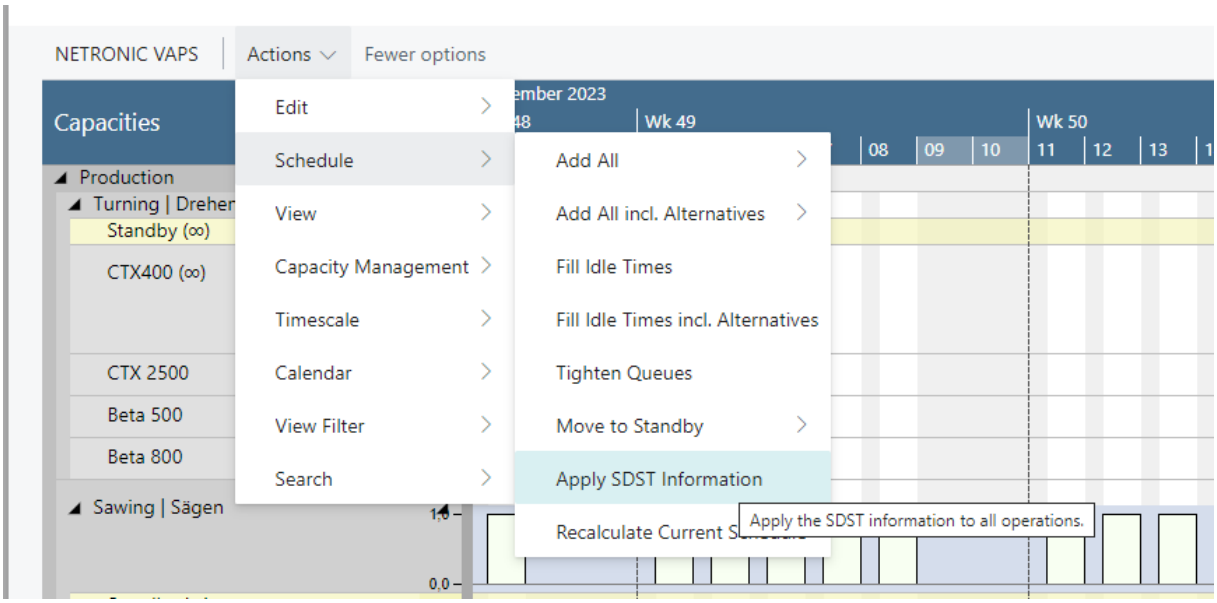
- on the MC/WC cards:



In both cases, a dialog appears where you can define which Item Attribute SDST Configuration should be applied to which work or machine center. Note that you can set the same configuration for multiple work and machine centers and set multiple configurations for one work or Machine Center.



Once the setup is complete, add the relevant attributes and values to items to be used in production orders. After that, you can load a simulation with the configured data and apply the SDST Configuration. This will prompt the scheduler to go through the operations and apply the correct setup times according to their sequence on the resources.



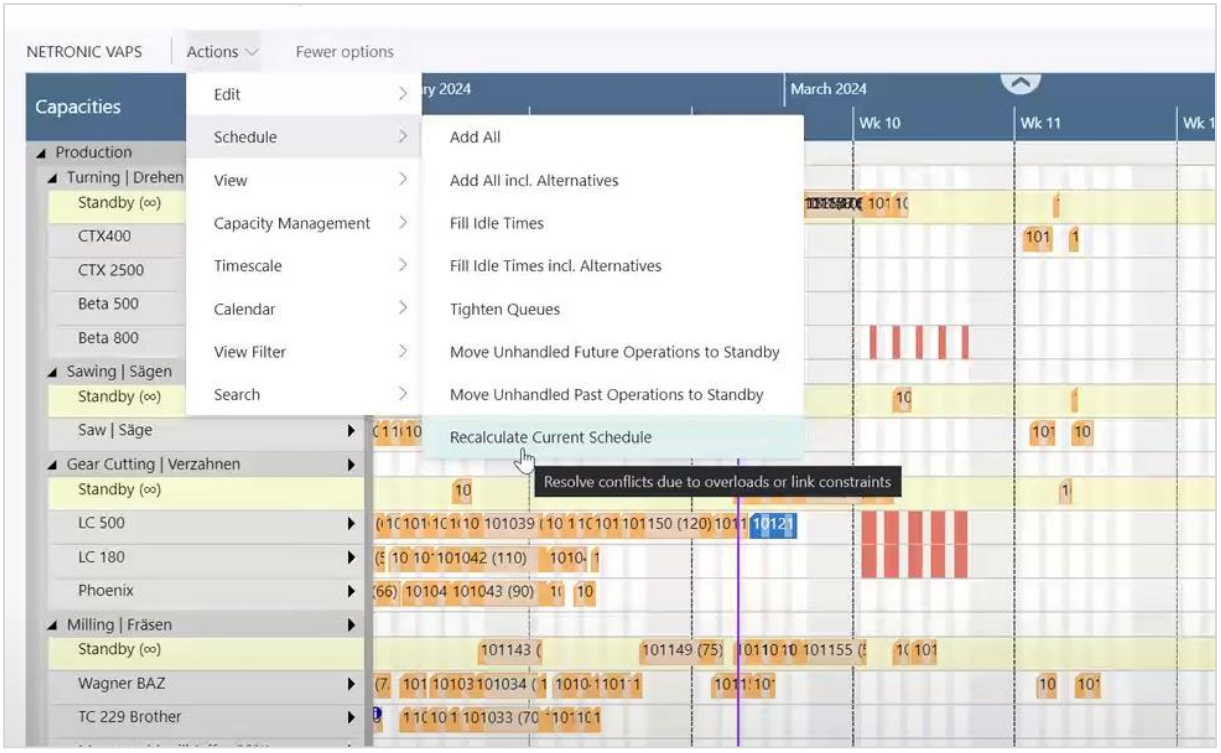
Please note:

- Currently, there is no easy way to see which operation or production order line has which attributes and values but we are working on a solution. For the time being, we recommend using item colors.
- Making changes to the SDST Configuration does not automatically update the simulations. However, clicking "Update Simulation" in an open simulation will load any changes made.

7.13. Resolve conflicts due to overloads or link constraints

It goes without saying that planners want - and need - to work with a schedule free from obvious conflicts such as sequence conflicts and overloads. On the other hand, due to the complex structure of Business Central data, production simulations, and updating the simulations with changed Business Central data, these conflicts cannot be fully avoided.

We solved this problem with the function "Recalculate current schedule":



This function ensures that

- the schedule will be literally "cleaned up" so that there will be no more sequence conflicts and overloads
- no operation will be pushed to the left - the earliest start date for each operation is the start date as of the current simulation

It can be very helpful after

- updating the schedule with shopfloor data
- changing the work/machine center capacity settings

8. Simulations

8.1. What is this simulation idea all about?

The Visual Advanced Production Scheduler does not just support one version of the schedule. You can create multiple simulations and scenarios, then compare them, and then publish the one that fulfills your purpose best.

Simulations are somewhat a cornerstone of the Visual Advanced Production Scheduler. In essence, the idea is as follows:

1. You can create a snapshot of the current production schedule.
2. This snapshot is saved as a copy of the production schedule. That way, your Dynamics 365 Business Central database does not get impacted.
3. You then can work with that snapshot (i.e., that copy) and check how certain changes to your schedule would impact your entire production schedule.
4. You can take as many snapshots as you like. Hence, you can build as many schedule scenarios as you need.

5. If you have a simulation/ scenario that you want to use as a new production schedule going forward, you can publish it. That way, your Dynamics 365 Business Central database gets updated.
6. As long as you do not publish, the Business Central database does not get changed.

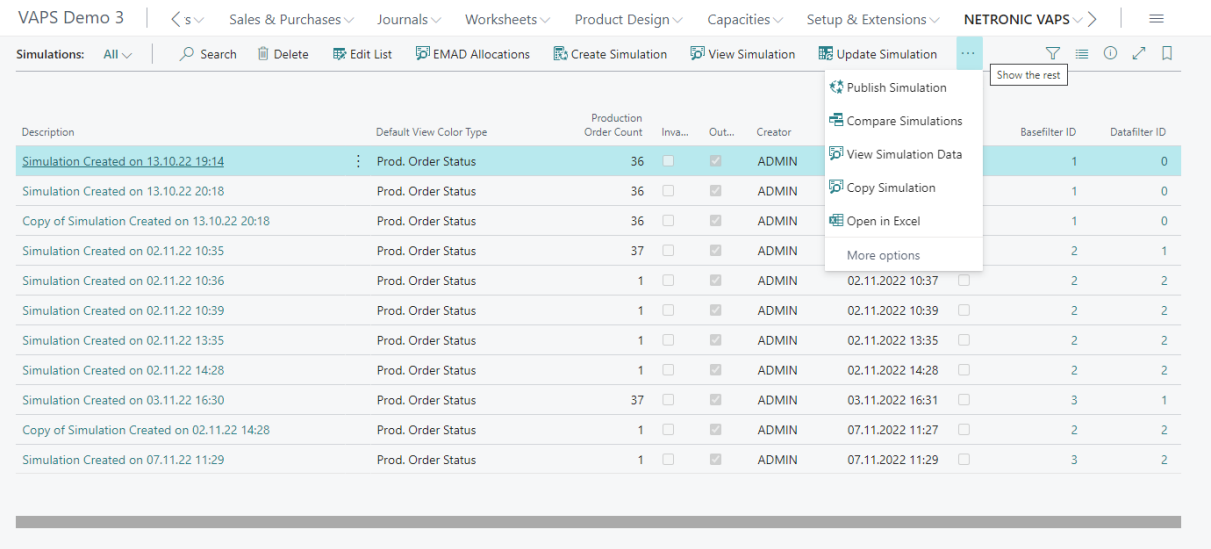
Some additional facts that are important to know:

- You can view each simulation both in tabular form and as a visual planning board,
- You can use the visual schedule to make drag & drop changes to a simulation.
- Any change that you do to a simulation gets automatically saved in the simulation table.

8.2. How does the production simulations page work?

We have our own page to manage simulations. It is called "production simulations". Here, you can create, change and publish simulations.

You can access the "production simulations" page from the NETRONIC VAPS menu, or by simply searching for "production simulations". The production simulations page looks as follows:



As you can see, this page consists of certain functions and a specific table. Let's have a look at both separately.

8.2.1. Functions of the simulations page

The following functions are available on the "production simulations" page:

- **Search**: The search field starts a dynamic search within the description column of the simulations overview table below. The list of simulations is automatically adapted while you type in your search term.
- **Delete**: You can delete the selected simulation. You can also select multiple simulations (press edit list first) and then delete them in one go. Please note ***you cannot undo a deletion.***.
- **Edit list**: This is standard Dynamics 365 Business Central functionality and allows you to edit the list below
- **EMAD Allocations:** Opens the EMAD – calculate allocations" page

- **Create a simulation**: Create a new simulation that is based on certain criteria such as timeframe and production order status. Here is more detailed information about how to create a simulation.
- **View simulation:** Select a simulation in the table below and click "view simulation" to open the visual schedule in which you can manage your production simulation via drag & drop.
- **Update simulation:** You can update a simulation here or also directly in the planning board. If you select more than one simulation, all selected simulations will be updated.
- **Publish simulation**: Select a simulation from the table below and publish it. A publish updates the underlying Dynamics 365 Business Central database. Once published, the respective simulation is removed from this table on the "production simulations" page.
- **Compare simulations**: You can compare different simulations and decide which one suits you best.
- **View simulation data**: With "view simulation data" you open a tabular view of all data that are part of the selected simulation.
- **Copy simulation**: If you want to create a new simulation that has lots of settings in common with an older one, just copy this simulation.
- **Filter**: Click on the filter icon to define and apply a filter to the table below.
- **Layout options**: You can choose whether to show your overview of simulations as list or in form of tiles.
- **Notes**: by clicking this icon in the menu ribbon, you open a small window where you can add, edit, and delete notes for a specific simulation to provide additional information.

8.2.2. Content of the simulations overview table

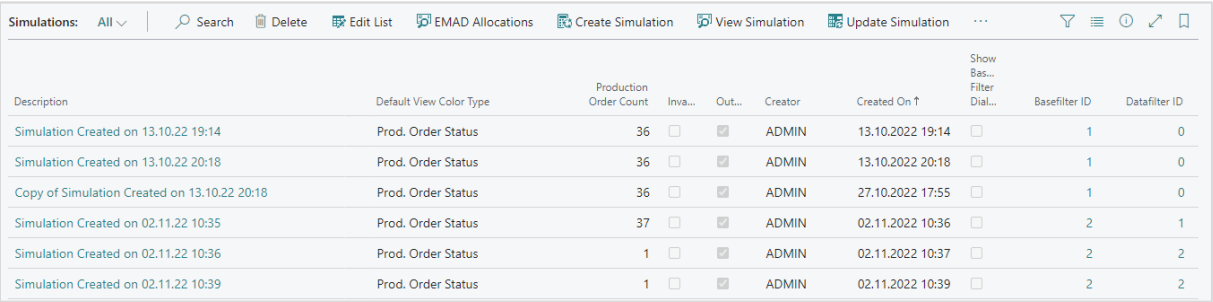
- Description: You can name a simulation with any description that you want. You can do this when you create the simulation. Or you can just click on a table cell in the "description" column and type in any name for that specific simulation. If you do not give a description on your own, the VAPS will determine one (like in the above table, where it says, "Simulation No. 0 on 07/22/19".
- **Default view color type**: Select the color scheme (see separate article on color schemes) that you want to apply when you view the simulation.
- **Created on**: Date on which this specific simulation was created.
- **Production order lines count**: Number of production orders that are included in this specific simulation.
- **Production routing lines count**: Number of production order routing lines that are included in this specific simulation.

8.3.How do I create a new simulation?

We have our own page to manage your simulations. It is called "production simulations". Here, you can create a simulation by applying various criteria.

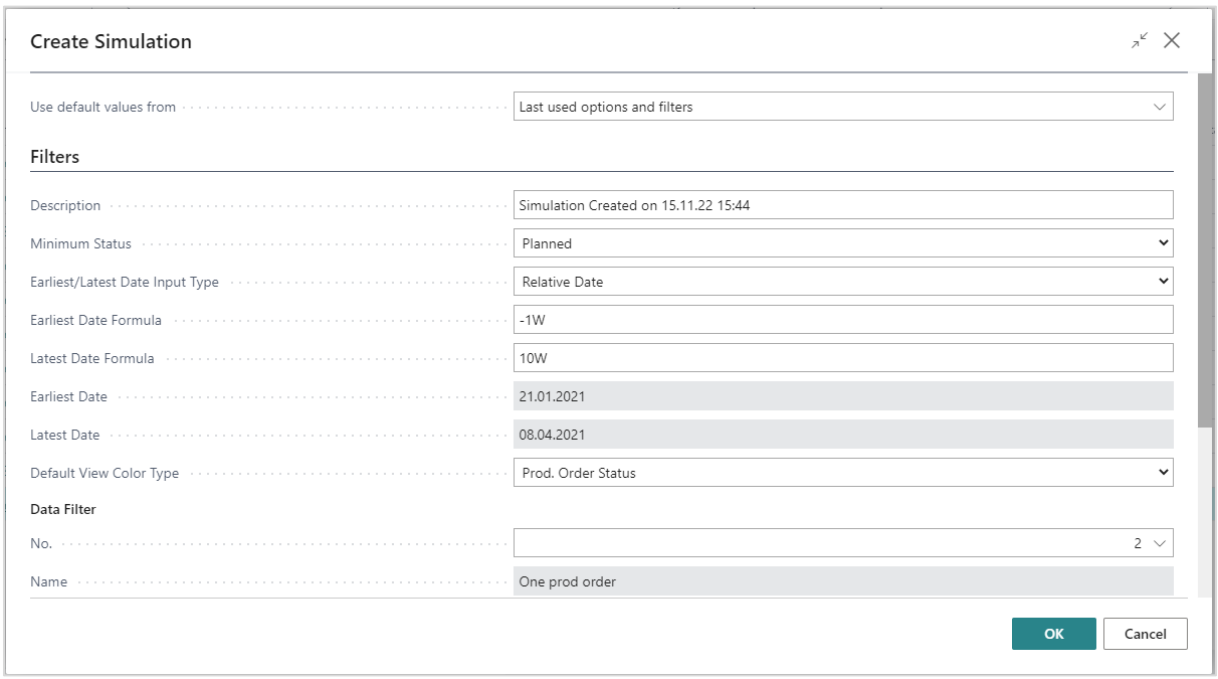
You can create as many simulations as you like. Each simulation is a snapshot of your current schedule, which you then can change via drag & drop in the visual scheduler. We keep each simulation persistent as long as you either publish or delete it.

You can create a new simulation on the "production simulations" page, which you can access from the NETRONIC VAPS menu, or by simply searching for "production simulations". The production simulations page looks as follows:



Description	Default View Color Type	Production Order Count	Inva...	Out...	Creator	Created On	Show Bas... Filter Dial...	Basefilter ID	Datafilter ID
Simulation Created on 13.10.22 19:14	Prod. Order Status	36	☐	☑	ADMIN	13.10.2022 19:14	☐	1	0
Simulation Created on 13.10.22 20:18	Prod. Order Status	36	☐	☑	ADMIN	13.10.2022 20:18	☐	1	0
Copy of Simulation Created on 13.10.22 20:18	Prod. Order Status	36	☐	☑	ADMIN	27.10.2022 17:55	☐	1	0
Simulation Created on 02.11.22 10:35	Prod. Order Status	37	☐	☑	ADMIN	02.11.2022 10:36	☐	2	1
Simulation Created on 02.11.22 10:36	Prod. Order Status	1	☐	☑	ADMIN	02.11.2022 10:37	☐	2	2
Simulation Created on 02.11.22 10:39	Prod. Order Status	1	☐	☑	ADMIN	02.11.2022 10:39	☐	2	2

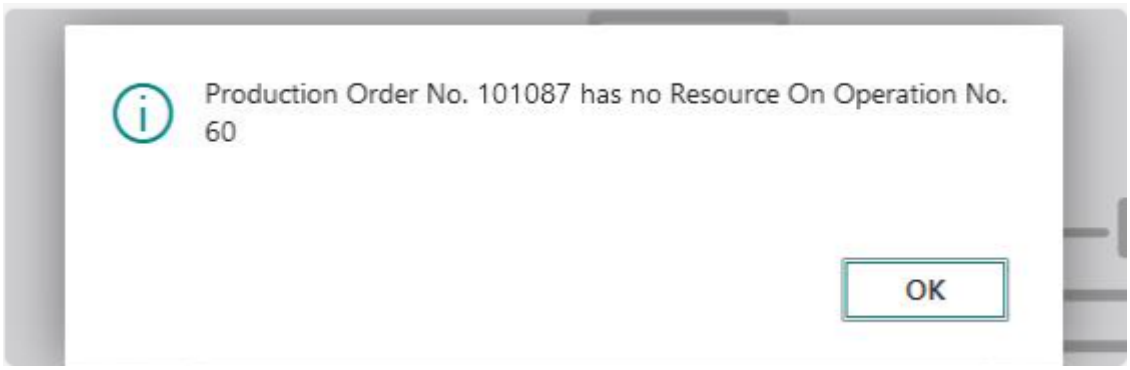
If you click "**create simulation**", a new page opens:



With this page, you define - in the **filters** section - certain criteria that should get applied for your simulation.

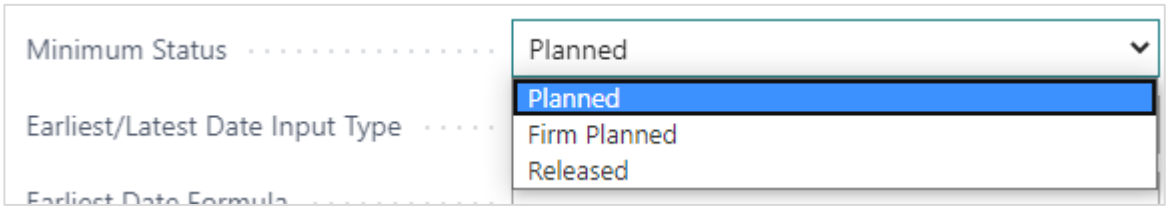
By clicking OK, a new simulation is created.

In case of inconsistent data, a warning message pops up:

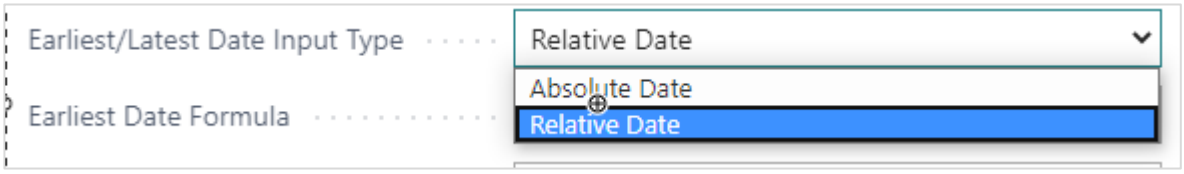


8.3.1. The Filter settings

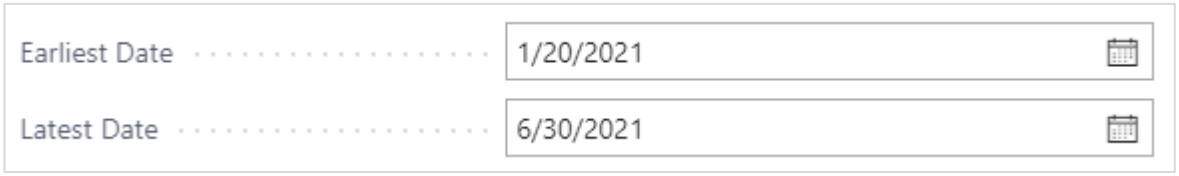
- **Minimum status**: Define which status the production orders included in the simulation shall have**.** Minimum status "planned" as in the picture above means that this simulation includes all production orders with the status planned, firm planned and released.



- **Time range** for the simulation: In the time fields relating to earliest/latest date you can specify either absolute or relative data.
  We recommend working with relative date settings.
  Please note that if you select "relative date", the absolute date fields get updated automatically!

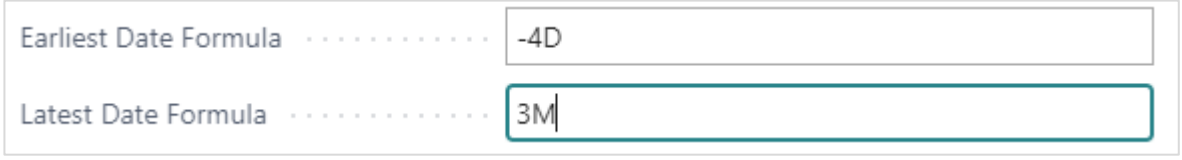


- **Absolute time range:** If you select "Absolute Date", you enter the desired dates in the according fields:

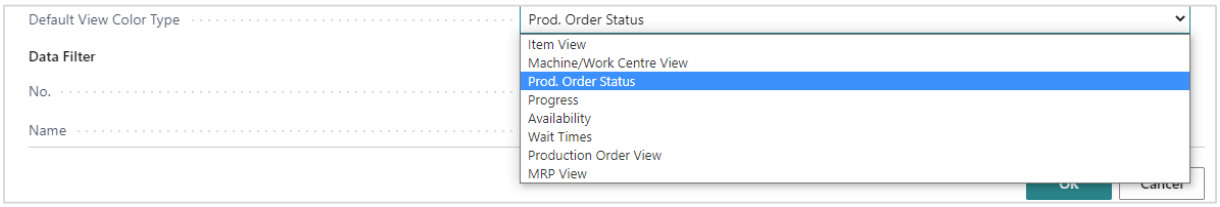


In the picture above, the simulation (remember this is the snapshot of your overall schedule that you then want to work with) includes all production orders with the minimum production order status "planned that start on or after 20 January 2021 and finish on or before 30 June 2021.

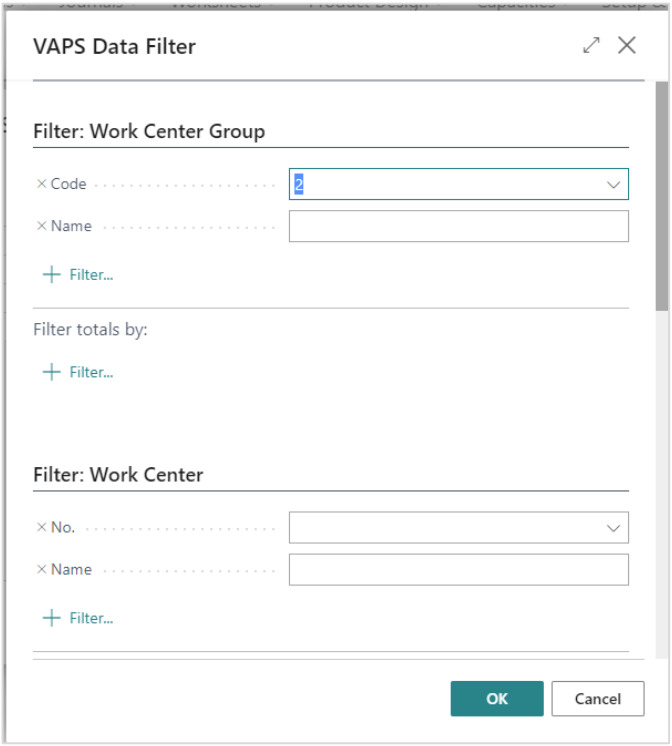
- **Relative time range**: If you select "Relative date", you have to enter an according data formula. In the picture below, we look four days back and three months into the future:



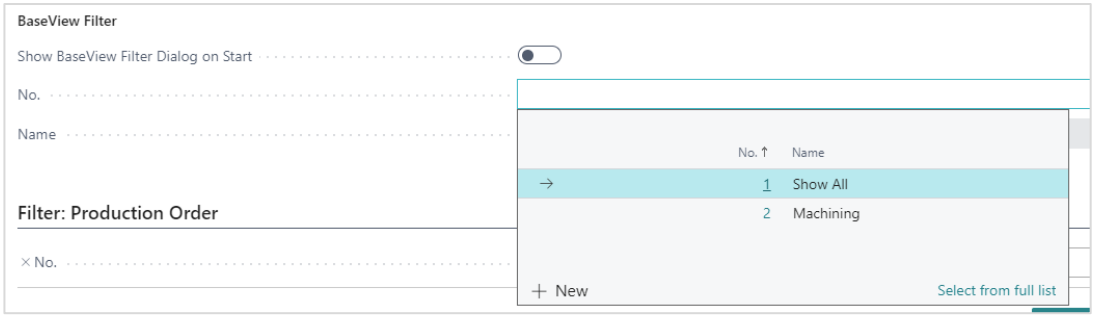
- **Default view color type**: Select the default color type for this simulation



- **Data filter**
  The settings in this area allow you to load only data that you really need (e.g., if you only need to work with data from your department). This means that these filter settings work as a Dynamics 365 BC data filter on loading the data into the simulation. Data filters are already effective at the data interface to make sure that only filtered data are handed over from Dynamics 365 BC to the VAPS. You create and edit filters as is described below under “Base view filter.”
  Read more about using data filters in this chapter

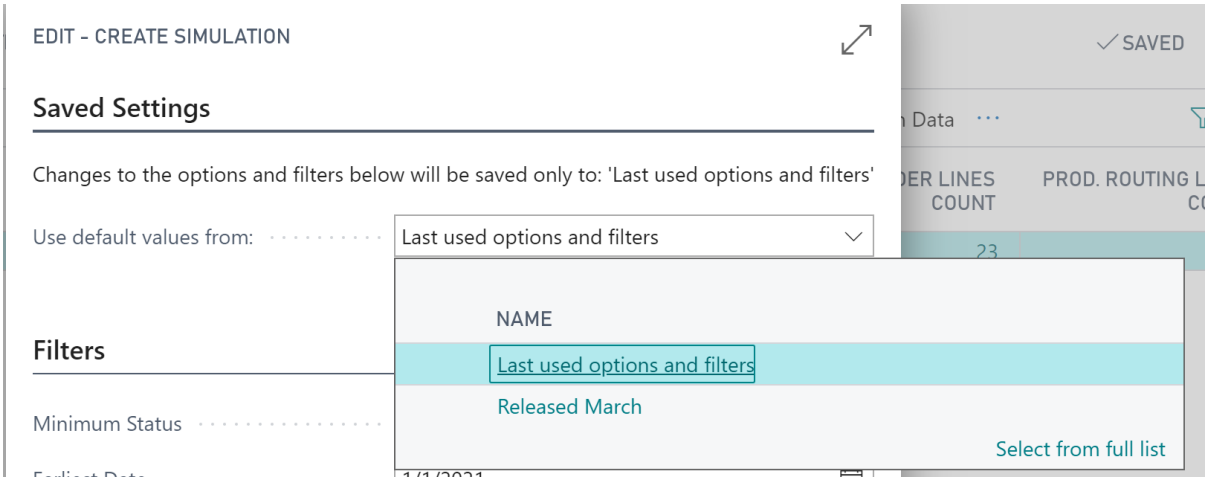


- **Base view filter**
  A base view filter is assigned to a simulation. This means that by opening the according simulation, the settings of the base filter come into play in addition to the data filter, but in contrast to the data filter, the data filtered out by the base filter are nevertheless taken into account for the planning. Please note that the settings of the base filter cannot be changed while the simulation is running.
  A base filter can be created directly upon creating a new simulation or via the simulations page
    - Decide whether the base view filter dialog pops up at the start of the simulation
    - Select an existing filter from the drop drown list
    - Create a new one by clicking "Select from full list". For details, please see the description below on "How to define regularly used filters".

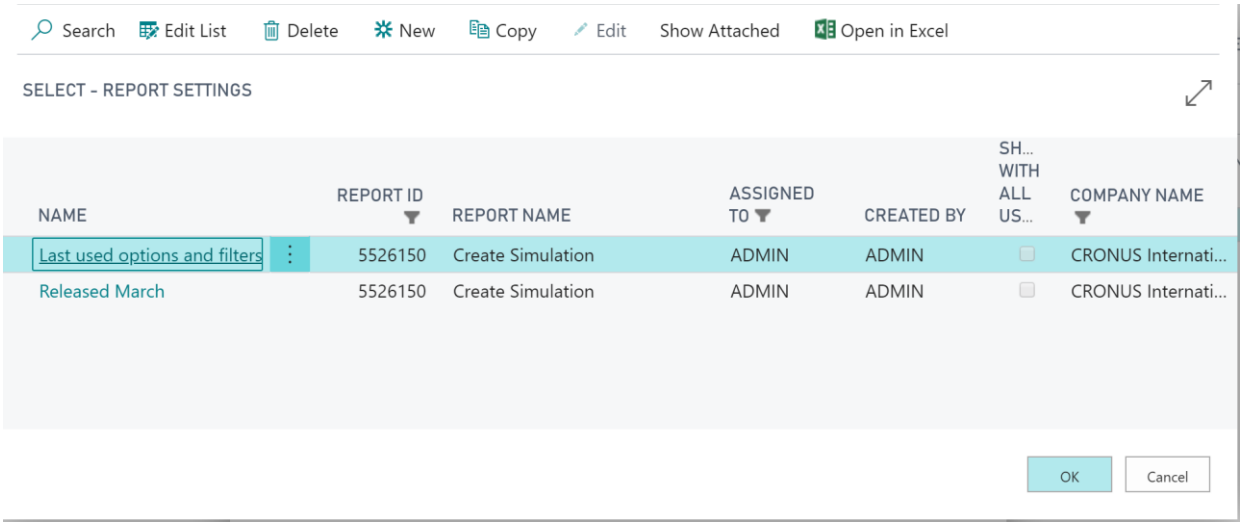


8.3.2. How to define regularly used base view and production order filters

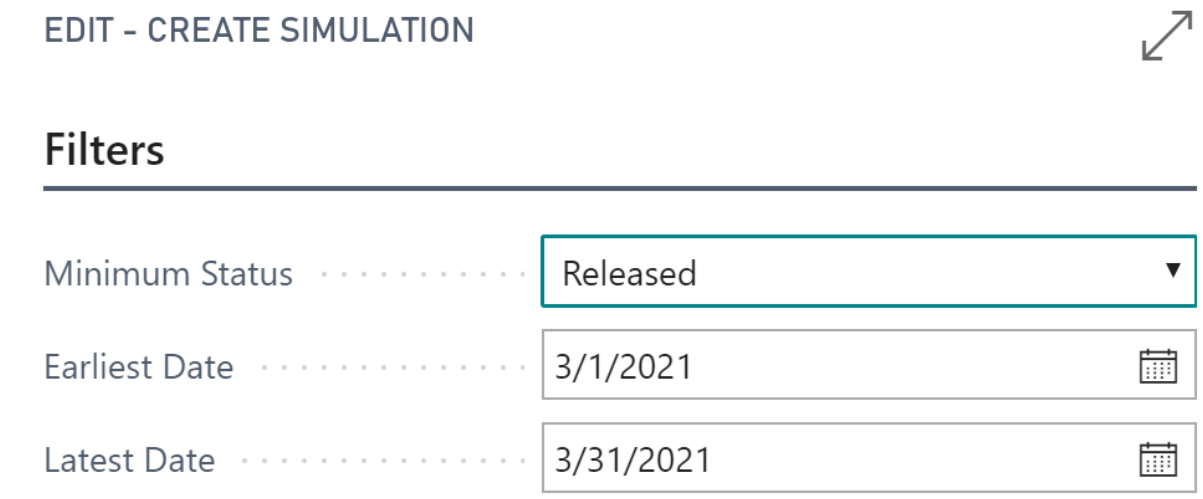
If you have filters that you want to apply multiple times, it makes sense to define them once. In order to do so, click the downward-facing triangle in the dropdown menu under "saved settings" and then click "select from full list".



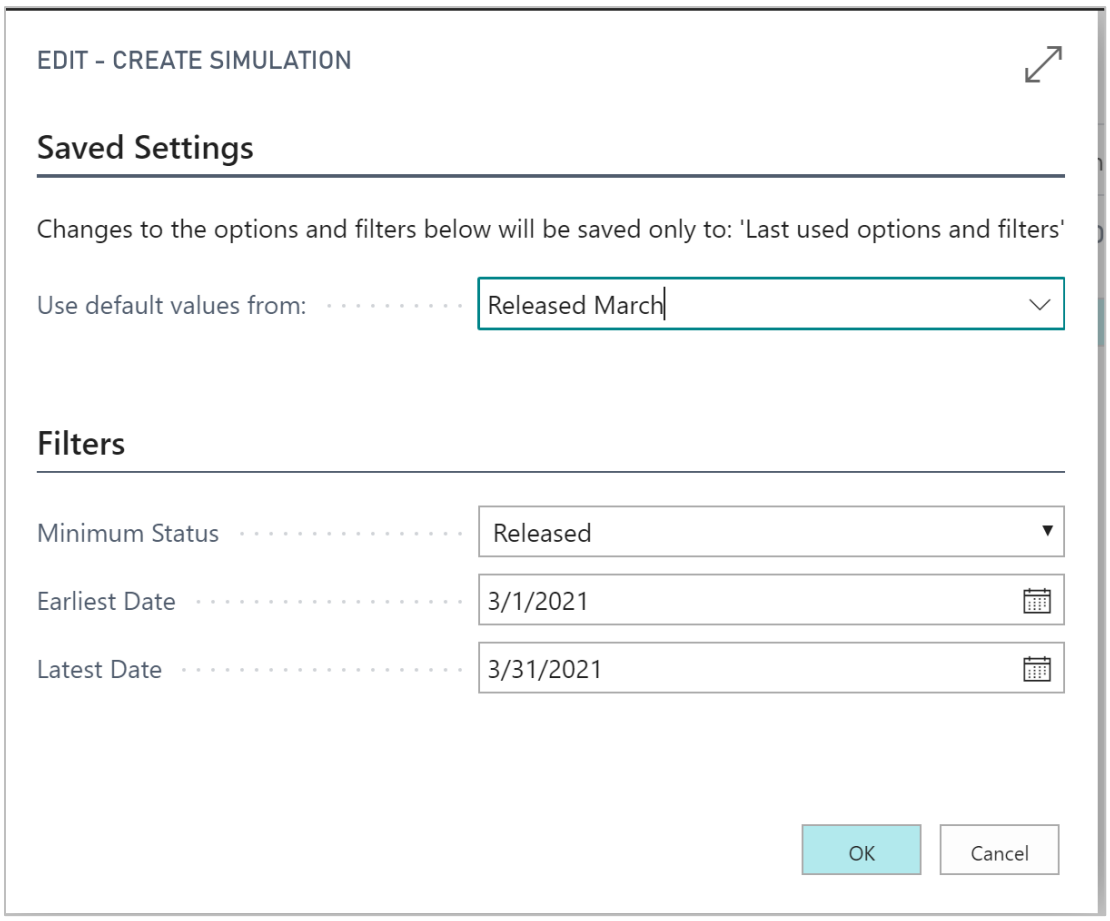
A new page opens, from where you can manage (i.e., create, edit, and delete) all your filters:



When you click "new", you can create a new filter with certain criteria. Here is how the "Released March" filter was defined:



Once defined, you can also apply this filter if you create a new simulation:



8.4. How changes to a simulation are managed

While working in a simulation, multiple changes can happen that are treated in different ways

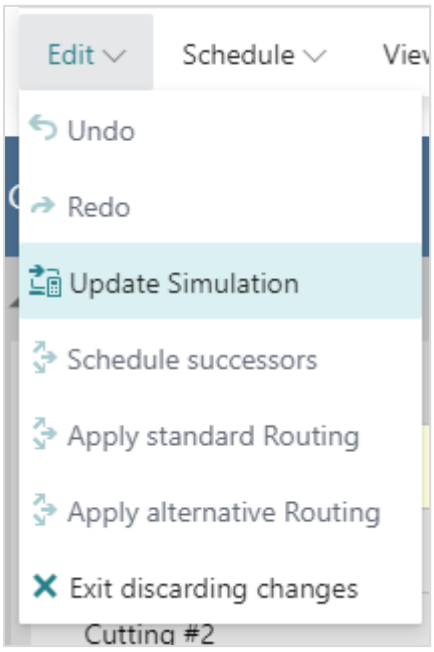
8.4.1. General changes to production orders

General changes to production orders while there are simulations (opened or not opened) that do not include these production orders are

- add new production orders
- delete production orders
- change "general" production order data, like
  - due date
  - required due date
  - color
  - quantity
  - setup time for one routing line etc.

Effects of general changes

- the simulation gets outdated
- you get a notification if this happens while a simulation is open
- you can directly update the simulation



8.4.2. A specific change to a production order: the status change

Changing the production order status can lead to a change of the production order ID, this making the handling of simulations rather tough.

Impacts of changing the production order status

- If you change the production order status from within the VAPS, we will seamlessly update the open (and all other simulations)
- If you change the production order status from another session/as another user
    - all **not opened simulations** get silently updated
    - in the **open simulation**: if you made a schedule change to the production order and somebody else changed the status while you did so, you will not be able to save your changes because the production order ID got changed.

8.4.3. A change to the production order routing line status

Changes to the production order routing line status can happen if

- somebody starts posting output/consumption on an operation from a released production order
- somebody finishes an operation from a released production order

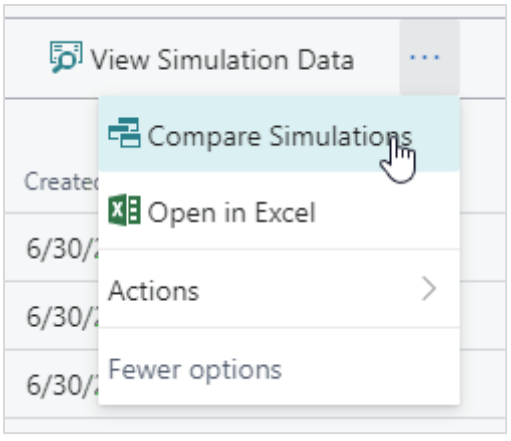
Impacts of changing the production order routing line status

- the simulation silently updates

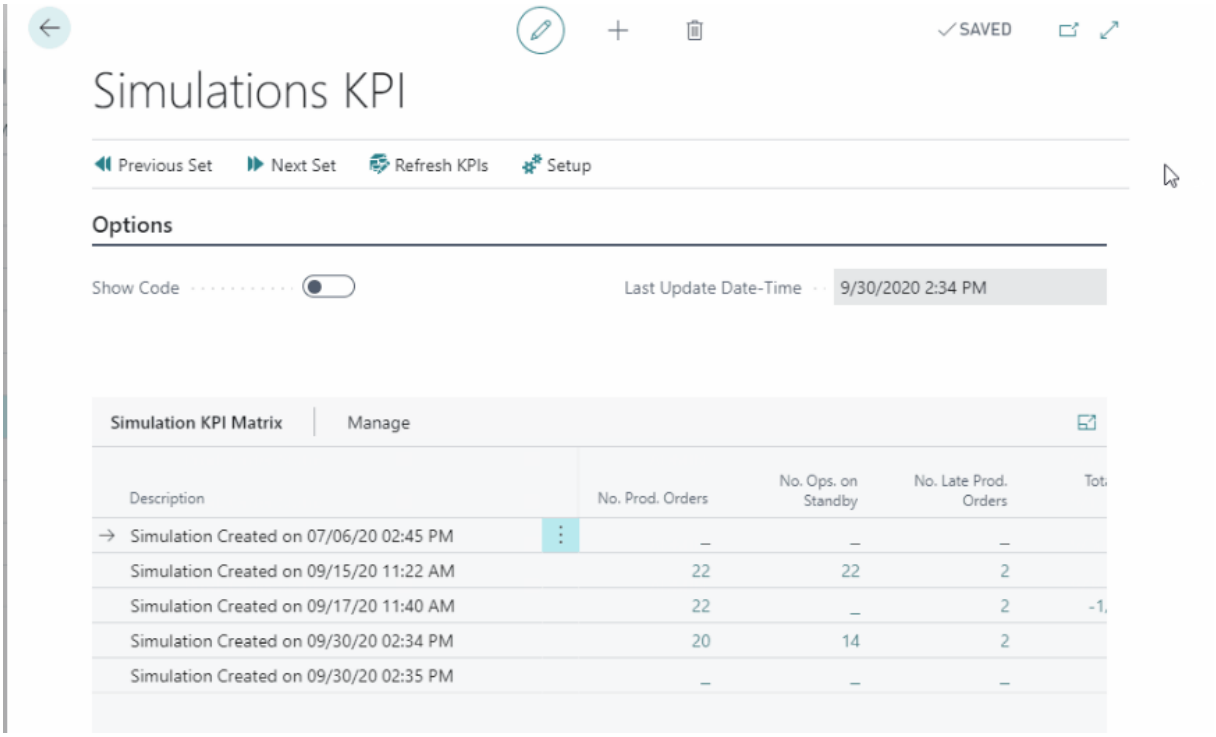
8.5.Compare simulations

With version 1.3 of the VAPS we introduced a (first) set of KPIs so that you can compare different simulations and decide which suits you best.

Click "Compare Simulations" on the simulations page:



The “Simulations KPI” pages opens up:

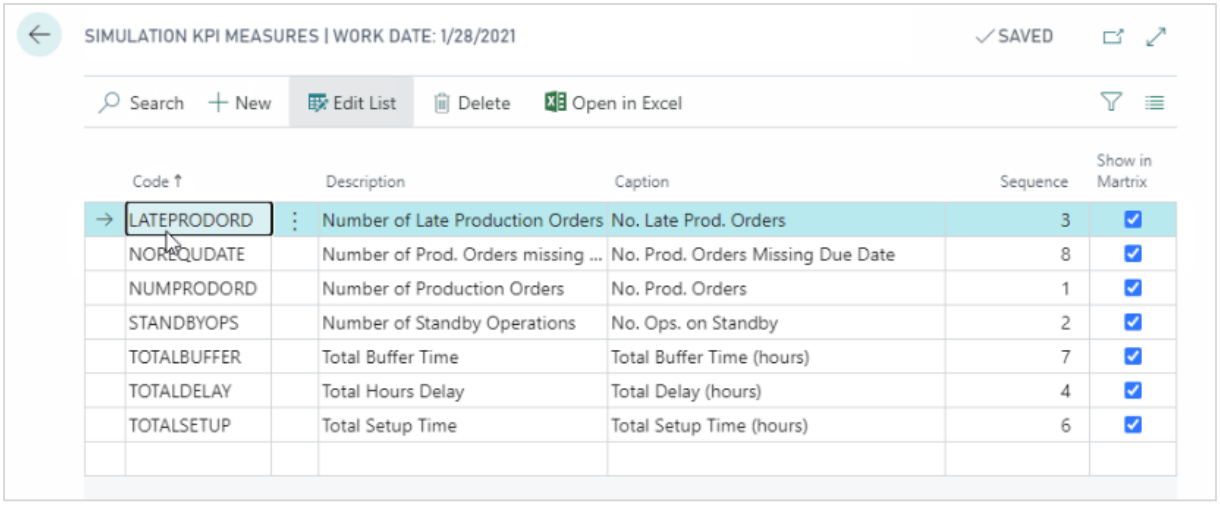


This page shows the following KPIs per simulation:

- Number of production orders
- Number of operations on standby
- Number of late production orders
- Total delay (hours)
- Total setup time
- Total buffer time (time between end of production order and required due date)
- Number of production orders without required due date

On the "Simulations KPI" page you can

- refresh the KPIs: if you have added a new simulation, the KPIs of this simulation remain empty until you have refreshed them
- call the "KPI Setup" dialog, where you can exclude/include outdated simulations from/in your comparison
- call another dialog via **Setup-->Navigate-->Measures** where you can **administrate your KPIs** (delete, hide, change order)

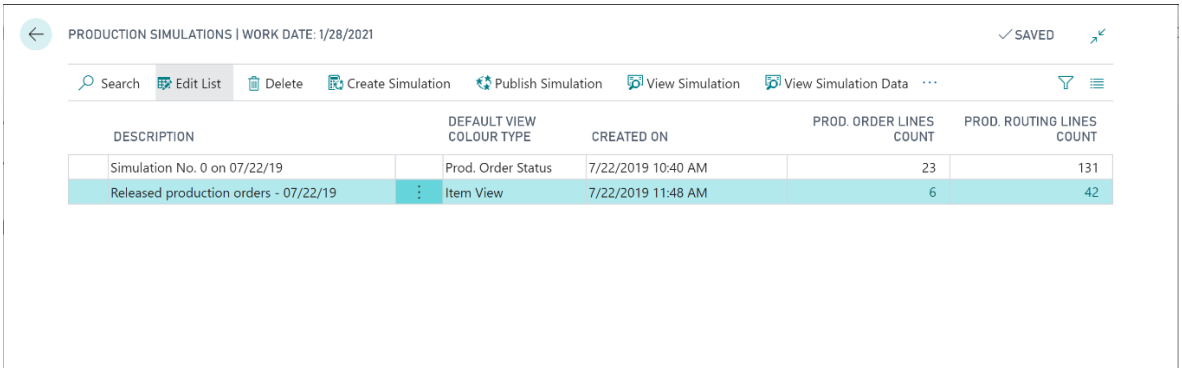


Code	Description	Caption	Sequence	Show in Martrix
LATEPRODORD	Number of Late Production Orders	No. Late Prod. Orders	3	☑
NOREQUDATE	Number of Prod. Orders missing ...	No. Prod. Orders Missing Due Date	8	☑
NUMPRODORD	Number of Production Orders	No. Prod. Orders	1	☑
STANDBYOPS	Number of Standby Operations	No. Ops. on Standby	2	☑
TOTALBUFFER	Total Buffer Time	Total Buffer Time (hours)	7	☑
TOTALDELAY	Total Hours Delay	Total Delay (hours)	4	☑
TOTALSETUP	Total Setup Time	Total Setup Time (hours)	6	☑

8.6. How do I publish a simulation?

We have our own page to manage your simulations. It is called "production simulations". From here, you can publish a simulation. "Publish" means that we update the underlying Dynamics 365 Business Central database.

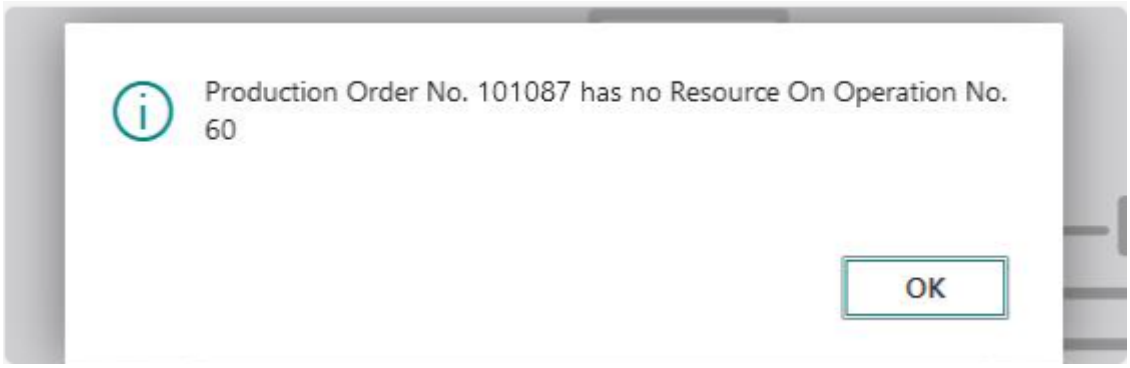
You can publish a simulation from the "production simulations" page, which you can access from the NETRONIC VAPS menu, or by simply searching for "production simulations". The production simulations page looks as follows:



DESCRIPTION	DEFAULT VIEW COLOUR TYPE	CREATED ON	PROD. ORDER LINES COUNT	PROD. ROUTING LINES COUNT
Simulation No. 0 on 07/22/19	Prod. Order Status	7/22/2019 10:40 AM	23	131
Released production orders - 07/22/19	Item View	7/22/2019 11:48 AM	6	42

If you click "**publish simulation**", the selected simulation gets published. Once it is published, it gets automatically deleted and removed from the above-shown table.

In case of inconsistent data, a warning message pops up:

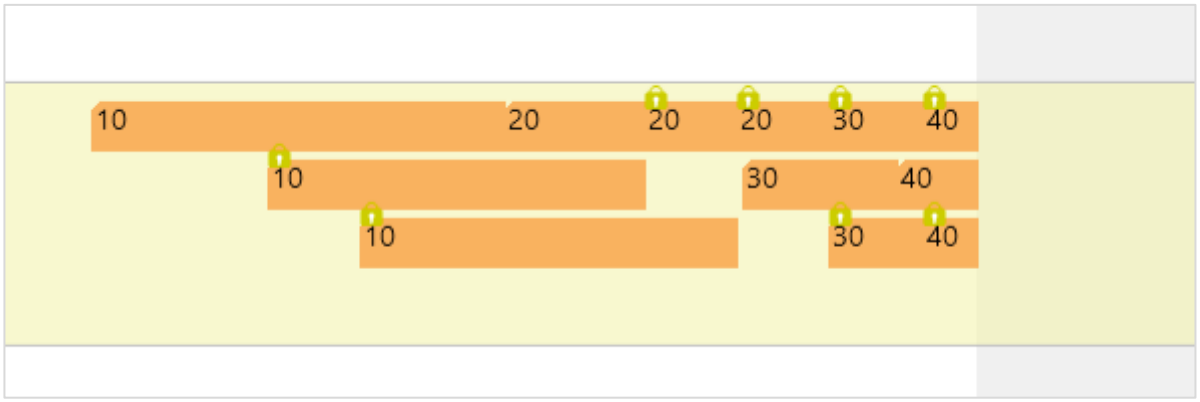


Please remember: "publish" means that we update the Dynamics 365 Business Central database. "Publish" means that the simulation becomes your new production schedule.

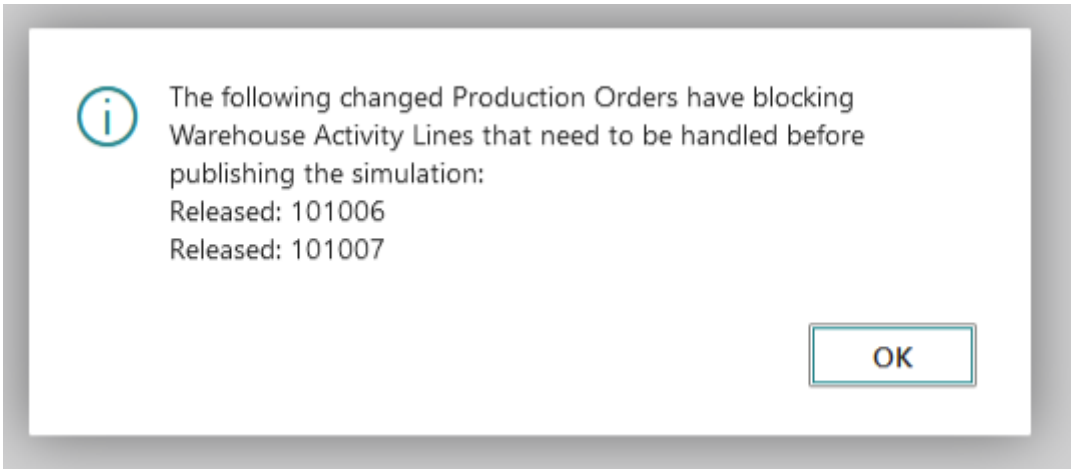
8.7. Handling of simulations with warehouse activity lines

When a production order contains a warehouse activity line, the order cannot be modified, and the associated simulation cannot be published. To provide more meaningful user information in these cases than the generic error message from Business Central, the VAPS offers the following support:

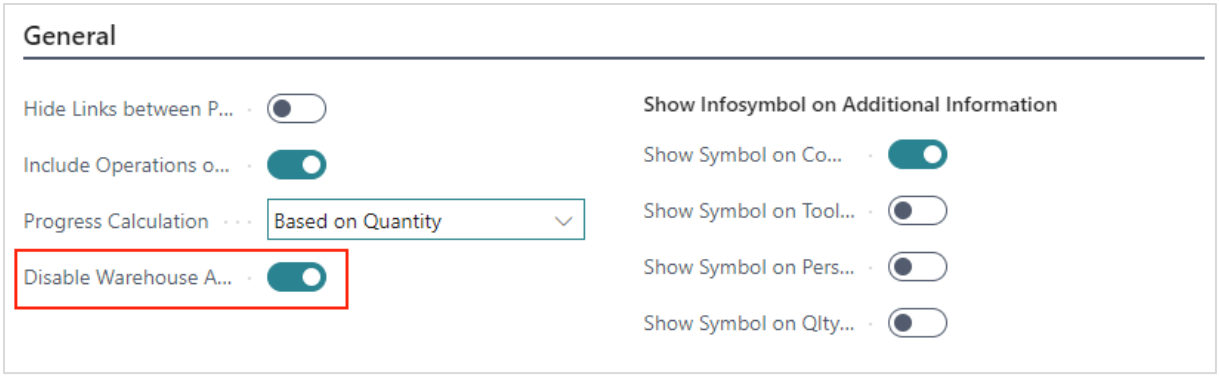
- a symbol for blocked production order routing lines



- an info window telling the users which production orders have been blocked



Since checking for affected production orders could consume excessive time in environments with a high volume of orders, the "Disable Warehouse Activity Line Check" option in the "General" section of the VAPS setup dialog allows for disabling the checking process. Please note, however, that in this case, the affected orders will still be blocked from modification.


General
Hide Links between P...
Include Operations o...
Progress Calculation
Based on Quantity
Disable Warehouse A...
Show Infosymbol on Additional Information
Show Symbol on Co...
Show Symbol on Tool...
Show Symbol on Pers...
Show Symbol on Qlty...

9. Day-to-day use cases

9.1. Working with subcontracting work centers

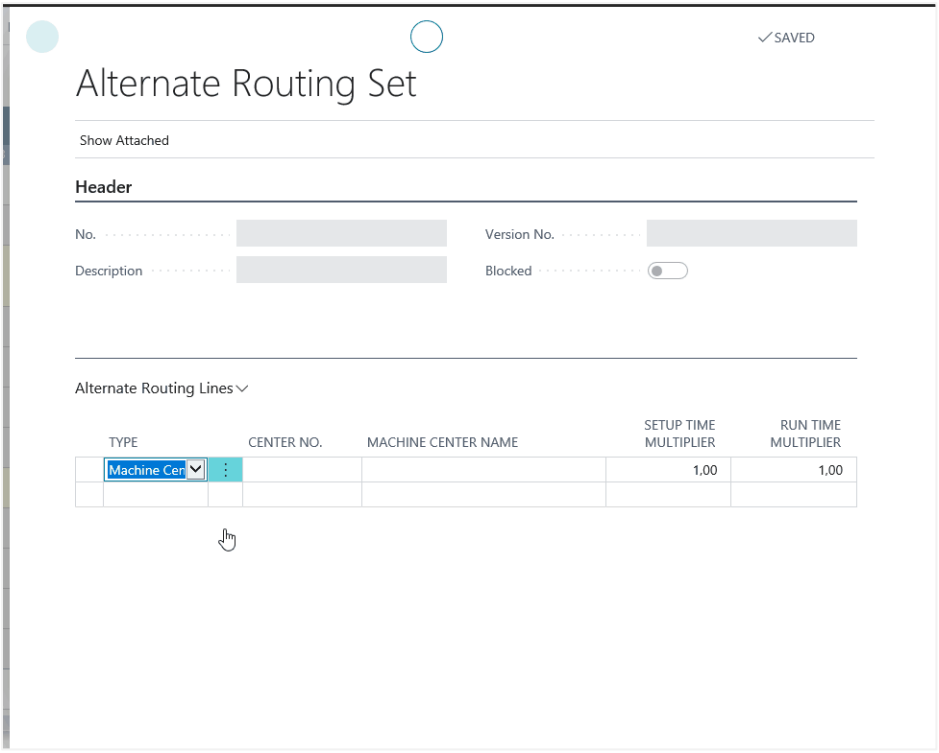
The VAPS supports setting up and visualizing subcontract work centers

Many manufacturers seem to use the subcontracting functionality of Dynamics 365 Business Central which implies setting up a work center as a subcontract work center. In general, two major use cases can be differentiated:

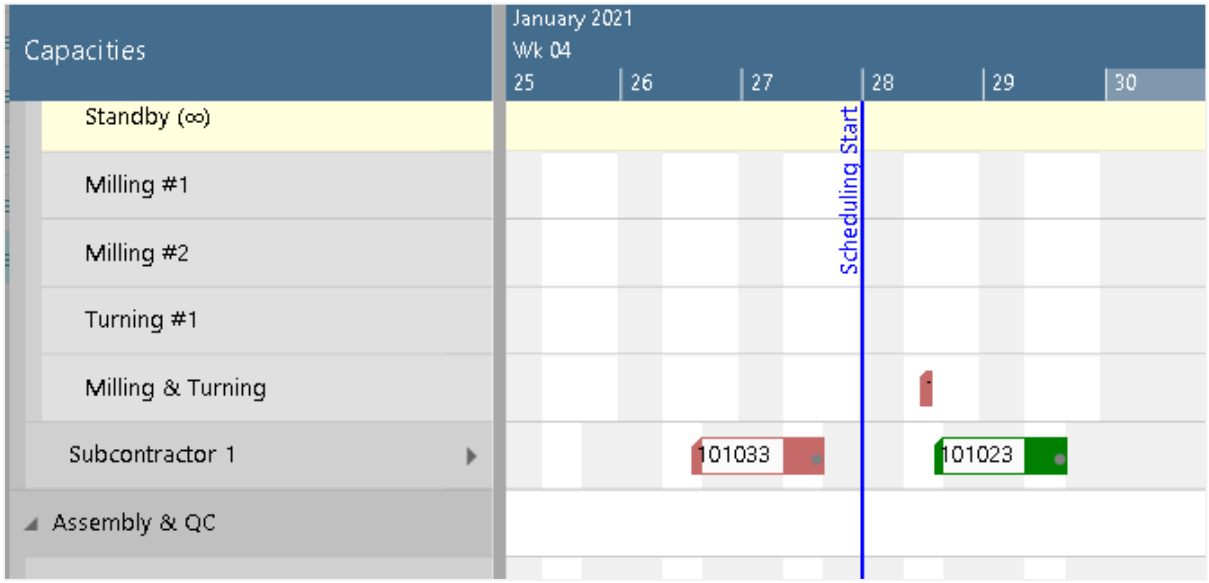
1. **Subcontractor as standard operation**
   In some cases, manufacturers need to outsource certain steps of their production process, because they don't have the needed machines. In this case, they set up a routing and have a subcontracting work center (which equals their supplier) as usual step of this routing.
2. **Subcontractor as option to deal with bottlenecks**
   In this case, manufacturing companies do everything on their own. But there might be cases in which they want to outsource something to a subcontractor because all their machines are busy. In that case, their standard routing is on their own machines, but they can change it manually so that then they send one operation to a subcontractor.

Since working with subcontractors is a really fundamental functionality for manufacturers, the VAPS enables visualizing and handling subcontractors as follows:

- Subcontract work centers are treated as work centers with infinite capacities because capacities and availability of the subcontractors are unknown to us.
- Subcontract work centers can be made part of alternate routing sets (although the rest of the VAPS currently still focuses machine centers when scheduling).



After having set up a subcontractor work center, operations can be assigned just the same as is done with "normal" work centers. However, please note that there is no Standby machine center.



The default color of the subcontract work centers can be set in the "Color Setup":

9.1.1. Handling of subcontractor production orders with related purchase orders

If a purchase order mirrors a certain production order (and is used for communication with the subcontractor/vendor), the due date from the subcontractor production order is used for EMAD calculation. The reasons for this are as follows:

in this constellation, the purchase order has no quantity (and hence cannot be used for EMAD calculation).

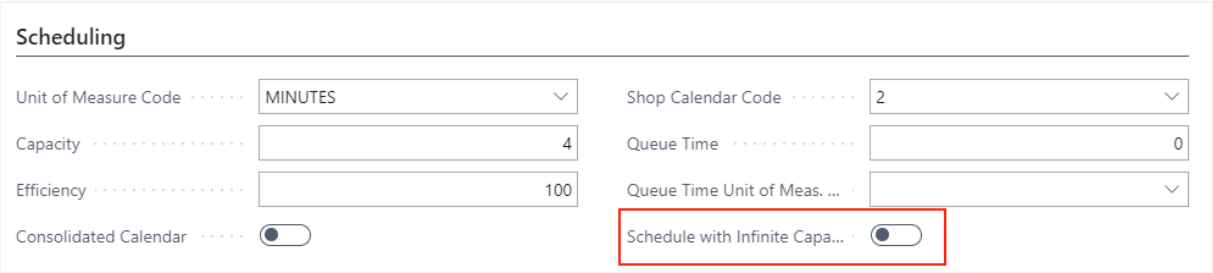
There is also no reservation/tracking between the purchase order and the production order.

9.2. Infinite capacity for work centers/machine centers

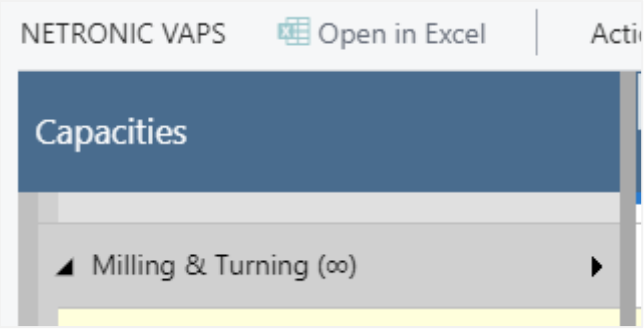
This feature is helpful for customers who have, e.g., certain clearly defined bottleneck areas in which it is imperative to plan with limited capacity and other areas in which it is perfectly possible to plan with unlimited capacity.

Moreover, in cases of orders being late, this feature helps to find out more easily where the bottleneck is, based on the overload that has occurred (when setting a machine center to infinite).

The respective work center and machine cards were enhanced to activate the “Schedule with infinite capacity” option.



Having activated this setting will be indicated by the ∞ symbol on the respective work/machine center:

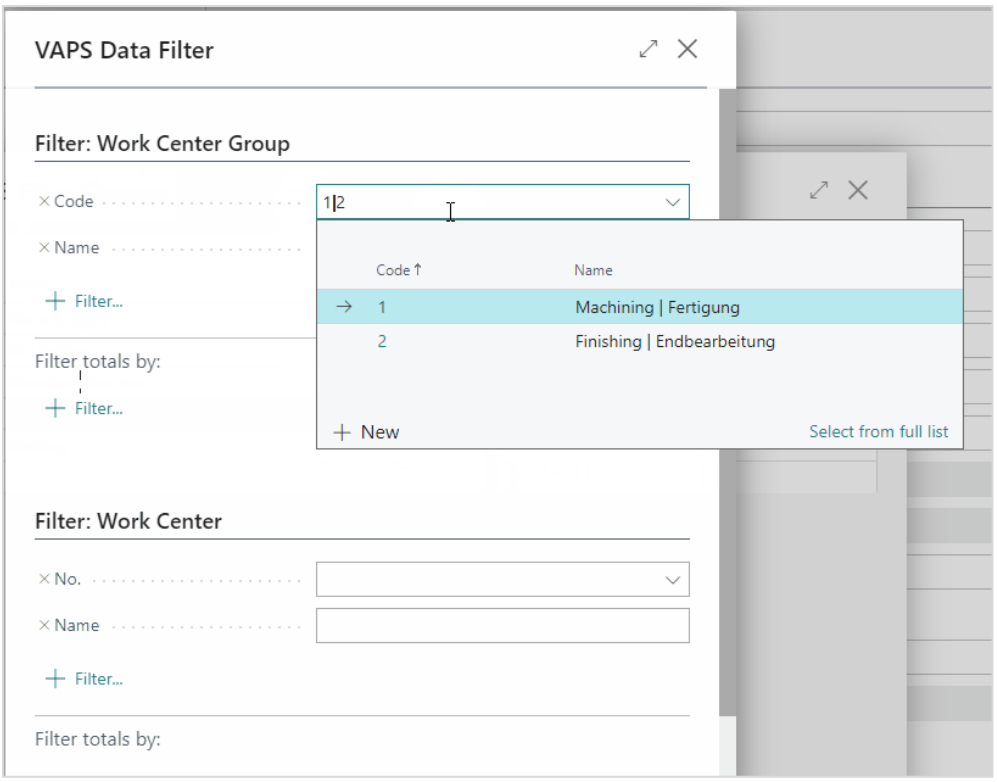


The behavior on such an "infinite" center is the same as on standby resources and subcontractor work centers. Operations may overlap without driving out each other. Switching on or off this option will affect the respective center in all existing simulations but operations having been scheduled already will not be rescheduled automatically.

9.3. Using data filters: filter on capacities

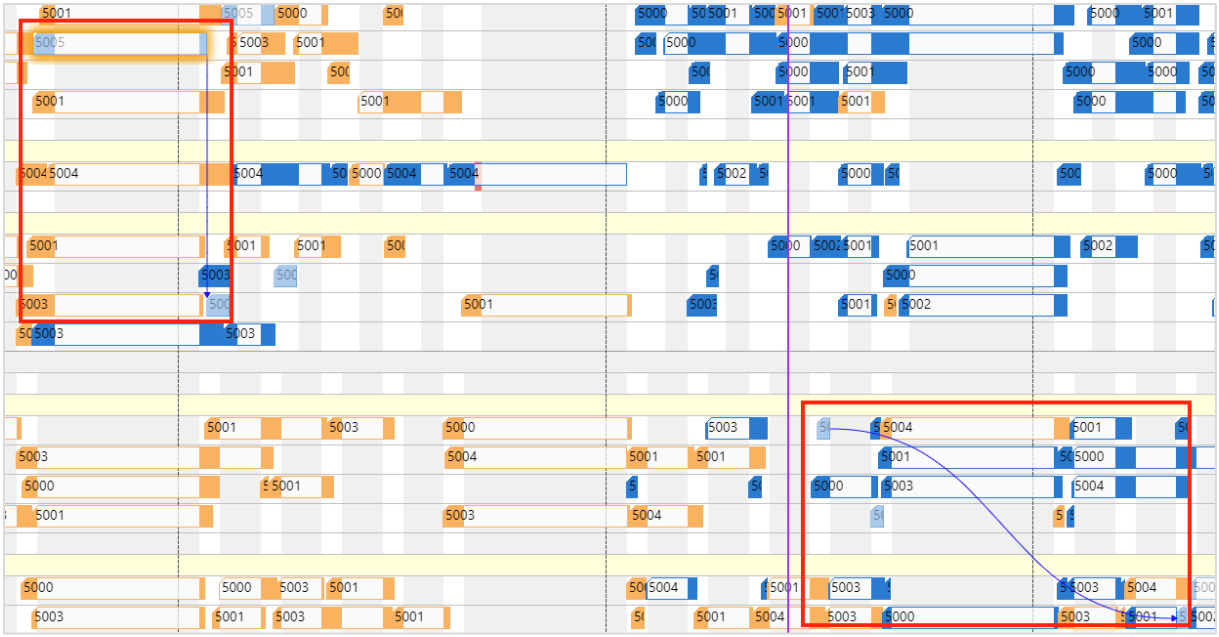
With a data filter you can load only data that you really need (e.g., if you only need to work with data from your department). This means that these filter settings work as a Dynamics 365 BC data filter on loading the data into the simulation. Data filters are already effective at the data interface to make sure that only filtered data are handed over from Dynamics 365 BC to the VAPS. Read more on creating and editing filters in this chapter.

Let’s say, in your overall plan there is a capacity “Subcontractors” but in your individual day-to-day work, this capacity does not matter so that you don’t need to load it. So, what would be more obvious than creating a data filter for this with the settings shown below?



Filtering by capacities results in loading only production order lines that are assigned to these capacities via routing. Production order lines that, due to filtering, have no child elements are not loaded. If lines that are not complete because, for example, an operation is missing because its capacity is filtered out, the remaining operations are displayed paler and can no longer be moved, i.e., they are treated as "pinned with blocked capacity". The same applies to production orders.

After opening our newly created simulation with the filter "No subcontractors", you'll recognize some operations appearing in a pale color and some links being somewhat "interrupted" because the operations of this production order that are handled by the subcontractors get, of course, filtered out. The paler color indicates that these operations can't be moved.



9.4.(Basic) production line scheduling

This feature is helpful for customers with a line-type scheduling approach.

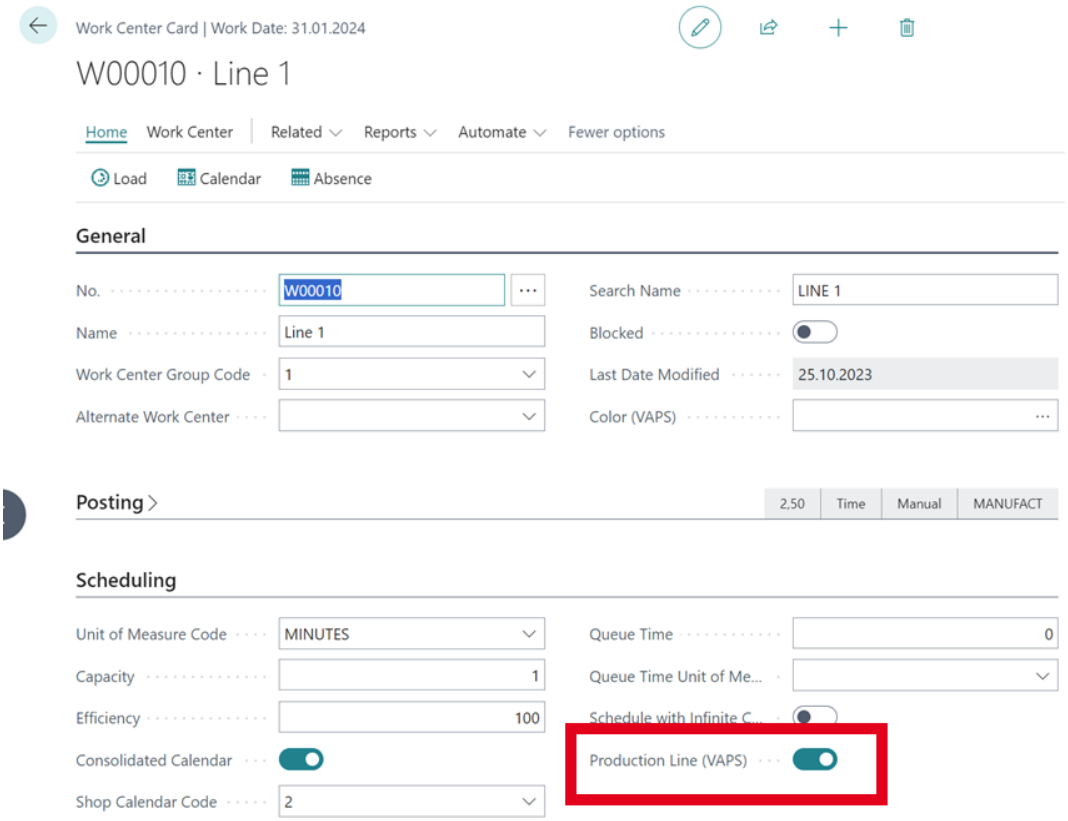
We've encountered certain customers who follow a line-type scheduling approach. Through collaborative sessions with these customers and their partners and a deep understanding of their processes, we've identified specific requirements that posed challenges with our initial VAPS design. This process revealed a plethora of potential features that could enhance the VAPS for more effective production line scheduling.

Recognizing the substantial amount of work involved, we opted to begin with a minimum viable set of features that would enable these customers to benefit from the VAPS immediately. Naturally, we plan to gradually expand this functionality with future releases.

As a first step in this direction, here's what we've implemented (and what we haven't):

9.4.1. Business Central setup

- Define the line as work center
- Define each “workstation” (i.e., each process step) as a machine center
- Flag the work center as “Production Line (VAPS)”
- Example:
    - Work center = line 1
    - Machine centers of that work center
        - Step 1
        - Step 2
        - Step 3
        - Step 4
        - Step 5
        - ...



9.4.2. Scheduling: We take the “line dependency” into account

Example:

- 2 work centers flagged as “production line”
- Both with 5 machine centers: step 1 … step 5
- If the first operation of a production order is assigned to the machine center “step 1” within work center 2, all subsequent operations will also get assigned ONLY to machine centers within that same work center 2

9.4.3. Visualization: We also monitor the “physical dependency”

- Once production order 1 is on a certain line, it cannot be overtaken by production order 2

Hence, on each machine center in that work center, the operations of production order 1 must start and end earlier than the operations of production order 2

The line dependency is taken into account as hard restrictions, when you do the following:

- Apply alt. routing (if prod order is on standby)
- Add all incl. alternatives
- (Apply routing and add all only work if your default routing keeps the line assignment)

Notice: All other scheduling tools currently do not take the line dependency into account.

Attention: you can violate any of these restrictions via drag & drop.

DANGER: "fill idle times" will most likely break up all line dependencies.

9.4.4. How to cope with the limitations

- Two new color schemes
  - Production Line Assignment -> gives a visual warning if the "line dependency" restriction is violated (e.g., multiple operations from one production order flipping between lines)
  - Production Line Sequence -> gives a visual warning if the "physical dependency" restriction is violated (e.g., one production order overtaking the other)
- Recommendations
  - Set your default routings in a way that the line assignment is granted
  - Set alternate routing sets so that you can efficiently "fill" all your lines
  - When doing line scheduling, trust the automatic scheduling
  - Avoid drag & drop as much as you can
  - If there are issues (sequence or line assignment violation), move the production order to standby and reschedule -> all line restrictions will be considered again