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Instruction design SFK4DP with LinSelect (constant path velocity)

Required information:

- Dimension contour
- Smallest radius
- Path velocity
- Accuracy
- Mass (dispensing head & connections)

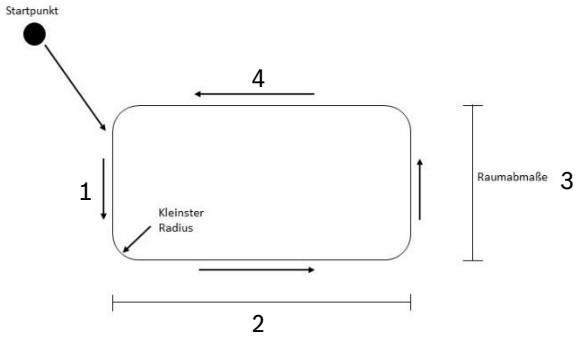
Typical process parameters:

- Velocity 0,05 - 0,3 m/s | 50 - 300 mm/s
- Acceleration 10 - 15 m/s² | max. 15000mm/s²

Due to the currently missing reference process for dispensing applications in LinSelect, this instruction describes a procedure by which a dispensing application can be designed. This is done by an individual input of the process.

1. Define workspace

The working space can be defined by the given contour. The contour must be simplified to a rectangle. If an absolute constant path velocity is to be achieved at all points of the contour, the direction changes must be driven with a radius. The smallest radius is important here, since the greatest forces and accelerations are applied there.



2. Calculate the maximum path velocity

With the help of the typical process parameters and the derived maximum acceleration and the smallest radius of the entire contour, it is possible to determine the maximum permissible path velocity.

$$v = \sqrt{a * r}$$

Specimen calcuation:

$$v = \sqrt{15\frac{m}{s^2} * 0{,}006m} = 0{,}3\ \frac{m}{s}$$

3. Calculation of the cut-off time

After calculating the path velocity or checking with the maximum permissible path velocity, the time of the individual sections (1 - 4, see first figure), which are important for LinSelect, can be calculated. Here, s is the distance to the corner of the imaginary rectangle (neglect radius) of the respective section and v is the calculated or desired path velocity.

$$t = \frac{s}{v}$$

Specimen calcuation:

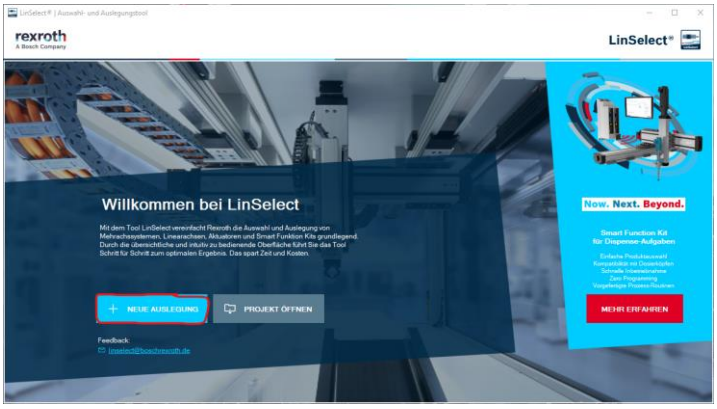
$$t_1, t_3 = \frac{0{,}1\ m}{0{,}3\ \frac{m}{s}} = 0{,}3\ s$$

$$t_2, t_4 = \frac{0{,}2\ m}{0{,}3\ \frac{m}{s}} = 0{,}7\ s$$

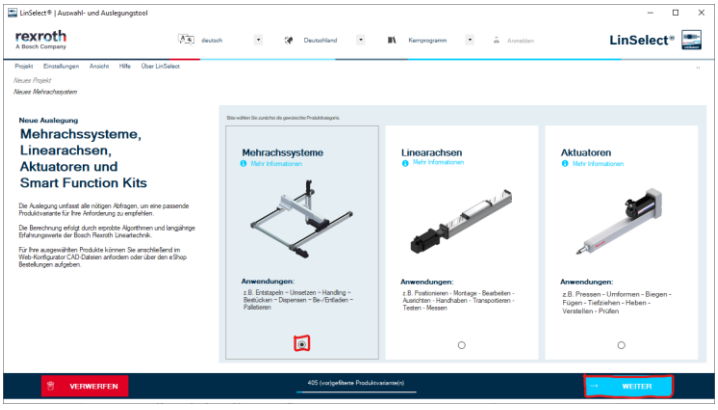
4. LinSelect workspace input

As soon as the calculations are finished and all 4 section times are calculated, LinSelect can be started. The following selection must be confirmed:

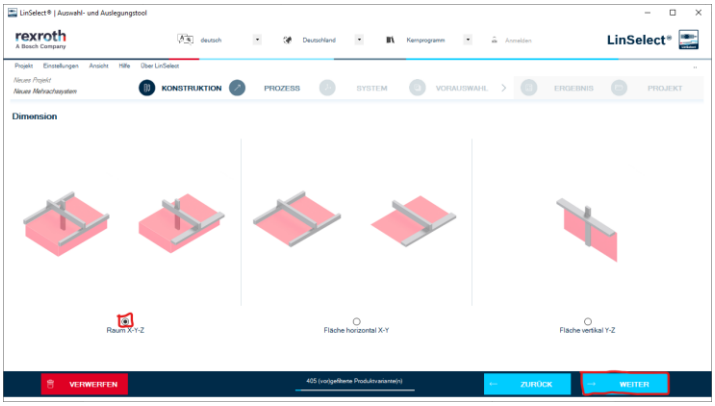
- ✓ Start new design



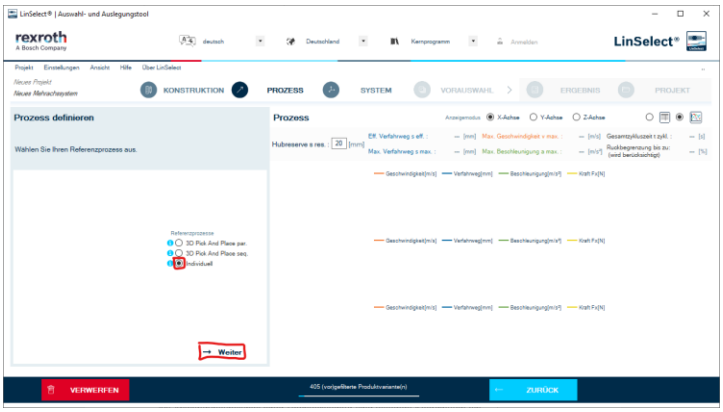
✓ Select multi-axis system



✓ Select room x-y-z

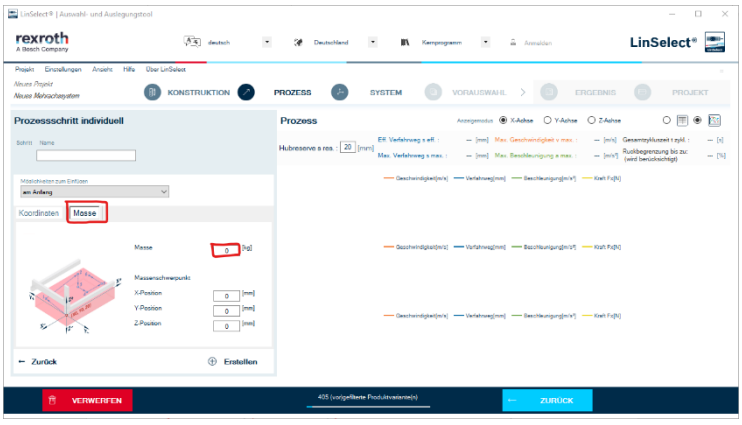


✓ Enter individual process

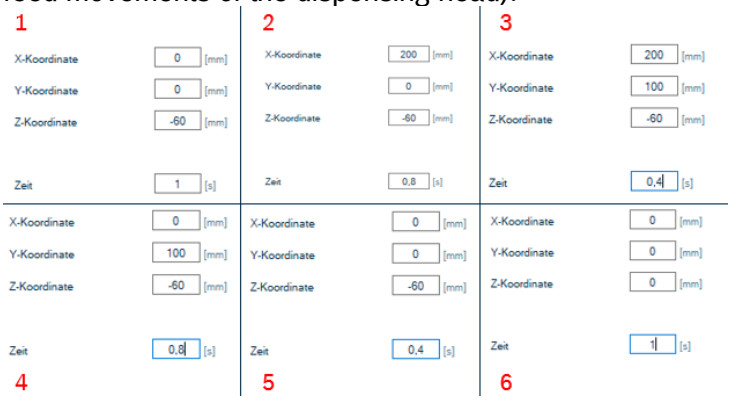


The input mask appears, in which the coordinate points and the calculated times must be entered in sequence.
As an application example of a rectangular contour, the following coordinates are entered (Attention Move dispensing head into position and do not forget the total mass of the dispensing head!) The mass of the dispensing head may vary depending on the design.

Enter the total mass of the dispensing head to be moved:



Subsequently, the coordinate points are entered in order to map the dispensing contour in a simplified manner. The input of the coordinate points is not done with relative, but with absolute values. The calculated time required for the individual sections must now be taken into account (steps 1 and 6 are the feed movements of the dispensing head):

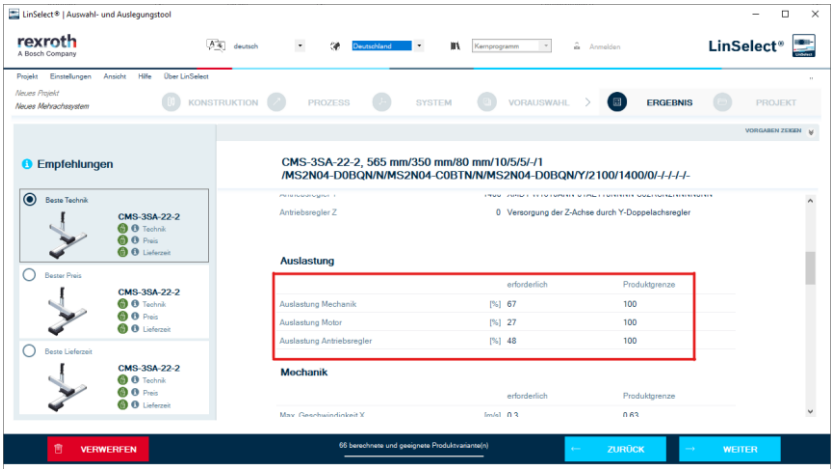


If processes such as stripping and rinsing are desired, this point can be additionally included. These fast secondary processes are important and have the greatest influence on the cycle time, since the dispensing processes often represent the slower part of the process.
In the next step, the accuracy class and stiffness must be selected in Lin-Select. Typically, the value "Medium" is used for the accuracy class. The stiffness class must be decided depending on the desired dispensing process. It should be noted that, in general, stiffness plays a very important role in dispensing processes. After this step has been successfully completed, the ctrlX Drive is selected as the drive package in the next window.

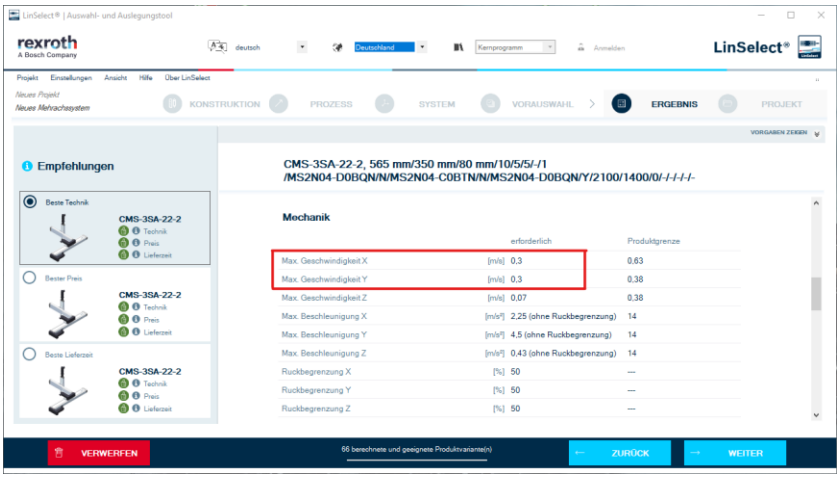
Finally, the product selection can be started.

5. Checking the product selection

When selecting the axes, make sure that there are sufficient reserves in the mechanics (max. utilization 90%), in the motor and in the drive controller (max. utilization 80%).



In the smallest radius, the acceleration that was calculated at the beginning is effective. At maximum velocity, LinSelect must have calculated the same velocity that was calculated manually as path velocity.



The design is finished after checking the selected products. With this design, only the axes (mechanical components), drive and control were designed. A suitable dispensing head that can dispense the desired quantity has not yet been considered here. This is the current status of designing a dispensing application with the help of LinSelect.