IndraSize - Drive sizing quickly, efficiently and safely

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Content

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1.
Frequently asked Questions

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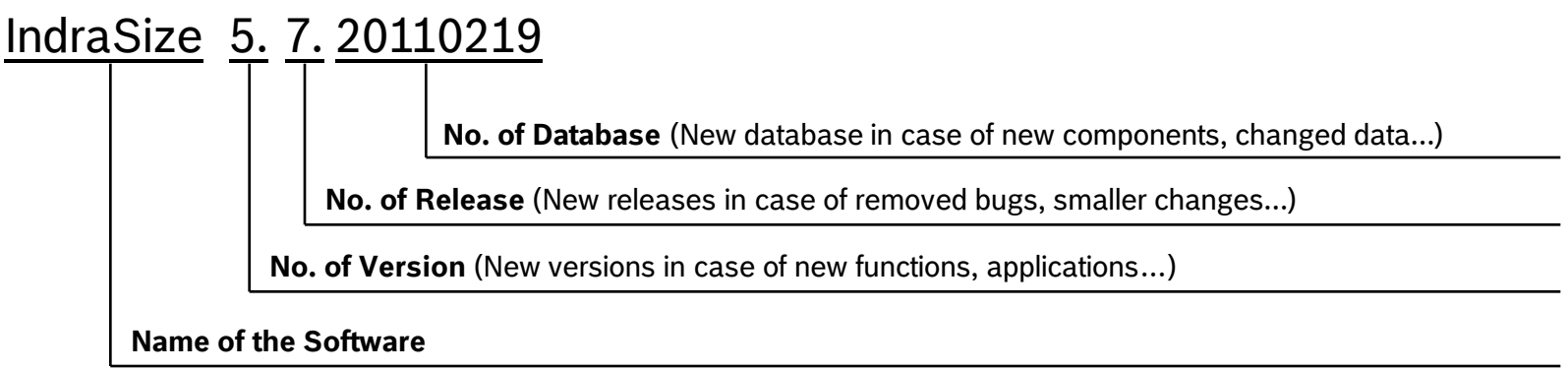
What is IndraSize?

- IndraSize is the drive sizing software from Bosch Rexroth for Bosch Rexroth drives
- The user should be able to size the right drive (motor and inverter) for his application due to the entered data for mechanism and motion profile
- It is not a technical toy for engineers but: Drive sizing quickly, efficiently and safely

Is a license necessary in order to use IndraSize?

- IndraSize is a license free software. You get it as free download from the Internet site www.boschrexroth.com/indrasize

What means the description of IndraSize?



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Software Handling

How can I get the current software IndraSize?

- IndraSize is available as free download on internet: www.boschrexroth.com/indrasize
- Download and uncompress the ZIP-file

- Possibility 1:
  - Click on Setup.exe: Start the installation
  - Afterwards start the software from the Windows start menu or from icon on desktop
- Possibility 2:
  - Click on Start.exe: Start the software without installation

- In some cases it could be necessary that you need administrator rights for installation or for running the software. It depends on the operating system of your computer and it depends on the settings from your administrator. In some cases it helps with the setting "Run this program in compatibility mode for"..."Windows XP (Service Pack 3)" or with the setting "run as administrator". (Click in the Windows explorer on the file "IndraSize.exe" (right mouse button) and select "Properties".)

How to update the software IndraSize?

- There is an automatic update function implemented in IndraSize

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What is the difference between a project file and a single file?

- A project file has the extension .IPL (IndraSize Project List)
  - A project file includes several axes (an axes can be a drive sizing and/or a motor drive select)
  - The content of a project file is shown in the project management screen as project list
- A single file has the extension .ISA (IndraSize Single Axis)
  - A single file consist of: either a drive sizing or motor drive select
  - A single file is used in order to import it in another or in the same project

How can I open a project file?

- Go to the project management screen
- Click on the project button and then on “Open…”

How can I open a single file?

- Go to the project management screen
- Click on the project button and then on “Load Drive…”

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Software Handling

How to navigate in the Software?

- If you have started a drive sizing or a motor drive select it is possible to navigate with the buttons “back” or “next” only
- From the “Home” screen or from the “Project Management” screen you can use also the navigation tree on the left side in order to navigate to “Defaults” or to “About IndraSize” or to “Help and FAQ”

Software Handling

What is a motor drive select?

- You can use the motor drive select if you don't know the details of the application but you know the requirements of the torque (or force) and speed conditions for the motor
  or: If you only want to see the curve of a drive -motor combination
  - Enter the requirements of your application (optional)
  - Make settings for the drive series, motor series…
  - Start the searching in the data base

What is a drive sizing?

- In case of a drive sizing you have to know the data of the mechanism and of the motion profile of the application:
  - Select a type of mechanical model and a type of the motion profile
  - Enter the data of the mechanism of your application
  - Enter the data of the motion profile of the application
  - Make settings for the drive series, motor series…
  - Start the searching in the data base

How to start a motor drive select or a drive sizing?

- You can start a motor drive select or an drive sizing even on the start screen or in the project management screen

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How to copy a computed axis or a motor drive select from the project list in the project management screen?

- Select the axis you want to copy in the project list on the project management screen
- Press the icon "…Save as Drive"
- Enter a name for the axis in the following window and safe it
- The axis is now stored as single axis (extension .ISA, Indrasize Single Axis)
- Press the button "Project" and select "Load Drive…"
- Select the stored axis in the following window and press the button open
- The axis is now added at the end of the axis list in the project management screen

- This possibility is helpful:
  - If you want to calculate the same mechanism with another motion profile
  - If you want to calculate the same motion profile with another mechanism
  - If you want to calculate the same motion profile and the same mechanism but with another drive or motor

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Mechanism, Motion Profile

Is it possible to change the type of the mechanical model or the type of the motion profile after a finished drive computing?

- If you finished a drive sizing you select this axis in the project list on the project management screen
- Click on the icon “Modify Drive”
- Click on the button “Back”
- Now you can change:
  - If you change the type of the mechanical model all data for the motion profile will be kept
  - If you change the type of the motion profile all data for the mechanical model will be kept
- With this possibilities you have an easy way to calculate:
  - The same motion profile wit another mechanical model
  - The same mechanical model with another motion profile

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Mechanism, Motion Profile

What are the possible combinations of mechanical model and motion profile?

- The following chart gives you an overview:

Mechanism Type \ Motion Profile type	Standard (linear motion)	Standard (rotative motion)	Roll Feed	Press Feeder	Flying cut off	Rotary Knife	Winder	Relative Power-On-Time
Ballscrew (rotating ballscrew)	●				●			●
Ballscrew (rotating nut)	●				●			●
Rack and Pinion	●				●			●
Belt and Pulley	●				●			●
Linear direct Drive	●				●			●
Rollers	●				●			●
Rotary Drive		●						●
Rotary Knife						●		
Winder							●	
Roll feed			●					

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Mechanism, Motion Profile

When should I use the motion profile type “Standard (linear motion)”?

- If you know the details of the motion you want to realize and…
- If you want to realize a linear motion and you want to create a free configurable motion profile

When should I use the motion profile type “Standard (rotative motion)”?

- If you know the details of the motion you want to realize and…
- If you want to realize a rotative motion and you want to create a free configurable motion profile

When should I use the motion profile type “Relative Power-On-Time”?

- If you don’t know the details of the motion profile
- If you can estimate the relative power on time of the several

Motion Profile - Standard

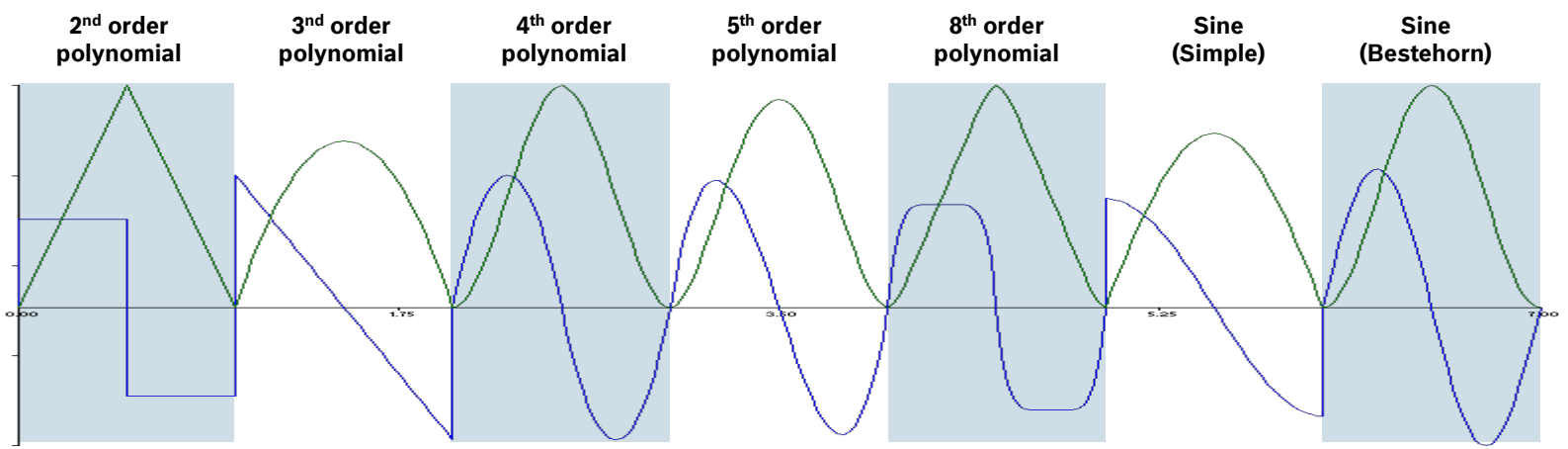
What means the several motion phases for standard (linear and rotative motion)?

- In the motion profile screen for standard (linear or rotative) you have 5 possibilities:
  - Motion Phase
    - Acceleration phase (You have only to know 2 values of speed, distance, acceleration, time)
    - Deceleration phase (You have only to know 2 values of speed, distance, acceleration, time)
    - Phase with constant speed (You have to know either the time or the distance)
    - Dwell (motor is under control, with torque but without movement, you have to know the time)
    - Off (motor switched off, without torque and without movement, you have to know the time)
  - Triangle
    - You have only to know 2 values of speed, distance, acceleration, time
    - The triangle consist of the phases acceleration and deceleration
  - Trapezoid
    - You have only to know 3 values of speed, distance, acceleration, time
    - the trapezoid consist of the phases acceleration, constant speed and deceleration
  - Trapezoid 1/3
    - You have only to know distance and time
    - The trapezoid according 1/3 rule consist of 1/3 of the time for acceleration, 1/3 of the time for consatant speed and 1/3 of the time for deceleration
  - Cam Import
    - You have only to know distance and time
    - Import a complex motion profile of a created Cam from the Rexroth CamBuilder (XML format)

Motion Profile - Standard

What means the law of motion?

- In a “normal” case the “2nd order polynomial” is used. That means that curve of the distance over the time has the function according “2nd order polynomial”
- Some applications needs motion profiles with another law of motion. The decision about the suitable motion profile has to make the customer! He knows the details of the machine. The customer has also to know the advantages and disadvantages of the several laws of motion.
- If you use another law of motion than “2nd order polynomial” you get a limitation of the jerk but you get higher values for the acceleration if the distance and the time keeps constant.
- The differences between the several laws of motion shows the picture below. Basis is the condition 1m in 1 s.



blue: acceleration / deceleration; green: speed

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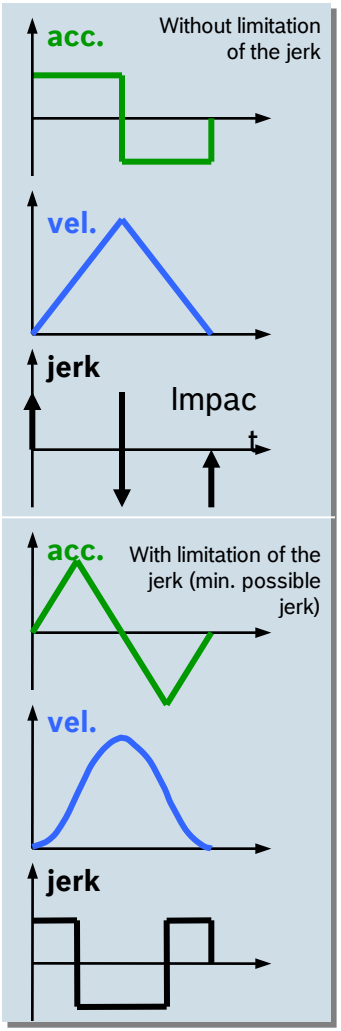
Motion Profile

What effects has the limitation of the jerk in case of "2nd order polynomial" and how to set?

- If you set a limitation of the jerk you will get a higher value for the maximum acceleration
- The condition for the jerk is: Same distance in the same time as before
- With limitation of the jerk the acceleration raises from zero to maximum acceleration in a certain time (slower as without limitation)
- Without limitation of the jerk the acceleration raises suddenly from zero to maximum (in this case the maximum acceleration is simultaneously the maximum acceleration)

- In the motion profile screen you have the possibility to set a jerk limitation
- Click on the item “Others”
- It is shown the value for the minimum possible jerk
- The value you want to set for the jerk has to be higher than the shown value minimum jerk
- Set the mark in order to activate the limitation of the jerk
- Note: The shown values for the acceleration in the motion profile list is not changed because this value is the average acceleration and not the maximum acceleration



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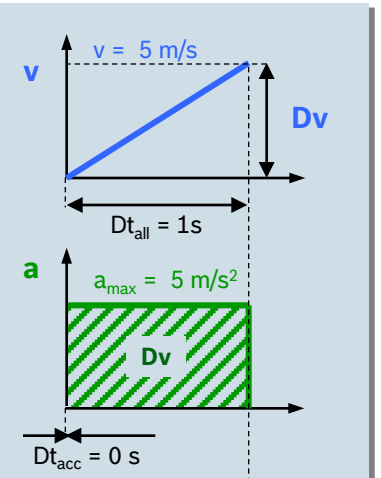
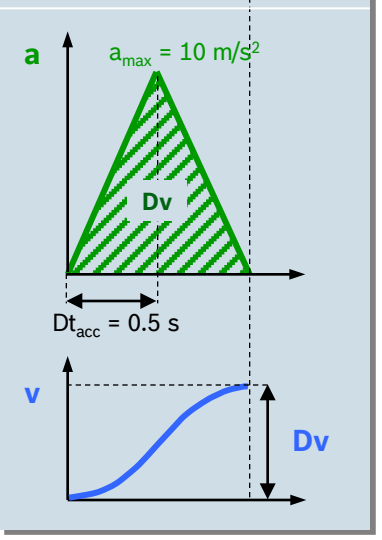
Motion Profile

What is the minimum possible value of the jerk?

- accelerate in t_{all} = 1 s up to a speed of v = 5 m/s according polynomial 2nd order
- acceleration: a_{max} = Dv / Dt_{all} = (5 m/s) / (1 s) = 5 m/s²
- the shape of the acceleration is a rectangle
- jerk: j = Da / Dt_{acc} = infinite (because t_{acc} is zero)
- the area below the acceleration curve is the velocity
- Dv = a_{max} * Dt_{all}



- the smallest jerk is possible with the smallest possible gradient of the acceleration → the acceleration becomes the shape of a triangle
- in order to reach the same velocity → the area below the triangle has to be the same like below the rectangle
- Dv = a_{max} * (Dt_{all} / 2)
- acceleration: a_{max} = (Dv *2) / Dt_{all} = (5 m/s * 2) / 1 s = 10 m/s²
- jerk: j = Da / Dt_{acc} = 10 m/s² / 0,5 s = 20 m/s³



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Motion Profile - Standard

What is the tab "CAM-Table" for?

- In some applications the motion sequences are very complex. With the Rexroth CamBuilder you get an useful tool in order to create these moving sequences very easy. Furthermore it is possible to export a created CAM table as XML file. The XML file consist of 1024 values in percent for distance.

- In IndraSize you can choose the tab "CAM-Table" and enter the distance and the time. Then you click on "import CAM file". Select the exported XML file and import it.
  The distance refers to the percentage values of the CAM table (see next page)
- The drive sizing is done with each 16th value of the 1024 CAM table values.

Is it possible to use a CAM table in Excel format?

- Yes, it is... with a small work around.
- In the folder "Example" is an Excel file "Cam_Data_to_XML.xls".
- Open this file and copy your 1024 values for the distance (in the unit percent) in this file.
- The Excel file has to be converted in a XML format
- The procedure is described in the Excel file

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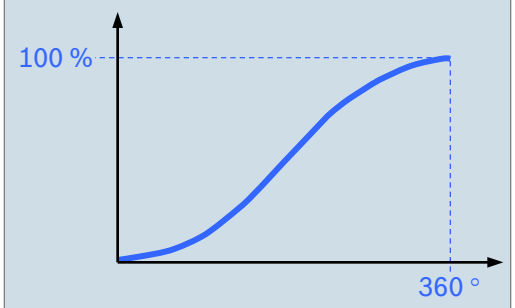
Motion Profile - Standard

How are the relations between CAM-Table and IndraSize ?

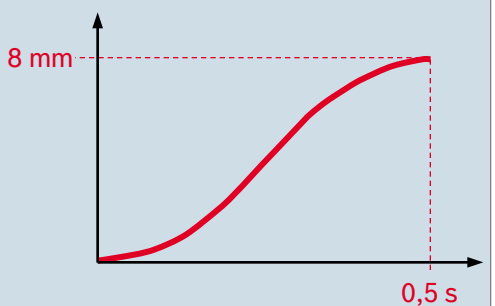
- see the three examples in the picture below...

CamBuilder

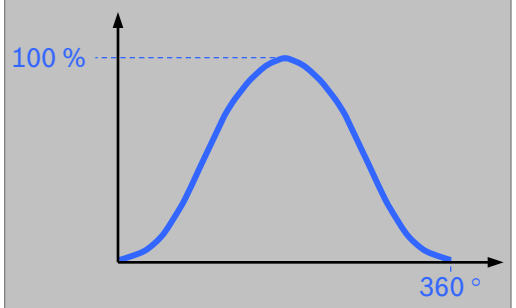


input: distance = 8 mm, time = 0,5 s

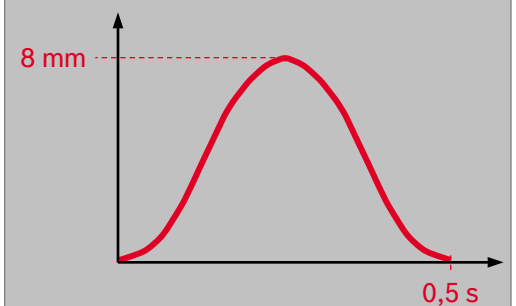
IndraSize



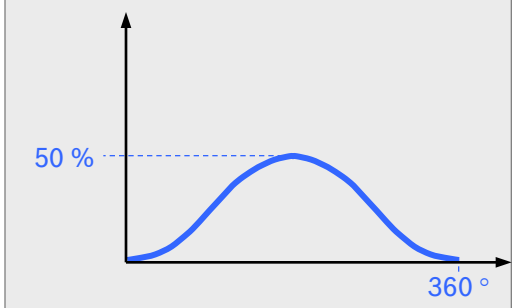
absolute distance = **8 mm**



input: distance = 8 mm, time = 0,5 s



absolute distance = **16 mm**
(8 mm forward + 8 mm backward)



input: distance = 8 mm, time = 0,5 s

absolute distance = **8 mm**
(4 mm forward + 4 mm backward)

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Motion Profile

How can I add an additional force or mass in a certain phase of the motion profile?

- If you enter the data for a motion profile you can also enter the value for an additional force and/or for an additional mass for this sequence of the motion profile
- If you enter an additional force or mass in the motion profile types trapezoid, the additional force and/or mass will be considered in all sequences of the trapezoid (acceleration, constant and deceleration)
- If you enter an additional force or mass in the motion profile types triangle, the additional force and/or mass will be considered in all sequences of the triangle (acceleration and deceleration)

- Please consider:
  - The additional force effects always against the direction of the movement independent of the algebraic sign
  - For the additional mass it is possible to enter negative values - then the additional mass will be subtracted from the total weight

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Motion Profile - Flying cut off

What means the special motion profile “Flying cut off”?

- It takes a lot of time to calculate and create some motion profiles like “Flying cut off”
- With this special motion profile you can enter the relevant data of the application and the software creates the correct sequences of the motion in an easy way - there are 2 possibilities:

  Presetting Distance (if you know the distance between the cuts)
  - Enter the master velocity of the material you want to cut
  - Enter the max. allowed acceleration of your mechanism
  - Enter the distance between the cuts in the material
  - Enter the process time (is the time in order to make the cut)
  - Optional: You can enter a synchronization time and/or a pause time
  - For the movement backwards you can choose between triangle or trapezoid
  - In case of trapezoid backwards you have to know either the allowed velocity or acceleration
  - After the click on the button “Calculate” you will see the calculated cycle time and number of clocks and the detailed motion profile in the chart and in the diagram as well

  Distance Computation (if you want to know the minimum distance between the cuts)
  - Enter the master velocity of the material you want to cut
  - Enter the max. allowed acceleration of your mechanism
  - Enter the process time (is the time in order to make the cut)
  - Optional: You can enter a synchronisation time and/or a pause time
  - For the movement backwards you can choose between triangle or trapezoid
  - In case of triangle backwards you have to know either the allowed velocity or acceleration
  - In case of trapezoid backwards you have to know both the allowed velocity and acceleration
  - After the click on the button “Calculate” you will see the calculated cycle time, number of clocks, the detailed motion profile in the chart and in the diagram and the minimum distance between the cuts

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Motion Profile - Winder

What means the special motion profile “Winder”?

- With this special motion profile you can enter the relevant data of the winder application and the software creates the correct sequences of the motion in an easy way
- With the entered data for the diameters, velocity of the material and the time in order to accelerate and decelerate the material, the software creates the correct sequences of the motion in an easy way
- Please note:
  - The time to speed up the system should be the normal acceleration time
  - The time to slow down the system should be the worst case (e.g. emergency stop)

Motion Profile - Roll Feed

What means the special motion profile “Roll feed”?

- With this special motion profile you can enter the relevant data of the roll feed application and the software creates the correct sequences of the motion in an easy way
- The mechanism of a roll feed can be with or without straightening rollers
- In case of roll feed with straightening rollers: In the machine is a gearbox. Due to the different diameter of the feed roller and the straightening rollers are two ratios in this gearbox. You have to enter the ratio of the gearbox for the feed rollers. The second ratio of the gearbox for the straightening rollers is calculated automatically.
- The maximum allowed speed and acceleration are the limits for the calculation of the motion profile. Enter the relevant data of the application and you can see the possible strokes per minute and also the type of motion profile.
- In the tab "Feed Table" you see the data of the application in several steps from min. format length to max. format length. (The number of steps are adjustable in the screen "Defaults" -> "Other Settings")
- In the tab "Estimate Dynamics" you can calculate and try several data and you see the effects for the velocity and acceleration.

Motion Profile - Rotary Knife

What means the special motion profile “Rotary knife”?

- With this special motion profile you can enter the relevant data of the rotary knife application and the software creates the correct sequences of the motion in an easy way.
- The mechanical arrangement is prepared for these typical application. You have only to activate or deactivate the elements and to enter the data.
- In the motion profile screen you can enter a minimum and a maximum format length. The software creates two motion profiles for these lengths at the maximum speed.
- It is also possible to import a Cam table from the Rexroth CamBuilder. If you have created an application Cam profile for crosscutter with the CamBuilder then export it to XML format. Then go to the tab "CAM-Table" in IndraSize. Import the XML file. Do this for both cut lengths. Please consider that the value for the roller diameter has to be the same in IndraSize and in CamBuilder.
- The Cam import is only possible if the number of knifes is one.

Mechanism

What is the difference between a mechanical, hydraulic and pneumatic counterbalance?

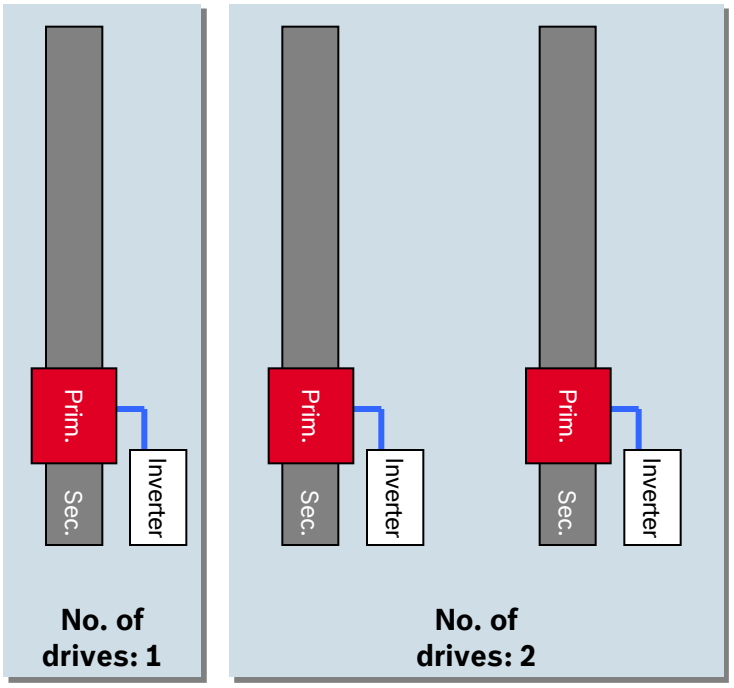
- An mechanical counterbalance consist of a simple mass
  - Advantage: A simple possibility
  - Disadvantage: The application requires more torque or force in order to accelerate the mass of the counterbalance
- An hydraulic counterbalance consist of a hydraulic cylinder
  - Advantage: The application doesn't require a torque or force in order to accelerate a mass because there isn't a mass
  - Disadvantage: Not so simple like a mechanical counterbalance
- An pneumatic counterbalance: The same like a hydraulic, only air instead of oil ☺

When should I use a counterbalance and how to size?

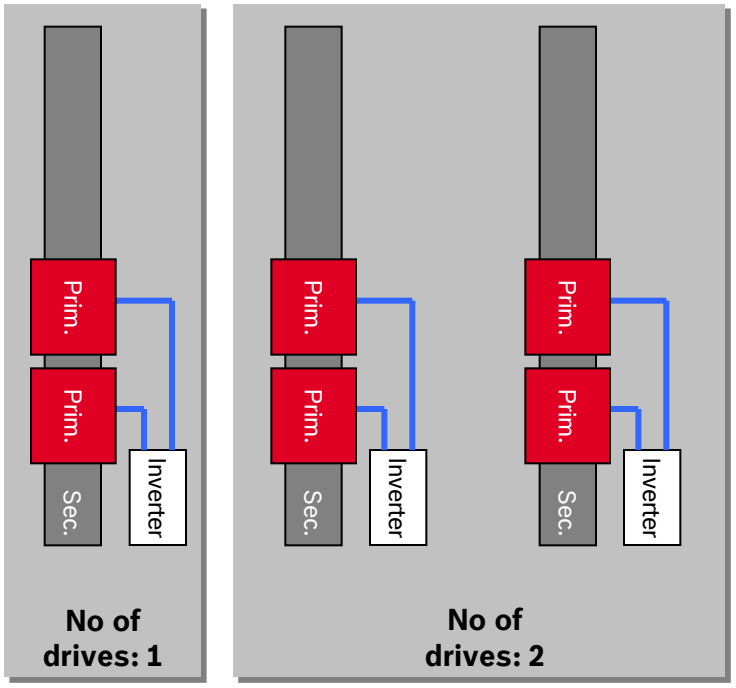
- An counterbalance is used in case of e.g. vertical applications
- The counterbalance reduces the weight torque or the weight force
- The counterbalance should balance the mass which is moved in all phases of the motion profile
- Example for estimation: The application moves in every phase of the motion profile a mass of 100 kg up and down. In some phases of the motion profile are 50 kg added. The mass of the mechanical counterbalance should be (at least) 100 kg. The force of the hydraulic or pneumatic counterbalance should be (at least) 100 kg x 9,81 m/s^2 = 981 N.

What means “Adjustment” and “No. of drives” in case of a linear direct drive?

Adjustment: Single
One primary part at one inverter



Adjustment: Parallel
Two primary parts parallel at one inverter



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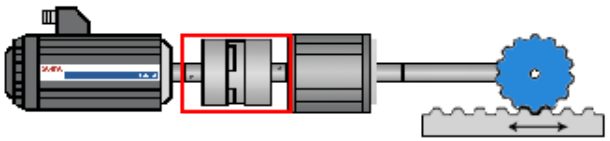
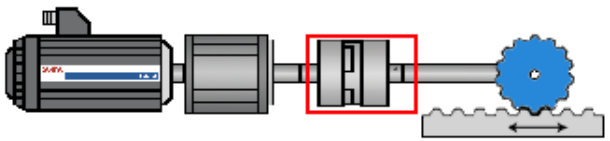
I don’t have the data of the moved mass. I have only the value of the moment of inertia of the moved mass. How can I size the drive?

- If you have the moment of inertia of the moved mass (already reflected to the motor shaft) then you have to insert a coupling on the motor side.
  Enter the moment of inertia of the moved mass in the field for the moment of inertia of the coupling.



- If you have the moment of inertia of the moved mass (reflected to the load side) then you have to insert a coupling on the load side.
  Enter the moment of inertia of the moved mass in the field for the moment of inertia of the coupling.



- Please note: It is not the right way to size a drive because the mass together with the coefficient of friction creates the friction forces!

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What means “Values on Motor Shaft”?

- If you finished the entering of the data for the mechanism and you enter the data for the motion profile, you will see the “Values on Motor Shaft”
- This values requires your application from the motor but the values doesn’t consider the required torque in order to accelerate or decelerate the moment of inertia of the motor
- This values are helpful in order to get a “feeling” what your application requires

- In case of a rotating motor are shown the following values:
  - Average speed of the application: Average Speed [1/min]
  - Maximum Speed of the application: Maximum Speed [1/min]
  - Max. required torque of the application: Maximum Torque [Nm]
  - RMS Torque of the Application: Effective Torque [Nm]
  - Sum of the external inertia of the application: Ext. Inertia [kgm^2]

- In case of a linear motor are shown the following values:
  - Average speed of the application: Average Speed [m/min]
  - Maximum Speed of the application: Maximum Speed [m/min]
  - Max. required force of the application: Maximum Force [N]
  - RMS force of the Application: Effective Force [N]

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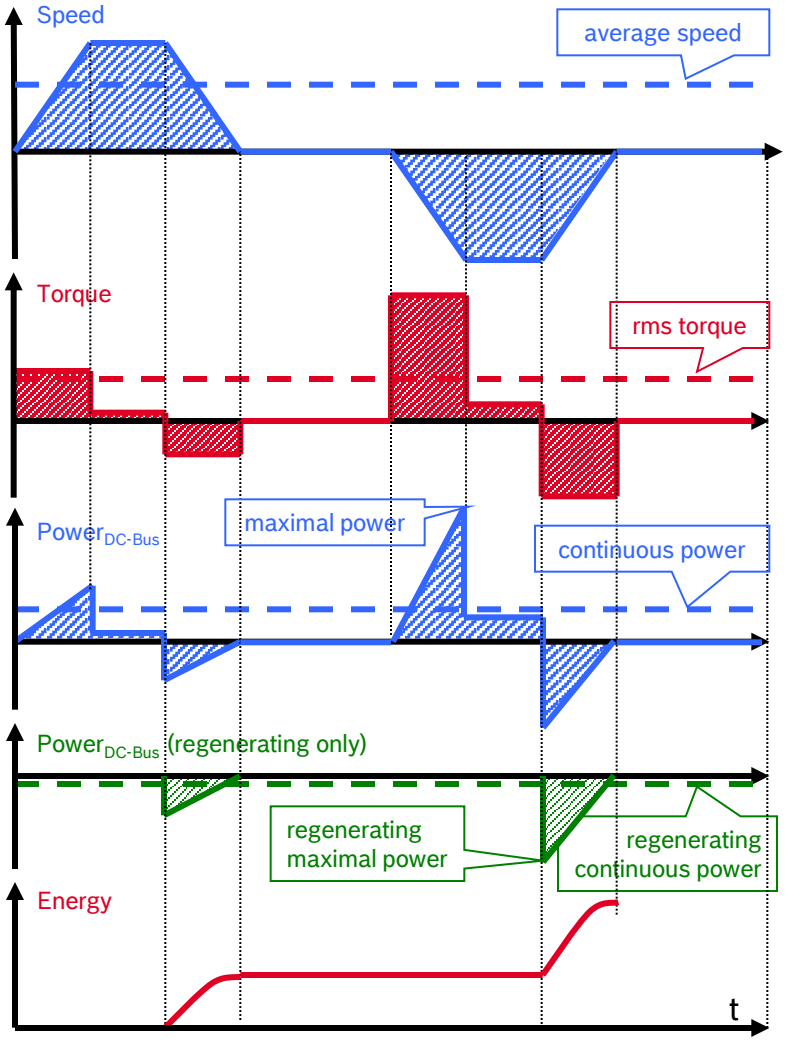

How are the DC-bus values calculated?

- From torque and speed the software calculates the power at the DC-bus by consideration of the motor and inverter efficiency and by consideration of the direction of the torque.
- The "continuous power" is the average value from the whole DC-bus power sequence.
- The "maximal power" is the absolute maximum of the whole DC-bus power sequence.
- The "regenerating continuous power" is the average value from the negative DC-bus power sequence.
- The "regenerating maximal power" is the absolute maximum of the negative DC-bus power sequence.
- The "regenerating energy" is the area below the regenerating continuous power.

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Drive Sizing

Why are the values for the regenerating power sometimes zero ?

- The friction force or the additional force is so big that (even in case of deceleration) the motor does not work in generating mode
- Only the moving sequence upwards is entered in the motion profile in case of a vertical application
- Without a moving sequence downwards there is no regenerating power

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Motor Search Database

Is it possible to add or to calculate third party motors?

- It is not possible to add third party motors (e.g. standard motors) to the database
- If you want to make a drive sizing with third party motors there is a work around:
  - Select the type of the mechanical model and the type of the motion profile
  - Enter the data of the mechanism
  - Enter the data of the motion profile
  - Go to the drive selection screen and select the line "without" in the table below
  - go to details screen and you see the required values
  - Select a suitable third party motor which is able to manage the requirements
  - Go back to the data of mechanism
  - Insert the transmission element coupling on the motor side
  - Enter the value Moment of inertia of the third party motor in the field for the moment of inertia of the coupling (the coupling simulate the motor)
  - Go to the drive selection screen again
  - go to details screen and you see the required values
  - Now you see the values on the motor shaft and now this values considers the moment of inertia of the motor
  - Check the third party motor again: Is the third party motor able to cover the torque and speed conditions it should be possible to use

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What means the security factors?

An example:

- If you set a security factor for the effective torque to 1:
  The continuous torque of the motor is at least equal or higher than the required effective torque of your application
- If you set a security factor for the effective torque to 1,2:
  The continuous torque of the motor is at least equal or 1,2 times higher than the required effective torque of your application
- If you set a security factor for the effective torque to 0,8:
  The continuous torque of the motor can be 0,8 times lower than the required effective torque of your application
- Security factors more than 1 are used if you have unknown conditions in your application
- Attention! Security factors less than 1 are only used to see the next smaller motors but the application doesn't work in the reality
- The effects of the security factors for the maximum torque has the same meaning

Are there any "hidden" security factors in the software?

- No, there aren't. The software calculates the required torques, forces, speeds… according the physical laws.

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Motor Search Database

What means the Inertia Ratio Jext/Jmot (Minimum and Maximum)?

- In some applications you have special requirements on the ratio moment of inertia of the load to moment of inertia of the motor
- If you want only to find motors which are fulfill a certain condition for this ratio, you can enter the data for the limits before you start the motor search
- Jext is also known as Jload or Jlast

Motor Search Database

What means the following Abbreviations in the ServoRotative List?

- MMax – Maximum torque (is available for the time tMmax and depends on the revolutions per minute)
- MKB – Intermittent torque (is available for the relative power on time ED and depends on the revolutions per minute and on the over temperature of the motor)
- ED – Relative power on time for the short time operation torque
- MdN – Continuous torque (is available in continuous operation and depends on the revolutions per minute and on the over temperature of the motor)
- nmax – Maximum of the revolutions per minute for a certain torque (is not the absolute maximum of the motor)
- SB – Value for the overload ability of the drive – motor combination
- JL/JM – Relation of the moment of inertia of the load to the moment of inertia of the motor
- tMmax – Available time for the Maximum torque MMax
- Mkb0 – Available intermittent torque if the revolutions per minute less than n0 for a longer time
- Md0 - Available continuous torque if the revolutions per minute less than n0 for a longer time
- n0 – Until this revolutions per minute the intermittent torque and the continuous torque is reduced if is needed for a longer time
- Status – Shows the current status of the values (Vorl. means preliminary)

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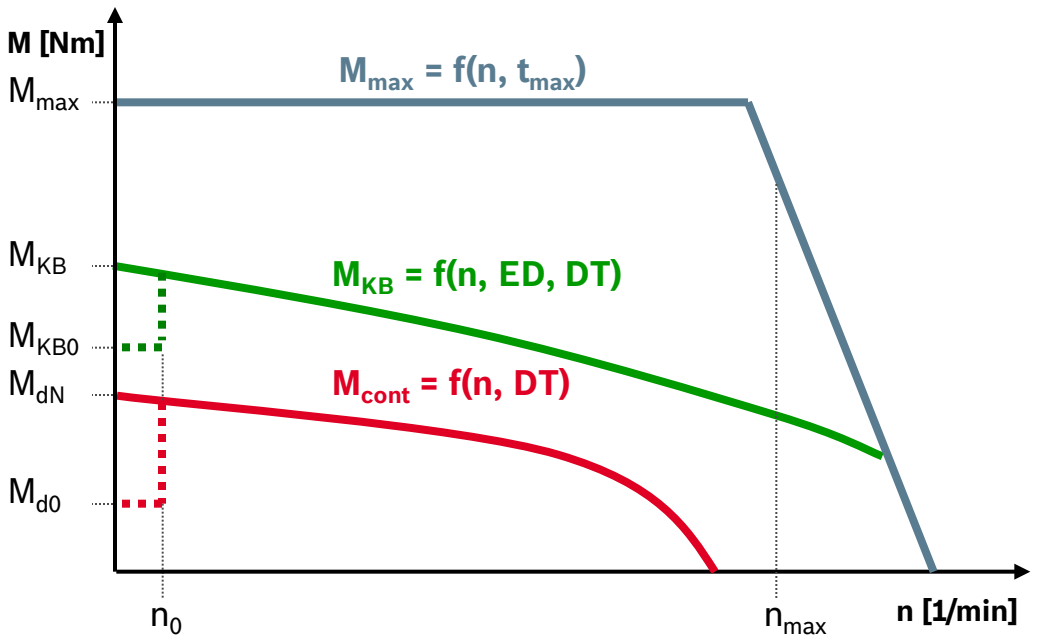
Motor Search Database

What shows the curve of the drive – motor combination from the ServoRotative List?

- The curves shows the typical values maximum torque, intermittent torque, continuous torque, reduced intermittent torque and reduced continuous torque



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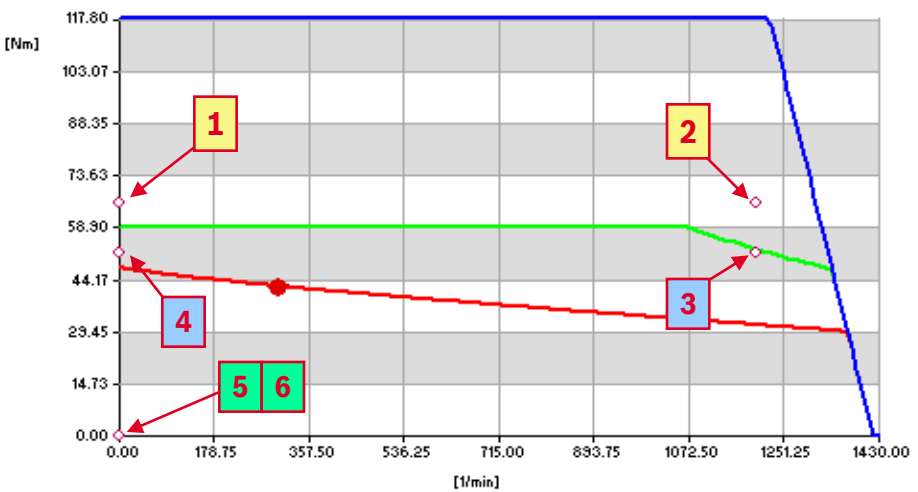
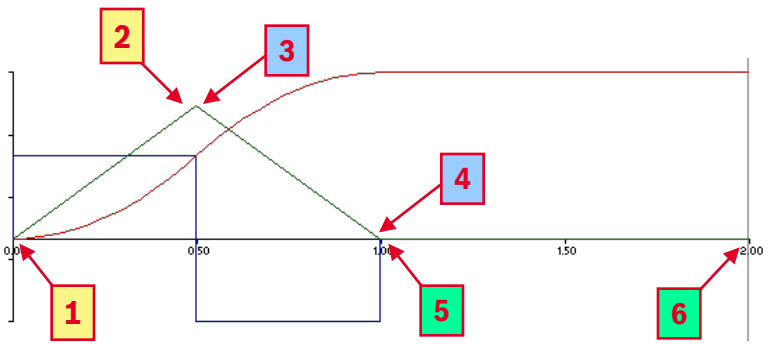
Motor Search Database

What shows the several "working points" in the curve of the drive – motor combination in case of a drive sizing?

- A working point is a fix pair of torque and speed. We calculate for each movement phase the working point at the begin and at the end of the phase:
- (1) start of the first movement phase (acceleration) with 66 Nm at 0 rpm
- (2) end of the first movement phase (acceleration) with 66 Nm at 1200 rpm
- (3) start of the second movement phase (deceleration) with 52 Nm at 1200 rpm
- (4) end of the second movement phase (deceleration) with 52 Nm at 0 rpm
- (5) start of the third movement phase (off) with 0 Nm at 0 rpm
- (6) end of the third movement phase (off) with 0 Nm at 0 rpm





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Motor Search Database

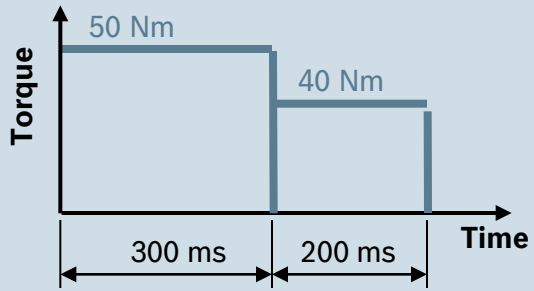
What are the Conditions that a drive – motor combination from the ServoRotative List is suitable for the application (1/2)?

- The effective torque at the average speed has to be smaller or equal than the continuous torque of the motor
- All working points of the application has to be smaller or equal than the maximum torque
- Is there a working point required for more than the allowed time for the maximum torque, then this working point has to be smaller or equal then the intermittent torque
- Is there a succession of motion phases which takes longer than the time tMax and the required torques are higher than the intermittent torque then this motor will be rejected
- The weight torque of the application has to be smaller or equal than 2/3 of MdN
- Is the whole cycle time of the motion profile smaller or equal than 600 s: Is there a sequence in the motion profile, where the average speed is smaller or equal than n0 and the time is longer than tMax, then the torque in this sequence has to be smaller or equal than Mkb0
- Is the whole cycle time of the motion profile higher than 600 s: Is there a sequence in the motion profile, where the average speed is smaller or equal than n0 and the time is longer than tMax, then the torque in this sequence has to be smaller or equal than Md0
- The ratio moment of inertia of the load to moment of inertia of the motor has to be in the range of the users entered limits
- The torque of the motor brake has to be higher or equal then the users entered value

Motor Search Database

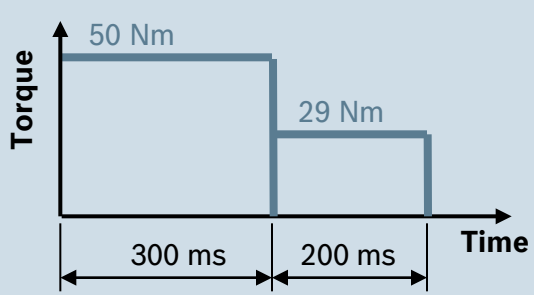
What are the Conditions that a drive – motor combination from the ServoRotative List is suitable for the application (2/2)?

Required torque and time of the application



Motordata:
MMax = 100 Nm MKB = 30 Nm tMax = 400 ms

Motor will be rejected



Motor will be used

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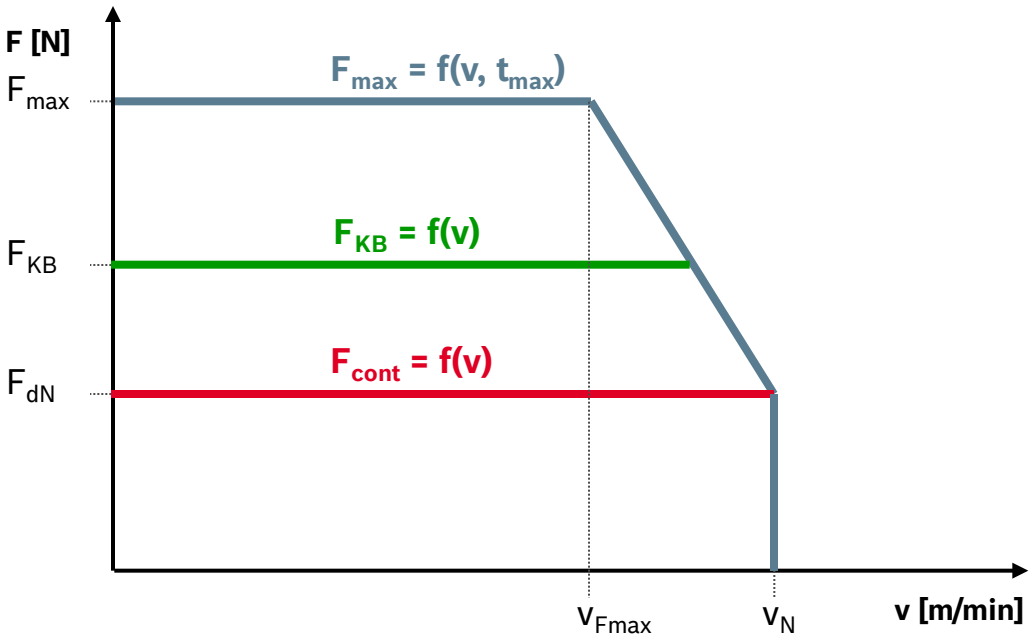
Motor Search Database

What means the following Abbreviations in the ServoLinear List?

- FMax – Maximum force (is available for the time tMmax and depends on the velocity)
- FKB – Intermittent force (is available for the relative power on time ED and depends on the velocity)
- FdN – Continuous force (is available in continuous operation and depends on the velocity)
- vn – Maximum velocity of the motor
- SB – Value for the overload ability of the drive – motor combination
- tMmax – Available time for the maximum force FMax
- Status – Shows the current status of the values (Vorl. means preliminary)

What shows the curve of the drive – motor combination from the ServoLinear List?

- The curves shows the typical values Maximum force, intermittent force, continuous force



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Motor Search Database

What are the conditions that a drive – motor combination from the ServoLinear List is suitable for the application?

- The effective force at the average speed has to be smaller or equal than the continuous force of the motor
- All working points of the application has to be smaller or equal than the maximum force
- Is there a working point required for more than the allowed time for the maximum force, then this working point has to be smaller or equal then the intermittent force
- Is there a succession of motion phases which takes longer than the time tMax and the required forces are higher than the intermittent force then this motor will be rejected
- The weight force of the application has to be smaller or equal than 2/3 of FdN

Motor Search Database

What means the following Abbreviations in the MainSpindle List?

- MMax – Maximum torque (depends on the revolutions per minute)
- PMax – Maximum power (depends on the revolutions per minute)
- MKB – Intermittent torque (is available for the relative power on time ED and depends on the revolutions per minute)
- PKB – Intermittent power (is available for the relative power on time ED and depends on the revolutions per minute)
- ED – Relative power on time for the intermittent torque
- Md – Continuous torque (is available in continuous operation and depends on the revolutions per minute)
- PD – Continuous power (is available in continuous operation and depends on the revolutions per minute)
- nmax – Maximum of the revolutions per minute
- SB – Value for the overload ability of the inverter – motor combination
- JL/JM – Relation of the moment of inertia of the load to the moment of inertia of the motor
- Status – Shows the current status of the values (Vorl. means preliminary)

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Motor Search Database

What means the following Abbreviations in the S1 List?

- n1 – entered revolutions per minute
- Pdn1 - power @ n1
- MdN1 – Continuous torque @ n1 (is available in continuous operation and depends on the revolutions per minute and on the over temperature of the motor)
- Mkz(10s) – Short time torque (is available for 10 s and depends on the revolutions per minute)
- Mkz(60s) – Short time torque (is available for 60 s and depends on the revolutions per minute)
- PDC - DC bus continuous power (only valid for direct drive selection as estimated value)
- n0 – Until this revolutions per minute the intermittent torque and the continuous torque is reduced if is needed for a longer time
- SB – Value for the overload ability of the inverter – motor combination
- JL/JM – Relation of the moment of inertia of the load to the moment of inertia of the motor
- Mkb0 – Available intermittent torque if the revolutions per minute less than n0 for a longer time
- Md0 - Available continuous torque if the revolutions per minute less than n0 for a longer time
- Status – Shows the current status of the values (Vorl. means preliminary)

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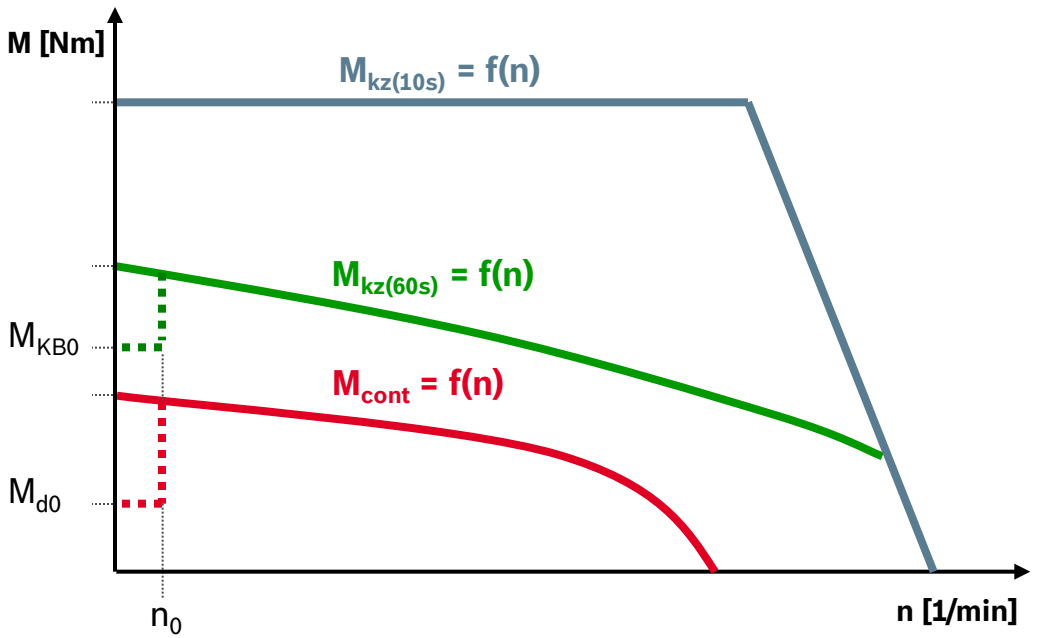
What shows the curve of the drive – motor combination from the S1 List?

- The curves shows the typical values short time torque for 10 s, short time torque for 60 s, continuous torque, reduced intermittent torque and reduced continuous torque



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Motor Search Database

What are the Conditions that a drive – motor combination from the S1 List is suitable for the application?

- The required process torque at the minimum and at the maximum speed has to be smaller or equal than the continuous torque
- If a acceleration or deceleration torque is required for less than 10 s then the torque has to be smaller or equal than Mkz(10s)
- If a acceleration or deceleration torque is required for more than 10 s and less than 60 s then the torque has to be smaller or equal than Mkz(60s)
- Is there a speed which is smaller or equal than n0, then the torque in this sequence has to be smaller or equal than Md0

Motor Search Database

What means the following Abbreviations and Terms?

- IndraDrive M – New generation of the modular drive series of Bosch Rexroth (single axis inverters or double axes inverters)
- IndraDrive Mi – New generation of a very compact drive series of Bosch Rexroth (motor integrated inverter and control unit)
- IndraDrive C – New generation of the converter series of Bosch Rexroth
- IndraDrive Cs – New generation of the converter series of Bosch Rexroth in small size
- EcoDrive Cs – Converter series of Bosch Rexroth in small size
- MAD – New generation of the asynchronous servo motors (surface cooled)
- MAF - New generation of the asynchronous servo motors (liquid cooled)
- MKE – Synchronous servo motors
- MSK – New generation of the synchronous servo motors (in several cooling methods)
- MSM - Synchronous servo motor (small size, surface cooled)
- MST - New generation of the synchronous torque motor (kit component motor, liquid cooled)
- MLP – New generation of the synchronous linear motor (kit component motor, liquid cooled)
- MLC - New generation of ironless synchronous linear motor (kit component motor, air cooled)
- 1MS - Asynchronous high speed motors (kit component motor, liquid cooled)

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Motor Search

The Software doesn't find a drive motor combination for the application. What could be the reason?

- Is the maximum required torque within the range of the products?
  - Try to take a gear with a higher ratio
  - Try to set a lower acceleration
  - If you have a mechanical counterbalance in the application, try to replace it with a hydraulic or a pneumatic counterbalance
- Is the maximum required speed within the range of the products?
  - Check your entered speed in the motion profile
  - Try to take a gear with a lower ratio
  - Try to use a trapezoidal motion profile instead of a triangle motion profile
  - Try to increase the acceleration and decrease the speed in the motion profile
- Are the entered limits for the ratio moment of inertia of the load to moment of inertia of the motor correct?
  - Enter a higher value for the maximum
  - Try to take a gear with a higher ratio
- Is the entered value for the brake torque within the range of the brake torques of the motors?
  - Try to increase the ratio of the gear
  - Try to use a counter weight in case of vertical applications

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2.
First Steps in IndraSize

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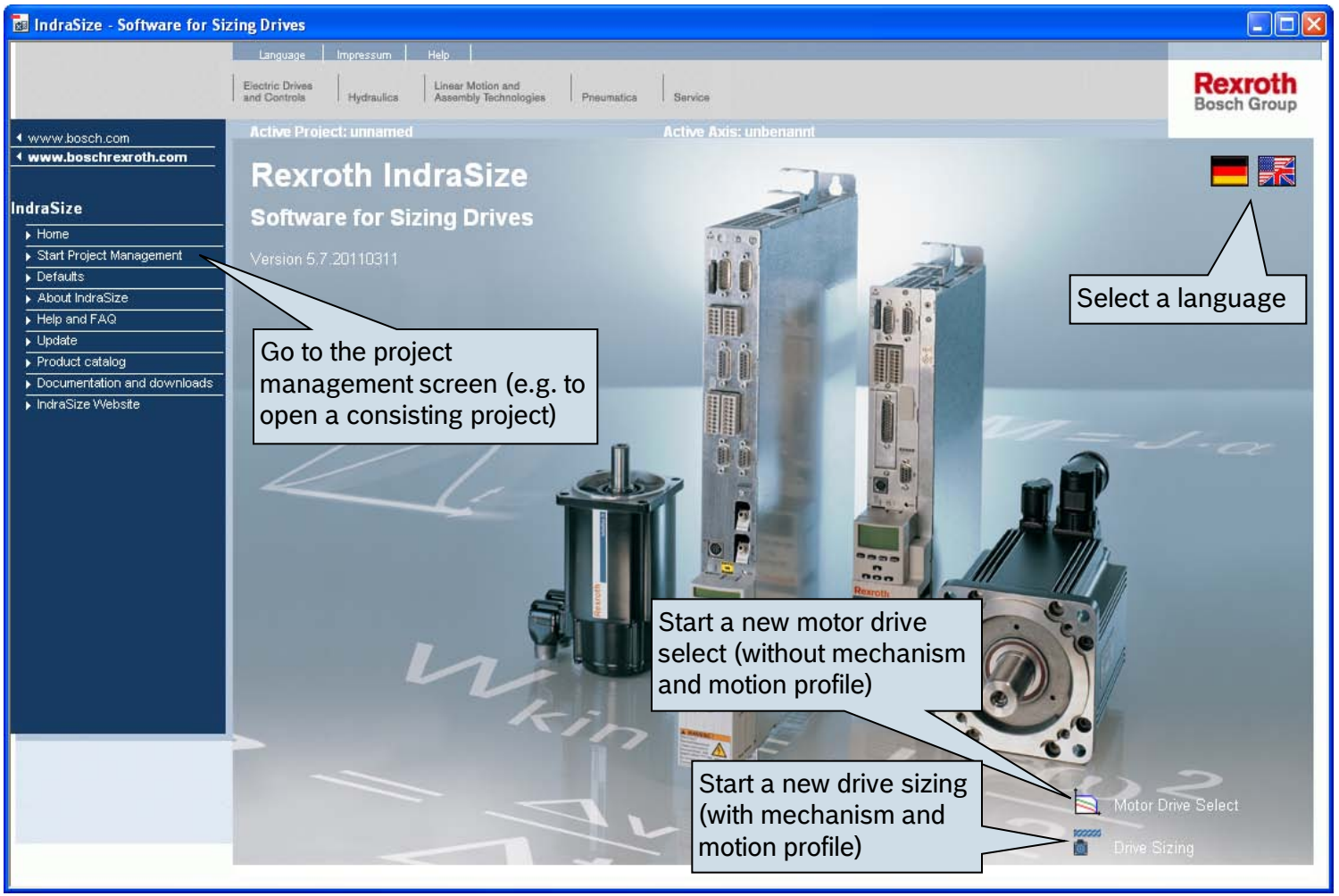
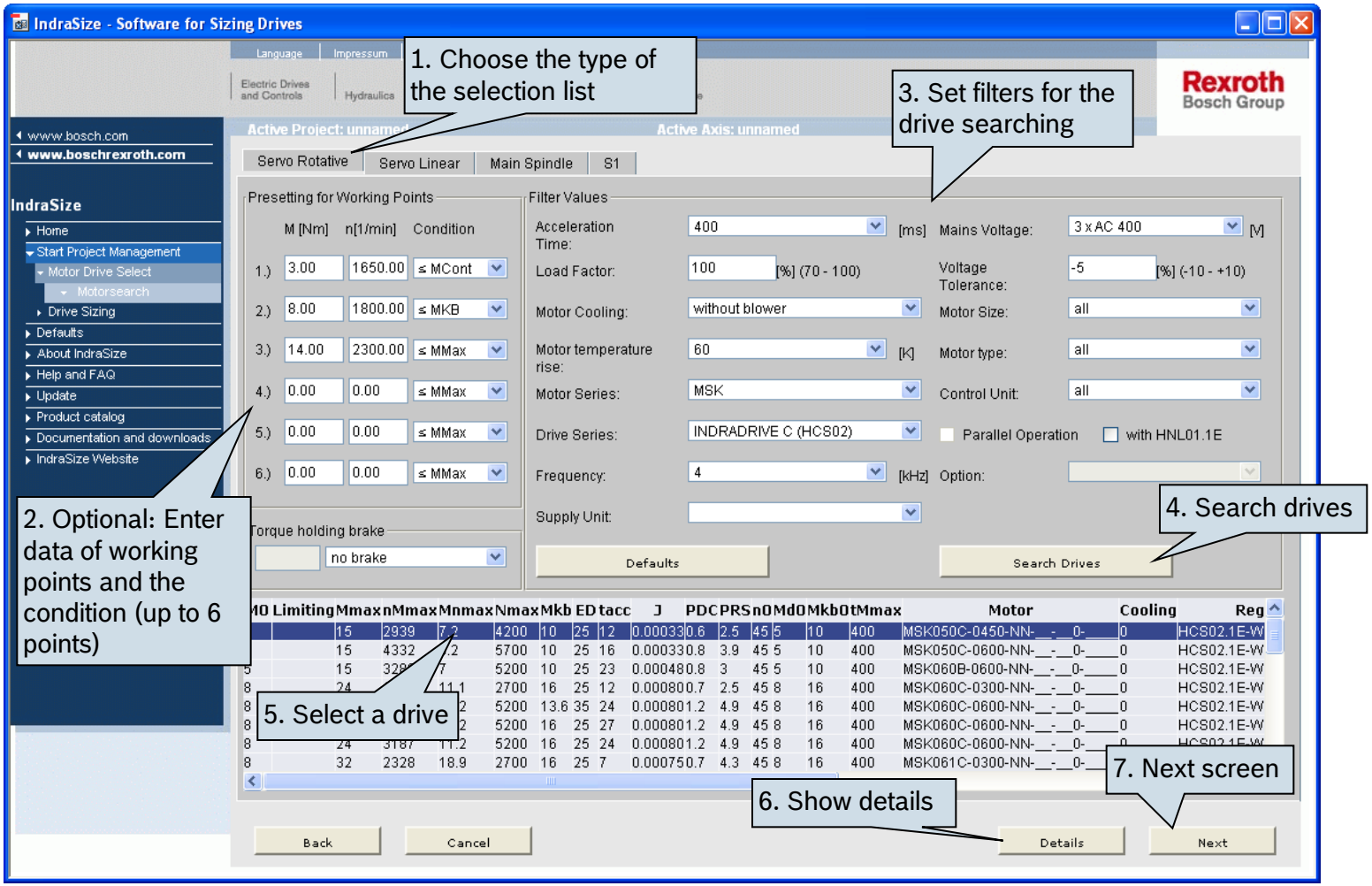
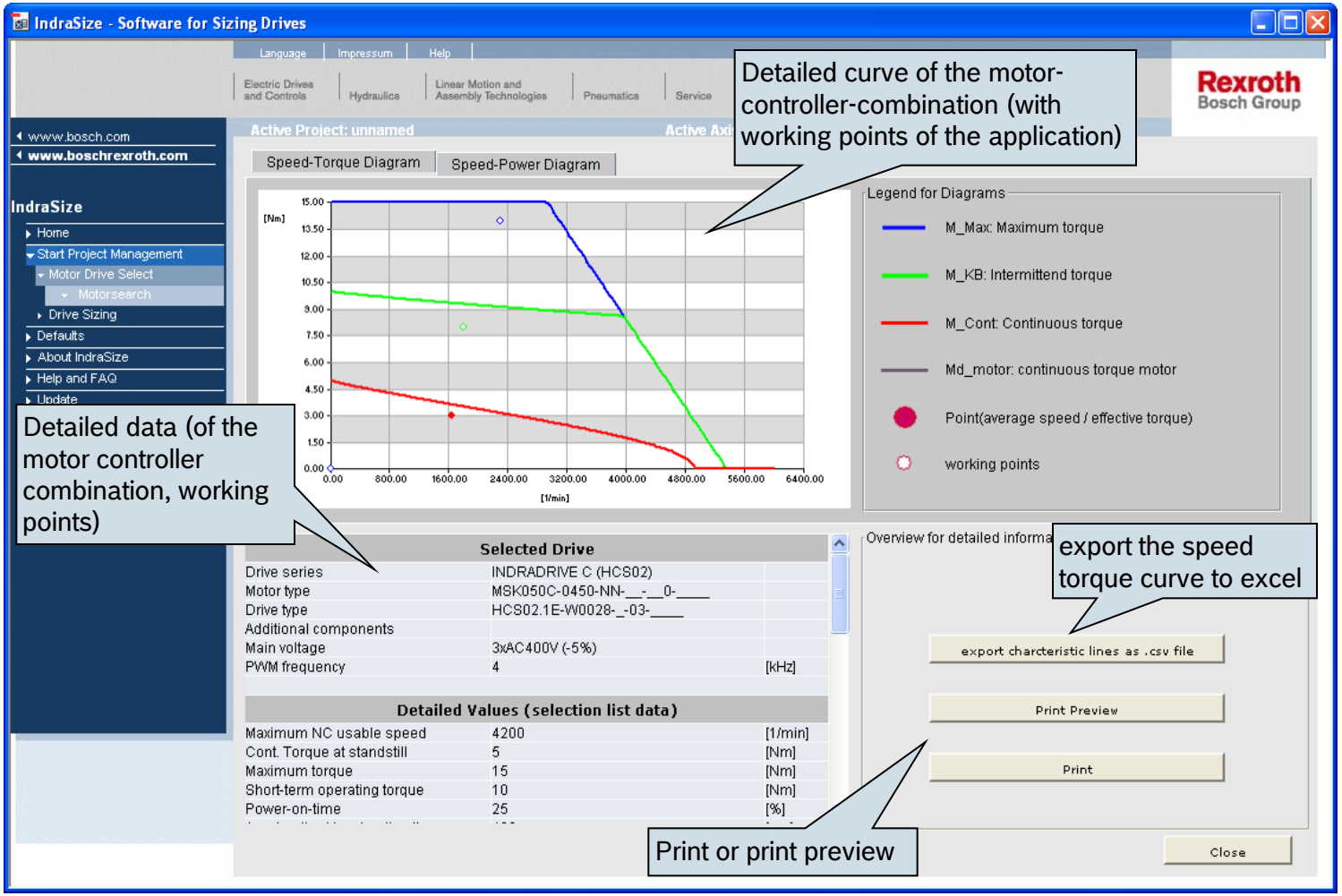
Home Screen



Motor Drive Select - Search



Motor Drive Select - Details



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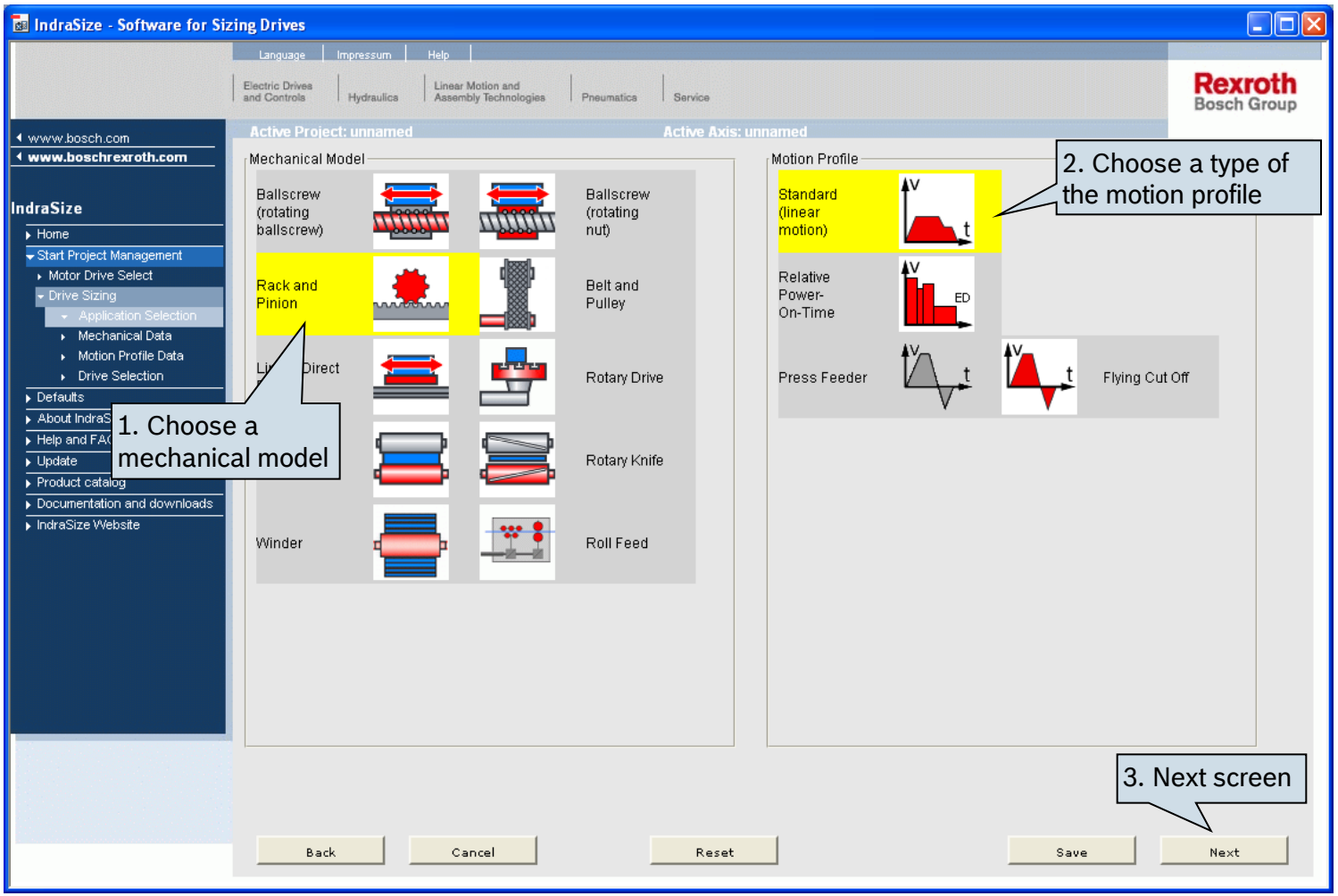
Drive Sizing - Application Selection



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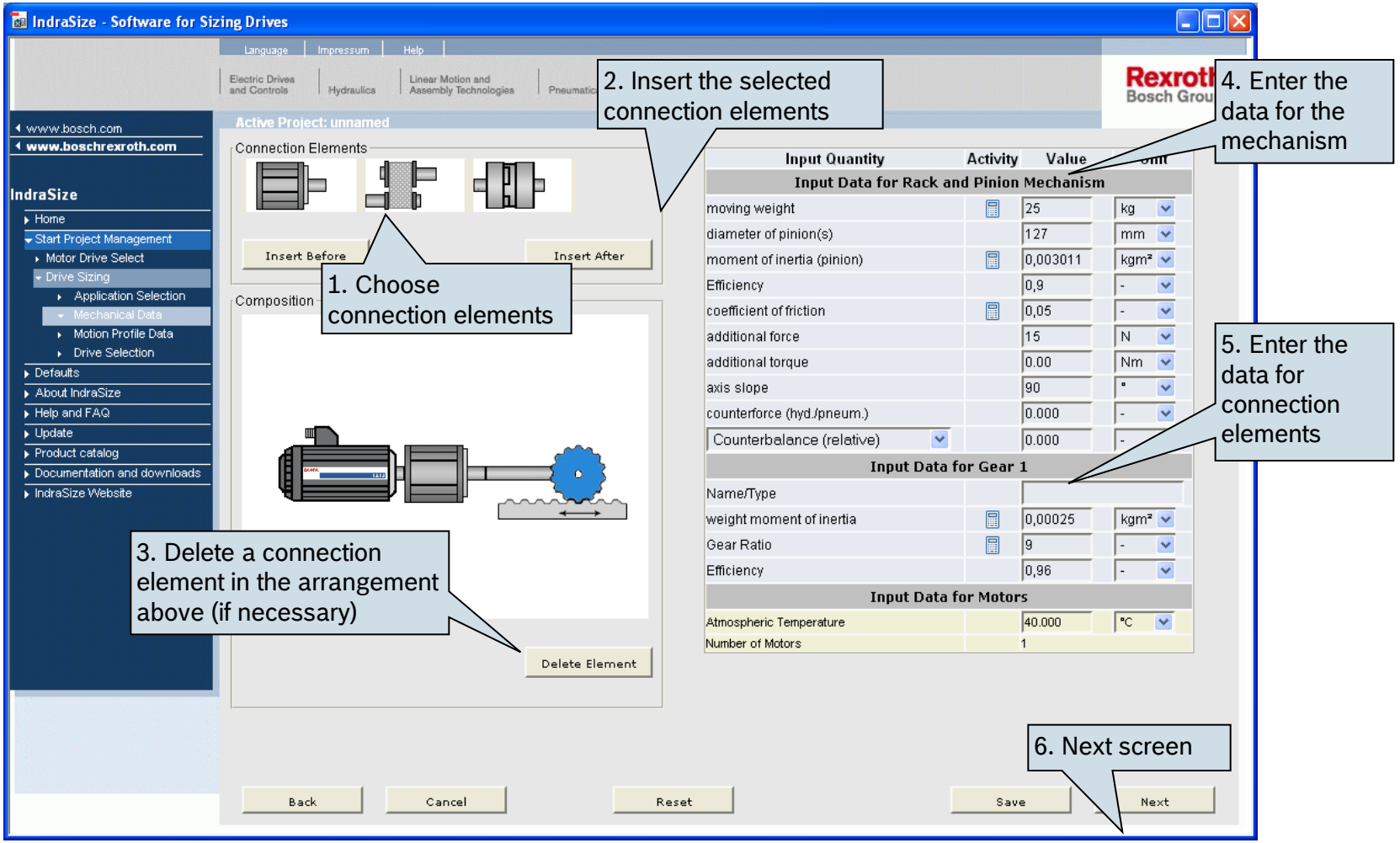
Drive Sizing - Mechanical Data



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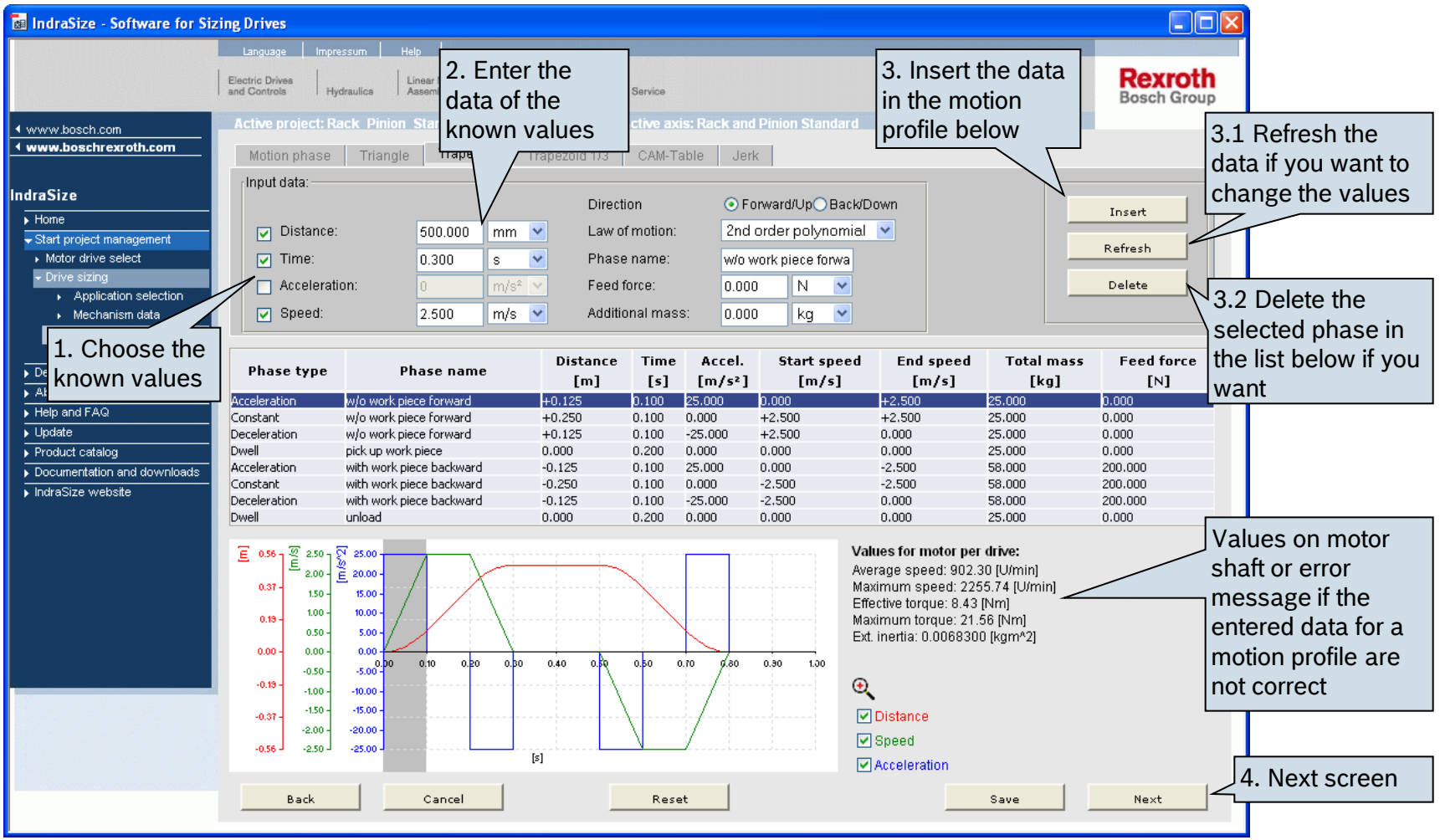
Drive Sizing - Motion Profile Data



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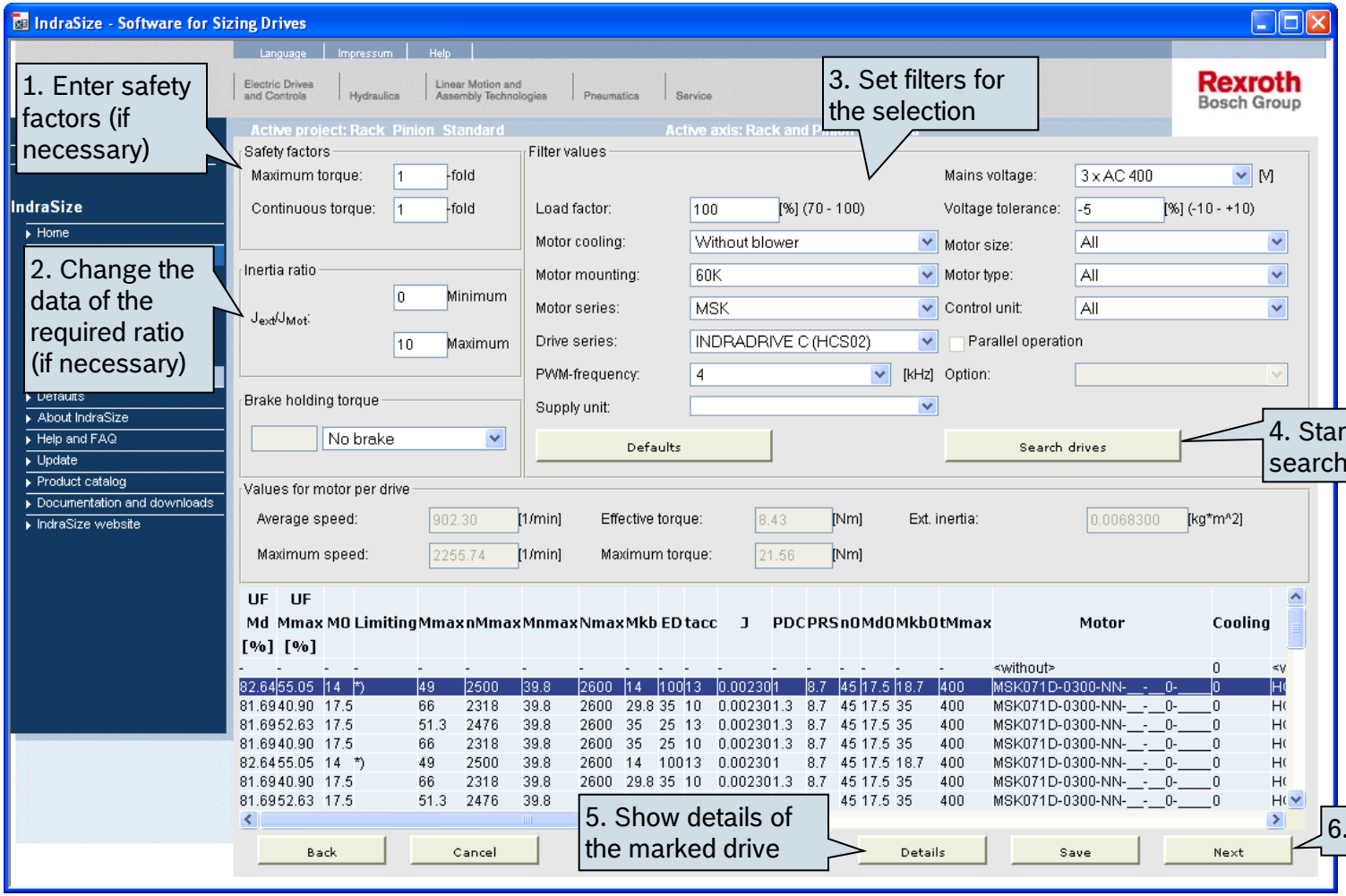
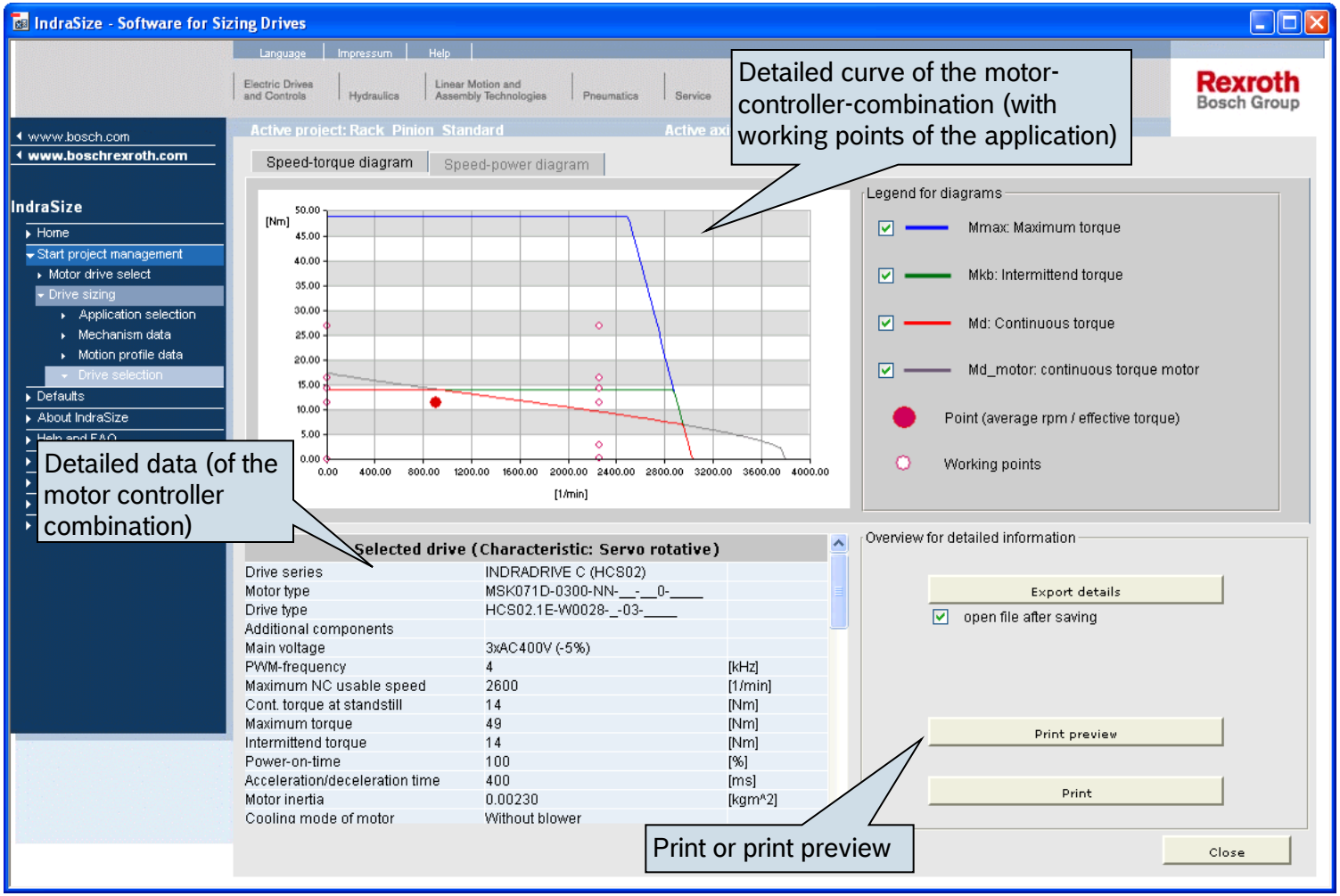
Drive Sizing - Drive Selection



Drive Sizing - Details



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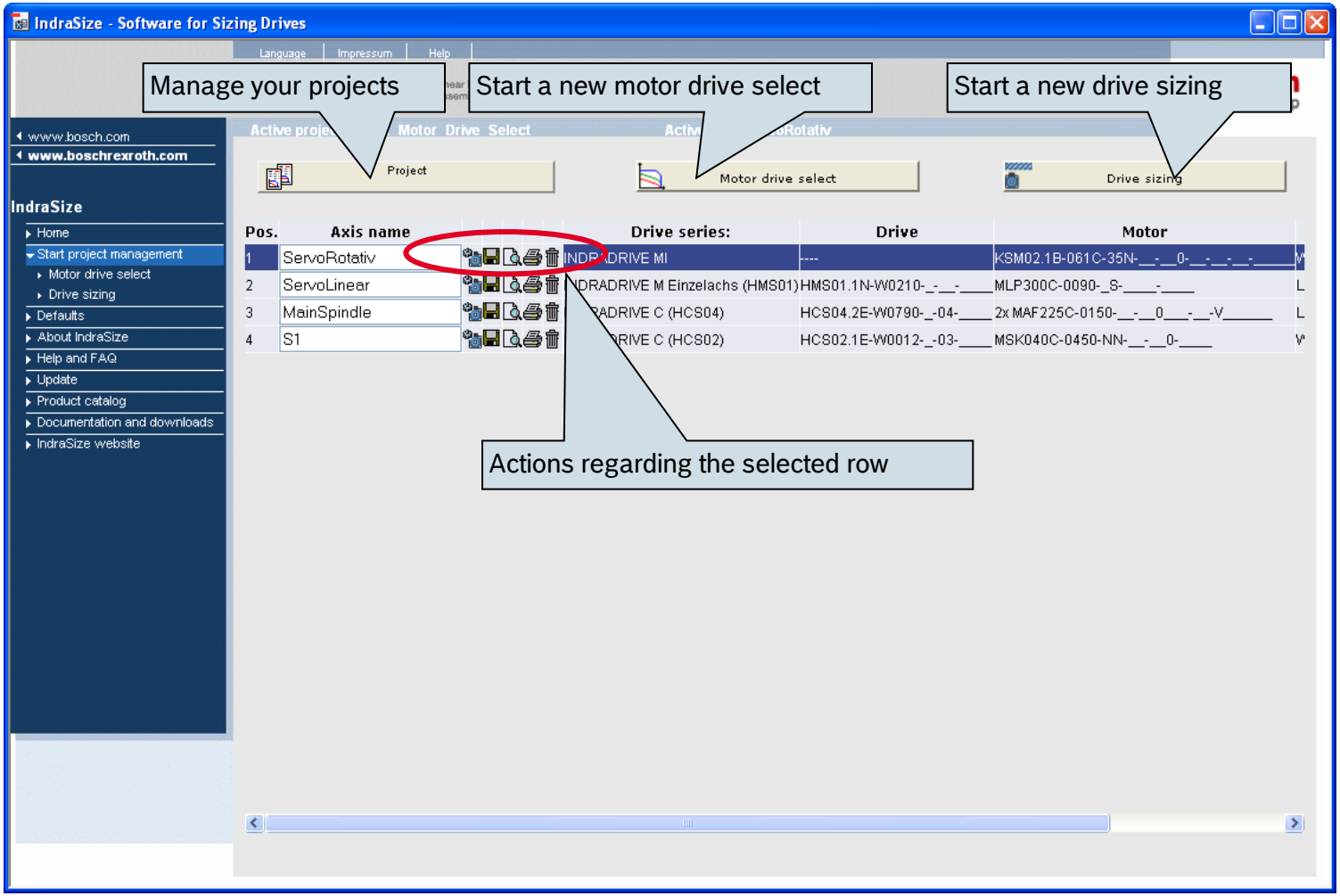
Project Management Screen



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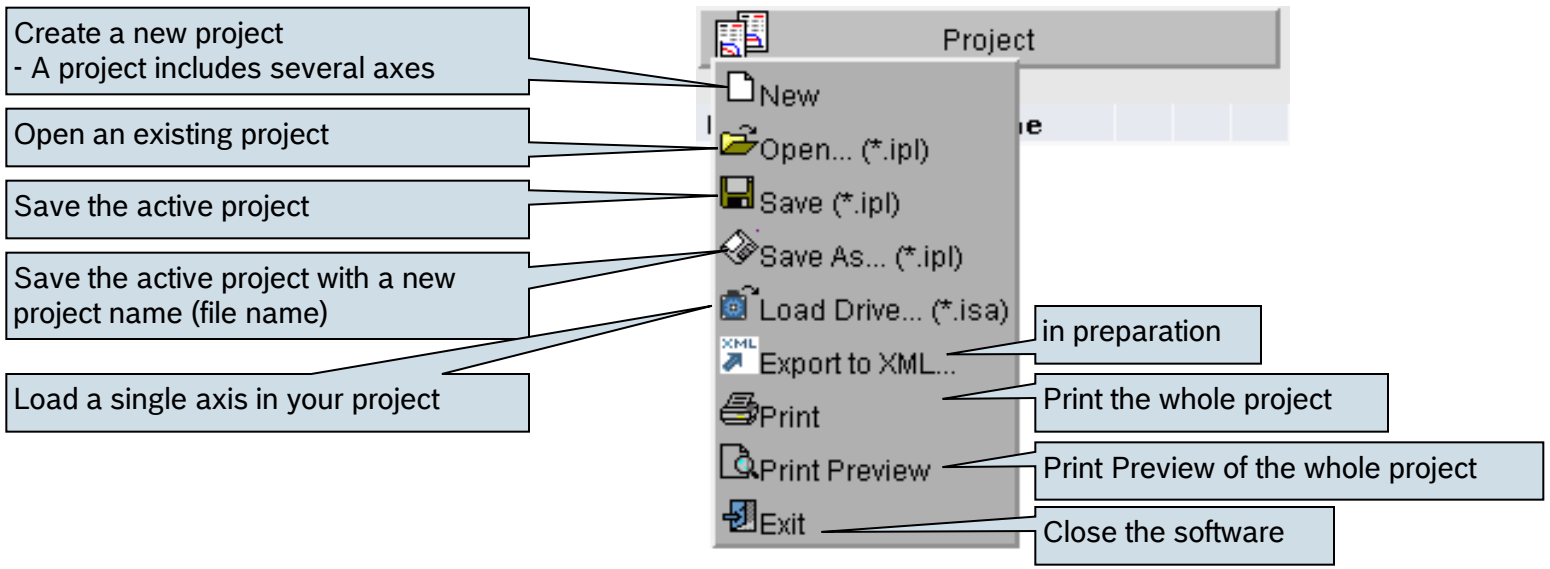
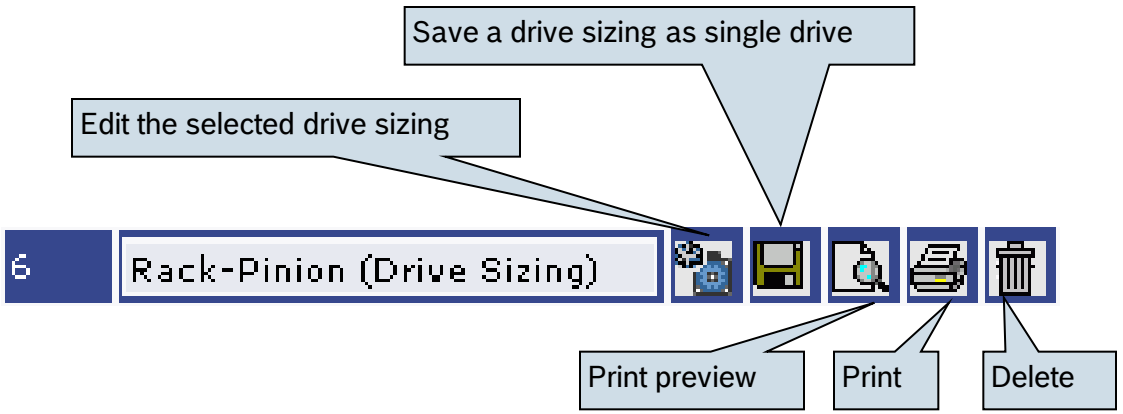
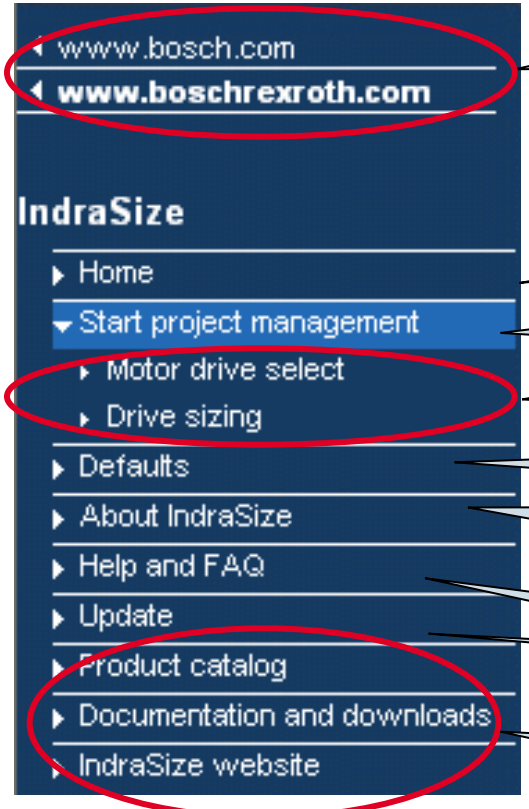
Project Management Screen



Project Management Screen



Navigation



links to Bosch and Rexroth websites

Change to the Home screen

Change to the Project Management screen

Start a Motor Drive Select or start a Drive Sizing

Set languages, addresses and other settings

Information about software version, database version, system requirements and copyright

QuickStart, Hepl, FAQ, Examples

check updates

links to special Rexroth websites

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3.
Example

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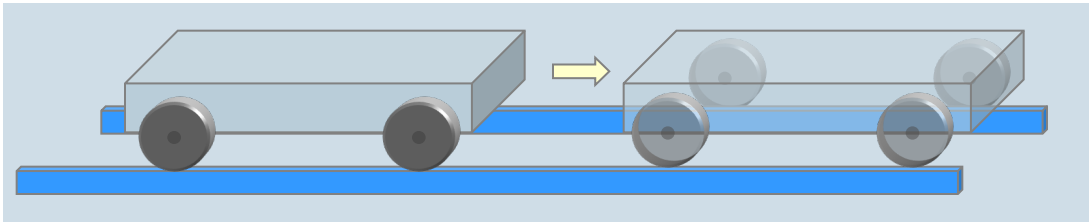
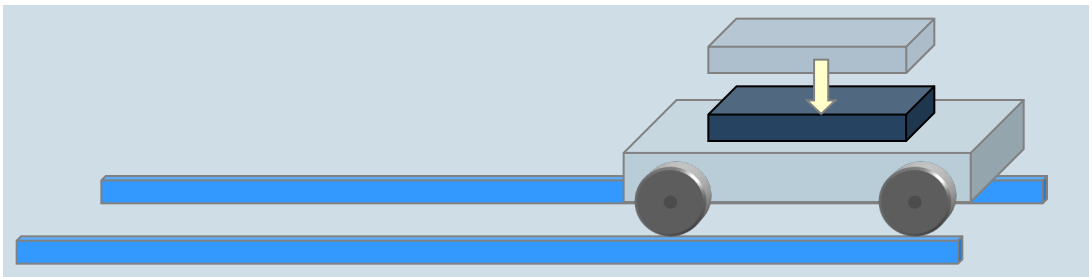
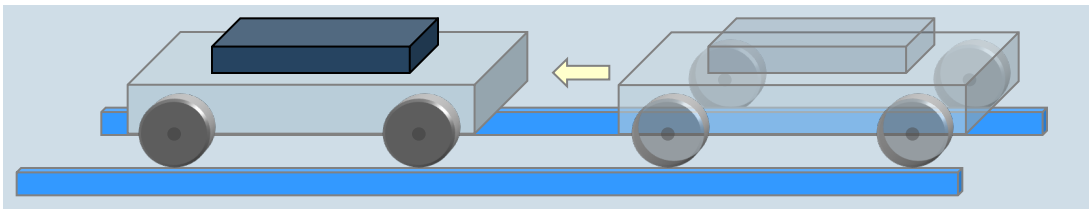
Example - Shuttle



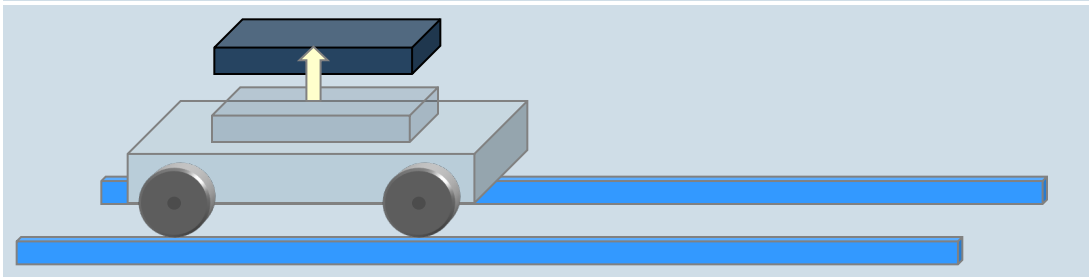
- Drive forward
- Distance = 0,5 m
- Time = 0,3 s
- Allowed velocity = 2,5 m/s



- Pick up the work piece
- Time = 0,2 s



- Drive backward
- Distance = 0,5 m
- Time = 0,3 s
- Allowed velocity = 2,5 m/s



- Put down the work piece
- Time = 0,2 s

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Example - Shuttle

- Conditions to the Mains:
  - Voltage: 3 x AC 400 V, 50 Hz
  - Regeneration is not sufficient
  - Converter

- Mechanical Data
  - Weight of the shuttle m_S = 25 kg
  - Weight of the work piece m_W = 33 kg
  - Coefficient of friction m = 0,05
  - Additional force F_Z = 15 N (cables….)
  - Max. allowed acceleration a_{max} = 50 m/s²

Movement	Dist.	Time	Velocity
Without work piece and process force forward:	0,5 m	0,3 s	2,5 m/s
Pick up work piece:		0,2 s	
With work piece and process force F_P= 200 N backward:	0,5 m	0,3 s	2,5 m/s
Put down work piece		0,2 s	
Next cycle			
Same amount for acceleration and deceleration			
Linear velocity			

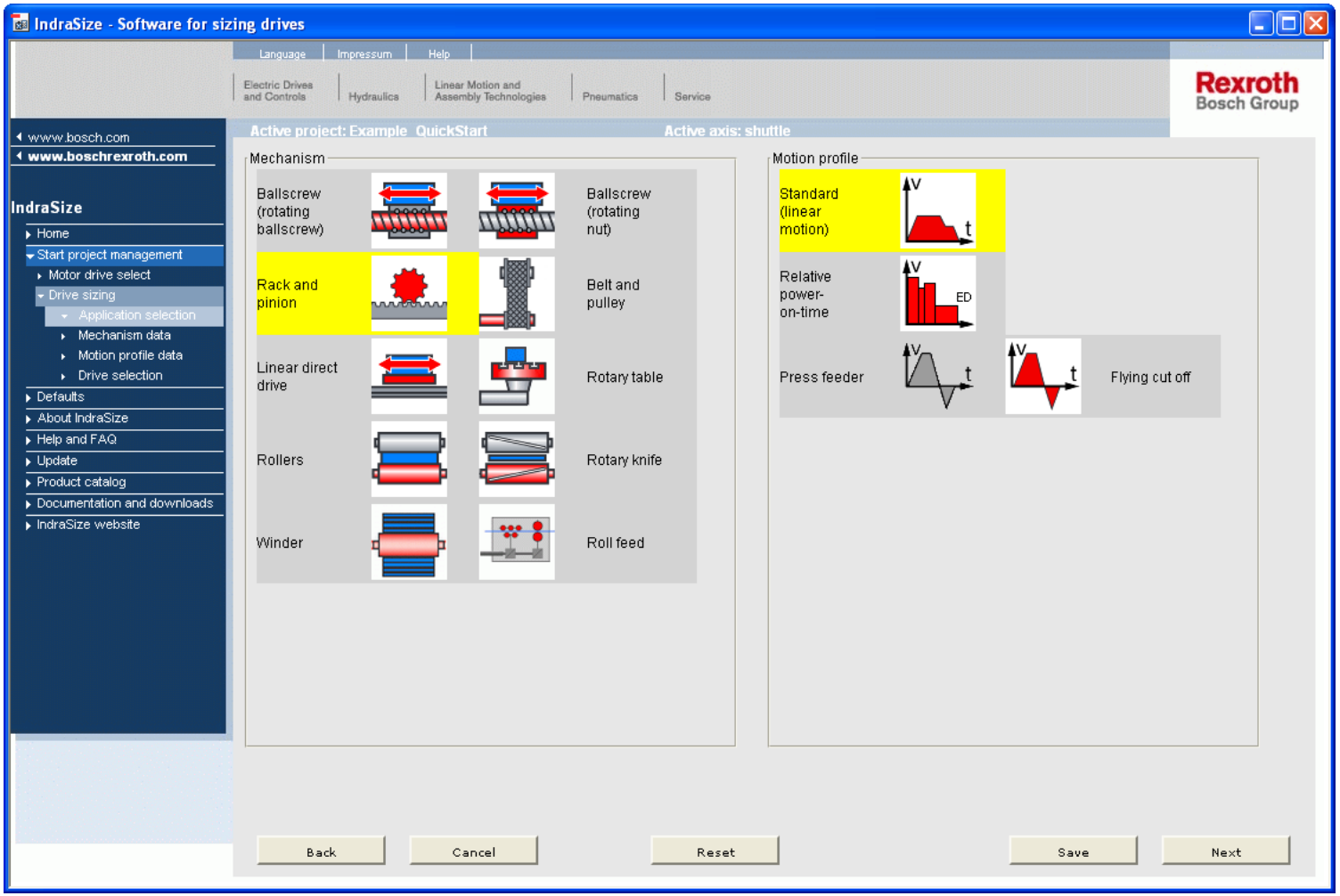
Example - Shuttle

- Mechanical Model: Rack & Pinion
  - Diameter of pinion d_R = 127 mm
  - Width b_R = 15 mm
  - Material steel r = 7,85 kg/dm^3
  - Efficiency h_R = 0,9

- Transmission element: Gear
  - Ratio i_G = 6
  - Efficiency h_G = 0,96
  - Inertia J_G = 0,00025 kgm^2

- Motor
  - Synchronous motor
  - Natural cooling

Example - Shuttle



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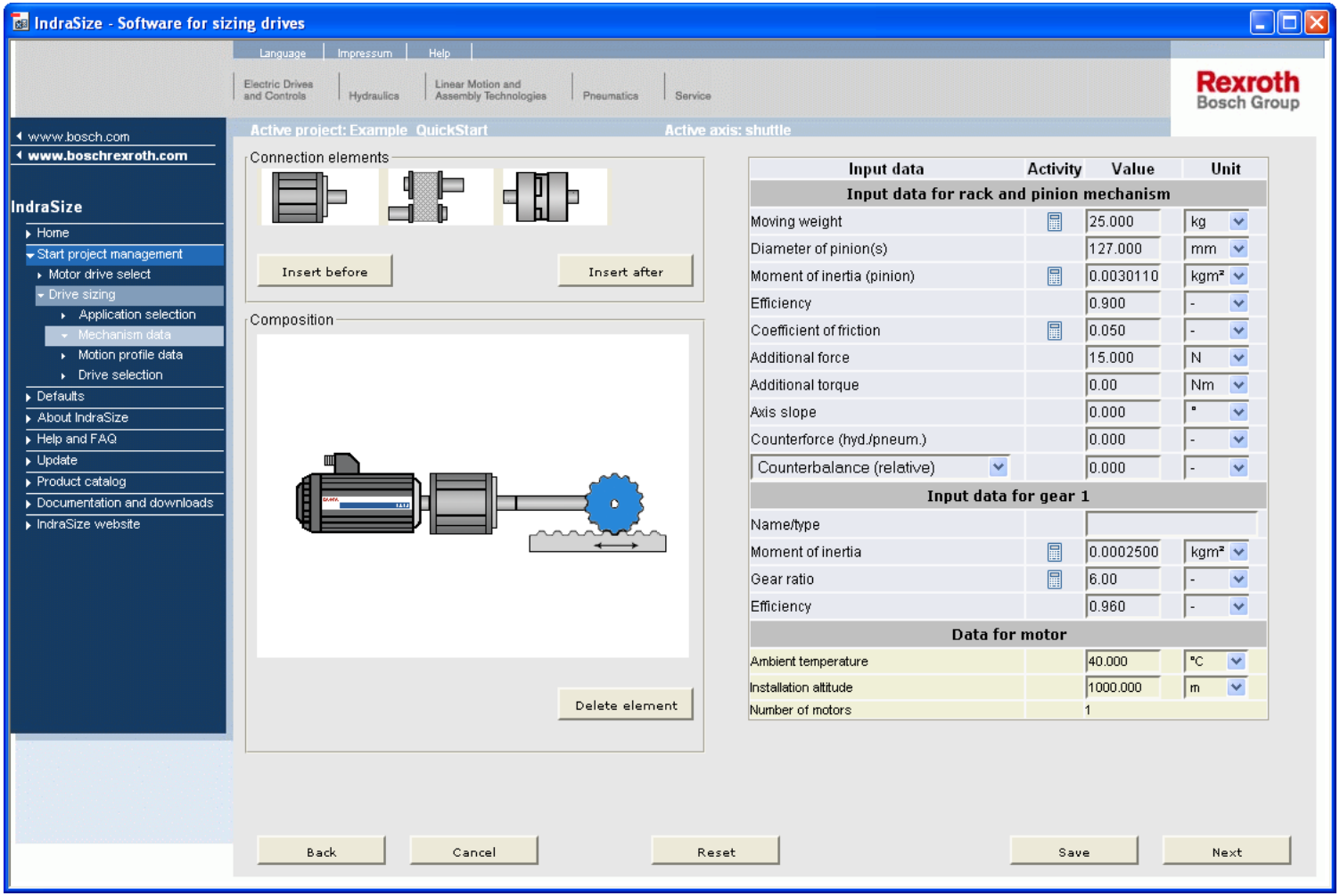
Example - Shuttle



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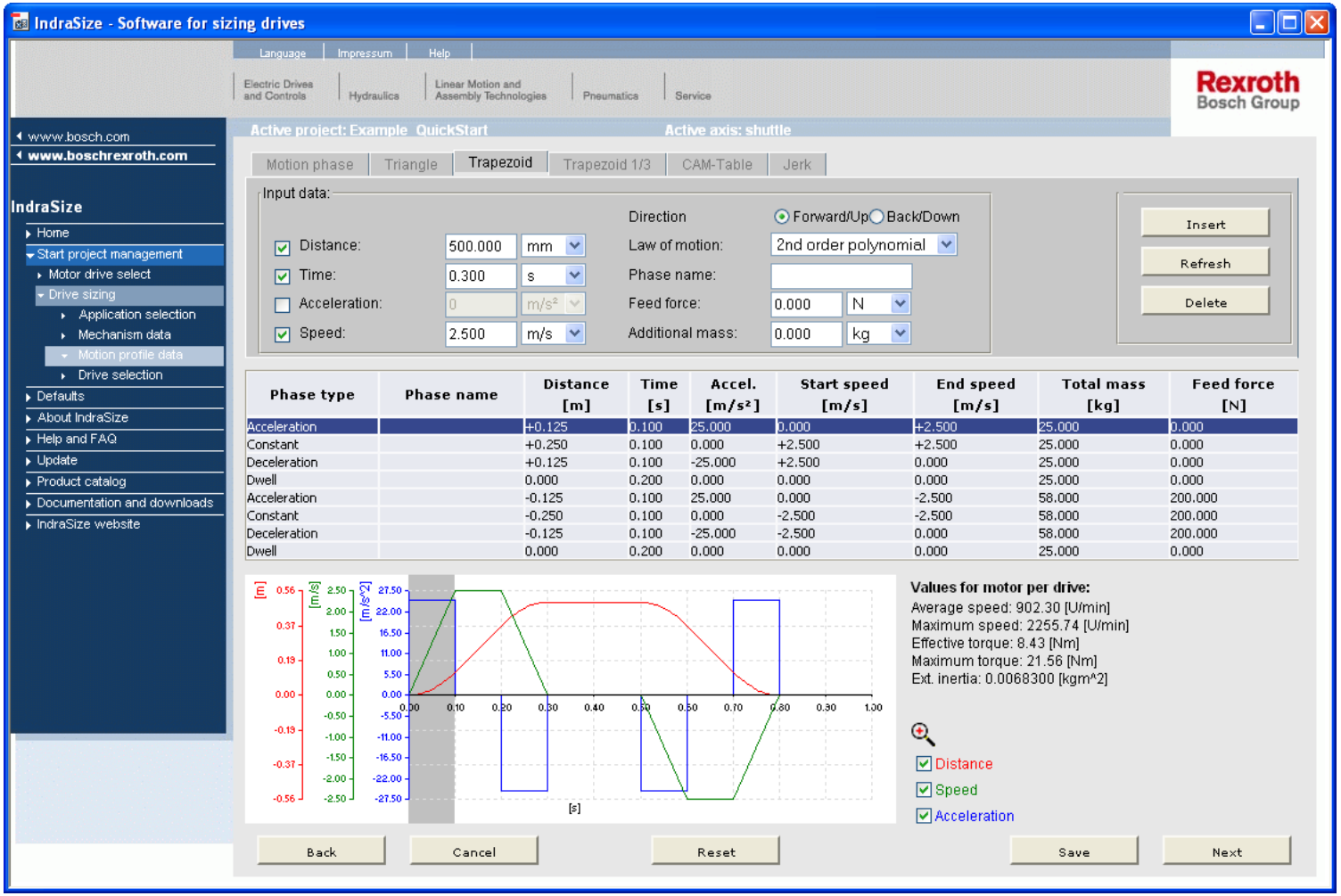
Example - Shuttle



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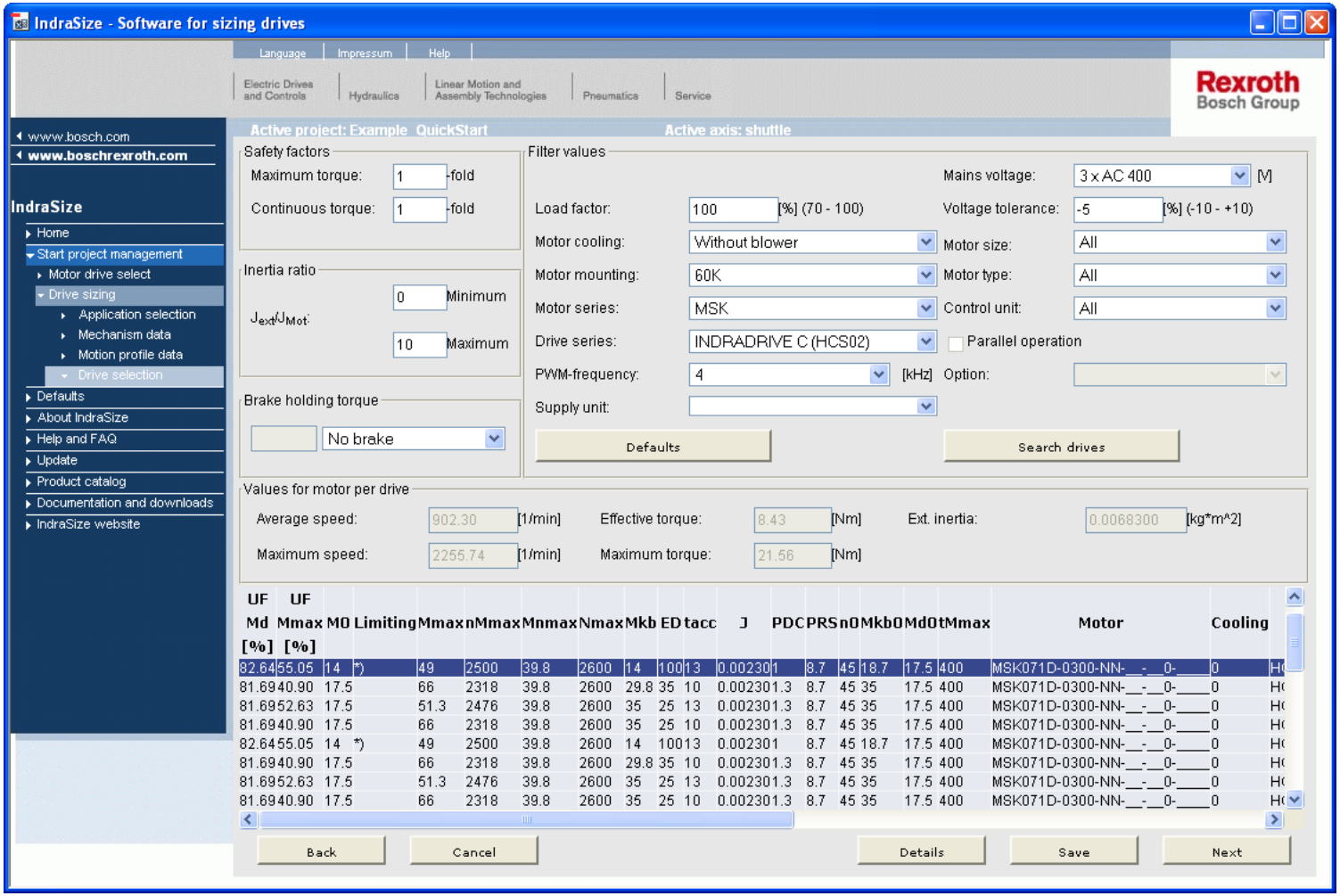
Example - Shuttle



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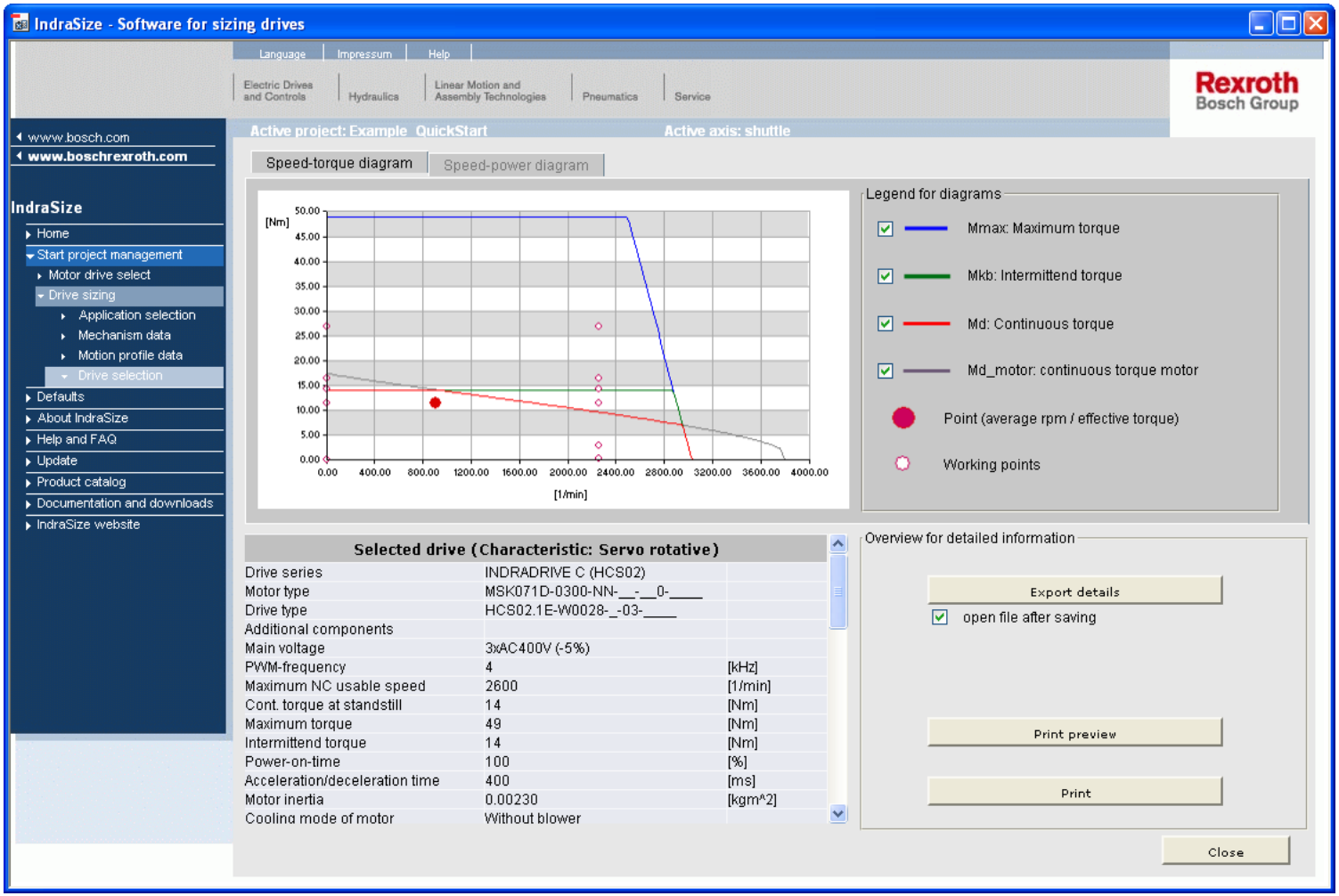
Example - Shuttle



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