QUICK-GUIDE

WITTEC

THE WITTUR CALCULATION TOOL
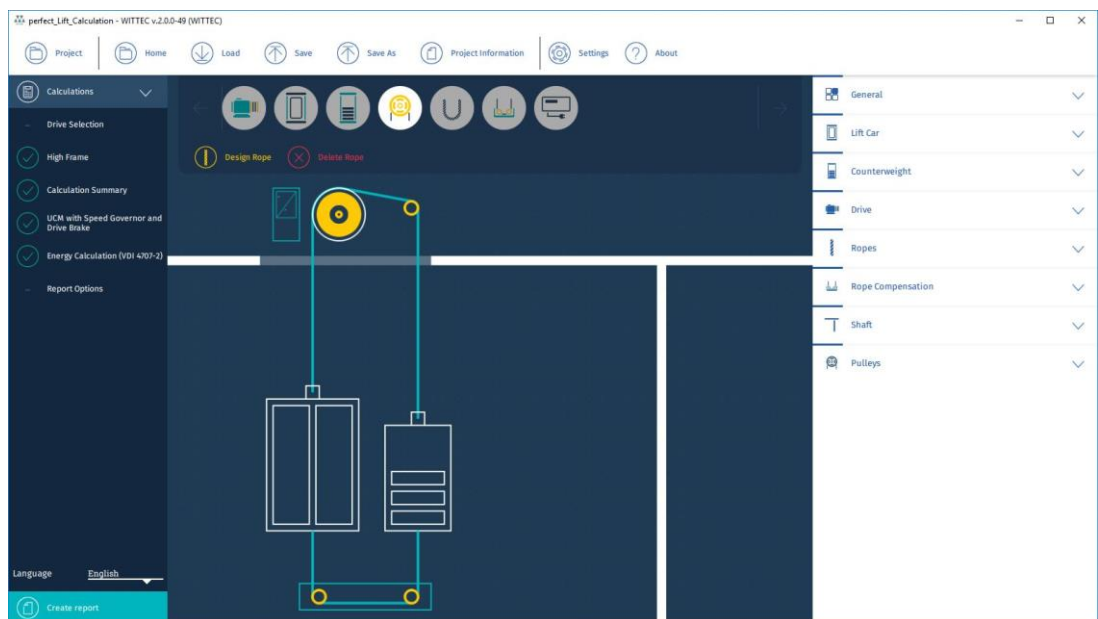
WITTUR

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safety in motion™

WITTEC
The Wittur calculation tool
Quick guide

Code: GM.8.004555.EN
Date: 09 Sep 2020
Version: 2020-09-09

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What is WITTEC?

WITTEC is a very efficient calculation tool for the selection of drives made by WITTUR Electric Drives Dresden, while the user is designing new elevator systems or modernizing existing systems. The focus of the WITTEC calculations is on the drive and the safety of the components related to the drive.

This tutorial shall help you to work with WITTUR's Calculation Tool WITTEC.

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Chapter 1: Starting WITTEC

Before you start a new project in WITTEC, there are some things to be checked first:
- You have downloaded the latest version of WITTEC.
- You have a valid WITTEC account with your individual user name and password
- You use Chrome or Firefox as your default web browser.
   (If you are using Internet Explorer, your login may fail. The Internet Explorer is an old browser that does not support the secure encryption methods of the WITTEC server.)

After downloading the zip-file with the latest version of WITTEC, unpack it locally and run the "wittec-application.exe".
(e.g. C:\Users\[username]\Documents\WITTEC).

The login page of WITTEC will open and you can select the language or you can use your login.

If it is your first login with your initial password, you have to change your password after your first login.

Follow the instructions.

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Before you start a new project in WITTEC, you should always check if a new software or database version is available.

It is necessary to keep your software up to date so that you can always work with the latest WITTEC version.

If an update is available, the corresponding icons (highlighted in green) are visible on the start screen.
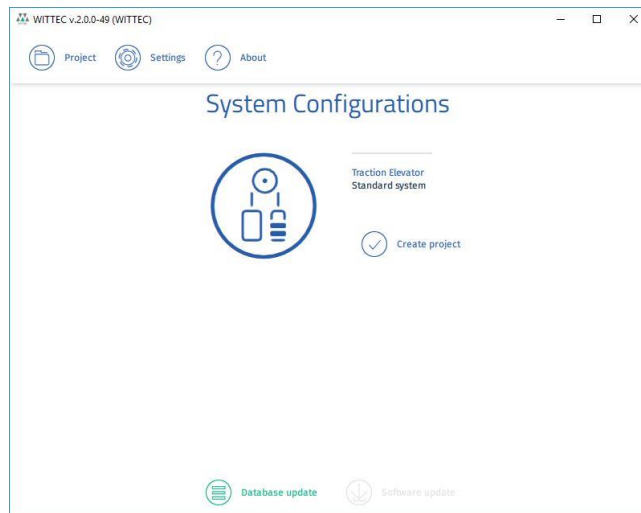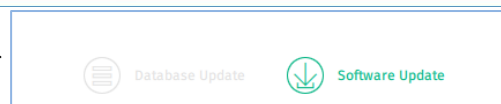
WITTEC gives you detailed instructions what to do during the updates.

After the Update is completed, you have to restart WITTEC.

Database Updates are smaller updates that just require just a restart of WITTEC. *Software Updates* are bigger updates that require a complete new installation of WITTEC.

You can start a new calculation project when you click on the button "Create project".

If you have already saved projects, you can open them using the "Load" button in the top menu bar of the program.

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Chapter 2: Starting a Project in WITTEC

All WITTEC projects are starting with your idea of a new system or the setting of the system you want to modernize. With WITTEC, you can create your desired elevator system in two ways.

a. If you use the Configurator, Wittec will create the complete design for you.
b. You can create the entire design by yourself using the construction box.

The construction box is most obvious part that distinguishes WITTEC from other calculation tools! It allows you to select individually the elevator components required in your elevator system. After you have run through the configurator with your specifications, you can still adjust your design manually in the construction box.

Step 0: Configurator

The big improvement in WITTEC 2.1 is the Configurator. It opens automatically when you start a new project.
All you have to do then is to choose the location of the drive, the suspension and to decide whether there is a machine room or not. If you want, you can add the position of the diverter pulley and the press pulley.
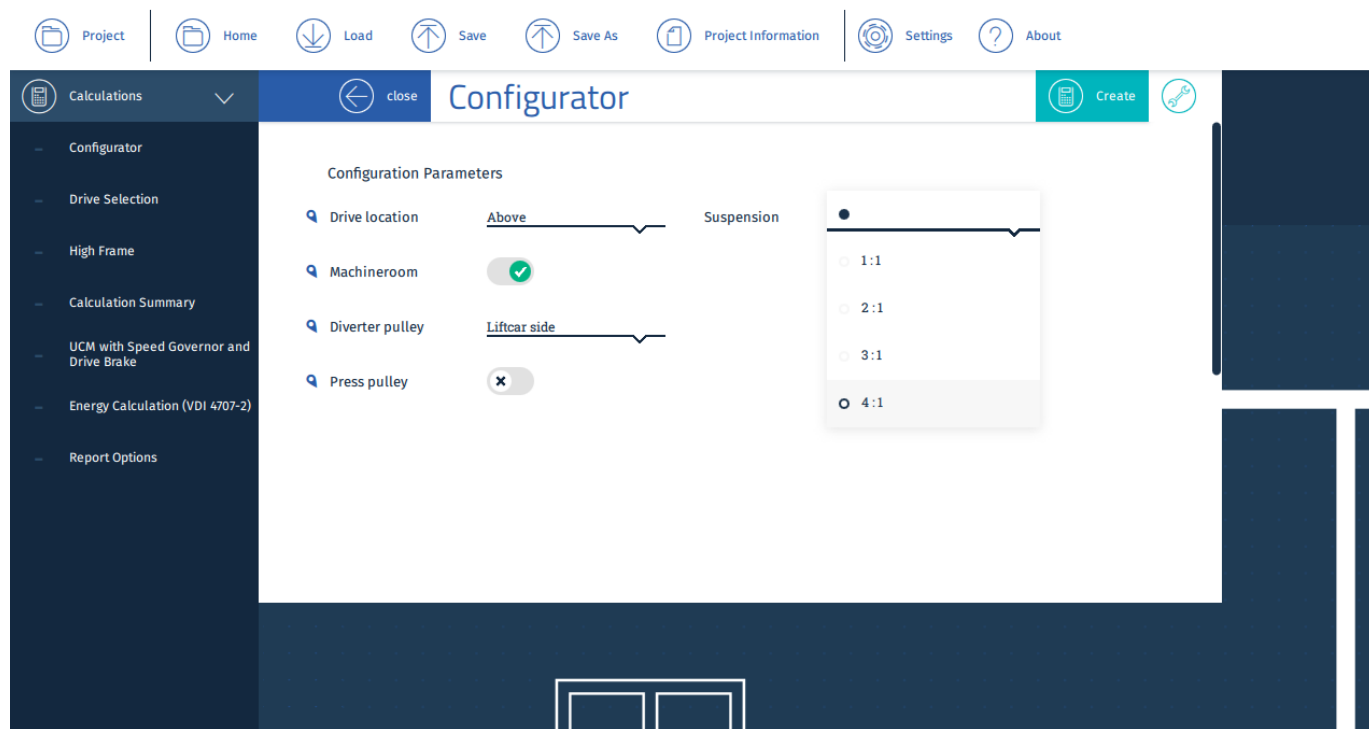
When you click on create, WITTEC does all the construction for you. Now you go to the construction box or the components to individualize your settings.

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Step 1: Construction Box

To carry out fine tuning after using the configurator or to individually create and select the elevator components required in your elevator system, you can go directly to the construction box.

You can select them by dragging and dropping them into the construction box.

In WITTEC 2.1 you will not see the lift car or the counterweight in the component bar, because they are placed in the Construction box by default.

Components that are set only once (Motor, Inverter, Rope Compensation) are no longer visible in the component bar after being set.

The positions where you can place the components are marked in gray. If you want to place pulleys, the positions where a pulley is definitely needed are marked in red.

On top of our construction box, you can see the components that are available for the construction of your lift system.
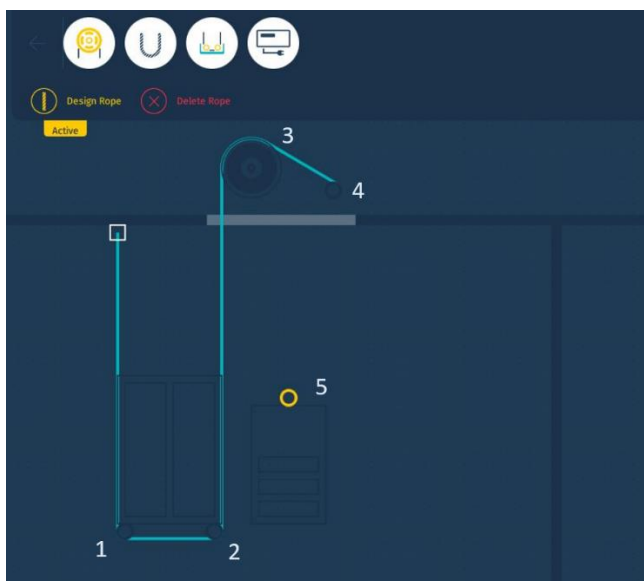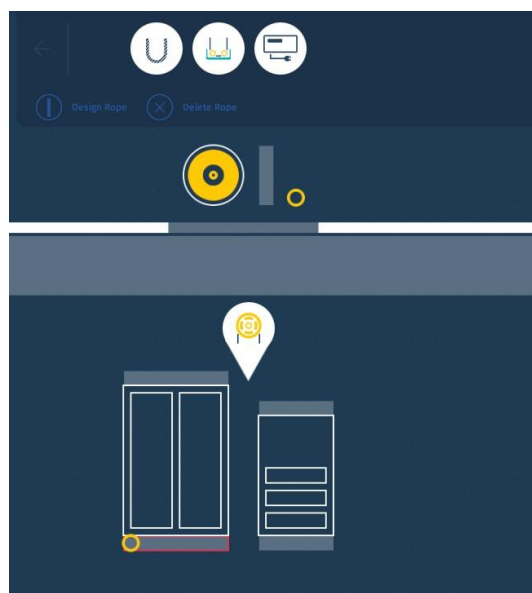
After you have selected all elevator-components that are required in your specific case, you can click the button "*Design Rope*" to design the rope.

If you have pulleys in the system, you have to click these pulleys (and the traction sheave) in the requested order. Pulleys that are allowed to be clicked next are highlighted yellow, others are blue.

In our example, you can see a 2:1 suspension. With the WITTEC configurator you can create suspensions up to 4:1.

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Step 2: Components
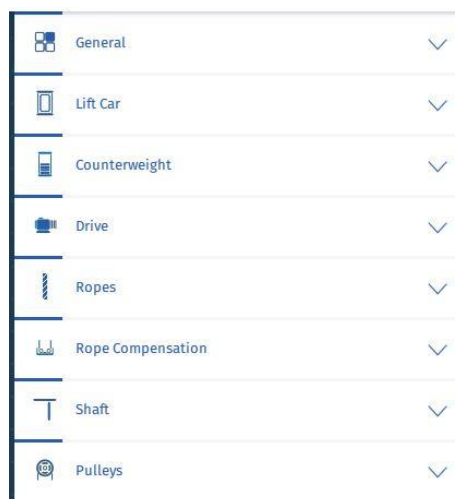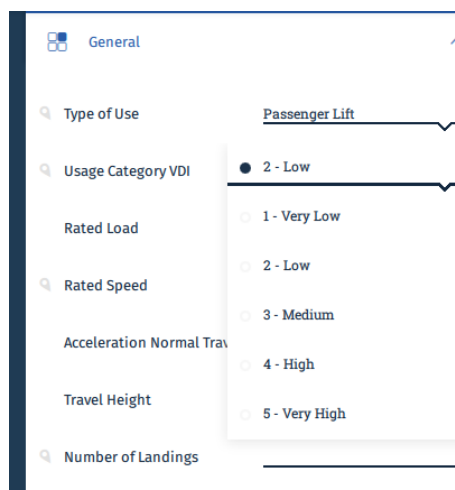
On the right side of the user interface you can see all components that you have chosen and positionned in the construction box in Step 1.

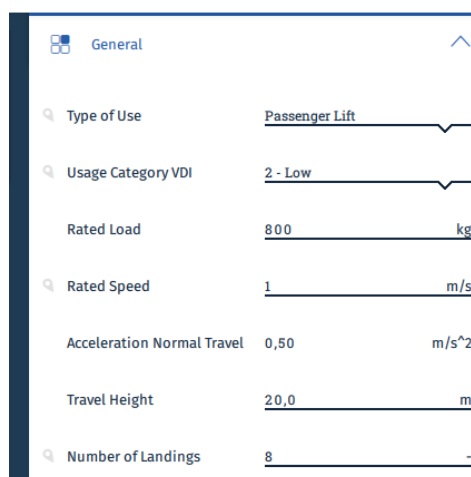|		
General		∨
Lift Car		∨
Counterweight		∨
Drive		∨
Ropes		∨
Rope Compensation		∨
Shaft		∨
Pulleys		∨

Here you can see the component *General*.
The user should choose a suitable usage category (VDI 4707) that fits to the frequency of the calculated elevator system. A higher usage category goes hand in hand with an often used drive.

In Chapter 3 you find a description of the different usage categories.

General

Type of Use	Passenger Lift
Usage Category VDI	● 2 - Low
	○ 1 - Very Low
Rated Load	○ 2 - Low
Rated Speed	○ 3 - Medium
Acceleration Normal Trav	○ 4 - High
Travel Height	○ 5 - Very High
Number of Landings	

After you have chosen the Usage Category you can choose the *Rated Load* and the *Travel Height* (in this example 800 kg and 20 m).

Now you have already typed in enough values to start the *Drive* Selection on the left side of the user interface to find a suitable drive in a first trial.

General

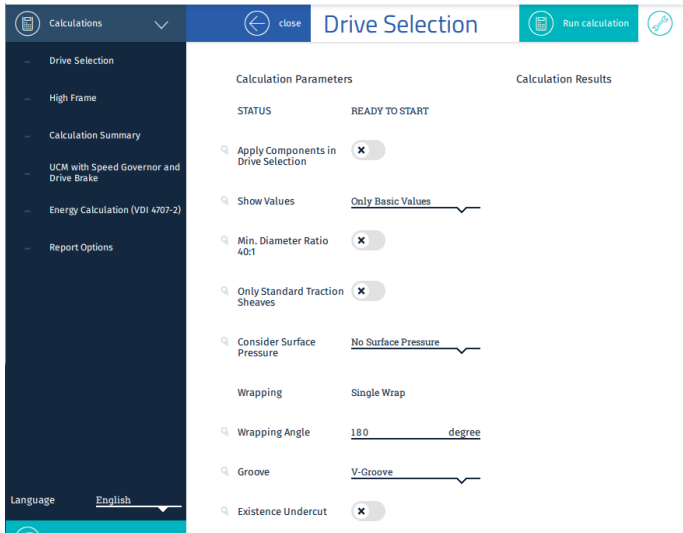|		
Type of Use	Passenger Lift	
Usage Category VDI	2 - Low	
Rated Load	800	kg
Rated Speed	1	m/s
Acceleration Normal Travel	0,50	m/s^2
Travel Height	20,0	m
Number of Landings	8	-

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Step 3: Drive Selection
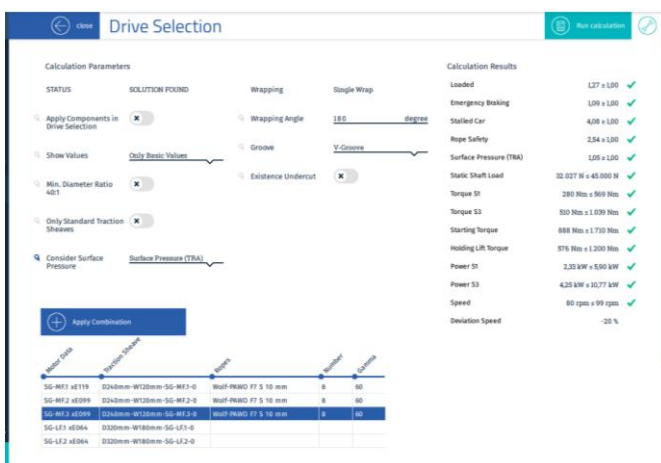

You can run the drive selection when the status says "Ready To Start".

Click on "*Run calculation*" and WITTEC calculates a suitable drive for your system.

After the calculation is complete, a list with all possible drives is displayed below the settings.

If you click on one of these drives, you can see different possible rope solutions. You can click on one solution to see the results and you can double-click on the solution to apply.

Now you have already completed the calculation of your elevator system. In the following chapter you will see how you can specify your elevator more precisely.

Chapter 3: Configure an elevator

In some cases, it might be necessary to specify the elevator in a more detailed way than shown in Chapter 2. That will be part of this chapter.

Step 1: Construction Box
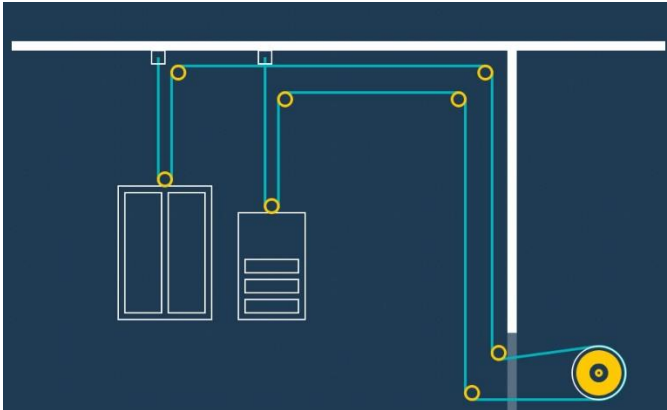
You can see the construction of a 2:1 suspension with the drive below and outside the shaft.

If you don't want to rebuild these constructions every time you start a new project, you can save your construction to reload it with the same settings in case of a new problem.

Step 2: Components

There is a difference between *Main Components* and *Sub Components* in WITTEC*. Main Components* should be filled in *before* the user starts the *Drive Selection*, because their parameters are relevant for the calculations in the *Drive Selection. Main Components* are all components that you see before you open any component. It is recommended to fill in the parameters of these components starting from top.
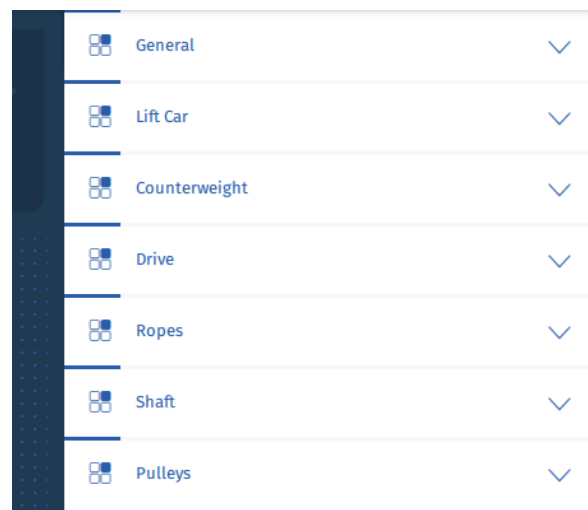
If you open the component *Drive* you see the *Sub Components Motor* and *Traction Sheave*.
These components are chosen by products in the Drive Selection, so you don't have to specify them before you start the *Drive Selection.*

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Product	Product type	Category	Weight per Meter	Breaking Strength	Rope Certificate
Pfeifer Drako-PTX 300		rope			KP 195-2
Pfeifer Drako-250T-1770		rope			CA 067
Pfeifer Drako-6 x 19 W-FC 1770		rope			
Pfeifer Drako-250T-1570		rope			default
	All				
	8 mm		0.271	43300	
	9 mm		0.343	54800	
	10 mm		0.423	67700	
	11 mm		0.512	81900	
	12 mm		0.609	97400	
	13 mm		0.715	114000	
	14 mm		0.829	133000	
	15 mm		0.94	134000	
	16 mm		1.08	173000	
	18 mm		1.36	192000	
Pfeifer Drako-300T-1570		rope			

Ropes are special main components because the selected rope product provides specifications that your lift system must meet. The selection of a rope product is optional, as you can start the drive selection without having selected a rope.
In this case, the Drive Selection will select a rope for you.
The rope catalogue can be selected in the Rope component by clicking on Catalogue. Here you can see the rope catalogue.

Catalog   Pfeifer Drako-300T-1570 9 mm

If you want to select a rope, you have to select it with a double click. In the catalogue you will also find ropes with special certificates and the names of the certificates.
If you delete the selected rope, the *drive selection* calculates again with the standard rope selection.

Step 3: Drive Selection

The parameter *Show Values* is set to *Only Basic Values* by standard, but you can also show *Calculation Options, Min./Max.Values* or *UCM Values.*

- in *Calculation Options* you can change some more detailed options like how many different drives you want to show in the results
- in *Min./Max. Values* you can define the range of values for that a solution will be searched
- in *UCM-Values* you can decide to show only results for that the UCM-calculation is also fulfilled

Important are also the switches *Min. Diameter Ratio 40:1* and *Only Standard Traction Sheaves*. Sometimes it is a good idea to calculate the *Drive Selection* a couple of times (first without and then with one of these values enabled). Then you can check if you still get a drive as small as before if you enable these values. Please keep in mind that you need ropes with certain diameters to use standard traction sheaves, because they have a special groove geometry. You find the information about the standard traction sheaves in the product catalog of the component *Traction Sheave.*
With the option *Consider Surface Pressure* you can show only results for that the surface pressure calculation is also fulfilled. By standard this value is disabled because this calculation doesn't have to be fulfilled in the used norm EN-81-20/50, but a better value of surface pressure leads to a better rope lifetime.

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Step 4: Calculation Summary

After you selected a solution in the *Drive Selection* you can see a summary of all calculations again in the *Calculation Summary.* You still can change something in the *Components* and will see in the *Calculation Summary* if the results are still fulfilled.

You can also work without the *Drive Selection* (Step 3) if you already know which *Motor* and *Traction Sheave* you need. Then you have to choose these products directly in the product catalogs of these components (first the *Motor*, then the *Traction Sheave)*.

You can also see more details of the calculations in the *Calculation Summary* by changing the value *Calculation Details.*

Step 5: Report
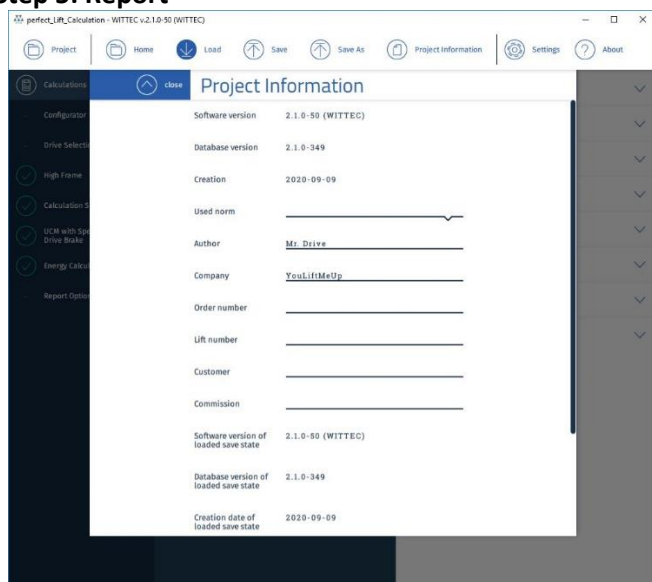
Before you create a report, it may be necessary to add project information.
Click *Project* and click *Project Information* on the top menu bar. Now enter the information required for the report.

In the top menu bar you will also find the links to *save*, *save as*, *load* and you can return to the *home* screen.

After you have filled in the project information and chosen a language (see Fig. 12), you can create the report by clicking on *Create Report*.

You will find your reports in the folder *reports* in the WITTEC-folder.

Chapter 4: Energy Calculation

WITTEC also includes the possibility to run an Energy Calculation according to VDI 4707-2. For that three classes of energy are determined for Run, Standby and Total (see Fig. 13).

Calculation Results

Energy Class B (Run)	0,622 mWh ≤ 0,840 mWh	✔
Energy Class B (Standby)	63 W ≤ 100 W	✔
Total Energy Class B	41,943 mWh ≤ 66,118 mWh	✔

Figure 1: Calculation Results for Energy Calculation

To be able to run the Energy Calculation and to see the results in Fig. 13, it is necessary that the user has already chosen the products Motor, Traction Sheave and Inverter. The Energy Calculation is also not possible for each motor, as there are required some specific parameters.

The input values are separated into Run Demand Energy, Standby Demand Power and Door Energy Options. For an accurate calculation, the user has to type in the values of each relevant component of the elevator. The Energy Calculation can be shown on the report when the user has chosen the value in the Report Options.

To show the Energy Calculation on report, the option in Report Options has to be enabled.

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Chapter 5: High Frame Calculation

In WITTEC there are three different High Frame Types available. To unlock the High Frame Calculation for a specific type, the user has to choose the correct construction in the construction box.

Standard High Frame:
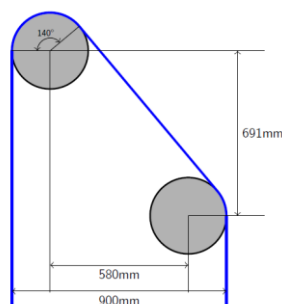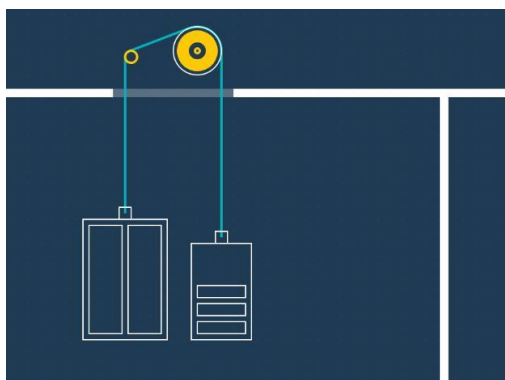
Standard High Frame
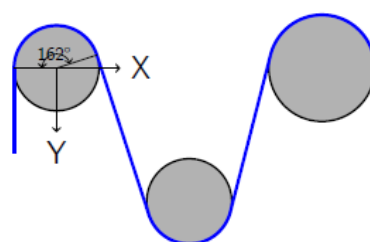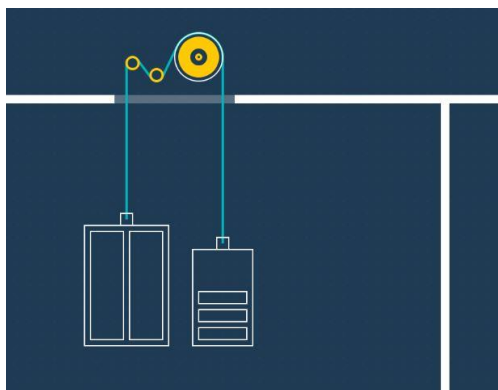
High Frame with Supporting Pulley
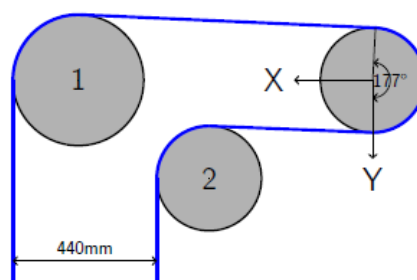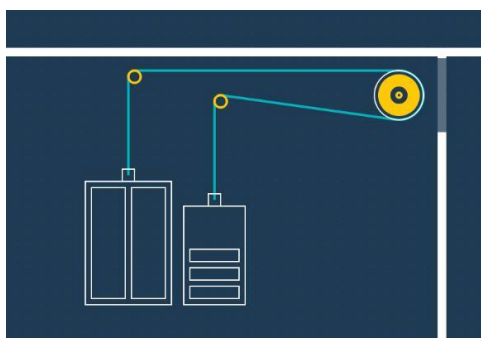
High Frame with Drive Lateral

Calculation Types

You can calculate the High Frame Calculation with the parameter *Calculation Type >Wrap Angl*e. This calculation allows the calculation of the *Wrapping Angle* and the *Distance Between Ropes* in dependence of *Diameter Traction Sheave*, *Diameter Deflection Pulley* and the Distance Between Axles. That makes sense if the user already knows which High Frame he will use and if he wants to know the *Wrapping Angle* for that High Frame.

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The Calculation Result shows if there is an overlap between Traction sheave and Pulley.

Apply Values in System
The switch allows to apply the values of the High Frame Calculation in the Drive Selection and Components. The relevant values in the system can't be changed anymore if this option is enabled.

Show High Frame on Report
In Report Options the High Frame can be shown on report. But first the same value has to be chosen in High Frame Calculation like in the system, otherwise warning messages will be shown for the values.

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Chapter 6: Apply Components in Drive Selection

Starting with software version 1.3.0-44 WITTEC offers the possibility to individualize each project to a maximum by many input parameters.

When you open a calculation-page you are now able to show all parameters that are relevant for each calculation. You can show and hide the components by clicking on the component-button:
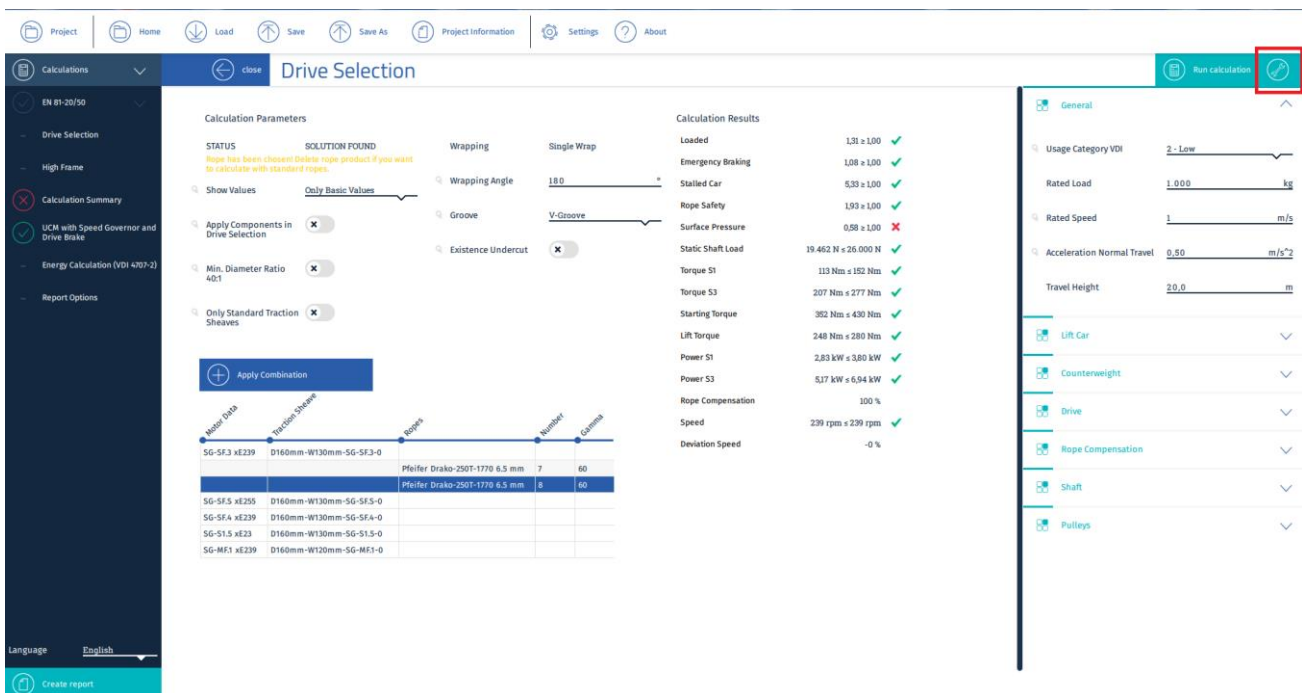
It is recommended to work with a resolution of 1920 x 1080 and in full screen mode to have a good overview of all parameters and calculation results.

Now there are two efficient ways to work with WITTEC:

If you want that WITTEC defines ropes, tractionsheave-diameter and groove-geometry for you:

Step 1: Build your construction in the construction box or use the configurator.

Step 2: Open the **Drive Selection** and open the Components to define the Component-parameters (parameters that are not relevant for Drive Selection are hidden)

Step 3: Run Calculation and check results (Apply Components button in Drive Selection is disabled)

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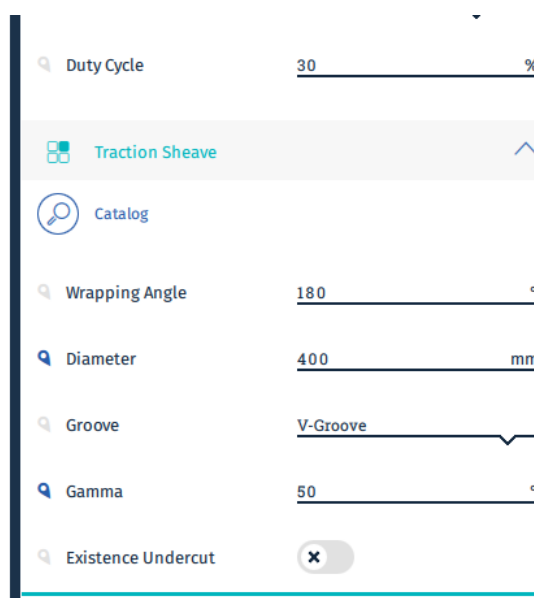Date: 09 Sep 2020
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If you want to define ropes, tractionsheave-diameter and groove-geometry by your own or if you already know ropes, tractionsheave-diameter and groove-geometry:

Step 1: Build your construction in the construction-box

Step 2: Open the **Calculation Summary** and open the Components to define the Component-parameters including **Traction Sheave** and **Rope** – you will see the results of Traction Calculation, Rope Safety Calculation and Surface Pressure Calculation directly in the Calculation Summary. So you can define the groove geometry by your own to fulfill the results:

Calculation Results

Loaded	1,48 ≤ 2,10	✓
Safety Factor Loaded	1,42	-
Emergency Braking	1,64 ≤ 1,86	✓
Safety Factor Emerg. Braking	1,13	-
Stalled Car	10,29 ≥ 4,42	✓
Safety Factor Stalled Car	2,33	-
Min. Rope Safety	36,71 ≥ 17,22	✓
Safety Factor Rope	2,13	-
Surface Pressure	4,93 N/mm^2 ≤ 6,83 N/mm^2	✓
Safety Factor Surface Pressure	1,39	-

Duty Cycle	30	%
Traction Sheave		∧
Catalog		
Wrapping Angle	180	°
Diameter	400	mm
Groove	V-Groove	
Gamma	50	°
Existence Undercut	✗	

Step 3: Open the Drive Selection and enable the button **Apply Components in Drive Selection** before you run the Drive Selection:

Apply Components in Drive Selection ✓
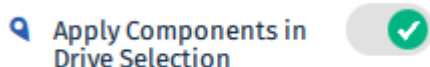
It depends very much on the specific task, which of the two approaches is appropriate in your particular case.

Chapter 7: Main Parameters in WITTEC

This chapter will show an explanation about the parameters of the different components in WITTEC.

General:
- **Type of use:** information about what is transported with the elevator. Has no influence on calculation results, but is shown as information on the report
- **Usage Category VDI:** information about how frequently the elevator is used

Usage category	1	2	3	4	5
Usage intensity/ frequency	very low very seldom	low seldom	medium occasionally	high frequently	very high very frequently
Average travel time in hours per day*)	0,2 (≤ 0,3)	0,5 (> 0,3–1)	1,5 (> 1–2)	3 (> 2–4,5)	6 (> 4,5)
Average standby time in hours per day	23,8	23,5	22,5	21	18
Typical types of buildings and use	• residential building with up to 6 dwellings • small office or administrative building with few operation	• residential building with up to 20 dwellings • small office or administrative building with 2 to 5 floors • small hotels • goods lift with few operation	• residential building with up to 50 dwellings • small office or administrative building with up to 10 floors • medium-sized hotels • goods lift with medium operation	• residential building with more than 50 dwellings • tall office or administrative building with more than 10 floors • large hotel • small to medium-sized hospitals • goods lift in production process with a single shift	• office or administrative building over 100 m in height • large hospital • goods lift in production process with several shifts

- **Rated Load:** the maximum possible load of the elevator
- **Rated Speed:** the maximum speed of the elevator in general usage
- **Acceleration Normal Travel:** the acceleration of the elevator in general usage
- **Travel Height:** the distance between lowest and highest landing
- **Number of Landings:** the number of landings/floors

Lift Car:
- **Mass of Empty Car:** Weight of lift car including pulleys
- **Traveling Cable Position:** Position of traveling cable in the shaft
- **Weight Per Meter Traveling Cable:** Weight per meter of one traveling cable
- **Number of traveling cables:** -
- **Guidance:** Location of the guide rails in relation to the lift car

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Counterweight:
- **Determination Type:** input of percentage of mass
- **Percentage:** percentage of the compensation of the rated load
- **Mass:** mass of counterweight including pulleys

Drive:
- **Installation:** information if machineroom or not
- **Voltage:** voltage of the drive
- **Operation Cycles:** Weight options for the up and down movement of the elevator for S1/S3
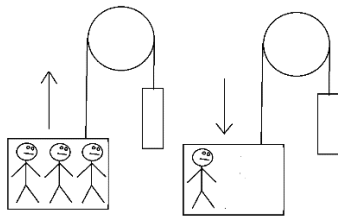
One Cycle Rated Load Up / One Cycle 1/3 Rated Load Down
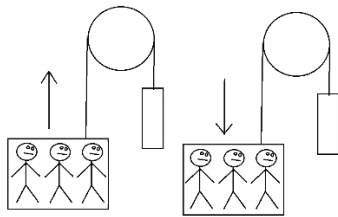
One Cycle Rated Load Up / One Cycle Rated Load Down

- **Operation Mode:** Different modes for the calculation of S1/S3- torque. If the acceleration has only a small influence in the calculation, the value *Static full load torque* should be selected.
- **Drives Per Hour: -**
- **Duty Cycle:** percentage of the time the elevator is used
- **Use Less Brakes (if possible):** If the drive has more than two brakes, there will be used one brake less. For example two instead of three brakes.

Rope Compensation:
- **Standard Compensation:** if enabled, the rope compensation is 100%
- **Allow Overcompensation:** allows to use rope compensation higher than 100%
- **Compensation Without Traveling Cable:** if enabled, the traveling cable weight is not compensated
- **Compensation input:** allows to input values mass or percentage
- **Mass Tensioning Device with Pulleys: -**
- **Percentage:** percentage of the rope mass that is compensated by the compensation ropes
- **Weight Per Meter:** weight per meter of one compensation rope
- **Number of Ropes:** number of compensation ropes

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Shaft:
- **Estimate Friction Forces:** estimates values of the friction forces
- **Friction Force Car Side:** friction force on lift car side (relevant for dynamic traction calculations)
- **Friction Force Counterweight Side:** friction force on counterweight side (relevant for dynamic traction calculations)
- **Shaft Efficiency:** efficiency of the shaft (relevant for torque calculations)
- **System Efficiency:** efficiency of the whole system (relevant for torque calculations)
- **Overhead:** height of the well head
- **Pit Depth:** depth of the pit

Pulleys:
- **Determine Average Values:** possibility to fill in the values for each pulley (Determine Average Values) or for all pulleys (Input Average Values)
- **Diameter:** Average Diameter of the Pulleys
- **Moment of Inertia:** Average Moment of Inertia of the Pulleys
- **Efficiency:** Average Efficiency of the Pulleys

Calculation Summary:
- **Pulleys with Reversed Bends:** Reversed bend: if the distance of the rope contracts on two pulleys, which have a fixed distance between their axles is less than 200 times the rope diameter and the bending planes are rotated through more than 120°
- **Pulleys with Simple Bends:** Simple bend: bend of ropes that is not a reversed bend