

# Использование DriveConstructor

## Введение

Онлайн курс (программа + учебник + задачник) – [driveconstructor.com](http://driveconstructor.com)

Учебный комплекс по системам преобразования энергии и электроприводу, основанный на примерах практических применений (applications). Разработчики: А.В. Матвеев и А.А. Гаврилов

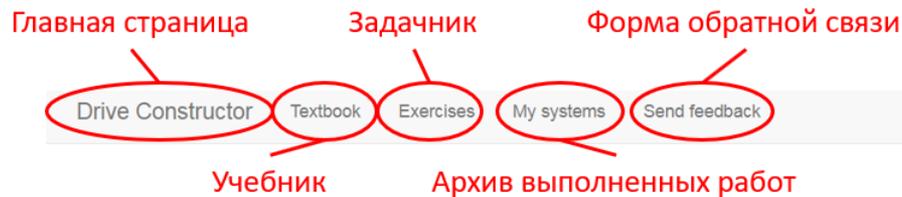
Система привода (drive train) обеспечивает работу механизма (насос, конвейер, лебедка) при питании от электрической сети либо преобразование энергии ветра/воды в электроэнергию

Система может содержать трансформатор, преобразователь частоты, электрическую машину, редуктор

Программа автоматически собирает системы привода из каталогов реальных компонентов, отслеживая их совместимость

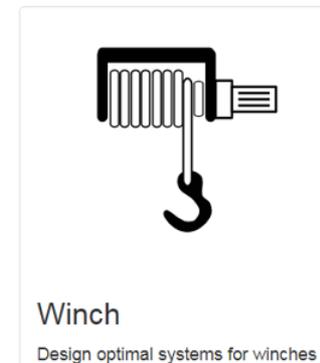
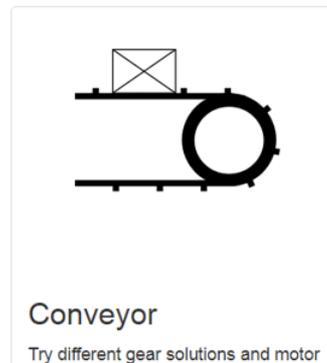
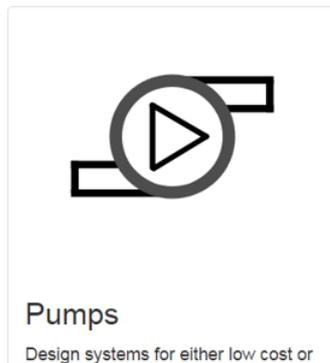
# Использование DriveConstructor

## Главное меню



## Welcome to DriveConstructor!

Discover the beauty and complexity of the world of standard components. Watch the complete list of tutorials on [our YouTube channel](#).



## Totally in English!

- Руководство пользователя переведено на русский
- Учебник и задачник выполнены двуязычными (англ/рус)

Только для студентов-электромехаников МЭИ [на сайте кафедры]

# Использование DriveConstructor

## 4 типа задач (применений / applications)

- **Pumps** – насосы
- **Conveyor** – конвейер
- **Wind/tidal mill** – ветряная / приливная турбина (свободно-поточная турбина)
- **Winch** – лебедка

Drive Constructor   Textbook   Exercises   My systems   Send feedback

### Welcome to DriveConstructor!

Discover the beauty and complexity of the world of standard components. Watch the complete list of tutorials on our [YouTube channel](#).

**Pumps**  
Design systems for either low cost or for low energy consumption for various pump type.  
[Select](#) [Help](#)

**Conveyor**  
Try different gear solutions and motor speeds to design for lowest cost and compactness.  
[Select](#) [Help](#)

**Wind/tidal mill**  
Experiment with different drive train topologies, design systems for lowest cost of energy.  
[Select](#) [Help](#)

**Winch**  
Design optimal systems for winches with both motoring and generating operation modes.  
[Select](#) [Help](#)

Открыть раздел электронного учебника

Выбрать данное применение и перейти к выбору схемы привода

# Использование DriveConstructor

Для каждого применения – несколько схем системы привода

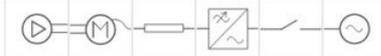
Разные схемы для насоса:

насос –  
[редуктор] –  
эл.двигатель –  
кабель –  
преобразователь  
частоты –  
[трансформатор] –  
авт. выключатель –  
сеть

Drive Constructor    Textbook    Exercises    My systems    Send feedback

## Select topology for your system

All the topologies include frequency converters (FC) to ensure variable speed operation. The FC provides full motor and pump controllability and protection. The switch is usually an automatic circuit breaker, though in certain cases it can be just a manual connector with fuses.



### Drive train with just variable speed drive

This simple system topology can be used when it is possible to find a motor matching speed of the pump and when both, the motor and the FC, have similar voltage rating to that of the supply network (the grid).

New system    Help

Открыть раздел  
электронного учебника



### Drive train with speed gearing

This solution can be used when for example the pump has too low rated speed to be matched by an available electric motor and the motor and the FC, have similar voltage rating to that of the supply network.

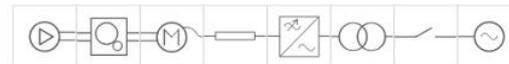
New system    Help



### Drive train with voltage step down

In this solution the transformer is used for matching the voltage in the grid and FC's rated voltage and/or for galvanic insulation. It is possible to find a motor matching speed of the pump without any gearbox.

New system    Help



### Drive train with voltage step-down and speed gearing

This solution can be used when the pump has too low rated speed to be matched by an electric motor, and the transformer is used for matching the voltage in the grid and FC's and/or for galvanic insulation.

New system    Help

Выбрать данное применение  
и перейти к выбору схемы привода

# Использование DriveConstructor

## Система привода, содержащая только регулируемый привод

Вначале задайте параметры  
нагрузочного механизма

Кликните на пиктограммах  
для задания параметров компонентов

The screenshot shows the DriveConstructor software interface. At the top, there are navigation tabs: Drive Constructor, Textbook, Exercises, My systems, and Send feedback. The main title is "Drive train with just variable speed drive". Below the title is a schematic diagram of a drive train consisting of a motor, a centrifugal pump, a gearbox, a motor, a switch, and a generator. The motor icon is circled in red. Below the diagram are several input fields and sliders for configuring the components. The "Type" is set to "centrifugal". The "Head, m" is 200, "Flow, l/s" is 50, "Rated speed, rpm" is 1450, "Minimal speed, rpm" is 0, and "Rated efficiency, %" is 81. There are also sliders for "Speed (rpm)" ranging from 0 to 1000, 0 to 500, 1 to 3500, 0 to 3500, and 0 to 100. A "More..." button is circled in red. A "Show report" button is also circled in red. To the right of the interface is a graph showing Torque (Nm) on the y-axis (0 to 900) versus Speed (rpm) on the x-axis (0 to 1800). The graph contains two curves: a blue curve representing the motor and a grey curve representing the pump. The blue curve starts at approximately 400 Nm at 0 rpm and rises to a peak of about 850 Nm at 1450 rpm, then decreases. The grey curve starts at 0 Nm at 0 rpm and rises to about 800 Nm at 1450 rpm, then decreases. A red arrow points from the text "Почитайте про нагрузочные характеристики в разделе «Принципы подбора компонентов» учебника" to the peak of the blue curve.

Почитайте про нагрузочные характеристики в разделе «Принципы подбора компонентов» учебника

Нажмите, чтобы  
увидеть все параметры

Кнопка имеет светлый оттенок и не нажимается в случае,  
когда выбраны не все компоненты системы

# Использование DriveConstructor

## Система привода, содержащая только регулируемый привод

Программа старается подобрать все компоненты автоматически, обеспечивая согласование нагрузочных характеристик

Пользователь задает нагрузку и может уточнять параметры компонентов (напряжение сети, тип ПЧ, класс эффективности ЭМ и способ охлаждения и т.д.)

Иногда приходится выбирать из предложенных вариантов

Frequency converter candidates

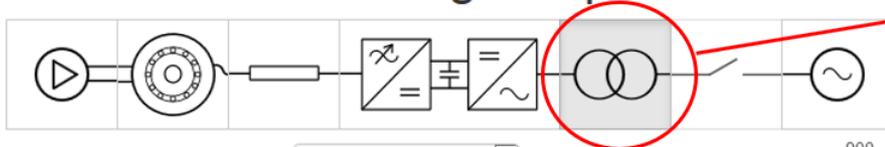
More...

| Select                           | Type         | Price, EUR | Rated power, kW | Voltage, V | Working voltage, V | Rated current HO, A | Cooling | Efficiency @100% load | Mounting variant | Height, m | Width, m | Depth, m | Volume, m3 | Footprint, m2 | Weight, kg | Designation                |
|----------------------------------|--------------|------------|-----------------|------------|--------------------|---------------------|---------|-----------------------|------------------|-----------|----------|----------|------------|---------------|------------|----------------------------|
| <input checked="" type="radio"/> | 2Q-2L-VSC-6p | 8990       | 160             | 360-420    | 400                | 198.38              | air     | 98                    | wall             | 1         | 0.4165   | 0.4      | 0.1666     | 0.4165        | 83.3       | 2Q-2L-400-160-IP2x-AC-W-6p |
| <input type="radio"/>            | 2Q-2L-VSC-6p | 13187      | 200             | 360-420    | 400                | 240.46              | air     | 98                    | floor            | 2.2       | 0.1578   | 0.6      | 0.2083     | 0.3472        | 104.12     | 2Q-2L-400-200-IP2x-AC-F-6p |

# Использование DriveConstructor

## Система привода с понижением напряжения

### Drive train with voltage step down



Параметры трансформатора определяют остальную часть системы привода

**Rated power, kVA:** <any>

**Voltage (HV):** 6000

**Transformation ratio:** 8.9

**Voltage (LV):** <any>

**Integrated or stand-alone:** stand-alone

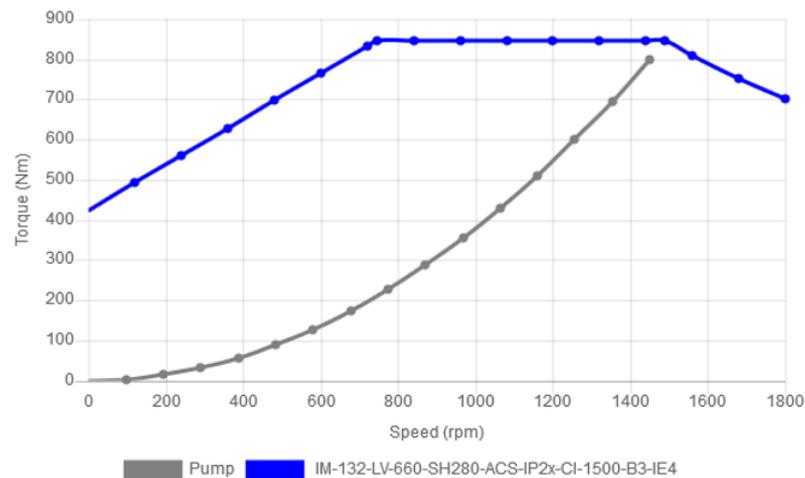
**Dry or oil-immersed:** dry

**Windings:** 2-winding

**Cooling:** air

**Protection (IP rating):** IP54/55

**Altitude, m:** 1000



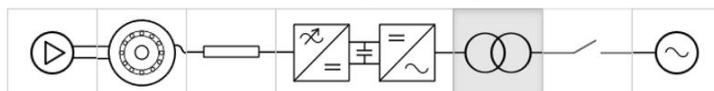
Это напряжение (НН) определяет напряжение преобразователя частоты и электрической машины

# Использование DriveConstructor

## Система привода с понижением напряжения

Можно не только выбирать уровень напряжения (НН), но и корректировать его (выбирать ступени регулирования)

Drive train with voltage step down



Rated power, kVA: <any>

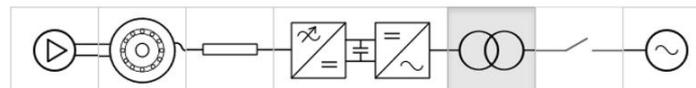
Voltage (HV): 6000

Tappings: 0

Transformation ratio: 14.71

Voltage (LV): 380-440

Drive train with voltage step down



Rated power, kVA: <any>

Voltage (HV): 6000

Tappings: 0

Transformation ratio: +5%

Voltage (LV): +2.5%

Integrated or stand-alone: stand-alone

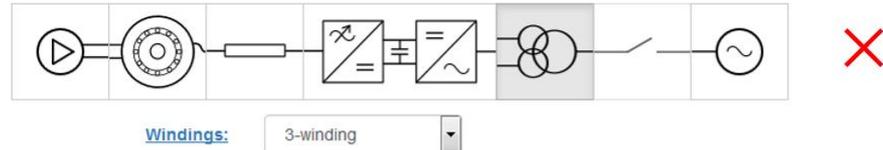
Ступени регулирования

# Использование DriveConstructor

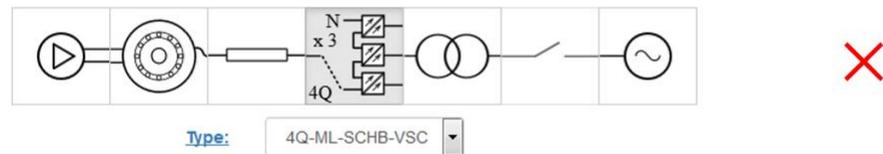
## Система привода с понижением напряжения

Разные типы трансформаторов и ПЧ должны быть согласованы друг с другом!

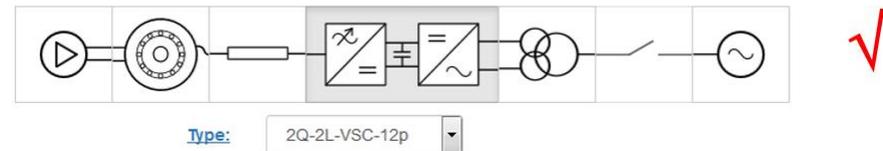
Drive train with voltage step down



Drive train with voltage step down



Drive train with voltage step down



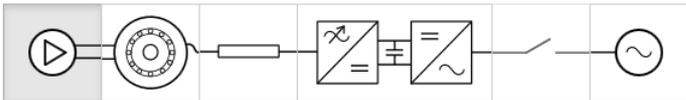
# Использование DriveConstructor

## Просмотр отчета по готовой системе привода

Когда все компоненты системы привода выбраны, становится доступной кнопка Show report

Drive Constructor    Textbook    Exercises    My systems    Send feedback

### Drive train with just variable speed drive



**Type:** centrifugal

**Head, m:** 200

**Flow, l/s:** 50

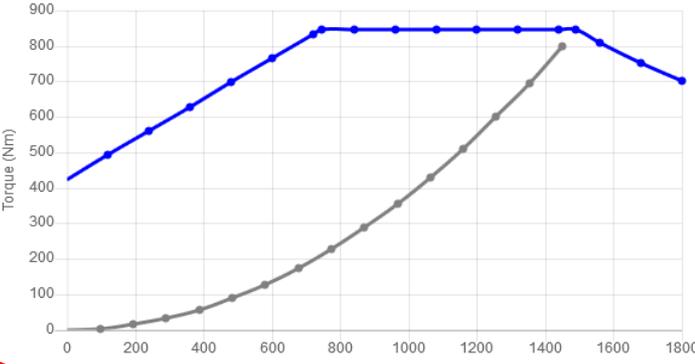
**Rated speed, rpm:** 1450

**Minimal speed, rpm:** 0

**Rated efficiency, %:** 81

More...

**Show report**



| Speed (rpm) | Pump Torque (Nm) | Motor Torque (Nm) |
|-------------|------------------|-------------------|
| 0           | 0                | 400               |
| 200         | 10               | 550               |
| 400         | 40               | 700               |
| 600         | 100              | 800               |
| 800         | 200              | 850               |
| 1000        | 350              | 850               |
| 1200        | 500              | 850               |
| 1450        | 800              | 850               |
| 1600        | -                | 800               |
| 1800        | -                | 700               |

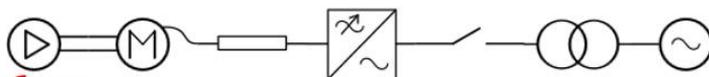
Legend: Pump (grey), IM-132-LV-400-SH280-ACS-IP2x-CI-1500-B3-IE4 (blue)

# Использование DriveConstructor

## Просмотр отчета по готовой системе привода

Drive Constructor    Textbook    Exercises    My systems    Send feedback

### Report:



Возврат к выбору  
компонентов

Go back    Save system

Основные параметры  
готовой системы



#### System

|                          |       |
|--------------------------|-------|
| Price, EUR:              | 41129 |
| Efficiency @ rated load: | 92.42 |
| Efficiency @ 75% load:   | 92.3  |
| Efficiency @ 50% load:   | 90.57 |
| Efficiency @ 25% load:   | 85.4  |
| Volume, m3:              | 1.37  |
| Footprint, m2:           | 2.37  |
| Weight, kg:              | 1954  |
| THD(u), %:               | 16    |

#### Trafo

|                            |             |
|----------------------------|-------------|
| Rated power, kVA:          | 190         |
| Price, EUR:                | 6025        |
| Integrated or stand-alone: | stand-alone |
| Dry or oil-immersed:       | dry         |
| Windings:                  | 2-winding   |
| Cooling:                   | air         |
| HV side voltage (max):     | 6600        |
| LV side voltage (max):     | 440         |

#### Frequency converter

|                        |              |
|------------------------|--------------|
| Type:                  | 2Q-2L-VSC-6p |
| Price, EUR:            | 8990         |
| Rated power, kW:       | 160          |
| Voltage, V:            | 360-420      |
| Working voltage, V:    | 407.8        |
| Rated current HO, A:   | 198.38       |
| Rated current LO, A:   | 240.46       |
| Cooling:               | air          |
| Efficiency @100% load: | 98           |

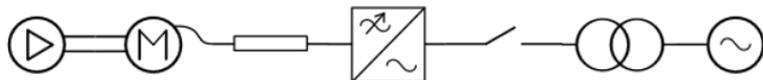
#### Electric machine

|                               |         |
|-------------------------------|---------|
| Type:                         | SCIM    |
| Price, EUR:                   | 25093   |
| Rated power, kW:              | 132     |
| Rated speed:                  | 1488    |
| Rated synchronous speed, rpm: | 1500    |
| Maximum speed, rpm:           | 1800    |
| Voltage, V:                   | 360-440 |
| Efficiency class:             | IE4     |
| Efficiency @100% load:        | 96.7    |

# Использование DriveConstructor

## Сохранение системы для последующего сравнения

Report:



Go back

Save system

Сохранение готовой системы для последующего сравнения

### System

|                          |       |
|--------------------------|-------|
| Price, EUR:              | 41129 |
| Efficiency @ rated load: | 92.42 |
| Efficiency @ 75% load:   | 92.3  |
| Efficiency @ 50% load:   | 90.57 |
| Efficiency @ 25% load:   | 85.4  |
| Volume, m3:              | 1.37  |
| Footprint, m2:           | 2.37  |
| Weight, kg:              | 1954  |
| THD(u), %:               | 16    |

### Trafo

|                            |             |
|----------------------------|-------------|
| Rated power, kVA:          | 190         |
| Price, EUR:                | 6025        |
| Integrated or stand-alone: | stand-alone |
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### Frequency converter

|                        |              |
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| Rated current LO, A:   | 240.46       |
| Cooling:               | air          |
| Efficiency @100% load: | 98           |

### Electric machine

|                               |         |
|-------------------------------|---------|
| Type:                         | SCIM    |
| Price, EUR:                   | 25093   |
| Rated power, kW:              | 132     |
| Rated speed:                  | 1488    |
| Rated synchronous speed, rpm: | 1500    |
| Maximum speed, rpm:           | 1800    |
| Voltage, V:                   | 360-440 |
| Efficiency class:             | IE4     |
| Efficiency @100% load:        | 96.7    |

Данные сохраняются только до конца сеанса работы с программой

# Использование DriveConstructor

## Сохранение системы для последующего сравнения

Drive Constructor   Textbook   Exercises   **My systems**   Send feedback

### My systems

| Select                   | Name | Topology  | Time update            | Price, EUR | Efficiency @ rated load | Efficiency @ 75% load | Efficiency @ 50% load | Efficiency @ 25% load | Volume, m3 | Footprint, m2 | Weight, kg | THD(u), % | THD(i), % |
|--------------------------|------|---|------------------------|------------|-------------------------|-----------------------|-----------------------|-----------------------|------------|---------------|------------|-----------|-----------|
| <input type="checkbox"/> | sys1 |  | 12/17/2017, 4:44:50 PM | 40663      | 92.52                   | 92.4                  | 90.66                 | 85.49                 | 1.39       | 2.42          | 1958.07    | 16        | 28        |

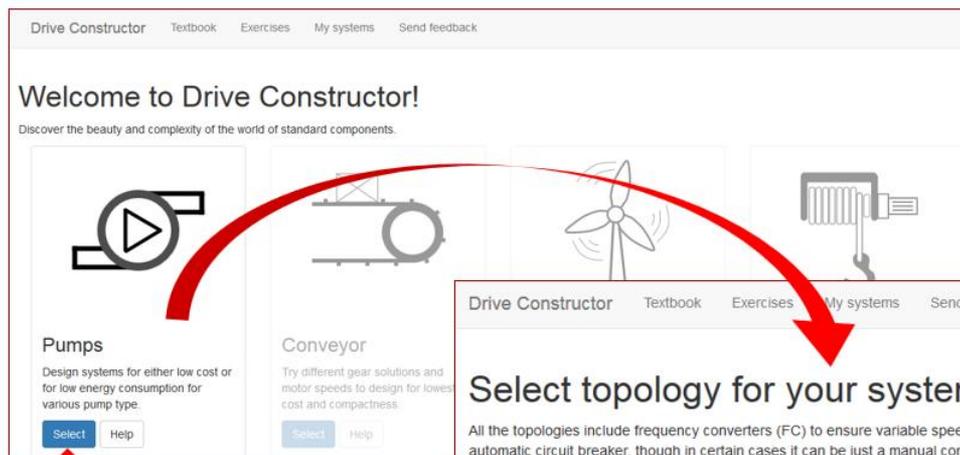
Delete   Compare

Доступны основные параметры системы

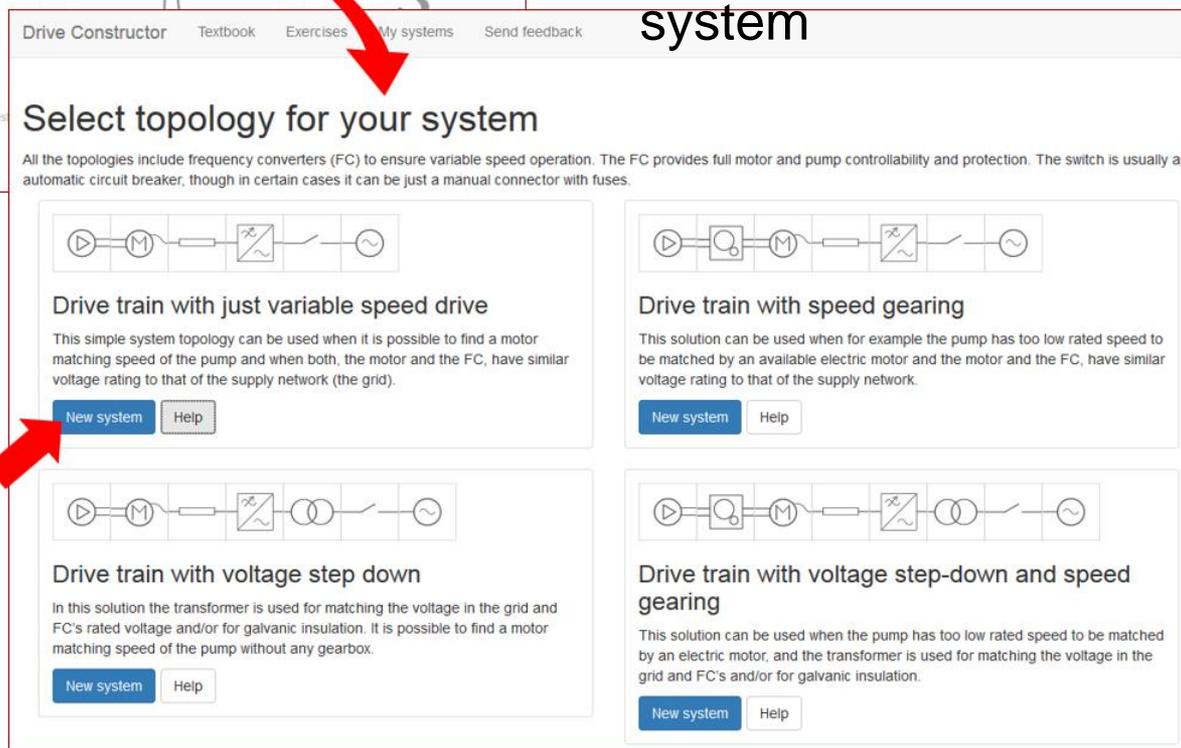
Подробности (report) – при нажатии на имя сохраненной системы

# Использование DriveConstructor

## Создание новой системы для последующего сравнения



DriveConstructor →  
application →  
topology →  
components → Save  
system



# Использование DriveConstructor

## Сравнение систем

Drive Constructor   Textbook   Exercises   **My systems**   Send feedback

### My systems

| Select                   | Name    | Topology | Time update            | Price, EUR | Efficiency @ rated load | Efficiency @ 75% load | Efficiency @ 50% load | Efficiency @ 25% load | Volume, m3 | Footprint, m2 | Weight, kg | THD(u), % | THD(i), % |
|--------------------------|---------|----------|------------------------|------------|-------------------------|-----------------------|-----------------------|-----------------------|------------|---------------|------------|-----------|-----------|
| <input type="checkbox"/> | system1 |          | 12/17/2017, 5:04:14 PM | 40663      | 92.52                   | 92.4                  | 90.66                 | 85.49                 | 1.39       | 2.42          | 1958.07    | 16        | 28        |
| <input type="checkbox"/> | system2 |          | 12/17/2017, 5:04:49 PM | 41826      | 92.52                   | 92.4                  | 90.66                 | 85.49                 | 1.43       | 2.46          | 2003.56    | 9.6       | 15        |

Delete   **Compare**

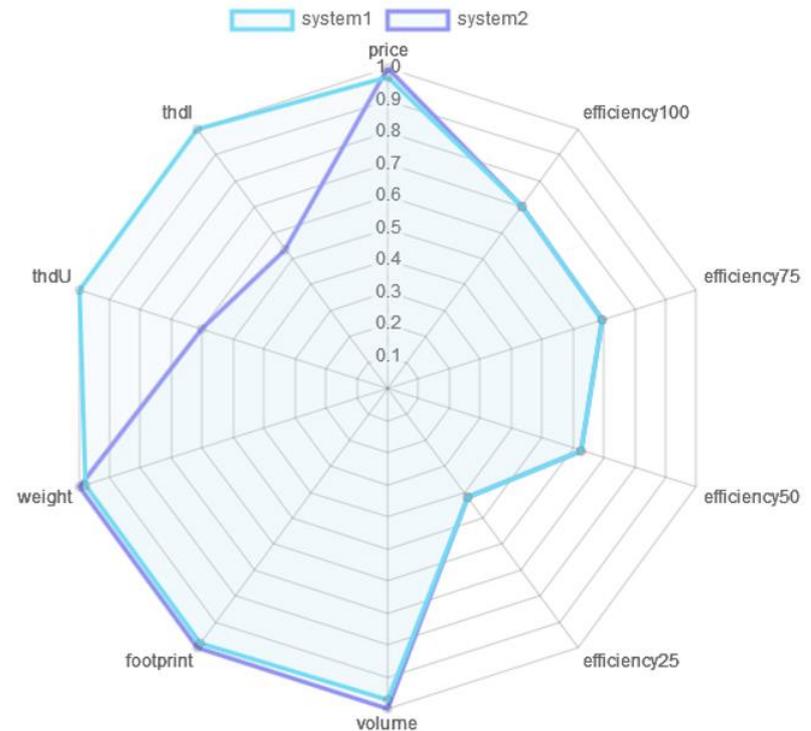
- Выбрать системы для сравнения
- Отметить параметры для сравнения
- Нажать “Compare”

# Использование DriveConstructor

## Сравнение систем

Наглядное сравнение – паутинная диаграмма

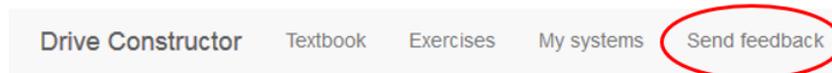
Comparison:



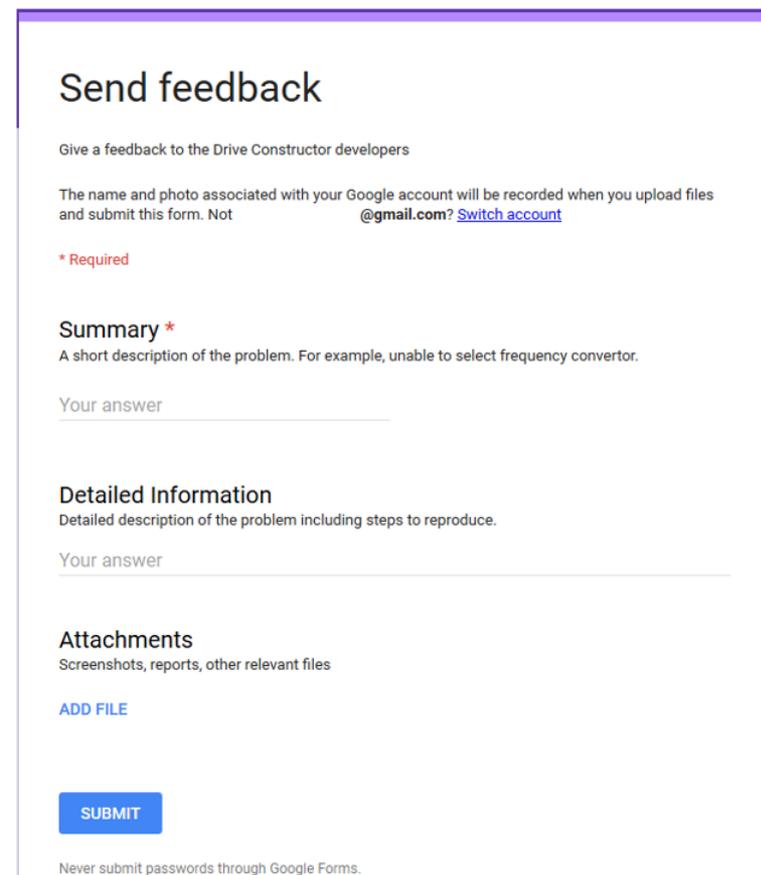
Для оформления отчета может понадобиться выписать более подробные параметры систем (вручную)

# Использование DriveConstructor

## Форма обратной связи



Используется для отправки сообщений разработчикам курса



**Send feedback**

Give a feedback to the Drive Constructor developers

The name and photo associated with your Google account will be recorded when you upload files and submit this form. Not [@gmail.com?](#) [Switch account](#)

**\* Required**

**Summary \***  
A short description of the problem. For example, unable to select frequency convertor.

Your answer

---

**Detailed Information**  
Detailed description of the problem including steps to reproduce.

Your answer

---

**Attachments**  
Screenshots, reports, other relevant files

[ADD FILE](#)

**SUBMIT**

Never submit passwords through Google Forms.

# Использование DriveConstructor

## Лабораторная работа №4

### «Выбор оптимальной электромеханической системы»

4 бригады – 4 задания

- Влияние номинальной скорости на вес, размер и момент инерции машины
- Класс эффективности, анализ жизненного цикла машины
- Влияние способа охлаждения на размер и стоимость машины
- Снижение мощности в зависимости от высоты и температуры

Самостоятельное выполнение исследования

Оформление отчета и презентации (постановка задачи, метод исследования, результаты, выводы)

Презентация и защита работы по расписанию 4 лаб. работы



# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

Разработать систему привода для трех вариантов конвейера, различающихся диапазоном скоростей: **40-200; 180-200; 180-220** об/мин

- один приводной барабан
- номинальный момент 5 кНм
- Редуктор с 1-ступенчатой косозубой передачей (helical) 1:5
- Расстояние между барабаном и преобразователем частоты 30 м
- Напряжение сети 400 В
- Чистая силовая станция с кондиционированным воздухом, хорошие условия отвода тепла
- Охлаждающая жидкость недоступна, возможно воздушное охлаждение IC411 (self ventilation) или IC416 (air forced ventilation)

Сравнить вес и стоимость двигателя, ПЧ, всей системы

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

[Drive Constructor](#) [Textbook](#) [Exercises](#) [My systems](#) [Send feedback](#)

### Welcome to DriveConstructor!

Discover the beauty and complexity of the world of standard components. Watch the complete list of tutorials on our [YouTube channel](#).

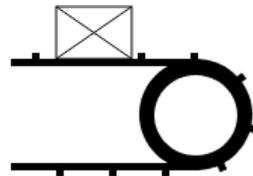


#### Pumps

Design systems for either low cost or for low energy consumption for various pump type.

Select

Help



#### Conveyor

Try different gear solutions and motor speeds to design for lowest cost and compactness.

Select

Help



#### Wind/tidal mill

Experiment with different drive train topologies, design systems for lowest cost of energy.

Select

Help



#### Winch

Design optimal systems for winches with both motoring and generating operation modes.

Select

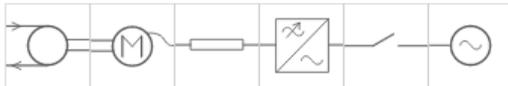
Help

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

Drive Constructor    Textbook    Exercises    My systems    Send feedback

### Select topology for your system



#### Drive train with just variable speed drive

This simple system topology can be used when it is possible to find a motor matching speed of the conveyor drum and when both, the motor and the FC, have similar voltage rating to that of the supply network (the grid).

New system

Help



#### Drive train with speed gearing

This solution can be used when for example the conveyor drum has too low rated speed to be matched by an available electric motor and the motor and the FC, have similar voltage rating to that of the supply network.

New system

Help

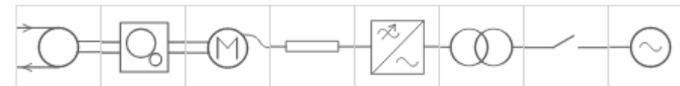


#### Drive train with voltage step down

In this solution the transformer is used for matching the voltage in the grid and FC's rated voltage and/or for galvanic insulation. It is possible to find a motor matching speed of the conveyor drum without any gearbox.

New system

Help



#### Drive train with voltage step-down and speed gearing

This solution can be used when the conveyor drum has too low rated speed to be matched by an electric motor, and the transformer is used for matching the voltage in the grid and FC's and/or for galvanic insulation.

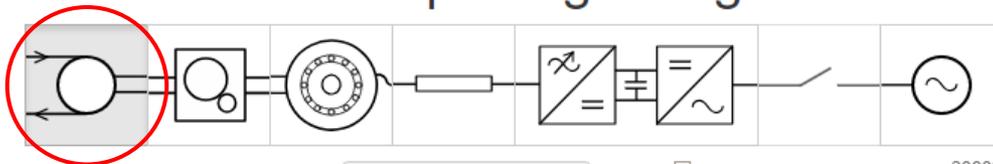
New system

Help

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Drive train with speed gearing



**Rated torque, kNm:**

**Max speed, rpm:**

**Min speed, rpm:**

**Starting torque as  $\cdot T_{rated}$ :**

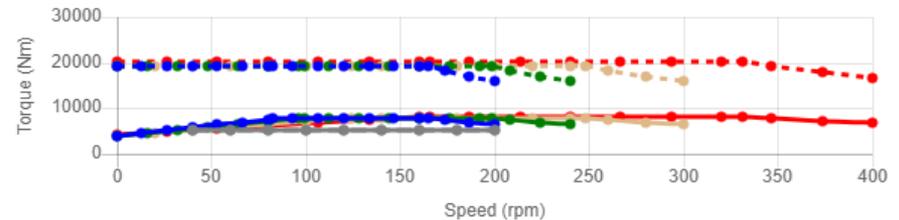
**Duty cycle period, min:**

**Duty, %:**

**Overload duration, sec:**

**Overload amplitude, %:**

**Overload cycle period, sec:**



- conveyor
- conveyor-overload
- Gearbox+IM-132-LV-400-SH315-ACS-IP2x-CI-500-B3-IE4
- Gearbox+IM-132-LV-400-SH315-ACS-IP2x-CI-500-B3-IE4-overload
- Gearbox+IM-160-LV-400-SH355-ACS-IP2x-CI-600-B3-IE4
- Gearbox+IM-160-LV-400-SH355-ACS-IP2x-CI-600-B3-IE4-overload
- Gearbox+IM-200-LV-400-SH355-ACS-IP2x-CI-750-B3-IE4
- Gearbox+IM-200-LV-400-SH355-ACS-IP2x-CI-750-B3-IE4-overload
- Gearbox+IM-280-LV-400-SH355-ACS-IP2x-CI-1000-B3-IE4
- Gearbox+IM-280-LV-400-SH355-ACS-IP2x-CI-1000-B3-IE4-overload

Предлагаемые варианты компонентов и их механические характеристики

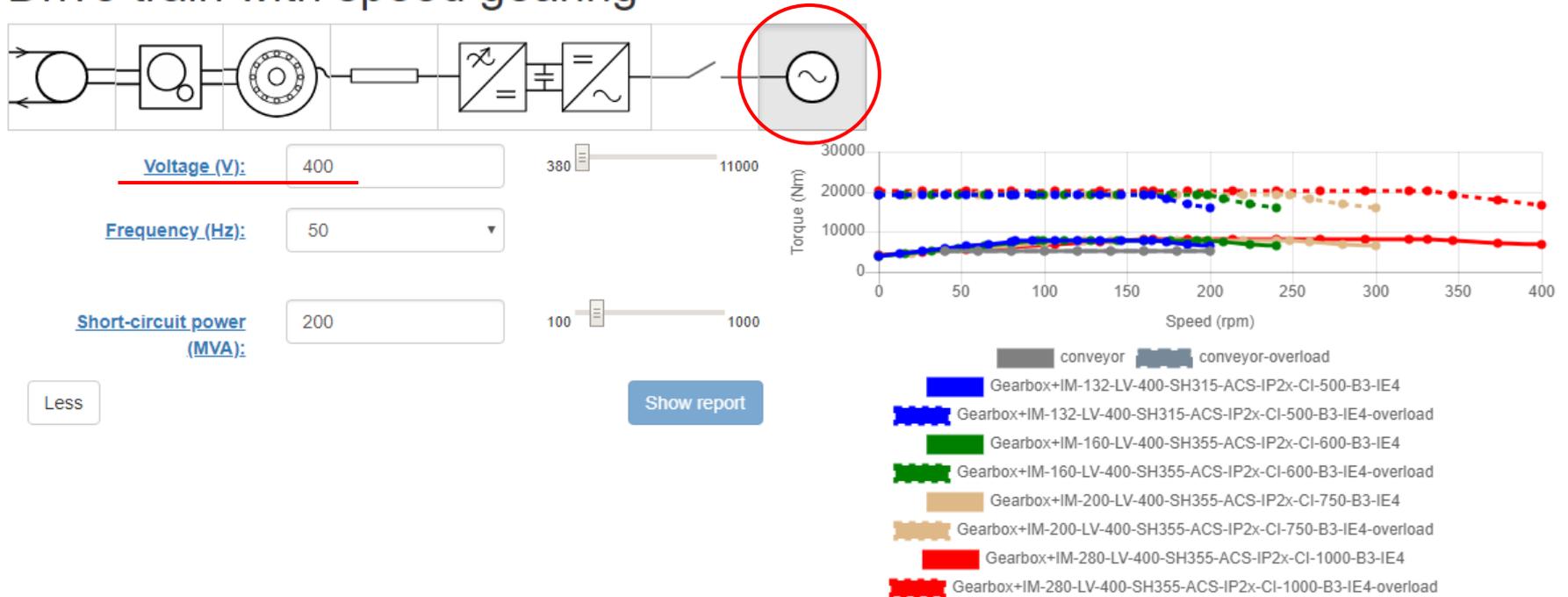
Less

Show report

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

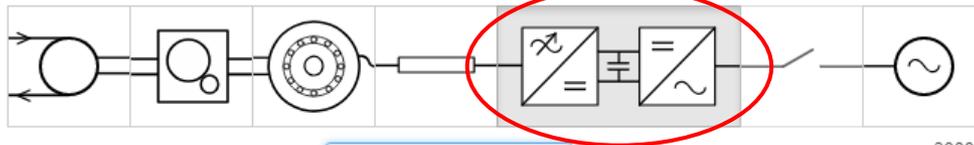
### Drive train with speed gearing



# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Drive train with speed gearing



Type: 2Q-2L-VSC-6p

Rated power (low overload), kW: <any>

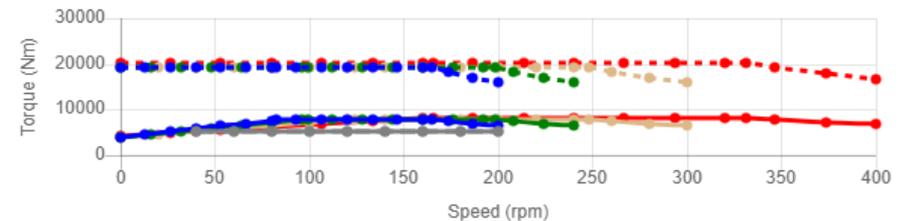
Grid side filter: choke

Machine side filter: no

Cooling: air

Mounting variant: <any>

Protection: IP21/31

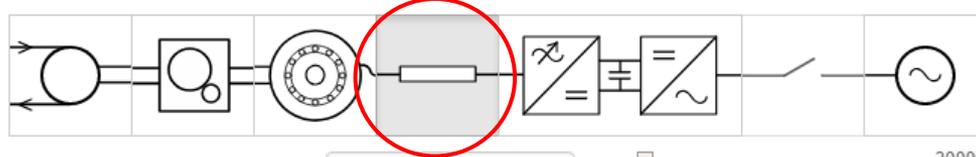


- conveyor
- conveyor-overload
- Gearbox+IM-132-LV-400-SH315-ACS-IP2x-CI-500-B3-IE4
- Gearbox+IM-132-LV-400-SH315-ACS-IP2x-CI-500-B3-IE4-overload
- Gearbox+IM-160-LV-400-SH355-ACS-IP2x-CI-600-B3-IE4
- Gearbox+IM-160-LV-400-SH355-ACS-IP2x-CI-600-B3-IE4-overload
- Gearbox+IM-200-LV-400-SH355-ACS-IP2x-CI-750-B3-IE4
- Gearbox+IM-200-LV-400-SH355-ACS-IP2x-CI-750-B3-IE4-overload
- Gearbox+IM-280-LV-400-SH355-ACS-IP2x-CI-1000-B3-IE4
- Gearbox+IM-280-LV-400-SH355-ACS-IP2x-CI-1000-B3-IE4-overload

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Drive train with speed gearing



Length (m): 30

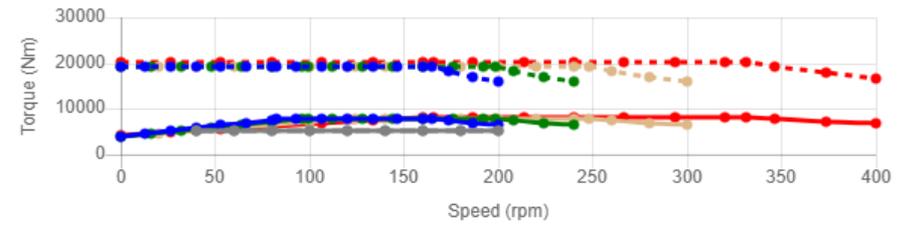
Conductor material: copper

Cross-section of phase conductor (mm<sup>2</sup>): auto

Number of runs: auto

Less

Show report

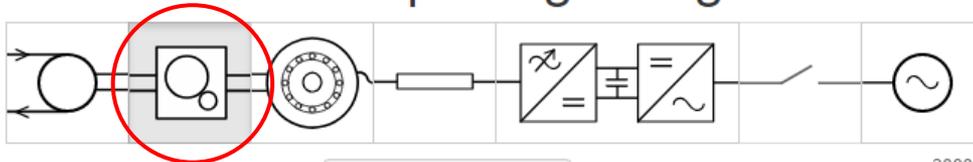


- conveyor
- conveyor-overload
- Gearbox+IM-132-LV-400-SH315-ACS-IP2x-CI-500-B3-IE4
- Gearbox+IM-132-LV-400-SH315-ACS-IP2x-CI-500-B3-IE4-overload
- Gearbox+IM-160-LV-400-SH355-ACS-IP2x-CI-600-B3-IE4
- Gearbox+IM-160-LV-400-SH355-ACS-IP2x-CI-600-B3-IE4-overload
- Gearbox+IM-200-LV-400-SH355-ACS-IP2x-CI-750-B3-IE4
- Gearbox+IM-200-LV-400-SH355-ACS-IP2x-CI-750-B3-IE4-overload
- Gearbox+IM-280-LV-400-SH355-ACS-IP2x-CI-1000-B3-IE4
- Gearbox+IM-280-LV-400-SH355-ACS-IP2x-CI-1000-B3-IE4-overload

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Drive train with speed gearing



Number of stages:

1

Stage 1 type:

helical

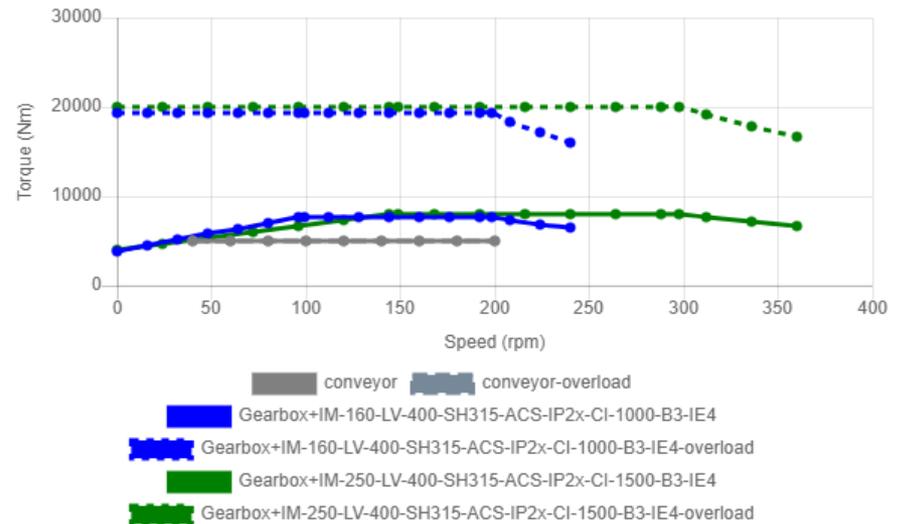
Stage 1 ratio:

5

3 8

Less

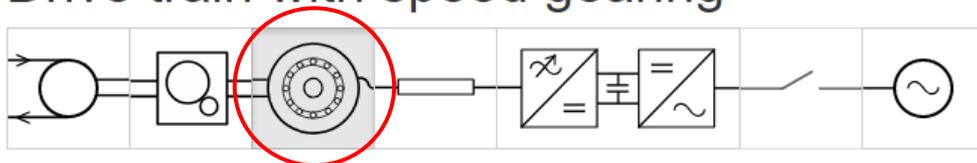
Show report



# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Drive train with speed gearing



Type: SCIM

Rated power, kW: <any>

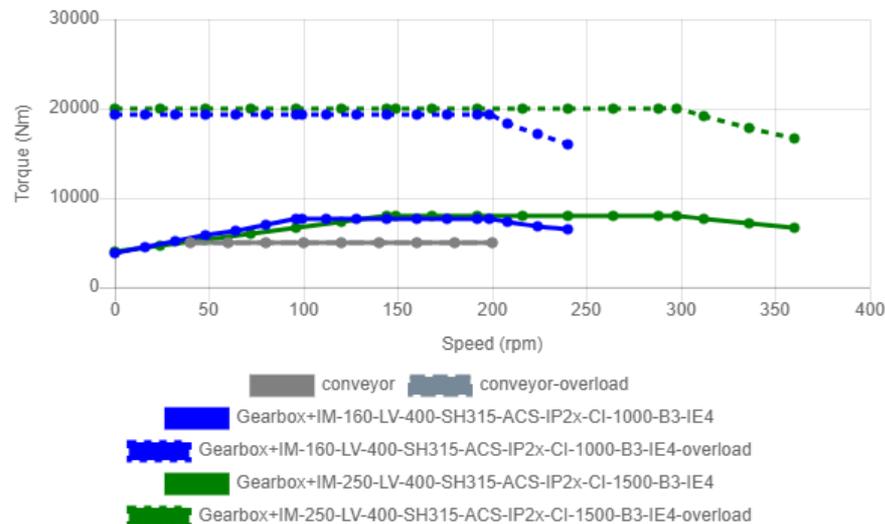
Efficiency class: IE4

Mounting: B3

Altitude, m: 1000

Cooling: self-ventilation

0 5000



# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Gearbox candidates

Дополнительная информация

| Select                           | Price, EUR | Input rated torque (KNm) | Output rated torque (KNm) | Number of stages | Stage 1 type | Stage 1 ratio | Gear ratio | Efficiency @ rated load | Efficiency @ 75% | Efficiency @ 50% | Efficiency @ 25% | Height, m | Width, m | Length, m | Weight, kg | Designation |
|----------------------------------|------------|--------------------------|---------------------------|------------------|--------------|---------------|------------|-------------------------|------------------|------------------|------------------|-----------|----------|-----------|------------|-------------|
| <input checked="" type="radio"/> | 11001      | 5                        | 0.99                      | 1                | helical      | 5             | 5          | 99                      | 98.97            | 98.21            | 96.52            | 0.5404    | 0.3753   | 0.4504    | 132.44     | H-5         |

### Electric machine candidates

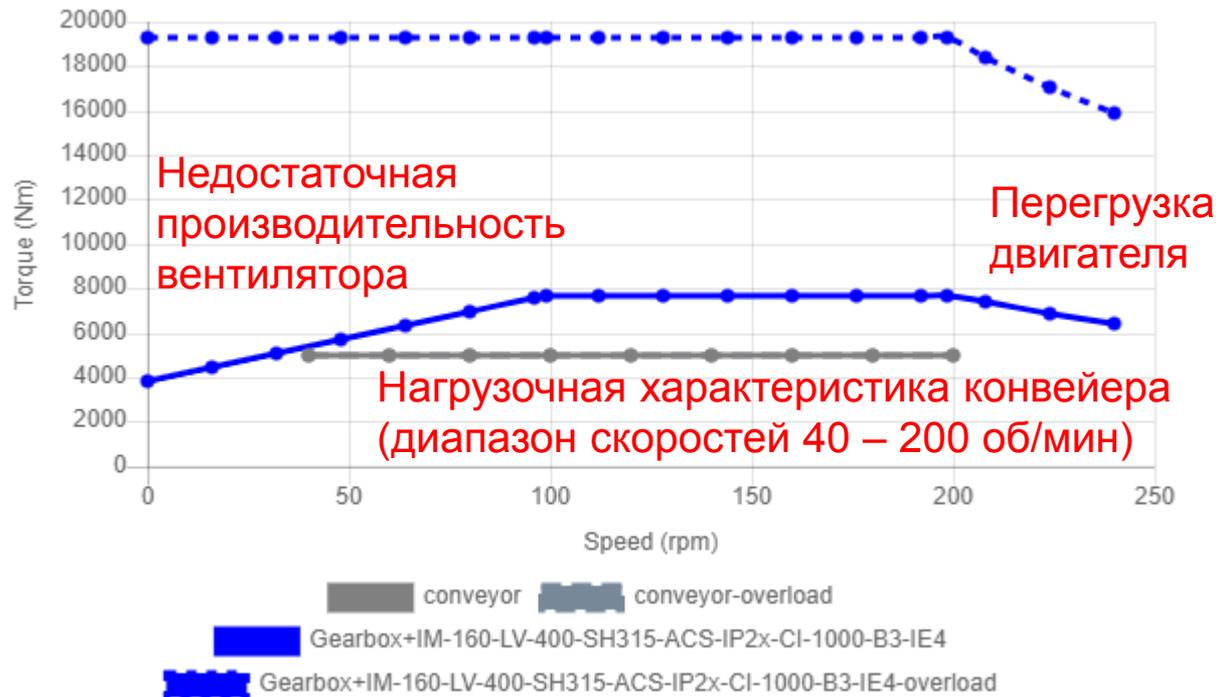
Дополнительная информация

| Select                           | Type | Price, EUR | Rated power, kW | Rated speed  | Voltage, V | Efficiency @100% load | Rated current, A | Working current, A | Cooling | Protection | Frame material | Volume, m3 | Footprint, m2 | Weight, kg | Designation                                 |
|----------------------------------|------|------------|-----------------|--------------|------------|-----------------------|------------------|--------------------|---------|------------|----------------|------------|---------------|------------|---|
| <input checked="" type="radio"/> | SCIM | 36136      | <u>160</u>      | <u>992.3</u> | 360-440    | 96.6                  | 328.82           | 215.2              | IC411   | IP21/23    | cast iron      | 0.3959     | 0.8001        | 1382       | IM-160-LV-400-SH315-ACS-IP2x-CI-1000-B3-IE4 |
| <input type="radio"/>            | SCIM | 37752      | <u>250</u>      | <u>1490</u>  | 360-440    | 96.9                  | 481.36           | 201.62             | IC411   | IP21/23    | cast iron      | 0.4582     | 0.9261        | 1601       | IM-250-LV-400-SH315-ACS-IP2x-CI-1500-B3-IE4 |

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

Для выбранного двигателя 160 кВт, 992 об/мин



# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Cable candidates

| Select                           | Length | Price, EUR | Conductor material | Cross-section of phase conductor (mm2) | Voltage rating (kV) | Number of runs | Losses, kW | Efficiency, % | Price per meter | Voltage drop | Reactance (PerHz) | Resistance per meter | Designatio    |
|----------------------------------|--------|------------|--------------------|--|---------------------|----------------|------------|---------------|-----------------|--------------|-------------------|----------------------|---------------|
| <input checked="" type="radio"/> | 30     | 1021       | copper             | 150                                    | 1                   | 1              | 0.5377     | 99.66         | 34.03           | 1.67         | 0.004477          | 0.000129             | CU-3x150-01kV |

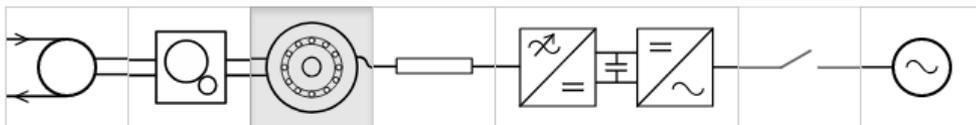
### Frequency converter candidates

| Select                           | Type         | Price, EUR | Rated power, kW | Voltage, V | Working voltage, V | Rated current HO, A | Cooling | Efficiency @100% load | Mounting variant | Height, m | Width, m | Depth, m | Volume, m3 | Footprint, m2 | Weight, kg | Designation                |
|----------------------------------|--------------|------------|-----------------|------------|--------------------|---------------------|---------|-----------------------|------------------|-----------|----------|----------|------------|---------------|------------|----------------------------|
| <input checked="" type="radio"/> | 2Q-2L-VSC-6p | 10989      | 200             | 360-420    | 400                | 240.46              | air     | 98                    | wall             | 1         | 0.5206   | 0.4      | 0.2082     | 0.5206        | 104.12     | 2Q-2L-400-200-IP2x-AC-W-6p |
| <input type="radio"/>            | 2Q-2L-VSC-6p | 13187      | 200             | 360-420    | 400                | 240.46              | air     | 98                    | floor            | 2.2       | 0.1578   | 0.6      | 0.2083     | 0.3472        | 104.12     | 2Q-2L-400-200-IP2x-AC-F-6p |

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Drive train with speed gearing



Type: SCIM

Rated power, kW: <any>

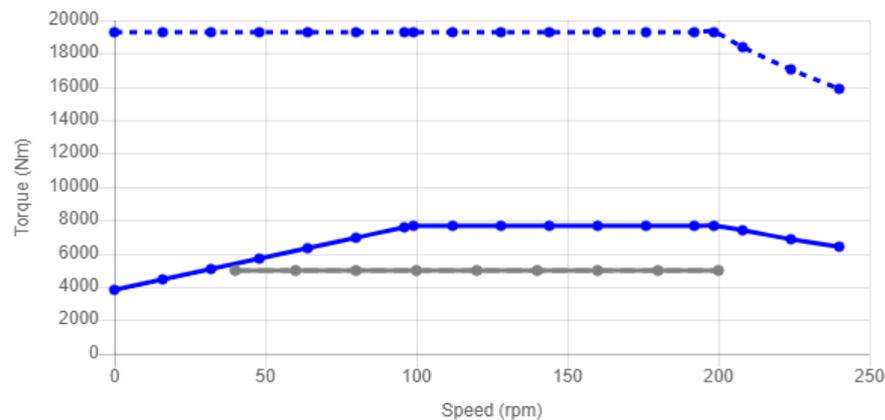
Cooling: self-ventilation

Protection: IP21/23

Frame material: cast iron

More...

Show report



conveyor conveyor-overload

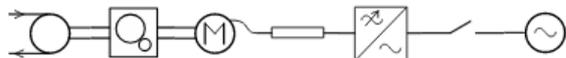
Gearbox+IM-160-LV-400-SH315-ACS-IP2x-CI-1000-B3-IE4

Gearbox+IM-160-LV-400-SH315-ACS-IP2x-CI-1000-B3-IE4-overload

# DriveConstructor – пример расчета

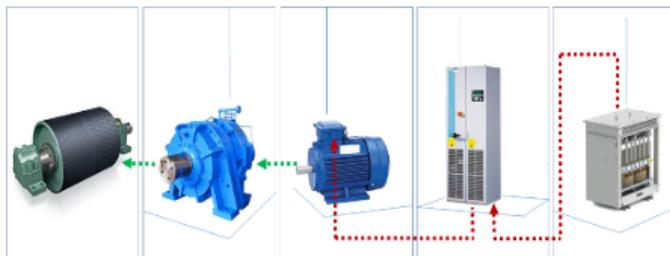
## Влияние диапазона скоростей конвейера на систему привода

Report:



Go back

Save system



### System

|                          |       |
|--------------------------|-------|
| Price, EUR:              | 59147 |
| Efficiency @ rated load: | 93.41 |
| Efficiency @ 75% load:   | 93.48 |
| Efficiency @ 50% load:   | 91.28 |
| Efficiency @ 25% load:   | 85.05 |
| Volume, m3:              | 0.7   |
| Footprint, m2:           | 1.52  |
| Weight, kg:              | 1619  |

### Frequency converter

|                        |              |
|------------------------|--------------|
| Type:                  | 2Q-2L-VSC-6p |
| Price, EUR:            | 10989        |
| Rated power, kW:       | 200          |
| Voltage, V:            | 360-420      |
| Working voltage, V:    | 400          |
| Rated current HO, A:   | 240.46       |
| Rated current LO, A:   | 300.58       |
| Cooling:               | air          |
| Efficiency @100% load: | 98           |
| Efficiency @75%        | 98.14        |

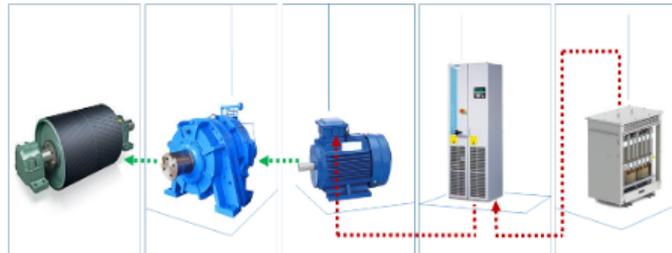
|         | цена, Евро | вес, кг |
|---------|------------|---------|
| ЭМ      | 36 136     | 1 382   |
| ПЧ      | 10 989     | 104     |
| Система | 59 147     | 1 619   |

Conveyor

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

Report:



Go back **Save system**

System

|                          |       |
|--------------------------|-------|
| Price, EUR:              | 59147 |
| Efficiency @ rated load: | 93.41 |
| Efficiency @ 75% load:   | 93.48 |
| Efficiency @ 50% load:   | 91.28 |
| Efficiency @ 25% load:   | 85.05 |
| Volume, m3:              | 0.7   |
| Footprint, m2:           | 1.52  |
| Weight, kg:              | 1619  |

Save system

Select the system name:

Cancel Save system Save system and compare

|                        |        |
|------------------------|--------|
| Rated current HO, A:   | 240.46 |
| Rated current LO, A:   | 300.58 |
| Cooling:               | air    |
| Efficiency @100% load: | 98     |
| Efficiency @75%        | 98.14  |

Conveyor

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

Drive Constructor   Textbook   Exercises   **My systems**   Send feedback

### My systems

| Select                   | Name                 | Topology  | Time update          | Price, EUR | Efficiency @ rated load | Efficiency @ 75% load | Efficiency @ 50% load | Efficiency @ 25% load | Volume, m3 | Footprint, m2 | Weight, kg | THD(u), % | THD(i), % |
|--------------------------|----------------------|---|----------------------|------------|-------------------------|-----------------------|-----------------------|-----------------------|------------|---------------|------------|-----------|-----------|
| <input type="checkbox"/> | <u>40-200 об/МИН</u> |  | 03.02.2019, 17:32:28 | 59146.9    | 93.41                   | 93.48                 | 91.28                 | 85.05                 | 0.7        | 1.52          | 1618.56    |           |           |

Delete

Compare

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

Drive Constructor

Textbook

Exercises

My systems

Send feedback

Разработка нового варианта системы –  
с самого начала

### Welcome to DriveConstructor!

Discover the beauty and complexity of the world of standard components. Watch the complete list of tutorials on our [YouTube channel](#).

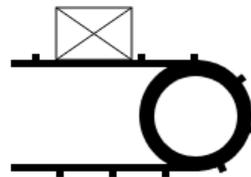


#### Pumps

Design systems for either low cost or for low energy consumption for various pump type.

Select

Help



#### Conveyor

Try different gear solutions and motor speeds to design for lowest cost and compactness.

Select

Help



#### Wind/tidal mill

Experiment with different drive train topologies, design systems for lowest cost of energy.

Select

Help



#### Winch

Design optimal systems for winches with both motoring and generating operation modes.

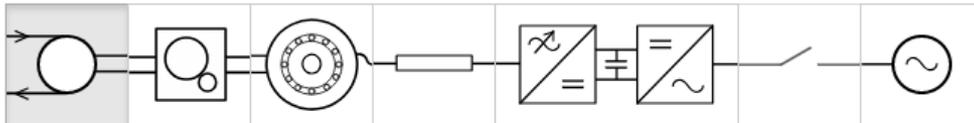
Select

Help

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Drive train with speed gearing



**Rated torque, kNm:**

**Max speed, rpm:**

**Min speed, rpm:**

**Starting torque as  $\hat{T}_{rated}$ :**

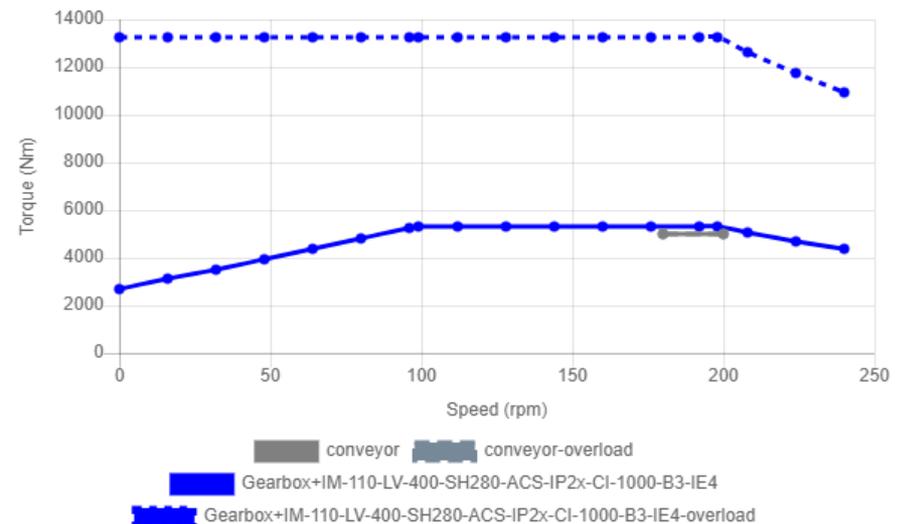
**Duty cycle period, min:**

**Duty, %:**

**Overload duration, sec:**

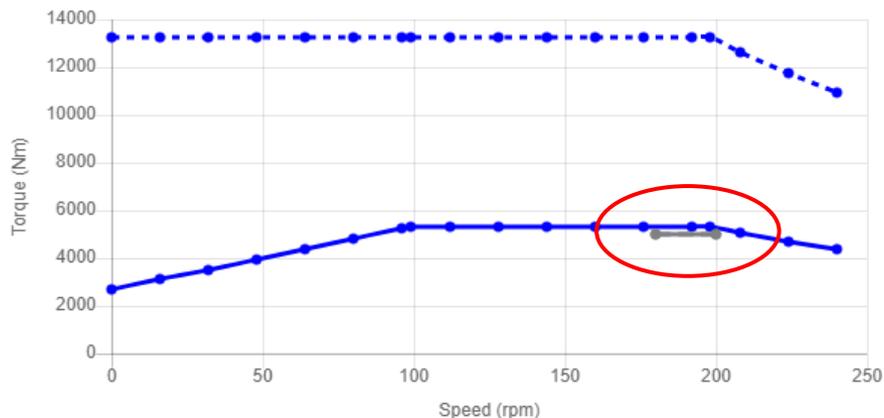
**Overload amplitude, %:**

**Overload cycle period, sec:**



# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода



### Electric machine candidates

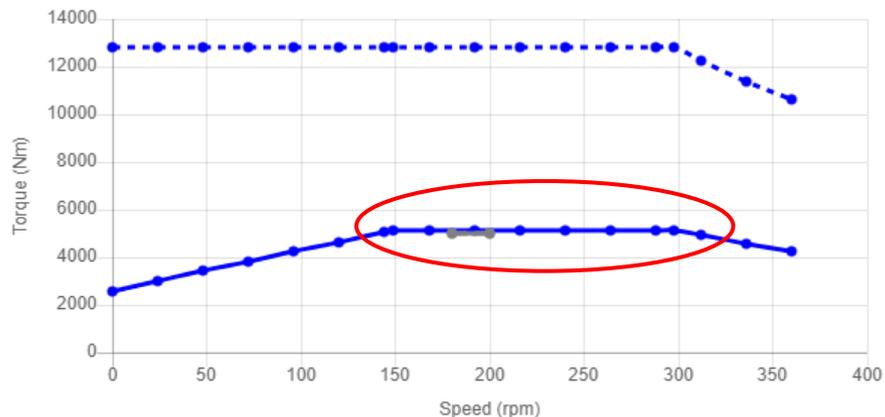
conveyor  
 conveyor-overload  
 Gearbox+IM-110-LV-400-SH280-ACS-IP2x-CI-1000-B3-IE4  
 Gearbox+IM-110-LV-400-SH280-ACS-IP2x-CI-1000-B3-IE4-overload

More...

| Select                           | Type | Price, EUR | Rated power, kW | Rated speed   | Voltage, V | Efficiency @100% load | Rated current, A | Working current, A | Cooling | Protection | Frame material | Volume, m3 | Footprint, m2 | Weight, kg | Designation                                 | .. |
|----------------------------------|------|------------|-----------------|---------------|------------|-----------------------|------------------|--------------------|---------|------------|----------------|------------|---------------|------------|---|----|
| <input checked="" type="radio"/> | SCIM | 28300      | <u>110</u>      | <u>991.12</u> | 360-440    | 96.2                  | 229.69           | 218.65             | IC411   | IP21/23    | cast iron      | 0.2931     | 0.6664        | 1025       | IM-110-LV-400-SH280-ACS-IP2x-CI-1000-B3-IE4 | .. |
| <input type="radio"/>            | SCIM | 28432      | <u>160</u>      | <u>1488</u>   | 360-440    | 96.8                  | 311.09           | 203.59             | IC411   | IP21/23    | cast iron      | 0.3202     | 0.728         | 1121       | IM-160-LV-400-SH280-ACS-IP2x-CI-1500-B3-IE4 | .. |

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода



Избыточная  
мощность ЭМ

### Electric machine candidates

conveyor  
 conveyor-overload  
 Gearbox+IM-160-LV-400-SH280-ACS-IP2x-CI-1500-B3-IE4  
 Gearbox+IM-160-LV-400-SH280-ACS-IP2x-CI-1500-B3-IE4-overload

More..

| Select                           | Type | Price, EUR | Rated power, kW | Rated speed | Voltage, V | Efficiency @100% load | Rated current, A | Working current, A | Cooling | Protection | Frame material | Volume, m3 | Footprint, m2 | Weight, kg | Designation                                 | .. |
|----------------------------------|------|------------|-----------------|-------------|------------|-----------------------|------------------|--------------------|---------|------------|----------------|------------|---------------|------------|---|----|
| <input type="radio"/>            | SCIM | 28300      | 110             | 991.12      | 360-440    | 96.2                  | 229.69           | 218.65             | IC411   | IP21/23    | cast iron      | 0.2931     | 0.6664        | 1025       | IM-110-LV-400-SH280-ACS-IP2x-CI-1000-B3-IE4 | .. |
| <input checked="" type="radio"/> | SCIM | 28432      | 160             | 1488        | 360-440    | 96.8                  | 311.09           | 203.59             | IC411   | IP21/23    | cast iron      | 0.3202     | 0.728         | 1121       | IM-160-LV-400-SH280-ACS-IP2x-CI-1500-B3-IE4 | .. |

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

Frequency converter candidates

Варианты ПЧ не изменились

More...

| Select                           | Type         | Price, EUR | Rated power, kW | Voltage, V | Working voltage, V | Rated current HO, A | Cooling | Efficiency @100% load | Mounting variant | Height, m | Width, m | Depth, m | Volume, m3 | Footprint, m2 | Weight, kg | Designation                | .. |
|----------------------------------|--------------|------------|-----------------|------------|--------------------|---------------------|---------|-----------------------|------------------|-----------|----------|----------|------------|---------------|------------|----------------------------|----|
| <input checked="" type="radio"/> | 2Q-2L-VSC-6p | 10989      | 200             | 360-420    | 400                | 240.46              | air     | 98                    | wall             | 1         | 0.5206   | 0.4      | 0.2082     | 0.5206        | 104.12     | 2Q-2L-400-200-IP2x-AC-W-6p | .. |
| <input type="radio"/>            | 2Q-2L-VSC-6p | 13187      | 200             | 360-420    | 400                | 240.46              | air     | 98                    | floor            | 2.2       | 0.1578   | 0.6      | 0.2083     | 0.3472        | 104.12     | 2Q-2L-400-200-IP2x-AC-F-6p | .. |

|         | цена, Евро | вес, кг |
|---------|------------|---------|
| ЭМ      | 28 300     | 1 025   |
| ПЧ      | 10 989     | 104     |
| Система | 51 311     | 1 262   |

Save system

---

Select the system name:

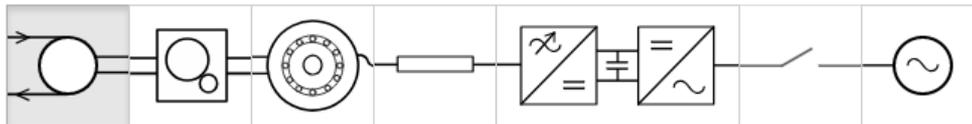


---

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### Drive train with speed gearing



### Третий вариант

Rated torque, kNm:

Max speed, rpm:

Min speed, rpm:

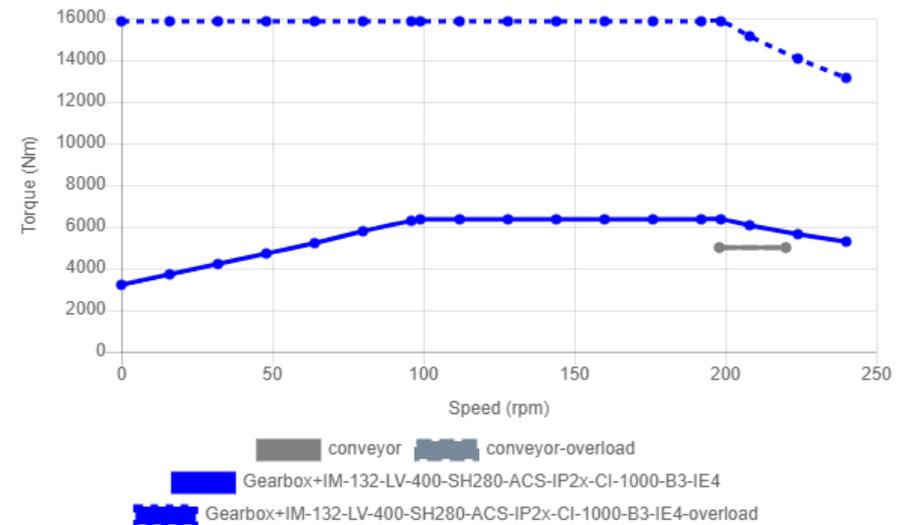
Starting torque as  $\wedge T_{rated}$ :

Duty cycle period, min:

Duty, %:

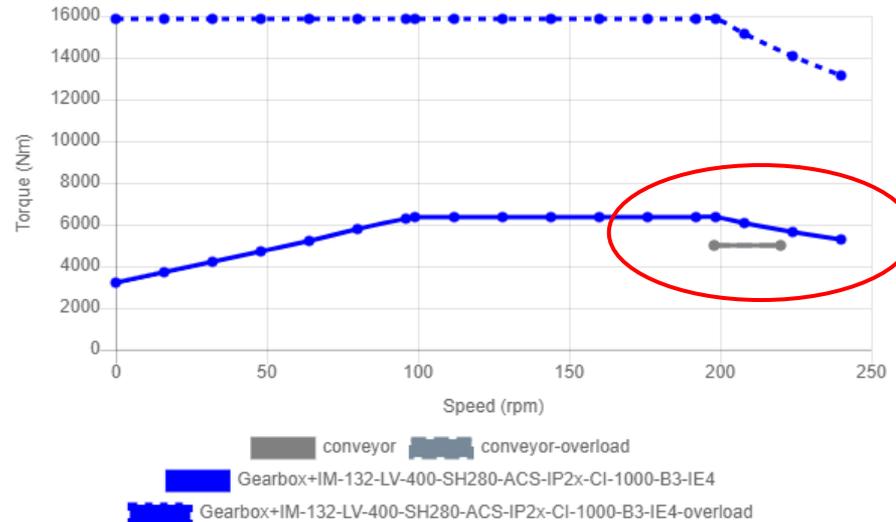
Overload duration, sec:

Overload amplitude, %:



# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода



### Electric machine candidates

| Select                           | Type | Price, EUR | Rated power, kW | Rated speed | Voltage, V | Efficiency @100% load | Rated current, A | Working current, A | Cooling | Protection | Frame material | Volume, m3 | Footprint, m2 | Weight, kg | Designation                                 |
|----------------------------------|------|------------|-----------------|-------------|------------|-----------------------|------------------|--------------------|---------|------------|----------------|------------|---------------|------------|---|
| <input checked="" type="radio"/> | SCIM | 31895      | <u>132</u>      | 991.71      | 360-440    | 96.5                  | 273.2            | 238.39             | IC411   | IP21/23    | cast iron      | 0.3399     | 0.7728        | 1185       | IM-132-LV-400-SH280-ACS-IP2x-CI-1000-B3-IE4 |
| <input type="radio"/>            | SCIM | 28432      | <u>160</u>      | 1488        | 360-440    | 96.8                  | 311.09           | 223.95             | IC411   | IP21/23    | cast iron      | 0.3202     | 0.728         | 1121       | IM-160-LV-400-SH280-ACS-IP2x-CI-1500-B3-IE4 |

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

|         | цена, Евро | вес, кг |
|---------|------------|---------|
| ЭМ      | 31 895     | 1 185   |
| ПЧ      | 10 989     | 104     |
| Система | 54 906     | 1 422   |

Save system

---

Select the system name:

---

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

### My systems

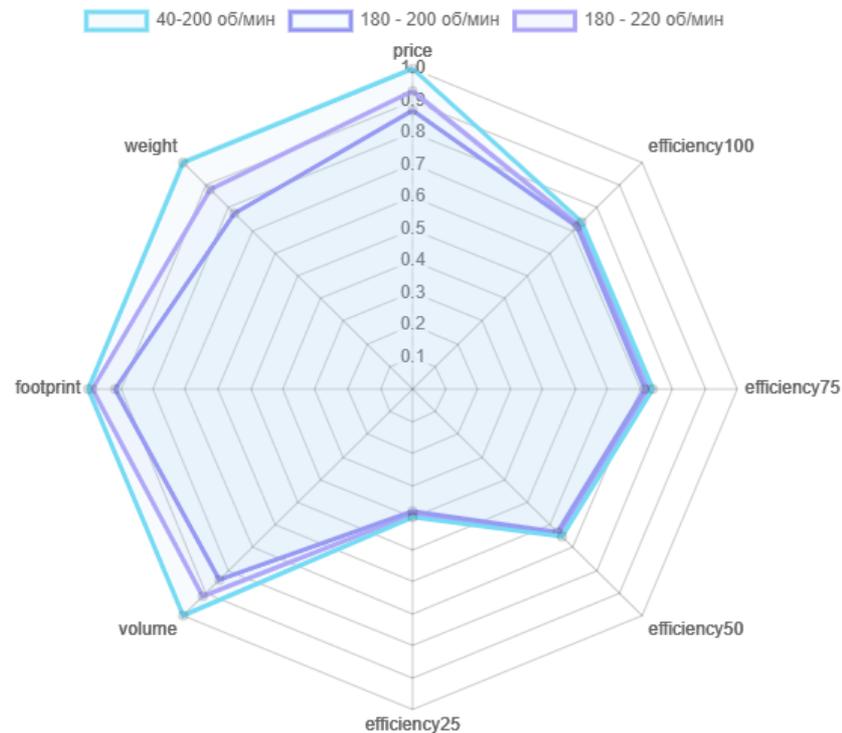
| Select                              | Name             | Topology  | Time update          | Price, EUR | Efficiency @ rated load | Efficiency @ 75% load | Efficiency @ 50% load | Efficiency @ 25% load | Volume, m3 | Footprint, m2 | Weight, kg | THD(u), %                           | THD(i), %                           |
|-------------------------------------|------------------|---|----------------------|------------|-------------------------|-----------------------|-----------------------|-----------------------|------------|---------------|------------|-------------------------------------|-------------------------------------|
| <input checked="" type="checkbox"/> | 40-200 об/мин    |  | 03.02.2019, 17:32:28 | 59146.9    | 93.41                   | 93.48                 | 91.28                 | 85.05                 | 0.7        | 1.52          | 1618.56    | <del><input type="checkbox"/></del> | <del><input type="checkbox"/></del> |
| <input checked="" type="checkbox"/> | 180 - 200 об/мин |  | 03.02.2019, 18:31:38 | 51310.9    | 92.86                   | 92.94                 | 90.75                 | 84.55                 | 0.59       | 1.39          | 1261.56    | <input type="checkbox"/>            | <input type="checkbox"/>            |
| <input checked="" type="checkbox"/> | 180 - 220 об/мин |  | 03.02.2019, 18:51:10 | 54905.9    | 93.16                   | 93.23                 | 91.03                 | 84.82                 | 0.64       | 1.5           | 1421.56    | <input type="checkbox"/>            | <input type="checkbox"/>            |

Delete Compare

# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

Comparison:



# DriveConstructor – пример расчета

## Влияние диапазона скоростей конвейера на систему привода

| <b>40-200</b> | <b>цена, Евро</b> | <b>вес, кг</b> |
|---------------|-------------------|----------------|
| ЭМ            | 36 136            | 1 382          |
| ПЧ            | 10 989            | 104            |
| Система       | 59 147            | 1 619          |

| <b>180-200</b> | <b>цена, Евро</b> | <b>вес, кг</b> |
|----------------|-------------------|----------------|
| ЭМ             | 28 300            | 1 025          |
| ПЧ             | 10 989            | 104            |
| Система        | 51 311            | 1 262          |

| <b>180-220</b> | <b>цена, Евро</b> | <b>вес, кг</b> |
|----------------|-------------------|----------------|
| ЭМ             | 31 895            | 1 185          |
| ПЧ             | 10 989            | 104            |
| Система        | 54 906            | 1 422          |