dertec®

Designed to Perform

Stainless Steel **Helical Gearboxes.**

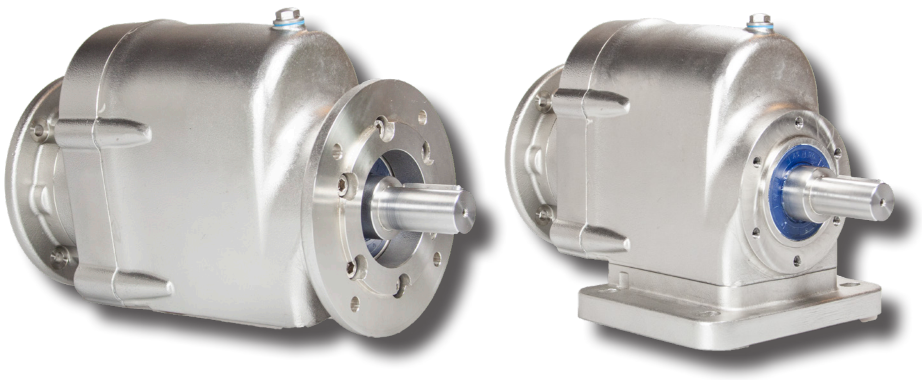
FRC

FRC Helical gearbox

With the food industry as a guideline, Dertec has developed a complete package of stainless steel drives.
The FRC Series Coaxial geared motor is a fine example of hygienic and easy to clean design.
The round shape and smooth surface contributes to the reduction of contamination building up and simplifies cleaning.

Using AISI 316 for the housing justifies the use of less reactive and therefore generally contributes to the surface water quality.

Dertec FRC coaxial gearboxes can be easily executed with different base plates and secondary flanges.
This makes them easily interchangeable with other brands available on the market.
Currently the 2-stage FRC coaxial gearboxes are available in 2 versions (FRC01 and FRC02) and suitable for IEC motor mounting.



Main Features

Made of high quality carefully electro polished Stainless Steel AISI 316 (mirror polished on request).
The smooth design gives the gearbox a nice appearance, ready to suit all kinds of
stainless steel machinery for the food industry.

Hardened shaft

All solid shafts are produced in duplex stainless steel AISI 2205. The special PNS surface treatment ensures enough hardness to collaborate with our special high temperature resistant blue shaft seals. The PNS treatment increases the lifetime of shaft / seal cooperation and helps to reduce wear on the shaft surface. By this, the gearbox achieves a longer drip free operation compared to standard shaft / seal combinations made of AISI 304 with NBR or FKM. The use of above combination offers all the positive characteristics of stainless steel and the surface hardness of a hardened shaft.

Blue shaft seals

Our high performance engineered shaft seals have a blue colour.
It is a well overthought feature for food industry applications.
It might be clear that the colour “blue” is a not existing organic colour.
In the context of food safety it is a common use to embed blue colours as these are very visible and easily to be recognised by vision scanning systems.

Foodgrade lubrication

All gearboxes are standard equipped with NSH H1 certified synthetic foodgrade lubrication.
On request it can be supplied with a halal, kosher or nut free certification.

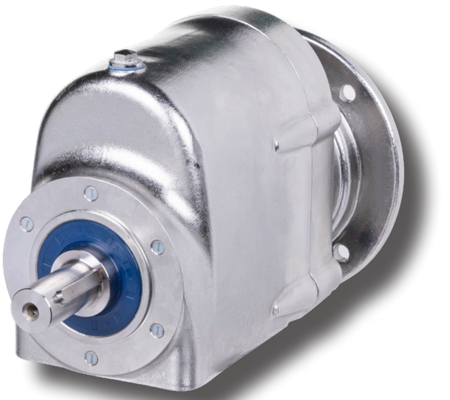
Laser engraved tag plate

To avoid dirt traps under the commonly used motor identification tag plate, all our motors and gearboxes are being equipped with a laser engraved tag plate.
Besides for the food safety this also prevents against possible loss of information because of taking away the tag plate or loosing the tag plate from the driveparts.

As a part of our standard procedure every drive is tested in our production facility in the Netherlands to ensure correct functioning.

General specifications

- Standard ratio’s 3,82 : 1 to 54 : 1
- IEC motor adaption
- Standard solid shafts 20, 25 mm
- High efficiency of 94%
- Optional output flanges available
- Stainless Steel AISI316
- Duplex stainless steel 2205 output shaft
- Interchangeable with euro sizes
- Designed and produced in the Netherlands
- Optional detachable feet to achieve different shaft heights
- Possible in combination with other gearboxes where the FRC gearbox funtions as a prestage gearbox



Foot

Flange

Product Characteristics

FRC 01	
Ratio's	From 3.82 : 1
	To 53.33 : 1
standard shaft	20 mm
Torque	Max. 117 Nm
Power	Max 1.5 kW

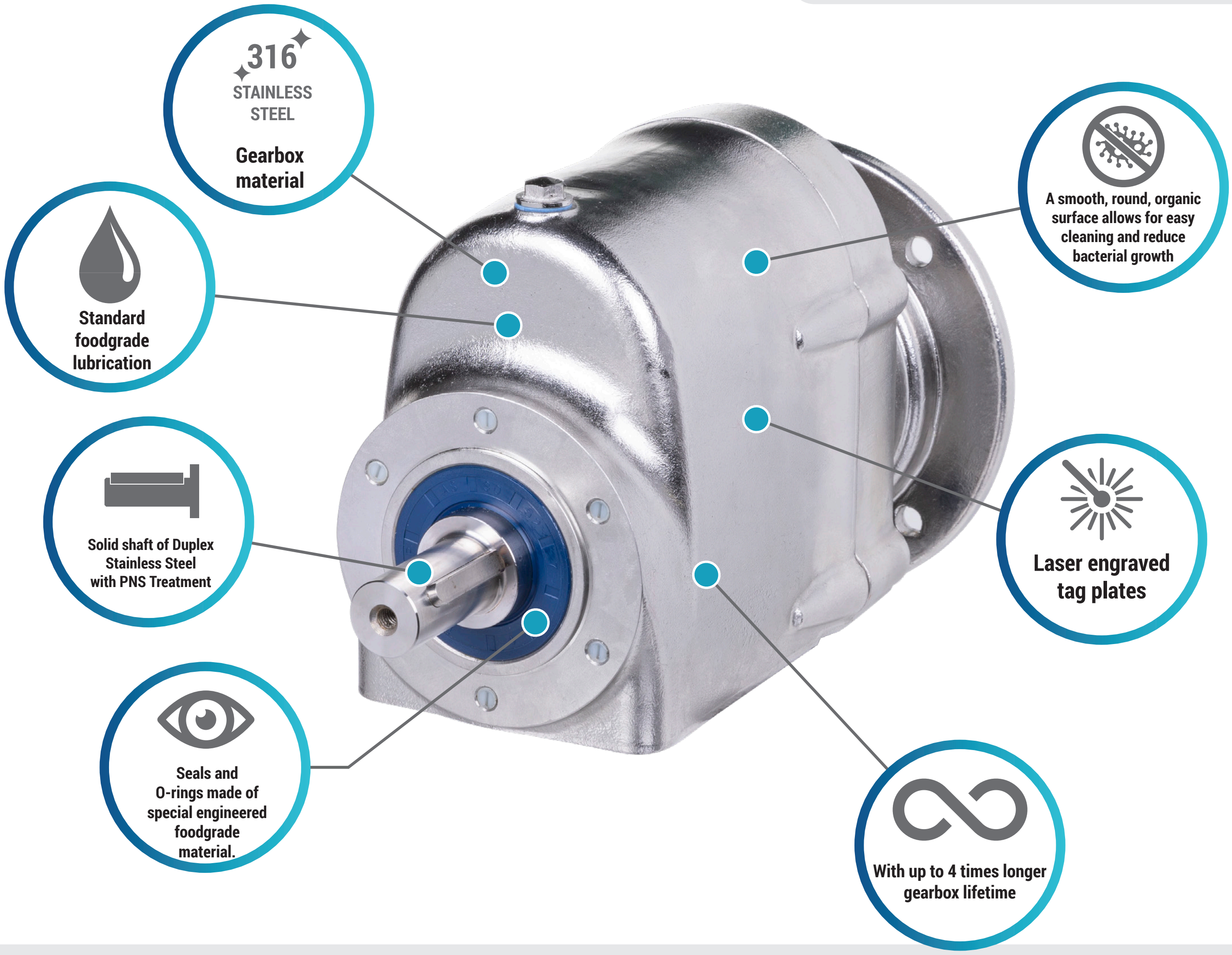
FRC 02	
Ratio's	From 3.66 : 1
	To 54.00 : 1
standard shaft	25 mm
Torque	Max. 208 Nm
Power	Max. 1.5 kW

FRC01 flange	
Gearbox	Flange
FRC01 FL120	SS 075 FL120
FRC01 FL140	SS 075 FL140
FRC01 FL160	SS 075 FL160

FRC02 flange	
Gearbox	Flange
FRC02 FL140	SS 085 FL140
FRC02 FL160	SS 085 FL160
FRC02 FL200	SS 085 FL200

FRC01 foot	
Gearbox	Foot
FRC01	M11
FRC01	G1

FRC02 foot	
Gearbox	Foot
FRC02	M21
FRC02	G2



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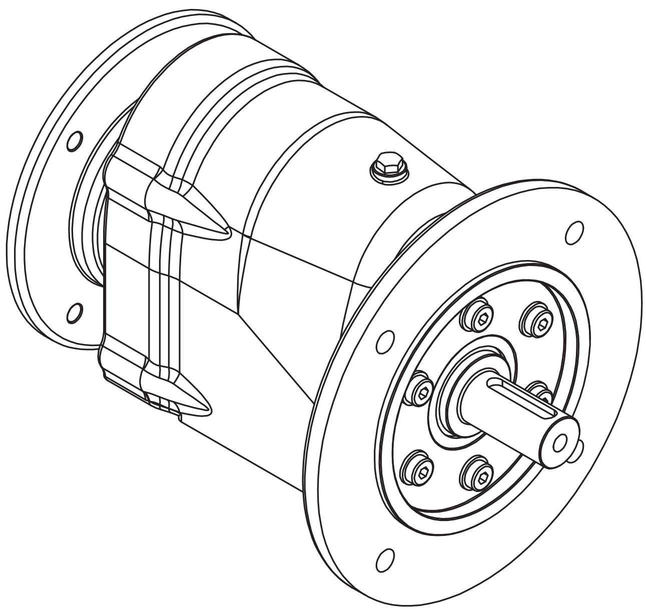
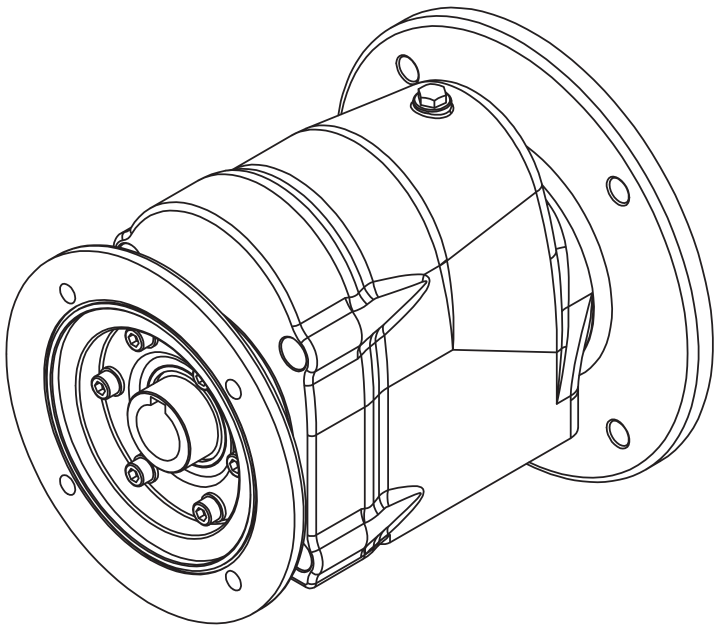




Project planning

Basic Parameters

Power P

The input power can be found in the **"Gearbox Selection Tables"** , it represents the amount of kilowatts [kW] that can be safely transmitted into the gearbox.

$$P_1 = \frac{P_2}{\eta}$$

P_1 = Input power (kW)
P_2 = Output power (kW)
η = Gearbox efficiency (%)

Rotation speed *n* and gear ratio *i*
The gear ratio can be calculated with the input and output speed

$$i = \frac{n_1}{n_2}$$

i = Gear ratio
n_1 = Input speed in (rpm)
n_2 = Output speed in (rpm)

Torque *M*
The output torque can be calculated with the input power, the efficiency and the output speed.

$$M_2 = \frac{9550 \cdot P_1 \cdot \eta}{n_2}$$

$$M_{2max} \geq M_2 \cdot fs_{gearbox}$$

M_2 = Output torque (Nm)
M_{2max} = Maximum output torque (Nm)
P_1 = Input power (kW)
n_2 = Output speed (rpm)
η = Gearbox efficiency (%)
$fs_{gearbox}$ = Service factor

Mass acceleration factor f_a
The mass acceleration factor is calculated with all the external mass moments of inertia and the mass moment of inertia from the motor.

$$f_a = \frac{J_c}{J_m}$$

f_a = Mass acceleration factor
J_c = All external mass moments of inertia [kg m^2]
J_m = Mass moment of inertia on the motor end [kg m^2]

If the mass acceleration factor $f_a \geq 10$, please contact us.

Efficiency of gearboxes *η*

The efficiency of gearboxes is mainly determined by the gear type, the gear ratio and the bearing friction. The efficiency of the gears at start-up and at sub-optimal operating speed is always lower than when the gears are running at the optimal operating speed. The gear shape of worm- and helical worm gearboxes causes more friction, thus a lower total efficiency. As a result of the higher friction, the temperature of worm gearboxes might also be higher than gearboxes with other gear types.

The efficiency of the different gear types can be found in the **"Possible Geometrical Combinations".**

For an approximate approach the following values can be used for the efficiency of gears at their (optimal) operational speed, beware these are generalized and can be different depending on the factors as discussed before.
For bevel-, helical- and parallel shaft gears the efficiency is in-between 94% (3-stage) and 96% (2-stage).
The efficiency of hypoid bevel gears is 90% (3-stage) and 92% (2-stage). For worm- and helical worm gears the efficiency depends on the gear ratio, incoming rotational speed and the temperature of the worm gearbox, the efficiency of the gears is between 40% and 90%.

To ensure the efficiency of the gears is optimal it is recommended but not limited to: Regularly change oil, use the optimal mounting position and use the gearbox at the optimal operating speed.
Choosing the right size gearbox for the application is recommended to achieve a better efficiency, at speeds below- and over the optimal operating speed the efficiency is lower than at optimal speeds and conditions.

Service factor fs_{min} and $fs_{gearbox}$

The service factor is a method to determine the effects of the driven machine or other application on the gearbox, with a sufficient level of accuracy for most applications. The minimal service factor **(fs_{min})** for a machine can be determined using the **"Service factor graph"**. This minimum service factor is only an approximation, for the service factor for each gearbox, see the **"Gearbox Selection Tables"**.

⚠ **The minimal service factor (fs_{min}) should always be lower than or equal to the actual service factor of the gearbox ($fs_{gearbox}$).**

$$fs_{min} \leq fs_{gearbox}$$

fs_{min} = Minimal determined service factor **"Service factor graph"**
$fs_{gearbox}$ = Actual service factor for the gearbox **"Gearbox Selection Tables"**

⚠ **The service factor for each gearbox ($fs_{gearbox}$) is the critical service factor, and should always be equal to or higher than the minimum service factor (fs_{min}) !**

Switching frequency

The switching frequency determines how often an application switches per hour.
The switching consists of: **turning on/off, changing of speeds, changing of loads and braking**

z = Switching frequency [1/h]

Load classification

There are three load classifications to be considered, they depend on the mass acceleration factor.
The mass acceleration factor can be calculated, see **"Mass acceleration factor f_a"**

f_a = Mass acceleration factor

The load classifications are split in three groups with each examples of the common applications for each load classification.

A: Uniform load, a mass acceleration factor of **$f_a \leq 0{,}3$**
Examples of applications: Screw feeders for light materials, fans, assembly lines, conveyer belts for light materials, small mixers, light application elevators, cleaning machines, fillers, control machines.

B: Moderate shock load, mass acceleration of **$f_a \leq 3$**
Examples of applications: Winding devices, woodworking machine feeders, medium application elevators, balancers, medium mixers, conveyer belts for heavy materials, winches, sliding doors, fertilizer scrapers, packing machines, concrete mixers, crane mechanisms, milling cutters, folding machines, gear pumps.

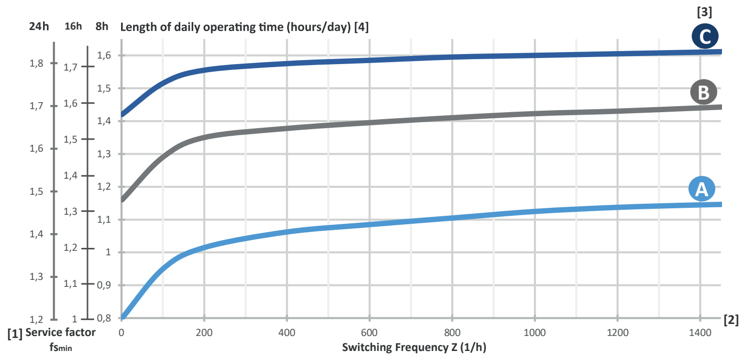
C: Heavy shock load, mass acceleration factor of **$f_a \leq 10$**.Examples of applications: Mixers for heavy materials, shears, presses, centrifuges, rotating supports, winches and lifts for heavy materials, heavy application elevators, grinding lathes, stone mills, bucket elevators, drilling machines, hammer mills, cam presses, folding machines, turntables, tumbling barrels, vibrators, shredders.

Service factor graph

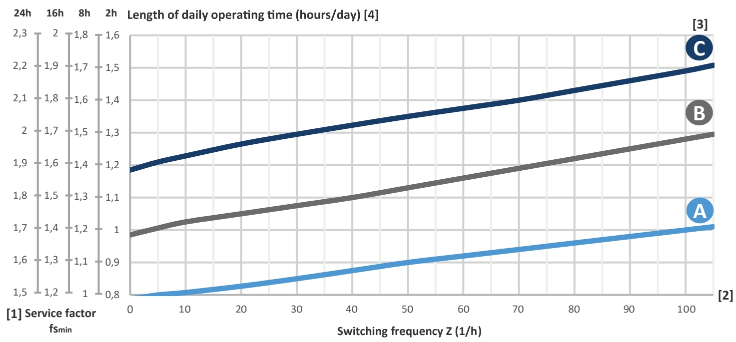
The determined Minimum **[1]** service factor is based on **[2]** switching frequency, **[3]** load classification and **[4]** length of daily operating time.

To get the expected service life from the gearbox, $fs_{min} \leq fs_{gearbox}$
see the "Gearbox Selection Tables" for the gearbox service factor

Service factor for a high Switching frequency [Z], used for all gearboxes:



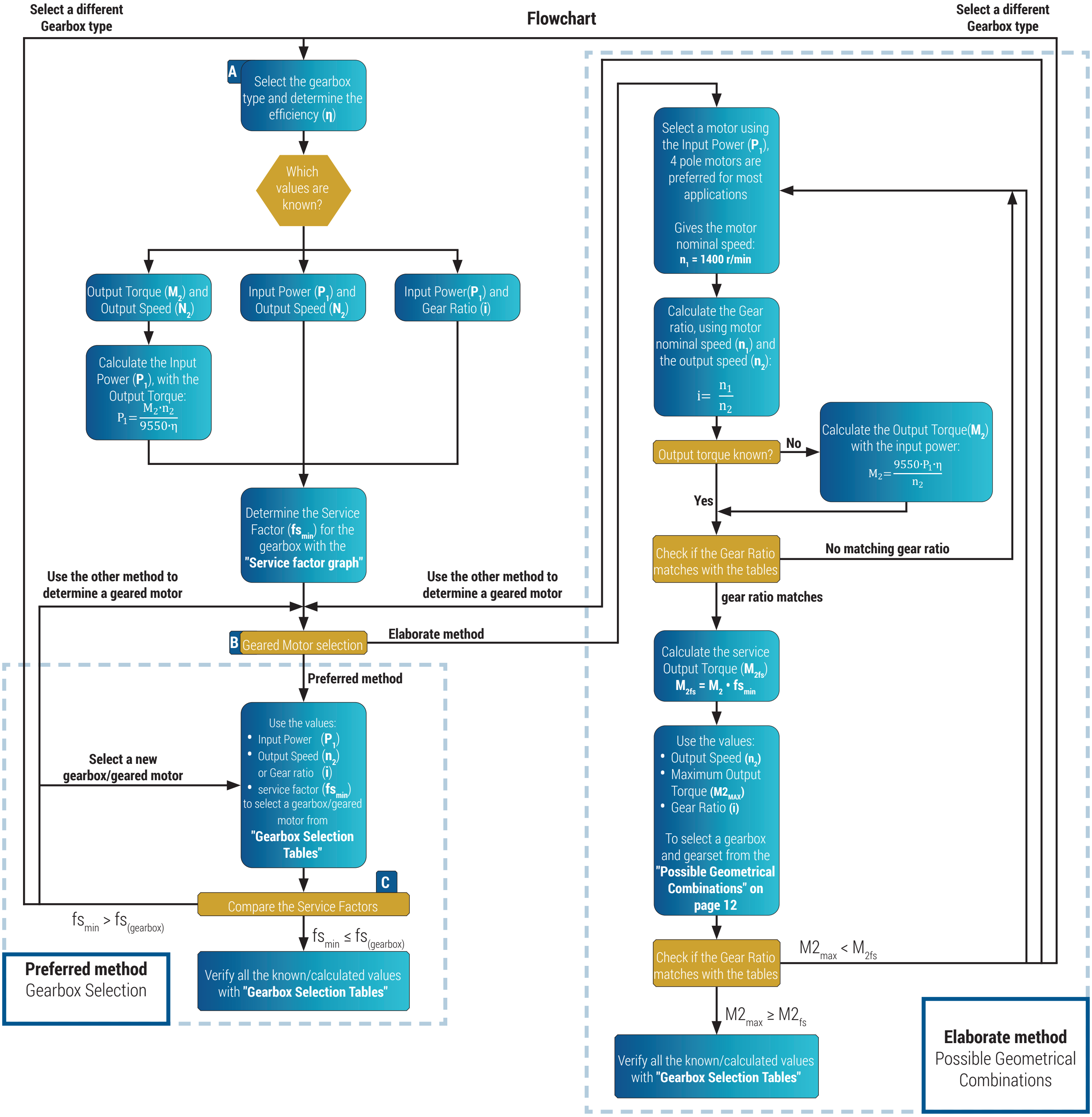
Service factor for low Switching frequency (Z), used mostly for worm- and helical worm gearboxes:



For worm gearboxes the ambient temperature has more influence on the service factor, the service factor should be adjusted as following:

Ambient temperature:
=30~40˚C, f_s•1,1 ~ 1,2
=40~50˚C, f_s•1,3 ~ 1,4
=50~60˚C, f_s•1,5 ~ 1,6

Flowchart



A Gearbox types by gear type:

- Worm gear
- Helical worm gear
- Helical bevel gear
- Hypoid bevel gear
- Parallel shaft gear
- (Compact) Helical gear

B Geared motor selection, there are 2 methods of selecting a geared motor:

- The elaborate method is used to select a geared motor based on calculations.
- The preferred method is based on a quick and accurate decision with our tables.

C The service factor, is a value to determine the effect of a driven machine on the gearbox. With **"Gearbox Selection Tables"** the minimum expected service factor (fs_{min}) can be determined.

The gearboxes themselves have a maximum service factor that varies per gearbox ($fs_{gearbox}$), always make sure that: $fs_{min} \leq fs_{(gearbox)}$

To get the expected service life from the gearbox.

Explanation of the flowchart

Gearbox selection type
To select a gearbox the values for efficiency and the service factor are needed. These can be predicted by choosing the type of gearbox, **"Possible Geometrical Combinations"**

Which values are known?
There are three sets of values that can be known and which can be used to select the right gearbox and geared motor.
These three sets of values are:

- **Output torque and speed**
- **Input power and speed**
- **Input power and gear ratio**

For only knowing the output torque- and speed it is necessary to determine the input power with the following equation:

$$P_1 = \frac{M_2 \cdot n_2}{9550 \cdot \eta}$$

P_1	Input power [kW]
M_2	Output torque [Nm]
η	Gearbox efficiency [%]
n_2	Rotational speed [rpm]

Determine the service factor
Use the **"Service factor graph"** to determine the service factor.

Select a geared motor
There are two methods to select a gearbox and a geared motor:

The preferred method: This method is accurate and quick, this method only needs a basic calculation in when the input power is unknown.

The elaborate method: This method gives more insight and a more hands on approach in the selection process for a gearbox and geared motor. There are a few calculations that have to be done in this method.

⚠ **If both methods don't give the correct results it can be possible that the gearbox and or motor are not correct for this application!**

Preferred method:

Use the "Gearbox Selection Tables"
Use the Input power, output speed or gear ratio and the service factor to select the gearbox/geared motor.

⚠ **Note: that the output torque is sufficiticated to your application**

Check the service factor
Check if the determined service factor $\mathbf{fs}_{min}$ is smaller or equal to the service factor from the **"Gearbox Selection Tables"** $\mathbf{fs}_{min} \leq \mathbf{fs}_{gearbox}$.

If $\mathbf{fs}_{min} > \mathbf{fs}_{gearbox}$ a different gearbox/geared motor should be selected if that is not possible then it is advised to check the other gearbox types..

If $\mathbf{fs}_{min} \leq \mathbf{fs}_{gearbox}$ go to the next step and verify the results.

Verify the results
If the service factor $\mathbf{fs}_{min}$ and $\mathbf{fs}_{gearbox}$ gives a valid result, verify the rest of the results with the tables from **"Gearbox Selection Tables"**.

Elaborate method:

Select a motor

Select a motor from in the **(Motor documentation)**.
4-pole motors are preferred for most applications. The given nominal motor speed of a 4-pole motor is n_1**=1400 rpm**.

Calculate the gear ratio

If the gear ratio is known, the output speed n_2 needs to be calculated.

$$n_2 = \frac{n_1}{i}$$

With the nominal speed from the selected motor and known output speed the gear ratio can be calculated.

$$i = \frac{n_1}{n_2}$$

i = Gear ratio [-]
n_1 = Gearbox input speed [rpm] (equal to motor speed)
n_2 = Gearbox output speed [rpm]

Check if the output torque is known

If the output torque is known go to the next step.
If the output torque is unknown use the following calculation to determine the output torque:

$$P_1 = \frac{M_2 \cdot n_2}{9550 \cdot \eta}$$

P_1 = Input power [kW]
M_2 = Output torque [Nm]
η = Gearbox efficiency [%]
n_2 = Rotational speed [rpm]

Check the gear ratio

With the known or calculated gear ratio and the **"Possible Geometrical Combinations"**, the gear ratio can be checked.
If the needed gear ratio is not in the list a different motor or gearbox should be selected.

Calculate the service output torque

With the determined service factor and the output torque, calculate the service output torque.

$$M_{2fs} = M_2 \cdot fs_{min}$$

M_{2fs} = Service output torque [Nm]
M_2 = Output torque [Nm]
fs_{min} = Service Factor

Use the Possible Geometrical Combinations tables

Use the Output speed, Service output torque and gear ratio to determine a gearbox and gearset with the tables from the **"Possible Geometrical Combinations"**.

Check the maximum output torque

Check if the maximum output torque in these tables matches the calculated service output torque. If the maximum torque is lower than the calculated service torque: $M_{2max} < M_{2fs}$ it is advised to select a different motor or gearbox.

If $M_{2max} \geq M_{2fs}$ go to the next step and verify the results.

Verify the results

If the maximum output torque matches the tables and gives a valid result, then verify the values from the tables with the calculated values and make a selection for the gearbox/geared motor.

Example 1: Preferred method

This example uses a different gearbox type but is generally applicable

Known parameters:

M_2	Nominal output torque [Nm]	= **110 Nm**
n_2	Rotational speed [rpm]	= **29 rpm**

Moderate shock load, operational **16 hours a day**, Switching frequency of **200 times per hour.**

Gearbox selection type

A hypoid bevel gearbox is selected. The estimated efficiency ***η≈90% to 94%***. For a more accurate efficiency look it up in the **"Possible Geometrical Combinations"**.

When in doubt use the lowest estimated efficiency.

Which values are known?

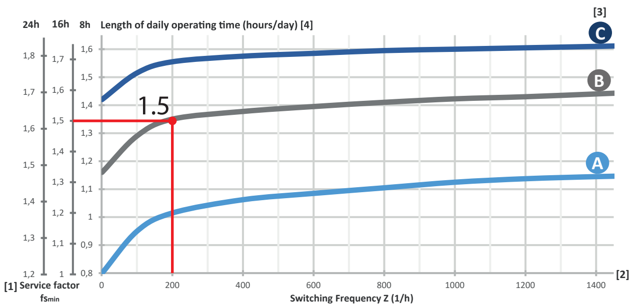
- Output torque- and speed
- ~~Input power- and speed~~
- ~~Input power and gear ratio~~

M_2 = **110Nm**
n_2 = **29 rpm**

Looking up the output speed and output torque in the **"Possible Geometrical Combinations" on page 15** tables gives an efficiency of: **η≈92%**
With the output torque- and speed it is necessary to determine the input power with the following equation:

$$P_1 = \frac{M_2 \cdot n_2}{9550 \cdot \eta} = \frac{110 \cdot 29}{9550 \cdot 0{,}92} = 0{,}363 \text{ kW}$$

Determine the safety factor



Select the *'Elaborate method'* or the *'Preferred method'*

Preferred method is chosen.

P_{1n} [kW]	n_2 min⁻¹	M_{2n} [Nm]	i	F_{r2} [N]	fs		
0.37	23	140	60.50	3430	1.40		
	29	113	48.71	3190	1.80		
	36	91	39.29	2970	2.00		
	46	70	30.31	2720	2.80	FK38B IEC71	712-4 B14a
	57	57	24.44	2530	3.20		
	69	47	20.25	2380	3.20		
	95	34	14.67	2130	3.20		

Check the service factor

fs_{min}=**1,5**
$fs_{(gearbox)}$=**1,8**

Check if the following is true

$fs_{min} \leq fs_{gearbox}$
Yes, because **1,5 < 1,8**

Verify the results

Needed Torque: **110 Nm**, available torque in selected gearbox: **113 Nm**
Needed output speed: **29 rpm**, available output speed in selected gearbox: **29 rpm**
Calculated Input power: **0,363 kW**, available input power in selected gearbox: **0.37 kW**

Service factor: $fs_{min} \leq$ fs(gearbox) = **1,5<1,8**
So the choice of gearbox/geared motor is: **FK38B IEC71 / 712-4 B14a.**

It is recommended to select a gearbox or geared motor that fits the application. Choosing a gearbox or geared motor that is too light or too heavy can cause damage (to the machine) and shorten the expected service life of the gearbox/geared motor!

This example uses a different gearbox type but is generally applicable

Example 2: Eleborate method

Known parameters:

P1 Input power [kW] = **0.55kW** **i** gear ratio = **30:1**
Heavy shock load, operational **24 hours a day**, switching frequency of **800 times per hour.**

Gearbox selection type
A hypoid bevel gearbox is selected. The estimated efficiency ***η≈90% to 94%***. For a more accurate efficiency look it up in the **"Possible Geometrical Combinations"**

When in doubt use the lowest estimated efficiency.

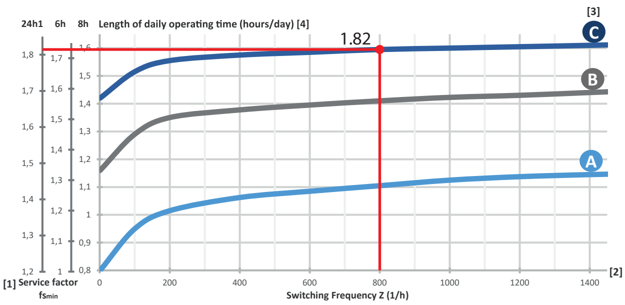
Which values are known?

- ~~Output torque and speed~~
- ~~Input power and speed~~
- Input power and gear ratio

P_1 = **0.55 kW**
i = **30:1**

Looking up the output speed and output torque in the **"Possible Geometrical Combinations"** tables gives an efficiency of: **η≈94%**

Determine the safety factor



Select the elaborate or the Simple method
Elaborate method is chosen

Select a motor
Check the **"Possible Geometrical Combinations"**, which motor is preferred. In this example an IEC80 B14a motor is preferred.

The choice of motor is based on a 4-pole motor, which means an input speed of 1400 rpm.
However it is possible to choose from a wide range of motors.

Calculate the output speed

i = 30:1
n_1 = 1400 rpm

$$i = \frac{n_1}{n_2} \rightarrow n_2 = \frac{n_1}{i} \rightarrow \frac{1400\ \text{rpm}}{30} = 46{,}67\ \text{rpm}$$

Check of the output torque is known
The output torque is not known yet, so it needs to be calculated with the known values.

$$M = \frac{9550 \cdot P \cdot \eta}{2} = \frac{9550 \cdot 0{,}55 \cdot 0{,}90}{46{,}67\ rpm} \quad 101{,}3\ Nm$$

Check the gear ratio
To check the gear ratio, look in the **"Possible Geometrical Combinations"** tables for the preferred gearbox. As seen below, the gear ratio and output speed match with this gearbox. The preferred motor is also possible with this gearbox type.

FK 28 B

Maximum torque = 130 Nm @ N1= 1400 rpm

n_2 [min⁻¹]	M_{2max} [Nm]	F_{r2} [N]	i		η%	IEC 63 B5	IEC 71 B14a	IEC 80 B14a	IEC 90 B14a
35	130	2610	40	40.09	94	✓	✓	✓	
48	130	2350	30	29.33	94	✓	✓	✓	
59	130	2200	25	24.07	94	✓	✓	✓	✓

Calculate the service output torque

Use the determined service factor and the calculated output torque.

$M_{2fs} = M_2 \cdot fs_{min} \rightarrow 101{,}3\ \text{Nm} \cdot 1{,}82 = 184{,}37\ \text{Nm}$

Use the Possible Geometrical Combinations tables

FK 28 B

*Maximum torque = **130 Nm** @ N1= 1400 rpm*

n_2 [Min⁻¹]	M_{2max} [Nm]	F_{r2} [N]	i		η%	IEC 63 B5	IEC 71 B14a	IEC 80 B14a	IEC 90 B14a
35	130	2610	40	40.09	94	✓	✓	✓	
48	130	2350	30	29.33	94	✓	✓	✓	
59	130	2200	25	24.07	94	✓	✓	✓	✓

Check the maximum output torque

With the known values and the selected gearbox, we can determine that the following values apply:

n_2 = 48 rpm ≈ 46.67 rpm [calculated]
I = 30 = 30 [known]
M2fs = 101,3 Nm [calculated]

So the determined gearbox has enough output torque for the application 130 Nm, but when we look at the service output torque, it is not recommended to choose this gearbox with this service factor and service output torque.

M_{2fs} = 184,37 Nm [calculated]
$M_{2max} < M_{2fs} \rightarrow$ 130 Nm < 184,37 Nm

It is recommended to choose another gearbox, the easiest way to do this is to look for a bigger gearbox within the same gearbox type.

Selecting a new gearbox

It is recommended to match the calculated results as before, but look for a higher maximum torque. Try to select a maximum torque that still matches the application, it is not recommended to select a gearbox with more maximum torque than the application needs.

FK 38 B

*Maximum torque = **200 Nm** @ N1= 1400 rpm*

n_2 [Min⁻¹]	M_{2max} [Nm]	F_{r2} [N]	i		η%	IEC 63 B5	IEC 71 B14a	IEC 80 B14a	IEC 90 B14a
36	200	2970	40	39.29	94	✓	✓	✓	✓
47	200	2720	30	30.31	94	✓	✓	✓	✓
58	200	25030	25	24.44	94		✓	✓	✓

Verify the results

With the table for the FK38B gearbox, we can determine the following.

n_2 = 47 rpm ≈ 46.67 rpm [calculated]
i = 30 = 30 = [known]
M_2 = 101,3 Nm [calculated]
M_{2fs} = 184,37 Nm [calculated]

Check if the maximum output torque is higher than the service output torque.

$M_{2max} > M_{2fs} \rightarrow$ 200 Nm > 184,37 Nm

So this gearbox can be used for the application, because the service output torque is lower than the maximum output torque.

The recommended gearbox with motor is:

For a gearbox, a **FK38B** with a true gear ratio of **30,31** and for a motor, the **IEC80 B14a** is possible.

It is recommended to select a gearbox or geared motor that fits the application. Choosing a gearbox or geared motor that is too light or too heavy can cause damage (to the machine) and shorten the expected service life of the gearbox/geared motor

Overhung and axial loads

Determing overhung loads

Each transmission element has a transmission element factor f_z , this factor is different for each element.

In order to properly use transmission elements, always make sure that they are aligned properly on the shaft of the gearbox and or the shaft of the machine or other application. It is important to check that the transmission element is mounted properly before use, the element might cause problems in dynamic situations if this isn't checked

$$F_r = \frac{M \cdot 2000}{d_0} \cdot fz$$

F_r = overhung load [N]
M = Torque [Nm]
d_0 = Mean diameter of the mounted element [mm]
F_z = Element factor [see table above]

Transmission elements	Transmission elements Factor Fz	Comments
Gears	1.00	≥ 17 Teeth
	1.15	< 17 Teeth
Chain sprockets	1.00	≥ 20 Teeth
	1.25	< 20 Teeth
	1.40	< 13 Teeth
Narrow V-belt Pulleys	1.75	Influence of the tensile force
Flat Belt Pulleys	2.50	Influence of the tensile force
Toothed Belt Pulleys	2.50	Influence of the tensile force

Rated bearing service life

The rated bearing service life L_{10h} (in hours, according to **ISO 281**) is used to calculate the estimated bearing life in hours. For special operating conditions the modified service life should be used.

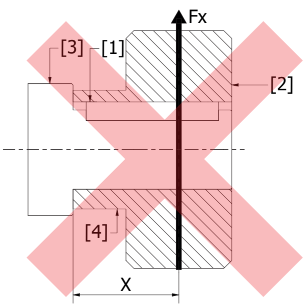
$$L_{10h} = \frac{10^6}{60 \cdot n_2} \cdot \left(\frac{C}{F_r}\right)$$

L_{10h} = Rated service life [hour]
C = Basic dynamic load rating, bearing [kN]
F_r = Equivalent dynamic load, bearing [kN]
ρ = Exponent for the life equation, ρ=3 for ball bearings, ρ=10/3 for roller bearings
n_2 = Gearbox output speed [rpm]

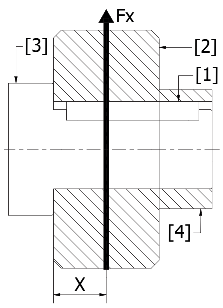
Preferred mounting for overhung loads

The preferred way of mounting the overhung load for sprockets, gears and other transmissions is with the hub **[4]** at the end of the shaft **[3]** and the sprocket/gear **[2]** against the shoulder, see **[B]** in the figure below. This method ensures a better load distribution on the end of the shaft.

[A] NOT Preferred



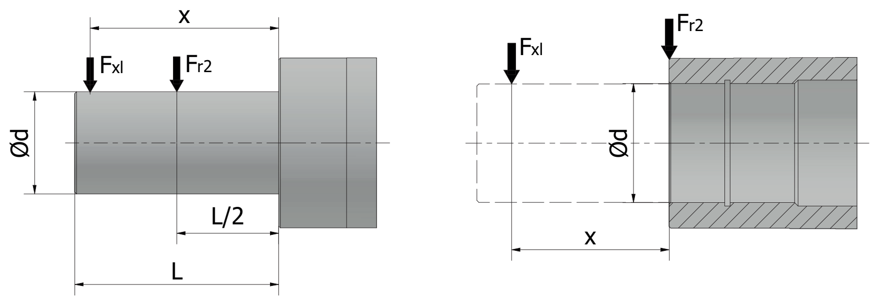
[B] Preferred



nr.	Part Name
[1]	Key
[2]	Sprocket / Gear
[3]	Solid shaft
[4]	Hub
[Fx]	Radial Force on the Sprocket / Gear
[X]	Distance to center of mass and force

Overhung load conversion for off-centre force applications

The rated bearing life is the basis for determining the permissible overhung load. The permissible overhung loads for foot mounted gearboxes with solid shafts can be calculated with the following calculation.



$$F_{xL}=F_{r2}\cdot\frac{a}{b+x}$$

F_{xL} = Permitted overhung load based on bearing service life[N]
F_{r2} = Permitted overhung load (x=L/2) for foot mounted gearboxes according to the selection tables [N]
F_{r2max} = Maximum permitted overhung load (x=L/2) for foot mounted gearboxes according to the sellection tables [N]
x = Distance from the shaft shoulder to the applied force [mm]
a,b ød, L = Gear unit constant for overhung load conversions [mm]

The values in table are for the foot mounted gearboxes with solid shaft only, the measurements are for the standard shafts.

FV	a [mm]	b [mm]	Ød [mm]	L [mm]	Fr2 max [N]
FV 030	65	50	14	30	1830
FV 040	84	64	18	40	3490
FV 050	101	76	25	50	4840
FV 063	120	95	25	50	6270
FV 075	131	101	28	60	7380
FV 090	162	122	35	80	8180

FKA	a [mm]	b [mm]	Ød [mm]	L [mm]
FKA 38	123,5	98,5	25	50
FKA 48	153,5	123,5	30	60
FKA 68	181,3	141,3	40	80
FKA 78	215,8	165,8	50	100
FKA 88	252	192	60	120

FFA	a [mm]	b [mm]	Ød [mm]	L [mm]
FFA 38	123,5	98,5	25	50
FFA 48	153,5	123,5	30	60
FFA 68	181,3	141,3	40	80
FFA 78	215,8	165,8	50	100

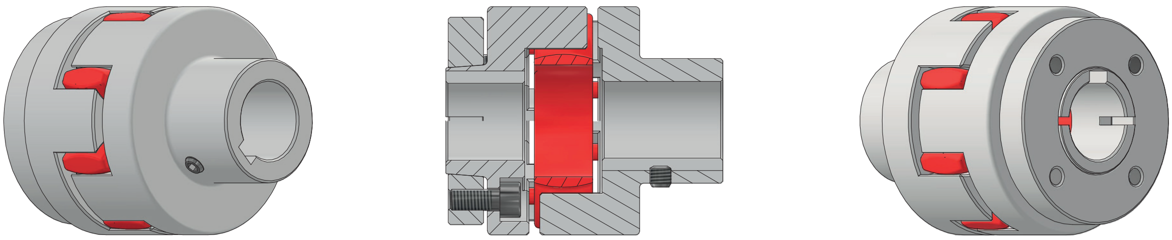
FRC	a [mm]	b [mm]	Ød [mm]	L [mm]
FRC 01	103	83	20	40
FRC 02	116,5	91,5	25	50

FK	a [mm]	b [mm]	Ød [mm]	L [mm]
FK 28 B/C	104	78	25	50
FK 38 B/C	118	93	25	50
FK 48 B/C	131	101	28	60
FK 58 B/C	159	119	35	80

FS(A)	a [mm]	b [mm]	Ød [mm]	L [mm]
FS(A) 38	118,5	98,5	20	40
FS(A) 48	130	105	25	50
FS(A) 58	150	120	30	60
FS(A) 68	184	149	35	70

FR	a [mm]	b [mm]	Ød [mm]	L [mm]
FR 38	118	93	25	50
FR 48	137	107	30	60
FR 68	168,5	133,5	35	70

The use of couplings



Example of a flexible coupling

Couplings are usually needed when a gearbox is rigidly mounted to a machine or other application. A coupling offers some room for misalignment that may be present or develop during use of the gearbox.

Not all misalignments can be statically determined, some may develop during dynamic processes are only present during use of the gearbox

Couplings give room for these misalignments and ensure the service life of the bearings inside of the gearbox, by offering a bit more room for error when there are misalignments.

There are different types of couplings that can be used in such applications, one example is a flexible coupling ***,see: example of a flexible coupling***.
Flexible couplings often have three parts, one for the shaft of the machine or application,
one for the shaft of the gearbox and a part that gives flexibility. The flexible part is often made of rubber or another kind of polymer.

Note: A coupling slightly increases the temperature of the shafts, due to friction and slightly decreases the efficiency of the gearbox.

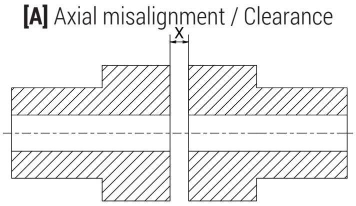
Mounting of couplings

To properly mount the couplings and prevent excessive wear on the gearbox, it is necessary to mount the couplings correctly.
To mount a coupling properly please pay attention to the following types of misalignment.

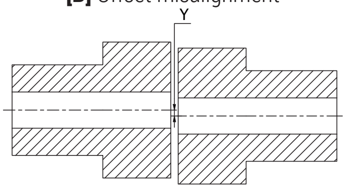
Note: The amount of allowable misalignment is often specified in the coupling datasheet, from the coupling manufacturer

Never mount couplings onto the shaft by hitting them with a hammer, this can cause damage to the gearbox bearings and can reduce the gearbox service life

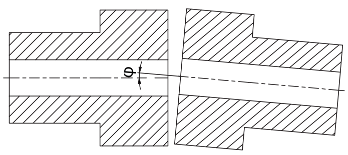
[A] Axial misalignment / Clearance



[B] Offset misalignment



[C] Angular misalignment



[A] Horizontal misalignment/Clearance:
Make sure that the horizontal misalignment/clearance [X] does not exceed the minimum and maximum clearance. This value is dependant on the type of coupling, material of the coupling and bore/shaft diameter and length. $X_{min} \leq X \leq X_{max}$, where $X_{min} > 0$.

Note: For the allowable clearance see the coupling manufacturers data sheet.

[B] Axial misalignment:
Make sure that the axial misalignment [Y] is as close to 0 as possible, in general axial misalignment will cause wear when the misalignment is too big.

[C] Angular misalignment:
Make sure the angular misalignment [φ] is as close to 0 (degrees) as possible, excessive angular misalignment will cause damage.

Couplings allow small misalignments, but excessive misalignment and couplings that aren't mounted properly can still cause damage to the gearbox and or machine or other applications.

Possible Geometrical Combinations

FRC 01

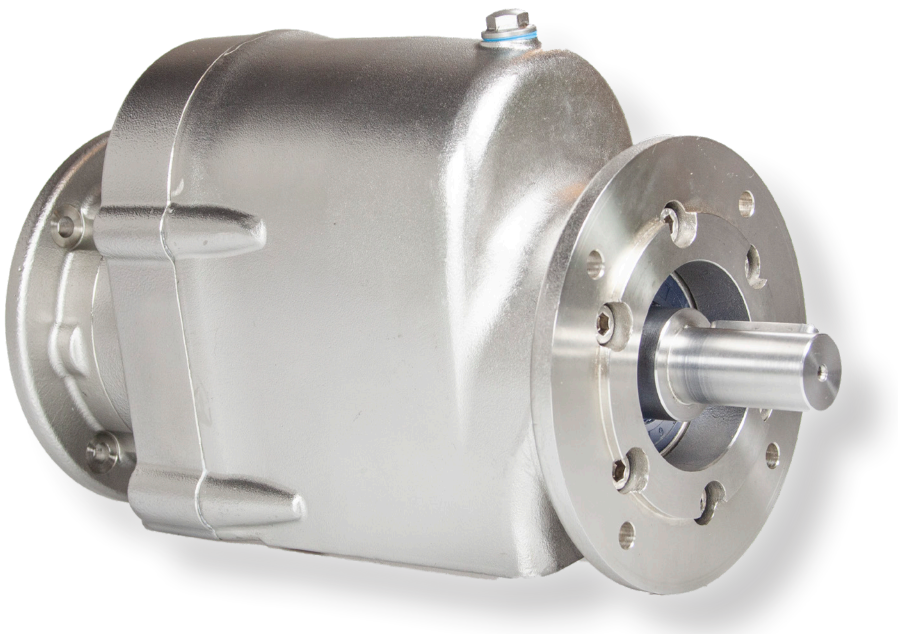
Maximum Torque = 120 Nm @ N1 = 1400 min^{-1}

n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	IEC63 B5	IEC71 B14A	IEC80 B14A	IEC90 B14A
26	120	2600	53,33	96 %	V	V		
31	120	2600	45,89	96 %	V	V	V	
35	120	2600	40,10	96 %	V	V	V	
39	120	2560	35,47	96 %	V	V	V	
49	120	2380	28,50	96 %	V	V	V	
59	120	2230	23,56	96 %	V	V	V	V
71	120	2100	19,83	96 %	V	V	V	V
78	90	2030	17,86	96 %	V	V	V	
96	120	1900	14,62	96 %	V	V	V	V
101	90	1860	13,80	96 %	V	V	V	V
118	120	1770	11,90	96 %	V	V	V	V
143	120	1660	9,81	96 %	V	V	V	V
153	80	1630	9,17	96 %	V	V	V	V
181	80	1540	7,72	96 %	V	V	V	V
246	70	1390	5,69	96 %	V	V	V	V
302	70	1290	4,63	96 %	V	V	V	V

FRC 02

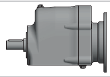
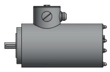
Maximum Torque = 200 Nm @ N1 = 1400 min^{-1}

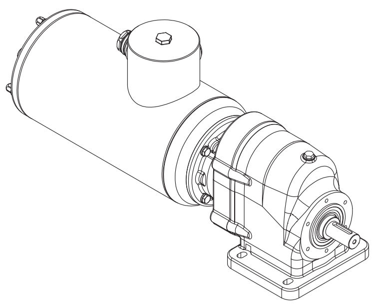
n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	IEC63 B5	IEC71 B14A	IEC80 B14A	IEC90 B14A
26	200	4500	54,00	96 %	V	V	V	
30	200	4500	46,46	96 %	V	V	V	
34	200	4500	40,60	96 %	V	V	V	V
39	200	4270	35,91	96 %	V	V	V	V
48	200	3970	28,88	96 %		V	V	V
59	200	3730	23,85	96 %		V	V	V
70	200	3520	20,08	96 %		V	V	V
82	140	3330	17,10	96 %		V	V	
95	200	3180	14,81	96 %		V	V	V
106	140	3060	13,21	96 %			V	V
116	200	2970	12,05	96 %			V	V
141	200	2780	9,93	96 %			V	V
159	120	2670	8,78	96 %			V	V
189	120	2520	7,39	96 %			V	V
257	100	2280	5,45	96 %			V	V
316	100	2120	4,43	96 %				V
383	80	1990	3,66	96 %				V



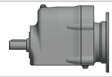
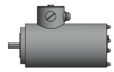
Gearbox Selection Tables

0,12 - 0,18 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
0,12	26	42	53,33	2600	2,9	FRC 01 IEC63	631-4 B5
	31	36	45,89	2600	3,3		
	35	32	40,1	2600	3,8		
	39	28	35,47	2560	4,3		
	49	22	28,5	2380	5,4		
	59	18,5	23,56	2230	6,5		
	71	15,6	19,83	2100	7,7		
	78	14	17,86	2030	6,4		
	96	11,5	14,62	1900	10,4		
	101	10,8	13,8	1860	8,3		
	118	9,4	11,9	1770	12,8		
	143	7,7	9,81	1660	15,6		
	153	7,2	9,17	1630	11,1		
	181	6,1	7,72	1540	13,2		
	246	4,5	5,69	1390	15,7		
	302	3,6	4,63	1290	19,2		
	366	3	3,82	1210	23,3		
0,18	26	63	53,33	2600	1,9	FRC 01 IEC63	632-4 B5
	31	54	45,89	2600	2,2		
	35	47	40,1	2600	2,5		
	39	42	35,47	2560	2,9		
	49	34	28,5	2380	3,6		
	59	28	23,56	2230	4,3		
	71	23	19,83	2100	5,1		
	78	21	17,86	2030	4,3		
	96	17,2	14,62	1900	7		
	101	16,3	13,8	1860	5,5		
	118	14	11,9	1770	8,6		
	143	11,6	9,81	1660	10,4		
	153	10,8	9,17	1630	7,4		
	181	9,1	7,72	1540	8,8		
	246	6,7	5,69	1390	10,4		
	302	5,5	4,63	1290	12,8		
	366	4,5	3,82	1210	15,5		
	16,9	98	53,33	2600	1,2	FRC 01 IEC71	711-6 B14a
	19,6	84	45,89	2600	1,4		
	22	74	40,1	2600	1,6		
	25	65	35,47	2600	1,8		
	32	52	28,5	2600	2,3		
	38	43	23,56	2580	2,8		
	45	36	19,83	2440	3,3		
	50	33	17,86	2360	2,7		
	26	64	54	4500	3,1	FRC 02 IEC63	632-4 B5

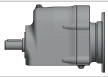
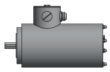


0,18 - 0,25 kW

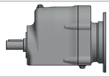
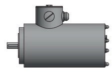
P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
0,18	16,7	99	54	4500	2	FRC 02 IEC71	711-6 B14a
	19,4	85	46,46	4500	2,3		
	22	74	40,6	4500	2,7		
	25	66	35,91	4500	3		
	31	53	28,88	4500	3,8		
0,25	26	87	53,33	2600	1,4	FRC 01 IEC71	711-4 B14a
	31	75	45,89	2600	1,6		
	35	66	40,1	2600	1,8		
	39	58	35,47	2560	2,1		
	49	47	28,5	2380	2,6		
	59	39	23,56	2230	3,1		
	71	32	19,83	2100	3,7		
	78	29	17,86	2030	3,1		
	96	24	14,62	1900	5		
	101	23	13,8	1860	4		
	118	19,5	11,9	1770	6,2		
	143	16,1	9,81	1660	7,5		
	153	15	9,17	1630	5,3		
	181	12,6	7,72	1540	6,3		
	246	9,3	5,69	1390	7,5		
	302	7,6	4,63	1290	9,2		
	366	6,3	3,82	1210	11,2		
	19,6	117	45,89	2600	1	FRC 01 IEC71	712-6 B14a
	22	102	40,1	2600	1,2		
	25	90	35,47	2600	1,3		
	32	73	28,5	2600	1,7		
	38	60	23,56	2580	2		
	45	51	19,83	2440	2,4		
	50	45	17,86	2360	2		
	62	37	14,62	2200	3,2		
	65	35	13,8	2160	2,6		
	76	30	11,9	2060	4		
	92	25	9,81	1930	4,8		
	98	23	9,17	1890	3,4		
	117	19,7	7,72	1780	4,1		
	158	14,5	5,69	1610	4,8		
	194	11,8	4,63	1500	5,9		
	236	9,7	3,82	1410	7,2		
	26	88	54	4500	2,3	FRC 02 IEC71	711-4 B14a
	30	76	46,46	4500	2,6		
	34	66	40,6	4500	3		
	39	59	35,91	4270	3,4		
	16,7	138	54	4500	1,5	FRC 02 IEC71	712-6 B14a
	19,4	118	146,46	4500	1,7		
	22	103	40,6	4500	1,9		
	25	91	35,91	4500	2,2		
	31	74	28,88	4500	2,7		

P_{1n} = Rated Motor Power [kW]
n_2 = Output Speed [min^{-1}]
M_{2n} = Rated Output torque [Nm]
M_{2max} = Maximum permissible output torque [Nm]
F_{r2} = Permitted Overhung Load Output Side [N]
i = Gear unit Ratio
η% = Transmission Efficiency %
fs = Service Factor

0,37 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
0,37	31	111	45,89	2600	1,1	FRC 01 IEC71	712-4 B14a
	35	97	40,1	2600	1,2		
	39	86	35,47	2560	1,4		
	49	69	28,5	2380	1,7		
	59	57	23,56	2230	2,1		
	71	48	19,83	2100	2,5		
	78	43	17,86	2030	2,1		
	96	35	14,62	1900	3,4		
	101	33	13,8	1860	2,7		
	118	29	11,9	1770	4,2		
	143	24	9,81	1660	5		
	153	22	9,17	1630	3,6		
	181	18,7	7,72	1540	4,3		
	246	13,8	5,69	1390	5,1		
	302	11,2	4,63	1290	6,2		
	366	9,3	3,82	1210	7,6		
	32	107	28,5	2600	1,1	FRC 01 IEC80	801-6 B14a
	38	89	23,56	2580	1,4		
	45	75	19,83	2440	1,6		
	50	67	17,86	2360	1,3		
	62	55	14,62	2200	2,2		
	65	52	13,8	2160	1,7		
	76	45	11,9	2060	2,7		
	92	37	9,81	1930	3,2		
	98	35	9,17	1890	2,3		
	117	29	7,72	1780	2,7		
	26	131	54	4500	1,5	FRC 02 IEC71	712-4 B14a
	30	113	46,46	4500	1,8		
	34	98	40,6	4500	2		
	39	87	35,91	4270	2,3		
	48	70	28,88	3970	2,9		
	59	58	23,85	3730	3,5		
	70	49	20,08	3520	4,1		
	82	41	17,1	3330	3,4		
	95	36	14,81	3180	5,6		
	16,7	204	54	4500	1	FRC 02 IEC80	801-6 B14a
	19,4	175	46,46	4500	1,1		
	22	153	40,6	4500	1,3		
	25	135	35,91	4500	1,5		
	31	109	28,88	4500	1,8		
	38	90	23,85	4320	2,2		
	45	76	20,08	4080	2,6		
	53	64	17,1	3860	2,2		
	68	50	13,21	3550	2,8		

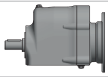
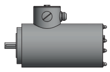
0,55 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
0,55	49	103	2850	2380	1,2	FRC 01 IEC80	801-4 B14a
	59	85	23,56	2230	1,4		
	71	71	19,83	2100	1,7		
	78	64	17,86	2030	1,4		
	96	53	14,62	1900	2,3		
	101	50	13,8	1860	1,8		
	118	43	11,9	1770	2,8		
	143	35	9,81	1660	3,4		
	153	33	9,17	1630	2,4		
	181	28	7,72	1540	2,9		
	246	20	5,69	1390	3,4		
	302	16,7	4,63	1290	4,2		
	366	13,8	3,82	1210	5,1		
	45	111	19,83	2440	1,1	FRC 01 IEC80	802-6 B14a
	62	82	14,62	2200	1,5		
	65	77	13,8	2160	1,2		
	76	67	11,9	2060	1,8		
	92	55	9,81	1930	2,2		
	98	51	9,17	1890	1,6		
	117	43	7,72	1780	1,8		
	158	32	5,69	1610	2,2		
	194	26	4,63	1500	2,7		
	236	21	3,82	1410	3,3		
	26	194	54	4500	1	FRC 02 IEC80	801-4 B14a
	30	167	46,46	4500	1,2		
	34	146	40,6	4500	1,4		
	39	129	35,91	4270	1,5		
	48	104	28,88	3970	1,9		
	59	86	23,85	3730	2,3		
	70	72	20,08	3520	2,8		
	82	62	17,1	3330	2,3		
	95	53	14,81	3180	3,7		
	106	48	13,21	3060	2,9		

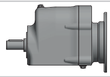
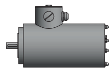
P_{1n} = Rated Motor Power [kW]
n_2 = Output Speed [min^{-1}]
M_{2n} = Rated Output torque [Nm]
M_{2max} = Maximum permissible output torque [Nm]
F_{r2} = Permitted Overhung Load Output Side [N]
i = Gear unit Ratio
η% = Transmission Efficiency %
fs = Service Factor

Gearbox Selection Tables

0,55 - 0,75 kW

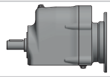
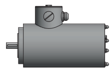
P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
0,55	25	201	35,91	4500	1	FRC 02 IEC80	802-6 B14a
	31	162	28,88	4500	1,2		
	38	134	23,85	4320	1,5		
	45	113	20,08	4080	1,8		
	53	96	17,1	3860	1,5		
	61	83	14,81	3680	2,4		
	68	74	13,21	3550	1,9		
	103	49	8,78	3090	2,4		
0,75	59	116	23,56	2230	1	FRC 01 IEC80	802-4 B14a
	71	97	19,83	2100	1,2		
	78	88	17,86	2030	1		
	96	72	14,62	1900	1,7		
	101	68	13,8	1860	1,3		
	118	58	11,9	1770	2,1		
	143	48	9,81	1660	2,5		
	153	45	9,17	1630	1,8		
	181	38	7,72	1540	2,1		
	246	28	5,69	1390	2,5		
	302	23	4,63	1290	3,1		
	366	18,8	3,82	1210	3,7		
	62	112	14,62	2200	1,1	FRC 01 IEC90	90S-6 B14a
	76	91	11,9	2060	1,3		
	92	75	9,81	1930	1,6		
	98	70	9,17	1890	1,1		
	117	59	7,72	1780	1,4		
	158	43	5,69	1610	1,6		
	194	35	4,63	1500	2		
	236	29	3,82	1410	2,4		
	34	199	40,6	4500	1	FRC 02 IEC80	FRC 02 IEC80
	39	176	35,91	4270	1,1		
	48	142	28,88	3970	1,4		
	59	117	23,85	3730	1,7		
	70	99	20,08	3520	2		
	82	84	17,1	3330	1,7		
	95	73	14,81	3180	2,7		
	106	65	13,21	3060	2,2		
	116	59	12,05	2970	3,4		
	141	49	9,93	2780	4,1		
	159	43	8,78	2670	2,8		
	189	36	7,39	2520	3,3		
	257	27	5,45	2280	3,7		

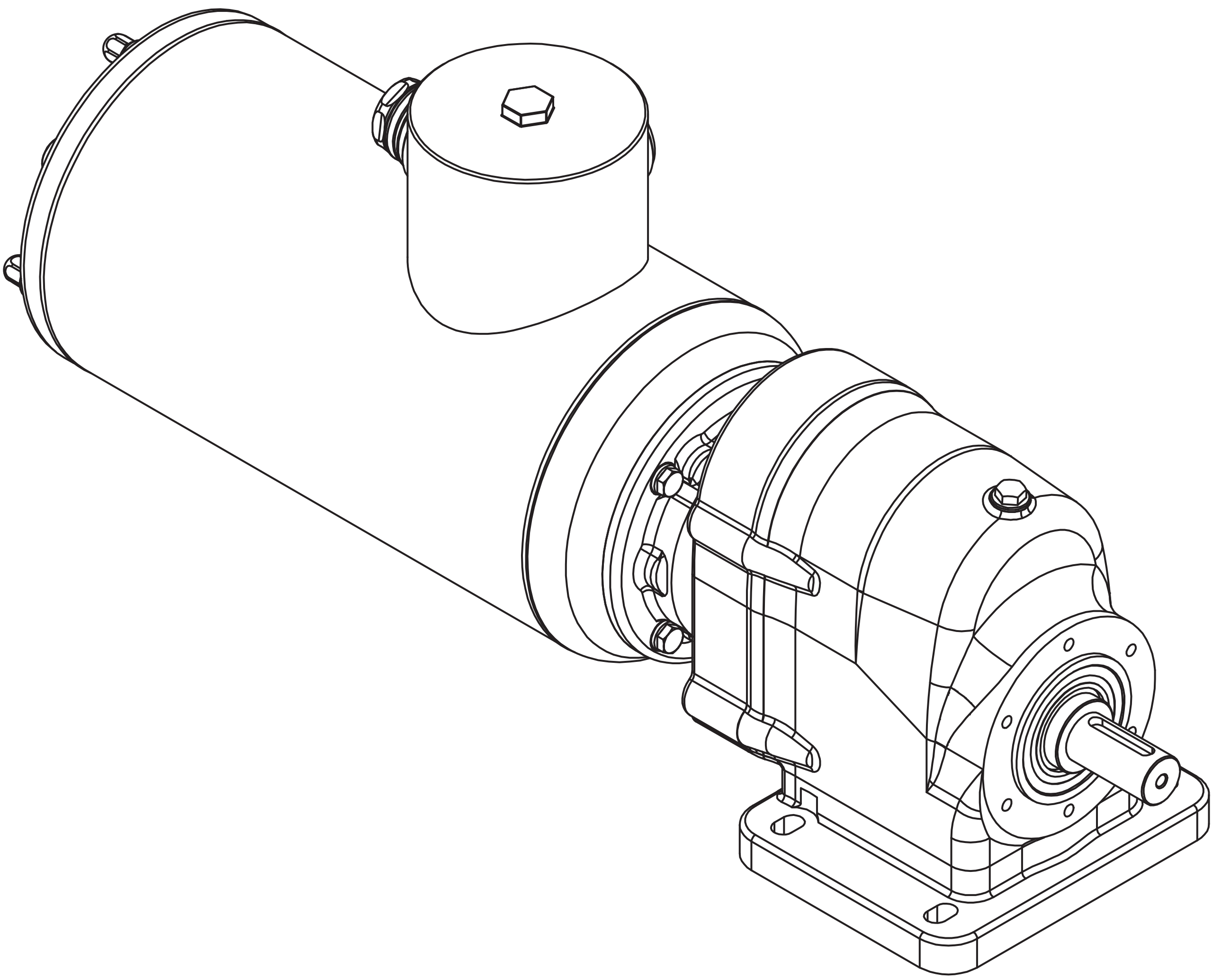
0,75 - 1,1 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
0,75	38	182	23,85	4320	1,1	FRC 02 IEC90	90S-6 B14a
	45	153	20,08	4080	1,3		
	61	113	14,81	3680	1,8		
	68	101	13,21	3550	1,4		
	75	92	12,05	3440	2,2		
	91	76	9,93	3220	2,6		
	103	67	8,78	3090	1,8		
	122	56	7,39	2920	2,1		
	165	42	5,45	2640	2,4		
1,1	96	105	14,62	1900	1,1	FRC 01 IEC90	90S-4 B14a
	118	86	11,9	1770	1,4		
	143	71	9,81	1660	1,7		
	153	66	9,17	1630	1,2		
	181	56	7,72	1540	1,4		
	246	41	5,69	1390	1,7		
	302	33	4,63	1290	2,1		
	366	28	3,82	1210	2,5		
	92	110	9,81	1930	1,1	FRC 01 IEC90	90L-6 B14a
	158	64	5,69	1610	1,1		
	194	52	4,63	1500	1,3		
	236	43	3,82	1410	1,6		
	59	172	23,85	3730	1,2	FRC 02 IEC90	90S-4 B14a
	70	145	20,08	3520	1,4		
	95	107	14,81	3180	1,9		
	106	95	13,21	3060	1,5		
	116	87	12,05	2970	2,3		
	141	72	9,93	2780	2,8		
	159	63	8,78	2670	1,9		
	189	53	7,39	2520	2,3		
	257	39	5,45	2280	2,5		
	316	32	4,43	2120	3,1		
	383	26	3,66	1990	3		
	61	166	14,81	3680	1,2	FRC 02 IEC90	90L-6 B14a
	75	135	12,05	3440	1,5		
	91	111	9,93	3220	1,8		
	103	98	8,78	3090	1,2		
	122	83	7,39	2920	1,4		
	165	61	5,45	2640	1,6		
	203	50	4,43	2460	2		
	246	41	3,66	2310	2		

P_{1n} = Rated Motor Power [kW]
n_2 = Output Speed [min^{-1}]
M_{2n} = Rated Output torque [Nm]
M_{2max} = Maximum permissible output torque [Nm]
F_{r2} = Permitted Overhung Load Output Side [N]
i = Gear unit Ratio
η% = Transmission Efficiency %
fs = Service Factor

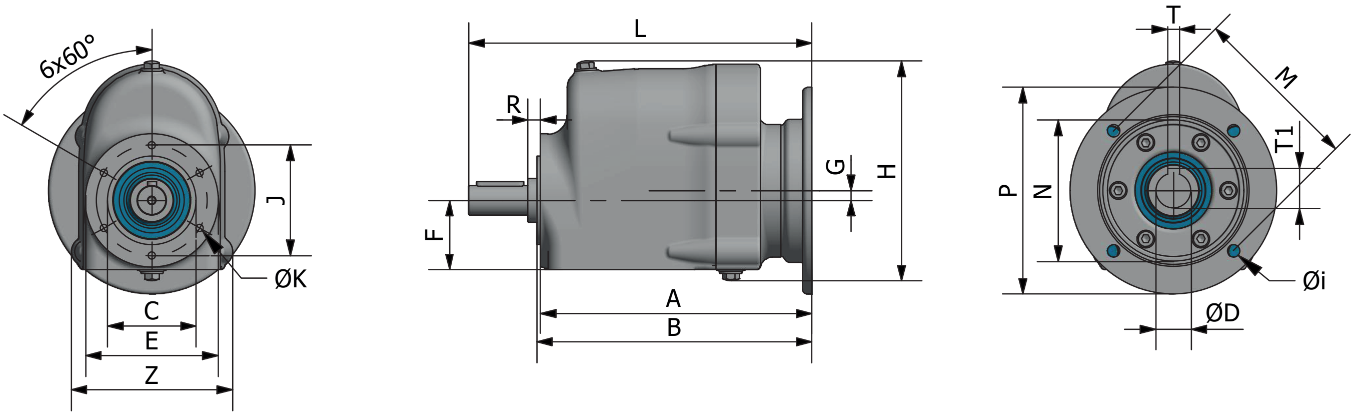
1,5 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
1,5	118	117	11,9	1770	1	FRC 01 IEC90	90L-4 B14a
	143	96	9,81	1660	1,2		
	181	76	7,72	1540	1,1		
	246	56	5,69	1390	1,3		
	302	45	4,63	1290	1,5		
	366	38	3,82	1210	1,9		
	95	145	14,81	3180	1,4	FRC 02 IEC90	90L-4 B14a
	116	118	12,05	2970	1,7		
	141	98	9,93	2780	2,1		
	159	86	8,78	2670	1,4		
	189	73	7,39	2520	1,7		
	257	54	5,45	2280	1,9		
	316	44	4,43	2120	2,3		
	383	36	3,66	1990	2,2		



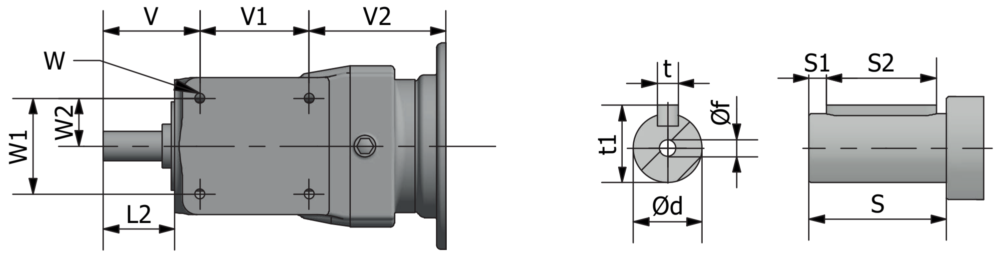
General Dimensions

General dimensions



Gearbox	Motor	A	B	C	D	E	F	G	H	i	J	ØK	L	M	N	P	R	T	T1	Z
FRC01	IEC63 B5	184	186,5	60	11	90	47	6,5	149	8,5	75	M6	232,5	115	95	140	8,5	4	12,8	110
	IEC71 B14a	185	187,5		14					6,5			233,5	85	70	105		5	16,3	
	IEC80 B14a	184	186,5		19								232,5	100	80	120		6	21,8	
	IEC90 B14a				24					8,5				115	95	140		8	27,3	
FRC02	IEC63 B5	195,5	198	70	11	100	53	11,5	161	8,5	85	M8	254	115	95	140	8,5	4	12,8	118
	IEC71 B14a	196,5	199		14					6,5			255	85	70	105		5	16,3	
	IEC80 B14a	195,5	198		19								254	100	80	120		6	21,8	
	IEC90 B14a				24					8,5				115	95	140		8	27,3	

Foot & shaft



Foot

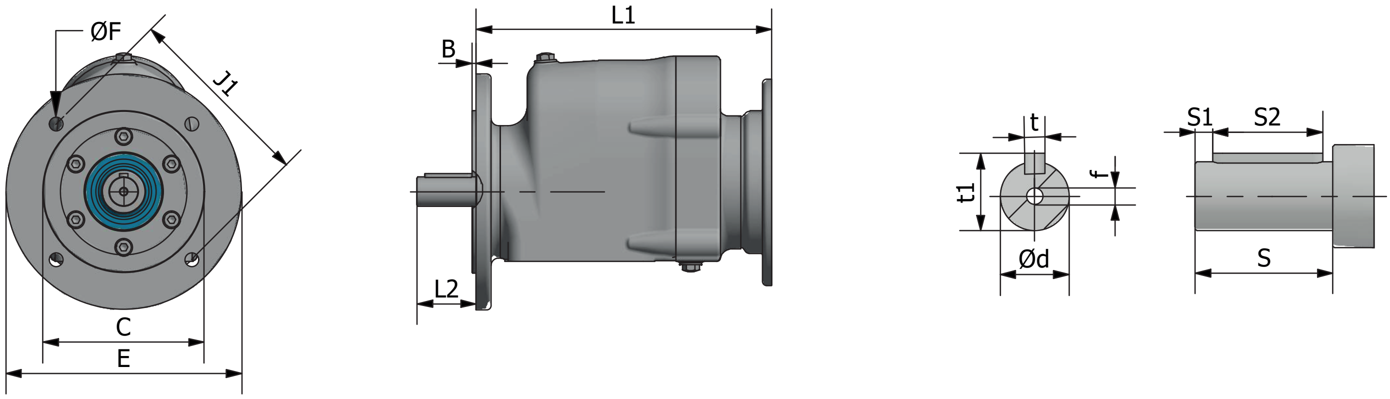
Gearbox	Motor	V	V1	V2	W	W1	W2	L2
FRC01	IEC63 B5	65,5	74	93	M8	32,5	65	48,5
	IEC71 B14a			94				
	IEC80 B14a			93				
	IEC90 B14a							
FRC02	IEC63 B5	91	75	88	M8	37,5	75	58,5
	IEC71 B14a			89				
	IEC80 B14a			88				
	IEC90 B14a							

Shaft

Gearbox	Motor	d[h6]	Øf	S	S1	S2	t	t1
FRC01	IEC63 B5	20	M8	40	5	32	6	22,5
	IEC71 B14a							
	IEC80 B14a							
	IEC90 B14a							
FRC02	IEC63 B5	25	M10	50	3,5	40	8	28
	IEC71 B14a							
	IEC80 B14a							
	IEC90 B14a							

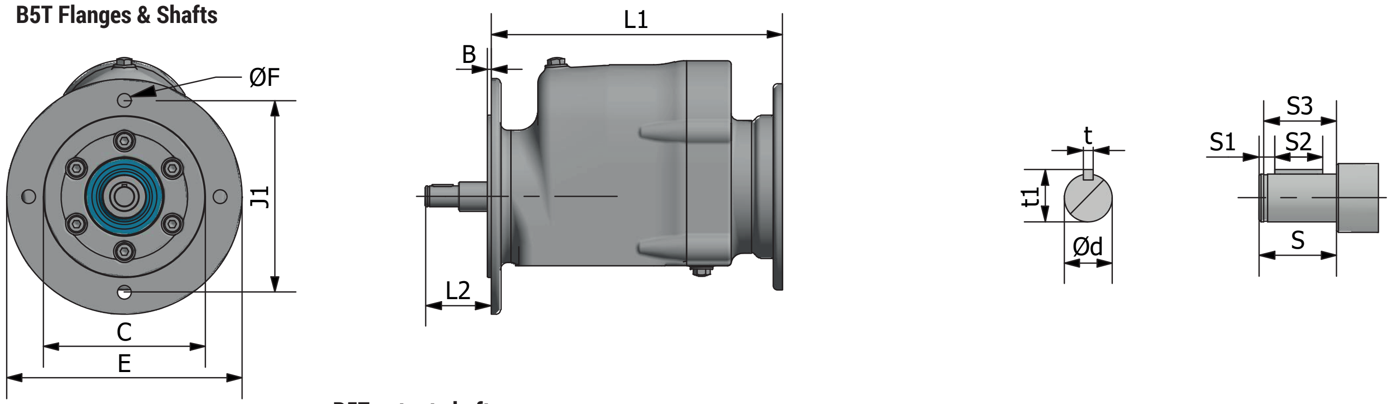
Different solid shaft dimensions possible on request

Flanges



Gearbox	Flange	B	C	E	ØF	J1	L1	L1 (IEC71)	L2	d[h6]	f	S	S1	S2	t	t1
FRC01	SS 075 FL 120	3	80	120	6,6	100	200,5	201,5	40	20	M8	40	5	32	6	22,5
	SS 075 FL 140		95	140	9	115										
	SS 075 FL 160		110	160		130										
FRC02	SS 085 FL 140	4	95	140	9	115	211,5	212,5	50	25	M10	50	3,5	40	8	28
	SS 085 FL 160		110	160		130										
	SS 085 FL 200		130	200	11	165										

B5T Flanges & Shafts



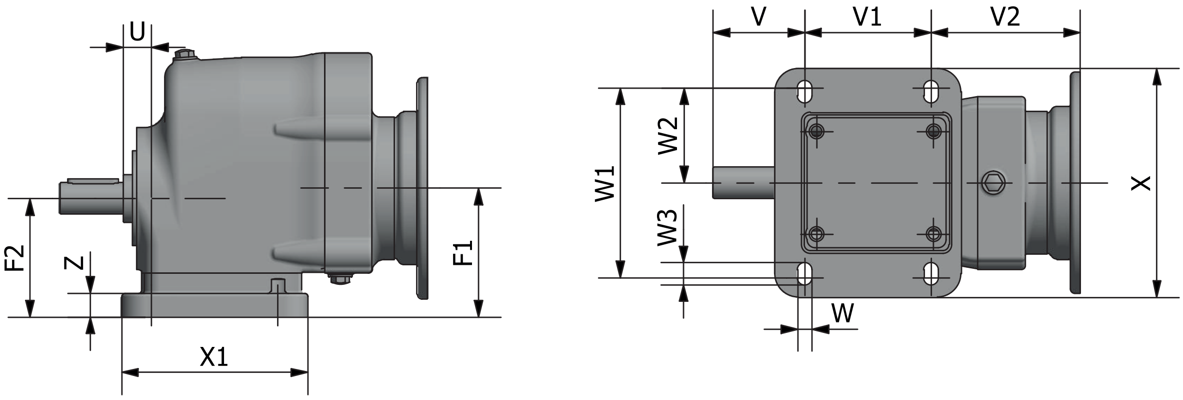
B5T output shaft

Gearbox	Shaft type	d[h6]	S	S1	S2	S3	t	t1	L2
FRC01	SA12 B5T1	12	20,5	4,5	14	19,5	3	13,2	35
	SA14 B5T1	14	22,5			21,1	3	15,2	32
	SA14 B5T2								41
	SA16 B5T3	16	26	6	18	24,1	4	17,5	51

B5T output flange

Gearbox	Flange	Shaft	B	C	E	ØF	J1	L1	L1 (IEC71)
FRC 01	SS 075 FL 120 B5T1	SA12	3	80	120	6,6	100	200,5	201,5
		SA14							
	SS 075 FL 160 B5T2	SA14	2,5	110	160	9	130	197,5	198,5
	SS 085 FL 200 B5T3	SA16		130	200	13,5	165		

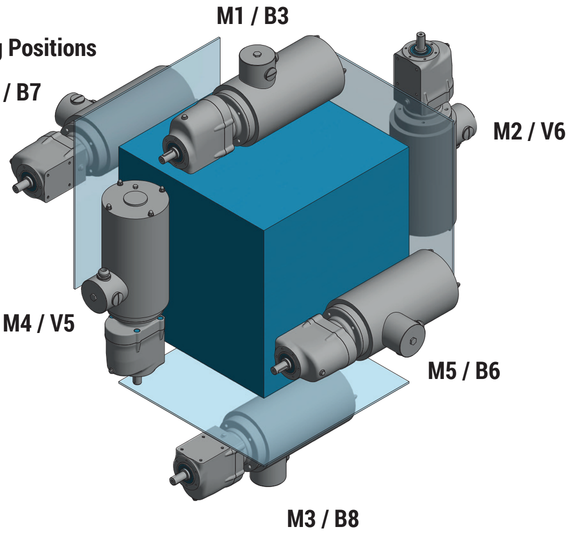
Optional foot



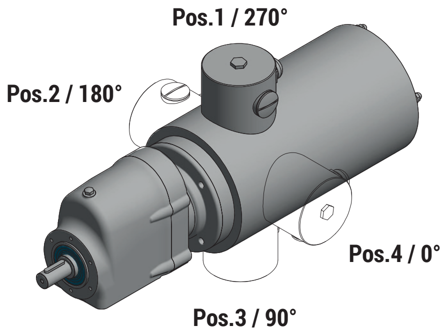
Gearbox	Foot	F2	U	V	V1	V2	V2 (IEC71)	W	W1	W2	W3	X	X1	Z
FRC01	M11	75	18	58	80	94,5	95,5	9	60	120	14	145	118	15
	G1	106	14	54	62	116,5	117,5		64	128	9	150	114	12
FRC02	M21	80	18	68	87	99	100	9	55	110	14	145	125,5	15
	G2	125			72	114	115	11	80	160	11	185	126	16

Extra information

Mounting Positions



Terminal Box Positions



Lubrication Quantity

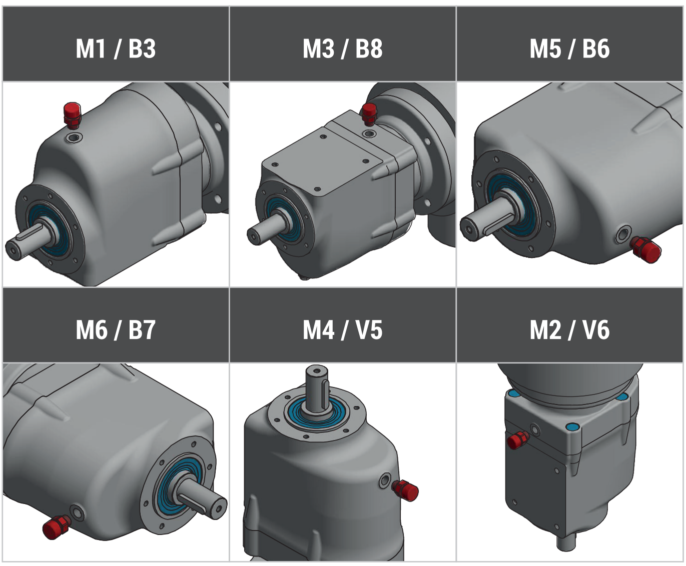
Oil Quantity in ML.	Mounting Position					
Gearbox	M1 (B3)	M3 (B8)	M6 (B7)	M5 (B6)	M4 (V5)	M2 (V6)
FRC 01	600	450	250	250	400	400
FRC 02	*	*	*	*	*	*

* in development

Lubrication Type

Lubrication Brand	Lubrication Type	
Matrix	Foodmax 460	Standard
Castrol	Optileb GT 460	Alternative
Bechem	Berusynth 460H1	Alternative
Shell	Casida Fluid GL460	Alternative
Mobil	SHC Cibus 460	Alternative

Debreather Positions



Weight

Gearbox	Weight
FRC 01	9.0 Kg
FRC 02	*

* in development

Given values are an average and may vary depending on oil quantity.

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3/3/2022

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Note: Unless otherwise stated all sizes are in millimeters