dertec®

Designed to Perform

Stainless Steel **Parallel Shaft Gearbox.**

FFA

FFA Parallel Shaft Gearbox

Dertec FFA series parallel shaft helical gear units have been specifically developed with a view to hygiene and cleanability. The design and shape aims to minimize build-up of dirt and contributes to less accumulation, adhesion of contaminants, and simplifies cleaning. Stainless steel gearbox housings do not only simplify cleaning but also contribute to reduce the use of strong chemical cleaning agents that, as a side effect, also benefits the surface water quality.

Dertec FFA series is a robust version of parallel shaft mounted gearboxes, widely used in the food industry and interchangeable with cast iron drives with EURO dimensions. Available in 4 sizes with standard hollow shaft diameters: 30, 35, 40 and 50 mm, ready for IEC motor mounting or with an integrated stainless steel Dertec motor. The maximum transmission ratio is 281.71: 1 and the maximum secondary torque is 1500 Nm.

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 machineries for the food industry.

Hardened shaft

All hollow shafts are produced in Duplex Stainless Steel 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 obtains a longer drip free operation compared to standard shaft / seal combinations made of SS304 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.

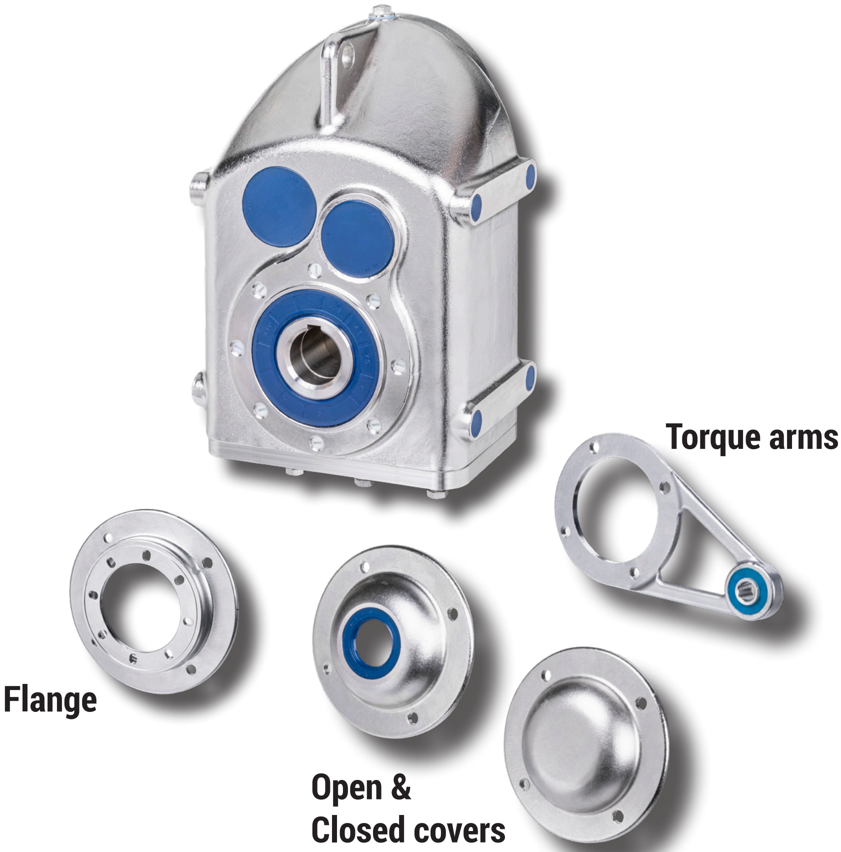
Laser engraved tag plate

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 lost 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 3,77 : 1 to 281,71 : 1
- IEC motor adaption versions (AM)
- Integrated motor versions (B5T..)
- Standard hollow shafts 30, 35, 40, 50 & 60 mm
- Extra hygienic optional shaft covers. (open and closed version)
- Easy clean torque arm with built in elastic element to reduce mis alignment.
- 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



Product Characteristics

FFA 38	
Ratio's	From 3.77 : 1
	To 128.51 : 1
Standard shaft	30mm
Max. Torque	200 Nm
Max. Power	3.0 kW

FFA 48	
Ratio's	From 4.99 : 1
	To 190.76 : 1
Standard shaft	35 mm
Max. Torque	400 Nm
Max. Power	3.0 kW

FFA 68	
Ratio's	From 3.97 : 1
	To 228.99 : 1
Standard shaft	40MM
Max. Torque	820 Nm
Max. Power	5.5 kW

FFA 78	
Ratio's	From 4.28 : 1
	To 281.71 : 1
Standard shaft	50 mm
Max. Torque	1500 Nm
Max. Power	7.5 kW

Easy Clean Open Cover	
FFA 38	SS 095 CO
FFA 48	SS 115 CO
FFA 68	SS 130 CO
FFA 78	SS 140 CO

Easy Clean Closed Cover	
FFA 38	SS 095 CC
FFA 48	SS 115 CC
FFA 68	SS 130 CC
FFA 78	SS 140 CC

Output Flanges	
FFA 38	SS 085 FL125
FFA 48	SS 095 FL 160
	SS 095 FL 180
FFA 68	SS 115 FL200
FFA 78	SS 130 FL 250

Torque Arms	
FFA 38	SS 095 MS L110S
	SS 095 MS L130S
FFA 38	SS 115 MS L160S
	SS 115 MS L200
FFA 68	SS 130 MS L200
FFA 78	SS 140 MS L

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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.

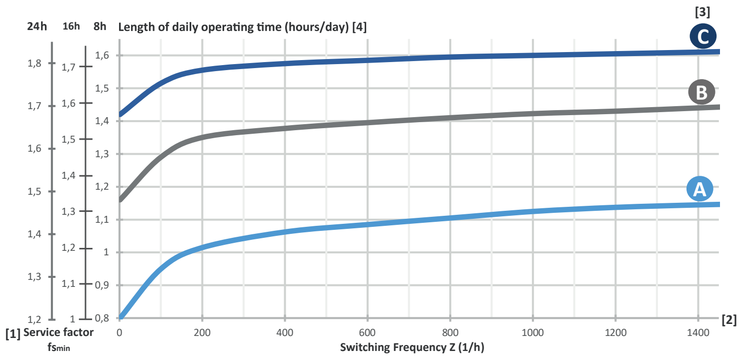
C: Heavy shock load, mass acceleration factor of **$f_a \leq 10$**.Examples of applications: Mixers for heavy materials, shears, presses, centrifuges, rotating supports, winches and lifts for heavy materials, heavy application elevators, grinding lathes, stone mills, bucket elevators, drilling machines,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

Service factor graph

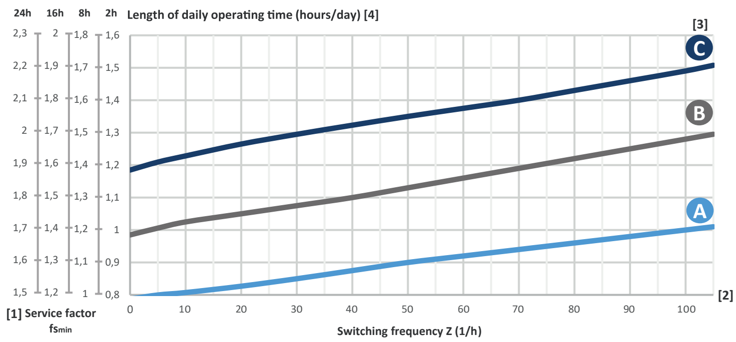
The determined Minimum **[1]** service factor is based on **[2]** switching frequency, **[3]** load classification and **[4]** length of daily operating time.

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:



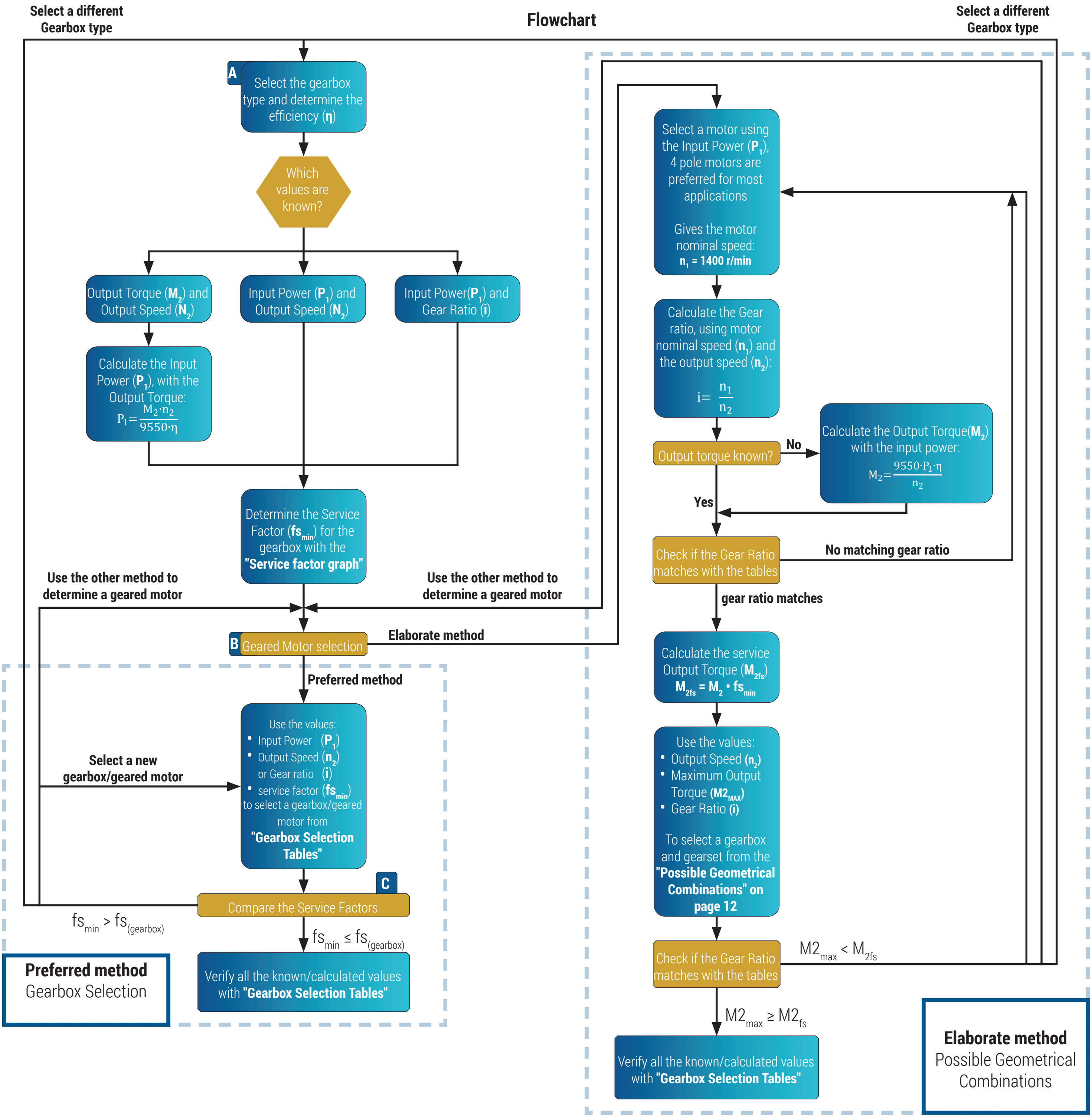
Service factor for low Switching frequency (Z), used mostly for worm- and helical worm gearboxes:



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 fs_{min} is smaller or equal to the service factor from the **"Gearbox Selection Tables"** $fs_{min} \leq fs_{gearbox}$.

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

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

Verify the results
If the service factor fs_{min} and $fs_{gearbox}$ 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?

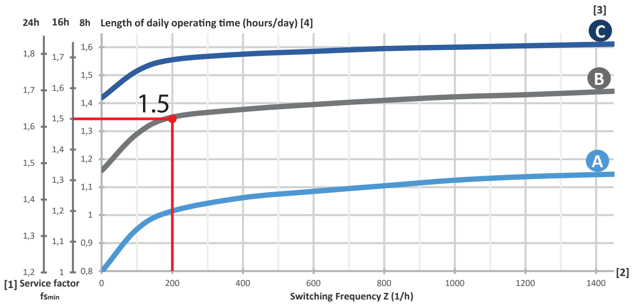
- Output torque- and speed
- ~~Input power- and speed~~
- ~~Input power and gear ratio~~

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	FK38B IEC71	712-4 B14a
	29	113	48.71	3190	1.80		
	36	91	39.29	2970	2.00		
	46	70	30.31	2720	2.80		
	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!

Example 2: Eleborate method

This example uses a different gearbox type but is generally applicable

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.

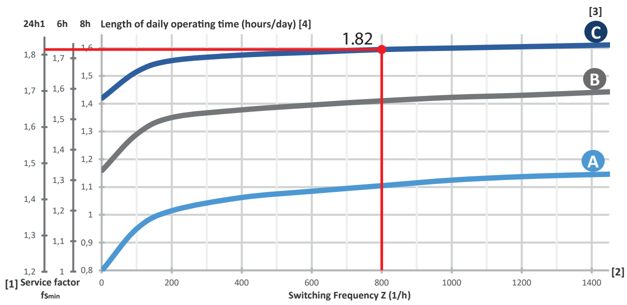
Which values are known?

- ~~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 • fs_{min} → 101,3 Nm • 1,82 = 184,37 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} → 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} → 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 $\mathbf{f_z}$, 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 $\mathbf{L_{10h}}$ (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.

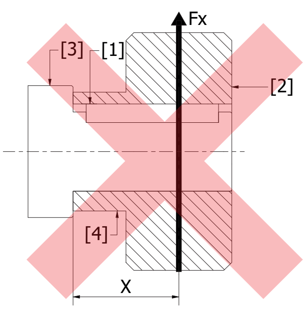
$$L_{10h} = \frac{10^6}{60 \cdot n_2} \cdot \left(\frac{C}{F_r}\right)$$

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]

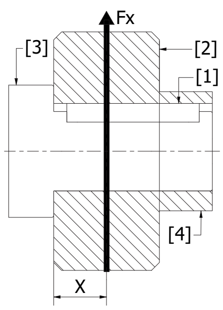
Preferred mounting for overhung loads

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



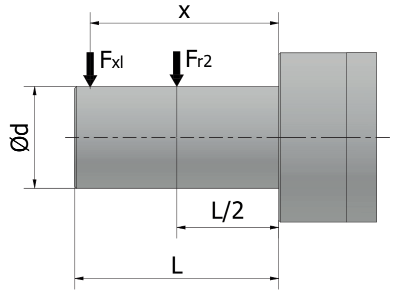
[B] Preferred

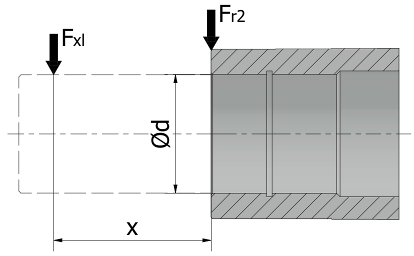


nr.	Part Name
[1]	Key
[2]	Sprocket / Gear
[3]	Solid shaft
[4]	Hub
[Fx]	Radial Force on the Sprocket / Gear
[X]	Distance to center of mass and force

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

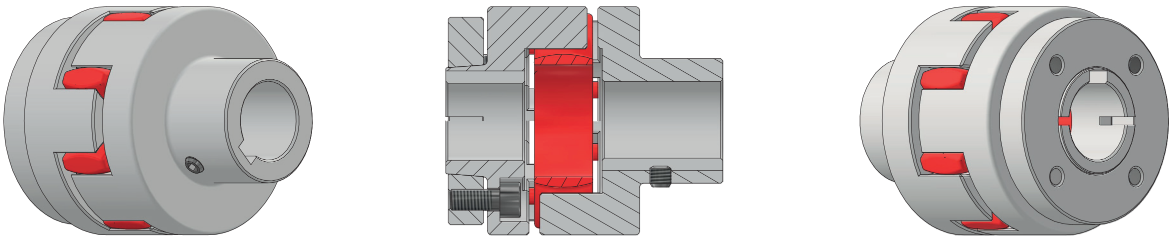
FRC	a [mm]	b [mm]	Ød [mm]	L [mm]
FRC 01	103	83	20	40
FRC 02	116,5	91,5	25	50

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.

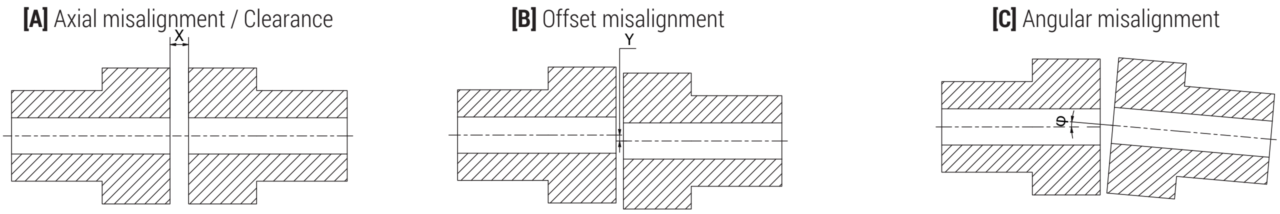
Note: A coupling slightly increases the temperature of the shafts, due to friction and slightly decreases the efficiency of the gearbox.

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] 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.

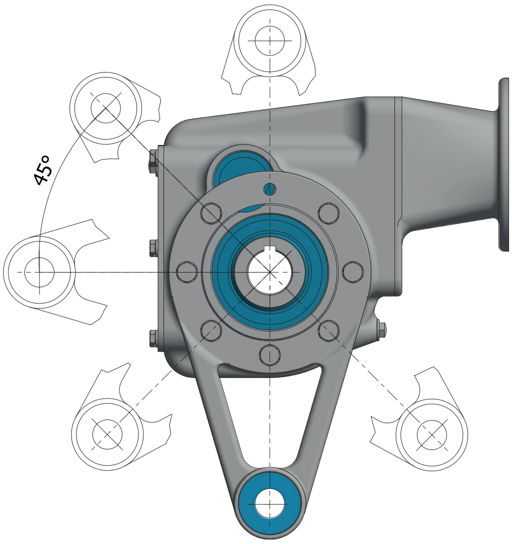
[C] Angular misalignment:
Make sure the angular misalignment [φ] is as close to 0 (degrees) as possible, excessive angular misalignment will cause damage.

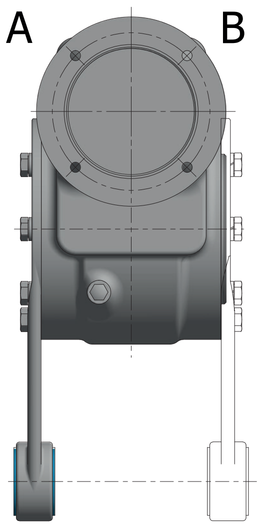
Couplings allow small misalignments, but excessive misalignment and couplings that aren't mounted properly can still cause damage to the gearbox and or machine or other applications.

Torque arm

A torque arm is an attachment for a gearbox that prevents the gearbox from spinning with the driven shaft. When a gearbox is mounted directly on the output shaft without any external support it is always necessary to use a torque arm.

Depending on the gearbox type and size, torque arms can be mounted in a multitude of different positions on the output sides of the gearbox, see the figure below for an example of the different positions.

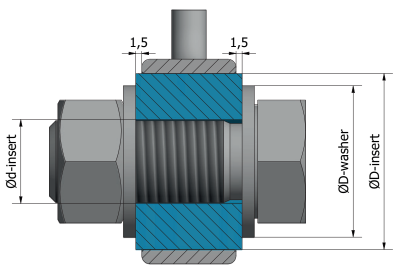


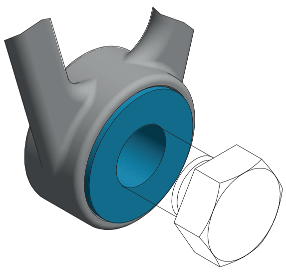


When mounting the torque arm pay attention to the following:

- A torque arm is used to prevent the gearbox from turning with the driven shaft, the torque arm does not prevent movement.
- It is important that the gearbox is allowed some movement when using a torque arm, to ensure that the gearbox bearings don't wear excessively.
- Make sure that the gearbox has enough clearance around it, so it is not in direct contact with the surroundings.
- It is always recommended to mount the torque arm on the gearbox side closest to the machine, this lowers the probability and the effect of misalignment.
- Avoid mounting the torque arm to a separate frame, this could cause misalignment. Mounting to the machine/application is always preferred.
- Always make sure the torque arm is properly mounted to the gearbox, and all available mounting holes are used.
- When using a torque arm, pay attention when mounting the torque arm to a "fixed" position. The torque arm should have enough room to move freely and should not be mounted too tight.
- When attaching the torque arm to a "fixed" position with a bolt, make sure that the bolt is hand tightened and that the rubber insert is not tightened too firm.
- Make sure when using a bolt to hold the torque arm in place, that the washer is smaller than the rubber insert (see figure below).
- If the rubber insert moves out of place, the alignment is not done properly. This does not mean that the torque arm is not tightened properly.

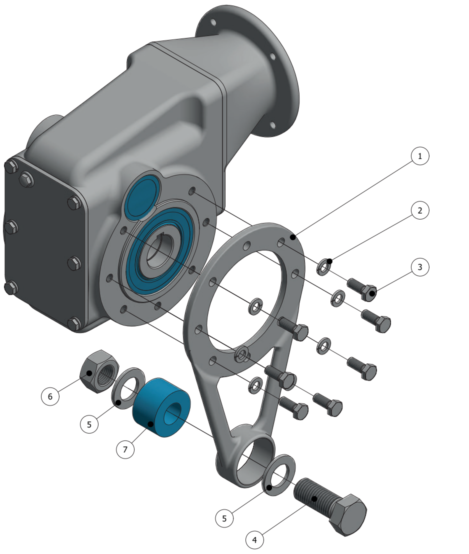
	ø D-ring [mm]	ø D-insert [mm]	ø d-insert
MSB 2510	<25	25	10
MSB 4320	<43	43	20





Mounting the torque arm

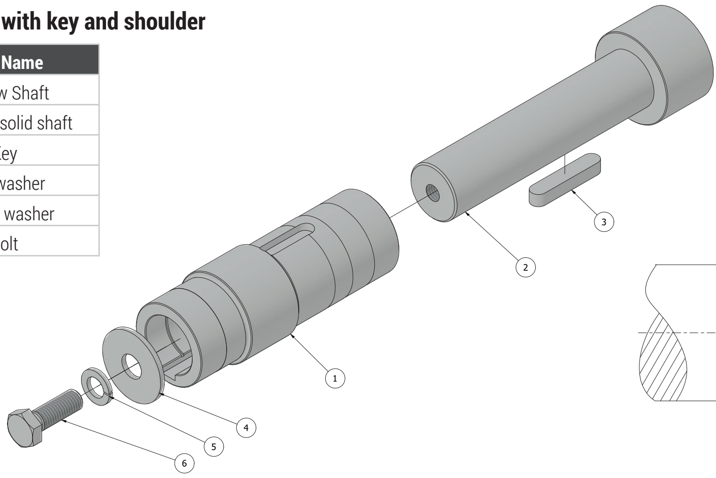
To mount the torque arm, mount the **[1]**torque arm to the gearbox and bolt it down with **[2]** spring washer and **[3]** bolts of the right size. Attach the holding **[4]**bolt with a **[5]** washer, through the hole of the **[7]**rubber insert. Add another **[5]**washer on the opposite side of the **[7]**rubber insert and attach the **[6]** nut hand tight to the holding **[4]**bolt.



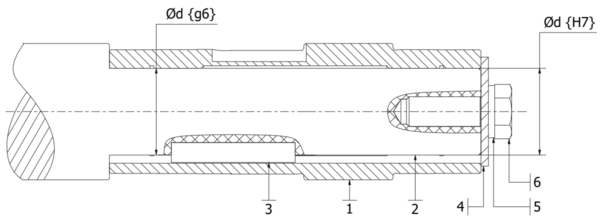
nr.	Part Name
1	Torque arm
2	Spring washer
3	Bolt
4	Bolt
5	Washer
6	Nut
7	Rubber insert

Hollow shaft with key and shoulder

nr.	Part Name
1	Hollow Shaft
2	Machine solid shaft
3	Key
4	Flat washer
5	Spring washer
6	Bolt

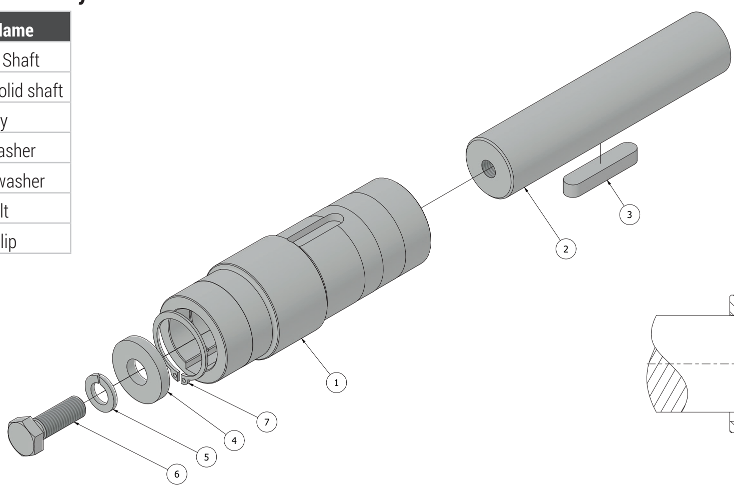


A machine shaft with a key and shoulder is usually held in place with a bolt, a lock washer and a flat washer on the outside of the hollow shaft.

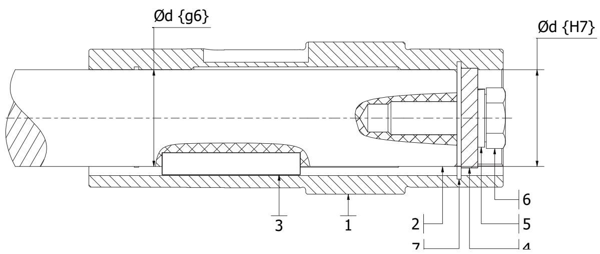


Hollow shaft with key without shoulder

nr.	Part Name
1	Hollow Shaft
2	Machine solid shaft
3	Key
4	Flat washer
5	Spring washer
6	Bolt
7	Circlip



A machine shaft with a key and without shoulder is usually held in place with a bolt, lock washer, a thick flat washer and a circlip on the inside of the hollow shaft.

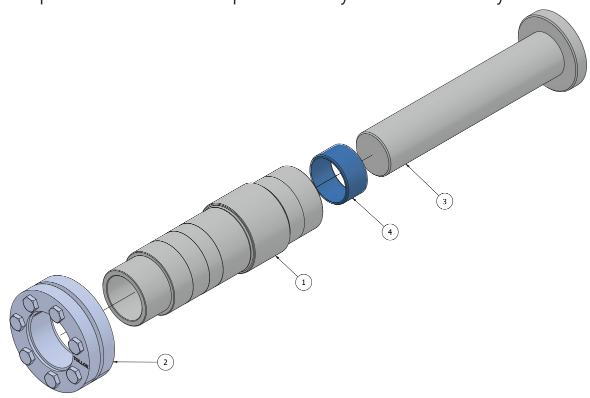


Hollow shaft with a shrink disk

For some applications a shrink disk is preferred, this is a disk that is installed on a longer hollow shaft, which clamps down onto is shaft. This friction holds the machine shaft inside the hollow shaft in place. Because of the friction fit, the machine shaft does not need to have a key in it.

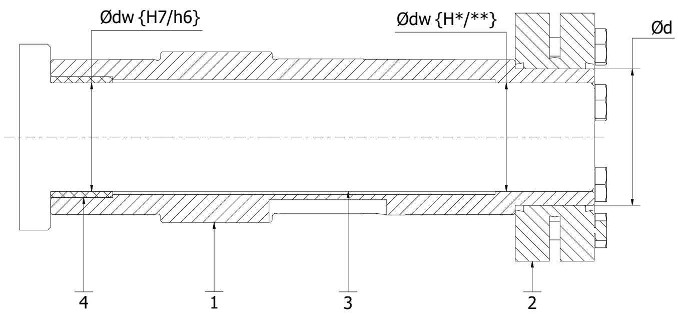
The benefit of a shrink disk is that it provides a way for easy removal of the shaft. Because it is a friction fit, no contact corrosion forms between the shafts, Also it provides an extra fail safe when the machine locks up. The gearbox will not be damaged because the shrink disk will slip when to much torque is applied. A shrink disk provides fast and simple assembly and disassembly. The downside to a shrink disk is that it takes up more space.

nr.	Part Name
1	Hollow Shaft SD
2	Shrinkdisk
3	Machine solid shaft
4	Spacer tube



Shrink disk specifications and installation

The measurements for the machine shaft diameter and the tolerances are shown in the table below. Here the amount of screws and screw type with the tightening torque are also shown.

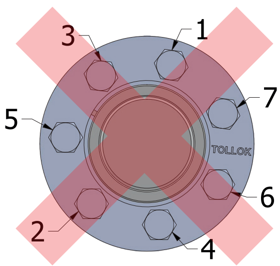


Ød [mm]	Ødw size [mm]	Ødw {H*/**} tolerance	Tightening screws [N° X Type]	Tightening torque [Nm]
14	11-12	H6/j6	4 x M5	4
16	13-14		5 x M5	
24	19-21		6 x M5	
30	24-26		7 x M5	
>30	24-26	H6/h6		
36	28-31		5 x M6	12
44	32-36		7 x M6	
50	38-42		8 x M6	
>50	38-42	H6/g6		
55	42-48			
62	48-52		10 x M6	
68	50-55			
75	55-65		7 x M8	30
80	60-75			
>80	60-75	H7/g9		

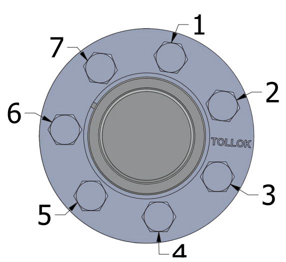
In order to ensure the shrinkdisk is used correctly the following has to be taken into account:

- When the shrink disk is untightened, make sure the screws don't get loosened all the way, this could cause them to fall out.
- When tightening the shrink disk do this in the correct order according to **[B]** with the right amount of torque as shown in the table. If tightening is not done properly situation **[E]** unequally tightening can occur.

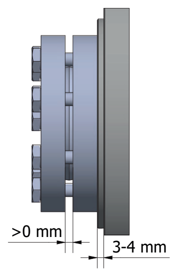
[A] Incorrect tightening order



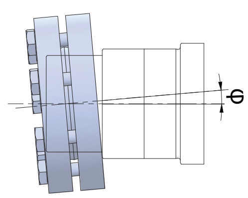
[B] Correct tightening order



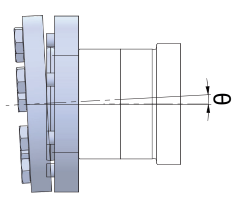
[C] Minumum and maximum clearance



[D] Angular misalignment



[E] Unequally tightened



Possible Geometrical Combinations

Possible Geometrical Combinations

FFA 38 (3 stage)
Maximum Torque = 200 Nm @ N1 = 1400 r/min

n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	AM / B5T1 IEC63	AM / B5T1 IEC71	AM / B5T1 IEC80	AM / B5T1 IEC90	AM / B5T1 IEC100
11	200	4290	128,51	94 %	V	V			
12	200	4290	117,88	94 %	V	V			
14	200	4290	100,36	94 %	V	V	V		
16	200	4290	86,53	94 %	V	V	V	V	
17	200	4290	80,65	94 %	V	V	V	V	
20	200	4290	70,50	94 %	V	V	V	V	V
21	200	4290	66,09	94 %	V	V	V	V	
24	200	4290	58,32	94 %	V	V	V	V	V
26	200	4290	54,54	94 %	V	V	V		
27	200	4290	51,70	94 %	V	V	V	V	V
30	200	4290	47,02	94 %	V	V	V	V	
32	200	4290	43,83	94 %	V	V	V	V	
37	200	4290	38,31	94 %	V	V	V	V	V
39	200	4290	35,91	94 %	V	V	V	V	
44	200	4290	31,69	94 %	V	V	V	V	V
50	200	4060	28,09	94 %	V	V	V	V	V
59	200	3760	23,88	94 %	V	V	V	V	V

FFA 38 (2 stage)
Maximum Torque = 200 Nm @ N1 = 1400 r/min

n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	AM / B5T1 IEC63	AM / B5T1 IEC71	AM / B5T1 IEC80	AM / B5T1 IEC90	AM / B5T1 IEC100
59	200	3740	23,63	96 %	V	V	V		
68	200	3500	20,57	96 %	V	V	V	V	
73	200	3390	19,27	96 %	V	V	V	V	
82	200	3180	17,03	96 %	V	V	V	V	V
89	200	3070	15,81	96 %	V	V	V	V	
98	200	2910	14,33	96 %	V	V	V	V	V
109	200	2750	12,87	96 %	V	V	V	V	V
126	190	2620	11,08	96 %	V	V	V	V	V
134	185	2580	10,42	96 %	V	V	V	V	V
156	175	2460	8,97	96 %	V	V	V	V	V
175	170	2360	8,01	96 %			V	V	V
188	145	2350	7,44	96 %	V	V	V	V	
208	140	2270	6,74	96 %	V	V	V	V	V
231	135	2190	6,05	96 %	V	V	V	V	V
269	125	2120	5,21	96 %	V	V	V	V	V
286	120	2100	4,90	96 %	V	V	V	V	V
332	110	2030	4,22	96 %	V	V	V	V	V
371	105	1970	3,77	96 %			V	V	V

FFA 48 (3 stage)
Maximum Torque = 400 Nm @ N1 = 1400 r/min

n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	AM / B5T1 IEC63	AM / B5T1 IEC71	AM / B5T1 IEC80	AM / B5T1 IEC90	AM / B5T1 IEC100
7,3	400	5920	190,76	94 %	V	V		V	
8,0	400	5920	175,38	94 %	V	V		V	
9,3	400	5920	150,06	94 %	V	V	V	V	
11	400	5920	130,07	94 %	V	V	V	V	
12	400	5920	121,57	94 %	V	V	V	V	
13	400	5920	105,09	94 %	V	V	V	V	V
16	400	5920	89,29	94 %	V	V	V	V	V
18	400	5920	79,72	94 %	V	V	V	V	V
21	400	5920	68,09	94 %	V	V	V	V	V
21	400	5920	65,36	94 %	V	V	V	V	
25	400	5920	56,49	94 %	V	V	V	V	V
29	400	5920	48,00	94 %	V	V	V	V	V
33	400	5920	42,86	94 %	V	V	V	V	V
38	400	5920	36,61	94 %	V	V	V	V	V
41	400	5920	34,29	94 %	V	V	V	V	V
48	400	5790	28,88	94 %	V	V	V	V	V

FFA 48 (2 stage)
Maximum Torque = 400 Nm @ N1 = 1400 r/min

n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	AM / B5T1 IEC63	AM / B5T1 IEC71	AM / B5T1 IEC80	AM / B5T1 IEC90	AM / B5T1 IEC100
45	400	5920	30,86	96 %	V	V	V	V	
48	400	5830	29,32	96 %	V	V	V	V	
54	400	5470	25,72	96 %	V	V	V	V	V
64	400	5030	21,82	96 %	V	V	V	V	V
71	400	4770	19,70	96 %	V	V	V	V	V
81	400	4450	17,33	96 %	V	V	V	V	V
86	400	4320	16,36	96 %	V	V	V	V	V
101	400	3950	13,93	96 %	V	V	V	V	V
111	400	3740	12,66	96 %			V	V	V
128	400	3440	10,97	96 %			V	V	V
156	330	3250	8,96	96 %	V	V	V	V	V
178	380	2630	7,88	96 %	V	V	V	V	V
188	380	2530	7,44	96 %	V	V	V	V	V
221	350	2470	6,34	96 %	V	V	V	V	V
243	340	2390	5,76	96 %			V	V	V
281	320	2310	4,99	96 %			V	V	V

FFA 68 (3 stage)
Maximum Torque = 820 Nm @ N1 = 1400 r/min

n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	AM B5T1 IEC63	AM B5T1 IEC71	AM B5T1 IEC80	AM B5T1 IEC90	AM B5T1 IEC100	AM B5T1 IEC112	AM B5T1 IEC132
6,1	820	10300	228,99	94 %	V	V					
7,2	820	10300	195,36	94 %	V	V	V				
8,2	820	10300	170,85	94 %	V	V	V	V			
8,6	820	10300	162,31	94 %	V	V	V	V			
9,8	820	10300	142,40	94 %	V	V	V	V	V		
12	820	10300	120,79	94 %	V	V	V	V	V	V	
13	820	10300	109,04	94 %	V	V	V	V	V	V	
15	820	10300	95,94	94 %	V	V	V	V	V	V	V
15	820	10300	90,59	94 %	V	V	V	V	V	V	V
18	820	10300	79,76	94 %	V	V	V	V	V	V	
21	820	10300	67,65	94 %	V	V	V	V	V	V	
23	820	10300	61,07	94 %	V	V	V	V	V	V	
26	820	10300	53,73	94 %	V	V	V	V	V	V	V
28	820	10300	50,74	94 %	V	V	V	V	V	V	V
32	820	10300	43,20	94 %	V	V	V	V	V	V	V
36	780	10700	39,26	94 %			V	V	V	V	V
41	740	11000	34,01	94 %			V	V	V	V	V

FFA 68 (2 stage)
Maximum Torque = 820 Nm @ N1 = 1400 r/min

n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	AM B5T1 IEC63	AM B5T1 IEC71	AM B5T1 IEC80	AM B5T1 IEC90	AM B5T1 IEC100	AM B5T1 IEC112	AM B5T1 IEC132
39	820	10300	36,30	96 %	V	V	V	V			
44	820	10300	32,08	96 %	V	V	V	V	V		
51	820	10300	27,41	96 %	V	V	V	V	V	V	
56	820	10300	25,13	96 %	V	V	V	V	V	V	
63	820	10300	22,05	96 %	V	V	V	V	V	V	V
67	820	10300	20,90	96 %	V	V	V	V	V	V	V
77	820	10300	18,29	96 %	V	V	V	V	V	V	V
85	820	10300	16,48	96 %			V	V	V	V	V
97	820	10300	14,46	96 %			V	V	V	V	V
110	820	10300	12,76	96 %				V	V	V	V
124	820	10300	11,31	96 %				V	V	V	V
145	820	10300	9,66	96 %				V	V	V	V
154	530	11400	9,08	96 %	V	V	V	V	V	V	V
163	570	10900	8,60	96 %	V	V	V	V	V	V	V
186	610	10100	7,53	96 %	V	V	V	V	V	V	V
206	620	9660	6,78	96 %			V	V	V	V	V
235	610	9200	5,95	96 %			V	V	V	V	V
267	590	8850	5,25	96 %				V	V	V	V
300	560	8590	4,66	96 %				V	V	V	V
353	500	8390	3,97	96 %				V	V	V	V

FFA 78 (3 stage)
Maximum Torque = 1500 Nm @ N1 = 1400 r/min

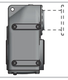
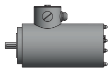
n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	AM / B5T1	AM / B5T1	AM / B5T1	AM / B5T1	AM / B5T1	AM / B5T1	AM / B5T1
					IEC63	IEC71	IEC80	IEC90	IEC100	IEC112	IEC132
38	1110	17900	36,58	96 %	V	V	V	V	V		
44	1380	16500	31,51	96 %	V	V	V	V	V	V	
49	1430	16200	28,75	96 %	V	V	V	V	V	V	
55	1500	15700	25,50	96 %	V	V	V	V	V	V	V
65	1500	15700	21,43	96 %	V	V	V	V	V	V	V
71	1500	15700	19,70	96 %			V	V	V	V	V
80	1500	15700	17,49	96 %			V	V	V	V	V
90	1500	15700	15,64	96 %				V	V	V	V
100	1500	15700	14,06	96 %				V	V	V	V
115	1500	14900	12,20	96 %				V	V	V	V
128	1500	14200	10,93	96 %					V	V	V
151	1080	13800	9,30	96 %			V	V	V	V	V
169	1080	13100	8,26	96 %			V	V	V	V	V
189	1080	12500	7,39	96 %				V	V	V	V
211	1080	12000	6,64	96 %				V	V	V	V
243	1080	11300	5,76	96 %				V	V	V	V
271	1080	10700	5,16	96 %					V	V	V
327	1010	10200	4,28	96 %					V	V	V

FFA 78 (2 stage)
Maximum Torque = 1500 Nm @ N1 = 1400 r/min

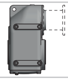
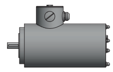
n2 [Min-1]	M2max [Nm]	Fr2 [N]	i	η%	AM / B5T1	AM / B5T1	AM / B5T1	AM / B5T1	AM / B5T1	AM / B5T1	AM / B5T1
					IEC63	IEC71	IEC80	IEC90	IEC100	IEC112	IEC132
5,0	1500	15700	281,71	94 %	V	V					
5,3	1500	15700	262,93	94 %	V	V					
6,2	1500	15700	225,79	94 %	V	V	V				
7,1	1500	15700	198,31	94 %	V	V	V	V			
7,4	1500	15700	188,40	94 %	V	V	V	V			
8,4	1500	15700	166,47	94 %	V	V	V	V	V		
9,8	1500	15700	142,27	94 %	V	V	V	V	V	V	
11	1500	15700	130,42	94 %	V	V	V	V	V	V	
12	1500	15700	114,45	94 %	V	V	V	V	V	V	V
13	1500	15700	108,46	94 %	V	V	V	V	V	V	V
15	1500	15700	94,93	94 %	V	V	V	V	V	V	V
16	1500	15700	85,52	94 %			V	V	V	V	V
19	1500	15700	75,02	94 %			V	V	V	V	V
19	1500	15700	72,50	94 %	V	V	V	V	V		
21	1500	15700	66,46	94 %	V	V	V	V	V		
24	1500	15700	58,32	94 %	V	V	V	V	V	V	V
25	1500	15700	55,27	94 %	V	V	V	V	V	V	V
29	1500	15700	48,37	94 %	V	V	V	V	V	V	V
32	1500	15700	43,58	94 %			V	V	V	V	V
37	1500	15700	38,23	94 %			V	V	V	V	V
41	1500	15700	33,74	94 %				V	V	V	V
47	1500	15700	29,91	94 %				V	V	V	V
55	1450	16100	25,54	94 %				V	V	V	V

Gearbox Selection Tables

0,12 - 0,18 kW

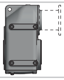
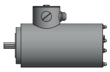
P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
0,12	11	107	128,51	5220	1,85	FFA 38 AM63 FFA 38 B5T1	631-4 B5 631-4 B5T1
	12	98	117,88	5270	2		
	14	83	100,36	5340	2,4		
	16	72	86,53	5400	2,8		
	17	67	80,65	5410	3		
	7,2	158	190,76	7970	2,5	FFA 48 AM63 FFA 48 B5T1	631-4 B5 631-4 B5T1
	7,9	146	175,38	8020	2,8		
	9,2	125	150,06	8100	3,2		
	11	108	130,07	8150	3,7		
0,18	10	167	128,51	4700	1,2	FFA 38 AM63 FFA 38 B5T1	632-4 B5 632-4 B5T1
	11	154	117,88	4850	1,3		
	13	131	100,36	5050	1,55		
	15	113	86,53	5180	1,75		
	16	105	80,65	5230	1,9		
	19	92	70,5	5300	2,2		
	20	86	66,09	5330	2,3		
	23	76	58,32	5380	2,6		
	8,7	198	100,36	4320	1	FFA 38 AM71 FFA 38 B5T1	711-6 B5 711-6 B5T1
	10	171	86,53	4660	1,15		
	11	159	80,65	4790	1,25		
	12	139	70,5	4970	1,45		
	6,9	250	190,76	7470	1,6	FFA 48 AM63 FFA 48 B5T1	632-4 B5 632-4 B5T1
	7,5	230	175,38	7610	1,75		
	8,8	195	150,06	7800	2,1		
	10	169	130,07	7920	2,4		
	11	158	121,57	7970	2,5		
	4,6	375	190,76	6240	1,05	FFA 48 AM71 FFA 48 B5T1	711-6 B5 711-6 B5T1
	5	345	175,38	6600	1,15		
	5,8	295	150,06	7090	1,35		
	6,7	255	130,07	7410	1,55		
	7,2	240	121,57	7530	1,65		
	5,8	300	228,99	13000	2,8	FFA 68 AM63 FFA 68 B5T2	632-4 B5 632-4 B5T2
	6,8	255	195,39	13000	3,2		
	7,7	225	170,85	13000	3,7		
	3,8	450	228,99	12600	1,8	FFA 68 AM71 FFA 68 B5T2	711-6 B5 711-6 B5T2
	4,5	385	195,39	12900	2,1		
	5,1	340	170,85	13000	2,4		
	3,1	555	281,71	19600	2,7	FFA 78 AM71 FFA 78 B5T3	711-6 B5 711-6 B5T3
	3,3	520	262,93	19700	2,9		
	3,9	445	225,79	19800	3,4		

0,25 kW

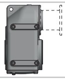
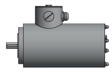
P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
0,25	13	184	100,36	4500	1,1	FFA 38 AM71 FFA 38 B5T1	711-4 B5 711-4 B5T1
	15	159	86,53	4790	1,25		
	16	148	80,65	4900	1,35		
	18	130	70,5	5060	1,55		
	20	121	66,09	5120	1,65		
	22	107	58,32	5210	1,85		
	24	100	54,54	5260	2		
	25	95	51,7	5280	2,1		
	28	86	47,02	5330	2,3		
	30	81	43,83	5360	2,5		
	34	70	38,31	5400	2,8		
	36	66	35,91	5420	3		
	41	58	31,69	5450	3,4		
	6,8	350	190,76	6550	1,15	FFA 48 AM71 FFA 48 B5T1	711-4 B5 711-4 B5T1
	7,4	320	175,38	6850	1,25		
	8,7	275	150,06	7270	1,45		
	10	240	130,07	7540	1,65		
	11	225	121,57	7640	1,8		
	12	193	105,09	7810	2,1		
	15	164	89,29	7950	2,4		
	5,9	405	150,06	5750	1	FFA 48 AM71 FFA 48 B5T1	712-6 B5 712-6 B5T1
	6,8	355	130,07	6530	1,15		
	7,2	330	121,57	6770	1,2		
	8,4	285	105,09	7190	1,4		
	5,7	420	228,99	12700	1,95	FFA 68 AM71 FFA 68 B5T2	711-4 B5 711-4 B5T2
	6,7	360	195,39	13000	2,3		
	7,6	315	170,85	13000	2,6		
	8	300	162,31	13000	2,8		
	9,1	260	142,4	13000	3,1		
	3,8	620	228,99	11800	1,3	FFA 68 AM71 FFA 68 B5T2	712-6 B5 712-6 B5T2
	4,5	530	195,39	12300	1,55		
	5,2	465	170,85	12600	1,75		
	5,4	440	162,31	12700	1,85		
	6,2	385	142,4	12900	2,1		
	3,1	765	281,71	19100	1,95	FFA 78 AM71 FFA 78 B5T3	712-6 B5 712-6 B5T3
	3,4	715	262,93	19200	2,1		
	3,9	615	225,79	19500	2,5		
	4,4	540	198,31	19600	2,8		
	4,7	510	188,4	19700	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

0,37 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
	20	181	70,5	4550	1,1	FFA 38 AM71 FFA 38 B5T1	712-4 B5 712-4 B5T1
	21	169	66,09	4680	1,2		
	24	149	58,32	4890	1,35		
	25	140	54,54	4970	1,45		
	27	132	51,7	5030	1,5		
	29	120	47,02	5120	1,65		
	31	112	43,83	5180	1,8		
	36	98	38,31	5270	2		
	38	92	35,91	5300	2,2		
	44	81	31,69	5300	2,5		
	49	72	28,09	5140	2,8		
	58	61	23,88	4930	3,3		
	9,2	385	150,06	6140	1,05	FFA 48 AM71 FFA 48 B5T1	712-4 B5 712-4 B5T1
	11	335	130,07	6740	1,2		
	13	270	105,09	7320	1,5		
	15	230	89,29	7600	1,75		
	17	205	79,72	7750	1,95		
	20	174	68,09	7900	2,3		
	21	167	65,36	7930	2,4		
0,37	6	585	228,99	12000	1,4	FFA 68 AM71 FFA 68 B5T2	712-4 B5 712-4 B5T2
	7,1	500	195,39	12400	1,65		
	8,1	435	170,85	12700	1,85		
	8,5	415	162,31	12800	1,95		
	9,7	365	142,4	12900	2,3		
	11	310	120,79	13000	2,7		
	4,6	765	195,39	10800	1,05	FFA 68 AM80 FFA 68 B5T2	801-6 B14a 801-6 B5T2
	5,3	670	170,85	11500	1,2		
	5,5	635	162,31	11700	1,3		
	6,3	560	142,4	12100	1,45		
	7,5	475	120,79	12500	1,75		
	4,9	720	281,71	19200	2,1	FFA 78 AM71 FFA 78 B5T3	712-4 B5 712-4 B5T3
	5,2	675	262,93	19300	2,2		
	6,1	580	225,79	19500	2,6		
	7	510	198,31	19700	3		
	4	890	225,79	18700	1,7	FFA 78 AM80 FFA 78 B5T3	801-6 B14a 801-6 B5T3
	4,5	780	198,31	19100	1,95		
	4,8	740	188,4	19200	2		
	5,4	655	166,47	19400	2,3		
	6,3	560	142,27	19600	2,7		

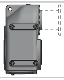
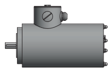
0,55 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
	26	200	51,7	4300	1	FFA 38 AM80 FFA 38 B5T1	801-4 B14a 801-4 B5T1
	29	182	47,02	4540	1,1		
	31	169	43,83	4680	1,2		
	36	148	38,31	4900	1,35		
	38	139	35,91	4980	1,45		
	43	122	31,69	4990	1,65		
	48	109	28,09	4870	1,85		
	57	92	23,88	4700	2,2		
	58	91	23,63	4690	2,2		
	66	79	20,57	4540	2,5		
	71	74	19,27	4470	2,7		
	80	66	17,03	4340	3		
	95	55	14,33	4150	3,6		
	13	405	105,09	5840	1	FFA 48 AM80 FFA 48 B5T1	801-4 B14a 801-4 B5T1
	15	345	89,29	6620	1,15		
	17	310	79,72	6990	1,3		
	20	265	68,09	7370	1,5		
	21	250	65,36	7440	1,6		
	24	220	56,49	7670	1,85		
	28	185	48	7850	2,2		
	32	166	42,86	7940	2,4		
	7	755	195,39	10900	1,1	FFA 68 AM80 FFA 68 B5T2	801-4 B14a 801-4 B5T2
0,55	8	660	170,85	11500	1,25		
	8,4	625	162,31	11700	1,3		
	9,6	550	142,4	12200	1,5		
	11	465	120,79	12600	1,75		
	12	420	109,04	12700	1,95		
	14	370	95,94	12900	2,2		
	15	350	90,59	13000	2,3		
	17	310	79,76	13000	2,7		
	6	870	225,79	18800	1,7	FFA 78 AM80 FFA 78 B5T3	801-4 B14a 801-4 B5T3
	6,9	765	198,31	19100	1,95		
	7,2	730	188,4	19200	2,1		
	8,2	645	166,47	19400	2,3		
	9,6	550	142,27	19600	2,7		
	10	505	130,42	19700	3		
	12	440	114,45	19800	3,4		
	13	420	108,46	19800	3,6		
	14	365	94,93	19900	4,1		
	4	1320	225,79	16800	1,15	FFA 78 AM80 FFA 78 B5T3	802-6 B14a 802-6 B5T3
	4,5	1160	198,31	17600	1,3		
	4,8	1100	188,4	17900	1,35		
	5,4	970	166,47	18400	1,55		
	6,3	830	142,27	18900	1,8		
	6,9	760	130,42	19100	1,95		

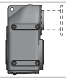
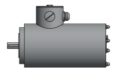
P_{1n} = Rated Motor Power [kW]
n_2 = Output Speed [Min^{-1}]
M_{2n} = Rated Output torque [Nm]
M_{2max} = Maximum permissible output torque [Nm]
F_{r2} = Permitted Overhung Load Output Side [N]
i = Gear unit Ratio
η% = Transmission Efficiency %
fs = Service Factor

Gearbox Selection Tables

0,75 kW

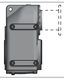
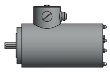
P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
0,75	36	199	38,31	4310	1	FFA 38 AM80 FFA 38 B5T1	802-4 B14a 802-4 B5T1
	38	186	35,91	4480	1,05		
	44	165	31,69	4620	1,2		
	49	146	28,09	4540	1,35		
	58	123	23,63	4400	1,65		
	67	107	20,57	4290	1,85		
	72	100	19,27	4240	2		
	81	88	17,03	4130	2,3		
	96	74	14,33	3970	2,7		
	107	67	12,87	3870	3		
	20	355	68,09	6520	1,15	FFA 48 AM80 FFA 48 B5T1	802-4 B14a 802-4 B5T1
	21	340	65,36	6680	1,2		
	24	295	56,49	7120	1,35		
	29	250	48	7470	1,6		
	32	220	42,86	7640	1,8		
	38	190	36,61	7820	2,1		
	40	178	34,29	7850	2,3		
	48	150	28,88	7540	2,7		
	9,7	740	142,4	11000	1,1	FFA 68 AM80 FFA 68 B5T2	802-4 B14a 802-4 B5T2
	11	625	120,79	11700	1,3		
	13	565	109,04	12100	1,45		
	14	500	95,94	12400	1,65		
	15	470	90,59	12500	1,75		
	17	415	79,76	12800	2		
	20	350	67,65	13000	2,3		
	23	315	61,07	13000	2,6		
	6,1	1170	225,79	17600	1,3	FFA 78 AM80 FFA 78 B5T3	802-4 B14a 802-4 B5T3
	7	1030	198,31	18200	1,45		
	7,3	980	188,4	18400	1,55		
	8,3	860	166,47	18800	1,75		
	9,7	740	142,27	19200	2		
	11	675	130,42	19300	2,2		
	12	595	114,45	19500	2,5		
	13	565	108,46	19600	2,7		
	4,8	1500	188,4	15700	1	FFA 78 AM90 FFA 78 B5T3	90S-6 B14a 90S-6 B5T3
	5,4	1320	166,47	16800	1,15		
	6,3	1130	142,27	17800	1,3		
	6,9	1040	130,42	18200	1,45		

1,1 kW

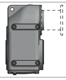
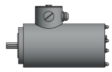
P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
1,1	59	179	23,88	3930	1,1	FFA 38 AM90 FFA 38 B5T1	90S-4 B14a 90S-4 B5T1
	68	154	20,57	3870	1,3		
	73	145	19,27	3840	1,4		
	82	128	17,03	3780	1,55		
	98	108	14,33	3680	1,85		
	109	97	12,87	3610	2,1		
	126	83	11,08	3500	2,3		
	134	78	10,42	3460	2,4		
	156	67	8,97	3350	2,6		
	29	360	48	6440	1,1	FFA 48 AM90 FFA 48 B5T1	90S-4 B14a 90S-4 B5T1
	33	320	42,86	6860	1,25		
	38	275	36,61	7280	1,45		
	41	255	34,29	7260	1,55		
	48	215	28,88	7040	1,85		
	45	230	30,86	7130	1,75		
	48	220	29,32	7060	1,8		
	54	193	25,72	6880	2,1		
	64	164	21,82	6640	2,4		
	71	148	19,7	6490	2,7		
	13	820	109,04	10300	1	FFA 68 AM90 FFA 68 B5T2	90S-4 B14a 90S-4 B5T2
	15	720	95,94	11100	1,15		
	15	680	90,59	11400	1,2		
	18	600	79,76	11900	1,35		
	21	510	67,65	12400	1,6		
	23	460	61,07	12600	1,8		
	26	405	53,73	12800	2		
	28	380	50,74	12900	2,2		
	32	325	43,2	13000	2,5		
	36	295	39,26	13000	2,7		
	41	255	34,01	13000	2,9		
	7,1	1490	198,31	15800	1	FFA 78 AM90 FFA 78 B5T3	FFA 78 AM90 FFA 78 B5T3
	7,4	1410	188,4	16300	1,05		
	8,4	1250	166,47	17200	1,2		
	9,8	1070	142,27	18000	1,4		
	11	980	130,42	18400	1,55		
	12	860	114,45	18800	1,75		
	13	810	108,46	18900	1,85		
	15	710	94,93	19200	2,1		
	16	640	85,52	19400	2,3		
	19	565	75,02	19600	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

1,5 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
1,5	73	196	19,27	3410	1	FFA 38 AM90 FFA 38 B5T1	90L-4 B14a 90L-4 B5T1
	83	173	17,03	3400	1,15		
	98	146	14,33	3350	1,35		
	110	131	12,87	3310	1,55		
	127	113	11,08	3250	1,7		
	135	106	10,42	3220	1,75		
	157	91	8,97	3140	1,9		
	176	81	8,01	3080	2,1		
	39	370	36,61	6300	1,1	FFA 48 AM90 FFA 48 B5T1	90L-4 B14a 90L-4 B5T1
	41	350	34,29	6580	1,15		
	49	295	28,88	6500	1,35		
	46	315	30,86	6550	1,3		
	48	300	29,32	6510	1,35		
	55	260	25,72	6390	1,55		
	65	220	21,82	6230	1,8		
	72	200	19,7	6110	2		
	81	176	17,33	5970	2,3		
	86	166	16,36	5900	2,4		
	101	142	13,93	5700	2,8		
	18	810	79,76	10400	1	FFA 68 AM90 FFA 68 B5T2	90L-4 B14a 90L-4 B5T2
	21	685	67,65	11400	1,2		
	23	620	61,07	11800	1,3		
	26	545	53,73	12200	1,5		
	28	515	50,74	12300	1,6		
	33	440	43,2	12700	1,85		
	36	400	39,26	12800	1,95		
	39	370	36,3	12900	2,2		
	44	325	32,08	13000	2,5		
	51	280	27,41	13000	2,9		
	56	255	25,13	13000	3,2		
	9,9	1450	142,27	16100	1,05	FFA 78 AM90 FFA 78 B5T3	90L-4 B14a 90L-4 B5T3
	11	1320	130,42	16800	1,15		
	12	1160	114,45	17600	1,3		
	13	1100	108,46	17900	1,35		
	15	960	94,93	18400	1,55		
	16	870	85,52	18800	1,75		
	19	760	75,02	19100	1,95		
	19	735	72,5	19200	2		
	21	675	66,46	19300	2,2		
	24	595	58,32	19500	2,5		
	26	560	55,27	19600	2,7		
	29	490	48,37	19700	3,1		
	32	445	43,58	19800	3,4		
	37	390	38,23	19900	3,9		
	39	370	36,58	19900	3		
	45	320	31,51	20000	4,3		

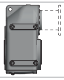
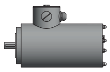
2,2 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
2,2	110	192	12,87	2810	1,05	FFA 38 AM100 FFA 38 B5T1	100L1-4 B14a 100L1-4 B5T1
	127	165	11,08	2820	1,15		
	135	155	10,42	2810	1,2		
	157	134	8,97	2790	1,3		
	176	119	8,01	2770	1,4		
	209	100	6,74	2630	1,4		
	233	90	6,05	2590	1,5		
	271	78	5,21	2540	1,6		
	288	73	4,9	2520	1,65		
	334	63	4,22	2460	1,75		
	374	56	3,77	2400	1,85		
	55	385	25,72	5560	1,05	FFA 48 AM100 FFA 48 B5T1	100L1-4 B14a 100L1-4 B5T1
	65	325	21,82	5520	1,25		
	72	295	19,7	5480	1,35		
	81	260	17,33	5410	1,55		
	86	245	16,36	5370	1,65		
	101	210	13,93	5250	1,95		
	111	189	12,66	5170	2,1		
	129	163	10,97	5040	2,5		
	157	133	8,96	4740	2,5		
	26	800	53,73	10500	1	FFA 68 AM100 FFA 68 B5T2	100L1-4 B14a 100L1-4 B5T2
	28	755	50,74	10800	1,1		
	33	645	43,2	11600	1,25		
	36	585	39,26	12000	1,35		
	41	505	34,01	12400	1,45		
	44	480	32,08	12500	1,7		
	51	410	27,41	12800	2		
	56	375	25,13	12900	2,2		
	64	330	22,05	13000	2,5		
	67	310	20,9	13000	2,6		
	77	275	18,29	13000	3		
	15	1410	94,93	16300	1,05	FFA 78 AM100 FFA 78 B5T3	100L1-4 B14a 100L1-4 B5T3
	16	1270	85,52	17100	1,2		
	19	1120	75,02	17800	1,35		
	21	990	66,46	18300	1,5		
	24	870	58,32	18800	1,75		
	26	820	55,27	18900	1,8		
	29	720	48,37	19200	2,1		
	32	650	43,58	19400	2,3		
	39	545	36,58	19600	2		
	45	470	31,51	19700	2,9		
	49	430	28,75	19800	3,3		
	55	380	25,5	19900	4		

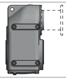
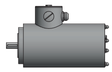
P_{1n} = Rated Motor Power [kW]
n_2 = Output Speed [Min^{-1}]
M_{2n} = Rated Output torque [Nm]
M_{2max} = Maximum permissible output torque [Nm]
F_{r2} = Permitted Overhung Load Output Side [N]
i = Gear unit Ratio
η% = Transmission Efficiency %
fs = Service Factor

Gearbox Selection Tables

3 kW

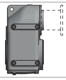
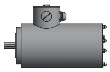
P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
3	175	164	8,01	2410	1,05	FFA 38 AM100 FFA 38 B5T1	100L2-4 B14a 100L2-4 B5T1
	208	138	6,74	2290	1		
	231	124	6,05	2300	1,1		
	269	107	5,21	2290	1,15		
	286	100	4,9	2280	1,2		
	332	86	4,22	2250	1,25		
	372	77	3,77	2220	1,35		
	71	405	19,7	4750	1	FFA 48 AM100 FFA 48 B5T1	100L2-4 B14a 100L2-4 B5T1
	81	355	17,33	4760	1,15		
	86	335	16,36	4760	1,2		
	100	285	13,93	4740	1,4		
	111	260	12,66	4700	1,55		
	128	225	10,97	4640	1,8		
	156	183	8,96	4370	1,8		
	41	695	34,01	11300	1,05	FFA 68 AM100 FFA 68 B5T2	100L2-4 B14a 100L2-4 B5T2
	44	655	32,08	11600	1,25		
	51	560	27,41	12100	1,45		
	56	515	25,13	12300	1,6		
	63	450	22,05	12600	1,8		
	67	430	20,9	12700	1,9		
	77	375	18,29	12900	2,2		
	85	335	16,48	13000	2,4		
	97	295	14,46	13000	2,8		
	19	1540	75,02	15500	1	FFA 78 AM100 FFA 78 B5T3	100L2-4 B14a 100L2-4 B5T3
	21	1360	66,46	16600	1,1		
	24	1190	58,32	17500	1,25		
	25	1130	55,27	17800	1,35		
	29	990	48,37	18300	1,5		
	32	890	43,58	18700	1,7		
	37	780	38,23	19000	1,9		
	38	750	36,58	19100	1,5		
	44	645	31,51	19400	2,1		
	49	590	28,75	19500	2,4		
	55	520	25,5	19700	2,9		
	65	440	21,43	19800	3,4		

4 - 5,5 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
4	52	735	27,41	11000	1,1	FFA 68 AM112 FFA 68 B5T2	112M-4 B14a 112M-4 B5T2
	57	675	25,13	11400	1,2		
	64	595	22,05	11900	1,4		
	68	560	20,9	12100	1,45		
	78	490	18,29	12400	1,65		
	86	445	16,48	12700	1,85		
	98	390	14,46	12900	2,1		
	111	345	12,76	13000	2,4		
	126	305	11,31	13000	2,7		
	147	260	9,66	13000	3,2		
	156	245	9,08	13000	2,2		
	165	230	8,6	12800	2,5		
	189	205	7,53	12400	3		
	209	183	6,78	12100	3,4		
	239	160	5,95	11700	3,8		
	270	141	5,25	11400	4,2		
	305	125	4,66	11000	4,5		
	357	107	3,97	10600	4,7		
	26	1490	55,27	15800	1	FFA 78 AM112 FFA 78 B5T3	112M-4 B14a 112M-4 B5T3
	29	1300	48,37	16900	1,15		
	33	1170	43,58	17600	1,3		
	37	1030	38,23	18200	1,45		
	42	910	33,74	18600	1,65		
	47	800	29,91	19000	1,85		
	56	685	25,54	19300	2,1		
	45	850	31,51	18800	1,65		
	49	775	28,75	19100	1,85		
	56	685	25,5	19300	2,2		
	66	575	21,43	19500	2,6		
	72	530	19,7	19600	2,8		
5,5	65	810	22,05	10400	1	FFA 68 AM132 FFA 68 B5T2	132S-4 B14a 132S-4 B5T2
	68	770	20,9	10800	1,05		
	78	670	18,29	11500	1,2		
	87	605	16,48	11900	1,35		
	99	530	14,46	12300	1,55		
	112	470	12,76	12500	1,75		
	126	415	11,31	12800	1,95		
	148	355	9,66	12900	2,3		
	158	335	9,08	12400	1,6		
	166	315	8,6	12300	1,8		
	190	275	7,53	12000	2,2		
	211	250	6,78	11700	2,5		
	240	220	5,95	11400	2,8		
	272	193	5,25	11100	3,1		
	307	171	4,66	10700	3,3		
	360	146	3,97	10300	3,4		

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

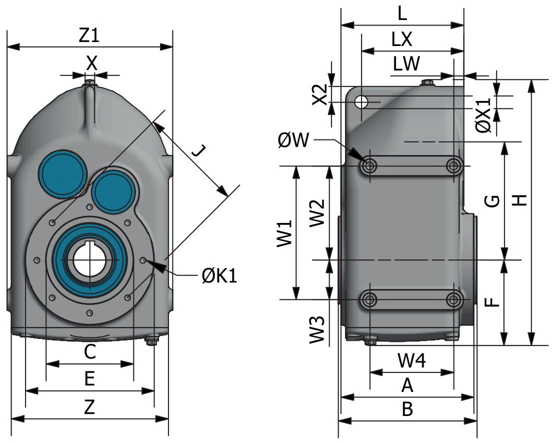
5.5 - 7.5 kW

P1 [kW]	n2 [Min-1]	M2 [Nm]	i	Fr2 [N]	fs gear-box		
5,5	37	1400	38,23	16300	1,05	FFA 78 AM132 FFA 78 B5T3	132S-4 B14a 132S-4 B5T3
	42	1240	33,74	17300	1,2		
	48	1100	29,91	17900	1,35		
	56	940	25,54	18500	1,55		
	56	940	25,5	18500	1,6		
	67	785	21,43	19000	1,9		
	73	725	19,7	19200	2,1		
	82	645	17,49	19400	2,3		
	91	575	15,64	19600	2,6		
	102	515	14,06	19300	2,9		
	117	450	12,2	18600	3,4		
7,5	48	1500	29,91	15700	1	FFA 78 AM132 FFA 78 B5T3	132M-4 B14a 132M-4 B5T3
	56	1280	25,54	17000	1,15		
	56	1280	25,5	17100	1,15		
	67	1070	21,43	18000	1,4		
	73	990	19,7	18400	1,5		
	82	880	17,49	18800	1,7		
	91	785	15,64	19000	1,9		
	102	705	14,06	18600	2,1		
	117	610	12,2	18000	2,5		
	131	545	10,93	17600	2,7		
	154	465	9,3	16500	2,3		
	173	415	8,26	16100	2,6		
	194	370	7,39	15700	2,9		
	215	335	6,64	15300	3,3		
	248	290	5,76	14800	3,7		
	277	260	5,16	14500	4,2		
	334	215	4,28	13800	4,7		

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

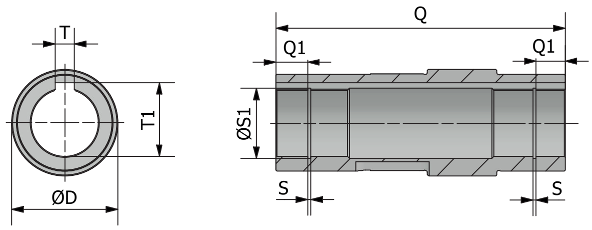
General Dimensions

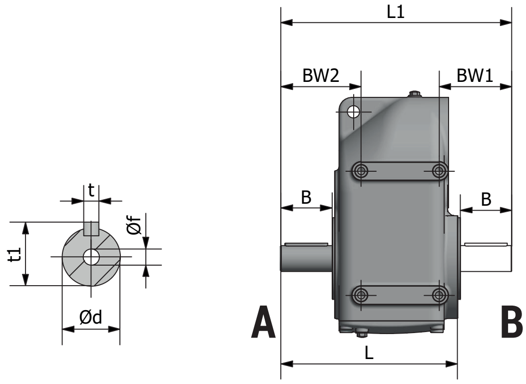
General dimensions



Gearbox	A	B	C	E	F	G	H	Øi	J	ØK1	ØK2	L	LX	LW	M	N	P	ØW	W1	W2	W3	W4	X	ØX1	X2	Z	Z1
FFA 38 B5T1	113,5	119,5	80	110	82,5	112	261	M6	95	8x M8	7x M8	106	77,7	10,4	100	80	120	M8	115	82,3	32,7	77	10	14	14	155	165
FFA 48 B5T1	144	150	95	140	92,4	128,1	287	M6	115	8x M8	7x M8	132,8	110,8	10,8	100	80	120	M10	145	102	43	91	10	14	17	170	180
FFA 68 B5T2	173	179	110	160	114,5	159,5	361	M8	130	7x M10	7x M10	160	121	17,4	130	110	160	M12	190	140	50	112	12	14	21,5	202	212
FFA 78 B5T3	202	208	118	170	120,6	200	428	M10	140	8x M12	8x M12	187,2	140,6	16,2	165	130	200	M16	240	170	70	140	21	25	26	260	269

Hollow shaft & Solid shaft





Hollow shaft

Gearbox	ØD[H7/h6]	T	T1	Q	Q1	S	ØS1
FFA 38	30	8	33,3	120	13,7	1,3	31,4
FFA 48	35	10	38,3	150	16,7	1,6	37
FFA 68	40	12	43,3	179	22,5	1,85	42,5
FFA 78	50	14	53,8	208	26	2,65	53

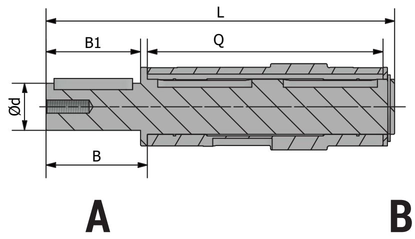
Different solid shaft dimensions possible on request

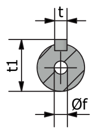
Solid shaft

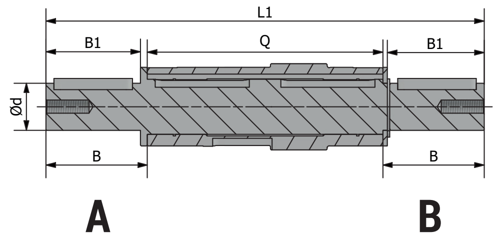
Gearbox	Ød[g6]	t	t1	Øf	L	L1	B	BW1	BW2
FFA 38	25	8	28	M10	170	220	50	70,9	71,6
FFA 48	30	8	33	M10	210	270	60	85	94
FFA 68	40	12	43	M16	259	339	80	113,5	113,5
FFA 78	50	14	53,5	M16	308	408	100	134	134

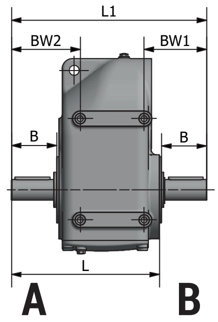
Different solid shaft dimensions possible on request

Solid input shaft





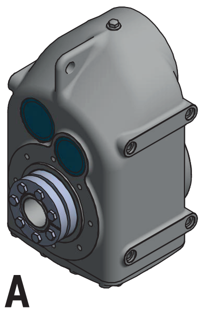


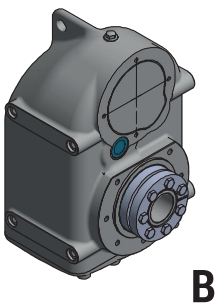


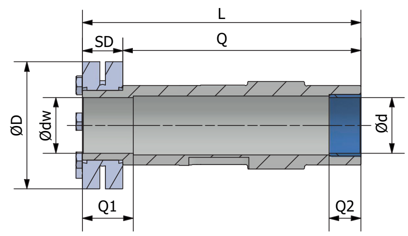
Gearbox	Ød[h6]	Øf	t	t1	L	L1	Q	B	B1	BW1	BW2
FFA 38	25	M10	8	28	182	227	120	50	53,5	74,7	75,4
FFA 48	30	M10	8	33	222	279	150	60	64,5	89,5	98,5
FFA 68	40	M16	12	43	274	348	179	80	84,5	118	118

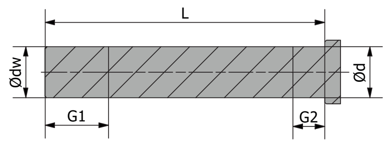
Different solid input shaft dimensions possible on request

Shrink disk





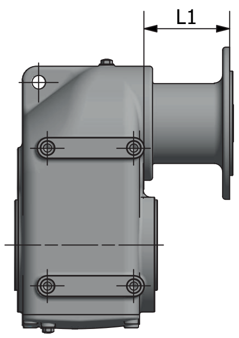


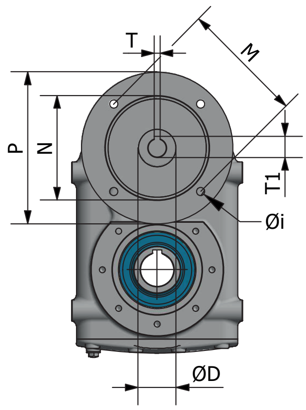


Gearbox	Ød[H7/h6]	Ødw[H6/*]	ØD	L	SD	Q	Q1	Q2	G1	G2	Tightening screws N° x Type	Tightening Torque Ms [Nm]	Torque shrink disc Mt [Nm]
FFA 38	30	30[*h6]	72	143,5	23,5	120	31	20	36	25	5 x M6	12	570
FFA 48	35	35[*h6]	80	175,5	25,5	150	32	20	37	25	7 x M6	12	780
FFA 68	40	40[*h6]	90	206,5	27,5	179	38	20	43	25	8 x M6	12	1160
FFA 78	50	50[*g6]	110	238,5	30,5	208	36	30	41	35	10 x M6	12	2200

Different shrinkdisk dimensions possible on request
From 18 mm to 30 mm H6/j6
From 30 mm to 50 mm H6/h6

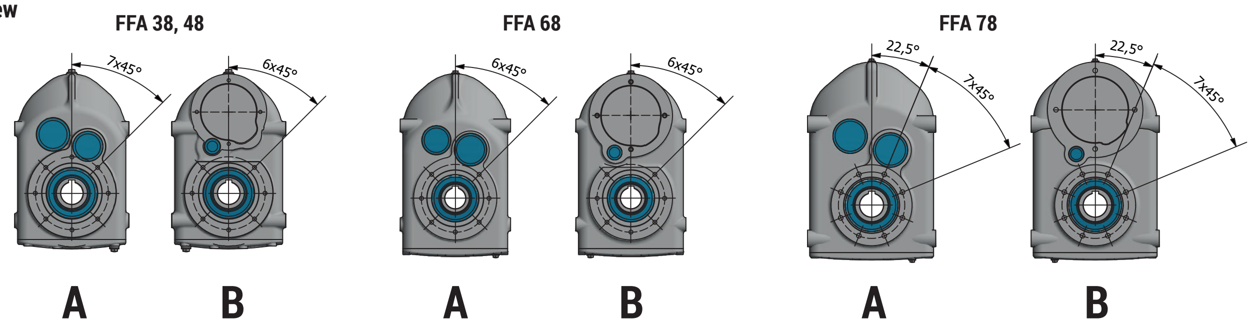
AM flange



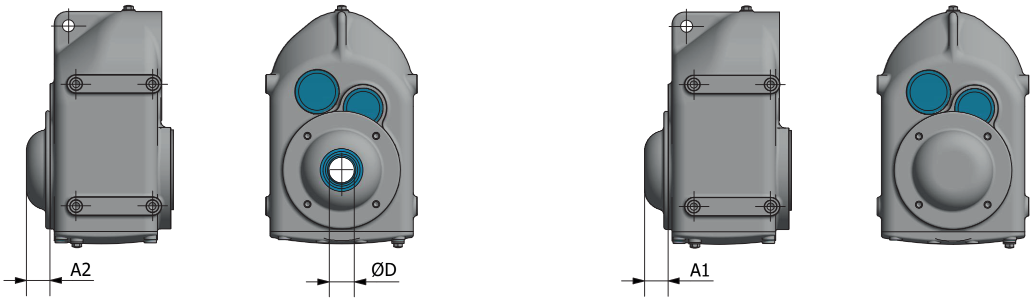


Gearbox	AM flange	ØD [H7/h6]	Øi	L1	M	N	P	T	T1
FFA38 B5T1	AM63	11	9	90	115	95	140	4	12,8
	AM71	14			130	110	160	5	16,3
	AM80	19	7		100	80	120	6	21,8
	AM90	24	9		115	95	140	8	27,3
	AM100	28			130	110	160		31,3
FFA48 B5T2	AM63	11	9	90	115	95	140	4	12,8
	AM71	14			130	110	160	5	16,3
	AM80	19	7		100	80	120	6	21,8
	AM90	24	9		115	95	140	8	27,3
	AM100	28			130	110	160		31,3
FFA68 B5T2	AM63	11	9	90	115	95	140	4	12,8
	AM71	14			130	110	160	5	16,3
	AM80	19	7		100	80	120	6	21,8
	AM90	24	9		115	95	140	8	27,3
	AM100	28			130	110	160		31,3
	AM112	28			130	110	160		
	AM132	38	11	126	165	130	200	10	41,3
FFA78 B5T3	AM71	14	9	105	130	110	160	5	16,3
	AM80	19			100	80	120	6	21,8
	AM90	24			115	95	140	8	27,3
	AM100	28			130	110	160		31,3
	AM112	28			130	110	160		
	AM132	38	11	125	165	130	200	10	41,3

Hole overview



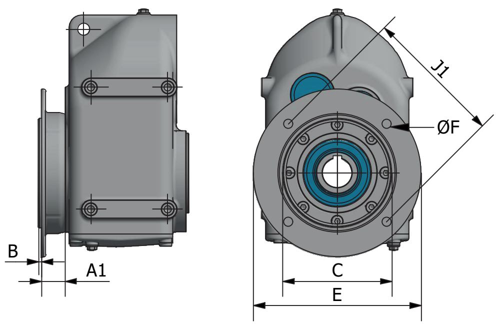
Open & Closed cover



Gearbox	Open cover	A2	ØD
FFA 38	SS 095 CO30	19,5	30
FFA 48	SS 115 CO35	28	35
FFA 68	SS 130 CO40	28	40
FFA 78	SS140 CO50	29	50

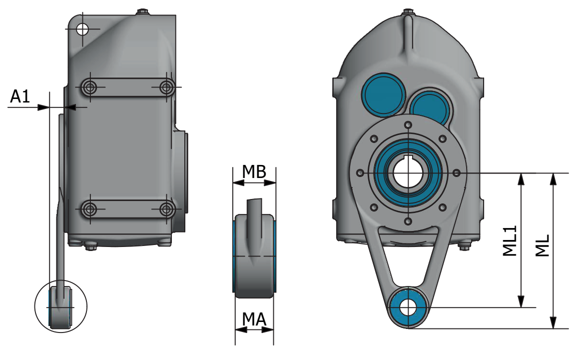
Gearbox	Closed cover	A1
FFA 38	SS 095 CC	26
FFA 48	SS 115 CC	28
FFA 68	SS 130 CC	28
FFA 78	SS 140 CC	29

Output flanges



Gearbox	Flange Type	A1	B	C	E	Øf	J1
FFA 38	SS 095 FL160	29	4	110	160	10	130
FFA 48	SS 115 FL200	28	3,5	130	200	11	165
FFA 68	SS 130 FL250	26,5	4	180	250	13,5	215
FFA 78	SS 140 FL250	41	4	180	250	13,5	215
	SS 140 FL300	41	4	230	300	13,5	265

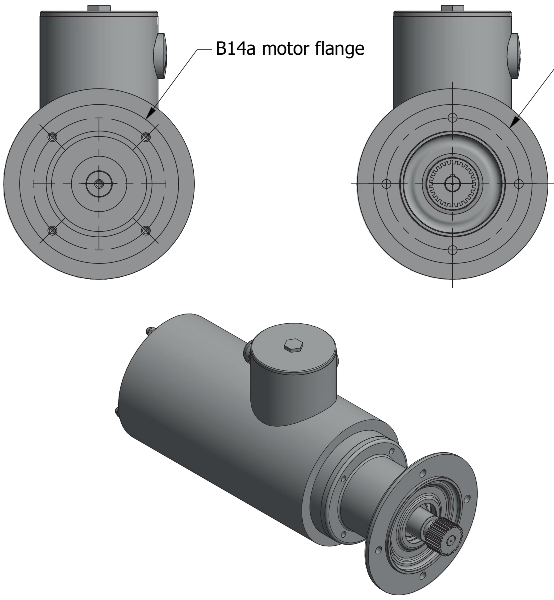
Torque arm

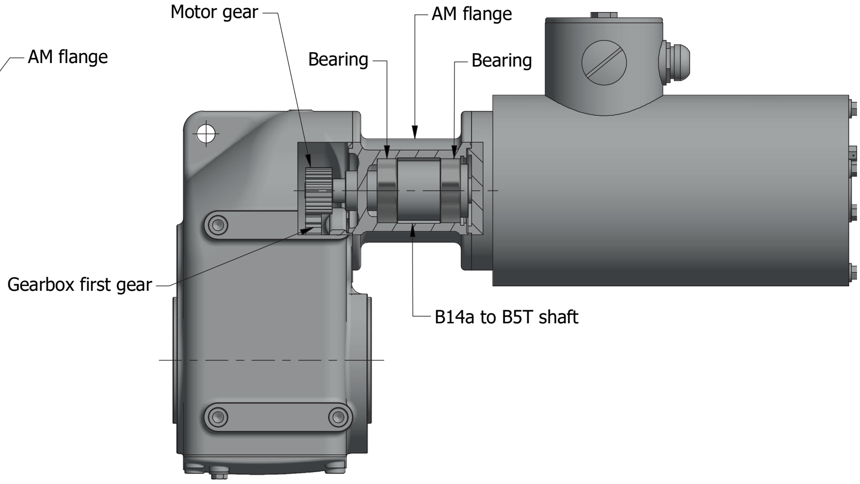


Gearbox	Torque arm	A1	MA	MB	ØD	ML	ML1
FFA 38	SS 095 MS L130S	11,8	12	15	10,5	146	130
	SS 095 MS L150	11,8	12	15	10,5	166	150
FFA 48	SS 115 MS L160S	17,3	23	26	20,5	185	160
	SS 115 MS L200	17,3	23	26	20,5	225	200
FFA 68	SS 130 MS L200	18,5	23	26	20,5	225	200
FFA 78	SS 140 MS L250	20	23	26	20,5	285	250

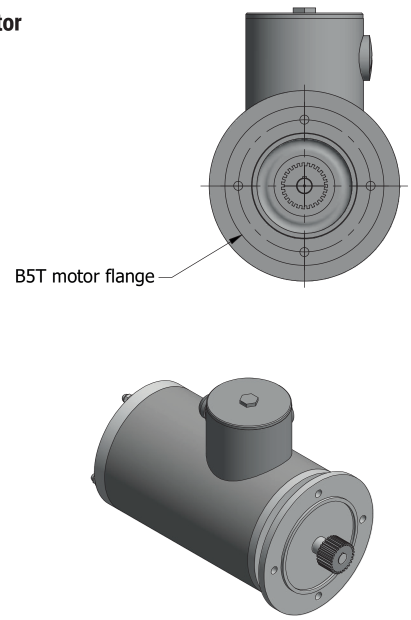
Difference between B5T and B14a

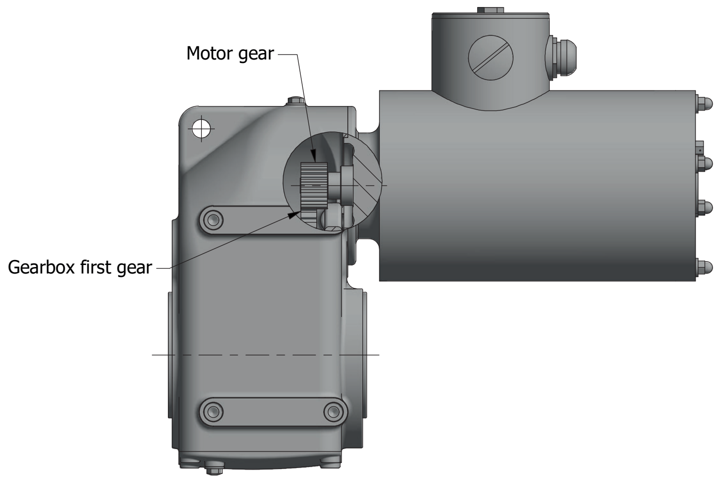
B14a motor with AM - flange





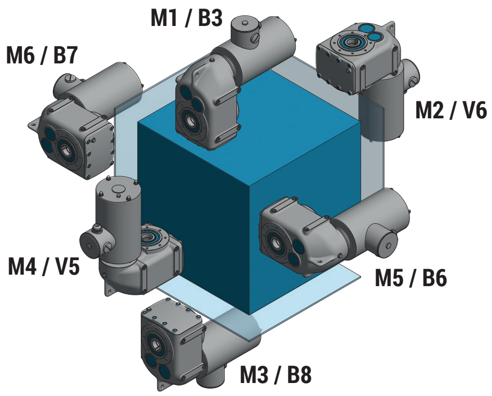
B5 motor



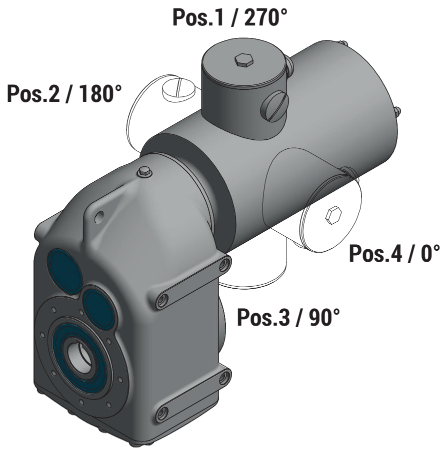


Extra information

Mounting Positions



Terminal Box Positions



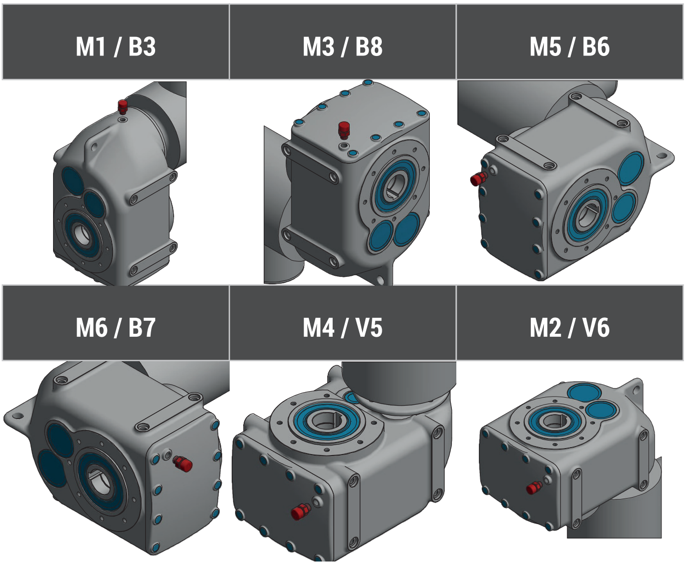
Lubrication Quantity

Oil Quantity in ML	Mounting Position					
Gearbox	M1 (B3)	M3 (B8)	M6 (B7)	M5 (B6)	M4 (V5)	M2 (V6)
FFA 38 BT51 & AM...	1150	1350	1250	1250	1250	1250
FFA 48 BT51 & AM...	2000	2100	2000	2000	1950	2000
FFA 68 BT52 & AM...	3900	3900	3900	3900	3900	3900
FFA 78 BT53 & AM...	6500	7200	6500	6500	6500	7200

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

B5T Weight

Gearbox	Weight
FFA 38 B5T1	10.5 Kg
FFA 48 B5T1	15.5 Kg
FFA 68 B5T2	25.5 Kg
FFA 78 B5T3	28.5 Kg

AM Weight

Gearbox	Weight
FFA 38 AM...	14 Kg
FFA 48 AM...	19 Kg
FFA 68 AM...	30 Kg
FFA 78 AM...	36 Kg

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

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Note: Unless otherwise stated all sizes are in millimeters