

dertec[®]
Designed to Perform

Stainless Steel
Hypoid Bevel Gearbox.

FH



FH Hypoid Bevel Gearbox

Dertec Hypoid bevel gearboxes are, just like the FV series worm gearboxes, specifically developed with a view to hygiene and cleanability.

With a design that aims to minimize build-up of dirt, the shape contributes to less accumulation and adhesion of contaminants.

The results is a more easy and faster cleaning process.

Using stainless steel AISI 316 also contributes to the reduced use of strong chemical cleaning agents, which benefits the surface water quality.

Dertec hypoid FH series bevel gear units are designed to achieve high torque and low energy consumption.

The high efficiency (92-94%) of the drive reduces energy consumption and contributes to a low surface temperature.

Dertec hardened gears ensure a long life and a smooth running, making the gearbox design ideal for use in the food industry.

Particularly at high ratios, it often pays to replace worm gear reducers for Dertec hypoid bevel gear units.

In combination with the Dertec PM synchronous motors, even at partial loads efficiencies of 88-90% can be achieved.

The Dertec FH series is available in 4 sizes with a maximum torque of 500 Nm and a maximum ratio of 300 : 1 in a single gearbox.

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 hollow 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 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 tagplate

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 FH B 7,5 : 1 - 60 : 1
- Standard ratio's FH C 50 : 1 - 300 : 1
- IEC motor adaption
- Standard hollow shafts 20, 25, 30, 35
- 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%
- Perfect alternative for less efficient wormgearboxes
- Optional output flanges available
- Stainless steel AISI 316
- Duplex stainless steel AISI 2205 output shaft
- Designed and produced in the Netherlands



Product Characteristics

FH28	
Ratio's	From 7,5 : 1 To 300 : 1
Standard shaft	20 mm
Torque	Max. 130 Nm
Power	Max. 1.5 kW

FH38	
Ratio's	From 7,5 : 1 To 300 : 1
Standard shaft	25 mm
Torque	Max. 200 Nm
Power	Max. 1.5 kW

FH48	
Ratio's	From 7,5 : 1 To 300 : 1
Standard shaft	30 mm
Torque	Max. 350 Nm
Power	Max. 4.0 kW

FH58	
Ratio's	From 7,5 : 1 To 300 : 1
Standard shaft	35 mm
Torque	Max. 500 Nm
Power	Max. 4.0 kW

Torque arms	
FH28	SS 085 MS L100 SS 085 MS L100S
FH38	SS 095 MS L130S SS 095 MS L150
FH48	SS 115 MS L160S SS 115 MS L200
FH58	SS 130 MS L200

Easy Clean Closed cover	
FH28	SS 085 CC
FH38	SS 095 CC
FH48	SS 115 CC
FH58	SS 130 CC

Easy Clean Open cover	
FH28	SS 085 CO
FH38	SS 095 CO
FH48	SS 115 CO
FH58	SS 130 CO

Output Flanges	
FH28	SS 085 FL120 SS 085 FL125
FH38	SS 095 FL160 SS 095 FL180
FH48	SS 115 FL200
FH58	SS 130 FL250

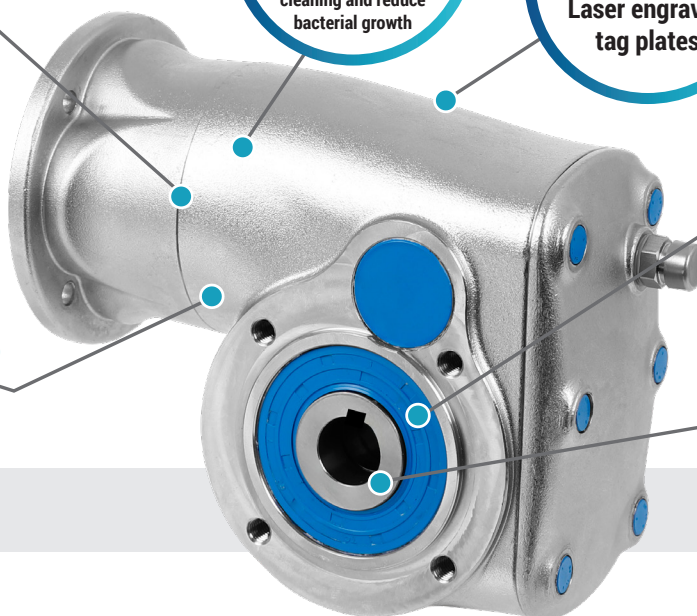
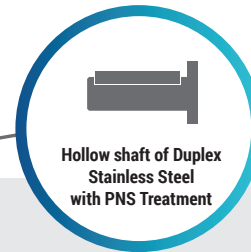
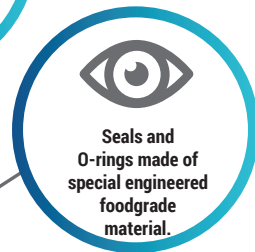
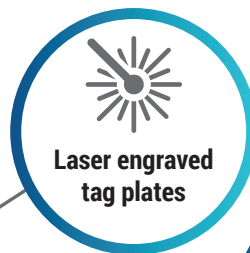
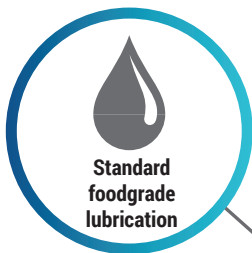




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Project planning

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.

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

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

- M_2 = Output torque (Nm)
- $M_{2\max}$ = 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 m²]
- J_m = Mass moment of inertia on the motor end [kg m²]



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.

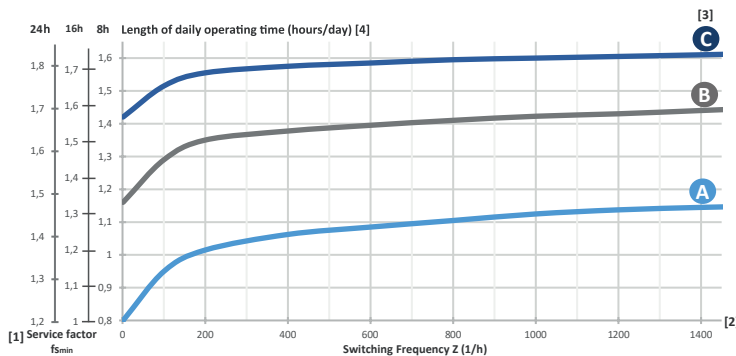
Service factor graph

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

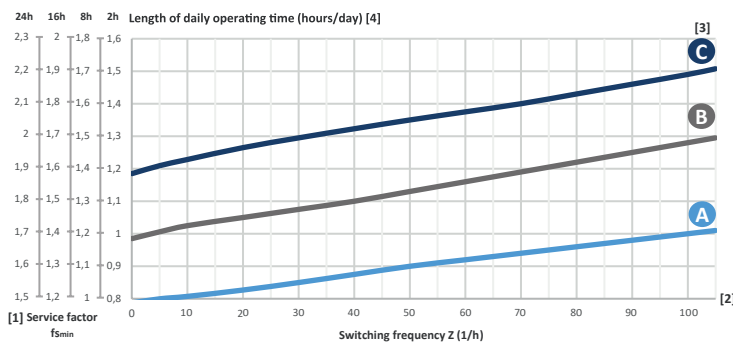


To get the expected service life from the gearbox, $f_{s_{min}} \leq f_{s_{gearbox}}$ see the "Gearbox Selection Tables" for the gearbox service factor

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:



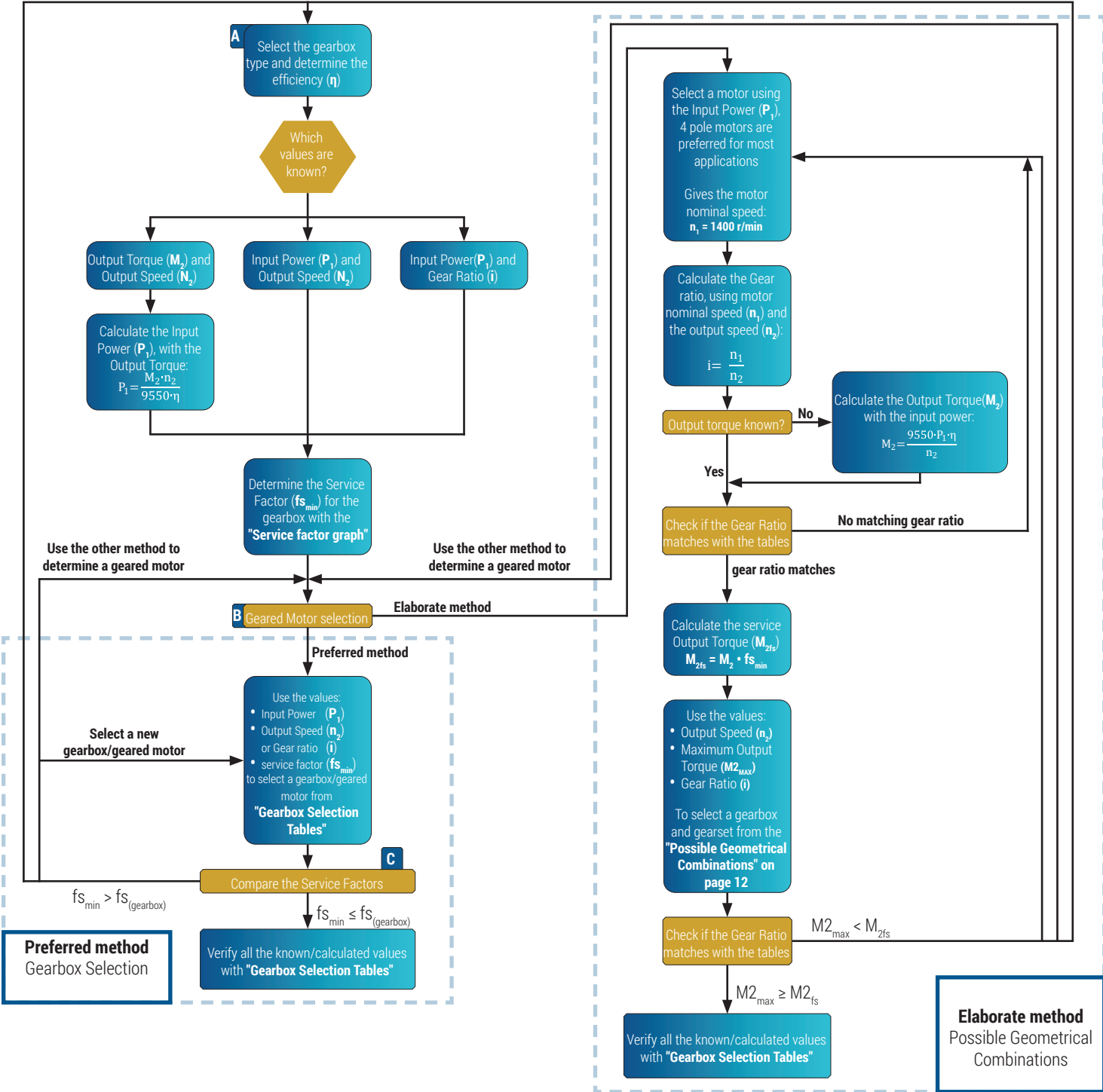
For worm gearboxes the ambient temperature has more influence on the service factor, the service factor should be adjusted as following:

Ambient temperature:
 =30~40°C, $f_s \cdot 1,1 \sim 1,2$
 =40~50°C, $f_s \cdot 1,3 \sim 1,4$
 =50~60°C, $f_s \cdot 1,5 \sim 1,6$

Select a different Gearbox type

Flowchart

Select a different Gearbox type



A Gearbox types by gear type:

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

B Gearing 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 ($f_{s_{min}}$) can be determined.

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

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 sufficitated 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: $M_{2\max} < M_{2fs}$ it is advised to select a different motor or gearbox.

If $M_{2\max} \geq M_{2fs}$ 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 $\eta \approx 90\%$ 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?

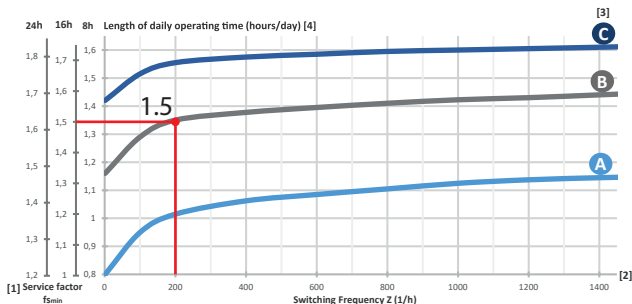
- Output torque- and speed
- Input power- and speed
- Input power and gear ratio

M_2 = **110 Nm**
 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: $\eta = 92\%$
 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]	f_s		
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

$$f_{s_{min}} = 1,5$$

$$f_{s_{(gearbox)}} = 1,8$$

Check if the following is true

$$f_{s_{min}} \leq f_{s_{gearbox}}$$

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: $f_{s_{min}} \leq f_{s(gearbox)} = 1,5 < 1,8$
 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: Elaborate 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 $\eta \approx 90\%$ to 94% . For a more accurate efficiency look it up in the "**Possible Geometrical Combinations**"

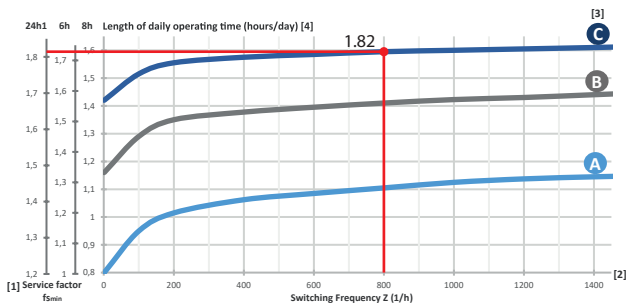
When in doubt use the lowest estimated efficiency.

Which values are known?

- Output torque and speed $P_1 = 0.55 \text{ kW}$
- Input power and speed $i = 30:1$
- Input power and gear ratio

Looking up the output speed and output torque in the "**Possible Geometrical Combinations**" tables gives an efficiency of: $\eta \approx 94\%$

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

$$i = 30:1$$

$$n_1 = 1400 \text{ rpm}$$

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

Check of the output torque is known

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

$$M = \frac{9550 \cdot P \cdot \eta}{n_2} = \frac{9550 \cdot 0,55 \cdot 0,90}{46,67 \text{ rpm}} = 101,3 \text{ Nm}$$

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 @ $N1 = 1400 \text{ rpm}$

n_2 [min ⁻¹]	M_{2max} [Nm]	F_{r2} [N]	i		$\eta\%$	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		$\eta\%$	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:

$$n_2 = 48 \text{ rpm} \approx 46.67 \text{ rpm [calculated]}$$

$$i = 30 = 30 \text{ [known]}$$

$$M_{2fs} = 101,3 \text{ Nm [calculated]}$$

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.

$$M_{2fs} = 184,37 \text{ Nm [calculated]}$$

$$M_{2max} < M_{2fs} \rightarrow 130 \text{ Nm} < 184,37 \text{ Nm} \leftarrow$$

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		$\eta\%$	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.

$$n_2 = 47 \text{ rpm} \approx 46.67 \text{ rpm [calculated]}$$

$$i = 30 = 30 \text{ [known]}$$

$$M_2 = 101,3 \text{ Nm [calculated]}$$

$$M_{2fs} = 184,37 \text{ Nm [calculated]}$$

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

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

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

Determining 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 on 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

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

- 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 F_z	Comments
Gears	1.00	≥ 17 Teeth
	1.15	< 17 Teeth
Chain sprockets	1.00	≥ 20 Teeth
	1.25	< 20 Teeth
Narrow V-belt Pulleys	1.40	< 13 Teeth
	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

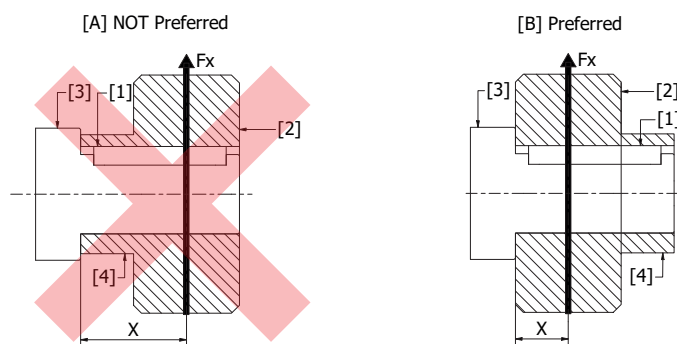
The rated bearing service life L_{10h} (in hours, according to **ISO 281**) is used to calculate the estimated bearing life in hours. For special operating conditions the modified service life should be used.

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

- 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, $\rho=3$ for ball bearings, $\rho=10/3$ for roller bearings
- n_2 = Gearbox output speed [rpm]

Preferred mounting for overhung loads

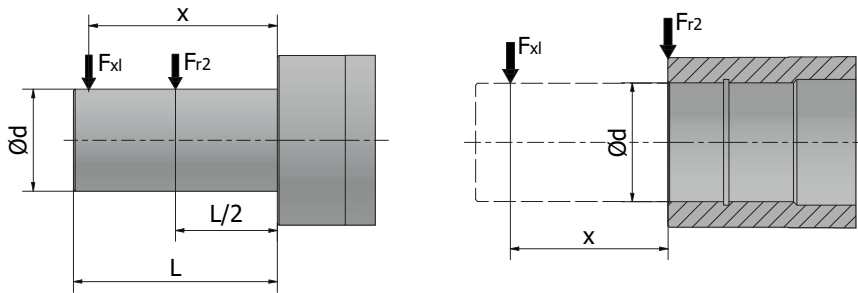
The preferred way of mounting the overhung load for sprockets, gears and other transmissions is with the hub [4] at the end of the shaft [3] and the sprocket/gear [2] against the shoulder, see [B] in the figure below. This method ensures a better load distribution on the end of the shaft.



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.



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

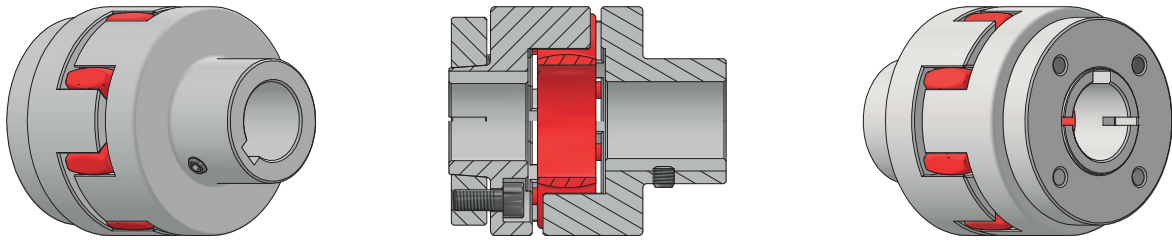
- F_{xL} = Permitted overhung load based on bearing service life [N]
- F_{r2} = Permitted overhung load ($x=L/2$) for foot mounted gearboxes according to the selection tables [N]
- x = Distance from the shaft shoulder to the applied force [mm]
- $a, b, \varnothing d, L$ = Gear unit constant for overhung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

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
FVS	a [mm]	b [mm]	Ød [mm]	L [mm]	Fr2 max [N]
FVS 040	84	64	18	40	3490
FVS 050	101	76	25	50	4840
FVS 063	120	95	25	50	6270
FVS 075	131	101	28	60	7380
FVS 090	162	122	35	80	8180
FVS 110	176	136	42	80	12000
FKA	a [mm]	b [mm]	Ød [mm]	L [mm]	Fr2 max [N]
FKA 38	123,5	98,5	25	50	5640
FKA 48	153,5	123,5	30	60	5920
FKA 68	181,3	141,3	40	80	12300
FKA 78	215,8	165,8	50	100	16100
FKA 88	252	192	60	120	27300
FFA	a [mm]	b [mm]	Ød [mm]	L [mm]	Fr2 max [N]
FFA 38	123,5	98,5	25	50	4290
FFA 48	153,5	123,5	30	60	5920
FFA 68	181,3	141,3	40	80	11400
FFA 78	215,8	165,8	50	100	17900

FS(A)	a [mm]	b [mm]	Ød [mm]	L [mm]	Fr2 max [N]
FS(A) 38	118,5	98,5	20	40	3000
FS(A) 48	130	105	25	50	5370
FS(A) 58	150	120	30	60	7520
FS(A) 68	184	149	35	70	9020
FR	a [mm]	b [mm]	Ød [mm]	L [mm]	Fr2 max [N]
FR 38	118	93	25	50	4950
FR 48	137	107	30	60	5420
FR 68	168,5	133,5	35	70	8400
FRC	a [mm]	b [mm]	Ød [mm]	L [mm]	Fr2 max [N]
FRC 01	103	83	20	40	2500
FRC 02	116,5	91,5	25	50	5000
FK	a [mm]	b [mm]	Ød [mm]	L [mm]	Fr2 max [N]
FK 28 B/C	104	78	25	50	4100
FK 38 B/C	118	93	25	50	4800
FK 48 B/C	131	101	28	60	6500
FK 58 B/C	159	119	35	80	8300
FH	a [mm]	b [mm]	Ød [mm]	L [mm]	Fr2 max [N]
FH 28 B/C	104	78	25	50	4100
FH 38 B/C	118	93	25	50	4800
FH 48 B/C	131	101	28	60	6500
FH 58 B/C	159	119	35	80	8300

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.

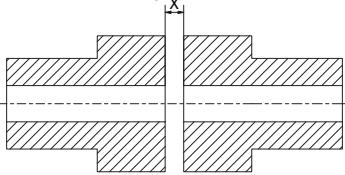
Mounting of couplings

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.

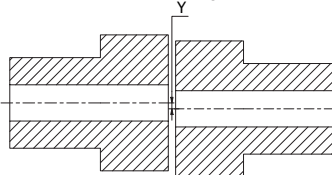
⚠ Note: The amount of allowable misalignment is often specified in the coupling datasheet, from the coupling manufacturer

⚠ 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

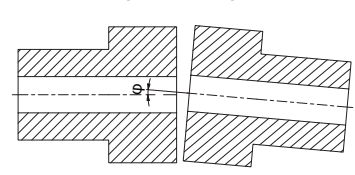
[A] Axial misalignment / Clearance



[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:

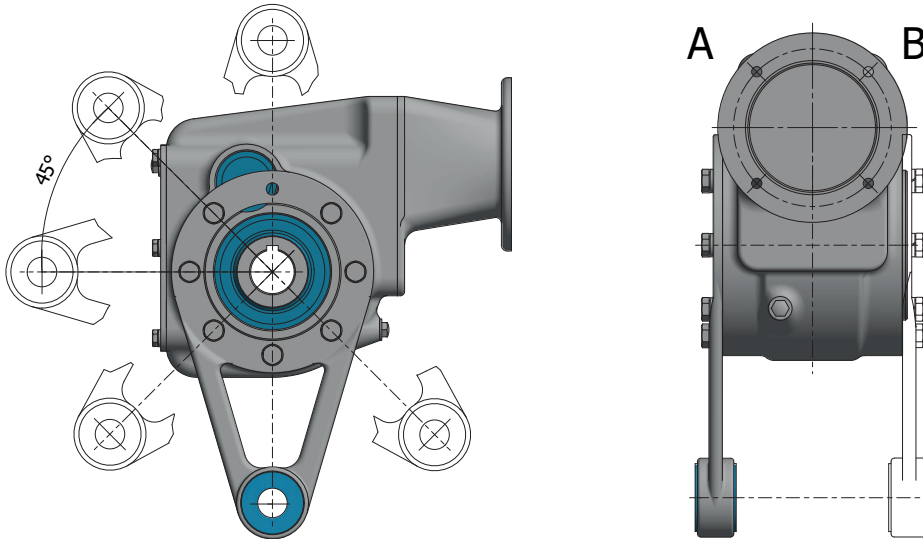
Make sure the angular misalignment [ϕ] is as close to 0 (degrees) as possible, excessive angular misalignment will cause damage.

⚠ 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.

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.

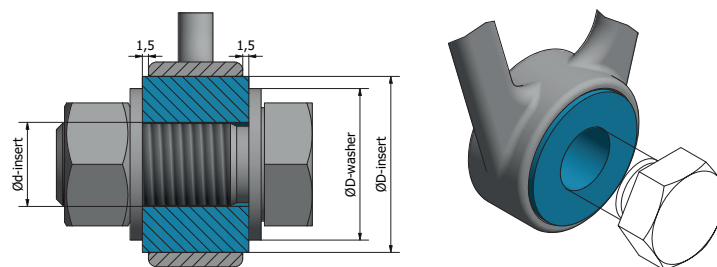
Depending on the gearbox type and size, torque arms can be mounted in a multitude of different positions on the output sides of the gearbox, see the figure below for an example of the different positions.



When mounting the torque arm pay attention to the following:

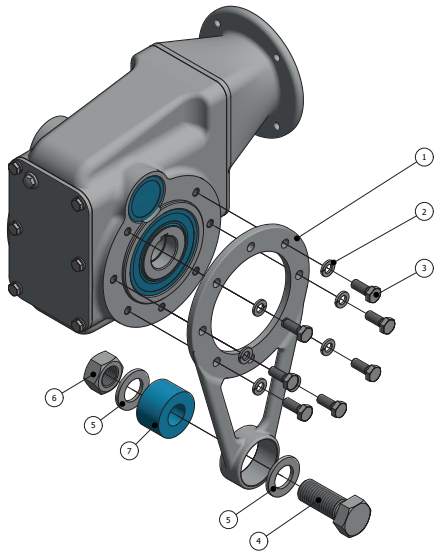
- A torque arm is used to prevent the gearbox from turning with the driven shaft, the torque arm does not prevent movement.
- It is important that the gearbox is allowed some movement when using a torque arm, to ensure that the gearbox bearings don't wear excessively.
- Make sure that the gearbox has 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

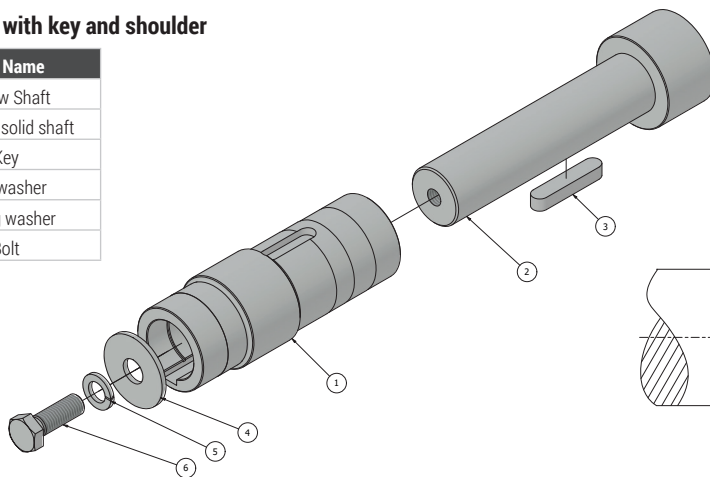
To mount the torque arm, mount the [1] torque arm to the gearbox and bolt it down with [2] spring washer and [3] bolts of the right size. Attach the holding [4] bolt with a [5] washer, through the hole of the [7] rubber insert. Add another [5] washer on the opposite side of the [7] rubber insert and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



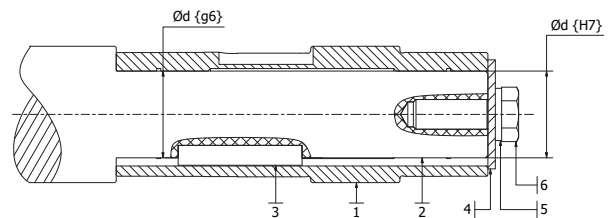
nr.	Part Name
1	Torque arm
2	Spring washer
3	Bolt
4	Bolt
5	Washer
6	Nut
7	Rubber insert

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

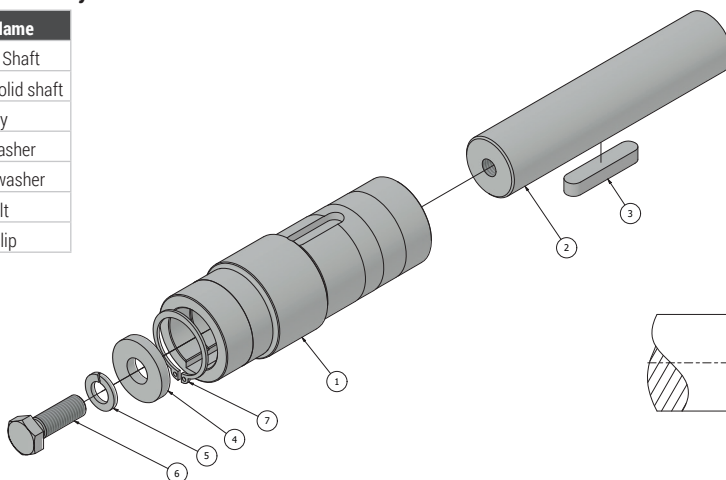


A machine shaft with a key and shoulder is usually held in place with a bolt, a lock washer and a flat washer on the outside of the hollow shaft.

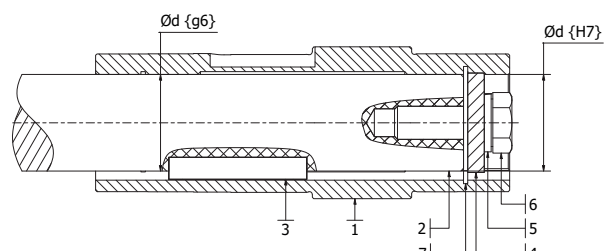


Hollow shaft with key without shoulder

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.

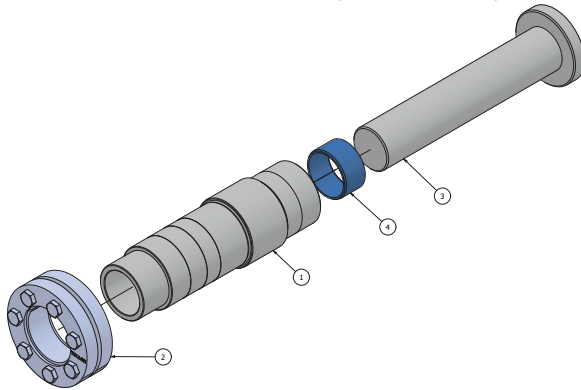


Hollow shaft with a shrink disk

For some applications a shrink disk is preferred, this is a disk that is installed on a longer hollow shaft, which clamps down onto its 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.

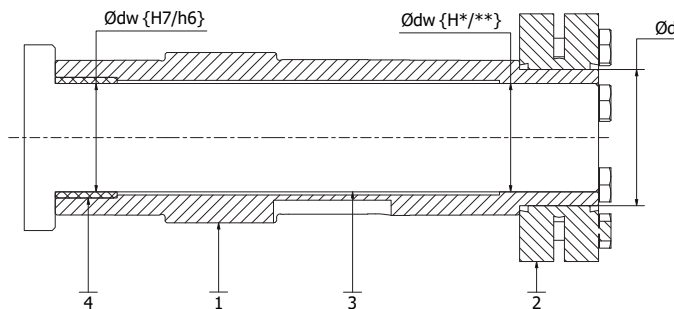
The benefit of a shrink disk is that it provides a way for easy removal of the shaft. Because it is a friction fit, no contact corrosion forms between the shafts. Also it provides an extra fail safe when the machine locks up. The gearbox will not be damaged because the shrink disk will slip when too 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.

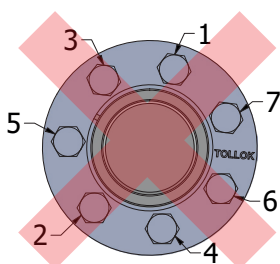


$\varnothing d$ [mm]	$\varnothing dw$ size [mm]	$\varnothing dw \{H^*/**\}$ tolerance	Tightening screws	Tightening torque [Nm]
			[N° X Type]	
14	11-12	H6/j6	4 x M5	4
16	13-14		5 x M5	
24	19-21		6 x M5	
30	24-26	H6/h6	7 x M5	12
>30	24-26		5 x M6	
36	28-31		7 x M6	
44	32-36	H6/g6	8 x M6	30
50	38-42		10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

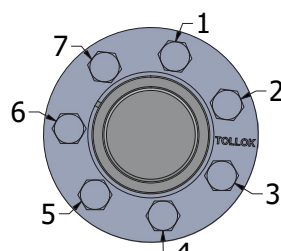
In order to ensure the shrinkdisk is used correctly the following has to be taken into account:

- 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.

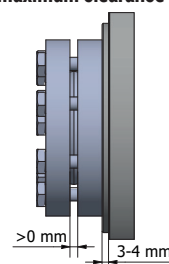
[A] Incorrect tightening order



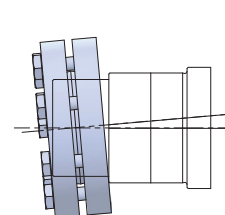
[B] Correct tightening order



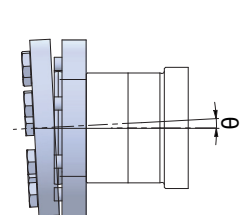
[C] Minimum and maximum clearance



[D] Angular misalignment



[E] Unequally tightened



Possible Geometrical Combinations

Possible Geometrical Combinations

FH 28 B

Maximum Torque = 130 Nm @ N1 = 1400 min⁻¹

n2 [min ⁻¹]	M2max [Nm]	Fr2 [N]	i		η% *	IEC63 B5	IEC71 B14a	IEC80 B14a	IEC90 B14a
24	130	2960	60	58,36	94	V	V		
29	130	2790	50	48,86	94	V	V		
35	130	2610	40	40,09	94	V	V	V	
48	130	2350	30	29,33	94	V	V	V	
58	130	2200	25	24,07	94	V	V	V	
69	100	2080	20	20,21	94	V	V	V	
94	80	1880	15	14,92	94	V	V	V	
113	130	1770	12,5	12,47	94	V	V	V	V
134	100	1670	10	10,47	94	V	V	V	V
181	80	1510	7,5	7,73	94	V	V	V	V

FH 28 C

Maximum Torque = 130 Nm @ N1 = 1400 min⁻¹

n2 [min ⁻¹]	M2max [Nm]	Fr2 [N]	i		η% *	IEC63 B5	IEC71 B14a	IEC80 B14a	IEC90 B14a
4,8	130	4100	300	291,79	92	V			
5,7	130	4100	250	244,29	92	V			
7	130	4100	200	200,44	92	V			
9,5	130	4000	150	146,67	92	V			
11,6	130	3770	125	120,34	92	V	V		
13,9	100	3560	100	101,04	92	V	V		
18,8	80	3220	75	74,62	92	V	V		
23	120	3030	60	62,36	92	V	V		
27	110	2860	50	52,36	92	V	V		

FH 38 B

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
23	200	3430	60	60,5	94	V	V	V	
29	200	3190	50	48,71	94	V	V	V	
36	180	2970	40	39,29	94	V	V	V	
46	200	2720	30	30,31	94		V	V	V
57	180	2530	25	24,44	94		V	V	V
69	150	2380	20	20,25	94		V	V	V
95	110	2130	15	14,67	94		V	V	V
110	180	2030	12,5	12,67	94			V	V
133	150	1910	10	10,5	94			V	V
184	110	1710	7,5	7,6	94			V	V

FH 38 C

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
4,6	200	4800	300	302,5	92	V			
5,7	200	4800	250	243,57	92	V			
7,1	180	4800	200	196,43	92	V			
9,2	200	4650	150	151,56	92	V			
11,5	180	4330	125	122,22	92	V	V		
13,8	150	4070	100	101,27	92	V	V		
19,1	110	3650	75	73,33	92	V	V		
23	140	3480	60	63,33	92	V	V	V	
27	120	3270	50	52,48	92	V	V	V	

FH 48 BMaximum Torque = 350 Nm @ N1 = 1400 min⁻¹

n2 [min ⁻¹]	M2max [Nm]	Fr2 [N]	i		η% *	IEC63 B5	IEC71 B14a	IEC80 B14a	IEC90 B14a	IEC 100 B14a	IEC112 B14a
24	350	4660	60	59,44	94		V	V	V		
29	350	4340	50	48,18	94		V	V	V		
35	300	4080	40	40,13	94		V	V	V		
46	350	3720	30	30,24	94			V	V	V	
56	300	3500	25	25,19	94			V	V	V	
71	240	3230	20	19,84	94			V	V	V	
93	200	2950	15	15,09	94			V	V	V	
112	300	2770	12,5	12,49	94				V	V	V
142	240	2550	10	9,84	94				V	V	V
187	200	2330	7,5	7,48	94				V	V	V

FH 48 CMaximum Torque = 350 Nm @ N1 = 1400 min⁻¹

n2 [min ⁻¹]	M2max [Nm]	Fr2 [N]	i		η% *	IEC63 B5	IEC71 B14a	IEC80 B14a	IEC90 B14a	IEC 100 B14a	IEC112 B14a
4,8	350	6500	300	297,21	92	V	V				
5,9	350	6500	250	240,89	92	V	V				
7	300	6500	200	200,66	92	V	V				
9,3	350	6500	150	151,2	92	V	V	V			
12	300	5980	125	125,95	92	V	V	V			
15	240	5520	100	99,22	92	V	V	V			
19	200	5040	75	75,45	92	V	V	V			
23	350	4730	60	62,43	92		V	V	V		
29	350	4370	50	49,18	92		V	V	V		

FH 58 BMaximum Torque = 500 Nm @ N1 = 1400 min⁻¹

n2 [min ⁻¹]	M2max [Nm]	Fr2 [N]	i		η% *	IEC63 B5	IEC71 B14a	IEC80 B14a	IEC90 B14a	IEC 100 B14a	IEC112 B14a
24	500	5890	60	59,04	94		V	V	V		
29	500	5500	50	48,18	94		V	V	V	V	
35	480	5170	40	40,13	94			V	V	V	
46	500	4710	30	30,24	94			V	V	V	
56	480	4430	25	25,19	94			V	V	V	
71	380	4090	20	19,84	94			V	V	V	
93	300	3730	15	15,09	94			V	V	V	
112	480	3510	12,5	12,49	94				V	V	V
142	380	3240	10	9,84	94				V	V	V
187	300	2950	7,5	7,48	94				V	V	V

FH 58 CMaximum Torque = 500 Nm @ N1 = 1400 min⁻¹

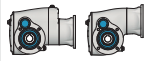

n2 [min ⁻¹]	M2max [Nm]	Fr2 [N]	i		η% *	IEC63 B5	IEC71 B14a	IEC80 B14a	IEC90 B14a	IEC 100 B14a	IEC112 B14a
4,8	460	8300	300	295,18	92	V	V				
5,9	500	8300	250	240,89	92	V	V				
7	480	8300	200	200,66	92	V	V	V			
9,3	500	8050	150	151,2	92	V	V	V			
12	480	7580	125	125,95	92	V	V	V			
15	380	7000	100	99,22	92		V	V	V		
18,6	300	6390	75	75,45	92		V	V	V		



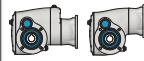

Gearbox Selection Tables

Gearbox Selection Tables

0,12 kW

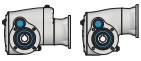

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)		
0,12	9,5	108	146,67	4000	1,2	FH28C IEC63	631-4 B14a
	11,6	89	120,34	3770	1,5		
	13,9	74	101,04	3560	1,3		
	18,8	55	74,62	3220	1,5		
	22	46	62,36	3030	2,8		
	27	39	52,36	2860	2,6		
	24	44	58,36	2960	3		
	29	37	48,86	2790	3,5		
	35	30	40,09	2610	4,3		
	48	22	29,33	2350	5,9		
	58	18,1	24,07	2200	7,2		
	69	15,2	20,21	2080	6,6		
	94	11,2	14,92	1880	7,1		
	112	9,4	12,47	1770	13,8		
	134	7,9	10,47	1670	12,7		
	181	5,8	7,73	1510	13,7		
	5,7	179	243,57	4800	1,1		
	7,1	145	196,43	4800	1,2		
9,2	112	151,56	4650	1,8			
11,5	90	122,22	4330	2			
13,8	75	101,27	4070	2			
19,1	54	73,33	3650	2			
22	47	63,33	3480	3,9			
27	39	52,48	3270	3,9			
23	46	60,5	3430	4,4			
29	37	48,71	3190	5,5			
36	30	39,29	2970	6,1			
46	23	30,31	2720	8,8			
4,7	219	297,21	6500	1,6			
5,8	177	240,89	6500	2			
7	148	200,66	6500	2			
9,3	111	151,2	6500	3,1			
11,1	93	125,95	5980	3,2			
14,1	73	99,22	5520	3,3			
18,6	56	75,45	5040	3,6			
4,7	217	295,18	8300	2,3			
5,8	177	240,89	8300	2,8			
7	148	200,66	8300	3,2			
9,3	111	151,2	8050	4,5			

0,18 kW

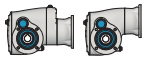

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)				
0,18	22	69	62,36	3030	1,9	FH28C IEC63	632-4 B14a		
	27	58	52,36	2860	1,7				
	24	66	58,36	2960	2	FH28B IEC63	632-4 B14a		
	29	55	48,86	2790	2,4				
	35	45	40,09	2610	2,9				
	48	33	29,33	2350	3,9				
	58	27	24,07	2200	4,8				
	69	23	20,21	2080	4,4				
	94	16,9	14,92	1880	4,7				
	14,4	107	62,36	3510	1,2	FH28C IEC71	711-6 B14a		
	17,2	90	52,36	3310	1,1				
	15,4	103	58,36	3430	1,3	FH28B IEC71	711-6 B14a		
	18,4	86	48,86	3240	1,5				
	22	70	40,09	3030	1,8				
	31	52	29,33	2730	2,5				
	37	42	24,07	2550	3,1				
	45	36	20,21	2410	2,8				
	60	26	14,92	2180	3,1				
	72	22	12,47	2050	5,9				
	86	18,4	10,47	1930	5,4				
	116	13,6	7,73	1750	5,9				
	9,2	167	151,56	4650	1,2			FH38C IEC63	632-4 B14a
	11,5	135	122,22	4330	1,3				
	13,8	112	101,27	4070	1,3				
	19,1	81	73,33	3650	1,4				
	22	70	63,33	3480	2,6				
	27	58	52,48	3270	2,6				
	23	68	60,5	3430	2,9	FH38B IEC63	632-4 B14a		
	29	55	48,71	3190	3,6				
	36	44	39,29	2970	4,1	FH38C IEC71	711-6 B14a		
	14,2	109	63,33	4030	1,7				
	17,1	90	52,48	3790	1,7				
	14,9	106	60,5	3970	1,9	FH38B IEC71	711-6 B14a		
	18,5	86	48,71	3690	2,3				
	23	69	39,29	3440	2,6				
	30	53	30,31	3150	3,8				
	37	43	24,44	2930	4,2				
	44	36	20,25	2760	4,2				
	61	26	14,67	2470	4,3	FH48C IEC63	632-4 B14a		
	4,7	328	297,21	6500	1,1				
	5,8	266	240,89	6500	1,3				
	7	222	200,66	6500	1,4				
9,3	167	151,2	6500	2,1					
11,1	139	125,95	5980	2,2					
14,1	110	99,22	5520	2,2					
18,6	83	75,45	5040	2,4					

P_{1n} = Rated Motor Power [kW] **M_{2max}** = Maximum permissible output torque [Nm] **η%** = Transmission Efficiency %
n₂ = Output Speed [min⁻¹] **F_{r2}** = Permitted Overhung Load Output Side [N] **fs** = Service Factor
M_{2n} = Rated Output torque [Nm] **i** = Gear unit Ratio

0,18 - 0,25 kW

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)			
0,18	6	260	151,2	6500	1,3	FH48C IEC71	711-6 B14a	
	7,1	217	125,95	6500	1,4			
	9,1	171	99,22	6400	1,4			
	11,9	130	75,45	5840	1,5			
	14,4	107	62,43	5480	2,8			
	18,3	85	49,18	5060	2,8			
	15,1	104	59,44	5390	3,4	FH48B IEC71	711-6 B14a	
	18,7	85	48,18	5030	4,1			
	22	71	40,13	4730	4,3			
	4,7	326	295,18	8300	1,5	FH58C IEC63	632-4 B14a	
	5,8	266	240,89	8300	1,9			
	7	222	200,66	8300	2,2			
	9,3	167	151,2	8050	3			
	11,1	139	125,95	7580	3,4			
	14,1	110	99,22	7000	3,5			
	18,6	83	75,45	6390	3,6	FH58C IEC71	711-6 B14a	
	3,7	414	240,89	8300	1,2			
	4,5	345	200,66	8300	1,4			
6	260	151,2	8300	1,9				
7,1	217	125,95	8300	2,2				
9,1	171	99,22	8110	2,2				
11,9	130	75,45	7400	2,3				
14,4	107	62,43	6950	4,5				
18,3	85	49,18	6420	4,5				
22	96	62,36	3030	1,4	FH28C IEC71			711-4 B14a
27	80	52,36	2860	1,2				
24	92	58,36	2960	1,4	FH28B IEC71	711-4 B14a		
29	77	48,86	2790	1,7				
35	63	40,09	2610	2,1				
48	46	29,33	2350	2,8				
58	38	24,07	2200	3,4				
69	32	20,21	2080	3,2				
94	23	14,92	1880	3,4				
18,4	119	48,86	3240	1,1			FH28B IEC71	712-6 B14a
22	98	40,09	3030	1,3				
31	72	29,33	2730	1,8				
37	59	24,07	2550	2,2				
45	49	20,21	2410	2				
60	36	14,92	2180	2,2				
72	30	12,47	2050	4,3				
86	26	10,47	1930	3,9				
116	18,9	7,73	1750	4,2	FH38C IEC71	711-4 B14a		
22	97	63,33	3480	1,9				
27	81	52,48	3270	1,9				

0,25 kW

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)			
0,25	23	95	60,5	3430	2,1	FH38B IEC71	711-4 B14a	
	29	76	48,71	3190	2,6			
	36	62	39,29	2970	2,9			
	46	48	30,31	2720	4,2	FH38C IEC71	712-6 B14a	
	14,2	151	63,33	4030	1,2			
	17,1	125	52,48	3790	1,2			
	14,9	148	60,5	3970	1,4	FH38B IEC71	712-6 B14a	
	18,5	119	48,71	3690	1,7			
	23	96	39,29	3440	1,9			
	30	74	30,31	3150	2,7			
	37	60	24,44	2930	3			
	44	49	20,25	2760	3			
	61	36	14,67	2470	3,1	FH48C IEC71	711-4 B14a	
	9,3	232	151,2	6500	1,5			
	11,1	193	125,95	5980	1,6			
	14,1	152	99,22	5520	1,6			
	18,6	116	75,45	5040	1,7			
	22	96	62,43	4730	3,1			
28	75	49,18	4370	3,2	FH48B IEC71			711-4 B14a
24	93	59,44	4660	3,8				
29	76	48,18	4340	4,6	FH48C IEC71			712-6 B14a
7,1	301	125,95	6500	1				
9,1	237	99,22	6400	1				
11,9	180	75,45	5840	1,1				
14,4	149	62,43	5480	2				
18,3	117	49,18	5060	2		FH48B IEC71	712-6 B14a	
15,1	145	59,44	5390	2,4				
18,7	118	48,18	5030	3		FH58C IEC71	711-4 B14a	
22	98	40,13	4730	3,1				
4,7	453	295,18	8300	1,1				
5,8	370	240,89	8300	1,4				
7	308	200,66	8300	1,6				
9,3	232	151,2	8050	2,2				
11,1	193	125,95	7580	2,5				
14,1	152	99,22	7000	2,5				
18,6	116	75,45	6390	2,6				
22	96	62,43	6000	5	FH58C IEC71			712-6 B14a
28	75	49,18	5540	5				
4,5	479	200,66	8300	1				
6	361	151,2	8300	1,4				
7,1	301	125,95	8300	1,6				
9,1	237	99,22	8110	1,6				
11,9	180	75,45	7400	1,7				
14,4	149	62,43	6950	3,2				
18,3	117	49,18	6420	3,2		FH58B IEC71	712-6 B14a	
15,2	144	59,04	6820	3,5				
18,7	118	48,18	6370	4,3				



P_{1n} = Rated Motor Power [kW]
n₂ = 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

0,37 kW

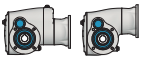

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)				
0,37	29	113	48,86	2790	1,1	FH28B IEC71	712-4 B14a		
	35	93	40,09	2610	1,4				
	48	68	29,33	2350	1,9				
	58	56	24,07	2200	2,3				
	69	47	20,21	2080	2,1				
	94	35	14,92	1880	2,3				
	112	29	12,47	1770	4,5				
	134	24	10,47	1670	4,1				
	181	17,9	7,73	1510	4,5				
	31	106	29,33	2730	1,2			FH28B IEC80	801-6 B14a
	37	87	24,07	2550	1,5				
	45	73	20,21	2410	1,4				
	60	54	14,92	2180	1,5				
	72	45	12,47	2050	2,9				
	86	38	10,47	1930	2,6				
	116	28	7,73	1750	2,9				
	22	144	63,33	3480	1,3	FH38C IEC71	712-4 B14a		
	27	119	52,48	3270	1,3				
	23	140	60,5	3430	1,4				
	29	113	48,71	3190	1,8	FH38B IEC71	712-4 B14a		
36	91	39,29	2970	2					
46	70	30,31	2720	2,8					
57	57	24,44	2530	3,2					
69	47	20,25	2380	3,2					
95	34	14,67	2130	3,2					
18,5	176	48,71	3690	1,1	FH38B IEC80			801-6 B14a	
23	142	39,29	3440	1,3					
30	109	30,31	3150	1,8					
37	88	24,44	2930	2					
44	73	20,25	2760	2,1					
61	53	14,67	2470	2,1					
71	46	12,67	2360	3,9					
86	38	10,5	2210	4					
118	27	7,6	1990	4					
9,3	343	151,2	6500	1		FH48C IEC71	712-4 B14a		
11,1	286	125,95	5980	1					
14,1	225	99,22	5520	1,1					
18,6	171	75,45	5040	1,2					
22	142	62,43	4730	2,1					
28	112	49,18	4370	2,1					
24	138	59,44	4660	2,5					
29	112	48,18	4340	3,1	FH48B IEC71			712-4 B14a	
35	93	40,13	4080	3,2					

0,37 - 0,55 kW

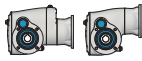

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)					
0,37	14,4	221	62,43	5480	1,4	FH48C IEC80	801-6 B14a			
	18,3	174	49,18	5060	1,4					
	15,1	215	59,44	5390	1,6	FH48B IEC80	801-6 B14a			
	18,7	174	48,18	5030	2					
	22	145	40,13	4730	2,1					
	30	109	30,24	4310	3,2					
	36	91	25,19	4050	3,3					
	45	72	19,84	3740	3,3					
	60	55	15,09	3410	3,7					
	7	456	200,66	8300	1,1			FH58C IEC71	712-4 B14a	
	9,3	343	151,2	8050	1,5					
	11,1	286	125,95	7580	1,7					
	14,1	225	99,22	7000	1,7					
	18,6	171	75,45	6390	1,8					
	22	142	62,43	6000	3,4					
	28	112	49,18	5540	3,4					
	24	137	59,04	5890	3,6	FH58B IEC71	712-4 B14a			
	29	112	48,18	5500	4,5					
	7,1	445	125,95	8300	1,1					
	9,1	351	99,22	8110	1,1	FH58C IEC80	801-6 B14a			
11,9	267	75,45	7400	1,1						
14,4	221	62,43	6950	2,2						
18,3	174	49,18	6420	2,2						
15,2	213	59,04	6820	2,3	FH58B IEC80			801-6 B14a		
18,7	174	48,18	6370	2,9						
22	145	40,13	6000	3,3						
48	101	29,33	2350	1,3					FH28B IEC80	801-4 B14a
58	83	24,07	2200	1,6						
69	70	20,21	2080	1,4						
94	51	14,92	1880	1,6						
112	43	12,47	1770	3						
134	36	10,47	1670	2,8						
181	27	7,73	1510	3						
60	80	14,92	2180	1	FH28B IEC80	802-6 B14a				
72	67	12,47	2050	1,9						
86	56	10,47	1930	1,8						
116	42	7,73	1750	1,9			FH38B IEC80	801-4 B14a		
29	168	48,71	3190	1,2						
36	136	39,29	2970	1,3						
46	105	30,31	2720	1,9						
57	84	24,44	2530	2,1						
69	70	20,25	2380	2,1						
95	51	14,67	2130	2,2						
110	44	12,67	2030	4,1						
133	36	10,5	1910	4,1						
184	26	7,6	1710	4,2						

P_{1n} = Rated Motor Power [kW] **M_{2max}** = Maximum permissible output torque [Nm] **η%** = Transmission Efficiency %
n₂ = Output Speed [Min⁻¹] **F_{r2}** = Permitted Overhung Load Output Side [N] **fs** = Service Factor
M_{2n} = Rated Output torque [Nm] **i** = Gear unit Ratio

0,55 kW

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)		
0,55	30	163	30,31	3150	1,2	FH38B IEC80	802-6 B14a
	37	131	24,44	2930	1,4		
	44	109	20,25	2760	1,4		
	61	79	14,67	2470	1,4		
	71	68	12,67	2360	2,6		
	86	56	10,5	2210	2,7		
	118	41	7,6	1990	2,7	FH48C IEC80	801-4 B14a
	22	211	62,43	4730	1,4		
	28	166	49,18	4370	1,4		
	24	205	59,44	4660	1,7		
	29	166	48,18	4340	2,1	FH48B IEC80	801-4 B14a
	35	139	40,13	4080	2,2		
	46	104	30,24	3720	3,4		
	56	87	25,19	3500	3,5		
	71	68	19,84	3230	3,5		
	93	52	15,09	2950	3,8		
	15,1	319	59,44	5390	1,1	FH48B IEC80	802-6 B14a
	18,7	259	48,18	5030	1,4		
	22	215	40,13	4730	1,4		
	30	162	30,24	4310	2,2		
	36	135	25,19	4050	2,2		
	45	107	19,84	3740	2,3		
	60	81	15,09	3410	2,5	FH58C IEC80	801-4 B14a
	11,1	425	125,95	7580	1,1		
	14,1	335	99,22	7000	1,1		
	18,6	255	75,45	6390	1,2		
	22	211	62,43	6000	2,3		
	28	166	49,18	5540	2,3		
	24	204	59,04	5890	2,5	FH58B IEC80	801-4 B14a
	29	166	48,18	5500	3		
	35	139	40,13	5170	3,5		
	46	104	30,24	4710	4,8		
	14,4	328	62,43	6950	1,5	FH58C IEC80	802-6 B14a
	18,3	258	49,18	6420	1,5		
	15,2	317	59,04	6820	1,6	FH58B IEC80	802-6 B14a
	18,7	259	48,18	6370	1,9		
22	215	40,13	6000	2,2			
30	162	30,24	5460	3,1			
36	135	25,19	5130	3,5			
45	107	19,84	4740	3,6			
60	81	15,09	4330	3,7			

0,75 kW

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)		
0,75	58	113	24,07	2200	1,1	FH28B IEC80	802-4 B14a
	69	95	20,21	2080	1,1		
	94	70	14,92	1880	1,1		
	112	59	12,47	1770	2,2		
	134	49	10,47	1670	2		
	181	36	7,73	1510	2,2		
	72	91	12,47	2050	1,4	FH28B IEC90	90S-6 B14a
	86	77	10,47	1930	1,3		
	116	57	7,73	1750	1,4		
	46	143	30,31	2720	1,4		
	57	115	24,44	2530	1,6	FH38B IEC80	802-4 B14a
	69	95	20,25	2380	1,6		
	95	69	14,67	2130	1,6		
	110	60	12,67	2030	3		
	133	49	10,5	1910	3		
	184	36	7,6	1710	3,1		
	37	179	24,44	2930	1	FH38B IEC90	90S-6 B14a
	44	148	20,25	2760	1		
	61	107	14,67	2470	1		
	71	93	12,67	2360	1,9		
	86	77	10,5	2210	2		
	118	56	7,6	1990	2		
	22	287	62,43	4730	1	FH48C IEC80	802-4 B14a
	28	226	49,18	4370	1,1		
	24	280	59,44	4660	1,3	FH48B IEC80	802-4 B14a
	29	227	48,18	4340	1,5		
	35	189	40,13	4080	1,6		
	46	142	30,24	3720	2,5		
	56	119	25,19	3500	2,5		
	71	93	19,84	3230	2,6		
	93	71	15,09	2950	2,8	FH48B IEC90	90S-6 B14a
	22	294	40,13	4730	1		
	30	221	30,24	4310	1,6		
	36	184	25,19	4050	1,6		
	45	145	19,84	3740	1,7		
	60	110	15,09	3410	1,8		
	72	91	12,49	3210	3,3		
	91	72	9,84	2960	3,3	FH58C IEC80	802-4 B14a
	120	55	7,48	2700	3,7		
	22	287	62,43	6000	1,7		
	28	226	49,18	5540	1,7		

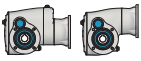

P_{1n} = Rated Motor Power [kW]
n₂ = Output Speed [Min⁻¹]
M_{2n} = Rated Output torque [Nm]

M_{2max} = Maximum permissible output torque [Nm]
F_{r2} = Permitted Overhung Load Output Side [N]
i = Gear unit Ratio

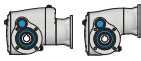

η% = Transmission Efficiency %
fs = Service Factor

Gearbox Selection Tables

0,75 - 1,1 kW

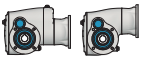

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)			
0,75	24	278	59,04	5890	1,8	FH58B IEC80	802-4 B14a	
	29	227	48,18	5500	2,2			
	35	189	40,13	5170	2,5			
	46	142	30,24	4710	3,5			
	56	119	25,19	4430	4			
	71	93	19,84	4090	4,1			
	93	71	15,09	3730	4,2			
	14,4	447	62,43	6950	1,1	FH58C IEC90	90S-6 B14a	
	18,3	352	49,18	6420	1,1			
	15,2	432	59,04	6820	1,2	FH58B IEC90	90S-6 B14a	
	18,7	353	48,18	6370	1,4			
	22	294	40,13	6000	1,6			
	30	221	30,24	5460	2,3			
	36	184	25,19	5130	2,6			
	45	145	19,84	4740	2,6			
60	110	15,09	4330	2,7				
112	86	12,47	1770	1,5	FH28B IEC90			90S-4 B14a
134	72	10,47	1670	1,4				
181	53	7,73	1510	1,5				
57	169	24,44	2530	1,1	FH38B IEC90	90S-4 B14a		
69	140	20,25	2380	1,1				
95	101	14,67	2130	1,1				
110	87	12,67	2030	2,1				
133	72	10,5	1910	2,1				
184	52	7,6	1710	2,1				
71	136	12,67	2360	1,3	FH38B IEC90	90L-6 B14a		
86	113	10,5	2210	1,3				
118	82	7,6	1990	1,3	FH48B IEC90	90S-4 B14a		
29	333	48,18	4340	1,1				
35	277	40,13	4080	1,1				
46	209	30,24	3720	1,7				
56	174	25,19	3500	1,7				
71	137	19,84	3230	1,8				
93	104	15,09	2950	1,9				
112	86	12,49	2770	3,5				
142	68	9,84	2550	3,5				
187	52	7,48	2330	3,9				
30	325	30,24	4310	1,1			FH48B IEC90	90L-6 B14a
36	271	25,19	4050	1,1				
45	213	19,84	3740	1,1				
60	162	15,09	3410	1,2				
72	134	12,49	3210	2,2				
91	106	9,84	2960	2,3				
120	80	7,48	2700	2,5				

1,1 - 1,5 kW

P1 [kW]	n2 [min-1]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)			
1,1	22	422	62,43	6000	1,1	FH58C IEC90	90S-4 B14a	
	28	332	49,18	5540	1,1			
	24	408	59,04	5890	1,2	FH58B IEC90	90S-4 B14a	
	29	333	48,18	5500	1,5			
	35	277	40,13	5170	1,7			
	46	209	30,24	4710	2,4			
	56	174	25,19	4430	2,8			
	71	137	19,84	4090	2,8			
	93	104	15,09	3730	2,9			
	22	431	40,13	6000	1,1			FH58B IEC90
	30	325	30,24	5460	1,5			
	36	271	25,19	5130	1,8			
	45	213	19,84	4740	1,8			
	60	162	15,09	4330	1,9			
	72	134	12,49	4060	3,6			
91	106	9,84	3750	3,6				
120	80	7,48	3420	3,7				
112	117	12,47	1770	1,1	FH28B IEC90	90L-4 B14a		
134	99	10,47	1670	1				
181	73	7,73	1510	1,1	FH38B IEC90	90L-4 B14a		
110	119	12,67	2030	1,5				
133	99	10,5	1910	1,5				
184	72	7,6	1710	1,5				
46	285	30,24	3720	1,2			FH48B IEC90	90L-4 B14a
56	237	25,19	3500	1,3				
71	187	19,84	3230	1,3				
93	142	15,09	2950	1,4				
112	118	12,49	2770	2,6				
142	93	9,84	2550	2,6				
187	70	7,48	2330	2,8	FH48B IEC100	100L1-6 B14a		
72	183	12,49	3210	1,6				
91	144	9,84	2960	1,7				
120	110	7,48	2700	1,8	FH58B IEC90	90L-4 B14a		
29	454	48,18	5500	1,1				
35	378	40,13	5170	1,3				
46	285	30,24	4710	1,8				
56	237	25,19	4430	2				
71	187	19,84	4090	2				
93	142	15,09	3730	2,1				
112	118	12,49	3510	4,1				
142	93	9,84	3240	4,1				
187	70	7,48	2950	4,3				

P_{1n} = Rated Motor Power [kW] **M_{2max}** = Maximum permissible output torque [Nm] **η%** = Transmission Efficiency %
n₂ = Output Speed [Min⁻¹] **F_{r2}** = Permitted Overhung Load Output Side [N] **fs** = Service Factor
M_{2n} = Rated Output torque [Nm] **i** = Gear unit Ratio

1,5 - 2,2 - 3 - 4kW

P1 [kW]	n2 [min ⁻¹]	M2 [Nm]	i	Fr2 [N]	fs(gear-box)		
1,5	30	443	30,24	5460	1,1	FH58B IEC100	100L1-6 B14a
	36	369	25,19	5130	1,3		
	45	291	19,84	4740	1,3		
	60	221	15,09	4330	1,4		
	72	183	12,49	4060	2,6		
	91	144	9,84	3750	2,6		
	120	110	7,48	3420	2,7		
2,2	112	172	12,49	2770	1,7	FH48B IEC100	100L1-4 B14a
	142	136	9,84	2550	1,8		
	187	103	7,48	2330	1,9		
	72	268	12,49	3210	1,1		
	91	211	9,84	2960	1,1	FH48B IEC100	100L2-6 B14a
	120	161	7,48	2700	1,2		
	46	418	30,24	4710	1,2	FH58B IEC100	100L1-4 B14a
	56	348	25,19	4430	1,4		
	71	274	19,84	4090	1,4		
	93	208	15,09	3730	1,4		
	112	172	12,49	3510	2,8		
	142	136	9,84	3240	2,8		
	187	103	7,48	2950	2,9		
	72	268	12,49	4060	1,8	FH58B IEC100	100L2-6 B14a
91	211	9,84	3750	1,8			
120	161	7,48	3420	1,9			
3	112	235	12,49	2770	1,3	FH48B IEC100	100L2-4 B14a
	142	185	9,84	2550	1,3		
	187	141	7,48	2330	1,4		
	56	474	25,19	4430	1	FH58B IEC100	100L2-4 B14a
	71	374	19,84	4090	1		
	93	284	15,09	3730	1,1		
	112	235	12,49	3510	2		
	142	185	9,84	3240	2,1		
187	141	7,48	2950	2,1			
4	112	320	12,49	2770	1,1	FH48B IEC100	112M-4 B14a
	142	252	9,84	2550	1,4		
	187	192	7,48	2330	1,5		
	71	509	19,84	4090	1	FH58B IEC100	112M-4 B14A
	93	387	15,09	3730	1,3		
	112	320	12,49	3510	1,4		
	142	252	9,84	3240	1,4		
187	192	7,48	2950	1,5			

P_{1n} = Rated Motor Power [kW]
n₂ = 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

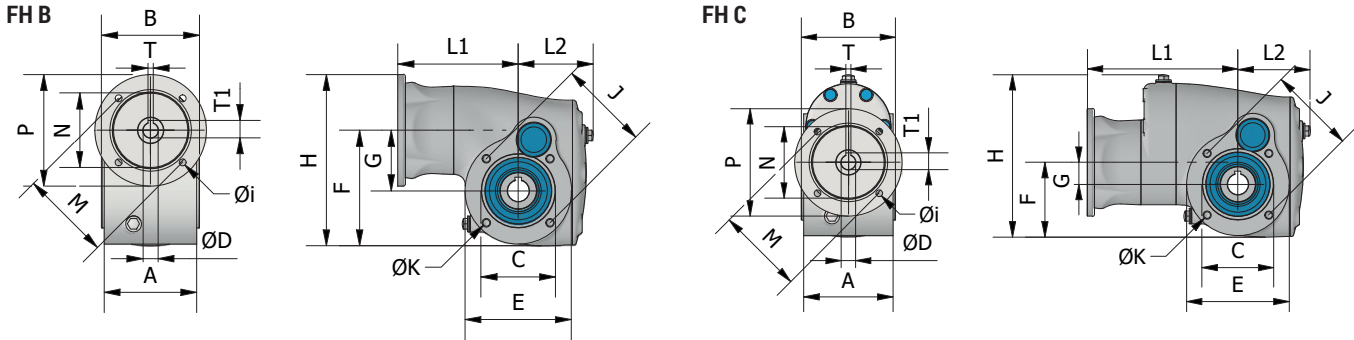
η% = Transmission Efficiency %
fs = Service Factor



General Dimensions

General Dimensions

General dimensions



FH B

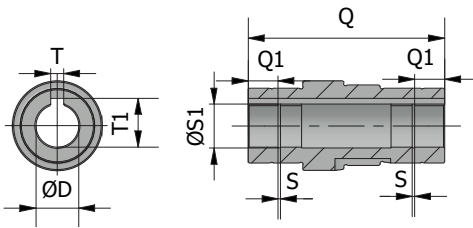
Gearbox	Motor	A	B	C	ØD	E	F	G	H	Øi	J	ØK	L1	L2	M	N	P	T	T1
FH 28B	IEC 63 B5	87	92	70	11	100	108,5	57	178,5	9	85	4 x M8	105,5	70,5	115	95	140	4	12,8
	IEC 71 B14a				14				161	6,6			113		85	70	105	5	16,3
	IEC 80 B14a				19				168,5	6,6			133		100	80	120	6	21,8
	IEC 90 B14a				24				178,5	9			133		115	95	140	8	27,3
FH 38B	IEC 63 B5	106	112	80	11	110	121	64,5	189,5	9	95	7 x M8	116,5	79,5	115	95	140	4	12,8
	IEC 71 B14a				14				172	6,6			124		85	70	105	5	16,3
	IEC 80 B14a				19				181	6,6			144		100	80	120	6	21,8
	IEC 90 B14a				24				191	9			144		115	95	140	8	27,3
FH 48B	IEC 63 B5	114	120	95	11	140	144	74,5	214,5	9	115	7 x M8	139	92,5	115	95	140	4	12,8
	IEC 71 B14a				14				197	6,6			146		85	70	105	5	16,3
	IEC 80 B14a				19				205	6,6			166		100	80	120	6	21,8
	IEC 90 B14a				24				215	9			166		115	95	140	8	27,3
	IEC 100 B14a				28				224,5	9			176		130	110	160	8	31,3
FH 58B	IEC 63 B5	134	140	110	11	160	168,5	88	238,5	9	130	7 x M10	155	108,5	115	95	140	4	12,8
	IEC 71 B14a				14				220,5	6,6			162		85	70	105	5	16,3
	IEC 80 B14a				19				228,5	6,6			182		100	80	120	6	21,8
	IEC 90 B14a				24				238,5	9			182		115	95	140	8	27,3
	IEC 100 B14a				28				248,5	9			192		130	110	160	8	31,3

FH C

Gearbox	Motor	A	B	C	ØD	E	F	G	H	Øi	J	ØK	L1	L2	M	N	P	T	T1
FH 28C	IEC 63 B5	87	92	70	11	100	72,4	21,3	157,9	9	85	4 x M8	139,5	70,5	115	95	140	4	12,8
	IEC 71 B14a				14				147	6,6			147		85	70	105	5	16,3
	IEC 80 B14a				19				167	6,6			167		100	80	120	6	21,8
	IEC 90 B14a				24				167	9			167		115	95	140	8	27,3
FH 38C	IEC 63 B5	106	112	80	11	110	84	29	169,5	9	95	7 x M8	150,5	79,5	115	95	140	4	12,8
	IEC 71 B14a				14				158	6,6			158		85	70	105	5	16,3
	IEC 80 B14a				19				178	6,6			178		100	80	120	6	21,8
	IEC 90 B14a				24				178	9			178		115	95	140	8	27,3
FH 48C	IEC 63 B5	114	120	95	11	140	100,5	31	208	9	115	7 x M8	179	92,5	115	95	140	4	12,8
	IEC 71 B14a				14				186	6,6			186		85	70	105	5	16,3
	IEC 80 B14a				19				206	6,6			206		100	80	120	6	21,8
	IEC 90 B14a				24				216	9			206		115	95	140	8	27,3
	IEC 100 B14a				28				216	9			216		130	110	160	8	31,3
FH 58C	IEC 63 B5	134	140	110	11	160	124	44	231,5	9	130	7 x M10	195	108,5	115	95	140	4	12,8
	IEC 71 B14a				14				202	6,6			202		85	70	105	5	16,3
	IEC 80 B14a				19				222	6,6			222		100	80	120	6	21,8
	IEC 90 B14a				24				222	9			222		115	95	140	8	27,3
	IEC 100 B14a				28				232	9			232		130	110	160	8	31,3

Hollow shaft & Solid shaft

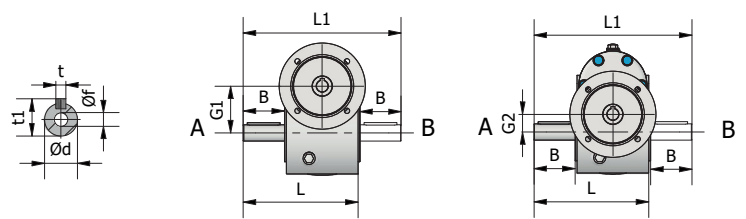
Hollow shaft



Gearbox	ØD[H7/h6]	T	ØS1	Q	Q1	S	S1
FH 28 B&C	20	6	22,8	92	14	1,1	21
FH 38 B&C	25	8	28,3	112	14	1,3	26
FH 48 B&C	30	8	33,3	120	13	1,3	31
FH 58 B&C	35	10	38,3	140	16	1,6	37

Different hollow shaft dimensions possible on request

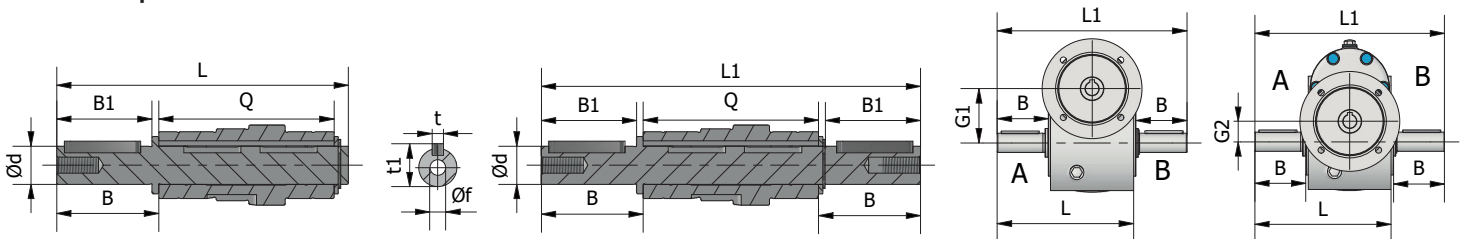
Solid shaft



Gearbox	Ød[g6]	Øf	t	t1	L	L1	B	G1 (FK B)	G2 (FK C)
FH 28 B&C	20	M6	6	28	140	192	50	57	21
FH 38 B&C	25	M10	8	28	159	212	50	65	29
FH 48 B&C	28	M10	8	31	177	240	60	75	31
FH 58 B&C	35	M12	10	38	207	280	70	88	44

Different solid shaft dimensions possible on request

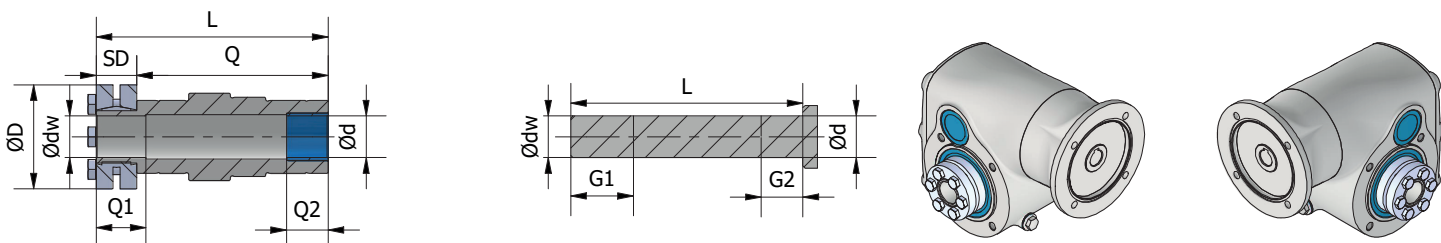
Solid output shaft



Gearbox	Ød[g7]	Øf	t	t1	L	L1	B	B1	Q	G1 (FK B)	G2 (FK C)
FH 28 B&C	20	M10	6	28	153	199	53,5	50	92	57	21
FH 38 B&C	25	M10	8	28	173	219	53,5	50	112	65	29
FH 48 B&C	28	M10	8	31	192,0	247	63,5	60	120	75	31
FH 58 B&C	35	M12	10	38	224,0	309	74,5	70	140	88	44

Different solid input shaft dimensions possible on request

Shrink disk



Gearbox	Ød[H7/h6]	Ødw[H6/*]	ØD	L	SD	Q	Q1	Q2	G1	G2	N° x Type	Tightening Torque Ms [Nm]	Tightening Torque Mt [Nm]	Torque shrink disc
FH 28 B&C	20	20 [*j6]	50	111,5	19,5	92	24	20	29	25	6xM5	4	210	
FH 38 B&C	30	30 [*h6]	72	135,5	23,5	112	31	20	36	25	5xM6	12	570	
FH 48 B&C	30	30 [*h6]	72	143,5	23,5	120	31	20	36	25	5xM6	12	570	
FH 58 B&C	35	35 [*h6]	80	165,5	25,5	140	32	20	37	25	7xM6	12	780	

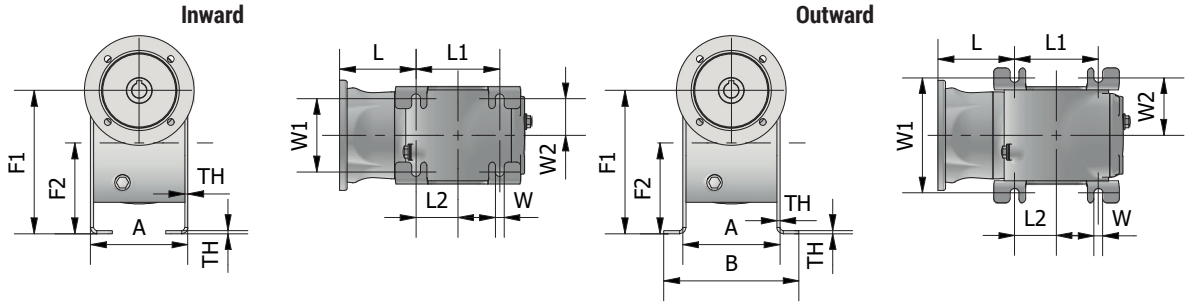
Different shrinkdisk dimensions possible on request

From 18 mm to 30 mm H6/j6

From 30 mm to 50 mm H6/h6

General Dimensions

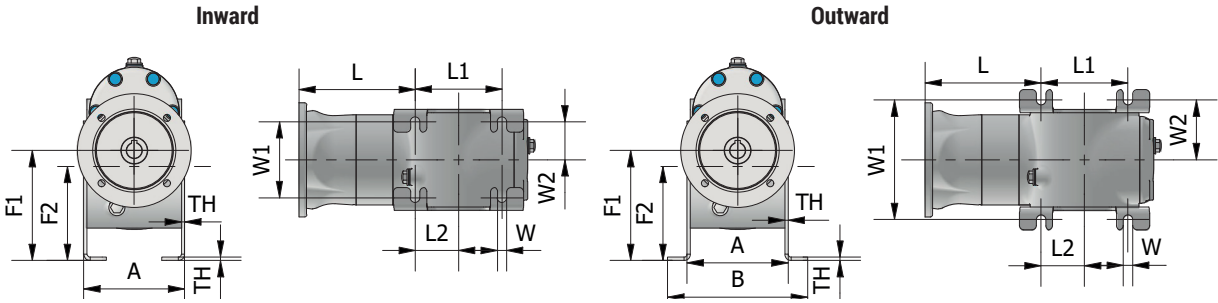
Feet



FH B

Gearbox	Foot	Position	A	B	F1	F2	L1	L2	TH	W	W1	W2
FH 28 B	SS 085 VP80	Inward	93	X	136,9	80	80	40	3	8,5	70	35
		Outward		129								
FH 38 B	SS 095 VP90	Inward	114	X	154,5	90	100	50	4	8,5	85	42,5
		Outward		157								
FH 48 B	SS 115 VP95	Inward	124	X	164,5	95	120	60	5	11,5	90	45
		Outward		170								
FH 58 B	SS 130 VP110	Inward	144	X	198	110	140	70	5	13	100	50
		Outward		204								

Gearbox	L				
	IEC63	IEC71	IEC80	IEC90	IEC100
FH 28 B	65,5	73	93	93	X
FH 38 B	66,5	74	94	94	X
FH 48 B	79	86	106	106	116
FH 58 B	85	92	112	112	122

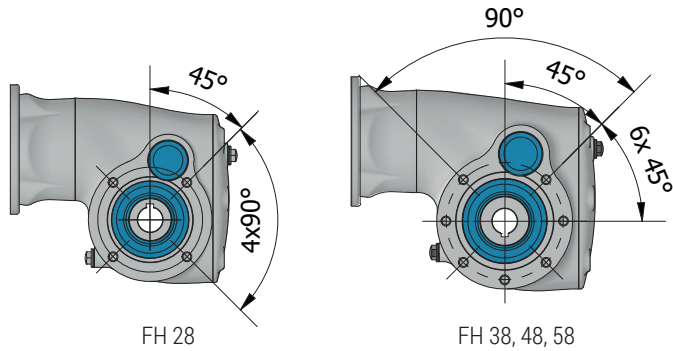


FH C

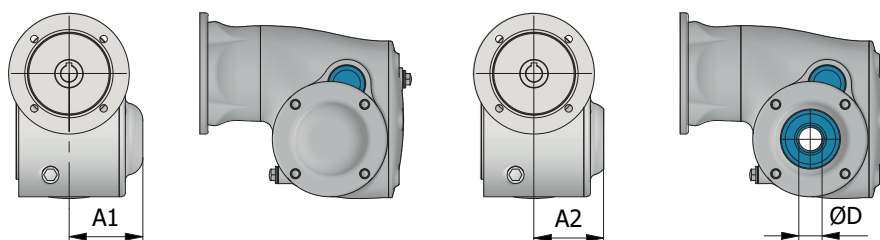
Gearbox	Foot	Position	A	B	F1	F2	L1	L2	TH	W	W1	W2
FH 28 C	SS 085 VP80	Inward	93	X	101	80	80	40	3	8,5	70	35
		Outward		129								
FH 38 C	SS 095 VP90	Inward	114	X	119	90	100	50	4	8,5	85	42,5
		Outward		157								
FH 48 C	SS 115 VP95	Inward	124	X	125,5	95	120	60	5	11,5	90	45
		Outward		170								
FH 58 C	SS 130 VP110	Inward	144	X	154	110	140	70	5	13	100	50
		Outward		204								

Gearbox	L				
	IEC63	IEC71	IEC80	IEC90	IEC100
FH 28 C	99,5	107	127	127	X
FH 38 C	100,5	108	128	128	X
FH 48 C	119	126	146	146	156
FH 58 C	125	132	152	152	162

Hole overview



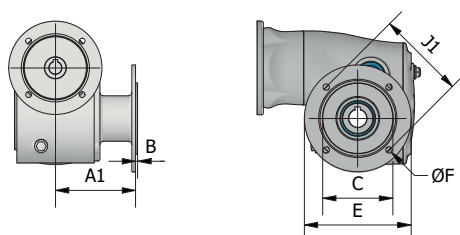
Open & Closed cover



Gearbox	Cover	A
FH 28 B&C	SS 085 CC	64
FH 38 B&C	SS 095 CC	79
FH 48 B&C	SS 115 CC	85
FH 58 B&C	SS 130 CC	95

Gearbox	Cover	A2	ØD
FH 28 B&C	SS 085 CC	61	20
FH 38 B&C	SS 095 CC	75	25
FH 48 B&C	SS 115 CC	85	30
FH 58 B&C	SS 130 CC	95	35

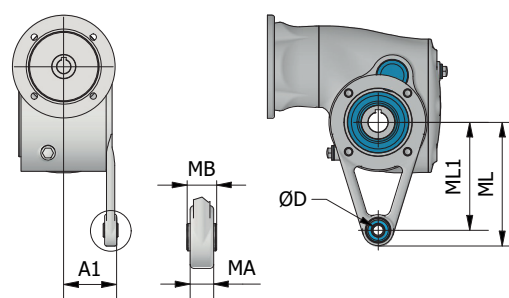
Output flanges



Gearbox	Flange type	A1	B	C	E	ØF	J1
FH 28 B&C	SS 085 FL120	90	2,5	80	120	7	100
	SS 085 FL125	90	2	70	125	11	85
FH 38 B&C	SS 095 FL160	82	4	110	160	9	130
	SS 095 FL180	112	2	115	180	11	150
FH 48 B&C	SS 115 FL200	85	3,5	130	200	11	165
FH 58 B&C	SS 130 FL250	93,5	4	180	250	13,5	215

Different output flange dimensions possible on request

Torque arm

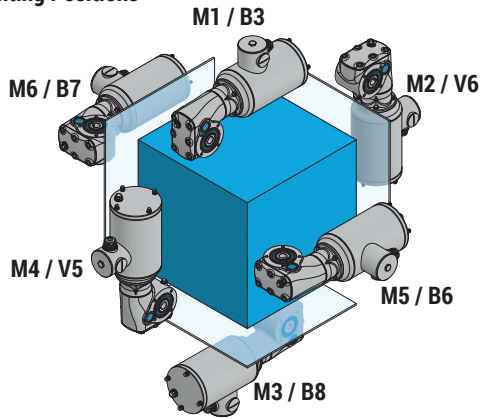


Gearbox	Torque arm	A1	MA	MB	ØD	ML	ML1
FH 28 B&C	SS 085 MS L100	55,3	12	15	10,5	116	100
	SS 085 MS L110S					126	110
FH 38 B&C	SS 095 MS L130S	64,8	12	15	10,5	146	130
	SS 095 MS L150					166	150
FH 48 B&C	SS 115 MS L160S	74,3	23	26	25	185	160
	SS 115 MS L200					225	200
FH 58 B&C	SS130 MS L200	85,5	23	26	25	225	200

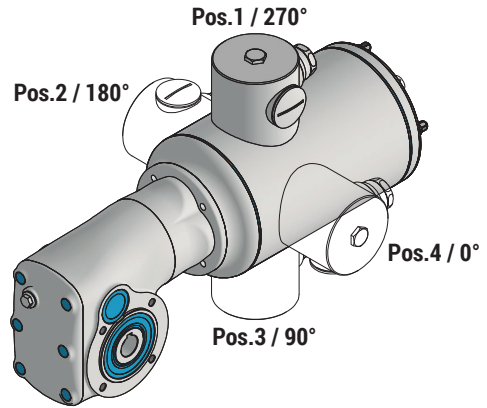
Different torque arm dimensions possible on request

Extra information

Mounting Positions



Terminal Box Positions



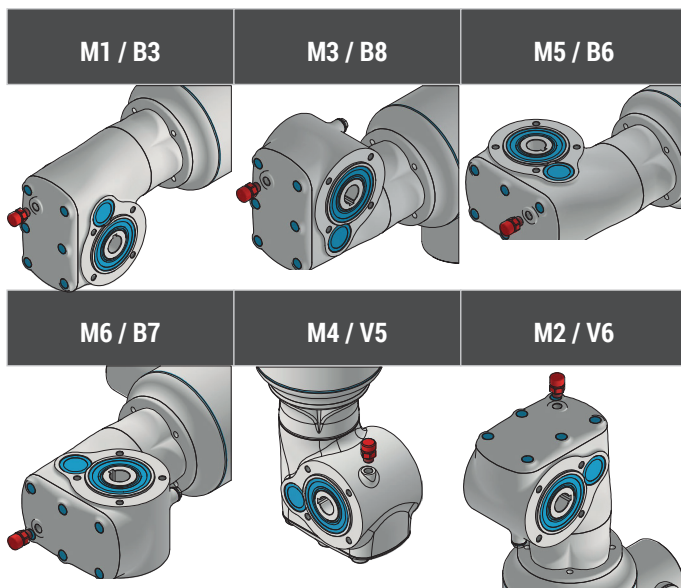
Lubrication Quantity

Oil Quantity in ML.	Mounting Position					
	M1 (B3)	M3 (B8)	M6 (B7)	M5 (B6)	M4 (V5)	M2 (V6)
FH28 B & C	210	150	150	180	210	130
FH38 B & C	350	250	280	350	450	280
FH48 B & C	850	500	550	700	950	550
FH58 B & C	1500	800	900	1250	1600	1100
FH 28 & 38 prestige	110	110	110	110	110	110
FH 48 & 58 prestige	180	180	180	180	180	180

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

Debreeather Positions

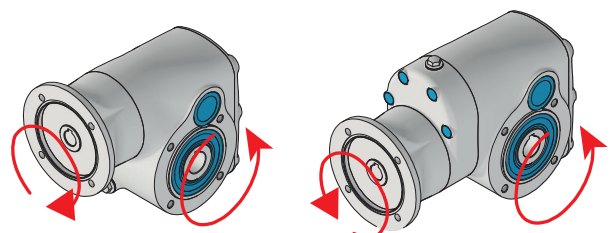


Weight

Gearbox	Weight	Gearbox	Weight
FH28 B	7 Kg	FH28 C	8,5 Kg
FH38 B	9,5 Kg	FH38 C	11 Kg
FH48 B	15,5 kg	FH48 C	17,5 Kg
FH58 B	20 Kg	FH58 C	21,5 Kg

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

Preferred rotation





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FH Documentation - 1.0
10-01-2024

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Note: Unless otherwise stated all sizes are in millimeters.