DERTEC
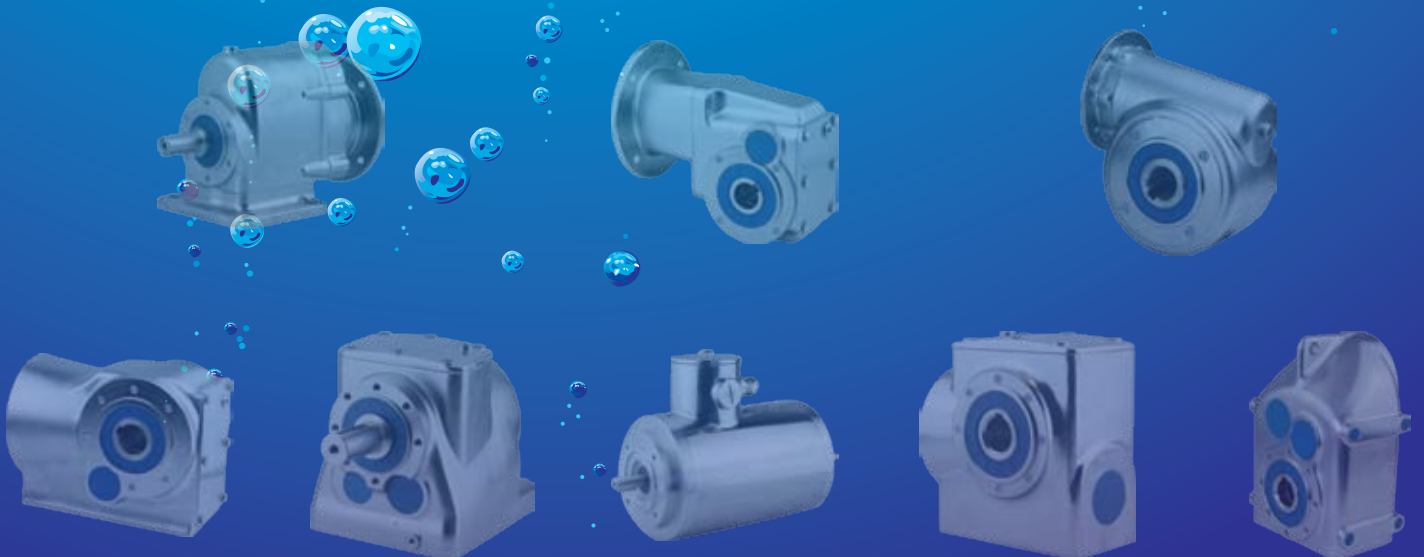
Stainless Steel Helical Gearboxes

FRC Series Helical Gearboxes

FRC series helical gearboxes are being developed to achieve high torque, low energy use and less surface heat.
The high efficiency of the drive reduces the energy consumption.
The case hardened gears ensure a long lifetime and smooth running.
The smart design with a detachable footplate offers great flexibility to replace common used standards in the market.

The design of the gearbox is organic round and the smooth design makes the gearboxes extremely applicable in the food industry.
The FRC helical gearboxes offer ratios up to 54 : 1 with a maximum output torque of 300 Nm.

The main features are:

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.

All solid 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.

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.

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.

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

Properties and features :

Standard ratio's 3,66 : 1 to 54 : 1
IEC motor adaption
Standard solid shafts 20, 25 & 30 mm

Easy clean torque arm with built in elastic element to reduce alignment mistakes allows easy assembling of the gearbox on the machine shaft.
There is no need to laser cut and bend your own torque arm.
The Easy clean torque arm has a very open design. This design offers better cleanability during the standard cleaning cycle.

For flange mounted applications we offer several types of secondary output flanges in Electro Polished SS316.

As a problem solver we are happy to investigate the best possible solutions for our customers that fits their budget.
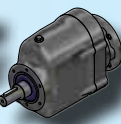
FRC 01		FRC 02	
Ratio's	3,82 : 1 up to 53,33 : 1	Ratio's	3,66 : 1 up to 54,00 : 1
Standard shaft	20 mm	Standard shaft	25 mm
Torque	Max. 117 Nm	Torque	Max. 208 Nm
Power	Max. 1,5 kW	Power	Max. 1.5 kW

FRC 03	
Ratio's	3,74 : 1 up to 51,30 : 1
Standard shaft	30 mm
Torque	Max. 300 Nm
Power	Max. 4.0 kW

Output Flanges

Under Development

Power P

This parameter can be found in the gearbox selection tables and represents the amount kW that can be safely transmitted into the gearbox

$$P_1 = \frac{P_2}{\eta} \, [kW]$$

$$P_{1n} \geq P_1 \cdot f_S \, [kW]$$

P_1	*Input Power (kW)*
P_2	*Output Power (kW)*
P_{1n}	*Rated Input Power (kW)*
f_S	*Service Factor*
η	*Transmission Efficiency %*

Rotation Speed n

n_1	*Gear Units Input Speed*
n_2	*Gear Units Output Speed*

All stated values are based on an input speed of 1500 min⁻¹.
We strongly advise , to obtain the expected lifetime, not to exceed the maximum input speed.
In case of a lower input speed the maximum input torque should be taken in consideration too.

Transmission ratio i

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

Torque M

$$M_2 = \frac{9550 \cdot P_1 \cdot \eta}{n_2} \, [Nm]$$

$$M_{2n} \geq M_2 \cdot f_S \, [Nm]$$

M_2	*= Output Torque (Nm)*
M_{2n}	*= Selected Output Torque (Nm)*
P_1	*= Input Power (kW)*
η	*= Transmission Efficiency %*
f_S	*= Service Factor*

Efficiency of gear units

The efficiency of gear units is mainly determined by the gearing and bearing friction. Keep in mind that the starting efficiency of a gear unit is always less than its efficiency at operating speed. This factor is particularly distinctive for worm & helical worm gear boxes.
The gearing in helical worm & worm gearboxes produces a high proportion of sliding friction.
As a result these gearboxes have higher gear efficiency losses than other gearboxes and therefore have a lower total efficiency.
A secondary result is that the surface temperature of these gearboxes will be higher than other gearboxes.
The efficiency of the Dertec Strainless Steel gearboxes can be found in the possible geometrical combinations page's of each gearbox serie.
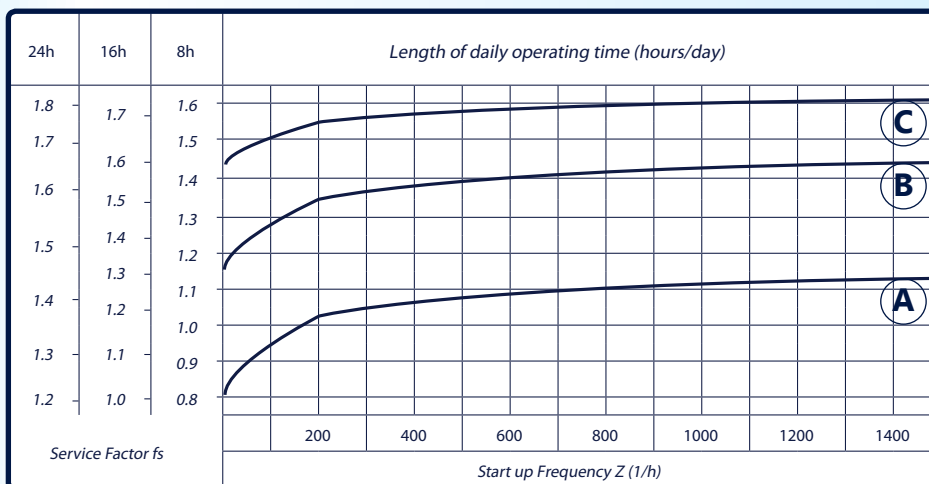
Service Factor

The effect of the driven machine on the gearbox is taken into account to a sufficient level of accuracy using the Service Factor f_S.

The Service Factor is determined according to the daily operating time and the starting frequency **Z**.
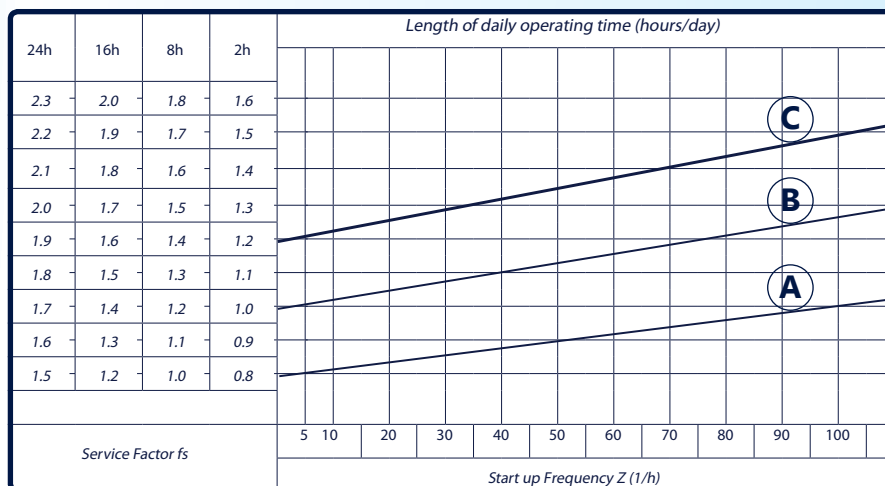
Three load classifications are considered depending on the mass acceleration factor.

You can read of the service factor applicable to your application in the figure below.

The service factor selected using this figure must be less than or equal to the service factor as given in the gearbox selection table.

24h	16h	8h	Length of daily operating time (hours/day)
1.8	1.7	1.6	C
1.7		1.5	
	1.6	1.4	B
1.6	1.5	1.3	
1.5	1.4	1.2	
	1.3	1.1	
1.4	1.2	1.0	A
1.3	1.1	0.9	
1.2	1.0	0.8	

Service Factor fs

Start up Frequency Z (1/h): 200 400 600 800 1000 1200 1400

Service Factor for wormgearboxes

24h	16h	8h	2h	Length of daily operating time (hours/day)
2.3	2.0	1.8	1.6	
2.2	1.9	1.7	1.5	C
2.1	1.8	1.6	1.4	
2.0	1.7	1.5	1.3	B
1.9	1.6	1.4	1.2	
1.8	1.5	1.3	1.1	
1.7	1.4	1.2	1.0	A
1.6	1.3	1.1	0.9	
1.5	1.2	1.0	0.8	

Service Factor fs

Start up Frequency Z (1/h): 5 10 20 30 40 50 60 70 80 90 100

Ambient temperature influence on the service factor for wormgearboxes
Service factor fs should be adjusted as following
ambient temperature = 30 ~ 40 : Fs x 1.1 ~1.2
ambient temperature = 40 ~ 50 : Fs x 1.3 ~1.4
ambient temperature = 50 ~ 60 : Fs x 1.5 ~1.6
ambient temperature = > 60, please contact Dertec.

Type of load:

A

Uniform load Permitted mass acceleration factor **(f_a)≤ 0.3**
Screw feeders for light materials, fans, assembly lines, conveyor belts for light materials, small mixers, lifts, cleaning machines, fillers, control machines.

B

Moderate shock load Permitted mass acceleration factor **(f_a)≤ 3**
Winding devices, woodworking machine feeders, goods lifts, balancers, threading machines, medium mixers, conveyor belts for heavy materials, winches, sliding doors, fertilizer scrapers, packing machines, concrete mixers, crane mechanism, milling cutters, folding machines, gear pumps.

C

Heavy Shock Load Permitted mass acceleration factor **(f_a)≤ 10**
Mixers for heavy materials, shears, presses, centrifuges, rotating supports, winches and lifts for heavy materials, grinding lathes, stone mills, bucket elevators, drilling machines, hammer mills, cam presses, folding machines, turntables, tumbling barrels, vibrators, shredders.

**To maintain the service life of the gear units,
the Service Factor mentioned in the gearbox selection table must be equal or slightly higher than the calculated service factor.**

Mass Acceleration Factor

The Mass acceleration factor is calculated as follows:

$$f_a \frac{Jc}{Jm}$$

f_a	= Mass Acceleration Factor
Jc	= All External Mass Moments Of Inertia [Kgm²]
Jm	= Mass Moment Of Inertia on the Motor End [Kgm²]

If the mass acceleration factor is f_a > 10, please contact us.

Overhung and axial loads

Determining overhung loads
An important factor for determining the resulting overhung load is the type of transmission element mounted to the shaft end.
The following transmission element factors f_z have to be considered for various transmission elements.

Transmission Element	Transmission Element 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

The overhung load exerted on the motor or gearshaft is calculated as follows

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

F_r	= Overhung load in N
M	= Torque in Nm
d_0	= Mean Diameter of the mounted transmission element in mm
f_z	= Transmission element factor

Permitted overhung load
The basis for determining the permitted overhung loads is the calculation of the rated bearing service life L_{10h} of the roller bearings (according ISO281)
For special operating conditions, the permitted overhung loads can be determined with regard to the modified service life on request.

The values refer to force applied to the center of the shaft end (in right angle gear units as viewed onto drive end)
The values for the force application angle α and direction of rotation are based on the most unfavorable conditions.
Definition of force application
The force application is defined according to the following figure.
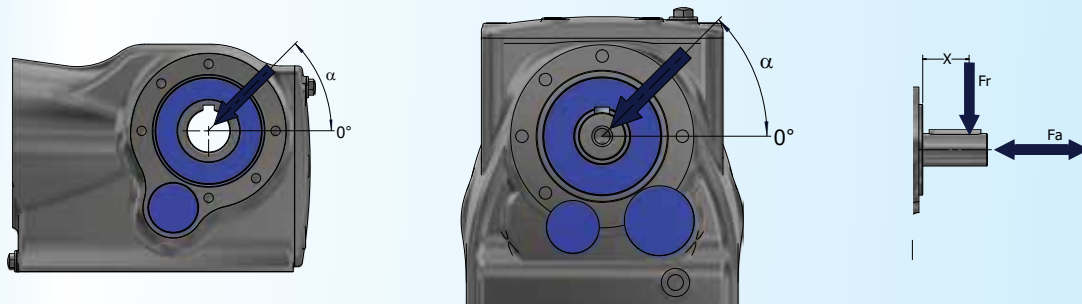
Fx = Permitted overhung load at point x [N]
Fa = Permitted axial load [N]

Permitted axial forces

If there is no overhung load, than an axial force Fa (Tension or Compression) amounting to 50% of the overhung load given in the selection tables is permitted.

Overhung load conversion for off-center force application

The permitted overhung loads must be calculated according to the selection tables using the following formula in the event that force is not applied at the center of the shaft end. Note that the calculations apply to M2max.
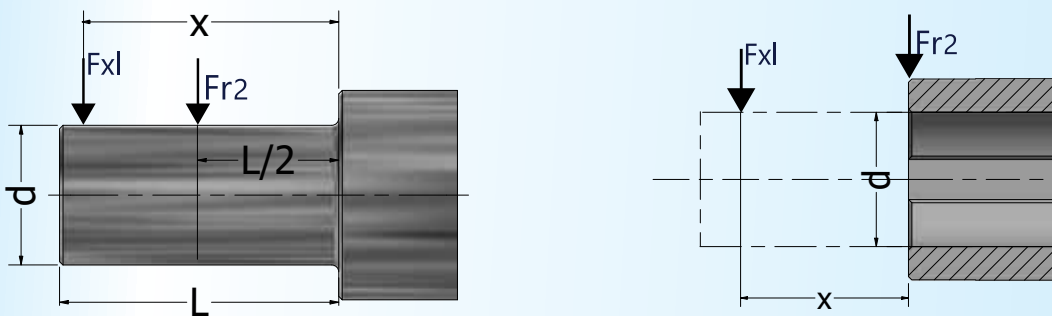
Fxl based on bearing life:

$$Fxl = F_{r2} \cdot \frac{a}{b + x} [N]$$

F_{r2} = Permitted overhung load (x = L/2) for foot mounted gear units according to the selection tables in [N]

x = Distance from the shaft shoulder to the force application point in [mm]

$a, b,$ = Gear unit constant for overhung load conversions [mm]

The following figure shows the overhung load Fr with increased distance X to the gear unit.

Values of a & b in mm are given in the following table

FV	a	b	FR	a	b
FV 030	65	50	FR 38	118	93
FV 040	84	64	FR 48	137	107
FV 050	101	76	FR 68	168.5	133.5
FV 063	12	95			
FK	a	b	**FS(A)**	a	b
FK 28 B/C	104	78	FS(A) 38	118.5	98.5
FK 38 B/C	118	93	FS(A) 48	130	105
FK 48 B/C	131	101	FS(A) 58	150	120
FK 58 B/C	159	119	FS(A) 68	184	149
FRC	a	b	**FKA**	a	b
FRC 01	103	83	FKA 38	123.5	98.5
FRC 02	116.5	91.5	FKA 48	153.5	123.5
FRC 03	130	100	FKA 68	181.3	141.3
FFA	a	b	FKA 78	215.8	165.8
FFA 38	123.5	98.5	FKA 88	252	192
FFA 48	153.5	123.5			
FFA 68	181.3	141.3			
FFA 78	215.8	165.8			

Efficiency & Irreversibility Characteristics

Efficiency is an important parameter of a wormgear reducer.
Efficiency η depends on the following parameters:

1) Helix angle of gearing

2) Driving speed

3) Running in of gearing

4) The performance of the Lubricant, Oil Seals and Bearings.

The Mesh table shows the dynamic effiency ($\eta_1=1400$) and static efficiency values.
Remember that these values are only achieved after the unit has been operating for ca. 24 hours. "Run in period"
Torque values M_{2n} indicated in the gearbox selection tables are calculated by considering the steady state performance of the gearboxes.
The actual values mentioned could have deflection.

Dynamic Irreversibility
Dynamic Irreversibility is achieved when the output shaft stops instantly when power is no longer transmitted through the wormshaft.
This condition requires a dynamic efficiency of $\eta_d<0.4$. See mesh table.

η_d	> 0.6	0.5 ~ 0.6	0.4 ~0.5	<0.4
Dynamic irreversibility	Dynamic reversibility	Low Dynamic reversibility	Good Dynamic irreversibility	Dynamic irreversibility

Static Irreversibility
Static Irreversibility is achieved when, at a standstill, the application of a load to the output shaft can't drive the wormshaft of the gear reducer.
This condition requires a static efficiency of $\eta_s <0.5$, See mesh table.

| η_s	> 0.55	0.5 ~ 0.55	< 0.5
Static irreversibility	Static reversibility	Low Static reversibility	Static irreversibility

The table shows approximate irreversibility classes. Vibrations and shocks can effect a gear reducers irreversibility.
As it is virtual impossible to provide and guarantee total non reversing, we recommend the use of an external brake with suffficient capability to prevent vibrations in duced starting, where these circumstances are required.
For the irreversibility conditions of a combined geared unit one must consider that the efficiency of the group is given by the product of the efficiencies of each single reducer, i.e.: Ntot = N1 x N2

Mesh Data

	i	7,5	10	15	20	25	30	40	50	60	80	100
FV 030	z1	4	3	2	2	1	1	1	1	1	1	
	Mn	1.36	1.39	1.42	1.09	1.69	1.43	1.10	0.89	0.74	0.56	
	Y	18°55'	14°25'	9°44'	7°50'	5°33'	4°54'	3°56'	3°17'	2°43'	2°7'	
	η_d	0.84	0.81	0.76	0.72	0.66	0.64	0.59	0.54	0.50	0.44	
	η_s	0.66	0.62	0.54	0.49	0.41	0.38	0.33	0.29	0.26	0.21	
FV 040	z1	4	3	2	2	2	1	1	1	1	1	1
	Mn	1.87	1.95	2.00	1.54	1.26	2.04	1.55	1.27	1.06	0.80	0.65
	Y	23°54'	18°23'	12°30'	10°3'	8°45'	6°19'	5°4'	4°24'	3°42'	2°52'	2°29'
	η_d	0.86	0.84	0.80	0.77	0.74	0.69	0.65	0.61	0.57	0.51	0.47
	η_s	0.70	0.66	0.59	0.54	0.51	0.44	0.39	0.36	0.32	0.27	0.24
FV 050	z1	4	3	2	2	2	1	1	1	1	1	1
	Mn	2.34	2.43	2.50	1.92	1.56	2.54	1.94	1.58	1.32	1.00	0.80
	Y	23°49'	18°19'	12°27'	10°3'	8°33'	6°18'	5°4'	4°18'	3°38'	2°52'	2°17'
	η_d	0.87	0.85	0.81	0.78	0.75	0.71	0.67	0.63	0.59	0.53	0.48
	η_s	0.70	0.66	0.59	0.54	0.51	0.44	0.39	0.36	0.32	0.27	0.24
FV 063	z1	4	3	2	2	2	1	1	1	1	1	1
	Mn	2.96	3.08	3.17	2.44	1.98	3.23	2.47	1.99	1.68	1.27	1.02
	Y	24°31'	18°53'	12°51'	10°29'	8°45'	6°30'	5°17'	4°24'	3°49'	2°59'	2°26'
	η_d	0.88	0.86	0.82	0.80	0.77	0.73	0.69	0.65	0.62	0.56	0.51
	η_s	0.70	0.66	0.59	0.55	0.51	0.44	0.40	0.36	0.33	0.28	0.24
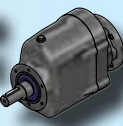
P1n [kW]	N2 min⁻¹	M2n [Nm]	i	Fr2 [N]	fs		

☐ = Combination with the motor in the header row is not possible

■ = Combination with the motor in the header row is possible

P_{1n} [kW] = Rated Motor Power [kW]

N_2 min⁻¹ = Output Speed [min⁻¹]

M_{2n} [Nm] = Rated Output torque [Nm]

M2Max = Maximum permissible output torque [Nm]

F_{r2} [N] = Permitted Overhung Load Output Side [N]

i = Gear unit Ratio

f_s = Service Factor

= Gear unit type
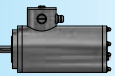
= Motor Type

FRC 01

Maximum Torque = 120 Nm @ N1 = 1400r/min

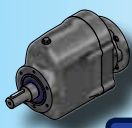| N2 min⁻¹	M2max [Nm]	Fr2 [N]	i	η %	IEC63 B5	IEC71 B14a	IEC80 B14a	IEC90 B14a
26	120	2600	53.33	96	■	■		
31	120	2600	45.89	96	■	■	■	
35	120	2600	40.10	96	■	■	■	
39	120	2560	35.47	96	■	■	■	
49	120	2380	28.50	96	■	■	■	
59	120	2230	23.56	96	■	■	■	■
71	120	2100	19.83	96	■	■	■	■
78	90	2030	17.86	96	■	■	■	
96	120	1900	14.62	96	■	■	■	■
101	90	1860	13.80	96	■	■	■	■
118	120	1770	11.90	96	■	■	■	■
143	120	1660	9.81	96	■	■	■	■
153	80	1630	9.17	96	■	■	■	■
181	80	1540	7.72	96	■	■	■	■
246	70	1390	5.69	96	■	■	■	■
302	70	1290	4.63	96	■	■	■	■
366	70	1210	3.82	96	■	■	■	■
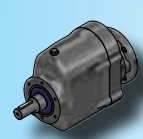
FRC 02 Maximum Torque = 200 Nm @ N1 = 1400r/min

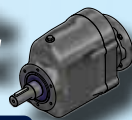| N2 min⁻¹	M2max [Nm]	Fr2 [N]	i	η %	IEC63 B5	IEC71 B14a	IEC80 B14a	IEC90 B14a
26	200	4500	54.00	96				
30	200	4500	46.46	96				
34	200	4500	40.60	96				
39	200	4270	35.91	96				
48	200	3970	28.88	96				
59	200	3730	23.85	96				
70	200	3520	20.08	96				
82	140	3330	17.10	96				
95	200	3180	14.81	96				
106	140	3060	13.21	96				
116	200	2970	12.05	96				
141	200	2780	9.93	96				
159	120	2670	8.78	96				
189	120	2520	7.39	96				
257	100	2280	5.45	96				
316	100	2120	4.43	96				
383	80	1990	3.66	96				

FRC 03 Maximum Torque = 300 Nm @ N1 = 1400r/min

N2 min⁻¹	M2max [Nm]	Fr2 [N]	i	η %	IEC71 B14a	IEC80 B14a	IEC90 B14a	IEC100 B14a	IEC112B14a
24	300	6000	58.09	96					
28	300	6000	50.02	96					
32	300	6000	43.75	96					
36	300	6000	38.73	96					
40	300	5860	34.62	96					
49	300	5480	28.30	96					
64	280	5020	21.78	96					
81	280	4660	17.33	96					
93	260	4440	15.06	96					
113	260	4160	12.37	96					
136	240	3910	10.28	96					
177	180	3590	7.93	96					
222	180	3320	6.31	96					
255	150	3170	5.48	96					
311	150	2970	4.50	96					
374	150	2790	3.74	96					
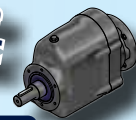
P_{1n} [kW]	N_2 min^{-1}	M_{2n} [Nm]	i	F_{r2} [N]	f_s		
0.12	26	42	53.33	2600	2.9		
	31	36	45.89	2600	3.3		
	35	32	40.10	2600	3.8		
	39	28	35.47	2560	4.3		
	49	22	28.50	2380	5.4		
	59	18.5	23.56	2230	6.5		
	71	15.6	19.83	2100	7.7		
	78	14.0	17.86	2030	6.4		
	96	11.5	14.62	1900	10.4	*FRC 01 IEC63*	*631-4 B5*
	101	10.8	13.80	1860	8.3		
	118	9.4	11.90	1770	12.8		
	143	7.7	9.81	1660	15.6		
	153	7.2	9.17	1630	11.1		
	181	6.1	7.72	1540	13.2		
	246	4.5	5.69	1390	15.7		
	302	3.6	4.63	1290	19.2		
	366	3.0	3.82	1210	23.3		
0.18	26	63	53.33	2600	1.9		
	31	54	45.89	2600	2.2		
	35	47	40.10	2600	2.5		
	39	42	35.47	2560	2.9		
	49	34	28.50	2380	3.6		
	59	28	23.56	2230	4.3		
	71	23	19.83	2100	5.1		
	78	21	17.86	2030	4.3		
	96	17.2	14.62	1900	7.0	*FRC 01 IEC63*	*632-4 B5*
	101	16.3	13.80	1860	5.5		
	118	14.0	11.90	1770	8.6		
	143	11.6	9.81	1660	10.4		
	153	10.8	9.17	1630	7.4		
	181	9.1	7.72	1540	8.8		
	246	6.7	5.69	1390	10.4		
	302	5.5	4.63	1290	12.8		
	366	4.5	3.82	1210	15.5		
	16.9	98	53.33	2600	1.2		
	19.6	84	45.89	2600	1.4		
	22	74	40.10	2600	1.6		
	25	65	35.47	2600	1.8		
	32	52	28.50	2600	2.3	*FRC 01 IEC71*	*711-6 B14a*
	38	43	23.56	2580	2.8		
	45	36	19.83	2440	3.3		
	50	33	17.86	2360	2.7		
	26	64	54.00	4500	3.1		
	30	55	46.46	4500	3.7	*FRC 02 IEC63*	*632-4 B5*
	34	48	40.60	4500	4.2		
	39	42	35.91	4270	4.7		
	16.7	99	54.00	4500	2.0		
	19.4	85	46.46	4500	2.3		
	22	74	40.60	4500	2.7	*FRC 02 IEC71*	*711-6 B14a*
	25	66	35.91	4500	3.0		
	31	53	28.88	4500	3.8		

P_{1n} [kW]	N_2 min⁻¹	M_{2n} [Nm]	i	F_{r2} [N]	f_S		
0.25	26	87	53.33	2600	1.4		
	31	75	45.89	2600	1.6		
	35	66	40.10	2600	1.8		
	39	58	35.47	2560	2.1		
	49	47	28.50	2380	2.6		
	59	39	23.56	2230	3.1		
	71	32	19.83	2100	3.7		
	78	29	17.86	2030	3.1		
	96	24	14.62	1900	5.0	*FRC 01 IEC71*	*711-4 B14a*
	101	23	13.80	1860	4.0		
	118	19.5	11.90	1770	6.2		
	143	16.1	9.81	1660	7.5		
	153	15.0	9.17	1630	5.3		
	181	12.6	7.72	1540	6.3		
	246	9.3	5.69	1390	7.5		
	302	7.6	4.63	1290	9.2		
	366	6.3	3.82	1210	11.2		
	19.6	117	45.89	2600	1.0		
	22	102	40.10	2600	1.2		
	25	90	35.47	2600	1.3		
	32	73	28.50	2600	1.7		
	38	60	23.56	2580	2.0		
	45	51	19.83	2440	2.4		
	50	45	17.86	2360	2.0		
	62	37	14.62	2200	3.2	*FRC 01 IEC71*	*712-6 B14a*
	65	35	13.80	2160	2.6		
	76	30	11.90	2060	4.0		
	92	25	9.81	1930	4.8		
	98	23	9.17	1890	3.4		
	117	19.7	7.72	1780	4.1		
	158	14.5	5.69	1610	4.8		
	194	11.8	4.63	1500	5.9		
	236	9.7	3.82	1410	7.2		
	26	88	54.00	4500	2.3		
	30	76	46.46	4500	2.6	*FRC 02 IEC71*	*711-4 B14a*
	34	66	40.60	4500	3.0		
	39	59	35.91	4270	3.4		
	16.7	138	54.00	4500	1.5		
	19.4	118	146.46	4500	1.7		
	22	103	40.60	4500	1.9	*FRC 02 IEC71*	*712-6 B14a*
	25	91	35.91	4500	2.2		
	31	74	28.88	4500	2.7		

P$_{1n}$ [kW]	N$_2$ min^{-1}	M$_{2n}$ [Nm]	i	F$_{r2}$ [N]	f$_S$		
0.37	31	111	45.89	2600	1.1		
	35	97	40.10	2600	1.2		
	39	86	35.47	2560	1.4		
	49	69	28.50	2380	1.7		
	59	57	23.56	2230	2.1		
	71	48	19.83	2100	2.5		
	78	43	17.86	2030	2.1		
	96	35	14.62	1900	3.4	*FRC 01 IEC71*	*712-4 B14a*
	101	33	13.80	1860	2.7		
	118	29	11.90	1770	4.2		
	143	24	9.81	1660	5.0		
	153	22	9.17	1630	3.6		
	181	18.7	7.72	1540	4.3		
	246	13.8	5.69	1390	5.1		
	302	11.2	4.63	1290	6.2		
	366	9.3	3.82	1210	7.6		
	32	107	28.50	2600	1.1		
	38	89	23.56	2580	1.4		
	45	75	19.83	2440	1.6		
	50	67	17.86	2360	1.3		
	62	55	14.62	2200	2.2	*FRC 01 IEC80*	*801-6 B14a*
	65	52	13.80	2160	1.7		
	76	45	11.90	2060	2.7		
	92	37	9.81	1930	3.2		
	98	35	9.17	1890	2.3		
	117	29	7.72	1780	2.7		
	26	131	54.00	4500	1.5		
	30	113	46.46	4500	1.8		
	34	98	40.60	4500	2.0		
	39	87	35.91	4270	2.3		
	48	70	28.88	3970	2.9	*FRC 02 IEC71*	*712-4 B14a*
	59	58	23.85	3730	3.5		
	70	49	20.08	3520	4.1		
	82	41	17.10	3330	3.4		
	95	36	14.81	3180	5.6		
	16.7	204	54.00	4500	1.0		
	19.4	175	46.46	4500	1.1		
	22	153	40.60	4500	1.3		
	25	135	35.91	4500	1.5		
	31	109	28.88	4500	1.8	*FRC 02 IEC80*	*801-6 B14a*
	38	90	23.85	4320	2.2		
	45	76	20.08	4080	2.6		
	53	64	17.10	3860	2.2		
	68	50	13.21	3550	2.8		
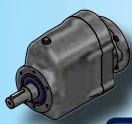
P_{1n} [kW]	N_2 min⁻¹	M_{2n} [Nm]	i	F_{r2} [N]	f_S		
0.37	24	141	58.09	6000	2.1		
	28	121	50.02	6000	2.5		
	32	106	43.75	6000	2.8	**FRC 03 IEC71**	**712-4 B14a**
	36	94	38.73	6000	3.2		
	40	84	34.62	5860	3.6		
	15.5	219	58.09	6000	1.4		
	18	189	50.02	6000	1.6		
	21	165	43.75	6000	1.8		
	23	146	38.73	6000	2.1	**FRC 03 IEC80**	**801-6 B14a**
	26	130	34.62	6000	2.3		
	32	107	28.30	6000	2.8		
	41	82	21.78	5820	3.4		
0.55	49	103	2850	2380	1.2		
	59	85	23.56	2230	1.4		
	71	71	19.83	2100	1.7		
	78	64	17.86	2030	1.4		
	96	53	14.62	1900	2.3		
	101	50	13.80	1860	1.8		
	118	43	11.90	1770	2.8	**FRC 01 IEC80**	**801-4 B14a**
	143	35	9.81	1660	3.4		
	153	33	9.17	1630	2.4		
	181	28	7.72	1540	2.9		
	246	20	5.69	1390	3.4		
	302	16.7	4.63	1290	4.2		
	366	13.8	3.82	1210	5.1		
	45	111	19.83	2440	1.1		
	62	82	14.62	2200	1.5		
	65	77	13.80	2160	1.2		
	76	67	11.90	2060	1.8		
	92	55	9.81	1930	2.2	**FRC 01 IEC80**	**802-6 B14a**
	98	51	9.17	1890	1.6		
	117	43	7.72	1780	1.8		
	158	32	5.69	1610	2.2		
	194	26	4.63	1500	2.7		
	236	21	3.82	1410	3.3		
	26	194	54.00	4500	1.0		
	30	167	46.46	4500	1.2		
	34	146	40.60	4500	1.4		
	39	129	35.91	4270	1.5		
	48	104	28.88	3970	1.9	**FRC 02 IEC80**	**801-4 B14a**
	59	86	23.85	3730	2.3		
	70	72	20.08	3520	2.8		
	82	62	17.10	3330	2.3		
	95	53	14.81	3180	3.7		
	106	48	13.21	3060	2.9		
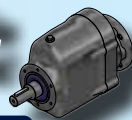
P_{1n} [kW]	N_2 min^{-1}	M_{2n} [Nm]	i	F_{r2} [N]	f_S		
0.55	25	201	35.91	4500	1.0		
	31	162	28.88	4500	1.2		
	38	134	23.85	4320	1.5		
	45	113	20.08	4080	1.8	**FRC 02 IEC80**	**802-6 B14a**
	53	96	17.10	3860	1.5		
	61	83	14.81	3680	2.4		
	68	74	13.21	3550	1.9		
	103	49	8.78	3090	2.4		
	24	209	58.09	6000	1.4		
	28	180	50.02	6000	1.7		
	32	158	43.75	6000	1.9		
	36	139	38.73	6000	2.2	**FRC 03 IEC80**	**801-4 B14a**
	40	125	34.62	5860	2.4		
	49	102	28.30	5480	2.9		
	64	78	21.78	5020	3.6		
	81	62	17.33	4660	4.5		
	18	280	50.02	6000	1.1		
	21	245	43.75	6000	1.2		
	23	217	38.73	6000	1.4		
	26	194	34.62	6000	1.5		
	32	159	28.30	6000	1.9	**FRC 03 IEC80**	**802-6 B14a**
	41	122	21.78	5820	2.3		
	52	97	17.33	5400	2.9		
	60	84	15.06	5150	3.1		
	73	69	12.37	4820	3.8		
0.75	59	116	23.56	2230	1.0		
	71	97	19.83	2100	1.2		
	78	88	17.86	2030	1.0		
	96	72	14.62	1900	1.7		
	101	68	13.80	1860	1.3		
	118	58	11.90	1770	2.1		
	143	48	9.81	1660	2.5	**FRC 01 IEC80**	**802-4 B14a**
	153	45	9.17	1630	1.8		
	181	38	7.72	1540	2.1		
	246	28	5.69	1390	2.5		
	302	23	4.63	1290	3.1		
	366	18.8	3.82	1210	3.7		
	62	112	14.62	2200	1.1		
	76	91	11.90	2060	1.3		
	92	75	9.81	1930	1.6		
	98	70	9.17	1890	1.1	**FRC 01 IEC90**	**90S-6 B14a**
	117	59	7.72	1780	1.4		
	158	43	5.69	1610	1.6		
	194	35	4.63	1500	2.0		
	236	29	3.82	1410	2.4		
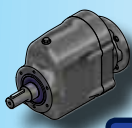
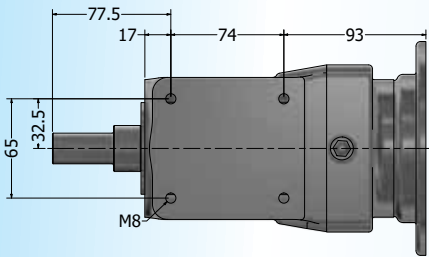| P1n [kW]	N2 min⁻¹	M2n [Nm]	i	Fr2 [N]	fs		
0.75	34	199	40.60	4500	1.0		
	39	176	35.91	4270	1.1		
	48	142	28.88	3970	1.4		
	59	117	23.85	3730	1.7		
	70	99	20.08	3520	2.0		
	82	84	17.10	3330	1.7		
	95	73	14.81	3180	2.7	*FRC 02 IEC80*	*802-4 B14a*
	106	65	13.21	3060	2.2		
	116	59	12.05	2970	3.4		
	141	49	9.93	2780	4.1		
	159	43	8.78	2670	2.8		
	189	36	7.39	2520	3.3		
	257	27	5.45	2280	3.7		
	38	182	23.85	4320	1.1		
	45	153	20.08	4080	1.3		
	61	113	14.81	3680	1.8		
	68	101	13.21	3550	1.4		
	75	92	12.05	3440	2.2	*FRC 02 IEC90*	*90S-6 B14a*
	91	76	9.93	3220	2.6		
	103	67	8.78	3090	1.8		
	122	56	7.39	2920	2.1		
	165	42	5.45	2640	2.4		
	24	285	58.09	6000	1.1		
	28	246	50.02	6000	1.2		
	32	215	43.75	6000	1.4		
	36	190	38.73	6000	1.6		
	40	170	34.62	5860	1.8	*FRC 03 IEC80*	*802-4 B14a*
	49	139	28.30	5480	2.2		
	64	107	21.78	5020	2.6		
	81	85	17.33	4660	3.3		
	93	74	15.06	4440	3.5		
	23	296	38.73	6000	1.0		
	26	264	34.62	6000	1.1		
	32	216	28.30	6000	1.4		
	41	166	21.78	5820	1.7		
	52	132	17.33	5400	2.1		
	60	115	15.06	5150	2.3	*FRC 03 IEC90*	*90S-6 B14a*
	73	95	12.37	4820	2.8		
	88	79	10.28	4530	3.1		
	113	61	7.93	4160	3.0		
	143	48	6.31	3850	3.7		
	164	42	5.48	3670	3.6		
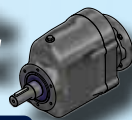
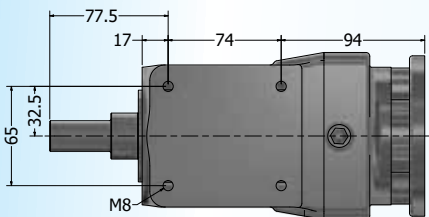| P_{1n} [kW]	N_2 min^{-1}	M_{2n} [Nm]	i	F_{r2} [N]	f_S		
1.1	96	105	14.62	1900	1.1		
	118	86	11.90	1770	1.4		
	143	71	9.81	1660	1.7		
	153	66	9.17	1630	1.2	*FRC 01 IEC90*	*90S-4 B14a*
	181	56	7.72	1540	1.4		
	246	41	5.69	1390	1.7		
	302	33	4.63	1290	2.1		
	366	28	3.82	1210	2.5		
	92	110	9.81	1930	1.1		
	158	64	5.69	1610	1.1	*FRC 01 IEC90*	*90L-6 B14a*
	194	52	4.63	1500	1.3		
	236	43	3.82	1410	1.6		
	59	172	23.85	3730	1.2		
	70	145	20.08	3520	1.4		
	95	107	14.81	3180	1.9		
	106	95	13.21	3060	1.5		
	116	87	12.05	2970	2.3		
	141	72	9.93	2780	2.8	*FRC 02 IEC90*	*90S-4 B14a*
	159	63	8.78	2670	1.9		
	189	53	7.39	2520	2.3		
	257	39	5.45	2280	2.5		
	316	32	4.43	2120	3.1		
	383	26	3.66	1990	3.0		
	61	166	14.81	3680	1.2		
	75	135	12.05	3440	1.5		
	91	111	9.93	3220	1.8		
	103	98	8.78	3090	1.2	*FRC 02 IEC90*	*90L-6 B14a*
	122	83	7.39	2920	1.4		
	165	61	5.45	2640	1.6		
	203	50	4.43	2460	2.0		
	246	41	3.66	2310	2.0		
	36	279	38.73	6000	1.1		
	40	249	34.62	5860	1.2		
	49	204	28.30	5480	1.5		
	64	157	21.78	5020	1.8		
	81	125	17.33	4660	2.2		
	93	108	15.06	4440	2.4		
	113	89	12.37	4160	2.9	*FRC 03 IEC90*	*90S-4 B14a*
	136	74	10.28	3910	3.2		
	177	57	7.93	3590	3.2		
	222	45	6.31	3320	4.0		
	255	39	5.48	3170	3.8		
	311	32	4.50	2970	4.6		
	374	27	3.74	2790	5.6		
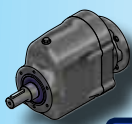
P$_{1n}$ [kW]	N$_2$ min^{-1}	M$_{2n}$ [Nm]	i	F$_{r2}$ [N]	f$_S$		
1.1	41	244	21.78	5820	1.1		
	52	194	17.33	5400	1.4		
	60	169	15.06	5150	1.5		
	73	139	12.37	4820	1.9		
	88	115	10.28	4530	2.1	*FRC 03 IEC90*	*90L-6 B14a*
	113	89	7.93	4160	2.0		
	143	71	6.31	3850	2.5		
	164	61	5.48	3670	2.4		
	200	50	4.50	3440	3.0		
	241	42	3.74	3230	3.6		
1.5	118	117	11.90	1770	1.0		
	143	96	9.81	1660	1.2		
	181	76	7.72	1540	1.1	*FRC 01 IEC90*	*90L-4 B14a*
	246	56	5.69	1390	1.3		
	302	45	4.63	1290	1.5		
	366	38	3.82	1210	1.9		
	95	145	14.81	3180	1.4		
	116	118	12.05	2970	1.7		
	141	98	9.93	2780	2.1		
	159	86	8.78	2670	1.4	*FRC 02 IEC90*	*90L-4 B14a*
	189	73	7.39	2520	1.7		
	257	54	5.45	2280	1.9		
	316	44	4.43	2120	2.3		
	383	36	3.66	1990	2.2		
	49	278	28.30	5480	1.1		
	64	214	21.78	5020	1.3		
	81	170	17.33	4660	1.6		
	93	148	15.06	4440	1.8		
	113	122	12.37	4160	2.1	*FRC 03 IEC90*	*90L-4 B14a*
	136	101	10.28	3910	2.4		
	177	78	7.93	3590	2.3		
	222	62	6.31	3320	2.9		
	255	54	5.48	3170	2.8		
	311	44	4.50	2970	3.4		
	374	37	3.74	2790	4.1		
	52	265	17.33	5400	1.1		
	60	230	15.06	5150	1.1		
	73	189	12.37	4820	1.4		
	88	157	10.28	4530	1.5		
	113	121	7.93	4160	1.5	*FRC 03 IEC100*	*100L1-6 B14a*
	143	96	6.31	3850	1.9		
	164	84	5.48	3670	1.8		
	200	69	4.50	3440	2.2		
	241	57	3.74	3230	2.6		
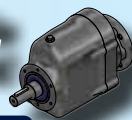
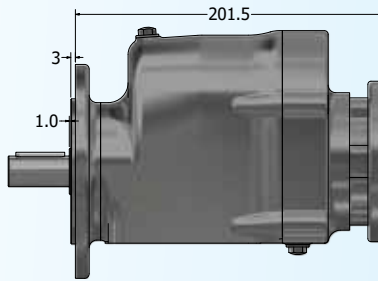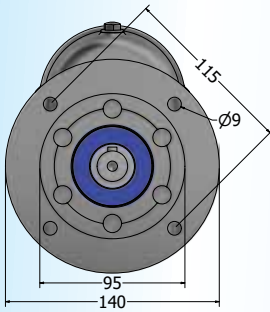| P₁n [kW]	N₂ min⁻¹	M₂n [Nm]	i	Fr2 [N]	fS		
2.2	81	250	17.33	4660	1.1	**FRC 03 IEC100**	**100L1-4 B14a**
	93	217	15.06	4440	1.2		
	113	178	12.37	4160	1.5		
	136	148	10.28	3910	1.6		
	177	114	7.93	3590	1.6		
	222	91	6.31	3320	2.0		
	255	79	5.48	3170	1.9		
	311	65	4.50	2970	2.3		
	374	54	3.74	2790	2.8		
	88	230	10.28	4530	1.0	**FRC 03 IEC112**	**112M2-6 B14a**
	113	178	7.93	4160	1.0		
	143	141	6.31	3850	1.3		
	164	123	5.48	3670	1.2		
	200	101	4.50	3440	1.5		
	241	84	3.74	3230	1.8		
3.0	113	243	12.37	4160	1.1	**FRC 03 IEC100**	**100L2-4 B14a**
	136	202	10.28	3910	1.2		
	177	156	7.93	3590	1.2		
	222	124	6.31	3320	1.5		
	255	108	5.48	3170	1.4		
	311	88	4.50	2970	1.7		
	374	73	3.74	2790	2.0		
4.0	222	165	6.31	3320	1.1	**FRC 03 IEC112**	**112M-4 B14a**
	255	144	5.48	3170	1.0		
	311	118	4.50	2970	1.3		
	374	98	3.74	2790	1.5		

DERTEC

FRC 01 IEC63B5 SA20
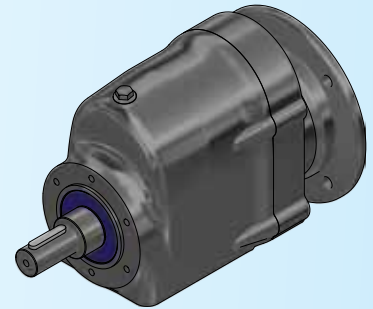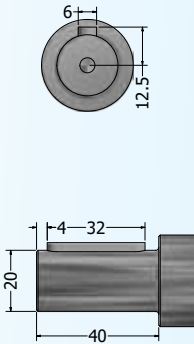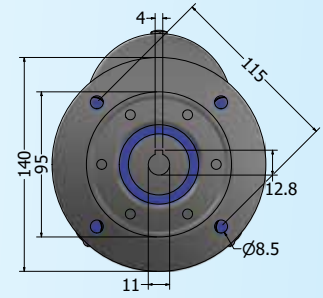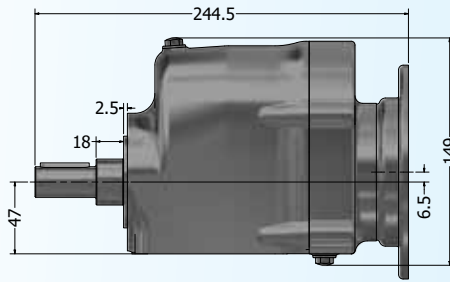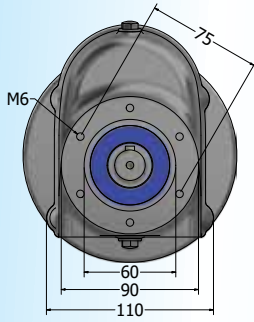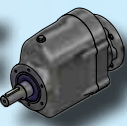

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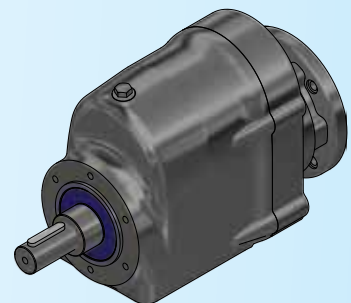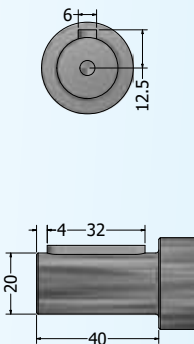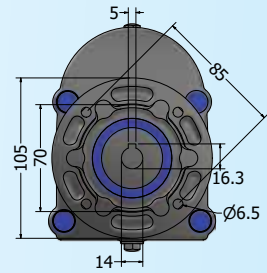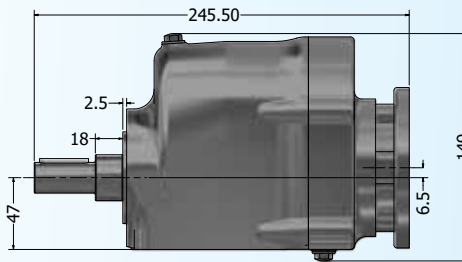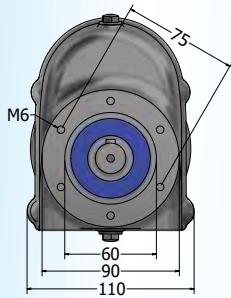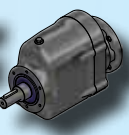
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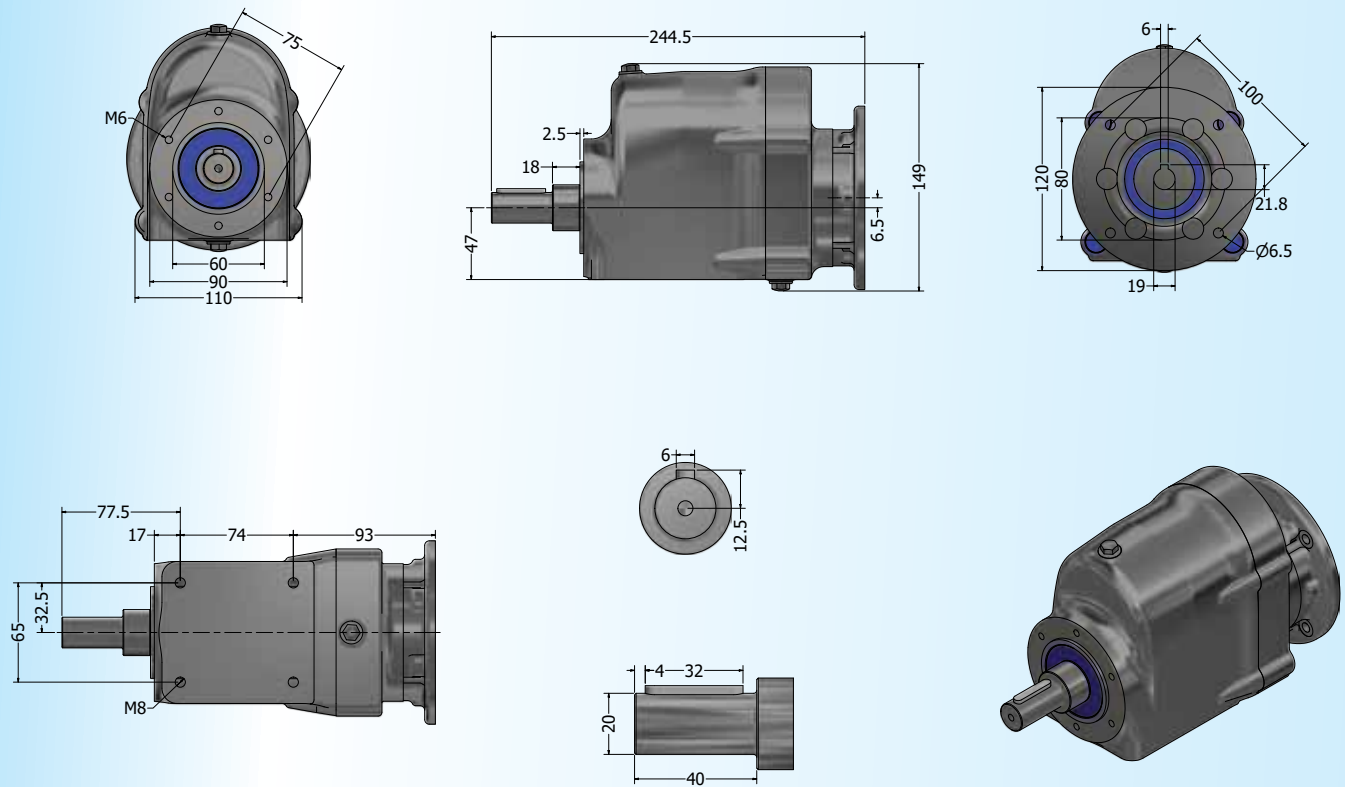
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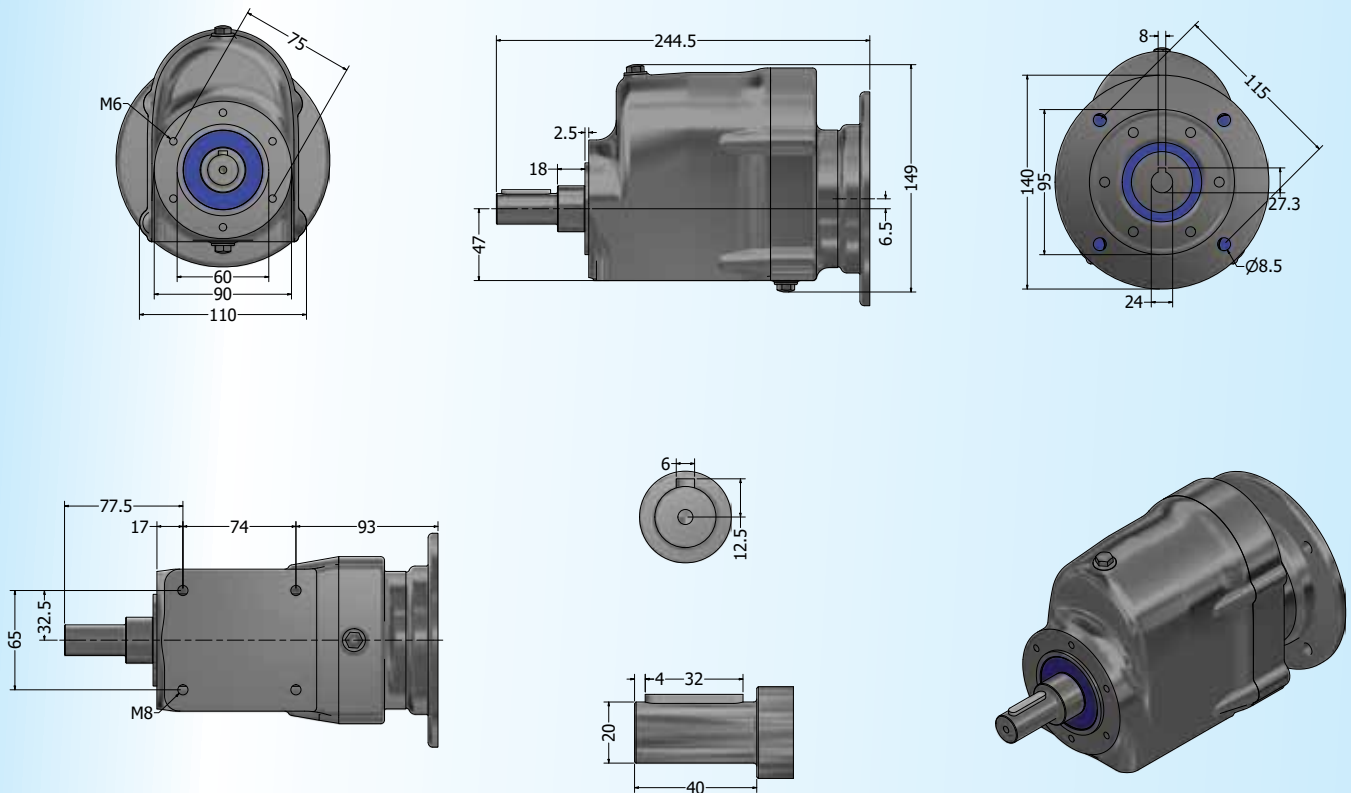
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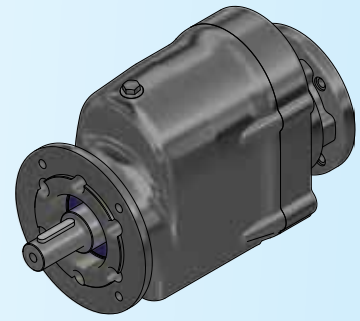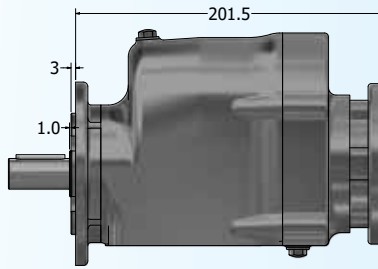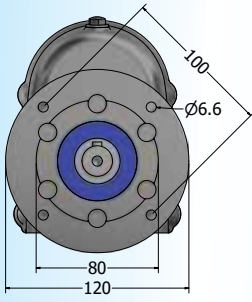
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Ø6.6
80
120

201.5
3
1.0

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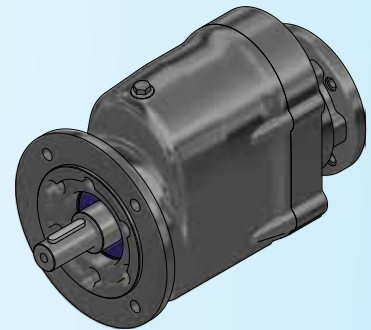
115
Ø9
95
140

201.5
3
1.0

FRC01 IEC71B14A SA20 G1

54   62   129.5
150
128
64
106
126
Ø9

FRC01 IEC71B14A SA20 M11

58   80   107.5
145
115
57.5
75
126
9   14

Mounting Positions

M1 / B3

M2 / V6

M6 / B7

M4 / V5

M5 / B6

M3 / B8

Terminal Box Positions

Pos.1
270°

Pos.2
180°

Pos.4
0°

Pos.3
90°
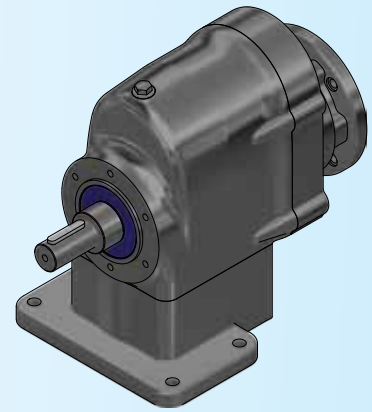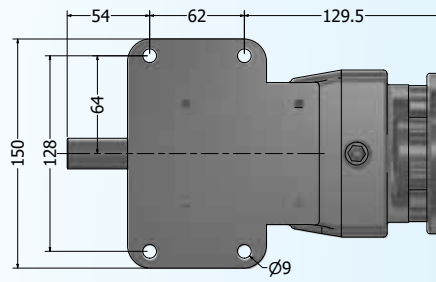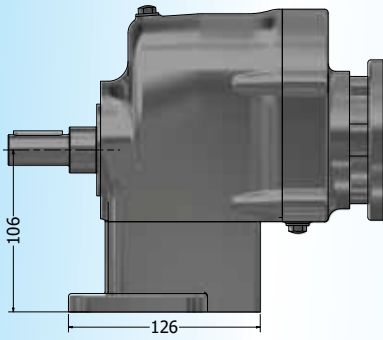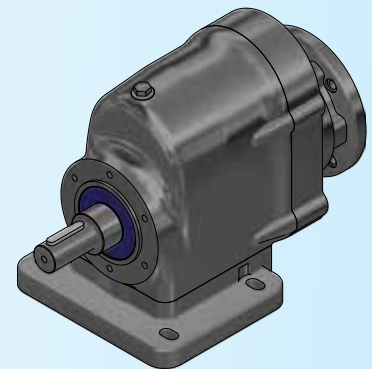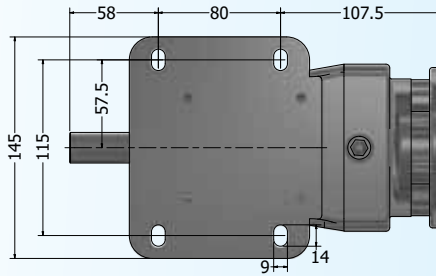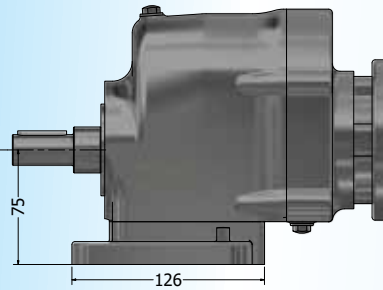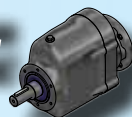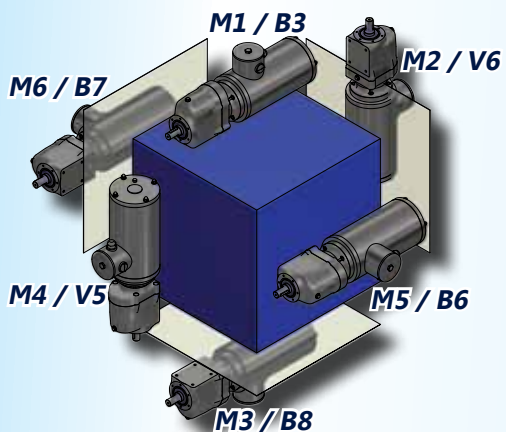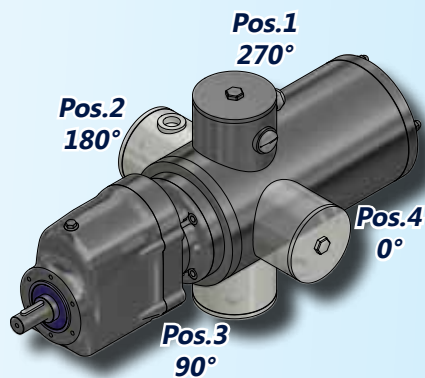
Lubrication Quantity

Oil Quantity in ML.	Mounting Position					
Gearbox	M1 (B3)	M3 (B8)	M6 (B7)	M5 (B6)	M4 (V5)	M2 (V6)
FRC 01	600	450	250	250	400	400
FRC 02 Under development	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
FRC 03 Under development	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

Lubrication Type

Gearbox	Oil Type	Temp. Range
FRC 01 FRC 02 FRC 03	Matrix Foodmax 460	-20°C ~ +40°C
	Castrol Optileb GT 460	-20°C ~ +40°C
	Bechem Berusynth 460 H1	-20°C ~ +40°C
	Shell Casida Fluid GL460	-20°C ~ +40°C
	Mobil SHC Cibus 460	-20°C ~ +40°C

Weight

Gearbox	Weight
FRC 01	9 Kg.
FRC 02	x
FRC 03	x

Maintenance

*For maintenance instructions
please see our maintenance manual on page ....*

Positioning of the debreather

M1 / B3

M3 / B8

M5 / B6

M6 / B7

M4 / V5

M2 / V6